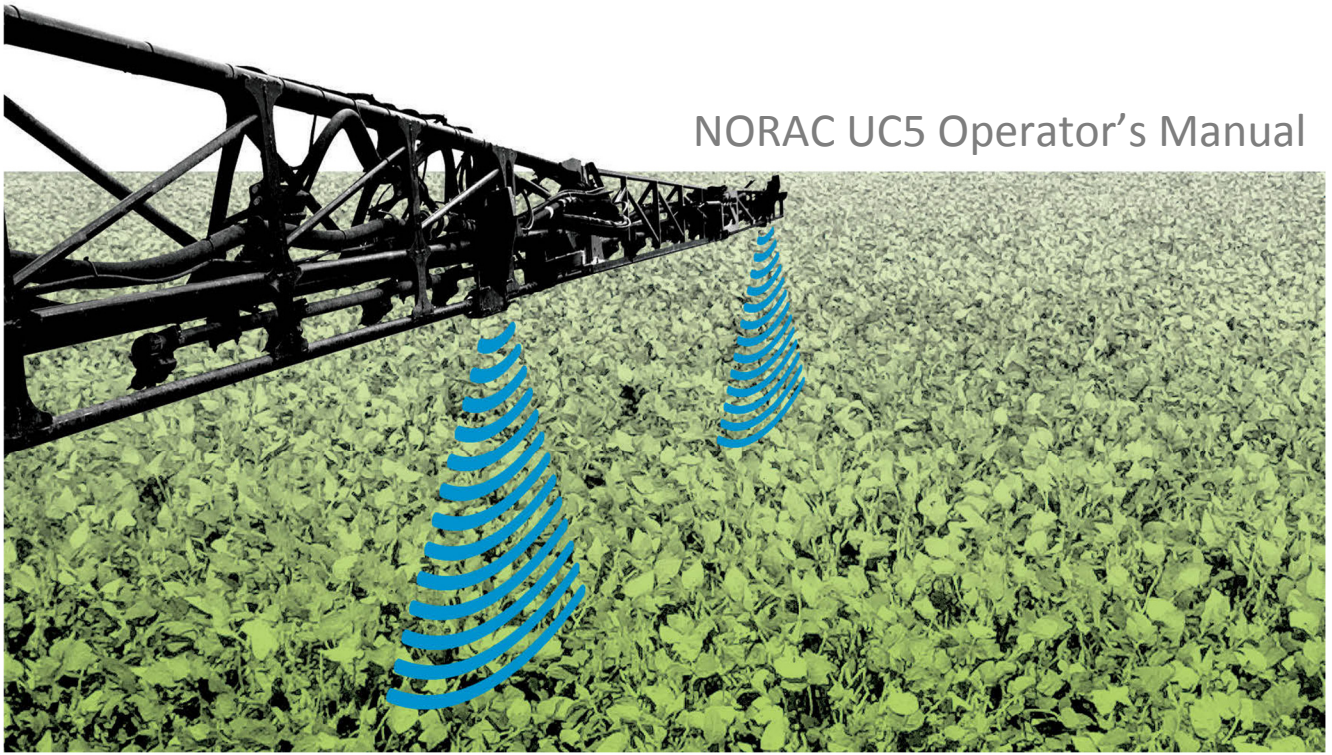
NORAC

TOPCON POSITIONING GROUP

NORAC UC5 Operator's Manual



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Reorder P/N: UC5-BC-MANUAL-OPERATOR Rev D

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1 Safety Precautions

The UC5™ Boom 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.

⚠ Important

Under no circumstances should any service work be performed on the machinery while the UC5 Boom Height Control system is in automatic mode.

Always ensure that the UC5 Boom 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 UC5 system to manual mode.
- Turn the sprayer engine off.

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.

Every effort has been made to ensure the accuracy of this document at the time of publication. NORAC Systems assumes no responsibility for omissions and errors. Nor is any liability assumed for damages resulting from the use of information contained herein.

If you have any questions, feedback or comments regarding the UC5™ Boom Height Control system, please contact any of the numbers below.

Phone: 888 979 9509

E-mail: tasupportn@topcon.com

Web: www.norac.ca

2 Technical Specifications







CAN ICES-3(A)/NMB-3(A)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

This Class A digital apparatus complies with Canadian ICES-003.

Pursuant to EMC Directive – Article 9, this product is not intended for residential use.

Table 1: System Specifications

Supply Voltage (rated)	12VDC
Supply Current (rated)	10A
Hydraulic Pressure (maximum)	3300 psi
Baud Rate	250 kbps
Clock Frequency (maximum)	96 MHz
Solenoid Valve PWM Frequency	300 Hz
Ultrasonic Sensor Transmit Frequency	50 kHz
Operating Temperature Range	0°C to 80°C

The 10A fuse on the power cable may be replaced by the operator if needed. The replacement fuse must be rated to blow in less than 120 seconds at 200% and be ANSI/UL248-14 or better.

Table 2: Replacement Fuse

NORAC Part Number	106676
Manufacturer Part Number	Littelfuse – 0287010.PXCN

The UC5™ product line is covered by multiple Patents including, but not limited to the following:

U.S. Pat. No: US200415838, US88432831

European Pat. No: EP1444894, EP2630856

Canadian Pat. No: CA2418610

3 UC5 Operation

NOTE: *Some functions and features may not be available for all sprayer makes and models. Consult your sales representative or technical support with any questions or concerns.*

3.1. Initial Start Up

On the initial startup and after confirming the legal disclaimer, a screen will appear informing the operator that an automatic setup must be performed. After confirming this screen, the automatic setup will begin. The automatic setup reminder at startup will also be shown each time a firmware update is performed.

3.2. Main Run Screen

Once the system is correctly configured, it is very simple to use. After confirming the legal disclaimer, the run screen will appear. For a virtual terminal, from the display's start up screen, select the UC5™ icon. An image of the boom with the height of each boom section is displayed as shown in Figure 1.

To change between automatic and manual mode, select the corresponding AUTO (A) or MANUAL (M) button. When the UC5 system is in manual mode, the height displayed under each boom section is measured from the spray nozzles to the soil (Soil Mode™) or crop canopy (Crop Mode™ or Hybrid Mode™). If there are five height sensors on the sprayer, the height displayed is the average for each boom section.

When the UC5 system is in automatic mode, arrows will appear on the screen above or below the boom sections. These arrows indicate the UC5 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.

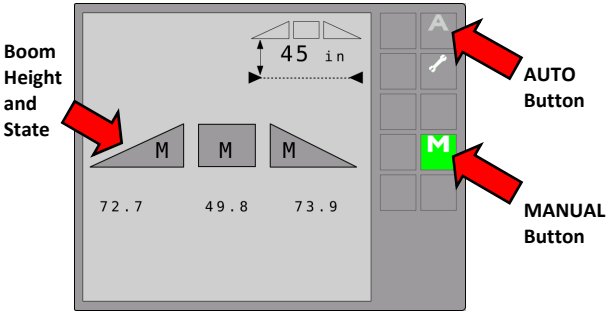


Figure 1: NORAC UC5 Run Screen – Manual Mode

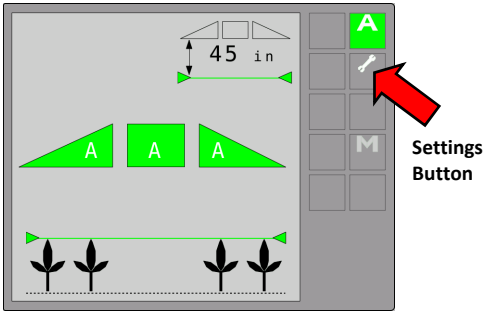


Figure 2: NORAC UC5 Run Screen – Automatic Mode

The height displayed under the boom in the upper right corner is known as the target height. This is measured from the spray nozzles to the soil (Soil Mode™) or to the crop canopy (Crop Mode™ or Hybrid Mode™). The crop at the bottom of the screen indicates the mode the controller is in. If the green line is above the crop, the system is in Crop Mode. If the green line is below the crop, the system is in Soil Mode. If the green line is both above and below the crop, the system is in Hybrid Mode.

The following applies to Virtual Terminal only:

When two or more virtual terminals are connected on the display bus, the move to next VT button will appear on the soft key area of the run screen. This button allows the user to select the preferred terminal on which to display the UC5™ screen. By pressing this button the UC5 screen will move to next available terminal.

3.3. Error Indicators

If an error is detected in the system, the error button will appear on the screen as shown in the figures below. The boom with the error will go to its manual state with the ‘M’ or ‘A’ on the display flashing depending on whether the system is in auto or manual mode.

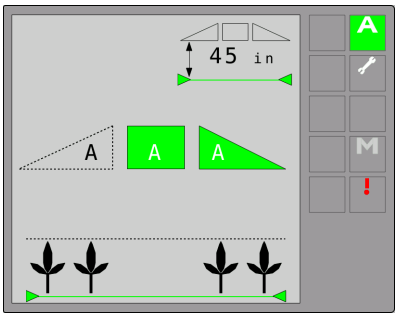


Figure 3: Error Indicator



Figure 4: Sample Error Viewing Screen

Selecting the error button allows all active system errors to be viewed. To navigate between multiple errors, use the next and previous arrow buttons.

If the boom is above normal working height (typically 60 inches/152 cm) when automatic mode is engaged, a warning message will appear requiring the boom to be lowered before allowing automatic mode to be activated.

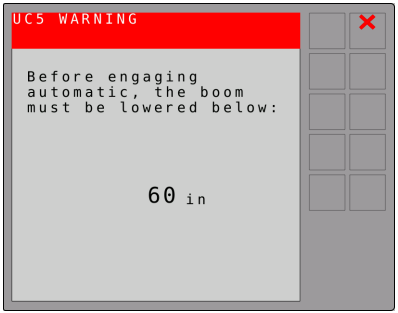


Figure 5: Over Height Warning

3.4. Sprayer Manual Boom Switches

When a manual switch is pressed, an arrow will be displayed on the screen showing which function is being activated.

While in automatic mode if either left or right tilt switches are pressed, the corresponding boom section will go into manual mode. If the main lift switch is held while in automatic mode, the entire system will go into manual mode. To return all boom sections to automatic mode, press the auto button.

3.5. Settings

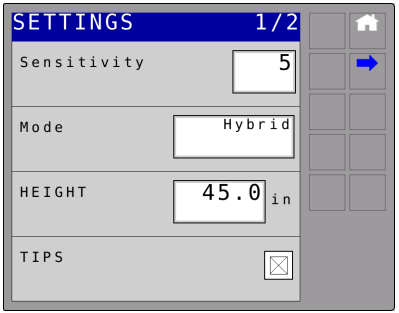


Figure 6: Settings Screen

Sensitivity:

The sensitivity can be adjusted from 1 to 10, with 5 being the default setting. A lower number will reduce the system sensitivity and improve stability. Higher settings will speed up the response.

Mode:

The mode button allows the system to be changed between Soil Mode™, Crop Mode™ and Hybrid Mode™. Soil Mode allows the sensors to read a height from the spray nozzles to the ground. Crop Mode will read the height from the spray nozzles to the top of the crop canopy. Hybrid Mode uses a combination of the crop and soil readings.

Height:

The height is the target height that the operator would like the boom to be set at when spraying in automatic mode.

In Hybrid Mode™, the target height is a combination of measurements to provide a more stable estimate of the distance from the crop canopy to the sprayer nozzles.

Tips On/Off:

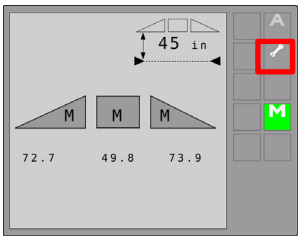
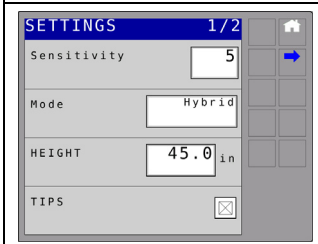
Some sprayers have the ability to fold in the boom tips and spray with only the inner sections of the boom. If the sprayer has this ability and is equipped with a five sensor system, the check box should be unchecked when spraying with the tips folded in (tips off).

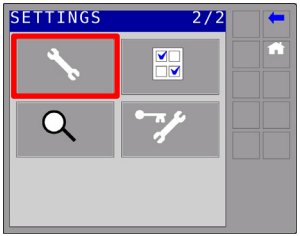
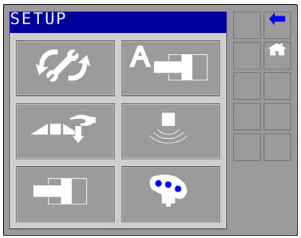
When in tips off the two outer sensors on the wings will be disabled and only the inner wing sensors will be used to control the height.

The check box is defaulted to be checked (tips on) and will return to be checked anytime the power is cycled.

3.6. Navigating to the UC5 Setup Menu

To perform either the automatic or manual system setup, the user must navigate to the setup screen. The system must be in manual mode to perform setups.

	When the system is in manual mode, select the settings button.
	Select the next button.

	Select the setup button.
	The setup screen will be displayed.

3.7. Automatic System Setup

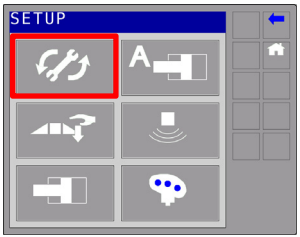
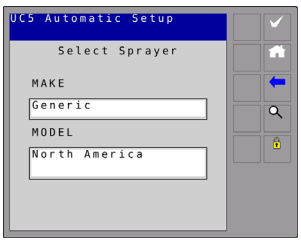
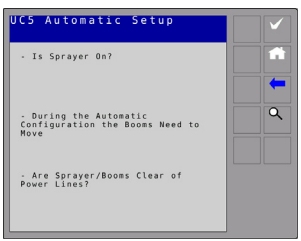
- *All boom sections will move during the automatic setup.*
- *People and equipment must be clear of sprayer boom.*
- *Ensure the booms have sufficient range to lift fully and are clear of any power lines.*

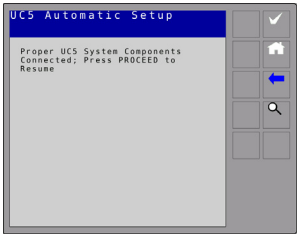
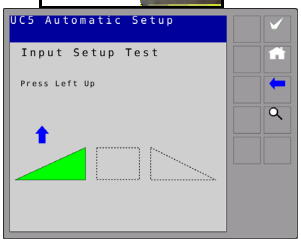
Unfold the sprayer in a location that is relatively level and where the sensors are over bare soil or gravel. Do not conduct the retune over standing crop, weeds or grass. Also, avoid concrete or asphalt surfaces.

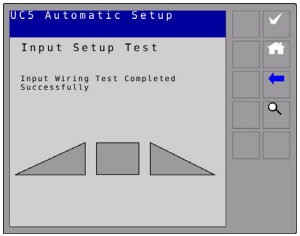
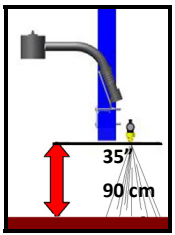
Ensure the boom roll suspension system is functioning properly and smoothly. Friction on wear surfaces can be relieved using lubricants (grease, etc.) or adjustment. Properly tuned suspension systems will optimize UC5™ performance.

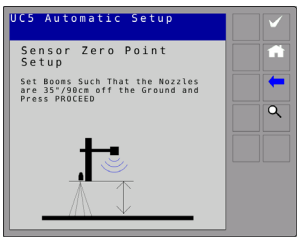
For best results, the hydraulic system should be under a normal load and at a normal working temperature.

- 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 trailed 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 UC5 performance.

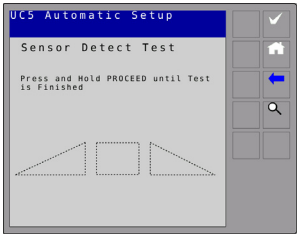
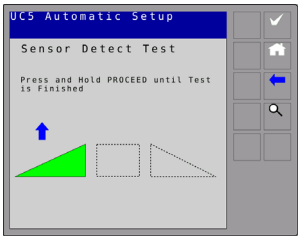
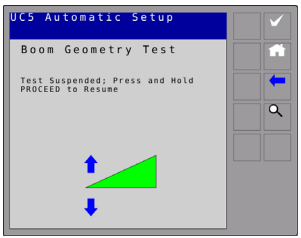
	Select automatic setup.
	Select the sprayer make and model from the lists. Then select the check button.
	A list of precautions will be displayed on the display. It is very important that you read these precautions and follow them. Once you have read the precautions, select the check button. At any point the magnifying glass can be pressed to obtain more detailed information of the setup procedure or to view any errors.

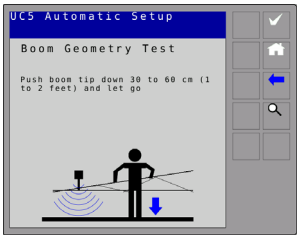
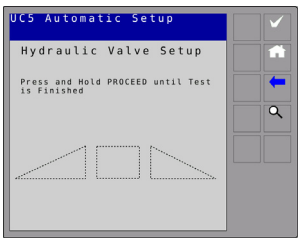
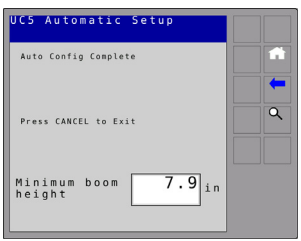
	A list of connected modules will be displayed. Make sure the modules match your system modules (*ECHO™ only*). If the list of modules matches the currently installed modules, press the check button.
 	The system will instruct you to move boom functions using the sprayer controls. Move each boom as instructed on the terminal.

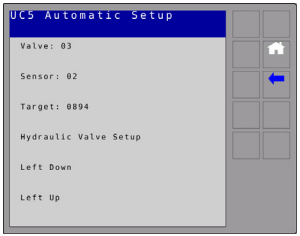
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</td>
<td>The setup will continue automatically when the switch test is finished.</td>
</tr>
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</td>
<td>You will then be instructed to place your booms so the nozzles are 35” (90cm) from the ground. Adjust the distance from the nozzle to the ground directly beneath. Ensure you are over bare, flat soil.

When the measured distance is 35” (90cm) select check button.</td>
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</table>

	You will then be instructed to hold the check button. Continue holding while each boom section is moved.
	The display will show an arrow. At this time the boom will be in motion. When it is done the display will instruct you to release the check button. Do not move the booms at this time.
	You will then be instructed to hold the check button. The terminal will display “cruising”.

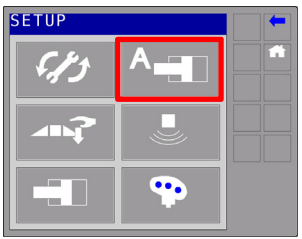
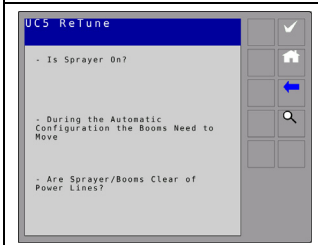
	The terminal will then instruct you to exit the cab and pull the boom tip down towards the ground, and then release the boom. Ensure you stay a minimum of 3 feet (1m) away from any of the sensors.
	Hold the check button and continue holding it until you are instructed to release it. The system will now calibrate the hydraulics. All boom sections will move. If you accidentally release the button, select and hold the check button to resume.
	When the setup is finished the terminal will instruct you to release the check to complete the automatic setup. Your NORAC UC5™ system is now configured and ready for operation.

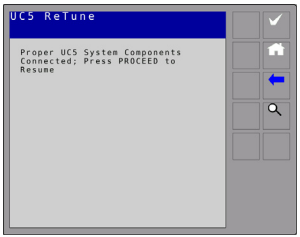
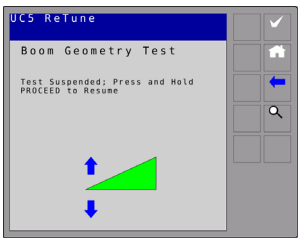
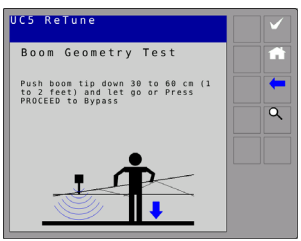
	The automatic setup diagnostic screen is reached by selecting the diagnostics button.

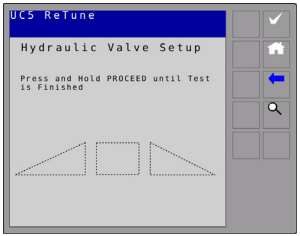
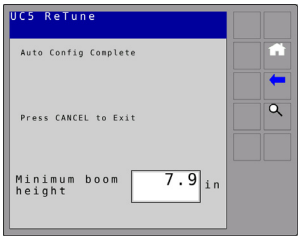
3.8. Hydraulic Retune

On occasion it is necessary to recalibrate the hydraulics of the NORAC UC5™ Boom Height Control system. When you press the retune button from the setup screen, the system will go through only the hydraulic tuning portion of the automatic setup. You may want to perform a retune when:

- A hydraulic solenoid has been changed.
- A hydraulic pump has been changed or adjusted.

	From the setup screen, select retune.
	A list of precautions will be displayed on the terminal. It is very important that you read these precautions and follow them. Once you have read the precautions, select the check button.

	A list of connected modules will be displayed (*ECHO™ only*). Make sure the modules match your system modules. If the list of modules matches the currently installed modules, select the check button.
	You will then be instructed to hold the check button. The terminal will display “cruising”.
	The terminal will then instruct you to exit the cab and pull the boom tip down towards the ground and then release the boom. Ensure you stay a minimum of 3 feet (1m) away from any of the sensors.

	Hold the check button and continue holding it until you are instructed to release it. The system will now calibrate the hydraulics. All boom sections will move. If you accidentally release the button, select and hold the check button to resume.
	When the setup is finished the terminal will instruct you to select the check button to complete the retune. Your NORAC UC5™ system is now configured and ready for operation.

3.9. Options Menu

NOTE: *Some functions and features may not be available for all sprayer makes and models. Consult your sales representative or technical support with any questions or concerns.*

Navigate to the UC5™ settings menu (Section 3.6) and choose options as shown in Figure 7. The first screen of the options menu is shown in Figure 8.

3.9.1. Remote Switches

When remote switches are enabled, the UC5 can be put into automatic or manual mode using external switches. For more information on setting up remote switches, refer to www.solutions.norac.ca (Section 4).

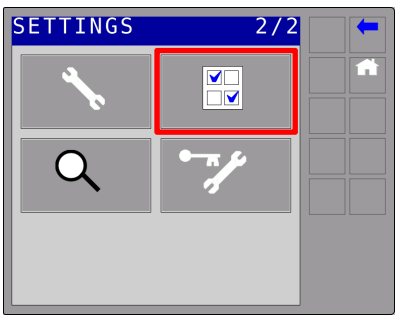


Figure 7: Selecting Options Menu

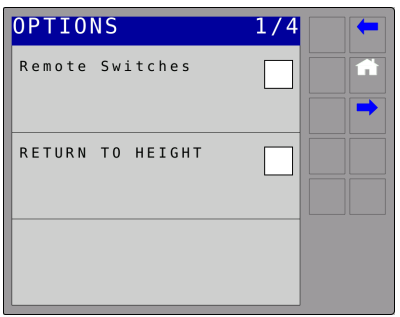


Figure 8: Options Menu

3.9.2. Return to Height

When this option is enabled (checked), the main lift will move to the target height and remain there while the UC5™ system is in automatic mode. After the initial main lift adjustments, no further adjustments are made to the center section.

3.9.3. Headland Assist

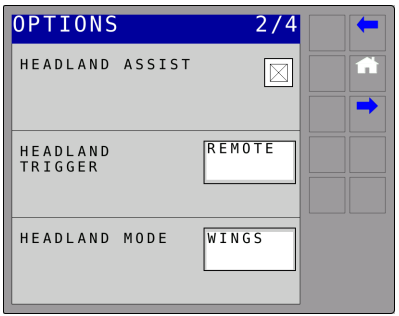


Figure 9: Headland Mode and Headland Trigger

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. The Headland Assist height can be changed when the Headland Assist feature is enabled by simply adjusting the target height. The Headland Assist feature can operate in two different modes; main or wings only.

If headland mode is set to main, when 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 headland mode is set to wings only, when 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.

When the Headland Assist feature is enabled, a trigger type must be selected to activate it in the field. The trigger may be either the main lift up/down switch or the remote auto input line.

Main Lift Switch:

If the main lift switch is enabled as the trigger, Headland Assist will be triggered when the operator presses the main up switch while in automatic mode. By pressing 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 that the Setpoint Bump increment/decrement and Terrain Assist™ features are disabled for the main lift switch when headland trigger is set to the main lift.

Remote Auto:

Enabling remote auto as the trigger will allow a separate switch to trigger Headland Assist. This switch must be a momentary type switch. Remote auto is an input line located on the UC5™ input module. If remote auto is enabled as the trigger then the remote switches will also be enabled.

While in manual mode, if the system voltage (+12 VDC) is momentarily applied to the remote auto line, the system will switch to automatic mode. While in automatic mode, each time the system voltage is momentarily applied to the remote auto line, the system will change between automatic mode and Headland Assist™.

With remote auto selected as the trigger, the set point increment/decrement feature can still be used with the main lift switch to change the target height for Headland Assist and automatic mode.

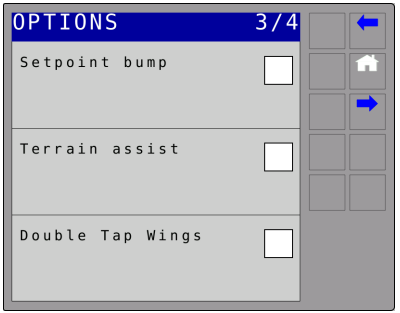


Figure 10: Options 3 Screen

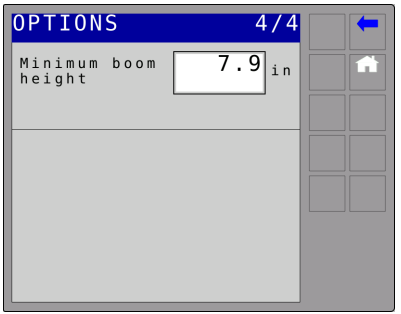


Figure 11: Options 4 Screen

3.9.4. Setpoint Bump

When this option is enabled (checked), the main lift sprayer switch is used to increase/decrease the target height while running in automatic mode. Note when Terrain Assist™ is enabled or Headland Assist™ is set to main lift trigger; the Setpoint Bump cannot be enabled.

3.9.5. Terrain Assist

When Terrain Assist is enabled (checked), tapping the main lift switch up will activate Terrain Assist. When activated, both wing sections will raise as quickly as possible to the Terrain Assist target height (adjustable when in Terrain Assist by modifying the height on the settings screen) and will continue to control at this height automatically. By pressing the main lift switch down momentarily, the system will return to regular automatic operation. Note the Setpoint Bump and Headland Assist cannot be active for the main lift while the Terrain Assist feature is enabled.

3.9.6. Double Tap Wings

When this option is enabled (checked), the system can be put into automatic mode by tapping either the left down switch or the right down switch twice provided that at least one boom section is already in automatic mode. Holding any of the up or down switches will still put the system into manual mode.

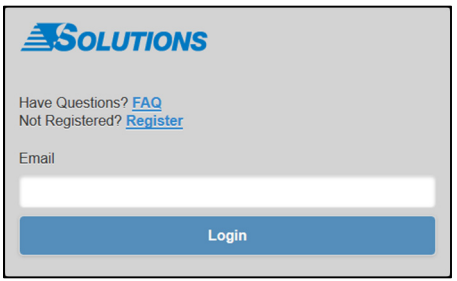
3.9.7. Minimum Boom Height

The Minimum Boom Height indicates the lowest mechanical height the boom could achieve. This feature allows the operator to set a minimum height that will not be exceeded by the automatic control system.

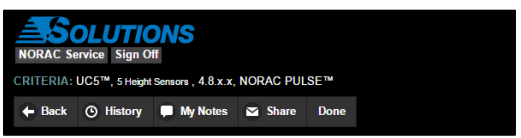
4 NORAC Solutions

NORAC Solutions™ is a free web application to help troubleshoot NORAC products.

- NORAC Solutions works offline if internet access is not available.
- Customer information and comments can be entered for future reference.
- Customers can escalate troubleshooting issues to NORAC technicians for follow up.



www.solutions.norac.ca



- The help menu contains links to:
  - A FAQ page
  - A video explaining how to use NORAC Solutions™
  - Contact information for NORAC
  - A history of diagnostic sessions

4.1. Supported Devices

- Apple iPad and iPhone iOS 6+
- Google Android 4+
- BlackBerry Tablet 2.1+, and Smartphone BB 10.1+
- Microsoft Windows Phone 7.5+

4.2. Supported Internet Browsers

- Internet Explorer - version 9+
- Google Chrome - version 23+
- Firefox - version 17+
- Safari - version 6+

5 UC5 System Service and Diagnostics

Height Sensor Test Page 32

Communication Test Page 34

Boom Functions Test Page 43

Hydraulics Page 44

System Settings Page 47

Replacing Components Page 50

5.1. Terminators and Couplers

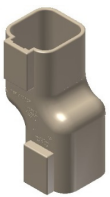


Figure 12: Network Terminator (White)

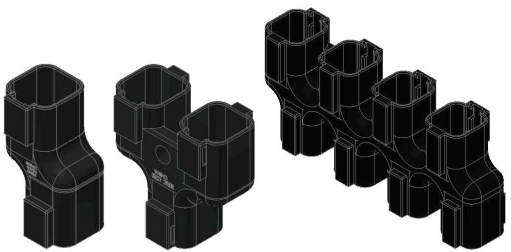
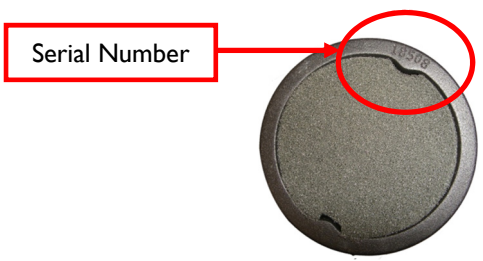


Figure 13: Network Couplers (Black)

5.2. Height Sensor Test

1. Inspect foam pads and sensors. Install clean dry foam pads if necessary.
2. Perform this test over level bare soil or gravel. The system must be in manual and Soil Mode™.
3. Level the booms and adjust the main lift to the bottom of the stroke.
4. Navigate to the height readings screen (Run Screen -> Settings -> Next -> Next -> Diagnostics -> Sensors).
5. Check the readings of all the height sensors while raising the center section.
6. A continuous and accurate height reading from 10 inches (25 cm) to 80 inches (200 cm) should be seen.
7. Repeat steps 2 to 6 in Crop Mode™.





5.2.1. Height Sensor Test – Results

5.2.1.1. "NR" or "No Data" (not getting a valid reading)

- Not communicating
- Dirty sensor or saturated with water
- Poor target or poor mounting
- Stuck in programming mode
- Damaged transducer – send to NORAC for repair

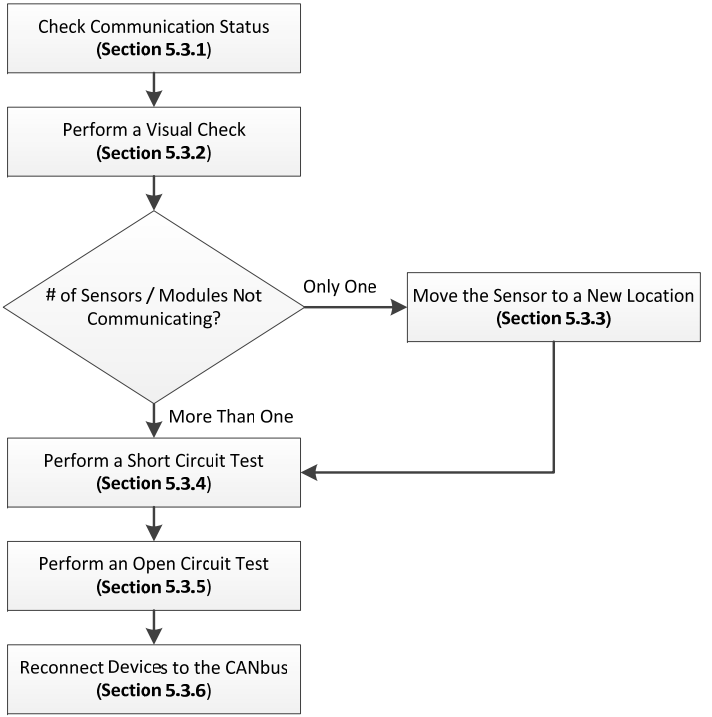
5.2.1.2. "NC" or "NA" or "Lost Communication" (not communicating)

- Perform a communication test

5.2.1.3. Inaccurate or Erratic Height Reading

- Poor sensor mounting
- Ensure the sensor is calibrated (offset) and configured

5.3. Communication Tests



5.3.1. Checking Communication Status

1. Cycle the power.
2. Navigate to the firmware versions menu (Run Screen-> Settings-> Next-> Diagnostics-> Versions).
3. Select a device from the drop down list.
4. The display will show “Ready” to indicate the device is communicating, or “No Communication”. The device also may not appear in the version list if it’s not communicating.
5. If all the devices are communicating, the test has passed.

5.3.2. Visual Check

1. Look for any pinched or stretched cables especially near the boom pivot points such as the main lift and fold points.
2. Ensure all the connectors and cavity plugs are clean, free of moisture and corrosion, and plugged in.
3. Dielectric grease must never be used on any of the CANbus connections.

5.3.3. Move Sensor to New Location

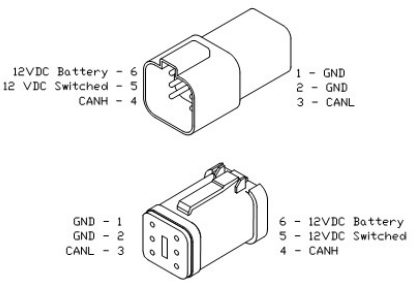
If there is only one device that is not communicating:

1. Power down the system. Plug the device into a location that had a known communicating device. Turn on the power. Check if the device is now communicating. Remember the device will still be assigned to its previous location.
2. If the device communicates, it indicates a problem with the cable it was previously connected to.
3. If the device still does not communicate, it indicates a problem with the device itself.

5.3.4. Short Circuit Test

1. Disconnect all the height sensors, modules, roll sensors and power from the NORAC CANbus. Ensure all cables and terminators are connected together.
2. Using an ohm meter, test the resistance of all the pin combinations on the 6-pin connector (C01).
3. If an incorrect value is measured, continue by testing at the next connection until the problem cable is isolated.

Pin #	Pin #	Value
1	2	Open Circuit
1	3	Open Circuit
1	4	Open Circuit
1	5	Open Circuit
1	6	Open Circuit
2	3	Open Circuit
2	4	Open Circuit
2	5	Open Circuit
2	6	Open Circuit
3	4	75Ω ± 10Ω
3	5	Open Circuit
3	6	Open Circuit
4	5	Open Circuit
4	6	Open Circuit
5	6	Open Circuit

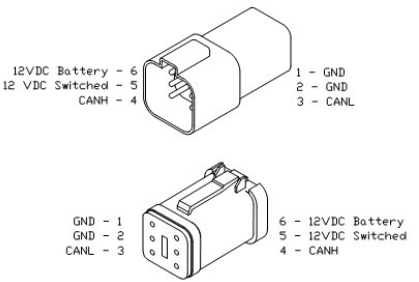


5.3.5. Open Circuit Test

The open circuit test will apply voltage to the cabling and check for any open circuits.

1. Ensure all the devices are still disconnected from the bus.
2. Reconnect the cables to the control module. (C01, battery, display)
3. Turn on the system power.
4. Using a voltmeter, measure the voltage of the following pin combinations at each of the sensor connections.

Pin #	Pin #	Value
1	3	0.5 to 6 VDC
1	4	0.5 to 6 VDC
1	6	12 ± 3 VDC
2	5	12 ± 3 VDC



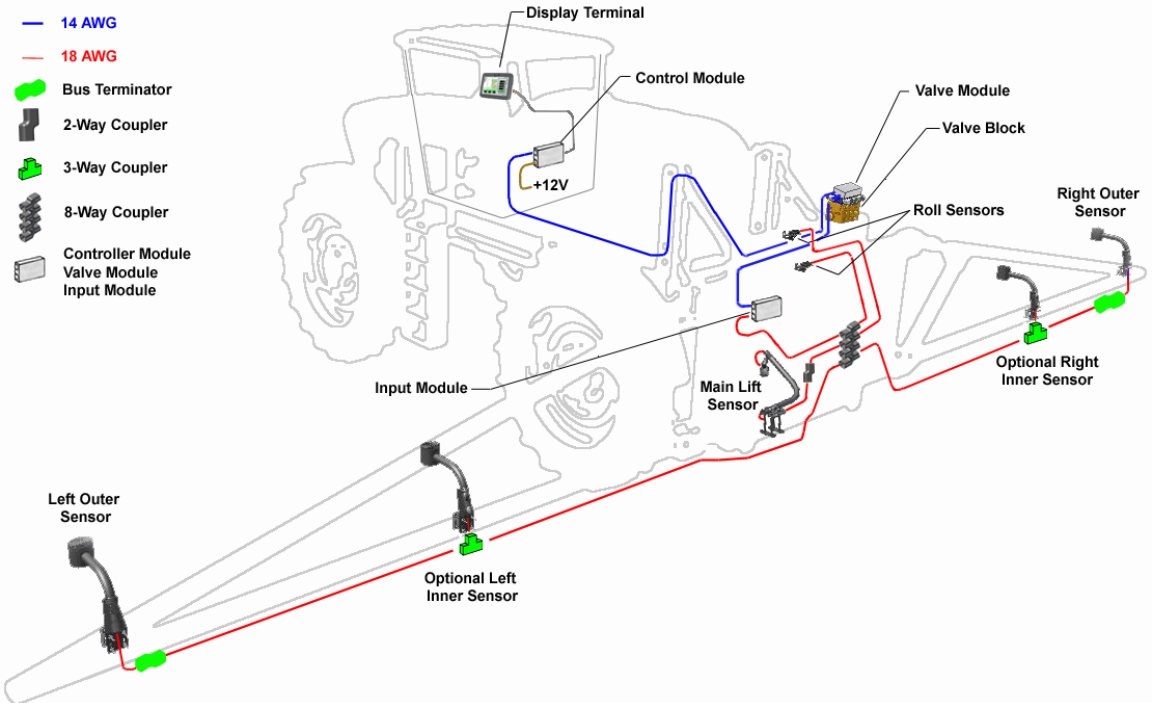
5. If an incorrect value is measured, continue by testing at the next connection until the problem cable is isolated.

5.3.6. Reconnecting Devices

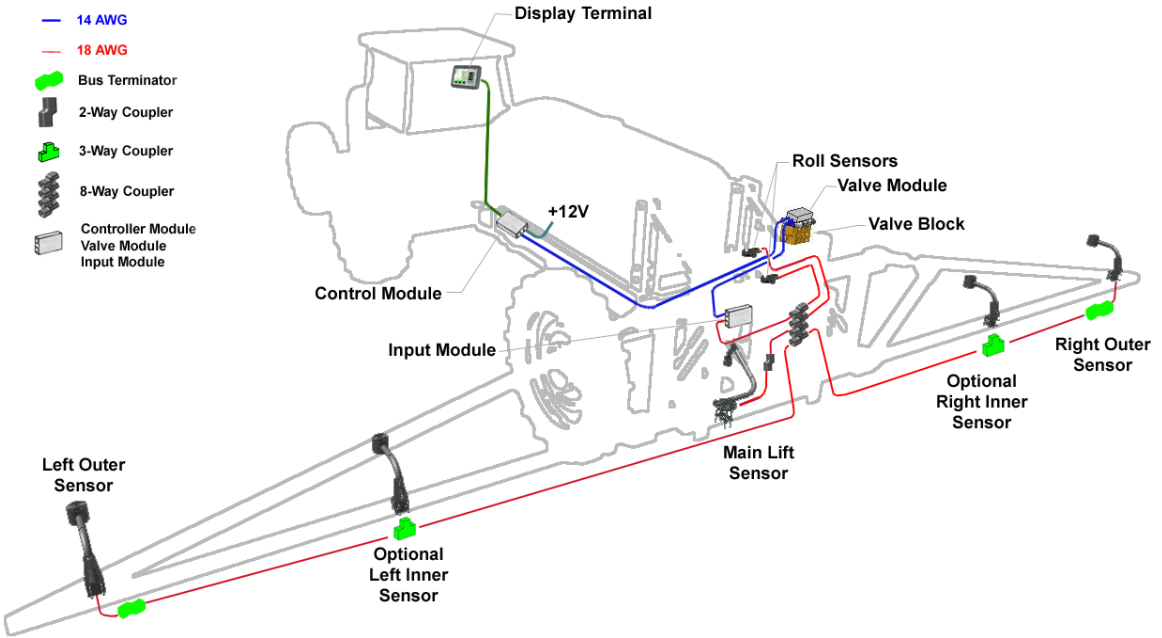
Once the cabling is confirmed to be acceptable by performing the short and open circuit tests, reconnect the devices one at a time to test each device individually.

1. Turn off the system power.
2. Reconnect one device to the CANbus.
3. Turn on the system power.
4. Check the communication status as previously explained.
5. If the device is not communicating, remove it.
6. If the device is communicating, leave it connected.
7. Repeat steps 1 to 6 for each of the devices until they are all connected to the CANbus. Replace any devices that do not communicate.

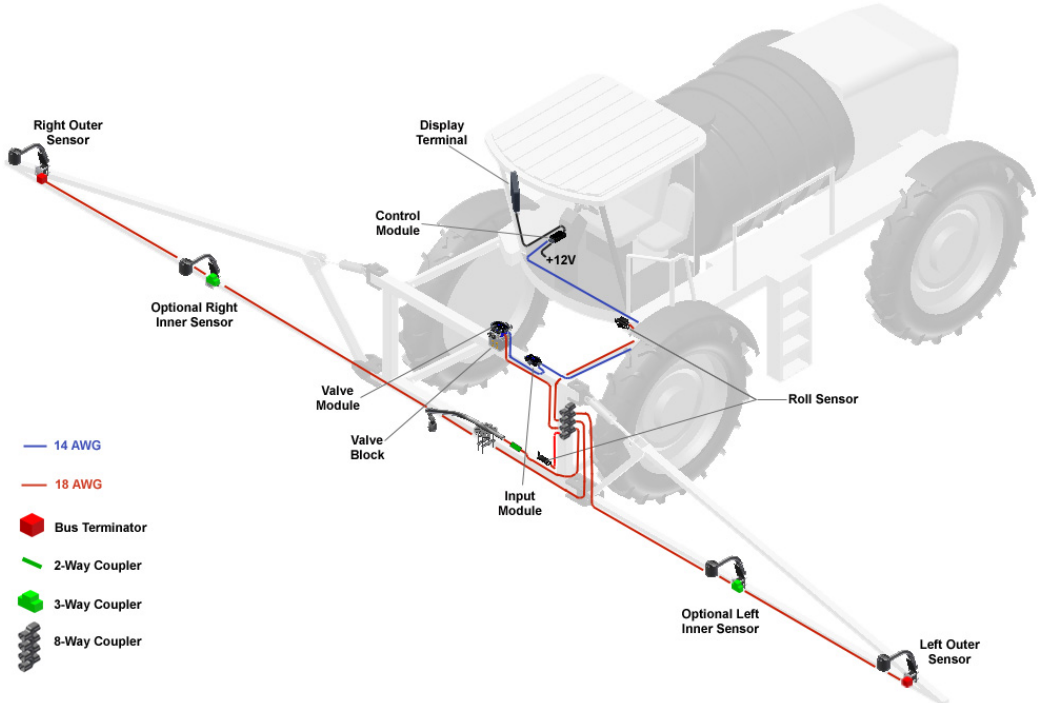
Typical Self-Propelled Sprayer Installation



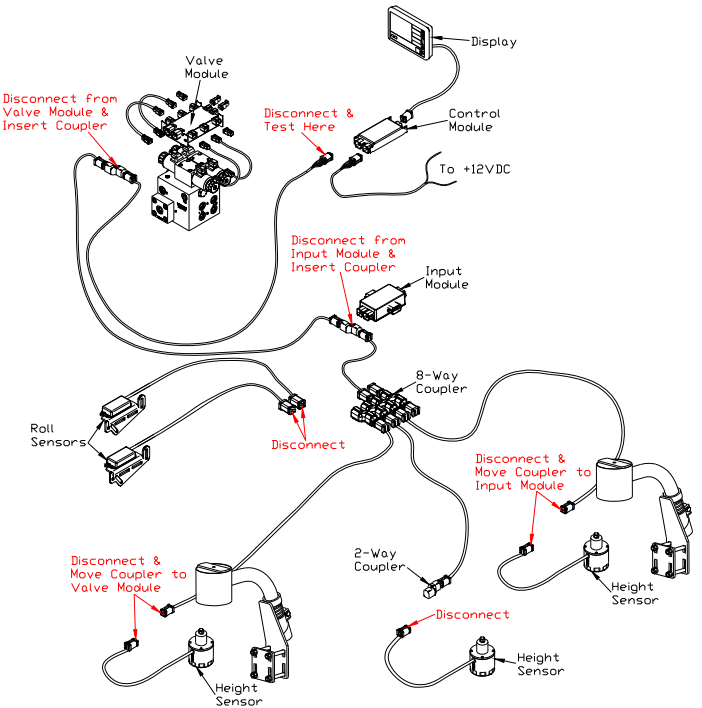
Typical Pull Type Sprayer Installation



Typical Front Mount Sprayer Installation



Typical Setup for Short Circuit Test



5.4. Boom Function Test

1. Navigate to the Boom Movements screen in the diagnostic menu (Run Screen-> Settings-> Next-> Diagnostics-> Boom Movements).
2. Press and hold the Left Up boom function on the display.
3. Ensure the Left Up boom function operates.
4. Repeat steps 1 to 3 for all the other boom functions: Left Down, Right Up, Right Down, Main Up, Main Down, Roll Clockwise and Roll Counter Clockwise.

5.4.1. Boom Function Test – Results

5.4.1.1. Proportional function does not move, or wrong one moves

- Ensure the bypass (jam) valve is being activated. Try pressing an unfold function at the same time to see if the boom function moves.
- Test the valve module drivers. This tests the electrical portion.
- Ensure the outputs are correctly configured.
- Perform a manual valve override test. This tests the hydraulic portion.
- Ensure the hydraulics are engaged.
- Check the hydraulics installation. The raise lines must be connected to the “B” ports and the lower lines must be connected to the “A” ports.

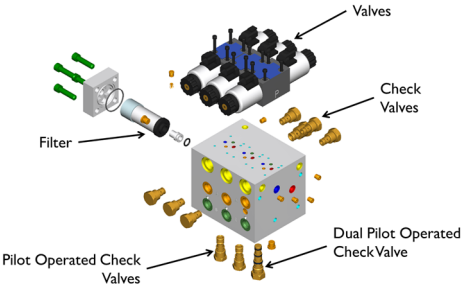
5.4.1.2. On / Off function does not move, or wrong one moves

- Ensure the outputs are correctly configured.
- Test the input module drivers. This tests the electrical portion.

5.5. Hydraulics

5.5.1. Failure Modes

- Leaking oil, stuck valves, debris in components, damaged seals from installation or worn out, incorrectly installed fittings, hoses or orifices, failed components.



**Individual components can be replaced instead of replacing the entire assembly.*

5.5.2. Leaking oil near the NORAC valve block

1. Inspect the fittings and O-rings on the pressure, tank, A and B ports. The fittings should be tightened to 18 ft-lbs (24 Nm). Proper NORAC seals and fittings should be used.
2. Inspect the valve block for cracks.
3. Check the components in the valve block and ensure they are correctly torqued and the seals are not damaged.

5.5.3. Leaking oil between the NORAC valve block and expansion block

1. Ensure the mating surfaces are clean and undamaged.
2. Seals must be coated with oil prior to installation.
3. Do not install the temperature probe or flat washers on the mounting bolts.
4. Ensure the mounting bolts are torqued correctly.

5.5.4. The boom slowly creeps down

1. Ensure the raise lines are connected to the “B” ports and the lower lines are connected to the “A” ports. The “B” port is always the load holding port.
2. The PO check valve may be leaking. Check for debris or a damaged seal.
3. Try swapping the left and right hoses. If the problem follows the hoses it may indicate a problem with the cylinder or sprayer’s valves.

5.5.5. The boom function won’t move

1. The pressure and tank hoses may be installed backwards.
2. The “A” and “B” lines may not be installed on the same station.
3. The valve may be stuck. Manually operate the valve in both directions using the manual override test. Perform the boom function test again.
4. The coil may have failed. Try swapping the coil with one from another known working valve.

5.5.6. The booms operate backwards

1. Ensure the raise lines are connected to the “B” ports and the lower lines are connected to the “A” ports.
2. Ensure the electrical connections are correct.
3. Ensure the valves are configured (mapped) correctly.

5.5.7. The booms move too fast or too slow

1. Ensure the orifices are installed correctly. If the “B” port is backwards, the boom will move up slowly and down fast. If the “A” port is backwards, it will raise slowly and may chatter when going down.
2. Ensure the orifices are not jammed in the port. Try removing and reinstalling the orifices.
3. Check to see if the filter is plugged. The filter can be removed to test, but it must be reinstalled.
4. Ensure the correct “A” and “B” port NORAC fittings are used. If the wrong fittings are used, the floating orifice may not be operating correctly.

5.6. System Settings

5.6.1. Calibrating Deadzones

Tip: Performing an automatic retune will set the deadzone and gain values.

The deadzone value relates to the smallest amount of boom movement the valve can produce.

1. Ensure the sprayer is over bare level soil or gravel. The sprayer should be at operating temperature and RPM.
2. Navigate to: Run Screen-> Settings-> Next-> Setup-> Valves.
3. Select the boom function. Press the Deadzone button.
4. Press and hold the manual (M) button.
5. Hold until the boom stops moving and the reading stabilizes.
6. The reported distance should be 1-2 inches (2-5cm). Adjust the deadzone until the distance is within 1-2 inches (2-5cm).

5.6.2. Gains

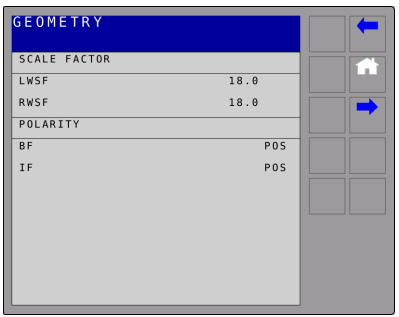
The gain value relates to the maximum speed of the boom.

1. The gain calibration is dependent on the deadzone value. Before calibrating the gain, the deadzone value must be correctly calibrated for the same channel.
2. Ensure the sprayer is over bare level soil or gravel. The sprayer should be at operating temperature and RPM.

3. Navigate to: Run Screen-> Settings-> Next-> Setup-> Valves.
4. Select the boom function. Press the Gain button.
5. Press and hold the automatic (A) button.
6. Hold until the boom stops moving and the reading stabilizes.
7. Continue to hold it until the display says “Test Complete”.

5.6.3. Boom Geometry

- Navigate to the Boom Movements screen in the diagnostic menu (Run Screen-> Settings->Next-> Diagnostics-> Boom Movements).
- LWSF and RWSF should be close to the same value.



5.6.4. Calibrating Boom Geometry

1. Ensure the sprayer is over bare level soil or gravel.
2. Ensure the boom is level and approximately 3 – 5 feet (100 - 150 cm) above the ground.
3. Navigate to the boom geometry test (Run Screen-> Settings-> Next-> Setup-> Boom Geometry Test).
4. The booms will be moved into position and, the display will prompt you to exit the cab and manually push either boom tip down. Stay at least 3 feet from the sensor.
5. Push either boom tip down 1 – 3 feet (30 – 90 cm) for a moment and then let go. Do not push the boom to the ground.

5.7. Replacing Components

5.7.1. Replacing a Height or Roll Sensor, Input or Valve Module

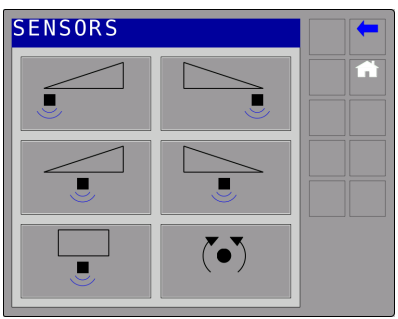
- Performing a retune or automatic setup is NOT necessary.
- Turn off the power, replace the component and turn on the power. The system will recognize that there is a new component.

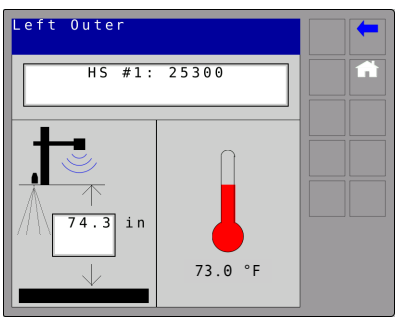
5.7.2. Replacing a Control Module

- Performing a new automatic setup is required.

5.7.3. Swapping Height or Roll Sensor Locations

- The sensors need to be reconfigured (mapped) to the new locations.





6 UC5 System Maintenance

6.1. Daily Maintenance

- Grease the friction pads on the sprayer boom.
- Sensors:
  - Foam - Ensure there is a clean and dry foam inserted into each sensor.
  - Mesh - Ensure that the mesh is clean and free from debris.



Figure 14: Ultrasonic Sensor with Foam



Figure 15: Ultrasonic Sensor with Mesh

6.2. Cleaning Ultrasonic Height Sensors

- Foam:
  - Remove the foam disc from the sensor and wash it with clean water. Squeeze out water and allow the foam disc to dry.
  - If the transducer inside the sensor is also dirty, wipe it using a clean, damp cloth. Do not submerge or pressure-wash the sensor.
  - When inserting the foam into the sensor, press it firmly into place so that the foam is contacting the Velcro retainer.
- Mesh:
  - Wipe the mesh covering with a clean, damp cloth. If the mesh is heavily soiled and/or if the sensor is not reporting height readings, remove the blue clip holding the mesh in place. Wash the mesh with clean water using a clean cloth and allow it to dry. Avoid creasing or crumpling the mesh when cleaning. See Figure 16 and Figure 17 for examples of soiled and clean mesh. The soiling can best be seen when holding the mesh up to a light source.
  - If the transducer inside the sensor is also dirty, wipe it using a clean, damp cloth. Do not submerge or pressure-wash the sensor.

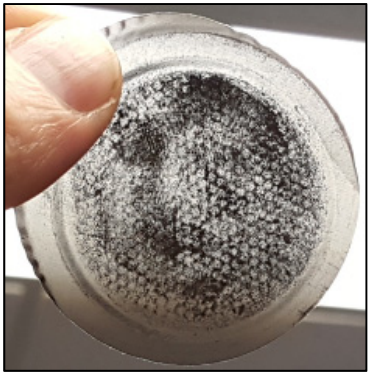


Figure 16: Soiled Mesh

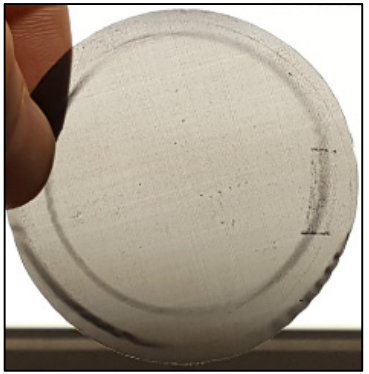
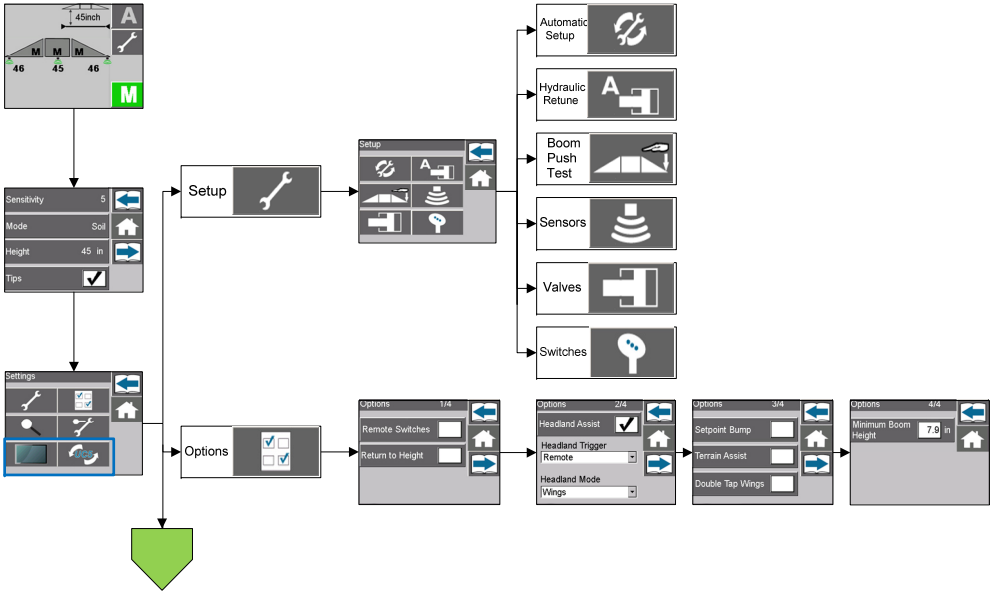


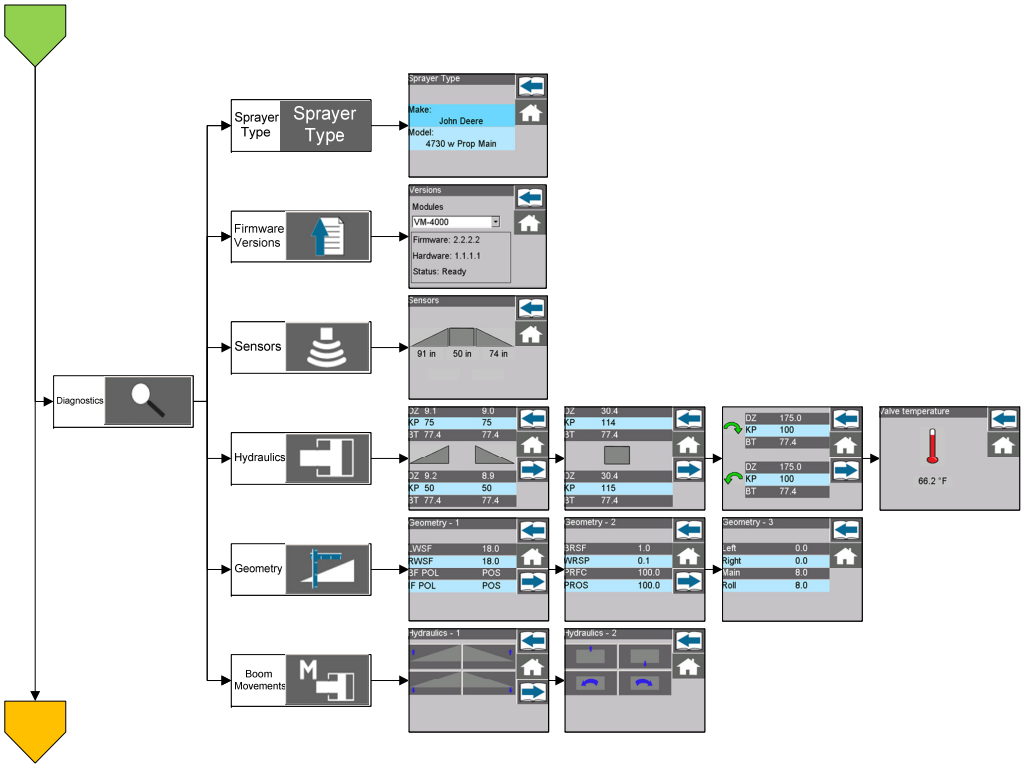
Figure 17: Clean Mesh

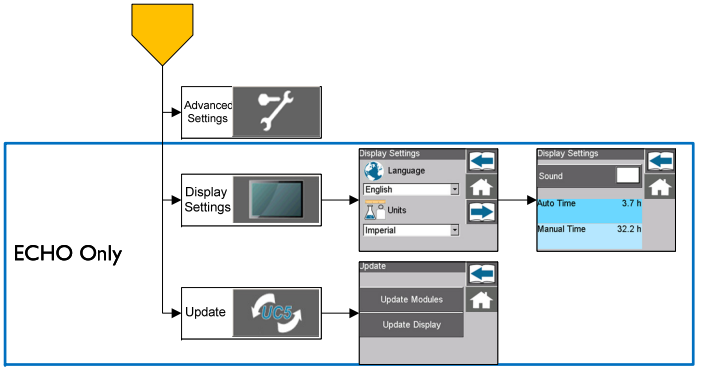
- Chemicals or compressed air should never be used.
- The sensor can be used if it is wet, however a valid height reading may not be obtained until it is completely dry.
- A replacement mesh/clip kit can be ordered using the part number below:

Part Number	Name	Quantity
45021	US SENSOR MESH/CLIP FIELD UPDATE KIT	1
411613	SENSOR UPDATE KIT - FOAM/VELCRO	1

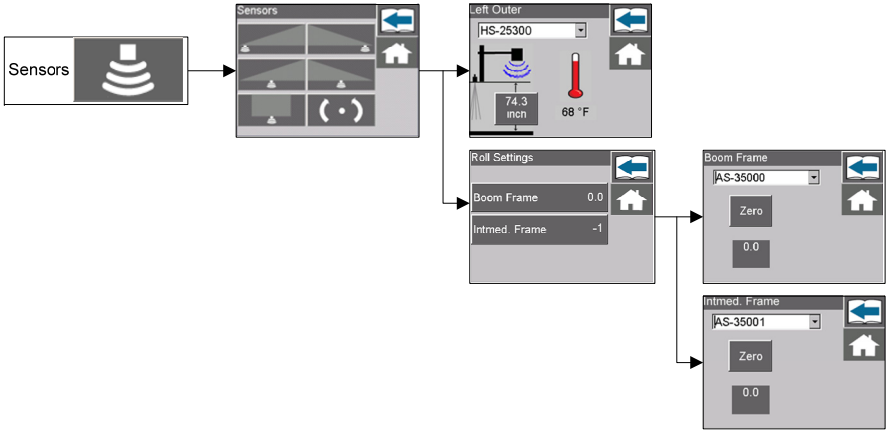
7 UC5 Menu Structure




Diagnostics
Sprayer Type
Sprayer Type
Firmware Versions
Sensors
Hydraulics
Geometry
Boom Movements
Sprayer Type
Make:
John Deere
Model:
4730 w Prop Main
Versions
Modules
VM-4000
Firmware: 2.2.2.2
Hardware: 1.1.1.1
Status: Ready
Sensors
91 in
50 in
74 in
Valve temperature
66.2 °F
Geometry - 1
Geometry - 2
Geometry - 3
Hydraulics - 1
Hydraulics - 2

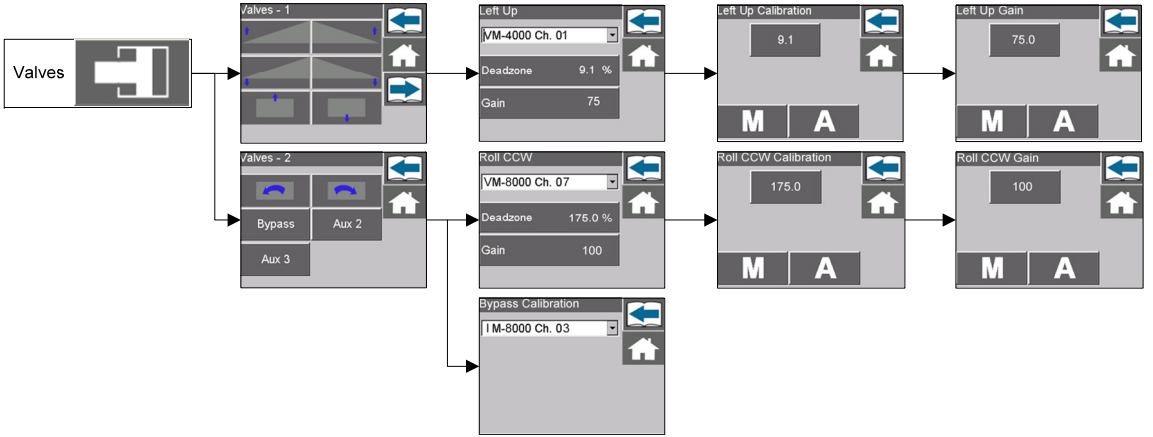

ECHO Only
Advanced Settings
Display Settings
Update
Display Settings
Language
English
Units
Imperial
Display Settings
Sound
Auto Time 3.7 h
Manual Time 32.2 h
Update
Update Modules
Update Display

7.1. Setup: Sensors

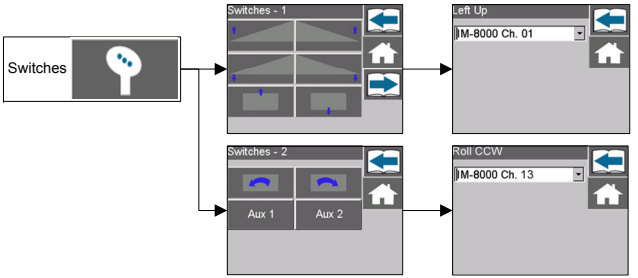


** The reference frame roll sensor button will only be visible if a reference frame roll sensor is installed in the system.*

7.2. Setup: Valves



7.3. Setup: Switches



8 Icon Descriptions

The following tables illustrate and describe the icons used in the display. These icons may look different depending on the type of display you have.

Table 3: Softkey Icons

Icon	Name	Description
	Check	Confirms selection or completion of a step
	Error	Indicates when there is an error
	Next	Navigates to the next page
	Previous	Navigates to the previous page
	Home	This button always returns directly to the run screen
	Manual Mode (Active)	Indicates the system is in manual mode
	Manual Mode (Inactive)	Changes system to manual mode when the system is in automatic mode

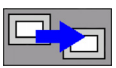
	Automatic Mode (Active)	Indicates the system is in automatic mode
	Automatic Mode (Inactive)	Changes system to automatic mode when the system is in manual mode
	Settings	Navigates to the settings screen
	Cancel	Cancels current selection or operation
	Setup Diagnostics	Navigates to the automatic setup diagnostic screen (** Applies to ECHO™ only*)
	Language	Change display language (** Applies to ECHO only*)
	Move to Next VT	Move the UC5 screen to a different VT (* Applies to VT only)

Table 4: Button Icons

Icon	Name	Description
	Setup	Navigates to the automatic/manual setup screen
	Options	Navigates to the options screen
	Diagnostics	Navigates to the diagnostics screen
	Advanced Settings	Navigates to the advanced settings
	Display	Navigates to the display settings (** Applies to ECHO™ only*)
	Update	Navigates to the software update screen (** Applies to ECHO only*)
	Automatic Setup	Starts an automatic setup
	Retune	Starts a retune
	Boom Geometry Test	Starts a boom geometry (push) test

	Sensor Setup/ Diagnostics	Navigates to the manual sensor setup or sensor diagnostics screens
	Valve Setup/ Diagnostics	Navigates to the manual valve setup or hydraulic diagnostics screens
	Switches	Navigates to the manual remote switches screen
	Versions	Navigates to the UC5™ modules versions screen
	Geometry	Navigates to the boom geometry screen
	Manual Valve Drive	Navigates to the manual valve drive screen
	Units	Change the display units (** Applies to ECHO™ only*)
	Language	Change the display language (** Applies to ECHO only*)

9 Contacting Support

- NORAC Solutions: http://solutions.norac.ca
- Service and Support: 888 979 9509
- Email: tasupportn@topcon.com
- Please have the following information available:
  - Product model: UC5™
  - Installation date
  - Sprayer make and model
  - Customer information: name and location
  - Control Module serial number and firmware version

10 Notes