Bendix

WINGMAN Fusion

Operator's Manual

Bendix® Wingman® Fusion™ Active Safety System

⚠ 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.

DO NOT REMOVE FROM VEHICLE

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® Wingman® Fusion™ system are also equipped with the Bendix® ESP® stability system. The Bendix ESP stability system is an always ready, full-stability system which monitors vehicle performance. When necessary, Bendix ESP automatically intervenes to reduce the throttle and/or apply the foundation brakes to help you maintain stability during potential loss-of-control or rollover events.

The Wingman Fusion system uses the ESP system to help maintain vehicle stability during automatic brake applications on slick surfaces.

The Bendix ESP stability system and the Wingman Fusion system do not replace the need for you to remain alert, react appropriately and in a timely manner, and use safe driving practices.

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⚠ WARNING

Improper use of the Bendix® Wingman® 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.

Important Safety Information About The Bendix® Wingman® Fusion™ Active Safety System (Fusion)

SECTION 1: GENERAL

You are always responsible for the control and safe operation of the vehicle at all times. The Bendix® Wingman® 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.

Due to the inherent limitations of image recognition technology, camera-based safety technology – on rare occasions – may not be able to detect or may misinterpret lane markings. At these times, alerts may not occur, or erroneous alerts may occur.

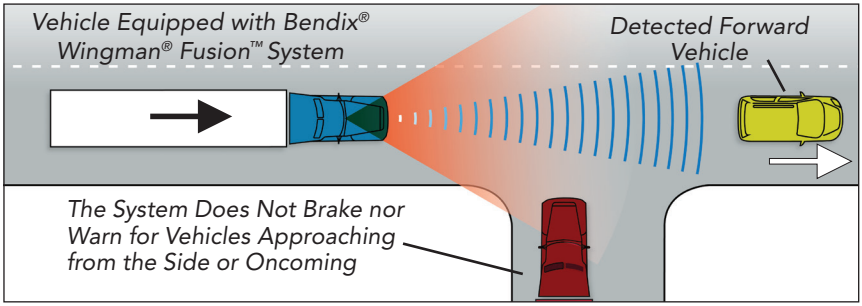
Use cruise control only in the conditions that are normally recommended for its use. Setting the cruise control will also set the Active Cruise with Braking (ACB) feature of the Bendix Wingman Fusion system. It must never be used on roads where you can not drive safely at a steady speed, including city streets, winding roads and sharp curves, downhill grades, poor road conditions (such as gravel or dirt), ice or wet surfaces (wet surfaces may increase the risk of hydroplaning), or in fog, heavy rain, or snowy conditions.

Also, the cruise control should not be used in inclement weather, in dense traffic, or where smaller vehicles–such as motorcycles–are ahead in the same lane.

Always switch off the cruise control (by stepping on the brakes or turning off the cruise control switch) when entering turning lanes, entering or exiting highways, driving through construction zones, or similar situations. *See page 30 for more details.*

Variations from this Manual – Vehicle manufacturers, and some previous models of the Fusion system, may use alerts, messages, and dash arrangements that vary from the examples shown here. Consult the vehicle operator's manual(s) for applicable details regarding use and operation. The contents of this manual are subject to change and revision – visit bendix.com for the latest version of this document – BW2681.

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



When the Wingman Fusion system needs to intervene, it works in conjunction with the Bendix® ESP® stability system to engage the 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.

SECTION 2: DRIVER ALERTS & WARNINGS

IMPORTANT: It is the responsibility of the driver to remain vigilant and change driving practices depending on traffic and road conditions.

Driver Alerts and Warnings – Before driving with Wingman Fusion, you should fully understand all the audible alerts and visual indicators that the system provides. This booklet will assist in explaining what each of them means.

The Impact Alert (IA) / Collision Mitigation Braking (CMB)

The Impact Alert is the most severe alert issued by the Wingman Fusion system. This alert indicates that a collision with the detected forward vehicle is likely. You must immediately act to potentially avoid, or lessen the severity of, a collision.

Collision Mitigation Braking applies vehicle braking to help avoid or lessen the severity of a collision, and the system will also provide visual and audible alerts when it is braking.

The IA and CMB are ready to alert you – and intervene – whenever the vehicle is moving above 15 mph / 24 kph.

When activated, the IA will sound and a visual message/icon typically appears on the dash screen or Bendix® Driver Interface Unit (DIU) display. The actual sound/display method varies by vehicle manufacturer.

The Following Distance Alert (FDA) provides both audible and visual alerts whenever the time between your vehicle and the vehicle ahead is at least one and a half (1.5) seconds* and getting closer. Once the audible alert is given, you should increase the distance between your vehicle and the vehicle ahead until the audible alert stops. The FDA is ready to alert you whenever the vehicle is moving above 5 mph / 8 kph. If the following distance continues to decrease, you will hear more rapid audible alerts. When the FDA reaches its highest level, a visual indication/alert will activate.

** 1.5 seconds is the system default and may vary by fleet/OEM.*

Stationary Object Alert (SOA) – The Bendix® Wingman® Fusion™ system will give up to a three (3) second alert when approaching a detected, sizable, stationary object with metallic (radar-reflective) surfaces in your lane of travel. This alert indicates that a collision with a stationary object is likely. As the driver, you must immediately act to potentially avoid, or lessen the severity of, a collision. The SOA is ready to alert you whenever the vehicle is moving above 10 mph / 16 kph.

Due to the inherent limitations of radar technology, the Stationary Object Alert System may alert in response to stationary objects not in the vehicle lane of travel. These objects may include bridges, signs, parked vehicles, and traffic lights. Braking or throttle intervention will not occur in response to stationary objects. As the driver, you remain responsible for safely controlling the vehicle at all times by appropriately applying the brakes, steering, or throttle as needed.

You should be especially careful when approaching certain types of vehicles and objects. The Wingman Fusion radar may not be able to detect objects with limited metal surfaces (such as recreational vehicles, horse-drawn buggies, motorcycles, logging trailers, etc.). *NOTE: Entering a curve may reduce the alert time to less than three (3) seconds.*

Stationary Vehicle Braking (SVB) – As part of the collision mitigation system, when a large, stationary, metallic object in a vehicle's lane of travel is definitively identified as a vehicle, the driver is notified up to three and a half (3.5) seconds before impact. If the driver does not take action to address the potential impact that caused the alert, the Bendix® Wingman® Fusion™ system can automatically engage the brakes to assist the driver in reducing the severity of or potentially avoiding a collision with that stationary vehicle.

If the system cannot definitively identify the stationary object as a vehicle — for example, if the vehicle is not a licensed motorized vehicle, or certain types of trailers — the driver will get up to three (3) seconds of alert to address the situation ahead; no automatic braking will be applied.

Stationary Vehicle Braking is most useful when approaching a line of stopped traffic or a stalled vehicle that is not immediately recognized by the driver. Without the automatic alert and braking, it may be too late to avoid impact. The SVB is ready to alert you whenever the vehicle is moving above 15 mph / 24 kph.

Pedestrians, Animals, Non-metallic, or Limited-metallic Objects – The Wingman Fusion system *will not* warn or react to pedestrians, animals, and 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.).

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.

Brake Overuse Alert – The Bendix Wingman Fusion system provides a warning when the system is intervening and using the foundation brakes excessively. Overuse 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 will cause this alert to be activated.

Approach grades as you would normally, with the appropriate gear selected and at a safe speed.

Cruise control should NOT be used on downhill grades.

You should use appropriate gearing and brake techniques on downhill grades.

When the system detects brake overuse – depending on the vehicle manufacturer – a text message will be displayed on the dashboard and an audible alert will be activated. You should intervene immediately.

- 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 – will discontinue the alert. Following an overuse alert, you should not reset cruise control for at least 20 minutes. This gives the brakes time to cool down.

  If you choose to reset cruise control during that 20 minute period, Bendix® Wingman® Fusion™ system interventions will be limited to de-throttling and engine retarder only. The system will automatically disable all Wingman 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 Wingman Fusion interventions (de-throttling, engine retarder or brake applications) will be disabled until the next ignition cycle.

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

Lane Departure Warnings (LDW) – The Bendix® Wingman® Fusion™ system has the ability to warn you if the vehicle is not tracking in the intended roadway path. In most vehicle applications the LDW system is enabled above 37 mph / 60 kph. The Lane Departure Warnings will be issued through the dedicated speakers and, in some cases, may mute the radio. You should immediately correct the vehicle tracking and maintain the correct position in the lane.

In some driving scenarios – such as constructions zones, overlapping or changing lanes – lines may cause LDW alerts. For these cases the LDW system can be temporarily disabled through a LDW Enable / Disable switch on the dash.

Speed Limit Sign Recognition – Above 25 mph / 40 kph, the Bendix Wingman Fusion system has the ability to warn you if the vehicle's speed exceeds the posted legal limits. The Overspeed Alert warns when the vehicle is traveling greater than 5 mph / 8 kph from the posted limit. You should immediately reduce speed to the posted legal limit. If you are exceeding 10 mph / 16 kph from the posted limit, the Overspeed Alert will be accompanied by a short throttle reduction.

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 US/Metric selection has been made within the Bendix Driver Display or the camera recognizes enough consecutive road signs and learns it is operating in a new region.

SECTION 3: EQUIPMENT MAINTENANCE

Importance of Antilock Braking System (ABS) Maintenance – Optimal Bendix® Wingman® 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 Wingman Fusion to deactivate.

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

System Problems – If a problem with the Wingman Fusion system is detected–depending on the vehicle manufacturer–typically there will be a message on the dashboard display. Depending on the type of problem detected, the system will determine if the vehicle may continue normal cruise control functions (without the benefits of Wingman Fusion), or whether all cruise control functions should be disabled until service is performed. The system should be serviced as soon as possible to restore full Wingman Fusion functionality.

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. *See Bendix Technical Bulletin TCH-061-003.*

Radar Damage / Misalignment / Tampering – In cases where the bumper and/or radar have sustained any damage, are misaligned – or if you suspect that 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 dash typically will illuminate if the system detects any of these conditions. *Consult your vehicle Operator's Manual or contact Bendix for more information.*

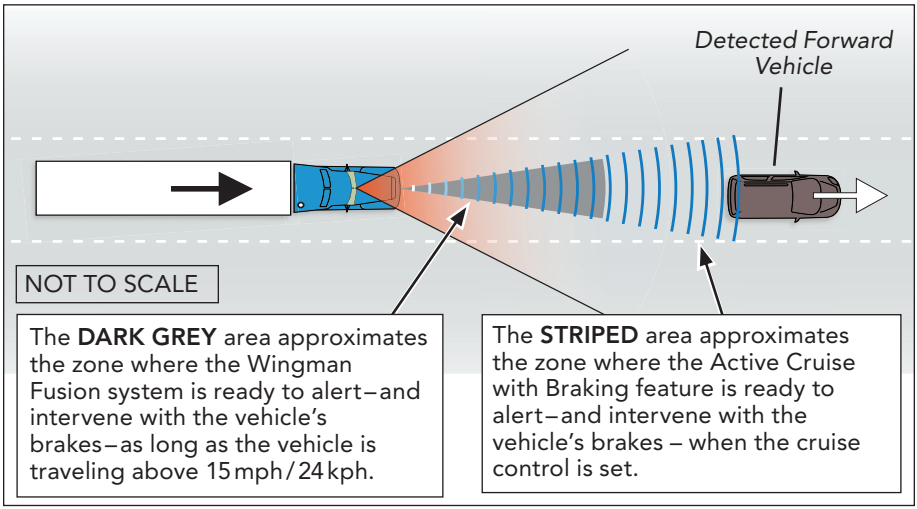
Camera Inspection – The Bendix Wingman Fusion camera is mounted to the windshield of the vehicle. The camera will be mounted inside the wiper pattern and should be clear of any obstructions.

System Overview

Integrating camera, radar, and brakes, the Bendix® Wingman® Fusion™ Active Safety System provides the following alerts and actions:

1. Stationary Vehicle Braking (SVB);
2. Enhanced Collision Mitigation Braking (CMB);
3. Active Cruise with Braking (ACB);
4. Overspeed Alert and Action (OAA);
5. Lane Departure Warnings (LDW);
6. Stationary Object Alerts (SOA); and
7. Alert prioritization.

See the diagram below



What Features are Included in the Bendix Wingman Fusion System?

Part One: Active Cruise with Braking

Think of the Active Cruise with Braking (ACB) feature as an additional upgrade to ordinary cruise control. When using cruise control, your vehicle not only will maintain the set speed, but the system will also intervene–as needed–to help maintain a set following distance behind the vehicle in front of you.

Using a radar (with a range of approximately 500 feet) mounted to the front of your vehicle, the System reacts ONLY to vehicles moving in the same direction as you. (The system DOES NOT respond to side-to-side moving traffic or oncoming traffic.)

See the STRIPED area in the diagram above. The Active Cruise with Braking feature is designed to help maintain a set following distance between your vehicle and the vehicle ahead when cruise control is set.

Once cruise control is set and the system is maintaining a set following distance between you and the forward vehicle:

- **If the vehicle in front of you slows down** below your cruise control's set speed, the system will intervene, as necessary, in this order:

  (a) reduce the engine throttle; then
  (b) apply the engine retarder; then
  (c) apply the foundation brakes,
  in an attempt to maintain the set following distance behind the vehicle ahead. *NOTE: If during the intervention, it is necessary to apply the foundation brakes, the vehicle will not automatically resume the cruise control set speed.*

- **If the vehicle ahead slows, below your cruise control's set speed, but then accelerates away** and the Bendix® Wingman® Fusion™ system did not need to use the foundation brakes, the system will automatically accelerate back to the original cruise control set speed, and again maintain a set following distance behind any vehicles ahead of you.

Because the Wingman Fusion system operates along with normal cruise control, all the typical features built into cruise control work as usual. For example, limits imposed by factory-set road speed governors, etc. are fully supported by the Wingman Fusion system.

Part Two: Alerts

The Bendix Wingman Fusion system also assists by giving audible and visual alerts, whether or not cruise control is on. *See Pages 24-29 for more information on the six (6) types of alerts you may hear and/or see displayed.*

Part Three: Collision Mitigation Technology

See the DARK GREY area in the diagram on page 11. Wingman Fusion's Stationary Vehicle Braking (SVB) is designed to be ready to react to the presence of stationary vehicles in front of your vehicle (whether or not cruise control is set, as long as the vehicle is traveling above 15 mph / 24 kph.)

The system provides you with an alert before an intervention occurs. You must immediately act to potentially avoid, or lessen the severity of, a collision.

System Components

The main components used in the Bendix® Wingman® Fusion™ system are the Bendix® ESP® EC-80™ Controller; the Bendix® Wingman® FLR-20™ radar; the Bendix™ AutoVue® FLC-20™ Camera (powered by the Mobileye® System-on-Chip EyeQ® processor with state-of-the-art-vision algorithms); the Bendix® Driver Interface Unit (DIU™), or OEM dash display; the SafetyDirect® by Bendix CVS Processor; and the vehicle's telematics system.

The Bendix Wingman Fusion radar locates and tracks moving vehicles. The radar is located at the front of your vehicle–either on the bumper or just behind it on a cross-member. When located behind the bumper, in some cases the unit may also be behind a protective covering that allows the radar signal to pass through. The camera is located on the windshield inside the wiper pattern.

The Bendix Wingman Fusion 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 dash lets you know that service is needed.

The Wingman Fusion camera works with the radar to better identify forward vehicles (moving and stationary).

System Display

Driver information about the Wingman Fusion system is either fully integrated into the vehicle dashboard, or uses the Bendix Driver Interface Unit (DIU™). Although the system functions the same, how the alerts are displayed to you can be different. *See the Alerts and Warnings section of this manual on pages 24-29 for more detailed information about the alerts.*

NOTE: For some integrated systems, the volume level of the alerts may not be adjustable, nor can they be switched off.

The Active Cruise with Braking (ACB) Feature

NOTE: Whenever the cruise control is set, the Active Cruise with Braking feature is also set. You can not engage cruise control without also using all the features of the Bendix® Wingman® Fusion™ system.

Setting Cruise Control

Activating the Active Cruise with Braking feature is as easy as using ordinary cruise control.

Examples of cruise control switches

First, switch on the cruise control. Accelerate your vehicle to the cruise control speed you wish to maintain, then press the cruise control set switch. The Active Cruise with Braking feature is now ready and will help you maintain a set following distance.

Once the cruise control speed is set, a green cruise-enabled icon (or similar) will illuminate on the instrument panel. If the cruise-enabled (or similar) icon does not illuminate, the cruise control is not functioning normally. *Please refer to your vehicle Operator's Manual to double-check the location of the icon and for further troubleshooting information.*

Example of Driver Interface Unit (DIU) detected forward Vehicle display

Some vehicle manufacturers use the instrument cluster to momentarily show the cruise control set speed to the driver.

Where the Bendix® Driver Interface Unit (DIU™) display is used, a text message will provide the set speed information.

You can switch the Active Cruise with Braking feature off manually by either stepping on the brake, or switching OFF the cruise control.

NOTE: Cruise control will automatically cancel whenever the Bendix® Wingman® Fusion™ system applies the foundation brakes. You can verify the system is disengaged by observing that the cruise-enabled icon is no longer illuminated. *You must resume, or set, cruise control in order to regain normal cruise control functionality and to re-engage the Active Cruise with Braking feature of the Fusion system.*

The Forward Detected Vehicle Icon

When cruise control is switched on and set, and a vehicle ahead of you is detected by the radar, the forward detected vehicle icon (or similar) on the vehicle dashboard will illuminate.

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

Adjusting the Cruise Control Speed

Use the switch(es) provided by the vehicle manufacturer to set your cruise control speed. When adjusted, your set speed will typically be indicated on the vehicle dash, message center, speedometer, etc.

What is Following Distance?

Following distance refers to the time gap – measured in seconds – between the vehicle with Wingman Fusion and the vehicle ahead. The actual physical distance between the two will vary based on the speeds of both vehicles; however, the set gap will remain the same for all set cruise speeds.

Fusion Collision Mitigation Feature Operation

Whenever the vehicle is traveling above 15 mph / 24 kph, the Wingman Fusion collision mitigation feature is ready to intervene, if needed. It does not require cruise control to be set. The collision mitigation feature of Wingman Fusion will automatically alert you and apply the vehicle's brakes, if a collision with the detected forward vehicle is likely to occur. You, the driver, must immediately act to potentially avoid, or lessen the severity of, a collision.

Automatic Foundation Brake Applications

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

What to Expect When Using the Bendix® Wingman® Fusion™ System

The following charts illustrate what to expect from the Bendix® Wingman® Fusion™ system in various driving situations you may encounter. Both the system indication and action to expect from the system are illustrated on the following pages.

Part One: All driving scenarios (Cruise is either "ON" or "OFF")		
What to Expect		
Situation	**Typical System Indication/Alerts**	**Typical System Actions/Cautions**
Stationary objects/vehicles ahead in your lane of travel		
A stationary – non-vehicle – object is detected ahead in your lane.	A Stationary Object Alert (SOA) may be issued up to three (3) seconds prior to impact.	None. **⚠ WARNING** **You must immediately act to potentially avoid, or lessen the severity of, a collision.**
A stationary motor vehicle is detected ahead in your lane. ***Note: Significant feature enhancement.*** *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.*	If the vehicle is traveling above 10 mph / 16 kph, a Stationary Vehicle Alert (SVA) may be issued up to three-and-a-half (3.5) seconds prior to impact.	**⚠ WARNING** **You must immediately act to potentially avoid, or lessen the severity of, a collision.** If a collision is likely to occur, the Bendix Wingman Fusion system can provide a warning and/or apply the vehicle brakes.

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

Part One: All driving scenarios (Cruise is either "ON" or "OFF")		
What to Expect		
Situation	**Typical System Indication/Alerts**	**Typical System Actions/Cautions**
Moving objects/vehicles ahead in your lane of travel		
Your vehicle comes up fast behind a slower-moving detected forward vehicle.	The Following Distance Alert (FDA) will sound and a visual message/ icon typically appears on the dash screen or Bendix® Driver Interface Unit (DIU™) display. Depending on how close your vehicle approaches, the system may initiate an Impact Alert (IA) warning.	None. **You must respond as needed.**
The detected forward vehicle slows rapidly.	The Following Distance Alert (FDA), or Impact Alert (IA) warning (continuous tone) will sound and a visual message/icon typically appears on the dash screen or DIU display.	None. **You must respond as needed.** **If a collision is likely to occur, the collision mitigation feature will apply your vehicle's brakes.**
A pedestrian, deer or dog runs in front of your vehicle or any organic or non-metallic object is in front of your vehicle.	None.	None. **You must respond as needed.**
Another vehicle crosses the road perpendicular to your path of travel – such as at an intersection.	None.	None. **You must respond as needed.**

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

Part One: All driving scenarios (Cruise is either "ON" or "OFF")		
What to Expect		
Situation	**Typical System Indication/Alerts**	**Typical System Actions/Cautions**
Lane Departure System Active (Lane detection icons being displayed)		
Your vehicle signals a lane-change and crosses a lane-marking.	None.	None.
Traveling below 37 mph / 60 kph, your vehicle crosses a lane-marker (without the corresponding turn signal activated).	None.	None. **You must respond as needed.**
Traveling above 37 mph / 60 kph, your vehicle departs your lane of travel without the corresponding turn signal activated.	A "rumble strip" audible/vibration/visual alert is initiated.	None. **You must respond as needed.** (Use the turn signal when changing lanes and/or keep your vehicle within the lane markings.)
Overspeed Alert & Action ***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 US/Metric selection has been made.*		
Your vehicle passes a US or Canadian speed limit sign.	The DIU will display the posted speed limit.	None.
Your vehicle exceeds the posted speed limit by 5 to 9 mph (8 to 14 kph).	An Overspeed Alert will be 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 audible Overspeed Alert and the posted speed limit will be visually presented to inform you that the vehicle should slow down.	**If cruise control is NOT ON:** A one-second de-throttle of the engine will occur.

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

Part Two: Cruise is "ON" and speed is "SET"		
What to Expect		
Situation	**Typical System Indication/Alerts**	**Typical System Actions/Cautions**
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.	The cruise control ON indicator is illuminated and the detected forward vehicle icon is illuminated.	The Active Cruise with Braking feature will maintain the set speed and following distance.
The detected forward vehicle slows moderately.	The Following Distance Alert (FDA) will sound and a visual message/ icon typically appears on the dash screen or Bendix® Driver Interface Unit (DIU™) display.	**You must respond as needed.** If the system intervenes, the vehicle throttle will be reduced; the engine retarder engaged; and the foundation brakes applied, in that order. *NOTE: When the foundation brakes are applied, cruise control is cancelled.*
The detected forward vehicle slows rapidly.	The Impact Alert (IA) warning (continuous tone), will sound and a visual message/icon typically appears on the dash screen or DIU display. The Following Distance Alert may also be heard.	**You must respond as needed.** If the system intervenes, the vehicle throttle will be reduced; the engine retarder engaged; and the foundation brakes applied, in that order. *NOTE: When the foundation brakes are applied, cruise control is cancelled.*
A detected forward vehicle cuts in front of your vehicle and speeds away.	Following Distance Alerts (FDAs) may be given to you, 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.	DO NOT USE cruise control on downhill grades.	DO NOT USE cruise control on downhill grades. Brake overuse may occur. *(See page 28 for more information.)*

Cruise control should *NOT* be used on downhill grades.
See the CDL manual instructions on proper gear usage for down grades.

NOTE: The section preceding shows examples of situations and typical Wingman Fusion system responses. However, the chart does not attempt to cover all possible situations.

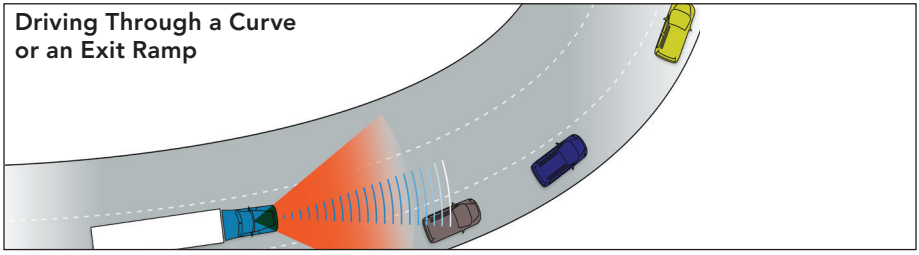
Due to the inherent limitations of radar and camera technology, the enhanced Collision Mitigation Technology – on rare occasions – may not detect moving vehicles or stationary vehicles in your vehicle's lane of travel. Alerts, warnings or brake interventions may not occur.

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.

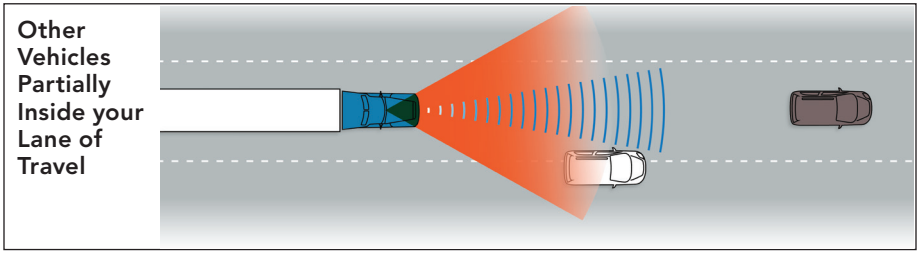
Potentially Challenging Situations for the Bendix® Wingman® Fusion™ System

The following examples illustrate situations that may issue an alert or braking in a manner not consistent with your expectations. The Bendix® Wingman® Fusion™ system may unexpectedly issue warnings, apply braking, or not respond.

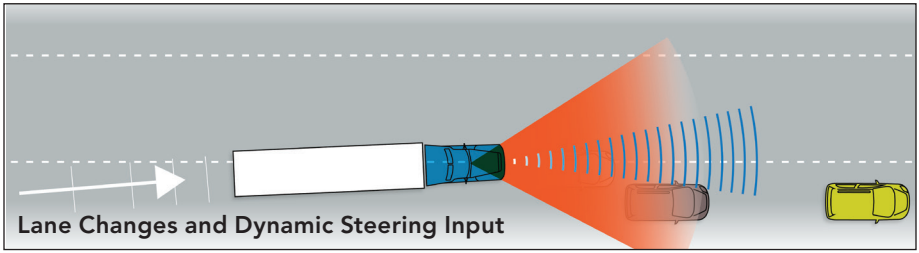
Challenging Situation Examples



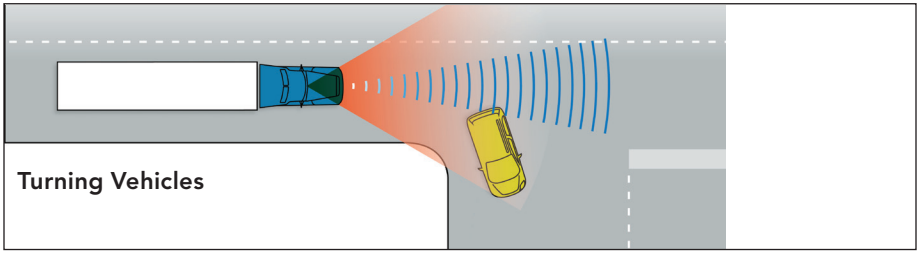
Example 1 - Driving through a curve



Example 2 - Other vehicles ahead in the lane of travel

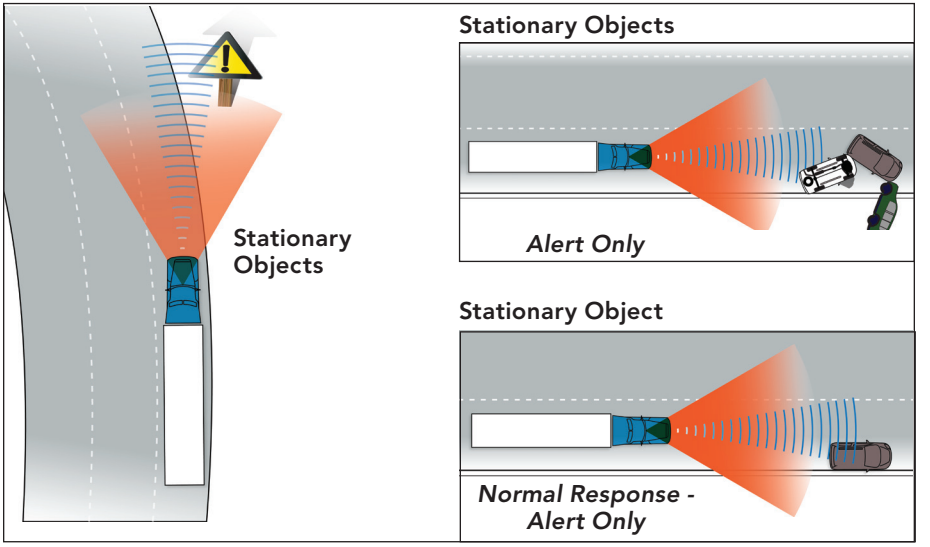


Example 3 - Lane changes

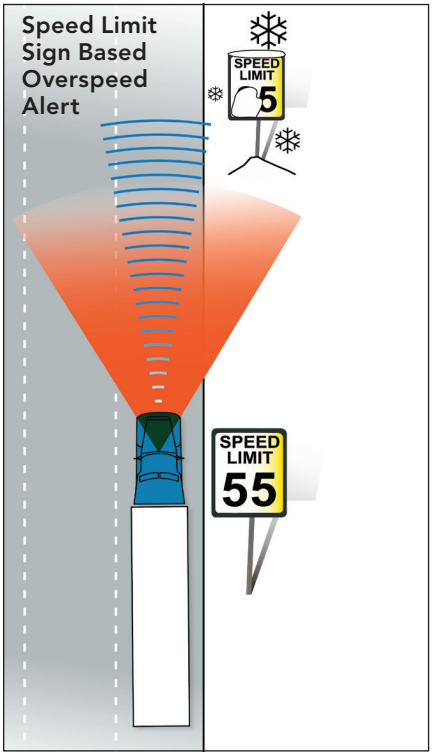


Example 4 - Turning vehicles

Challenging Situation Examples (continued)



Example 5 - Stationary objects



Example 6 - Speed limit sign unreadable

How Your Actions Impact the Bendix® Wingman® Fusion™ System

This chart illustrates how the Bendix® Wingman® Fusion™ system will react to various actions you may initiate.

Your Action:	Reaction of the Wingman Fusion System:
If you, the driver, do this:	**Expect the Wingman 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 override any Wingman 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 cancelled.
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 Active Cruise with Braking feature will not engage until the driver sets the cruise control speed.
Switch off the cruise control.	The Active Cruise with Braking 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 Active Cruise with Braking feature is automatically activated, and your vehicle maintains set speed and following distance behind the vehicle ahead.

Continued...

Your Action:	Reaction of the Wingman Fusion System:
Cover or block the radar or camera.	The Wingman Fusion system performance will be diminished, or disabled, when either the radar or the camera become blocked. An alert will be issued to alert the driver to indicate this condition. Radar: Radar blocked will be indicated through an alert and will disable all Wingman functions. Camera based functions such as LDW will remain. Camera: Camera blocked will be indicated through an alert and will disable all camera based functions. The radar will maintain its function as a Wingman Advanced system.
Use normal cruise control "+/-" switch.	Vehicle speed increased (+) or reduced (-) to achieve the new set speed while actively maintaining the following distance with the vehicle ahead, if one is present within 500 feet.

NOTE: The system responses above are typical, but may vary from the descriptions shown here by vehicle manufacturer, or earlier versions of the Wingman Fusion system. These represent examples of driver actions and typical Wingman Fusion system responses, however this chart does not attempt to cover all possible situations.

Alerts and Warnings

The Bendix® Wingman® Fusion™ system is a unique, patented system that functions differently than other cruise control/forward collision alert and mitigation systems. It is important for ***YOU*** to fully understand the system's features, especially the driver indications and alerts.

Six main alerts provided by the Wingman Fusion system are the **Impact Alert (IA), Following Distance Alert (FDA), Stationary Object Alert (SOA), Stationary Vehicle Braking (SVB), Lane Departure Warning (LDW), and Overspeed Alert (OA)**. All of the alerts are always ready to alert you, whether or not you are using cruise control.

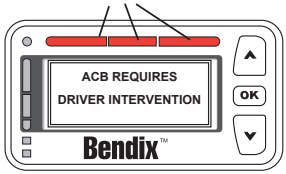
WARNING: Any audible and/or visual alert by the system means that your vehicle is too close to the vehicle ahead, your vehicle is outside the intended lane of travel, or your vehicle is overspeeding the posted speed limit. You must immediately act to potentially avoid, or lessen the severity of, a collision and to maintain regulated control of the vehicle to the intended lane and speed.

Driver Alerts and Warnings

Impact Alert (IA)/ Collision Mitigation Braking (CMB)

- **Always available above 15 mph / 24 kph**

All Red LEDs Illuminated



Above: Bendix® Driver Interface Unit (DIU™)–Showing Impact Alert warning–a loud continuous tone will also sound.

Below: Examples of other vehicle manufacturer's displays.

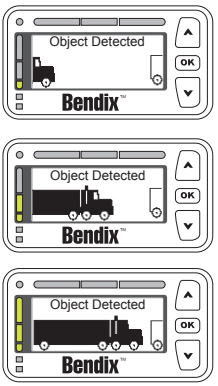
The Impact Alert (IA)/Collision Mitigation Braking (CMB) is the most severe warning issued by the Bendix® Wingman® Fusion™ system. This alert indicates that a collision with the detected forward vehicle is likely. As the driver, you must immediately act to potentially avoid, or lessen the severity of, a collision. The IA/CMB is ready to alert you, the driver, whenever the vehicle is moving above 15 mph / 24 kph.

When activated, the IA/CMB will sound and a visual message/icon typically appears on the dash screen or Bendix® Driver Interface Unit (DIU™) display. The actual sound/display method varies by vehicle manufacturer.

NOTE: The IA/CMB is typically accompanied by automatic brake interventions. The Wingman Fusion system is ready to intervene with braking as needed. You must apply additional braking, when necessary, to maintain a safe distance from the vehicle ahead.

Following Distance Alert (FDA)

- **Always available above 5 mph / 8 kph**



Above: Driver Interface Unit (DIU™) – Showing Examples of Following Distance Alerts – with progressively faster audible alerts.

The Following Distance Alert (FDA) provides both audible and visual alerts whenever the distance between your vehicle and the detected forward vehicle ahead is less than one and a half (1.5) seconds* and getting closer. Once the audible alert is given, you should increase the distance between your vehicle and the vehicle ahead until the audible alert stops.

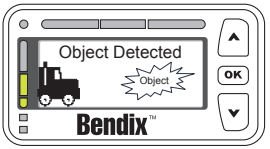
The FDA is ready to alert you whenever the vehicle is moving above 5 mph / 8 kph. If the following distance continues to decrease, you will hear more rapid audible alerts. When the FDA reaches its highest level, a visual indication/alert will activate.

Above: Examples of other vehicle manufacturer's displays.

* 1.5 seconds is the system default and may vary by fleet/OEM.

Stationary Object Alert (SOA)

- **Typically available above 10 mph / 16 kph**



DIU: Showing Stationary Object Alert – a continuous tone will also sound.

NOTE: Entering a curve may reduce the alert time to less than three (3) seconds.

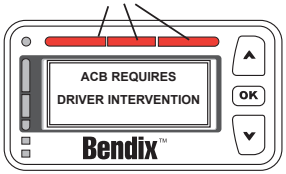
Stationary Object Alert (SOA) – The Bendix® Wingman® Fusion™ system will give up to three (3) seconds alert to you when approaching a detected, sizable, stationary object with metallic (radar-reflective) surfaces in your lane of travel. This alert indicates that a collision with a stationary object is likely and you must immediately act to potentially avoid, or lessen the severity of, a collision.

Typically, the SOA is ready to alert you whenever the vehicle is moving above ten (10) mph / 16 kph, but some OEs/fleets may select higher minimum speeds. You should be especially careful when approaching certain types of vehicles and objects. The Wingman Fusion radar may not be able to detect objects with limited metal surfaces (such as recreational vehicles, horse-drawn buggies, motorcycles, logging trailers, etc.).

Stationary Vehicle Braking (SVB)

- **Typically available above 15 mph / 24 kph**

All Red LEDs Illuminated



DIU: Showing Stationary Vehicle Braking Alert – a continuous tone will typically also sound. NOTE: Entering a curve may reduce the alert time to less than three (3) seconds.

Stationary Vehicle Braking (SVB) – When a large, stationary, metallic object in a vehicle's lane of travel is definitively identified as a vehicle, you will be notified up to 3.5 seconds before impact. If you do not take action to address the potential impact that caused the alert, Wingman Fusion can automatically engage the brakes to assist you in reducing the severity of or potentially avoiding a collision with that stationary vehicle.

If the system cannot definitively identify the stationary object as a vehicle – for example, if the vehicle is not a licensed motorized vehicle, or certain types of trailers – the driver will get up to 3.0 seconds of alert to address the situation ahead, but no automatic braking will be applied.

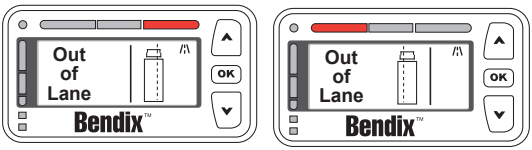
Stationary Vehicle Braking is most useful when approaching a line of stopped traffic or a stalled vehicle that is not immediately recognized by the driver. Without the automatic alert and braking, it may be too late to avoid impact.

Lane Departure Warning (LDW)

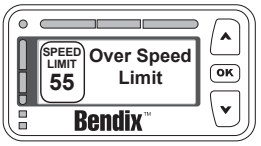
- **Enabled above 37 mph / 60 kph**

Red LED illuminated indicates direction of departure

Lane Departure Warning (LDW) – The Bendix® Wingman® Fusion™ system has the ability to warn you if the vehicle is not tracking in the intended roadway path. In most vehicle applications the LDW system is enabled above 37 mph / 60 kph. You should immediately correct the vehicle tracking and maintain the correct position in the lane.



Overspeed Alert (OA)
- **Enabled above 20 mph / 32 kph**



Overspeed Alert (OA) – The Bendix® Wingman® Fusion™ system has the ability to warn you if the vehicle's speed exceeds the posted legal limits. The Overspeed Alert is enabled when the vehicle is traveling greater than 5 mph / 8 kph from the posted limit. The driver should immediately reduce the vehicle's speed to the posted legal limit. Note that the system does not activate overspeed alerts where the posted speed limit is 20 mph / 32 kph or less.

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 US/Metric selection has been made.*

Special Alerts

Brake Overuse Warning – The Bendix® Wingman® Fusion™ system provides a warning when the system uses the foundation brakes excessively. Overuse of the foundation brakes can lead to the brakes overheating and a potential loss of braking performance caused by brake fade.

Approach grades as you would normally, with the appropriate gear selected and at a safe speed. Cruise control should *NOT* be used on downhill grades.

You should use appropriate gearing and brake techniques on downhill grades. When the system detects brake overuse, depending on the vehicle manufacturer, a text message will be displayed on the dashboard and an audible alert will be activated.

- 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–will discontinue the alert. Following an overuse alert, you should not reset cruise control for at least 20 minutes. This gives the brakes time to cool down. If you choose to reset cruise control during that 20 minute period, Wingman Fusion interventions will be limited to de-throttling and engine retarder only. The system will automatically disable all Wingman 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 Wingman Fusion interventions (de-throttling, engine retarder or brake applications) will be disabled until the next ignition cycle.

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

Bendix® Wingman® Fusion™ Diagnostic Trouble Codes

The Bendix® Wingman® Fusion™ system is monitored and if any malfunction is detected, a Diagnostic Trouble Code (DTC) will be set and you will be alerted. The exact alert given depends on the vehicle manufacturer: refer to your vehicle operator's manual and the *Bendix® Wingman Fusion Service Data sheet SD-61-4962, the Bendix™ AutoVue® FLC-20™ Camera Service Data sheet SD-64-20124, or the SafetyDirect® by Bendix CVS Processor Service Data sheet SD-65-21025* for more information.

Potential False Alerts

The Wingman Fusion system should have significantly fewer false alerts than earlier systems. Radar and camera technology is not perfect, and false alerts sometimes occur. Radar misalignment will likely lead to increases in stationary object false alerts. In the case of speed sign alerts, some road signs may potentially not be able to be recognized – or be recognized incorrectly – by the system.

Drivers should take into account the road conditions, and any other factors they are encountering, as they choose how to react to any alerts they receive from the Bendix Wingman Fusion system.

When Not to Use Cruise Control

The Active Cruise with Braking feature in the Bendix® Wingman® Fusion™ system is automatically ready when normal cruise control is set.

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® Wingman® Fusion™ system.	
Dense Traffic – Do not use cruise control in heavy traffic.	
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 – Do not use cruise control when entering or exiting roadways.	
Downhill Grades – Do not use cruise control on downhill grades.	
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.	

Visit bendix.com for more information and for any updates to these limitations and restrictions.

Additional Operational Notes

Adjusting the Alert Volume

The Bendix® Wingman® Fusion™ system audible alerts are pre-set at the factory for fully integrated systems and cannot be turned off by the driver, but, depending on the OE, the volume may adjustable.

For systems using a Bendix® Driver Interface Unit (DIU™) display, see *Bendix Wingman Fusion Service Data sheet SD-61-4962* for information about volume adjustment.

Temporarily Disable the Lane Departure Warning (LDW)

To avoid erroneous LDW warnings in areas such as construction zones–where the non-standard or overlapping road markings present might cause false alerts–the Wingman Fusion system has an enable/disable switch. Each OEM typically has a different arrangement to allow the driver to temporarily disable the Lane Departure Warning (LDW) system and to display the system status. Refer to the OEM Operator's Manual for any system indicator lamp(s). See below for some examples of OEM icons used at the time this document was published.

Dash/Switch Icon. (The design will vary by vehicle OEM. In some cases, the switch and lamps may be separate.)	International®	Kenworth®
Mack®	Peterbilt®	Volvo®

* All trademarks shown here are the property of their respective owners and are used for reference only.

Event Capture

In the case of vehicles configured to do so, the enable/disable switch used by the LDW system also functions–when depressed for six (6) seconds–to activate a request from the SafetyDirect® by Bendix CVS Processor to the On Board Computer (OBC)/Telematics system to transmit ten seconds of video data – the five (5) seconds before, and five (5) after the button was pressed). In some cases, more video data may be available using the Bendix SafetyDirect Client.

Passing a Vehicle/Changing Lanes

With cruise control set, if you decide to change lanes or pass a vehicle by applying the throttle, the vehicle being passed will no longer be detected by the radar and camera.

When No Other Vehicles are Present

When no forward vehicle is within range of the radar or camera, your vehicle will maintain its set speed just like ordinary cruise control.

Radar-Reflective Stationary Vehicles & Objects

You should be attentive to stopped vehicles and objects on the roadway.

⚠ **The Bendix® Wingman® Fusion™ system will give up to three (3) seconds alert when you approach a detected, sizable, stationary object with metallic (radar-reflective) surfaces in your lane of travel. When a large, stationary, metallic object in a vehicle's lane of travel is definitively identified as a vehicle, the driver is notified up to 3.5 seconds before impact.**

⚠ **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.

⚠ **Vehicles May Not be Recognized**

If the system cannot definitively identify the stationary object as a vehicle – for example, if the vehicle is not a licensed motorized vehicle, or certain types of trailers – the driver will get up to 3.0 seconds of alert to address the situation ahead; no automatic braking will be applied.

Pedestrians, Animals, Non-Metallic and Limited-Metallic Objects

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

Tracking Vehicles in a Curve

With cruise control set, when following a detected forward vehicle around a curve, the forward vehicle may be lost by the Bendix® Wingman® Fusion™ system. The Active Cruise with Braking feature will delay acceleration back to the set speed until it regains contact with the vehicle ahead, or detects that there is no longer a vehicle ahead, or after a time gap (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 Wingman Fusion system will delay the vehicle acceleration back to 50 mph / 80 kph for 3 seconds.*

You should be especially attentive to the Wingman Fusion system behavior through curves. In some cases, when traveling around a curve, the Fusion system may lose the vehicle ahead and attempt to accelerate when resuming the set speed.

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

Applying the Brakes Before the System Does

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

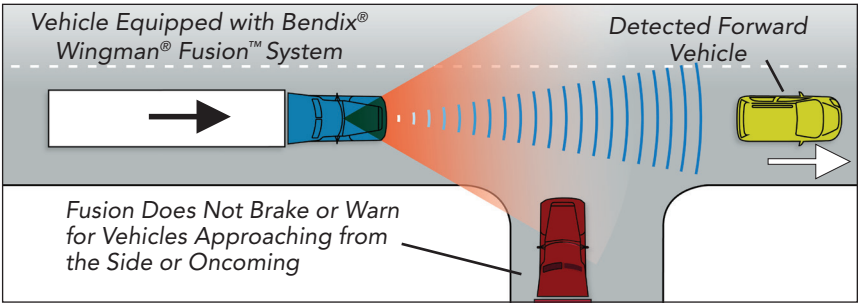
Safe operation and control of the vehicle is the responsibility of the driver at all times. If you, the driver, apply the brakes, cruise control will disengage automatically, and no Wingman Fusion intervention will occur.

Approaching Slower-Moving Vehicles

When approaching a slower-moving vehicle ahead, the driver should anticipate this and begin applying the vehicle's brakes early. **Do not wait for the Bendix Wingman Fusion system to intervene.**

Vehicles Crossing Your Path or Coming Towards You

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



Stability System Performance
System Maintenance and Troubleshooting

Importance of Foundation Brake Maintenance – Optimal Wingman 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 that the vehicle be equipped with properly sized and inflated tires, with a safe tread depth.

Importance of ABS Maintenance – Optimal Wingman Fusion system braking requires a properly maintained ABS (Antilock Brake System) system. Have any ABS Diagnostic Trouble Codes (DTCs) corrected by a qualified technician at the earliest opportunity.

Preventive Maintenance:

The Bendix® Wingman® Fusion™ system is not maintenance free. The key items to keep the system functioning properly include:

1. Keep the radar and camera lens clean and free of obstructions.
2. Visually inspect for any damage to the bumper or the Wingman Fusion cover, bracket, or radar to ensure that the alignment has not been compromised. **Never use the radar unit as a step**.
3. Periodically check the radar alignment.
4. Perform appropriate inspections of the braking system as required by the manufacturer to ensure brakes are in proper working order.
5. Ensure that the tires are properly inflated and that adequate tread is present.

When the Bendix Wingman Fusion System Isn't Working:

If the Bendix Wingman Fusion system has detected a problem, depending on the vehicle manufacturer, there will typically be a warning message on the dashboard display and a Diagnostic Trouble Code (DTC) will be set. 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 Wingman Fusion system), or if all cruise control functions need to be disabled until servicing is carried out. The system should be serviced as soon as possible to restore full functionality.

Frequently Asked Questions

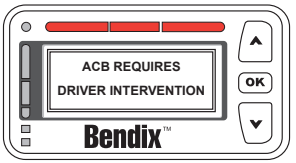
1. ***Are automatic foundation brake interventions always ready to intervene?***

   Yes, when the vehicle is moving above 15 mph / 24 kph. The Bendix® Wingman® Fusion™ system will alert the driver and activate the foundation brakes when a collision with a detected forward vehicle is likely. The Fusion system does not replace the need for the driver to remain alert, react appropriately and in a timely manner, and use safe driving practices.

2. ***Are the six driver alerts always available?***

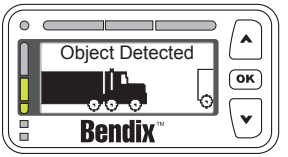
   Yes, but only above their minimum activation speeds. All six driver alerts (Impact Alert, Following Distance Alert, Stationary Object Alert, Stationary Vehicle Braking, Lane Departure Warning, and Overspeed Alert) are always ready to alert the driver regardless of whether or not cruise control is operating — unless a DTC is set.

Example of an Impact Alert Warning Display



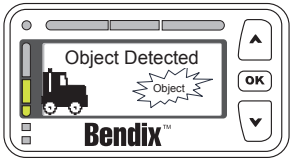
>15 mph / 24 kph

Example of a Following Distance Alert Display



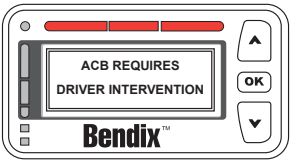
>5 mph / 8 kph

Example of a Stationary Object Alert Display



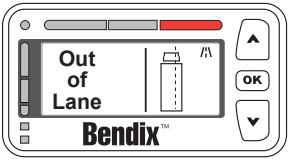
>10 mph / 16 kph

Example of a Stationary Vehicle Braking Display



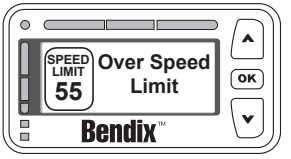
>15 mph / 24 kph

Example of a Lane Departure Warning Display



>37 mph / 60 kph

*Example of an Overspeed Alert Display**



>25 mph / 40 kph

*Overspeed alerts are not available for the first 10 minutes of vehicle operation.

3. ***How can I tell the difference between the alerts?***

Any audible and/or visual alert by the system means that your vehicle is too close to the vehicle ahead, your vehicle is outside the intended lane of travel, or your vehicle is overspeeding the posted speed limit. You must immediately act to potentially avoid, or lessen the severity of a collision and to maintain regulated control of the vehicle to the intended lane and speed limit.

A solid tone means you should actively apply the brakes because the Bendix® Wingman® Fusion™ braking capability is not enough to ensure a safe following distance. The alerts are audibly different, assisting the driver to pay full attention to the road, not the dash.

4. ***Does the Wingman Fusion system detect stationary vehicles and/or stationary objects?***

   Yes. In cases where the system recognizes a stationary vehicle ahead, the alert is up to three-and-a-half (3.5) seconds. The system will also give up to three (3) seconds alert when approaching a detected, sizeable, stationary object with metallic (radar-reflective) surfaces in your lane of travel. Braking or throttle intervention will only occur in response to stationary objects that are definitively identified as a motor vehicle, i.e. those which have easily recognized vehicle characteristics.

5. ***Can I use an aftermarket "deer guard" on my truck?***

   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. See Bendix Technical Bulletin TCH-061-003.

Other Information

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; (2) these devices must accept any interference received, including interference that may cause undesired operation.

Additional Information Sources About Bendix® Systems On Your Vehicle

Consult the vehicle manufacturer's documentation.

Visit bendix.com for free downloads of the Service Data sheets listed below, or order paper copies of these publications from the Literature Center at bendix.com.

Service Data Sheets

- SD-61-4963 Bendix® Wingman® 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

Contact the Bendix Tech Team for troubleshooting assistance at 1-800-AIR-BRAKE (1-800-247-2725) option 2 or techteam@bendix.com.

Bendix®

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