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.

THE BENDIX® ESP® STABILITY SYSTEM

All vehicles equipped with the Bendix® Fusion™ system are also equipped with the Bendix® 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. Never wait for the system to intervene. 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

Feature Removal: This version of the Bendix® Fusion™ system can read most – but not all – roadside automobile and truck speed limit signs in the United States and Canada. The Fusion system will not dethrottle the engine under any circumstance, including + 10 mph (16 kph) over the detected speed limit. It is only capable of providing audible and visual alerts to the driver.

New Functionalities Added: This version of the Bendix Fusion system includes two (2) new functionalities: Pedestrian Autonomous Emergency Braking (PAEB) 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 (OA), 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.

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



Figure 1 – Review Manual
NOTE: Images are preliminary and the actual vehicle dash icons and messaging may vary.

Keep this manual in the vehicle as a reference at all times. *See Figure 1* for an example of the message you may see on the integrated display.

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 is posted in 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*.

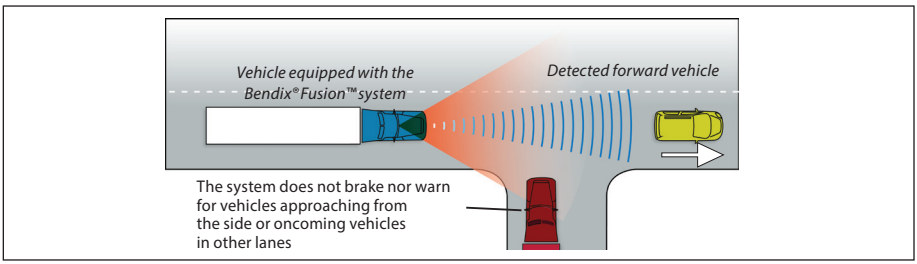


Figure 2 – Oncoming or Side-approaching Vehicles

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 the 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. Never wait for the system 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.

SYSTEM COMPONENTS

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

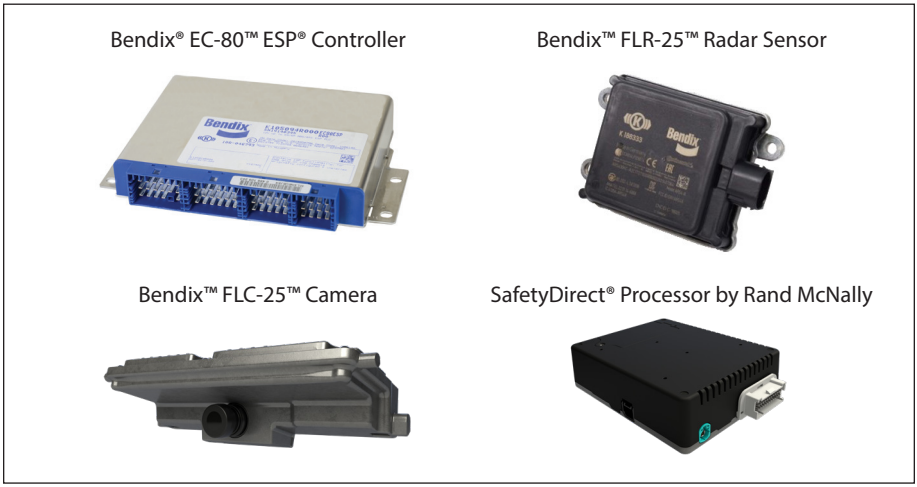


Figure 3 – System Components

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 Original Equipment Manufacturer (OEM) for the actual audible and visual indications your vehicle may display.

SYSTEM FEATURES

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

IMPORTANT FEATURE INFORMATION: DRIVER OVERRIDE

Some driver actions can override Bendix® Fusion™ system activations. Once an 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 intervene. Never wait for the system to intervene.

Active Cruise with Braking (ACB)

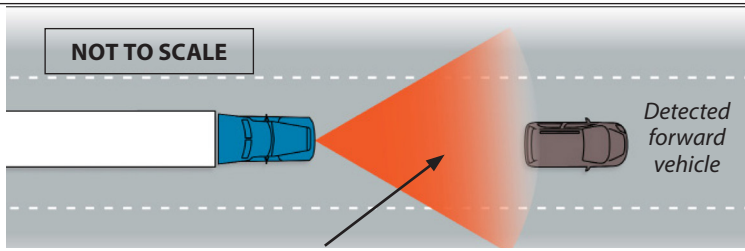
NOTE: The term ACC (Adaptive Cruise Control) may be used instead of – or interchanged with – ACB.

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 intervene. Never wait for the system to 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 detected 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

NOTE: When the Active Cruise with Braking (ACB) feature requests engine torque reduction or vehicle deceleration, the cruise control of the vehicle may be paused. *Figure 5* shows a message you may see on the integrated display identifying this condition.

NOTE: When the ACB feature is paused, the set speed is displayed in gray numbers. When the ACB feature is active, the set speed is displayed in white numbers.

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

If 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 previous ACB set speed while still attempting to maintain the set following distance with the forward vehicle.



Figure 5 – Paused ACB

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 intervene. Never wait for the system to intervene.

Canceling ACB

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 6a shows an integrated display message you may see when ACB is off and not set. *Figure 6b* shows a message you may see on the integrated display when ACB is on and maintaining the set following distance behind the detected forward vehicle.

Additionally, Figure 6c 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. 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 intervene. Never wait for the system to intervene.

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

NOTE: Certain vehicles with certain engine/powertrain combinations, may be equipped with ACB Stop and Auto-Go™ functionality. Under certain circumstances, after a normal ACB stop, ACB Stop and 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 on page 15 for more details*). 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 7.*

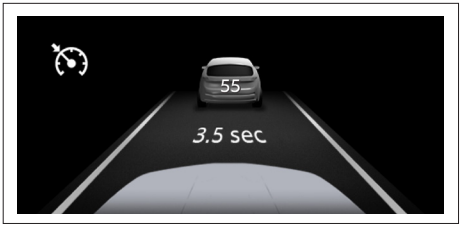


Figure 6a – ACB Off - Set Available

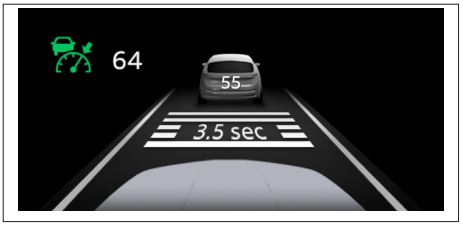


Figure 6b – ACB On, Actively Engaged, and Maintaining Set Following Distance

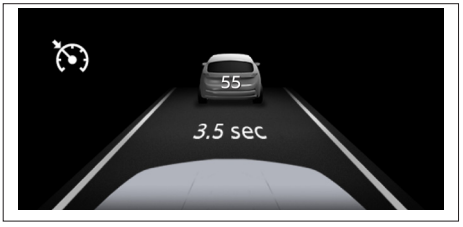


Figure 6c – ACB Off - ACB Available to Re-engage

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 8* shows a message you may see on the integrated display indicating a pedestrian has been detected.

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 9* shows a 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 intervene. Never wait for the system to intervene.

If the detected forward vehicle does not move forward within a few seconds and there is not a detected pedestrian, the service brakes will hold the vehicle at a stop until you, the driver, intervene. **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 previous ACB set speed. It should be noted that stepping on the brake will cancel ACB and the ACB resume function.

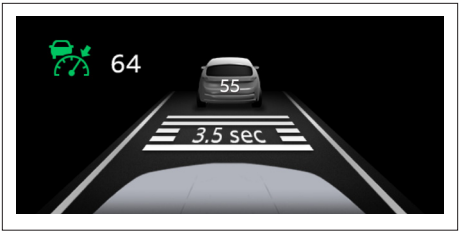


Figure 7 – ACB On, Actively Engaged, and Maintaining Set Following Distance



Figure 8 - Pedestrian Detection



Figure 9 – Service Brake Hold

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.

Curve Speed Control

In sharp curves, ACB may limit acceleration.

The Detected Forward Vehicle Icon



Figure 10 – Detected Forward Vehicle Icon

When 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 10.* 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.

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 forward vehicle. 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.	

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.



Figure 11a – AEB System Alert

The alert indicates that a collision with the detected forward vehicle is likely, and **you should take immediate action** to potentially help mitigate a collision.

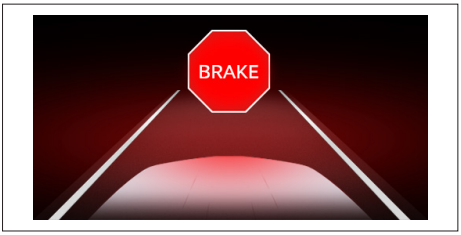


Figure 11b – Possible Autonomous Emergency Braking Applied

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 to potentially help mitigate a 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 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.

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™.

Figures 11a and 11b show examples of messages 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 intervene. Never wait for the system to 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 "Challenging Scenarios and System Limitations"* 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 help mitigate a collision.



Figure 12a – AEB System Alert

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 to potentially help mitigate a collision.

Figures 12a and 12b show examples of a message you may see on the integrated display when the PAEB feature is activated. Please verify with the vehicle Original Equipment Manufacturer (OEM) for the actual audible and visual indications your vehicle may display.

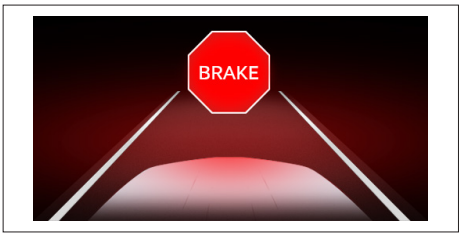


Figure 12b – Possible Autonomous Emergency Braking Applied

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™. 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 intervene. Never wait for the system to 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 field of view are not detectable.

  NOTE: Vehicle visors, hood additions, or vehicle types with large hoods may limit the field of view of the camera and potentially affect performance of the feature.
- In most applications, the PAEB feature is not available above 35 mph (56 kph).
- The vehicle is in reverse gear.
- The Bendix® ESP®/ABS system in vehicle/trailer is not fully operational.
- There is an active fault in the radar or camera, or the Bendix ESP system.

Service Brake Hold

NOTE: The Service Brake Hold function is only available on vehicles equipped with Active Cruise with Braking (ACB) Stop and Auto-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.

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 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 intervene. Never wait for the system to 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.

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 13* shows messages you may receive on the integrated display when the FDA is activated.

When the FDA reaches its highest level, the beeping may be rapid and the display may show an additional visual alert. *Figure 14* shows messages you may see on the integrated display when the highest level FDA and Impact Alert (IA), or AEB alert, is activated.



Figure 13 – FDA



Figure 14 – Highest Level FDA and IA Alerts

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 intervene. Never wait for the system to 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 "Challenging Scenarios and System Limitations"* in this Operator's Manual.

Stationary Vehicle Braking (SVB)

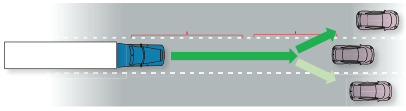
When a potential collision with a stationary vehicle in your lane of travel is detected, the system may sound an alert before braking. If you, the driver, don't take action to address the potential impact, the Bendix® Fusion™ system may reduce throttle and apply service brakes to potentially help mitigate a 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™. 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 intervene. Never wait for the system to 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.

Multi-lane Autonomous Emergency Braking (AEB)

See Figure 15. Once an Autonomous Emergency Braking (AEB) 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 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. 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.



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 15 – Multi-lane AEB

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™.

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 intervene. Never wait for the system to 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 16 shows integrated display messages you may see from the LDW feature. This includes:

A. The LDW feature is detecting the lane lines.

B. The vehicle speed is below 37 mph (60 kph) or the lane lines are not detected.

C. The LDW indicates vehicle is departing the lane.

D. The LDW feature is disabled

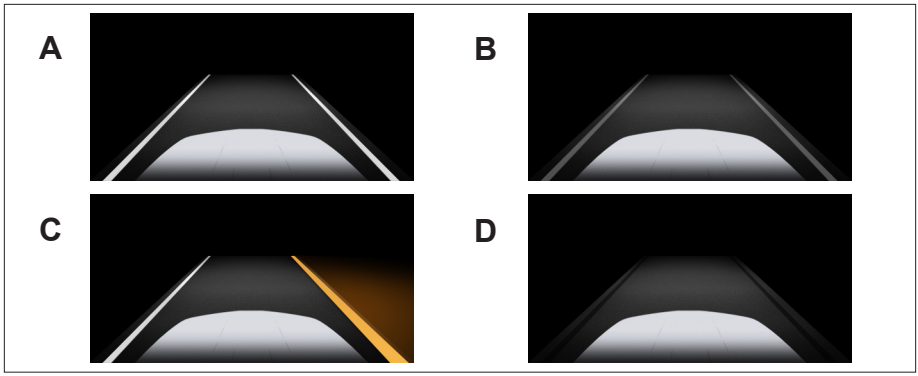


Figure 16 – Lane Departure Warning (LDW) Messages

NOTE: Bear in mind that the Lane Departure Warning (LDW) feature of the Bendix® 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 18*) 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.

Highway Departure Warning (HDW)

The 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.

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

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™. 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. Never wait for the system to intervene.

NOTE: An active 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 Highway Departure Braking (HDB) can only be activated if the lane markings are identifiable by the system.

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 18)* 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.

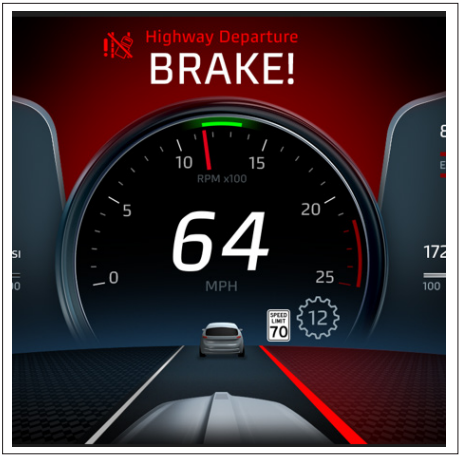


Figure 17 – HDB



Figure 18 – LDW, HDW, and HDB Disable Switch

When HDW and HDB are activated excessively, the Bendix Fusion system provides a warning and may disable these features until the driver restarts the vehicle. Other Fusion system features, including 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.

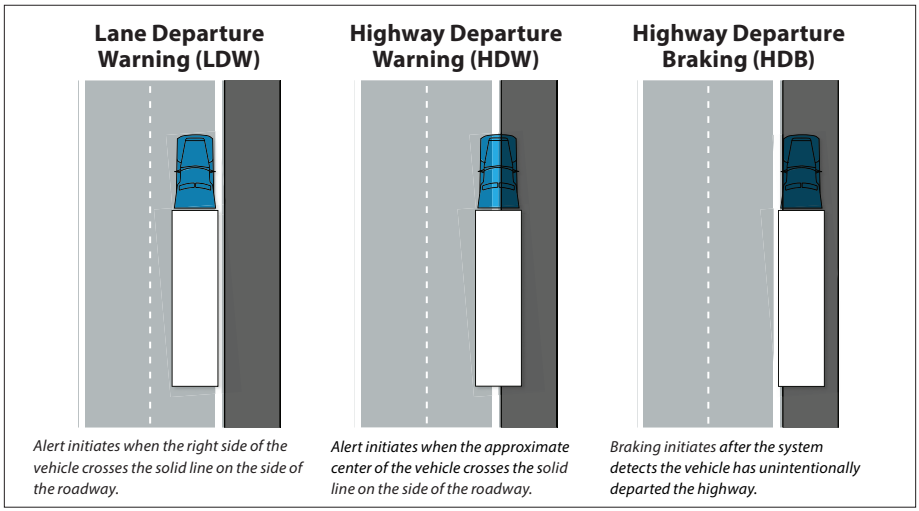


Figure 19 – LDW, HDW, and HDB

Overspeed Alert (OA)

The Bendix® Fusion™ system can read most – but not all – roadside automobile and truck speed limit signs in the United States and Canada. 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.

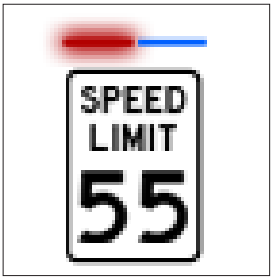


Figure 20 – OA

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

The +5 mph (8 kph) threshold is customizable by your fleet and may vary. Also, the system does not sound an OA when the posted speed limit is 20 mph (32 kph) or less.

Figure 20 shows a message you may see on the integrated display when the OA is activated. Please verify with the vehicle Original Equipment Manufacturer (OEM) for audible and visual indications your vehicle may display.

NOTE: The OA function does not apply vehicle brakes.

NOTE: This version of Fusion does not detect speed limit signs in Australia and 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 Original Equipment Manufacturer (OEM) for how to control the HBA feature in 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 page 21*), 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.

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

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. As the driver, you should intervene immediately. Please verify with the vehicle Original Equipment Manufacturer (OEM) for visual indications your vehicle may display.

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.

Power-On Self-Test (POST)

During every power-on cycle, the Bendix® Fusion™ system executes a Power-On Self-Test (POST) during which the driver assistance features described in this document are not available. Vehicle Active Cruise with Braking (ACB) is still available to the driver during the POST test. The POST test requires the vehicle speed to be above 5 mph (8 kph) and for the radar sensor to see objects to validate proper radar sensor operation. Under normal operating conditions, the POST test completes within a few seconds and all driver assistance features become available to you. *Figure 21* shows a message you may see on the integrated display when the POST test is in process.

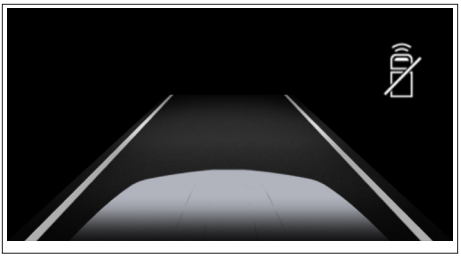


Figure 21 – POST Test in Process

In the special case where the radar sensor is blocked, the POST test will not be able to verify normal system operation and, after two (2) minutes driving under this condition, will set an active Diagnostic Trouble Code (DTC) rendering the functionality of the Fusion system reduced or inoperable. Two (2) minutes under this condition will lead to a DTC, but regular vehicle cruise control will remain available to you. *Figure 22* shows a message you may see on the integrated display when the POST test has failed.

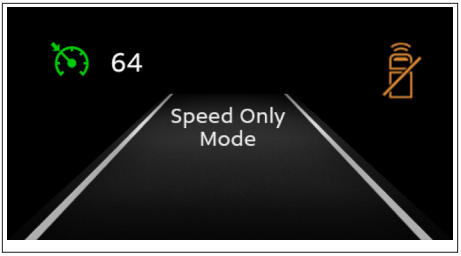


Figure 22 – POST Test Failed

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 (Active Cruise with Braking) feature will not engage until you, the driver, set the ACB speed.

Your Action:	Potential Reaction of the Bendix® Fusion™ System:
If you, the driver, do this:	The Fusion system may do this:
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.
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 camera-based functions (e.g., Following Distance Alerts, Active Cruise with Braking, Lane Departure Warning, Highway Departure Braking/Warning, Overspeed Alert, and Autonomous Emergency Braking which includes Stationary Vehicle Braking [SVB]).
Use normal cruise control "+/-" 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 help mitigate 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.

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		
Your vehicle passes a U.S. or Canadian 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 (OA) feature may detect speed signs on parallel roads, warning you, the driver.	An OA 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 greater than 5 mph (8 kph) over the posted speed limit.	An OA may potentially be issued and the posted speed limit will be visually presented to inform you, the driver, to slow down your vehicle.	You, the driver, must respond as needed.

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 Australia and 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 cruise control ON indicator is green and the detected forward vehicle icon is illuminated.	The Active Cruise with Braking (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 cruise control 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 cruise control on downhill grades.	DO NOT USE cruise control on downhill grades. Brake overuse may occur.
Cruise control 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.

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.

BENDIX® ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS) CHALLENGING SCENARIOS AND SYSTEM LIMITATIONS OVERVIEW

***Important:* Because each truck manufacturer may implement differing feature sets of the Bendix® Fusion™ system, check with the OEM or dealer to confirm available features and vehicle capabilities. Some of the scenarios within this document may or may not apply to your vehicle.**

OVERVIEW

Bendix® Advanced Driver Assistance Systems (ADAS) are intended to continuously monitor what is happening on and around the vehicle. However, all ADAS systems have limitations and may misinterpret a scenario, thereby potentially leading to system reactions that may differ from expectations (e.g. a false-positive response, where the system generates a response when it is not expected to or when a risk may not exist; or a false-negative response, where the system does not generate a response when it is expected to or when a risk may exist).

⚠WARNING

All ADAS systems are sensitive to conditions such as those described within this document, and all ADAS systems have limitations. It is unlikely that full elimination of unwanted false-positive or false-negative responses 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 training. Responsibility for the safe operation of the vehicle remains with the driver at all times.

⚠WARNING

Bendix technologies complement safe driving practices. No commercial vehicle technology replaces a skilled, alert driver exercising safe driving techniques and proactive, comprehensive driver training. Never wait for the system to intervene. Responsibility for the safe operation of the vehicle remains with the driver at all times.

TECHNICAL ASSISTANCE

The Bendix Tech Team is available by phone at 1-800-AIR-BRAKE (1-800-247-2725), option 2, or by email at techteam@bendix.com. Representatives are available Monday through Thursday, 8:00 a.m. – 6:00 p.m., and Friday, 8:00 a.m. – 5:00 p.m. ET.

NOTE: This section is based on BW8107, Challenging Scenarios, and is current at the time of publication. Refer to B2Bendix.com for the latest information.

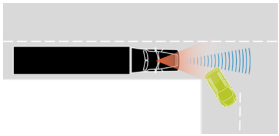
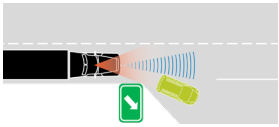
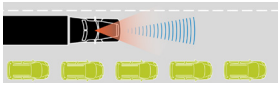
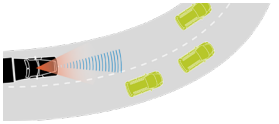
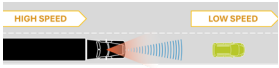
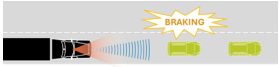
DRIVER OVERRIDE

Drivers are capable of overriding system interventions.

- **Active Cruise with Braking (ACB):** 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.
- **Autonomous Emergency Braking (AEB):** Once any type of 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 still respond to the situation with a warning and some braking before AEB is suppressed.
- **Lane Departure Warning (LDW), Highway Departure Warning (HDW), and Highway Departure Braking (HDB):** You, the driver, can activate the 15-minute LDW, HDW, and HDB disable switch when driving on roads with inconsistent lane markings that may cause excessive false warnings. Examples would include construction zones, poorly marked lanes, or lanes with missing markings. The system alerts will automatically become available again after 15 minutes or if the disable switch is pressed a second time.
- **High Beam Assist (HBA):** You, the driver, must always monitor the situation and intervene by switching the high beam headlights manually, if necessary. HBA is not a substitute for the driver's judgement of when to activate or deactivate the high beam headlights.

CHALLENGING SCENARIOS

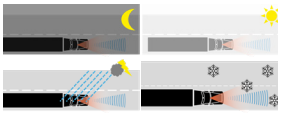
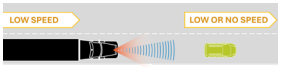
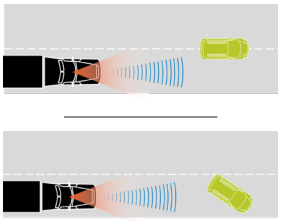
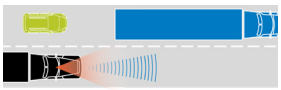
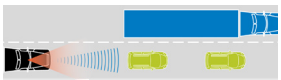
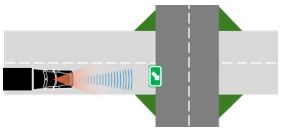
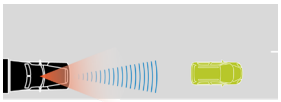
The following table describes some – not all – scenarios that may be challenging for any ADAS system, including the Bendix® Fusion™ System, Bendix® Wingman® Active Cruise with Braking System, Bendix™ BlindSpotter® Radar System, and Bendix™ VORAD® Radar System. Most scenarios assume one or multiple ADAS features are on and set.

Challenging Scenario	Description	Illustration
The detected forward vehicle slows to make a turn or the host vehicle changes lanes behind a detected forward vehicle.	The system may intervene with an alert and/or vehicle braking as long as the system perceives the detected forward vehicle to be in the lane of travel. The system may not anticipate that the detected forward vehicle will depart the lane of travel.	
The detected forward vehicle slows and exits the highway, or the lane merges into additional lanes or an exit ramp.	Vehicles exiting a lane and/or lane line discontinuity may lead to the system tracking the detected forward vehicle for an extended period, which may result in a system alert and/or vehicle braking.	
The host vehicle is traveling in an environment where there are parked vehicles nearby and no lane lines.	The system may identify one of these vehicles as a detected forward vehicle, which may result in a system alert and/or vehicle braking.	
The host vehicle is traveling in a curve where there are other forward vehicles in the same or adjacent lanes.	The system may identify one of these vehicles as a detected forward vehicle, which may result in a system alert and/or vehicle braking. When traveling in a curve, the system may stop tracking the forward vehicle, which may delay or prevent a system alert and/or vehicle braking. Also, the system may not recognize detected forward vehicles as in-lane and/or may react late depending on road curvature.	
The host vehicle approaches slow or stopped forward vehicles at a high difference in speed.	The system may not have enough time to properly detect (alert) and react (apply vehicle braking) to a slow or stopped forward vehicle.	
The host vehicle approaches a forward vehicle that stops aggressively.	The system may not have enough time to properly detect (alert) and react (apply vehicle braking) to a forward vehicle that stops aggressively.	

IMPORTANT **Illustrations are representative only and not to scale.**

WARNING **You, the driver, are responsible for the control and safe operation of the vehicle. Never wait for an ADAS system to intervene.**

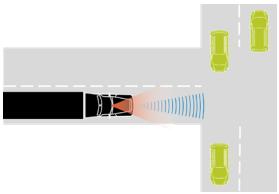
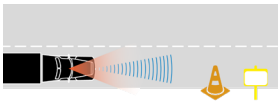
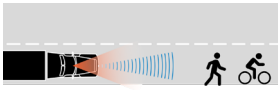
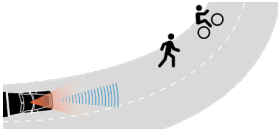
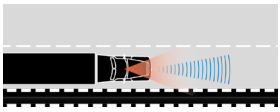
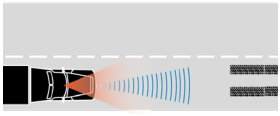
CHALLENGING SCENARIOS (*continued*)

Challenging Scenario	Description	Illustration
The host vehicle is traveling in environmental conditions that may lead to limited visibility, including – but not limited to – low light, glare, heavy precipitation, etc.	Environmental conditions may impact the system's ability to detect forward vehicles or track lane markings, which may result in little to no system alert and/or vehicle braking.	
The host vehicle is traveling at a low speed and approaches a detected forward vehicle also traveling at a low speed.	The ADAS system has a minimum activation speed. Traveling below the minimum activation speed may result in little to no system alert and/or vehicle braking.	
The host vehicle approaches a forward vehicle that is laterally offset or rotated in the lane.	A vehicle that is offset or rotated in the host vehicle's lane of travel may not be detected by the system as a forward vehicle and may result in little to no system alert and/or vehicle braking.	
The host vehicle passes vehicles in an adjacent lane.	The system may interpret a vehicle in an adjacent lane as a detected forward vehicle and may result in a system alert and/or vehicle braking.	
The host vehicle approaches stationary vehicles in close proximity to each other.	Stationary vehicles in close proximity to each other may not be detected by the system and may or may not result in a system alert and/or vehicle braking.	
The host vehicle is traveling through an underpass or under an overhead sign.	Overhead signs, bridges, or other sizeable, stationary, metallic objects may be falsely detected, which may result in a system alert and/or vehicle braking.	
The host vehicle is approaching a forward vehicle on a road with missing, inconsistent, low-quality, or confusing lane lines.	Missing, inconsistent, low-quality, or confusing lane lines may impact the system's ability to detect a forward vehicle, which may result in little to no system alert and/or vehicle braking.	

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WARNING **You, the driver, are responsible for the control and safe operation of the vehicle. Never wait for an ADAS system to intervene.**

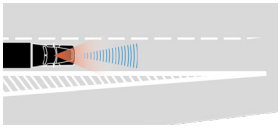
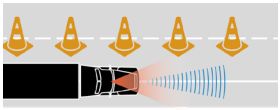
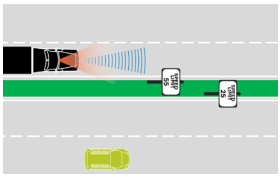
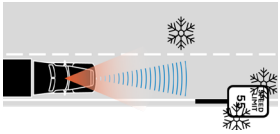
CHALLENGING SCENARIOS (*continued*)

Challenging Scenario	Description	Illustration
The host vehicle approaches cross-traffic, such as an intersection or a round-about.	ADAS systems may react ONLY to vehicles or objects that the system determines are stationary or moving in the same direction as the host vehicle. The system DOES NOT respond to side-to-side moving vehicles or oncoming vehicles. The system will not provide an alert or vehicle braking as the host vehicle approaches vehicles or objects in these circumstances.	
The host vehicle encounters construction barrels, road signage, or other infrastructure near the driving lane.	Nearby roadside objects may be detected as pedestrians, which may result in a system alert and/or vehicle braking.	
The host vehicle encounters a pedestrian or cyclist in the lane of travel.	The system may not recognize a pedestrian or cyclist, which may result in little to no system alert and/or vehicle braking.	
The host vehicle is traveling in a curve and encounters a pedestrian or cyclist in the lane of travel.	The system may not recognize a pedestrian or cyclist as in-lane, which may result in little to no system alert and/or vehicle braking due to road curvature.	
The host vehicle is traveling on a road with a high-contrast environment (e.g., the edge of the road, a guardrail, or snow).	Road edges, guardrails, or other scenarios where there is a transition between dark and light may be misinterpreted as lane lines, which may result in a false system alert and/or vehicle braking.	
The host vehicle is traveling on a road with markings other than lane markings (e.g., tar lines, skid marks, cracks on the roadway, or severe high-contrast shadows).	Tar lines, skid marks, cracks, or severe or high-contrast shadows may be misinterpreted as lane lines, which may result in a false system alert and/or vehicle braking.	

IMPORTANT **Illustrations are representative only and not to scale.**

WARNING **You, the driver, are responsible for the control and safe operation of the vehicle. Never wait for an ADAS system to intervene.**

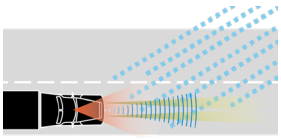
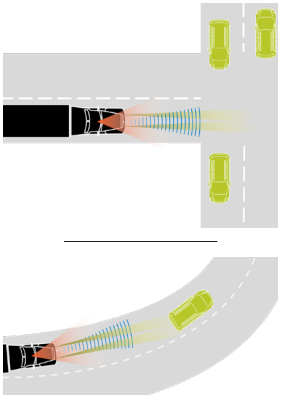
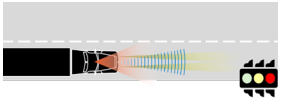
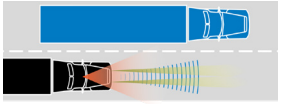
CHALLENGING SCENARIOS (*continued*)

Challenging Scenario	Description	Illustration
The host vehicle is traveling on a road where the lane markings begin to converge, diverge, or narrow (e.g. temporary lines in construction areas, off-ramps, or merge zones).	If lane markings do not follow a consistent pattern or lane width, the system may trigger a false system alert and/or vehicle braking, or may result in little to no system alert and/or vehicle braking.	
The host vehicle is traveling where a shift in traffic patterns (e.g. construction zones) forces the host vehicle to utilize the shoulder.	The system may interpret this situation as a roadway departure, which may result in a false system alert and/or vehicle braking.	
The host vehicle is traveling near a parallel or frontage road.	The system may detect speed limit signs from a nearby road, which may result in a false system alert and/or vehicle dethrottle.	
The host vehicle is traveling on a road with multiple speed signs shown together or digital speed signs.	The system may misinterpret multiple speed limit sign values, advisory speed limit signs, or digital speed signs, which may result in a false system alert and/or vehicle dethrottle.	
The host vehicle is traveling on a road with other signs that include numbers.	The system may misinterpret signs with numbers as speed limit signs, which may result in a false system alert and/or vehicle dethrottle.	
The host vehicle is traveling on a road with tilted, rotated, or partially blocked speed signs.	The system may not detect speed signs in these conditions, which may result in a false system alert and/or vehicle braking, or little to no system alert and/or vehicle dethrottle.	

IMPORTANT **Illustrations are representative only and not to scale.**

WARNING **You, the driver, are responsible for the control and safe operation of the vehicle. Never wait for an ADAS system to intervene.**

CHALLENGING SCENARIOS (*continued*)

Challenging Scenario	Description	Illustration
The host vehicle is traveling in unusual lighting conditions or adverse weather conditions like dense fog or heavy precipitation.	Areas with insufficient or unusual lighting may result in an incorrect high beam recommendation. Conditions like dense fog or heavy precipitation may interfere with the proper high beam recommendation, which may result in an incorrect high beam recommendation.	
The host vehicle is traveling around tight curves, hilltops, depressions, or intersections.	The system may only detect a portion of the detected forward vehicle's taillights or headlights, which may result in an incorrect high beam recommendation.	
The host vehicle is traveling toward a solid or flashing red or yellow traffic light.	The system may misinterpret a red or yellow traffic light for the taillights of a preceding vehicle, which may result in an incorrect high beam recommendation.	
The host vehicle is passing or being passed by a long vehicle such as a tractor/ trailer.	If the host vehicle is being passed or being slowly overtaken by a long vehicle, the system may not recommend low beams until the taillights of the overtaking vehicle are in sight. Similarly, while passing or slowly overtaking a long vehicle, the system may recommend a high beam after the taillights of the overtaken vehicle are no longer in sight.	

IMPORTANT **Illustrations are representative only and not to scale.**

WARNING **You, the driver, are responsible for the control and safe operation of the vehicle. Never wait for an ADAS system to intervene.**

Systems Covered in this Overview

This document covers some – but not all – aspects of Bendix ADAS systems with an emphasis on conditions that may limit their performance. If after becoming familiar with the contents of this document you, the driver, still believe the ADAS system is not performing properly, Bendix recommends the following:

- Fully understand when the braking event occurred. Driver training may be required to fully understand how the system operates.
- Run the most current version of Bendix® ACom® Diagnostic Software to determine if an active fault exists with the system. Correct the fault(s) prior to placing the vehicle back in service.
- Verify the radar is operating the latest software version. The software version can be determined by using ACom Diagnostic Software or by contacting your Bendix account manager. The proper radar software version is intended to reduce sensitivity to road conditions that may cause a radar blind condition.

Refer to B2Bendix.com for related product documentation.

⚠WARNING

Bendix technologies complement safe driving practices. No commercial vehicle technology replaces a skilled, alert driver exercising safe driving techniques and proactive, comprehensive driver training. Never wait for the system to intervene. Responsibility for the safe operation of the vehicle remains with the driver at all times.

DIMINISHED OR LIMITED BENDIX® FUSION™ SYSTEM FUNCTIONALITY

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

Figure 23 shows examples of alerts that may be issued on the integrated display to warn you of this condition.

When the radar is blocked, Active Cruise with Braking (ACB), Autonomous Emergency Braking ([AEB] which includes Stationary Vehicle Braking [SVB]), and Following Distance Alert (FDA) will not function.

When the camera is blocked, Following Distance Alerts (FDA), Active Cruise with Braking (ACB), Lane Departure Warning (LDW), Highway Departure Warning/ Braking (HDW/HDB), Overspeed Alert (OA), and AEB (which includes SVB) will not function.

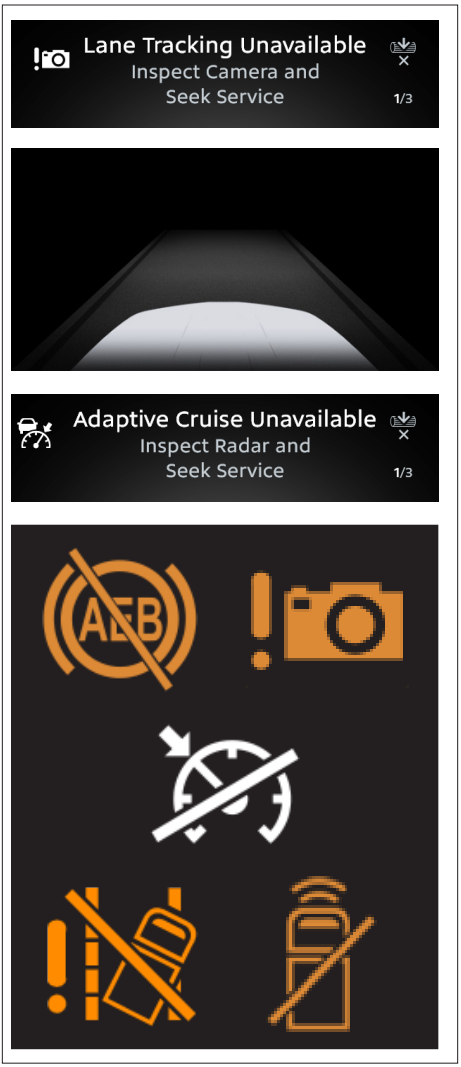


Figure 23 – Potential Messages During Active DTC

NOTE: When a camera is initially installed, it may potentially enter a calibration sequence where it may take up to 20 minutes of driving above 25 mph (40 kph) on well-marked roads in clear weather for the camera to be ready and fully calibrated. The camera should not be returned for any calibration faults found in this time period. If a calibration fault appears while driving, system functionality may be diminished or limited. Check the camera for looseness or misalignment and continue driving to clear the fault. If there are active camera faults present after 20 minutes, system performance is diminished or limited, and the vehicle should be serviced. *Refer to SD-29-50024, Bendix® Fusion™ FLC-25™ Camera Sensor Service Data sheet on B2Bendix.com for more information.*

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.

When the radar or camera becomes unblocked or is able to detect forward vehicles again, the system should return to expected operation and the driver notification(s) should no longer display.

Speed Only Mode

In the case of blocked radar or detection of a problem with 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 if 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.

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. *Figures 24 and 25* show messages you may receive on the integrated vehicle display when Speed Only Mode is active.

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.

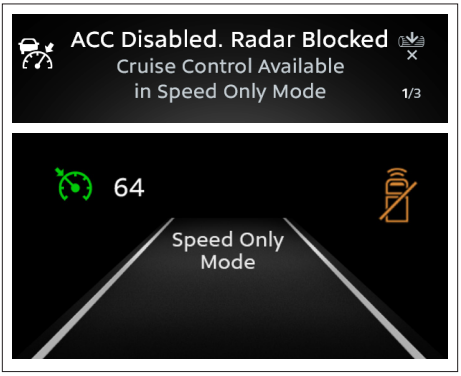


Figure 24 – POST Test Failed



Figure 25 – Speed Only Mode is Active

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 six (6) seconds. This will indicate to the SafetyDirect® Processor by Rand McNally to capture and possibly transmit 10 seconds of video and 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 26 – LDW, HDW, and 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.

Service Data Sheets

- 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
OA	Overspeed Alert
OBC	On-board Computer
PAEB	Pedestrian Autonomous Emergency Braking
POST	Power-On Self-Test
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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