



396-4519Y1

SurePoint
Ag Systems

SENTINEL NH₃
ANHYDROUS ROW MONITOR

Sentinel NH3 Blockage Monitor for ISOBUS

Installation and Setup

The screenshot displays the following interface elements:

- Top Left:** "Prod # 1 Row # 13" and "DEG F 72.00".
- Top Center:** "SENTINEL" logo and "1-N".
- Top Right:** SurePoint Ag Systems logo and a vertical bar chart labeled "SENTINEL".
- Middle Left:** "AVERAGE TEMP 72.1 DEG F".
- Middle Center:** A green "MASTER ON" button.
- Middle Right:** "SPEED 6.0 MPH" with a gear icon for settings.
- Bottom Left:** A grid of 16 columns labeled 1 through 16, representing individual rows.
- Bottom Right:** A vertical sidebar with icons for settings (wrench and screwdriver) and a status bar showing "MAW" and "2:11pm".
- Bottom Center:** A blue "Home 2/2" button and a "Page 0" indicator.
- Bottom Legend:**
 - Green square: ROW ON/OK
 - Grey square: ROW OFF
 - Red square: FLOOR CON ALARM

SurePoint Ag Systems



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ATTENTION: Please follow all of the instructions in this manual carefully and read the entire manual completely. Failure to do so may cause the product to function improperly or fail causing serious injury or death.



DANGER

DANGER

ANHYDROUS AMMONIA IS AN INHALATION HAZARD AND WILL CAUSE SERIOUS INJURY OR DEATH. PLEASE USE EXTREME CAUTION WHEN HANDLING IT OR PERFORMING ANY MAINTENANCE ON EQUIPMENT USED FOR ANHYDROUS AMMONIA.

ATTENTION: Before performing any installation, repair or maintenance please follow the instructions below.

1. You must be trained and certified to work with anhydrous ammonia. If you are not, please seek out the appropriate agricultural department to attend a class to obtain the proper training and certification.
2. Wear appropriate safety goggles, gloves and breathing apparatuses.
3. Always know which way the wind is blowing.
4. Drain all tanks, hoses and piping of anhydrous ammonia COMPLETELY before removing, installing, performing maintenance or repairing any equipment.
5. Always remove device from service before performing any maintenance or repair.
6. Have sufficient water nearby.
7. Obey all local, state and federal laws regarding the handling of anhydrous ammonia.



Anhydrous Ammonia Safety

Anhydrous ammonia is an important source of nitrogen fertilizer for crops. The improper handling of anhydrous ammonia can have catastrophic results on both plants and farm workers. Common injuries are severe burns to eyes, skin and the respiratory tract.

- Personal protective equipment (PPE) should always be worn. Standard PPE should be non-vented goggles, rubber gloves with thermal lining, face shield or an approved respirator. Wear a lightweight rubber suit, or (at the very least) a long sleeve shirt and coveralls.
- Make sure anhydrous ammonia tanks are not filled beyond the recommended capacity.
- Use care when handling the hose end valve so that it does not open accidentally. Do not move the hose by handling valve handle.
- Be sure to bleed the hose coupling before disconnecting. Use care when cleaning plugged knives as anhydrous ammonia could be built up behind the plug.
- Use emergency water supply for at least 15 minutes if exposed to anhydrous ammonia and then seek emergency medical attention.
- Always have a small squeeze bottle of fresh water at all times.
- Never assume NH₃ lines are empty, including the lines connected to the NH₃ cooler.
- Make sure the system is completely drained of NH₃. It can hide in low areas of the system. Look for frost on the hose or equipment. That usually means there is NH₃ there.
- Always use high pressure hose when ammonia can be trapped in that segment, such as between the tank and the NH₃ cooler.
- Any place that has a high pressure hose should also have a hydrostatic relief valve and a bleed valve.
- Always handle valves by the body and by the wheel or latch.
- Always make sure you are upwind of potential NH₃ release points.
- When you park, position NH₃ equipment downwind from dwellings, people, and livestock.
- Close the valve on the tank when you stop.
- The first treatment for anhydrous ammonia exposure is WATER.

NH₃ is a very dangerous product. It can kill you or blind you or worse. If you have not taken an approved NH₃ Safety class, do not work around NH₃. If you have had the course, follow ALL safety precautions ALL the time.

BE CAREFUL !

Before you start applying NH₃—

- Know the wind direction.
- Are the hoses in good condition?
- Has the expiration date been passed on any hose or other dated component?
- Are all fittings clean and free from rust?
- Do low-pressure tubes have any leaks?
- Are any knives plugged?
- Is the pressure relief valve operating correctly?
- Does the tank have five gallons of fresh water?
- Is PPE available and being worn (goggles, gloves, long-sleeve shirt) ?

Before performing maintenance on the toolbar or equipment—

- Put on gloves and goggles
- Make sure you have emergency water
- Check wind direction and stay upwind
- Park away from buildings, livestock, and people
- Before servicing, close the valve on the NH₃ tank and continue application to bleed the system.
- Be sure the tank valve is closed. Turn the Master valve on and leave it on during bleeding.
- Disconnect the nurse tank supply hoses.
- Open all bleeder valves on cooler and rest of system.
- Check any hoses that have a low loop in them
- Even after bleeding, slowly and cautiously loosen any fittings to be sure there is no ammonia trapped inside.

Things to Know About Anhydrous Ammonia (NH₃)

Anhydrous ammonia is a colorless non-flammable liquefied gas. Its vapor is lighter than air and has the same pungent odor as household ammonia. Although ammonia vapor is lighter than air, the vapors from a leak may hug the ground appearing as a white cloud. Chemically, ammonia is 82% nitrogen (N) and 18% hydrogen (H) and has the chemical formula NH₃. Ammonia by weight is 14 parts nitrogen to 3 parts hydrogen, or approximately *82% nitrogen and 18% hydrogen*.

The definition of *anhydrous* is *without water*. Whereas household ammonia is 95% water, anhydrous ammonia has no water. Ammonia is so hydroscopic (water loving) that one cubic foot of water will dissolve 1300 cubic feet of ammonia vapor making water the primary weapon for first responders.

Ammonia weighs 5.15 pounds per gallon (0,63 kg/L) in contrast to water which weighs 8.33 pounds per gallon (1,0 kg/L). Since ammonia is so soluble in water there will be no layering effect when liquid ammonia is spilled into a surface water body. Booms, pads, sweeps and pillows that are usually used to contain and recover petroleum are ineffective on spills of ammonia into surface water.

Ammonia is a non-flammable gas but will ignite at a temperature of 1204°F within vapor concentration limits between 15% and 28%. (Paper ignites at 450°F, coal at 750°F.) Outside conditions that would support these vapor concentrations are very rare.

Ammonia will corrode galvanized metals, cast iron, copper, brass, or copper alloys. All ammonia piping, valves, tanks and fittings are constructed of steel.

Liquid ammonia boils at any temperature greater than -28°F (-33° C) and will expand to 850 times its liquid volume. One gallon of liquid will expand to 850 gallons or 113 cubic feet of gas.

Ammonia Fast Facts

NH₃ Vapor

Ammonia appears in nature as a natural substance that results from decomposition.

Ammonia vapor is a colorless gas with a pungent odor.

Ammonia exists as a vapor at atmospheric conditions.

Ammonia vapor is lighter than air and tends to rise when released to atmosphere.

NH₃ Liquid

Liquid ammonia released to atmosphere forms a white smoke by freezing the moisture in the air.

Liquid ammonia has a very high coefficient of expansion with temperature.

One gallon of liquid ammonia weighs approximately 5.15 lbs.; however the weight varies with temperature.

A closed container of liquid ammonia is in equilibrium with ammonia vapor and the container pressure bears a definite relationship to the temperature.

Physical Data

Boiling point is -28°F (-33° C).

Ignition point is 1,204°F (651°C).



Storage and Handling

Ammonia is stored and transported as a liquid under pressure.

The pressure on the tank is the liquid pressure and remains the same whether the tank is 10% full or 80% full. **This pressure is dependent on the temperature of the NH₃.**

The maximum filling level of an anhydrous ammonia tank is 85%.

Flammability

Anhydrous ammonia is classified by the DOT as a non-flammable gas.

Ammonia vapor is flammable over a narrow range of 15% to 28% by volume in air and a strong ignition source must be present.

Anhydrous Ammonia Application

Precision application of anhydrous ammonia starts with a proper metering system. It is crucial to be sure the metering and control system is applying what is required.

Accurate metering of anhydrous ammonia is difficult to achieve with a conventional variable orifice meter. Anhydrous ammonia is stored and transported as a liquid. To maintain NH₃ as a liquid it must be kept below -28°F (-33°C) or maintained under pressure. If the temperature of the NH₃ increases above -28°F (-33°C) some of the liquid changes to a gas as the NH₃ begins to boil. Application equipment typically uses tank pressure to deliver NH₃ to the soil. An increase in tank pressure would tend to force more NH₃ through the distribution lines. The actual pounds of NH₃ being applied decreases or increases as tank pressure fluctuates unless continuous adjustments are made to the meter.

If NH₃ is released into the atmosphere it will expand rapidly to occupy a volume 850 times greater than the original liquid. NH₃ readily changes from liquid to gas in the nurse tank and distribution system. Consequently the ratio of NH₃ gas to liquid continually changes as it passes through the distribution lines. About 1% of the liquid will vaporize during the ammonia flow from the tank dip tube to the metering point. 1% liquid when expanded to vapor at 100 lb tank pressure will occupy approximately 25% to 30% of the delivery chamber. At 50 lb tank pressure this increases to over 60% of the delivery chamber occupied by vapor. This makes metering and distributing NH₃ very difficult to do consistently and accurately.

For high volume application, wide implements, fast speeds and cold temperatures the *delivery component pieces are critical for **delivering the flow needed***. A flow that can be delivered at 90° may not be achievable when the temperature drops to 40° if the system components are not designed and sized correctly. These pieces include: **Tank withdrawal valve, NH₃ delivery hose and breakaway coupler, and heat exchanger with adequate capacity.**

After this precise metering the *challenge of row distribution* still awaits. The proper **manifold system** is important for row to row accuracy. The manifold can also be a cause of flow restrictions in high flow applications.

General Description

A

Introduction

You have purchased a SurePoint Sentinel NH3 blockage system for your equipment. This system will be controlled by the Sentinel ECU through your in-cab ISO display. Your anhydrous system will continue to function as usual with application rates being regulated by your existing rate controller. The Sentinel NH3 works independently, monitoring the row-to-row accuracy of your system and alerting the operator of blocked rows.

SurePoint currently supports Sentinel operating on the following displays: **John Deere** 2630 & 4640, **Ag Leader** InCommand 800 and 1200, **Case IH** Pro 700, **Trimble** Fm2050. The use of Sentinel NH3 on any other display may result in diminished functionality.

A 2-pin Molex power and 12-pin Ampseal Power/CAN connector are required on your implement to connect the Sentinel ECU to the implement bus. While some equipment manufacturers already provide this connection, SurePoint offers harnessing to provide this connection on any implement. Ask your SurePoint representative what accommodations may be needed for your specific equipment.

Basic Installation Steps

1. Install all Row sensors using the guidelines laid out in the Applicator Plumbing Requirements section on page 8.
2. Locate the 2-pin Molex power and 12-pin Ampseal POWER/CAN connectors (typically next to the rate controller) that the Sentinel ECU will be connected to and remove the terminator. If you can't identify these connectors, call SurePoint. Save the terminator for Step 5.
3. Mount the Sentinel ECU using the provided bracket in a location within 4 feet of the above connection.
4. Attach the ECU harness (208-06-5021Y2 or 5374Y1) to the Sentinel ECU and plug the other end of the harness into the above Molex/Ampseal POWER/CAN connection.
5. Use the previously removed terminator to terminate the POWER/CAN connection found on the ECU harness.
6. Mount the SurePoint NH3 Temperature Interface module (226-01-4210Y1) to the back of the ECU bracket used in step 2.
7. Plug the 4-pin Deutsch connector on the temperature interface module into the Flowmeter Bus 1.
8. Unplug the 3-pin Weather Pack dust plug that is connected to the temperature interface module and save.
9. Use a 3-pin Weather Pack extension cable (206-03-XXXX) to connect the temperature interface module to the row sensor mounted on Row 1.
10. Make sure all row sensors are daisy chained together, using 3-pin Weather Pack extension cables to get from NH3 manifold to NH3 manifold.
11. Install the 3-pin Weather Pack dust cover removed in step 8 and install it on the last row.

SurePoint Sentinel NH3 Row Sensor Installation.

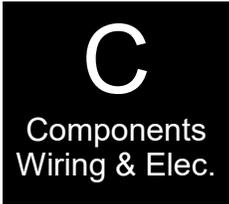


1. At the first NH3 manifold, disconnect the first NH3 line saving the hose clamp.
2. Use the included 3" piece of EVA tubing and connect it to the NH3 manifold hose barb.
3. Slide both hose clamps on the EVA tubing.
4. Push Row Sensor into the 3" piece of EVA tubing, turning the sensor so the wires drop straight down and tighten both hose clamps.
5. Re-connect NH3 line disconnected in step 1.
6. Continue back at step 1 until all Row sensors are installed.

SurePoint Sentinel NH3 Applicator Plumbing Requirements.

1. All hose/ tubing from the manifolds must be equal in length with no splices or kinks.
2. All excess hose/ tubing from the manifolds must be fastened horizontally to the toolbar in coils no smaller than 18" in diameter.
3. If you have multiple manifolds, make sure they are all the same make and model. Make sure all the hose barbs are from the same manufacturer. NOT all hose barbs have the same inside diameter!
4. If you are not using all the ports on the NH3 manifold, make sure you evenly space out the plugs around the manifold.
5. Make sure all application knives are from the same manufacturer. Take time to inspect each knife to ensure all will flow equal. Make sure to pay attention to the NH3 application tube looking for kinks or bends that aren't normal. Also inspect for weld slag at the weld points.
6. Make sure that plumbing from the splitter to the manifold is all equal length. If doing more than two sections, make sure you use a high quality splitter to get even flow to each NH3 manifold.

SurePoint Harness Layout for Sentinel NH3



The SurePoint Temperature Interface module communicates with the Sentinel ECU through a proprietary communication network (CAN). The Sentinel ECU then, using the ISOBUS communication protocol, relays information through the tractor ISOBUS and generates the user interface on the in-cab display. A series of connections are required to form this communication network.

Tractor Connection

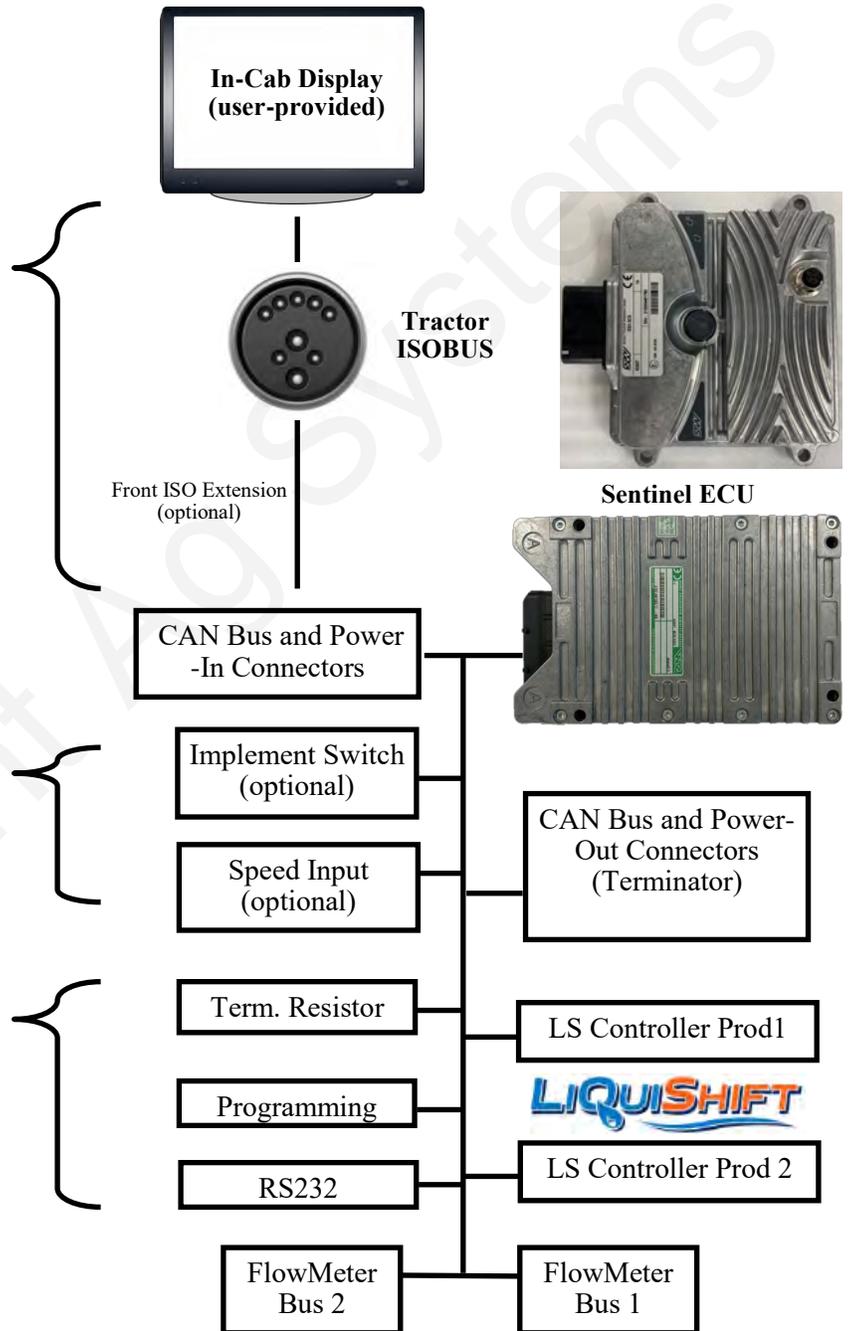
Designed to integrate with any implement, in some cases, connecting the Sentinel starts at the tractor's ISOBUS connection. Power and information is relayed to the Sentinel ECU using a SurePoint Front ISO Extension which includes power and CAN bus connections. Already using the tractor ISOBUS? No Problem. SurePoint carries ISOBUS-Y harnesses to split the ISO connection at the tractor.

Implement Height and Speed Input

Not used in all configurations, the implement height and speed input connections provide additional input options in situations that require advanced alarm control and an auxiliary speed source. These conditions generally exist only in hybrid systems, utilizing multi-branded components.

Service Connections

The Terminating Resistor, Programming and RS232 connectors are for service only and should not be used.



Bus Connections

Two Flowmeter Bus connections are provided for use in several applications. For standard Sentinel NH3 use, connect the Temperature Interface Module to Flowmeter Bus 1.

LiquiShift Connections

These two connectors are not used for Anhydrous Ammonia Application.

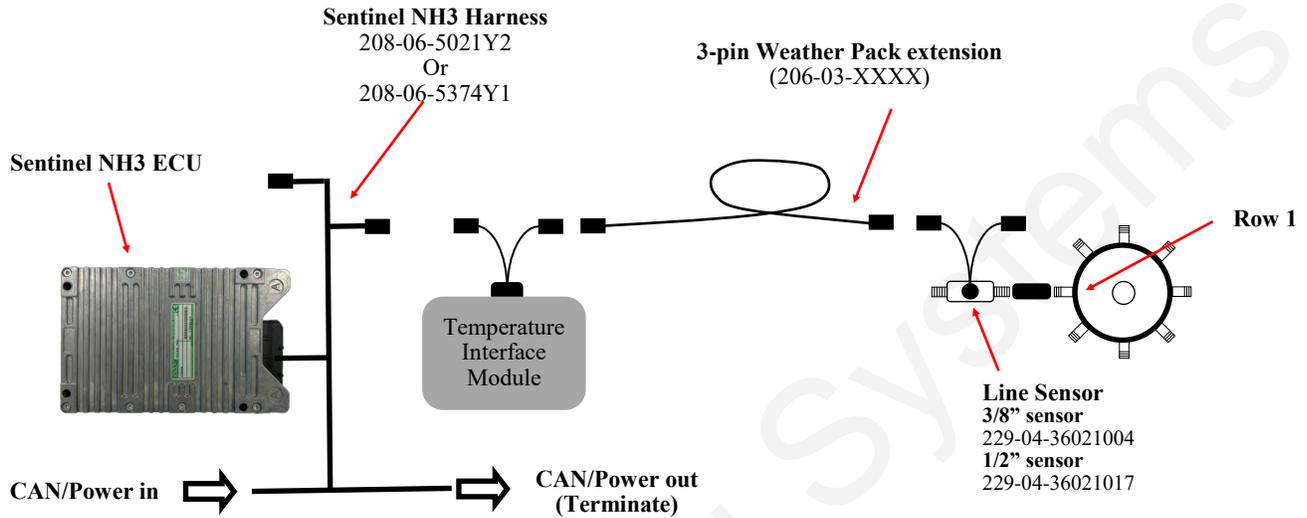


Component List

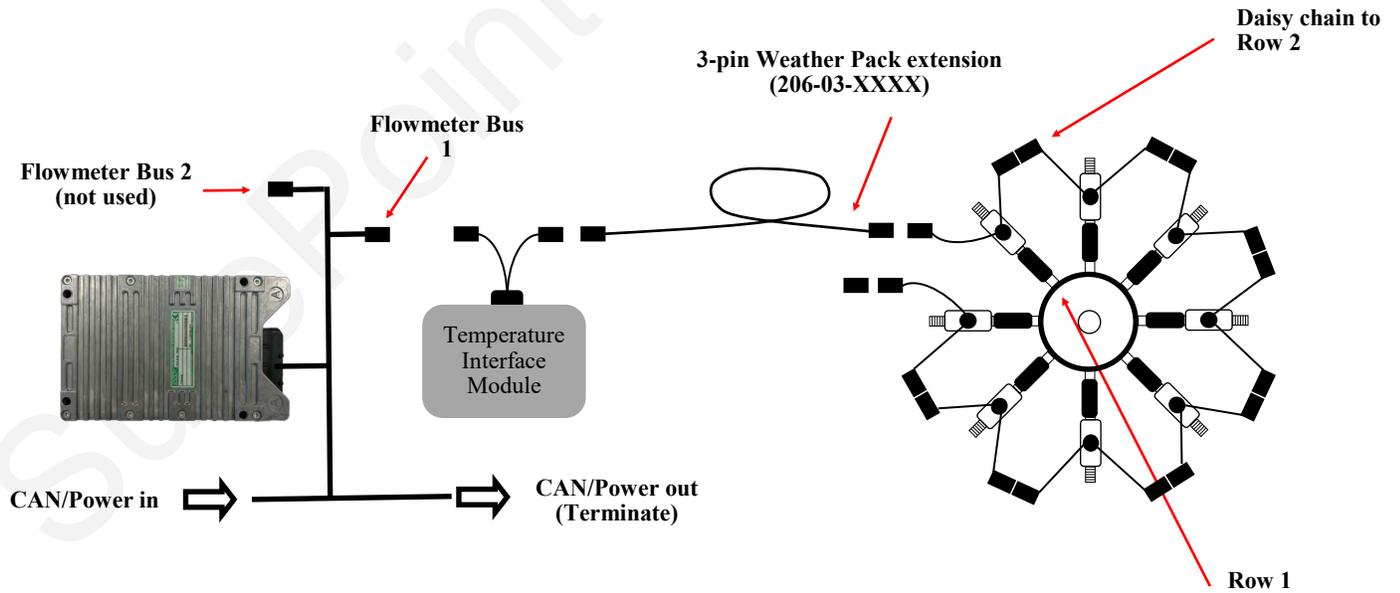


The major components of a Sentinel NH3 System are:

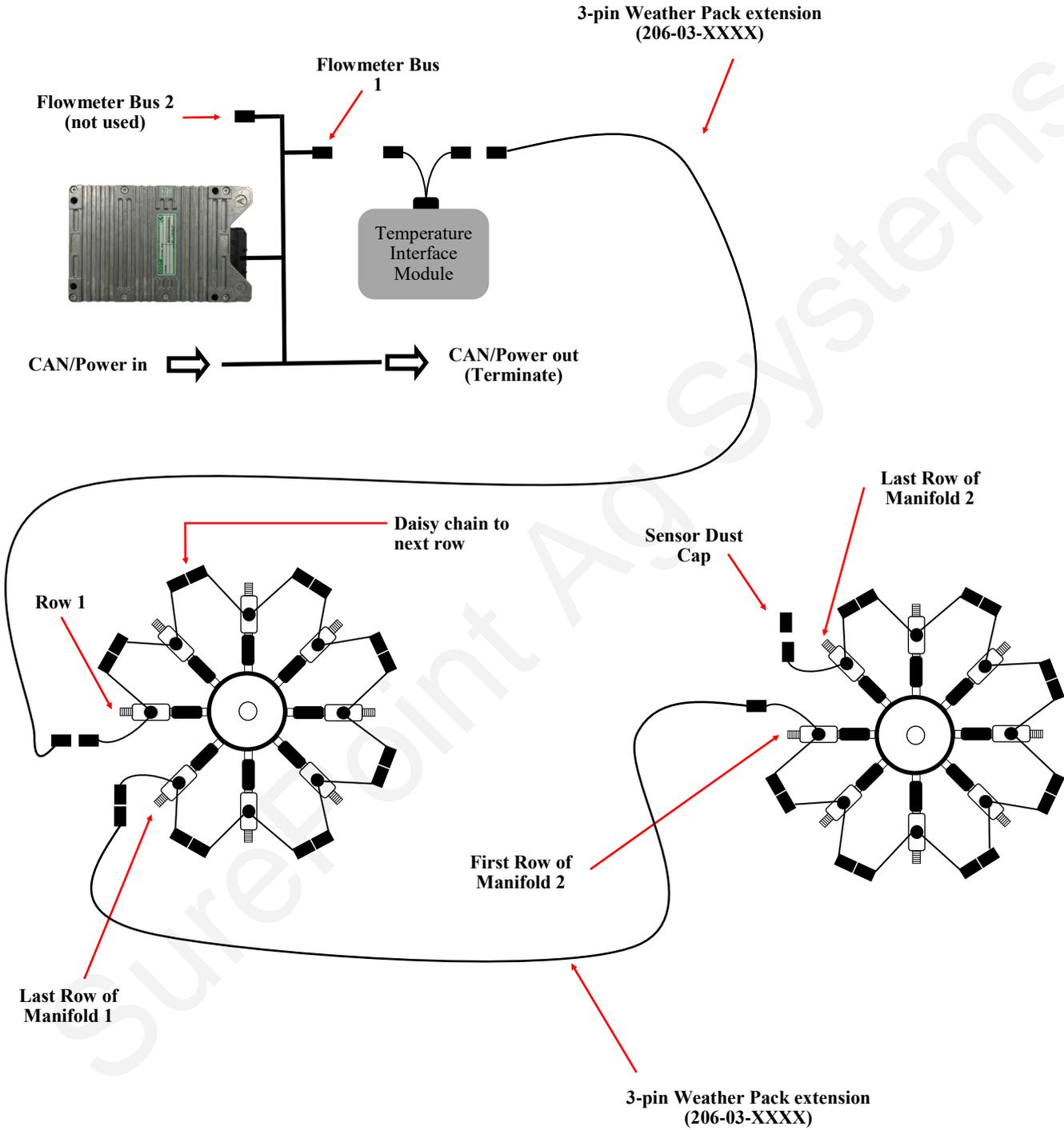
- Sentinel NH3 ECU
- Sentinel NH3 harness
- Temperature Interface Module
- Line Sensors (1 per row)
- 3-Pin Weather Pack extensions



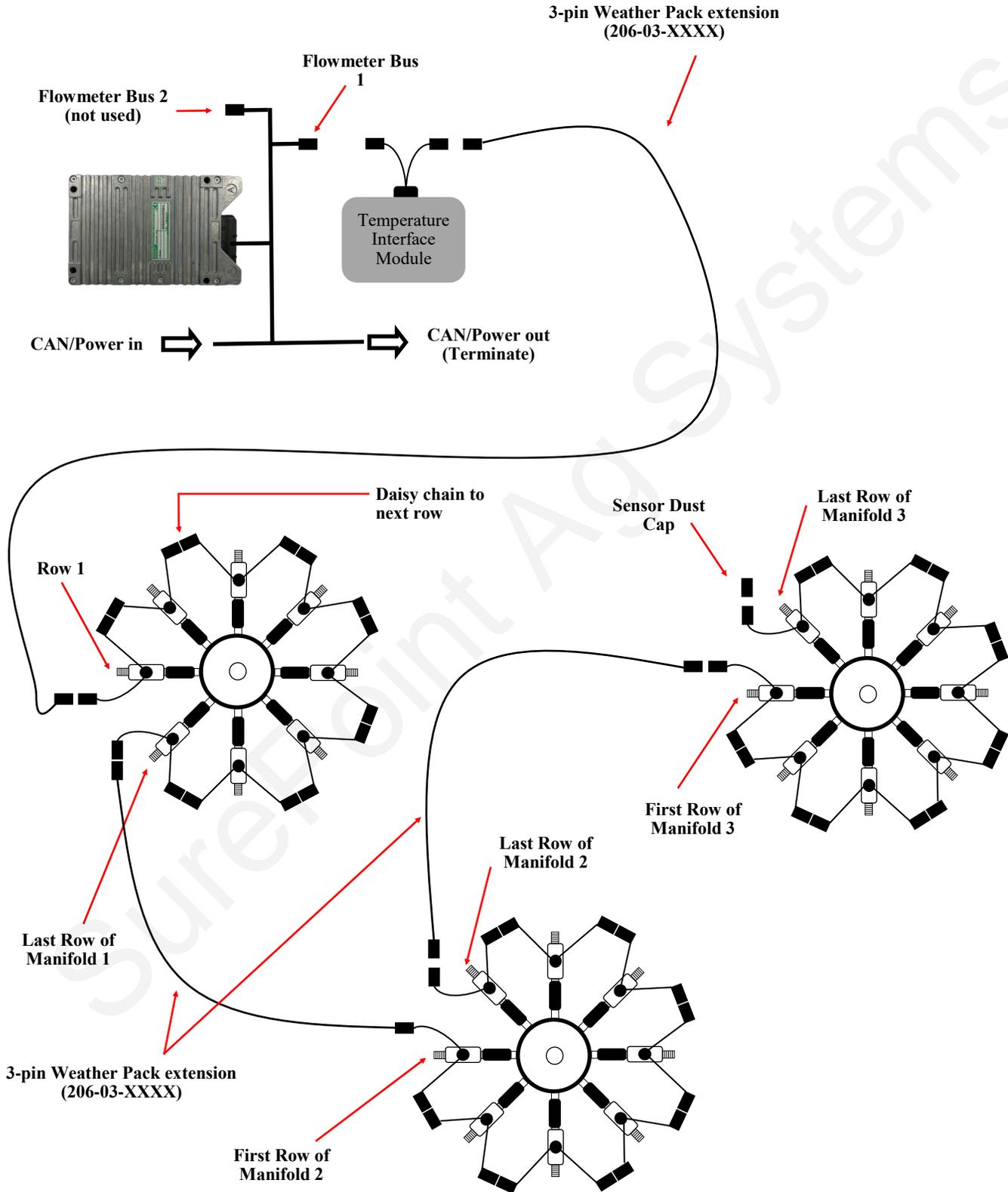
Component Layout—Single NH3 manifold Layout



Dual NH3 manifold Layout



Three NH3 manifold Layout



SurePoint Ag Systems



1

2

3

4

5

6

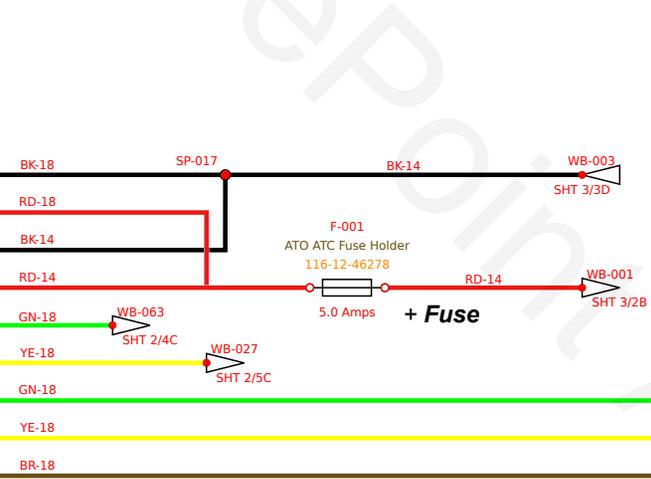
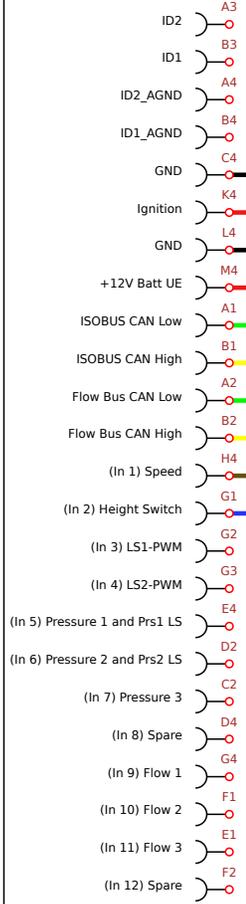
Sentinel ECU

Motex 48-pin
64320-3311



Part 1 of 2

PART NUMBER
208-06-5374Y1



A different ECU harness may be used, depending on which Sentinel ECU is used and what other activities Sentinel may be performing. The connectors on the right side of this drawing will be similar no matter which harness is used.

Speed Input - not used very often. Only used if a separate radar or GPS speed sensor is used on implement. Select *ECU Input Speed*. +12v between B&C.

Speed Input

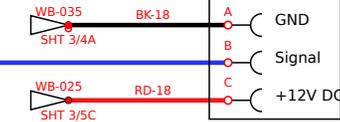
MP-150 Tower 3-pin



Height Switch

Add 201-5381Y1

WP Tower 3-pin 12015793



Height Switch - if using a height switch for the NH3 Row Monitoring, plug it in here. This is optional, but sometimes a good idea.

Can jump between A&C on 3-pin or between A&B on the 2-pin with a short wire or paper clip for testing.

Flow Meter BUS 1

Add 208-06-2912Y1 Terminator

4 PIN Deutsch Tower



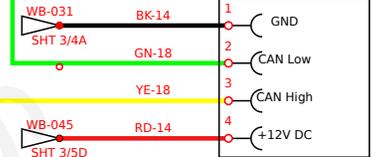
Flow Meter BUS 1 & 2 - Plug in Temperature Interface Module or extension to Temp Interface Module

+ 12v between 4&1.
+ 2.5 +/-1v between 3&1.
+ 2.5 +/-1v between 2&1.

Flow Meter BUS 2

Add 208-06-2912Y1

4 PIN Deutsch Tower DT06-4S



1

2

3

4

5

6

Sentinel ECU

Molex 48-pin
64320-3311



Part 2 of 2

PART NUMBER
208-06-5374Y1

- (In 13) RPM 1 F3
- (In 14) RPM 2 E2
- (In 15) RPM 3 E3
- (In 16) Master F4
- (Out 1) PWM 1 M3
- (Out 2) PWM 2 L3
- (Out 3) PWM 3 K1
- (Out 4) Spare J1
- (Out 5) Flow Return 1 K2
- (Out 6) Flow Return 2 J2
- (Out 7) Flow Return 3 K3
- (Out 8) Spare J3
- (Out 9) Spare M2
- (Out 10) Spare L2
- (Out 11) LS1-A J4
- (Out 12) LS1-B H1
- (Out 13) LS2-A H2
- (Out 14) LS2-B H3
- (Out 15) Spare L1
- RS232 TxD C1
- RS232 RxD D1
- (Relay) +12V M1
- 5-12Vext D3
- 5Vext C3



Programming



- 1 +12V
- 2 CAN H
- 3 GND
- 4 CAN L

RS232



- A TX
- B RX
- C GND

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SurePoint Ag Systems

A

B

C

D

1

2

3

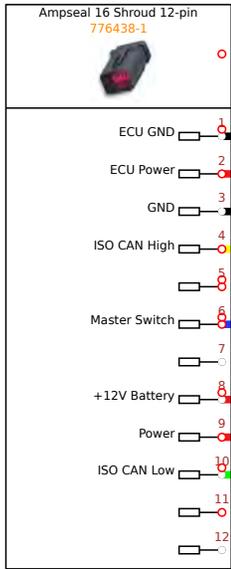
4

5

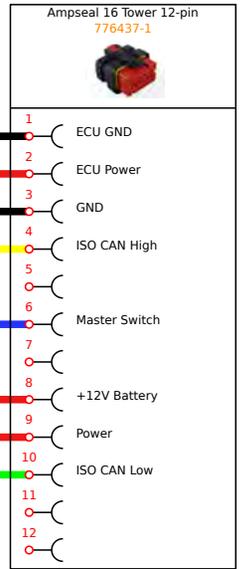
6

PART NUMBER
208-06-5374Y1

ISO

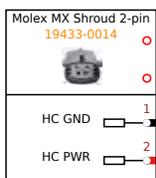


ISO

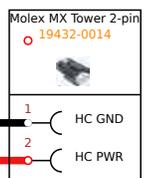


+ ISO 12-pin Connector
+ 12-13v between 2&1.
+ 2.5 +/-1v between 4&1.
+ 2.5 +/-1v between 10&1.

Power



Power



+ 2-pin Molex Power - High Current power and ground from 9-pin ISO.
+ 12-13v between 2&1.
+ The pins in here can get pushed back and not make good contact.



+ : i g y

A

B

C

D

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214-00-3553Y1 Thru 214-00-3557Y1

Front Extension Harness – (9-Pin ISO Connector w/ 3-Pin Master Switch & 12-Pin ISO and 2-Pin Molex Power)

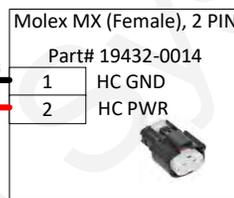
Wire 18AWG unless otherwise specified

+ Use this for troubleshooting harnessing, voltage, or communication issues. Some issues may need to be traced back to the 9-pin ISO connector on the back of the tractor and the battery.

Implement Connector



POWER CONNECTOR



+ 2-pin Molex Power
+ 12-13v between 2&1.
+ The pins in here can get pushed back and not make contact.

12 Pin ISO Connector



12-pin ISO connector
+ 12-13v between 2&1
12-13 v between 9&3
2.5+/-1v between 4&3
2.5+/-1v between 10&3

Master Switch Connector



Master Switch

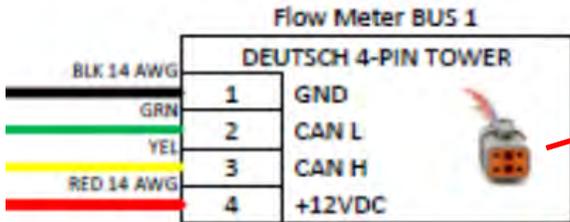
For testing or for emergency use, you can jump between A&C to activate Master Switch. + 8.2v between C&A.

Temperature Interface Module and Temperature Sensor



If the Temperature Interface Module is red on the NH3 module diagnostics screen, check voltages on the Flowmeter Bus connector to make sure the module is getting proper voltages.

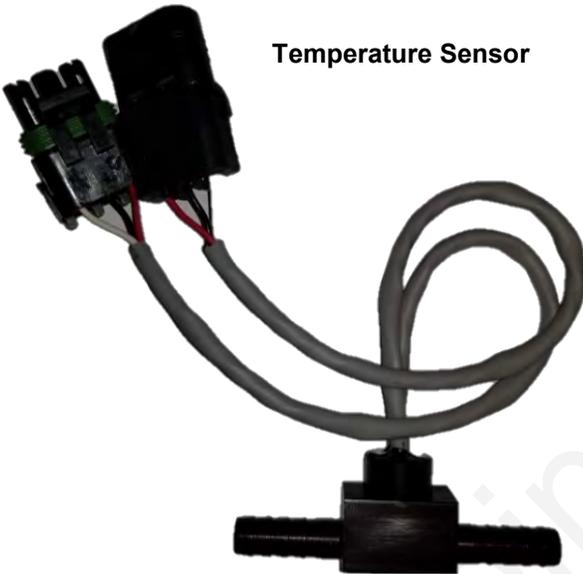
Test voltage:
 Pin 4 to 1 = 12v
 Pin 2 to 1 = 2.5v +/- 1v
 Pin 3 to 1 = 2.5v +/- 1v



Temperature Interface Module



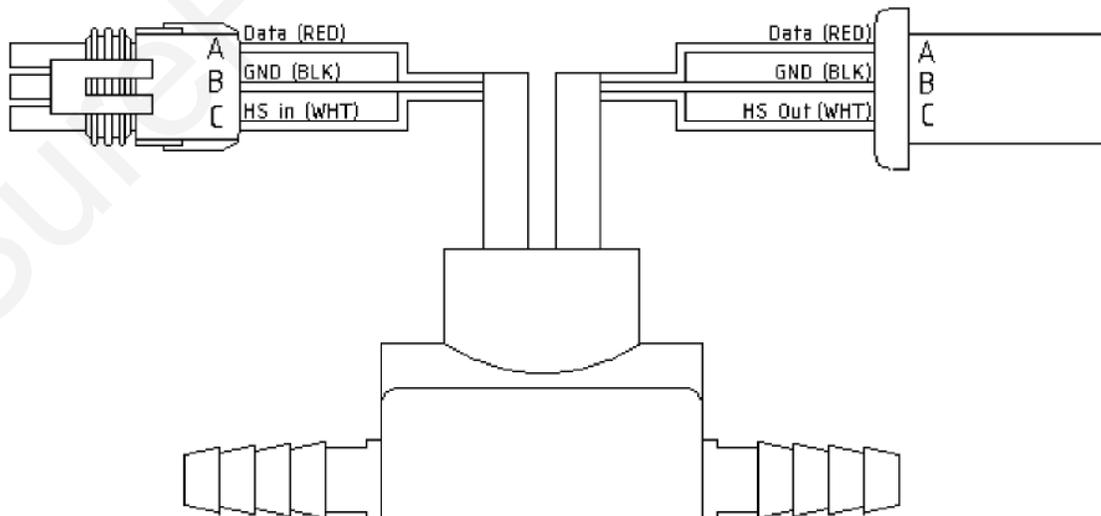
Temperature Sensor



3-Pin WeatherPack connector on the sensors
 A — Data
 B — Ground
 C — Handshake

Test voltage:
 Pin A to B = 4-5v
 Pin B to C = less than 1v

Line Sensor Connectors



Sentinel Setup and Configuration

Set-up and Configuration



The following pages will guide you through the initial set-up and configuration of your Sentinel system. Below is an overview of the steps necessary to fully configure the system before operation. Each subsequent page outlines the page features as well as the sequence of buttons used to navigate to that page from the HOME screen.

Basic Steps for Initial System Set-up

For detailed information on a step, go to the referenced page.

Beginning with Software Version 1.4.0, setup can be navigated by starting with the Setup Guide button. That will guide you through the screens shown on the following pages:



REFERENCE Page #	STEP	
20	1. Press the HOME button	
21	2. Go to the Settings Page by touching the SETTINGS button	
21	3. On the Settings Page, specify the number of products being monitored (max. of 4)	
21	4. Configure each product by touching the PRODUCT button	
21	5. Select Device (Mode): NH3 Row Monitor (Temp)	
21	6. Set up each product with number of sections, rows, spacing, implement width and temperature tolerance. Start with tolerance at 15 degrees. Verify the Number of Rows in each Section. Press the More arrow if using half-rate or rate-and-a half on end rows. Press BACK arrow to go back.	
22	7. Rate Mode - AVG	
	8. Set up the implement dimensions by touching the IMPLEMENT button. Then press BACK .	
23	9. Choose a speed source by selecting the SPEED button.	
	10. Select system control options (task control, lift switch, etc.) under HARDWARE .	
	11. Touch the NEXT button.	
24	12. Customize alarms as desired.	
24	13. Click on NH3 Module Diagnostics .	
24	14. Ensure that all line sensors are plugged in and click Readdress NH3 Sensors .	

Sentinel Setup and Configuration

Home Screen Navigation

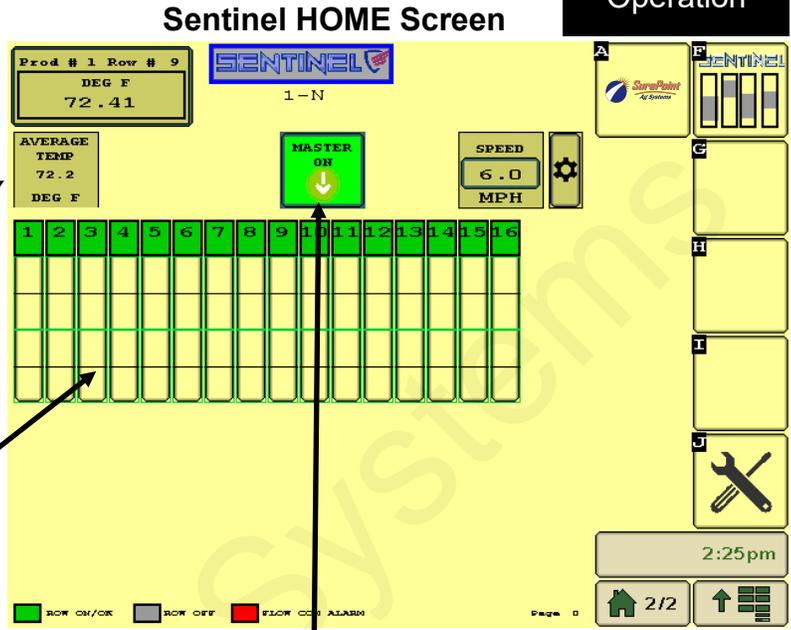


Real-time, row specific temperature data is displayed here.

Real-time, average temperature data for entire implement

The flow chart provides a quick visual reference of total system performance as well as individual row temperature.

The black bars represent the user-defined temperature tolerance above and below the current average temperature

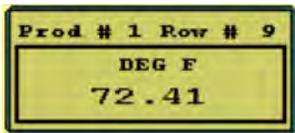


If equipped with an implement height switch that is plugged into the Sentinel ECU, this indicator shows the current implement height status.

BUTTONS:



The HOME screen is accessible from any page by touching the Sentinel button.



Touching the ROW DETAIL button will display individual row details including individual row temperature, module temperature, voltage, etc. (see page 24) To change the row that is being displayed in this button, touch the row on the flow chart. (see pg. 24)



Toggle between up to 4 product screens by touching the NEXT PRODUCT button. The Sentinel NH3 ECU has the ability to also monitor liquid products along with anhydrous ammonia.



The SETTINGS button will be used to access the system configuration pages and to change individual product alarm, tolerance, and rate settings. (see next page)



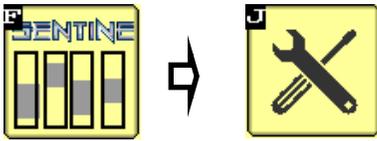
The MASTER ON/OFF button enables and disables the Sentinel NH3 system.

Sentinel Setup and Configuration



SETTINGS

Sentinel Settings Screen



INPUT the number of products to be monitored through the Sentinel

Current Setup	
	Product 1
Mode	NH3RowMon
Rows	16
Sections	4
Spacing	30.00 Inch
Implement Width	40.0 FT

Versions 1.4.0 and later will have the **SET-UP GUIDE** button. Press the SETUP GUIDE and you will be navigated through the setup screens.

PRODUCT SETUP



INPUT:

Product Name-

Mode (Device)- Choose **NH3 Row Monitor** (Temp on older Software)

Sections - Number of NH3 manifolds

Total Rows

Spacing - Row spacing in inches

Start Row - Sentinel row at which product starts. Leave at Row 1

Tolerance - Alarm setpoint above and below target rate measured in degrees Fahrenheit. Start with 15 degrees. This can be lowered as you get an idea of what typical temperatures are (this depends on the manifolds).

Num Rows - Number of rows in each section

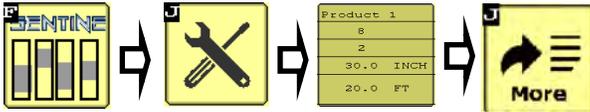
Press **More** arrow.

Product Setup Screen

Sentinel Setup and Configuration

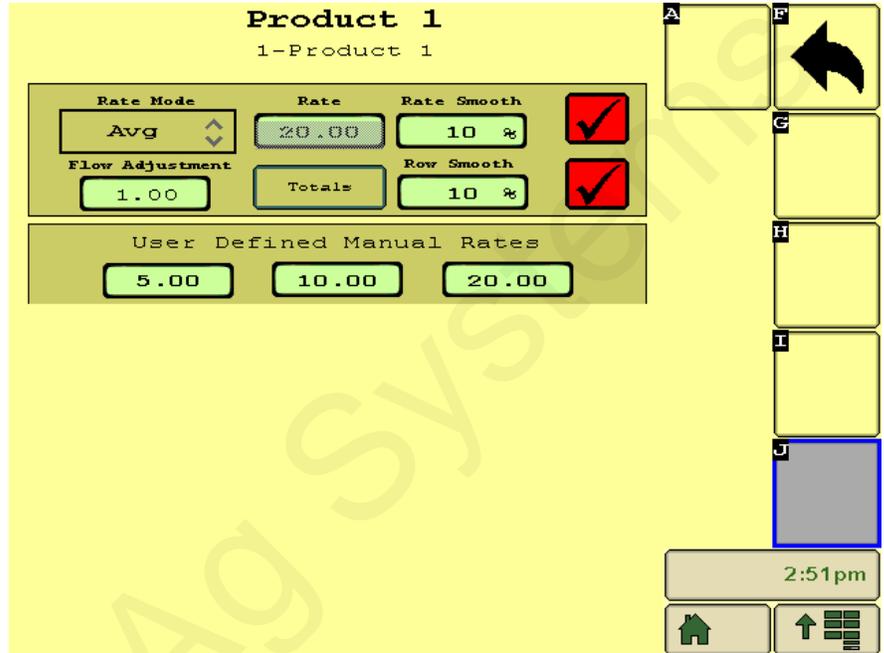


PRODUCT SETUP (cont.)



Rate Mode - AVG for NH3 Row Monitoring

Product Setup Screen (pg 2)



Implement SETUP

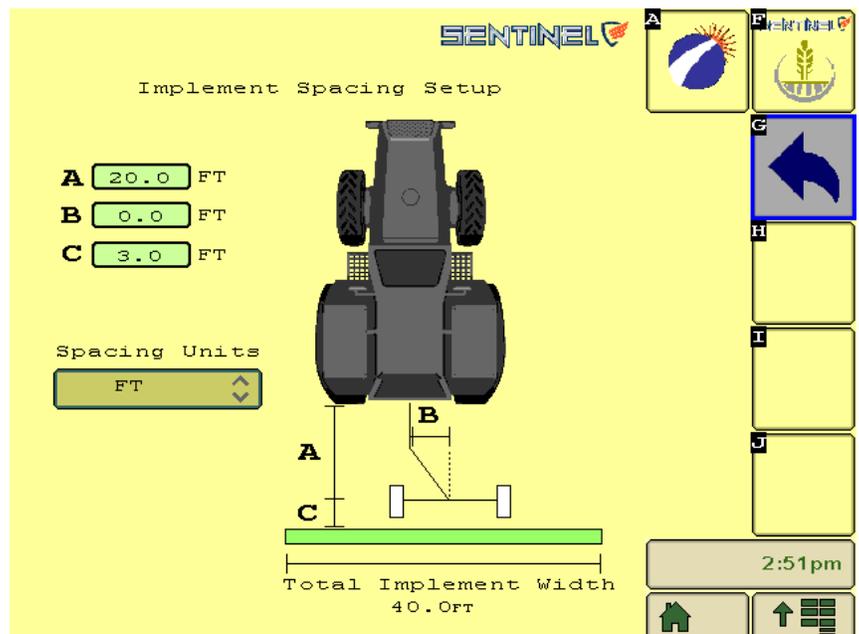


The implement setup dimensions are used when Task Control is enabled. This allows the display to know the position of the liquid boom to turn on/off sections to match the liquid. Sentinel then automatically disables the alarms for sections as flow to those sections is turned off.

- A = distance from Hitch to Implement Pivot (axle)
- B = implement offset (Left or Right)
- C = distance from pivot (axle) to application point

BACK arrow.

Implement Setup Screen



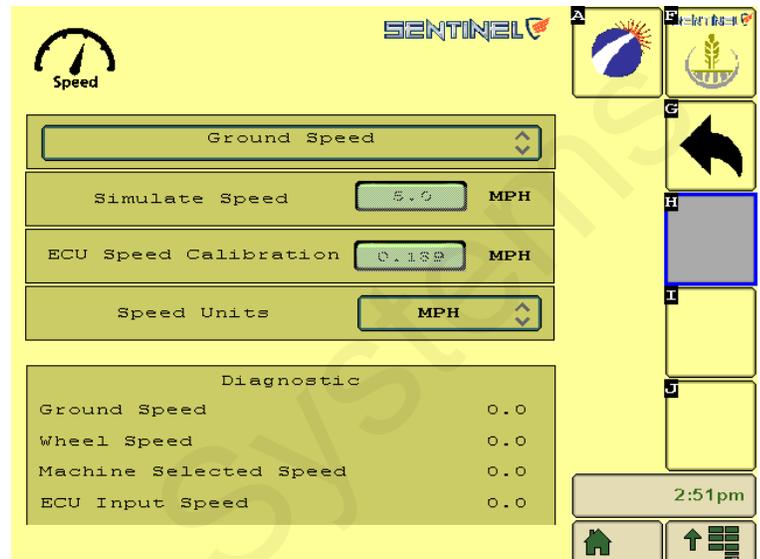
Sentinel Setup and Configuration



Speed Input and Calibration



Speed Setup Screen



Select Speed Source:

Ground Speed (default) - GPS speed or speed posted by the tractor ECU

Wheel Speed - speed of the tractor wheels. Slip is not accounted for.

Machine Selected Speed - user-defined speed posted by tractor ECU

Simulated Speed - to perform stationary flow tests, a simulated speed must be entered

ECU Input Speed - alternate speed input on Sentinel ECU harness can be plugged into a wheel-speed sensor or GPS speed receiver.

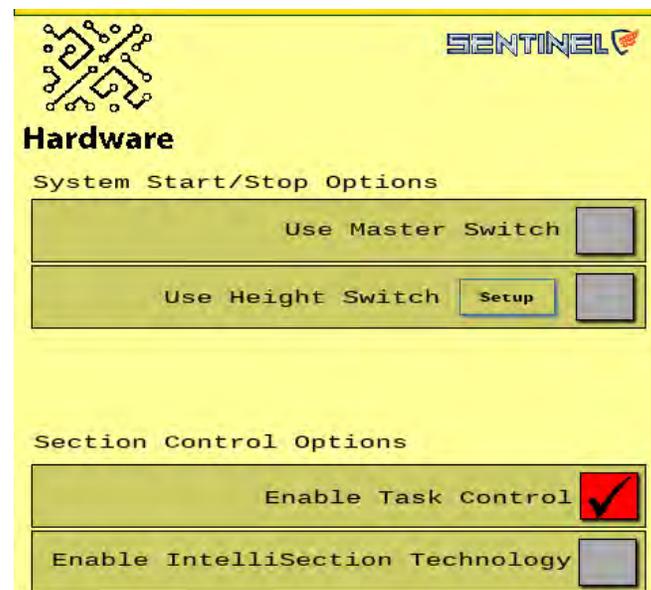
Speed Calibration - used to calibrate the ECU input speed source.

Diagnostic - When moving, this box will show which speed sources are reporting to the Sentinel.

Hardware



Hardware Setup Screen



Select Hardware Options:

Master Switch-- Check only if there is a dedicated Master Switch plugged into the Sentinel. (Not typical)

Height Switch - check ONLY if the Sentinel has a dedicated height switch plugged into the Sentinel harnessing. The switch used by your rate controller IS NOT used by Sentinel. If using a dedicated height switch, the implement position indicator will appear on the HOME screen.

Task Control - permits Sentinel to use available task control information on the bus regarding section control. ENABLE TASK CONTROL if Task Control is available from your display.

IntelliSection - normally not used with NH3 Row Monitoring.

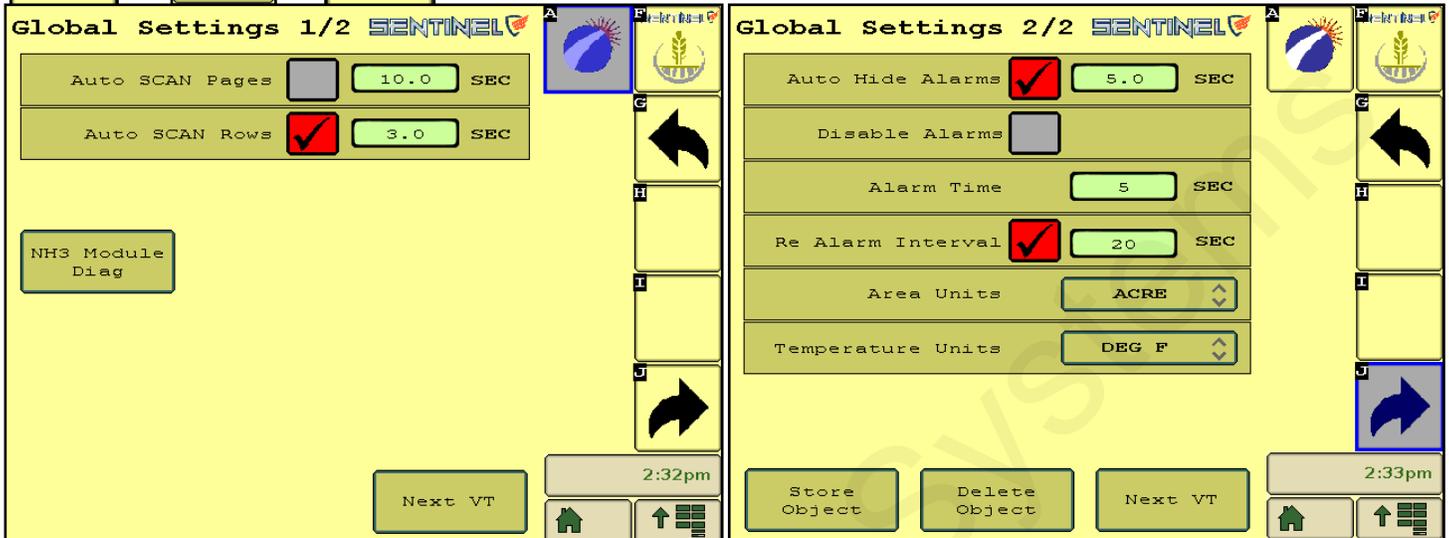
Go BACK.

Sentinel Setup and Configuration

Customizing Alarms, etc



Customizing Alarms Screen



This screen allows the user to change how row information is displayed on the HOME screen. When checked, the **Auto Scan** feature will scan through the rows and/or product pages on the HOME screen.

Auto Hide Alarms sets how long full-page alarms are displayed. (see pg. 26)

Disable Alarms: Only used when setting up or testing the system.

Alarm Time is how long a row must be outside of the specified tolerance before the alarm sounds.

Re Alarm Interval: Set at 20 seconds so it will re-alarm if the problem has not been fixed.

NH3 Module Diagnostics - NH3 module diagnostics is addressed below.

Store Object Pool - Stores the current layout

Delete Object Pool - Deletes the current layout and forces the monitor to regenerate the display

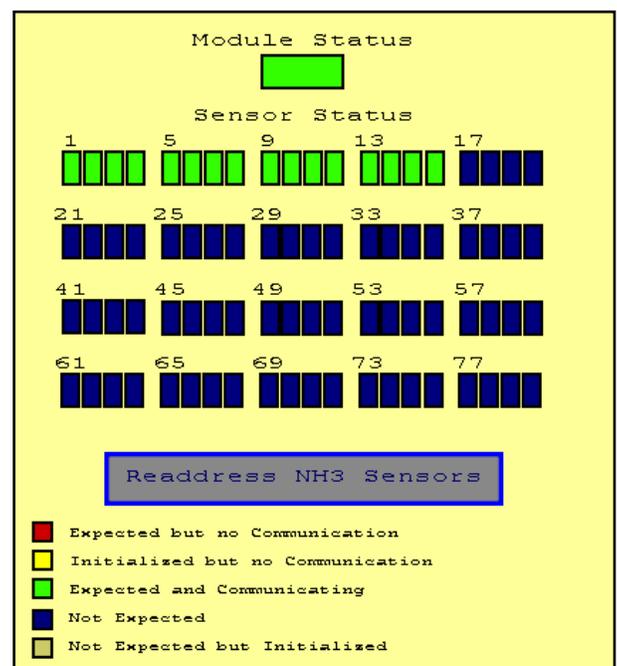
Next VT - press to push Sentinel to another virtual terminal.

Addressing Sentinel Flow Modules



NH3 Module Diagnostics

To address the Sentinel Line Sensors, start by having all the sensors plugged in. From this screen, push **Readdress NH3 Sensors** button. This turns off all the sensors and turns them back on. Sensor 2 does not turn on unless Sensor 1 has turned on first because of how the sensors daisy chain together.





WARNING

ANHYDROUS AMMONIA

An NH₃ product is selected. Exercise caution when operating this controller. Failure to do so could result in serious injury or death. When operating, ensure the area is clear of people and animals. If operating while the vehicle is stopped, turn the vehicle into the wind. NH₃ systems should only be operated and serviced by personnel who have been properly trained in operating and servicing NH₃ systems.

OK

Sentinel Operation



Once the Sentinel has been set up in the display, little is required of the user to operate the Sentinel. The system is designed to run in the background and only alert you if there is a problem. As previously mentioned, the HOME screen yields a quick snapshot of row-to-row comparisons while the row detail report gives more specific information about each row.

From the HOME screen, when the temperature for a row or rows goes outside the set tolerance, the row will display red in the bar chart.

Anhydrous at the tank is under pressure and at a higher temperature than at the bottom of the knife. Anhydrous is colder at the bottom of the knife because the pressure is lower where the anhydrous is exiting the plumbing system. If the bar temporarily goes down (lower temperature than average) and then gradually gets warmer than the average, typically the plug will be before the sensor. This happens because the remaining anhydrous in the line is no longer under pressure from the manifold and the line cools because of the boiling off of the anhydrous. The sensor will eventually warm up because of the extended period of no flow.

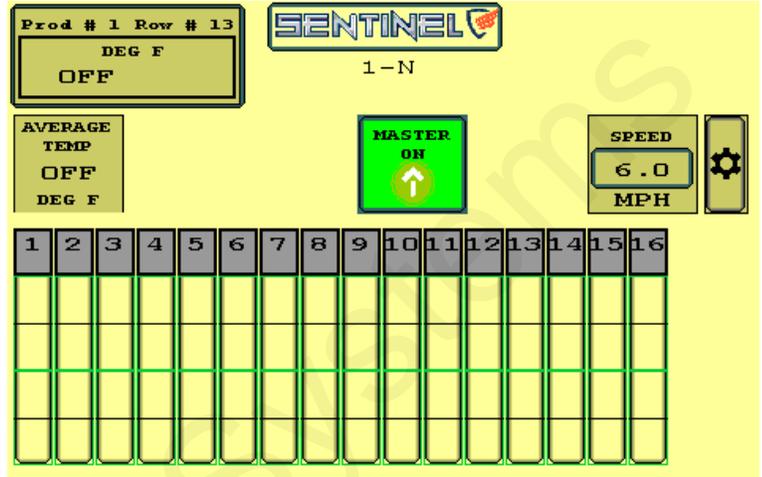
If the bar goes up, typically the plug would be after the sensor. NH3 would be under pressure because of the plugged knife and unable to bleed off. This higher pressure and no flow would cause the sensor to be warmer.

A broken hose/ knife can also cause the bar to go down. A broken NH3 hose can cause an overflow of anhydrous to go to that broken line, making that line sensor colder than the others.

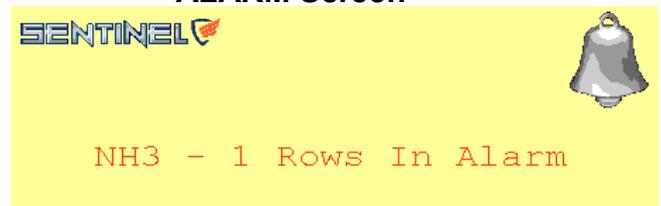
Watch this Home Screen to get an idea of where the Tolerance should be set. If the Tolerance is too low, you will get false alarms. If it is too high, it will take longer to alarm if there is a problem. You may be able to set the Tolerance to 10 or less.

If a row falls outside the set tolerance, a full page alarm is displayed. The length of time from when the row shows a problem to when this alarm is displayed is determined by the **ALARM TIME** previously set. This page will close automatically based on the **AUTO HIDE** time previously set.

Sentinel HOME Screen



ALARM Screen



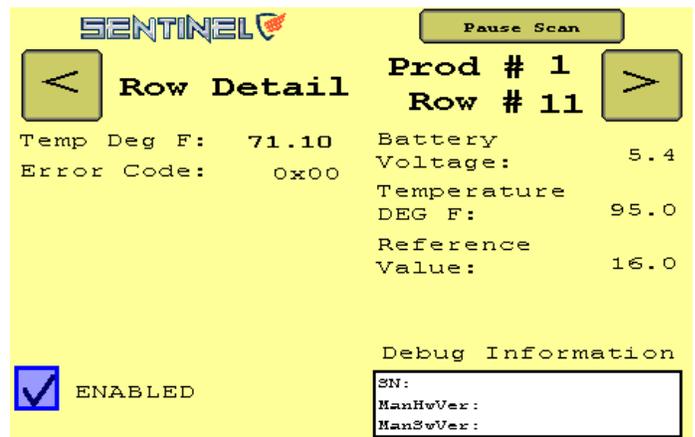
Row Detail Button



From the HOME screen, touching the row detail button will display the row detail page. The user can toggle through the rows by touching the < > buttons. The user can also pause the **Auto Scrolling** feature pressing the **Pause Scan** button.



Row Detail Page



Sentinel NH3 Troubleshooting

E

Trouble-Shooting

Sentinel doesn't show up on my display

1. Verify that the Sentinel ECU has power - 2 green lights should be illuminated on the ECU.
 - A. Using a voltage tester, check voltage on the ECU harness as identified on pages 14-17.
2. Check connections:
 - A. Tractor ISO plug
 - B. CAN and power connections leading to the ECU harness

Sentinel NH3 Line Sensor(s) will not address

1. Make sure that the Temperature Interface Module is plugged into the Flowmeter Bus connector on Sentinel harness.
2. Make sure Line Sensor 1 is plugged into the Temperature Interface Module like on the Component Layout on Page 10.
3. Make sure all Line Sensors are plugged in correct order.
4. Check the **NH3 Module Diagnostics** screen to confirm all Line Sensors and Temperature Interface module are green. Press **READDRESS NH3 SENSORS** to restart all the sensors and readdress them.

All Sentinel NH3 Line Sensors are red on NH3 Module Diagnostics page.

1. On the top of the NH3 Module diagnostics screen, is the module status green? If yes, move on to step 2. If no, skip to step 3.
2. Unplug all line sensors except Sensor 1. Push **Readdress NH3 sensors** button and see if first sensor status turns green. If the sensor status turns green, then continue to plug one sensor at a time, pushing the **Readdress NH3 sensor** button between each time you plug in a sensor. If you come across a sensor that makes all the sensors turn red, unplug it and skip it on the daisy chain of sensors and see if the sensor after the bad sensor will turn green. If the next sensor turns green, then call SurePoint for sensor replacement.
3. If the module status is red, refer to page 18 wiring diagram and test voltages.

Sentinel shows no flow and rows are grey

1. Make sure the **MASTER** button on the **HOME** screen displays **MASTER ON**. If not, touch the button to cycle it.
2. Is Sentinel disabling the rows?
 - A. Go to the **HARDWARE** page.(pg. 23) If **HEIGHT SWITCH** box is checked, and a dedicated height switch is not installed, the Sentinel is disabling flow on all rows because it thinks the implement is up. Uncheck the **HEIGHT SWITCH** box. If a dedicated lift switch is installed and plugged into the Sentinel ECU harness, the switch may need adjusted to correctly show the implement status. If a lift switch is used that is normally closed, the **INVERT LIFT SWITCH** box needs to be checked.
3. Are you performing a stationary test? If so, a simulated speed must be entered.
4. Is a speed being displayed on the Sentinel **HOME** screen when moving?
 - A. If not, change the speed source (see pg. 23)

Sentinel NH3 Troubleshooting

E

Trouble-Shooting

Individual rows read high or low

1. Check row plumbing
 - A. Look for pinched or kinked lines to the row
 - B. Look for plugged knives
 - C. Make sure all row plumbing is the same length
 - D. Check to make sure knives are all from the same manufacturer
 - E. Flip the outlet plumbing for 2 rows and determine if the problem follows the row
 - If the low/high reading stays with the same row on the Sentinel, inspect sensor and before for plugging.
 - If the low/high reading follows the row plumbing, look after the sensor for issues
5. If the row continues to read high/low, the sensor may be faulty.

Sentinel alarms too often

Often times during initial start-up the Sentinel alarms can seem excessive as Sentinel highlights the row-to-row inaccuracies in the system. Small things like tubing lengths and line splices can make big differences in row to row accuracy. To start out, a user may consider increasing the **TOLERANCE** up to 15 degrees until these issues are resolved. Here are some other adjustments that can be made:

1. Decrease the length of time that full-page alarms display by changing the **AUTO HIDE ALARMS** setting.
2. Increase the time before a row alarms by increasing the **ALARM TIME** setting.
3. Is Sentinel alarming when the implement is up or when turning around?
 - Consider disabling alarms with the use of a height switch.
4. Go to the **ROW DETAILS** and disable the problematic row
5. Disable all alarms by checking the **DISABLE ALARMS** box

Sentinel Doesn't display speed

1. Change the speed source as reference on page 23. Toggle through the speed sources until speed displays.
2. If none of the speed sources are working, a communication problem with the tractor may exist. Consult your tractor dealer or add a GPS speed receiver found in the Accessories section of this manual.

Sentinel Care and Maintenance

F

Care &
Maintenance

Cleaning

Under no circumstance should the Sentinel modules or ECU be cleaned with a pressure washer. While the flow modules and ECU are sealed, the intense pressure generated by pressure washers may penetrate the seals and cause irreversible damage.



Winterization

If injecting a nitrogen stabilizer, SurePoint recommends flushing your system by running at least one tank of NH₃ without the nitrogen stabilizer to clean the system out.

Pre-season Service

(A little time spent here may prevent some downtime when you want to be rolling.)

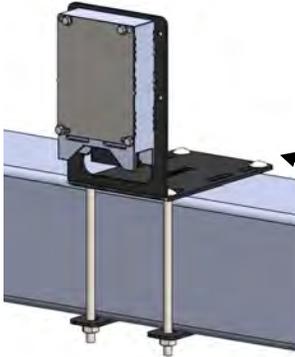
1. Visually check entire system (hoses, fittings, harnesses, etc.) for any signs of wear or trouble.
2. On the display, recheck all setup screens (see Section D) to verify correct setup.
3. Tighten all clamps. Loose clamps may be evident by leaks on the output side of the system.

Sentinel NH3 Accessories

G

Accessories

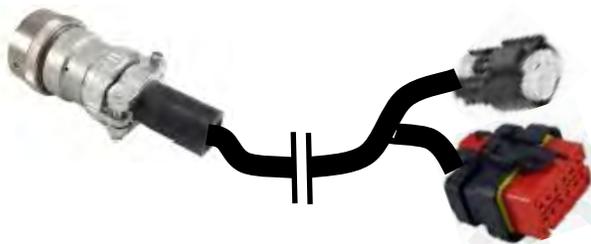
Mounting Brackets



Sentinel Mounting Brackets

Part Number	Description
515-100950	Sentinel ECU Mounting Bracket Kit

Front ISO Extension Harnesses



Part Number	Description
214-00-3553Y1	10 FT. Front ISO Extension Harness
214-00-3554Y1	20 FT. Front ISO Extension Harness
214-00-3555Y1	30 FT. Front ISO Extension Harness
214-00-3556Y1	40 FT. Front ISO Extension Harness
214-00-3557Y1	50 FT. Front ISO Extension Harness

Implement Height Switches



Part Number	Description
501-100530	Magnetic Finger Type Height Switch
501-1005	Magnetic Mercury Switch

GPS Speed Receiver



Part Number	Description
203-01-01410	Astro II with 3-pin MP 150 Shroud

Sentinel NH3 Accessories

3-Pin Weather Pack Extensions

G

Accessories



Part Number	Description
206-03-10450	3-pin 5' WP Extension Cable
206-03-10449	3-pin 10' WP Extension Cable
206-03-10876	3-pin 15' WP Extension Cable
206-03-10829	3-pin 20' WP Extension Cable
206-03-11462	3-pin 25' WP Extension Cable
206-03-11530	3-pin 30' WP Extension Cable
206-03-11535	3-pin 35' WP Extension Cable
206-03-11540	3-pin 40' WP Extension Cable
206-03-11545	3-pin 45' WP Extension Cable
206-03-11550	3-pin 50' WP Extension Cable

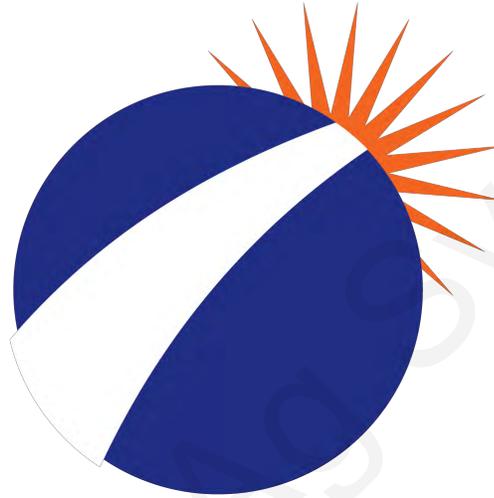
Dust Cap



Part Number	Description
374-3687Y1	3-Pin WP Dust Cap

SENTINEL NH_3

ANHYDROUS ROW MONITOR



SurePoint
Ag Systems

SurePoint Ag Systems
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Atwood, KS 67730
www.surepointag.com

