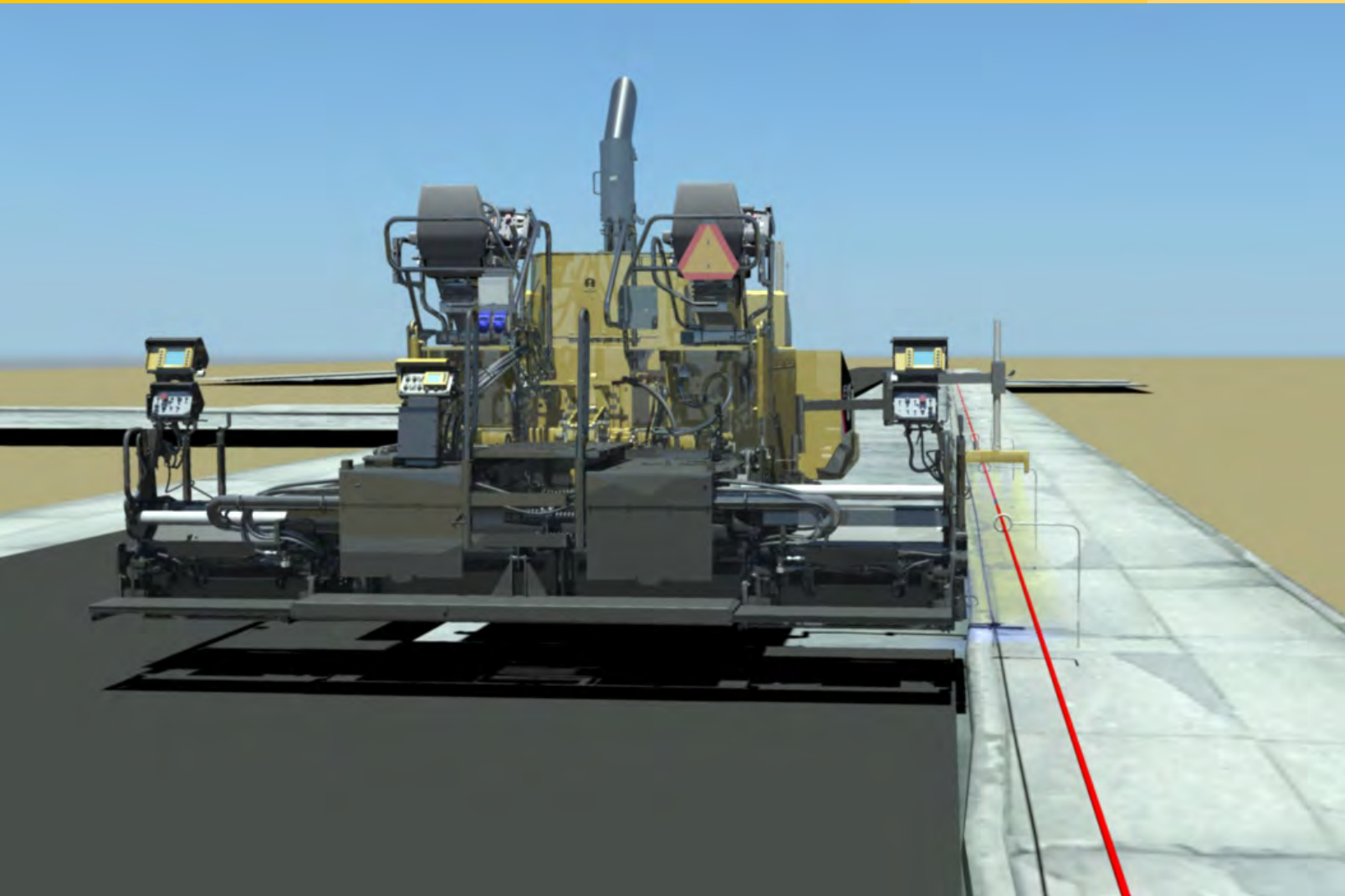


Automatic Grade And Slope Fundamentals



Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules and precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “WARNING” as shown below.



The meaning of this safety alert symbol is as follows:

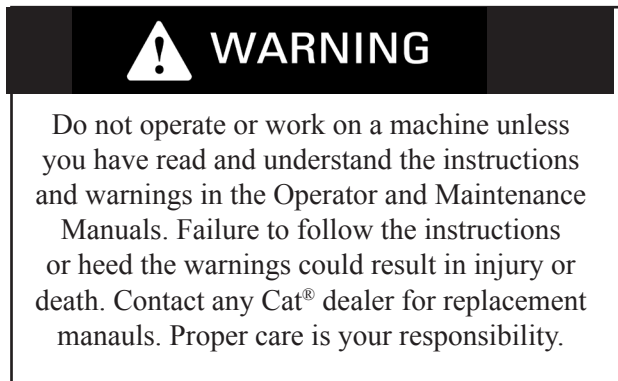
Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operation that may cause product damage are identified by NOTICE labels on the product and in this presentation.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this presentation and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustrations in this presentation are on the basis of information available at the time it was written. The specifications, illustrations and other items can change at any time. These changes can effect the service given to the product. obtain the complete and most current information available.



What Is Automatic Grade & Slope?



Grade



Slope

PAVING PRODUCTS



What does automatic grade and slope control do?

Automatic grade and slope control is a system that maintains the correct elevation of the asphalt mat along its length, referred to as the grade. It also maintains the angle of the mat across its width, which is referred to as slope.

Advantages Of Automatic Grade & Slope Control



- Constant Mat Thickness
- Better Material Control
- Increased Production
- Smoother Roads
- Faster Reaction
- Precise Corrections
- Hands Off Operation

PAVING PRODUCTS



Advantages of automatic grade and slope control

There are many advantages to paving with automatic grade and slope control including:

More consistent mat thickness, which results in better material control, and more accurate material estimates. Less stopping, means increased production. Smoother roads, because the system reacts faster, and with greater precision to grade changes than is possible with manual paving. Automatic grade and slope control means easier, hands off operation without chasing the grade by manually adjusting the screed.

Grade Control



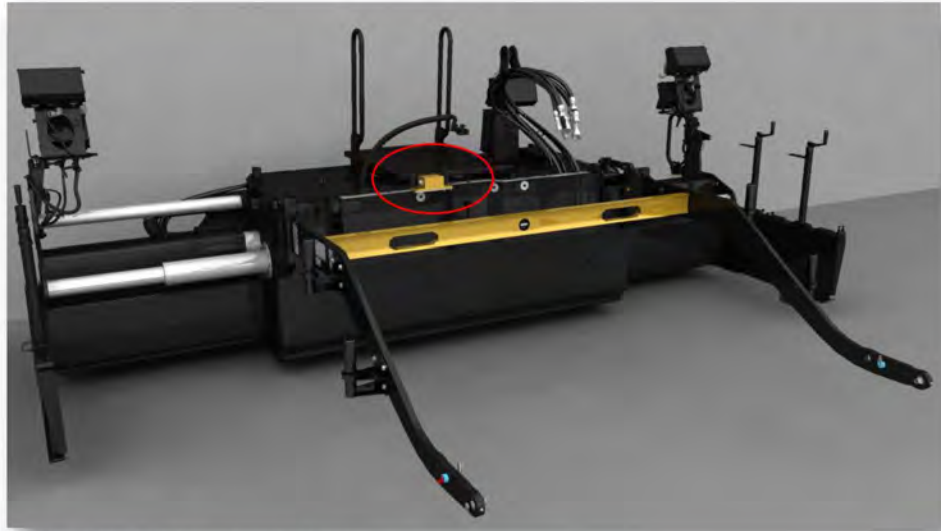
PAVING PRODUCTS



Grade Control

To maintain grade control, sensors positioned on the paver measure the distance to a reference surface. The reference can be a curb, a stringline, an existing mat or the ground. As the distance between the sensor and the reference changes, the system compensates by adjusting the screed angle of attack by raising or lowering the tow points.

Slope Control



PAVING PRODUCTS



Slope Control

Slope is measured by a sensor mounted to the cross beam between the screed arms. This sensor can be compared to a carpenter's level, it measures the angle of the screed and sends that information to the controller. The controller compares the screed angle to the required slope setting, then adjusts the screed angle using the tow points.

Automation Basics Summary

- **Grade and or slope automation is simply a measuring device much like a tape measure or a carpenter's level.**
- **These systems are used on asphalt pavers to assist the paver crews in maintaining thickness and or slope of the asphalt mat being placed.**
- **Proper paving techniques must be employed when using grade and slope automation.**
- **Grade and or slope automation can not prevent mat defects that are caused by poor or bad paving techniques. It can only minimize the defect.**

PAVING PRODUCTS



Automation basics summary

Grade and or slope automation is simply a measuring device much like a tape measure or a carpenter's level.

These systems are used on asphalt pavers to assist the paver crews in maintaining thickness and or slope of the asphalt mat being placed.

Proper paving techniques must be employed when using grade and slope automation.

Grade and or slope automation can not prevent mat defects that are caused by poor or bad paving techniques. It can only minimize the defect.

Automatic Grade And Slope Fundamentals - Components



PAVING PRODUCTS



The Components That Make Up The System

Components: Control Box



- User Interface
- May Have 1 or 2
- Mounted On Screenshot

PAVING PRODUCTS



Control box

The control box is the users interface with the system. The paver may utilize one or two control boxes mounted on the screed.

Components: Control Box



- **System Computer**
 - Receives Input Signals From Sensors
 - Compares Data To Settings
 - Displays Information On Screen

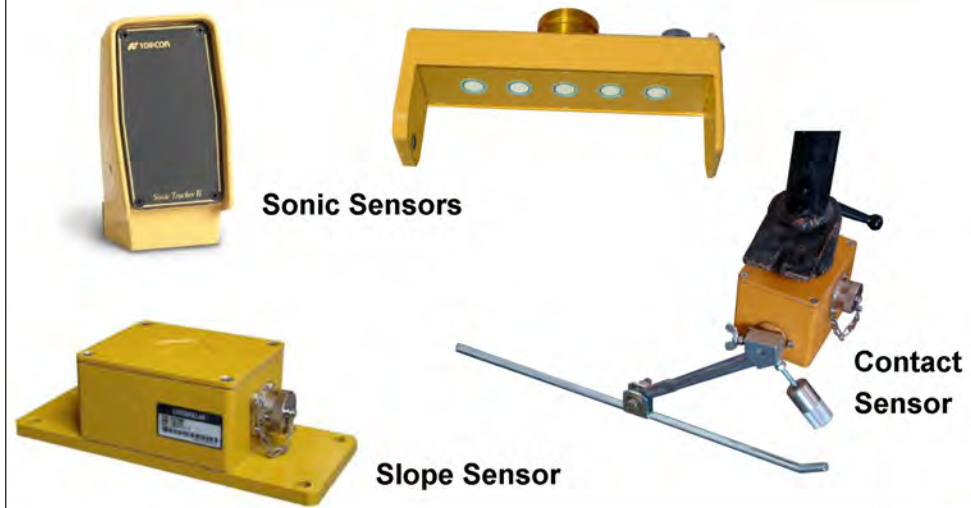
PAVING PRODUCTS



The control box is a computer.

The control receives signals from the sensors via cables. It compares this input data to the parameters programmed into the controller, then communicates this information to the crew by displaying it on the controller screen, and drives the tow point cylinders which adjust the angle of the screed.

Components: Sensors



PAVING PRODUCTS

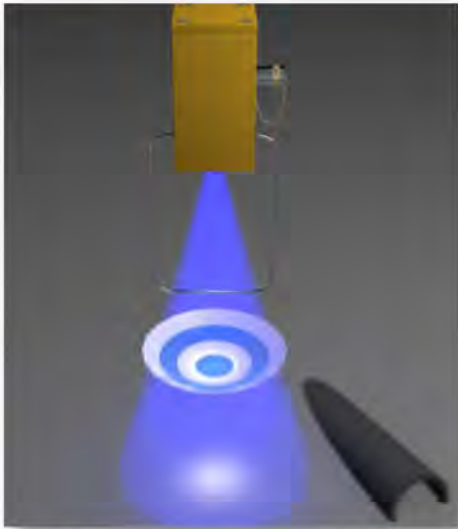


Sensors

There are three types of sensors used in the automatic grade and slope system:

- Sonic
- Contact
- Slope

Components: Sensors



- **Sonic Sensor (Single Transducer)**
 - Measures Distance
 - Projects Sound Waves
 - Bounces Off Surface
 - Returns To Sensor
 - Measures Time To Return
 - Communicates With Control

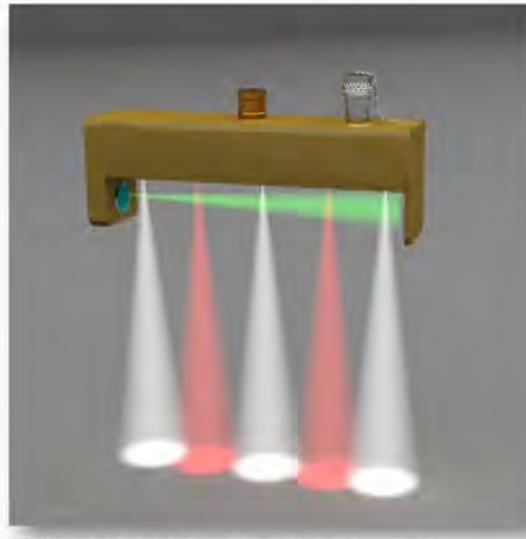
PAVING PRODUCTS



Sonic sensors

Sonic sensors are a measuring device. A transducer projects a sound wave which bounces off a surface and returns to the transducer. The amount of time it takes for the sound to return is measured. Then, using the speed of sound, the distance to the object can be calculated.

Components: Sensors



- **Sonic Sensor (Multiple Transducer)**
 - Measures Distance
 - Projects Sound Waves
 - Bounces Off Surface
 - Returns To Sensor
 - Measures Time To Return
 - Averages Three Measurements
 - Discards Two Measurements
 - Communicates With Control

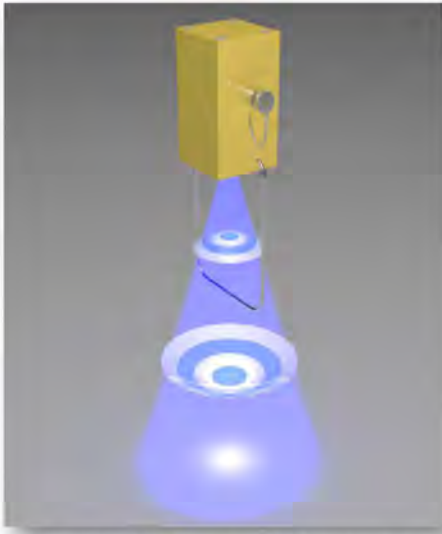
PAVING PRODUCTS



Sonic sensors (multiple transducer)

Some sonic sensors have multiple transducers, in this case five sound waves are projected to the reference surface. The two extreme measurements are discarded, the other three are averaged in order to accurately determine the distance.

Components: Sonic Sensors



- **Single Transducer**
 - Temperature Correction
 - Calibration Distance
 - Temperature bail
 - Returns Part Of Signal

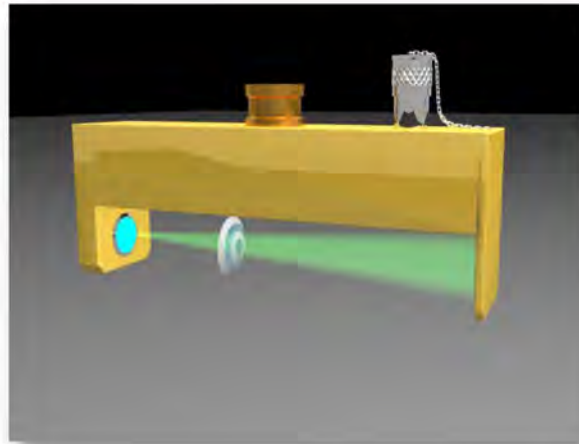
PAVING PRODUCTS



Temperature correction

However, the speed of sound is not constant. It varies according to the temperature. Sound travels slower in cold air and faster in hot air. To compensate for changes in air temperature and the speed of sound, a distance constant is used to correct the calculation. Measuring the time it takes for the sound wave to return from a known distance allows the controller to correct for changes in temperature. Sonic sensors with a single transducer are equipped with a bail. Part of the sound wave bounces off the bail providing the temperature correction.

Components: Sonic Sensors



- **Multiple Transducer**
 - Temperature Correction
 - Dedicated Transducer
 - Calibration Distance
 - Across Sensor
 - Returns full Signal

PAVING PRODUCTS



Temperature correction

Sonic sensors with multiple transducers use the length of the sensor as the distance constant. One of the transducers is mounted horizontally measuring the time it takes for the sound wave to travel across the sensor, providing the information necessary for temperature correction.

Components: Sonic Sensors



- **Working Height**
 - Distance From Reference Surface
 - Less than Sensor Range
 - Specification In Owners Handbook Or Owners Handbook

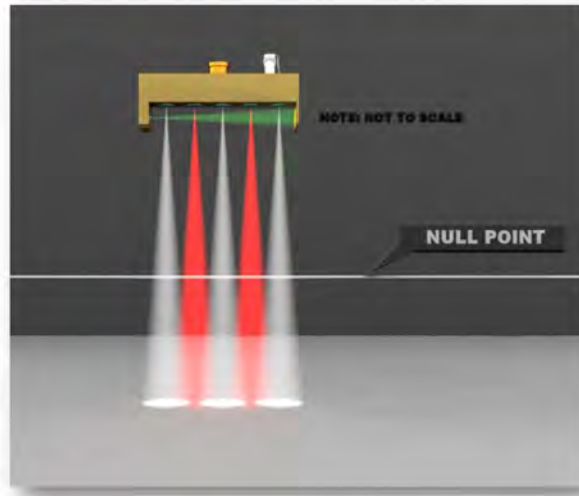
PAVING PRODUCTS



Working height

The distance the sensor is installed above the reference surface is referred to as the working height. The specifications for setting working height vary depending on the sensor used. The specification for working height can be found in the pavers handbook or owners handbook.

Components: Sonic Sensor



- **Null Point**
 - Zero Point Of Sensor
 - Procedure In Paver's Handbook

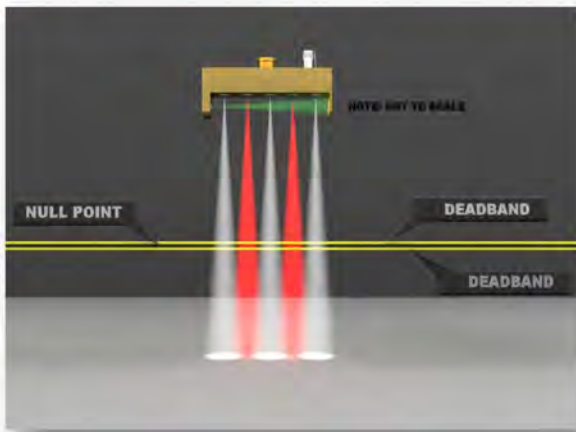
PAVING PRODUCTS



Null point

The zero point of the sensor is referred to as the null point. To set the null point follow the procedure described in the system manual.

Components: Sonic Sensor



- **Deadband**
 - Range Above And Below Null Point
 - Measured In tenths of a Millimeter (.01")
 - Allows For Vibration
 - No Tow Point Movement
 - Adjusted In Control
 - See Paver's Handbook

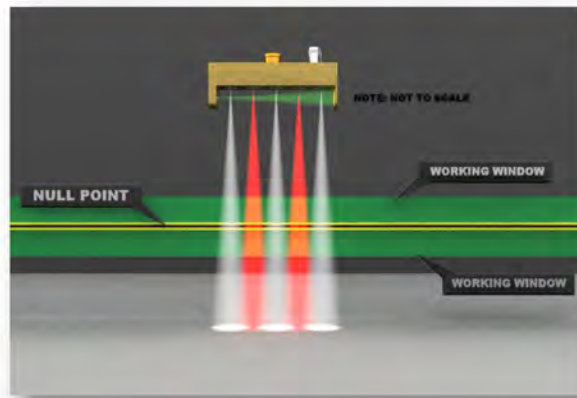
PAVING PRODUCTS



Deadband

There is a narrow band that extends a few tenths of a millimeter (.01") above and below the null point called the deadband. Its purpose is to allow for the normal vibration in the machine. No signal is sent to adjust the tow point when the sensor is moving within the deadband. The actual width of the deadband is programmed into the control settings. The value of the deadband can be found in the pavers handbook.

Components: Sonic Sensor



- **Working Range**
 - Working Window
 - Adjustable in Menu

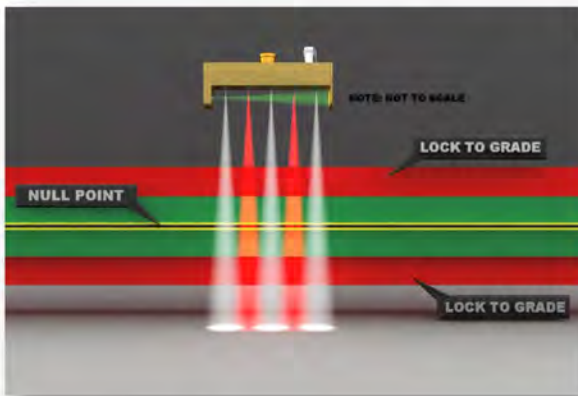
PAVING PRODUCTS



Working Range

When the machine is in operation and the reference surface elevation variation is greater than the deadband, the system operates within the working window. Sensor signals are transmitted to the controller describing the distance to the reference in terms of; amount of change, direction of change and rate of change. The controller adjusts the tow point accordingly as long as the reference stays within this window. The window can be adjusted in the systems menu. Reference manual for proper setting.

Components: Sonic Sensor



- Lock To Grade
 - Outside Of Operating Range
 - No Tow Point Adjustment

PAVING PRODUCTS



Lock to grade

Large deviations in the distance between the sensor and the reference surface can cause the sensor signal to move beyond the working range. When this happens the system locks to grade. In this case no tow point adjustment is made. This prevents large, unintended grade changes.

Components: Contact Sensor



- **Measures Distance**
 - Rotating Arm
 - Follows Reference Surface
 - Sends Signal to Control
 - Drives Tow Point

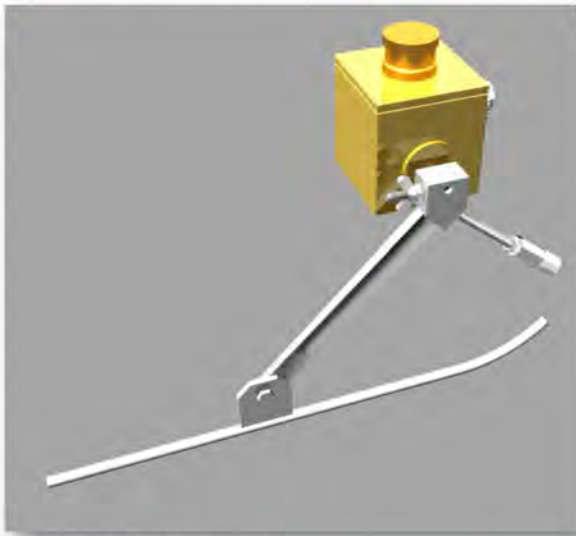
PAVING PRODUCTS



Contact sensor

A contact sensor is another type of measuring device. It consists of a sensor with a rotating shaft connected to an arm, which is in contact with, and follows the reference surface. As the distance between the reference surface and sensor changes, the arm rotates the shaft and varies the signal sent to the controller, which in turn adjusts the tow point.

Components: Contact Sensor



- **Ground Reference**
 - **Shoe Installed**
 - **Follows Reference Surface**
 - **Rotates Shaft**
 - **Sends Signal to Control**
 - **Communicates With Control**

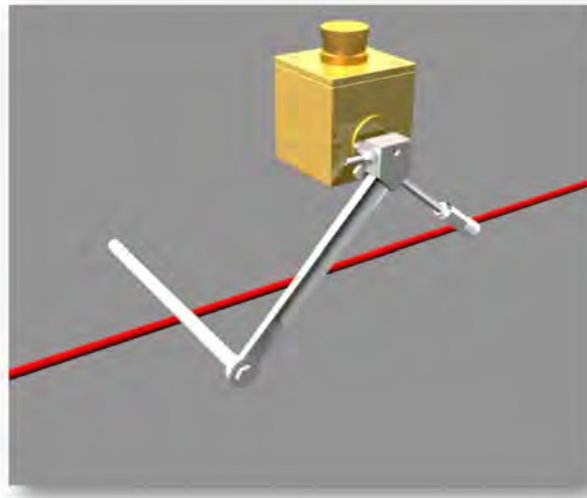
PAVING PRODUCTS



Contact sensor ground reference

Contact sensors should be installed with the arm toward the rear at a 45 degree angle, with the shaft at the center of rotation. When the reference is a curb, existing mat or grade, a shoe is installed on the arm. The counterweight or spring should be adjusted so that the shoe remains in contact with the reference surface.

Components: Contact Sensor



- **Stringline Reference**
 - Wand Installed
 - Follows Reference String
 - Rotates Shaft
 - Sends Signal to Control
 - Communicates With Control

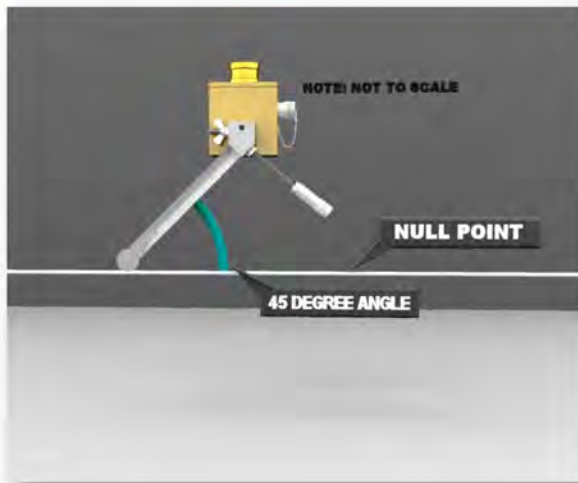
PAVING PRODUCTS



Stringline reference

When used with a stringline, a wand is attached to the arm and centered on the string. The counter weight or spring should be adjusted to allow the wand to follow the string without deflecting it.

Components: Contact Sensor



- **Null Point**
 - Zero Point Of Sensor
 - Arm At 45 Degrees
 - Rotor Centered Between Stops
 - Procedure In Paver's Handbook

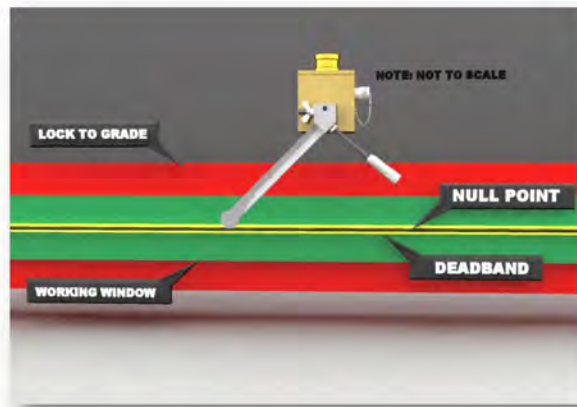
PAVING PRODUCTS



Null point

The zero point of the sensor with the arm at 45 degrees and the shaft centered is referred to as the null point. To set the null point follow the procedure described in the system manual.

Components: Contact Sensor



- Deadband
- Working Range
- Lock To Grade

PAVING PRODUCTS



Deadband

There is a narrow band that extends a few tenths of a millimeter (.01 inch) above and below the null point called the deadband. Its purpose is to allow for the normal vibration in the machine. No signal is sent to adjust the tow point when the sensor is moving within the deadband. The actual width of the deadband is programmed into the control settings. The value of the deadband can be found in the pavers handbook.

Working window

When the machine is in operation and the reference surface elevation variation is greater than the deadband, the system is operating within the working range. Sensor signals are transmitted to the controller describing the distance to the reference in terms of; amount of change, direction of change and rate of change. The controller communicates this information to the machine ECM which adjusts the tow point.

Lock to grade

Large deviations in the distance between the sensor and the reference surface can cause the sensor signal to move beyond the working range. When this happens the system locks to grade. In this case; no signal is sent to the machine ECM, and no tow point adjustment is made. This prevents large, unintended grade changes.

Components: Slope Sensor



- **Precision Level**
 - Similar To A Carpenters Level
 - Mounted On Beam Between Tow Arms
 - Transversely
 - Connected To Both Control Boxes
 - Only One Control In Slope Mode At A Time

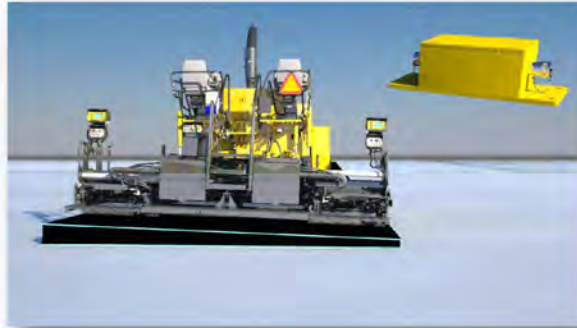
PAVING PRODUCTS



Slope sensor

The slope sensor is an electronic precision angle measuring device, similar to a carpenter's level. The slope sensor is mounted to the cross beam traversing the tow arm. If two control boxes are installed on the paver it is connected to both boxes, but only one control can be in slope mode at any point in time.

Components: Slope Sensor



- **Measures Slope**
 - Angle Of The Mat
 - Across Width
 - Expressed As Percent Of Slope
 - 10mm/Meter = 1%
(.120 in/ft = 1%)
 - Projected From Grade Control Point

PAVING PRODUCTS



Slope measurement

The angle of the asphalt mat across its width is referred to as slope. The amount of slope is expressed as percent of slope; an angle of 10mm/Meter (.120 inch / Ft) = 1% slope. When paving manually the slope angle is projected from the end of the screed. When paving in auto mode the slope angle is projected from the grade sensor location.

Components: Slope Sensor



- Slope Control Does Not Control Mat Thickness
- Controls Slope Angle
 - On Slope Control Side
 - Slope Side Matches Grade Control
 - Adjusts Slope Across Screed
 - Adjusts Tow Point

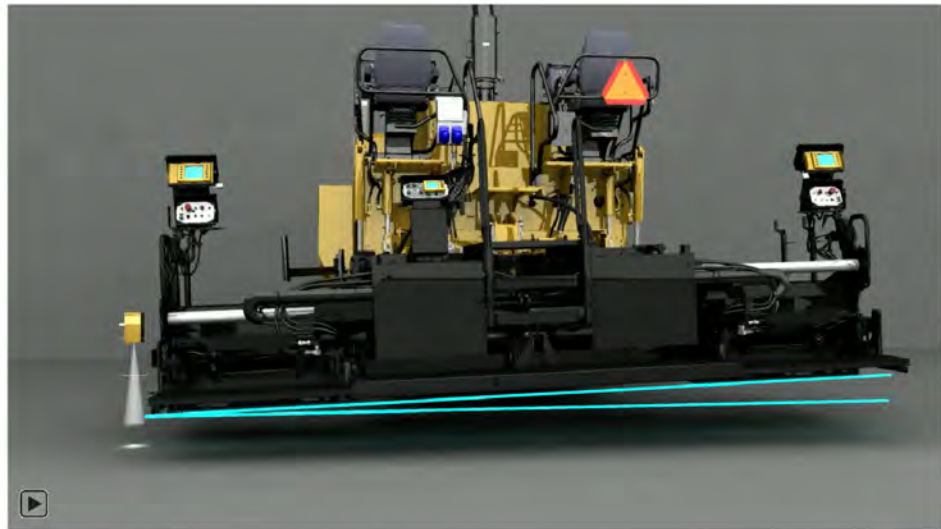
PAVING PRODUCTS



Slope correction

While paving the slope sensor detects changes in the slope angle provides that information to the controller via electronic signal. The controller adjusts the tow point which adjusts the slope of the screed.

Components: Slope Sensor

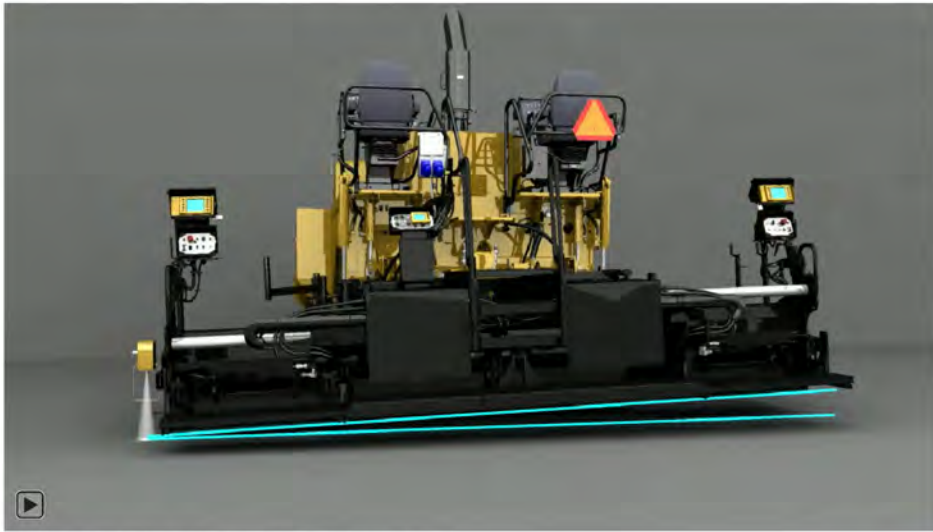


PAVING PRODUCTS



The slope control system does not control mat thickness on the side activated for slope. It only controls the slope angle. Mat thickness that varies on the slope side is due to changes in the slope of the existing grade.

Components: Slope Sensor



PAVING PRODUCTS



If the grade or manual control side thickness is increased or decreased, the slope side will match the amount of change, maintaining the slope angle.

Components: Slope Sensor



- **Null Point**
 - **Set In Control**
 - **To Existing Screed Angle**
 - **With Screed Resting On Surface**

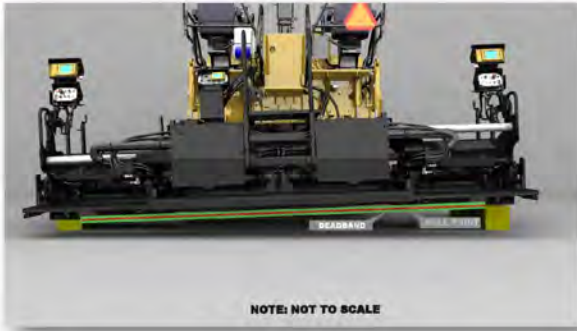
PAVING PRODUCTS



Null point

When the screed is resting on the mat and the control is nulled, the angle of the screed becomes the null point. Refer to the pavers handbook for the nulling procedure.

Components: Slope Sensor



- **Deadband**
 - **Set In Control**
 - Range Above And Below Null Point
 - Measured In Hundredths Of A Percent Of Slope
 - Allows For Machine Vibration

PAVING PRODUCTS



Deadband

Deadband is a range above and below the null point where no signal is sent and no tow point adjustments are made. The purpose of deadband is to allow for normal machine vibration. Deadband is measured in hundredths of a percent of slope and is entered into the control as part of the setup procedure. Refer to the pavers handbook for specifications.

Components: Averaging Ski



- **Averaging Ski**
 - Beam Mounted To Paver
 - Averages Surface Variation Over Large Distance
 - Several Types
 - Configuration Varies Depending On Conditions

PAVING PRODUCTS



Averaging ski

An averaging ski is a beam that ranges in length from 4.5 – 15 meters long (15 – 50 ft.) , and is mounted to the side of the paver with brackets and/or pull arms. There are several types of averaging skis used depending on the type of paving and paving conditions. An averaging ski can have 1 to 4 sensors installed depending on the type of ski, its purpose and the reference surface used.

Components: Averaging Ski



- **Purpose**
 - Provides Smoother Mat
 - Increases Ride Quality
 - Increases Profits

PAVING PRODUCTS



Averaging ski purpose

The reason for using an averaging ski is to provide a smoother mat. The length and construction of the ski allow it to provide the controller a much more accurate picture of the reference surface. The averaging ski is able to ignore small deviations such as rocks, shovels, small holes and depressions in the surface, while still providing necessary information about larger changes in the reference surface. This allows the paver to make small slow corrections, which increases ride quality by reducing road waves caused by chasing the grade. Improved ride quality increases profits by increasing ride quality incentives and reducing penalties.

Components: Averaging Ski



- **Outboard Leveler**
 - 9 or 12 Meters Long (30 or 40 Ft.)
 - References Outside Of Paving Width
 - Recommended For Highway Projects
 - Used With A Contact Or Sonic Sensor

PAVING PRODUCTS



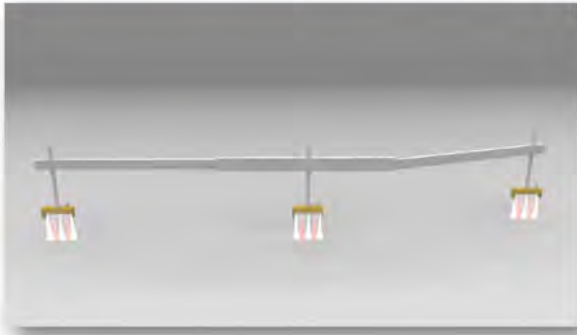
Averaging Ski types – Outboard leveler

The articulated outboard leveler ski is 9-12 meters long (30 – 40 Ft.) and is mounted to the paver by pull arms and brackets. It rides directly on the reference surface outside the paving width. It uses a single sensor mounted in the center which references a string mounted to the ski.

This ski is recommended for highway projects when long pulls are the norm.

The ski can be used with a contact sensor or a sonic sensor.

Components: Averaging Ski



- Noncontact
- Solid Mount
- Moves Vertically With Paver

PAVING PRODUCTS



Articulated outboard leveler ski - operation

As this type of averaging ski moves across the reference surface it floats vertically. It's many contact points and multiple articulation points greatly reduce sensed grade deviation. A 25.4mm (1 inch) deviation in the reference surface results in a 3mm (1/8 inch) deviation signal to the controller.

Components: Averaging Ski



- **Characteristics**
 - Excellent Smoothness
 - Large Size
 - Many Moving Parts
 - Suitable For Most Grade Conditions

PAVING PRODUCTS



Articulated outboard leveler ski - characteristics

This type of averaging ski provides excellent smoothness due to its large size and many articulating points, it can be used for most grade conditions

Components: Averaging Ski



- **Fore And Aft Leveler**
 - Traveling Stringline
 - Bridges Screed
 - Two Mounting Points
 - Ahead Of Screed
 - Behind Screed
 - References Inside Of Paving Width
 - Rear Shoe Rides On Finished Mat To Provide Smooth Reference

PAVING PRODUCTS



Averaging ski types – Fore ‘N Aft Leveler

The Fore ‘N Aft Leveler is a traveling stringline that bridges the screed. It contacts the reference surface ahead of and behind the screed. It is mounted inboard of the screed end plate, and references inside the paving width. The rear shoe rides on the asphalt mat.

Components: Averaging Ski



- **Characteristics**
 - Used When Outboard Referencing Is not Available
 - Limits Access To Screed

PAVING PRODUCTS



Fore 'N Aft Leveler – characteristics

This type of averaging ski is used when outboard referencing is not available.

Because of the mounting configuration, access to the screed is limited.

Components: Averaging Ski



- **Inboard Leveler**
 - Traveling Stringline
 - References Grade Inside Of Paving Width
 - Mounts Ahead Of Screed

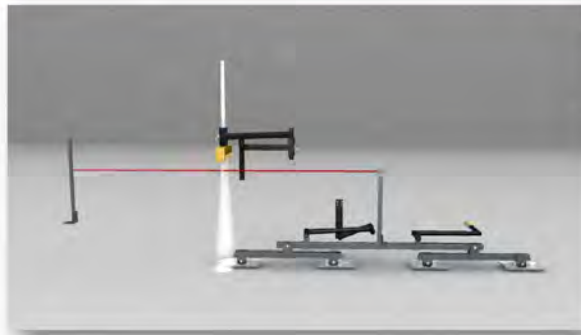
PAVING PRODUCTS



Averaging ski types – inboard leveler

The inboard leveler is a traveling stringline which references the grade inside the mat width. It is mounted to the paver with brackets and pull arms ahead of the screed. It uses a single center mounted sensor which references a stringline

Components: Averaging Ski



- **Sensor Monitors Stringline**
- **Averaging Capability**
 - 50% Of Outboard Leveler

PAVING PRODUCTS



Traveling stringline – operation

With a traveling stringline, the center point of the string is deflected every time a shoe passes over a depression or high point. The amount of deflection is one half the amount of grade deviation.

Components: Averaging Ski



- **Characteristics**
 - Used When There Are No Ski Length Requirements

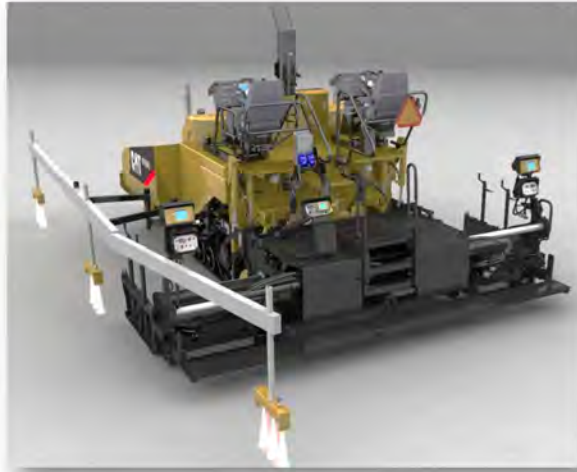
PAVING PRODUCTS



Traveling stringline – Characteristics

A traveling stringline is used when outboard referencing is not available and there are no ski length requirements.

Components: Averaging Ski



- **Sonic Averaging Ski (SAS)**
 - Aluminium Beam
 - Mounted To Tow Arm
 - Hinged Section Front And Rear
 - 1 to 4 Sonic Sensors

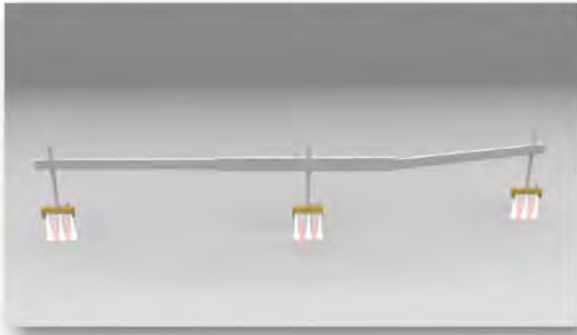
PAVING PRODUCTS



Averaging ski types – sonic averaging ski (SAS)

A sonic averaging ski consists of a hinged aluminum beam attached to the paver tow arm. It can have 1 to 4 sonic sensors mounted. Because it is hinged, it can reference the grade inside or outside the paving width.

Components: Averaging Ski



- Noncontact
- Solid Mount
- Moves Vertically With Paver

PAVING PRODUCTS



Sonic averaging ski – operation

The sonic averaging ski uses sonic sensors exclusively so it is a non contact system. Since it is solidly attached to the tow arms it is affected by the vertical movement of the paver.

Components: Averaging Ski



- **Characteristics**
 - Latest Technology
 - Low Maintenance
 - Affected By Paver Vertical Movement
 - Solid Mount
 - Easy Transport And Set Up
 - Versatile

PAVING PRODUCTS



Sonic averaging ski – characteristics

The sonic averaging ski is the newest type of averaging ski. Because it is a non contact ski it allows maneuvering the paver without raising the ski. Being non contact also means it stays cleaner and requires less maintenance. The ski is solidly mounted to the tow arm, because of this, it is affected by the up and down movement of the paver.

Because it is hinged and of aluminum construction its relatively easy to transport and setup. The sonic averaging ski is very versatile and can be used in most grade conditions.

Automatic Grade And Slope Fundamentals – Installation Configurations



PAVING PRODUCTS



Installation configurations

Installation Configurations: Single Sensors



- **Choose Position**
 - Position Between Auger Centerline And Tow Point Cylinder
 - Sensor Location Is The Control Point

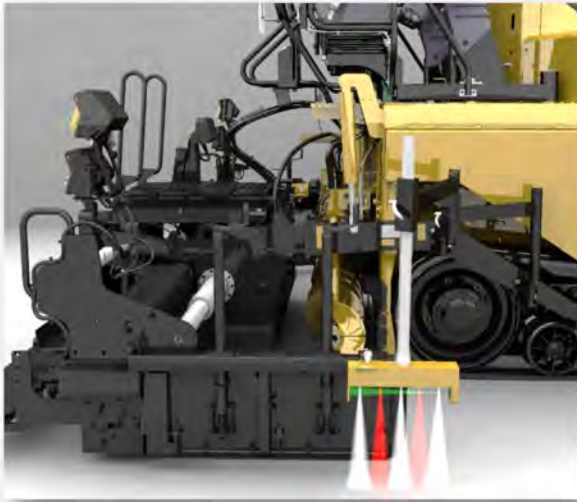
PAVING PRODUCTS



Installation configurations – single sensors

A grade sensor whether mechanical or sonic, can be positioned anywhere between the centerline of the augers and the tow point cylinder. Where the sensor is positioned affects how quickly the screed reacts to grade variations. A sensor positioned close to the auger centerline reacts quickly, and is usually chosen when joint matching. A sensor positioned close to the tow point cylinder produces gradual changes resulting in a smoother surface. The sensor position is the control point.

Installation Configurations: Single Sensors



- **Auger Centerline**
 - **Faster Response**
 - **Reaction Ratio 4 To 1**
 - **Change Takes Place Over Short Distance**
 - **Use When Joint Matching**

PAVING PRODUCTS



Auger centerline position

Positioning the sensor at the auger centerline results in faster response to changes in grade elevation. It makes no difference whether a sonic or mechanical sensor is used. Screed reaction to grade deviation is the same with either type. When a sensor is placed at the centerline of the auger, the reaction ratio is 4 to 1. This means the tow point cylinder will move 4 times farther than the detected deviation. This means the initial screed rate of change is very fast. As the screed height goes beyond the null point of the sensor, the tow point is moved up or down, and the original screed angle of attack is resumed. The vertical change in screed position now equals the amount of detected deviation. This change occurs very quickly.

Installation Configurations: Single Sensors



- **Tow Point Cylinder**
 - **Slower Response**
 - **Reaction Ratio 1 To 1**
 - **Change Takes Place Over 5 Tow Arm Lengths**
 - **Use When Smooth Surface Is Required**

PAVING PRODUCTS



Tow point cylinder position

When a sensor is placed at the center of the tow point pivot, the reaction ratio is 1 to 1. This means the tow cylinder will move the same distance as the detected deviation amount. The screeds rate of change takes place over 5 lengths of the tow arm. Therefore, changes are spread out over a long distance, producing a very smooth mat. For maximum smoothness, forward positioned sensors are often used in conjunction with an averaging ski. The ski bridges over most grade deviations and provides a relatively unchanging reference plane. This configuration helps eliminate mat deviations caused by the tractor shifting the tow point up and down as it travels over irregular grade conditions. With the sensor positioned forward and referencing off a ski, The tractor is able to move up or down while the tow point height remains unchanged.

Installation Configurations: Single Sensors



- **Locate Sensors Close To Screed End**
 - **Control Point Matches Mat Thickness**
 - **Grade Conditions Change Farther from Screed End**

PAVING PRODUCTS



Sensor, screed alignment

Position the sensor as close as possible to the end of screed without sensing the end of the screed . The control point height and mat thickness at the end of the screed are the same. Positioning the sensor too far from the end of the screed will cause it to read grade conditions which may not be the same as those close to the screed end. Also, grade changes on the opposite end of the screed can affect mat thickness on the sensor end, even though the sensor is not calling for a change.

Installation Configurations: Sensor Positioning



- **Sonic Sensor**
 - Specified Height Above Reference Surface
 - Consult Paver's Handbook
 - Connector Toward Rear

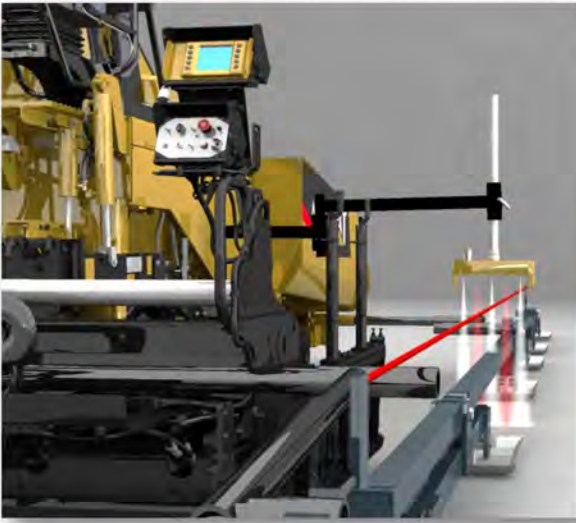
PAVING PRODUCTS



Position sensor – Sonic

When positioning a sonic sensor above an existing grade, adjust the height above the grade to the dimensions listed in the pavers handbook. When paving in windy conditions place the sensor near the minimum distance specified. Position the sensor with the connector toward the rear.

Installation Configurations: Sensor Positioning



- **Sonic Sensor With Multiple Transducers**
 - Centered Above Stringline
 - Perpendicular To Stringline
 - Connector To Left When Viewed From The Rear (On Cat® Systems)

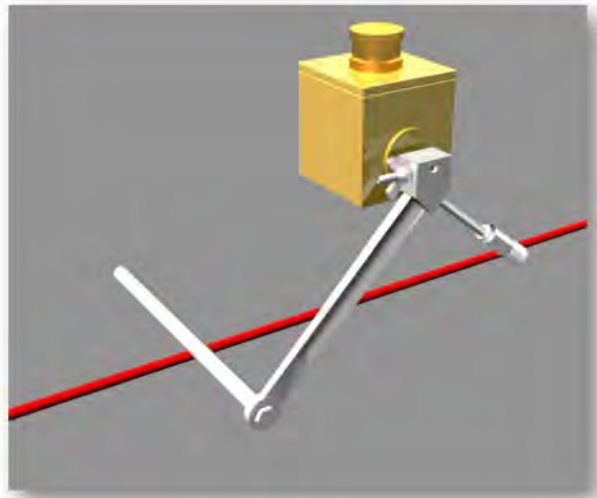
PAVING PRODUCTS



Position sensor – Sonic

When positioning a sonic sensor above a stringline the sensor should be centered on the stringline. Sensors with multiple transducers should be positioned perpendicular to the stringline with the connector to the left when viewed from the rear of the paver (on Cat® systems). Consult paver handbook for recommended height.

Installation Configurations: Sensor Positioning



- **Contact Sensor Above Stringline**
 - Wand Installed
 - Arm Toward Rear
 - Arm At 45 Degrees
 - Rotor Centered
 - Counterbalance Adjusted

PAVING PRODUCTS



Position sensor – Contact

When positioning a contact sensor to follow a stringline, adjust the height so that the arm is to the rear at a 45 degree angle with the wand centered on the string. The rotor should be at the center of its rotation, and the counterweight or spring adjusted so that the wand follows the string without distorting it.

Installation Configurations: Sensor Positioning



- **Contact Sensor Above Grade**
 - Arm Toward Rear
 - Arm At 45 Degrees
 - Rotor Centered
 - Counterbalance Adjusted

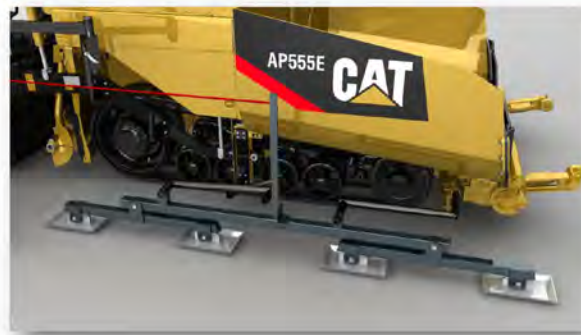
PAVING PRODUCTS



Position sensor – Contact

When positioning a contact sensor to reference an existing grade, adjust the height so that the arm is at the rear at a 45 degree angle. The rotor should be centered in its rotation, and the counterbalance weight or spring adjusted so that the skate accurately follows the grade.

Installation Configurations: Averaging Skis



- **Drag Ski**
 - Inspect Shoes
 - Replace If Worn Or Damages
 - Clean Tack Coat

PAVING PRODUCTS



Averaging skis – Drag Ski

When installing a drag ski inspect the contact shoes and replace any that show excessive wear or damage. Clean any tack coat from the ski and make sure all the pivot points move freely.

Installation Configurations: Averaging Skis



- **Drag Ski Sensor Location**
 - Adjust Ski so Centerline Of Ski Is near Tow Point
 - Always Position Sensor In The Center Of Ski
 - Best Averaging Occurs When These Conditions Are Met

PAVING PRODUCTS



Position averaging ski

Position the sensor for the reaction desired; near the tow point cylinder for a smoother surface, near the auger for faster reaction. Always position the sensor in the center of the ski.

Installation Configurations: Averaging Skis



- **Tow Links**
 - Allow For Free Movement
 - Parallel To Line Of Travel

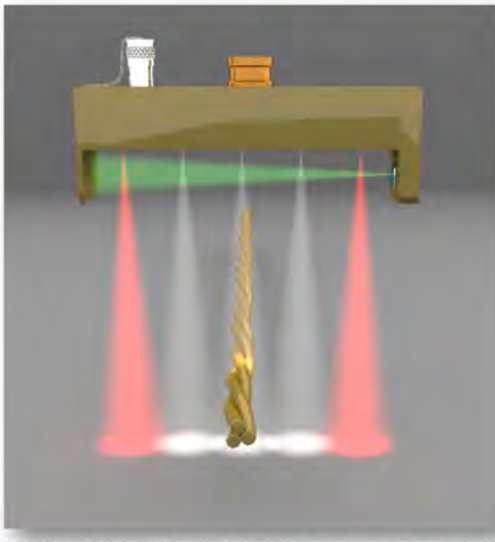
PAVING PRODUCTS



Adjust the tow links

Install the tow links to allow the ski to move freely in the vertical direction. It is also important that the links are positioned parallel to the direction of travel in order to provide vertical stability when the paver stops and starts.

Installation Configurations: Averaging Skis



- **Stringlines**
 - Larger Is Better
 - Multiple Strands
 - Minimum 4 Inches Above Beam

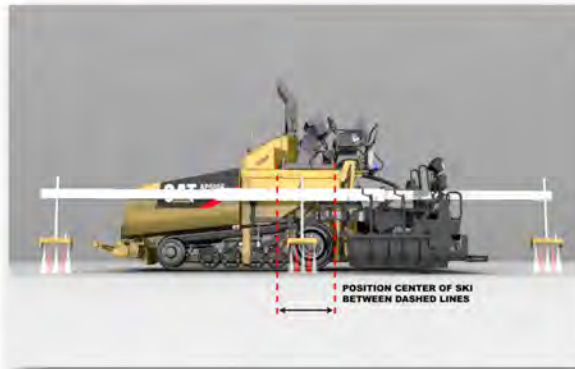
PAVING PRODUCTS



Stringlines

When installing stringlines with sonic sensors, it's important to note that larger stringlines provide a stronger signal. The stringline should be a minimum of 3mm (1/8 inch) in diameter and multiple strands. Also position the stringline at least 10 cm (4 inches) above the beam to avoid an erratic signal.

Installation Configurations: Averaging Skis



- **Sonic Ski Sensors**
 - Center Sensor
 - Ahead Of Auger
 - Away From Material
 - Front And Rear Sensors
 - Equal Distance from Center Sensor
 - Working Height
 - To Specifications

PAVING PRODUCTS



Sonic ski – Sensor location

When installing a sonic ski be sure to position the center sensor so that its away from the material being spread by the auger. If front and rear sensors are fitted, they should be equal distances form the center sensor to provide the best average. Working height should be set according to the specifications given in the pavers handbook.

QEDQ1793 (1/2014)
© 2014 Caterpillar
All Rights Reserved.

Materials and specifications are subject to change without notice.
Featured machines in photography may include additional equipment for special applications. CAT, CATERPILLAR, their respective logos, "Caterpillar Yellow" and the POWER EDGE trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.

