Operation & Maintenance Instructions

System Four
Grade and Slope Automation

Cedarapids
A Terex Company

21048 (12/95)

Part # 49999-188

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Introduction

To the Owner & Operator:

We have tried to provide information which will give you a clear understanding of equipment construction, function, capabilities and requirements. This information is based on the knowledge and experience of highly qualified people at our company and in our field organization. Proper use of this information will promote high efficiency, maximum service life and low maintenance costs.

We strongly recommend that all persons directly involved with this equipment be familiar with this manual.

The information contained in this manual should not be considered all-inclusive for every application. Questions about specific uses of this equipment should be directed to Cedarapids Inc. Anyone who uses this equipment for any purposes other than its intended use assumes the risk of any danger in doing so.

Respectfully,
Cedarapids Inc.

Important Notice!

Federal, state and local safety regulations must be complied with to prevent possible danger to person(s) or property from accidents or harmful exposure. This equipment must be used in accordance with all operation and maintenance instructions.

(1) Read all warning, caution and instruction signs. Know what guards and protective devices are included and see that each is used. Additional guards and protective devices that may be required due to proximity to related equipment must be installed by the user (owner) before operating.

(2) ***Never lubricate or adjust equipment when it is operating!***

(3) Securely lock out the involved power source before doing maintenance, cleaning, adjusting or repair. Secure the power source lockout to prevent start-up by other persons.

(4) Wear a protective mask whenever harmful air pollution exists.

(5) Use ear plugs whenever noise level is above established limits.

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Introduction

About This Manual

We have tried to provide information which will give you a clear understanding of equipment construction, function capabilities and requirements. This information is based on the knowledge and experience of highly qualified people at our company and in our field organization. Proper use of this information will promote high efficiency, maximum service life and low maintenance.

We strongly recommend that all persons directly involved with this equipment be familiar with this manual whether or not you have experience with previous generations of machines.

Experience has shown that it is to your advantage to have a copy of this manual on site where the operators can consult it as needed and have a copy on file in your office so supervisors can conveniently refer to it.

Danger! *This manual contains vital information essential to proper and safe operation of this equipment. Carefully read the entire manual before attempting to operate this equipment. Failure to follow instructions and warnings contained in this manual can cause severe personal injury or death or substantial property damage.*

Additional copies can be ordered through your local Cedarapids Distributor Representative.

On going improvement of product design may result in future changes to some parts. When ordering replacement parts, please be exact as possible in describing the part. Use part numbers, model number and serial number to communicate with your local Cedarapids Distributor Representative.

When you have a question about your machine or operation manual, please contact your local Cedarapids Distributor Representative.

About Cedarapids Inc.

Cedarapids is proud to manufacture this machine for your use and profit. We also take pride in the quality of our service and replacement parts.

Cedarapids Inc., located in Cedar Rapids, Iowa, USA, has been manufacturing heavy equipment for the construction industry since 1923. Our friendly, helpful people are ready and able to serve your needs.

If you have a question or concern please feel free to give us a call at (319) 363-3511 Monday - Friday 7:30 am to 4:30 PM Central Time. If you have a problem and need assistance during after hours, call our emergency service number at (319) 398- 9114. An operator will get your name and number so a service representative can return your call (usually with in 30 minutes). If your concern can not be resolved at that time a representative from engineering will be contacted. We are looking forward to serving you.

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Safety

Safety Rules

When operating the equipment, always follow the safety rules. Cedarapids makes no guarantee either expressed or implied that the equipment meets all local or federal safety regulations. It is the responsibility of the individual user to verify that all safety regulations are complied with before starting the machine.

Personal Safety Rules

Cedarapids equipment is designed with the safety of all personnel in mind. Do not attempt to change, modify, or eliminate the accident prevention devices installed at the factory. Make sure all personnel who regularly work or who might do work in the area of the equipment are familiar with the safety precautions. Owners and operators are responsible for safety information and following safe practices.

Guards, covers, and shields are installed around moving parts at the factory whenever necessary to prevent accidental injury to operators and others working on or near the equipment. Do not remove them. In some cases it is the customer's responsibility to properly guard the machine before operation.

Danger! *This manual contains important information regarding the operation of your machine. Carefully read the entire manual before attempting to operate. Failure to read this manual and follow the instructions and warnings in it can cause severe personal injury, death or substantial property damage.*

- Only qualified and trained persons should operate, repair or maintain this equipment.
- Keep this manual for future reference.
- Federal, state and local safety regulations must be complied with to prevent possible danger to person(s) or property from accidents or harmful exposure.
- This equipment must be used in accordance with all operation and maintenance instructions.
- We strongly recommend that all persons involved with this equipment be familiar with this manual and all related engine manuals.
- Read all Danger, Warning, Caution and instruction decals.
- Know what guards and protective devices are included and see that each is used.

Hazard Seriousness Level

Signal words (Danger!, Warning! and Caution!) are used to identify levels of hazard seriousness in this manual and on decals located on the equipment.

Definitions for identifying hazard levels are provided below with their respective signal words.

Danger! *Immediate hazards which WILL result in severe personal injury or death.*

Warning! *Hazards or unsafe practices which COULD result in severe personal injury or death.*

Caution! *Hazards or unsafe practices which COULD result in minor personal injury.*

Instructional and Informational Levels

Signal words (Notice and Important) are used to identify instructional procedures and informational suggestions or directions for Cedarapids equipment operation and maintenance

Definitions for identifying instructional or informational levels are provided below.

Notice

Notice: Failure to follow proper instructional procedures could lead to serious and/or expensive damage to the equipment.

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Important

Important: Informational suggestions or directions regarding operational and maintenance of equipment.

Danger! *Failure to avoid the following hazards will result in severe personal injury or death.*

- Never attempt to install or remove any part or assembly when the paver is running.
- Do not allow personnel to walk between the machine and truck.
- Do not refule the machine with the engine running. All sparks and open flames must be kept to a minimum of 50 feet away from the machine while refueling.

Warning! *Failure to take action to resolve these hazards or unsafe conditions could result in severe personal injury or death.*

- Wear clothing that fits snug to prevent getting caught in moving parts. Loose-fitting clothing should never be worn.
- Mount and dismount the machine using only the steps, handrails and walkways.
- Do not mount or dismount the machine when it is moving.
- Keep all personnel clear of machine when operating.

Caution! *Failure to heed the following could result in personal injury.*

- Wear protective mask when harmful air pollution exists.
- Wear safety goggles, gloves and long-sleeve shirts when in close proximity to hot asphalt materials.
- Wear ear plugs if needed.
- To prevent fire hazards, keep the engine area free of oil, fuel and trash buildup.

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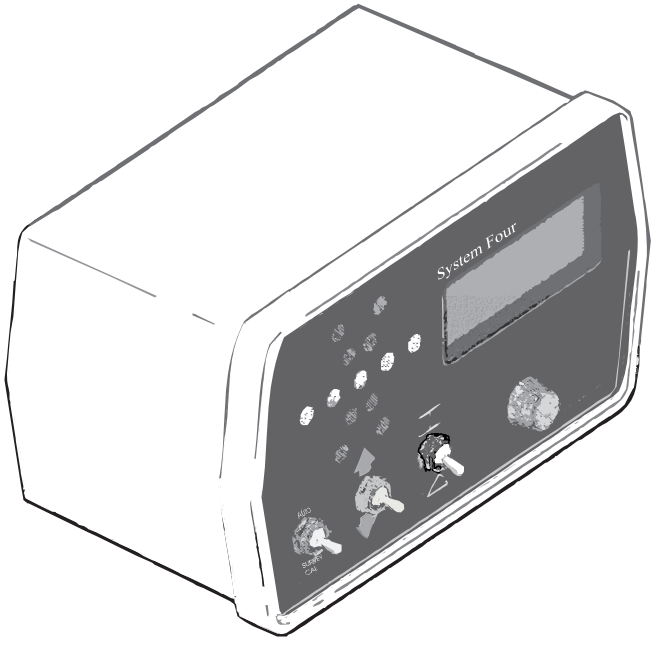
System Overview

System Four is a complete, non-contacting control system which combines both elevation control and slope control into a simple, easy to use package. The system includes two Control Boxes, two Sonic Tracker II's and a single Slope Sensor. The Control Box on the right side of the machine controls the right side for either elevation or slope. Likewise, the left Control Box controls the left side for either elevation or slope.

The primary function of the System Four is to provide screed control so that the paving material is placed into position at the correct elevation and slope.

Control Box

The Control Box is the operator's interface to System Four. The Control Box receives signals from the sensors, (Sonic Tracker II, Laser Trackers and/or Slope Sensor), and uses these signals to determine if grade or slope correction is necessary. If a change in grade or slope is required, the Control Box sends a signal to the valve controlling the tow point cylinder on the appropriate side of the machine to raise or lower, thus maintaining correct mat thickness.

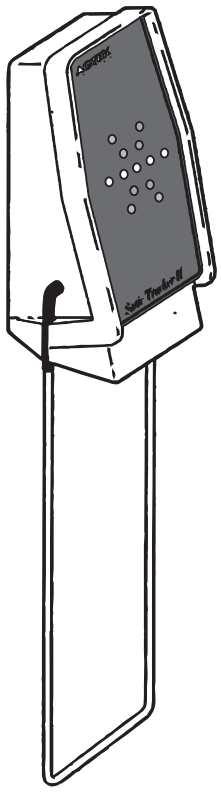


All of the controls for the System Four are on the front panel of the Control Box. The Control Box connects to the Junction Box on the respective side with one cable. It attaches easily with one mounting clamp, and at the end of the day can be quickly removed for storage.

Sonic Tracker II

The Sonic Tracker II is an elevation control sensor. It sends out pulses of high frequency sound and measures the time it takes for the echoes reflected from physical objects to return. Sonic Tracker II then sends that information to the Control Box. The Control Box then evaluates the information and raises or lowers the towpoint cylinder to maintain proper mat thickness.

Sonic Tracker II attaches to the system through one quick connect cable and attaches to the machine with a single bolt. At the end of the day, Sonic Tracker II should be removed for proper storage in the carrying case.



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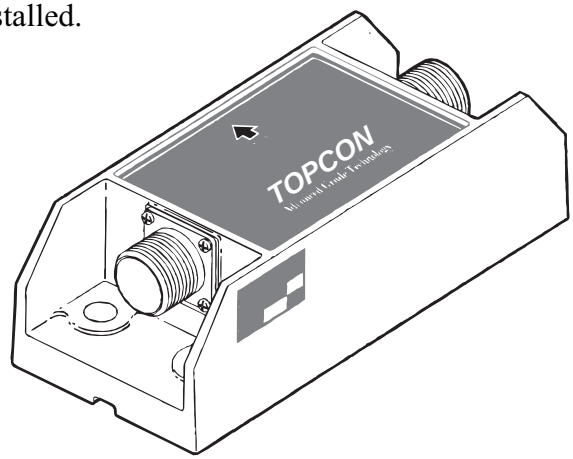
Slope Sensor

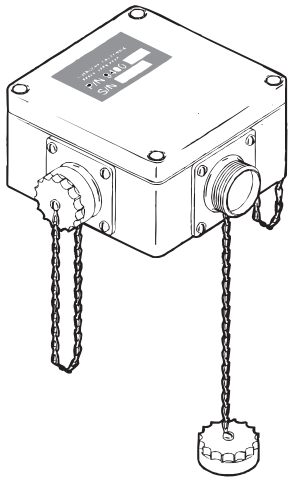
The Slope Sensor is a precision electronic sensor which functions much like a precision carpenters level. The Slope Sensor reads the inclination (tilt) of the screed and sends the signal to the Control Box.

The Slope Sensor is a sealed unit and contains no adjustments. It is the only component of System Four which may be selected to control either side of the paver. It is connected to both Junction Boxes by two cables, and is not removed from the paver once installed.



Junction Box

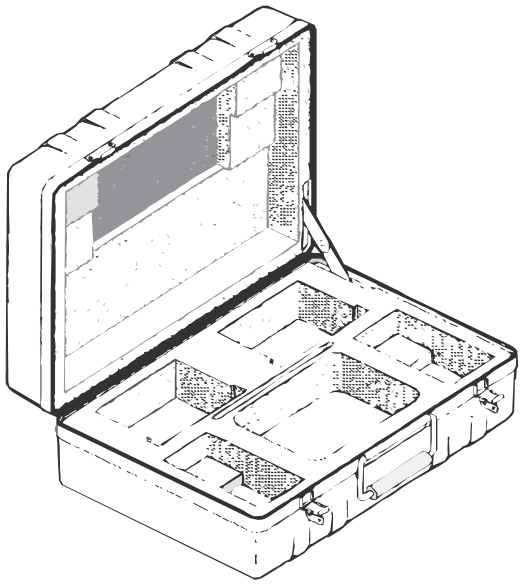
The primary function of the Junction Box is to route power and ground from the paving machine to the Control Box, and to route correction signals from the Sonic Tracker II or Slope Sensor to the Control Box. It also routes valve signals from the Control Box to the paving machine valves.



The Junction Box allows for quick and easy attachment and removal of the system cables, and once installed on the paving machine it is not removed.

Carrying Case

A Carrying Case is provided with each System Four. The Carrying Case is lined and includes pre-cut sections for each Sonic Tracker II and Control Box. A plastic bucket is also provided for storing coil cords and cables.



At the end of each job or at the end of the day, always wipe down each of the components and place them and the coil cords in the appropriate sections for storage. This will ensure the continued integrity of these components and will protect them from vandalism or theft.

Notice: Keep the Carrying Case dry and store in a dry location. Never let the Carrying Case become wet. If the case does become wet, remove the components and air until dry.

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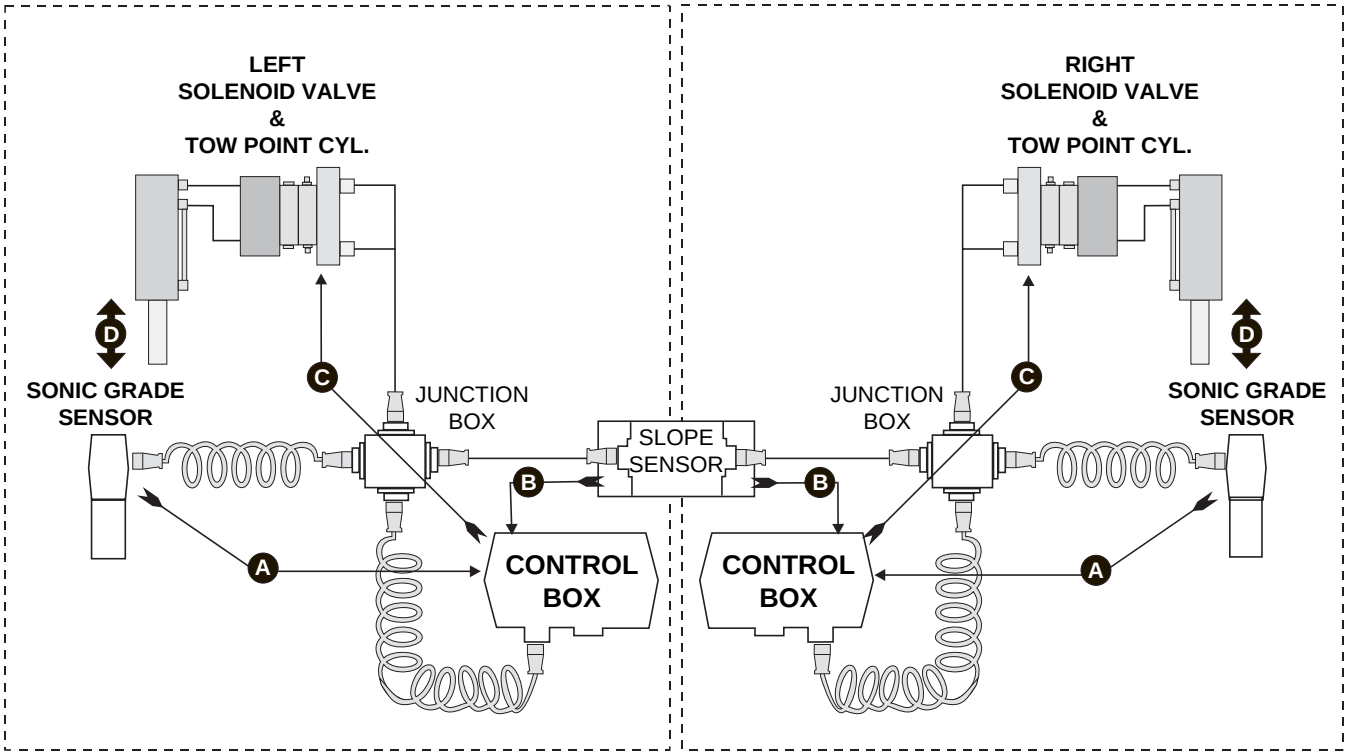
System Four Signal Routing



(A) The Sonic Tracker II measures the distance between it and the reference plane and sends the information to the Control Box.

(B) The Slope Sensor measures angle of the slope beam and sends the information to the Control Box.

(C) The Control Box determines if corrections are required and sends correction signals to the pavers hydraulic valve.

(D) The pavers hydraulic valve responds by moving the tow point cylinder to make the correction.

Non-Contacting Systems

Non-Contacting Grade control or Paving control systems operate from Sonic, Laser or Gravitational sensors that do not require physical contact with a Control Reference to maintain a desired Elevation or Slope. The following sections will explain the principles of the Sonic (Sonic Tracker II) and the Gravitational (Slope Sensor) devices supplied with System Four.

Sonic Tracker II: How It Works

The Sonic Tracker II measures distances to a physical reference (Control Reference) using sound pulses, much like a SONAR.

A Transducer, located in the bottom of the Sonic Tracker II generates sound pulses like a speaker, and listens for returned echoes like a microphone. When the Transducer generates a sound pulse, it also starts a counter that is a lot like a stopwatch.

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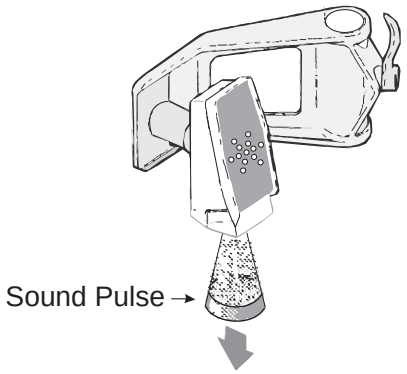
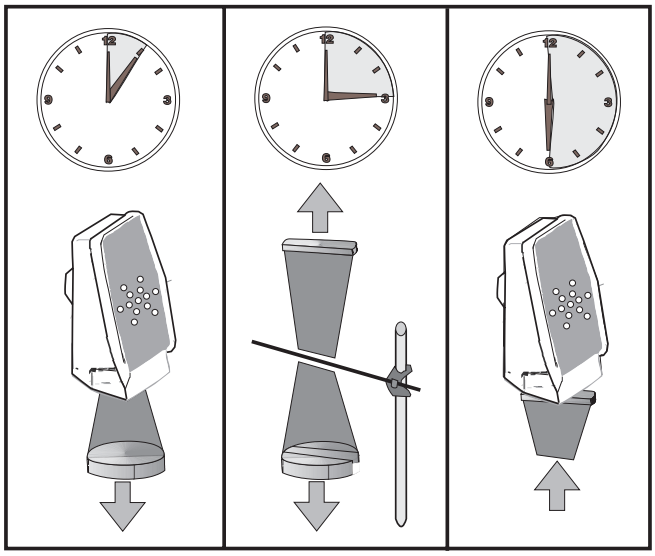
The pulse travels away from the Sonic Tracker II at the speed of sound, gradually increasing in diameter.



When the sound pulse strikes an object (Control Reference), a portion of the sound pulse is reflected back up toward the Transducer. The size of the cone determines what the Sonic Tracker II can "see". Objects within the cone reflect sound back (an echo). Objects outside of the cone do not reflect back sound. When the Transducer "hears" the returning sound pulse (echo), the Sonic Tracker II stops the counter. Using the elapsed time measured by the counter and knowing the speed of sound, the Sonic Tracker II calculates the exact distance to the object (Control Reference). It repeats this procedure 40 times per second.

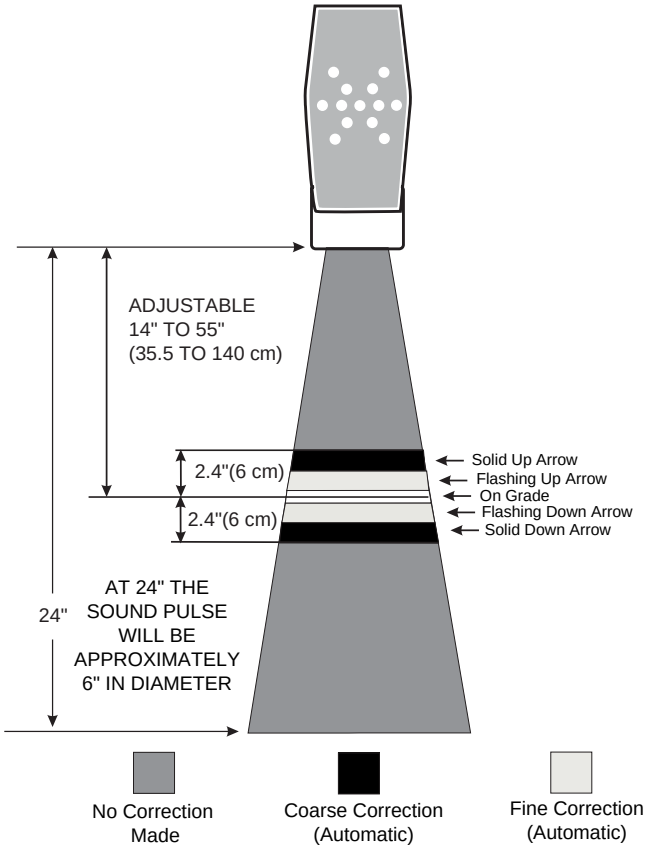


Transducer generates a sound pulse and starts timer. | Sound pulse strikes control reference | Echo returns and stops timer

Distance = Elapsed Time x Speed of Sound

The Working Window

Before paving is started, the operator will use the Control Box to set (or Calibrate) a control region or zone around the Control Reference (see Sonic Tracker II Calibration). This process is called "Nulling".



The Working Window is a zone 2.4" above and 2.4" below the On Grade distance. When the distance measured by Sonic Tracker II to the Control Reference is within the Working Window, automatic control of the screed can occur. If the distance measured is outside of the control window, control is switched to manual and no corrections are sent to the control valve unless the measured distance is returned to within the Working Window. This prevents the system from "diving" should the Sonic Tracker II be moved off of a Control Reference like ski, stringline, or curb.

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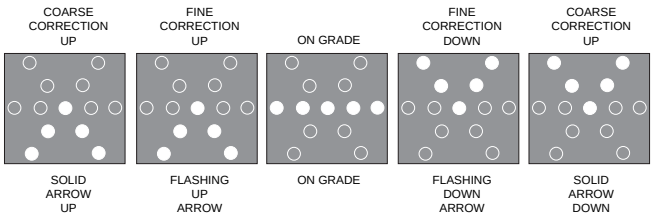
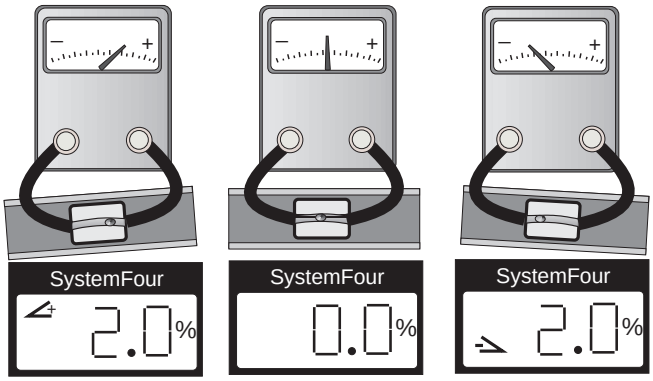
Under automatic control, the Control Box tries to keep the Control Reference at a constant distance from the Sonic Tracker II (On Grade). If the Sonic Tracker II measures the distance to the Control Reference and the Control Box finds its not at the desired distance (On Grade), the Control Box determines which part of the Working Window (Fine or Course Correction above or below On Grade) the Control Reference is residing in. Once this is determined, the Control Box displays the appropriate correction symbol on its LED Display as well as on the Sonic Tracker II LED Display, and sends correction signals to the paver valve to adjust the screed to bring the screed back to On Grade.



If the Control Reference is measured to be outside of the Working Window (above, or below 2.4" of On Grade), the LED arrows on Sonic Tracker II will flash once every two seconds, and one of the Grade Correction Arrows around the Grade Correction Knob on the Control Box will flash indicating which way to turn the knob to bring the Working Window back around the Control Reference. The System will also be placed under manual control.

Slope Sensor: How It Works

The Slope Sensor has a precision electronic device much like a carpenter's level inside the slope sensor that constantly measures the slope that the paver is operating on. Using the Control Box to set (Calibrate) the Slope Sensor (see Slope Sensor Calibration), the operator can maintain a desired left hand or right hand slope from +20% to -20%.

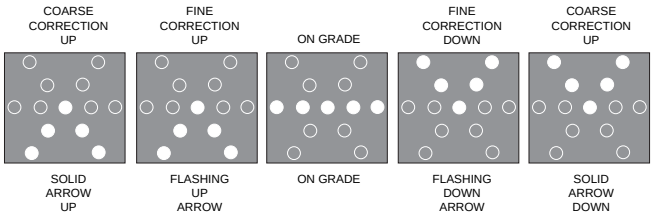


Once the desired Slope has been set at the Control Box, the Slope Sensor measurements will be indicated on the Control Box LCD and LED Displays. When the paver is at the correct slope (On Grade), the Control Box will display the On Grade Symbol.

Slope Sensor Correction Zones

The Control Box receives signals from the Slope Sensor and sets up Correction Zones regions around the On Grade Zone. These Correction Zones are divided into two sections. Just above and just below On Grade to ± .05% is the Fine Correction Zone. Any slope measured beyond the Fine Correction Zones is in the Course Correction Zone. When a slope that is more than ± 2.0% beyond On Grade is encountered, a Grade Adjustment Arrow around the Grade Adjustment Knob will illuminate.

Each of these Correction Zones also have there own symbols. While displaying the desired control slope of the paver on the Control Box LCD Display, symbols will also appear on the Control Box LED's so the operator knows, at any time, the correction needed for the paver to reach On Grade.



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Function

This chapter reviews the System Four components and explains the function of each.

Notice: When operating in rainy weather or in wet conditions, the Control Box, Sonic Tracker II, and cables must be thoroughly dried BEFORE placing them in the Carrying Case at the end of the day.

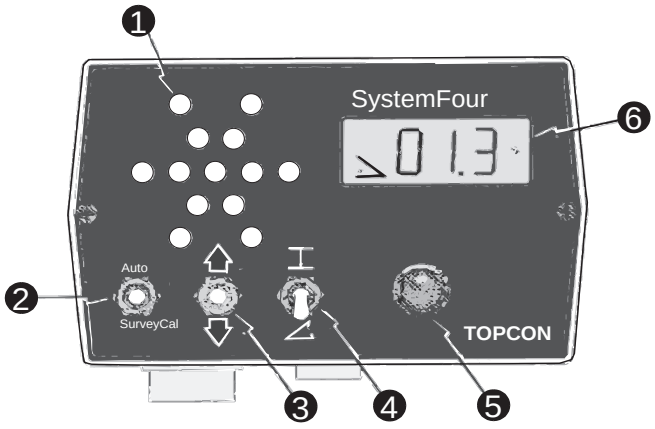
Any moisture left on the Control Box, Sonic Tracker II, and/or cables when put in the Carrying Case will cause condensation on the inside of the components which may severely affect accurate operation during the next paving operation.

Control Box

The Control Box is the main operator control interface for the System Four. It contains LED's (Light Emitting Diodes) as well as an LCD (Liquid Crystal Display) to inform the operator of the systems performance. The Control Box's LED's duplicate the symbols being displayed on the Sonic Tracker II's LED display.

The Control Box is also the "brains" of the System Four. It receives information from the sensors, processes the information, and sends out correction signals to the paver's tow arm valves.

Control Box Front Panel Switches and Controls



1) Grade Correction Display LED's
2) Auto/Manual/Survey (Cal) Switch
3) Jog Switch
4) Elevation: Power Off Slope: Power
5) Grade Adjustment Knob
6) LCD Display

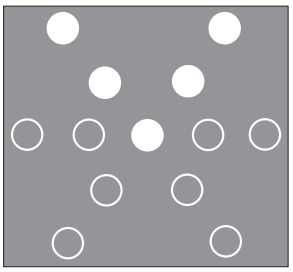
All features of the System Four can be accessed using the switches and displays located on the front panel of the Control Box.

The function of each is as follows:

1) Grade Correction Display

The Grade Correction Display cues you when grade is too high, on grade or too low.

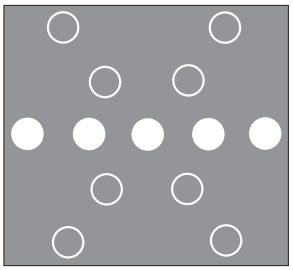
- Control Box LED's indicate the correction required to return to grade.



Too High (lower tow point to reach grade)

Flashes when within .6" 1.5 cm, of On Grade

Solid when greater than .6" (1.5cm) but less than 2.4" (6 cm) of On Grade

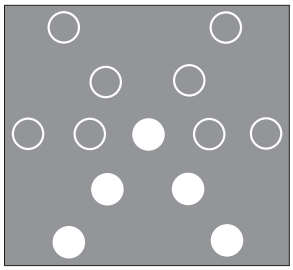


Off when beyond 2.4" (6 cm) of On Grade

On Grade

At correct grade.

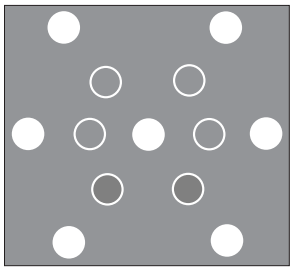
(the depth of On Grade depends on the amount of deadband calibrated)



Too Low (Raise tow point to reach grade)

Flashes when within .6" (1.5 cm) of On Grade

Solid when greater than .6" (1.5cm) but less than 2.4" (6 cm) of On Grade



Off when beyond 2.4" (6 cm) of On Grade

Survey Mode (Flashing)

Indicates that the system is no longer in Control Mode and that the LCD Display is now showing the actual grade or slope of the screed.

2) Auto/Manual/Survey (Cal) Switch

The Auto/Manual/ Survey (Cal) Switch is used to select Manual or Automatic control and to calibrate the System Four.

- Up position sets the system to the Automatic Mode. This is the normal operating mode. Paver tow arms are automatically adjusted up or down to maintain proper grade.
- Center position sets the system to the Manual Mode. In this mode System Four will give readings, but the pavers tow arms will not be adjusted.
- Down position controls three separate functions:

A) After the Control Box has been powered on, holding this switch down less than 2 (two) seconds will set the Control Box in the Survey Mode (see "Survey/Control Function" later in this chapter).

Holding the switch again for less that 2 (two) seconds will set the Control Box to the Control Mode (see "Survey/Control Function" later in this chapter).

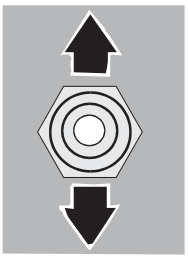
B) After the Control Box has been powered On, continuously holding this switch down while turning the Grade Adjustment Knob will set the Control Box LCD to a new numerical value. (See "Calibrating the Tracker or Slope Sensor" later in this chapter).

C) Powering On the Control Box while holding the switch down continuously will allow selection of system Performance Settings. The Grade Correction Arrows will flash and the LCD will be blank. Turn the Grade Adjustment Control Knob (while continuing to hold down the Auto/Manual/Survey (Cal) Switch) to the right 1 (one) click at a time. The Calibration Modes will appear in the following order:

1) **Blank** (Exit)
2) **Gain** (Elevation)
3) **Gain** (Slope)
4) **Unit** (Sets unit of measure: Ft/In/cm)
5) **Slope Resolution** (Sets to: . 1 or to: .01)
6) **Beeper** (Sets audible beep to On or Off)
7) **Hour Meter** (Total hours the system has been On/Total hours system has been in the Auto Mode)
8) **Deadband** (Sets On Grade Deadband)
9) **Valve Offset**

(See "Accessing System Four Performance Settings" later in this chapter).

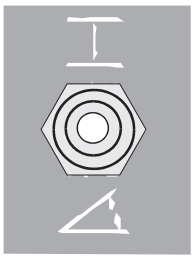
3) Jog Switch



This switch is used to manually move the tow point up or down. The Jog Switch is always active when the Control Box is turned on.

Up position causes the tow arm cylinder to raise. Down position causes the tow arm cylinder to lower.

4) Elevation: Power/Off/Slope: Power Switch



This switch sets the control for either Elevation or Cross Slope. It is also the power switch for the system.

Up position turns power On and selects Elevation Control.

Middle position turns power Off.

Down position turns power on and selects cross Slope Control.

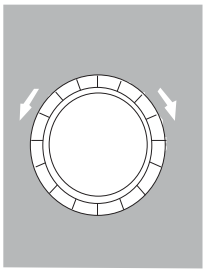
5) Grade Adjustment Knob

This knob is used to make measured adjustments to the cross slope or elevation settings.

This knob is also used to access Calibration and System Performance Settings when used in conjunction with the Auto/Man/Survey (Cal) Switch. (See "Calibrating the Tracker or Slope Sensor" or "Accessing System Four Performance Settings" later in this chapter).

- Adjusts the grade height for the Sonic Tracker II when elevation control is selected.
- Adjusts the percentage slope when cross slope control is selected.

Grade Adjustment Direction Arrows



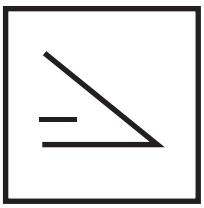
These red arrows light up around the Grade Adjustment Knob to indicate the direction the knob should be rotated to reach On Grade.

1) Rotate the knob to the right to reach grade.
2) Rotate the knob to the left to reach grade.

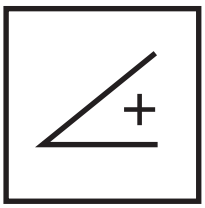
6) LCD Digital/Symbol Display

This display allows the operator to view a numerical representation of the grade or slope the System Four is currently maintaining. When setting System Four performance settings, their individual symbols will be displayed (See "Accessing System Four Performance Settings" later in this chapter).

- Graphic symbols indicate the type of control that has been selected:

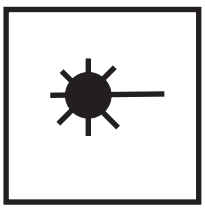


Cross Slope Control
Slope down to the right



Cross Slope Control
Slope down to the left (+)

Sonic Tracker II
Control

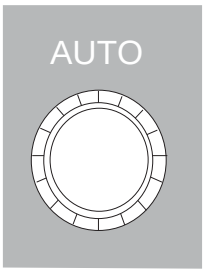


Laser Tracker Control

- When Cross Slope Control is selected, the numbers on the display represent percentage of slope.

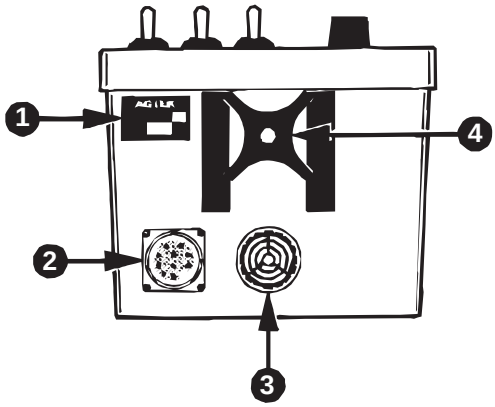
- When Elevation Control is selected, the numbers on the display represent elevation measurements in either feet, inches, or centimeters.

Auto Indicator



This indicator illuminates when the system is switched to Automatic.

Lower Control Box Components



1) **Serial Number Plate** - The Serial Number Plate contains your System Four's part number and serial number.
2) **11 Pin Cable Connector** - Power and signal communications between System Four components travel via this connector.
3) **Audible Beeper** - When the power is turned on, or calibration selections are made, the beeper will sound. The beeper may be turned Off or On using the Beeper Calibration Mode (see Accessing System Four Performance Settings later in this chapter).
4) **Mounting Knob** - The Mounting Knob is used to secure the Control Box to its mounting bracket. The mounting stud is permanently attached to the Control Box and is long enough to allow the Mounting Knob to be loosened without being removed from the stud when mounting the Control Box.

Control Box Memory

The Control Box automatically stores all operating information when it is turned Off.

NOTICE: If power is interrupted to the Control Box within 2 (two) seconds after making an adjustment, the new setting will not have had time to be stored and the settings will revert to the previous (or original) setting.

Entering Survey/Control Mode

The Survey Mode allows the operator to view the actual elevation or slope of the screed. In this mode, the LCD Display reading will change as the screed is raised or lowered or tilted. This feature is useful in setting up the machine or pre-surveying the job.

NOTICE: The screed cannot be controlled in the Survey Mode.

To activate the Survey mode do the following:

1) Turn the System Four "On" by selecting either Elevation or Slope Control.
2) Momentarily press the Auto/Manual/Survey (Cal) Switch down.

The Control Box will beep one time and the Grade Correction Display will show a flashing, circular pattern . The LCD Display will now show the correct elevation if Elevation Control has been selected or the current slope if Slope Control has been selected.

To return to the Control mode:

- Momentarily press the Auto/Manual/Survey (Cal) Switch again (less than 2 seconds) then place in Auto.

The system will be returned to the normal Control mode and grade will automatically be set to On Grade.

Calibrating the Tracker or Slope Sensor (changing numbers only)

Once the Control Box is powered On by selecting Elevation or Slope Control, pressing the Auto/Manual/Survey (Cal) Switch down to Survey (Cal) continuously places the unit in the Display Setting Mode and under Manual Control.

NOTICE: Turing the Grade Adjustment Knob with the Auto/Manual/Survey (Cal) Switch depressed enters the display setting mode instantly, without the 2 second wait.)

As long as the Auto/Manual/Survey (Cal) Switch is depressed, the arrows around the Grade Adjustment Knob will flash. The LCD can be set to any reading by turning the Grade Adjustment Knob.

Releasing the Auto/Manual/Survey(Cal) Switch stores the LCD reading and sets system control to On Grade.

To return to Automatic Control, push switch up.

If Elevation Control has been selected, the elevation displayed is set by this process. If Cross Slope has been selected, cross slope calibration is set.

Accessing System Four Performance Settings

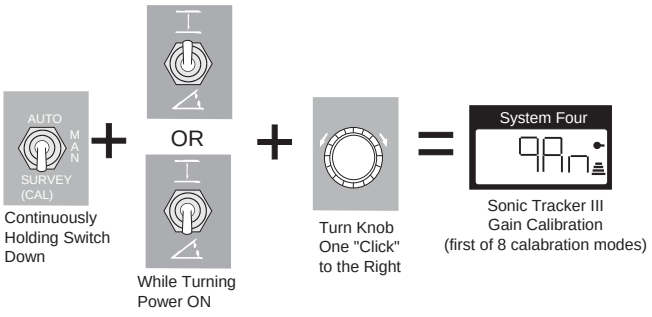
With the screed remote Man/Setup/Auto switch in SETUP, continuously pressing the Auto/Manual/Survey (Cal) Switch on th econtrol box down when powering the System Four On (selecting Elevation Control or Slope Control) allows access to the System Performance Settings. These settings are Blank, Gain (Elevation), Gain (Slope), Units, Slope Resolution, Beeper, Hour Meter Deadband, Valve Offsets and units.

When the Performance Setting menu is entered at start-up, the arrows around the Grade Adjustment Knob will flash. Rotating the Grade Adjustment Knob clockwise scrolls the LCD display through the System Performance Settings in the order listed above. Releasing the Auto/Manual/Survey (Cal) Switch while a particular Performance Setting is displayed will select that Setting for adjustment.

NOTICE: The recommended, or "typical" values listed in some of the Performance Settings to follow are meant to be suggested starting points for those settings. If your machine does not perform properly within those recommended values, adjust that setting accordingly until satisfactory performance of your machine is reached.

NOTICE: Because of the potential to seriously affect System Four performance and accuracy, three System Four Performance Settings may be "locked-out' by a Cedarapids authorized technician once the correct values for these Settings are set for your paver. These Settings are Units, Deadband, and Valve Offsets. If you feel further adjustments to these Settings are required, contact your Cedarapids Inc. representative.

Continue to hold the Auto/Manual/Survey (Cal) Switch down and turn the Grade Adjustment Knob



one click at a time to access the other Performance Settings.

Releasing the Auto/Manual/Survey (Cal) Switch will display the current system settings. Turning the Grade Adjustment Knob one click at a time will change the settings.

NOTICE: The Blank Screen must be displayed to exit and SAVE changes made to the System Performance Settings

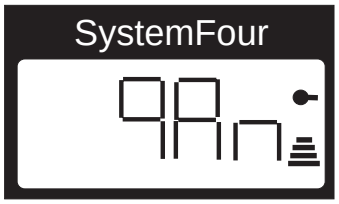
1) Blank Screen

The Blank Screen will be the first setting displayed when entering the System Performance Settings and must be displayed to exit and save the System Performance Settings.

2) Gain (Elevation)

This setting determines the speed at which System Four will cause the Tow Point Cylinders to adjust to a change in elevation.

When the Sonic Tracker II senses a change in elevation, the Control Box takes that information and makes a determination as to how far from On



Grade the screed currently rests.

The Control Box will then send a signal to the paver valve to open a pre-determined amount, returning the screed to the desired grade at a certain speed. The Gain (Elevation) setting allows the paver operator to set Sonic Tracker II so that the paver valve opens a pre-determined amount allowing the screed to react (adjust to the change in elevation) faster or slower. The objective is to set the Gain so the screed reacts to the change in grade quickly, but without "overshooting" the new elevation.

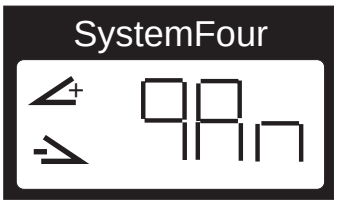
When chosen, the Gain symbol along with the Sonic Tracker II and Laser symbols are displayed until the Auto/Manual/Survey (Cal) Switch is released. The percentage gain, 1 % to 100%, is then displayed. The arrows around the Grade Adjustment Knob flash.

The typical Gain setting for the Tracker is 25%.

After the desired value is selected by turning the Grade Adjustment Knob pressing and holding the Auto/Manual/Survey (Cal) Switch stores the value into the Control Box memory and returns the LCD to the main System Performance Settings menu. You may now rotate the Grade Adjustment knob to access another Performance Setting or exit the System Four Performance Settings menu by rotating the Grade Adjustment Knob until the Blank Screen is displayed and releasing the Auto/Manual/Survey (Cal) Switch.

3) Gain (Slope Control)

This setting determines the speed at which System Four" will cause the Tow Point Cylinders to adjust to a change in slope.



When the Slope Sensor senses a change in slope, the Control Box takes that information and makes a determination as to how far from On Grade the screed currently rests.

The Control Box will then send a signal to the paver valve to open a predetermined amount, returning the screed to the desired slope at a certain speed.

The Gain (Slope) setting allows the paver operator to set System Four so that the paver valve opens a predetermined amount allowing the screed to react (adjust to the change in slope) faster or slower. The objective is to set the Gain so the screed reacts to the change in slope quickly, but without "overshooting" the new slope.

The Gain Symbol along with the + Slope and - Slope symbols are displayed until the Auto/Manual/Survey (Cal) Switch is released. The percentage gain, 1 % to 100%, is then displayed. The arrows around the Grade Adjustment Knob flash.

The typical gain setting for the Slope is 25%.

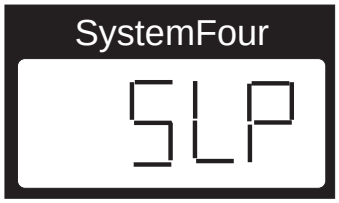
After the desired value is selected by turning the Grade Adjustment Knob Pressing and holding the Auto/Manual/Survey (Cal) Switch stores the value

into the Control Box memory and returns the LCD to the main System Performance Settings menu. You may now rotate the Grade Adjustment knob to access another Performance Setting or exit the System Four Performance Settings menu by rotating the Grade Adjustment Knob until the Blank Screen is displayed and releasing the Auto/Manual/Survey (Cal) Switch.

4) Slope Resolution

(Sets display to read in increments of .1 % or to .01 %)

The is displayed until the Auto/Manual/Survey (Cal) Switch is released. The arrows around the Grade Adjustment Knob flash and rotating the knob cycles the display between a resolution of . 1 % and .01%.



Slope Resolution should be set to .1% (tenths) for paving applications.

After the desired resolution is selected by turning the Grade Adjustment Knob, pressing and holding the Auto/Manual/Survey (Cal) Switch stores the value into the Control Box memory and returns the LCD to the main System Performance Settings menu. You may now rotate the Grade Adjustment knob to access another Performance Setting or exit the System Four Performance Settings menu by rotating the Grade Adjustment Knob until the Blank Screen is displayed and releasing the Auto/Manual/Survey (Cal) Switch.

5) Beeper

(Sets audible beep On or Off)

The Beeper symbol is displayed until the Auto/Manual/Survey (Cal) Switch is released. The arrows around the Grade Adjustment Knob flash and rotating the knob cycles the display between On and Off.

After On or Off has been selected by turning the Grade Adjustment Knob, pressing and holding the Auto/Manual/Survey (Cal) Switch stores the value into the Control Box memory and returns the LCD to the main

System Performance Settings menu. You may now rotate the Grade Adjustment knob to access another Performance Setting or exit the System Four Performance Settings menu by rotating the Grade Adjustment Knob until the Blank Screen is displayed and releasing the Auto/Manual/Survey (Cal) Switch.

6) Hour Meter

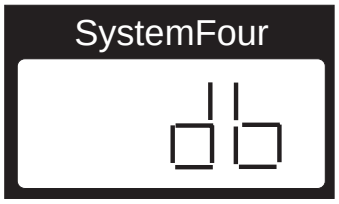
(Displays Total and Auto Hours) The Hour Meter symbol is displayed until the Auto/Manual/Survey (Cal) Switch is released. The arrows around the Grade Adjustment Knob flash and rotating the knob cycles the display between total hours System Four has been powered On, and hours System Four has been under automatic control. Auto hours are represented by a colon (:) preceding the number.

After viewing the desired hours by turning the Grade Adjustment Knob, pressing and holding the Auto/Manual/Survey (Cal) Switch returns the LCD to the main System Performance Settings menu. You may now rotate the Grade Adjustment knob to access another Performance Setting or exit the System Four Performance Settings menu by rotating the Grade Adjustment Knob until the Blank Screen is displayed and releasing the Auto/Manual/Survey (Cal) Switch.

7) Deadband

(Sets On Grade Deadband)

Deadband is the area of the Working Window that is On Grade and simply means that while the reference is within that area, the pavers valves are idle (closed). Therefore the wider the Deadband (On Grade area), the more a reference can move up or down without a correction being initiated.



When Deadband is added or taken away from the On Grade region of the working window, it takes this extra area from the Fine Correction region (.6" above or below On Grade). It Does Not add this distance to the overall working window height.

NOTICE: The amount of Deadband should be carefully selected so that constant hunting of the screed (rising up and down) is prevented.

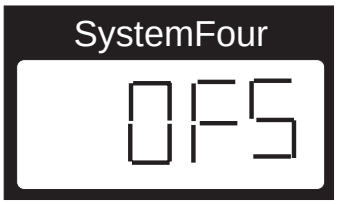
The Deadband symbol is displayed until the Auto/Manual Survey (Cal) Switch is released. The arrows around the Grade Adjustment Knob flash. Rotating the knob cycles the display between 0 and 15. The number displayed represents the Deadband (On Grade area) in millimeters.

The typical Deadband setting is 3 mm.

After the desired value is selected by turning the Grade Adjustment pressing and holding the Auto/Manual/Survey (Cal) Switch stores the value into the Control Box memory and returns the LCD to the main System Performance Settings menu. You may now rotate the Grade Adjustment knob to access another Performance Setting or exit the System Four Performance Settings menu by rotating the Grade Adjustment Knob until the Blank Screen is displayed and releasing the Auto/Manual/Survey (Cal) Switch.

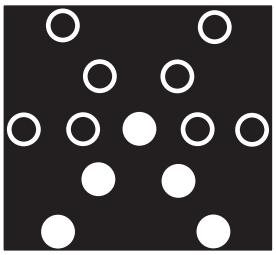
8) Valve Offset

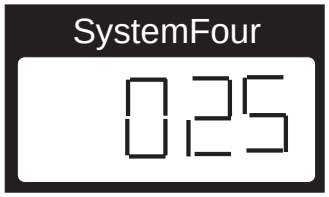
The Valve Offset setting controls the duration of the signal sent to the paver valves from the Control Box. If the signal is to short in duration, the operator will hear the paver valve "clicking" but the cylinder will not move. Like wise, if the signal is too long in duration the valve will "spring" wide open causing the cylinder to jump and overcorrect.



To set the Valve Offset release the Auto/Manual/Survey (Cal) switch. The LED display will momentarily display the letters "CAL" and then back to "OFS"

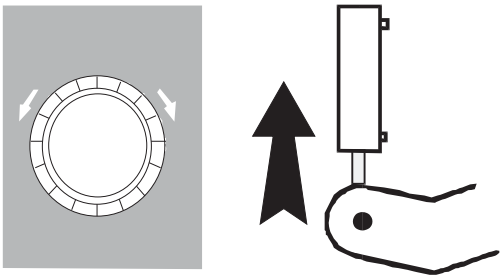
Press the Auto/Manual/Survey (Cal) switch to Survey (Cal) and Release.





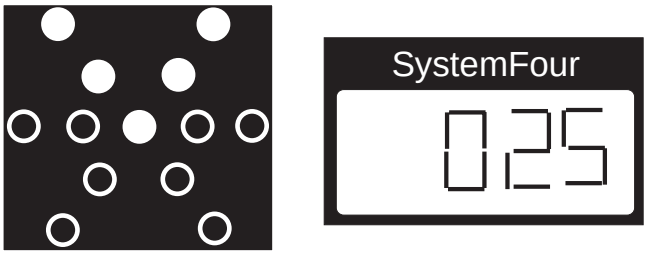
This causes the current offset in the up direction to be displayed and shows a UP light indicator.

Turning the Grade Adjustment Knob adjusts the rate at which the tow point cylinder moves.



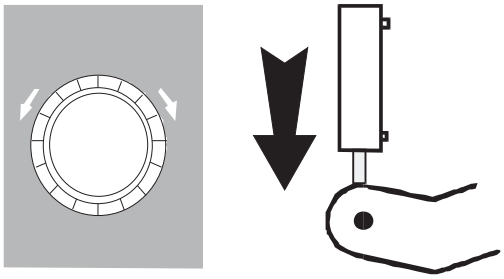
Adjust the Grade Knob until No cylinder movement is noted and then adjust to the point where a slight cylinder movement is noted.

Press the Auto/Manual/Survey (Cal) switch to Survey (Cal) and Release.



This causes the current offset in the up direction to be displayed and shows a DOWN light indicator.

Turning the Grade Adjustment Knob adjusts the rate at which the tow point cylinder moves.



Adjust the Grade Knob until No cylinder movement is noted and then adjust to the point where a slight cylinder movement is noted.

After the desired value have been selected Press the Auto/Manual/Survey (Cal) switch to Survey (Cal) and hold while turning the Grade Adjustment Knob to the next performance setting.

NOTICE: The control boxes should be marked and used on the same side of the machine the Valve Offset was set for as setting may vary from left to right sides.

9) Unit

(Sets display to read in feet, inches, or centimeters)

The Unit symbol is displayed until the Auto/Manual/Survey (Cal) Switch is released. At switch release, the current unit of measure is displayed. The arrows around the Grade Adjustment Knob will flash and rotating the knob cycles through the units of Feet, Inches and Centimeters.

The Units should be set to Inches or Centimeters. (Feet settings are not used in paving applications.)

After the desired unit of measure is selected by turning the Grade Adjustment Knob, pressing and holding the Auto/Manual/Survey (Cal) Switch stores the value into the Control Box memory and returns the LCD to the main System Performance Settings menu. You may now rotate the Grade Adjustment knob to access another Performance Setting or exit the System Four Performance Settings menu by rotating the Grade Adjustment Knob until the Blank Screen is displayed and releasing the Auto/Manual/Survey (Cal) Switch.

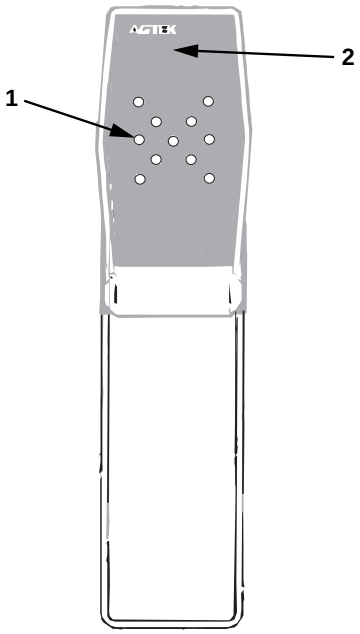
Sonic Tracker II

The Sonic Tracker II measures the distance to a Control Reference. It can be set to maintain a specific elevation above a given control reference (Ski, Stringline, Curb or Gutter, Existing Mat, etc.).

See “Sonic Tracker II: How It Works”.

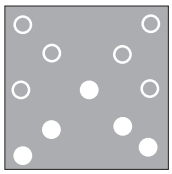
Sonic Tracker II Front Panel

The Sonic Tracker II- front panel contains an LED display similar to the Control Box as well as a Bail Sensor LED:

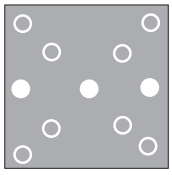


1) Grade Correction Display

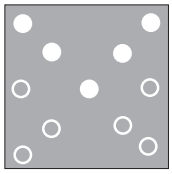
The Sonic Tracker II Grade Correction Display, like the Control Box, cues you when the grade level is Too High, On Grade or Too Low:



Too High (lower tow point to reach grade). Flashes when within .6" (1.5 cm) of On Grade. Solid when greater than .6" (1.5cm) but less than 2.4" (6.1 cm) of On Grade. Slowly flashes when beyond 2.4" (6.1cm) of On Grade



On Grade - At correct grade.



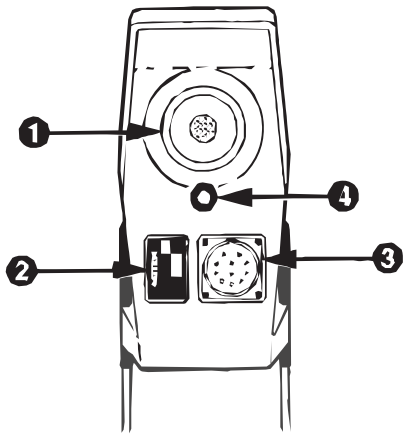
Too Low (Raise tow point to reach grade). Flashes when within 6" (1.5 cm) of On Grade. Solid when greater than .06" (1.5cm) but less than 2.4" (6.1 cm) of On Grade. Slowly flashes when beyond 2.4" (6.1 cm) of On Grade

The Sonic Tracker II- Grade Correction LED's and the Control Box Grade Correction LED's will simultaneously display the same symbols during operation.

2) Sonic Tracker II Bail LED

In the upper right corner of the Sonic Tracker II face plate is a small symbol used to represent the use of the Sonic Tracker II Bail. This LED symbol will

automatically illuminate when the Bail is attached to the Sonic Tracker II (see Sonic Tracker II Bail- later in this chapter).



Sonic Tracker II Rear

The Sonic Tracker II rear contains the areas for mounting and System Four hook up, as well as a temperature sensor.

1) **Mounting Access** - The Sonic Tracker II Mounting Access mates to a bracket on the paver (Installation).

2) **Serial Number Plate** - The Serial Number Plate contains your Sonic Tracker II's part number and your Sonic Tracker II serial Number.

3) **11 Pin Connector** - Power and signal communications between the Sonic Tracker II and the Control Box travel via this connector.

4) **Temperature Sensor** - The Temperature Sensor is used to compensate for air temperature changes during non-paving operations. When the Sonic Tracker II Bail is in place, this sensor is overridden by the Bail.

Sonic Tracker II Bail

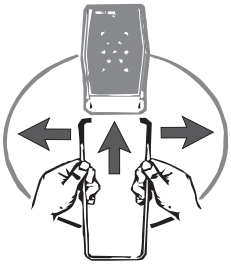
The Sonic Tracker II Bail is used to compensate for the rapid air temperature changes that can occur while paving.

The Sonic Tracker II transducer sends out sound pulses. These pulses bounce off of a physical reference (Ski, Stringline, Curb or Gutter, Existing Mat, etc.) and return to the transducer at the speed of sound.

The speed at which these pulses hit the reference and return are affected by the air temperature they travel through, slower through cooler air, and faster through warmer air. The Sonic Tracker II Bail provides a constant physical reference for the Sonic Tracker II to calibrate the speed of sound, thus avoiding effects caused by rapid fluctuations in air temperature over freshly laid asphalt (see Sonic Tracker II How It Works).

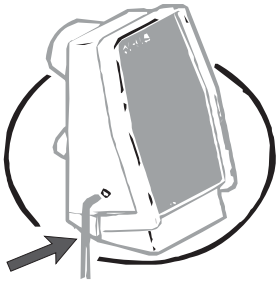
Sonic Tracker II Bail Installation

Mount the Bail to the Sonic Tracker II using the following procedures:

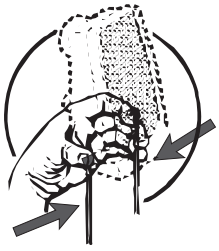


1) With the Sonic Tracker II laying face up on a flat surface, gently pull outward on the Bail forks until they just clear the lower "Skirt" of the Sonic Tracker II.

NOTICE: Do Not pull the bail forks out far enough to permanently bend them. Repeated bending will weaken the bail resulting in breakage or a bail that will not stay affixed to the Sonic Tracker II.

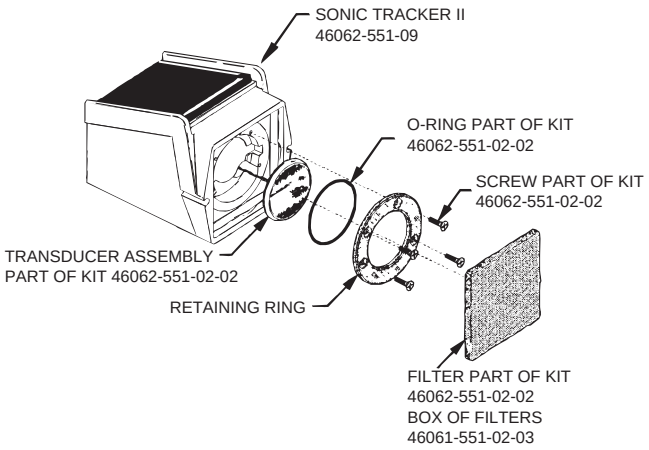


2) Making sure the rubber material is all the way to the bail fork ends, place the fork ends in the existing holes in each side of the Sonic Tracker II.



3) Once the Bail fork ends are set in the existing holes, gently squeeze the bail forks into the securing slots. Make sure the ends have securely "snapped" into place.

Sonic Tracker II Components



1) Sonic Tracker II Transducer

NOTICE: If the Sonic Tracker II is experiencing erratic or inconsistent readings, Transducer contamination should be considered first before assuming any other type of failure. The most common sign of Transducer contamination is the ability of the Sonic Tracker II See the ground, but not a Fixed Stringline or the Bail.

The Transducer operates by generating sound pulses. This is done by sending an electrical charge through a very thin piece of metallic material which vibrates rapidly creating the sound pulse. When oily or moisture laden particles stick to this metallic material it reduces its ability to vibrate therefore reducing the strength of the sound pulse.

NOTICE: During normal operation, the Sonic Tracker II should always have the small piece of Filter Foam over the Transducer assembly. This Filter Foam" will trap most of the contaminants that can foul the Transducer. This Filter Foam' should be replaced at least every month.

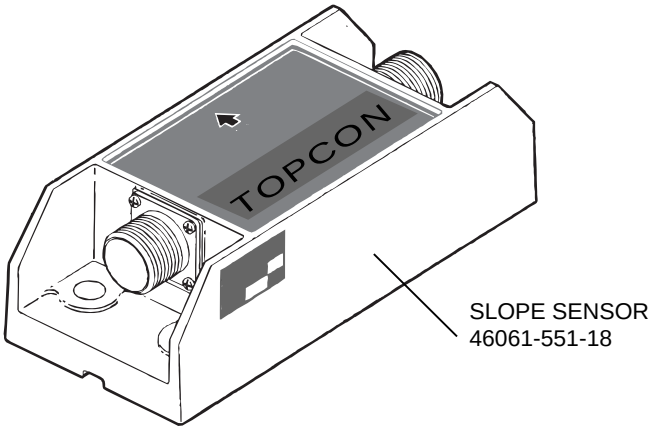
Over an extended period, very fine particles can pass through the Filter Foam and stick to the Transducer slowly reducing its sound pulse. When this happens the Transducer can be easily removed, and a new Transducer installed returning the Sonic Tracker II to its original condition.

Sonic Tracker II Transducer Replacement

(see: Maintenance and Parts)

Slope Sensor

The Slope Sensor "reads" slope using an internal precision level. It works by reading the lateral inclination (right side to left side tilt, or left side to right side tilt) of the screed.



Unlike the Sonic Tracker II, the Slope Sensor is a sealed unit and contains no adjustments or user serviceable parts. Once the Slope Sensor is mounted to the paver, all calibration and/ or operating displays are represented on the Control Box. The Slope Sensor contains no displays or adjustments and once the Slope Sensor is mounted to the paver, it is not removed.

Junction Box

The primary function of the Junction Box is to route power and ground from the paving machine to the Control Box, and to route correction signals from the Sonic Tracker II and Slope Sensor to the Control Box. It also routes valve signals from the Control Box to the paving machine.

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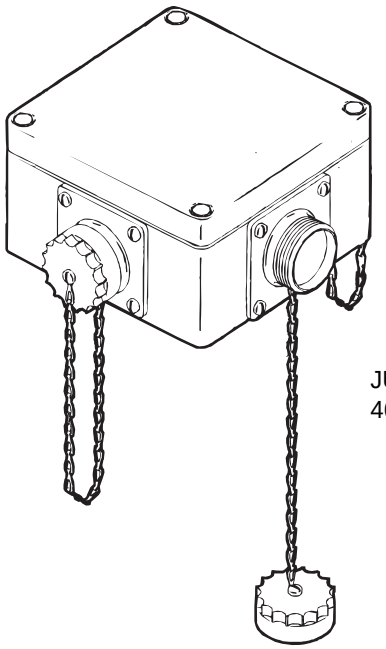
System Four
Grade and Slope Automation

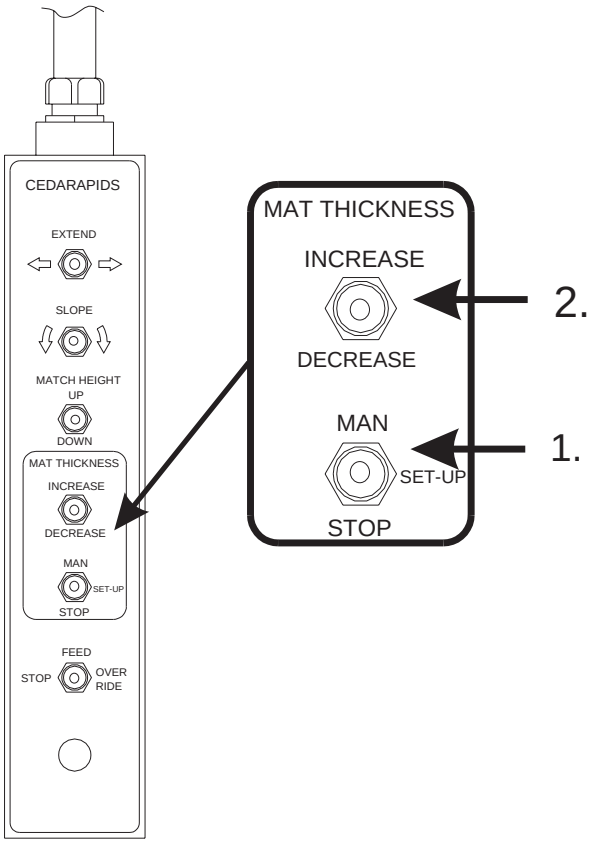


JUNCTION BOX
46061-551-19

The Junction Box is a sealed unit and contains no adjustments or user serviceable parts. It allows for quick and easy attachment and removal of the system cables, and once installed on the paving machine it is not removed.

Power & Interlock (Screed Remote Controls)

Located on the left and right Screed Remote Control boxes are two switches that provide manual operation of the tow point cylinders or allow function of the System Four automation. The left and right Mat Thickness switches are independent of each other and control only the tow point function of its respective side.



1) The MAN/SET-UP/AUTO controls the function modes listed:

   • MAN/SET-UP/AUTO switch in MAN mode: Power is provided to the INCREASE/DECREASE switch. The System Four automation will not control the tow point cylinder in this mode(isolation relay is open).

   • MAN/SET-UP/AUTO switch in SET-UP mode: The System Four automation can drive the tow point cylinder with the paver stopped or moving (isolation relay is closed). The INCREASE/DECREASE switch will not work in this mode.

   • MAN/SET-UP/AUTO switch in AUTO mode: Function of the System Four automation is interlocked to the travel system. When the paver is moving forward, the isolation relay is closed the automation is allowed to drive the tow point cylinder. As the travel lever (s) or the

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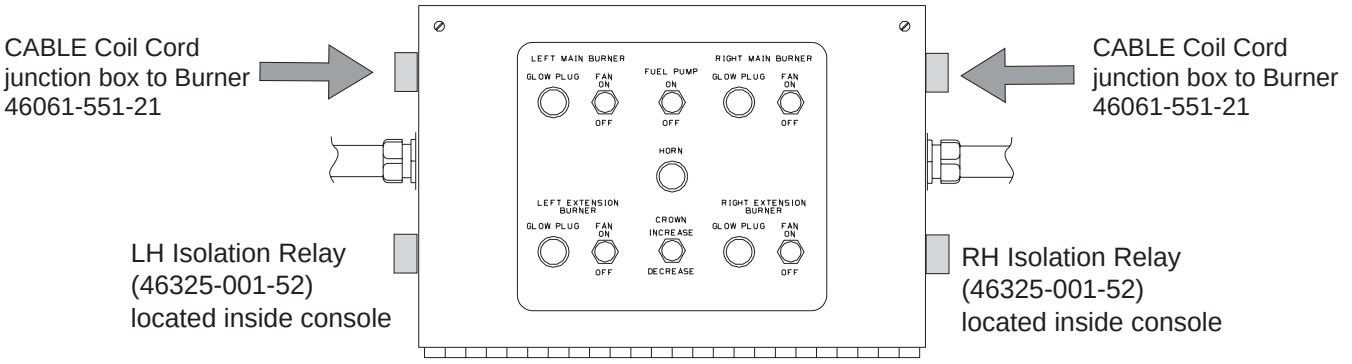
System Four
Grade and Slope Automation



Forward/Neutral/Reverse switch are placed in neutral or the brake switch is engaged. The isolation relay is opened, preventing the automation from driving the tow point cylinder.

2) The INCREASE/DECREASE switch allows manual positioning of the tow point cylinder when the MAN/SET-UP/Auto switch is in the MAN mode.

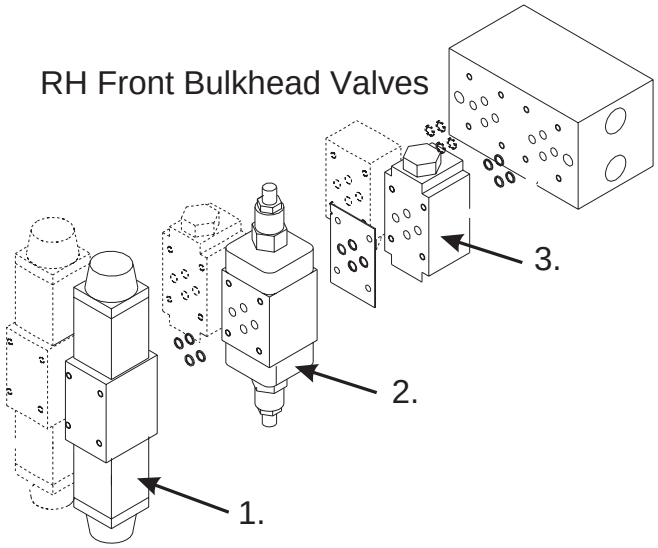
Burner Control Console Components

The Burner Control Console has cable connection points on the top LH & RH to connect the System Four junction box to the respective tow point solenoid valve.

The isolation relays for each side are located inside the console.

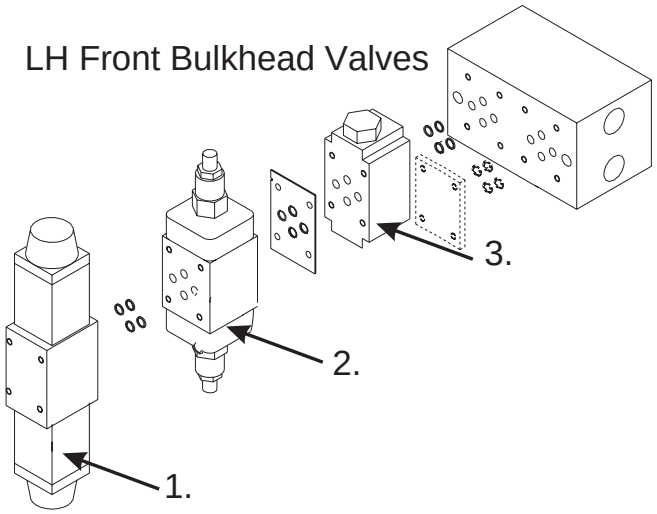
Tow Point Valves

Right Tow Point Valves



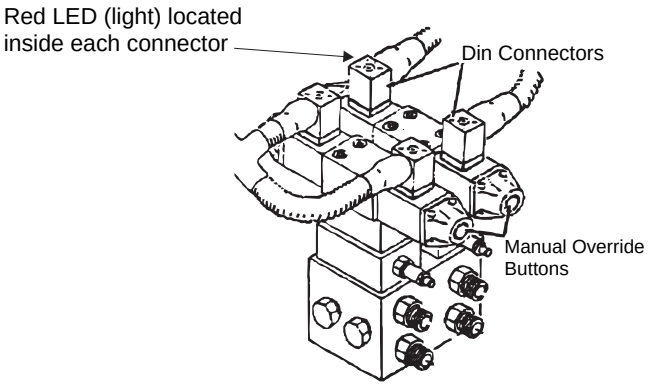
1) Solenoid Valve: Used to direct hydraulic fluid to either the rod or base ports of the tow point cylinder. The valve has a manual override on each end for trouble-shooting purposes.
2) Dual Throttle Valve: Used to set cylinder travel speed for both directions to 18 seconds.
3) Holding Valve: Used to hydraulically lock the tow point cylinders.

Left Tow Point Valves



1) Solenoid Valve: Used to direct hydraulic fluid to either the rod or base ports of the tow point cylinder. The valve has a manual override on each end for trouble-shooting purposes.
2) Dual Throttle Valve: Used to set cylinder travel speed for both directions to 18 seconds.
3) Holding Valve: Used to hydraulically lock the tow point cylinders.

Solenoid Valve Din Connectors



Each solenoid valve electrical connector (Din Connector) has a red LED (light) located inside the clear connector cap. This LED is used for trouble-shooting purposes.

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System Four
Grade and Slope Automation

Getting Started

This chapter is designed to get the operator started using System Four. Before starting however, decisions have to be made as to the type of control to be used Sonic Tracker II for longidudinal grade elevation, or Slope Sensor for controlling transverse slope and whether the controls should be placed to enhance rideability or build profile, see "Building Rideability or Profile".

If elevation control is to be used, a control reference must be decided upon (Fixed Stringline", Surface String, Existing Mat, Ski etc.). (For information on setting control references, see "Control References".

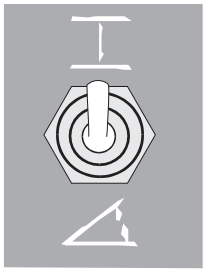
Once these factors have been chosen and System Four has been installed on the paver use the following steps to Null and Calibrate the System Four and begin a paving session.

Getting an On Grade Bar: (NULLING)

Sonic Tracker II Control

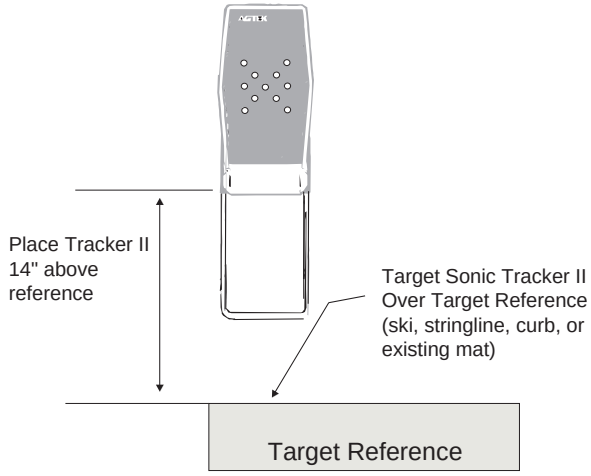
To set the Sonic Tracker II to "On Grade" or "Null":

1) Set the Auto/Manual/Survey switch to Manual

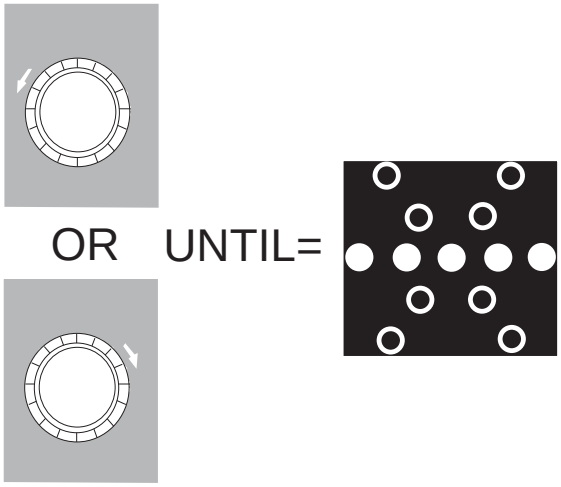


2) Make sure that the Power Switch is set to Sonic Tracker Control

3) Place the Sonic Tracker II over the control reference



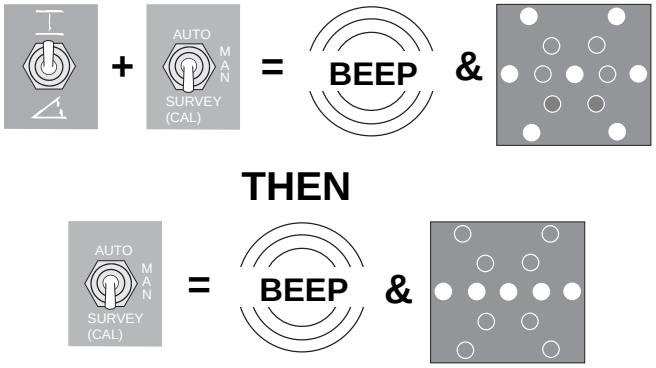
4) Turn the Grade Adjustment Knob on the Control Box in the direction the arrows indicate until the On Grade Bar comes on:



OR:

a) Momentarily hold the Auto/Manual/Survey switch down until it beeps (This will place the Control Box in the Survey mode)

b) Momentarily hold the switch down again until it beeps (This will place the Control Box back to the control mode (NULL) and the "On Grade" Bar will be set)

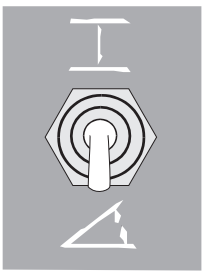


For more information on Control Box settings see Functions.

Slope Control

To set the Slope Control to "On Grade" or "Null":

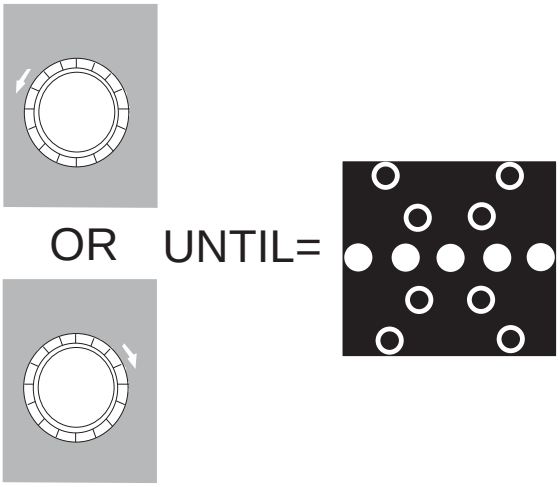
1) Set the Auto/Manual/Survey (Cal) switch to Manual



2) Make sure that the Power Switch is set to Slope Control

NOTICE: Only one side of the paver should be in the slope mode.

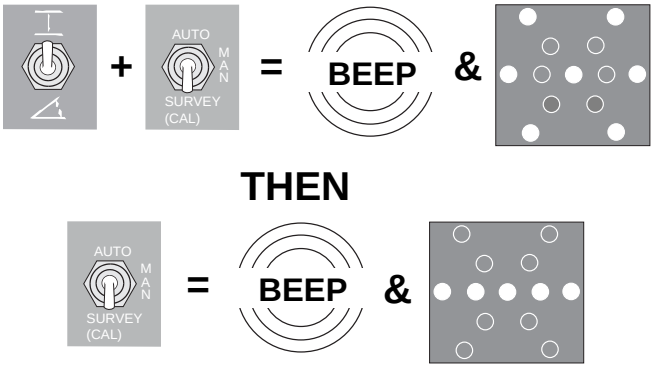
3) Turn the Grade Adjustment Knob on the Control Box in the direction the arrows indicate until the On Grade Bar comes on:



OR

A) Momentarily hold the Auto/Manual/Survey (Cal) switch down until it beeps (This will place the Control Box in the Survey mode)

B) Momentarily hold the switch down again until it beeps (This will place the Control Box back to the control mode and the "On Grade" or ("NULL") Bar will be set)



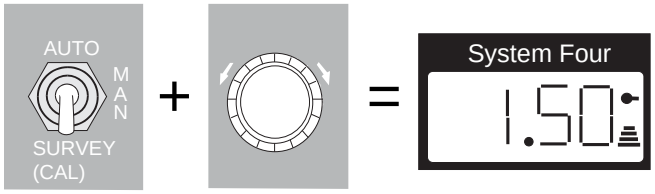
For more information on Control Box settings Functions.

Setting Control Box Display (Changing Numbers ONLY):

Sonic Tracker II Control

To set the Control Box Display to a desired number:

1) Follow instructions listed in "Getting an On Grade Bar: (NULLING)" to get the Tracker II over the control reference and get it NULLED (on grade bar showing).
2) While holding the Auto/Manual/Survey (Cal) Switch down, turn the grade adjustment knob until the desired number is displayed



3) Release the Auto/Manual/Survey (Cal) Switch
4) The number entered will remain on the display and the "On Grade" symbol will be set
5) Place Auto/Manual/Survey (Cal) Switch in Auto mode.

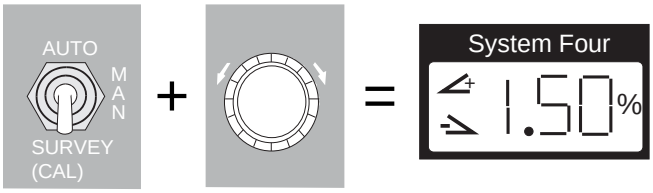
NOTICE: The number display does not necessarily reflect mat depth being placed and should not be used to control depth.

NOTICE: When using grade control, never adjust the screed using the manual hand cranks.

Slope Sensor Calibration

To Calibrate the Slope Sensor (Change number readout to reflect percentage of slope being placed):

1) Pave manually using screed depth cranks until desired percentage of slope has been established
2) Follow instructions listed in "Getting an On Grade Bar: (NULLING)" to get the slope control NULLED (on grade bar showing).
3) While holding the Auto/Manual/Survey (Cal) switch down, turn the grade adjustment knob until the slope being laid is displayed



NOTICE: Make sure to enter a positive slope if the grade slopes Up to the right and a negative slope if it slopes Down to the right

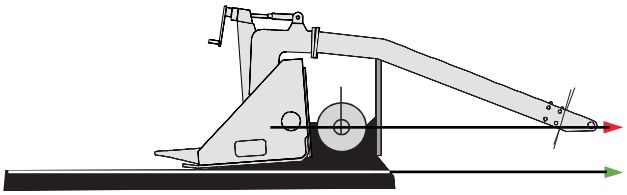
4) Release the Auto/Manual/Survey (Cal) Switch. The slope entered will remain on the display and the "On Grade" symbol will be.
5) Place Auto/Manual/Survey (Cal) Switch in Auto mode.

NOTICE: When using slope control, never adjust the screed using the manual hand cranks. Adjustments using the hand cranks will require re-calibrating the Slope Sensor.

Getting Started Paving

1) Pre-heat the screed to the temperature of the material being delivered. A cold screed bottom will tear and drag causing the mat depth to be lower than desired (a depression).
2) If a transverse joint is to be created the quality and durability of the joint depends on careful preparation of the existing mat or lane. It is critical that any taper or defective area be removed. **The joint area has to be perfectly flat and parallel with the line of paving!** If not, a depression or bump will be produced. Refer to "Transverse Joint" in this chapter
3) Set initial tow point height in relation to mat depth. Refer to "Line of Pull" in this chapter.

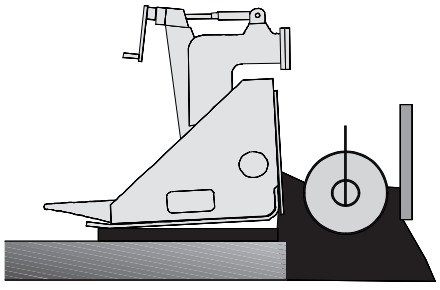
Line of Pull Applied Parallel to the Line of Paving



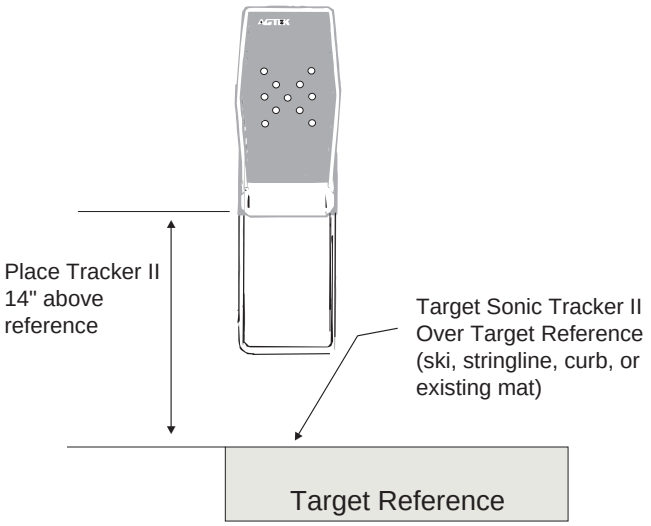
4) Nulling the screed is traditionally done with the use of boards that equal the desired loose mat depth. Then a given amount ($^{1}|_{8}$" to $^{1}|_{4}$") of nose up attitude is introduced to the screed. The boards needed should be equal to the thickness of the loose or unrolled mat. The number need will depend the width the screed is set up to pave at. Generally 2 boards at 10' wide, 4 boards at 20' and etc. The length of each board should be such that the screed bottom is fully supported from front to tail when set on the boards.

5) Null the screed, then manually preset the angle of attack. Refer to "Nulling the Screed" in this chapter

6) Fill auger chamber to exactly 1/2 an auger level. Hand filling outboard ends of the screed to prevent force feeding.



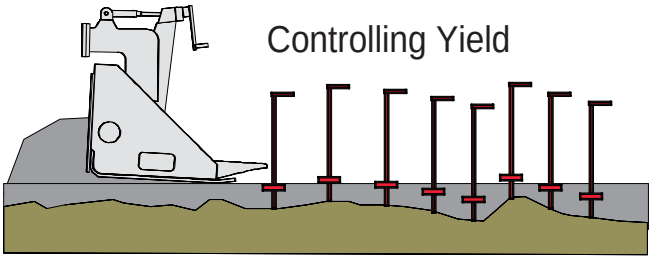
7) Place the Sonic Tracker II('s) 14 inches over the control reference. Refer to "Control References" in this chapter.



8) Null the Control Box (s) to get an on grade bar. Refer to "Getting an ON Grade Bar (Nulling)" in this chapter.

9) Place the Auto/Manual/Survey switch(s) in Auto and begin paving.

After the machine has traveled at least a few feet, measure the mat thickness. Make mat thickness changes by making small adjustments using the Grade Adjustment Knob.



Take at least 5 checks about 5 foot apart and average the checks. DO NOT adjust the screed depth after each check. Doing so will produce a rough riding surface. Remember the purpose of a paver is to place a flat mat over an irregular grade.

NOTICE: For best performance, make only small adjustments and let the paver move several machine lengths before making another adjustment.

NOTICE: When using slope control, never adjust the screed using the manual hand cranks. Adjustments using the hand cranks will require re-calibrating the Slope Sensor.

Once satisfactory mat thickness has been reached, you may want to set the Control Box LCD (Elevation) to display that mat thickness.

The paver will now maintain the desired mat thickness until another change is desired or the job is completed.

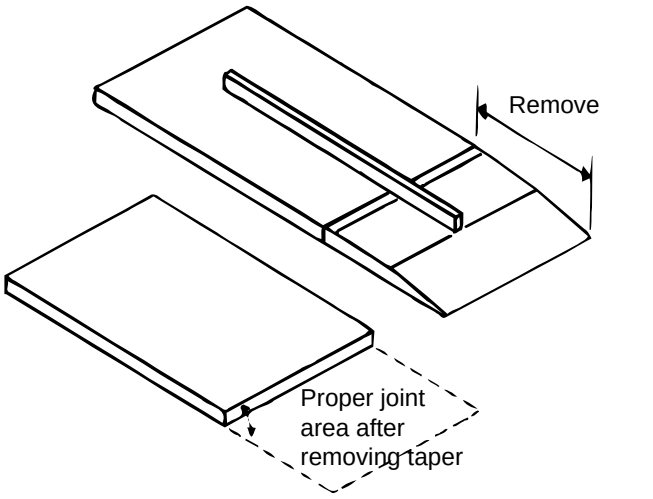
Transverse Joints

Transverse joints are created when an existing mat or lane is to be continued. The quality and durability of the joint depends on careful preparation of the existing mat or lane. It is critical that any taper or defective area be removed. The joint area has to be perfectly flat and parallel with the line of paving! If not, a depression or bump will be produced.

Joint Preparation

An existing mat should be checked and the tapered area removed to produce a joint area that is flat and parallel with the line of paving.

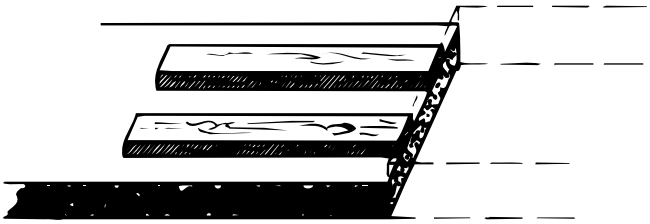
Checking the existing mat with a good straight edge



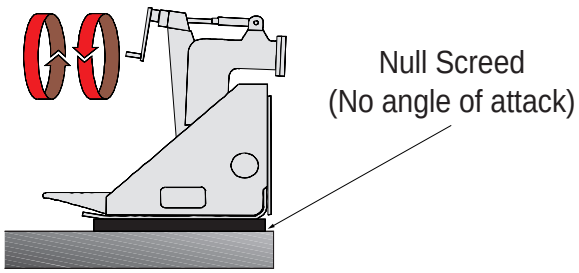
Nulling the Screed

1) Place boards or lath that equal the amount of compaction in the joint area. Remember compaction rates change due to thickness of material & material design. Once the compaction rate has been determined and the correct thickness of lath has been acquired, place the lath at the edge of the joint to elevate & support the screed to the correct starting level.

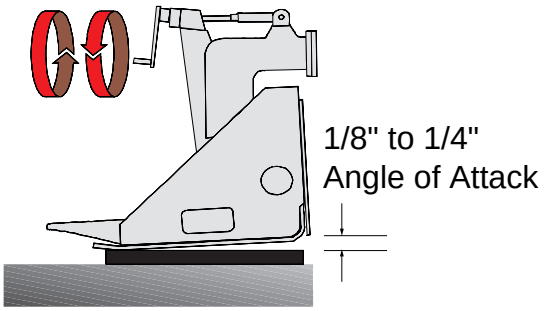
Place boards or lath that equal the compaction rate of the material from thickness of the joint.



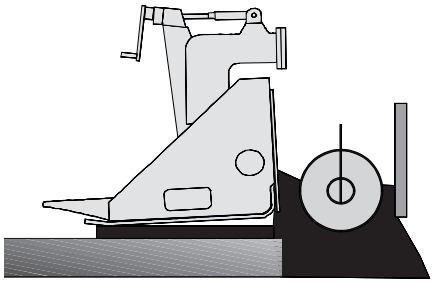
2) Back the paver up over the joint and align the screed so the face or mold board is square with the edge of the joint. Lower the screed onto the boards or lath and adjust the screed depth cranks so the screed is resting flat on the boards.



3) Using the screed depth cranks, introduce approx. 1/8" to 1/4" initial angle of attack.



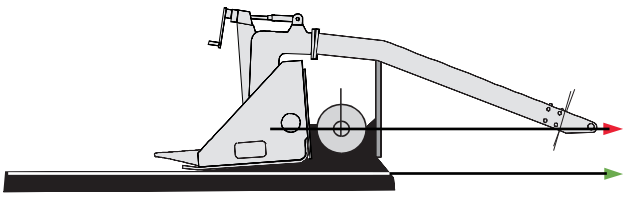
4) The auger chamber should be filled to no more than 1/2 an auger level. **Do Not over fill the auger chamber**, as this is the most common cause of creating a bump just after pulling off a joint. If needed the corner areas on the ends of the screed should be hand filled to prevent force feeding an excessive high head of material in the center areas of the screed.



Line of Pull

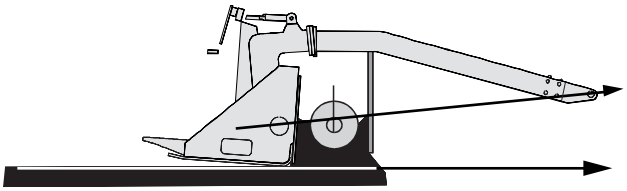
The Line of Pull refers to the angle at which the screed is being towed forward. Best results occur when the towing force is applied relatively parallel to the grade. To do this we set the tow point cylinders in relation to the general depth we will be paving.

Line of Pull Applied Parallel
to the Line of Paving



Rule of Thumb: Thin mats will require a lower initial tow point setting, while thicker mats will require a higher initial tow point setting.

Line of Pull Applied Upwards
Can cause the screed to run with a
nose-down attitude.



We see above a thin mat being placed, but the initial tow point setting is extremely high. In this condition the towing forces are being applied at a upward angle, increasing the lift forces applied to the screed. To maintain a given depth, the angle of attack must be decreased to compensate for the increased lift. The screed is now running with a slight nose down attitude. Only the front portion of the screed is compacting & finishing the material being placed, causing poor mat texture & extreme wear at the front portion of the screed bottom. Also, when the screed stops, it will have more of a tendency to rock or teeter as the tractor relaxes the tension on the screed. This could increase the amount of settling & deviations introduced to the mat.

Building Rideability or Profile

Evaluation of Jobs

Evaluation of specifications and grade conditions on a job is extremely important if the paver and automation are to be configured properly to produce the desired or required results. Failure to properly configure the screed and automation for each phase of the paving operation, or specific conditions, will result in producing a road that is unsatisfactory or will not meet specifications. Just as one size of shoe does not fit everyone, one configuration of the screed and automation will not produce superior results in all conditions and jobs.

Building Profile

The screed inherently resists immediate changes in depth or slope and averages changes over approximately five lengths of the tow arm. Job specifications that require an exact profile (thickness of material and or slope) at any given point in the grade, require the screed to react very quickly to maintain it's position in relation to the established line of grade and or percentage of slope. Very simply, when building profile we are over correcting the screed to force it into changing depth very quickly to maintain exact thickness and or slope at

given points in the grade. Building for profile is not necessarily building a smooth rideable surface, as any changes will be introduced very quickly.

Building for profile is desirable on jobs where two or more layers of pavement will be placed or where exacting slopes (transitions & super elevations) have to be built or maintained. By reestablishing or building the desired profile of a road on the first layer, all other layers can be built for rideability or smoothness.

Rideability

When building for rideability, automation enhances the screeds resistance to immediate changes, producing a very smooth riding surface. Very simply, when building for rideability we are taking a given change and stretching that change over a long area to produce a superior riding surface. Building for rideability is desirable where job specifications place a high emphasis on the smoothness of the finished job. On jobs where two or more layers of pavement will be placed, the first layer should be built for profile to get the grade and slope to proper elevation specifications. All other lifts should be built for rideability, to smooth out any deviations from the previous lift.

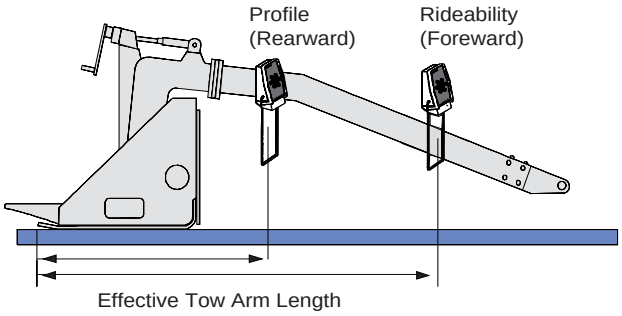
Sensor Positioning

The position of the sensor on the tow arm determines how fast the screed will react to a change of the null point at the sensor. By positioning the sensor, we can build profile or rideability. We need to evaluate job specifications and grade related conditions to determine the desired mounting position that will produce the required results.

Rule: Sensor(s) mounted 1/4 the tow arm length back from the tow point builds RIDEABILITY. Sensor(s) mounted inline with the augers builds PROFILE.

Effective Length of Tow Arm

Automation sensors will always move the tow point up or down to maintain the sensors null point, in effect the location of the sensor becomes our control point. The tow point becomes only a point from which we raise or lower the tow arm to reestablish the null point at the sensor. The effective length of tow arm becomes the distance between the control point (sensor) and the pivot point (trailing edge of the screed). Because the screed must travel 5 tow arm lengths to fully react to a correction, shortening the effective tow arm length shortens the distance the paver must travel to complete a correction, therefore increasing reaction time. Moving the sensor towards the screed increases reaction time (builds profile), while moving the sensor towards the tow point decreases reaction time (builds rideability).



NOTICE: Never mount Tracker II behind the center line of the augers. This could cause severe over-correction.

Control References

Grade Control (Joint Matching)

Joint matching or matching the height of the mat being placed to an existing mat or curb, requires the screed to be very responsive to any changes in the elevation of the existing mat or curb. This is an application where we are building “Profile”, or over-correcting the screed, forcing it change depth in a very short distance.

The grade sensor should be mounted 3/4 of the way back from the tow point, or just ahead of the augers.

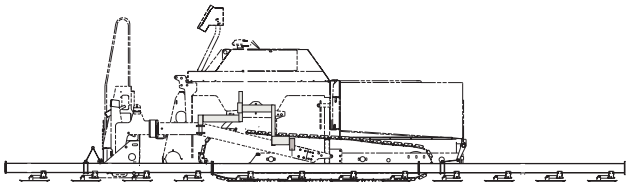
With the sensor mounted close to the screed, it is very responsive to any deviation in the screeds position, though not very responsive to deviations of the tow point position, caused by the tractor traveling over irregular grades. Therefore it is not anticipating these deviations , it can only react when a deviation of the tow point position affects the position of the screed.

Grade Control (Ski)

When using automation off a ski, corrections to deviations that occur at the sensor or the screed, will require the paver to travel approximately 5 lengths of the tow arm before the correction is fully completed. Deviations that occur at the tow point, due to the tractor traveling over irregular grades, are corrected for immediately. In effect the sensor is correcting for deviations at the tow point before they can affect the screeds angle of attack (position). In this application we are building “Rideability”, or averaging all required changes in depth over a longer area.

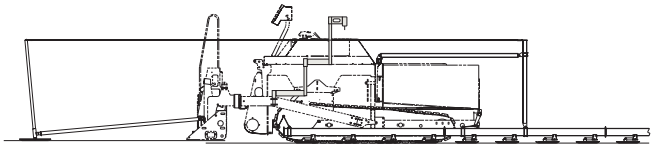
The grade sensor should be mounted 1/4 of the way back from the tow point. With the sensor mounted in the forward position, any deviation at the tow point caused by the tractor traveling over irregular grades, will cause the sensor to react immediately, to correct for that deviation. Therefor maintaining the same tow point position (angle of attack on the screed) in relation to the reference (ski), regardless of the grade irregularities.

Averaging Ski

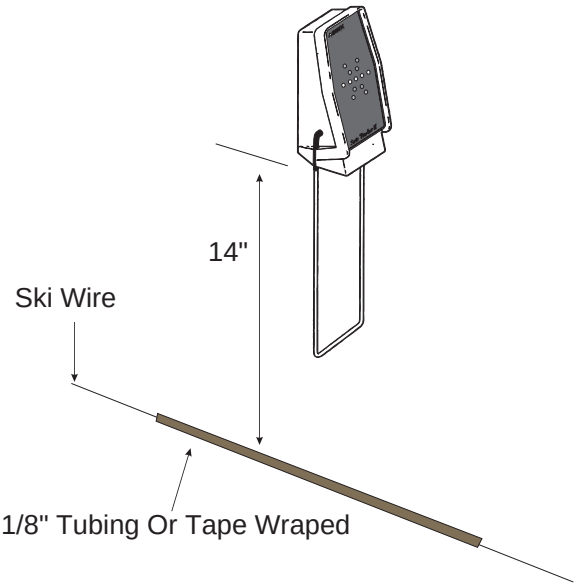


Over the Screed Ski

The over the screed ski is the preferred reference system when paving wide widths or where job conditions will not permit running a ski beside the screed. When paving at wide widths the over the screed ski is mounted in close to the tractor, the reference system being close to the tractor, provides the automation a more precise reference in relation to tow point deviations caused by grade conditions, by virtue of being mounted close to the tractor. Problems of flexing mounting hardware simply do not exist due to the close mounting position. The Cedarapids Over the Screed Ski system provides a true independent mounted ski reference system that is not effected by the tractor traveling over irregular grades and provides a very consistent reference plane for the grade sensory system.



Mount the Sonic Tracker II 14 inches above the top wire. A piece of 1/8” tubing should be placed over the wire to increase its reflective surface for best results.



Existing Surface

The Sonic Tracker II can follow nearly any existing surface. Simply place the Sonic Tracker II 14 to 24 inches above the surface. Get an On Grade Bar (Refer to "Getting an On Grade Bar Sonic Tracker II Control " earlier in this chapter), switch the Control Box to Auto and start paving.

Notice: Using automation to follow existing surfaces is NOT RECOMMENDED as every deviation in the existing surface will be introduced into the mat being placed.

Curb or Gutter

A curb or gutter that is poured before paving can be used as a reference. Simply line the Sonic Tracker II 14" above the curb or gutter edge and get an On Grade Bar. Switch the Control Box to Auto and start paving.

Notice: Curbs and gutters make a very poor reference if smoothness of the placed mat is of concern. This is due to the variations in elevation along the length of the curb or gutter.

Surface Stringline

A Surface Stringline is stretched over a given length of grade. It rests on the high places and bridges the low, creating an average over a distance as long as 1500 feet. Since the Sonic Tracker II is non-contacting, it can track Surface Stringline without deflecting it, producing an average of the surface. Surface Stringlines can produce acceptable results in low specification type jobs, but traditionally are not used in very demanding or high specification jobs.

Once Surface Stringline is in place, all you need to do is line up the Sonic Tracker II 14 to 18 inches above the string, get an On Grade Bar and switch to Auto.

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System Four
Grade and Slope Automation

Slope Conversion Table

Slope	Actual decimal inch per ft.	Approx. fraction inch per ft.	Inch per 10 ft.	Inch per 11 ft.	Inch per 12 ft.	Inch per 13 ft.	Inch per 14 ft.	Inch per 15 ft.	Inch per 16 ft.	Inch per 17 ft.	Inch per 18 ft.	Inch per 19 ft.	Inch per 20 ft.
0.10%	.012	1/64	1/8	1/8	5/32	5/32	5/32	3/16	3/16	7/32	7/32	7/32	1/4
0.13%	.015	1/64	5/32	5/32	3/16	3/16	7/32	7/32	1/4	1/4	9/32	9/32	5/16
0.20%	.024	1/32	1/4	1/4	9/32	5/16	11/32	3/8	3/8	13/32	7/16	15/32	15/32
0.26%	.031	1/32	5/16	11/32	3/8	13/32	7/16	15/32	1/2	17/32	9/16	19/32	5/8
0.30%	.036	3/64	3/8	13/32	7/16	15/32	1/2	17/32	9/16	5/8	21/32	11/16	23/32
0.40%	.048	3/64	1/2	17/32	9/16	5/8	11/16	23/32	25/32	13/16	7/8	29/32	31/32
0.50%	.060	1/16	19/32	21/32	23/32	25/32	27/32	29/32	31/32	1-1/32	1-3/32	1-1/8	1-3/16
0.52%	.062	1/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1-1/16	1-1/8	1-5/16	1-1/4
0.60%	.072	5/64	23/32	25/32	7/8	15/16	1	1-3/32	1-5/32	1-7/32	1-9/32	1-3/8	1-7/16
0.78%	.093	3/32	15/16	1-1/32	1-1/8	1-7/32	1-5/16	1-13/32	1-1/2	1-19/32	1-11/16	1-25/32	1-7/8
0.80%	.096	3/32	31/32	1-1/16	1-5/32	1-1/4	1-11/32	1-7/16	1-17/32	1-5/8	1-23/32	1-13/16	1-29/32
1.0%	.120	1/8	1-3/16	1-5/16	1-7/16	1-9/16	1-11/16	1-13/16	1-29/32	2-1/32	2-5/32	2-9/32	2-13/32
1.5%	.180	3/16	1-13/16	1-21/32	2-5/32	2-11/32	2-17/32	2-11/16	2-7/8	3-1/16	3-1/4	3-13/32	3-19/32
2%	.240	1/4	2-7/16	2-5/8	2-7/8	3-1/8	3-3/8	3-19/32	3-27/32	4-3/32	4-5/16	4-9/16	4-13/16
3%	.360	3/8	3-5/8	3-31/32	4-5/16	4-11/16	5-1/32	5-13/32	5-3/4	6-1/8	6-15/32	6-27/32	6-3/16
4%	.480	15/32	4-13/16	5-9/16	5-3/4	6-1/4	6-23/32	7-3/16	7-11/16	8-5/32	8-5/8	9-1/8	9-19/32
5%	.600	19/32	6	6-19/32	7-3/16	7-13/16	8-13/32	9	9-19/32	10-3/16	10-13/16	11-13/32	12
6%	.720	23/32	7-3/16	7-29/32	8-5/8	9-3/8	10-3/32	10-13/16	11-17/32	12-1/4	12-31/32	13-11/16	14-13/32
7%	.840	27/32	8-13/32	9-1/4	10-3/32	10-29/32	11-3/4	12-19/32	13-7/16	14-9/32	15-1/8	15-21/32	16-13/16
8%	.960	32/32	9-19/32	10-9/16	11-17/32	12-15/32	13-7/16	14-13/32	15-3/8	16-5/16	17-9/32	18-1/4	19-3/16
9%	1.08	1-3/32	10-13/16	11-7/8	12-31/32	14-1/32	15-1/8	16-3/16	17-9/32	18-3/8	19-7/32	20-17/32	21-19/32
10%	1.20	1-3/16	12	13-3/16	14-13/32	15-19/32	16-13/16	18	19-3/16	20-13/32	21-19/32	22-13/16	24
11%	1.32	1-5/16	13-3/16	14-17/32	15-27/32	17-5/32	18-15/32	19-13/16	21-1/8	22-7/16	23-3/4	25-3/32	26-13/32
12%	1.44	1-7/16	14-13/32	15-27/32	17-9/32	18-23/32	20-5/32	21-19/32	23-1/32	24-15/32	25-29/32	27-3/8	28-13/16

All figures in feet are measured horizontally.
All figures in inches should be measured vertically and accurately to within 1/32 inch.

Maintenance and Parts

This section contains information regarding preventative maintenance and daily care of System Four. Also included are:

1) An Illustrated Parts Guide
2) An Illustrated Cable Guide
3) Replacement procedures for the Sonic Tracker II "Transducer"
4) Wiring Diagram

Preventative Maintenance & Daily Care

A good Preventative Maintenance and Daily Care routine will prevent many problems before they occur. The most important part of Daily Care for System Four is to clean it and keep it free of debris, and to thoroughly dry removable components (Sonic Tracker II's, Control Boxes, and cables) before storing them in the Carrying Case. In addition, the following procedures will ensure trouble free operation:

1) Keep the Carrying Case clean and dry. Do not leave it open and exposed to the elements. Clean and dry all components prior to placing them in the Carrying Case.
2) Be sure protective connector caps, provided on the Junction Box, are in place when the cables are not in use. Water accumulating on the connectors can cause electrical shorts.
3) The components can be used in the rain or light spraying but are not submergible. Do not spray water or use high pressure steam cleaner hoses directly on cables and components.
4) Check the Sonic Tracker II Transducer daily to make sure the Filter Foam and Transducer are clean and free of debris. If the Filter foam is clogged with dirt, replace it (see Illustrated Parts Guide for Filter Foam re-order part number).

   If the Transducer appears to be covered with debris and performance is being affected (see "Lower Sonic Tracker II Components" in Function) replace the Transducer using the steps listed later in this chapter.

Illustrated Parts Guide

Using the chart below, match the item number of the part located on the illustration to the item numbers listed on the chart below. The chart is divided into three categories: Component Assemblies, Bracket Assemblies, and Kits. For cable part numbers see "Illustrated Cable Guide" later in this chapter

Component Assembly Part Numbers			
Item	Part #	Part Description	Qty
2	46061-551-10	Control Box	2
3	46061-551-09	Sonic Tracker II	2
4	46061-551-02-01	Temperature Bail	2
5	46061-551-18	Slope Sensor	1
6	46061-551-19	4-Way Junction Box	2
Bracket Assembly Part Numbers			
9	46061-551-11	Asm., Sonic Tracker II Mtg. Bracket	2
10	46061-511-38	Bracket, Tracker End Gat Mtg.	2
11	46061-551-37	Bracket, Tracker Tow Arm Mtg.	2
12	46061-551-27	Arm, Tracker Swing (Short)	2
13	46061-551-28	Arm, Tracker Swing (Long)	2
Kit Part Numbers			
	46061-551-02-02	Kit, Transducer Replacement	1
	46061-551-02-03	Filter Foam, Box of 10 Transducer	1
	46061-551-12	Kit, .75" Sonic Tracker II Mtg. Bolt	2

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System Four
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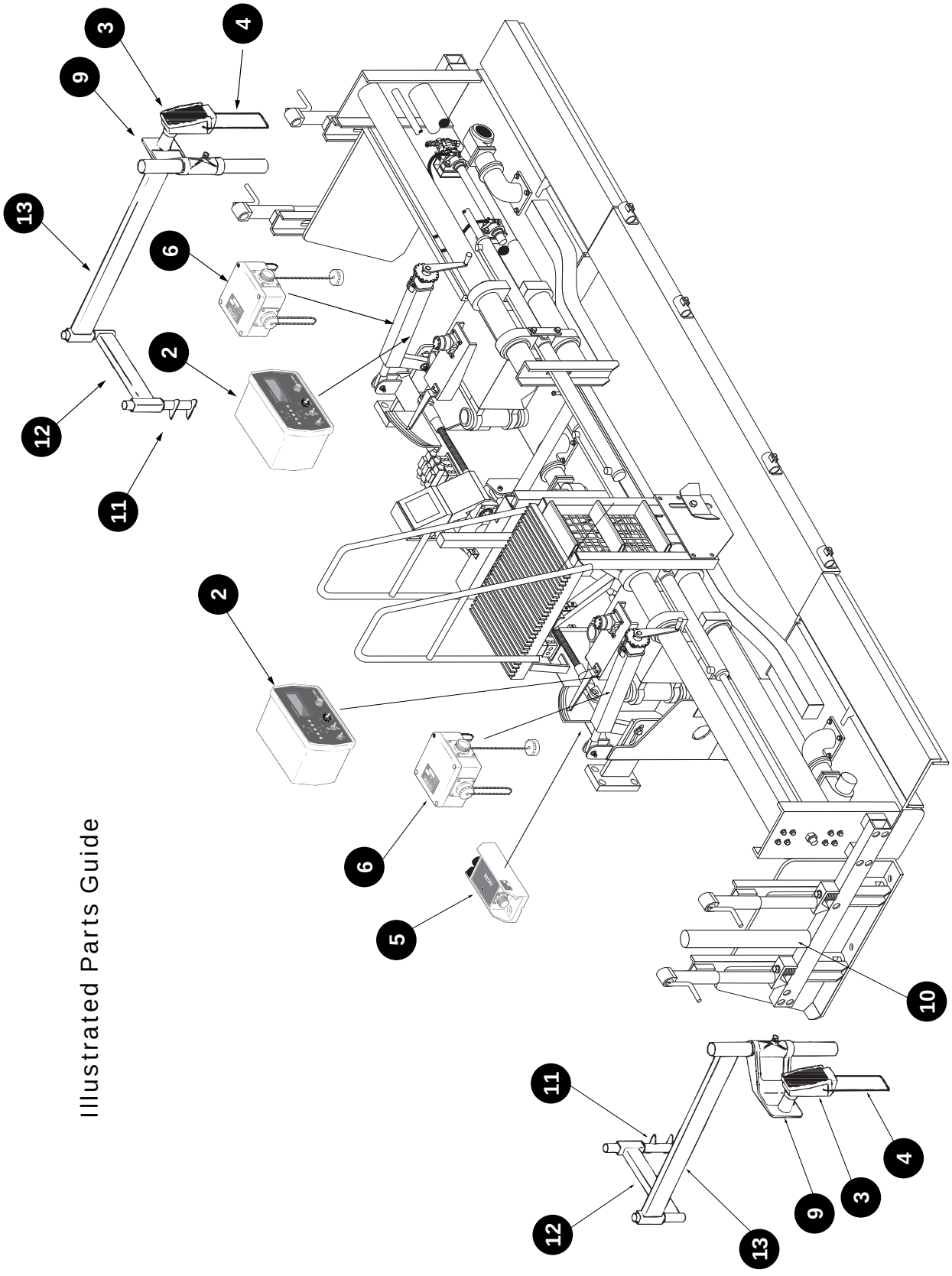

Illustrated Parts Guide

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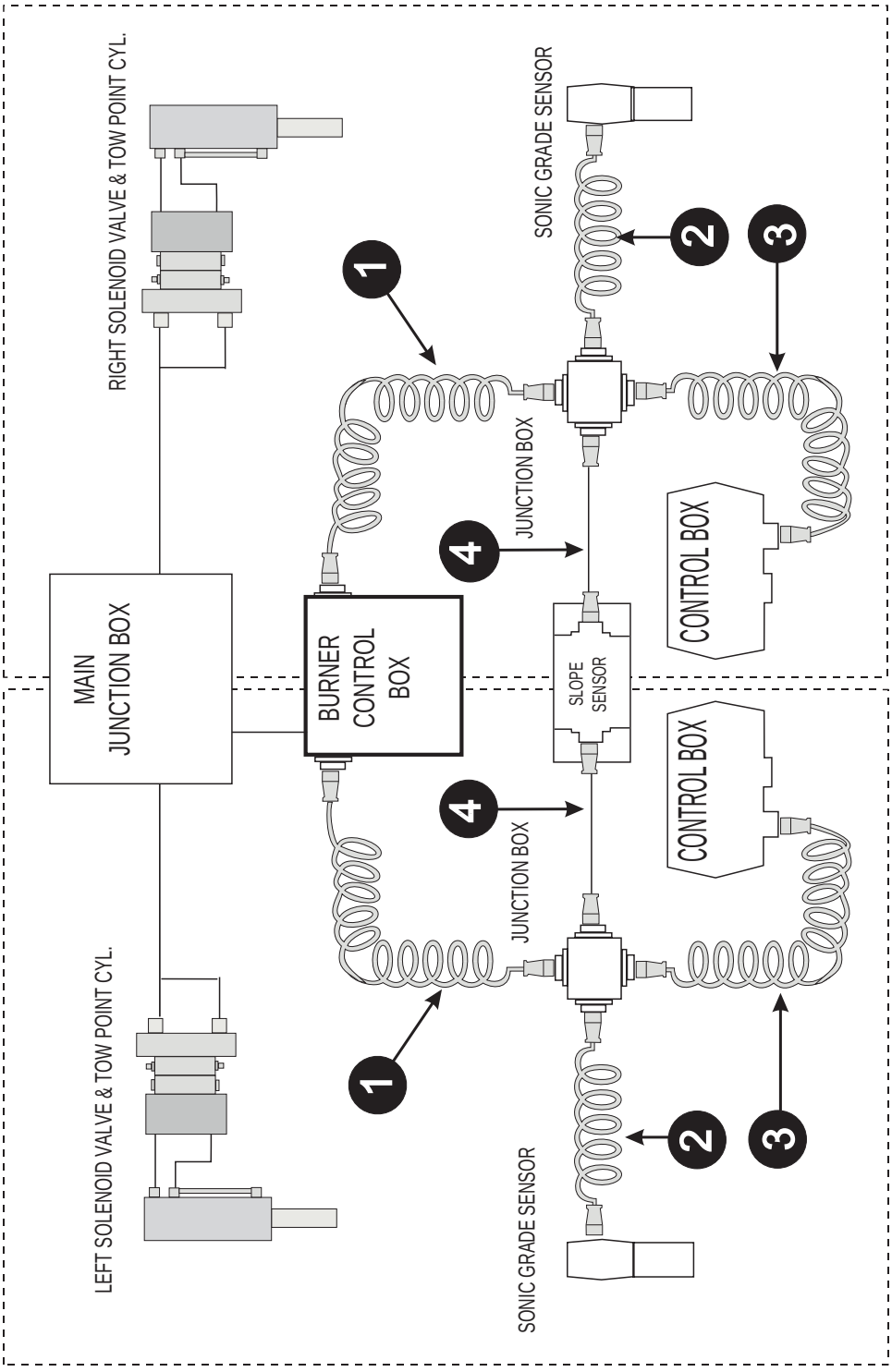
System Four
Grade and Slope Automation

Illustrated Cable Guide

Using the chart below, match the item number of the cable located on the illustration to the item numbers listed on the following page.



System Four Cable Numbers

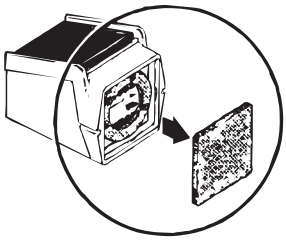
Cable Part Numbers			
Item	Part#	Part Description	Qty
1	46061-551-21	Coil Cord, Power	2
2	46061-561-07	Coil Cord Sonic Tracker to Junction Box	2
3	46061-551-08	Cable Control Box to Junction Box (44")	2
4	46061-551-16	Cable Junction Box to Slope Sensor (3')	1
	46061-551-17	Cable Junction Box to Slope Sensor (8')	1
	46061-551-20	Cable Junction Box to Slope Sensor (20')	2

Transducer Replacement Procedure

NOTICE: If the Sonic Tracker II is experiencing erratic or inconsistent readings, Transducer contamination should be considered first before assuming any other type of failure. The most common sign of Transducer contamination is the ability of the Sonic Tracker II to "see" the ground, but not a Stringline.

Sonic Tracker II "Transducer" Replacement

The only tools needed are a Philips screwdriver and a small pair of cutters. Replace the Transducer as follows:



1) Remove and discard the Filter foam (a new Filter foam is provided in the Transducer Replacement Kit).

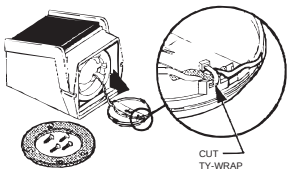
2) Remove the 4 screws that secure the black Retaining Ring and remove the Retaining Ring, (4 replacement screws are supplied in the Transducer Replacement Kit, but it is advisable to use the original screws and keep the 4 supplied in the kit for replacements in the event one or more are lost). Remove and discard the "O"-Ring (a new O-Ring is supplied with the Transducer Replacement Kit').

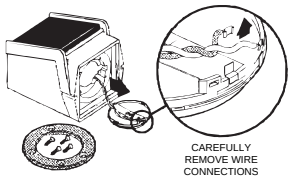
NOTICE: Always remove and discard used O-Rings. Used O-Rings will be distorted and may loose their elasticity due to weather or exposure to diesel fumes.

3) The Transducer can now be gently pulled out.

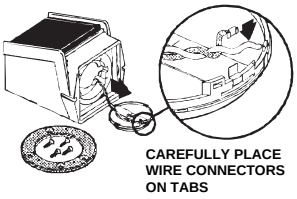
Use a SMALL pair of wire cutters to gently cut the Ty-Wrap then remove the small wire connectors from their tabs.

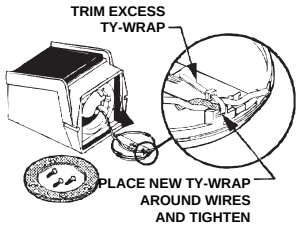
NOTICE: When cutting the Ty-Wrap, be careful not to cut or damage the wires.



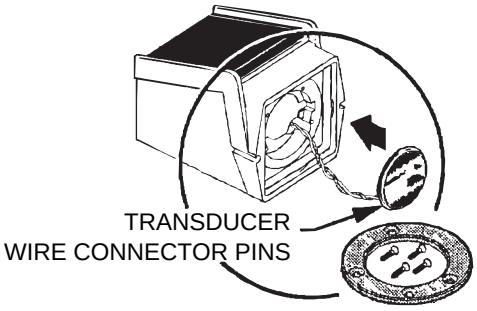


4) Place the wire connectors of the new Transducer firmly on their tabs (the gray wire connector is placed on the elevated tab). Place the Ty-Wrap in the slot next to the elevated (gray wire) tab, tighten and trim. DO NOT pinch the wires.





5) "Feed" the wires back up into the Sonic Tracker II and seat the Transducer into place (the two wire tabs have to sit down into the extra deep area of the recess). Place the new "O"-ring around the Transducer and seat firmly between the Transducer and the Sonic Tracker II Transducer recess.

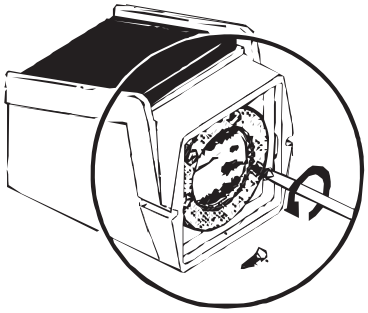


6) Place the black Retaining Ring over the Transducer assembly with the beveled edges out and the flat surface against the Sonic Tracker II base. Lineup the holes for the mounting screws (the mounting screw holes are set to an irregular pattern. This ensures the retaining ring will only line up with the mounting holes one way).

7) Start the mounting screws into the holes and tighten each until firm. DO NOT OVER TIGHTEN. Use a cross (X) pattern to tighten screws.

NOTICE: Over tightening may distort the Transducer metallic material and may crack the Retaining Ring. Use of the O-Ring assures tightness while preventing vibration from loosening the Mounting Screws.

NOTICE: DO NOT use Loctite on the mounting screws. Loctite will attack the plastic retaining ring.



8) Make sure no wrinkles in the metallic surface is visible inside the Transducer. If distortion is evident repeat Steps 5 through 8.

9) Place a NEW Filter Foam over the Transducer. The Sonic Tracker II' is now ready to return to operation.

Connector and Wiring Diagram

The electrical diagram shows which wires and pins are used in each components connector.

The diagram may also be used to determine the specific part number of a cable needed to connect to a specific paver. Simply find the cable on the diagram, then use the Cable Specification Chart to determine the part number for the cable to your paver.

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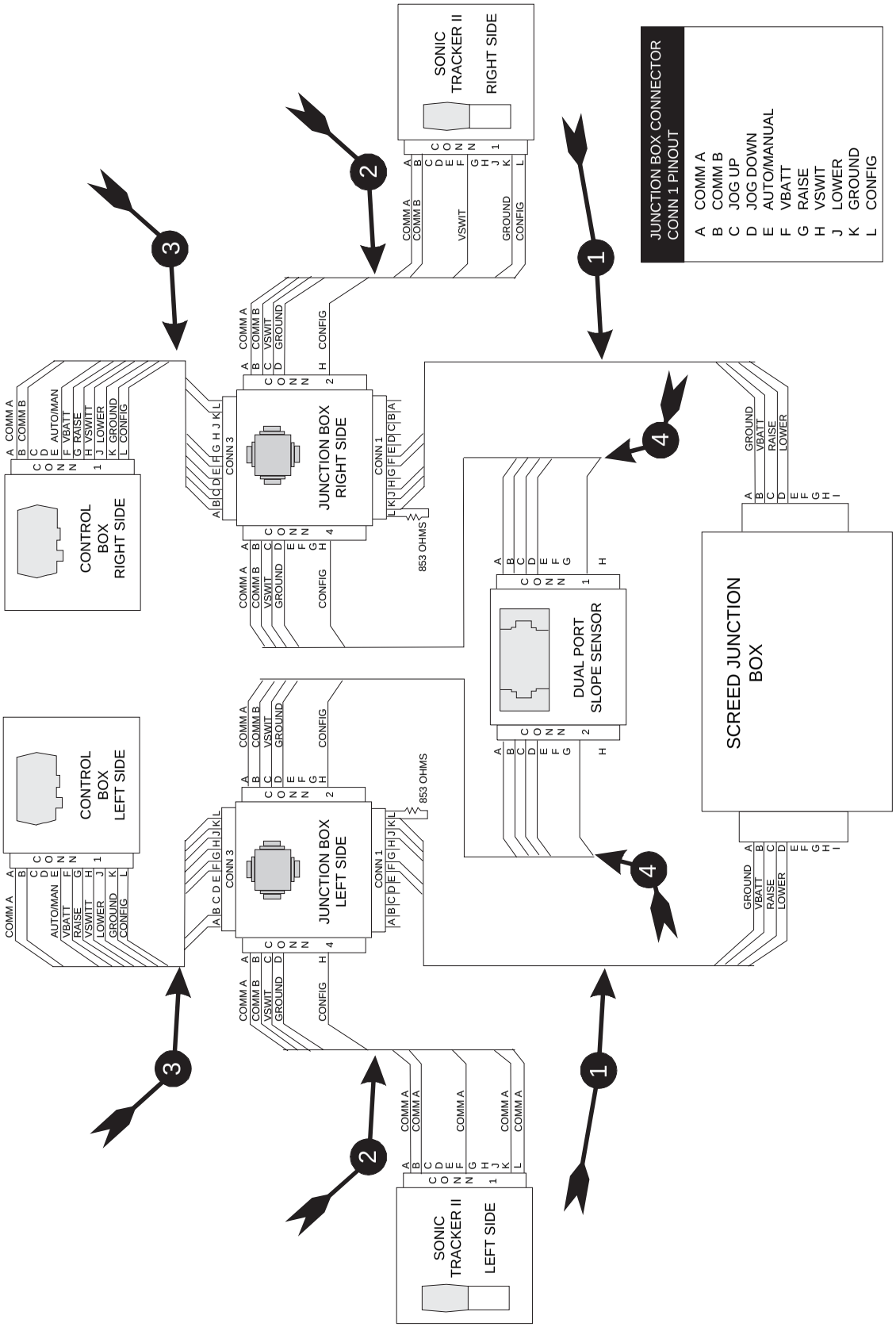
System Four
Grade and Slope Automation

Connector and Wiring Diagram



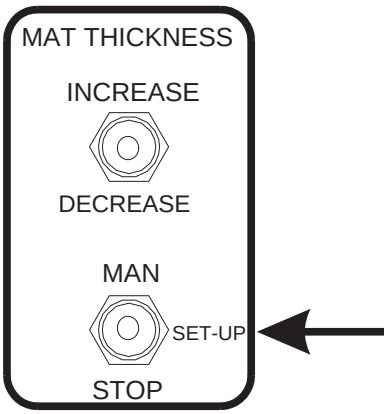
Troubleshooting

System Checkout Grade

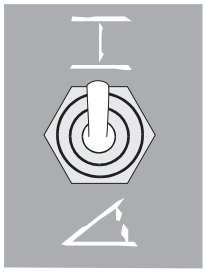
Set-Up

1) Place the screed on the ground
2) Turn off engine. Ensure all switches are in the OFF position and the Brakes are Engaged.
3) Mount all System Four components on the machine and attach all connectors properly.
4) Position the Sonic Tracker II 14 inches above the ground. Install the Temperature Bail on both Sonic Tracker II
5) Start engine and let idle.
6) Switch the Auto/ Manual/ Survey(Cal) switch to Manual on both control boxes.

7) Place screed remote Mat Thickness Man/Setup/ Auto switches in SETUP on both sides of the screed.



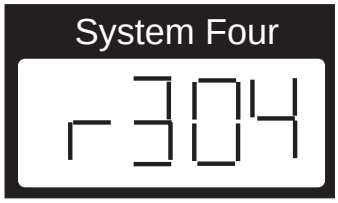
8) On the right control box, switch the Elevation: Power / Off/ Slope: Power Switch to Elevation.



Observe the following:

1) The Control Box should give a single audible beep.
2) The LCD Digital/Symbol Display should come on.

   a. A digital number should appear.

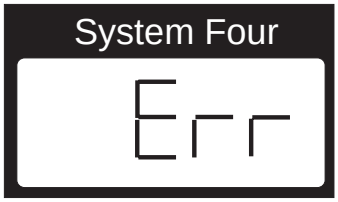


   This is a software revision number.

   b. A configuration number should appear next.

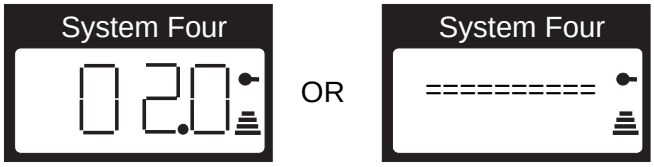
NOTICE: The display should always show "c009" as the configuration. If any thing other than this appears it is an indicator of a bad power cable or damaged junction box.

   c. The digital display should momentarily display an "*ERR*".

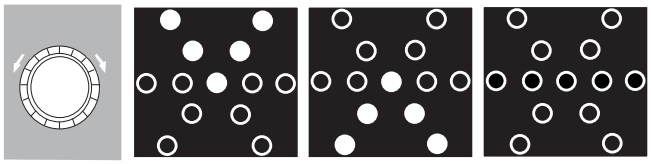


NOTICE: If "ERR" is displayed continuously, the control box is not able to communicate with the Sonic Tracker II. Check the cable and connections.

d. The Tracker symbol in the lower right corner of the LCD display should appear.



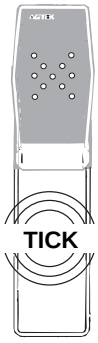
3) Grade Correction Display may show an UP, DOWN, ON GRADE or no light indicators. Also Grade Adjustment Arrows around the Grade Adjustment Knob should appear if the Correction Display is not showing ON GRADE.



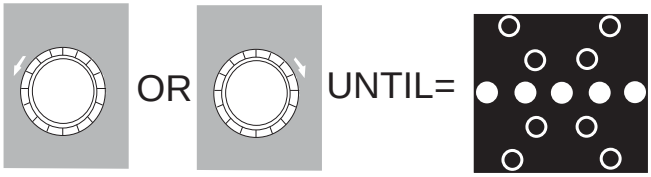
4) Temperature Bail symbol should be displayed on the Sonic Tracker II display.

NOTICE: A transducer is failing if the Sonic Tracker II Bail indicator does nor appear while the bail is installed.

5) The Sonic Tracker II Transducer" should emit a ticking sound.

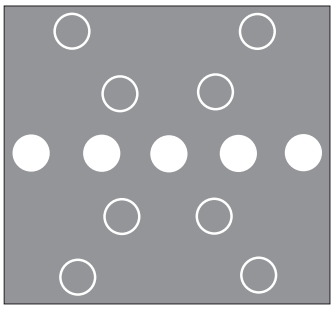


1) Adjust the Grade Adjustment Knob on the Control Box in the direction indicated by the Grade Adjustment Arrows until the On Grade symbol illuminates.



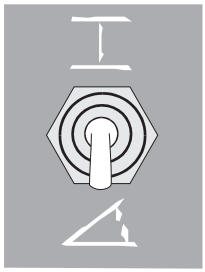
Observe the following:

1) The Sonic Tracker II and Control Box, Grade Correction Display should show On Grade.



System Checkout Slope

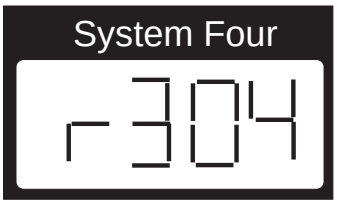
1) Switch the Elevation: Power / Off / Slope: Power Switch to Slope.



Observe the following:

1) The Control Box should give a single audible beep.
2) The LCD Digital/Symbol Display should come on.

a. A digital number should appear.

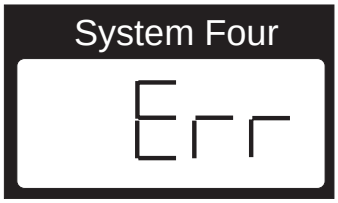


This is a software revision number.

b. A configuration number should appear next.

NOTICE: The display should always show "c009" as the configuration. If any thing other than this appears it is an indicator of a bad power cable or damaged junction box.

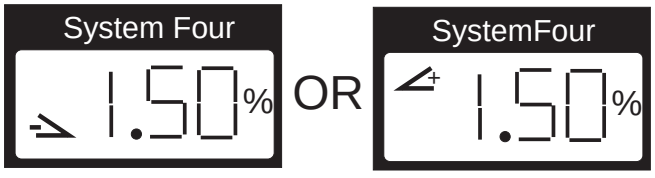
c. The digital display should momentarily display an "*ERR*".



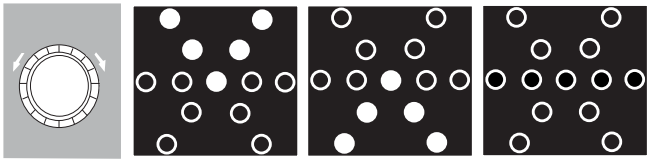
NOTICE: If "ERR" is displayed continuously, the control box is not able to communicate with the Sonic Tracker II. Check the cable and connections.

3) LCD Digital/Symbol Display should come on

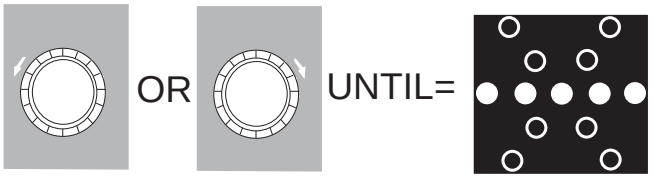
a. The (+ Slope) or (-Slope) should be on. A digital slope number should appear and the "%" symbol should appear.



4) Grade Correction Display may show an UP, DOWN, ON GRADE or no light indicators. Also Grade Adjustment Arrows around the Grade Adjustment Knob should appear if the Correction Display is not showing ON GRADE.

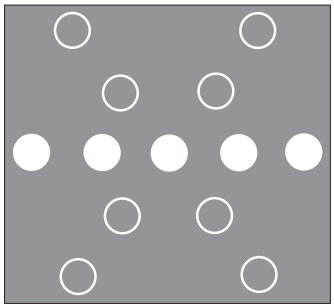


1) Turn the Adjustment Knob on the Control Box in the direction indicated by the Grade Adjustment Arrows until the On Grade symbol illuminates.



Observe the following:

1) The Control Box, Grade Correction Display should show On Grade.



Switch the right control box OFF. Repeat System Checkout procedures for both grade and slope on the left side of the paver.

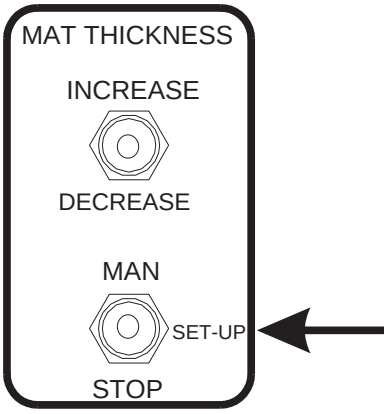
Operating Checkout Grade

Set-Up

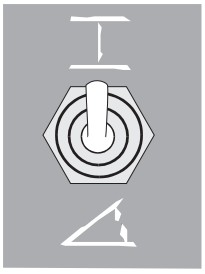
1) Place the screed on the ground
2) Turn off engine. Ensure all switches are in the OFF position and the Brakes are Engaged.

3) Mount all System Four components on the machine and attach all connectors properly.
4) Position the Sonic Tracker II 14 inches above the ground. Install the Temperature Bail on both Sonic Tracker II
5) Start engine and let idle.
6) Switch the Auto/ Manual/ Survey(Cal) switch to Manual.

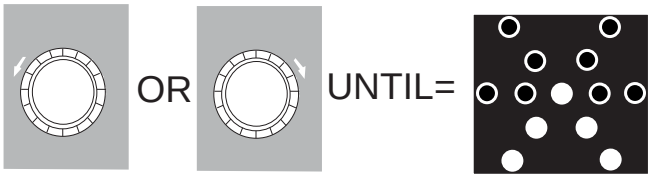
7) Place screed remote Mat Thickness Man/Setup/ Auto switches in SETUP on both sides of the screed.



8) On the right control box, switch the Elevation: Power / Off/ Slope: Power Switch to Elevation.



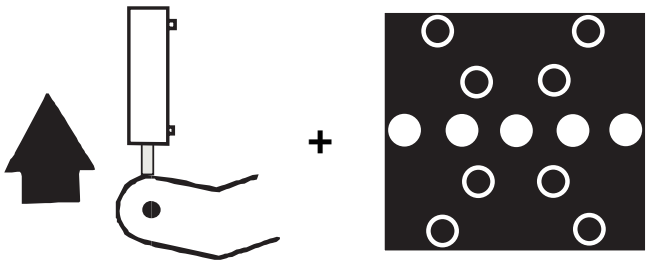
9) Using the Grade Adjustment Knob, adjust the Grade Correction Display for an Up correction.



10) Switch the Auto/Manual/Survey(Cal) Switch to AUTO.

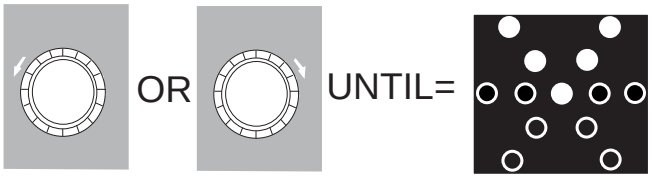
Observe the following:

1) The tow point should move up
2) The Grade Correction Display should indicate On Grade when the cylinder stops moving.



1) Switch the Auto/Manual/ Survey (Cal) Switch to Manual

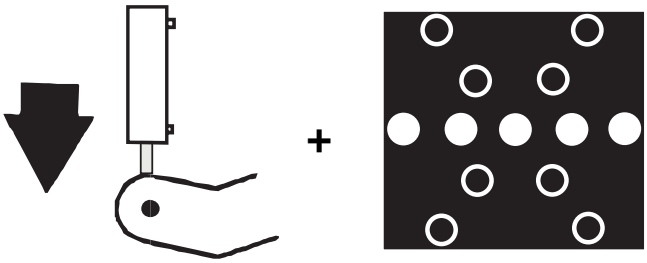
2) Adjust the Grade Correction Display for a Down correction



3) Switch the Auto / Manual / Survey (Cal) Switch to Auto

Observe the following:

1) The tow point should move down
2) The Grade Correction Display should indicate On Grade when the cylinder stops moving.

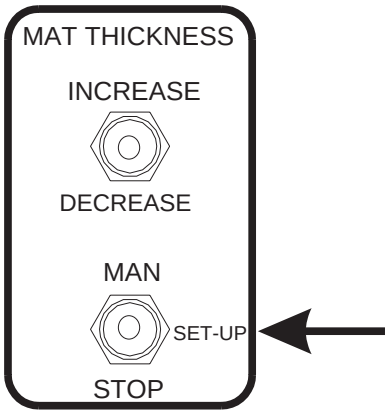


Operating Checkout Slope

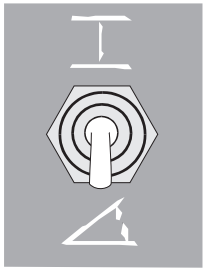
Set-Up

1) Place the screed on the ground
2) Turn off engine. Ensure all switches are in the OFF position and the Brakes are Engaged.
3) Mount all System Four components on the machine and attach all connectors properly.
4) Start engine and let idle.
5) Switch the Auto/ Manual/ Survey(Cal) switch to Manual.

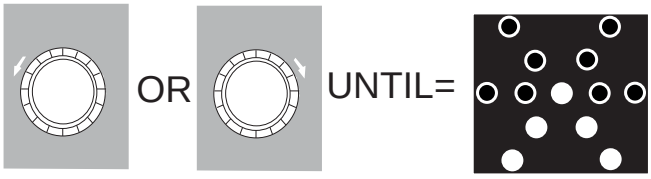
6) Place screed remote Mat Thickness Man/Setup/ Auto switches in SETUP on both sides of the screed.



7) On the right control box, switch the Elevation: Power / Off/ Slope: Power Switch to Slope.



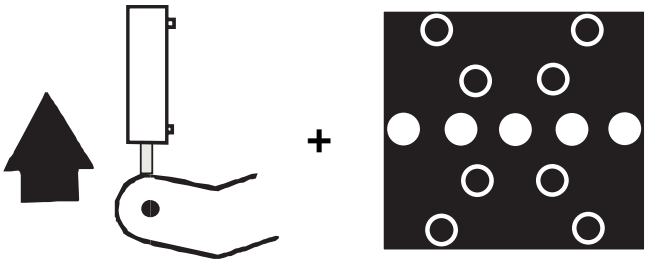
8) Using the Grade Adjustment Knob, adjust the Grade Correction Display for an Up correction.



9) Switch the Auto/Manual/Survey(Cal) Switch to AUTO.

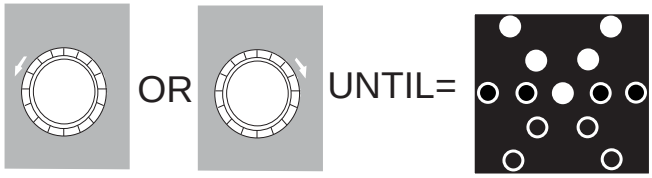
Observe the following:

1) The tow point should move up
2) The Grade Correction Display should indicate On Grade when the cylinder stops moving.



1) Switch the Auto/Manual/ Survey (Cal) Switch to Manual

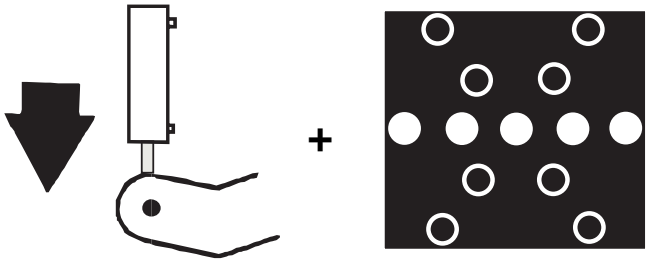
2) Adjust the Grade Correction Display for a Down correction



3) Switch the Auto / Manual / Survey (Cal) Switch to Auto

Observe the following:

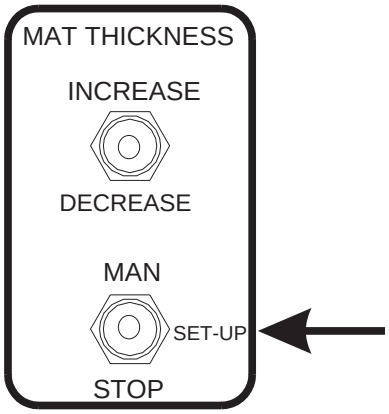
1) The tow point should move down
2) The Grade Correction Display should indicate On Grade when the cylinder stops moving.



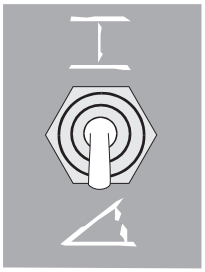
System Performance Operational Check

1) Switch the Auto/ Manual/ Survey(Cal) switch to Manual on both control boxes.

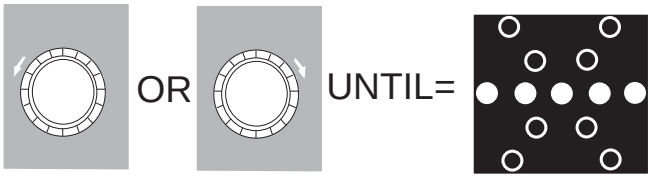
2) Place screed remote Mat Thickness Man/Setup/ Auto switches in SETUP on both sides of the screed.



3) Switch the Elevation: Power / Off / Slope: Power Switch to Slope.

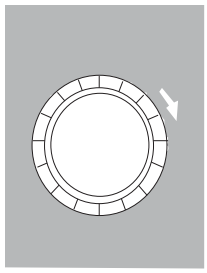


4) Adjust the Grade Adjustment Knob on the Control Box in the direction indicated by the Grade Adjustment Arrows until the On Grade symbol illuminates.

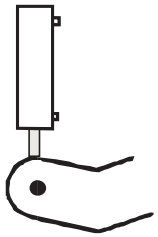


5) Switch the Auto/Manual/Survey(Cal) Switch to AUTO.

6) Turn the Grade Adjustment Knob on the Control Box one click clockwise.



OBSERVE THE FOLLOWING TOW POINT CYLINDER REACTION

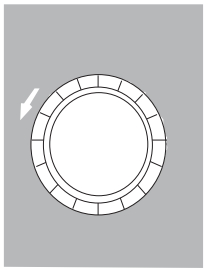


The tow point cylinder should move to the new position and stop.

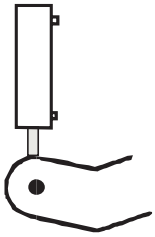
If the tow point cylinder does not move, the valve offset performance setting for that direction of cylinder movement is too slow and needs to be increased.

If the tow point cylinder jumps a large distance and has to come back before stopping, the valve offset performance setting for that direction of cylinder movement is too Fast and needs to be decreased.

7) Turn the Grade Adjustment Knob on the Control Box one click counterclockwise.



OBSERVE THE FOLLOWING TOW POINT CYLINDER REACTION



The tow point cylinder should move to the new position and stop.

If the tow point cylinder does not move, the valve offset performance setting for that direction of cylinder movement is too slow and needs to be increased.

If the tow point cylinder jumps a large distance and has to come back before stopping, the valve offset performance setting for that direction of cylinder movement is too Fast and needs to be decreased.

IF NECESSARY READJUST VALVE OFFSET PERFORMANCE SETTING AND REPEAT SYSTEM PERFORMANCE OPERATIONAL CHECKS

Symptom Quick Reference

1) Control Box LCD Digital/Symbol Display does not come on
2) Control Box LCD Digital/Symbol Display reads “Err”
3) Cannot adjust to On Grade when Elevation control is selected
4) Tow point cylinder does not move Up or Down
5) Tow point cylinder moves too fast or too slow
6) Cross slope being placed is not correct

Troubleshooting Procedures

Symptom 1 - Control Box LCD Digital/Symbol Display does not come on.

Probable Cause

No power to Control Box.

1) Check that machine power is on and all switches for automatic control are in the proper position
2) Check that all cables are properly connected to System Four
3) Disconnect cables and inspect them for damage or contamination. Clean all connections with a commercial De-Greaser / Cleaner
4) Swap Control Box with the unit from the other side to see if the symptom continues.

Symptom 2 - Control Box LCD Digital/Symbol Display reads “ERR”.

Probable Cause

No communication with the sensor selected.

1) Check that all cables are properly connected to System Four
2) Disconnect cables and inspect them for damage or contamination. Clean all connections with a commercial De-Greaser /Cleaner
3) If slope has been selected, check that slope had not been selected on the other Control Box
4) If elevation has been selected, swap the Sonic Tracker II and/or Cables with unit from opposite side to determine if symptom continues

Symptom 3 - Cannot adjust to on grade when elevation control is selected.

Probable Cause

Tracker is too close to control reference.

1) Check that the Sonic Tracker II is at least 14 inches away from the control reference
2) Check for contamination on Sonic Tracker II. Transducer. Refer to Transducer and Filter replacement information in Maintenance and Parts
3) Swap the Tracker with the unit on the opposite side to determine if the symptom continues

Symptom 4 - Tow point cylinder does not move up or down.

Probable Cause

Paver electrical switches are not in the proper position or hydraulics to the cylinder are not active.

1) Check that all paver electrical switches are in the correct position for automatic control.
2) Check hydraulic system is functioning properly.

3) Check that the Auto / Manual / Survey (Cal) Switch is in Auto and that the Auto symbol is illuminated on the front panel
4) Disconnect cables and inspect them for damage or contamination. Clean all connections with a commercial De-Greaser /Cleaner
5) Swap the Control Box with the unit on the opposite side to determine if the symptom still exists

Symptom 5 - Tow point cylinder moves too fast or too slow.

Probable Cause

System Performance Settings are not correct.

1) Adjust both the Gain, Deadband and Valve Offset Performance Settings to there recommended settings. Refer to "Accessing System Performance Settings"
2) Tow Point valve timing set faster or slower than 18 seconds.

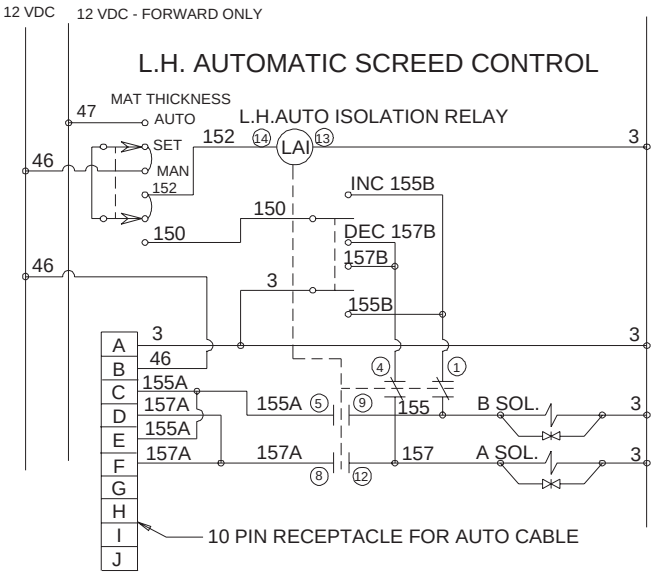
Symptom 6 - Cross slope being placed is not correct.

Probable Cause

Calibration on Slope Sensor is incorrect.

1) Calibrate the Slope Sensor as described in "Slope Calibration" in the Function section
2) Check that the Transverse Beam is mounted properly with no looseness or damage.
3) Re-check grade using a good reference such as a laser or level
4) Paver's mat thickness controls have been used.

LH Electrical Automatic Screed Control



Tow Point Cylinder Does Not Raise or Lower in Manual

Man/Setup/Auto switch in Manual.

Press Manual Override button on solenoid valve;

If Non-functional, refer to Hydraulic Troubleshooting.

If Functional, proceed below.

Check DIN connector on valve for light;

If light is ON, check for 12VDC across solenoid coil (pin I to pin 2);

If no voltage, check connection of DIN connector.

If voltage, check and/or replace solenoid coil.

If No Light;

Check for 12VDC from 155 to 3 with switch in Increase, 157 to 3 with switch in Decrease.

If no voltage, check 155B to 3 in Increase, 157B to 3 in Decrease.

If voltage, check 152 to 3. Shouldn't have any voltage.

Replace Man-Setup-Auto switch if voltage present. Replace Isolation Relay if no voltage.

If NO voltage, check 150 to 3;

If voltage, replace Increase-Decrease switch.

If NO voltage, check/replace Man/Setup/Auto switch.

If voltage, check wiring to valves.

Topcon Control Does Not Raise or Lower Tow Point in Manual or Auto

If Topcon control will NOT power up when Grade or Slope is selected;

Check for 12VDC from 46 to 3 in Main Screed Box.

If NO voltage, check wiring from Tractor.

If voltage, check for 12VDC from pin F to pin K at Controller power cable.

If NO voltage, check wiring from Main Screed Box.

If voltage, proceed to Topcon Troubleshooting.

If Topcon control powers up when Grade or Slope is selected but valves will not operate;

Check for 12VDC from 155A for UP, 157A for DOWN;

If NO voltage, proceed to Topcon Troubleshooting.

If voltage, check for 12VDC from 155 for UP, 157 for DOWN;

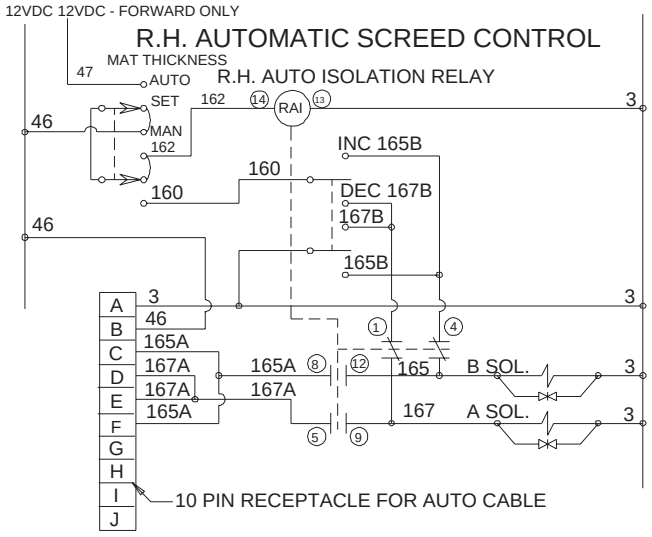
If voltage, check wiring to valves.

If NO voltage, check 152 to 3.

If voltage, check Isolation Relay by switching with RH Relay. Replace if defective.

If NO voltage, check/replace Man/Setup/Auto switch.

RH Electrical Automatic Screed Control



Tow Point Cylinder Does Not Raise or Lower in Manual

Man/Setup/Auto switch in Manual.

Press Manual Override button on solenoid valve;

If Non-functional, refer to Hydraulic Troubleshooting.

If Functional, proceed below.

Check DIN connector on valve for light;

If light is ON, check for 12VDC across solenoid coil (pin I to pin 2);

If no voltage, check connection of DIN connector.

If voltage, check and/or replace solenoid coil.

If No Light;

Check for 12VDC from 165 to 3 with switch in Increase, 167 to 3 with switch in Decrease.

If no voltage, check 165B to 3 in Increase, 167B to 3 in Decrease.

If voltage, check 162 to 3. Should not have any voltage.

Replace Man/Setup/Auto switch if voltage present. Replace Isolation Relay if no voltage.

If NO voltage, check 160 to 3;

If voltage, replace Increase-Decrease switch.

If NO voltage, check/replace Man/Setup/Auto switch.

If voltage, check wiring to valves.

Topcon Control Does Not Raise or Lower Tow Point in Manual or Auto

If Topcon control will NOT power up when Grade or Slope is selected;

Check for 12VDC from 46 to 3 in Main Screed Box.

If NO voltage, check wiring from Tractor.

If voltage, check for 12VDC from pin F to pin K at Controller power cable.

If NO voltage, check wiring from Main Screed Box.

If voltage, proceed to Topcon Troubleshooting.

If Topcon control powers up when Grade or Slope is selected but valves will not operate;

Check for 12VDC from 165A for UP, 167A for DOWN;

If NO voltage, proceed to Topcon Troubleshooting.

If voltage, check for 12VDC from 165 for UP, 167 for DOWN;

If voltage, check wiring to valves.

If NO voltage, check 162 to 3.

If voltage, check Isolation Relay by switching with LH Relay. Replace if defective.

If NO voltage, check/replace Man/Setup/Auto switch.

Tow Point Hydraulic

Auxiliary System

Check hydraulic fluid level.

Engine at FULL THROTTLE.

Check other auxiliary functions for operation. (screed raise/lower, any extend/ retract function, tow point functions and etc.) If other functions work, this indicates the problem is only in the effected function and the general auxiliary system is working.

If paver is equipped with SCREED ASSIST, check manual dump needle valve to insure it is closed. If no other function is working, install a 3000 psi gauge in the test port. Refer to pressure setting above for each series of paver. If pressure can not be obtained, check and clean suction strainer, check suction hose for lose fittings, damaged hose, or obstructions.

Tow Point Will Not Increase

Engine at FULL THROTTLE.

Tow point Increase/Decrease switch to the INCREASE position.

Check for DIN connector light, if no light refer to electrical troubleshooting.

If light is ON:

1) Refer to electrical for testing ground connection.
2) Press MANUAL OVERRIDE button on solenoid valve.

If tow point cylinder increases, defective solenoid.

If tow point cylinder does not increase:

1) Install a 3000 psi gauge in-line, between hose going to rod end of cylinder and manifold block. if full pressure reading but no cylinder movement, plugged or defective holding valve.
2) Extend cylinder all the way, disconnect the hose going to the ROD END of the tow point cylinder. Carefully push the increase/decrease switch to DECREASE. If fluid comes out of the fitting on the cylinder, check cylinder for blown piston packing.

If no fluid, defective solenoid.

Tow Point Will Not Decrease

Engine at FULL THROTTLE.

Tow point increase/decrease switch to the DECREASE position.

Check for DIN connector light, if no light refer to electrical troubleshooting.

If light is ON:

1) Refer to electrical for testing ground connection.
2) Press MANUAL OVERRIDE button on solenoid valve.

If tow point cylinder decreases, defective solenoid.

If tow point cylinder does not decrease:

1) Install a 3000 psi gauge in-line, between hose going to base end of cylinder and manifold block. If full pressure reading but no cylinder movement, plugged or defective holding valve.
2) Retract cylinder all the way, disconnect the hose going to the BASE END of the tow point cylinder. Carefully push the increase/decrease switch to INCREASE, If fluid comes out of the fitting on the cylinder, check cylinder for blown piston packing.

If no fluid, defective solenoid.

Tow Point Cylinder Drifts Up or Down

Engine at FULL THROTTLE

Check DIN connectors for lights, If any light on, electrical system is telling the cylinder to move. If no lights are flashing on, proceed with checks.

Extend cylinder all the way, disconnect the hose going to the ROD END of the tow point cylinder. Carefully push the increase/decrease switch to DECREASE, if fluid comes out of the fitting on the cylinder, check cylinder for blown piston packing.

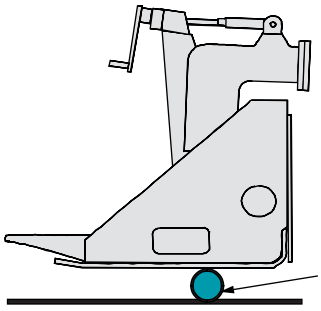
If no fluid, defective holding valve.

Tow Point Cylinder Timing

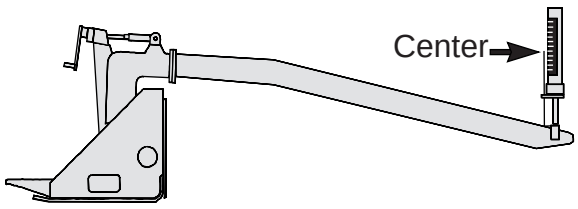
Refers to the length of time it takes to extend or retract the tow point cylinder. A dual hydraulic throttle valve is adjusted so the extend and retract stroke of the cylinder occurs in 18 seconds.

Checking Cylinder Timing

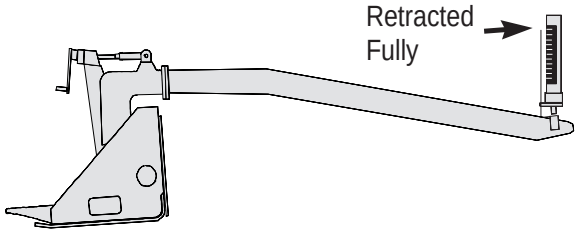
1) Acquire two pieces of pipe 2" OD or greater and 1' in length.
2) Place the pieces of pipe under each end of the screed.



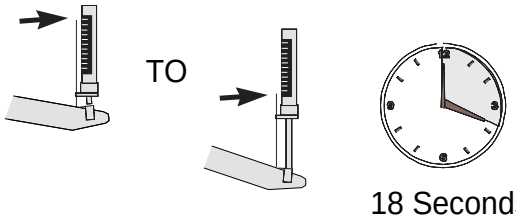
3) Center both tow point cylinders at 6 on the number scale.



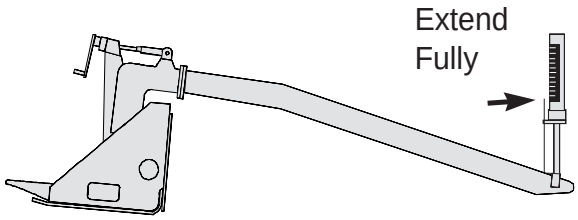
4) Set engine at Full Throttle.
5) On the right side retract the tow point cylinder fully.



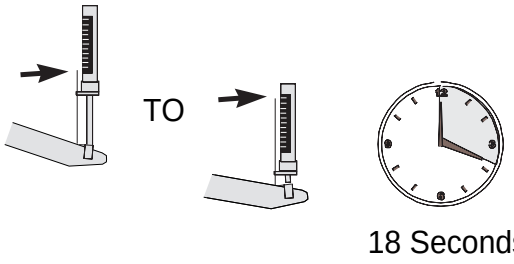
6) Extend cylinder: Using a stop watch note the amount of time it takes to fully extend the tow point cylinder.



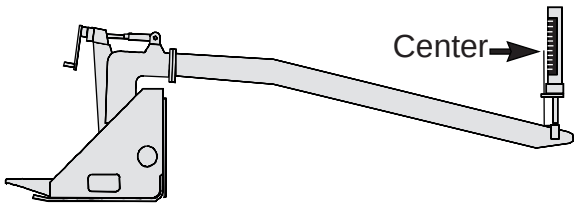
7) On the right side extend the tow point cylinder fully.



8) Retract cylinder: Using a stop watch note the amount of time it takes to fully extend the tow point cylinder.



9) Center right tow point cylinders at 6 on the number scale.



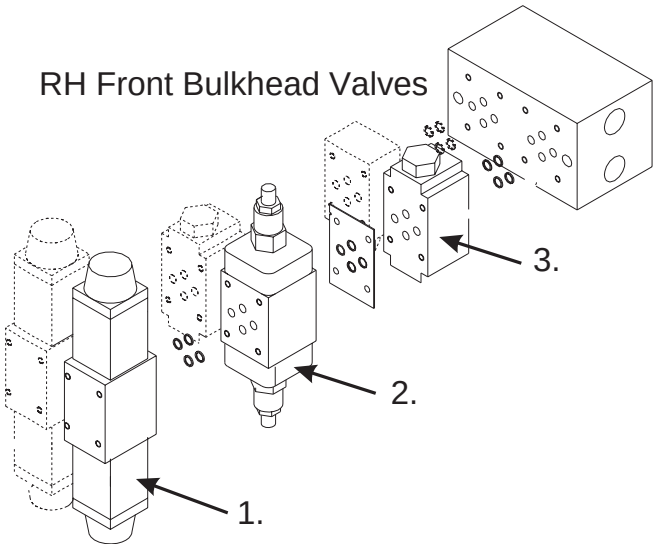
10) Repeat Steps 4 through 9 on the left side.

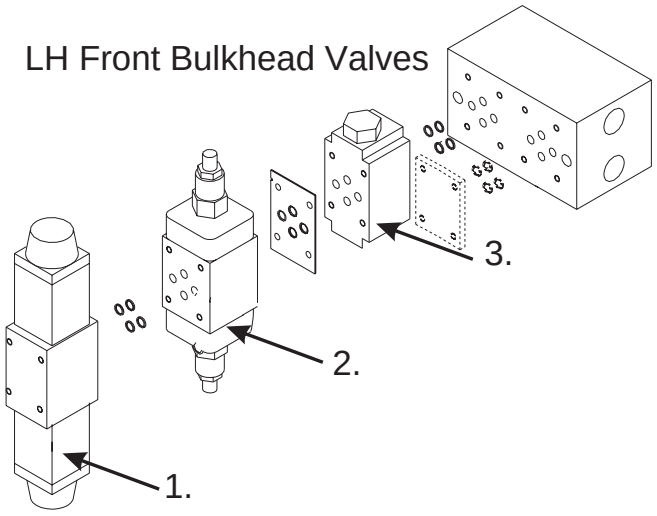
If either the up or down stroke time was anything other than 18 seconds, adjust Tow Point Timing according to "Tow Point Timing Adjustment" in this chapter.

Tow Point Timing Adjustment

All checks and adjustments should be performed with Engine at FULL THROTTLE and machine at operating temperature.

To adjust the tow point timing locate the perspective dual throttle valve.



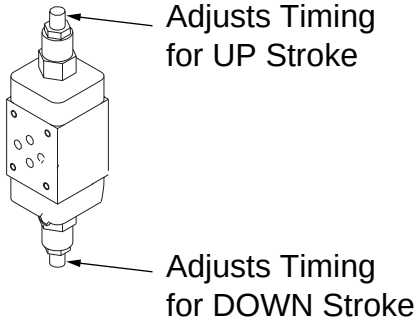


1) Solenoid Valve: Used to direct hydraulic fluid to either the rod or base ports of the tow point cylinder.

2) Dual Throttle Valve: Used to set cylinder travel speed for both directions to 18 seconds.

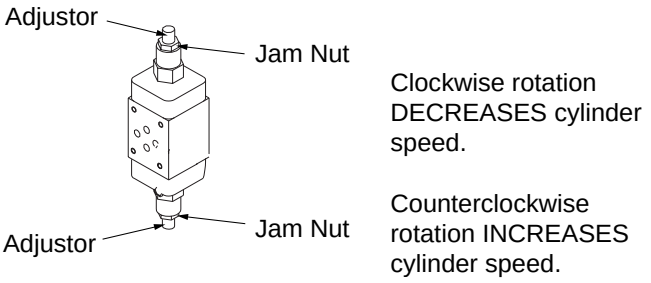
3) Holding Valve: Used to hydraulically lock the tow point cylinders.

The Dual Throttle Valve adjustment points are as follows:



To adjust the perspective up or down stroke time.

1) Loosen Jam Nut.
2) Using a Allen Wrench (Hex Wrench) turn adjuster a slight amount.



3) Tighten Jam Nut.
4) Recheck tow point timing according to procedures listed in :Checking Tow Point Timing" and readjust if necessary.

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System Four
Grade and Slope Automation