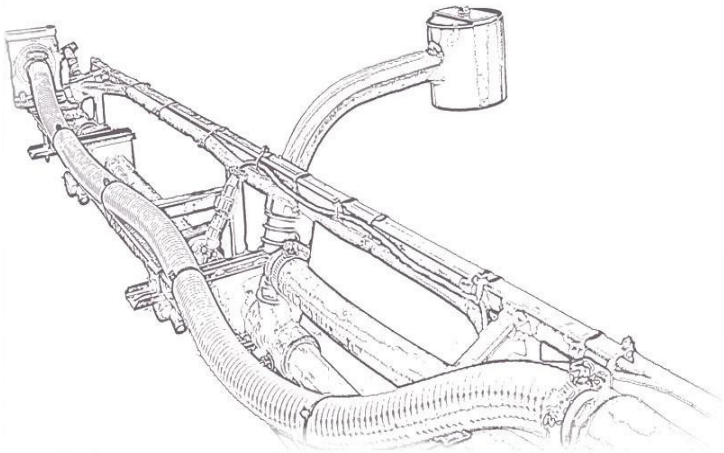


NORAC

UC5 Spray Height Control System



UC5 Height Sensor, Roll Sensor and
Position Sensor Testing

Printed in Canada

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Reorder P/N: 54645-MAN Revision H

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I Introduction

This manual serves as an instruction manual for testing UC5 height sensors, roll sensors and position sensors. This procedure is useful in determining if a product needs to be returned to NORAC for repairs or if it is possible to continue using it. This procedure also provides a method for performing some basic calibration of the UC5 height sensor to improve its performance.

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2 54645 – UC5 Resource Upgrade Kit

2.1 Parts List

Table 1: Items included in the UC5 Resource Kit Upgrade

Item	Part Number	Name	Quantity
C01	44644-08	CABLE BUSMONITOR (DT FEMALE TO AMP MALE)	1
E01	54733	NORAC USB DRIVE - TOOLSUITE AND VERIFICATION TOOL	1
E03	43764T	UC5 NETWORK COUPLER 2-WAY WITH TERMINATOR	1
M01	54645-MAN	MANUAL UC5 SENSOR TESTING	1

NOTE: This kit must be used in conjunction with the UC4 Resource Kit (NORAC Part Number 44645).

Table 2: Items included in the UC4 Resource Kit and Available for Re-order from NORAC

Item	Part Number	Name	Quantity
*M05	106127	ADH RTV 162 WHITE SILICONE - 85mL TUBE	1
M06	44645-02	TRANSDUCER SERVICE KIT	1
M07	44645-03	O-RING SERVICE KIT	2
M08	44645-04	FOAM DISC SERVICE KIT	1

** Item M05 is available for re-order from NORAC, as well as from the manufacturer:

Item #	Description	Manufacturer	Part #
M05	ADH RTV 162 WHITE SILICONE - 85mL TUBE	MG Chemicals /Momentive	RTV162-85mL

2.2 PC Requirements

1. Operating System: Windows XP, Windows Vista or Windows 7.
2. Microsoft .NET Framework: Version 4.0 or higher.

2.3 Software Installation

1. Insert the included UC5 Toolsuite USB Drive.
2. Double-click the UC5 Toolsuite .exe file and follow the prompts to install.
3. A shortcut to the program is placed in the Start Menu.

2.4 Cable Connections

1. Connect the USB-to-Serial Adapter to the computer.
2. Connect the Bus Monitor's connector labeled "To CANbus" to the Stand-Alone Power Cable connector labeled "To Bus Monitor".
3. Connect the Stand-Alone Power Cable to a 12VDC power supply. The red banana plug must be connected to the positive terminal and the black banana plug to the ground.
4. Switch the power supply on, check that the LED on the Bus Monitor is illuminated and switch off power supply.
5. Connect the 4-pin AMP receptacle (R4) on 44644-08 (C01) to the AMP connector on the Bus Monitor labeled "To CANbus".
6. Connect the 2-way terminator (43764T [E03]) to the 6-pin Deutsch plug on 44644-08 (C01).

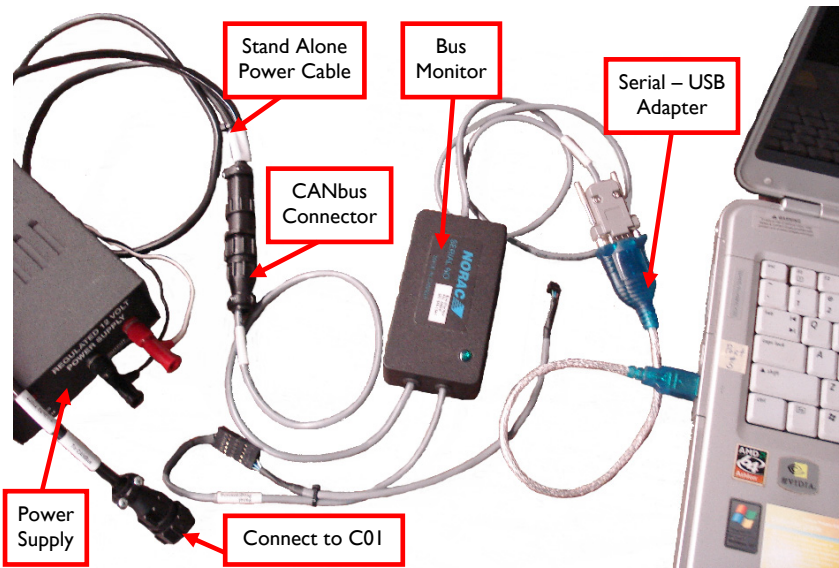


Figure 1: NORAC Bus Monitor Connections

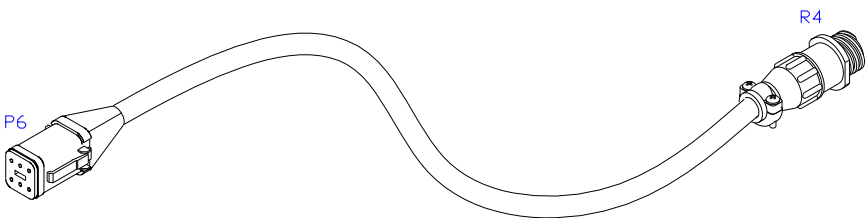


Figure 2: 44644-08

3 54646 – UC5 Resource Kit

3.1 Parts List

Table 3: Items included in the UC5 Resource Kit

Item	Part Number	Name	Quantity
B01	44968	ULTRASONIC SENSOR CALIBRATION FIXTURE TYPE2	1
C01	44644-11	CABLE BUS MONITOR PEAK PCAN TEE (MALE & FEMALE DT)	1
C02	43250-12	CABLE UC5 BATTERY PIGTAIL (ECU AND SIGNAL POWER)	1
E01	106359	CAN BUS MONITOR (PEAK PCAN-USB)	1
E02	54733	NORAC USB DRIVE - TOOLSUITE AND VERIFICATION TOOL	1
E03	43764T	UC5 NETWORK COUPLER 2-WAY WITH TERMINATOR	1
M01	54645-MAN	MANUAL UC5 RESOURCE KIT	1
**M05	106127	ADH RTV 162 WHITE SILICONE - 85mL TUBE	1
*M06	44645-02	TRANSDUCER SERVICE KIT	1
*M07	44645-03	O-RING SERVICE KIT	2
*M08	44645-04	FOAM DISC SERVICE KIT	1

* Items M06, M07 and M08 are available for re-order from NORAC.

** Item M05 is available for re-order from NORAC, as well as from the manufacturer:

Item #	Description	Manufacturer	Part #
M05	ADH RTV 162 WHITE SILICONE - 85mL TUBE	MG Chemicals /Momentive	RTV162-85mL

3.2 PC Requirements

1. Operating System: Windows XP, Windows Vista or Windows 7.
2. Microsoft .NET Framework: Version 4.0 or higher.

3.3 Software Installation

1. Insert the PEAK System CD into the disk drive. After selecting a language, select the **Drivers** button. Select the **PCAN-USB** driver and click *Install Now*. Follow the prompts to install.
2. Insert the included UC5 Toolsuite USB Drive. Double-click the UC5 Toolsuite .exe file and follow the prompts to install.
3. A shortcut to the program is placed in the Start Menu.

3.4 Cable Connections

1. Connect 44644-11 (C01) to the bus monitor. Connect 43250-12 (C02) to the 6-pin receptacle on 44644-11. Connect the 2-way terminator (43764T [E03]) to the 6-pin plug on 44644-11.
2. Connect the pigtail end of 43250-12 to a 12 VDC (2A or greater) power supply. Ensure the in-line fuse is connected to the positive terminal and the black wire is connected to the negative terminal.
3. Connect the bus monitor to the computer's USB port.

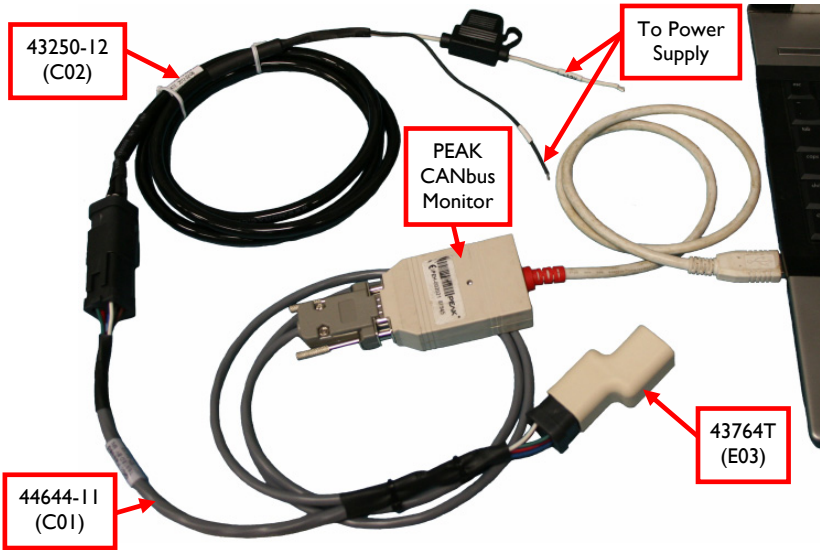


Figure 3: PEAK Bus Monitor Connections

4 Calibration Stand Assembly and Alignment

* Refer to Appendix A for setup and calibration of the 44730 calibration stand.

1. Assemble the two parts of the test stand as shown in **Figure 4**. Insert the sheet metal insert into the rectangular hole. Install the spring, flat washer and wing nut onto the stud. Tighten wing nut until the spring is approximately half compressed.



Figure 4: Test Stand Assembly

2. Insert the alignment tool (44968-2) into the test stand. **(Figure 5)**
3. Adjust the threaded mount (A) of the golf ball target so the surface of the ball will touch the tip of the alignment tool (it may be necessary to align the calibration stand first (Step 4) before this is possible).
4. Using the adjustment screws (B and C), align the tip of the alignment tool to the center of the golf ball.
 - To move the tip of the rod upwards, turn both adjustment screws in an equal amount.
 - To move the tip of the rod downwards, turn both adjustment screws out an equal amount.
 - To move the tip of the rod side to side, turn one screw in and one screw out an equal amount.
5. Rotate the alignment tool 180 degrees and repeat the alignment process (Step 4). If after rotating the alignment tool the tip of the rod is not centered on the ball target, split the difference of the two calibrations.
6. It may be necessary to adjust the threaded mount of the ball target (A) after Step 5.



Figure 5: Test Stand Alignment

7. If the test stand is ever disassembled, it must be realigned when reassembled. Use the alignment tool to check the alignment of the test stand before each use.
8. Inspect the sensor for visible damage. Inspect the transducer by removing the foam and looking through the screen. The underlying gold foil should be clean and free from tears, chemical deposits or wrinkles. Ensure a **clean** foam disc is in the sensor before testing.

NOTE: It is advised that a new foam disc is used for sensor testing.

9. Mount the sensor into the sensor test stand. Press the handle towards the stand and insert the sensor with the transducer facing the golf ball as shown in **Figure 6**.



Figure 6: Sensor Mounted in Test Stand

5 UC5 Toolsuite Setup

1. Start the UC5 ToolSuite software.
2. In the UC5 Toolsuite Initialization screen (Figure 7), select the bus monitor being used in the *Bus Monitor Port* drop-down list:
 - **PCAN USB** is the PEAK bus monitor (54646).
 - **USB to Serial Adapter** is the NORAC bus monitor (54645).
 - Select the COM port that the NORAC bus monitor (54645) is connected to (Windows 7 and 8 users).
3. Select the units desired for the measurements. Click “OK”.

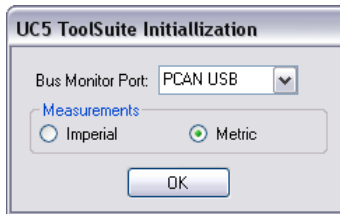


Figure 7: UC5 Toolsuite Initialization Screen

6 Height Sensors

6.1 Testing UC5 Height Sensors

1. Connect a sensor to the 2-way terminator, turn on the power supply and allow the sensor to run for at least 5 minutes before attempting to test it.
2. Start the UC5 Toolsuite software as described in Section 5.

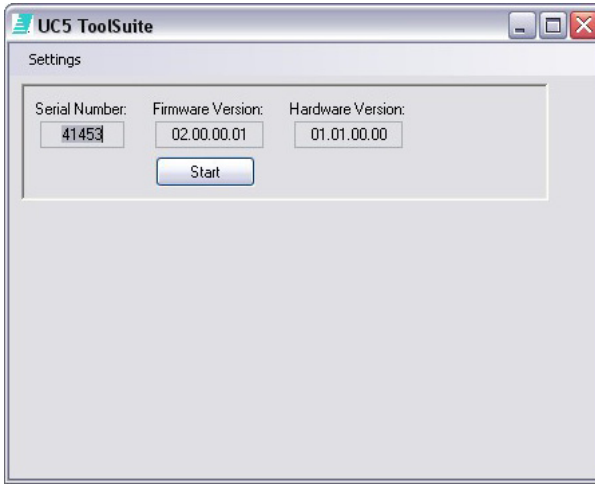


Figure 8: UC5 Toolsuite Screen with a Height Sensor Connected

3. Click the “Start” button to view and change the sensors settings. (Figure 8)
4. If the sensor is not communicating properly, the settings screen will not appear after clicking “OK” in the Initialization screen. Ensure that the power is turned on and the cabling is connected. If the settings screen is still not shown, there is a problem with the sensor and it should be sent to NORAC for repair.
5. Verify that the serial number displayed matches the serial number on the sensor and take note of the sensor’s firmware and hardware versions.

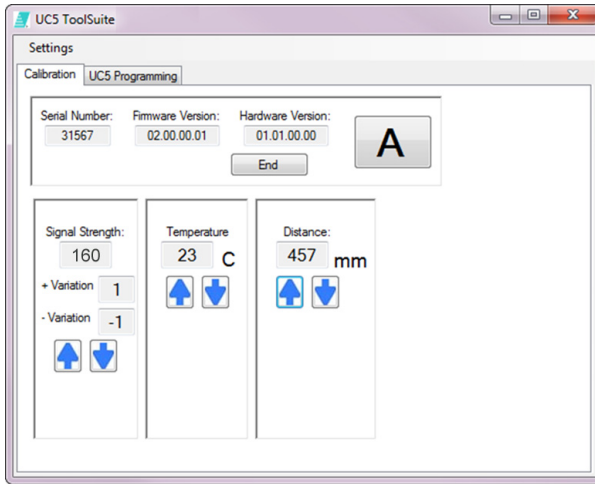


Figure 9: UC5 Height Sensor Settings

6. Use a thermometer to measure the current room temperature.
7. If the sensor's temperature reading is not the same as the room temperature, adjust the temperature using the "up" and "down" arrow buttons in the *Temperature* field.

NOTE: The temperature should not be calibrated until the sensor has been in the room for a minimum of 15 minutes.

Table 4: Temperature Adjustment Results

Test Result	Action
Temperature is the same as room temperature.	Continue with testing.
Temperature is different than room temperature.	Adjust the temperature setting. If it will not adjust to be within the range, the thermistor may be damaged and will need to be replaced.
Temperature cannot be adjusted to room temperature.	The sensor's thermistor is damaged. The sensor should still function, but its accuracy and reliability will decrease. The sensor should be returned to NORAC for repair.
The temperature measurement displays zero.	If the temperature will not change, the thermistor is most likely damaged and the sensor should be returned to NORAC for repair.

8. Verify changes in measured distance by placing a hand in front of the golf ball and moving it towards and away from the sensor.

9. Use the “Automatic Calibration” button (“A”) to adjust the sensor’s settings. Press and hold the “A” button until the readings stop changing.
10. The distance and signal strength can also be adjusted manually by using the “up” and “down” arrow buttons in the Signal Strength and Distance fields.
11. The distance reading should be 457mm \pm 1mm [18” \pm 0.1”].
12. The signal strength reading should be 160 (\pm 10).
13. The signal strength variation must be within \pm 5.

Table 5: Results When Adjusting the Signal Strength

Test Result	Action
The signal strength is 160 (\pm 10).	The sensor is OK to continue using.
The signal strength cannot be adjusted to 160 (\pm 10).	Replace the transducer and retest the sensor.

Table 6: Results When Adjusting the Distance Measurement

Test Result	Action
The distance measurement is 457mm \pm 1mm [18” \pm 0.1”].	The transducer is performing correctly.
The distance measurement is not 457mm \pm 1mm [18” \pm 0.1”].	If the distance cannot be adjusted to 457mm \pm 2mm [18” \pm 0.08”], try replacing the transducer and retest the sensor.
No measurement is displayed for the distance measurement.	If no distance measurement is displayed, try replacing the transducer and retest the sensor.

14. Click the “End” button and disconnect the sensor.

NOTE: If testing multiple sensors, connect the next sensor to the terminator. The software does not have to be reset between sensors, but the “Start” button must be clicked for each new sensor.

NOTE: If testing multiple sensors, it is recommended that each sensor be powered and running for at least 5 minutes prior to calibration.

6.2 Replacing Transducers

1. Using a small flat screwdriver, remove the o-ring from around the sensor transducer.
2. Peel the RTV silicone off the two tabs on the transducer. The spade connectors on the wires should now slide off the tabs.

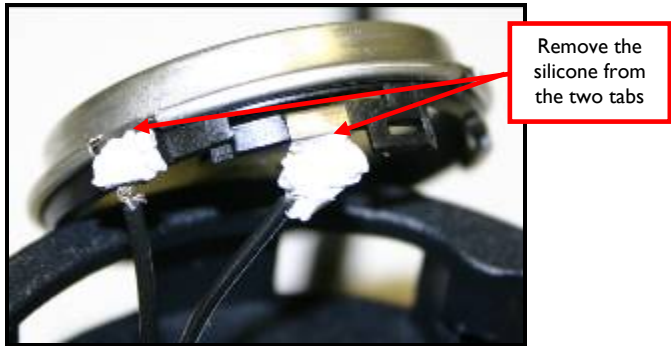


Figure 10: Transducer Connector Tabs

3. Attach the spade-end connectors of the wires to the new transducer as shown in **Figure 11**.
 - The flat side of the spade connector should point towards the center of the transducer.
 - The black/white striped wire connects to the center metal band terminal.
 - The black wire connects to the outer case terminal (screen).

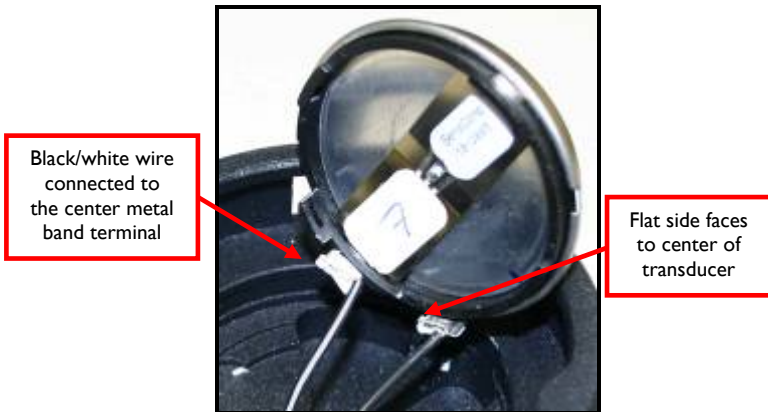


Figure 11: Transducer Wire Connection

4. Position the wires so they lie close to the transducer and have a right angle bend as shown in **Figure 12**.

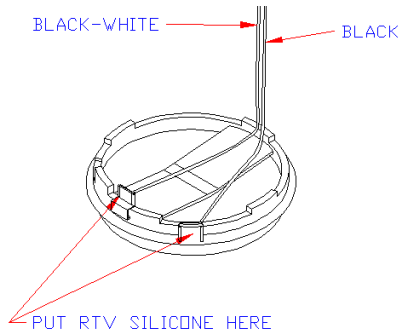


Figure 12: Transducer Wire Positioning

5. Add two small beads of RTV silicon to fasten the spade connectors to the transducer terminals.



CAUTION:

Do NOT allow the RTV to contact any part of the transducer, except the wire connection tabs. This will affect the transducer performance.

6. Lay the transducer wires in place so they sit in the two slots cut on the bottom of the sensor housing (**Figure 13**).
7. Position the transducer so it sits flat in the sensor casing. The transducer should not rock back and forth and should be flush with the top edge of the cut-out once it is properly seated in the casing.



Figure 13: Slots for the Transducer Wires

NOTE: If the existing o-ring is made of black rubber, it is recommended that it be replaced with an orange silicone o-ring (See Section 2.1 or 3.1 for ordering information). Follow the steps in Section 6.3 to replace the o-ring.

NOTE: Do NOT use any type of grease or lubricant on the o-ring.

8. Press the o-ring into place.
 - Insert the o-ring as evenly as possible.
 - The o-ring cannot have any bulges in it or have any spots that sit higher than the rest of the o-ring.
 - Inspect the gold foil on the transducer to ensure there are no wrinkles.
9. The new transducer should now be operational and a recalibration can be performed as outlined in **Section 6.1**.

6.3 Replacing O-Rings

NORAC recommends that all black rubber o-rings be replaced with an orange silicone o-ring even if the transducer is not being replaced. See Section 2.1 or 3.1 for ordering information.

1. Using a small flat screwdriver, remove the o-ring from around the sensor transducer.
2. Thoroughly cleanse the area where the o-ring is installed with Isopropyl alcohol and allow to dry. If the transducer is not being replaced, also thoroughly cleanse the outer rim of the transducer where it contacts the o-ring.
3. Position the transducer so it sits flat in the sensor casing. The transducer should not rock back and forth and should be flush with the top edge of the cut-out once it is properly seated in the casing.

NOTE: Do NOT use any type of grease or lubricant on the o-ring.

4. Press the o-ring into place.
 - Insert the o-ring as evenly as possible.
 - The o-ring cannot have any bulges in it or have any spots that sit higher than the rest of the o-ring.
 - Inspect the gold foil on the transducer to ensure there are no wrinkles.
5. A recalibration should now be performed as outlined in **Section 6.1**.

7 Roll Sensors

7.1 Testing UC5 Roll Sensors

1. Connect a roll sensor to the 2-way terminator and turn on the power supply.
2. Start the UC5 Toolsuite software as described in Section 5.

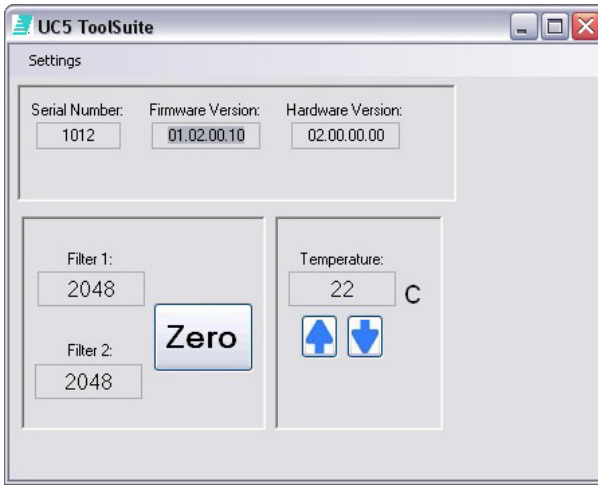


Figure 14: UC5 Toolsuite Roll Sensor Screen

NOTE: The temperature field is only displayed for roll sensors with a temperature probe (P/N: 43742).

3. If the roll sensor is not communicating properly, the settings screen will not appear after clicking “OK” in the Initialization screen. Ensure that the power is turned on and the cabling is connected. If the settings screen is still not shown, there is a problem with the roll sensor.
4. Verify that the serial number displayed matches the serial number on the sensor and take note of the sensor’s firmware and hardware versions.
5. Place the roll sensor on a flat, level, stationary surface with the power cable to the right. (Figure 15) The *Filter 2* angle reading should be 2048 (± 3).
6. If the *Filter 2* angle reading is not 2048 (± 3), ensure that the roll sensor is completely flat on the level surface and click the “Zero” button.

NOTE: It is very important that the surface is level, flat and stationary.



Figure 15: UC5 Roll Sensor with the Power Cable to the Right

7. The *Filter 2* angle reading should now be 2048 (± 3).
8. Test the roll sensor's functionality by lifting each end and observing the *Filter 2* angle reading. When the power cable end is lifted (Figure 16), the angle reading should increase. When the opposite end is lifted (Figure 17), the angle reading should decrease.



Figure 16: Power Cable End Lifted



Figure 17: Opposite End Lifted

Table 7: Roll Sensor Testing Results

Test Result	Action
The <i>Filter 2</i> angle reading is 2048 (± 3).	The roll sensor is OK to continue using.
The <i>Filter 2</i> angle reading cannot be adjusted to 2048 (± 3).	The roll sensor is not working properly and must be replaced.
The reading does not increase when the power cable end is lifted.	The roll sensor is not working properly and must be replaced.
The reading does not decrease when the opposite end is lifted.	The roll sensor is not working properly and must be replaced.

NOTE: The following section is only for roll sensors with a temperature probe (P/N: 43742).

9. Use a thermometer to measure the current room temperature.
10. If the sensor's temperature reading is not the same as the room temperature, adjust the temperature using the "up" and "down" arrow buttons in the *Temperature* field.

NOTE: The temperature should not be calibrated until the roll sensor has been in the room for a minimum of 15 minutes.

Table 8: Temperature Adjustment Results

Test Result	Action
Temperature is the same as room temperature.	Roll sensor is OK to continue using.
Temperature is different than room temperature.	Adjust the temperature setting. If it will not adjust to be within the range, the temperature probe may be damaged.
Temperature cannot be adjusted to room temperature.	The roll sensor's temperature probe is damaged.
The temperature measurement displays zero.	If the temperature will not change, the temperature probe is most likely damaged.

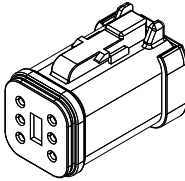
8 CANbus Short Test for Height and Roll Sensors

1. This test should be performed on all height sensors and roll sensors.
2. Using an ohm meter, test the resistance of all the pin combinations shown in Table 9 on the 6-pin connector.
3. If an incorrect value is measured, the sensor should be returned to NORAC for repair.

Table 9: Pin Combinations and Expected Values

Pin #	Pin #	Value
2	3	> 300 k Ω
2	4	> 300 k Ω
2	5	Open Circuit
3	4	75 Ω \pm 10 Ω
3	5	> 1 M Ω
4	5	> 1 M Ω

N/C - 1
Ground - 2
CAN Low - 3



6 - N/C
5 - 12VDC Switched
4 - CAN High

9 Position Sensors

9.1 Testing UC5 Position Sensors

1. Connect a position sensor to the 2-way terminator and turn on the power supply.
2. Start the UC5 Toolsuite software as described in Section 5.

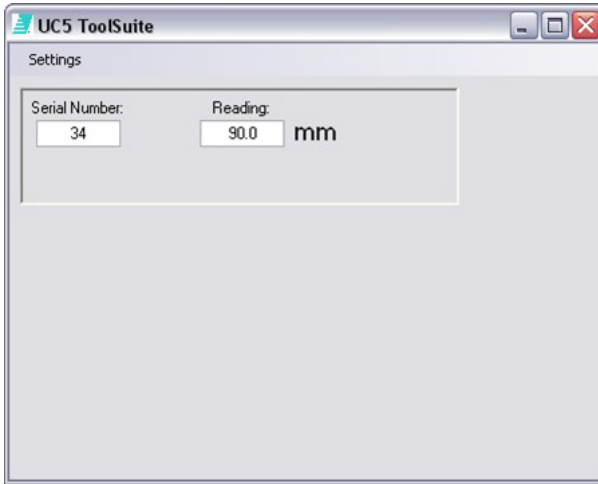


Figure 18: UC5 Toolsuite Roll Sensor Screen

3. If the position sensor is not communicating properly, the settings screen will not appear after clicking “OK” in the Initialization screen. Ensure that the power is turned on and the cabling is connected. If the settings screen is still not shown, there is a problem with the position sensor.
4. Verify that the serial number displayed matches the serial number on the position sensor’s label.
5. Verify that when the position sensor is fully closed (Figure 19), the reading is “NR”.



Figure 19: Fully Closed Position Sensor

6. Slide the position sensor open approximately half-way. Use a ruler or tape measure to measure the distance between the two parts of the position sensor. (Figure 20) Check that the reading is measuring the same distance minus 5mm [0.2”].

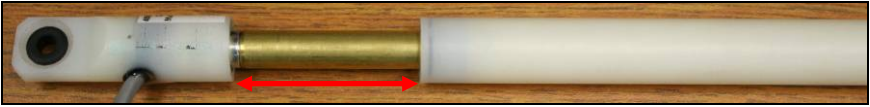


Figure 20: Open Position Sensor

Table 10: Position Sensor Test Results

Test Result	Action
Reading displayed is the measurement minus 5mm [0.2"].	Position sensor is OK to continue using.
Reading displayed is not the measurement minus 5mm [0.2"].	The position sensor is not working properly and must be replaced.

10 Updating UC5 System Software

10.1 NORAC Bus Monitor Connections (54645)

1. Connect the bus monitor as described in Section 2.4.
2. Connect the network cable to the 43764T (E03). Connect the other end of the network cable to the UC5 Control Module's display bus (end with only one connector).
3. Disconnect the Stand-Alone Power Cable from the power supply. **Ensure that the banana plugs do not contact each other.**
4. Ensure that the control module is connected to power and that all other system components are connected.

10.2 PEAK Bus Monitor Connections (54646)

1. Connect the bus monitor as described in Section 3.4.
2. Connect the network cable to the 43764T (E03). Connect the other end of the network cable to the UC5 Control Module's display bus (end with only one connector).
3. Disconnect the 43250-12 (C02) cable from the 44644-11 (C01) cable.
4. Connect 43250-12 (C02) to one of the CANbus connectors on the control module (end with two connectors). This is not necessary if there is an existing power cable.
5. Ensure that all other system components are connected.

10.3 Programming

1. Start the UC5 Toolsuite software as described in Section 5.
2. Select the **UC5 Programming Tab**.
3. A list of connected UC5 devices will be displayed. If the list is not displayed, click the "Refresh List" button (Figure 21).
4. Using the "..." button, browse for the programming file ending in **.fw2**. Select the "Program" button (Figure 21).

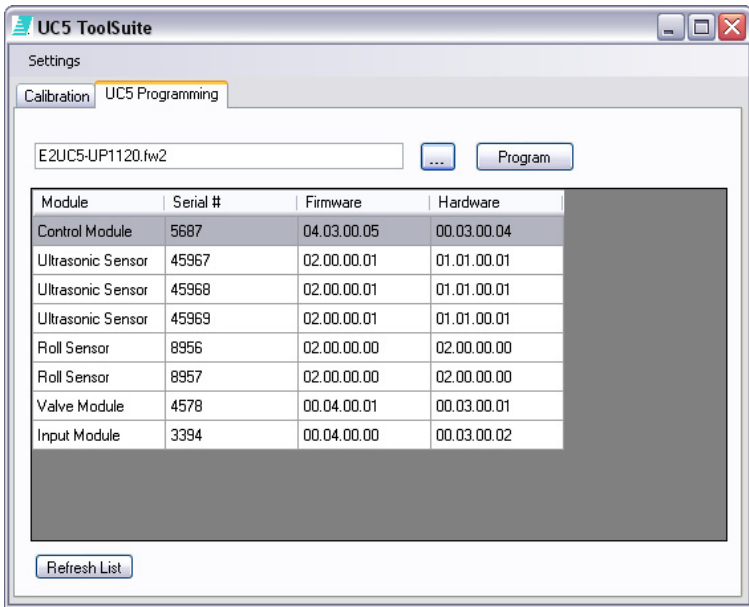


Figure 21: Toolsuite UC5 Programming Window

5. A *Confirm Programming* window will pop up (Figure 22). Select “Yes” to continue programming the system. Select “No” to cancel.

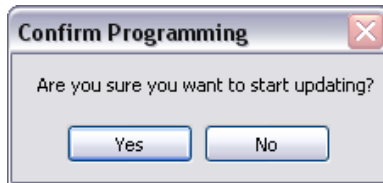
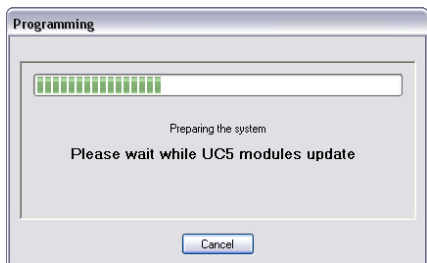
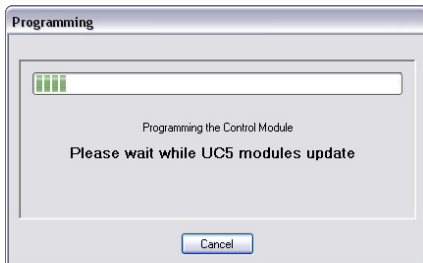


Figure 22: Toolsuite UC5 Confirm Programming Window

6. A *Programming* window will appear (Figure 23) showing the programming progress. This may take several minutes.



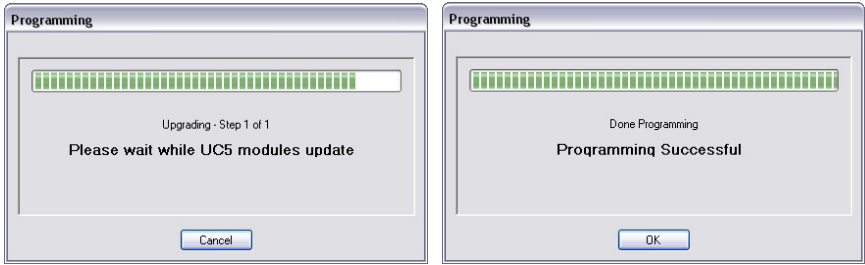


Figure 23: Toolsuite UC5 Programming Progress Window

7. When programming is finished, confirm the updated software versions for all the devices in the list.

11 Frequently Asked Questions

1. Nothing happens after “OK” is clicked in the Initialization screen.
 - a) Ensure the power is turned on.
 - b) Try cycling the power OFF then ON and reconnecting the UC5 Toolsuite Software.
 - c) Check all cable connections to be sure everything is properly connected.
2. Sensor information does not display after connecting.

Cycle the power OFF then ON and exit the software and restart.
3. I do not know the password to access the Protect Fields.

The **Protected Fields** password is used to enable features that are only required during the initial production of the product. These features should **ONLY** be used at the NORAC factory.

12 Height Sensor Log Sheet

This log sheet is provided to keep records of the height sensors tested. Be sure to record the temperature, signal strength and distance **BEFORE** and **AFTER** calibrating each sensor.

Date	Serial Number	Temperature	Signal Strength	Distance

Date	Serial Number	Temperature	Signal Strength	Distance

Date	Serial Number	Temperature	Signal Strength	Distance

13 Roll Sensor Log Sheet

This log sheet is provided to keep records of the roll sensors tested.

Date	Serial Number	Angle Reading	Temperature

14 Position Sensor Log Sheet

This log sheet is provided to keep records of the position sensors tested.

Date	Serial Number	Fully Closed Reading	Open Reading

15 Appendix A – Adjusting 44730 Calibration Stand

I. Tools Required:

- 2 x 9/16 Wrenches
 - 1 x 24" Square
 - 1 x Tape Measure
 - 1 x Pliers
2. With the sensor stand fully assembled, place it on a flat surface standing on end.
 3. Loosen the nuts holding the ball target and adjust until the bottom surface of the ball is 20.5" from the sensor mounting ring. (**Figure 24**)

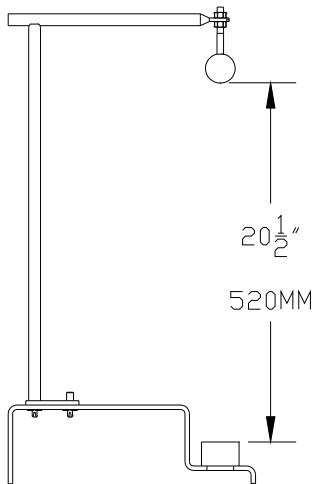


Figure 24: Distance from Ball Target to Mounting Ring

4. Tighten the ball target nuts.
5. Using a 24" square, place the base of the square on the sensor mounting ring as shown in **Figure 25**. The side of the ball should be aligned with the inside edge of the sensor mounting ring. Check both sides of the ball target. If the ball is not aligned bend the ball mounting arm until alignment is achieved.

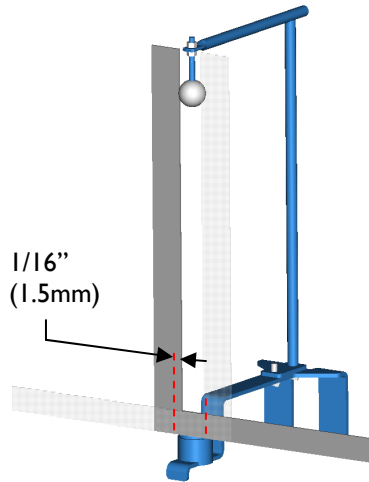


Figure 25: Squaring the Ball Target to the Mounting Ring

6. Place the square on the sensor ring as shown in **Figure 26** and follow the procedure in Step 5.

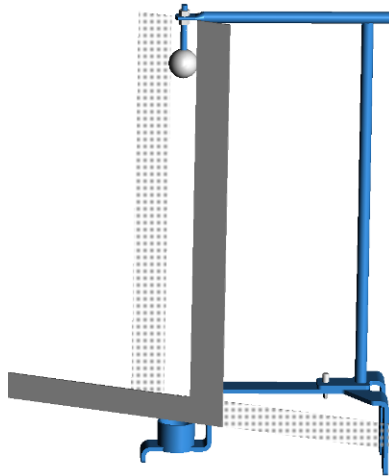


Figure 26: Squaring the Ball Target to the Mounting Ring

7. Repeat the process until the ball target is centered 20.5" from the sensor mounting ring.

Notes:

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Notes:

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