



Bendix™ VORAD® VS-500™ System

Operator's Manual



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.



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

Introduction

The Bendix™ VORAD® VS-500™ system includes Bendix™ SmartCruise® adaptive cruise control system and Forward Collision Warning. This Operator's Manual explains the features and functions, enabling maximum performance from the system.

Read this manual thoroughly before operating the system. Be familiar with the controls, system alerts, and what to expect when the system is on. Keep this manual in the vehicle as a reference for the system, its operation, and performance characteristics.

Additional Information About Bendix® Systems

For additional information about Bendix® systems, contact the Bendix Tech Team at techteam@bendix.com or call 1-800-AIR-BRAKE (1-800-247-2725). Visit www.bendix.com for more information and for any updates to this document.



GENERAL SAFETY GUIDELINES

**WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS
TO AVOID PERSONAL INJURY OR DEATH:**



When working on or around a vehicle, the following guidelines should be observed AT ALL TIMES:

- ▲ Park the vehicle on a level surface, apply the parking brakes and always block the wheels. Always wear personal protection equipment.
- ▲ Stop the engine and remove the ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically-charged components.
- ▲ Do not attempt to install, remove, disassemble or assemble a component until you have read, and thoroughly understand, the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
- ▲ If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with a Bendix® AD-IS® air dryer system, a Bendix® DRM™ dryer reservoir module, or a Bendix® AD-9si® air dryer, be sure to drain the purge reservoir.
- ▲ Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
- ▲ Never exceed manufacturer's recommended pressures.
- ▲ You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.
- ▲ Never connect or disconnect a hose or line containing pressure; it may whip and/or cause hazardous airborne dust and dirt particles. Wear eye protection. Slowly open connections with care, and verify that no pressure is present. Never remove a component or plug unless you are certain all system pressure has been depleted.
- ▲ Use only genuine Bendix® brand replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, wiring, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
- ▲ Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
- ▲ Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
- ▲ For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.
- ▲ The power MUST be temporarily disconnected from the radar sensor whenever any tests USING A DYNAMOMETER are conducted on a vehicle equipped with a Bendix® Wingman® system.

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IMPORTANT SAFETY INFORMATION



The driver is always responsible for the control and safe operation of the vehicle at all times. The Bendix™ VORAD® VS-500™ system does not replace the need for a skilled, alert, professional driver, reacting in a timely manner, and using safe driving practices.

Before driving with the VS-500 system, the driver must fully understand all audible alerts and visual indicators.

The VS-500 system reacts **ONLY** to vehicles moving in the same direction as your vehicle. The system **DOES NOT** recognize side-to-side moving traffic, or oncoming traffic. The system **WILL NOT** slow your vehicle or provide an alert when approaching vehicles in these circumstances.

Pedestrians, Animals, Non-metallic or Limited-metallic Objects – The VS-500 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 that the radar may detect in or close to the vehicle's path (such as crash barriers, guard rails, construction zone barricades, tunnel entrances, etc.) may decrease the function of the radar.

Inspect the radar and mounting bracket regularly and remove any mud, snow, ice build-up, or other obstructions. Installing aftermarket deer 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 re-aligned.

If a problem is detected with the VS-500 system, there is an audible alert, and/or icon on the Driver Interface Unit (DIU™). Depending on the type of problem, the system may disable cruise control functions until service is performed.

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

Smaller forward vehicles, such as motorcycles, may be difficult for the radar to identify. It is the driver's responsibility to be aware of this type of vehicle and to be cautious.

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FCC Part 15

This device complies 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) this device may not cause harmful interference; and (2) this device must accept any interference received, including interference that may cause undesired operation.

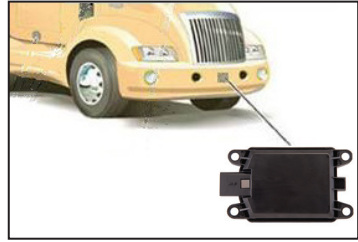
System Components

The Bendix™ VORAD® VS-500™ system includes a Bendix™ DIU™ (Driver Interface Unit) display connected to a forward looking radar sensor. The DIU display is located on the dash. It provides audible and visual alerts to the driver. Information about the forward monitored vehicle displayed on the DIU display is sent from the radar.



Bendix Driver Interface Unit

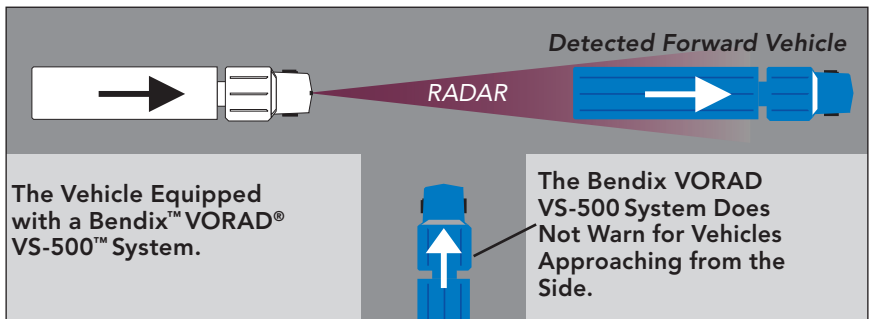
The forward looking radar sensor locates and tracks moving vehicles in the same lane ahead of the monitoring vehicle. The radar is located at the front of the vehicle either on the bumper or behind it on a cross-member.



Examples of Radar Locations

System Features

The Bendix™ VORAD® VS-500™ System is a combination of the Bendix™ SmartCruise® adaptive cruise control system and three levels of visual and audible alerts.



SmartCruise System

The SmartCruise system maintains a set following distance between your vehicle and the vehicle ahead when cruise control is set. See *RADAR* area in the diagram above.

The forward looking radar locates and tracks a moving vehicle approximately 300 feet in the same lane in front. If the vehicle ahead slows down below the set speed on your cruise control, the system will take the following actions as necessary:

- 1) Reduce the engine throttle; then
- 2) Apply the engine retarder.



No Object Detected

If the vehicle ahead slows below the cruise control set speed, but then accelerates away, the system accelerates back to the original set speed of the cruise control. The system will again maintain a set following distance between your vehicle and a vehicle ahead in your lane.

When the cruise control speed is set, a green cruise-enabled icon illuminates on the Bendix™ DIU™ (Driver Interface Unit) display. A text message on the DIU display provides the set speed information.

Adjustable Following Distance

Following distance refers to the time gap, measured in seconds, between the vehicle with a Bendix™ VORAD® VS-500™ system and the vehicle ahead. The actual physical distance between the two vehicles changes based on the speed of each vehicle. The time gap remains the same for all set cruise speeds. The adjustable following distance is set on the DIU display.



Adjustable Following Distance

Alerts and Warnings

Visual and audible alerts and warnings are displayed on the DIU display. All alerts are always available, whether or not cruise control is turned on.

The three main alerts provided by the system are Impact Alert (IA), Following Distance Alert (FDA), and Stationary Object Alert (SOA).



Object Detected In Cruise Control

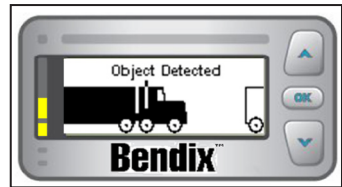
Following Distance Alert

The Following Distance Alert (FDA) provides both a single repeating audible tone and a visual alert whenever the distance between your vehicle and the detected forward vehicle ahead is less than 1.5 seconds (default) and the distance is decreasing.

Once the audible alert starts, increase the distance between your vehicle and the vehicle ahead until the audible alert stops. If the following distance continues to decrease, there is a double repeating audible tone and a two LED visual alert.



3 Second Warning - Single LED Illuminated



2 Second Warning - Two LEDs Illuminated

Following Distance Alert (*continued*)

When the FDA reaches its highest level, there is a continuously repeating audible tone and a three LED visual alert. The FDA is active when the vehicle is moving above 5 mph (8 kph).

The Bendix™ VORAD® VS-500™ FDA default is 1.5 seconds. This value may vary by fleet.



*1 Second Warning -
Three LEDs Illuminated*

Impact Alert

The Impact Alert (IA) is the most severe warning issued by the system. The IA alert indicates that a collision with the detected forward vehicle is likely and the driver must immediately act to avoid a collision. The IA is active when the vehicle is moving above 15 mph (24 kph).



*Impact Alert -
All Three Red LEDs
Illuminated*

Stationary Object Alert

The Stationary Object Alert (SOA) provides up to three (3) seconds alert time when approaching a detected, stationary object with metallic (radar-reflective) surfaces in your lane. The SOA indicates that a collision with a stationary object is likely with a single audible tone and a two LED visual alert. The driver must immediately act to avoid a collision.

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

The SOA is active when the vehicle is moving above 10 mph (16 kph). The SOA will sound a continuous tone and an icon appears on the DIU display.



*Stationary Object Alert -
Two LEDs Illuminated*

Using the Bendix™ VORAD® VS-500™ System

This chart lists the system reactions to specific situations.

What to Expect			
Situation	System Alerts	System Actions, if...	
		Cruise On/Set	Cruise Off or Not Set
A detected forward vehicle is in your lane.	The detected forward vehicle icon is illuminated.	The system maintains the set speed or following distance.	None.
The detected forward vehicle slows <u>moderately</u> .	The Following Distance Alert (FDA) will be displayed.	The system reduces the throttle and, if needed, engages the engine retarder.	None.
The detected forward vehicle slows <u>rapidly</u> .	The FDA, or Impact Alert (IA) (continuous tone) will sound and an icon appears.	The system reduces the throttle and engages the engine retarder. The driver may need to act to avoid impact.	None. The driver may need to act to avoid impact.
A detected forward vehicle cuts in front of your vehicle <u>and speeds away</u> .	The FDA may be given, depending on how close the vehicle cuts in front.	The system maintains the vehicle set speed. The driver may need to act to avoid impact.	None. The driver may need to act to avoid impact.
If your vehicle comes up fast behind a slower detected forward vehicle.	The FDA will sound and an icon appears. Depending on how close your vehicle approaches, the system may initiate an IA.	The system reduces the throttle and engages the engine retarder. The driver may need to act to avoid impact.	None. The driver may need to act to avoid a collision.
A stationary vehicle is in your lane.	A Stationary Object Alert may be issued up to three (3) seconds prior to impact.	None. The driver must act to avoid impact.	None. The driver must act to avoid impact.

NOTE: These are examples of situations and typical system responses. This chart does not attempt to cover all possibilities.

System Responses

This chart lists the system response to specific driver actions.

If You Do This:	The System Responses Are:
Step on the brake any time.	The driver is always able to apply full braking force (assuming a properly maintained vehicle).
Step aggressively on the accelerator during an event.	The driver's actions override system actions. Press the accelerator to override the cruise control. When released, the cruise control resumes set speed.
Step on the accelerator when in cruise.	The cruise control is overridden until the accelerator is released; then cruise control resumes the original set speed automatically.
Switch ON the cruise control.	None. The Bendix™ SmartCruise® adaptive cruise control system will not engage until the cruise control speed is set. System alerts are available.
Switch OFF the cruise control.	The SmartCruise system turns off. System alerts are still available.
Set the cruise control speed.	The SmartCruise system is automatically activated. Your vehicle maintains the set speed and following distance behind the vehicle ahead.
Pass a vehicle or change lanes.	The vehicle in front, still in the lane being exited, is no longer detected by the radar.
Cover or block the radar.	The system performance is diminished or disabled. A Diagnostic Trouble Code (DTC) is set. Blocking the radar may affect the cruise control availability.
Use normal cruise control +/- switch.	Vehicle speed increased (+) or reduced (-) to set the new speed and maintain a following distance with the vehicle ahead, if it is within 300 feet.

NOTE: These are examples of driver actions and typical system responses. The chart does not attempt to cover all possible situations.

When Not to Use Cruise Control

The Bendix™ SmartCruise® adaptive cruise control system is active when a speed is set and the cruise control is on.



Use cruise control only in recommended conditions. Do not use cruise control when the following situations exist:

Inclement Weather – Do not use cruise control in rain, snow, fog, ice or other severe weather conditions that may affect the performance of the 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.



Road curvature may impact the ability of the radar 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 steep downhill grades.



Construction Zones – Do not use cruise control in construction zones.



Off-Road – Do not use cruise control in off-road conditions.



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

System Maintenance and Troubleshooting

Potential False Alerts

The Bendix™ VORAD® VS-500™ system is one of the latest advances in commercial vehicle technology. However, radar technology is not perfect and false alerts occasionally occur. Radar misalignment may increase false alerts. Take into account road conditions and other factors when choosing how to react to system alerts.

System Warnings and Trouble Codes

The system monitors itself. If a malfunction is detected, a Diagnostic Trouble Code (DTC) is set and the driver is alerted. The system determines if the cruise control functions continue, or should be disabled. Service the system as soon as possible.

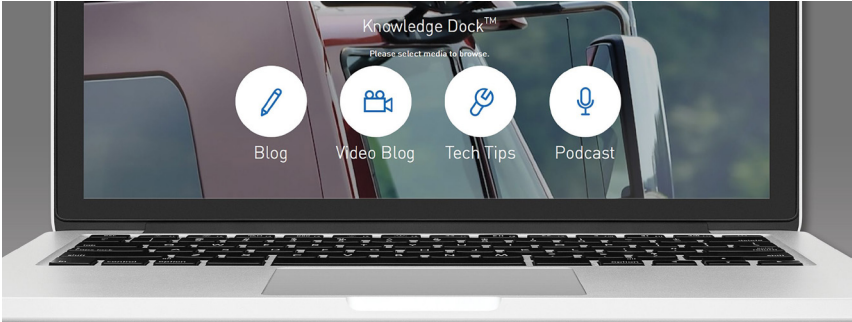
Preventive Maintenance:

The VS-500 system is relatively maintenance free. The key items to keep the system functioning properly include:


1. Keep the radar clean and free of obstructions.
NOTE: Installing aftermarket deer guards is not recommended and could impair the operation of the radar.
2. Inspect for any damage to the bumper or the radar sensor 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. Clear the cause of the trouble codes. Document trouble codes and their causes.



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