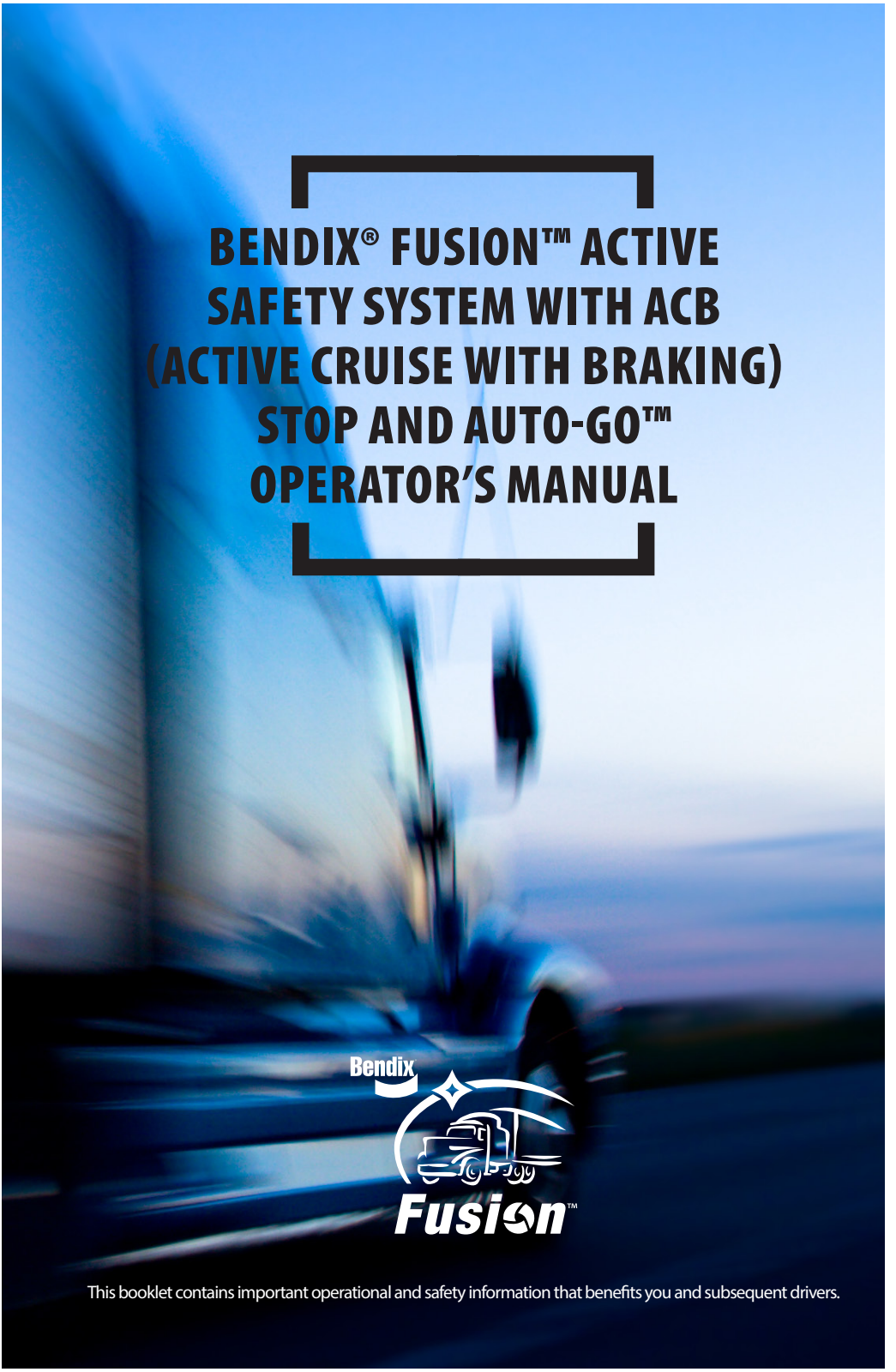
# BENDIX® FUSION™ ACTIVE SAFETY SYSTEM WITH ACB (ACTIVE CRUISE WITH BRAKING) STOP AND AUTO-GO™ OPERATOR'S MANUAL




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, Bendix ESP automatically intervenes to reduce the accelerator pedal input and/or apply the foundation 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 brake applications.

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 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® PRO™ 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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# INTRODUCTION

This Operator's Manual provides an overview of the Bendix® Fusion™ system with ACB (Active Cruise with Braking) Stop and Auto-Go™. This manual explains the components, features, and functions, along with 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 controls, system alerts, and what to expect when the system is on.

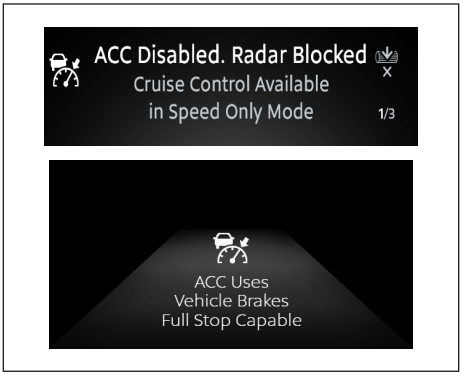



***Figure 1 - System Initializing***

Keep this manual in the vehicle as a reference for the system, its operation, and its performance characteristics. *See Figure 1* for examples 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, visit b2bendix.com or call 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 enhanced feature set released by Bendix. It is possible for this Operator's Manual to be moved from vehicle to vehicle. You must verify with the vehicle OEM to determine which features are included on your own vehicle.

## 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. At these times, alerts may not occur, or erroneous alerts may occur.**

**The Bendix Fusion system reacts ONLY to vehicles that are stationary or moving in the same direction as your vehicle. The Fusion 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*.**

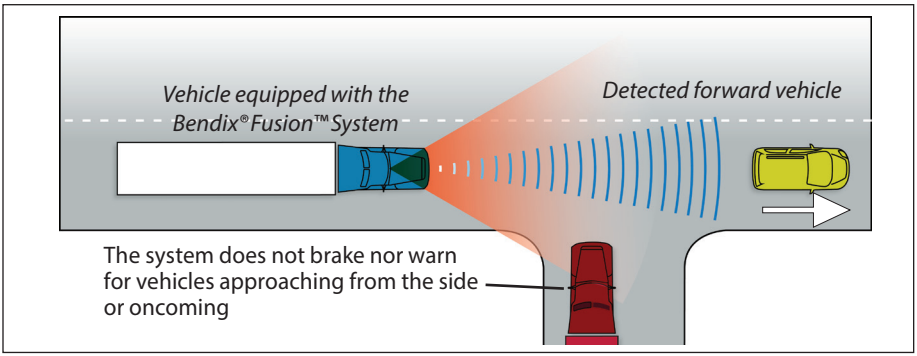



***Figure 2 - System Responses***

**When the Fusion system needs to intervene, it works in conjunction with the Bendix® ESP® full stability system to engage the foundation brakes. 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.**

**Potential False Alerts – The Fusion system may generate a false alert or false braking. Radar and camera technology is not perfect, and false alerts sometimes occur.**

⚠ **Pedestrians, Animals, Non-Metallic, or Limited-Metallic Objects – The Bendix® 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 Fusion system may react to pedestrians in the vehicle path during ACB (Active Cruise with Braking) Stop and Auto-Go™.**

⚠ **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. Caution is advised if you, the driver, decide to use ACB during downhill grades. Follow all safe driving practices. ACB should not be used on hills greater than OEM recommendations.**

⚠ **Inspect the radar and mounting bracket regularly and remove any mud, snow, ice build-up, or other obstructions. Installing aftermarket deer or bumper 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 cruise control until the vehicle is repaired and the radar is re-aligned.**

⚠ **If a problem is detected with the Bendix® Fusion™ system, there is an audible alert and/or icon on the display. Depending on the type of problem, the system may disable cruise control functions until service is performed.**

⚠ **Smaller forward vehicles, such as motorcycles, may be difficult for the radar to identify. As the driver, it is your responsibility to be aware of this type of vehicle and to be cautious.**

⚠ **As the driver, you should always be responsible for the safe operation of the vehicle and 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 take over.**

⚠ **Indefinite service brake hold is not a parking brake. After ACB, you, the driver, must take over and secure the vehicle. As the driver, you should use caution and manually apply the parking brake when parking the vehicle on a steep grade or when exiting the vehicle.**

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

## SYSTEM COMPONENTS

*See Figure 3*. The main components used in the Bendix® Fusion™ system are the Bendix® ESP® Controller; the Bendix® radar; the Bendix™ camera (powered by the Mobileye® System-on-Chip EyeQ® processor with state-of-the-art-vision algorithms); the OEM display; and the SafetyDirect® by Bendix CVS processor.


***Figure 3 - System Components***

The Fusion system locates and tracks moving and stationary vehicles and objects. The radar is located at the front of your vehicle. The camera is located on the windshield, inside the wiper path.

The Fusion system radar is pre-aligned at the factory and no adjustment should be needed. If the radar 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.

## SYSTEM FEATURES

### Active Cruise with Braking (ACB)

**NOTE:** Some OEMs use the term ACC (Active Cruise Control) instead of ACB.

When normal cruise control is on and set, as confirmed by the green cruise control icon on the display, the ACB feature also becomes available. The system will not only intervene to maintain the cruise control set speed, but also can intervene – if needed – to maintain a set default following distance behind the moving vehicle in front of you.

When you encounter a detected forward vehicle that slows down below the cruise control set speed, the system has the ability to decrease the accelerator pedal input, apply the retarder, or activate the foundation brakes – if needed – in order to maintain the gap with the forward vehicle. The following distance is adjustable on some vehicles. *See the striped area in Figure 4.*

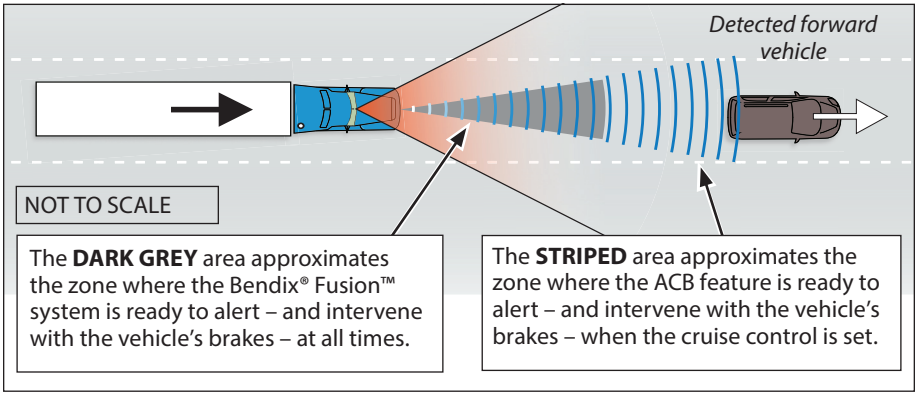



***Figure 4 - ACB***

### Auto-Resume™ after an ACB Event

If the Fusion system automatically applies the foundation brakes in order to maintain the gap with the forward vehicle, and the vehicle remains above a minimum speed defined by the OEM, the vehicle will "auto-resume" back to the cruise control set speed while still attempting to maintain the set following distance gap with the forward vehicle. The cruise control icon will remain green, indicating cruise control is engaged. If the vehicle is below the minimum defined speed, cruise control will automatically cancel and will not attempt to adjust the speed to the previously set speed. The cruise control icon will change to white, indicating cruise control is not set.

**NOTE:** As the driver, you should always be alert and ready to take over.

### Canceling Cruise Control and Active Cruise with Braking (ACB)

At any time, you can step on the brake pedal, press "cancel," or turn cruise control off via the switch to cancel cruise control and the ACB (Active Cruise with Braking) Auto-Resume™ feature.

*Figure 5* shows an integrated display message you may see when the ACB and the ACB Auto-Resume feature are actively engaged and maintaining a set following distance behind the forward vehicle. Additionally, *Figure 5* shows a message you may see on the integrated display when ACB and the ACB Auto-Resume function cancel, and ACB is monitoring the forward vehicle. Alerts and messages will come from the OEM display. Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.

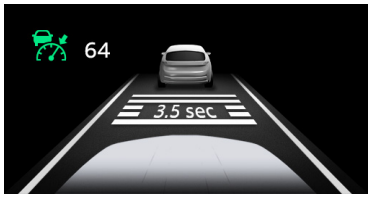



***Figure 5 - Canceling Cruise Control and ACB***

**NOTE:** As the driver, you should always be alert and ready to take over.

### ACB Stop and Auto-Go™

When cruise control is on and set, if the detected forward vehicle slows down to a stop, the system can automatically de-throttle the engine, activate the engine retarder, and apply the foundation brakes to bring the vehicle to a full stop. If the detected vehicle in front of your vehicle moves forward within the ACB Auto-Resume time period and an object or pedestrian is not detected between the front of your vehicle and the detected forward vehicle, your vehicle will "auto-resume" and return back to the cruise control set speed while attempting to maintain the set following distance with the forward vehicle. *Figure 6* shows a message you may see on the integrated display when the ACB Auto-Resume function is actively engaged during the ACB Stop and Auto-Go function.


***Figure 6 - ACB Stop and Auto-Go***

**NOTE:** Confirm the auto-resume time period with your OEM.

**NOTE:** The Bendix® Fusion™ system may react to pedestrians in the vehicle path during ACB (Active Cruise with Braking) Stop and Auto-Go™. *Figure 7* shows a message you may see on the integrated display indicating a pedestrian or object has been detected.

***Figure 7 - Pedestrian Detection***

If the detected forward vehicle does not move within the auto-resume time period, the ACB Auto-Resume™ function will cancel and the foundation brakes will hold the vehicle at a stop indefinitely. You, the driver, must take over. You can manually speed up the vehicle by pressing down on the accelerator pedal or pressing the cruise control resume switch. The ACB system will automatically re-engage upon reaching the vehicle's minimum cruise control set speed defined by the OEM and will "auto-resume" back to the cruise control set speed.

*Figure 8* shows a message you may see on the integrated display when the ACB Auto-Resume function cancels and ACB is monitoring the forward vehicle. Alerts and messages will come from the OEM display. Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.

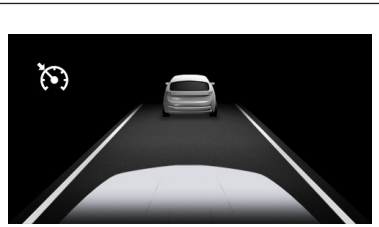


***Figure 8 - ACB Auto-Resume Cancelation***

**NOTE:** As the driver, you should always be alert and ready to take over.

**NOTE:** The indefinite service brake hold can be canceled if you, the driver, press the accelerator pedal or the brake pedal, apply the parking brake, or resume cruise control.

**NOTE:** Indefinite service brake hold is not a parking brake. As the driver, you must take over and secure the vehicle.

If the system detects a pedestrian between your vehicle and the detected forward vehicle, the Active Cruise with Braking (ACB) function will cancel and the foundation brakes will hold the vehicle at a stop indefinitely. As the driver, you must take over. This function can only detect pedestrians within the radar field of view and it is important to note that the pedestrians are not instantly detectable. You, the driver, should always be responsible for the safe operation of the vehicle and be aware of potential threats that may enter the vehicle's lane of travel. ACB and the ACB Auto-Resume™ feature should not be used in city environments with a high occurrence of pedestrians or other objects crossing in front of the vehicle. The Auto-Resume feature will also cancel under any of the following circumstances:

- If the forward vehicle tracking is lost
- If the turn signal is activated
- If the hazard lights are activated
- If 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 Vehicles are Present

When cruise control is switched on and set and no forward vehicle is within range of the Bendix® Fusion™ system, the vehicle will maintain the set speed like ordinary cruise control.

### The Forward Detected Vehicle Icon

When cruise control is switched on and set, and a vehicle ahead of you is detected by the system, the forward detected vehicle icon on the vehicle display will illuminate. *See Figure 9.*

This is an indication to you that the Fusion system is actively managing the distance between your vehicle and the vehicle ahead, and that the system may automatically intervene.

***Figure 9 - Forward Detected Vehicle Icon***

## What is Following Distance?

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

## Automatic Foundation Brake Applications

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

## When Not to Use Cruise Control

⚠ This vehicle's cruise control must only be used in the same conditions that are normally recommended for ordinary cruise control. THERE ARE CERTAIN SITUATIONS WHEN CRUISE CONTROL SHOULD NOT BE USED:

| | |
|---|---|
| Inclement Weather/Low Visibility Situations – Do not use cruise control in inclement weather or low visibility conditions – such as rain, snow, smoke, fog, ice, or other severe weather conditions – that may affect the performance of the Bendix® Fusion™ system. |  |
| Dense Traffic – Caution is advised if you, the driver, decide to use ACB (Active Cruise with Braking) in dense traffic. Follow all safe driving practices. |  |
| Sharp Curves and Winding Roads – Do not use cruise control when traveling sharply curved or winding roadways. CAUTION: Road curvature may impact the radar's ability to track vehicles ahead in the same lane. |  |
| Entrance or Exit Ramps – Caution is advised if you, the driver, decide to use cruise control when entering or exiting roadways. Follow all safe driving practices. |  |
| Downhill Grades – Caution is advised if you, the driver, decide to use ACB during downhill grades. Follow all safe driving practices. ACB should not be used on hills greater than OEM recommendations. |  |
| Construction Zones – Do not use cruise control in construction zones. |  |
| Off-Road – Do not use cruise control in off-road conditions. |  |
| Smaller Forward Vehicles – Smaller forward vehicles, such as motorcycles, or certain types of trailers, may be difficult for the radar and camera to identify. It is your responsibility to be aware of these types of vehicles and to slow down if necessary. |  |

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

This is the most severe warning and action the Bendix® Fusion™ system can make. 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 do not address the potential forward collision, the Fusion system may automatically apply up to full foundation brakes on the tractor while pulsing the trailer brakes – if needed – to help mitigate or lessen its severity.

When activated, you will be notified by an audible and visual indication from the OEM-integrated display.

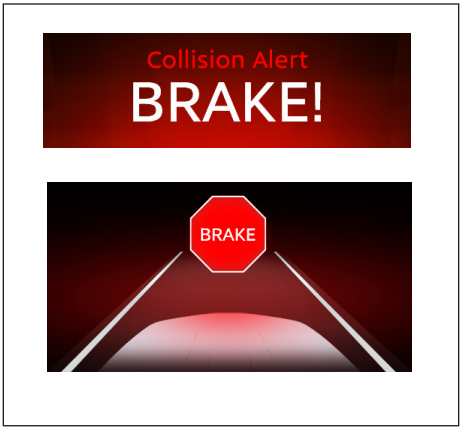



***Figure 10 - IA and AEB***

*Figure 10* shows examples of messages you may see on the integrated display when the IA or AEB is activated. Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.

**NOTE**: As the driver, you should always be alert and ready to take over.

## Indefinite Service Brake Hold

If, as a result of the Fusion system intervention, the vehicle comes to a full stop, the foundation brakes will hold the vehicle at a stop indefinitely and you, the driver, must take over. Indefinite service brake hold is not a parking brake and you must take over and secure the vehicle. If after a set period of time the driver does not respond, the integrated display will show a driver takeover request (*See Figure 11*). As the driver, you should use caution and manually apply the brakes on steep grades or when exiting the vehicle. You, the driver, can manually launch the vehicle by pressing down on the accelerator pedal.


***Figure 11 - Indefinite Service Brake Hold***

**NOTE:** As the driver, you should never exit the vehicle without first securing the vehicle parking brake.

**NOTE:** As the driver, you should always be alert and ready to take over.

**NOTE:** The indefinite service brake hold can be canceled if you, the driver, press the accelerator pedal or the brake pedal, or apply the parking brake.

### Slower Moving Vehicles Ahead

The Bendix® Fusion™ system is ready to intervene with braking, as needed, if the system determines that a potential collision with a slower moving vehicle ahead is imminent. You, the driver, must apply additional braking when necessary to maintain a safe distance with the vehicle ahead. When approaching a slower moving vehicle ahead, you should anticipate this and take necessary action. Do not wait for the system to intervene!

### Stationary Vehicle Braking (SVB)

When a potential collision with a large, stationary, metallic vehicle in your lane of travel (definitively identified as a vehicle) is detected, the system can sound an alert before impact.

If you don't take action to address the potential impact, the Fusion system can apply foundation brakes to assist you in reducing the severity of or potentially avoiding the collision with that stationary vehicle.

If, as a result of the Fusion system intervention, the vehicle comes to a full stop, the foundation brakes will hold the vehicle at a stop indefinitely and you, the driver, must take over. Indefinite service brake hold is not a parking brake and you must take over and secure the vehicle. As the driver, you should use caution and manually apply the brakes on or when exiting the vehicle. You, the driver, can manually accelerate the vehicle by pressing down on the accelerator pedal.

**NOTE:** As the driver, you should always be alert and ready to take over.

**NOTE:** The indefinite service brake hold can be canceled if you, the driver, press the accelerator pedal or the brake pedal, or apply the parking brake.

The stationary vehicle braking feature of the Fusion system's Autonomous Emergency Braking (AEB) is most useful when approaching a line of stopped traffic or a stalled vehicle that is not immediately recognized by a distracted driver. This includes conditions such as while driving in limited-sight conditions, at night, or in fog.

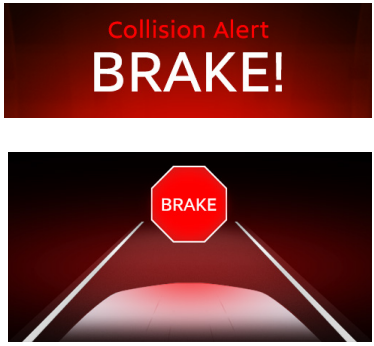



***Figure 12 - IA and AEB***

*Figure 12* shows examples the messages you may see on the integrated display when the Impact Alert (IA), or AEB, is activated. Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.

**NOTE:** As the driver, you should always be alert and ready to take over.

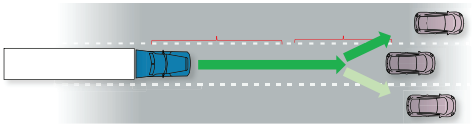
### Multi-lane Autonomous Emergency Braking (AEB)

*See Figure 13.* Not only can the Bendix® Fusion™ system potentially mitigate a forward collision with an in-lane vehicle, it can also help you mitigate one when more than one highway lane is blocked. Once a collision mitigation braking event begins and you, as the driver, steer into an adjacent lane to avoid the forward vehicle, the Fusion system's Multi-lane AEB feature may continue to apply the brakes and sound an alert when it detects another forward vehicle ahead posing a threat in the new lane of travel.

If, as a result of the Fusion system intervention, the vehicle comes to a full stop, the foundation brakes may hold the vehicle at a stop indefinitely and you, the driver, must take over. Indefinite service brake hold is not a parking brake and you must take over and secure the vehicle. As the driver, you should use caution and manually apply the brakes on or when exiting the vehicle. As the driver, you can manually accelerate the vehicle by pressing down on the accelerator pedal.

**NOTE:** As the driver, you should always be alert and ready to take over.

**NOTE:** The indefinite service brake hold can be canceled if you, the driver, press the accelerator pedal or the brake pedal, or apply the parking brake.



*The Fusion system's Multi-lane AEB feature can help you, the driver, mitigate both the first, and potentially the second, crash situation when more than one traffic lane is blocked.*

***Figure 13 - Multi-lane AEB***

## Following Distance Alerts (FDA)

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 whenever the distance between your vehicle and the detected forward vehicle is getting closer and you are within the alert range.

Once the audible alert is given, you should increase the distance between your vehicle and the forward vehicle until the audible alert stops. *Figure 14* shows messages you may receive on the integrated display when the FDA is activated.

The FDA is ready to alert you even when the vehicle is moving at low speeds. If the distance continues to decrease, you will hear and see more rapid alerts. *Figure 15* shows messages you may see on the integrated display if the following distance continues to decrease.

When the FDA reaches its highest level, the beeping will be rapid and the display may show an additional visual alert. *Figure 16* shows messages you may see on the integrated display when the Impact Alert (IA) or AEB is activated. Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.


***Figure 14 - FDA***


***Figure 15 - Following Distance Warning***

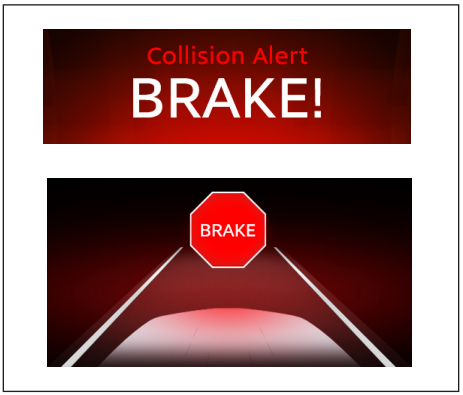



***Figure 16 - IA and AEB***

## Challenging Situations

The Bendix® Fusion™ system does not automatically apply foundation brakes on stationary objects – only stationary vehicles as previously described.

Also, the Fusion system may not be able to detect objects with limited radar-reflecting surfaces or materials such as recreational vehicles, horse-drawn buggies, motorcycles, logging trailers, etc. As the driver, you are responsible for the safe operation of the vehicle at all times.

## Lane Departure Warning (LDW)

The Fusion system has the ability to warn you if your vehicle unintentionally departs its lane by emitting an audible rumble strip sound to get your attention.

In most applications, the LDW system is enabled above 37 mph (60 kph). If the turn signal is used to change lanes, the LDW is suppressed and no audible or visual alerts are activated. You should always be ready to immediately correct the vehicle lane position, especially when the LDW is activated.

*Figure 17* shows integrated display messages you may see from the LDW system.

A. The LDW function is detecting the lane lines

B. The vehicle speed is below 37 mph (60 kph) and the LDW system is not activated

C. The vehicle is traveling over a lane marking without a turn signal

D. The LDW function is disabled or faulted

Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.

**NOTE:** As the driver, you should always be alert and ready to take over.

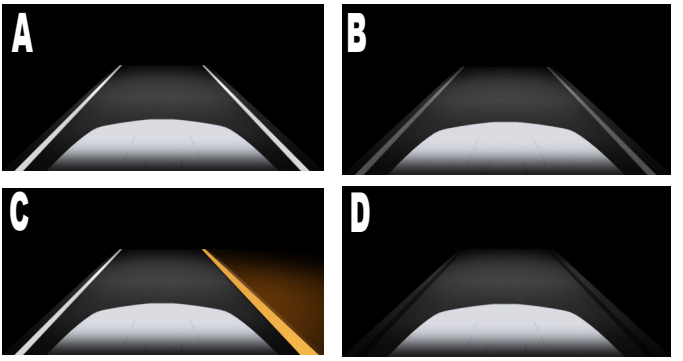



***Figure 17 - LDW Messages***

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

***Figure 18 - LDW Disable Switch***

The vehicle is equipped with a 15-minute LDW, HDW, and HDB disable switch 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.

### Highway Departure Warning (HDW)

Built on the Lane Departure Warning (LDW) functionality, HDW provides an audible 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 sounded, you should immediately correct the vehicle path into the correct lane position.

### Highway Departure Braking (HDB)

If the highway departure situation that caused the HDW is not addressed, the Fusion system may alert you by automatically applying the brakes to assist in reducing your vehicle speed moderately. In some circumstances, the system may be capable of reducing the vehicle speed to a full stop and indefinite service brake hold.

As the driver, you remain responsible for the safe operation of the vehicle at all times.

*Figure 19* shows the message you may see on the integrated display when HDB is activated. Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.


***Figure 19 - HDB***

**NOTE:** HDW and HDB can only be activated if the lane markings are identifiable by the system.

When HDW and HDB are activated excessively, the Bendix® Fusion™ system provides a warning and will disable these functions until the driver restarts the vehicle. Other Fusion system features, including LDW, will remain available.

If, as a result of the Fusion system intervention, the vehicle comes to a full stop, the foundation brakes will hold the vehicle at a stop indefinitely and you, the driver, must take over. Indefinite service brake hold is not a parking brake and you must take over and secure the vehicle. You, the driver, should use caution and manually apply the brakes on or when exiting the vehicle. You can manually accelerate the vehicle by pressing down on the accelerator pedal.

**NOTE:** As the driver, you should always be alert and ready to take over.

**NOTE:** The indefinite service brake hold can be canceled if you press the accelerator pedal or the brake pedal, or apply the parking brake.

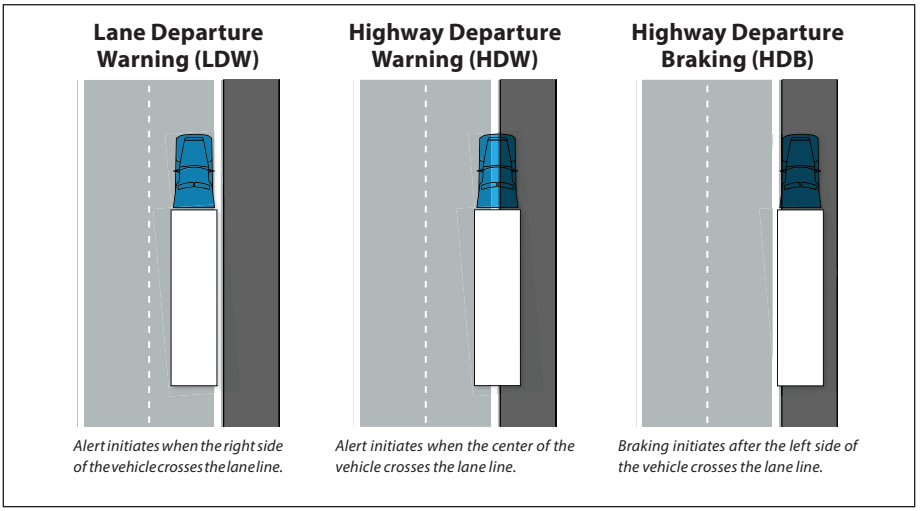



***Figure 20 - LDW, HDW, and HDB***

### Over-speed Alert and Action (OAA)

The Fusion system can read most roadside speed limit signs in North America and can warn you if your vehicle speed exceeds the posted speed limit.

The OAA will sound an audible and visual alert to you when your vehicle is traveling at +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 will experience a haptic warning through a brief engine torque reduction of about one (1) second. A message will then be transmitted to fleet management via the Bendix™ SafetyDirect® web portal.

Both the +5 and +10 mph 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. When driving between regions which post speeds in miles, and those which post in kilometers, the speed sign recognition feature will not function until the correct U.S./Metric selection is made or auto-learned after detecting multiple speed signs in the new regions (this is applicable to U.S. and Canada only).


***Figure 21- OAA Icon***

*Figure 21* shows a message you may see on the integrated display when the OAA is activated. Please verify with the vehicle Operator's Manual for audible and visual indications your vehicle may display.

## SPECIAL ALERTS

### Brake Overuse Alert

The Bendix® Fusion™ system provides a warning when it is intervening and using the foundation brakes excessively. Over use of the foundation brakes can lead to the brakes overheating and a potential loss of braking performance caused by brake fade. Using cruise control on downhill runs may cause this alert to activate. When the system detects brake overuse, a text message will be shown on the display along with an audible alert. As the driver, you should intervene immediately. Please verify with the vehicle Operator's Manual for the actual audible and visual indications your vehicle may display.

Once the brake overuse alert is activated, certain driver interventions that cancel cruise control – such as stepping on the brake pedal or switching off cruise control – will discontinue the alert. Following a brake overuse alert, you should not reset cruise control for at least 20 minutes. This will give the brakes time to cool down.

If you choose to reset cruise control during that 20-minute period, the Fusion system interventions will be limited to de-throttling and engine retarder only. The system will automatically disable all the Fusion system foundation brake applications for at least 20 minutes.

If the system does not detect a driver intervention within 15 seconds after the brake overuse alert sounds, it will shut itself off and set a Diagnostic Trouble Code (DTC). You will continue to receive alerts, but all Fusion system interventions (de-throttling, engine retarder, or brake applications) will be disabled until the next ignition cycle.

**NOTE:** In all cases, you have the ability to apply the foundation brakes if necessary. You should take care since overheated brakes may reduce the vehicle's braking capability.

## POWER-ON SELF-TEST (POST)

During every power-on cycle, the Bendix® Fusion™ system executes a Power-On Self-Test during which the driver assistance features described in this document are not available. Vehicle cruise control is still available to the driver during POST. The POST requires the vehicle speed to be above 4 mph (6 kph) and for the radar to see objects to validate proper radar operation. Under normal operating conditions, the POST completes within a few seconds and all driver assistance features become available to the driver. In the special case where the radar is blocked, the POST 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 radar fault code, but regular vehicle cruise control will remain available to the driver.

## SYSTEM RESPONSES

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

| **Your Action:** | **Reaction of the Bendix® Fusion™ System:** |
|---|---|
| If you, the driver, do this: | Expect the Fusion system to do this: |
| Step on the brake (during a collision mitigation event). | As the driver, you are always in control and are able to apply full braking power. |
| Step aggressively on the accelerator (during a collision mitigation event). | As the driver, you are always in control. Your actions can override any Fusion system actions. **NOTE:** If cruise control is engaged, it will be overridden until the accelerator is released; then cruise control will resume the original set speed automatically. |
| Step on the brake (when in cruise). | Cruise control will be canceled. |
| Step on the brake or accelerator pedal, or activate the parking brake (when in indefinite service brake hold). | Indefinite service brake hold will be canceled. You, the driver, must take over and secure the vehicle by pressing the accelerator pedal, brake pedal, or parking brake as appropriate. |
| Step on the accelerator (when in cruise). | Cruise control will be overridden until the accelerator is released; then cruise control will resume the original set speed automatically. |
| Switch on the cruise control. | Nothing. The ACB (Active Cruise with Braking) feature will not engage until you set the cruise control speed. |
| Switch off the cruise control. | The ACB feature will turn off; the collision mitigation feature remains active and ready to intervene. You, the driver, will continue to hear all alerts as needed. |
| Set the cruise control speed. | The ACB feature is automatically activated, and your vehicle maintains set speed and following distance behind the vehicle ahead. |

| Your Action: | Reaction of the Bendix® Fusion™ System: |
|---|---|
| If you, the driver, do this: | Expect the Fusion system to do this: |
| Cover or 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 will be issued to warn of this condition. A blocked radar will be indicated through an alert and will disable most Fusion system functions. Specific, camera-based functions, such as Lane Departure Warning (LDW), will remain operable. Conventional engine cruise control may be re-engaged by the driver when the radar is disabled for blocked conditions. It is important to visually inspect the radar and the mounting bracket regularly and remove any mud, snow, ice build-up, or other obstructions. After clearing any obstructions, turn the vehicle off and then on to clear the fault code. |
| Cover or block the camera. | The Fusion system performance will be diminished, or disabled, when the camera becomes blocked. An alert will be issued to alert you of this condition.<br>A blocked camera will be indicated through an alert and will disable all camera-based functions. The radar will maintain its function as a Bendix® Wingman® Advanced™ system. |
| Use normal cruise control "+/-" switch. | Vehicle speed will be increased (+) or reduced (-) to achieve the new set speed, while actively maintaining the following distance with the vehicle ahead, if one is present within 328 ft (100 m). |

**NOTE:** The system responses described above are typical but may vary with different versions of the Fusion system. These represent examples of driver actions and typical Fusion system responses; however, this chart does not attempt to cover all possible situations.

## 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 motor vehicle is detected ahead in your lane.<br><br>Factors that can potentially affect the system's ability to identify a vehicle include: if the vehicle is not a licensed motorized vehicle; or certain types of trailers.<br><br>Cruise is either "ON" or "OFF." | A stationary vehicle alert may be issued if the Fusion system determines a stationary vehicle is an imminent threat. | **⚠ WARNING**<br><br>You must immediately act to potentially avoid – or lessen the severity of – a collision.<br><br>If a collision is likely to occur, the Fusion system can 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.<br><br>Cruise is either "ON" or "OFF." | The Following Distance Alert (FDA) can sound, and a visual message/icon typically appears on the display.<br><br>Depending on how close your vehicle approaches, the system may initiate an Impact Alert (IA) warning. | None.<br><br>You must respond as needed. If a collision is likely to occur, the collision mitigation feature can apply your vehicle's foundation 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** |
| The detected forward vehicle slows rapidly.<br><br>Cruise is either "ON" or "OFF." | The FDA and IA warning (continuous tone) will sound, and a visual message/icon typically appears on the display. | None.<br>You must respond as needed.<br>If a collision is likely to occur, the collision mitigation feature can apply your vehicle's brakes. |
| A pedestrian or animal runs in front of your vehicle, or any organic or non-metallic object is in front of your vehicle.<br><br>Cruise is either "ON" or "OFF." | These objects may only be detected during ACB (Active Cruise with Braking) Stop and Auto-Go™ maneuvers. If detected, the system will provide a brief alert to notify that cruise control has canceled. The Bendix® Fusion™ system will not warn or react to animals or non-metallic objects. | Cruise control is canceled.<br>Note that these items are difficult to detect and you, the driver, should maintain awareness of the environment at all times.<br>You must respond as needed. |
| **Moving vehicles ahead in your lane of travel** | | |
| Another vehicle crosses the road perpendicular to your path of travel – such as at an intersection.<br><br>Cruise is either "ON" or "OFF." | None. | None.<br>You must respond as needed. |

**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** |
| A collision mitigation braking event has begun and you, as the driver, steer into an adjacent lane to avoid the forward vehicle.<br><br>Cruise is either "ON" or "OFF." | If the adjacent lane is blocked by another forward vehicle, the Impact Alert (IA) warning will sound and a visual message/icon typically appears on the display. | The Bendix® Fusion™ system may continue to apply the brakes if it detects another vehicle ahead in the new traffic lane posing a threat. |
| **Lane Departure System Active (Lane detection icons being displayed)** | | |
| Your vehicle signals a lane-change and crosses a lane-marking.<br><br>Cruise is either "ON" or "OFF." | None. | None. |
| Traveling below 37 mph / 60 kph, your vehicle crosses a lane marker (without the corresponding turn signal activated).<br><br>Cruise is either "ON" or "OFF." | None. | None.<br>You must respond as needed. |

**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 Departure System Active (Lane detection icons being displayed)** | | |
| Traveling above 37 mph / 60 kph, your vehicle departs your lane of travel without the corresponding turn signal activated.<br><br>Cruise is either "ON" or "OFF." | A "rumble strip" audible/ vibration/visual alert is initiated. | None.<br>You must respond as needed. If you do not respond, the Bendix® Fusion™ system may apply the brakes to reduce the vehicle speed moderately to alert you.<br>(Use the turn signal when changing lanes and/or keep your vehicle within the lane markings.) |
| **Over-speed Alert and Action**<br>**International travel: When changing between regions which post speeds in miles and those which post in kilometers, the speed limit sign recognition feature will not function until the correct U.S./Metric selection has been made.** | | |
| Your vehicle passes a U.S. or Canadian speed limit sign. In some cases, this feature may detect speed signs on parallel roads, warning you, the driver, and reducing the accelerator pedal input.<br><br>Cruise is either "ON" or "OFF." | The OEM-integrated display will show the posted speed limit. | None. |
| Your vehicle exceeds the posted speed limit by 5 to 9 mph (8 to 14 kph). | An Over-speed Alert and Action (OAA) is issued and the posted speed limit will be visually presented to you, the driver. | None. |
| The vehicle exceeds the posted speed limit by more than 10 mph / 16 kph. | An OAA is sounded and the posted speed limit will be visually presented to inform you that your vehicle should slow down. | If cruise control is NOT ON:<br>A one-second accelerator pedal decrease of the engine will occur. |

**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** | | |
| With no detected forward vehicle. | None. | Your vehicle maintains the set speed. |
| With a detected forward vehicle.<br><br>Cruise is "ON" and speed is "SET." | The cruise control ON indicator is illuminated 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.<br><br>Cruise is "ON" and speed is "SET." | The Following Distance Alert (FDA) can sound, and a visual message or icon typically appears on the display. | You must respond as needed.<br>If the system intervenes, the vehicle accelerator pedal will be reduced, the engine retarder engaged, and the foundation brakes applied, in that order. If your vehicle speed falls below the minimum defined speed, the vehicle will automatically cancel cruise control and will not attempt to increase the accelerator pedal input to the previously set cruise control speed. |
| The detected forward vehicle slows moderately to a full stop.<br><br>Cruise is "ON" and speed is "SET." | The FDA can sound, and a visual message or icon typically appears on the display. | The system can intervene to bring the vehicle to a full stop. If the detected forward vehicle moves within the auto-launch time period and a pedestrian is not detected between the front of your vehicle and the detected forward vehicle, the vehicle will "auto-launch" and resume back to the cruise control set speed. |
| The detected forward vehicle slows rapidly.<br><br>Cruise is "ON" and speed is "SET." | The Impact Alert (IA) warning (continuous tone), can sound and a visual message/icon typically appears on the display. The Following Distance Alert (FDA) may also be heard. | You must respond as needed.<br>If the system intervenes, the vehicle accelerator pedal input will be reduced; the engine retarder engaged; and the foundation brakes applied, in that order. |

| What to Expect | | |
|---|---|---|
| **Situation** | **Typical System Indications and Alerts** | **Typical System and/or Driver Actions** |
| A detected forward vehicle cuts in front of your vehicle and speeds away.<br><br>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. |
| **Downhill Grades** | | |
| Going down a grade with a detected forward vehicle.<br><br>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 preceding section shows examples of situations and typical Bendix® Fusion™ system responses. However, the chart does not attempt to cover all possible situations.

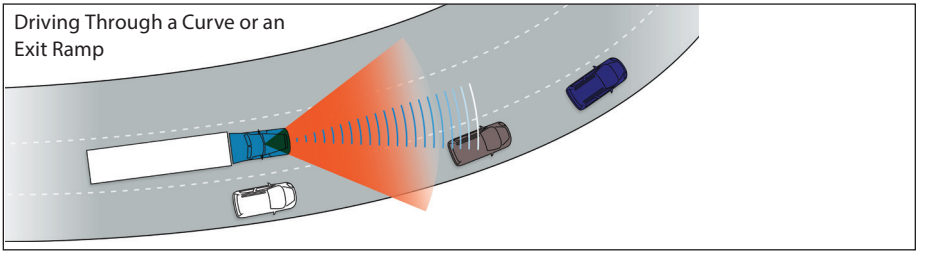
⚠ **Due to the inherent limitations of radar and camera technology, the enhanced collision mitigation technology – on rare occasions – may not detect moving vehicles or stationary vehicles in your vehicle's lane of travel. Alerts, warnings, or brake interventions may not occur.**

⚠ **Due to the inherent limitations of radar and camera technology, the enhanced collision mitigation technology – on rare occasions – may react to moving vehicles not in your vehicle's lane of travel. Alerts, warnings, or brake interventions may occur.**

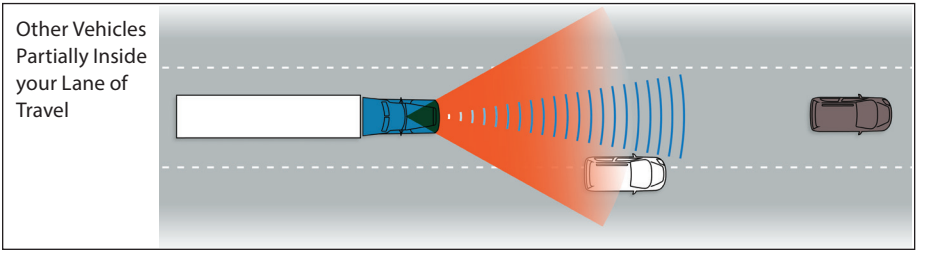
## POTENTIALLY CHALLENGING SITUATIONS FOR THE BENDIX® FUSION™ SYSTEM

The following examples illustrate situations in which the Fusion system may 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.

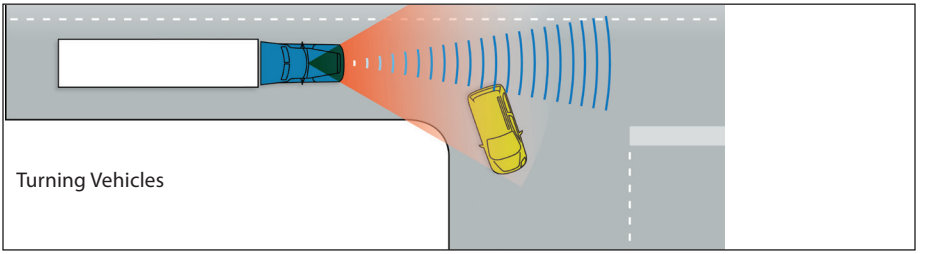
**Challenging Situation Examples**




***Example 1 - Driving Through a Curve***

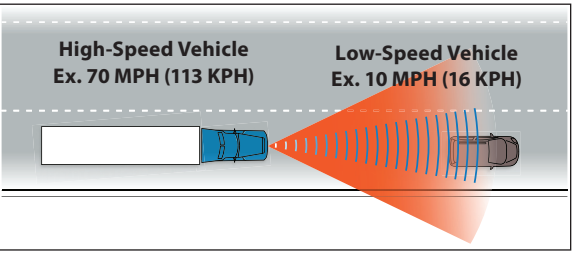



***Example 2 - Other Vehicles Ahead in your Lane of Travel***



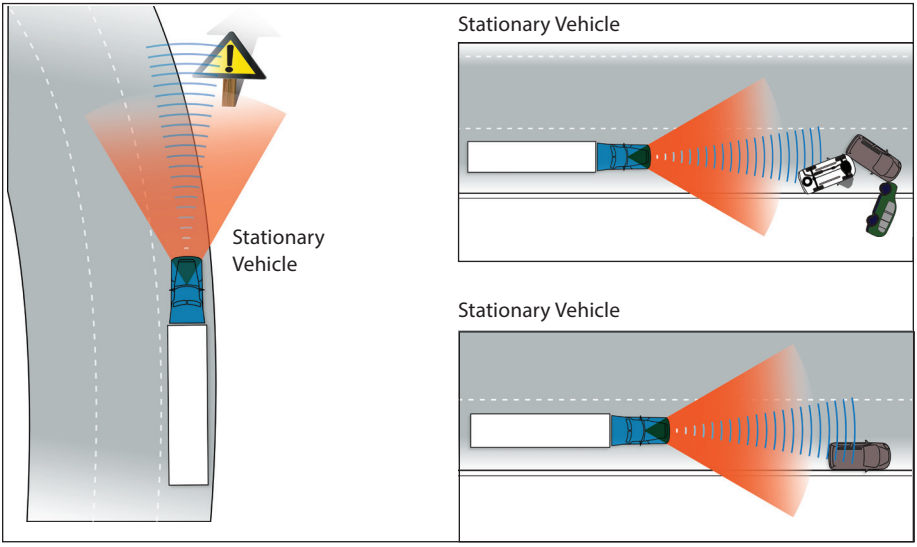

***Example 3 - Turning Vehicles***

High Differences in Speed: The higher the difference in speed between the host truck and the targeted forward vehicle, the less time the system has to react. High speed differences can cause little to no system alert or activation.

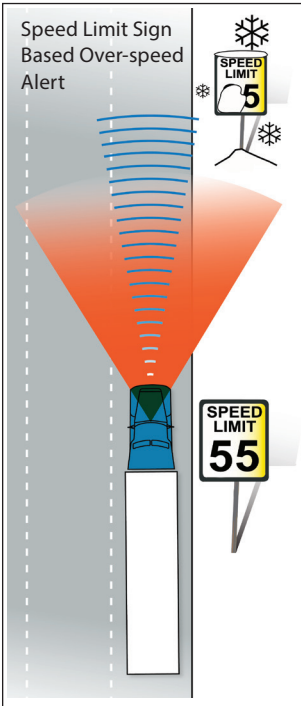



***Example 4 - High Differences in Speed***

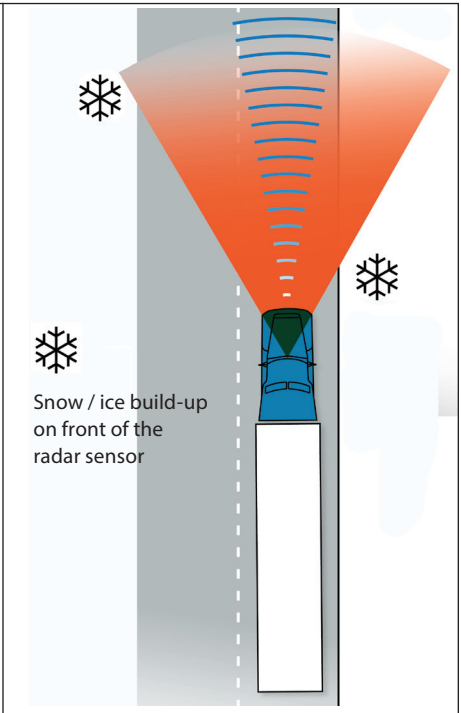
## Challenging Situation Examples (continued)




***Example 5 - Stationary Vehicles***




***Example 6 - Speed Limit Sign Unreadable***




***Example 7 - Weather Conditions***

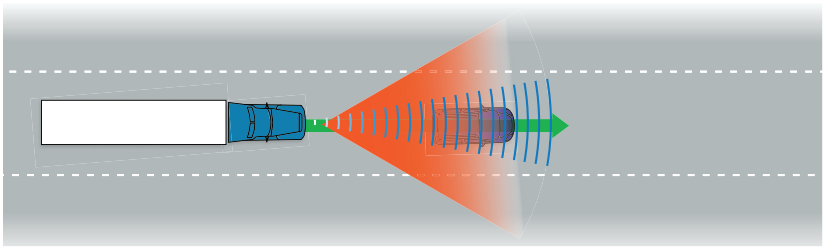
## Challenging Situation Examples (continued)

If stopped behind a stationary vehicle and the detected forward vehicle does not move within the auto-resume time period, the ACB (Active Cruise with Braking) Auto-Resume™ function will cancel and the foundation brakes will hold the vehicle at a stop indefinitely. You, the driver, must take over.

If the system detects a pedestrian between your vehicle and the detected forward vehicle, the ACB function will cancel and the foundation brakes will hold the vehicle at a stop indefinitely. As the driver, you must take over.

The ACB Auto-Resume feature will also cancel under any the following circumstances:

- If the forward vehicle tracking is lost
- If the turn signal is activated
- If the hazard lights are activated
- If steering system input indicates the vehicle is planning to turn



***Example 8 - ACB Auto-Resume does not Respond***

### Speed Only Mode

The performance of the Bendix® Fusion™ system may be diminished or disabled when the radar becomes blocked or has not detected a forward vehicle for an extended period of time. *Figure 22* shows examples of alerts that will be issued on the integrated display to warn you of this condition. 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.

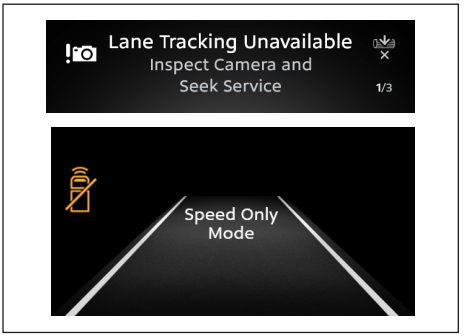



***Figure 22 - Speed Only Mode***

### Tracking Vehicles in a Curve

With cruise control set, when following a detected forward vehicle around a curve, the forward detected vehicle tracking may be lost by the Bendix® Fusion™ system. The ACB (Active Cruise with Braking) feature will delay acceleration back to the set speed until one of the following events occur:

- The system regains contact with the vehicle ahead;
- 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 cruise control 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 in your lane, the system may intervene and begin making brake applications.

## SYSTEM MAINTENANCE AND TROUBLESHOOTING

### Preventive Maintenance

The 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.

## When the Bendix® Fusion™ System Isn't Working

If the Bendix® Fusion™ system has detected a problem, depending on the vehicle manufacturer, there will typically be a warning message on the display, a Diagnostic Trouble Code (DTC) will be set, and you will be alerted. *Figure 23* shows messages you may receive on the integrated vehicle display.

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 Fusion system), or if all cruise control functions need to be disabled until the vehicle is serviced. The system should be serviced as soon as possible to restore full Fusion functionality.

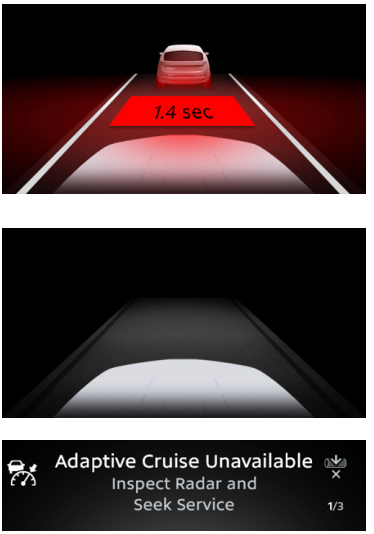



***Figure 23 - Warnings***

## Equipment Maintenance

**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 Brake Maintenance – Optimal Fusion system braking requires properly maintained truck foundation 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. The installation of aftermarket deer guards, bumper guards, snow plows, or similar potential obstructions is not recommended, and could impair the operation of the radar. An alert will 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.**

**Radar Damage / Misalignment / Tampering – In cases where the bumper and/or radar have sustained any damage, are misaligned – or if you suspect the radar has been tampered with – do not use the cruise control until the vehicle has been repaired and the radar re-aligned. 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 will 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 by you, the driver. Depending on the OEM, the volume may be adjustable.

### Event Capture

In the case of vehicles configured to do so, the enable/disable switch used by the system also functions – when depressed for six seconds – to activate a request from the SafetyDirect® by Bendix CVS Processor on the On-board Computer (OBC)/ telematics system. The request captures, and possibly transmits, 10 seconds of video data – the five seconds before and the five seconds after the button was pressed. In some cases, more video data may be available using the SafetyDirect web portal (subscription fee applies). A separate subscription to the SafetyDirect portal is needed to view the video and data captured via a wireless connection.

SafetyDirect by Bendix CVS delivers actionable information that can help improve fleet and driver safety. Data from the Fusion system's brake sensors, camera, and radar provides real-time knowledge and insight about your vehicle and surroundings while on the road. Together with the SafetyDirect Processor (SDP), they collect complex safety data and video that the SDP transfers to the SafetyDirect web portal (safetydirectportal.com) for review.

The user-friendly, subscription-based SafetyDirect web portal captures that data then, using your fleet's telematics system, automatically transmits driver performance and event-based information – including video – to your back office for analysis.

## 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 for free downloads of the technical documentation. Consult the vehicle manufacturer's documentation.

### Service Data Sheets

- SD-61-4963 *Bendix® Fusion™ System*
- SD-64-20124 *Bendix™ AutoVue® FLC-20™ Camera*
- SD-13-4986 *Bendix® EC-80™ ESP® Controllers*
- SD-65-21025 *SafetyDirect® Processor by Bendix CVS*

For additional support, visit b2bendix.com or contact the Bendix Tech team for direct telephone technical support at 1-800-AIR-BRAKE (1-800-247-2725), option 2, 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 |
| Bendix® ACom® PRO™ | Diagnostic Software |
| AEB | Autonomous Emergency Braking |
| ATC | Automatic Traction Control |
| DTC | Diagnostic Trouble Code |
| ESP | Electronic Stability Program |
| FDA | Following Distance Alert |
| HDB | Highway Departure Braking |
| HDW | Highway Departure Warning |
| IA | Impact Alert |
| LDW | Lane Departure Warning |
| LED | Light Emitting Diode |
| OAA | Over-speed Alert and Action |
| OBC | On-board Computer |
| SVB | Stationary Vehicle Braking |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