

**AutoBoom<sup>®</sup>**  
**Calibration and Operation**  
**Manual**

*P/N 016-0130-062 Rev. G    7/16    E23362*

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## CHAPTER

# 1

# ***Important Safety Information***

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## **NOTICE**

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the AutoBoom™ system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of your Raven equipment, contact your local Raven dealer for support.
- Follow all safety labels affixed to the AutoBoom system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact your local Raven dealer.

When operating the machine after installing AutoBoom, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate AutoBoom or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position or a safe working distance away from the booms at all times when AutoBoom is engaged.
- Disable AutoBoom when exiting from the operator's seat and machine.
- Do not drive the machine with AutoBoom enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling AutoBoom when the safe working distance has been diminished.
- Ensure AutoBoom is disabled prior to starting any maintenance work on AutoBoom or the machine.

## **WARNING**

- When starting the machine for the first time after installing AutoBoom, be sure that all persons stand clear, in case a hose has not been properly tightened.
- The machine must remain stationary and switched off, with the booms unfolded and supported while installation or maintenance is conducted.

## **CAUTION**

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### ***Hydraulic Safety***

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing AutoBoom hydraulics or performing diagnostics, maintenance, or routine service, ensure that precautions are taken to prevent any foreign material or contaminants from being introduced into the machine's hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will adversely reduce performance and possibly damage the AutoBoom hydraulic valves.

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### ***Electrical Safety***

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.

## CHAPTER

# 2

# Introduction

Congratulations on your purchase of the Raven AutoBoom™ system! The AutoBoom system, used in conjunction with the Raven field computer/controller, is designed to provide automated boom height adjustment for agricultural equipment. Using the machine's existing hydraulics, AutoBoom's parallel hydraulic system keeps the machine's hydraulic system open, using only the hydraulic fluid needed to balance the hydraulic cylinders to allow the booms to raise or lower effortlessly.

The instructions in this manual are designed to assist in the proper calibration and operation of the AutoBoom system when used with the Viper or Viper Pro, Envizio Pro, SCS 4000/5000 Series Console, or AutoBoom controller.

**Important:** *Installation of the AutoBoom system must be completed before calibrating the system. If you have questions regarding the installation of the AutoBoom system, refer to the machine-specific AutoBoom Installation Manual provided with the installation kit. For questions about the field computer/controller, refer to the Installation & Operation Manual provided with the field computer/controller.*

**Important:** *The Raven field computer/controller must be calibrated specifically for the vehicle before being used to operate the AutoBoom system. For questions about the field computer, refer to the Installation & Operation Manual provided with the field computer.*

## Installation



### WARNING

Carefully read and follow all safety requirements and precautions contained in this manual and the machine-specific Installation Manual. Failure to follow safety instructions may lead to equipment damage, personal injury, or death.

Before any components of the AutoBoom are installed, activated, or operated, and at the beginning of each season Raven Industries recommends performing the following steps to ensure the machine will function with the AutoBoom system:

1. Ensure the machine's hydraulic filters have been changed and there are no problems with any components of the machine's hydraulic system:

- Hydraulic pump issues
  - Faulty hydraulic motors
  - Other issues that may leave fine metal deposits in the circuits
2. Operate each of the machine's boom hydraulic functions three times to ensure the machine's valve has fresh oil and any debris has been flushed through the system's hoses, valves, and filters.
    - Tilt
    - Fold
    - Center rack control
    - Tongue extension
    - Any other functions operated by the machine's hydraulic valves

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## Recommendations

Raven Industries recommends the following best practices before installing or operating the AutoBoom system for the first time, at the start of the season, or when moving the AutoBoom system to another machine:

- Ensure the machine's hydraulic filters have been recently changed and there are no issues with the machine's hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Operate each of the machine's boom hydraulic functions (i.e., tilt, fold, center rack, tongue extension, or other hydraulic valve functions) three times to ensure the machine's hydraulic valve is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.
- Upon installation of the AutoBoom system, operate the boom and center rack raise/lower functions through the machine's manual control functions first before operating them via the AutoBoom controller/field computer to ensure the hydraulic system has been installed correctly and air is released from the system.

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## Point of Reference

The instructions in this manual assume that you are standing behind the machine, looking toward the cab.

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## Updates

Updates for equipment manuals and software are available on the Raven Industries Applied Technology website at:

[www.ravenhelp.com](http://www.ravenhelp.com)

Sign up for e-mail alerts, and you will automatically be notified when updates for your Raven products are available on the website!

*At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.*

*Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.*

*To serve you best, please send an e-mail with the following information to*

**[techwriting@ravenind.com](mailto:techwriting@ravenind.com)**

- AutoBoom® Calibration & Operation Manual*
- Manual No. 016-0130-062 Rev. G*
- Any comments or feedback (include chapter or page numbers if applicable).*
- Let us know how long have you been using this or other Raven products.*

*We will not share your e-mail or any information you provide with anyone else. Your feedback is valued and extremely important to us.*

*Thank you for your time.*



## CHAPTER

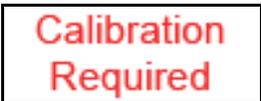
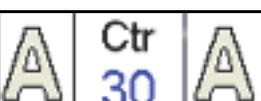
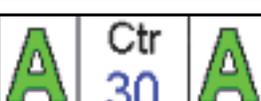
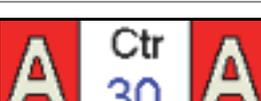
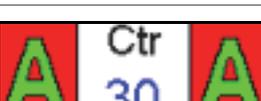
# 3

# Viper Pro Calibration and Operation

## Introduction

### AutoBoom Status Display

The current status of the AutoBoom system can be determined by the message displayed in the AutoBoom section of the Viper Pro screen.

	AutoBoom is detected and calibrated, but is currently turned off. The system must be turned on to be used.
	AutoBoom is detected but not calibrated. The system must be calibrated before it can be used.
	AutoBoom was detected but communication has been lost. Refer to Chapter 7, <i>Troubleshooting</i> to troubleshoot the issue.
	AutoBoom is detected and turned on, but is not enabled. Press both A buttons to enable the AutoBoom system.
	AutoBoom is detected and in operation, with no errors detected.
	AutoBoom is detected and turned on, but is not enabled and alarm conditions have occurred on both booms. Refer to Chapter 7, <i>Troubleshooting</i> to troubleshoot the issue.
	AutoBoom is detected, turned on, and enabled, but alarm conditions have occurred on both booms. Refer to Chapter 7, <i>Troubleshooting</i> to troubleshoot the issue.

**Note:** If a center rack sensor is installed, Ctr Ht is displayed in place of the set height.

## Advanced Setup Tools

Advanced setup tools allow fine-tuning of stability control, minimum boom pressure, and sensor height offset parameters in the AutoBoom system. To access these tools, select **Setup**. The following screen will appear:

AutoBoom Setup		
↑ Min. Pressure % ↓ 65	↑ Ht. Offset Center ↓ 6	↑ Slant Factor ↓ 10
↑ Ht. Offset Outer ↓ 13	↑ Ht. Offset Mid ↓ 13	↑ Ht. Offset Inner ↓ 13
↑ Manual Dn Speed ↓ 0	↑ Manual Up Speed ↓ 0	↑ Stability Factor ↓ 15
<div style="display: flex; justify-content: space-between;"> <span>Diag</span> <span>Next</span> <span>OK</span> </div>		
2.0 10.0 Off	Product Control	NoA-B Msg AutoBoom Off
3.0 20.0 Off		Menu
4.0 25.0 Off		

AutoBoom Setup		
Outer Sensors <input checked="" type="checkbox"/> Enabled <input type="checkbox"/> Disabled	Units <input checked="" type="radio"/> in. <input type="radio"/> cm. <input checked="" type="radio"/> PSI <input type="radio"/> KPA	Center Rack Control <input checked="" type="checkbox"/> On <input type="checkbox"/> Off
Slant Control <input checked="" type="checkbox"/> On <input type="checkbox"/> Off	Alarm Settings <input checked="" type="checkbox"/> Audible <input type="checkbox"/> Logging	
<div style="display: flex; justify-content: space-between;"> <span>Diag</span> <span>Prev</span> <span>OK</span> </div>		
2.0 10.0 Off	Product Control	NoA-B Msg AutoBoom Off
3.0 20.0 Off		Menu
4.0 25.0 Off		

- **Stability Factor** - Allows fine-tuning of the rigidity of the machine's center rack. The default value of 20 is recommended for machines with a rigid center rack. A value of 5 - 14 is recommended for machines with center racks that float freely. Adjust this value as needed to prevent boom oscillation.
  - Stability settings of 0 disable the stability control completely, making the left and right booms completely independent of each other. When above target, the control of both booms is accelerated to increase the down speed. This setting is useful for machines that have a rigid center rack.
  - Stability settings of 1 - 99 will adjust the stability of the center section. Lower numbers cause the opposing boom that is not being controlled to counteract the movement of the controlled boom by raising to balance or stabilize the center section and to prevent undesired rotation or movement. While lower numbers allow the booms to react at the same rate and time, low settings may prevent the booms from lowering. Higher stability settings allow the booms to react independently from each other, but may cause the center section to oscillate, diminishing performance.
- **Min Pressure %** - Sets a low limit pressure, preventing the boom pressure from falling below a percentage of static pressure, overriding the control when necessary to maintain a low limit of pressure on each boom. Minimum Pressure % also prevents the booms from resting on the stops for travel-limited booms.
- **Outer Sensors (UltraGlide Only)** - Allows the operator to disable outer boom sensors if the machine is equipped with optional inside boom sensors. This feature is useful when the outer boom tips are folded in, and only the inside boom sensors are needed for control.

**Note:** *The system must be re-calibrated if the outer sensors option is disabled, then re-enabled.*

- **Height Offsets (Outer, Inner, and Center)** - Allows sensor heights to be adjusted according to the sensor mounting location. Enter a positive value if the sensors are mounted above the sprayer tips, and a negative value if the sensors are mounted below. Refer to the Sensor Height Offsets section on page 34 for more information.

- **Manual Dn Speed and Manual Up Speed** - Allows the speed at which the AutoBoom hydraulic valve manually raises and lowers the booms to be adjusted on machines that do not have their own hydraulic control. **Leave the setting at the default of 0 if the machine is equipped to hydraulically control boom functions.**
- **Units** - Allows the operator to select the desired units of measure.
- **Center Rack Control** - Turns the center rack control on and off. Selecting Center Rack Control ON allows center rack control to be enabled on the field computer/console or the machine's switch. If Center Rack Control OFF is selected, center rack control cannot be used.

**Note:** Center rack control should only be turned on if the machine is equipped with a center rack sensor and the appropriate cabling that allow center rack control.

- **Slant** - Turns the slant feature on and off. Selecting Slant Control ON allows slant control to be enabled when both booms are enabled on the field computer or the machine's switch.

**Note:** The slant control feature can be turned on only when the system is in UltraGlide XT mode and the center ultrasonic sensor is detected.

### Diagnostic Tools

Integrated diagnostic tools allow the status of all AutoBoom inputs and outputs to be viewed on the Viper Pro display. To access the diagnostic tools, select **Diag**. The following screen will appear:

Inputs	Left	Center	Right
Raise	Off	Off	Off
Lower	Off	Off	Off
Unfold	On		On
PSI	275		58
Outer Ht.	64		64
MID Ht.	0		0
Inner Ht.	32		64
Center Ht.	71		
Slant Rate	0.00		
Slant Deg	-1.65		
Outputs	Left	Center	Right
Blocker	Off	LS OFF	Off
PWM %	0.00		0.00
Base PWM %	52.72		54.08
Slant %	0.00		0.00
Stats	0		0
Node Info.	PGM: 218	VER: 5.00.0	SER: 1075

Inputs	Left	Center	Right
PSI	275		62
Outer Ht.	64		64
Center Ht.	71		
Slant Rate	0.00		
Slant Deg	-1.65		
Outputs	Left	Center	Right
Blocker	Off	LS OFF	Off
PWM %	0.00		0.00
Slant %	0.00		0.00

**Manual Boom Control**

Left Boom

↑

↓

Center Rack

↑

↓

Right Boom

↑

↓

**Manual Slant Control**

↻

Prev

OK

- **Raise and Lower** - Indicate the status of the boom switches. When the using the machine's manual control functions, the corresponding boom switch will indicate On.
- **Unfold** - Indicates the status of the unfold proximity switch (if equipped). The booms will not be enabled until the proximity switch is activated.
- **PSI, Outer Ht., Inner Ht, and Center Ht.** - Indicate the status of the corresponding sensors.
- **Slant Rate** - Indicates the measured chassis roll rate. The Slant Rate value will change when the machine's chassis is rolling left or right.
- **Slant Deg** - Indicates the detected rotation of the machine's boom relative to the chassis, measured in degrees. The Slant Deg value will be nearly zero when the boom suspension is centered relative to the machine's chassis and will change when the boom is rotated.

- **Blocker** - Indicates the status of the double-blocker output. Blocker will indicate On when individual booms are engaged or calibrating
- **PWM %** - Indicates the duty cycle to the proportional valves. This value will be 0 if the individual booms are disengaged, and will vary in output up to 100 when AutoBoom is engaged and the system is operating.
- **Base PWM %** - Indicates the system's calculated static duty cycle to maintain the set height or pressure. This number will typically change slowly from 0 - 5 points during routine operation.
- **Slant %** - Indicates the duty cycle of the slant control proportional valves. It also allows the operator to view the duty cycle of the slant control proportional valves while rotating the boom via the Manual Slant Control icons. This value will be 0 if slant control is not enabled and can vary in output up to 100 when slant control is engaged and operating. A minimum value will be maintained when slant control is enabled.
- **Stats** - Indicate the boom performance. This value is for Raven use only.
- **Manual Boom Control** - This can be used to troubleshoot wiring or hydraulic issues by using the AutoBoom valve for raising and lowering functions, and the machine's valve for center rack functionality (if the machine is equipped with center rack control cabling).
- **Manual Slant Control** - Used to rotate the boom clockwise or counterclockwise relative to the machine's chassis. Manual slant control can be used to troubleshoot wiring or hydraulic issues using the AutoBoom valve to control boom functions.

### Alarms

Alarm tones will not sound if the operator is navigating through any of the configuration menus. However, the enable/disable alarms will always sound when appropriate.

- **Pressure alarms (PowerGlide Plus mode only)** - The pressure alarm occurs if the pressure is detected at a level lower than the alarm set point. The pressure alarm is a steady tone, and will continue to sound for one second after the pressure rises above the set point.
- **Proximity alarm (if equipped)** - The proximity alarm occurs if a boom is not completely folded but is enabled. The boom will be disabled after five seconds.
- **Check AutoBoom high current voltage alarm** - This alarm occurs if the node senses a low voltage supply to the node. Check the power and ground wiring to the node.
- **Pressure sensor failure alarms** - The pressure sensor failure alarm occurs immediately when a pressure sensor is not detected. The alarm is a steady tone, and will stop immediately after the sensor is located.
- **Ultrasonic sensor - too low alarm (UltraGlide mode only)** - This alarm occurs if the ultrasonic sensor is closer than ten inches to the ground for 1/2 a second. The alarm will continue to sound for three seconds.
- **Ultrasonic sensor - too high alarm (UltraGlide mode only)** - This alarm occurs when the ultrasonic sensor is higher than 65 inches from the ground for five seconds. The alarm will continue to sound for one second.
- **Ultrasonic sensor - failure alarm (UltraGlide mode only)** - This alarm occurs immediately when an ultrasonic sensor is not detected. The alarm is a steady tone, and will stop immediately after the sensor is located.
- **Center rotation center out of range** - This alarm occurs when the center rotation center is out of the calibrated range. The alarm is a steady tone that stops immediately when the sensor is in the calibrated range.
- **Center rotation sensor failure** - This alarm occurs when there is no signal from the rotation sensor while slant control is enabled. The alarm is a steady tone that stops immediately when the center rotation sensor signal is detected.
- **Boom unfold alarm** - This alarm applies only to machines that are equipped with proximity sensors. The alarm will occur if the operator tries to enable AutoBoom with the booms folded. It may also occur if the center sensor is greater than 60 inches off the ground, or it does not receive an echo from the ground.

- **Other tones** - When enabling the AutoBoom system in automatic mode via the machine’s boom control functions or switches, a single beep will occur. When disabling AutoBoom, a double beep will sound.

## AutoBoom Pre-Calibration Diagnostics

While every effort has been made to properly label and document connections for the hydraulic and electrical components of the AutoBoom system, boom function connections may not be identified due to changes in the make and model of the machine. This makes it especially important to trace the hoses from the connection points and verify the electrical connections are correct to ensure proper AutoBoom system operation. In order to verify connections, it is necessary to perform a pre-calibration diagnostic test.

1. Select **Setup**.
2. Select **Diag**. The following screens will appear:

AutoBoom Diagnostics			
Inputs	Left	Center	Right
Raise	Off	Off	Off
Lower	Off	Off	Off
Unfold	On		On
PSI	275		58
Outer Ht.	64		64
MID Ht.	0		0
Inner Ht.	32		64
Center Ht.	71		
Slant Rate	0.00		
Slant Deg	-1.65		
Outputs	Left	Center	Right
Blocker	Off	LS OFF	Off
PWM %	0.00		0.00
Base PWM %	52.72		54.08
Slant %	0.00		0.00
Stats	0		0
Node Info.	PGM: 218	VER: 5.00.0	SER: 1075

AutoBoom Diagnostics			
Inputs	Left	Center	Right
PSI	275		62
Outer Ht.	64		64
Center Ht.	71		
Slant Rate	0.00		
Slant Deg	-1.65		
Outputs	Left	Center	Right
Blocker	Off	LS OFF	Off
PWM %	0.00		0.00
Slant %	0.00		0.00

Manual Boom Control		
↑ Left Boom	↑ Center Rack	↑ Right Boom
↓	↓	↓

Manual Slant Control	
↶	↷

3. Verify that the following components on the Viper Pro screen are displayed correctly and change when raising and lowering the booms via the machine’s controls:
  - Pressures
  - Sensor heights
  - Right and left raise/lower functions
  - Center raise/lower functions
  - Fold/unfold functions
  - Slant control functions

## PowerGlide Plus

The PowerGlide Plus AutoBoom system uses gauge wheels to maintain optimum boom height, while state-of-the-art hydraulics maintain constant hydraulic pressure to the tilt cylinders. PowerGlide Plus systems are typically used in pre-emergence applications.

**Note:** *Terrain conditions and the machine's hydraulic system dictate the actual speeds that can be achieved during application with an engaged AutoBoom system. Typically, rougher and varied field terrain require slower speeds while AutoBoom is enabled.*

## Calibration

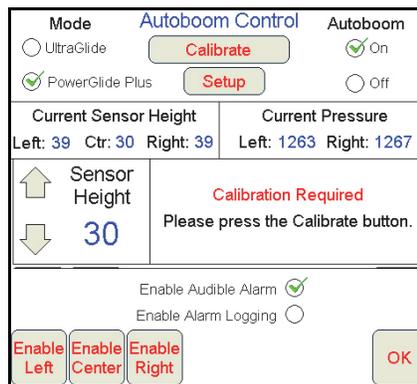
### Boom Calibration

After the AutoBoom installation is complete, it is necessary to calibrate the AutoBoom system before use. AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the system to find the system base duty cycles for operation. Booms must be free to travel 10" up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

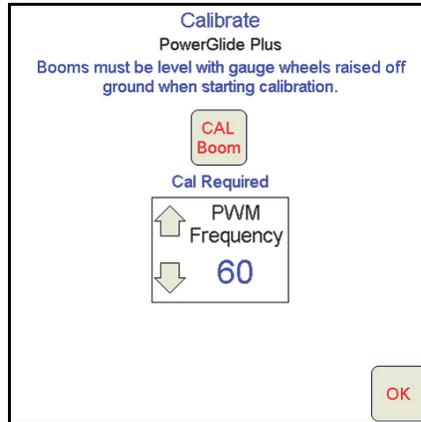
1. Touch inside the AutoBoom section on the screen to display the AutoBoom Control screen.



2. Select **PowerGlide Plus** from the Mode section in the upper-left corner of the screen.
3. Verify that AutoBoom is turned on.
4. Verify that the booms are unfolded, and lower the center rack so that the wheels are approximately six inches from the ground.

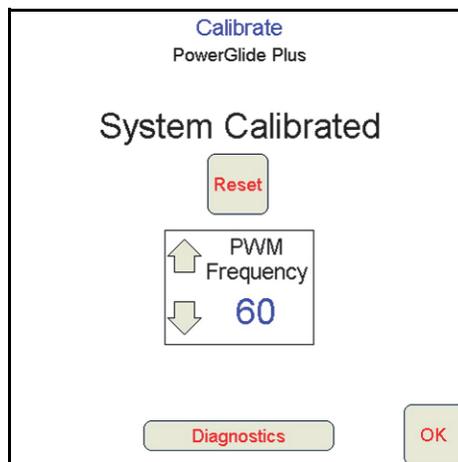
**Note:** *If the booms do not go over center or are travel-limited, raise the booms so that the boom tips are approximately ten inches above the horizontal position and lower the center section slightly below the normal spraying height.*

5. Select **Calibrate**. The following screen will appear:



6. Select **CAL Boom**.

**Note:** The calibration process may take several seconds to complete. “Calibrating” will flash, indicating that calibration is in progress. If the boom fails to calibrate, touch **STOP CAL** and refer to Chapter 7, Troubleshooting on page 119. Once the boom calibration is complete, the following screen will appear:



**Note:** The PWM Frequency will display 60 as the value if the AutoBoom valve has square coils, and 250 if the valve has round coils.

7. Select **OK**.

### Center Rack Control Calibration (If Equipped)

There are many different valve configurations used to control the machine’s center rack functions. The AutoBoom system must “learn” which of the machine’s solenoids are used to raise and lower the booms. Complete the following steps to calibrate the center rack control feature after the individual booms have been calibrated.

1. Press and hold the center rack raise button on the machine’s control panel or joystick for six seconds so that the center rack raises.

**Note:** The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.

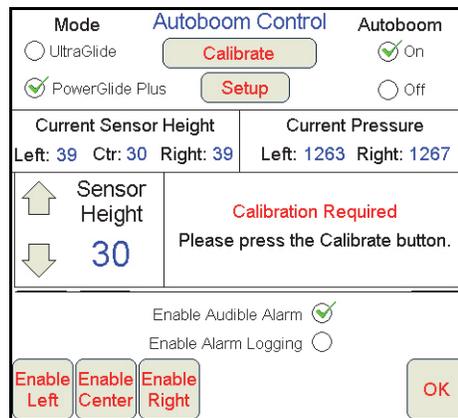
2. Press and hold the center rack lower button on the machine's control panel or joystick for six seconds so that the center rack lowers.

**Note:** The center rack may reach the lower limit of travel during this time, but continue holding the button until the full six seconds has passed.

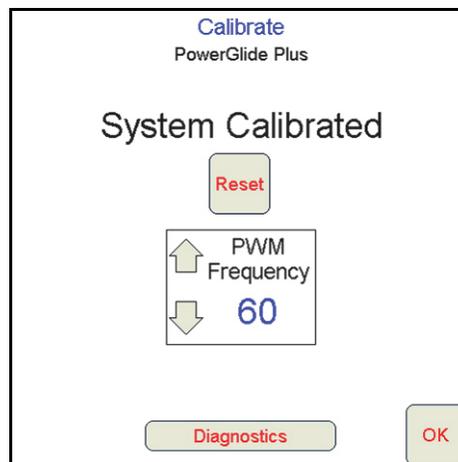
## Resetting Calibration

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the calibration of the AutoBoom system. System calibration will be required after the AutoBoom system calibration has been reset.

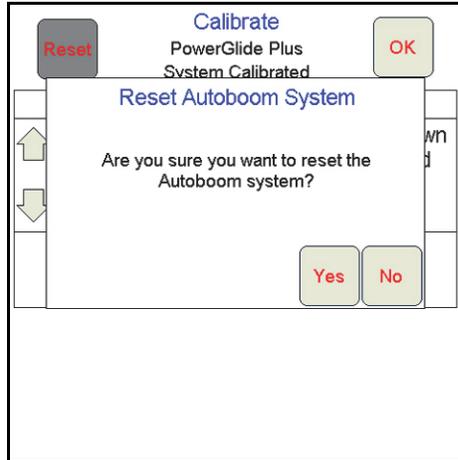
1. Touch anywhere in the AutoBoom section on the Viper Pro screen. The following screen will be displayed:



2. Select **Calibrate**. The following screen will appear:



3. Select **Reset**. The following screen will appear:



4. Select **Yes** to reset the AutoBoom calibration, or **No** to return to the calibrations screen.

## Routine Operation

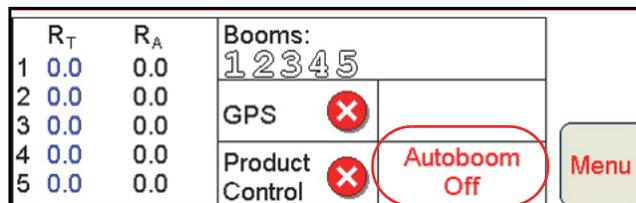
### Joystick Functions

- When AutoBoom control is on, control of each boom can be enabled or disabled via the Viper Pro console by tapping the sprayer’s switch functions (if equipped).

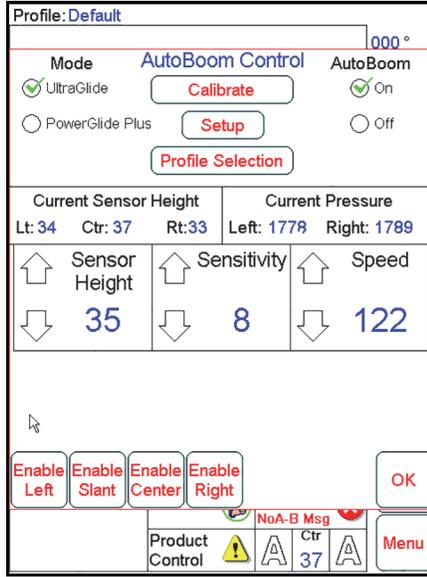
**Note:** Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.

- A single up-tap on the sprayer’s switch functions disables AutoBoom on that boom.
- A single down-tap on the sprayer’s switch functions enables AutoBoom on that boom.
- The fast-down feature (double-tap down) is used to quickly lower the booms when the pressure setting is set to a higher setting, which causes the booms to lower slowly.
  - On machines with one proportional valve (square coils on the AutoBoom valve), a double-tap up will raise both booms slightly. A double-tap down will lower both booms quickly, and AutoBoom will re-engage to the set pressure setting.
  - On machines with two proportional valves (round coils on the AutoBoom valve), a double-tap up on the inside boom will raise only that boom slightly. A double-tap down will lower the one boom quickly, and AutoBoom will re-engage to the set pressure setting.

### Enabling AutoBoom via the Viper Pro



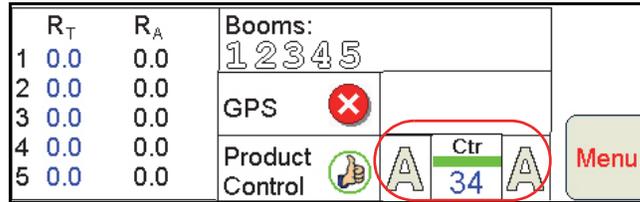
1. Touch **AutoBoom Off** on the Viper Pro screen.



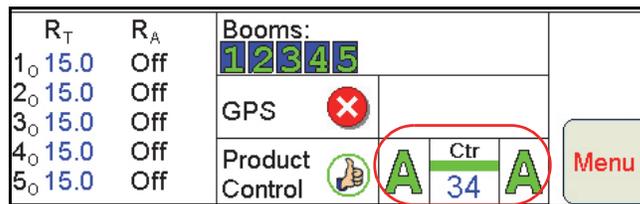
2. Select **On** in the upper-right corner of the screen.

**Note:** The AutoBoom system is now powered on, but is not yet enabled.

3. Select **OK** to return to the Viper Pro main screen. The AutoBoom section should appear similar to the screen shown below:



4. Press the gray A buttons. Once the buttons turn green as shown below, AutoBoom is enabled and ready to operate.



**Note:** AutoBoom can be disabled by pressing the green A buttons. Once the buttons turn gray, AutoBoom is disabled.

### Boom Adjustments When Approaching Headlands

When approaching the headlands to make a turn, the gauge wheel must be raised approximately six inches from the ground to prevent it from sliding sideways or backward, causing damage to the gauge wheel assembly. The fast-down feature may be used to raise the wheels in this situation.

## Center Rack Control (AutoBoom Enabled and Center Rack Control On) - If Equipped

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, and enable both booms.
- **Center Up Switch** - A single up-tap will disable the center rack and both booms. Two consecutive up-taps will raise the center rack to the desired transport height (if set). Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

## Center Rack Control (AutoBoom Enabled and Center Rack Control Off) - If Equipped

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable both booms.

**Note:** *Center rack control will not be enabled since center rack control is off.*

- **Center Up Switch** - Two consecutive up-taps will disable both booms and raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

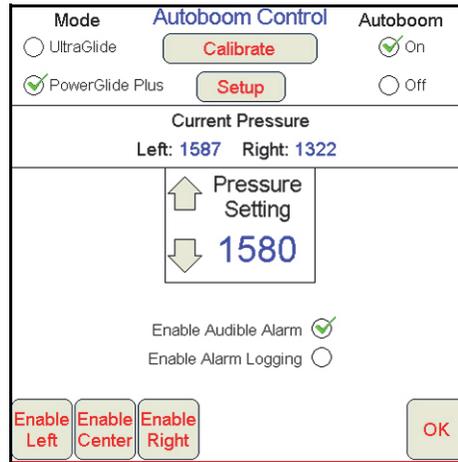
## System Adjustments

During the calibration process, the AutoBoom system calculates a default Pressure Setting. Normally, the calculated value will be the level at which the machine should operate. However, at times an adjustment to the Pressure Setting may be necessary.

**Note:** *During routine operation, the gauge wheels should touch down momentarily, raise slightly, then lower back to the target height. Wheels should not continuously ride on the ground.*



- From the main menu, select the AutoBoom function. Navigate through the screens until the following screen appears:



- Verify that AutoBoom is turned on, then select **Enable Left** or **Enable Right**, or tap the left and right boom down buttons on the joystick.
- Exit the cab and physically lift the end of each boom up, watching the responsiveness of the booms.

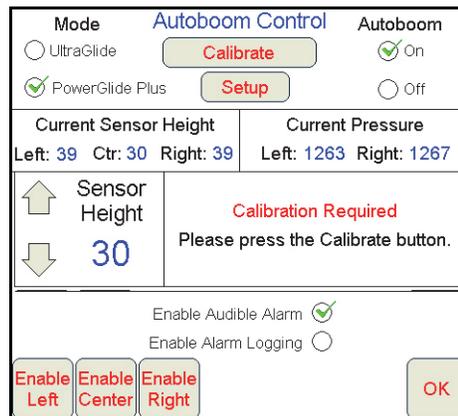
**Note:** The force required by the operator to lift the boom should never exceed 200 lbs.

- Adjust the Pressure Setting of each boom as needed to optimize performance.
  - Increasing the Pressure Setting makes the boom lighter and reduces down speed.
  - Decreasing the Pressure Setting makes the boom heavier and increases the down speed.
- Select **Disable Left** or **Disable Right**, or tap the left and right boom up buttons on the joystick.
- Select **OK**.

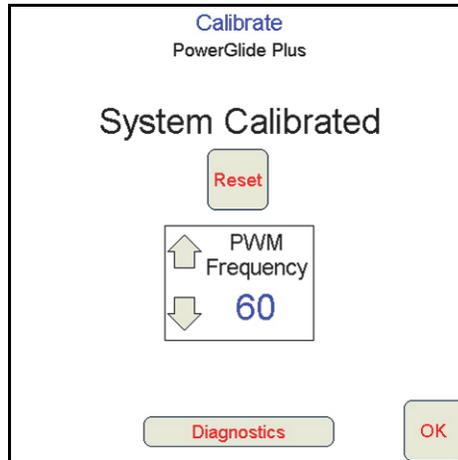
## Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

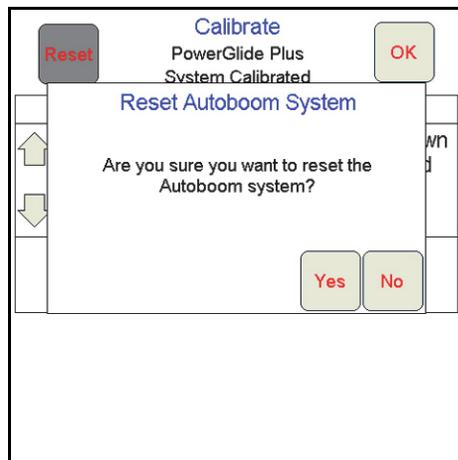
- Touch anywhere in the AutoBoom section on the Viper Pro screen. The following screen will be displayed:



2. Select **Calibrate**. The following screen will appear:



3. Select **Reset**. The following screen will appear:



4. Select **Yes** to reset the AutoBoom system.
5. Turn off the Viper Pro console and the machine's power.
6. Turn on the machine and the Viper Pro console.

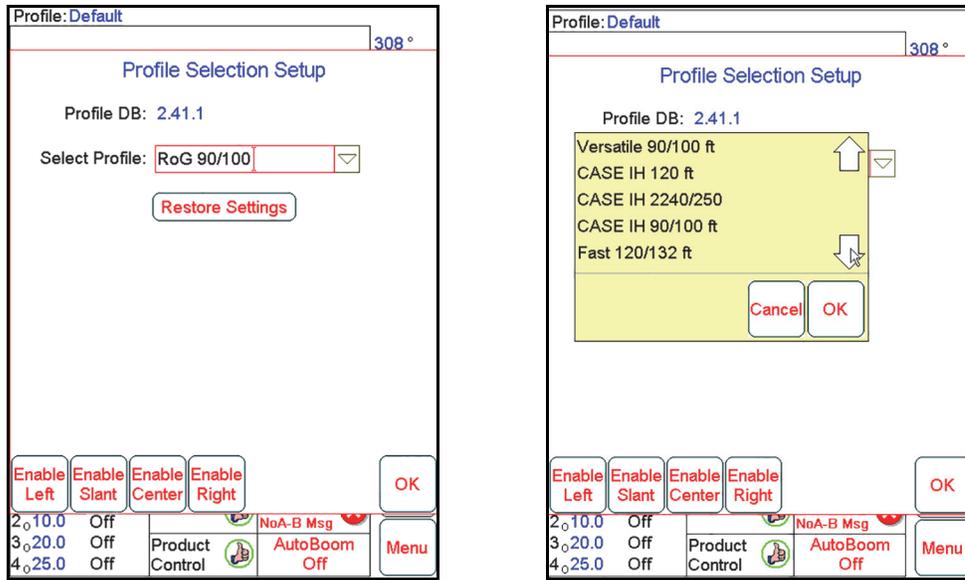
## UltraGlide

The UltraGlide AutoBoom system uses ultrasonic sensors to measure the boom's height above ground, and state-of-the-art hydraulics to maintain constant hydraulic pressure to the tilt cylinders. The UltraGlide AutoBoom system is ideal for use in pre-emergence and post-emergence applications.

**Note:** *Terrain conditions and the machine's hydraulic system dictate the actual speeds that can be achieved during application with an engaged AutoBoom system. Typically, rougher and varied field terrain require slower speeds while AutoBoom is enabled.*

### Machine Selection Database

To access the machine selection database, select **Profile Selection** from the home screen.



**Machine Selection Database** - Applicable to AutoBoom software versions 5.00.00 and greater. The machine selection database contains a list of machines that, when selected, automatically populates the ideal settings for that specific machine. If the specific machine is not listed, choose the profile that best fits the machine:

- Standard0 - Generic profile suitable for most machines.
- Standard100 - Generic profile for machines with heavy booms that require more pressure to lift the booms quickly. Select this profile if the static pressure required to hold the booms level is 1800 psi or greater.
- Standard200 - Generic profile for machines with lighter booms that require less pressure to lower the booms at a faster rate. Select this profile if the static pressure required to hold the booms level is 900 psi or lower.

## Calibration

### Boom Calibration

After the AutoBoom installation is complete, it is necessary to calibrate the AutoBoom system before use. AutoBoom calibration requires pressure in the machine’s cylinders and enough boom travel to allow the system to find the system base duty cycles for operation. Booms must be free to travel 10” up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

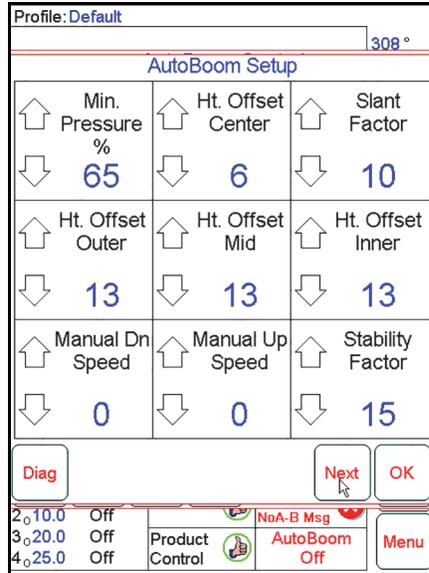
**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

**Important:** *Be sure that the area is clear of people and obstructions before beginning the calibration process.*

1. Move the machine to a flat area.
2. Verify that AutoBoom is turned on.

3. Verify that the booms are unfolded, and lower the center rack.

**Note:** If the booms do not go over center or are travel limited, raise the booms so that the wheels are approximately ten inches above the horizontal position and lower the center section to approximately 20 inches.



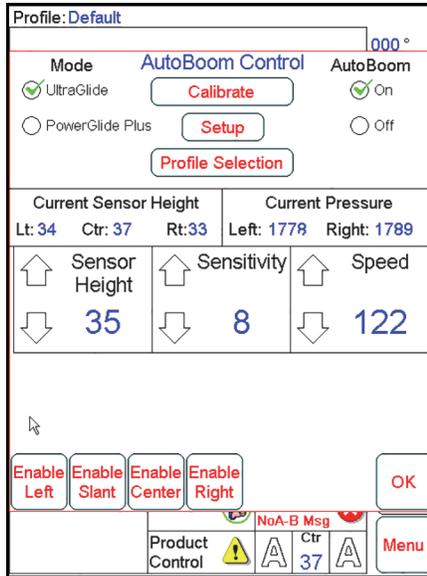
4. Using a tape measure, measure the distance from the bottom of the sensor to the spray nozzle tip.
5. Access the AutoBoom Setup screen.
6. Adjust the vertical sensor height offset settings in the Viper Pro to sensor position as measured in step 4.
  - Positive offsets indicate the sensor surface is located above the nearest spray tips.
  - Negative offsets indicate the sensor surface is located below the nearest spray tips.
  - Inner, outer, and center offsets are not required to be the same across the width of the machine, but they must be correctly measured relative to the spray tips.

**Note:** If the machine is equipped with a center sensor, the center rack height can be verified through the main menu or diagnostics screen in AutoBoom section of the Viper Pro.

7. Raise the boom tips to approximately the target height.

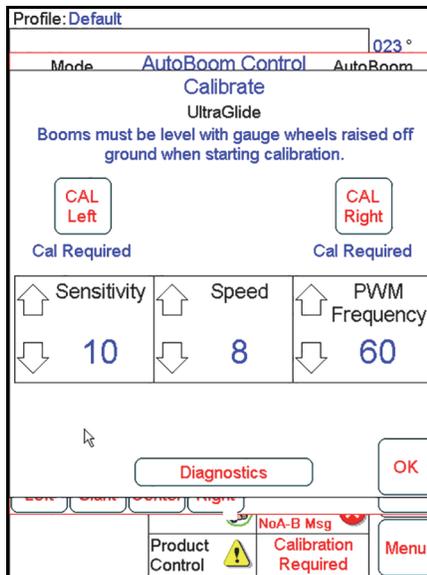
**Note:** The default target height is 30 inches. Verify that the booms are not fully raised to the boom stops. If gauge wheels are installed, the setting must be adjusted to 40 - 45 inches to prevent the wheels from touching the ground during the system calibration.

8. Touch inside the AutoBoom section on the screen to display the AutoBoom Control screen.



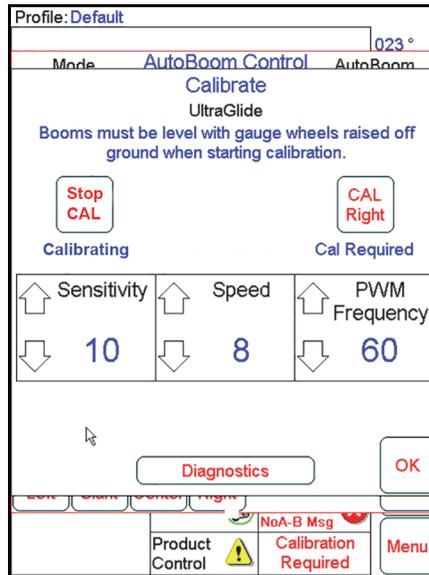
9. Select **UltraGlide** from the Mode section in the upper-left corner of the screen and turn AutoBoom on in the upper-right corner.

10. Select **Calibrate**. The following screen will appear:

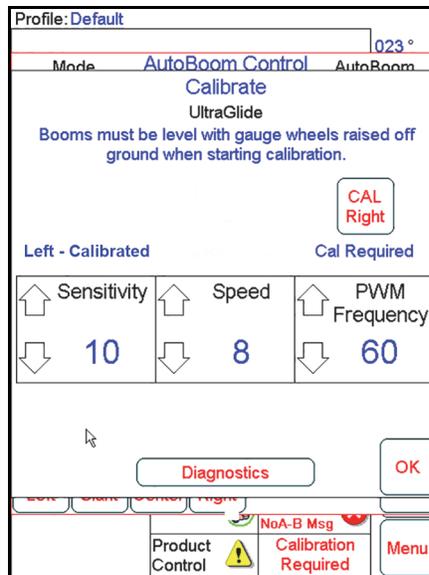


11. Select **CAL Left** to begin the calibration of the left boom.

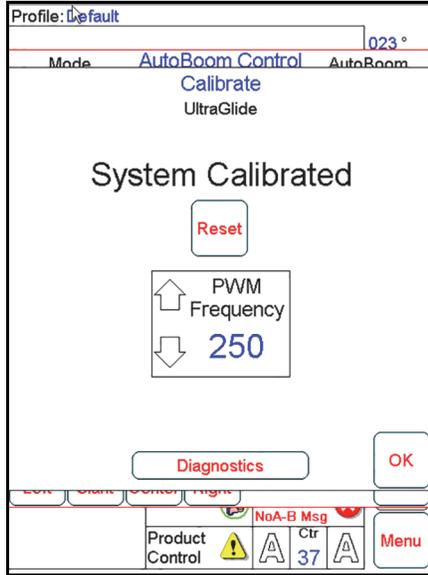
**Note:** The left boom will raise and then lower. This is a normal part of the calibration process. During the calibration process, the following screen will be displayed:



**Note:** The calibration process may take several seconds to complete. “Calibrating” will flash, indicating that calibration is in progress. If the boom fails to calibrate, touch **Stop CAL** and refer to Chapter 7, Troubleshooting on page 119. Once the left boom calibration is complete, the following screen will appear:



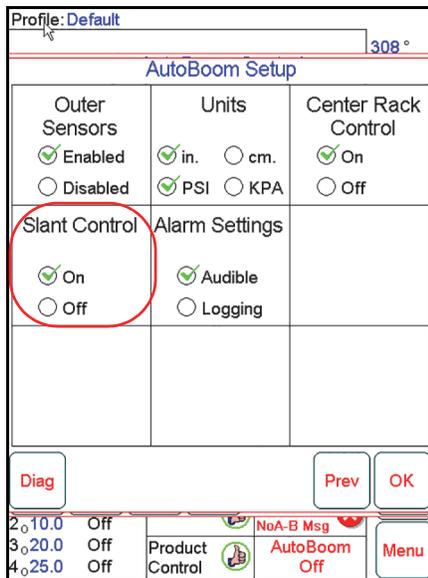
12. Select **CAL Right** to calibrate the right boom. Once the right boom calibration process is complete, the following screen will appear:



**Note:** The PWM Frequency will display 60 as the value if the AutoBoom valve has square coils, and 250 if the valve has round coils.

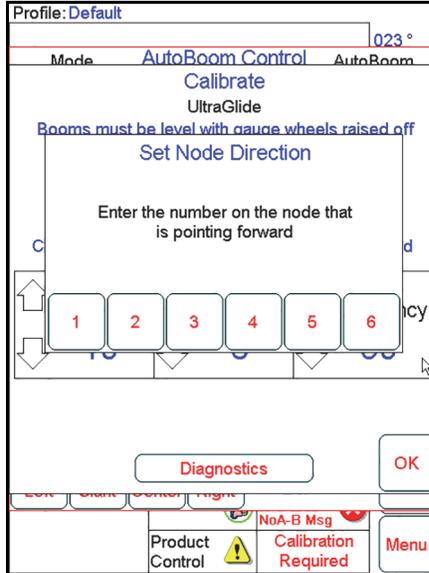
13. Select **OK** to return to the AutoBoom Control screen.

**Slant Control Calibration (If Applicable)**

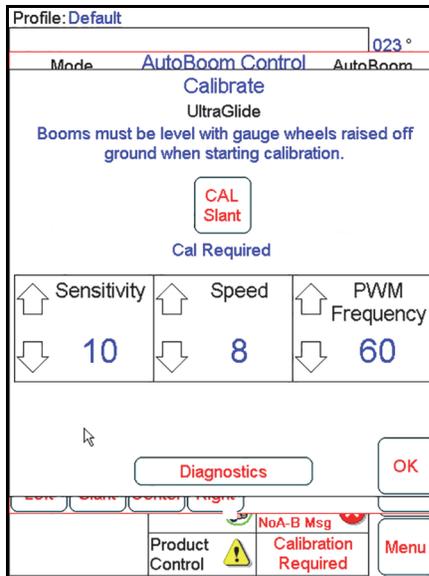


1. Verify the Slant Control feature is turned on in the Setup screen.

2. Select the **Calibrate** icon on the Home screen. The following screen will appear:



3. Enter the number of the direction arrow on the node that is pointing forward. The following screen will appear:



4. Select the **CAL Slant** icon on the Calibration screen.

**Note:** The boom tips may raise automatically to allow for full rotation of the center section. Pressure in one slant cylinder will increase until the center section begins to rotate slightly. The center section will then rotate fully clockwise then counterclockwise to calibrate the center rotation sensor position.

**Note:** The center rotation sensor may be re-centered by recalibrating the slant control or by manual adjustment of the centering bolt while the center section is confirmed to be in the center position.

### Center Rack Control Calibration

There are many different valve configurations used to control the machine’s center rack functions. The AutoBoom system must “learn” which of the machine’s solenoids are used to raise and lower the booms.

Complete the following steps to calibrate the center rack control feature after the individual booms have been calibrated.

1. Press and hold the center rack raise button on the machine's control panel or joystick for six seconds so that the center rack raises.

**Note:** The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.

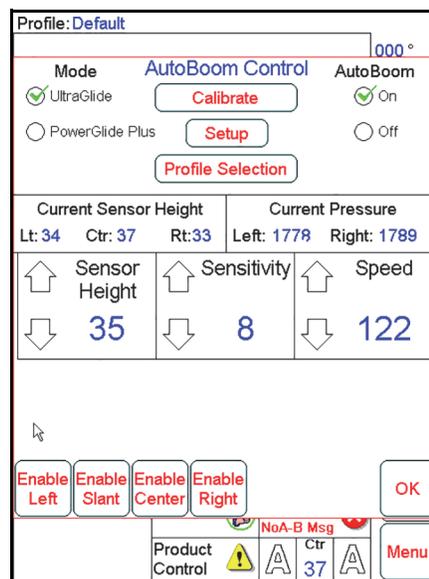
2. Press and hold the center rack lower button on the machine's control panel or joystick for six seconds so that the center rack lowers.

**Note:** The center rack may reach the lower limit of travel during this time, but continue holding the button until the full six seconds has passed.

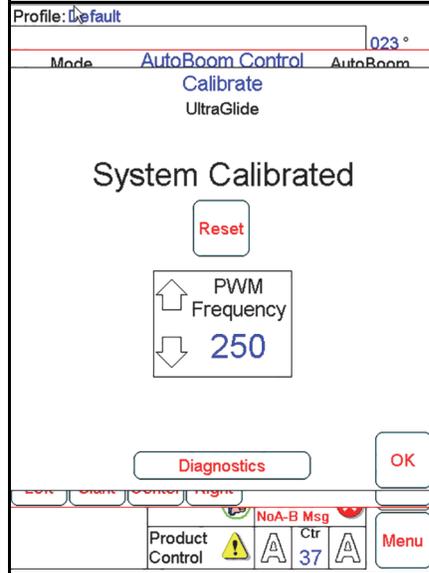
## Resetting Calibration

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the calibration of the AutoBoom system. System calibration will be required after the AutoBoom system calibration has been reset.

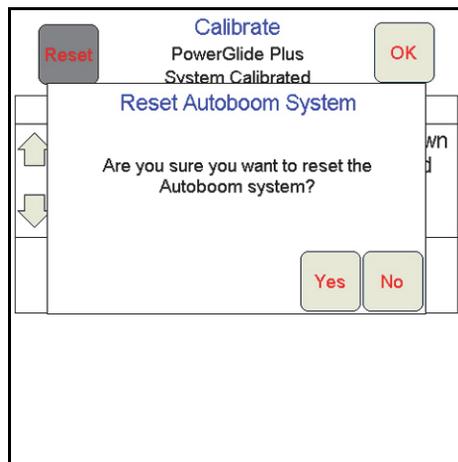
1. Touch anywhere in the AutoBoom section on the Viper Pro screen. The following screen will be displayed:



2. Select **Calibrate**. The following screen will appear:



3. Select **Reset**. The following screen will appear:



4. Select **Yes** to reset the AutoBoom calibration, or **No** to return to the calibrations screen.

## Routine Operation

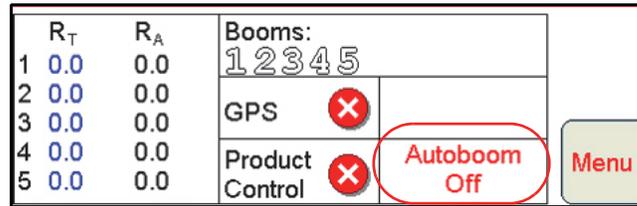
### Joystick Functions

- When AutoBoom control is on, control of each boom can be enabled or disabled via the Viper Pro console or by tapping the sprayer’s joystick switch functions.

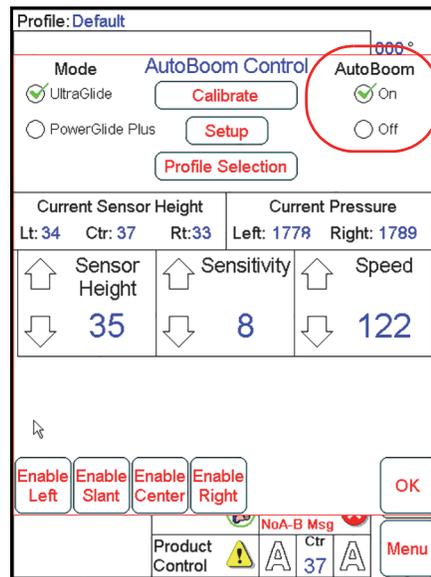
**Note:** Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.

- A single up-tap on the sprayer’s switch functions disables AutoBoom on that boom.
- A single down-tap on the sprayer’s switch functions enables AutoBoom on that boom.

## Enabling AutoBoom via the Viper Pro



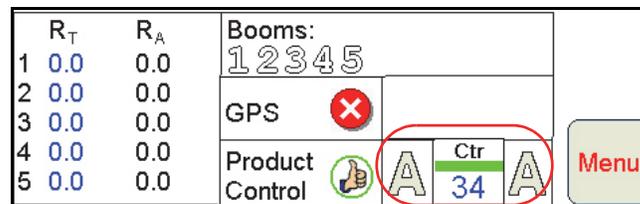
1. Touch **AutoBoom Off** on the Viper Pro screen.



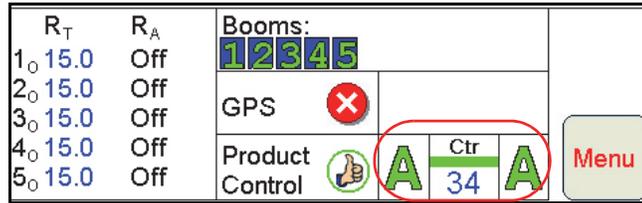
2. Select **On** in the upper-right corner of the screen.

**Note:** The AutoBoom system is now powered on, but is not yet enabled.

3. Select **OK** to return to the Viper Pro main screen. The AutoBoom section should appear similar to the screen shown below:



- Press the gray A buttons. Once the buttons turn green as shown below, AutoBoom is enabled and ready to operate.



**Note:** AutoBoom can be disabled by pressing the green A buttons. Once the buttons turn gray, AutoBoom is disabled.

### Boom Adjustments When Approaching Headlands (If Equipped with Gauge Wheels)

When approaching the headlands to make a turn, the gauge wheel must be raised approximately six inches from the ground to prevent it from sliding sideways or backward, causing damage to the gauge wheel assembly.

### Center Rack Control (AutoBoom Enabled and Center Rack Control On)

**Note:** The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

**Note:** Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

**Note:** Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, enable both booms, and enable slant control (if equipped).
- Center Up Switch** - A single up-tap will disable the center rack, both booms, and slant control (if equipped). Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Center Rack Control (AutoBoom Enabled and Center Rack Control Off)

**Note:** The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

**Note:** Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

**Note:** Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable slant control and both booms.

**Note:** *Center rack control will not be enabled since center rack control is off.*

- **Center Up Switch** - Two consecutive up-taps will disable slant control and both booms and raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

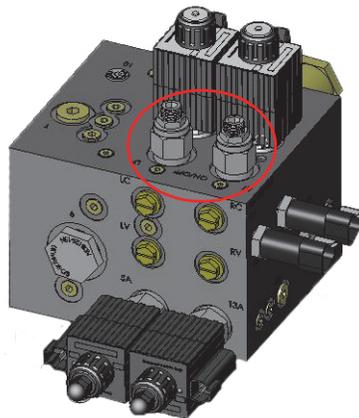
### Operating the UltraGlide AutoBoom System in PowerGlide Plus Mode (Square Coils on the AutoBoom Valve)

The UltraGlide AutoBoom system is also capable of operating in the PowerGlide Plus mode. In addition to the AutoBoom valve modification listed below, a gauge wheel kit is required for the system to operate in the PowerGlide Plus mode. For available kits and ordering information, contact your local Raven dealer

Complete the following steps to convert the UltraGlide AutoBoom valve to the PowerGlide Plus Mode.

**FIGURE 1. Needle Valves on the UltraGlide AutoBoom Valve**

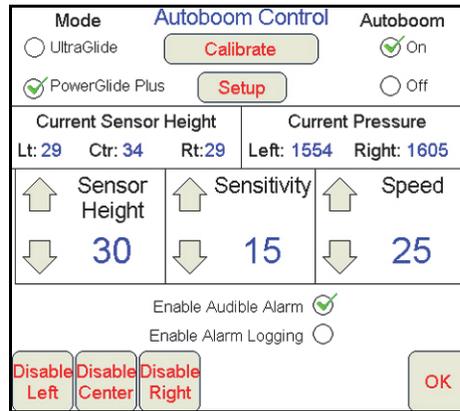
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1. Locate the needle valves in Ports RT and LF on the AutoBoom valve.
2. Loosen the jam nuts on the needle valves.
3. Use an Allen wrench to turn the set screws counter-clockwise until they won't move any further.
4. Tighten the jam nuts.

**Note:** *When converting the AutoBoom system back to UltraGlide, the needle valves must be screwed all the way back in (clockwise).*

FIGURE 2. Viper Pro Programmed to Run in PowerGlide Plus Mode



5. Select **PowerGlide Plus** mode on the AutoBoom Control screen.

### Operating the UltraGlide AutoBoom System in PowerGlide Plus Mode (Round Coils on the AutoBoom Valve)

To operate the AutoBoom system in PowerGlide Plus mode, it is necessary to remove orifice fittings from the AutoBoom valve. Failure to remove these fittings from the valve will restrict the down speed of the booms when the system is enabled.

FIGURE 3. Port 3A and 3B Location



1. Locate Ports 3A and 3B on the AutoBoom valve.



**Important:** Tip the AutoBoom valve on its side and use the Allen wrench to remove the orifice from the cavity, taking care not to let the fitting fall into the valve.

FIGURE 7. Port Plug Reinstalled on the AutoBoom Valve



5. Use the Allen wrench to reinstall the port plugs on Ports 3A and 3B of the AutoBoom valve.

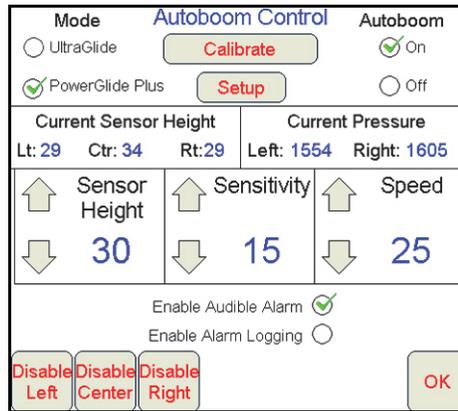
FIGURE 8. Coil Reinstalled on the AutoBoom Valve



6. Reinstall the coils on the solenoids of the AutoBoom valve.

**Note:** When converting the AutoBoom system back to UltraGlide, the orifice fittings must be reinstalled.

FIGURE 9. Viper Pro Programmed to Run in PowerGlide Plus Mode

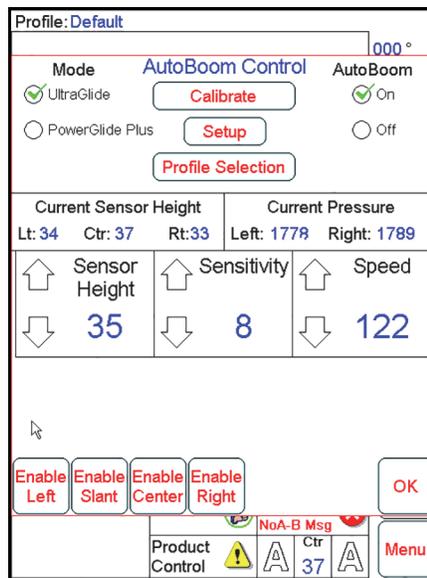


7. Select **PowerGlide Plus** mode on the AutoBoom Control screen.

**Note:** When converting the AutoBoom system back to UltraGlide, the UltraGlide option must be chosen in the AutoBom Control screen.

## System Adjustments

**Note:** AutoBoom must be enabled after both booms have been calibrated in order to make system adjustments.



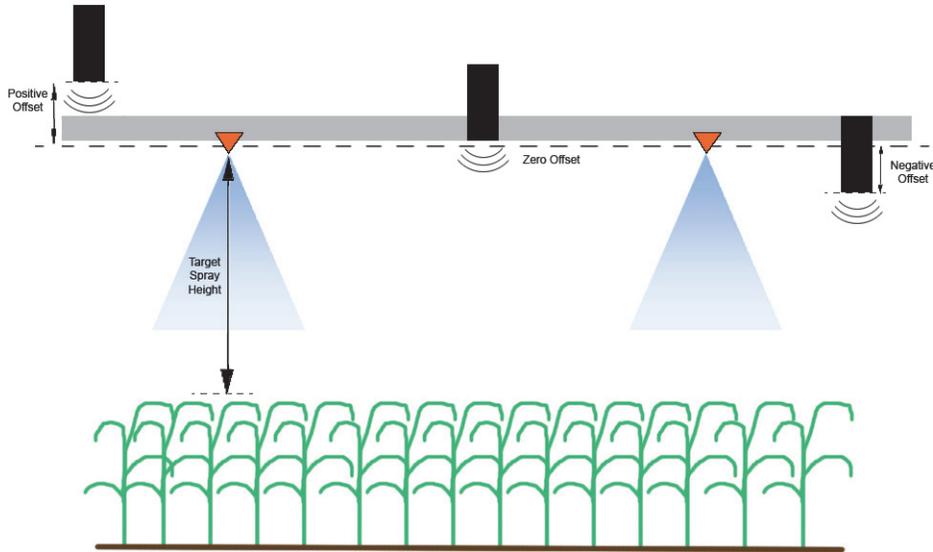
## Ultrasonic Sensor Height Offsets

Ultrasonic sensor height offset adjustments are used to compensate for the difference between the height of the sensor surface and the height of the spray tip. The offset height is calculated by measuring the distance from the bottom of the sensor to the height of the crop, measuring the distance between the spray tip to the

height of the crop, and then subtracting the spray tip distance from the sensor distance. Refer to the diagram below to determine whether the offset value should be positive or negative.

**Note:** The maximum offset height value is 20 inches.

**Note:** Ultrasonic sensors will react to the first object that reflects an echo, whether it is the ground or the crop. For row-crop situations, it may be beneficial to adjust the sensor positions to directly over a row, or add additional boom sensors.



- Touch the up arrow in the Sensor Height section to increase the value representing the distance between the sensor and the ground.
- Touch the down arrow in the Sensor Height section to decrease the value representing the distance between the sensor and the ground.

**Note:** On machines with travel-limited booms, center sensor height offsets may need to be entered as less than the measured value from the sensor to the ground to ensure the boom cylinders have sufficient pressure during operation.

**Sensitivity**

1. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface.

**Note:** The boom should react immediately and raise at approximately the same speed as your hand.

2. Adjust the Sensitivity setting as needed to make the boom more or less reactive to hand motions.

**Note:** The default setting is 15. If the Sensitivity is too high, the boom will appear unstable and jittery, reacting to slight changes in target height or crop movement. The typical Sensitivity setting that works best for most machines is 13 - 17. During routine operation, AutoBoom should be unresponsive to changes in height of 2" - 3", but should react quickly to changes of 5" or more.

For row-crop situations, or when crop conditions are sparse and not fully covering the ground, it may be beneficial to decrease the sensitivity so the boom is less reactive to sudden changes in crop height, and less likely to cause sudden movements that diminish performance.

### Speed

The Speed setting controls how fast the boom will move away from an obstacle, and how much the boom overshoots the target height. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. Adjust the Speed setting as needed so that boom raise rates match hand movement rates, but so that the booms don't overreact and become unstable.

1. Place one hand at ground level below one boom sensor and raise it quickly (about 2 feet per second) to within 12 inches of the sensor surface.

**Note:** *The boom should react immediately and adjust at a raise speed matching the hand movement, overshooting the new target height by one foot or less.*

2. Adjust the Speed setting as needed.

**Note:** *The default setting is 25. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. The typical Speed setting that works best for most machines is 22 - 27, but can be much higher depending on the static pressures of the boom, boom geometry, and the Sensitivity settings.*

### Stability

1. Place one hand at ground level below one boom sensor and raise it quickly (about two feet per second) to within 12 inches of the sensor surface, while observing the movement of the opposite boom.

**Note:** *The opposite boom should raise slightly (usually no more than six inches) simultaneously.*

2. Adjust the Stability setting to minimize movement of the opposite boom.

**Note:** *Lower the Stability value to make the opposite boom more rigid, but keep the number high enough to allow for natural movement of the boom without affecting the chassis roll.*

### Min Press %

**Note:** *On machines with travel-limited booms, operate the AutoBoom system with center rack control enabled, or with the center sensor at or slightly below the target height to prevent the booms from continuously entering the Min Press % mode. This mode is for boom emergency protection only, and AutoBoom system should not be run in this mode during routine operation.*

1. Raise the center rack section to the target height, so that the booms and center rack are horizontal.
2. Enable the AutoBoom system.
3. Locate the Min Press % setting in the AutoBoom control menus.

**Note:** *The default setting is 65.*

4. Increase the Min Press % value to approximately 80.
5. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface, or until the boom travels up approximately three feet higher than the original target.
6. Pull hand away, and verify that the booms lower slowly after a slight delay.

**Note:** *If the booms do not lower, decrease the Min Press % setting value by one and repeat the steps above. Continue performing the Min Press % test until the booms begin to lower.*

## Slant Gain

Slant gain allows fine-tuning of the allowable rotation of the center section suspension. Higher slant gain values cause the slant control to react more aggressively when chassis roll is sensed by the node. This can cause the boom to become excessively rigid, potentially causing damage to the center rack. Lower slant gain values cause the slant control to react less aggressively, causing the system to be unresponsive and not controlling the suspension.

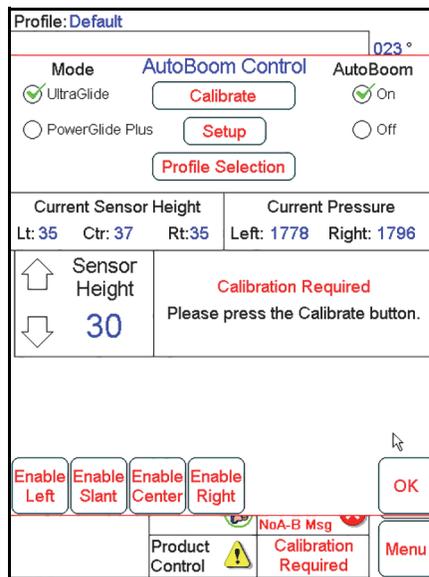
1. Take the machine to the field and observe the rotation of the center section suspension with the AutoBoom system on and left, right, and slant enabled.
2. Adjust the Slant Gain setting to cause the slant control to be more or less reactive.

**Note:** The default setting is 10.

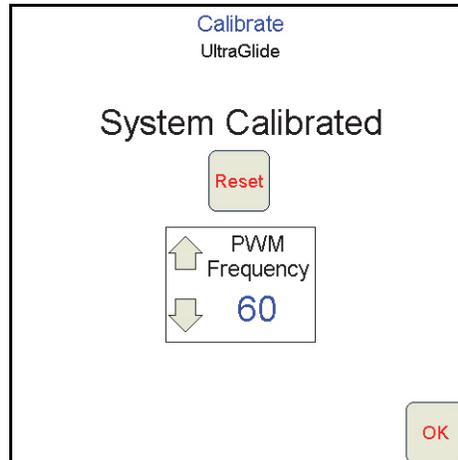
## Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

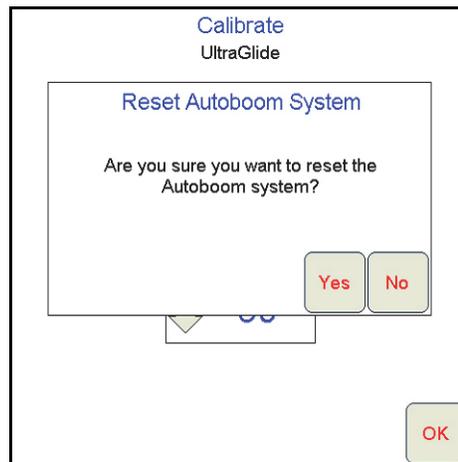
1. Touch anywhere in the AutoBoom section on the Viper Pro screen. The following screen will be displayed:



2. Select **Calibrate**. The following screen will appear:



3. Select **Reset**. The following screen will appear:



4. Select **Yes** to reset the AutoBoom system.
5. Turn off the Viper Pro console and the machine's power.
6. Turn on the machine and the Viper Pro console.

## CHAPTER

# 4

# ***Envizio Pro Calibration and Operation***

## ***Introduction***

### **Control and Navigation Icons**

	AutoBoom is currently turned off. The system must be turned on to be used. Touch this icon to turn AutoBoom on.
	AutoBoom is currently turned on. Touch this icon to turn AutoBoom off.
	The Up icon increases displayed values in preset increments. Press this icon to increase the value until the desired value is displayed.
	The Down icon decreases displayed values in preset increments. Press this icon to increase the value until the desired value is displayed.
	The Next icon accepts changes and proceeds to the next page in the setup procedure.
	The Previous icon returns to the previous page in the setup procedure.
	The Accept icon confirms and saves any changes made to the point in the setup procedure in which it is displayed.
	The Cancel icon exits the page currently displayed without accepting or saving any changes.

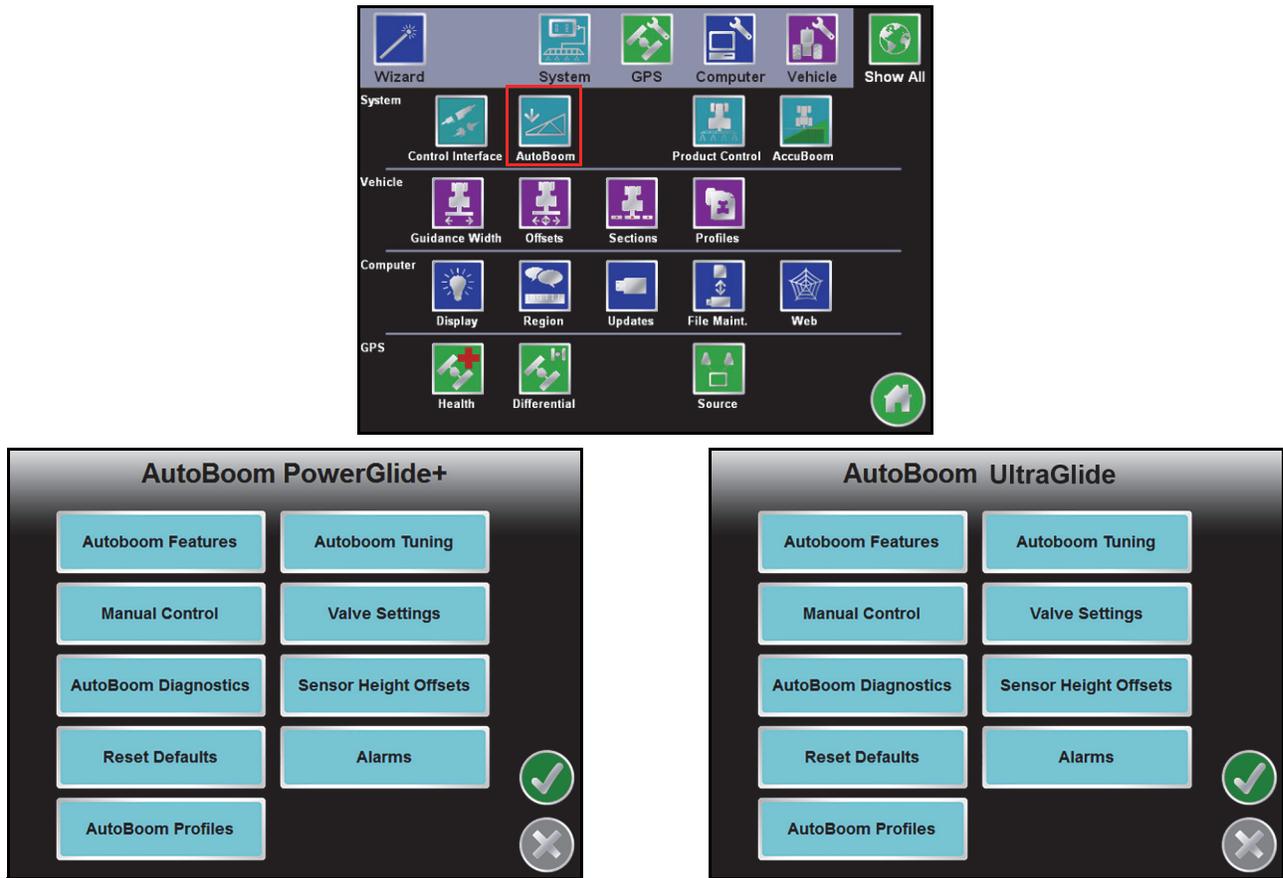
## AutoBoom Status Display

The current status of the AutoBoom system can be determined by the message displayed in the guidance page of the Envizio Pro.

	AutoBoom is off and disabled.
	AutoBoom is on but disabled.
	AutoBoom is on and enabled
	The left boom is enabled, the center rack and right boom are disabled.
	The right boom is enabled, the center rack and left boom are disabled.
	The left boom and center rack are enabled, the right boom is disabled.
	The right boom and center rack are enabled, the left boom is disabled.
	The center rack is enabled, the left and right booms are disabled.

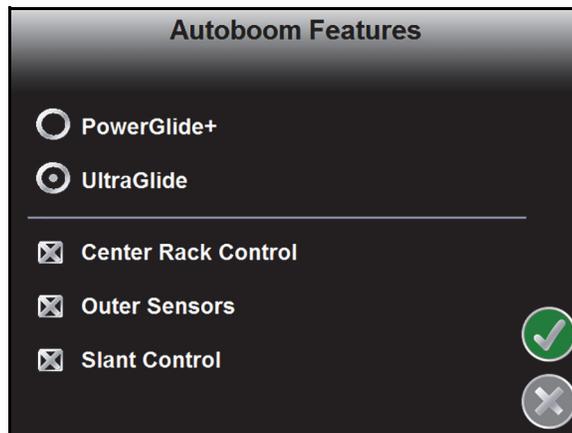
## Envizio Pro Setup Pages

FIGURE 1. AutoBoom Main Menu



The AutoBoom setup pages allow adjustment of all of the parameters in the AutoBoom system. To access these tools, select the **AutoBoom** icon, then select the appropriate button on the AutoBoom main menu.

FIGURE 2. AutoBoom Features Page

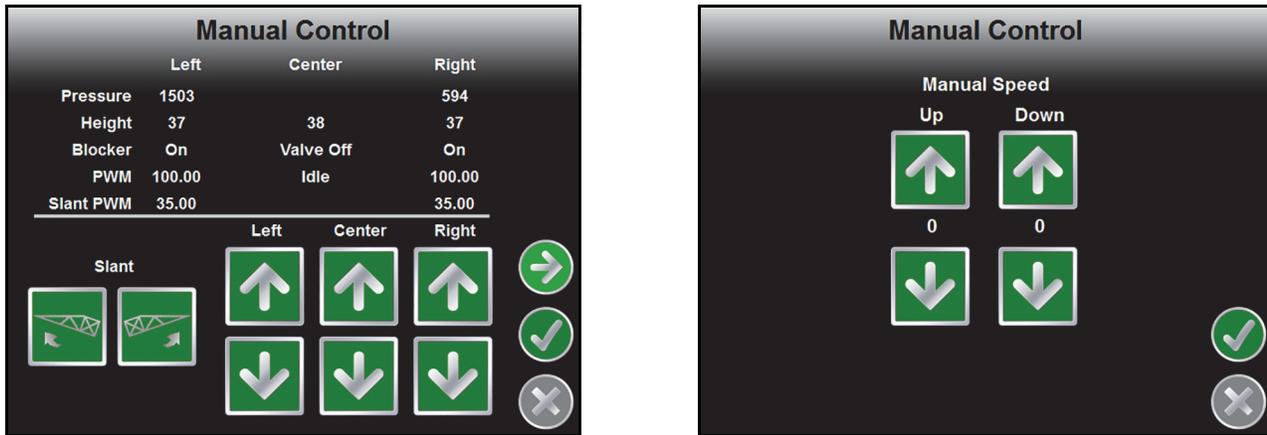


- **AutoBoom Features** - Allows the operator to switch between the PowerGlide Plus and UltraGlide modes.
  - Allows the operator to enable Center Rack Control and Slant Control features.

- When in UltraGlide mode, the AutoBoom Features option also allows the operator to disable the outer boom sensors if the machine is equipped with optional inside boom sensors. This feature is useful when the outer boom tips are folded in, and only the inside boom sensors are needed for control.

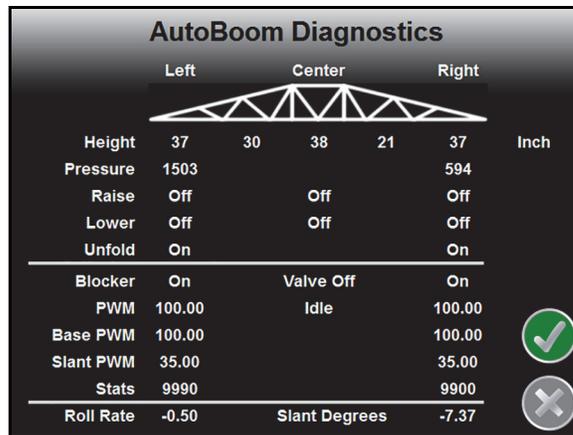
**Note:** The system must be re-calibrated when the Outer Sensors option is disabled, then re-enabled.

FIGURE 3. Manual Control Page



- **Manual Control Page** - The first Manual Control page allows the operator to manually raise and lower the boom functions using the AutoBoom valve for left and right functions, and the machine’s hydraulic valve for center rack functions. The Manual Slant Control buttons allow the operator to manually rotate the boom clockwise or counterclockwise relative to the machine’s chassis. The manual control buttons can be used to troubleshoot wiring or hydraulic issues. The second Manual Control page allows the speed at which the AutoBoom hydraulic valve manually raises and lowers the booms to be adjusted on machines that do not have their own hydraulic control. Since most machines are equipped to hydraulically control boom functions, the default setting is 0.

FIGURE 4. AutoBoom Diagnostics Page



- **AutoBoom Diagnostics** - This page allows the status of all AutoBoom inputs and outputs to be viewed on the Envizio Pro display.
  - **Height** - Displays the individual sensor heights relative to the ground, adjusted for the values entered in the Sensor Height Offsets.
  - **Pressure** - Displays the actual pressure in the left and right boom cylinders at all times.

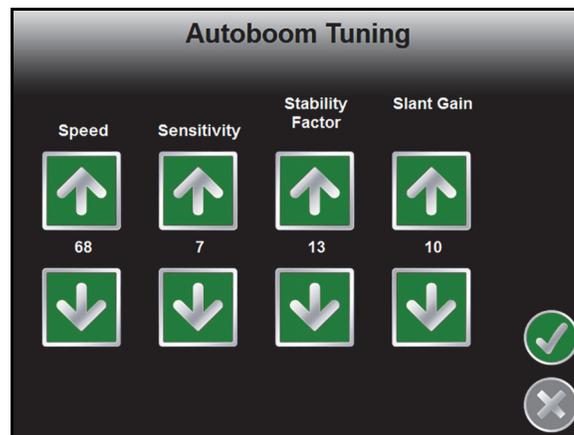
- **Raise and Lower** - Indicate the status of the boom switches. When using the machine's manual control functions, the corresponding boom switch will indicate On.
- **Unfold** - Indicates the status of the unfold proximity switch (if equipped). The boom will not be enabled until the proximity switch is activated.
- **Blocker** - Indicates the status of the double-blocker output.
- **PWM** - Indicates the duty cycle to the proportional valves. This value will be 0 if the individual booms are disengaged, and will vary in output up to 100 when AutoBoom is engaged and the system is operating.
- **Base PWM %** - Indicates the system's calculated static duty cycle to maintain the set height or pressure. This number will typically change slowly from 0 - 5 points during routine operation.
- **Slant PWM** - Indicates the duty cycle of the slant control proportional valves. It also allows the operator to view the duty cycle of the slant control proportional valves while rotating the boom via the Manual Slant Control icons. This value will be 0 if slant control is not enabled and can vary in output up to 100 when slant control is engaged and operating. A minimum value will be maintained when slant control is enabled.
- **Stats** - Indicate the boom performance. This value is for Raven use only.
- **Roll Rate** - Indicates the measured chassis roll rate. This value changes when the machine's chassis is rolling left or right.
- **Slant Degrees** - Indicates the detected rotation of the machine's boom relative to the chassis, measured in degrees. The Slant Deg value will be nearly zero when the boom suspension is centered relative to the machine's chassis and will change when the boom is rotated.

FIGURE 5. Reset Defaults Page



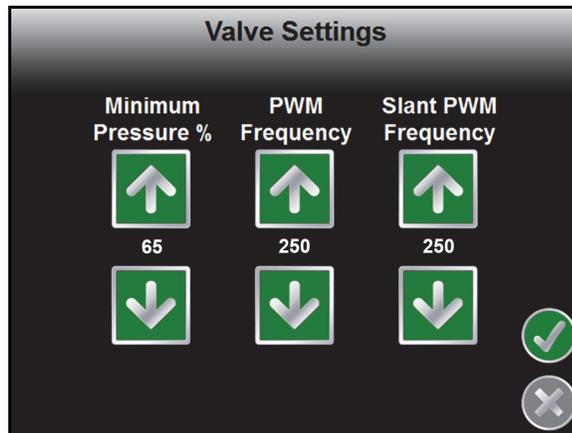
- **Reset Defaults Page** - Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. The Reset Defaults page allows the operator to reset the defaults, erasing all AutoBoom system settings and adjustments that have been performed. System calibration is required after the defaults have been reset.

FIGURE 6. AutoBoom Tuning Page



- **AutoBoom Tuning Page** - The AutoBoom tuning page is available in the UltraGlide system only.
  - **Speed** - The Speed setting allows the operator to adjust the rate at which the booms raise and lower. The Speed setting should be set so that the boom motion is smooth and does not oscillate.
  - **Sensitivity** - The Sensitivity setting allows the operator to adjust the sensitivity level of the sensors. If the Sensitivity setting is too high, the boom will appear unstable and jittery, reacting to slight changes in the target height or crop movement.
  - **Stability Factor** - The Stability Factor setting allows fine-tuning of the rigidity of the machine's center rack. The default value of 20 is recommended for machines with a rigid center rack. A value of 5 - 14 is recommended for machines with center racks that float freely. Adjust this value as needed to prevent boom oscillation.
    - Stability settings of 0 disable the stability control completely, making the left and right booms completely independent of each other. When above target, the control of both booms is accelerated to increase the down speed. This setting is useful for machines that have a rigid center rack.
    - Stability settings of 1 - 99 will adjust the stability of the center section. Lower numbers cause the opposing boom that is not being controlled to counteract the movement of the controlled boom by raising to balance or stabilize the center section and to prevent undesired rotation or movement. While lower numbers allow the booms to react at the same rate and time, low settings may prevent the booms from lowering. Higher stability settings allow the booms to react independently from each other, but may cause the center section to oscillate, diminishing performance.
  - **Slant Gain** (if equipped with slant feature enabled) - Allows fine-tuning of the allowable rotation of the center section suspension. The default value is 10. A higher number will apply more pressure to the slant control cylinders when the chassis is maneuvering over challenging terrain.

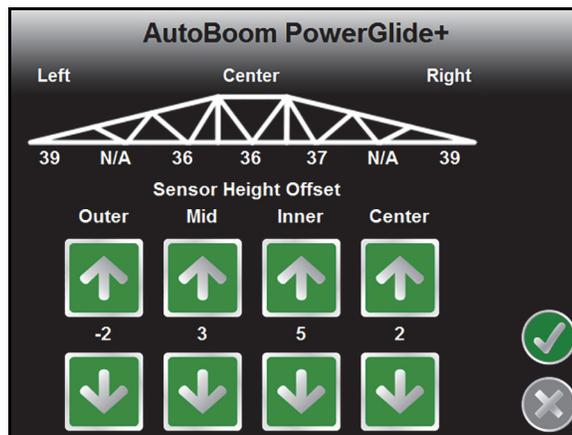
FIGURE 7. Valve Settings Page



• **Valve Settings Page**

- **Minimum Pressure % (UltraGlide Only)** - Sets a low limit pressure, preventing the boom pressure from falling below a percentage of static pressure, overriding the control when necessary to maintain a low limit of pressure on each boom. Minimum Pressure % also prevents booms from resting on the stops for travel-limited booms.
- **PWM Frequency** - Sets the frequency of the PWM signal to the proportional control valve. The default value of is 60 Hz is recommended with AutoBoom valves with square coils and 250 Hz for valves with round coils.
- **Slant PWM Frequency** - Sets the frequency of the PWM signal to the slant proportional control valve. The default value is 250 Hz. This value is automatically detected during calibration and should not be adjusted.

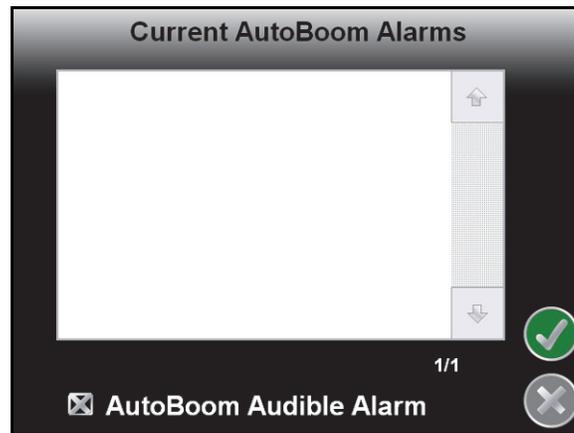
FIGURE 8. Sensor Height Offsets Page



- **Sensor Height Offsets Page** - Allows sensor heights to be adjusted according the mounting location. Enter a positive value if the sensors are mounted above the sprayer tips, and a negative value if the sensors are mounted below. Refer to the Sensor Height Offsets section on page 63 for more information.

## Alarms

FIGURE 9. AutoBoom Alarms



Alarm tones will not sound if the operator is navigating through any of the configuration menus. However, enable/disable alarms will always sound when appropriate.

**Note:** *The audible alarms can be disabled by deselecting the AutoBoom Audible Alarm box.*

- **Pressure alarms (PowerGlide Plus mode only)** - The pressure alarm occurs if the pressure is detected at a level lower than the alarm set point. The pressure alarm is a steady tone, and will continue to sound for one second after the pressure rises above the set point.
- **Proximity alarm (if equipped)** - The proximity alarm occurs if a boom is not completely folded but is enabled. The boom will be disabled after five seconds.
- **Check AutoBoom high current voltage alarm** - This alarm occurs if the node senses a low voltage supply to the node. Check the power and ground wiring to the node.
- **Pressure sensor failure alarms** - The pressure sensor failure alarm occurs immediately when a pressure sensor is not detected. The alarm is a steady tone, and will stop immediately after the sensor is located.
- **Ultrasonic sensor - too low alarm (UltraGlide mode only)** - This alarm occurs if the ultrasonic sensor is closer than ten inches to the ground for 1/2 a second. The alarm will continue to sound for three seconds.
- **Ultrasonic sensor - too high alarm (UltraGlide mode only)** - This alarm occurs when the ultrasonic sensor is higher than 65 inches from the ground for five seconds. The alarm will continue to sound for one second.
- **Ultrasonic sensor - failure alarm (UltraGlide mode only)** - This alarm occurs immediately when an ultrasonic sensor is not detected. The alarm is a steady tone, and will stop immediately after the sensor is located.
- **Center rotation center out of range** - This alarm occurs when the center rotation center is out of the calibrated range. The alarm is a steady tone that stops immediately when the sensor is in the calibrated range.
- **Center rotation sensor failure** - This alarm occurs when there is no signal from the rotation sensor while slant control is enabled. The alarm is a steady tone that stops immediately when the center rotation sensor signal is detected.
- **Boom unfold alarm** - This alarm applies only to machines that are equipped with proximity sensors. The alarm will occur if the operator tries to enable AutoBoom with the booms folded. It may also occur if the center sensor is greater than 60 inches off the ground, or it does not receive an echo from the ground.
- **Other tones** - When enabling the AutoBoom system in automatic mode via the machine's boom control functions or switches, a single beep will occur. When disabling AutoBoom, a double beep will sound.

## AutoBoom Pre-Calibration Diagnostics

While every effort has been made to properly label and document connections for the hydraulic and electrical components of the AutoBoom system, boom function connections may not be identified due to changes in the make and model of the machine. This makes it especially important to trace the hoses from the connection points and verify the electrical connections are correct to ensure proper AutoBoom system operation. In order to verify connections, it is necessary to perform a pre-calibration diagnostic test.

1. Select **AutoBoom Diagnostics**. The following page will appear:

	Left	Center	Right			
Height	37	30	38	21	37	Inch
Pressure	1503				594	
Raise	Off		Off		Off	
Lower	Off		Off		Off	
Unfold	On				On	
Blocker	On		Valve Off		On	
PWM	100.00		Idle		100.00	
Base PWM	100.00				100.00	
Slant PWM	35.00				35.00	
Stats	9990				9900	
Roll Rate	-0.50		Slant Degrees		-7.37	

2. Verify that the following components are displayed correctly on the screen and change when raising and lowering the booms via the machine's controls:
  - Pressures
  - Sensor heights
  - Right and left raise/lower functions
  - Center raise/lower functions
  - Fold/unfold functions
  - Slant rotation clockwise/counterclockwise

## PowerGlide Plus

The PowerGlide Plus AutoBoom system uses gauge wheels to maintain optimum boom height, while state-of-the-art hydraulics maintain constant hydraulic pressure to the tilt cylinders. PowerGlide Plus systems are typically used in pre-emergence applications.

**Note:** *Terrain conditions and the machine's hydraulic system dictate the actual speeds that can be achieved during application with an engaged AutoBoom system. Typically, rougher and varied field terrain require slower speeds while AutoBoom is enabled.*

## Calibration

### Boom Calibration

After the AutoBoom installation is complete, it is necessary to calibrate the AutoBoom system before use. AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the

system to find the base duty cycles for operation. Booms must be free to travel 10” up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

**Important:** *Be sure that the area is clear of people and obstructions before beginning the calibration process.*

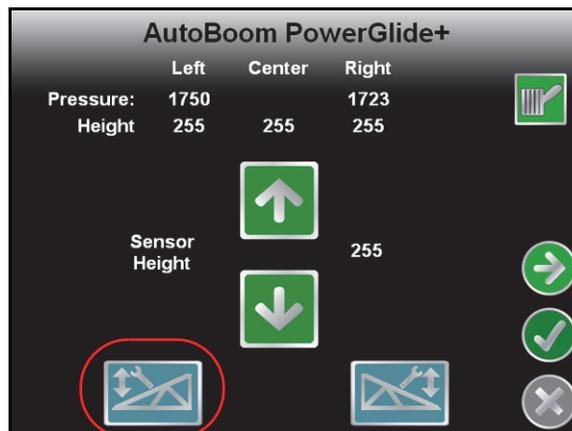
1. Select the **Tools** icon on the main Envizio page.
2. Select the **AutoBoom** icon.

**Note:** *If the Function Disabled page appears when the AutoBoom icon is selected, troubleshoot problems with the AutoBoom node. Refer to the Envizio Pro Installation and Operation Manual for troubleshooting information.*

3. Select **PowerGlide+** in the AutoBoom Features page.
4. Select the **Accept** icon.
5. Verify that AutoBoom is turned on.
6. Verify that the booms are unfolded, and lower the center rack so that the wheels are approximately six inches from the ground.

**Note:** *If the booms do not go over center or are travel-limited, raise the booms so that the boom tips are approximately ten inches above the horizontal position and lower the center section slightly below the normal spraying height.*

FIGURE 10. Calibrate Booms



7. Select the blue left boom icon to begin the calibration process.

**Note:** *The message “Calibration in Process” will appear during the system calibration. The calibration process may take several seconds to complete. If the boom fails to calibrate, select **Cancel Calibration** and refer to Chapter 7, Troubleshooting on page 119. Once the left boom calibration is complete, the following screen will appear:*

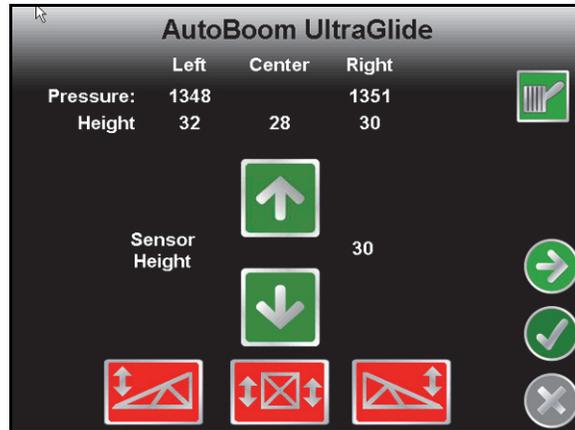
8. Select the **Next** button to return to the AutoBoom main menu.

## Center Rack Control Calibration (If Equipped)

There are many different valve configurations used to control the machine's center rack functions. The AutoBoom system must "learn" which of the machine's solenoids are used to raise and lower the booms. Complete the following steps to calibrate the center rack control feature after the individuals booms have been calibrated.

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

1. From the AutoBoom Features page, ensure **Center Rack Control** is selected.
2. Select the **Accept** icon. The following page will appear:



3. Press and hold the center rack raise button on the machine's joystick for six seconds so that the center rack raises.

**Note:** *The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.*

4. Press and hold the center rack lower button on the joystick for six seconds so that the center rack lowers.

**Note:** *The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.*

## Resetting Calibration

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the calibration of the AutoBoom system. System calibration will be required after the AutoBoom system calibration has been reset.

1. From the AutoBoom main menu, select **Reset Defaults**. The following screen will appear:



2. Select the **Accept** icon.

## Routine Operation

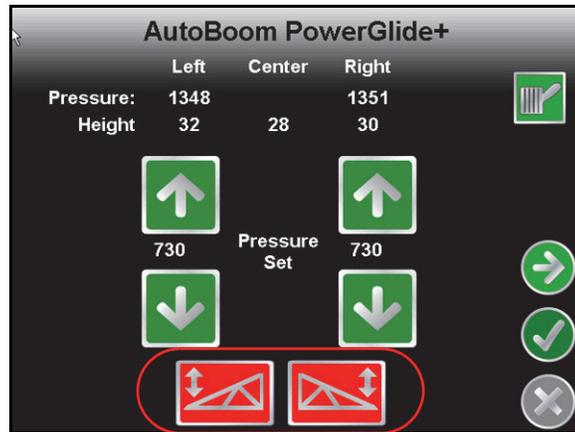
### Joystick Functions

- When AutoBoom control is on, control of each boom can be enabled or disabled via the Envizio Pro console or by tapping the sprayer's switch functions (if equipped).

**Note:** *Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.*

- A single up-tap on the sprayer's joystick switch functions disables AutoBoom on that boom.
- A single down-tap on the sprayer's joystick switch functions enables AutoBoom on that boom.
- The fast-down feature (double-tap down) is used to quickly lower the booms when the pressure setting is set to a higher setting, which causes the booms to lower slowly.
  - On machines with one proportional valve (square coils on the AutoBoom valve), a double-tap up will raise both booms slightly. A double-tap down will lower both booms quickly, and AutoBoom will re-engage to the set pressure setting.
  - On machines with two proportional valves (round coils on the AutoBoom valve), a double-tap up on the inside boom will raise only that boom slightly. A double-tap down will lower the one boom quickly, and AutoBoom will re-engage to the set pressure setting.

## Enabling AutoBoom via the Envizio Pro



AutoBoom control of each boom can be enabled or disabled by selecting the boom icons on the bottom of the page, or by tapping the sprayer's joystick switch functions.

**Note:** Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.

## Boom Adjustments When Approaching Headlands

When approaching the headlands to make a turn, the gauge wheel must be raised approximately six inches from the ground to prevent it from sliding sideways or backward, causing damage to the gauge wheel assembly. The fast-down feature may be used in this situation.

## Center Rack Control (AutoBoom Enabled and Center Rack Control On) - If Equipped

**Note:** The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

**Note:** Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

**Note:** Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- **Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, and enable both booms.
- **Center Up Switch** - A single up-tap will disable the center rack and both booms. Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down- tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

## Center Rack Control (AutoBoom Enabled and Center Rack Control Off) - If Equipped

**Note:** The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

**Note:** Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

**Note:** Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable both booms.

**Note:** Center rack control will not be enabled since center rack control is off.

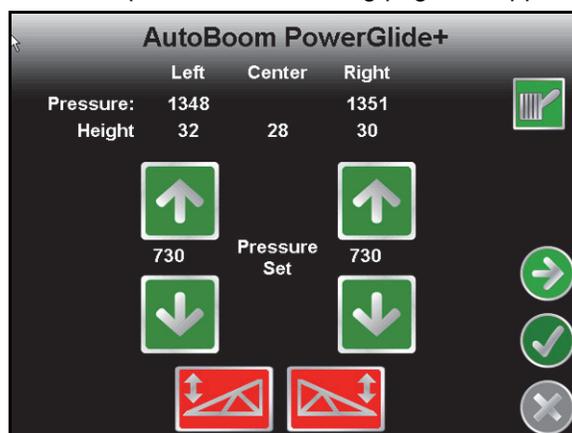
- **Center Up Switch** - Two consecutive up-taps will disable both booms and raise the center rack to the desired transport height. four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

## System Adjustments

During the calibration process, the AutoBoom system calculates a default Pressure Setting. Normally, the calculated value will be the level at which the machine should operate. However, at times an adjustment to the Pressure Setting may be necessary.

**Note:** During routine operation, the gauge wheels should touch down momentarily, raise slightly, then lower back to the target height. Wheels should not continuously ride on the ground.

1. From the main menu, select the Accept icon. The following page will appear:



2. Select the **Enable Left** and **Enable Right** icons on the bottom of the page so that the icons turn green.
3. Exit the cab and physically lift the end of each boom up, watching the responsiveness of the booms.

**Note:** The force required by the operator to lift the boom should never exceed 200 lbs.

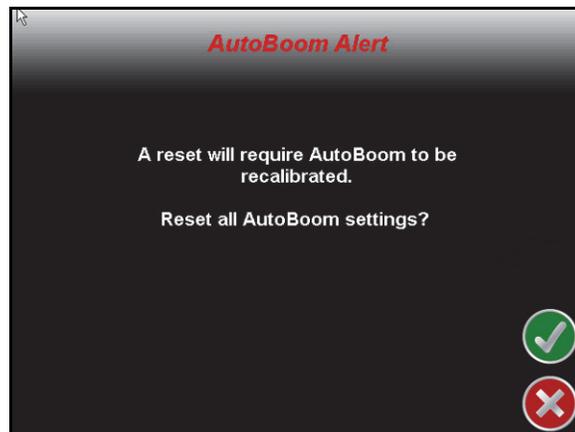
4. Adjust the Pressure Setting value of each boom as needed to optimize performance.
  - Increasing the Pressure Setting makes the boom lighter and reduces the down speed.

- Decreasing the Pressure Setting makes the boom heavier and increases the down speed.
5. Select **Disable Left** or **Disable Right**, or tap the left and right boom up buttons on the joystick.
  6. Select the **Accept** icon.

## Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

1. From the AutoBoom main menu, select **Reset Defaults**. The following screen will appear:



2. Select the **Accept** icon.
3. Turn off the Envizio Pro console and the machine's power.
4. Turn on the machine and the Envizio Pro console.

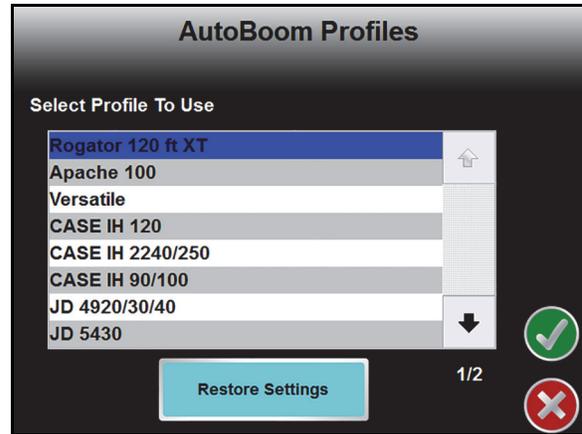
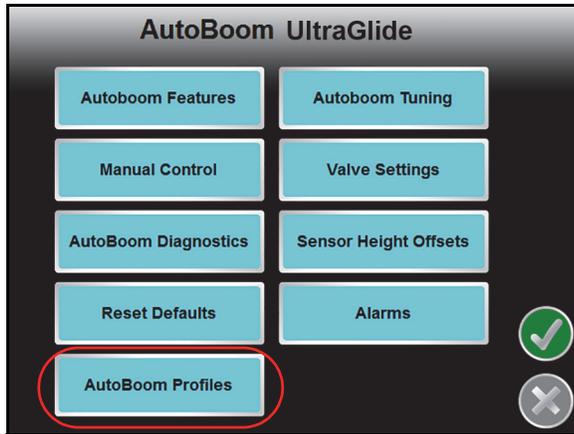
## UltraGlide

The UltraGlide AutoBoom system uses ultrasonic sensors to measure the boom's height above ground, and state-of-the-art hydraulics to maintain constant hydraulic pressure to the tilt cylinders. The UltraGlide AutoBoom system is ideal for use in pre-emergence and post-emergence applications.

**Note:** *Terrain conditions and the machine's hydraulic system dictate the actual speeds that can be achieved during application with an engaged AutoBoom system. Typically, rougher and varied field terrain require slower speeds while AutoBoom is enabled.*

## Machine Selection Database

To access the machine selection database, select **AutoBoom Profiles** from the home screen.



**Machine Selection Database** - Applicable to AutoBoom software versions 5.00.00 and greater. The machine selection database contains a list of machines that, when selected, automatically populates the ideal settings for that specific machine. If the specific machine is not listed, choose the profile that best fits the machine:

- Standard0 - Generic profile suitable for most machines.
- Standard100 - Generic profile for machines with heavy booms that require more pressure to lift the booms quickly. Select this profile if the static pressure required to hold the booms level is 1800 psi or greater.
- Standard200 - Generic profile for machines with lighter booms that require less pressure to lower the booms at a faster rate. Select this profile if the static pressure required to hold the booms level is 900 psi or lower.

## Calibration

### Boom Calibration

After the AutoBoom installation is complete, it is necessary to calibrate the system before use. AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the system to find the system base duty cycles for operation. Booms must be free to travel 10" up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

**Important:** *Be sure that the area is clear of people and obstructions before beginning the calibration process.*

1. Move the machine to a flat area.
2. Verify that the booms are unfolded, and lower the center rack.

**Note:** *If the booms do not go over center or are travel limited, raise the booms so that the wheels (if equipped) are approximately ten inches above the horizontal position and lower the center section to approximately 20 inches.*

3. Using a tape measure, measure the distance from the bottom of the sensor to the spray nozzle tip.
4. Select the **Tools** icon on the main Envizio Pro screen.

5. Select the **AutoBoom** icon.

**Note:** *If the Function Disabled page appears when the AutoBoom icon is selected, troubleshoot problems with the AutoBoom node. Refer to the Envizio Pro Installation and Operation Manual Operation Guide for troubleshooting information.*

6. Select **UltraGlide**.

7. Select the **Accept** icon.

8. Verify that AutoBoom is turned on.

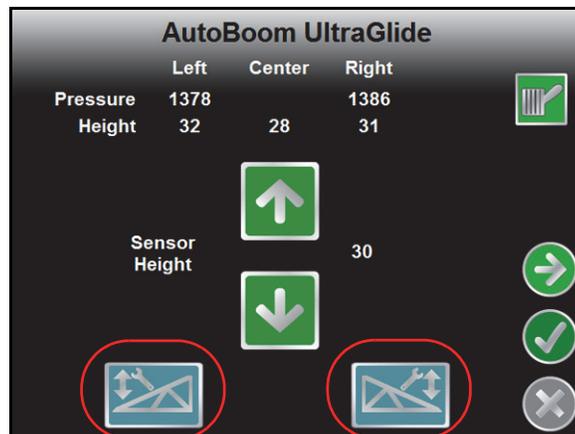
9. Adjust the vertical sensor height offset settings in the Envizio Pro to sensor position as measured in step 3.

- Positive offsets indicate the sensor surface is located above the nearest spray tips.
- Negative offsets indicate the sensor surface is located below the nearest spray tips.
- Inner, outer, and center offsets are not required to be the same across the width of the machine, but they must be correctly measured relative to the spray tips.

10. Raise the boom tips to approximately the target height.

**Note:** *The default target height is 30 inches. Verify that the booms are not fully raised to the stops. If gauge wheels are installed, the setting must be adjusted to 40 - 45 inches to prevent the wheels from touching the ground during system calibration.*

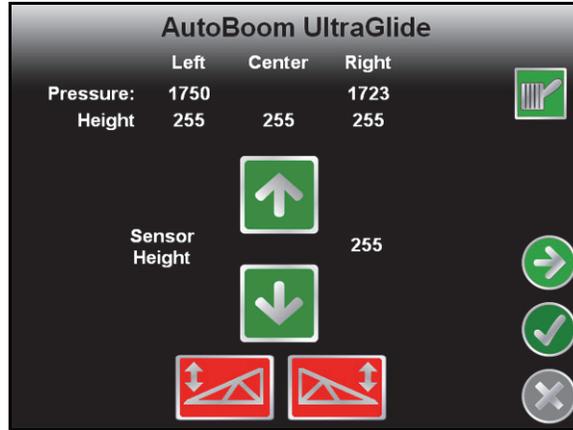
FIGURE 11. Calibrate Booms



11. Select the blue left boom icon to begin the calibration process.

**Note:** *The message "Calibration in Process" will appear during the system calibration. The calibration process may take several seconds to complete. If the boom fails to calibrate, touch select **Cancel Calibration** and refer to Chapter 7, Troubleshooting on page 119. Once the left boom calibration is complete, the following screen will appear:*

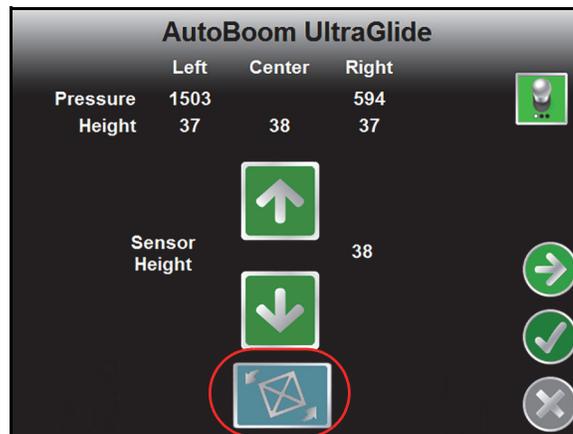
12. Select the blue right boom icon to calibrate the right boom. The following page will appear:



### Slant Control Calibration

1. Verify the Slant Control feature is turned on in the Features screen.

FIGURE 12. Main Screen



2. Return to the Main screen and select the slant calibration icon.
3. Enter the number of the direction arrow on the node that is pointing forward.
4. Select the Slant Calibration icon on the Calibration screen.

**Note:** The boom tips may raise automatically to allow for full rotation of the center section. Pressure in one slant cylinder will increase until the center section begins to rotate slightly. The center section will then rotate fully clockwise then counterclockwise to calibrate the center rotation sensor position.

**Note:** The center rotation sensor may be re-centered by recalibrating the slant control or by manual adjustment of the centering bolt while the center section is confirmed to be in the center position.

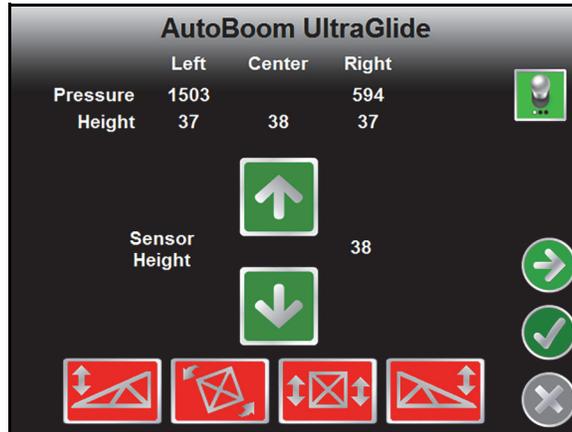
### Center Rack Control Calibration

There are many different valve configurations used to control the machine's center rack functions. The AutoBoom system must "learn" which of the machine's solenoids are used to raise and lower the booms.

Complete the following steps to calibrate the center rack control feature after the individuals booms have been calibrated.

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

1. From the AutoBoom Features page, ensure **Center Rack Control** is selected.
2. Select the **Accept** icon. The following page will appear:



3. Press and hold the center rack raise button on the machine’s joystick for six seconds so that the center rack raises.

**Note:** *The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.*

4. Press and hold the center rack lower button on the joystick for six seconds so that the center rack lowers.

**Note:** *The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.*

## Resetting Calibration

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the calibration of the AutoBoom system. System calibration will be required after the AutoBoom system calibration has been reset.

1. From the AutoBoom main menu, select **Reset Defaults**. The following screen will appear:



2. Select the **Accept** icon.

## Routine Operation

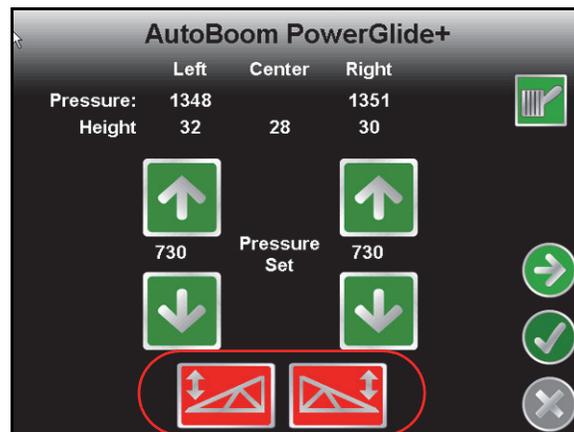
### Joystick Functions

- When AutoBoom control is on, control of each boom can be enabled or disabled via the Envizio Pro console or by tapping the sprayer's switch functions (if equipped).

**Note:** Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.

- A single up-tap on the sprayer's switch functions disables AutoBoom on that boom.
- A single down-tap on the sprayer's switch functions enables AutoBoom on that boom.

### Enabling AutoBoom via the Envizio Pro



- Enable the left boom by selecting the red left boom icon on the bottom of the page.
- Enable the right boom by selecting the red right boom icon on the bottom of the page.

### Boom Adjustments When Approaching Headlands (If Equipped with Gauge Wheels)

When approaching the headlands to make a turn, the gauge wheel must be raised approximately six inches from the ground to prevent it from sliding sideways or backward, causing damage to the gauge wheel assembly.

### Center Rack Control (AutoBoom Enabled and Center Rack Control On)

**Note:** The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

**Note:** Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

**Note:** Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, both booms, and slant control (if equipped).
- Center Up Switch** - A single up-tap will disable the center rack, slant control, and both booms. Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.

- Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
- Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Center Rack Control (AutoBoom Enabled and Center Rack Control Off)

**Note:** The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

**Note:** Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

**Note:** Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable slant control and both booms.

**Note:** Center rack control will not be enabled since center rack control is off.

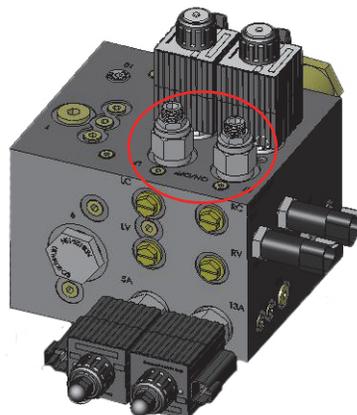
- **Center Up Switch** - Two consecutive up-taps will disable both booms and slant control and raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Operating the UltraGlide AutoBoom System in PowerGlide Plus Mode (Square Coils on the AutoBoom Valve)

The UltraGlide AutoBoom system is also capable of operating in the PowerGlide Plus mode. In addition to the AutoBoom valve modification listed below, a gauge wheel kit is required for the system to operate in the PowerGlide Plus mode. For available kits and ordering information, contact your local Raven dealer

Complete the following steps to convert the UltraGlide AutoBoom valve to the PowerGlide Plus Mode.

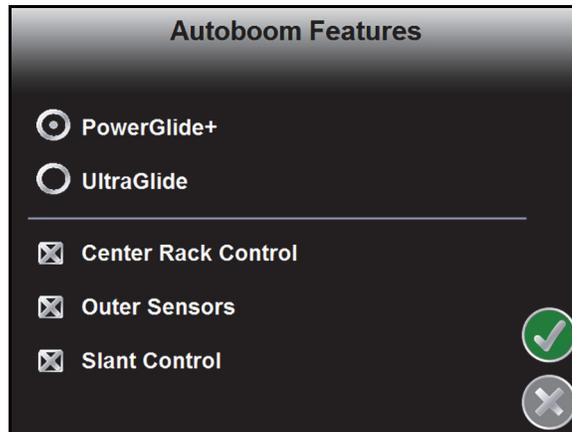
FIGURE 13. Needle Valves on the UltraGlide AutoBoom Valve



1. Locate the needle valves in Ports RT and LF on the AutoBoom valve.
2. Loosen the jam nuts on the needle valves.
3. Use an Allen wrench to turn the set screws counter-clockwise until they won't move any further.
4. Tighten the jam nuts.

**Note:** When converting the AutoBoom system back to UltraGlide, the needle valves must be screwed all the way back in (clockwise).

FIGURE 14. Envizio Pro Programmed to Run in PowerGlide Plus Mode



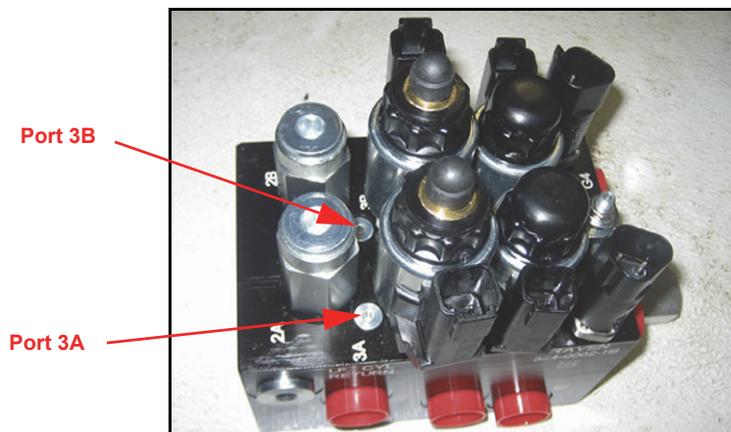
5. Select **PowerGlide+** in the AutoBoom Features screen.

**Note:** When converting the AutoBoom system back to UltraGlide, the UltraGlide option must be chosen in the AutoBom Features screen.

### Operating the UltraGlide AutoBoom System in PowerGlide Plus Mode (Round Coils on the AutoBoom Valve)

To operate the AutoBoom system in PowerGlide Plus mode, it is necessary to remove orifice fittings from the AutoBoom valve. Failure to remove these fittings from the valve will restrict the down speed of the booms when the system is enabled.

FIGURE 15. Port 3A and 3B Location



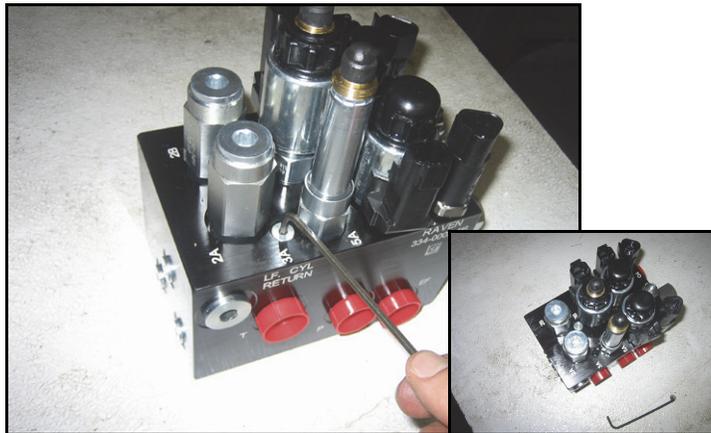
1. Locate Ports 3A and 3B on the AutoBoom valve.

**FIGURE 16. Coil Removed from the AutoBoom Valve**



2. Remove the coils from the solenoids near Ports 3A and 3B to gain easy access to those ports.

**FIGURE 17. Port Plugs Removed from the AutoBoom Valve**



3. Use an Allen wrench to remove the plugs from Ports 3A and 3B.

**FIGURE 18. Orifice Fitting Removed from the AutoBoom Valve**



Orifice Fitting  
Removed - Keep for  
Future Use

4. Remove the orifice fittings from Ports 3A and 3B.

**Important:** Tip the AutoBoom valve on its side and use the Allen wrench to remove the orifice from the cavity, taking care not to let the fitting fall into the valve.

FIGURE 19. Port Plug Reinstalled on the AutoBoom Valve



5. Use the Allen wrench to reinstall the port plugs on Ports 3A and 3B of the AutoBoom valve.

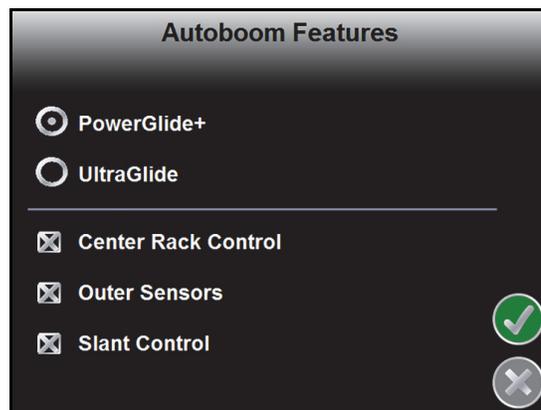
FIGURE 20. Coil Reinstalled on the AutoBoom Valve



6. Reinstall the coils on the solenoids of the AutoBoom valve.

**Note:** When converting the AutoBoom system back to UltraGlide, the orifice fittings must be reinstalled.

FIGURE 21. Envizio Pro Programmed to Run in PowerGlide Plus Mode



7. Select **PowerGlide+** on the AutoBoom Features screen.

**Note:** When converting the AutoBoom system back to UltraGlide, the UltraGlide option must be selected on the AutoBoom Features screen.

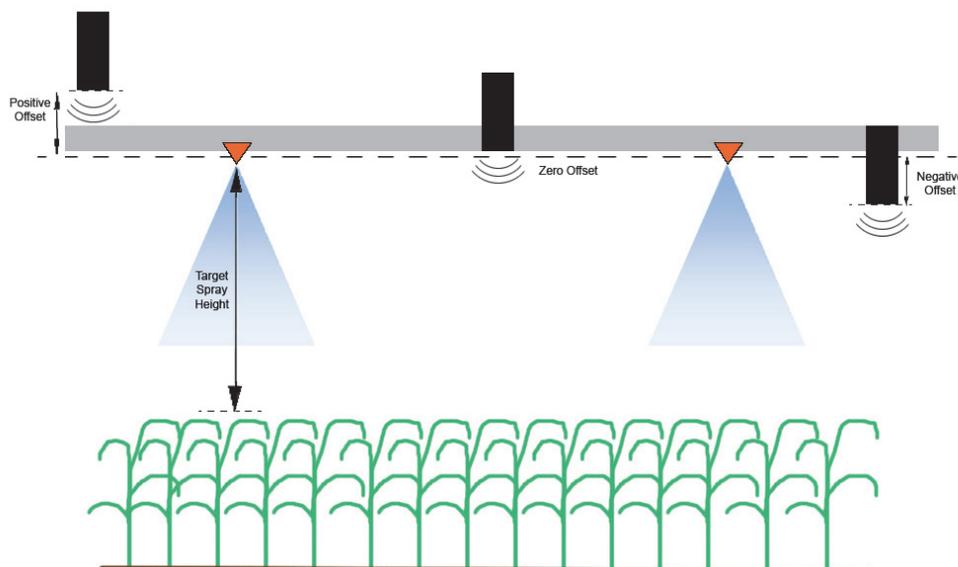
## System Adjustments

### Ultrasonic Sensor Height Offsets

Ultrasonic sensor height offset adjustments are used to compensate for the difference between the height of the sensor surface and the height of the spray tip. The offset height is calculated by measuring the distance from the bottom of the sensor to the height of the crop, measuring the distance between the spray tip to the height of the crop, and then subtracting the spray tip distance from the sensor distance. Refer to the diagram below to determine whether the offset value should be positive or negative.

**Note:** The maximum offset height value is 20 inches.

**Note:** Ultrasonic sensors will react to the first object that reflects an echo, whether it is the ground or the crop. For row-crop situations, it may be beneficial to adjust the sensor positions to directly over a row, or add additional boom sensors.



- Touch the up arrow in the Sensor Height section to increase the value representing the distance between the sensor and the ground.
- Touch the down arrow in the Sensor Height section to decrease the value representing the distance between the sensor and the ground.

**Note:** On machines with travel-limited booms, center sensor height offsets may need to be entered as less than the measured value from the sensor to the ground to ensure the boom cylinders have sufficient pressure during operation.

### Sensitivity

1. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface.

**Note:** The boom should react immediately and raise at approximately the same speed as your hand.

2. Adjust the Sensitivity setting as needed to make the boom more or less reactive to hand motions.

**Note:** *The default setting is 15. If the Sensitivity is too high, the boom will appear unstable and jittery, reacting to slight changes in target height or crop movement. The typical Sensitivity setting that works best for most machines is 13 - 17. During routine operation, AutoBoom should be unresponsive to changes in height of 2" - 3", but should react quickly to changes of 5" or more.*

*For row-crop situations, or when crop conditions are sparse and not fully covering the ground, it may be beneficial to decrease the sensitivity so the boom is less reactive to sudden changes in crop height, and less likely to cause sudden movements that diminish performance.*

### Speed

The Speed setting controls how fast the boom will move away from an obstacle, and how much the boom overshoots the target height. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. Adjust the Speed setting as needed so that boom raise rates match hand movement rates, but so that the booms don't overreact and become unstable.

1. Place one hand at ground level below one boom sensor and raise it quickly (about 2 feet per second) to within 12 inches of the sensor surface.

**Note:** *The boom should react immediately and adjust at a raise speed matching the hand movement, and overshoot the new target height by one foot or less.*

2. Adjust the Speed setting as needed.

**Note:** *The default setting is 25. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. The typical Speed setting that works best for most machines is 22 - 27, but can be much higher depending on the static pressures of the boom, boom geometry, and the Sensitivity settings.*

### Stability

1. Place one hand at ground level below one boom sensor and raise it quickly (about two feet per second) to within 12 inches of the sensor surface, while observing the movement of the opposite boom.

**Note:** *The opposite boom should raise slightly (usually no more than six inches) simultaneously.*

2. Adjust the Stability setting to minimize movement of the opposite boom.

**Note:** *Lower the Stability value to make the opposite boom more rigid, but keep the number high enough to allow for natural movement of the boom without affecting the chassis roll.*

### Slant Gain

Allows fine-turning of the allowable rotation of the center section suspension. Higher Slant Gain values cause the slant control to react more aggressively when chassis roll is sensed by the node and can cause the boom to be excessively rigid, possibly causing damage to the center rack. Lower Slant Gain values cause the slant control to be less aggressive and can cause the system to be unreactive, not controlling the suspension based on the chassis roll.

1. Take the machine to the field and observe the rotation of the center section suspension with the AutoBoom system on and left, right, and slant enabled.
2. Adjust the Slant Gain setting to cause the slant control to be more or less reactive.

**Note:** *The default setting is 10.*

## Min Press %

**Note:** On machines with travel-limited booms, operate the AutoBoom system with center rack control enabled, or with the center sensor at or slightly below the target height to prevent the booms from continuously entering the Min Press % mode. This mode is for boom emergency protection only, and AutoBoom system should not be run in this mode during routine operation.

1. Raise the center rack section to the target height, so that the booms and center rack are horizontal.
2. Enable the AutoBoom system.
3. Locate the Min Press % setting in the AutoBoom control menus.

**Note:** The default setting is 65.

4. Increase the Min Press % value to approximately 80.
5. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface, or until the boom travels up approximately three feet higher than the original target.
6. Pull hand away, and verify that the booms lower slowly after a slight delay.

**Note:** If the booms do not lower, decrease the Min Press % setting value by one and repeat the steps above. Continue performing the Min Press % test until the booms begin to lower.

## Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

1. From the AutoBoom main menu, select **Reset Defaults**. The following screen will appear:



2. Select the **Accept** icon.
3. Turn off the field computer and the machine power.
4. Turn on the machine and the field computer.



## CHAPTER

# 5

# SCS Console Calibration and Operation

## Introduction

### AutoBoom Status Display

The current status of the AutoBoom system can be determined by the message displayed on the SCS console display. Advanced setup tools allow fine-tuning of stability control, minimum boom pressure, and sensor height offset parameters in the AutoBoom system. To access these tools, press the DATA MENU button until the AutoBoom Main Menu is displayed, then use the arrow keys to select the desired feature.

FIGURE 1. UltraGlide Main Menus

Page 1

```
ULTRAGLIDE AUTOBOOM
PSI:      LEFT CT RIGHT
          1393 30 1378
HEIGHT:   24 30 27
→ULTRAGLIDE: OFF
RIGHT:   DISABLED
LEFT:    DISABLED
CENTER RK: DISABLED
SLANT:   DISABLED
HEIGHT SETTING 30
```

Page 2

```
ULTRAGLIDE AUTOBOOM
PSI:      LEFT CT RIGHT
          1389 30 1375
HEIGHT:   24 30 27
→AUTOBOOM FEATURES
AUTOBOOM TUNING
MANUAL CONTROL
VALVE SETTINGS
DIAGNOSTICS
SNSR HEIGHT OFFSETS
CALIBRATE
```

- **PowerGlide + or UltraGlide** - These settings are either ON or OFF. Toggle between these settings by selecting CE on the SCS console keypad.
- **Right** - Displays the status of the right boom. This setting is either DISABLED or ENABLED. Toggle between these settings by selecting CE on the SCS console keypad.
- **Left** - Displays the status of the left boom. This setting is either DISABLED or ENABLED. Toggle between these settings by selecting CE on the SCS console keypad.

- **Center Rk** - Displays the status of the center rack control. These settings are either ENABLED or DISABLED. Toggle between these settings by selecting CE on the SCS console keypad.

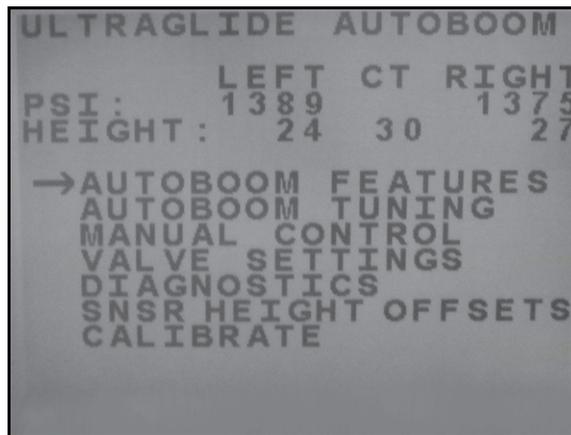
**Note:** *The machine must be equipped with the center rack ultrasonic sensor and center rack control cabling to enable this function.*

- **Slant** - Displays the status of slant control, if equipped. These settings are either ENABLED or DISABLED. Toggle between these settings by selecting CE on the SCS console keypad.
- **Height Setting** - Displays the target center rack height that AutoBoom is going to maintain during operation. To adjust this setting, arrow down to this option and select ENTER. Use the up and down arrows on the SCS console keypad to change the value. When the desired value is displayed, select ENTER.

## Setup Tools

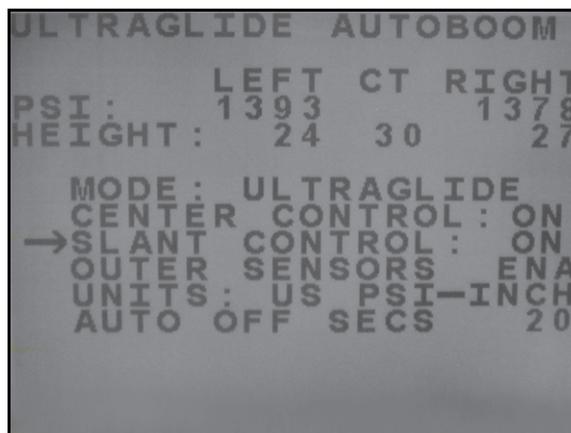
**Note:** *To access the AutoBoom Setup screen, press the down arrow button in the AutoBoom Main Menu screen until the AutoBoom Setup screen appears as shown in Figure 2 below.*

FIGURE 2. Setup Screen



Setup tools allow fine-tuning of stability control, slant gain (if equipped), minimum boom pressure, and sensor height offset parameters in the AutoBoom system. To access these tools, press the DATA MENU button until the AutoBoom Main Menu is displayed, then use the arrow keys to select the desired feature.

FIGURE 3. AutoBoom Features Screen



- **AutoBoom Features**

- **MODE** - Allows the operator to switch between the PowerGlide Plus and UltraGlide modes.
- **CENTER CONTROL** - Allows the operator to enable center rack control. This setting is either ON or OFF. Toggle between these settings by selecting CE on the SCS console keypad.

**Note:** *The machine must be equipped with the center rack ultrasonic sensor and center rack control cabling to enable the center rack control function.*

- **SLANT CONTROL** - Allows the operator to enable slant control, if equipped. This setting is either ON or OFF. Toggle between these settings by selecting CE on the SCS console keypad.
- **OUTER SENSORS** - Allows the operator to disable outer boom sensors if the machine is equipped with optional inside boom sensors. This feature is useful when the outer boom tips are folded in and not able to control.

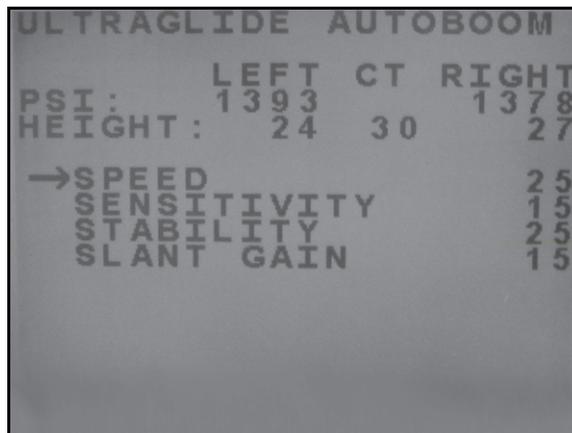
**Note:** *The system must be re-calibrated when the Outer Sensors option is disabled, then re-enabled.*

- **UNITS** - Allows the operator to select the desired units of measure.

**Note:** *Units must be changed on the SCS console before changing the units of measure in the AutoBoom system. Refer to the SCS 4000/5000 Series Consoles Installation & Operation Manual for information on changing the console units of measure.*

- **AUTO OFF SECS** - The setting is the amount of time (in seconds) in which the AutoBoom system will be automatically shut off when either the master switch or all boom sections are turned off. Upon turning the master switch or a boom switch back on, AutoBoom is automatically turned on with all booms disabled. This value can be set from 0 to 240 seconds. A setting of 0 disables the Auto Off Secs feature.

FIGURE 4. AutoBoom Tuning Screen



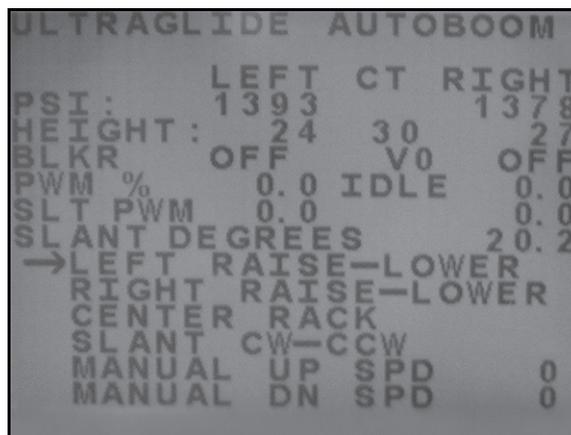
- **AutoBoom Tuning Screen** - The AutoBoom tuning screen is available in the UltraGlide system only.

- **SPEED** - The Speed setting allows the operator to adjust the rate at which the booms raise and lower. The Speed setting should be set so that the boom motion is smooth and does not oscillate.
- **SENSITIVITY** - The Sensitivity setting allows the operator to adjust the sensitivity level of the sensors. If the Sensitivity setting is too high, the boom will appear unstable and jittery, reacting to slight changes in the target height or grass movement.
- **STABILITY** - The Stability setting allows fine-tuning of the rigidity of the machine's center rack. The default value of 20 is recommended for machines with a rigid center rack. A value of 5 - 14 is recommended for machines with center racks that float freely. Adjust this value as needed to prevent boom oscillation.



- Stability settings of 0 disable the stability control completely, making the left and right booms completely independent of each other. When above target, the control of both booms is accelerated to increase the down speed. This setting is useful for machines that have a rigid center rack.
- Stability settings of 1 - 99 will adjust the stability of the center section. Lower numbers cause the opposing boom that is not being controlled to counteract the movement of the controlled boom by raising to balance or stabilize the center section and to prevent undesired rotation or movement. While lower numbers allow the booms to react at the same rate and time, low settings may prevent the booms from lowering. Higher stability settings allow the booms to react independently from each other, but may cause the center section to oscillate, diminishing performance.
- o **SLANT GAIN** (if equipped with slant feature enabled) - Allows fine-tuning of the allowable rotation of the center section suspension. The default value is 10. A higher number will apply more pressure to the slant control cylinders when the chassis is maneuvering over challenging terrain.

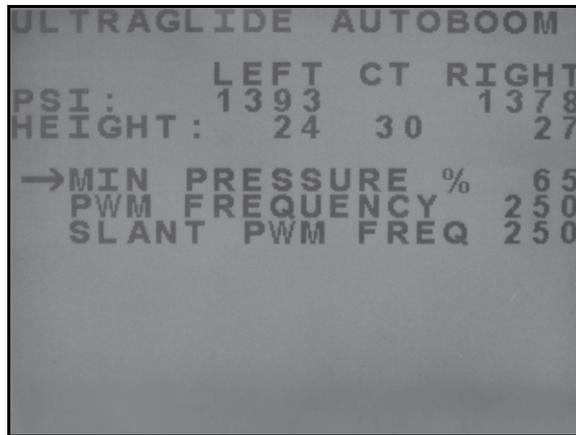
FIGURE 5. Manual Control Screen



- **Manual Control Screen** - This page allows the status of all AutoBoom inputs and outputs to be viewed on the SCS display.
  - o **PSI** - Displays the actual pressure in the left and right boom cylinders at all times.
  - o **HEIGHT** - Displays the individual sensor heights relative to the ground, adjusted for the values entered in the Sensor Height Offsets.
  - o **BLKR** - Indicates the status of the double-blocker output.
  - o **PWM %** - Indicates the duty cycle to the proportional valves. This value will be 0 if the individual booms are disengaged, and will vary in output up to 100 when AutoBoom is engaged and the system is operating.
  - o **SLT PWM** - Indicates the duty cycle of the slant control proportional valves, if equipped. This value will be 0 if the slant control is not enabled, and can vary in output up to 100 when slant control is engaged and operating. A minimum value will be maintained when the slant control system is enabled, and move slightly when the boom is re-centering.
  - o **SLANT DEGREES** - Indicates the degrees of detected rotation of the machine's boom relative to the chassis. This value will be nearly zero when the boom suspension is centered, and will change when the boom is rotated relative to the machine's chassis.
  - o **LEFT and RIGHT RAISE-LOWER** - Allows the left and right booms to be raised and lowered via the SCS console.
  - o **CENTER RACK SLANT CW-CCW** - Allows the operator to manually rotate the boom clockwise or counterclockwise relative to the machine's chassis using the machine's hydraulic valve if the machine is equipped with slant control. This function can be used to troubleshoot wiring or hydraulic issues.

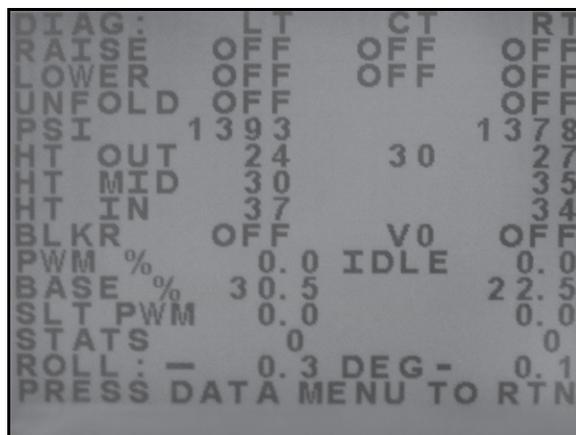
- **MANUAL UP** and **DN SPD** - Allows the speed at which the AutoBoom hydraulic valve raises and lowers the booms to be adjusted on machines that do not have their own hydraulic control. Since most machines are equipped to hydraulically control boom functions, the default setting is 0.

FIGURE 6. Valve Settings Screen



- **MIN PRESSURE %** - Sets a low limit pressure, preventing the boom pressure from falling below a percentage of static pressure, overriding the control when necessary to maintain a low limit of pressure on each boom. Minimum Pressure% also prevents the booms from resting on the stops for travel-limited booms.
- **PWM FREQUENCY** - Sets the frequency of the PWM signal to the proportional control valve. The default value is 250 Hz. This value is automatically detected during calibration and should not be adjusted.
- **SLANT PWM FREQUENCY** - Sets the frequency of the PWM signal to the slant proportional control valve, if equipped. The default value is 250 Hz. This value is automatically detected during calibration and should not be adjusted.

FIGURE 7. Diagnostics Screen

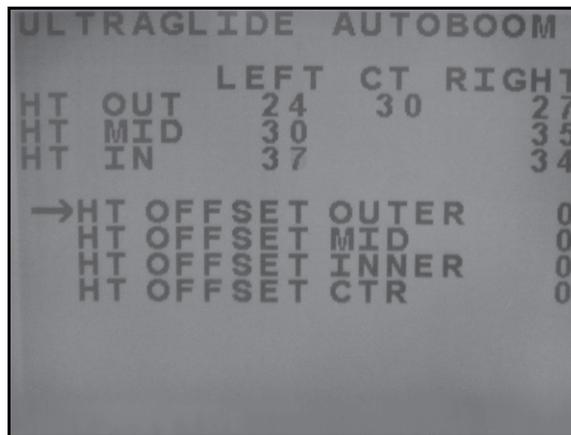


- **AutoBoom Diagnostics** - This page allows the status of all AutoBoom inputs and outputs to be viewed on the SCS display.
  - **RAISE** and **LOWER** - Indicate the status of the boom switches. When using the machine's manual control functions, the corresponding boom switch will indicate On.
  - **UNFOLD** - Indicates the status of the unfold proximity switch (if equipped).
  - **PSI** - Displays the actual pressure in the left and right boom cylinders at all times.



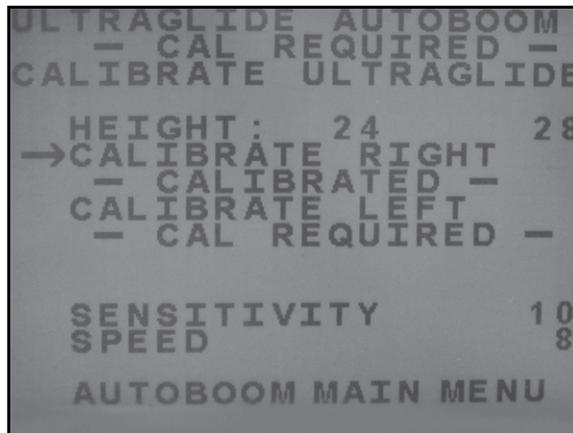
- **HT OUT, MIN, and IN** - Displays the individual sensor heights relative to the ground, adjusted for the values entered in the Sensor Height Offsets.
- **BLKR** - Indicates the status of the double-blocker output.
- **PWM %** - Indicates the duty cycle to the proportional valves. This value will be 0 if the individual booms are disengaged, and will vary in output up to 100 when AutoBoom is engaged and the system is operating.
- **BASE %** - Indicates the system's calculated duty cycle to maintain the set height or pressure. This number will typically change slowly from 0 - 5 points during routine operation.
- **SLT PWM** - Indicates the duty cycle of the slant control proportional valves. It also allows the operator to view the duty cycle of the slant control proportional valves while rotating the boom via the Manual Slant Control icons. This value will be 0 if slant control is not enabled and can vary in output up to 100 when slant control is engaged and operating. A minimum value will be maintained when slant control is enabled.
- **STATS** - Reflects the boom performance. This value is for Raven use only.
- **ROLL** - Indicates the measured chassis roll rate. This value will change when the machine chassis is rolling left or right.
- **DEG** - Indicates the degrees of detected rotation of the machine's boom relative to the chassis. This value will be nearly zero when the boom suspension is centered, and will change when the boom is rotated relative to the machine's chassis.

FIGURE 8. Sensor Height Offsets Screen



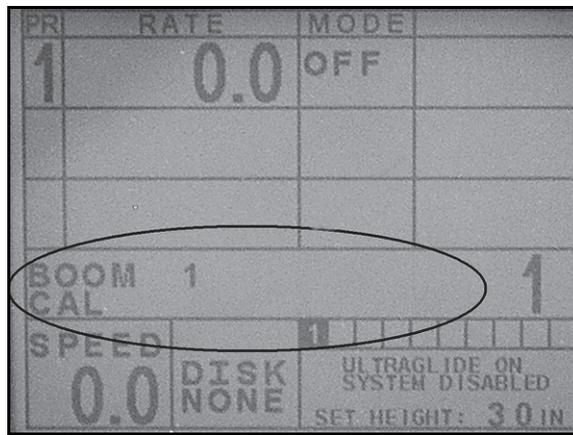
- **Sensor Height Offsets Screen** - Allows sensor heights to be adjusted according to the mounting location. Enter a positive value if the sensors are mounted above the sprayer tips, and a negative value if the sensors are mounted below. Refer to the *Ultrasonic Sensor Height Offsets* section on page 92 for more information.

FIGURE 9. Calibration Screen



- **Calibration Screen** - Used to calibrate the AutoBoom system. Refer to *Calibration* section on page 81 for more information.

## Alarms



Alarm tones will not sound if the operator is navigating through any of the configuration menus. However, the enable/disable alarms will always sound when appropriate. The SCS console will display the following errors below the product control/above the speed section when an error exists.

**Note:** Alarms can occur for left or right booms independently. The boom experiencing the error will be indicated by LT for the left boom and RT for the right boom.

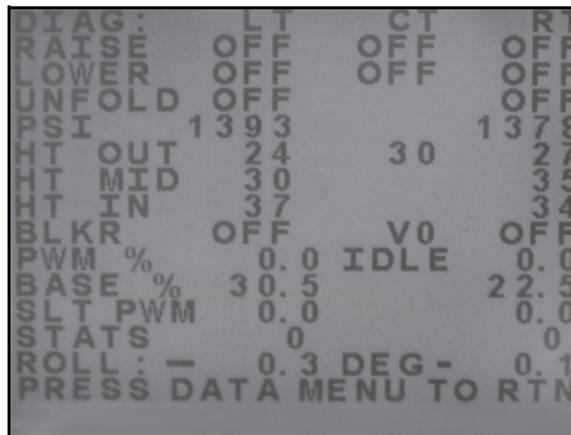
- **LOW PRESSURE ALARM (PowerGlide Plus mode only)** - The pressure alarm occurs if the pressure is detected at a level lower than the alarm set point. The pressure alarm is a steady tone, and will continue to sound for one second after the pressure rises above the set point.
- **LT/RT UNFOLD TO ENAB BOOM** - This alarm occurs if a boom is not completely folded but is enabled. The boom will be disabled after five seconds. The machine must be equipped with proximity sensors for this alarm to occur. It may also occur if the center sensor is greater than 60 inches off the ground, or it does not receive an echo from the ground.
- **CHK AUTOBM HC VOLTAGE** - This alarm occurs if the node senses a low voltage supply to the node. Check the power and ground wiring to the node.
- **ULTRASONIC FAILURE** - The pressure sensor failure alarm occurs immediately when a pressure sensor is not detected. The alarm is a steady tone, and will stop immediately after the sensor is located.

- **LOW ULTRASONIC SEN** - This alarm occurs if the ultrasonic sensor is closer than ten inches to the ground for 1/2 a second. The alarm will continue to sound for three seconds.
- **HI ULTRASONIC SENS** - This alarm occurs when the ultrasonic sensor is higher than 65 inches from the ground for five seconds. The alarm will continue to sound for one second.
- **CENTER ROTATION SENSOR OUT OF RANGE** - This alarm occurs when the center rotation is out of the calibrated range. This alarm is a steady tone, and will stop immediately when the sensor is in the calibrated range.
- **CENTER ROTATION SENSOR FAILURE** - Occurs when there is no signal from the rotation sensor when slant control is enabled, if equipped. This alarm is a steady tone, and will stop immediately when the center rotation sensor signal is detected.
- **Other tones** - When enabling the AutoBoom system in automatic mode via the machine's boom control functions or switches, a single beep will occur. When disabling AutoBoom, a double beep will sound.

## AutoBoom Pre-Calibration Diagnostics

While every effort has been made to properly label and document connections for the hydraulic and electrical components of the AutoBoom system, boom function connections may not be identified due to changes in the make and model of the machine. This makes it especially important to trace the hoses from the connection points and verify the electrical connections are correct to ensure proper AutoBoom system operation. In order to verify connections, it is necessary to perform a pre-calibration diagnostic test.

FIGURE 10. Diagnostics Screen



1. Navigate to the **Diagnostics** screen on the SCS console as shown above.
2. Verify that the following components on the SCS console screen are displayed correctly and change when raising and lowering the booms via the machine's controls and the AutoBoom manual functions:
  - Pressures
  - Sensor heights
  - Right and left raise/lower functions
  - Center raise/lower functions
  - Fold/unfold functions
  - Slant rotation clockwise/counterclockwise (if equipped)

## PowerGlide Plus

The PowerGlide Plus AutoBoom system uses gauge wheels to maintain optimum boom height, while state-of-the-art hydraulics maintain constant hydraulic pressure to the tilt cylinders. PowerGlide Plus systems are typically used in pre-emergence applications.

**Note:** *Terrain conditions and the machine's hydraulic system dictate the actual speeds that can be achieved during application with an engaged AutoBoom system. Typically, rougher and varied field terrain require slower speeds while AutoBoom is enabled.*

## Calibration

### Boom Calibration

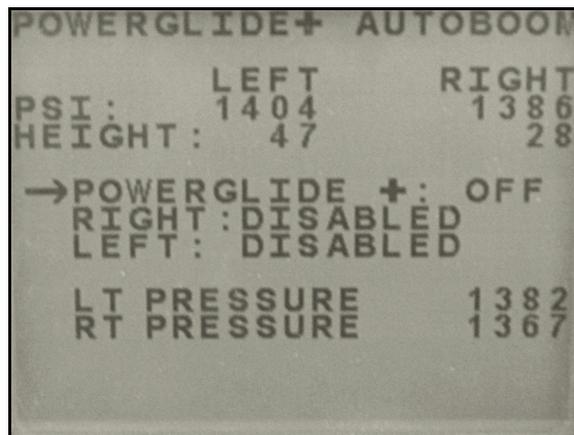
After the AutoBoom installation is complete, it is necessary to calibrate the computer and vehicle before use. AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the system to find the system base duty cycles for operation. Booms must be free to travel 10" up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

1. Press the DATA MENU button on the SCS console keypad until the AutoBoom Main Menu is displayed.

FIGURE 11. AutoBoom Main Menu



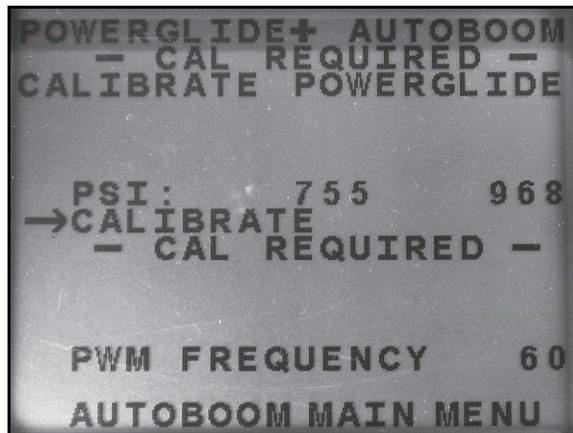
2. Press the CE button to toggle PowerGlide + to ON.
3. Verify that the booms are unfolded, and lower the center rack so that the wheels are approximately six inches from the ground.

**Note:** *If the booms do not go over center or are travel-limited, raise the booms so that the boom tips are approximately ten inches above the horizontal position and lower the center section slightly below the normal spraying height.*

4. Press the arrow down button to move the cursor to CALIBRATE and select ENTER.

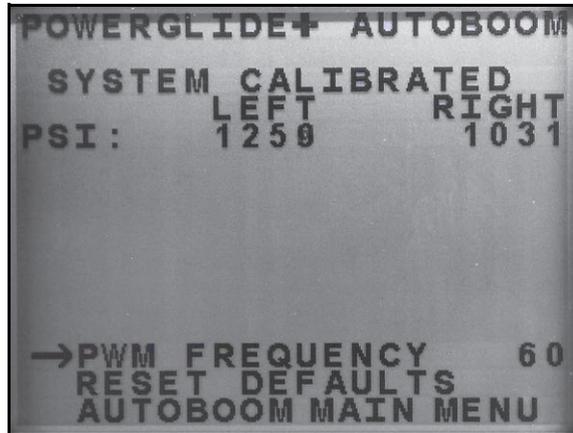


FIGURE 12. Calibration Screen



5. Press the ENTER button on the SCS console to begin calibration.

**Note:** The calibration process may take several seconds to complete. “Calibrating” will flash, indicating that calibration is in progress. If the boom fails to calibrate, press ENTER to stop the calibration process and refer to Chapter 7, Troubleshooting on page 119. Once the boom calibration is complete, the following screen will appear:



**Note:** The PWM Frequency will display 60 as the value if the AutoBoom valve has square coils, and 250 if the valve has round coils.

6. Press the arrow down button twice to return to the AutoBoom Main Menu.

### Center Rack Control Calibration (If Equipped)

There are many different valve configurations used to control the machine’s center rack functions. The AutoBoom system must “learn” which of the machine’s solenoids are used to raise and lower the booms. Complete the following steps to calibrate the center rack control feature after the individual booms have been calibrated.

1. Press and hold the center rack raise button on the machine’s control panel or joystick for six seconds so that the center rack raises.

**Note:** The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.

2. Press and hold the center rack lower button on the machine's control panel or joystick for six seconds so that the center rack lowers.

**Note:** *The center rack may reach the lower limit of travel during this time, but continue holding the button until the full six seconds has passed.*

## Resetting Calibration

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the calibration of the AutoBoom system. System calibration will be required after the AutoBoom system calibration has been reset.

1. From the Calibration menu, use the arrow buttons to navigate to RESET CALIBRATION.
2. Press the ENTER button on the SCS console to reset the AutoBoom calibration.

## Routine Operation

### Joystick Functions

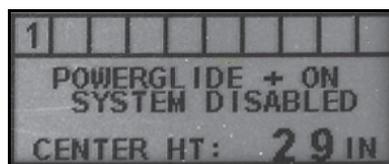
- When AutoBoom control is on, control of each boom can be enabled or disabled via the SCS console or by tapping the sprayer's switch functions (if equipped).

**Note:** *Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.*

- A single up-tap on the sprayer's switch functions disables AutoBoom on that boom.
- A single down-tap on the sprayer's switch functions enables AutoBoom on that boom.
- The fast-down feature (double-tap down) is used to quickly lower the booms when the pressure setting is set to a higher setting, which causes the booms to lower slowly.
  - On machines with one proportional valve (square coils on the AutoBoom valve), a double-tap up will raise both booms slightly. A double-tap down will lower both booms quickly, and AutoBoom will re-engage to the set pressure setting.
  - On machines with two proportional valves (round coils on the AutoBoom valve), a double-tap up on the inside boom will raise only that boom slightly. A double-tap down will lower the one boom quickly, and AutoBoom will re-engage to the set pressure setting.

### Enabling AutoBoom via the SCS Console

FIGURE 13. AutoBoom Status Display

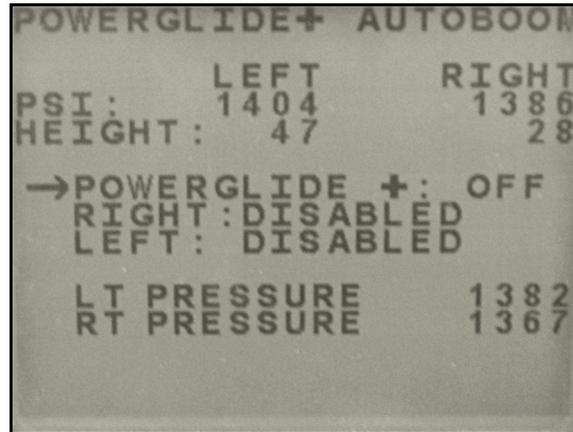


The status of the AutoBoom system is displayed in the lower-right corner of the SCS console display. The status details displayed are:

- The type of AutoBoom system installed and whether it is powered on or off.
- The status of the AutoBoom system (enabled or disabled).
- Center rack height (if equipped with center rack control).

1. Press the DATA MENU button to navigate to the AutoBoom Main Menu.

FIGURE 14. AutoBoom Main Menu



2. Select POWERGLIDE + and use the CE button to toggle the setting to ON.

**Note:** *The AutoBoom system is now powered on, but the booms are disabled.*

3. Press the down arrow to navigate to the RIGHT boom setting.
4. Press the ENTER button to select the RIGHT boom setting.
5. Press the down arrow to enable the RIGHT boom setting.
6. Repeat the steps above to enable the LEFT boom setting.

**Note:** *AutoBoom can be disabled by selecting the boom settings and pressing the up arrow.*

### Boom Adjustments When Approaching Headlands

When approaching the headlands to make a turn, the gauge wheel must be raised approximately six inches from the ground to prevent it from sliding sideways or backward, causing damage to the gauge wheel assembly. The fast-down feature may be used in this situation.

### Center Rack Control (AutoBoom Enabled and Center Rack Control On) - If Equipped

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, and enable both booms.
- **Center Up Switch** - A single up-tap will disable the center rack and both booms. Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.

- Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

**Center Rack Control (AutoBoom Enabled and Center Rack Control Off) - If Equipped**

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable both booms.

**Note:** *Center rack control will not be enabled since center rack control is off.*

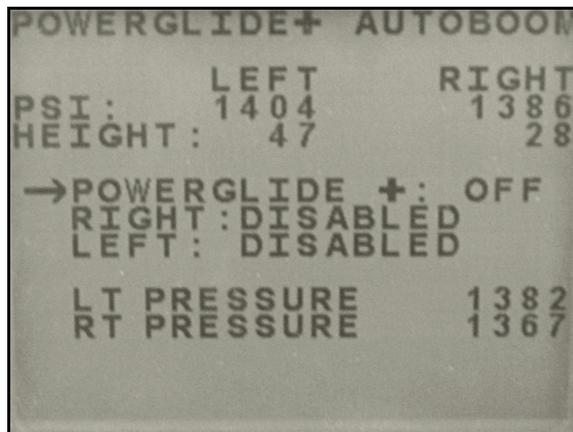
- **Center Up Switch** - Two consecutive up-taps will disable both booms and raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

**System Adjustments**

During the calibration process, the AutoBoom system calculates a default pressure setting. Normally, the calculated value will be the level at which the machine should operate. However, at times an adjustment to the Pressure Setting may be necessary.

**Note:** *During routine operation, the gauge wheels should touch down momentarily, raise slightly, then lower back to the target height. Wheels should not continuously ride on the ground.*

FIGURE 15. Pressure Settings



1. Press the DATA MENU button on the SCS console keypad until the AutoBoom Main Menu is displayed.
2. Use the down arrow to navigate to LEFT DISABLED and press the ENTER button to enable the left boom.
3. Use the arrow down button to navigate to LT PRESSURE.
4. Press the ENTER button.
5. Use the arrow up or down buttons to adjust the LT PRESSURE setting to the desired value.
6. Press ENTER when the desired value is reached.
7. Repeat the steps above to adjust the RIGHT PRESSURE setting.
8. Exit the cab and physically lift the end of each boom up, watching the responsiveness of the booms.

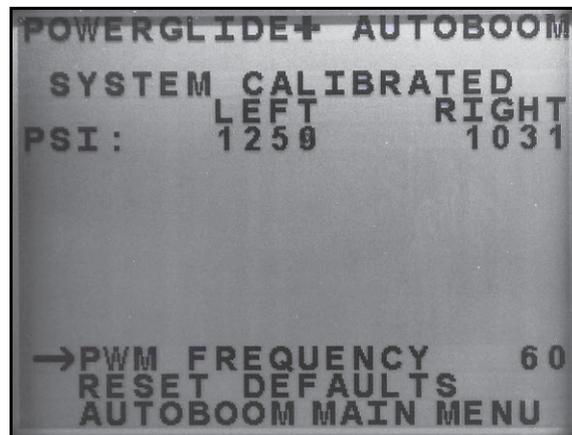
**Note:** The force required by the operator to lift the boom should never exceed 200 lbs.

9. Select **YES** to reset the AutoBoom system, or **NO** to return to the calibrations screen.

## Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

FIGURE 16. PowerGlide Plus Calibration Screen



1. From the Calibration menu, use the arrow buttons to navigate to RESET DEFAULTS.
2. Press the ENTER button on the SCS console to reset the AutoBoom settings.
3. Turn off the SCS console and the machine's power.
4. Turn on the machine and the SCS console.

# UltraGlide

## Calibration

### Boom Calibration

After the AutoBoom installation is complete, it is necessary to calibrate the system before use. AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the system to find the system base duty cycles for operation. Booms must be free to travel 10" up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

**Important:** *Be sure that the area is clear of people and obstructions before beginning the calibration process.*

1. Move the machine to a flat area.
2. Verify that AutoBoom is turned on.
3. Verify that the booms are unfolded, and lower the center rack.

**Note:** *If the booms do not go over center or are travel limited, raise the booms so that the boom tips are approximately ten inches above the horizontal position and lower the center section to approximately 20 inches.*

4. Using a tape measure, measure the distance from the bottom of the sensor to the spray nozzle tip.
5. Access the AutoBoom Setup screen.
6. Adjust the vertical sensor height offset settings in the SCS console to sensor position as measured in step 4.
  - Positive offsets indicate the sensor surface is located above the nearest spray tips.
  - Negative offsets indicate the sensor surface is located below the nearest spray tips.
  - Inner, mid, outer, and center offsets are not required to be the same across the width of the machine, but they must be correctly measured relative to the spray tips.
7. Lower the center rack section to approximately 20 inches.

**Note:** *If the machine is equipped with a center sensor, the center rack height can be verified through the main menu or diagnostics screen in AutoBoom section of the SCS console.*

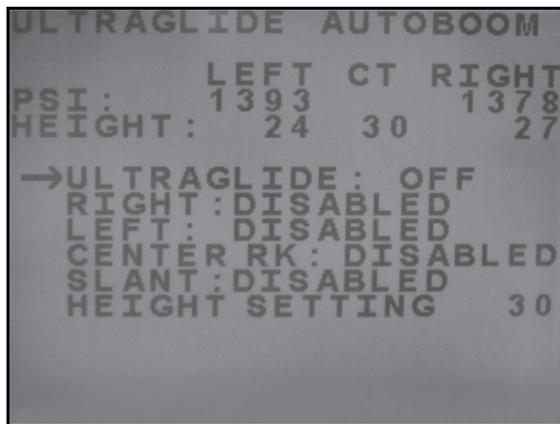
8. Raise the boom tips to approximately the target height.

**Note:** *The default target height is 30 inches. Verify that the booms are not fully raised to the boom stops. If gauge wheels are installed, the setting must be adjusted to 40 - 45 inches to prevent the wheels from touching the ground during system calibration.*

9. Press the **DATA MENU** button on the SCS console keypad until the AutoBoom Main Menu is displayed.

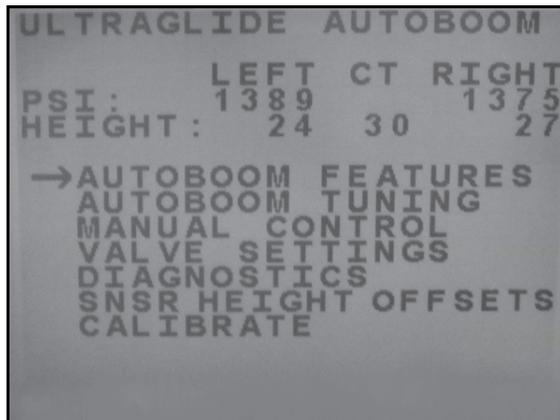


FIGURE 17. AutoBoom Main Menu



10. Press the **CE** button to toggle UltraGlide to ON.

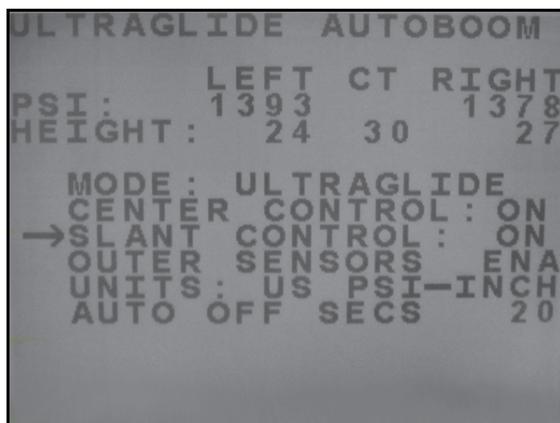
FIGURE 18. AutoBoom Setup Screen



11. Press the down arrow on the SCS console keypad to access the AutoBoom Setup screen.

12. Press **ENTER** on the AUTOBOOM FEATURES line.

FIGURE 19. AutoBoom Features Screen



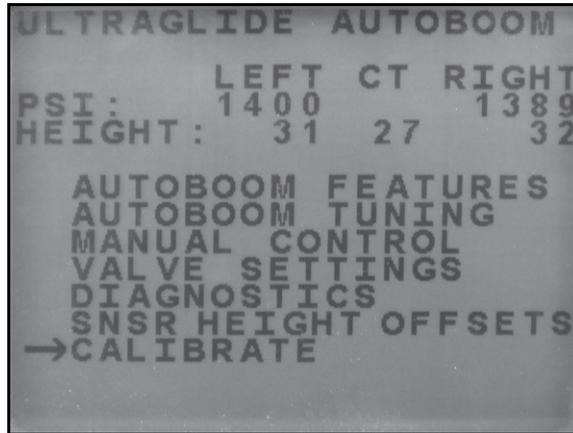
13. Verify that SLANT CONTROL is set to ON (if applicable).

- Verify that the booms are unfolded, and lower the center rack so that the wheels are approximately six inches from the ground.

**Note:** *If the booms do not go over center or are travel-limited, raise the booms so that the boom tips are approximately ten inches above the horizontal position and lower the center section slightly below the normal spraying height.*

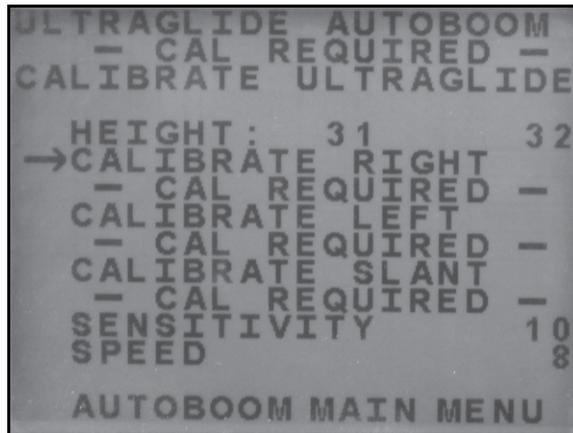
- Press the up arrow on the SCS console keypad to access the AutoBoom Setup screen.

FIGURE 20. Calibration Screen



- Press the arrow down button to move the cursor to CALIBRATE and press **ENTER**. The following screen will appear:

FIGURE 21. Calibration Screen



- Press the arrow down button to move the cursor to CALIBRATE RIGHT.
- Press the **ENTER** button on the SCS console to begin calibration.

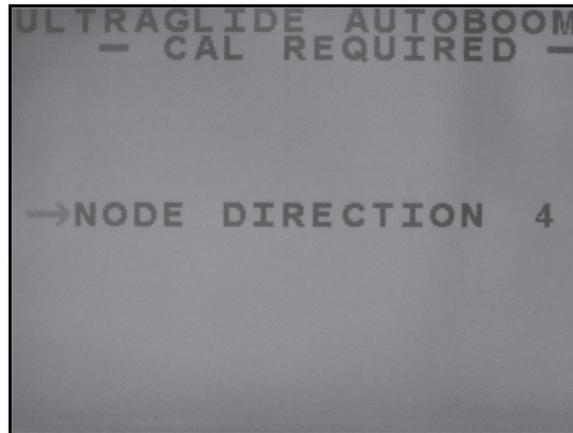
**Note:** *The message “Calibrating” will appear during the system calibration. The calibration process may take several seconds to complete. If the boom fails to calibrate, press ENTER to stop the calibration process and refer to Chapter 7, Troubleshooting on page 91.*

- Press the arrow down button to move the cursor to CALIBRATE LEFT.
- Press the **ENTER** button on the SCS console to begin calibration.
- Press the arrow down button to move the cursor to CALIBRATE SLANT (if applicable).



22. Press **ENTER**.

FIGURE 22. Node Direction Screen



23. Enter the number of the direction arrow on the node that is pointing forward.

24. Press **ENTER**.

**Note:** *The boom tips may raise automatically to allow for full rotation of the center section. Pressure in one slant cylinder will increase until the center section begins to rotate slightly (if applicable). The center section will then rotate fully clockwise then counterclockwise to calibrate the center rotation sensor position.*

**Note:** *The center rotation sensor may be re-centered by recalibrating the slant control (if applicable) or by manual adjustment of the centering bolt while the center section is confirmed to be in the center position.*

### Center Rack Raise/Lower Calibration

There are many different valve configurations used to control the machine's center rack functions. The AutoBoom system must "learn" which of the machine's solenoids are used to raise and lower the booms. Complete the following steps to calibrate the center rack control feature after the individual booms have been calibrated.

1. Press and hold the center rack raise button on the machine's control panel or joystick for six seconds so that the center rack raises.

**Note:** *The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.*

2. Press and hold the center rack lower button on the machine's control panel or joystick for six seconds so that the center rack lowers.

**Note:** *The center rack may reach the lower limit of travel during this time, but continue holding the button until the full six seconds has passed.*

## Routine Operation

### Joystick Functions

When AutoBoom control is on, control of each boom can be enabled or disabled via the SCS console or by tapping the sprayer's switch functions (if equipped).

**Note:** Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.

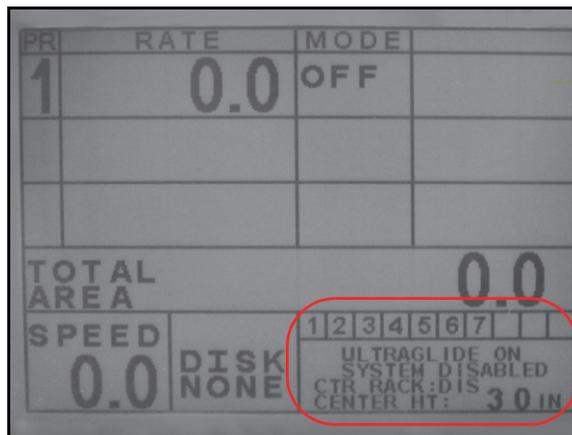
- A single up-tap on the sprayer's switch functions disables AutoBoom on that boom.
- A single down-tap on the sprayer's switch functions enables AutoBoom on that boom.

### Enabling AutoBoom via the SCS Console

The status of the AutoBoom system is displayed in the lower-right corner of the SCS console display. The status details displayed are:

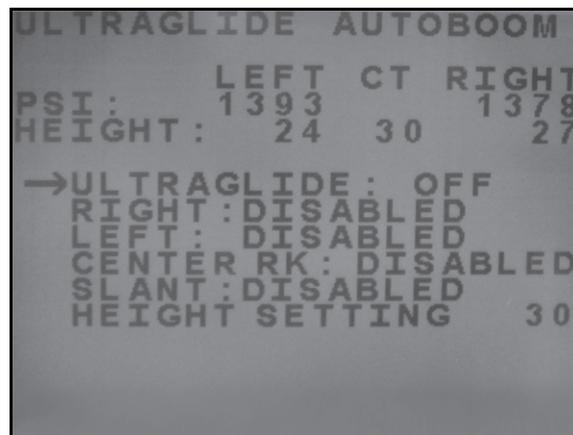
- The type of AutoBoom system installed and whether it is powered on or off.
- The status of the AutoBoom system (enabled or disabled).
- Center rack height (if equipped with center rack control).

FIGURE 23. AutoBoom Status Display



1. Press the DATA MENU button to navigate to the AutoBoom Main Menu.

FIGURE 24. AutoBoom Main Menu



2. Select ULTRAGLIDE and press the **CE** button to toggle the setting to ON.

**Note:** The AutoBoom system is now powered on, but the booms are disabled.

3. Press the down arrow to navigate to the RIGHT boom setting.
4. Press the **ENTER** button to select the RIGHT boom setting.
5. Press the down arrow to enable the RIGHT boom setting.
6. Repeat the steps above to enable the LEFT, RIGHT, CENTER RK, and SLANT settings (if applicable).

**Note:** AutoBoom can be disabled by selecting the boom settings and pressing the up arrow.

### Boom Adjustments When Approaching Headlands (If Equipped with Gauge Wheels)

When approaching the headlands to make a turn, the gauge wheel must be raised approximately six inches from the ground to prevent it from sliding sideways or backward, causing damage to the gauge wheel assembly.

### Center Rack Control (AutoBoom Enabled, Slant Control On - if equipped, and Center Rack Control On)

**Note:** The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

**Note:** Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

**Note:** Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- **Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, slant control (if equipped), and both booms.
- **Center Up Switch** - A single up-tap will disable the center rack, slant control (if equipped), and both booms. Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.

- Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Center Rack Control (AutoBoom Enabled and Center Rack Control Off )

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable slant control (if equipped) and both booms.

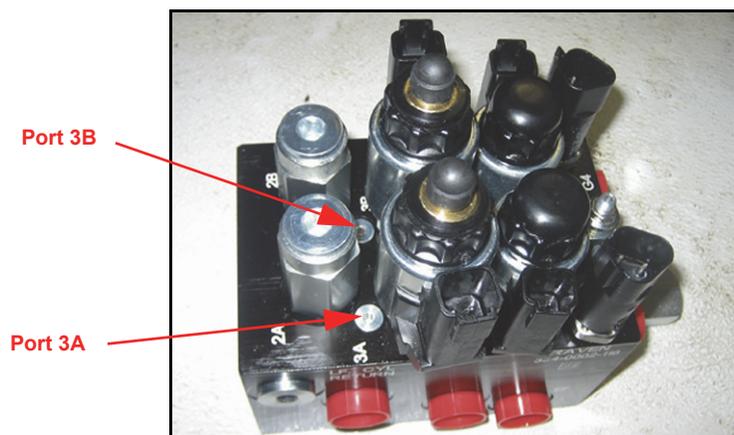
**Note:** *Center rack control will not be enabled since center rack control is off.*

- **Center Up Switch** - Two consecutive up-taps will disable slant control (if equipped) and both booms, and raise the center rack to the desired transport height. four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Operating the System in PowerGlide Plus Mode

To operate the AutoBoom system in PowerGlide Plus mode, it is necessary to remove orifice fittings from the AutoBoom valve. Failure to remove these fittings from the valve will restrict the down speed of the booms when the system is enabled.

FIGURE 25. Port 3A and 3B Location



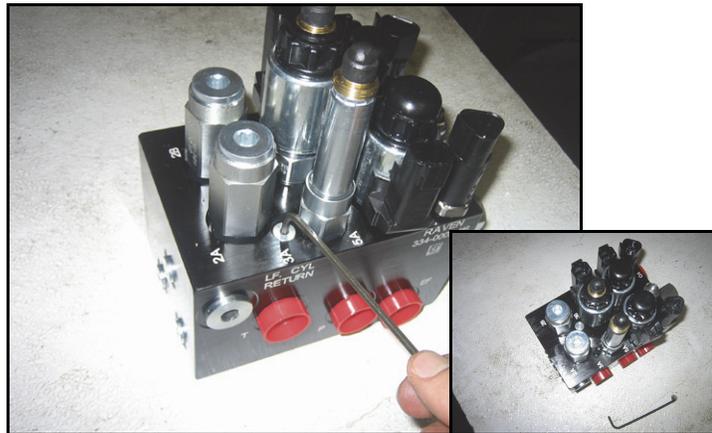
1. Locate Ports 3A and 3B on the AutoBoom valve.

FIGURE 26. Coil Removed from the AutoBoom Valve



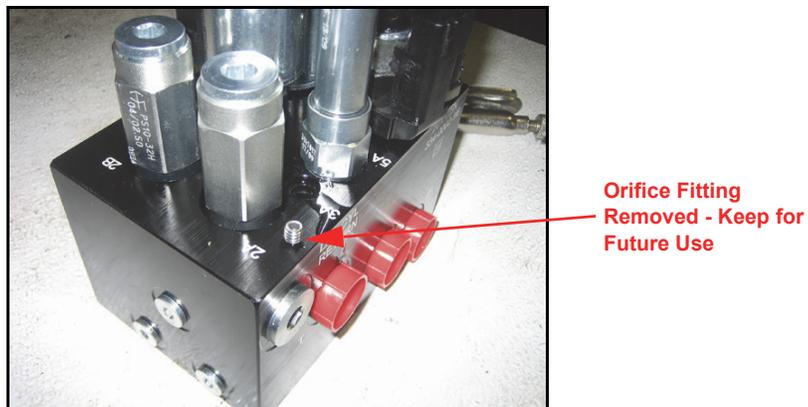
2. Remove the coils from the solenoids near Ports 3A and 3B to gain easy access to those ports.

FIGURE 27. Port Plugs Removed from the AutoBoom Valve



3. Use an Allen wrench to remove the plugs from Ports 3A and 3B.

FIGURE 28. Orifice Fitting Removed from the AutoBoom Valve



4. Remove the orifice fittings from Ports 3A and 3B.

**Important:** Tip the AutoBoom valve on its side and use the Allen wrench to remove the orifice from the cavity, taking care not to let the fitting fall into the valve.

FIGURE 29. Port Plug Reinstalled on the AutoBoom Valve



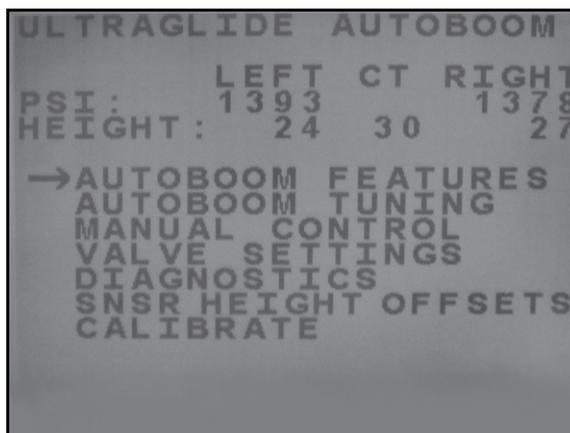
5. Use the Allen wrench to reinstall the port plugs on Ports 3A and 3B of the AutoBoom valve.

FIGURE 30. Coil Reinstalled on the AutoBoom Valve



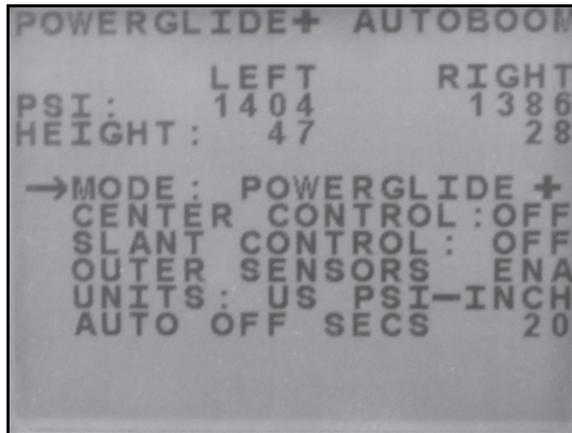
6. Reinstall the coils on the solenoids of the AutoBoom valve.

FIGURE 31. AutoBoom Features Screen

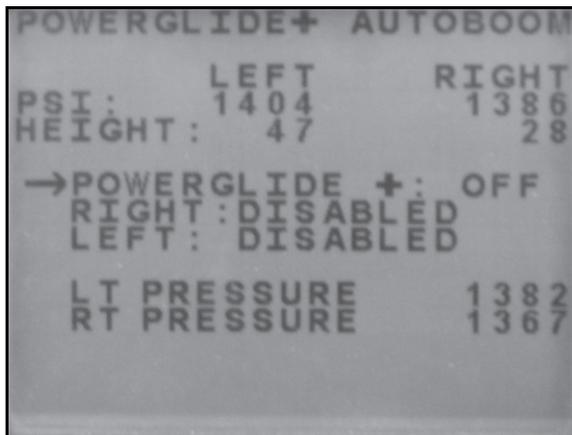


7. In the AutoBoom Main Menu, arrow down to AUTOBOOM FEATURES.

FIGURE 32. PowerGlide Plus Mode Selected



8. Arrow down to select MODE and press the **CE** button to toggle the setting to run in the PowerGlide + mode. The following screen will appear:



**Note:** When converting the AutoBoom system back to UltraGlide, the SCS console must be reprogrammed to run in the UltraGlide mode.

## System Adjustments

**Note:** AutoBoom must be enabled after both booms have been calibrated in order to make system adjustments.

### Speed

The Speed setting controls how fast the boom will move away from an obstacle, and how much the boom overshoots the target height. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. Adjust the Speed setting as needed so that boom raise rates match hand movement rates, but so that the booms don't overreact and become unstable.

1. Place one hand at ground level below one boom sensor and raise it quickly (about two feet per second) to within 12" of the sensor surface.

**Note:** *The boom should react immediately and adjust at a raise speed matching the hand movement, overshooting the new target height by one foot or less.*

2. Adjust the Speed setting as needed.

**Note:** *The default setting is 25. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. The typical Speed setting that works best for most machines is 22 - 27, but can vary depending on the static pressures of the boom, boom geometry, and the Sensitivity settings.*

### Sensitivity

1. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface.

**Note:** *The boom should react immediately when your hand is approximately 6" from the ground.*

2. Adjust the Sensitivity setting as needed to make the boom more or less reactive to hand motions.

**Note:** *The default setting is 15. If the Sensitivity is too high, the boom will appear unstable and jittery, reacting to slight changes in target height or crop movement. During routine operation, AutoBoom should be unresponsive to changes in height of 2" - 3", but should react quickly to changes of 5" or more.*

*The typical Sensitivity setting for most machines with a 30" target spray height is 13 - 17. For target spray heights less than 25", lower the sensitivity setting and for target heights greater than 40", raise it.*

*For row-crop situations, or when crop conditions are sparse and not fully covering the ground, it may be beneficial to decrease the sensitivity so the boom is less reactive to sudden changes in crop height, and less likely to cause sudden movements that diminish performance.*

### Stability

1. Place one hand at ground level below one boom sensor and raise it quickly (about two feet per second) to within 12 inches of the sensor surface, while observing the movement of the opposite boom.

**Note:** *The opposite boom should raise slightly (usually no more than six inches) simultaneously.*

2. Adjust the Stability setting to minimize movement of the opposite boom.

**Note:** *Lower the Stability value to make the opposite boom more rigid, but keep the number high enough to allow for natural movement of the boom without affecting the chassis roll.*

### Slant Gain

Allows fine-tuning of the allowable rotation of the center section suspension, if equipped. Higher Slant Gain values cause the slant control to react more aggressively when chassis roll is sensed by the node and can cause the boom to be excessively rigid, possibly causing damage to the center rack. Lower Slant Gain values cause the slant control to be less aggressive and can cause the system to be unreactive, not controlling the suspension based on the chassis roll.

1. Take the machine to the field and observe the rotation of the center section suspension with the AutoBoom system on and left, right, and slant enabled.

2. Adjust the Slant Gain setting to cause the slant control to be more or less reactive.

**Note:** *The default setting is 10.*

### Min Press%

**Note:** *On machines with travel-limited booms, operate the AutoBoom system with center rack control enabled, or with the center sensor at or slightly below the target height to prevent the booms from continuously entering the Min Press % mode. This mode is for boom emergency protection only, and AutoBoom system should not be run in this mode during routine operation.*

1. Raise the center rack section to the target height, so that the booms and center rack are horizontal.
2. Enable the AutoBoom system.
3. Locate the Min Press% setting in the AutoBoom control menus.

**Note:** *The default setting is 65.*

4. Increase the Min Press% value to approximately 80.
5. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface, or until the boom travels up approximately three feet higher than the original target.
6. Pull hand away, and verify that the booms lower slowly after a slight delay.

**Note:** *If the booms do not lower, decrease the Min Press % setting value by one and repeat the steps above. Continue performing the Min Press % test until the booms begin to lower.*

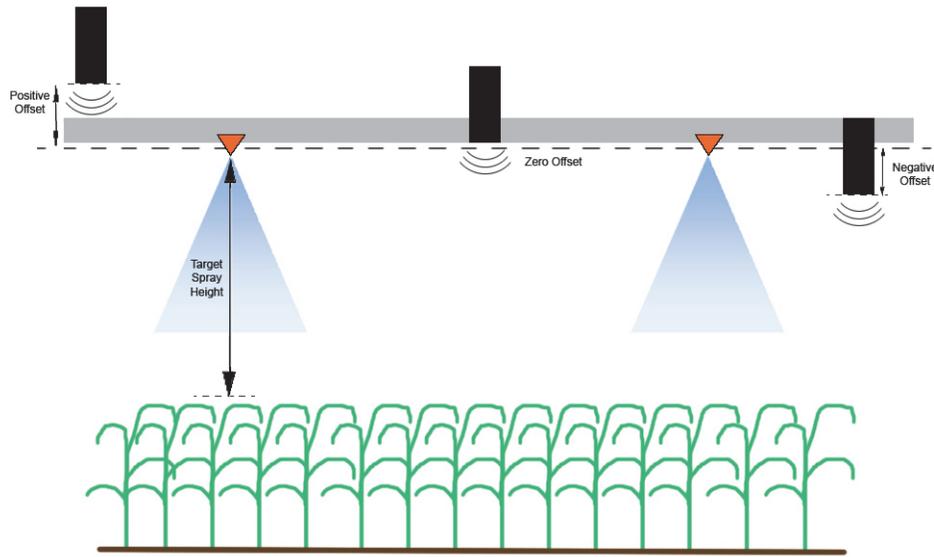
### Ultrasonic Sensor Height Offsets

Ultrasonic sensor height offset adjustments are used to compensate for the difference between the height of the sensor surface and the height of the spray tip. The offset height is calculated by measuring the distance from the bottom of the sensor to the height of the crop, measuring the distance between the spray tip to the

height of the crop, and then subtracting the spray tip distance from the sensor distance. Refer to the diagram below to determine whether the offset value should be positive or negative.

**Note:** *The maximum offset height value is 20 inches.*

**Note:** *Ultrasonic sensors will react to the first object that reflects an echo, whether it is the ground or the crop. For row-crop situations, it may be beneficial to adjust the sensor positions to directly over a row, or add additional boom sensors.*



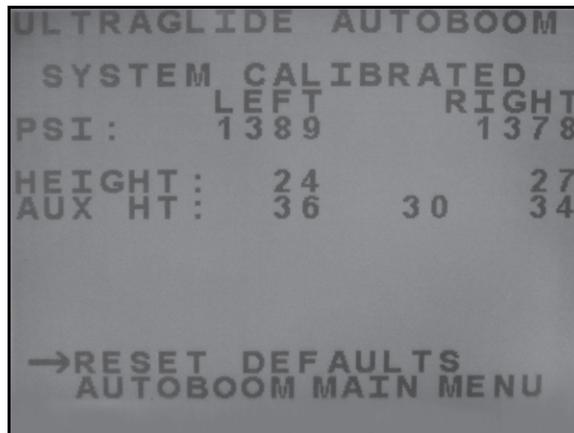
- Touch the up arrow in the Sensor Height section to increase the value representing the distance between the sensor and the ground.
- Touch the down arrow in the Sensor Height section to decrease the value representing the distance between the sensor and the ground.

**Note:** *On machines with travel-limited booms, center sensor height offsets may need to be entered as less than the measured value from the sensor to the ground to ensure the boom cylinders have sufficient pressure during operation.*

## Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

FIGURE 33. UltraGlide Calibration Screen



1. From the Calibration menu, use the arrow buttons to navigate to RESET DEFAULTS.
2. Press the **ENTER** button on the SCS console to reset the AutoBoom settings.

---

## CHAPTER

# 6

# ***AutoBoom Control Console Calibration and Operation***

---

## ***Introduction***

### **Console Updates**

Software updates are periodically available for the AutoBoom controller on the Raven website. Go to:

[www.ravenhelp.com](http://www.ravenhelp.com)

1. Select **Software** from the left side of the screen under the Support heading.
2. Select **Boom Controls**.
3. Select **AutoBoom**.
4. Select **More...** next to the AutoBoom - Console software.
5. Follow the steps outlined in the procedure for updating AutoBoom control consoles.

### **Console Navigation**

To select one of the menu options at the bottom of the AutoBoom control console, select the button directly below the desired menu option.

**Note:** *The blue “power” button on the AutoBoom control console is multi-functional. It is not only used to power on/off the console, but also select the menu option listed directly above the button. To use the power button as a navigation button, momentarily depress the button. To use the button to power on/off the console, press and hold the button for 5 - 10 seconds.*

### **Advanced Setup Tools**

Advanced setup tools allow fine-tuning of stability control, minimum boom pressure, and sensor height offset parameters in the AutoBoom system. To access these tools, select **Setup** from the Main Menu, then select **Next** three times.

```
->CT RACK: CTRL OFF
    CT RACK: DISABLED

NEXT   PREV   TOGGLE
```

- **Center Rack Control** - Turns the center rack control on and off. Selecting Center Rack Control ON allows center rack control to be enabled on the field computer/console or the machine's switch. If Center Rack Control OFF is selected, center rack control cannot be used.

```
->STABILITY           20
    MIN PRESSURE %    65
    OUTER SENSORS    ENA
NEXT   PREV   ENTER
```

- **Stability Factor** - Allows fine-tuning of the rigidity of the machine's center rack. The default value of 20 is recommended for machines with a rigid center rack. A value of 5 - 14 is recommended for machines with center racks that float freely. Adjust this value as needed to prevent boom oscillation.
  - Stability settings of 0 disable the stability control completely, making the left and right booms completely independent of each other. When above target, the control of both booms is accelerated to increase the down speed. This setting is useful for machines that have a rigid center rack.
  - Stability settings of 1 - 99 will adjust the stability of the center section. Lower numbers cause the opposing boom that is not being controlled to counteract the movement of the controlled boom by raising to balance or stabilize the center section and to prevent undesired rotation or movement. While lower numbers allow the booms to react at the same rate and time, low settings may prevent the booms from lowering. Higher stability settings allow the booms to react independently from each other, but may cause the center section to oscillate, diminishing performance.
- **Min Pressure %** - Sets a low limit pressure, preventing the boom pressure from falling below a percentage of static pressure, overriding the control when necessary to maintain a low limit of pressure on each boom. Minimum Pressure % also prevents the booms from resting on the stops in travel-limited booms.
- **Outer Sensors (UltraGlide Only)** - Allows the operator to disable outer boom sensors if the machine is equipped with optional inside boom sensors. This feature is useful when the outer boom tips are folded in, and only the inside boom sensors are needed for control.

**Note:** *The system must be re-calibrated if the outer sensors option is disabled, then re-enabled.*

```
->OUT HT OFFSET 0
    IN HT OFFSET 0
    CTR HT OFFSET 0
NEXT     PREV     ENTER
```

- **Height Offsets (Outer, Inner, and Center)** - Allows sensor heights to be adjusted according to the sensor mounting location. Enter a positive value if the sensors are mounted above the sprayer tips, and a negative value if the sensors are mounted below. Refer to the Sensor Height Offsets section on page 113 for more information.

```
->MANUAL DN SPEED 0
    MANUAL UP SPEED 0
    PWM FREQUENCY 60
NEXT     PREV     ENTER
```

- **Manual Dn Speed and Manual Up Speed** - Allows the speed at which the AutoBoom hydraulic valve manually raises and lowers the booms to be adjusted on machines that do not have their own hydraulic control. Since most machines are equipped hydraulically to control boom functions, the default setting is 0.

```
->UNITS: US--PSI/IN
    AUDIBLE ALARM: ENA
    MODE: ULTRAGLIDE
NEXT     PREV     TOGGLE
```

- **Units** - Allows the operator to select the desired units of measure.

## Diagnostic Tools

Integrated diagnostic tools allow the status of all AutoBoom inputs and outputs to be viewed on the AutoBoom control console display. To access these tools, select **SETUP** from the Main Menu, select **Next** three times, then select **DIAG**.

**Note:** The information contained in the following screens are only examples.

Screen 1

```
PSI: 2268      3000
H 20  21  25  21  20
P100% B100 P100% B10
EXIT  MANUAL  MORE
```

Screen 2 (More)

```
L:R0 L0 U0 P 0% B69%
R:R0 L0 U0 P 0% B69%
C:R0 L0 V0 CTR IDLE
EXIT  MANUAL  PREV
```

### Screen 1

- The first line indicates the left and right pressure readings on the AutoBoom valve.
- The second line Indicates the height readings of the ultrasonic sensors (from left to right).



- The “P” in the third line indicates the PWM cycle of the proportional control valve. The “B” indicates the base PWM percentage (the controller’s calculation of the static duty cycle required to hold the boom level).

### Screen 2

- The first and second lines indicate inputs and outputs on the left and right booms, respectively. The “R” indicates the raise switch input, followed by ‘0’ for off and ‘1’ for on. The “L” indicates the lower switch input. the “U” indicates the unfold proximity switch (if equipped).
- The third line indicates the inputs and outputs of the center rack. The “V” indicates the center rack 2-speed valve inputs (if equipped). V0 is displayed on the screen when the valve is off, and V1 indicates the valve is on.
- Manual boom control can be used to troubleshoot wiring or hydraulic issues by using the AutoBoom valve for raising and lowering functions, and the machine’s valve for center rack functionality (if the machine is equipped with center rack control cabling).

## Alarms

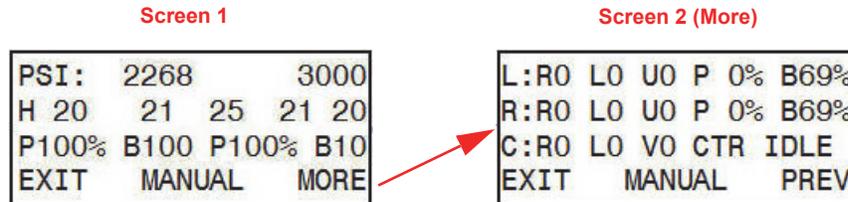
Alarm tones will not sound if the operator is navigating through any of the configuration menus. However, the enable/disable alarms will always sound when appropriate.

- **Pressure Alarms (PowerGlide Plus mode only)** - The pressure alarm occurs if the pressure is detected at a level lower than the alarm set point. The pressure alarms is a steady tone, and will continue to sound for one second after the pressure rises above the set point.
- **Proximity alarm (if equipped)** - The proximity alarm occurs if a boom is not completely folded but is enabled. The boom will be disabled after five seconds.
- **Check AutoBoom high current voltage alarm** - This alarm occurs if the node senses a low voltage supply to the node. Check the power and ground wiring to the node.
- **Pressure sensor failure alarms** - The pressure sensor failure alarm occurs immediately when a pressure sensor is not detected. The alarm is a steady tone, and will stop immediately after the sensor is located.
- **Ultrasonic sensor - too low alarm (UltraGlide mode only)** - This alarm occurs if the ultrasonic sensor is closer than ten inches to the ground for 1/2 a second. The alarm will continue to sound for three seconds.
- **Ultrasonic sensor - too high alarm (UltraGlide mode only)** - This alarm occurs when the ultrasonic sensor is higher than 65 inches from the ground for five seconds. The alarm will continue to sound for one second.
- **Ultrasonic sensor - failure alarm (UltraGlide mode only)** - This alarm occurs immediately when an ultrasonic sensor is not detected. The alarm is a steady tone, and will stop immediately after the sensor is located.
- **Boom unfold alarm** - This alarm applies only to machines that are equipped with proximity sensors. The alarm will occur if the operator tries to enable AutoBoom with the booms folded. It may also occur if the center sensor is greater than 60 inches off the ground, or it does not receive an echo from the ground.
- **Other tones** - When enabling the AutoBoom system in automatic mode via the machine’s boom control functions or switches, a single beep will occur. When disabling AutoBoom, a double beep will sound.

## AutoBoom Pre-Calibration Diagnostics

While every effort has been made to properly label and document connections for the hydraulic and electrical components of the AutoBoom system, boom function connections may not be identified due to changes in the make and model of the machine. This makes it especially important to trace the hoses from the connection points and verify the electrical connections are correct to ensure proper AutoBoom system operation. In order to verify connections, it is necessary to perform a pre-calibration diagnostic test.

1. Select **SETUP** from the Main Menu.
2. Select **Next** three times.
3. Select **DIAG**. The following screen will appear:



4. Verify that the following components on the AutoBoom console screen are displayed correctly and change when raising and lowering the booms via the machine's controls:
  - Pressures
  - Sensor heights
  - Right and left raise/lower functions
  - Center raise/lower functions
  - Fold/unfold functions

## PowerGlide Plus

The PowerGlide Plus AutoBoom system uses gauge wheels to maintain optimum boom height, while state-of-the-art hydraulics maintain constant hydraulic pressure to the tilt cylinders. PowerGlide Plus systems are typically used in pre-emergence applications.

**Note:** *Terrain conditions and the machine's hydraulic system dictate the actual speeds that can be achieved during application with an engaged AutoBoom system. Typically, rougher and varied terrain require slower speeds while AutoBoom is enabled.*

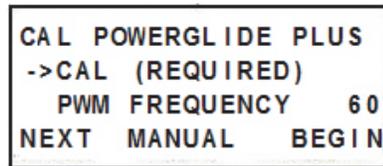
## Calibration

After the AutoBoom installation is complete, it is necessary to calibrate the computer and vehicle before use. AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the system to find the system base duty cycles for operation. Booms must be free to travel 10" up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

1. Press the left button on the front of the AutoBoom control console to power on the system.



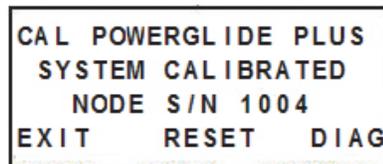
CAL POWERGLIDE PLUS  
->CAL (REQUIRED)  
PWM FREQUENCY 60  
NEXT MANUAL BEGIN

2. Verify that the booms are unfolded, and lower the center rack so that the wheels are approximately six inches from the ground.

**Note:** *If the booms do not go over center or are travel-limited, raise the booms so that the boom tips are approximately ten inches above the horizontal position and lower the center section slightly below the normal spraying height.*

3. Select **BEGIN**.

**Note:** *The calibration process may take several seconds to complete. "Calibrating" will flash, indicating that calibration is in progress. If the boom fails to calibrate, select **STOP** and refer to Chapter 7, Troubleshooting on page 119. Once the boom calibration is complete, the following screen will appear:*



CAL POWERGLIDE PLUS  
SYSTEM CALIBRATED  
NODE S/N 1004  
EXIT RESET DIAG

4. Select **EXIT**.

## Center Rack Control Calibration (If Equipped)

There are many different valve configurations used to control the machine's center rack functions. The AutoBoom system must "learn" which of the machine's solenoids are used to raise and lower the booms. Complete the following steps to calibrate the center rack control feature after the individual booms have been calibrated.

1. Press and hold the center rack raise button on the machine's control panel or joystick for six seconds so that the center rack raises.

**Note:** *The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.*

- Press and hold the center rack lower button on the machine's control panel or joystick for six seconds so that the center rack lowers.

**Note:** *The center rack may reach the lower limit of travel during this time, but continue holding the button until the full six seconds has passed.*

## Routine Operation

### Joystick Functions

- When AutoBoom control is on, control of each boom can be enabled or disabled via the AutoBoom console or by tapping the sprayer's switch functions (if equipped).

**Note:** *Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.*

- A single up-tap sprayer's switch functions disables AutoBoom on that boom.
  - A single down-tap sprayer's switch functions enables AutoBoom on that boom.
- The fast-down feature (double-tap down) is used to quickly lower the booms when the pressure setting is set to a higher setting, which causes the booms to lower slowly.
  - On machines with one proportional valve (square coils on the AutoBoom valve), a double-tap up will raise both booms slightly. A double-tap down will lower both booms quickly, and AutoBoom will re-engage to the set pressure setting.
  - On machines with two proportional valves (round coils on the AutoBoom valve), a double-tap up on the inside boom will raise only that boom slightly. A double-tap down will lower the one boom quickly, and AutoBoom will re-engage to the set pressure setting.

### Enabling AutoBoom via the AutoBoom Console

When AutoBoom control is on, control of each boom can be enabled or disabled via the AutoBoom console or by pressing the **LT-BM** or **RT-BM** buttons or by tapping the sprayer's switch functions (if equipped).

**Note:** *Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.*

### Center Rack Control (AutoBoom Enabled and Center Rack Control On) - If Equipped

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, and enable both booms.
- Center Up Switch** - A single up-tap will disable the center rack and both booms. Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.



- Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Center Rack Control (AutoBoom Enabled and Center Rack Control Off) - If Equipped

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable both booms.

**Note:** *Center rack control will not be enabled since center rack control is off.*

- **Center Up Switch** - Two consecutive up-taps will disable both booms and raise the center rack to the desired transport height. four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

## System Adjustments

During the calibration process, the AutoBoom system calculates a default Pressure Setting. Normally, the calculated value will be the level at which the machine should operate. However, at times an adjustment to the Pressure Setting may be necessary.

**Note:** *During routine operation, the gauge wheels should touch down momentarily, raise slightly, then lower back to the target height. Wheels should not continuously ride on the ground.*

LT:DISABLED	HT: 30IN
RT:DISABLED	
CENTER HEIGHT:	28 IN
SETUP	LT-BM RT-BM

1. Select LT-BM to enable the left boom.
2. Select RT-BM to enable the right boom.
1. Select SETUP.
2. Select ENTER.
3. Exit the cab and physically lift the end of each boom up, watching the responsiveness of the booms.

**Note:** *The force required by the operator to lift the boom should never exceed 200 lbs.*

```

->HEIGHT SETTING 30
  SENSITIVITY    15
  SPEED          25
INC      DEC      ENTER
    
```

4. Select INC or DEC to adjust the Pressure Setting of each boom as needed to optimize performance.
  - Increasing the Pressure Setting makes the boom lighter and reduces down speed.
  - Decreasing the Pressure Setting makes the boom heavier and increases the down speed.
5. Select ENTER.
6. Select PREV to return to the AutoBoom Main Menu.

## Resetting Defaults

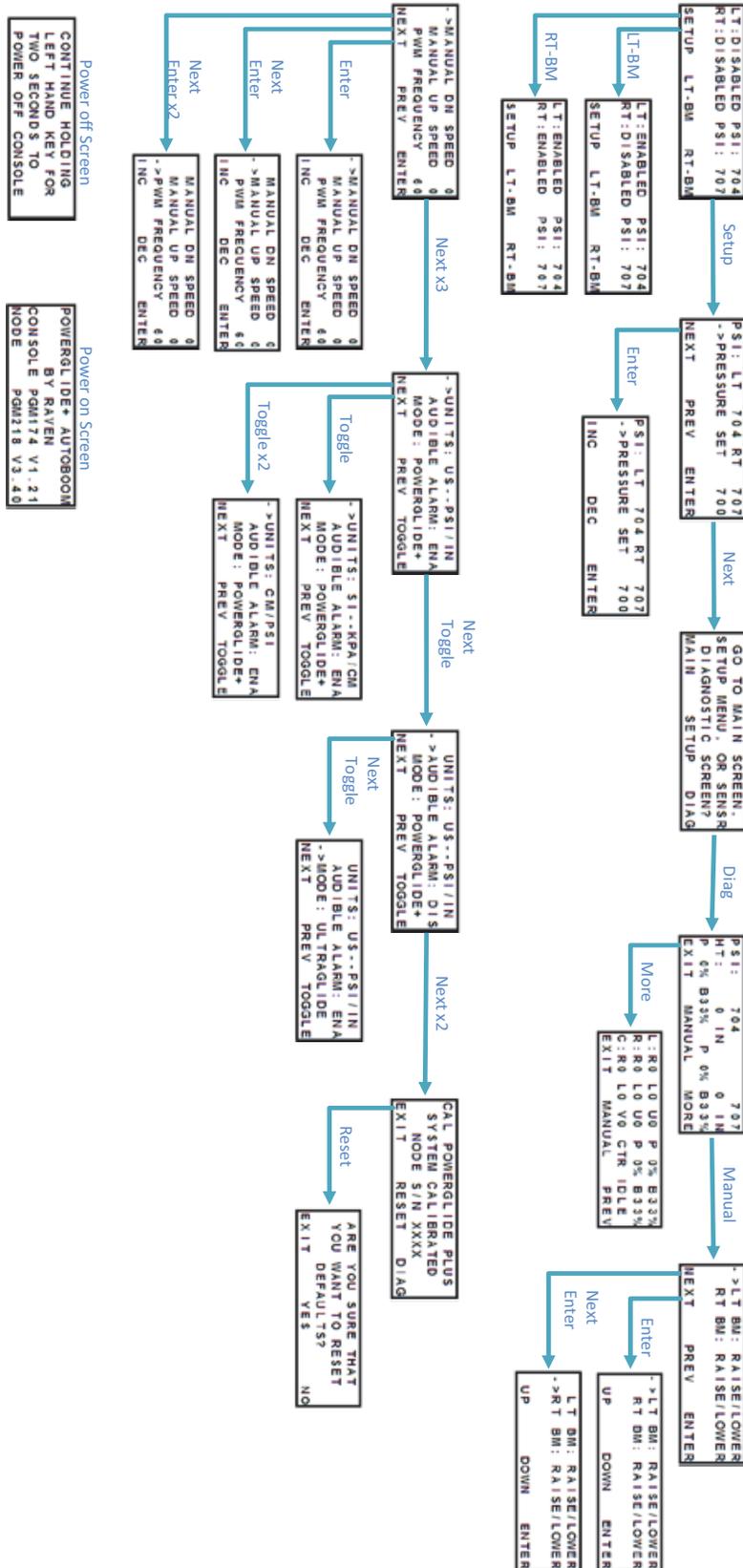
Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

```

CALIBRATE ULTRAGLIDE
SYSTEM CALIBRATED
  NODE S/N  XXXX
EXIT   RESET  DIAG
    
```

1. Refer to the PowerGlide Plus Menu Navigation flow chart on the following page to navigate to the screen shown above.
2. Select **RESET** to reset the AutoBoom settings.

# PowerGlide Plus Menu Navigation



## UltraGlide

The UltraGlide AutoBoom system uses ultrasonic sensors to measure the boom's height above ground, and state-of-the-art hydraulics to maintain constant hydraulic pressure to the tilt cylinders. The UltraGlide AutoBoom system is ideal for use in pre-emergence and post-emergence applications.

**Note:** *Terrain conditions and the machine's hydraulic system dictate the actual speeds that can be achieved during application with an engaged AutoBoom system. Typically, rougher and varied field terrain require slower speeds while AutoBoom is enabled.*

## Calibration

After the AutoBoom installation is complete, it is necessary to calibrate the computer and vehicle before use. AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the system to find the system base duty cycles for operation. Booms must be free to travel 10" up or down without reaching the tops or bottoms of the cylinder stops.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow to the hydraulic system.

**Note:** *If the machine has an open center hydraulic system, or the type of hydraulic system is unknown, all calibration procedures should be performed with the machine operating at the normal operating engine RPM.*

**Important:** *Be sure that the area is clear of people and obstructions before beginning the calibration process.*

1. Move the machine to a flat area.
2. Verify that AutoBoom is turned on.
3. Verify that the booms are unfolded, and lower the center rack so that the wheels (if equipped) are approximately six inches from the ground.

**Note:** *If the booms do not go over center or are travel limited, raise the booms so that the wheels are approximately ten inches above the horizontal position and lower the center section to approximately 20 inches.*

4. Verify the vertical sensor height offset settings in the AutoBoom console relative to the spray tip to sensor position.
  - Positive offsets indicate the sensor surface is located above the nearest spray tips.
  - Negative offsets indicate the sensor surface is located below the nearest spray tips.
  - Inner, outer, and center offsets are not required to be the same across the width of the machine, but they must be correctly measured relative to the spray tips.
5. Lower the center rack section to approximately 20 inches.

**Note:** *If the machine is equipped with a center sensor, the center rack height can be verified through the main menu or diagnostics screen in AutoBoom section of the AutoBoom console.*

6. Raise the boom tips to approximately the target height.

**Note:** *The default target height is 30 inches. Verify that the booms are not fully raised to the boom stops. If gauge wheels are installed, the setting must be adjusted to 40 - 45 inches to prevent the wheels from touching the ground during system calibration.*

7. Press the left button on the front of the AutoBoom control console to power on the system.



```
CALIBRATE ULTRAGLIDE
->CAL RT. (REQUIRED)
  CAL LT. (REQUIRED)
NEXT  MANUAL  BEGIN
```

8. Select **BEGIN**.

**Note:** The calibration process may take several seconds to complete. “Calibrating Right” will flash, indicating that calibration is in progress and the right boom will raise into the air and fall. If the boom fails to calibrate, select **STOP** and refer to Chapter 7, Troubleshooting on page 119. Once the boom calibration is complete, the following screen will appear:

```
CALIBRATE ULTRAGLIDE
->CAL RT. (COMPLETE)
  CAL LT. (REQUIRED)
NEXT  MANUAL  BEGIN
```

9. Select **NEXT** to advance to the left boom, then select **BEGIN**.

10. Select **EXIT** once the AutoBoom system is finished calibrating the left boom.

## Center Rack Control Calibration

There are many different valve configurations used to control the machine’s center rack functions. The AutoBoom system must “learn” which of the machine’s solenoids are used to raise and lower the booms. Complete the following steps to calibrate the center rack control feature after the individual booms have been calibrated.

1. Press and hold the center rack raise button on the machine’s control panel or joystick for six seconds so that the center rack raises.

**Note:** The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.

2. Press and hold the center rack lower button on the machine’s control panel or joystick for six seconds so that the center rack lowers.

**Note:** The center rack may reach the lower limit of travel during this time, but continue holding the button until the full six seconds has passed.

## Routine Operation

### Joystick Functions

- When AutoBoom control is on, control of each boom can be enabled or disabled via the AutoBoom console or by tapping the sprayer's switch functions (if equipped).

**Note:** *Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.*

- A single up-tap on the sprayer's switch functions disables AutoBoom on that boom.
- A single down-tap on the sprayer's switch functions enables AutoBoom on that boom.
- The fast-down feature (double-tap down) is used to quickly lower the booms when the pressure setting is set to a higher setting, which causes the booms to lower slowly.
  - On machines with one proportional valve (square coils on the AutoBoom valve), a double-tap up will raise both booms slightly. A double-tap down will lower both booms quickly, and AutoBoom will re-engage to the set pressure setting.
  - On machines with two proportional valves (round coils on the AutoBoom valve), a double-tap up on the inside boom will raise only that boom slightly. A double-tap down will lower the one boom quickly, and AutoBoom will re-engage to the set pressure setting.

### Enabling AutoBoom via the AutoBoom Console

When AutoBoom control is on, control of each boom can be enabled or disabled via the AutoBoom controller console or by pressing the **LT-BM** or **RT-BM** buttons or by tapping the sprayer's switch functions (if equipped).

**Note:** *Pressing the down function for longer than 1/2 a second will switch the function to manual control. The operator must tap the down function to enable AutoBoom.*

```

LT:DISABLED HT: 30IN
RT:DISABLED
CENTER HEIGHT: 28 IN
SETUP  LT-BM  RT-BM
    
```

1. Select LT-BM from the AutoBoom controller Main Menu. The following screen will appear:

```

LT:ENABLED HT: 30IN
RT:DISABLED
CENTER HEIGHT: 28 IN
SETUP  LT-BM  RT-BM
    
```

2. Select RT-BM from the AutoBoom controller Main Menu to enable the right boom.

### Center Rack Control (AutoBoom Enabled and Center Rack Control On)

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - A single down-tap will lower the center rack to the desired spray height, enable the center rack, and enable both booms.
- **Center Up Switch** - A single up-tap will disable the center rack and both booms. Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Center Rack Control (AutoBoom Enabled and Center Rack Control Off)

**Note:** *The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.*

**Note:** *Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.*

**Note:** *Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.*

- **Center Down Switch** - Two consecutive down-taps will lower the center rack to the desired spray height and enable both booms.

**Note:** *Center rack control will not be enabled since center rack control is off.*

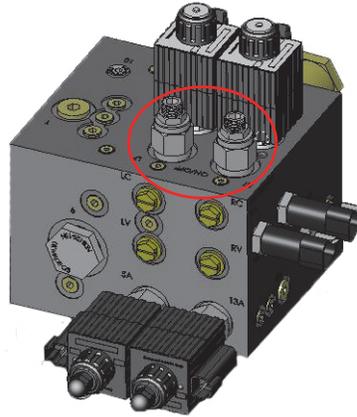
- **Center Up Switch** - Two consecutive up-taps will disable both booms and raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.
  - Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.
  - Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

### Operating the UltraGlide AutoBoom System in PowerGlide Plus Mode (Square Coils on the AutoBoom Valve)

The UltraGlide AutoBoom system is also capable of operating in the PowerGlide Plus mode. In addition to the AutoBoom valve modification listed below, a gauge wheel kit is required for the system to operate in the PowerGlide Plus mode. For available kits and ordering information, contact your local Raven dealer

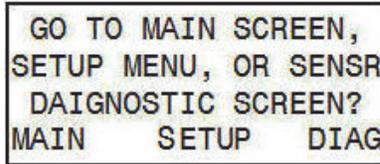
Complete the following steps to convert the UltraGlide AutoBoom valve to the PowerGlide Plus Mode.

FIGURE 1. Needle Valves on the UltraGlide AutoBoom Valve

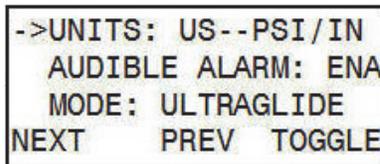


1. Locate the needle valves in Ports RT and LF on the AutoBoom valve.
2. Loosen the jam nuts on the needle valves.
3. Use an Allen wrench to turn the set screws counter-clockwise until they won't move any further.
4. Tighten the jam nuts.

**Note:** When converting the AutoBoom system back to UltraGlide, the needle valves must be screwed all the way back in (clockwise).



5. Select SETUP, then NEXT three times until the screen shown above appears.
6. Select SETUP.
7. Select NEXT several times until the following screen appears:



8. Select TOGGLE to switch the mode from UltraGlide to PowerGlide Plus.
9. Select YES confirm the mode change.
10. Select NEXT.
11. Select MAIN to return to the Main Menu.

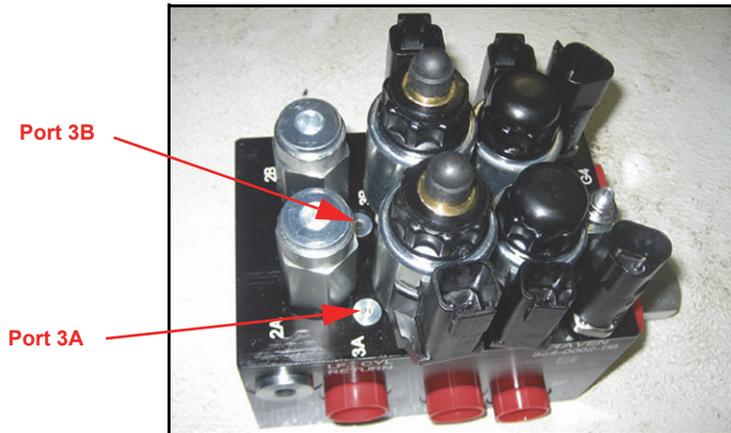
**Note:** When converting the AutoBoom system back to UltraGlide, the Viper Pro must be reprogrammed to run in the UltraGlide mode.



## Operating the UltraGlide AutoBoom System in PowerGlide Plus Mode (Round Coils on the AutoBoom Valve)

Before populating the hydraulic fittings on the AutoBoom valve, it is necessary to remove orifice fittings from the valve in the PowerGlide Plus system. Failure to remove these fittings from the valve will restrict the down speed of the booms when the system is enabled.

FIGURE 2. Port 3A and 3B Location



1. Locate Ports 3A and 3B on the AutoBoom valve.

FIGURE 3. Coil Removed from the AutoBoom Valve



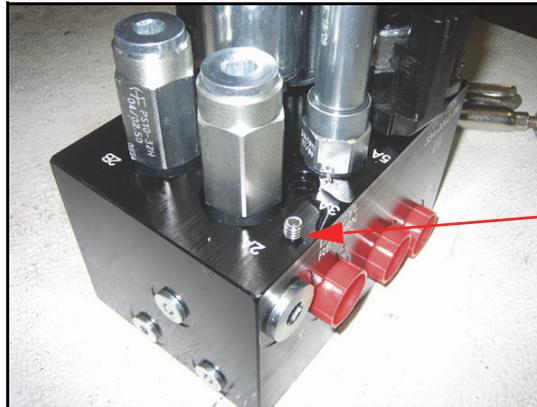
2. Remove the coils from the solenoids near Ports 3A and 3B to gain easy access to those ports.

FIGURE 4. Port Plugs Removed from the AutoBoom Valve



3. Use an Allen wrench to remove the plugs from Ports 3A and 3B.

FIGURE 5. Orifice Fitting Removed from the AutoBoom Valve



4. Remove the orifice fittings from Ports 3A and 3B.

**Important:** Tip the AutoBoom valve on its side and use the Allen wrench to remove the orifice from the cavity, taking care not to let the fitting fall into the valve.

FIGURE 6. Port Plug Reinstalled on the AutoBoom Valve



5. Use the Allen wrench to reinstall the port plugs on Ports 3A and 3B of the AutoBoom valve.

FIGURE 7. Coil Reinstalled on the AutoBoom Valve



6. Reinstall the coils on the solenoids of the AutoBoom valve.

**Note:** When converting the AutoBoom system back to UltraGlide, the orifice fittings must be reinstalled.

```
GO TO MAIN SCREEN,  
SETUP MENU, OR SENSR  
DAIGNOSTIC SCREEN?  
MAIN  SETUP  DIAG
```

7. Select SETUP, then NEXT three times until the screen shown above appears.
8. Select SETUP.
9. Select NEXT several times until the following screen appears:

```
->UNITS: US--PSI/IN  
AUDIBLE ALARM: ENA  
MODE: ULTRAGLIDE  
NEXT  PREV  TOGGLE
```

10. Select TOGGLE to switch the mode from UltraGlide to PowerGlide Plus.
11. Select YES confirm the mode change.
12. Select NEXT.
13. Select MAIN to return to the Main Menu.

**Note:** When converting the AutoBoom system back to UltraGlide, the AutoBoom controller must be reprogrammed to run in the UltraGlide mode.

## System Adjustments

**Note:** *AutoBoom must be enabled after both booms have been calibrated in order to make system adjustments.*

```
LT:DISABLED HT: 30IN
RT:DISABLED
CENTER HEIGHT: 28 IN
SETUP  LT-BM  RT-BM
```

1. Select SETUP. The following screen will appear:

```
->HEIGHT SETTING 30
  SENSITIVITY    15
  SPEED          25
INC      DEC    ENTER
```

2. Select INC or DEC to change the setting to the desired value.
3. Select ENTER.
4. Select NEXT or PREV to adjust the next setting.
5. Repeat the steps above until all of the settings are adjusted as desired.

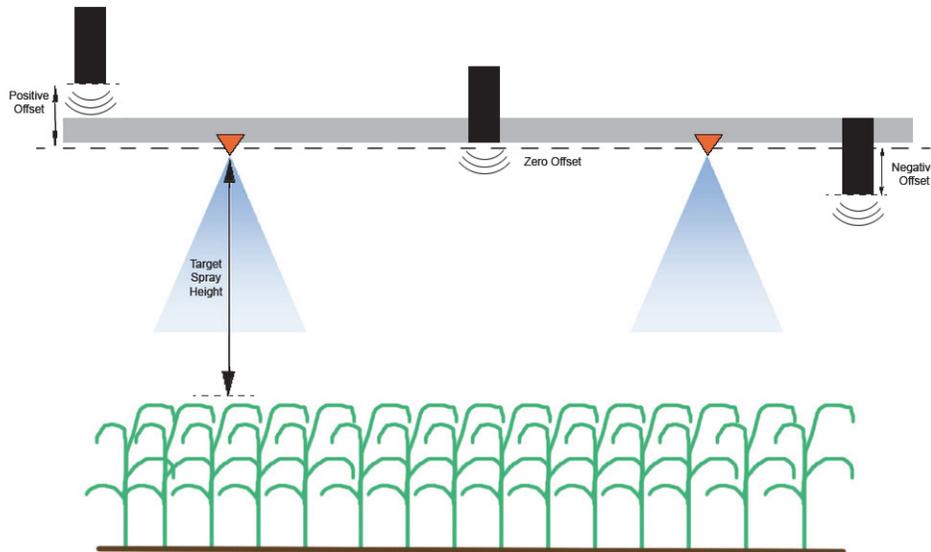
### Ultrasonic Sensor Height Offsets

Ultrasonic sensor height offset adjustments are used to compensate for the difference between the height of the sensor surface and the height of the spray tip. The offset height is calculated by measuring the distance from the bottom of the sensor to the height of the crop, measuring the distance between the spray tip to the

height of the crop, and then subtracting the spray tip distance from the sensor distance. Refer to the diagram below to determine whether the offset value should be positive or negative.

**Note:** The maximum offset height value is 20 inches.

**Note:** Ultrasonic sensors will react to the first object that reflects an echo, whether it is the ground or the crop. For row-crop situations, it may be beneficial to adjust the sensor positions to directly over a row, or add additional boom sensors.



**Note:** On machines with travel-limited booms, center sensor height offsets may need to be entered as less than the measured value from the sensor to the ground to ensure the boom cylinders have sufficient pressure during operation.

### Sensitivity

1. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface.

**Note:** The boom should react immediately and raise at approximately the same speed as your hand.

2. Adjust the Sensitivity setting as needed to make the boom more or less reactive to hand motions.

**Note:** The default setting is 15. If the Sensitivity is too high, the boom will appear unstable and jittery, reacting to slight changes in target height or crop movement. The typical Sensitivity setting that works best for most machines is 13 - 17. During routine operation, AutoBoom should be unresponsive to changes in height of 2" - 3", but should react quickly to changes of 5" or more.

For row-crop situations, or when crop conditions are sparse and not fully covering the ground, it may be beneficial to decrease the sensitivity so the boom is less reactive to sudden changes in crop height, and less likely to cause sudden movements that diminish performance.

## Speed

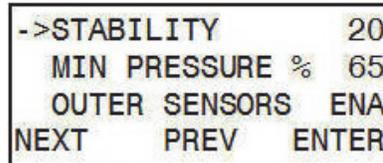
The Speed setting controls how fast the boom will move away from an obstacle, and how much the boom overshoots the target height. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. Adjust the Speed setting as needed so that boom raise rates match hand movement rates, but so that the booms don't overreact and become unstable.

1. Place one hand at ground level below one boom sensor and raise it quickly (about 2 feet per second) to within 12 inches of the sensor surface.

**Note:** *The boom should react immediately and adjust at a raise speed matching the hand movement, overshooting the new target height by one foot or less.*

2. Adjust the Speed setting as needed.

**Note:** *The default setting is 25. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. The typical Speed setting that works best for most machines is 22 - 27, but can be much higher depending on the static pressures of the boom, boom geometry, and the Sensitivity settings.*



## Stability

1. Place one hand at ground level below one boom sensor and raise it quickly (about two feet per second) to within 12 inches of the sensor surface, while observing the movement of the opposite boom.

**Note:** *The opposite boom should raise slightly (usually no more than six inches) simultaneously.*

2. Adjust the Stability setting to minimize movement of the opposite boom.

**Note:** *Lower the Stability value to make the opposite boom more rigid, but keep the number high enough to allow for natural movement of the boom without affecting the chassis roll.*

## Min Press %

**Note:** *On machines with travel-limited booms, operate the AutoBoom system with center rack control enabled, or with the center sensor at or slightly below the target height to prevent the booms from continuously entering the Min Press % mode. This mode is for boom emergency protection only, and AutoBoom system should not be run in this mode during routine operation.*

1. Raise the center rack section to the target height, so that the booms and center rack are horizontal.
2. Enable the AutoBoom system.
3. Locate the Min Press % setting in the AutoBoom control menus.

**Note:** *The default setting is 65.*

4. Increase the Min Press % value to approximately 80.
5. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface, or until the boom travels up approximately three feet higher than the original target.



6. Pull hand away, and verify that the booms lower slowly after a slight delay.

**Note:** *If the booms do not lower, decrease the Min Press % setting value by one and repeat the steps above. Continue performing the Min Press % test until the booms begin to lower.*

## Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.

CALIBRATE ULTRAGLIDE		
SYSTEM CALIBRATED		
NODE S/N XXXX		
EXIT	RESET	DIAG

1. Refer to the UltraGlide Menu Navigation flow chart on the following page to navigate to the screen shown above.
2. Select **RESET** to reset the AutoBoom settings.
3. Turn off the console and the machine power.
4. Turn on the machine and the console.





## CHAPTER

# 7

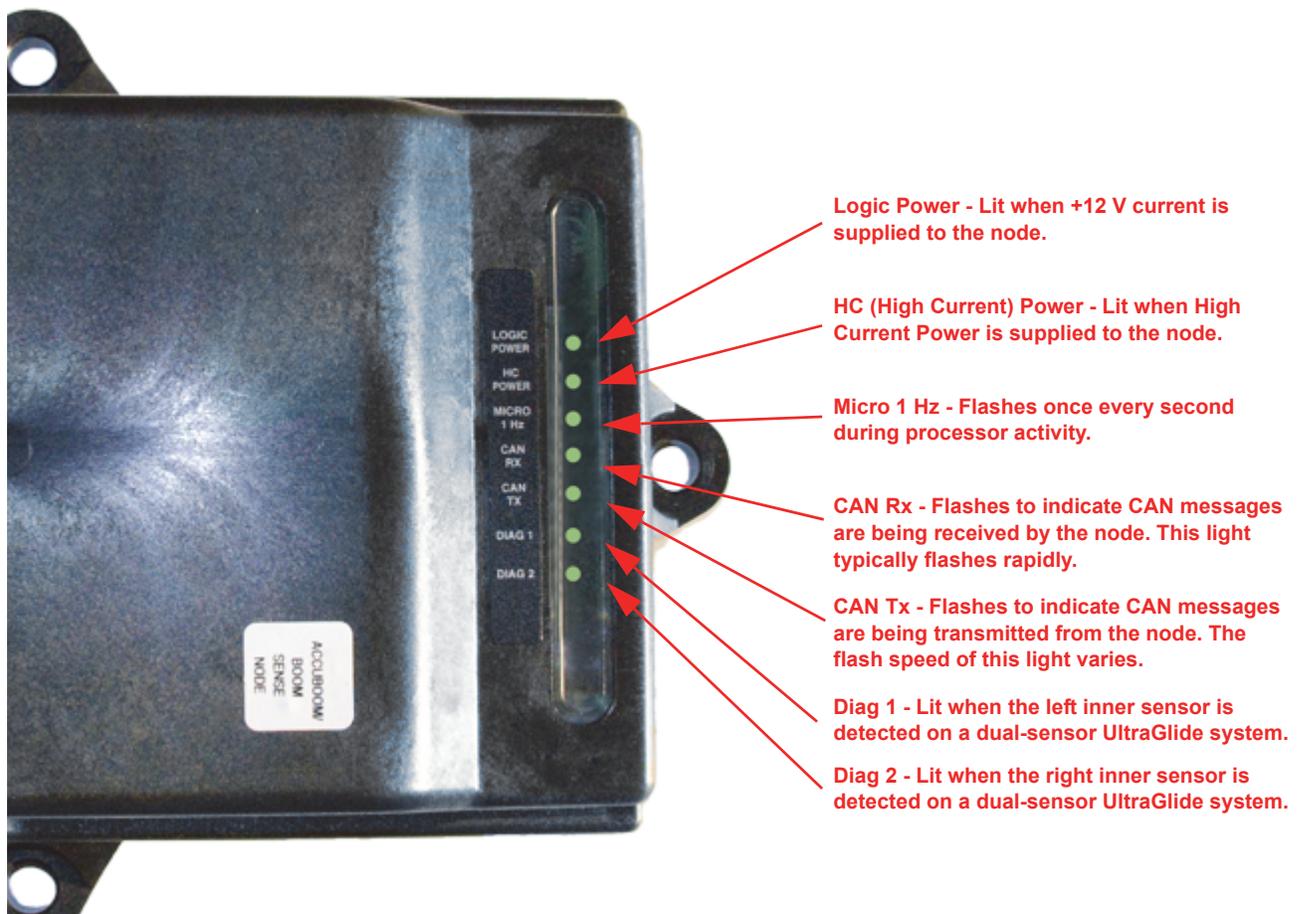
# Troubleshooting

## Node

The AutoBoom CAN control node features several green light-emitting diodes (LEDs) which may be used to diagnose issues within the AutoBoom system.

**Note:** *If the LEDs are not displayed as outlined in the figure below or are all on continuously, check the CAN connections and the control cable connections on the node. If the issue persists, contact your local Raven dealer for additional technical support.*

FIGURE 1. AccuBoom CAN Control Node LEDs



## AutoBoom Pre-Calibration Diagnostics

Problem	Possible Cause	Corrective Action
Standalone AutoBoom Controller will work in PowerGlide mode only.	The AutoBoom system is not detecting the node.	Check the electrical connections to the node, including the power and CAN communication circuits.
	The power circuits are improperly detected.	Check the power circuits and verify that the high current, logic, and CAN power systems are connected to the battery and switched power correctly.
	The CAN system is malfunctioning.	Check the CAN system setup, and verify that the terminators, cables, and connections are connected and functioning properly.
Pressures/heights are not being displayed in the correct units of measure.	The units of measure are set incorrectly in the AutoBoom system.	Change the units of measure in the controller being used in the AutoBoom system.
Pressures for the left and right boom are not displayed on the correct side.	The left and right pressure transducer connections are reversed.	Reverse the left and right transducer connections.
	The left and right hose connections are reversed.	Reverse the left and right cylinder connections on the AutoBoom valve.
Ultrasonic sensor heights are displaying incorrect locations.	The left and right sensor connections are reversed.	Reverse the left and right outer sensor connections on the AutoBoom harness cable.
	The outer sensors are connected to the inner sensor connectors.	Disconnect the sensors from the AutoBoom harness cable and connect the outer sensor connectors to the sensors.
Left, right, and center raise/lower functions are not sensed correctly when the machine's functions are used.	The boom sense cables/connections are connected to the incorrect machine coils.	Check the connections to the machine's coils and trace the wiring to ensure the connections are made to the correct cylinders.
Center section will not raise/lower manually with the machine's functions.	The center rack boom sense cables are not connected to the correct center sense/control function.	Check the connections to the machine's coils and trace the wiring to ensure the connections are made to the correct coils.
	The AutoBoom node hardware does not support the center rack control function.	The node must be revision B or higher to support the center rack control function. Contact your Raven dealer.
Fold/unfold status does not change when booms are folded/unfolded (if equipped).	The fold/unfold sensors are not connected.	Check the electrical connections to the fold/unfold sensors.

Problem	Possible Cause	Corrective Action
Booms and center section will not raise/lower properly though the Raven controller/field computer.	The proportional/blocker coil connections from the AutoBoom harness cable are incorrect on the AutoBoom valve.	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The hydraulic connections are reversed.	Reverse the left and right hydraulic connections.
	The electrical connections are reversed.	Reverse the left and right electrical connections (proportional, blocker, and possibly pressure transducers).
	Improper high current voltage electrical connection or blown fuse.	Check the electrical connections and fuses.
	The center sense/control cables are improperly connected.	Check the center rack section control cabling (connections to center control valve(s), directional valve, load sense valve, and open center valve - if applicable).

## AutoBoom Calibration

Problem	Possible Cause	Corrective Action
Left and right booms do not move during calibration.	The proportional/blocker connections are reversed or improperly connected.	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The hydraulic connections are improperly connected.	Check the hydraulic connections.
	Booms are resting on their stops or the cylinders are fully extended.	Raise the booms and lower the center rack to ensure the pressure is sufficient in the booms for calibration.
	The pressure transducer or connection is faulty.	Check the transducer connections to the AutoBoom harness cable.
	There is insufficient high current power.	Check the power and ground connections at the battery and the connections to the node.
The booms overreact or oscillate during calibration.	There are objects beneath the sensors causing faulty readings.	Attempt to calibrate the system over open ground or consistent crop canopy.
	The inner and outer sensor connections are reversed.	Check the inner and outer sensor connections and reverse if necessary.
	Faulty ultrasonic sensor readings.	Check the sensors and cabling and replace if necessary.
	The Speed setting is too high.	Decrease the Speed setting.
	The Sensitivity setting is too high.	Decrease the Sensitivity setting.
	The hydraulic flow is too high (pull-type sprayers only).	Decrease the hydraulic flow the AutoBoom circuit remote.
	The orifices are missing from the AutoBoom valve.	Reinstall orifices into the AutoBoom valve.

Problem	Possible Cause	Corrective Action
<p>The booms fully raise during calibration and do not lower.</p>	<p>The inner and outer sensor connections are reversed.</p>	<p>Check the inner and outer sensor connections and reverse them if necessary.</p>
	<p>The ultrasonic sensors are giving poor readings.</p>	<ul style="list-style-type: none"> <li>• Check the cabling to the sensors.</li> <li>• Verify the sensor surface is clean.</li> <li>• Verify no obstructions or boom components are interfering with sensor readings.</li> </ul>
	<p>The hydraulic connections are improperly connected.</p>	<ul style="list-style-type: none"> <li>• Check the hydraulic connections.</li> <li>• Reverse the direction of the hydraulic lever on pull-type sprayers.</li> </ul>
	<p>The electrical connections to the AutoBoom valve are reversed.</p>	<p>Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.</p>
	<p>The Speed setting is too high.</p>	<p>Decrease the Speed setting.</p>
	<p>The Sensitivity setting is too high.</p>	<p>Decrease the Sensitivity setting.</p>
	<p>The hydraulic flow is too high (pull-type sprayers only).</p>	<p>Decrease the hydraulic flow the AutoBoom circuit remote.</p>
<p>The booms fall to the ground during calibration.</p>	<p>The proportional valve connections are reversed on the AutoBoom valve.</p>	<p>Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.</p>
	<p>The hydraulic connections are improperly connected.</p>	<ul style="list-style-type: none"> <li>• Check the hydraulic connections.</li> <li>• Reverse the direction of the hydraulic lever on pull-type sprayers.</li> </ul>
	<p>Malfunctioning proportional valve.</p>	<p>Turn the set screws in on the proportional valve to verify the booms raise during calibration.</p> <ul style="list-style-type: none"> <li>• If the booms raise, troubleshoot the electrical system and/or AutoBoom node.</li> <li>• If the booms do not raise, troubleshoot the hydraulic system and/or AutoBoom valve.</li> </ul>
	<p>The hydraulics are not activated (pull-type sprayers only).</p>	<ul style="list-style-type: none"> <li>• Verify the hydraulics are activated.</li> <li>• Ensure hydraulic flow going to the AutoBoom valve.</li> </ul>

## AutoBoom Operation

Problem	Possible Cause	Corrective Action
Booms raise but will not lower when starting the machine or engaging the hydraulics (pull-type sprayers) with AutoBoom engaged.	The PWM base is too high.	Engage the AutoBoom hydraulics and allow the PWM base to decrease and the booms to lower automatically.
	The system is out of calibration.	Re-calibrate the AutoBoom system.
	(Pull-Type only) The flow is turned up too high on the remotes.	Reduce flow on the sprayer to 3 - 5 gallons per minute.
	(Pull-Type only) There is a restriction in the tank line hose.	<ul style="list-style-type: none"> <li>• Check the quick couplers on the sprayer.</li> <li>• If the sprayer is equipped with a case drain line (non-restricted), connect the tank line to this hose.</li> </ul>
The booms will not enable with the down-tap of the machine's functions.	The boom sense adapter cables are damaged or not connected.	<ul style="list-style-type: none"> <li>• Check the cabling.</li> <li>• Use the Diagnostics menu to determine the proper wiring setup.</li> </ul>
	There is inadequate voltage to the system.	Use a multi-meter to verify +12V is provided to the machine's coils when the function is activated.
	The AutoBoom system is not calibrated.	Calibrate the AutoBoom system.
	The AutoBoom harness cable is damaged.	Inspect the cable for damage and repair or replace as needed.
	The AutoBoom node is faulty.	Replace the AutoBoom node.
The pressure alarm is always on.	The pressure alarm setting in the PowerGlide Plus mode is set too low.	Increase the pressure alarm setting.
	The pressure and tank hoses are reversed.	Check the hoses and reverse if necessary.
	The pressure transducer is faulty.	<ul style="list-style-type: none"> <li>• Inspect the transducer and verify the pressure reading on the Diagnostic screen.</li> <li>• Replace the pressure transducer if necessary.</li> </ul>
	The AutoBoom harness cable is damaged.	Inspect the cable for damage and repair or replace as needed.
	Booms are resting on their stops or the cylinders are fully extended.	Raise the booms, lower the center section, and re-engage AutoBoom.
Objects under one boom makes the opposite side react.	The inner and outer sensor connections are reversed.	Check the inner and outer sensor connections and reverse them if necessary.
	The proportional valve connections are reversed or one side is not connected.	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The Stability setting is too low.	Increase the Stability setting incrementally until the opposite side barely raises.
	The proportional valve is faulty.	<ul style="list-style-type: none"> <li>• Inspect the proportional valve.</li> <li>• Clean and/or replace if necessary.</li> </ul>

Problem	Possible Cause	Corrective Action
The booms oscillate or overreact when the machine is stationary.	The Sensitivity setting is too high.	Decrease the Sensitivity setting by one increments until the boom oscillation stops.
	The wind is affecting the sensor readings.	Decrease the Sensitivity setting by one increments until the boom oscillation stops.
	The Speed setting is too high.	Decrease the Speed setting by one until the boom oscillation stops.
	The center section is unstable.	Decrease the Stability setting to balance the movement of the booms on both sides of the center section.
	Sporadic ultrasonic sensor readings.	Inspect the sensor cabling for damage and repair or replace as needed.
The booms raise but will not lower or lower too slowly during operation.	The incorrect PWM frequency was entered.	Verify the PWM frequency setting in the Raven console/field computer. (60 Hz for square coil valves, 250 Hz for round coil valves).
	The Speed setting is too low	Increase the Speed setting.
	The Minimum Pressure % setting is too high.	Decrease the minimum pressure % setting by one until the booms lower at the desired rate.
	The set pressure is too high (PowerGlide Plus only).	Decrease the set pressure by 10 until the booms lower at the desired rate.
	The inner and outer sensor connections are reversed.	Check the inner and outer sensor connections and reverse them if necessary.
	Faulty ultrasonic sensor readings.	Check the sensors and cabling and replace if necessary.
	The orifices or circuit restrictions are restricting the return flow from the tilt cylinders.	Inspect the AutoBoom hydraulics and remove orifices or restrictions in the circuit if necessary.
The booms are slow to raise or are unresponsive to height changes.	The Speed setting is too low.	Increase the Speed setting.
	The Sensitivity setting is too low.	Increase the Sensitivity setting.
	Excessive ground speed.	Decrease the ground speed.
	The incorrect sensor height offsets were entered.	Verify the proper height offset and adjust the settings as needed. Refer to the appropriate chapter in this manual for the Raven controller/field computer being used to determine the height offset settings calculation.
	The orifices or circuit restrictions are restricting the return flow from the tilt cylinders.	Inspect the AutoBoom hydraulics and remove orifices or restrictions in the circuit if necessary.

Problem	Possible Cause	Corrective Action
<p>The system can not be switched from PowerGlide Plus to UltraGlide mode.</p>	<p>The ultrasonic sensors are not being detected.</p>	<ul style="list-style-type: none"> <li>• Connect the sensor cables from the harness cable to the sensors.</li> <li>• Check the node cable connections.</li> <li>• Repair or replace cables as necessary.</li> </ul>
	<p>The outer sensors are connected to the inner sensor connectors (non-dual sensor system).</p>	<p>Disconnect the sensors from the AutoBoom harness cable and connect the outer sensor connectors to the sensors.</p>
	<p>The UltraGlide node is not connected to the CAN system.</p>	<p>Verify the UltraGlide node is connected to the CAN system.</p>





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# RAVEN

## Limited Warranty

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### ***What Does this Warranty Cover?***

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

### ***How Long is the Coverage Period?***

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

### ***How Can I Get Service?***

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

### ***What Will Raven Industries Do?***

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

### ***What is not Covered by this Warranty?***

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

**Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.**



## Extended Warranty

### ***What Does this Warranty Cover?***

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

### ***Do I Need to Register My Product to Qualify for the Extended Warranty?***

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

### ***Where Can I Register My Product for the Extended Warranty?***

To register, go online to [www.ravenhelp.com](http://www.ravenhelp.com) and select Product Registration.

### ***How Long is the Extended Warranty Coverage Period?***

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology Division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

### ***How Can I Get Service?***

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

### ***What Will Raven Industries Do?***

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

### ***What is Not Covered by the Extended Warranty?***

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

**Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.**