



# Service Data

SD-13-3333

## Bendix® Wingman® ACB (Active Cruise with Braking)

### DESCRIPTION

The Bendix® Wingman® ACB system is an additional feature of cruise control. When using cruise control, the system will maintain the set speed and intervene, as needed, to help maintain a set following distance behind a vehicle ahead in the same lane. The system features include an always available, if needed, audible and visual warning system.

### WARNING

Improper use of the Wingman ACB – Active Cruise with Braking system – can result in a collision causing property damage, serious injuries, or death.

**Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times. Even with Bendix® Wingman® ACB, the driver must remain alert, react appropriately and in a timely manner, and use good driving practices.**

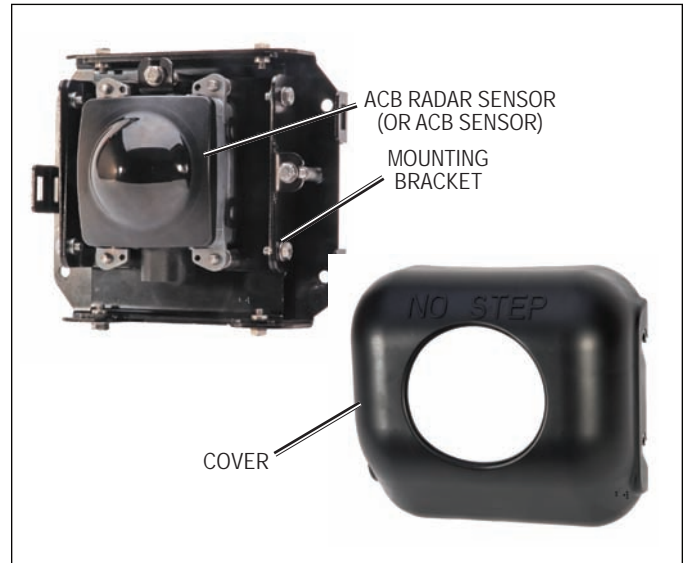


FIGURE 1 - WINGMAN® ACB SENSOR AND COVER

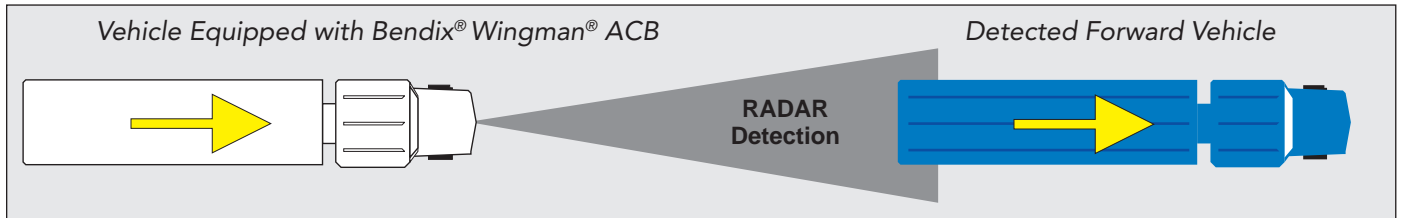


FIGURE 2 - BENDIX® WINGMAN® ACB SYSTEM RADAR DETECTION

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Be sure to read, understand, and follow all these instructions carefully.

## 1.0 OPERATION SECTION

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## 1.01 IMPORTANT SAFETY INFORMATION

**Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times. Even with the Bendix® Wingman® ACB system, the driver must remain alert, react appropriately and in a timely manner, and use good driving practices.**

The Bendix® Wingman® ACB system must be used only in conditions recommended for ordinary cruise control. The Wingman ACB system must never be used on roads that cannot be driven safely at a steady speed, including city streets, winding roads and sharp curves, downhill grades, poor road conditions (such as gravel, dirt), ice or wet surfaces (wet surfaces may increase the risk of hydroplaning), or in fog, heavy rain or snowy conditions.

## 1.02 OVERVIEW

The Wingman ACB system is integrated with the vehicle's normal cruise control. Once the driver activates and sets normal cruise control, Wingman ACB is engaged.

Using a radar sensor (with a range of approximately 500 feet) mounted to the front of the vehicle, the Wingman ACB system tracks moving vehicles ahead.

Once cruise control is activated and a set following distance maintained, if the forward vehicle slows down below the cruise control's set speed, the system will intervene - as necessary, to perform the following tasks in this order:

- (a) de-throttle the engine; and
- (b) apply the engine retarder; and
- (c) apply the foundation brakes.

*NOTE: If the foundation brakes are applied by Bendix Wingman ACB or the driver, the vehicle will not resume set speed automatically.*








If the vehicle ahead slows below the cruise control's set speed, but then accelerates away, and the Wingman ACB system did not need to use the foundation brakes as it managed the intervention, the vehicle will automatically accelerate back to the original cruise control set speed, and resume the set following distance behind the vehicle ahead.

The system features include an always available, audible and visual warning system. A detailed description of warnings can be found in Section 1.07: *Indications and Warnings*, on page 6 of this document.

Because Wingman ACB operates together with normal cruise control, the typical features built into cruise control operate as usual. For example, limits imposed by factory-set road speed governors are fully supported by the Bendix Wingman ACB system.

## WHEN NOT TO USE BENDIX® WINGMAN® ACB

**⚠** The Bendix® Wingman® ACB system should be used only in the same conditions that are recommended for ordinary cruise control use. As noted below, there are certain situations when ACB should not be used.

<ul style="list-style-type: none"> <li>• <b>Inclement Weather</b> – As with ordinary cruise control, Wingman ACB should not be used in rain, snow, fog, ice or other severe weather conditions that may affect the performance of the Bendix Wingman ACB system.</li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Dense Traffic</b> – As with ordinary cruise control, the Wingman ACB system should never be used in heavy traffic.</li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Sharp Curves and Winding Roads</b> – When traveling sharply curved roadways, or highway entrance and exit ramps, the Wingman ACB system should not be used.  CAUTION: Road curvature may impact the radar sensor's ability to track vehicles ahead in the same lane. This may result in potentially unexpected acceleration back to the original set speed.</li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Downhill Grades</b> – Wingman® ACB should not be used on downhill grades.</li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Smaller Forward Vehicles</b> – Smaller forward vehicles, such as motorcycles, may be difficult for the radar to identify. It is the driver's responsibility to be aware of these types of vehicles and to slow down if necessary.</li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Construction Zones</b> – Do not use Wingman® ACB in construction zones.</li> </ul>	
<ul style="list-style-type: none"> <li>• <b>Off-Road*</b> – Do not use Wingman® ACB in off road conditions.</li> </ul>	

\* Visit [www.bendix.com](http://www.bendix.com) for more information and any updates to this restriction.

Vehicle manufacturers may use alerts, messages, and dash arrangements that vary from the examples shown here. Consult the vehicle operator's manual for applicable details regarding use and operation.

## AUTOMATIC FOUNDATION BRAKE APPLICATIONS

The Bendix® brake system automatically manages foundation brake priorities among the various vehicle systems that use the foundation brakes, such as Bendix® Wingman® ACB – Active Cruise with Braking, Bendix® ESP® Electronic Stability Program, Bendix® ATC (Automatic Traction Control) and Bendix® ABS (Antilock Braking System).

After an ACB event in which the foundation brakes were applied by the system, normal cruise will automatically be cancelled. The driver must activate the cruise control (resume or set) for the vehicle to throttle up.

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

### 1.03 SYSTEM COMPONENTS

The ACB radar sensor (or ACB sensor) used in the Wingman ACB unit is located at the front of the vehicle – either on the bumper or just behind it on a cross-member. See Figure 3.

The ACB sensor is pre-aligned at the factory and no adjustment should be needed. If the sensor becomes misaligned (or a diagnostic trouble code is issued), either a message – or light on the dash, depending on the vehicle – lets the driver know that service is needed.



**FIGURE 3 - COMPONENT: RADAR SENSOR**

In many cases, the Wingman ACB system is fully integrated into the vehicle dashboard so that a separate status/display box is not required. The vehicle's instrument cluster is used to supply all visual, text, and audible indicators and alerts. The volume levels of the alerts are not adjustable, nor can they be switched off.



**FIGURE 4 - BENDIX DRIVER INTERFACE UNIT (DIU)**

Alternatively, where a DIU (Driver Interface Unit) is used, all visual, text, and audible indicators and alerts will be provided by the DIU. The DIU allows the volume to be adjusted. See Appendix B.

## 1.04 WHAT TO EXPECT WHEN USING BENDIX® WINGMAN® ACB

Table 1 illustrates what to expect from the Wingman ACB system in various driving situations. Both the system indication and action to expect from the system are illustrated.

What to Expect When Using Wingman® ACB (1.04)		
Situation	System Indication/Alerts	Actions by Wingman® ACB
With cruise control set and a forward vehicle present (in range) ahead of you.	The cruise control switched ON indicator and the Forward Vehicle Detected icon both will be illuminated.	ACB will maintain the set speed and following distance.
With cruise control set, the vehicle ahead slows <u>moderately</u> .	The Following Distance Alert (FDA) – a fast beeping – will sound.	The vehicle will be slowed by (in order) (a) reducing throttle; (b) engaging the engine retarder; or (c) applying the foundation brakes. If the foundation brakes are applied, cruise control and Wingman ACB are cancelled: the driver needs to re-engage cruise control.
With cruise control set, the vehicle ahead slows <u>rapidly</u> .	The Following Distance Alert (fast beeping) is given, and may be followed by the Impact Alert (continuous tone), and a text message appears on the dash screen or Bendix® DIU display.	The vehicle will be de-throttled; the engine retarder engaged; and the foundation brakes applied. Cruise control and Wingman ACB are cancelled; the driver needs to reengage cruise control.
Cruise control is not switched on, or not set, the vehicle ahead slows rapidly.	The Following Distance Alert (fast beeping sound), or Impact Alert (continuous tone) is given.	None. No action taken by the Wingman® ACB. The driver must take appropriate action.
With cruise control set, but no vehicle ahead detected (vehicles in front of you are farther <u>than 500 feet</u> ahead of your vehicle).	None.	Vehicle maintains set speed.
With the cruise set, if a vehicle cuts in front of the truck <u>and speeds away</u> .	Depending on the exact ACB system configuration that has been set for the vehicle, and how close the vehicle cuts in front, Following Distance Alerts will be given to the driver.	Typically, if the vehicle ahead does not cut in within a set distance and then speeds away, the ACB vehicle maintains the set speed.
With cruise set, a vehicle cuts in front of the truck within range of the sensor <u>and slows down</u> .	The system alerts using the Following Distance Alert (fast beeping). Depending on how rapidly the vehicle ahead slows, the system may initiate an Impact Alert warning.	ACB reduces the throttle and retards the engine; the foundation brakes also may be engaged.
With cruise set, and a vehicle detected ahead, the vehicle goes down a grade. (Downhill grade use is not recommended.)	If the ACB system intervenes and has to apply the brakes for a long period of time, or applies them repeatedly for an extended duration, a Brake Overuse Alert will appear on the dash display.	<i>(See the CDL manual instructions on proper gear usage for down grades.)</i> ACB de-throttles, then uses the engine retarder, followed by braking. If the brakes remain on for an extended duration, the display requests that the driver intervene, and if ACB detects no intervention, it may shut itself down. <i>See Section 1.07: ACB Brake Overuse Alert in this manual.</i>
With cruise set, a faster vehicle passes on the left or right.	None.	None. The driver must take appropriate action, if needed.
A broken-down vehicle is stationary in the lane in which the truck is traveling.	(If configured to do so) a stationary object alert may be issued up to 3.0 seconds prior to impact.	None. Wingman ACB only reacts to moving objects. The driver must take appropriate action, if needed.
A deer or moose runs in front of the truck.	None.	None. The driver must take appropriate action, if needed.
Another vehicle crosses the road perpendicular to the truck's path of travel – such as at an intersection.	None.	None. The driver must take appropriate action, if needed.
<i>NOTE: These represent examples of typical situations and responses that may occur when using Wingman® ACB. All possible situations and responses are not covered in this table.</i>		

**TABLE 1 - OPERATIONAL SCENARIOS WITH THE BENDIX® WINGMAN® ACB SYSTEM**



## SWITCHING ON THE BENDIX® WINGMAN® ACB SYSTEM

To have the advanced cruise control features of the Wingman ACB system (engine de-throttle/retard, foundation brake interventions) the vehicle's regular cruise control must be switched on. See Figure 5 for examples of switches that may be used.

When the vehicle reaches the desired cruise speed, the driver presses the cruise control set switch to activate the system. The Wingman ACB system will then engage and help the driver maintain a set following distance behind the vehicle traveling in front.

Once the cruise control speed is set, a cruise-enabled icon (or similar) will illuminate on the instrument panel. If the cruise-enabled or set (or similar) icon does not illuminate, the Wingman ACB system is not functioning normally. Refer to the vehicle operator's manual to double-check the location of the icon and for further troubleshooting information.

The driver can switch off the Wingman ACB system manually by either stepping on the brake pedal or switching off the cruise control.



FIGURE 5 - EXAMPLES OF CRUISE CONTROL SWITCHES

**IMPORTANT NOTE:** Cruise control will automatically cancel whenever Wingman ACB applies the foundation brakes.

## 1.05 HOW THE DRIVER'S ACTIONS INTERACT WITH BENDIX® WINGMAN® ACB

Table 2 illustrates how the Wingman® ACB system will react to various actions initiated by the driver when using Wingman® ACB system on the road.

**Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times. Even with the Bendix® Wingman® ACB system, the driver must remain alert, react appropriately and in a timely manner, and use good driving practices.**

How the Driver's Actions Interact with Bendix® Wingman® ACB (1.05)	
Action	Reaction of Wingman® ACB
<b>If the driver does this:</b>	<b>Expect the ACB system to do this:</b>
Steps on the brake.	Both cruise control and Wingman ACB will be cancelled.
Steps on the accelerator.	Cruise control and Wingman ACB will be overridden until the accelerator is released. Then, cruise control and ACB will resume the original set speed automatically.
Switch off the cruise control.	Wingman ACB will turn off. However, the driver will continue to hear all alerts as needed.
Switch on the cruise control.	Wingman ACB will not engage until the driver selects cruise speed.
Set the cruise control speed.	Wingman ACB is automatically activated and will help the driver maintain the set speed and following distance from the vehicle ahead.
Covers or blocks the sensor.	Depending on the type and extent of the blockage, Wingman ACB will be diminished or even disabled and a Diagnostic Trouble Code set. A blockage will also affect engine cruise control availability.
Uses 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 500 feet.
<i>NOTE: The actions presented above reflect many, but not all, potential driver actions that may interact with the Wingman ACB system.</i>	

TABLE 2 - HOW THE DRIVER'S ACTIONS INTERACT WITH BENDIX® WINGMAN® ACB

## THE FORWARD VEHICLE DETECTED ICON

When cruise control is switched on, speed is set, and a vehicle ahead is detected by the radar, the Forward Vehicle Detected Icon – or a similar icon – will illuminate on the vehicle dashboard. See Figure 6 for examples.

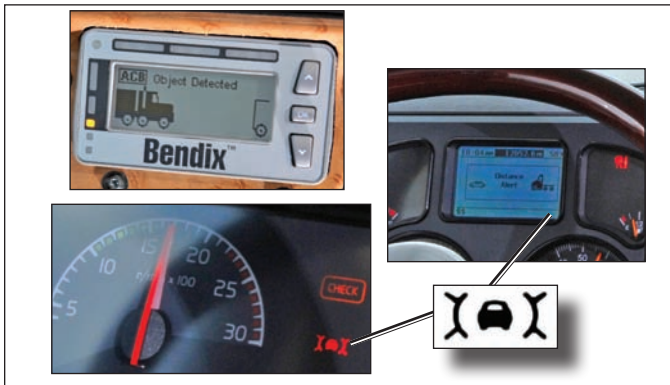


FIGURE 6 - FORWARD VEHICLE DETECTED ICONS

This is an indication to the driver that the Bendix® Wingman® ACB system is enabled to assist the driver in maintaining the set following distance.

## ADJUSTING THE CRUISE CONTROL SPEED

The “+/-” switch of the vehicle cruise control system is used to increase (+) or decrease (-) the vehicle set speed.

When adjusted, the new set speed will be indicated on the vehicle dash. The new set speed is displayed on the message center, on the DIU, speedometer or other location on the dash.

## 1.06 FOLLOWING DISTANCE

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

### FOLLOWING DISTANCE ADJUSTMENT SWITCH

This optional ACB feature, allows the driver to adjust the following distance or time gap. The availability of this feature is determined by the vehicle manufacturer. The switch has an increase or decrease function. Pressing increase (+) will provide a larger following distance, measured in seconds. Pressing decrease (-) will provide a shorter following distance.

## 1.07 INDICATIONS AND WARNINGS

The Bendix® Wingman® ACB system functions act 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.

Three important warnings provided by the Wingman ACB system are the Following Distance Alert (FDA), Impact Alert (IA), and Stationary Object Alert (SOA). The driver will be alerted by any of the three warnings, whether or not the cruise control is activated.

See Appendix B, Sections 3.0-5.0, for more information about how DIUs communicate alerts.

**⚠ WARNING:** Any audible or visual alert by the Bendix® Wingman® ACB system means that the truck is too close to the vehicle ahead.

## IMPACT ALERT (IA)

**⚠ This is the most severe alert issued by Wingman ACB. This alert indicates the driver must take immediate evasive action by applying more braking force and/or steering clear of the vehicle ahead to avoid a potential collision. The actual display text/sounds vary by vehicle manufacturer. When activated, text appears either on the dashboard screen or Driver Interface Unit (DIU), and a loud continuous tone (or similar,) will sound. The Impact Alert is ready to alert the driver whenever the vehicle is moving above twelve (12) mph (whether or not cruise control is engaged.)**

When the Impact Alert activates, the driver must take immediate evasive action by applying more braking power and/or steering clear of the vehicle ahead to avoid a potential collision. See Figure 7 for an example of an Impact Alert Icon.

**⚠ WARNING:** Wingman ACB will apply up to two-thirds of the vehicle's braking capacity. The driver must apply additional braking, when necessary, to maintain a safe distance from the vehicle ahead.

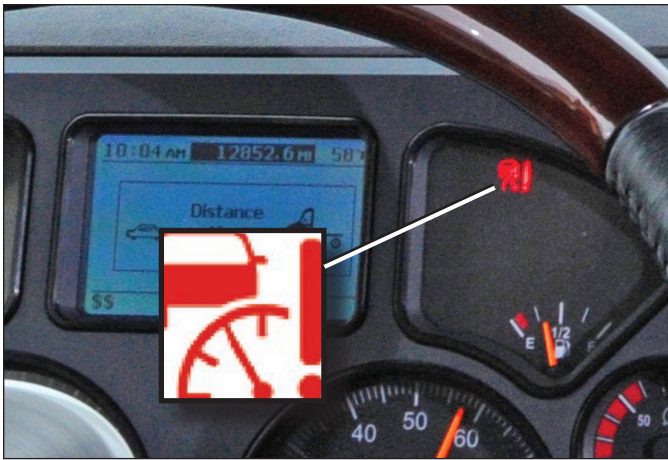


FIGURE 7 - EXAMPLE OF IMPACT ALERT ICON



FIGURE 8 - IMPACT ALERT TEXT AND LIGHT PATTERN AS SEEN ON THE BENDIX® DIU

### FOLLOWING DISTANCE ALERT (FDA)

**⚠ The Following Distance Alert (FDA) provides both audible and visual alerts whenever the distance between the truck and the vehicle ahead is less than the set distance and getting closer. The FDA is ready to alert the driver whenever the vehicle is moving above five (5) mph (whether or not cruise control is engaged.) If the following distance continues to decrease, the driver will hear more rapid audible alerts. When the distance interval reaches a critical point, typically a red LED also illuminates on the instrument cluster.**

The FDA may be accompanied by a message on the dash screen displaying “Distance Alert”, or similar text. Where a DIU is used, additional yellow LEDs illuminate to show the three levels of this alert. Once the audible alert is given, the driver must increase the distance between his/her vehicle and the vehicle ahead until the audible alert stops.

### STATIONARY OBJECT ALERT (SOA)

**⚠ Stationary Object Alert – The Bendix® Wingman® ACB system will give up to a three (3) second warning to the driver when approaching sizable stationary objects with reflective surfaces in your lane of travel. The SOA is ready to alert the driver whenever the vehicle is moving above ten (10) mph (whether or not cruise control is engaged.)**

The driver should be especially careful when approaching certain types of vehicles and objects. The Wingman ACB sensor may not be able to detect vehicles and objects with limited metal surfaces (such as recreational vehicles, horse-drawn buggies, motorcycles, logging trailers, etc.).

**NOTE: Entering a curve will reduce the SOA warning time to less than three (3) seconds.**

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

### ACB BRAKE OVERUSE ALERT

The Wingman ACB system provides an alert when the system is intervening and using the foundation brakes excessively. Overuse of the foundation brakes can lead to brake overheating and a potential loss of braking performance from brake fade.



FIGURE 9 - ACB BRAKE OVERUSE DISPLAYED

For example, the use of Wingman ACB on downhill runs may cause this alert to be activated. It is recommended that Wingman ACB be disengaged on downhill grades. The driver should use appropriate gearing and brake techniques, not Wingman ACB, on downhill grades.

When the Wingman ACB system detects brake overuse, depending on the vehicle manufacturer, a text message will be displayed on the dashboard or an audible alert will be activated. Once the driver applies the brakes or disengages ACB, the alert is discontinued.

If the driver does not respond to the brake overuse alert(s) after a brief delay, the Wingman ACB system will switch itself off. A self-disabled Wingman ACB system will be restored the next time the vehicle is started.



Using Bendix® Wingman® ACB system on downhill grades is the primary condition that activates the ACB Brake Overuse Alert. As such, it is not recommended that Wingman® ACB be used on downhill grades. Approach grades as you normally would, with the appropriate gear selected and at a safe speed.

### 1.08 ACB DIAGNOSTIC TROUBLE CODES

The Wingman ACB system monitors the operation of the system. If any malfunction is detected, a Diagnostic Trouble Code (DTC) will be set and the driver will be alerted. The exact alert given depends on the vehicle manufacturer. Refer to your vehicle operator's manual and the troubleshooting section of this document for more information.

### 1.09 RADAR SENSOR INTERCHANGEABILITY

Many variables must be considered when determining whether or not the radar sensor can be relocated from one vehicle to another vehicle. They include, but are not limited to, the version of the Bendix® ESP® stability system used on the vehicle, the instrument cluster, the vehicle ECU, the engine and the transmission. Contact the Bendix Tech Team at 1-800-AIR-BRAKE to determine if this is a viable option.

 **WARNING:** Do not interchange sensors without contacting Bendix first!

### 1.10 ALERT VOLUME

For Wingman ACB systems installed on vehicles with alerts that come directly through the instrument cluster, audible alert levels are pre-set at the factory and cannot be turned off, nor can the volume be adjusted.

However, where the Bendix® Driver Interface Unit (DIU) is used, volume adjustment is permitted.

### 1.11 POTENTIAL FALSE WARNINGS

In certain unusual traffic or roadway conditions, ACB may issue a false alert. While eliminating all false alerts is not possible, if false alerts occur too frequently (more than twice a day), this may indicate sensor misalignment. Service the system at the earliest opportunity.

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 ACB system.

**Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times. Even with the Bendix® Wingman® ACB system, the driver must remain alert, react appropriately and in a timely manner, and use good driving practices.**



## 2.0 MAINTENANCE SECTION

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### 2.1 GENERAL SAFETY GUIDELINES

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

When working on or around a vehicle, the following general precautions should be observed at all times.

1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses.
2. Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components.
3. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
4. If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with a Bendix® AD-IS® air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.
5. Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
6. Never exceed manufacturer's recommended pressures.
7. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.
8. Use only genuine Bendix® brand replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type


and strength as original equipment and be designed specifically for such applications and systems.

9. Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
10. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
11. For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.

### 2.2 EQUIPMENT MAINTENANCE: BRAKE SYSTEM AND ABS FUNCTIONALITY

***IMPORTANT NOTE: All vehicle trouble codes related to the engine, transmission, instrument cluster, engine cruise control and Bendix® ABS, ATC or ESP® systems must have the issue resolved – with no trouble codes present during the vehicle operation while in cruise control – in order to accurately diagnose Bendix® Wingman® ACB trouble codes.***

**ABS Maintenance** - Optimal Wingman ACB performance requires a properly maintained ABS system. Have any ABS Diagnostic Trouble Codes (DTCs) corrected by a qualified technician at the earliest opportunity.

** WARNING: Any ABS Diagnostic Trouble Code will result in the Wingman ACB system being disabled.**

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

### 2.3 BENDIX® WINGMAN® ACB SYSTEM PREVENTIVE MAINTENANCE

To keep the system functioning properly, perform the following:

1. Keep the sensor lens clean and free of obstructions.
2. Inspect for any damage to the bumper or Wingman ACB sensor to ensure that sensor alignment has not been compromised.
3. Perform appropriate inspections of the braking system, as required by the vehicle manufacturer, to ensure brakes are in proper working order.
4. Ensure that the tires are properly inflated and that adequate tread is present.

**Sensor Inspection** - The driver should regularly inspect the radar sensor and mounting, and remove any mud, snow, ice build-up, or other obstructions.

**Sensor Damage / Misalignment / Tampering** - In cases where the bumper and/or sensor are found to have sustained damage; are misaligned; or if you suspect the sensor has been tampered with, do not use the Bendix® Wingman® ACB system until the vehicle has been repaired and the sensor realigned. Typically, an indicator on the dash will illuminate if the system detects any of these conditions. Consult the vehicle operator's manual or contact Bendix for more information.

*NOTE: Any vehicle trouble code that disables vehicle cruise control will also cause a trouble code in Wingman® ACB.*

## **2.4 ADDITIONAL SUPPORT AT WWW.BENDIX.COM/1-800-AIR-BRAKE**

For the latest information, and for free downloads of the Bendix® ACom® Diagnostics software, and its User Guide, visit the Bendix website at [www.bendix.com](http://www.bendix.com).

You will also find a current list of compatible RP1210 data link adapters for ABS and the Wingman ACB system. See *Figure 5*.

For direct telephone technical support, the Bendix Tech Team is available at 1-800-AIR-BRAKE (1-800-247-2725), Monday through Friday, 8:00 A.M. to 6:00 P.M. EST. For assistance, follow the instructions in the recorded message.

The Bendix Tech Team can also be reached at: [techteam@bendix.com](mailto:techteam@bendix.com).

### 3.0 INTRODUCTION TO TROUBLESHOOTING

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This section introduces three initial steps to accurately troubleshoot the Bendix® Wingman® ACB system.

We recommend reading this introductory section as well as the Troubleshooting/Diagnostics Section (4.0) before performing any troubleshooting.

When diagnosing the ACB system, in many cases Bendix® ACom® Diagnostics software (6.3 or higher) will be required (available as a free download from [www.bendix.com](http://www.bendix.com)).

### 3.1 TROUBLESHOOTING BASICS

Troubleshooting Basics (3.1)	
Questions	Next Steps
What color is the radar sensor?	Bendix Wingman ACB has a black “eyeball” sensor ( <i>See photo on page 1</i> ). If the sensor is flat-fronted, or is yellow, it is not a Wingman ACB radar sensor. As of the date of release of this document, March 2011, ACB is featured on Kenworth®, Mack®, Navistar®, Peterbilt®, Prevost®, and Volvo® vehicles.
Have the driver run the Power-Up Self-Test.	<p><b>Power-Up Self-Test</b></p> <p>This is a self diagnostic check, to determine if ACB operation is normal. (<i>This feature was introduced on Bendix ACB systems during early 2010.</i>)</p> <ol style="list-style-type: none"> <li>1. Park the vehicle. Power off.</li> <li>2. Put the key into the ignition, and turn to the “ignition power” position.</li> <li>3. Toggle the cruise control switch at least once, and leave it in the “on” position.</li> <li>4. Start the vehicle, but do not drive away.           <p><b>Note that if the cruise control is in the “off” position, or if the vehicle is moving, this test will not run.</b></p> </li> <li>5. The ACB self-test will start after 15 seconds, and takes approximately five (5) seconds to complete. (Note that other vehicle system self-tests, e.g. the ABS “chuff” test, may run during the initial 15 seconds after ignition “on.”)</li> </ol> <p>As the ACB self-test runs, the driver should hear a short set of beeps. The test checks the engine, transmission, and brake systems to make sure they are communicating. In addition, depending on the vehicle, the test may briefly display a distance alert message and/or cause the Forward Vehicle Detected icon in the instrument cluster to illuminate; this is normal.</p>
Does the driver hear a long warning beep?	<p>If no problem is found and the test is passed, no additional beeps/lamps will be displayed nor will a trouble code be set.</p> <p>If Wingman ACB has found an issue that will prevent it from functioning properly, <b>a long warning beep will sound</b> to alert the driver, and a Diagnostic Trouble Code will be logged in the system (typically with an ACB status indicator/dash icon illuminated). Descriptions for all DTCs are found in Section 4.3: <i>Diagnostic Trouble Codes</i>.</p>
Have the driver describe the system behavior that they believe shows the system is not working properly.	When diagnosing the ACB system, especially in cases where there are no diagnostic trouble codes logged, find out which part of the system behavior appears to be operating improperly. <i>See Section 3.2: Narrowing Down the Problem.</i>

TABLE 3 - TROUBLESHOOTING BASICS

### 3.2 NARROWING DOWN THE PROBLEM

Use the questions found in Table 3.2 below to help assess if the ACB is not performing correctly. Be sure to have a thorough understanding of the system's normal behavior; this will reduce the troubleshooting time.

The table provides a guide to basic troubleshooting questions and possible corrective actions. Items in *Italics* cross-reference to the service procedures in this manual to repair the condition described.

If Bendix Tech Team assistance is needed, prior to calling 1-800-AIR-BRAKE, complete the Troubleshooting Checklist (See *Appendix A*), to help reduce the time needed to troubleshoot the system.

<b>Narrowing Down the Problem (3.2)</b>	
<b>Questions</b>	<b>Next Steps</b>
<b>Alignment Problems</b>	
<p>Is the sensor mounting location (bumper or cross member) damaged?</p> <p>Does the system seem to lose, or "not hold on to," the forward vehicle when going around curves? Does the system seem to warn on vehicles in adjacent lanes? Are there false alerts when passing other vehicles? Is this more than a typical ACB-equipped truck?</p> <p>Does the system seem to warn late when another vehicle cuts in front of the truck?</p> <p>Does the system seem to not "see" as far as it "used to", or warn on many more overhead bridges/signs than previously?</p> <p>Does the system seem to be inconsistent when tracking forward vehicles?</p>	<p>Re-align the sensor vertically and laterally. Use the following procedures:</p> <ul style="list-style-type: none"> <li>• Check Section 6.07: <i>Vertical Alignment</i> and adjust if needed.</li> <li>• Check Section 6.09: <i>Lateral Alignment</i> and adjust if needed.</li> <li>• Check Section 6.02: <i>ACB Mounting</i> – The ACB sensor needs a solid mounting surface in order to hold the alignment. If the bumper or mounting cross member is damaged, replace it first, then align the sensor.</li> </ul>
<b>Blocked Sensor Issues</b>	
<p>Is mud, ice, or snow covering the sensor?</p> <p>Is anything blocking the view of the sensor?</p>	<p>Clean the sensor lens immediately. Remove anything blocking the sensor then power cycle and read any remaining trouble codes.</p> <p>Read Section 4.3: <i>Bendix® Wingman® ACB Diagnostic Trouble Codes</i>.</p> <p>If the vehicle's cruise control is set and the sensor is blocked by ice, snow, mud, tampering, etc. so that it cannot "see" a forward vehicle, Wingman ACB will log a trouble code.</p> <p>After the blockage is removed, the Wingman ACB trouble code will clear automatically. This process also will set a vehicle cruise control trouble code which must be cleared with an ignition key cycle.</p> <p>Add a visual check of the radar sensor for blockage to the driver's pre-trip inspection checklist.</p>
<b>Potential False Warnings</b>	
<p>Do false alerts seem to happen in construction zones or going under bridges?</p>	<p>Several road scenarios have a tendency to cause false warnings, including construction zones and bridges (if stationary object warning is enabled). Unless these false warnings are frequent, the system is likely reacting normally. The driver should not set the cruise control in construction zones. If driver complaints persist, continue asking questions to more narrowly define the driving condition presenting the problems. Review proper operating conditions in the operator's manual.</p>
<b>Other Questions</b>	
<p>Has the system worked properly in the past and is not working correctly now?</p>	<p>This is a good indication that something has changed such as misalignment of the sensor. Review questions listed above with the driver to further diagnose the problem.</p>
<p>Has the sensor been changed recently?</p>	<p>If so, the new sensor may be incompatible with the vehicle. Follow Section 1.09: <i>Sensor Interchangeability</i> procedure and check system trouble codes with Bendix® ACom® Diagnostics software.</p> <p>Read Section 4.3: <i>Bendix® Wingman® ACB Diagnostic Trouble Codes</i>.</p>

**TABLE 4 - NARROWING DOWN THE PROBLEM (PAGES 12-13)**



### Narrowing Down the Problem (3.2)

Questions	Next Steps
Does the mounting bracket look damaged or tampered with?	<p>Other than expected surface scratches or some discoloration over time, there should be no visible damage to the sensor bracket assembly. If so, realign the sensor vertically and laterally. If sensor alignment cannot be held in place, the bracket assembly must be replaced. Verify the bumper is not damaged.</p> <ul style="list-style-type: none"> <li>• Check the Vertical Alignment (6.07) and adjust if needed.</li> <li>• Check the Lateral Alignment (6.09) and adjust if needed.</li> </ul> <p>The Bendix® Wingman® ACB Mounting - The ACB radar sensor needs a solid mounting surface in order to hold the alignment. If the bumper or mounting cross member is damaged, replace it first, then align the sensor.</p>
Did the ACB sensor currently on the vehicle come from another vehicle?	<p>The sensor may be incompatible with the new vehicle. Follow Section 1.09: <i>Sensor Interchangeability</i> procedure and check system trouble codes with Bendix® ACom® Diagnostics software.</p> <p>Read Section 4.3: <i>Bendix® Wingman® ACB Diagnostic Trouble Codes</i>.</p>
With cruise control set, does the system consistently apply the foundation brakes when a forward vehicle slows?	<p>This is normal operation. Continue asking the driver questions to diagnose the problem. The sensor may be blocked or misaligned. The service technician will need to check trouble codes as well.</p> <ul style="list-style-type: none"> <li>• Check the Vertical Alignment (6.07) and adjust if needed.</li> <li>• Check the Lateral Alignment (6.09) and adjust if needed.</li> </ul> <p>The Wingman ACB Mounting - The ACB radar sensor needs a solid mounting surface in order to hold the alignment. If the bumper or mounting cross member is damaged, replace it first, then align the sensor.</p> <p>Read Section 4.3: <i>Bendix® Wingman® ACB Diagnostic Trouble Codes</i>.</p>
Does a diagnostic trouble code (DTC) seem to occur when driving through the desert or in barren areas (no road signs, trees or vehicles)?	<p>In normal operation, the Wingman ACB radar sensor may “go dormant” if it hasn’t “seen” a metallic object after a pre-determined period. This is rare, but most likely to occur when driving in deserts or barren areas. If the sensor does “go dormant,” Wingman ACB provides a visible warning to the driver. In addition, the vehicle also will drop out of cruise mode, providing an audible and/or visual warning to the driver as well.</p> <p>The driver must actively re-engage the vehicle’s cruise control. Once the desired cruise speed is set, Wingman ACB will resume operation. When metallic objects are again “seen” by the Wingman sensor, the trouble code previously recorded in the Wingman system will clear automatically.</p>
Does the system seem to disengage after an automatic braking event?	<p>This is normal operation. The driver must set or "resume" the cruise control once again to regain the following distance management function provided by Wingman® ACB.</p>
Does cruise control disengage sometimes when the brakes come on and not at other times?	<p>This is normal operation. When traveling with lightly loaded trailers or bobtail, Wingman ACB may continue to function even after an automatic brake application. No driver input is needed.</p>
Does the connector or wiring appear damaged?	<p>Wires can become corroded if the sensor is not plugged in properly. Clean the connectors on the wire harness as well as the sensor and reattach. If wires are chafed, replace the wire harness. Also, check for trouble codes.</p> <p>Read Section 4.3: <i>Bendix® Wingman® ACB Diagnostic Trouble Codes</i>, and Section 4.8: <i>Troubleshooting Wiring Harnesses</i>.</p>
Does the system generate a diagnostic trouble code going down a grade, but the code goes away later?	<p>This is normal operation. Wingman ACB is not intended to be used on grades. If the system detects this, it will generate a diagnostic trouble code (DTC). Verify there are no diagnostic trouble codes. Proper downgrade driving techniques should be used.</p> <p>Read Section 4.3: <i>Bendix® Wingman® ACB Diagnostic Trouble Codes</i>.</p>
Does the radar sensor have noticeable damage beyond normal discoloration or surface scratches?	<p>The radar sensor and bracket are very durable. However, if the sensor housing or lens is cracked or broken, immediately look for trouble codes via Bendix® ACom® Diagnostics (version 6.3 or higher) and replace the damaged sensor.</p> <p>Read Section 4.3: <i>Bendix® Wingman® ACB Diagnostic Trouble Codes</i>, and Section 6.02: <i>ACB Radar Sensor Mounting</i>.</p>

**TABLE 4 - NARROWING DOWN THE PROBLEM (PAGES 12-13)**

### 3.3 OVERVIEW OF POSSIBLE ISSUES

Some customer issues are actually misunderstandings of how the Bendix® Wingman® ACB system performs normally. Use Table 5 below to learn the causes of potential issues if ACB is not performing correctly. Some issues can be investigated by a visual inspection. Others may cause a diagnostic trouble code (DTC) to be logged – see *Section 4.3: Diagnostic Trouble Codes*.

Overview of Possible Issues (3.3)	
Issue	Description
System familiarity	Verify the system functionality. Is it operating normally or not? Drivers who are unfamiliar with the system may report they don't like the way it beeps or how it activates the brakes. Use <i>Section 3.0: Introduction to Troubleshooting</i> , <i>Section 4.3: Diagnostic Trouble Codes</i> and <i>Section 3.1: Questions to Ask the Driver</i> to verify if the system is functioning normally; then continue.
DTCs caused by temporary operating conditions	Some diagnostic trouble codes (DTCs) indicate a temporary condition and will clear when that condition is no longer present. If these persist, further investigation is warranted. See <i>Section 3.1: Questions to Ask the Driver</i> .
Sensor misalignment	If the performance of the system seems to be erratic or unpredictable, the forward radar sensor could be misaligned and may need to be aligned both vertically and laterally. If there is a trouble code set or if the system does not function, the sensor may be severely misaligned and Wingman ACB will not operate until this is corrected. See <i>Section 6.01: Vehicle Applications</i> .  Inspect the front of the vehicle. If it has been damaged or if the vehicle does not track straight, both of these conditions must be repaired before troubleshooting Wingman ACB.
Sensor blocked	If the system doesn't seem to work at all, the sensor is probably blocked. A diagnostic trouble code (DTC) will also be set. Visually inspect it, clear the blockage, turn the ignition on and run through a power cycle.
Vehicle diagnostic trouble codes (DTCs)	Wingman ACB can not operate and will set a diagnostic trouble code if any of the following vehicle systems also show a diagnostic trouble code: engine, engine cruise, instrument cluster, Bendix® ABS, Bendix® ATC, Bendix® ESP, or transmission. These components must be repaired and cleared of diagnostic trouble codes before troubleshooting Wingman ACB. (NOTE: <i>Clearing the vehicle diagnostic trouble codes may be the only step needed to reestablish ACB function. See Section 4.4: Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i> )
Damaged sensor or bracket	If the vehicle has been in an accident, it is likely the sensor will need to be re-aligned or replaced. Inspect the sensor lens and housing for damage. Sensor discoloration or small scratches may be acceptable. Significant damage will require sensor replacement. Regardless of the exterior condition, check for diagnostic trouble codes outlined in the <i>Section 4.3: Table of Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i> to determine if sensor replacement is necessary.
Damaged connector or wiring	Visually inspect the connector and wire harness for corrosion or chaffing. Refer to <i>Section 4.5: Troubleshooting Diagnostic Trouble Codes: Power Supply</i> of this document for additional troubleshooting.
J1939 network problems	If the entire system is non-functional, it may be a J1939 network problem. Follow the instructions in <i>Section 4.6: Serial Data (J1939) Communications Link</i> .
Power to sensor problems	If the entire system is non-functional, another likely cause may be a lack of power to the sensor. Follow the instructions in <i>Section 4.5: Troubleshooting Diagnostic Trouble Codes: Power Supply</i> .

**TABLE 5 - REVIEW OF POSSIBLE ISSUES**

## 4.0 TROUBLESHOOTING/DIAGNOSTICS

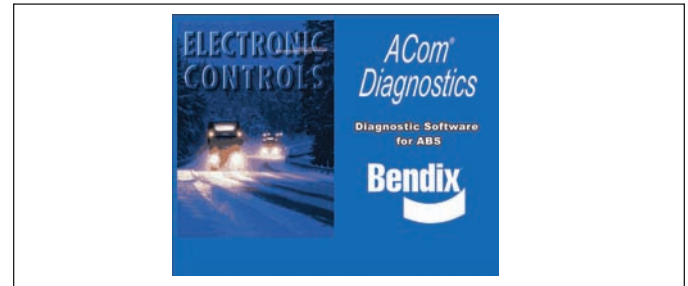
### Section Index

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**IMPORTANT NOTE:** All vehicle diagnostic trouble codes related to the engine, transmission, instrument cluster, engine cruise control and Bendix® ABS, ATC or ESP® systems must first be resolved, with no trouble codes present during the vehicle operation while in cruise control, before attempting to diagnose Bendix® Wingman® ACB diagnostic trouble codes.

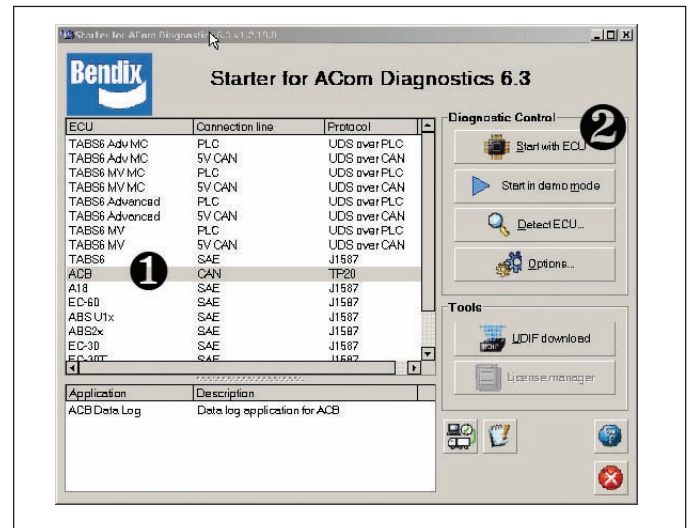
## 4.1 BENDIX® ACOM® DIAGNOSTICS SOFTWARE

ACom® Diagnostics is a PC-based software program available as a free download from the Bendix web site (www.bendix.com) or on a CD from the Bendix Literature Center. This software provides the technician with access to all the available ECU diagnostic information and configuration capability. For Bendix Wingman ACB diagnostics, use Bendix ACom version 6.3 or higher.



**FIGURE 10 - BENDIX® ACOM® DIAGNOSTICS SOFTWARE STARTING ACOM® DIAGNOSTICS**

The Bendix® ACom® Diagnostics software can be started from the desktop shortcut, or from the main Windows® screen with “Start-Programs-Bendix-ACom® Diagnostics.” See Figure 11 and also **Appendix C**. To begin, the technician selects “ACB” from the Starter screen, then “Start with ECU” from the Diagnostic Control panel.

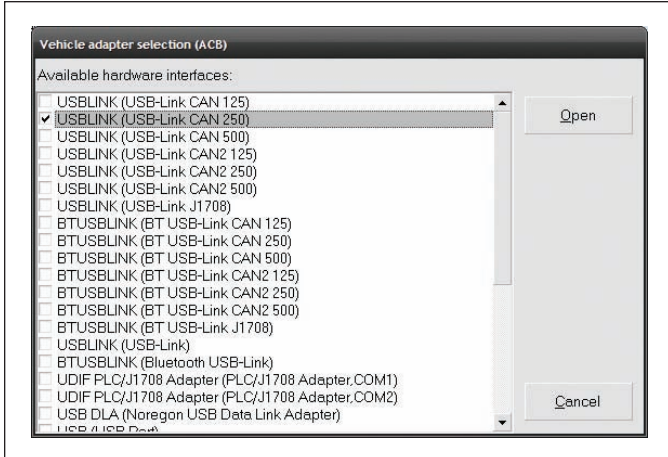


**FIGURE 11 - STARTING BENDIX® ACOM® DIAGNOSTICS SOFTWARE**

**NOTE:** When using ACom Diagnostics for the first time, the service technician will be asked to select the communication adapter for both the ACB and Bendix® EC-60™ controllers. While both controllers will use the same physical adapter, the technician will need to indicate which communication protocol to use for each. Once a successful connection has been made, these steps will no longer be necessary.

The Bendix® ACom® Diagnostics for ABS User Guide is available for download at the [www.bendix.com](http://www.bendix.com) web site and should be used as a reference to all functions of the ACom service tool.

In general, the protocol for ACB is described as CAN or CAN 250. (See Figure 12 for an example of an adapter compatible with ACB). The Bendix® EC-60™ controller protocol will be described as J1708.



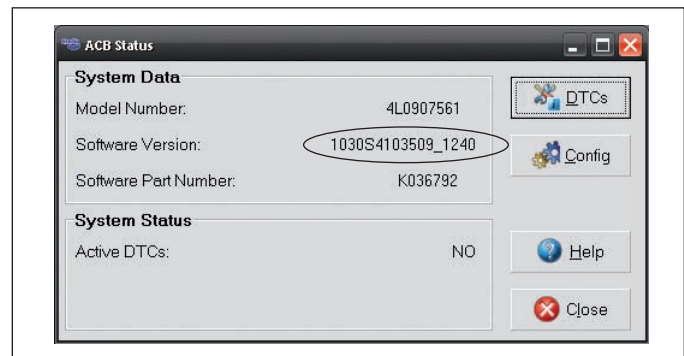
**FIGURE 12 - BENDIX® ACOM® DIAGNOSTICS SOFTWARE - HARDWARE INTERFACE SCREEN**

## 4.2 READING BENDIX® WINGMAN® ACB SYSTEM DIAGNOSTIC TROUBLE CODES (DTCs) USING BENDIX® ACOM® SOFTWARE

If the system generates a Diagnostic Trouble Code (DTC), where a lamp or icon is illuminated on the instrument cluster, then ACom Diagnostics software – version 6.3 or later – is required. Select “ACB” from the starter screen, then “Start with ECU”. Click “DTC” to show the diagnostic trouble codes. **See Appendix C for screen shots.** See Section 4.3 for a complete table showing DTCs and troubleshooting information.

### 4.21 READING BENDIX® WINGMAN® ACB SYSTEM SOFTWARE VERSION

If during troubleshooting, you are asked for the Wingman ACB software version, the number is found on the “ACB Status” tab. See Figure 13. See also Section 5.1 for other system indicators.



**FIGURE 13 - BENDIX® ACOM® DIAGNOSTICS SOFTWARE - ACB STARTER SCREEN SHOWING SOFTWARE VERSION**



### 4.3 BENDIX® WINGMAN® ACB SYSTEM TABLE OF DIAGNOSTIC TROUBLE CODES (DTCs)

See Table 6 below:

Table of Diagnostic Trouble Codes (DTCs), Causes and Recommended Actions (4.3)	
DTC	Actions
40 - Short to ground 41 - Short to battery Voltage too high (includes DTCs 81, 89, 92, 94) Voltage too low (includes DTCs 90, 91, 95, 96)	<p><b>Possible causes:</b>                      These trouble codes result from incorrect ignition, battery supply voltage, or wiring harness issues as measured at the ACB sensor.</p> <p><b>Review the following sections:</b></p> <ul style="list-style-type: none"> <li>• 4.5: <i>Ignition Voltage Too Low</i></li> <li>• 4.5: <i>Ignition Voltage Too High</i></li> <li>• 4.5: <i>Power Supply Tests</i></li> <li>• 4.8: <i>Troubleshooting Wiring Harnesses</i></li> </ul> <p><b>Perform the following:</b></p> <ul style="list-style-type: none"> <li>• Verify ignition supply voltage to the ACB sensor is between 9 to 16 VDC.</li> <li>• Visually check for damaged or corroded connectors.</li> <li>• Visually check for damaged wiring.</li> <li>• Clear the Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i>. If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
55 - Maximum misalignment value is reached 56 - Fast misalignment value is reached  57 - Slight misalignment value is reached (This trouble code will not cause ACB to disable. Loss of performance following a vehicle or following distance alerts may be observed.)	<p><b>Possible causes:</b>                      SENSOR OUT OF ALIGNMENT</p> <p><b>Review the following sections:</b></p> <ul style="list-style-type: none"> <li>• 6.09: <i>Check Lateral Alignment</i></li> <li>• 6.10: <i>Adjust Lateral Alignment</i></li> <li>• 6.11: <i>Reset the Misalignment Value</i></li> </ul> <p><b>Perform the following:</b>                      Clear the Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i>.                      If the error returns, call Bendix for assistance at 1-800-AIR-BRAKE.</p>
83 - Invalid Temperature 84 - Temperature too high 85 - Temperature too high (All) Internal ACB sensor errors 152 - Transmission ratio learning process not completed	<p><b>Possible causes:</b>                      Some error conditions may occur at extreme high or low temperatures. These trouble codes must be diagnosed with the ambient temperature above 32°F (0°C).</p> <p><b>Perform the following:</b></p> <ul style="list-style-type: none"> <li>• Clear the Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
144 - Vehicle is not providing expected deceleration during engine retarder or foundation braking	<p><b>Possible causes:</b>                      Brake system and/or engine retarder are not performing as they should.</p> <p><b>Perform the following:</b></p> <ul style="list-style-type: none"> <li>• Check engine, and engine retarder trouble codes.</li> <li>• Inspect brake mechanical and pneumatic system for proper operation.</li> <li>• Clear the Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>

TABLE 6 - DIAGNOSTIC TROUBLE CODES (PAGES 17-20)

**Table of Diagnostic Trouble Codes (DTCs), Causes and Recommended Actions (4.3)**

DTC	Actions
<p>153 - J1939 All vehicle communications lost                      155 - J1939 All vehicle communications lost                      157 - J1939 signal error: ABS fully operational                      158 - J1939 signal error: EBS brake switch                      159 - J1939 signal error: ABS active                      160 - J1939 signal error: ASR engine control/                      ASR brake control active                      161 - J1939 signal error: ABS based wheel                      speed                      163 - J1939 signal error: Foundation brake use                      165 - Error in yaw rate signal                      168 - J1939 signal error: Actual retarder percent                      torque                      169 - J1939 signal error: Actual retarder percent                      torque                      170 - J1939 signal error: Actual retarder percent                      torque                      171 - J1939 signal error: Driver demand retarder                      percent torque                      172 - J1939 signal error: Driver demand retarder                      percent torque                      173 - J1939 signal error: Driver demand retarder                      percent torque                      174 - J1939 signal error: Gross combination                      vehicle weight                      175 - J1939 signal error: Cruise control enable                      switch                      187 - J1939 signal error: Engine speed                      188 - J1939 signal error: Actual engine percent                      torque                      189 - J1939 signal error: Nominal friction percent                      torque                      190 - J1939 signal error: Driver's demand                      engine percent torque                      191 - J1939 signal error: Accelerator pedal                      position 1                      192 - J1939 signal error: Engine reference                      torque                      197 - J1939 signal error: CC active                      198 - J1939 signal error: CC set speed</p>	<p><b>Possible causes:</b>                      J1939 missing signal on the communication link, or the source of the signal is indicating an error in the signal.</p> <p><b>Review the following sections:</b></p> <ul style="list-style-type: none"> <li>• 1.09: <i>Sensor Interchangeability</i></li> <li>• 4.6: <i>J1939 Serial Data Communications Link</i></li> <li>• 4.7: <i>J1939 Engine Communications Test Procedure</i></li> <li>• 4.6: <i>J1939 Troubleshooting Procedure</i></li> <li>• 4.8: <i>Troubleshooting Wiring Harnesses</i></li> </ul> <p><b>Perform the following:</b></p> <ul style="list-style-type: none"> <li>• Check for loss of data communications.</li> <li>• Check for damaged or reversed J1939 wiring.</li> <li>• Check for damaged or corroded connectors.</li> <li>• Check for other devices inhibiting J1939 communications.</li> <li>• With the power off, check the resistance across connector pins (60 ohm).</li> <li>• Check the reverse polarity of J1939 communication circuits at the engine, the ABS and the ACB sensor, and at the harness interconnections.</li> <li>• Check the source of the signal to identify why the signal has an error.</li> <li>• Check the engine, engine retarder, and ABS for trouble codes using the manufacturer's diagnostic procedures. Either the engine, engine retarder, or the ABS are the source of the signal. If the signal is in error, then the issue is from the sensor or switch input to one of these controllers. The signal with the trouble code may be computed from one or more inputs to these other controllers and may use an additional J1939 signal from another controller. The controller that broadcasts the signal must be investigated first, but the origin of the signal could be another component. Some examples are gross vehicle weight and various engine torque signals.</li> <li>• Clear the Bendix® Wingman® ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTC)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
<p>156 - ABS off-road switch is turned on</p>	<p><b>Perform the following:</b>                      Check engine, and engine retarder trouble codes.                      Inspect and troubleshoot the cruise control system wiring, switches, etc. for proper operation.</p> <ul style="list-style-type: none"> <li>• Clear the Bendix® Wingman® ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul> <p><i>NOTE: ACB is disabled when the ABS off-road switch is ON. However, the engine cruise control may still operate. This trouble code will result in the engine cruise control being de-activated.</i></p>

**TABLE 6 - DIAGNOSTIC TROUBLE CODES (PAGES 17-20)**

**Table of Diagnostic Trouble Codes (DTCs), Causes and Recommended Actions (4.3)**

DTC	Actions
<p>162 - DTC showing a problem in the interface of the ACB brake system</p>	<p><b>Possible causes:</b></p> <ul style="list-style-type: none"> <li>• One or more components within the Bendix® EC-60™ ABS or ESP® stability system have active trouble codes that need to be diagnosed and corrected. In this case, inspect the vehicle's mechanical and pneumatic brake system for proper operation. Correct the issues found in the Bendix® ABS or ESP® systems and clear all trouble codes before proceeding to the ACB system.</li> <li>• The controller is recognizing that there are components installed that have part numbers incompatible with the current system configuration. (For example, when a technician attempts to install a more recent radar sensor onto a vehicle with an earlier ACB system.) Contact the dealer or call the Bendix Tech Team at 1-800-AIR-BRAKE for the correct part number to use, or the re-programming steps to take for the newer part number to be accepted.</li> </ul> <p><b>After addressing the possible causes:</b></p> <ul style="list-style-type: none"> <li>• Clear the Bendix® Wingman® ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTC)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
<p>164 - ACB braking overuse</p>	<p><b>Possible causes:</b> The system was used improperly, such as on grades.</p> <p><b>Review the following sections:</b> Section 1.07: <i>ACB Brake Overuse Alert</i></p> <p><b>Perform the following:</b></p> <ul style="list-style-type: none"> <li>• Check engine, and engine retarder trouble codes.</li> <li>• Clear the Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
<p>186 – J1939 Outside air temperature signal not available or signal in error. (This trouble code alone will not cause ACB to disable. The heater on the lens of the ACB sensor will not operate and will not prevent ice or snow build up. The sensor may become blocked and then ACB will disable, logging a trouble code 201.)</p>	<p><b>Review the following sections:</b></p> <ul style="list-style-type: none"> <li>• 4.6: <i>J1939 Serial Data Communications Link</i></li> <li>• 4.6: <i>J1939 Engine Communications Test</i></li> <li>• 4.8: <i>J1939 Troubleshooting Procedure Troubleshooting Wiring Harnesses</i></li> <li>• <i>Diagnostic Trouble Code 201</i> in Table 6</li> </ul> <p><b>Perform the following:</b> Check for loss of data communications.</p> <ul style="list-style-type: none"> <li>• Check for damaged or reversed J1939 wiring.</li> <li>• Check for damaged or corroded connectors.</li> <li>• Check for other devices inhibiting J1939 communications.</li> <li>• With the power off, check the resistance across connector pins (60 ohm) J1939.</li> <li>• Check the reverse polarity of J1939 communications circuits at engine, ABS, and ACB sensor and at harness interconnections.</li> <li>• Check the source of the signal for why the signal has an error.</li> <li>• Check engine, and vehicle for trouble codes using the manufacturers diagnostic procedures. The engine, or a vehicle controller may be the sources of the signals. If the signal is in error, then the issue is from the sensor input to one of these controllers.</li> </ul> <p>Clear the Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® Diagnostic Trouble Codes</i>. If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</p>

**TABLE 6 - DIAGNOSTIC TROUBLE CODES (PAGES 17-20)**

Table of Diagnostic Trouble Codes (DTCs), Causes and Recommended Actions (4.3)	
DTC	Actions
193 - J1939 signal error: Reference velocity unavailable	<p><b>Possible causes:</b> One or more components within the Bendix® EC-60™ ABS, or ESP® stability system have active trouble codes that need to be diagnosed and corrected.</p> <p><b>Perform the following:</b></p> <ul style="list-style-type: none"> <li>• Inspect the brake mechanical and pneumatic system for proper operation. Correct any issues found in the ABS or ESP systems. (See <i>Bendix Service Data sheet SD-13-4869</i> for more information.) Clear all trouble codes before proceeding to the ACB system.</li> <li>• Clear the Bendix® Wingman® ACB system trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTC)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
199 - ACB self disable  Some system or signal or component caused the ACB to be disabled. Engine cruise control is unavailable and should not operate when the ACB is disabled.	<p><b>Perform the following:</b> Check engine, and engine retarder trouble codes. Inspect and troubleshoot the cruise control system wiring, switches, etc. for proper operation.</p> <ul style="list-style-type: none"> <li>• Clear the Wingman ACB trouble codes by cycling the power. Start the engine.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
201 - Sensor lens is dirty or blocked 202 - Forward vehicle is lost or too close to sensor	<p><b>Possible causes:</b> These trouble codes may arise from infrequent conditions that could occur normally.</p> <p><b>Perform the following:</b></p> <ul style="list-style-type: none"> <li>• Check for ACB lens obstruction. Clean dirt or packed snow or ice from the lens if present.</li> <li>• Clear the Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>
203 - ACB and ABS have a mismatch of the Collision Mitigation Configuration	<p><b>Possible causes:</b></p> <ul style="list-style-type: none"> <li>• The controller is recognizing that there are components installed that have part numbers incompatible with the current system configuration. (For example, when a technician attempts to install a more recent radar sensor onto a vehicle with an earlier ACB system, or a replacement ECU is programmed incorrectly for this vehicle's system.) Contact the dealer or call the Bendix Tech Team at 1-800-AIR-BRAKE for the correct part number to use, or the reprogramming steps to take for the newer part number to be accepted.</li> </ul> <p><b>After addressing the possible causes:</b></p> <ul style="list-style-type: none"> <li>• Clear the Bendix Wingman ACB trouble codes using the procedure in Section 4.4: <i>Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTC)</i>.</li> <li>• If the error returns, call the Bendix Tech Team for assistance at 1-800-AIR-BRAKE.</li> </ul>

TABLE 6 - DIAGNOSTIC TROUBLE CODES (PAGES 17-20)



#### 4.4 CLEARING BENDIX® WINGMAN® ACB SYSTEM DIAGNOSTIC TROUBLE CODES (DTCs)

This procedure must be used when troubleshooting the diagnostic trouble codes shown in Table 6.

Clear the Wingman ACB system diagnostic trouble codes (DTC) using the Bendix® ACom® service tool. Click the “Clear” button located on the “Read/Clear Fault Codes” screen. Using ignition power only, power off the vehicle for at least 15 seconds. Next start the engine and run it at idle for at least 15 seconds.

Drive the vehicle and, on a test track or suitable section of roadway, engage the cruise control to verify proper operation.

If the error returns, call Bendix at 1-800-AIR-BRAKE for assistance.

#### 4.5 TROUBLESHOOTING DIAGNOSTIC TROUBLE CODES: POWER SUPPLY

##### IGNITION VOLTAGE TOO LOW

Measure the ignition voltage under load. Ensure that the ignition voltage is greater than 10 VDC (volts DC). Check the vehicle battery and associated components. Inspect for damaged wiring, damaged or corroded connectors and loose connections. Check condition of the fuse.

##### IGNITION VOLTAGE TOO HIGH

Measure the ignition voltage. Ensure that ignition voltage is not greater than 16 VDC. Check the vehicle battery and associated components. Inspect for damaged wiring, damaged or corroded connectors and loose connections.

#### POWER SUPPLY TESTS

1. Take all measurements at the radar sensor harness connector.
2. Place a load (e.g. 1157 stop lamp) across the supply voltage and ground connection. Measure the voltage with the load. The supply voltage on pin 8 to ground should measure between 10 to 16 VDC (volts DC).
3. Check for damaged wiring, damaged or corroded connectors and loose connections.
4. Check the condition of vehicle battery and associated components. Ensure the connection to ground is secure and tight.
5. Using the procedures described by the vehicle manufacturer, check the alternator output for excessive noise.

Power Supply Pin Codes (4.5)		
Pin #	Designation	Description
1	GND (-)	Sensor Ground
2	CAN-H	J1939 High
3	CAN-L	J1939 Low
4	NC	No Connection
5	NC	No Connection
6	NC	No Connection
7	NC	No Connection
8	IGN (+)	Supply Voltage
<i>NOTE: View from pin side</i>		

**TABLE 7 - POWER SUPPLY PIN CODES**

## 4.6 SERIAL DATA (J1939) COMMUNICATIONS LINK

Check for a loss of communications between the Bendix® Wingman® ACB system radar sensor, the ABS controller, the engine ECU, and other devices connected to the J1939 link. Check for damaged or reversed J1939 wiring. Check for corroded or damaged connectors and loose connections. Using procedures described by the vehicle manufacturer, verify the presence of the engine ECU and the ABS controller on the J1939 link.

Verify the engine ECU configuration. Check for other devices inhibiting J1939 communications.

## 4.7 ENGINE COMMUNICATIONS (J1939) TEST PROCEDURE

The Wingman® ACB system requires several J1939 messages from the engine ECU to control the engine and retarder torque for distance control and braking. The ACB system will set a diagnostic trouble code if one of these messages is not present.

Use the engine manufacturer's diagnostic test procedures to verify that there are no errors present in the engine that may prevent the ACB system from controlling the engine or retarder torque.

### J1939 TROUBLESHOOTING PROCEDURE

1. Take all measurements at the harness connector unless otherwise indicated.

**CAUTION:** DO NOT INSERT PROBES INTO THE BACK SIDE OF THE CONNECTOR AS THIS WILL DAMAGE THE SEAL AROUND THE WIRE.

**CAUTION:** DO NOT INSERT ANY PROBE INTO THE PIN ON THE MATING CONNECTOR OF THE RADAR SENSOR THAT IS GREATER THAN 0.62 mm DIAMETER OR SQUARE. THIS WILL DAMAGE THE CONNECTOR PIN AND REQUIRE REPLACEMENT OF THE HARNESS.

2. Check for damaged or reversed J1939 wiring.

If the J1939 HIGH or J1939 LOW wiring circuits are damaged, such as shorting together, the entire J1939 link will be lost. The problem may be intermittent, enabling the J1939 link to operate normally sometimes. In that event, multiple diagnostic trouble codes will be logged in multiple engine and vehicle controllers.

If the J1939 HIGH and J1939 LOW wiring circuits are reversed, communication over the entire J1939 link will not be lost. Only those devices that are outside of the problem point from other devices will not receive, or be able to transmit, data messages.

3. Check for corroded or damaged wiring connector problems such as opens or shorts to voltage or ground.

If the connector terminals are corroded, this may be an indication of water intrusion into the wiring system and possibly into the radar sensor. Replacement of the entire harness is recommended. If the terminals of the radar sensor are corroded, replacement of the radar sensor is recommended.

4. Check for other J1939 devices which may be inhibiting J1939 communication. The service technician should consult the vehicle manufacturer's procedures for other J1939 troubleshooting procedures. The device's power should be removed and measurements made at the ECU pins for shorts to ground and power pins and resistance between the J1939 HIGH or J1939 LOW input circuits.
5. Unplug the radar sensor. With the ignition switch off, measure the resistance (ohms) using a multimeter between harness pins 2 and 3. The reading should be approximately 60 ohms. If it is not, the vehicle wiring should be investigated using procedures described by the manufacturer.
6. Unplug the radar sensor. With the ignition switch off, using a multimeter, measure the resistance in ohms, between harness pins 2 and ground. The measurement should indicate an open circuit or very high resistance. If this is not the case, the vehicle wiring should be investigated using procedures described by the manufacturer.
7. Unplug the radar sensor. With the ignition switch off, using a multimeter, measure the resistance in ohms, between harness pins 3 and ground. The measurement should indicate an open circuit or very high resistance. If this is not the case, the vehicle wiring should be investigated using procedures described by the manufacturer.

## 4.8 TROUBLESHOOTING WIRING HARNESSES

All wire harness connectors must be properly seated to maintain environmental seals. Push the mating connector until it seals with a click. When replacing an ACB radar sensor, check that the wire harness connector is free of corrosion before plugging into a new sensor. Check for corroded or damaged wiring connector problems such as opens or shorts to voltage or ground.

If the connector terminals are corroded, this may be an indication of water intrusion into the wiring system and possibly into the radar sensor. Replacement of the entire harness is recommended. If the terminals of the sensor are corroded, replacement of radar sensor is recommended.

## 5.0 OTHER SYSTEM FEATURES

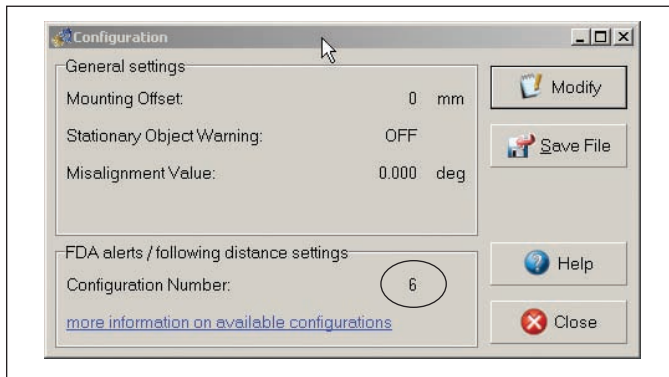
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### 5.1 READING BENDIX® WINGMAN® ACB SYSTEM KEY INDICATORS

To check the Bendix® Wingman® ACB system key indicators such as software version number, Bendix® ACom® Diagnostics version 6.3, or higher, must be used. From the main menu of ACom Diagnostics software, the technician highlights ACB, then clicks “Start with ECU”. The ACB Status screen will appear. Clicking “Config” will display the key system indicators. See Section 4.21 for an example of reading the software version. See Figure 14 for an example of ACom software configuration information. See Appendix D.

*NOTE: ACom® Diagnostics is also used for troubleshooting Bendix® ESP®, ATC, and ABS systems.*



**FIGURE 14 - BENDIX® ACOM® SCREEN SHOWING CONFIGURATION NUMBER**

### 5.2 BENDIX® WINGMAN® ACB DIAGNOSTIC TROUBLE CODE (DTC) SELF CLEARING

Many of the diagnostic trouble codes (DTCs) will automatically clear when the cause of the problem is corrected. When the technician troubleshoots a diagnostic trouble code, it is recommended that the Bendix® ACom® Diagnostics (version 6.3 or higher) service tool be used to clear the diagnostic trouble codes as directed by the repair procedure.

Some codes will clear immediately and the functionality will resume. Some codes will clear after powering off the ignition for about 15 seconds and then turning it back on. Other codes will clear after the engine runs for about 15 seconds.

If the vehicle’s cruise control can be engaged, that indicates all Wingman ACB trouble codes have been cleared.

### 5.3 FOLLOWING DISTANCE ADJUSTMENT SWITCH (OPTIONAL)

If the vehicle is equipped with the following distance adjustment switch and the following distance does not change after an adjustment is made, the switch, wiring, or a controller on the vehicle should be checked using the diagnostic procedures described by the vehicle manufacturer. The ACB radar sensor receives the driver’s desired following distance on the J1939 data communication link from a controller on the vehicle. No diagnostic trouble code will be set if the vehicle is not equipped with a following distance adjustment switch.

## 5.4 CONFIGURING BENDIX® WINGMAN® ACB FOLLOWING DISTANCE ALERTS

Multiple alert and distance setting strategies, known as Following Distance Alert (FDA) configurations, can be chosen using the Bendix® ACom® Diagnostics tool. In ACom software (version 6.3 or higher), the service technician will find a selection box called “Configuration Number” which gives the service technician the choices shown in Figure 15 and in Table 8.

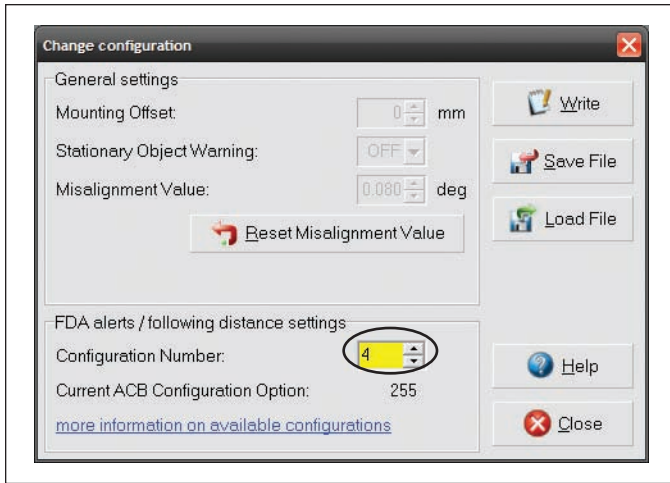
See Appendix B for an example of following distance alerts for systems where a Bendix® Driver Interface Unit (DIU) is used.

**Note 1:** For Configurations 8 and 9 the stationary object alert minimum activation speed is 30 mph. All other configurations are 10 mph.

Configuring Wingman® ACB Following Distance Alerts (5.4)						Stationary Object Alert
Configuration No.	Option	Following Distance Audible Alert (sec.)			Default ACB Following Distance (seconds)	Minimum Alert Activation Speed
		Alert 1: Slow	Alert 2: Medium	Alert 3: Fast		
1 (Bendix Default)	City	—	—	0.5	2.8	10 mph
	Highway (>37 mph)	1.5	1.0	0.5		
2	City	—	—	0.5	3.5	10 mph
	Highway (>37 mph)	1.5	1.0	0.5		
3	City	—	1.5	1.0	2.8	10 mph
	Highway (>37 mph)	2.0	1.5	1.0		
<b>4</b>	City	—	1.5	1.0	3.5	10 mph
	Highway (>37 mph)	2.0	1.5	1.0		
5	City	—	1.5	1.0	3.5	10 mph
	Highway (>37 mph)	3.0	2.0	1.0		
6	City	3.0	1.5	1.0	3.5	10 mph
	Highway (>37 mph)	3.0	2.0	1.0		
7	City	—	—	0.2	2.8	10 mph
	Highway (>37 mph)	—	—	0.2		
8 <i>See Note 1 above</i>	City	—	—	0.5	1.7	30 mph
	Highway (>37 mph)	1.5	1.0	0.5		
9 <i>See Note 1 above</i>	City	—	—	0.5	2.3	30 mph
	Highway (>37 mph)	1.5	1.0	0.5		

**TABLE 8 - CONFIGURING FOLLOWING DISTANCE ALERTS (FDA) FOLLOWING DISTANCE (SHOWING CONFIGURATION NUMBER FOUR HIGHLIGHTED FOR COACH APPLICATIONS ONLY).**





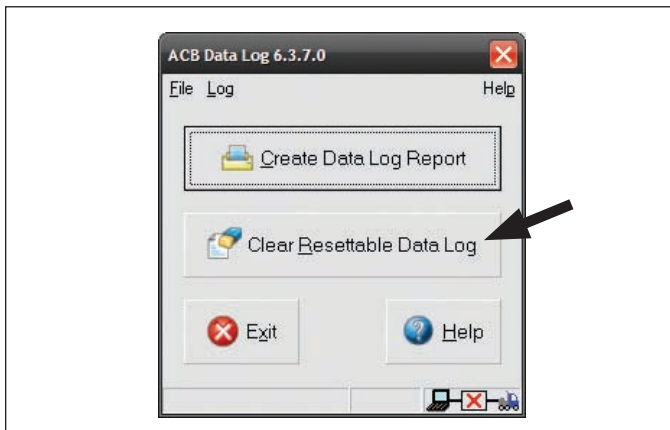
**FIGURE 15 - BENDIX® ACOM® DIAGNOSTICS – CONFIGURATION NUMBER (SHOWING CONFIGURATION FOUR SELECTED). SEE ALSO TABLE 8.**

Changing configuration allows the fleet user to adjust both the following distance alerts and the following distance behind a detected forward vehicle. See Figure 15.

## 5.5 EXTRACTING BENDIX® WINGMAN® ACB SYSTEM DATA

### 5.5.1 DATA AVAILABILITY

Data will not be stored by the system until the “Clear Resettable Data Log” (see Figure 16) is selected and the proper Bendix® ACom® Diagnostics license key is present. Contact Bendix (1-800-AIR-BRAKE) for the ACom Diagnostics software license key and the set-up procedure.



**FIGURE 16 - CLEARING THE RESETTABLE LOG**

### 5.5.2 DATA OVERVIEW

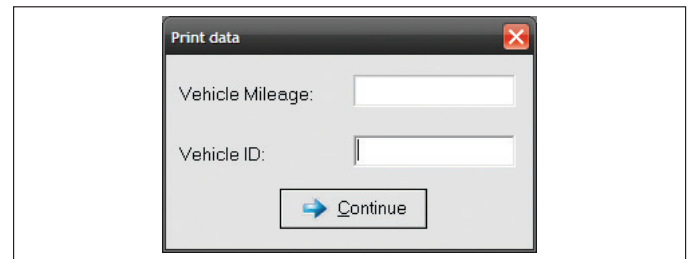
At the fleet’s discretion, Wingman ACB makes data available (see Figure 19), in a data log, regardless of whether or not ACB is used. The log can be reset using the Bendix ACom Diagnostics software as often as needed.

### 5.5.3 EXTRACTING DATA AND SAVING A REPORT

The ACom Diagnostics tool and User Guide is available online at “ABS Software” link under “Services and Support” on the Bendix website (www.bendix.com). Use this manual for specific instructions on extracting data from the Wingman® ACB system.

After a successful connection, the service technician will be presented with the window shown in Figure 16.

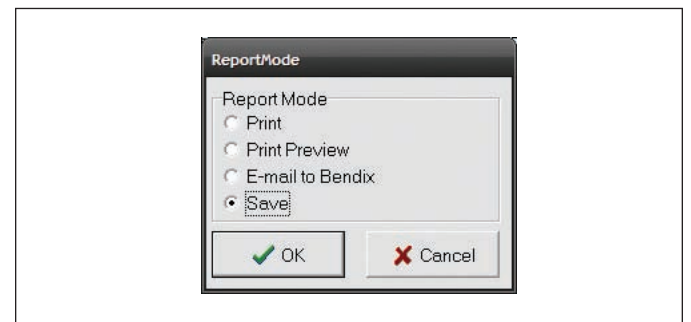
Select “ACB Data Log” and click “Start ACB Data Log”. The service technician will be asked to enter the vehicle ID and mileage. This data will be stored in the report. See Figure 17.



**FIGURE 17 - VEHICLE DATA**

The service technician can choose whether to “Print”, “Print Preview”, “E-mail”, or “Save” the report to disk. See Figure 18. The data can be saved as a comma delimited file or an HTML web page file.

See Figure 19 on next page for a sample report.



**FIGURE 18 - REPORT MODE**

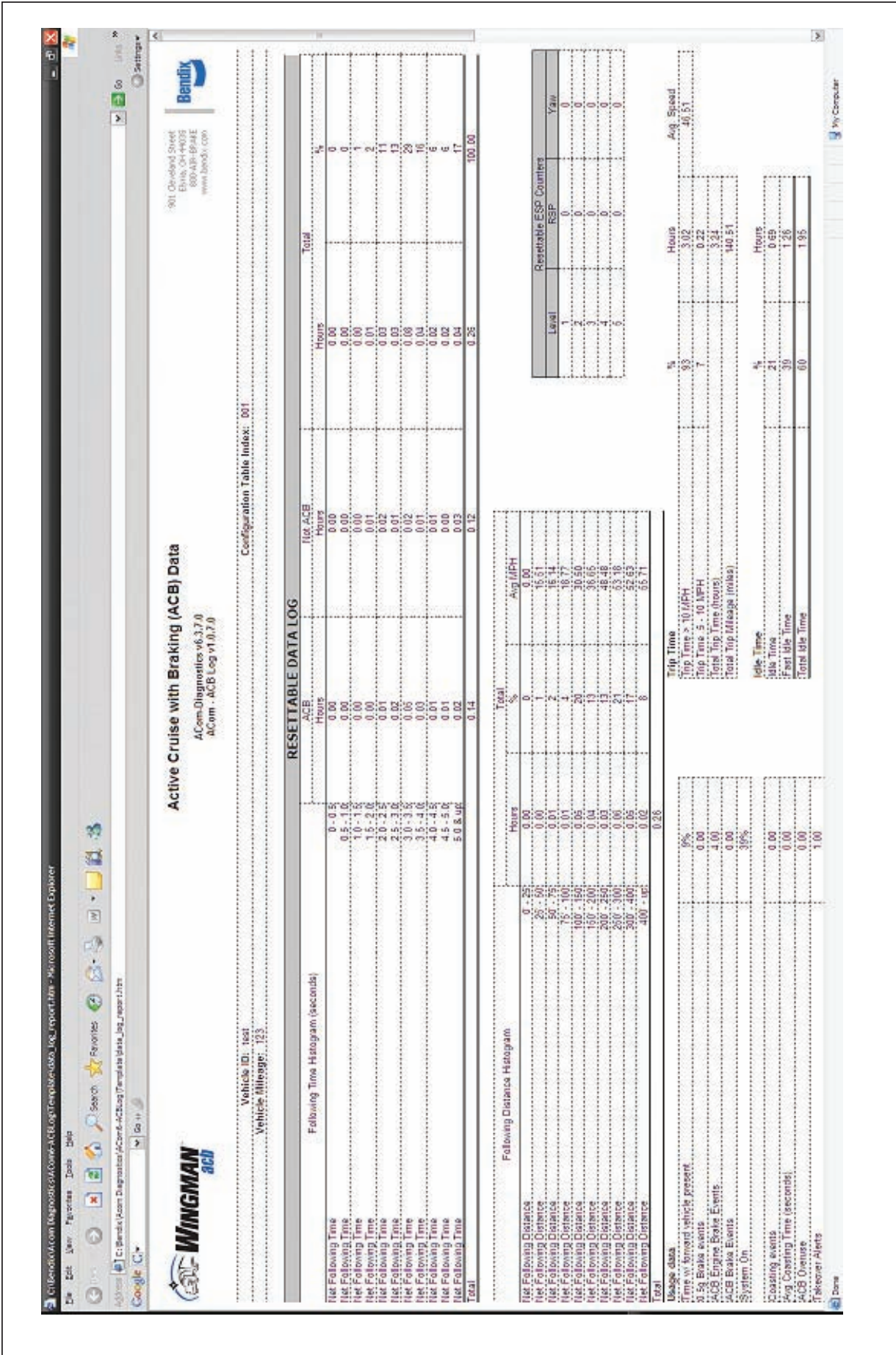


FIGURE 19 - TYPICAL ACB VEHICLE REPORT

## 6.0 BENDIX® WINGMAN® ACB SENSOR MOUNTING AND INSTALLATION

Note: This section only covers Bendix-supplied mounting arrangements. (See Figure 20 for Bendix-supplied mounting arrangement. At time of printing, Bendix-supported mounting arrangements are used on Mack® and Volvo® trucks). For other mounting arrangements consult the OEM.

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### 6.01 VEHICLE APPLICATIONS

The Wingman ACB system radar sensor can be mounted and installed only on vehicles that have Wingman ACB already installed. At this time ACB cannot be retrofitted onto vehicles, even if that vehicle is equipped with the Bendix® ESP® stability system.

### 6.02 ACB RADAR SENSOR MOUNTING

When mounting an ACB radar sensor, the wire harness connector should always point down. The ACB sensor assembly is mounted to the front of the vehicle using an adjustable bracket. This adjustable bracket allows for the ACB sensor to be properly aimed laterally and vertically to maximize ACB system performance.

The ACB assembly should always be mounted in the original OEM location. If this location is not in the center of the vehicle, the mounting offset will need to be programmed through Bendix® ACom® Diagnostics software; see Section 6.09: Check Lateral Alignment.

For proper operation of your Wingman ACB system, adhere to the following guidelines:

- The ACB sensor assembly should be rigidly installed on the vehicle following all OEM recommended torque specifications.
- The ACB sensor assembly should be installed in the original OEM designated location.
- The ACB sensor cover should always be installed. This helps protect components such as the connector and wiring harness from road debris.
- The ACB sensor assembly must be oriented so that the electrical connector points down. **Mounting the radar upside down will impair performance significantly.**
- The radar's field of view must NOT have interference from any other vehicle components such as bumpers, cow-catcher bumpers, engine blankets, seasonal decorations, or any other commonly mounted front-of-vehicle components.

*NOTE: If original OEM installation was behind a translucent panel, this panel must be reinstalled. Check the panel for damage or scratches that may impact the performance of ACB. Replace the panel, if necessary, with an original OEM supplied panel. Do not paint over the panel.*

### 6.03 REPLACEMENT PARTS

Replacement parts exist for all components shown in Figure 20. Parts are available from any Bendix authorized parts supplier.

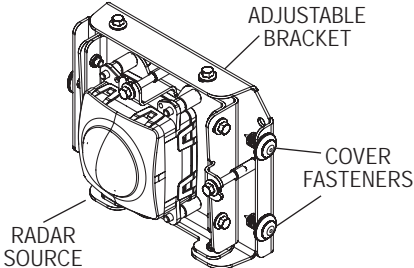
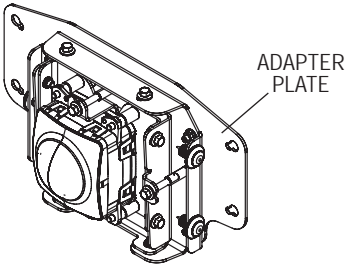
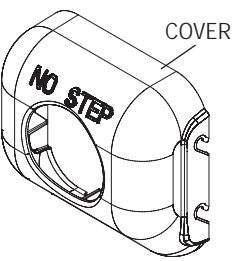
		
<p><b>Typical ACB Sensor Assembly</b></p>	<p><b>Typical ACB Assembly with Adaptor Plate</b></p>	<p><b>ACB Cover</b></p>
<ul style="list-style-type: none"> <li>• ACB Radar Sensor (or ACB Sensor)</li> <li>• Adjustable Bracket</li> <li>• Cover Fasteners – Plastic Tree Style</li> </ul>	<ul style="list-style-type: none"> <li>• Radar</li> <li>• Adjustable Bracket</li> <li>• Adaptor Plate</li> <li>• Cover Fasteners – Plastic Tree Style</li> </ul>	<ul style="list-style-type: none"> <li>• Cover Fasteners – Plastic Tree Style (Note: cover may vary depending on OEM installation)</li> </ul>

FIGURE 20 - TYPICAL ACB ASSEMBLIES AND COVER WITH SERVICE REPLACEMENT PARTS



## 6.04 ACB SENSOR ALIGNMENT

Accurate vertical and lateral alignment of the ACB sensor is critical for proper operation of Bendix® Wingman® ACB. Improper alignment will cause false warnings, missed warnings and a diagnostic trouble code in the system.

The ACB sensor is mounted to the front of the vehicle using an adjustable bracket. Use the following procedures to align the ACB sensor in its adjustable bracket:

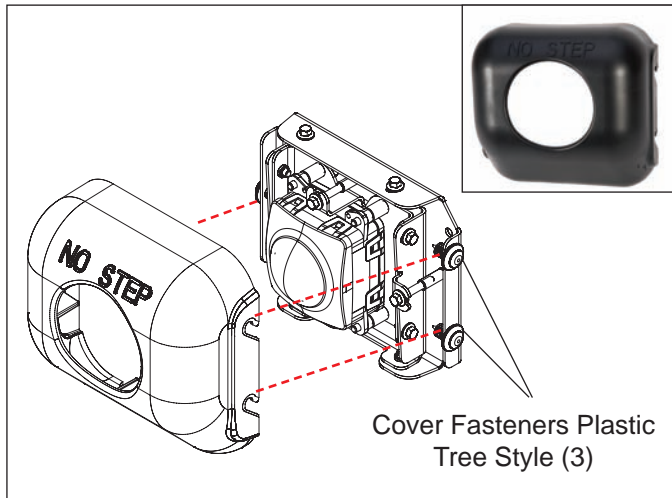


FIGURE 21 - ACB COVER AND PLACEMENT OVER ACB SENSOR ASSEMBLY

## 6.05 ACB COVER REMOVAL

To remove the ACB cover, use a slight force to pull the cover up and away from the bracket. The three cover fasteners do not need to be removed. See Figures 21 and 22.



FIGURE 22 - ACB COVER REMOVAL

## 6.06 BENDIX® ACB ALIGNMENT TOOL

The Bendix® ACB Alignment Tool (Bendix part no: K041451) is used to align the ACB sensor both vertically and laterally. It fastens magnetically to the ACB sensor assembly for easy placement and removal. See Figures 23-25.

## 6.07 CHECK VERTICAL ALIGNMENT

Tools needed: ACB Alignment Tool, available from Bendix parts outlets (Bendix part no. K041451).

If the vehicle has an air suspension system, the system must be charged prior to alignment. If the system is not charged, the vertical alignment will be off and the ACB system will not perform correctly.

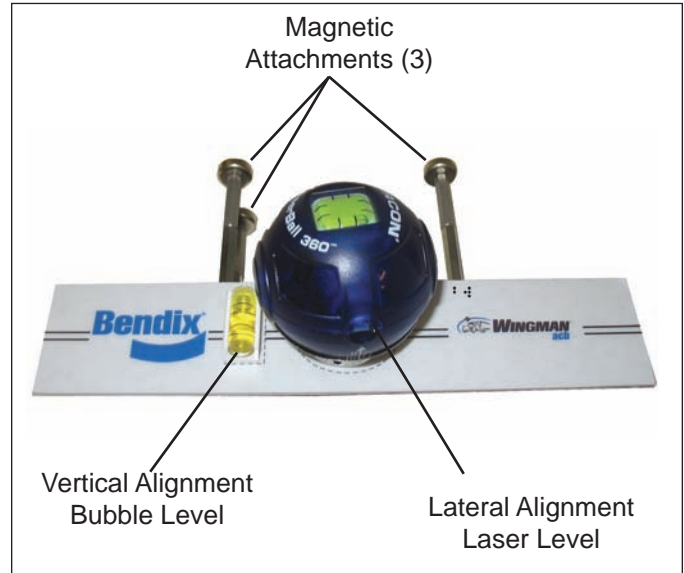


FIGURE 23 - BENDIX® ACB ALIGNMENT TOOL

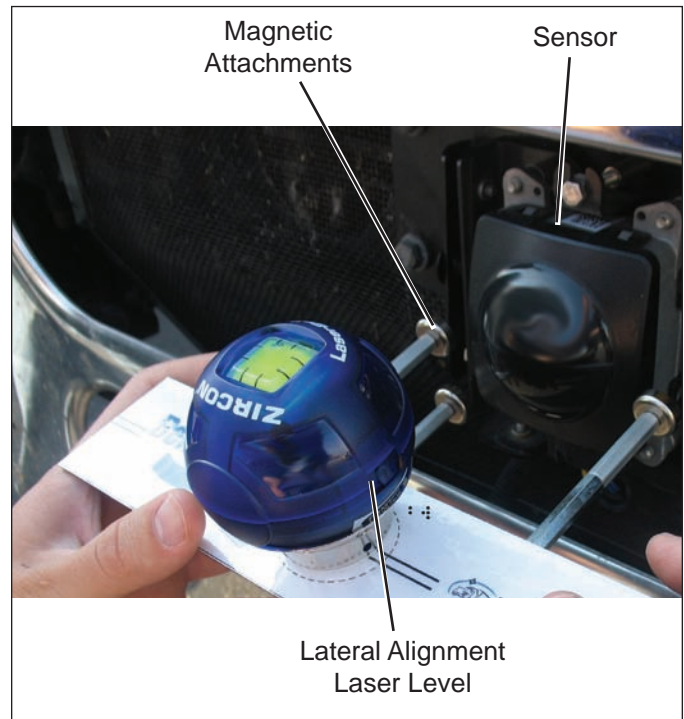
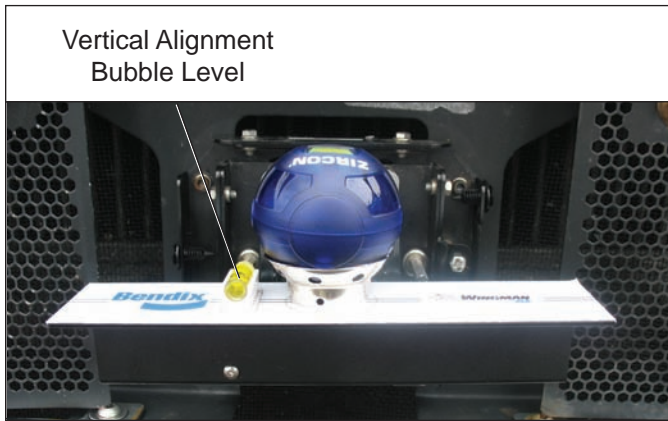
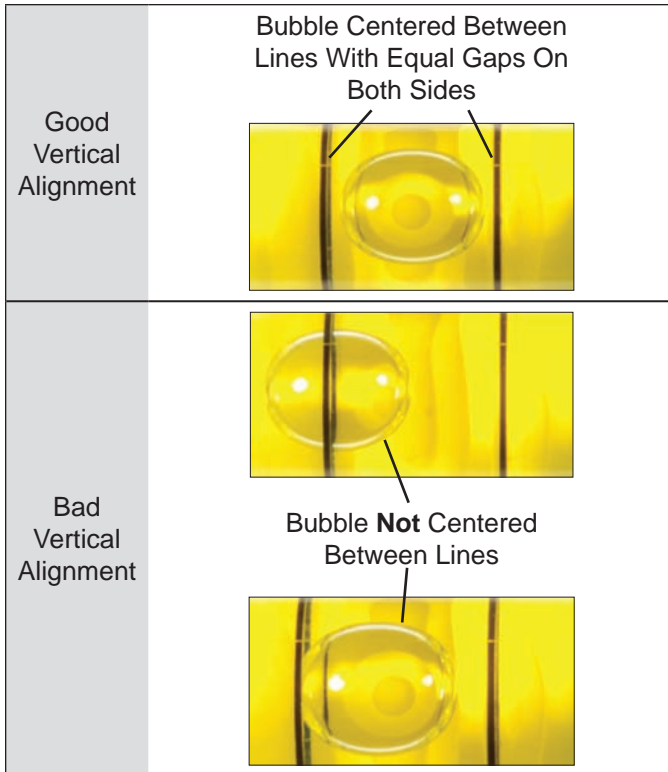


FIGURE 24 - ATTACHING THE ALIGNMENT TOOL





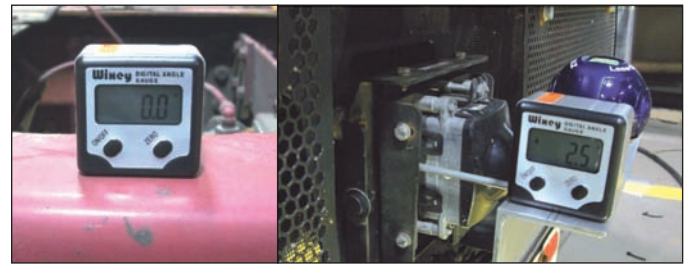
**FIGURE 25 - ALIGNMENT TOOL ATTACHED TO BRACKET**



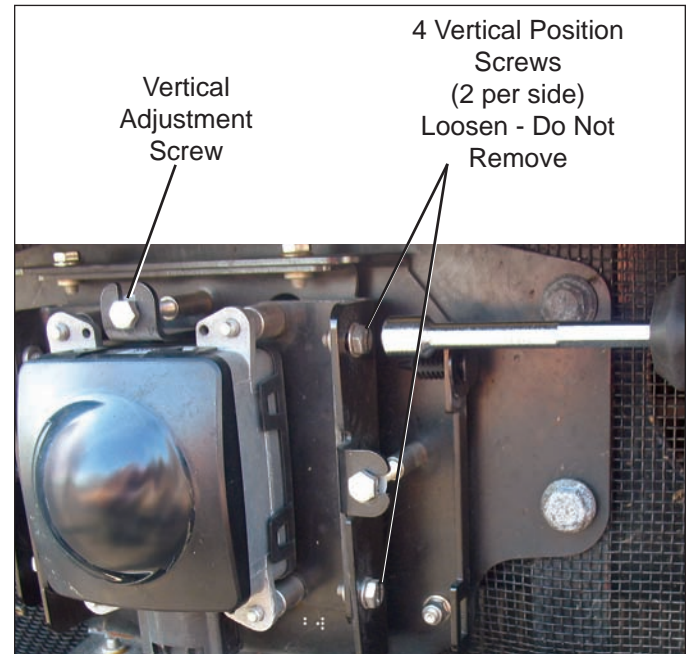
**FIGURE 26 - VERTICAL ALIGNMENT INDICATION**

If the vehicle has stationary object warning enabled, **a digital inclinometer must be used for vertical alignment** as described in Step 6.07.1. Use the Bendix® ACom® Diagnostics configuration tab to verify if stationary object warning is enabled. See Figure 14, on page 23.

6.07.1. Park the vehicle on a flat, level surface. (NOTE: If the service technician is unable to park the vehicle on a level floor, a digital inclinometer can be used to align the sensor vertically. First, zero the inclinometer on the frame rail. Then, use it in place of the bubble level in the vertical alignment process – see Figure 27.)



**FIGURE 27 - INCLINOMETER**



**FIGURE 28 - VERTICAL ADJUSTMENT**

For best results the ACB sensor should be aligned  $-0.5^{\circ}$  to  $-0.7^{\circ}$  downward. Vertical alignment outside these bounds will result in increased false warnings and possible driver complaints.

2. Remove the cover as shown previously in Section 6.05: *Cover Removal*.
3. Position the alignment tool over the sensor so that it straddles the sensor. Attach the alignment tool to the bracket / sensor assembly with its magnet attachments. See Figures 24 and 25.
4. Verify that the vertical alignment bubble is centered between the two lines as shown in Figure 24. If it is not, follow the instructions below from Section 6.08: *Vertical Adjustment Procedure* to align the sensor. When using the bubble level for vertical alignment, it is important that the bubble be centered with equal space between edges of the bubble and the reference lines. System performance will be too degraded if the bubble touches either reference line. If using inclinometer, sensor alignment should be  $-0.5^{\circ}$  downward. See Figure 24.

## 6.08 VERTICAL ADJUSTMENT PROCEDURE

Tools needed: 7 mm box wrench and Bendix® ACB alignment tool.

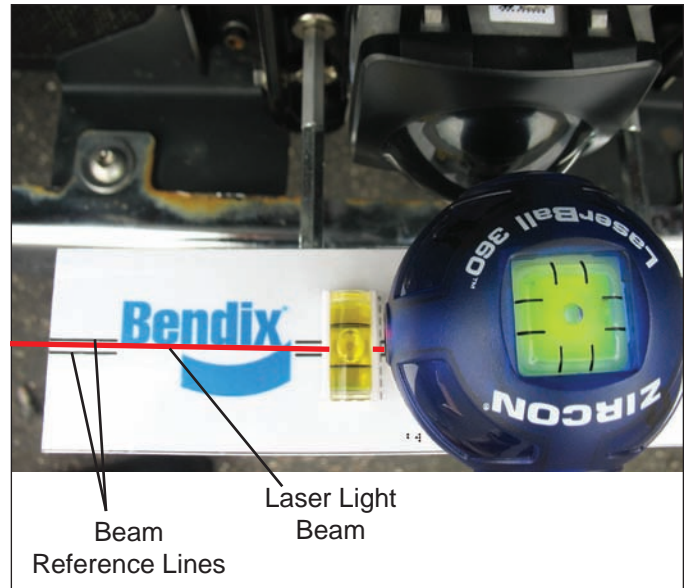
*NOTE: Complete these steps only if a vertical adjustment is necessary.*

1. With the Bendix alignment tool still in place, loosen the four vertical position screws. DO NOT remove these screws. See Figure 28.
2. Adjust the vertical adjustment screw until the desired alignment is reached. Turn the screw clockwise or counterclockwise depending on the vertical direction (up or down) needed. Clockwise aligns the sensor up and counterclockwise moves the sensor down.
3. Re-tighten the four vertical position screws to hold desired alignment in place.
4. Continuously check vertical alignment with the bubble level as adjustments are made.
5. Check vertical alignment one more time after tightening the four vertical position screws. For proper bubble position refer to Figure 26.

## 6.09 CHECK LATERAL ALIGNMENT

Tools needed: Bendix® ACB alignment tool and a ruler or tape measure.

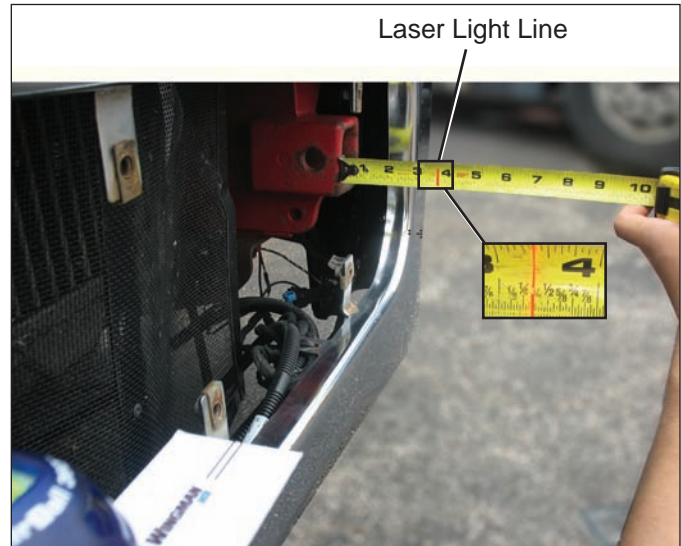
1. Park vehicle on a flat, level surface such as a garage floor. The vertical alignment must be checked and adjusted, if needed, before the lateral adjustment can be made.
2. Remove the cover as shown previously in Section 6.05: *Cover Removal*.
3. Position the ACB alignment tool over the ACB sensor so that it straddles the sensor. Attach the alignment tool to the bracket / sensor assembly with its magnet attachments. See Figures 24 and 25.
4. Turn the switch on the side of the lateral alignment laser level to the on position and place it in its cradle, making sure it is sitting level. Align the laser beam between the reference lines on the Bendix ACB alignment tool left or right. See Figure 29.



**FIGURE 29 - POSITIONING THE LASER LEVEL**

*NOTE: The technician must be extremely careful during the laser positioning process to double-check the values measured on each side of the truck. Be sure to check back and forth for each side of the sensor several times to ensure accuracy.*

5. Using a ruler or tape measure, measure the distance from a symmetrical vehicle point (such as the tow hooks) to the laser light line. Record this measurement. See Figure 30.



**FIGURE 30 - LATERAL ALIGNMENT VERIFICATION**

6. Repeat the same process for the opposite side and measure the reference distance to the laser line.



- Compare the left and right distance measurements. A properly aligned sensor will have the same measurement from side to side. If these two dimensions are within 1/8" (3 mm), no alignment is necessary. If not, follow the instructions in Section 6.10: *Lateral Adjustment Procedure*.

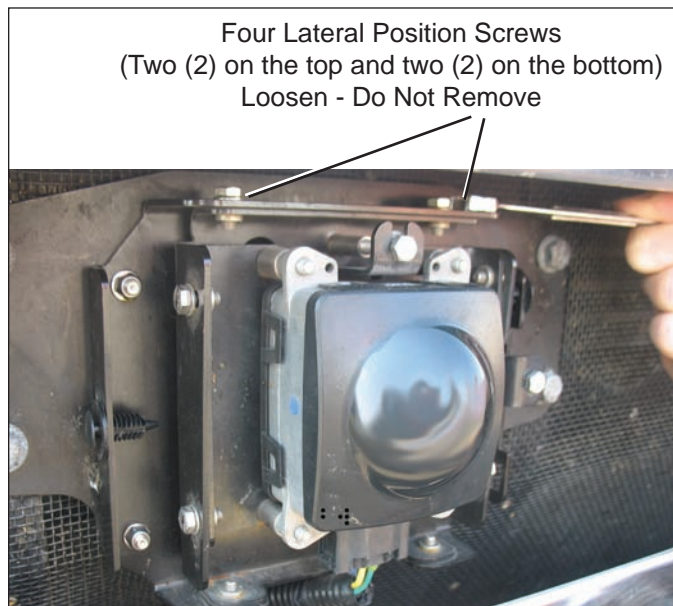
If the value is less than (<) -1.3°, or greater than (>) 1.3°, the system will issue a trouble code. The service technician should align the ACB sensor laterally. A positive value means the sensor should be aligned toward the driver side. A negative value means the sensor should be aligned towards the passenger side. The vehicle must be driven at least 20 miles between adjustments. See "Misalignment Value" in Figure 15.

**NOTE:** Lateral alignment also can be checked with Bendix ACom® Diagnostics (version 6.3 or higher). A value between -0.8° and 0.8° is acceptable and the system should operate normally. A value between -0.8° to -1.3° OR 0.8° to 1.3° means the sensor is misaligned and system performance will be degraded. The service technician should align the ACB sensor using the procedures noted in the following sections.

## 6.10 LATERAL ADJUSTMENT PROCEDURE

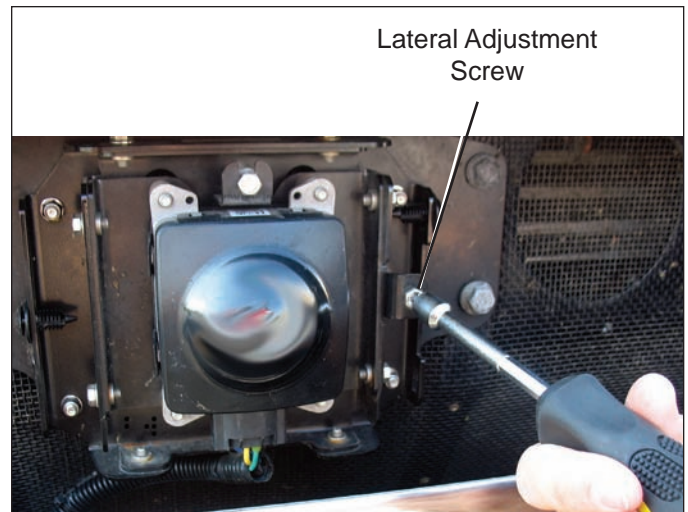
Complete these steps only if lateral adjustment is necessary.

- Loosen the four lateral position screws. DO NOT fully remove them. See Figure 31.



**FIGURE 31 - LATERAL POSITION SCREWS**

- Adjust the lateral adjustment screw until the desired alignment is reached. DO NOT remove screws. See Figure 32. Use steps 4 through 7 in Section 6.09: *Check Lateral Alignment* section to measure.



**FIGURE 32 - LATERAL ADJUSTMENT**

- Retighten the four lateral position screws to hold the desired alignment in place.
- Recheck the lateral alignment as described above.
- After the lateral alignment procedure is complete, use the Bendix ACom Diagnostics service tool to reset the misalignment value.

## 6.11 RESET LATERAL MISALIGNMENT VALUE IN BENDIX® ACOM® DIAGNOSTICS

If a "radar misalignment" diagnostic trouble code (DTC) was logged, after repairs, the vehicle will need to be connected to a PC with ACom Diagnostics software to reset the "Misalignment Value" to zero.

- In ACom Diagnostics select ACB on the starter screen, and then select "Start with ECU."
- Select "Config" on the ACB Status window.
- Select "Modify" on the Configuration Status window.
- Select "Reset Misalignment Value" in the Change Configuration box.
- Select "Write" button in the dialogue box.
- Clear the Bendix® Wingman® ACB system trouble code using the procedure in Section 4.4: *Clearing Bendix® Wingman® ACB Diagnostic Trouble Codes (DTCs)*. Also, see Appendix D.
- Close the ACom Diagnostics program and any open windows.
- Cycle the vehicle ignition.

## 6.12 REINSTALL THE PLASTIC COVER

With a slight force, push the cover onto the bracket so that the plastic fasteners line up with the slots on the plastic cover. Ensure the cover is secure over the ACB sensor assembly before driving the vehicle.

## APPENDIX A - TROUBLESHOOTING CHECKLIST

Appendix A	
Troubleshooting Checklist	
Detailed Scenarios and Tests	Record Driver's Answers for Follow-up with Bendix
Does the vehicle maintain its set speed when cruise control is switched on and set?	Yes <input type="checkbox"/> No <input type="checkbox"/> _____
Is the cruise control "set" icon displayed?	Yes <input type="checkbox"/> No <input type="checkbox"/> _____
<p>While following a forward vehicle within radar range and the cruise control switched on and set, observe the following.</p> <p>Is the forward vehicle detected icon displayed?</p> <p>What color is the icon?</p> <p>When the forward vehicle slows down, does the truck also slow down to maintain the set distance?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Icon Color _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p>
With engine cruise "off" and a forward vehicle present, does the beeping become faster as the truck moves closer to the forward vehicle?	Yes <input type="checkbox"/> No <input type="checkbox"/> _____
<p>With cruise control switched on and set, when the forward vehicle slows moderately or cuts in front of the truck and slows, did you observe any of the following conditions?</p> <p>Does the vehicle slow and ACB maintain the following distance?</p> <p>Is the engine throttle reduced?</p> <p>Is the engine retarder applied?</p> <p>Are foundation brakes applied?</p> <p>Are there diagnostic trouble codes logged?</p> <p>Does the truck proceed toward the forward vehicle without a following distance alert or braking intervention?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p>
With cruise control "off", when a forward vehicle cuts in front of the truck at a distance of 20 feet or less, does the following distance alert give a slow, medium or fast beeping sound?	Slow <input type="checkbox"/> Medium <input type="checkbox"/> Fast <input type="checkbox"/> _____
<p>With cruise control engaged, and while following a vehicle ahead on a straight road (assuming a 3 to 3.5 second following distance):</p> <p>Does ACB continue to follow the vehicle?</p> <p>Does the truck proceed toward the forward vehicle without a following distance alert or braking intervention?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p>



<b>Appendix A</b>	
<b>Troubleshooting Checklist</b>	
<b>Detailed Scenarios and Tests</b>	<b>Record Driver's Answers for Follow-up with Bendix</b>
<p>With cruise control engaged, and while following a vehicle ahead in gentle curves (assuming a 3 to 3.5 second following distance):</p> <p>Does ACB continue to follow the vehicle through the curves following at a constant distance?</p> <p>Does the truck proceed toward the forward vehicle without a following distance alert or braking intervention?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p>
<p>With cruise engaged, when your vehicle passes a slower vehicle on left or right on a straight or slightly curvy road:</p> <p>Does ACB ignore the vehicle you are overtaking?</p> <p>Does it give a following distance alert?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p>
<p>With cruise engaged, and a faster vehicle passes your vehicle on the left or right on a straight or slightly curvy road:</p> <p>Does your vehicle throttle up and try to keep pace with the faster moving vehicle?</p> <p>Does it give a following distance alert?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p>
<p>With cruise control engaged, if the vehicle ahead slows moderately or cuts in front of your truck and slows down:</p> <p>Does your vehicle slow and ACB maintain the following distance?</p> <p>Is the engine throttle reduced?</p> <p>Is the engine retarder applied?</p> <p>Are the foundation brakes applied?</p> <p>Are there diagnostic trouble codes logged?</p> <p>Does your truck proceed toward the forward vehicle without a following distance alert or braking intervention?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/> _____</p>
<p>What version of Bendix® ABS and Bendix® Wingman® ACB is installed on the vehicle? <i>See Section 4.21: ACB Software Version.</i></p>	<p>_____</p> <p>_____</p>
<p>What are the key system indicators? <i>See Section 3.04: Key System Indicators.</i></p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>Call the Bendix Tech Team at 1-800-AIR-BRAKE for troubleshooting assistance.</p>	



Appendix B

Driver Interface Unit: Displays & Alerts

**B1 Operator Interface**

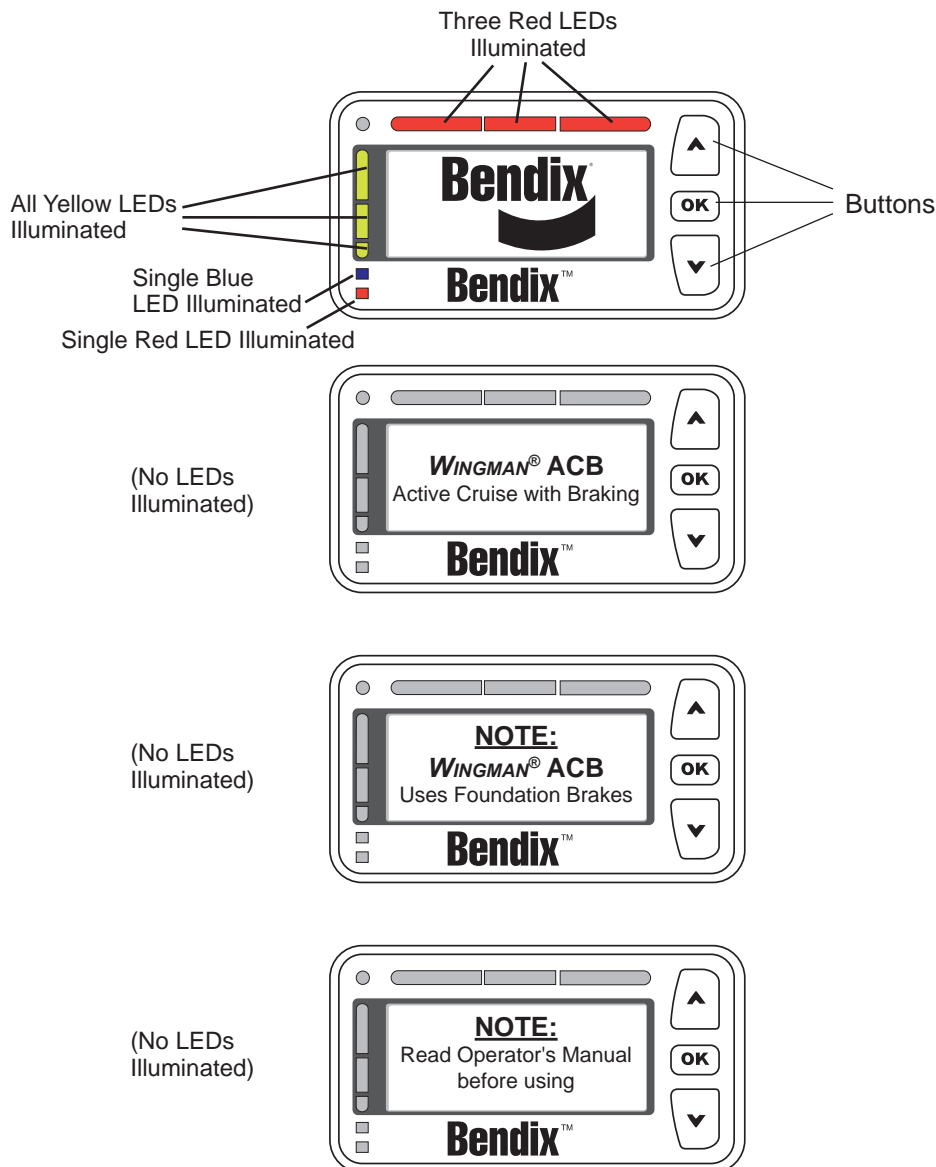
The Bendix® Wingman® ACB system is either integrated into the vehicle's dash or console, or uses the Bendix® Driver Interface Unit (DIU) to communicate with the driver. *(For integrated systems, see the vehicle operator's manual for more information.)*

This Section describes the functions of the DIU. The DIU mounts in, or on, the vehicle dash and provides the interface between the driver and the ACB system. The DIU provides visual and audio warnings to the driver and accepts input from the driver through the "Up", "Down" and "OK" buttons.

The DIU contains an internal speaker to provide audible warnings, 2 LED arrays (one each in yellow and red), a single orange and blue LED and an LCD screen for visual warnings, and a light sensor to distinguish between day and night conditions.

**B1.1 Start-Up Mode**

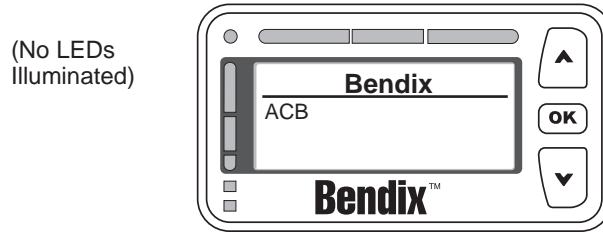
At initialization, the DIU executes self-test routines during which the following screens are displayed and all LEDs are activated (power-on bulb check) for approximately 3 seconds. If configured, a power-up tone is also sounded.



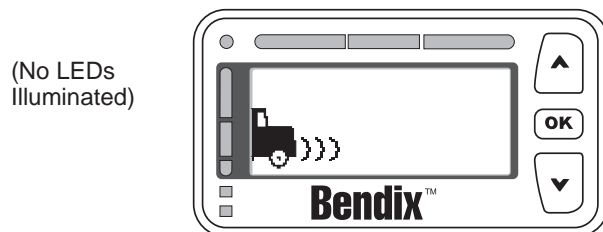
## Appendix B

### Driver Interface Unit: Displays & Alerts

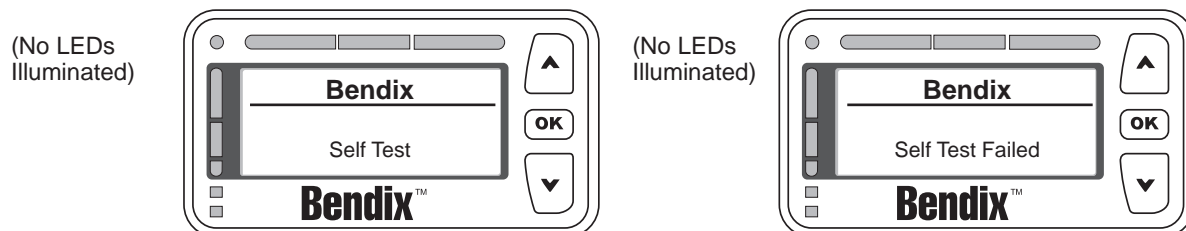
When the initialization sequence is complete, the following screen is displayed for approximately 3 seconds to indicate the features available to the driver.



Next, the DIU will enter normal operation. Under normal operation, the screen is:



If the Bendix® Wingman® ACB goes into self test mode, the DIU may briefly display the “Bendix Self Test” screen. Also, the audible distance alerts will activate, followed by a screen indicating that the Self Test has run. Below left is the screen that will be briefly displayed if the self test runs and passes. Below right is the screen that will be briefly displayed if the self test runs and fails. If the self test fails, a diagnostic trouble code (DTC) will be set. The driver should turn off the vehicle, wait 15 seconds and then turn it back on again. If the problem persists, a qualified technician will be necessary for troubleshooting. See the “Power-Up Self-Test” in this service data sheet Section 3.1: Troubleshooting Basics for further information.



### B1.2 Menu Operation

Pressing the “OK” button at any time will enter the “Menu Operation Mode”. The following selections will appear in a scrollable window. Some items may not appear if the feature is not configured or not allowed as shown below.

- Volume
- Dist. Setting (Distance Setting)
- Dist. Units (Distance Units)
- US/Metric
- Brightness
- System Status
- Diag. Display (Diagnostic Display)
- Demo (Demonstration. Note: Demo is available only when vehicle is not moving)

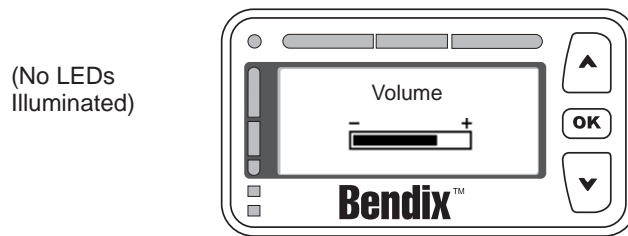
The desired menu item is highlighted using the up (▲) or down (▼) arrow buttons and selected with the “OK” button. The following sections describe each menu item.

## Appendix B

### Driver Interface Unit: Displays & Alerts

#### B1.3 Volume

Selecting “Volume” from the main menu displays the following screen.



The driver uses the up (▲)/down (▼) arrow buttons to change the volume. Pressing the “OK” button exits this menu item.

The modified volume setting will be retained through ignition cycles unless configured not to do so. If not configured, the volume setting will default to 100% on each new ignition cycle.

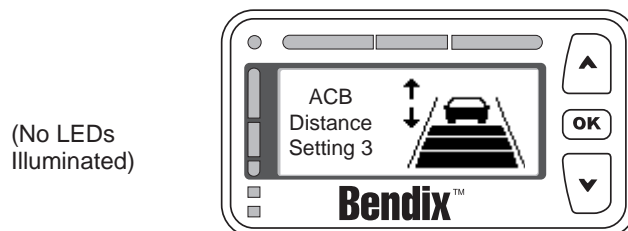
*NOTE: The DIU can be configured to limit the minimum volume setting that the driver can select. The bar shown above always represents the adjustable range based on minimum and maximum values. For example, if the minimum value is set to 50% (midpoint between lowest (70 +/- 3dB) and highest (89 +/- 3dB) audio levels, the bar represents an adjustable range from 50% (approx. 80dB) to 100% (approx. 89dB). Once the minimum (or maximum) has been reached, a message will be shown indicating that further adjustment is not allowed (e.g. “Minimum volume reached”). The step change per button press is approximately 2dB.*

#### B1.4 Distance Setting (Dist Setting)

The “Distance Setting” will adjust the following distance the Bendix® Wingman® ACB system will attempt to maintain while in the following distance mode. ACB Distance Setting 1, 2, 3, and 4 will have different meanings based on the configuration chosen by the user in Bendix® ACom® Diagnostics (version 6.3 or greater). Generally, 4 relates to the farthest distance setting available and 1 relates to the closest distance setting available. In many of the ACB configurations available in ACom®, two or more distance settings may be made equivalent to one another.

For more information on user configurations available through the Bendix ACom Diagnostics software, see *Section 5.4: Configuring Bendix Wingman ACB Following Distance Alerts* in this service data sheet for further information.

Selecting “Dist. Setting” from the main menu displays the following screen.



#### B1.5 Distance Units (Dist Units)

From the “Dist Units” menu item, the user may choose to have the following distance from the forward vehicle displayed in either seconds or feet. By default, this item is set to seconds. If the user selects feet, the DIU will display the approximate distance from the bumper to the selected forward vehicle in feet. If the user selects seconds, the DIU will display the approximate distance from the bumper to the selected forward vehicle in seconds.

*NOTE: Following distance in seconds is calculated based on the current speed of the Wingman® ACB-equipped truck, and the distance, in feet, of the selected forward vehicle. For instance, if the selected forward vehicle is 88 feet from the bumper of the Wingman ACB-equipped truck, and the Wingman ACB-equipped truck is traveling 60 mph, then the following distance in seconds would be 1.0 seconds because a truck traveling 60 mph can travel 88 feet in one (1) second.*



## Appendix B

### Driver Interface Unit: Displays & Alerts

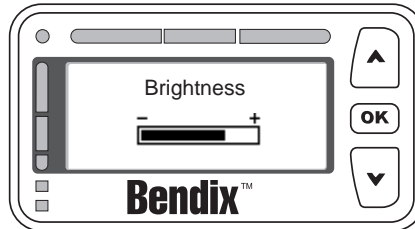
#### B1.6 US/Metric

From this menu item, the user may select whether English or Metric units are displayed. For instance in “metric” mode, the following distance is shown in meters. In “US” mode, the following distance is shown in feet.

#### B1.7 Brightness

Selecting Brightness from the main menu displays the following screen.

(No LEDs  
Illuminated)



The driver uses the up (▲)/down (▼) arrow buttons to change the LCD backlighting, LED brightness and button backlighting. Pressing the OK button exits this menu item.

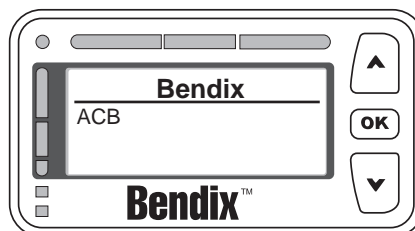
The light sensor reading determines whether the current cab lighting mode is bright (day) or dark (night). When the light mode is bright, any brightness adjustment made by the driver is applied to only the bright mode setting. Likewise, when the light sensor sets the light mode to dark, any brightness adjustment made by the driver is applied to only the dark mode setting. This functionality allows the driver to adjust the brightness setting for the two cab lighting conditions after which the DIU will automatically toggle between the two settings based on the light sensor’s input. Both the bright mode setting and the dark mode setting are stored across power cycles.

*NOTE: The DIU does not allow the brightness control to completely shut off the LEDs.*

#### B1.8 System Status

This screen shows the configured features of the system and their current operational status (i.e., “Failed” or “OK”). The failed status means that some system malfunction is preventing the feature from properly operating and that the feature is not available for use by the driver at this time. Pressing “OK” exits this menu item.

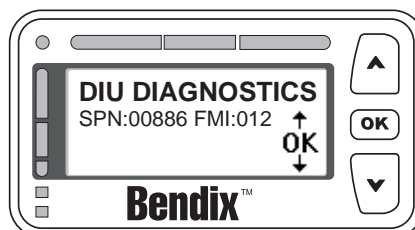
(No LEDs  
Illuminated)



#### B1.9 Diagnostics

Selecting Diagnostics from the main menu displays any active Bendix® Wingman® ACB Diagnostic Trouble Code (DTC) conditions [including SAE standard diagnostics codes called J1939 SPNs (Suspect Parameter Numbers) and J1939 FMIs (Failure Mode Identifiers)] that may be present in the DIU and radar sensor. The following is a typical screen displayed in this mode when an active DTC is present:

(No LEDs  
Illuminated)



## Appendix B

### Driver Interface Unit: Displays & Alerts

#### B2.0 Driver Demonstration Mode

Selecting Demo from the main menu starts a demonstration mode that shows the various lights, display screens, and sounds produced by the DIU – along with a brief explanation of their meaning – for the configured features. Pressing the down (▼) arrow button advances through the screens. The up (▲) arrow button has no functionality in this mode. The mode may be exited at any time by pressing the OK button.

*NOTE: This mode can only be entered while the vehicle is not moving. Also, while in the demonstration mode, if the vehicle begins to move, the demonstration mode terminates.*

If a screen is associated only with a configurable feature, and that feature is not configured, then that screen will not be shown in the demonstration mode.

The screens presented to the driver in the demonstration mode are shown with the following text: “Error! Reference source not found.”

#### B3.0 Following Distance Alerts (FDAs)

One of the features of the Bendix® Wingman® ACB system is the Following Distance Alert system (FDA). A proprietary system combining vehicle speed, forward vehicle speed, distance, and driving scenario, FDAs are used to provide the driver with distance alerts which are intelligent in that they will give appropriate distance alerts for the given situation. They alert the driver to objects far ahead in highway and country road driving situations while not over-alerting in dense city traffic.

The Wingman ACB sensor uses the DIU to communicate the FDA alerts to the driver. This system can be configured through Bendix® ACom® Diagnostics software (version 6.3 or greater), for use by a fleet as a driver training tool with or without coordinating the data made available by Wingman® ACB. In addition to being a reminder of when a driver may be dangerously close to the vehicle ahead, the following distance alerts may also be configured to reinforce safe following distance habits taught by the fleet.

The FDA is based on the following interval between the host vehicle and the object ahead. In other words, this is the time required by the host vehicle to travel forward and reach the object's current location. With the exception of the volume, the FDA may not be adjusted by the driver through the DIU. A qualified technician must connect to the vehicle through the diagnostic port and run ACom® Diagnostics (version 6.3 or greater), in order to change the configuration. The volume cannot be turned all the way down, but other adjustments may be made by the fleet. *See Section B1.3 for more details on volume adjustment.*

The FDA system is intended only to alert the driver about following distance. For more information on alerts for forward objects with high relative velocities and sudden decelerations, *see Section B4.0: Impact Alert.*

Only objects detected in the vehicle's lane, traveling in the same direction, are considered valid objects for the FDA. For more information on stationary objects, *see Section B5.0: Stationary Object Alert.*

*Also, see Section 5.4: Configuring Bendix Wingman ACB Following Distance Alerts.*

**Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times. Even with the Bendix® Wingman® ACB system, the driver must remain alert, react appropriately and in a timely manner, and use good driving practices.**

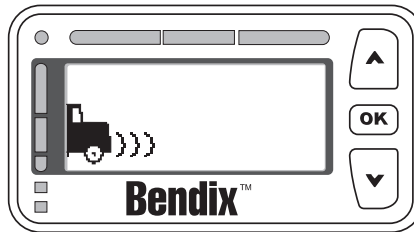
## Appendix B

### Driver Interface Unit: Displays & Alerts

#### B3.1 Object Detected

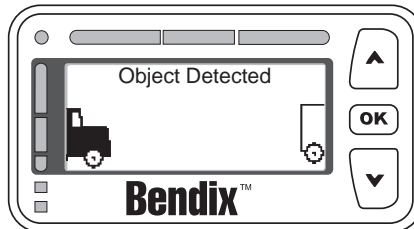
When there is no valid object detected and no other high priority alert is displayed, the DIU will stand by with the following screen.

(No LEDs Illuminated)



When a valid object is detected, and is outside the range of the first level of alert, and no other higher priority alert is displayed, the DIU will display the following and no audio tones will be issued. The distance to the object will be displayed in large characters in the white space at the center of the screen (not shown) in seconds, feet, or meters, depending on the menu-selected preferences. By default, seconds will be displayed.

(No LEDs Illuminated)

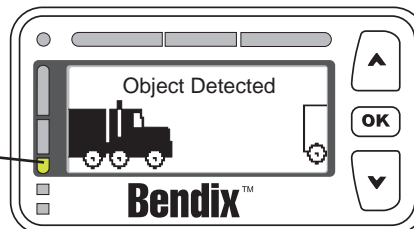


#### B3.2 Following Distance Alert (FDA) Level 1 (Slow audible two-tone alert/single LED illuminated)

When FDA Level 1 is issued, the following distance to the object/vehicle ahead has been reduced to the distance determined in the current configuration for FDA Level 1. The DIU will begin to give the driver audio and visual alerts for as long as the forward vehicle is in this zone and traveling at the same speed or slower.

The DIU will not display following distance units while in an FDA Level. For FDA Level 1, the audible alert will be a single repeating tone, and the visual alert is a single yellow LED and a screen with the vehicles slightly closer as shown below.

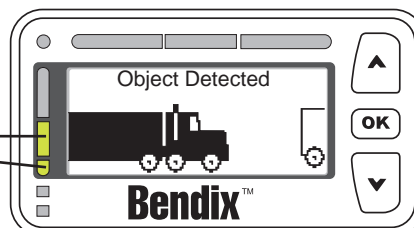
Single Yellow LEDs Illuminated



#### B3.3 Following Distance Alert (FDA) Level 2 (Medium audible two-tone alert/two LED's illuminated)

The DIU will give the driver audio and visual alerts for as long as the object/vehicle ahead is in this zone and traveling at the same speed or slower. The DIU will not display following distance while in an FDA Level. For FDA Level 2, the audible alert will be a repeating double tone, and the visual alert is two yellow LEDs and a screen with the vehicles closer as shown below.

Two Yellow LEDs Illuminated



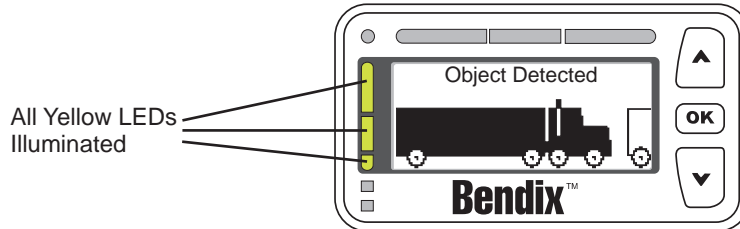
## Appendix B

### Driver Interface Unit: Displays & Alerts

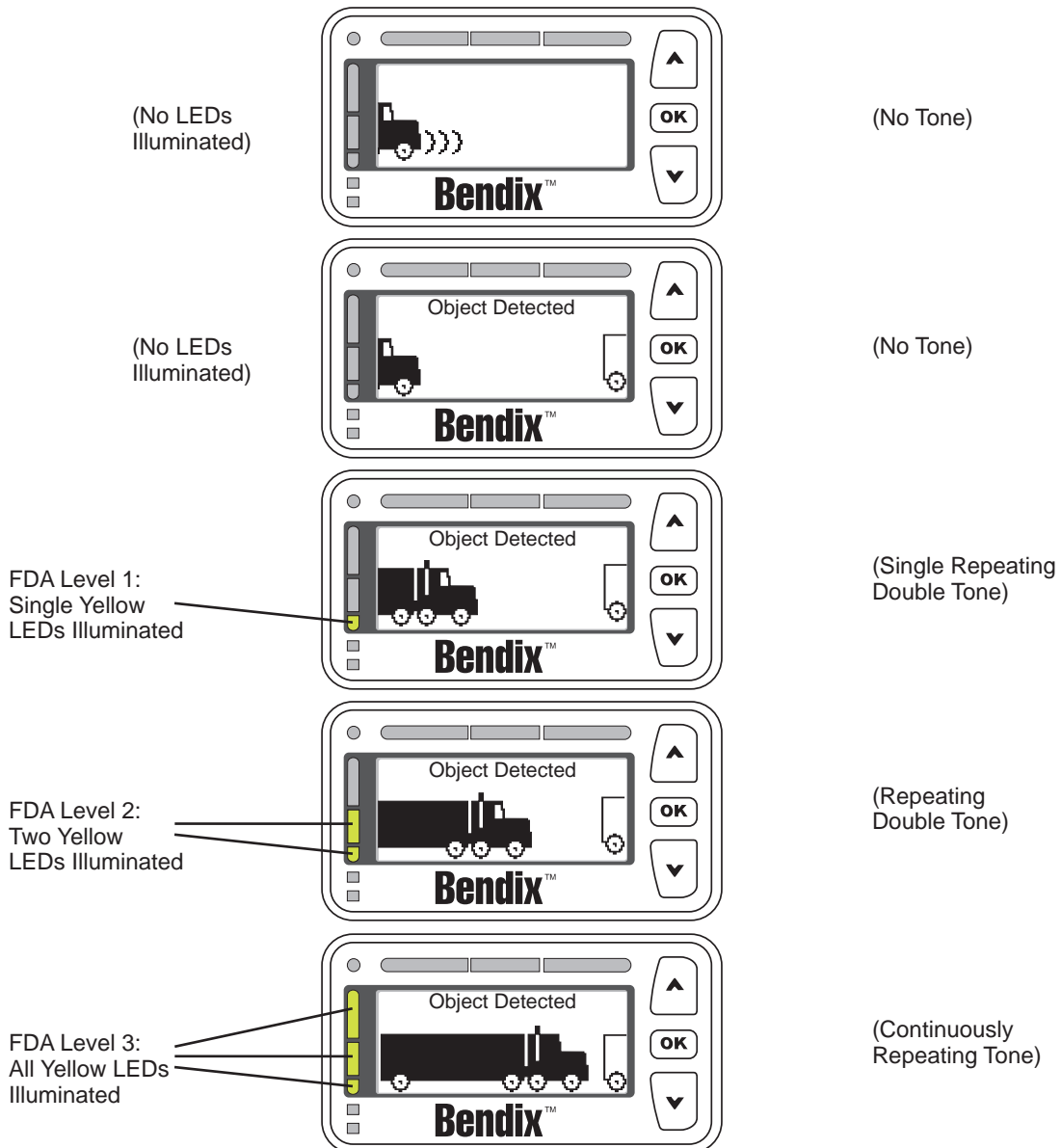
#### B3.4 Following Distance Alert (FDA) Level 3 (*Fast audible two-tone alert/three yellow LED's illuminated*)

The DIU provides the driver with audio and visual alerts for as long as the vehicle ahead is in this zone and traveling at the same speed or slower. This is the closest and most urgent Following Distance Alert.

The DIU will not display following distance while in an FDA Level. For FDA Level 3, the audible alert will be a continuously repeating tone, and the visual alert is three yellow LEDs and a screen with the vehicles close as shown below.



All five states of the FDA system can be seen together below.

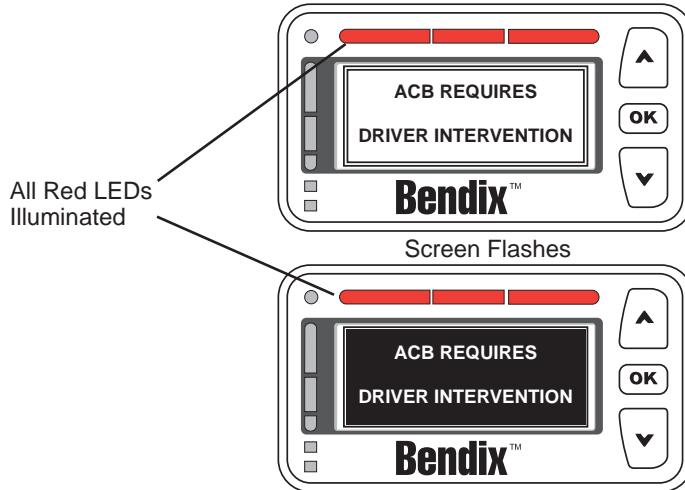


## Appendix B

### Driver Interface Unit: Displays & Alerts

#### B4.0 Impact Alert (IA)

The “Impact Alert”, uses a combination of distance to the vehicle ahead, plus high relative velocity, to decide when to issue a loud solid tone as well as a visual indicator to the driver. The red LED bar across the top of the DIU will illuminate and “ACB REQUIRES DRIVER INTERVENTION” will flash using the two screens below:



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

The impact alert cannot be configured or turned off.

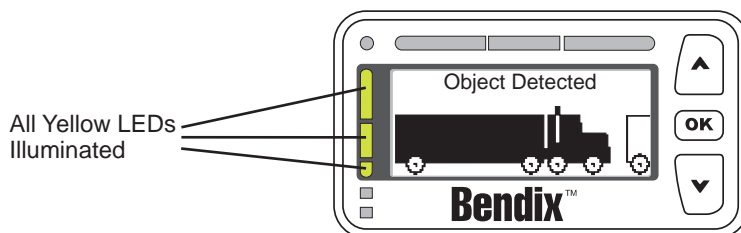
*NOTE: At most, Bendix® Wingman® ACB will apply up to one-third of the vehicle's braking capability. The driver must apply additional braking, when necessary, in order to maintain a safe distance from the vehicle ahead.*

#### B5.0 Stationary Object Alert (SOA)

Stationary Object Alert (SOA) is an alert given to the driver when the radar detects a sizeable, nonmoving metallic object in the vehicle's path of travel. To reduce the number of false detections, such as bridges and overhead signs, an advanced set of filters are put in place so the SOA will not warn on every stationary object.

The SOA can be configured to be on or off through the display.

If a SOA is issued, the DIU will very briefly send out an alert identical to a very brief FDA Level 3: continuous tone and three yellow LEDs, as shown below.





## Appendix B

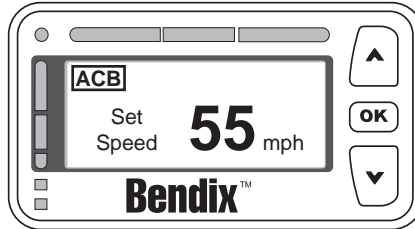
### Driver Interface Unit: Displays & Alerts

#### B6.0 ACB Icon

The ACB icon appears in the upper left-hand corner of the DIU's screen to indicate to the driver that ACB is ready and able to intervene.

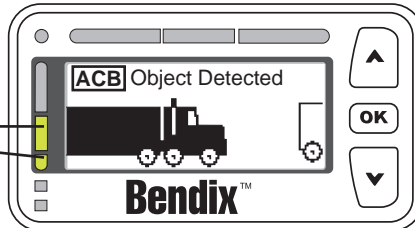
Once the driver sets cruise, the DIU will display the set speed and the Bendix® Wingman® ACB system icon as shown below.

(No LEDs  
Illuminated)



When a forward vehicle is detected and either the distance to the vehicle or a following distance alert is shown, the Wingman® ACB system icon should remain on the screen if Wingman ACB is still engaged and/or ready and able to intervene.

Two Yellow LEDs  
Illuminated



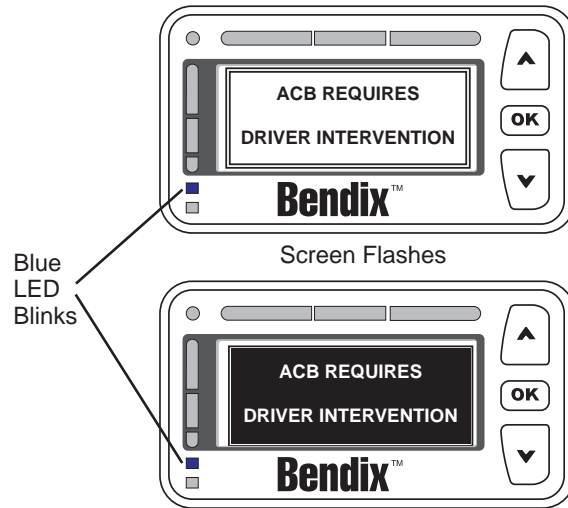
*NOTE: If the Wingman ACB icon is not displayed on the screen, the driver must assume that Wingman ACB is not ready or able to intervene!*

## Appendix B

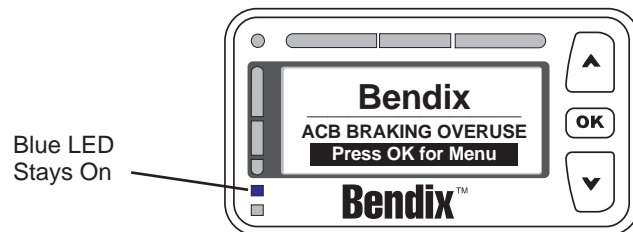
### Driver Interface Unit: Displays & Alerts

#### B7.0 Brake Overuse Alert

To guard against foundation brake overuse by the ACB system, the Bendix® Wingman® ACB system monitors the frequency of ACB-initiated brake interventions. If the system detects a situation where the brakes are being applied by the system too many times in a given time period, the brake overuse alert will activate. This is designed to help prevent overheating of the brakes which may lead to brake fade and reduced vehicle braking capability. In this situation, the Brake Overuse Alert will flash a message requesting driver intervention. Also, an audible alert will sound and a blue LED will blink on the Bendix Driver Interface Unit (DIU), as illustrated below:



This alert will continue for 15 seconds, during which time the driver should step on the brake or turn off cruise control using the cruise control on/off switch. This will deactivate cruise control and turn off interventions (dethrottling, engaging the engine retarder or applying the brakes) by the Bendix Wingman ACB system. The driver will still receive all three (3) alerts (FDA/ Impact/ and Stationary Object) but no automatic following distance interventions will occur. If the driver reengages cruise control shortly after this alert and intervenes with a brake application, ACB will go into a special mode where braking interventions will be suspended for a period of time. This time frame equals 20 minutes from the time the Brake Overuse Alert was activated. During this period, the capability of the system to provide following distance interventions will be limited to dethrottling or engaging the engine retarder. It's important to note that the driver will continue to receive all three (3) alerts during this time of reduced ACB intervention capability. Finally, the DIU will provide a new message "ACB Braking Overuse" and the blue LED will remain lit, as illustrated below:



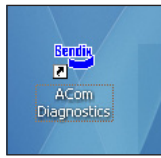
At the end of the 20 minute time period, the "ACB Braking Overuse" message and blue LED will turn off and normal ACB functionality will return.

# APPENDIX C - HOW TO READ AND RESET THE BENDIX® WINGMAN® SYSTEM DIAGNOSTIC TROUBLE CODES USING BENDIX® ACOM® DIAGNOSTICS SOFTWARE (VERSION 6.3 OR HIGHER)

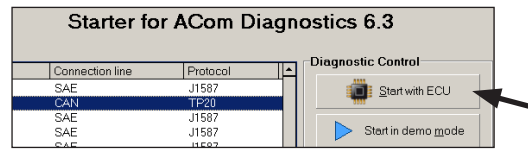
## Appendix C

### How to Read and Reset Wingman® Diagnostic Trouble Codes with ACom® Diagnostics

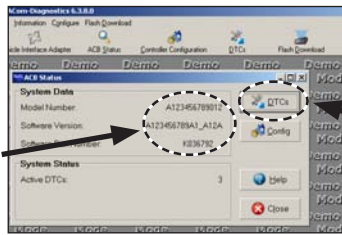
1. Click Bendix ACom desktop icon



2. Select ACB from the starter screen. Click "start with ECU"



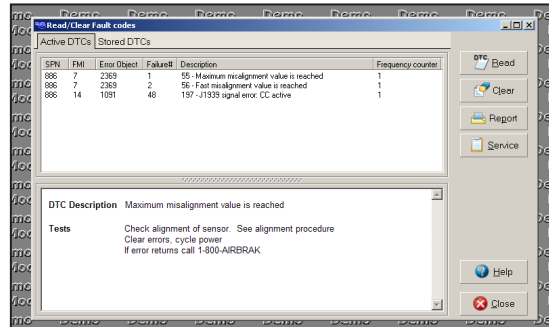
3. Read Wingman ACB status screen.



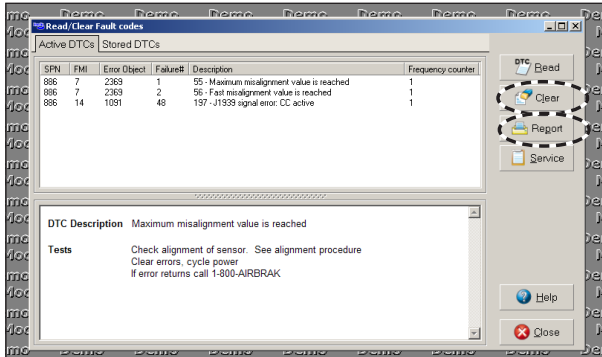
A. Take Note of: Model #, Software Version, Software P/N, Active DTCs

B. Click DTCs

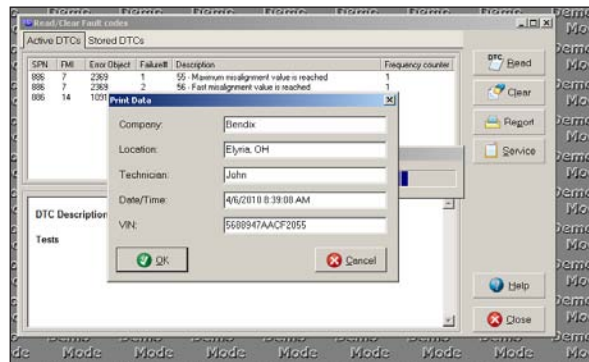
4. Click "Read". Active DTCs (diagnostic trouble codes) are shown along with descriptions of the codes and tests that can be run to troubleshoot the code. You can select "stored DTCs" also, to show inactive DTCs.



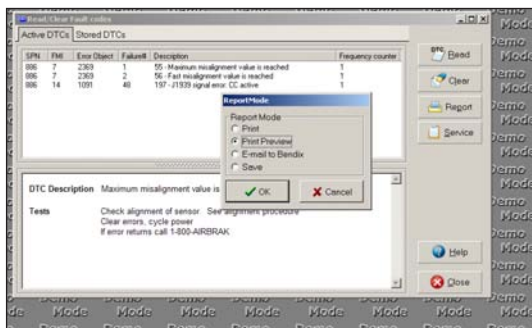
5. Click "clear" to clear all active DTCs. Click "Report" to get the ACom report.



6. Fill in the requested information: Company, location, technician, date/time, VIN, and click "OK"



7. Select how you want the report displayed or printed. Then click "OK"



8. The event report is generated. This can be saved if desired.



9. You can also use the shortcut menu at the top of the screen and select: ACB status; DTCs; and Controller Configuration.

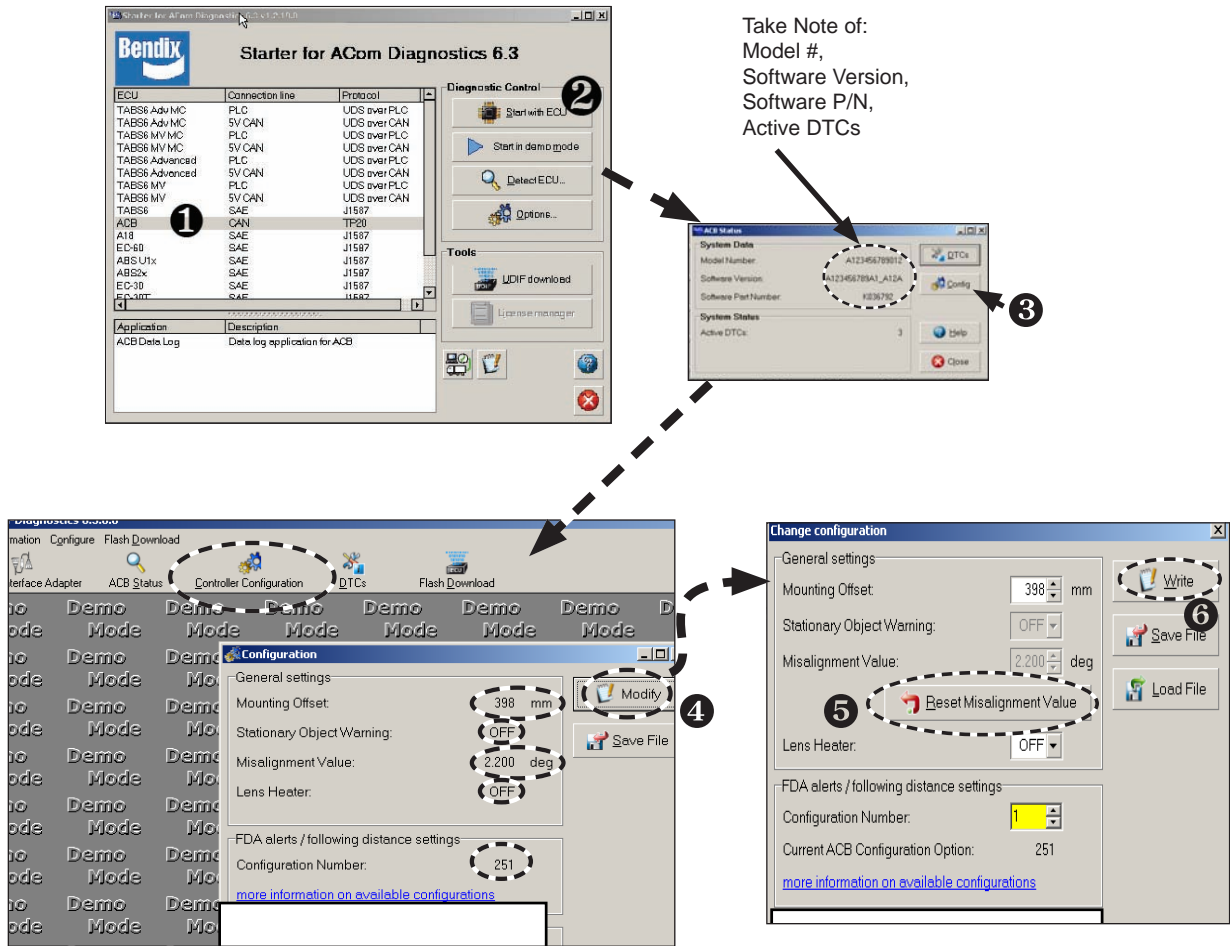
Call the Bendix Tech Team at 1-800-AIR-BRAKE for troubleshooting assistance.

## Appendix D

### How to Read Key System Indicators and Reset Misalignment Values

#### Read Key System Indicators (Configuration)

1. Start Bendix® ACom® Diagnostics and connect to vehicle.
2. Select “ACB” and Click “Start with ECU” to display the “ACB Status” window.
3. Click “Config” to display the indicators



#### Key System Indicators

Attribute	Description	See Section:					
<b>Mounting Offset</b>	This value should equal 0 if the sensor is mounted on the center line of the vehicle. If the service technician believes the sensor should be mounted offset from center, call 1-800-AIR-BRAKE.	6.10					
<b>Stationary Object Warning Indicator</b>	This is a status indicator for the function of stationary object warning. Available for use in Bendix® Wingman® ACB system versions since 2010.	1.07					
<b>Misalignment Value</b>	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>Trouble code will be set if value is -1.3° or less</td> <td>Abnormal operation: -0.8°</td> <td>Normal operation: normal</td> <td>Abnormal operation: 0.8°</td> <td>Trouble code will be set if value is 1.3° or more</td> </tr> </table>	Trouble code will be set if value is -1.3° or less	Abnormal operation: -0.8°	Normal operation: normal	Abnormal operation: 0.8°	Trouble code will be set if value is 1.3° or more	6.07
Trouble code will be set if value is -1.3° or less	Abnormal operation: -0.8°	Normal operation: normal	Abnormal operation: 0.8°	Trouble code will be set if value is 1.3° or more			
<b>Configuration Number</b>	This indicates the distance setting and following distance alert that are configured for the vehicle. Refer to Table 7 for setting information.	5.4					

#### How To Reset The “Misalignment Value”

4. From the configuration window shown above, click “Modify.”
5. From the Change Configuration window, select “Reset Misalignment Value.”
6. Click “Write.”

Cycle the vehicle ignition power to complete the process.

Call the Bendix Tech Team at 1-800-AIR-BRAKE for troubleshooting assistance.



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