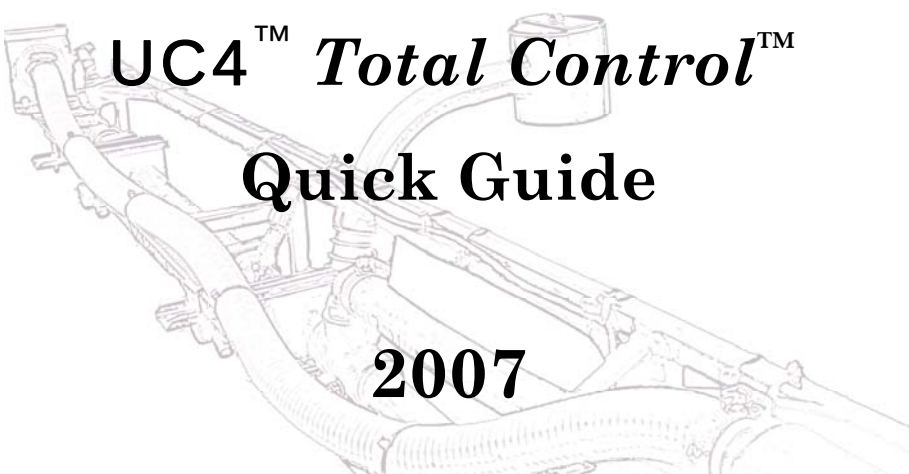


NORAC

WEIGHING AND CONTROL SYSTEMS



UC4TM Total ControlTM

Quick Guide

2007

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NOTICE

NORAC Systems International Inc. reserves the right to improve products and their specifications without notice and without the requirement to update products sold previously. Every effort has been made to ensure the accuracy of the information contained in this manual. The technical information in this manual was reviewed at the time of approval for publication.

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1 INTRODUCTION

This booklet is a quick on-site reference for the operator of the UC4 automatic boom height control system.

This booklet is intended to be used in conjunction with the:

- **UC4 Total Control Automatic Boom Height Technical Manual (UC4 Technical Manual)**
- **UC4 Total Control Automatic Boom Height System Installation Manual (UC4 Installation Manual)**

It is important for the operator to be familiar with the UC4 Technical Manual before attempting operation. As well, it is assumed that the operator is familiar with navigating through the UC4 control panel menu structure and with making setting adjustments.

Section 3 outlines basic operation of the UC4 control system.

Section 4 describes solutions for common symptoms regarding the UC4 system operation. Irregular behavior is sometimes a combination of several causes. Please take time to read this section thoroughly.

Section 5 presents common error messages on the UC4 control panel's LCD screen.

Section 6 discusses detailed information regarding the sensor and rod alignment. This information will be useful to operate and maintain the system efficiently.

Section 7 is a quick reference to the common symptoms. It guides you to find a proper solution quickly when experiencing difficulty during System Setup or field operation.

 **This guide is based on UC4 software Version 5**

If you can not determine the cause of your problem, contact your dealer or NORAC for assistance.

Phone:	1-800-667-3921	in Canada (Toll Free)
	1-866-306-6722	in the United States (Toll Free)
	0-800-404-8389	in the United Kingdom (Toll Free)
	1-306-664-6711	all other regions

E-mail: service@norac.ca

Web Site: www.norac.ca

2 OPERATOR SAFETY



STEP 1: Always ensure that the UC4 system is powered down or in MANUAL mode:

- before leaving the operator's seat
- while the machine is not moving
- or when transporting the machine

STEP 2: Under no circumstances should any service work be performed on the machinery while the UC4 system is in the AUTOMATIC mode.

STEP 3: Before working on any part of the booms:

- set the UC4 system to MANUAL mode
- turn the sprayer engine off

STEP 4: Do not operate this system before:

- reading and understanding the UC4 Technical Manual
- thoroughly understanding your machine operation

STEP 5: The UC4 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. Refer to the warranty statement in Section 0 for more details.

3 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 Normal Operating Screen (**Figure 1**) is displayed
- To access either the **SENSOR DISPLAY** or **SETUP** menus ensure you are at the Normal Operating 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 Normal Operating Screen
- To return to the Normal Operating Screen toggle and hold the "**SETUP (NO)**" switch for two seconds
- New settings take effect once the Normal Operating Screen is displayed

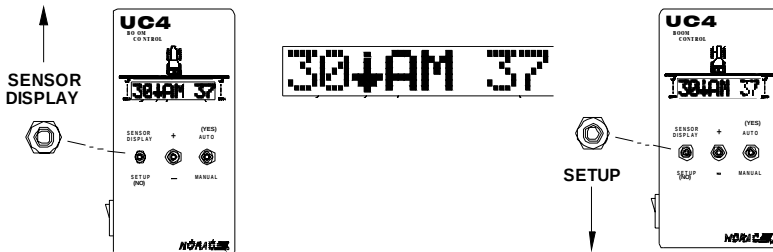


Figure 1 – SENSOR DISPLAY / SETUP Switch and Normal Operating Screen

3.1 NORMAL OPERATING SCREEN

- In **AUTOMATIC** mode the digits represent target boom height in inches
- In **MANUAL** mode the digits represent actual boom height in inches

Table 1 – Examples of Normal Operating Screens

LCD Display	Description
	Right and left booms in AUTOMATIC mode, target height is 36"
	Left side taking corrective action upwards
	Right side taking corrective action downwards
	Main lift is taking corrective action downwards
	Main roll section is taking action in the clockwise direction
	Left boom in MANUAL mode with actual height of 36" Right boom in AUTO mode with target height of 34"
	Booms in MANUAL mode with actual height of 36" Operator is manually lowering the right boom

3.2 CHANGING TO AUTOMATIC OR MANUAL MODE

- From the Normal Operating Screen toggle the control panel "**AUTO**" switch to change between **MANUAL** and **AUTO** modes
- In **MANUAL** mode, the boom may be controlled as usual with the boom control switches on the sprayer's multifunction handgrip
- Operating the sprayer's left or right boom control switches while in **AUTO** mode immediately causes that boom to revert to **MANUAL** mode.
 - the sprayer's joystick switches override automatic height control on either the left, right, or both sides
- To return to **AUTO** mode the "**AUTO (YES)**" switch must be activated.
- The target height (**Section 3.3**) can be adjusted by momentarily pressing the sprayer's main lift control switches (main up or main down).
- Pressing and holding the sprayer's main up or down switches for more

than two seconds reverts ALL booms (left, right, main and roll) to **MANUAL** mode.

- this is a convenient method for switching to **MANUAL** mode when folding for transport

3.3 ADJUSTING THE TARGET HEIGHT (SETPOINT)

36 AA 36

The system is in **AUTO** and can have the target height adjusted

- Use the " +/- " switch in **AUTO** mode to adjust the target height setting.
- Alternately, adjust the main boom target height by momentarily pressing the sprayer's main lift control switch while in **AUTO** mode
 - each press of the up/down switch increases/decreases the target height by one inch, respectively
- The smallest target height setting is called the minimum height override.
- Default minimum height settings are factory programmed before shipping.

3.4 VIEWING THE ACTUAL BOOM HEIGHT

36 34 36

Left boom is at 36", right center section is at 34" and right boom is at 36"

- Toggle the "**SENSOR DISPLAY**" switch to view actual boom heights.
 - the left, main (center) and right boom heights are displayed on this screen
- To view additional sensor heights (if installed) toggle the "**SENSOR DISPLAY**" switch again.
- To lock the currently viewed sensor heights on the screen indefinitely toggle the " + " switch once
- Height menus can be viewed in both **AUTO** and **MANUAL** mode.
- More information on sensor height menus is available in the UC4 Technical Manual.

3.5 CHANGING THE SYSTEM SENSITIVITY (**SENSI**)

Sensi 5

A sensitivity setting of 5 (default setting)

- Toggle the "**SETUP**" switch to view the current **Sensi** setting
 - while viewing this menu, toggle the " **+/-** " switch to adjust the **Sensi** value.
 - lower numbers reduce system sensitivity and improve stability
 - increasing the number will speed up the response (five is the default setting)
- If the **Sensi** setting is modified, the panel will return to the Normal Operating screen after 3 seconds.
- A lower **Sensi** setting may be required for stable control at the start of operation (before sprayer is warmed up).
- As the sprayer warms up increase the **Sensi** setting until the performance reaches an optimum level.
- Refer to the UC4 Technical Manual for a discussion of performance issues

3.6 CHANGING BETWEEN **SOIL** AND **CROP** MODE

Crop on

System is in **CROP** mode

Soil on

System is in **SOIL** mode

- **SOIL** or **CROP** mode can be adjusted in both **MANUAL** and **AUTO** modes.
- To view the current setting, toggle the "**SETUP (NO)**" switch twice.
- While viewing this menu, use the " **+/-** " switch to change between **SOIL** and **CROP** mode.
 - wait five seconds for the change to take effect on all sensors
- If the mode is modified the panel will return to the Normal Operating screen after 3 seconds.

3.7 PERFORMING A ReTUNE

NOTE: Sensors are not adjusted or calibrated by performing a ReTune. A retune recalibrates the hydraulic valve parameters.

Perform a system return when:

- When a hydraulic solenoid valve is changed.
- When the hydraulic pump is changed or adjusted.
- When the normal working temperature of the hydraulic oil has shifted significantly from when the system was previously calibrated.
- If you are running a pull type sprayer and use different tractors to operate the sprayer, you should perform a **ReTune** 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 perform a **ReTune**.

Before starting a ReTune:

- Prepare the equipment and select an appropriate location (refer to the UC4 Technical Manual for more details)

Performing a ReTune:

- Navigate to the "ReTune?" menu prompt in the **SETUP** menu.
- To start a **ReTune**, confirm with the "AUTO (YES)" switch.
- Follow the instructions on the LCD screen.

NOTE: If an error occurs during a ReTune, refer to Section 4 and 5. If the solution is not listed, contact NORAC. During the ReTune, progress will be displayed on the LCD screen. Please record these displayed messages before or while the error occurs. Providing us with these messages will help determine the problem.

4 COMMON SYMPTOMS AND SOLUTIONS

- This section discusses common symptoms and suggested solutions when the UC4 control system is being installed or operated.
- It is recommended that you use Section 7 to identify your problem and use that reference to navigate to the details within this section.

4.1 GENERAL OPERATION

4.1.1

- **LCD screen does not light up**
- **System resets itself when a boom valve is turned on**

Possible Cause(s)	Suggested Solution(s)
a) Inadequate power supply NOTE: If your system is operating below +12 volts, this may cause a problem. If you have a low voltage problem, it could be due to the sprayer's electrical system (e.g. faulty alternator, battery, or poor ground connection).	a-1) Ensure the UC4 power cable is connected to the UC4 control panel a-2) Ensure the UC4 power cable is connected to the sprayer's power supply properly. a-3) Ensure the sprayer's power supply voltage is high enough (more than +12V). Measure the supply voltage when the valve is being used, since the valve action may cause a voltage drop.
b) Defective power cable	b) Follow a-1) to a-3). Wiggle cables/wires around. If the symptom continues, the cable may need repairing.
c) Damaged LCD screen	c) Follow a) and b). If the symptom continues, the screen may need replacing.

4.1.2

- **Part of the LCD screen is black**
- **Some of the digits do not appear on the LCD screen**
- **LCD screen turns black (high contrast) temporarily**

Possible Cause(s)	Suggested Solution(s)
The control panel is mounted so that direct sunlight hits the front panel (LCD screen)	High temperature causes the LCD screen to turn black (high contrast). This symptom will disappear when the LCD cools down.

4.1.3

- UC4 randomly switches between AUTO and MANUAL modes
- LCD screen display changes erratically
- UC4 system unintentionally goes into MANUAL mode

Possible Cause(s)	Suggested Solution(s)
a) Poor cable connection NOTE: Connectors used to interface with sprayer hydraulics are often located outside and are susceptible to moisture.	a-1) Ensure that all cables are correctly connected according to the UC4 Installation Manual. The connections should be tight and free of corrosion. a-2) Wiggle cables/wires around while in AUTO mode. This will detect any interruptions, as it will change the system into MANUAL mode.
b) Defective cable(s)	b) Follow a-1) and a-2). If the symptom continues, the cable may need repairing.
c) Electrical noise on the sprayer's D.C. system	c) Add a power line filter or freewheeling diodes on one or more of the sprayer's solenoid valves.

4.1.4

- Height increases/decreases unintentionally

Possible Cause(s)	Suggested Solution(s)
Intermittent electrical noise on the main lift interface cable(s). NOTE: This is similar to when the operator momentarily presses main up/down buttons to increase/decrease the spray height setpoint (Section 3.3).	a) Try installing a power line filter b) Diodes may have to be installed in the main lift lines (these must be sized appropriately for the sprayer ex. IN5408 for a 3 Amp or smaller coil) Contact NORAC for more information

4.1.5

- UC4 system does not go into AUTO mode

Possible Cause(s)	Suggested Solution(s)
a) Incomplete System Setup (Install)	Perform an Install successfully (see Section 4.1 of the UC4 Technical Manual)
b) Accidentally initiated an Install and aborted it before completion	

4.1.6

- **Boom does not appear to be sufficiently level after System Setup**

Possible Cause(s)	Suggested Solution(s)
a) Sensitivity (Sensi) setting is low	a-1) Check the nozzle heights on LCD screen in MANUAL mode a-2) If the displayed heights differ from the target heights (setpoints), check Sensi setting and adjust it, if necessary. NOTE: The default tolerate distance between the actual nozzle heights and the target heights is ± 2.5" at Sensi setting of 5.
b) Improper System Setup	b-1) Repeat the Automatic System Setup (Section 8.2 of the UC4 Technical Manual) b-2) Confirm sensor height readings manually by referring to "Calibrating the Sensor's Height Reading (Zero Height)" in the UC4 Technical Manual.

4.2 SENSOR RELATED ISSUES

4.2.1

- **Display stuck at "'Mot'n Dly" or "KP Stp 9"**

Possible Cause(s)	Suggested Solution(s)
a) Sensor is too close to the boom	a) Move the sensor to a better location. It should be 9" of front of and 9" above the spray nozzle. The sensor requires a 12" diameter clear view of the ground
b) The target is too weak	b) Move to a new location with either dirt or gravel on the ground c) Make sure there is no grass or other plants under the sprayer boom d) Verify the sensor is approximately parallel to the ground

4.2.2

- **Sensor appears not to work: Displaying "HC"**
- **Wrong number of sensors displayed during System Setup**
- **Displaying "Absent" during System Setup – Sensor Detect**

Possible Cause(s)	Suggested Solution(s)
a) Serial number (SN) entered in the control panel does not match the connected sensor's SN	a) Check SNs entered in the control panel and verify numbers with each sensor in the respective boom location. Reenter the correct SN, if necessary.
b) Poor cable connection or defective cable(s)	b) Follow a), 4.1.3a-1) and perform Sensor Swapping described in 4.2.6. If the symptom continues, the cable(s) may need repairing. c) Ensure the sensor cables are not strained or pinched by boom fold actions
c) Damaged sensor	d) Follow b). If the symptom appears in the moved boom location, the sensor may need repairing.

4.2.3

- **Invalid sensor measurement: Displaying "HF"**

Possible Cause(s)	Suggested Solution(s)
a) Sensor is out of range or reading a target closer than 7"	a-1) Move the boom(s) until sensor(s) is between 30 and 60 inches above the ground. a-2) Check sensor alignment (Section 6). NOTE: If the sensor is facing forward/backward too far, the signal cannot echo back to the sensor. a-3) Check for obstructions between the sensor and the ground. NOTE: Any object between them can deflect the signal such that it cannot echo back to the sensor.
b) Protective foam shield is contaminated	b) Inspect and clean the foam shield. Remove the foam and clean with compressed air. NOTE: Do not blow out the foam while it is still in the sensor. Sensor damage will result.

4.2.2 continues	
c) Protective Weather Caps are not removed. * Prior to 2004 shipped sensors only	c) Remove the Protective Weather Caps that fit over the mouth of the sensor.
d-1) Moisture in sensor d-2) Direct exposure to rain NOTE: It may cause this error especially if the sensor mouth points upward while sprayer booms are folded to transport position. Measures should be taken to minimize rain exposure to sensors.	d-1) Remove the protective foam shield and check the sensor's transducer foil. d-2) Allow the transducer to dry. NOTE: The foil is the gold-colored material beneath the metal screen. The foil should be clean, dry and wrinkle free. NOTE: Running the sensor will accelerate the drying effect.
e) Ultrasonic transducer is damaged or contaminated	e) Follow a) to d-1), and listen to the sensor for a ticking sound. If the sensor is not ticking or the transducer is contaminated, the sensor may need repairing.

4.2.4

- **Sensor not working: Displaying "##" or "-#" (too high or low)**

Possible Cause(s)	Suggested Solution(s)
a) Boom section is too high ("##").	a) Lower the boom section NOTE: The sensor is reporting a reading that has too many digits to display on the LCD screen. When the boom returns to normal heights, the reading should reappear on the screen.
b) Sensor Zero Height setting is incorrect	b) Check the sensor Zero Height. Calibrate it, if necessary. NOTE: Refer to Section 8.5.3.1.2 Calibrating the Sensor's Height Reading in the UC4 Technical Manual. NOTE: This symptom may occur when sensors have been "swapped" from different mounting locations.
c) Sensor is facing very strong sonic targets (e.g. concrete) NOTE: This may cause measurement errors, flashing from a valid height reading to "0", "##" or "-#"	c) Try a different/adequate target.

4.2.5

- Displaying "SHR xxxx" during Automatic System

Possible Cause(s)	Suggested Solution(s)
a) Improper sensor alignment NOTE: Sensor is not reading the ground or the target properly	a) Check sensor alignment (Section 6), primarily the sensor involved with the error. For example, if the System Setup is performing a "LftDet." and this message appears, check the Left wing sensor(s).
b) Poor targets such as wet gravel or stubble	b) Try a different target.

4.2.6 Sensor Swapping

Swapping Sensors is a useful procedure for determining whether a sensor error message (e.g. "LO NR") 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 (Refer to **Section 8.5.3.1.1 "Entering Sensor Serial Numbers"** in the UC4 Technical Manual).
- If the problem still exists in the same location ("LO NR"), and the sensor on the "RO" is reporting correctly, the wiring from the left outer ("LO") branch may have a fault and the sensor itself is functional.
- If the error appears on the right outer sensor ("RO NR"), the sensor may not be functioning.

4.3 HYDRAULIC RELATED ISSUES

- Determine whether the problem is hydraulic or electrical
- If your hydraulic valve has an override pin, use it to manually open the valve
- If there is no reaction the problem is hydraulic, if the boom moves the problem may be electrical

NOTE: If there is a bypass valve with the hydraulic system, the bypass valve is also needed to open at same time as with the tested valve.

- **Hydraulic**

4.3.1

- **Boom(s) will not raise or lower**

Possible Cause(s)	Suggested Solution(s)
a) Hydraulic oil is not being supplied to the NORAC valve block	a) Ensure that oil is being supplied to the NORAC valve block in the proper direction (Tank and Pressure lines). NOTE: If the direction is wrong, the check valve may prevent oil from flowing through the valve.
b) Hydraulic quick couplers are not properly connected	b) Ensure that all quick couplers in the hydraulic system are properly connected.
c) Not enough back-pressure to activate the check valves in the NORAC valve block NOTE: Some Single Acting valve systems only	c) Place orifices in the “A” lines going to Tank (“T”) in order to create sufficient back-pressure to activate the pilot-operated check valves in the NORAC valve block.

4.3.2

- **Booms will not lower**

Possible Cause(s)	Suggested Solution(s)
Insufficient back-pressure to activate the pilot-operated check valves in the NORAC valve block	Some single acting circuits may require orifices be placed in the “A” lines going to the tank

4.3.3

- **"Timeout!" error during System Setup**

Possible Cause(s)	Suggested Solution(s)
a) Hydraulic cylinder has reached the end of its stroke but the system is still trying to move in that direction	a-1) Ensure the hydraulic cylinders are not being prevented from moving by a cylinder cap. a-2) If a cylinder is fully extended or retracted, manually reposition the boom into the middle of the cylinder stroke and resume the setup with the "AUTO (YES)" switch. a-3) For left and right booms that do not adjust below the level of the main boom, ensure that the main boom is within 50 inches above ground before attempting an Install or ReTune (System Setup).
b) Boom is moving too slow	b) Ensure the hydraulic oil is at working temperature.
c) Not enough pressure to the hydraulic circuits at main lift ("MlfDet.") Boom Geometry Tuning NOTE: This is for sprayers with load-sensing hydraulic circuits.	c-1) Ensure the solution pump is running. c-2) Put the hydraulic system into high pressure manually. NOTE: On a John Deere sprayer, this can be accomplished by pressing and holding the brake.
d) The sensor may be reading off the boom	d-1) Move the sensor to a location where the boom will not interfere with the sensor readings

4.3.4

- **Boom raises when it should lower, or vice versa**

Possible Cause(s)	Suggested Solution(s)
a) Wrong valve cable connection	a) Ensure cable connection to the NORAC valve block
b) Wrong plumbing	b) Ensure the plumbing is correct: • The boom raise line(s) connect(s) to the "B" port(s) on the NORAC valve block. • The boom lower line(s) connect(s) to the "A" port(s) on the NORAC valve block. • The Tank and Pressure lines connect to the Tank ("T") port and Pressure ("P") port on the NORAC valve block, respectively.

4.3.5

- **Boom(s) creep up or down in MANUAL mode**
- **Boom will not stay level or settle over a long period of time**

Possible Cause(s)	Suggested Solution(s)
a) Internal problem with the NORAC valve block (e.g. a sticking or worn valve)	a) The valve block may need repairing or replacing.
b) Cylinder leakage	b) The cylinder seals may need replacing.
c) Faulty check valve(s) in the NORAC valve block	c) The check valve(s) may need replacing.
d) Foreign object stuck in an internal port of the NORAC valve	d) If possible, remove the foreign object or the valve block may need repairing.
e) Not enough back-pressure to activate the check valves in the NORAC valve block NOTE: Some Single Acting valve systems only	e) Follow 4.3.1c).
f) Problem within the sprayer's hydraulic network (system)	f) Check the sprayer's hydraulic network.

4.3.6

- **Boom(s) creep(s) upwards when in the transport position**

Possible Cause(s)	Suggested Solution(s)
a) Valve leakage	a) The valve block may need repairing or replacing.
b) Faulty check valve(s) in the NORAC valve block	b) The check valve(s) may need replacing.

4.3.7

- **Hydraulic oil overheat**
- **Sprayer shuts down or alarm sounds due to the hydraulic oil overheat**

Possible Cause(s)	Suggested Solution(s)
a) High performance automatic boom leveling system requiring elevated amounts of hydraulic power to constantly maintain proper setpoint is increasing oil temperature	a) Lowering the Sensitivity (" ~~Sensi~~ ") setting may reduce the system activity and lower the temperature as a result.
b) Plumbing single acting systems as double acting with both A ports orificed may reduce heating	b) Contact NORAC for more information
c) Depending on your type of system, other adjustments may be made.	

• **Electrical**

4.3.8

- **Boom(s) will not raise or lower**

Possible Cause(s)	Suggested Solution(s)
a) Poor cable connection, defective cable(s) or defect in the NORAC valve block	a-1) Check all cable connections between the control panel and the valve block. Ensure that they are tight and free of corrosion. a-2) Check the LCD screen in which the valve command arrows ("↑" or "↓") appear. a-3) Measure the voltage at the valve connection. a-4) If there is no voltage, the cable(s) may need repairing or replacing. a-5) If there is sufficient voltage (+12V), and the valve is not reacting, the valve may need repairing or replacing

4.4 BOOM INSTABILITY AND MAIN LIFT

4.4.1

- Erratic or “jumpy” boom behavior (in CROP mode)
- Bouncing boom(s)

Possible Cause(s)	Suggested Solution(s)
a) Sensor readings from the crop canopy are less uniform than from soil	a) Tune the hydraulic system properly. NOTE: This symptom occasionally appears on the main lift control. If so desired, the main lift control may be disabled (Passive Roll control will still be functional).
b) Inappropriate accumulator(s) on lift hydraulics	b) Check the accumulator(s). Replace it (them) to adequate one(s), if necessary.

4.4.2

- Boom unintentionally moves all the way up in CROP mode

Possible Cause(s)	Suggested Solution(s)
Improper sensor alignment	Check sensor alignment (Section 6). Ensure the sensor is not reading off part of the boom.

4.4.3

- Irregular boom movement or boom instability
- Control panel interferes with auto steer or rate controller operation

Possible Cause(s)	Suggested Solution(s)
a) Improper sensor alignment	a) Follow 4.2.3. NOTE: Boom instability is often associated with poor readings from the target rods.
b) System conflict between certain devices (such as other automatic control devices) and the UC4 system	b) May need plumbing changes or adjusting pump pressure settings. NOTE: This symptom may occur on sprayers that use load-sensing hydraulic systems.
c) Wear in boom damper shocks	c) Check the boom damper shocks. Replace them, if necessary. NOTE: Without adequate mechanical damping, the system may become unstable.

Possible Cause(s)	Suggested Solution(s)
d) Wear in a mast-style lift system	d) Apply shims or filler strips to the mechanism, or adjust it, if applicable. NOTE: Some sprayer designs use a mast-style lift rather than parallel links. The sliding surfaces on some of these machines are susceptible to wear which leads to this symptom. The UC4 Passive Roll control cannot take into account error on the lift mechanism.

4.5 ACTIVE AND PASSIVE ROLL

4.5.1

- **Poor performance of Active/Passive Roll control**

Possible Cause(s)	Suggested Solution(s)
Weak or intermittent rod readings – Improper sensor alignment	Check and adjust sensor alignment (Section 6).

4.5.2

- **Incomplete Setup of the Roll section during Boom Geometry Tuning**
- **Poor performance or improper action of Active Roll control**

Possible Cause(s)	Suggested Solution(s)
Wear in pins and linkages of main lift section NOTE: This is commonly found on sprayers equipped with Active Roll control.	Check the pins and linkages. Adjust or replace them, if necessary.

4.5.3

- **Poor performance or improper action of Passive Roll control**

Possible Cause(s)	Suggested Solution(s)
a) Target rod is not detected during System Setup.	a-1) Verify that the system is using passive roll ("F"), as indicated by type "Roll OnF" found in the Roll channel SETUP menu. a-2) Perform a ReTune.
b) Main lift sensor and target rod are installed on a common frame	b-1) Install them properly (Section 6.2). b-2) Perform a ReTune.

4.5.4

- Main section tends to lower into the crop in CROP mode

Possible Cause(s)	Suggested Solution(s)
Target rod is installed on the boom too low (too close to the crop canopy)	Follow 4.5.3 b-1) and b-2).

5 UC4 ERROR MESSAGES

5.1 SYSTEM SETUP ERROR MESSAGES

- During an **Install** or **ReTune** if any of the following messages appear on the LCD screen the system will halt any valve action and wait for operator acknowledgement
- Some of these messages appear after the operator is prompted to **"Release" "Switch"** while holding the **"AUTO (YES)"** switch
release the switch and correct the problem using Table 2
- Exit the procedure by toggling the **"SETUP (NO)"** switch

Table 2 – System Setup Error Messages

Timeout! = Retry ?		
Explanation	Possible Causes	Required Action
Boom Geometry Tuning has taken too long to complete.	a. Hydraulic cylinder has reached the end of its stroke, but the system is still trying to move in that direction.	a. Follow 4.3.2 a).
	b. Boom is moving too slow.	b. Follow 4.3.2 b).
	c. There is not enough hydraulic pressure to move the boom.	c. Follow 4.3.2 c).
	d. If the boom was moving before this message appeared, this is probably not an error of concern.	d. Some booms will take longer than others to calibrate, triggering a "Timeout!".
Wiring! = Retry ?		
Explanation	Possible Causes	Required Action
Setup cannot proceed because the control panel cannot receive appropriate signal from a sensor.	a. Wrong or poor cable connection.	a. Follow 4.1.3 a).
	b. Defective cable(s).	b. Follow 4.1.3 b)
	c. Pressing the wrong switch on the sprayer's hand-control.	c. Toggle the "AUTO (YES)" switch to restart the wiring test.

SNR 2521 = Retry ?		
Explanation	Possible Causes	Required Action
Setup cannot proceed because the indicated sensor is not returning a valid height reading. * The number is arbitrary	a. Improper sensor alignment	a. Follow 4.2.5
	b. Sensor is not reading the ground or the target properly.	b. Follow 4.2.5.
	c. Faulty sensor.	c. Replace sensor.
SN=0 det = Retry ?		
Explanation	Possible Causes	Required Action
At least one sensor has been detected with improper factory programming.	The sensor(s) was not set up properly at the factory.	Replace sensor(s).
Too Many = Retry ?		
Explanation	Possible Causes	Required Action
The system has detected that too many sensors are connected.	Too many sensors have been connected to the system.	Remove sensors, or setup the system manually.
Bakwards = Retry ?		
Explanation	Possible Causes	Required Action
Boom moves in the wrong direction.	a. Wiring or hydraulic plumbing problem. b. Extremely under-damped boom.	a. Follow 4.3.3, 4.3.7 b. Add mechanical damping to the boom and/or consult NORAC.
TooHigh! or TooLow! ...= Retry ?		
Explanation	Possible Causes	Required Action
Boom is positioned higher than 60" or lower than 30"	System Setup was started with the boom positioned too high or too low.	Follow 4.2.3 a), 4.2.4 and 4.3.2 a-3).

5.2 OPERATIONAL ERROR MESSAGES

- The following messages are non-critical messages that appear on the LCD screen during operation

they usually require some simple adjustment or setting changes

Table 3 – Operational System Error Messages

NR MA 35		
Explanation	Possible Causes	Required Action
"NR" indicates the sensor is communicating but <u>Not Reading</u> a valid measurement.	a. Sensor is out of range or reading a target closer than 7". b. Protective foam shield is contaminated. c. Moisture in sensor. d. Transducer is damaged or contaminated.	a. Follow 4.2.3 a). b. Follow 4.2.3 b). c. Follow 4.2.3 d-1), d-2). d. Follow 4.2.3 e).
NC MA 35		
Explanation	Possible Causes	Required Action
"NC" indicates <u>No Communication</u> from the sensor.	a. Serial number entered in control panel does not match connected sensor. b. Poor cable connection or defective cable(s). c. Damaged sensor.	a. Follow 4.2.1 a). b. Follow 4.2.1 b). c. Follow 4.2.1 c).
## MM 35		
Explanation	Possible Causes	Required Action
"##" is displayed if the sensor is reading a height greater than 99 inches. It is commonly mistaken as an error.	a. Boom section is too high. b. Sensor Zero Height setting is incorrect. c. Sensor is facing very strong sonic targets (e.g. concrete).	a. Follow 4.2.4 a). b. Follow 4.2.4 b). c. Follow 4.2.4 c).
-# MM 35		
Explanation	Possible Causes	Required Action
"-#" is displayed if the sensor is reading a	a. Sensor Zero Height setting is incorrect.	a. Follow 4.2.4 b).

height lower than -9 inches. It is commonly mistaken as an error.	b. Sensor is facing very strong sonic targets (e.g. concrete).	b. Follow 4.2.4 c).
BF NoRdg		
Explanation	Possible Causes	Required Action
The Roll reading is not being measured properly. Similar error screens may replace the "BF" reading identifier with "LO", "ML", "RI", "CY", "SP", "IF", "RF", etc.	This is commonly a sensor-rod alignment issue. * If this message is displayed very briefly, it may not be a problem.	Investigate the source of reading error with the identified sensor / rod. Refer to Section 6 for more information.
Minimum Override		
Explanation	Possible Causes	Required Action
This message is displayed when a target height setpoint is lower than allowed (minimum height override).	Operator is proceeding to use a lower target height setpoint than allowed.	Adjust the boom height setpoint greater than the minimum height override (Section 3.3).
Disabled		
Explanation	Possible Causes	Required Action
Access to System Setup features (Install, ReTune) have been locked out.	Access to these features was disabled by installer to avoid unintentional system changes.	Contact NORAC for instructions to enable feature access.

6 SENSOR AND ROD ALIGNMENT

Proper sensor and rod alignment is critical in order for UC4 performance. The majority of problems reported by operators in the field are due to improper rod alignment and sensor mounting.

6.1 WING SENSORS

- When the boom is in its lowest position, the sensor mouth must be nine inches or more above the spray nozzles.
- The bottom of the sensor must be at least nine inches in front of the nozzles.
- The sensor must be approximately vertical at normal operating heights.
- Ensure that there are no obstructions within a six-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 (as shown in **Figure 2**), check that the sensor can not read off the bottom part of the boom.
 - This is most common in **CROP** mode (refer to **Section 4.2.3**)

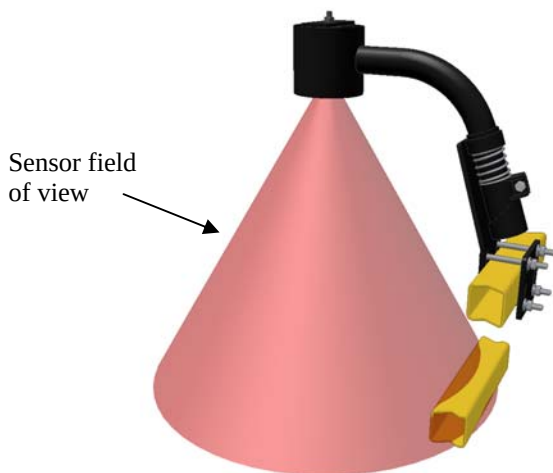


Figure 2 – Sensor Reading of the Boom

6.2 PASSIVE ROLL SYSTEMS

The following is a checklist for troubleshooting Passive Roll systems.

- Ensure the rod is mounted perpendicular (90°) to the sensor.
 - if the sensor is straight vertical, the rod must be horizontal (**Figure 5**)
- Distance from the sensor to the target should be 20 (± 2) inches (**Figure 5**).
- The target rod should cross the sensor's central axis. The sensor alignment tube (**Figure 3**) will help make these adjustments.
- Ensure none of the parts collide with any part of the machine during folding or operation.
 - if desired, the Passive Roll rod may be trimmed, but no shorter than 2 inches past the center of the sensor.
- Ensure the adjustable target mount is tight to prevent rotation.
- Ensure the sensor cable does not pull tight during operation or folding, causing the sensor to be pulled out of alignment.

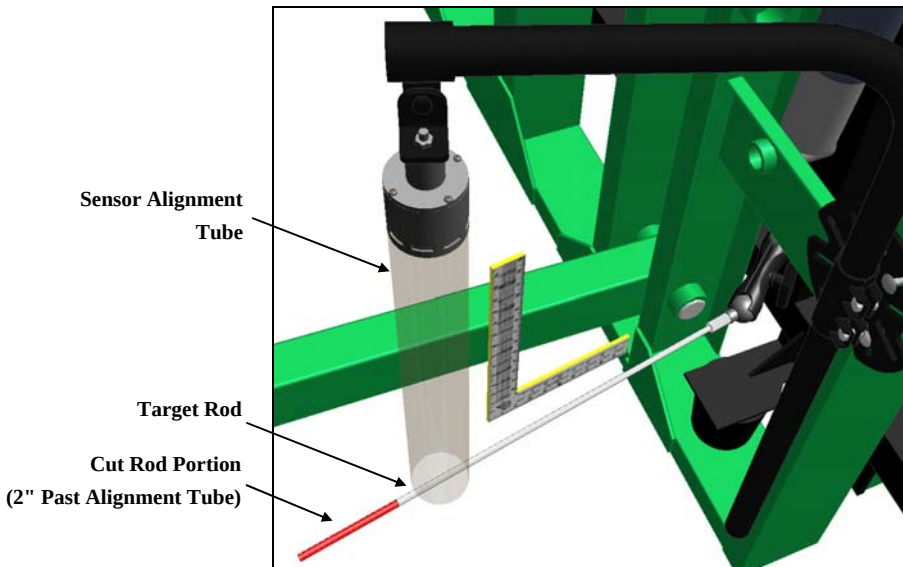


Figure 3 – Sensor Alignment Tube

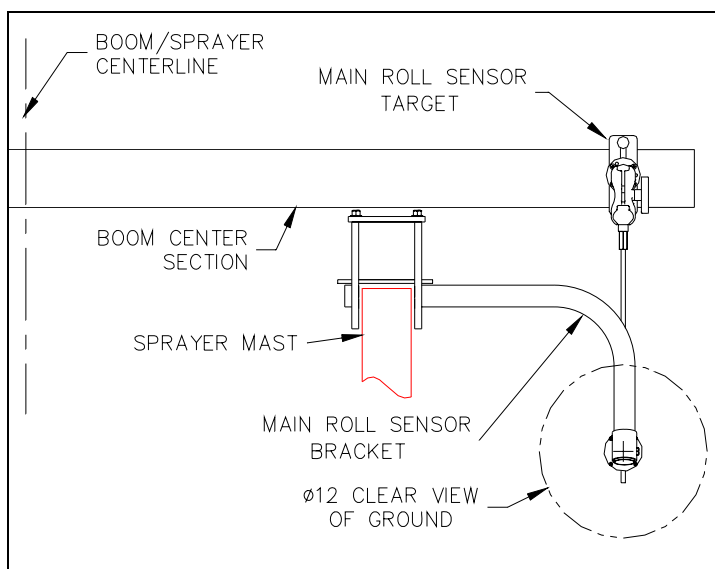


Figure 4 – Sensor Alignment Tube (Top)

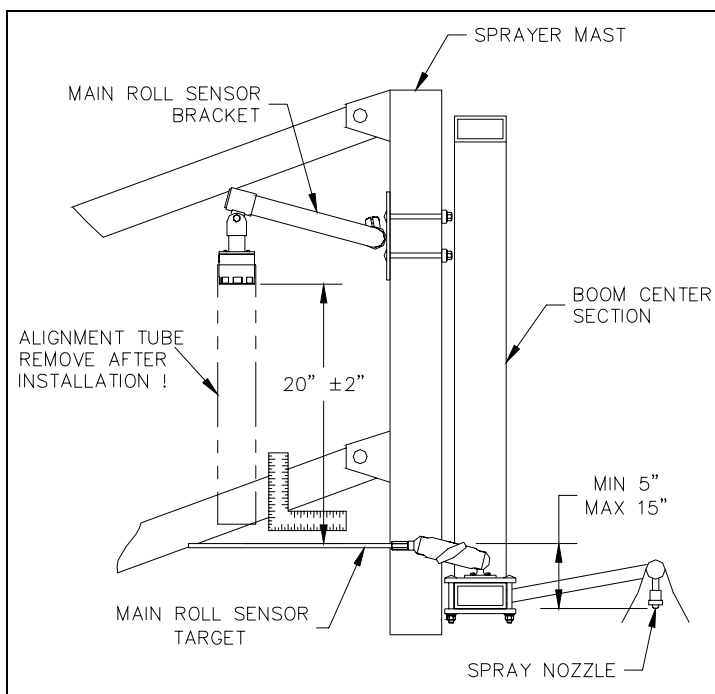


Figure 5 – Sensor Alignment Tube (Side)

ACTIVE ROLL SYSTEMS

An additional target rod is used on Active Roll systems. The following includes additional details for mounting and adjusting the second rod.

- Before installing or adjusting, ensure sprayer is level and the booms are level.
- The spring target should cross directly below the sensor centerline (**Figure 7**).
- The frame target should be located 1/2" off the centerline (**Figure 7**).
- Trim spring target flush with the central axis of the sensor (**Figure 8**).
- Both the spring and frame target should be perpendicular (90°) to the central axis of the sensor (**Figure 8**).
- Ensure the sensor view of the ground is not obstructed by anything other than the targets (e.g. hydraulic hoses from the wheel motor or the lower parallel lift arm).
 - a 12" diameter clear view of the ground is usually sufficient.

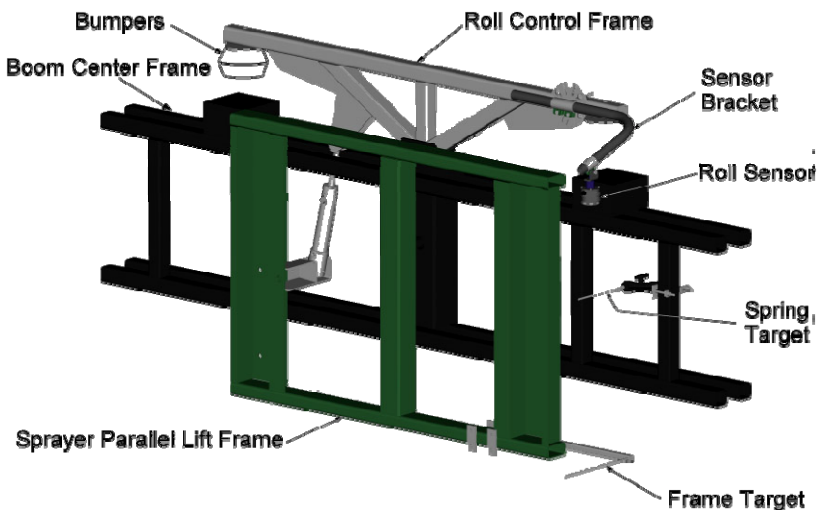


Figure 6 – 47XX Active Roll Setup

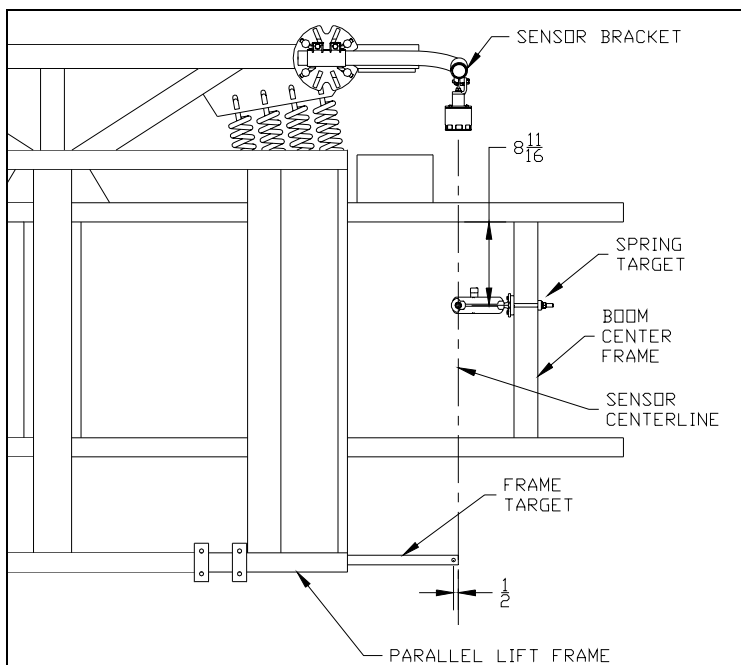


Figure 7 – Active Roll Rod and Sensor Details for a John Deere 47XX (Front View)

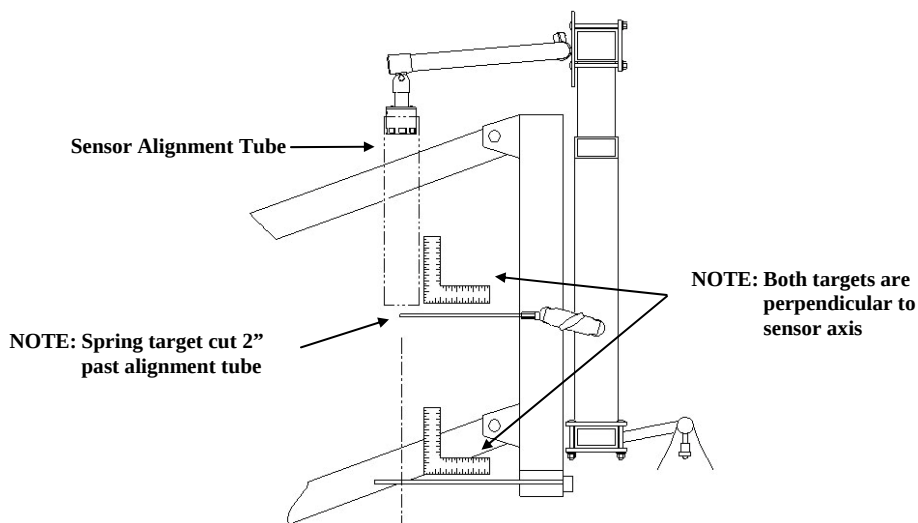


Figure 8 – Active Roll Rod and Sensor Details for a John Deere 47XX (Side View)

7 QUICK REFERENCE

7.1 ISSUES DURING SYSTEM SETUP

Table 4 – During System Setup (Install or ReTune)

Symptom	See Section	See Page
• During Control Panel Power Up Wrong number of sensors shown Number of sensors are "Absent" "Scanning" or ">>>>" stuck on display	4.2.1 4.2.1 4.2.1	10 10 10
• During Wiring Test "Wiring!" Displayed Control panel displayed "OK" but the wrong boom moved Control panel displayed "OK" but the boom moved wrong direction Booms do not move	4.1.3a) b), 5.1 4.3.3 4.3.3 4.3.1, 4.3.7	9, 21 14 14 14, 16
• During Sensor Detect "SN=0 det" "Retry" displayed "Too Many" "Retry" displayed "SNR xxxx" "Retry" Stuck at "Exit Cab" "Push"...	5.1 5.1 4.2.5 4.5.1, 4.5.2, 4.5.3	21 21 13 19, 19
• During Boom Geometry Tuning Timeout Error at "LftDet" or "RgtDet" Timeout Error at "MlfDet" Timeout Error at "Mr1Det" Timeout Error at "DZ Stp 1" Timeout Error at "KP Stp 4" Timeout Error at "Adj 255" Timeout Error at "Adj 4" "Too High" or "Too Low" message "Backwards" "Retry" displayed	4.3.3 a), b), 4.3.8 4.3.3 a), b), c), 4.3.8 4.3.2a), b), 4.3.8 4.3.3 a) 4.3.3 a) 4.3.3 a) 4.4 4.2.3 a), 4.3.3 a-3) 5.1	14, 17 14, 17 14, 17 14 14 14 18 11, 14 21

Symptom	See Section	See Page
ReTune procedure stalls at "OZ" or "KP" screen	4.4	18
Incomplete System Setup of the Roll section	4.5.2	19
• During Control System Test Boom does not appear to be sufficiently level after System Setup	4.1.6	10

7.2 OPERATIONAL ISSUES

Table 5 – During Operation

Symptom	See Section	See Page
• LCD Screen Issues (General Operation) LCD screen does not light up System resets itself when the valve is turned on Part of the LCD screen is black Some of the digits do not appear on the LCD screen LCD screen turns black (high contrast) temporarily	4.1.1 4.1.1 4.1.2 4.1.2 4.1.3	8 8 8 8 8
• UC4 Problems (General Operation) UC4 system switches between AUTO and MANUAL modes randomly LCD screen display changes erratically UC4 system unintentionally goes into MANUAL mode from AUTO mode Target height on the main lift boom unintentionally increases/decreases over time UC4 system does not go into AUTO mode	4.1.3 4.1.3 4.1.3 4.1.4 4.1.5	9 9 9 9 9
• Sensor Related Issues Sensor appears not to work. Displaying: "HC" "HR" "##" or "—#"	4.2.1 4.2.3 4.2.4	10 11 12
• Hydraulic Related Issues Boom(s) will not raise or lower	4.3.1, 4.3.7	14, 16

Symptom	See Section	See Page
Boom(s) raise(s) when it should lower, or vice versa	4.3.3	14
Boom(s) keep(s) raising or lowering in MANUAL mode (creeping up or down)	4.3.4	15
Boom will not stay level or settle over a long period of time	4.3.4	15
Boom(s) creep(s) upwards when in the transport position	4.3.6	16
Hydraulic oil overheats	4.3.6	16
Sprayer system shuts down or alarm sounds due to the hydraulic oil overheat	4.3.6	16
• Boom Instability and Main Lift Problems Erratic or "jumpy" boom behavior (in CROP mode) Bouncing boom(s) Boom unintentionally moves all the way up in CROP mode Irregular boom movement or boom instability Control panel in AUTO mode interferes with auto steer or rate controller operation	4.4.1 4.4.1 4.4.2 4.4.3 4.4.3 b)	18 18 18 18 18
• Active and Passive Roll Issues Poor performance of Active/Passive Roll control Poor performance or improper action of Active Roll control Poor performance or improper action of Passive Roll control Main section tends to lower into the crop in CROP mode "SP NoRds" displayed "Minimum" "Override" displayed "Disabled" displayed	4.5.1 4.5.2 4.5.3 4.5.4 5.2 5.2 5.2	19 19 19 19 23 23 23

Notes:

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.

MAIN MENU

Navigating past the end of the menu will return the control panel to the Normal Operating Screen		
More ?	Toggle the "AUTO (YES)" switch to edit or view more sensor settings.	
25 29	Displays readings from optional boom sensors (left inner and right inner). <i>This menu prompt may not be displayed.</i>	
31 31 32	Displays the current boom heights in inches. The heights are adjusted for the offset between the sensor and nozzles. <i>If any sensor errors are detected the type of error will be displayed here.</i>	
30 MM 35	SENSOR DISPLAY Menu ↑ SENSOR DISPLAY / SETUP (NO) Switch ↓ SETUP Menu	The Normal Operating Screen is normally displayed. While at other menu prompts, if no switch has been pressed for 30 seconds, the control panel will revert to this screen. Also, from any menu prompt, if you toggle and hold the "SETUP (NO)" switch for two seconds, the control panel will return to this screen. <i>To navigate to the other menu prompts in this table, toggle the "SENSOR DISPLAY / SETUP (NO)" switch in the indicated direction</i>
Sensi 5	A higher number means more control actions and quicker response. A lower number will tend to stabilize the boom and make it less active.	
Soil ON Or Crop ON	Use the " +/- " switch to set the sensor target to SOIL or CROP mode.	
ReTune?	The ReTune will optimize your system for the best performance possible.	
More ?	Toggle the "AUTO (YES)" switch to edit or view more control settings	
Navigating past the end of the menu will return the control panel to the Normal Operating Screen		