SurePoint™ Ag Systems

SENTINEL

Sentinel Rate Control and Row Monitoring

Installation and Operator's Manual

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Abstract

This manual provides installation, setup, operation, calibration, maintenance, and troubleshooting information for the SurePoint Sentinel® Liquid Rate Control and Row Monitoring system. Sentinel is an ISOBUS-compatible liquid application platform that provides automated rate control, row-by-row flow monitoring, or both functions within a single system.

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Table of Contents

1. Safety - General 1
    1.1. Recognize Safety Information 1
    1.2. Signal Words 1
    1.3. Personal Protective Equipment (PPE) 2
    1.4. A Word to the Operator 2
    1.5. Chemical Safety 2
    1.6. Park Machine Safely 2
    1.7. Follow Safety Instructions 3
    1.8. Replace Safety Signs 3
    1.9. Safety - Welding 3
2. About SurePoint Sentinel 5
    2.1. Sentinel Rate Control 5
        2.1.1. Plumbing Connections 6
        2.1.2. Harness Connections 6
    2.2. Sentinel Row Monitoring 8
        2.2.1. Plumbing Connections 8
        2.2.2. Harness Connections 8
    2.3. Supported Displays 9
    2.4. Required Connection 10
    2.5. Installation Flow 10
3. ECU Installation 13
    3.1. Sentinel Harness Overview 13
4. Rate Control Installation 15
    4.1. System Overview 15
    4.2. Hardware Installation 15
    4.3. Plumbing Connections 15
    4.4. Harness Connections 16
    4.5. Next Steps 16
5. Row Monitoring Installation 17
    5.1. System Overview 17
    5.2. Hardware Installation 17
    5.3. Plumbing Connections 18
    5.4. Harness Connections 19
    5.5. Next Steps 20
6. Accessing Sentinel 21
    6.1. John Deere 4640 21

SurePoint Ag Systems

6.2. John Deere 2630 21
6.3. Case IH AFS Pro 700 / Pro 1200 22
6.4. Ag Leader InCommand 23
6.5. Other Displays and Features 24
7. Set Up Sentinel 25
7.1. Sentinel Installation Wizard 25
7.2. Connecting Flowmeter Modules 32
7.2.1. Other LED Signals 35
7.2.2. Flowmeter Module Orientation 36
7.3. Synchronize Sentinel with an Existing Rate Controller 37
7.4. Rate Control Functional Verification 39
8. Sentinel Interface 41
8.1. Sentinel Icons 41
8.2. Sentinel Home Screen 42
8.3. Sentinel Toolbar Customization 44
8.4. Totalizers and Counters 45
8.4.1. Totalizer Functions 46
8.4.2. Using Totalizers 46
8.4.3. Resetting Totals 46
8.4.4. Best Practices 47
8.4.5. Counter Functions 47
8.5. Product Configuration 48
8.5.1. Configuring Products 49
8.6. Speed Screen 52
8.7. Rate Screen 53
8.8. Implement Screen 55
8.9. Hardware Screen 55
8.10. Auto SCAN and Alarms 57
8.10.1. Alarm and SCAN Settings 57
8.10.2. Global Settings 1/2 Screen 57
8.11. Rows Screen 59
8.12. Diagnostics 60
8.12.1. Nozzle Test 60
8.12.2. Rate Calibration Catch Test 62
8.12.3. System Information Screen 65
8.12.4. Auxiliary Settings 65
8.13. Flowmeter Module Diagnostics Screen 67
8.13.1. Setting/Resetting Flowmeter Module Addresses 69

SurePoint Ag Systems

9. Sentinel Harness Part Numbers 71
9.1. ECU Harnesses 71
9.2. CAN Trunklines 71
9.3. Front ISO Extension Harnesses 71
10. Operating Sentinel 73
10.1. Operating Sentinel: Rate Control 73
10.1.1. Operate, Setup, and Diagnostic Tabs 74
10.2. Operating Sentinel: Row Monitoring 78
10.2.1. Rows Screen Example 81
10.2.2. Interpreting Row Behavior During Operation 82
10.2.3. Interpreting Overall Row Patterns 83
10.2.4. Alarms 83
11. Fine-Tuning Rate Control 85
11.1. Recommended Starting Values 85
11.2. Tuning Recommendations 85
11.2.1. Control Speed 85
11.2.2. RPM Calibration 86
11.2.3. Maximum RPM 86
11.2.4. Flow Calibration 86
11.2.5. PWM Maximum 87
11.2.6. PWM Minimum 87
11.2.7. Start Boost 87
11.2.8. Open PWM 88
12. Fine-Tuning Row Monitoring 89
12.1. Recommended Starting Values 89
12.2. Tuning Recommendations 89
12.2.1. Tolerance 89
12.2.2. Row Smoothing 89
12.2.3. Flow Adjustment 89
13. Care and Maintenance 91
13.1. Cleaning 91
13.2. Winterization 91
13.3. Pre-Season Service 91
14. Troubleshooting 93
14.1. General Troubleshooting 93
14.1.1. Display Does Not Show Sentinel 93
14.1.2. Sentinel Doesn't Display Speed 93
14.2. Troubleshooting Rate Control 94

SurePoint Ag Systems

14.2.1. Section Valves Do Not Open or Close During Manual Section Test 94
14.2.2. Pump Does Not Run During Manual Pump Operation 94
14.2.3. Rate, Flow, or Duty Cycle Oscillates During AUTO Operation 95
14.2.4. Sentinel Does Not Operate 95
14.2.5. Pump Does Not Run Even Though Duty Cycle Is Displayed 96
14.2.6. Working Width Does Not Display or Change 96
14.2.7. As-Applied Rate Does Not Match Rate Controller 97
14.3. Troubleshooting Row Monitoring 97
14.3.1. Interpreting Row Patterns 98
14.3.2. Sentinel Shows No Flow and Rows Are Gray 98
14.3.3. Sentinel Flowmeter Module(s) Will Not Address 98
14.3.4. Modules Flash Green or Stay Blue 99
14.3.5. Sentinel Alarms Too Often 99
14.3.6. Individual Rows Read High or Low 100
15. Technical Resources 103
15.1. Flowmeter Modules for Isolated Rows 103
15.2. Flowmeter Module Parts for Manifold Feed 104
15.3. Flowmeter Module Connections 105
15.4. Flowmeter Module Trunkline Drawings 105
15.5. Trunkline to System Connections 107
16. Index 109

SurePoint Ag Systems

1. Safety - General

Safety alert symbols found throughout this manual are 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.

1.1. Recognize Safety Information



This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

1.2. Signal Words

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

DANGER

DANGER indicates imminently hazardous situation that, if not avoided, can 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

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.

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CAUTION

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

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

1.3. Personal Protective Equipment (PPE)

Wear clothing and personal protective equipment appropriate for the job. Wear steel-toed shoes when operating. Wear hearing protection when exposed to loud noises. Do not wear additional hearing impairment devices such as radio headphones, etc.

1.4. 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.

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

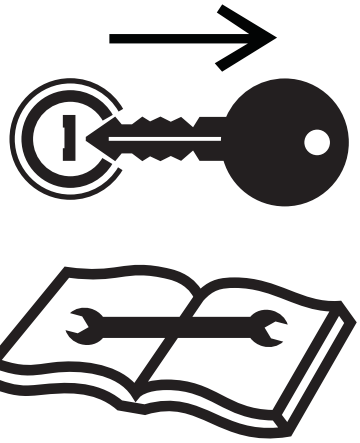
1.5. Chemical Safety

Chemicals used in agricultural applications can be harmful to personal health and/or the environment if not used correctly. Always follow all label directions for effective, safe, and legal use of any chemicals.

1.6. Park Machine Safely

Before working on the machine:

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- Lower all equipment to the ground.
- Stop the engine and remove the key.
- Disconnect the battery ground strap
- Display a "DO NOT OPERATE" tag in the operator station.

1.7. Follow Safety Instructions

Carefully read all safety messages in this instruction. Read the product operator's manual for operating instructions and safety messages. Do not let anyone operate without instruction.

1.8. Replace Safety Signs

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

1.9. Safety - Welding



Welding can cause significant damage to electronic components. Ensure that electronics are isolated when welding. Before welding:

- On self-propelled equipment, disconnect the battery ground cable (-).
- On towed implements, disconnect the wiring harnesses from the tractor.

SurePoint Ag is not responsible for damage to electronic components caused by welding.

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2. About SurePoint Sentinel

Sentinel® is an ISOBUS-compatible control and monitoring platform designed for liquid application systems. It provides:

- **Rate Control:** Sentinel Rate Control serves as the primary rate controller for the implement. The ECU monitors machine speed and system performance data and adjusts pump output to maintain the target application rate.
- **Row Monitoring:** Sentinel Row Monitoring tracks application performance at each row to identify flow variations, restrictions, and blockages. The system utilizes solid-state, electromagnetic flow measurement technology to capture flow data without moving parts.

  The system performs continuous cross-row flow analysis and generates operator alerts for:
  - Overapplication
  - Underapplication
  - Flow restriction
  - Full row blockage

  Sentinel Row Monitoring can function as an independent system alongside third-party rate controllers, allowing operators to add per-row insight without replacing existing control hardware.
- **Rate Control with Row Monitoring**: Sentinel Rate Control with Row Monitoring combines automated liquid application management and row-by-row diagnostics into a unified hardware and software interface. The integrated system performs two functions simultaneously:
  - Command Tracking: Manage total system output based on the target application rate.
  - Delivery Verification: Measure actual fluid delivery independently at each row drop point.
  - Performance Verification: Verify that actual application matches the commanded rate.

  The Electronic Control Unit (ECU) processes control-loop data and sensor feedback. Sentinel compares target rates to real-time flow data and verifies that the actual application matches configured rates across all rows.

2.1. Sentinel Rate Control

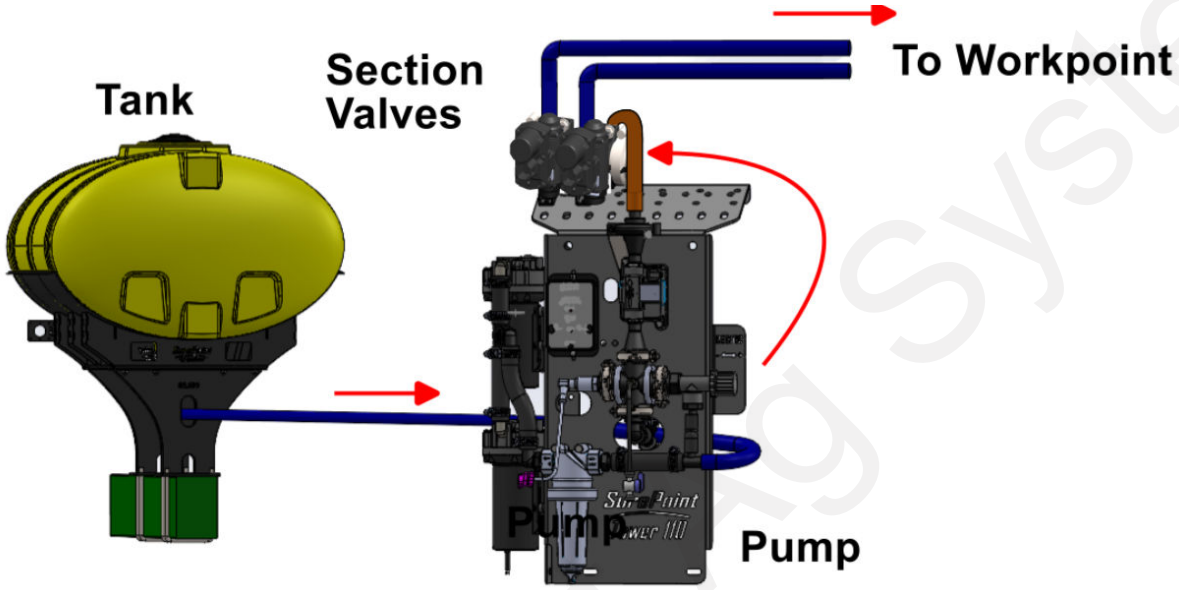
Use the following examples as a reference when installing a Rate Control system.

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2.1.1. Plumbing Connections

This illustration shows an example of the plumbing routing for a SurePoint rate-control system with these components:

- Tank
- Pump
- Section Valves



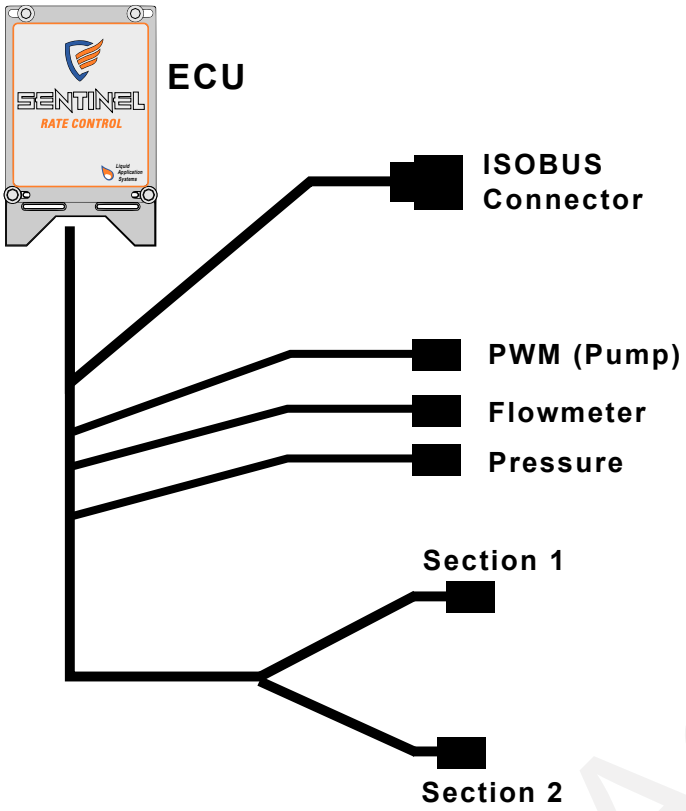
The connection to the workpoint can optionally include check valves or dual metering tubes based on your desired configuration.

2.1.2. Harness Connections

This illustration shows an example of the harness connections for a complete SurePoint liquid application system with these components:

- ECU
- ISOBUS
- PWM (Pump)
- System flowmeter
- Pressure
- Section 1, Section 2 (Section valves)

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Install CAN terminators on all open CAN connections.



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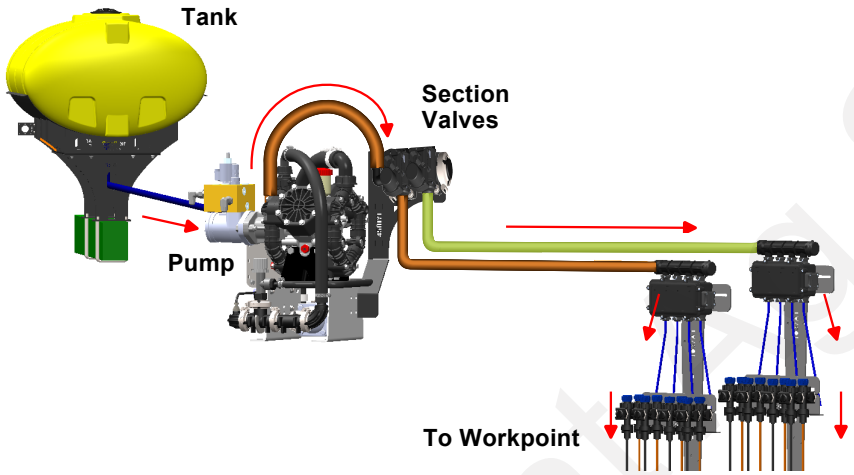
2.2. Sentinel Row Monitoring

These sections show an example of a complete system setup for Row Monitoring.

2.2.1. Plumbing Connections

This illustration shows an example of the plumbing for a SurePoint system with these components:

- Tank
- Pump
- Section valves
- Sentinel flowmeter modules

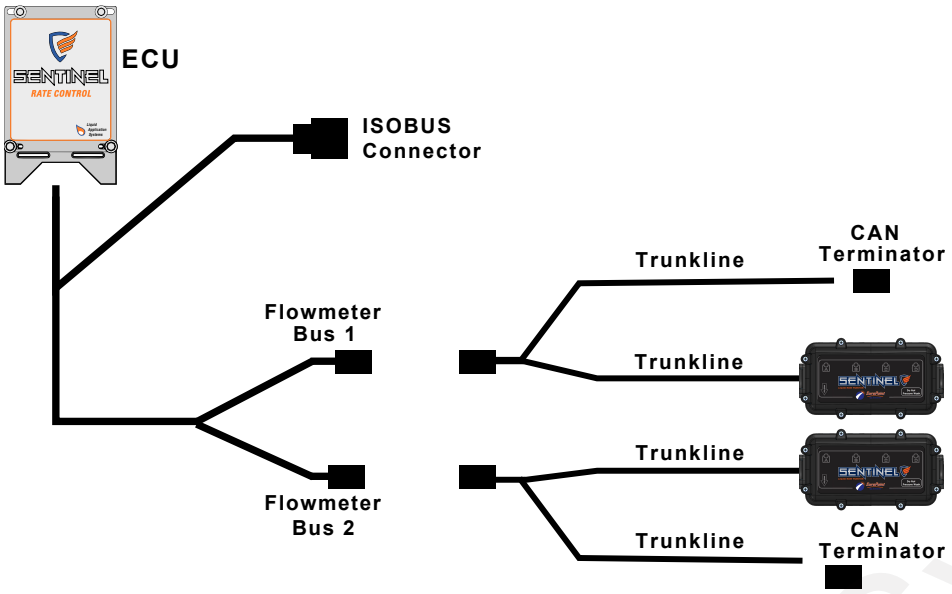


The connection to the workpoint can optionally include check valves, zip valves, or dual metering tubes based on your desired configuration.

2.2.2. Harness Connections

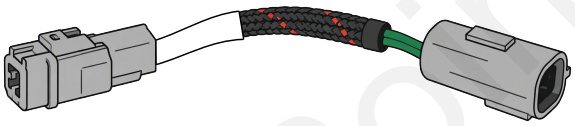
This illustration shows an example of the harness connections for a SurePoint liquid application system with these components:

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- ECU
- ISOBUS
- Bus 1, Bus 2 (Flowmeter modules)
- CAN trunklines as needed for flowmeter modules

Install CAN terminators on all open CAN connections.



2.3. Supported Displays

SurePoint currently supports Sentinel on the following displays:

- John Deere G5
- John Deere 2630

NOTE

The 2630 display supports only one ISOBUS ECU when used with Task Control. Because of this, if using this display to control planter functions, task control functions like section control will not work with Sentinel.

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- John Deere 4640
- Ag Leader InCommand Go
- Ag Leader InCommand 1200
- Ag Leader InCommand 800
- Case IH Pro 700
- Case IH Pro 1200
- Trimble TMX-2050
- Trimble GFX-1060
- Trimble GFX-1260

Using Sentinel with other displays may reduce functionality.

2.4. Required Connection

A 9-pin or 12-pin ISO connector is required on your implement to connect the Sentinel ECU to the implement bus. Some equipment comes with this connection pre-installed. If one is not available, install the required SurePoint harness and adapter components. Contact SurePoint Technical Support or your SurePoint representative if assistance is needed selecting the correct components.

2.5. Installation Flow

The following table describes the installation flow for installing Sentinel for rate control, row monitoring, or both.

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If installing...	Complete these section in order:
Rate control only	1. Complete ECU Installation (page 13) 2. Proceed to Rate Control Installation (page 15). 3. Set Up Sentinel (page 25)
Row monitoring only	1. Complete ECU Installation (page 13). 2. Proceed to Row Monitoring Installation (page 17). 3. Set Up Sentinel (page 25).
Rate control with row monitoring	1. Review ECU Installation (page 13) and verify. 2. Review Rate Control Installation (page 15)and verify. 3. Complete Row Monitoring Installation (page 17). 4. Proceed to Connecting Flowmeter Modules (page 32).
Adding row monitoring to an existing Sentinel rate-control install	1. Review ECU Installation (page 13) and verify. 2. Review Rate Control Installation (page 15)and verify. 3. Complete Row Monitoring Installation (page 17). 4. Proceed to Connecting Flowmeter Modules (page 32).

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3. ECU Installation

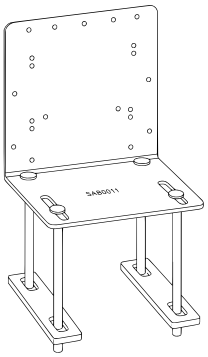
Before you can use Sentinel for Rate Control, you must install the Sentinel ECU.

ECU



Sentinel 2000 ECU

Bracket



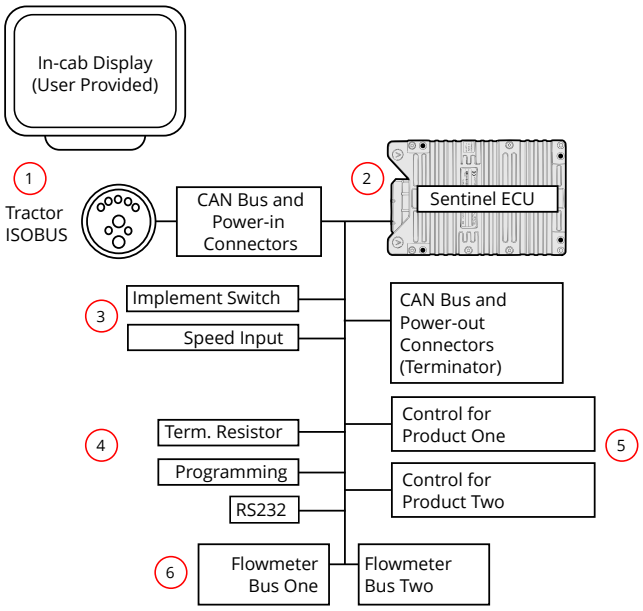
Installation Steps

1. Install the ECU on your implement or tractor in a location where it will not interfere with operation. Use the provided bracket and bolts to mount the ECU. The bracket supports both vertical and horizontal mounting of the ECU.
   Note: When mounted vertically, the connector should point downward.
2. If necessary, route the provided ISO extension cable from the implement hitch to the desired Sentinel ECU mounting location.
3. Locate the 2-pin Molex power connector and the 12-pin Ampseal POWER/CAN connector or the 9-pin ISO connector that the Sentinel ECU will be connected to. These connectors are labeled. Remove the terminator.
4. Connect the harness connector labeled ECU to the Sentinel ECU.
5. Connect the other end of the harness to the Molex/Ampseal POWER/CAN connection.
6. Use the previously removed terminator to terminate the ISO OUT POWER/CAN connection found on the ECU harness.

3.1. Sentinel Harness Overview

SurePoint Sentinel components communicate with the Sentinel ECU over a proprietary CAN network. The Sentinel ECU transmits flow data over ISOBUS and displays the user interface on the in-cab display. Sentinel communication requires several harness connections:

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1. **Tractor Connection:** The SurePoint Sentinel system is compatible with a wide range of implements. Installation may begin at the tractor ISOBUS connection. The SurePoint Front ISO Extension transmits power and communication signals to the Sentinel ECU. For tractors that already use an ISOBUS connection, SurePoint offers ISOBUS Y-harnesses that split the existing connection without interrupting operation. If the implement has a 12-pin ISO connector, connect the ECU harness directly. If connection to the tractor's 9-pin ISO connector is required, use a SurePoint Front ISO Extension.
2. **ECU:** The Sentinel ECU can perform Rate Control, Row Monitoring, or Rate Control with Row Monitoring.
3. **Implement Height and Speed Input:** These optional inputs provide additional functionality in applications that require them.
4. **Service Connections:** The Terminating Resistor, Programming Connector, and RS-232 Connector are for service and maintenance only. Do not use for normal system operation.
5. **Product Control:** The Sentinel ECU incorporates embedded software that provides customized control of up to four products total.
6. **Bus Connections:** Bus connection points simplify system wiring by allowing each side of the implement to connect directly to the ECU harness. This design eliminates a continuous daisy-chain connection across the implement, reducing harness complexity and making installation and service easier.

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4. Rate Control Installation

If you are installing Sentinel for Rate Control this section provides instructions for hardware, plumbing, and harness installation.

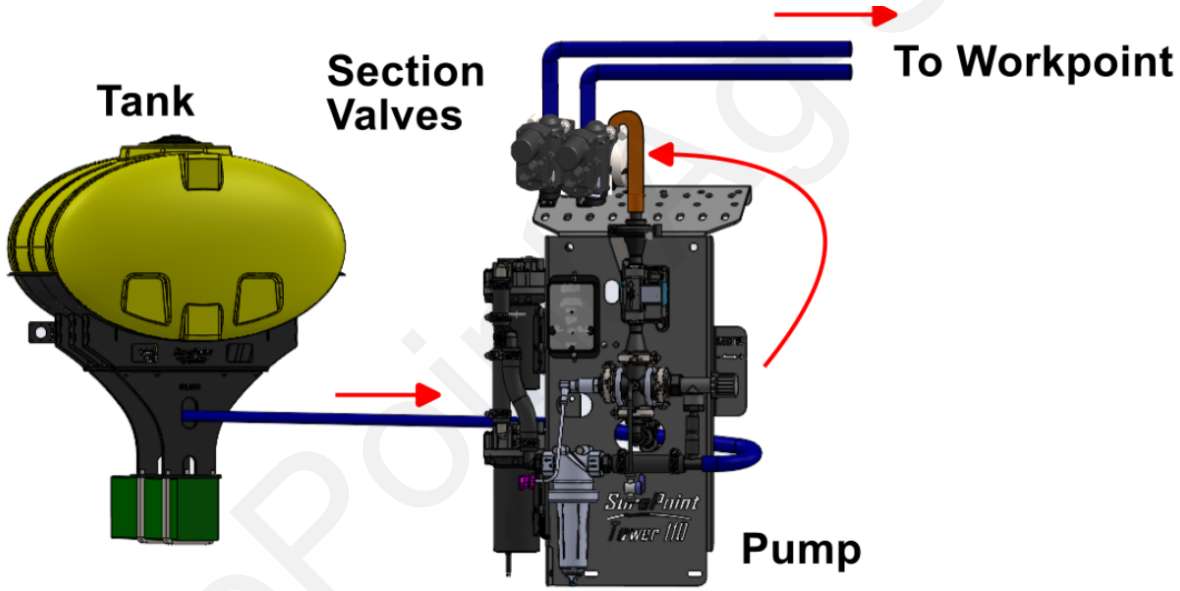
Installation Prerequisites

Before installing Rate Control:

- Complete ECU Installation (page 13)

4.1. System Overview

The following illustration provides an overview of the plumbing connections needed for a typical Rate Control installation. Your specific application may differ.



4.2. Hardware Installation

Once you have installed the Sentinel ECU, follow these steps to install Rate Control components.

With the tractor powered off, install or connect your pump(s). SurePoint recommends our Tower electric or PumpRight™ hydraulic pumps for best compatibility with Sentinel Rate Control. See the Tower or PumpRight™ documentation for detailed pump installation instructions.

4.3. Plumbing Connections

To install plumbing for Rate Control:

1. Route plumbing connections from your tank to the pump.
2. Connect pump output to section valves.
3. Route the section valve output as follows:
   - If using Sentinel for Rate Control only, plumb the output to your workpoint.
   - If using Sentinel for Row Monitoring, route the output to the Flowmeter Modules.

4.4. Harness Connections

After plumbing is complete, connect the Sentinel harness.

1. Route the Sentinel harness from the ECU to the pump location and secure it, ensuring that it is routed in a way that prevents chafing or pinching.
2. Connect the connector labeled **PWM** to the EPD or hydraulic control valve.
3. Connect the **Flowmeter** connector to the system flowmeter.
4. Connect the **Pressure** connector to the pressure transducer if applicable.
5. Connect the **RPM** connector to the RPM sensor if applicable.
6. Locate the **Product 1** / **Product 2** connectors from the Sentinel harness and connect them to the Pump Final Harness.

4.5. Next Steps

If you are using Sentinel only for Rate Control, your installation is complete and you should continue to Set Up Sentinel (page 25). If you are also installing Row Monitoring, proceed to Row Monitoring Installation (page 17).

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5. Row Monitoring Installation

If you are installing Sentinel for Row Monitoring, this section provides instructions for hardware, plumbing, and harness installation.

Installation Prerequisites

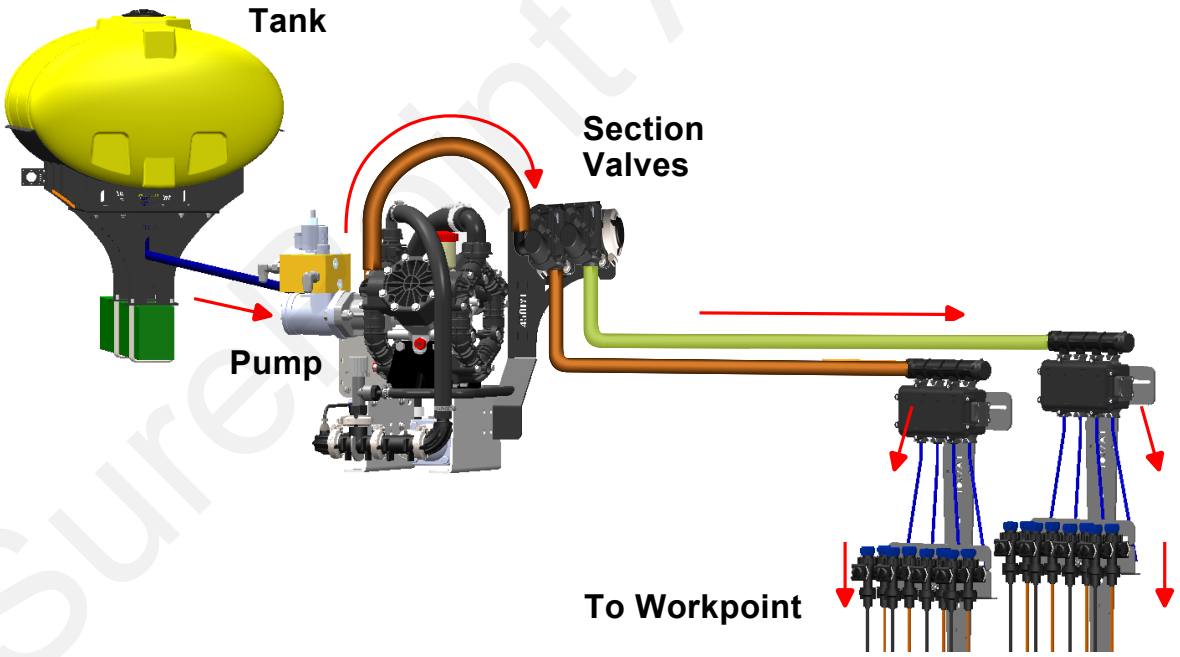
Before installing Row Monitoring:

- Complete ECU Installation (page 13).
- Complete Rate Control Installation (page 15) if Sentinel will handle Rate Control for your system.

5.1. System Overview

The following illustration provides an overview of the plumbing connections needed for Row Monitoring. Your specific application may differ.

The plumbing shown below is also used when combining Rate Control and Row Monitoring. In those systems, Sentinel uses the system flowmeter and pump control hardware described in Sentinel Rate Control while simultaneously monitoring individual rows using Flowmeter Modules.



5.2. Hardware Installation

Row Monitoring requires the installation of Flowmeter Modules on the implement to monitor the flow of product.

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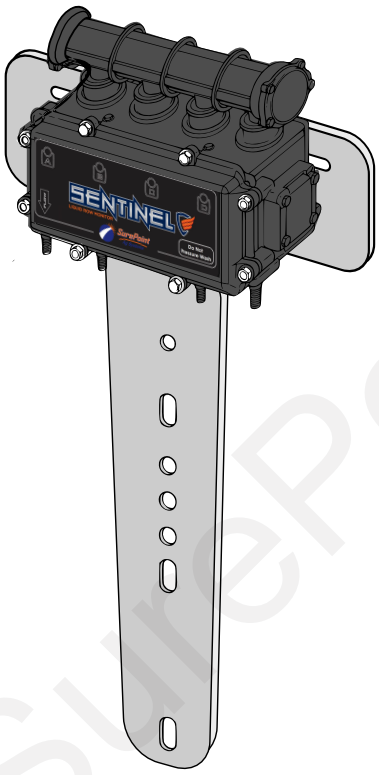
To install Sentinel for Row Monitoring:

1. Mount the provided Flowmeter Module brackets to the implement. SurePoint recommends installing modules near the center of the rows they will be feeding to minimize plumbing and harness routing complexity and simplify service.
2. Mount the Flowmeter Modules on the brackets. Orient all brackets in the same direction, noting the direction of flow.

5.3. Plumbing Connections

Connect the Flowmeter Modules to the manifolds according to the required section-control configuration. See Flowmeter Module Parts for Manifold Feed (page 104) or Flowmeter Modules for Isolated Rows (page 103) for applicable fittings and components.

To install plumbing for Row Monitoring:



1. Lubricate the O-rings prior to installation of the manifold (or other feed plumbing) to prevent rolling, stretching, or tearing.
2. Insert the male plugs into the top of the Flowmeter Module, secure them with fork fittings, and connect them to the manifold.
3. Insert outlet hose barb or quick connect fittings into the bottom ports of the module and secure with fork fittings.
4. Connect the Flowmeter Module outputs to your workpoint so that each output feeds one row.

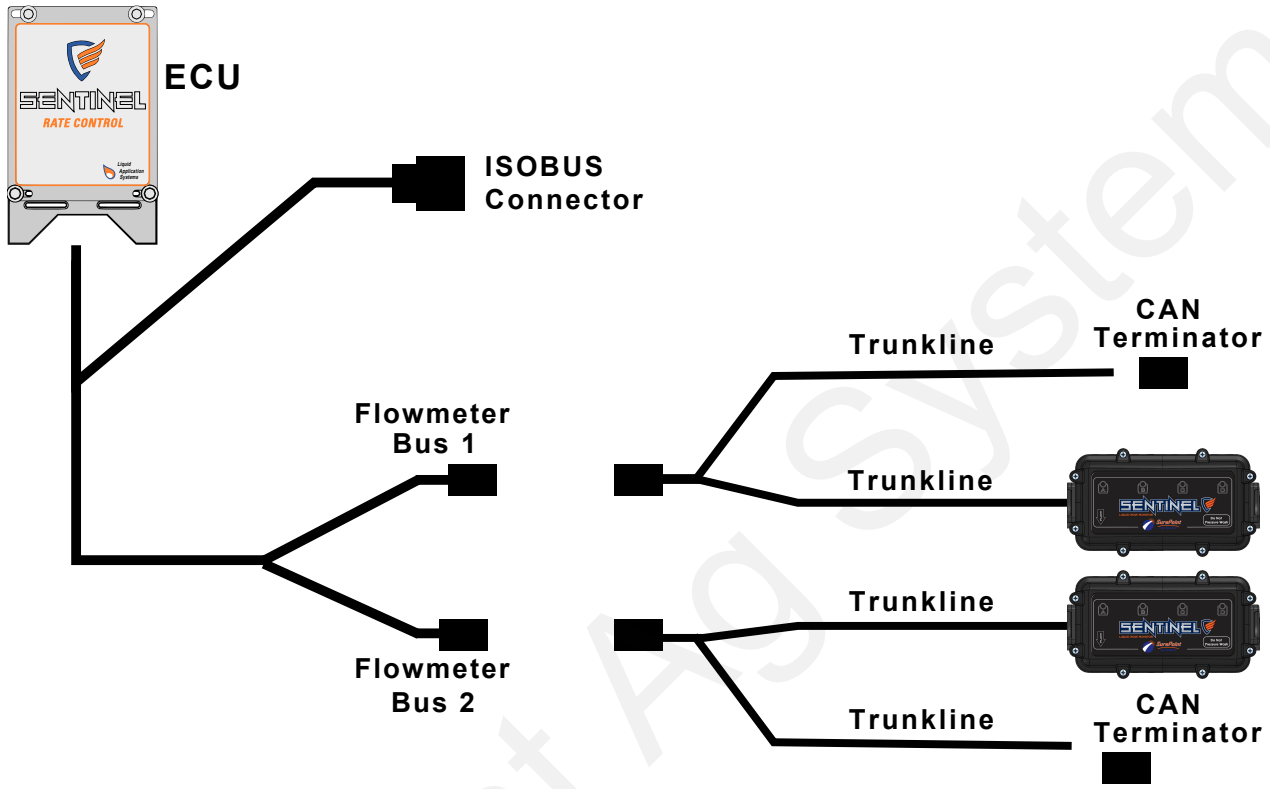
> **NOTE**
>
> If using CAN/Zip Valves, install them inline between the Flowmeter Module output and the workpoint.

5. Route plumbing connections from your liquid supply system to the Flowmeter Modules.
6. If you have not already done so, plumb the pump to the tank.

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5.4. Harness Connections

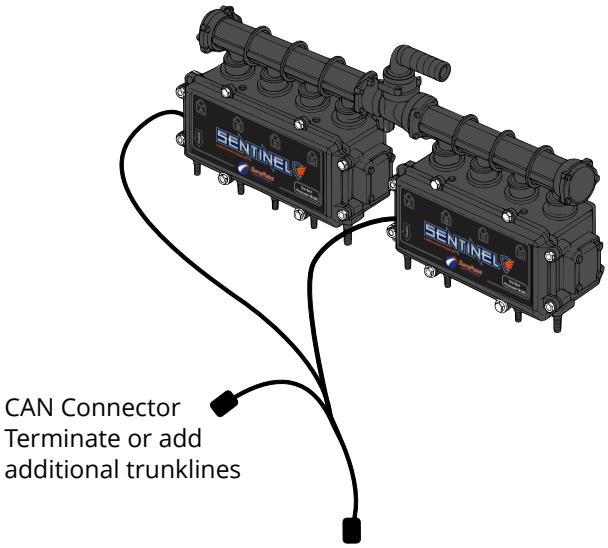
Connect the harness:



Install CAN terminators on all open CAN connections.



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Connect the Flowmeter Modules together using CAN trunklines. Connect the trunkline to the Flowmeter Module port labeled +12V DC, labeled with a gray sticker. Install a dust plug in any unused module port. Do not leave CAN connections open.

When a terminator is removed to install a trunkline, the terminator must be relocated to the end of the trunkline to maintain proper CAN bus termination.

Use of both Flowmeter Bus connections on the ECU harness is optional. If Flowmeter Bus 2 is not used, install a terminator on that connector.

1. If you are installing Sentinel for Row Monitoring only, connect the harness to your tractor's ISOBUS connector and to the Sentinel ECU. If you are installing Row Monitoring with Rate Control, you should have already connected your harness to the system flowmeter, pump control, and other needed connections.
2. Connect the Flowmeter Modules to the CAN trunklines.
3. Connect the trunklines to the main Sentinel harness.

5.5. Next Steps

Continue to Set Up Sentinel (page 25).

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6. Accessing Sentinel

Sentinel is accessed on in-cab displays as a virtual terminal (VT)/virtual implement (VI). Because Sentinel is ISOBUS-compliant, it can operate on a range of displays. Follow the instructions below to access Sentinel on your specific screen.

6.1. John Deere 4640

To access Sentinel on the John Deere Gen4 or G5 display:

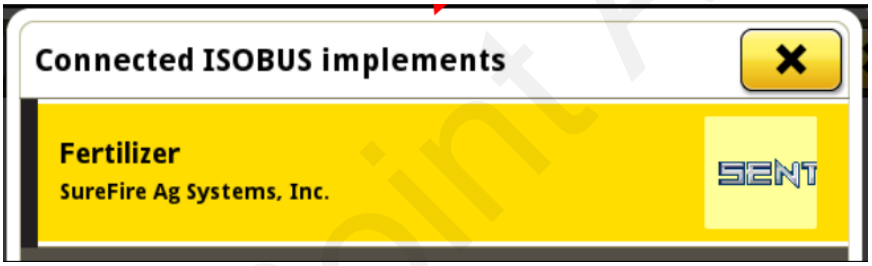
1. Select **ISO** from the 4640 Home screen.



2. If you have more than one ISOBUS implement attached, it may be necessary to select **ISOBUS Menu** to open the ISOBUS selection list.



3. Select **Sentinel** from the list.



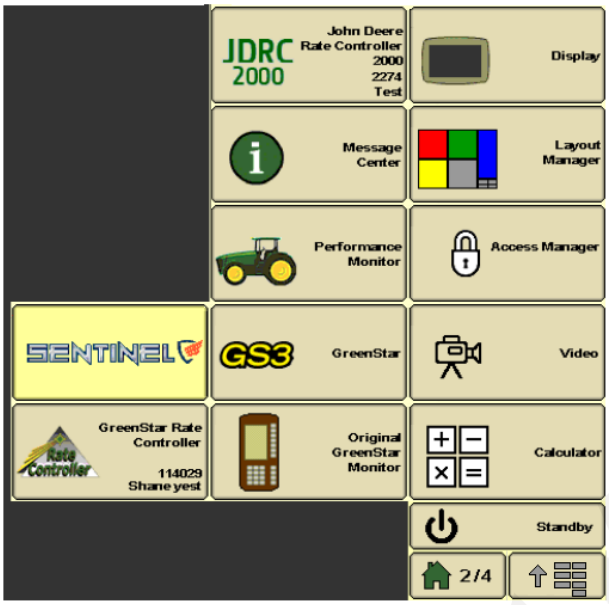
6.2. John Deere 2630

To access Sentinel on a John Deere 2630 display:

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1. Sentinel should appear automatically on the Home screen of the 2630 after the initial connection.

> **NOTE**
>
> It may take several minutes for Sentinel's interface to load the first time it is connected. Subsequent loading should be significantly faster.



2. Select **Sentinel**.

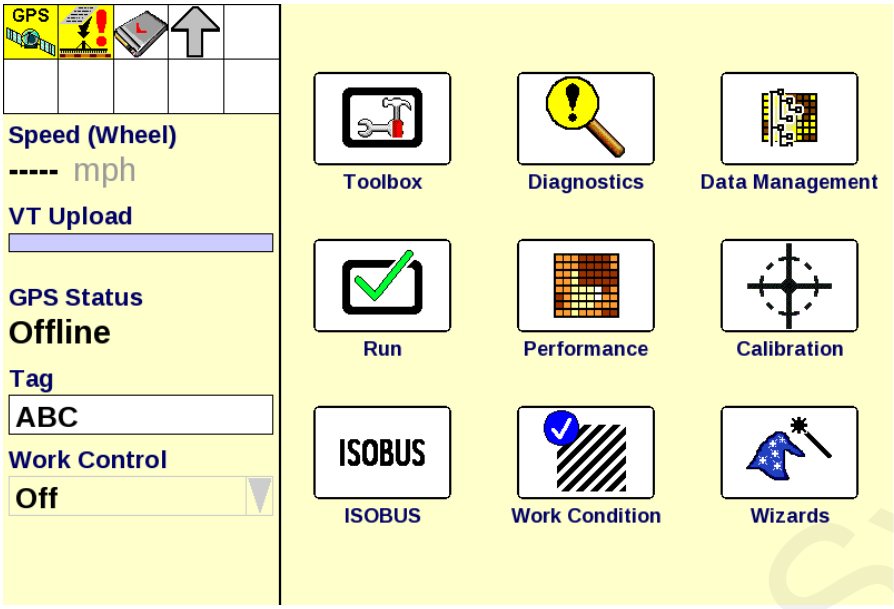
> **NOTE**
>
> The 2630 display supports only one ISOBUS ECU when used with Task Control. Because of this, if using this display to control planter functions, task control functions like section control will not work with Sentinel.

6.3. Case IH AFS Pro 700 / Pro 1200

To access Sentinel on a Pro 700 display:

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1. Select **Toolbox > Layout** to tell the display to update the list of connected devices.



> **NOTE**
>
> It may take several minutes for the display to find and load Sentinel's interface the first time it is connected. Subsequent loading should be significantly faster.

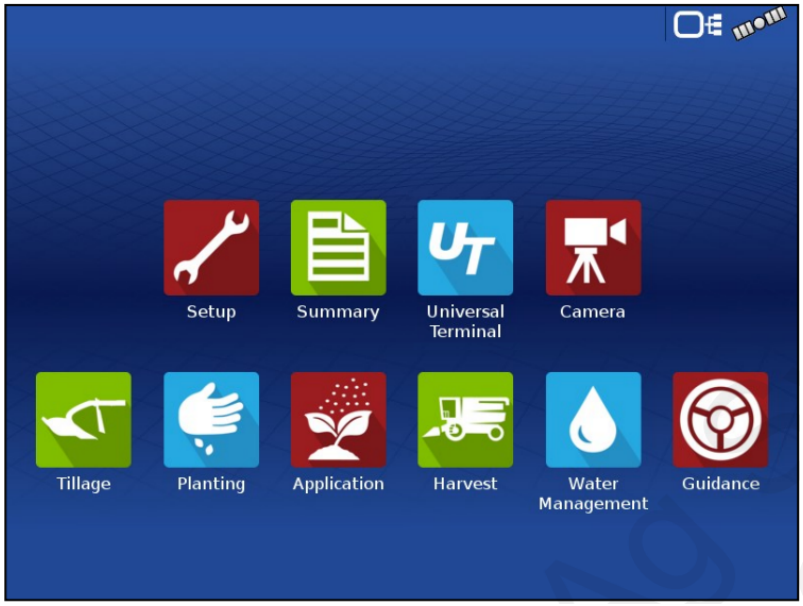
2. Select **ISOBUS** to display the list of ISOBUS devices or select **Sentinel**.

6.4. Ag Leader InCommand

To access Sentinel on the Ag Leader InCommand:

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1. Select **Universal Terminal**.



2. Select **Sentinel**.



6.5. Other Displays and Features

SurePoint Technical Support has additional screenshot-based instructions for configuring displays to use Sentinel. This includes setting up Task Control, Section Control, Work Setup, and other options depending on display.

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7. Set Up Sentinel

Sentinel can be installed in three different configurations:

- Rate Control only
- Row Monitoring only
- Rate Control with Row Monitoring

7.1. Sentinel Installation Wizard

After completing Sentinel installation, including all plumbing connections and all harness connections, proceed to configure Sentinel from the display.

NOTE

Not all screens from this section apply to every Sentinel installation. Some screens are shown only for Rate Control, others only for Row Monitoring. The Installation Wizard shows only the appropriate screens for the selected configuration.

1. Select **Tools** to configure Sentinel.

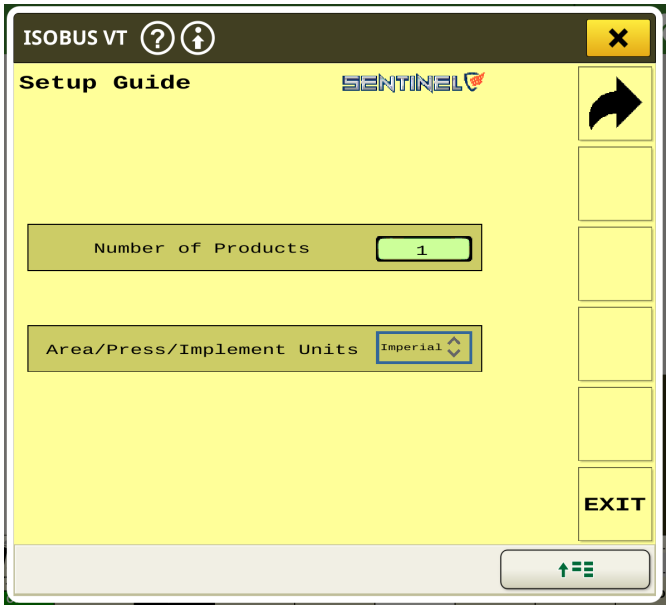


2. Select **Installation Wizard** to begin the configuration process.



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3. The **Product Configuration** screen opens.



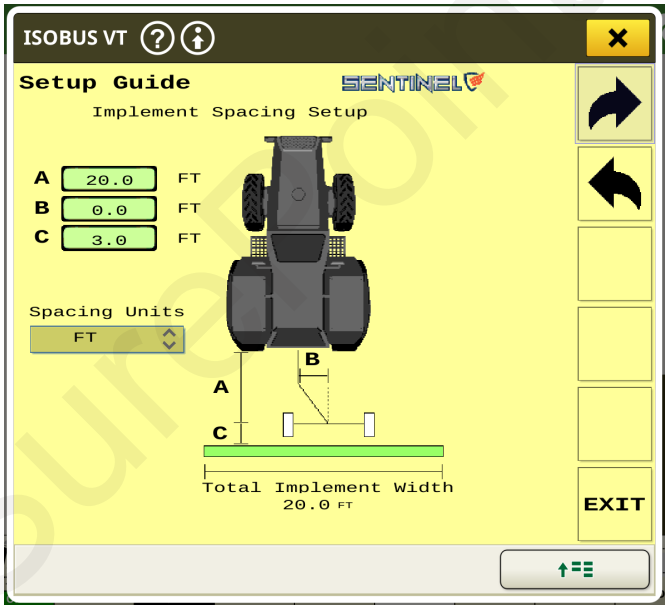
Configure products:

- Enter the **Number of Products** (1-4).
- Select **Units**.

4. Select **Next**.



5. The **Implement** screen opens.



Configure implement measurements:

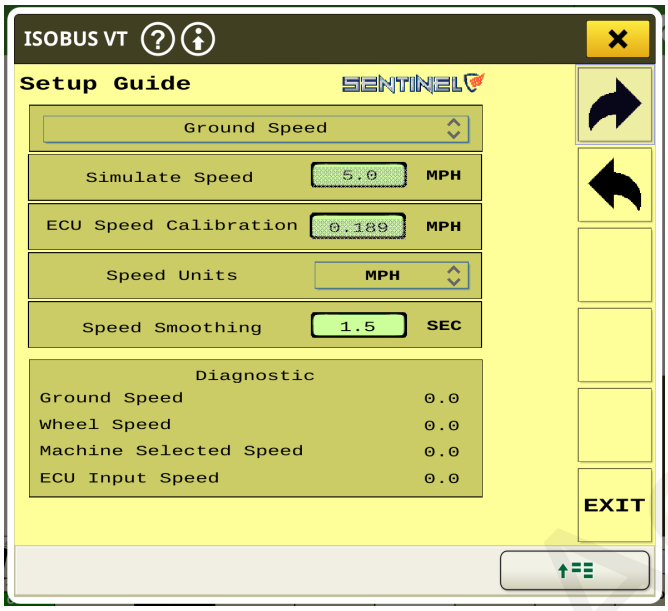
- **A** sets the tractor to implement distance. This is the distance from the tractor hitch to the implement axle.
- **B** configures implement offset if needed.
- **C** sets the implement axle to workpoint distance.

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6. Select **Next**.



7. The **Speed** screen opens.



Configure speed settings:

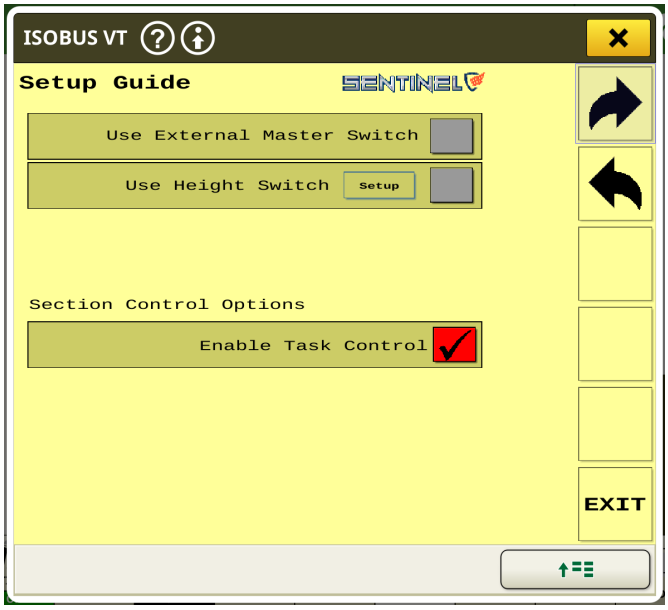
- Select speed source:
  - Select **Ground Speed** if you are using GPS.
  - Select **Wheel Speed** to calculate speed based on wheel rotation.
  - Select **Machine Selected Speed** when using a separate, tractor-provided speed input.
  - Select **ECU** to select GPS input from the ECU, if installed.
  - Select **Simulate Speed** if testing/calibrating Sentinel.
- Enter **ECU Speed Calibration** if using external GPS. The GPS manufacturer provides this value, usually on a sticker on the GPS receiver unit.
- Select **Speed Units**.
- Enter **Speed Smoothing Interval** to smooth out speed reporting.
- The **Diagnostic** panel displays which speed sources are reporting (only available when moving).

8. Select **Next**.



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9. The **Hardware** screen opens.



Configure hardware settings:

- Select **Use External Master Switch** if you are using a foot pedal or other external switch to control Sentinel.
- Select **Use Height Switch** to enable height switch sensing.
  - Select **Setup** to configure your height switch.
- Select **Enable Task Control** if you are using Sentinel with Task Control.

If using a variable voltage sensor instead of a binary switch, to configure the sensor:

a. From the **Hardware** screen, select **Use Height Switch**.

b. Select **Setup** to configure the sensor.

c. Select Sensor in **Signal Type**.

d. Select **Voltage SP** to configure the voltage that will trigger the height switch.

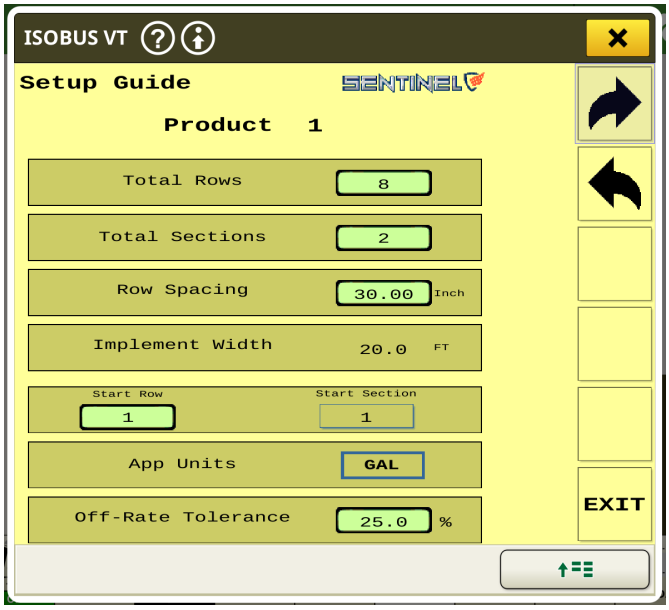
10. Select **Next**.



11. The **Product Type** screen opens.
12. Select the appropriate configuration:
    - Select **Liquid Row Monitor** for Row Monitoring only.
    - Select **Rate Control** for Rate Control only.
    - Select **Liquid Rate Control + Monitor** for both Rate Control and Row Monitoring.

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13. The **Product Configuration** screen opens.



Configure Product(s):

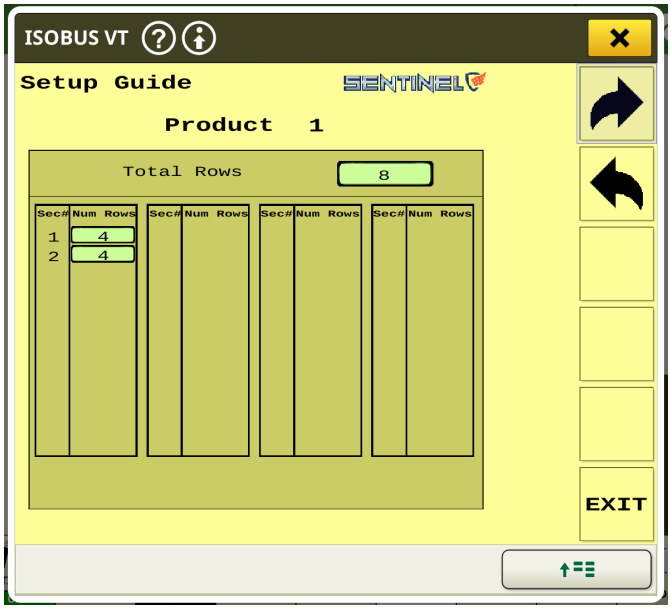
- Enter the **Total Rows** for this product.
- Enter the **Total Sections** for this product.
- Enter the **Row Spacing** for your implement.
- Verify **Implement Width**.
- Enter **Start Row**.
- Enter **Start Section**.
  - Select **Wired** if using wired section valves.
  - Select **CAN** if using CAN controlled valves.
  - Select **Unused** if not using section inputs
- Select **App Units**.
- Enter **Off-Rate Tolerance**. This setting defines how far the overall application can deviate from the configured rate before Sentinel triggers an alarm.

14. Select **Next**.



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15. The **Product Rows and Sections** screen opens.



Configure rows and sections for this product:

- Verify that **Total Rows** is correct.
- **Num Rows** shows the number of rows per section.

  On initial setup, Sentinel calculates this and sets the number of rows per section by dividing the total rows by the number of sections.

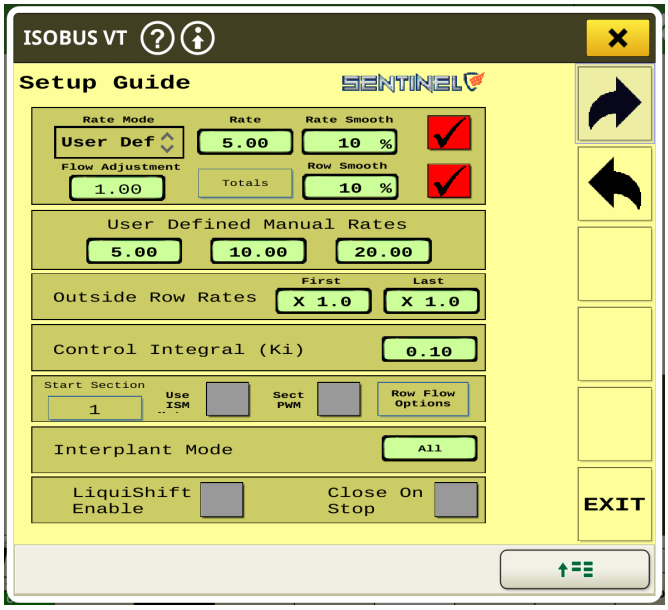
  If this is not the correct configuration for your application, enter **Num Rows** for each section manually.

16. Select **Next**.



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17. The **Rate** screen opens.



Configure the rate for this product:

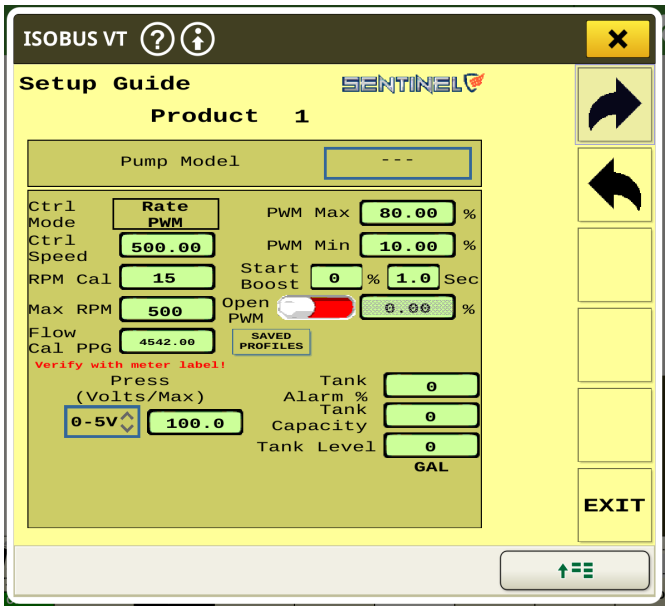
- Select a **Rate Mode**.
- Enter the desired **Rate**.
- Enter **Flow Adjustment** to calibrate Sentinel Flowmeter Module flow to the system flowmeter rate as needed.
- Enter **User Defined Manual Rates**. These rates appear on the Sentinel **Home** screen and enable quick rate changes without opening the **Rate** screen.
- Enter **Outside Row Rates** to set a different flow rate for outside rows only.
- Do not adjust **Control Integral**.
- Select a **Start Section**.
  Do not adjust **Row Flow** options.
- Select **Interplant Mode** for split-row planters.Only used with Row Monitoring, this setting determine whether Sentinel will alarm when interplant rows are off.
- If your system is using LiquiShift, select **LiquiShift Enable**.

18. Select **Next**.



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19. The **Product Pump** screen opens. See Recommended Starting Values (page 85) for information on recommended values for these settings.



Configure pump settings for this product:

- Select **Pump Model**.
- Select **Ctrl Mode** to choose between:
  - **Rate PWM**
  - **Rate Servo**
  - **Servo Close**
- Configure Tank Alarm:
  - In **Tank Alarm %**, enter the percentage at which the alarm is triggered.
  - Enter the **Tank Capacity** to allow Sentinel to calculate tank contents.
  - Enter **Tank Level** to set the initial tank fill level.

20. Select **Next**.



21. If additional products are configured, the wizard repeats these screens for each product.
22. If you have made changes that require a restart, Sentinel prompts you to restart.

7.2. Connecting Flowmeter Modules

Once all plumbing and harness connections are complete and Sentinel is accessible from the display, address the Flowmeter Modules. Sentinel assigns module addresses in the order they are connected, so modules must be connected sequentially to establish the correct module order. To address the modules:

1. Ensure that all Flowmeter Modules are connected to the harness.
2. Open the Sentinel interface.

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3. Select **Tools**.



4. Select **Next**.



5. Select **Flow Module Diag**.
6. Select **Reset All Addresses**. This clears all previously assigned Flowmeter Module addresses. Ensure that all modules display red before continuing.
7. Disconnect all the modules from the harness.
8. Start with the first product at row one. Connect the modules sequentially in row order. If possible, have one operator monitor the **Flowmeter Module Diagnostics** screen while another connects the modules.
   a. Connect the first Flowmeter Module to the bus.
   b. Sentinel assigns the next available Flowmeter Module address based on the connection order.

> **NOTE**
>
> Use the LED flash patterns to identify the rows controlled by each Flowmeter Module. See Table 1: “Flowmeter Module Identification” for detailed information on identifying Flowmeter Module addresses by their LEDs.

   c. After connecting a module, monitor the **Flowmeter Module Diagnostics** screen. Wait until Sentinel detects the module and displays it in green as **Expected & Communicating**. Then connect the next module.

> **NOTE**
>
> If modules do not address correctly, start the tractor to maintain adequate system voltage, then repeat the addressing process.

   d. Connect the next module, again waiting for Sentinel to recognize the module and displays it in green.
   e. Repeat until all modules for the first product are connected.
9. After all Flowmeter Modules for the first product are addressed, if you have additional products, repeat step 8 as needed until the Flowmeter Modules for each product have been addressed, starting from the same row each time.
10. Once all modules are connected, proceed to Flowmeter Module Orientation (page 36).

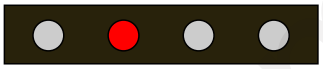
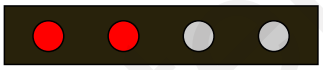
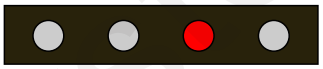
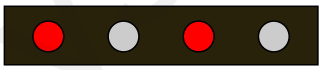
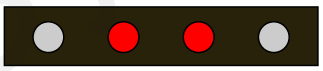
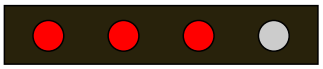
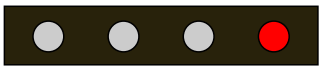
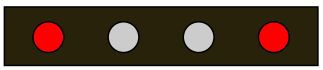
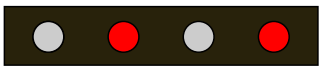
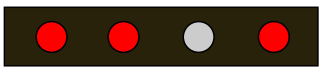
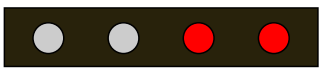
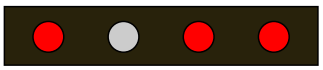
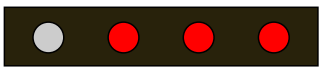
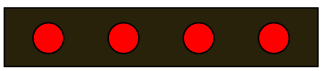
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When a Flowmeter Module is connected, verify that the module powers on and begins its startup light sequence. During addressing, verify that the module LEDs match the status shown on the **Flowmeter Module Diagnostics** screen. Do not connect the next module until the current module has been detected and is communicating.

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Table 1. Flowmeter Module Identification

Unit	Light pattern	
Flowmeter Module 1 (Rows 1-4)	Alternating A-B and C-D repeating	Alternates between A-B and C-D in a repeating pattern.
Flowmeter Module 2 (Rows 5-8)	Light B on	
Flowmeter Module 3 (Rows 9-12)	Light A and B on	
Flowmeter Module 4 (Rows 13-16)	Light C on	
Flowmeter Module 5 (Rows 17-20)	Light A and C on	
Flowmeter Module 6 (Rows 21-24)	Light B and C on	
Flowmeter Module 7 (Rows 25-28)	Light A, B, and C on	
Flowmeter Module 8 (Rows 29-32)	Light D on	
Flowmeter Module 9 (Rows 33-36)	Light A and D on	
Flowmeter Module 10 (Rows 37-40)	Light B and D on	
Flowmeter Module 11 (Rows 41-44)	Light A, B, and D on	
Flowmeter Module 12 (Rows 45-48)	Light C and D on	
Flowmeter Module 13 (Rows 49-52)	Light A, C, and D on	
Flowmeter Module 14 (Rows 53-56)	Light B, C, and D on	
Flowmeter Module 15 (Rows 57-60)	Light A, B, C, and D on	

7.2.1. Other LED Signals

The LEDs on the front of the Flowmeter Modules indicate flow status:

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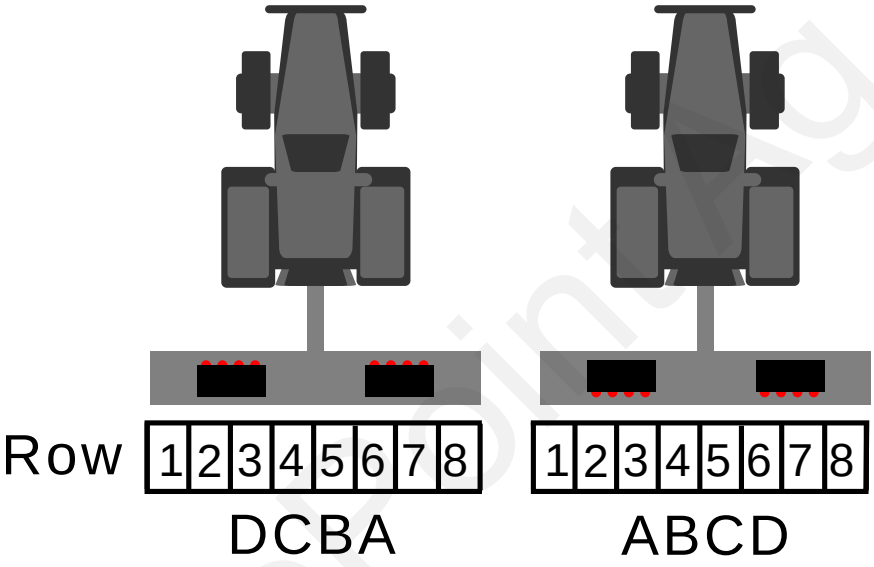
- LEDs on chambers with flowing liquid will flash with a frequency proportional to the flow rate.
- LEDs on chambers that contain liquid that is not flowing will be on, with a short blink off every 3 seconds.
- LEDs on chambers where no liquid is detected will be off, with a short blink on every 3 seconds.

If all rows display the "on with a short blink off" LED pattern, the fluid may have conductivity that is too low for detection. If only one or two rows display this pattern, the cause may be marginal conductivity, a dirty chamber, or a faulty Flowmeter Module channel. If necessary, clean the chamber with soapy water and a soft cloth.

7.2.2. Flowmeter Module Orientation

Configure Flowmeter Module orientation so that the Sentinel display matches the implement layout. The following illustration shows module orientation and row numbers.

With the modules mounted facing forward, with the lights toward the tractor, Row 1 corresponds to row D on the module. In this case, select **DCBA**. Alternatively, if the modules are mounted facing back, with lights toward the workpoint, select **ABCD**.



NOTE

All modules must be oriented the same way.

To set Flowmeter Module orientation, from the **Home** screen:

1. Select **Tools**.



2. Select **Next**.



3. Select **Flow Module Diag**.
4. Select the correct orientation setting, **DCBA** or **ABCD**.

7.3. Synchronize Sentinel with an Existing Rate Controller

Sentinel Row Monitoring can operate with a separate rate-control system. In this configuration, the application rate reported by Sentinel may differ slightly from the rate reported by the rate controller. This typically occurs when the system flowmeter and the Flowmeter Modules are calibrated differently. Synchronization is only required if the difference between the Sentinel reported rate and the rate controller is greater than 20%.

Before adjusting Sentinel settings, verify that the existing rate controller is accurately calibrated.

Recommended Procedure

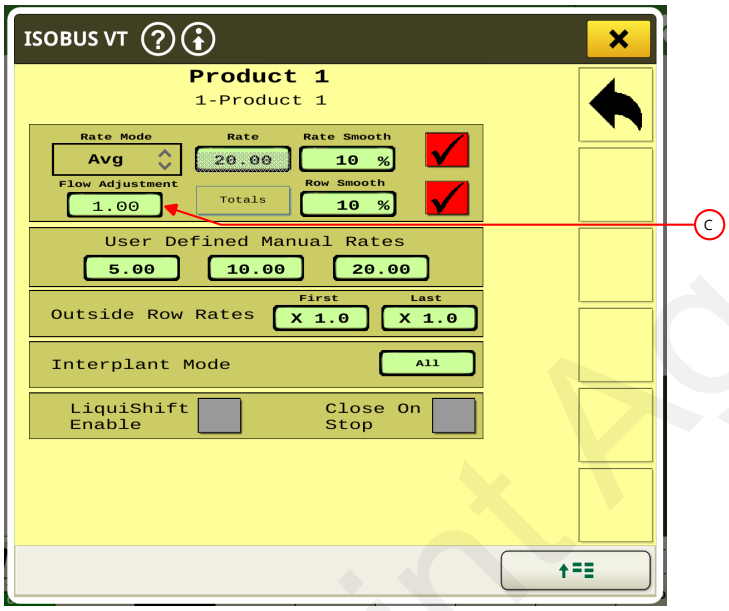
1. Compare the application rate reported by the rate controller to the rate reported by Sentinel.
2. If the values do not agree, perform a Catch Test using the primary rate controller flowmeter to verify its calibration. Adjust the rate controller flowmeter calibration as necessary.
3. Once the rate controller has been verified as accurate, compare the Sentinel rate or total-flow reading with the corresponding value reported by the rate controller.

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4. If a discrepancy remains, adjust the **Flow Adjustment** value in Sentinel to synchronize the Flowmeter Modules with the verified rate controller reading. To set the **Flow Adjustment** value, from the **Home** screen:
   a. Select **Tools**.



   b. Select the desired Product Summary panel of the product to use for the test.
   c. Enter the **Flow Adjustment** value.



Determining Flow Adjustment Value

- If Sentinel reports more flow than the verified rate controller, increase the **Flow Adjustment** value.
- If Sentinel reports less flow than the verified rate controller, decrease the **Flow Adjustment** value.
- Start with small adjustments, (typically 0.95 or 1.05) and fine-tune until both systems agree.

Example

A verified rate-controller displays 5.5 GPA while Sentinel displays 5.0 GPA.

1. Perform a Rate Calibration Catch Test (page 62) and verify the primary rate controller is accurate.
2. Compare the Sentinel rate to the verified controller rate.
3. From the **Rate** screen, increase or decrease **Flow Adjustment** as needed until the Sentinel reading matches the verified controller.
4. Make small changes and allow the readings to stabilize before making additional adjustments.

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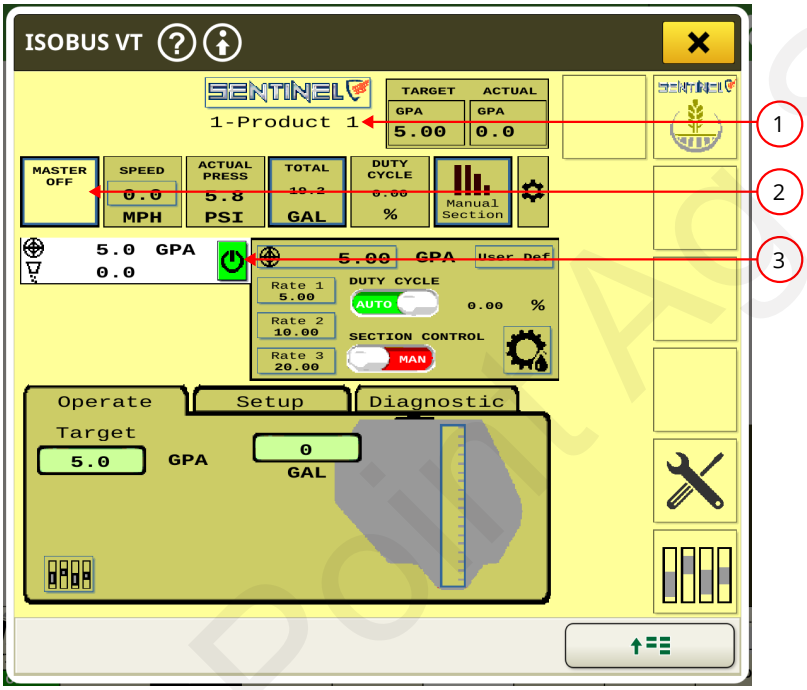
IMPORTANT

Do not adjust Sentinel calibration to match a rate controller that has not been verified through a Catch Test or other calibration procedure. Always confirm the accuracy of the primary system flowmeter before making **Flow Adjustment** changes in Sentinel.

7.4. Rate Control Functional Verification

After completing installation and setup, perform the following procedure to verify Rate Control operation and flowmeter calibration before field use.

1. From the **Home** screen, verify that the desired product is selected.



2. Select **MASTER** to turn the system on.



3. Verify the **Product Enable** switch is on.
4. Select **SPEED** and enter a simulated speed if a valid speed source is not available.
5. Establish product flow through the system.
6. Verify that all sections are enabled and the pump is operating correctly.
7. From the Sentinel **Home** screen, observe the **TARGET** and **ACTUAL** rate displays.
8. Increase the **TARGET** rate.

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9. Verify the **ACTUAL** rate, system flow, and pressure increase appropriately.
10. Return the target application rate to its original value and allow the system to stabilize.
11. Reduce the **TARGET** rate.
12. Verify the **ACTUAL** rate, system flow, and pressure decrease appropriately.
13. Select **MASTER** to turn the system off.
14. Run a Rate Calibration Catch Test (page 62).

Expected Results

- **ACTUAL** rate follows **TARGET** rate during rate changes.
- System flow and pressure respond appropriately to rate changes.
- Catch Test results match the measured product volume.
- No unexpected alarms occur during normal operation.

If the response is unsatisfactory, proceed to:

- Fine-Tuning Rate Control (page 85).
- Troubleshooting Rate Control (page 94).

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8. Sentinel Interface

Once you have completed the installation wizard, Sentinel is configured and ready to use. If you need to make changes to your settings in the future, this section provides information on accessing Sentinel configuration screens. For instructions on Sentinel operation, see Operating Sentinel: Rate Control (page 73) and/or Operating Sentinel: Row Monitoring (page 78).

8.1. Sentinel Icons



Sentinel: Open or return to the **Home** screen.



SurePoint: View system information.



Tools: Configure products, devices, rows, and sections.



Hardware: Configure hardware.



Implement: Set implement geometry.



Rate: Set rate mode, target rate, smoothing.



Speed: Select or view the speed source.



LiquiShift: Configure LiquiShift. Only available if LiquiShift is installed.



Rows: Display row bars showing per-row flow. Only available with Row Monitoring.



More Rows: Display additional rows. Only available with Row Monitoring.



Nozzle Test: Available from the Product Configuration screen. Run a test with simulated speed and rate.



Catch Test: Available from the Product Configuration screen. Check and adjust the system flowmeter calibration.



Next VT: Move Sentinel to the next screen. Only shown when multiple VTs are attached.



Save VT: Save the Sentinel position on current VT. Only shown when multiple VTs are attached.

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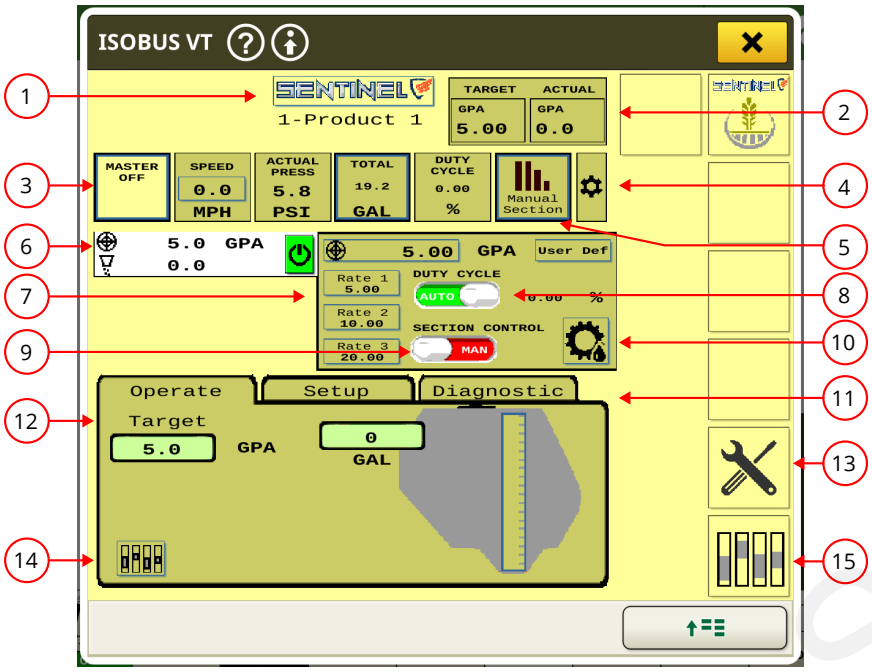
8.2. Sentinel Home Screen

Access the **Home** screen at any time by selecting **Sentinel**.



Screen details:

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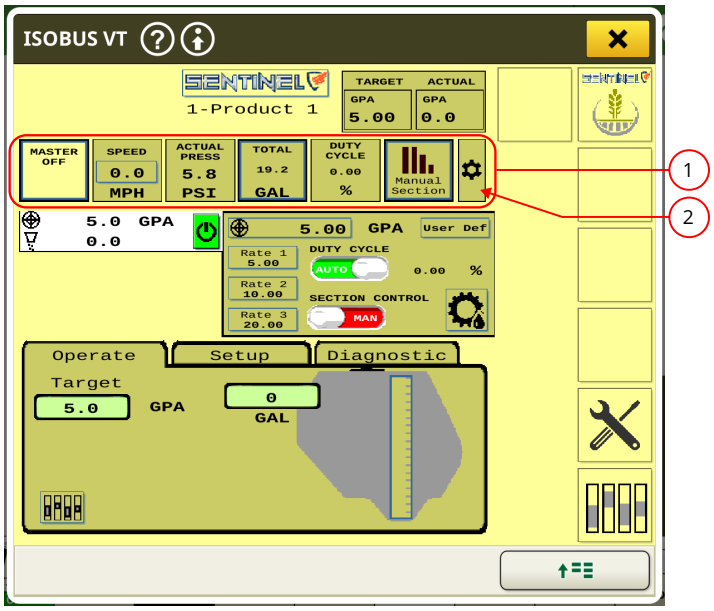


1. Product name of the currently selected product.
2. Application **TARGET/ACTUAL** rate display.
3. **MASTER** button (system on/off).
4. **Toolbar Settings** icon (gear icon).
5. **Manual Section**: manual selection of sections.
6. Indicidual **Product Enable** switch.
7. User-defined rate selection.
8. **DUTY CYCLE** mode: selects AUTO or MAN. When MAN is selected, enter the desired duty cycle percentage
9. **SECTION CONTROL** mode: selects AUTO or MAN. When MAN is selected, sections can be operated individually.
10. Rate settings.
11. Diagnostics.
12. Application **Target** rate.
13. Tools.
14. View toggle (switches between tabbed and row views).
15. Row view (only available if Sentinel is configured for Row Monitoring).

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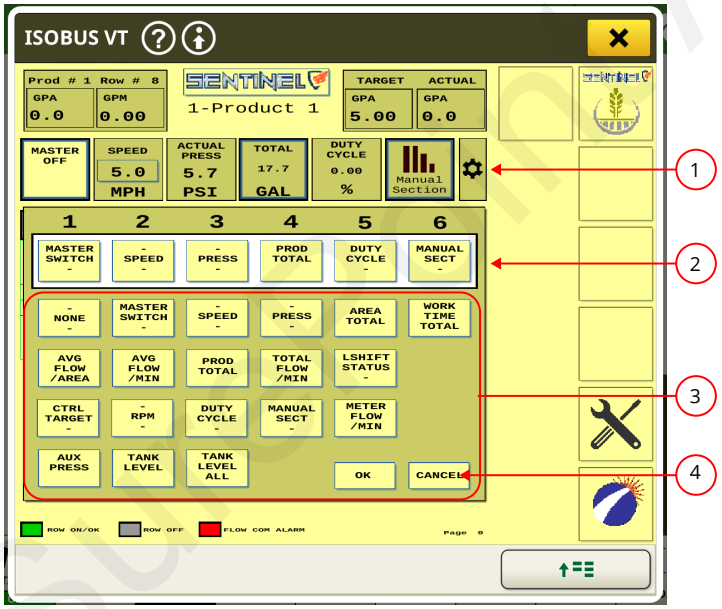
8.3. Sentinel Toolbar Customization

Configure the **Home** screen to show your preferred toolbar items.



1. The toolbar.
2. **Toolbar Settings** icon (gear icon).

Select the **Toolbar Settings** icon (gear icon) to open the **Toolbar Customization** screen.



1. Toolbar on the **Home** screen.
2. Toolbar items currently displayed.
3. Available toolbar items.
4. Save/Cancel toolbar changes.

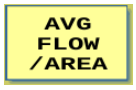
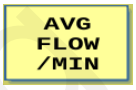
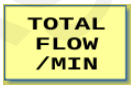
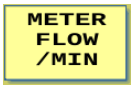
To change which items Sentinel shows on the **Home** screen:

1. Select the position where the item should display.

   In the example shown, **Duty Cycle** is in position **5**. To change the item shown in position 5, select **Duty Cycle**.

2. Select the item from the available items for Sentinel to display in this position.
   To replace **Duty Cycle** with **Speed** in position 5, select **Speed**.
3. The new item is displayed in the toolbar.
4. When you have finished, select **OK**.

Table 2. Available Toolbar Items

Item	Description	Item	Description
	Leaves the toolbar position empty.		Turns the system on or off.
	Displays current speed.		Displays system pressure.
	Displays total area worked; select reset total.		Displays total time worked; select to reset total.
	Displays average flow over traversed area.		Displays average flow per minute.
	Displays total product applied; select to reset.		Displays total flow per minute.
	Displays status of LiquiShift system.		Displays target.
	Displays pump RPM.		Displays pump duty cycle (percentage).
	Provides a manual section control shortcut.		Displays meter-measured flow per minute.
	Displays auxiliary pressure.		Displays tank level for this product.
	Displays tank levels for all products		

8.4. Totalizers and Counters

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Sentinel maintains cumulative operating totals that can be used to verify application performance, monitor productivity, and compare actual product usage with expected application rates. Display Totalizer values on the Sentinel **Home** screen using the customizable toolbar. See Sentinel Toolbar Customization (page 44). Use Totalizers as a quick operational reference throughout the season.

8.4.1. Totalizer Functions

Sentinel tracks several accumulated values during operation.

Item	Description
Total Area Worked	Total applied area accumulated while the product is active.
Total Product Applied	Total volume of product applied by the system.

8.4.2. Using Totalizers

The totalizer values provide a useful verification tool during operation.

Examples include:

- Compare Total Product Applied against remaining tank volume.
- Compare Total Area Worked against field acreage.
- Monitor Average Flow to verify consistent system performance.
- Confirm application totals after completing a field, customer, or test run.
- Compare accumulated gallons applied against flowmeter calibration and Catch Test results.

8.4.3. Resetting Totals

Reset Totalizers when beginning a new season, field, product application, or customer application.

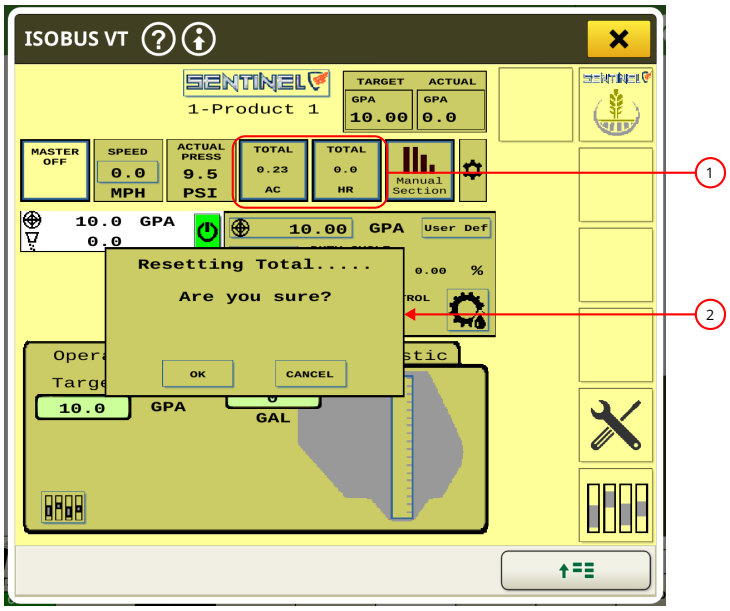
SurePoint recommends recording totalized values before resetting them if application records are required.

Resetting totalizers allows operators to:

- Track individual field applications.
- Monitor seasonal product usage.
- Verify calibration over a known acreage.
- Measure productivity during testing or troubleshooting procedures.

To reset a total, from the **Home** screen:

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1. Select the item to reset from the toolbar.
2. Sentinel displays a reset confirmation dialog.
3. Select **OK**.
4. The totalizer resets.

8.4.4. Best Practices

Follow these standard practices with totalizers:

- Record Area, Time, and Product Applied totals at the completion of each field if application records are needed.
- Periodically compare Product Applied totals against actual product used to verify system calibration.
- Use Total Area Worked and Total Product Applied together when validating flowmeter calibration after a Catch Test.
- Maintain records of accumulated totals throughout the season to assist with troubleshooting and performance verification.

NOTE

Totalizer values are intended as an operational reference and should be periodically verified against actual field records, product inventory, and calibrated application equipment. Catch Test verification remains the recommended method for confirming flowmeter accuracy.

8.4.5. Counter Functions

Counters display the current or average measured values.

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Item	Description
Total Time Worked	Total application time accumulated during operation.
Average Flow Over Area	Average application flow calculated over the worked area.
Total Flow Per Minute	Current system flow rate.

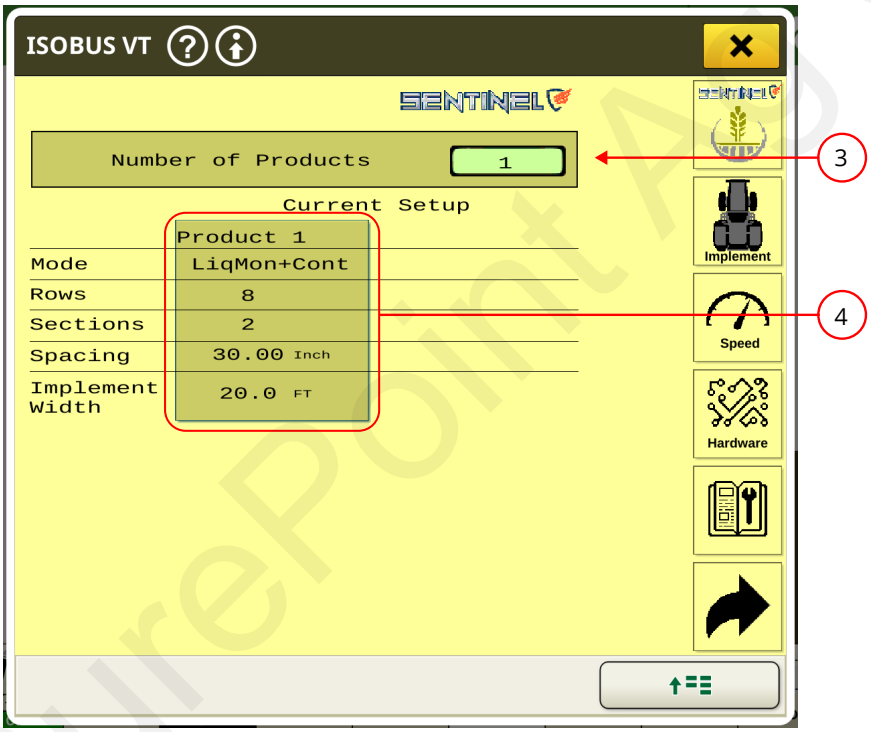
8.5. Product Configuration

Use the **Products** screen to select the number of products and to configure individual product settings. To access this screen, from the **Home** screen:

1. Select **Tools**.



2. The **Products** screen opens.

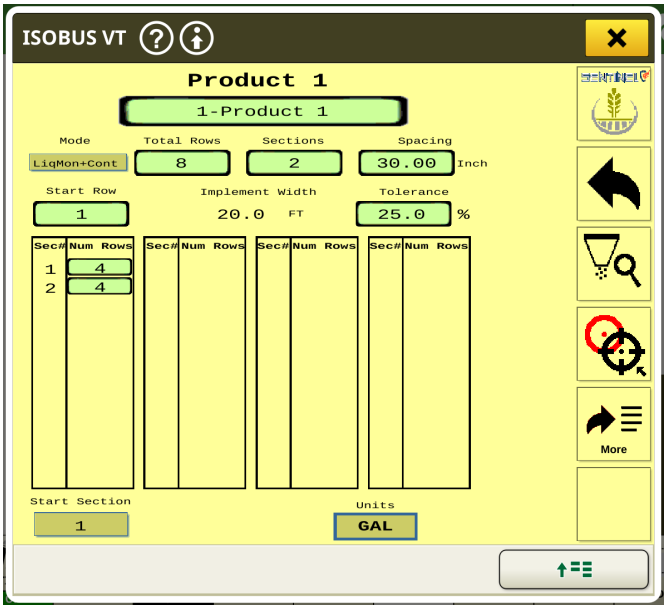


3. Enter the **Number of Products**.
   This sets the number of products Sentinel is controlling. Up to four products can be controlled by Sentinel.
4. Select the desired **Product Summary** panel to configure this product's settings.

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8.5.1. Configuring Products

1. The selected product's **Configuration** screen opens.



2. Sentinel sets the product name by default. Select the displayed name to change the product name.
3. Sentinel sets the system **Mode** at install time. To change the configuration:
   - Select **Mode**.
   - Select **Liquid**.
   - Select the appropriate mode:
     - **Liquid Row Monitor** for Row Monitoring only.
     - **Rate Control** for Rate Control only.
     - **Liquid Rate Control + Monitor** for both Rate Control and Row Monitoring.
4. Set **Total Rows** to the number of rows for this product. If you have an eight-row planter and this product will be applied to every row, set **Total Rows** to 8.
5. Set **Sections** to the number of sections for this product. If you have an eight-row planter with two section valves, set **Sections** to 2.

   Sentinel automatically assigns an equal number of rows to each section. If this does not match your implement setup, select **Num Rows** by each section to change.
6. Set the **Spacing** to match the row spacing of your implement. This allows Sentinel to correctly calculate the per-acre rate.

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7. If Sentinel is configured for Row Monitoring, enter the **Start Row**.
   - For **Product 1**, enter 1.
   - If you are using a Sentinel 2000 ECU and configuring a different product, enter the next row number after the previous product's last assigned row.

   Example: (8-row planter):
   - Product 1: Rows 1 to 8 → Start Row = 1
   - Product 2: Rows 9 to 16 → Start Row = 9
   - Product 3: Rows 17 to 24 → Start Row = 17

   The Start Row should always be the next available row number after the previous product's last assigned row.
8. Verify **Implement Width**.
9. Set the **App Units**.
10. **Tolerance** sets the percentage of off-rate application that will trigger an alarm.

    SurePoint recommends initially configuring this to 25% and adjusting as needed. The row view will show red if an individual row is off by the **Tolerance** percentage. If **Tolerance** is set too low, Sentinel will produce unnecessary alarms.
11. Enter **Start Section** for this product.

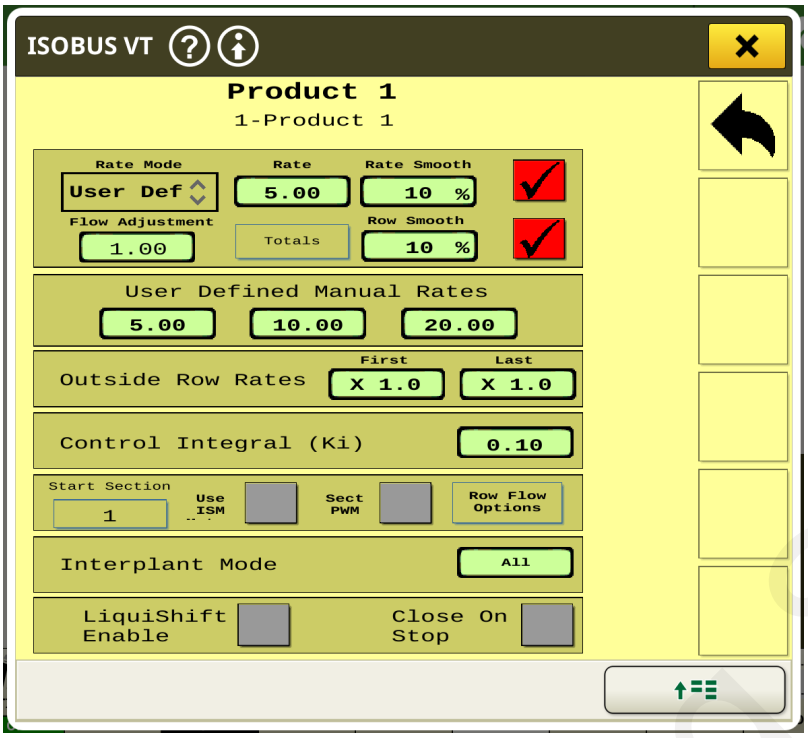
> **NOTE**
>
> For multi-product systems, Product 2 typically starts with the next available row after Product 1. Depending on the harness, Product 2 may also start with a later section number.
> For example, on some systems, Product 2 may start with Section 7 when the main harness separates Sections 1-6 and Sections 7-12.

12. Select **More** to access rate configuration.



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13. The selected product's **Rate** screen opens.



- Select a **Rate Mode** for this product. This determines the mode Sentinel will use for rate control on this product. There are four options:
  - Select **User Def** to enable user-selected rates.
  - Select **Avg** to configure Sentinel to report how far each row is from the average application rate.
  - Select **Rx** to enable prescription-based rates.

  For Row Monitoring-only systems, set **Rate Mode** to **Avg**. In **Avg** mode, Sentinel reports how far each row deviates from the average application rate. A target rate is normally unnecessary.
- Enter a **Rate**.
- Enter **Rate Smooth** value. This value sets the allowable rate variation.
- Leave the **Flow Adjustment** value at the default setting of 1.0.
- Enter **Row Smoothing** value. This sets the allowable row variation. In the Sentinel user interface, this setting appears as **Row Smooth** due to screen space limitations.
- Enter **User Defined Manual Rates**.

  Sentinel displays these rates on the Home screen for quick selection/switching between manual rates.
- Enter **Outside Row Rates** for **First** and **Last** rows.

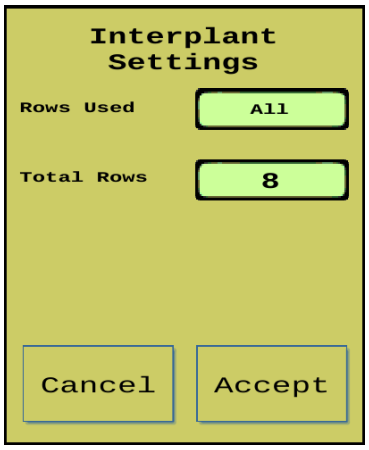
  These settings define the expected application rate for the outside rows. Sentinel suppresses alarms unless the row deviates beyond the configured **Tolerance** percentage.
  - Enter 1.0 to use the system-configured product rate.
  - Enter a value lower than 1.0 if the outside row is configured to apply less product.
  - Enter a value higher than 1.0 if the outside row is configured to apply more product.

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Example

If the last row applies product at 50% of the standard rate, enter 0.5 for **Last**. Sentinel will use 50% of the overall rate as the expected rate for that row and alarm only when the row exceeds the configured **Tolerance**.

- Select **Interplant Mode** if you are using a split-row planter. Interplant mode tells Sentinel to switch off alarms for alternate rows when using wider row spacing.



14. Continue until all products are configured.
15. Select **Save** to save your configuration.



16. Your Sentinel system will restart.

8.6. Speed Screen

Use the **Speed** screen to configure Sentinel's speed input. To access the Speed screen, from the **Home** screen:

1. Select **Tools**.

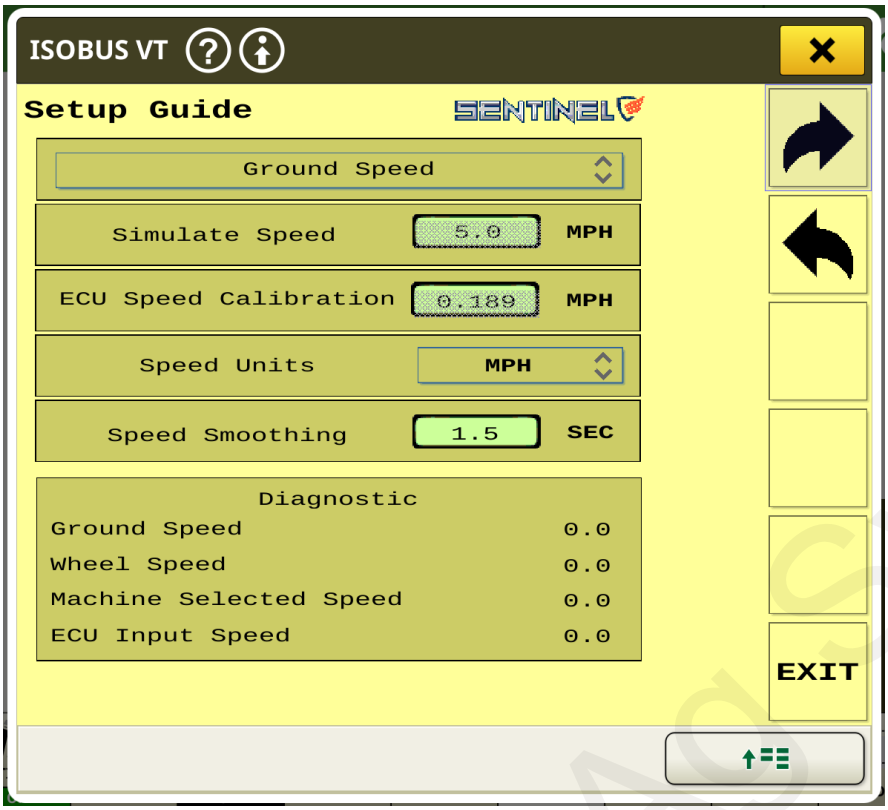


2. Select **Speed**.



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3. The **Speed** screen opens.



4. Select a speed input. Sentinel uses the speed input to calculate the correct application rate. There are five options:
   - Select **Ground Speed** to use a GPS input.
   - Select **Wheel Speed** to use the tractor wheel speed input.
   - Select **Machine Selected Speed** when your tractor is using automatic speed control via task control.
   - Select **ECU Input Speed** to use a speed input connected directly to the Sentinel ECU.
   - Select **Simulate Speed** for testing or demo purposes.
5. When **Simulate Speed** is selected, enter the desired speed in **Simulate Speed**.
6. Enter an **ECU Speed Calibration** number to adjust ECU calculated speed to actual tractor speed.
7. Select **Speed Units**.
8. Enter a **Speed Smoothing** value, in seconds. This value determines how often Sentinel updates the speed information and adjusts rates.
9. When moving, the **Diagnostic** panel shows the reported speeds for various inputs. Monitor this panel to determine the most accurate speed input selection.

8.7. Rate Screen

Use the **Rate** screen to view and configure rate-control settings for the selected product.

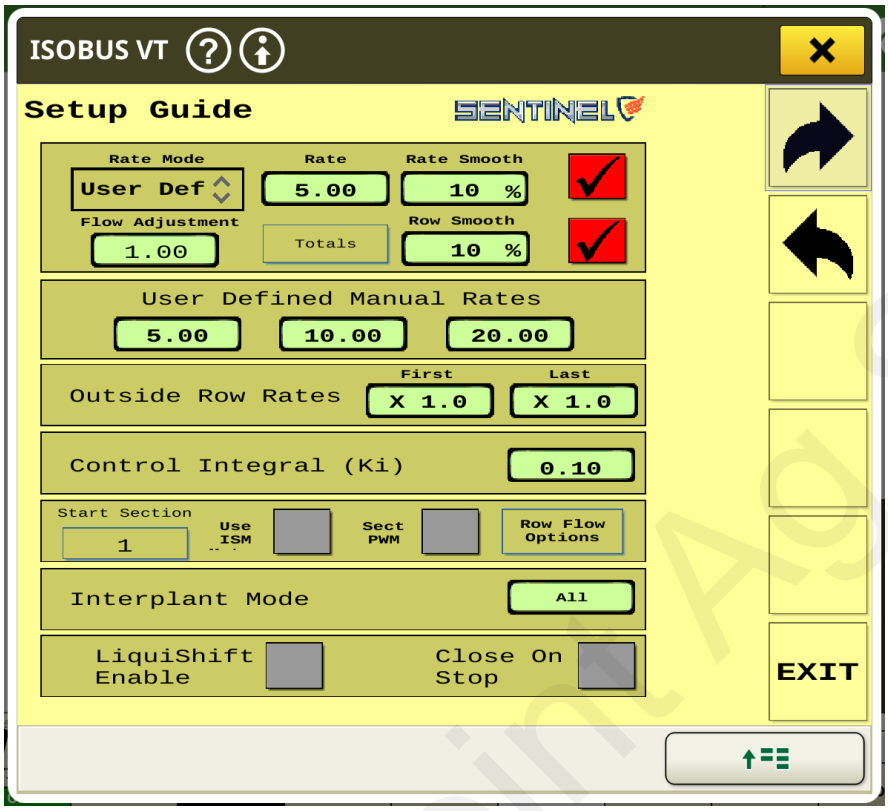
To configure product rates, from the **Home** screen:

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1. Select the desired **Product Summary** panel to open Product Configuration.
2. Select **Next** to open the **Rate** screen.

   Alternatively, select **Rate** directly from the Home screen.





Configure the rate for this product:

1. Select a **Rate Mode**.
2. Enter the desired **Rate**.
3. Enter a **Rate Smooth** value. This value determines the percentage within which Sentinel will report the rate variation.
4. Enter **Flow Adjustment** to calibrate Flowmeter Module flow to the system flowmeter rate as needed.
5. Enter **User Defined Manual Rates**.

   These rates appear on the **Home** screen and allow quick rate changes without opening the **Rate** screen.
6. Enter **Outside Row Rates** to set a different flow rate for outside rows only.
7. Do not adjust the **Control Integral** without consulting SurePoint Technical Support.
8. Select a **Start Section**.
9. Do not adjust **Row Flow** options without consulting SurePoint Technical Support.

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10. Select **Interplant Mode** for split-row planters.

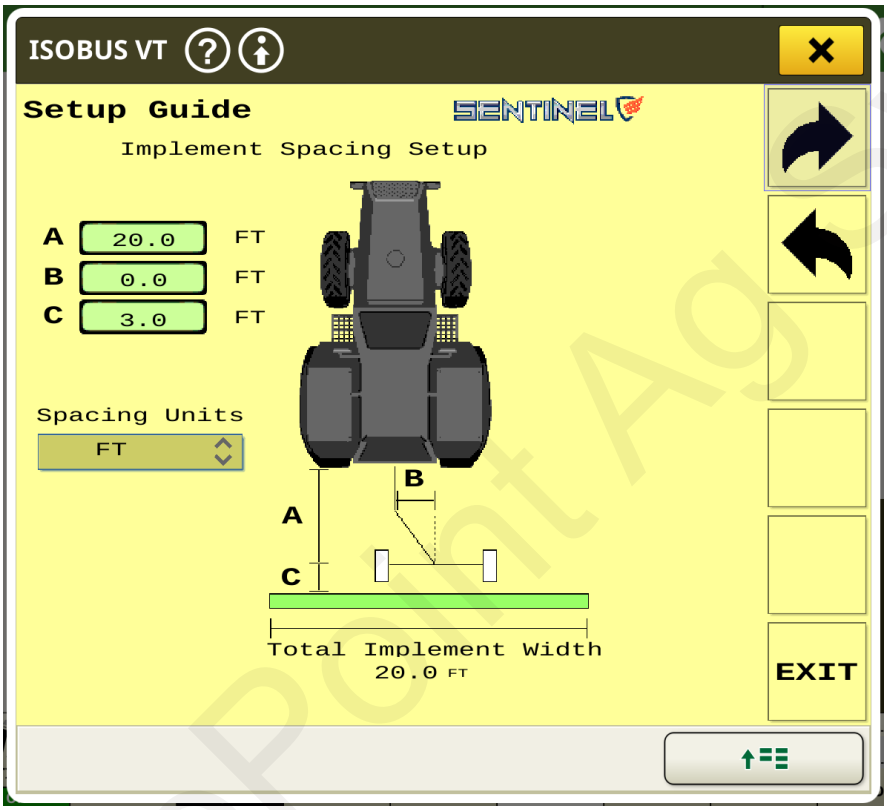
8.8. Implement Screen

Use the **Implement** screen to configure implement geometry. From the **Home** screen:

1. Select **Implement**.



2. The **Implement** screen opens.



3. Configure your implement geometry here:
   - Enter the distance from your tractor hitch to the implement axle in **A**.
   - Enter the implement offset (if any) in **B**.
   - Enter the distance from the implement axle to the workpoint in **C**.

8.9. Hardware Screen

Use the **Hardware** screen to configure hardware settings. To access the **Hardware** screen, from the **Home** screen:

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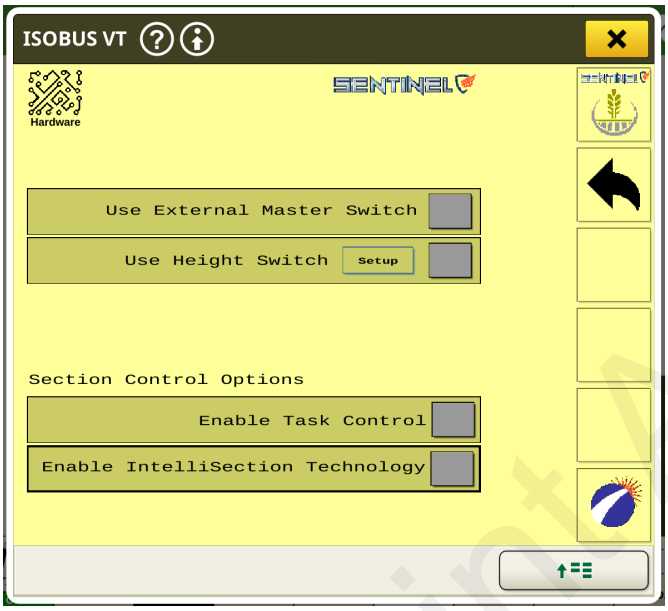
1. Select **Tools**.



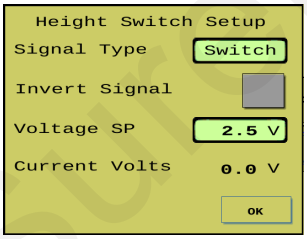
2. Select **Hardware**.



3. The **Hardware** screen opens.



4. Select **Use External Master Switch** to enable the use of a foot pedal or other switch to control Sentinel's **MASTER** on/off switch.
5. Select **Use Height Switch** to configure Sentinel to turn rate control on or off based on an implement height switch. Configure the switch hardware by selecting **Setup**.



- Select **Signal Type** to choose between **Switch** or **Sensor**.
- Select **Invert Signal** to reverse the operation of the height switch. If the switch is reporting "Up" when it is down, select this option.
- Enter **Voltage SP** to configure the voltage of the switch/signal.
- **Current Volts** will display the input from the switch when connected.

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6. Select **Enable Task Control** to enable task control.This enables mapping, section control, and prescription application through the display.

8.10. Auto SCAN and Alarms

Use the **Auto SCAN and Alarms** screen to control how Sentinel presents alarm conditions to the operator. Use these settings to balance prompt notification of application issues with minimizing nuisance alarms during normal operation.

8.10.1. Alarm and SCAN Settings

Setting	Description
Auto Hide Alarms	Sets how long a full-page alarm remains visible before automatically closing.
Disable Alarms	Turns all Sentinel alarms off. This is typically used only for testing or troubleshooting.
Alarm Time	Determines how long a row must remain outside the configured **Tolerance** before an alarm is generated.
Re Alarm Interval	Determines how long Sentinel waits after an alarm has been acknowledged before alarming again. If the condition still exists, Sentinel will continue to generate alarms at this interval until the issue is corrected.
Auto Scan	Automatically cycles through product pages and/or rows on the Home screen. The scan interval determines how long each page or row is displayed before advancing.
Bus Update Interval	Adjusts the rate of ISOBUS communication updates. This should only be changed when directed by SurePoint Technical Support.

8.10.2. Global Settings 1/2 Screen

To access alarm settings, open the **Global Settings 1/2** screen. From the **Home** screen:

1. Select **Tools**.

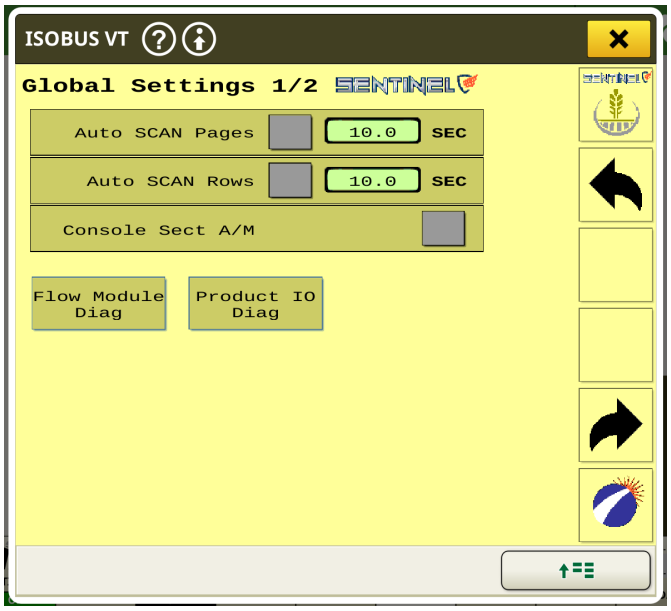


2. Select **Next**.



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3. The **Global Settings 1/2** screen opens.

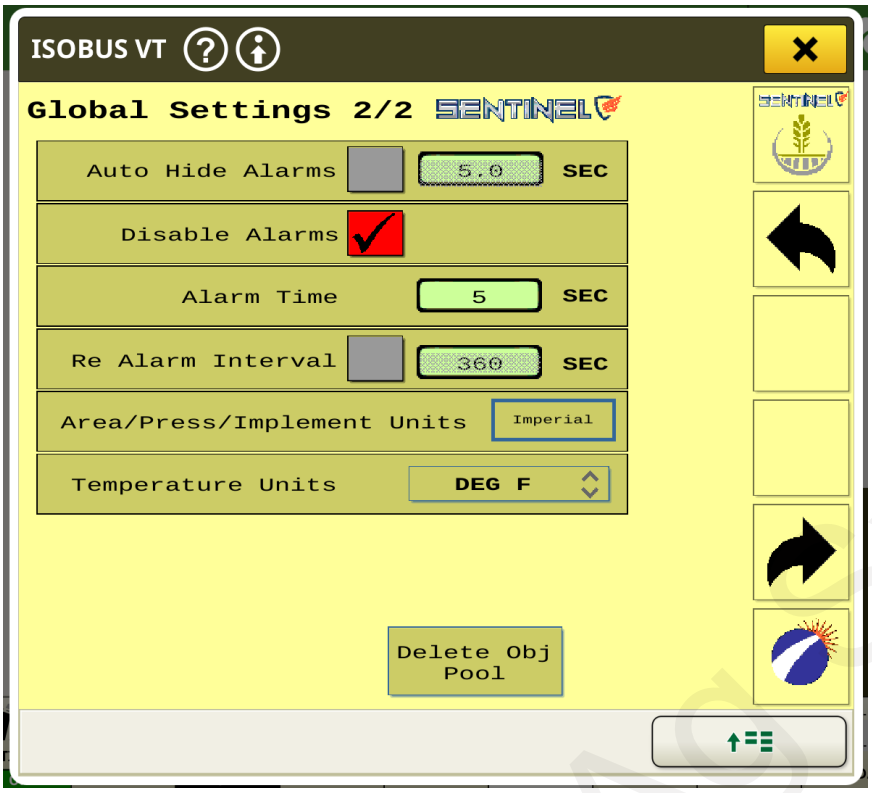


4. Select **Auto SCAN Pages** to configure Sentinel to automatically cycle through product pages on the **Home** screen.
5. Enter a value in **SEC** to set the number of seconds to display each page before advancing to the next.
6. Select **Auto SCAN Rows** to set Sentinel to automatically cycle through rows on the **Home** screen.
7. Enter a value in **SEC** to set the number of seconds to display each row before advancing to the next.
8. Select **Console Sect A/M** to configure Sentinel to mirror the section control signals sent by the display. This setting only takes effect when task control is active.
9. Select **More**.



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10. The **Global Settings 2/2** screen opens.

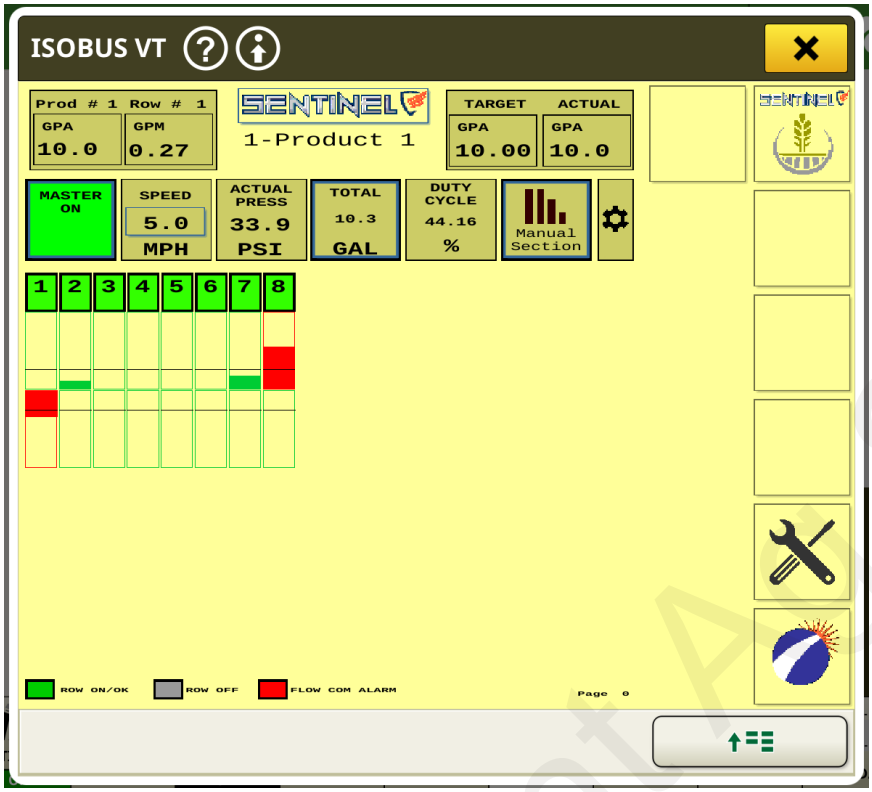


11. Select **Auto Hide Alarms** to configure the interval before an alarm is automatically hidden.
12. Enter a value in **SEC** to set the number of seconds before an alarm is automatically hidden.
13. Select **Disable Alarms** to turn off all alarms.
    This setting is recommended only for testing or troubleshooting.
14. Enter **Alarm Time** to set the number of seconds a row must be out of **Tolerance** before Sentinel triggers an alarm.
15. Select **Re Alarm Interval** to configure how long Sentinel waits before triggering an alarm for the same condition. When selected, Sentinel waits the specified interval before triggering the alarm again if the condition still exists.
16. Enter a value in **SEC** (only available when **Re Alarm Interval** is selected) to specify the number of seconds before an active alarm is triggered again. If the alarm condition persists, the alarm will continue to recur at the specified interval until the issue is resolved.
17. Select **Area/Press/Implement** Units to set Sentinel's display units.
18. Select **Temperature Units** to set Sentinel's temperature display units.
19. Select **Delete Obj Pool** to delete the current object pool on the VT and force the monitor to regenerate the display when rebooted.

8.11. Rows Screen

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Use the **Rows** screen, available with Row Monitoring, to see a graphical view of row-by-row performance. From here, you can monitor flow, identify application differences between rows, and detect rows that are outside the configured **Tolerance** setting. Rows are displayed as color-coded bars that indicate relative performance. See Operating Sentinel: Row Monitoring (page 78) for detailed interpretation of row behavior and alarms.



Row bars use color and thickness to indicate row performance:

- Green bars indicate normal operation.
- Red bars indicate rows outside the configured **Tolerance**.

8.12. Diagnostics

Use the following diagnostic tools to verify/calibrate Sentinel settings.

8.12.1. Nozzle Test

Run the Nozzle Test after the system is primed to verify the system functions correctly, locks on the **Target** rate, and runs smoothly. The Nozzle Test runs the system at a simulated speed and target rate so that you can verify system function. Run the Nozzle Test to help fine tune pump performance, as well as before going to the field.

To run the Nozzle Test, from the **Home** screen:

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1. Select **Tools**.



2. Select the desired **Product Summary** panel of the product to use for the diagnostic test.
3. Select **Nozzle Test**.

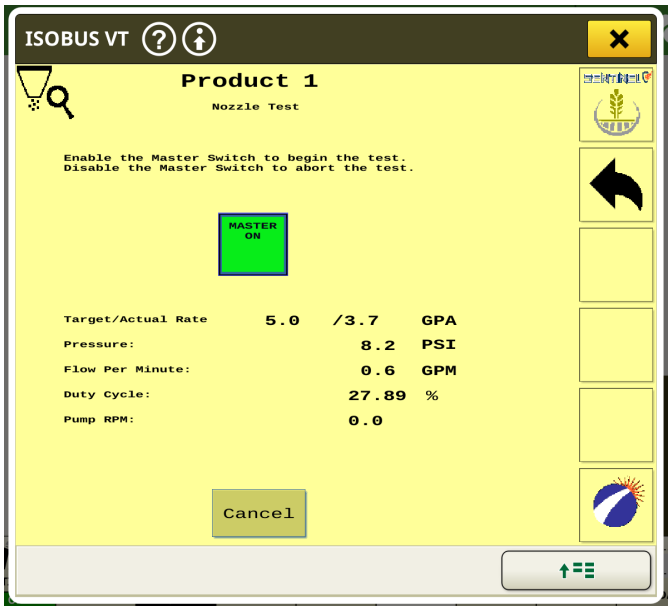


4. Ensure **MASTER** is off and select **Next**.
5. Select the **Sections** to include in the test. By default, all sections are selected. Selecting a section toggles it between selected (green) and unselected (red).
6. Select **Next**.
7. Enter the **Simulate Speed** and **Target Rate**.
8. Select **Next**.

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9. Select the **MASTER** switch to begin the test.

   Sentinel will show the test progress.



Field	Description
Target/Actual Rate	The target rate (per acre) set for the product and the actual rate as measured by the system flowmeter.
Pressure	The operating pressure within the system.
Flow Per Minute	The rate of flow as units-per-minute.
Duty Cycle	Pump duty cycle as a percentage.
Pump RPM	Pump RPM.

10. Select **MASTER** again to end the test.

    Selecting **Cancel** will end the test and return to the **Product Configuration** screen.

8.12.2. Rate Calibration Catch Test

To ensure that the Sentinel system flowmeter rate matches the actual application rate, perform a catch test. A catch test allows you to verify and adjust the flowmeter calibration. Place containers at the workpoint under rows to be tested.

To run a catch test, from the **Home** screen:

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1. Select **Tools**.



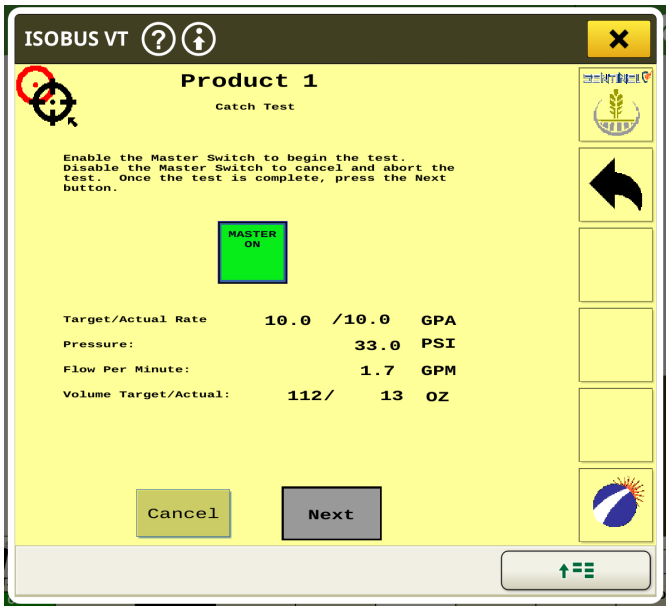
2. Select the desired **Product Summary** panel of the product to use for the diagnostic test
3. Select **Catch Test**.



4. Select **Catch Test** again.
5. Ensure **MASTER** is off.
6. Select **Next**.
7. Select the **Sections** to use for the test. SurePoint recommends selecting a minimum of four rows.
8. Select **Next**.
9. Enter the **Number of Rows to Catch**.
10. Enter the **Simulate Speed**. Sentinel will use this to calculate the rate for the test.
11. Enter a **Target Rate**.
12. Enter the **Volume to Dispense Per Row**.
13. Select **Next**.
14. Ensure that you have a container positioned under the selected row(s).

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15. Select **MASTER** to begin the test.



Sentinel will show the test progress.

Field	Description
Target/Actual Rate	The target rate (per acre) set for the product and the actual rate as measured by the system flowmeter.
Pressure	The operating pressure within the system.
Flow Per Minute	The rate of flow as units-per-minute.
Volume Target/Actual	The **Volume Target** is the volume per row multiplied by the number of rows included in the test. When the **Volume Target** for the test rows is reached, the test will stop.

16. Combine and measure the amount caught from all rows tested.
17. Enter this amount in **Actual Volume**.
18. If the **Expected Volume** and **Actual Volume** do not match, Sentinel will calculate a new flowmeter calibration number. Select **Accept New Cal** to save the new calibration number.

> **NOTE**
>
> Catch tests performed with water, especially when the system is operating at low pressure, may not produce accurate results.

19. Run the catch test at least twice to verify consistency and accuracy.

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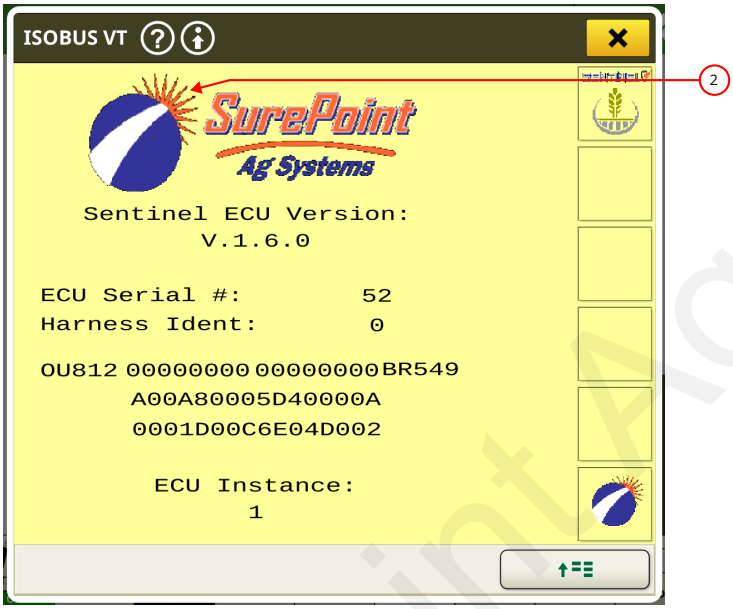
8.12.3. System Information Screen

The System Information screen displays software versions, hardware information, and other diagnostic information that may be requested by SurePoint Technical Support. To open the **System Information** screen, from the **Home** screen:

1. Select **SurePoint**



2. The **System Information** screen opens.



Label	Description
ECU Version	Software version for this ECU
ECU Serial #	Serial Number
ECU Instance	Number of ECUs connected

8.12.4. Auxiliary Settings

This screen provides access to advanced troubleshooting and diagnostics settings.

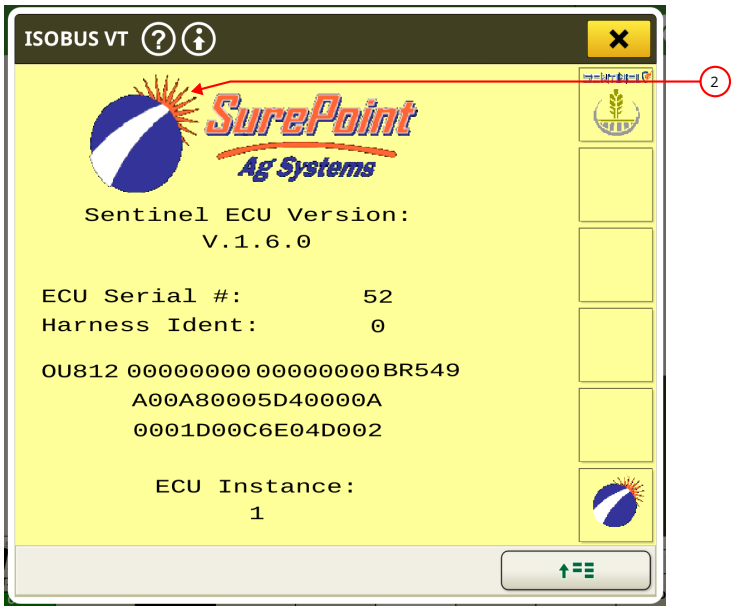
To access **Auxiliary Settings**, from the **Home** screen:

1. Select **SurePoint** to open the **System Information** screen.



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2. Select the **SurePoint** logo at the top of the **System Information** screen.

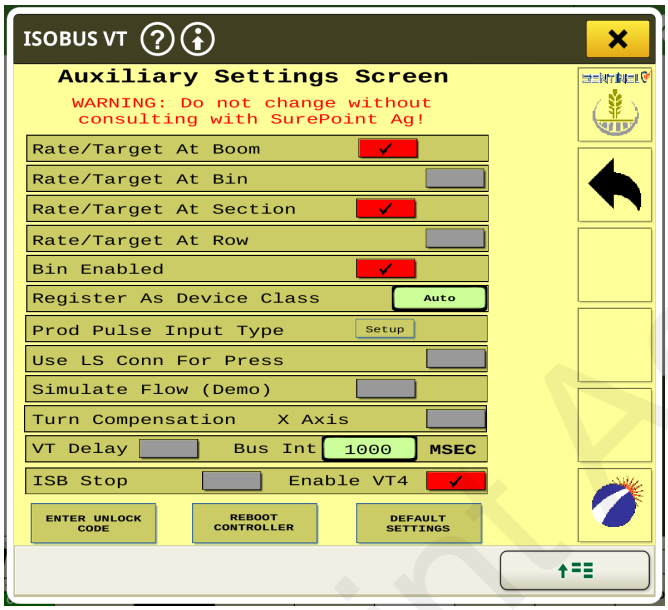


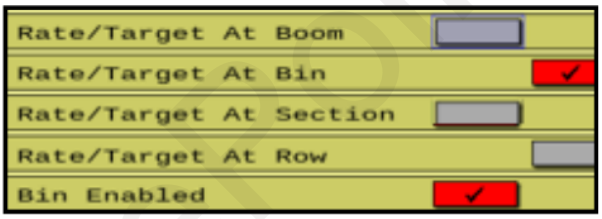
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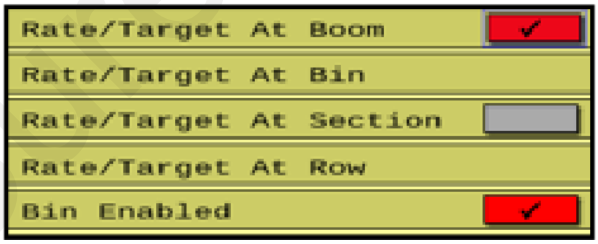
3. The **Auxiliary Settings** screen is displayed.

> **NOTICE**
>
> Do not make changes to these settings unless directed to do so by SurePoint Technical Support.

These factory settings should only be changed after consulting with SurePoint Ag Technical Support. The following screens provide a reference if needed for that process.







8.13. Flowmeter Module Diagnostics Screen

Use the **Flowmeter Module Diagnostics** screen to view Flowmeter Module status and reset Flowmeter Module addresses.

To access this screen, from the **Home** screen:

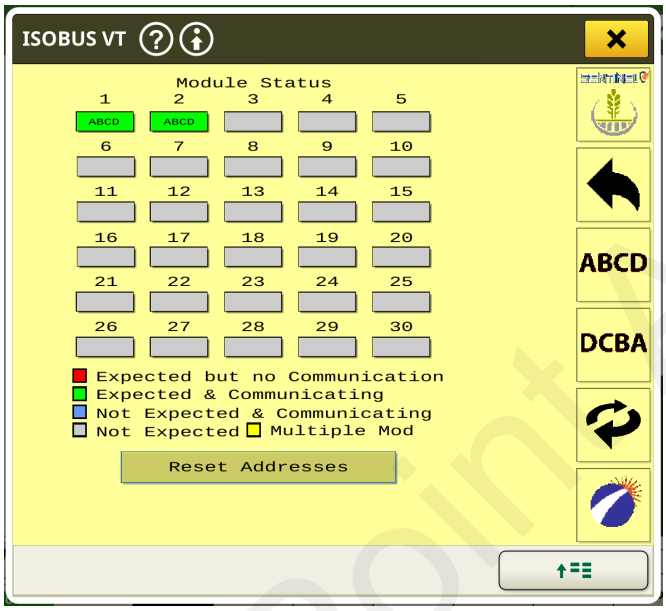
1. Select **Tools**.



2. Select **Next**.



3. Select **Flow Module Diag**.
4. The **Flowmeter Module Diagnostics** screen opens. This displays the status of Flowmeter Modules.



5. Status for modules is displayed here:
   - Red: **Expected but no Communication**. Addressed modules that are not currently communicating.
   - Green: **Expected & Communicating**. Modules that have been addressed and are communicating normally.
   - Blue: **Not Expected and Communicating**. Modules that have not previously had their address saved to the system that are reporting their status. This typically indicates a detected module that has not yet been assigned an address or saved in the system.
   - Gray: **Not Expected**. Addresses that are available and not currently assigned to a module. These locations are not expected to communicate with the system.
   - Yellow: **Multiple Mod**. Multiple modules have the same address. To correct this, reset module addresses as described below.

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6. Select **Next Page** to toggle the next page of modules if needed.



8.13.1. Setting/Resetting Flowmeter Module Addresses

Occasionally it may be necessary to set or reset Flowmeter Module addresses. This can occur if a module has been replaced or if the system loses track of which modules are assigned to which addresses.

To assign or reassign module addresses, from the **Home** screen:

1. Select **Tools**.



2. Select **Next**.



3. Select **Flow Module Diag**.
4. The **Flowmeter Module Diagnostics** screen opens.
5. Select **Reset All Addresses**.
   This instructs all Flowmeter Modules to erase their currently assigned address.

> **NOTE**
> Wait until all module statuses display as red before continuing.

6. Disconnect all Flowmeter Modules from the harness.
7. With system power on, reconnect the modules one at a time, beginning at row one. Sentinel should detect and address each module within 30 seconds. If you are troubleshooting a communication issue, have an operator monitor the display. Verify that the module status displays **Expected & Communicating** before connecting the next module.

> **NOTE**
> If modules are not addressing, start the tractor to ensure adequate system voltage.

8. Once all modules are addressed, select the proper orientation setting for the implement.

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SurePoint Ag Systems

9. Sentinel Harness Part Numbers

Refer to the following tables for Sentinel harness part numbers.

9.1. ECU Harnesses

Part No.	Description
208-06-5993Y2	Sentinel ECU Harness
208-06-5374Y1	Sentinel Level 1 Monitor Only Harness

9.2. CAN Trunklines

Part No.	Description
208-06-2908Y2	CAN Trunkline, 1 Flowmeter Connector, 5 ft
208-06-2909Y2	CAN Trunkline, 1 Flowmeter Connector, 15 ft
208-06-4975Y1	CAN Trunkline, 2 Flowmeter Connectors, 5 ft
208-06-2910Y2	CAN Trunkline, 2 Flowmeter Connectors, 15 ft
208-06-2911Y2	CAN Trunkline, 3 Flowmeter Connectors, 15 ft
208-06-4976Y1	CAN Trunkline, 4 Flowmeter Connectors, 5 ft
208-06-4977Y1	CAN Trunkline, 4 Flowmeter Connectors, 15 ft
208-06-2912Y1	CAN Bus Terminator

9.3. Front ISO Extension Harnesses

Part No.	Description
214-00-3553Y1	Front ISO Extension Harness, 9-Pin Tractor ISO to 12-Pin Implement ISO + 2-Pin Molex Power + 3-Pin Master Switch. 10 ft.
214-00-3554Y1	Front ISO Extension Harness, same configuration as above, 20 ft.
214-00-3555Y1	Front ISO Extension Harness, same configuration as above, 30 ft.
214-00-3556Y1	Front ISO Extension Harness, same configuration as above, 40 ft.
214-00-3557Y1	Front ISO Extension Harness, same configuration as above, 50 ft.
214-00-6871Y1	Front ISO Extension Harness, same configuration as above, 60 ft.

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SurePoint Ag Systems

10. Operating Sentinel

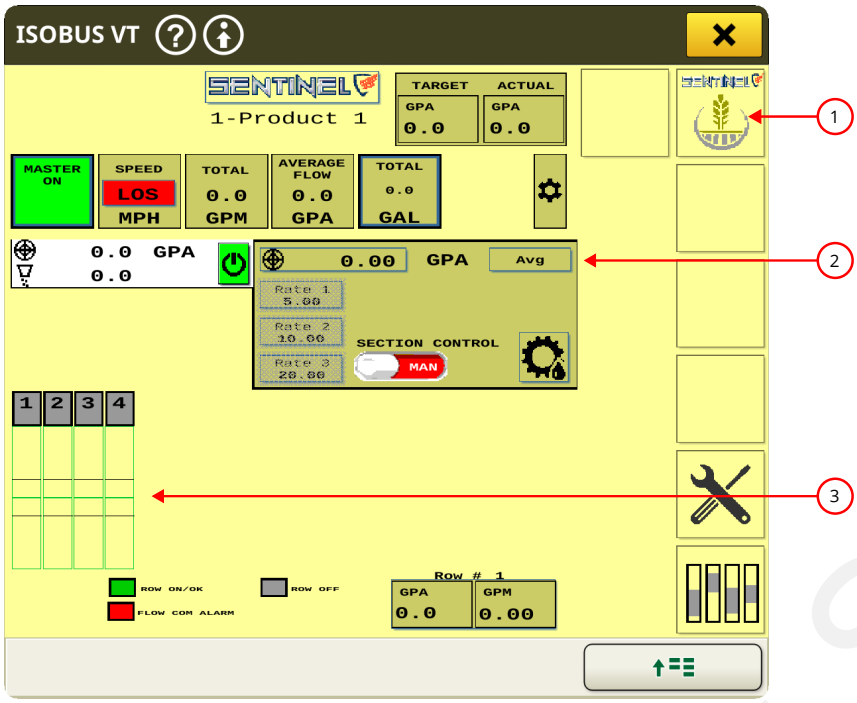
The following sections describe the operation of Sentinel for Rate Control and Row Monitoring. These scenarios assume that the operator has completed the Sentinel Installation Wizard and that Sentinel has been properly installed and configured.

10.1. Operating Sentinel: Rate Control

When used for Rate Control, Sentinel automatically controls the pump using feedback from the system flowmeter to maintain the target application rate. The following procedure describes operation for a single product. Multi-product operation follows the same procedure.

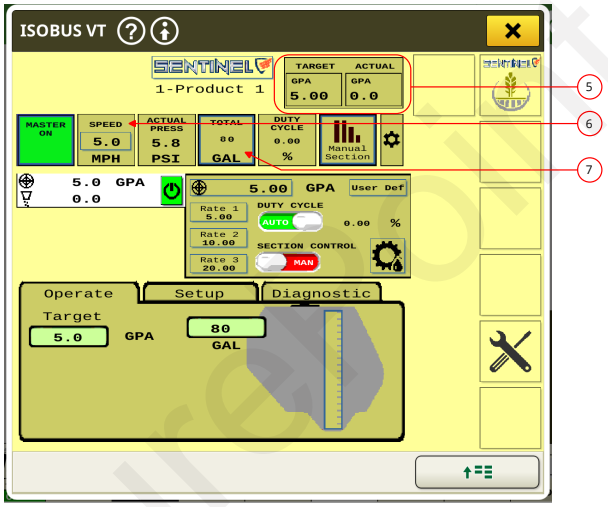
To begin operations with Rate Control:

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1. Select **Sentinel** to open the **Home** screen.
2. Ensure the Product Enable switch is on.
3. Verify the correct product rate is shown.
4. If necessary, select your desired rate from the list of available user-defined rates.
5. Ensure that **SECTION CONTROL** is set to **AUTO**.



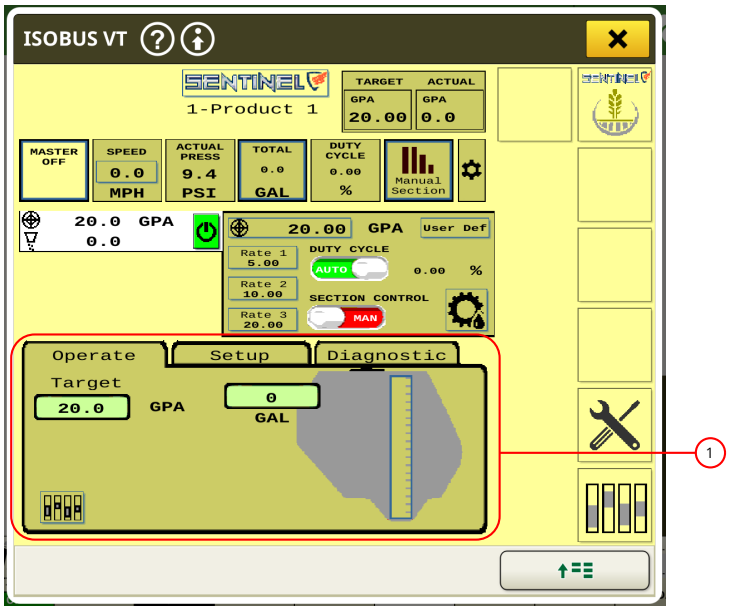


6. Select **MASTER** to activate the rate-control system.
7. Begin application and monitor the **TARGET** and **ACTUAL** rates to ensure they match.
8. Periodically verify that the **SPEED** displayed matches actual speed.
9. Monitor the product **TOTAL** as a system verification check.
10. When finished, select **MASTER** to turn the rate-control system off.

10.1.1. Operate, Setup, and Diagnostic Tabs

When Sentinel is configured for Rate Control, three tabs are displayed on the **Home** screen. These tabs provide useful information about Sentinel and quick access to various settings.

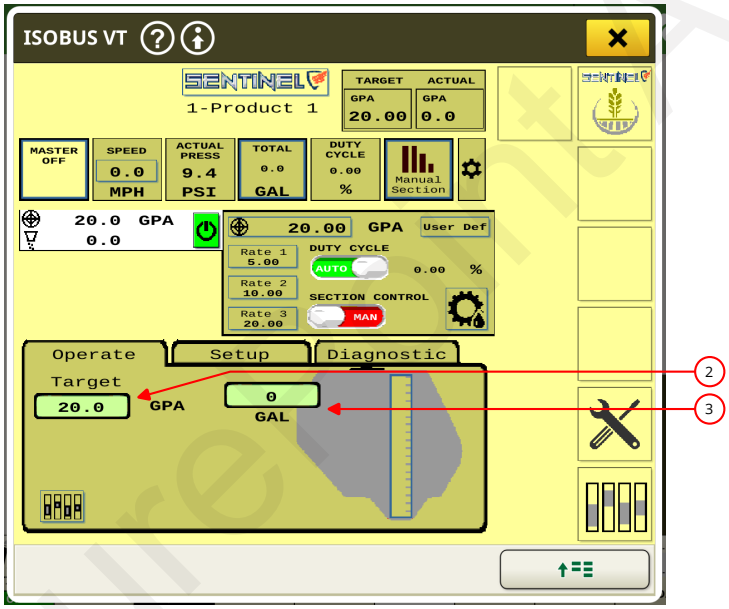
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1. The Operate, Setup, and Diagnostic Tabs are available on the Sentinel **Home** screen.
   Select a tab to display its contents.

Operate Tab

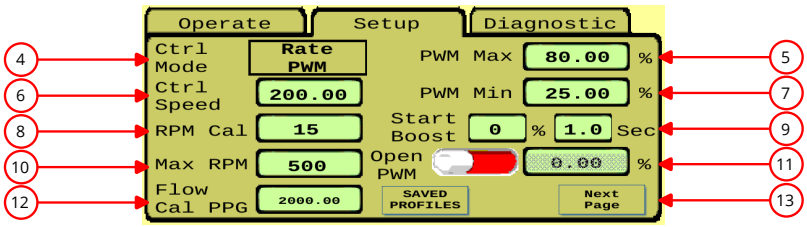
The **Operate** tab shows the target rate and tank volume.



2. **Target** displays the target rate for the current product. Select to change the value.
3. **GAL** displays the calculated remaining contents of the tank.

Setup Tab

The **Setup** tab offers quick access to common Rate Control settings.



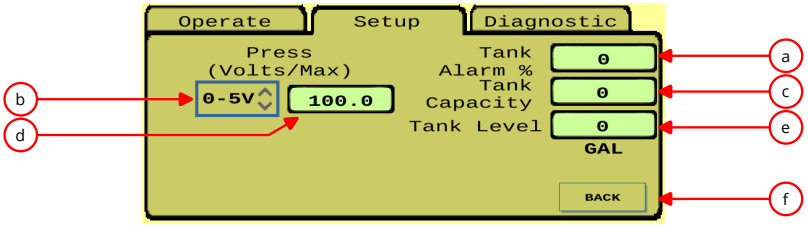
4. **Ctrl Mode**: Select the pump control mode.
5. **PWM Max**: Enter the maximum PWM rate for the pump.
6. **Ctrl Speed**: Enter the interval between control signal adjustments. Increase this value if pump adjustments are slow. Decrease if the pump surges or oscillates around the target rate.
7. **PWM Min**: Enter the minimum PWM rate for the pump.
   Decrease this value if the pump speed is too high for low-speed, low-rate, or narrow-width applications.
8. **RPM Cal**: Do not change.
9. **Start Boost**: Enter 0 for no boost. Enter a higher value to configure a higher initial pump speed for starting product flow.
10. **Max RPM**: Enter the maximum pump RPM.
11. **Open PWM**: Select to toggle between active (green) and inactive (red). Set to Active to configure the pump to continue running for product agitation during non-application periods. Enter a PWM (**%**) to set the pump speed for agitation. Set the speed between 30% and 40% for optimal agitation performance.
12. **Flow Cal PPG**: Displays the pulses-per-gallon calibration value for the system flowmeter connected to Sentinel. Sentinel uses **Flow Cal PPG** to convert system flowmeter pulses into measured flow and applied volume. Enter the factory **Flow Cal PPG** value printed on the system flowmeter label. Adjust this value only when an accurate catch test or field-volume comparison confirms a difference between actual product output and the flow reported by Sentinel.
    - If Sentinel is underapplying, increase **Flow Cal PPG**.
    - If Sentinel is overapplying, decrease **Flow Cal PPG**.

    Adjust the value in small increments and repeat the Catch Test after each change.

> **NOTE**
>
> **Flow Cal PPG** calibrates the main system flowmeter. It does not adjust an individual Sentinel row flowmeter. Use **Flow Adj** on the **Row Detail** screen to correct the reported flow for an individual row.

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13. **Next Page**: Displays the next **Setup** page.



a. **Tank Alarm %**: Enter the percentage of remaining tank contents at which Sentinel triggers an alarm.

b. **Press**: Sets the voltage range.

c. **Tank Capacity**: Enter the tank capacity to enable Sentinel to calculate tank-level alarms.

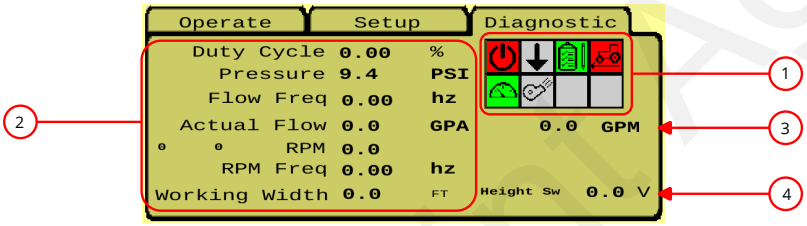
d. **Max**: Enter the percentage of the value selected in **Press** for maximum voltage.

e. **Tank Level**: Enter the initial tank contents that Sentinel will use as a starting point.

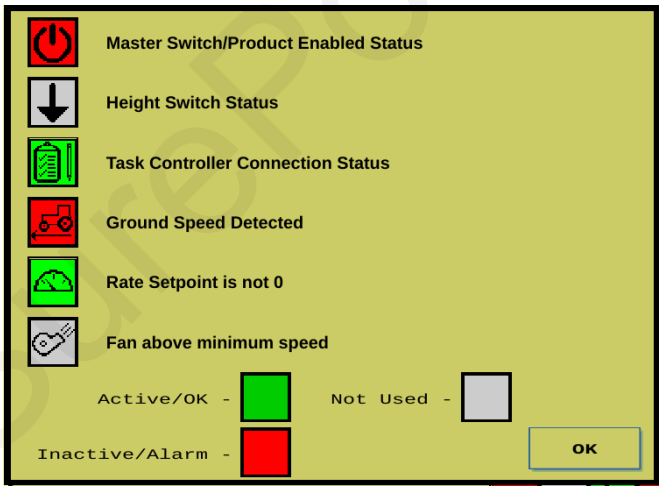
f. **BACK**: Return to Setup tab.

Diagnostic Tab

The **Diagnostic** tab displays detailed information about rate control values while Sentinel is operating. Leave this tab open when operating to view these values in real time.



1. **Status**: Displays the status of system components. Select to open the **Status** window.



a. Items displayed in green are Active or reporting an OK status.

b. Items displayed in red are Inactive or reporting an alarm condition.

c. Items displayed in gray are not configured.

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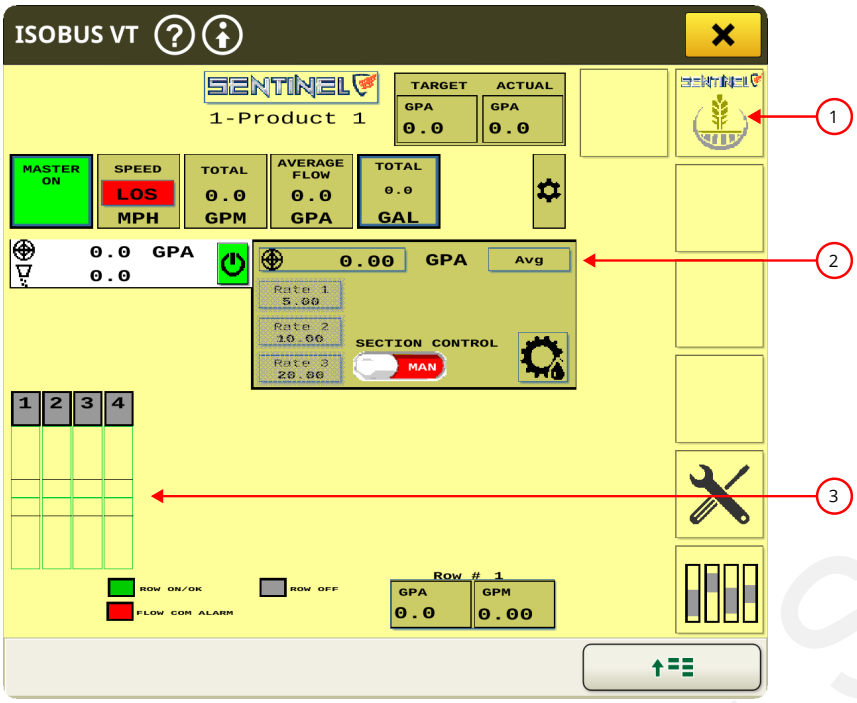
2. **Information** panel: Displays the current values reported by system components when Sentinel is operating.
3. **GPM**: Shows current flow rate.
4. **Height Sw**: Displays current status of height switch.

10.2. Operating Sentinel: Row Monitoring

When configured for Row Monitoring, Sentinel continuously monitors feedback from Flowmeter Modules to verify the target application rate for each row. The following procedure describes operation using a single product. Multi-product operation follows the same process.

To begin operations with Row Monitoring:

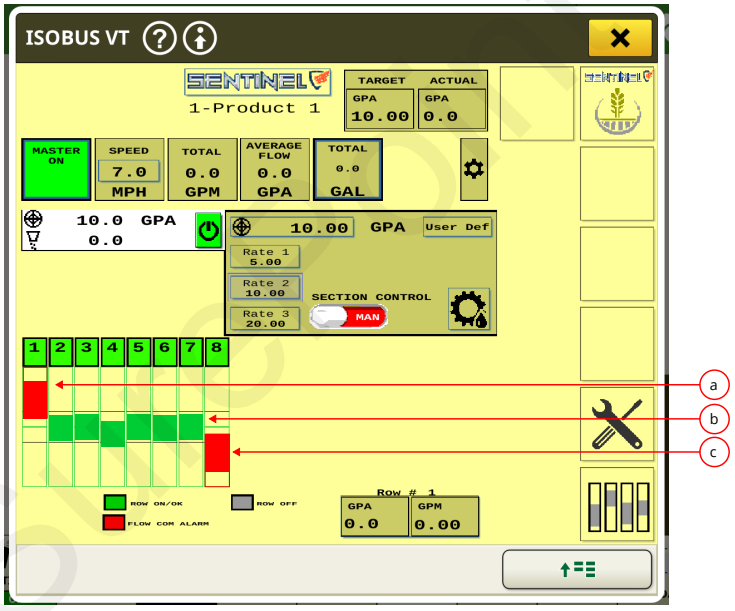
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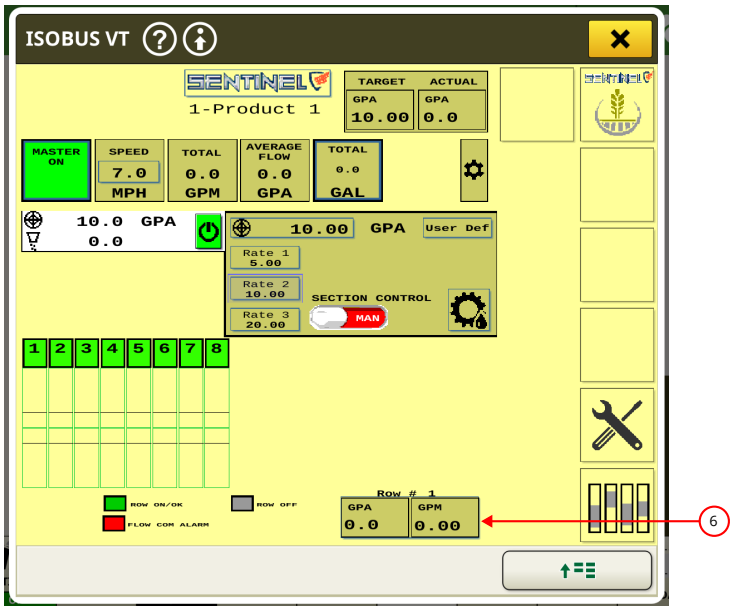
1. Select **Sentinel** to open the **Home** screen.
2. If using Row Monitoring only, verify that the target rate shows **AVG**. If Sentinel is also configured for Rate Control, check that it is the correct rate for the product.
3. Row display. Shows the current status of individual rows.



4. Select **MASTER** to activate Row Monitoring. The **MASTER** switch will turn green.
5. Begin the application and monitor the rows on the row display:
   a. Rows displayed in red above the upper **Tolerance** line indicate overapplication.
   b. Rows displayed in green are operating within the **Tolerance** range.
   c. Rows displayed in red below the **Tolerance** line indicate underapplication.

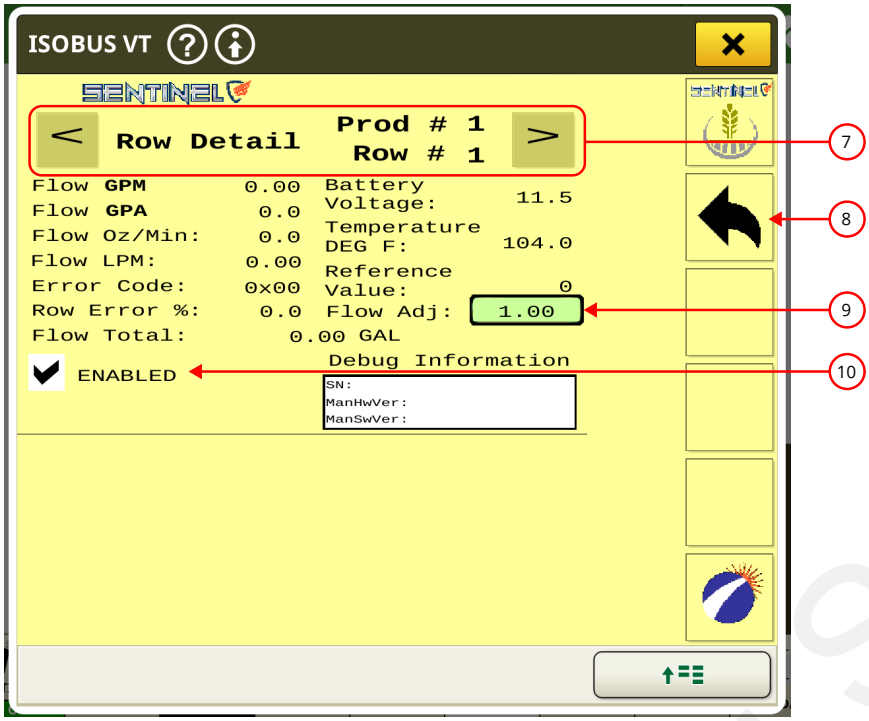


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6. Select **Row # 1** to view the **Row Detail** screen.

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7. Select **<** to view the previous row, or **>** to view the next row.
8. Select **Back** to return to the previous screen.
9. Enter a **Flow Adj** value to adjust the flowmeter calibration for this row. Values greater than 1.0 decrease the reported flow rate when the flowmeter reading is higher than the actual flow. Values lower than 1.0 increase the reported flow rate when the flowmeter reading is lower than the actual flow.
10. Select **ENABLED** to toggle the row between enabled or disabled.

Other elements on this screen are provided as service diagnostic information.

10.2.1. Rows Screen Example

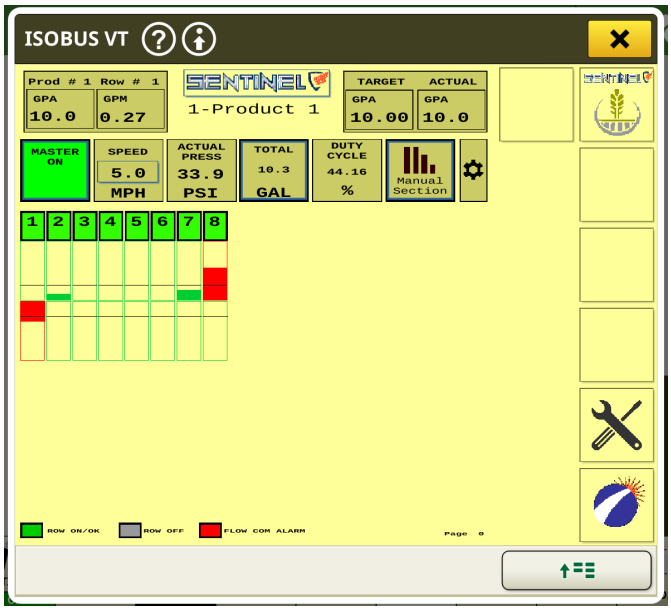
When operating Sentinel for Row Monitoring, you can view row status from the **Rows** screen. To open the Rows screen, from the **Home** screen:

1. Select **Rows**.



2. The **Rows** screen opens.

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In this example, Row 1 is underapplying and Row 8 is overapplying. The black lines represent the alarm limits, set in **Tolerance**. The upper line shows the maximum allowable deviation above the target rate. The lower line shows the maximum allowable deviation below the target rate.

Row-bar thickness indicates how far each row is from the expected flow. A thin green bar indicates the row is within the configured **Row Smoothing** range. A thicker green bar indicates the row is outside the **Row Smoothing** range but still within the configured **Tolerance**. A red bar indicates the row is outside the configured **Tolerance** and is in an alarm state.

In this example:

- Row 1's application rate is below the target rate by more than the allowable **Tolerance**, so it is in an alarm state, indicated by the red bar.
- Row 2's application rate is outside the **Row Smoothing** range, but within **Tolerance**, indicated by a thick green bar.
- Row 3 through 6 are applying within the **Row Smoothing** range, indicated by thin green bars.
- Row 8's application rate is above the target rate by more than the allowable **Tolerance** and is also in an alarm state, shown by a red bar.

10.2.2. Interpreting Row Behavior During Operation

During initial operation, use the **Rows** screen to establish normal row-to-row variation. Every application system will exhibit some variation between rows based on plumbing layout, operating pressure, product characteristics, and other factors. Use this normal operating pattern as a baseline when monitoring row performance.

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10.2.3. Interpreting Overall Row Patterns

Row behavior is best understood as part of the overall row pattern, rather than in isolation. Changes affecting one row can influence the flow reported by other rows, creating identifiable patterns across multiple rows.

- A plugged or restricted row creates higher pressure in the overall system. As a result, neighboring rows may appear higher than expected as product that cannot flow through the restricted row is redistributed in the system.
- A leaking hose, damaged plumbing component, or other excessive-flow condition reduces overall system pressure. When this occurs, adjacent rows may appear lower than expected because less product is available to the remainder of the system.
- A row that consistently behaves differently from nearby rows may indicate a restriction, leak, calibration issue, plumbing issue, or flowmeter-related problem.
- Problems affecting multiple adjacent rows often indicate a system-level issue rather than a single-row problem. Inspect the common plumbing, section, or supply components serving those rows.

When investigating an alarm condition, evaluate the overall row pattern rather than focusing only on the row displaying the alarm. Comparing multiple rows can help determine whether the problem is isolated to a single row or is affecting the application system more broadly.

If one row remains red, repeatedly alarms, or behaves differently from nearby rows, investigate using Troubleshooting Row Monitoring (page 97).

10.2.4. Alarms

If a row remains outside the configured **Tolerance**, Sentinel will display a row alarm. Row alarms identify the affected product and row and indicate whether the row is above or below the expected flow range. The delay before an alarm appears is controlled by the **Alarm Time** setting, and alarm display behavior is controlled by the **Auto Hide Alarms** and **Re Alarm Interval** settings.

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11. Fine-Tuning Rate Control

Start with the parameters below for Sentinel Rate Control. Adjust to optimize performance for specific equipment and application conditions.

11.1. Recommended Starting Values

Parameter	Starting Value
Control Mode	Rate
Control Speed	<table><tr><th>Pump</th><th>Speed</th></tr><tr><td>PR17</td><td>250-300</td></tr><tr><td>PR30</td><td>200</td></tr><tr><td>PR40</td><td>160</td></tr><tr><td>D250</td><td>150</td></tr><tr><td>Tower Electric</td><td>2000-2500</td></tr></table>
RPM Cal	15
Max RPM	500
Flow Cal	Set Flow Calibration.
PWM Max	80% for hydraulic pumps, 100% for electric.
PWM Min	25% (hydraulic), 5% - 10% (electric)
Start Boost	0
Open PWM	Only for agitation. 30% - 40% if used

11.2. Tuning Recommendations

The following sections provide information on fine-tuning Sentinel Rate Control.

11.2.1. Control Speed

Location: **Setup** tab.

Ctrl Speed determines how aggressively Sentinel responds to rate corrections. These numbers set the frequency of signal updates that Sentinel sends to the pump. Adjust as required for field conditions:

- Increase **Ctrl Speed** if the system is slow to respond to speed or rate changes.
- Decrease **Ctrl Speed** if the system surges, oscillates, or continually hunts above and below the target rate.

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11.2.2. RPM Calibration

Location: **Setup** tab.

RPM Cal, used only on hydraulic pump systems equipped with an RPM sensor, matches the displayed RPM to actual pump speed. Adjust RPM Cal only if the RPM reported in Sentinel does not match the actual pump RPM.

NOTICE

Do not adjust from the default setting of 15.

11.2.3. Maximum RPM

Location: **Setup** tab.

Max RPM sets the maximum pump speed. The maximum allowable setting is 550 RPM. Lower values may be used to limit pump speed and maximum system output.

11.2.4. Flow Calibration

Location: **Setup** tab.

Flow Cal determines how Sentinel converts system flowmeter signals into reported flow. The factory calibration number is printed on the system flowmeter label.

Recommended Starting Values

Pump Type	Starting Value
Hydraulic or electric pump systems using .2-24 GPM flowmeters	4542
Hydraulic pump systems using 1.45-58 GPM flowmeters	2063
Hydraulic pump systems using 5-106 GPM flowmeters	568

NOTE

Start with the flow calibration number printed on your flowmeter label. Flow calibration should only be adjusted after a successful Catch Test or field verification confirms a discrepancy between actual flow and reported flow.

Adjusting Flow Calibration

- Increase **Flow Cal PPG** if the reported flow is greater than the actual application rate. This will increase the physical output.

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- Decrease **Flow Cal PPG** if the reported flow is less than the actual application rate. This will decrease the physical output.

> **NOTE**
> Always verify calibration with field measurements comparing acres covered and gallons applied.

11.2.5. PWM Maximum

Location: **Setup** tab.

PWM Max limits the maximum PWM control signal sent to the pump. Adjust PWM Max only when maximum pump output should be restricted or when troubleshooting excessive pump speed.

- Lower the setting if maximum pump output should be restricted.
- Increase only as needed to achieve required application rates.

11.2.6. PWM Minimum

Location: **Setup** tab.

PWM Min establishes the lowest PWM command Sentinel can use while maintaining pump operation.

Recommended Starting Values

Pump Type	Percentage
Hydraulic	25%
Electric	5% to 10%

If the system cannot reduce output sufficiently at low rates, low speeds, or reduced working widths, PWM Min may need to be lowered.

11.2.7. Start Boost

Location: **Setup** tab.

Start Boost allows a higher initial PWM output during startup to improve pump responsiveness.

When needed, set Start Boost slightly higher than the normal operating PWM duty cycle to help the pump quickly achieve operating pressure and flow.

Example

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If the controller actual rate matches the target rate when the reported Duty Cycle is 40%, that is the Duty Cycle required to meet the demand/output. Setting the Start Boost to 45% helps the pump reach the targeted pressure and flow more quickly.

11.2.8. Open PWM

Location: **Setup** tab.

Open PWM configures the pump to continue operating when application is stopped. This setting is used to agitate product even when the tractor is not in motion or when work has temporarily stopped.



NOTE

Open PWM is normally disabled. Enable it only if you are using system bypass plumbing to agitate product when work is stopped.

- Enter a PWM percentage to maintain pump speed.
- Recommended agitation settings are between 30-40% PWM.
- Useful when product agitation is required during headland turns or temporary shutdowns.

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12. Fine-Tuning Row Monitoring

Start with the parameters below for Sentinel Row Monitoring. Adjust as needed to match the application system and operating conditions.

12.1. Recommended Starting Values

Parameter	Starting Value
Tolerance	25%
Row Smoothing	10%
Flow Adjustment	1.00

12.2. Tuning Recommendations

The following sections provide information on fine-tuning Sentinel Row Monitoring.

12.2.1. Tolerance

Location: **Product Configuration** screen.

Tolerance determines how far a row may deviate from the expected flow before Sentinel identifies the row as out of tolerance and displays a warning condition.

To adjust:

- Increase **Tolerance** if nuisance alarms occur during normal operation.
- Decrease **Tolerance** if earlier detection of row-flow problems is desired.

12.2.2. Row Smoothing

Location: **Rate** screen.

Row Smooth determines how much row-to-row variation Sentinel ignores before displaying differences on the Row Bar graph.

To adjust:

- Increase **Row Smooth** if normal row variation causes excessive display fluctuations.
- Decrease **Row Smooth** if smaller row flow differences should be shown more clearly.

12.2.3. Flow Adjustment

Location: **Rate** screen.

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Flow Adjustment synchronizes the total flow reported by the Flowmeter Modules with the flow reported by the verified system flowmeter.

To adjust:

- Decrease **Flow Adjustment** if Sentinel reports less total flow than the verified system flowmeter.
- Increase **Flow Adjustment** if Sentinel reports more total flow than the verified system flowmeter.



NOTE

Verify system flowmeter accuracy using a Catch Test before adjusting **Flow Adjustment**.

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13. Care and Maintenance

With basic care and maintenance, your SurePoint Sentinel system will provide reliable service.

13.1. Cleaning

Never clean Sentinel modules or the ECU with a pressure washer. While the flowmeter modules and the ECU are sealed, the intense pressure generated by a pressure washer may penetrate the seals and cause irreversible damage.

SurePoint recommends cleaning flowmeter tubes only if there are issues with flow reporting.

To clean the Flowmeter Module tubes:

1. Remove the top fitting.
2. Run a cotton swab, soft cloth, or soft brush through the tube on the Flowmeter Module. Hot, soapy water may be used.Product film can build up on the electrodes inside the tube and affect performance. Clean the tube carefully to remove any buildup.
3. Reinstall the top fitting.

13.2. Winterization

SurePoint recommends flushing the system thoroughly with clean water before winter storage. After flushing, use RV antifreeze to winterize the system by pumping an adequate amount through all components. At the beginning of the next season, fill and operate the system with water to verify proper operation and confirm there are no leaks.

13.3. Pre-Season Service

After removing your SurePoint Sentinel system from storage, pre-season service can help ensure proper operation.

1. Visually inspect the entire system, including hoses, fittings, harnesses, and electrical connections, for signs of wear, damage, or deterioration.
2. If your system includes hydraulic pumps, verify that strainers are unblocked and check the oil level via the sight glass.
3. Review all Sentinel setup screens and settings to verify the system is configured correctly for the implement and application.
4. Fill the system with water and operate it in Manual Mode to verify all components are functioning properly.

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5. Tighten all clamps. Loose clamps may create leaks on the pressure side of the system. Clamps between the tank and pump may not leak externally but can allow air to enter the system. Hydraulic pumps generate significant suction and air entering the inlet side of the pump can cause erratic flowmeter readings and inconsistent system performance.
6. Verify that all tubing is fully seated in quick-connect fittings. Tubing that is not fully inserted may not leak but can allow air into the system, potentially causing check valves to malfunction or leak.
7. Verify that all rows are flowing properly and that all metering tubes and orifices are open and unobstructed. Note that higher flow rates may be required when using water to generate sufficient pressure to open all check valves.
8. Perform a flow check (Nozzle Test) to confirm the system can achieve and maintain the target application rate. Pressure will generally be lower when testing with water than with fertilizer. In some regions, tap water may not be conductive enough for accurate Sentinel flow measurement. Adding a small amount of fertilizer to the water will typically improve conductivity.
9. Perform a Catch Test to verify flowmeter calibration. For best results, conduct the Catch Test using the actual product that will be applied. Flow calibration values may vary slightly between water and fertilizer products. Always verify calibration by comparing acres covered and gallons applied during field operation.

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14. Troubleshooting

The following sections provide information on identifying, diagnosing, and correcting issues with Sentinel.

14.1. General Troubleshooting

14.1.1. Display Does Not Show Sentinel

Possible Causes:

- Insufficient voltage to Sentinel ECU.
- Sentinel displayed on secondary screen.

Corrective Actions:

1. Verify that the Sentinel ECU has power. Two green lights should be illuminated on the ECU. Using a voltage tester, check voltage on the ECU harness.
2. On a multi-display setup, Sentinel may be displayed on the second display.
3. Check connections:
   - Tractor ISO plug.
   - CAN and power connections leading to the ECU harness.
4. Reboot.

14.1.2. Sentinel Doesn't Display Speed

Possible Causes

- Incorrect speed source selected.
- Communications error between Sentinel and tractor.

Corrective Actions:

1. Change the speed source. Toggle through the speed sources on the **Speed** screen to determine which source shows speed while the tractor is moving.
2. If none of the speed sources work, a communication problem with the tractor may exist. Check CAN and power connections.



NOTE

If necessary, you can install a third-party GPS sensor for speed input to the ECU.

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14.2. Troubleshooting Rate Control

Use the following troubleshooting procedures to diagnose and correct Rate Control issues. If you cannot resolve an issue using these procedures, contact SurePoint support for help.

Use the following symptom list to locate the appropriate troubleshooting topic:

- Section Valves Do Not Open or Close During Manual Section Test (page 94).
- Pump Does Not Run During Manual Pump Operation (page 94).
- Rate, Flow, or Duty Cycle Oscillates During AUTO Operation (page 95).
- Pump Does Not Run Even Though Duty Cycle Is Displayed (page 96).
- Working Width Does Not Display or Change (page 96).
- As-Applied Rate Does Not Match Rate Controller (page 97).

14.2.1. Section Valves Do Not Open or Close During Manual Section Test

Possible Causes:

- **Section Control** is not set to **MAN**.
- **MASTER** is not on.
- No **Speed** is entered for stationary testing.
- Section valve wiring, harnessing, or valve hardware is not connected correctly.

Corrective Actions:

- Select **Manual Section**, then select each section button to turn the valve off or on.
- For stationary testing, set **DUTY CYCLE** to **MAN**, turn **MASTER** on, enter a speed, and set **Section Control** to **MAN**.
- Verify that the selected section changes state on the Sentinel screen.
- If the screen changes state but the valve does not move, inspect the section valve harnessing, connector, and valve hardware.

14.2.2. Pump Does Not Run During Manual Pump Operation

Possible Causes:

- **DUTY CYCLE** is not set to **MAN**.
- No **Duty Cycle** percentage has been entered.
- **MASTER** is not on.
- No speed is entered for stationary testing.
- Implement height switch is not activated
- Hydraulic flow is not present, is not enabled, or is not plumbed correctly.

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- Electric pump drive or pump power is not operating correctly.

Corrective Actions:

- Set **DUTY CYCLE** to **MAN**.
- Turn **MASTER** on and enter a speed if the machine is stationary.
- Enter a **DUTY CYCLE** percentage sufficient to operate the pump.
- Verify that flow and pressure remain steady. Adjust Duty Cycle as necessary.
- If **Duty Cycle** is displayed but the pump does not run, check hydraulic supply or electric pump drive operation.
- Verify voltage at the 2-pin PWM connector.

14.2.3. Rate, Flow, or Duty Cycle Oscillates During AUTO Operation

Possible Causes:

- **Control Speed** is set too aggressively.
- System response is being tested outside the expected operating range.
- Water testing is producing lower pressure than fertilizer operation.
- Check valves are not opening because the test rate or pressure is too low.
- Flow, pressure, hydraulic supply, or pump response is unstable.

Corrective Actions:

- Enter a speed, select a rate, turn **MASTER** on, and set **Section Control** to **MAN**.
- Adjust speed and rate throughout the expected operating range.
- Observe **Flow (GPM)**, **Pressure**, **DUTY CYCLE**, and **RPM** on hydraulic pumps.
- If testing with water, increase the rate as needed to build enough pressure to open check valves and achieve flow on all rows.
- Use **Manual Section** to close sections and observe system response.
- If **DUTY CYCLE**, **Rate**, or **Flow** oscillates and will not stabilize, decrease **Control Speed**. Adjust as needed for best field performance.

14.2.4. Sentinel Does Not Operate

Sentinel Rate Control does not apply product or does not respond as expected during operation.

Possible Causes:

- **MASTER** is not on.
- **Product Enable** switch is not on.
- No speed is present.

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- No rate is entered.
- **Section Control** is not set to **MAN** during testing.
- Hydraulic flow is not present or is not plumbed correctly.
- **Task Control** is enabled in Sentinel but is not activated or enabled in the display software.
- **Master Switch** or **Implement Switch** settings are enabled but not connected directly to Sentinel harnessing.

Corrective Actions:

- Verify that **MASTER** is on, **Product Enable** switch is enabled and green, speed input is present, a **Rate** is entered, **Section Control** is set to **MAN**, a **DUTY CYCLE** is displayed, and hydraulic flow is present and correctly plumbed.
- On the Hardware screen, clear **Task Control**. If **Task Control** is enabled in Sentinel, it must also be activated and enabled within the display software.
- Verify **Master Switch** and **Implement Switch** settings. If enabled, these devices must be connected directly to Sentinel harnessing.
- If using an **Implement Switch**, verify switch orientation and the arrow direction on the **MASTER** button.
- Verify that **Product Enable** switch is enabled and green.

14.2.5. Pump Does Not Run Even Though Duty Cycle Is Displayed

Possible Causes:

- Hydraulic supply is not available or is not correctly connected.
- Electric pump drive is not operating correctly.
- The 2-pin PWM connector does not have the expected voltage.
- Pump or pump-control wiring is damaged or disconnected.

Corrective Actions:

- Check hydraulic supply and verify hydraulic plumbing.
- On electric pump systems, check the EPD.
- Verify voltage at the 2-pin PWM connector.
- Inspect pump-control wiring and connectors.

14.2.6. Working Width Does Not Display or Change

Possible Causes:

- Sections are not turning on or off as expected.
- Section configuration does not match the implement.
- Section Control, Task Control, or implement setup is preventing Sentinel from detecting active sections.

Corrective Actions:

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- Turn sections on and off manually and verify that Working Width changes as sections change state.
- Verify the configured number of rows, sections, row spacing, and implement width.
- If Task Control is enabled, verify that it is also activated and enabled in the display software.
- Verify that the **Product Enable** switch is enabled and green.

14.2.7. As-Applied Rate Does Not Match Rate Controller

Possible Causes:

- The system has not been calibrated.
- The primary flowmeter calibration is incorrect.
- **Flow Adjustment** has been changed before verifying the main flowmeter.
- For implements with few rows, automatic rate calculation may be inaccurate.

Corrective Actions:

- Verify flow and main flowmeter calibration by performing a catch test.
- Do not adjust Sentinel application rates to match a system that has not been calibrated.
- Use the **Flow Adjustment** input box on the **Rate** screen to adjust the Flowmeter Modules only after the primary system has been verified.
- For implements with few rows, try using manual rate mode if automatic rate calculation does not produce expected results.

14.3. Troubleshooting Row Monitoring

Use the following troubleshooting procedures to diagnose and correct Row Monitoring issues. If you cannot resolve an issue using these procedures, contact your dealer or SurePoint support for help.

Use the following symptom list to locate the appropriate troubleshooting topic:

- Sentinel Shows No Flow and Rows Are Gray (page 98).
- Sentinel Flowmeter Module(s) Will Not Address (page 98).
- Modules Flash Green or Stay Blue (page 99).
- Sentinel Alarms Too Often (page 99).
- Individual Rows Read High or Low (page 100).

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14.3.1. Interpreting Row Patterns

Before troubleshooting an individual row, evaluate the overall row pattern on the **Rows** screen. A plugged or restricted row may cause neighboring rows to appear higher than expected, while a leaking or excessive-flow condition may cause neighboring rows to appear lower than expected. Problems affecting multiple rows often indicate a common plumbing, section-control, pressure, or supply issue rather than a problem with a single row. Use the overall pattern to determine whether troubleshooting should focus on an individual row or other components of the application system.

14.3.2. Sentinel Shows No Flow and Rows Are Gray

Possible Causes:

- **MASTER** switch is off.
- Section Control is not configured correctly for stationary testing.
- Speed source is not available or is configured incorrectly.

Corrective Actions:

- Ensure the **MASTER** button on the Sentinel **Home** screen displays a green **MASTER ON**. If not, select the button to cycle it. If there is a **Height Switch** arrow on the **MASTER** button, be sure it shows down to run.
- If performing a stationary flow test, enter a simulated speed and set **Section Control** to **MAN**.
- Verify that speed is displayed on the Sentinel **Home** screen while moving. If not, change the speed source.

14.3.3. Sentinel Flowmeter Module(s) Will Not Address

Possible Causes:

- Missing CAN terminator.
- Incorrect harness connections.
- Low system voltage.
- Module power or communication failure.
- Faulty module.

Corrective Actions:

- Ensure there is a terminator on the end of Flowmeter Bus 1 and Flowmeter Bus 2.
- Verify that all trunklines are plugged into the correct port on the module (+12V DC).
- Ensure the tractor is running. Low voltage may cause modules not to address correctly.
- Verify that all modules are plugged in before selecting **RESET ALL ADDRESSES**.
- Unplug ALL modules for the product that won't address. Then plug the modules in one at a time, making sure each module addresses before moving on to the next. Have someone watch the display and check that the startup light sequence on the module matches the address shown.

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- Verify that the lights on the module are flashing.
  - If the module lights do not turn on, check the connection to the module and inspect all connections to the ECU harness.
  - After checking connections, use a voltmeter to check the voltage at the module using the harness drawings.
  - If 12 volts is present and the module fails to light up, the module may be faulty.
- Reboot.

14.3.4. Modules Flash Green or Stay Blue

Possible Causes:

- Implement row count is configured incorrectly.
- Modules are installed beyond the number of rows expected by Sentinel.
- Implement row count is not evenly divisible by four.

Corrective Actions:

- Make sure that the implement is set up with the correct number of rows.
- If a module is plugged in and Sentinel reports it as not expected, verify the implement configuration on the **Implement** screen and row count on the **Product** screen.
- If the row count is not divisible by four, verify that the final module and displayed rows match the implement configuration.

14.3.5. Sentinel Alarms Too Often

Possible Causes:

- Flow calibration is incorrect.
- Alarm settings are too sensitive.
- Water is being used for testing.
- Normal row-to-row variation exists within the application system.
- A specific row is causing repeated alarms.

Corrective Actions:

> **IMPORTANT**
>
> Before attempting anything else, verify that your **Flow Cal** setting matches the flow calibration number on the label of your system flowmeter.

- Verify that you are not testing with water.

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- Decrease the length of time that full-page alarms display by changing the **Auto Hide Alarms** setting.
- Increase the time before a row alarms by increasing the **Alarm Time** setting.
- If alarms occur when the implement is raised or during turns:
  - Use IntelliSection.
  - Consider disabling alarms through a lift switch.
- Disable the problematic row from the **Row Detail** screen.
- Disable all alarms by checking the **Disable Alarms** box.

> **CAUTION**
>
> Temporarily disable alarms only during controlled diagnostic testing. Restore all alarms and re-enable any disabled rows before resuming field operation.

14.3.6. Individual Rows Read High or Low

Compare individual row performance with adjacent rows and evaluate the overall row pattern before making calibration adjustments or replacing components.

Possible Causes:

- Water is being used for testing.
- Insufficient system pressure.
- Restrictions or damage in row plumbing.
- Flow through the row is below the measurable range.
- Product conductivity is too low.
- Flowmeter calibration adjustment is required.

Corrective Actions:

- Verify that you are not testing with water.
- Increase rate to build a minimum of 15 PSI system pressure.
- Check row plumbing.
  - Look for pinched or kinked lines to the row.
  - Inspect check valves for plugging or damage.
  - Inspect placement devices for plugging.
  - Swap outlet plumbing between two rows and determine if the problem follows the row.
    - Inspect the module for plugging.
    - Flush the module with warm water and clean inside the Flowmeter Module with a soft brush or cloth.
- Increase rate or add a small amount of fertilizer to increase conductivity.

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- Perform a catch test on several rows to determine if the displayed information is correct.
- Adjust the individual Flowmeter Module using **Flow Adj** on the **Row Detail** screen.



NOTE

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

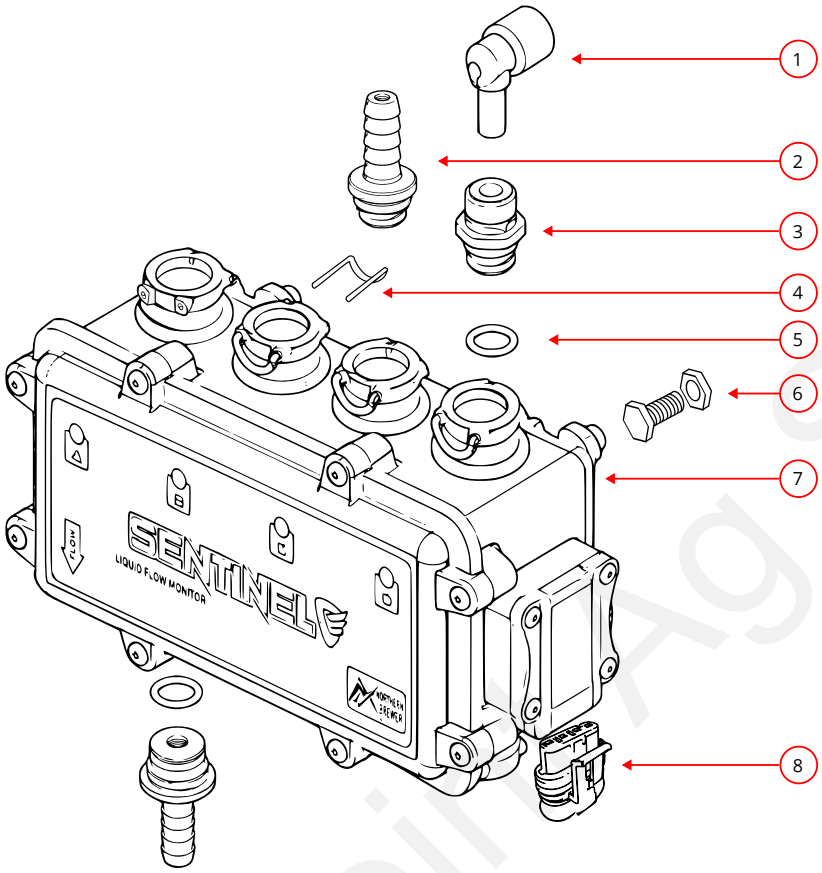
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15. Technical Resources

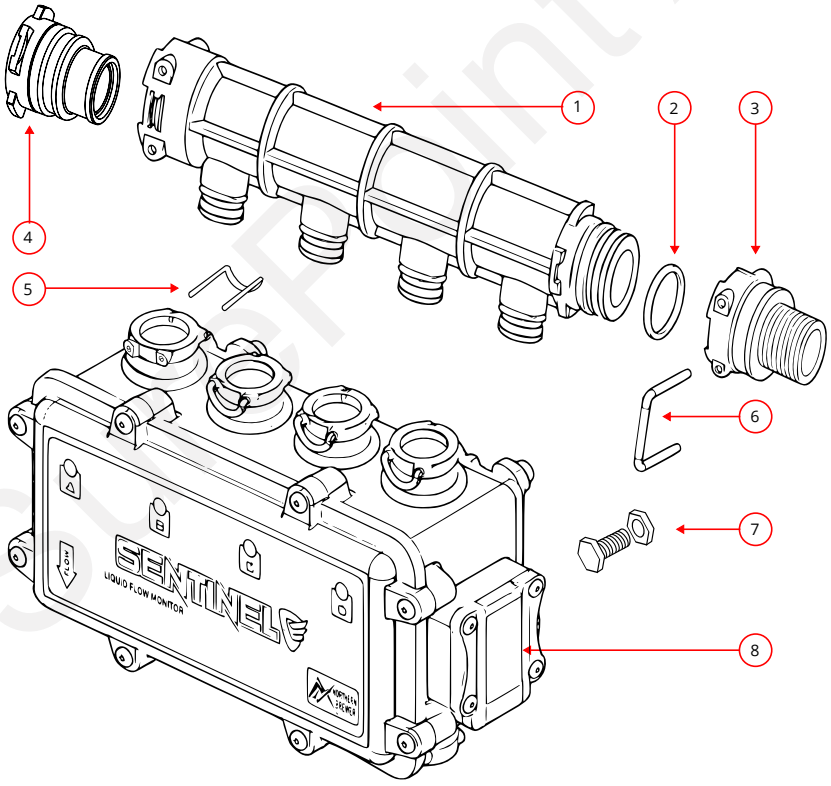
15.1. Flowmeter Modules for Isolated Rows



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ITEM NO.	PART NUMBER	DESCRIPTION
1	113-12-038038	Stem Elbow—3/8” Stem x 3/8” QC
2	121-T1M038	T1 Male x 3/8” HB
	121-T1M050	T1 Male x 1/2” HB
3	120-T1M038QC	T1 Male x 3/8” Quick Connect
	120-T1M025QC	T1 Male x 1/4” Quick Connect
4	124-02-010001	T1 Fork
5	124-01-G11056-V	Viton O-ring for T1 Fittings
6	384-1105	Flowmeter Module Mounting Hardware Kit
7	204-01-4625AAGB1B1	4-Row Sentinel Flowmeter Module
8	374-4024Y1	4-Pin Amp Superseal dust plug
Available but not shown:		
	113-05-025	Plug - 1/4” Quick Connect
	113-05-038	Plug - 3/8” Quick Connect

15.2. Flowmeter Module Parts for Manifold Feed



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ITEM NO.	PART NUMBER	DESCRIPTION
1	120-T3MT3F-4XT1M	T3 Male/Female Manifold w/ (4)T1 Male Outlets
2	124-01-G11058-V	Viton O-ring for T1 fittings
	124-01-G11054-V	Viton O-ring for T3 fittings
	124-01-G11056-V	Viton O-ring for T4 fittings
3	120-T4MT3MRN	T4 Male x T3 Male FC Reducer Nipple
4	120-T3MPLUG	T3 Male FC Plug
5	124-02-010003	T3 Fork
6	124-02-010004	T4 Fork
7	384-1105	Flowmeter Module Mounting Hardware Kit
8	204-01-4625AAGB1B1	Sentinel™ Flowmeter Module
Available but not shown:		
	120-T3FTEE	T3 Tee
	120-T4FT3FRC	T4 Female x T3 Female FC Reducer Coupling
	121-T3M075-90	T3 Male FC x 3/4" HB - 90 degree
	121-T3F075	T3 Female x 3/4” HB

15.3. Flowmeter Module Connections



1. Each Sentinel Flowmeter Module is connected to the system network using the port labeled +12 VDC.
2. The remaining port should be fitted with a dust cover.

The module is subsequently assigned to a specific implement location through the Sentinel interface.

15.4. Flowmeter Module Trunkline Drawings

These drawings illustrate the connectors and wiring of CAN trunklines for connecting Flowmeter Modules.

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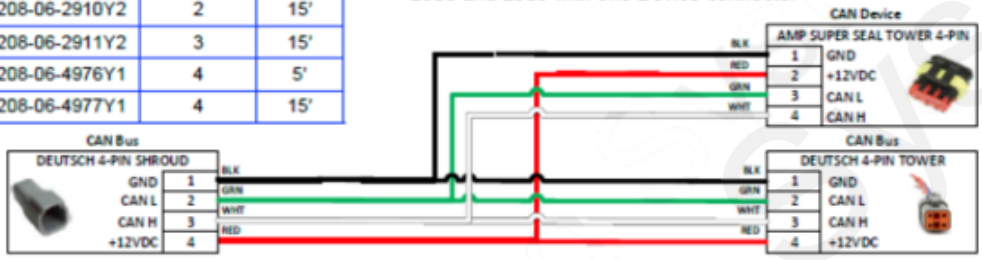
4-Pin Deutsch CAN Trunklines to 4-Pin AMP SuperSeal to connect Sentinel Flowmeter Modules

Part #	Number of flowmeter connectors	Length
208-06-2908Y2	1	5'

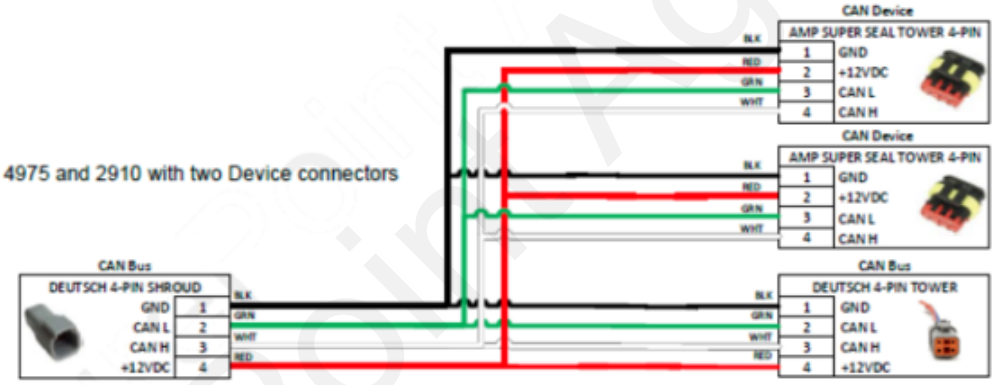
4-Pin Deutsch CAN Trunklines to 4-Pin AMP SuperSeal to connect Sentinel Flowmeter Modules

Part #	Number of flowmeter connectors	Length
208-06-2908Y2	1	5'
208-06-2909Y2	1	15'
208-06-4975Y1	2	5'
208-06-2910Y2	2	15'
208-06-2911Y2	3	15'
208-06-4976Y1	4	5'
208-06-4977Y1	4	15'

2908 and 2909 with one Device connector



4975 and 2910 with two Device connectors



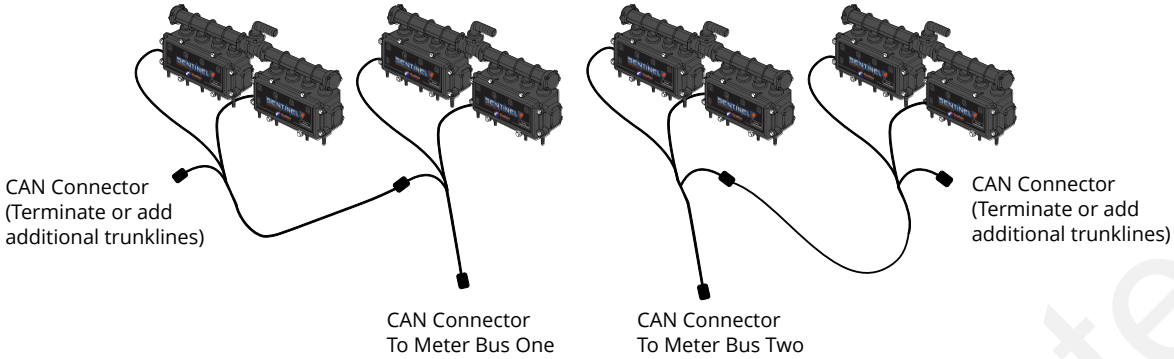
2911 is similar to the above, but with three Device connectors.

4976 and 4977 are similar to the above, but with four Device connectors.

The Deutsch 4-pin Tower CAN Bus connector (bottom right of each drawing above) is plugged into another trunkline or, if it is the last trunkline, it is plugged into a Terminator.

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15.5. Trunkline to System Connections



You can add additional CAN trunklines to add additional modules. You can also add extension harnesses if the trunklines are not long enough for your application.

CAN trunklines are part number 208-06-XXXX

4-pin extension harnesses are part number 206-04-XXXX.

Utilization of both bus connections on the main harness is not required. If Meter Bus 2 is not used, a terminator shall be installed in the unused connector.

SurePoint Ag Systems

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SurePoint Ag Systems

16. Index

A

ABCD, 37
Accessing Sentinel
  Ag Leader InCommand, 23
  Case Pro 700, 22
  John Deere 2630, 21
  John Deere 4640, 21
  Other displays, 24
Addressing (see Flowmeter Module Addresses)
alarms, 57
  Alarm Time, 59
  Auto Hide Alarms, 59
  Disable Alarms, 59
  frequent alarms, 99
  Re Alarm Interval, 59
application rate
  target rate, 31
Auto SCAN, 57
Auxiliary Settings, 65

C

Calibrate Flow (see Catch Test)
CAN bus
  harness connections, 14
  termination, 20
  trunkline, 20
CAN Bus
  trunkline drawings, 105
Catch Test
  pre-season service, 92
  running, 62
configure
  product, 48
Control Speed, 85
Controller (see ECU)
counters, 47

D

DCBA, 37
Diagnostics
  Catch Test, 62
  Nozzle Test, 60
display
  Sentinel not shown, 93
Duty Cycle, 43

E

ECU
  bracket, 13
  harness overview, 13
  installation, 13
  orientation, 13
ECU Speed Calibration, 27
external master switch, 56

F

Flow Adjustment, 86
  row calibration, 81
  synchronize with rate controller, 37
  tuning, 89
Flow Cal, 85
Flow Cal PPG, 86
flowmeter module
  harness diagram, 19
  manifold, 18
  parts diagram, 104
  troubleshooting addressing, 98
Flowmeter Module
  connecting, 32
  diagnostics screen, 67

SurePoint Ag Systems

identification, 35
LEDs, 35
orientation, 36
set/reset addresses, 69
flowmeter module connections, 105

G

GPS (see Speed Sources)

H

Hardware
external master switch, 56
screen, 55
Height Switch
configure, 56
enable, 56
troubleshooting, 98

I

Implement
geometry, 55
Implement Switch, 14, 95
Installation Wizard, 25
Interplant, 31, 55
interplant mode, 52

M

Master Switch, 43
Max RPM, 85
module addressing failure, 98

N

Network Terminator (see CAN bus termination)
no flow displayed, 98
Nozzle Test
pre-season service, 92
running, 60

O

Object Pool, 59
Off-Rate Tolerance, 29
Open PWM, 85
oscillation, 95
outside row rates, 51

P

product
manual rate, 51
mode, 49
Product Configuration, 26, 48
Pump Calibration (see Catch Test)
PWM Max, 85
PWM Min, 85

R

Rate, 51
screen, 53
Rate Control
fine-tuning, 85
Functional Verification, 39
installation, 15
not operating, 95
operating, 73
oscillation, 95
overview, 5
troubleshooting, 94
rate mode, 51
row
first and last, 51
outside, 51
Row Monitoring
fine-tuning, 89
individual rows high or low, 100
installation, 17
operating, 78
overview, 8

SurePoint Ag Systems

troubleshooting, 97
Row smoothing, 89
Rows screen, 59
RPM Cal, 85

S

screen
Auto SCAN, 57
Flowmeter Module Diagnostics, 67
Hardware, 55
Implement, 55
Rate, 53
Rows, 59
Speed, 52
System Diagnostics, 60
System Information, 65
Speed, 52
Ground Speed, 53
Simulated Speed, 53
Speed Smoothing, 53
Speed Units, 53
Wheel Speed, 53
Speed Input, 14
Speed Sources, 53
Start Boost, 85
Startup Light Sequence, 35

T

Tank Alarm, 77
Tank Capacity, 77
Task Control, 28
enabling, 57
Tolerance, 50, 89
Toolbar
available items, 45
customization, 44
Totalizers, 45
best practices, 47
resetting, 46
troubleshooting
frequent alarms, 99
module addresses, 98
Rate Control, 94
Row Monitoring, 97
Sentinel display, 93

U

User Defined Rates, 31

W

Working Width, 96

SurePoint Ag Systems