Adaptive Cruise with Braking, Design and Function

M-366-001

(August 2009)

Valid for

All CHU,CXU,GU and TD built with collision avoidance system.

Case description

Adaptive Cruise with Braking, Design and Function, August 2009

Danger

Be sure to read, understand and follow all these instructions carefully. Improper use or service practices with the Mack Adaptive Cruise with Braking (ACB) system can result in a collision causing property damage, serious injuries or death.

Note: Does not apply to Mack Trucks Australia

Important Safety Information

The ultimate responsibility for the safe operation of the vehicle remains with the driver. Even with the Mack Adaptive Cruise with Braking (ACB), the driver must remain alert, react appropriately and in a timely manner, and use good driving practices.

The ACB system should be used only in the same conditions that are recommended for ordinary cruise control use. ACB should never be used on roads that cannot be driven safely at a steady speed, including city roads, winding roads or when road conditions are poor, such as on gravel, dirt, ice or wet surfaces (wet surfaces may increase the risk of hydroplaning), or in fog, heavy rain or snowy conditions. Always switch off ACB on steep downhill grades; when entering turning lanes, entering or exiting highways, driving through construction zones or similar situations. There are certain situations when ACB should not be used: Inclement weather; dense traffic; sharp curves and winding roads; steep downhill grades; situations where smaller vehicles — such as motorcycles are present in your lane; construction zones, and off-road use. Different vehicle manufacturers may use varying alerts, messages and dash arrangements from the examples shown here. Consult the Vehicle Operator’s Manual for applicable details regarding use and operation of the adaptive cruise control system.

Overview

Mack Adaptive Cruise with Braking (ACB) is integrated with the vehicle’s normal cruise control. Once the driver turns “on” and “sets” normal cruise control, ACB is automatically engaged.

Description

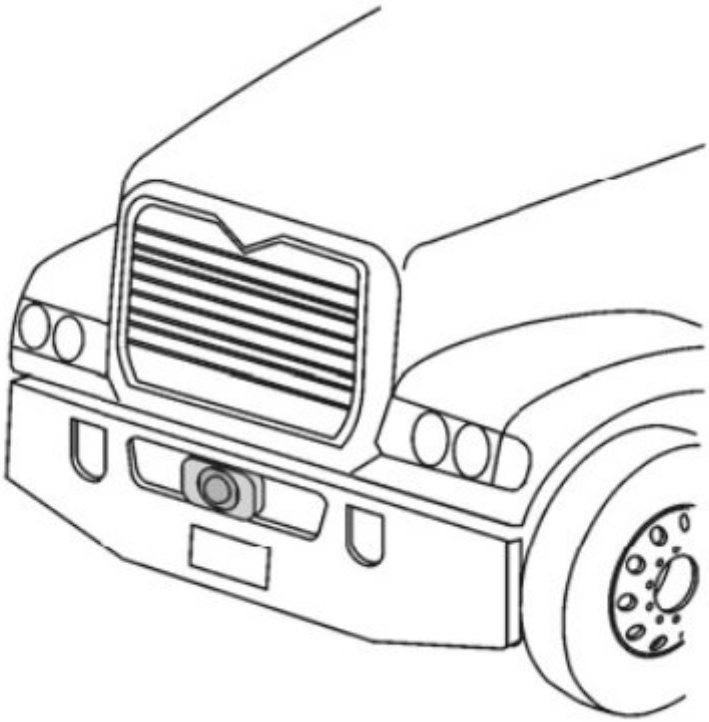
Mack Adaptive Cruise with Braking (ACB) is an additional integrated feature of cruise control. When using cruise control, the vehicle will now not only maintain the “set” speed, but the system will also intervene, as needed, to help maintain a set following distance behind the vehicle in front of you. Using a radar sensor (with a range of approximately 152 m (500 ft.)) mounted to the front of your vehicle, the ACB system reacts to moving vehicles ahead of you. As a brief introduction, once cruise control is engaged and you are maintaining a set following distance between you and the vehicle in front: If the vehicle in front of you slows down below your cruise control’s set speed, the system will intervene and, as necessary, in this order:

1. de-throttle the engine,
2. apply the engine retarder and.
3. apply the foundation brakes,

In an attempt to maintain the set following distance behind the vehicle ahead. Note: If during the intervention, it is necessary to apply the foundation brakes, the vehicle will not automatically resume to the set speed. If the vehicle ahead slows below your cruise control's set speed, but then accelerates away, and the Mack Adaptive Cruise with Braking (ACB) system did not need to use the foundation brakes as it managed the intervention, your vehicle will automatically accelerate back to the original cruise control set speed, and again maintain a set following distance behind any vehicles that are ahead of you.

Other system features include a two-stage audible and visual warning system, part of which is always on, whether or not cruise control is on. Since ACB operates along with normal cruise control, all the typical features built into cruise control work as usual. For example, limits imposed by factory-set road speed governors, etc. are fully supported by ACB.

System Components



The radar unit that provides Mack Adaptive Cruise with Braking (ACB) with its ability to locate and track moving vehicles, is located at the front of the vehicle — mounted into the bumper. When located behind the bumper, in some cases the unit may be behind a protective covering that allows the radar signal to pass through. The ACB radar sensor is pre-aligned at the factory and no adjustment should be needed. If the sensor becomes misaligned, (or any other system problem is detected) a message, or light on the dash lets the driver know that service is needed. The ACB system is fully integrated into the vehicle dashboard so that a separate display is not required. All visual, text and audible indications and warnings come directly from the vehicle's instrument cluster. The volume level of the alerts is not adjustable, nor can they be switched off.

Automatic Foundation Brake Application

The vehicle automatically manages foundation braking priorities among the various vehicle systems that use the foundation brakes, such as Mack Adaptive Cruise with Braking, Bendix® ESP® (Electronic Stability Program), Bendix® ATC (Automatic Traction Control) and the Bendix® ABS (Anti-lock Braking System).

After an ACB event where the foundation brakes are applied, normal cruise will automatically be cancelled. The driver must activate "resume" or "set" in order for the vehicle to throttle up. The trademarks used in this document, including Bendix®, are United States trademarks owned by or licensed to Bendix Commercial Vehicle Systems LLC.

Bendix ESP Stability System

All vehicles equipped with Adaptive Cruise with Braking are also equipped with the Bendix® ESP® Stability System. The Bendix® ESP® system is a constantly on, full-stability system which monitors vehicle performance and, when necessary, automatically intervenes to reduce the throttle and/or applies the foundation brakes to help the driver maintain vehicle stability during potential loss-of-control and/or rollover events.

ACB uses the Bendix® ESP® stability system to help maintain vehicle stability during automatic brake applications on slick surfaces. NOTE: The Bendix® ESP® stability system is always operational when the vehicle is running; the active interventions and select warnings of the ACB are only operational when the cruise control is engaged.

Additional information, and complete troubleshooting procedures for the Bendix® ESP® stability system, can be found in Service Data Sheet SD-13-4869.

Operating Mack Adaptive Cruise with Braking (ACB)

For operator information about the use of the ACB system, refer to the ACB Operator's Handbook.

Operating results of Mack Adaptive Cruise with Braking (ACB)

The following chart illustrates what to expect from ACB in various driving situations you may encounter. Both the system indication and action to expect from the system are illustrated below.

Note: These represent examples of typical situations and responses that may occur when using ACB. Not all possible situations and responses are covered in this table.

Situation	**System Alert**	**System Reaction**
With cruise set and a vehicle is present (in range) ahead of you.	The cruise control "on" indicator is illuminated and the green "Target Detected Icon" will be illuminated.	ACB will maintain the set speed and following distance.
With cruise set, the vehicle ahead slows moderately.	The system will alert the driver with the Following Distance Alert (FDA): either a slow or moderately beeping sound.	The vehicle will be slowed by (in order): 1 reducing throttle, 2 engaging the engine retarder, or 3 applying the foundation brakes. **Note:** If the foundation brakes are applied, ACB cancels after the event; driver needs to "resume" to reengage cruise.
With cruise set, the vehicle ahead slows rapidly.	The Following Distance Alert (fast beeping) is given, followed by the Impact Alert (continuous modulating tone), and a text message appears on the dash screen. Also, the Target Detected Icon turns red.	The vehicle will be; • de-throttled, • the engine retarder engaged and, • the foundation brakes applied. ACB cancels after the event; driver needs to "resume" to reengage cruise and ACB.
Cruise not on, or not set, the vehicle ahead slows rapidly.	The Following Distance Alert is given: fast beeping sound.	None. **The driver should use safe driving practices to avoid a vehicle collision.**
With cruise set, but no vehicle ahead detected (vehicles ahead are further away than 152 m [500 ft]).	None.	Vehicle maintains "set" speed.
With the cruise set, if a vehicle cuts in front of the truck and speeds away.	• If the vehicle cuts in front of truck at a distance of 6 m [20 ft] or less, a fast beeping warning is given until	Vehicle maintains "set" speed.

	the vehicle ahead is beyond the 6 m [20 ft] range. • If the vehicle cuts in front further than 6 m [20 ft] away, no warning is given.	
With cruise set, a vehicle cuts in front of the truck within range of the sensor and slows down.	The system alerts using the Following Distance Alert (fast beeping) & dash warnings. Depending on how rapidly the vehicle ahead slows, the system may initiate an Impact Alert.	ACB reduces the throttle and retards the engine; the foundation brakes may also be engaged.
With cruise set, the vehicle goes down a steep grade.	If the brakes remain applied for an extended duration "Brake overuse" warning will appear on the dash display.	De throttling, followed by engine retarder, followed by braking. If the brakes remain on for an extended duration, dash warns driver, ACB may be disabled (see “Mack Road Stability Advantage by Bendix with Adaptive Cruise Control Brake Overuse Warning” page 8).
With cruise set, a faster vehicle passes on left or right.	None.	None. **The driver should use safe driving practices to avoid a vehicle collision.**
A broken-down vehicle is stationary in the lane in which the truck is travelling.	No warning is given.	No system action is taken: ACB only reacts to moving objects. **The driver should use safe driving practices to avoid a vehicle collision.**
An animal runs in front of your truck.	No warning is given.	No system action is taken: ACB only reacts to moving objects. **The driver should use safe driving practices to avoid a vehicle collision.**
Another vehicle crosses the road perpendicular to your path of travel — such as at an intersection.	No warning is given.	No system action is taken: ACB only reacts to moving objects. **The driver should use safe driving practices to avoid a vehicle collision.**

Impact of Action on the Mack Adaptive Cruise with Braking

The following chart illustrates how the ACB system will react to various actions you may initiate while on the road.

Note: Note: The actions presented below reflect many, but not all, potential driver actions that may interact with the ACB system.

Danger

The ultimate responsibility for the safe operation of the vehicle remains with the driver. Even with the Mack Adaptive Cruise with Braking, you must remain alert, react appropriately and in a timely manner, and use good driving practices. Failure to follow these instructions and good driving practices can lead to vehicle damage, personal injury or death.

Action	Affect on Mack Adaptive Cruise with Braking
Step on the brake.	Both Cruise Control and ACB will be cancelled until driver pushes “set” or “resume”.
Step on the accelerator.	Cruise Control and ACB will be overridden until the accelerator is released; Cruise control and ACB will then resume original set speed automatically.

Turn the cruise control "off".	ACB will turn off until the driver selects “on” and “set”; However, the driver will hear Following Distance Alerts as needed.
Turn the cruise control "on".	ACB will not engage until the driver selects “set”.
"Set" the cruise control.	ACB is automatically activated, and your vehicle maintains set speed and set following distance from the vehicle ahead.
Cover or block the sensor.	Depending on the type and extent of the blockage, ACB will be diminished or even disabled. A blockage will also affect engine cruise control availability.
Use normal cruise “+/-” switch.	Vehicle speed increased (+) or reduced (-) to achieve the new set speed while actively maintaining the following distance with the vehicle ahead, if one is present within 152 m [500 ft].

Indications and Warnings

The system is a unique patented system that functions differently than other cruise control/forward collision warning systems. It is important that the driver fully understand the system’s features, especially the driver indications and warnings. Two important warnings provided by the system are the Following Distance Alert (FDA) and Impact Alert (IA). The driver will be alerted by FDA warnings, whether or not you are using cruise control. The driver is only alerted to IA’s when in cruise control mode with the system functioning.

Following Distance Alert (FDA) - Always ON

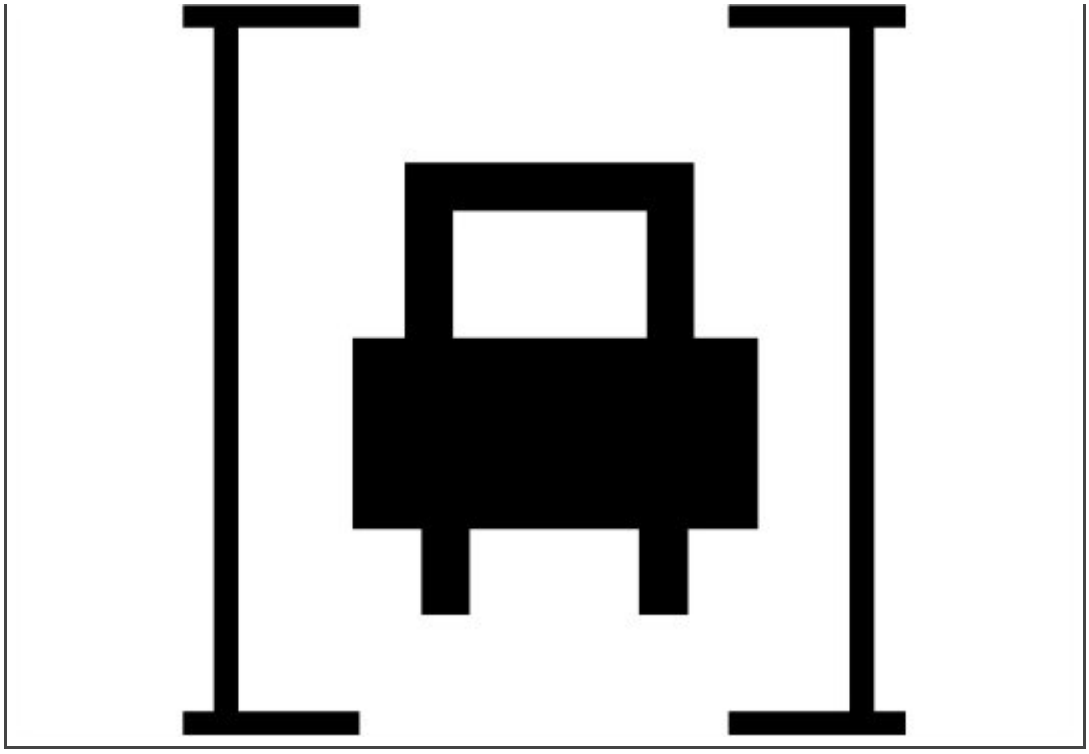
FDA is active whenever the vehicle is moving (whether or not cruise control is engaged)

The alert provides both audible and visual warnings whenever the following time gap between your vehicle and the vehicle ahead is less than the set time gap and getting closer. If the following time continues to get shorter, the driver will hear beeping that will increase in speed. When the time gap reduces to a critical point, Impact Alert telltale illuminates in the cluster. For more information on the Impact Alert Telltale. For more information, see “Impact Alert Warning” page 6.

Note: Any beeping from the Mack Road Stability Advantage by Bendix with Adaptive Cruise Control system means that your vehicle is too close to the vehicle ahead.

The FDA is accompanied by a icon bar, displayed in the Instrument Cluster. Once the audible warning is given, the driver must increase the distance between his/her vehicle and the vehicle ahead until the audible warning stops.

Time Gap Alert Icon



Impact Alert Warning

Danger

Ignoring the Impact Alert warning from the Mack Road Stability Advantage Bendix with Adaptive Cruise Control can lead to vehicle damage, personal injury or death.

The "Impact Alert" is the most severe warning issued by the system. The Impact Alert is only active when the vehicle cruise control is set and the system is operational. The Impact Alert Warning indicates the driver should apply additional braking force immediately. The instrument cluster illuminates Red LEDs, and a Pop-up comes up requesting the driver to take action and a continuous tone is sounded.

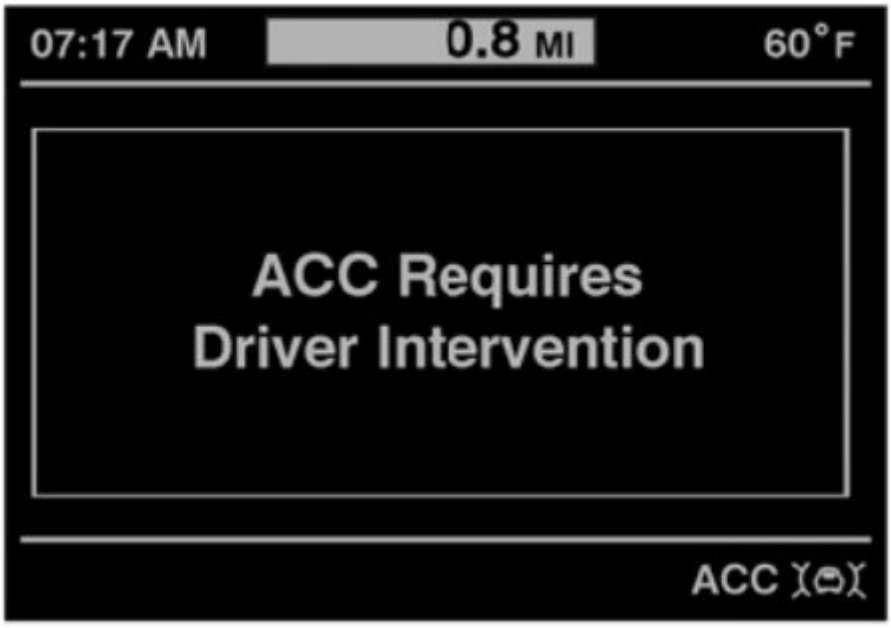
When the Impact Alert activates, you must take immediate evasive action by applying more braking power and/or steering clear of the vehicle ahead to avoid a potential collision.

Note: At most, Mack Road Stability Advantage by Bendix with Adaptive Cruise Control will apply up to one-third of your vehicle's braking capability. The driver must apply additional braking, when necessary, in order to maintain a safe distance from the vehicle ahead.

Impact Alert Telltale

If an impact alert occurs and driver intervention is required, a continuous audible sounds and the ACC Requires Driver Intervention screen displays.

DID Screen Caption



Mack Road Stability Advantage by Bendix with Adaptive Cruise Control Brake Overuse Warning

Danger

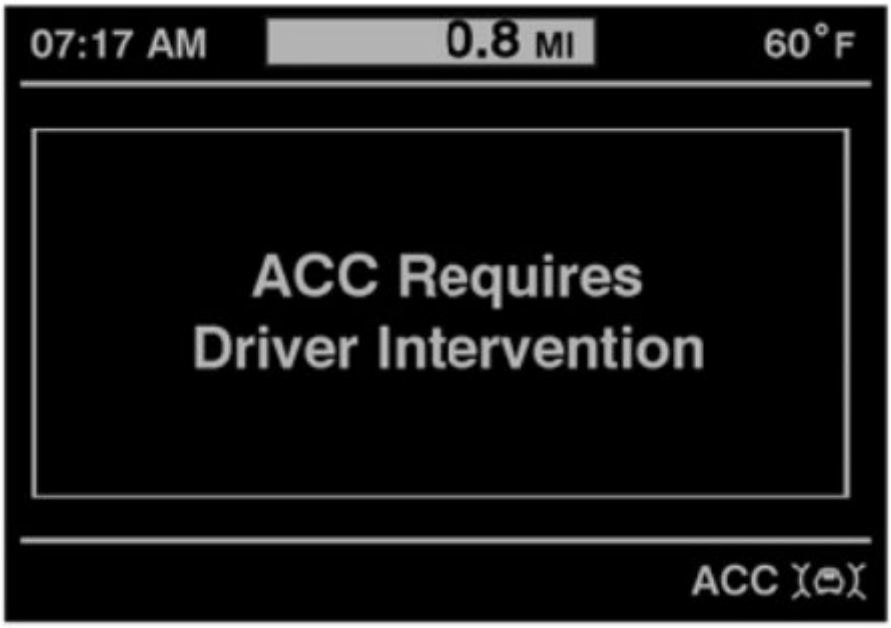
Excessive application of the foundation brakes can cause the brakes to overheat resulting in increasing stopping distances. Increased stopping distances can result in vehicle collision, serious personal injury or death.

The Mack Road Stability Advantage by Bendix with Adaptive Cruise Control system provides a warning when the system is using the foundation brakes excessively. Overuse of the foundation brakes can lead to the brakes overheating and a potential loss of braking performance from brake fade.

For example, the use of the system on long, steep downhill runs may cause this warning to be activated. It is recommended that the system be disengaged on long downhill grades. The driver should use appropriate gearing and brake techniques, on long, downhill grades. When the Mack Road Stability Advantage by Bendix with Adaptive Cruise Control system detects brake overuse ”ACC Requires Driver Intervention” is displayed in the DID, at which time the driver has 15 seconds to deactivate or the system will fault. Once the driver applies the brakes or disengages the system, the warning is discontinued. After a brief delay, however, if the driver does not respond to the brake overuse warning(s), the system will stop functioning and be disabled. The “ACC Braking Temporarily Unavailable“ screen displays in the Co- Pilot.

A self-disabled Mack Road Stability Advantage by Bendix with Adaptive Cruise Control system will be restored the next time the vehicle is started.

DID Screen Caption

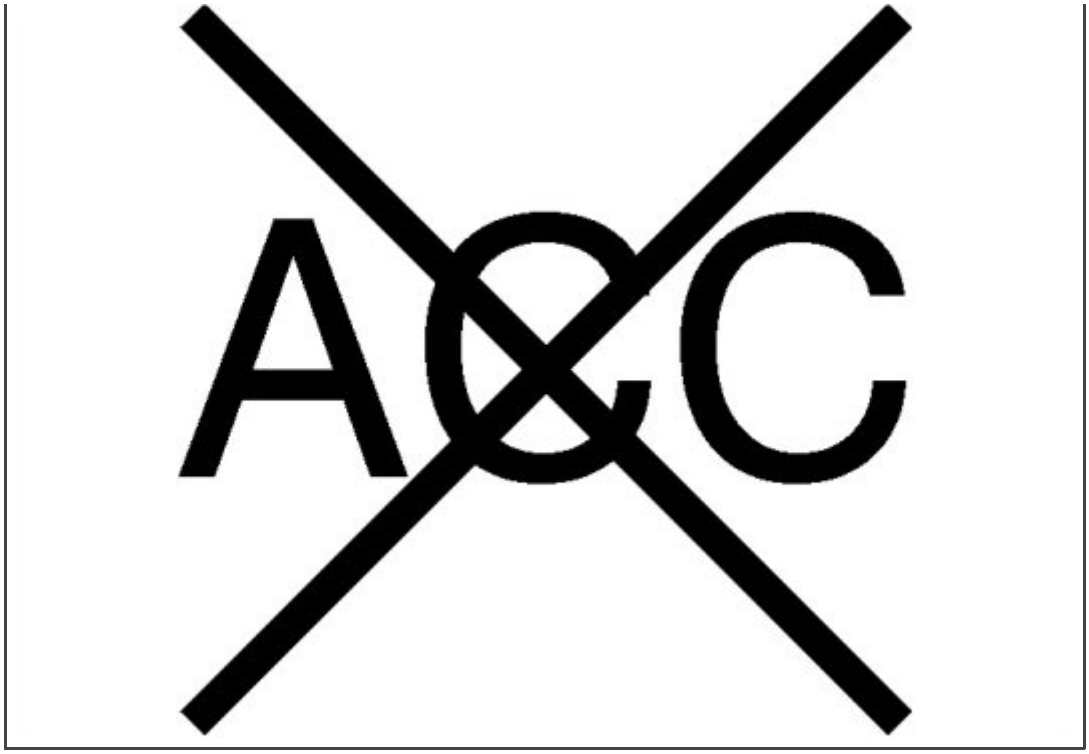


When the system is disabled the ACC Disabled icon displays in the cluster and the ACC Braking Temporarily Unavailable screen appears in the Co-Pilot.

Caution

The primary condition that activates the "ACC Braking Temporarily Unavailable" is using the system down steep grades. Approach grades as you normally would, with the appropriate gear selected and at a safe speed. It is recommended that the system not be used on downhill grades! Failure to follow these instructions can lead to damage to the system.

ACC Disabled Icon



DID Screen Caption

When the system is restored to normal operation the ACC Now Available screen appears in the Co-Pilot and the ACC ON icon displays in the cluster.

ACC ON Icon

DID Screen Caption

Alert Sound Level

The Mack Road Stability Advantage by Bendix with Adaptive Cruise Control audible alerts are pre-set in the factory and cannot be turned off, nor can the volume be adjusted.

Potential False Warnings

The Mack Road Stability Advantage by Bendix with Adaptive Cruise Control system should have significantly less false alerts than earlier systems. Radar technology is not perfect, however, and false alerts sometimes occur. If false alerts occur too frequently (more than twice a day) this may indicate sensor misalignment. Service the system at the earliest opportunity.

Note: For more information on sensor damage/misalignment/tampering that can cause a false alert refer to

"Equipment Maintenance" in the ACB Operator’s Handbook.

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

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