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2012 FORD Fusion Energi OEM Service and Repair Workshop Manual

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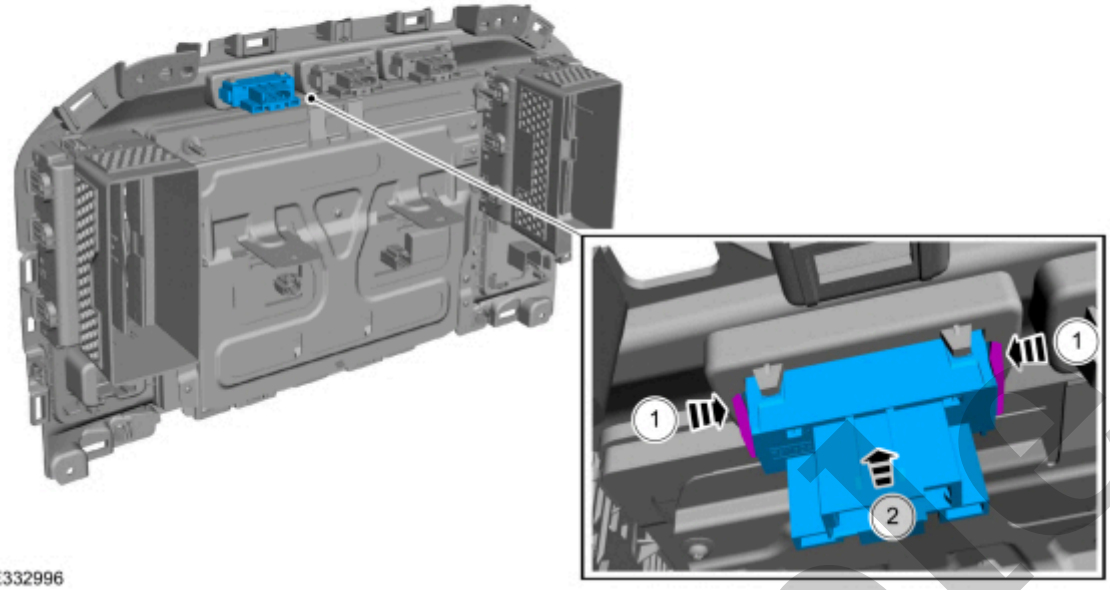

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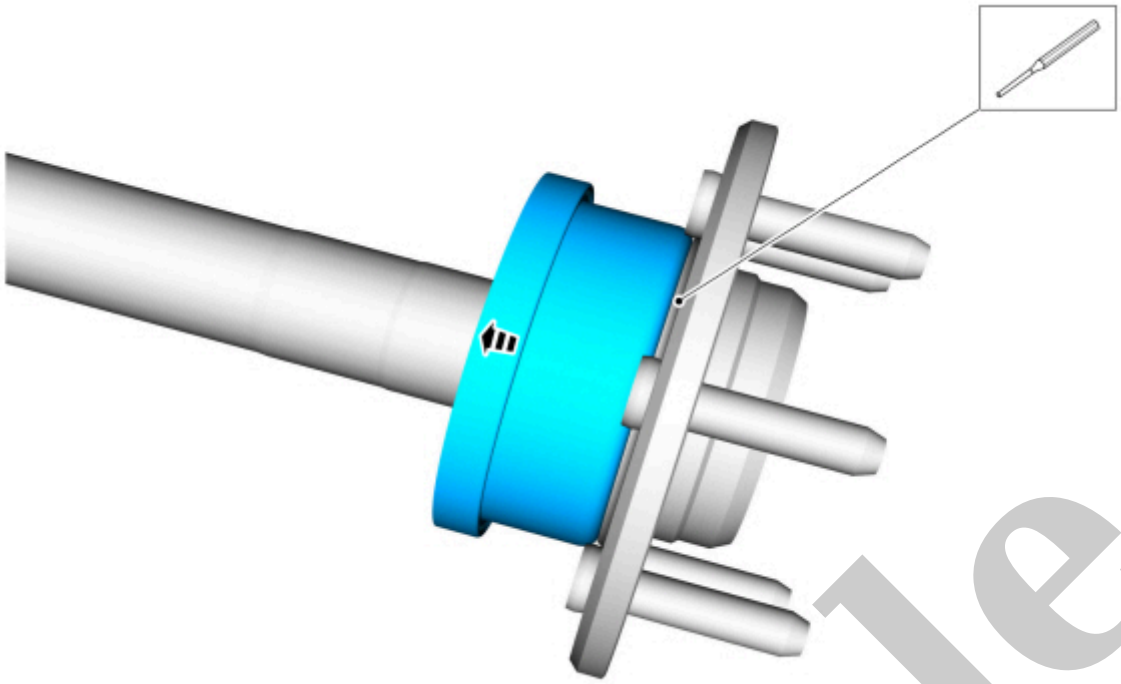
Click here to learn about symbols, color coding, and icons used in this manual.

Installation

1. To install, reverse the removal procedure.



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Click here to learn about symbols, color coding, and icons used in this manual.

Installation

1. Using a hydraulic press and wooden blocks, install the wheel speed sensor ring.

   Use the General Equipment: Hydraulic Press

   Use the General Equipment: Wooden Block

Auxiliary Brake System - Overview

206-10 Auxiliary Brake System	***2022 F-150***
Description and Operation	***Procedure revision date: 11/13/2014***

Auxiliary Brake System - Overview

Trailer Brake Control

The trailer brake system uses an Electronic Control Unit (ECU) called the TBM (trailer brake control module) to provide variable braking power to the electric-actuated brakes on a towed trailer (1 to 4 axles only). The braking energy provided to the trailer is modulated with a PWM (pulse width modulation) signal that varies between 0 volt and battery voltage, the higher the duty cycle the more braking power available.

1	IPC (instrument panel cluster)
2	GWM (gateway module A)
3	ITBM
4	BCM (body control module)
5	PCM (powertrain control module)
6	ABS (anti-lock brake system)
7	Trailer Tow Connector
8	Gain Buttons
9	Manual Slider Switch
10	Trailer Brake Switch
11	BPP (brake pedal position)

Network Message Chart

TBM (trailer brake control module) Network Input Messages

Broadcast Message	Originating Module	Message Purpose
ABS (anti-lock brake system) active	ABS (anti-lock brake system) Module	When the TBM (trailer brake control module) receives this message, it adjusts the PWM (pulse width modulation) signal sent to the trailer brakes to aid in the ABS (anti-lock brake system) event.
ABS (anti-lock brake system) fault	ABS (anti-lock brake system) Module	Alerts the TBM (trailer brake control module) of possible system failures in the ABS (anti-lock brake system) .
Brake on / off switch	PCM (powertrain control module)	Used to inform the TBM (trailer brake control module) the driver has pressed the brake pedal. The TBM (trailer brake control module) uses this message to activate the trailer brakes.

trailer tow connector C4099.

When not braking the TBM (trailer brake control module) sends a voltage pulse to pin 3 of the trailer tow connector to determine if a trailer is connected to the trailer tow connector.

TBM (trailer brake control module) Message Center

The TBM (trailer brake control module) continually monitors the trailer brake system operation and trailer connectivity. The TBM (trailer brake control module) sends system operation information such as gain setting and relative braking power to the IPC (instrument panel cluster) along the HS-CAN3 (high-speed controller area network 3) . If a system fault or a trailer connectivity issue is detected. The GWM (gateway module A) sends this message to the IPC (instrument panel cluster) along the HS-CAN3 (high-speed controller area network 3) . When the IPC (instrument panel cluster) receives a trailer brake message from the GWM (gateway module A) , one or more of the following messages is displayed in the message center:

- **TRAILER CONNECTED**

  – Displays when the TBM (trailer brake control module) detects a correct trailer wiring connection during the current ignition cycle.

- **TRAILER DISCONNECTED**

  – Displays when the TBM (trailer brake control module) detects a trailer connection and then a disconnection, either intentional or unintentional, during the current ignition cycle, the display is accompanied by a single audible chime. This message also displays if a vehicle or trailer-wiring fault occurs causing the trailer to appear disconnected, or if the manual slider switch is activated without a trailer connected.

- **TRAILER BRAKE MODULE FAULT**

  – Displays in response to Diagnostic Trouble Codes (DTCs) reported by the TBM (trailer brake control module) , accompanied by a single audible chime. When this message appears, the system may still function, but performance may be degraded.

- **WIRING FAULT ON TRAILER**

  – Displays when there is a short circuit on the TBM (trailer brake control module) PWM (pulse width modulation) output signal circuit. If the message is displayed and accompanied by a single audible chime, without a trailer connected, the concern is in the vehicle wiring. If the message only displays with a trailer connected, the concern is in the trailer wiring.

- **TBC GAIN = XX.X NO TRAILER**

  – Shows the current gain setting for the current ignition cycle and when adjusting the gain. This message also displays if the manual slider switch or gain buttons are used without a trailer connected.

Component Description

Auxiliary Brake System

206-10 Auxiliary Brake System	***2022 F-150***
Diagnosis and Testing	***Procedure revision date: 08/26/2022***

Auxiliary Brake System

Diagnostic Trouble Code (DTC) Chart

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.

REFER to: Diagnostic Methods

(100-00 General Information, Description and Operation).

Diagnostic Trouble Code Chart

Module	DTC (diagnostic trouble code)	Description	Action
BCMC (body control module C)	C0040:08	Brake Pedal Switch 'A': Bus Signal/Message Failures	GO to Pinpoint Test L
BCMC (body control module C)	C0040:11	Brake Pedal Switch 'A': Circuit Short To Ground	GO to Pinpoint Test L
BCMC (body control module C)	C0040:16	Brake Pedal Switch 'A': Circuit Voltage Below Threshold	GO to Pinpoint Test L
BCMC (body control module C)	C0040:17	Brake Pedal Switch 'A': Circuit Voltage Above Threshold	GO to Pinpoint Test L
TRM (trailer module)	B148A:11	Trailer Brake Output: Circuit Short To Ground	GO to Pinpoint Test

Global Customer Symptom Code (GCSC) Chart

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.

REFER to: Diagnostic Methods

(100-00 General Information, Description and Operation).

Global Customer Symptom Code Chart

Customer Symptom	Action
Driver Aid & Information > Warning Indicators/Messages/Chimes > Trailer/Towing > Inoperative	GO to Pinpoint Test A
Driver Aid & Information > Warning Indicators/Messages/Chimes > Trailer/Towing > Inoperative	GO to Pinpoint Test E
Driver Aid & Information > Warning Indicators/Messages/Chimes > Trailer/Towing > Inoperative	GO to Pinpoint Test F
Driver Aid & Information > Warning Indicators/Messages/Chimes > Trailer/Towing > Stays On	GO to Pinpoint Test C
Stop/Steer/Ride > Stopping > Performance/Effectiveness > While Towing	GO to Pinpoint Test A
Stop/Steer/Ride > Stopping > Performance/Effectiveness > While Towing	GO to Pinpoint Test B

Symptom Charts

Symptom Chart: Trailer Brake System

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.

REFER to: Diagnostic Methods

(100-00 General Information, Description and Operation).

Symptom Chart

Condition	Actions
The trailer brakes are inoperative	GO to Pinpoint Test

Pinpoint Tests

PINPOINT TEST A : THE TRAILER BRAKES ARE INOPERATIVE

Refer to Wiring Diagrams Cell 95for schematic and connector information.

Normal Operation and Fault Conditions The braking energy provided to the trailer is modulated with a PWM (pulse width modulation) signal which varies between 0 volt and battery voltage, according to the TRM (trailer module) gain setting, the higher the duty cycle the more braking power available. The TRM (trailer module) varies the PWM (pulse width modulation) signal based on various inputs such as vehicle speed, the brake torque message, BPP (brake pedal position) switch input, the manual slider switch and the gain buttons. With the vehicle stationary and with the manual slider switch fully to the left with a gain of 10, there should be more than 11 volts supplied to the trailer tow connector. Without a trailer connected, the TRM (trailer module) sends a voltage pulse to the trailer tow connector every 4 seconds as a trailer connectivity test. An open circuit or short to ground in the PWM (pulse width modulation) signal circuit, an open or short to ground in the TRM (trailer module) BPP (brake pedal position) switch circuit, damaged or corroded connectors, open fuses, an internal failure of the TRM (trailer module) , an open or short to ground in the trailer wiring can all prevent the trailer brakes from operating. The trailer brake system only works with electric-magnet actuated drum type brakes and electric over hydraulic brakes. If the trailer is equipped with a different style of brakes or if the trailer is not equipped with brakes, the system does not function. REFER to: Auxiliary Brake System - System Operation and Component Description (206-10 Auxiliary Brake System, Description and Operation).

Possible Sources

- Fuse
- Wiring, terminals or connectors
- TRM (trailer module)
- Trailer

Visual Inspection and Pre-checks

- Make sure BCMC (body control module C) fuse 42 (30A) is OK.
- Make sure BCM (body control module) fuse 21 (5A) is OK.
- Make sure the trailer brakes are electric-magnet actuated drum type brakes.

NOTICE

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

A1 CHECK FOR BCM (BODY CONTROL MODULE) DIAGNOSTIC TROUBLE CODES (DTCS)

NOTE

- Using a diagnostic scan tool, carry out the TRM (trailer module) self-test.

Does the TRM (trailer module) communicate with the diagnostic scan tool?

Yes	If there are Diagnostic Trouble Codes (DTCs) in the TRM (trailer module) , DIAGNOSE all TRM (trailer module) Diagnostic Trouble Codes (DTCs). GO to the DTC (diagnostic trouble code) Chart: TRM (trailer module) . If there are no Diagnostic Trouble Codes (DTCs) in the TRM (trailer module) , GO to A4

No	DIAGNOSE the TRM (trailer module) does not communicate with the diagnostic scan tool.

A4 CHECK THE BCM (BODY CONTROL MODULE) BRK_PDL_SW2 PID (PARAMETER IDENTIFICATION)

- Using a diagnostic scan tool,
  Access the BCM (body control module) and monitor the BRK_PDL_SW2 (Brake Pedal Switch 2) PID (parameter identification)

Does the BRK_PDL_SW2 () PID display ACTIVE with the brake pedal pressed and INACTIVE with the brake pedal released?

Yes	GO to A5

No	DIAGNOSE the vehicle stoplamps. REFER to: Stoplamps (417-01 Exterior Lighting, Diagnosis and Testing).

A5 CHECK THE TRM (TRAILER MODULE) BRK_PDL_SW PID (PARAMETER IDENTIFICATION)

- Using a diagnostic scan tool,
  Access the TRM (trailer module) and monitor the BRK_PDL_SW (Brake Pedal Switch) PID (parameter identification)

Does the BRK_PDL_SW PID (parameter identification) display ACTIVE with the brake pedal pressed and INACTIVE with the brake pedal released?

Yes	GO to A6