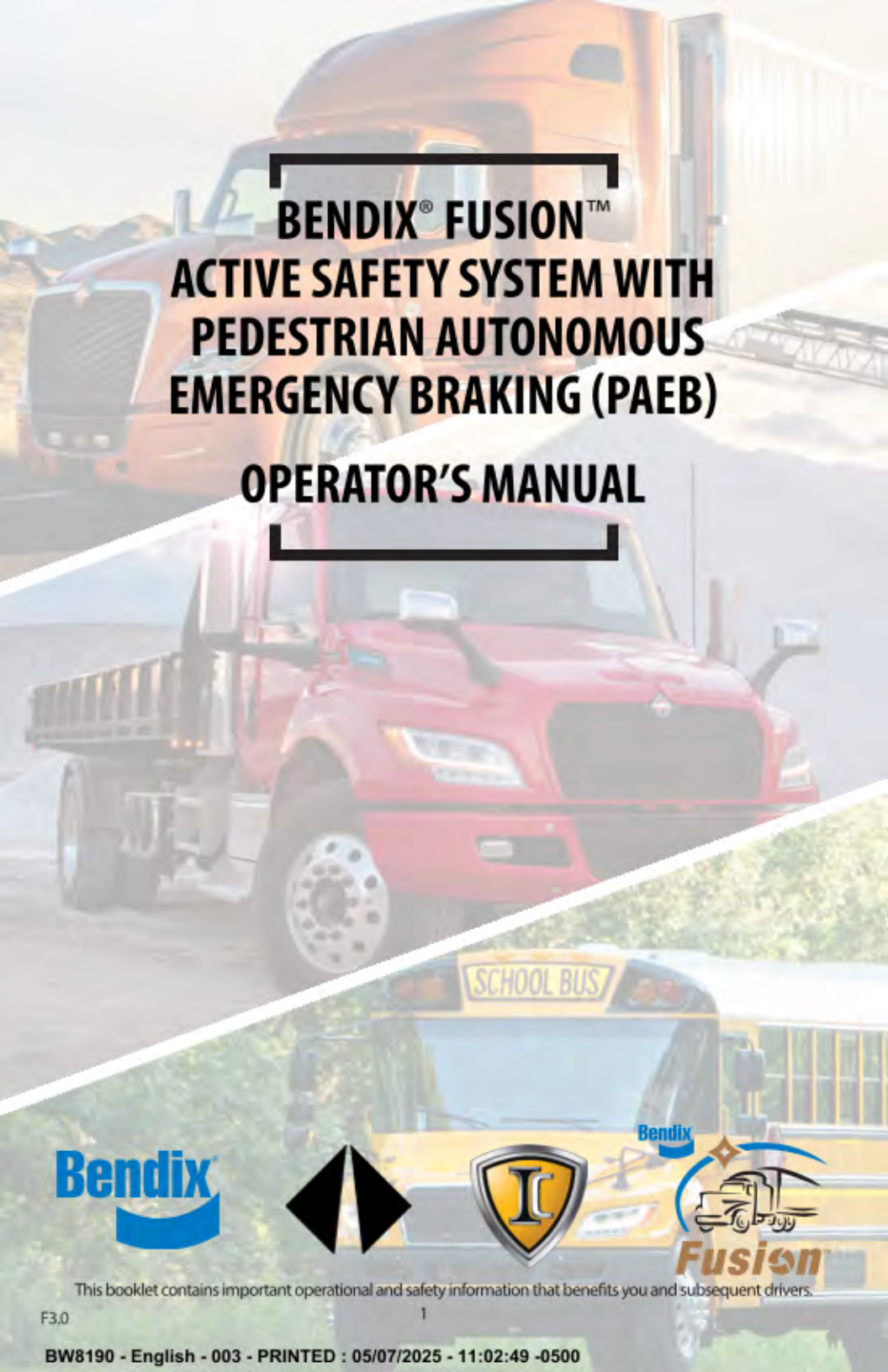
BENDIX® FUSION™ ACTIVE SAFETY SYSTEM WITH PEDESTRIAN AUTONOMOUS EMERGENCY BRAKING (PAEB)

OPERATOR'S MANUAL



This booklet contains important operational and safety information that benefits you and subsequent drivers.

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THE BENDIX® ESP® STABILITY SYSTEM

All vehicles equipped with the Bendix® Fusion™ system are also equipped with the Bendix® Electronic Stability Program (ESP®) full-stability system. When necessary, the Bendix ESP system may automatically reduce the accelerator pedal input and/or apply the service brakes to help you maintain stability during potential loss-of-control or rollover events.

The Fusion system uses the ESP system to help maintain vehicle stability during service brake applications. The stability icon will be visible on the dash when the ESP system activates.

The Bendix ESP stability system and the Fusion system do not replace the need for you to remain alert, react appropriately and in a timely manner, and use safe driving practices. Bendix safety technologies complement safe driving practices. Responsibility for the safe operation of the vehicle remains with you, the driver, at all times.

⚠ WARNING

Improper use of the Bendix ESP and Bendix Fusion system can result in a collision causing property damage, serious injuries, or death. Be sure to read, understand, and follow all these instructions carefully.

⚠ WARNING

Bendix safety technologies complement safe driving practices. No commercial vehicle safety technology replaces a skilled, alert driver exercising safe driving techniques and proactive, comprehensive driver training. Responsibility for the safe operation of the vehicle remains with the driver at all times.

⚠ IMPORTANT

Bendix®-brand Electronic Control Units (ECUs) are not designed to store data for purposes of accident reconstruction, and Bendix® ACom® Diagnostic Software is not intended to retrieve data for purposes of accident reconstruction. Bendix makes no representations as to the accuracy of data or video retrieved and interpreted from ECUs for purposes of accident reconstruction. Bendix does not offer accident reconstruction services or interpretation of stored data. Bendix ECUs are not protected from fire, loss of power, impact damage, or other conditions that may be sustained in a crash situation and may cause data to be unavailable or irretrievable.

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IMPORTANT FEATURE INFORMATION

New Functionalities Added: This version of the Bendix® Fusion™ system includes three (3) new functionalities: Pedestrian Autonomous Emergency Braking (PAEB), Pedestrian Brake Hold, and High Beam Assist (HBA). This Operator's Manual informs you how these features work. Since this version of the Bendix Fusion system uses a new camera, differences in traditional features like Autonomous Emergency Braking (AEB), Lane Departure Warning (LDW), Overspeed Alert and Action (OAA), and Highway Departure Warning/Braking (HDW/HDB) exist and may or may not be noticed by the driver.

INTRODUCTION

This Operator's Manual provides an overview of the Bendix® Fusion™ Active Safety System with Pedestrian Autonomous Emergency Braking (PAEB). This manual explains the components, features, functions, and known system limitations. There are also example descriptions and explanations of the audio and visual alerts and system interventions that can be expected during operation.



Figure 1 - System Initializing

Read this manual thoroughly before operating the system. Be familiar with the possible system actions, alerts, and its limitations.

Keep this manual in the vehicle as a reference at all times. *See Figure 1* for an example of the messages you may see on the integrated display when the Fusion system is initializing.

Additional Information about Bendix® Systems

For additional information about Bendix® systems, contact your local sales representative, visit B2Bendix.com, or call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725). Representatives are available to assist you Monday through Thursday, 8:00 a.m. to 6:00 p.m. and Friday, 8:00 a.m. to 5:00 p.m. ET.

NOTE: All of these alerts and actions are part of the Fusion system's feature set released by Bendix. It is possible for this Operator's Manual to be moved from vehicle to vehicle. Always verify the features that are included on your vehicle with your dealer or OEM.

Information about features, operation, and other aspects discussed in this manual is subject to change and updating, and are posted on the document library located at B2Bendix.com.

IMPORTANT SAFETY INFORMATION

As a driver, you are always responsible for the control and safe operation of the vehicle at all times. The Bendix® Fusion™ system does not replace the need for a skilled, alert professional driver, reacting appropriately and in a timely manner, and using safe driving practices.

If you determine that a hazard or unsafe condition exists, you should take all necessary actions immediately. Never wait for the Fusion system to intervene.

Due to the inherent limitations of image recognition technology, camera-based safety technology may not be able to detect or may misinterpret lane markings, vehicles, or other objects and may have limited visibility at night. At these times, alerts may not occur, or erroneous alerts may occur.

The Fusion system may react ONLY to vehicles that the system determines are stationary or moving in the same direction as your vehicle. The system DOES NOT respond to side-to-side moving traffic, or oncoming traffic. The system will not slow your vehicle or provide an alert as you approach vehicles in these circumstances. *See Figure 2.*

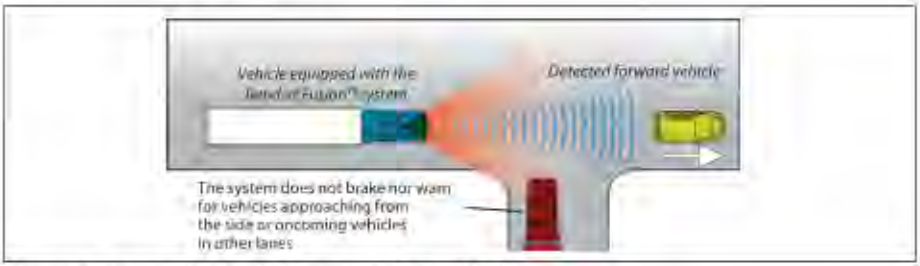


Figure 2 – Oncoming or Side-approaching Vehicles

When the Fusion system needs to intervene, it works in conjunction with the Bendix® Electronic Stability Program (ESP®) full-stability system to activate the service brakes. The system should never be relied upon to stop your vehicle or to avoid a collision. You can, and should, still apply full service braking force, if needed.

The ESP system is specifically calibrated and validated only for your vehicle's original configuration. If the vehicle's chassis components are altered (for example, a wheel base extension or reduction; tag axle addition or removal; a major body change such as conversion of a tractor into a truck; or an axle, suspension, or steering system component modification), the ESP Electronic Control Unit (ECU) must be updated to reflect these changes. Contact your OEM prior to making any modifications to your vehicle.

If you modify your vehicle and do not update the ESP ECU, the ESP system may fail to function as intended. Serious vehicle braking and performance issues could result, including unnecessary ESP system interventions, exceeding regulated stopping distance, and/or system faults leading to loss of system functions. These types of failures can lead to loss-of-control of the vehicle and/or collisions causing property damage, serious injuries, or death.

Potential False Alerts – The Bendix® Fusion™ system may generate a false alert or false braking. Radar and camera technology has limitations and false alerts or false braking sometimes occur.

The Fusion system DOES NOT respond to stationary objects. The system will not slow your vehicle or provide an alert as you approach stationary objects.

Animals, Non-Metallic, or Limited-Metallic Objects – The Fusion system will not warn or react to animals, or non-metallic objects. The system may not warn or react to limited-metallic objects (such as recreational vehicles, horse-drawn buggies, motorcycles, logging trailers, etc.).

The Pedestrian Autonomous Emergency Braking (PAEB) feature can only detect pedestrians in the path of the host vehicle and it is important to note that pedestrians are not instantly detectable, nor are they always detectable. The system may not react to objects including pedestrians outside the vehicle's path.

The system should never be relied upon to stop your vehicle or to avoid a collision. You can, and should, still apply full braking force, if needed.

Metallic objects may impair the radar. Objects that are radar-reflective – such as crash barriers, guard rails, construction zone barricades, and tunnel entrances – may impair the function of the radar.

Approach grades as you would normally, with the appropriate gear selected and at a safe speed. Active Cruise with Braking (ACB) SHOULD NOT be used on steep downhill grades. Follow all safe driving practices.

Inspect the radar and mounting bracket regularly and remove any mud, snow, ice build-up, debris, or other obstructions that may be blocking the radar. Installing aftermarket deer, bumper, or grille guards is not recommended and could impair the operation of the radar.

If the bumper and/or radar are damaged or misaligned – or if the radar was tampered with – do not use ACB until the vehicle is repaired.

If a problem is detected with the Fusion system, there is an audible alert and/or an icon on the display. Depending on the type of problem, the system may disable ACB functions or other safety functionality until service is performed.

Smaller forward vehicles – such as motorcycles and certain types of trailers – may be difficult for the system to identify. As the driver, it is your responsibility to be aware of these types of vehicles, to be cautious, and to slow down if necessary.

As the driver, you are always responsible for the safe operation of the vehicle and you should be aware of potential threats that may enter the vehicle's lane of travel. As the driver, you should always be alert and ready to intervene.

Service Brake Hold is not a parking brake. After any Bendix safety system braking that brings the vehicle to a complete stop, you, the driver, must intervene. As the driver, you should use caution and manually apply the parking brake as needed.

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SYSTEM COMPONENTS

See Figure 3. The main Bendix® components used in the Bendix® Fusion™ system are the Bendix® Electronic Stability Program (ESP®) controller; the Bendix® radar; and the Bendix™ camera.



Figure 3 – System Components

The Fusion system may detect and monitor moving and stationary vehicles within its field of view. The radar is located at the front of the vehicle. The camera is located on the windshield, inside the wiper path.

If the radar or camera becomes misaligned – or any other system problem is detected – a message (or light) on the display lets you know that service is needed.

SYSTEM DISPLAY

Driver information about the Fusion system is fully integrated into the vehicle display. *See the System Features section of this manual* for more detailed information about the alerts.

Please verify with the vehicle OEM for the actual audible and visual indications your vehicle may display.

SYSTEM FEATURES

NOTE: You should check with the vehicle OEM to verify which features are included on your vehicle.

IMPORTANT FEATURE INFORMATION: DRIVER OVERRIDE

Some driver actions can override Bendix™ Fusion™ system activations. Once an Active Cruise with Braking (ACB) or Autonomous Emergency Braking (AEB) event has started, you, the driver, can override its activation. Refer to each specific feature section of this Operator's Manual for overrides specific to that feature.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

Active Cruise with Braking (ACB)

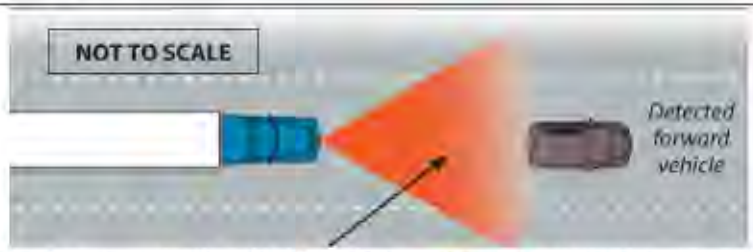
NOTE: The term ACC (Adaptive Cruise Control) may be used instead of – or interchanged with – ACB.

When normal cruise control is on and set, the ACB feature also becomes available. The system may not only intervene to maintain the ACB set speed, but also may potentially intervene – if needed – to maintain a set following distance behind the detected forward vehicle in front of you.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

NOTE: You, the driver, can override an ACB system intervention by applying the accelerator pedal. ACB will be overridden until the accelerator is released; then, ACB will resume the original set speed and distance control automatically.

When you encounter a detected forward vehicle that slows down below the ACB set speed, the system has the ability to automatically activate the engine retarder and apply the service brakes – if needed – in order to maintain the distance between you and the forward vehicle. The following distance may be adjustable on some vehicles. *See Figure 4.*



The **shaded** area approximates the field of view of the Fusion system. Detected forward vehicles in this area may generate an alert or braking by the system.

Figure 4 – ACB Example

Auto-Resume™ after Active Cruise with Braking (ACB)

If Active Cruise with Braking (ACB) is on and set, the Bendix® Fusion™ system may automatically apply the service brakes during an ACB braking event in order to maintain the distance between your truck and the detected forward vehicle. If your vehicle remains above the minimum ACB set speed as defined by the OEM, your vehicle may automatically accelerate back up to the ACB set speed while still attempting to maintain the set following distance with the forward vehicle. If your vehicle is below the minimum defined ACB set speed, ACB may automatically cancel and will not attempt to adjust the vehicle speed.

NOTE: Vehicles equipped with ACB Stop and Auto-Go™ do not have a minimum defined speed and may auto-resume at very low speeds.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

Canceling ACB

NOTE: At any time, you, the driver, can step on the brake pedal or turn ACB off via the switch to cancel the ACB feature.

Figure 5 shows an integrated display message you may see when ACB is actively engaged and maintaining a set following distance behind the detected forward vehicle.



Figure 5 – ACB Actively Engaged and Maintaining Set Following Distance

Additionally, *Figure 6* shows a message you may see on the integrated display when the ACB function cancels, and the ACB feature is available for you, the driver, to re-engage.



Figure 6 – ACB Canceled, Auto-Resume Available

If your vehicle speed is below the OEM-defined minimum speed for AEB operation, the ACB display may be blank. Alerts and messages will come from the OEM display.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

NOTE: The term CMS (Collision Mitigation System) may be used instead of – or interchanged with – AEB.

Active Cruise with Braking (ACB) Stop and Driver-Go™

NOTE: This feature only applies to vehicles equipped with Active Cruise with Braking (ACB) Stop and Driver-Go™.

When ACB is on and set, if the detected forward vehicle slows down to a stop, the system may automatically de-throttle the engine, activate the engine retarder, and apply the service brakes to bring your vehicle to a full stop. You, the driver, can resume ACB by pressing down on the throttle. The vehicle will accelerate back up to the previous ACB set speed while maintaining the distance between your truck and the detected forward vehicle. *Figure 7* shows a message you may see on the integrated display when the ACB function is actively engaged.



Figure 7 – ACB Actively Engaged

If you do not press down on the throttle within a few seconds, the service brakes will hold the vehicle at a stop until you, the driver, intervene.

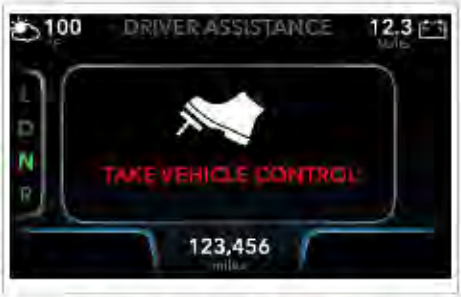


Figure 8 – ACB Canceled - Take Vehicle Control

NOTE: You, the driver, can press the brake pedal, apply the parking brake, or you can manually accelerate the vehicle by pressing down on the accelerator pedal.

When the vehicle reaches the minimum ACB set speed defined by the OEM, you can press the resume button to accelerate back up to the previous ACB set speed.

Figure 8 shows a message you may see on the integrated display when the ACB Stop and Driver-Go function cancels and you, the driver, must intervene. Alerts and messages will come from the OEM display.

Please verify with the vehicle OEM for the actual audible and visual indications your vehicle may display.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

Active Cruise with Braking (ACB) Stop and Auto-Go™

NOTE: Certain vehicles with certain engine/powertrain combinations, may be equipped with Active Cruise with Braking (ACB) Stop & Auto-Go™ functionality. Under certain circumstances, after a normal ACB stop, ACB Stop & Auto-Go may automatically accelerate the vehicle up to the previous ACB set speed without additional driver input while also attempting to maintain the set following distance between your vehicle and the detected forward vehicle.

After a normal ACB stop, the service brakes may hold the vehicle at a stop (*refer to the Service Brake Hold section of this document*). If the detected forward vehicle moves forward within a few seconds and a pedestrian is not detected, your vehicle may accelerate back up to the previous ACB set speed while attempting to maintain the set following distance between your vehicle and the detected forward vehicle. *See Figure 9.*



Figure 9 – ACB Actively Engaged

The Bendix® Fusion™ system may react to detected pedestrians in the vehicle path during ACB Stop and Auto-Go. The Fusion system can only detect pedestrians in the vehicle's path and it is important to note that pedestrians are not instantly detectable.



Figure 10 – ACB Canceled - Take Vehicle Control

When the vehicle comes to a complete stop in ACB, and the system detects a pedestrian between your vehicle and the detected forward vehicle, the service brakes may hold the vehicle at a stop (Service Brake Hold) until you, the driver, intervene.

NOTE: You, the driver, can intervene by pressing the accelerator pedal or the brake pedal or applying the parking brake.

Figure 10 shows an example of the message you may see on the integrated display when the ACB Stop and Auto-Go feature cancels after a pedestrian is detected, and you, the driver, must intervene. Alerts and messages will come from the OEM display.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

If the detected forward vehicle does not move forward within a few seconds and there is not a detected pedestrian, the driver may see a Paused Cruise Control message on the dash display. *See Figure 11*. The service brakes will hold the vehicle at a stop until you, the driver, intervene.



Figure 11 – Paused Cruise Control

NOTE: You, the driver, can intervene and cancel the system operation by pressing the brake pedal or applying the parking brake.

If the driver intervenes with the accelerator pedal or ACB resume button, the ACB feature will automatically re-engage and will accelerate back up to the ACB set speed. It should be noted that stepping on the brake will cancel ACB and the ACB resume function.

In addition to a pedestrian being detected while the vehicle is stopped, the ACB Stop and Auto-Go™ feature may also cancel and the Service Brake Hold may activate under any of the following circumstances:

- If the forward vehicle is no longer detected
- If the turn signal is activated
- If the hazard lights are activated
- If the steering system input indicates the vehicle is planning to turn

Passing a Vehicle / Changing Lanes

The accelerator pedal can be applied to pass a vehicle at any time while the ACB system is active.

When No Forward Vehicle is Present

When ACB is switched on and set and no forward vehicle is within range of the Bendix® Fusion™ system, the vehicle will use standard cruise control to help maintain the set speed.

The Detected Forward Vehicle Icon

When Active Cruise with Braking (ACB) is switched on and set, and a vehicle ahead of you is detected by the system, the detected forward vehicle icon on the vehicle display will illuminate. *See Figure 12.* This is an indication to you that the Bendix® Fusion™ system detected the forward vehicle, and the system may automatically intervene to help maintain the distance.



Figure 12 – Detected Forward Vehicle

What is Following Distance?

Following distance refers to the time gap – measured in seconds – between the vehicle equipped with the Fusion system and the detected vehicle ahead. The following distance between the two will vary based on the speeds of both vehicles. This physical distance is sometimes referred to as "headway."

Automatic Service Brake Applications

The vehicle automatically manages service braking priorities among the various Bendix® vehicle systems that automatically use the service brakes, such as the Bendix® Electronic Stability Program (ESP®), Bendix® Automatic Traction Control (ATC), Bendix® Antilock Braking System (ABS), and the Fusion system.

NOTE: Vehicle stability has priority over all other braking requests.

When Not to Use Active Cruise with Braking (ACB)

⚠ This vehicle's Active Cruise with Braking (ACB) system must only be used in the same conditions that are normally recommended for ACB systems that do not have active, adaptive, or predictive systems. **DO NOT** USE ACB IN THE FOLLOWING SITUATIONS:

Inclement Weather/Low Visibility Situations – Do not use ACB in inclement weather or low visibility conditions – such as rain, snow, smoke, fog, ice, or other severe weather conditions.	
Dense Traffic – Follow all safe driving practices.	
City/Local Roads – Follow all safe driving practices.	
Sharp Curves and Winding Roads – Do not use ACB when traveling sharply curved or winding roadways. CAUTION: Road curvature may impact the radar sensor's ability to detect forward vehicles in the same lane.	
Entrance or Exit Ramps – Follow all safe driving practices.	
Downhill Grades – Follow all safe driving practices.	
Construction Zones – Do not use ACB in construction zones.	
Off-Road – Do not use ACB in off-road conditions.	

Service Brake Hold

NOTE: The Service Brake Hold function is only available on vehicles equipped with ACB Stop and Auto-Go™ and ACB Stop and Driver-Go™.

If, as a result of the Bendix® Fusion™ system brake intervention, the vehicle comes to a full stop, the service brakes may hold the vehicle at a stop until you, the driver, intervene

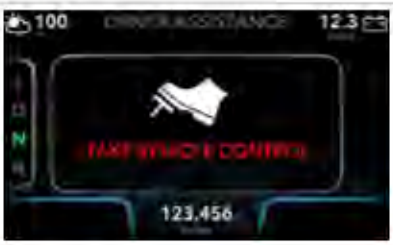


Figure 13 – Service Brake Hold

NOTE: The Service Brake Hold can be canceled if you, the driver, press the accelerator pedal or the brake pedal, or apply the parking brake. Service Brake Hold is not a parking brake and you must intervene.

If after a set period of time the driver does not respond, the integrated display may show a driver intervention request. *See Figure 13.*

If you choose to exit the vehicle, you are responsible for setting the parking brakes.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

Following Distance Alerts (FDA)

Following Distance Alerts (FDAs) are enabled above the minimum speed threshold and are independent of Active Cruise with Braking (ACB). FDAs are both audible and visual indications to you, the driver, whenever your vehicle is within the alert range of the detected forward vehicle.



Figure 14 - FDA

Once the audible alert is given, you should increase the distance between your vehicle and the forward vehicle until the audible alert stops.

The FDA is ready to alert you even when your truck is moving at low speeds. If the distance continues to decrease, you may hear and see more rapid alerts. *Figure 14* shows messages you may receive on the integrated display when the FDA is activated.



Figure 15 - Highest Level FDA and IA Alerts

When the FDA reaches its highest level, the beeping may be rapid and the display may show an additional visual alert. *Figure 15* shows messages you may see on the integrated display when the highest level FDA and Impact Alert (IA), or AEB alert, is activated.

NOTE: If you are following very close to the detected forward vehicle while your distance with the detected forward vehicle is also decreasing, the system may anticipate a potential collision and may activate the Impact Alert (IA) and may apply the vehicle brakes.

NOTE: You, the driver, should intervene to slow down, increase your following distance with the forward vehicle, or take other action as needed to address the potential collision.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

NOTE: The Bendix® Fusion™ system does not react (alert and/or brake) to all potential collision situations. The system also does not react to stationary objects. As the driver, you are responsible for the safe operation of the vehicle at all times. For more information on system limitations, *refer to BW8107, Challenging Scenarios, on B2Bendix.com or the section "Potentially Challenging Situations for the Bendix Fusion system"* in this Operator's Manual.

Impact Alert (IA) and Autonomous Emergency Braking (AEB)

Impact Alert (IA) is the most severe warning the Bendix® Fusion™ system can make. It can become active starting at low vehicle speeds, but can also change with different versions of Fusion. Contact your dealer for more information.

The alert indicates that a collision with the detected forward vehicle is likely, and **you should take immediate action** to potentially avoid – or lessen the severity of – the potential collision.

If you, the driver, do not address the potential forward collision, the Autonomous Emergency Braking (AEB) function may reduce throttle and automatically apply up to full service brakes on the tractor while pulsing air to the trailer brakes – if needed – to help mitigate or lessen the severity of the potential collision.

NOTE: As the driver, your actions can override any Fusion system actions. Once an AEB event has started, you, the driver, can override its activation by applying a signifcant change in accelerator or steering position during the initial stage of braking or by making a full throttle application. The system may respond with a warning and some braking before AEB is suppressed.

If, as a result of the Fusion system intervention, the vehicle comes to a full stop, the service brakes may hold the vehicle at a stop until you, the driver, intervene.

NOTE: You, the driver, can intervene by pressing the accelerator or brake pedal, or applying the parking brake.

Service Brake Hold is only available on vehicles equipped with ACB Stop and Auto-Go™ and ACB Stop and Driver-Go™.

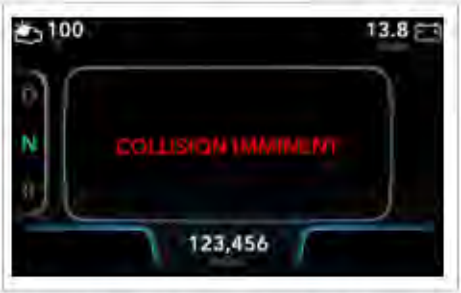


Figure 16 – AEB System Alert and Possible Autonomous Emergency Braking Applied

Figure 16 shows an example of the message you may see on the integrated display when the IA or AEB is activated.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

NOTE: The Bendix Fusion system does not react (alert and/or brake) to all potential collision situations. The system also does not react to stationary objects. For more information on system limitations, *refer to BW8107, Challenging Scenarios, on B2Bendix.com or the section "Potentially Challenging Situations for the Bendix Fusion system"* in this Operator's Manual.

Pedestrian Autonomous Emergency Braking (PAEB)

At low vehicle speeds, the Bendix® Fusion™ system may react to a detected pedestrian in the vehicle path and may provide an audible and visual alert from the OEM integrated display. In most applications, the Pedestrian Autonomous Emergency Braking (PAEB) feature is enabled at low vehicle speeds. The alert indicates that a collision with the pedestrian may be likely, and you should take immediate action to potentially avoid – or lessen the severity of – the potential collision.

If you, the driver, do not address the potential forward collision, the Fusion system may automatically apply up to full service brakes on the tractor while pulsing air to the trailer brakes – if needed – to help mitigate or lessen the severity of the potential collision.



Figure 17 – PAEB System Alert and Possible Autonomous Emergency Braking Applied

Figure 17 shows an example of the message you may see on the integrated display when the PAEB feature is activated. Please verify with the vehicle OEM for the actual audible and visual indications your vehicle may display.

If, as a result of the PAEB feature intervention, the vehicle comes to a full stop, the service brakes may hold the vehicle at a stop until you, the driver, intervene. Service Brake Hold is only available on vehicles equipped with ACB Stop and Auto-Go™ and ACB Stop and Driver-Go™. Service Brake Hold is not a parking brake and you must intervene. You, the driver, should manually set the parking brakes when exiting the vehicle.

NOTE: You, the driver, can intervene by pressing the accelerator or brake pedal, or applying the parking brake.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

Examples of Pedestrian Autonomous Emergency Braking (PAEB) Limitations

NOTE: As the driver, you are always responsible for the safe operation of the vehicle and you should be aware of potential threats that may enter the vehicle's lane of travel. As the driver, you should always be alert and ready to intervene.

The following conditions limit PAEB system performance:

- Not all pedestrians are instantly detectable and some may not be detectable at all.
- Pedestrians outside the camera's field of view are not detectable.
- In most applications, the PAEB feature is not available above 35 mph (56 kph).
- The vehicle is in reverse gear.
- The Bendix® Electronic Stability Program (ESP®)/Antilock Braking System (ABS) system in vehicle/trailer is not fully operational.
- There is an active fault in the radar or camera, or the Bendix ESP system.

Stationary Vehicle Braking (SVB)

When a potential collision with a stationary vehicle in your lane of travel is detected, the system may sound an alert before braking. If you, the driver, don't take action to address the potential impact, the Bendix® Fusion™ system may reduce the throttle and apply the service brakes to assist you in potentially avoiding and/or reducing the severity of the collision with the detected stationary vehicle. If, as a result of the Fusion system intervention, the vehicle comes to a full stop, the service brakes may hold the vehicle at a stop until you, the driver, intervene.

NOTE: The Service Brake Hold can be canceled if you, the driver, press the accelerator pedal or the brake pedal, or apply the parking brake.

Service Brake Hold is only available on vehicles equipped with ACB Stop and Auto-Go™ and ACB Stop and Driver-Go™.

Service Brake Hold is not a parking brake and you must intervene. As the driver, you should use caution and manually apply the parking brakes on or when exiting the vehicle.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

NOTE: The Fusion system **DOES NOT** respond to stationary objects. Fusion will not slow the truck or provide an alert as it approaches stationary objects.

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Multi-lane Autonomous Emergency Braking (AEB)

See Figure 18. Once an autonomous emergency braking event begins and if you, the driver, steer into an adjacent lane to avoid potential impact with the detected forward vehicle, the Fusion system's Multi-lane Autonomous Emergency Braking (AEB) feature may continue to apply the brakes and sound an alert when it detects a potential collision threat in the new lane of travel. If there is no potential threat in the lane you swerve into, system intervention may stop.



The Bendix Fusion system's Multi-lane AEB feature may potentially help you, the driver, mitigate both the first, and potentially the second, collision situation.

Figure 18 – Multi-lane AEB

If, as a result of the Bendix® Fusion™ system intervention, the vehicle comes to a full stop, the service brakes may hold the vehicle at a stop until you, the driver, intervene.

NOTE: You, the driver, can intervene with a service brake application, throttle, or by setting the parking brake. Service brake hold is only available on vehicles equipped with ACB Stop and Auto-Go™ and ACB Stop and Driver-Go™.

Service Brake Hold is not a parking brake and you must intervene. As the driver, you should use caution and manually apply the parking brakes on or when exiting the vehicle.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to potentially intervene.

Lane Departure Warning (LDW)

The Bendix® Fusion™ system has the ability to warn you if your vehicle unintentionally departs its lane or you change lanes without using the turn signal by emitting an audible rumble strip sound to get your attention. In most applications, the Lane Departure Warning (LDW) feature is enabled above 37 mph (60 kph). If you use the turn signal to change lanes, the LDW feature is suppressed and no audible or visual alerts are activated. You should always be aware of your vehicle's lane position and be ready to immediately correct as needed.

Figure 19 shows integrated display messages you may see from the LDW feature. This includes:

A. Driver Assistance Screen. The system is detecting the lane lines.

B. Right LDW feature (when not viewing the Driver Assistance Screen).

C. Driver Assistance Screen; LDW indicates vehicle is departing the lane.

D. The LDW feature is disabled for approximately 15 minutes.

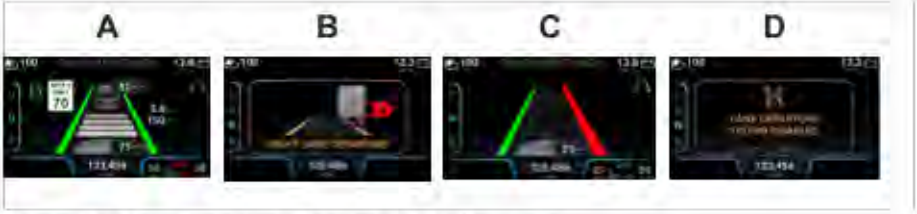


Figure 19 – Lane Departure Warning (LDW) Messages

NOTE: Bear in mind that the LDW feature of the Fusion system needs clear lane markings for optimal operation. If lane lines are faded or hard to see, the system may not deliver alerts when needed.

NOTE: When making lane changes, the proper use of the turn signals and/or hazard lights ensures the Fusion system LDW, Highway Departure Warning (HDW), and Highway Departure Braking (HDB) technologies are aware of the driver's intention to depart a lane and may suppress alerts and braking.

The vehicle is equipped with a 15-minute LDW, HDW, and HDB disable switch (*Figure 20*) that you can activate when driving on roads with inconsistent lane markings that can cause excessive false warnings. Examples would include construction zones, poorly marked lanes, or missing lane markings. The system alerts will automatically become available again after 15 minutes or if the disable switch is pressed a second time.



Figure 20 – LDW, HDW, & HDB Disable Switch

Highway Departure Warning (HDW)

The Highway Departure Warning (HDW) feature may potentially provide an audible and visual alert if the system determines your vehicle has unintentionally left the roadway.

In most applications, the HDW alert is enabled above 37 mph (60 kph). If this alert is displayed, you should immediately correct the vehicle path into the proper lane position.

Figure 21 shows the message you may see on the integrated display when the HDW alert is activated.



Figure 21 – HDW

Highway Departure Braking (HDB)

If the highway departure situation that caused the HDW is not addressed, the Bendix® Fusion™ system may potentially apply the brakes to assist in reducing your vehicle speed. In some circumstances, the system may be capable of reducing the vehicle speed to a full stop.

Figure 22 shows the message you may see on the integrated display when Highway Departure Braking (HDB) is activated.

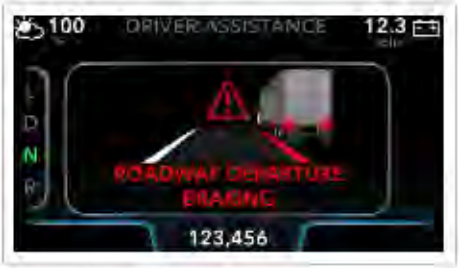


Figure 22 – HDB

If, as a result of the HDB feature intervention, the vehicle comes to a full stop, the service brakes may hold the vehicle at a stop until you, the driver, intervene. Service Brake Hold is only available on vehicles equipped with ACB Stop and Auto-Go™ and ACB Stop and Driver-Go™. Service Brake Hold is not a parking brake and you must intervene. You, the driver, should manually set the parking brakes when exiting the vehicle.

NOTE: At all times, you, the driver, are responsible for the control and safe operation of the vehicle and you should be alert and ready to intervene.

NOTE: An active Highway Departure Braking (HDB) event can be overridden by the driver with steering, with service brake input, or with full throttle application. Additionally, the HDB feature can be suppressed by activating the turn signal or hazard lights when making a lane change.

NOTE: Highway Departure Warning (HDW) and HDB can only be activated if the lane markings are identifiable by the system.



Figure 23 – LDW, HDW, & HDB Disable Switch

NOTE: When making lane changes, the proper use of the turn signals and/or hazard lights ensures the Bendix® Fusion™ system Lane Departure Warning (LDW), HDW, and HDB features are aware of the driver's intention to depart a lane and may suppress LDW, HDW, and HDB alerts and braking. The vehicle is equipped with a 15-minute LDW, HDW, and HDB disable switch (*Figure 23)* that you can activate when driving on roads with inconsistent lane markings that can cause excessive false warnings. Examples would include construction zones, poorly marked lanes, or missing lane markings. The LDW, HDW, and HDB alerts will automatically become available again after 15 minutes or if the disable switch is pressed a second time within the 15-minute window.

When HDW and HDB are activated excessively, the Fusion system provides a warning and may disable these features until the driver restarts the vehicle. Other Fusion system features, including Lane Departure Warning (LDW), will remain available.

NOTE: The Service Brake Hold can be canceled if you press the accelerator pedal or the brake pedal, or apply the parking brake.

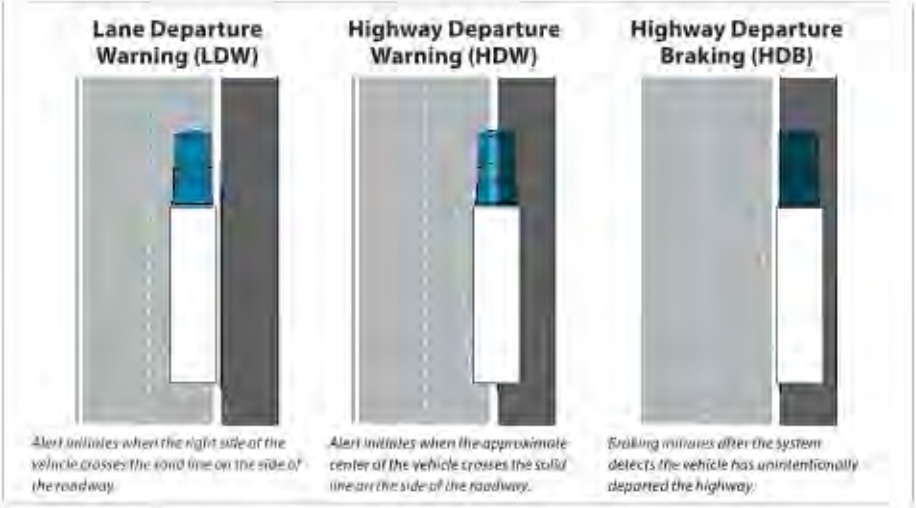


Figure 24 – LDW, HDW, and HDB

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Overspeed Alert and Action (OAA)

The Bendix® Fusion™ system can read most – but not all – roadside speed limit signs in the United States. Sign detection is enabled for all vehicle speeds from near 0 mph to maximum design speed. If more than one sign is visible, the system may choose the lowest posted speed limit value.



Figure 25 – OAA

The Overspeed Alert and Action (OAA) may potentially sound an audible and visual alert when your vehicle is traveling +5 mph (8 kph) over the posted speed limit.

If your vehicle is traveling at +10 mph (16 kph) over the posted speed limit, in addition to the alert, you may potentially experience a haptic warning through a brief engine torque reduction of about one (1) second.

Both the +5 mph (8 kph) and +10 mph (16 kph) thresholds are customizable by your fleet and may vary. Also, the system does not sound an OAA when the posted speed limit is 20 mph (32 kph) or less.

Figure 25 shows a message you may see on the integrated display when the OAA is activated. Please verify with the vehicle OEM for audible and visual indications your vehicle may display.

NOTE: The OAA function does not apply vehicle brakes.

NOTE: This version of Fusion does not detect speed limit signs in Canada or Mexico.

High Beam Assist (HBA)

When the driver enables High Beam Assist (HBA), the Bendix® Fusion™ system may automatically deactivate the high beam headlights if one of the following turn-off conditions exist. Verify with the vehicle OEM for how to control the HBA feature on your vehicle.

Turn-off Conditions

HBA may deactivate the high beam headlights if any of the following turn-off conditions are met (several of these conditions can occur simultaneously):

- The headlights or taillights of another vehicle are detected.
- The vehicle is traveling below the minimum activation speed. This speed may be configurable.
- The brightness of the sky or ambient light indicates it is not night.
- The vehicle is traveling in a city or built-up area with visible or passed street lamps.
- Severe weather conditions are present (e.g., heavy rain or fog).
- The vehicle is traveling in a tunnel.
- The camera is blocked or a system error is detected.

Oncoming Traffic

The Bendix Fusion system may deactivate the high beam headlights when it detects the headlights of another vehicle. If it detects an oncoming vehicle – with either one (1) or two (2) headlights – the high beam headlights may be deactivated. If the vehicle is no longer visible (usually because it has passed the driver's vehicle) and no turn-off conditions exist (*see above*), the high beam headlights may be reactivated after a delay.

Preceding Traffic

If the system detects a vehicle in front – with either one (1) or two (2) taillights – the high beam headlights may be deactivated. If the vehicle is no longer visible and no turn-off conditions exist (*see above*), the high beam headlights may be reactivated after a delay.

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High Beam Assist (HBA) Limitations

NOTE: High Beam Assist (HBA) is not a substitute for the driver's judgement of when to activate or deactivate the high beam headlights. Therefore, the driver must always monitor the situation and intervene by switching the high beam headlights manually – if necessary – to avoid annoyance or risk for any traffic participant.

HBA may not function correctly in the following situations, and driver intervention may be necessary:

- In severe weather conditions (e.g., dense fog or heavy precipitation)
- In the presence of poorly lit traffic participants (e.g., pedestrians)
- In tight curves, at hilltops, or in depression intersections
- In poorly lit built-up areas, in the presence of highly reflective signs, or other unusual lighting conditions
- When the windshield in front of the camera is fogged, dirty, or otherwise obscured

Pedestrian Brake Hold

Pedestrian Brake Hold is an independent feature from all other Bendix® Fusion™ system features. The purpose of this feature is to help prevent the vehicle from moving forward when a detected pedestrian is in the path of the vehicle after the driver has brought the vehicle to a stop. This feature becomes active when the vehicle is stationary, but not parked. In that scenario, if a pedestrian is detected in the vehicle path and the brake pedal is not depressed, the system may display a visual or audible warning and the service brakes may hold the vehicle at a stop. *Figure 26* shows a message you may see on the integrated display when the Pedestrian Brake Hold feature is actively engaged. Accelerator pedal input by the driver will be suppressed while a detected pedestrian is in the path of the vehicle.



Figure 26 – Pedestrian Detected - Vehicle Hold Active

NOTE: The driver can override the Pedestrian Brake Hold feature activation by making a full throttle application, by pressing the brake pedal, or by applying the parking brake. If the driver attempts to override with the accelerator pedal while the detected pedestrian remains in the vehicle path and the vehicle remains stationary, the system may display an additional visual or audible alert on the integrated display (*see Figure 27*).



Figure 27 – Pedestrian Detected - Vehicle Hold Active

The Pedestrian Brake Hold feature may cancel under either of the following circumstances:

- Stepping on the brake pedal
- Applying the parking brake

Examples of Pedestrian Brake Hold Limitations

NOTE: As the driver, you are always responsible for the safe operation of the vehicle and you should be aware of potential threats that may enter the vehicle's lane of travel. As the driver, you should always be alert and ready to intervene.

The following conditions limit Pedestrian Brake Hold feature performance:

- Not all pedestrians are instantly detectable and some may not be detectable.
- Pedestrians outside the camera's field of view are not detectable.
- The driver intervenes by applying the parking brake.
- The vehicle is in reverse gear.
- There is an active fault in the radar or camera, or the Bendix® Electronic Stability Program (ESP®) system.

Brake Overuse

The Bendix® Fusion™ system may set an active Diagnostic Trouble Code (DTC) when it is intervening and using the service brakes excessively. Overuse of the service brakes can lead to the brakes overheating which may result in a reduction or loss of braking performance. This scenario is typically referred to as brake fade. When the system detects brake overuse, a message may be shown on the display. *Figure 28* shows a message you may see on the integrated display when the Brake Overuse Alert is activated. As the driver, you should intervene immediately. Please verify with the vehicle OEM for visual indications your vehicle may display.



Figure 28 – Brake Overuse

If the Fusion system does not detect a driver intervention, it will shut itself off and set a DTC. All Fusion Active Cruise with Braking (ACB) system interventions (de-throttling, engine retarder, or brake applications) will be disabled until the next ignition cycle or until the DTC clears.

NOTE: In all cases, you have the ability to apply the service brakes if necessary. You should take care since overheated brakes may reduce the vehicle's braking capability. Overheated brakes could be an indicator of a malfunctioning system or service brake and should be checked by a certified technician immediately.

NOTE: In all cases, it is the driver's responsibility to maintain safe operation of their vehicle. This includes proper gear and speed selection, and engine retarder activation, especially when driving routes with extended downhill sections of roadway.

SYSTEM RESPONSES

This chart illustrates how the system reacts to specific driver actions.

Your Action:	Potential Reaction of the Bendix® Fusion™ System:
If you, the driver, do this:	The Fusion system may do this:
Step on the brake (during an Autonomous Emergency Braking [AEB] event).	You, the driver, are always in control and are able to apply full braking power. The Bendix Fusion system will honor the greater braking power demand from either the driver or the system.
Step aggressively on the accelerator (during an AEB event).	You, the driver, are always in control. As the driver, your actions can override any Fusion system actions. Once an AEB event has started, you, the driver, can override its activation by applying a significant change in accelerator or steering position during the initial stage of braking or by making a full throttle application. The system may respond with a warning and some braking before AEB is suppressed.
Step on the brake (when Active Cruise with Braking [ACB] is on and set).	ACB will be canceled.
Step on the brake or accelerator pedal, or activate the parking brake (when in Service Brake Hold).	Service Brake Hold will be canceled. You, the driver, must intervene by pressing the accelerator pedal, brake pedal, or parking brake as appropriate.
Step on the accelerator (when ACB is on and set).	ACB will be overridden until the accelerator is released; then ACB will resume the original set speed automatically.
Switch on ACB.	Nothing. The ACB feature will not engage until you, the driver, set the ACB speed.
Switch off ACB.	The ACB feature will turn off; the AEB feature remains active and ready to intervene, if needed. You, the driver, will continue to hear all alerts as needed.
Set the ACB speed.	The ACB feature is automatically activated, and your vehicle maintains set speed and following distance behind the vehicle ahead.

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Your Action:	Potential Reaction of the Bendix® Fusion™ System:
If you, the driver, do this:	The Fusion system may do this:
Block the radar.	The Fusion system performance will be diminished, or disabled, when the radar becomes physically blocked. When the radar can detect this condition, an alert may be issued to warn you, the driver, of this condition. You, the driver, should visually inspect the radar and mounting bracket regularly and remove any mud, snow, ice build-up, or other obstructions. After clearing any obstructions, you, the driver, may need to turn the vehicle off and then on to clear the fault code.
Block the camera.	The Fusion system performance will be diminished, or disabled, whenever the camera becomes blocked. An alert may be issued to alert you, the driver, of this condition. A blocked camera will be indicated through an alert and will disable all functions (e.g., Following Distance Alerts, Active Cruise with Braking, Autonomous Emergency Braking, Lane Departure Warning, Highway Departure Braking/Warning, and Overspeed Alert and Action).
Use normal Active Cruise with Braking (ACB) "+/-" switch.	Vehicle speed will be increased (+) or decreased (-) to achieve the new set speed, while actively maintaining the following distance with the vehicle ahead, if one is detected and within the set following distance.

NOTE: The system indicators/alerts above are typical, but may vary from the descriptions shown here by vehicle manufacturer.

WHAT TO EXPECT

The following charts illustrate what to expect from the Bendix® Fusion™ system in various driving situations you may encounter. Both the system indication, as well as action(s) to expect from the system, are illustrated on the pages that follow.

What to Expect		
Situation	**Typical System Indications and Alerts**	**Typical System and/or Driver Actions**
Stationary vehicles ahead in your lane of travel		
A stationary forward vehicle is detected ahead in your lane. Cruise is either "ON" or "OFF."	An Impact Alert (IA) may potentially be issued if the Fusion system determines a detected stationary vehicle is a potential collision threat.	**⚠ WARNING** You, the driver, must immediately act to potentially avoid – or lessen the severity of – a collision. If a collision is likely to occur, the Fusion system may potentially provide a warning and/or apply the vehicle brakes.
Moving vehicles ahead in your lane of travel		
Your vehicle comes up fast behind a slower-moving detected forward vehicle or the detected forward vehicle slows rapidly. Cruise is either "ON" or "OFF."	The Following Distance Alert (FDA) may potentially sound, and a visual message/icon may potentially appear on the display. Depending on how close your vehicle approaches, the system may initiate an IA warning.	You, the driver, must respond as needed. If a collision is likely to occur, the Autonomous Emergency Braking (AEB) feature may potentially apply your vehicle's service brakes.

NOTE: The system indicators/alerts above are typical, but may vary from the descriptions shown here by vehicle manufacturer.

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What to Expect		
Situation	**Typical System Indications and Alerts**	**Typical System and/or Driver Actions**
Moving vehicles ahead in your lane of travel		
Another vehicle crosses the road perpendicular to your path of travel – such as at an intersection. Cruise is either "ON" or "OFF."	None.	No system action. You, the driver, must respond as needed.
An Autonomous Emergency Braking (AEB) event has begun and if you, the driver, steer into an adjacent lane to avoid the forward vehicle. Cruise is either "ON" or "OFF."	If the system detects the adjacent lane is blocked by a potentially threatening situation, the Impact Alert (IA) warning and braking may continue.	The Bendix® Fusion™ system may continue to alert and apply the brakes if it detects another vehicle ahead in the new traffic lane posing a threat of collision.
Lane Departures		
You, the driver, activate the right or left turn signal, then merge into the corresponding lane. Cruise is either "ON" or "OFF."	No Lane Departure Warning (LDW), Highway Departure Warning (HDW), or Highway Departure Braking (HDB) alerts or braking would occur. However, other Autonomous Emergency Braking-related (AEB) functions would operate as intended.	No system action.

NOTE: The system indicators/alerts above are typical, but may vary from the descriptions shown here by vehicle manufacturer.

What to Expect		
Situation	**Typical System Indications and Alerts**	**Typical System and/or Driver Actions**
Lane Departures		
Traveling below approximately 37 mph / 60 kph, your vehicle crosses a lane marker (without the corresponding turn signal activated). Cruise is either "ON" or "OFF."	No Lane Departure Warning (LDW), Highway Departure Warning (HDW), or Highway Departure Braking (HDB) alerts or braking would occur. However, other Autonomous Emergency Braking-related (AEB) functions would operate as intended.	No system action. You, the driver, must respond as needed.
Traveling above approximately 37 mph / 60 kph, your vehicle crosses a lane marker (without the corresponding turn signal activated). Cruise is either "ON" or "OFF."	A simulated "rumble strip" audible vibration/visual alert may potentially activate.	You, the driver, must respond as needed. (Use the turn signal when changing lanes and/or keep your vehicle within the lane markings.)
Traveling above approximately 37 mph / 60 kph, your vehicle crosses the solid line on the side of the roadway. The vehicle continues to depart the lane with approximately the center (or more) of the vehicle crossing the solid line on the side of the roadway.	A simulated "rumble strip" audible vibration/visual alert may activate when the right side of the vehicle crosses the fog line (aka Lane Departure Warning [LDW]). If the vehicle continues to depart the lane across the fog line, an additional audible alert may be sounded.	You, the driver, must respond as needed. If you, the driver, do not act to correct the vehicle path into the proper lane position, the alert may continue and the Bendix Fusion system may apply the brakes to assist you, the driver, in reducing the vehicle speed.

NOTE: The system indicators/alerts above are typical, but may vary from the descriptions shown here by vehicle manufacturer.

What to Expect		
Situation	**Typical System Indications and Alerts**	**Typical System and/or Driver Actions**
Overspeed Alert and Action		
Your vehicle passes a U.S. speed limit sign and you are not speeding. Cruise is either "ON" or "OFF."	The OEM-integrated display may potentially show the posted speed limit.	No system action.
In some cases, the Overspeed Alert and Action (OAA) feature may detect speed signs on parallel roads, warning you, the driver.	An OAA may potentially be issued and the posted speed limit will be visually presented to you, the driver.	You, the driver, must respond as needed.
Your vehicle passes a speed limit sign and your vehicle is traveling 5 to 9 mph (8 to 14 kph) over the posted speed limit.	An OAA may potentially be issued and the posted speed limit will be visually presented to you, the driver.	You, the driver, must respond as needed.
Your vehicle passes a speed limit sign and is traveling >10 mph (16 kph) over the posted speed limit.	An OAA may potentially be issued and the posted speed limit will be visually presented to inform you to slow down your vehicle.	A one-second torque reduction may potentially occur.

NOTE: The system indicators/alerts above are typical, but may vary from the descriptions shown here by vehicle manufacturer.

NOTE: This version of the Bendix® Fusion™ system does not detect speed limit signs in Canada or Mexico.

What to Expect		
Situation	**Typical System Indications and Alerts**	**Typical System and/or Driver Actions**
Interactions with vehicles ahead in your lane of travel		
With no detected forward vehicle.	None.	No system action.
With a detected forward vehicle. Cruise is "ON" and speed is "SET."	The Active Cruise with Braking (ACB) ON indicator is illuminated and the detected forward vehicle icon is illuminated. Forward vehicle is displayed on the Driver Assistance screen. Speed of the forward vehicle is displayed on the Driver Assistance screen and in the lower right-hand corner.	The ACB feature will maintain the set speed and following distance.
The detected forward vehicle slows moderately. Cruise is "ON" and speed is "SET."	The Following Distance Alert (FDA) may potentially sound, and a visual message or icon typically appears on the display.	You, the driver, must respond as needed. If the system intervenes, the vehicle accelerator input may be reduced; the engine retarder may be engaged, and the service brakes may be applied, in that order.
The detected forward vehicle slows moderately to a full stop. Cruise is "ON" and speed is "SET."	The FDA may sound, and a visual message or icon typically appears on the display.	The system may intervene to bring the vehicle to a full stop. You, the driver, can resume ACB by pressing the accelerator pedal or the brake pedal, or applying the parking brake.

NOTE: The system indicators/alerts above are typical, but may vary from the descriptions shown here by vehicle manufacturer.

What to Expect		
Situation	**Typical System Indications and Alerts**	**Typical System and/or Driver Actions**
Interactions with vehicles ahead in your lane of travel		
The detected forward vehicle slows rapidly. Cruise is "ON" and speed is "SET."	The Impact Alert (IA) warning (continuous tone) may potentially sound and a visual message/icon typically appears on the display. The Following Distance Alert (FDA) may also be heard and Autonomous Emergency Braking (AEB) may activate.	You, the driver, must respond as needed. If the system intervenes, the vehicle accelerator input may be reduced; the engine retarder may be engaged; and the service brakes may be applied, in that order.
A detected forward vehicle traveling at a higher rate of speed cuts in front of your vehicle and speeds away. Cruise is "ON" and speed is "SET."	FDAs may be given, depending on the exact system configuration that has been set for the vehicle, and how close the vehicle cuts in front.	Vehicle maintains set speed and distance.
Downhill Grades		
Going down a grade with a detected forward vehicle. Cruise is "ON" and speed is "SET."	DO NOT USE Active Cruise with Braking (ACB) on downhill grades.	DO NOT USE ACB on downhill grades. Brake overuse may occur.
ACB should NOT be used on downhill grades. *See the CDL manual instructions on proper gear usage for downhill grades.*		

NOTE: The system indicators/alerts above are typical, but may vary from the descriptions shown here by vehicle manufacturer. Certain steering system features are separate from Fusion and may also affect vehicle performance.

NOTE: The preceding sections show examples of situations and typical Bendix® Fusion™ system responses. However, the charts do not attempt to cover all possible situations.

Due to the inherent limitations of radar and camera technology as well as the vast number of traffic scenarios possible, the enhanced Autonomous Emergency Braking (AEB) technology may not:

- **React to vehicles or pedestrians in your vehicle's lane of travel.**
- **Sound alerts, warnings, or brake interventions when expected.**

Additionally, alerts, warnings, or brake interventions may occur when not expected.

POTENTIALLY CHALLENGING SITUATIONS FOR THE BENDIX® FUSION™ SYSTEM

The following examples illustrate situations in which the Bendix® Fusion™ system may potentially issue an alert or braking in a manner not consistent with your expectations. The Fusion system may unexpectedly issue warnings, apply braking, or not respond. For further information on challenging scenarios, *refer to BW8107, Challenging Scenarios*, on B2Bendix.com.

Driver Assistance Systems (DAS), such as the family of Bendix Fusion active safety solutions, help to continuously monitor a variety of vehicle parameters and sensors to determine if the vehicle is near a collision or a following distance threshold. As a reminder, all Driver Assistance Systems have limitations and may misinterpret a scenario leading to a reaction when one is not anticipated or when one may not be required. This section describes driving scenarios that may be challenging for any Bendix safety system.

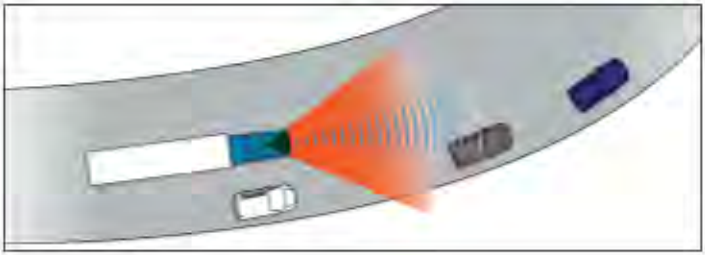
KEY SYSTEM FUNCTIONALITY CLARIFICATIONS

- High speed differences between your truck and the detected forward vehicle may potentially result in little to no system alert or activation.
- Radars work based on reflections from metallic objects which can overlap, cancel, or interfere, causing the radar sensor to miss targets or see false targets.
- Low light or low roadway-background contrast conditions can impact the camera's ability to recognize the forward vehicle and limit system braking performance.

Driving Through Curves:

When driving through curves, Active Cruise with Braking (ACB) and collision mitigation systems may detect vehicles in adjacent lanes. The system also may not recognize forward vehicles as in-lane depending on curvature and may react late to in-lane objects within a curve.

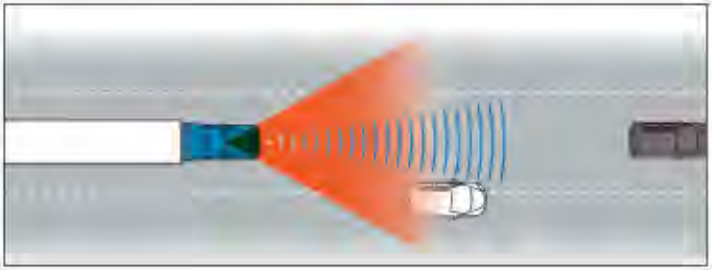
Driving Through a Curve or an Exit Ramp



Offset Forward Vehicles:

Vehicles that are offset, or not completely in your vehicle's lane of travel, may not be detected or trigger a reaction by the vehicle's collision mitigation system.

Other Vehicles Partially Inside Your Lane of Travel

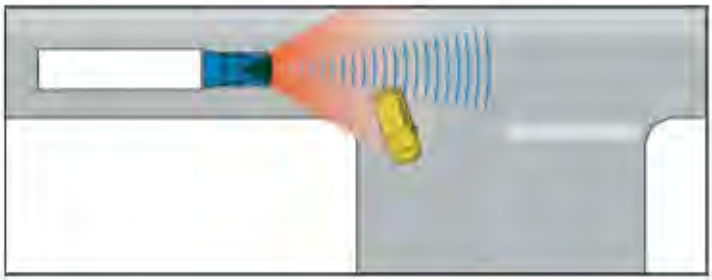


In-Lane Slow Vehicles:

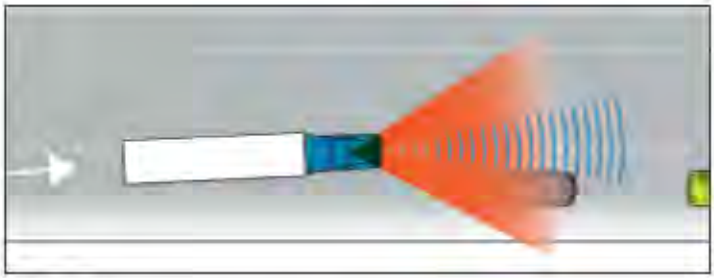
When the detected forward vehicle makes a sharp turn or your vehicle changes lanes behind a slow, in-lane vehicle, the Bendix® Fusion™ system may perceive this as an in-lane slow or stopped vehicle. The system may continue to track the vehicle as the forward vehicle continues through the turn or your vehicle completes a lane change causing the Fusion system to possibly warn or brake.

The system may continue reacting as the forward vehicles turns off the original road and onto the new road or as your vehicle has transitioned into the other lane. The system will release when the forward vehicle is sufficiently out of the initial lane and no longer considered a detected forward vehicle by the system.

Turning Vehicles



Lane Changes and Dynamic Steering Input

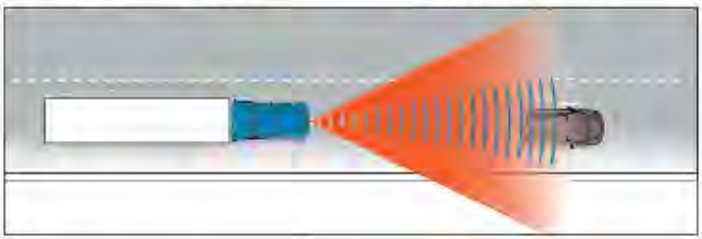


High Differences in Speed:

The higher the difference in speed between your truck and the detected forward vehicle, the less time the system has to react. High speed differences between your truck and the detected forward vehicle may potentially result in little to no system alert or activation.

High-Speed Vehicle e.g., 70 MPH (113 KPH)

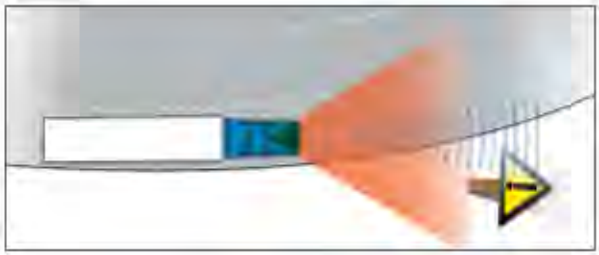
Low-Speed Vehicle e.g., 10 MPH (16 KPH)



Stationary Vehicles and Objects:

- Signs, bridges, or other sizeable, stationary metallic objects may be falsely detected by collision mitigation systems. Although not very common and usually not very long in duration, the system may, on occasion, activate a false alert or possibly a momentary false braking event on these objects.
- Objects that are not recognized as a forward vehicle may not trigger a reaction by the system.
- Stationary objects or offset vehicles in your vehicle's lane of travel may or may not generate a system response.
- Stationary vehicles in close proximity to each other may not be detected by the system and may or may not generate a system response.

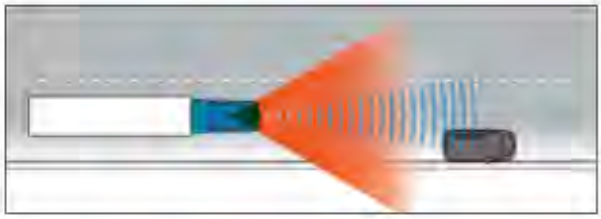
False detection possible: a stationary object or pedestrian in the forward detection path of the system around a bend may inadvertently generate a system response.



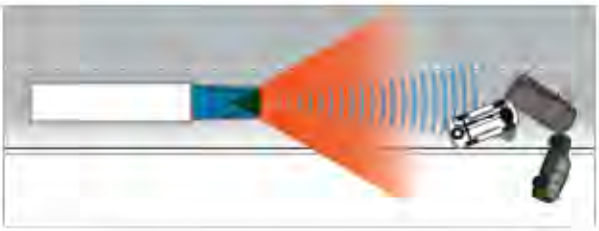
Stationary vehicles in close proximity to each other may not be detected by the system and may or may not generate a system response.



Stationary or offset vehicles may not be detected by the system and may or may not generate a system response.



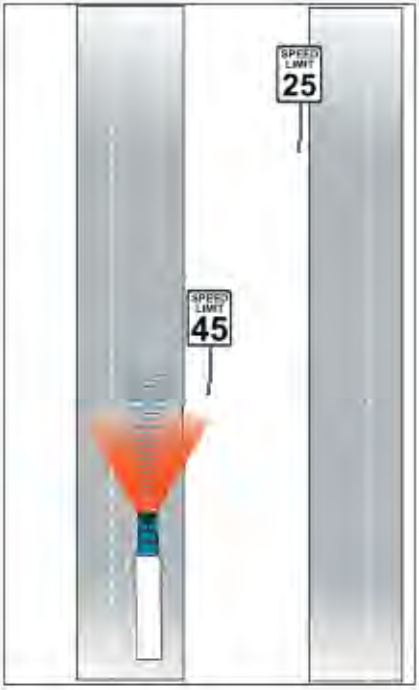
Stationary or offset vehicles may not be detected by the system and may or may not generate a system response.



Speed Limit Sign Detection:

The Bendix® Fusion™ system detects roadway speed signs in order to alert the driver when traveling over the posted speed limit (Overspeed Alert and Action). In some scenarios, the system may detect the speed limit sign from a parallel roadway and inadvertently alert the driver.

In some other situations, the system may not detect roadway speed signs. In about the first five (5) minutes of driving, the Fusion system will conduct a calibration procedure in which the system will not provide any Overspeed Alert and Action (OAA).

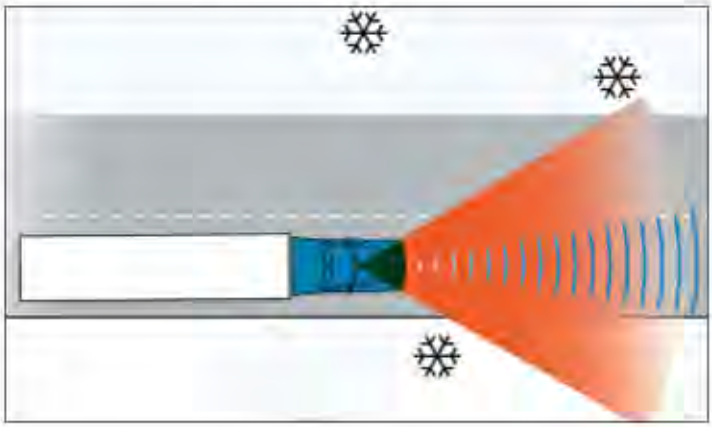


Weather Conditions:

Heavy precipitation – in particular, snow and ice build-up in front of collision mitigation sensors – may contribute to false detection of objects. This may, in turn, lead to false alerts, nuisance braking events, or no/partial system intervention.

If the forward sensor(s) becomes blocked and the Fusion system cannot reliably detect forward objects, a sensor fault may be set.

Snow/Ice Build-up on the Collision Mitigation Sensors



Potential Causes of False Object Detection, Warning, and Braking

Potential Cause	Solution
Obstruction of radar – deer/moose/grille guards, bumpers, etc.	Installing aftermarket deer or bumper guards is not recommended and could impair the operation of the radar. *For further information, refer to Appendix A of the Bendix® FLR-25™ Radar Sensor Service Data Sheet (SD-29-50022)* on B2Bendix.com.
Obstruction of radar and/or camera – mud/ice/snow/debris accumulation in front of the radar and/or camera	Inspect the radar and/or camera and remove any mud, ice, snow, or debris build-up in front of the radar and/or camera.
Radar misalignment	Inspect the radar mounting (specified by the OEM). A solid mounting surface is necessary in order to hold the alignment. If the bumper or mounting cross-member is damaged, replace it. *Refer to Appendix A of the Bendix® FLR-25™ Radar Sensor Service Data Sheet (SD-29-50022)* on B2Bendix.com.

If, after becoming familiar with the contents of this document, you still believe the Bendix® Fusion™ system is not performing properly, Bendix recommends the following:

- Run the most current version of the Bendix® ACom® Diagnostic Software to determine if a specific fault exists with the system. Correct the fault(s) prior to placing the vehicle back in service.
- Fully understand when the braking occurred. It may be a challenging condition for the system that may not be called out in this document. Driver training may be required to fully understand how the system(s) operates.

NOTE: All radar-based systems are sensitive to conditions such as those described within this document, and all radar systems have limitations. It is unlikely that full elimination of unwanted false-positive activations will be possible with this generation of technology. There is no substitute for a skilled, alert driver exercising safe driving techniques and proactive, comprehensive driver education. Responsibility for the safe operation of the vehicle remains with the driver at all times.

NOTE: The preceding section shows examples of situations and typical Bendix® Fusion™ system responses. However, the scenarios do not attempt to cover all possible situations.

Tracking Vehicles in a Curve

With Active Cruise with Braking (ACB) set, while traveling through a curve, the detected forward vehicle may no longer be detected by the Bendix Fusion system. The ACB feature will delay acceleration back to the set speed until one of the following events occur:

- The system detects a forward vehicle;
- The system detects that there is no longer a vehicle ahead; or
- A time gap has occurred (based on the last following distance recorded).

  For example: Assume ACB is set at 50 mph (80 kph) and you are following 3 seconds behind a vehicle traveling at 45 mph (72 kph) that just entered a sharp curve. If the vehicle ahead is no longer detected as you travel around the curve, the Fusion system will delay the vehicle acceleration back to 50 mph (80 kph).

It is also possible for the Fusion system to begin tracking vehicles in other lanes when traveling around curves. In cases where the Fusion system perceives that an adjacent-lane vehicle is a detected forward vehicle, the system may intervene and begin making brake applications.

Curve Speed Control

In sharp curves, ACB may limit acceleration to prevent reducing following distance with lead vehicles.

DIMINISHED OR PARTIAL BENDIX® FUSION™ SYSTEM FUNCTIONALITY

The performance of the Bendix® Fusion™ system may be diminished or disabled when the radar or camera becomes blocked or has not detected a forward vehicle for an extended period of time.

Figure 29 shows an example of the alert that may be issued on the integrated display to warn you of this condition.



Figure 29 – Blocked Sensors

When the radar is blocked, Active Cruise with Braking (ACB), Autonomous Emergency Braking (AEB), and Following Distance Alert (FDA) will not function.

When the camera is blocked, Following Distance Alerts (FDA), ACB, AEB, Lane Departure Warning (LDW), Highway Departure Braking (HDB), and Overspeed Alert and Action (OAA)will not function.

If the Fusion system has detected a problem, depending on the vehicle manufacturer, there may typically be a warning message on the display, a Diagnostic Trouble Code (DTC) may be set, and you may be alerted.

Speed Only Mode

In the case of blocked radar or detection of a problem on the radar, the system will determine – depending on the type of problem detected – if the vehicle may continue to have normal cruise control functions (without the benefits of the Bendix® Fusion™ system), or all Active Cruise with Braking (ACB) functions need to be disabled until the vehicle is serviced. The system should be serviced as soon as possible to restore full Fusion functionality.

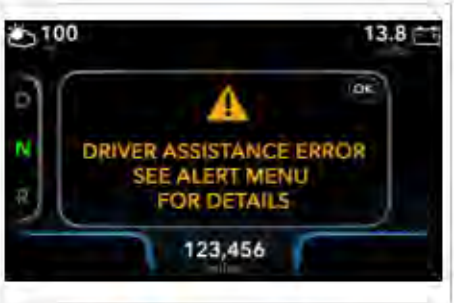


Figure 30 – Driver Assistance Error

Conventional engine cruise control may be re-engaged by the driver when the radar is disabled. Camera-based functions, such as Lane Departure Warning (LDW) will remain. *Figure 30* shows messages you may receive on the integrated vehicle display.

SYSTEM MAINTENANCE AND TROUBLESHOOTING

Preventive Maintenance

The Bendix Fusion system is relatively maintenance-free. The key items to keep the system functioning properly include:

- Keep the area in front of the radar sensor and camera lens clean and free of obstructions.
- Visually inspect for any damage to the bumper or the Fusion cover, bracket, or radar to ensure the alignment has not been compromised. Never use the radar unit as a step.
- Verify there are no active system Diagnostic Trouble Codes (DTCs).

Importance of Antilock Braking System (ABS) Maintenance – Optimal Bendix® Fusion™ system braking requires a properly maintained ABS system, without any active ABS Diagnostic Trouble Codes (DTCs). Have active DTCs repaired by a qualified technician. Any ABS DTCs will cause the Fusion system to deactivate.

Importance of Vehicle System Maintenance – The Bendix Fusion system will not operate and will set a DTC if any of the following vehicle systems also show a relevant DTC: engine, engine cruise, instrument cluster, Bendix® ABS, Bendix® Automatic Traction Control (ATC), Bendix® Electronic Stability Program (ESP®), or transmission.

Importance of Brake Maintenance – Optimal Fusion system braking requires properly maintained truck service brakes (drum, wide-drum, or air disc), which meet appropriate safety standards and regulations. Brake performance also requires the vehicle be equipped with properly sized and inflated tires with a safe tread depth.

Radar Inspection – You should visually inspect the radar and mounting bracket regularly and remove any mud, snow, ice build-up, or other obstructions. An alert may be issued when the radar detects it is blocked. After clearing any obstructions, you will need to turn the vehicle off and then on to clear the fault code. Installing aftermarket deer, bumper, or grille guards is not recommended and could impair the operation of the radar.

Radar Damage / Tampering – In cases where the bumper and/or radar have sustained any damage, or if you suspect the radar has been tampered with, do not use Active Cruise with Braking (ACB) until the vehicle has been repaired. In addition, an indicator on the display typically will illuminate if the system detects any of these conditions. Consult your vehicle's Operator's Manual or contact Bendix for more information.

Camera Inspection – The Bendix Fusion system camera is mounted to the windshield of the vehicle. The camera will be mounted inside the wiper pattern and should be clear of any obstructions. An alert may be issued to the driver when the camera is blocked. After clearing any obstructions, you will need to turn the vehicle off and then on to clear the fault code.

ADDITIONAL OPERATIONAL NOTES

Adjusting the Alert Volume

The Bendix® Fusion™ system audible alerts are pre-set at the factory for fully integrated systems and cannot be turned off.

Event Capture

For vehicles configured to do so, you can manually activate data and video capture by pushing and holding the Lane Departure Warning (LDW) disable switch for 6 seconds. This will indicate to the SafetyDirect® Processor by Rand McNally to capture and possibly transmit 10 seconds of video & data (5 before and 5 after button press). In some cases, more video data may be available using the optional SafetyDirect web portal (subscription fee applies).



Figure 31 – LDW, HDW, & HDB Disable Switch

For SafetyDirect technical support, contact the Rand McNally support team by phone at 1-800-641-7263 or by email at safetydirectsupport@randmcnally.com.

Other Information

Federal Communications Commission (FCC) Part 15: These devices comply with Part 15 of the FCC rules with the limits for a Class B digital device and with RSS-210 of Industry Canada. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference; and (2) these devices must accept any interference received, including interference that may cause undesired operation.

Additional Information Sources for Bendix® Systems on Your Vehicle

Visit B2Bendix.com to download the Service Data sheets listed below. Consult the vehicle manufacturer's documentation.

- SD-29-50022 *Bendix® Fusion™ FLR-25™ Radar Sensor*
- SD-13-4986 *Bendix® EC-80™ ESP® Controllers*
- SD-29-50024 *Bendix® Fusion™ FLC-25™ Camera Sensor*
- *(Optional)* SD-61-5010 *Bendix™ BlindSpotter® Side Object Detection System*

For additional support, contact your local sales representative, visit B2Bendix.com, or call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725). Representatives are available to assist you Monday through Thursday, 8:00 a.m. to 6:00 p.m. and Friday, 8:00 a.m. to 5:00 p.m. ET.

Acronyms and Definitions

ABS	Antilock Braking System
ACB	Active Cruise with Braking
ACC	Adaptive Cruise Control
Bendix® ACom	Bendix diagnostic software
AEB	Autonomous Emergency Braking
ATC	Automatic Traction Control
CMS	Collision Mitigation System
Detected Forward Vehicle	The forward vehicle identified by the safety system that can cause a system reaction (alert or automatic braking).
DTC	Diagnostic Trouble Code
ESP	Electronic Stability Program
FDA	Following Distance Alert
Forward Vehicle	A car/truck/other vehicle in front of the host vehicle.
HBA	High Beam Assist
HDB	Highway Departure Braking
HDW	Highway Departure Warning
IA	Impact Alert
LDW	Lane Departure Warning
LED	Light Emitting Diode
OAA	Overspeed Alert and Action
OBC	On-board Computer
PAEB	Pedestrian Autonomous Emergency Braking
SafetyDirect®	Web portal
SVB	Stationary Vehicle Braking
Your Vehicle/ Host Vehicle	The truck/tractor/specialty vehicle equipped with the Bendix safety system.









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