Roadranger®

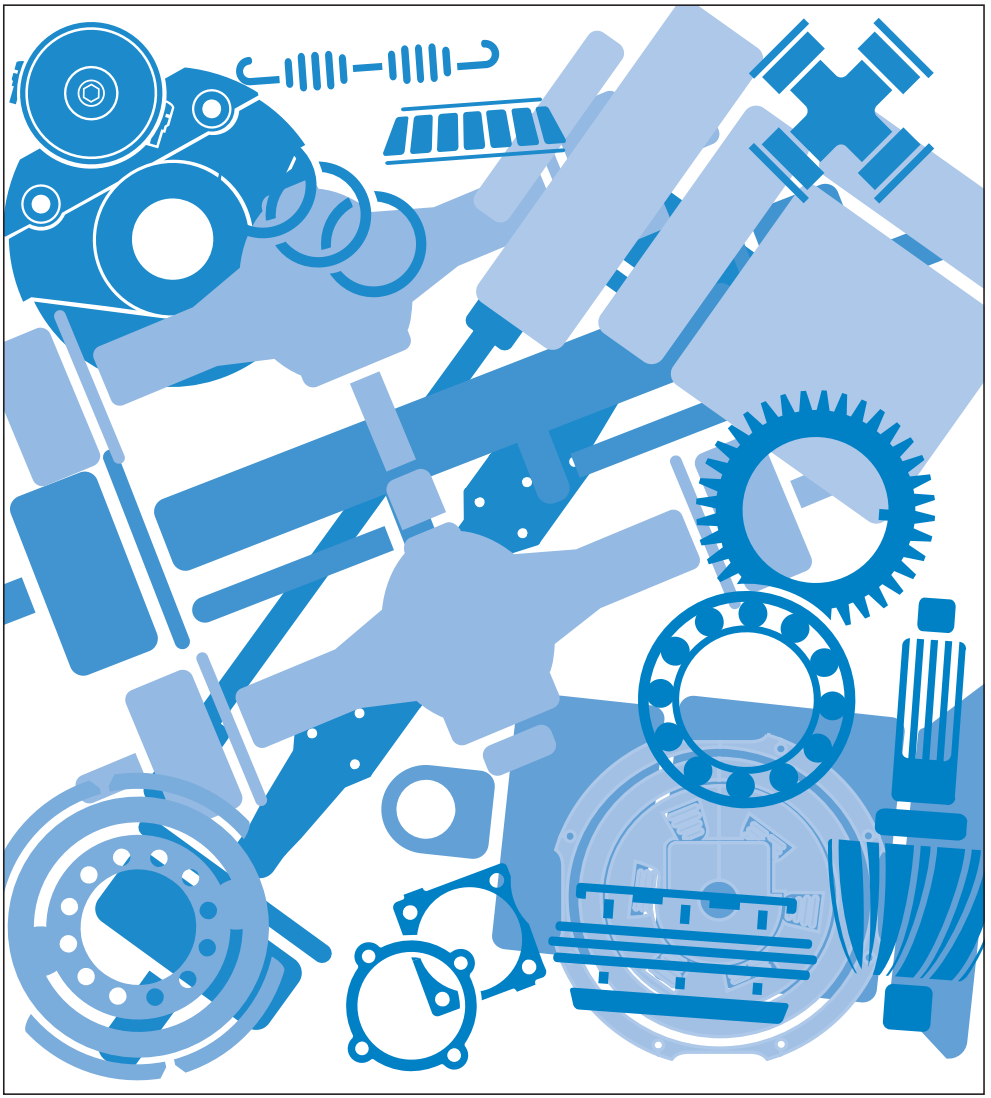
Eaton® VORAD® Collision Warning Systems

EVT-300

DANA | EATON

One Great Drivetrain from Two Great Companies

Driver Instructions VODR-0030 December 2004



For the most current information, visit the Roadranger web site at www.roadranger.com

FCC Compliance Statement

Federal Communications Commission

This device is sold under a waiver of FCC (Federal Communications Commission) rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must be able to accept any interference received, including interference that may cause undesired operation. Any interference that may be caused should be reported to the local FCC field office or to the Federal Communications Commission; Field Operation Bureau; Enforcement Bureau; 445 12th Street S.W.; Room 7-C485; Washington, D.C. 20054.

Any changes or modifications made by the user to this equipment that are not expressly approved by Eaton Corporation could void the user's authority to operate the equipment.

Every effort has been made to ensure the accuracy of all information in this brochure. However, Eaton Corporation makes no expressed or implied warranty or representation based on the enclosed information. Errors or omission should be reported to: Technical Services, Eaton Corporation, 13100 E. Michigan Ave., Galesburg, MI 49053, 1-800-826-HELP (4357).

Table of Contents

Product Safety Information

Warnings

WARNING: Improper use of this system could lead to a serious accident. Read this entire Driver Reference Manual before operating the EVT-300 System or SmartCruise®. Pay particular attention to the safety messages below. This manual should be used in conjunction with proper training.

Limitations of Collision Warning Systems

The Eaton VORAD EVT-300 Collision Warning System is intended solely as an aid for an alert and conscientious professional driver. It is not to be used or relied upon to operate a vehicle. The system should be used in conjunction with rear view mirrors and other instrumentation to maintain safe operation. A vehicle equipped with the EVT-300 Collision Warning System should be operated in the same safe manner as if the EVT-300 Collision Warning System were not installed. The system is not a substitute for normal safe driving procedures. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue.

The Eaton VORAD EVT-300 Collision Warning System may provide little or no warning for some hazards, such as pedestrians, animals, oncoming vehicles, and cross traffic.

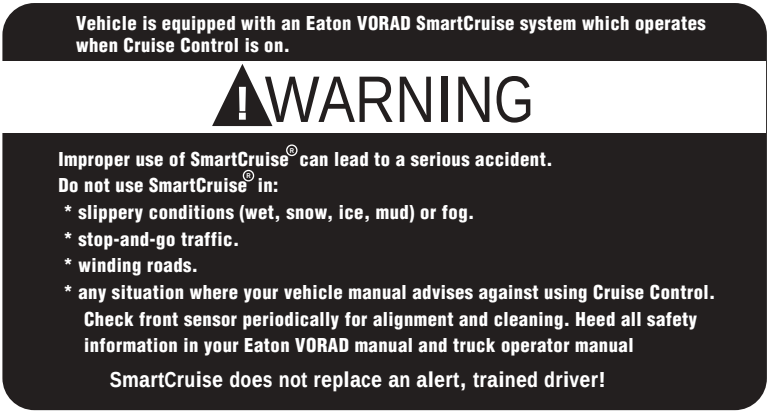
WARNING: The system will not sense objects if the sensor view is obstructed. Therefore, do not place objects in front of the system sensors. Remove heavy buildups of mud, dirt, ice, and other materials.

WARNING: Proper alignment is critical to correct operation of the system.

WARNING: Be sure the vehicle is not moving during the initial self-test at vehicle's start-up. Otherwise, the system may not operate properly.

SmartCruise

- SmartCruise works with the cruise control feature of your vehicle. Refer to the Cruise Control instructions in the Owner's Manual of the vehicle.
- SmartCruise will not react to stationary objects, and it does not have the capability to bring the vehicle to a stop.
- SmartCruise may operate the engine brake without warning. Do not operate this feature in slippery or wet conditions where sudden braking could cause loss of control.



Note the above warning in your vehicle. It is there to remind you of the safe use of SmartCruise.

If you have any questions regarding the operation of the EVT-300 or SmartCruise, call 1-800-826-HELP (4357) in the U.S., Canada, and Mexico; contact your OE dealer in Europe. An Eaton VORAD EVT-300 Driver Training Video can also be ordered by calling 1-888-386-4636. Eaton wants you to use your VORAD system safely.

Overview

VORAD EVT-300 Overview

The Eaton VORAD EVT-300 Collision Warning System is a sophisticated, computerized device that uses forward-looking radar and optional side-looking radar to constantly monitor vehicles ahead and in the blind spot area, respectivily.

The Collision Warning System uses transmitted and received radar signals to determine the distance and relative speed between the vehicle and objects in front. This information is used to warn the driver of potentially dangerous situations through visual and audible alerts. The system can perform in adverse conditions, but objects must be within the field of view of the radar beam and must provide a surface that can reflect the radar beam back for detection.

The optional Side Sensor is a radar transmitter and receiver mounted on the side of the vehicle to detect objects from two (2) to ten (10) feet (.6 - 3 m) from the side of the vehicle. The Side Sensor can detect vehicles or objects unseen by the driver, moving or stationary, provided the vehicle or object is moving adjacent to the vehicle.

The EVT-300 also has the ability to operate in a mode called “SmartCruise”. SmartCruise is an optional feature requiring installation by the Original Equipment Manufacturer (OEM). This feature is offered as a convenience to the driver in conjunction with the standard vehicle cruise control.

WARNING: This system does not work under all conditions and can be deceived under certain weather types. The driver must stay alert at all times to avoid an accident.

EVT-300 Collision Warning System Features

- Visual display indicating when objects are detected within 350 feet (106 m) in front of the vehicle.
- Audible alerts when the vehicle is closing within one half (1/2) second, one (1) second, and two (2) second following intervals.
- Visual display indicating that an object is in the Side Sensor detection area.
- Audible alert indicating that an object is detected by the Side Sensor when the turn indicator is activated.
- Volume control for audible alerts.
- Range control for setting forward object detection distance.
- Headway control to select following interval when using Smart-Cruise.
- Warnings for stationary and slow moving objects.
- Visual and audible proximity alerts.
- Audible alerts are disabled when brakes are applied if the vehicle is more than one half (1/2) second away from the host vehicle or when the vehicle is going faster than the host vehicle.
- Automatic adjustment of display intensity to accommodate ambient light conditions.
- Simultaneously tracks up to 20 moving or stationary objects within its range.
- Warnings indicating absence of the optional Driver Identification Card.
- Warning indicating a system or component failure.
- Data storage for Accident Reconstruction.
- Self troubleshooting every 15 seconds.

Component Description

EVT-300 Components

The Eaton VORAD EVT-300 Collision Warning System is comprised of four main components: the Antenna Assembly, Central Processing Unit, Driver Display Unit, and the Interconnecting Harness. Two components, the Side Sensor and Side Sensor Display, are optional. Each of the components are shown in their approximate location on a vehicle (see Figure 1 below), and their functions are described in the following paragraphs.

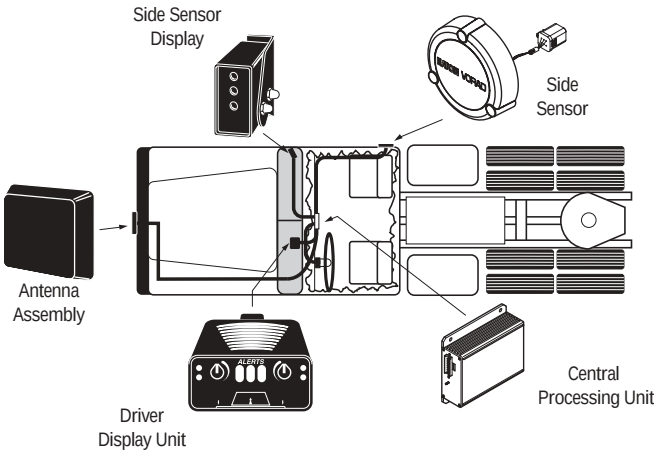


Figure 1

Antenna Assembly
The Antenna Assembly located on the front of the vehicle, transmits and receives low power, high frequency radar signals. The transmitted radar signals are reflected off objects in front of the vehicle and are received back at the Antenna Assembly. The Antenna Assembly compares the difference between the transmitted and received signals, converts this information into a digital format, and transmits it to the Central Processing Unit (see page 6) for additional processing. The Antenna Assembly is usually mounted in the center of the bumper. This mounting location ensures that the radar beam is aimed directly in front of the vehicle. The Antenna Assembly will simultaneously monitor up to 20 objects within a 350 feet (106 m) range, whether moving or stationary.

Component Description

Central Processing Unit
The Central Processing Unit (CPU) is the electronic control unit for the EVT-300 Collision Warning System. The CPU and Antenna Assembly are programmable though a slot located in the opposite end from the cable connection on the CPU (system parameters can be set with a Prolink Diagnostic Tool or ServiceRanger). The CPU compiles information from the Antenna Assembly, Engine Control Unit, Speedometer, optional Side Sensor (see page 7), Brake, and Turn Signal Circuits to produce audible and visual warnings.

The CPU can be located in a variety of places, depending upon the orientation of the CPU inside the vehicle in which it is installed. Typical locations are on the vehicle firewall, underneath the dashboard, or behind the driver's seat.

Driver Display Unit
The Driver Display Unit contains controls and indicators related to system operation. The Driver Display Unit controls system power-up, speaker volume, range for vehicle warnings, and headway thresholds for SmartCruise. A slot is also provided at the front bottom edge of the Driver Display Unit to insert the optional Driver Identification Card (see page 15). Driver Display Unit indicator lights come on to indicate system power, system failure, absence of the Driver Identification Card, SmartCruise enabled, and multiple stages of warning levels.

A light sensor in the face of the Driver Display Unit adjusts indicator brightness with changes in ambient light. The Driver Display Unit also contains a small speaker that provides audible alert tones. The alert tones are sounded when the vehicle is closing on an object, or if an object is detected by the Side Sensor and the turn signal is activated for a lane change. Additionally, the speaker provides informational tones such as volume level, system failures, and the Driver Identification Card related tones.

The Driver Display Unit mounts on top of, or is recessed in, the dashboard in an area that is easily visible and accessible to the driver.

In certain applications there may not be a Driver Display Unit installed. The information that is normally displayed on the Driver Display Unit may be included on an OEM installed integrated dashboard display. Consult your OEM literature for these integrated systems for proper operation.

Component Description

Side Sensor (Optional)
The Side Sensor is also a radar device that senses objects from two (2) to ten (10) feet (.6 - 3 m) from the side of the vehicle in a blind spot area on either side of the vehicle. This information is provided to the Central Processing Unit for processing, lighting of appropriate indicator lamps, and sounding of appropriate alarms. Side sensors are generally mounted on the right side of the vehicle, at or near a blind spot area (see figure 2). The vehicle can be configured to have a Side Sensor on each side, left or right, or have two sensors located on the same side.

Side Sensor Display (Optional)
The Side Sensor Display contains red and yellow indicator lights that indicate whether or not the Side Sensor is detecting an object. The yellow indicator light is on when there is no object within the Side Sensor detection zone. When the Side Sensor detects an object, the red indicator light illuminates and the yellow indicator lights goes off. The red light also illuminates when the Side Sensor has failed. The red and yellow lights may illuminate together during system start-up, and in certain heavy rain conditions. The Side Sensor may not be able to detect in heavy rain. A light sensor in the Side Sensor display adjusts indicator brightness with changes in ambient light.

The Side Sensor Display is generally mounted to the right side A-pillar (See figure 2) on the inside of the vehicle, easy visible by the driver, and usually along the same line of sight as the side mirror.

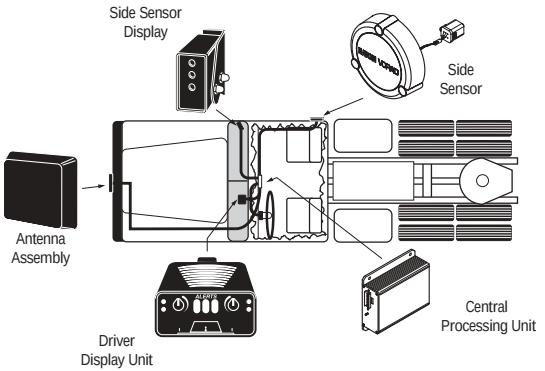


Figure 2

EVT-300 Controls

Driver Display Unit
All controls for the EVT-300 Collision Warning System are located on the Driver Display Unit or on the dash if your vehicle has an integrated display. System controls and indicators are located on the Driver Display Unit. The optional Side Sensor Display indicates the status of the optional Side Sensor.

Controls and indicators for the Driver Display Unit are shown below (see figure 3) and described on pages 9 through 13. Indicators for the Side Sensor Display are shown below (see figure 4) and described on page 14.

Driver Display Unit

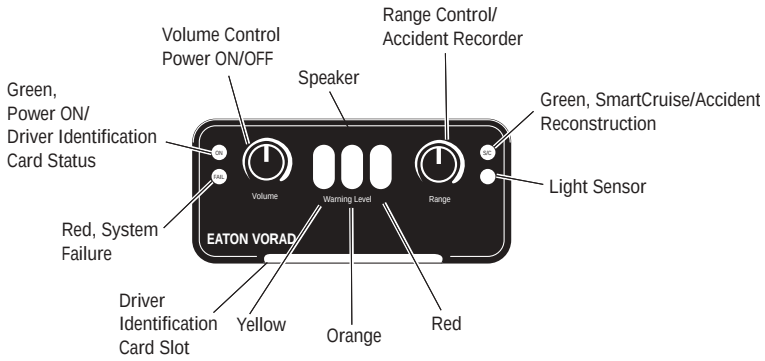


Figure 3

Side Sensor Display Unit (Optional)

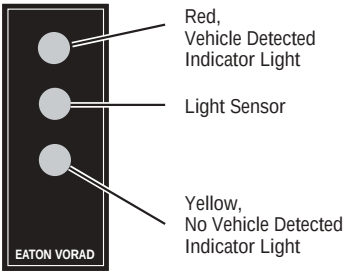


Figure 4

Driver Display Indicators

Driver Display Indicators

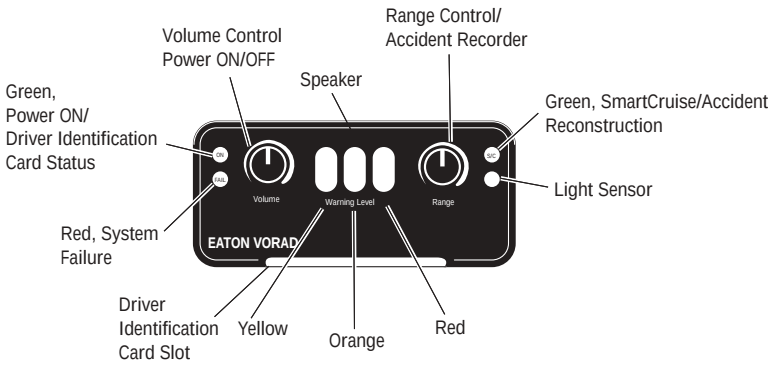


Figure 5

Item	***Description***
Green, Power On/ Driver's Identification Card Status*	*Illuminates after power is applied to the system and the power-on self test (described on page 16) is complete. The green "ON" light may blink continuously if the Driver's Identification Card is not installed, (the Driver ID Card is an optional feature) and card alarm might be enabled*. (See figure 5)*
Volume Control* and Power On/Off	*When pushed in until a distinctive click is heard and/or felt, this turns the power on or off* if enabled. Adjusts the volume of the Driver Display Unit speaker if enabled. Activates "Failure Display Mode" when the knob is pressed in and held for eight (8) seconds and then released. (See Figure 5)*
Speaker	*Located under the top cover of the Driver Display Unit. Sounds audible tones to alert the driver of a possible hazard. May be set to limit the volume to a minimum level*. (See Figure 5)*

Range Control* and Accident Recorder*	*When rotated from minimum to maximum*, and not in SmartCruise*, this control knob provides range adjustment of the first alert (3 to 2 seconds) and the second alert (2 to 1.75 seconds). Function may be configured to prevent range adjustment control* (See Figure 5). When SmartCruise is selected, rotation of the knob, from maximum to minimum, will change the following interval from 3.25 to 2.25 seconds. Accident Reconstruction is initiated by pushing and holding this knob for 5 seconds thereby freezing the most recent event data in half of the allocated memory. (See "In Case of an Accident" page 26) (See Figure 5)*
Red, System Failure	*Illuminates when a problem has been detected in the forward looking radar system. A pattern of flashes blink out the faults that are stored in memory when activated by holding in the volume control knob for five seconds (See "Diagnostic Features", page 27). (See Figure 5)*
Green, SmartCruise*/ Accident Reconstruction*	*Comes on when SmartCruise is enabled and vehicle cruise control has been engaged. If Accident Reconstruction* has been initiated to store information, it will flash 8 times. After system power-up and power-on LED test is completed and if Accident Reconstruction information was previously stored, the display will flash 8 times. (See Figure 5)*
Light Sensor	*Photo sensor senses ambient lighting and adjusts intensity of the indicator lights accordingly, i.e., increases brightness of indicator lights in daytime and decreases brightness of indicator lights during nighttime. (See Figure 5)*

NOTE: *Items marked with an asterisk (*) can be changed (configured), by a Technician, by using ServiceRanger, a PC-based service support tool.*

Driver Display Indicators

Driver Display Unit

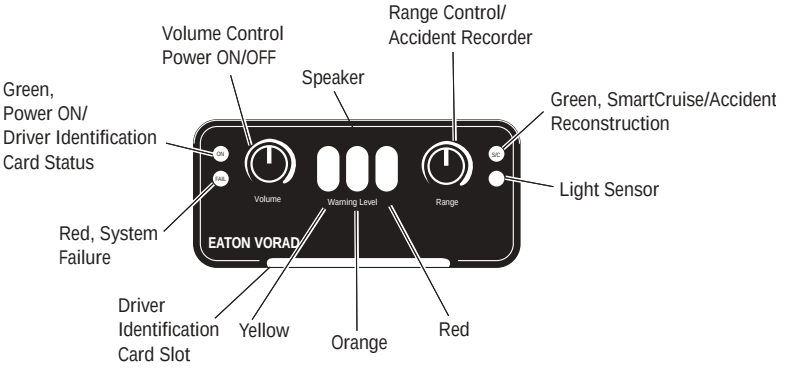


Figure 6

CWS Alert Warning Levels

Figure 7

Warning Level Descriptions

- Warnings are received only on a vehicle in your lane.
- Range is reduced on curved roads.
- Warnings are disabled in sharp turns and **when the brake is applied**.
- The distances and times below are based on setting the Driver Display Unit "RANGE" knob to maximum.

As you approach a slower vehicle ahead:

- At 350 ft. (106 m) to the vehicle, the yellow indicator illuminates.
- At 3 seconds to the vehicle, the yellow, orange indicator illuminates.
- At 2 seconds to the vehicle, the yellow, orange indicators illuminate and a single beep will sound.
- At 1 second, to the vehicle, the yellow, orange, and red indicators illuminate, accompanied by a double beep.
- At 0.5 seconds to the vehicle ahead, the three indicators illuminate and the beeps will be continuous.

If a faster moving vehicle pulls into your lane and accelerates away:

- If less than 0.5 seconds away, the three indicators illuminate with continuous beeps.
- At 0.5 to 1 second away, three indicators illuminate and no beeps.
- At more than 1 second away, the red indicator will go out.
- At 3 seconds away, the orange indicator will go out.
- At 350 ft. (106 m), the yellow indicator will go out.

Proximity Alert
If your vehicle rolls very slowly (less than 2 MPH (3 km/h)) toward any stationary object, or if an vehicle in front rolls back toward your vehicle, the yellow indicator lights and a warning double beep sounds when vehicle is within 15 ft. (4.5 m).

Stationary Object
If a stopped vehicle is within 220 feet (67 m), a warning tone sounds and all three lights illuminate when less than 3 seconds away.

Driver Display Indicators

Slow Moving Object
If a vehicle ahead is moving 20% slower than your vehicle and is within 220 feet (67m), a warning tone sounds and all three lights illuminate when less than 3 seconds away.

Miscellaneous Tones

Light/Tones	***Description***
Fail Light, One Low Tone	*Sounded when the system diagnostics detect a failure.*
One Tone	*Each time the volume control is turned, a single tone is sounded.*
Double Tone	*Driver Identification Card is successfully read when inserted into the slot.*
One Low Tone	*Driver Identification Card is unsuccessfully read when inserted into the slot.*
Flashing On Light, One continuous Tone (Configurable)	*Repeats if the Driver Identification Card is required and is not inserted.*

Driver Display Unit

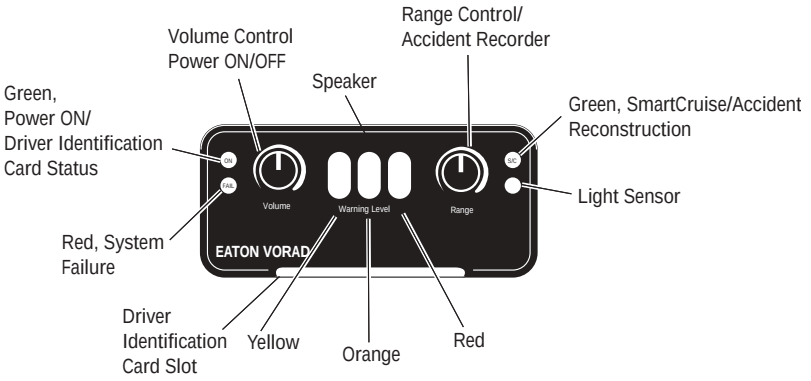


Figure 8

Side Sensor Display Indicators

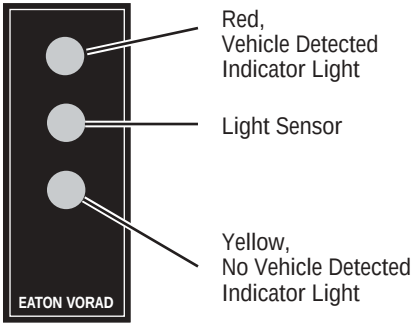


Figure 9

Light/Tones	***Description***
Red/Triple Tone	*Indicator light illuminates after objects have been detected by the Side Sensor(s), and remain in proximity for more than one (1) second. When the right turn signal is activated and the Side Sensor detects an object, the Red indicator light comes on, and the Driver Display Unit speaker sounds a triple tone.* ***The Tone is sounded only once per activation of the turn signal.*** *(See Figure 9)*
Light Sensor	*Photo sensor senses ambient light and increases brightness of indictor lights in the daytime and decreases brightness of indicator lights during nighttime. Takes ten seconds to activate. (See Figure 9)*
Yellow	*Indicator light stays on when no objects are detected by the Side Sensor(s). (See Figure 9)*
Red and Yellow	*Indicates the Side Sensor is performing a start-up self-test or there is a failure. (See Figure 9)*

Driver ID Card (Optional)

Driver Identification Card

If the system configuration requires a Driver Identification Card, (see Figure 10), it must be inserted into the slot provided on the front of the Driver Display Unit (see Figure 8, page 13). After the system is powered on, insert the card into the slot with a smooth steady continuous motion. Allow approximately one (1) second to ensure the reading of the bar code. A high-pitched confirmation tone will sound when the card is correctly scanned. *The card should be removed and stored is a safe place until required again.* If the bar code is not scanned correctly, one low-pitched tone will be heard.

If the card is not installed into the slot in the Driver Display Unit, when required, two events can occur, the green “ON” light will flash continuously or the green “ON” light will flash continuously accompanied by a matching audible tone. This is a configurable option.

Driver Identification Card (Optional)

Figure 10

EVT-300 Start-Up

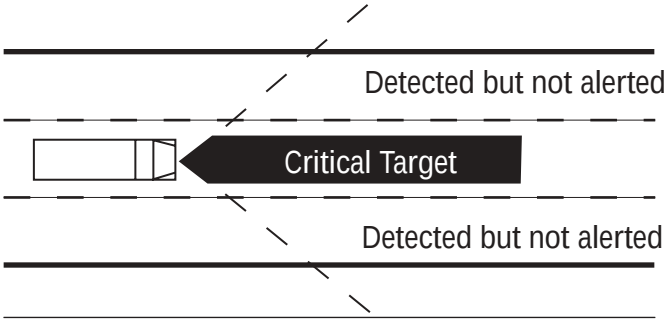
WARNING: Be sure the vehicle is not moving during the initial self-test at vehicle's start-up. Otherwise, the system may not operate properly. No Collision Warning System alerts will be given by the EVT-300 until all lights are extinguished after the self-test is complete.

1. The EVT-300 system powers up when turning the vehicle ignition key to the run position. All Driver Display Unit and Side Sensor indicator lights will illuminate and stay on until the self-test is complete.
2. If the green "ON" indicator is flashing, insert the Driver Identification Card (see page 15) into the Driver Display Unit so the system can identify the driver of the vehicle.
3. If the green "S/C" (SmartCruise) light flashes eight (8) times after the self-test is completed, an Accident Reconstruction event has been stored in memory. The light will continue to flash 8 times during every start-up until the event is cleared. Notify management to assist you with this procedure. If the event has been stored mistakenly, the system software should clear the system in 30 days.
4. If the "FAIL" indicator light (or headway control failure) comes on and stays on after the self-test or while driving, a component or system failure has occurred. This may render the VORAD system inoperable. If the SmartCruise option is enabled and a failure occurs, SmartCruise will no longer function (see page 25) until the fault has been corrected and the ignition switch has been turned OFF and then back ON. Collision Warning lights and tones may still work correctly when SmartCruise failures occur that are brought on by a component or system failure.

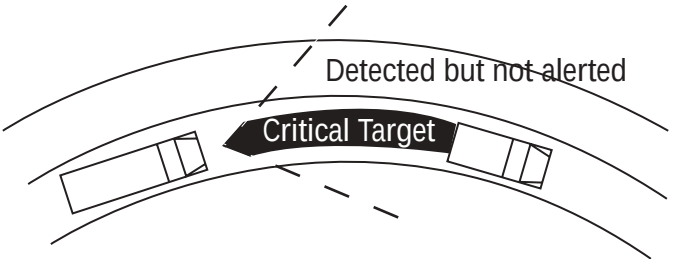
Typical System Tracking

EVT-300 Vehicle Tracking

Straight Ahead Same Lane Tracking
The system's same-lane target discrimination capability eliminates detection of nuisance objects in adjacent lanes.



Curved Same Lane Tracking
While driving on curved roads, the same lane target discrimination is maintained using host vehicle turn rate information and vehicle azimuth. Due to limitations on the radar's field of view, maximum range is limited in sharp turns.

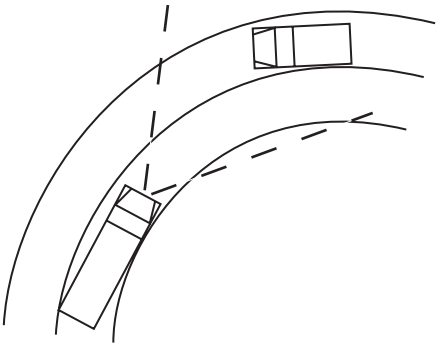


EVT-300 Road Situations

WARNING: The EVT-300 Collision Warning system will not warn of all possible hazards. Do not assume it is “all clear” if no warning signals are indicated. This system is intended solely as a driver aid, and not to be relied upon to operate a vehicle. Use the EVT-300 in conjunction with rear view mirrors and other instrumentation to maintain safe operation of the vehicle.

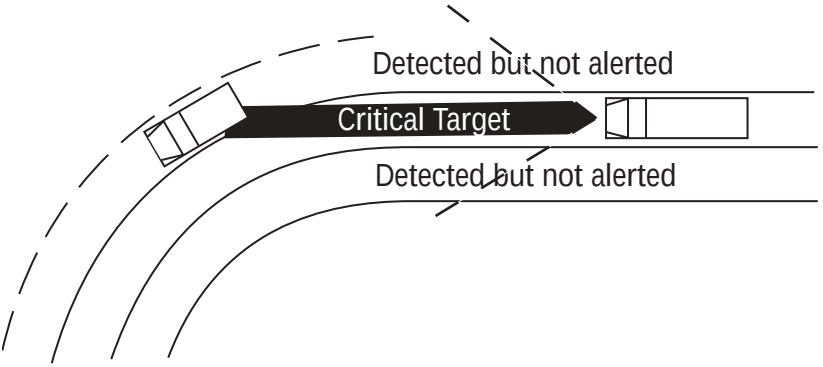
Certain road situations can affect the system’s ability to detect objects. Curves, dips, and hills on the road in front of the vehicle can affect detection. The radar system may sound a warning when it detects an object in front of the vehicle even though the driver may be planning to turn away or stop prior to reaching the object. The following examples illustrate some special road situations that must be taken into account.

Detecting Objects while Vehicle is in a Turn
Audible alarms will not sound with oncoming traffic during very sharp right or left hand turns of less than 750 feet (228 m) radius.



Special Road Situations

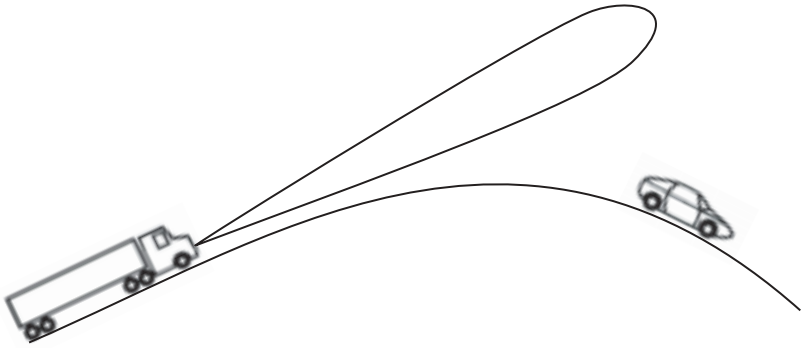
Detecting Objects Alongside an Approaching Curve
When approaching a curve, warnings may sound and indicators may illuminate due to objects, such as a parked car, on the side of a curved portion of the road in direct line with the radar beam, until the vehicle is actually starting into the turn.



Detecting Elevated Obstacles
Some unusual road elevation angles may cause the system to detect overhead signs or overpasses.

Detecting Vehicles on Other Side of a Hill

The system cannot detect vehicles over a hill. No alarm will sound until objects are within the field of view of the radar antenna.



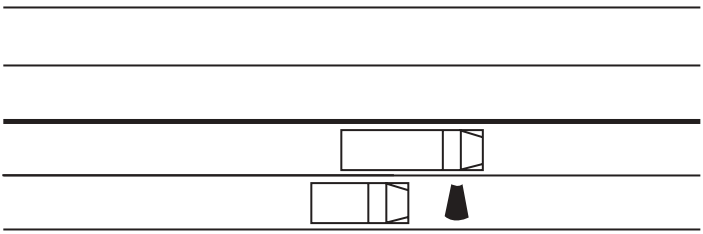
Approaching a Steep Hill

The system cannot detect objects above its beam. Generally, the alarm does not sound from the beam hitting the road surface.

Special Road Situations

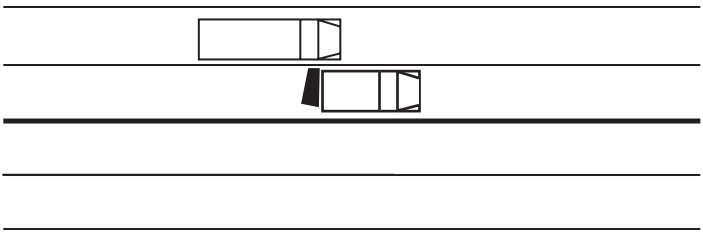
Side Sensor Coverage
Note that the optional Side Sensor(s) only detects object motion within its field of view. This view includes the 2 to 10 feet (.6 - 3 m) next to the vehicle.

Note: Vehicles outside of the field of view will not be detected.



Side Sensor Range
The Side Sensor(s) range is set to detect vehicles in the adjacent lane two (2) to ten (10) feet (.6 - 3 m) away.

Note: When a fixed object maintains a continuous presence along the right side of the vehicle (i.e. guard rails, construction walls, tunnels, bridges, etc.), the “Red” light on the optional Side Sensor Display may stay on.



EVT-300 SmartCruise (Optional)

SmartCruise is an optional enhancement to the Eaton VORAD EVT-300 CWS system. SmartCruise is activated whenever the vehicle's standard cruise control system is activated and the EVT-300 is powered on. When SmartCruise is active, the green "S/C" (SmartCruise) light in the upper right corner of the Driver Display Unit will illuminate or a headway control indicator will be evident on an OEM proprietary - messaging center.

The "RANGE" control knob (see Figure 8, page 13), adjusts the SmartCruise "following intervals". The SmartCruise system will either maintain the selected following interval between the host vehicle and a vehicle ahead or, in the case of no target vehicle, the set cruise control speed. The following interval takes precedence over the set cruise control speed.

Listed below are descriptions of the most common situations encountered while using SmartCruise.

- **Cruise On and No Vehicle Detected**

  If no vehicle is present in front of the vehicle (or if present and beyond the range of the EVT-300 system), the vehicle will maintain the speed selected by the cruise control.

- **Cruise On and Vehicle Detected**

  The driver can adjust the SmartCruise following interval from 2.25 to 3.25 seconds if enabled. See table on next page for following interval in seconds versus following interval in feet, at various speeds.

WARNING: SmartCruise does not replace an alert, trained driver. SmartCruise will not react to stationary objects and cannot bring the vehicle to a complete stop. The driver still needs to use good driving practices to avoid an accident.

SmartCruise (Optional)

Following Intervals

Following Interval in Seconds	*Following Interval in Feet (m) at 50 MPH*	*Following Interval in Feet (m) at 55 MPH*	*Following Interval in Feet (m) at 60 MPH*	*Following Interval in Feet (m) at 65 MPH*
2.25	*165 (50)*	*182 (55)*	*198 (60)*	*214 (65)*
2.50	*183 (56)*	*202 (62)*	*220 (67)*	*238 (73)*
2.75	*202 (62)*	*222 (68)*	*242 (74)*	*262 (80)*
3.00	*220 (67)*	*242 (74)*	*264 (80)*	*286 (87)*
3.25	*238 (73)*	*262 (80)*	*286 (87)*	*309 (94)*

SmartCruise On

- **Normal Operation**

  As the VORAD-equipped vehicle approaches a target vehicle in the same lane, the VORAD-equipped vehicle will slow to the speed of the other vehicle and maintain the set following interval at their speed. The speed reduction may be accomplished by the engine ECM (Engine Control Module) issuing a command to reduce fuel and engaging the engine retarder.

WARNING: If the host vehicle speed and the target vehicle speed are drastically different, the driver may need to apply the service brakes to maintain a safe distance. As with cruise control, Smart-Cruise must be reset after brakes have been applied.

WARNING: If another vehicle in an adjacent lane cuts in front and continues to the opposite lane, SmartCruise may not respond.

Cut In and Out
If the speed of the target vehicle is faster than that of the host vehicle, the host will continue to maintain its speed. However, if the speed of the target vehicle is less than the host's speed, the engine ECM will issue a command to reduce fuel and may also engage the engine retarder. Once the target vehicle moves out of the hosts lane, the host will restore the cruise control speed or resume the following interval if another target vehicle is in the lane. Again, the driver may need to apply the service brake to maintain a safe distance. The driver may also depress the acceleration pedal at any time to override SmartCruise.

Cut in and Stay
If a target vehicle in an adjacent lane cuts in front of the host vehicle and remains there, the system will respond by slowing the host to restore the set following interval to the target vehicle. The engine ECM will reduce fuel and may also engage the engine retarder to accomplish this. Again, the driver may need to apply the brake to maintain a safe distance.

Vehicle Ahead Changes Lane
When maintaining a following interval to a target vehicle in front, and that vehicle moves into an adjacent lane, the system will respond. If there is no other vehicle ahead (or within the range of the system), the host will accelerate to the set cruise speed. If there is another vehicle ahead, the host vehicle will restore the following interval to that vehicle. Again, the driver may need to apply the brake to maintain a safe distance.

SmartCruise and AutoShift™ Transmissions
Under any situation that causes the system to slow the vehicle, and the engine RPM reaches a preset minimum, the AutoShift will automatically downshift. Similarly, any situation that causes the vehicle to accelerate and a preset maximum engine RPM is reached, the AutoShift will upshift.

SmartCruise and Manual Transmissions
Under any situation that causes the system to slow the vehicle, and the engine rpm reaches a preset minimum, the engine ECM will disengage cruise control and the driver may need to manually downshift the transmission. If this happens, the vehicle cruise control will need to be re-engaged (Resume or Set) before SmartCruise will be operational again.

SmartCruise (Optional)

Road Curves and SmartCruise

1. **Gentle Curves**
   SmartCruise will continue to maintain a set following interval in a gentle curve as long as the turn is greater than 750 feet (228 m) radius.

2. **Sharp Curves**
   When maintaining a set following interval, the system may lose track of the target vehicle in front. If this happens, the host vehicle will maintain its current speed. When the target vehicle in front is again within the view of the EVT-300, SmartCruise will restore the set following interval. Refer to pages 17 through 21 for “Typical System Tracking” and “Special Road Situations”.

Note: The previous paragraphs do not address all the possible driving situations that the vehicle and driver may encounter while in SmartCruise.

SmartCruise Failure

Cruise Control/SmartCruise Fails to Operate
Due to various engine OEM’s, the procedure to override this error and return to normal cruise control must come from the engine manufacturer.

Note: The most widely used method among engine manufacturers is to toggle the cruise control on/off switch 2 times within 10 seconds starting from the “ON” position. If this does not work, please contact your dealership or maintenance personnel.

WARNING: SmartCruise is not a substitute for an alert, trained driver. The driver is ultimately responsible for the safe operation of the vehicle and the driver should fully understand the operating characteristics of SmartCruise and take all necessary actions to operate the vehicle in a safe manner.

Accident Reconstruction Capability (Optional)

The Accident Recorder can store two segments of system data in the system's non-volatile memory. The first of the two segments may be stored by pushing and holding the "RANGE" knob on the Driver Display Unit for approximately five (5) seconds. Within six (6) seconds, the green "S/C" light will blink eight times, confirming storage of the data (see Figure 11). Subsequent pushing of the "RANGE" knob will cause the system to respond with a "FAIL" tone. After the first segment is frozen, the second segment runs continuously recording system data until the system is powered down.

The system's Central Processing Unit must be returned to Eaton Corporation to download and interpret the recorded data in the non-volatile memory. This must be done before 30 days have elapsed, or the event will be removed from the system memory. Before shipping the unit contact the Eaton Corporation at 1-800-826-HELP (4357). After confirmation, ship the Central Processor Unit to Eaton Corporation, Attn: Accident Reconstruction Specialist, 13100 E. Michigan Ave., Galesburg, MI 49053.

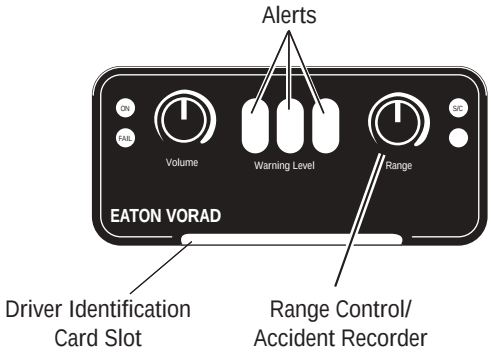


Figure 11

Maintenance/Diagnostic

Preventive Maintenance

The only maintenance required should be to keep the Antenna Assembly and Side Sensor clean of heavy buildups of mud, dirt, ice, and other materials that could reduce the range of the system. Antenna alignment should also be checked if any occurrence may have caused it to be misaligned.

WARNING: The system will not sense objects if sensor view is obstructed. Therefore, do not place objects in front of the system sensors. Remove heavy buildups of mud, dirt, ice, and other materials.

WARNING: Proper alignment is critical to correct operation of the system (see VOSM-0030 for Antenna Assembly Alignment procedure).

WARNING: Be sure the vehicle is not moving during the initial self-test at vehicle's start-up. Otherwise, the system may not operate properly.

Diagnostic Features

The system performs testing on a continuous basis. Every 15 seconds, the results of these tests are evaluated by the Central Processing Unit to determine whether or not to report a failure. If a failure occurs within the front radar system, the red "FAIL" light on the Driver Display Unit will illuminate continuously as long as the failure is active, and the associated failure code is stored in the Central Processing Unit memory until maintenance personnel are able to check the system.

The EVT-300 can indicate active and inactive fault codes stored in the Central Processing Unit memory when it is placed into its "Failure Display Mode". Inactive fault codes are faults which have occurred and have self-corrected. Active faults are faults that are still present. These fault codes provide the driver the ability to record the system fault during a trip and call either the maintenance department or Eaton Corporation for assistance. When placed into its "Failure Display Mode" (see "How to Activate Failure Display Mode" on page 28), specific fault codes are indicated by a pattern of flashes blinked out on the Driver Display Unit's red "FAIL" light indicator.

How to Activate Failure Display Mode

1. Press in and hold the Driver Display Unit “VOLUME” knob for at least five (5) seconds. If the knob is released before five (5) seconds has lapsed, the system will turn off. After five (5) seconds the Driver Display Unit’s red ”FAIL” indicator light begins to blink out the failures. If there are no faults found, the Driver Display Unit will flash a 41 code. At the conclusion of flashing the fault codes, the system will flash a 41 code.
2. To read active fault codes, position the Driver Display Unit “RANGE” knob to the left of center and only active codes will be sent to the “FAIL” indicator light. Position the Driver Display Unit “RANGE” knob to the right of center and inactive faults will flash the “FAIL” indicator light.
3. Each fault code consists of a two digit number. A pause (approximately 3/4 of a second in duration) separates the blinking of the first and second digit of the fault code. Example: Fault code 22 is indicated by two (2) blinks, a 3/4 second pause, and two (2) more blinks. In this case, the fault code of 22, suspects a faulty “LT Turn Signal”. There is a pause of three (3) seconds between each flash code fault. It there are no faults, a code 41 will be flashed.
4. Additional fault codes are blinked out at approximately 8 second intervals. After all fault codes have been displayed, a code 41 will be flashed.

Failure Display Mode

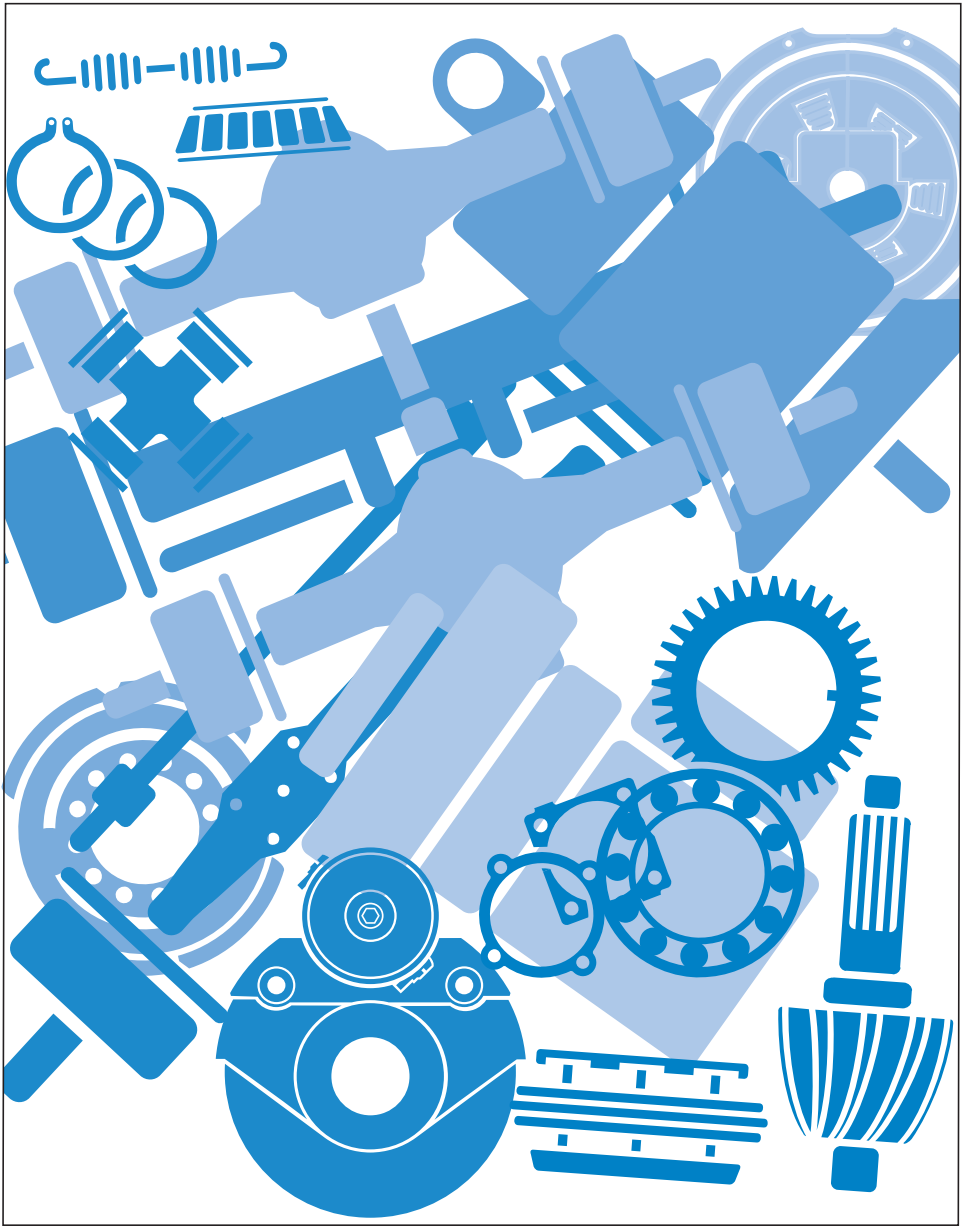
Fault Code Chart

Fault Code	*Suspect Failure*
11	*Central Processing Unit*
12	*Central Processing Unit*
13	*Driver Display Unit*
14	*Antenna Assembly*
15	*Right Side Sensor*
16	*Left Side Sensor*
21	*Right Turn Signal*
22	*Left Turn Signal*
23	*Brake Input*
24	*Speed Input*
25	*SmartCruise Compatibility*
31	*J-1587*
32	*J-1939*
33	*VBUS*
34	*Driver Display Unit*
35	*Antenna Assembly*
41	*No Fault or End of Fault Codes*

Report any failures indicated by the Driver Display Unit or Side Sensor Display to maintenance personnel for service. If the red “FAIL” indicator light comes on while driving, turn the system off (if available), and do not use until it has been repaired.

Side Sensor failures will illuminate either the red or yellow lights on the Side Sensor Display. The lights will remain illuminated as long as a failure is detected.

If you have any further questions regarding VORAD, call 1-800-826-HELP (4357) in the U.S., Canada, and Mexico; contact your OE dealer in Europe.



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