



UC4⁺
ROLL CONTROL
Patented

Spray Height Controller



Operator Manual

Printed in Canada

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Reorder P/N: 446BC+MAN7 Rev B (UC4+ Operator Manual)

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Contents

1	INTRODUCTION.....	1
2	SAFETY PRECAUTIONS.....	2
3	KEY FEATURES.....	3
4	SYSTEM DESCRIPTION	4
4.1	General UC4+ System Layout	4
4.2	Height Sensors.....	5
4.3	Roll Sensors	5
4.4	Control Panel.....	5
5	OPERATION	6
5.1	Basic UC4+ Operation	6
5.2	Sprayer Switches	7
5.3	Main Menu Settings	8
5.4	Main Menu Map.....	9
6	UNDERSTANDING THE UC4+ SYSTEM	10
6.1	Ditches, Waterways and Outside Rounds.....	10
6.2	Driving Through Ditches and Over Terraces	10
6.3	Height Sensor Capabilities and Limitations	10
6.4	Soil Mode and Crop Mode	11
7	SETUP.....	12
7.1	Automatic System Setup	12
7.2	Retune	18
7.3	Manual Setup.....	19
7.4	Quick Install	28
8	OPTIONAL KITS.....	30
8.1	Severe Terrain Kit	30
8.2	Enhanced Stability Kit.....	30
8.3	Roll Bias (Active Roll) Kit.....	31
9	OPTIONS.....	32
9.1	Headland Assist.....	32
9.2	Remote Switches	34
9.3	Crop Filter Toggle.....	34
9.4	High Oil Temperature Alarm	34
9.5	Sensor Reading Alarm.....	34
9.6	Minimum Height Mode.....	35

9.7 Changing the Units.....	35
9.8 Valve and Air Temperature.....	35
10 MAINTENANCE.....	36
11 TROUBLESHOOTING.....	37
11.1 General Operation	37
11.2 Sensors	38
11.3 Hydraulics	40
11.4 Boom Stability.....	41
11.5 Setup Messages	42
11.6 Operational Messages	43
12 STATEMENT OF LIMITED WARRANTY	44
13 SPRAYER TYPES.....	45
14 UC4+ MENU STRUCTURE.....	46

1 Introduction

Congratulations on your purchase of a NORAC UC4+ Spray Height Control System. This system has an unmatched reputation within the industry for boom protection and spray height accuracy.

When properly used, the UC4+ Spray Height Control system provides protection from boom damage as well as improving sprayer efficiency and chemical performance by ensuring correct chemical application.

To fully understand your new system and use it to its fullest capacity it is recommended that you read this manual. This manual provides a general overview, key features, operating instructions, assistance with system setup, regular maintenance recommendations and troubleshooting.

If you have any questions, feedback or comments regarding the NORAC UC4+ Spray Height Control system, please contact any of the numbers below.

Phone:	1 800 667 3921	Canada (Toll Free)
	1 866 306 6722	United States (Toll Free)
	0 800 404 8389	United Kingdom (Toll Free)
	(+1) 306 664 6711	All other regions
E-mail:	service@norac.ca	
Web:	www.norac.ca	

The information in this manual applies to systems with Version 7 software.

2 Safety Precautions

The UC4+ Spray Height Control system will greatly improve your spraying height accuracy and protect the boom against damage in a wide variety of field conditions. However, under some circumstances performance may be limited. The operator of the sprayer must remain alert at all times and override the automatic control when necessary.

CAUTION

Under no circumstances should any service work be performed on the machinery while the UC4+ Spray Height Control system is in the automatic mode.

Always ensure that the UC4+ Spray Height Control system is powered down or in manual mode:

- Before leaving the operator's seat.
- While the machine is not moving.
- When transporting the machine.

Before working on any part of the booms:

- Set the UC4+ system to manual mode.
- Turn the sprayer engine off.

Do not operate this system before:

- Reading and understanding the operator's manual.
- Thoroughly understanding the machine operation.

3 Key Features

Non-contact Sensing:

- Sensing is done using ultrasonic sensors which means no parts of the UC4+ Spray Height Control System come in contact with the ground.
- Using a non-contact system means there will be no additional forces put on the boom, which could cause damage to the sprayer boom.

Automatic Software Setup:

- The system completes an automatic system setup, which calibrates the software specifically for the sprayer.
- This provides the maximum performance for the height control system.

Individual Boom Overrides:

- When necessary one boom section can be put into manual mode to avoid an obstacle, while the other boom sections stay in automatic.
- This can take the stress out of spraying along obstacles such as fences because you only have to watch the boom along the obstacle, knowing that the UC4+ is maintaining the height on the rest of the boom sections.

Smart Sensor Technology:

- All sensors are designed by NORAC specifically for the agricultural industry.

4 System Description

4.1 General UC4+ System Layout

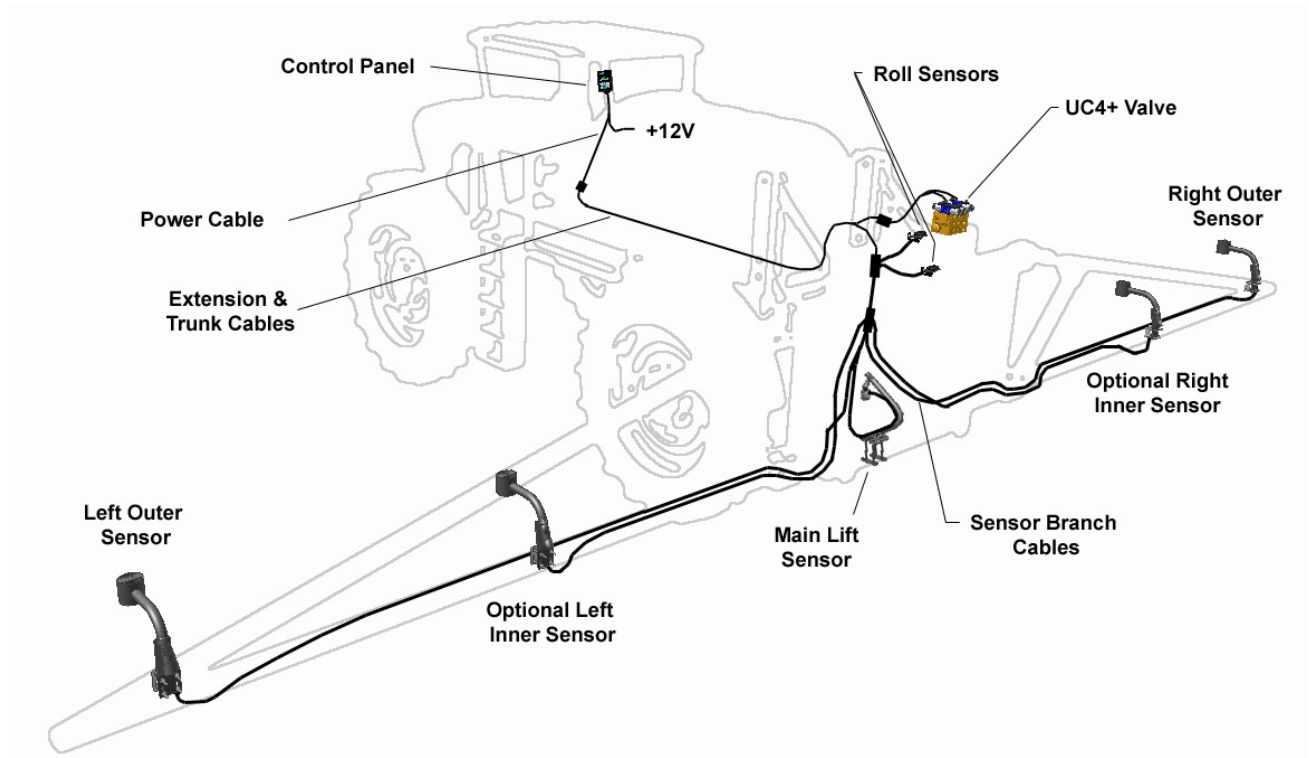


Figure 1: General UC4+ System Layout (Self Propelled)

4.2 Height Sensors

- Height sensors use an ultrasonic signal to measure distance to the ground or crop canopy.
- Normally there are three height sensors used, but a system may have as many as 6 sensors. A sensor is mounted to the outer part of each boom tip, and another sensor is mounted to the center section.

4.3 Roll Sensors

- Roll sensors are important for measuring boom and sprayer roll dynamics.
- Two roll sensors are normally used for a UC4+ Spray Height Control System.
- The mounting position of the roll sensors vary from sprayer to sprayer depending on boom geometry and suspension.

4.4 Control Panel

The UC4+ control panel (Figure 2) is the main component of the UC4+ Spray Height Control System. The control panel uses the readings from the ultrasonic sensors to control solenoid operated valves that in turn adjust the boom height. The control panel will:

- Indicate when the system is in AUTOMATIC or MANUAL mode.
- Indicate any hydraulic action which is underway.
- Accept input to adjust all control system settings.

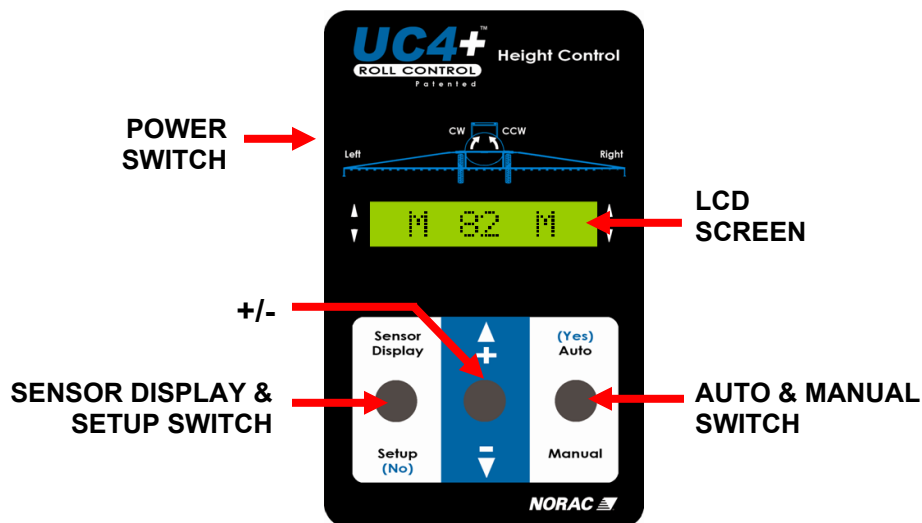


Figure 2: UC4+ Control Panel

5 Operation

5.1 Basic UC4+ Operation

Upon power-up a sequence of messages are temporarily displayed on the control panel LCD screen. The system is ready for use once the run screen is displayed.

- To access either the "SENSOR DISPLAY" or "SETUP" menus, ensure you are at the run screen.
- Toggle toward the menu you wish to access.
- Adjust the menu settings using the "+/-" switch while the prompt is displayed.
- After 30 seconds menu prompts will return to the run screen.
- To return to the run screen press and hold "SETUP" for two seconds.
- New settings take effect once the run screen is displayed.

When the UC4+ Height Control System is in automatic mode, arrows will appear on the screen above or below the boom sections. These arrows indicate the UC4+ system is making a correction to part of the boom in the displayed direction. Often the correction will be very small and there may not be a noticeable change in boom position.

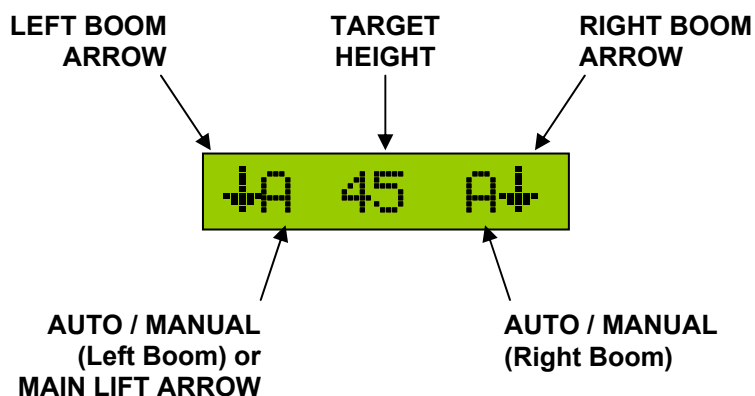


Figure 3: Run Screen

Changing to Automatic or Manual Mode:

From the run screen, toggle the control panel "AUTO" switch to put the system into automatic mode. The run screen will show an "A" for each side of the boom to indicate the system is in auto. Toggling the "MANUAL" switch or a sprayer joystick function will put the system into manual mode. The run screen will show an "M" for each boom to indicate the system is in manual mode.

Viewing the Sensor or Target Height:

When in manual mode the run screen shows the average of all the sensor heights. In automatic mode the number shown on the run screen is the target height.

Toggle "SENSOR DISPLAY" to view the actual sensor heights. The left, right, and main (center) sensor heights are each displayed on a separate screen. If there are 2 sensors on each wing, both sensor heights will be displayed on the same screen. The sensor heights are shown in either centimeters or inches depending on the sprayer type. The height displayed is measured from the spray nozzles to the soil (soil mode) or crop canopy (crop mode).

To lock the currently viewed sensor heights on the screen indefinitely, toggle the "+" switch once. Sensor height menus can be viewed in both automatic and manual mode.

5.2 Sprayer Switches

When a sprayer switch is pressed, an arrow will be displayed on the screen showing which function is being activated. For example, if the left up switch is pressed then an arrow will be shown on the left side pointing up.

Tilt Switches:

While in automatic mode if either left or right tilt switches are pressed, the corresponding boom section will go into manual mode. The corresponding "A" on the display will change to an "M" to indicate that boom is in manual mode. This is useful when spraying near ditches or fences where you would like to manually control one of the booms while leaving the other boom in automatic mode. To return all boom sections to automatic mode, toggle the "AUTO (YES)" switch. If the system is operating with only one boom in automatic mode, you will occasionally hear an audible chirp to remind you that one of the booms is in manual mode.

Main Lift Switch:

While in automatic mode if the main lift up or down switch is momentarily pressed, the target height is incrementally adjusted up or down.

If Headland Assist is enabled with the trigger as the main lift switch, then the main lift switch will be used to control Headland Assist instead of the target height. The main lift up switch will activate Headland Assist. By toggling main lift down the system will return to automatic mode. Refer to **Section 9.1** for more information on Headland Assist.

Pressing and holding the main lift switch will always put the system into manual mode.

Note: These features may not be available for all sprayer types.

5.3 Main Menu Settings

Soil / Crop Mode:

Soil mode configures the sensors to read the height from the spray nozzles to the ground, where as crop mode will read the height from the spray nozzles to the top of the crop canopy.

To change between soil and crop mode, toggle "SETUP" twice from the run screen. The screen will display either "SOIL" or "CROP". Toggle the "+/-" switch once to change the setting. For more information on crop and soil mode refer to Section 6.4.

Sensitivity:

The sensitivity can be adjusted from 1 to 10, with 5 being the default setting. A lower number will reduce the system sensitivity. Higher settings will speed up the response and also create a greater demand on the hydraulics.

To change the sensitivity, toggle the "SETUP (NO)" switch once from the run screen. The current sensitivity will be displayed. Use the "+/-" switch to change the setting.

Target Height:

The target height is the height you would like the boom to be set at when spraying. When operating in soil mode, the target height is measured from the spray nozzles to the soil. In crop mode the target height is measured from the crop canopy to the spray nozzles. The target height can be changed from the run screen while the system is in automatic mode by using the "+/-" switch.

Severe Terrain Mode:

Some sprayers have the ability to fold in the boom tips and spray with only the inner sections of the boom. If your sprayer has this ability and is equipped with a five sensor system (severe terrain kit) then this feature may be used when spraying with the tips folded in.

Toggle "SENSOR DISPLAY" from the run screen until you see "Tips on". Toggle the "+/-" switch to turn it on or off. By turning the tips off, the two outer sensors on the wings will be disabled and only the inner wing sensors will be used to control the height.

When the tips are turned off the run screen will show a lower case "a" in automatic to indicate the outer sensors are turned off. The Severe Terrain Mode is defaulted to "Tips on" and will return to "Tips on" anytime the power is cycled. When spraying with the full boom, the setting should be "Tips on" to allow the outer sensors to operate again.

5.4 Main Menu Map

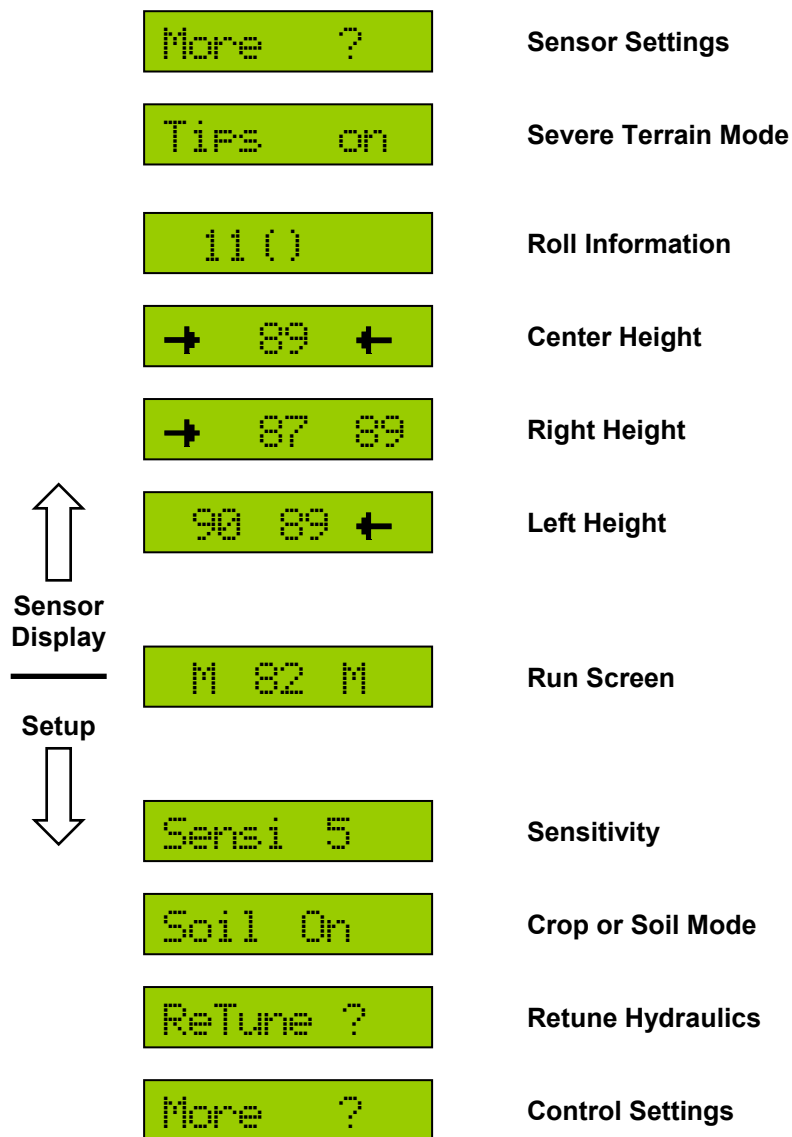


Figure 4: UC4+ Main Menu Map

*Note: Refer to **Section 14** for a full menu structure map.*

6 Understanding the UC4+ System

The UC4+ Spray Height Control System will work well in most situations. As with any equipment, it is important that the operator remains alert at all times. There may be some situations and terrain where performance is limited and in these situations the operator must resume manual control of the booms.

Sprayer hydraulics and boom suspension systems are the governing components to boom reaction time. The maximum hydraulic speed of the boom is determined by the sprayer manufacturer and is not diminished by the addition of the UC4+ hydraulic system.

6.1 Ditches, Waterways and Outside Rounds

In many situations it is necessary to spray with one sensor reading over terrain that does not reflect the same situation of the rest of the boom. These situations may arise when spraying over ditches, waterways, or field edges. When spraying in these situations the operator must remain alert and override the height controller when necessary.

6.2 Driving Through Ditches and Over Terraces

Changes in terrain such as driving over terraces or through ditches are special performance situations. This type of terrain can cause the sprayer to pitch and roll significantly and when operating at high speeds this can cause rapid changes in boom tip height. Sprayer hydraulic systems are not capable of tip speeds high enough to correct for the boom tip error. There are two solutions to this problem.

- The first is for the operator to recognize these situations before they occur and manually raise the boom to a safe height.
- The second is to add the Roll Control option, if one is available for the specific sprayer. This will compensate for the sprayer roll and make the required corrections faster and smoother, allowing for increased boom protection and higher spraying speeds. For a description of the Roll Control, see **Section 8.3**.

6.3 Height Sensor Capabilities and Limitations

The UC4+ sensors are designed and built specifically for agricultural purposes. However, the ultrasonic transducer must be clean and dry for optimal performance. The foam disc fitted into the bottom of the sensor protects the transducer from dust. If the protective foams become wet (from rain, drift from the spray nozzles... etc) the sensors may have trouble reading.

The height sensors will provide height readings from 22 to 300 cm (9 to 120 inches), under typical conditions. In order to optimize sensor performance, the UC4+ sensor has a minimum distance that it will read (also known as the blanking range). As a result, the UC4+ sensor is designed to ignore targets closer than 8 inches (20cm) from the bottom of the sensor housing.

6.4 Soil Mode and Crop Mode

Height sensors use “smart sensor” technology, which take measurements from both the top of the crop canopy and from the soil surface. This allows the user to select either “Crop” or “Soil” mode. In “Soil” mode the target height is measured from the soil to the sprayer nozzle. In “Crop” mode the target height is measured from the crop canopy to the sprayer nozzle.

Crop mode is usually used when operating in mature cereal grains, row crops or specialty crops. Soil mode is generally used to follow the ground through young crops, stubble or normal trash. Generally, if 60 percent of the ground is covered, crop mode should be used. Sometimes either mode may be used, depending on the crop.

- In row-crops, crop mode will work best with the sensor placed directly above a row. Soil mode will work best with the sensor placed between two rows.
- Crops in growing stages are relatively good targets for crop mode.
- Bearded crops are relatively poor targets for crop mode as they are a poor reflector of sound.
- Some crops will produce a more varying canopy than others. In these situations, the severe terrain option will provide more representative measurements when in crop mode and better performance.
- When mounting the main lift height sensor, ensure the sensor does not measure behind a wheel or tramline, when driving straight or turning. The crop behind a wheel will be flattened, resulting in inaccurate readings and poor crop mode performance.
- When operating in crop mode when the crop is lodged, or where there is no crop, the sensor will follow the target down and begin to track the soil. However, when the crop resumes, the sensor may be beneath the crop canopy therefore preventing the sensor from making proper measurements. This situation may require the operator to manually raise the boom.

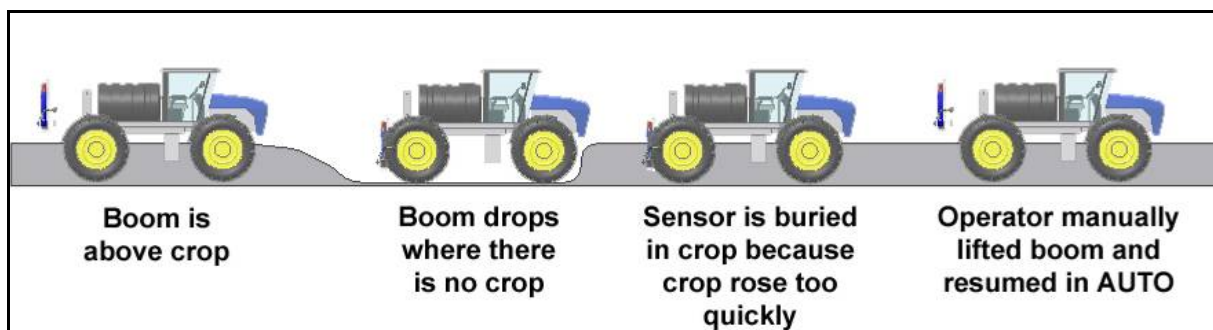


Figure 5: Area of No Crop When Operating in Crop Mode

7 Setup

When the control panel is turned on for the first time, the UC4+ control panel guides the operator through the Automatic System Setup. Normally the UC4+ Spray Height Control System will automatically configure and calibrate itself to the sprayer. If this process does not produce the desired results, perform the Manual System Setup described in **Section 7.3**. From time to time it may be necessary to ReTune the UC4+ electronics to your sprayer's hydraulics. This procedure is described in **Section 7.2**.

7.1 Automatic System Setup

The first time the UC4+ Spray Height Control System is powered up, it will guide you through the Automatic System Setup to customize the UC4+ settings to your sprayer. The entire procedure should take approximately two to seven minutes.

At any point during the setup procedure, you can exit by toggling the "SETUP (NO)" switch. However, if you exit without completing the Automatic System Setup, you may not be able to use the UC4+ in automatic mode.

If you wish to restart this procedure after an initial setup has been completed, navigate to the "Install?" prompt in the setup menu and confirm the action with the "AUTO (YES)" switch. If you confirm the "Install?" menu prompt by accident, you can exit by toggling "SETUP (NO)" before confirming a sprayer type. No settings will be lost. However, if you confirm a sprayer type and the "Dfaling" message appears, all previous system settings will be lost. You may need to perform Automatic System Setup again.

CAUTION

- **All boom sections will move during the automatic install. People and equipment must be clear of sprayer boom.**
- **Ensure the booms have sufficient range to lift fully and are clear of any power lines.**

7.1.1 Preparation

Unfold the sprayer in a location that is relatively level and where the sensors are over bare soil or gravel. Do not conduct the system setup or retune procedures over standing crop or weeds/grass. Also, avoid concrete or asphalt surfaces.

Ensure the boom roll suspension system is functioning properly and smoothly. Friction on wear surfaces can be relieved using lubricants (grease, etc) or adjustment. Properly tuned suspension systems will optimize UC4+ performance, especially on roll-bias (active roll) systems.

For best results, the hydraulic system should be under a normal load and at a normal working temperature. Start the solution pump and run the sprayer's engine at a normal working RPM for the entire setup. Cycle all boom sections up and down manually for five minutes to warm the oil. For pull-type sprayers, ensure any hydraulic flow controls are adjusted for normal field operation. Changing the hydraulic flow controls after or during the system setup will affect the UC4+ performance.

7.1.2 Turn On the UC4+ Control Panel

- If this is the first setup for the panel, this process will begin automatically. If the panel was previously setup, you need to select "Install?" from the setup menu to initiate the Automatic System Setup.

7.1.3 Select the Sprayer Type



- Use the "+/-" switch to toggle through a list of available sprayer types. The types are listed in **Section 13**.



- When the desired type is shown, confirm the selection with the "AUTO (YES)" switch.
- If you wish to exit the install now before changing any settings toggle the "SETUP (NO)" switch.



- The control panel is loading all the settings for your sprayer.

7.1.4 Wiring Test

Press ⇒ Left Up

- Use the sprayer's manual controls to move the left boom up.
- If the wrong boom moves or if the direction is incorrect, stop the setup. Consult the UC4+ Installation Manual to check the hydraulic plumbing and electrical wiring of your system.

Left ↑ Ok

- The control panel confirms the wiring is correct. Continue the process with the remaining booms, as shown below.

Press ⇒ Left Dn

Press ⇒ Right Up

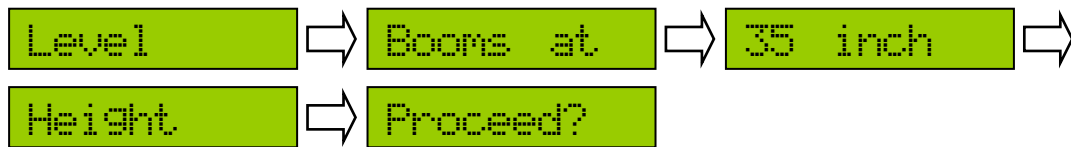
Press ⇒ Right Dn

Press ⇒ Main Up

Press ⇒ Main Dn

Note: Some sprayer types do not support a wiring test or they may support a different style of test. If you do not see any of the messages in this step, simply continue as prompted by the panel.

7.1.5 Sensor Detect



- Position all boom sections such that the nozzles are 35 inches (90 cm) from the ground.
- Toggle "AUTO (YES)" to continue.

*Note: If you cannot get all the booms set to exactly 35 inches (90 cm), you can adjust the sensor height after you have finished the install. Refer to **Section 7.3.1** for more details.*



- Hold the "AUTO (YES)" switch to begin the sensor detect sequence. During the procedure you must hold the "AUTO (YES)" switch. If "AUTO (YES)" is released, simply press and hold again to continue the procedure.
- The control panel will automatically move the booms to detect and assign the sensors to the correct locations.



- Release the "AUTO (YES)" switch to continue.

7.1.6 Boom Geometry Tuning



- Exit the cab and manually push either boom tip down 1 – 3 feet (30 – 90 cm) for a moment and then let go.
- Do not walk near the sensors when approaching the boom. Stay at least 3 feet from the sensor to not induce a measurement error.

Note: This step may not be applicable for all sprayer types.

7.1.7 Hydraulic Tuning



- Hold the "AUTO (YES)" switch to continue the hydraulic tuning. If "AUTO (YES)" is released before "Done" is displayed, simply press and hold again to continue the procedure.
- The panel will display various messages as it is working. The messages are displayed for informational purposes only.



- Release the "AUTO (YES)" switch, the hydraulic tuning is complete.

7.1.8 System Testing



- The run screen is shown above. It shows the system is in manual mode with an average height reading of 39 inches (100 cm).

CAUTION

- **In the following procedure, switch the control panel to manual mode immediately if the boom movements are erratic.**
- Toggle "Auto" to start automatic mode. Observe the behavior of the booms while correcting to the target height.



- The run screen is shown above. It shows the system is in automatic mode with a target height of 45 inches (114 cm).
- The boom movements should be smooth and stable. Boom corrections should stop after a few seconds under normal conditions (excessive wind may cause small corrections to continue).
- Toggle the "MANUAL" switch to return to manual mode. If the boom corrections are done in an acceptable manner your system is ready to use.

**** Automatic System Setup Complete ****

7.2 Retune

From time to time it may be necessary to recalibrate (Retune) the UC4+ electronics to your sprayer's hydraulics. Examples of such times are:

- A hydraulic solenoid valve has been changed.
- The hydraulic pump has been changed or adjusted.
- A different tractor has been connected to the sprayer.
- The tractor's hydraulic flow control has been adjusted.

If you are running a pull type sprayer and use different tractors to operate the sprayer, you should run the Retune procedure each time the tractor is changed. If you have a flow control for the boom hydraulics, set it prior to tuning. If you change the flow setting by more than 20 percent, you should run the Retune.

Follow **Section 7.1.1** (level booms, working RPM, etc.) before beginning the Retune. Navigate to the "Retune?" menu prompt in the SETUP menu and confirm with the "AUTO (YES)" switch. The procedure described in the Automatic System Setup, starting at **Section 7.1.7** will begin.

Note: The booms are to be leveled at a normal working height when Retune starts – it is not necessary to set them to 35 inches. The 35 inch height is only required during the Automatic System Setup.

7.3 Manual Setup

The UC4+ Spray Height Control System will not operate in automatic mode until the system has been configured. It is recommended that the Automatic System Setup be used, but if necessary a manual system setup may be used. The manual system setup involves setting up each sensor (programming serial numbers and sensor locations) as well as tuning the hydraulic parameters manually.

7.3.1 Sensor Setup

Before beginning, it is necessary to know the serial number and location for each of the sensors. The sensor serial number is located on the bottom of the sensor housing, beside the foam disc.

It is recommended that you record the sensor location and serial number in **Figure 6** because this information may be required during troubleshooting.

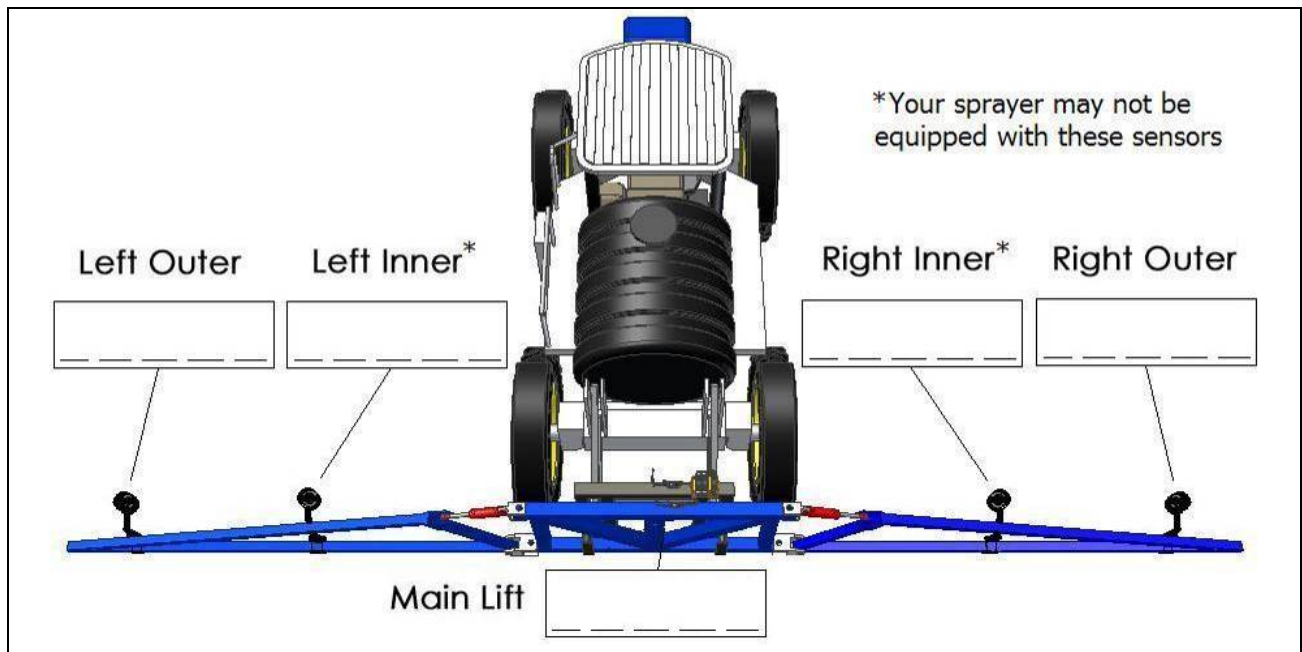


Figure 6: Sensor Serial Numbers and Positions

Navigating to the Sensor Menu:

- Ensure the UC4+ control panel is in manual mode, at the run screen.
- Navigate to the "More?" menu prompt in the SENSOR DISPLAY menu. Toggle "AUTO (YES)" to confirm.
- Navigate to the boom section you would like to change. Toggle "AUTO (YES)". The left channel menu prompts are shown below. For other channels, the basic structure and behavior of the prompts is the same.

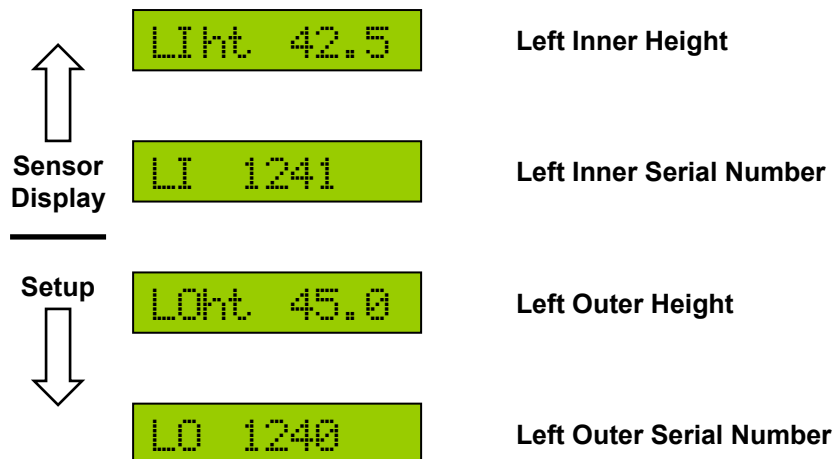


Figure 7: Sensor Setup Menu (for Left Channel)

Entering Sensor Serial Numbers:

- Navigate to the sensor location you would like to change, for example, "LO" for the left outer sensor. This screen will show the previously installed sensor serial number (if any) as shown in **Figure 7**.
- Toggle the "+/-" switch once to search for the all connected sensors.
- Use the "+/-" switch to toggle through a list of available sensor serial numbers with their respective "live" height readings.



- When the desired serial number is shown, toggle "AUTO (YES)" switch to confirm.
- Proceed to "LOht" menu prompt to calibrate the sensor's height reading.
- Press and hold the "SETUP (NO)" or "SENSOR DISPLAY" switch for two seconds to return to the run screen.

Calibrating the Sensor's Height Reading (Zero Height):

- Ensure the sprayer boom is unfolded and the sensors are located over bare soil or gravel. Position the boom at a normal working height. Do not conduct this procedure over standing crop or tall grass/weedy areas.
- Using a tape measure, measure the distance from the bottom of the spray nozzle to the ground (**Figure 8**) Use the spray nozzle closest to the sensor. Round this measurement to the nearest half-inch.

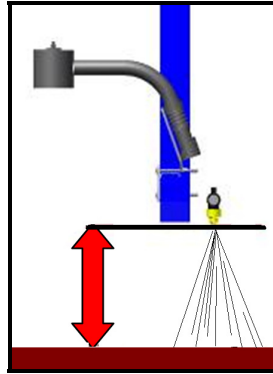


Figure 8: Measurement for Calibrating the Sensor Height

- Navigate to the location you measured, for example, "LOht" for the left outer sensor (**Figure 7**).
- If the currently displayed height reading is not correct, adjust it using the " +/- " switch. The " + " switch will increase the reading, the " - " switch will decrease the reading.
- To return to the Normal Operating Screen, press and hold the "SETUP (NO)" or "SENSOR DISPLAY" switch for two seconds.

Note: To view the absolute height reading from the sensor to the ground, press and hold the "AUTO (YES) switch from the "LOht" menu. This height reading can be useful for troubleshooting purposes.

7.3.2 Valve Tuning

Each valve must be tuned correctly for optimum performance from the UC4+ Spray Height Control System. When setting up the valves, the sprayer booms must have room to move in their full range of motion. Make sure there are no obstructions, such as power lines, that the booms may come into contact with.

Before setting up the valves manually, it is recommended you attempt the automatic install. Starting the automatic install will load the default valve settings, which will make the manual valve setup much simpler. At any time the automatic install can be cancelled and the default settings are still stored.

Each valve has two settings; dead zone and gain. The dead zone relates to the smallest amount of movement the valve can produce. The maximum boom speed is dependant on the gain.

A dead zone and gain parameter exists for each valve. Each valve may be tuned:

- Automatically (as part of the automatic install or retune).
- Automatically (one valve at a time).
- Manually.

Note: You do not need to run both the AUTO and Manual tests. The tests are entirely independent.

The left channel menu prompts are shown below. For other channels, the basic structure and behavior of the prompts is the same.

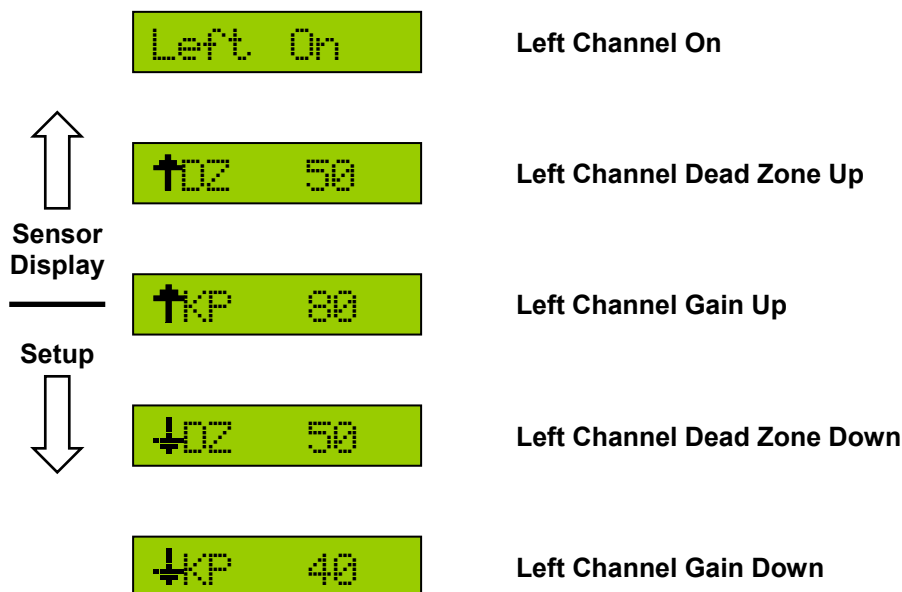


Figure 9: Hydraulic Setup Menu (for Left Channel)

Automatic Dead Zone Calibration:

- Follow **Section 7.1.1** (level booms, working RPM, etc.) before proceeding.
- Ensure the UC4+ control panel is in manual mode, at the run screen.
- Navigate to the "More?" menu prompt in the SETUP menu. Toggle "AUTO (YES)" to confirm.
- Navigate to the boom section you wish to setup, for example "Left?" to adjust the left up or the left down settings. Toggle the "AUTO (YES)" switch to confirm.
- Toggle the "SETUP (NO)" switch to access the next menu prompt. Choose the dead zone up or down setting (**Figure 9**).
- Press and hold the "AUTO (YES)" switch.
- When the "Done" message is displayed, release the "AUTO (YES)" switch to view the new setting.

Manual Dead Zone Calibration:

- Follow **Section 7.1.1** (level booms, working RPM, etc.) before proceeding.
- Ensure the UC4+ control panel is in manual mode, at the run screen.
- Navigate to the "More?" menu prompt in the SETUP menu. Toggle "AUTO (YES)" to confirm.
- Navigate to the boom section you wish to setup, for example, "Left?" to adjust the left up and/or the left down settings. Toggle the "AUTO (YES)" switch to confirm.
- Toggle the "SETUP (NO)" switch to access the next menu prompt. Choose the dead zone up or down setting (**Figure 9**).
- Press and hold the "MANUAL" switch.
- The valve will turn on at the indicated setting for exactly one-second. The screen will show the actual change in height.
- The change in height reading is live as long as you hold the "MANUAL" switch. Wait until the height reading has settled to a stable value and record this reading.
- Average three readings. The acceptable average change in height should be from 0.5 to 1.5 inches (13 to 38 mm). Ideal would be 1 inch exactly (25 mm).
- If the average is less, increase the DZ setting with the "+/-" switch. If the average is more, decrease the DZ setting with the "+/-" switch.
- Repeat the manual dead zone test until the average falls into the acceptable range.

Automatic Gain Calibration:

- Before tuning the gain setting, the dead zone for that function must be tuned. If the dead zone tuning has not been completed, follow the instructions for tuning a dead zone.
- Follow **Section 7.1.1** (level booms, working RPM, etc.) before proceeding.
- Ensure the UC4+ control panel is in manual mode, at the run screen.
- Navigate to the "More?" menu prompt in the SETUP menu. Toggle "AUTO (YES)" to confirm.
- Navigate to the boom section you wish to setup, for example, "Left?" to adjust the left up and/or the left down settings. Toggle the "AUTO (YES)" switch to confirm.
- Toggle the "SETUP (NO)" switch to access the next menu prompt. Choose the gain up or down setting (**Figure 9**).
- Press and hold the "AUTO (YES)" switch.
- When the "Done" message is displayed, release the "AUTO (YES)" switch to view the new setting.

Manual Gain Calibration:

CAUTION

This test will drive the boom at full speed in the selected direction for one second. Make sure the boom has full range of movement and if driving the boom down, make sure it is not close to the ground.

- The purpose of this test is to determine the sprayer boom speeds. It is recommended that you perform each test three times and average your readings.
- From the speed measurements taken, use **Table 1** to determine the appropriate gain values to use for each function. This test will provide approximate results for gain values. Proper gain values rely on more than just boom speed so it is highly recommended to use the automatic gain setup if possible.
- Follow **Section 7.1.1** (level booms, working RPM, etc.) before proceeding.
- Ensure the UC4+ control panel is in manual mode, at the run screen.
- Navigate to the "More?" menu prompt in the SETUP menu. Toggle "AUTO (YES)" to confirm.
- Navigate to the boom section you wish to setup, for example, "Left?" to adjust the left up and/or the left down settings. Toggle the "AUTO (YES)" switch to confirm.
- Toggle the "SETUP (NO)" switch to access the next menu prompt. Choose the gain up or down setting (**Figure 9**).
- Press and hold the "MANUAL" switch.
- The valve will turn on at 100 percent speed for exactly one-second, regardless of what the gain setting already is. The screen will show the actual change in height.

- The change in height reading is live as long as you hold the "MANUAL" switch. Wait until the height reading has settled to a stable value and record this reading. This is your boom speed in inches per second (in/s) or mm per second (mm/s).
- Repeat the Manual Gain Test three times, repositioning the boom as necessary.
- Average your three readings. Typical values are between 15 and 50 inches/sec.
- Set the Gain value using the "+/-" switch using the tables below as a guideline. Right and left gain settings are polarized for direction as shown in **Table 1**.

Note: Gain values depend on many more factors than just speed, and therefore are best set automatically or by an experienced operator.

Note: Test the system in automatic mode at a sensitivity of five. The sensitivity setting will scale the gain settings. If the booms are not reacting quickly enough a higher gain setting will make the boom respond faster. If the booms are too jerky or unstable, you must lower the gain setting or improve the boom's mechanical damping.

Function	Boom Speed (inch / sec)	Up Gain	Down Gain
Left / Right	1 - 5	Too Slow	Too Slow
Left / Right	5 - 15	225 - 175	100 - 70
Left / Right	15 - 25	175 - 150	70 - 50
Left / Right	25 - 40	150 - 100	50 - 30
Left / Right	40 - 70	100 - 50	30 - 15
Left / Right	70 +	50 - 1	15 - 1
Main (on / off)	1 - 5	100 - 75	100 - 75
Main (on / off)	5 - 10	75 - 50	75 - 50
Main (on / off)	10 - 15	50 - 30	50 - 30
Main (on / off)	15 - 20	30 - 15	30 - 15
Main (proportional)	1 - 5	85 - 75	85 - 75
Main (proportional)	5 - 10	75 - 66	75 - 66
Main (proportional)	10 - 15	66 - 60	66 - 60
Main (proportional)	15 - 20	60 - 53	60 - 53
Roll	1 - 10	254 - 225	254 - 225
Roll	10 - 15	225 - 175	225 - 175
Roll	15 - 20	175 - 150	175 - 150
Roll	20 +	150 - 100	150 - 100

Table 1: Gain Settings

7.3.3 Boom Geometry Tuning (Push Test)

If you would like to redo the push test, or if you have manually set up the system and need to calibrate the boom geometry you can manually launch the push test again.

To Manually Launch the Boom Geometry Test:

- Navigate to the "More?" menu prompt in the SETUP menu. Toggle "AUTO (YES)" to confirm.
- Navigate to "Roll?". Toggle "AUTO (YES)" to confirm.
- Press and hold "AUTO (YES)" from the "Roll On" screen to launch the Boom Geometry Test.



- Exit the cab and manually push either boom tip down 1 – 3 feet (30 – 90 cm) for a moment and then let go.
- Do not walk near the sensors when approaching the boom. Stay at least 3 feet from the sensor to not induce a measurement error.

To View the Roll Values:

By pressing and holding "MANUAL" from the run screen you can view the Roll Values. The screen will appear as shown below.

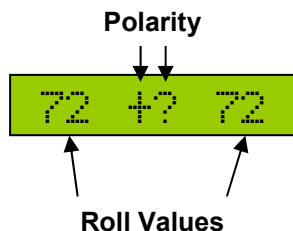


Figure 10: Roll Values

The left and right values should normally be very close (within 10). For trapeze style booms the values will be around 20 to 40. For center pivot style booms the values will be around 70 to 120.

The polarity will show "+ ?" until the sprayer has turned a corner or driven over a bump. For sprayers which have 2 roll sensors installed with the cable facing the right hand wing, the polarity should show "+ -".

7.3.4 Turning Booms Off or On

You can turn UC4+ automatic height control off for each individual boom section. In automatic mode, boom sections that are turned off will not automatically adjust, and are indicated with a "D" in the run screen, as shown in **Figure 11**.

This may be useful if you are mounting the main lift sensor directly behind a sprayer tire which can impair the main lift control when operating in crop mode. Height readings from crop that is flattened by the sprayer wheel do not provide an accurate measurement of canopy height, resulting in poor performance. By turning off the main section you can disable the main section's automatic control; however, manual height readings from this section will still be available. The sprayer's wing booms will still be controlled automatically.



Left Channel is turned off ("D" = Disabled)

Figure 11: Turning a Boom Off (for Left Channel)

- Ensure the UC4+ control panel is in manual mode and at the run screen.
- Navigate to the "More?" menu prompt in the SETUP menu. Toggle "AUTO (YES)" to confirm.
- Navigate to the boom section you wish to turn off or on, for example, "Left?". Toggle the "AUTO (YES)" switch to confirm.
- At the "Left On" menu prompt toggle the "+/-" switch to change the status.
- Press and hold the "SETUP (NO)" or "SENSOR DISPLAY" switch for two seconds to return to the run screen.

7.4 Quick Install

The Quick Install feature of the UC4+ Spray Height Control System is designed to help diagnose problems that cannot be identified during the Automatic Setup. It will instantly setup the system with typical values for hydraulic calibration and sprayer geometry, based on the sprayer type selected. Perform the following procedure for a Quick Install.

STANDARD SYSTEM (Including Passive Roll):

- Your system must have a minimum of two sensors.
- Verify the sensors are installed with the lowest serial number on the left side increasing to the highest serial number on the right side.
- Level the boom at 35 inches (90 cm) height.

A screenshot of a green rectangular screen with the text "Install ?" in a black, pixelated font.

- Navigate in the setup menu to the "Install?" screen and toggle "AUTO (YES)" switch.

A screenshot showing two green rectangular screens. The left screen displays "Select" and the right screen displays "Type +/-". A white right-pointing arrow is positioned between the two screens.

- Use the "+/-" switch to toggle through a list of available sprayer types. The types are listed in **Section 13**.

A screenshot of a green rectangular screen with the text "AN2 ?" in a black, pixelated font.

- Press and hold "AUTO (YES)" for 5 seconds.

A screenshot of a green rectangular screen with the text "Sensor" in a black, pixelated font.

- When the word "Sensor" is displayed, release the switch. Your system will be configured with the standard settings based on the type you have selected and the number of sensors present.
- The UC4+ system will now prompt you to perform a push test (**Section 7.1.6 - Boom Geometry Tuning**).
- Perform a ReTune (**Section 7.2**).

ACTIVE ROLL SYSTEM:

- Perform the Quick Install for the standard system as previously described.

A rectangular LCD screen with a black border. The screen has a light blue background and displays the text "Roll OnA" in a black, monospaced font. The text is centered horizontally and vertically.

- Navigate to the "Roll ?" menu prompt in the SETUP menu. Toggle "AUTO (YES)", and then change it to "Roll OnA" using the "+/- " switch. Toggle "AUTO (YES)" to confirm.

A rectangular LCD screen with a black border. The screen has a light blue background and displays the text "IFh 0" in a black, monospaced font. The text is centered horizontally and vertically.A rectangular LCD screen with a black border. The screen has a light blue background and displays the text "BFh 0" in a black, monospaced font. The text is centered horizontally and vertically.

- Navigate to the "Roll ?" menu prompt in the SENSOR DISPLAY menu. Toggle "AUTO (YES)", and then set the "IFh" (intermediate frame height) and "BFh" (boom frame height) to zero using the "+/- " switch. Toggle "AUTO (YES)" to confirm.
- Perform a ReTune (**Section 7.2**).

8 Optional Kits

The kits shown below are optional add on kits for the UC4+ Spray Height Control System. These kits will help improve the performance for certain situations described below.

8.1 Severe Terrain Kit

- Additional sensors may be added to improve boom protection and system performance.
- This is more suitable for larger booms and in severe terrain conditions.

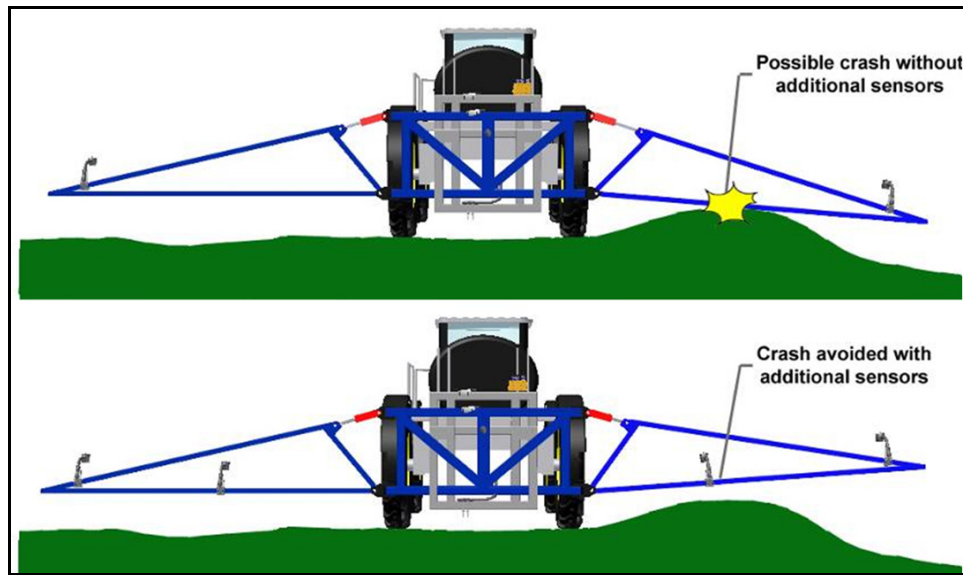


Figure 12: Example of Severe Terrain

8.2 Enhanced Stability Kit

- This kit is designed to provide enhanced boom stability for sprayers which are loosely coupled between the intermediate frame (para-lift arms or mast) and the sprayer chassis.
- The roll sensor included in this kit will provide an additional measurement of the sprayer dynamics to allow for greater stability of the boom.

8.3 Roll Bias (Active Roll) Kit

- Available on certain sprayer models (most sprayers with boom roll capability).
- Full boom roll is controlled actively together with wing tilt functions.
- Provides active isolation between the boom and sprayer, and increases reaction speed.
- This option improves spray height accuracy and provides unprecedented control.

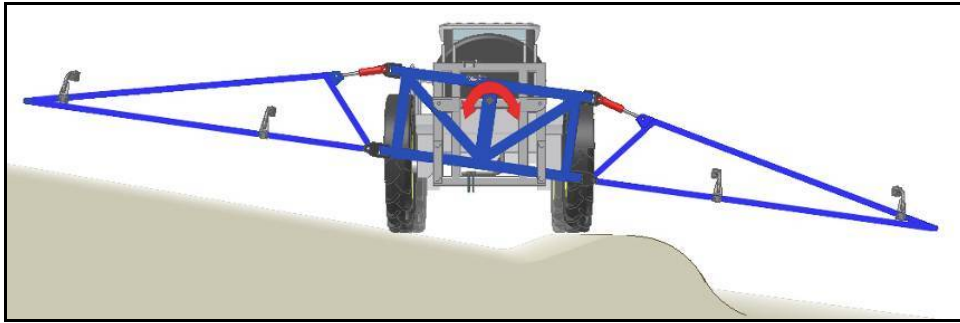


Figure 13: Roll Bias over a Terrace

9 Options

9.1 Headland Assist

Headland Assist is used to raise the wings only or the entire boom at the end of the field for turning. This feature operates when the system is in automatic mode. This feature is enabled for certain sprayer types.

The headland mode height can be changed. While the boom is in headland assist mode, the operator can change the height by simply adjusting the target height (**Section 5.3**).

Navigating the Headland Assist & Remote Switch Menu:

- Ensure the UC4+ control panel is in manual mode and at the run screen.
- Navigate to the "More?" menu prompt in the SETUP menu. Toggle "AUTO (YES)" to confirm.
- Toggle "SETUP (NO)" until the display says "Other?". Toggle "AUTO (YES)" to confirm.
- At this point you are in the Headland Assist menu. Use the "+/-" switch to navigate the menu.
- The setting is selected when you leave the Headland Assist menu by pressing and holding "SETUP (NO)" / "SENSOR DISPLAY" or just toggling the "SETUP (NO)" / "SENSOR DISPLAY" switch.
- By pressing and holding "AUTO (YES)" at any time in the Headland Assist menu, you can switch between the wings only mode and the main lift mode. **Figure 14** shows the menu structure for the Headland Assist menu.

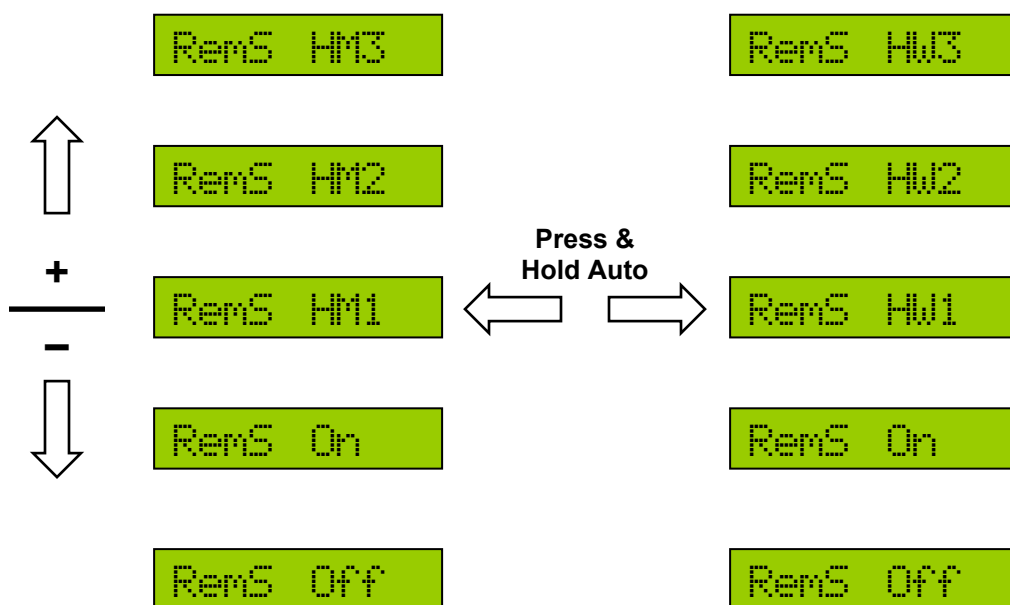


Figure 14: Headland Assist and Remote Switch Menu

Setting	Remote Switches	Headland Assist	Trigger	Mode
Rems Off	Disabled	Disabled	Disabled	Disabled
Rems On	Enabled	Disabled	Disabled	Disabled
HM1	Disabled	Enabled	Main Up / Down	Main Lift
HM2	Enabled	Enabled	Main Up / Down	Main Lift
HM3	Enabled	Enabled	Remote Auto	Main Lift
HW1	Disabled	Enabled	Main Up / Down	Wings Only
HW2	Enabled	Enabled	Main Up / Down	Wings Only
HW3	Enabled	Enabled	Remote Auto	Wings Only

Table 2: Headland Assist & Remote Switch Settings

Main Lift Trigger:

If the main lift switch is enabled as the trigger, the Headland Assist will be triggered when the operator toggles the “main up” switch while in automatic mode. By toggling the “main down” switch the boom will return to automatic mode. When in manual mode the main lift switch will operate the normal main lift function.

Note: If the main lift switch is enabled as the trigger, the set point increment / decrement feature is disabled for the main lift switch.

Remote Auto Trigger:

Enabling remote auto as the trigger will allow a separate switch to trigger the Headland Assist. This switch must not be a momentary type switch. Remote auto is an input line normally located in the wiring harness in the cab. Refer to **Section 9.2** for the location of the remote switch inputs.

When +12 VDC is applied to the remote auto line the system will change to automatic mode from either manual mode or headland mode. When 0 VDC is applied to the line the system will change to headland mode from automatic mode. If the system is put into automatic from the display, then the voltage on the remote auto line will dictate what mode (auto or headland) the system will start in.

Headland Assist Mode:

The Headland Assist feature can operate in two different modes; main lift or wings only.

If the main lift mode is selected, when the Headland Assist is triggered the wings will temporarily be disabled and the main lift will raise to the predetermined Headland Assist height to allow the operator to turn around at the end of the field. When triggered again, the entire boom will return to automatic mode.

If the wings only mode is selected; when the Headland Assist is triggered only the wings will raise to the Headland Assist height. When triggered again, the entire boom will return to automatic mode.

9.2 Remote Switches

When remote switches are enabled, the UC4+ can be put into automatic or manual mode using a remote switch connected to the remote auto and manual input lines. This feature can still be used in conjunction with the remote auto line as the trigger in headland mode. The remote auto and manual input lines are located on pin 1 and pin 6 of connector P16B on cables 44650-35 and 44650-39. Please refer to your UC4+ Installation Manual for detailed schematics of these cables.

To activate automatic mode, apply +12 VDC to the remote auto line. The voltage must always be applied after the display has been powered up. The UC4+ will not go into automatic mode if voltage is applied to the remote auto input line before the system is powered up.

To activate manual mode, apply +12 VDC to the remote manual line. The remote manual function always has priority over the automatic function.

9.3 Crop Filter Toggle

The Crop Filter option is normally defaulted to off for most sprayer types. To access this feature press and hold "AUTO (YES)" from the run screen. "CropF n" means the crop filter is off, "CropF y" means the crop filter is set to on. While holding the "AUTO (YES)" switch, toggle the "+/-" switch to turn the feature on or off.

There are two main reasons why you might want this feature enabled. One reason is if a main lift sensor is having difficulty reading properly in crop mode. The second reason is if the wings seem excessively jumpy in crop mode. Enabling this feature will tend to reject electrical and sonic noise and keep the sensor locked on to stronger targets.

There are two main reasons why you might want this feature disabled. First, the sensor may track the canopy in thin crop better. Also, disabling this feature may also produce less "No Data" messages flashing in place of the sensor height readings.

9.4 High Oil Temperature Alarm

The High Oil Temperature Alarm will sound if the Norac valve block reaches a temperature of 95° C. This alarm will only sound once and will not repeat. The alarm is re-enabled each time the automatic mode is entered. If the alarm sounds, the screen will also show "VT Max" for 2 seconds to inform the operator that the valve block temperature is at a maximum.

This alarm is for informational purposes only, to indicate when there is a major oil heating issue with the machine. This alarm does not reflect the warranty of any components. Actual maximum oil temperature is determined by the fluid used in the system and should be recommended by the sprayer manufacturer.

9.5 Sensor Reading Alarm

Pressing and holding "SENSOR DISPLAY" will enable / disable the sensor reading alarm. If enabled, the alarm will sound if an ultrasonic sensor has lost a reading. The alarm is defaulted to off.

9.6 Minimum Height Mode

Minimum height mode is normally used only for systems with five sensors (severe terrain kit). Since the five sensor system has two wing sensors that average the height, it is possible to have a boom tip close to the ground while still maintaining an acceptable average height. The minimum height defines the lowest height in which a single sensor on the wings is allowed to go.

The relative "Rel" setting defines the number as the distance below the target height. The fixed "Fixd" setting defines the number as the distance above the ground.

- To access the minimum height mode settings; toggle "SENSOR DISPLAY" from the run screen until you see "More?". Toggle "AUTO (YES)" to accept.
- Toggle "SENSOR DISPLAY" again until you see "Other?". Toggle "AUTO (YES)" to accept.
- Use the "+/-" switch to change the settings.

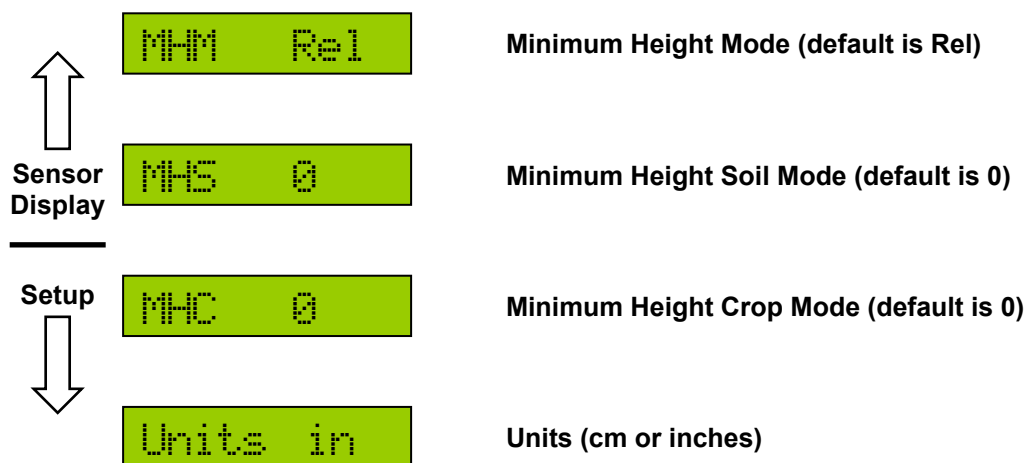


Figure 15: Minimum Height Mode and Units Menu

9.7 Changing the Units

To change the units, simply navigate to the units menu as shown in **Figure 15**. Use the "+/-" switch to change between inches and cm.

9.8 Valve and Air Temperature

Pressing and holding "SETUP" will cycle the display between the valve block temperature "VT" and the air temperature "AT".

Metric (cm height) = Celsius

Imperial (inch height) = Fahrenheit

10 Maintenance

The UC4+ Height Control System requires very little maintenance, but there are a few procedures that will ensure the system continues to work correctly for many years.

Before each day:

- It is highly recommended that the sprayer friction pads are greased. This will ensure the boom is pivoting separately from the sprayer. It is very important to keep the friction pads greased on active roll systems. It may be necessary to grease the friction pads multiple times throughout each day.
- Ensure the UC4+ sensor breakaway brackets are functioning correctly.
- Inspect the foam insert in each sensor. If it is clogged with dust or other debris, clean it. When the foam is removed from the sensor it can be blown out with an air compressor. If necessary replace the foam.

At the end of the season:

- Remove the height sensors from and store inside. Use **Figure 6** in **Section 7.3.1** and record the sensor serial numbers to ensure each height sensor is returned to its original location at the start of the next season.
- Replace the oil filter in the NORAC hydraulic manifold (PT# 104827) annually.
- If necessary, contact your NORAC dealer to have the sensors recalibrated or repaired. A typical sensor can operate three to ten years without requiring attention.

11 Troubleshooting

11.1 General Operation

Boom does not appear to be level after system setup:

- The sensitivity setting may be too low. Check the sensor height readings, if it differs from the target height then try turning up the sensitivity. The default tolerance for a sensitivity setting of 5 is ± 6 cm (2.5 inches).
- The dead zone may be calibrated incorrectly. If the dead zone is set too low the system cannot make small corrections. Recalibrate the dead zones as described in **Section 7.3.2**.
- The sensor offset heights may be incorrect. Refer to **Section 7.3.1**.

The system will not go into automatic mode:

- Ensure the system has completed an automatic install. If you have started and not finished an automatic install, you will need to manually tune at least one hydraulic function (**Section 7.3.2**) before the system will allow you to go into automatic mode.

The system resets when a valve is turned on:

- Check the power supply. The sprayer's power supply voltage must be more than 12 VDC.
- This may also be caused by a damaged or defective power supply cable. Check the power cable for a good connection to the supply.

The system randomly switches between auto and manual mode:

- This may be caused by a damaged or defective interface cable. Ensure all cables are connected correctly. The connections should be tight and free of corrosion.
- There may be electrical noise on the sprayer's D.C. system. Add a power line filter or freewheeling diodes on one or more of the sprayer's solenoid valves.

11.2 Sensors

Height or roll sensor appears not to work (displays "NC" or "No Comm"):

- "NC" or "No Comm" refers to no communication. This may be caused by a damaged or defective CAN-bus cable. Ensure all cables are connected correctly. The connections should be tight and free of corrosion.
- Ensure the correct serial numbers are entered for each of the sensors (**Section 7.3.1**).
- If the cables check out ok the sensor may be damaged. Try swapping sensors to see if the problem follows the sensor.

Invalid height sensor measurement (displays "NR" or "NoRdg"):

- "NR" and "NoRdg" refers to no reading. It is normal to see this message occasionally. If you are seeing this message all the time the sensor may be having difficulty obtaining a proper reading. Ensure the sensor is not out of range. Check the sensor alignment. The sensor should point almost perpendicular to the ground and there should be no obstructions between the sensor and the ground.
- The protective foam shield may be contaminated. Inspect and clean the foam shield. If it is severely worn or dirty replace the foam shield.
- The sensor may have moisture in it. This can be common for sprayers which fold the wing tips up; therefore pointing the sensors into the air. If rain or moisture collects in the sensor, remove the protective foam disc and allow the water to drain out. If you leave the sensor running it will dry out on its own and start working again.
- The sensor transducer may be damaged. Remove the foam shield and check if you can hear the sensor ticking. If you cannot hear the ticking sound or if it is very faint then the transducer may be damaged and the sensor would need repairing.

During power up the panel shows "1 Absent":

- One of the configured sensors was not found during power up. One of the sensors is disconnected or not communicating.
- Ensure the correct serial numbers are entered for each of the sensors (**Section 7.3.1**).

Sensor Swapping:

Swapping Sensors is a useful procedure for determining whether a sensor error message (e.g. "LO NC") is due to the sensor or the wiring to the sensor.

Note: A sensor may have power and emit a ticking sound, but have broken communication wire(s), which would cause this error. Performing Sensor Swapping would help determining the cause.

The procedure is as follows:

- Exchange the affected sensor with one that is reporting correctly (e.g. "LO" and "RO").
- Swap (input) their respective location serial numbers into the control panel (**Section 7.3.1**).
- If the problem still exists in the same location, the wiring from that branch may have a fault.
- If the error appears in the new location, the sensor may not be functioning properly.

Sensor Alignment:

Proper sensor alignment is critical for proper UC4+ performance.

- When the boom is in its lowest position, the sensor mouth must be 22cm (9 inches) or more above the spray nozzles.
- The bottom of the sensor must be at least 25cm (9 inches) in front of the nozzles.
- The sensor must be approximately vertical at normal operating heights.
- Ensure that there are no obstructions within a 30cm (12 inch) diameter circle projected directly below the sensor.
- When mounting or relocating sensor brackets, ensure they do not interfere with boom folding operation.
- When mounting to the top part of the boom (**Figure 16**), check that the sensor can not read off the bottom part of the boom. This is most common in Crop Mode.

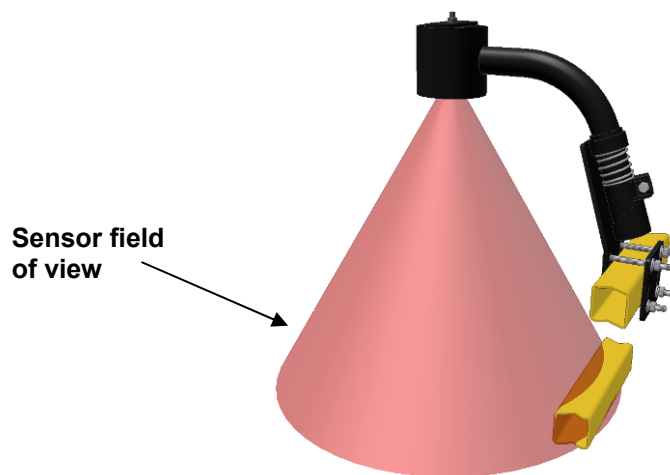


Figure 16: Sensor Reading of the Boom

11.3 Hydraulics

- When diagnosing hydraulic problems you should first determine if the electrical system is ok. Check all cable connections and ensure they are tight and free of corrosion. Measure the electrical output at the valve to ensure there is voltage at the connection.
- Most valves will have an override pin. This is a small brass colored hole located at the end of each coil in the center. There will be one for each valve. By pushing in the pin you can manually activate the valve. There must be pressure at the block for the function to move.
- If your sprayer is equipped with a bypass valve it will need to be activated anytime a hydraulic function is required.

Boom(s) will not raise or lower:

- Ensure there is hydraulic oil being supplied at the Norac valve block and that there is pressure at the pressure port. The hydraulics will not work if the pressure and tank lines are reversed. If you have any quick couplers in the system they must be properly connected.
- The raise and lower lines to the tilt cylinders may be reversed. Ensure the raise lines are connected to the "B" ports on the Norac valve block. The lower lines should be connected to the "A" ports.

The boom will raise when it should lower, or vise versa:

- Check the cable connections to the valve block and ensure they are not reversed.
- The raise and lower lines to the tilt cylinders may be reversed. Ensure the raise lines are connected to the "B" ports on the Norac valve block. The lower lines should be connected to the "A" ports.

The boom will creep up or down in manual mode:

- The raise and lower lines to the tilt cylinders may be reversed. Ensure the raise lines are connected to the "B" ports on the Norac valve block. The lower lines should be connected to the "A" ports.
- This may be caused by a problem with the sprayer's hydraulic system. Check the sprayer hydraulics. Check if the tilt cylinders are leaking and replace the seals if needed.
- There may be an internal problem with the Norac valve block. Some possible causes are; a sticky valve, worn valve, faulty check valves or a foreign object stuck in the valve block. If possible try removing any foreign objects in the valve. The valve block may need also repairing.

The hydraulic oil is over heating:

- Using the UC4+ system at higher sensitivities may create a greater demand on the sprayer's hydraulics. Try lowering the sensitivity.
- Plumbing single acting systems as double acting with orifices in both "A" ports may reduce the heating.

11.4 Boom Stability

The boom is unstable in automatic mode:

- Ensure the sprayer's boom suspension is operating correctly and moving freely. If the suspension is sticking or too loose the boom will be unstable. If the boom is unstable in manual mode, the height control system will not make it more stable.
- If there are friction pads on the boom, ensure they are well greased. Check the boom damper shocks and replace them if they are worn. If there is substantial wear in the mast-style main lift the boom will be too loose. Install shims or adjust the mast-style lift if possible.
- If the hydraulic settings are not calibrated correctly the boom may be unstable. Perform a Retune (**Section 7.2**) and redo the Boom Geometry Test (**Section 7.3.3**).
- Check the mounting of the roll sensors. They must be mounted for the type of boom suspension as shown in the installation manual.
- Ensure the height sensors are reading properly and consistently. The sensors must be aligned and mounted correctly. The sensor should point almost perpendicular to the ground and there should be no obstructions between the sensor and the ground.
- If your sprayer is equipped with accumulators on the tilt cylinders they should be charged to the manufacturers specifications. There should also be orifices installed between the accumulators and tilt cylinders.

The boom(s) move all the way to the top in crop mode:

- The sensors are likely reading off of the boom in crop mode. Ensure the sensors are aligned and mounted correctly. The sensor should point almost perpendicular to the ground and there should be no obstructions between the sensor and the ground.

11.5 Setup Messages

The following are descriptions of messages or problems that may be encountered during the automatic setup or retune.

"Timeout":

- This message may occur if the system is trying to move a boom but does not see any change in the sensor heights. If the cylinder is fully extended or retracted, manually reposition the boom into the middle of the stroke and resume the setup by holding the "AUTO (YES)" switch.
- For left and right booms that do not adjust below the level of the main boom, ensure that the main boom is within 125cm (50 inches) above ground before attempting an Install or ReTune.
- Ensure there is enough hydraulic pressure to move the boom.

"Mot'n Dly":

- The system detects motion and is waiting for the boom to stop moving.

"Wiring!":

- This message is shown at the wiring test if the system receives a signal from the wrong sprayer switch. This will occur if the wiring is incorrect or there is a poor cable connection. Pressing the wrong switch during this test will also display this error message.

"Too Many":

- The system has detected too many sensors connected. Remove the additional sensors or setup the system manually.

"Bakwards":

- This message will be shown if the boom moves in the wrong direction of what is expected by the UC4+ system. This may be caused by a wiring or hydraulic problem. An extremely under damped boom or high wind conditions may also cause this message to appear.

"TooHigh!" or "TooLow!":

- The boom is positioned higher than 60 inches (150 cm) or lower than 30 inches (80 cm). The system setup was likely started with the boom too high or too low. Restart the setup with the boom positioned at 35 inches (90 cm).

The display is stuck at "Mot'n Dly" or "KP Stp 9" during an install or retune:

- The sensor may be reading off the boom. Try moving the sensor to a better location.
- The target may be too weak. Move the sprayer to a better location with either dirt or gravel on the ground. Ensure there is no grass or other plants under the sprayer boom.
- The sensor may be out of range. Release the "AUTO (YES)" switch and manually adjust the entire boom to approximately 35 inches (90 cm) above the ground. Press and hold "AUTO (YES)" to continue with the install or retune.
- It may be too windy outside to complete an Install or Retune. If the boom cannot stop moving due to high wind conditions, the system cannot be properly calibrated.

11.6 Operational Messages

The following messages may appear during normal operation and may not indicate an error with the system.

"NR" or "NoRdg":

- This indicates the sensor is not receiving a good reading. It is normal to see this message occasionally, however if the message is constantly displayed there may be a problem with a sensor. Refer to **Section 11.2** for more information.

"Minimum Override":

- This message is displayed when the target height is lower than the Minimum Height Mode allows.

"Disabled":

- Access to the system setup features (Automatic Install, ReTune) has been disabled by the installer to avoid unintentional system changes.

">>>>>>>":

- The control panel is busy with a task that may take a few seconds. Wait for the arrows to disappear before activating any control panel switches.

12 Statement of Limited Warranty

NORAC SYSTEMS INTERNATIONAL INC., also known as NORAC, warrants all equipment of its manufacture to be free of defects in material and workmanship for a period of one year. This warranty period is for a period of twelve months from the date the equipment is delivered by NORAC or its authorized dealer to the purchaser. Items include weighing systems, instrumentation, and control systems manufactured by NORAC. Auxiliary components not manufactured by NORAC such as tires, axles, pumps, or rebuilt parts are covered by a 6 month warranty only.

NORAC will repair free of charge items returned within the warranty period to one of NORAC's authorized Service Centers. Freight will be paid one way and returned by the same carrier unless instructed differently.

NORAC or its authorized Service Center will repair or replace, at its option, any defective part or component at no cost to the purchaser during the warranty period. If service in the field is required NORAC will authorize on-site repairs at no charge for parts and labor. Travel time, travel costs and per diem expenses to and from the place where repairs are made will be charged to the purchaser at prevailing rates.

For the nearest Service Center visit our website at www.norac.ca or call 306-664-6711.

Any evidence of, negligent or abnormal use, alteration of serial numbers, or repairs attempted by other than NORAC authorized personnel using NORAC certified or recommended parts, automatically voids the warranty. Normal wear is not covered under this warranty.

NORAC will not warranty any complaints relating to inadequate installation (unless the installation was performed by NORAC), adjustments or calibration.

The forgoing states the entire liability of NORAC regarding the purchase and use of its equipment. NORAC will not be held responsible for any consequential loss or damage of any kind.

This warranty is in lieu of all other warranties, except as set forth above. Any implied warranty merchantability or fitness for a particular purpose is hereby disclaimed. This warranty is in lieu of all other warranties, expressed or implied.

13 Sprayer Types

Type	Sprayer Model	Type	Sprayer Model
AN2	Generic Sprayer Boom	HG2	Hagie 2100 / 2101
AP1	Apache (Year 2001-2004)	HG3	Hagie 2005 STS
AP2	Apache 2005+ (AS models)	HG4	Hagie STS STS 120 with Proportional Main Lift and Active Roll
BA1	Bateman Sprayers - Variable Geometry type	JD6	John Deere 4920
BA2	Bateman Sprayers - Fixed Geometry type	JD7	John Deere 4720, 4710, 4700
BT2	Brandt SB4000	JD8	John Deere 30 series
BT3	Brandt SB4000 c/w Suspension	JD9	John Deere 30 series with Proportional Main Lift Control
CS1	Case 4260, 4410 (Year 2000+)	JD10	John Deere 30 series
CS2	Case 3150, 3185, 3200, 3310, Tyler Patriot	MS1	MS sprayers
CS3	Case 4420, 3320	NT2	Nitro-Miller Technologies 120 Foot Boom
CS4	Case 4420, 3320 c/w proportional Main Lift	NT3	Nitro-Miller Technologies 90 Foot Boom
EV1	Evrard TR4 Sprayer type	OM1	Original Equipment Manufacturer (NORAC Wiring and Grip)
EV2	Evrard Sprayer type	PL1	Pla sprayers
FC1	Flexi-Coil 67 Series (Year 1999+)	RA1	Rau Sprayers - Variable Geometry type
FC2	Flexi-Coil/NH/CaseIH 68 Series, SF210/216, SRX100/160	RA2	Rau Sprayers - Fixed Geometry type
FT1	Fast with Directional Manifold	RG2	Rogator Sprayer 64 and 74 Series
FT2	Fast with Active Roll	RG4	Rogator Sprayer 854, 1054 and 1254 Series
FT5	Fast OEM Style Install 5 station (Norac Grip)	RG5	Rogator Sprayer with active roll (LRC)
FT6	Fast OEM Style Install 6 station (Norac Grip)	RG6	Rogator Sprayer with active roll (LRC) c/w prop. ML
GM1	Gregson Maverick 120 Series (Year 1999+)	RH2	RHS Bestway 1200/1600 with no Main Lift Valve
GN1	Variable Geometry with Slow Roll Option (Metric)	SC1	Spray Coupe 7000 Series
GN2	Fixed(non-VG) boom with Slow Roll Option (Metric)	SM1	Summers Pull-type
GN3	Variable Geometry with Active Roll (Metric)	SM2	Summers Pull-type c/w proxy switch sense
GN4	Variable Geometry (Metric)	SM3	Summers Pull-type c/w proxy switch sense and prop. ML
HD1	Hardi Retrofit Install North America	TA1	Top Air
HD3	Hardi Factory Install - Australlia	WR1	Wilmar 8100/8500
HD4	Hardi Factory Install - Denmark (Metric)	WR2	Wilmar 8400/8600
HD5	Hardi Autoslant	ZX1	Generic Active Roll Type OEM Style (Norac Grip, Wiring)
HG1	Hagie STS12	ZX2	Generic Active Roll Type Retrofit

Table 3: Sprayer Types



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