

ROS AccuBoom™ Calibration & Operation Manual

Manual No. 016-1001-087 Rev. E 08/17 E29195

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CHAPTER

1

IMPORTANT SAFETY INFORMATION

DANGER

CHEMICAL AND AGRICULTURAL PRODUCT SAFETY

- Thoroughly bleed the nurse tank hose and all other system lines prior to disassembling the flow meter, fittings and hoses, especially in the case of anhydrous ammonia (NH₃) application systems.
- Follow all label instructions for proper chemical mixing, handling and container disposal methods.

NOTICE

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

- Follow all safety information presented within this manual.
- Contact a local Raven dealer for additional assistance with any portion of the installation, service, or operation of Raven equipment or components.
- Follow all safety labels affixed to the AccuBoom components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacement safety labels, contact a local Raven dealer.

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

- Be alert and aware of surroundings at all times during equipment operation.
- Do not operate AccuBoom or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator position at all times when AccuBoom is enabled.
- Turn the AccuBoom feature off when leaving the operator position or exiting the implement cabin.
- Do not drive the implement on any public road with the AccuBoom feature on or enabled.
- Determine and maintain a safe working distance from bystanders and any hazards. The operator is responsible for disabling AccuBoom when the safe working distance has been diminished.
- Disable the AccuBoom feature prior to starting any maintenance work on the implement or machine.

CAUTION

OPERATOR CONTROL

Always be aware of the equipment position during field operations. Do not approach other field equipment, nurse trucks or refilling stations, and etc. with automatic section control enabled. If the equipment travels outside of the covered field area, or surrounding “no-spray” zone (if applicable), AccuBoom may activate sections unexpectedly.

It is good practice to toggle the equipment master switch off when the application system is not in use or when a safe working distance has diminished.

ELECTRICAL SAFETY

- Disconnect the Raven control console or ROS device and all electrical components of the Raven system before jump-starting the vehicle or welding on any component of the implement.
- Always verify that power leads are connected to the correct polarity as marked or instructed. Reversing the power leads could cause severe damage to the equipment or components.
- Ensure that the power cable is the last cable to be connected.

INSTRUCTIONS FOR WIRE ROUTING

The word “harness” is used to mean all electrical leads and cables, bundled and unbundled. When installing harness, secure it at least every 30 cm (12in) to the frame. Follow existing harness as much as possible and use these guidelines:

Harness should not contact or be attached to:

- Lines and hoses with high vibration forces or pressure spikes
- Lines and hoses carrying hot fluids beyond harness component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps
- Wire exiting conduit without protection, either ends or side of conduit
- Hose and tube fittings

Routing should not allow harnesses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of harness components
- Wiring should be protected or shielded if it needs to route near hot temperatures beyond harness component specifications

Harnessing should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets

- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For harness sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp harnesses securely to force controlled movement to occur in the desired harness section
- Avoid sharp twisting or flexing of harnesses in short distances
- Connectors and splices should not be located in harness sections that move

Protect harnesses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures

IMPORTANT: Avoid directly spraying electrical components and connections with high pressure water. High pressure water sprays can penetrate seals and cause electrical components to corrode or otherwise become damaged. When performing maintenance:

- Inspect all electrical components and connections for damage or corrosion. Repair or replace components, connections, or cable as necessary.
- Ensure connections are clean, dry, and not damaged. Repair or replace components, connections, or cable as necessary.
- Clean components or connections using low pressure water, pressurized air, or an aerosol electrical component cleaning agent.
- Remove visible surface water from components, connections, or seals using pressurized air or an aerosol electrical component cleaning agent. allow components to dry completely before reconnecting cables.

INSTRUCTIONS FOR HOSE ROUTING

The word "hose" is used to mean all flexible fluid carrying components. Follow existing hoses as much as possible and use these guidelines:

Hoses should not contact or be attached to:

- Components with high vibration forces
- Components carrying hot fluids beyond component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads

- Ends of adjustable hose clamps

Routing should not allow hoses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of hose components
- Hoses should be protected or shielded if it needs to route near hot temperatures beyond hose component specifications

Hoses should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For hose sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp hoses securely to force controlled movement to occur in the desired hose section
- Avoid sharp twisting or flexing of hoses in short distances

Protect hoses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures
- High pressure wash

OVERVIEW

Raven AccuBoom reduces chemical use and minimizes overlapping application during field operations. AccuBoom provides automatic section on and off control during field operations based upon GPS position of the implement and the existing coverage map created during the job.

NOTE: With a Raven rate control system configured for automatic rate control, the system will automatically adjust the rate of product applied as section valves are opened or closed to maintain the desired coverage and spray or spread pattern.

ACCUBOOM™ SYSTEMS

Several hardware options are available for adding the AccuBoom feature to many existing application control systems. Contact a local Raven dealer for additional information on adding AccuBoom to an implement or fleet.

NOTE: When used with a CAN product control system, AccuBoom requires a boom/speed node with program D or newer for proper AccuBoom operation.

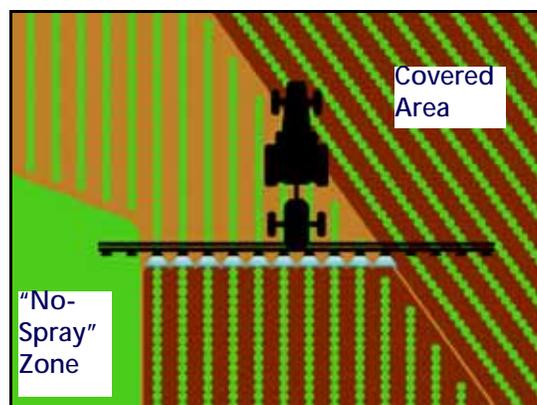
SWITCH PRO™ AND CAN SWITCH BOX

If a Raven Switch Pro or CAN switch box is installed with the ROS device, the section switches must be in the "Accu" position to allow AccuBoom control of the assigned sections. If the section switches are in the "ON" or "OFF" position, the AccuBoom feature will treat the section as manually overridden and will not automatically turn the section on or off based on previous application areas or zone boundaries.

NOTE: If connected, the Switch Pro or CAN switch box must be used as the primary control interface for section, master or product control status.

ACCUBOOM OPERATION

AccuBoom may be used in two ways to best fit the type of field operation and the type of control necessary during the application:



Basic AccuBoom. When enabled during any active job, AccuBoom will automatically toggle sections on or off based upon areas previously covered in the job. As the implement covers field area, AccuBoom references the coverage map created by the ROS device. As the implement crosses into an area previously covered during the job, AccuBoom will automatically shut off any sections in the covered area while the other sections remain on. As the implement crosses out of the previously covered area, AccuBoom will re-activate sections for normal operation. Basic operation requires no previous field scouting or input from the operator for operation.

NOTE: All automatic section control will be based upon the coverage map only.

Field Boundaries and Zone Maps. Zone maps may be created for each field to scout areas and features where product application or coverage should be avoided. Areas such as well heads, water ways, tree lines, rock piles, etc., may be assigned to “no-spray” or “no-plant” zones. As the implement crosses a zone boundary for a “no-spray” area during the job, AccuBoom will automatically shut off any sections that cross into the zone while the other sections remain on. As the implement crosses out of the zone, AccuBoom will re-activate sections for normal operation.

Field boundaries may be recorded or loaded into an active job to control sections at the field perimeter. AccuBoom will assign the area within the completed field boundary to a normal “spray” or “plant” zone. “No-spray” or “no-plant” zones may be added to the zone map later to modify the map as necessary. AccuBoom will also assign everything outside of the field boundary to a “no-spray” or “no-plant” zone. Additional “spray” or “plant” zones may be added to this area to modify the boundary if necessary.

NOTE: Do not approach nurse trucks or refilling stations while automatic section control is enabled. Toggle the master switch to keep AccuBoom from turning on sections unexpectedly.

RECOMMENDATIONS AND BEST PRACTICES

	<p>WARNING</p> <p>Carefully read and follow all safety requirements and precautions contained in this manual and the machine or implement operation instructions. Failure to follow safety instructions may lead to equipment damage, personal injury, or death.</p>
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Perform the following steps to ensure the machine will function properly with the AccuBoom feature before installing, activating, or operating any AccuBoom components and at the beginning of each season:

- Verify operation of section or boom on/off valves and control valves and switches prior to engaging the AccuBoom feature. Troubleshoot and replace any components not operating as expected.
- Ensure that there are no issues with the function of the factory product control system (e.g. pump issues, faulty hydraulic motors, clogged strainer or spray tips, etc.).
- Toggle the master switch to the off position when closing or exiting a job to avoid unintentional product application once the ROS device or control console closes application management functions. It is also good practice to shut off product and section switches when the application system is not being used.
- Use clean water in liquid tanks or an empty granular bin when testing the AccuBoom feature after installation or at the beginning of each season.

UPDATES

Product software and documentation updates may be made available periodically on the Raven Applied Technology web site:

<https://portal.ravenprecision.com/>

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 email with the following information to

techwriting@ravenind.com

- ROS AccuBoom™ Calibration & Operation Manual
- Manual No. 016-1001-087 Rev. E
- 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 email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

ACCUBOOM™ CALIBRATION OVERVIEW

After installing the AccuBoom feature, verify that any switch hardware for controlling section on/off valves controls the expected section valves when the switch is toggled.

NOTE: AccuBoom will require a constant 12 V on and 0 V off signal to properly monitor and control section status during field operations. Pulsed or momentary switches will not work with the AccuBoom feature.

For best results controlling liquid application systems, ensure spray tips, product strainers, or filters are clean and unobstructed. Use clean water to test and verify the AccuBoom installation.

CALIBRATION

Prior to using the AccuBoom feature during a field operation, the system should be calibrated or tuned for each product and the control hardware connected to the control system.

ACCUBOOM™ LOOK AHEAD SETTINGS

The AccuBoom “look ahead” settings are used to adjust how far ahead of the current equipment position the system is allowed to scan for coverage or zone map changes. The off look ahead and on look ahead values may be used to help compensate for the time it takes for valves to close or to establish a spray or spread pattern when turning sections on.

NOTE: Setting the look ahead values too high may cause valves to begin opening or closing too early. This may cause skips, overlaps, or undesirable product application in some areas. Generally, a value between 1 to 2 seconds will yield best results. Look ahead settings should not exceed 5 seconds.

Do not enter negative values for either the on or off look ahead values.

To set up the AccuBoom look ahead settings:



1. Touch the Edit icon in the Machine Configuration panel to expand the panel.

2. Locate and select the AccuBoom button. The AccuBoom Settings tab will be displayed.

NOTE: Select the "Apply to all products" option at the top of the AccuBoom Settings tab to set entered values for all control channels universally. Each channel may be adjusted individually later if desired. "Apply to All Products" only affects the Look Ahead Options.

3. Touch the AccuBoom Enabled option to enable the AccuBoom feature to automatically control sections during application operations.

4. Select the type of look ahead (either time or distance) for the look ahead value. Refer to the Look Ahead Type section on page 12 for additional information on the look ahead types.

NOTE: If distance is set as the look ahead type, the system will require a target operation speed for section control. The system will use the target speed when controlling sections automatically.

5. Enter the desired on-look ahead value for the implement application control system. Refer to the On-Look Ahead section on page 13 for recommendations for setting the on-look ahead values.

6. Enter the desired off-look ahead value for the implement application control system. Refer to the Off-Look Ahead section on page 13 for additional information on recommended off look ahead values.

NOTE: The off look ahead value should never be set higher than the on look ahead value. Review the Look Ahead Options section on page 13 for additional information on setting and using the look ahead values.

7. Enter the desired on AccuBoom override time. Refer to On Override section on page 13 for additional information on the override settings or the Enable AccuBoom Override section on page 16 for details on using the AccuBoom override during an active field operation.

8. Enter the desired turn off percent. Refer to the Turn Off Percent section on page 13 for more information regarding the turn off percent value.

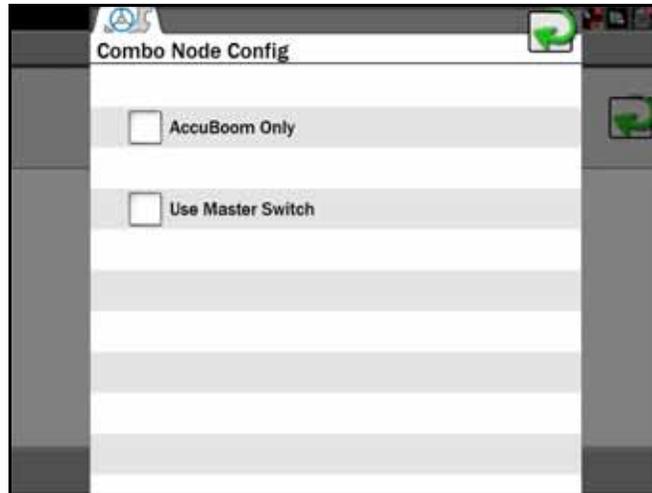
ACCUBOOM™ SETTINGS DEFINITION

ACCUBOOM COMBO NODE CONFIGURATION TAB



1. Touch the Edit icon in the Machine Configuration panel to expand the panel.

2. Locate and select the Combo Node button. The Combo Node Configuration tab will display.



AccuBoom Only. The AccuBoom Only option is only necessary for specific OEM factory installed AccuBoom systems. Leave this option disabled unless instructed by a Raven technician or dealer.

NOTE: Some OEM applications of AccuBoom require both an AccuBoom combo node (P/N 063-0172-714) and boom/speed node for section control capabilities. If AccuBoom came installed as an OEM option from the equipment manufacturer, contact a local implement dealer for additional assistance.

Use Master Switch. This option allows the system to display section status, and field coverage, based upon the section status reported by the AccuBoom node. Leave this option disabled unless instructed by a Raven technician or dealer.

NOTE: If the master switch option is selected, the orange wire with white stripe on the AccuBoom node harness must be connected to the machine master switch.

Contact a local Raven dealer for more information on part numbers and availability of this AccuBoom feature for specific equipment models. Contact the machine manufacturer for more information on connecting the master switch feature.

ACCUBOOM LOOK AHEAD SETTINGS TAB



1. Touch the Edit icon in the Machine Configuration panel to expand the panel.



2. Locate and select the AccuBoom button. The AccuBoom Settings tab will display.



ACCUBOOM ENABLED

Touch the AccuBoom Enabled option at the top of the AccuBoom Settings tab to toggle automatic section control features on or off for field operations. This feature may be useful for operations in which automatic section control may not be desired. AccuBoom enabled is a global settings and applies to all products.

CORRECTED COVERAGE

Corrected Coverage does not affect AccuBoom Performance, it only affects how the system paints to coverage. Corrected Coverage can only be turned on or off while out of a job.

If Corrected Coverage is disabled, it is commanded by the commanded state. If Corrected Coverage is enabled, the Turn-On and Turn-Off Look-Aheads are applied to the coverage. Also, when enabled, Corrected Coverage will remove the no applied areas when coming into the headlands as a result of AccuBoom off look-ahead.

- With a one second Turn-On Look-Ahead, the system will delay the painting for one second when coming out of an applied area.
- With a .5 second Turn-Off Look-Ahead the system will continue to paint for .5 seconds when coming into an applied area.

NOTE: If Corrected Coverage is not enabled when closing the job it will not save and exported with Corrected Coverage. If Corrected Coverage is enabled when closing the job, it will save and export with Corrected Coverage.

APPLY TO ALL PRODUCTS OPTION

Enable the “Apply to all products” option at the top of the AccuBoom Settings tab to apply the displayed settings to all control channels on the CANbus. Use this option to quickly configure consistent AccuBoom settings to all control channels available on the CANbus. Each channel may be tuned individually later if desired. “Apply All Products” only affects the Look Ahead Options.

LOOK AHEAD TYPE

Look ahead values may be entered in either time (seconds determined by vehicle speed) or distance (inches or centimeters).

Time. The time option is the recommended method for calibrating the look ahead values. This method allows the system to use the current vehicle speed to calculate when the system should begin controlling valves.

Distance. The distance option allows the operator to measure the distance which the system is currently overlapping for coverage and the equipment speed at the time of the measurement to adjust the system performance.

NOTE: If look ahead values are entered in distance, the equipment must travel at a consistent and constant speed to avoid skips or overlaps in coverage.

Select the look ahead type best suited for the implement, field operation, or control system currently connected with the ROS device.

LOOK AHEAD OPTIONS

The following settings displayed on the AccuBoom Settings tab may be used to adjust or fine tune AccuBoom feature response for each control channel on the CANbus. Refer to the following sections for assistance with making system adjustments:

Off-Look Ahead. The off look ahead value is the time or distance ahead of the current section positions which the system will scan for disabling section application. Use the off look ahead value to adjust AccuBoom response for the time or distance it takes to stop product flow, lose the spray or spread pattern, or stop applying product after toggling the master switch off.

NOTE: A value of 0 (zero) seconds is generally a good starting point and may be increased to fine tune the AccuBoom system if necessary.

Do not set the off look ahead value higher than the value entered for the on look ahead setting.

On-Look Ahead. The on look ahead value is the time or distance ahead of the current section positions which the system will scan for activating section application. Use the on look ahead value to adjust AccuBoom response for the time or distance it takes to obtain the desired spray or spread pattern, or begin applying product after toggling the master switch on.

NOTE: A value of 2 seconds is generally a good starting point and may be adjusted as necessary to fine tune the AccuBoom system for the specific implement or control system.

Do not enter an on look ahead value lower than the value entered for the off look ahead setting.

ON OVERRIDE

The on override value is the time which the system will override automatic section control and enable any sections currently disabled or turned off due to AccuBoom control. Use the on override value to set the time which the system should override AccuBoom section commands and keep sections on. This feature may be used when starting application with the equipment at a complete stop or to manually override all sections on for the set number of seconds.

NOTE: This setting is for the on-screen override and does not apply to the override switch on a CAN switch box.

The default on override value is five seconds.

The override will only activate sections set for automatic section control. Any sections configured for manual control, or set on or off manually, will not be affected by the AccuBoom Override feature.

TURN OFF PERCENT

The turn off percent is the percentage of the section width which must cross a zone boundary, or into a previous application area, before AccuBoom will control that section.

The default value for the turn off percent is 99. Using the default setting, when 99% of a section crosses over a “no-spray” zone or into a previously applied area, AccuBoom will toggle the section off. When applying over point rows, it may be necessary to adjust the turn off percent value to adjust the AccuBoom system to avoid skips or overlaps in coverage as desired.

NOTE: The default value of 99% is set to virtually guarantee complete field coverage during field operations.

Depending upon the accuracy of GPS corrections being used, and the configured section widths, setting the turn off percent too low may cause AccuBoom to shut off sections unexpectedly within the field. Setting the turn off percent too high may cause AccuBoom not to shut off section as expected. With any turn off percent value, observe the feature control of sections during field operations and adjust the value to obtain the desired performance.

OVERVIEW

The following items may be useful when operating the AccuBoom feature during field operations:

1. Scouting widget for zone mapping.
2. AccuBoom override widget to manually override automatic section control.
3. Section status widget to monitor section controls.
4. Forward override to ensure equipment heading is mapping in the correct direction when starting from a stop and to ensure automatic section control toggles the correct sections.

OPERATIONAL NOTES

NOTE: Make sure to toggle the master switch to the off position when closing or exiting a job to avoid unintentional product application once the ROS device closes application management functions. It is also good practice to shut off product and section switches when the application system is not being used.

DISABLING ACCUBOOM CONTROL

Disable automatic section control when approaching nurse trucks or refilling stations, or anytime a safe working distance has diminished. If the equipment travels outside of the covered field area, or the surrounding "no-spray" zone (if applicable), AccuBoom will activate sections as though they were in an uncovered area within the field area. To keep AccuBoom from activating sections unexpectedly, toggle the master switch to the off position.

Toggle the master switch to the off position when closing or exiting a job to avoid unintentional product application once the ROS device closes application management functions.

RAVEN CAN SWITCH BOX OR SWITCH PRO

If a Raven CAN Switch Box or Switch Pro is installed with the ROS device, the section switches must be in the 'Accu' position to allow AccuBoom control for the assigned sections. If the section switches are in the 'On' or 'Off' position, the AccuBoom system will treat the section as manually overridden and will not automatically turn the section on or off based on previous application areas or field boundaries.

NOTE: The CAN Switch Box or Switch Pro must be used as the primary control interface for section, master or product control status.

ACCUBOOM OPERATION

If the Enable AccuBoom option is enabled prior to starting a job, no additional steps are necessary to begin automatic section control features. Refer to the Raven Operating System Basic Operation Manual for assistance using scout groups and the Scouting widget to create field boundaries and zone features.

The AccuBoom Override widget is required to enable AccuBoom, or adjust AccuBoom settings, during an active job. Refer to the Raven Operating Software Basic Operation Manual for details on adding widgets to guidance screens.

ENABLE ACCUBOOM

To enable AccuBoom during an active job:



AccuBoom

NOTE: The vehicle must be stopped to change AccuBoom settings or options during a job.

1. Touch and hold the AccuBoom Override widget to display the AccuBoom Settings prompt.
2. Select the Enable AccuBoom option to enable the AccuBoom feature.

ENABLE ACCUBOOM OVERRIDE

To override all sections on for the configured override time:



Override

NOTE: The vehicle must be stopped to change AccuBoom settings or options during a job.

1. Tap the AccuBoom Override widget.
AccuBoom will override all enabled sections on for the configured override time and will display a countdown until the override time expires and automatic section control is resumed.

ADJUST ACCUBOOM SETTINGS DURING A JOB

To make adjustments to the AccuBoom feature without closing or exiting an active job:



AccuBoom

NOTE: The vehicle must be stopped to change AccuBoom settings or options during a job.

1. Touch and hold the AccuBoom Override widget to display the AccuBoom Settings prompt.
2. Refer to the AccuBoom Look Ahead Settings Tab section on page 11 for assistance with the look ahead settings.

ON-SCREEN SWITCH BOX

Refer to the ROS Basic Operation manual for information on configuring the On-Screen Switch Box.

LIMITED 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.

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 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.