396-4035Y1

SENTINEL

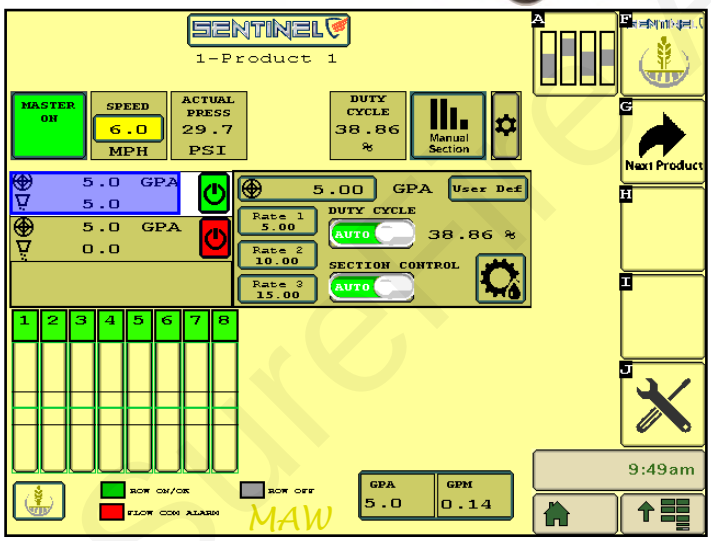
LIQUID ROW MONITOR and RATE CONTROL

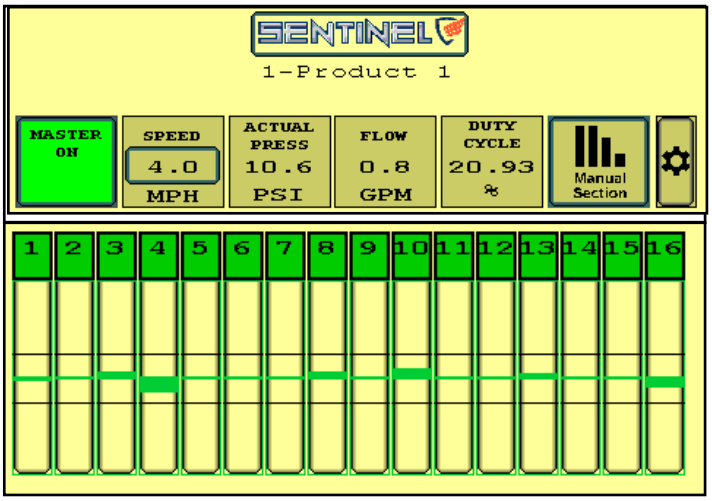
Sentinel Liquid Row-Flow Monitor
Sentinel Rate Control

for ISOBUS

Installation and Setup

SCAN ME





Minimum and Maximum Application Rates at 6 MPH					
Spacing	**15”**	**20”**	**30”**	**36”**	**40”**
MIN GPA	**5**	**4**	**2.5**	**2.2**	**2**
MAX GPA	**105**	**80**	**52**	**44**	**40**

Table Of Contents

A Introduction

B Components Liquid

C Components Wiring & Elec.

D Setup & Operation

E Trouble-Shooting

F Care & Maintenance

G Accessories

Safety

TAKE NOTE! THIS SAFETY ALERT SYMBOL FOUND THROUGHOUT THIS MANUAL IS USED TO CALL YOUR ATTENTION TO INSTRUCTIONS INVOLVING YOUR PERSONAL SAFETY AND THE SAFETY OF OTHERS. FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN INJURY OR DEATH.

THIS SYMBOL MEANS ATTENTION!

BECOME ALERT!

YOUR SAFETY IS INVOLVED!

Note the use of the signal words DANGER, WARNING and CAUTION with the safety messages. The appropriate signal word for each has been selected using the following guidelines:

DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations typically for machine components which, for functional purposes, cannot be guarded.

WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE is used to address safety practices not related to personal safety.

DANGER

Hydraulic Fluid and Equipment Safety

This system uses hydraulic equipment with hydraulic fluid under extremely high pressure.

Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin causing serious injury. Keep all hoses and connections in good serviceable condition. Failure to heed may result in serious personal injury or death. Avoid the hazard by relieving the pressure before disconnecting lines or performing work on the system.

Make sure hydraulic fluid connections are tight and all hydraulic hoses and lines are in good condition before applying pressure to the system. Use a piece of paper or cardboard, NOT BODY PARTS, to check for suspected leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. DO NOT DELAY!

Check hydraulic hoses and fittings frequently. Loose, broken, and missing hardware can cause equipment to not perform properly and can result in serious injury or death.
Hydraulic systems can be hot and cause burns. Before working on any system, wait until the fluid has cooled.

If an accident occurs, see a doctor familiar with this type of injury immediately. Any fluid injected into the skin or eyes must be treated within a few hours or gangrene may result.

WARNING

A Word to the Operator

It is YOUR responsibility to read and understand the safety messages in this manual. YOU are the key to safety.

SAFETY IS YOUR RESPONSIBILITY.

General Description

A
Introduction

You have purchased a SureFire Sentinel system for your equipment. This system will be controlled by the Sentinel ECU through your in-cab ISO display. If you are using the Sentinel for row monitoring, your liquid system will continue to function as usual with application rates being regulated by your existing rate control. The Sentinel works independently, monitoring the row-to-row accuracy of your system and alerting the operator of over-applying, restricted or blocked rows.

If you are using Sentinel for Rate Control, the Sentinel ECU will be the rate controller for your system.

SureFire currently supports Sentinel operating on the following displays: **John Deere** 2630 & 4640, **Ag Leader** InCommand 800 and 1200, **Case IH** Pro 700, and **Trimble** TMX-2050. The use of Sentinel 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, SureFire offers harnessing to provide this connection on any implement. Ask your SureFire representative what accommodations may be needed for your specific equipment.

Basic Installation Steps

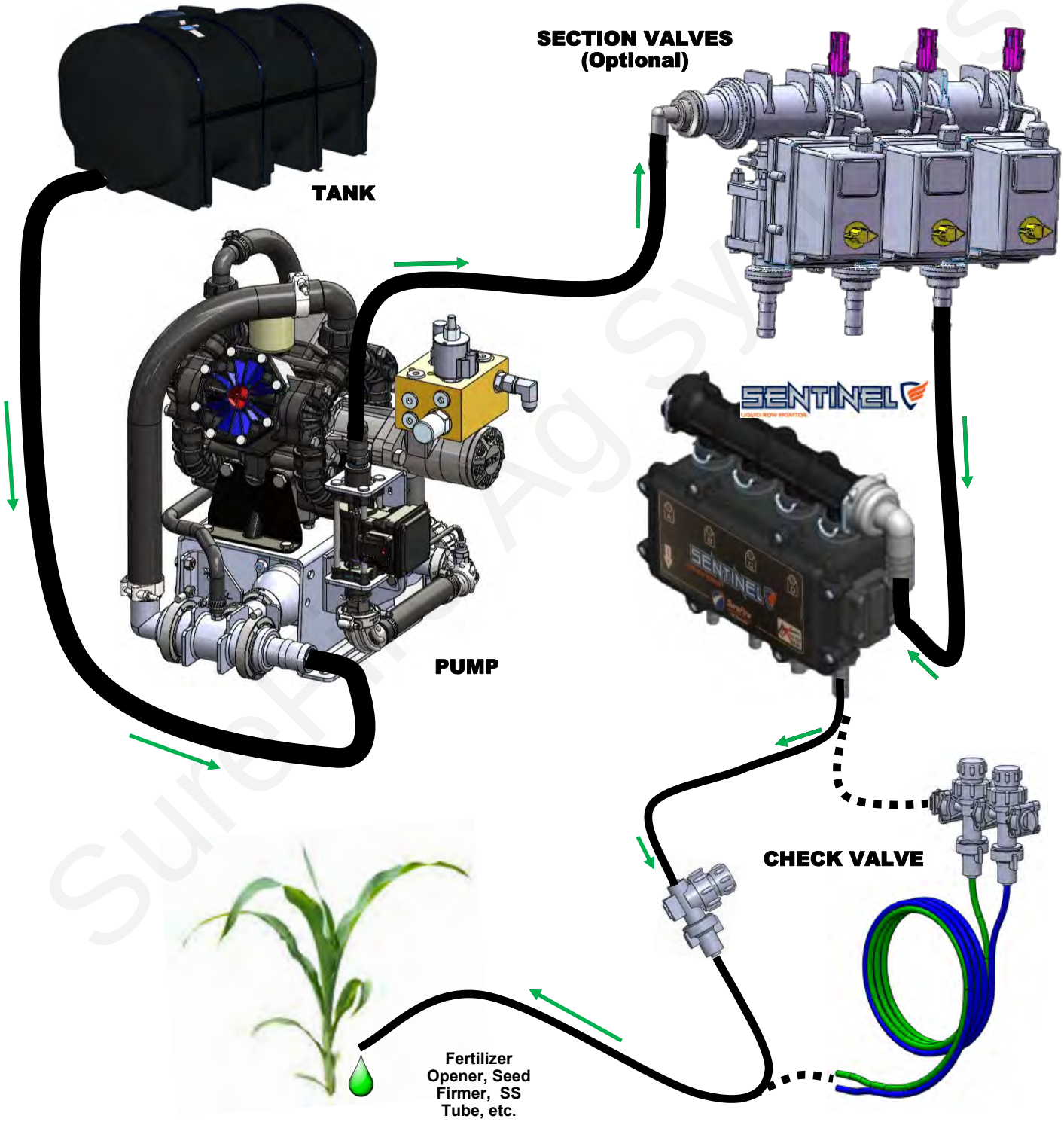
1. Manifold together the Sentinel flow modules as necessary to obtain the correct section-control configuration.
2. Mount the Sentinel flow modules as necessary using existing or provided brackets and hardware.
3. If necessary, route the provided ISO extension cable from the implement hitch to the desired Sentinel ECU mounting location.
4. Locate the 2-pin Molex power and 12-pin Ampseal POWER/CAN connectors that the Sentinel ECU will be connected to and remove the terminator.
5. Mount the Sentinel ECU using the provided bracket in a location within 4 feet of the above connection.
6. Attach the ECU harness (208-06-3536Y2) to the Sentinel ECU and plug the other end of the harness into the above Molex/Ampseal POWER/CAN connection.
7. Use the previously removed terminator to terminate the POWER/CAN connection found on the ECU harness.
8. Locate the CAN Trunkline harness (208-06-29XX) and plug the 4-pin Amp Superseal connectors into the open connection on Flow module(s) as shown on page 7.
9. Route this harness to the ECU harness, using 4-pin Deutsch extensions when needed.
10. Locate the “Flowmeter Bus” connector on the ECU harness. Remove the terminator (208-06-2912Y1) and plug the 4-pin Deutsch from the flow modules into this connection.
11. Move the terminator to the open 4-pin connector on the end of the CAN Trunkline harness.
12. From the in-cab display, address the flow modules and configure the implement as outlined in the setup instructions in this manual beginning on page 14.

System Overview Example 1

B
Components
Liquid

The following gives an example of a complete SureFire Fertilizer system with these components:

- Tank
- Pump
- Section Valves
- Sentinel Flow Monitor
- Check Valve
- Optional: Dual metering tube plumbing

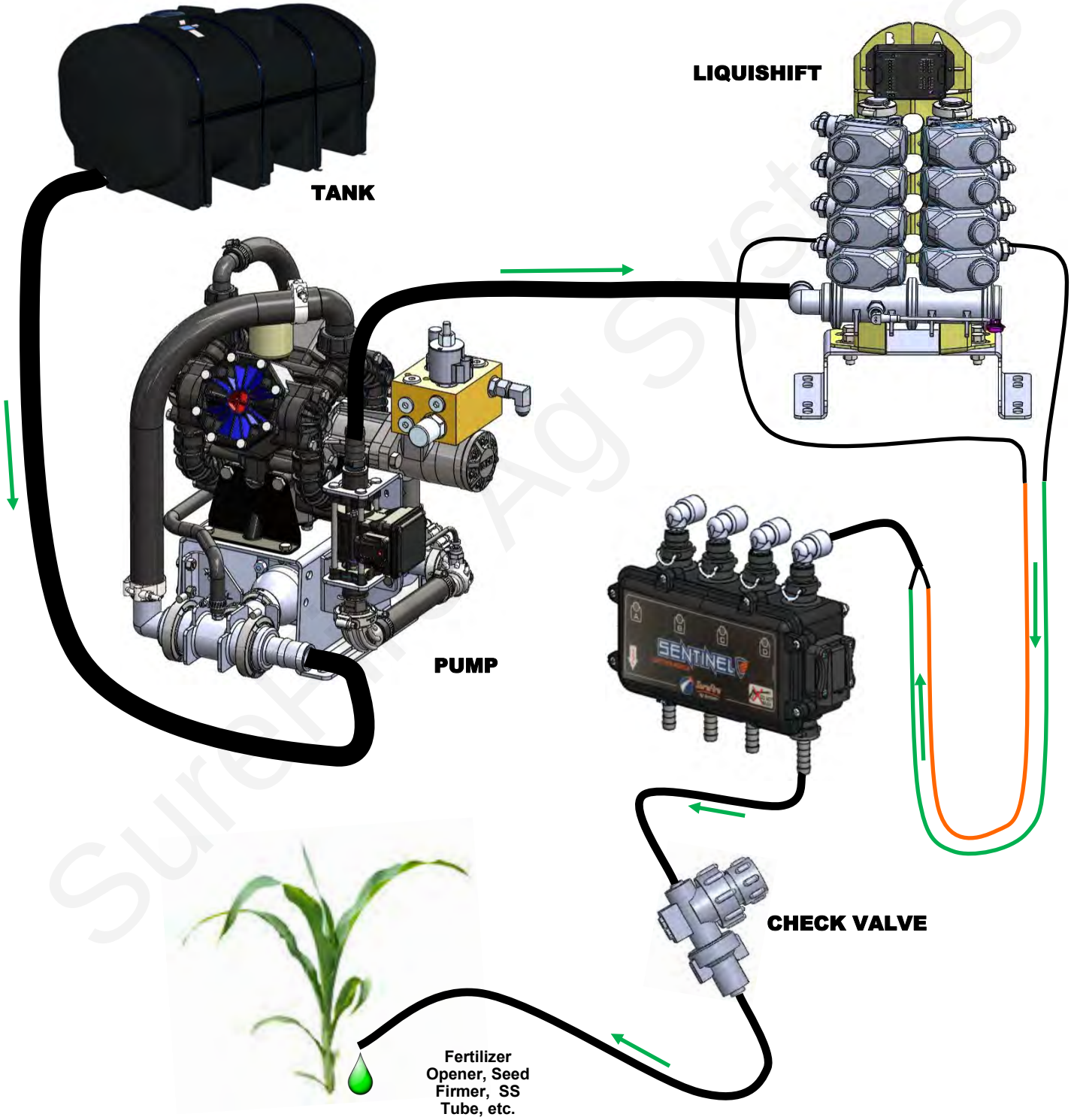


System Overview Example 2

B
Components
Liquid

The following gives an example of a complete SureFire Fertilizer system with LiquiShift and these components:

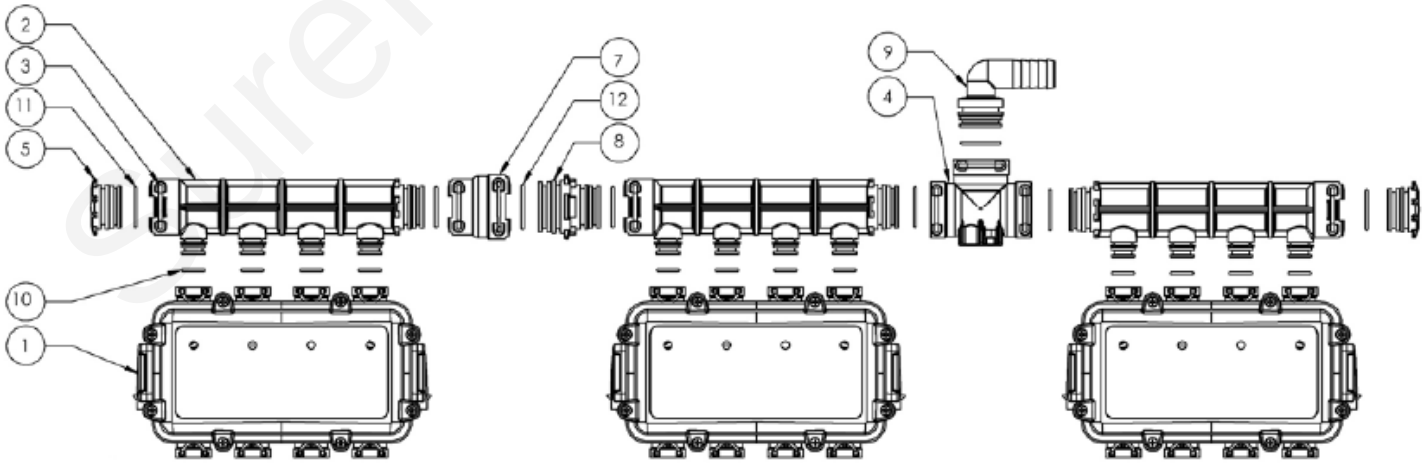
- Tank
- Pump
- LiquiShift Valve Stack
- Sentinel Flow Monitor
- Check Valves



Parts and Fittings

Manifold Feed

ITEM NO.	PART NUMBER	DESCRIPTION
1	204-01-4625AAGB1B1	Sentinel™ Flowmeter Module
2	120-T3MT3F-4XT1M	T3 Male/Female Manifold w/ (4)T1 Male Outlets
3	124-02-010003	T3 Fork
4	120-T3FTEE	T3 Tee
5	120-T3MPLUG	T3 Male FC Plug
6	124-02-010004	T4 Fork
7	120-T4FT3FRC	T4 Female x T3 Female FC Reducer Coupling
8	120-T4MT3MRN	T4 Male x T3 Male FC Reducer Nipple
9	121-T3M075-90	T3 Male FC x 3/4" HB - 90 degree
10	121-T3F075	T3 Female x 3/4” HB
11	124-01-G11056-V	Viton O-Ring for T1 fittings
12	124-01-G11058-V	Viton O-Ring for T3 fittings
13	124-01-G11054-V	Viton O-Ring for T4 fittings



See next page for a list of T1 fittings

Parts and Fittings
for
Isolated Rows

Commonly used Quick-Connect (QC) Fittings

Part Number	Description
113-12-038038	Stem Elbow—3/8” Stem x 3/8” QC
113-05-025	Plug - 1/4” QC
13-05-038	Plug - 3/8” QC

T1 Fittings

Part Number	Description
120-T1M038QC	T1 Male x 3/8” QC
120-T1M025QC	T1 Male x 1/4” QC
121-T1M038	T1 Male x 3/8” HB
121-T1M050	T1 Male x 1/2” HB
124-01-G11056-V	Viton O-ring for T1 Fittings

Sentinel Flow Meter

Part Number	Description
204-01-4625AAGB1B1	4-Row Sentinel flow meter
124-02-010001	T1 Fork
374-4024Y1	4-Pin Amp Superseal dust plug
384-1105	Hardware Kit - mounting bolts

SureFire Harness Layout for ISO Sentinel

The SureFire Sentinel module communicates with the Sentinel ECU through a proprietary communication network (CAN). The Sentinel ECU then, using the ISOBUS communication protocol, relays the flow 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 SureFire Front ISO Extension which includes power and CAN bus connections. Already using the tractor ISOBUS? No Problem. SureFire carries ISOBUS-Y harnesses to split the ISO connection at the tractor.

Implement Height and Speed Input

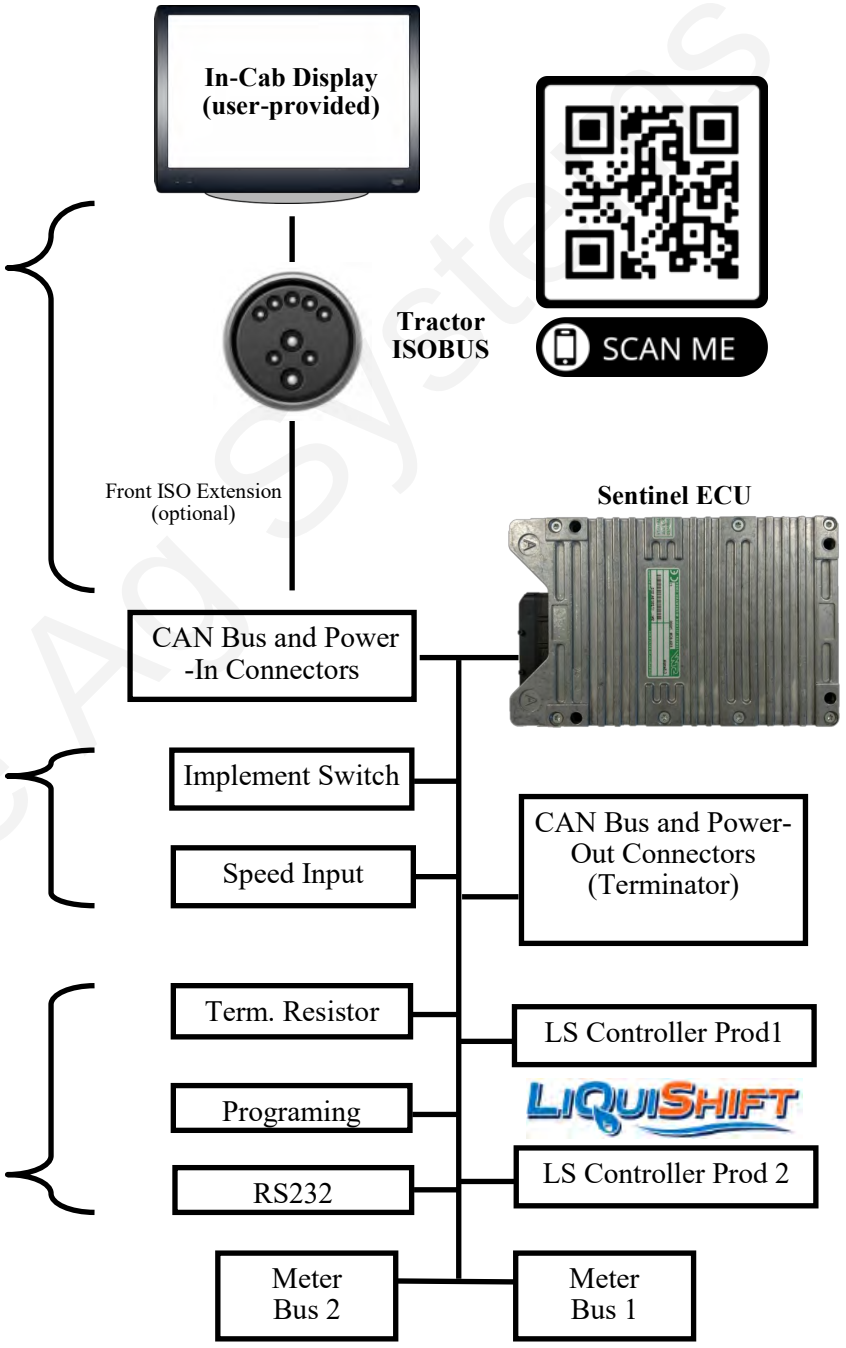
Not used in all configurations, the implement height and speed input connections provide additional input options in situations that require advanced alarm control and an auxiliary speed source. These conditions generally exist only in hybrid systems, utilizing multi-branded components.

Sentinel and LiquiShift

The Sentinel ECU has incorporated software that allows for customized control of up to 2 SureFire LiquiShift systems. When used, the ECU replaces the LiquiShift Controller.

Service Connections

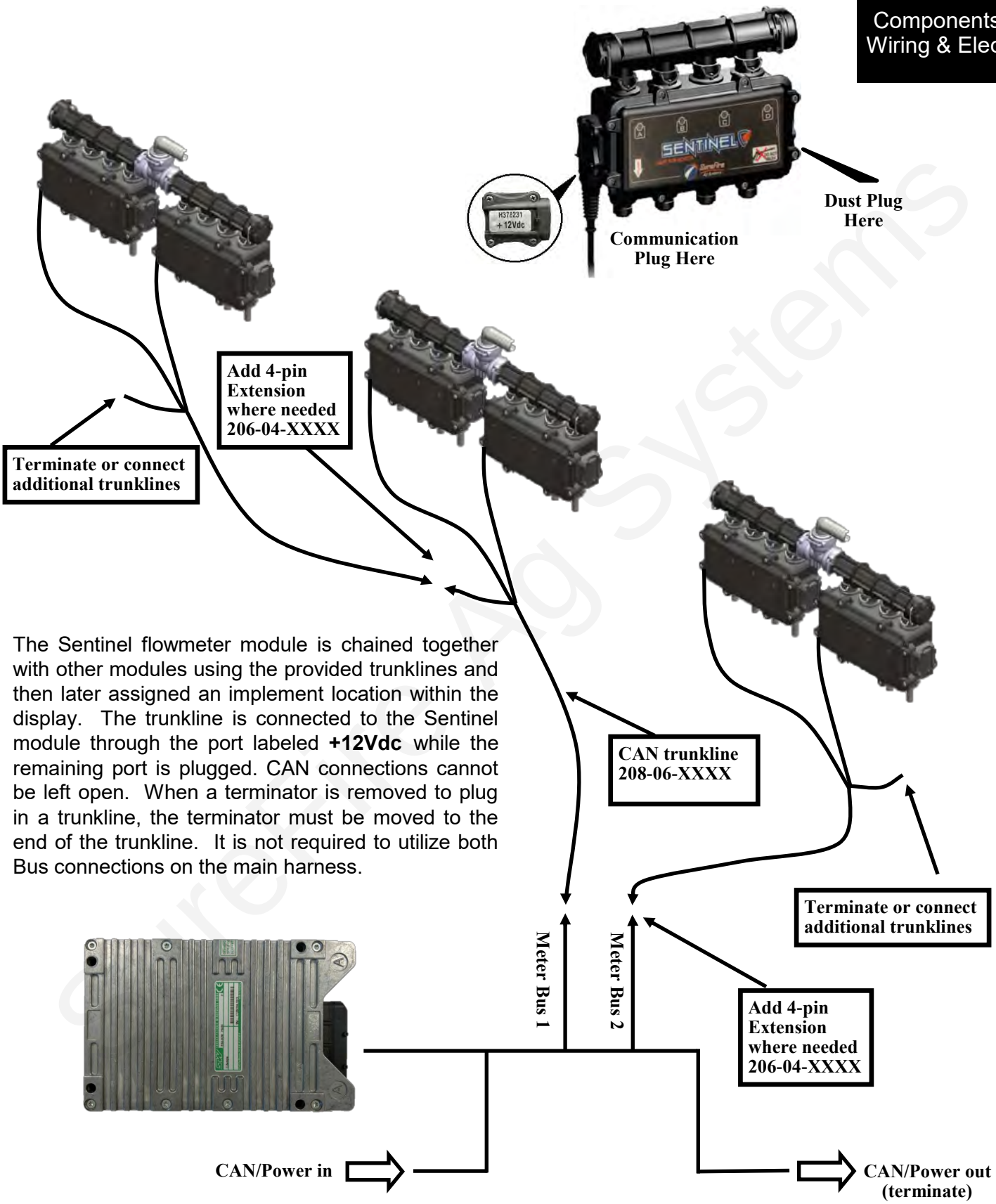
The Terminating Resistor, Programming and RS232 connectors are for service only and should not be used.



Bus Connections

2 Bus connections are provided for convenience so that each side of the implement can plug into the ECU harness without the need for a long, continuous chain of connections.

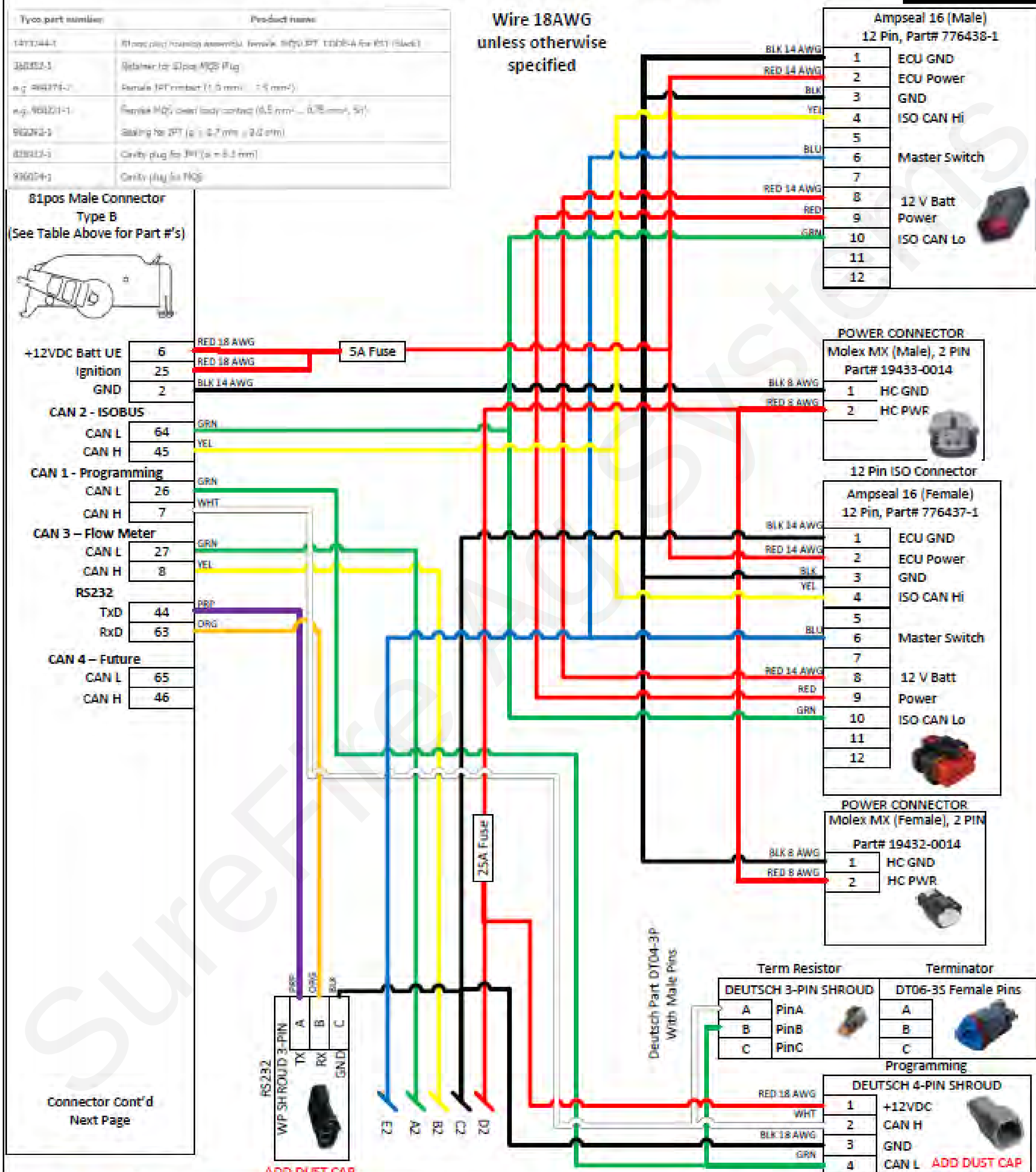
SureFire Harness Layout for ISO Sentinel



The Sentinel flowmeter module is chained together with other modules using the provided trunklines and then later assigned an implement location within the display. The trunkline is connected to the Sentinel module through the port labeled **+12Vdc** while the remaining port is plugged. CAN connections cannot be left open. When a terminator is removed to plug in a trunkline, the terminator must be moved to the end of the trunkline. It is not required to utilize both Bus connections on the main harness.

208-06-3536Y2

208-06-3536Y2 Sentinel ECU Harness



SureFire Ag Systems	Part No:	208-06-3536Y2	Drawn By:	Albert E. Popp
	Description:	208-06-3536Y2 Sentinel ECU Harness	Last Edit Date: 10/18/2017	Revision A-02
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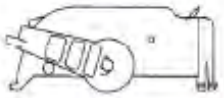
208-06-3536Y2

208-06-3536Y2 Sentinel ECU Harness

Wire 18AWG unless otherwise specified

81pos Male Connector Type B
Cont'd Page 1



35V Inputs

X_IN_01/Imp Swch	70	BLU
X_IN_02/Speed	12	BRN
X_IN_03/Left Spd	31	NA
X_IN_04/Right Spd	50	NA
X_IN_05/PWM1	69	NA
X_IN_06/PWM2	11	NA
X_IN_07/Master	30	NA
X_IN_08/P1_Flow	49	NA
X_IN_09/P2_Flow	68	NA
X_IN_10/P3_Flow	10	NA
X_IN_11/P4_Flow	29	NA
X_IN_12/Sect 10	48	NA

12V Analog/Digital/4-20mA

X_IN_13/Press1	67	PRP
X_IN_14/Press2	9	PRP
X_IN_15/Press3	28	NA
X_IN_16/Press4	74	NA
X_IN_17/AI5	16	NA
X_IN_18/AI6	35	NA
X_IN_19/AI7	54	NA
X_IN_20/AI8	73	NA

Digital/Analog 0-5V/12V/ Freq/ Pull-Up Only

X_IN_21/Spare	57	YEL
X_IN_22/Spare	76	YEL
X_IN_23/Spare	18	NA
X_IN_24/Spare	37	NA
X_IN_25/Spare	41	NA
X_IN_26/Spare	60	NA
X_IN_27/Spare	79	NA
X_IN_28/Spare	21	NA

High Current Outputs 2.5Amps

X_SYS_RELAY_04/ PWR	1	RED
X_OUT_21/LSA_P1	43	WHT/BLU
X_OUT_22/LSB_P1	62	PNK
X_OUT_23/LSA_P2	81	WHT/BLU
X_OUT_24/LSB_P2	23	PNK
X_OUT_25/PWM1	41	NA
X_OUT_25/PWM2	60	NA
X_OUT_25/PWM3	DO7	NA
X_OUT_25/PWM4	21	NA

E1 A1 B1 C1 D1

Flow Meter BUS 1

DEUTSCH 4-PIN TOWER

BLK 14 AWG	1	GND
GRN	2	CAN L
YEL	3	CAN H
RED 14 AWG	4	+12VDC

Include/Connect 208-06-2912Y1 (4Pin to 3Pin Deutsch CAN Bus Terminator) Harness to Flow Meter 2 Connector

Flow Meter BUS 2

DEUTSCH 4-PIN TOWER

BLK 14 AWG	1	GND
GRN	2	CAN L
YEL	3	CAN H
RED 14 AWG	4	+12VDC

Include/Connect 208-06-2912Y1 (4Pin to 3Pin Deutsch CAN Bus Terminator) Harness to Flow Meter 2 Connector

LS Controller Prod1

8 Pin Deutsch Male

RED	1	+12VDC
BLK	2	GND
PRP	3	Pressure 1
YEL	4	PWM+
BLK	5	PWM-
WHT/BLU	6	Section 9
PNK	7	Section 10

ADD DUST CAP

LS Controller Prod2

8 Pin Deutsch Male

RED	1	+12VDC
BLK	2	GND
PRP	3	Pressure 1
YEL	4	PWM+
BLK	5	PWM-
WHT/BLU	6	Section 9
PNK	7	Section 10

ADD DUST CAP

Speed Input

150 MP Tower 3-PIN

BRN	A	SIG
RED	B	+12V
BLK	C	GND

Implement Switch

WP TOWER 2-PIN

BLU	A	SIG
GND	B	GND

SureFire Ag Systems	Part No:	208-06-3536Y2	Drawn By:	Albert E. Popp	
	Description:	208-06-3536Y2 Sentinel ECU Harness	Last Edit Date:	10/18/2017	Revision A-02
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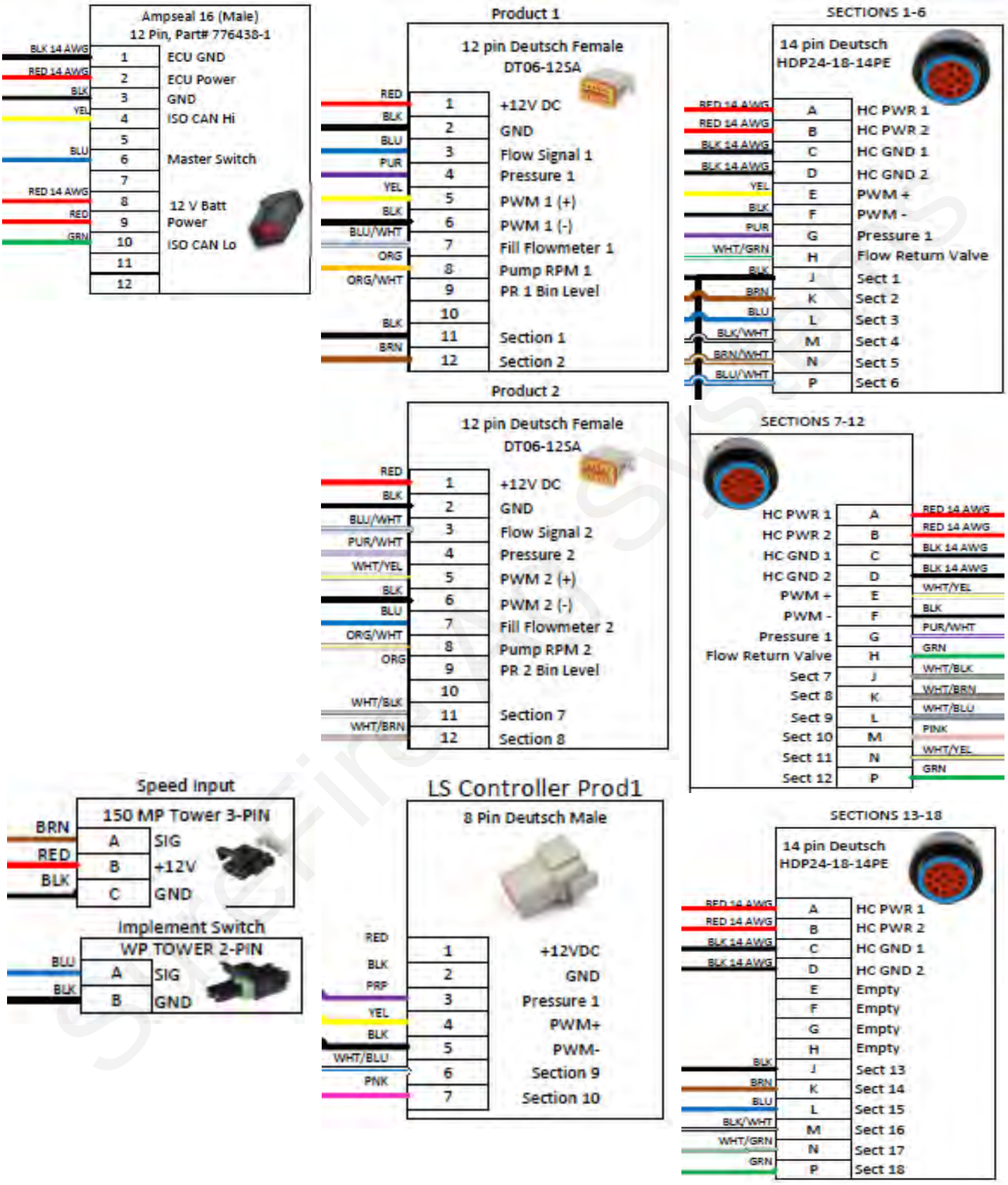
208-06-4099Y4 Connector pinouts for Rate Control and Row Control

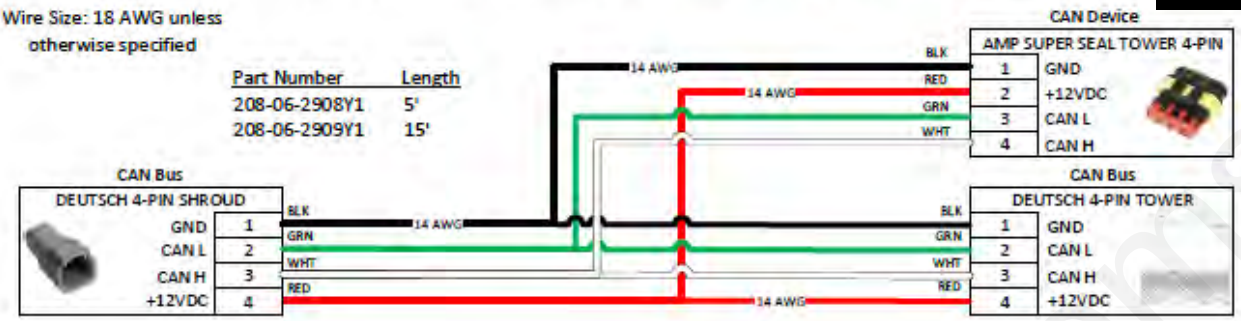


208-06-2908 Through 2911Y1

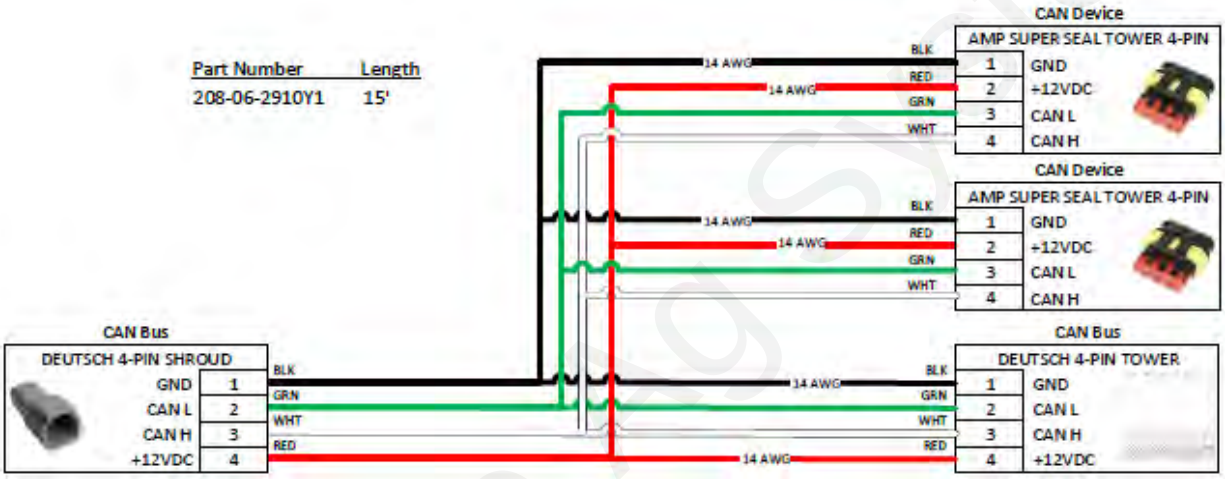
4 Pin Deutsch CAN Trunkline to 4 Pin SuperSeal

Wire Size: 18 AWG unless otherwise specified

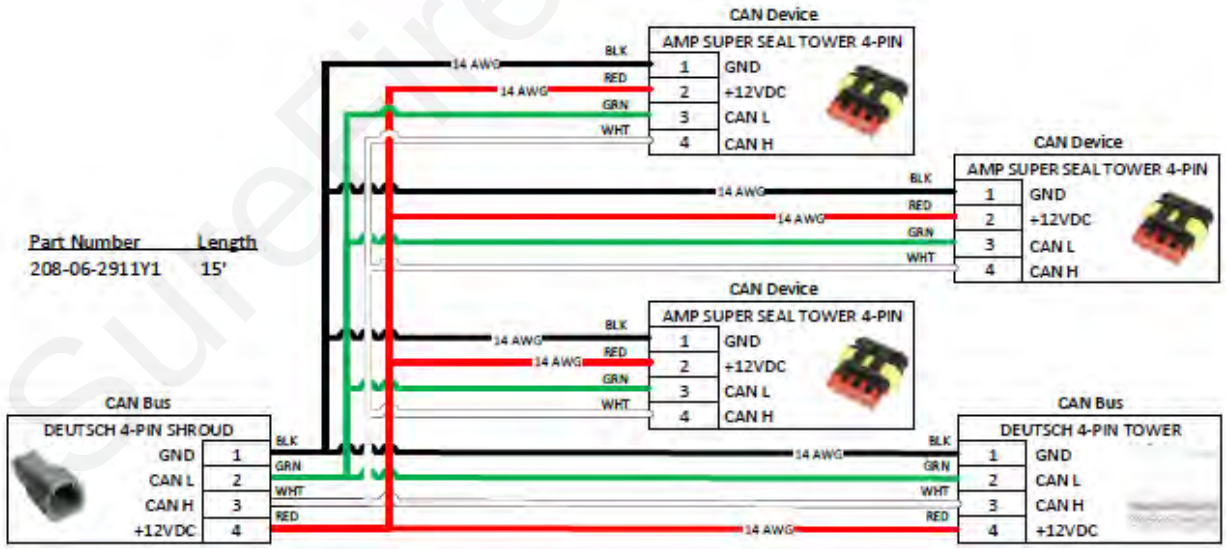
Part Number	Length
208-06-2908Y1	5'
208-06-2909Y1	15'



Part Number	Length
208-06-2910Y1	15'



Part Number	Length
208-06-2911Y1	15'

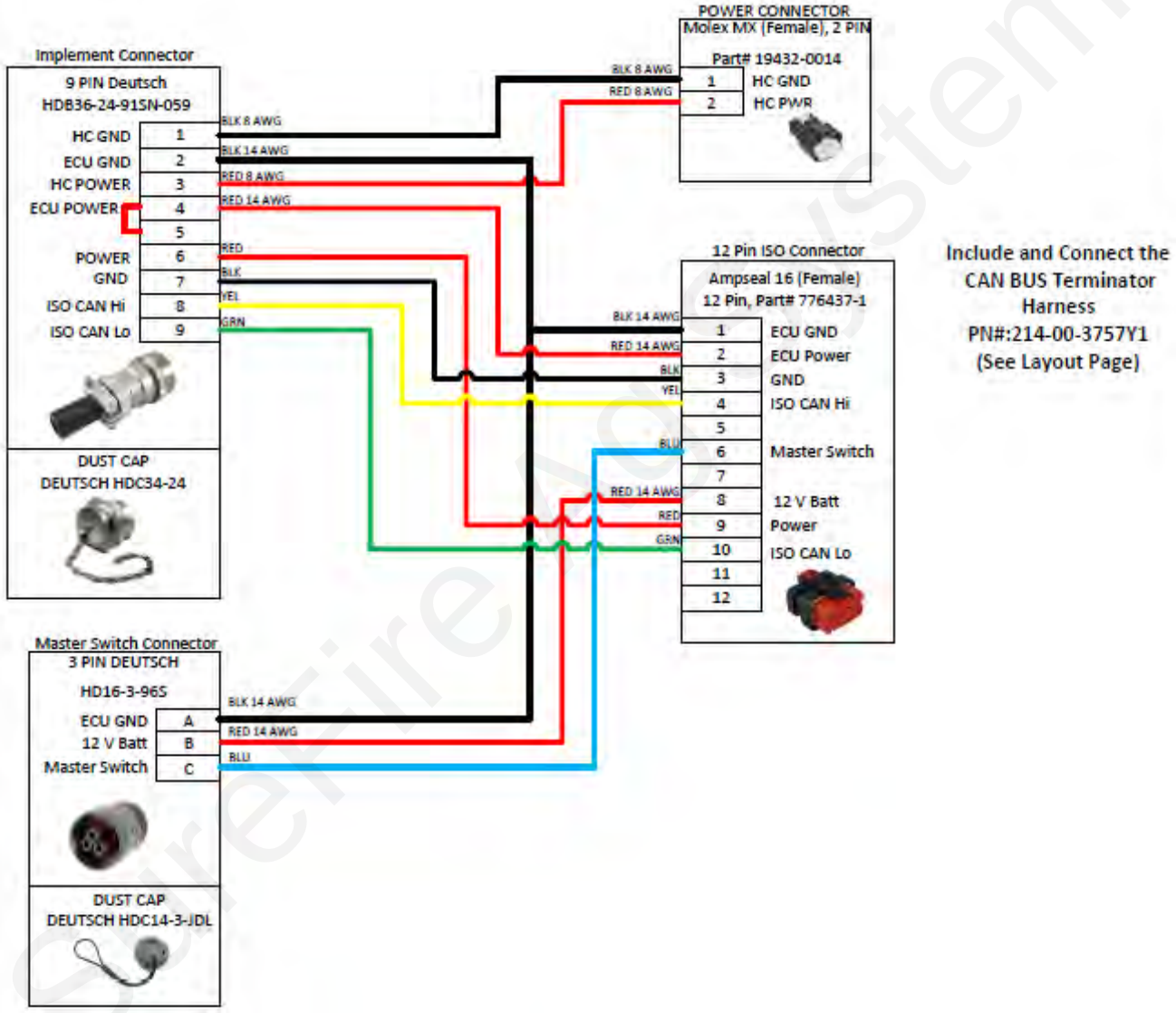


SureFire Ag Systems	Part No:	208-06-2908 Through 2911Y1	Drawn By:	Dirk Ricker	
	Description:	4 Pin Deutsch CAN Trunkline to 4 Pin SuperSeal	Last Edit Date:	1/23/2017 2:23:24 PM	Revision A-01
			Page of Pages	1 of 2	

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

Front Extension Harness – (9-Pin ISO Connector @ 3-Pin Master Switch to 12-Pin Ampseal 16 ISO and 2-Pin Molex Power)

Wire 18AWG unless otherwise specified



Include and Connect the CAN BUS Terminator Harness PN#:214-00-3757Y1 (See Layout Page)

SureFire Ag Systems	Part No:	214-00-3553Y1 Thru 214-00-3557Y1	Drawn By:	Cavenee	
	Description:	Front Extension Harness – (9-Pin ISO Connector @ 3-Pin Master Switch to 12-Pin Ampseal 16 ISO and 2-Pin Molex Power)	Last Edit Date:	4/12/2018	Revision A-01
			Page of Pages	1 of 2	

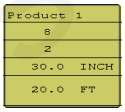
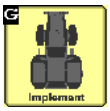
Sentinel Setup and Configuration
Set-up and Configuration

D
Setup & Operation

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

REFERENCE Page #	STEP
15	1. Press the **HOME** button 
16-17	2. Go to the settings page by touching the **SETTINGS** button 
16-17	3. On the settings page, specify the number of products being monitored (maximum of 4)
16-17	4. Configure each product by touching the **PRODUCT** button 
18-19	5. Use the BACK arrow to go back to the SETTINGS menu.
18-19	6. Select DEVICE and set up each product with requested information.
18-19	7. Set up the implement dimensions by touching the I**MPLEMENT** button. 
20	8. Choose a speed source by selecting the **SPEED** button. 
20	9. Select system control options (task control, lift switch, etc.) under **HARDWARE** 
21	10. Set up the product rate and rate mode with **RATE SETUP** 
21	11. **Rate Control Setup**
22	12. **Row Bar Button and Wheat Button --Customizing Alarms**
	13. From the Settings screen, touch the **NEXT** button. 
23	14. Click on **Flow Module Diagnostics**
	15. Ensure that all flow modules are plugged in and click **Reset All Addresses**
	16. Unplug all modules for Product 1.
	17. Beginning with module #1, plug it back in - module 1 should turn green on the screen
	18. Moving across the implement, plug in each module for Product 1 in order.
	19. If applicable, address the modules for product 2 by repeating steps 14-16 for product 2
	20. Select the correct module orientation (**ABCD** or **DCBA**) (What is Row 1? (A) or (D)?
24-27	21. More operation and setup information

Sentinel Setup and Configuration
Home Screen Navigation for Row Monitoring

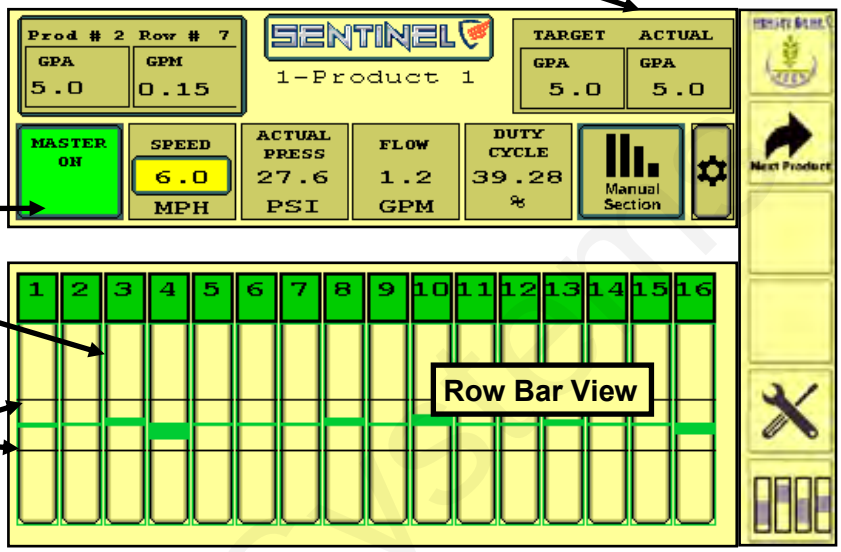
Real-time, implement-wide performance is displayed here as both target rate and actual rate

If an implement height switch is plugged into the Sentinel harnessing, there is an arrow showing the current implement height status.

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

The black bars represent the user-defined row-flow tolerance above and below the current flow

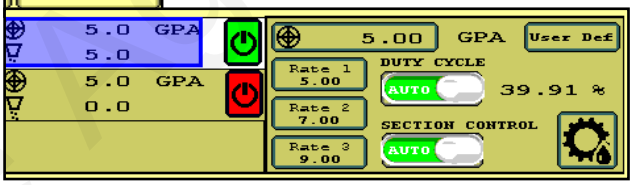
Sentinel HOME Screen

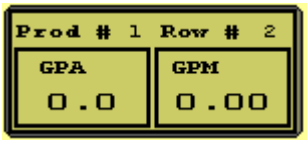


BUTTONS: Row Bar & Wheat

The SENTINEL ROW BAR button appears when using row flow monitoring. When doing row flow monitoring, this takes you to the row bar view page (above). This button may appear on the right side of the screen or on bottom left, where it puts the Row Bar View on the bottom half of the screen.

The wheat button takes you to the Multi-Product RUN SCREEN (below). This button may appear on the right side of the screen or on bottom left, where it puts the Operate > Setup > Diagnostic view on the bottom half of the screen (see page 22).



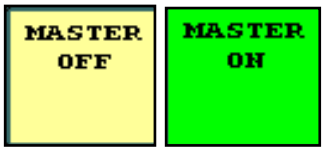


Touching the **ROW DETAIL** button will display individual row details including individual row flow, rate, module temperature, voltage, etc. (see page 24) To change the row that is being displayed in this button, touch the row on the flow chart. (see pg. 24)

Touching this button will allow you to set up the icons on this row of the screen. When you press this button you will see three rows of icons. The top row shows what is on your screen now. To change an icon, press on that icon on the top row and then press on the icon you want there on the 2nd or 3rd row. Click OK.

Toggle between up to 4 product screens (Liquid Row Flow Monitoring) or 2 products (Rate Control) by touching the **NEXT PRODUCT** button.

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)



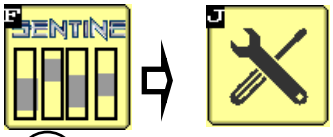
The **MASTER ON/OFF** button enables and disables the Sentinel system. *This must be **GREEN (MASTER ON)** for Sentinel to work.*

ARROW indicates implement position when using Implement Switch with Sentinel

Sentinel Setup and Configuration

D
Setup & Operation

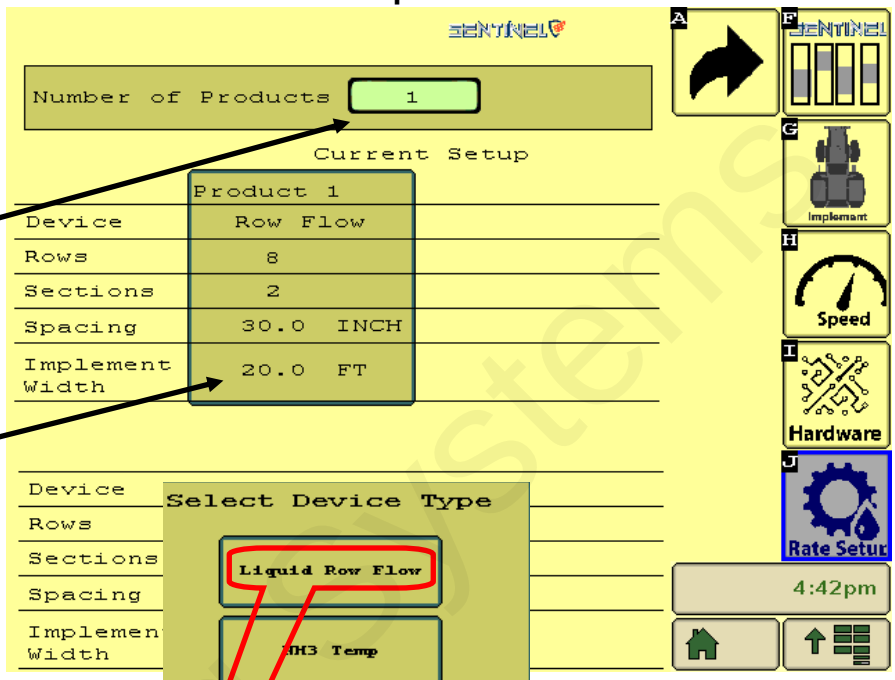
SETTINGS



1

INPUT the number of products to be monitored through the Sentinel

Product Setup Screen



2 **PRESS** this box to go to Product Setup.

PRODUCT SETUP for Row Flow Monitoring

INPUT: 3

Product Name - Press and enter in top box

Device - Liquid Row Flow

Sections - Number of liquid sections

Total Rows - Enter number

Spacing - Row spacing in inches

Start Row - Sentinel row at which this product starts.

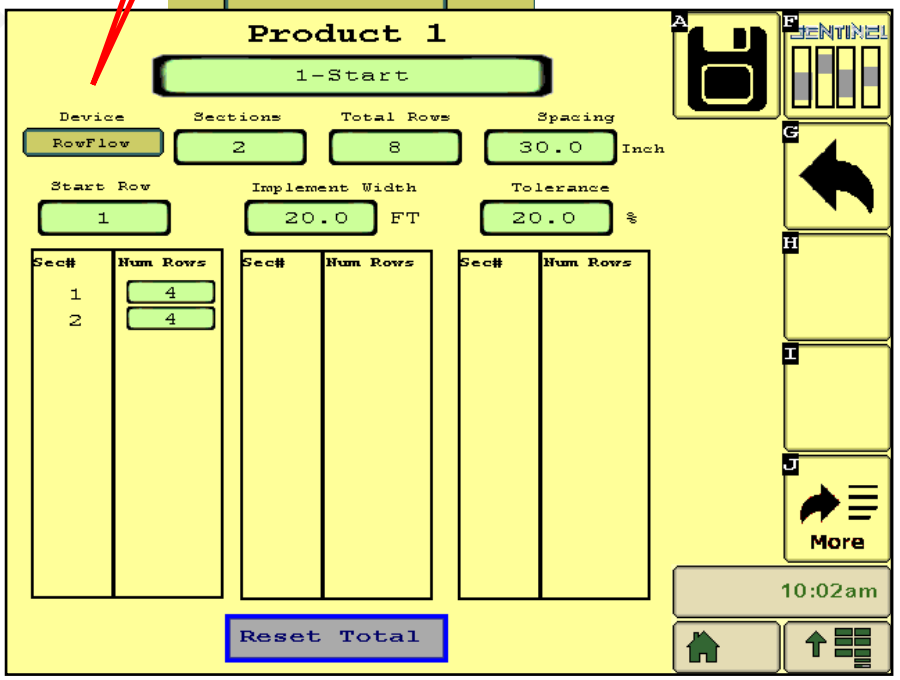
16-row example: Product 1 starts at row 1, Product 2 starts at row 17, product 3 starts at row 33.

Tolerance - Alarm setpoint above and below target rate. Adjust as needed.

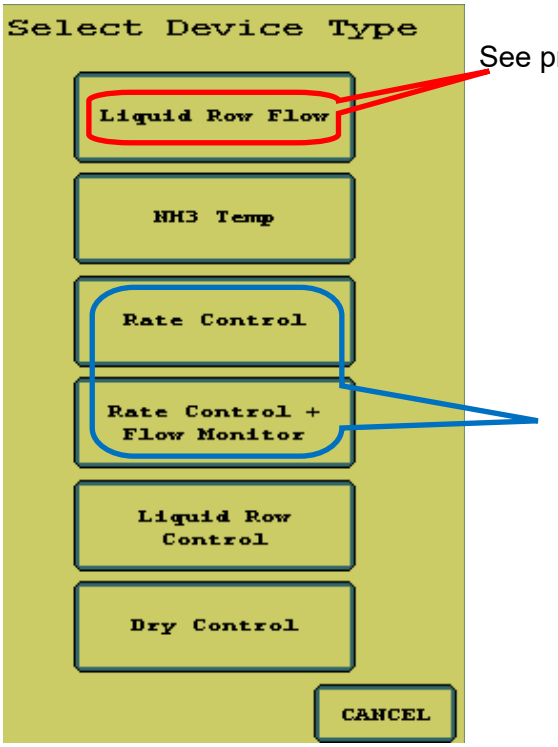
Num Rows - Number of rows in each section

Press **More** arrow.

For Rate Control select standalone **Rate Control** or **Rate Control + Flow Monitor.**
Much of the same setup will follow.
See pages for Rate Control screens later.

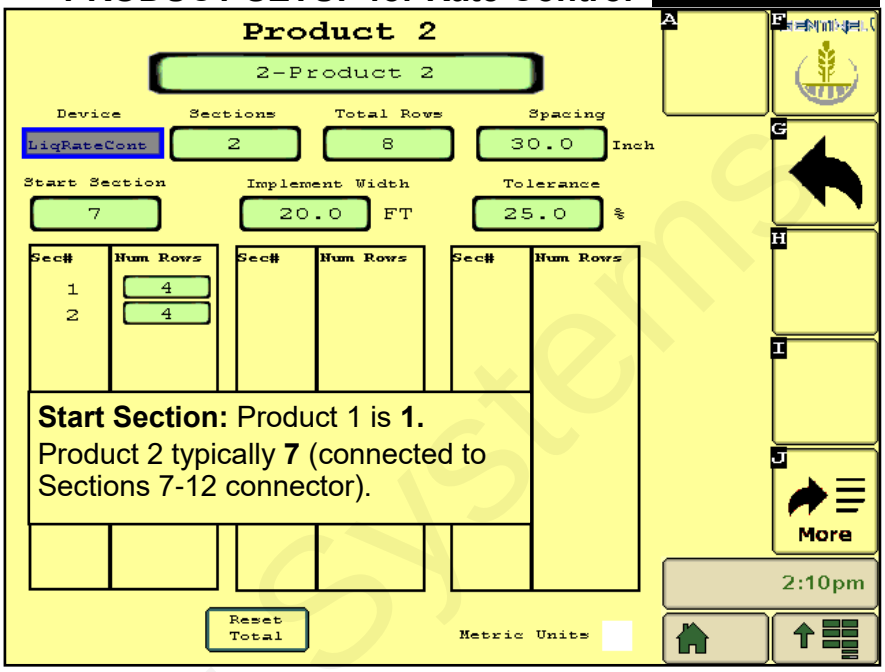


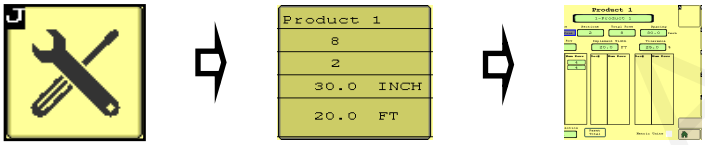
Sentinel Setup and Configuration



See previous page

PRODUCT SETUP for Rate Control





INPUT: (3)

Product Name - Press and enter in top box

Device - LiqMon+Cont

Sections - Number of liquid sections

Total Rows - Enter number

Spacing - Row spacing in inches

Start Row - Sentinel row at which this product starts.

16-row example: Product 1 starts at row 1, Product 2 starts at row 17…..

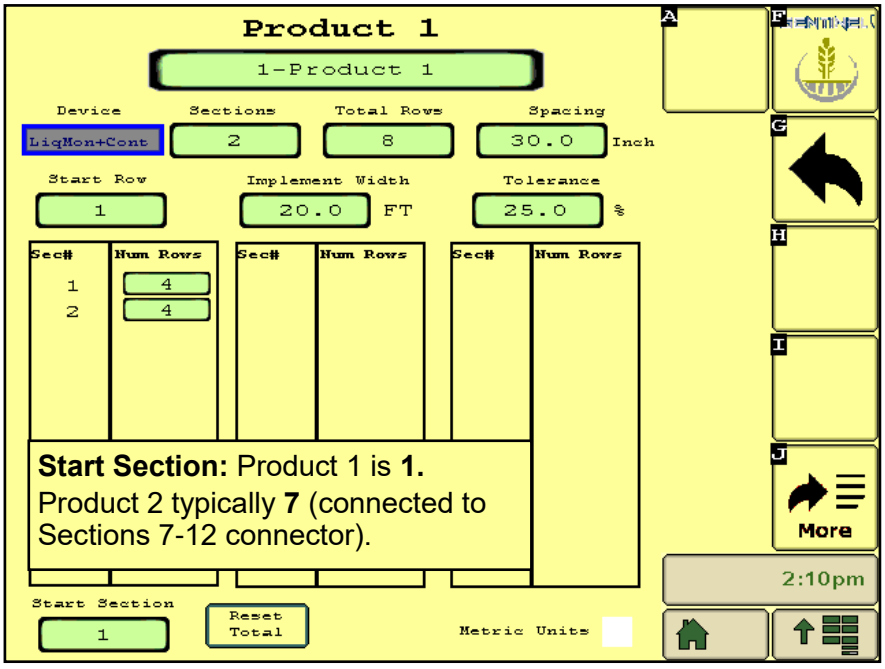
Tolerance - Alarm setpoint above and below target rate. Adjust as needed.

Num Rows - Number of rows in each section

Start Section: Product 1 is **1.** Product 2 typically **7** (connected to Sections 7-12).

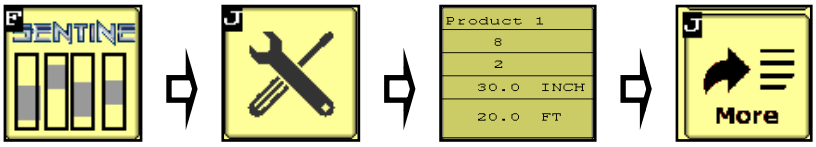
Press **More** arrow.

PRODUCT SETUP for Rate Control + Flow Monitor



Sentinel Setup and Configuration

PRODUCT SETUP for Row Flow Monitoring (cont.)



Rate Mode: For Row Monitoring > **Avg.** Sentinel will report how from the average each row is. For systems less than 6 rows, may need to use **User Def.** and enter the Rate.

Smoothing: Check the box and enter % (10 def.)

Rate for Outside Rows: for Row Monitoring if applying half rate or rate and a half on outside rows.

Special settings for interplant planters

The following settings can be activated to monitor only the rows that are being used

Split Row Md - check this box when interplant rows are disabled.

Disable ODD Rows - press to disable the Sentinel for all odd-numbered rows

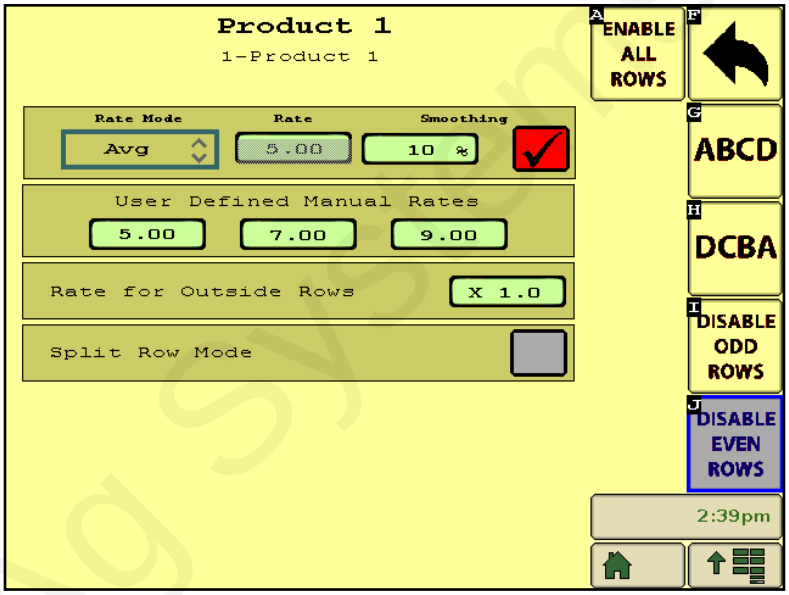
Disable Even Rows - press to disable the Sentinel for all even-numbered rows

Enable All Rows - press to read all rows

ABCD or DCBA: Sets orientation of Sentinel modules.

Press Arrow to go BACK.

RATE MODE / Smoothing

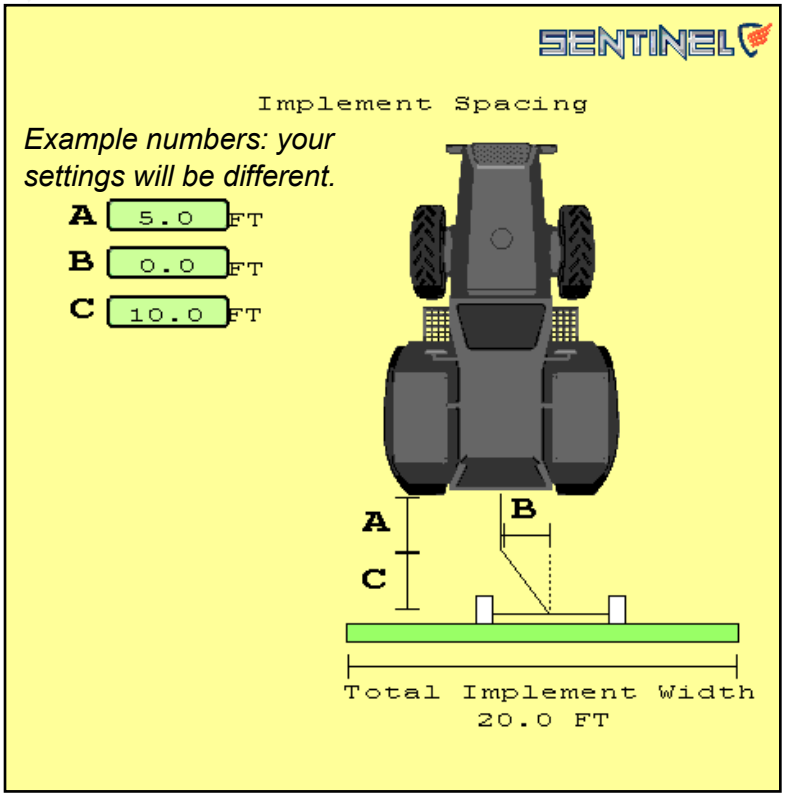


Implement SETUP

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.

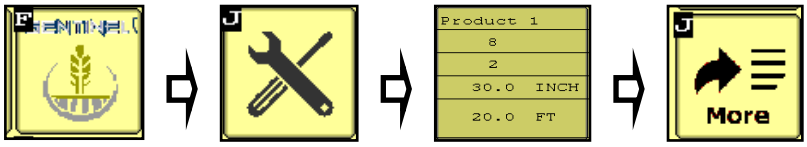
A = distance from GPS Antenna to Hitch
B = implement offset
C = distance from hitch to application point

IMPLEMENT SETUP



Sentinel Setup and Configuration

PRODUCT SETUP for Rate Control



Rate Mode: For **Rate Control** > **User Def(ined)** > enter up to 3 rates; or **Rx** for prescription rates.

For Row Monitoring > **Avg.** For systems less than 6 rows, may need to use **User Def.**

Smoothing: Check the box and enter % (10% is the default)

Rate for Outside Rows: for Row Monitoring if applying half rate or rate and a half on outside rows.

Control Integral (K_i): For SureFire technical support.

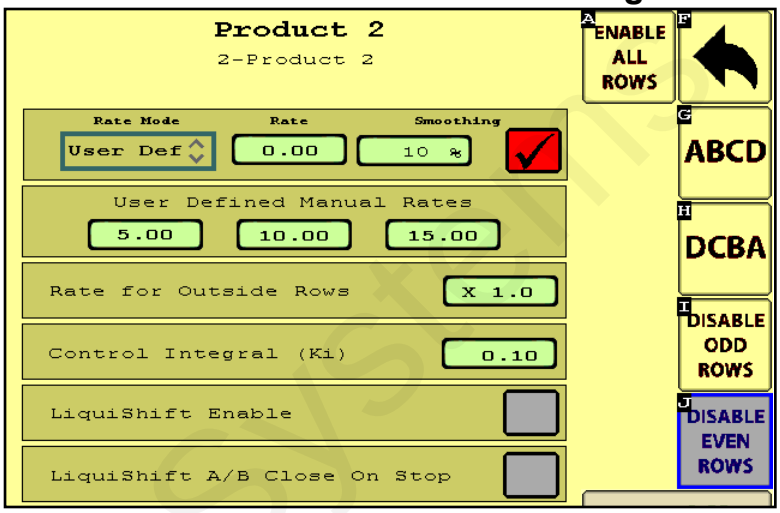
LiquiShift Enable: Check the box if this product is a LiquiShift system.

LiquiShift A/B Close on Stop: For SureFire technical support.

ABCD or DCBA: Sets orientation of Sentinel modules.

Press Arrow to go BACK.

RATE MODE / Smoothing



Special settings for interplant planters row monitoring

Disable ODD Rows - press to disable the Sentinel for all odd-numbered rows

Disable Even Rows - press to disable the Sentinel for all even-numbered rows

Enable All Rows - press to read all rows

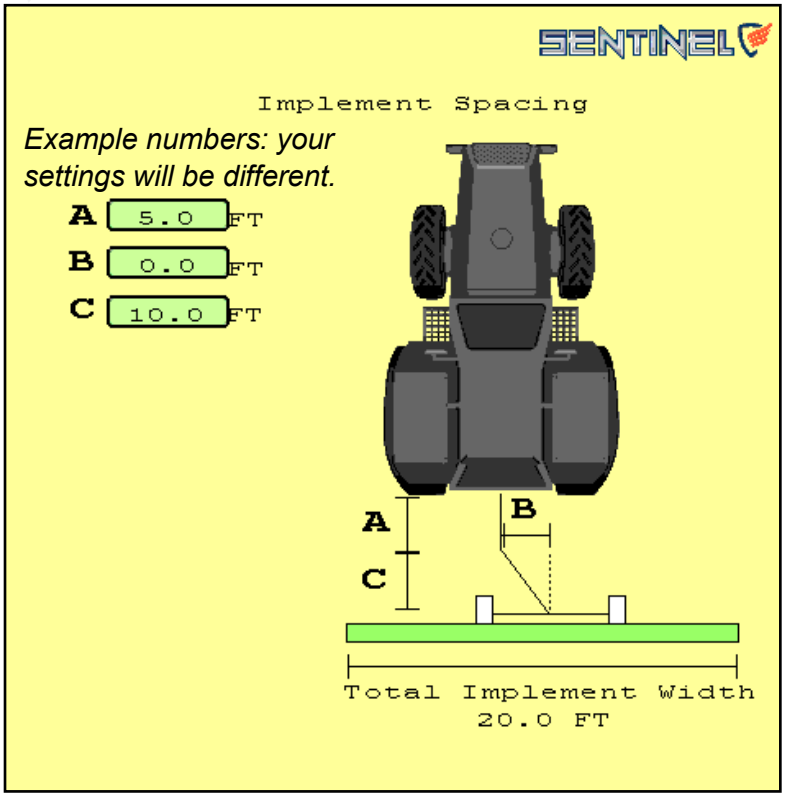
Implement SETUP

The implement setup dimensions are used when Task Control is enabled. (*Task Control should be enabled for Sentinel Rate Control.)* 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 GPS Antenna to Hitch

B = implement offset

C = distance from hitch to application point



Sentinel Setup and Configuration

D
Setup & Operation

Speed Input and Calibration

Select Speed Source:

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

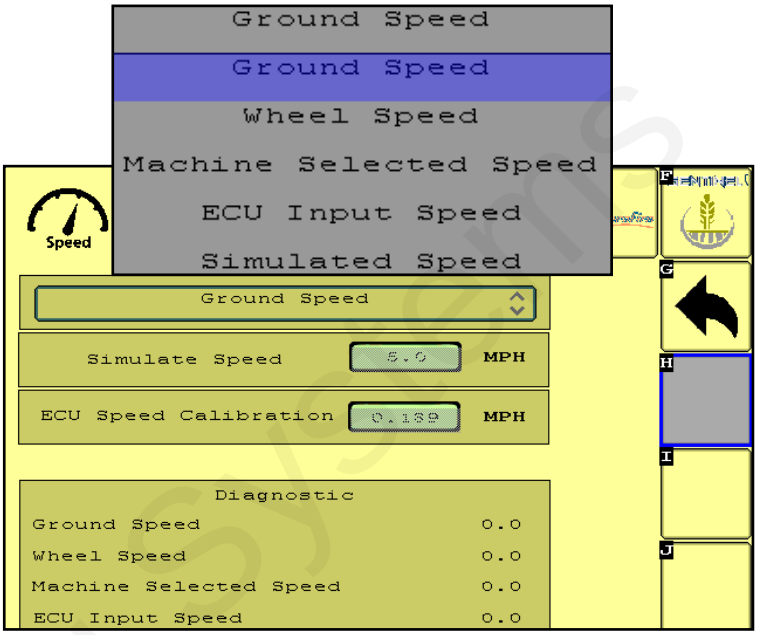
Wheel Speed - speed of the tractor wheels. Slip is not accounted for.

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.



NOTE: If the selected speed source does not cause Sentinel to display speed, choose another source until speed is displayed.

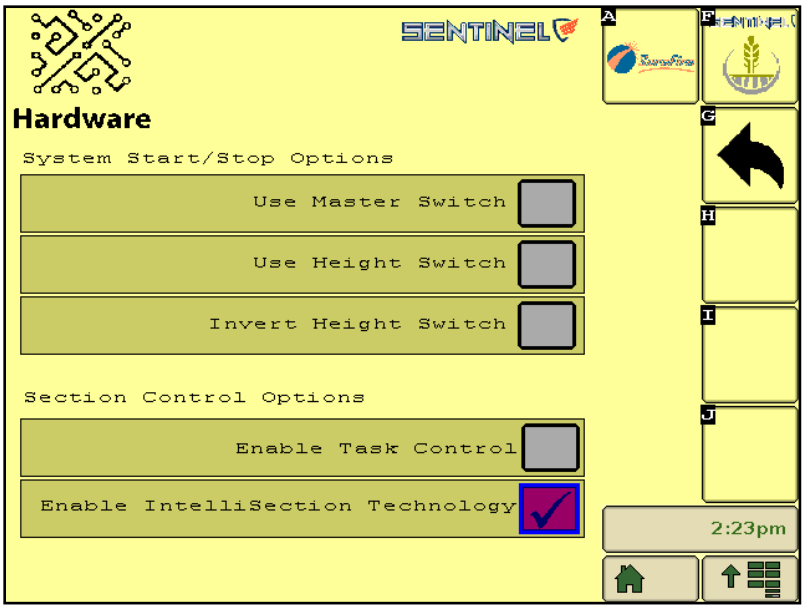
Hardware

Select Hardware Options:

Master Switch-- Check only if there is a dedicated Master Switch (Foot Switch) plugged into Sentinel.

Use Height Switch - check ONLY if the Sentinel has a dedicated lift switch. The switch used by your non-Sentinel rate controller IS NOT used by Sentinel. If this box is checked, the implement position indicator will appear on the HOME screen on the MASTER ON/OFF indicator. **Invert Height Switch** if necessary for correct orientation.

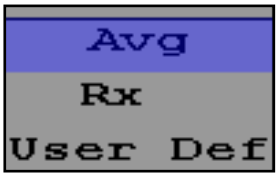
Task Control - permits Sentinel to use available task control information on the bus regarding section control. **Check this box for Rate Control**. Must have Task Control Software enabled on the display.



IntelliSection - enabling IntelliSection allows the Sentinel to determine when sections are turned off by looking at flow across the entire section. When the average flow across the section drops near zero, alarms for those rows are disabled. ***Check this box if not using Task Control.*** *Often used when using Sentinel for* ***Row Flow Monitoring****.*

Sentinel Setup and Configuration

Rate and Rate Mode Setup



RATE MODE: In **AVG**, Sentinel calculates the application rate based on average flow across all rows. AVG is typically used for Row Flow Monitoring. Small implements (less than 6 rows) may work better with User Def. **User Def** is used for Rate Control. **Rx** is used for prescription rates.

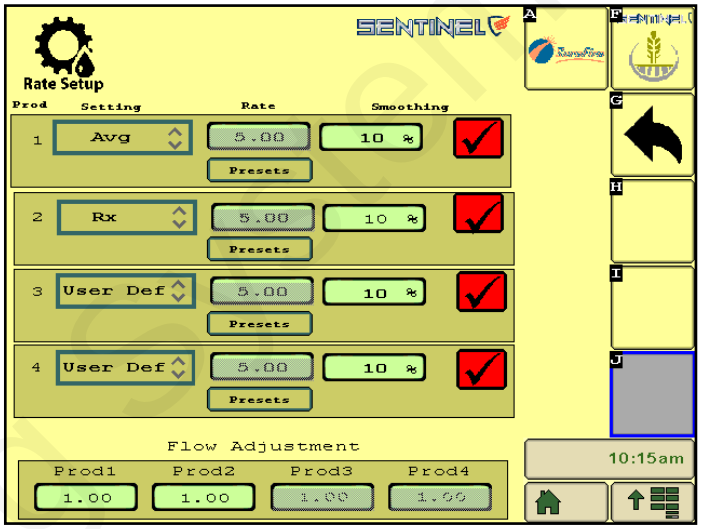
INPUT:

Product Rate: If you selected "User Def" enter the target rate for each product configured. Product rates will be greyed out unless configured for multiple products on the SETTINGS page or if AVG is selected.

Smoothing: Check the box. If the applied rate is within the percent set here, the applied rate will show on the screen as equal to the Target Rate. Typical setting is 10%.

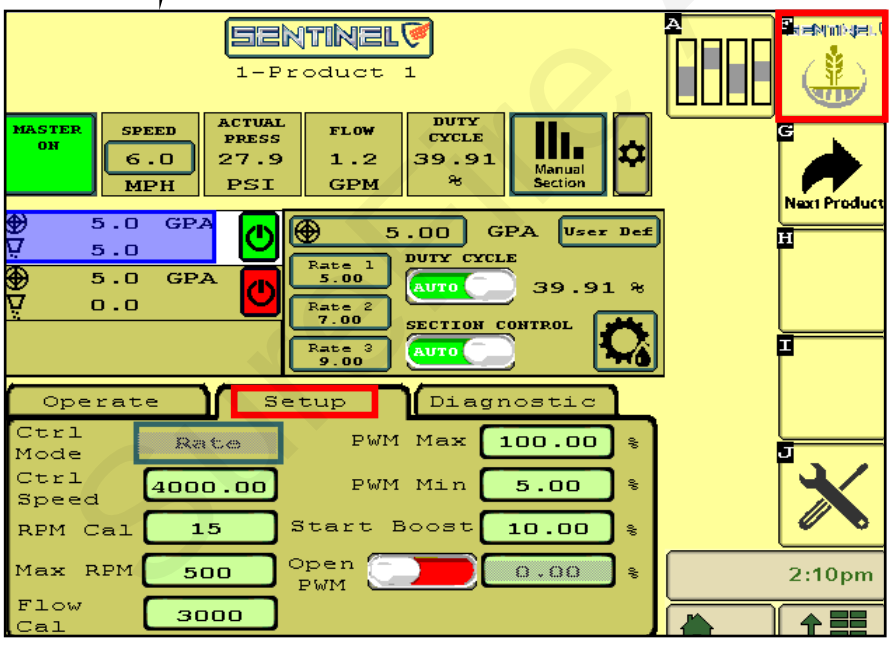
Flow Adjustment: Flow can be calibrated system-wide. This does not calibrate individual rows. Generally this number is left at 1.00

Rate and Rate Mode Setup Screen



Rate Control > Setup Tab

Setup Tab



Typical setup entries. Adjust as needed for best operation.

	Tower (Electric)	PumpRight (Hydraulic)
Ctrl Speed	4000	200
RPM Cal		15
Max RPM		500
Flow Cal	3000	2000
PWM Max	100	80
PWM Min	10	30
Start Boost	10	30

Ctrl Speed: Increase if system seems too slow in getting back to rate when speed/width/rate changes. Decrease if system surges and won't lock on to rate going across the field.

Max RPM: Increase to 550 if maximum pump output is needed.

Flow Cal: Written on Serial Number label on side of flowmeter.

Flow Cal: 0.13 to 2.6 gpm and 0.3 to 5 gpm = 3000 pls/gal. 0.6 to 13 gpm and larger flowmeters = 2000 pls/gal.

PWM Min: If the pump won't go slow enough for low rate or low speed, lower the PWM Min.

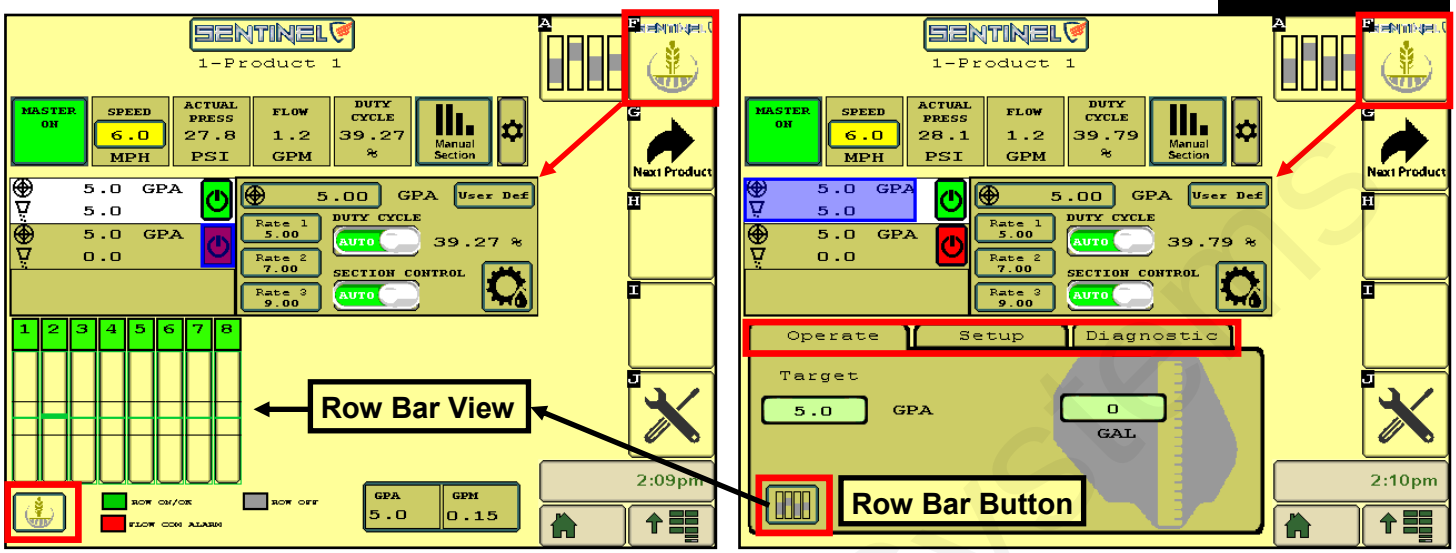
Start Boost: Increase this if needed to get more product flowing on the start of a pass.

Open PWM: Turn this on to have pump run while not applying. Set pump speed with number in % box.

Sentinel Setup and Configuration

D
Setup & Operation

When operating with RATE CONTROL **and** ROW FLOW MONITORING, the Wheat button in the **top right corner** gives you the top half of the screens below.



When operating with RATE CONTROL **and** ROW FLOW MONITORING, pressing the **Wheat button** in the **lower left corner** gives you the bottom half of the screen with Operate > Setup > Diagnostic. Pressing the **Row Bar Button** in the **lower left corner** gives you the Row Bar View on the bottom half of the screen.

Customizing Alarms, etc

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 product pages and/or rows on the HOME screen.

Auto Hide Alarms (if checked) sets how long full-page alarms are displayed. (see pg. 20) **Alarm Time** is how long a row must be outside of the specified tolerance before the alarm sounds**.**

Re Alarm Interval - The time before the Alarm alarms again after being acknowledged. If an alarm gets acknowledged on accident, it will keep alarming at this interval until resolved (if the box is checked).

Bus Update Interval - Use this to slow down ISOBUS traffic if the BUS load is too high. *Reset only after talking to a SureFire representative.*

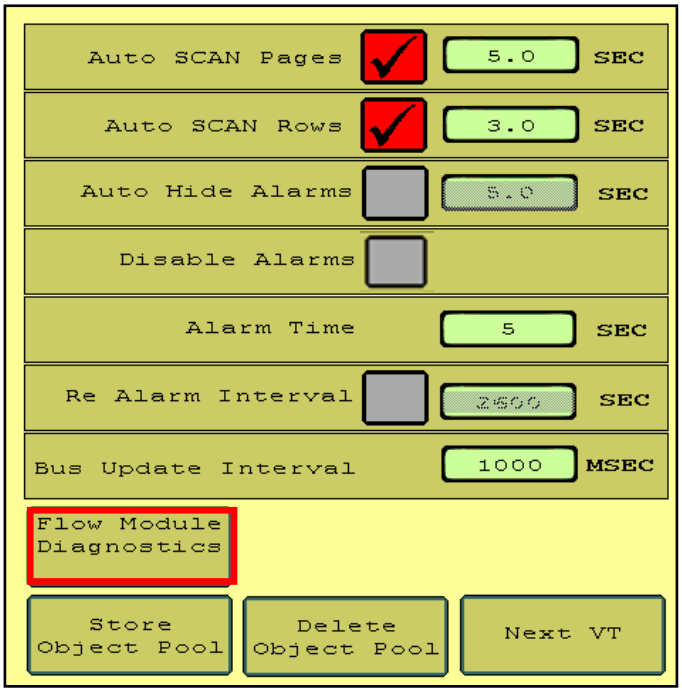
Flow Module Diagnostics - Flow Module Diagnostics are addressed on the next page.

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.

Customizing Alarms Screen



Sentinel Setup and Configuration

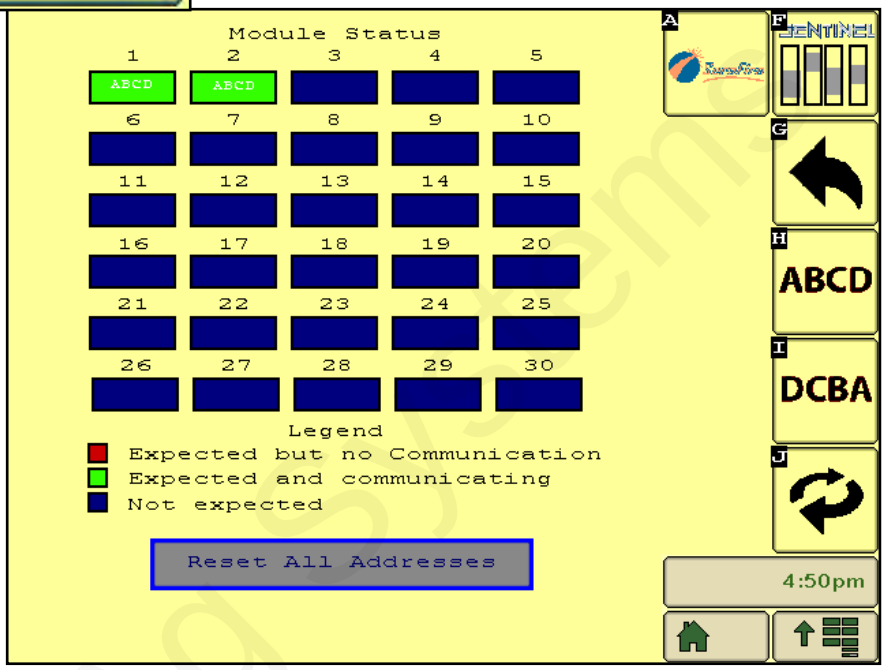
Addressing Sentinel Flow Modules

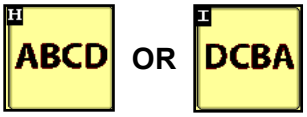
Flow Module Diagnostics

To address the Sentinel flow modules, start by having all the modules plugged in. From this screen, push **Reset All Addresses**. This sends a message to the modules to erase their factory address. All modules for Product 1 are then unplugged and then plugged back in, in order across the machine. As each module is plugged in, Sentinel identifies it's location on the machine and the module is then given its new address and it will turn green on the screen. Once all modules are addressed, choose the proper orientation as described below.

Repeat for each Product.

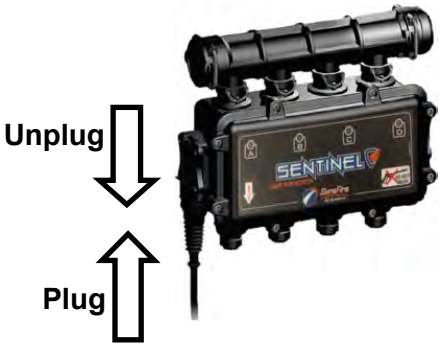
Flow Module Diagnostics Screen





Most machines will have the modules mounted facing forward, causing Row 1 to correspond with row D on the module. Therefore, the orientation DCBA must be selected. Likewise, if the modules are mounted rear-facing, the orientation ABCD will be selected.

Press the toggle button to go to the next page of modules



Example 16-Row—D C B A Orientation

Sentinel Row Flow Monitoring Operation

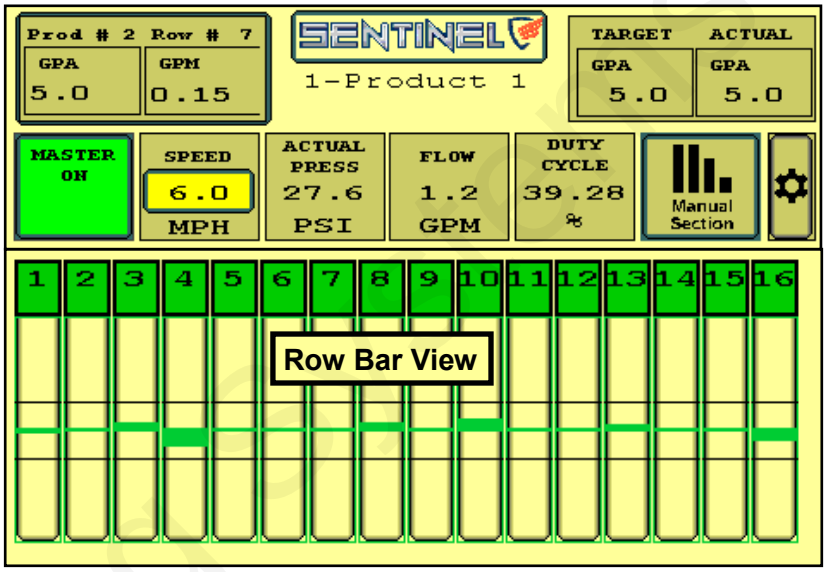
Once the Sentinel has been set up in the display, little is required of the user to operate the Sentinel. The system is designed to run in the background and only alert you if there is a problem. Most Sentinel users will spend a portion of their initial start-up time correcting inaccuracies in row-to-row flow on their implement. As previously mentioned, the HOME screen (Row Bar View) yields a quick snapshot of row-to-row comparisons while the row detail report gives more specific information about each row.

Row Bar Button

From the HOME screen, when the flow for a row or rows goes outside the set tolerance, the row will display red in the bar chart. When a row becomes plugged, the rest of the rows will show an increase in flow as product from the plugged row is now sent to the remaining rows. Likewise, if a row begins to show increased flow, such as in the case of a broken hose, the rest of the rows may show a decrease in flow.

Watching this screen for a while will allow you to see what the normal operating range is, so you can adjust the tolerance to avoid false alarms but to get timely notification if there is a problem.

Sentinel HOME Screen for Row Flow Monitoring



If a row-flow falls outside the set tolerance, a full page alarm is displayed with Product #, Row #, and low-flow (LF) or high-flow (HF). 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.

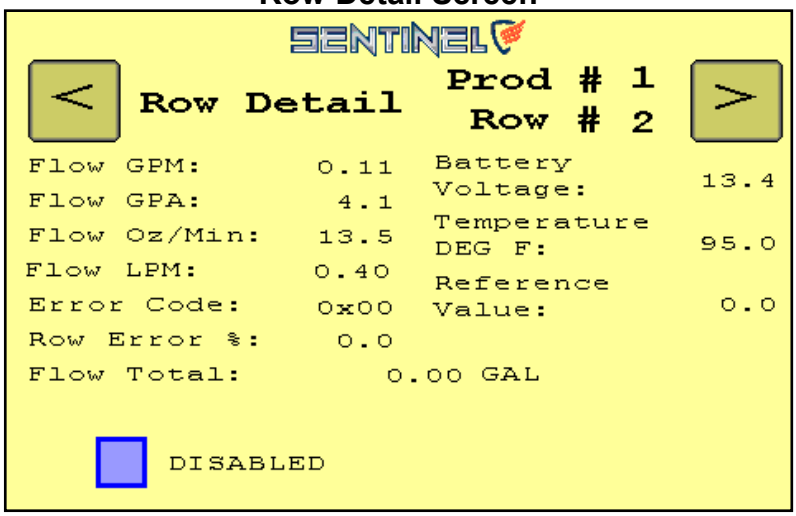
Alarm Screen

Row Detail Button

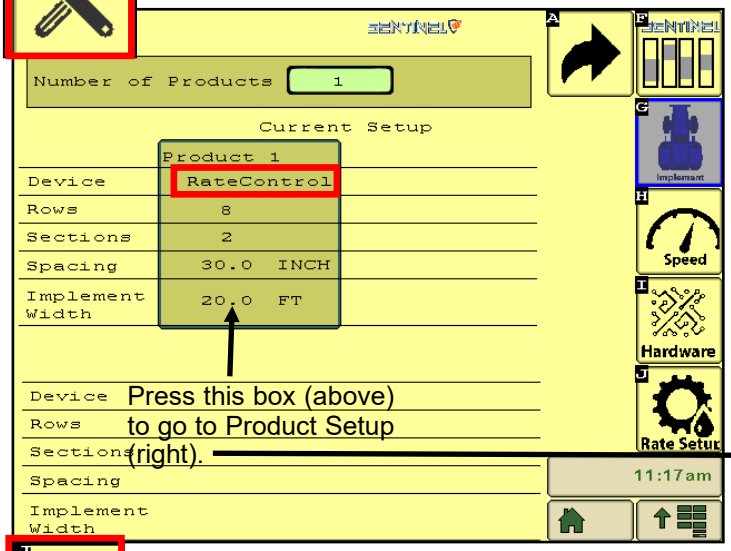
From the HOME screen, touching the row detail button will display the row detail page. The user can toggle through the rows by touching the **<** **>** buttons.

If there is an issue with the system, monitoring of individual rows may be disabled by checking the box.

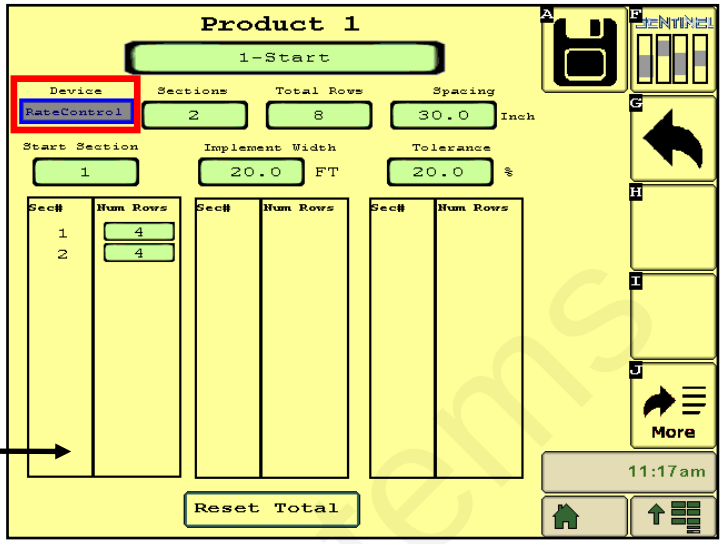
Row Detail Screen



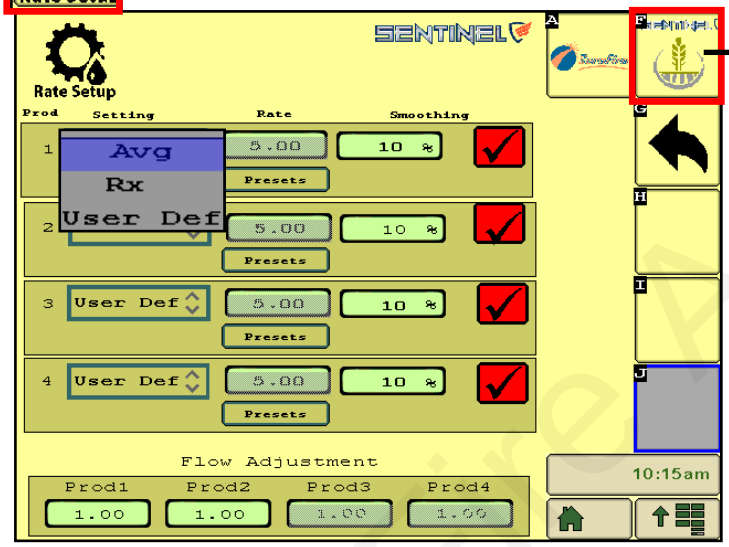
Setting up for Rate Control



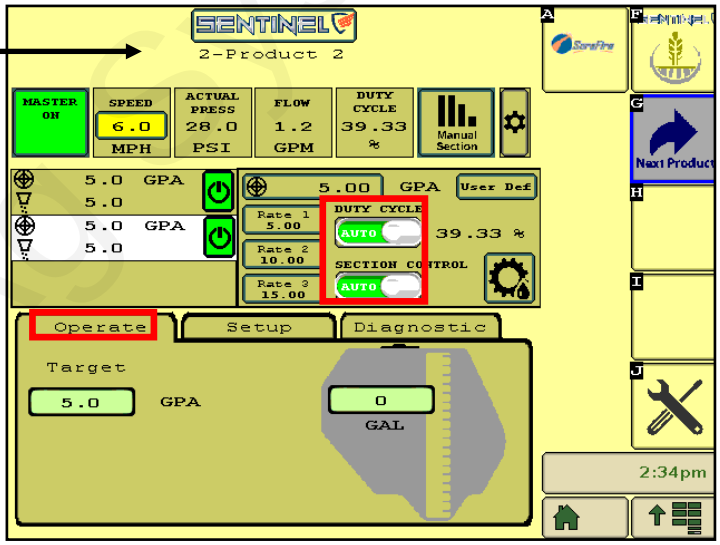
Device - Rate Control or **Rate Control + Flow Monitor**



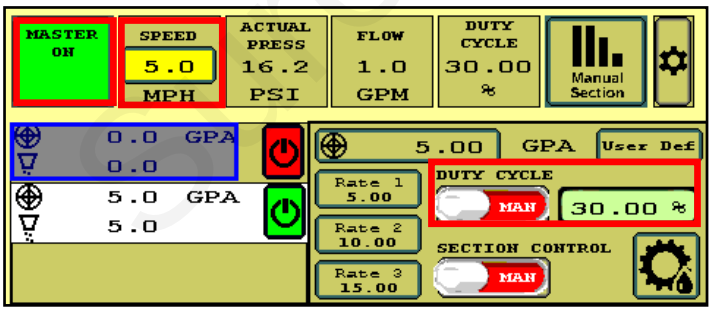
To enter a rate, press **Rate Setup,** select **User Def** and then enter the rate (GPA). Select **Rx** if using a prescription. Check **Rate Smoothing** (10%)

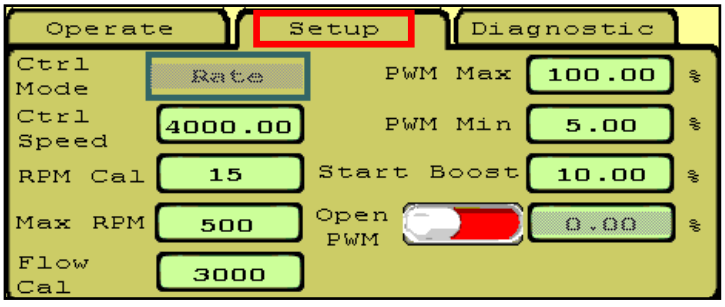


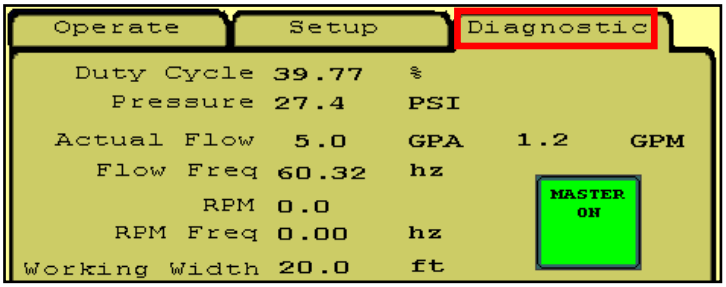
Operate: Normal operation will be set to **AUTO.**
Target is the Target Rate entered on Rate Setup or the current value from the prescription.



To operate manually, press **Speed**, enter a speed, select **DUTY CYCLE MAN**, enter a **DC%** (minimum of 15 for electric, minimum of 30 for hydraulic),
Section Control: MAN. **Master ON.**



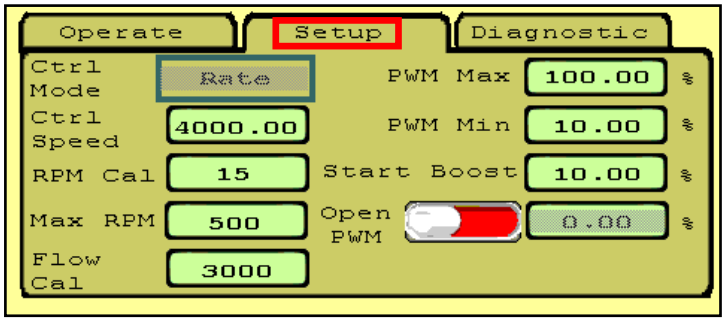




To test the system, you can change the Duty Cycle % as the pump is running. Observe the Flow (GPM) and Pressure with each Duty Cycle %. On an electric pump system, you can do this with one pump plugged in at a time to verify the operation of each pump. Look at the Diagnostic tab for more information.

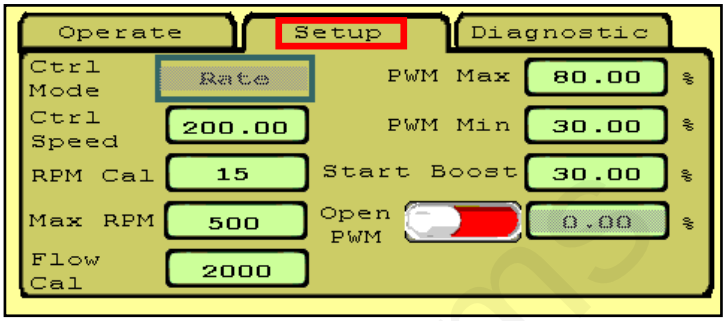
Sentinel HOME Screen for Rate Control -- Setup and Diagnostic Tabs

Setup values are shown for typical **electric** pump system. These can be adjusted as necessary for best operation.



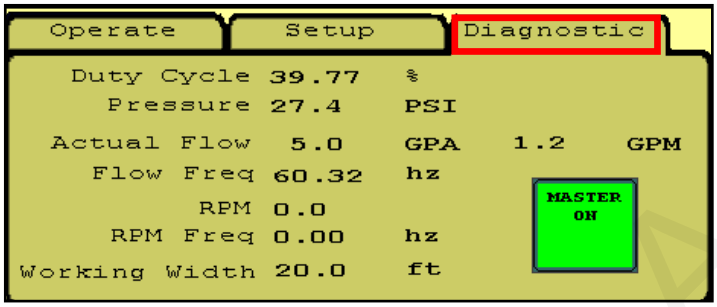
Ctrl Speed: Decrease if pump surges or oscillates back and forth above and below the rate. Increase if pump is slow to adjust.
RPM is not used with electric pumps.

Setup values are shown for typical **hydraulic** pump system. These can be adjusted as necessary for best operation.



Flow Cal can be adjusted slightly if an accurate catch test or field verification indicates it should. Increase Flow Cal if more product is needed. Decrease flow cal if less product is needed.
Decrease **PWM Min** if pump will not slow down enough for low speed/rate/width.

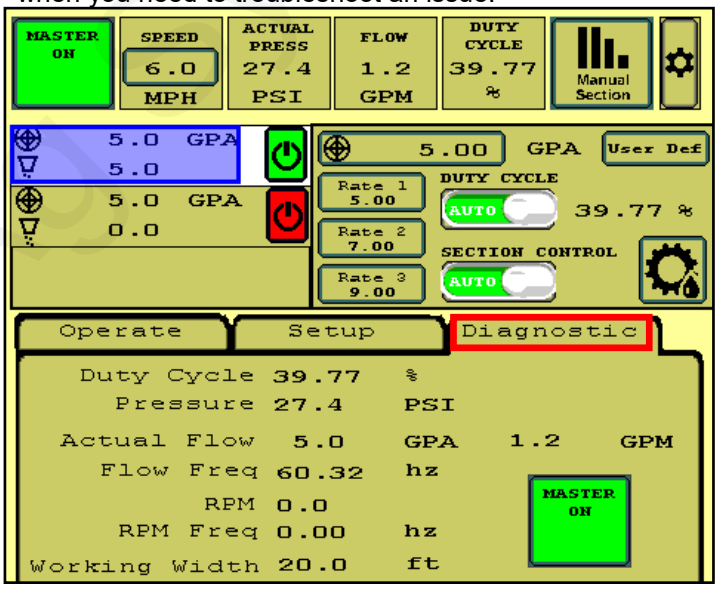
Diagnostic is a screen that can be seen while operating in the field or while testing. The important system parameters can be seen here.



Diagnostic Tip: Note the relationship between Duty Cycle (%), Pressure, Flow (GPM), and RPM (hydraulic pump). If Duty Cycle and RPM increase above what Is normal for a given flow, there could be a restriction on the inlet side of the pump. This could be a plugged strainer or a strainer that gets gelled over, especially with cold fertilizer.

Increased Duty Cycle with no increase in RPM could mean the pump is not getting enough hydraulic flow to spin the pump faster.

Check the **Diagnostic** screen regularly so you have an idea what “normal” operating numbers are. This can help when you need to troubleshoot an issue.



Diagnostic: (PWM) **Duty Cycle** shows the PWM signal sent from the controller to control the pump. On a hydraulic system, this needs to be around 30% before the pump will run. 40%- 50% is a typical operating range. On a normal pass this should be fairly stable (± 2%). The Duty Cycle will adjust for speed, rate changes or width changes (sections going on and off).
Actual Flow shows the GPA being applied based on the Speed and the Machine Width.
Flow is the GPM measured by the flowmeter.
Flow Freq shows the number of pulses per second (hz) being received from the flowmeter. This should be fairly stable (± 2). When diagnosing flowmeter issues, watch this number during a tap test to see if the signal gets from the flowmeter harness connector to the display.
RPM shows the pump RPM on a hydraulic pump equipped with an RPM sensor. This should be less than 500. Can be set at 550 if maximum pump output is required. **RPM Freq** shows the signals received from the RPM sensor. This can also be used during a tap test.
Watch these values regularly during operation so you know what “normal” looks like. For example, a plugged strainer could mean the pump has to run faster than normal to get enough product. This will show up in an increased Duty Cycle and RPM.
Working Width will change as sections turn on and off. It should show the application width at any time.

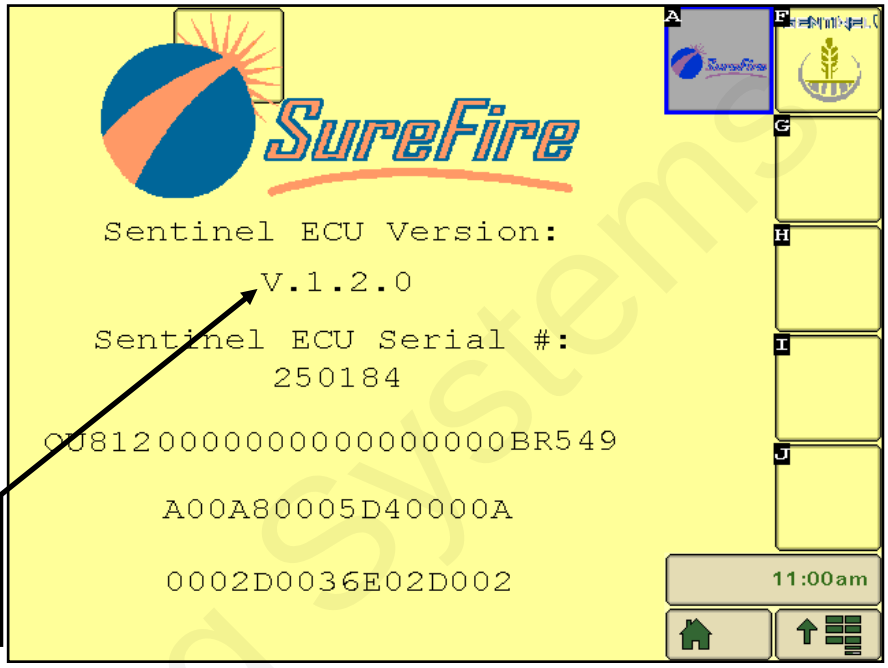
Sentinel Operation

Sentinel Software Information

Sentinel software information can be accessed through most of the Sentinel screens by clicking on the SureFire icon. In the rare instance that you need technical assistance, your SureFire rep may ask for this information.

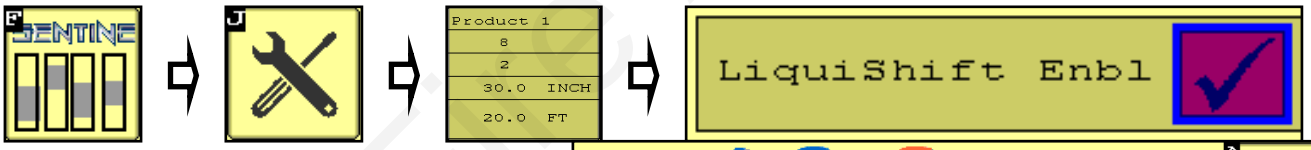
My current software version:

_____



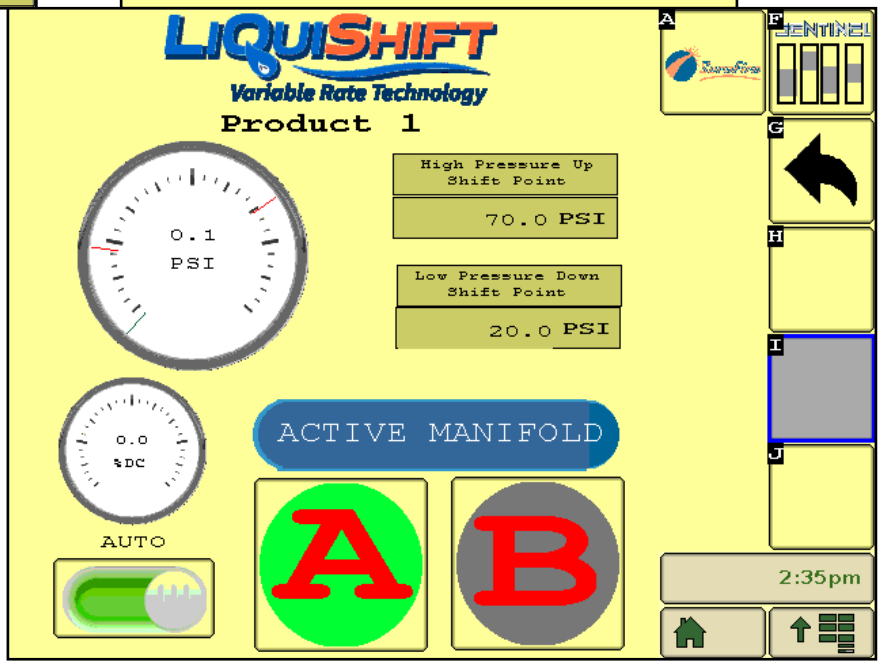
Sentinel and SureFire LiquiShift

If your system includes SureFire's LiquiShift variable rate technology, it can be controlled through the Sentinel ECU provided that the 8-pin harness extension (206-08-XXXX) is installed. To activate LiquiShift, follow these buttons:



The LiquiShift button will now be displayed on the HOME screen

Using Sentinel to control your LiquiShift eliminates the need for the LiquiShift Controller (218-2565Y1). An 8-pin harness extension (206-08-XXXX) is added from the Sentinel ECU harness to the LiquiShift. The Sentinel gives the operator absolute control over the LiquiShift's shift points, real-time pressure readings, and provides in-cab manual control. For more information regarding the use of Sentinel in controlling your SureFire LiquiShift, refer to your LiquiShift system manual.



Sentinel 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 8-9.
2. Check connections:
   A. Tractor ISO plug
   B. CAN and power connections leading to the ECU harness

SCAN ME

Sentinel flow module(s) will not address

1. Make sure that the trunk lines are plugged into the correct port on the module (see pg.8)
2. Make sure that you have all the modules plugged in before touching **RESET ALL ADDRESSES**
3. Unplug ALL modules for that Product and plug the modules in one at a time, making sure the previous module addresses before moving on to the next.
4. Verify that the lights on the module are flashing.
   A. If the module lights do not light up, check the connection to the module and inspect all connections to the ECU harness.
   B. If all connections look good, use a voltmeter to check voltage to the module using the harness drawings on pages 8-12.
   C. If 12 volts is present and module fails to light up, the module may be faulty.

When addressing modules, one or more modules flash green or stay blue

1. Make sure that the implement is set up with the correct number of rows. (see pg. 16-17)
   A. If a module is plugged in that the Sentinel is not expecting, it may flash blue/green to signify that it is addressed, but not expected. Not all ISO displays will respond this way.
2. If your implement is configured with a number of rows not divisible by 4, the last module will not show as "expected". For instance, in the case of a 6-row potato planter, 2 modules are used but only 2 rows are plumbed on the second module. When addressing, module 2 will display as "not expected." When plugged in, it will be issued an address and 6 rows will display on the Sentinel HOME screen. The last 2 rows on the module will be ignored.

Sentinel shows no flow and rows are grey

1. Make sure the **MASTER** button on the Sentinel **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. (see pg. 20) If **USE LIFT SWITCH** box is checked, and a dedicated lift switch is not installed, the Sentinel is disabling flow on all rows because it thinks the implement is up. Uncheck the **USE LIFT 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.
   B. If you are not using the **PUMP SPEED** input on the Sentinel ECU harness and the **USE PUMP SPEED** box is checked, flow will be disabled to all rows. Uncheck this box if not using this feature.
3. Are you performing a stationary flow test? If so, a simulated speed must be entered. (see pg. 20)
4. Is a speed being displayed on the Sentinel **HOME** screen when moving?
   A. If not, change the speed source (see pg. 20)

Sentinel Row Flow Troubleshooting

E
Trouble-Shooting

Individual rows read high or low

1. Are you testing with water? Unless the system is designed for water, row-flow will be uneven. Some rows may not flow if there is not enough pressure.
    A. Increase rate to build a minimum of 15 pounds of system pressure
2. Check row plumbing
    A. Look for pinched or kinked lines to the row
    B. Inspect check valves for plugging or damage
    C. Clean out orifices and inspect placement (seed firmer, stainless tube, etc.) for plugging
    D. Flip the outlet plumbing for 2 rows and determine if the problem follows the row
        1. If the low/high flow reading stays with the same row on the Sentinel, inspect the module for plugging.
        2. Flush the module with warm water
3. Row-flow may be too low for Sentinel to read or product may not be conductive
    A. Increase rate or add a small amount of fertilizer to product to increase conductivity
4. Perform a catch test on several rows to determine if the information being displayed is correct.
5. If the row continues to read high/low, the flow module may be faulty.

NOTE: Water is not always a great conductor. If you are having problems reading flow with water, try adding a small amount of fertilizer to your product tank.

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 check valve springs can make big differences in row-flow. To start out, a user may consider increasing the **TOLERANCE** up to 75% 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?
    A. Use the **IntelliSection** option
    B. Consider disabling alarms with the use of a lift switch
4. Go to the **ROW DETAILS** and disable the problematic row
5. Disable all alarms by checking the **DISABLE ALARMS** box

As-applied rate doesn't match my rate controller

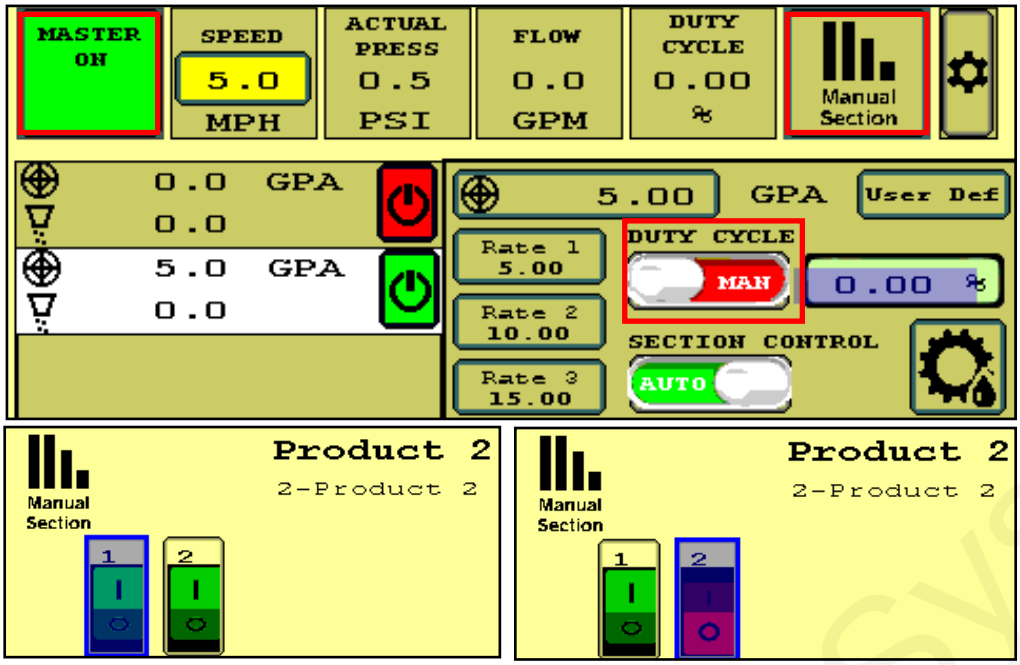
1. Do you have a small implement?
    A. If your implement has few rows, **AUTO RATE** may not calculate correctly. Try using **MANUAL RATE**
2. Use the FLOW ADJUSTMENT input box to adjust the as-applied rate. (see pg. 18)
    NOTE: Don't calibrate the Sentinel to a system that hasn't been calibrated first. Always verify flow by preforming a catch test.

Sentinel Doesn't display speed

1. Change the speed source as reference on page 21. 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 Rate Control Troubleshooting

Section Test or Manual Section Valve Operation and Manual Pump Operation

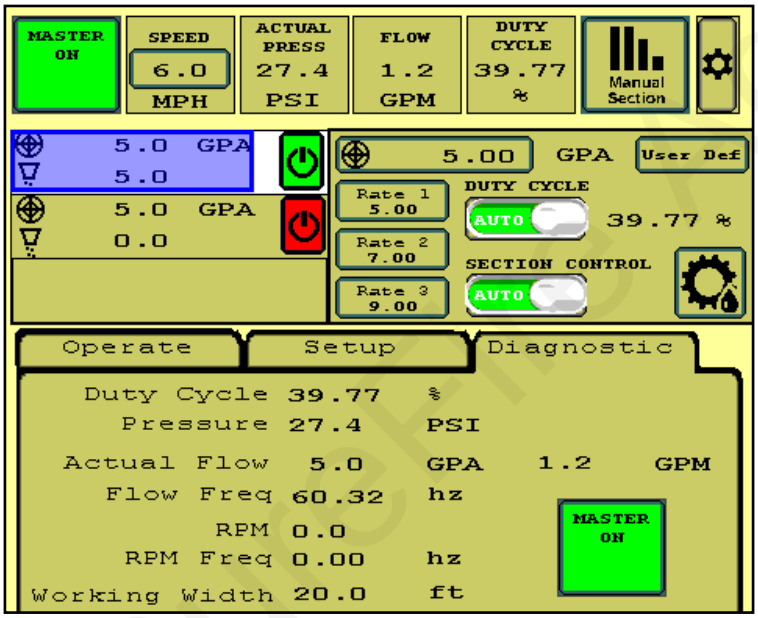


To operate the Section Valves manually, press **Manual Section**, then press any section button to turn the valve off/on.

To test the valves sitting still, put **DUTY CYCLE to MAN, MASTER** must be ON, and there must be a **SPEED** entered to actually open the valve.

To run the pump while doing this, enter a number for the Duty Cycle %. The Flow (GPM) and Pressure should be steady. Adjust DC%.

AUTO Test Operation



1. Enter a **SPEED** (tap the box and enter).
2. Select a **RATE.**
3. **Master ON.** May need to turn Auto Section Control off.
4. Adjust SPEED and RATE to test range.
5. Observe Flow (GPM), Pressure, and Duty Cycle %. On hydraulic pump observe RPM.
6. When testing with water, the pressure will be much less than it will be with a heavier fertilizer. You may have to increase the rate significantly to open all the check valves so all rows will flow.
7. You can go to Manual Section (on the top row) and close some sections to see system response.
8. If Duty Cycle / Rate / Flow oscillate and won't lock in, decrease the Control Speed on the Setup Tab (adjust electric pump by 500, hydraulic by 50). Adjust Control Speed as needed for best field performance.

System Won't Run

1. Is MASTER ON? Is there a SPEED? Is there a RATE? Switch Section Control from AUTO to MANUAL.
2. On **Hardware** screen, uncheck TASK CONTROL. If you have TASK CONTROL checked on the Sentinel, Task Control must be activated and turned ON on the display software.
3. Verify settings for Master Switch and Implement Switch. If these boxes are checked, these items must be plugged into the Sentinel harnessing, not into harnessing for another control module. If using an IMPLEMENT SWITCH for Sentinel, is the orientation correct (check arrow on MASTER ON button)?
4. If there is a DC% showing, but the pump is not running, check the hydraulics or the EPD on an electric pump system. Verify there is voltage on the 2-pin PWM Connector.

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

SureFire recommends flushing your system with adequate amounts of water first. Next, use RV antifreeze to winterize your system by pumping an adequate amount through all components. At the beginning of the next season, begin with water to verify the system is in working order with no leaks.

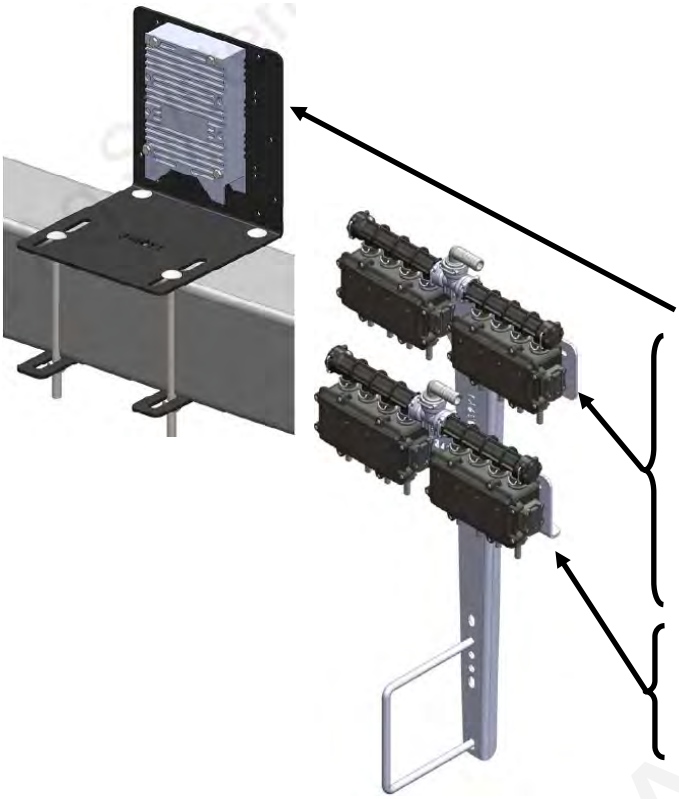
Pre-season Service

(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. Fill system with water and run in Manual mode (Section Test) to verify components and system are in working order.
4. Tighten all clamps. Loose clamps may be evident by leaks on the output side of the system. Loose clamps from the tank to the pump are not always apparent, but can be sources of air getting into the system which can create issues.
5. Push in tubes at all Quick-Connect fittings so they are seated tightly. Tubes that are not fully seated are not always obvious, but may allow air in, which can cause check valves to leak.
6. Be sure all rows are flowing and that all metering tubes/orifices are open. (Note: It will take a higher flow rate with water to create enough pressure to open all the check valves.)
7. Run a flow check to verify that system will lock on to a Target Rate. Pressure will be much lower when testing with water than it will be with fertilizer. In some regions, tap water may not be conductive enough for the Sentinel to read accurately. Adding a small amount of fertilizer to the water will generally help.

Sentinel Accessories

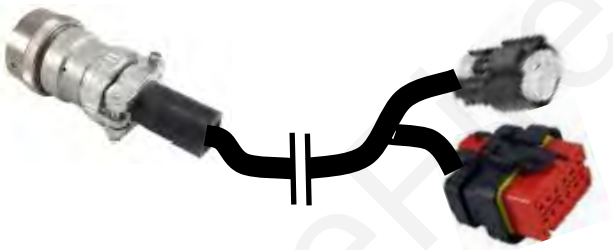
Mounting Brackets



Sentinel Mounting Brackets

Part Number	Description
515-100950	Sentinel ECU Mounting Bracket Kit
515-100201	4-Row Sentinel Mounting Bracket Kit
515-100202	8-Row Sentinel Mounting Bracket Kit
515-100203	12-Row Sentinel Mounting Bracket Kit
515-200201	4-Row **Low-Profile** Bracket Kit
515-200202	8-Row **Low-Profile** Bracket Kit
515-200203	12-Row **Low-Profile** Bracket Kit
515-100701	4-Row Dual Product Add-on Kit
515-100702	8-Row Dual Product Add-on Kit
515-100703	12-Row Dual Product Add-on Kit

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
501-100520 / 100525	Push Button Switch for Parallel Arms

GPS Speed Receiver

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

Notes:

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