NAVISTAR®

Bendix® Wingman® Fusion™ System Overview

Study Guide

Course Code: 8792

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Course Introduction

System Requirements

If playback or course completion issues are experienced while viewing this course, Flash® Player may need to be updated to the latest version. The following instructions assume the user is using Internet Explorer® 9 or later.

- Go to get.adobe.com/flashplayer.
- Be sure to uncheck any checkboxes that appear under the OPTIONAL OFFERS heading to prevent unwanted software from being installed.
- Click the INSTALL NOW button on the right of the screen.
- A message should appear at the bottom of the screen to RUN or SAVE the file. Click RUN.
- Depending on the security settings, a message could appear asking: "Do you want to allow the following program to make changes to this computer?" Click YES.
- Choose the preferred Update Flash Player Preferences and click NEXT. Installation should begin.
- The user may be asked to close the browser in order to complete the installation process.
- Once the installation is complete, click FINISH. Internet Explorer® will open an Adobe® page with a message at the top confirming the installation.

The user may now log back in to OnCommand™ (the LMS).

Contact Us

If you have questions or concerns regarding this course, please contact Navistar® Service Education by submitting a case file (Dealer Personnel), or by calling 1-800-365-0088.

THE INFORMATION PROVIDED WITHIN THIS COURSE IS FOR TRAINING PURPOSES ONLY. ALWAYS CONSULT THE LATEST SERVICE, DIAGNOSTIC, AND TOOL INFORMATION, LOCATED ON NAVISTAR'S SERVICE PORTAL, PRIOR TO PERFORMING SERVICE ON NAVISTAR ENGINES, VEHICLES, AND EQUIPMENT.

Welcome

Welcome to the Navistar® training course: Bendix® Wingman® Fusion™ System Overview. This course is intended to introduce service personnel to the Bendix® Wingman® Fusion™ driver assistance system.

Bendix® Wingman® Fusion™ integrates next-generation advanced safety technologies such as radar, camera, brakes, and SafetyDirect. This combination is a comprehensive driver assistance system that's more powerful than any other safety technology – or combination of technologies – in the commercial vehicle marketplace today.

Objectives

Upon completion of this course, the student will be able to describe the:

- Capabilities of the Bendix® Wingman® Fusion™ system.
- Components of the Bendix® Wingman® Fusion™ system.
- Features of the Bendix® Wingman® Fusion™ system.
- Calibration procedure for the Bendix® Wingman® Fusion™ system.

System Components

Components Introduction

WARNING

TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY, AND / OR DEATH, THE BENDIX® WINGMAN® FUSION™ SYSTEM IS NOT TO BE USED OR RELIED UPON TO OPERATE A VEHICLE. THE SYSTEM SHOULD BE USED IN CONJUNCTION WITH BRAKES, REAR VIEW MIRRORS, AND OTHER INSTRUMENTATION TO MAINTAIN SAFE OPERATION. A VEHICLE EQUIPPED WITH THE BENDIX® WINGMAN® FUSION™ SYSTEM SHOULD BE OPERATED IN THE SAME SAFE MANNER AS IF THE SYSTEM WERE NOT INSTALLED. THE SYSTEM IS NOT A SUBSTITUTE FOR NORMAL SAFE DRIVING PROCEDURES. IT WILL NOT COMPENSATE FOR ANY DRIVER IMPAIRMENT, SUCH AS DRUGS, ALCOHOL, OR FATIGUE. PLEASE REFER TO THE BENDIX® WINGMAN® FUSION™ OPERATOR'S MANUAL FOR ADDITIONAL WARNINGS, SYSTEM OPERATION, AND SYSTEM LIMITATIONS. THE BENDIX® WINGMAN® FUSION™ SYSTEM IS INTENDED SOLELY AS AN AID FOR AN ALERT AND CONSCIENTIOUS PROFESSIONAL DRIVER.

The main components that are integrated into the Bendix® Wingman® Fusion™ system are:

- Bendix® ESP® EC-80 Controller
- Bendix® Wingman® FLR21 radar
- Bendix® Driver Interface Unit, or OEM dash display on some vehicles
- Bendix® AutoVue® FLC20 Camera
- SafetyDirect by Bendix® CVS Web Portal Processor
- Vehicle telematics system, if equipped

Many of these components are upgraded from the Bendix® Wingman® Advanced™ system. This means that many of the safety features are supported in the newer Fusion™ system.

Some of the system features that will be covered in this course are:

- Adaptive Cruise-control with Braking
- Alerts (several different types)
- Collision Mitigation Technology
- **Lane Departure Warning**
- **Overspeed Alert & Action** (sometimes known as traffic sign recognition)
- Safety data recording and **communication** with the vehicle's telematics

– *The features that are new with Fusion™ are listed in bold.*

ESP® EC-80 Controller

The ESP® EC-80 Controller, located in the cab of the vehicle, is a module that monitors and controls the brake system. It controls the antilock braking and full stability functions of the vehicle, using a combination of wheel speed, yaw, steering-angle, and load sensors. The controller also manages any actions requested by the Fusion™ system.

FLR21 Radar

The FLR21 radar sensor is located at the front of the vehicle, either on the bumper, or just behind it. The radar sensor has a range of approximately 500 feet, and detects the presence of, and distance to, large metal objects ahead of the equipped vehicle.

Driver Interface Unit

The Fusion™ system and the driver communicate through the Driver Interface Unit (DIU™). Some applications display messages on the vehicle's instrument cluster display instead of using a DIU™.

AutoVue® FLC20 Camera

The Bendix® AutoVue® FLC20 Camera is mounted near the top center of the windshield and supplies supplemental visual data that, along with the radar sensor, helps the system analyze the traffic and environment around the vehicle. The Fusion™ system uses this data to supply feedback to the driver during Lane Departure Warning (LDW) incidents, using audible alerts and / or seat vibrations.

SafetyDirect Web Portal Processor

MISALIGNMENT OF THE SAFETYDIRECT WEB PORTAL PROCESSOR MAY RESULT IN A VARIATION IN THE REPORTING OF EXCESSIVE BRAKING AND TURNING.

The SafetyDirect by Bendix® CVS Web Portal Processor is located near the FLC20 Camera, and packages data to be sent to the SafetyDirect web portal.

Telematics

If equipped, the vehicle's telematics system can be used to transmit vehicle and driver safety information after safety related events. Data collected includes; signals on the vehicle communication network, images and video from the Bendix® AutoVue® FLC20 camera, and internally generated data.

ACom®

Bendix® ACom® is diagnostic software that can be used to view sensor data, calibrate sensors, test components, and update vehicle specifications such as tire size. If the Fusion™ system generates a Diagnostic Trouble Code (DTC) that illuminates the warning lamp, the Bendix® ACom® diagnostic software will need to be used to correct the issue. In addition, the ACom® software will automatically install any available updates once it is connected to the vehicle.

System Features

Adaptive Cruise with Braking

The Adaptive Cruise Control with Braking feature is an upgrade to the standard cruise control system. When using cruise control, the Bendix® Wingman® Fusion™ system will maintain the set vehicle speed. It will also intervene as needed, to help maintain the set following distance behind a detected vehicle, up to the preset speed.

Using the radar sensor mounted to the front of the vehicle, the Fusion™ system reacts to detected vehicles in the same lane, and traveling in the same direction.

IF DURING COLLISION INTERVENTION, IT IS NECESSARY TO APPLY THE FOUNDATION BRAKES, THE VEHICLE WILL NOT AUTOMATICALLY RESUME THE CRUISE CONTROL'S SET SPEED.

With the cruise control set and the desired following distance established, if the forward vehicle slows down below the cruise control's set speed, the Fusion™ system will intervene, as necessary, in this order:

- Reduce the engine throttle; then
- Apply the engine brake; then
- Apply the foundation brakes

These interventions are an attempt to maintain the set following distance behind the vehicle ahead.

In order to maintain the set following distance, it's possible for the Fusion™ system to slow the vehicle without applying the foundation brakes, and then accelerate the vehicle up to the cruise control's preset speed. However, once the foundation brakes are applied, the system will not accelerate the vehicle. Because the Fusion™ system operates along with standard cruise control, all the typical features built into cruise control work normally. For example, limits imposed by factory-set road speed governors are fully supported by the Bendix® Wingman® Fusion™ system.

Alerts

The system also assists by giving audible and visual alerts. Three important warnings provided by the Fusion™ system are the Following Distance Alert, Impact Alert, and Stationary Object Alert. The driver will be alerted by any of the three warnings, even if the cruise control is not activated.

Following Distance Alerts

The Following Distance Alert is enabled whenever the vehicle is moving 5 MPH (8 KPH) or faster. If a vehicle equipped with Wingman® Fusion™ is approaching another vehicle too quickly, an audible alert is given. If this occurs, the driver should increase the distance between their own vehicle and the vehicle ahead until the audible alert stops. If the following distance continues to decrease, the driver will hear more rapid audible alerts. When the Following Distance Alert reaches its highest level, a red LED will illuminate on the instrument cluster.

Impact Alerts

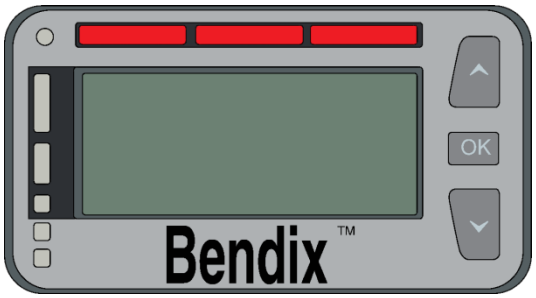
WARNING

TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY, AND / OR DEATH, THE IMPACT ALERT IS THE MOST SEVERE WARNING ISSUED BY THE BENDIX® WINGMAN® FUSION™ SYSTEM. THIS ALERT INDICATES THAT A COLLISION WITH THE DETECTED FORWARD VEHICLE IS LIKELY AND THE DRIVER MUST IMMEDIATELY ACT TO POTENTIALLY AVOID, OR LESSEN THE SEVERITY OF, A COLLISION. THE IMPACT ALERT IS READY TO ALERT THE DRIVER WHENEVER THE VEHICLE IS MOVING 15 MPH (24 KPH) OR FASTER.

WARNING

TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY, AND / OR DEATH, THE IMPACT ALERT IS TYPICALLY ACCOMPANIED BY AUTOMATIC BRAKE INTERVENTIONS. THE BENDIX® WINGMAN® FUSION™ SYSTEM WILL APPLY THE VEHICLE'S BRAKES. THE DRIVER MUST IMMEDIATELY ACT TO MAINTAIN A SAFE FOLLOWING DISTANCE.

When activated, the Impact Alert will sound and a visual message or icon will appear on the instrument cluster display or the Bendix® Driver Interface Unit display.



Stationary Object Alert

WARNING

TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY, AND / OR DEATH, BE AWARE THAT THE BENDIX® WINGMAN® FUSION™ SYSTEM MAY PROVIDE LITTLE TO NO WARNING OR STATIONARY VEHICLE BRAKING FOR SOME HAZARDS, SUCH AS PEDESTRIANS, ANIMALS, ONCOMING VEHICLES, AND CROSS TRAFFIC.

The Stationary Object Alert is enabled whenever the vehicle is moving 10 MPH (16 KPH) or faster. The Fusion™ system will activate an alert when approaching a detected, sizable, radar-reflective, stationary object in the vehicle's lane of travel. This alert indicates that a collision with a stationary object is likely and the driver must immediately act to potentially avoid, or lessen the severity of, a collision.

If the system identifies the stationary object as a vehicle, and the driver does not act immediately, the system can automatically activate Stationary Vehicle Braking to reduce the severity of, or potentially avoid a collision with the stationary vehicle.

If the system cannot definitively identify the stationary object as a vehicle, the driver will get an alert of up to 3 seconds to address the situation ahead. No automatic braking will be applied.

Brake Overuse Alert

Another important alert the system provides is the Brake Overuse Alert, which is only available when the Cruise Control is set.

WARNING

TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY AND / OR DEATH, APPROACH GRADES NORMALLY, WITH THE APPROPRIATE GEAR SELECTED AND AT A SAFE SPEED. CRUISE CONTROL SHOULD NOT BE USED ON DOWNHILL GRADES.

The brake overuse alert sounds when the system is using the foundation brakes excessively. Overuse of the foundation brakes can lead to the brakes overheating, and a potential loss of braking performance, caused by brake fade. Using cruise control on downhill grades will cause this alert to be activated.

Collision Mitigation Technology

The Bendix® Wingman® Fusion™ system's Collision Mitigation Technology is designed to be ready to alert the driver of a potential collision, even if the cruise control is not activated. Collision Mitigation Technology can also react to stationary or moving vehicles in the lane ahead. Collision Mitigation events provide the driver with an alert before an intervention occurs. The driver must act immediately to potentially avoid, or lessen the severity of, a collision.

Lane Departure Warning

WARNING

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The Fusion™ system also includes a Lane Departure Warning (LDW) feature, which will monitor the visible lane markings on the road and alert the driver to make a correction if the vehicle begins to leave its lane when the turn signal is not on. The driver should immediately correct the vehicle tracking and maintain the correct position in the lane. The LDW system is enabled whenever the vehicle is moving faster than the preset factory specification.

Overspeed Alert and Action

The Fusion™ system has the ability to assist the driver by recognizing U.S. and Canadian speed limit signs.

When the vehicle exceeds the posted speed limit by 5 MPH (8 KPH), the system will sound an audible alert for the driver. If the vehicle speed exceeds 10 MPH (16 KPH) above the posted speed limit, an audible alert signals the driver to slow down, and a one-second de-rate of the engine will occur.

Safety Data Recording and Transmission

Vehicles equipped with Bendix® Wingman® Fusion™ use the vehicle's telematics processor to record safety data after a safety related event occurs. This includes signals on the CAN bus and video from the FLC20 camera. Telematics devices are used to transmit this data and video to the SafetyDirect website.

System Calibration

General Calibration

THE RADAR SENSOR IS PREALIGNED AT THE FACTORY AND NO ADJUSTMENT SHOULD BE NEEDED. IF THE RADAR SENSOR BECOMES MISALIGNED OR A DIAGNOSTIC TROUBLE CODE (DTC) IS ISSUED, A MESSAGE OR LIGHT ON THE DASHBOARD WILL INDICATE THAT SERVICE IS NEEDED.

In the event that the FLR21 Radar sensor needs to be aligned or calibrated, there are procedures available to make adjustments. If the alignment is outside a certain range, it could cause false warnings, missed warnings, and Diagnostic Trouble Codes (DTCs) in the system.

TO ENSURE PROPER OPERATION OF THE FLR21 RADAR SENSOR, THE STAND-OFF IN THE LOWER RIGHT CORNER SHOULD NOT BE ADJUSTED. ADJUSTING THIS STAND-OFF COULD CAUSE THE RADAR'S RANGE TO BE REDUCED OR BLOCKED.

The radar sensor is mounted to the front of the vehicle using a bracket with three stand-offs, two of which are used when making adjustments. It is important to use the correct stand-off when making any alignment adjustments.

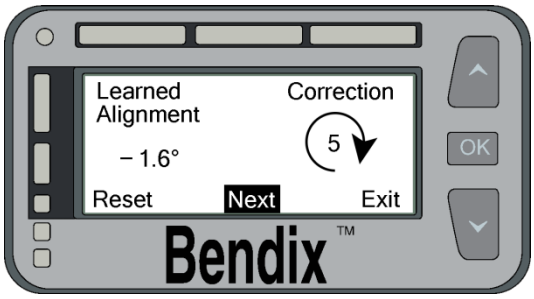
Lateral Alignment

THE FOLLOWING ALIGNMENT METHOD IS FOR VEHICLES WITH BENDIX® DRIVER INTERFACE UNIT DISPLAYS THAT USE SOFTWARE VERSION 12.220 AND ABOVE.

Driver Interface Unit

If the radar's lateral alignment is not correct, the system takes many hours of driving to calculate an alignment adjustment value. If alignment is needed, the Driver Interface Unit (DIU™) can display the learned alignment value and show the technician which direction, and how many times, to turn the lateral alignment adjusting screw.

For this example, selecting the "Alignment Check" menu displays the following screen:



The display shows a correction value of five full turns clockwise is needed. Once the adjustment has been made, the alignment value will need to be reset through the DIU™. The ignition will need to be cycled off and back on after the alignment value is reset.

ACom®

If the vehicle is not equipped with an applicable DIU™, the Bendix® ACom® diagnostic software can be used to laterally align the radar sensor. The ACom® software will display much of the same information as the DIU™. However, the number of turns required, may not be shown by the diagnostic software.

Once the adjustment has been made, the alignment value will need to be reset by clicking the MODIFY button, and then the RESET ALIGNMENT VALUE button. The ignition will need to be cycled off and back on after the alignment value is reset.

Dynamic Radar Alignment

If a learned alignment value is not stored, the Dynamic Radar Alignment test can be performed.This test requires the assistance of another vehicle and driver, as well as an assistant in the cab of the equipped vehicle.

To perform the test, the equipped vehicle must be traveling behind the assisting vehicle on a straight, level length of highway. While obeying all traffic laws; follow the vehicle while maintaining a minimum speed of 35 MPH (56 KPH). For the most accurate results, the distance between the two vehicles must be between 50 and 300 feet (15 to 91 meters). The displayed distance can help the driver maintain the correct range.

Verify that both vehicles remain in the middle of the lane during the test. The radar determines the distance and alignment to the vehicle ahead and, if needed, calculates an alignment correction value. Any needed correction will be displayed on the DIU™ screen. Because this is a dynamic measurement, the alignment correction value will constantly change. The average value indicates how much adjustment is needed, and in which direction.

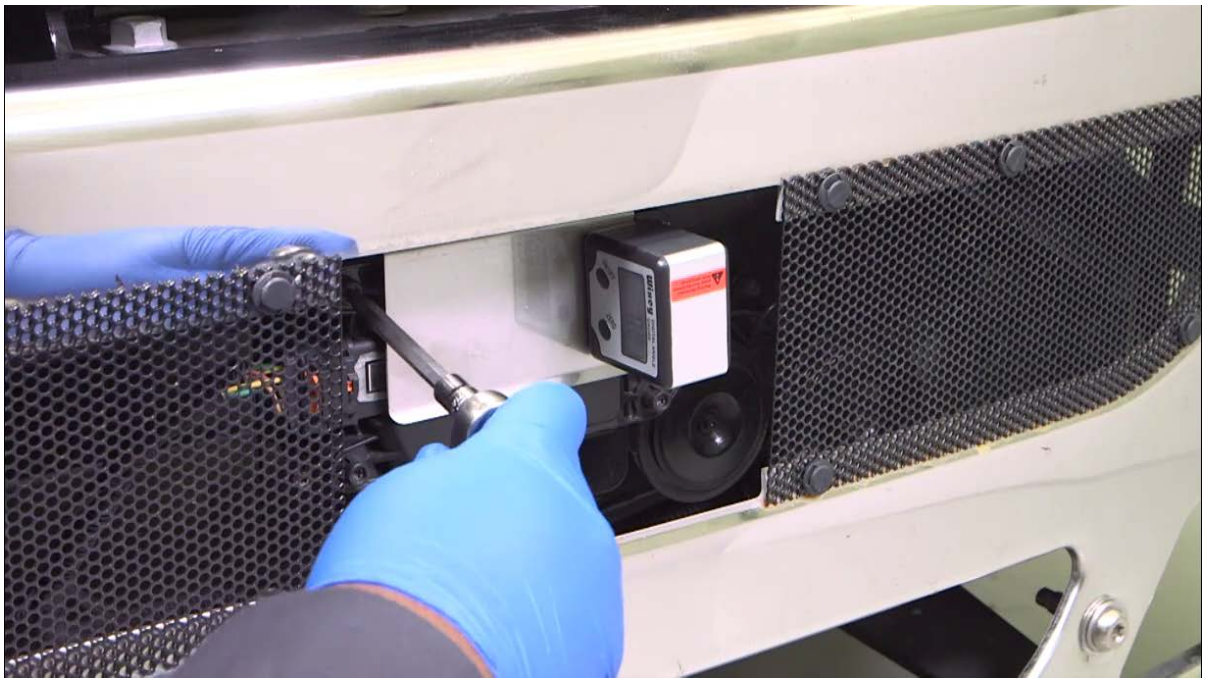
The next step is to vertically align the radar sensor.

Vertical Alignment

NOTE

IF A CLIP FROM THE BENDIX® ALIGNMENT TOOL KIT IS AVAILABLE, THE CLIP CAN BE PLACED OVER THE FRONT OF THE RADAR SENSOR DURING THIS PROCESS. IF THE CLIP IS USED, BE SURE TO REMOVE IT BEFORE RETURNING THE VEHICLE TO SERVICE.

To begin, park the vehicle on a level surface, and ensure the air suspension system, if equipped, is fully inflated and stable. Follow the manufacturer's instructions to calibrate an inclinometer on a horizontal section of the frame rail. Place the calibrated digital inclinometer against the front surface of the radar, or on the attached clip, so that the tool is held in the same direction as it was on the frame rail.



NOTE

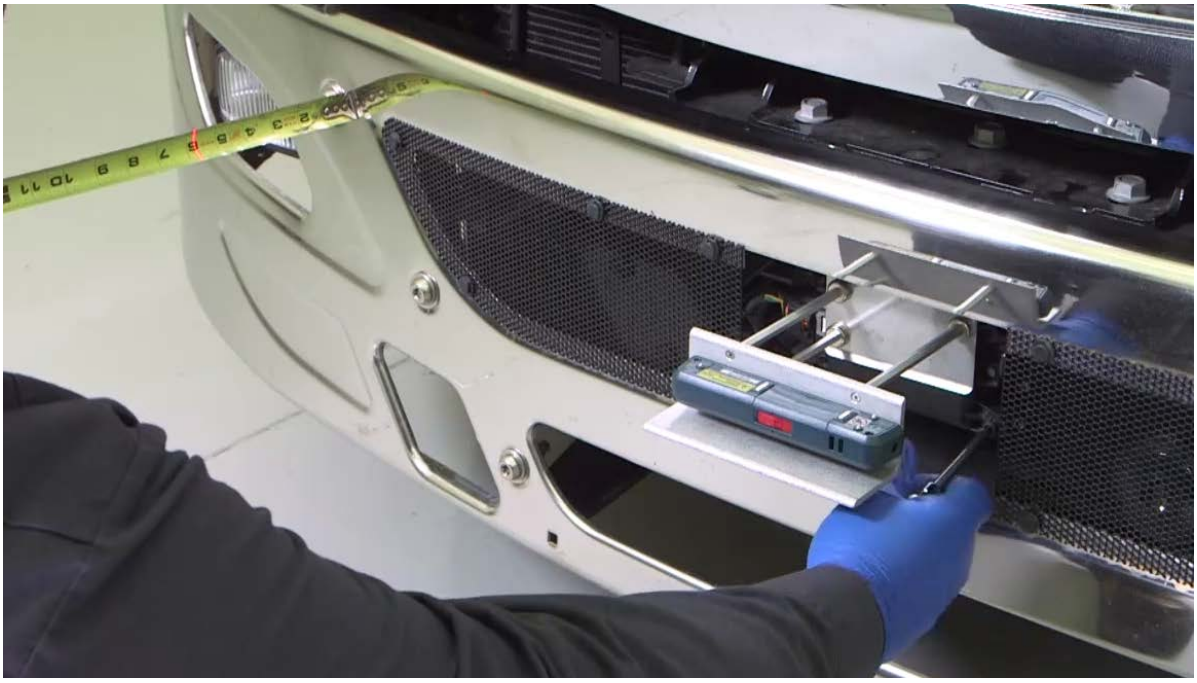
PERFORM THE FOLLOWING STEPS ONLY IF A VERTICAL ADJUSTMENT IS NECESSARY.

Slowly turn the top-right adjustment stand-off. During the adjustment, observe the digital display on the inclinometer and turn the vertical alignment screw clockwise or counterclockwise depending on the needed adjustment, until the reading is 0.0 degrees. Remove the inclinometer and clip from the vehicle.

Replacing the FLR21™

If the radar sensor is replaced, it is important to make sure it is properly aligned. To begin, park the vehicle on a level surface, and ensure the air suspension system, if equipped, is fully inflated and stable.

Attach the steel clip to the radar sensor. Attach the alignment tool onto the clip using the magnetic feet. Ensure the alignment tool is as horizontal as possible and turn on the laser light on the alignment tool.



Locate symmetrical points on the front of the vehicle that are at least 12 inches (30 mm) from the vehicle's center line. Using a ruler or tape measure; measure the distance between the laser light line and the vehicle. Repeat this measurement on the opposite side of the vehicle. Compare the left and right distance measurements. A properly aligned radar sensor will have the same measurement on each side.

Vertical alignment must be performed after the lateral alignment has been completed.

Conclusion

This concludes the Navistar® training course: Bendix® Wingman® Fusion™ System Overview.

Thank you for your participation.

Notes