MERITOR WABCO

Maintenance Manual MM-1306

OnGuard™ Collision Mitigation System

Revised 11-15

About This Manual

This service manual applies to all vehicles equipped with the OnGuard™ Collision Mitigation System.

Before You Begin

1. Read and understand all instructions and procedures before you begin to service components.
2. Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.
3. Follow your company's maintenance and service, installation and diagnostics guidelines.
4. Use special tools when required to help avoid serious personal injury and damage to components.

Hazard Alert Messages and Torque Symbols

⚠ WARNING

A Warning alerts you to an instruction or procedure that you must follow exactly to avoid serious personal injury and damage to components.

⚠ CAUTION

A Caution alerts you to an instruction or procedure that you must follow exactly to avoid damage to components.

This symbol alerts you to tighten fasteners to a specified torque value.

How to Obtain Additional Maintenance, Service and Product Information

Visit Literature on Demand at meritor.com to access and order additional information.

Contact the OnTrac Customer Service Center at 866-668-7221 (United States and Canada); 001-800-889-1834 (Mexico); or email OnTrac@meritor.com.

If Tools and Supplies are Specified in This Manual

TOOLBOX™ Software (11.0 or higher) is available at meritorwabco.com.

OnGuard™ Warnings, Cautions and Operating Guidelines

Driver-Related Information

⚠ WARNING

The OnGuard™ Collision Mitigation System (CMS) is a driver aid only. It is designed to assist the vehicle operator in maintaining a safe following distance and, if needed, provide limited initial braking to reduce the severity of a possible collision. It is not an auto-pilot system for operating the vehicle.

The OnGuard™ CMS is no substitute for the most important factor in vehicle safety, which is a safe, conscientious driver. Use of OnGuard™ CMS cannot compensate for a driver that is distracted, inattentive or impaired by fatigue, drugs or alcohol.

As always, it is the driver's responsibility to:

- Use safe driving techniques
- Exercise proper judgment for the traffic, road and weather conditions
- Maintain a safe distance between vehicles
- Apply the brakes when needed to maintain control of the vehicle

Whether OnGuard™ CMS is in use or not, the driver is responsible for the vehicle's speed, distance between other vehicles and braking the vehicle, if necessary, to avoid a collision. Never wait for an OnGuard™ CMS warning before applying the brakes. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

The driver is responsible for understanding the operation and limitations of the OnGuard™ CMS before operating the vehicle. Failure to do so can result in serious personal injury or death, and/or severe property damage.

Environment-Related Information

⚠ WARNING

The driver should consider the benefit/risk of using OnGuard™ Collision Mitigation System (CMS) under the following conditions.

- Weather such as rain, sleet, snow, ice, heavy fog, as well as smoke or dust. These conditions can make roads slippery which can cause a spinout, or block or limit the radar's distance sensing ability.
- Construction zones, off road, dirt roads or muddy roads with loose surface. These conditions can cause the wheels to lose traction and limit OnGuard™'s ability to provide appropriate warning and adequate braking.
- Curvy or winding roads, roads with sharp turns. Curvy roads can make it difficult for the OnGuard™ CMS radar to track vehicles in it's path. While in a sharp turn or if the preceding vehicle is in a sharp turn, OnGuard™ may no longer track a vehicle in front of you. Your vehicle could then unexpectedly accelerate to the previously selected speed.
- Heavy or complicated traffic, entry and exit ramps, downhill, cross traffic and intersections. OnGuard™ CMS is not capable of taking into account these complex traffic situations and respond to each scenario. It cannot track traffic and objects traveling perpendicular to it's path.

Driving in these conditions with OnGuard™ CMS active can produce false warnings, unexpected braking or no response at all. Serious personal injury or death, and/or severe property damage can result.

⚠ WARNING

The OnGuard™ Collision Mitigation System (CMS) is designed to monitor only the distance between your vehicle and the vehicle moving in the same direction directly ahead of it. It may not identify a vehicle moving TOWARDS it or stationary objects in the road, such as a vehicle that is stopped in traffic or disabled. As such, the OnGuard™ System will not provide engine torque control or braking. The driver must always be aware of the objects in front of his vehicle and be ready to apply the brakes, if required. Failure to apply the brakes when needed can result in an accident.

OnGuard™ CMS is designed to detect and track common size automobiles and trucks with metal surfaces. It is not designed to detect smaller objects such as pedestrians, narrow vehicles, motorcycles, mopeds, bicycles, or similar sized items. It also cannot detect vehicles of unusual shape or with limited metal surfaces, such as recreational vehicles, horse-drawn buggies, or logging trailers. As such, OnGuard™ may provide little or no warning of these objects in the vehicle's path. It is the driver's responsibility to be aware of these objects and apply the brakes as necessary to avoid an accident.

It is always the driver's responsibility to apply the brakes, if needed, to avoid an accident. Never wait for an OnGuard™ CMS warning before applying the brakes. Failure to apply the brakes when needed can result in serious personal injury or death, and/or severe property damage.

System-Function Information

⚠ WARNING

Once the driver applies the brake, the OnGuard™ CMS will be disabled and no longer provide braking intervention. It is the driver's responsibility to maintain a safe speed and distance from other vehicles and brake as necessary to maintain vehicle control. Failure to apply the brakes when necessary can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

The driver is responsible for selecting a safe and legal speed setting that is appropriate for the traffic, road surface and weather conditions. Adjust the speed setting as necessary when driving in reduced visibility or potentially slick conditions. Driving with OnGuard™ CMS at a speed that is inappropriate for following a vehicle safely can lead to an accident. Serious personal injury or death, and/or severe property damage can result.

⚠ WARNING

While the OnGuard™ CMS is in System/Radar Alignment mode, the system will not track vehicles or operate. Make sure that the Service Alignment procedure is completed before releasing the vehicle from service. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

If a potential collision is developing and the driver does not take action to decelerate the vehicle, the OnGuard™ CMS sounds an alert, automatically de-throttles the engine and applies the foundation brakes to provide up to 0.35g of braking power. The driver must still apply the brakes to provide additional braking force to help avoid an accident. Failure to apply the brakes when necessary can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

Do not allow the installation of bumpers, cattle guards or other such items in front of the radar area. If the radar is blocked, the OnGuard™ CMS will have limited or no functionality, which can lead to an accident. Serious personal injury or death, and/or severe property damage can result.

⚠ WARNING

OnGuard™ CMS automatically becomes active once the vehicle reaches a speed of 15 mph (24 kph). It does not provide warning and braking functionality below 15 mph (24 kph). It is the driver's responsibility, at all times, to use safe driving techniques, be alert, maintain a proper distance between vehicles and brake the vehicle, if needed, to avoid a collision. Never wait for OnGuard™ CMS to provide a warning or braking before applying the brakes. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

OnGuard™ CMS may initiate forward collision warnings or in seldom cases unwanted or inappropriate acceleration or deceleration. In such cases, the driver has to either deactivate or override the system as necessary to maintain proper vehicle control. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

If the driver accelerates to a faster speed than the one set to overtake a vehicle, OnGuard™ CMS will return to the last stored speed once the vehicle has been overtaken. The driver must be aware of the last stored speed to make sure that the vehicle can remain in control or deactivate the system. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

OnGuard™ CMS may take a few moments to adjust to the selected speed. Adjust the speed as necessary to accommodate the current road, traffic and weather conditions. Use care to avoid dramatic acceleration or deceleration of the vehicle which can lead to a loss of control. Serious personal injury or death, and/or severe property damage can result.

⚠ WARNING

Using the "Resume" option will return the vehicle to the last stored set speed. It is the driver's responsibility to be aware of what the last stored speed is and ensure it is safe and legal for the current road, traffic and weather conditions. Failure to do so can result in serious personal injury or death, and/or severe property damage.

System Functions and Miscellaneous Information

⚠ WARNING

Always keep the path of the radar clear of obstructions. Snowy and muddy conditions can cause the radar to become blocked or debris to get between the fascia and radar. Always remove snow, mud or other debris from the front of the fascia and between the fascia and radar immediately to ensure proper radar operation. Do not allow the installation of bumpers, shields, deflectors, guards or other such items in front of the radar area. Do not allow items to block the radar or the OnGuard™ CMS will have limited or no functionality, which can lead to an accident. Serious personal injury or death, and/or severe property damage can result.

⚠ WARNING

The OnGuard™ CMS requires time to recognize an object or potential obstacle. An object moving at a speed of approximately 20 mph or more may not be recognized in enough time to produce a warning or brake the vehicle. Never wait for the OnGuard™ CMS to intervene when a potentially hazardous situation arises. The driver must always monitor traffic and apply the brakes, if needed, to avoid a crash. Failure to do so can result in serious personal injury or death, and/or severe property damage.

System Malfunction Information

⚠ WARNING

Do not allow the fascia to become blocked by any foreign matter (dirt, snow, ice, stickers etc.), otherwise a system fault will occur and the OnGuard™ CMS will be disabled. If the system becomes disabled, immediately inspect the OnGuard™ CMS fascia for a blockage and correct it as necessary. Whether or not the radar is working correctly, it is the driver's responsibility to apply the brakes when necessary to maintain vehicle control. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

If the OnGuard™ CMS is not correctly tracking vehicles that are in your lane or is tracking vehicles that are not in your lane, this may be due to radar operational issues. Typically, these are radar operational issues that can result from the following problems:

- Debris (dirt, snow, ice) on the radar fascia or between the fascia and the radar sensor. This must be removed.
- A loose radar sensor or one that is not tightly secured on the mounting bracket.
- The radar sensor may be too close to or actually contacting the bumper as mounted. There should be at least 1/4 inch of clearance between the fascia, radar sensor or bracket and the bumper.
- Radar interference from other radar sources or strong radar reflections.

If OnGuard™ CMS is not functioning correctly or as expected, immediately have the OnGuard™ CMS inspected to correct the issue. Whether or not the radar is working correctly, it is the driver's responsibility to apply the brakes when necessary to maintain vehicle control. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

When active Diagnostic Trouble Codes (DTCs) are present, the OnGuard™ CMS may be partially or fully disabled depending on whether the DTC(s) is associated with the Adaptive Cruise Control (ACC) functions or the CMS functions. If OnGuard™ CMS is not functioning correctly or as expected, have the

OnGuard™ CMS inspected immediately to correct the issue. Whether or not the radar is working correctly, it is the driver's responsibility to apply the brakes when necessary to maintain vehicle control. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

If the OnGuard™ CMS is not correctly tracking vehicles that are in your lane or is tracking vehicles that are not in your lane, the radar may not be aligned correctly. If this occurs, immediately have the OnGuard™ CMS radar inspected and corrected as needed. Refer to the Radar Sensor Service Alignment procedure. Whether or not the radar is working correctly, it is the driver's responsibility to be aware of vehicles in front of the driver's vehicle and apply the brakes when necessary to maintain vehicle control. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

If OnGuard™ CMS is not providing alerts as expected, immediately have the OnGuard™ CMS inspected to correct the issue. Whether or not the radar is working correctly, it is the driver's responsibility to apply the brakes when necessary to maintain vehicle control. Failure to do so can result in serious personal injury or death, and/or severe property damage.

⚠ WARNING

In order to reduce the potential danger of injuries caused during OnGuard™ activated vehicle decelerations, the driver and front passenger must always be correctly seated and with seat belts correctly fastened when operating the vehicle. Additionally, the driver should secure all loose items in the cab so that they will not fly forward during a full brake application.

Contents

Overview

OnGuard™

OnGuard™ is a collision safety system that incorporates adaptive cruise control with active braking and CMS. It is currently available for pneumatically braked vehicles.

Adaptive Cruise Control (If Equipped)

Adaptive Cruise Control (ACC) adjusts the speed of your vehicle while in cruise control and attempts to maintain a pre-set following interval defaulted at 3.6 seconds when there is a vehicle ahead driving at a lower speed than your vehicle.

ACC works in conjunction with conventional cruise control to maintain the set cruise speed when the lane ahead is clear and will automatically adjust the vehicle's speed to maintain the set following interval when a vehicle ahead is detected. OnGuard™ achieves the set following interval by controlling engine torque, engine and foundation brakes without driver intervention. When the lane ahead again becomes clear, the set cruise speed resumes automatically.

Collision Mitigation System

OnGuard™'s Collision Mitigation System (CMS) assists the driver in recognizing and responding to potentially dangerous driving scenarios that could lead to a rear end collision. The system responds by sending warnings, automatically reducing engine torque and applying foundation brakes.

OnGuard™'s CMS will provide both visual and audible alerts through an in-cab dash display when the vehicle's following interval could result in a rear-end collision. If a potential rear-end collision is developing and the driver does not take action to decelerate the vehicle, OnGuard™'s active braking feature issues a haptic warning (short brake pulse) and automatically de-throttles the engine.

If a potential rear-end collision still exists, and the driver has not taken the appropriate action, OnGuard™'s CMS will apply the foundation brakes to provide up to 50% of available braking power. When OnGuard™ activates the vehicle's brakes, the brake lights will come on.

The active braking application is intended to assist the driver to avoid or reduce the severity of a collision. The driver must take the appropriate corrective action in response to the collision warning. OnGuard™ warnings will not be issued below a vehicle speed of 15 mph.

Forward Collision Warning

The Forward Collision Warning (FCW) will generate an audible and visible alert when the vehicle's following distance may result in a collision. FCW will also generate an audible and visible alert when a threatening stationary object is detected. FCW provides only a warning and will not control vehicle speed unless ACC is engaged or a collision mitigation event is detected. FCW cannot be turned off and is always active at speeds above 15 mph.

Cruise Control

Cruise Control is the standard OEM system that maintains a vehicle speed set by the driver.

System Components

Radar Sensor

The radar sensor is used to detect vehicles and obstacles for the OnGuard™ Collision Mitigation System. It is mounted in the front of the vehicle near the center of the bumper and recessed in the bumper in most applications. Figure 1.1. The sensor has an electrical connector that provides power, ground and communication to the SAE J1939 network which is required for correct operation.

The mounting orientation is determined by the 3 hole bolt pattern of the bracket. The radar sensor generally is mounted with the connector on the driver's side of the vehicle. The sensor connector is protected by a rubber boot. This boot should fully cover the connector upon completion of the sensor installation or repair.

Figure 1.1

Fascia

The fascia is a protective cover for the radar sensor and is assembled to the same bracket on which the radar sensor is mounted. Some vehicle manufacturer's use other fascia designs. Only original equipment fascias supplied by Meritor WABCO and the vehicle manufacturer may be used to protect the radar sensor. Figure 1.2.

The fascia should not be blocked by any foreign matter (dirt, snow, ice, stickers, etc.), otherwise a system fault will occur and the OnGuard™ system will be disabled.

Figure 1.2

Display

The OnGuard™ display provides the interface for the driver. Figure 1.3. Audible and visual warnings, as well as verification of correct system operation and faults, are communicated to the driver. The driver is able to monitor the status of lead vehicles that the OnGuard™ system is tracking. The functions of the OnGuard™ display may be integrated into a vehicle's instrument panel. If the vehicle has an integrated display, please refer to your vehicle owner's manual for correct operation.

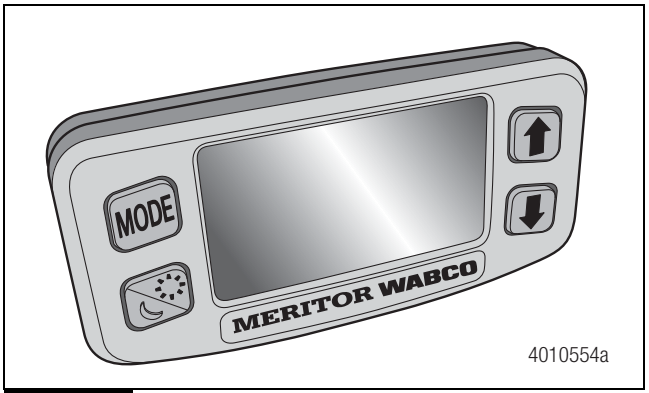


Figure 1.3

SAE J1939 Network

The SAE J1939 Serial Control and Communications Heavy-Duty Vehicle Network allows various electronic controllers on the vehicle to interact efficiently and in coordination with each other. The interactions between controllers include sharing sensor data, calculated information, subsystem operating state and configuration. This communication allows subsystems to influence each other's operation.

How OnGuard™ Works

OnGuard™ is a Collision Warning System (CWS) and Collision Mitigation System (CMS) with Adaptive Cruise Control (ACC) if so equipped.

ACC is a radar-based tracking system that works in conjunction with standard Cruise Control to maintain the set cruise speed when no vehicle is being tracked and maintains a safe following distance when a lead vehicle is being tracked. The safe following distance is maintained by controlling engine throttle, engine retarder and the foundation brakes as necessary. This automatic brake application is intended only to provide early braking until the driver is recognizing and reacting to the situation (the driver must also apply the brakes in response to the Collision Warning).

If the cruise control is not set, the CWS provides the driver with audible and visual alerts to notify the driver of a potentially dangerous driving situation. The CWS does not apply braking, engine throttle or retarder control.

If the driver is following too close behind another vehicle at a steady driving speed, the following distance alert emits an audible tone and the in-cab dash display screen turns yellow. This alert ends when the driver's vehicle speed drops below the lead vehicle speed and the following distance is increased. The alert also activates if the driver is using the accelerator pedal to override the cruise control and approaches too close to a vehicle. The CWS is always active when at a road speed of approximately 15 mph (24 kph) or faster. No action is needed to turn CWS on and it cannot be arbitrarily turned off.

Collision Mitigation System (CMS) is integral to the OnGuard™ Collision Safety System. The system will provide driver alerts with both visual and audible alarms through an in-cab dash display when the vehicle's following distance could result in a rear-end collision. If a potential rear-end collision is developing and the driver does not

take action to decelerate the vehicle, OnGuard™'s Active Braking automatically de-throttles the engine followed by the application of the foundation brakes to provide up to 0.35g of braking power. The CMS will activate on moving objects and objects that were seen moving by the radar and have stopped.

If hard braking is required to prevent a collision, a haptic warning may occur. This situation can occur if another vehicle crosses into the path of the driver's vehicle at a distance near the front of the vehicle. The foundation brakes are applied very briefly at 0.25g to make the driver aware of the impending danger. With this notification, the driver has the opportunity to attempt a steering maneuver and further driver initiated brake applications to avoid the collision. If the situation requires further system intervention, automatic braking for collision prevention or mitigation can provide up to 0.35g of braking.

Stationary Object Warning

The OnGuard™ system can also identify stationary objects (objects that the radar never saw moving) that are in the path of the vehicle and will provide audible and visual warning to the driver. The system does not provide engine torque control or braking during this situation.

⚠ WARNING

The OnGuard™ CMS should only be considered an aid to drivers in maintaining a safe following distance and is not intended to replace driver control of the vehicle at any time. OnGuard™ is only intended to initiate braking of the vehicle in an effort to reduce the severity of an impending collision. OnGuard™ will not become active below 15 mph (24 kph). It is not to be relied on to always function and is a mitigation safety system. In the event the OnGuard™ CMS requires activation of the foundation brakes, there is a limit to its maximum braking ability (by design). The driver is expected to intervene and assume control of the braking of the vehicle.

OnGuard™ should not be relied on to track vehicles when either or both vehicles (base and lead vehicle) have entered and are traveling through a curve in the road. ACC is not recommended for use in winding (curving) roads. OnGuard™ should not be expected to track smaller objects such as motorcycles, mopeds, bicycles, etc.

When operating a vehicle, always use safe driving techniques. The driver is ALWAYS the most important factor in safe vehicle operation.

In-Cab Dash Display

The in-cab dash display has five different screen background colors.

Blue: General operating mode with no target vehicle detected

Green: Target vehicle detected ahead

Yellow: Following distance alert, System capability warning

Red: Collision warning, Stationary object warning

Amber: Diagnostic Trouble Code (DTC) screen

Operating Modes

Adaptive Cruise Control Not Set

The vehicle operates as usual when the ACC speed is not set. The system will still emit audible and visual warnings when it detects a possible rear-end collision. CMS is active above 15 mph and will apply brakes if deemed necessary.

During the power up process, the "Radar not Aligned 0%", then the "Radar aligned 100%" screens will display briefly. Figure 1.4 and Figure 1.5.

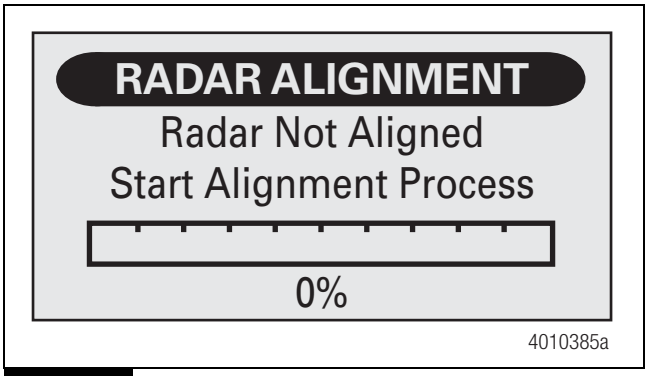


Figure 1.4

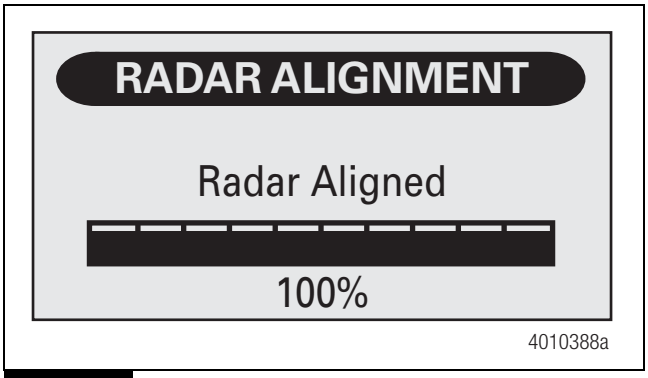
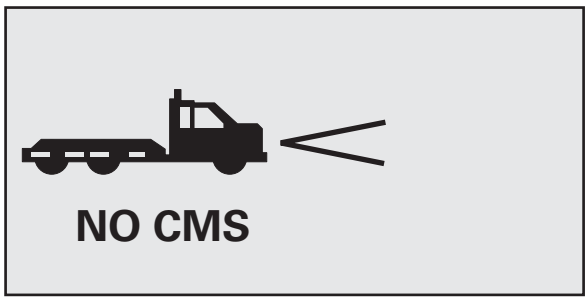


Figure 1.5

After the alignment screens, the “NO CMS” screen will be displayed and will remain on the screen while the vehicle is traveling less than 15 mph. Figure 1.6.



4011864a

Figure 1.6

Once the vehicle is traveling faster than 15 mph, the following screens will be displayed. Figure 1.7.

Cruise Control not set. No lead vehicle detected. **Cruise Control not set. Lead vehicle detected.**

4011856a

Figure 1.7

Following Distance Alert: Adaptive Cruise Control Not Set

The Following-Distance Alert will provide an audible alert and the in-cab dash display screen will turn yellow if the vehicle is following another vehicle too closely at a 3.0 seconds (hwy)/1.5 seconds (city) following interval (tailgating). This alert will end when the following distance is increased to a safe level or if the speed drops below the lead vehicle speed. Figure 1.8.

Cruise Control not set. Following distance alert.

4011857a

Figure 1.8

Adaptive Cruise Control Set

When the ACC speed is set, the set cruise speed appears on the display. When a slower vehicle is detected in front of the vehicle, ACC will attempt to reduce the speed to the speed of the lead vehicle. This speed adjustment may momentarily drop lower than the lead vehicle in order to maintain a 3.6 seconds following interval between the vehicle and the vehicle ahead when appropriate. While ACC is on, the display will emit visual and audible collision warnings, and the system will control throttle and apply engine and service brakes if needed while attempting to maintain a set following interval. Figure 1.9.

Cruise Control set. No lead vehicle detected. **Cruise Control set. Lead vehicle detected.**

4011858a

Figure 1.9

Following Distance Alert: Adaptive Cruise Control Set

When the vehicle is in cruise control mode, the Following-Distance Alert will provide an audible alert and the in-cab dash display screen will turn yellow if the driver uses the accelerator pedal to override the ACC and approaches a vehicle too closely. The Following-Distance Alert will not provide warnings when the vehicle speed is below 15 mph. Figure 1.10.

Cruise Control set. Following distance alert. ACC at maximum braking and requesting additional driver braking.

4011859a

Figure 1.10

Collision Warning and Mitigation

When an unforeseen event occurs, such as another vehicle enters the vehicle's lane traveling slower than the vehicle, or the gap between the vehicles becomes too close, OnGuard™ will provide an audible alert and the display will turn red with a collision warning symbol. If the system determines that a rear-end collision is imminent, it will automatically apply the brakes to reduce the vehicle's speed. The driver may also feel a haptic warning (short brake pulse) to warn of collision danger. **The driver** must also take the appropriate corrective action to avoid dangerous driving situations.

If OnGuard™ detects a stationary object in the vehicle's lane (such as a disabled car) it will provide an audible alert and the display will turn red showing a stationary object symbol. **OnGuard™ will not apply the brakes or reduce the vehicle's speed when it detects a stationary object.** CMS will not be active when the vehicle's speed is below 15 mph. Figure 1.11.

Object Collision Warning **Stationary Collision Warning**

4011860a

Figure 1.11

System Limitations

The OnGuard™ CMS only brakes for moving objects located directly in front of the vehicle and does not operate when the speed is less than 15 mph. Accordingly, OnGuard™:

- Will not react and alert the driver to objects crossing in front of the vehicle or oncoming traffic.
- Should not be relied on to track lead vehicles when traveling through a severe curve in the road. Because of this, ACC is not recommended for use on winding (curving) roads.
- Will alert but not actively brake on stationary objects.
- Should not be relied upon to track smaller objects (e.g. motorcycles, mopeds, bicycles, pedestrians, etc.).
- Should not be relied on to alert drivers to vehicles in an adjacent lane.

General Information

Radar Sensor and Display Software Levels

Many diagnostic and troubleshooting procedures will require knowledge of the software version of the OnGuard™ radar sensor and display.

NOTE: The radar sensor software version can be determined using TOOLBOX™ Software.

The display software revision level can be determined using the following display operating procedure.

1. Turn the ignition key ON and wait for the display to power up.
2. Press the "Mode" key on the display several times until the screen labeled "Software Rev" shown in Figure 2.1 appears.

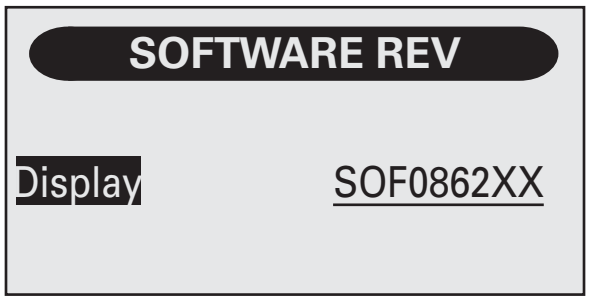


Figure 2.1

NOTE: Take note of the software version of each component for reference during procedures required in this manual and for component replacement.

Error Screens and Diagnostic Trouble Codes

If the system is not operating correctly, an error screen or a screen containing Diagnostic Trouble Codes (DTCs) may be shown on the display. Only currently **active DTCs** are displayed.

NOTE: It is important to document any DTC that is displayed because stored DTCs are not displayed and are only retrievable with TOOLBOX™ Software.

NOTE: When active DTCs are present, the OnGuard™ system may be partially or fully disabled depending on whether the DTC(s) is associated with the ACC functions or the CMS functions.

Multiple DTCs may be active simultaneously. If a DTC is shown on the display, use the UP and DOWN keys on the OnGuard™ display to scroll through each code. Figure 2.2. Record each DTC for future reference.

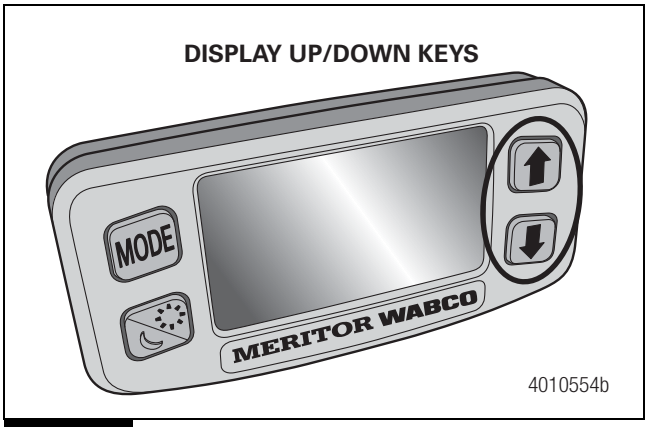


Figure 2.2

OnGuard™ DTCs may become active during service procedures on other electrical system components (e.g., engine, transmission, ABS, etc.). If there are other vehicle systems with faults, they should be repaired first. After completion of service on the other vehicle system components, cycle the ignition OFF for one minute and then turn the ignition back ON. Start the engine and run it at idle speed for one minute. This frequently clears the OnGuard™ DTCs.

Troubleshooting Guide

When ignition power is switched on, the screen shown in Figure 2.3 will be displayed for several seconds.

Figure 2.3

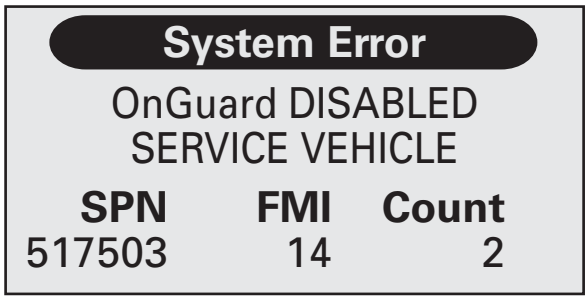
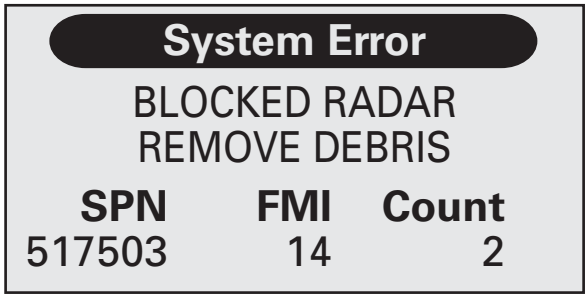
If the OnGuard™ display does not light up when the ignition is on, make sure that the display brightness is turned up sufficiently to make the screen visible. If the display brightness adjustment is correct or the adjustment screen cannot be seen, the display is not receiving any power or input signals. This can be caused by problems in the electrical harness. Refer to Display Harness Electrical Checks in the Electrical System and Harness Troubleshooting Section.

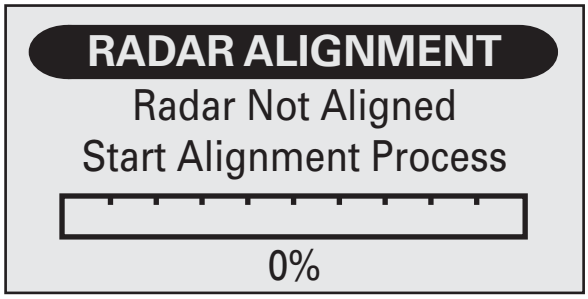
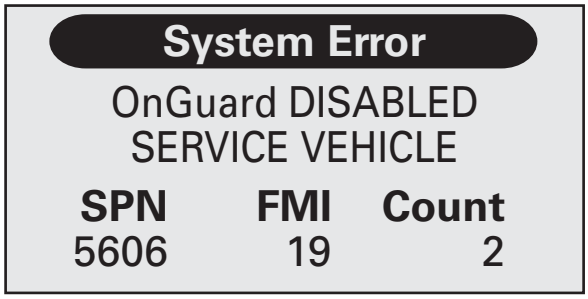
If the OnGuard™ display shows an amber error screen use the following Error/System Failure Screen Repair Table to determine the correct repair action. If the error requires use of TOOLBOX™ Software use the Diagnostic Trouble Code Table section to identify the correct repair action. Also, refer to the Troubleshooting Section and Sub-Section of this manual, listed in the last column of the Diagnostic Trouble Code Table.

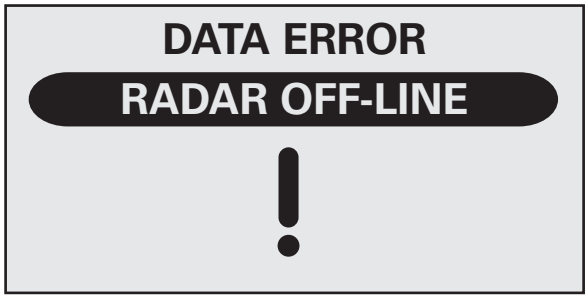
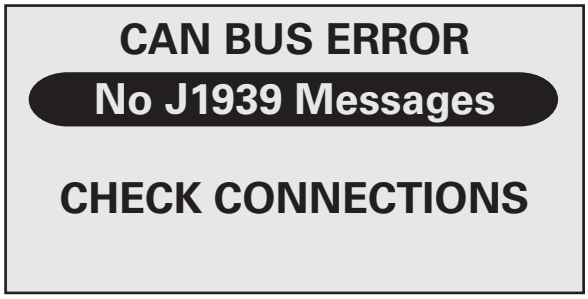
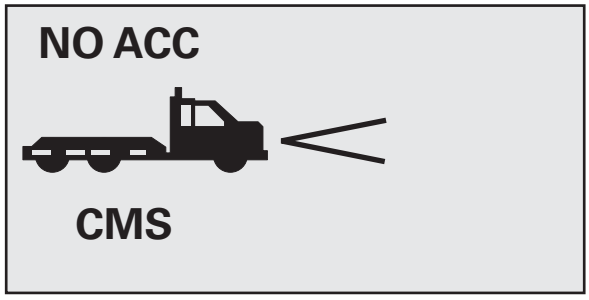
NOTE: If the display remains dark after performing a display update, attempt the update again until the procedure is successful.

NOTE: OnGuard™ is sensitive to faults in other vehicle systems and will set a DTC as a reaction. As such, it is recommended that all faults in any other vehicle ECUs are diagnosed and repaired prior to diagnosing OnGuard DTCs.

Table A: System Error Screen Repair Action

Display Message	Repair Action	Troubleshooting Section
 4010632a  4010633a	Remove snow, mud, etc. from fascia or between radar and fascia.	Blocked

Display Message	Repair Action	Troubleshooting Section
 4010385a	Radar not aligned. Perform Radar Sensor Service Alignment using TOOLBOX™ Software. Ignition cycle may be required to clear the fault and restore system function.	Radar Sensor Alignment
 4011863a	Diagnose with TOOLBOX™ Software and Diagnostic Trouble Code Table to determine system error.	TOOLBOX™ Software and Diagnostic Trouble Code Table
 4010406a	Diagnose with TOOLBOX™ Software and Diagnostic Trouble Code Table to determine reason for disabled CMS.	TOOLBOX™ Software and Diagnostic Trouble Code Table

Display Message	Repair Action	Troubleshooting Section
 4010390a	Communication between the radar and display is interrupted. Troubleshoot harnesses between radar and display. Diagnose J1939 wiring harness, power and ground.	Display Harness Electrical Checks and Radar Harness Electrical Checks
 4010391a	Diagnose J1939 wiring harness.	Electrical System and Harness Troubleshooting
 4010379a	ACC is Inactive. CMS is still active. Cruise control is disabled. Diagnose with TOOLBOX™ Software and Diagnostic Trouble Code Table to determine reason for disabled ACC.	TOOLBOX™ Software and Diagnostic Trouble Code Table

OnGuard™ DTCs may be generated and displayed during service procedures on other electrical system components (i.e., engine, transmission, ABS, etc.). If the OnGuard™ display screen turns amber with error screens or DTCs visible after the vehicle has been serviced for other vehicle system issues, cycle the ignition OFF for one minute, turn the ignition back ON, start the engine and run at idle speed for one minute. OnGuard™ DTCs caused by other systems that have been repaired should be cleared. If active DTCs remain, continue troubleshooting.

If the OnGuard™ Collision Mitigation System is not correctly tracking vehicles that are in your lane or is tracking vehicles that are not in your lane, this may be due to radar operational issues.

Typically these are radar operational issues that can result from the following problems:

- Debris (dirt, snow, ice) on the radar fascia or between the fascia and the radar sensor. This must be removed.

- The radar sensor may be loose or not tightly secured on the mounting bracket.
- The radar sensor may be too close to or actually contacting the bumper as mounted, which will affect the radar signal. There should be at least 1/4 inch of clearance between the fascia, radar sensor or bracket and the bumper. Contact your vehicle manufacturer representative on adjustments to the bumper for radar sensor clearance.
- The radar may not be aligned correctly. Refer to the Radar Sensor Service Alignment procedure.

If the vehicle's standard cruise control is working and OnGuard™ Adaptive Cruise Control (ACC) is not working, consult your dealer or engine supplier. This can occur if the engine controller has been re-programmed or the engine parameter that activates Adaptive Cruise Control has been turned off. Consult with your dealer or engine supplier for engine software and parameter adjustments.

TOOLBOX™ Software

NOTE: To download TOOLBOX™ Software, visit meritorwabco.com.

To access the Meritor WABCO TOOLBOX™ Software from the desktop screen, double-click on the Meritor WABCO TOOLBOX™ icon. Figure 2.4.

Figure 2.4

From the message box that appears, click on the OnGuard™ Radar Diagnostics button. Figure 2.5.

Figure 2.5

NOTE: OnGuard™ will only communicate on J1939. Verify that the correct device and protocol are selected under "Adapter selection" in "Utilities". If the protocol was changed, you will need to cycle the key.

Displaying Radar Information:

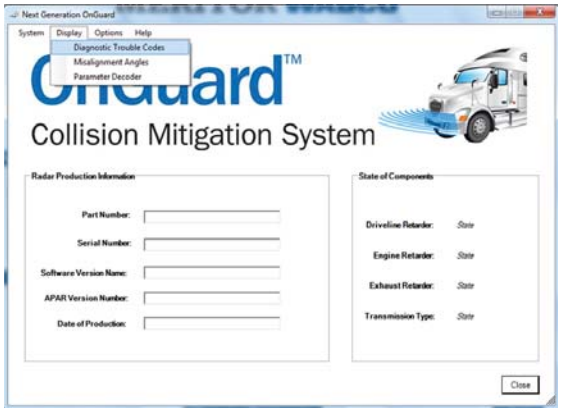
To retrieve radar sensor information, select "Diagnostic Information" from the home screen.

This will then display the radar sensor part number and radar software version, as well as other important information. Figure 2.6.

Figure 2.6

Retrieving DTCs:

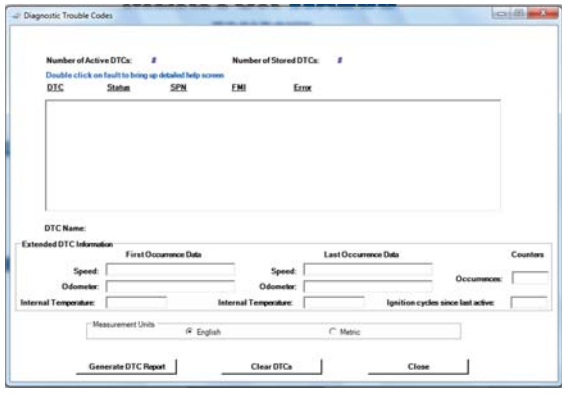
1. To display OnGuard™ radar sensor DTCs, select the “Display” option from the menu.
2. From the pull-down menu, select “Diagnostic Trouble Codes” to bring up the DTC information screen. Figure 2.7.



4012508a

Figure 2.7

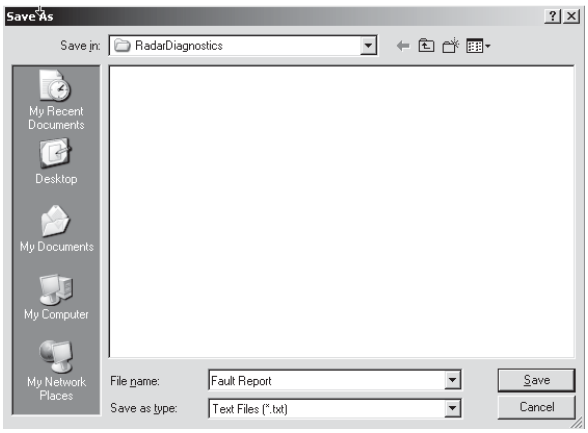
3. A description of the DTC, the number of times the DTC occurred, the suspect parameter number (SPN) and the failure mode identifier (FMI) are all displayed in the Diagnostic Trouble Codes window. When you click on one of the DTCs in the window, the “Extended DTC Information” will populate below. Information includes vehicle speed, odometer reading and the radar’s internal temperature the first and last time this trouble code was reported. The fields under “Counters” will show how many times this code was reported and how many ignition cycles since the last time this code was active. Figure 2.8. After making the necessary repairs, use the “Clear DTCs” to reset the radar.



4012509a

Figure 2.8

4. A fault report can also be generated by selecting the “Generate Fault Report“ button, while in the “Diagnostic Trouble Codes” screen. A “Save As” screen will then come up asking you to name the file and select where it will be saved. Figure 2.9. The “Fault Report” screen provides additional information that is not included in the “Diagnostic Trouble Codes” screen. Figure 2.10.



4008874a

Figure 2.9

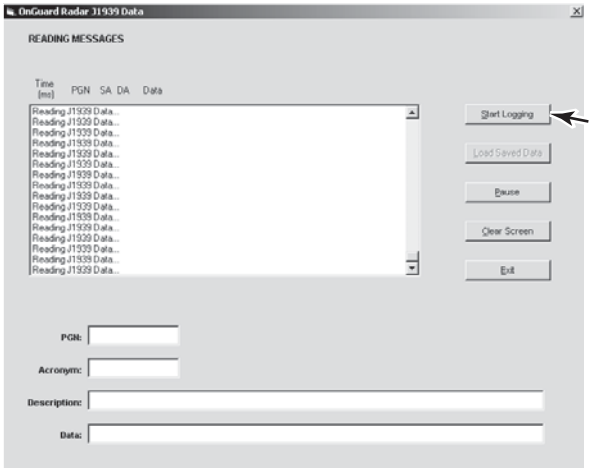
4008875b

Figure 2.10

DTCs can be cleared after generating a fault report. Only stored DTCs will clear. Figure 2.8.

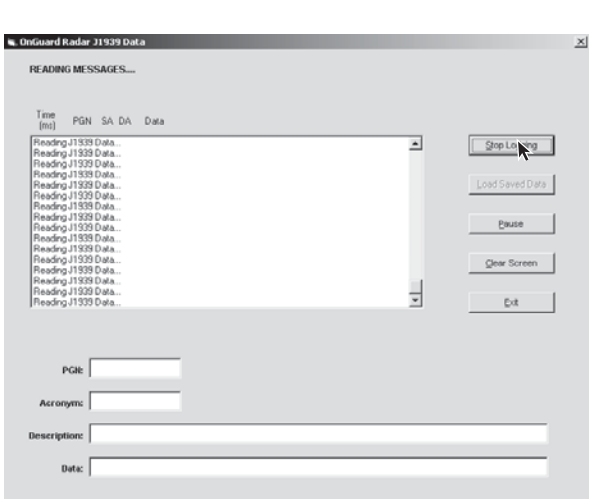
Recording J1939 Data:

1. Go to “J1939 Bus Monitor” in the TOOLBOX™ Software Utilities menu.
2. To capture a log file, click on “Start Logging”. Figure 2.11. A single log file will capture up to five minutes of information. To pause a log file, click on “Pause”; to resume logging, click on “Resume”. Once the required data has been captured, click on “Stop Logging”. Figure 2.12.



4008877a

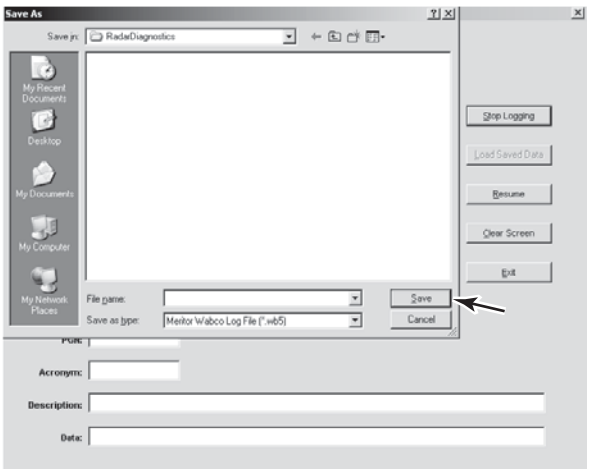
Figure 2.11



4008878a

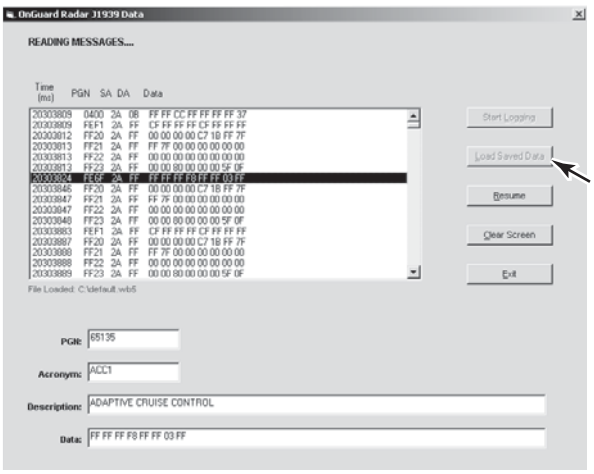
Figure 2.12

3. A “Save As” screen will then come up asking you to name the file and select where it will be saved. Figure 2.13. Specific messages can also be viewed after saving the file by clicking on “Load Saved Data”, and then highlighting the desired message. Figure 2.14.



4008879a

Figure 2.13



4008880a

Figure 2.14

Displaying Parameter Decoder Information:

1. To display Parameter Decoder information, from the “Display” menu, select “Parameter Decoder”. Figure 2.15.

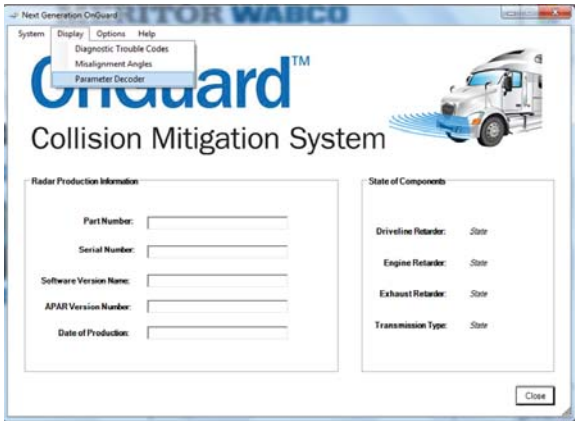


Figure 2.15

2. Information from the radar will be displayed on the screen. The Event Counters for Forward, Haptic Collision Warnings and Collision Mitigation Braking will display the total number of times these events occurred during the lifetime of the radar. The Last Event Record will display the information from the last occurrence of Haptic Collision Warnings and Collision Mitigation Braking. Meritor WABCO recommends entering the Fleet Name, Unit ID and Odometer before saving the file for correct identification. Figure 2.16.

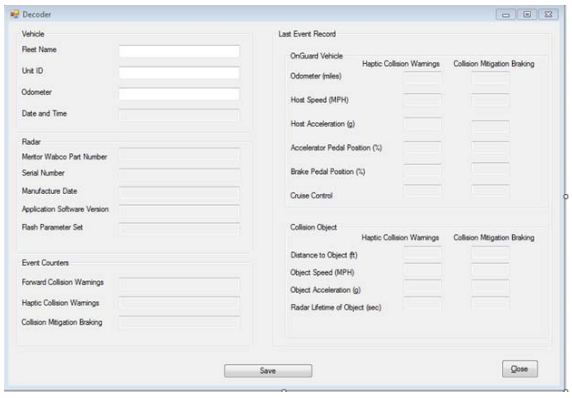


Figure 2.16

OnGuard™ Radar Diagnostic Trouble Code Table

The following table provides repair instructions and the corresponding Troubleshooting Sections in this manual for SPN/FMI DTCs that are readable using TOOLBOX™ Software. If the display shows a code not listed in the table, contact the Meritor OnTrac™ Customer Call Center at 866-OnTrac1 (668-7221) for assistance.

Table B: Diagnostic Trouble Code Table

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
70	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Parking Brake Switch data received in CCVS1 message (from engine ECM, body, cab or chassis controller)	• Verify operation of the Parking Brake Switch and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is installed on the vehicle.
84	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Wheel-Based Vehicle Speed data received in CCVS1 message (usually from engine ECM)	• Verify the correct radar part number is installed on the vehicle. • Verify the engine ECM is functional and has correct software and parameters.
86	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Cruise Control Set Speed data received in CCVS1 message (usually from engine ECM)	• Verify the correct radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM is functional and has correct software and parameters.
91	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Accelerator Pedal Position 1 data received in EEC2 message (usually from engine ECM, also possible in body, cab or chassis controller)	• Verify the Accelerator Pedal is operating correctly and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is used on the vehicle.
188	9	Amber	OnGuard™ System Disabled	J1939 Engine Configuration 1 (EC1) message not received or intermittent	• Cycle the ignition to clear DTCs after engine servicing. • Verify engine ECM is functional and has correct software and parameters.
188	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Engine Speed At Idle data received in EC1 message from engine	• Cycle the ignition to clear DTCs after engine servicing. • Verify engine ECM is functional and has correct software and parameters.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
190	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Engine Speed data received in EEC1 message from engine	• Cycle the ignition to clear DTCs after engine servicing. • Verify engine ECM is functional and has correct software and parameters.
191	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Transmission Output Shaft Speed data received in ETC1 message from transmission	• Verify the correct radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after transmission servicing. • Verify the transmission ECU is functional and has correct software and parameters.
512	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Driver's Demand Engine - Percent Torque data received in EEC1 message from engine	• Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM is functional and has correct software and parameters.
513	9	Amber	OnGuard™ System Disabled	J1939 Electronic Engine Controller 1 (EEC1) message not received or intermittent	• Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM is functional and has correct software and parameters.
513	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Actual Engine - Percent Torque data received in EEC1 message from engine	• Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM is functional and has correct software and parameters.
520	9	Amber	OnGuard™ System Disabled	J1939 Electronic Retarder Controller 1 (ERC1) message not received or intermittent	• Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM is functional and has correct software and parameters.
520	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Actual Retarder - Percentage Torque data received in ERC1 message from engine retarder	• Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM is functional and has correct software and parameters.
521	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Brake Pedal Position data received in EBC1 message from ABS	• Use Meritor WABCO TOOLBOX™ Software PC Diagnostics to test the ABS Brake Pedal Pressure Sensor. • Verify the correct radar part number is installed on the vehicle. • Verify the correct ABS ECU part number is used on the vehicle. • Cycle the ignition to clear DTCs after ABS servicing.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
523	9	Amber	OnGuard™ System Disabled	J1939 Electronic Transmission Controller 2 (ETC2) message not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after transmission servicing. • Verify transmission ECU is functional and has correct software and parameters.
523	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Transmission Current Gear data received in ETC2 message from transmission	• Verify the correct radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after transmission servicing. • Verify transmission ECU is functional and has correct software and 527 parameters.
527	9	Amber	OnGuard™ System Disabled	J1939 Cruise Control/Vehicle Speed 1 (CCVS1) message from the primary source (usually the engine) not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing. • Verify engine ECU is functional and has correct software and parameters.
527	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Cruise Control States data received in CCVS1 message (usually from engine, also possible from body, cab or chassis controller)	• Verify the correct radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM (or body, cab or chassis controller) is functional and has correct software and parameters.
544	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Engine Reference Torque data in EC1 message received from engine	• Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM is functional and has correct software and parameters.
559	9	Amber	OnGuard™ System Disabled	J1939 Electronic Engine Controller 2 (EEC2) message not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing. • Verify engine ECU is functional and has correct software and parameters.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
560	9	Amber	OnGuard™ System Disabled	J1939 Electronic Transmission Controller 1 (ETC1) message not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after transmission servicing. • Verify transmission ECU is functional and has correct software and parameters.
560	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Transmission Driveline Engaged data received in ETC1 message from transmission	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after transmission servicing. • Verify transmission ECU is functional and has correct software and parameters.
563	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Anti-Lock Braking Active data received in EBC1 message from ABS	• Verify the correct ABS ECU part number is used on this vehicle. • Cycle the ignition to clear the DTCs after ABS servicing.
574	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Transmission Shift In Process data received in ETC1 message from transmission	• Verify the correct radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after transmission servicing. • Verify the transmission ECU is functional and has correct software and parameters.
596	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Cruise Control Enable Switch data received in CCVS1 message (from engine ECM, body, cab or chassis controller)	• Verify operation of the Cruise Control Enable Switch and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is installed on the vehicle.
597	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Brake Switch data received in CCVS1 message (from engine ECM, body, cab or chassis controller)	• Verify operation of the Brake Switch and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is installed on the vehicle.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
598	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Clutch Switch data received in CCVS1 message (from engine ECM, body, cab or chassis controller)	• Verify operation of the Clutch Switch and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is installed on the vehicle.
599	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Cruise Control Set Switch data received in CCVS1 message (from engine ECM, body, cab or chassis controller)	• Verify operation of the Cruise Control Set Switch and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is installed on the vehicle.
601	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Cruise Control Resume Switch data received in CCVS1 message (from engine ECM, body, cab or chassis controller)	• Verify operation of the Cruise Control Resume Switch and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is installed on the vehicle.
770	19	Amber	OnGuard™ System Disabled	Bootloader error usually caused when there is an issue during a radar software update	• Run the software update again. • Is usually seen in TOOLBOX™ Software with SPN 197120 FMI 31 on the display.
904	9	Amber	OnGuard™ System Disabled	J1939-Wheel Speed Information (EBC2) message from the ABS not received or intermittent	• Verify the ABS ECU is connected to the J1939 network and is functional. • Verify correct ABS part number is used. • Cycle ignition to clear DTCs after ABS servicing.
904	19	Amber	OnGuard™ System Disabled	CAN Out of Range for signal EBC2_FRNT_AXLE_SPD. See ABS ECU.	• Verify the ABS ECU is connected to the J1939 network and is functional. • Verify correct radar part number is installed on the vehicle. • Verify wheel speed sensor signal per ABS ECU diagnostics. • Cycle ignition to clear DTCs after ABS servicing.
905	19	Amber	OnGuard™ System Disabled	CAN Out of Range for signal EBC2_RELSPD_FRNTAXLE_LW	• Check ABS ECU for proper function and active faults. • Verify correct ABS ECU is installed.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
906	19	Amber	OnGuard™ System Disabled	CAN Out of Range for signal EBC2_RELSPD_FRNTAXLE_RW	• Check ABS ECU for proper function and active faults. • Verify correct ABS ECU is installed.
907	19	Amber	OnGuard™ System Disabled	CAN Out of Range for signal EBC2_RELSPD_REARAXLE_LW	• Check ABS ECU for proper function and active faults. • Verify correct ABS ECU is installed.
908	19	Amber	OnGuard™ System Disabled	CAN Out of Range for signal EBC2_RELSPD_REARAXLE_RW	• Check ABS ECU for proper function and active faults. • Verify correct ABS ECU is installed.
1121	9	Amber	OnGuard™ System Disabled	J1939 Electronic Brake Controller 1 (EBC1) message from the ABS not received or intermittent	• Verify the ABS ECU is connected to the J1939 network and is functional. • Verify correct ABS part number is used. • Cycle ignition to clear DTCs after ABS servicing.
1121	19	Amber	OnGuard™ System Disabled	Incorrect J1939 EBS Brake Switch data received in EBC1 message from ABS	• Use Meritor WABCO TOOLBOX™ Software PC Diagnostics to test the ABS Brake Pedal Pressure Sensor. • Verify the correct radar part number is installed on the vehicle. • Verify the correct ABS ECU part number is used on the vehicle. • Cycle the ignition to clear DTCs after ABS servicing.
1243	19	Amber	OnGuard™ System Disabled	Incorrect J1939 ABS Fully Operational data received in EBC1 message from ABS	• Use Meritor WABCO TOOLBOX™ Software PC Diagnostics to test the Anti-Lock Braking System. • Verify the correct radar part number is installed on the vehicle. • Verify the correct ABS ECU part number is used on the vehicle. • Cycle the ignition to clear DTCs after ABS servicing.
1590	9	Amber	OnGuard™ System Disabled	J1939 Adaptive Cruise Control 1 (ACC1) message from the engine not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM has the Adaptive Cruise Control parameter enabled.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
1590	19	Amber	OnGuard™ System Disabled	Incorrect J1939 ACC Mode data in ACC1 message received from engine. This code may indicate the engine has recognized a radar malfunction (e.g. blocked radar) and has disabled Cruise Control. This code may also indicate the engine is not configured for operation with an Adaptive Cruise Control system.	• Check for multiple active DTCs in the radar. • If there is more than one active code, repair all other codes, then cycle the ignition to clear the error recognition in the engine. • If this is the only active DTC, verify the engine ECM has the Adaptive Cruise Control parameter enabled.
1633	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Cruise Control Pause Switch data received in CCVS1 message (from engine ECM, body, cab or chassis controller)	• Verify operation of the Cruise Control Pause Switch and the ECU broadcasting this information on the J1939 network (engine ECM, body, cab or chassis controller) is functional. • Verify the correct radar part number is installed on the vehicle.
2919	9	Amber	OnGuard™ System Disabled	J1939 Electronic Brake Controller 5 (EBC5) message from ABS not received or intermittent	• Verify the ABS ECU is connected to the J1939 network and is functional. • Verify the correct OnGuard™ radar part number is installed on the vehicle. • Verify correct ABS part number is used. • Cycle ignition to clear DTCs after ABS servicing.
5023	9	Amber	OnGuard™ System Disabled	J1939 Adaptive Cruise Control 2 (ACC2) message from the OnGuard™ display (or instrument cluster) not received or intermittent	• Intermittent power or J1939 network connection to OnGuard™ display or instrument cluster. • Verify harness is correct. • Verify correct software version in OnGuard™ display or instrument cluster.
5606	9	Amber	OnGuard™ System Disabled	J1939 Cruise Control/Vehicle Speed 3 (CCVS3) message (usually from the engine) not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM has the Adaptive Cruise Control parameter enabled.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
5606	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Adaptive Cruise Control Readiness Status data received in CCVS3 message from engine. This code may indicate the engine has recognized a radar malfunction (e.g. blocked radar) and has disabled Cruise Control. This code may also indicate the engine is not configured for operation with an Adaptive Cruise Control system.	• Verify the fault is active at all times by cycling the key off for 2 to 3 minutes and powering it back up to see if the fault code is still active. • Verify there are no faults in any system on the vehicle and repair all other faults before diagnosing the OnGuard™ system. • Check for multiple active DTCs in the radar. • If there is more than one active code, repair all other codes, then cycle the ignition to clear the error recognition in the engine. • If this is the only active DTC, instruct the dealer to verify with the engine manufacturer that the engine parameters are set correctly. • Check any optional components that are connected to the J1939 network that may cause a message issue.
5681	9	Amber	OnGuard™ System Disabled	J1939 Advanced Emergency Braking System 2 (AEBS2) message from the OnGuard™ display (or instrument cluster) not received or intermittent	• Intermittent power or J1939 network connection to OnGuard™ display or instrument cluster. • Verify harness is correct. • Verify correct software version in OnGuard™ display or instrument cluster.
5681	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Driver activation demand for Advanced Emergency Braking System data received in AEBS2 message from OnGuard™ display (or instrument cluster)	• Intermittent power or J1939 network connection to OnGuard™ display (or instrument cluster). • Verify harness is correct. • Verify correct software version in OnGuard™ display (or instrument cluster).
5682	19	Amber	OnGuard™ System Disabled	Incorrect J1939 AEBS2 Message Counter data received in AEBS2 message from OnGuard™ display (or instrument cluster)	• Intermittent power or J1939 network connection to OnGuard™ display (or instrument cluster). • Verify harness is correct. • Verify correct software version in OnGuard™ display (or instrument cluster).
5683	19	Amber	OnGuard™ System Disabled	Incorrect J1939 AEBS2 Message Checksum data received in AEBS2 message from OnGuard™ display (or instrument cluster)	• Intermittent power or J1939 network connection to OnGuard™ display (or instrument cluster). • Verify harness is correct. • Verify correct software version in OnGuard™ display (or instrument cluster).

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
197120	31	Amber	OnGuard™ System Disabled	Bootloader error usually caused when there is an issue during a radar software update.	• Run the software update again. • Is usually seen in MeritorWABCO TOOLBOX™ Software PC Diagnostics with SPN 197120 FMI 31 on the display.
516096	9	Amber	OnGuard™ System Disabled	J1939 Cruise Control/Vehicle Speed 1 (CCVS1) message from second source (usually the body controller or chassis controller) not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Verify the body/chassis ECU is functional and has correct software and parameters. • Cycle the ignition to clear DTCs after servicing body/chassis ECU. • If SPN 516097 FMI 9 is also active in conjunction with this code, there may be an issue with the Central Gateway Module, review with the OEM.
516097	9	Amber	OnGuard™ System Disabled	J1939 Cruise Control/Vehicle Speed 1 (CCVS1) message from third source (usually the body controller or chassis controller) not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Verify the body/chassis ECU is functional and has correct software and parameters. • Cycle the ignition to clear DTCs after servicing body/chassis ECU. • If SPN 516096 FMI 9 is also active in conjunction with this code, there may be an issue with the Central Gateway Module, review with the OEM.
516108	9	Amber	OnGuard™ System Disabled	J1939 Retarder Configuration (RC) message from the engine retarder not received or intermittent	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing.
516108	19	Amber	OnGuard™ System Disabled	Incorrect J1939 Reference Retarder Torque data received in RC message from engine retarder	• Verify engine-retarder-ECU is functional and has correct parameters and software downloaded from database. • Verify the correct engine-retarder-ECU part number is installed on this vehicle. • Cycle the ignition to clear DTCs after retarder servicing.
516211	5	Amber	OnGuard™ System Disabled	CAN 1 Bus Off	• Check CAN wiring at other ECUs.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
516215	9	Amber	OnGuard™ System Disabled	J1939 network messages not received or intermittent	• Verify J1939 network backbone, stub connections to each ECU and terminating resistors are correct. • Verify engine, ABS and OnGuard™ display are operational and communicating on J1939 network.
516219	8	Amber	OnGuard™ System Disabled	Excessive automatic braking is used to maintain safe following interval while driving down hill	• Stored Fault: Driver must reduce speed and use a lower gear while driving down hill.
516497	12	Amber	OnGuard™ System Disabled	Extended plausibility check for signal	• Verify the correct OnGuard™ radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after engine servicing. • Verify the engine ECM has the Adaptive Cruise Control parameter enabled.
516499	12	Amber	OnGuard™ System Disabled	Malfunction in the Anti-Lock Braking System caused OnGuard™ to be temporarily disabled	• Use Meritor WABCO TOOLBOX™ PC Diagnostics to test the Anti-Lock Braking System. • Verify the correct radar part number is installed on the vehicle. • Verify the correct ABS ECU part number is used on the vehicle. • Cycle the ignition to clear DTCs after ABS servicing.
516500	12	Amber	OnGuard™ System Disabled	Malfunction in the Anti-Lock Braking System caused OnGuard™ to be temporarily disabled	• Verify the correct ABS ECU part number is used on the vehicle. • Use Meritor WABCO TOOLBOX™ Software PC Diagnostics to test the Anti-Lock Braking System. • Verify the correct radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after ABS servicing.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
516501	12	Amber	OnGuard™ System Disabled	Extended Plausibility check for Signal Brake System accepts AEBS XBR	• Verify the correct ABS ECU part number is used on the vehicle. • Use Meritor WABCO TOOLBOX™ Software PC Diagnostics to test the Anti-Lock Braking System. • Verify the correct radar part number is installed on the vehicle. • Cycle the ignition to clear DTCs after ABS servicing.
516503	13	Amber	OnGuard™ System Disabled	OnGuard™ radar sensor is not aligned	• Perform Service Alignment. • Cycle ignition and determine if issue is resolved.
516507	12	Amber	OnGuard™ System Disabled	Cruise Control States and Adaptive Cruise Control Mode are Mismatched	• Driver must cycle Brake Switch and Clutch Switch prior to activating Cruise Control.
516998	12	Amber	OnGuard™ System Disabled	Wabco Production Data could not be read from EEPROM during startup	• Cycle the ignition to clear DTCs.
517503	14	Amber	Blocked Radar. Remove Debris.	OnGuard™ Radar Sensor blocked by ice, mud or debris while driving. Reflected signal from other vehicles is too weak	• Park the vehicle in a safe location, set the Parking Brake and turn ignition OFF. • Inspect and clean the radar fascia. • The DTC will be cleared when ignition is switched ON. • Drive the vehicle in traffic about 5 minutes at speeds above 20 mph to confirm the blockage is cleared.
517504	14	Amber	OnGuard™ System Disabled	OnGuard™ Radar Sensor blocked. No stationary objects observed within 2 minutes while driving	• Park the vehicle in a safe location, set the Parking Brake and turn ignition OFF. • Inspect and clean the radar fascia. • Re-start the engine. DTC should clear as the vehicle begins driving above 15 mph. • If the Blocked Radar DTC causes a secondary engine DTC, an additional ignition OFF cycle may be required to clear the secondary DTC.
517505	13	Amber	OnGuard™ System Disabled	VDY velocity correction factor is Out of Range	• Check speed signal parameters in engine, braking system, and tachograph.
517525	13	Amber	OnGuard™ System Disabled	Unknown error during alignment. Software did not respond on time	• Perform Service Alignment.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
517527	13	Amber	Radar Alignment. Failed Left.	Alignment monitoring failed in azimuth - Radar sensor is looking too far to the right. This code may indicate the radar installation was damaged by impact (frame cross-member, bumper, radar bracket, etc.). This code may also indicate a Radar Service Alignment was not completed following axle alignment.	• Check for damage to radar sensor, bracket and fascia. • Perform Service Alignment.
517528	13	Amber	Radar Alignment. Failed Right.	Alignment monitoring failed in azimuth - Radar sensor is looking too far to the left. This code may indicate the radar installation was damaged by impact (frame cross-member, bumper, radar bracket, etc.). This code may also indicate a Radar Service Alignment was not completed following axle alignment.	• Check for damage to radar sensor, bracket and fascia. • Perform Service Alignment.
517529	13	Amber	Radar Alignment. Failed High.	Alignment monitoring failed in azimuth - Radar sensor is looking too low. This code may indicate the radar installation was damaged by impact (frame cross-member, bumper, radar bracket, etc.). This code may also indicate a Radar Service Alignment was not completed following axle alignment.	• Check for damage to radar sensor, bracket and fascia. • Perform Service Alignment.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
517530	13	Amber	Radar Alignment. Failed Low.	Alignment monitoring failed in azimuth - Radar sensor is looking too high. This code may indicate the radar installation was damaged by impact (frame cross-member, bumper, radar bracket, etc.). This code may also indicate a Radar Service Alignment was not completed following axle alignment.	• Check for damage to radar sensor, bracket and fascia. • Perform Service Alignment.
517558	4	Amber	OnGuard™ System Disabled	Electrical supply voltage too low	• Verify that the voltage at the radar sensor connector is greater than 6 VDC with a 1 amp load (e.g. tail light or marker light bulb). • Inspect the radar connector for corrosion. • Inspect each of the power connections between the ignition switch and the radar to determine where loss of power may be occurring.
517559	3	Amber	OnGuard™ System Disabled	Electrical supply voltage too high	• Monitor the battery voltage to determine if the battery is providing voltage between 10 and 16 VDC. • If the voltage is too high, troubleshoot the voltage regulator and alternator system. • Determine if a jump start or battery charging has occurred that could cause a vehicle overvoltage condition.
517648	12	Amber	OnGuard™ System Disabled	Shutdown by OSEK	• Cycle ignition power off for 2 to 3 minutes. • Verify fault does not return.
517652	7	Amber	OnGuard™ System Disabled	Motor azimuth: Blockage detected	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
517653	7	Amber	OnGuard™ System Disabled	Motor azimuth: Blockage detected	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.
517654	7	Amber	OnGuard™ System Disabled	Motor azimuth: crosscheck between light barrier and bemf speed	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.
517655	7	Amber	OnGuard™ System Disabled	Motor Azimuth: drum runs in a wrong direction	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.
517656	7	Amber	OnGuard™ System Disabled	Motor Azimuth: light barrier speed is out of range for more than 5 minutes	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.
517657	7	Amber	OnGuard™ System Disabled	Motor Azimuth: bemf speed is out of range for more than 5 minutes	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.
517658	7	Amber	OnGuard™ System Disabled	Motor elevation: plate is blocked or not available	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.

SPN	FMI	Display Color	System Reaction	Cause/Description	Action/Repair Instructions
517659	7	Amber	OnGuard™ System Disabled	Motor elevation: Fault while setting back the original plate position occurred	• Verify no visible/physical damage to radar. • Check power ground and load test at the radar harness connector. • Place the vehicle back in service and the code will become stored after driving above 10 mph for one minute.
517996	7	Amber	OnGuard™ System Disabled	Bootloader: invalid Bootloader and application interface	• Run the software update again. • Cycle ignition power off for 3 minutes and power on. • If fault persists after completing previous checks and repairs, this may indicate the radar has failed.

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Release all air from the air systems before you remove any components. Pressurized air can cause serious personal injury. Refer to the vehicle manufacturer's service manual for instructions.

Radar Inspection and Preventive Maintenance

Radar Inspection

NOTE: It is recommended to perform the radar inspection process every time normal preventive maintenance is performed on the vehicle.

1. Remove the fascia and inspect the bumper positioning. Check if the bumper is physically touching the radar sensor, fascia or mounting bracket at any point.
   - **If the bumper is touching the fascia:** Reposition the bumper so there is a minimum of 1/4-inch (6.35 mm) clearance between it and the fascia at all points.
2. Visually inspect the radar connector and housing for any damage. Inspect the edge of the fascia for any signs of wear or prior contact with the bumper. Also, inspect the routing of the radar sensor harness to ensure it is not pinched in the bumper or damaged at any point. The rubber boot on the radar harness connector must fully cover the connector.
3. Grab onto the radar sensor and gently wiggle it back and forth. You should not feel any slack or movement in the installation. The radar sensor should be securely mounted at all three positions.
4. If the radar passes all of these inspections, reinstall the fascia and verify correct vertical and horizontal alignment according to the Radar Sensor Service Alignment procedure in this section.

Radar System Troubleshooting

Refer to the Diagnostic Trouble Code Table for further information.

The following sections and sub-sections are the troubleshooting sections and sub-sections referenced in the last column of the Diagnostic Trouble Code Table.

Radar Sensor Connector Corrosion

Radar sensor connector corrosion has been found on vehicles where the radar sensor connector or protective rubber boot has been incorrectly installed following service. When the connector is not fully seated during installation or repair activities, water, corrosive road salts or other contaminants can enter the radar sensor

connector. When salt water interacts with electrical current, corrosion occurs quickly. When this occurs, severe corrosion can occur on the radar sensor and harness pins. If this corrosion is not detected early enough, a fault may be generated and the radar sensor and radar sensor harness may need to be replaced.

Corrosion in the connector may also occur if the radar sensor harness becomes damaged somewhere along the length of the harness. Water and corrosive road salts can wick down the harness and into the radar sensor connector. If damage to the harness is detected early enough, damage to the radar sensor connector can be avoided.

Use of rubber boot to protect the connector improves the corrosion performance of the connector. After the harness connector has been mated to the radar sensor connector, slide the boot over the harness connector body. This will ensure that water, salt, mud, ice, snow and other debris will not enter the connector during vehicle operation.

Radar Blocked

The radar sensor is protected by a fascia. The fascia and the radar sensor must not be blocked in any manner. The radar sensor can become blocked by snow, ice, dirt or other foreign matter. If this occurs, the radar sensor will have limited or no functionality. If a "Radar Blocked" error occurs, the screen in Figure 2.17 or Figure 2.18 will be presented on the OnGuard™ display:

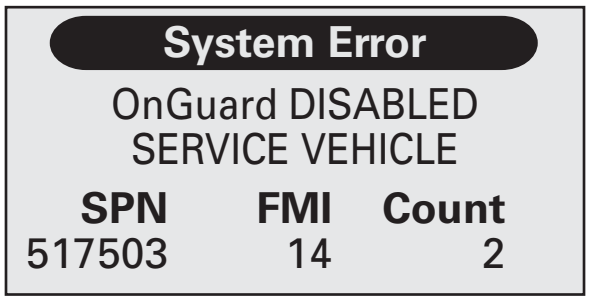


Figure 2.17

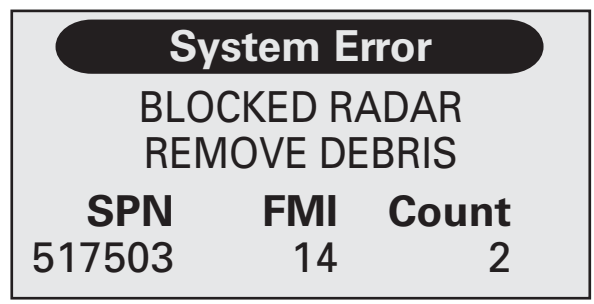


Figure 2.18

If this occurs, perform the following procedure:

1. Determine if the radar sensor is blocked by snow, ice, dirt or anything else.
2. Clean the surface of the fascia and between the fascia and the radar sensor. Remove any foreign debris that may form in this area. Removal of the fascia may be necessary to completely remove the radar sensor and the inside of the fascia. Do not remove the radar.
3. Verify the fascia is correctly installed.
4. Cycle the ignition OFF for one minute to clear the fault. The vehicle must be driven to determine if the fault has been corrected.

Radar Sensor Service Alignment

If the radar sensor needs to be replaced, the radar sensor mounting system has become damaged or has loosened, or new radar sensor software has been installed, a Radar Sensor Service Alignment will need to be performed.

If a Radar Sensor Service Alignment is required, the Radar Not Aligned Screen may be displayed as shown in Figure 2.19.

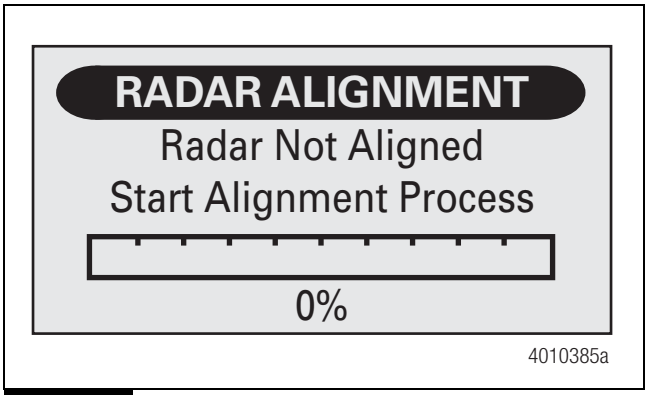


Figure 2.19

NOTE: While the OnGuard™ system is in Service Alignment mode, OnGuard™ will not track vehicles or operate until the Service Alignment procedure is completed. Due to this, the system will set a DTC SPN 5606 FMI 19. This can be cleared by cycling the key off for a few minutes.

1. Before starting the alignment procedure, visually verify that the radar sensor is not loose.

To correctly inspect the integrity of the radar mounting hardware, hold on to the radar and wiggle it back and forth. There should not be any physical or visual movement or slack in the radar or radar mounting bracket. Ensure there is at least 1/4-inch (6.35 mm) of clearance between the radar sensor and the bumper in all directions. Contact between the radar sensor and bumper can cause damage to the radar sensor.

2. Use TOOLBOX™ Software to send a diagnostic command to put the OnGuard™ system into the service alignment mode. While in this mode, the OnGuard™ display will show the progress of the alignment process as shown in Figure 2.20.

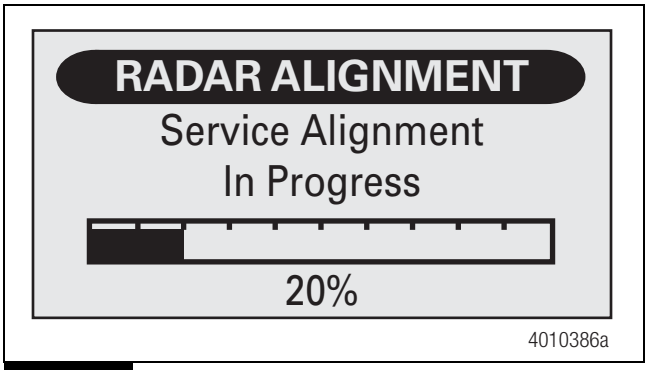


Figure 2.20

3. Drive the vehicle on a straight road above 30 mph (48 kph). The road should have telephone poles, signposts and other non-moving objects along the roadside. There must also be other traffic on the road, either on coming or lead vehicles at distances greater than 150 ft. Stopping the vehicle while traveling in traffic is acceptable but will increase the time needed to complete the alignment procedure.
4. Wait until the Radar Aligned screen in Figure 2.21 appears. This typically takes 10 to 30 minutes of driving time to complete.

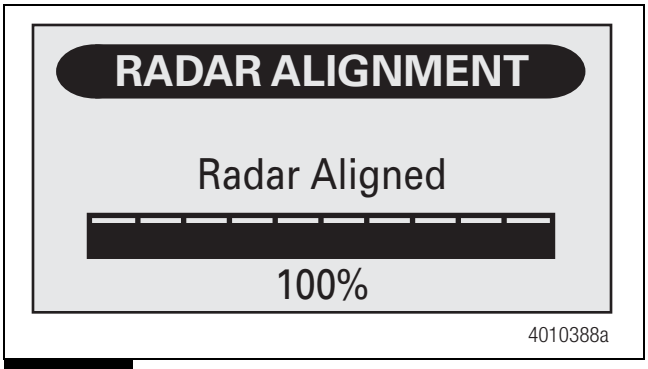


Figure 2.21

5. Once completed, the system will revert to one of the normal operating screens. This completes the Radar Sensor Service Alignment procedure. The OnGuard™ system should now be aligned. The key must now be cycled off for a few minutes to save the alignment.

   NOTE: If the radar alignment fails, a specific radar alignment error will appear that indicates the direction in which the sensor is incorrectly aimed. If this occurs, review the radar sensor installation, determine if the radar sensor needs to be repositioned (or in some way serviced) and then re-perform the Radar Sensor Service Alignment procedure. Contact OnTrac if the radar service alignment fault cannot be resolved.

   NOTE: As the vehicle continues to be driven following the Radar Sensor Service Alignment, the OnGuard™ system performs continuous adjustments to the radar sensor alignment. Further service alignments will generally not be required unless the radar sensor mounting assembly is disturbed, becomes loose or the radar sensor requires replacement.

If the OnGuard™ Radar Service Alignment will not initiate, perform the following procedure.

1. Turn off the ignition for 90 seconds.
2. Start the vehicle and drive above 10 mph.
3. Pull to the side of the road and come to a complete stop d and leave the key on.
4. With the TOOLBOX™ Software connected, initiate the service alignment to complete the alignment process.

Electrical System and Harnesses Troubleshooting

Refer to the Diagnostic Trouble Code Table for further information.

The following sections and sub-sections are the troubleshooting sections and sub-sections referenced in the last column of Diagnostic Trouble Code Table.

The following procedures require a multi-meter. Note that during pin probing, damage to connector pins can result if the probe exceeds the recommended maximum diameter. For the radar sensor, the maximum diameter is 0.015-inch (1/64-inch). For the OnGuard™ Display connector, the maximum diameter is 0.015-inch (1/64-inch).

Harness Routing and Associated Wire Fatigue or Abrasion

Wire fatigue will occur at any harness location where sufficient harness motion allows bending of the wiring. When this occurs, individual harness wires become weakened and can break. The harness can have intermittent or permanent open circuit failures causing the OnGuard™ Collision Mitigation System to malfunction.

Harness abrasion will occur at any harness location where sufficient harness motion allows rubbing of the harness against adjacent vehicle components. When this occurs, the outer harness jacket and the individual wire insulation can wear, causing short circuits between each of the exposed wires or to the vehicle chassis causing the OnGuard™ Collision Mitigation System to malfunction. The harness is especially susceptible to wear when the harness rubs against a sharp edge.

Both wire fatigue and harness abrasion can be prevented by correctly attaching the harness to the chassis at closely spaced intervals while avoiding contact with sharp edges. The harness should be secured with tie wraps every two feet or less in areas where damage may occur. Tie wraps should be tightened with a tie wrap gun set to the appropriate setting to correctly secure the harness without allowing a loose mounting but also not causing the harness to be over-tightened. Over-tightening the tie wrap to the harness can crush the harness jacket and conductors causing harness damage and system failures.

Radar Harness Electrical Checks

The radar harness is connected to the radar sensor using an eight-pin connector. Figure 2.22.

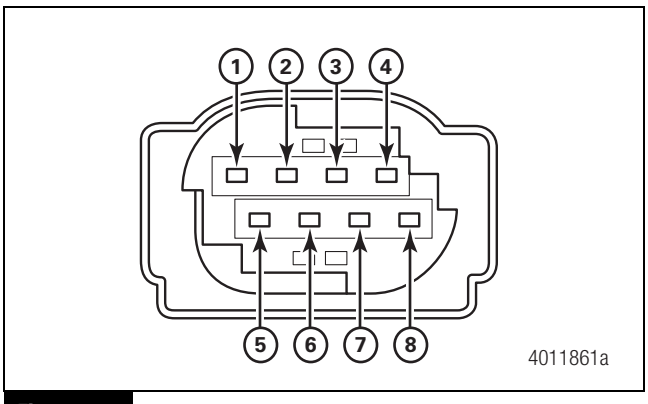


Figure 2.22

Table C: Radar Harness Connector Pinouts

Pin	Circuit
1	+12V (or ignition)
2	Ignition
3	J1939 High
4	No Connection
5	No Connection
6	J1939 Low
7	No Connection
8	Ground

The radar harness connector consists of harness connector housing part number AMP MQS 1-1534299-1, socket pin part number AMP 965707-1, WABCO socket AMP 962885 (0.2-0.5mm^2) or AMP 965906 (0.75mm^2).

The following radar sensor harness check should be performed when various DTCs occur. Refer to the Troubleshooting Guide and the Diagnostic Trouble Code Table for further information.

Disconnect the radar harness connector and perform the following procedures.

1. Key On/Engine Off — Check Pin 1 (power) to Pin 8 (ground) for 12 volts.
   - If the power shows 12 volts, go to step 2.
   - If the power is less than 12 volts, trace and inspect the harness for severe abrasion or kinks that might crush or cut wires and check all connections for corrosion or connector damage. If any damage is found, replace as necessary.
2. Repeat this procedure for Pin 2 (Ignition) to Pin 8 (ground).
3. Key Off/Engine Off — Check Pin 8 (ground) to chassis for resistance of less than 1 ohm.
   - If the resistance is less than 1 ohm, go to step 4.
   - If the resistance is higher than 1 ohm, trace and inspect the harness for severe abrasion or kinks that might crush or cut wires and check all connections for corrosion or connector damage. Over-tightened tie wraps may cause this type of damage. If any damage or corrosion is found, repair and replace as necessary. Clean connector corrosion using electrical contact cleaner.
4. Key On/Engine Off — Perform a load test across Pins 1 and 8.
   - If good, go to step 5.

- If bad, trace and inspect the harness for severe abrasion or kinks that might crush or cut wires and check all connections for corrosion or connector damage. Over-tightened tie wraps may cause this type of damage. If any damage or corrosion is found, repair and replace as necessary. Clean connector corrosion using electrical contact cleaner.

5. Repeat Step 4 across Pins 2 and 8.
   - If good, go to step 6.
6. Key Off/Engine Off — Check across Pins 3 and 6 (SAE J1939) for resistance of 60 ohms.
   - If the resistance is 120 ohms, check the two termination resistors. Each should measure 110-130 ohms across the resistor pins. If each individual resistor does not measure 110-130 ohms, replace the bad termination resistor.
   - Check harness SAE J1939 circuits for open or shorts. If the resistance between Pins 3 and 6 is greater than 130 ohms, both SAE J1939 circuits are open or both termination resistors are missing. Repair and replace as necessary.
   - If the resistance between Pins 3 and 6 is equal to 120 ohms, one of the SAE J1939 circuits is open or one of the termination resistors is missing. Repair and replace as necessary.
   - If the resistance between Pins 3 and 6 is less than 60 ohms, more than two termination resistors are installed, the SAE J1939 harness is shorted or one or more ECUs on the SAE J1939 network are damaged. Remove each ECU connected to the bus one by one until the bus resistance returns to 60 ohms. Repair and replace as necessary.

     NOTE: Make sure to check the firewall pass-thru connections for loose or broken connections.
7. Key On/Engine Off — Check voltage to ground on Pins 3 and 6.
   - The voltage readings on pins 3 and 6 will fluctuate but should always be within a certain range and should never be the same.

     Pin 3 should be 2.5 volts to 5 volts.

     Pin 6 should be 2.49 volts or less.

     The total voltage between pins 3 and 6 should be approximately 5 volts.
   - If the voltages are out of range, review J1939 diagnostics with the vehicle OEM.
8. If no problems are found with the harness, 12V is present at the radar harness connector and the SAE J1939 bus resistance is 60 ohms, replace the radar sensor per the Radar Sensor Replacement procedure in Section 3.
9. Pins 4, 5 and 7 are not used.

Display Harness Electrical Checks

The display harness is connected to the OnGuard™ Display mounted in the dashboard. The following display harness checks should be followed when various DTCs occur. Refer to Troubleshooting Guide for further information.

Remove the dash to access the back of the OnGuard™ Display and harness connector. Figure 2.23.

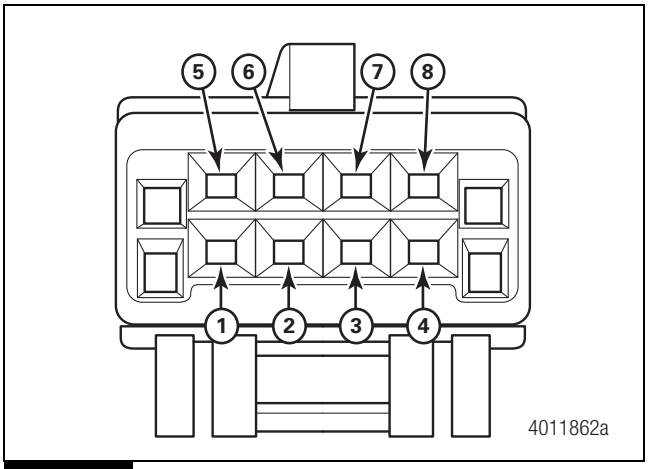


Figure 2.23

Disconnect the OnGuard™ Display harness connector and perform the following electrical checks.

Table D: Radar Harness Connector Pins

Pin	Circuit
1	No Connection
2	No Connection
3	No Connection
4	Ignition
5	Ground
6	J1939 Low
7	J1939 High
8	No Connection

1. Key On/Engine Off — Check Pin 4 (power) to Pin 5 (ground) for 12 volts.
   - If power shows 12 volts, go to step 2.
   - If power shows less than 12 volts, trace and inspect the harness for severe abrasion or kinks that might crush or cut wires and check all connections for corrosion or connector damage. If damage is found, repair and replace as necessary.
2. Key Off/Engine Off — Check Pin 5 (ground) to chassis for resistance of less than 1 ohm.
   - If the resistance is less than 1 ohm, go to step 3.
   - If the resistance is higher than 1 ohm, trace and inspect the harness for severe abrasion or kinks that might crush or cut wires and check all connections for corrosion or connector damage. If damage is found, repair and replace as necessary.
3. Key On/Engine Off — Perform a load test across Pins 4 and 5.
   - If good, go to step 4.
   - If bad, trace and inspect the harness for severe abrasion or kinks that might crush or cut wires and check all connections for corrosion or connector damage. If damage is found, repair and replace as necessary.
4. Key Off/Engine Off — Check across Pins 7 and 6 (SAE J1939) for resistance of 60 ohms.
   - If the resistance is 120 ohms, check the two termination resistors. Each should measure 110-130 ohms across the resistor pins. If each individual resistor does not measure 110-130 ohms, replace the bad termination resistor.
   - Check harness SAE J1939 circuits for open or shorts. If the resistance between Pins 7 and 6 is greater than 130 ohms, both SAE J1939 circuits are open or both termination resistors are missing. Repair and replace as necessary.
   - If the resistance between Pins 7 and 6 is equal to 120 ohms, one of the SAE J1939 circuits is open or one of the termination resistors is missing. Repair and replace as necessary.
   - If the resistance between Pins 7 and 6 is less than 60 ohms, more than two termination resistors are installed, the SAE J1939 harness is shorted or one or more ECUs on the SAE J1939 network are damaged. Remove each ECU connected to the bus one by one until the bus resistance returns to 60 ohms. Repair and replace as necessary.

   NOTE: Make sure to check the firewall pass-thru connections for loose or broken connections.
5. Key On/Engine Off – Check voltage to ground on Pins 7 and 6
   - The voltage readings on pins 7 and 6 will fluctuate, but should always be within a certain range and should never be the same.

     Pin 7 should be 2.5 volts to 5 volts.

     Pin 6 should be 2.49 volts or less.

     The total voltage between pins 7 and 6 should be approximately 5 volts.
   - If the voltages are out of range, review J1939 diagnostics with the vehicle OEM.
6. If no problems are found in the harness, 12V is present at the display connector, the SAE J1939 network resistance is 60 ohms and the connector is correctly installed, replace the display per the display replacement procedure in Section 3.
7. Pins 1, 2, 3 and 8 are not used.

System Voltage DTC

Occasionally the vehicle battery, voltage regulator or alternator can cause the OnGuard™ Collision Mitigation System to generate high or low voltage DTCs. Refer to the Key ON section of the Radar Harness Electrical Check in this section to determine if correct power is supplied to the system. If a radar undervoltage or overvoltage DTC is present, troubleshoot the vehicle alternator, battery and voltage regulator as required.

SAE J1939 Network

SAE J1939 network communication errors can occur if all components interacting with the OnGuard™ Collision Mitigation System are not correctly connected to the network, are transmitting at a different rate than expected or the termination resistors are missing or not correctly positioned at the ends of the SAE J1939 network. Perform the Radar Harness Electrical Check in this section if a radar SAE J1939 network DTC is present.

Display Message Timeout Error

Occasionally, the OnGuard™ Collision Mitigation System will generate Display Message Timeout DTCs because the OnGuard™ Display has stopped sending messages to the radar sensor at a 250 ms rate. This can be caused by an intermittent OnGuard™ Display power or intermittent SAE J1939 data link connection. Perform the Display Harness Electrical Checks in this section if a Display Message Timeout DTC is present.

Display Message Data Error

If the Display Message DTC occurs, replace the display per the Display Replacement procedure in Section 3.

Component Message Fault Troubleshooting

Refer to the Diagnostic Trouble Code Table for further information.

The following sections and sub-sections are the troubleshooting sections and sub-sections referenced in the last column of the Diagnostic Trouble Code Table.

Message Timeout

Occasionally the OnGuard™ Collision Mitigation System will generate Message Timeout DTCs due to data not being received from the ECUs connected on the SAE J1939 network. This can occur if the cruise control, engine, transmission, ABS, engine retarder or driveline retarder ECUs have been re-flashed with new software that is incorrect, was not downloaded correctly or has the incorrect parameter set. This information may reside in the vehicle OEM ECU database. It is also possible that various ECUs are not operating correctly on the SAE J1939 network or DTCs have occurred during diagnostic procedures. Perform the following procedure if a Message Timeout DTC is present:

NOTE: Certain diagnostic software programs, other than TOOLBOX™ Software, can generate Timeout DTCs. Verify code is Active on the display without any diagnostic software connected to the vehicle.

1. Determine if the software or parameter set from the appropriate ECU has recently been modified. Install the correct software and parameter set if required.
2. Verify that the SAE J1939 network is functioning correctly. Use the Radar Harness Electrical Checks procedure to repair any SAE J1939 network issues.
3. After any ECU servicing has been completed, cycle the ignition OFF for one minute and then back ON for one minute with the engine idling to clear the OnGuard™ DTC. Verify that the DTC has been cleared.

Message Data Error

Occasionally the OnGuard™ Collision Mitigation System will generate Message Data Error DTCs from ECUs connected on the SAE J1939 network. This can occur if an ECU has been re-flashed with new software that is incorrect, was not downloaded correctly or has the wrong parameter set. This information resides in the OEM ECU database. It is also possible that the problem ECU was replaced with the wrong ECU. Perform the following procedure if a Message Data Error DTC is present:

1. Determine if the appropriate ECU has been recently replaced. Verify that the correct ECU part number has been installed. Install the correct ECU if required.
2. Determine if the ECU software or parameter set have recently been modified. Install the correct software and parameter set if required.
3. Use the OnGuard™ display to determine if the various functions (i.e., set, resume, accel, coast, etc.) are functioning correctly. Consult the OnGuard™ display operating instructions for more information.
4. After ECU servicing has been completed, cycle the ignition OFF for one minute and then back ON for one minute with the engine idling to clear the OnGuard™ DTC. Verify that the DTC has been cleared.

Cruise Control System Troubleshooting

Refer to the Diagnostic Trouble Code Table for further information.

The following sections and sub-sections are the troubleshooting sections and sub-sections referenced in the last column of the Diagnostic Trouble Code Table.

The Engine Ignores ACC Control DTC may be generated due to other vehicle system DTCs or issues. Check for multiple OnGuard™ DTCs using the TOOLBOX™ Software. If multiple DTCs are present, the DTC is most likely a secondary DTC. Take corrective action for the primary DTC first and cycle the ignition. Document all DTCs present. If the other DTCs are corrected and the Engine Ignores ACC DTC is still present, then the Engine Ignores ACC Control DTC becomes the primary DTC. There is a communication issue with the other vehicle systems. Verify the Engine and Gateway ECU software is up-to-date and cycle the ignition.

Programming DTCs

1. Verify with the OEM or engine manufacturer that the correct engine parameters are programmed to accept TSC1 messages from the Adaptive Cruise Control (ACC).

2. Reprogram the engine parameters if not correct. Refer to the vehicle manufacturer's service manual for further instruction.
3. Check for multiple DTCs using the OnGuard™ Display. If there are multiple DTCs, this is a secondary DTC caused by other DTCs.
4. Correct the other DTCs and cycle ignition to clear this DTC. If it is a single DTC, update the Engine and Vehicle Gateway software.

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Release all air from the air systems before you remove any components. Pressurized air can cause serious personal injury. Refer to the vehicle manufacturer's service manual for instructions.

Radar Sensor

⚠ WARNING

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

Radar Sensor Replacement

1. Turn the ignition switch to the OFF position.
2. Place blocks under the rear tires to prevent the vehicle from moving. Apply the parking brake.
3. Remove the three fascia mounting bolts and remove the fascia from the radar sensor. Figure 3.1.

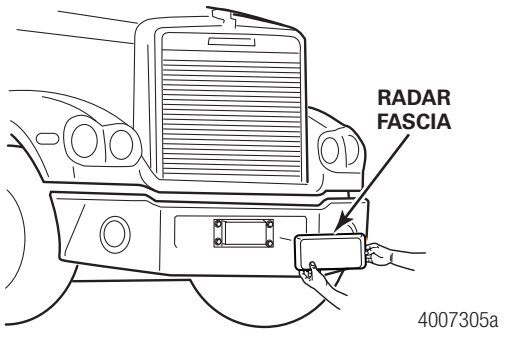


Figure 3.1

4. Pull back the rubber boot from the radar connector. Disconnect the radar sensor connector by depressing the lock tabs on both sides of the radar connector.
5. Remove the radar sensor from the radar sensor bracket by removing the three M6 nuts on the rear of the radar sensor bracket.
6. Verify that the mounting bracket bolts are securely tightened and the mounting bracket is in good condition. If the bracket is loose, repair or replace as necessary.

   NOTE: Care should be taken to verify the correct part number radar is being installed on the vehicle as all CMS radars look alike.

7. Mount the replacement radar sensor to the bracket. Tighten the mounting nuts to 61-75 in-lb (6.9-8.4 N•m). No motion should occur between the bracket and the radar sensor after the sensor has been correctly installed on the mounting bracket. ❶
8. Verify that there is at least 1/4-inch gap, between the radar sensor and the bumper. If there is not a 1/4-inch gap, contact the manufacturer for assistance in adjusting the bumper. **This gap is critical to the correct operation of the OnGuard™ Collision Mitigation System.**
9. Reconnect the sensor connector by pushing on the connector until it snaps into the radar sensor. Slide the rubber boot over the connector until the connector is completely covered by the boot. If required, snap the cable clip into the hole at the corner of the bracket and make sure the harness does not rub against any sharp edges.
10. Replace the fascia using the M6 x14 mm flange head bolts (bolt class ISO 8.8) or M6 bolt with 12 mm washer that was removed or recommended hardware per OEM requirements. Dry tighten the bolts to 91 in-lb (10.3 N•m). Figure 3.1. ❶
11. Perform the Radar Sensor Service Alignment procedure in Section 2.

Display Replacement

1. Follow the vehicle manufacturer's recommendation for removal of the instrument panel.
2. Make sure the ignition is in the OFF position. Disconnect the wiring connector from the OnGuard™ Display.
3. Remove the OnGuard™ Display. Save the 6-32 nuts for installation of the new display.
4. Reinstall the new OnGuard™ Display.
5. Connect the wiring connector to the new OnGuard™ Display.

OnGuard™ System Information

What is OnGuard™?

OnGuard™ is a radar-based active safety system that offers Forward Collision Warning, Collision Mitigation and Adaptive Cruise Control (ACC). OnGuard™ detects objects ahead and measures the vehicle's position in relation to others on the road to assist the driver in recognizing and responding to potentially dangerous driving scenarios that could lead to a rear-end collision. The system responds by sending audible, visual and haptic warnings, automatically reducing engine torque and applying the foundation brakes when necessary to help avoid or mitigate an impending collision. OnGuard™ is always monitoring the road and provides warnings and active braking even when cruise control is not set. The system also warns on stationary objects, such as disabled cars, to alert drivers of potential obstructions in their lane.

OnGuard™'s Adaptive Cruise Control (ACC) automatically adjusts the vehicle's set cruising speed to maintain a safe following distance whenever a vehicle ahead is detected.

OnGuard™ should only be considered as an aid and is not intended to replace driver control over the vehicle at any time. The active braking application is intended to assist the driver to avoid or reduce the severity of a collision. The driver remains in control of the vehicle and ultimately determines the actions that are necessary for safe operation. OnGuard™ warnings will not be issued below a vehicle speed of 15 mph.

How does OnGuard™ work?

OnGuard™ uses a forward-looking dual-beam radar sensor to detect objects in the vehicle's path at distances up to 650 feet away. The dual beam radar uses far-range and near-range detection to expand the total width of radar coverage.

What is ACC? How can I enable/disable it?

The ACC maintains a safe following interval of 3.6 seconds between the vehicle and the vehicle ahead. When there is no moving vehicle detected ahead, the set cruise speed resumes automatically.

To enable ACC, simply press the "ON" and "Set" button for cruise control in the vehicle, the same as using conventional cruise control. The driver can disengage the ACC at anytime by applying the brakes, applying the clutch (if the vehicle has one), or pressing the cruise control "OFF" button.

What is Haptic Warning?

The OnGuard™ system utilizes three alerting methods to warn drivers of a collision danger; audible, visual and haptic. The audible warning will beep while the visual warning changes the color and screen image of the OnGuard™ display. The haptic warning is a quick pulse of braking felt when a collision danger is present, depending on the speed and distance of vehicles ahead. These warnings will occur when an unforeseen event occurs, such as another vehicle entering the lane and travelling slower than you are, or when the gap between the vehicles becomes too small. For a detailed explanation of OnGuard™'s alerts, please refer to the driver tips document available on Meritor WABCO's website.

What is Active Braking?

Active braking is a system-initiated brake application that can be triggered by OnGuard™ without the driver's input. If OnGuard™ determines that a rear-end collision is imminent and a safe evasive maneuver is no longer possible, it will automatically apply foundation brakes to help mitigate or prevent a collision. Active braking can also be triggered by ACC to maintain a safe following distance or by the stability control systems to maintain control of they vehicle during hazardous weather conditions or to reduce rollover risks.

What is the difference between a stopped object and a stationary object? How does OnGuard™ respond differently?

A stationary object is an object that was never detected as moving. When the object comes into the radar range and does not move (such as a disabled car), the radar classifies it as "stationary" and will provide only visible and audible warnings, but will not activate the brakes. A stopped object is an object that was detected moving and came to a stop.

When the radar detects the object as moving and decelerates to a complete stop, the radar will classify the object as "stopped" and will provide visible and audible warnings as well as activate the CMS braking sequence if necessary to mitigate rear-end collision.

What objects does OnGuard™ warn on or actively brake on?

OnGuard™ warns and reacts to objects such as cars, trucks or buses that are moving in the same direction as the vehicle on the road. In addition, OnGuard™ provides only visual and audible warnings on stationary objects (such as disabled cars) that are in the path of the vehicle to alert the driver of potential obstruction. The system will not apply the brakes on stationary objects. OnGuard™ will not warn or react to oncoming traffic or traffic crossing the vehicle's driving lane.

Is OnGuard™ active while at very low speeds? Will the system react to stop and go traffic?

OnGuard™ will not react to objects when the vehicle is travelling at speeds below 15 mph to prevent slow-speed activation in heavy traffic, truck stops and rest areas.

Do the brake lights come on when OnGuard™ activates the brakes?

Yes, the vehicle brake lights will come on when OnGuard™ applies the brakes.

What are Meritor WABCO's Roll Stability Control (RSC) and Electronic Stability Control (ESC) systems? Why is either one required for OnGuard™ to be installed?

RSC and ESC are active vehicle safety systems that assist drivers in maintaining control of the vehicle. RSC monitors conditions that can lead to a rollover, and it automatically intervenes if a high rollover risk is detected by reducing engine torque, engaging the engine retarder and if necessary, applying drive axle and trailer brakes. ESC combines RSC with the added capability of directional or rotational control to reduce the potential of jack-knifing and drift out conditions. OnGuard™ utilizes the stability control systems on the vehicle to ensure the vehicle's stability during active braking in all weather conditions.

How much braking power does OnGuard™ apply? Will the system override the ABS and lock up the brakes?

OnGuard™ applies the brakes during ACC to maintain a safe following distance and during collision mitigation when a rear-end collision is deemed unavoidable. Depending on the speed of the vehicle and the vehicle ahead, OnGuard™ will calculate the braking required and will apply up to 50% of a vehicle's braking power to help in avoiding or mitigating a collision.

The system utilizes the vehicle's ABS and stability system to prevent wheel lock-up and maintain control.

How does the system adjust for severe and slippery weather conditions that could cause sliding or jackknifing?

OnGuard™ works with the Anti-Lock Braking System (ABS) and stability control systems on the vehicle and therefore the braking initiated by the system is not likely to cause the vehicle to slide or jack-knife.

Sometimes when cruise control is set, the vehicle slows down on its own while going around a curve even though there is no vehicle ahead, why?

Vehicles equipped with OnGuard™ are also equipped with a sophisticated stability control system, either SmartTrac Electronic Stability Control System (ESC) or SmartTrac Roll Stability Control System (RSC). These systems monitor the vehicle's speed and weight to determine the threshold of a potential loss of control. When the stability control system determines the vehicle is going around a curve at a speed that can cause a potential loss of control, it will reduce engine torque, apply engine brakes and, if necessary, apply the service brakes of the vehicle. This type of intervention can happen whether cruise control is set or not.

OnGuard™ sometimes gives audible warnings even though there is nothing in the lane, why?

OnGuard™ relies on a radar device mounted to the front of the your vehicle. If the radar is not mounted correctly, has come loose or the alignment of the device is not adjusted properly, the unit could detect objects that may not be in the vehicle's intended path. Check the OnGuard™ device during pre- and post-trip inspection for proper mounting, or broken or loose mounting brackets. Any issues should be reported to the fleet manager.

What happens if the driver receives an OnGuard™ System Error Notification? Can the vehicle still be driven?

If the driver receives an OnGuard™ System Error Notification, the display will turn amber and a Diagnostic Trouble Code (DTC) will appear. While the vehicle will still be operable, certain OnGuard™ functions such as standard cruise control and CMS will not be available. It is recommended that the driver find a safe place to park and turn off the ignition for one to three minutes. This will reboot the systems and should correct most errors. If the condition persists, contact the fleet manager to review the issue. Any DTC information should be recorded for troubleshooting purposes.

Meritor WABCO Vehicle Control Systems
2135 West Maple Road
Troy, MI 48084-7121
866-OnTrac1 (668-7221)
meritorwabco.com

Printed in USA

Revised 11-15
Maintenance Manual MM-1306 (16579)

MERITOR WABCO