



USER GUIDE

AgGPS® FieldManager™ Display



USER GUIDE

AgGPS[®] FieldManager[™] Display

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Agriculture Business Area

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5521 DZ Eersel, NL



Safety

In this chapter:

- Warnings
- Cautions

Always follow the instructions that accompany a Warning or Caution. The information they provide is intended to minimize the risk of personal injury and/or damage to property. In particular, observe safety instructions that are presented in the following format:



WARNING – This alert warns of a potential hazard which, if not avoided, can cause severe injury.



CAUTION – This alert warns of a hazard or unsafe practice which, if not avoided, can cause injury or damage.

Note – An absence of specific alerts does not mean that there are no safety risks involved.

Warnings



WARNING – Incorrect adjustment of the Manual Override Sensitivity calibration setting could cause this critical safety feature to fail, resulting in personal injury or damage to the vehicle. Any adjustment to this setting should only be made by an experienced user.



WARNING – During the Deadzone calibration, the system moves the vehicle's steering wheels. To avoid injury, be prepared for sudden vehicle movement.



WARNING – When you tap the liquid flow calibration **Start** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.



WARNING – When you tap the control valve calibration **Start** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.



WARNING – When you tap the fill disk **Start** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.



WARNING – When the implement is down and the master switch is in the On position, the machine is fully operational. Take all necessary precautions to ensure user safety. Failure to do so could result in injury or death.

Cautions



CAUTION – Do not use a sharp item, such as a pencil, to press the screen or you may damage the surface of the screen. Use your finger to press the screen.



CAUTION – Avoid turning off the display by holding down the Power button for 10 seconds unless it is absolutely necessary. If the display is writing to the Compact Flash card, this method of shutdown can corrupt the data on the card. If possible, use one of the other shutdown methods instead.



CAUTION – Do not remove the CompactFlash card from the slot while the system is writing to the card, or you will corrupt data. When you open the card socket, a prompt appears. Select Yes and then remove the card.



CAUTION – Obstacles in the field can cause collisions, which may injure you and damage the vehicle. If an obstacle in the field makes it unsafe to continue a particular phase of the Automated Deadzone calibration, stop the vehicle to abort the phase and turn the steering wheel to disengage the system. Reposition the vehicle and continue from the current test phase.



CAUTION – The wheels can move abruptly during the Proportional Steering Gain procedure while the AgGPS Autopilot system tests the hydraulic response to the steering commands. These sudden movements can cause collisions with nearby obstacles or cause injury to occupants of the vehicle. Be prepared for sudden wheel movements.



CAUTION – The vehicle will need to move during the Hydraulic Tracked Pump Knees calibration procedure. To avoid injury, be prepared for vehicle movement.



CAUTION – The Steering Center Bias test requires the vehicle to be in motion. To avoid collisions causing injury to you or damage to the vehicle, ensure that the vehicle is in an area that is free of obstacles.



CAUTION – If you use the same farm, field, or event names on more than one display unit, you could accidentally overwrite existing files when you copy data to the office computer. To prevent this, create a separate directory for each unit. For example:

```
C:\AgGPSFMD_SN123456\  
C:\AgGPSFMD_SN123457\  
C:\AgGPSFMD_SN123458\  

```



CAUTION – When you select a shapefile prescription, if you choose the wrong column when using a variable rate controller, the applied rate will be incorrect.



CAUTION – If you switch the *External Interface / Local Control* switch on the *DataLink Interface* box of a Mid-Tech controller, the changes do not take effect until the variable rate controller is turned off and turned back on again.



CAUTION – With Mid-Tech controllers, if a channel has been set to lbs/ac, any value that is less than 10.0 is interpreted as tons/acre.



CAUTION – The first boom section width set on the Raven controller **must** be greater than 0. If you set it to 0, the AgGPS FieldManager display will not communicate with the controller.



CAUTION – Some Raven controllers do not support zero rates. If the target rate is zero, and spray is still being applied you need to turn off your boom sections manually.



CAUTION – When you have finished testing, remove the test switch. If it accidentally engages, the implement could cause injury.



CAUTION – Do not use the master module enclosure as a guide when drilling. Do not overtighten nuts as this may damage the mounting tabs of the enclosure.



CAUTION – Do not use the member module enclosure as a guide when drilling. Do not overtighten nuts as this may damage the mounting tabs of the enclosure.



CAUTION – Please note that in the Multi-Application Control plugin chapter, the value “0” represents “disabled”. For example, the *Shut Off Speed* option enables you to set the low speed that will cause the system to shut off. If you set the *Shut Off Speed* to 0, it will not shut off when the value reaches 0. Instead, the *Shut Off Speed* option will be disabled and the multi-application device will not shut off due to a low speed.



CAUTION – Do not reset the master module unless you want to reset all system data settings to the factory default. Trimble recommends that you do not reset the system unless instructed to by Technical Support.

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Introduction

In this chapter:

- Welcome
- About the product
- Related information
- Technical assistance
- Your comments

Welcome

This manual describes how to install, configure, and use the Trimble® AgGPS® FieldManager™ display version 5.10.

Even if you have used other Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product. If you are not familiar with GPS, visit the Trimble website (www.trimble.com) for an interactive look at Trimble and GPS.

About the product

The Trimble *AgGPS* FieldManager display, which consists of both software and hardware, is an easy-to-use advanced field management system. The software runs on a 26.4 cm (10.4") touch-sensitive, color LCD screen.

The *AgGPS* FieldManager display is Trimble's highest level display for agricultural purposes.

It is compatible with the *AgGPS* Autopilot automated steering system. For several years, the *AgGPS* Autopilot system has been Trimble's most accurate system for agricultural guidance. Now, with the FieldManager display, that same accuracy can be controlled with a touch-screen interface to provide easy, precise, and reliable steering.

With the additions to the software in version 5.10, you can use the FieldManager display to perform many new functions, including implement guidance or field leveling.

Using this manual

The AgGPS FieldManager display uses segments of product functionality called *plugins* to add or remove display options.

This manual contains a description of all the plugins. It is unlikely that you will use all of the plugins:

Item	Chapter
Recommended reading	Chapters 1 through 10 Chapters 20 through 22
Read if relevant	Chapters 11 through 19

Related information

Sources of related information include the following:

- Release notes – The release notes describe new features of the product, information not included in the manuals, and any changes to the manuals. The release notes are available at www.trimble.com.
- Trimble training courses – Consider a training course to help you use your GPS system to its fullest potential. For more information, go to the Trimble website at www.trimble.com/training.html.

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Alternatively, you can send an email to trimble_support@trimble.com

Your comments

Your feedback about the supporting documentation helps us to improve it with each revision. Email your comments to ReaderFeedback@trimble.com.

Features and Functions

In this chapter:

- System components
- System hardware
- System software
- View modes

The *AgGPS* FieldManager display is a touch-sensitive screen that runs field management software.

This chapter describes the parts of the display and some of the basic operation.

System components

The following components are included in the box with the *AgGPS* FieldManager display:

- The display unit, see page 31.
- The *AgGPS* Autopilot harness, see page 34.
- The 128 MB CompactFlash card, see page 35.
- The mount bracket and screws, see page 46.

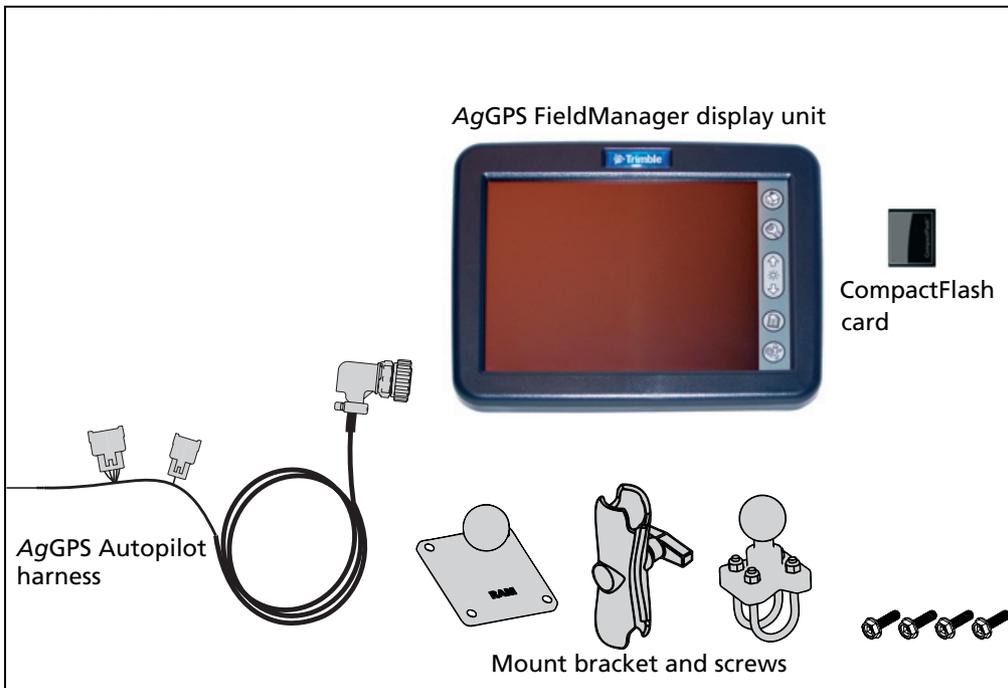


Figure 2.1 Components in the box

System hardware

The system hardware consists of:

- The display unit itself
- The AgGPS Autopilot harness
- The 128 MB CompactFlash card

Display unit



Figure 2.2 The front of the AgGPS FieldManager display unit

Item	Description
1	Touch-sensitive screen
2	Touch screen buttons

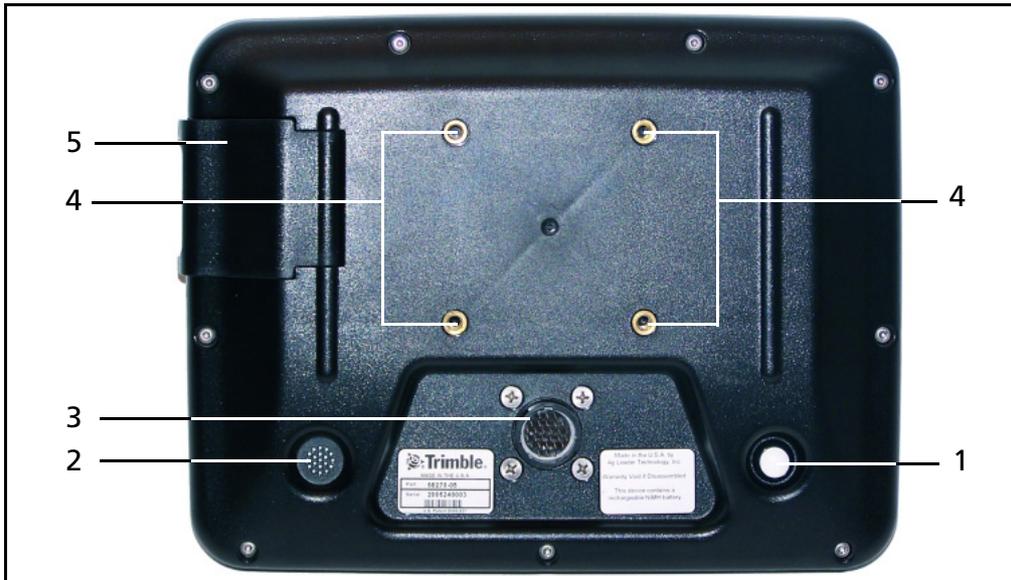


Figure 2.3 The back of the AgGPS FieldManager display unit

Item	Description
1	Power button
2	Speaker
3	AgGPS Autopilot harness AMP socket
4	Mount bracket screw sockets
5	CompactFlash memory card socket

The six buttons

There are six touch screen buttons to the right of the display, see [Figure 2.2](#) on page 31.

Press this button ...	To ...
	access the Home screen (see page 68)
	access the Configuration screen (see page 69)
	increase the screen brightness
	decrease the screen brightness
	access the <i>Data Management</i> screen (see page 70)
	access the Run screen (see page 71)

These buttons enable you to access all features of the software.

For example, if you press the Configuration button , the *Configuration* screen appears. From here you can configure the whole system.

Screen

The FieldManager display has a 10.4" touch-sensitive screen. In the field, the easiest way to interact with the system is to tap an item on the display screen.



CAUTION – Do not use a sharp item, such as a pencil, to press the screen or you may damage the surface of the screen. Use your finger to press the screen.

Power button

The Power button is on the back of the display, and is a simple push button. To turn the system on or off, push the button in and hold it down for approximately 0.5 seconds.

Speaker

There is a speaker on the back of the display. The volume cannot be changed.

AgGPS Autopilot harness socket

There is one 28-pin AMP socket on the back of the display. This socket supplies power and data to the display.

AgGPS Autopilot harness

The cable that attaches to the system is called the *AgGPS* Autopilot harness. The harness provides the display with power and allows communication between the display and external devices.

The harness has:

- 1 x 4-pin Deutsch CAN connector (P3)
- 1 x 8-pin Deutsch connector (P2 switched inputs: remote output or an implement switch)
- 2 x 12-pin Deutsch connector (P4 controller and P5 extension)
- 1 x power connector pin (P9 Battery +)
- 1 x 28-pin AMP plug

128 MB CompactFlash card

The *AgGPS* FieldManager display comes with a 128 MB CompactFlash memory card. Any data that you record is saved on this card. See [Inserting the CompactFlash card in the socket, page 66](#).

System software

The AgGPS FieldManager display includes the following features:

- Field definition and mapping
- Feature mapping
- Guidance to predefined field patterns
- Logging of coverage data
- Variable rate control
- Boom/Row switching
- Logging of topographic mapping data
- Output of information for analysis in office-based Geographic Information System (GIS) software
- Seed, Liquid, Granular, and Anhydrous Ammonia control
- Seed monitoring

Directory hierarchy

The AgGPS FieldManager display stores data in a directory hierarchy according to client, farm, field, and event.

Item	Description
Client	The customer for whom the work is being done
Farm	A collection of fields (see below)
Field	A specific area of land where events are carried out. A "field" can be created on the display to represent an actual field, part of an actual field, or a group of more than one actual fields.
Event	A precision agriculture application or activity on a particular field (see above). For example: <ul style="list-style-type: none">- Planting of seed- Application of fertilizer or lime- Spraying with fungicide, herbicide, or insecticide

Each client may have several farms, each of the farms may consist of several fields, and each field may be broken into a number of events.

Touch screen elements

The following interactive features appear on the touch screen:

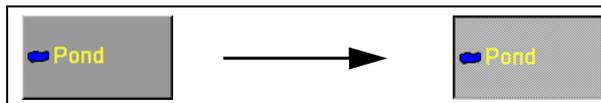
- Virtual buttons
- Virtual keyboard
- Virtual number pad
- Drop-down boxes
- Slider bars
- Lists

See also Slide-out tabs, page 95.

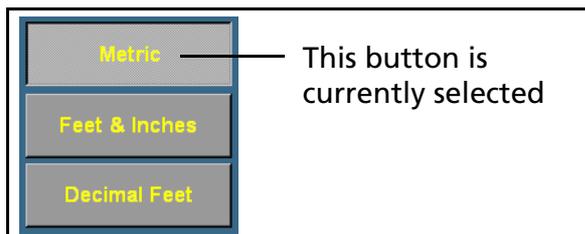
Virtual buttons

The most common way to interact with the system is to use the virtual buttons.

Treat a virtual button as you would a normal button. To press the button, press (tap) the area of the screen where it appears.

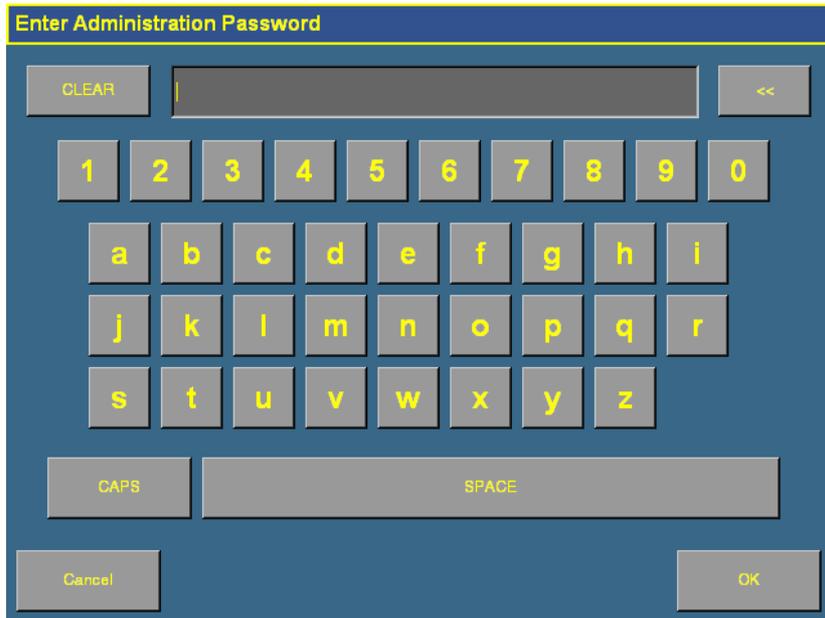


Some AgGPS FieldManager display buttons have a direct action, while others change to show that a feature is enabled or disabled.



Virtual keyboard

Use the virtual keyboard to enter text and numbers.



To ...	Tap ...
enter a letter or number	the appropriate button
enter caps mode	the CAPS button
leave caps mode	the CAPS button again
erase a letter that you have typed by mistake	the << (backspace) button
clear all the text you have entered	the CLEAR button
finish entering text	the OK button

Virtual number pad

The virtual number pad works in the same way as the virtual keyboard. For example, the following screen appears when you edit the width of an implement in the *Implement Boom Setup* screen:

The screenshot shows a dialog box titled "Enter Section Width". It features a central input field with the number "5" and the unit "Meters" below it. To the left of the input field is a "clear" button, and to the right is a "<<" button. Below the input field is a numeric keypad with buttons for digits 1-9, 0, and a decimal point. To the right of the keypad are three unit selection buttons: "Metric", "Feet & Inches", and "Decimal Feet". At the bottom left is a "Cancel" button and at the bottom right is an "OK" button.

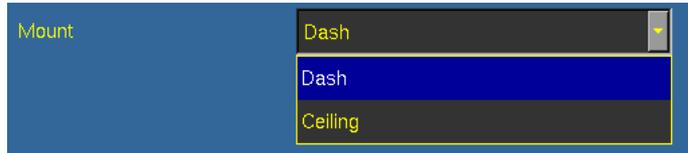
Select the **Metric**, **Feet & Inches**, or **Decimal Feet** button to change the units.



Tip – When you change units, the number value in the window is automatically converted to the new unit, so select the correct units **before** you enter a number value.

Drop-down box

A drop-down box, if provided, lists the items that you can select in that field.



To select an item:

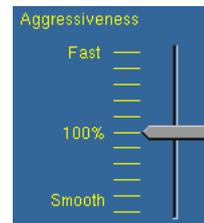
1. Tap the list once to display the drop-down list.
2. Tap the required item from the list.

The drop-down list disappears and the selected item appears in the field.

Slider bars

A slider bar appears on several of the configuration screens.

A slider bar shows how extreme a selection is. In the example above, you could enter an *Aggressiveness* value of 140% in a text window without being aware of what that meant. If you use a slider bar to select the value, it is apparent that you are nearing the extreme value.

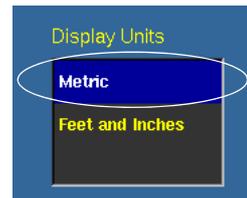


There are two ways to use a slider bar:

- To move up by one increment, tap on the slider bar in the direction that you want to move the pointer.
- To slide the pointer:
 - a. Touch the screen where the pointer is located and hold your finger on the screen.
 - b. Move your finger along the axis, in the direction that you want to move the pointer.
 - c. Remove your finger when you are satisfied with the position of the pointer.

Lists

A list shows all the available options. To select an item from a list, tap the item.



View modes

The AgGPS FieldManager display screen has two views for representing vehicle guidance on the Run screen:

- Plan view: Shows a bird's eye view of the field, with the vehicle in it.
- Perspective view: Shows a three-dimensional representation of the field from the driver's perspective.

On the Run screen, both views appear at all times. One is shown as the main view, and the other appears as the smaller, auxiliary view in the top right corner:

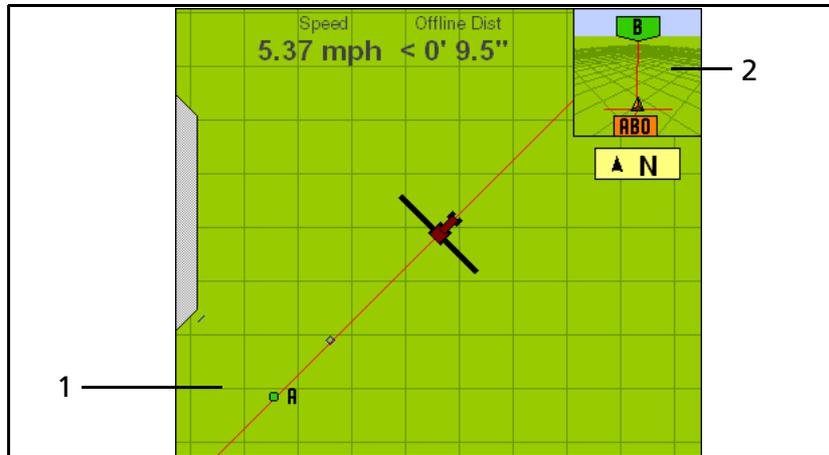


Figure 2.4 The Run screen

Item	Description
1	Main view (in this example, Plan view)
2	Auxiliary view (in this example, Perspective view)

To change the view mode, tap the small auxiliary view in the top right corner.

Zooming

The AgGPS FieldManager display has five levels of zoom. A close-up view of the vehicle enables you to navigate more accurately, while a long view enables you to see more of the field.

To zoom the screen in, tap the main view.

The fifth level of zoom in the plan view is a summary view of all your coverage. It adjusts, depending on the size of the field. It does not include grid lines.



Tip – If you close the field, create a second field, and then show the summary view, the summary view may be zoomed to show the area of both fields. To avoid this, restart the display. The view will be correct.

Getting Started

In this chapter:

- Installing the display
- Connecting the display
- Installing key Multi-Application Control components
- Inserting the CompactFlash card in the socket
- Turning on the display
- Turning off the display

This chapter explains how to complete the initial installation and then turn on the display.

Installing the display

Mount the AgGPS FieldManager display in the vehicle cab, in a position that is easily accessible.

1. Use the included M6 x 1" screws to firmly screw the mounting plate to the back of the display.



2. Attach the RAM mount to the ball on the mounting plate.



3. Select where in the cab you would like the display to be. The AgGPS FieldManager display is mounted in the cab with a bar style RAM mount.
4. Use the provided bolts to attach the bar mount to the rail.



5. Hold the display in the location that you have selected, to ensure that it is comfortably accessible from the driver's seat.
6. Attach the other end of the RAM mount to the ball on the bar mount and then tighten the screw.



Connecting the display

***Note** – The AgGPS FieldManager display connects to the AgGPS Autopilot automated steering system. The Autopilot system requires professional installation in your vehicle. If the AgGPS Autopilot system is not currently installed in your vehicle, consult your local reseller.*

1. Connect one end of the AgGPS Autopilot harness to the vehicle.
2. Insert the 28-pin AMP plug (at the other end of the harness) into the AMP socket on the back of the display.
3. Connect the single wire to the positive output from the battery.
4. Connect the implement switch if required.

The following section describes how to install DICKEY-john components for flow and application control with the Multi-Application Control plugin. If this is not relevant to you, go to [Inserting the CompactFlash card in the socket, page 66](#).

Installing key Multi-Application Control components

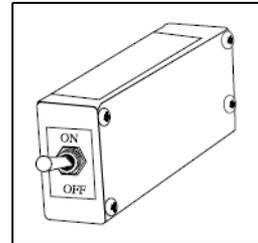
Installing an implement master switch

When you install a product control system, a master switch is connected to the display.

Note – *When a master switch is installed, you cannot use the display to manually engage application.*

To install the switch:

1. Select a location in the cab that is within easy reach of the operator's seat.
2. Attach the switch with one of the following:
 - Tie wraps
 - Tape
 - Velcro stripping
 - Bond clamps
3. The switch plugs into the FieldManager Display Application Control cab harness.



Installing a test switch

You can install a test switch on the implement that runs the implement. This can be used to run the implement for a set number of revolutions, so you can review the seed count that the system calculates over a set number of cycles.

Connect the test switch to the 4 Channel Control harness.

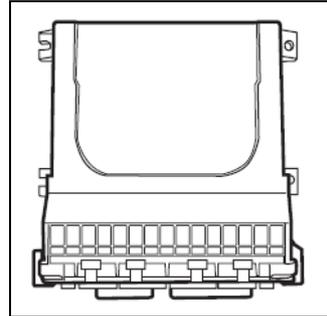


CAUTION – When you have finished testing, remove the test switch. If it accidentally engages, the implement could cause injury.

Installing the working set master module

Mount the working set master module (WSMT) on the implement:

1. Select an area on the implement to mount the WSMT that allows for easy hookup and access.
2. Use the module enclosure as a template to mark the location of the mounting holes.



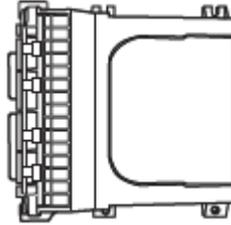
CAUTION – Do not use the master module enclosure as a guide when drilling. Do not overtighten the nuts as this may damage the mounting tabs of the enclosure.

3. Drill four 9/32 inch diameter holes where marked.
4. Select one of the following orientations to mount the WSMT on the vehicle:

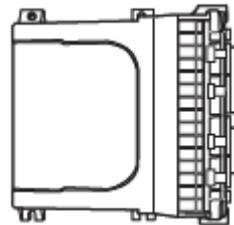
Facing down (preferred)



Facing left (acceptable)



Facing right (acceptable)



Note – Do not install the module in any other orientation. The connection wires must not point upwards or dust and rain may enter the module.

Installing working set member (WSMB) modules

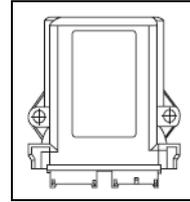
Mount the working set member module(s) (WSMB) on the implement:

1. Select an area on the implement to mount the module.

If you must install the module in a remote or hard-to-reach area on the implement, you can use an extension.

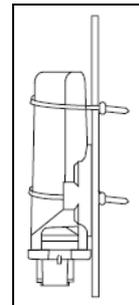
The acceptable mounting orientations are the same as those for a master module. See [Installing the working set master module, page 50](#). Mount the module with the label facing out.

2. Do one of the following:
 - To bolt the module to the implement:
 - a. Use the module as a template to mark the position of the 2 bolt holes.



CAUTION – Do not use the member module enclosure as a guide when drilling. Do not overtighten the nuts as this may damage the mounting tabs of the enclosure.

- b. Remove the module and then drill the two 9/32 inch holes that you marked on the frame.
 - c. Attach the module to the frame with two ¼ x 20 bolts or a threaded U-bolt.
- To tie-strap the module to the implement:
 - a. If mounting holes on the implement are required, use the module as a template to mark the position of the 2 bolt holes.
 - b. Drill the two 9/32 inch holes that you marked on the frame.



- c. Feed a long tie-strap through the two mounting holes on the module and then through the holes on the implement.
 - d. Securely tighten the tie-strap.
 - e. Install a second tie-strap around the module at the label end of the enclosure for additional support.
3. Connect a WSMB harness to the module. Insert both connectors until the connector locking tabs engage.

The WSMB module harness can accept a standard DICKEY-john style planter harness. Harnesses are available for a number of row configurations.

4. Repeat these steps for any additional member modules.

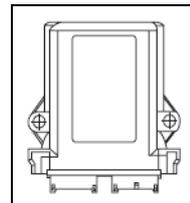
Note – *You must install a CAN terminator on the last module harness for proper system operation.*

Installing output modules

Mount the output modules on the implement:

1. Select an area on the implement to mount the module.

If you must install the module in a remote or hard-to-reach area on the implement, you can use an extension.



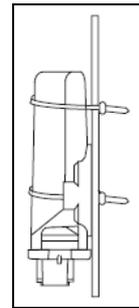
The acceptable mounting orientations are the same as those for a master module. See [Installing the working set master module, page 50](#). Mount the module with the label facing out.

2. Do one of the following:
 - To bolt the module to the implement:
 - a. Use the module as a template to mark the position of the 2 bolt holes.



CAUTION – Do not use the output module enclosure as a guide when drilling. Do not overtighten the nuts as this may damage the mounting tabs of the enclosure.

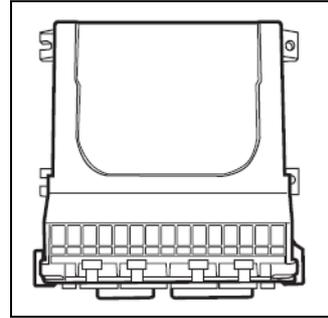
- b. Remove the module and then drill the two 9/32 inch holes that you marked on the frame.
 - c. Attach the module to the frame with two ¼ x 20 bolts or a threaded U-bolt.
 - To tie-strap the module to the implement:
 - a. If mounting holes on the implement are required, use the module as a template to mark the position of the 2 bolt holes.
 - b. Drill the two 9/32 inch holes that you marked on the frame.
 - c. Feed a long tie-strap through the two mounting holes on the module and then through the holes on the implement.
 - d. Securely tighten the tie-strap.
 - e. Install a second tie-strap around the module at the label end of the enclosure for additional support.
3. Connect a Tru Count or Boom Section harness to the module. Insert both connectors until the connector locking tabs engage.
4. Repeat these steps for any additional output modules.



Installing the tractor ECU

Mount the tractor ECU in the cab:

1. Select an area in the cab to mount the tractor ECU that allows for easy hookup and access.
2. Use the ECU enclosure as a template to mark the location of the mounting holes.



CAUTION – Do not use the ECU enclosure as a guide when drilling. Do not overtighten nuts as this may damage the mounting tabs of the enclosure.

3. Drill four 9/32 inch diameter holes where marked.

Installing a master module harness

1. Connect the module to the Working Set Master Module harness.
2. If necessary, connect the WSMT valve/sensor harness.

3. Connect any additional adaptor harnesses to the module harness. The WSMT module harness can accept the following adaptor harnesses:
 - **4 Channel Control Harness (Actuator Harness):** This harness allows for 4 output control channels and associated feedback sensors, a hopper level sensor input, a shaft sensor input, a ground speed input, an implement switch input, and an air pressure input. In addition, a pair of 6-pin connectors are available for Servo connection. Install sensors, valves, etc. per the instructions included with the items. Install the PWM valve assembly and feedback sensor for each control loop and connect the devices to their respective inputs on the harness, making certain to match PWM 1 with FEEDBACK 1, PWM 2 with FEEDBACK 2, etc. Secure any unused and excess cable lengths where necessary.
 - **Seed Sensor Harness:** This harness accommodates any standard DICKEY-john Seed Sensor harness (PM or SE style). A wide variety of harnesses are available to accommodate various numbers of sensor inputs. Install all seed sensors per the instructions included with the individual sensors. Secure any unused or excess cable lengths as necessary.
 - **Accessory Harness for Air Seeders:** This harness enables you to connect 4 additional air pressure sensors, 4 hopper level sensors, and 1 fan/shaft RPM sensor.
 - **Accessory Harness for Sprayers:** This harness enables you to connect 4 liquid pressure sensors and 2 fan/shaft RPM sensors.
 - **Accessory Harness for Spreaders:** This harness enables you to connect 2 additional hopper level sensors and 2 fan/shaft RPM sensors.

Installing sensors

The FieldManager system can read the following optional DICKEY-john sensors:

Item	Description
Seed sensor	Blockage or high rate population-style seed sensor provides seed population or blockage information to the system.
Application rate sensor	Measures shaft rotation speed by counting pulses over time. This enables accurate feedback for product control.
Hopper level sensor	A hopper is a planter seed bin. The hopper level sensor mounts low in the seed tank or hopper and reports when the seed level drops to that point.
Shaft speed (RPM) sensor	Measures the RPM of the implement driveshaft, either by counting the teeth on a gear, magnets on a shaft, or lug nuts on a wheel.
Air pressure sensor	Mounts in the planter seed tank and provides real-time air pressure or vacuum readings to the system.
Ground speed sensor	Produces pulses that are multiplied by a constant to calculate the speed of the vehicle.
PWM control valves Servo control valves	Pulse Width Modulation (PWM) or servo valves provide control of seed, liquid, and granular flow.
Flow meters	Ensures accurate feedback to the liquid control channel for optimal control accuracy.
Tru Count clutch control	Automatically controls planter rows on/off for precise seed placement.
Implement lift switch	Enables on/off control based on the implement position.

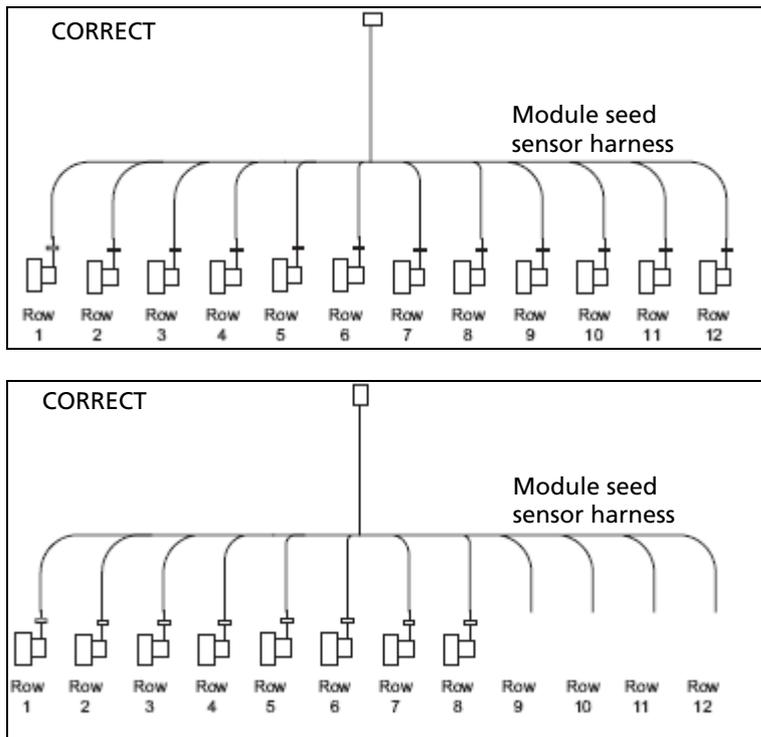
For proper system operation, connect all sensors used with the system as described in the following sections. The system will not identify sensors that are incorrectly installed, and this will result in the incorrect numbering of the sensors.

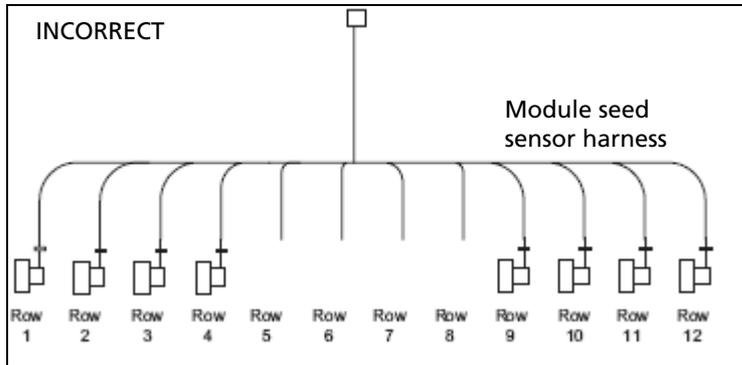
Seed sensors

The system is compatible with DICKEY-john seed sensors. You can connect seed sensors to the WSMT module and all WSMB planter monitor modules. You can connect any number of sensors up to the maximum capacity of the module, with a maximum of 148 seed sensors connected to the system.

When connecting seed sensors to the modules, the following requirements must be observed:

All installed seed sensors must be connected to the seed sensor harness SEQUENTIALLY, starting with the Row 1 input. If you will not use all of the row inputs on the module, the unused inputs must be the last inputs on that module:





Failure to correctly install seed sensors will result in incorrect row assignment on the planter monitor display functions.

Hopper level sensors

The system is compatible with DICKEY-john hopper level sensors. The system supports the following number of hopper level sensors:

Application type	Maximum number of sensors
planter/drill	1
air seeding	4
granular application	3

RPM/Fan sensors

The system is compatible with DICKEY-john RPM/fan sensors. The system supports the following number of RPM/fan sensors:

Application type	Maximum number of sensors
planter/drill	1
air seeding	3
granular/spraying application	3

Air pressure sensors

The system is compatible with DICKEY-john air pressure sensors. The system supports the following number of air pressure sensors:

Application type	Maximum number of sensors
planter/drill	1
air seeding	4

Liquid pressure sensors

The system is compatible with DICKEY-john liquid pressure sensors for sprayers. These system supports the following number of liquid pressure sensors:

Application type	Maximum number of sensors
sprayer	4

Application rate sensors

The system is compatible with DICKEY-john application rate sensors. The system supports the following number of application rate sensors:

Application type	Maximum number of sensors
planter/drill	4
air seeding	4
granular application	4

Installing the cab harness

Note – The following harnesses are appropriate when installing the system in a planter. For information on installing the harnesses in a sprayer, air cart, spreader, or anhydrous unit, refer to the Flow and Application Ordering Guide.

To install the cab harness, refer to the following diagram:

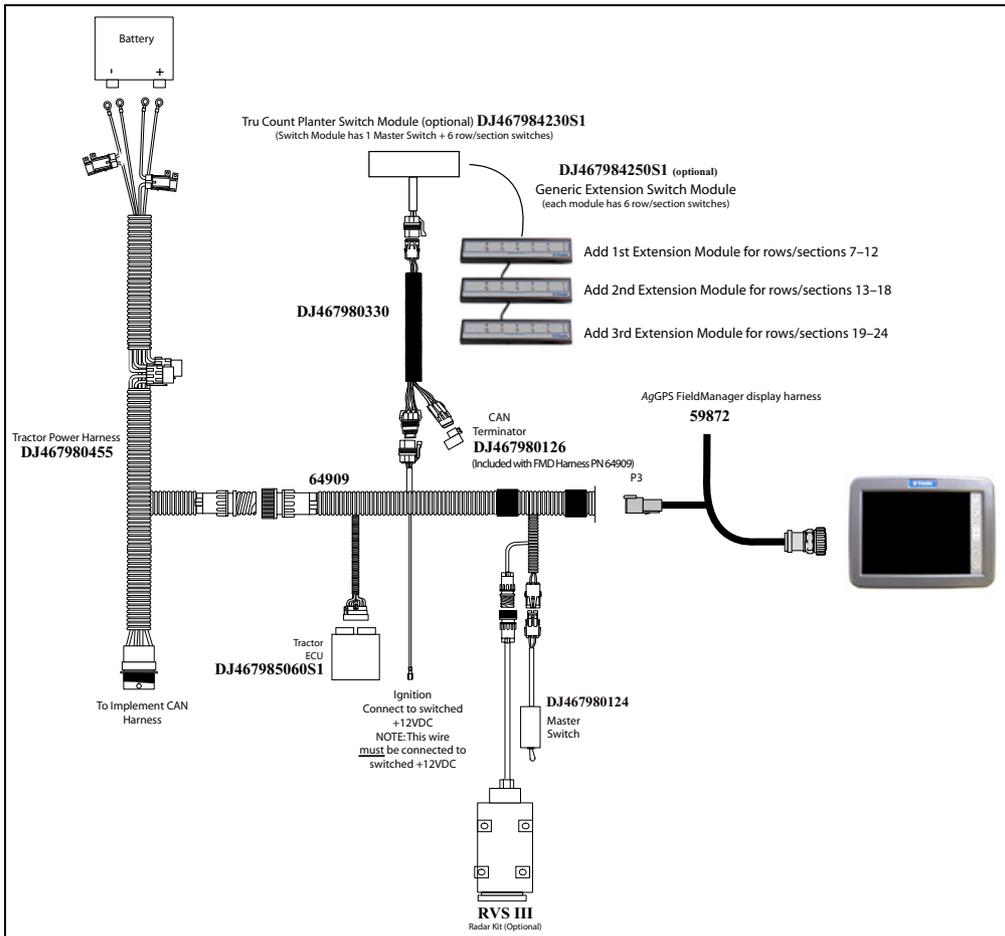


Figure 3.1 Planter cab base kit diagram

1. Connect the power leads directly to the battery. Connect the ignition wire to a switched +12 VDC.
2. Connect the chassis ground lead to a bare point of the cab frame that offers a good chassis ground connection. For the system to power properly, you must connect the ignition lead to switched +12 VDC.
3. Connect the master switch, CAN terminator, and tractor ECU to their respective connectors on the cab harness.
4. Connect the radar speed sensor, if required. If you connect the speed sensor to the WSMT, do not connect anything to the speed sensor connector on the cab harness.

Installing the implement harness

To install the implement harness, refer to the following diagrams:

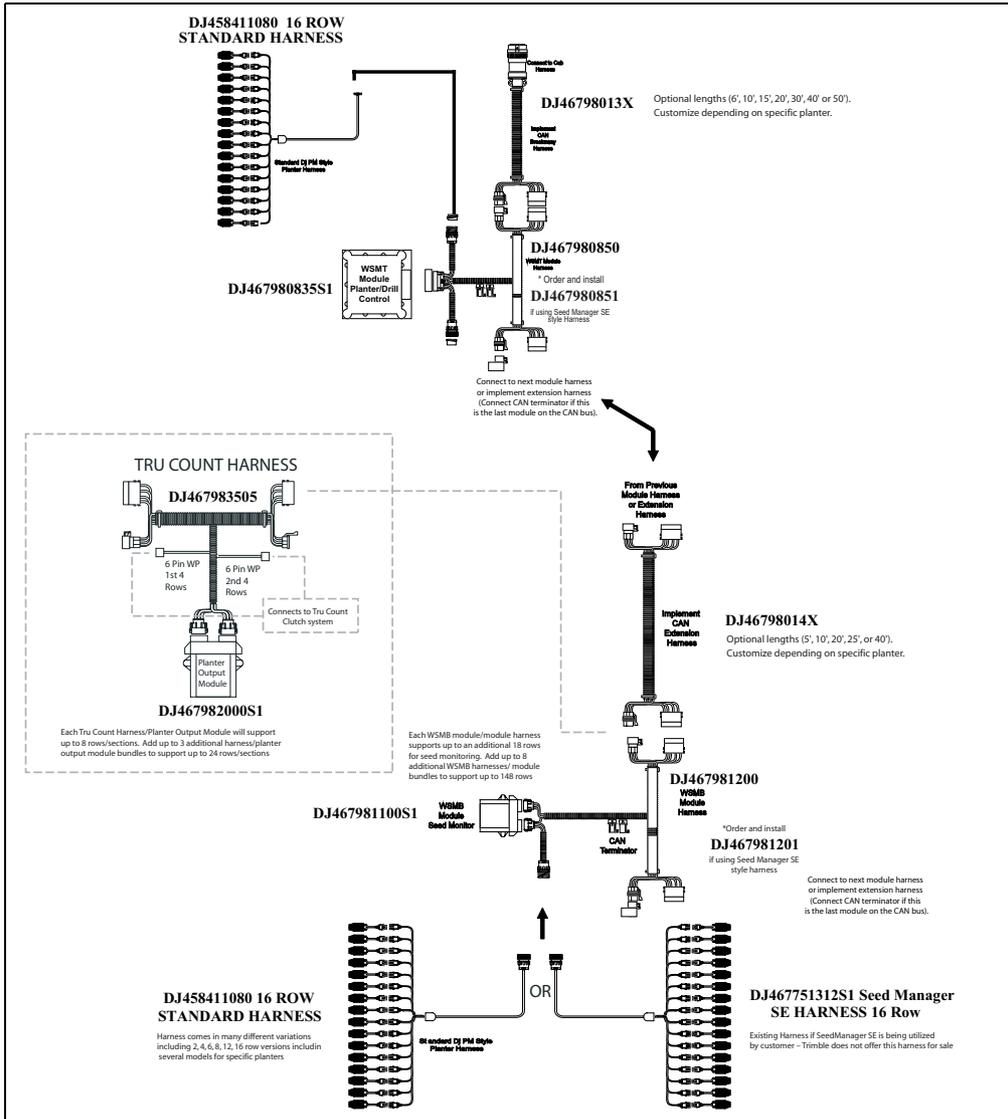


Figure 3.2 Planter monitoring only system diagram: Implement CAN harnessing

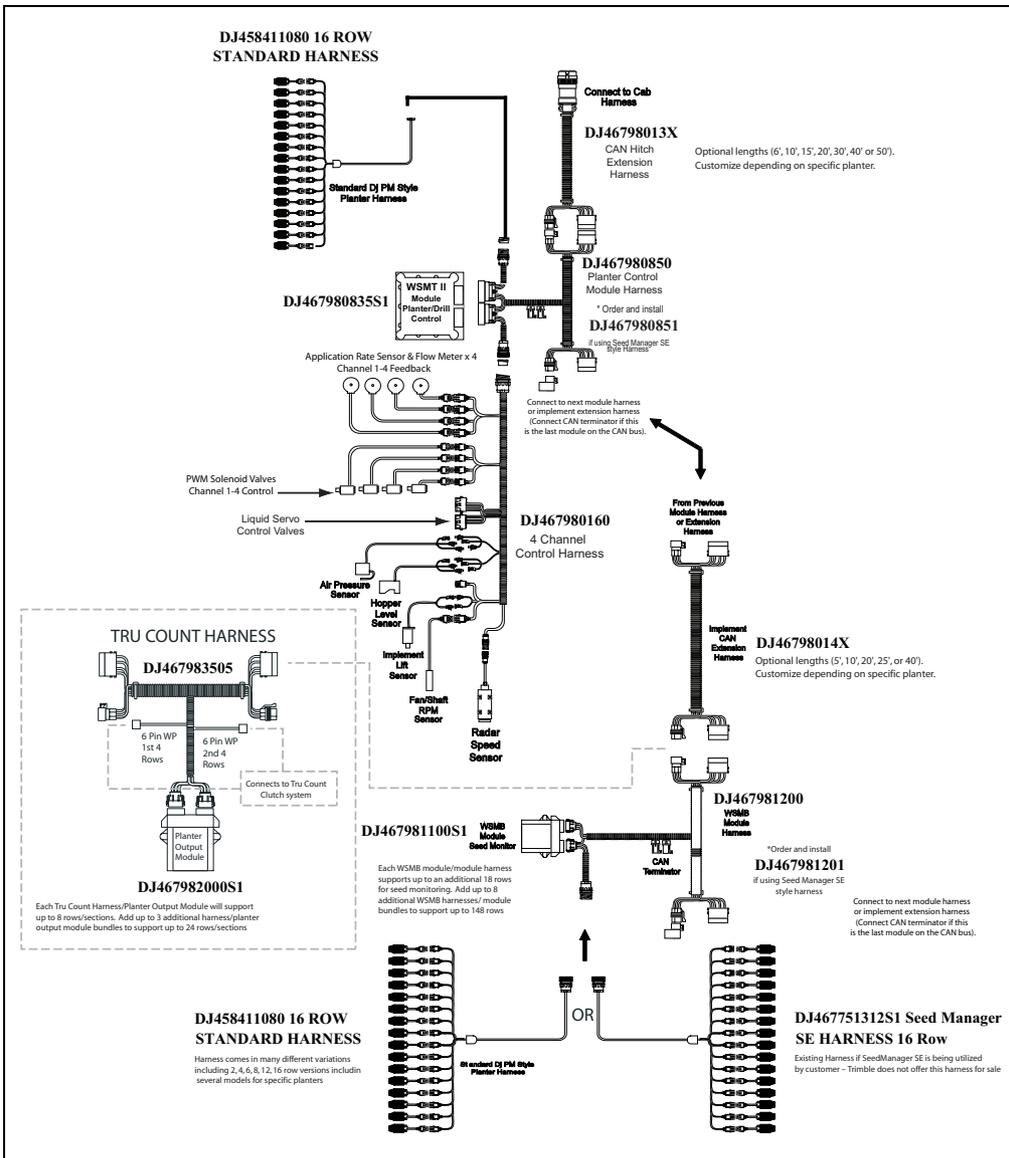


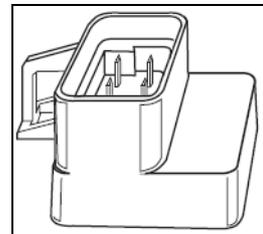
Figure 3.3 Planter monitoring and control system diagram: Implement CAN harnessing

1. Lay the implement harness along the frame of the implement to each of the seed sensors. You are unlikely to require extensions.
2. Route the sensor wires to locations where they will not be damaged by parts of the implement.
3. Connect the implement CAN breakaway extension to the mating connector of the cab harness.
4. Secure the implement harness to the toolbar with tie-straps.
5. Coil and secure any unused sensor connections.
6. Route the implement harness along the implement hitch to the master module harness (if additional length is required, use an implement extension harness).
7. Secure the implement harness as needed.
8. Connect the master module harness to the mating connectors of the implement CAN harness and then connect the module to the implement harness. The member module uses a 48-pin connector with a jackscrew to secure the connector to the module. The WSMB uses a pair of 12-pin connectors.
9. Secure the module harness as needed.

CAN terminators

You must install CAN terminators on cable ends for the system to communicate correctly:

1. Install one terminator on the cab harness (P/N 64909).
2. Install one terminator plug into the implement harness of the last module connected to the CAN bus.



Installing additional equipment

Additional equipment is available to enable specific row/section control. For more information on installing Tru Count air clutches or boom section valves, contact the specific manufacturer.

Switch boxes

You can install switch boxes to control sprayer (BSM: boom switching module) and planting (CSM: clutch switching module) applications. These are boxes with switches that enable you or the system to turn individual sections on and off.



You can connect up to 4 switch boxes together so you have up to 24 switches. Install the switch boxes in a convenient place in the cab where you can comfortably reach them.

The system uses TCOM modules to control the switch outputs.

Other components

To install flow and application control components (for example, control valves, flow meters, etc) refer to the instructions that are included with them.

Inserting the CompactFlash card in the socket

The card socket, which is located on the right side of the display, opens toward the rear.

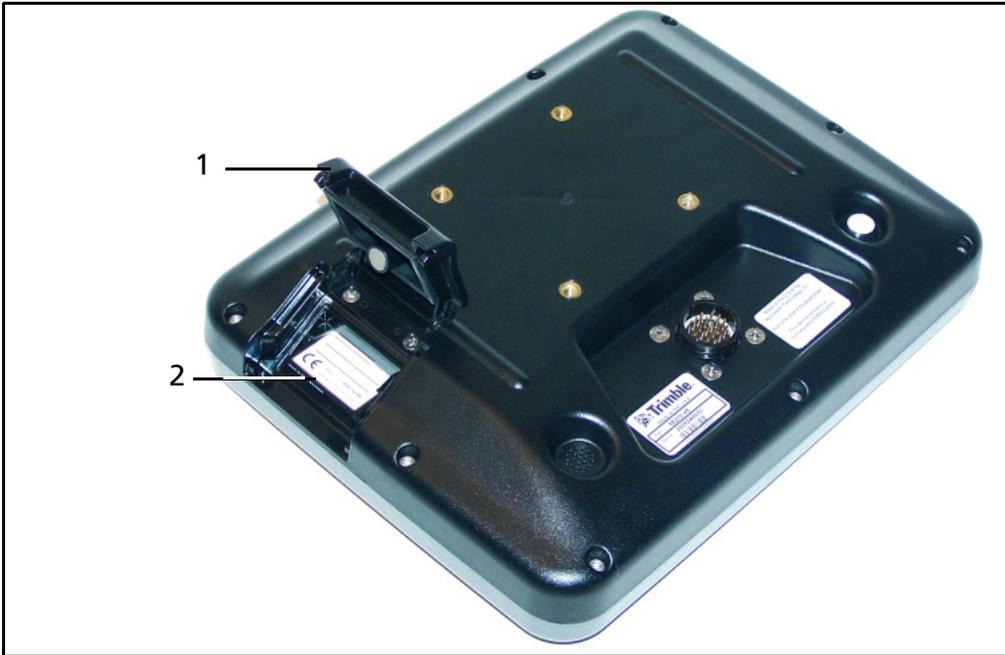


Figure 3.4 The reverse of the display with the card socket open

Item	Description
1	Open card socket
2	CompactFlash card



CAUTION – Do not remove the CompactFlash card from the slot while the system is writing to the card, or you will corrupt data. When you open the card socket, a prompt appears. Select Yes and then remove the card.

To insert the CompactFlash card:

1. Rotate the display so you can see the back of it.
2. Open the card socket.
3. Insert the CompactFlash card with the label facing the inside of the display. Push the card in until it clicks.
4. Close the card socket.

To remove the card:

1. Rotate the display so you can see the back of it.
2. Open the card socket.
3. Put your fingernail into the ridge on the card and then slide it straight out. Do not try to lever the card out at an angle.

The system automatically detects when a card is inserted or removed. If no card is present, a message appears on the *Configuration* screen.

Turning on the display

Briefly hold down the Power button (for approximately half a second). The system turns on and after a pause the Home screen appears.

The AgGPS FieldManager display has four main screens:

- Home screen
- Configuration screen
- Data Management screen
- Run screen

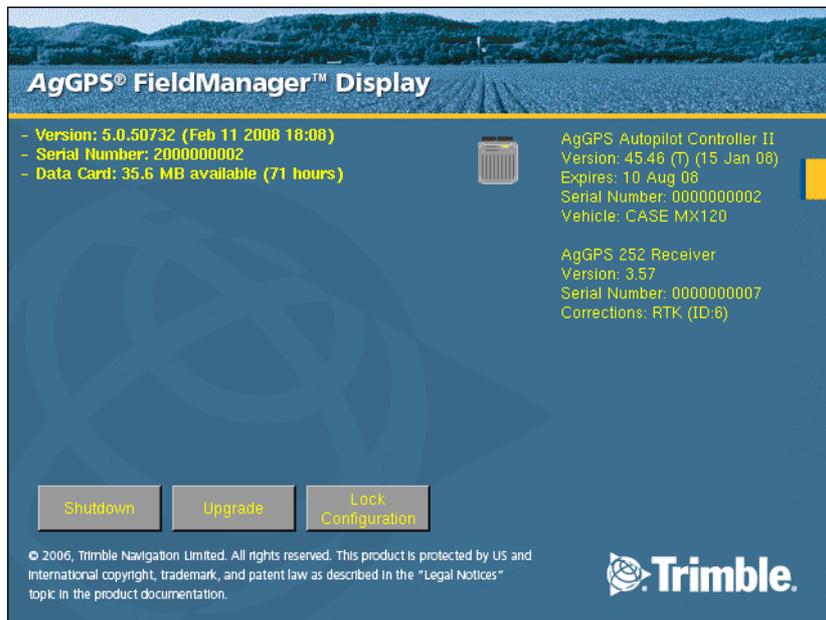
You can access each of these screens by pressing the appropriate button to the right of the display. See page 33.

Note – *The display may take longer to turn on than in previous versions of the software.*

Home screen

The Home screen lists the following information about the system:

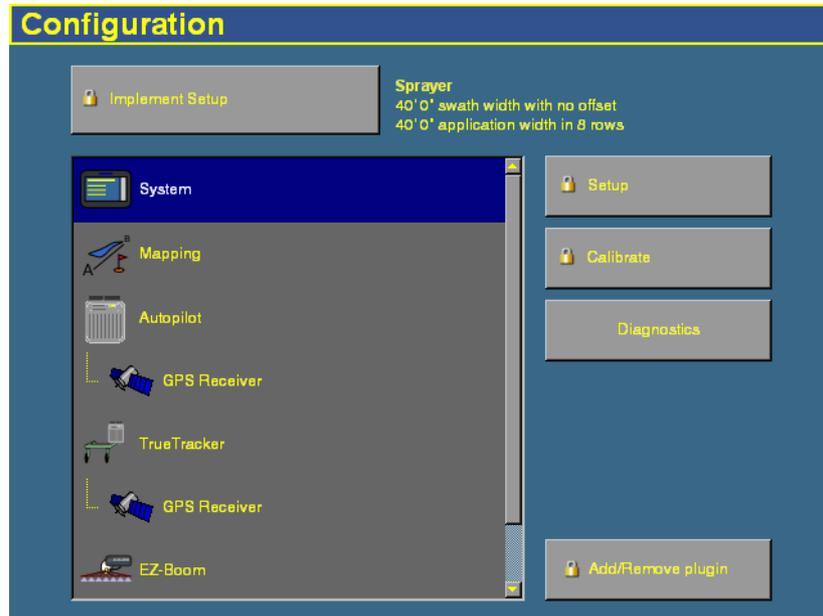
- The display build date, firmware, and hardware version
- The AgGPS Autopilot controller version, date, and serial number
- The GPS receiver version, correction source, and subscription information
- The selected vehicle make and model



Note – If two AgGPS Autopilot NavController II controllers are connected, the Home screen shows a summary of both controllers. If only a single controller is connected, the Home screen appears as before.

Configuration screen

The *Configuration* screen enables you to access most of the system settings that can be changed:

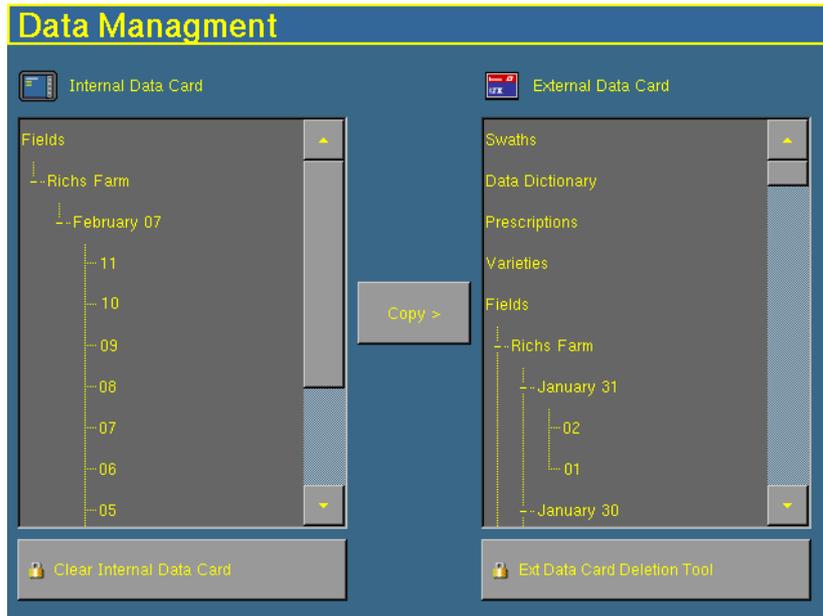


To access the *Configuration* screen, press the Configuration button .

Note – Some configuration settings are unavailable when a field is open in the Run screen. To access these settings, return to the Run screen and then press the Home button. When the display asks if you would like to close the field, tap **Yes**.

Data Management screen

The *Data Management* screen enables you to manipulate your saved data:

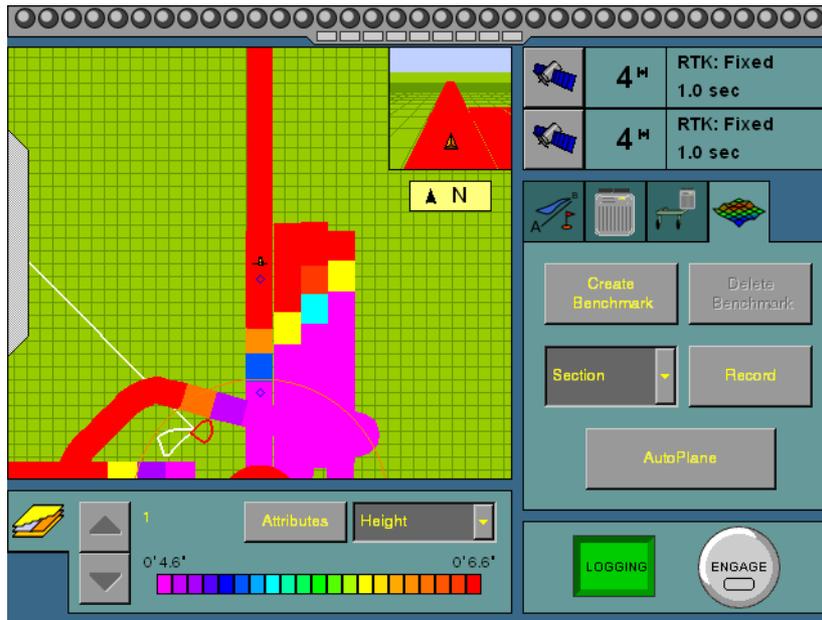


From either the display's internal memory or the CompactFlash card, you can copy implements, prescriptions, data dictionaries, field data, or delete unwanted data.

To access the *Data Management* screen, press the Data Management button .

For more information, see [Copying or deleting card data, page 583](#).

Run screen



The Run screen displays the steering navigation. If you select the Run screen and you have a field open, the display shows that field. If you select the Run screen when none is open, the *Field Selection* screen appears.

Turning off the display

***Note** – If a field is open, close the field before you turn off the system. To close a field, see [Closing a field, page 168](#).*

There are several ways to turn off the system:

- Press the Home button. From the Home screen, tap **Shutdown**.
- Hold down the Power button (on the reverse of the display) for approximately half a second.

There is sometimes a short delay between the time when you press the Power button and when the display turns off. This is because the display is saving settings. When the display turns off, it plays a sound.

***Note** – The display may take longer to turn off than in previous versions of the software.*

Overview of Plugins

In this chapter:

- Introduction to plugins
- Adding or removing a plugin
- Configuring a plugin
- Entering the password to activate a plugin

This chapter describes what plugins are and gives an overview of how to configure them.

***Note** – Some configuration settings are unavailable when a field is open in the Run screen. To access these settings, return to the Run screen and then press the Home button. When the display asks if you would like to close the field, tap **Yes**.*

Introduction to plugins

The AgGPS FieldManager display version 5.10 has a number of plugins that can be installed to expand the functionality of the display:

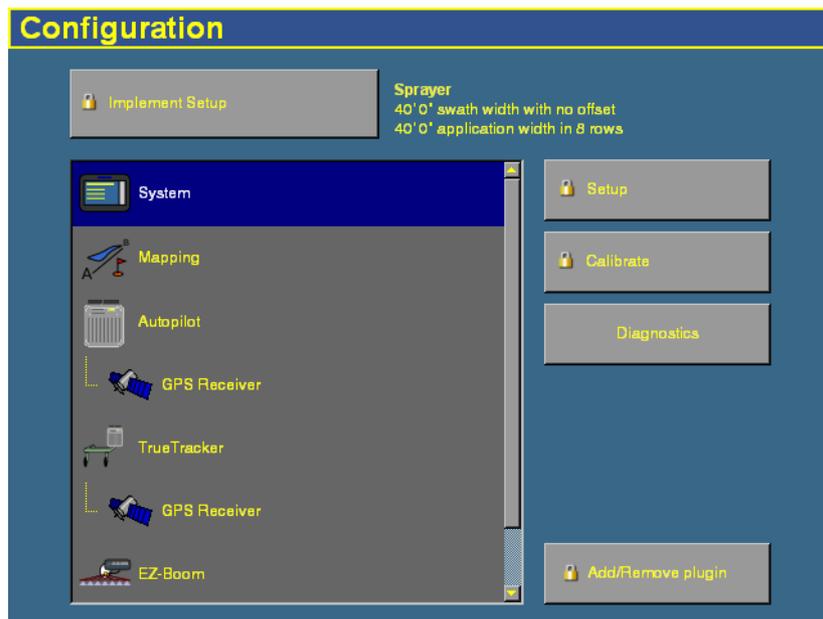
Item	Status	Description	See ...
System	Permanent	Configure the appearance of the display	Chapter 5, page 83
Mapping	Permanent	Configure the field features	Chapter 7, page 123
Manual Guidance	Optional	Enable GPS diagnostic information for manual steering guidance. Note – <i>You must install either the Manual Guidance plugin, the Autopilot plugin, or the FieldLevel plugin.</i>	Chapter 8, page 169
Autopilot	Optional	Configure the AgGPS Autopilot™ automated steering system	Chapter 9, page 173
GPS Receiver	Required	Configure the GPS receiver	Chapter 10, page 219
TrueTracker	Optional	Configure the AgGPS TrueTracker™ system to enable implement steering	Chapter 11, page 225
EZ-Boom	Optional	Configure the EZ-Boom® 2010 automated application control system to enable spray boom and rate control	Chapter 12, page 261
Serial Rate Controller	Optional	Configure a non-Trimble variable rate controller	Chapter 13, page 287
Multi-Application Control	Optional	Configure a planter, drill, air seeder, spreader, sprayer, or anhydrous ammonia applicator for flow and application purposes	Chapter 14, page 303
FieldLevel Survey/ Design	Optional	Survey a field and then create a design for it that can later be completed with the FieldLevel II plugin	Chapter 15, page 469
FieldLevel	Optional	Configure the AgGPS FieldLevel II system for field water management	Chapter 16, page 487
Remote Output	Optional	Enable and configure remote data output to an external device	Chapter 17, page 537

Item	Status	Description	See ...
Serial Data Input	Optional	Enable and configure data input from an external serial device	Chapter 18, page 541
Productivity monitoring	Optional	Enable and configure the display to work with an Enalta display to record workflow	Chapter 19, page 545

Note – Most of these plugins require additional hardware to work correctly.

For example, to use the display to perform water management with the FieldLevel II system, add the FieldLevel II plugin. This enables you to configure the FieldLevel II system settings, and adds the FieldLevel II screen items to the main guidance screen.

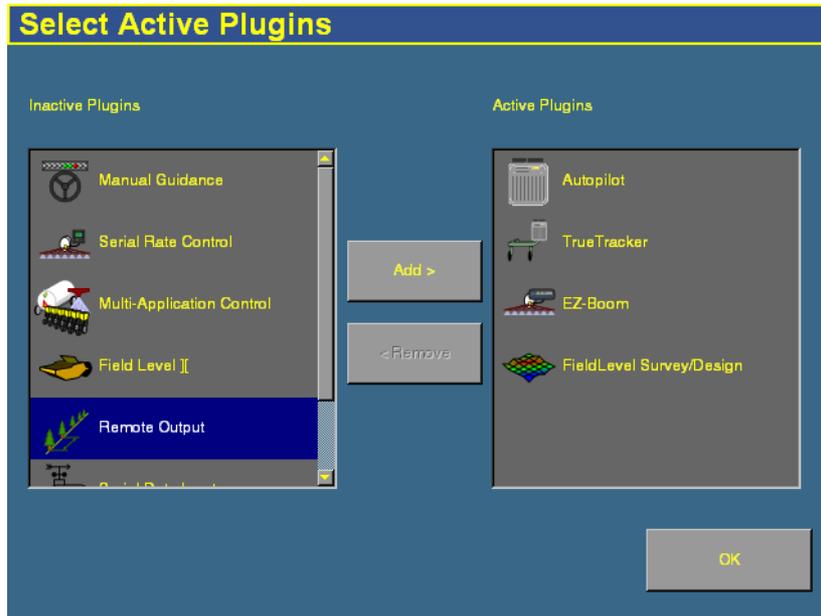
To view the plugins, press the Configuration button  to the right of the display. The *Configuration* screen appears:



The currently installed plugins appear in the plugins list on the left of the screen.

Adding or removing a plugin

1. On the *Configuration* screen, tap **Add/Remove plugin**. The *Select Active Plugins* screen appears:



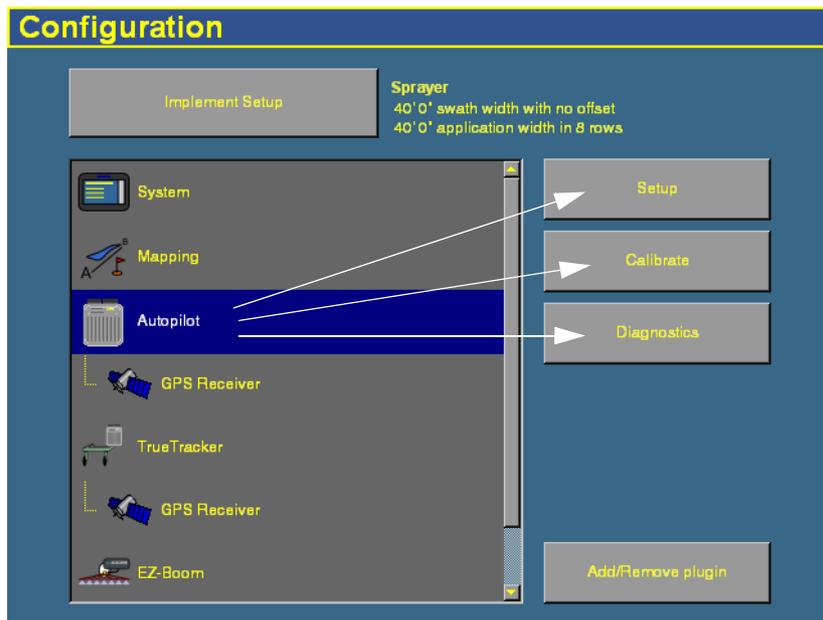
- The available but uninstalled plugins are in the *Inactive Plugins* list on the left.
 - The currently installed plugins are in the *Active Plugins* list on the right.
2. Do one of the following:
 - To install a plugin from the *Inactive Plugins* list, tap it and then tap **Add >**. The plugin moves to the *Active Plugins* list.
 - To remove a currently installed plugin from the *Active Plugins* list, tap it and then tap **< Remove**. The plugin moves to the *Inactive Plugins* list.
 3. Tap **OK** to return to the *Configuration* screen.

Configuring a plugin

Each plugin requires different configuration. For a detailed description of how to configure each one, see the appropriate chapter later in this manual.

In general:

- Each plugin has several setup screens. To access the screens, tap the plugin and then tap either the **Setup**, **Calibrate**, or **Diagnostics** button.



- Most of the plugins add additional features to the main guidance screen.

Entering the password to activate a plugin

To activate some plugins, you must enter the activation password. If you do not have an activation password, contact your local Trimble reseller.

There are two ways to activate a plugin:

Option 1. Activating automatically via a text file

Note – This method of activating the system is quicker than the manual method.

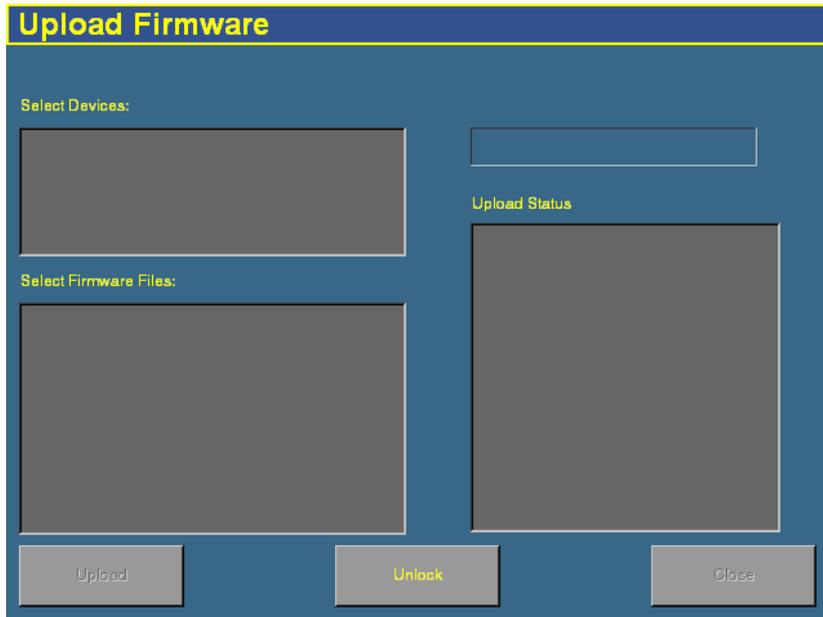
When you purchase the TrueTracker system, the FieldLevel system, or a variable rate system, your local Trimble reseller provides you with a text file containing a password.

1. Insert the CompactFlash card from the AgGPS FieldManager display into a card reader that is attached to an office computer.
2. Copy the password text file from the office computer into the `\AgGPS\Firmware\` folder on the card.

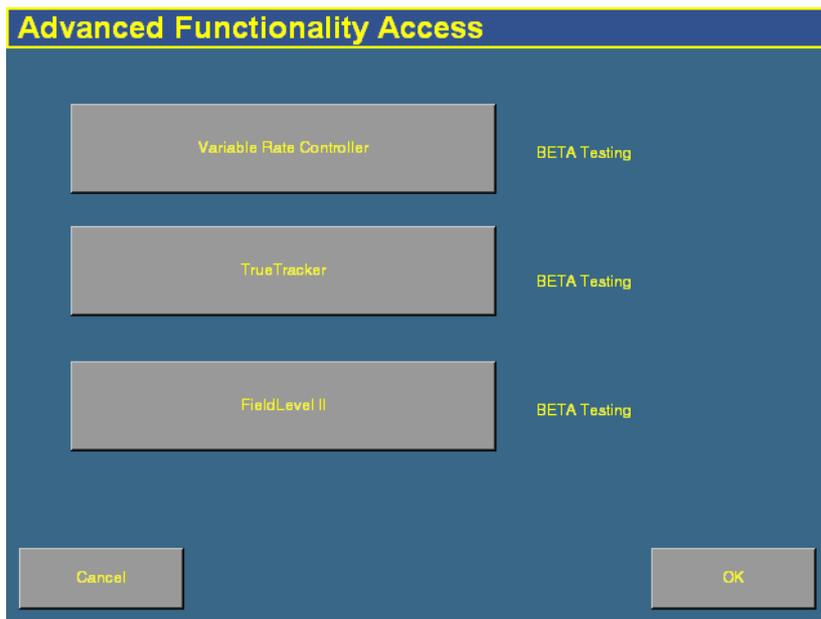
When you next insert the CompactFlash card in the display and turn the display on, the plugin is automatically activated.

Option 2. Activating manually via the display

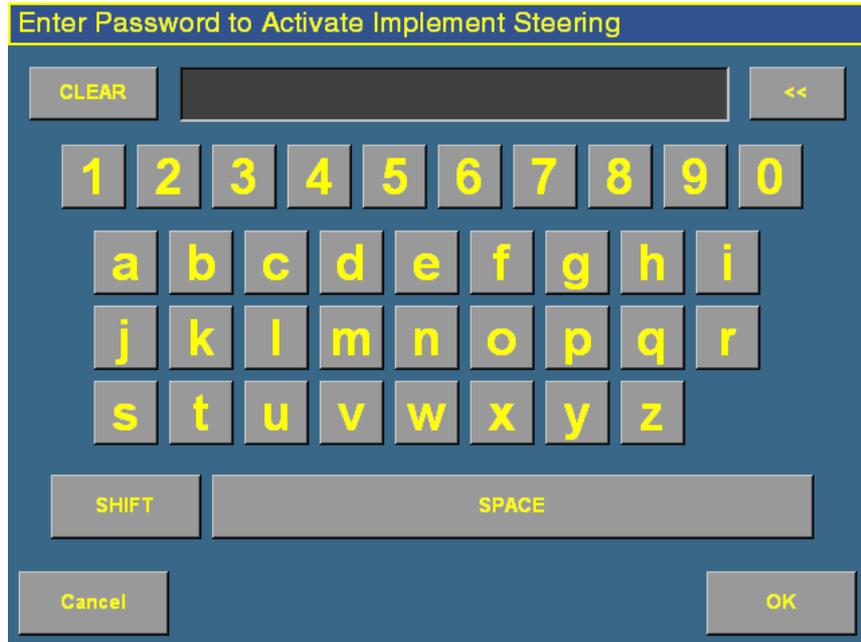
1. Turn on the display. The Home screen appears.
2. Tap **Upgrade**. The *Upload Firmware* screen appears.



3. Tap **Unlock**. The *Advanced Functionality Access* screen appears.



4. Tap the appropriate button for the plugin you want to activate. The *Enter Password...* screen appears:



5. Enter the activation password that your local Trimble reseller gave to you and then tap **OK**.
 - If you enter a correct password, the following message appears:
Enabled.
The plugin is now activated.
 - If you enter an invalid password, a message appears warning that you have not entered the correct password.

Try entering the password again. If it still does not work, contact your local Trimble reseller.

The System Plugin

In this chapter:

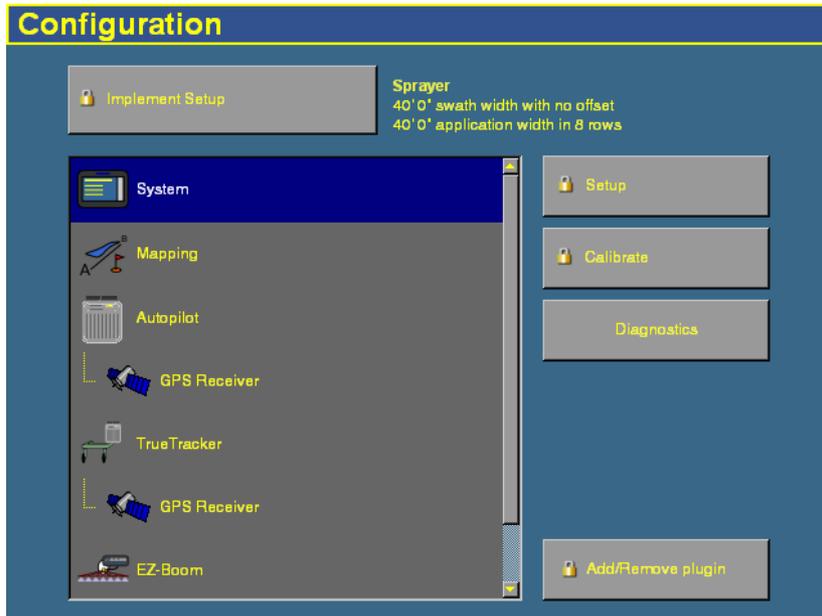
- [Accessing the configuration settings](#)
- [Calibrating the touch screen](#)
- [Configuring the display](#)
- [Using settings files](#)

The System plugin controls the basic settings and appearance of the display. This chapter describes how to use the plugin to configure the display.

***Note** – Some configuration settings are unavailable when a field is open in the Run screen. To access these settings, return to the Run screen and then press the Home button. When the display asks if you would like to close the field, tap **Yes**.*

Accessing the configuration settings

- Press the Configuration button  to the right of the screen. The *Configuration* screen appears:



Password access

Any **Setup** or **Calibrate** button marked with a padlock icon  is protected by 2 passwords:

Password type	Description
Administration password	Your password. The default is "2005".
Master password	A backup password in case you lose the Administration password. If you require the Master password, contact your local reseller.

The password screen appears the first time that you tap a **Setup** or **Calibrate** button after you turn on the display. Use the virtual keyboard to enter the Administration password and then tap **OK**.

Note – Passwords are case sensitive.

Calibrating the touch screen

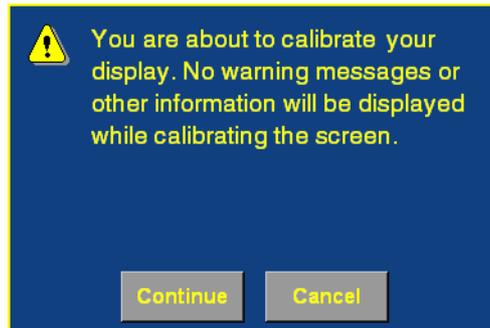
Calibrate the touch screen so it reads your selections accurately.

1. Press the Configuration button . The *Configuration* screen appears.
2. Tap the System plugin in the *Plugins* list. The **Setup**, **Calibrate**, and **Diagnostics** buttons become available.
3. Tap **Calibrate**.

If you have not entered an Administrator password during this session, the *Enter Administration Password* screen appears. See [Password access, page 84](#).

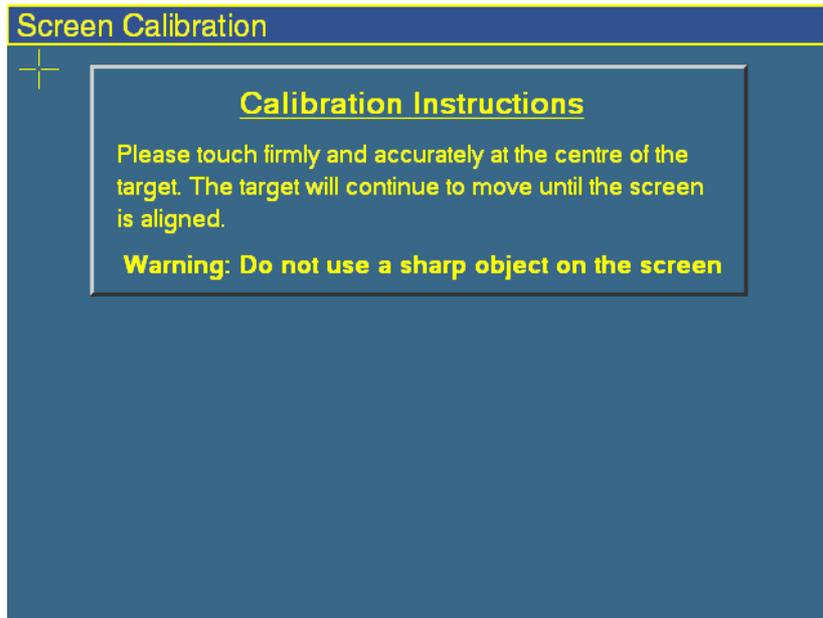
4. Enter your password and then tap **OK**.

A warning message appears.



5. Read the message and then tap **Continue**.

The *Screen Calibration* screen appears:



There is a cross-hair in the top left corner.

6. Press in the center of the crosshair.



CAUTION – Do not use a sharp item, such as a pencil, to press the screen or you may damage the surface of the screen. Use your finger to press the screen.

The crosshair will appear on another part of the touch screen.

7. Repeat Step 6 eight times.

When the calibration sequence finishes, a dialog appears:

- If your responses were accurate enough, the dialog displays the following message:

You have successfully calibrated your touch screen.

- If your responses were not accurate enough, the dialog displays the following message:

Your screen calibration failed. The difference between actual and calculated points was too large.

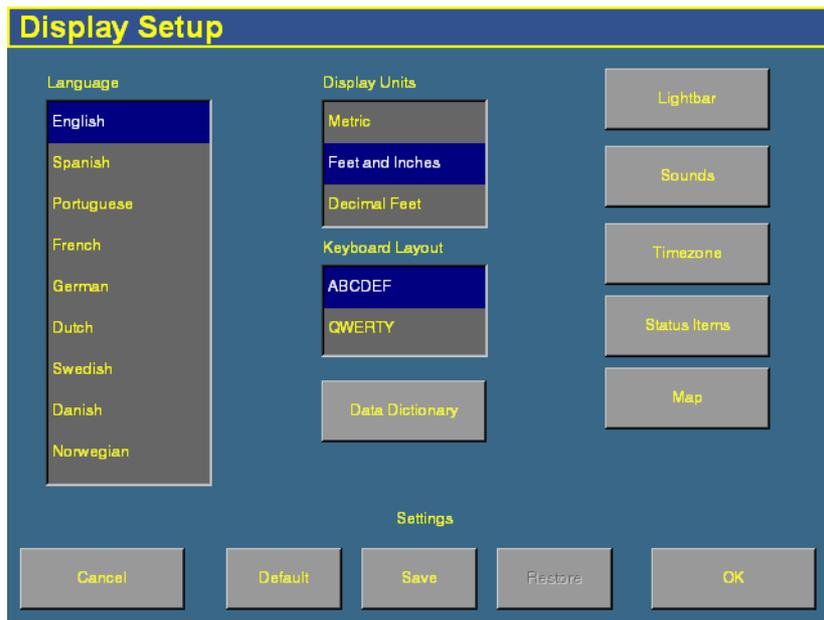
8. Tap **OK**. You are returned to the *Configuration* screen.

If the calibration was successful, proceed to [Configuring the display](#). If the calibration failed, tap **Calibrate** again and then repeat Steps 5 through 7 until calibration is successful. If display calibration continues to fail, consult your local Trimble reseller.

Configuring the display

1. Press the Configuration button  to the right of the screen. The *Configuration* screen appears.
2. Select the System plugin and then tap **Setup**.
3. If necessary, enter the Administrator password. See [Password access](#), page 84.

The *Display Setup* screen appears:



From this screen you can configure:

- the language
- the units of measure
- the keyboard layout
- the lightbar settings
- sounds

- the timezone
- the status text items on the Run screen
- mapping
- the data dictionary

These steps are described in more detail below.

Selecting the language

Tap the language that you would like to use in the *Language* list and then tap **OK**.

If you change the language, a warning message appears. It warns that the display will turn off so the change can take effect.

The default language is English.



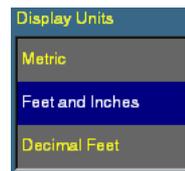
Selecting the units of measure

Tap the units that you would prefer in the *Display Units* list.

There are three options:

- Metric
- Feet and Inches
- Decimal Feet

The default option is Feet and Inches.



Configuring the keyboard layout

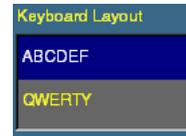
The FieldManager display uses a virtual keyboard on the touch screen for you to enter characters (see [Virtual keyboard](#), page 38).

The virtual keyboard can be laid out in two ways:

Setting	Description
ABCDEF	The letters appear in alphabetical order.
QWERTY	The keyboard is laid out like the Qwerty keyboard on a computer.

To select one, tap the format that you prefer on the *Keyboard Layout* list.

The default option is ABCDEF.



Configuring the lightbar settings

The display has two lightbar options:

- the virtual lightbar at the top of the display
- a peripheral EZ-Guide Plus lightbar attached to the AgGPS Autopilot system (emulating an AgGPS 21A lightbar).

If both lightbars are in use, the lightbar configuration settings apply to both.

Note – *If you connect an EZ-Guide Plus lightbar to the system, it will act as a lightbar only. The lightbar screen will not display guidance.*

The AgGPS FieldManager display has default settings for the lightbar which should suit most drivers. If the settings are not appropriate, use the instructions below to configure the lightbar:

1. From the *Configuration* screen, select the System plugin and then tap **Setup**.
2. If necessary, enter the Administrator password. See [Password access](#), page 84.

The *Display Setup* screen appears.

3. Tap **Lightbar**. The *Lightbar Settings* screen appears:

Configure the following settings:

Setting	Affects ...	Default setting	This setting determines...
Look ahead time	EZ-Guide Plus lightbar	0 seconds	the distance ahead of the vehicle that the lightbar will use for LED guidance and offline distance.
LED spacing	Virtual lightbar and EZ-Guide Plus lightbar	3 cm per LED/1" per LED	the distance represented by each LED on the lightbar.
LED Brightness	EZ-Guide Plus lightbar	5	the brightness of the lightbar LEDs. The setting can be a digit from 1 (faintest) to 5 (brightest).

Setting	Affects ...	Default setting	This setting determines...
Display Mode	Virtual lightbar and EZ-Guide Plus lightbar	show error (chase mode)	how the LEDs respond to offline distances. When "Show error" is selected, the display shows the direction that you need to move in. When "Show correction" is selected, the display shows your current distance offline.
Text message	EZ-Guide Plus lightbar	None	which text is displayed on the lightbar while online: None, Swath Number, or Accuracy.
Mount	EZ-Guide Plus lightbar	Dash	the direction that the LEDs move, based on which way up the lightbar is mounted: <ul style="list-style-type: none"> • Dash = mounted on the dash • Ceiling = suspended from the ceiling

To set the Look ahead time, LED spacing, or the LED brightness:

1. Tap the appropriate number field. A dialog appears.
2. Enter the value and then tap **OK**.

To set the display mode, text message, or mount, select the appropriate value from the drop-down list.

Configuring sounds

To enable sounds on the display:

1. Press the Configuration button  to the right of the screen.
2. If necessary, enter the Administration password.

The *Configuration* screen appears.

3. Select the System plugin and then tap **Setup**. The *Display Setup* screen appears.

4. Tap **Sounds**. The *Sounds Setup* screen appears:

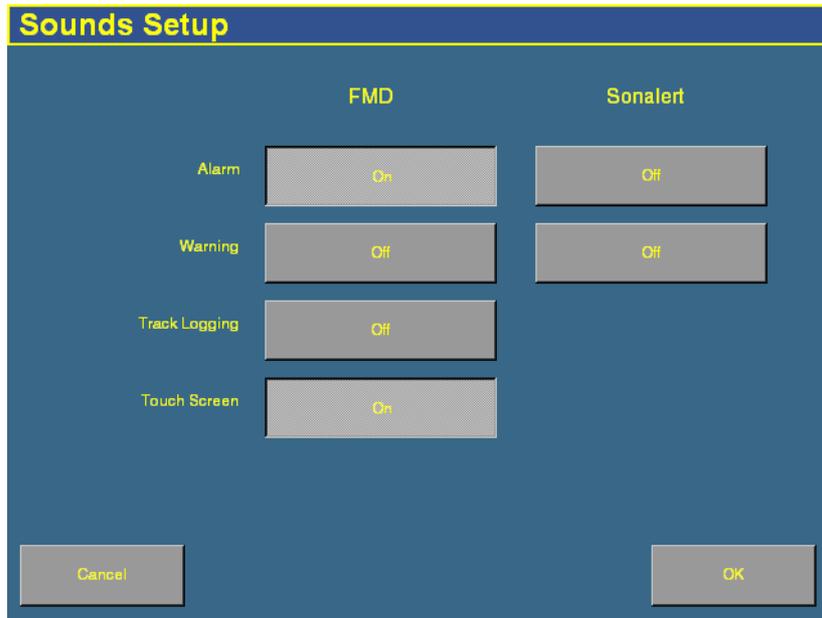


Figure 5.1 Options on the *Sounds Setup* screen

There are two ways that the display can produce sounds:

- FMD: through the display’s speaker
 - Sonaalert: through an optional Sonaalert alarm
5. To enable a sound, select the button next to it.
 6. Tap **OK** when done.

You can enable sound on the display and the sonalert at the same time.

Configuring the time

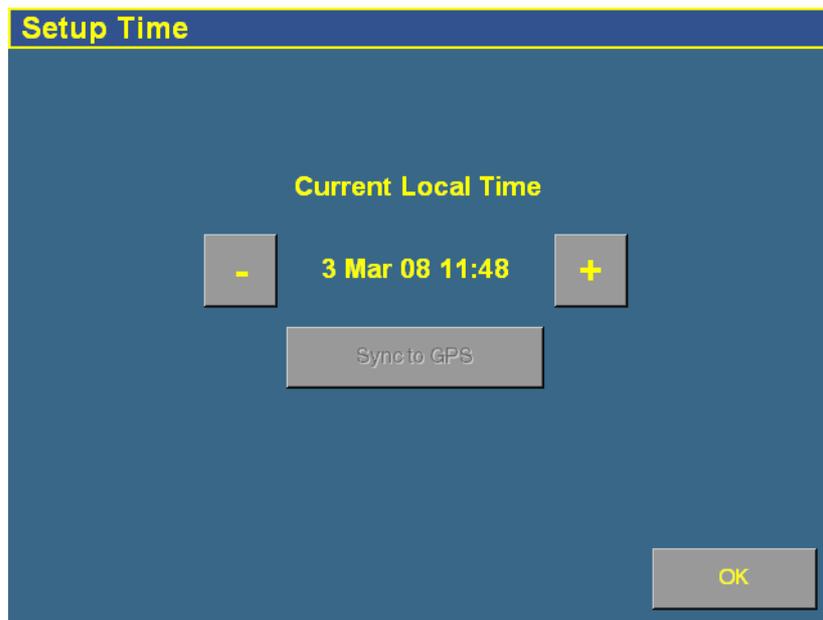
Note – *Configuring the Timezone can cause multiple warning messages to appear. Do not be concerned by this.*

To synchronize the display time to the GPS signals:

1. Press the Configuration button  to the right of the screen.
2. If necessary, enter the Administration password.

The *Configuration* screen appears.

3. Select the System plugin and then tap **Setup**. The *Display Setup* screen appears.
4. Tap **Timezone**. The *Setup Time* screen appears:

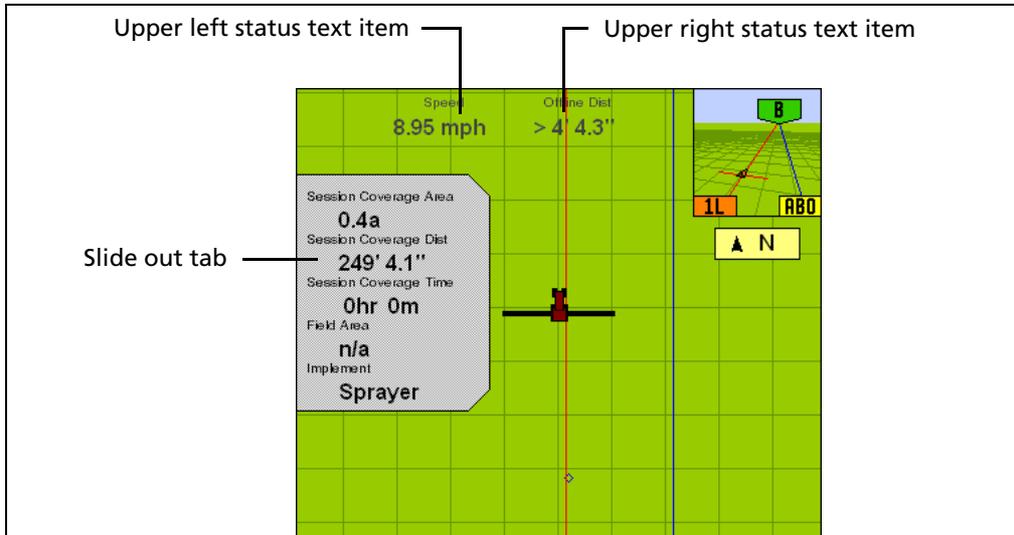


5. Tap **Sync to GPS**.
6. If the time is not correct, tap the - or + button to change the time by 1 hour increments.

*Note – The **Sync to GPS** button is only available after ZDA packets from the GPS receiver are received. This can take several minutes. Ensure that your GPS device has ZDA NMEA messages enabled.*

Configuring the status text items

The *status text items* are segments of information that appear on the Run screen. The information appears in three different locations:



- In two places at the top of the screen
- On a slide-out tab at the left of the screen

The slide-out tab overlies the main screen, but is transparent so you can still see guidance underneath it. To extend the slide-out tab, tap the end of the tab on the left of the screen.

The slide-out tabs automatically slide back in when the specified timeout value is reached. To close the tab before then, tap the tab.

The status text items are ordered by plugin. If a plugin is removed, the status text items associated with it are no longer available. The available items are:

Category	Item	Description
	(blank)	The status text item is not displayed
Autopilot (or Manual Guidance)	Altitude	The current height of the vehicle
	CMR Percent	The percentage of radio CMR packets received over the last 100 seconds
	Correction Age	The length of time since the last correction was received
	Correction Type	The correction type that is being used
	East	The distance that the vehicle is to the East of the field origin point (a negative number means the vehicle is to the West of the field origin point)
	Engaged Time (Autopilot only)	The length of time that the system has been engaged for
	GPS Status	The GPS correction type that the GPS receiver is currently using
	H Error	(Horizontal error) An estimation of the level of precision of the GPS position in 2 dimensions
	HDOP	Horizontal Dilution of Precision: A measure of accuracy based on the geometry of the satellites in the sky. If the satellites are near each other in the sky, the HDOP is higher (lower is better).
	Heading	The current heading of the vehicle in degrees from direct north
	Latitude	The vehicle's current latitude
	Longitude	The vehicle's current longitude
	Network ID	The RTK network ID of the GPS receiver's corrections
	North	The distance that the vehicle is to the North of the field origin point (a negative number means the vehicle is to the South of the field origin point)
	Nudge/Trim (Autopilot only)	The amount of Nudge or Trim currently applied.
	Offline Dist	The distance away from the guidance line

Category	Item	Description
Mapping	Satellites	The number of satellites the system is currently receiving
	Speed	The current vehicle speed
	Steering Angle (Autopilot only)	The angle reported by the rotary potentiometer or the AgGPS AutoSense™ device
	Up	The vertical height of the vehicle relative to the field origin point (a negative number means the vehicle is lower than the field origin point)
	Vehicle Model (Autopilot only)	The model of vehicle that is configured
	Dist to Feature	The distance to the nearest feature
	Dist to Pause	The distance to the pause position
	Heading to Feature	Vehicle location relative to the nearest feature (feature is directly ahead = 0°, feature is directly behind = 180°)
	Heading to Pause	Direction vehicle is facing relative to the paused vehicle position (directly ahead = 0°, directly behind = 180°).
	Nearest Point Name	The name of the nearest point feature
Multi-Application Control	Swath Length	The length of the current guidance line Note – FreeForm curves are made up of line segments, so the Swath Length value is not appropriate for FreeForm curves.
	Swath Number	The swath number (L=left, R=right) Note – FreeForm curves are made up of line segments, so the Swath Number value is not appropriate for counting FreeForm curves.
	Swath Points	The number of points that define the current line
	Average Population	The average rate across all rows
	Avg. Seed Spacing	The average spacing between the planted seeds (across all of the rows)
System	Control Speed	The speed reported to the multi-application controller
	Available Memory	The available internal memory in the display
	Coverage Percent	The percentage of the field area that is covered area

Category	Item	Description
	Event Coverage Area	The area that has been logged during the current event
	Event Coverage Distance	The distance covered while logging during the current event
	Event Coverage Time	The length of time that coverage logging has been engaged for during the current event
	Field Area	The field area within a pivot or headland boundary
	Free Space on Card	The amount of free space on the CompactFlash card
	GMT Time	The current Greenwich Mean Time
	Implement	The name of the current implement
	Local Time	The local time
	Productive Area	The area of Area Features that are designated as "productive"
	Session Coverage Area	The area that has been logged during the current session
	Session Coverage Dist	The distance covered while logging during the current session
	Session Coverage Time	The length of time that coverage logging has been engaged for during the current session
	Session Time	The length of the current field session
EZ-Boom	Applied Rate	The current rate
	Area to Empty	The area that can still be sprayed before the tank is empty
	Current Flow	The current flow of the EZ-Boom system
	Pressure	The current pressure, as reported by the primary pressure sensor
	Secondary Pressure	The current pressure, as reported by the secondary pressure sensor
	Tank Level	The current level of the sprayer's tank
	Target Rate	The spraying target rate
	Total Vol Applied	The total volume of solution applied
TrueTracker	Impl. Altitude	The current height of the implement

Category	Item	Description
	Impl. CMR Percent	The percentage of radio CMR packets received over the last 100 seconds by the implement GPS receiver
	Impl. Correction Age	The age of the corrections used by the implement receiver
	Impl. Correction Type	The correction type used by the implement receiver
	Impl. East	The distance that the implement is to the East of the field origin point (a negative number means the vehicle is to the West of the field origin point)
	Impl. Engaged Time	The time that the implement has been engaged
	Impl. GPS Status	The status of the GPS correction used for the implement
	Impl. H Error	(Horizontal error) An estimation of the level of precision of the implement GPS position in 2 dimensions
	Impl. HDOP	The Horizontal Dilution of Precision of the implement receiver: A measure of accuracy based on the geometry of the satellites in the sky. If the satellites are near each other in the sky, the HDOP is higher (lower is better).
	Impl. Latitude	The implement's current latitude
	Impl. Longitude	The implement's current longitude
	Impl. Network ID	The RTK network ID of the implement receiver's corrections
	Impl. North	The distance that the implement is to the North of the field origin point (a negative number means the vehicle is to the South of the field origin point)
	Impl. Nudge/Trim	The amount of Nudge or Trim currently applied to the implement position
	Impl. Offline Dist	The implement offline distance
	Impl. Satellites	The number of satellites that the implement receiver is reading
	Impl. Speed	The speed of the implement
	Impl. Steering Angle	The steering angle of the implement

Category	Item	Description
	Impl. Up	The vertical height of the implement relative to the field origin point (a negative number means the vehicle is below the field origin point)
	Impl. Vehicle Model	The implement profile name
Serial Rate Control	Applied Rate	The applied rate
	Current Flow	The current flow
	Target Rate	The current target rate
	Total Vol Applied	The total volume applied so far
FieldLevel	Altitude	The current height of the vehicle (as reported by the blade GPS receiver)
	Blade Height	The current height of the blade
	CMR Percent	The percentage of radio CMR packets received over the last 100 seconds by the blade GPS receiver
	Correction Age	The time since the GPS corrections were last received from the FieldLevel GPS receiver.
	Correction Type	The correction type used by the blade receiver
	Cut/Fill	The difference between the Blade Height and the Target Height: <ul style="list-style-type: none"> • When Cut is displayed, the current ground height is above the target height. The height adjustment indicator shows a red down arrow, which means that the blade needs to move down to reach the Target Height. • When fill is displayed, the current ground height is below the target height. The height adjustment indicator shows a red up arrow, which means that the blade needs to move up to reach the Target Height.
	Design Height	The height the blade will attempt to reach. This is the Design Height ± the Offset. When the blade reaches the Target Height, the arrows turn green.
	Distance Traveled	(For use with Point to Slope mode) The distance traveled since Auto mode was enabled.

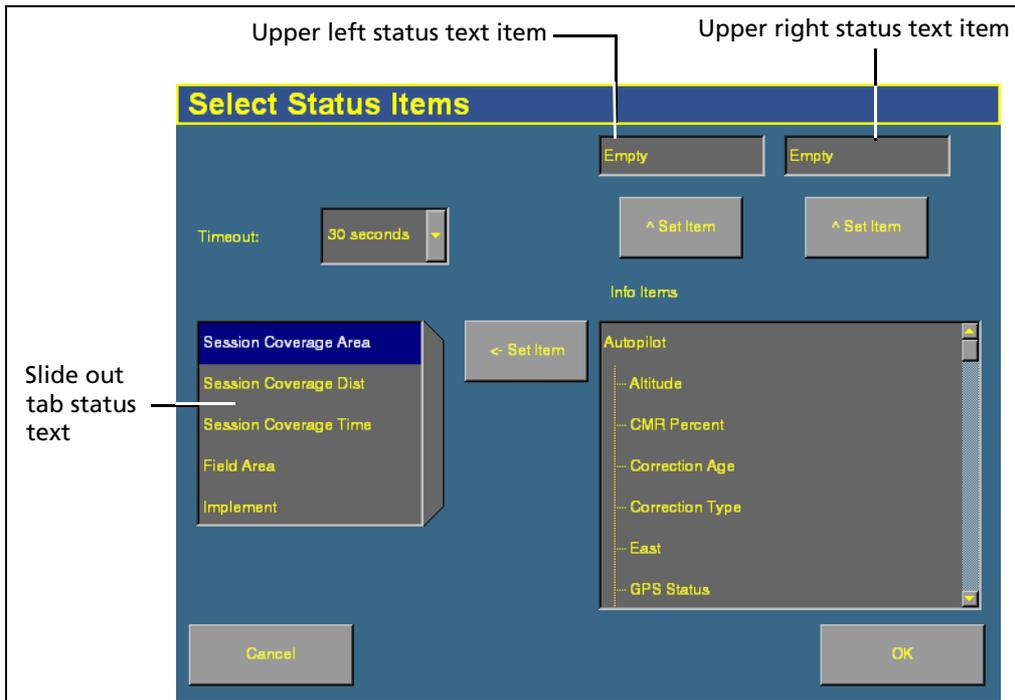
Category	Item	Description
	East	The distance that the blade receiver is to the East of the field origin point (a negative number means the vehicle is to the West of the field origin point)
	GPS Status	The GPS correction type that the blade GPS receiver is currently using
	H Error	(Horizontal error) An estimation of the level of precision of the blade GPS position in 2 dimensions
	HDOP	The current Horizontal Dilution of Precision of the blade receiver: A measure of accuracy based on the geometry of the satellites in the sky. If the satellites are near each other in the sky, the HDOP is higher (lower is better).
	Heading	The current heading of the blade in degrees from direct north
	Latitude	The blade's current latitude
	Longitude	The blade's current longitude
	Network ID	The RTK network ID of the blade receiver's corrections
	North	The distance that the blade receiver is to the North of the field origin point (a negative number means the vehicle is to the South of the field origin point)
	Offset	A separate plane that is parallel to the design plane. The offset is defined by a single measurement, which is the height that the offset plane is from the design plane.
	Offset X	The Relative Position X offset from the master benchmark.
	Offset Y	The Relative Position Y offset from the master benchmark.
	Satellites	The number of satellites currently being received by the FieldLevel GPS receiver.
	Speed	The speed of the vehicle as reported by the blade GPS receiver

Category	Item	Description
	Target Height	The height the blade will attempt to reach. This is the Design Height \pm the Offset. When the blade reaches the Target Height, the arrows turn green.
	Up	The height of the blade receiver relative to the field origin point (a negative number means the blade is below the field origin point)
	VDOP	The current VDOP of the FieldLevel GPS receiver.
	Vertical Error Estimate	The current estimate of error in the height calculated by the FieldLevel GPS receiver.
FieldLevel Survey/Design	Survey Points	The number of survey points that have been created

To set the status text items:

1. Press the Configuration button  to the right of the screen.
2. If necessary, enter the Administration password.
The *Configuration* screen appears.
3. Select the System plugin and then tap **Setup**. The *Display Setup* screen appears.

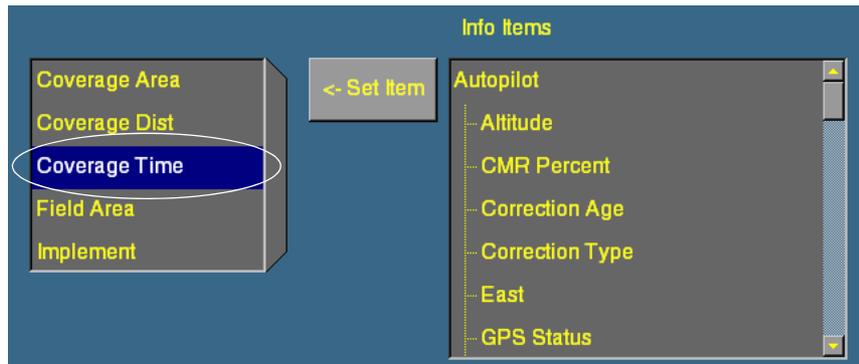
4. Tap **Status Items**. The *Select Status Items* screen appears:



The status text items appropriate for your plugins appear in the *Info Items* list.

5. Set the upper left status text item:
- Tap the item you want to use in the Info Items list.
 - Tap the left **^ Set Item** button.
The information appears in the upper left text box.
6. Set the upper right status text item:
- Tap the item you want to use in the Info Items list.
 - Tap the right **^ Set Item** button.
The information appears in the upper right text box.

7. Select a time in the *Timeout* list. This is how long the tab remains on display before retracting. To have the tab extended until you close it manually, select Never.
8. To add status items to the slide-out tab:
 - a. Tap the position on the tab that you want to fill. For example, to add an item to the third position on the list, tap at the location shown:



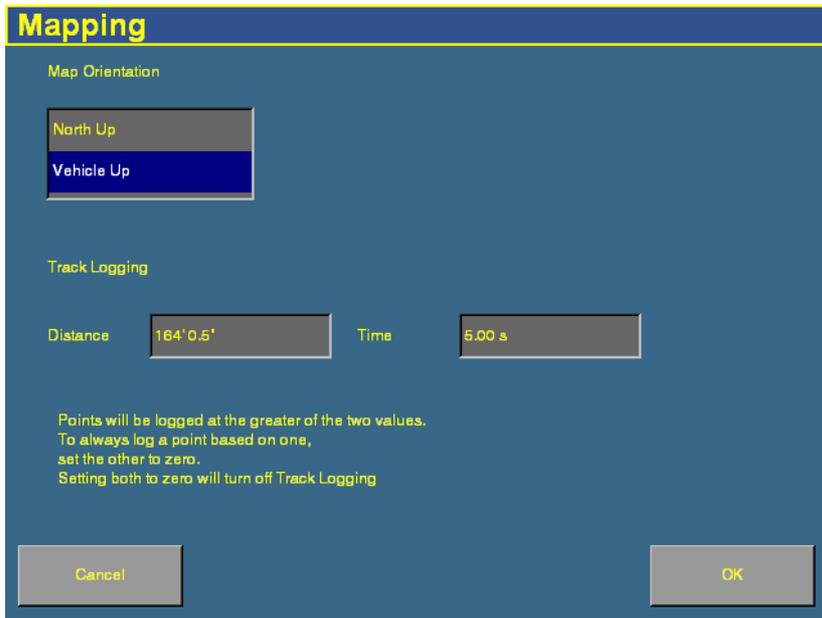
- b. Select the item to add from the *Info Items* list.
- c. Tap <- **Set Item**.

Configuring mapping

The *Mapping* screen enables you to configure:

Item	Description
Map orientation	The direction that the screen follows the position of the vehicle.
Track logging	How often the display records points along the path that the vehicle has driven.

1. Press the Configuration button  to the right of the display. The *Configuration* screen appears.
2. Select the System plugin and then tap **Setup**. The *Display Setup* screen appears.
3. Tap **Map**. The *Mapping* screen appears:



Mapping

Map Orientation

North Up

Vehicle Up

Track Logging

Distance 164'0.5" Time 5.00 s

Points will be logged at the greater of the two values.
To always log a point based on one,
set the other to zero.
Setting both to zero will turn off Track Logging

Cancel OK

4. Tap your preferred map orientation in the *Map Orientation* list:

Map orientation	Example of view	Explanation
North Up		When you perform a turn, the field remains stationary and the vehicle turns.
Vehicle Up		When you perform a turn, the field rotates but the vehicle remains pointing up.

Note – The map orientation can also be changed on the *Run* screen by tapping the north arrow.

5. Track logging can be recorded in different ways:

Setting	Description
Distance = 0, Time = 0	Track logging is turned off
Distance = 1+, Time = 0	Track logging is recorded by distance (m)
Distance = 0, Time = >1+	Track logging is recorded by time (s)
Distance = >1+, Time = >1+	Track logging is recorded by whichever setting is higher

Track logging files

Track logging files are created whenever an event is opened. The track file records points at the rate defined in the *Mapping* screen (see above). At each point, a number of attributes are recorded.

The data stored in the track attribute file (Track3D_<date time>.dbf) is in metric units.

Table 5.1 lists the information stored for each point in the track logging attribute file.

Table 5.1 Track logging file contents

Column	Field description	Units
Version	Track attribute file version	–
UTC_Date	Point creation date	YYYYMMDD
UTC_Time	UTC time	hh:mm:ss.s
Local_Time	Local time	hh:mm:ss.s
Logging_On	Coverage logging flag (1=on, 0=off)	On or off
Auto_Steer	Auto-Steer flag (1=on, 0=off)	On or off
GPS_Status	GPS status value (NMEA)	1, 2, 5, 4
Status_Text	GPS status description	–
Num_Stats	Number of GPS satellites	–
HDOP	Horizontal Dilution of Precision – a measure of the quality of positions based on satellite geometry	–
Corct_Age	DGPS signal correction age	seconds
Ant_Lat	Antenna latitude (WGS-84)	DD.dddddddd
Ant_Long	Antenna longitude (WGS-84)	DD.dddddddd
Height	Mean sea level height of ground	meters
Ant_HAE	Antenna height above ellipsoid Note – Not currently implemented.	meters
Ground_HAE	Ground height above ellipsoid Note – Not currently implemented.	meters
Speed	GPS-derived ground speed	kph
Heading	Direction of travel with respect to true North.	decimal degrees
Swath_Num	Current swath/headland number.	
Offline	Offline distance from swath center line.	meters
Along_Line	Along line distance from start of swath. Note – Not currently implemented.	meters
Swath_Width	Swath width	meters
Appln_Width	Application width	meters
Units	Units Note – Not currently implemented.	metric
Field_Name	The name of the field	–
Target	The target rate at the current position	–

Column	Field description	Units
As_Applied	Applied rate Note – Not currently implemented.	–
Pitch	The pitch Note – Not currently implemented.	–
Roll	The roll Note – Not currently implemented.	–
Yaw	The yaw Note – Not currently implemented.	–
Total_Qty	Total volume of material as applied for the current field. Only supported for the AgGPS Aerial Flow Controller, Autocal Flow controller, and Crophawk Flow Meter.	–
Relative_Height	Height	meters

Configuring the data dictionary

Data dictionaries enable you to enter a list of common entries that you will be able to select for lists. They save you from having to repeatedly type the same thing.

For more information, see [Data dictionaries, page 588](#).

Using settings files

Note – The display configuration is different from the vehicle configuration. The vehicle configuration saves the Autopilot vehicle settings that you have created. The display configuration saves the display appearance features that you have selected. See also [Saving the vehicle configuration, page 554](#).

There are three settings you can apply to the display:



To...	Do this...
Restore the display default settings	Tap Default
Save the current settings for future use	Tap Save
Restore the saved settings file	Tap Restore

Note – The *FieldManager* display saves only one settings file. When you save the current display settings, they overwrite any configuration that you previously saved.

The settings are saved to the `\AgGPS\Diagnostics\Preferences\` directory.

To apply the same settings to another *FieldManager* display:

1. Save the settings to the CompactFlash card.
2. Insert the CompactFlash card into the second display.
3. Restore the settings on the second display (see above).

For any additional displays, repeat Steps 2 and 3.

Advanced diagnostics

The System plugin's Diagnostics mode enables you to configure advanced guidance settings. If you are setting up the system for the first time, you should not need to adjust these settings.

To review the settings, or if you have any guidance lines originally generated with an AgGPS 170 Field Computer, see [Advanced diagnostics, page 594](#).

You can also use the *System Diagnostics* screen to view raw port data. For more information, see [Viewing raw serial data, page 597](#).

Implement Configuration

In this chapter:

- Introduction
- Selecting an existing implement
- Creating an implement
- Importing an implement from the AgGPS 170 Field Computer
- Adjust the implement settings
- Deleting an implement

This chapter describes how to configure a vehicle implement. See also [Chapter 20, Advanced Configuration](#).

Configure an implement so the system can tell:

- which type of implement is attached
- how much area it covers
- how far offset it is

Note – *Some configuration settings are unavailable when a field is open in the Run screen. To access these settings, return to the Run screen and then press the Home button. When the display asks if you would like to close the field, tap **Yes**.*

Introduction

To obtain an implement, do one of the following:

- Create a new implement, see below.
- Select an existing implement, see [page 114](#).
- Import an implement that was created for the AgGPS 170 Field Computer, see [page 115](#).

When you have selected an implement, adjust its settings. See [page 116](#).

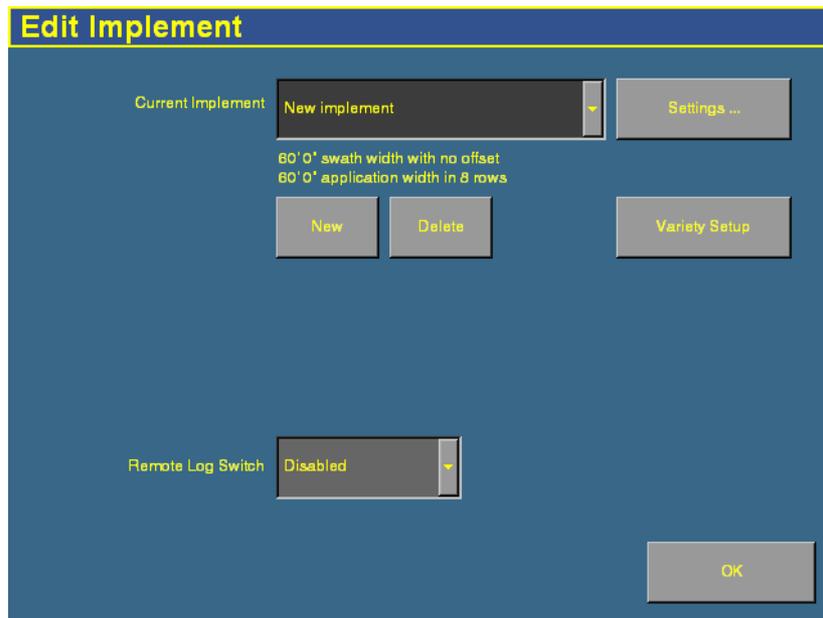
Creating an implement

1. Press the Configuration button  to the right of the display. The *Configuration* screen appears.
2. Tap **Implement Setup**.



3. If necessary, enter the Administration password. See [Password access, page 84](#).

The *Edit Implement* screen appears:



Note – Additional setup options appear on this screen for the Multi-Application Control or EZ-Boom plugins. See [Step 1: Configuring the spray boom \(in the FieldManager display\)](#), page 265.

4. Tap **New**. The *New Implement Name* screen (with a virtual keyboard) appears.
5. Enter a name for the new implement and then tap **OK**. The *Edit Implement* screen appears.
6. Tap **Settings**.

Selecting an existing implement

To configure an implement:

1. Press the Configuration button  to the right of the screen. The *Configuration* screen appears.
2. Tap **Implement Setup**.
3. If necessary, enter the Administration password. See [Password access, page 84](#).

The *Edit Implement* screen appears.

Any previously configured implements appear in the *Current Implement* list at the top of the screen.

To select an item, tap the list to open it and then select the appropriate implement.

If there is only one available implement, it is selected by default.

Importing an implement from the AgGPS 170 Field Computer

The AgGPS FieldManager display can import and use implements that were created in the AgGPS 170 Field Computer.

To import an AgGPS 170 Field Computer implement:

1. Copy the implement file into the `\AgGPS\` directory on the FieldManager display CompactFlash card.
2. Replace the card in the FieldManager display and then turn on the display.
3. Press the Configuration button  to the right of the display. The *Configuration* screen appears.
4. Tap **Implement Setup**.
5. If necessary, enter the Administration password. See [Password access, page 84](#).

The *Edit Implement* screen appears.

6. Tap **Import**.

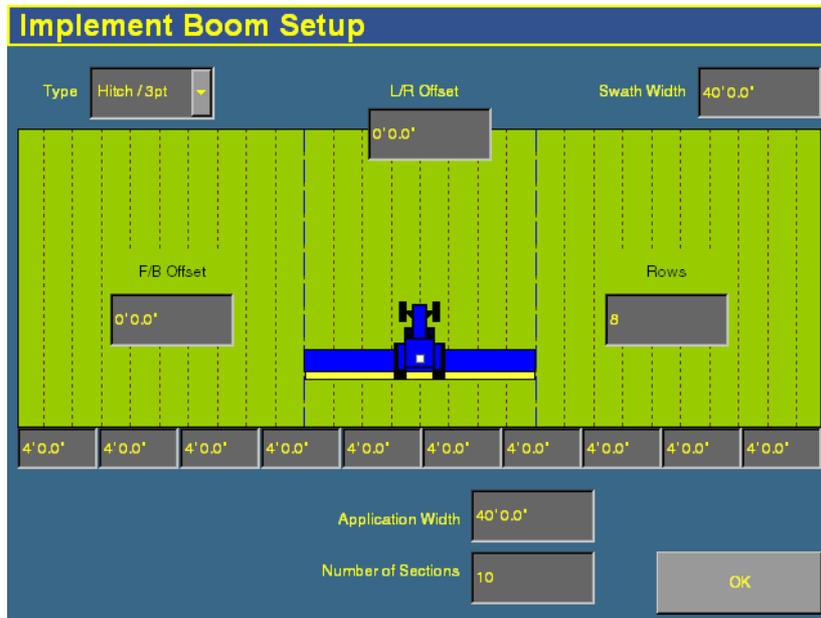
Note – The **Import** button is only available when there is an implement from an AgGPS 170 Field Computer in the `\AgGPS\` directory on the CompactFlash card.

The implements from your AgGPS 170 Field Computer now appear in the drop-down list.

Note – If you press **Import** more than once, you will get multiple copies of the implements.

Adjust the implement settings

- From the *Edit Implement* screen, select the implement from the Current Implement list and then tap **Settings**. The *Implement Boom Setup* screen appears:



- Select the implement type from the Type list:
 - Hitch/3pt: the implement is fixed to the vehicle
 - Drawbar: the implement can pivot (like a trailer)

3. If the implement is offset to one side, set the left/right offset:
 - a. Tap the *L/R Offset* text box. The *Enter Left/Right Implement Offset* screen appears.

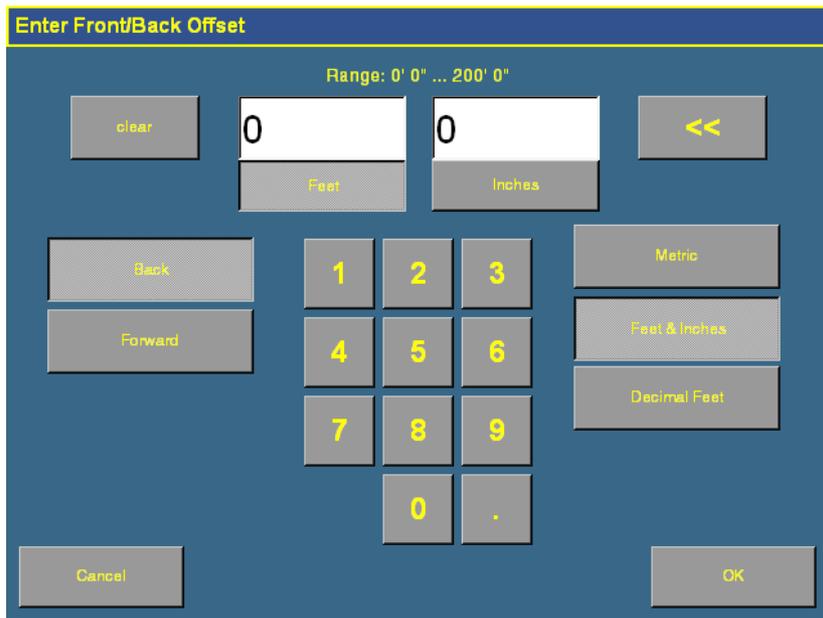
- b. Tap **Metric**, **Feet & Inches**, or **Decimal Feet** to select the units that the offset is measured in.
- c. Enter the offset distance.
- d. Tap either **Left** or **Right** to select the direction of the offset. An offset to the left indicates the implement extends to the left of the driver when seated in the vehicle.
- e. Tap **OK**.

The *Implement Boom Setup* screen appears. The image of the vehicle will show the offset you have just set.



CAUTION – It is important that you configure the correct front/back offset. If you are using an Autopilot system alone, set the front/back offset to the distance from the rear axle of the vehicle to the implement. If you are using any of the plugins that include switching (Serial Rate Control, Multi-Application Control, or EZ-Boom), set the front/back offset to the distance from the antenna to the implement.

4. Enter the *F/B Offset* setting:
 - a. Tap **F/B Offset**. The *Enter Front/Back Offset* screen appears:



- b. If necessary, tap either **Metric**, **Feet & Inches**, or **Decimal Feet** to change the units that the offset is measured in.
 - c. Enter the offset distance.
 - d. Tap either **Back** or **Forward** to select the direction of the offset. A forward offset indicates that the implement is located ahead of the antenna position.

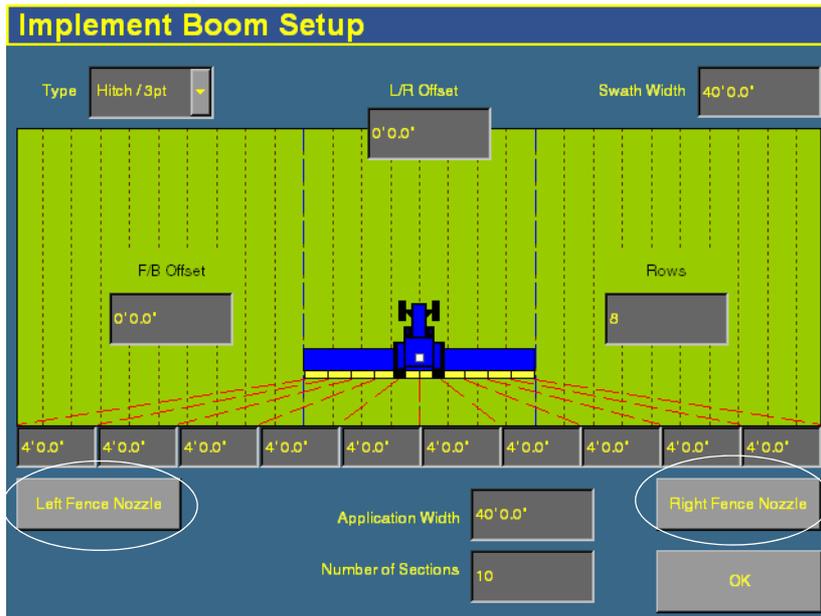
- e. Tap **OK**.

The *Implement Boom Setup* screen appears. The image of the vehicle will show the offset that you just set.

***Note** – The screen is scaled to whichever is larger, the swath or application width. This can mean that if any offset is greater than this, the tractor image can pass the edge of the screen.*

5. Tap the *No. Rows* text box to enter the number of rows that span across the swath width, which are used for navigation. When you press the **Skip** button to adjust the guidance line, the guidance line can move across by rows.
6. Tap the *Application Width* text box and then enter the distance from one end of the implement to the other. When you return to the *Implement Boom Setup* screen, the graphic will show the new application width.
7. Change the *Swath Width* text box, if necessary. To create an overlap, set the *Application Width* value to slightly more than the *Swath Width* value.

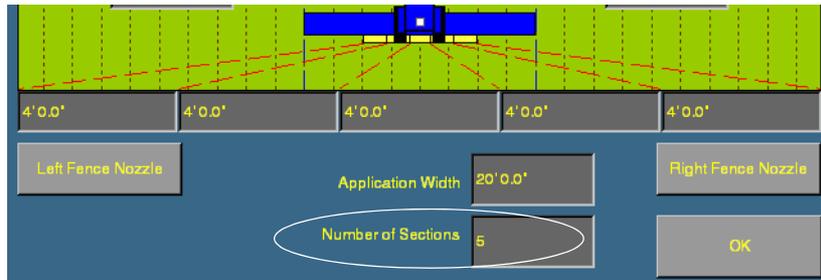
If you have the EZ-Boom, Multi-Application Control, or Serial Rate Control plugin installed, additional options are available on the screen:



For the EZ-Boom, Multi-Application Control, or Serial Rate Control plugins, complete the following steps as well:

1. Enter the number of implement sections:
 - a. Tap the *No. Sections* text box.
The *Enter Number of Sections* screen appears.
 - b. Enter the number of boom sections and then tap **OK**.
Note – Do not include fence sections when you count the total number of sections.

The *Implement Boom Setup* screen reappears. The graphic and the number of buttons along the base of the graphic will match the new number of sections.



Note – The EZ-Boom controller supports up to 10 boom sections. If one fence section is enabled, you can have a maximum of 9 boom sections. If both fence sections are enabled, you can have a maximum of 8 sections.

- c. Tap each of the numbered buttons (under the graphic) to set the boom section widths. By default, each section width is set to an equal amount (calculated by dividing the application width by the number of sections).
2. If you are configuring an EZ-Boom system and the implement has a left fence section, tap **Left Fence Section**.

A **fence section** is a spray section at the far left or right of the spray boom that points out to the side to cover fence lines. The left fence section is controlled by the far left (number 1) switch and the right fence section is controlled by the furthest active switch to the right on the EZ-Boom controller.

3. If you are configuring an EZ-Boom system and the implement has a right fence section, tap **Right Fence Section**.
4. Tap **OK**. The *Edit Implement* screen appears.
5. Tap **OK** again.

Deleting an implement

To delete an implement that you no longer require:

1. From the *Edit Implement* screen, select the appropriate implement from the *Current Implement* list.
2. Tap **Delete**. A warning dialog appears.
3. Tap **Delete** to confirm the deletion.

The Mapping Plugin

In this chapter:

- Introduction to field features
- Configuring field features
- Starting a field
- The parts of the Run screen
- Selecting a swath pattern
- Creating a new line
- Swath management
- Using the “Guide to” tabs
- Changing the implement
- Using Skip to fine-tune navigation
- Placing field features onscreen
- Pausing guidance
- Adjusting the status text size
- Introduction to coverage logging
- Varieties
- Closing a field

The Mapping plugin is permanently installed. It adds field features and guidance patterns to the display.

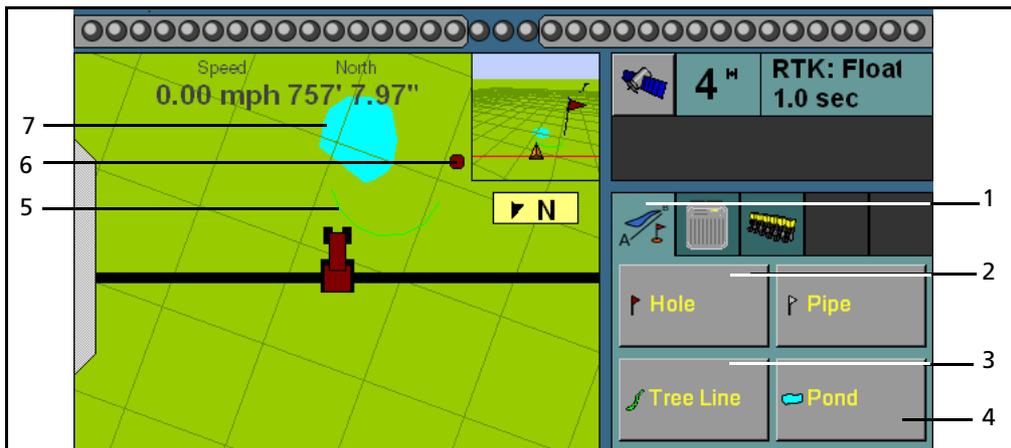
This chapter describes how to set up and use field features and how to use the plugin to perform steering navigation.

Introduction to field features

You can place field features in the field to define points of interest or areas to avoid. There are three types of field feature:

Feature type	What it defines	Example
Point	a single point in a field	Tree
Line	a straight or curved line in a field	Fence
Area	an area of land	Pond

Configure field features that you will want to add to your fields and then assign up to four of them to buttons. These buttons appear on the *Mapping* tab on the Run screen. You can then use the buttons to add field features to your map while driving.



Item	Description
1	Mapping tab
2	Feature button set up to represent a hole in the ground
3	Feature button set up to represent a tree line
4	Feature button set up to represent a pond
5	Line feature drawn with the Tree Line feature button (item 2)
6	Point feature drawn with the Hole feature button (item 1)
7	Area feature drawn with the Pond feature button (item 3)

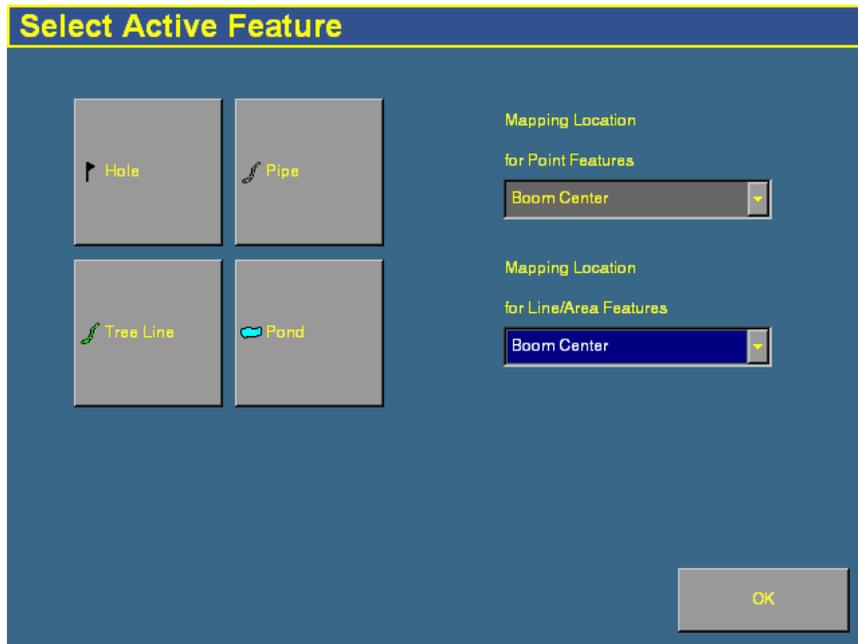
Configuring field features

To set up a field feature:

1. Press the  button. The *Configuration* screen appears.

Note – Ensure that you do not have a field open on the *Run* screen. You can only modify some configuration settings when all fields are closed. To close a field, select the *Run* screen and then press the  button.

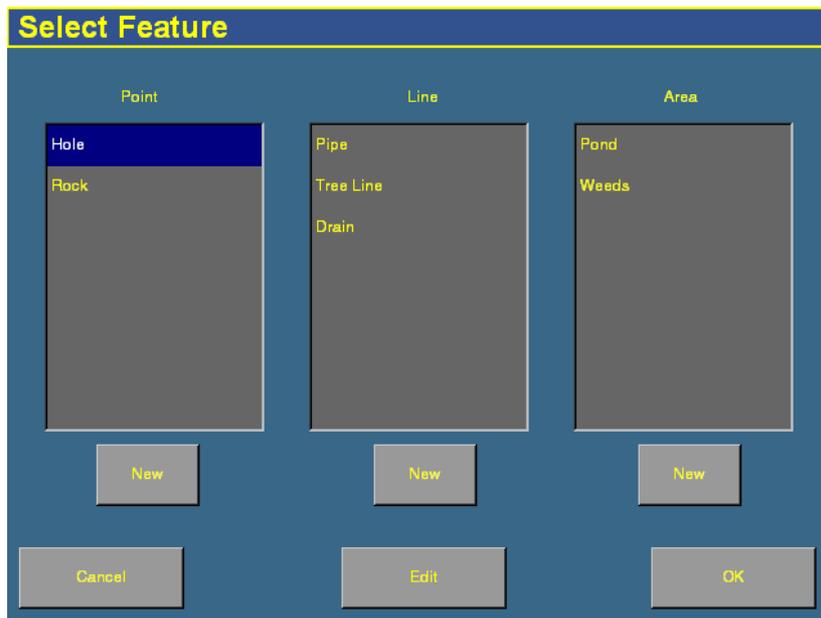
2. From the *Configuration* screen, select the Mapping plugin and then tap **Setup**. The *Select Active Feature* screen appears:



The four buttons on the left of the screen represent the four field feature buttons that appear on the *Mapping* tab on the *Run* screen (see previous page).

3. Select Boom Left, Boom Center, or Boom Right as the point on the vehicle where the feature will be created:
 - For a Point feature, select the setting from the *Mapping Location for Point Features* drop-down box.
 - For a Line or Area feature, select the setting from the *Mapping Location for Line/Area Features* drop-down box.
4. Select one of the four feature buttons to assign a feature to.

The *Select Feature* screen appears:



5. Do one of the following:
 - To assign an existing feature to the button, select a feature from one of the lists and then tap **OK**. The *Select Active Feature* screen reappears with the feature you selected assigned to the feature button.

- To create a new feature and assign it to the button, tap the **New** button under the appropriate list. The *Edit Feature screen* appears. This screen differs depending on which type of feature you selected.

Creating a point feature

1. Enter values for the four settings below:

Item	Description
Name	The name of the feature. For example, "Tree".
Alarm Radius	When the vehicle comes within this radius of the feature, the alarm appears. The Alarm Radius appears on the screen as a solid red block of color. The alarm radius is more serious than the warning radius, so it should be set to a shorter distance.
Warning Radius	The distance around the feature that causes a warning message to appear. The warning radius appears on the screen as an orange line.
Average Position	This is a way to improve the quality of the point feature position. <ul style="list-style-type: none"> • If you select the Average Position button, the display calculates the average position of the feature over 30 seconds. • If you un-select the button, the display places the Feature at the coordinates the vehicle is at when you press the button.

2. Tap **Color** to select the feature appearance color.
3. Tap **OK** to return to the *Select Feature* screen.
The new feature appears in the *Point* list.
4. Select the new feature from the list and then tap **OK** to return to the *Select Active Feature* screen.
The new feature appears on the button you selected.
5. Tap **OK** to exit.

Creating a line feature

1. Enter a name for the feature in the *Name* window.
2. Tap **Color** to select the feature appearance color.
3. Tap **OK** to return to the *Select Feature* screen.
The new line feature appears in the *Line* list.
4. Select the new feature in the list and then tap **OK** to return to the *Select Active Feature* screen.
The new feature appears on the button you selected.
5. Tap **OK**.

Creating an area feature

You can use area features to define areas of land as *Productive* or *Unproductive*. If the sprayer passes into an area that is defined as unproductive, the boom sections will turn off. This can be useful for setting exclusion zones that you do not want to spray, for example waterways.

1. Enter the name of the feature in the *Name* window.
2. If the area feature will be a section of land that can be included in area calculations, set the **Productive Area** button to Yes. If it is unproductive land, set the button to No.
3. Tap **Color** to select the feature appearance color.
4. If a signal pin is attached to the system, set the **Remote Output** button to Enabled. This enables you to trigger a pulse to an external device when you enter or exit this area.

5. Select one of the following settings from the *Trigger Warning When* list:

Item	Description
No Warning	No warning appears
Entering Area	A warning appears while you are inside the area
Leaving Area	A warning appears while you are outside the area

***Note** – The Remote Output and Trigger Warning settings only relate to this type of area feature. They do not apply to any of your other area features. You must set the warning for each type of Area Feature individually.*

6. Tap **OK** to return to the *Select Feature* screen.
The new area feature appears in the *Area* list.
7. Select the new feature from the list and then tap **OK** to return to the *Select Active Feature* screen.
The new feature appears on the button you selected.
8. Tap **OK**.

For more information on applying field features during navigation, see [Placing field features onscreen, page 158](#).

Starting a field

1. Tap the  button to the right of the display. The *Field Selection* screen appears:

This is the screen where you either re-open an existing field or create a new field. You must select a Client, Farm, and Event, in that order.

Note – *The first time that you use the Field Selection screen, there are no existing fields so you must create one.*

2. Do one of the following:
 - Create a new client. See [Creating a client, page 131](#).
 - Select an existing client from the *Client* list. The *Farm* list now contains only the farms associated with that client.
3. Select the appropriate farm or create a new one.
4. Select the appropriate field or create a new one.

5. Select the appropriate event or create a new one.
6. To add more information for record keeping, tap **Event Attributes**. The *Event Attributes* screen appears. See [Adding record keeping information, page 132](#).
7. If necessary, select a different implement. See below.
8. Tap **OK** to enter the Run screen.

When you have created the field, select a swath pattern to use while you drive the field.

Creating a client

1. Tap the **New** button beside the Client list. The *Client* screen appears.
2. Tap the appropriate buttons to enter the name.

Select...	To...
CAPS	enter capital letters or symbols
<<	delete the previous character
CLEAR	delete all characters and start again

3. Tap **OK** when the name is entered.
4. Repeat this process to create a farm, field, and event (and record keeping Event Attributes, if required).
5. If necessary, change the implement. See below.
6. Tap **OK**.

Additional settings

Changing the implement

When you select the Run button, the *Field Selection* screen appears. The *Field Selection* screen includes information about the currently selected implement. To change the implement:

1. Tap **Change Implement**. The *Edit Implement* screen appears.
2. Do one of the following:
 - To select from predefined implements, select one from the *Current Implement* list.
 - To create a new implement, see [Creating an implement](#), page 112.

Adding record keeping information

To add the following categories, tap **Event Attributes**:

Item	Description
Operator name	The name of the vehicle operator
Operator EPA#	The vehicle operator's EPA license number for spreading restricted-use or state-restricted pesticides or herbicides
Harvest Year	The year that the crop is going to be harvested
Farm Location	The country or region where the farm is located
Vehicle	The vehicle used in the operation
Implement	The implement connected to the vehicle
Application Method	The application method used (for example, spraying, seeding, or harvesting)
Wind speed	The average wind speed
Wind gust speed	The maximum speed of any wind gusts
Wind direction	The average wind direction
Sky conditions	The amount of cloud cover
Soil conditions	A description of the state of the soil

Item	Description
Soil type	A description of the soil type in the field
Temperature	The current temperature
Relative humidity	The humidity percentage
Crop	The crop grown in this field
Target pests	(If spraying) the pest that the spray targets
Custom 1	Additional information of your choosing
Custom 2	Additional information of your choosing
Custom 3	Additional information of your choosing
Custom 4	Additional information of your choosing
Material	The material being applied

The parts of the Run screen

The Run screen is where you receive guidance and drive the vehicle.

The appearance of the screen changes, depending on which plugins you have installed.

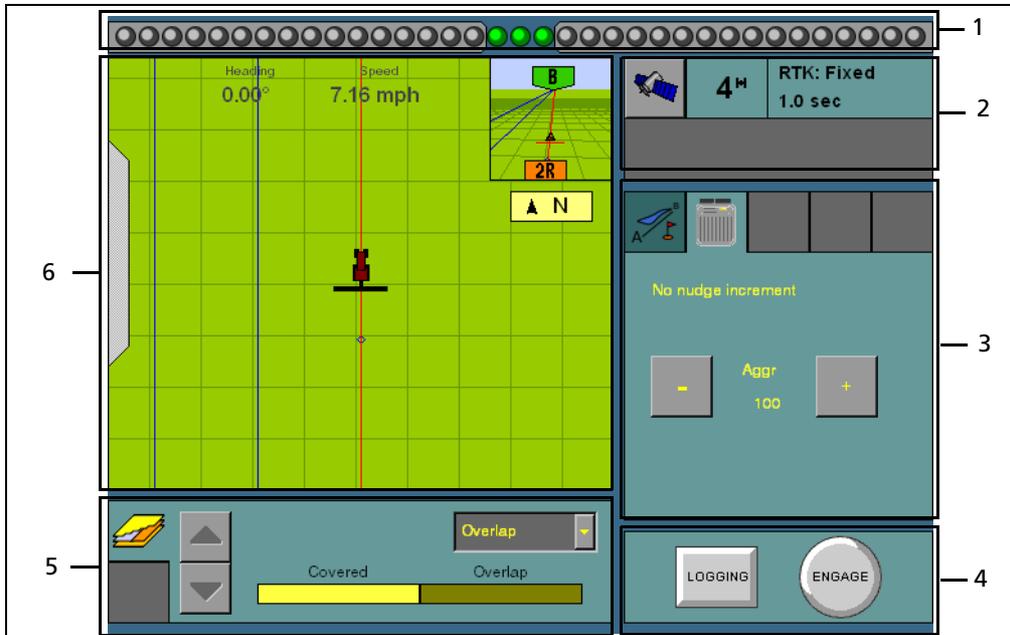


Figure 7.1 Parts of the Run screen

Item	Description
1	Virtual lightbar
2	GPS receiver(s) information
3	Plugin tabs (Autopilot tab shown)
4	Logging and engage buttons
5	Plugin information tabs (Mapping plugin tab shown)
6	Guidance window

These items are described in more detail below.

Virtual lightbar

The virtual lightbar provides vehicle guidance. When the vehicle is perfectly on the guidance line, the 3 center (green) LEDs are lit:



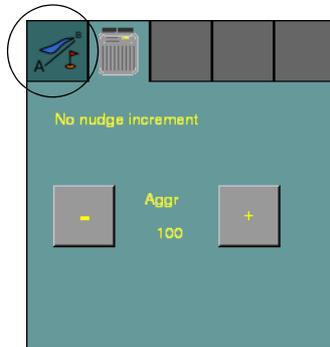
When the vehicle moves off the guidance line to the left or the right, the 3 LEDs that are lit drift to the side:



To configure the virtual lightbar, see [Configuring the lightbar settings](#), page 90.

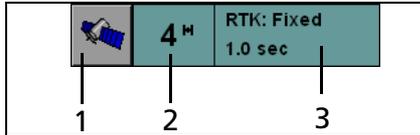
Plugin tabs

Most of the plugins have features that appear on a tab on the Run screen. To select a tab, tap the top of it:



GPS receiver information

The button in the top right of the Run screen provides information about GPS:



Item	Description
1	Satellite Information button
2	Current number of satellites
3	Type and age of correction

If the GPS signal is lost completely, the No GPS message appears.



Tap the satellite information button to view the information on it.

There can be more than one row, depending on the plugin that is installed. If the plugin requires a second GPS receiver (for example, the second GPS receiver mounted on the implement for the TrueTracker system), then the upper information row relates to the vehicle GPS receiver and the lower information row relates to the second GPS receiver.

Vehicle GPS Status

Longitude : 167°54'46.85"E
 Latitude : 29°2'43.09"S
 Altitude : 431' 5.29"
 Satellites : 7
 HDOP : 1.2
 VDOP : 3.4

Correction Type : RTK
 Status : Fixed
 Age : 1.0 secs

OK

Engage button

When you create a guidance line, you can use the **Engage** button to engage or disengage the AgGPS Autopilot automated steering system. The button has three states:

Engage button color	Meaning	
Red	The system cannot be engaged	
Gray	The system can be engaged but currently is not engaged	
Green	The system is engaged	

To engage the vehicle, tap **Engage**. The system engages and the button turns green.

To disengage the vehicle:

- Turn the steering wheel to trigger the manual override.
- Tap **Engage**.

The system disengages and the **Engage** button turns gray.

If the button is red, tap it to find out why.

Logging button

The **Logging** button engages and disengages coverage logging:

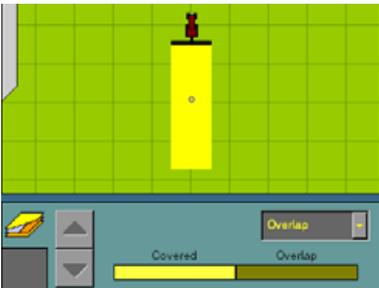
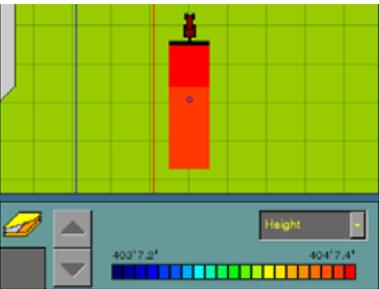
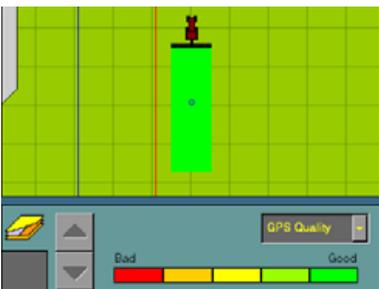
Logging button color	Meaning	
Gray	Coverage logging is not engaged	
Green	Coverage logging is engaged	

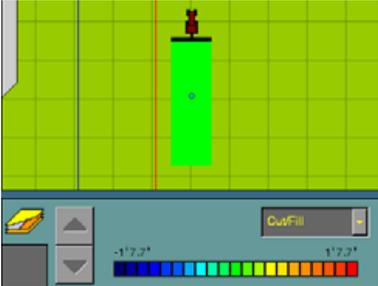
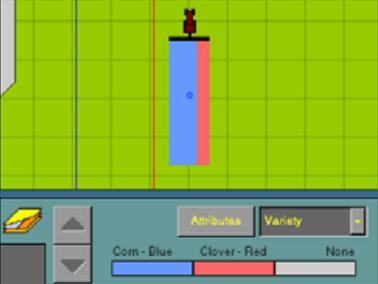
Plugin information tabs

As with the plugin tabs, the plugin information tabs that appear differ depending on which plugins are installed:

Mapping information tab

The Mapping information tab enables you to view your coverage from a number of perspectives:

Setting	Example	Description
Overlap		Coverage shows general coverage and overlap
Height		Coverage shows altitude of GPS receiver
GPS Quality		Coverage shows GPS signal quality

Setting	Example	Description
Cut/Fill (FieldLevel)		Coverage shows cut and/or fill
Variety		Coverage shows different varieties. See Varieties , page 162.

Guidance window

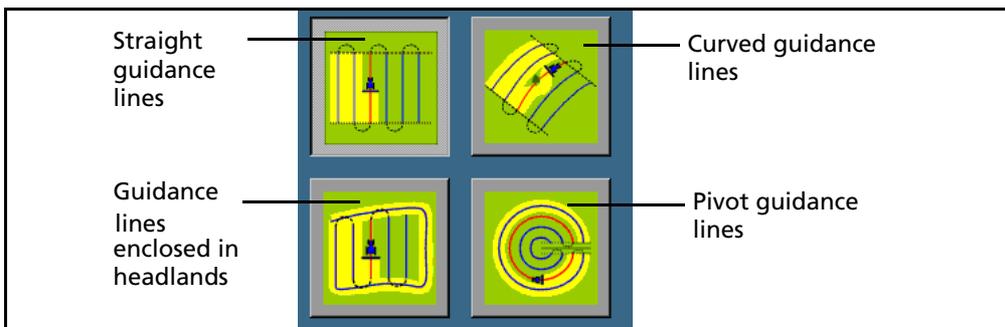
The guidance window shows your vehicle, coverage, field features, and guidance lines. For a description of the ways you can view the window, see [View modes](#), page 42.

Selecting a swath pattern

To obtain guidance with the AgGPS FieldManager display, you can use:

- 1 of the 4 standard swath pattern types
- the FreeForm™ guidance pattern. See [Creating guidance with the FreeForm pattern, page 147](#).

Use the standard patterns to create different shaped guidance lines on the display.



To select a swath pattern:

1. On the Run screen, select the *Mapping* tab:



2. Tap **Swaths**. The *Swath Management* screen appears.

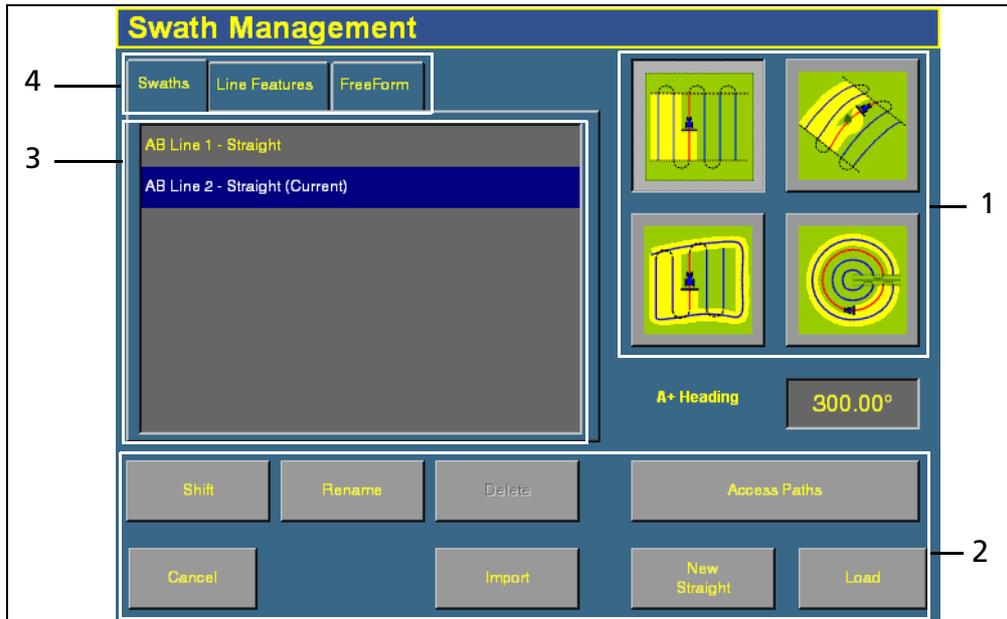


Figure 7.2 *Swath Management* screen

Item	Description
1	Guidance patterns
2	Line management buttons
3	Existing guidance lines
4	Guidance type buttons

3. Tap the appropriate pattern button on the right of the screen.

Creating a new line

The type of line that you can create depends on the swath pattern that you have selected.

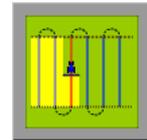
Creating a straight line

There are 2 ways to create a straight line:

- **AB Line** – Define the start and end points.
- **A+ Line** – Define a point on the line and the heading direction.

To create a straight AB Line:

1. From the *Swath Management* screen, select the straight line field pattern.
2. Enter an access path, if required. See [Adding an access path, page 152](#).
3. Tap **New Straight**. The Run screen appears.
4. To create the start point of the line, tap **Set A**.
5. Drive to the end of the line. The end (B) point must be at least 50 meters (160 feet) from the A point.
6. Tap **Set B**. The new AB Line appears onscreen.



To extend the line, drive further along it and then tap **Set B** again.

7. Tap **Done**.

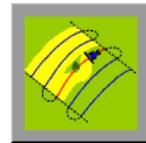
To create a straight A+ line by selecting one point and the angle:

1. From the *Swath Management* screen, select the AB Line field pattern.
2. Enter an access path, if required. See [Adding an access path, page 152](#).

3. In the A+ Heading window, enter the angle that you want the line to be on or select a previous AB Line to use its heading. The default angle is the same as the previous AB Line heading.
4. Tap **New Straight**. The Run screen appears.
5. Drive to the start of the line and then tap **Set A**.
6. Tap **Use A+**. The new A+ line appears.
7. Tap **Done**.

Creating a curved line

1. From the *Swath Management* screen, tap the Curve field pattern.
2. Enter an access path, if required. See [Adding an access path, page 152](#).
3. Tap **New Curve**. The Run screen appears.
4. Drive to the start point of the curve and then tap **Set A**.
To stop recording your exact path and create a straight section of line, use the **Record** button. See page 146.
5. Drive the curve until you reach the end point and then tap **Set B**.
The new curve appears.

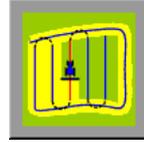


Creating a headland

A Headland is a straight AB Line or an A+ line pattern that is confined inside a boundary. This boundary is called the headland.

***Note** – If you want to create a headland based on the A+ line pattern, select the straight line pattern and then set the A+ heading for the internal line. Then complete the steps below.*

1. From the *Swath Management* screen, select the Headlands field pattern.
2. In the # *Headlands* window, enter the width of the headland boundary in swaths. For example, if you enter **2**, the headland will be 2 swaths wide.
3. Tap **New Headland**.



The Run screen appears with the headland definition buttons on the Mapping tab.



4. Drive to the start point of the headland and then tap **Record**. A red line appears behind the vehicle to show that the headland is being recorded.

You need to define the inner pattern *before* you complete the headland.

5. To define the inner pattern, tap **Infill**. The Mapping tab changes to show the inner pattern buttons:



6. When you get to the point where you want the A point, tap **Set A**.
7. Do one of the following:
 - To create an internal AB Line, drive to the point where you want the B point (at least 50 m (164 ft)) and then tap **Set B**.
 - To create an internal A+ line, tap **Use A+**.
8. Tap **Back to HL**. The buttons on the Mapping tab change back to their original appearance.



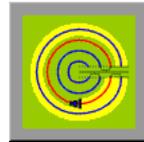
When you complete the headland circuit, the system will draw a straight line from the vehicle back to the start point, so drive the vehicle to a position on the headland circuit where a straight line back to the start will not cut off part of the pattern.

9. Tap **Close HL**.

The new headland appears.

Creating a pivot

1. From the *Swath Management* screen, tap the Pivot field pattern.



2. Tap **New Pivot**.

The Run screen appears.

3. Drive to a point on the outermost rut of the pivot and then tap **Set A**.
4. Follow the pivot rut around to the end and then tap **Set B**. The *Enter Distance to Pivot Field Edge* screen appears.
5. Enter the distance or the number of rows from the current path to the outside of the pivot and then tap **OK**.

The pivot appears.

Adjusting the outer edge radius

The pivot has an outer edge radius that is used to calculate coverage area. Once you have created a pivot, you can adjust the outer edge radius:

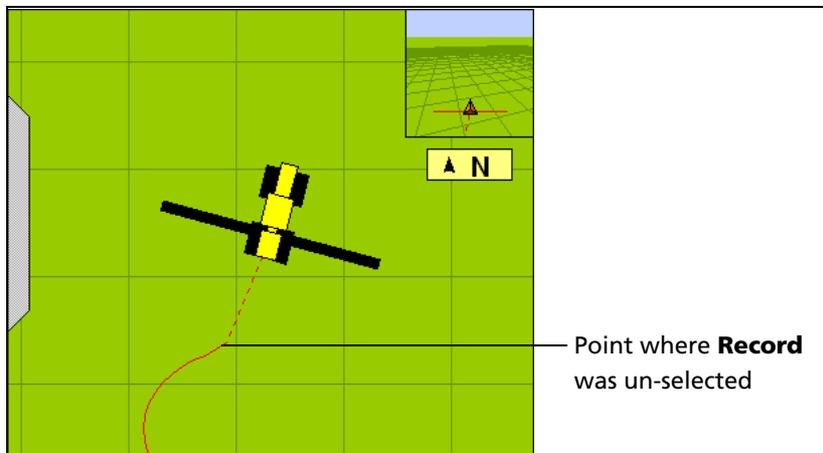
1. From the Run screen, tap **Swaths**. The *Swath Management* screen appears.
2. In the *Outer Edge Radius* window, enter a value that represents the distance from the pivot center to the outer edge.

Note – The default is the AB curve.

The Record button

When you create guidance based on the curve or headland pattern, the **Record** button is available. The **Record** button enables you to insert a straight section of line, rather than having the line follow the exact path of the vehicle (as happens with direct mapping).

When you select (tap) **Record**, the line you are driving is mapped. When you deselect **Record**, the display stops directly mapping your path. Instead, a dotted line spans from the vehicle to the point where you deselected **Record**. When you select the button again, the line becomes solid and your path is mapped again.



Creating guidance with the FreeForm pattern

The FreeForm pattern is slightly different. It is an advanced pattern that enables you to create multiple lines of different types in a single field to obtain guidance in fields of any shape. You need to record each line that you drive, to generate the next guidance line. You can create:

- Curved line segments
- Straight line segments in the form of straight AB Lines

With this combination, the FreeForm pattern can be useful for creating non-circular spirals or multiple curved guidance lines for irregular-shaped fields.



Tip – With FreeForm curves, the important thing to remember is that your next guidance line will only appear if you record your vehicle's path along the current guidance line. Record each pass to generate your next guidance line.

Creating a FreeForm section

1. From the Run screen, tap **Swaths**. The *Swaths Management* screen appears.
2. Select the *FreeForm* tab (in the upper left of the screen). The **New FreeForm** button becomes available (toward the lower right of the screen).
3. If necessary, select the **Record FreeForm when logging** button. See [Recording FreeForm guidance simultaneously with coverage, page 150](#).
4. Tap **New FreeForm**. The Run screen reappears with the **Define FF, Next Path**, and **Pause** buttons on the *Mapping* tab.



Creating a curved FreeForm section

1. Tap **Define FF**. The FreeForm buttons change:
2. Tap **FreeForm** to begin drawing a FreeForm line. The line follows the path of the vehicle.
3. To complete the FreeForm pattern, do one of the following:
 - Unselect the **FreeForm** button.
 - Perform a U-turn.



***Note** – If you are driving an inward spiral, leave the **FreeForm** button selected. The segments will continue to be defined.*

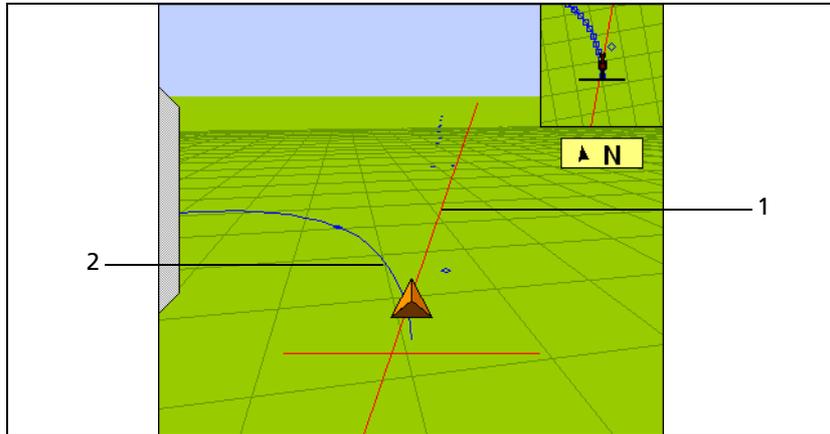
Creating a straight FreeForm section

1. Tap **Define FF**. The FreeForm buttons change:
2. Drive to the start point of the line and then tap **Set A**.
3. Drive to the other end of the line and then tap **Set B**. The guidance line appears.



Switching between FreeForm sections

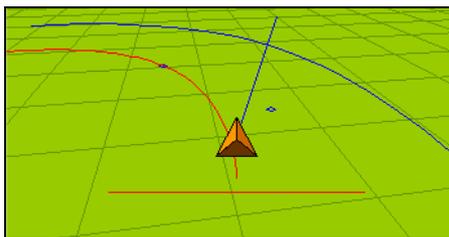
You can switch (“snap”) between the different FreeForm sections. In the following example, there are 2 FreeForm sections:



Item	Description
1	A straight FreeForm AB Line (selected)
2	A curved FreeForm section

You might want guidance along either line.

To snap between one section and another, tap the **Next Path** button on the Run screen (If the **Next Path** button is not available, tap **Back** and then **Next Path**). Guidance jumps to the next section:



To cycle through the available sections, keep tapping **Next Path**.

Note – This will only select a curve if the curve is within the snapping zone.

Recording FreeForm guidance simultaneously with coverage

When you select the FreeForm pattern on the *Swaths Management* screen, you can select the **Record FreeForm when logging** button:



When this button is selected, the system activates FreeForm logging whenever coverage is being logged.

You can simultaneously turn on or off coverage and FreeForm logging with the **Logging** button on the Run screen, or if you have an external remote logging switch that controls coverage logging, the system records FreeForm curves when the remote logging switch is enabled (the remote switch turns on coverage, which begins FreeForm logging).

However, if an EZ-Boom or Multi-Application Control system is connected, the master switch (on the EZ-Boom controller or the Multi-Application Control harness) now controls FreeForm logging and not coverage itself.

Note – Coverage switching will not create large numbers of short FreeForm sections.

Loading a line

To load a line that you have previously created in this field:

1. From the Run screen, tap the Swaths button. The *Swath Management* screen appears.
2. To load a straight section:
 - From the list on the left of the screen, select the appropriate straight section.

To load a FreeForm curve:

- From the list on the left of the screen, select a FreeForm curve. The system will load the closest line to you.
3. Tap **Load**. The Run screen appears, with the line loaded.

If you try to load a line that is over 100 km (63 miles) away, the following message appears:

Your current position is too far from the field to work in it.

Adding an access path

An access path is a space between your guidance lines. They can be useful if there is road (or other field feature that breaks the consistent flow of swaths) through the middle of your field. You can add access paths on a straight or curved pattern (not headlands or pivots).



You specify the location and width of the access path when you create the line:

1. From the *Swath Management* screen, tap **Access Paths**. The *Access Path Setup* screen appears:

Swaths in first group	0
ABs place in the first group (left to right)	0
Path width	0' 0.00''
Swaths in remaining groups	0

Cancel Ok

2. Enter a value in the *Swaths in first group* text box. The access path will appear after this number of swaths (including the master line).
3. Enter a value in the *ABs place in the first group (left to right)* text box. This setting enables you to specify where the master line appears in the first group (from left to right).
4. Enter a value in the *Swaths in remaining group* text box. This value must be equal to or higher than the *Swaths in first group* setting. The next access path will appear this number of swaths beyond the first access path, and will continue to repeat after this number of swaths.

Note – You must fill in both of these fields.

5. Enter a value in the *Path width* text box. This is the width of the access paths.
6. Tap **OK**.

Swath management

Several options are available on the *Swath Management* screen. You can delete swaths, rename swaths, or shift them to the left or right.

To access these features, select the *Swaths* tab. You cannot delete, rename, or shift line features or FreeForm curves.



Deleting a swath

To be able to delete swaths, you need to have entered the Administration password.

1. From the Run screen, tap the Swath button. The *Swath Management* screen appears.
2. From the list on the left, select the swath to delete.
3. Tap **Delete**. If prompted, enter the password.

The swath is marked as deleted. The next time that you close the field, the swath will be removed from the list.

Note – You cannot delete a swath that is currently active.

Renaming a swath

To be able to rename swaths, you need to have entered the Administration password.

1. From the Run screen, tap the Swath button. The *Swath Management* screen appears.
2. From the list on the left, select the swath to rename.
3. Tap **Rename**. If prompted, enter the password. The *Enter new swath name* screen appears.
4. Enter the new name for the swath and then tap **OK**.

The swath is renamed.

Shifting a swath

1. From the *Swath Management* screen, select the swath to shift from the list on the left.
2. Tap **Shift**.
The *Enter the Shift Distance* screen appears.
3. Select the correct units for the shift (metric, feet and inches, or rows).
4. Enter the distance that you would like the swath to move.
5. Select the direction for the shift.

Note – *The swath shifts relative to the AB Line. Therefore, if you are facing from point B to point A on the swath, the line will appear to shift in the wrong direction.*

Note – *If you shift a line, it will shift the original version of the line and remove any skip that you have applied.*

6. Tap **OK**. The *Swath Management* screen appears.
The new shifted swath appears in the swath list on the left of the screen.

Using the “Guide to” tabs

The Guide to tabs allow automated steering along a swath, line feature, or FreeForm curve.



To use the Guide to tabs:

1. Tap the Swaths button. The *Swath Management* screen appears.
2. From the Guide to tabs, select:
 - *Swaths* for guidance along a swath.
 - *Line Features* for guidance along a line feature.
 - *FreeForm* for FreeForm curves.
3. If you selected:
 - *Swaths*, select the appropriate swath from the list on the left and then tap **Load**.
 - *Line Features*, guidance will automatically occur on the nearest feature. Tap **Load**. The list shows the types and numbers of line features in the current field.
 - *FreeForm*, select the appropriate FreeForm curve and then tap **Load**.

The Run screen appears. The next time that you engage automated steering, you will be guided along the swath, line feature, or FreeForm curve.

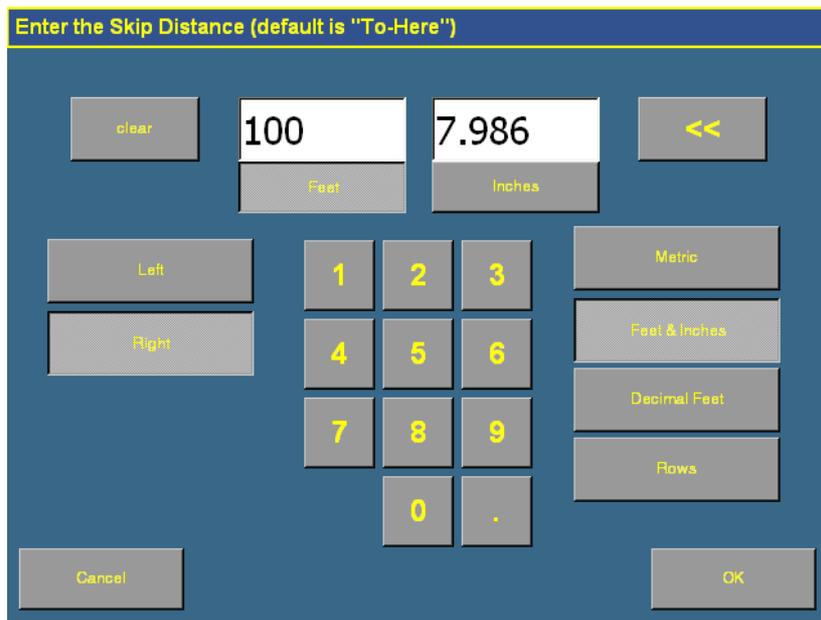
Using Skip to fine-tune navigation

The software uses the original swath that you have driven to automatically generate the position of the other swaths. Occasionally, these new onscreen swaths do not perfectly reflect where your swaths are. For example, you might need to skip to the other side of a road.

To correct the spacing of the automatically generated swaths in a field, use the Skip function. After the swaths have been generated:

1. From the Run screen, tap **Skip**  :

The *Enter the Skip Distance* screen appears.



2. Enter the Skip distance and then tap **OK**. The guidance line moves the required amount. The default is your current position.

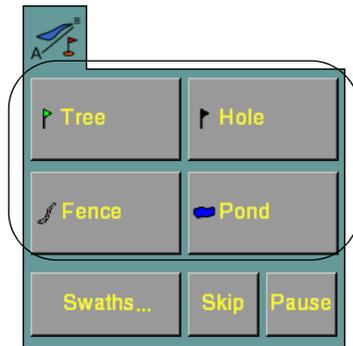
Note – *The Skip position is temporary; it is not saved to the line permanently. To save a line adjustment, use the Shift feature. See [Shifting a swath](#), page 155.*

Placing field features onscreen

For a description of field features and how to configure the field feature buttons, see [Configuring field features, page 125](#).

To add a field feature to the map:

1. If it is not already selected, select the *Mapping* tab on the Run screen. The features that you defined appear on the tab:



2. Begin to drive the field.
3. When you reach the point where you want to add a feature, tap the appropriate feature button:
 - If the feature is a Point Feature (such as the **Tree** button in the example above), the feature is added.
 - If the feature is a Line Feature (such as the **Fence** button in the example above) or an Area Feature (such as the **Pond** button), the feature will begin. Area and Line features continue until you tap the button a second time.

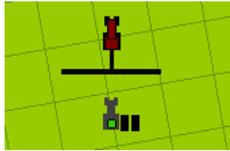
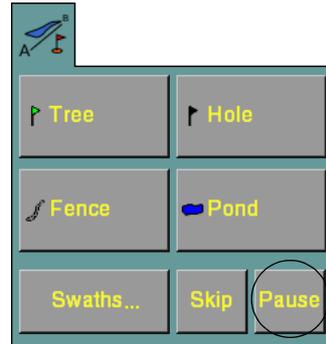
Note – It is possible to add a Point feature *while* you add a Line or Area feature. For example, it is possible to use a Line feature to draw an overhead telephone wire and to simultaneously use a Point feature to add the telephone poles.

Pausing guidance

You can pause guidance and return to your position later.

- To pause guidance, from the Run screen tap **Pause**.

The pause icon will appear at the point where your vehicle was when you pressed the button. The status text will indicate the distance and angle required to return to that point. Swath snapping will occur to the pause position and not follow your vehicle.

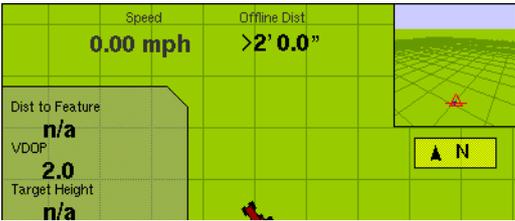


When you return to your former position, tap **Resume**.

When you pause your position, it is saved to a file on the CompactFlash card. You can close the field and turn off the FieldManager display. When you next open that field, you will be guided back to your former position.

Adjusting the status text size

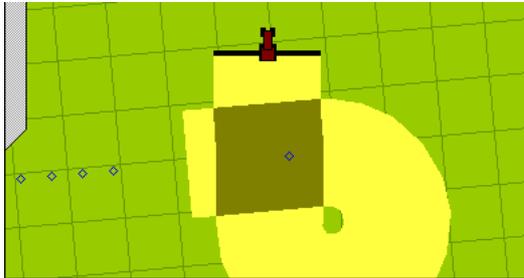
You can control the size of the status text items that are shown at the top of the Run screen. You can show either one of the status text items in a large size, or both status text items in a smaller size:

Description	Example
One large status text item	
Two smaller status text items	

To cycle through the status text item display modes, tap the items at the top of the screen.

Introduction to coverage logging

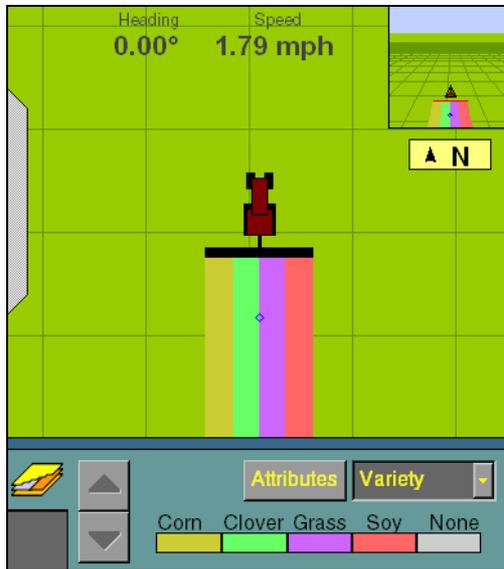
Coverage logging records the area that you have covered when you carry out an operation, for example applying fertilizer to a field. The covered area is shown on the Run screen as a solid yellow area (or as a gray area if you have overlapped and covered an area twice).



To activate coverage logging, tap the **Logging** button on the Run screen so it changes from gray to green. Tap the button again to stop coverage logging.

Varieties

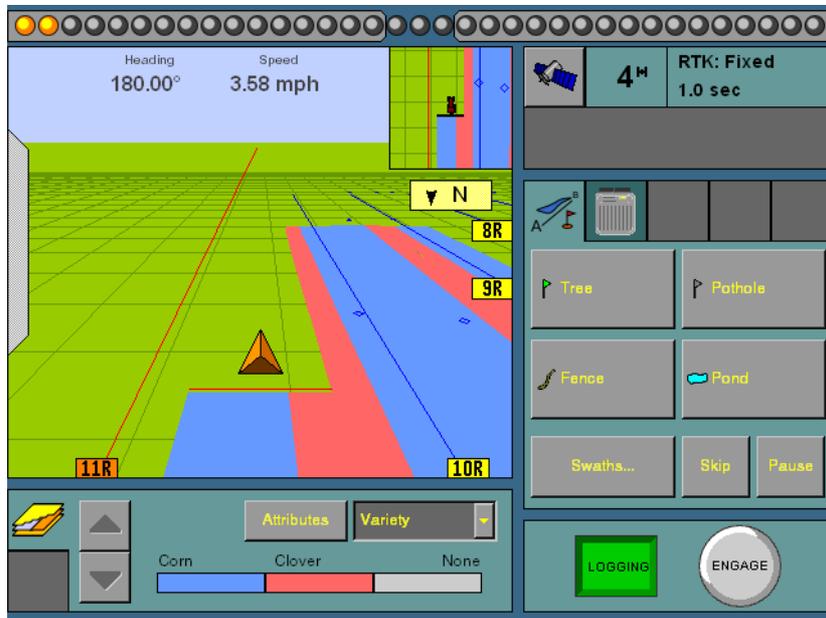
By default, your coverage logging is shown as a solid yellow block (see above). However, you can set up *varieties* that make it easy to see the difference between different types of coverage.



This enables you to:

- Change product part way through a field, so you can later tell which parts of the field are covered in which product.

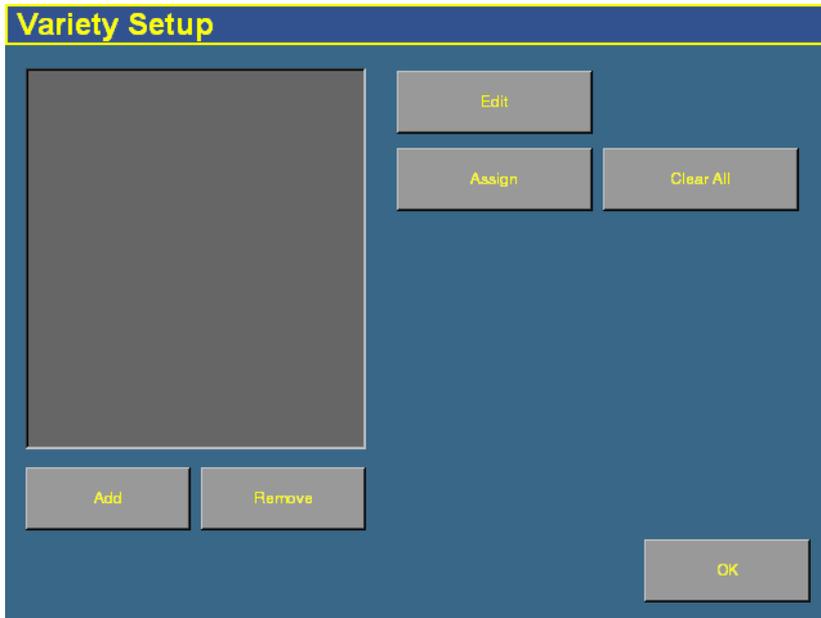
- Plant or apply two or more different products side-by-side and record the locations in your field. For example, you could put corn seed in the left side hoppers on your planter and clover seed in the right side hoppers and track where each set of seeds is planted:



The varieties are assigned to rows on your implement. You specify the number of rows on your implement when you configure it.

To configure varieties:

1. From the *Configuration* screen, tap **Implement Setup**. The *Edit Implement* screen appears.
2. Tap **Variety Setup**. The *Variety Setup* screen appears.



3. To add a new variety, tap **Add**. The virtual keyboard appears.
4. Enter a name for the variety and then tap **OK**. The *Variety Setup* screen reappears with the new variety name in the list:



- To configure the variety, select it and then tap **Edit**. The *Variety Attributes* screen appears:

The screenshot shows the 'Variety Attributes' screen. The title bar is blue with 'Variety Attributes' in yellow. Below the title bar, there are several input fields: 'Variety Name' with 'Corn' entered, 'Coverage Color' with a grey color block, 'Seed Variety' with an empty field, 'Seed Rate' with '0.00', 'Seed Rate Units' with an empty field, 'Fertiliser Type' with an empty field, 'Fertiliser Rate' with '0.00', and 'Fertiliser Rate Units' with an empty field. At the bottom, there are 'Cancel' and 'OK' buttons.

- To change the color that will represent this variety on the Run screen, tap the *Coverage Color* color block:

The screenshot shows the 'Variety Attributes' screen, similar to the previous one, but with a white oval highlighting the 'Coverage Color' color block.

The *Select Color* dialog appears.

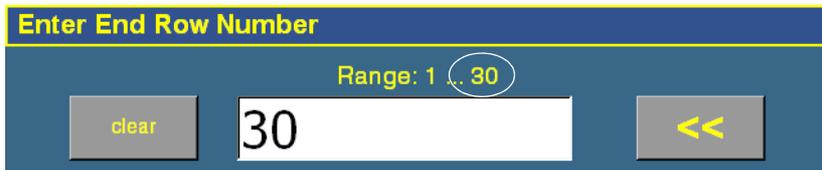
- Tap the new color.
- Enter any relevant record keeping information.
- Tap **OK**. The *Variety Setup* screen appears.

10. To add additional varieties, repeat Steps 3 through 9.

Now that the varieties are configured, assign them to segments of the the coverage.

To assign one variety to the entire implement:

1. Select it from the list and then tap **Assign**. The *Set row range for variety* screen appears.
2. Ensure that the *Start Row* text box is set to 1.
3. In the *End Row* text box, enter the number that appears at the high end of the range:



4. Tap **OK**.

The variety is assigned. When you enable coverage logging and set the Mapping information tab drop-down list to Variety, this variety color will be shown in the guidance window. See page 138.

To assign multiple varieties to the implement at once:

1. On the *Variety Setup* screen, select a variety and then tap **Assign**. The *Set row range for variety* screen appears.
2. Tap the *Start Row* text box and then enter the row that variety will start at.

The default is the first row that is now currently assigned. Row 1 is on the left side of the implement.

3. Tap the *End Row* text box and then enter the row that variety will end at:

4. Tap **OK**. The *Variety Setup* screen reappears.
5. Select the next variety and then tap **Assign**.
6. Repeat Steps 2 through 5 for any additional varieties.



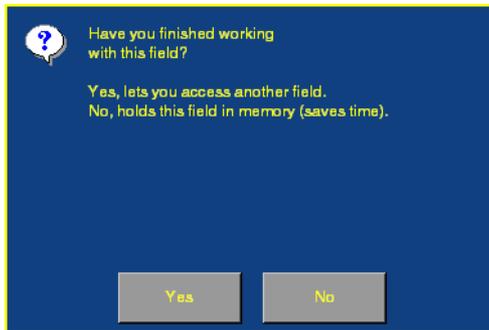
Tip – For quick access to the *Variety Setup* screen from the Run screen, set the Mapping information tab drop-down list to Variety and then tap **Attributes**.

If you select a different implement or change the settings of the current implement, the variety assignments will be removed.

Closing a field

When you have finished using a field:

1. Tap the Home button  to close it. The following dialog appears:



2. Tap **Yes** to close the field.

The system closes the field and saves an HTML summary of the field. See [Saving an HTML version of the current field, page 555](#).

The Manual Guidance Plugin

In this chapter:

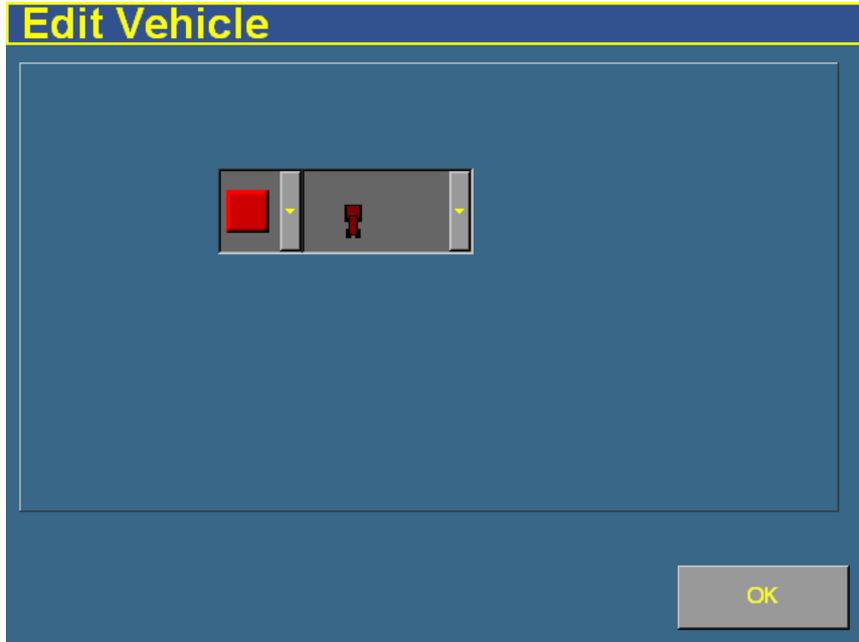
- [Configuration](#)
- [Configuring the GPS receiver](#)
- [Guidance](#)

You must install the Manual Guidance plugin, the Autopilot plugin, or the FieldLevel plugin. The Manual Guidance plugin enables you to use the display for guidance from the virtual lightbar.

Configuration

The Manual Guidance plugin enables you to configure the onscreen vehicle appearance and color:

1. From the *Configuration* screen, select the Manual Guidance plugin and then tap **Setup**. The *Edit Vehicle* screen appears:



2. To change the onscreen vehicle color, select a color from the list on the left.
3. To change the vehicle's onscreen appearance, select a vehicle type from the list on the right.
4. Tap **OK**.

Note – Any changes that you make to the vehicle color or appearance will remain, even if you remove the Manual Guidance plugin and replace it with the Autopilot plugin.

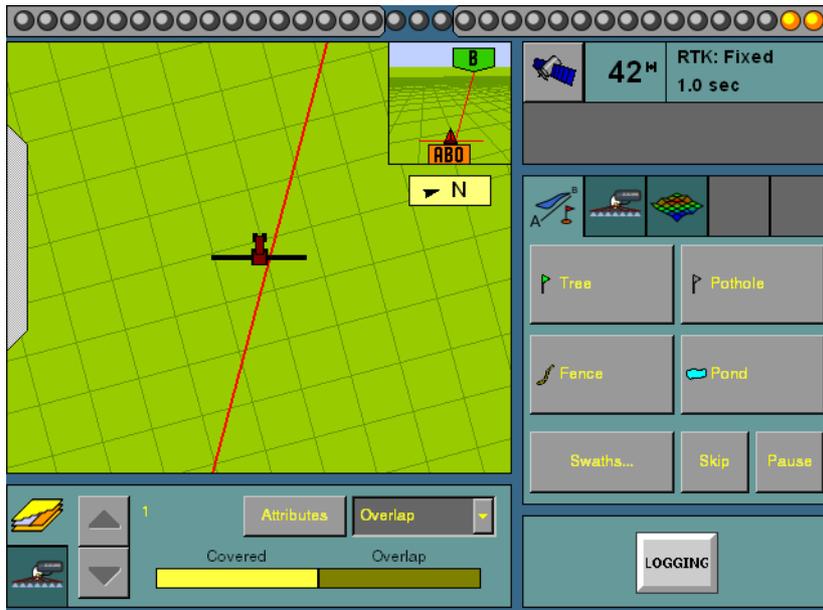
Configuring the GPS receiver

When you install the Manual Guidance plugin, the GPS Receiver plugin is installed too. For instructions on configuring the GPS receiver, see [Chapter 10, The GPS Receiver Plugin](#).

Guidance

When you use the Manual Guidance plugin, the Run screen looks similar to when the Autopilot plugin is installed, except:

- there is no Autopilot tab on the right
- there is no **Engage** button:



You can still access the Mapping plugin to add field features or create guidance lines.

Since there is no Autopilot system to control steering, you must steer the vehicle manually while you watch the virtual lightbar for guidance.

The Autopilot Plugin

In this chapter:

- [Configuring the Autopilot plugin](#)
- [Introduction to Autopilot calibration](#)
- [Calibrating the Autopilot plugin](#)
- [Saving a vehicle profile](#)
- [Configuring the GPS receiver](#)

This chapter describes how to configure and use the Autopilot plugin, which controls an attached AgGPS Autopilot automated steering system.

You must install the Manual Guidance plugin, the Autopilot plugin, or the FieldLevel plugin.

There are 2 stages to configuring the Autopilot plugin:

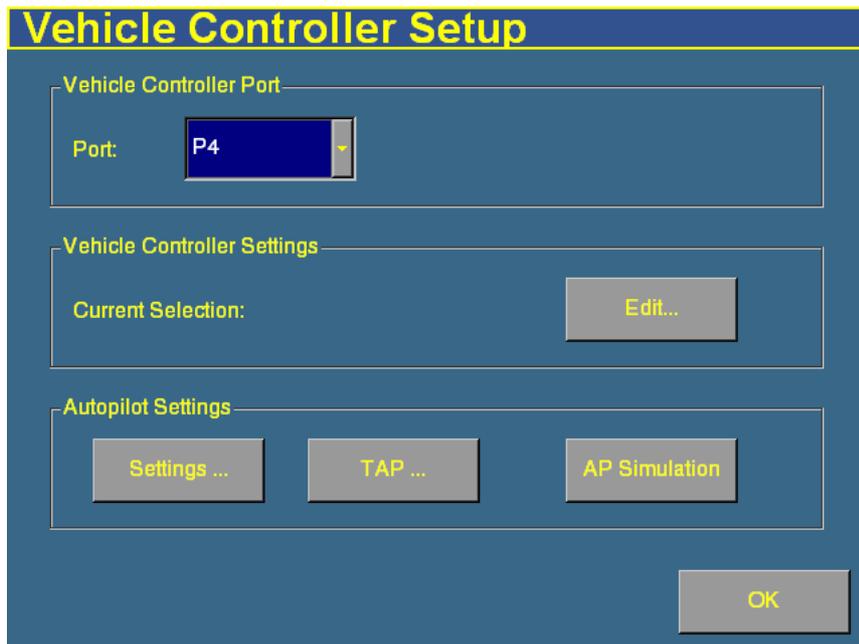
1. Configure the vehicle – Select the vehicle make and model that the system is installed on.
2. Calibrate the Autopilot system for your vehicle – Adjust the settings specifically for your vehicle.

Configuring the Autopilot plugin

Note – This is usually done when the system is professionally installed.

To configure the system for your vehicle:

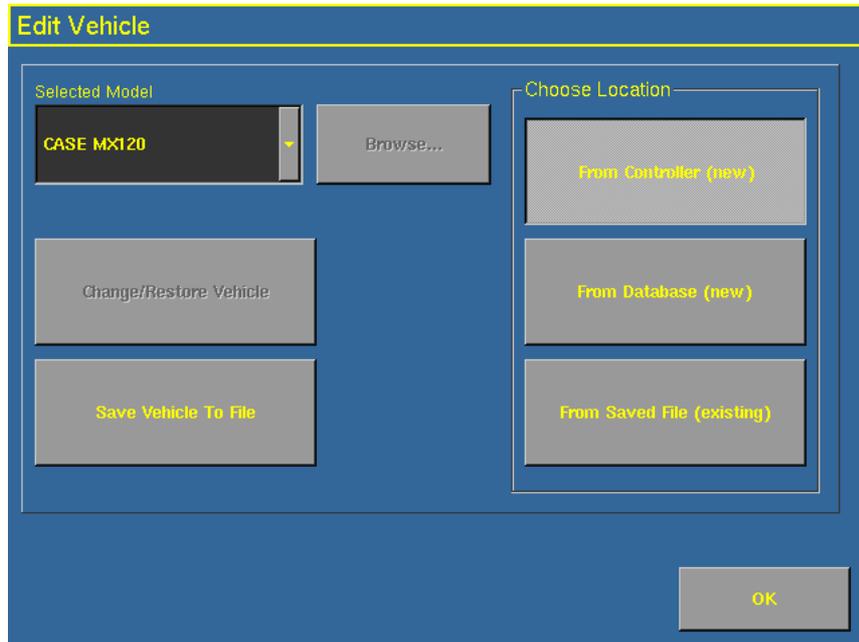
1. Press the Configuration  button to the right of the screen. The *Configuration* screen appears.
2. Select the Autopilot plugin and then tap **Setup**. The *Vehicle Controller Setup* screen appears:



3. In the Port list, select the port on the FieldManager harness that the Autopilot controller is connected to.

Selecting the vehicle

1. In the Vehicle Controller Settings group, tap **Edit**. The *Edit Vehicle* screen appears:



There are a number of pre-configured profiles for the various vehicle makes and models. You can load them from:

- Autopilot controller – the majority of vehicle profiles are stored on the Autopilot controller.
- Vehicle profile database file – as additional profiles become available or are updated, they are added to a vehicle profile database. You can download the database and load profiles from it.
- Saved file – you can install an individual vehicle profile that you have previously saved.

2. In the *Choose Location* group, select the source that you will select the make and model from.

Tap this button...	To...	Complete step...
From Controller (new)	Select a new make and model from the list that is in the AgGPS Autopilot controller firmware.	3
From Database (new)	Select a new make and model from a database of vehicles (.vdb) on the AgGPS FieldManager display CompactFlash card. If you need to obtain a .vdb file, contact your local reseller.	4
From Saved File (existing)	Select an existing vehicle from a previously saved file (.cfg) on the card.	5

3. To select from the list on the AgGPS Autopilot controller:
 - a. Tap **From Controller (new)**.
 - b. Tap the Selected Model drop-down box and then select the make and model that you require from the list.
4. To select from a database on the CompactFlash card:
 - a. Tap **From Database (new)**.
 - b. Tap **Browse**.
 - c. Select the .vdb file that you want to open and then tap **Open**.
5. To select a saved vehicle make and model from the card:
 - a. Tap **From Saved File (existing)**.
 - b. Tap **Browse**.
 - c. Select the file that you require and then tap **Open**.
6. Tap **Change/Restore Vehicle**. The following message appears:
 The specified vehicle model will now be selected on the Autopilot controller. This will cause the Autopilot controller to be reset. Do you want to continue?

Note – If you select a vehicle make and model but do not upload that configuration to the AgGPS Autopilot controller, that make and model will not be loaded.

7. Tap **OK** to load the new configuration.
A dialog with the message **Upload completed** appears.
8. Tap **OK**.
A warning message appears. The file is now loaded.

Adjusting the basic Autopilot settings

1. From the Configuration screen, select the Autopilot plugin and then tap **Setup**. The *Vehicle Controller Setup* screen appears.
2. Tap **Settings**. The *Vehicle Settings* screen appears:

Vehicle Settings

Nudge/Trim Increment	0' 1.0"	Sensor Options
End of Row warning distance	150' 0.0"	
Operator alert time out	5 min	
Smoothing Turn Radius	32' 9.7"	
Control coverage log	No	

Cancel OK

3. Enter a value in the *Nudge/Trim Increment* window. Use this increment to set the amount by which the **Nudge** buttons move the line back to the correct path, or by which the **Trim** buttons move the vehicle position.

The guidance line can move off target (requiring **Nudge**) as a result of:

- GPS position drift when you return to the field for guidance, for example after you pause or turn off the system.
- GPS satellite constellation changes as you drive in the field.

The vehicle can steer offline (requiring **Trim**) as a result of:

- Uneven drag on a vehicle from an unbalanced implement.
- Uneven drag on a vehicle from soil conditions.

*Note – The **Nudge** buttons become **Trim** buttons in RTK mode.*

4. If necessary, adjust the distance associated with the End of Row warning. (Longer vehicles that take longer to turn will need an earlier warning and so a greater distance).
5. If necessary, adjust the *Operator alert time out* value. The alert appears when the operator has not responded for the defined period of time. If the operator still fails to respond, the vehicle will begin to drive in a tight loop.
6. If necessary, adjust the *Smoothing Turn Radius* value. This smoothes out tight turns on curves and headlands. Any changes will not be applied until the next field is opened.
7. Select the Control coverage logging selection method. If you select When Engaged, your coverage logging is linked to the **Engage** button. When you engage automated steering, coverage logging engages too.
8. In the Sensor Options list, select the type of turn sensor connector that your system uses. Most recent Autopilot systems use an AgGPS AutoSense™ device.

Introduction to Autopilot calibration

When you have configured the vehicle make and model, calibrate the system for your individual vehicle.

The AgGPS Autopilot automated steering system calibration process records additional details about your vehicle. These details help the system to steer the vehicle more accurately. It is especially important to have all the settings correct for high accuracy systems.

The vehicle calibration screens contain tools for calibrating the vehicle. These tools are similar to the tools found in the AgGPS Autopilot Toolbox II software.

Notes on calibration

- Before you perform vehicle calibration, select the vehicle make and model on the *Vehicle Setup* screen. See [Selecting the vehicle, page 175](#).
- No calibration is required if the system is installed on a Cat MT 700/800 series equipped with the ISO option.

Common calibration items

You can calibrate several aspects of the vehicle. The calibrations that are available depend on which components are installed in the vehicle and system.

Four calibration options appear for all types of vehicle.

Note – You must perform the Controller Orientation and the Roll Correction calibrations.

Option	Description
Controller Orientation	Properly associate the outputs of the AgGPS Autopilot controller sensors with the direction of the vehicle.
Manual Override	Required for platforms that employ a pressure transducer for the manual override function. Change the default only if the operation of the manual override function is unacceptable.
Roll/Antenna Compensation	Compensates for antenna height and static roll caused by minor variations in the AgGPS Autopilot controller and the GPS receiver mounting.
Line Acquisition	How aggressively the vehicle approaches the guidance line.

For articulated and front-wheel steered vehicles, three additional calibration options appear:

*Note – The steering sensor and automated steering deadzone procedures are **required**. The steering sensor calibration must be performed first.*

Option	Description
Steering Sensor	Converts the sensor output into commands for steering full left, full right, and any position in between.
Automated Steering Deadzone	Required to learn the vehicle’s steering deadzones.
Steering Gain (proportional steering gain)	only if system steering performance is unsatisfactory.

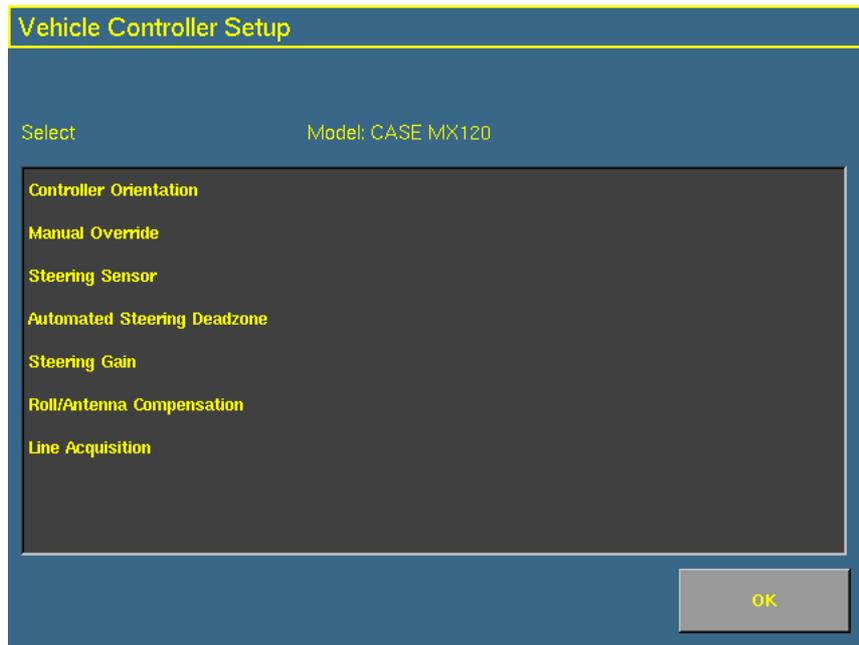
The *steering deadzone* is the amount of pressure that the system must apply to the hydraulics before the wheels begin to turn.

To configure this vehicle type ...	See ...
Hydraulically-steered tracked tractors	Page 210
Fly-by-wire tracked tractor	Page 213
Tracked tractor	Page 210

Calibrating the Autopilot plugin

To calibrate the system for your vehicle:

1. Press the Configuration  button to the right of the screen. The *Configuration* screen appears.
2. Select the Autopilot plugin and then tap **Calibrate**. The *Vehicle Controller Setup* screen appears:



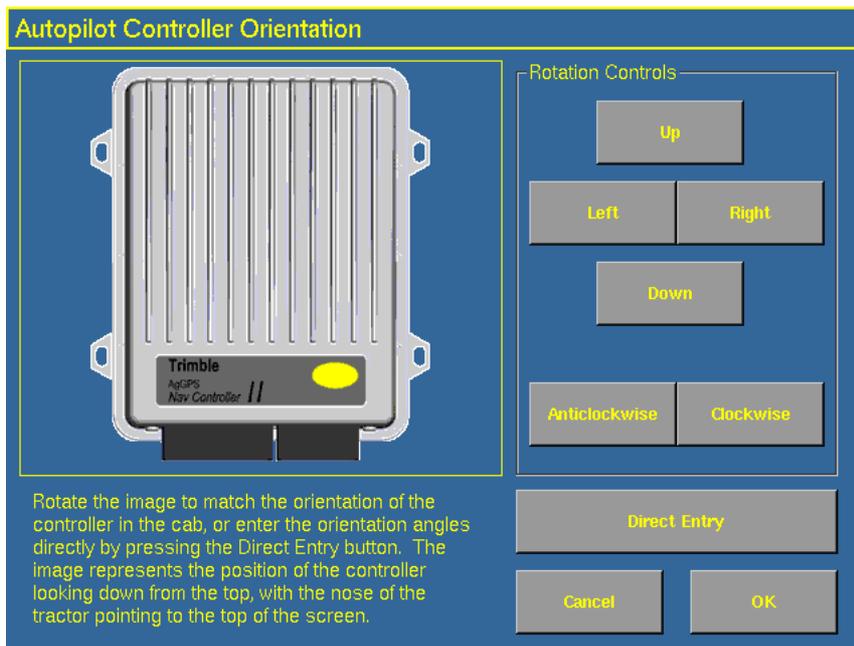
3. Select an item to configure and tap **OK**.
4. Configure the selected item.

To configure ...	See page ...
Controller orientation	page 182
Manual override	page 183
Steering sensor	page 186
Automated steering deadzone	page 191

To configure ...	See page ...
Steering gain	page 196
Roll/antenna correction	page 203
Line acquisition	page 209

Configuring the controller orientation

1. Select the *Controller Orientation* option from the list. The *Autopilot Controller Orientation* screen appears.



An image represents the current mounting orientation of the controller.

The image is shown as though:

- You are looking down on the vehicle from above.
 - The top of the screen points to the nose of the vehicle.
2. Use the buttons to select the orientation of the controller.

If the controller is set at a sloped angle, tap **Direct Entry** and then enter the yaw, pitch, and roll angles of the controller.

Note – If you use the Direct Entry method to set custom angles, the onscreen image of the controller will not be displayed.

3. Tap **OK** to accept the new orientation, or **Cancel** to exit.

Configuring the manual override sensitivity

Manual Override sensitivity calibration is only valid for platforms that employ a pressure transducer for the manual override function. The software automatically detects whether or not the vehicle configuration includes this type of sensor and provides this option if required.

One way to disengage the AgGPS Autopilot system is to turn the steering wheel. This is called the *Manual Override*.

When you turn the steering wheel, there is a voltage spike that then tapers off. This spike and decline occurs at different levels for different models of tractor.

The manual override sensitivity is the level that the voltage must spike to before the override occurs and the system disengages. The voltage must also taper below that level before automated steering can be engaged again.

- If you set a high level of sensitivity, the system will disengage more quickly and you will have to wait longer before you can re-engage.
- If you set a low level of sensitivity, the system will take longer to disengage and you will be able to re-engage more quickly.



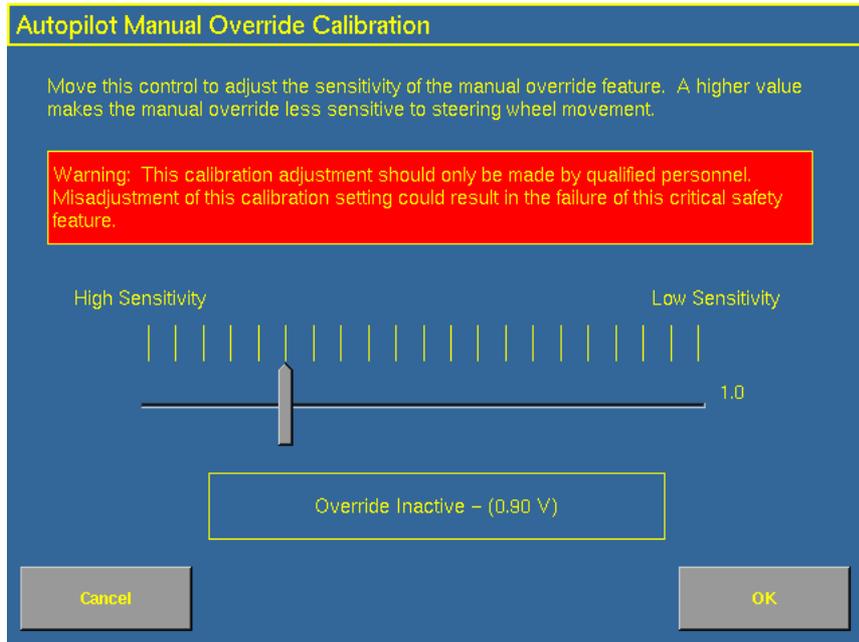
WARNING – Incorrect adjustment of the Manual Override Sensitivity calibration setting could cause this critical safety feature to fail, resulting in personal injury or damage to the vehicle. Any adjustment to this setting should only be made by an experienced user.

Trimble strongly recommends that you perform this calibration only if the default sensitivity is unacceptable under all conditions. ***Be very careful not to choose a sensitivity setting that is either too sensitive or not sensitive enough.*** In either case, the manual override function may cease to function properly. On some platforms, it may be possible to set the sensitivity so low that the manual override function will not detect any steering wheel motion. It is vital that you avoid this.

To configure and check the manual override:

1. Select the *Manual Override* option from the procedure list. (See page 179).

The *Autopilot Manual Override Calibration* screen appears:



2. Test the current manual override setting:
 - a. Turn the steering wheel. The **Override Inactive** button changes color when the Override becomes active. With the system active, assess whether the manual override feature is at an acceptable level of sensitivity for:
 - Speed of steering wheel turn
 - Distance of steering wheel turn
 - b. To adjust the manual override sensitivity setting, select the slider bar. Move the slider bar as follows:

Slider bar direction	Result	Triggers manual override ...
Left	Increased sensitivity	more easily
Right	Decreased sensitivity	less easily

The value to the right of the slider shows the current setting. The total range is 0.5 to 2.5 (where 0.5 is the most sensitive setting and 2.5 is the least sensitive).

- c. To try the new setting, tap **OK**.
The *Vehicle Calibration* screen appears.
- d. Select Manual Override again.
The *Autopilot Manual Override Calibration* screen appears again.
- e. Repeat Steps b, c, and d to test each new setting.



Tip – You can also evaluate the performance of the manual override feature under conditions of loading and/or activities which may affect the pressure of the hydraulic system. For example, you can turn on the auxiliary hydraulics while you evaluate the manual override sensitivity.

- f. Tap **OK** to accept the new setting, or **Cancel** to exit.

Calibrating the steering angle sensor

Perform steering sensor calibration to convert the voltage output of the steering sensor into an equivalent steering angle measurement.

Note – *Only perform the steering sensor calibration if a rotary potentiometer is installed on the vehicle. If an AgGPS AutoSense™ device is selected as the steering angle sensor, the Steering Sensor screen will not appear.*

Note – *Complete this calibration before you attempt to calibrate the steering deadzone or roll correction procedures.*

This calibration requires the vehicle to be in motion. Ensure that you:

- perform this procedure on a hard, level surface that is free of obstructions.
- follow the instructions presented on each page.
- maintain a tractor speed above 1.6 kph (1 mph).
- watch the *Sensor Angle* field for a symmetrical angle reading at the steering extremes while you manually steer the wheels to full right and full left.
- watch the *Sensor Angle* field to ensure that the angle reading is near zero while you manually steer the wheels straight ahead.

To run the steering sensor calibration:

1. Select the *Steering Angle* procedure from the calibration list. See [Introduction to Autopilot calibration, page 179](#).

The first *Autopilot Steering Sensor Calibration* screen appears.

Autopilot Steering Sensor Calibration

Steering Angle Sensor Calibration - Press Next to proceed

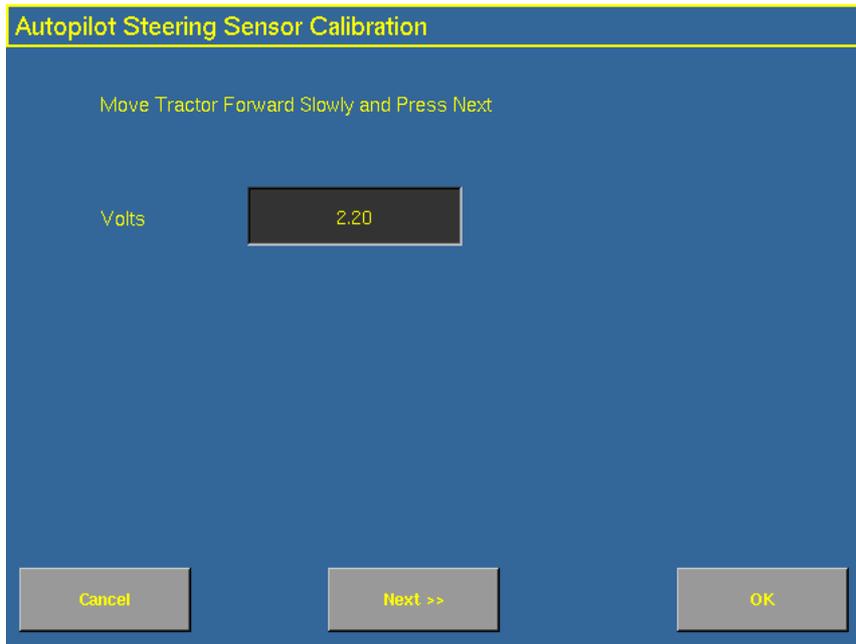
Volts 2.20

Degrees -4.7

Cancel Next >> OK

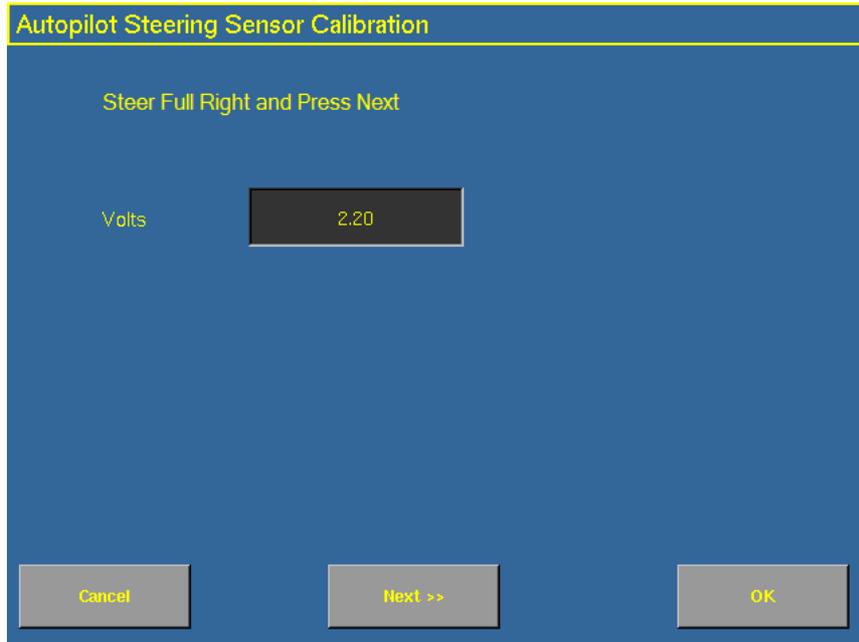
2. Move the tractor forward slowly.

3. Center the steering wheel and then tap **Next** to continue.



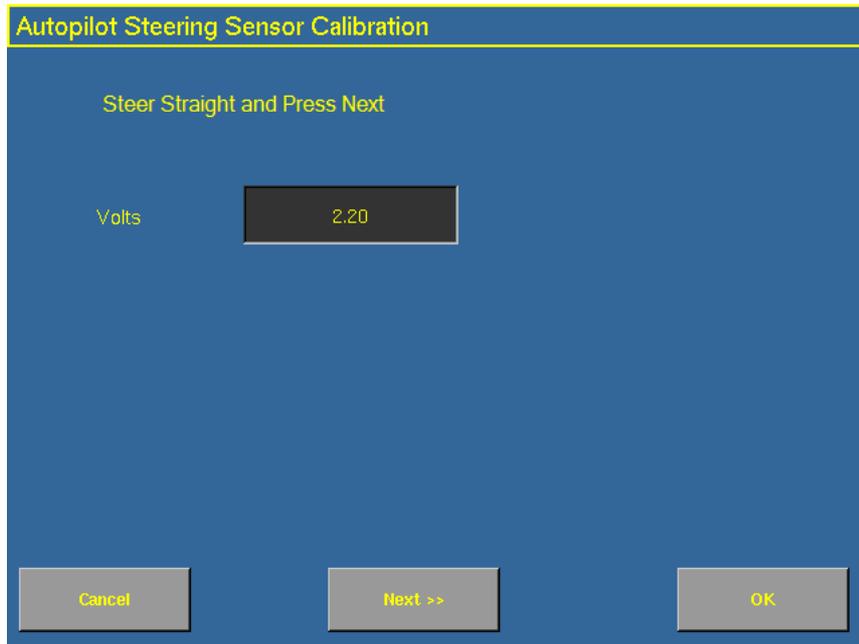
4. Turn the steering wheel completely to the left and then tap **Next**. If the steering wheel is not turned completely to the left or if the steering sensor requires adjustment or replacement, an error message appears.

The value in the *Volts* field is updated as you turn the steering wheel.



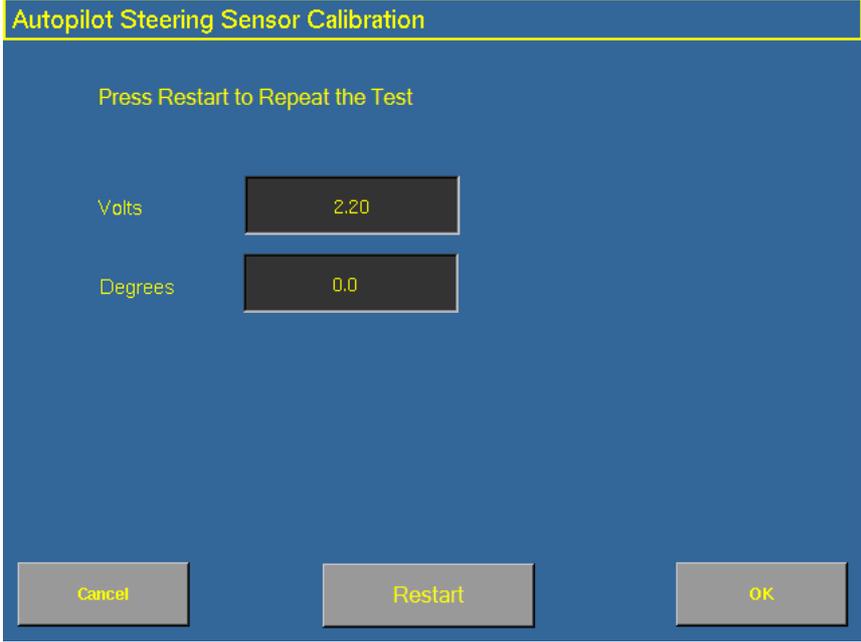
5. Turn the steering wheel completely to the right and then tap **Next**. If the steering wheel is not turned to the full right position or if the steering sensor requires adjustment or replacement, an error message appears.

The following screen appears.



6. Center the steering wheel. While the wheel is at the center position, tap **Next**.

The value in the *Volts* field is updated as you turn the steering wheel.



Autopilot Steering Sensor Calibration

Press Restart to Repeat the Test

Volts 2.20

Degrees 0.0

Cancel Restart OK

7. Tap **OK** to accept the calibration.

Calibrating the automated steering deadzone

The Automated Deadzone calibration procedure runs a series of tests on the valve and steering hydraulics to determine the point at which steering movement occurs.



WARNING – During the Automated Deadzone calibration, the system moves the wheels that steer the vehicle. To avoid injury, be prepared for sudden vehicle movement.

In this test, the system independently opens and closes each side of the steering system while determining the point at which wheel movement occurs.

Notes on calibrating the automated steering deadzone

- You must complete the Steering Angle procedure before you run this procedure.
- To ensure optimal system performance, the hydraulic fluid must be at normal operating temperature when you run this procedure. On some vehicles with large reservoirs, it may take several hours for the fluid to reach operating level, especially if the implement circuit is lightly loaded. Consult the vehicle documentation to determine if the hydraulic fluid temperature can be displayed on a vehicle console.
- If you perform the calibration while the system is still cold, repeat both the Deadzone and the Proportional gain calibration procedures once the system is at operating temperature.

To configure the automated steering deadzone:

1. Place the vehicle in a large field that is free of hazards. To minimize the effect of the ground conditions, the field should have smooth soil that is loose but firm.
2. Select the Automated Steering Deadzone procedure from the calibration list. See page 181.

The *Autopilot Automated Deadzone Calibration* screen appears.

Autopilot Automated Deadzone Calibration

Only proceed if the steering sensor calibration has been performed. Press Next.

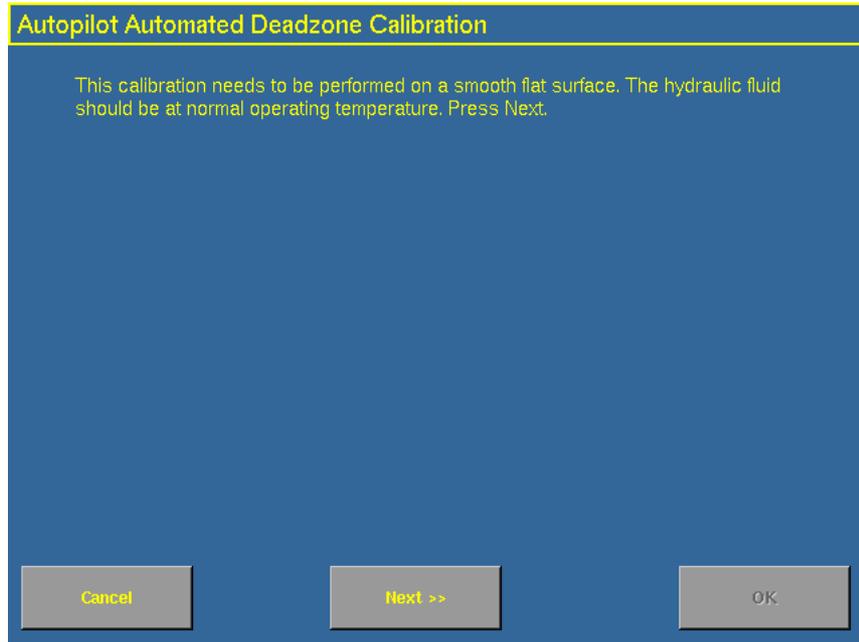
Deadzone Left 25.0

Deadzone Right 25.0

Cancel Next >> OK

3. Tap **Next** to continue.

The second *Autopilot Automated Deadzone Calibration* screen appears.



4. Tap **Next** twice.

Note – Read the onscreen instructions on each page.

5. Follow the instructions. Tap the **Test Right** and **Test Left** buttons to perform the Deadzone calibration.

As ground conditions affect the results of this calibration, Trimble recommends that you perform the calibration at least three times, or until the average deadzones displayed change by less than about 0.5.

To minimize the total amount of space needed for the complete calibration, you can reposition the vehicle between the phases of the test. If the available flat, smooth space is extremely limited, re-align the vehicle after each segment of the calibration.

To reposition the vehicle:

1. Wait until the software prompts you that the next phase is ready to begin.
2. Look at the screen to determine whether the next phase will require a left or right turn.
3. Reposition the vehicle so that the turn will use the space that you have available.
4. Tap the button to begin the next phase.



CAUTION – Obstacles in the field can cause collisions, which may injure you and damage the vehicle. If an obstacle in the field makes it unsafe to continue a particular phase of the Automated Deadzone calibration, stop the vehicle to abort the phase and turn the steering wheel to disengage the system. Reposition the vehicle and continue from the current test phase.

Automated Deadzone error messages

If a calibration cycle is unable to complete successfully, one of the error messages below will appear:

Message	Meaning
Error - Manual Override Detected	Manual override was detected before the calibration cycle could be completed. Retry.
Error - Vehicle Moving Too Slow	The vehicle was moving too slowly for the calibration cycle to successfully finish. Make sure the vehicle is moving at least 0.8 kph (0.5 mph) during each calibration cycle.
Error - Steering Close To End Stops	Before the calibration cycle could be completed, the measured steering angle approached the end stops. Retry, and if the problem persists, instead of centering the steering at the start of each cycle, try turning the steering in the opposite direction to that which is being tested so that the calibration procedure has a greater range to test over.

Message	Meaning
Error - Valve Connectors Could Be Swapped	The calibration test sensed the steering turning in the opposite direction to what was expected. Retry, and if the problem persists either the valve connectors have been accidentally swapped or the steering sensor calibration was performed incorrectly.
Error - No GPS	A GPS receiver must be connected and outputting positions before the software can run the calibration procedure.
Error - No Steering Response Detected	During the calibration cycle, insufficient movement was sensed in order for the calibration to complete. If the problem persists, the hydraulic installation could be faulty.
Error - Unable To Determine DZ: Try Again	A problem occurred when trying to compute dead zone. Retry, and if the problem persists, contact Technical Support.
Error - Software Problem Detected	The software was unable to complete the calibration due to insufficient movement of the vehicle. If the problem persists, contact Technical Support.

Calibrating the proportional steering gain

***Note** – Complete the steering sensor calibration before you perform the proportional gain calibration. **ONLY** perform the proportional steering gain calibration when the AgGPS Autopilot system performance is less than satisfactory.*

The proportional steering gain (PGain) setting enables you to reach a compromise between rapid steering response and stability.

Modifications to the PGain setting affect two steering characteristics:

- *Slew Time*: The amount of time the front wheels take to move from the far left to the far right position and vice versa.
- *Overshoot*: The percentage by which the front wheels exceed the commanded angle before they settle on the correct value.

To correct slight variations caused by valve current response, friction, and hydraulic fluid viscosity, alter these settings.

High PGain values ...	Low PGain values ...
Decrease the slew time and increase the overshoot. This provides rapid responses, but can cause the steering to exhibit signs of instability (for example, a tendency to excessively overshoot).	Increase the slew time and decrease the overshoot. This improves the stability but can introduce significant delays in the steering response and can cause the vehicle to oscillate from side to side.

Notes on performing the proportional steering gain calibration

- Perform the Automatic Deadzone calibration immediately before you run the PGain calibration, even if the Automatic Deadzone calibration has been performed in the past.
- Perform this calibration on a hard, level surface, free of obstructions.
- Maintain a vehicle speed above 1.6 kph (1 mph) while you perform the calibration.

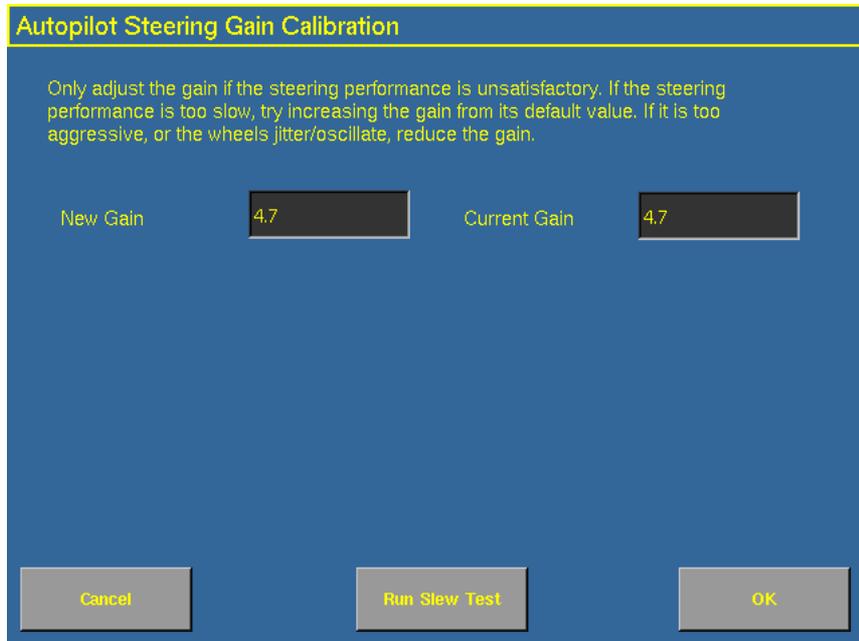
Increase the proportional gain up to the point just before any one of the following occurs:

- Slew times no longer decrease (a low value is desired)
- Overshoot exceeds 5–8 % (depending on vehicle)
- Wheels noticeably shake near end stops

To calibrate the proportional steering gain:

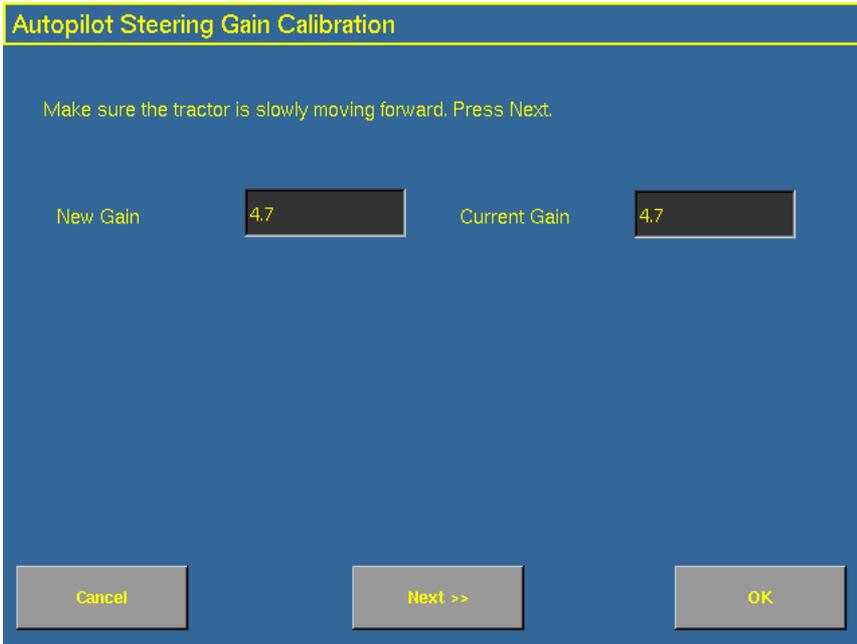
1. Select the Valve P-gain procedure from the calibration list. See [Introduction to Autopilot calibration, page 179](#).

The first *Autopilot Steering Gain Calibration* screen appears.



2. Tap **Run Slew Test**. A warning message appears.
3. Tap **Next**.

The third *Autopilot Steering Gain Calibration* screen appears.



Autopilot Steering Gain Calibration

Make sure the tractor is slowly moving forward. Press Next.

New Gain 4.7 Current Gain 4.7

Cancel Next >> OK



CAUTION – The wheels can move abruptly during the Proportional Steering Gain procedure while the AgGPS Autopilot system tests the hydraulic response to the steering commands. These sudden movements can cause collisions with nearby obstacles or cause injury to occupants of the vehicle. Be prepared for sudden wheel movements.

4. Tap **Next**.

The fourth *Autopilot Steering Gain Calibration* screen appears.

5. Tap **Next** to continue.

The fifth *Autopilot Steering Gain Calibration* screen appears.

6. Test various gain settings while you monitor the vehicle performance and the values in the *Slew Time* and *Overshoot* fields for the Turn Left phase.
 - a. Adjust the *New Gain* field (if desired).
 - b. Turn the front wheels completely to the right to begin the test. (The test is for the stop-to-stop position).
 - c. Tap **Turn Left**. Both turn buttons are unavailable while the wheels slew.

Autopilot Steering Gain Calibration

By pressing Turn Left or Turn Right and adjusting the Gain determine the value that minimizes slew time and overshoot percentage. Press Ok when completed.

New Gain	4.7	Current Gain	4.7
----------	-----	--------------	-----

Slew Time		0 ms
Overshoot		0.0 %

Turn Left	Turn Right
Cancel	OK

***Note** – The optimum gain setting has short slew time (short millisecond reading) and low overshoot percentage (less than 5–8%).*

7. Repeat Step 5 with **Turn Right**. Both turn buttons will be grayed out while the wheels slew.

8. When you locate the best gain value:
 - Tap **OK** to save the value in the AgGPS Autopilot controller memory.
 - Tap **Cancel** to restart the calibration procedure.

Configuring the antenna position and roll offset correction

1. Select *Roll/Antenna Correction* from the calibration list. See page 179.

The *Autopilot Roll/Antenna Compensation* screen appears.

Autopilot Roll/Antenna Compensation

Antenna Height Above Ground	10' 0.00"
Antenna Distance From Fixed Axle	0' 0.00"
Roll Offset	0' 0.00"
Vehicle is to the RIGHT of the line	Right
Vehicle is to the LEFT of the line	Left

Cancel OK

2. Before changing these settings, complete the procedures described below.

Notes on configuring the antenna position

- Before configuring the antenna compensation, make sure that:
 - the AgGPS Autopilot system is completely set up
 - the Autopilot software is properly configured
 - the correct GPS corrections are enabled
 - you read this section carefully
- If multiple GPS technologies will be used (for example, RTK and WAAS), use the technology with the highest accuracy when you perform the Roll Correction calibration.

1. Setting the antenna height above the ground

1. Place the tractor on a flat, level surface.
2. Measure the distance from the ground to the base of the GPS receiver (or antenna).
3. Enter this value in the *Antenna Height Above Ground* field.

2. Setting the antenna distance from the fixed axle

1. Place the tractor on a flat, level surface.
2. Measure the distance from the fixed axle to the center of the GPS receiver (or antenna).
3. Enter this value into the *Antenna Distance from Fixed Axle* field. Enter a negative value if the GPS receiver antenna is to the rear of the fixed axle. The nose of the vehicle is considered the forward direction.

3. Configuring the roll offset correction

Use one of the following methods to calculate the roll offset and then enter the roll offset correction to compensate for it:

- Tire track offset method
- Flag offset method

Choose the method which best matches the conditions.

Calculating the roll offset: Tire track offset method



Tip – Trimble recommends that you use a highly repeatable GPS correction mode for roll correction. For best results, use a RTK mode or OmniSTAR HP signal that has been converged for at least twenty minutes. If you do a roll calibration with less accurate GPS correction modes, repeat the measurements **at least four times** to ensure a more consistent result.

1. Remove any implement from the vehicle.
2. Drive the tractor to a relatively flat field where tire impressions are visible and where you can complete passes of at least 400 m (1320 ft) in length.
3. Reset the roll offset value to 0 (zero).
4. Create an AB Line.
5. Create a clean set of tire tracks in the field. To do this, start a new pass away from the area where the AB Line was created. When the system is stable, engage automatic steering mode and allow the AgGPS Autopilot system to complete the pass.
6. At the end of the pass, turn the tractor around to return along the same pass from the opposite direction.
7. Engage automated steering mode and allow the system to complete the pass.
8. In the middle of the return pass, stop the tractor and confirm that the current position is directly on the AB Line. This ensures there is no cross track error.

9. Park the tractor and exit the cab. Evaluate the tire track pattern between the first and return paths.
10. Measure the difference between the track passes and record the distance. Also note whether the return pass is to the left or the right of the original pass. Record the results in [Table 9.1 on page 208](#).

Note – The offset should be consistently to the left or right.

11. Repeat Steps 5 to 10 two more times, for a total of three test runs. Use [Table 9.1 on page 208](#) to record the offset distance and the left or right direction of offset for each test run.

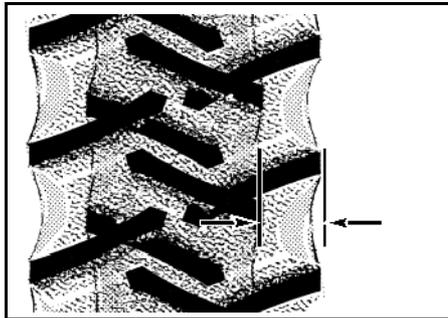
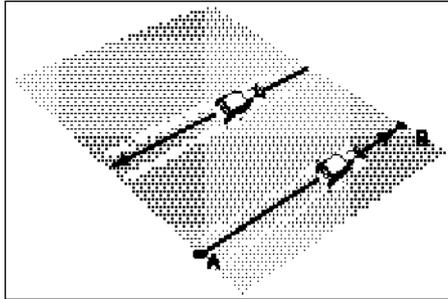


Figure 9.1 Right offset shown

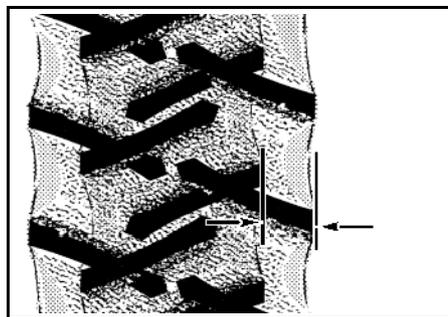
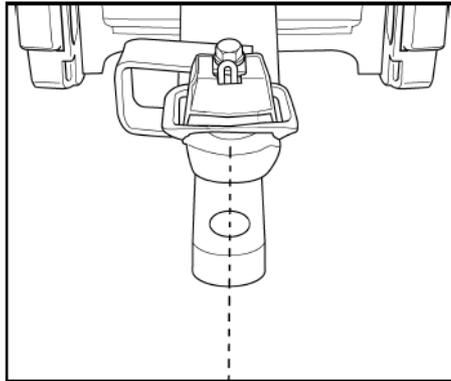


Figure 9.2 Left offset shown

Calculating the roll offset: Flag offset method

1. Remove any implement from the vehicle. The vehicle drawbar must be centered.
2. Drive the vehicle to a relatively flat area where you can complete passes that are at least 400 m (1320 ft) in length.
3. Reset the *Roll Offset* value to 0 (zero) on the *Roll Correction* screen. See [3. Configuring the roll offset correction, page 203](#).
4. Create an AB Line.
5. Start a new pass. Engage automatic steering mode when the system is stable. Stop the tractor midway through the pass. Confirm that there is no cross track error: the current vehicle position should be directly on the AB Line.
6. Park the vehicle and exit the cab. Use the hitch pin hole in the drawbar as a guide to insert a flag in the ground to mark the vehicle centerline for this pass.



7. Complete the pass. Turn the vehicle around to return along the same pass from the opposite direction.
8. Engage automatic steering mode. Stop the vehicle midway down the pass with the drawbar pin location very close to the marker flag. Confirm that there is no cross track error: the current vehicle position should be directly on the AB Line.

9. Park the vehicle and exit the cab. Use the hitch pin hole in the drawbar as a guide to insert a second flag in the ground to mark the tractor centerline for this pass. Note whether the second pass is to the left or the right of the first pass.
10. Measure the difference between the flags for the two passes and record the distance. Also record whether the return pass is to the left or the right of the original pass. Record the results in [Table 9.1 on page 208](#).

Note – The offset should be consistently to the left or right.

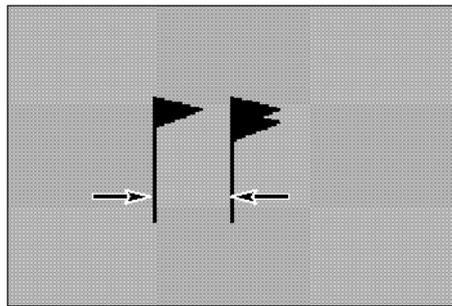


Figure 9.3 Right offset: Measure the distance between the flags

11. Repeat Steps 5 to 10 two more times for a total of three test runs. Use [Table 9.1 on page 208](#) to record the offset distance and the left or right direction of offset for each test run.
12. Average the results of the three runs. (Total the offset distances from the three passes and divide by three).

Table 9.1 Table for recording the roll correction results

Test run	Offset distance	Offset direction
1		
2		
3		
	Total =	
	Total/3 = (Average offset value)	

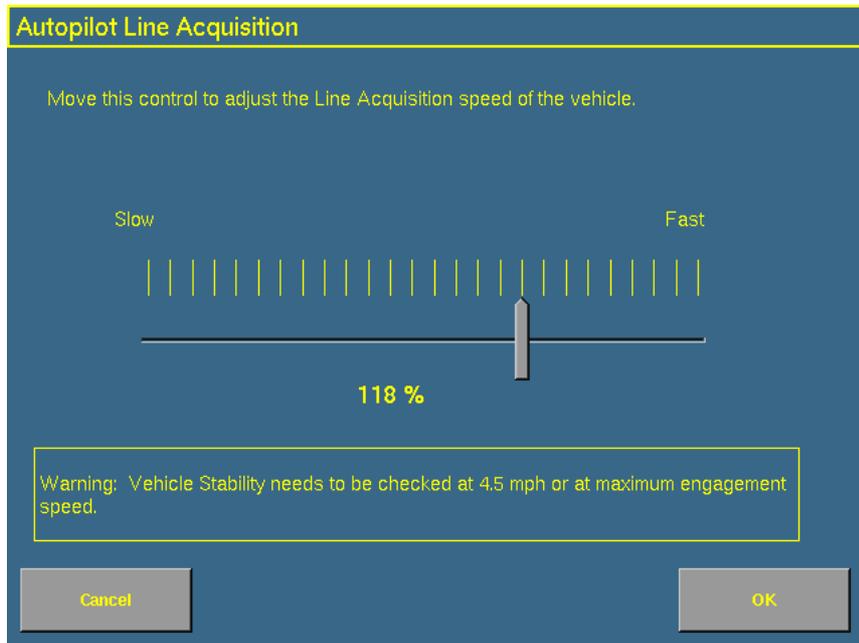
Entering the roll offset

1. Enter the average offset value in the *Roll Offset* field. See [Configuring the antenna position and roll offset correction, page 201](#).
2. Select one of the offline direction options, depending on whether the roll offset distance is to the left or right.

Calibrating the line acquisition aggressiveness

1. Select *Line Acquisition* from the calibration list. See page 179.

The *Autopilot Line Acquisition* screen appears.



2. Adjust the line acquisition aggressiveness slider. The slider controls how aggressively the vehicle approaches the guidance line, using a scale from 50% to 150%. The optimal value for each profile is not necessarily 100%: it varies for different vehicle profiles.

Note – When you adjust the slider, check vehicle stability at the speed shown (4.5 mph in the example above) or at the maximum engage speed.

Calibrating a tracked tractor

If you selected a tracked tractor as the make and model, the *Track Spacing* option appears on the calibration list. (This option is not shown in the *Vehicle Controller Setup* screen shown on page 181).

Track Spacing value

Use this option to configure the width of the tracks on the vehicle. The width of the vehicle tracks is the distance from halfway across the width of the left track to halfway across the width of the right track.

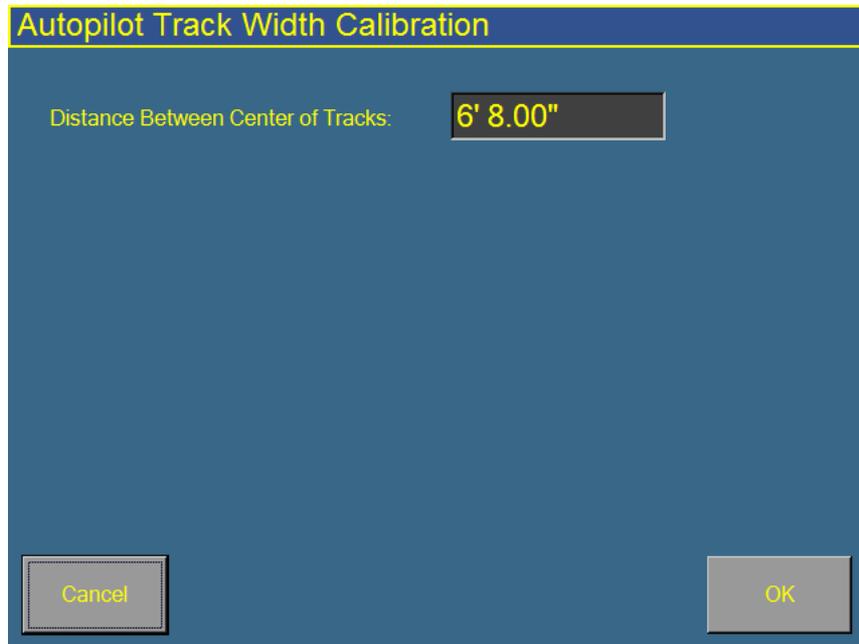


Figure 9.4 Track Spacing calibration screen

Calibrating a hydraulically-steered tracked tractor

If you selected a hydraulically-steered tracked tractor as the make and model, *Engine Speed* appears on the calibration list.

Notes on hydraulically-steered tracked vehicles

- This group of vehicles includes the CAT/AGCO Challenger Tracked family.
- No calibration is required if the system is installed on a CAT MT 700/800 series equipped with the ISO option.

Autopilot Engine Speed Calibration screen

The *Autopilot Engine Speed Calibration* screen enables you to verify that the RPM sensor output is correct.

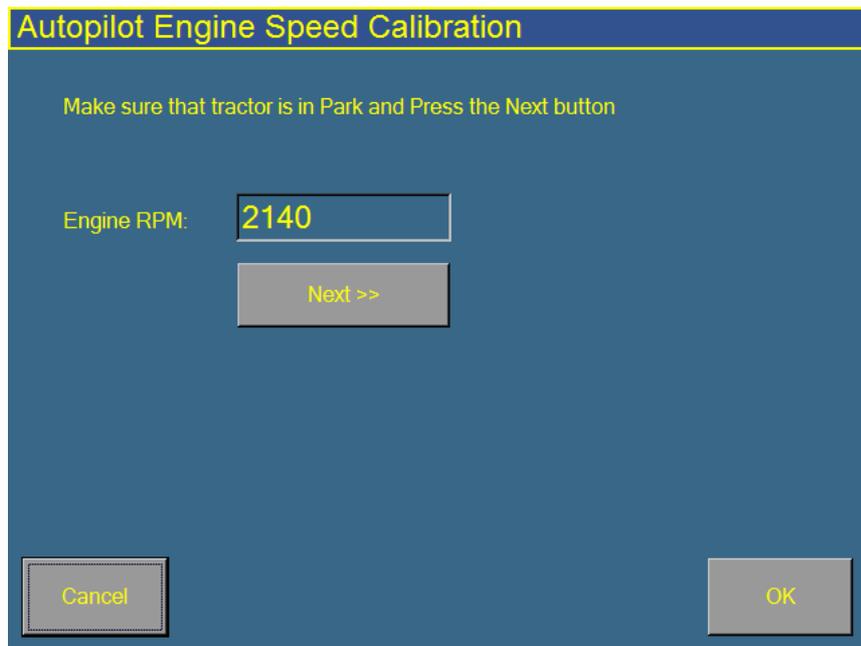


Figure 9.5 Engine speed calibration screen

If the *Engine RPM* value is not close to the actual engine RPM, follow the onscreen instructions to adjust the sensor output.

Autopilot Hydraulic Tracked Integral Gain Calibration screen

The *Autopilot Hydraulic Tracked Integral Gain Calibration* screen verifies and optimizes the response of the hydraulic steering pumps. Follow the onscreen instructions to perform this procedure.

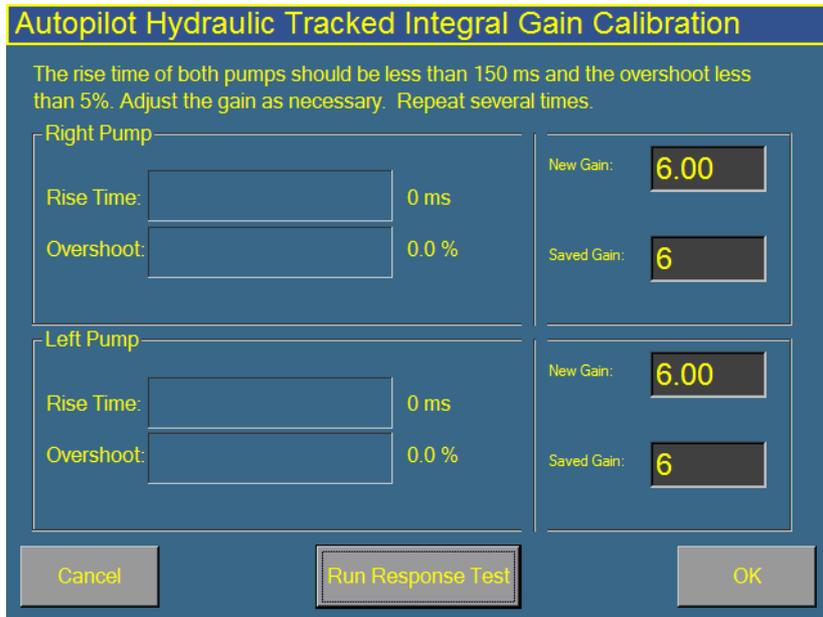


Figure 9.6 Pump Response calibration screen

Autopilot Hydraulic Tracked Pump Knees Calibration screen

This calibration procedure determines the compensation required for deadband in the steering pumps.

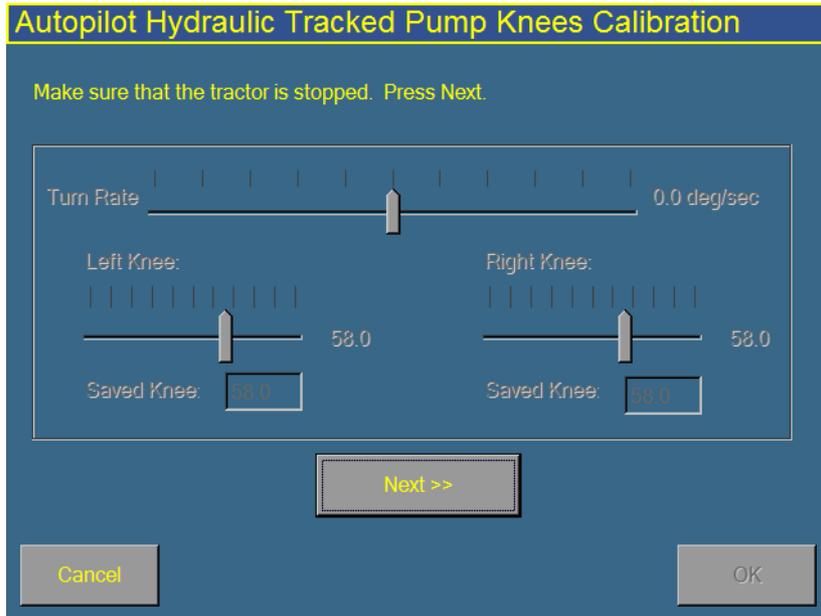


Figure 9.7 Pump Knee calibration screen



CAUTION – The vehicle will need to move during the Hydraulic Tracked Pump Knees calibration procedure. To avoid injury, be prepared for vehicle movement.

The instructions for this calibration test span several pages onscreen. Follow the instructions presented on each page.

Calibrating a fly-by-wire tracked tractor

Note – Vehicles in this group include the John Deere 8xxxT/9xxxT series and the CAT/AGCO MT7xx/8xx series tractors.

Calibrating the manual override

Configure the threshold at which turning the steering wheel will cause automatic guidance to stop and manual steering to take control.

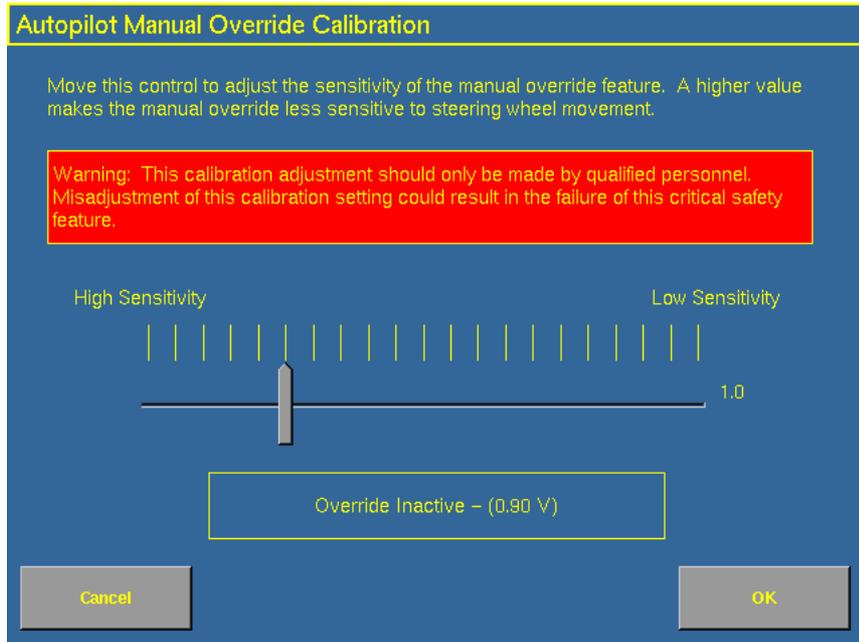


Figure 9.8 Manual Override calibration screen

Follow the onscreen instructions to run this procedure.

Calibrating the steering center bias

The *Autopilot CAT MT Steering Calibration* screen determines the center voltage required for controlling the electronic steering interface.

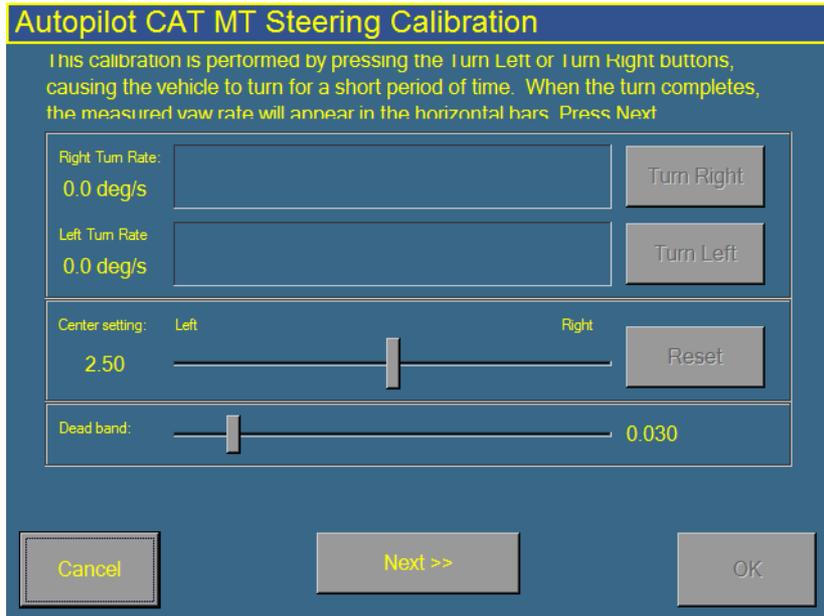


Figure 9.9 Steering center bias calibration screen

A correctly calibrated center voltage setting ensures that the automated steering is balanced for left and right steering commands.



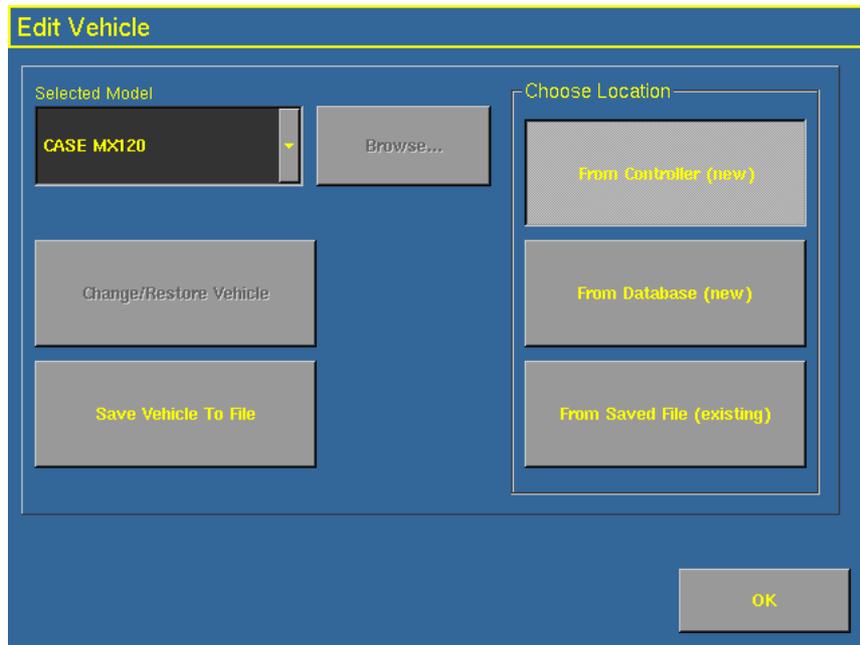
CAUTION – The Steering Center Bias test requires the vehicle to be in motion. To avoid collisions causing injury to you or damage to the vehicle, ensure that the vehicle is in an area that is free of obstacles.

The instructions for this calibration test span several onscreen pages. Follow the onscreen instructions.

Saving a vehicle profile

When you have completed the Autopilot system configuration and calibration for your vehicle, you can save that information for later use. This can be useful if you want to try tweaking the settings or you move the display from one vehicle to another.

1. Press the Configuration  button to the right of the screen. The *Configuration* screen appears.
2. Select the Autopilot plugin and then tap **Setup**. The *Vehicle Controller Setup* screen appears.
3. In the Vehicle Controller Settings group, tap **Edit**. The *Edit Vehicle* screen appears:



4. Tap **Save Vehicle to File**.
Your current vehicle profile is saved.

Configuring the GPS receiver

When you install the Autopilot plugin, the GPS Receiver plugin is installed too. For instructions on configuring the GPS receiver, see Chapter 10, The GPS Receiver Plugin.

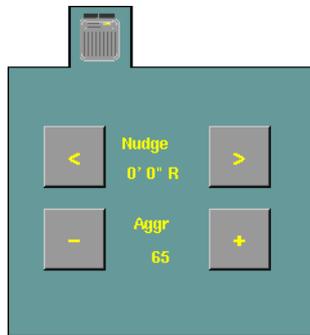
Adjusting the Aggressiveness setting

Aggressiveness is the measure of how strongly the system makes steering changes.

A higher *Aggressiveness* setting will bring the vehicle back online faster, but may cause tight oscillations about the line. A lower *Aggressiveness* setting will be slower to bring the vehicle back online, but can avoid overshoot.

To adjust the *Aggressiveness* setting:

1. From the Run screen, select the Autopilot tab.



2. Use the - or + button to adjust the setting.

Note – The default *Aggressiveness* setting is 100%.

For a description of the Autopilot **Engage** button, see [Engage button](#), page 137.

The GPS Receiver Plugin

In this chapter:

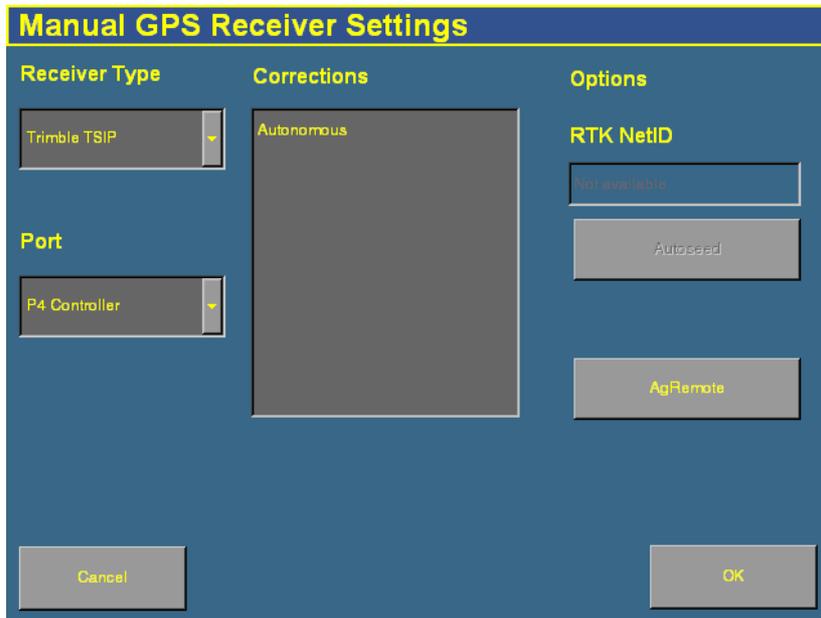
- [Configuring the GPS receiver](#)
- [AgGPS Autoseed fast restart technology](#)
- [Configuring a GPS receiver with the AgRemote software](#)
- [Enabling NMEA message output](#)

You must install either the Manual Guidance plugin, the Autopilot plugin, or the FieldLevel plugin. When you do so, the FieldManager system automatically adds a GPS Receiver plugin that controls the connected GPS receiver.

In addition, the system may have another GPS receiver. For example, the AgGPS TrueTracker system uses a second receiver that is configured with a separate GPS Receiver plugin. This chapter covers the configuration of 4 versions of the GPS receiver plugin.

Configuring the GPS receiver

- From the *Configuration* screen, select the appropriate GPS Receiver plugin and then tap **Setup**. The GPS Receiver Settings screen appears.

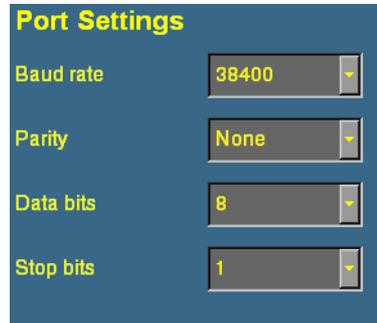


Note – The Receiver Type list and the Port list only appear for the Manual Guidance or FieldLevel plugin receivers. If you are configuring the Autopilot or TrueTracker plugin receivers, skip to Step 4.

- In the Receiver Type list, select the type of messages that the GPS receiver produces:
 - If it is a TSIP receiver, select the correction type from the *Corrections* list, enable the AgGPS Autoseed™ fast restart technology if required, and enter the RTK network ID in the *RTK NetID* window.
 - If it is a DCOL receiver, select the correction type from the *Corrections* list and enter the RTK network ID in the *RTK NetID* window.

If you select Trimble DCOL, the Default Settings list appears. Select Restore to restore the receivers default settings before the configuration file is sent from the controller, or select Do Not Restore to keep the current settings and apply the configuration file over the top.

- If it is a NMEA receiver, select the port settings in the *Port Settings* lists. The port settings must be the same as the NMEA receiver's output settings.



The image shows a screenshot of the 'Port Settings' menu. The menu has a dark blue background with yellow text. It contains four settings, each with a dropdown arrow on the right:

Setting	Value
Baud rate	38400
Parity	None
Data bits	8
Stop bits	1

The available GPS corrections appear in the Corrections list.

3. In the Port list, select the port on the FieldManager display harness that the GPS receiver is connected to.
4. In the Corrections list, tap the appropriate corrections to use.
5. If appropriate, enable *AgGPS* Autoseed technology. See [AgGPS Autoseed fast restart technology, page 222](#).

AgGPS Autoseed fast restart technology

AgGPS Autoseed fast restart technology greatly reduces the time needed for OmniSTAR HP/XP/VBS convergence. Once the OmniSTAR signal has initially converged, you can turn off the receiver. When you turn the receiver back on, accuracy levels will be similar to those experienced before shutdown.

To benefit from AgGPS Autoseed technology:

- you must have an AgGPS 252 or 332 GPS receiver
- you must use OmniSTAR HP or XP corrections
- the receiver must be shut down
- the vehicle must not be moved before you turn the receiver on again
- the GPS receiver must have a clear view of the sky

***Note** – Vehicle movement will result in unsatisfactory performance, including longer convergence times and positional offsets.*

To enable the AgGPS Autoseed technology:

1. On the *Configuration* screen, select the appropriate GPS Receiver plugin and then tap **Setup**. The *GPS Receiver Settings* screen appears.
2. In the Receiver Type list, select TSIP.
3. In the Corrections list, select either OmniSTAR HP/XP or OmniSTAR HP/XP-VBS.
The **Autoseed** button becomes available.
4. Select **Autoseed** and then tap **OK**.

Configuring a GPS receiver with the AgRemote software

The FieldManager display has a virtual AgRemote interface for manually adjusting GPS receiver settings. This is recommended for advanced users only.

To access the virtual AgRemote interface:

1. From the *Configuration* screen, select the appropriate GPS Receiver plugin and then tap **Setup**. The *GPS Receiver Settings* screen appears.
2. Tap **AgRemote**. The virtual AgRemote interface appears.

For more information on the correct use of the AgRemote interface, refer to the *AgGPS AgRemote Software Guide for AgGPS Receivers* on www.trimble.com, or refer to your GPS receiver manual.

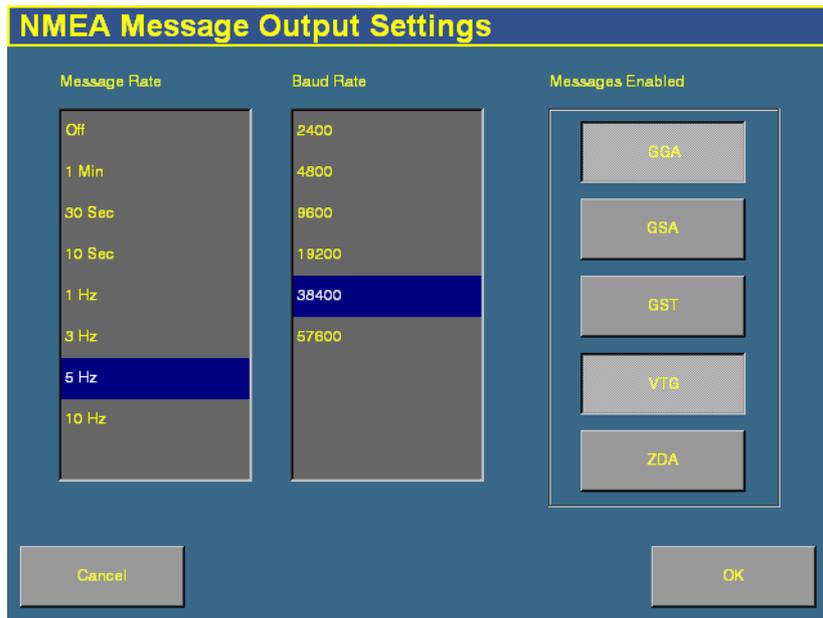
Enabling NMEA message output

The NMEA message formats are a standard format through which GPS receivers can communicate. If you have an external device connected to the AgGPS Autopilot controller, you can enable NMEA message output from the controller so the device receives NMEA GPS positions.

The messages are output through the NavController harness laptop connector.

Some GPS receivers can output NMEA messages to an external device. To do this:

1. On the *Configuration* screen, select the appropriate GPS Receiver plugin and then tap **Setup**. The *GPS Receiver Settings* screen appears.
2. Tap **NMEA Output**. The *NMEA Message Output Settings* screen appears:



3. Tap the appropriate Message Rate and then the Baud Rate.
4. In the Messages Enabled group, select the appropriate NMEA message types to output. Do not just enable all formats.
5. Tap **OK** to continue.

Note – To enable NMEA output from another receiver (for example, the GPS receiver connected to an AgGPS TrueTracker system controller), select the plugin for that receiver in the plugin list.

The TrueTracker Plugin

In this chapter:

- [About the AgGPS TrueTracker system](#)
- [Configuration](#)
- [Using the TrueTracker system](#)

One of the *AgGPS* FieldManager display features that can be unlocked is the *AgGPS* TrueTracker implement steering system.

This chapter explains what the TrueTracker system is and describes the configuration steps required to use it to steer implements more accurately.

About the AgGPS TrueTracker system

The AgGPS TrueTracker implement steering system is an upgrade for the AgGPS Autopilot automated steering system. With the Autopilot system, the vehicle receives guidance and pulls the implement. When the TrueTracker system is added to the Autopilot system, the implement receives separate guidance and steering to increase accuracy.

The system is comprised of two parts:

- Additional hardware installed on the implement
- Additional FieldManager display software provided by the TrueTracker plugin

The AgGPS TrueTracker system extends the sub-inch, year-to-year repeatable accuracy of the AgGPS Autopilot automated steering system to the implement.

Terminology

The term *implement steering* refers to the ability to actively steer the implement that a vehicle is towing.

Normally, it is not possible to tell the exact location of the implement. When you use the AgGPS FieldManager display with the AgGPS Autopilot automated steering system for sub-inch accuracy, the GPS antenna and receiver are mounted on the vehicle, and it is the vehicle that is guided.

On flat ground the implement will probably be directly behind the vehicle, but in the following conditions the implement can pull (*draft*) to one side:

- on side slopes
- in variable soil conditions
- on curved guidance patterns

The stand-alone AgGPS Autopilot automated steering system has no way to detect or correct for implement draft.



Figure 11.1 Vehicle with implement on a slope

In these conditions, the draft distance can be significant enough to lose repeatability for successive field operations despite the ± 25 mm (± 1 inch) accuracy of the tractor equipped with the AgGPS Autopilot system.

Benefits of the AgGPS TrueTracker system

The AgGPS TrueTracker implement steering system is an optional upgrade for the AgGPS Autopilot system. It requires an additional AgGPS Autopilot controller and AgGPS 252 receiver on the implement which report the position of the implement. Using T3 inertial terrain compensation technology and the accuracy of the AgGPS 252 receiver, the TrueTracker system is able to steer the implement, ensuring it remains online behind the vehicle even on extremely sloped ground.

The TrueTracker system supports the following:

- Steering in reverse
- Straight and curved guidance patterns
- Independent implement offset
- Independent aggressiveness control for the implement

Requirements of the AgGPS TrueTracker system

The TrueTracker system requires:

- An AgGPS Autopilot system with the FieldManager display (firmware version 3.00 and above)
- An unlock code for the FieldManager display implement steering functionality
- An Orthman 2, 3, 4, or 6 blade Tracker IV implement guidance system

Installing the TrueTracker system

The AgGPS TrueTracker system requires professional installation. For more information, please refer to your local Trimble reseller.

Configuration

There are six steps to configuring the TrueTracker system:

1. Activate the implement steering upgrade.
2. Enable the implement controller.
3. Configure the implement controller.
4. Configure the GPS receiver on the implement.
5. Configure the implement.
6. Calibrate the implement.

These steps are described in more detail below.

Step 1. Activating the TrueTracker system

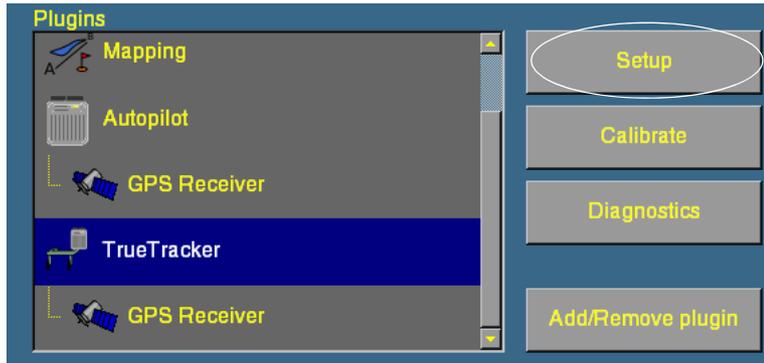
Before you can use the TrueTracker system, you must activate it on the AgGPS FieldManager display. For step-by-step instructions, see [Entering the password to activate a plugin, page 78](#).

***Note** – This process requires you to enter the activation password. If you do not have an activation password, contact your local Trimble reseller.*

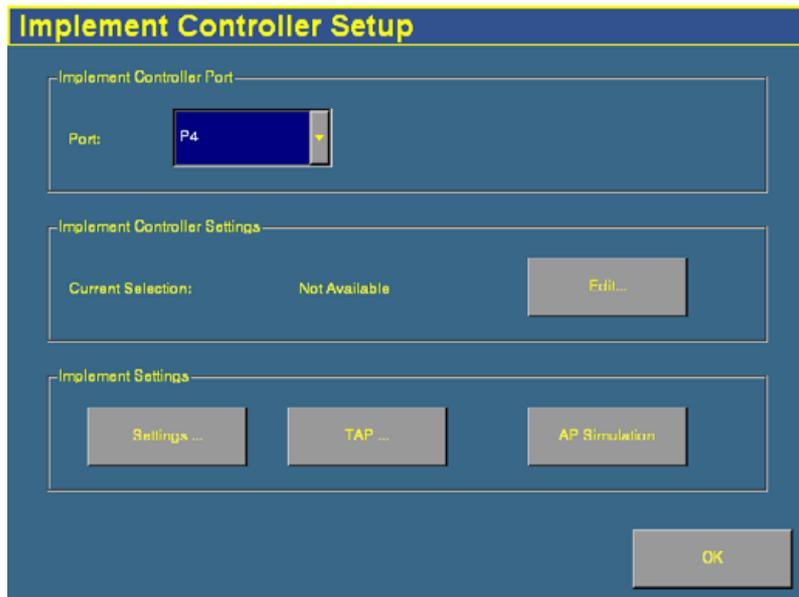
Step 2. Enabling the implement controller

1. Press the Configuration button  to the right of the display. The *Configuration* screen appears.
2. Ensure that the Autopilot plugin and the TrueTracker plugin are both installed. See [Adding or removing a plugin, page 76](#).

3. On the *Configuration* screen, select the TrueTracker plugin and then tap **Setup**.



The *Implement Controller Setup* screen appears:



4. In the *Port* list, select the connector on the FieldManager harness that the TrueTracker implement controller is connected to.

Note – Before you continue to the next section of the setup, tap **OK** and then return to this screen.

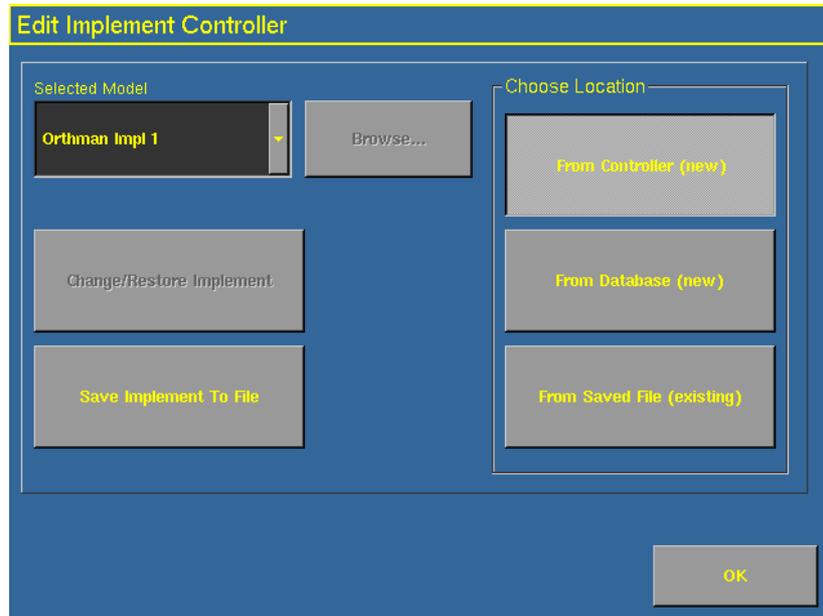
Step 3. Configuring the implement controller

Your vehicle make and model were selected when your AgGPS TrueTracker system was installed. This selection appears in the *Implement Controller Settings* group. Ensure that the implement make and model that are displayed are correct. If they are correct, skip this step and proceed to [Step 4. Configuring the GPS receiver on the implement, page 234](#). Otherwise, configure the implement controller as described here.

Note – When you configure the implement make and model, the previous calibration settings are lost. If you will want to use the current vehicle settings again, save them before you proceed.

Configuring the implement make and model

1. Tap **Edit...** in the *Implement Controller Settings* group. The *Edit Implement Controller* screen appears:



2. Do one of the following:
 - To select a new make and model from the list that is in the AgGPS Autopilot controller firmware:
 - a. Tap **From Controller (new)**.
 - b. Tap the Selected Model drop-down box and then select the make and model that you require from the list.
 - c. Select *Orthman Imp 1* for a Tracker III or Tracker IV system.
 - To select a new make and model from a database of vehicles (.vdb) on the AgGPS FieldManager display CompactFlash card.
 - a. Tap **From Database (new)**.
 - b. Tap **Browse**.
 - c. Select the .vdb file that you want to open and then tap **Open**.

If you need to obtain a .vdb file, contact your local reseller.
 - To select an existing vehicle from a previously saved file (.cfg) on the card:
 - a. Tap **From Saved File (existing)**.
 - b. Tap **Browse**.
 - c. Select the file that you require and then tap **Open**.
3. Tap **Change/Restore Vehicle**. The following message appears:

The specified vehicle model will now be selected on the Autopilot controller. This will cause the Autopilot controller to be reset. Do you want to continue?
4. Tap **OK** to load the new configuration, or **Cancel** to abort.

A dialog with the message **Upload completed** appears.
5. Tap **OK**. Warning text appears. The file is now loaded.

Configuring the Engage button

The **Engage** button can be set to work in two different ways. See [Configuring the Engage button, page 233](#).

In the *Two stage engage* list, select the appropriate option:

Item	Description
On	<p>The Engage button requires multiple taps to engage:</p> <ul style="list-style-type: none"> – The first tap engages implement steering – The second tap engages the vehicle steering – The third tap disengages both implement and vehicle steering
Off	<p>The Engage button engages with one tap:</p> <ul style="list-style-type: none"> – The first tap engages implement and vehicle steering – The second tap disengages both implement and vehicle steering

Implement Setup

Nudge/Trim Increment: 0' 1.0"

End of Row warning distance: 150' 0.0"

Operator alert time out: 5 min

Smoothing Turn Radius: 32' 9.7"

Control coverage log: No

Two stage engage: Off

Sensor Options: Use AutoSense

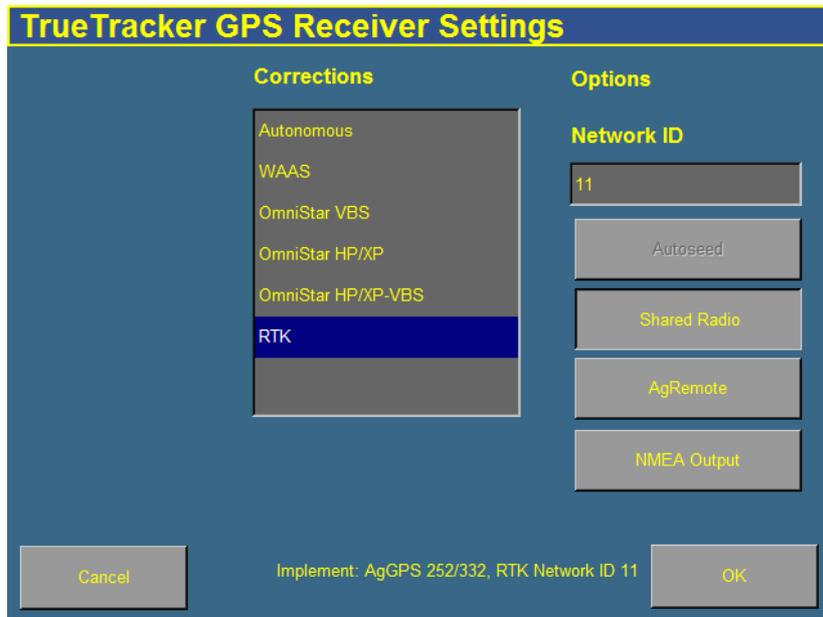
Cancel OK

Step 4. Configuring the GPS receiver on the implement

1. From the *Configuration* screen, select the GPS Receiver plugin that is associated with the TrueTracker plugin:



2. Tap **Setup**. The *TrueTracker GPS Receiver Settings* screen appears:



If your GPS receivers share a radio, tap **Shared Radio**.

Any changes made in this screen apply to both GPS receivers.

Step 5. Configuring the implement

Configure an implement so the system can tell:

- which type of implement is attached
- how much area it covers
- how far it is offset

See Chapter 6, Implement Configuration.

Note – When you enter the number of implement sections, if the implement does not have sections, enter **1**.

Step 6. Calibrating the implement

1. From the *Configuration* screen, select the TrueTracker plugin and then tap **Calibrate**. The *Implement Controller Setup* screen appears.



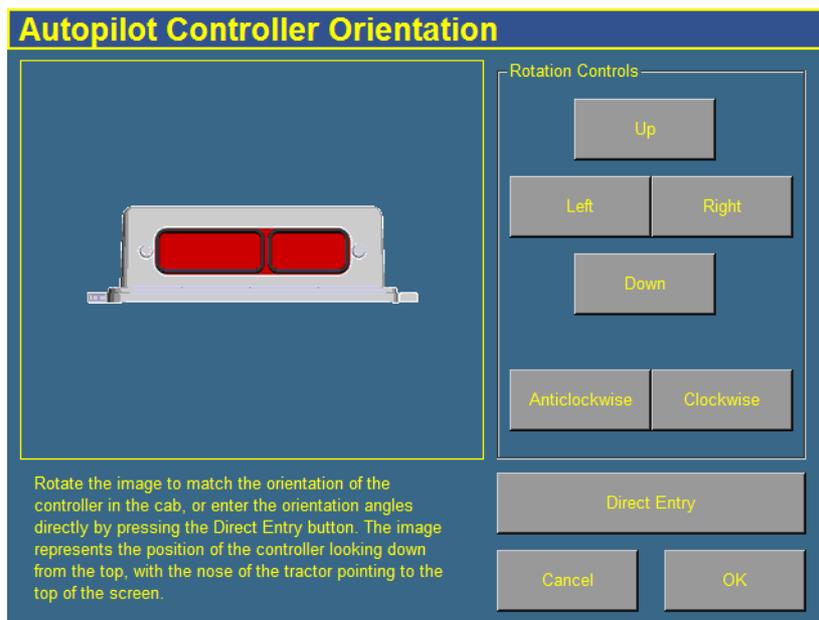
2. Select an item to configure and then tap **OK**.

3. Configure the selected item.

To configure ...	See page ...
Controller orientation	page 236
Steering sensor	page 237
Automated steering deadzone	page 239
Steering gain	page 243
Roll/antenna correction	page 251
Line acquisition	page 255

Configuring the controller orientation

1. Select the *Controller Orientation* option from the list. The *Autopilot Controller Orientation* screen appears.



An image represents the current mounting orientation of the controller.

The image is shown as though:

- You are looking down on the vehicle from above.
 - The top of the screen points to the nose of the vehicle.
2. Use the buttons to select the orientation of the controller.

If the controller is set at a sloped angle, tap **Direct Entry** and then enter the yaw, pitch, and roll angles of the controller.

***Note** – If you use the Direct Entry method to set custom angles, the onscreen image of the controller will not be displayed.*

3. Tap **OK** to accept the new orientation, or **Cancel** to exit.

Calibrating the Implement Steering Sensor

Perform steering sensor calibration to convert the voltage output of the steering sensor into an equivalent steering angle measurement.

***Note** – Complete this calibration before you attempt to calibrate the steering deadzone or roll correction procedures.*

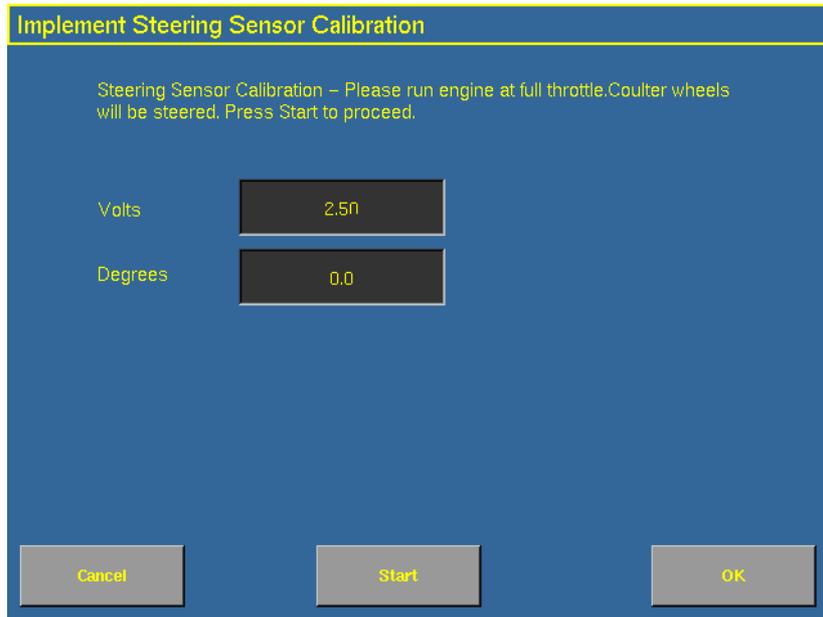
Ensure that you:

- perform this procedure on a level surface that is free of obstructions.
- follow the instructions presented on each page.
- run the engine at full throttle.
- raise the implement.

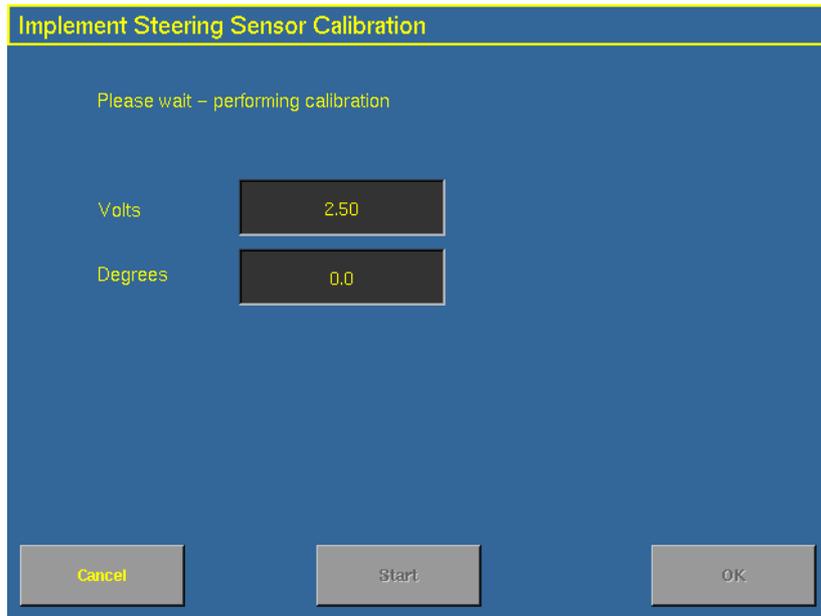
To run the steering sensor calibration:

1. Select the *Steering Angle* procedure from the calibration list.

The first *Implement Steering Sensor Calibration* screen appears.



2. Tap **Start**.



Implement Steering Sensor Calibration

Please wait - performing calibration

Volts 2.50

Degrees 0.0

Cancel Start OK

3. Perform the calibration. The value in the *Volts* field is updated as the wheels are steered.

Calibrating the Implement Automatic Deadzone

The Implement Automatic Deadzone calibration procedure runs a series of tests on the valve and steering hydraulics to determine the point at which steering movement occurs.



WARNING – During the Implement Automatic Deadzone calibration, the system moves the wheels that steer the implement. To avoid injury, ensure the area around the vehicle and implement is clear.

In this test, the system independently opens and closes each side of the steering system while determining the point at which wheel movement occurs.

Notes on calibrating the Implement Automatic Deadzone

- You must complete the Steering Angle procedure before you run this procedure.
- To ensure optimal system performance, the hydraulic fluid must be at normal operating temperature when you run this procedure. On some vehicles with large reservoirs, it may take several hours for the fluid to reach operating level, especially if the implement circuit is lightly loaded. Consult the vehicle documentation to determine if the hydraulic fluid temperature can be displayed on a vehicle console.
- If you perform the calibration while the system is still cold, repeat both the Deadzone and the Proportional gain calibration procedures once the system is at operating temperature.

To configure the automated steering deadzone:

1. Place the vehicle in an area that is free of hazards.
2. Raise the implement.
3. Select the Implement Automatic Deadzone procedure from the calibration list. See page 235.

The *Autopilot Automated Deadzone Calibration* screen appears.

Autopilot Automated Deadzone Calibration

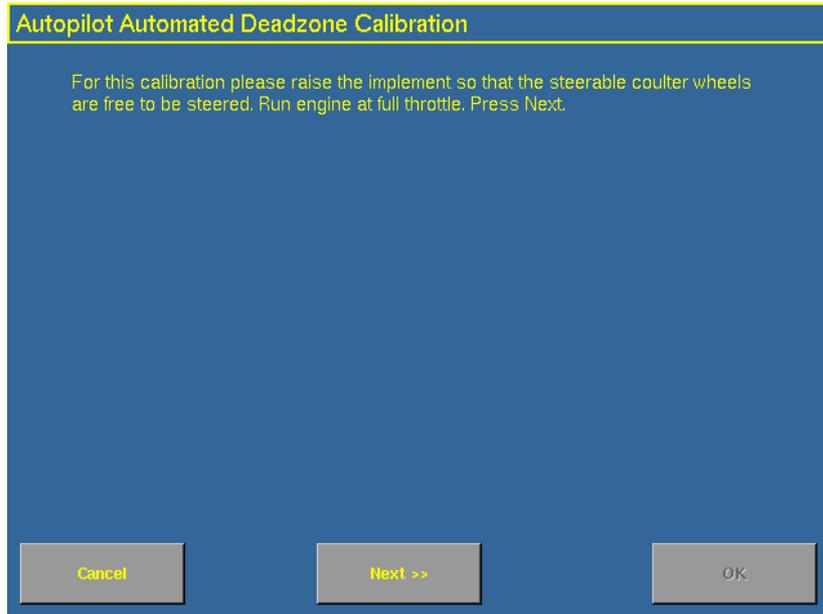
Only proceed if the steering sensor calibration has been performed. Press Next.

Deadzone Left	40.0
Deadzone Right	40.0

Cancel Next >> OK

4. Tap **Next** to continue.

The second *Autopilot Automated Deadzone Calibration* screen appears.



5. Tap **Next** twice.

Note – Read the onscreen instructions on each page.

Follow the instructions. The system will automatically move the coulter wheels in both directions several times.

6. Tap **Start**. The system engages and performs the calibration.

Automated Deadzone error messages

If a calibration cycle is unable to complete successfully, one of the error messages below will appear:

Message	Meaning
Error - Steering Close To End Stops	Before the calibration cycle could be completed, the measured steering angle approached the end stops. Retry, and if the problem persists, instead of centering the steering at the start of each cycle, try turning the steering in the opposite direction to that which is being tested so that the calibration procedure has a greater range to test over.
Error - Valve Connectors Could Be Swapped	The calibration test sensed the steering turning in the opposite direction to what was expected. Retry, and if the problem persists either the valve connectors have been accidentally swapped or the steering sensor calibration was performed incorrectly.
Error - No GPS	A GPS receiver must be connected and outputting positions before the software can run the calibration procedure.
Error - No Steering Response Detected	During the calibration cycle, insufficient movement was sensed in order for the calibration to complete. If the problem persists, the hydraulic installation could be faulty.
Error - Unable To Determine DZ: Try Again	A problem occurred when trying to compute dead zone. Retry, and if the problem persists, contact Technical Support.

Proportional steering gain calibration

Note – Complete the steering sensor calibration before you perform the proportional gain calibration. **ONLY** perform the proportional steering gain calibration when the TrueTracker system performance is less than satisfactory.

The proportional steering gain (PGain) setting enables you to reach a compromise between rapid steering response and stability.

Modifications to the PGain setting affect two steering characteristics:

- *Slew Time*: The amount of time the steering coulters take to move from the far left to the far right position and vice versa.
- *Overshoot*: The percentage by which the steering coulters exceed the commanded angle before they settle on the correct value.

To correct slight variations caused by valve current response, friction, and hydraulic fluid viscosity, alter these settings.

High PGain values ...	Low PGain values ...
Decrease the slew time and increase the overshoot. This provides rapid responses, but can cause the steering to exhibit signs of instability (for example, a tendency to excessively overshoot).	Increase the slew time and decrease the overshoot. This improves the stability but can introduce significant delays in the steering response and can cause the vehicle to oscillate from side to side.

Notes on performing the proportional steering gain calibration

- Perform the Automatic Deadzone calibration immediately before you run the PGain calibration, even if the Automatic Deadzone calibration has been performed in the past.
- Perform this calibration on a level surface, free of obstructions.
- Run the engine at full throttle.
- Raise the implement.

Increase the proportional gain up to the point just before any one of the following occurs:

- Slew times no longer decrease (a low value is desired)
- Overshoot exceeds 10 % (depending on the Tracker unit)
- Steering coulters noticeably shake near end stops

To calibrate the proportional steering gain:

1. Select the Steering Gain procedure from the calibration list.

The first *Autopilot Steering Gain Calibration* screen appears.

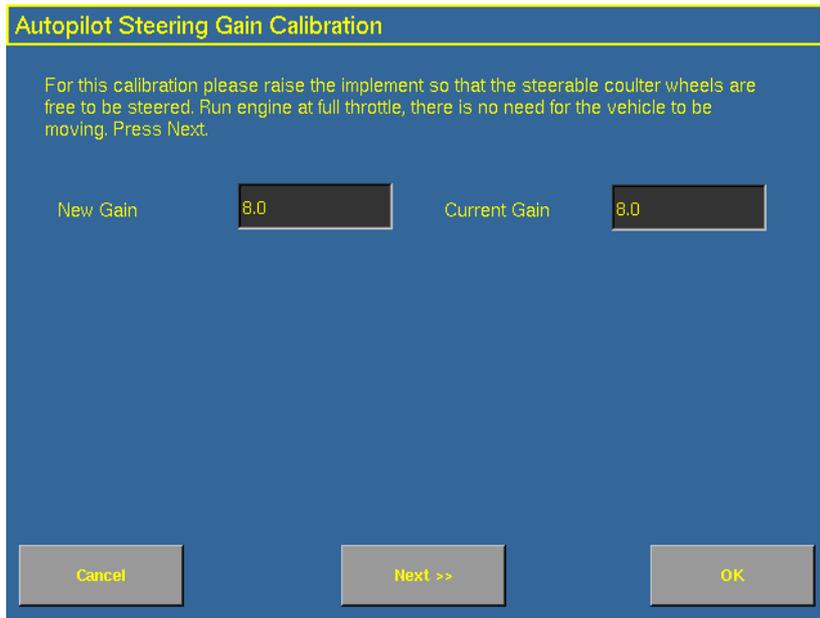
Autopilot Steering Gain Calibration

Only adjust the gain if the steering performance is unsatisfactory. If the steering performance is too slow, try increasing the gain from its default value. If it is too aggressive, or the wheels jitter/oscillate, reduce the gain.

New Gain Current Gain

2. Tap **Run Slew Test**. A warning message appears.
3. Tap **Next**.

The third *Autopilot Steering Gain Calibration* screen appears.



CAUTION – The steering coulters can move abruptly during the Proportional Steering Gain procedure while the AgGPS TrueTracker system tests the hydraulic response to the steering commands. These sudden movements can cause collisions with nearby obstacles or cause injury. Be prepared for sudden steering coulters movements.

4. Tap **Next**.

The fourth *Implement Steering Gain Calibration* screen appears.

5. Tap **Next** to continue.

The fifth *Implement Steering Gain Calibration* screen appears.

6. Test various gain settings while you monitor the implement steering performance and the values in the *Slew Time* and *Overshoot* fields for the Turn Left phase.
 - a. Adjust the *New Gain* field (if desired).
 - b. Tap **Turn Left**. Both turn buttons are unavailable while the wheels slew.

Autopilot Steering Gain Calibration

By pressing Turn Left or Turn Right and adjusting the Gain determine the value that minimizes slew time with an overshoot percentage not more than 10%. Press Ok when completed.

New Gain	8.0	Current Gain	8.0
----------	-----	--------------	-----

Slew Time		0 ms
Overshoot		0.0 %

Turn Left

Turn Right

Cancel

OK

Note – The optimum gain setting has short slew time (short millisecond reading) and overshoot percentage less than 10%.

7. Repeat Step 5 with **Turn Right**. Both turn buttons will be grayed out while the wheels slew.
8. When you locate the best gain value:
 - Tap **OK** to save the value in the AgGPS Autopilot controller memory.
 - Tap **Cancel** to restart the calibration procedure.

Configuring the antenna position and roll offset correction

1. Select *Roll/Antenna Compensation* from the calibration list.
The *Autopilot Roll/Antenna Compensation* screen appears.

Autopilot Roll/Antenna Compensation

Antenna Height Above Ground	5' 10.9"
Antenna Distance from centerline	0' 0.0"
Roll Offset	0' 0.0"
Implement is to the RIGHT of the line	Right
Implement is to the LEFT of the line	Left

Cancel OK

2. Before changing these settings, complete the procedures described below.

Notes on configuring the antenna position

- Before configuring the antenna compensation, make sure that:
 - the AgGPS TrueTracker system is completely set up
 - the Autopilot software is properly configured
 - the correct GPS corrections are enabled

Read this section carefully before you attempt the configuration.

1. Setting the antenna height above the ground

1. Place the tractor and implement on a flat, level surface.
2. Measure the distance from the ground to the base of the GPS receiver (or antenna).
3. Enter this value in the *Antenna Height Above Ground* field.

2. Setting the antenna distance from the centerline

1. Place the tractor and implement on a flat, level surface.
2. Measure the distance from the centerline of the implement to the center of the GPS receiver (or antenna).

3. Enter this value into the *Antenna Distance from centerline* field and indicate whether it is left or right of the centerline. Values to the left of the centerline are displayed as negative numbers. The nose of the vehicle is considered the forward direction.

3. Configuring the roll offset correction

Use one of the following methods to calculate the roll offset and then enter the roll offset correction to compensate for it:

- Coulter wheel track offset method
- Flag offset method

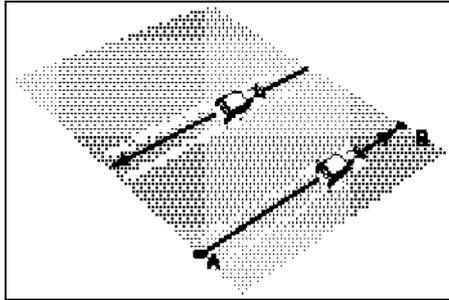
Choose the method which best matches the conditions.

Calculating the roll offset: coulter wheel track offset method

1. Drive the tractor to a relatively flat field where tire impressions are visible and where you can complete passes of at least 400 m (1320 ft) in length.
2. Reset the roll offset value to 0 (zero).
3. Start a new field.
4. Create a straight AB Line.
5. Create a clean set of tire tracks in the field. To do this, start a new pass away from the area where the AB Line was created. When the system is stable, engage automatic steering mode and allow the AgGPS Autopilot and TrueTracker systems to complete the pass.
6. At the end of the pass, turn the tractor around to return along the same pass from the opposite direction.
7. Engage automated steering mode and allow the system to complete the pass.
8. In the middle of the return pass, stop the tractor and confirm that the current position is directly on the AB Line. This ensures there is no cross track error.
9. Park the tractor and exit the cab. Evaluate the coulter wheel track pattern between the first and return paths.
10. Measure the difference between the track passes and record the distance. Also note whether the return pass is to the left or the right of the original pass. Record the results in [Table 11.1 on page 254](#).

Note – The offset should be consistently to the left or right.

11. Repeat Steps 5 to 10 two more times, for a total of three test runs. Use [Table 11.1 on page 254](#) to record the offset distance and the left or right direction of offset for each test run.



Calculating the roll offset: flag offset method

1. Drive the vehicle to a relatively flat area where you can complete passes that are at least 400 m (1320 ft) in length.
2. Reset the *Roll Offset* value to 0 (zero) on the *Roll Correction* screen. See [3. Configuring the roll offset correction, page 250](#).
3. Start a new field.
4. Create a straight AB Line.
5. Start a new pass. Engage automatic steering mode when the system is stable. Stop the tractor midway through the pass. Confirm that there is no cross track error: the current vehicle position should be directly on the AB Line.
6. Park the vehicle and exit the cab. Insert a flag in the ground to mark the implement centerline for this pass.
7. Complete the pass. Turn the vehicle around to return along the same pass from the opposite direction.
8. Engage automatic steering mode. Stop the vehicle midway down the pass very close to the marker flag. Confirm that there is no cross track error: the current vehicle position should be directly on the AB Line.

9. Park the vehicle and exit the cab. Insert a second flag in the ground to mark the implement centerline for this pass. Note whether the second pass is to the left or the right of the first pass.
10. Measure the difference between the flags for the two passes and record the distance. Also record whether the return pass is to the left or the right of the original pass. Record the results in [Table 11.1 on page 254](#).

Note – The offset should be consistently to the left or right.

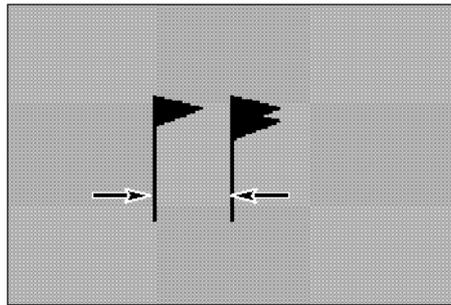


Figure 11.2 Right offset: Measure the distance between the flags

11. Repeat Steps 5 to 10 two more times for a total of three test runs. Use [Table 11.1 on page 254](#) to record the offset distance and the left or right direction of offset for each test run.
12. Average the results of the three runs. (Total the offset distances from the three passes and divide by three).

Table 11.1 Table for recording the roll correction results

Test run	Offset distance	Offset direction
1		
2		
3		
	Total =	
	Total/3 = (Average offset value)	

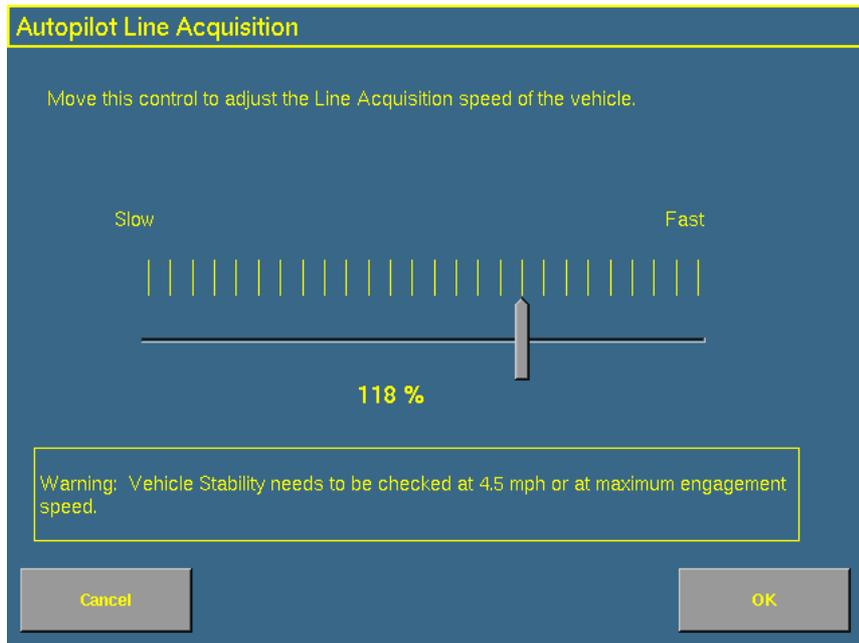
Entering the roll offset

1. Enter the average offset value in the *Roll Offset* field. See [Configuring the antenna position and roll offset correction, page 248](#).
2. Select one of the offline direction options, depending on whether the roll offset distance is to the left or right.

Calibrating the line acquisition aggressiveness

1. Select *Line Acquisition* from the calibration list.

The *Autopilot Line Acquisition* screen appears.



Adjust the line acquisition aggressiveness slider. The slider controls how aggressively the implement approaches the guidance line, using a scale from 50% to 150%. The optimal value for each profile is not necessarily 100%; it varies for different implement profiles.

Using the TrueTracker system

When you have configured the TrueTracker plugin, you can begin driving in the field with implement steering.

Main guidance screen

The FieldManager display's main guidance screen changes when implement steering is enabled.

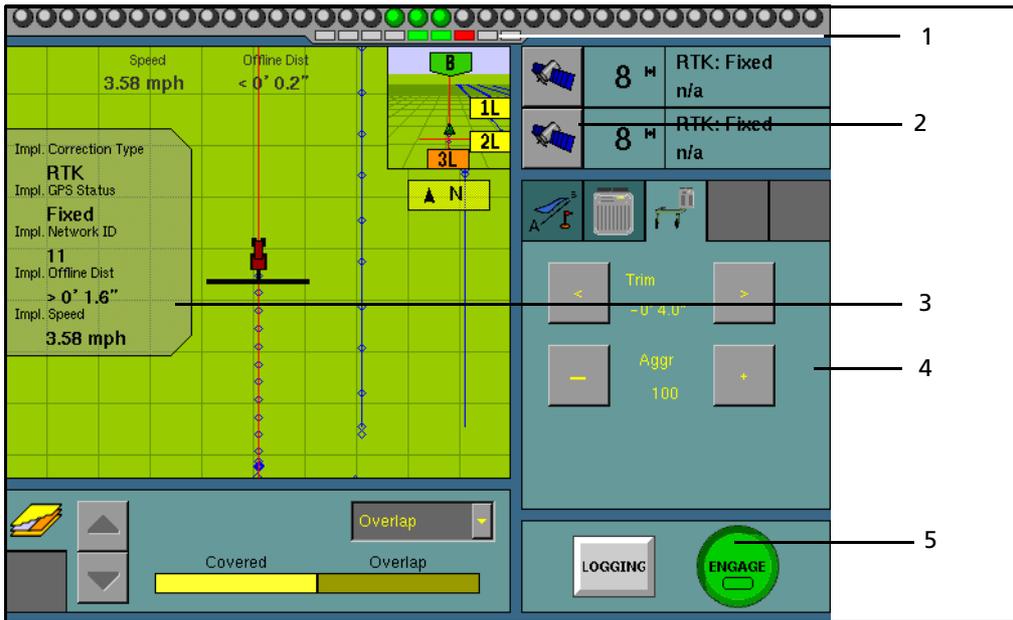


Figure 11.3 Main guidance screen with implement steering features

Item	Description
1	Implement lightbar
2	Implement GPS information button
3	Implement status text items
4	implement tab
5	Implement steering engage button

These new features are described in greater detail below.

Implement lightbar

When implement steering is enabled, a second, smaller lightbar appears below the main lightbar.

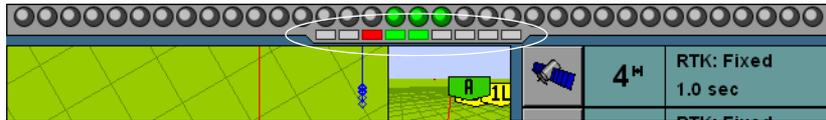


Figure 11.4 The second lightbar

This lightbar shows the implement guidance relative to the guidance line. Each LED on the second lightbar represents 1 inch.

Implement status text items

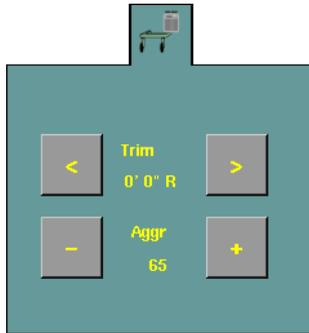
A number of status text items provide information about the implement. For more information, see page 95.

These status text items can be set to appear permanently at the top of the screen or on a slide-out tab. The following items can also be viewed by tapping the corrections status button at the top right of the screen:

- Implement GPS Status
- Implement Correction Type
- Implement Correction Age
- Latitude
- Longitude
- Altitude
- Satellites
- HDOP
- VDOP
- Network ID

Implement tab

When the TrueTracker plugin is installed, the TrueTracker tab becomes available on the main run screen.



The TrueTracker tab enables you to adjust the implement steering independently of the vehicle steering. For example, if you can see that the implement is consistently to one side of the guidance line but the vehicle is correctly online, you can apply Trim to the implement to correct it.

***Note** – If the implement is consistently offline, there may be a roll calibration issue. Recheck the roll calibration.*

Engage button

When implement steering is enabled, the **Engage** button changes state. It has two status indicators:

- The main button color, which represents vehicle steering
- The small inner color, which represents implement steering

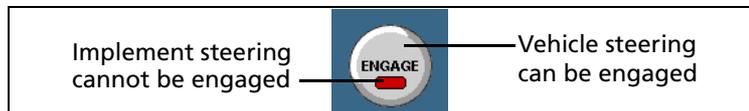


Figure 11.5 Two status indicators on the Engage button

Configuring the Engage button

The **Engage** button can be configured to work in two different ways:

Item	Description
Single press	The Engage button engages with one tap: <ul style="list-style-type: none">– The first tap engages implement and vehicle steering– The second tap disengages automated steering
Two-stage press	The Engage button requires two taps to engage: <ul style="list-style-type: none">– The first tap engages implement steering– The second tap engages the vehicle steering– The third tap disengages automated steering

To configure how the **Engage** button works, see [Step 3. Configuring the implement controller, page 231](#).

The EZ-Boom Plugin

In this chapter:

- [AgGPS EZ-Boom 2010 automated application control system](#)
- [EZ-Boom tab](#)
- [Additional information about the EZ-Boom system](#)
- [EZ-Boom system implement diagnostics](#)
- [Controlling an application device with the EZ-Boom controller](#)
- [Updating the firmware on the EZ-Boom controller](#)

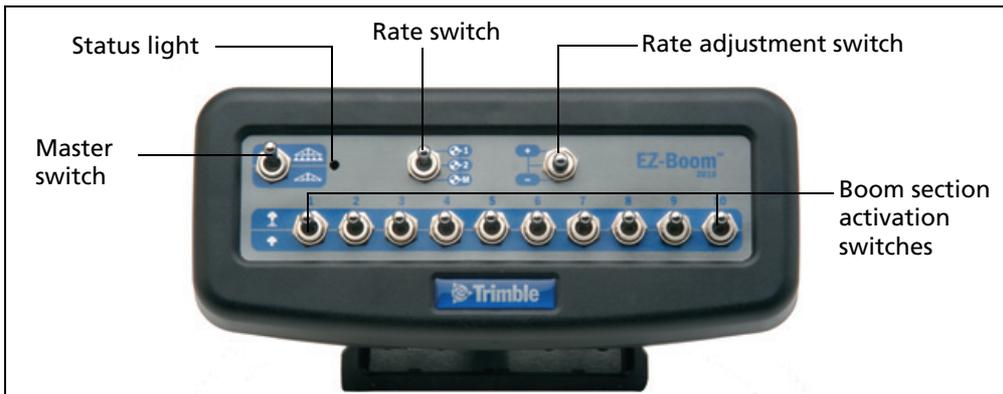
This chapter describes how to configure the EZ-Boom 2010 automated application control system to work with the AgGPS FieldManager display to provide sprayer boom switching and rate control.

***Note** – You can only install one variable rate control plug at once. You cannot run the Serial Rate Control plugin or the Multi-Application Control plugin at the same time as the EZ-Boom plugin.*

AgGPS EZ-Boom 2010 automated application control system

The AgGPS EZ-Boom® 2010 automated application control system is a variable rate and automated boom switch controller. It enables you to control application rate sprayers, on either self-propelled vehicles or towed sprayers.

This figure shows the front panel of the EZ-Boom controller:



Installing the EZ-Boom controller

For information on installing the EZ-Boom controller, refer to the *AgGPS EZ-Boom 2010 Automated Application Control System Getting Started Guide*.

Connecting the EZ-Boom system

To connect the EZ-Boom system to the Field Manager display:

1. Connect the FieldManager display.
2. Attach the EZ-Boom controller to the dash. Use the provided bracket.

3. Connect the 28-pin AMP plug on the Autopilot harness to the FieldManager display.
4. Connect the EZ-Boom CAN cable (P/N 59873) to P3 on the Autopilot harness and to the Deutsch socket on the back of the EZ-Boom controller.



5. Connect the terminator extension to the CAN extension.

Note – To connect the EZ-Boom controller to the FieldManager display, you require the Autopilot harness (P/N 59872). The version of the harness that was shipped with the FieldManager display v1.00 and v1.2.3 is **not** compatible. To obtain an Autopilot harness (P/N 59872), contact your local Trimble reseller.

Note – To unlock an EZ-Boom controller for use, see [Entering the password to activate a plugin, page 78](#).

Configuring the EZ-Boom system

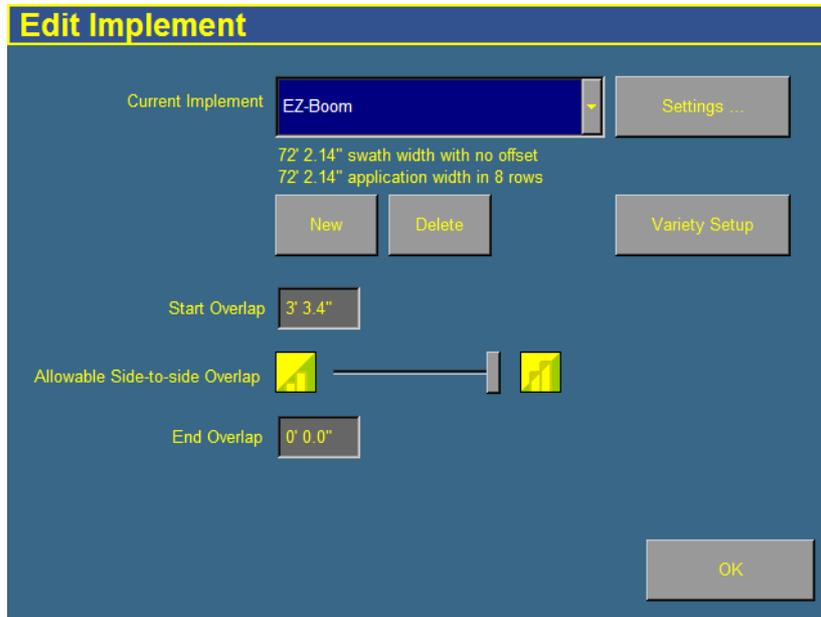
To use the EZ-Boom controller to operate a spray boom:

1. Configure the spray boom in the FieldManager display.
2. Enable the EZ-Boom plugin in the FieldManager display.
3. Configure the EZ-Boom system settings.
4. Calibrate the valve.
5. Calibrate the flow meter.
6. Calibrate the pressure sensor.

These steps are described in greater detail below.

Step 1: Configuring the spray boom (in the FieldManager display)

When you configure an implement with the EZ-Boom or the Multi-Application Control plugin installed, additional options appear on the *Edit Implement* screen.



1. From the *Configuration* screen, tap **Implement Setup**. The *Edit Implement* screen appears.
2. Adjust the *Overlap Threshold* slider.

If a section turns off when you are crossing a diagonal covered ground, there will need to be some overlap or some skip. Use this slider to select your preference.

- To ensure that there is no coverage double-up, move the slider fully to the left. This will result in some uncovered ground.

- To ensure that the system does not skip any ground, move the slider fully to the right. This will result in some double-up.
 - To have an even share of overlap and skip, move the slider to the middle.
3. Set the *Start Overlap* value. In some cases, you may want to begin applying material some distance before you reach uncovered ground to ensure that you cover all of the ground. The *Start Overlap* setting is the distance before uncovered ground that the implement will begin operating. A positive value causes overlap and a negative value causes skip.
 4. Set the *End Overlap* value. In some cases, you may want to stop applying some distance after you reach covered ground to ensure that you cover all of the ground. The *End Overlap* setting is the distance after covered ground that the implement will stop applying. A positive value causes overlap and a negative value causes skip.
 5. Configure the rest of the implement settings as described in [Chapter 6, Implement Configuration](#).

Step 2: Enabling the EZ-Boom plugin (in the FieldManager display)

Note – If you need to unlock the EZ-Boom controller for use, see [Entering the password to activate a plugin, page 78](#).

Step 3: Configuring the EZ-Boom system settings

- From the *Configuration* screen, select the EZ-Boom plugin and then tap **Setup**. The *EZ-Boom Setup* screen appears:

EZ-Boom Setup

Boom

Boom Switching: On

Turn Off When Stopped: Yes

Valve On Latency: 0.0 s

Rate

Rate 1 (default): 20.00 gal/a

Rate 2: 18.00 gal/a

Rate Increment: 0.41 gal/a

Tank

Tank Capacity: 0.00 gal

Warning Level: 0.00 gal

Current Volume: 0.00 gal

Manual Flush

Refill Tank

Cancel

OK

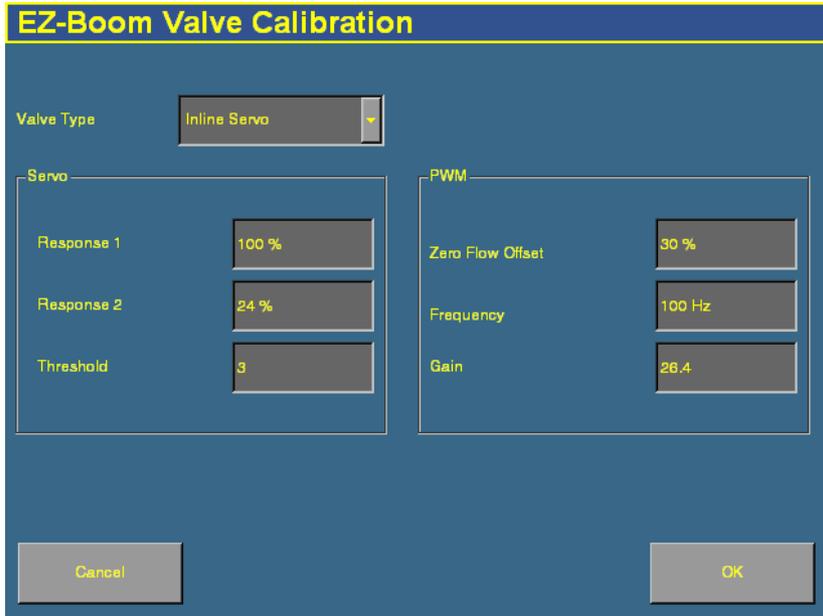
- Set the following options as required:

Option	Description
Boom Switching	To turn off boom switching, set the <i>Boom Switching</i> option to Off. This lets you manually control the boom sections. To use automated boom switching, keep it set to On.
Turn Off When Stopped	If the vehicle is a clutch-operated planter, set this option to No so you can continue planting even when the vehicle is stopped. Otherwise, select Yes.
Valve On Latency	There can be a delay between the time when you send a command to the sprayer and the time when it begins or ends spraying. Set the <i>Valve On Latency</i> setting to the number of seconds that the system takes to respond when a command is sent.
Rate1 (default)	This is the volume that the sprayer supplies when the Rate switch is set to 1.

Option	Description
Rate2	This is the volume that the sprayer supplies when the Rate switch is set to 2.
Rate Increment	When the Rate switch is in the Rate 1 or Rate 2 position, the current application rate increases or decreases by this amount each time you press the Rate adjustment (inc/dec) switch.
Tank Capacity	The capacity of the tank when full.
Warning Level	A warning appears when the calculated solution level reaches this point.
Current Volume	The amount of solution that is currently in the tank. Note – <i>To do a partial refill, just add the amount to the Current Volume.</i>
Manual Flush	Pushes solution through the system at the maximum rate. The tank will flush until either empty or stopped by the user.
Refill Tank	This resets the <i>Current Volume</i> value to the <i>Tank Capacity</i> value.

Step 4: Calibrating the valve

1. From the *Configuration* screen, select the EZ-Boom plugin and then tap **Calibrate**. The *Implement Calibration* screen appears.
2. Tap *Valve Calibration*. The *EZ-Boom Valve Calibration* screen appears:



The image shows the 'EZ-Boom Valve Calibration' screen. At the top, there is a title bar with the text 'EZ-Boom Valve Calibration' in yellow on a dark blue background. Below the title bar, the screen is divided into several sections. On the left, there is a 'Valve Type' dropdown menu with 'Inline Servo' selected. Below this, there is a 'Servo' section with three input fields: 'Response 1' set to '100 %', 'Response 2' set to '24 %', and 'Threshold' set to '3'. On the right, there is a 'PWM' section with three input fields: 'Zero Flow Offset' set to '30 %', 'Frequency' set to '100 Hz', and 'Gain' set to '26.4'. At the bottom of the screen, there are two buttons: 'Cancel' on the left and 'OK' on the right.

3. Select the valve type from the drop-down list:
 - Inline Servo
 - Bypass Servo
 - Pump PWM
 - Pump Servo
 - Pump PWM Ground
 - HARDI
 - None

***Note** – If you have an existing Raven bypass servo system, it may be wired so the valve open and close commands are reversed. The EZ-Boom controller reverses the commands in the software. Either select Inline Servo, or rewire the valve. Some systems have a short crossover cable which can be removed to correct the issue.*

4. If you selected Inline, Bypass, or Pump Servo, enter values in the three text boxes in the Servo group.

Item	Description
Response 1 (%)	The responsiveness of the valve when the application rate is far away from the target rate.
Response 2 (%)	The responsiveness of the valve when the application rate is close to the target rate.
Response Threshold	This ratio is the point at which the application rate is close enough to the target rate for the responsiveness of the valve to switch from <i>Valve Response 1</i> to <i>Valve Response 2</i> .

If you selected Pump PWM or Pump PWM Ground, enter values in the three text boxes in the PWM group.

Item	Description
Zero Flow Offset (%)	The shut-off point of the valve.
Frequency (Hz)	The operating frequency of the valve.
Gain	The sensitivity of the valve.

5. Tap **OK** to return to the *Implement Calibration* screen.

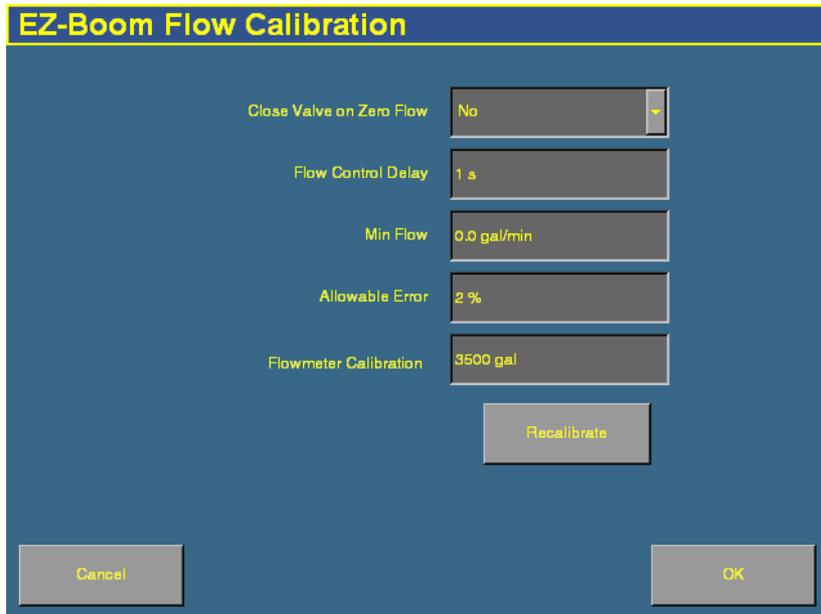
Step 5: Calibrating the flow meter

1. From the *Configuration* screen, select the EZ-Boom plugin and then tap **Calibrate**.

The *Implement Calibration* screen appears. It has a list with three options:

- Flow Calibration
- Valve Calibration
- Pressure Calibration

2. Tap *Flow Calibration*. The *EZ-Boom Flow Calibration* screen appears:



The screenshot shows the 'EZ-Boom Flow Calibration' screen. It has a dark blue background with a yellow title bar at the top. The screen contains several input fields and buttons:

- Close Valve on Zero Flow:** A dropdown menu with 'No' selected.
- Flow Control Delay:** A text input field containing '1 s'.
- Min Flow:** A text input field containing '0.0 gal/min'.
- Allowable Error:** A text input field containing '2 %'.
- Flowmeter Calibration:** A text input field containing '3500 gal'.
- Recalibrate:** A button located below the 'Flowmeter Calibration' field.
- Cancel:** A button at the bottom left.
- OK:** A button at the bottom right.

- Set the Close Valve on Zero Flow drop-down list to Yes or No.

Setting	Description
Yes	The valve will be closed when all the boom sections are closed.
No	The valve will remain in its current position when all the boom sections are closed.

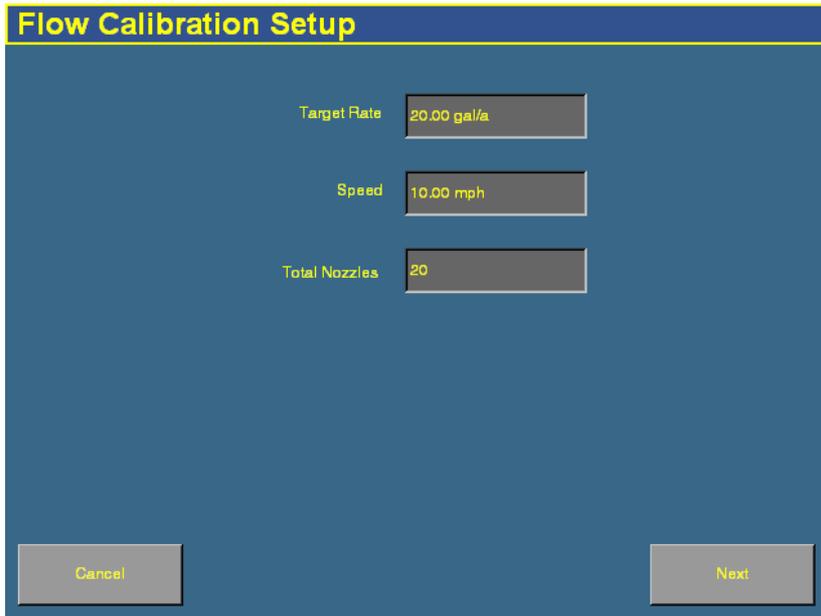
- Enter values in the four text boxes:

Item	Description
Flow Control Delay (s)	How long it takes the system to change rates.
Min Flow (gpm)	The lowest flow rate that the system will allow. If this point is reached, a warning message will appear and the flow control valve will not close any further.
Allowable Error (%)	The level of allowable Rate 1 or Rate 2 error before the control valve adjusts.
Flowmeter Calibration	<ul style="list-style-type: none"> – For a Raven flowmeter, enter the number printed on the flowmeter. – For other makes of flowmeter, multiply the number printed on the flowmeter by 10 and then enter it (for example, if the number on the flowmeter is 75 pulses/gallon, enter 750).

If you are unsatisfied with the performance using the number printed on the flowmeter, run the flowmeter calibration process.

To run the flowmeter calibration:

1. Tap **Recalibrate**. The *Flow Calibration Setup* screen appears.

The image shows a screenshot of the 'Flow Calibration Setup' screen. The title 'Flow Calibration Setup' is at the top in yellow text on a dark blue background. Below the title, there are three input fields: 'Target Rate' with the value '20.00 gal/a', 'Speed' with the value '10.00 mph', and 'Total Nozzles' with the value '20'. At the bottom of the screen, there are two buttons: 'Cancel' on the left and 'Next' on the right, both in yellow text on a dark blue background.

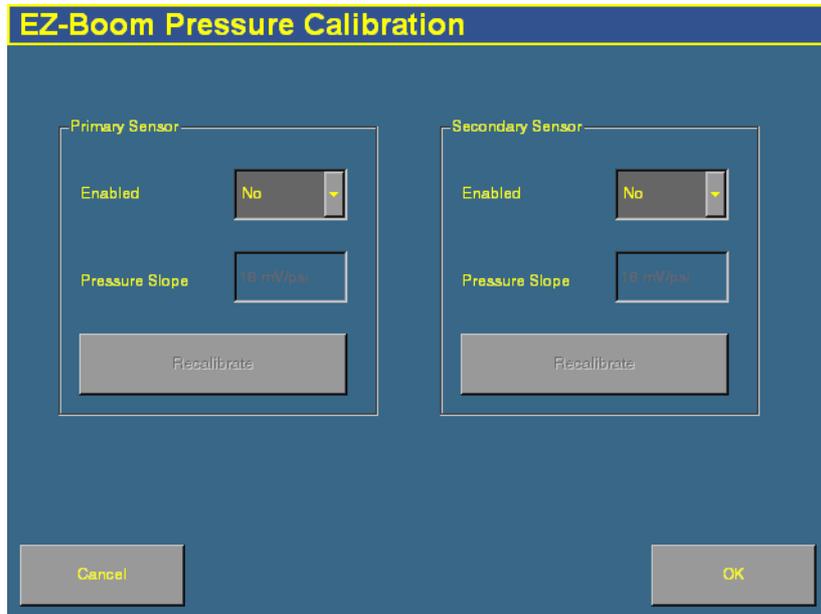
2. Set the *Target Rate* field to your normal operating rate.
3. Set the *Speed* field to your normal operating speed.
4. In the *Total Nozzles* field, enter the total number of nozzles on your spray boom. Do not include any fence nozzles in the nozzle count. (Fence nozzles are nozzles at the far left or right of the boom that point out to the side.)
5. Tap **Next**. The *Flow Calibration Test* screen appears.
6. On the EZ-Boom controller, set the rate switch to Rate 1.

The test requires using a measuring device (for example, a calibration jug) to collect the flow for one minute. To achieve a more accurate result for the spray boom, collect the flow from at least three nozzles by moving the measuring device from one nozzle to the next during the test.

7. Tap **Start Flow** to begin the test.
8. Collect the sample volume for one minute.
Note – You can collect for any length of time you like. A longer sample may produce a more accurate result. However, you must then divide the result to determine the volume per minute.
9. After one minute has passed, stop collecting. Tap **Stop Flow**.
10. Tap **Next**. The *Flow Calibration Result* screen appears.
11. Tap the Measured Flow/Nozzle text box. The *Enter Measured Flow/Nozzle for Calibration* screen appears.
12. Select the units and then enter the volume that you have collected.
13. Tap **OK** and then tap it again.

Step 6: Calibrating the pressure sensor

1. From the *Configuration* screen, select the EZ-Boom plugin and then tap **Calibrate**. The *Implement Calibration* screen appears.
2. Tap *Pressure Calibration*. The *EZ-Boom Pressure Calibration* screen appears:



The image shows the 'EZ-Boom Pressure Calibration' screen. It has a blue background with a yellow title bar at the top. The screen is divided into two main sections: 'Primary Sensor' and 'Secondary Sensor'. Each section contains an 'Enabled' dropdown menu (currently set to 'No'), a 'Pressure Slope' input field (currently set to '10 cm/psi'), and a 'Recalibrate' button. At the bottom of the screen, there are 'Cancel' and 'OK' buttons.

3. Set the *Use Pressure Sensor* drop-down list:
 - If your system does not have a pressure sensor, set both the Enabled options to No. The pressure sensor calibration is complete.
 - If your system only has a primary pressure sensor, set the Enabled option in the Primary Sensor group to Yes and the Enabled option in the Secondary Sensor group to No.
 - If your system has two pressure sensors, set both Enabled options to Yes.

If you selected Yes for the *Enabled* option in the Primary Sensor group, the **Recalibrate** button becomes available.

4. Tap the *Pressure Slope* text box in the Primary Sensor group to enter the value. The pressure slope is the relationship between pressure and the output of the sensor. The default of 16mV/psi is recommended for a Raven pressure sensor.
5. If you enabled the secondary sensor, tap the *Pressure Slope* text box in the Secondary Sensor group to enter the value. The default of 16mV/psi is recommended for a Raven pressure sensor.
6. Tap **Recalibrate** in either group to run the pressure calibration sequence. The *EZ-Boom Pressure Calibration* screen appears. See below.

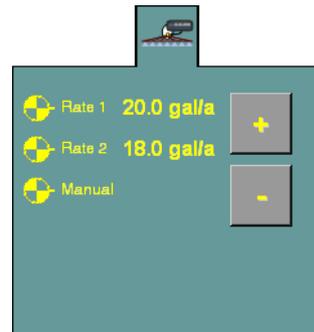
Pressure calibration sequence

1. Read the pressure off the pressure gauge.
2. Enter the pressure value in the *Actual Pressure* text box.
3. Tap **Send Calibration**. The screen updates to show the current pressure.
4. Tap **OK**.

EZ-Boom tab

The EZ-Boom tab is located on the Run screen. It shows your Rate 1, Rate 2, and Manual rates. The rate that is currently active is animated.

The + and - buttons on the EZ-Boom tab enable you to manually increase or decrease the flow. These function the same way as the Rate Adjustment (Inc/Dec) switch on the EZ-Boom controller.



Setting up the EZ-Boom system for automatic section control only

To disable the variable rate control of the EZ-Boom system (and just use the automatic boom-switching function):

1. From the *Configuration* screen, select the EZ-Boom plugin and then tap **Calibrate**. The *Implement Calibration* screen appears.
2. Tap *Valve Calibration*. The *EZ-Boom Valve Calibration* screen appears.
3. Set the *Valve Type* drop-down menu to None.



4. Tap **OK**.

Additional information about the EZ-Boom system

Prescriptions

You can define variable rate controller setup data, and load prescription files that define the rates to be applied in different areas of the field. This information is used to send target rates to the variable rate controller. Applied rates are received from the controller, and both target and applied rates are displayed on the screen. In addition, data relating to the variable rate application may be logged to the card.

The AgGPS FieldManager display can load prescription files created by a Geographic Information System (GIS). The method you use to create the prescription will depend on which GIS package you use.

When you have created the prescription, store either the three prescription files in ESRI shapefile format or the single .gdx file in the `\AgGPS\Prescriptions\` directory. Then, when you are within the proximity criteria, the prescription will be available to load.

When you map a new field or select an existing field, you can also select any shapefile (.shp) or AgInfo GDX (.gdx) prescription file created in AgInfo versions 3.5.44.0 or later, that is within the following limits:

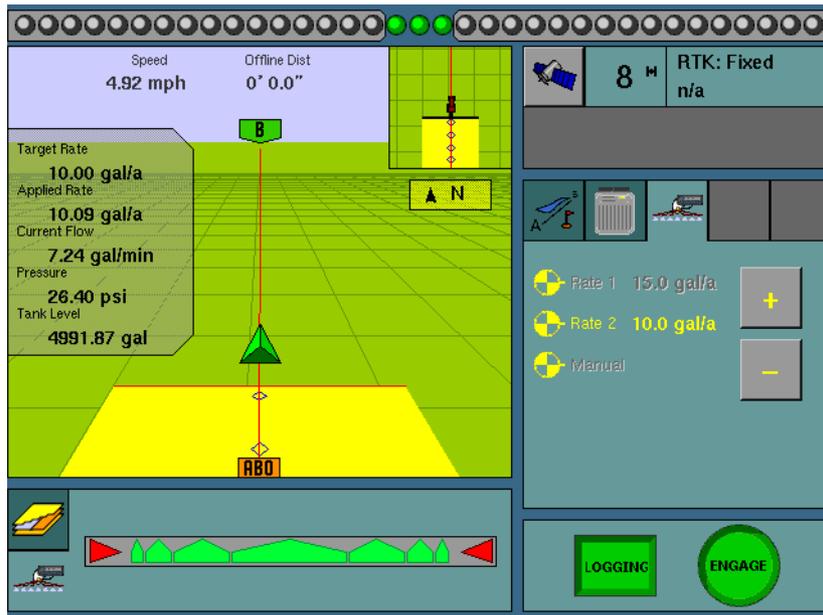
For this type of field ...	Prescriptions must ...
Boundary	overlap the field boundary
AB Line	overlap the AB Line be within 1 km of the field

If you load a shapefile prescription, select the rate column.

If you use complex contoured prescriptions, loading the prescriptions can take some time. The AgGPS FieldManager display shows progress bars while it loads and converts prescriptions.

You can configure the status sliders on the main navigation screen (the Run screen) to display the target rate specified in the prescription file, and the applied rates returned from the controller for the active channel.

When a field is open, a prescription is loaded, and a controller is connected, the target rates (read from the prescription) and applied rates (received from the controller) can be displayed in the status text items. An example with as-applied rates displayed is shown below:



For more information, see [Configuring the status text items, page 95](#).

To load a prescription file:

1. Map a new field or select an existing field.

The AgGPS FieldManager display searches the card for prescription files within the specified limits. If there are a lot of prescriptions on the card, this can take several seconds and a progress bar is displayed.

- If any prescription files are within the specified limits, the *Select Prescription* screen appears:

- From the Available Prescriptions list, select a prescription file.

Note – If an AgInfo GDX prescription has an incorrect format, it will not be listed in the Available Prescriptions list.

- If you select a shapefile prescription, then you must select the correct prescription rate column.



CAUTION – When you select a shapefile prescription, if you choose the wrong column when using a variable rate controller, the applied rate will be incorrect.

If you select an AgInfo GDX prescription, the *Rate Column* box is not displayed.

5. Set the prescription scale factor. If you use a different material that you need to apply more or less of, you can scale the rates by this amount. For example, to apply twice as much, set the scale factor to 2.00.
6. Set the lead time. See below.
7. In the When off prescription use list, select the target rate for when you are outside the area that is covered by the prescription file. See [Last, default, or zero rate, page 283](#).
8. Tap **OK** to load the prescription file.

A prescription only works when the EZ-Boom Rate switch is in the Rate 1 position. When the switch is in the Rate 1 position, the Increment/Decrement switch is disabled.

If the Rate switch is in the Rate 2 position, the prescription is disabled but the Increment/Decrement switch does work.

Controller lead time

Lead-time is the average time required by the controller before it can react to a requested rate change. This value can be defined in the *Select Prescription* screen. For example, a value of 5.0 means that, on average, it takes the controller around five seconds to change from one rate to a new rate.

The lead time value is used by the AgGPS FieldManager display to project the position of the vehicle into the future. The direction and speed of the vehicle are combined with the lead time to project a future position. The target rate at this projected position is sent to the variable rate controller, giving the controller time to reach the desired rate at approximately the same time that the vehicle arrives at the projected position.

It is important that you choose an appropriate lead time. This depends on the controller type and configuration, the type of materials being applied, and the nature and specifications of the delivery equipment.

Last, default, or zero rate

When the vehicle moves outside the area covered by the prescription file, no target rate is available. There are three options for controlling the output rate:

- Continue to use the last rate being output when the vehicle moves off the prescription
- Use a default rate
- Use a zero rate

The desired option can be specified in the *Select Prescription* screen.

Varying the active boom sections

Some variable rate controllers report to the AgGPS FieldManager display which boom sections are active at any given time. For these controllers, the width of the coverage polygons displayed on the Run screen vary according to the currently active boom sections.

The coverage polygons that are logged to the coverage Shape file are identical to those displayed on screen; that is, the logged coverage width is also varied according to the active boom sections.

***Note** – When you use a variable rate controller and are logging, the AgGPS FieldManager display shows the active boom width. This may result in nothing being displayed if all boom sections are off.*

Limitations

Since not all controllers are able to provide information on the active boom sections, the width and placement of the coverage depends on what information is available:

- If the controller provides no information on the active boom sections, then the coverage width will be the *Application Width* as defined in the *Implement Setup* screen.

- If the controller provides information on the total active boom width, but not which boom sections are on or off, then the coverage width will also be the *Application Width*.
- If the controller provides both active width and offset information, then this will be reflected accurately in the coverage drawing.

If you have a non-Trimble variable rate controller with a central boom section that is turned off, and boom sections remain on either side of this central section, this is not reflected in the coverage logging.

Logging variable rate data

Data describing the status of various variable rate parameters is logged to ESRI shapefiles. Positions and associated data are logged at 5 Hz. The FieldManager display logs an average for each polygon, the size of which changes based on a number of tests.

When all boom sections are off, logging is stopped.

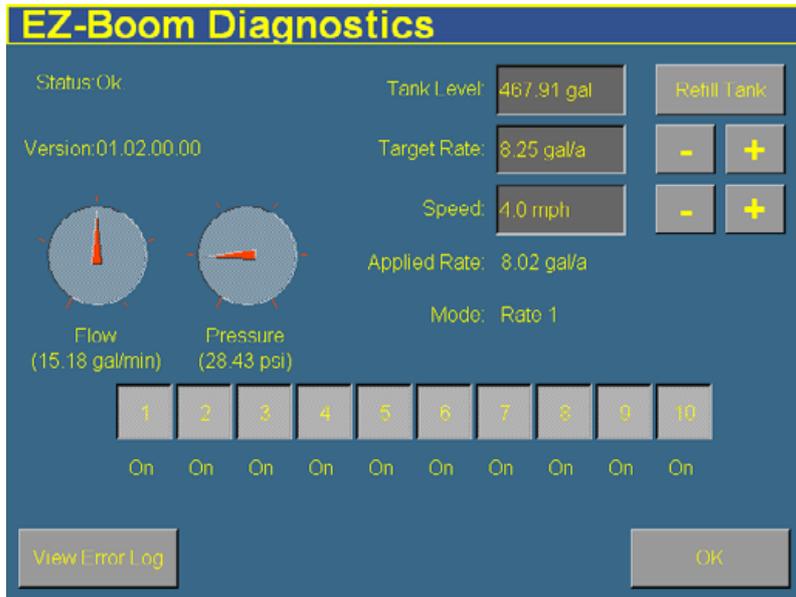
Data is recorded in metric units.

Column	Field description
Version	Coverage attribute file version
GPS_Status	Numeric GPS status value
Status_Txt	GPS status description
Swath	The current swath number when coverage was recorded
Height	Height in meters
DateClosed	Date the polygon was closed
TimeClosed	Time the polygon was closed
Applied_Rate	Applied rate reported by the variable rate controller
Material	See page 162
Material_ID	An index number related to the material

EZ-Boom system implement diagnostics

When an EZ-Boom system is connected, you can view EZ-Boom system diagnostic information:

1. From the *Configuration* screen, select the EZ-Boom plugin and then tap **Diagnostics**. The *EZ-Boom Diagnostics* screen appears.



The *EZ-Boom Diagnostics* screen includes information on:

- current flow
- current pressure
- boom valve state
- EZ-Boom controller version number

It also displays the status of the EZ-Boom controller to ensure it is working as expected.

To check that the system is responding as expected, set the *Target Rate* and *Speed* fields to a fixed known value.

To view previous errors, tap **View Error Log**.

Controlling an application device with the EZ-Boom controller

You can use the EZ-Boom controller to control an application device (a planter, liquid spreader, granular seed, granular fertilizer, or air spreader). This enables you to:

- use automatic boom switching to automatically turn individual seed boxes off and on
- use the EZ-Boom controller switches to manually turn individual seed boxes off and on

For more information, see [The Multi-Application Control Plugin](#).

Updating the firmware on the EZ-Boom controller

See [Upgrading the EZ-Boom controller or Multi-Application firmware](#), page 557.

The Serial Rate Control Plugin

In this chapter:

- [Non-Trimble variable rate controllers](#)
- [Additional information for non-Trimble variable rate controllers](#)

The FieldManager display can be connected to third-party variable rate controllers manufactured by Flex Air, Raven, Rawson, New Leader, MID-TECH, and DICKEY-john.

This chapter describes how to configure the display for use with these rate controllers.

***Note** – You can only install one variable rate control plug at once. You cannot run the EZ-Boom plugin or the Multi-Application Control plugin at the same time as the Serial Rate Control plugin.*

Non-Trimble variable rate controllers

The AgGPS FieldManager display supports the following non-Trimble variable rate controllers:

Make	Model
Raven	SCS 440, 440DB, 450, 450DB, 460, 660, 661, 700, 710, 750, 760
Rawson	Accu-Plant and Accu-Rate
New Leader	Mark III and Mark IV
MID-TECH	TASC 6000, 6100, 6200, 6300, 6500, 6600
DICKEY-john	PCS, Land Manager I, and Land Manager II
Tyler	Flex-Air

The AgGPS FieldManager display can only send control signals to vary one channel at a time.



Tip – You can only make changes when no field is open.

To use a non-Trimble variable rate controller to operate a spray boom:

1. Install the non-Trimble variable rate controller.
2. Enable the Serial Rate Control plugin.
3. Select the port for the variable rate controller.
4. Configure the spray boom in the FieldManager display.
5. Enable and configure the variable rate controller in the FieldManager display.
6. Configure the variable rate controller.
7. Set any other features of the variable rate controller.

These steps are described in greater detail below.

Step 1. Installing a non-Trimble variable rate controller

Use the hardware provided with your variable rate controller to mount it in the vehicle cab.

To use a variable rate controller you need to connect it to P5–Serial on the Autopilot harness. Your controller may need a special adaptor cable to work correctly. If so, see your local Trimble reseller.

Most controllers will also need to be configured to accept input data from the AgGPS FieldManager display. See the section covering your specific controller for additional instructions below.



Tip – Always make sure that the serial port connector is in place with screws firmly tightened (if available).

Step 2. Enable the Serial Rate Control plugin

For instructions on installing the Serial Rate Control plugin, see [Entering the password to activate a plugin, page 78](#).

Step 3. Configuring the spray boom in the FieldManager display

Configure the spray boom as described in [Chapter 6, Implement Configuration](#).

Step 4. Enabling and configuring the variable rate controller (in the FieldManager display)

1. From the *Configuration* screen, select the Serial Rate Control plugin and then tap **Setup**. The *Edit Variable Rate Controller settings* screen appears:

The screenshot shows the 'Edit Variable Rate Controller settings' dialog. The title bar is yellow with the text 'Edit Variable Rate Controller settings' in blue. The background is dark blue. There are two dropdown menus at the top: 'Flex Air' and 'Port' (set to 'P4 Controller'). Below these are two text boxes: 'Default Rate' (set to '0.00') and 'Step Size' (set to '1.00'). Below these is a text box for 'Active Channel' (set to 'm'). At the bottom, there are two buttons: 'Cancel' and 'OK'.

The text boxes that appear on the screen depend on which controller you selected.

2. Enter the default rate for the controller in the *Default Rate* text box.
3. Enter the lead time in the *Lead Time* field. See [Controller lead time, page 282](#).
4. If the *Active Channel* text box appears, enter the active channel name.
5. When you have entered the settings, tap **OK**.

Step 5. Configuring the variable rate controller

If you have specified a variable rate controller type, the AgGPS FieldManager display initiates communications with the controller each time a field is opened. Communications are terminated when the field is closed.

If the AgGPS FieldManager display cannot communicate with the controller:

- a message is displayed identifying the problem. If the specified controller type has a configurable baud rate, the error message includes details of the baud rate that the AgGPS FieldManager display requires the controller to use.
- the *Applied rate* disappears from the Run screen.
- variable rate logging is suspended while the controller is disconnected.

Mid-Tech

The AgGPS FieldManager display can control all TASC 6X00 series controllers that use the Mid-Tech protocol version 4 (released in June 1998).

If your controller does not support the new protocol, contact your local Mid-Tech dealer for a firmware upgrade for your controller.

The minimum software versions required for the various Mid-Tech controllers are:

Controller	Minimum software version
TASC 6000 series	Version 3.20
TASC 6100 series	Version 1.20
TASC 6200 series	Version 2.60
TASC 6300 series	Version 3.20
TASC 6500 series	Version 2.60
TASC 6600 series	Version 3.20
DataLink	version 5.00

Configuring the controller

To connect the AgGPS FieldManager display to a Mid-Tech controller you need a DataLink interface (Mid-Tech part number 78-05007). This DataLink allows communication with the AgGPS FieldManager display at 19200 baud.

***Note** – You can upgrade the firmware on data links with Mid-Tech PN 406-0069, to enable communication at 19200 baud. Check with your Mid-Tech dealer to determine if an upgrade is necessary.*

The interface has a switch marked *External Enable* and *Local Control*:

- When the switch is set to *External Enable*, the AgGPS FieldManager display can send and receive rates to and from the controller.
- When the switch is set to *Local Control*, the AgGPS FieldManager display can only log the rates received from the controller as the controller ignores any rates that get sent to it.



CAUTION – If you switch the *External Interface / Local Control* switch on the *DataLink Interface* box of a Mid-Tech controller, the changes do not take effect until the variable rate controller is turned off and turned back on again.

Communications

The FieldManager display requires the Mid-Tech controller to be set to 19200 baud for communications.

To configure the controller to 19200 baud:

1. Make sure the controller is turned off.
2. Make sure that all switches and signals are turned OFF (master switch, channel switches, tach, and ground speed).
3. Set the OPERATE / SETUP switch to SETUP.
4. Using the rotary switch, select SCAN.

5. While holding the INC / DEC switch in the DEC position, turn the unit on. (At this stage, the controller may emit a continuous audible tone.)

After the controller has gone through the power-up sequence, the display will display either 9600 or 19200 baud. Every time the DEC switch is now depressed, the rate will toggle to the other baud rate.

6. The rate that is displayed on the display at the time the unit is turned off is the rate that will be saved and used in future sessions—make sure this rate is set to 19200 baud.

Application width

When the AgGPS FieldManager display is connected to a Mid-Tech controller, the AgGPS FieldManager display uses the boom section widths (*boom_cals*) that you set on the controller to determine the application width. The *Application Width* setting in the *Implement Boom Setup* screen is ignored.



Tip – Make sure that boom sections are used sequentially, starting with boom section 1, and make sure that any unused boom section widths are set to zero. Otherwise, the AgGPS FieldManager display may not display the logging correctly.

The controller may not immediately recognize configuration changes, for example, if the switch position of the DataLink interface changes, or if the boom section width changes. If configurations change in this way, turn the variable rate controller off and then back on. This will force it to re-read all settings.

Using the controller

When the controller is used in the field, make sure that the channel that you are using for spraying has its channel switch set to *Alt-Rate*. This tells the controller to accept rates for that channel from the external computer.

If the channel being controlled has its switch set to either the *OFF* or *Rate* position, the rate being sent to the controller by the *AgGPS FieldManager* display will be ignored. If a channel switch other than that the one corresponding to the channel selected is set to the *Alt-Rate* position, then that rate will be set to zero.



CAUTION – With Mid-Tech controllers, if a channel has been set to lbs/ac, any value that is less than 10.0 is interpreted as tons/acre.

The *AgGPS FieldManager* display sends the GPS speed to the Variable Rate Controller. To use GPS speed, you need to configure your controller speed source to GPS.

Raven

To use a Raven controller with an *AgGPS FieldManager* display, the controller must:

- be GPS-ready
- use Raven’s latest communications protocol which was introduced around 1996.

If your controller is not GPS-ready or does not use the latest protocol contact Raven about obtaining an upgrade pack.

To use a Raven controller you need a special adaptor cable (Trimble P/N 40568) to connect from P5 on the *AgGPS FieldManager* display harness to the Raven controller. You can also make your own cable, as shown:

Raven (M)	(F)	Adapter Cable	(F)	(M)	AgGPS FieldManager display
2 RX <--	2	RX <----	TX 3	<--	TX 3
3 TX -->	3	TX ---->	RX 2	-->	RX 2
5 GND ---	5	GND -----	GND 5	---	GND 5
4 DTR -->	4	DTR ---->	CTS 8	-->	CTS 8
8 CTS <--	8	CTS <-+--	RTS 7	<--	RTS 7
6 DSR <--	6	DSR <-'			

This cable is not symmetrical, so each end of the cable must be clearly labeled to show where it should be plugged in.

Configuring the controller

For a Raven controller to operate correctly with an *AgGPS* FieldManager display, the following *Data Menu* settings are required.

Required Data Menu settings

- BAUD 9600
- GPS Inac
- DLOG ON
- TRIG 1
- UNIT sec

Some Raven controllers may forget settings if the power source is disconnected. This will mean that you have to reconfigure the unit.

Application width

When the *AgGPS* FieldManager display is connected to a Raven controller, the total boom section width must be set to match the *Application Width* setting in the *Implement Boom Setup* screen.



CAUTION – The first boom section width set on the Raven controller **must** be greater than 0. If you set it to 0, the *AgGPS* FieldManager display will not communicate with the controller.

The *AgGPS* FieldManager display varies the width of the coverage polygons according to the number of boom sections, but it does not know the **absolute** width of each boom section—it only knows the **relative** width of each boom section with respect to the total boom section width.

When recording coverage polygons, each section is considered to be a percentage of the *Application Width* set in the AgGPS FieldManager display *Implement Boom Setup* screen. For example, if you create an intentional overlap to avoid gaps in the application coverage by making the application width greater than the swath width. This proportionally changes the recorded width of each boom section.

Using the controller

To allow the rates being sent by the AgGPS FieldManager display to be used by the Raven controller, the channel must be either set to Rate 1 (SCS4XX, SCS6XX) or Product X Auto (SCS7XX).

If the controller is set to Rate 2 or Manual, the controller ignores the rates being sent, but the AgGPS FieldManager display still records the applied rates.

Limitations

The baud rate must be 9600 baud. Some older controllers are only capable of 1200 baud. These controllers need to be upgraded.



CAUTION – Some Raven controllers do not support zero rates. If the target rate is zero, and spray is still being applied you need to turn off your boom sections manually.

Rawson and New Leader

The Rawson and New Leader controllers use a nominal flow rate (Yield) and a step size to describe rates.

Set the *Default rate* in the *Edit Variable Rate Controller settings* screen to match the *Yield* value (or nominal flow rate) in the Rawson controller.

Any non-zero rate will be adjusted to the nearest value selectable by the controller. A rate of zero will turn off the hydraulic drive.

If you have a dual-channel Rawson Accu-Rate controller, see page 298.

Configuring the controller

To allow the *AgGPS* FieldManager display to change the rates on the controller, the controller must first be put into GPS mode. (If this is not done, then the *AgGPS* FieldManager display will only log the rates being used).

To put the unit into GPS mode:

1. Turn the controller on.
2. Press the **MODE** button twice.
3. Press the **SET** button to switch the controller between GPS and non-GPS.

Communications

The baud rate used by the controller must set to 9600 baud.

You need to connect the *AgGPS* FieldManager display to the controller via a straight (not null modem) serial cable.

Using the controller

When in GPS mode, the hydraulic drive will only operate when both the switch and the *AgGPS* FieldManager display allow the drive to be on. For the controller to work correctly, the hydraulic drive switch on the controller should be set to the ON position. If for any reason the hydraulic drive needs to be turned off quickly, the machine operator can turn the hydraulic drive off using the switch on the controller.

Non GPS mode

The *AgGPS* FieldManager display sends commands to the controller. If communication cannot be established, it may be because the controller is set to Non GPS mode. A message appears and gives you the option to continue in Non GPS mode.

If the controller is set to Non GPS mode, the *AgGPS FieldManager* display still displays and records as applied rates. If a prescription is loaded, target rates are also displayed for reference, but these are not used by the controller. In this mode rates must be varied manually on the controller.

Loss of communication

In GPS mode, if communication with a Rawson controller is lost, the *AgGPS FieldManager* display does not report an error until you cross into a region of the prescription that specifies a different rate.

In Non GPS mode, the *AgGPS FieldManager* display has no way of knowing when communication with a Rawson controller is lost.

Special note on using a Rawson Accu-Rate controller

The display can only send rates and record coverage for the Rawson Accu-Rate controller for one drive at a time: either Drive A or Drive B.

To correctly send rates to the controller and log coverage based on the drive master switch:

- To operate both Drives, set the drive that is not being controlled by the display to "Non-GPS mode" (see above).
- You must connect the *FieldManager* display Variable Rate cable to the COM port that matches the drive:
 - To control Drive A, connect to COM A.
 - To control Drive B, connect to COM B.
- When you use Drive B, ensure that you set the COM port to COM B. Drive A does not have a configuration for this and will always use COM A.
- Bit 7 Mode (which sends two prescriptions) is not supported by the *FieldManager* display. Configure this setting to OFF.

DICKEY-john

The *AgGPS* FieldManager display can send rates to and receive rates from the following DICKY-john controllers:

- Precision Control System
- Land Manager I
- Land Manager II

Configuring the controller

You need to connect the *AgGPS* FieldManager display to the controller via a null modem cable.

Communications

The baud rate used by the controller must be set to 19200 baud, 8 data bits, 1 stop bit, no parity.

To configure the Land Manager consoles:

1. Make sure the master switch module switch is off.
2. Press **SYSTEM**.
3. Select **CONFIGURATION** and press **ENTER**.
4. Use the arrow keys to get to Serial Port and press **ENTER**.
5. Select **GPS** and press **ENTER**.
6. Select **MODIFY ACTIVE** and press **ENTER**.
7. Use arrow keys to set the baud rate to 19200 and press **ENTER**.
8. Select **SAVE CHANGES** and press **ENTER**.
9. Press **OPERATE** to exit from the setup.

To configure the Precision Control System (PCS) consoles:

1. Press **SYSTEM**.
2. Select **CONFIGURATION MENU**.

3. Select **SERIAL PORT CONFIGURATION**.
4. Set the baud rate to 19200.

Using the controller

If you are using a DICKEY-john controller the prescription must contain rates in gallons per acre or pounds per acre.

You can only control and log rates on channel one on DICKEY-john variable rate controllers.

Flex-Air

The AgGPS FieldManager display can send rates to the Tyler Flex-Air variable rate controller. The controller can have four channels: main, liquid, coapplicator, and supplemental. Rates from all channels are recorded in the variable rate logging .dbf file, but the FieldManager display can only send rates to one channel at a time. This is the active channel.

The Tyler Flex-Air controller uses GPS speed sent by the FieldManager display.

Using the Tyler Flex-Air controller

The *Total_Qty* field in the variable rate logging .dbf file, and the *Avg_Rate* field in the EventHistory .dbf file, record statistics for the active channel. If you want to use these statistics, you should start a new event before changing the active channel.

Application width

You can individually configure the widths of the boom sections on the controller. The FieldManager display draws coverage logging at the width of the sum of all the boom sections. If you turn boom sections off, the FieldManager display varies the width of the coverage polygons according to which boom sections are on.

Step 6. Setting any other features of the variable rate controller

Coverage mapping

The AgGPS FieldManager display receives the applied rate and can also receive the number of active boom sections from a variable rate controller. It does not receive any information about the swath or application width.

To accurately record coverage maps, if your controller does not send the number of active boom sections, make sure that you set the application width to match the agricultural equipment that you are using (for example, the width of the spray boom).

Target and applied rates

The AgGPS FieldManager display can control only a single channel at any one time. This active channel is specified in the *Edit Variable Rate Controller settings* screen. The target and applied rates displayed on the Run screen are specific to this active channel.

Units

Most controllers can be configured to use either US Imperial or metric units of measurement. Each channel can be configured to use different types of units (for example, lb/ac, oz/ac, gal/ac, etc.).

When constructing prescription maps, make sure that the maps use the same units that the controller is configured for.

Alarms

If you want low limit and target rate alarms, you need to set these on the variable rate controller. You can also set a default rate to be used if you go off the prescription or do not have a prescription. For more information, refer to the documentation provided with your variable rate controller.

Additional information for non-Trimble variable rate controllers

Prescriptions

You can define variable rate controller setup data, and load prescription files that define the rates to be applied in different areas of the field. This information is used to send target rates to the variable rate controller. Applied rates are received from the controller, and both target and applied rates are displayed on the screen. In addition, data relating to the variable rate application may be logged to the card.

The information describing prescriptions for the EZ-Boom system also applies to non-Trimble variable rate controllers. See [Additional information about the EZ-Boom system, page 279](#).

The Multi-Application Control Plugin

In this chapter:

- Introduction
- Introduction to flow and application functionality
- Definition of terms
- Benefits of the system
- Installation (all implements)
- Configuration: All models
- Configuring the plugin
- Configuring a planter
- Configuring liquid flow
- Configuring granular seed
- Configuring granular fertilizer
- Configuring anhydrous
- Combining channels
- Calibrating sensors
- Operating a planter or drill
- Operating a sprayer (liquid flow)
- Operating an air seeder (granular seed)
- Operating a spreader (granular fertilizer)
- Operating an anhydrous unit
- Running the system in Monitor-only mode
- Obtaining diagnostics information about the Multi-Application Control device
- Resetting the master module
- Warning messages

Introduction

When the Multi-Application Control plugin is installed, the FieldManager display can control application devices, such as a planter, sprayer, drill, air seeder, spreader, or anhydrous ammonia applicator. This chapter explains how to configure and use the Multi-Application Control plugin.

The configuration and operation differs depending on which implement type you are using. This chapter is broken into 5 parts. See the relevant section that applies to your implement.



CAUTION – Please note that in this chapter, the value “0” represents “disabled”. For example, the *Shut Off Speed* option enables you to set the low speed that will cause the system to shut off. If you set the *Shut Off Speed* to 0, it will not shut off when the value reaches 0. Instead, the *Shut Off Speed* option will be disabled and the multi-application device will not shut off due to a low speed.

You can only install one variable rate control plugin at once. You cannot run the EZ-Boom plugin or the Serial Rate Control plugin when the Multi-Application Control plugin is installed.

Introduction to flow and application functionality

This chapter describes how to use the Multi-Application Control plugin with DICKEY-john components to control the following applications:

Item	Description
Planter	<ul style="list-style-type: none"> • Seed monitoring for up to 148 rows for population or blockage • Seed population, liquid, and granular control of up to 4 products • Accessory monitoring of additional optional sensors (hopper, pressure, and RPM) • Variety tracking • Variable Rate Technology (VRT) for up to 4 products at once • Tru Count air clutch support for turning rows or sections on or off automatically
Drill	<ul style="list-style-type: none"> • Seed monitoring for up to 148 rows for population or blockage • Seed population, liquid, and granular control of up to 4 products • Accessory monitoring of additional optional sensors (hopper, pressure, and RPM) • Variety tracking • Variable Rate Technology (VRT) for up to 4 products at once
Air Seeder	<ul style="list-style-type: none"> • Seed monitoring for up to 148 rows for population or blockage • Seed population, liquid, and granular control of up to 4 products • Accessory monitoring of additional optional sensors (hopper, pressure, and RPM) • Variety tracking • Variable Rate Technology (VRT) for up to 4 products at once
Sprayer	<ul style="list-style-type: none"> • Liquid control of up to 4 products • Accessory monitoring of additional optional sensors (pressure or RPM) • Variable Rate Technology (VRT) for up to 4 products at once • Automatic boom section control for turning sections on or off automatically
Spreader	<ul style="list-style-type: none"> • Granular control of up to 4 products • Accessory monitoring of additional optional sensors (hopper or RPM) • Variable Rate Technology (VRT) for up to 4 products at once
Anhydrous Ammonia (NH ₃) application	<ul style="list-style-type: none"> • Anhydrous ammonia control of up to 2 products • Variable Rate Technology (VRT) for up to 2 products at once

Definition of terms

Planter and drill

A *planter* is traditionally used for planting corn, soybeans, or other crops that require a specific row spacing.



A *drill* is traditionally used for sowing wheat, barley, grass, or other crops that do not require row spacing.

When controlled with the Multi-Application Control plugin, the planter or drill can support up to 4 channels of material at once, enabling you to plant combinations of seed or to plant the seeds with liquid or granular fertilizer.

Air seeder

An *air seeder* also plant seeds, but it uses pressurized air to push seeds from an external seed cart to the planter:



When controlled with the Multi-Application Control plugin, the air seeder can support up to 4 channels of material at once, enabling you to plant combinations of seed or to plant the seeds with liquid, granular fertilizer, or anhydrous ammonia.

Sprayer

You can use a *sprayer* to spray liquids, such as liquid fertilizer and pesticides:



When controlled with the Multi-Application Control plugin, the sprayer can control up to 4 products at once.

Spreader

A *spreader* spreads granular product over the ground:



With the Multi-Application Control plugin, a spreader can control up to 4 channels of product at once.

Anhydrous

The *anhydrous unit* is used to inject anhydrous ammonia (NH₃) into the soil:



Anhydrous ammonia is stored as a liquid in a cooler tank towed behind the vehicle, but because it has a boiling point of -34°C (-29°F), it becomes a gas as soon as it is released. It is injected into the ground as a gas, where it enriches the soil with nitrogen.

With the Multi-Application Control plugin, an anhydrous unit can control up to 2 channels of product at once.

Channel

A *channel* is a product that is being controlled via a control valve with feedback (for example, an application rate sensor or flow meter). A user can either have a seed, granular seed, granular fertilizer, liquid, or anhydrous product type which has different set-up parameters.

Section

A *section* is any number of spray nozzles or rows that are controlled by either a boom section valve or by Tru Count clutches.

A section can be either a single row/nozzle or multiple rows/nozzles depending on how the system is set up.

Row

A **row** is the individual row unit that seed is coming out of on the planter. This can be one section by itself, or belong to a section that is also controlling other rows as well.

Note – The FieldManager display allows for up to 24 rows/sections.

Units of measure

The units of measure differ depending on the type of material:

Type	Unit	Symbol	Description
Seed	Metric	kS/ha	Thousands of seeds per hectare
	US/Imperial	kS/a	Thousands of seeds per acre
Granular seed	Metric	kg/ha	Kilograms of seed per hectare
	US/Imperial	lbs/a	Pounds of seed per acre
Liquid application	Metric	L/ha	Liters per hectare
	US/Imperial	Gal/a	Gallons per acre
Granular fertilizer	Metric	kg/ha	Kilograms of fertilizer per hectare
	US/Imperial	lbs/a	Pounds of fertilizer per acre
Anhydrous	Metric	kg/ha	Kilograms of nitrogen per hectare
	US/Imperial	lbs/a	Pounds of nitrogen per acre

Benefits of the system

Product control

To control the product that is output, the system uses control valves and feedback sensors. This gives you precise control over product application at varying speeds.

The values read by the valves are shown on the display.

Independent row or section switching

Planting, seeding, and application equipment has traditionally been limited to fully on or fully off operation. However, with the following additional components, it is now possible to control individual rows and sections for precise product application:

- the FieldManager display Multi-Application Control plugin
- one or more Tru Count air clutches or boom section valves
- a CSM (Clutch Switch Module) or a BSM (Boom Switching Module)

This gives you 2 additional options:

- manual section or row control via the switches on the CSM or BSM
- automatic boom and/or row switching

This means that if you were to encounter the edge of the field or a waterway, the system would automatically turn off the rows/sections that were going to cover already planted/sprayed ground, and switch them on again when you returned to an area that had not yet been planted/sprayed.

Controlling row/section switching with a CSM or BSM

The CSM or BSM is a control module with a master switch and 6 row/section control switches:



The switches enable you to perform manual section control, or the FieldManager display can use the module to switch sections or rows on and off automatically.

The LEDs show section status, not switch position status. If a section turns off automatically, the light will go off even if the switch is still on.

Note – *The CSM and BSM are only used for planting and spraying applications.*

You can join up to 3 generic switch modules to the control module to provide up to 24 switches. The generic switch modules look similar to the control module, except without the master switch.

You can control one row with each switch, or you can connect more than one row to each switch to control multiple rows at once.

Installation (all implements)

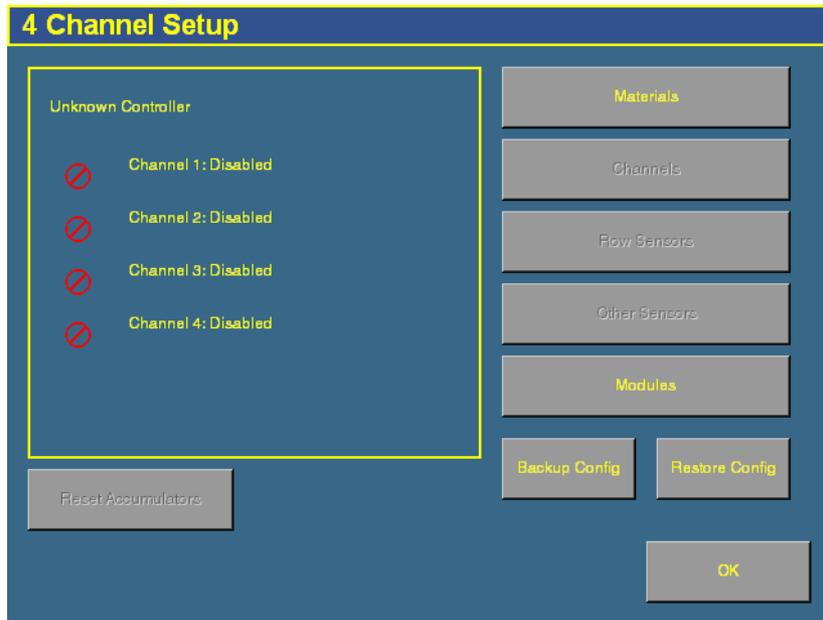
See [Installing key Multi-Application Control components](#), page 49.

Configuration: All models

1. Install the Multi-Application Control plugin. See [Adding or removing a plugin](#), page 76.
2. Configure the implement. This process is the same as for the EZ-Boom plugin. See [Step 1: Configuring the spray boom \(in the FieldManager display\)](#), page 265.

Configuring the plugin

1. From the *Configuration* screen, select the Multi-Application Control plugin and then tap **Setup**. The *4 Channel Setup* screen appears:



The first time that you configure the plugin, the channels will not be set.

2. Configure each of the sections as described below.

Saving a configuration file

You can save your configuration to a file. To do so, tap **Backup Config**.

Reloading a configuration file

When you reload a configuration, it replaces all of the Multi-Application Control plugin settings. To return to your previous settings, you must write-down the settings on each of these pages before you proceed, and then re-enter them later.

Calibration settings are not saved. When you reload a configuration you must write down the calibration parameters or repeat the calibration sequences.

Configuring the modules

The implement is controlled by a **master module** that is usually mounted on the implement. The master module comes in 5 different configurations, depending on the required application:

- Planter/drill
- Air seeder
- Sprayer
- Spreader
- Anhydrous ammonia

The master module stores all of the system settings and can control the following:

Master module type	Supports
Planter	Up to 16 seed sensors (system can support up to 148 with the addition of member modules) Up to 4 control valves and 4 feedback sensors 1 hopper level sensor 1 air pressure or 1 RPM sensor 1 implement lift switch GPS or radar-based speed sources Up to 24 Tru Count clutches (Requires the addition of 3 output modules/harnessing + 4 switch boxes)

Master module type	Supports
Air seeder	Up to 4 control valves and 4 feedback sensors Up to 4 hopper levels sensors Up to 4 air pressure sensors Up to 3 RPM sensors 1 implement lift switch GPS or radar-based speed sources Up to 148 seed sensors with the addition of member modules
Sprayer	Up to 4 control valves and 4 feedback sensors Up to 4 liquid pressure sensors Up to 3 RPM sensors GPS or radar-based speed sensors Up to 24 boom section valves (Required the addition of 4 output modules/harnessing + 4 switch boxes)
Spreader	Up to 4 control valves and 4 feedback sensors Up to 3 hopper level sensors Up to 3 RPM sensors GPS or radar-based speed sources
Anhydrous	Up to 2 servo control valves and 2 feedback sensors 1 implement lift switch GPS or radar-based speed sources

To control more than 16 seed sensors, you can add additional modules called **member modules**. You can have up to 8 member modules, and each member module can control up to 18 seed sensors. This allows up to 148 rows of seed sensors in total (16 + (18 x 8)). The member modules pass information back to the master module. They can be installed anywhere on the implement.

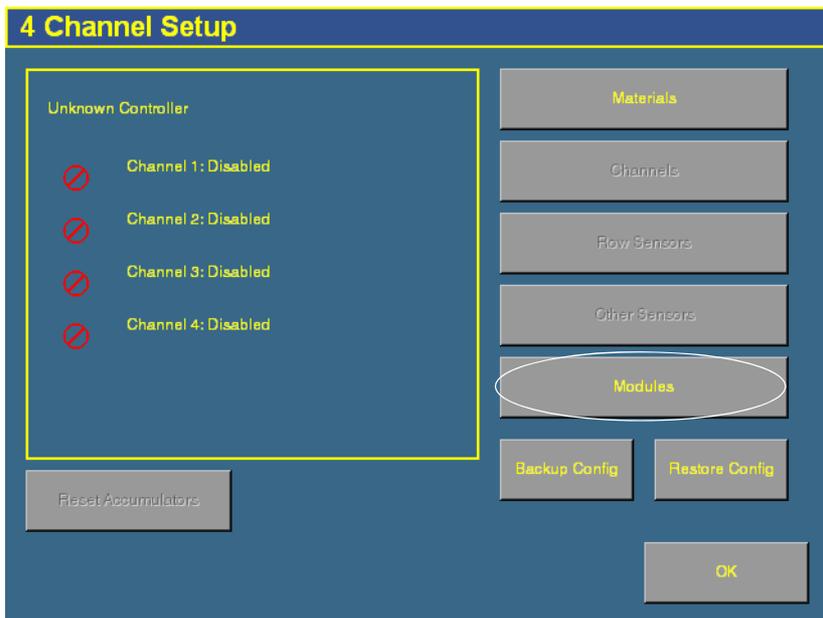
Note – The air seeder **master** module does not accept seed sensors (all seed sensors must connect via the member modules). Therefore, air seeder master modules require a total of 9 member modules to reach the 148 row limit.

You can do either of the following:

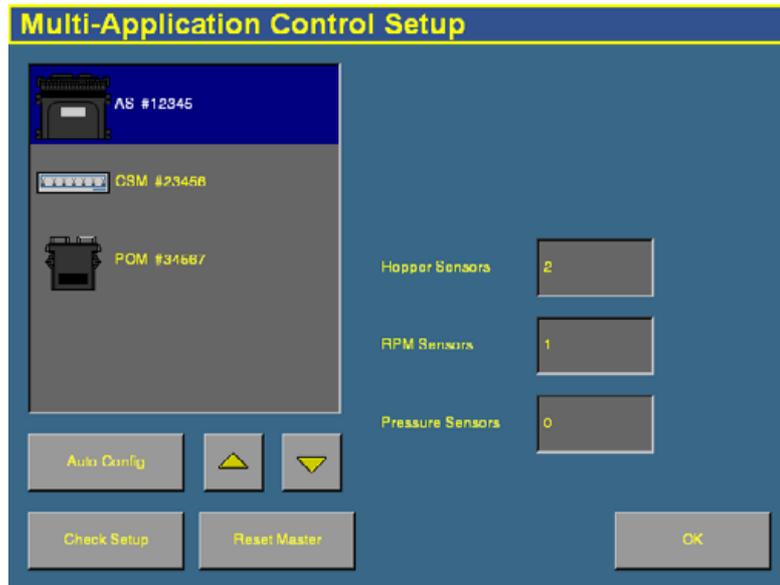
- **Auto Config:** Automatically configure the components that are connected. This will replace any current settings. See below.
- **Check Setup:** Send the current settings to the controller to be checked, see [Checking the module setup, page 321](#).

Auto-configuring the modules

1. From the *4 Channel Setup* screen, tap **Modules**:



The *Multi-Application Control Setup* screen appears:



The system can automatically configure the modules.

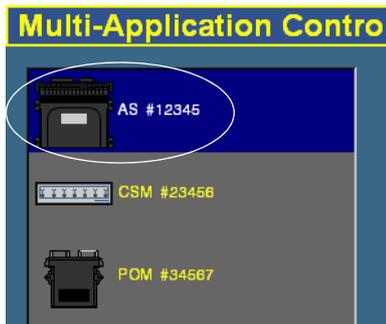
2. Ensure that all sensors are correctly connected to the modules.
3. Tap **Auto Config**. The display automatically detects how many:
 - Master, Member, and Output modules are connected
 - seed sensors are attached to each module
 - hopper sensors are connected to the system
 - pressure sensors are connected to the system
 - RPM sensors are connected to the system
 - switch boxes (BSM: Boom Switch Modules, or CSM: Clutch Switch Modules) are connected to the system

The master module prefix changes to describe which sort you have:

Implement type	Prefix
Planter	PL # xxxxx
Air seeder	AS # xxxxx
Sprayer	SP # xxxxx
Fertilizer spreader	FS # xxxxx
Anhydrous ammonia	AA # xxxxx

The xxxxx number represents the module serial number.

In the following example, the master module is for an air seeder:



4. Ensure that the modules are shown in the list in the order that they are connected to the harness. The master module is not necessarily the first module.

For example, you may have rows 1–8 connected to a member module, while rows 9–16 are connected to the master. The module with rows 1–8 connected would come first in the list due to the row arrangement.



Tip – Trimble recommends ordering the modules both physically and in the software in order of serial number.

To reorder the list of modules, select a module and then tap  or  to move it up or down.

5. Select each module and then ensure that the number of sensors in the *Row Sensors* field is correct. If necessary, edit the number.
6. Select the master module and then select the connected accessory sensor in the Accessory Sensor list:

Item	Description
Disabled	No accessory sensor is connected.
Hopper sensors	The hopper level sensor mounts low in the seed tank or hopper and reports when the seed level drops to that point.
RPM Sensors	The sensor is a fan or shaft RPM sensor. If you select this option, RPM Sensor 1 is enabled in the <i>Other Sensor Setup</i> screen. You must manually configure the sensor there yourself.
Pressure Sensors	The sensor is an air pressure sensor. If you select this option, Pressure Sensor 1 is enabled and automatically configured in the <i>Other Sensor Setup</i> screen.
Liquid pressure sensors	The number of connected liquid pressure sensors is displayed.
Note – You cannot adjust this setting.	

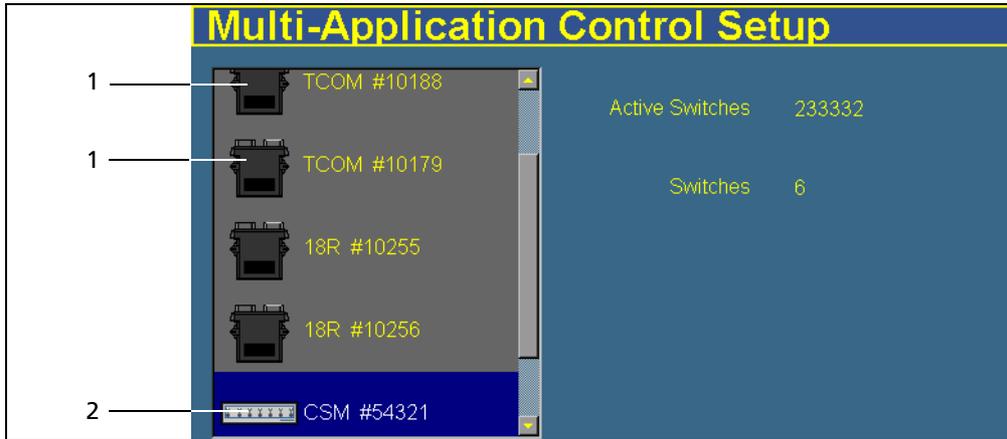
Note – For a planter or drill, you can only have an RPM **or** an air pressure sensor. You cannot have both.

Note – The FieldManager display can show a maximum of 6 sensors on the screen at once.

7. Tap **OK**. The *4 Channel Setup* screen reappears.

Configuring the switch box(es)

Switch boxes enable you to use clutches to switch sections on and off. The system uses TCOM modules (or BOM modules for liquid) to control the switch boxes. The system automatically detects the number of outputs on the attached TCOM modules and then assigns those outputs to the switches available on the attached switch box(es):



Item	Description
1	Automatically detected TCOM modules (or BOM modules for liquid)
2	CSM (switch box) (BSM for liquid distribution)

In the example above, the system has detected 16 outputs on the TCOM modules and 6 switches on the available CSM. On the CSM configuration screen, those 16 outputs are assigned to the 6 switches.

The first and last switches only control 2 outputs, while the middle switches control 3 outputs. Where possible, the system assigns fewer outputs to the first and last switch so the left and right sections that are most likely to turn on or off during overlap affect less of the width.

Switch box and module configuration is completed automatically. It is not adjustable.

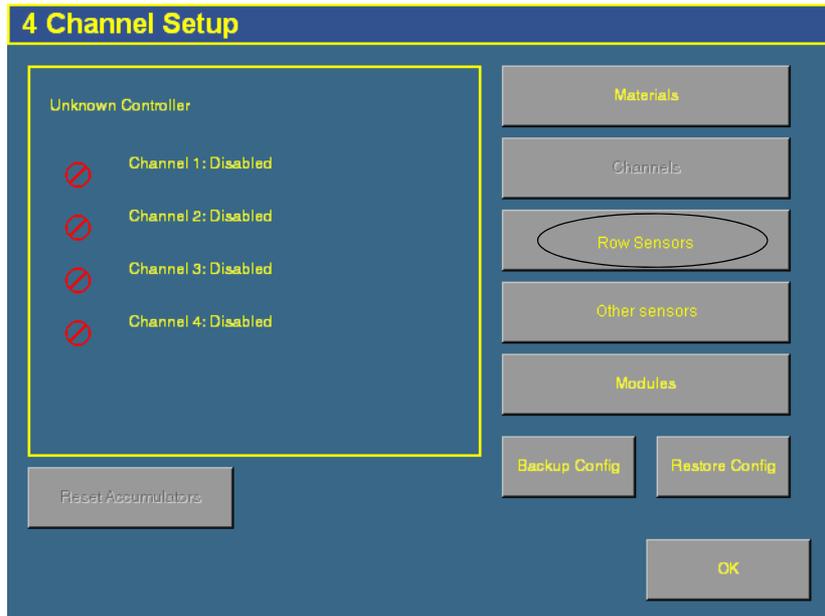
Checking the module setup

To send the current settings to the controller to check if they are correct, tap **Check Setup**.

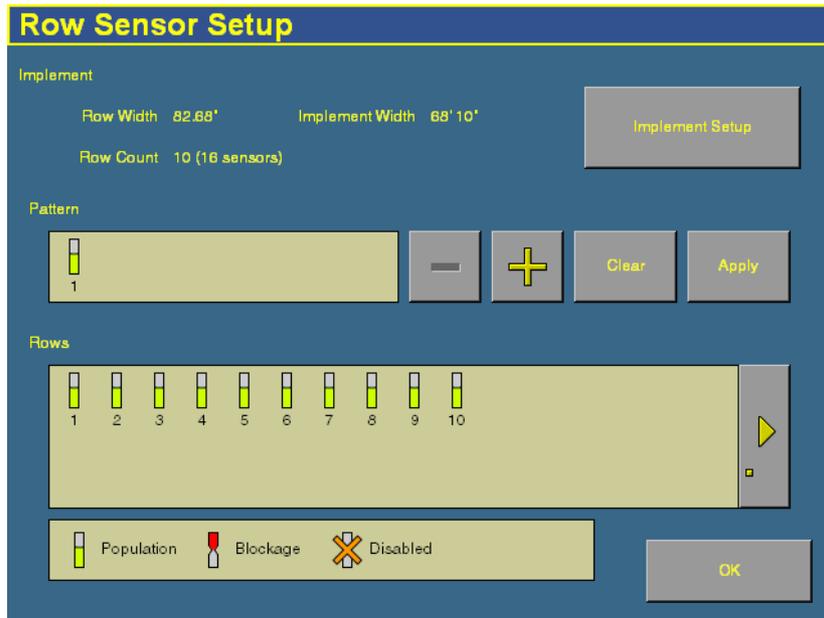
If necessary, from the *Multi-Application Control Setup* screen, you can reset the master module. For more information, see [Resetting the master module, page 456](#).

Configuring the row sensors on Planter/drill and air seeder modules

1. From the *4 Channel Setup* screen, tap **Row Sensors**:



2. The *Row Sensor Setup* screen appears:



This screen enables you to configure the sensors on the planter, drill, or air seeder rows. You can enable up to 148 rows.

The information at the top of the screen shows:

- The row width
- The implement width
- The row count (based on the number of rows set in the implement setup)
- The number of sensors (based on the total number of sensors controlled by all the modules, as defined in the module setup)

3. Tap **Implement Setup** to configure the implement, if necessary.

4. Set the rows. There are 4 possible settings for a sensor:

Heading	Appearance	Description
Population (ON)		The sensor is configured as a population or Hi Rate sensor that has the ability to count each seed as it passes the sensor. Note – To utilize this option, a Hi Rate/population style seed sensor must be installed on the planter, drill, or air seeder.
Blockage (ON)		The sensor is configured as a blockage type sensor that has the ability to detect seed passing by the sensor. When this option is selected, the user is notified when there is a blockage on a specific row; This style of seed sensor is not accurate enough to provide population information. Note – To utilize this option, a blockage style seed sensor must be installed on the planter, drill, or air seeder.
Disabled (OFF)		The row is disabled
Absent		The sensor is not there. Note – This setting is not selectable. It is automatically assigned by the system if it does not detect a sensor.

There are two ways to set the row sensors:

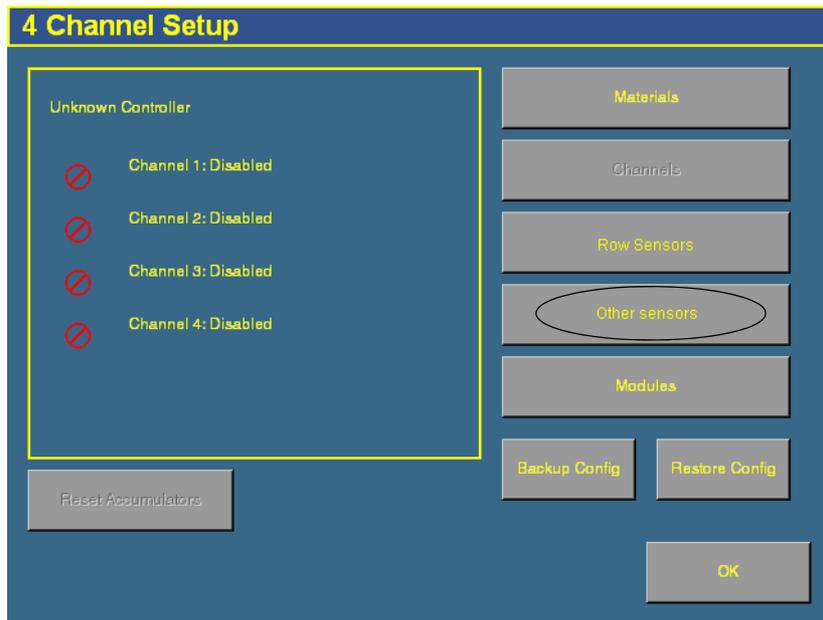
- You can use the Pattern group to apply a repeating pattern to the sensors. Tap **+** to add or **-** to remove a sensor until you have the correct number of sensors for the repeating pattern and then tap each sensor to adjust its setting. When the pattern is complete, tap **Apply**. The pattern you have entered will be applied to all sensors. To clear an existing pattern and start again, tap **Clear**.
- You can adjust each sensor in the Rows group by tapping it. To access additional sensors, tap .

5. Tap **OK**.

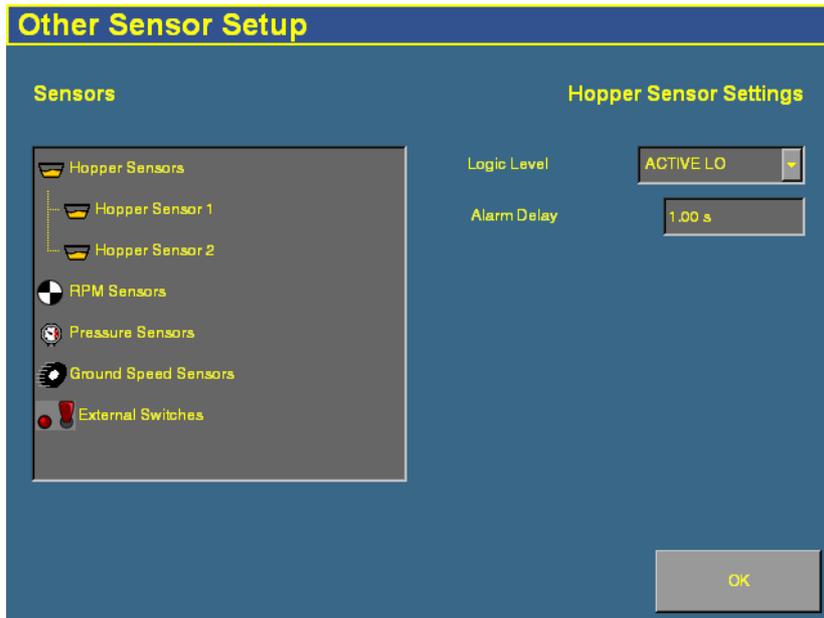


Other sensors

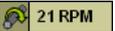
1. From the *4 Channel Setup* screen, tap **Other Sensors**:



The *Other Sensor Setup* screen appears:



There are 5 different types of sensor you can connect:

Sensor type	Description
Hopper Sensor 	A hopper sensor mounts inside a tank/bin and reports when that tank/bin is empty. The hopper sensor does not report the current level of the tank/bin – it reports when the product level drops below where the sensor is mounted. To monitor current tank levels, see Material accumulator, page 417 .
RPM Sensor 	An RPM sensor monitors the speed of a shaft in an implement. It measures the number of shaft rotations per minute.
Pressure Sensor 	There are two types of pressure sensors that can be connected to the system: <ul style="list-style-type: none"> • An air pressure sensor measures the air or vacuum pressure within a tank for implements that utilize air to move product. • A liquid pressure sensor can be used in spraying applications to measure the liquid pressure at a given point within the system.

Sensor type	Description
Ground Speed Sensor	There are 3 different types of ground speed sensors: <ul style="list-style-type: none"> • GPS • Radar • Manual input
External switch	The system can support 2 external switches: <ul style="list-style-type: none"> • a master switch that turns on or off operation (required) • an implement lift switch that turns on or off operation, depending on implement position

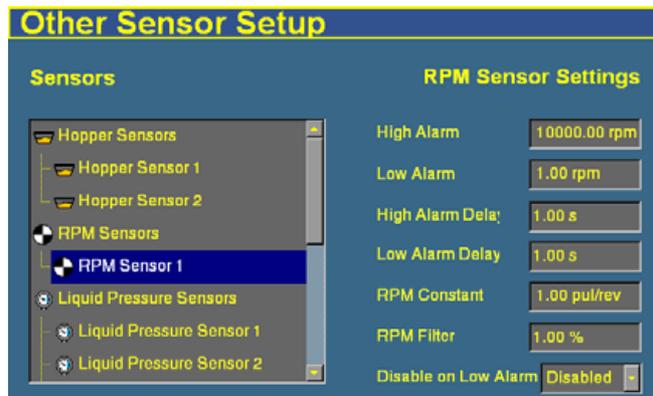
- If a hopper sensor is connected, set the following settings:

Setting	Description
Logic Level	A hopper sensor either outputs a low condition when active or a high condition when active. Select the appropriate setting for your sensor: ACTIVE LO – An alarm is triggered when the sensor’s output is in a low state. Use this setting if the connected sensor outputs a low condition when active. ACTIVE HIGH – An alarm is triggered when the sensor’s output is in a high state. Use this setting if the connected sensor outputs a high condition when active. Note – If the sensor is a DICKY-john Hopper Level sensor, set the logic level to ACTIVE LO.
Alarm Delay	When a hopper alarm is triggered, the system will wait for this length of time before reporting it. This can be useful for filtering out occasions when the alarm is momentarily triggered. The value is entered in seconds.



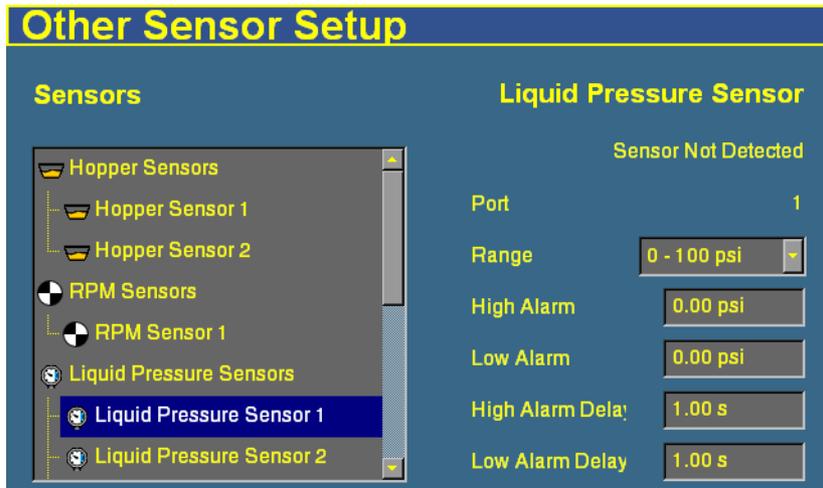
- If an RPM sensor is connected, set the following settings:

Setting	Description
High Alarm	If the RPM sensor detects a shaft RPM that is higher than this, a warning appears.
Low Alarm	If the RPM sensor detects a shaft RPM that is lower than this, a warning appears.
High Alarm Delay	You can set a delay so momentary changes in shaft RPM speed do not trigger the warning. The High Alarm warning will not appear until the <i>High Alarm</i> limit has been reached for this length of time.
Low Alarm Delay	You can set a delay so momentary changes in shaft RPM speed do not trigger the warning. The Low Alarm warning will not appear until the <i>Low Alarm</i> limit has been reached for this length of time.
RPM Constant	This is the number of pulses that the shaft speed sensor generates in 1 revolution of the monitored shaft. This is typically the number of teeth (sense points) on the gear attached to the monitored shaft. For example, for a gear with 12 teeth, enter 12.00 . If the sense gear is not directly attached to the monitored shaft, enter 0.01 . To disable the Shaft Speed function, enter 0.00 .
RPM Filter	The RPM filter value applies a filter to the signal from the RPM sensor. Typically no filtering is required so the standard value is set at 0%. If the RPM readout on the Run screen oscillates in excess of 10%, increase the filter value to filter the signal to reduce the oscillation. For a true RPM value, this number should be set to 0%.
Disable on Low Alarm	ENABLED – All of the control channels will shut down if the RPM value of the selected sensor falls below the <i>Low Alarm</i> value. DISABLED – Disables the function. The control channels will continue to operate normally regardless of the RPM value.



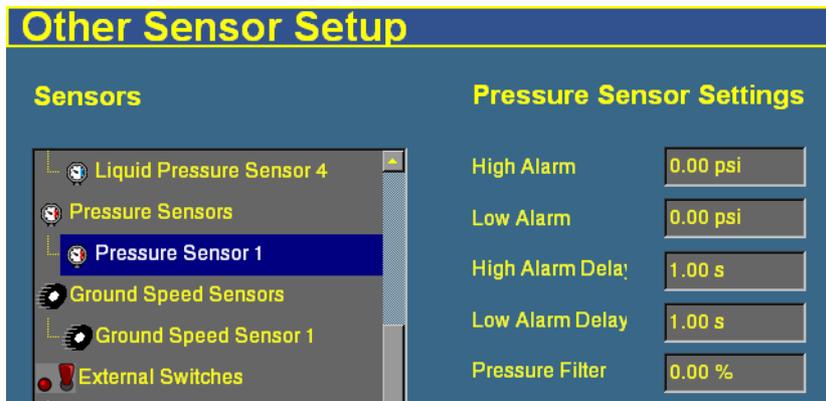
4. If a liquid pressure sensor is connected, set the following settings:

Setting	Description
Range	The pressure range that the sensor is capable of. Select DISABLED to disable the sensor.
High Alarm	If the liquid pressure sensor detects a pressure that is higher than this, a warning appears.
Low Alarm	If the liquid pressure sensor detects a pressure that is lower than this, a warning appears.
High Alarm Delay	You can set a delay so momentary changes in pressure do not trigger the warning. The High Alarm warning will not appear until the <i>High Alarm</i> limit has been reached for this length of time.
Low Alarm Delay	You can set a delay so momentary changes in pressure do not trigger the warning. The Low Alarm warning will not appear until the <i>Low Alarm</i> limit has been reached for this length of time.



5. If an air pressure sensor is connected, set the following settings:

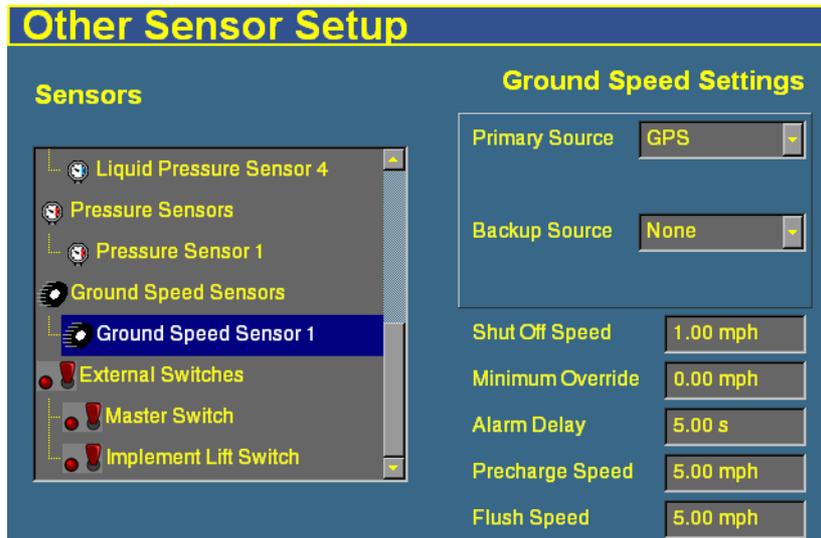
Setting	Description
High Alarm	If the pressure sensor detects a pressure that is higher than this, a warning appears.
Low Alarm	If the pressure sensor detects a pressure that is lower than this, a warning appears.
High Alarm Delay	You can set a delay so momentary changes in pressure do not trigger the warning. The High Alarm warning will not appear until the <i>High Alarm</i> limit has been reached for this length of time.
Low Alarm Delay	You can set a delay so momentary changes in pressure do not trigger the warning. The Low Alarm warning will not appear until the <i>Low Alarm</i> limit has been reached for this length of time.
Pressure Filter	The <i>Pressure Filter</i> value applies a filter to the signal from the pressure sensor. Typically no filtering is required so the standard value is set at 0%. If the pressure readout on the Run screen oscillates in excess of 10%, increase the filter value to filter the signal to reduce the oscillation. For a true pressure value, this number should be set to 0%.



6. If a ground speed sensor is connected, set the following settings:

Setting	Description
Primary Source	<p>The primary source of ground speed information:</p> <ul style="list-style-type: none"> • CAN ground – A radar/digital (3-wire) sensor is connected to the cab harness or a radar/forward ground speed sensor is connected to the CAN bus. • Digital Freq – A radar/digital (3-wire) sensor provides ground speed data through the 4 Channel Control (actuator) harness. • Reluct Freq – A reluctance (2-wire) sensor provides ground speed data through the 4 Channel Control (actuator) harness. • User Manual – Sets the system to operate using an internally generated ground speed. No ground speed sensor is required when using the <i>User Manual</i> setting. • GPS – Speed information is provided by the GPS system.
Backup Source	<p>(Only available when the Primary Source is set to GPS)</p> <p>This is the secondary source of ground speed information:</p> <ul style="list-style-type: none"> • CAN ground – Used when ground speed is provided by a radar/digital (3-wire) type sensor connected to the cab harness or if radar/forward ground speed is available on the CAN bus. • Digital Freq – Used when ground speed is provided by a radar/digital (3-wire) type sensor connected to the 4 Channel Control (actuator) harness. • Reluct Freq – Used when ground speed is provided by a reluctance (2-wire) type sensor connected to the 4 Channel Control (actuator) harness. • User Manual – Sets the system to operate using an internally generated ground speed. No ground speed sensor is required when using the <i>User Manual</i> setting.
Speed Constant	<p>(Only available when the Primary or Backup Source is set to CAN Ground, Digital Freq, or Reluct Freq)</p> <p>The constant required to convert the sensor data to the correct value. This is the number of pulses the sensor makes over a 400 ft distance. To calibrate this, see Ground speed constant, page 392.</p>
Manual Speed	<p>(Only available when the Primary or Backup Source is set to User Manual)</p> <p>The speed at which you wish the control channel to run to if GPS- or Radar-based speed is not available. The control system will simulate the manual speed entered independent of your actual speed.</p>
Shut Off Speed	<p>(Not available when the Primary Source is set to User Manual)</p> <p>The low speed that will cause the system to shut off.</p>

Setting	Description
Minimum Override	(Not available when the Primary Source is set to User Manual) When the vehicle ground speed drops below this level, the minimum override takes over and runs the system at this speed until the vehicle ground speed rises above this level or drops below the Shut Off Speed value and stops altogether.
Alarm Delay	(Not available when the Primary Source is set to User Manual) When the ground speed drops to 0 but seed flow continues, the alarm will trigger after this delay. This alarm only triggers when all control channels are disabled and the system is running in a planter monitor only mode.
Precharge Speed	Precharging is rotating the planter disk so it is full of seed when you begin planting. This setting is the ground speed that the system will use when you perform a precharge while the vehicle is moving. (0 = Off).
Flush Speed	For Flush mode to work, the vehicle must not be moving. However, the system will flush solution as if the vehicle is traveling at this speed.



Configuring an external switch

A *master switch* is a switch installed in the vehicle cab that enables you to turn the implement on or off. A master switch is required for all applications. To calibrate it:

1. On the *Other Sensor Setup* screen, select Master Switch from the Sensors list.
2. From the Switch Status list, select Installed.
3. Set the *Timeout* value in seconds. When the vehicle ground speed drops to 0 and the master switch remains on, the system waits for this length of time and then stops operation. You must turn the Master switch off and on again to restart operation.

The optional implement lift switch provides On/Off control based on implement position. To enable it:

1. Select Implement Lift Switch from the Sensors list.
2. From the Switch Status list, select Enabled.
3. Tap **OK** and then **OK** again.

Continuing the configuration

The rest of the configuration process differs depending on the type of implement that the plugin will control:

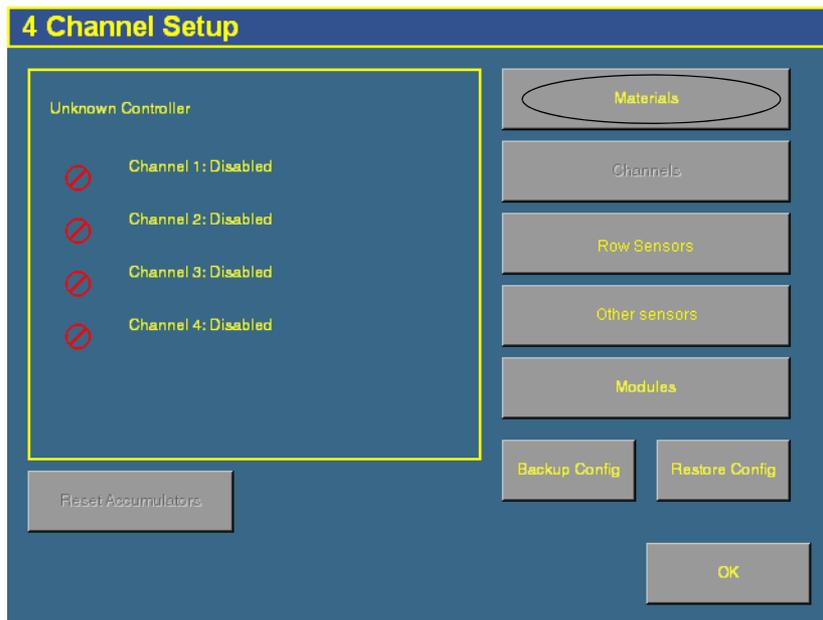
To configure a...	See...
planter (seed)	Configuring a planter, page 334
liquid flow	Configuring liquid flow, page 346
drill or air seeder (granular seed)	Configuring granular seed, page 358
granular fertilizer/ material	Configuring granular fertilizer, page 370
anhydrous	Configuring anhydrous, page 380

Configuring a planter

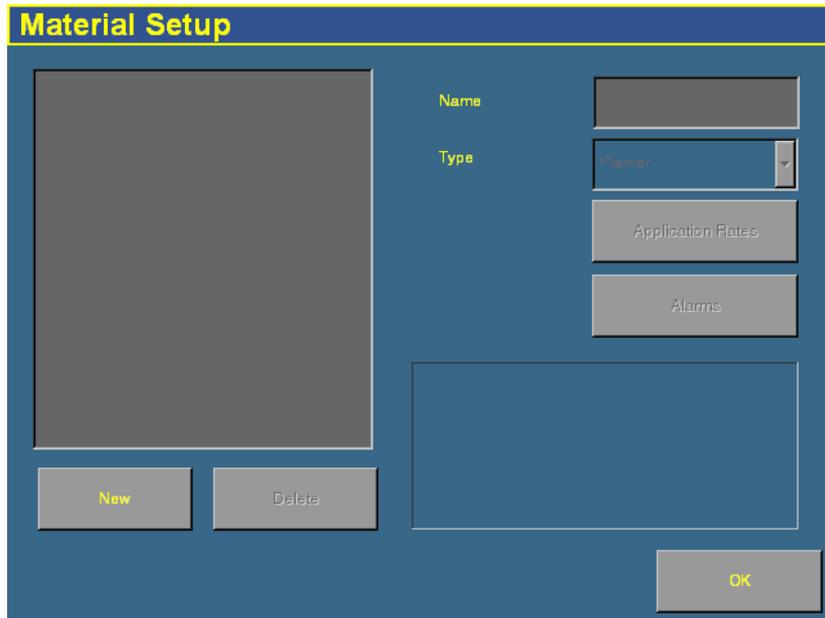
Entering materials

At this stage of the setup, enter the materials that the planter will be applying. This may include different types of seed, liquid, or granular fertilizer.

1. From the *4 Channel Setup* screen, tap **Materials**:



- The *Material Setup* screen appears:



- Tap **New**. The *Enter material name* screen appears.
- Tap **CLEAR** and then enter a name that describes the material.
- Tap **OK**. The *Material Setup* screen reappears with the new material in the list on the left of the screen.
- In the *Type* list on the right of the screen, select the type of material. The icon beside the material name changes to reflect the type:

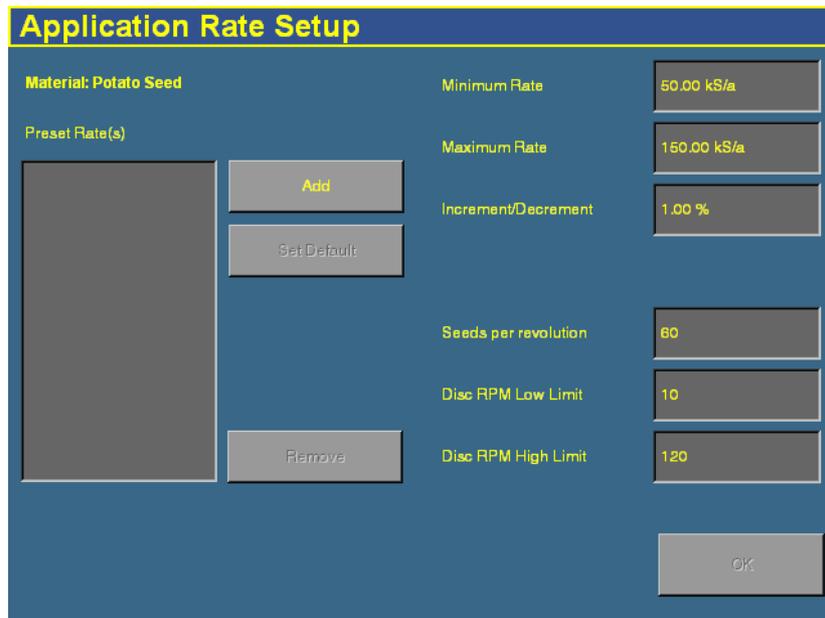


Product	Select...	Icon
Seed	Planter	
Liquid	Liquid Flow	

Product	Select...	Icon
Granular seed	Granular Seed	
Granular fertilizer	Granular Fertilizer	

Note – It is important that you select the correct type, as this determines which options you see later in the setup process.

7. Tap **Application Rates**. The *Application Rate Setup* screen appears:



Seed planting rates are measured in the following units:

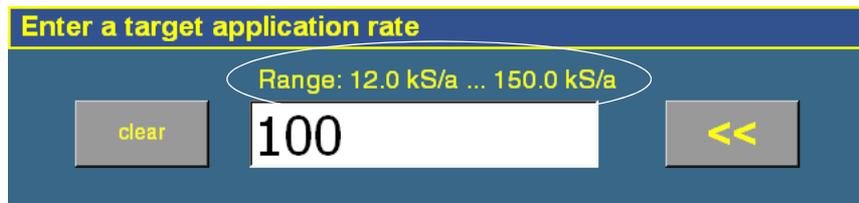
Unit	Symbol	Description
Metric	kS/a	Thousand seeds per hectare
US/Imperial	kS/ha	Thousand seeds per acre

8. Enter the following values:

Item	Description
Minimum Rate	The minimum preset rate that the system will allow you to select.
Maximum Rate	The maximum preset rate that the system will allow you to select.
Increment/ Decrement	When you press the + or – button on the run screen planter tab, you increase or decrease the planter target rate. The <i>Increment/Decrement</i> value is the percentage that the target rate changes by.
Seeds per revolution	The number of seeds being planted per rotation of the seed disks.
Disk RPM Low Limit	The lowest disk RPM at which control channel will operate. The control will not allow the disk to rotate slower than this setting.
Disk RPM High Limit	The highest disk RPM at which control channel will operate. The control will not allow the disk to rotate faster than this setting.

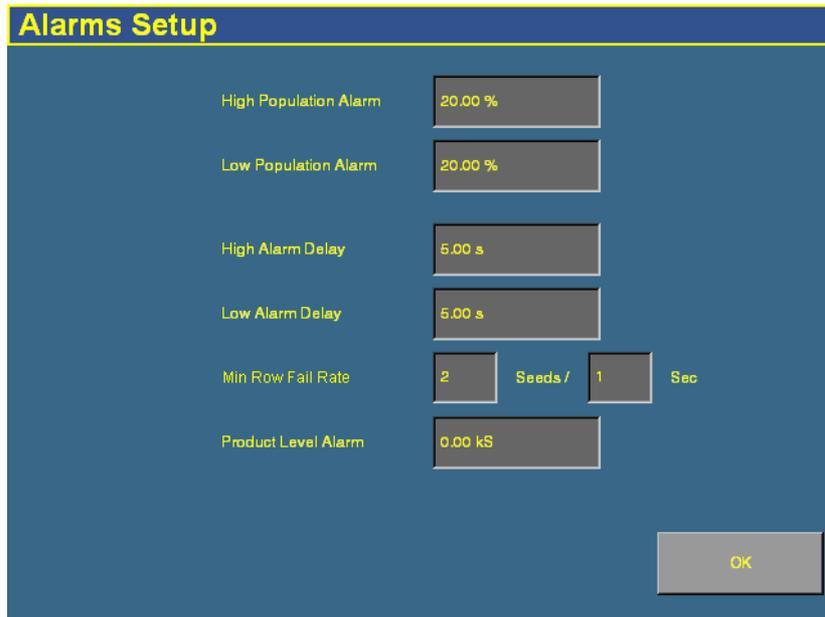
The **target rate** is the rate at which the planter will distribute this material. You must add at least one target rate before you can exit this screen.

9. To add a target rate:
 - a. Tap **Add**. The *Enter a target application rate* screen appears.
 - b. Tap the appropriate units button (either kS/ha or kS/a).
 - c. Enter the new rate and then tap **OK**. The rate must be higher than the *Minimum Rate* and lower than the *Maximum Rate*. These limits are shown on the screen:



Note – This is seed flow per row.

- d. Repeat this process to enter additional rates, if required. This enables you to switch between multiple rates on the run screen. You can add up to 8 preset target rates. If you create multiple rates, select the one that is to be the default rate and then tap **Set Default**.
- 10. Tap **OK**. The *Material Setup* screen reappears.
- 11. Tap **Alarms**. The *Alarms Setup* screen appears:



12. Enter the alarm trigger rates:

Item	Description
High Population Alarm	When a sensor detects that the seed rate has risen to this percentage above the preset rate, a warning appears. For example, if the setting is 20%, the warning appears when the sensor detects that the seed rate has risen to 120% of the preset rate.
Low Population Alarm	When a sensor detects that the seed rate has fallen to this percentage below the preset rate, a warning appears. For example, if the setting is 20%, the warning appears when the sensor detects that the seed rate has fallen to 80% of the preset rate.
High Alarm Delay	This setting is in seconds. The alarm must be triggered constantly for this many seconds before it activates and alerts you of a high population.
Low Alarm Delay	This setting is in seconds. The alarm must be triggered constantly for this many seconds before it activates and alerts you of a low population.
Min Row Fail Rate	The rate of failure that is acceptable before the Row Fail alarm is triggered. Increase the number in the <i>Seeds</i> field to reduce the reporting of errors.
Product Level Alarm	The weight of product (Kg/lbs) that will trigger the low seed level alarm.

13. Tap **OK** and then tap **OK** again.

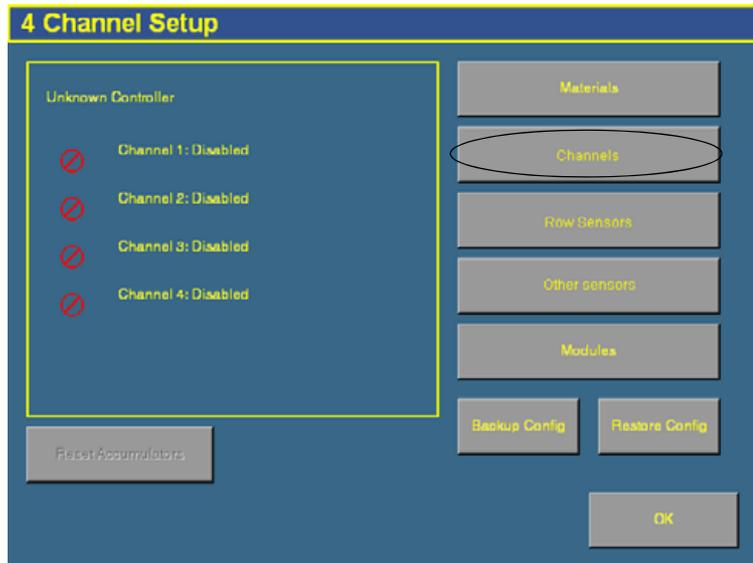
The material is now configured. Repeat this process to add an additional material.

Configuring the channels

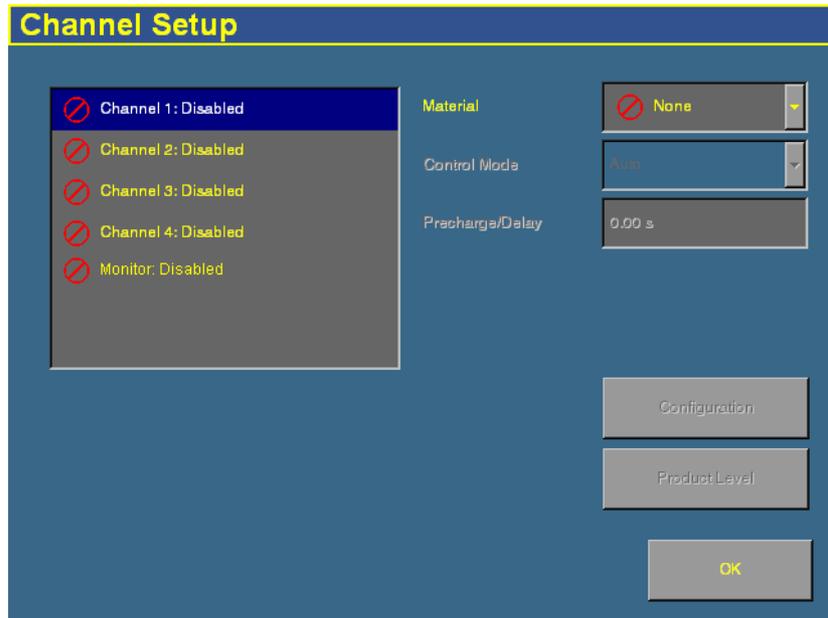
When you have configured a material, you can configure the channels. The FieldManager display can control up to 4 channels of different materials at once.

To configure a channel for liquid or granular fertilizer, see page 350 or page 374 respectively.

1. From the *4 Channel Setup* screen, tap **Channels:**



The *Channel Setup* screen appears:

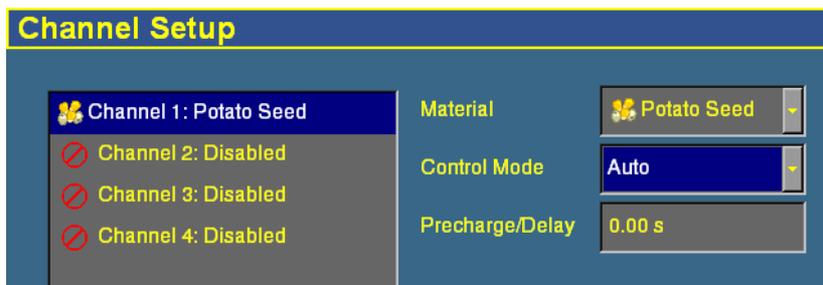


If you do not have population sensors to supply rate information (you only have block sensors), it is possible to run the system in Monitor-only mode. For more information, see page 452.

2. Select a channel to configure from the list on the left.

The materials that you have set up are available in the Material list.

3. Select one of the materials from the list.



Note – The material being controlled must reflect the sequence of what is connected to the 4 channel control harness.

4. Select the appropriate entry from the *Control Mode* list:

Item	Description
Auto	The control channel automatically calculates application rates and adjusts them according to speed under normal operating conditions.
Manual with Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease buttons on the Run screen, you adjust the Control Channel PWM % rate. The system shows the actual application rate being applied.
Manual w/out Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease buttons on the Run screen, you adjust the Control Channel PWM % rate. No application rate feedback is displayed.

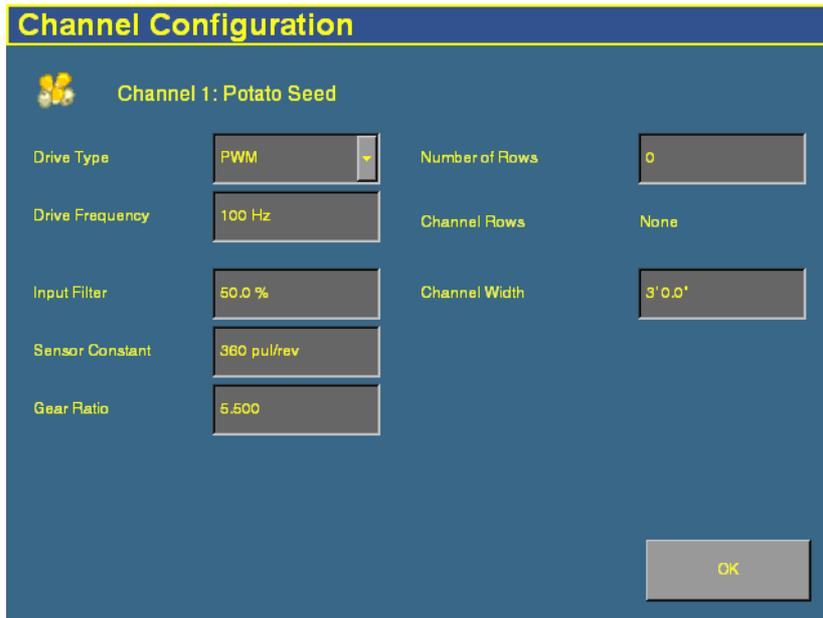
5. Change the *Precharge/Delay* setting, if necessary.

The ***Precharge time*** is the length of time that a control channel will operate or be active when there is a minimum Precharge ground speed of greater than 1 (for precharge ground speed setup information, see [Ground speed constant, page 392](#)).

The Precharge feature is typically used in applications with a significant distance between the storage bulk fill tank and the implement row unit, where seed/fertilizer travel time takes several seconds. The feature operates until the Precharge time lapses or the Precharge ground speed is exceeded. If ground speed stops while in Precharge mode, the Precharge feature aborts. Any time the Preset feature is established or changed and the Master Switch is turned on, a Precharge alarm appears.

After the master switch is turned on and the implement switch is lowered, the system waits for the ***delay time*** before the control channel starts operating. When the implement is raised or the master switch is turned off, the system immediately shuts down the channel.

6. Tap **Configuration**. The *Channel Configuration* screen appears:



7. Configure the appropriate settings:

Item	Description
Drive Type	Select the planter drive type: <ul style="list-style-type: none"> PWM – (Pulse Width Modulation) A proportional valve that varies the oil flow to a hydraulic motor based on the electric current supplied. This type of valve consists of a flow cartridge and coil assembly.
Drive Frequency	The frequency of the drive. This information is supplied by the drive manufacturer.
Input Filter	The amount of filtering that is applied to the flow meter feedback. Only adjust this setting if instructed to by Trimble Technical Support. If you adjust this setting, you must calibrate the drive.
Sensor Constant	The number of pulses per revolution of the sensor. For DICKEY-john application rate sensors, set the value to 360.0.
Gear Ratio	Gear Ratio specifies the actual ratio from the application rate sensor to the seed meter shaft RPM. This is the number of revolutions the application rate sensor turns for each revolution of the seed meter.

Item	Description
Number of Rows	Enables entry of a specific number of seed rows to the control channel. Row assignment is given a priority based on the channel and is assigned sequentially thereafter. Channel 1 is always assigned to the first set of rows, Channel 2 to the next set of rows, and so on.
Channel Width	The combined width of the rows assigned to this channel.

The system lists the rows currently used with these settings in the *Channel Rows* field.

8. Tap **OK**. The *Channel Setup* screen reappears.
9. Tap **Product Level**. The *Channel Product Level* screen appears:



On this screen, you set the *Capacity*, *Reset Level*, and *Partial Refill* values, so you can quickly adjust the planter volume in the field.

Note – You can only set the *Current Level* and *Accumulated Level* from the *Run* screen.

10. Tap the *Capacity* text box and then enter the number of seeds (in thousands) that the planter holds when full.
11. Tap the *Reset Level* text box and then enter the number of seeds (in thousands) that the planter can be reset to, for example, if you only fill it to the halfway point. You must set the capacity for this setting to work.
12. Tap the *Partial Refill* text box and then enter the number of seeds (in thousands) that you will add to the planter if you do a partial refill.
13. Tap **OK**. The *Channel Setup* screen reappears.
14. Repeat this process for Channels 2, 3, and 4 if necessary.

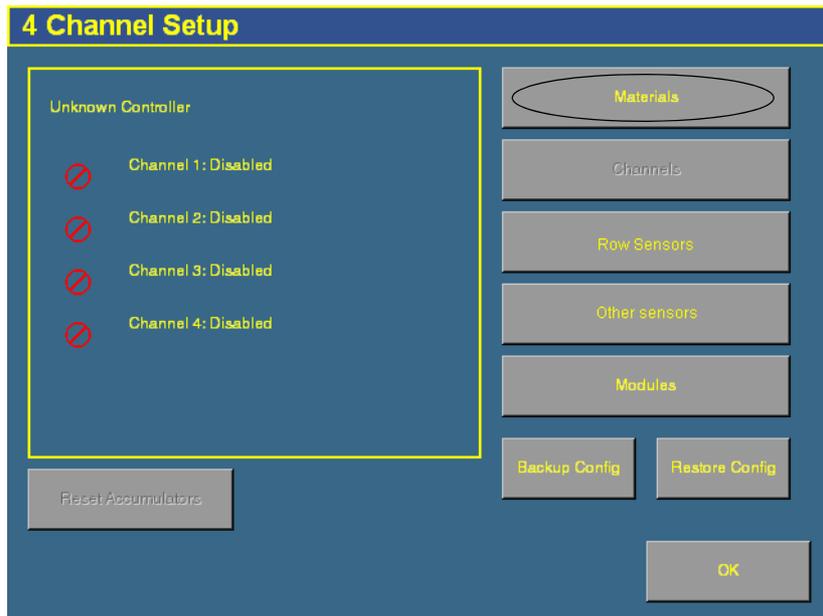
When you have assigned the materials to channels, see [Combining channels, page 389](#).

Configuring liquid flow

Entering materials

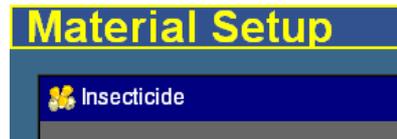
At this stage of the setup, enter the solution (material) that the implement or sprayer will distribute.

1. From the *4 Channel Setup* screen, tap **Materials**.



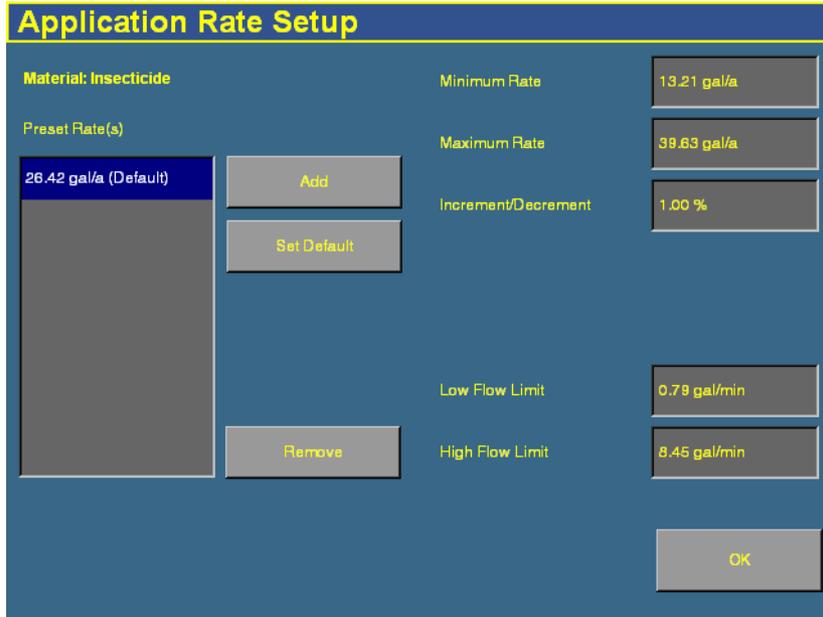
The *Material Setup* screen appears:

2. Tap **New**. The *Enter material name* screen appears.
3. Tap **CLEAR** and then enter a name that describes the material.
4. Tap **OK**. The *Material Setup* screen reappears with the new material in the list on the left of the screen:
5. In the *Type* list on the right of the screen, set the product type to Liquid Flow. The icon beside the material name changes to reflect the type: 



Note – It is important that you select the correct type, as this determines which options you see later in the setup process.

- Tap **Application Rates**. The *Application Rate Setup* screen appears:



Liquid rates are measured in the following units:

Unit	Symbol	Description
Metric	L/ha	Liters per hectare
	L/min	Liters per minute
US/Imperial	gal/a	Gallons per acre
	gal/min	Gallons per minute

- Enter the following values:

Item	Description
Minimum Rate	The minimum preset rate that the system will allow you to select.
Maximum Rate	The maximum preset rate that the system will allow you to select.

Item	Description
Increment/ Decrement	When you press the + or – button on the run screen tab, you increase or decrease the sprayer target rate. The Increment/Decrement value is the percentage that the target rate changes by.
Low Flow Limit	The lowest flow at which the system will operate.
High Flow Limit	The highest flow at which the system will operate.

The **target rate** is the rate at which the implement or sprayer will distribute this material. You must add at least one target rate before you can exit this screen.

8. To add a target rate:
 - a. Tap **Add**. The *Enter a target application rate* screen appears.
 - b. Tap the appropriate units button (either kS/ha or kS/a).
 - c. Enter the new rate and then tap **OK**. The rate must be higher than the *Minimum Rate* and lower than the *Maximum Rate*. These limits are shown on the screen:



- d. Repeat this process to enter additional rates, if required. This enables you to switch between multiple rates on the run screen. You can add up to 8 preset target rates. If you create multiple rates, select the one that is to be the default rate and then tap **Set Default**.
9. Tap **OK**. The *Material Setup* screen reappears.

10. Tap **Alarms**. The *Alarms Setup* screen appears.
There is only one setting on the *Alarms Setup* screen for liquid flow.
11. Enter the product level alarm. When the solution in the tank drops to this level, a warning appears.
12. Tap **OK** and then tap **OK** again.

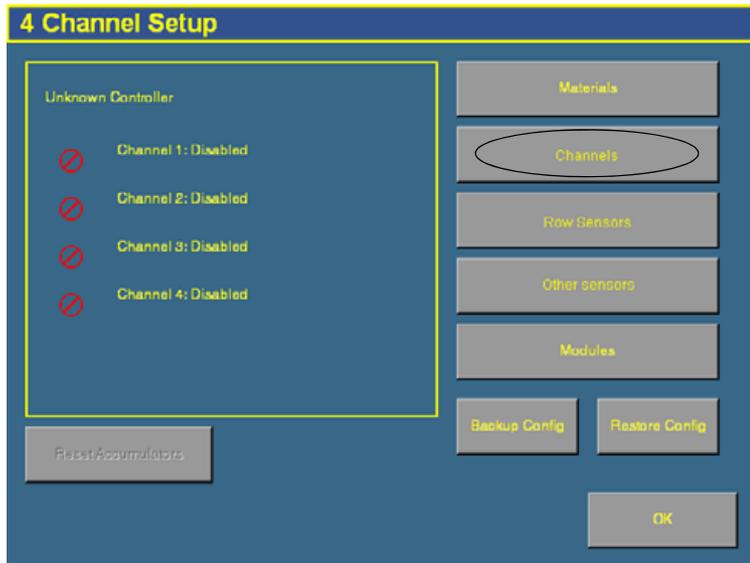
The material is now configured. Repeat this process to add an additional material.

Configuring the channels

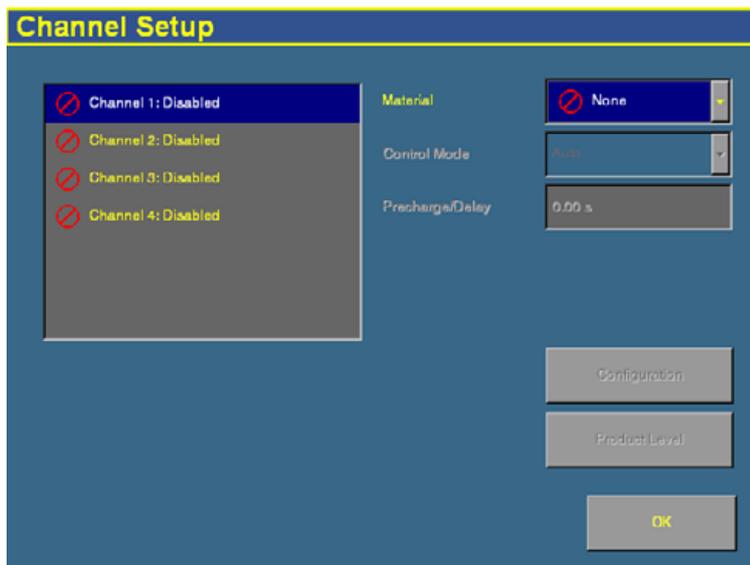
When you have configured a material, you can configure the channels. The FieldManager display can control up to 4 channels of different materials at once.

***Note** – The system can control a combination of 4 of the following: Up to 2 servo control valves and/or up to 4 PWM valves for a total of 4 valves controlled at once.*

1. From the *4 Channel Setup* screen, tap **Channels:**



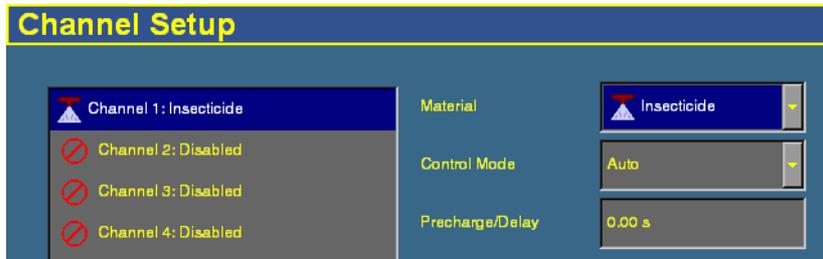
The *Channel Setup* screen appears:



2. Select a channel to configure from the list on the left.

The materials that you have set up are available in the Material list.

3. Select one of the materials from the list.



Note – The material being controlled must match the sequence of what is connected to the 4 channel control harness.

4. Select the appropriate entry from the *Control Mode* list:

Item	Description
Auto	Control Channel automatically calculates application rates and adjusts according to speed under normal operating conditions.
Manual with Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease button on the Run screen, you adjust the Control Channel PWM % rate. The system shows the actual application rate being applied.
Manual w/out Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease buttons on the Run screen, you adjust the Control Channel PWM % rate. No application rate feedback is displayed.

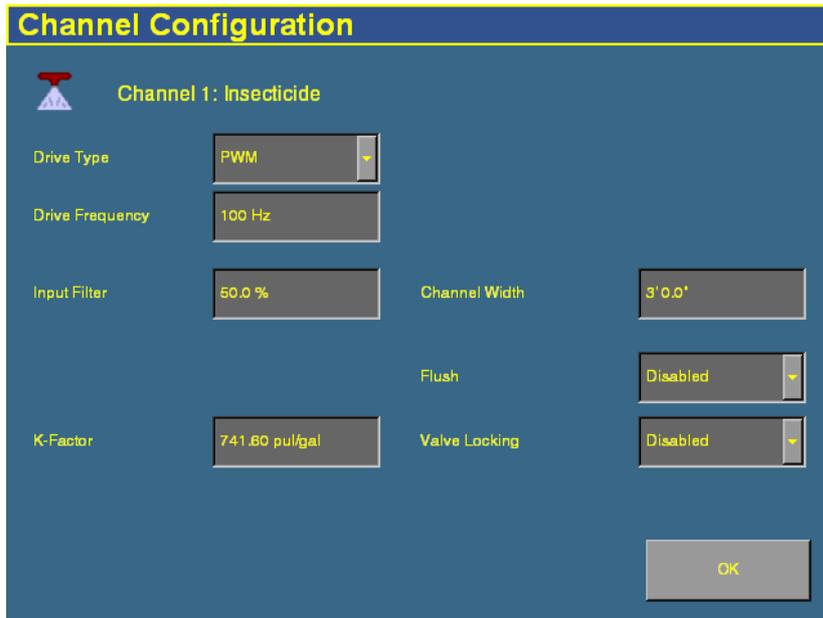
5. Change the *Precharge/Delay* setting, if necessary.

The ***Precharge time*** is the length of time that a control channel will operate or be active when there is a minimum Precharge ground speed of greater than 1 (for precharge ground speed setup information, see [Ground speed constant, page 392](#)).

The Precharge feature is typically used in applications with a significant distance between the storage bulk fill tank and the implement row unit, where seed/fertilizer travel time takes several seconds. The feature operates until the Precharge time lapses or the Precharge ground speed is exceeded. If ground speed stops while in Precharge mode, the Precharge feature aborts. Any time the Preset feature is established or changed and the Master Switch is turned on, a Precharge alarm appears.

After the master switch is turned on and the implement switch is lowered, the system waits for the ***delay time*** before the control channel starts operating. When the implement is raised or the master switch is turned off, the system immediately shuts down the channel.

6. Tap **Configuration**. The *Channel Configuration* screen appears:



7. Configure the appropriate settings:

Item	Description
Drive Type	<p>Select the liquid drive type:</p> <ul style="list-style-type: none"> • PWM – (Pulse Width Modulation) A proportional valve that varies the oil flow to a hydraulic motor based on the electric current supplied. This type of valve consists of a flow cartridge and coil assembly. • Servo – A ball valve or butterfly valve driven by an electric motor gearbox and installed in the main product delivery line. • Servo Return – A ball valve or butterfly valve driven by an electric motor gearbox and installed in the tank return line.
Drive Frequency	The frequency of the drive. This information is supplied by the drive manufacturer.
Input Filter	The amount of filtering that is applied to the flow meter feedback. If you adjust this setting, you must calibrate the drive.

Item	Description
K-Factor	<p>The number of pulses per liter (or gallon) that the sensor produces.</p> <ul style="list-style-type: none"> • If you already know the K-Factor, enter it here. • If you do not know the K-Factor, perform a flowmeter calibration. See Flow meter constant, page 394. • If the system has a Raven flow meter, divide the number by 10 and then enter the result as the K-Factor.
Channel Width Flush	<p>The combined width assigned to this channel.</p> <p>Flush Enable is a manual override mode that opens the valve and dispenses granular fertilizer, granular seed, or liquid material for a period of time in relation to a user-defined flush speed. The Flush Enable feature can only be activated when the tractor is stopped. You should have already configured the rate at which Flush dispenses when you configured the ground sensor. See Other sensors, page 325.</p>
Valve Locking	<p>Valve locking locks the valves in their last position when the booms are turned off. Use this mode to maintain pressure when doing turns and for tank agitation.</p> <p>If valve locking is not required, set the <i>Valve Locking</i> setting to Not Installed.</p>

8. Tap **OK**. The *Channel Setup* screen reappears.

9. Tap **Product Level**. The *Channel Product Level* screen appears:

The screenshot shows a screen titled "Channel Product Level" with a subtitle "Channel 1: Insecticide". On the left side, there are four buttons: "Zero Accum.", "Refill", "Reset", and "Topup". On the right side, there are four rows of controls, each with a label and a text box: "Accumulated Level" (0.00 gal), "Current Level" (0.00 gal), "Capacity" (0.26 gal), and "Reset Level" (0.00 gal). Below these is another row for "Topup Amount" (0.00 gal). At the bottom right, there is an "OK" button.

On this screen, you set the *Capacity*, *Reset Level*, and *Partial Refill* values, so you can quickly adjust the sprayer volume in the field.

Note – You can only set the *Current Level* and *Accumulated Level* from the *Run* screen.

10. Tap the *Capacity* text box and then enter the volume (in Liters or gallons) that the implement/sprayer holds when full.
11. Tap the *Reset Level* text box and then enter the volume (in Liters or gallons) that the implement/sprayer can be reset to, for example, if you only fill it to the halfway point. You must set the capacity for this setting to work.
12. Tap the *Partial Refill* text box and then enter the volume (in Liters or gallons) that you will add to the implement/sprayer if you do a partial refill.
13. Tap **OK**. The *Channel Setup* screen reappears.

14. Repeat this process for Channels 2, 3, and 4 if necessary.

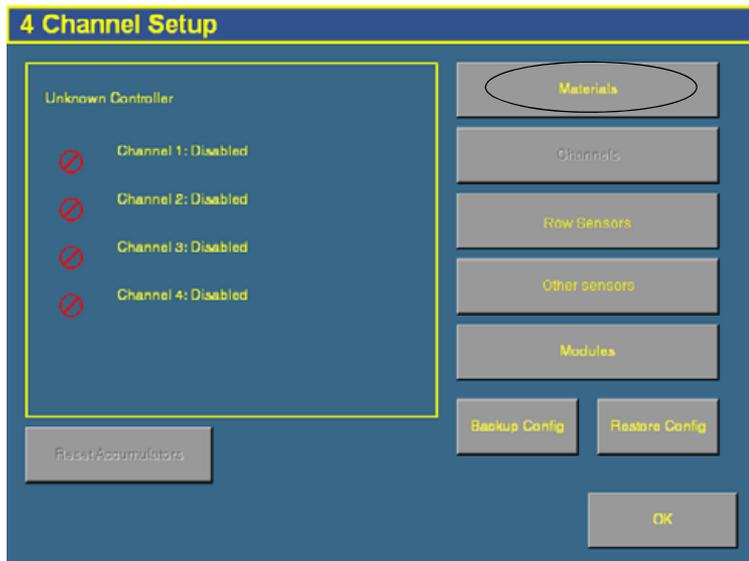
When you have assigned the materials to channels, see [Combining channels, page 389](#).

Configuring granular seed

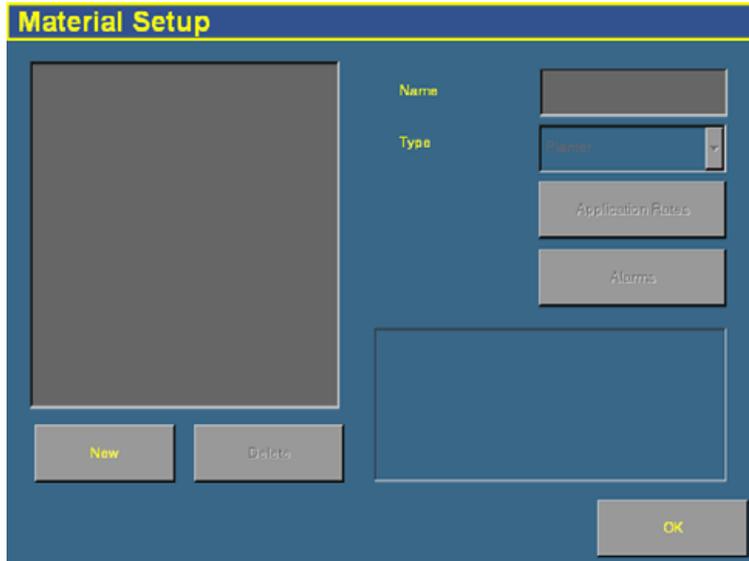
Entering materials

At this stage of the setup, enter the materials that the drill/seeder will be planting.

1. From the *4 Channel Setup* screen, tap **Materials**:



- The *Material Setup* screen appears:



- Tap **New**. The *Enter material name* screen appears.
- Tap **CLEAR** and then enter a name that describes the material.
- Tap **OK**. The *Material Setup* screen reappears with the new material in the list on the left of the screen:



- In the *Type* list on the right of the screen, set the product type. The icon beside the material name changes to reflect the type.

Product	Select...	Icon
Seed	Planter	
Liquid	Liquid Flow	

Product	Select...	Icon
Granular seed	Granular Seed	
Granular fertilizer	Granular Fertilizer	

Note – It is important that you select the correct type, as this determines which options you see later in the setup process.

7. Tap **Application Rates**. The *Application Rate Setup* screen appears:

Application Rate Setup

Material: Mustard Seed

Preset Rate(s)

Add
Set Default

Remove

Minimum Rate 110.23 lbs/a

Maximum Rate 330.69 lbs/a

Increment/Decrement 1.00 %

Density 62.43 lbs/ft³

Seeds per Pound 45

Low Shaft RPM 10

High Shaft RPM 120

Spreader Const 2831.68 pul/ft³

OK

Granular seed distribution rates are measured in the following units:

Unit	Symbol	Description
Metric	kg/ha	Kilograms of seeds per hectare
	kg/l	Kilograms per liter (density)
US/Imperial	lbs/a	pounds of seeds per acre
	lbs/ft ³	pounds per cubic foot (density)

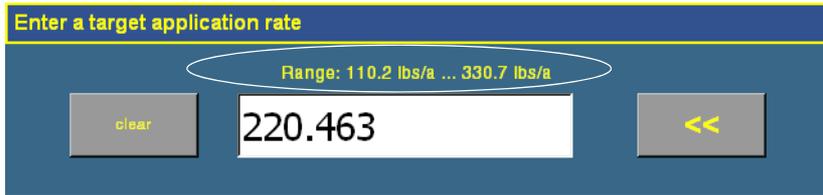
8. Enter the following values:

Item	Description
Minimum Rate	The minimum preset rate that the system will allow you to select.
Maximum Rate	The maximum preset rate that the system will allow you to select.
Increment/ Decrement	When you press the + or – button on the run screen channel tab, you increase or decrease the granular seeder target rate. The <i>Increment/Decrement</i> value is the percentage that the target rate changes by.
Density	The weight per volume of the material to dispense. If you do not know the density, enter 1.
Seeds per Pound	The number of seeds per pound. This is used to convert the current application rate to kS/ha (kS/a).
Low Shaft RPM	The lowest shaft speed at which the control channel will operate.
High Shaft RPM	The highest shaft speed at which the control channel will operate.
Spreader Constant	Each material has its own constant that is the number of application rate sensor pulses per liter (cubic ft) of material. Note – Ensure that this is as accurate as possible. Using the <i>Spreader Constant Calibration wizard</i> is recommended. See Spreader constant, page 402 .

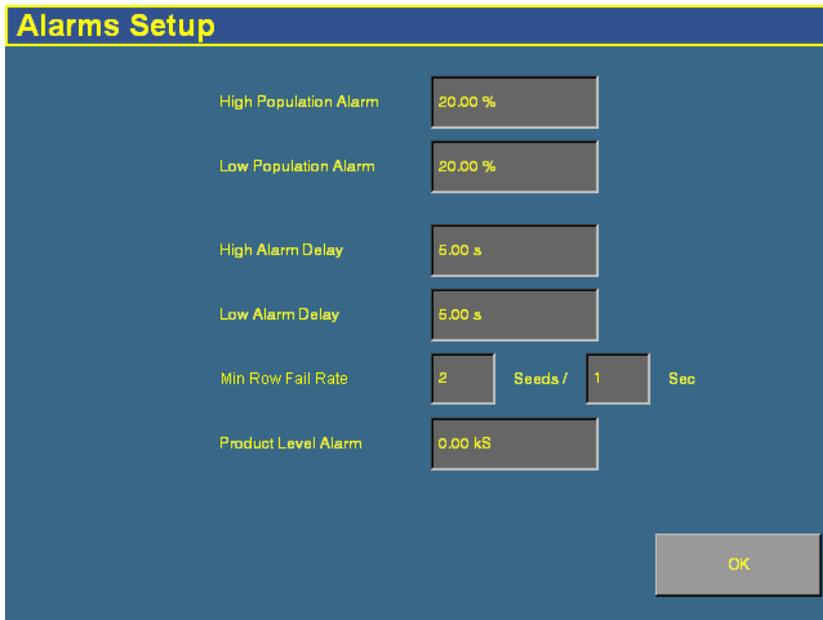
The **target rate** is the rate at which the implement will distribute this material. You must add at least one target rate before you can exit this screen.

9. To add a target rate:
 - a. Tap **Add**. The *Enter a target application rate* screen appears.
 - b. Tap the appropriate units button (either kS/ha or kS/a).

- c. Enter the new rate and then tap **OK**. The rate must be higher than the *Minimum Rate* and lower than the *Maximum Rate*. These limits are shown on the screen:



- d. Repeat this process to enter additional rates, if required. This enables you to switch between multiple rates on the run screen. You can add up to 8 preset target rates. If you create multiple rates, select the one that is to be the default rate and then tap **Set Default**.
10. Tap **OK**. The *Material Setup* screen reappears.
 11. Tap **Alarms**. The *Alarms Setup* screen appears:



12. Enter the alarm trigger rates:

Item	Description
High Population Alarm	When a sensor detects that the seed rate has risen to this percentage above the preset rate, a warning appears. For example, if the setting is 20%, the warning appears when the sensor detects that the seed rate has risen to 120% of the preset rate.
Low Population Alarm	When a sensor detects that the seed rate has fallen to this percentage below the preset rate, a warning appears. For example, if the setting is 20%, the warning appears when the sensor detects that the seed rate has fallen to 80% of the preset rate.
High Alarm Delay	This setting is in seconds. The alarm must be triggered constantly for this many seconds before it activates to alert you of a high population.
Low Alarm Delay	This setting is in seconds. The alarm must be triggered constantly for this many seconds before it activates to alert you of a low population.
Min Row Fail Rate	The rate of failure that is acceptable before the Row Fail alarm is triggered. Increase the number in the <i>Seeds</i> field to reduce the reporting of errors.
Product Level Alarm	When the product gets down to this level, a warning is triggered.

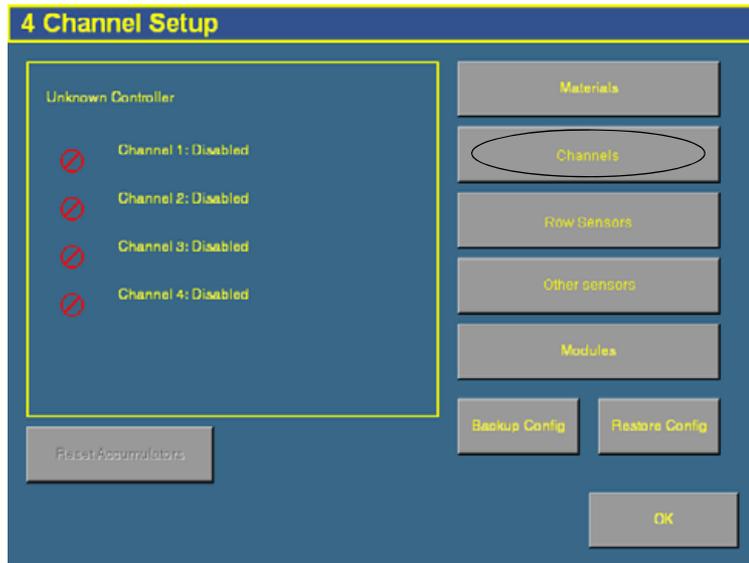
13. Tap **OK** and then tap **OK** again.

The material is now configured. Repeat this process to add an additional material.

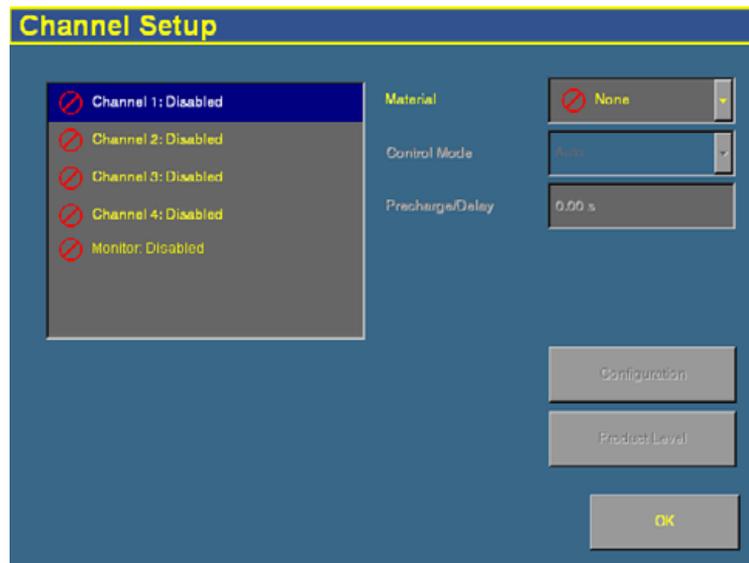
Configuring the channels

When you have configured a material, you can configure the channels. The FieldManager display can control up to 4 channels of different materials at once.

1. From the *4 Channel Setup* screen, tap **Channels:**

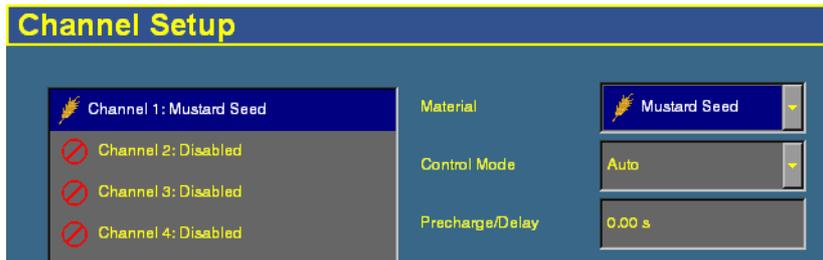


2. The *Channel Setup* screen appears:



If you do not have population sensors to supply rate information (you only have block sensors), it is possible to run the system in Monitor-only mode. For more information, see page 452.

3. Select a channel to configure from the list on the left.
The materials that you have set up are available in the Material list.
4. Select one of the materials from the list.



Note – The material being controlled must match the sequence of what is connected to the 4 channel control harness.

5. Select the appropriate entry from the *Control Mode* list:

Item	Description
Auto	The Control Channel automatically calculates application rates and adjusts according to speed under normal operating conditions.
Manual with Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease button on the Run screen, you adjust the Control Channel PWM % rate. The system shows the actual application rate being applied.
Manual w/out Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease buttons on the Run screen, you adjust the Control Channel PWM % rate. No application rate feedback is displayed.

6. Change the *Precharge/Delay* setting, if necessary.

The ***Precharge time*** is the length of time that a control channel will operate or be active when there is a minimum Precharge ground speed of greater than 1 (for precharge ground speed setup information, see [Ground speed constant, page 392](#)).

The Precharge feature is typically used in applications with a significant distance between the storage bulk fill tank and the implement row unit, where seed/fertilizer travel time takes several seconds. The feature operates until the Precharge time lapses or the Precharge ground speed is exceeded. If ground speed stops while in Precharge mode, the Precharge feature aborts. Any time the Preset feature is established or changed and the Master Switch is turned on, a Precharge alarm appears.

After the master switch is turned on and the implement switch is lowered, the system waits for the ***delay time*** before the control channel starts operating. When the implement is raised or the master switch is turned off, the system immediately shuts down the channel.

7. Tap **Configuration**. The *Channel Configuration* screen appears:

Channel Configuration

Channel 1: Mustard Seed

Drive Type: PWM

Drive Frequency: 100 Hz

Input Filter: 50.0 %

Sensor Constant: 360 pul/rev

Gear Ratio: 5.500

Number of Rows: 0

Channel Rows: None

Channel Width: 3' 0.0'

OK

8. Configure the appropriate settings:

Item	Description
Drive Type	Select the granular seeder drive type: <ul style="list-style-type: none"> • PWM – (Pulse Width Modulation) A proportional valve that varies the oil flow to a hydraulic motor based on the electric current supplied. This type of valve consists of a flow cartridge and coil assembly. • Servo – A ball valve or butterfly valve driven by an electric motor gearbox and installed in the main product delivery line.
Drive Frequency	The frequency of the drive. This information is supplied by the drive manufacturer.
Input Filter	The amount of filtering that is applied to the flow meter feedback. If you adjust this setting, you must calibrate the drive.
Sensor Constant	The number of pulses per revolution of the sensor. For DICKEY-john application rate sensors, set the value to 360.0.
Gear Ratio	The ratio of the number of turns of application rate sensor to each turn of the seed meter.

Item	Description
Number of Rows	The specific number of seed rows for the channel. Channel 1 will always be assigned to the first set of rows, Channel 2 to the next set of rows, and so on.
Channel Width	The combined width of the rows assigned to this channel.

9. Tap **OK**. The *Channel Setup* screen reappears.
10. Tap **Product Level**. The *Channel Product Level* screen appears:



On this screen, you set the *Capacity*, *Reset Level*, and *Partial Refill* values, so you can quickly adjust the drill/seeder volume in the field.

Note – You can only set the *Current Level* and *Accumulated Level* from the *Run* screen.

11. Tap the *Capacity* text box and then enter the weight of seeds (in kilograms or pounds) that the drill/seeder holds when full.

12. Tap the *Reset Level* text box and then enter the weight of seeds (in kilograms or pounds) that the drill/seeder can be reset to, for example, if you only fill it to the halfway point. You must set the capacity for this setting to work.
13. Tap the *Partial Refill* text box and then enter the weight of seeds (in kilograms or pounds) that you will add to the drill/seeder if you do a partial refill.
14. Tap **OK**. The *Channel Setup* screen reappears.
15. Repeat this process for Channels 2, 3, and 4 if necessary.

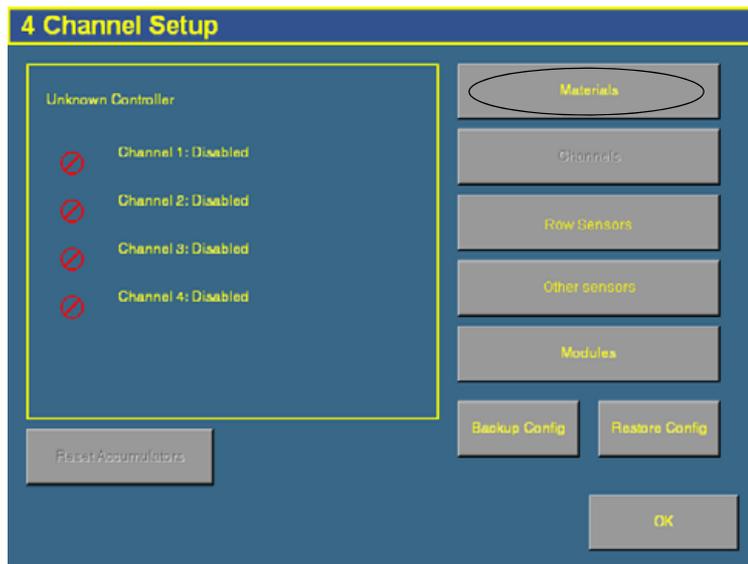
When you have assigned the materials to channels, see [Combining channels, page 389](#).

Configuring granular fertilizer

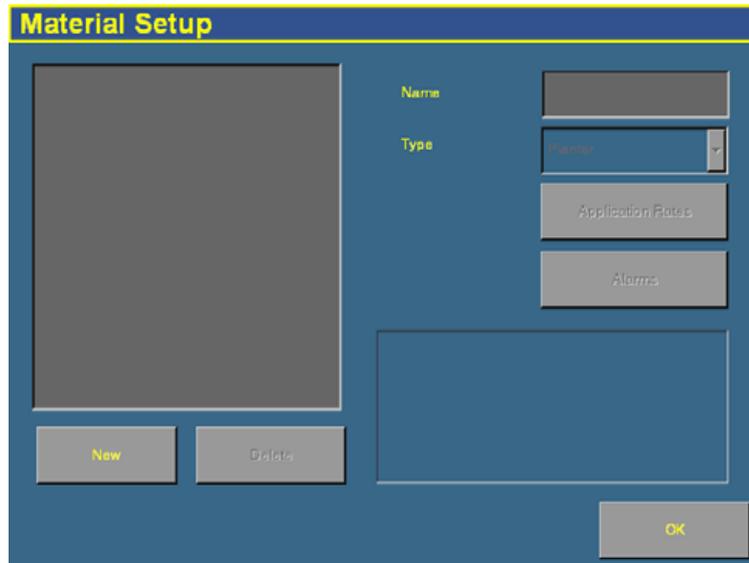
Entering materials

At this stage of the setup, enter the materials that the planter or spreader will be applying. This may include different types of fertilizer or other granular materials.

1. From the *4 Channel Setup* screen, tap **Materials**:



The *Material Setup* screen appears:

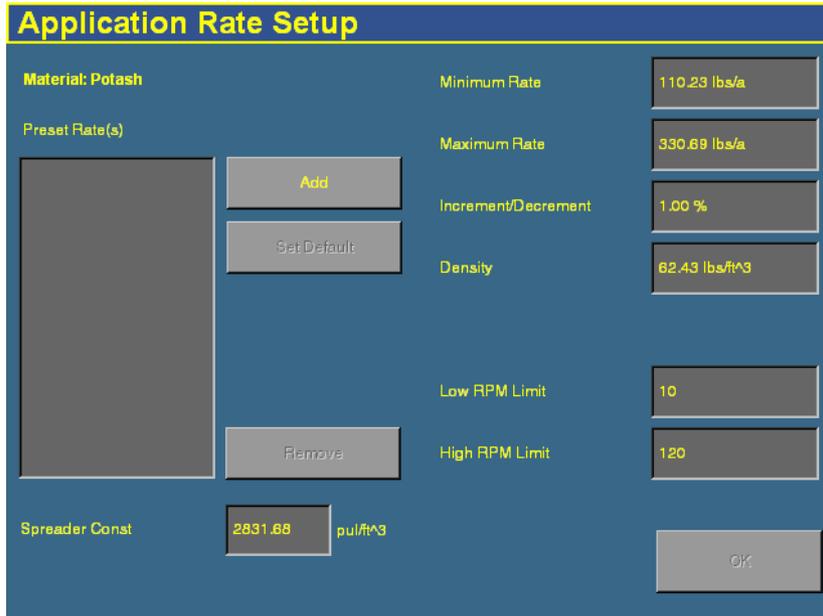


2. Tap **New**. The *Enter material name* screen appears.
3. Tap **CLEAR** and then enter a name that describes the material.
4. Tap **OK**. The *Material Setup* screen reappears with the new material in the list on the left of the screen:
5. In the *Type* list on the right of the screen, set the type of material to Granular Fertilizer. The icon beside the material name changes to reflect the type .



Note – It is important that you select the correct type, as this determines which options you see later in the setup process.

- Tap **Application Rates**. The *Application Rate Setup* screen appears:



Seed planting rates are measured in the following units:

Unit	Symbol	Description
Metric	kg/ha	Kilograms of fertilizer per hectare
	kg/l (density)	Kilograms of fertilizer per liter
US/Imperial	lb/a	Pounds of fertilizer per acre
	lb/ft ³ (density)	Pounds of fertilizer per cubic foot

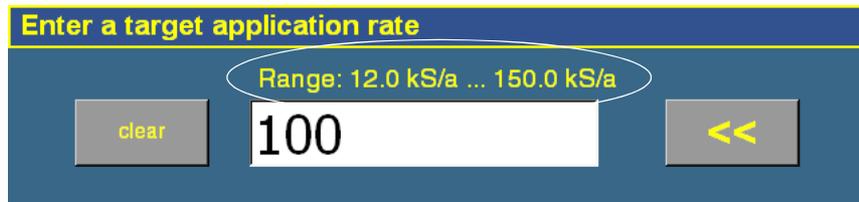
- Enter the following values:

Item	Description
Minimum Rate	The minimum preset rate that the system will allow you to select.
Maximum Rate	The maximum preset rate that the system will allow you to select.

Item	Description
Increment/ Decrement	When you press the + or – button on the run screen channel tab, you increase or decrease the granular fertilizer target rate. The Increment/Decrement value is the percentage that the target rate changes by.
Density	The weight per volume of the material to dispense. If you do not know the density, enter 1.
Low RPM Limit	The lowest shaft speed at which the control channel will operate.
High RPM Limit	The highest shaft speed at which the control channel will operate.
Spreader Constant	Each material has its own constant that is the number of application rate sensor pulses per liter (cubic ft) of material. Ensure that this is as accurate as possible. If you know the spreader constant, enter it, but using the Spreader Constant Calibration wizard is recommended. See Spreader constant, page 402 .

The *target rate* is the rate at which the implement will distribute this material. You must add at least one target rate before you can exit this screen.

8. To add a target rate:
 - a. Tap **Add**. The *Enter a target application rate* screen appears.
 - b. Tap the appropriate units button (either kg/ha or lbs/a).
 - c. Enter the new rate and then tap **OK**. The rate must be higher than the *Minimum Rate* and lower than the *Maximum Rate*. These limits are shown on the screen:



- d. Repeat this process to enter additional rates, if required. This enables you to switch between multiple rates on the run screen. You can add up to 8 preset target rates. If you create multiple rates, select the one that is to be the default rate and then tap **Set Default**.

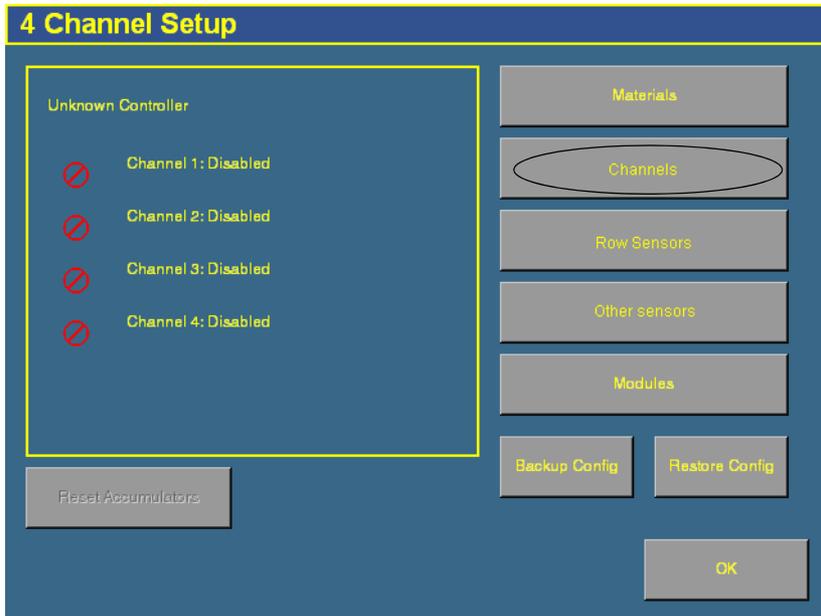
9. Tap **OK**. The *Material Setup* screen reappears.
10. Tap **Alarms**. The *Alarms Setup* screen appears.
11. Enter the *Product Level Alarm* time. When the product drops to this level, a warning is triggered.
12. Tap **OK** and then tap **OK** again.

The material is now configured. Repeat this process to add an additional material.

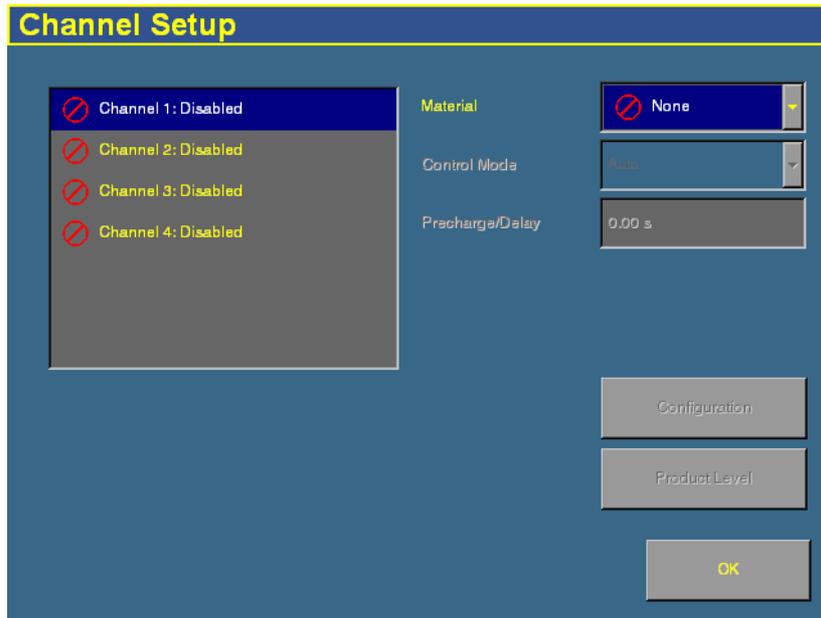
Configuring the channels

When you have configured a material, you can configure the channels. The FieldManager display can control up to 4 channels of different materials at once.

1. From the *4 Channel Setup* screen, tap **Channels**:



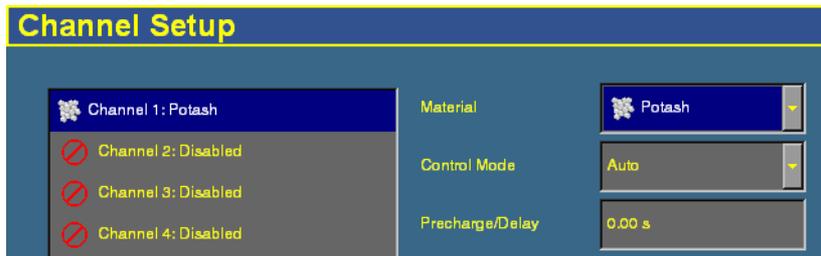
The *Channel Setup* screen appears:



2. Select a channel to configure from the list on the left.

The materials that you have set up are available in the Material list.

3. Select one of the materials from the list.



4. Select the appropriate entry from the *Control Mode* list:

Item	Description
Auto	Control Channel calculates application rates under normal operating conditions.
Manual with Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease button on the Run screen, you adjust the Control Channel PWM % rate. The system shows the actual application rate being applied.
Manual w/out Feedback	Overrides the current system when not operating correctly. When you tap the Increase/Decrease buttons on the Run screen, you adjust the Control Channel PWM % rate. No application rate feedback is displayed.

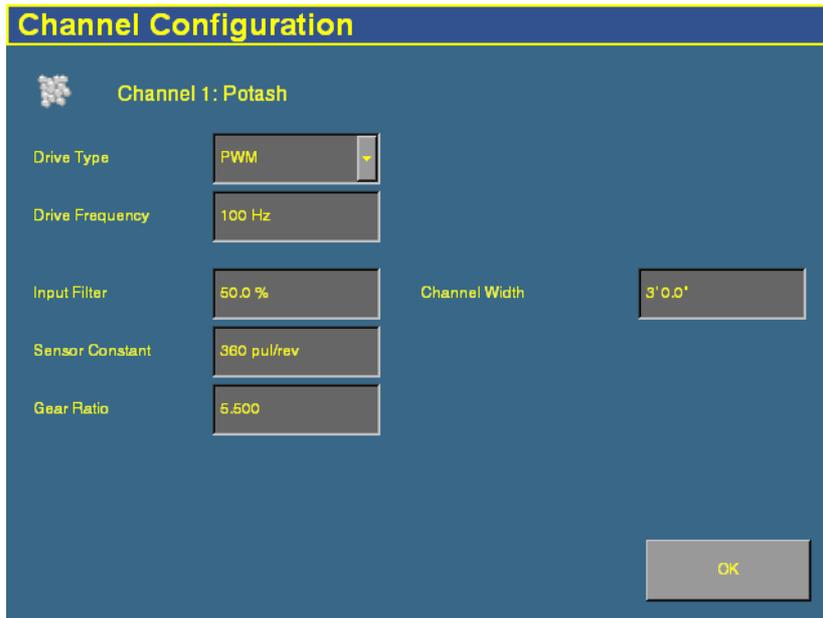
5. Change the *Precharge/Delay* setting, if necessary.

The ***Precharge time*** is the length of time that a control channel will operate or be active when there is a minimum Precharge ground speed of greater than 1 (for precharge ground speed setup information, see [Ground speed constant, page 392](#)).

The Precharge feature is typically used in applications with a significant distance between the storage bulk fill tank and the implement row unit, where seed/fertilizer travel time takes several seconds. The feature operates until the Precharge time lapses or the Precharge ground speed is exceeded. If ground speed stops while in Precharge mode, the Precharge feature aborts. Any time the Preset feature is established or changed and the Master Switch is turned on, a Precharge alarm appears.

After the master switch is turned on and the implement switch is lowered, the system waits for the ***delay time*** before the control channel starts operating. When the implement is raised or the master switch is turned off, the system immediately shuts down the channel.

6. Tap **Configuration**. The *Channel Configuration* screen appears:



7. Configure the appropriate settings:

Item	Description
Drive Type	Select the granular fertilizer drive type: <ul style="list-style-type: none"> • PWM – (Pulse Width Modulation) A proportional valve that varies the oil flow to a hydraulic motor based on the electric current supplied. This type of valve consists of a flow cartridge and coil assembly. • Servo – A ball valve or butterfly valve driven by an electric motor gearbox and installed in the main product delivery line.
Drive Frequency	The frequency of the drive. This information is supplied by the drive manufacturer.
Input Filter	The amount of filtering that is applied to the flow meter feedback. If you adjust this setting, you must calibrate the drive.
Sensor Constant	The number of pulses per revolution of the sensor. For DICKEY-john application rate sensors, set the value to 360.0.
Gear Ratio	The ratio of the number of turns of application rate sensor to each turn of the granular fertilizer metering shaft.

Item	Description
Number of Rows	The specific number of seed rows for the channel. Channel 1 will always be assigned to the first set of rows, Channel 2 to the next set of rows, and so on.
Channel Width	The width of fertilizer applied for this channel.

8. Tap **OK**. The *Channel Setup* screen reappears.
9. Tap **Product Level**. The *Channel Product Level* screen appears:



On this screen, you set the *Capacity*, *Reset Level*, and *Partial Refill* values, so you can quickly adjust the fertilizer weight in the field.

Note – You can only set the *Current Level* and *Accumulated Level* from the *Run* screen.

10. Tap the *Capacity* text box and then enter the weight of fertilizer (in kilograms or pounds) that the planter/spreader holds when full.

11. Tap the *Reset Level* text box and then enter the weight of fertilizer (in kilograms or pounds) that the planter/spreader can be reset to, for example, if you only fill it to the halfway point. You must set the capacity for this setting to work.
12. Tap the *Partial Refill* text box and then enter the weight of fertilizer (in kilograms or pounds) that you will add to the planter/spreader if you do a partial refill.
13. Tap **OK**. The *Channel Setup* screen reappears.
14. Repeat this process for Channels 2, 3, and 4 if necessary.

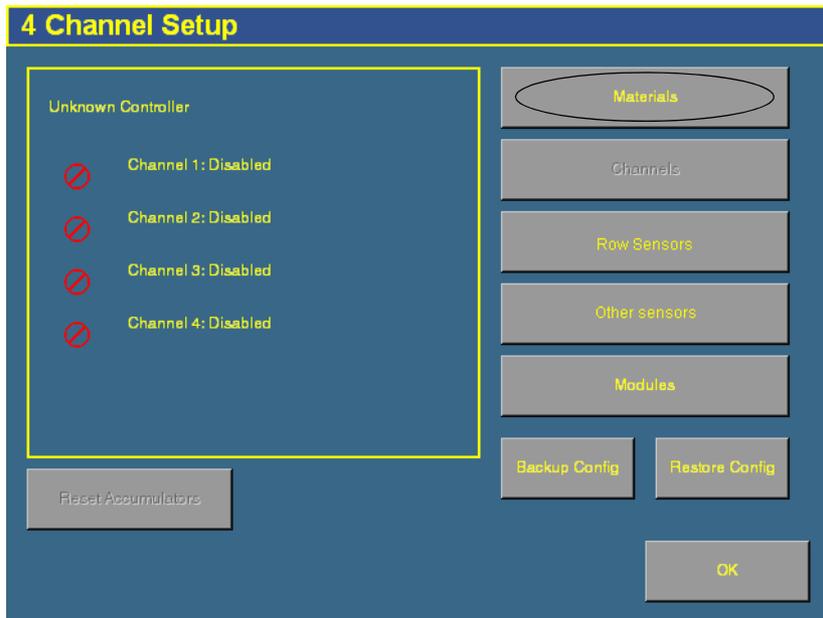
When you have assigned the materials to channels, see [Combining channels, page 389](#).

Configuring anhydrous

Entering materials

At this stage of the setup, enter the material to be applied:

1. From the *4 Channel Setup* screen, tap **Materials**:

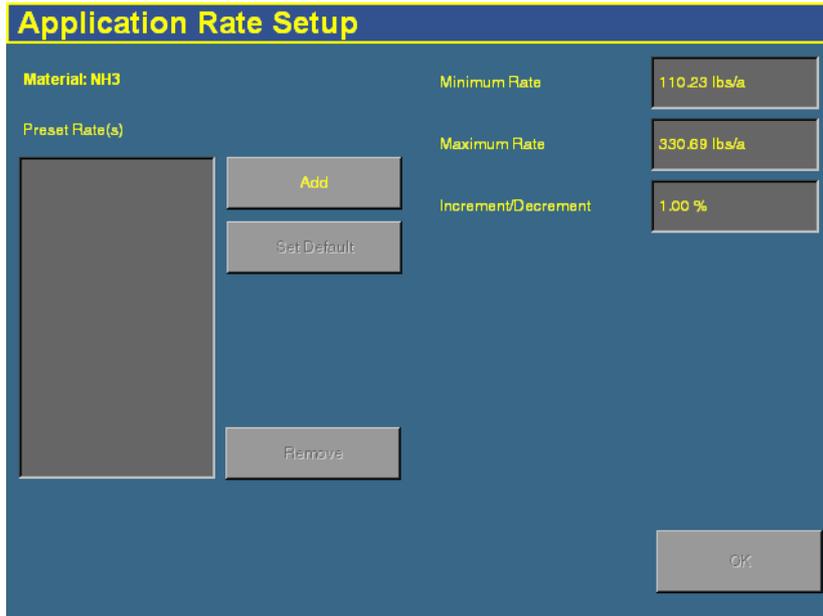


The *Material Setup* screen appears:

2. Tap **New**. The *Enter material name* screen appears.
3. Tap **CLEAR** and then enter a name that describes the material.
4. Tap **OK**. The *Material Setup* screen reappears with the new material in the list on the left of the screen:
 
5. In the *Type* list on the right of the screen, set the type of material to Anhydrous. The icon beside the material name changes to reflect the type .

Note – It is important that you select the correct type, as this determines which options you see later in the setup process.

6. Tap **Application Rates**. The *Application Rate Setup* screen appears:



Seed planting rates are measured in the following units:

Unit	Symbol	Description
Metric	kg/ha	Kilograms of nitrogen per hectare
US/Imperial	lbs/a	Pounds of nitrogen per acre

7. Enter the following values:

Item	Description
Minimum Rate	The minimum preset rate that the system will allow you to select.
Maximum Rate	The maximum preset rate that the system will allow you to select.
Increment/Decrement	When you press the + or – button on the run screen planter tab, you increase or decrease the planter target rate. The Increment/Decrement value is the percentage that the target rate changes by.

The **target rate** is the rate at which the implement will distribute this material. You must add at least one target rate before you can exit this screen.

8. To add a target rate:
 - a. Tap **Add**. The *Enter a target application rate* screen appears.
 - b. Tap the appropriate units button (either kg/ha or lbs/a).
 - c. Enter the new rate and then tap **OK**. The rate must be higher than the *Minimum Rate* and lower than the *Maximum Rate*. These limits are shown on the screen:

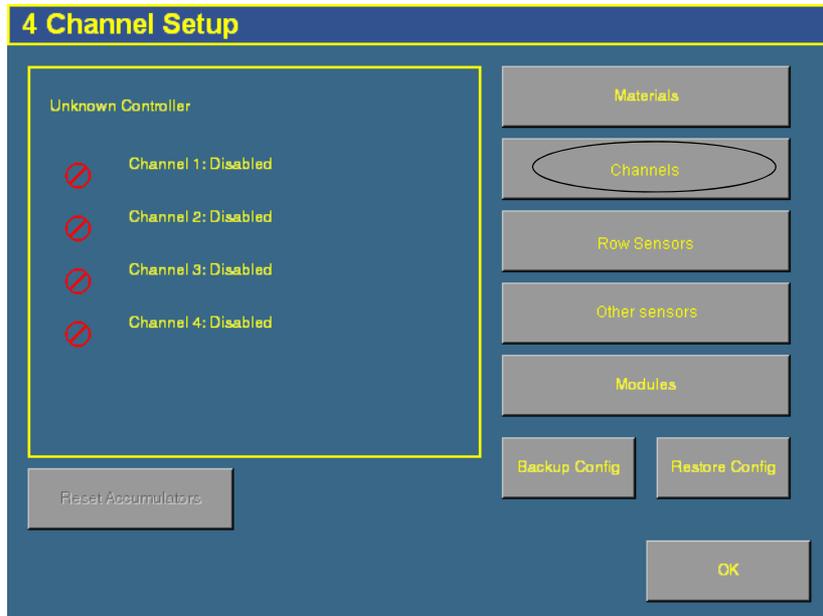
- d. Repeat this process to enter additional rates, if required. This enables you to switch between multiple rates on the run screen. You can add up to 8 preset target rates. If you create multiple rates, select the one that is to be the default rate and then tap **Set Default**.
9. Tap **OK**. The *Material Setup* screen reappears.
10. Tap **Alarms**. The *Alarms Setup* screen appears.
11. Enter the *Product Level Alarm* weight. When the amount of product drops to this level, a warning is triggered.
12. Tap **OK** and then tap **OK** again.

The material is now configured. Repeat this process to add an additional material.

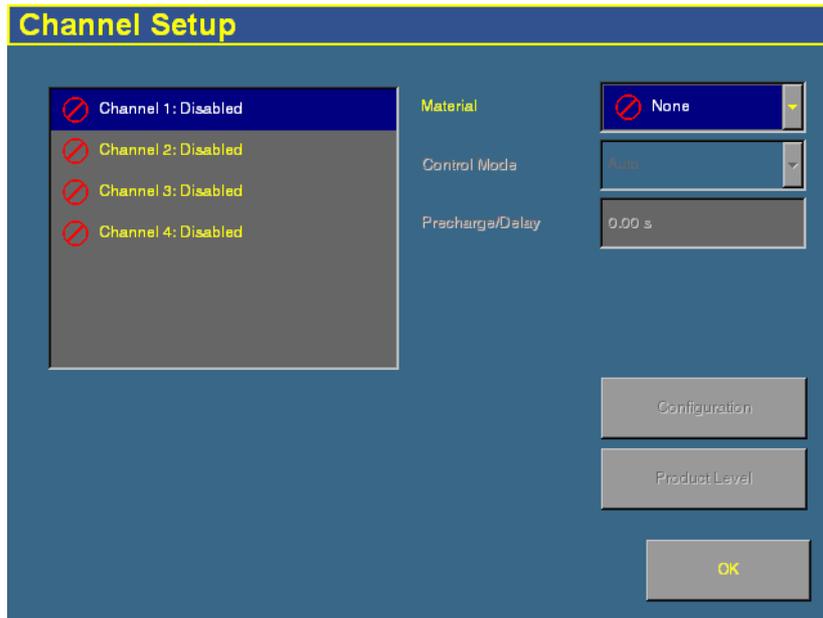
Configuring the channels

When you have configured a material, you can configure the channels. With anhydrous application, the FieldManager display can control up to 2 channels of material at once.

1. From the *4 Channel Setup* screen, tap **Channels**:



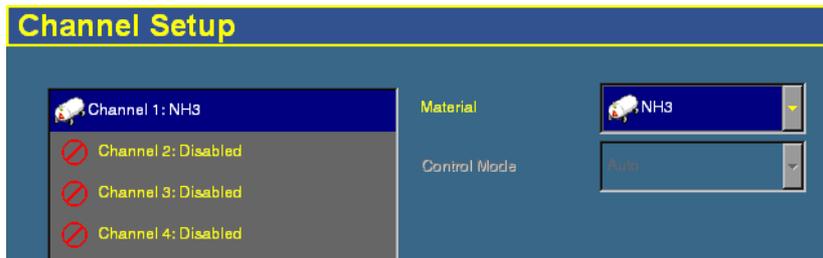
The *Channel Setup* screen appears:



2. Select a channel to configure from the list on the left.

The materials that you have set up are available in the Material list.

3. Select one of the materials from the list.



4. Tap **Configuration**. The *Channel Configuration* screen appears:

Channel Configuration

 Channel 1: NH3

Drive Type: Servo

Drive Frequency: 100 Hz

Input Filter: 50.0 %

Channel Width: 3' 0.0"

K-Factor: 3.21039 pul/in³

Measurement Unit: N

Max Flow Rate: 9800.01 lbs/hr

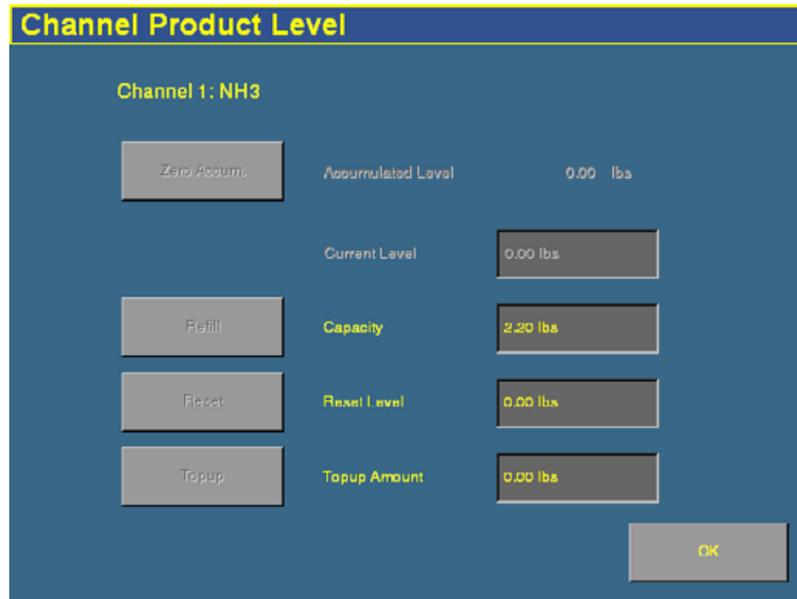
OK

5. Configure the appropriate settings:

Item	Description
Drive Type	Servo – A ball valve or butterfly valve driven by an electric motor gearbox and installed in the main product delivery line.
Drive Frequency	The frequency of the drive. This information is supplied by the drive manufacturer.
Input Filter	The amount of filtering that is applied to the flow meter feedback. If you adjust this setting, you must calibrate the drive.
Channel Width	The combined width assigned to this channel.
K-Factor	<p>Every flowmeter has a K-Factor, which is the number of pulses per unit of measure. The K-Factor may be marked on the assembly. This K-Factor is a good starting point before doing a flowmeter calibration. In order to do an anhydrous flowmeter calibration, the system must be run in the field. With the K-Factor entered and accumulators cleared, record the weight of the nurse tank and proceed to apply nitrogen on at least ten acres at normal operating speeds and conditions. Verify that the control is stable during the calibration. Once the area is covered, record the tank weight. Calculate the amount of nitrogen used and compare that to the controller's accumulated values. Determine the percent of error and adjust the K-Factor accordingly. A typical DICKEY-john anhydrous flowmeter K-Factor starting point is 2.15 P/in^3.</p> <p>Fine-tuning the calibration: If the actual application is 5% above the <i>Target Application</i> rate, the K-Factor needs to be decreased by 5%. Therefore, if the K-Factor is 2.250, a 5% decrease would be $2.250 \times 0.95 = 2.1375$. The opposite applies for under application.</p>
Measurement Unit	How the product is measured for the <i>Max Flow Rate</i> setting: N (nitrogen) or NH3 (anhydrous ammonia)
Max Flow Rate	When the nitrogen application reaches this flow rate, a warning appears.

6. Tap **OK**. The *Channel Setup* screen reappears.

- Tap **Product Level**. The *Channel Product Level* screen appears:



On this screen, you set the *Capacity*, *Reset Level*, and *Partial Refill* values, so you can quickly adjust the weight in the field.

Note – You can only set the *Current Level* and *Accumulated Level* from the *Run* screen.

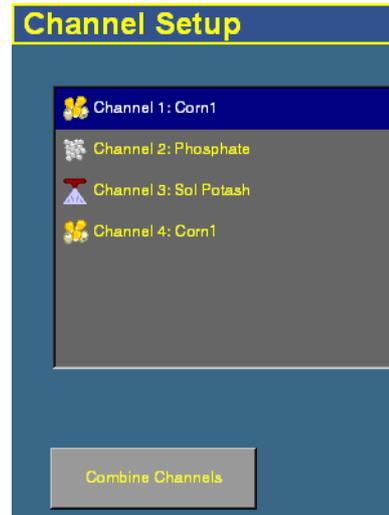
- Tap the *Capacity* text box and then enter the quantity (in kilograms or pounds) that the anhydrous tank holds when full.
- Tap the *Reset Level* text box and then enter the quantity (in kilograms or pounds) that the anhydrous unit can be reset to, for example, if you only fill it to the halfway point. You must set the capacity for this function to work.
- Tap the *Partial Refill* text box and then enter the quantity (in kilograms or pounds) that you will add to the anhydrous unit if you do a partial refill.
- Tap **OK**. The *Channel Setup* screen reappears.
- Repeat this process for Channels 2, 3, and 4 if necessary.

Combining channels

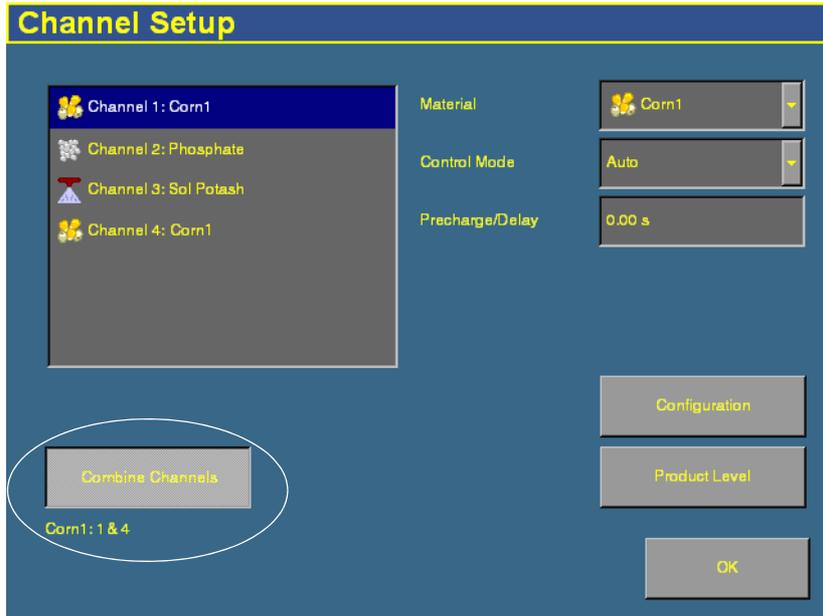
Now that you have assigned all of your products, you can combine channels of the same product type that have the same name. This enables you to control multiple channels with one target rate.

If you have more than one product with the same name, the **Combine Channels** button appears on the *Channel Setup* screen.

In the example to the right, there are 2 channels of planter seed named “Corn1”. The 2 channels that these seeds run through can be combined to utilize the same target rate.

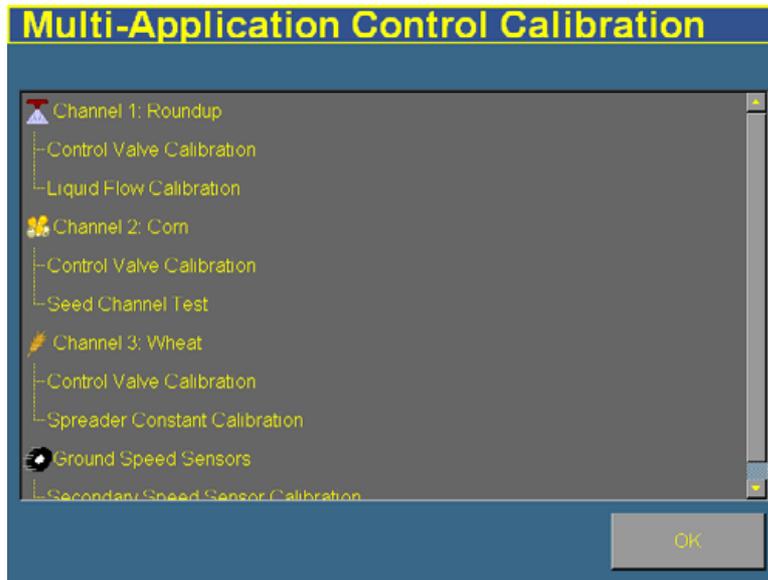


When you tap **Combine Channels**, the channels with the same names are combined:



Calibrating sensors

To calibrate the sensors, on the *Configuration* screen select the Multi-Application Control plugin and then tap **Calibrate**. The *Multi-Application Control Calibration* screen appears:



This section describes how to calibrate:

To calibrate a...	See...
ground speed constant	page 392
flow meter constant	page 394
control channel valve for a planter, granular seed, granular fertilizer, or liquid fertilizer	page 396
control channel valve for anhydrous application	page 400
spreader constant	page 402
planter seed count	page 404

When you have calibrated the system, see [Continuing, page 406](#).

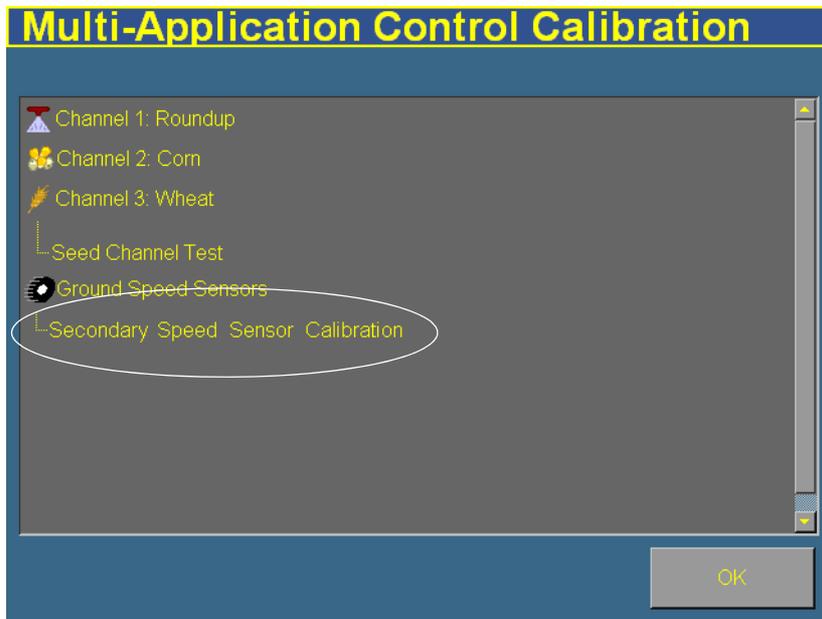
Ground speed constant

If you have set either the primary ground speed sensor or the backup ground speed sensor to CAN Ground, Digital Sensor, or Reluctance Sensor, you need to perform a calibration to determine the ground speed constant. To determine the constant, the system must count the number of pulses that the sensor produces while driving at a constant speed over:

- a 400 ft distance when driving in US/Imperial mode.
- a 100 m distance when driving in metric mode.

To configure the sensor:

1. Position the vehicle somewhere where you can drive for 400 ft (US/Imperial mode) or a 100 m distance (metric mode) without stopping or changing speed.
2. From the *Multi-Application Control Calibration* screen, select *Secondary Speed Sensor Calibration*:



The *Ground Speed Calibration* screen appears:

Note – This screen shows the values for a system using US/Imperial units.

3. Begin to drive the vehicle at a constant speed (3.2–8 kph, or 2–5 mph).
4. When you are moving at a constant speed, tap **Start**.
 - The *Pulse Count* field will begin to increase.
 - The *Distance To Go* field will begin to reduce as you get closer to the end of the stretch.
5. Drive at the same speed until the *Distance To Go* field reads 0. The number of pulses counted appears in the *New Ground Spd Const* field.



Tip – Repeat this process 2 more times to ensure that the result is accurate.

6. To save the new sensor constant, tap **Save**.

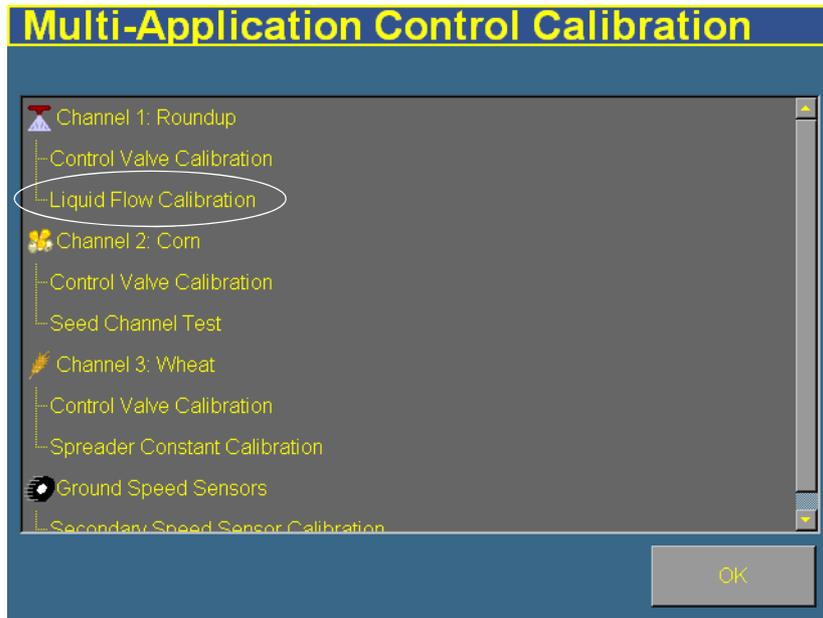
7. To leave the *Ground Speed Calibration* screen, tap **OK**. If you have not saved the sensor constant that you calculated, it will not be used.

Flow meter constant

The flow meter constant is derived by finding the number of pulses of the flow meter that occur for a known quantity of liquid. This ratio of pulses to volume is called the *K-Factor*.

To calibrate the sensor:

1. Put the vehicle transmission in park or in a locked, neutral position.
2. Run the engine at normal operating speed until the hydraulic fluid is at normal operating temperature.
3. From *Multi-Application Control Calibration* screen, select Liquid Flow Calibration:



The *Liquid Flow Calibration* screen appears:

Liquid Flow Calibration

Channel 1: liquid

Start Master

K-Factor 195.91 pul/L

Pulse Count 0 pul

Target Rate 935.39 L/ha

Target Ground Speed 8.05 kph

Target Flow Rate 213.26 L/min

**MOVING PARTS DURING THIS OPERATION.
STAY CLEAR OF IMPLEMENT!**

Instructions

- Prepare to catch liquid
- Setup target ground speed and target flow rate
- Press Start to begin calibration

OK

- Adjust the *Target Ground Speed* or the *Target Flow Rate*.
 - The *Target Ground Speed* is the vehicle speed that the system will simulate.
 - The *Target Flow Rate* is the simulated application rate.

The *Target Ground Speed* and *Target Flow Rate* are linked. If you adjust one, the other adjusts as well. This is to is because the faster the vehicle is traveling, the higher the flow rate must be to obtain the same level of application.



WARNING – When you tap the liquid flow calibration **Start** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.



Tip – The tank must contain liquid. Use a container to catch the liquid so you can measure the volume. For example, put buckets under the spray nozzles. Collect all of the liquid output by the channel.

5. Tap **Start** and then turn on the master switch.
6. Allow the system to run for a while and then tap **Stop**. The longer that you run the system, the more accurate the result will be.
7. Calculate the volume of liquid collected and then enter it into the *Amount Dispensed* window.
8. Tap **Continue**. The system calculates the *New K-Factor* value.
9. Tap **Save**. The new K-Factor is saved.
10. Tap **OK**.

Control channel valve calibration: Planter, granular seed, granular fertilizer, or liquid fertilizer

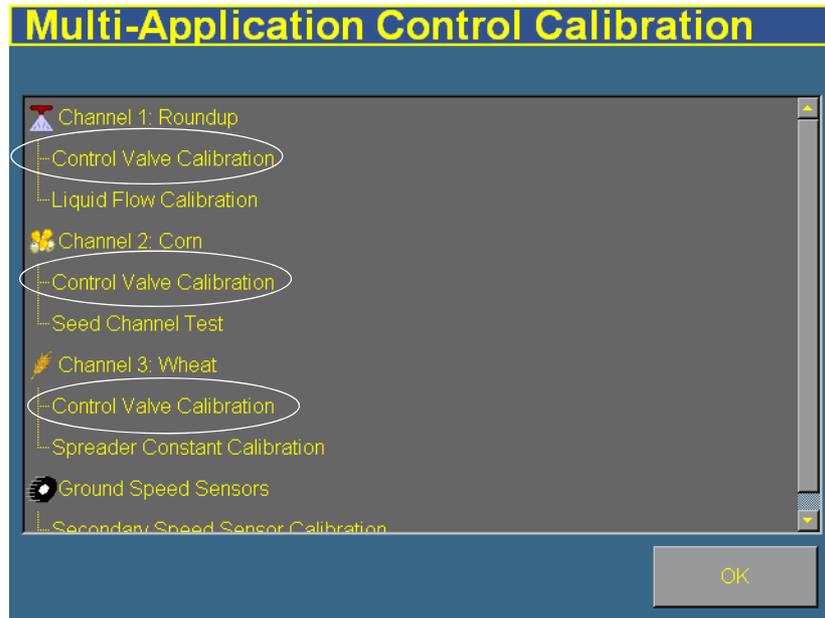
The control channel valve calibration sets the vehicle hydraulic system parameters. Perform this calibration for each control channel that you have set up.



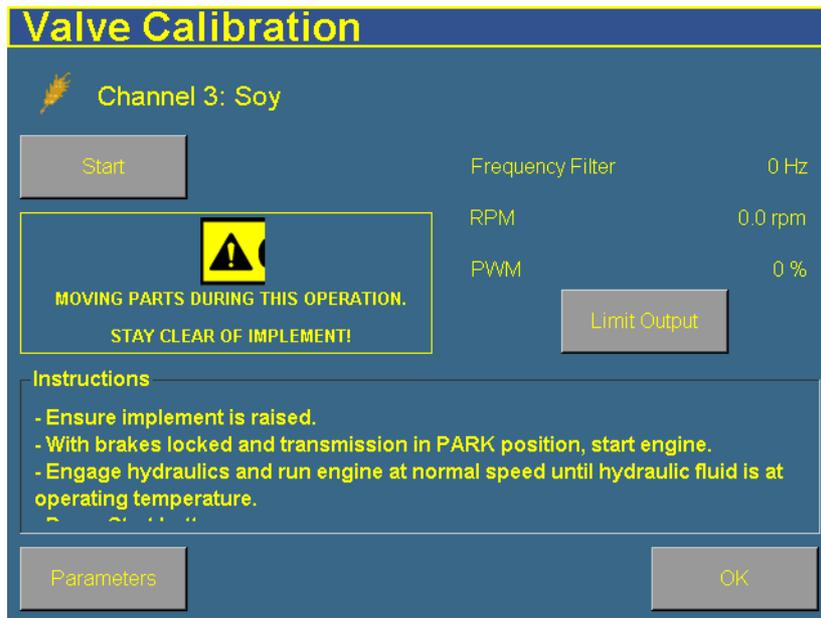
Tip – The hoppers can be empty for this calibration. If they contain material, it will fall on the ground.

To calibrate the valve:

1. From the *Multi-Application Control Calibration* screen, tap the appropriate Control Valve Calibration entry:



The *Valve Calibration* screen appears:



Note – The **Limit Output** button does not appear for planters.

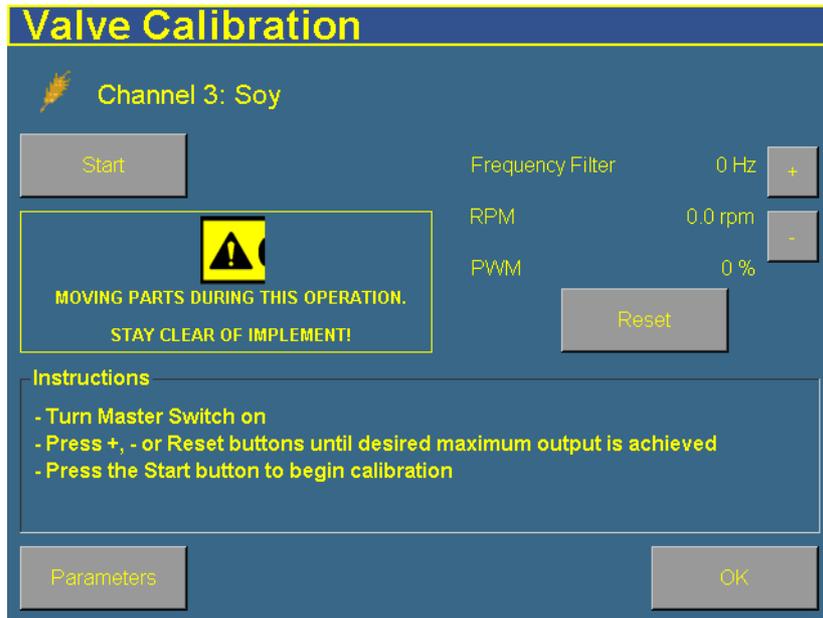
2. Raise the implement.
3. Apply the tractor brakes and lock in the applied position.
4. Put the transmission in park or in a locked, neutral position.
5. Start the tractor and engage PTO if used to drive the hydraulic system.
6. Run the engine at normal operating speed until the hydraulic fluid is at normal operating temperature.



CAUTION – Only adjust the calibration parameters if instructed to do so by Technical Support.

7. Turn on the master switch.

8. If the material is granular seed, granular fertilizer, or liquid fertilizer and you want to limit the range of the PWM valve:
 - a. Tap **Limit Output**. + and – buttons appear on the screen:



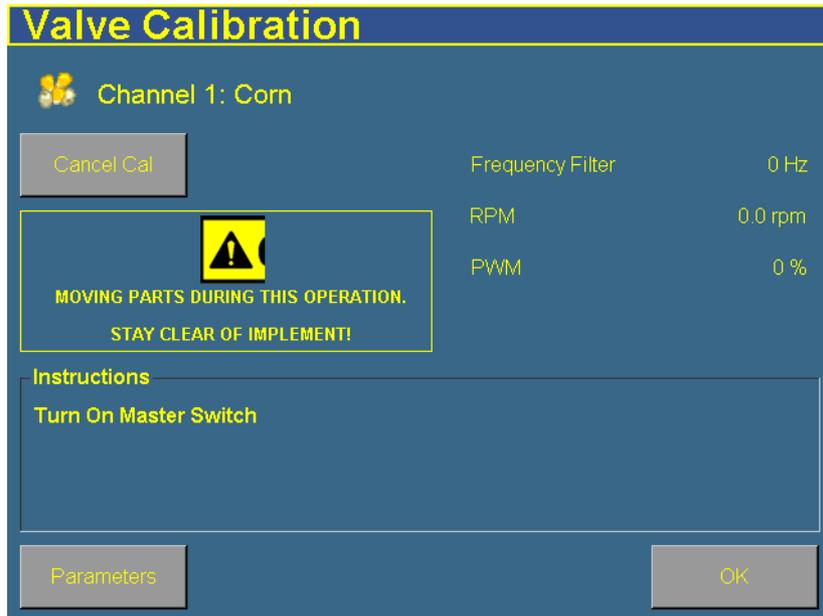
- b. Press + or – to adjust the limit of the valve.



WARNING – When you tap the control valve calibration **Start** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.

- c. When you have found the maximum limit, tap **Start**:

- If you used the Limit Output function, the calibration begins:



- If you did not use the Limit Output function, turn on the Master switch. The calibration begins.

The *PWM* value increases and then decreases. The calibration proceeds through several steps. When the calibration is complete, the message **Calibration complete** appears in the *Instructions* window and the system turns off. The settings are automatically saved.

9. Tap **OK**.
10. Calibrate each of the valves on other channels.

Control channel valve calibration: Anhydrous

The anhydrous control channel valve calibration sets the vehicle hydraulic system parameters for anhydrous application.

1. From the *Multi-Application Control Calibration* screen, tap the anhydrous entry. The *Valve Calibration* screen appears.

Note – The **Limit Output** button that was present for the other control channels does not appear for anhydrous.

2. In the *Max Speed* window, enter the upper speed limit.
3. In the *Max App Rate* window, enter the maximum application rate.



CAUTION – Only adjust the calibration parameters if instructed to do so by Technical Support.

4. If necessary, adjust the calibration parameters:
 - a. Tap **Parameters**. The *Edit calibration parameters* screen appears.
 - b. Adjust any settings and then tap **OK**. The *Valve Calibration* screen reappears.



WARNING – The anhydrous valve calibration requires the vehicle and implement to be moving and the implement must be in the ground (the implement lift switch must be down). Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.

5. Begin to drive the vehicle.
6. Tap **Start** and then turn on the master switch. The calibration begins. If the vehicle speed drops too far, or the vehicle stops moving, the calibration will abort.

The value increases and then decreases. The calibration proceeds through several steps. When the calibration is complete, the message **Calibration complete** appears in the *Instructions* window and the system turns off. The settings are automatically saved.

7. Tap **OK**.

Spreader constant

Note – This is only available for granular seed and fertilizer applications.

The spreader constant establishes the value for the amount of material dispensed through the application rate sensor. The value entered defines the pulses from the feedback sensor per ft³ of material discharged. Each material (and gate setting as applicable) has its own spreader constant. For best results, the value must be as accurate as possible.

This value may be set manually. However, using the spreader constant calibration sequence is recommended for the most accurate results.

Note – This calibration requires scales to measure the amount of material collected.



Tip – The hopper must contain material. Use a container to catch the material so you can weigh it. For example, put buckets under the spreader tubes.

To calibrate the sensor:

1. Place material in the hopper.
2. Raise the implement.
3. Apply the tractor brakes and lock in the applied position.
4. Put the transmission in park or in a locked, neutral position.
5. Start the tractor and engage PTO if used to drive the hydraulic system.
6. Run the engine at normal operating speed until the hydraulic fluid is at normal operating temperature.



WARNING – When you tap the fill disk **Output Shaft** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.

7. Tap **Output Shaft** to rotate the shaft through one full rotation.

8. Adjust the *Target Meter RPM* value. This is the speed at which the seed meter shaft turns while the calibration is performed.
9. Adjust the *Number of Revs* value. This is the number of revolutions the meter will turn during the calibration. This will constitute the length of the test. The higher the number, the more accurate the calibration.
10. Tap **Start**.
11. Either tap **Master** or turn on the external master switch in the cab. The calibration begins.

The system runs the dispensing unit (meter/conveyor) at the specified RPM for the specified number of meter revolutions and then automatically shuts down.

Spreader Constant Calibration

Channel 3: Wheat

Restart Master

Spreader Constant 25782.49

Pulse Count 9882 pul

Amount Dispensed 2.00 lbs

MOVING PARTS DURING THIS OPERATION.
STAY CLEAR OF IMPLEMENT!

Continue

Instructions
Enter the amount of material collected and press **Continue** or press **Restart** to restart the calibration

OK

12. Weigh the material dispensed and enter the value into the *Amount Dispensed* field.



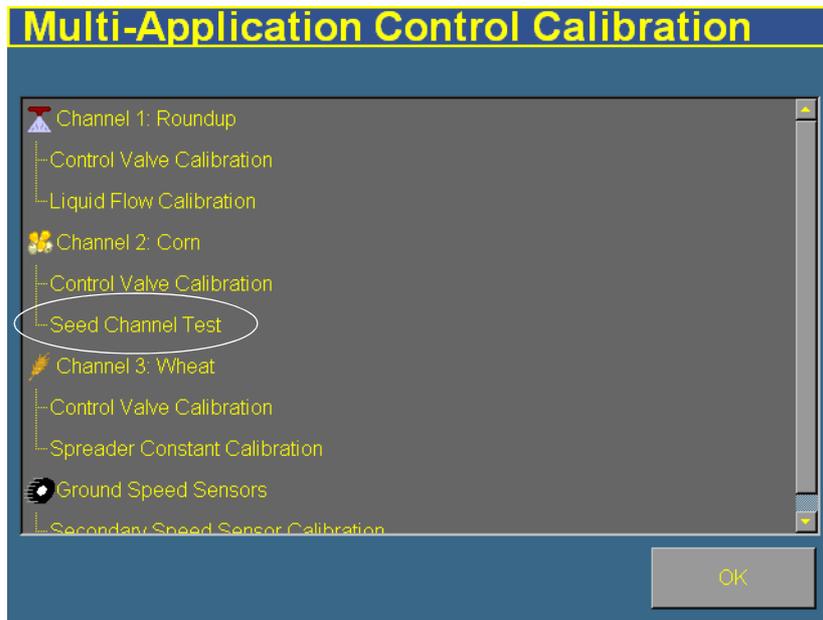
Tip – Remember to subtract the weight of the bucket or other receptacle.

13. Tap **Continue** and then tap **Save** to save the new spreader constant. Otherwise, select **OK** to exit.

Planter seed count

This test uses the test switch. It enables you to run the system without lowering it. In this test, you run the planter for a known number of disk rotations and then count the seeds to ensure that they match the system's count.

1. From the *Multi-Application Control Calibration* screen, select *Seed Channel Test*:



The *Seed Channel Test* screen appears:

2. Select the number of revolutions that you want the disk to turn through. The default is 5.
3. Select the ground speed that the system will simulate.
4. Select the row to monitor. You can select from the rows that are assigned to this channel, so the first row may not be 1.
5. Select the target planting rate.



Tip – The hopper must contain seed. Use a container to catch the material so you can count it. For example, put a bucket under the planter tube.

6. Tap **Start** and press the test switch. The disk turns and dispenses seed for the specified number of revolutions and then stops. The *Seed Count* value increases as the seed is dispensed.
7. Count the number of seeds collected to ensure that the quantity matches the *Seed Count* value.

Continuing

The sensors are now calibrated. Select one of the following:

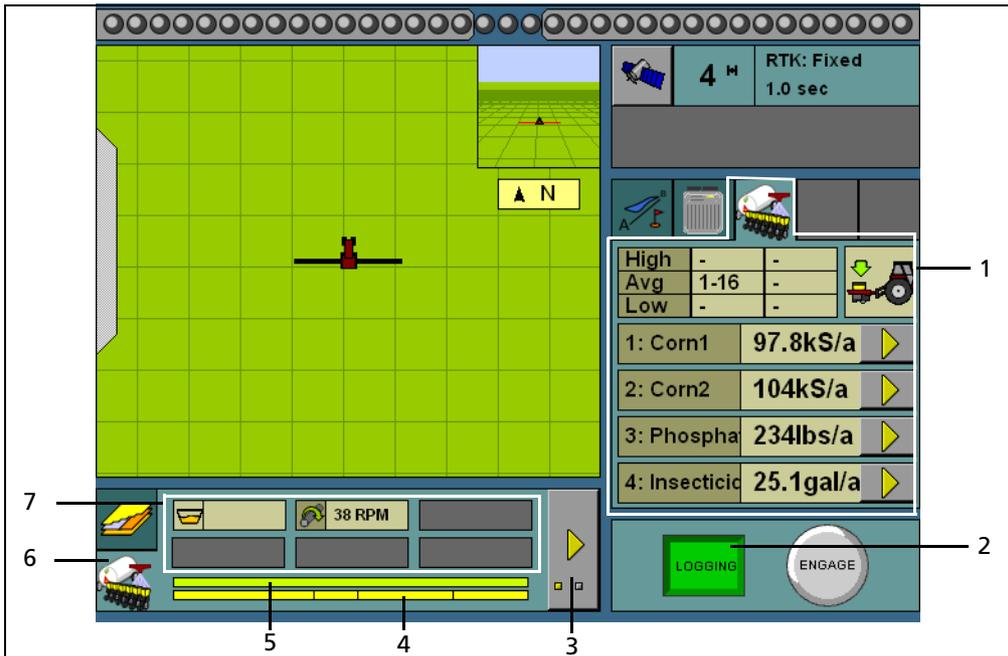
To operate a...	See...
planter or drill	Operating a planter or drill, page 407
sprayer	Operating a sprayer (liquid flow), page 419
air seeder	Operating an air seeder (granular seed), page 424
spreader	Operating a spreader (granular fertilizer), page 436
anhydrous unit	Operating an anhydrous unit, page 444

Operating a planter or drill



CAUTION – When the implement is down and the master switch is On, the machine is fully operational. Take all necessary precautions to ensure user safety. Failure to do so could result in injury or death.

When you are controlling a planter or drill with the Multi-Application Control plugin, several new items appear on the Run screen:



Item	Description
1	Planter tab
2	Logging on/off button
3	Planter row details button
4	Channel-to-row assignment bar
5	Row status bar
6	Row and sensor information tab
7	Additional sensor readings

Turning the planter on or off

Implement lift switch installed

If an implement lift switch is *not* installed, see page 410.

If an optional implement lift switch is installed, to plant seed you must engage both the *master switch* and the *implement lift switch*.

When the master switch is engaged, the **Logging** button is engaged. When the implement lift switch is engaged so the implement is down, the implement lift switch indicator changes to show this:

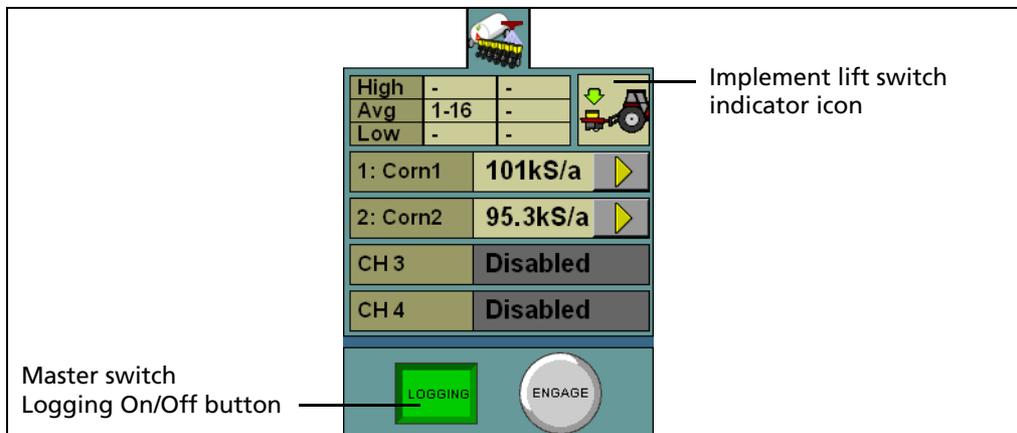


Illustration	Status	Description
 	<p>Implement switch is Off</p> <p>Master switch is Off</p>	<p>The implement is raised and the system is off</p>
 	<p>Implement switch is Off</p> <p>Master switch is On</p>	<p>The implement is raised. The master switch is turned on but logging does not occur because the planter is not applying seed.</p>
 	<p>Implement switch is On</p> <p>Master switch is Off</p>	<p>The implement is lowered, but the system is off and therefore not planting seed (or logging coverage).</p>
 	<p>Implement switch is On</p> <p>Master switch is On</p>	<p>The implement is lowered and the system is on and logging coverage.</p>

Implement lift switch not installed

For the planter to plant seed, you must engage the *master switch*.

When the master switch is engaged, the **Logging** button engages and the implement lowers. The **Logging** button and the position switch indicator change to show this:

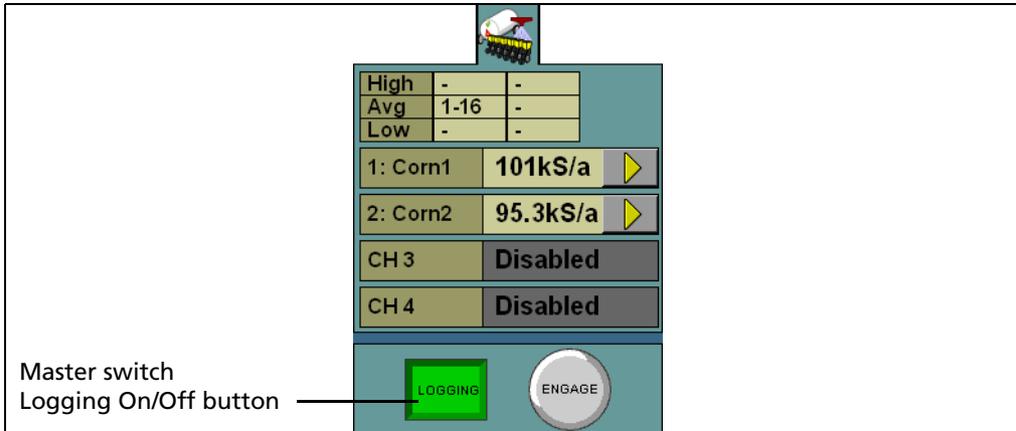
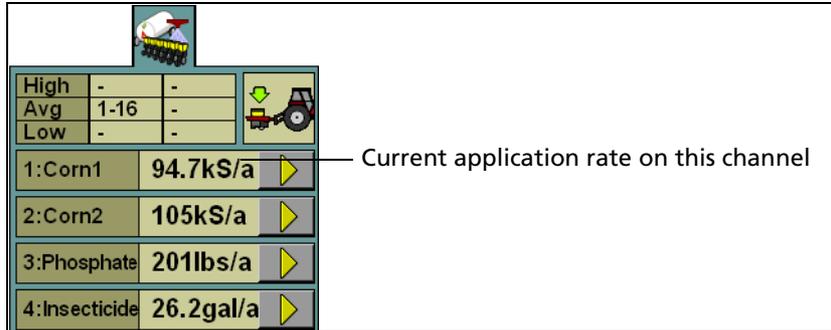


Illustration	Status	Description
	Master switch is Off	The implement is raised and the system is off
	Master switch is On	The implement is lowered and the system is on and logging coverage.

The planter channel (product) tab (overview mode)

The Multi-Application Control plugin can control up to 4 products on a planter at once, enabling you to plant seed while spreading granular fertilizer, and/or spraying liquid. The planter tab on the right of the Run screen shows all the configured channels and their current status:

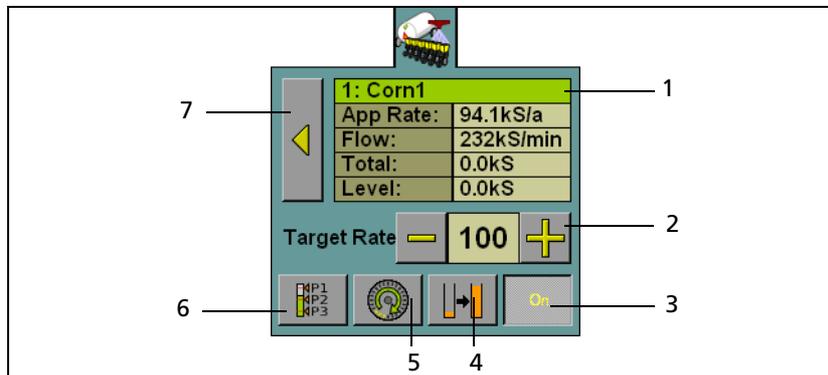


High	-	-	
Avg	1-16	-	
Low	-	-	
1: Corn1		94.7kS/a	
2: Corn2		105kS/a	
3: Phosphate		201lbs/a	
4: Insecticide		26.2gal/a	

Figure 14.1 The planter channel (product) tab

Detailed channel information button

To adjust the settings for an individual channel, tap the arrow button  next to the channel. The tab will display the details of that channel:



Item	Description
1	<ul style="list-style-type: none"> • Channel name • Current application rate • Channel flow rate • Total applied so far • Tank level
2	Target rate (with Increase/Decrease buttons)
3	Channel on/off button
4	Quick link to the <i>Channel Product Level</i> screen. See page 344.
5	Fill disk button
6	Preset target rate selection button: Select a different application rate from your preset entries. See page 336. Note – This button is only available if you entered more than one target rate.
7	Return button: Leave the detailed channel view and return to the overview.

Turning individual channels on or off

On the detailed channel tab, tap **On**. The channel is turned off when the **On** button is raised .

When you return to the channel status tab, the channel's current planting rate will appear as **Off**. See Figure 14.8.

To return to the overview, press .

Adjusting the target rate (manually)

The Target Rate is the rate that you want the planter to plant at. To manually increase the target rate, press **+**. To manually decrease the target rate, press **-**. 

The target rate adjusts by the Increment/Decrement value. See page 372.

Adjusting the target rate (with a preset rate)

If you have created more than one preset rate for a material, the Preset Rate Selection button will be available . Tap the button to select between the preset target rates.

The new preset rate will appear between the **+** and **-** buttons.

Filling the planter disks before driving (Pre-prime button)

The planter has disks that rotate and drop seeds one-at-a-time. When the vehicle is moving, the seeds in the disk are continually replenished.

However, when you begin driving, the disks will be empty. To avoid this, before you begin moving, press the Fill Disk button .

It rotates the disks through one revolution to ensure that they are pre-loaded with seed before you begin.

To fill the disks on this channel (and any channels combined with this one):

1. Tap the Fill Disk button. The *Fill Disk* screen appears.
2. Raise the implement.
3. Lock the vehicle brakes and put the vehicle in park.
4. Start the vehicle engine.
5. Run the vehicle until the hydraulic fluid is at operating temperature.



CAUTION – When you tap the fill disk **Start** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.

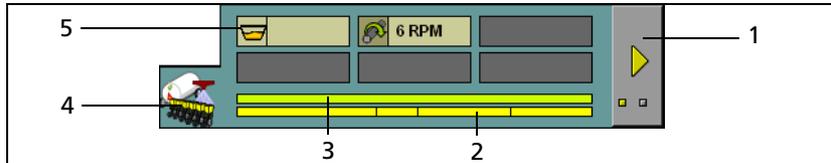
6. Tap **Start**.

The planter disks rotate and fill with seed. Repeat this process for any uncombined channels.

Row Information tab

A planter can have up to 148 rows. Each row on the planter can have a sensor that reports the row's planting state.

The information that is reported by the sensors appears on the Row Information tab, which appears under the guidance screen:



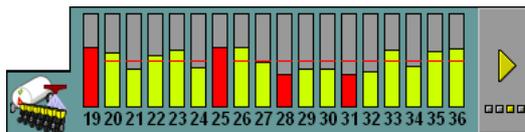
Item	Description
1	Show next screen (row details)
2	Channel-to-row assignment bar
3	Row status bar
4	Row Information tab selector
5	Additional sensor readings

The first screen of the tab shows a summary of all the rows, and any additional screens show the output of the rows in detail.

To view the next screen, tap the  button.

Row details

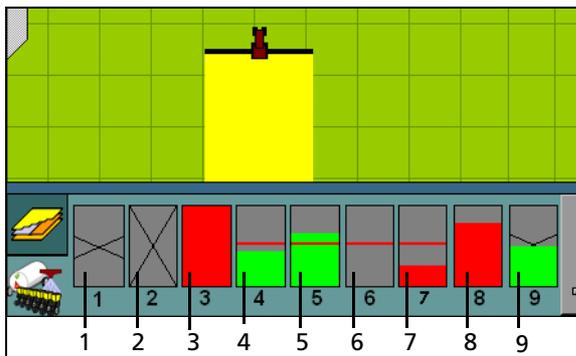
The row detail screens show the status of the rows in detail:



The row status is represented by its color:

Color	Description
Green	The row is operating within bounds
Red	The row is outside the acceptable bounds
A cross	Row is disabled

The onscreen width of the rows varies, depending on how many of them there are. In this example, the planter only has 9 rows:



Item	Description
1	Row is off by clutch
2	Row is off by channel
3	Row is blocked (block sensor) or failed (population sensor)
4	Row is operating (slightly below the target rate line)
5	Row is operating (slightly above the target rate line)
6	Row is passive (master switch is off)
7	Row is operating (but below the acceptable bounds)
8	Row is operating (but above the acceptable bounds)
9	Row is operating (block sensor)

Note – Coverage is drawn even if an individual row is not operating (unless Tru Count air clutches are installed and switching is being used).

Material accumulator

The *material accumulator* counts the amount of material that passes through each channel. The material accumulator value appears as the *Total* value on the Run screen.

You can reset this value on the application setup screen or by selecting the *Channel Product Level* screen from the Run screen:

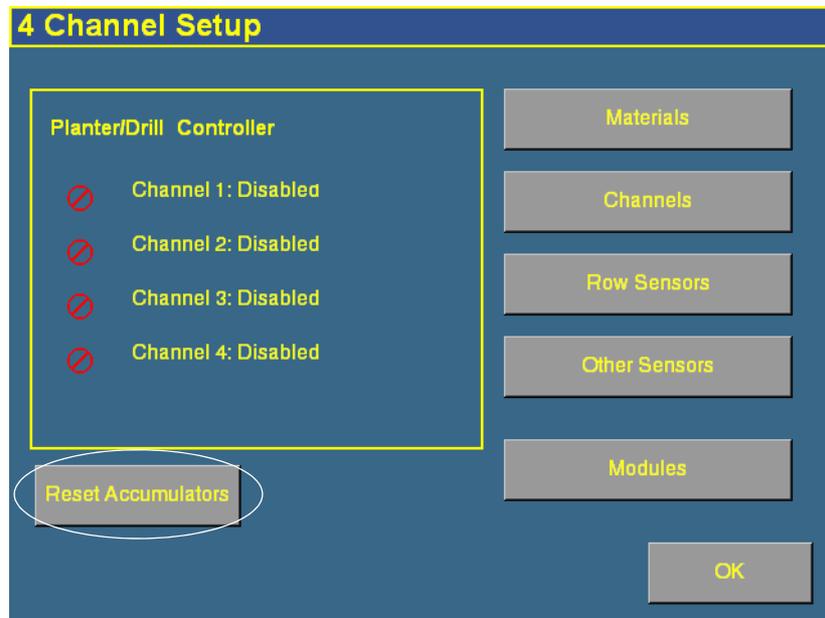
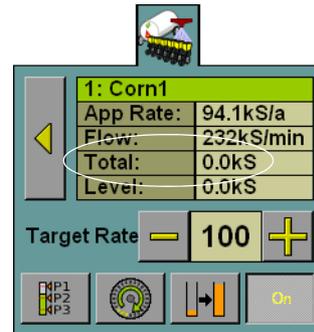
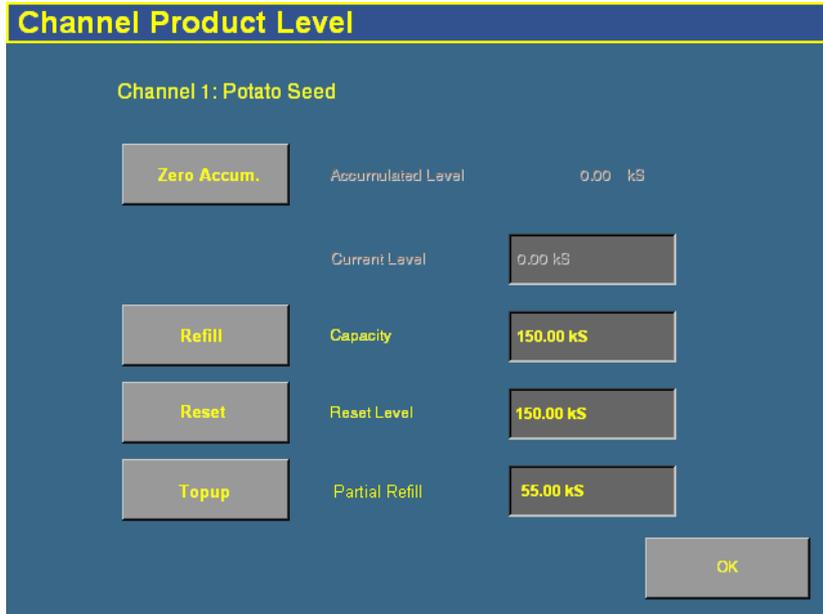


Figure 14.2 Application setup screen

To access the *Channel Product Level* screen from the Run screen:

1. Show the details of one of the channels. See [Detailed channel information button](#), page 412.
2. Tap the  button. The *Channel Product Level* screen appears:



To reset the material accumulator and the tank level, tap **Zero Accum.**

Operating a sprayer (liquid flow)



CAUTION – When the master switch is in the On position, the machine is fully operational. Take all necessary precautions to ensure user safety. Failure to do so could result in injury or death.

When you are controlling a sprayer with the Multi-Application Control plugin, several new items appear on the main guidance screen:

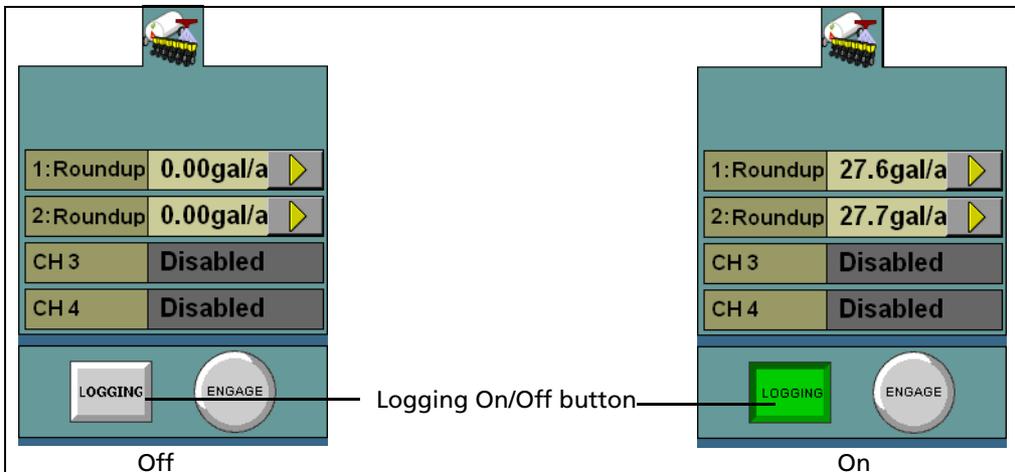


Item	Description
1	Sprayer tab
2	Logging on/off button
3	Sprayer bar
4	Sprayer section and sensors information tab
5	Additional sensor readings

Turning the sprayer on or off

The master switch controls spraying. When you turn on the master switch, logging begins and the **Logging** button is engaged.

You can turn off logging by tapping the **Logging** button:



The Sprayer tab (overview mode)

The Multi-Application Control plugin can control up to 4 liquid products on a sprayer at once. The sprayer tab on the right of the main guidance screen shows all the configured channels and their current status:

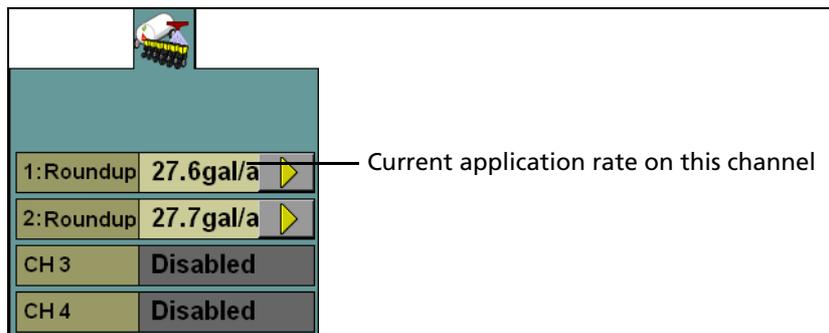
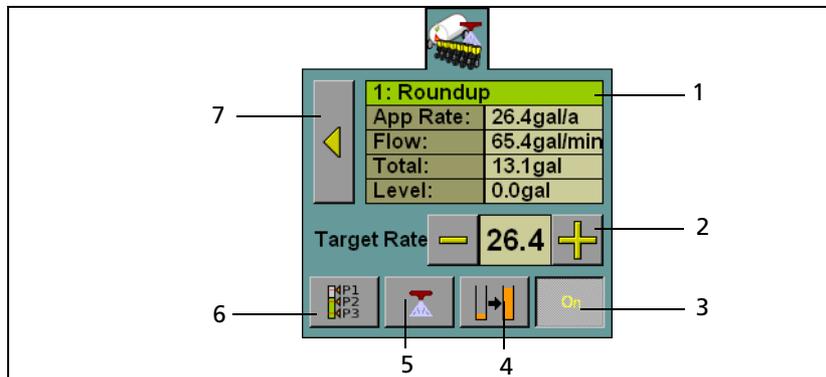


Figure 14.3 The sprayer tab

Detailed channel information button

To adjust the settings for an individual channel, tap the arrow button  next to the channel. The tab will display the details of that channel:



Item	Description
1	<ul style="list-style-type: none"> Channel name Current application rate Channel flow rate Total applied so far Tank level
2	Target rate (with Increase/Decrease buttons)
3	Channel on/off button
4	Quick link to the <i>Channel Product Level</i> screen. See page 356.
5	Flush button (only available when Flush is enabled. See page 355 and page 422)
6	Preset target rate selection button: Select a different application rate from your preset entries. See page 347. Note – This button is only available if you entered more than one target rate.
7	Return button: Leave the detailed channel view and return to the overview.

Turning individual channels on or off

On the detailed channel tab, tap **On**. The channel is turned off when the **On** button is raised .

When you return to the channel status tab, the channel's current spraying rate will appear as **Off**.

To return to the overview, press .

Adjusting the target rate (manually)

The Target Rate is the rate that you want the sprayer to spray at. To manually increase the target rate, press **+**. To manually decrease the target rate, press **-**. 

The target rate adjusts by the *Increment/Decrement* value. See page 348.

Adjusting the target rate (with a preset rate)

If you have created more than one preset rate for a material, the Preset Rate Selection button will be available . Tap the button to select between the preset target rates.

The new preset rate will appear between the **+** and **-** buttons.

Flush mode

Flush is a manual override mode that opens the valve and dispenses material for a period of time for a defined flush speed. The Flush Enable feature can only be activated when the vehicle is stopped.

Section Information tab

A sprayer can have up to 24 sections. Each section is represented on the section layout bar.

The information that is reported by boom sections and additional sensors appears on the Section Information tab, which appears under the guidance screen:



Item	Description
1	Section layout bar
2	Sprayer Information tab selector
3	Additional sensor readings

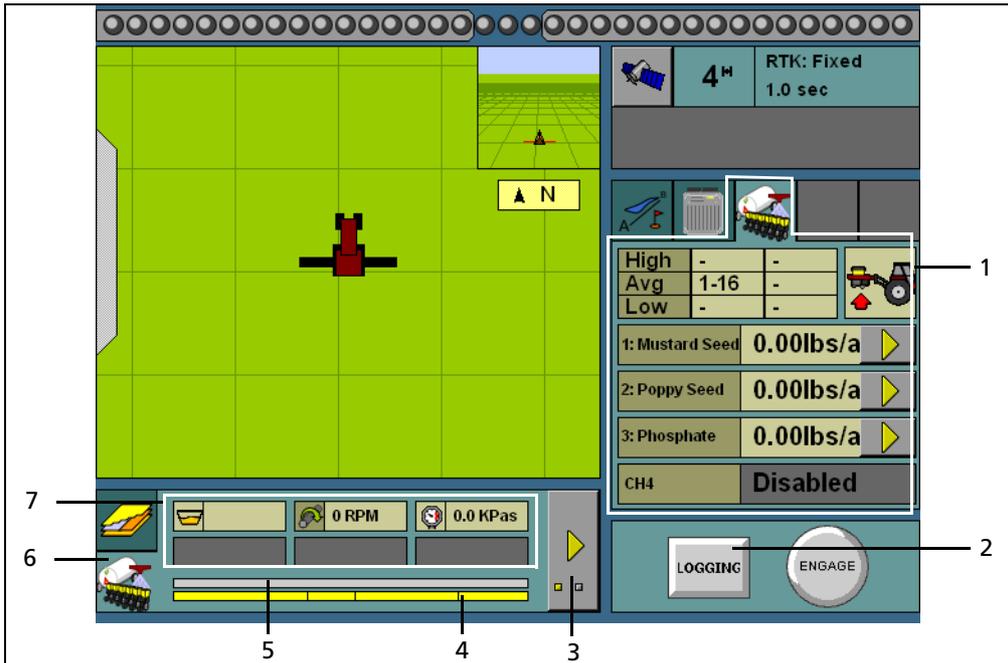
The first screen of the tab shows a summary of all the sections.

Operating an air seeder (granular seed)



CAUTION – When the implement is down and the master switch is On, the machine is fully operational. Take all necessary precautions to ensure user safety. Failure to do so could result in injury or death.

When you are running an air seeder with the Multi-Application Control plugin, several new items appear on the main guidance screen:



Item	Description
1	Air seeder tab, see page 428
2	Logging on/off button
3	Air seeder row details button, see page 432
4	Channel-to-row assignment bar
5	Row status bar
6	Row Information tab
7	Additional sensor readings

Turning the air seeder on or off

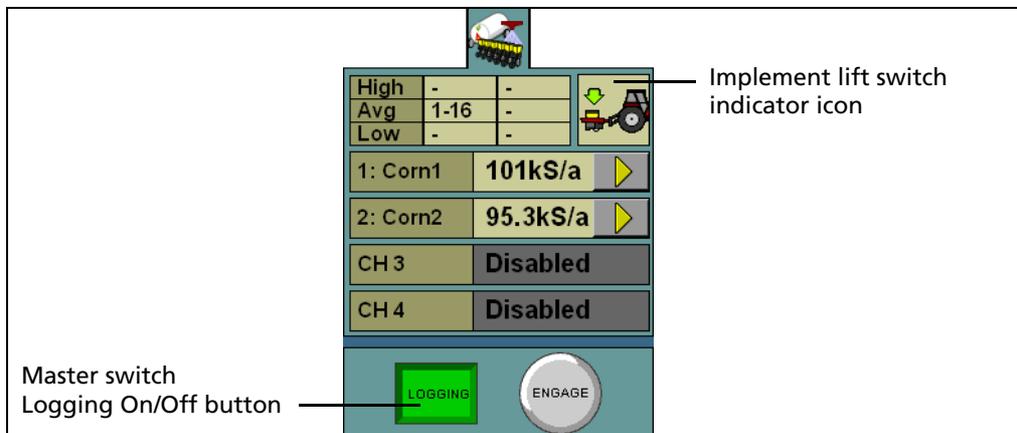
Implement lift switch installed

If an implement lift switch is *not* installed, see page 427.

If an optional implement lift switch is installed, to apply seed you must engage both the *master switch* and the *implement lift switch*.

When the master switch is engaged, the **Logging** button is engaged.

When the implement lift switch is engaged so the implement is down, the implement lift switch indicator changes to show this:



14 The Multi-Application Control Plugin

Illustration	Status	Description
 	Implement switch is Off Master switch is Off	The implement is raised and the system is off
 	Implement switch is Off Master switch is On	The implement is raised. The master switch is turned on but logging does not occur because the air seeder is not applying seed.
 	Implement switch is On Master switch is Off	The implement is lowered, but the system is off and therefore not applying seed (or logging coverage).
 	Implement switch is On Master switch is On	The implement is lowered and the system is on and logging coverage.

Implement lift switch not installed

For the air seeder to apply seed, you must engage the *master switch*.

When the master switch is engaged, the **Logging** button engages and the implement lowers. The **Logging** button and the position switch indicator change to show this:

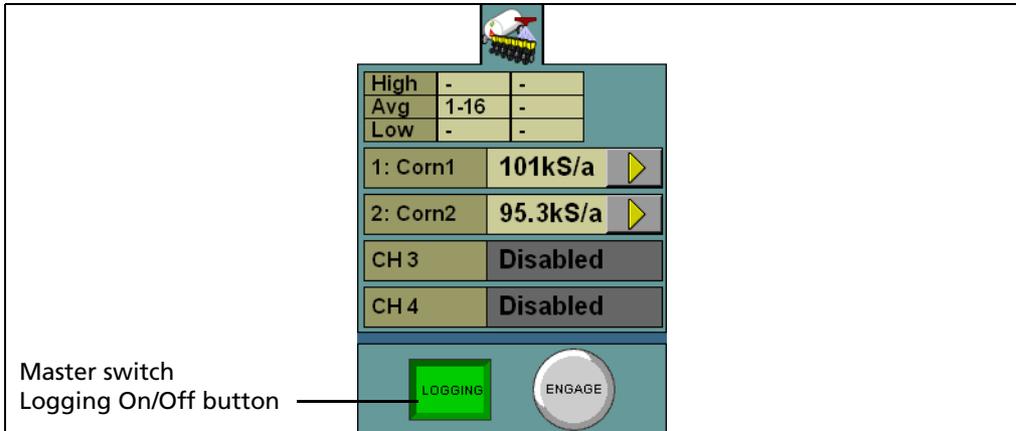


Illustration	Status	Description
	Master switch is Off	The implement is raised and the system is off
	Master switch is On	The implement is lowered and the system is on and logging coverage.

The air seeder product (channel) tab (overview mode)

The Multi-Application Control plugin can control up to 4 products on an air seeder at once, enabling you to distribute seed while spreading granular fertilizer, spraying liquid, and/or applying anhydrous ammonia. The air seeder tab on the right of the main guidance screen shows all the configured channels and their current status:

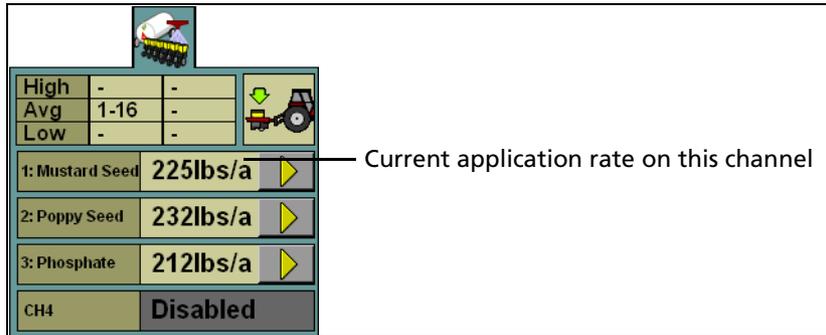
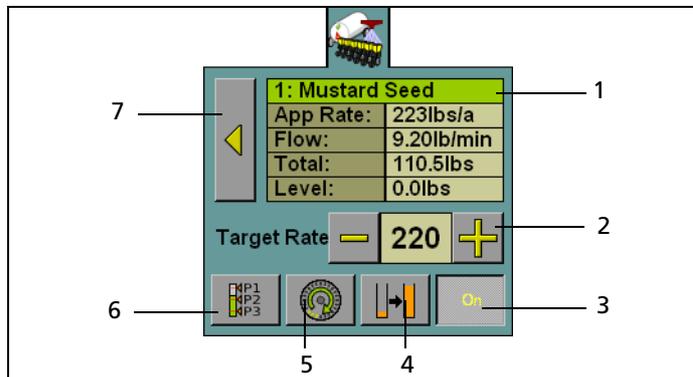


Figure 14.4 The air seeder product (channel) tab

Detailed channel information button

To adjust the settings for an individual channel, tap the arrow button  next to the channel. The tab will display the details of that channel:



Item	Description
1	<ul style="list-style-type: none"> Channel name Current application rate Channel flow rate Total applied so far Tank level
2	Target rate (with Increase/Decrease buttons)
3	Channel on/off button
4	Quick link to the <i>Channel Product Level</i> screen. See page 368.
5	Precharge button. This button changes to the Flush button  when you turn on the master switch. See page 422.
6	Preset target rate selection button: Select a different application rate from your preset entries. See page 360. Note – This button is only available if you entered more than one target rate.
7	Return button: Leave the detailed channel view and return to the overview.

Turning individual channels on or off

On the detailed channel tab, tap **On**. The channel is turned off when the **On** button is raised .

When you return to the channel status tab, the channel's current application rate will appear as **Off**.

To return to the overview, press .

Adjusting the target rate (manually)

The target rate is the rate that you want the air seeder to plant at. To manually increase the target rate, press **+**. To manually decrease the target rate, press **-**. 

The target rate adjusts by the Increment/Decrement value. See page 361.

Adjusting the target rate (with a preset rate)

If you have created more than one preset rate for a material, the Preset Rate Selection button will be available . Tap the button to select between the preset target rates.

The new preset rate will appear between the **+** and **-** buttons.

Precharging the air seeder before driving

When the vehicle is moving, the air seeder is continually distributing seed.

However, when you begin driving, the seed can take time to reach the tubes. To avoid this, before you begin moving, press the Precharge button .

It begins moving seed to ensure that seed distribution can begin when you begin planting.

To precharge this channel (and any channels combined with this one):

1. Tap the Precharge button. The *Precharge* screen appears.
2. Raise the implement.
3. Lock the vehicle brakes and put the vehicle in park.
4. Start the vehicle engine.
5. Run the vehicle until the hydraulic fluid is at operating temperature.



CAUTION – When you tap the fill disk **Start** button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.

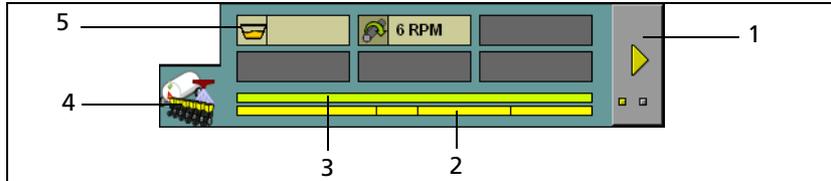
6. Tap the **Start** button.

The air seeder moves seed from the seeder bin. Repeat this process for any uncombined channels.

Row Information tab

An air seeder can have up to 148 rows. Each row on the air seeder can have a sensor that reports the row's planting state.

The information that is reported by the sensors appears on the Row Information tab, which is under the guidance screen:



Item	Description
1	Show next screen (row details)
2	Channel-to-row assignment bar
3	Row status bar
4	Row Information tab selector
5	Additional sensor readings

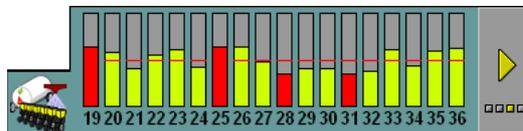
The first screen of the tab shows a summary of all the rows, and any additional screens show the output of the rows in detail.

To view the next screen, tap the



Row details

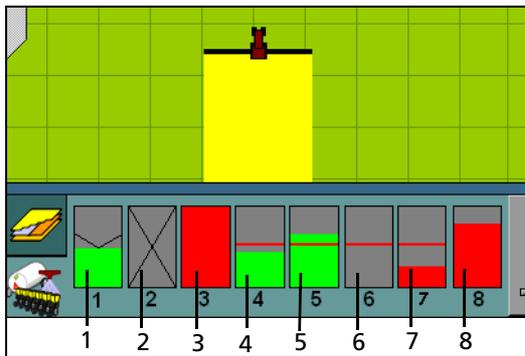
The row detail screens show the status of the rows in detail:



The row status is represented by its color:

Color	Description
Green	The row is operating within bounds
Red	The row is outside the acceptable bounds
A cross	Row is disabled

The onscreen width of the rows varies, depending on how many of them there are. In this example, the planter only has 8 rows:



Item	Description
1	Row is operating (block sensor)
2	Row is off by channel
3	Row is blocked or failed
4	Row is operating (slightly below the target rate line)
5	Row is operating (slightly above the target rate line)
6	Row is passive (master switch is off)
7	Row is operating (but below the acceptable bounds)
8	Row is operating (but above the acceptable bounds)

Note – Coverage is drawn even if an individual row is not operating.

Material accumulator

The *material accumulator* counts the amount of material that passes through each channel. The material accumulator value appears as the *Total* value on the main guidance screen.

You can reset this value on the application setup screen or by selecting the *Channel Product Level* screen from the main guidance screen:

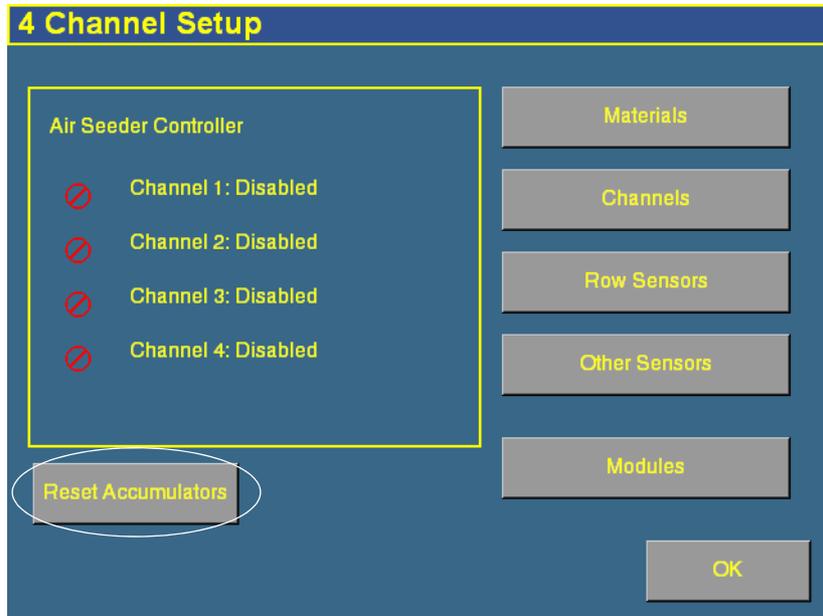
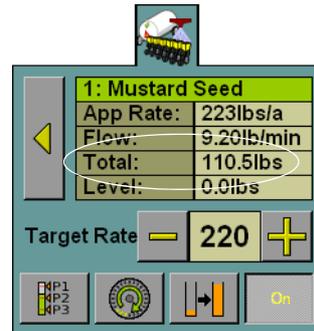
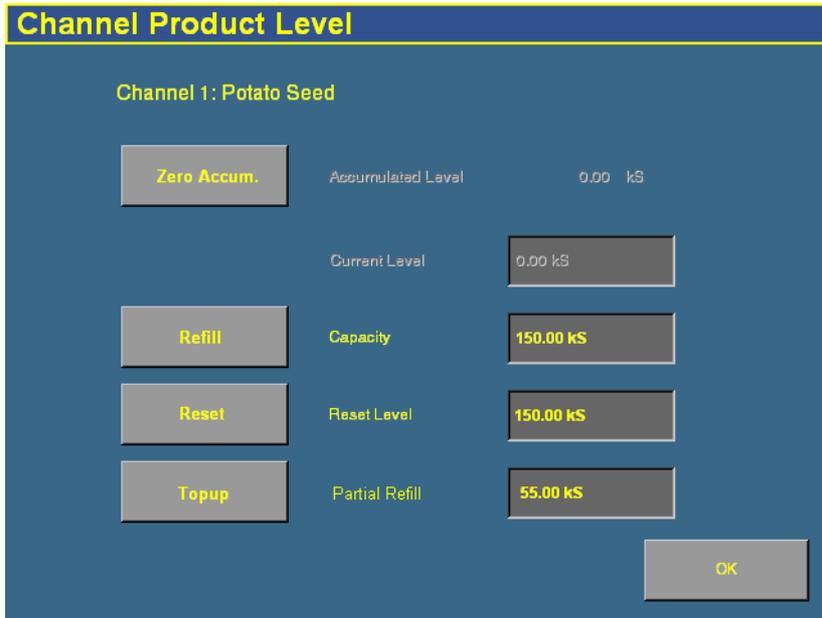


Figure 14.5 Application setup screen

To access the *Channel Product Level* screen from the main guidance screen:

1. Show the details of one of the channels. See [Detailed channel information button](#), page 412.
2. Tap the  button. The *Channel Product Level* screen appears:



Channel Product Level

Channel 1: Potato Seed

Zero Accum.	Accumulated Level	0.00 kS
	Current Level	0.00 kS
Refill	Capacity	150.00 kS
Reset	Reset Level	150.00 kS
Topup	Partial Refill	55.00 kS

OK

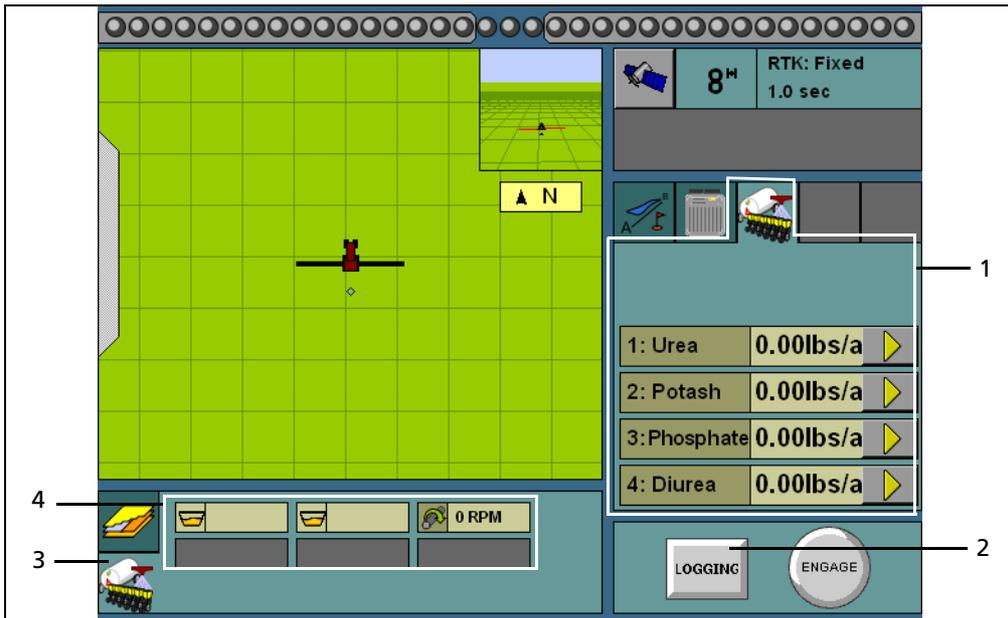
To reset the material accumulator and the air cart level, tap **Zero Accum.**

Operating a spreader (granular fertilizer)



CAUTION – When the master switch is in the On position, the machine is fully operational. Take all necessary precautions to ensure user safety. Failure to do so could result in injury or death.

When you are running a spreader with the Multi-Application Control plugin, several new items appear on the main guidance screen:

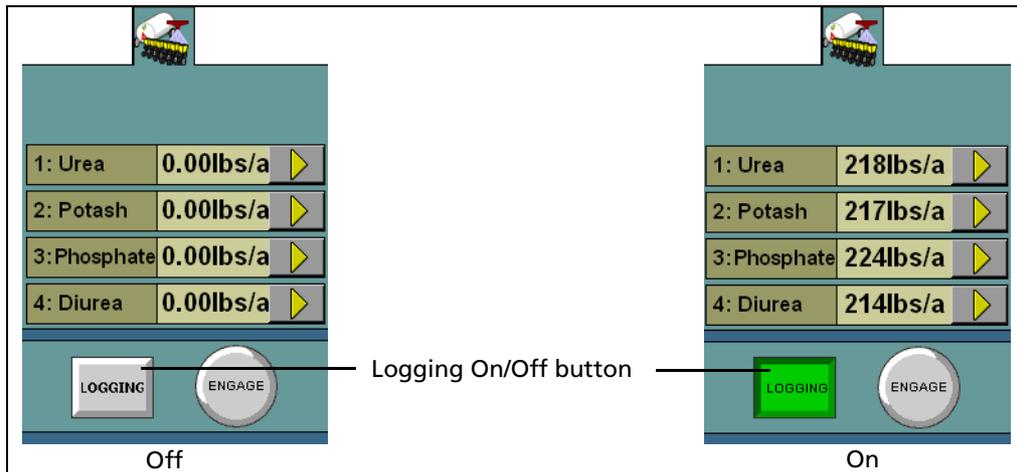


Item	Description
1	Spreader tab
2	Logging on/off button
3	Spreader Information tab
4	Additional sensor readings

Turning the spreader on or off

The Multi-Application Control plugin is controlled by the master switch and the **LOGGING** button. When logging is engaged, the spreader application is on, and when logging is disengaged, the spreader application is off.

The tractor icon shows this:



The Spreader product (channel) tab (overview mode)

The Multi-Application Control plugin can control up to 4 products on a spreader at once. The spreader tab on the right of the main guidance screen shows all the configured channels and their current status:

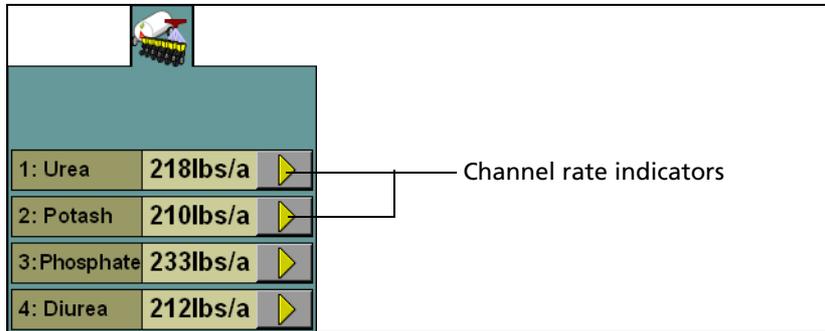
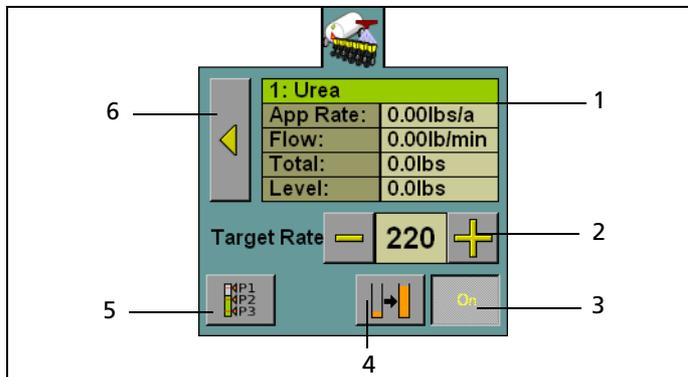


Figure 14.6 The spreader product (channel) tab

Detailed channel information button

To adjust the settings for an individual channel, tap the detailed channel information button  next to the channel. The tab will display the details of that channel:



Item	Description
1	<ul style="list-style-type: none"> • Channel name • Current application rate • Channel flow rate • Total applied so far • Tank level
2	Target rate (with Increase/Decrease buttons)
3	Channel on/off button
4	Quick link to the <i>Channel Product Level</i> screen. See page 378.
5	Preset target rate selection button: Select a different application rate from your preset entries. See page 371. Note – This button is only available if you entered more than one target rate.
6	Return button: Leave the detailed channel view and return to the overview.

Turning individual channels on or off

On the detailed channel tab, tap **On**. The channel is turned off when the **On** button is raised .

When you return to the channel status tab, the channel's current planting rate will appear as Off.

To return to the overview, press .

Adjusting the target rate (manually)

The Target Rate is the rate that you want the spreader to spread at. To manually increase the target rate, press **+**. To manually decrease the target rate, press **-**.



The target rate adjusts by the *Increment/Decrement* value. See page 372.

Adjusting the target rate (with a preset rate)

If you have created more than one preset rate for a material, the Preset Rate Selection button will be available . Tap the button to select between the preset target rates.

The new preset rate will appear between the **+** and **-** buttons.

Sensor Information tab

A spreader can be fitted with a hopper or RPM sensor.

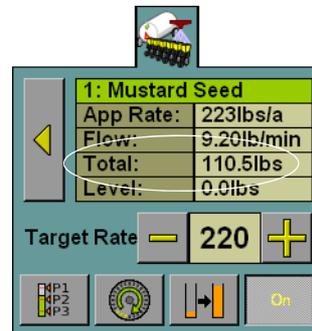
The information that is reported by the sensors appears on the Row Information tab, which is under the guidance screen:



Item	Description
1	Row Information tab selector
2	Additional sensor readings

Material accumulator

The *material accumulator* counts the amount of material that passes through each channel. The material accumulator value appears as the *Total* value on the main guidance screen.



You can reset this value on the application setup screen or by selecting the *Channel Product Level* screen from the main guidance screen:

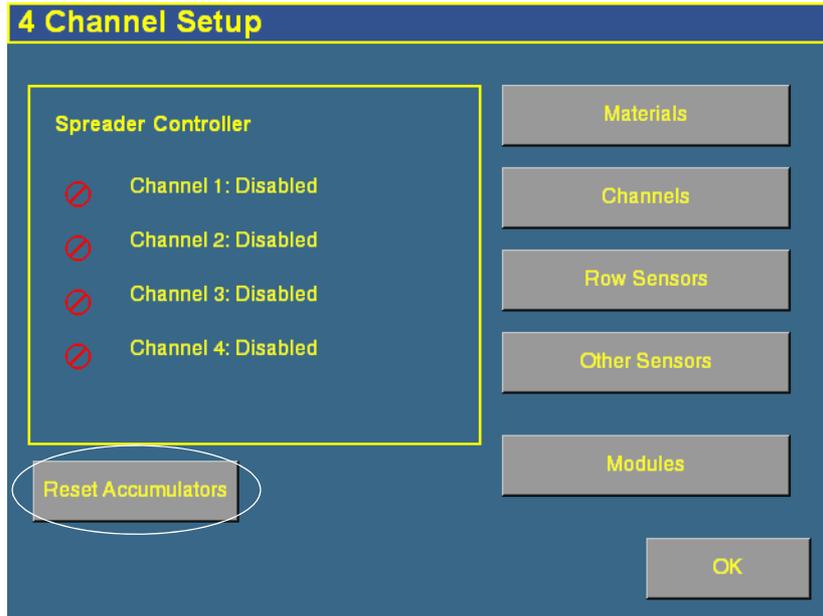


Figure 14.7 Application setup screen

To access the *Channel Product Level* screen from the main guidance screen:

1. Show the details of one of the channels. See [Detailed channel information button](#), page 412.
2. Tap the  button. The *Channel Product Level* screen appears:



Channel Product Level

Channel 1: Urea

Zero Accum.	Accumulated Level	0.00 lbs
	Current Level	0.00 lbs
Refill	Capacity	150.00 lbs
Reset	Reset Level	150.00 lbs
Topup	Partial Refill	55.00 lbs

OK

To reset the material accumulator and the air cart level, tap **Zero Accum.**

Operating an anhydrous unit



CAUTION – When the implement is down and the master switch is in the On position, the machine is fully operational. Take all necessary precautions to ensure user safety. Failure to do so could result in injury or death.

When you are running an anhydrous unit with the Multi-Application Control plugin, several new items appear on the main guidance screen:



Item	Description
1	Anhydrous tab, see page 448
2	Logging on/off button
3	Row Information tab
4	Additional sensor readings. The  sensors show the percentage of capacity.

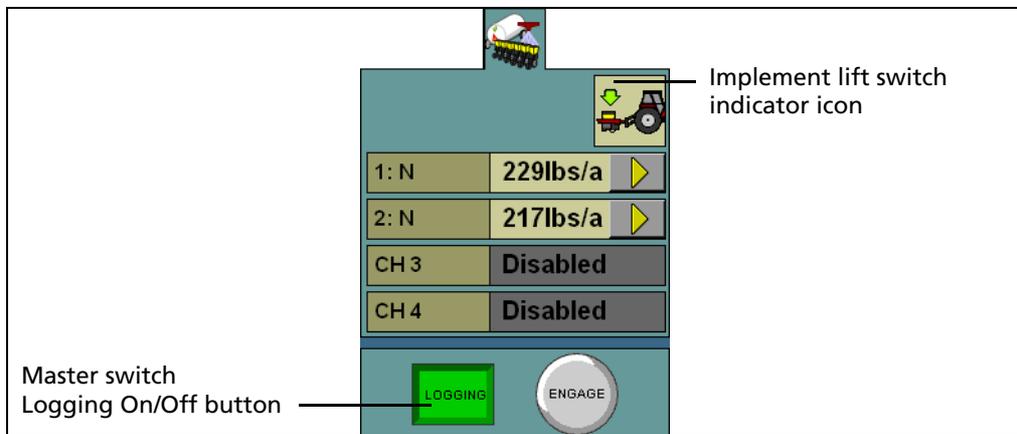
Turning the anhydrous on or off

Implement lift switch installed

If an implement lift switch is *not* installed, see page 427.

If an optional implement lift switch is installed, to apply ammonia you must engage both the *master switch* and the *implement lift switch*.

When the master switch is engaged, the **Logging** button is engaged. When the implement lift switch is engaged so the implement is down, the implement lift switch indicator changes to show this:



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Illustration	Status	Description
 	Implement switch is Off Master switch is Off	The implement is raised and the system is off
 	Implement switch is Off Master switch is On	The implement is raised. The master switch is turned on but logging does not occur because the anhydrous unit is not applying ammonia.
 	Implement switch is On Master switch is Off	The implement is lowered, but the system is off and therefore not applying ammonia (or logging coverage).
 	Implement switch is On Master switch is On	The implement is lowered and the system is on and logging coverage.

Implement lift switch not installed

For the anhydrous unit to apply ammonia, you must engage the *master switch*.

When the master switch is engaged, the **Logging** button engages and the implement lowers. The **Logging** button and the position switch indicator change to show this:

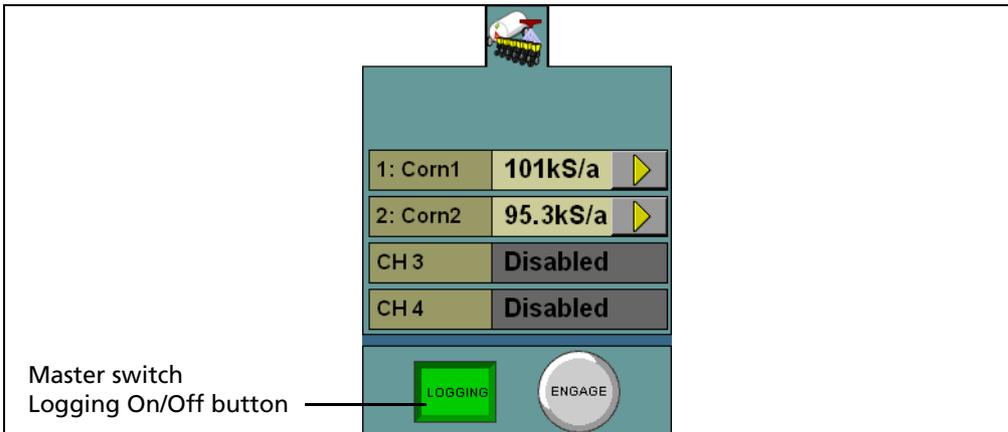


Illustration	Status	Description
	Master switch is Off	The implement is raised and the system is off
	Master switch is On	The implement is lowered and the system is on and logging coverage.

The Anhydrous product (channel) tab (overview mode)

The Multi-Application Control plugin can control up to 2 products on an anhydrous unit at once. In overview mode, the anhydrous tab on the right of the main guidance screen shows all of the configured channels and their current status:

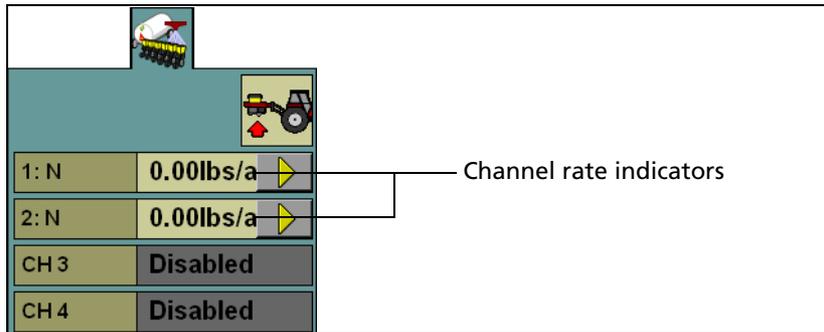
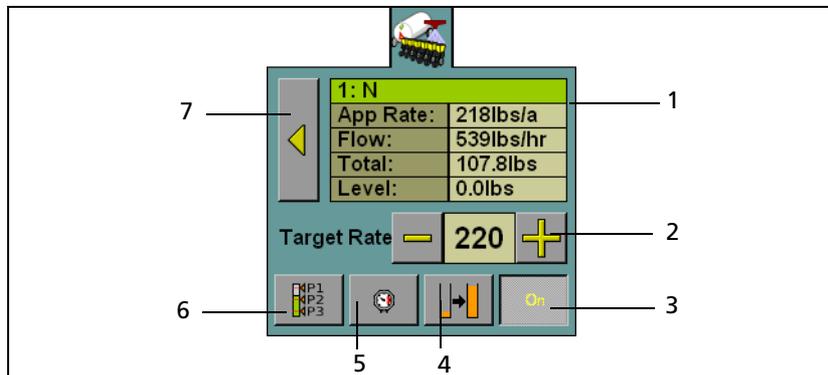


Figure 14.8 The anhydrous tab

Detailed channel information button

To adjust the settings for an individual channel, tap the detailed channel information button  next to the channel. The tab will display the details of that channel:



Item	Description
1	<ul style="list-style-type: none"> • Channel name • Current application rate • Channel flow rate • Total applied so far • Tank level
2	Target rate (with raise/lower buttons)
3	Channel on/off button
4	Quick link to the <i>Channel Product Level</i> screen. See page 388.
5	Tank pressure button
6	Preset target rate selection button: Select a different application rate from your preset entries. See page 381. Note – This button is only available if you entered more than one target rate.
7	Return button: Leave the detailed channel view and return to the overview.

Note – For anhydrous application, the actual channel rate and the target rate are shown in lbs/acre of N (nitrogen), not NH₃ (anhydrous ammonia).

Turning individual channels on or off

On the detailed channel tab, tap **On**. The channel is turned off when the **On** button is raised .

When you return to the channel status tab, the channel's current application rate will appear as **Off**.

To return to the overview, press .

Adjusting the target rate (manually)

The Target Rate is the rate that you want the planter to plant at. To manually increase the target rate, press **+**. To manually decrease the target rate, press **-**. 

The target rate adjusts by the Increment/Decrement value. See page 382.

Adjusting the target rate (with a preset rate)

If you have created more than one preset rate for a material, the Preset Rate Selection button will be available . Tap the button to select between the preset target rates.

The new preset rate will appear between the **+** and **-** buttons.

Tank pressure button

The tank pressure button  enables you to enter the tank pressure from the nurse tank gauge. The system then calculates the density of the nitrogen or anhydrous ammonia.

To calculate the density:

1. Read the nurse tank pressure gauge.
2. Round the pressure down to the nearest pressure in the following table:

Nurse tank temperature (F°)	Nurse tank pressure (PSI)	Pounds per cubic foot NH₃	Pounds per cubic foot Nitrogen
-28	0	42.5	35.0
-8	10	41.7	34.3
6	20	41.1	33.8
16	30	40.6	33.4
26	40	40.2	33.1
34	50	39.8	32.8
42	60	39.4	32.4
50	75	39.0	32.1
58	90	38.6	31.8
68	110	38.1	31.4
77	130	37.7	31.0
86	155	37.2	30.6
96	185	36.6	30.2
105	215	36.1	29.7
115	250	35.6	29.3

For example, if the nurse tank pressure gauge reads 49 psi, use the 40 psi listing in the table. If the tank pressure gauge is inoperative, you can use the tank temperature to determine the approximate density values.

3. Enter the appropriate density.

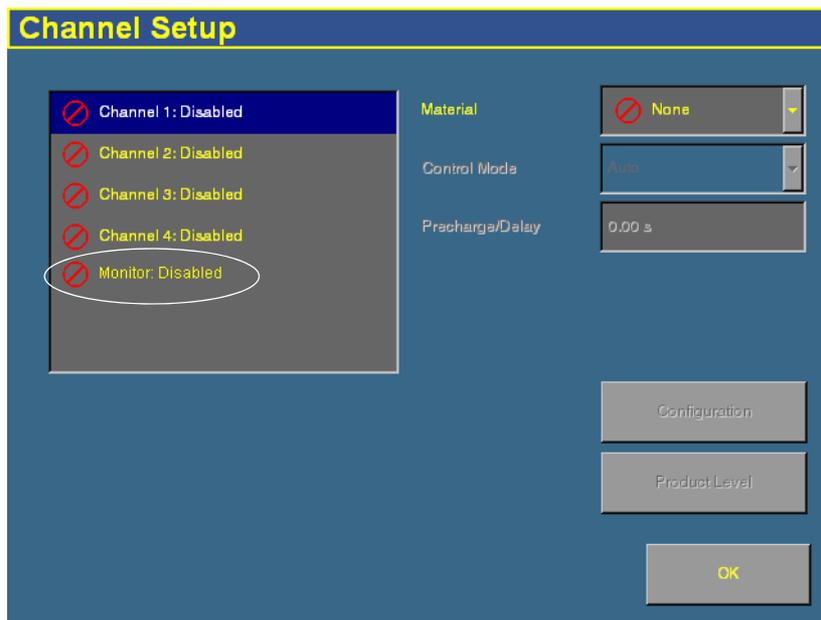
Running the system in Monitor-only mode

To receive rate information, the system must have the appropriate sensors (such as population sensors). If the system has block sensors (which do not report rate, they only report blockages), the display will be unable to determine the current rate or calculate whether the rate needs to increase or decrease.

However, it is still possible to run the system without rate information in Monitor-only mode. In Monitor-only mode, all other channels are disabled and rate is not controlled.

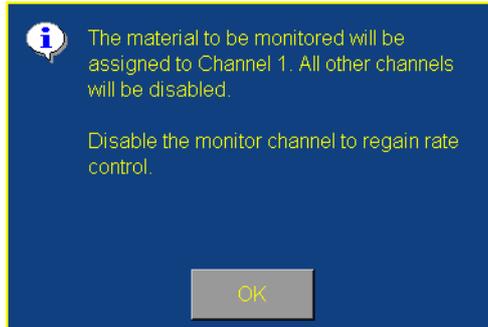
When you have configured the modules and entered the materials, but you have not yet assigned the materials to channels:

1. From the *4 Channel Setup* screen, tap **Channels**. The *Channel Setup* screen appears:

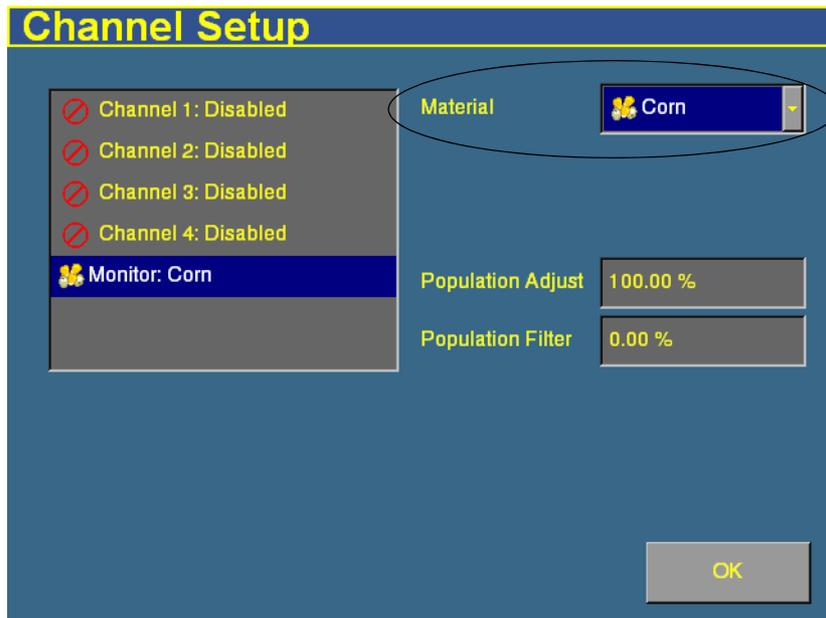


The 4 possible channels are available, but there is also an additional monitor channel.

2. Select Monitor: Disabled from the channel list. A warning message appears:



3. Read the warning and then tap **OK**.
4. Select the material to assign to Monitor-only mode from the Material list:



5. Adjust the *Population Adjust* and *Population Filter* settings, if necessary:

Item	Description
Population Adjust	Scales the displayed population by a percentage (100% = no scaling).
Population Filter	Stabilizes the monitored population display (0% = no filtering, 99% = maximum filtering).

6. Tap **OK**.

When you operate the plugin in the field, the system will not display rate information. Instead, it will display the text **Monitor only**. The channel detail button  will not be available.

To disable Monitor-only mode:

1. Select the *Channel Setup* screen.
2. Select Monitor from the Channel list.
3. Set the Material list to None. A warning message appears.
4. Tap **OK**.
5. Re-assign materials to the channels.

Obtaining diagnostics information about the Multi-Application Control device

To obtain diagnostics information regarding the current status of the Multi-Application Control device and the sensors, from the *Configuration* screen, select the Multi-Application Control plugin and then tap **Diagnostics**. The *Multi-Application Control Diagnostics* screen appears:

The screenshot shows the 'Multi-Application Control Diagnostics' screen with the following data:

CH	Target	Actual	Raw Rate	RPM	PWM	Pulse Count	Freq(Hz)
1	0.00 gal/a	0.00 gal/a	0.00	0	0	0	0
2	0.00 kS/a	0.00 kS/a	0.00	0	0	0	0
3	Disabled						
4	Disabled						

Additional information on the screen includes:

- WSMT Type: 4 Channel Granular
- Firmware Version: 3.56, 3.00
- Implement State: Down
- Speed: 0.00 mph (GPS)
- Sensor Status: Pressure
- Voltages(V): Solenoid (13.653), ECU (13.646), Sensor (8.094), Ground (0)
- Message: No pressure sensor
- Buttons: View Fault Log, OK

Item	Description
1	WSMT and TECU firmware versions
2	The pulse count. The pulse accumulator (which appears on the table as Pulse Count) counts the number of pulses that the system makes. You cannot reset the pulse accumulator value.
3	The View Fault Log button. Tap this button to view the Multi-Application Control plugin faults.
4	Sensor information. To view a different sensor, select it from the dropdown list.
5	The WMST module type

Resetting the master module



CAUTION – Do not reset the master module unless you want to reset the channel calibration settings. Trimble recommends that you do not reset the system unless instructed to by Technical Support.

When you reset the master module, it clears the value on the module. The next time that you exit the setup menu, the FieldManager display will send the settings to the module again.

To reset the memory (NOVRAM) of the master module:

1. From the *Configuration* screen, select the Multi-Application Control plugin and then tap **Setup**. The *4 Channel Setup* screen appears.
2. Tap **Modules**. The *Multi-Application Control Setup* screen appears.
3. Tap **Reset Master**. A confirmation dialog appears.
4. Tap **Reset**. The module is reset.



Tip – If you reset the master module, you may need to run the auto configuration twice.

Warning messages

When the Multi-Application Control plugin is active, the system can display warning messages. The following table lists warning messages, causes of the messages, and how to correct the situation:

Alarm #	Alarm	Probable cause	Solution
200	Master Switch Timeout – toggle Master to clear	<ol style="list-style-type: none"> 1. Master switch ON at power up. 2. Master switch ON after leaving a setup screen. 3. Shorted or damaged tractor harness. 4. Defective master switch. 	<ol style="list-style-type: none"> 1. Move master switch to the OFF position. 2. Move master switch to the OFF position. 3. Check for damage on the tractor harness at the master switch connector. 4. Inspect master switch for damage or replace.
201	Invalid Master Switch Assignment	External master switch is not assigned to the Auxiliary Input.	<ol style="list-style-type: none"> 1. Assign master switch to the Auxiliary Input. Refer to Auxiliary Input/Function Assignment. 2. Decline use of Auxiliary Input Switch.
202	Ground Speed Failure	<p>ONLY ACTIVE IN PLANTER MONITOR MODE. SEEDS ARE DETECTED WHEN THERE IS NO GROUND SPEED.</p> <ol style="list-style-type: none"> 1. Incorrect speed source setting or calibration. 2. Defective speed sensor or harness. 3. Defective module or display. 	<ol style="list-style-type: none"> 1. Verify correct speed source setting and speed calibration on the <i>Ground Speed Calibration</i> screen. 2. Inspect speed sensor/harness for damage or replace speed sensor. 3. Replace module or display.
203	Continuous Test Failure	<p>CONTROL CONDITIONS EXCEED THE DISK RPM LIMITS.</p> <ol style="list-style-type: none"> 1. Test Speed setting is set too high or low. 2. <i>Disk High Limit</i> and/or <i>Disk Low Limit</i> settings are incorrect. 	<ol style="list-style-type: none"> 1. Enter an appropriate test speed. 2. Verify or enter appropriate <i>Disk High Limit</i> and/or <i>Disk Low Limit</i> values.

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Alarm #	Alarm	Probable cause	Solution
205	Control Channel Failure	<ol style="list-style-type: none">1. Defective control valve.2. Defective feedback sensor.3. Defective module harness or module harness fuse.4. Defective module.	<ol style="list-style-type: none">1. Inspect control valve for damage or replace.2. Inspect feedback sensor for damage or replace.3. Inspect module harness for damage. Replace harness fuse.4. Inspect module for damage or replace.
206	Control Channel Unable to Control	<ol style="list-style-type: none">1. Incorrect control channel settings.2. Incorrect feedback sensor installation.3. Defective feedback sensor.	<ol style="list-style-type: none">1. Verify correct setup constants on the <i>Channel Configuration</i> screen. Perform a valve calibration.2. Verify correct installation of the feedback sensor.3. Inspect feedback sensor for damage or replace.
207	Control Channel Unstable	<ol style="list-style-type: none">1. Incorrect control channel settings.2. Incorrect feedback sensor installation.3. Defective feedback sensor.	<ol style="list-style-type: none">1. Verify correct setup constants on the <i>Channel Configuration</i> screen. Perform a valve calibration.2. Verify correct installation of the feedback sensor.3. Inspect feedback sensor for damage or replace.
208	Control Channel Saturation Exceeded	<ol style="list-style-type: none">1. Excessive speed.2. Incorrect control channel settings. Desired rate too high for implement.3. Target Rate too high.	<ol style="list-style-type: none">1. Reduce speed.2. Verify correct setup constants on the <i>Channel Configuration</i> screen. Perform a valve calibration and a spreader constant calibration.3. Reduce target rate.

Alarm #	Alarm	Probable cause	Solution
209	Control Channel High Limit Exceeded	CONTROL LIMITED BY HIGH LIMIT. UNDER APPLICATION IS OCCURRING. Note – <i>The system will not run faster than High Limit value.</i>	<ol style="list-style-type: none"> 1. Check and/or reduce speed. 2. Verify control channel setup (high RPM). 3. Perform new valve calibration. 4. Check and/or reduce target rate. 5. Inspect feedback sensor for damage. 6. Inspect control valve for damage. 7. Inspect harness/module for damage. 8. Decrease target rate.
210	Control Channel Low Limit Exceeded	CONTROL RATE LIMITED BY LOW LIMIT. OVER APPLICATION IS OCCURRING.	<ol style="list-style-type: none"> 1. Increase speed. 2. Verify correct setup constants (low RPM). 3. Perform valve calibration. 4. Increase target rate.
211	All Rows Failed	<ol style="list-style-type: none"> 1. Seed meter drive malfunction. 2. Rows are not assigned to channel and channels are turned off. 	<ol style="list-style-type: none"> 1. Check seeding drive(s). 2. Assign rows to channels.
212	Row Failure	<p>SEED RATE HAS FALLEN BELOW THE <i>MIN ROW FAIL RATE</i> SETTING ON THE <i>ALARMS SETUP</i> SCREEN.</p> <ol style="list-style-type: none"> 1. Seed meter malfunction. 2. Dirty or defective seed sensor. 3. Damaged planter harness. 4. Defective module harness or module. 5. Out of seed. 	<ol style="list-style-type: none"> 1. Verify proper planter operation. 2. Inspect seed sensor for dirt or damage. Replace if necessary. 3. Inspect planter harness for damage. Repair or replace. 4. Inspect harness and module for damage. Replace if necessary. 5. Fill with seed.

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Alarm #	Alarm	Probable cause	Solution
213	High Population Limit Exceeded	SEED RATE HAS EXCEEDED THE <i>HIGH POPULATION ALARM</i> SETTING ON THE <i>ALARMS SETUP</i> SCREEN. 1. Seed meter malfunction or incorrect setup. 2. Defective seed sensor. 3. Defective module.	1. Verify proper planter operations/setup. 2. Inspect seed sensor for damage. Replace if necessary. 3. Inspect module for damage. Replace if necessary.
214	Low Population Limit Exceeded	SEED RATE HAS DROPPED BELOW THE <i>LOW POPULATION ALARM</i> SETTING ON THE <i>ALARMS SETUP</i> SCREEN. 1. Seed meter malfunction or incorrect setup. 2. Defective seed sensor. 3. Defective module. 4. Running out of seed.	1. Verify proper planter operation/setup. 2. Inspect seed sensor for damage. Replace if necessary. 3. Inspect module for damage. Replace if necessary. 4. Fill with seed.
215	High Pressure Limit Exceeded	SENSED PRESSURE EXCEEDS THE <i>HIGH ALARM</i> SETTING ON THE <i>OTHER SENSOR SETUP</i> SCREEN. 1. Implement malfunction or incorrect setup. 2. Defective pressure sensor. 3. Defective module.	1. Verify proper implement operation/setup. 2. Inspect pressure sensor for damage. Replace if necessary. 3. Inspect module for damage. Replace if necessary.
216	Low Pressure Limit Exceeded	SENSED PRESSURE BELOW THE <i>LOW ALARM</i> SETTING ON THE <i>OTHER SENSOR SETUP</i> SCREEN. 1. Implement malfunction or incorrect setup. 2. Defective pressure sensor. 3. Defective module harness or module.	1. Verify proper implement operation/setup. 2. Inspect pressure sensor for damage. Replace if necessary. 3. Inspect module and/or module harness for damage. Replace if necessary.

Alarm #	Alarm	Probable cause	Solution
217	Member Module Detection	<p>NUMBER OF MEMBER MODULES DOES NOT MATCH THE SYSTEM CONFIGURATION.</p> <ol style="list-style-type: none"> 1. Too few modules connected to system. 2. Too many modules connected to system. 3. Defective CAN/module harness. 4. Blown module harness fuse. 5. Defective module. 6. New module has been added to system. 	<ol style="list-style-type: none"> 1. Verify correct module configuration setup on the <i>Multi-Application Control Setup</i> screen. 2. Verify correct module configuration setup on the <i>Multi-Application Control Setup</i> screen. 3. Identify missing module in the <i>Multi-Application Control Setup</i> list. Inspect CAN/module harness of the missing module for damage. Repair or replace harness. 4. Inspect module harness fuse of the identified module. Replace if necessary. 5. Identify missing module in the <i>Multi-Application Control Setup</i> list. Inspect missing module for damage or replace. 6. Verify correct module configuration setup on the <i>Multi-Application Control Setup</i> screen.
218	Pressure Sensor Detection	<p>NUMBER OF PRESSURE SENSORS CONNECTED DIFFERS FROM THE NUMBER OF SENSORS CONFIGURED ON THE <i>OTHER SENSOR CONFIGURATION</i> SCREEN.</p> <ol style="list-style-type: none"> 1. Defective Sensor. 2. Defective module or damaged module harness. 3. Additional pressure sensor detected. 	<ol style="list-style-type: none"> 1. Inspect pressure sensor for damage or replace. 2. Inspect module and/or module harness for damage. Replace if necessary. 3. Verify correct # ACC setting for each module.

Alarm #	Alarm	Probable cause	Solution
219	Row Sensor Detection	<p>NUMBER OF SEED SENSORS CONNECTED DOES NOT AGREE WITH THE NUMBER OF SENSORS CONFIGURED ON THE <i>MULTI-APPLICATION CONTROL SETUP</i> SCREEN.</p> <ol style="list-style-type: none"> Defective seed sensor. Damaged planter harness. Defective module or damaged module harness. Additional seed sensor detected. 	<ol style="list-style-type: none"> Inspect seed sensor for damage or replace. Inspect planter harness for damage. Repair or replace. Inspect module and/or module harness for damage. Replace if necessary. Verify correct # ROWS setting for each module.
220	Row Sensors Installed Incorrectly	<p>ROWS ARE NOT DETECTED SEQUENTIALLY ON A MODULE.</p> <ol style="list-style-type: none"> Incorrect seed row connections. Defective seed sensor. Damaged planter harness. Defective module or damaged module harness. 	<ol style="list-style-type: none"> Verify seed sensors are connected sequentially on all modules as instructed in installation. Inspect seed sensor for damage or replace. Inspect planter harness for damage. Repair or replace. Inspect module and/or module harness for damage. Replace if necessary.
221	Control Channel Invalid State	Internal system software error.	Turn system power Off/On. If condition persists, contact Technical Support.
222	Control Channel Setup Height Error	<ol style="list-style-type: none"> Implement hydraulic system malfunction. Defective control valve. Incorrect feedback sensor installation. Defective feedback sensor. <i>Limit Max Output</i> is set too low. Recalibrate the valve. 	<ol style="list-style-type: none"> Verify implement hydraulic system operation. Inspect control valve for damage. Replace if necessary. Verify correct installation of the feedback sensor. Inspect feedback sensor for damage or replace. Set <i>Limit Max Output</i> to a higher PWM% on the <i>Valve Calibration</i> screen. Perform a new valve calibration.

Alarm #	Alarm	Probable cause	Solution
223	Control Channel Max Feedback Unreachable	<ol style="list-style-type: none"> 1. <i>Limit Max Output</i> set too low. 2. Incorrect feedback sensor installation. 3. Defective feedback sensor. 	<ol style="list-style-type: none"> 1. Set <i>Limit Max Output</i> to a higher level on the <i>Valve Calibration</i> screen. Perform a new valve calibration. 2. Verify correct installation of the feedback sensor. 3. Inspect feedback sensor for damage or replace.
224	No Control Channel Gain Steps Calculated	<ol style="list-style-type: none"> 1. Implement hydraulic system malfunction. 2. Defective control valve. 3. Incorrect feedback sensor installation. 4. Defective feedback sensor. 	<ol style="list-style-type: none"> 1. Verify implement hydraulic system operation. 2. Inspect control valve for damage. Replace if necessary. 3. Verify correct installation of the feedback sensor. 4. Inspect feedback sensor for damage or replace.
225	Hopper Sensor Low	<ol style="list-style-type: none"> 1. Incorrect logic level setting on the <i>Other Sensor Setup</i> screen. 2. Dirty or defective hopper sensor. 3. Defective module harness or module. 4. Hopper empty. 	<ol style="list-style-type: none"> 1. Verify correct logic level setting on the <i>Other Sensor Setup</i> screen. 2. Clean/inspect hopper sensor. Replace if necessary. 3. Inspect harness and module for damage. Replace if necessary. 4. Fill hopper.
226	RPM Sensor High Limit Exceeded	<p>SENSED RPM EXCEEDS THE HIGH ALARM SETTING ON THE OTHER SENSOR SETUP SCREEN.</p> <ol style="list-style-type: none"> 1. Implement malfunction or incorrect setup. 2. Defective RPM sensor. 3. Defective module. 	<ol style="list-style-type: none"> 1. Verify proper implement operation/setup. 2. Inspect RPM sensor for damage. Replace if necessary. 3. Inspect module for damage. Replace if necessary.

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Alarm #	Alarm	Probable cause	Solution
227	RPM Sensor Low Limit Exceeded	SENSED RPM BELOW THE <i>LOW ALARM</i> SETTING ON THE <i>OTHER SENSOR SETUP</i> SCREEN. 1. Implement malfunction or incorrect setup. 2. Defective RPM sensor. 3. Defective module harness or module.	1. Verify proper implement operation/setup. 2. Inspect RPM sensor for damage. Replace if necessary. 3. Inspect module for damage. Replace if necessary.
228	Hopper Sensor Detection	NUMBER OF HOPPER SENSORS CONNECTED DOES NOT AGREE WITH THE NUMBER OF SENSORS CONFIGURED ON THE <i>MULTI-APPLICATION CONTROL SETUP</i> SCREEN. 1. Defective hopper sensor. 2. Defective module or damaged module harness. 3. Additional hopper sensors detected.	1. Inspect hopper sensor for damage or replace. 2. Inspect module and/or module harness for damage. Replace if necessary. 3. Verify correct hopper setting for each module.
229	Hopper Sensors Installed Incorrectly	HOPPER SENSORS ARE NOT INSTALLED SEQUENTIALLY ON A MODULE. 1. Incorrect hopper sensor connections. 2. Defective hopper sensor. 3. Defective module or damaged module harness.	1. Verify hopper sensors are connected sequentially on all modules. 2. Inspect hopper sensor for damage or replace. 3. Inspect module and/or module harness for damage. Replace if necessary.

Alarm #	Alarm	Probable cause	Solution
230	Pressure Sensors Installed Incorrectly	<p>PRESSURE SENSORS ARE NOT INSTALLED SEQUENTIALLY ON A MODULE.</p> <ol style="list-style-type: none"> 1. Incorrect pressure sensor connections. 2. Defective pressure sensor. 3. Defective module or damaged module harness. 	<ol style="list-style-type: none"> 1. Verify pressure sensors are connected sequentially on all modules. 2. Inspect pressure sensor for damage or replace. 3. Inspect module and/or module harness for damage. Replace if necessary.
232	RPM Sensor Low Limit Exceeded With Control Channel Shutdown	<p>RPM HAS DROPPED BELOW THE <i>LOW ALARM LEVEL</i> AND THE <i>DISABLE CONTROL ON LOW ALARM SETTING</i> IS ENABLED ON THE <i>OTHER SENSOR SETUP SCREEN</i>.</p> <ol style="list-style-type: none"> 1. Defective RPM sensor. 2. Damaged module harness. 3. Defective module. 4. Low RPM. 	<ol style="list-style-type: none"> 1. Inspect RPM sensor for damage. Replace if necessary. 2. Inspect module harness for damage. Repair or replace. 3. Inspect module for damage. Replace if necessary. 4. Increase RPM.
233	Channel Delay or Precharge Enabled	<p>CHANNEL DELAY OR PRECHARGE IS ENABLED. DURING THIS THE CONTROL WILL RUN WITHOUT GROUND SPEED OR WITHOUT THE IMPLEMENT DOWN.</p>	<ol style="list-style-type: none"> 1. Acknowledge alarm to activate control channels. 2. Acknowledge alarm and disable Delay or Precharge to stop control.
234	Control Channel Precharge Activation Timeout	<p>CONTROL CHANNEL PRECHARGE TIME HAS EXPIRED WHILE THE SYSTEM IS STATIONARY. CONTROL CHANNEL HAS STOPPED.</p> <ol style="list-style-type: none"> 1. Ground speed is at zero. 2. Ground speed is less than Precharge Speed after Precharge time is expired. 	<p>Acknowledge alarm and increase ground speed.</p>

14 The Multi-Application Control Plugin

Alarm #	Alarm	Probable cause	Solution
235	New Member Module Detected	New member module has been found.	Assign sensors to the new module at the <i>Multi-Application Control Setup</i> screen and its position.
236	Intermittent Member Module Detected	A member module that had previously failed communication has come online.	Inspect harness connections to this module.
237	Product Level Low	Calculated product level has dropped below alarm level.	Fill product bin and reset level.
240	Seeding Detected on a Control Off Row	Control Channel turned off and seed continue to be detected.	Check seed dispensing unit for proper shut off.
241	Control Not Active With Implement Lowered and Speed	Control will not operate while on a setup screen.	<ol style="list-style-type: none">1. Navigate to the Run screen to activate the control.2. Raise the implement and stop forward speed to clear alarm.
246	Master Switch Softkey Press	Warning of action associated with keypress.	Press Control Start key to activate control.
602	8 Volt Supply Failure	<p>8V SUPPLY VOLTAGE IS BELOW 7.2V OR HIGHER THAN 16V.</p> <ol style="list-style-type: none">1. Damaged planter or module harness.2. Defective seed or hopper sensor.3. Defective module.	<ol style="list-style-type: none">1. Inspect planter harness or module harness for damage. Repair or replace harness.2. Inspect seed or hopper sensors connected to the identified module for damage. Replace sensors if necessary.3. Replace identified module.

Alarm #	Alarm	Probable cause	Solution
603	Member Module Communication Failed	<p>COMMUNICATION WITH AN ACTIVE MODULE HAS FAILED</p> <ol style="list-style-type: none"> 1. Damaged CAN or module harness. 2. Blown module harness fuse. 3. Defective module. 	<ol style="list-style-type: none"> 1. Identify missing module in the <i>Multi-Application Control Setup</i> screen list. Inspect CAN/module harness of the missing module for damage. Repair or replace harness. 2. Inspect module harness fuse, replace if necessary. 3. Identify missing module in the <i>Multi-Application Control Setup</i> screen list. Inspect missing module for damage or replace.
604	ECU Voltage Out of Range Alarm	<p>ECU VOLTAGE IS BELOW 11V OR HIGHER THAN 16V.</p> <ol style="list-style-type: none"> 1. Damaged CAN or module harness. 2. Defective module. 	<ol style="list-style-type: none"> 1. Inspect CAN/module harness of the identified module for damage. 2. Inspect identified module for damage or replace.
605	Solenoid Voltage Out of Range	<p>SOLENOID VOLTAGE IS BELOW 11V OR HIGHER THAN 16V.</p> <ol style="list-style-type: none"> 1. Damaged CAN or module harness. 2. Blown module harness fuse. 3. Defective module. 	<ol style="list-style-type: none"> 1. Inspect CAN/module harness of the identified module for damage. Repair or replace harness. 2. Inspect module harness fuse or replace. 3. Inspect identified module for damage or replace.
606	Ground Offset Voltage Out of Range	<ol style="list-style-type: none"> 1. Damaged/shorted Actuator Harness. 2. Defective PWM valve driver or Servo valve driver. 3. Defective module. 	<ol style="list-style-type: none"> 1. Inspect Actuator Harness for damage around the PWM and Servo valve connections. Repair or replace harness. 2. Inspect PWM or Servo valve drivers for damage and replace if necessary. 3. Inspect identified module for damage and replace if necessary.

The FieldLevel Survey/Design Plugin

In this chapter:

- Introduction to field leveling
- Installation
- Configuration
- Operation
- Field design

The FieldManager display has two FieldLevel plugins:

- FieldLevel Survey/Design
- FieldLevel II

This chapter describes what each of them does, and then describes in detail how to configure and use the FieldLevel Survey/Design plugin to create and manipulate field surveys.

Introduction to field leveling

Description

For years farmers have been improving their crop yields by using systems to level their fields for uniform drainage. The consistent water flow over the crops improves crop yields and crop consistency, which improves profits. The FieldLevel system is designed in two parts:

- The FieldLevel Survey/Design plugin enables you to use a high-accuracy GPS receiver on the leveling implement to create a topographic **survey** of the layout of your field. The three-dimensional data shows the surface topography of the land.

***Note** – If you are working in a field that has already been leveled, you may not need to perform a survey and you can jump straight to leveling with the FieldLevel II system.*

When you have completed the survey, you can use it to **design** the optimum drainage slope that can be graded with minimal dirt movement.

- When you have created a survey of the field and a design for how to modify it, you can use the FieldLevel II plugin to control a land leveling implement on your vehicle and adjust the land to an optimal slope. The FieldLevel II system uses a high-accuracy GPS receiver mounted on the implement blade to measure and control its elevation. The FieldLevel II design defines the three-dimensional height for the field and controls how the implement reshapes the ground. The FieldLevel II system automatically raises and lowers the blade on the implement to match the design height anywhere in the field. The color cut/fill map, simple onscreen adjustments, and automatic blade control makes leveling easy. See Chapter 16, The FieldLevel II Plugin.

Benefits of the AgGPS FieldLevel II system

The AgGPS FieldLevel II system enables you to:

- reduce erosion and conserve topsoil.
- perform touch-up leveling each year, to avoid expensive land leveling services.
- use RTK GPS technology, which has a significantly larger operating range than a laser, and no vertical limit.
- work with your existing AgGPS guidance products to manage your fields with one collective system. For example, you can connect the AgGPS Autopilot system to the FieldManager display at the same time as the FieldLevel implement.

Requirements of the AgGPS FieldLevel II system

The FieldLevel II system requires:

- An AgGPS FieldManager display (firmware version 4.00 or above), with or without the AgGPS Autopilot system
- An unlock code for the FieldManager display field leveling functionality
- A leveling implement

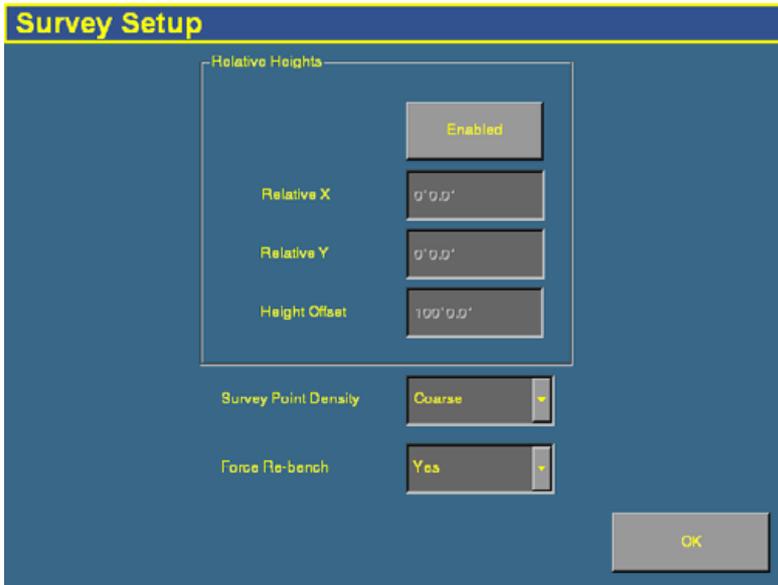
Installation

For installation instructions, refer to the *AgGPS FieldLevel II System Installation Instructions* that are specific to your vehicle.

Configuration

Install the FieldLevel Survey Design plugin and then press the Run button  to create a new field. For more information, see [Adding or removing a plugin, page 76](#). To configure the plugin:

1. Select the FieldLevel Survey/Design plugin and then tap **Setup**. The *Survey Setup* screen appears:



2. To enable relative positions, tap **Enabled**.

By default, coordinates are recorded relative to the master benchmark. Setting the relative positions establishes the coordinates of the master benchmark when it is set. These coordinates are then used for field leveling and topographic mapping every time the field is opened. You can set the relative position using these values:

- the X-axis coordinate (Relative X)
- the Y-axis coordinate (Relative Y)
- the height (Height Offset)

3. Tap each of the text boxes and then enter the appropriate offset.



Tip – To display relative offset values on the Run screen, set the offsets as status text items on the slide-out tab.

4. Select the survey point density. When you create a survey of a field, this setting determines the distance between the collected survey mapping points. The approximate distances between points are:

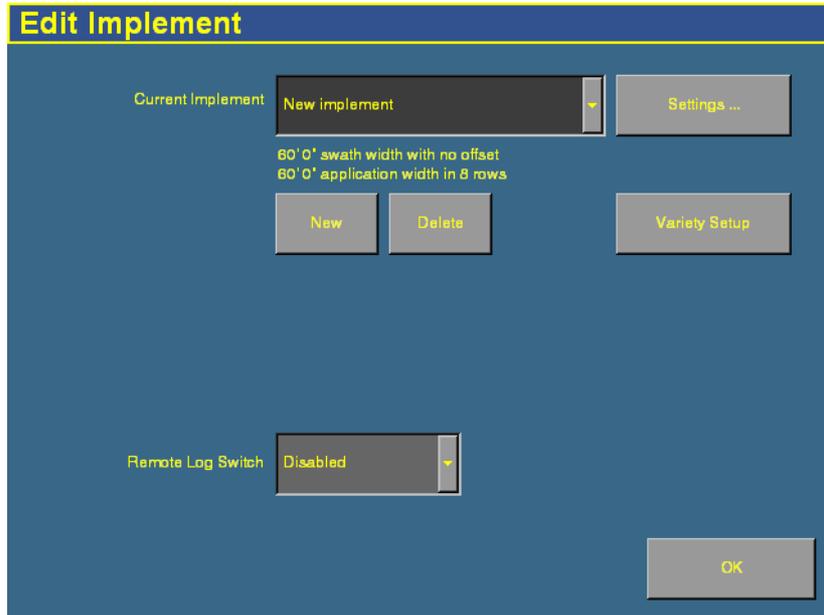
Item	Distance
Coarse	7.8 m (25 ft)
Medium	3 m (10 ft)
Fine	1.5 m (5 ft)

5. Select whether or not the system will force you to rebench each time that you reload the field.

If you configure the *Force Rebench* setting to No, the RTK base station must be placed in ***exactly*** the same position in order for the field to be correct.

Configuring the implement for leveling

1. From the *Configuration* screen, tap **Implement Setup**. The *Edit Implement* screen appears:



2. Do one of the following:
 - Tap **New** and then enter a new implement name.
 - Select an existing implement from the list.
3. Tap **Settings**. The *Implement Boom Setup* screen appears.
4. Enter the details of the leveling implement:
 - Enter the appropriate implement width and offsets.
 - For a Multiplane survey, set the *Swath Width* field to the width that you will use for collecting interior points.
 - When you are not using FieldLevel GPS, set the front/back offset (F/B Offset) to 0.
 - In the *Number of boom sections* field, enter **1**.
5. Tap **OK**.

Operation

Run screen

When the FieldLevel Survey/Design plugin is installed, the following tab appears on the main guidance screen (the Run screen):

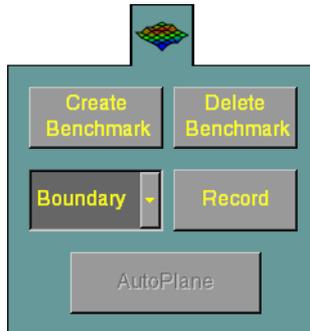


Figure 15.1 FieldLevel Survey/Design plugin tab

Creating a survey

Benchmarks

Before you can create a survey, you must set a **benchmark**. A benchmark is a point at a known location. When you are leveling, you can use benchmarks to do two things:

- Return to a point in the field with known coordinates to re-calibrate your exact position. This may include setting the bucket on the ground or on a solid surface that will not be disturbed while you perform field leveling.
- Move the design up or down to match the field surface at that point.

A benchmark is shown on the screen as follows:

View	Shown as
Plan	A black circle
Perspective	A black flag in a red circle

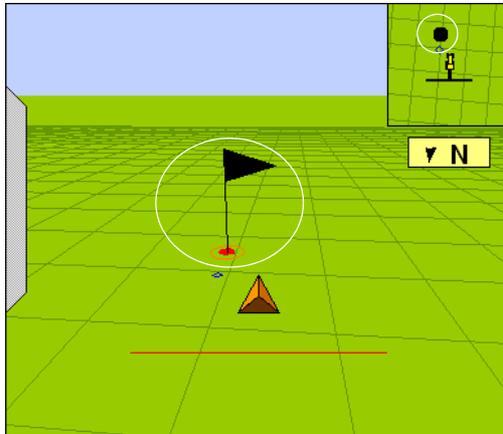


Figure 15.2 A benchmark in the Perspective (main) view

The first benchmark you create on a field is called the **master benchmark**. Field coordinates are calculated from this point. Subsequent benchmarks are called **benchmarks**.

Note – You can choose for coordinates to be recorded with *X, Y, and Height* offsets from the master benchmark position. See [Configuration, page 472](#).

Creating a benchmark

To create a benchmark:

1. Place the GPS antenna in a known, repeatable location that will not change throughout the leveling of a field.



Tip – Mark this location with flags or some other marker so you can return to the exact same spot.

2. Stop the vehicle.

3. Tap **Bench** on the FieldLevel Survey/Design tab.

***Note** – If the FieldLevel II plugin is installed, you can also tap the **Bench** button on it. Both **Bench** buttons have the same effect.*

A message counts for 30 seconds and then the system creates the benchmark. To stop the averaging during the 30 second countdown, tap **Bench** again.

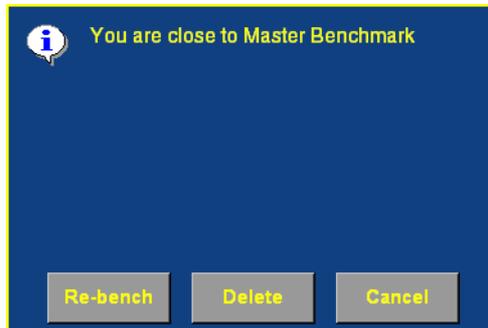
***Note** – If you are within the circle around an existing benchmark, a new mark will not be created.*

Rebenching

When you are within the circle around an existing benchmark, the following message appears:

Close to Master Benchmark!

If you tap either of the **Bench** buttons when the receiver is within the circular radius of a benchmark, the following dialog appears:



Tap...	To ...
Re-bench	Calibrate the receiver to the existing benchmark
Delete	To Delete the existing benchmark so you can create a new one <i>Note – if you tap Delete, you will need to enter the Administrator password before continuing.</i>
Cancel	To Cancel the operation

Re-establishing a benchmark

If you open a field that has an existing master benchmark, a large red circle is shown for 100 m (300 ft) around the master benchmark flag:



This indicates that you need to rebench over the master benchmark location to ensure that the design is aligned with the previous position.

You must be within this circle before you are allowed to re-establish the master benchmark. To ensure that the design is properly aligned:

1. Return exactly to the master benchmark location that you marked on the ground (for example, with flags, see [Creating a benchmark, page 477](#)), regardless of where your current onscreen position appears to be.
2. Re-establish the benchmark.

This process is designed to accommodate RTK base station setup differences from the last time the field was open.

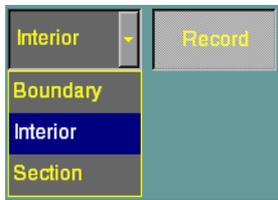
Collecting field data

When you have created the benchmark(s), collect field layout data.

You can define 3 types of data:

Item	Description
Boundary	The outside of the field
Interior	Points on the inside of the boundary
Section	Can be used to divide the field into smaller sections

To define an item, select it from the list on the tab and then tap **Record**:



To stop recording, tap **Record** again.

Defining the boundary

Define a boundary to establish the confines of your field. Drive around the boundary, while you record the shape.

Defining interior points

When you have surveyed the boundary of the field, select Interior from the list and then tap **Record**. As you drive, the system records interior points.

To complete a full survey, create guidance lines and then drive over all of the interior of the field boundary, while the system records interior points.

Defining a section

When you have defined a boundary, you can define sections to split the field into parts. This enables you to create a design for just that section, rather than the whole field.

There are 2 ways to define a section:

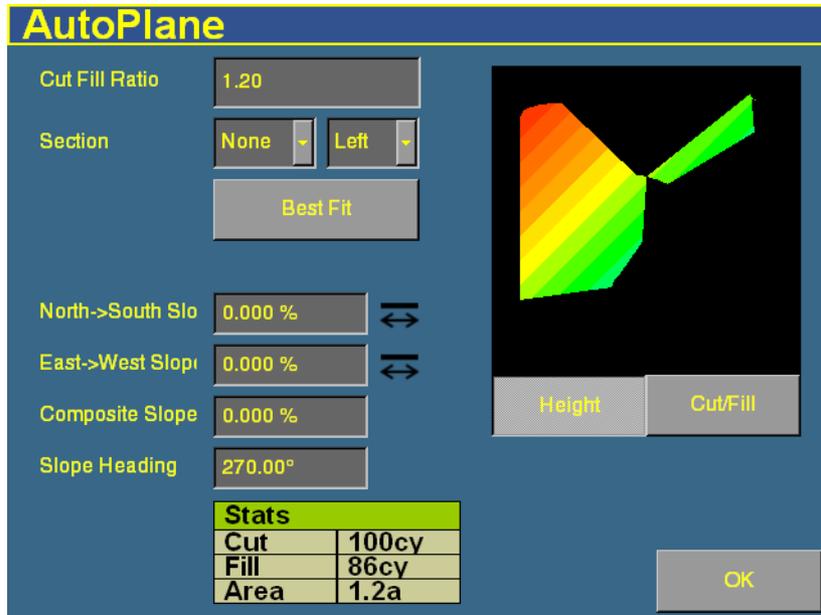
- Begin recording the section line outside the boundary. Drive through the field to define the section line and then cross outside the boundary again. The section is defined.
- Record a section line inside the boundary. The ends of the line will extend to meet the boundary.

For example, sections can be useful if you have finished working on the field for the day. Define the area that you have completed as a section, and when you return to the field, you can level the remaining area to a second best-fit plane.

Field design

When you have defined your field points, the **AutoPlane** button becomes available.

To create a design for the field, tap the button. The *AutoPlane* screen appears:



This screen shows field information and enables you to create the design for your field. The AutoPlane functionality uses the topographic survey of your field to estimate the field surface elevations. Once this has been completed, you can establish a design either by manually editing the slopes or by using the display to calculate a best-fit plane. The best-fit calculation optimizes the height and slopes of a design plane to minimize the amount of dirt that has to be moved. Once a design has been completed, you can specify that either the topographic height map or the cut/fill color theme is transferred to the Run screen with the design, simply by selecting it before exiting the AutoPlane design screen.

Terminology

A **cut** is a point on the field where dirt needs to be removed. A cut occurs when the existing field is higher than the proposed field surface.

A **fill** is a point on the field where dirt must be added. A fill occurs when the existing field is lower than the proposed field surface.

A **neutral** is a point on the field where the existing and proposed elevations are the same. No dirt needs to be moved at this location.

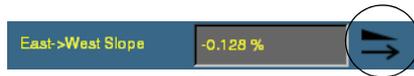
Options on the screen

Item	Description
Cut/Fill Ratio	When you move dirt, compaction or expansion can change the volume that it covers. The Cut/Fill Ratio is the amount of cut dirt that equals one volume of fill dirt. For example, the default <i>Cut/Fill Ratio</i> is 1.20. This means you lose 20% of your cut yards to compaction when you put the cut yards back down in the fill areas.
Section	If you set up sections when you defined the field, you can select one from the list.
Left/Right list	The section to the left of the section line, or the section to the right of the section line.

The design slope values show the angles and heading of the slope:

Item	Description
North -> South Slope	The angle of the design slope from North to South.
East -> West Slope	The angle of the design slope from East to West.
Composite Slope	The true angle of fall of the design. This is the angle of the slope when the two angles above are combined.
Slope Heading	The heading direction of the slope, when the 2 slopes are combined.

The icon beside each slope option shows the direction of the slope:



Because this is a negative slope, it drops from East to West.

The Stats table at the bottom of the screen shows field information:

Item	Description
Cut	The volume of dirt that must be cut for the current design.
Fill	The volume of dirt that must be added for the current design. Note – <i>If the Cut and Fill values are the same, you will only be moving dirt. The volumes will balance out.</i> The system includes the Cut/Fill Ratio when configuring these amounts. See page 483.
Area	The area of the field inside the boundary.

The image of the field on the right of the screen can show one of two things:

- When the **Height** button is selected, the image shows the topographical height of the field as it currently is.
- When the **Cut/Fill** button is selected, the image shows where dirt needs to be removed and where it needs to be added:
 - Areas that require dirt to be cut are red shades.
 - Areas that require dirt to be filled are blue shades.
 - Neutral areas that do not need adjusting are green.

Creating a design

To create a design for the optimum slope for your field that requires the minimum amount of dirt to be moved:

1. Enter the Cut/Fill Ratio.
2. In the *Section* list, do one of the following:
 - Select the section to level.
 - Select None to level the whole field.
3. Tap **Best Fit**.

The system uses the interior points that you collected to calculate the optimum slope of the field. The design information appears in the design slope options and the Stats table. An arrow appears on the image of the field to show the direction of fall.

If necessary, you can manually adjust the angle of the slope. However, this may require a greater amount of dirt to be moved, because the original design was the optimum.

Saving the new design

Tap **OK** to close the *AutoPlane* screen. Your new design is saved as the default plane for this field. For more information on using the design, see Chapter 16, The FieldLevel II Plugin. When the field is opened, the design loads but the color theme does not get saved. To re-establish the color theme, press **AutoPlane** and then reselect the **Height** or **Cut/Fill** button.

Reloading a field

When you create a design for a field (for example, a target leveling plane), the design is saved in the */field/* directory.

The design files are associated with the field, so if you close the field and then open it again, the design reloads with the field.

With RTK GPS, the position of the RTK base station is important to the heights used when the field was previously open. If the base station is not accurately positioned in the same physical location, you must re-establish the design over an existing benchmark to re-establish the height.

The FieldLevel II Plugin

In this chapter:

- [Introduction to field leveling](#)
- [Configuring the FieldLevel II plugin](#)
- [Performing leveling in the field](#)

When you have completed a field survey and design with the FieldLevel Survey/Design plugin, you can use the FieldLevel II plugin to level the field to that design.

This chapter describes the steps required to configure and use the FieldLevel II plugin to modify fields.

Introduction to field leveling

MultiPlane designs

The FieldLevel II system supports external leveling designs from MultiPlane design software. MultiPlane can run a wide range of “what if” scenarios, enabling you to create complex designs with multiple field sections. You can export these design control files and then load them into the FieldLevel II system, to shape the field surface based on the work in the office.

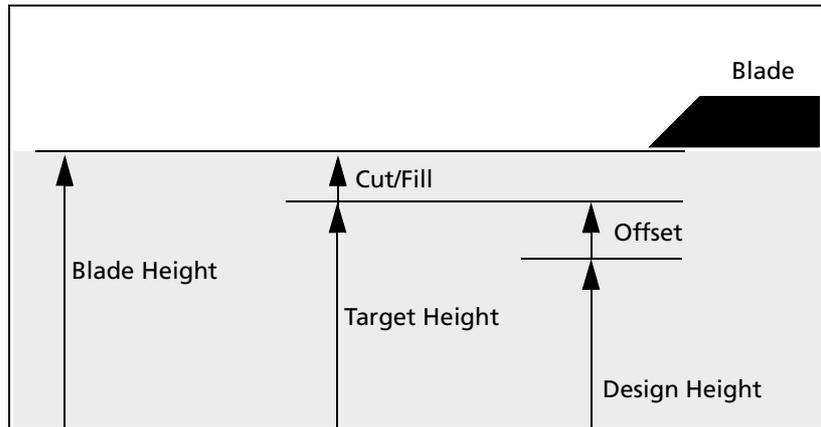
Leveling models

In addition to AutoPlane and MultiPlane design support, the FieldLevel II system has four additional leveling models:

- Point to Slope - the system levels at a consistent upward or downward slope, regardless of the vehicle’s direction. This can be useful for installing tile and field drainage.
- Leveling (laser) - you define a plane and then level the field to that plane using lasers for accuracy measurements.
- Contour – you level around a contour. The system indicates whether to drive up or down to maintain your current level. This is designed for creating contours for planting.
- Leveling (GPS) – you define a plane and then level the field to that plane using GPS for accuracy measurements.

Terminology

The FieldLevel II system uses the following terms:



Item	Description
Blade Height	The current altitude (height) of the blade.
Design Height	The height at the current location determined by the original design plane.
Offset	The difference between Design Height and Target Height. Using the offset buttons creates a plane that is parallel to the original design.
Target Height	The height on the target plane that the blade will attempt to reach. This is the Design Height \pm the Offset. When the blade reaches the Target Height, the height indicator arrow turns green.
Cut/Fill	The difference between the Blade Height and the Target Height: <ul style="list-style-type: none"> • When Cut is displayed, the current ground is above the target. The height indicator arrow turns red and points down, which means that the blade needs to move down to reach the Target Height. • When Fill is displayed, the current ground is below the target. The height indicator arrow turns red and points up, which means that the blade needs to move up to reach the Target Height.

Configuring the FieldLevel II plugin

***Note** – Before you can configure the system, it must be professionally installed. For more information, contact your local reseller.*

There are five steps to complete:

- [Step 1. Activating the FieldLevel II system, page 490](#)
- [Step 2. Configuring the implement, page 494](#)
- [Step 3. Configuring the leveling model, page 494](#)
- [Step 4. Calibrating the FieldLevel valve module, page 501](#)
- [Step 5. Configuring the FieldLevel GPS receiver, page 502](#)

Step 1. Activating the FieldLevel II system

Before you can use the FieldLevel system, you must activate it on the AgGPS FieldManager display.

***Note** – This process requires you to enter the activation password. If you do not have an activation password, contact your local Trimble reseller.*

There are two ways to activate the system:

- [Activating automatically via a text file](#), see below
- [Activating manually via the display, page 491](#)

Activating automatically via a text file

***Note** – This method of activating the system is quicker than the manual method.*

When you purchase the FieldLevel system, your local Trimble reseller provides you with a text file containing a password.

1. Insert the CompactFlash card from the AgGPS FieldManager display into a card reader that is attached to an office computer.
2. Copy the password text file from the office computer into the `/AgGPS/Firmware/` folder on the card.

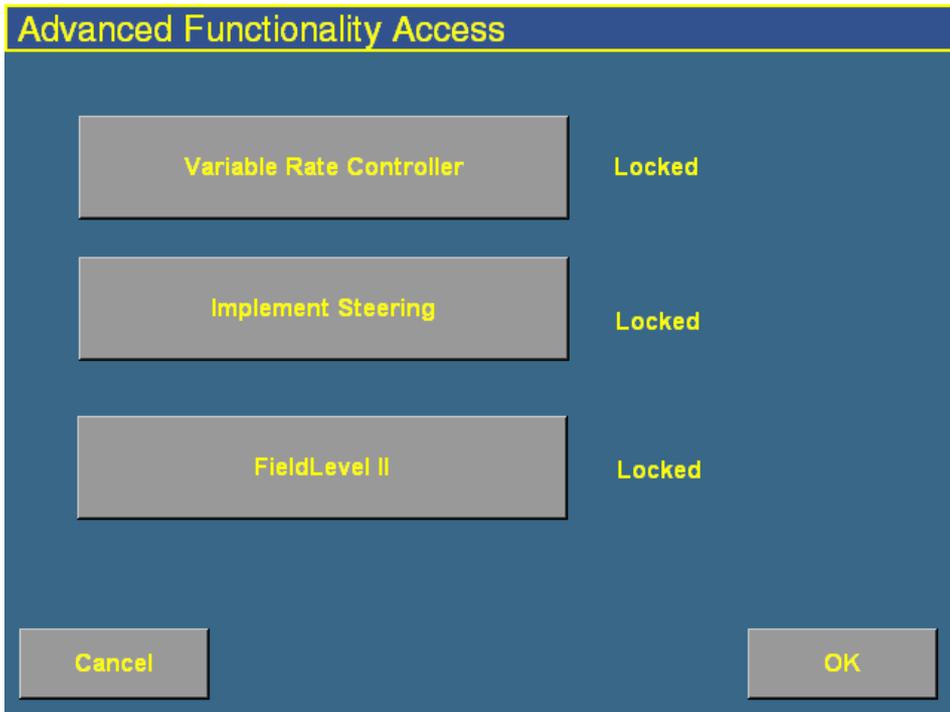
When you next insert the CompactFlash card in the display and turn on the display, the system is automatically activated.

Activating manually via the display

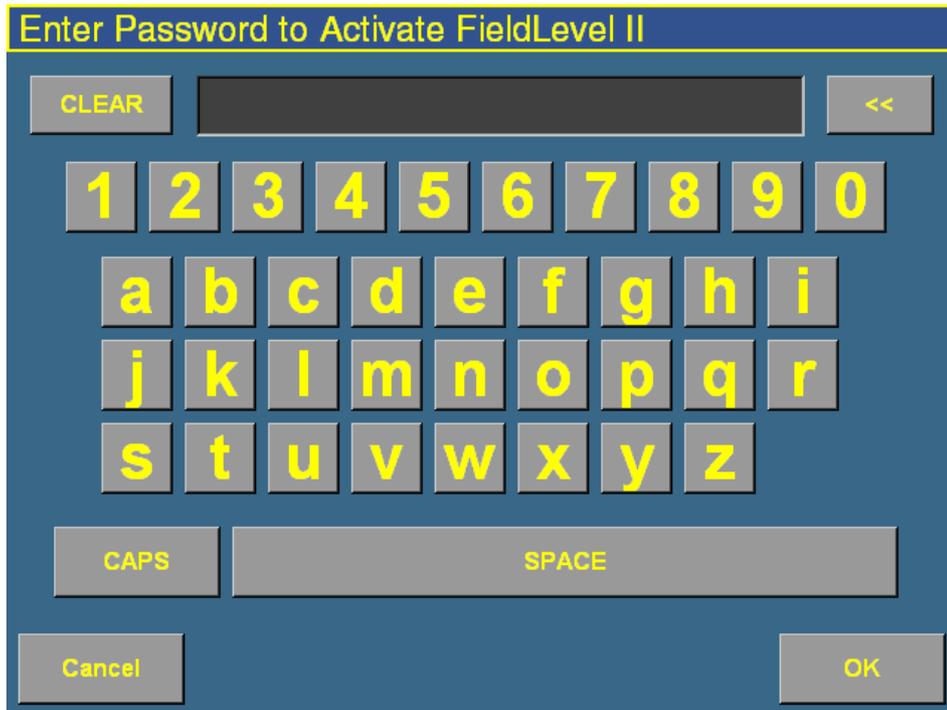
1. Turn on the display. The Home screen appears.
2. Tap **Upgrade**. The *Upload Firmware* screen appears:



3. Tap **Unlock**. The *Advanced Functionality Access* screen appears:



4. Tap **FieldLevel II**. The *Enter Password to Activate FieldLevel II* screen appears:



5. Enter the activation password that your local Trimble reseller gave to you and then tap **OK**.
 - If you enter a correct password, the following message appears:
Enabled.
Field leveling is now activated.
 - If you enter an invalid password, the following message appears:
Your password is not valid for Field Leveling.
Try entering the password again. If it still does not work, contact your local Trimble reseller.

Step 2. Configuring the implement

If you have not already configured the implement, see [Configuring the implement for leveling](#), page 474.

Step 3. Configuring the leveling model

1. From the *Configuration* screen, select the FieldLevel II plugin and then tap **Setup**. The *FieldLevel II Setup* screen appears:

The screenshot shows the 'FieldLevel II Setup' screen with the following configuration options:

- Leveling Model: Point to Slope
- Slope Adjust: 0.00 %
- Allowable Cut/Fill Range: 2' 0.0"
- On-grade Limit: 0' 3.94"
- Valve Module: N/A
- CAN Bus: P3 CAN A
- Antenna Height: 8' 2.42"
- Valve Type: N/A
- VDOP Level: 3.0
- Relative Heights (button)
- Cancel (button)
- OK (button)

2. Select the leveling model:

Leveling model	Description
Point to Slope	This model creates consistently sloped tile or surface drainage. From the starting point, the vehicle levels at a constant slope, regardless of its direction. See below.
Leveling (laser)	This model uses the <i>Topo</i> tab to create a plane (based on 1, 2, or 3 points), so you can level to that plane. It uses a line-of-sight laser leveling system. See Configuring laser leveling mode, page 497 .
Contour	This model use the FieldManager display virtual lightbar to guide the vehicle along contours to keep the vehicle at the same elevation. This can be used for levee marking and applications that require guidance to elevations. See Configuring Contour mode, page 498 .
Leveling (GPS)	This model uses the <i>Topo</i> tab to create a plane (based on 1, 2, or 3 points), so you can level to that plane. it uses a high accuracy GPS receiver mounted on the leveling implement. See Configuring Leveling (GPS) mode, page 499 .

The configuration and operation is different for each of these methods. They are described separately below:

Configuring Point to Slope leveling

When you select Point to Slope leveling, the *FieldLevel II Setup* screen changes to show the following items:

Item	Description
Slope Adjust	The <i>Slope Adjust</i> field controls the amount that the gradient changes each time you press the up arrow  or the down arrow  on the <i>Level</i> tab. For example, if the leveling gradient is set to -3%, and the <i>Slope Adjust</i> field is set to 2%, when you press the down arrow  on the <i>Level</i> tab, the leveling gradient increases to -5%.
CAN Bus	Select the port on the FieldManager display harness that the valve module is connected to.
Valve Type	Tap the <i>Valve Module</i> field and then select the type of valve that is connected.

Item	Description
Allowable Cut/Fill Range	Tap the <i>Allowable Cut/Fill Range</i> field and then enter the acceptable warning distance. When Auto mode is engaged and the blade is outside this range for more than 3 seconds, this warning appears.
On-grade Limit	Tap the <i>On-grade Limit</i> field and then enter the limit. This sets the distance the blade can move before the green blade height indicators change to thin red arrows. At twice this distance, the height indicators become thick red arrows. See Blade position indicators, page 505 .
Antenna Height	Tap the <i>Antenna Height</i> field and then enter the height of the antenna above the lower edge of the blade.
VDOP Level	VDOP, or Vertical Dilution of Precision , is a measure of the vertical accuracy of the GPS signal. If the VDOP reaches this value, a warning message appears. A VDOP of below 3 is recommended.

By default, coordinates are recorded relative to the master benchmark. For field leveling or data collection, you can set relative offsets so the coordinates are recorded relative to the offsets set for the master benchmark. You can set offsets in any of the following directions:

- the X-axis
- The Y-axis
- The height



Tip – To display relative offset values on the Run screen, set the offsets as status text items on the slide-out tab.

To enable relative positions:

1. Tap **Relative Heights**. The *Relative Height Setup* screen appears.
2. Tap **Enabled**.
3. Tap each of the offset windows and enter the offset distance as required.
4. Tap **OK**.

Configuring laser leveling mode

When you set the leveling model to Leveling (Laser), the *FieldLevel II Setup* screen changes to show the following items:

Item	Description
Blade Step	Tap the <i>Blade Step</i> field and then enter the amount that you require the blade to move, each time it is “stepped” up or down by the  or  offset buttons.
Coarse Blade Step	Coarse mode enables you to offset the target height in large increments with a single press, such as a 0.2' fill. Tap the <i>Coarse Blade Step</i> field and then enter the amount that you require the blade to move, each time it is stepped up or down in Coarse mode.
CAN Bus	Select the port on the FieldManager display harness that the valve module is connected to.
Valve Type	Tap the <i>Valve Module</i> field and then select the type of valve that is connected.
Allowable Cut/Fill Range	Tap the <i>Allowable Cut/Fill Range</i> field and then enter the acceptable warning distance. When Auto mode is engaged and the blade is outside this range for more than 3 seconds, this warning appears.
On-grade Limit	Tap the <i>On-grade Limit</i> field and then enter the limit. This sets the distance the blade can move before the green blade height indicators change to thin red arrows. At twice this distance, the height indicators become thick red arrows. See Blade position indicators , page 505.
Antenna Height	Tap the <i>Antenna Height</i> field and then enter the height of the antenna above the lower edge of the blade.
VDOP Level	VDOP, or Vertical Dilution of Precision , is a measure of the vertical accuracy of the GPS signal. If the VDOP reaches this value, a warning message appears. A VDOP of below 3 is recommended.

By default, coordinates are recorded relative to the master benchmark. For field leveling or data collection, you can set relative offsets so the coordinates are recorded relative to the offsets set for the master benchmark. You can set offsets in any of the following directions:

- the X-axis

- The Y-axis
- The height



Tip – To display relative offset values on the Run screen, set the offsets as status text items on the slide-out tab.

To enable relative positions:

1. Tap **Relative Heights**. The *Relative Height Setup* screen appears.
2. Tap **Enabled**.
3. Tap each of the offset windows and enter the offset distance as required.
4. Tap **OK**.

Configuring Contour mode

When you set the leveling model to Leveling (Laser), the *FieldLevel II Setup* screen changes to show the following items:

Item	Description
CAN Bus	Select the port on the FieldManager display harness that the valve module is connected to.
Valve Type	Tap the <i>Valve Module</i> field and then select the type of valve that is connected.
Antenna Height	Tap the <i>Antenna Height</i> field and then enter the height of the antenna above the lower edge of the blade.
VDOP Level	VDOP, or Vertical Dilution of Precision , is a measure of the vertical accuracy of the GPS signal. If the VDOP reaches this value, a warning message appears. A VDOP of below 3 is recommended.

By default, coordinates are recorded relative to the master benchmark. For field leveling or data collection, you can set relative offsets so the coordinates are recorded relative to the offsets set for the master benchmark. You can set offsets in any of the following directions:

- the X-axis

- The Y-axis
- The height



Tip – To display relative offset values on the Run screen, set the offsets as status text items on the slide-out tab.

To enable relative positions:

1. Tap **Relative Heights**. The *Relative Height Setup* screen appears.
2. Tap **Enabled**.
3. Tap each of the offset windows and enter the offset distance as required.
4. Tap **OK**.

Configuring Leveling (GPS) mode

When you set the leveling model to Leveling (GPS), the *FieldLevel II Setup* screen changes to show the following items:

Item	Description
Blade Step	Tap the <i>Blade Step</i> field and then enter the amount that you require the blade to move, each time it is “stepped” up or down by the  or  offset buttons.
Coarse Blade Step	Coarse mode enables you to offset the target height in large increments with a single press, such as a 0.2' fill. Tap the <i>Coarse Blade Step</i> field and then enter the amount that you require the blade to move, each time it is stepped up or down in Coarse mode.
CAN Bus	Select the port on the FieldManager display harness that the valve module is connected to.
Valve Type	Tap the <i>Valve Module</i> field and then select the type of valve that is connected.
Allowable Cut/Fill Range	Tap the <i>Allowable Cut/Fill Range</i> field and then enter the acceptable warning distance. When Auto mode is engaged and the blade is outside this range for more than 3 seconds, this warning appears.

Item	Description
On-grade Limit	Tap the <i>On-grade Limit</i> field and then enter the limit. This sets the distance the blade can move before the green blade height indicators change to thin red arrows. At twice this distance, the height indicators become thick red arrows. See Blade position indicators, page 505 .
Antenna Height	Tap the <i>Antenna Height</i> field and then enter the height of the antenna above the lower edge of the blade.
VDOP Level	VDOP, or Vertical Dilution of Precision , is a measure of the vertical accuracy of the GPS signal. If the VDOP reaches this value, a warning message appears. A VDOP of below 3 is recommended.

By default, coordinates are recorded relative to the master benchmark. For field leveling or data collection, you can set relative offsets so the coordinates are recorded relative to the offsets set for the master benchmark. You can set offsets in any of the following directions:

- the X-axis
- The Y-axis
- The height



Tip – To display relative offset values on the Run screen, set the offsets as status text items on the slide-out tab.

To enable relative positions:

1. Tap **Relative Heights**. The *Relative Height Setup* screen appears.
2. Tap **Enabled**.
3. Tap each of the offset windows and enter the offset distance as required.
4. Tap **OK**.

Step 4. Calibrating the FieldLevel valve module

1. From the *Configuration* screen, select the FieldLevel II plugin and then tap **Calibrate**. The *FieldLevel Calibration* screen appears:

FieldLevel Calibration

AutoCal
Status: none

Start

Manual Calibration

Valve Speed Raise Range 25-150% 50.00 Control DeadBand 0' 0.0''

Valve Speed Lower Range 25-150% 50.00 Valve Table Default

Cancel OK

2. Set the vehicle throttle to 100%.
3. Tap **Start**.

The system performs its calibration sequence to test the speed at which the blade raises and lowers. This process takes approximately 8–10 minutes.

To manually calibrate the valve, enter values in the 3 Manual Calibration windows and then tap **OK**.

Step 5. Configuring the FieldLevel GPS receiver

The FieldLevel system uses a second, separate GPS receiver to record the exact position of the leveling blade. To configure this receiver:

1. From the *Configuration* screen, select the GPS Receiver plugin that is associated with the FieldLevel II plugin and then tap **Setup**. The *Blade GPS Receiver Settings* screen appears:

The screenshot shows the 'Blade GPS Receiver Settings' dialog box. It features three main sections: 'Receiver Type' with a dropdown menu set to 'Trimble TSIP'; 'Port' with a dropdown menu set to 'P5 Extension'; and 'Corrections' with a large grey area containing the text 'Autonomous'. The 'Options' section includes an 'RTK NetID' input field with 'Not available', an 'Autoseed' button, and an 'AgRemote' button. At the bottom, there are 'Cancel' and 'OK' buttons.

2. In the *Receiver Type* list, select the type of correction messages that the receiver will send.
 - If it is a TSIP receiver, select the correction type from the *Corrections* list, enable the *AgGPS* Autoseed technology if required, and enter the RTK network ID in the *RTK NetID* window.
 - If it is a DCOL receiver, select the correction type from the *Corrections* list and enter the RTK network ID in the *RTK NetID* window.

- If it is a NMEA receiver, select the port settings in the *Port Settings* lists. The port settings must be the same as the receiver's output settings.
 - 3. In the *Port* list, select the connector on the FieldManager display harness that the receiver is connected to.
- The FieldLevel II plugin is now configured and ready to use.

Performing leveling in the field

Main guidance screen

Run screen

The AgGPS FieldManager display's main guidance screen (the Run screen) changes when the FieldLevel II plugin is installed:

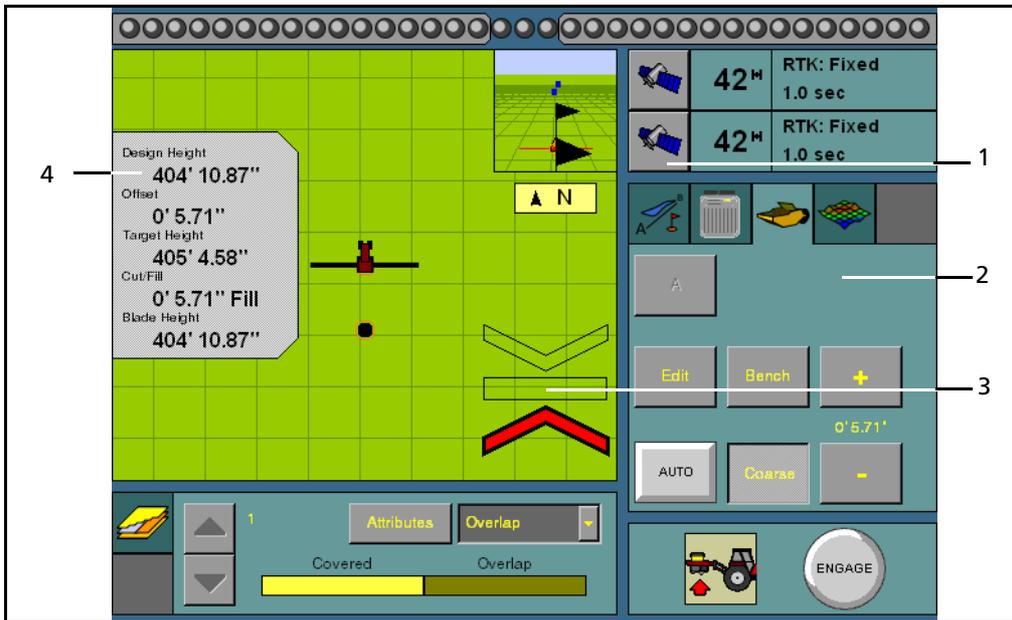


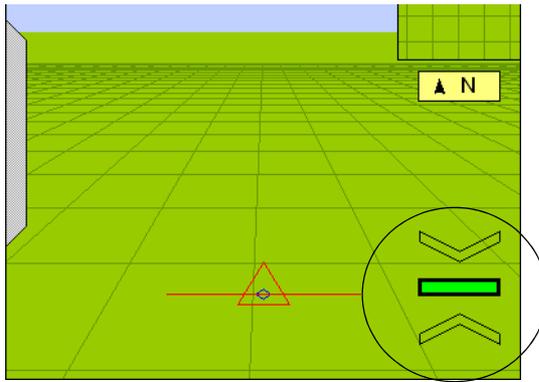
Figure 16.1 Run screen with field leveling features

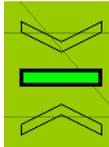
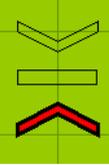
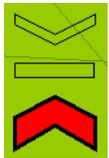
Item	Description	See
1	FieldLevel GPS receiver GPS information	page 509
2	FieldLevel II tab	The description of the leveling method you have chosen, later in this chapter
3	Blade position indicators	page 505
4	Slide-out tab	page 506

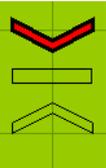
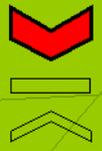
Blade position indicators

When you use the FieldManager display to provide guidance (for example, with the Autopilot system), guidance is displayed on the virtual lightbar at the top of the screen.

When you use the display to show field leveling information, blade position indicators appear on the Run screen:



Item	Description	Example
Green bar in center	The blade is at the correct target height (it is within the <i>On-Grade Limit</i>).	
Small red arrow pointing up	The blade is beyond the <i>On-Grade Limit</i> value below the target height.	
Large red arrow pointing up	The blade is considerably below the target height (more than double the <i>On-Grade Limit</i> value).	

Item	Description	Example
Small red arrow pointing down	The blade is beyond the <i>On-Grade Limit</i> value above the target height.	
Large red arrow pointing down	The blade is considerably above the target height (more than double the <i>On-Grade Limit</i> value).	

The size of the up or down arrow indicates the movement required. The arrow points in the direction that the blade needs to move.

FieldLevel status text items

A number of status text items provide information about field leveling.

Note – All of the FieldLevel status text items begin with “FL”.

Item	Description
FL Blade Height	The current height of the blade.
FL Correction Age	The time since the GPS corrections were last received from the FieldLevel GPS receiver.
FL Cut/Fill	The difference between the Blade Height and the Target Height: <ul style="list-style-type: none"> • When Cut is displayed, the current ground height is above the target height. The height adjustment indicator shows a red down arrow, which means that the blade needs to move down to reach the Target Height. • When fill is displayed, the current ground height is below the target height. The height adjustment indicator shows a red up arrow, which means that the blade needs to move up to reach the Target Height.
FL Design Height	The originally planned or designed height at the current location.
FL Distance Traveled	(For use with Point to Slope mode) The distance traveled since Auto mode was enabled.

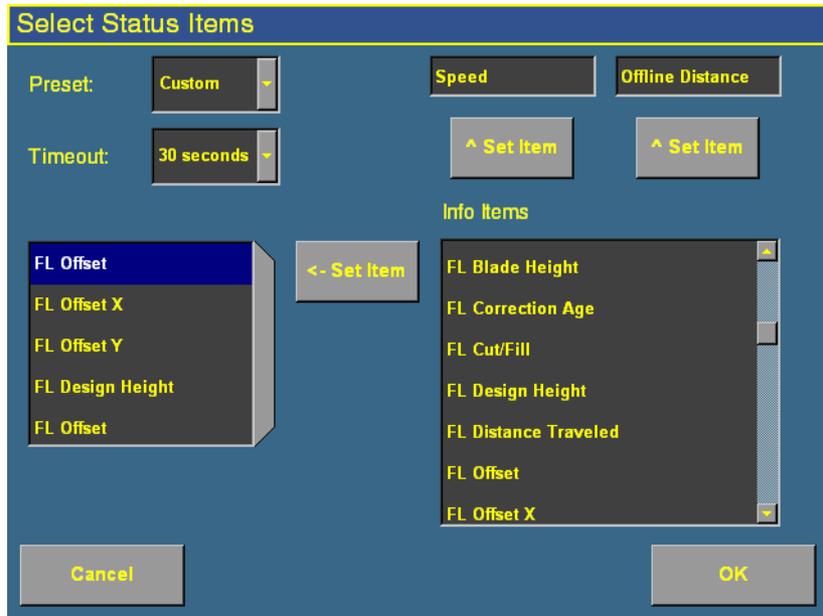
Item	Description
FL Offset	A separate plane that is parallel to the design plane. The offset is defined by a single measurement, which is the height that the offset plane is from the design plane.
FL Offset X	The Relative Position X offset from the master benchmark.
FL Offset Y	The Relative Position Y offset from the master benchmark.
FL Satellites	The number of satellites currently being received by the FieldLevel GPS receiver.
FL Target Height	The height the blade will attempt to reach. This is the Design Height \pm the Offset. When the blade reaches the Target Height, the arrows turn green.
FL VDOP	The current VDOP of the FieldLevel GPS receiver. See Step 5. Configuring the FieldLevel GPS receiver, page 502 .
FL Vertical Error Estimate	The current estimate of error in the height calculated by the FieldLevel GPS receiver.

These status text items can be set to appear permanently at the top of the screen or on a slide-out tab. The following items can also be viewed by tapping the GPS corrections status button at the top right of the Run screen:

- FieldLevel GPS status
- FieldLevel correction type
- FieldLevel correction age

You can either choose the individual status text items that are on the slide-out tab, or you can use the default selections:

1. From the *Configuration* screen, select the System plugin and then tap **Setup**. The *Display Setup* screen appears.
2. Tap **Status Items**. The *Select Status Items* screen appears:



3. To manually add a status text item to the tab:
 - a. Tap the position to fill in the list on the left.
 - b. Tap the status text item in the *Info Items* list that you want to add.
 - c. Tap **<- Set Item**.

Note – To prevent the Status tab from automatically retracting, select *Never* from the Timeout menu. The Status tab will then only retract when tapped.

Vertical error estimate

When you use the FieldManager display for steering guidance (for example, with the Autopilot system), **horizontal** accuracy is important.

When you are leveling a field, however, **vertical** accuracy is just as important. You can configure one of the status text items to show the vertical error estimate.



Reloading a field

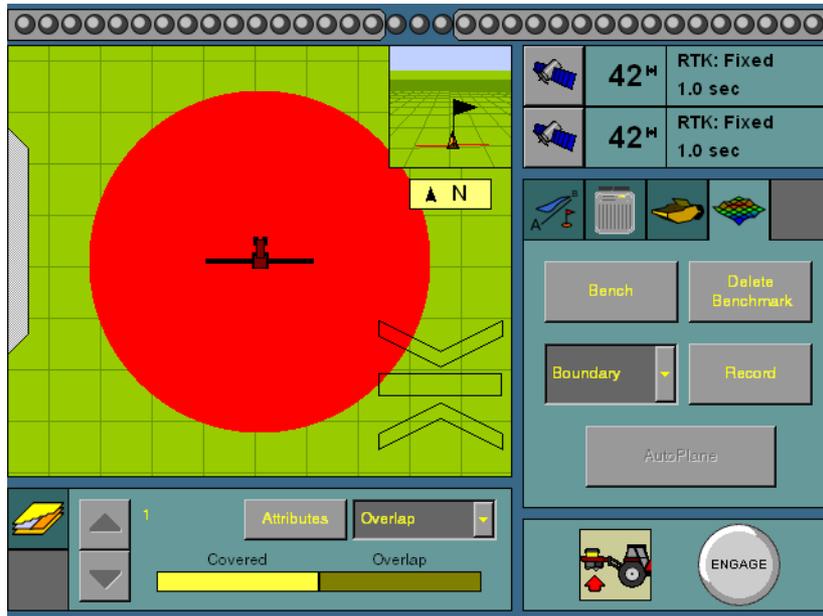
When you create a design for a field (for example, a target leveling plane), the design is saved in the */field/* directory.

The design files are associated with the field, so if you close the field and then open it again, the design reloads with the field.

With RTK GPS, the position of the RTK base station is important to the heights used when the field was previously open. If the base station is not accurately positioned in the same physical location, you must re-establish the design over an existing benchmark to re-establish the height.

Re-establishing a benchmark

If you open a field that has an existing master benchmark, a large red circle is shown for 100 m (300 ft) around the master benchmark flag:



This indicates that you need to rebench over the master benchmark location to ensure that the design is aligned with the previous position.

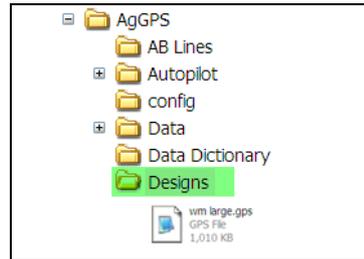
You must be within this circle before you are allowed to re-establish the master benchmark. To ensure that the design is properly aligned:

1. Return exactly to the master benchmark location that you marked on the ground (for example, with flags, see [Benchmarks, page 476](#)), regardless of where your current onscreen position appears to be.
2. Re-establish the benchmark.

This process is designed to accommodate RTK base station setup differences from the last time the field was open.

Working with MultiPlane designs

When you have finished manipulating a topographic survey file in MultiPlane, you can export a control file (*.GPS) for use with the FieldLevel II system. Copy the design control file into the `\AgGPS\Designs\` folder on the FieldManager display data card.



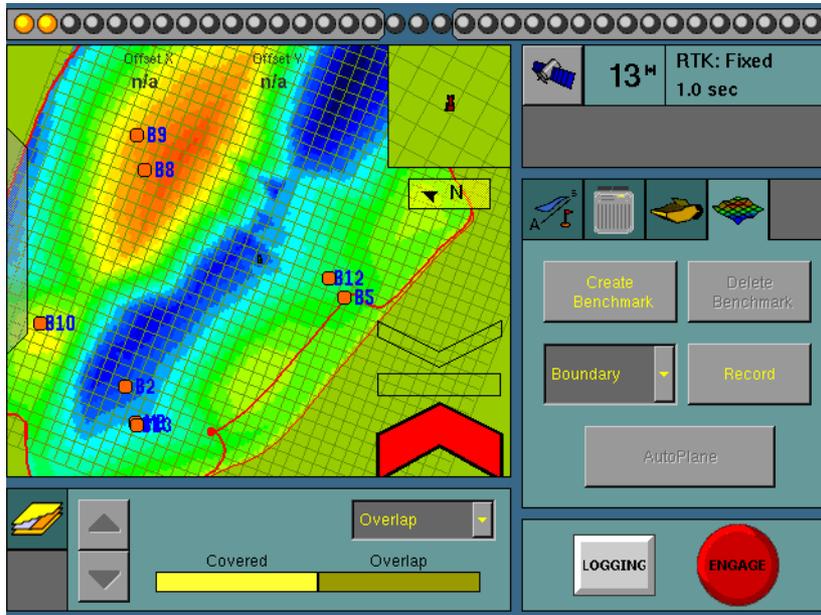
When the display opens a field, it scans the `\AgGPS\Designs\` folder and any MultiPlane .GPS control files that are close to your current position are displayed:



- Select the appropriate control file.

The control file will be loaded, displaying a color cut/fill map of the field (Red = cut; blue = fill).

When you use a MultiPlane design control file, the FieldLevel II system remains in AUTO mode if you drive off the design, but maintains the design height it had when you left the design. If you disengage AUTO mode when you are off the design, the display will not allow you to re-engage the FieldLevel II system until your position is back over the color Cut/Fill map.



Leveling model specific information

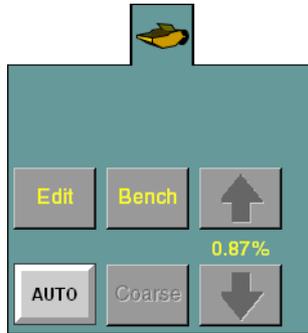
You have different leveling options, depending on the leveling mode that you selected (see [Step 3. Configuring the leveling model, page 494](#)):

For information specific to the leveling model:

- For Point to Slope mode, see below.
- For Leveling (Laser) mode, see [page 515](#).
- For Contour mode, see [page 525](#).
- For Leveling (GPS) mode, see [page 526](#).

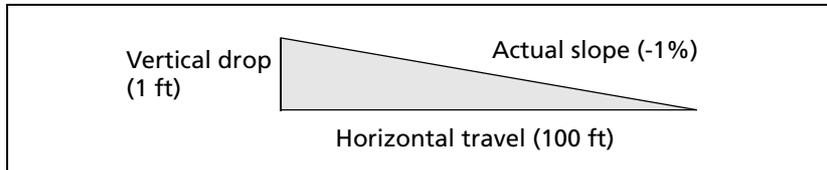
Driving in Point to Slope mode

When you drive in Point to Slope mode, the *FieldLevel* tab appears as follows:



Tap ...	To ...
Edit	Edit the design slope.
Up arrow	Increase the design slope by the Slope Adjust amount.
Down arrow	Decrease the design slope by the Slope Adjust amount.
Bench	Create a benchmark, see Benchmarks, page 476 . Set the Design Height equal to the Blade Height.
Auto	Engage automatic blade height control: <ul style="list-style-type: none"> • starts the slope calculation • resets the height • resets the cut/fill
Coarse	When selected, the Up and Down arrows change the blade height by the <i>Coarse Blade Step</i> amount. This enables you to move the blade by a large amount instead of small increments.

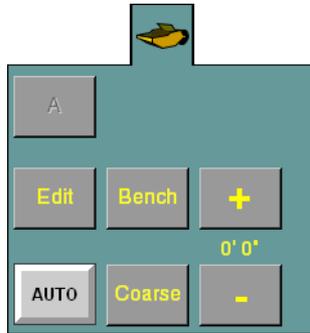
The slope is defined as the percentage vertical drop against horizontal travel. A positive slope goes upwards and a negative slope goes downward. For example, if the slope is set to -1%, the slope will drop 1 ft for every 100 ft horizontally traveled:



To view or change the Point to Slope gradient, tap **Edit** on the *Level* tab.

Driving in Leveling (Laser) mode

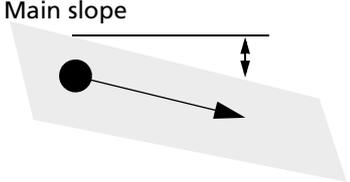
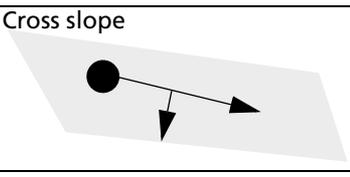
When you drive in Leveling (Laser) mode, the *FieldLevel* tab appears as follows:



Tap ...	To ...
Edit	Edit the design slope.
Bench	Create a benchmark, see Benchmarks, page 476 . Set the Design Height equal to the Blade Height.
+	Raise the blade by the <i>Blade Step</i> amount.
-	Lower the blade by the <i>Blade Step</i> amount.
Auto	Engage automatic blade height control: <ul style="list-style-type: none"> • starts the slope calculation • resets the height • resets the cut/fill
Coarse	When the Coarse button is selected, pressing the + or - button will move the blade by the <i>Coarse Blade Step</i> amount.

Defining a plane

A plane is define by four basic measurements:

Description	Example
<p>1. An initial point (A). Point A is the hinge point for the main slope. When the main slope is changed in the <i>Plane Leveling Setup</i> screen, the plane will pivot about point A.</p>	<p>A point</p> 
<p>2. The heading or direction of the main slope.</p>	<p>Heading</p> 
<p>3. Main slope (in percent).</p>	<p>Main slope</p> 
<p>4. The cross slope of the plane (in percent). The cross slope plane rotates about the main slope defined by A.</p>	<p>Cross slope</p> 

Note – The design will always rotate about the A point and the main slope as described. However, if you create a benchmark after the design has been defined, the design plane will go through the benchmark height which can change the height of A. The slopes remain the same.

Creating the current field plane

There are three ways to enter the four measurements that define a plane:

- If none of the slopes in the field are known, set three points (A, B, and C) to define direction and the main and cross slopes.
- If the direction of the main slope is unknown, set two points in the field (A and B) to define a heading and main slope, and then manually enter the cross slope.
- If both the heading and main slope are known, set a point (A) in the field and then manually set the heading and main slope.

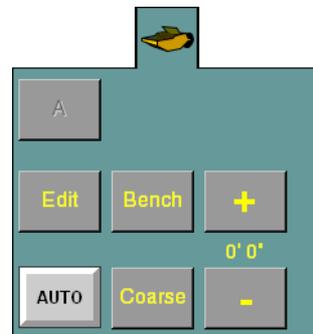
Note – You can adjust points after you have set them. See [Editing points in a plane, page 523](#).

In all three cases:

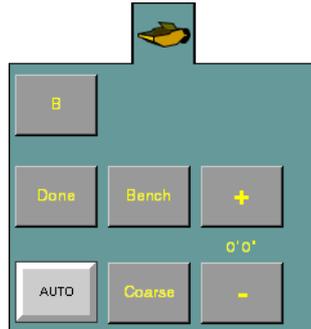
1. Press the Run button . The *Field Selection* screen appears.
2. Create a new field.
3. Tap **OK**. The Run screen appears, showing the new field.

Defining a plane from three points

1. Select the FieldLevel tab.
2. Drive the vehicle to the location of the first point that defines the plane.
3. Tap **A**. The A point begins averaging.

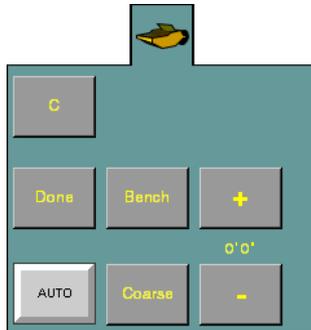


On the FieldLevel tab, the **A** button changes to the **B** button, and the **Done** button becomes accessible:



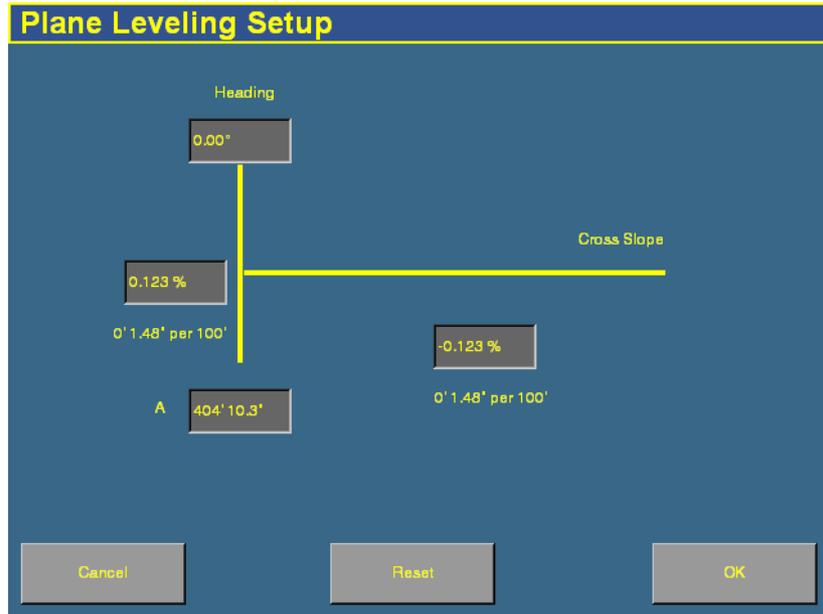
4. Drive the vehicle to the location of the second point on the plane.
5. Tap **B**. The B point begins averaging.

On the *Topo* tab, the **B** button changes to the **C** button:



6. Drive the vehicle to the location of the third point on the plane.

7. Tap **C**. The C point begins averaging. The *Plane Leveling Setup* screen appears:



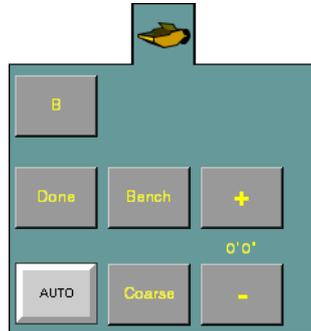
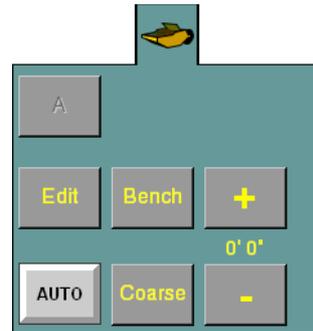
This screen contains the four settings that define the plane. See [Defining a plane, page 516](#).

8. Tap **OK**.

Defining a plane from two points

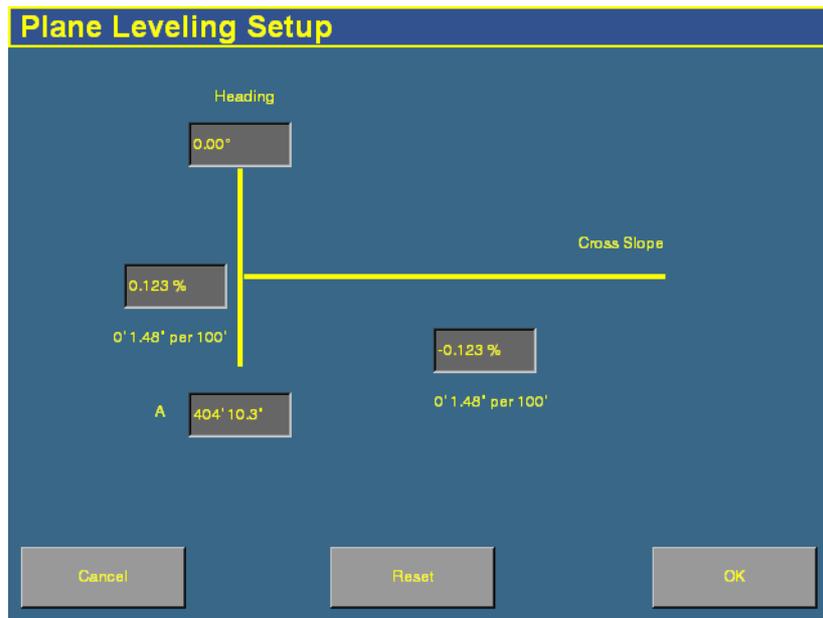
1. Select the FieldLevel tab:
2. Drive the vehicle to the location of the first point that defines the plane.
3. Tap **A**. The A point begins averaging.

On the FieldLevel tab, the **A** button changes to the **B** button, and the **Done** button becomes accessible:



4. Drive the vehicle to the location of the second point on the plane.
5. Tap **B**. The B point begins averaging.

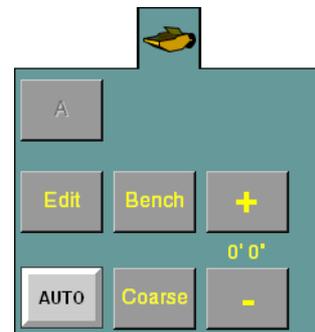
- Tap **Done**. The *Plane Leveling Setup* screen appears:



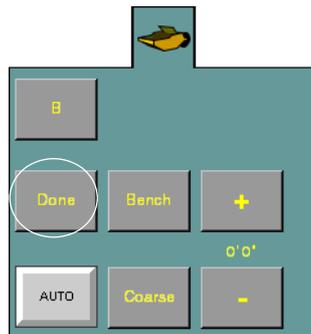
- Tap the *Cross Slope* field and then enter the cross slope.
- Tap **OK**.

Defining a plane from one point

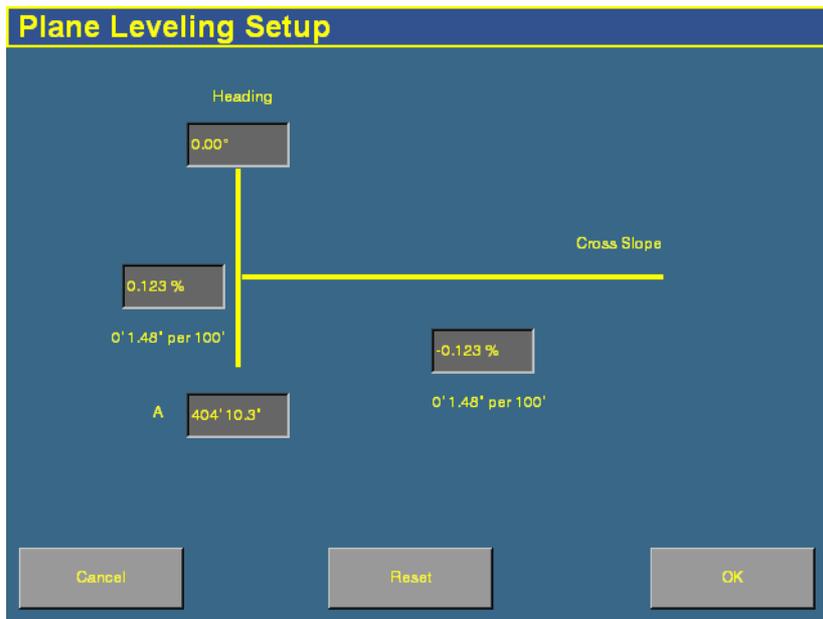
- Select the FieldLevel tab:
- Drive the vehicle to the location of the first point that defines the plane.
- Tap **A**. The A point begins averaging.



On the FieldLevel tab, the **Done** button becomes accessible:



4. Tap **Done**. The *Plane Leveling Setup* screen appears:

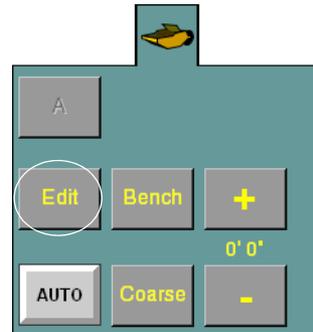


5. Tap the *Heading* field and then enter the heading direction.
6. Tap the primary slope field and then enter the primary slope.
7. Tap the *Cross Slope* field and then enter the cross slope.
8. Tap **OK**.

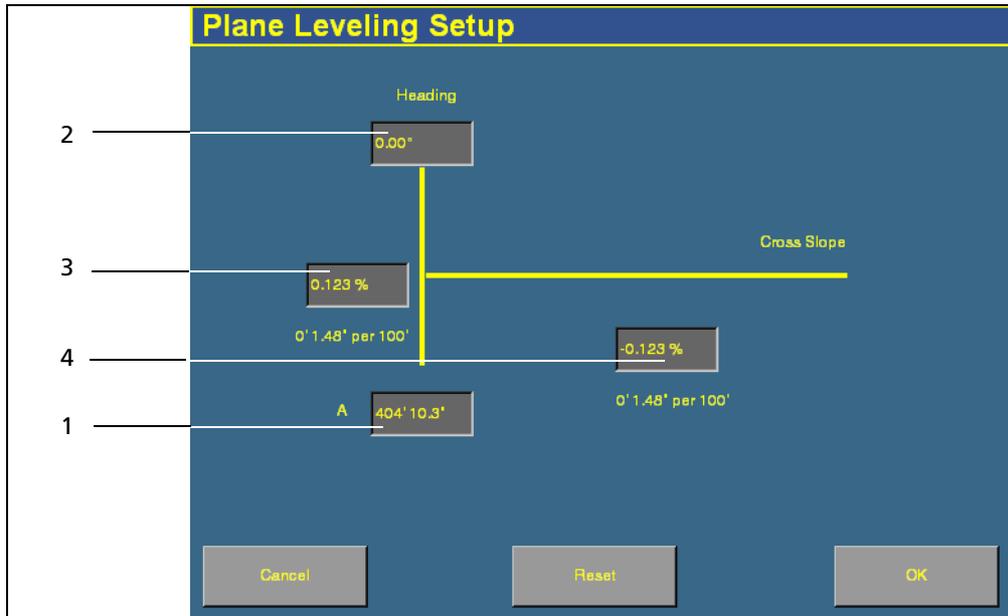
Editing points in a plane

When you are in Leveling mode, you can edit the points on your existing target plane:

1. On the Run screen, select **Edit** on the FieldLevel tab.

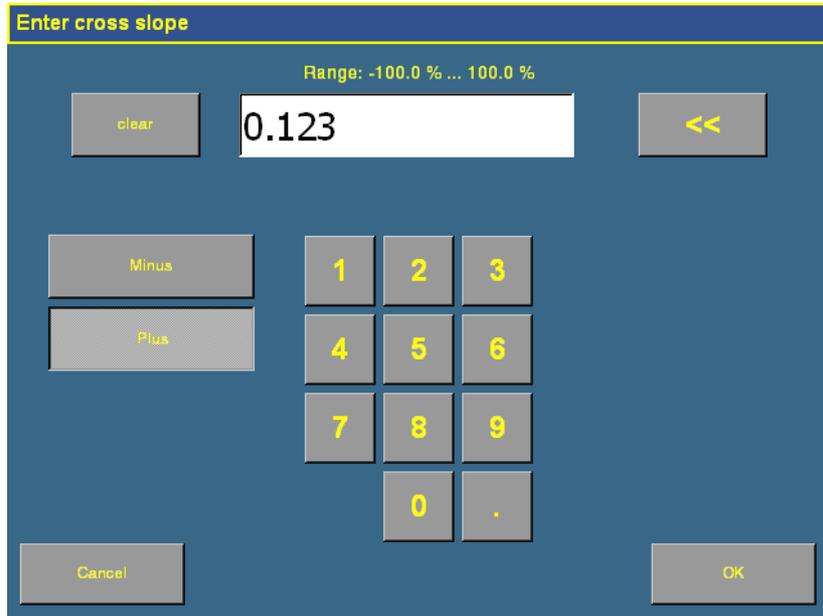


The *Plane Leveling Setup* screen appears:



Item	Description
1	A point
2	Heading
3	Main slope
4	Cross slope

2. To reset any of the points, tap the appropriate text box. For example, to change the cross slope:
 - a. Tap the cross slope text box. The *Enter cross slope* screen appears:

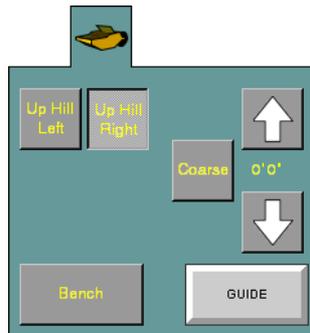


- b. Enter the new value and then tap **OK**.

Tap **OK** in the *Plane Leveling Setup* screen to return to the *Run* screen.

Driving in Contour mode

When you drive in Contour mode, the *FieldLevel* tab appears as follows:

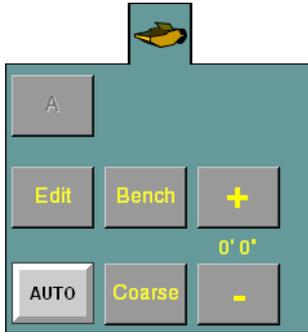


Item	Description
Up Hill Left	Select whichever of these 2 buttons is appropriate: <ul style="list-style-type: none"> • If you are driving around the contour with the uphill slope on your left and the downhill slope on your right, select Up Hill Left. • If you are driving around the contour with the uphill slope on your right and the downhill slope on your left, select Up Hill Right.
Up Hill Right	
Coarse	When selected, the Up and Down arrows change the blade height by the <i>Coarse Blade Step</i> amount. This enables you to move the blade by a large amount instead of small increments.
Up arrow	Increase the design slope by the Slope Adjust amount.
Down arrow	Decrease the design slope by the Slope Adjust amount.
Bench	Create a benchmark, see Benchmarks, page 476 . Set the Design Height equal to the Blade Height.
Guide	Select Guide to get lightbar guidance at the current level.

The FieldLevel height indicators on screen show you whether to raise or lower the blade for the contour to remain at the same level.

Driving in Leveling (GPS) mode

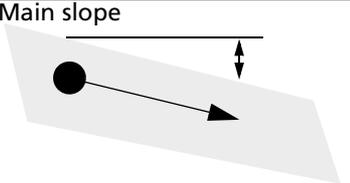
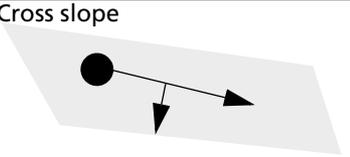
When you drive in Leveling (Laser) mode, the *FieldLevel* tab appears as follows:



Tap ...	To ...
Edit	Edit the design slope.
Bench	Create a benchmark, see Benchmarks, page 476 . Set the Design Height equal to the Blade Height.
+	Raise the blade by the <i>Blade Step</i> amount.
-	Lower the blade by the <i>Blade Step</i> amount.
Auto	Engage automatic blade height control: <ul style="list-style-type: none"> • starts the slope calculation • resets the height • resets the cut/fill
Coarse	When the Coarse button is selected, pressing the + or - button will move the blade by the <i>Coarse Blade Step</i> amount.

Defining a plane

A plane is define by four basic measurements:

Description	Example
1. An initial point (A). Point A is the hinge point for the main slope. When the main slope is changed in the <i>Plane Leveling Setup</i> screen, the plane will pivot about point A.	<p>A point</p> 
2. The heading or direction of the main slope.	<p>Heading</p> 
3. Main slope (in percent).	<p>Main slope</p> 
4. The cross slope of the plane (in percent). The cross slope plane rotates about the main slope defined by A.	<p>Cross slope</p> 

Note – The design will always rotate about the A point and the main slope as described. However, if you create a benchmark after the design has been defined, the design plane will go through the benchmark height which can change the height of A. The slopes remain the same.

Creating the current field plane

There are three ways to enter the four measurements that define a plane:

- If none of the slopes in the field are known, set three points (A, B, and C) to define direction and the main and cross slopes.
- If the direction of the main slope is unknown, set two points in the field (A and B) to define a heading and main slope, and then manually enter the cross slope.
- If both the heading and main slope are known, set a point (A) in the field and then manually set the heading and main slope.

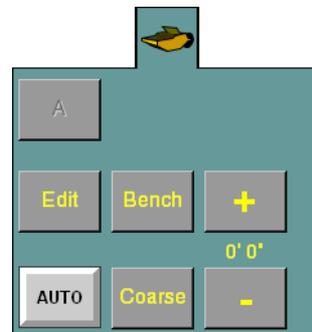
Note – You can adjust points after you have set them. See [Editing points in a plane, page 534](#).

In all three cases:

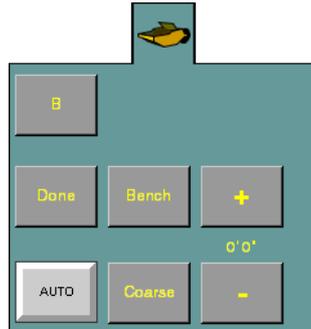
1. Press the Run button . The *Field Selection* screen appears.
2. Create a new field.
3. Tap **OK**. The Run screen appears, showing the new field.

Defining a plane from three points

1. Select the FieldLevel tab.
2. Drive the vehicle to the location of the first point that defines the plane.
3. Tap **A**. The A point begins averaging.

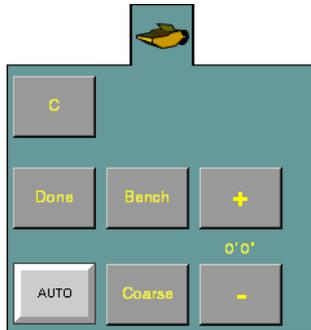


On the FieldLevel tab, the **A** button changes to the **B** button, and the **Done** button becomes accessible:



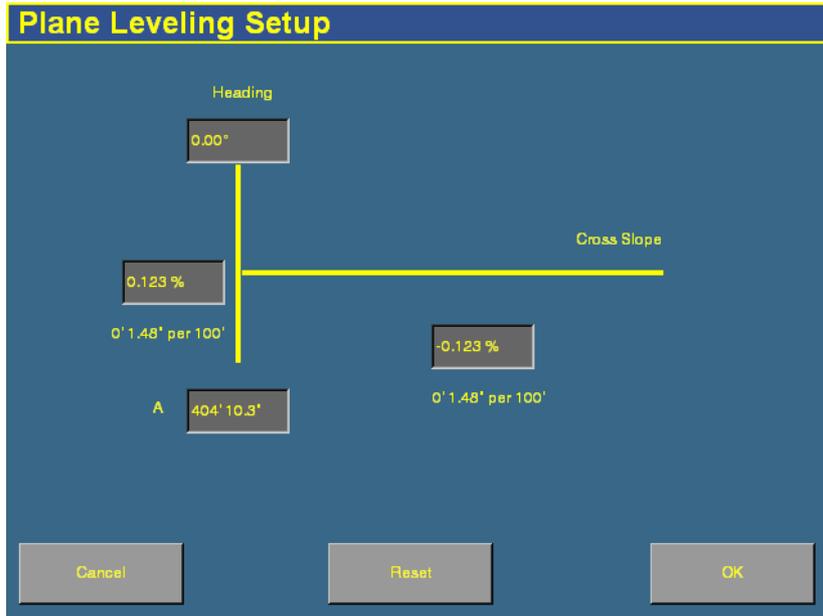
4. Drive the vehicle to the location of the second point on the plane.
5. Tap **B**. The B point begins averaging.

On the *Topo* tab, the **B** button changes to the **C** button:



6. Drive the vehicle to the location of the third point on the plane.

7. Tap **C**. The C point begins averaging. The *Plane Leveling Setup* screen appears:



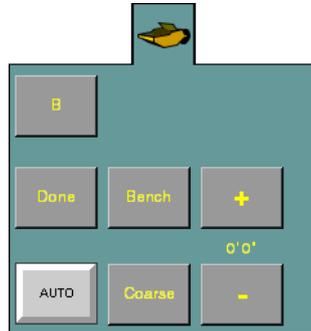
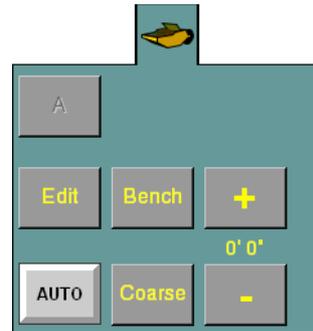
This screen contains the four settings that define the plane. See [Defining a plane, page 516](#).

8. Tap **OK**.

Defining a plane from two points

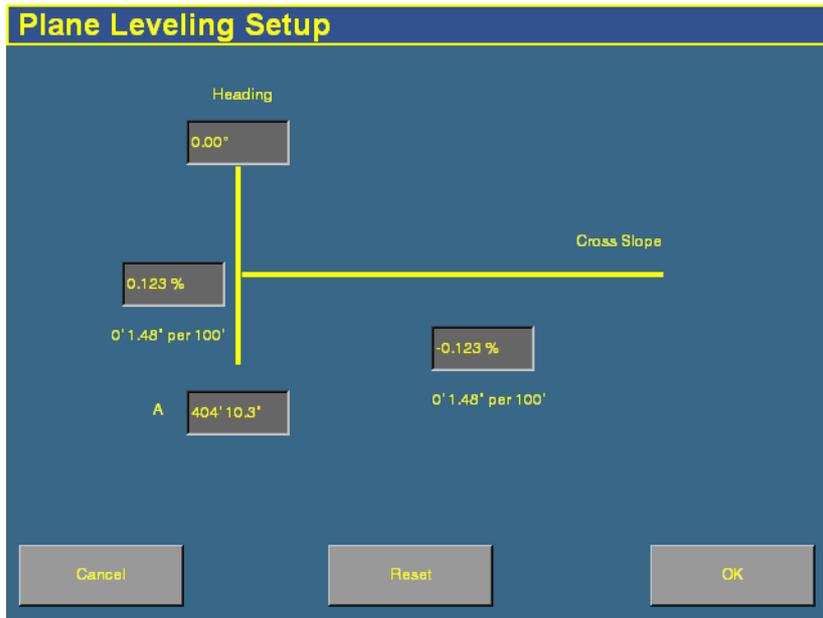
1. Select the FieldLevel tab:
2. Drive the vehicle to the location of the first point that defines the plane.
3. Tap **A**. The A point begins averaging.

On the FieldLevel tab, the **A** button changes to the **B** button, and the **Done** button becomes accessible:



4. Drive the vehicle to the location of the second point on the plane.
5. Tap **B**. The B point begins averaging.

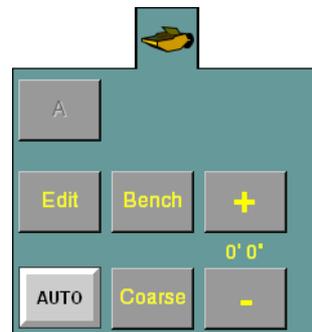
6. Tap **Done**. The *Plane Leveling Setup* screen appears:



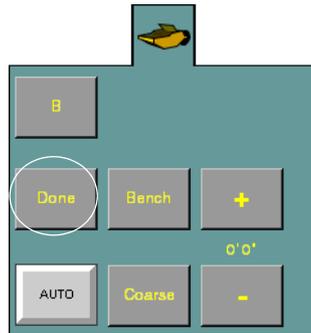
7. Tap the *Cross Slope* field and then enter the cross slope.
8. Tap **OK**.

Defining a plane from one point

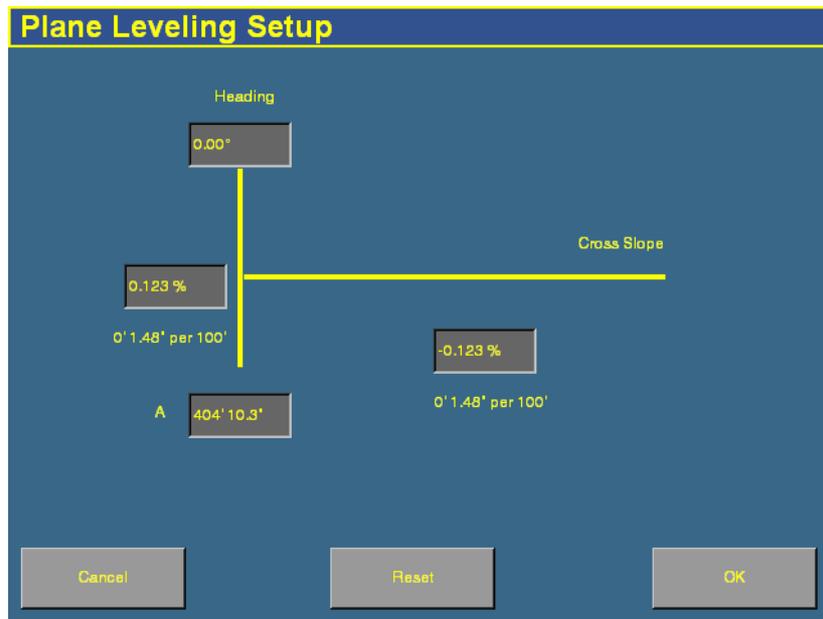
1. Select the FieldLevel tab:
2. Drive the vehicle to the location of the first point that defines the plane.
3. Tap **A**. The A point begins averaging.



On the FieldLevel tab, the **Done** button becomes accessible:



4. Tap **Done**. The *Plane Leveling Setup* screen appears:

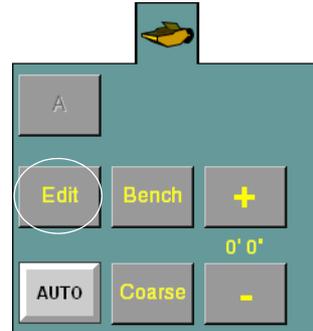


5. Tap the *Heading* field and then enter the heading direction.
6. Tap the primary slope field and then enter the primary slope.
7. Tap the *Cross Slope* field and then enter the cross slope.
8. Tap **OK**.

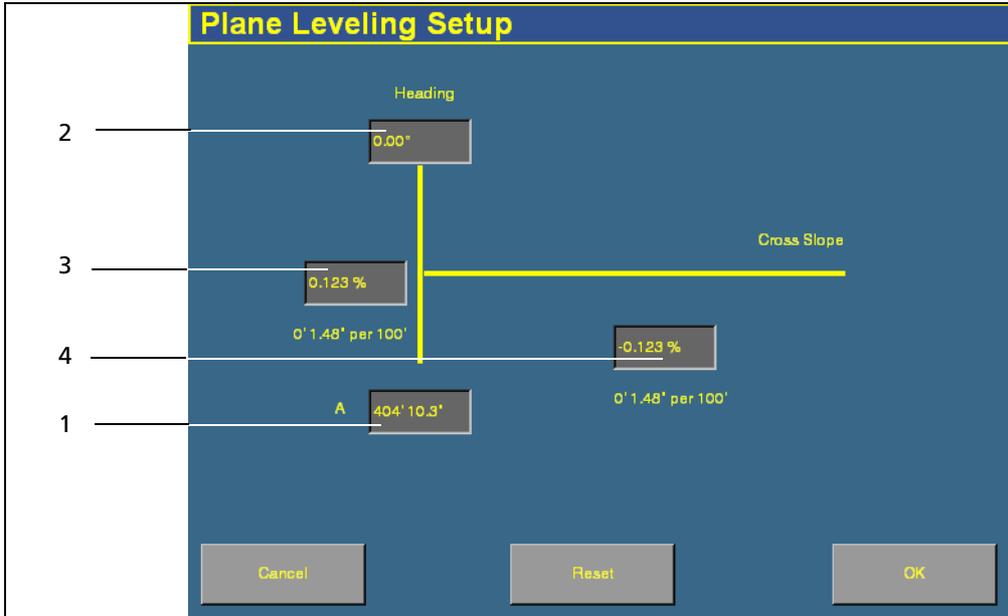
Editing points in a plane

When you are in Leveling mode, you can edit the points on your existing target plane:

1. On the Run screen, select **Edit** on the FieldLevel tab.



The *Plane Leveling Setup* screen appears:



Item	Description
1	A point
2	Heading
3	Main slope
4	Cross slope

2. To reset any of the points, tap the appropriate text box. For example, to change the cross slope:
 - a. Tap the cross slope text box. The *Enter cross slope* screen appears:

The screenshot shows the 'Enter cross slope' screen. The title bar at the top is dark blue with the text 'Enter cross slope' in white. Below the title bar, the range '-100.0 % ... 100.0 %' is displayed in yellow. A white text input field in the center contains the value '0.123'. To the left of the input field is a 'clear' button, and to the right is a '<<' button. Below the input field is a numeric keypad with buttons for digits 1-9, 0, and a decimal point. To the left of the keypad are 'Minus' and 'Plus' buttons. At the bottom left is a 'Cancel' button, and at the bottom right is an 'OK' button.

- b. Enter the new value and then tap **OK**.

Tap **OK** in the *Plane Leveling Setup* screen to return to the *Run* screen.

The Remote Output Plugin

In this chapter:

- [Connecting remote output](#)
- [Configuring the Remote Output plugin](#)

When remote output is activated, the display outputs pulses for an external device. For example, you can use a remote output signal to control a tree planter.

This chapter explains how to configure the Remote Output plugin so the display can output data.

Connecting remote output

For remote output, connect to the P2 (8-pin Deutsch) connector on the AgGPS Autopilot harness. The remote output wires are:

Pin	Description
Pin 3	5 v
Pin 8	Ground

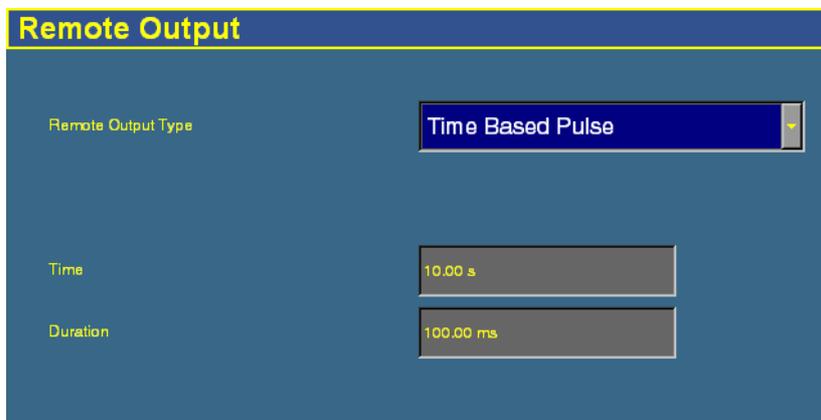
Configuring the Remote Output plugin

When remote output is activated, the display outputs pulses for an external device. For example, you can use a remote output signal to control a tree planter.

Note – Pulse output only occurs when autosteering is engaged and coverage logging is enabled.

To enable pulse remote output:

1. Install the Remote Output plugin. See [Adding or removing a plugin, page 76](#).
2. From the *Configuration* screen, select the Remote Output plugin and then tap **Setup**. The *Remote Output* screen appears:



3. From the *Remote Output Type* drop-down list, select one of the following:

If you select ...	Then enter ...
No Output	Nothing: Remote output is not enabled.
Time Based Pulse	<ul style="list-style-type: none"> • Pulse interval in seconds in the <i>Time</i> field. • Pulse duration in milliseconds in the <i>Duration</i> field.
Distance Based Pulse	<ul style="list-style-type: none"> • Distance in meters/decimal feet/feet and inches in the <i>Distance</i> field. The pulse will occur at each increment of this distance. <p>Note – <i>The first pulse will occur at the A point. Pulse remote output is not recommended for Headland patterns.</i></p> <ul style="list-style-type: none"> • Lead time for the pulse in the <i>Lead Time</i> field. The lead time is the time in advance of reaching a point that you want the pulse to occur. It compensates for system delay. • Duration of the pulse in milliseconds (ms) in the <i>Duration</i> field. • Distance in the <i>Within Distance</i> field. The pulse only occurs when the vehicle is within this distance of being online. If the vehicle is more than this distance offline, no pulse occurs.
Feature Signal	<ul style="list-style-type: none"> • Lead time for the pulse in the <i>Lead Time</i> field. The lead time is the time in advance of reaching a point that you want the pulse to occur. It compensates for system delay. <p>Note – <i>The pulse only occurs when Remote Output is enabled. You must enable Remote Output for each feature individually.</i></p>
When Engaged	There are no options to set. Remote output occurs when the system is engaged.

4. Tap **OK**.

Remote output is now configured.

The Serial Data Input Plugin

In this chapter:

- [Connecting serial data input](#)
- [Configuring serial data input](#)

When serial data input is activated, the display can receive and log NMEA messages from an external device (for example, an infra-red sensor).

This chapter explains how to configure the display to receive data.

Connecting serial data input

To connect a device to the FieldManager display, connect the Variable Rate Control cable (P/N 59875) to the P5 connector on the display harness.

The other end of the Variable Rate Control cable connects to a serial connector.

Configuring serial data input

1. Install the Serial Data Input plugin. See [Adding or removing a plugin, page 76](#).
2. On the *Configuration* screen, select the Serial Data Input plugin and then tap **Setup**. The data input setup screen appears:

The screenshot shows the Serial Data Input Setup screen with the following configuration:

Label	Value
Port	P5 Extension
Baud rate	9600
Parity	None
Data bits	8
Stop bits	1
Prefix	
Suffix	0D0A
Log Interval	60.00 s

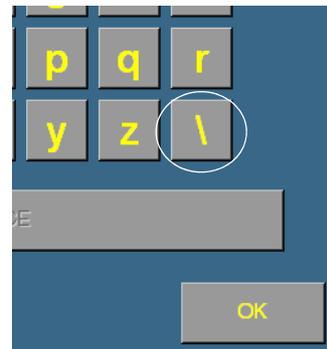
Buttons: Cancel, OK

3. In the Port list, select the port that the device is connected to. It is usually P5 Serial I/O. Configuration settings for that port appear on the right of the screen.
4. Set the following drop-down boxes to the settings at which the sensor outputs data:
 - Baud rate
 - Parity
 - Data bits
 - Stop bits
5. The *Prefix* and *Suffix* fields are the start and end points of the data you want to collect.
 - To log data from the start of the line, leave the *Prefix* field empty.
 - To drop introductory characters, enter them in the *Prefix* field. For example, if you receive data that begins “\$GPGGA...”, enter “\24GP” in the *Prefix* field. The logged data will begin “GGA...”

Note – “\24” is the ASCII code for “\$”.

 - To log to the end of the line, keep the default *Suffix* field (“\0D\0A”).
6. Enter the log interval. This determines how regularly the data is written to the file.

The system is now configured to receive remote data from an external device.



The Productivity Monitoring Plugin

In this chapter:

- Installation
- Configuring the Productivity Monitoring plugin
- Operation

The Productivity Monitoring plugin enables the AgGPS FieldManager display to interface with an Enalta CDA 1000 display, for sugar cane harvesting.

This chapter explains how to combine the two systems, so the information from both displays appears on the FieldManager display.

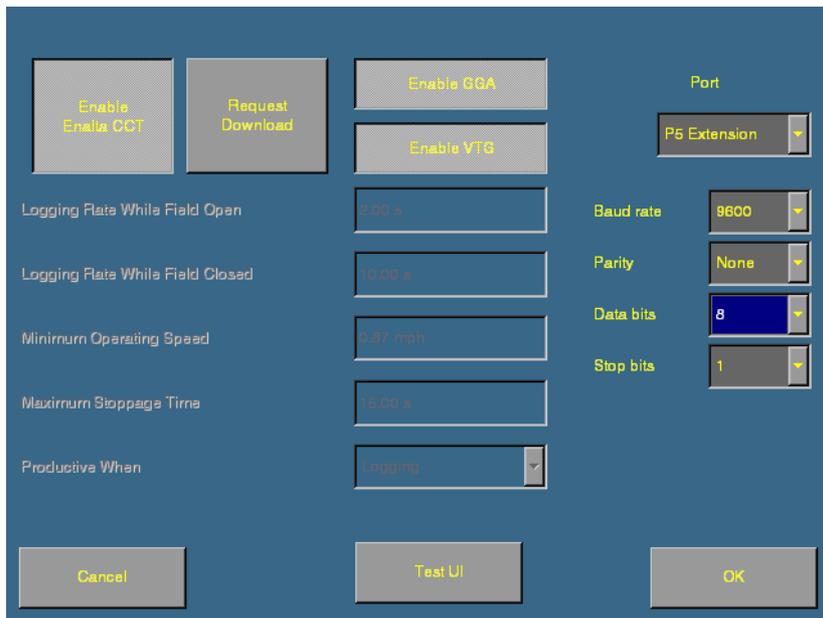
***Note** – You can only use this plugin if you have an Enalta CCT system.*

Installation

1. Install the FieldManager display, harness, and GPS receiver. See [Installing the display, page 46](#).
2. Connect the Enalta sensors to a serial port on the FieldManager display harness.

Configuring the Productivity Monitoring plugin

1. Install the Productivity Monitoring plugin. See [Adding or removing a plugin, page 76](#).
2. On the *Configuration* screen, select the Productivity Monitoring plugin and then tap **Setup**. The setup screen appears:



3. In the port list, select the port on the FieldManager display harness that the Enalta sensors are connected to.

4. Adjust the port settings.
5. Select the NMEA messages that the systems will use to communicate. You can select:
 - GGA: Select **Enable GGA**.
 - VTG: Select **Enable VTG**.
 - GGA and VTG messages: Select both buttons.
6. Select **Enable Enalta CCT** to enable the Enalta system.
7. Enter the following settings:

Item	Description
Logging Rate While Field Open	The rate at which data is logged when a field is open. (1 sec–300 sec).
Logging Rate While Field Closed	The rate at which data is logged when the field is closed (1 sec–300 sec).
Minimum Operating Speed	When a field is open and the vehicle speed drops below this speed, a pop-up message appears onscreen asking the driver to select a reason for the low speed. The system will not operate until the driver selects a reason.
Maximum Stoppage Time	When a field is open and the vehicle stops moving for longer than this time, a pop-up message appears onscreen asking the driver to select a reason for the stoppage. The system will not operate until the driver selects a reason.
Productive When	The system will be marked “productive” when a condition is active: <ul style="list-style-type: none"> • None – the system is not productive • Logging – On = productive, Off = Non-productive • AP Engaged – Engaged = productive Disengaged = non-productive • Minimum Speed – Above = productive, Below - non-productive

Operation

When you go to open a field, enter the additional details.

When the conditions that you set in the configuration are met, they trigger pop-up messages on the FieldManager display.

Advanced Configuration

In this chapter:

- Configuring remote logging
- Changing the password
- Saving the vehicle configuration
- Saving an HTML version of the current field
- Upgrading the FieldManager display firmware
- Upgrading the EZ-Boom controller or Multi-Application firmware
- Unlocking additional devices

When you have completed the basic configuration steps, you can:

- Use this chapter to configure more advanced features for higher accuracy or better performance.
- Begin driving. See [Chapter 7, The Mapping Plugin](#).

***Note** – Some configuration settings are unavailable when a field is open in the Run screen. To access these settings, return to the Run screen and then press the Home button. When the display asks if you would like to close the field, tap **Yes**.*

Configuring remote logging

Connect a spray boom switch

If you connect a boom switch to your system, you can start and stop coverage logging remotely.

To connect a boom switch to the system:

1. Attach 18-gauge insulated wire to the hot side of the boom switch.
2. Install a fuse in the wire.
3. Connect the wire to the positive terminal of the battery.
4. Connect the cold side of the boom switch to pin 1 of connector P2.
5. Use a voltmeter to verify that when the boom switch is turned on, 5–12 V DC is measured between pin 1 and GND. Ensure that when the boom switch is turned off, the voltage is zero.

Figure 20.1 shows the wiring for connecting an external boom switch to the system.

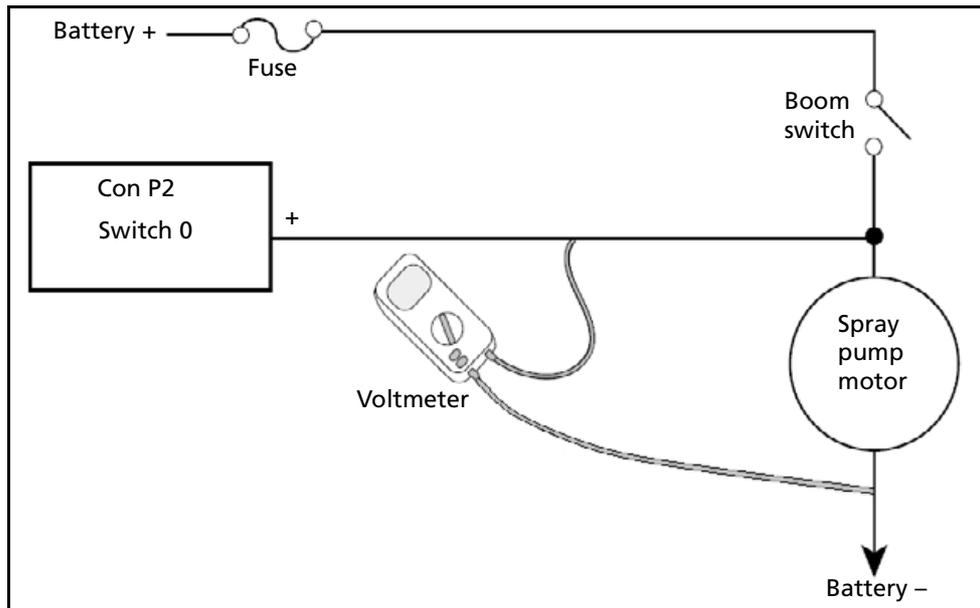


Figure 20.1 External boom switch connection

Connecting an implement pressure switch

To connect a pressure switch to the system:

1. Attach 18-gauge insulated wire to the hot side of the pressure switch.
2. Install a fuse in the wire.
3. Connect the cold side of the pressure switch to pin 1 of connector P2.
4. Use a voltmeter to verify that when the pressure switch is turned on, 5–12 V DC is measured between pin 1 and GND. Ensure that when the boom switch is turned off, the voltage is zero.

Figure 20.2 shows the wiring for connecting an external pressure switch to the system.

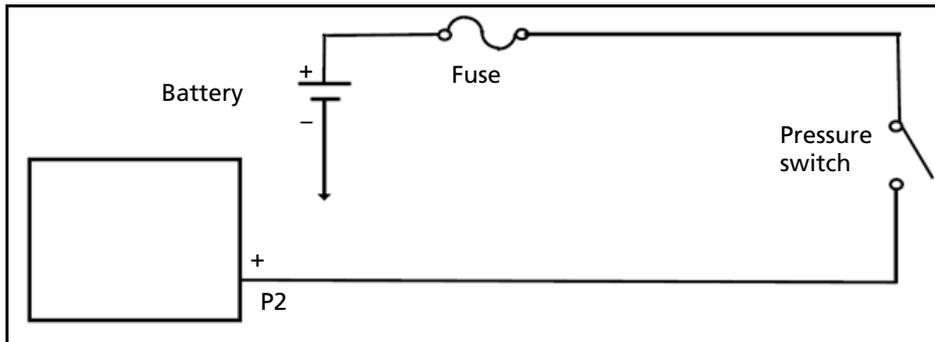


Figure 20.2 External pressure switch connections

Enable the external switch

To enable the external switch:

1. Press the Configuration button  to the right of the display. The *Configuration* screen appears.
2. Tap **Implement/Vehicle Setup**. The *Edit Implement* screen appears.
3. Set the Remote Logging list to either Log on high or Log on low:

Item	Description
Log on high	The system records logging when the switch is turned on and stops recording when the switch is turned off.
Log on low	The system records logging when the switch is turned off and stops recording when the switch is turned on.

Note – When remote logging is on, the **Logging** button on the Run screen is disabled. Use the external switch to turn logging on or off.

Changing the password

Note – To change the Administration password, you require the Master password. If you do not know it, contact your local Trimble reseller. See also [Password access, page 84](#).

1. Do one of the following:
 - If you have not entered the password during the current session, from the *Configuration* screen tap either **Setup** or **Calibrate**.
 - If you have already entered the password during this session, press the Home button and then tap **Lock Configuration**. On the *Configuration* screen tap either **Setup** or **Calibrate**.

The *Enter Administration Password* screen appears.

2. Enter an **incorrect** password.

The *Wrong Password* screen appears.

3. Tap **Enter Master Password**.

4. Enter the Master password and then select **OK**.

The *Change Administration Password* screen appears.

5. Enter your new Administration password in both fields.

The new Administration password is now active.

Locking the display (to re-enable the password)

To re-enter the password if you have already entered the Administration Password:

1. From the Home screen, tap **Lock Configuration**.
2. Press the Configuration  button. The *Configuration* screen appears.

Tap a **Setup** or **Calibrate** button. The *Enter Administration Password* screen appears.

Saving the vehicle configuration

***Note** – The vehicle configuration is different from the display configuration. The vehicle configuration saves the Autopilot vehicle settings that you have created. The display configuration saves the display appearance features that you have selected. See [Using settings files](#), page 108.*

1. From the *Configuration* screen, select the Autopilot plugin and then tap **Setup**. The *Edit Vehicle* screen appears.
2. Tap **Save Vehicle to File**. The *Save Vehicle Configuration* screen appears.

The default file name contains the date and time.

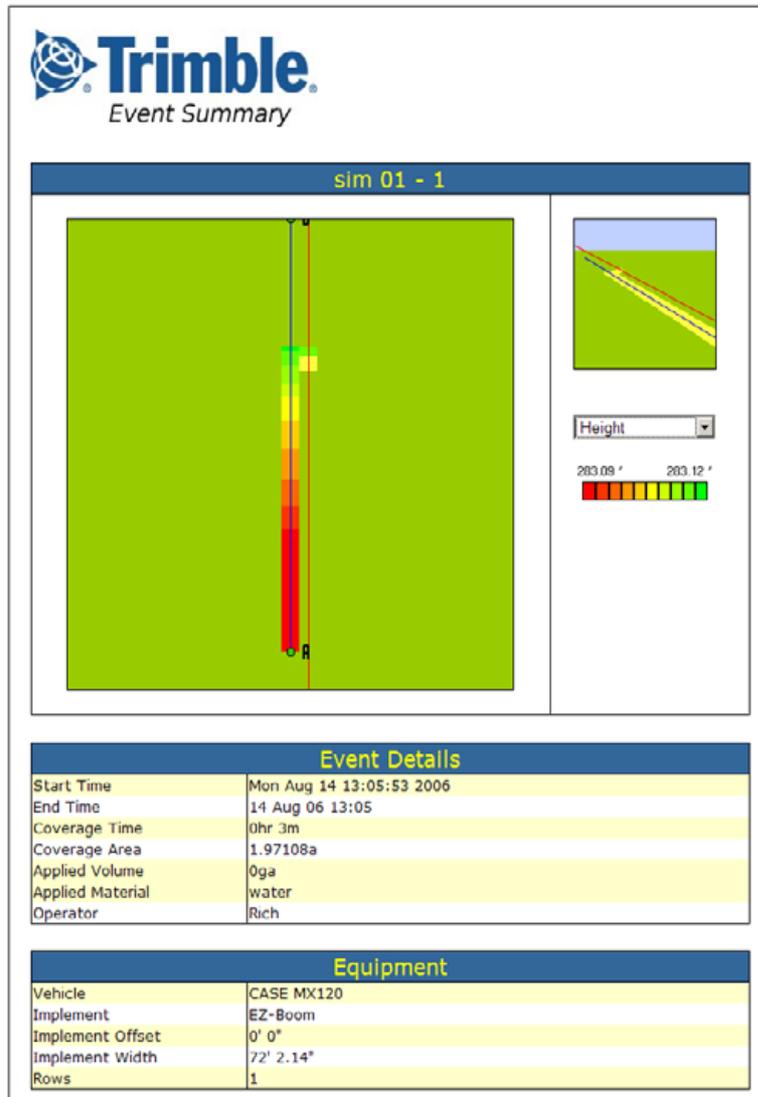
- To select a different file name, tap the text box.
 - To overwrite a previous configuration file, select the previous file from the *Configuration* list.
3. To save the file, tap **OK**.

When the configuration file is saved, the following message appears:

File Download Complete.

Saving an HTML version of the current field

When you close a field, the system automatically creates an HTML summary file. The file *index.html* is saved in the `\AgGPS\Summaries\client_farm_field_event` directory.



The Event Summary file can show the following images of the field:

- Overlap – the coverage and any overlaps.
- Height – the vertical height of the GPS position.
- Applied rate – the volume at which the spray boom has applied solution.
- GPS quality – the quality of the GPS signal.

The file also displays information about:

- The event
- the vehicle setup

By tapping the appropriate buttons, you can show or hide coverage area and/or area features. If any Prescriptions are available, a prescriptions button will also be available.

To view a summary report on an office computer:

1. Remove the CompactFlash card from the display and then insert it into an office computer.
2. Select the directory `\AgGPS\Summaries\` and then open the file `Index.html`.
3. Select the appropriate field from the list.

Note – *If you use the Microsoft Internet Explorer® internet browser, you may need to allow ActiveX® technology to see all of the summary file.*

Upgrading the FieldManager display firmware

1. Transfer the new firmware file from www.trimble.com to your office computer.
2. Connect the FieldManager display CompactFlash card to your office computer (for example, via a card reader).
3. Unzip the firmware file and then save it to the root directory of the CompactFlash card.
4. Insert the CompactFlash card into the card slot on the AgGPS FieldManager display.
5. Press the Power button on the rear of the display to turn on the FieldManager display. Allow the display to boot up. The system automatically detects the firmware file and begins the upgrade process.

Upgrading the EZ-Boom controller or Multi-Application firmware

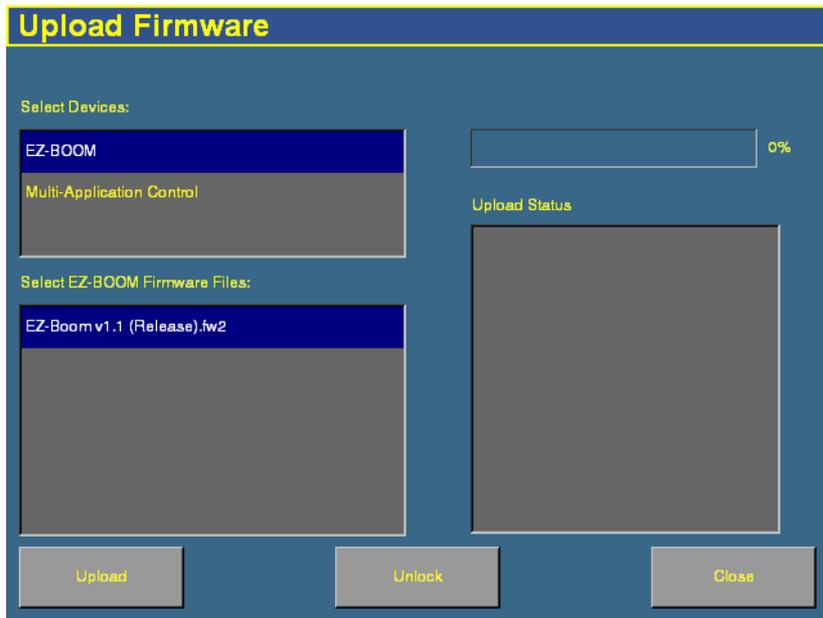
You can use the display to upgrade the firmware in the following components:

Plugin	Item
EZ-Boom	EZ-Boom controller
Multi-Application Control	Working Set Master Module (WSMT)
Multi-Application Control	Tractor ECU

To upgrade a component's firmware:

1. Transfer the new firmware file from www.trimble.com to your office computer.
2. Connect the FieldManager display CompactFlash card to your office computer (for example, via a card reader).
3. Copy the firmware upgrade file to the `\AgGPS\Firmware\` directory on the CompactFlash card.

4. Insert the CompactFlash card into the card slot on the AgGPS FieldManager display.
5. Press the Power button on the rear of the display to turn on the FieldManager display. Allow the display to boot up. The Home screen appears.
6. Tap **Upgrade**. The *Upload Firmware* screen appears:



7. Select the appropriate plugin from the Select Devices list. Any available firmware upgrade files appear in the lower left list.
8. Select the appropriate firmware file.
9. Tap **Upload**. System messages appear in the box on the right of the screen and progress is displayed on the progress bar.

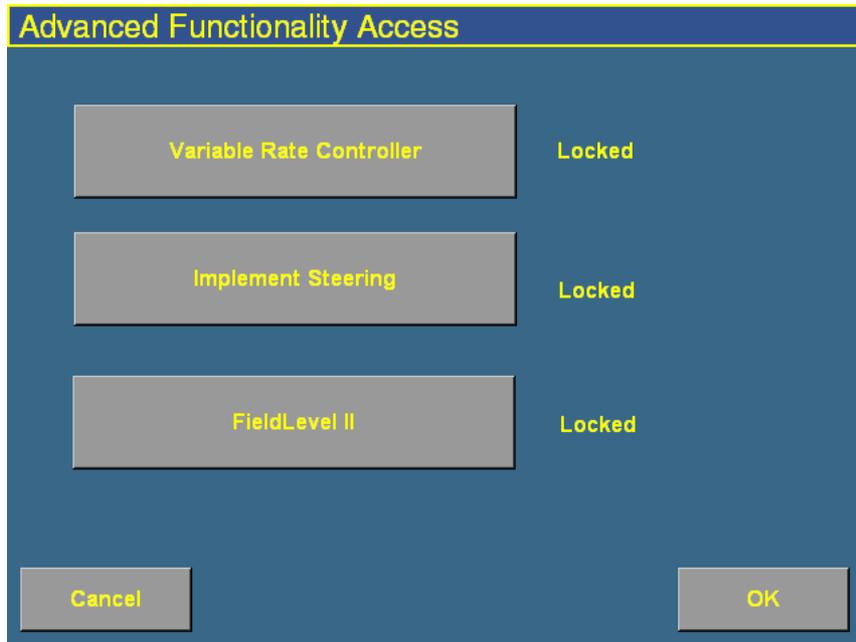
The component's firmware is updated.

Unlocking additional devices

You can purchase enhanced features for the FieldManager display from your local Trimble reseller. To enable the additional features:

Note – When you purchase an EZ-Boom or Multi-Application Control system, you receive a text file containing the unlock password. Place this file in the `\AgGPS\Firmware\` directory on the CompactFlash card. You can now avoid the steps below.

1. Turn on the FieldManager display. The Home screen appears.
2. Tap **Upgrade**. The *Upload Firmware* screen appears.
3. Tap **Unlock**. The *Advanced Functionality Access* screen appears.



4. Tap the button for the feature that you want to unlock. The *Enter Password to Activate...* screen appears.
5. Enter the password and then tap **OK**. The feature is enabled. The password is saved to the card for future use.

Data Management

In this chapter:

- Transferring data to an office computer
- Data formats
- Directories on the CompactFlash card
- Files on the CompactFlash card
- Importing AB Lines or boundaries
- Data dictionaries

This chapter describes the files and directories on the FieldManager display CompactFlash card.

Transferring data to an office computer

All field data collected by the FieldManager display is saved onto the CompactFlash card loaded in the card slot.

To transfer data to an office computer:

1. Remove the CompactFlash card from the AgGPS FieldManager display.
2. Insert the CompactFlash card into your office computer using an appropriate adaptor (for example, a card reader).



CAUTION – If you place the files in a series of directories, the combined filename and directory path may become too long and the operating system may not allow you to open the files. To avoid this, Trimble recommends that you place data in your computer's C:\ directory.

3. Copy the appropriate directory to the office computer using a Windows application such as Microsoft® Windows® Explorer. This copies all the subdirectories and files in the directory.

Note – When you copy or move files using Microsoft Windows Explorer, you must keep all the shapefiles (.dbf, .shp, and .shx) together so that office software can open the theme file. To ensure that the files stay together, always copy the entire directory rather than just the individual files.

If you have just created a new event in a field, and already have the *\Field* directory containing any previous events on the office computer, you should still copy the *\Field* directory so that the new EventHistory information is copied across.



CAUTION – If you use the same farm, field, or event names on more than one display unit, you could accidentally overwrite existing files when you copy data to the office computer. To prevent this, create a separate directory for each unit. For example:

```
C:\AgGPSFMD_SN123456\  
C:\AgGPSFMD_SN123457\  
C:\AgGPSFMD_SN123458\  

```

Data formats

The AgGPS FieldManager display uses the Environmental Systems Research Institute (ESRI) 3D shapefile format for storing the layers of graphical information collected in the field (for example, spray coverage, track logging points, and features). The three files in a shapefile “set” are:

- The <filename>.dbf file, which contains the feature attributes.
- The <filename>.shp file, which contains position information.
- The <filename>.shx file, which is an index file that links the position information with its attributes.

In this manual, the term **shapefile** is used to refer to the three files collectively.

The AgGPS FieldManager display records all latitude, longitude, and height data in decimal degrees.

Note – *The AgGPS FieldManager display reads and writes ESRI ArcView version 2.0 or 3.1 3D polylines, polygons, and points. The M and Z entity types introduced in ArcView 3.1 can be generated in the track logging files, but cannot be read by the AgGPS FieldManager display. For more information, go to the ESRI website (www.esri.com).*

Editing files

ESRI shape (.shp) and attribute (.dbf) files can be used in many other software packages that can import or use .shp and .dbf formats.

Trimble recommends the EZ-Office™ software. For more information, go to www.EZ-OfficeSoftware.com.

Data collected by the FieldManager display can be opened directly into the EZ-Office software. You can make changes to the files and save them on an office computer.

Do not save changes back to the CompactFlash card as this could mean that you are not able to select the field with the FieldManager display.

The Microsoft Excel[®] spreadsheet software and most database software also let you open and view the data in the attribute (.dbf) file.

Generating files in the office

The FieldManager display can load files that you have created in office software. Save Shapefile or Agfile (.gdx) prescriptions to the `|AgGPS|Prescriptions|` directory on the card to send rates to a variable rate controller.

Directories on the CompactFlash card

Table 21.1 lists the names and types of files containing mapping and logging information, and the directory where the AgGPS FieldManager display saves these files on the CompactFlash card.

Table 21.1 Output files

Data	Description	Files	Directory
Field AB Line	Boundary and/or AB Lines polylines	Swaths.shp Swaths.dbf Swaths.shx	\Field\ For more information, see Field directory , page 570.
Field boundary	Polygon	Boundary.shp Boundary.dbf Boundary.shx	
Event history	Event information	EventHistory.dbf	
Point features	Attribute ID and latitude, longitude, and height	PointFeature.shp PointFeature.dbf PointFeature.shx	
Line features	Line with attribute ID	LineFeature.shp LineFeature.dbf LineFeature.shx	
Area features	Area polygons with attribute ID	AreaFeature.shp AreaFeature.dbf AreaFeature.shx	
Coverage	Series of polygons	Coverage.shp Coverage.dbf Coverage.shx	\Event\ For more information, see Event directory , page 572.
Track	Series of 3D points with attributes	Track3D_<date time>.shp Track3D_<date time>.dbf Track3D_<date time>.shx	
Summary	HTML	<eventname>_Summary.txt	\AgGPS\Summaries\<<Client_Farm_Field_Event>\br/>For more information, see Event directory , page 572.

21 Data Management

Data	Description	Files	Directory
Diagnostic	Folder files	ProgramLog.txt ProgramLog.old (FieldManager display logs) FaultLog.txt (Autopilot faults) EZ-BoomFaultLog.txt (EZ-Boom faults) service messages messages_.gz messages_.gz.1...9 (Operating system logs) core.gz (Debug data) <Date>	\Diagnostics\
	Autopilot config	Vehicle.cfg	\Diagnostics\Autopilot\
	System settings	<Preferences>.xml	\Diagnostics\Preferences\
	–	Screenshot_<num>.png	\Diagnostics\screenshots\

The AgGPS directory

The `\AgGPS\` directory stores system utility files and subdirectories that contain the input and output files of the AgGPS FieldManager display. See [Prescriptions, page 279](#) and [Directories on the CompactFlash card, page 565](#).

Figure 21.1 shows system utility files and the data directories in the `\AgGPS\` directory saved on a CompactFlash card by the AgGPS FieldManager display.

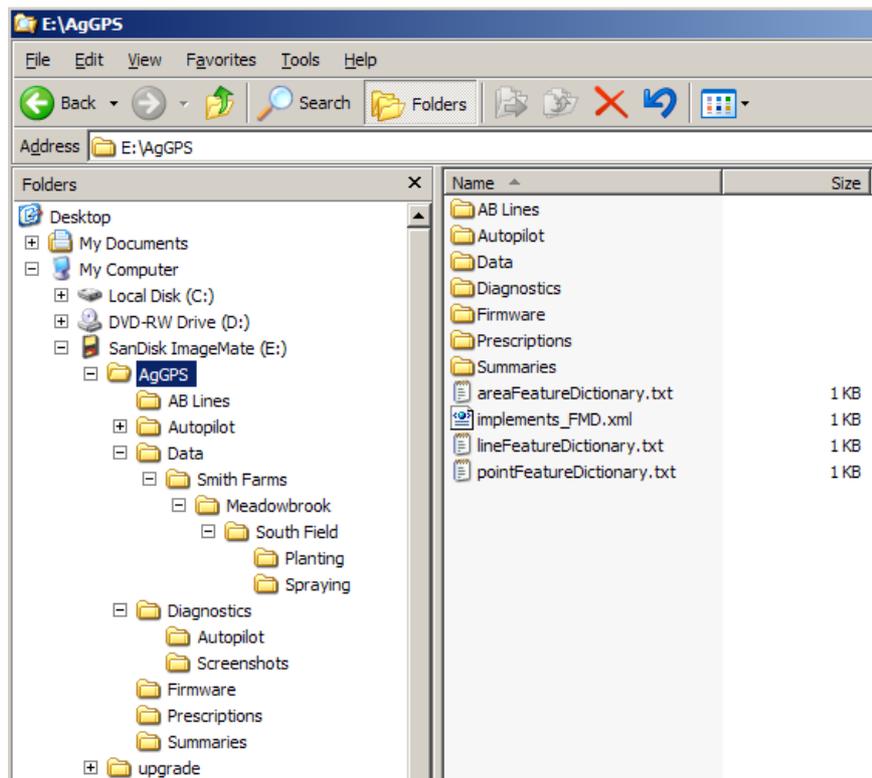


Figure 21.1 AgGPS directory on a CompactFlash card

Client directory

The *\Client* directory stores a subdirectory for each farm defined for the client.

Figure 21.2 shows the *\Client* directory and file organization.

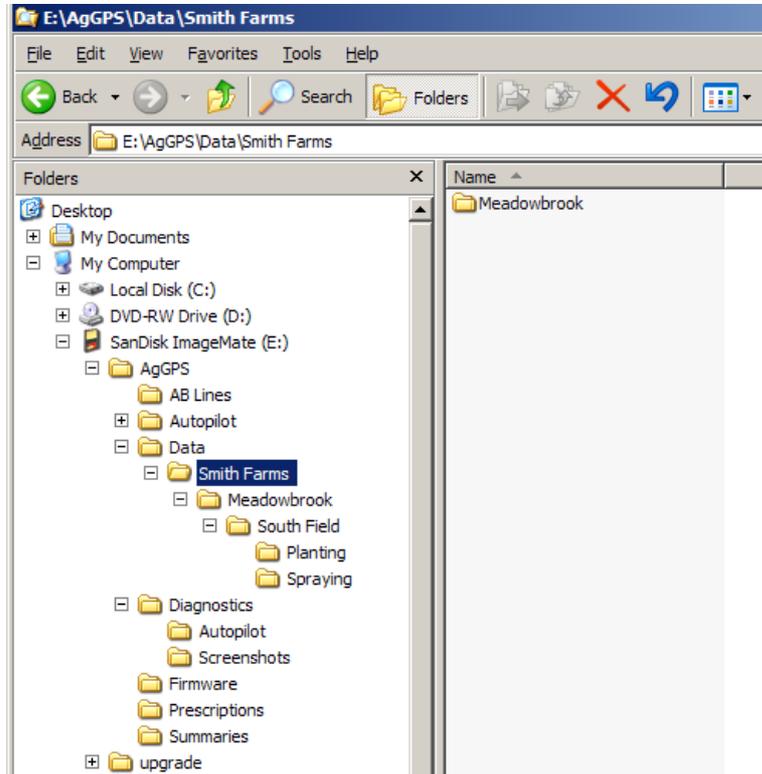


Figure 21.2 Client directory and file organization

Farm directory

The *|Farm|* directory stores a subdirectory for each field defined for the farm.

Figure 21.3 shows the *|Farm|* directory and file organization.

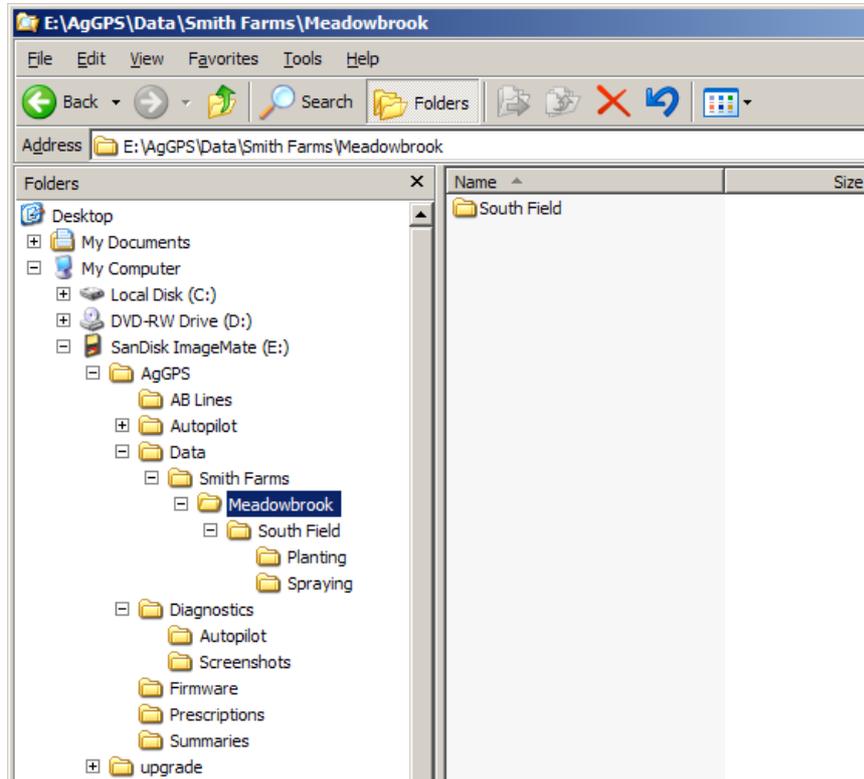


Figure 21.3 Farm directory and file organization

Field directory

Each *|Field|* directory stores the following:

- A subdirectory for each event performed on the field. See [Event directory, page 572](#).
- Three Swaths files.
- If it is a bounded (headland) field, three Boundary files. See [Field boundary and AB Line files, page 573](#).
- An empty file whose name represents the coordinates of the field boundary file (for example: 172.000E43.000S12H.pos locates the boundary at latitude 172.000 East, longitude 43.000 South, and altitude 12 m high).
- Any recorded features files. See [Features files, page 577](#).
- Any paused files. See [Pausing guidance, page 159](#).
- The field event history file: EventHistory.dbf. It contains information about each event carried out in the field. See [EventHistory file, page 576](#).

Figure 21.4 shows a *\Field* directory and file organization.

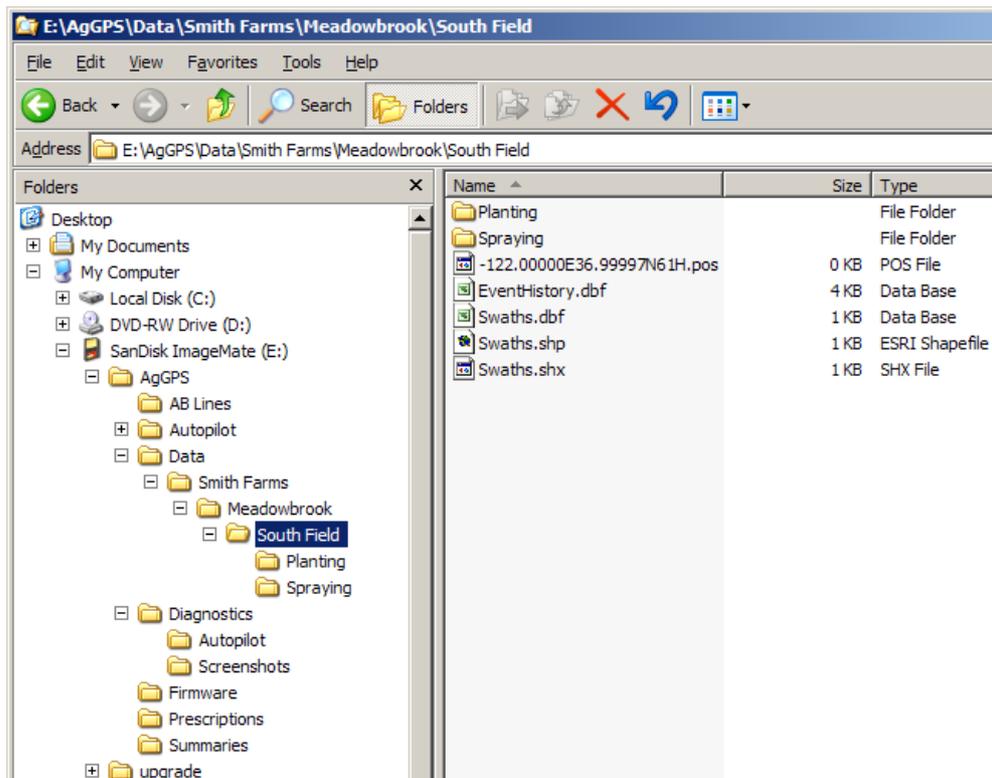


Figure 21.4 Field directory and file organization

Event directory

Each `|Event|` directory stores:

- coverage logging shapefiles that are recorded during the event, called Coverage.*. See [Coverage logging data, page 574](#).
- track logging shapefiles that are recorded during the event, called Track3D_<date time>.*.

Figure 21.5 shows an `|Event|` directory and file organization.

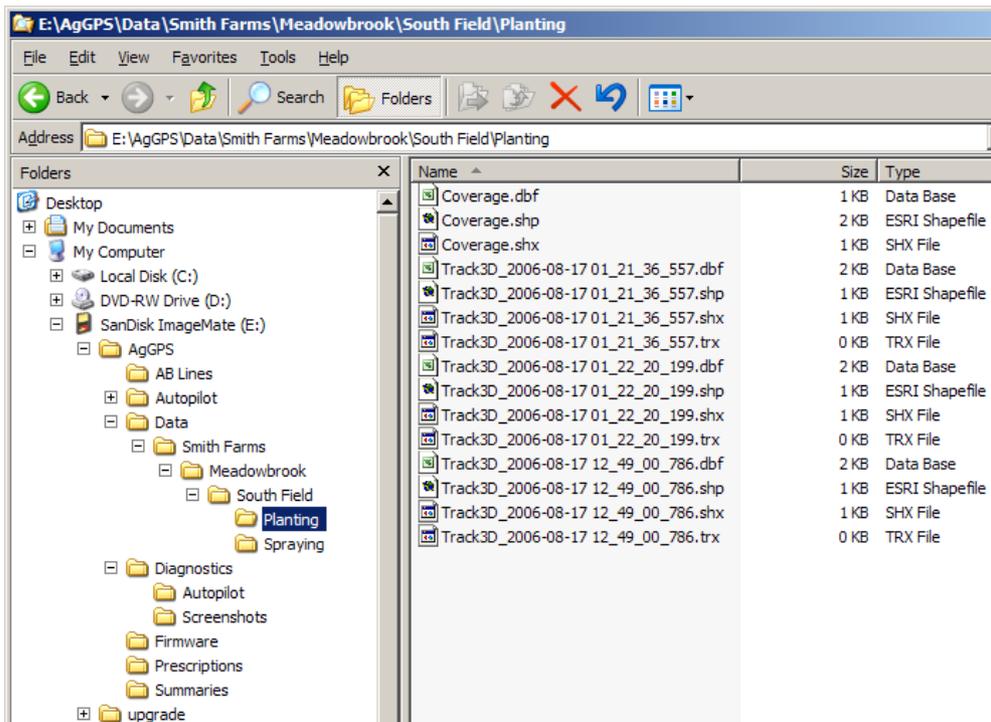


Figure 21.5 Event directory and file organization

Files on the CompactFlash card

Field boundary and AB Line files

There is one set of boundary and AB Line shapefiles for each field called:

- Boundary.*
- Swaths.*

Information stored in the Boundary.shp file for fields with boundaries includes a boundary polygon. Fields without boundaries do not contain a boundary file.

Information stored in the Swaths.shp file for fields with boundaries includes AB polylines.

Units will always be metric in files created by the FieldManager display.

Table 21.2 lists the information stored in the boundary and ABLine attribute files.

Table 21.2 Boundary and ABLine attribute file contents

Column	Field description	Notes
Date	Date the field was created	YYYYMMDD
Time	Field creation time (local time, am/pm format)	hh:mm:ss
Version	Boundary or ABLine attribute file version	
ID	AB Line number ID	
Name	Name assigned to the AB Line	
Area	Field area (Boundary area)	ha
Perimeter	Field perimeter distance (Boundary only)	meters
Length	Length of the AB Line	meters
SwathsIn		
Dist1		
Dist2		
PrefWeight		

Unless a field has a boundary, the size of the field is not defined. Therefore, for fields without boundaries the `%_Complete` in the `EventHistory.dbf` file is always zero.

Note – If you browse the `.dbf` files using Microsoft Excel, date fields may appear in a different format, depending on your local settings.

Coverage logging data

Coverage logging files are created whenever any application coverage is recorded. Table 21.3 lists the information stored for each coverage polygon in the coverage logging attribute file.

Table 21.3 Coverage file contents

Column	Field description
Version	Coverage attribute file version
GPS_Status	Numeric GPS status value
Status_Txt	GPS status description
Swath	The current swath number when coverage was recorded
Height	Height in meters
DateClosed	Date the polygon was closed
TimeClosed	Time the polygon was closed
AppliedRate	Applied rate reported by the variable rate controller

Track logging files

Track logging files are created whenever the event is opened. See page 106. At each point, a number of attributes are recorded.

The units stored in the track attribute file (`Track3D_<date time>.dbf`) are in metric units.

Table 21.4 lists the information stored for each point, in the track logging attribute file.

Table 21.4 Track file contents

Column	Field description	Units/notes
TRACK_ID	Date and time stamp	–
Version	Track attribute file version	–
UTC_Date	Point creation date	YYYYMMDD
UTC_Time	UTC time	hh:mm:ss.s
Local_Time	Local time	hh:mm:ss.s
Logging_On	Coverage logging Flag (1=on, 0=off)	On or off
Auto_Steer	Auto-Steer Flag (1=on, 0=off)	On or off
GPS_Status	GPS status value	1 to 12
Status_Text	GPS status description	–
Num_Stats	Number of GPS satellites	–
DOP	Horizontal Dilution of Precision – a measure of the quality of positions based on satellite geometry	–
Corct_Age	DGPS signal correction age	seconds
Ant_Lat	Antenna latitude (WGS-84)	DD.dddddddd
Ant_Long	Antenna longitude (WGS-84)	DD.dddddddd
Height	Mean sea level height of ground	meters
Ant_HAE	Antenna height above ellipsoid	meters
Ground_HAE	Ground height above ellipsoid	meters
Speed	GPS derived ground speed	kph
Heading	Direction of travel with respect to true North.	decimal degrees
Swath_Num	Current swath/headland number.	
Offline	Offline distance from swath center line.	meters
Along_Line	Along Line distance from start of swath.	meters
Swath_width	Swath width	meters
Appln_Width	Application width	meters
Units	Units	metric
Field_Name	The name of the field	–
Target	The target rate at the current position	–
Pitch	The pitch	–

Column	Field description	Units/notes
Roll	The roll	–
Yaw	The yaw	–
	Note – <i>Not currently implemented.</i>	
Total_Qty	Total volume of material as applied for the current field. Only supported for the AgGPS Aerial Flow Controller, Autocal Flow controller, and Crophawk Flow Meter.	–
Relative_Height	Height	meters

EventHistory file

The EventHistory.dbf file contains information on every event carried out in the field:

Data	Description
Version	FieldManager display firmware version
Client	Client name
Farm	Farm name
Field	Field name
Event	Event name
Operator	Operator name
Material	Material name
Date open	Date the field was opened
Time open	Time the field was opened
Date close	Date the field was closed
Time close	Time the field was closed
Duration	Length of time that the field was open (seconds)
PrimaryAB	Number of the primary AB Line
ABLine	
Cover area	Area covered
Cover distance	Distance covered
Cover time	
Engage time	Time engaged

Features files

When features are recorded in the field, each type of feature is saved in three feature shapefiles in the *|Field|* directory as follows:

These features ...	Are saved in these files ...
Point	PointFeature.*
Line	LineFeature.*
Area	AreaFeature.*

One row of data is stored in the *<type>.dbf* file for each feature of that feature type recorded in the field. Table 21.5 lists the information stored in the *<type>.dbf* file for each feature.

Table 21.5 Features files contents

Column	Field description	Notes
Date	Date the feature was created.	yyyy/mm/dd
Time	Time the feature was recorded.	hh:mm:ss.s
Version	Features attribute file version.	
ID	Feature ID	
Name	Feature name	
Area	Field area (Area only)	ha
Perimeter	Field perimeter distance (Area only)	meters
Length	Length of the AB Line.	meters
SwathsIn		
Dist1		
Dist2		
PrefWeight		
Only recorded in point features:		
Latitude	Antenna latitude	decimal degrees
Longitude	Antenna longitude	decimal degrees
Height	Ground mean sea level height at antenna position. If you are mapping on a slope, the height may be wrong.	meters
AlarmRad	Alarm radius	meters

Column	Field description	Notes
WarningRad	Warning radius	meters
Status_Txt	GPS status	meters

ProgramLog message file

The AgGPS FieldManager display performs checks:

- when the display is turned on or off
- periodically, while running

This information is saved to the ProgramLog.txt file, which is in the `\AgGPS\Diagnostics\` directory. When this file becomes larger than 1024 KB, it is backed up to a file called ProgramLog.old.

The ProgramLog.txt file may be useful for troubleshooting. The file can be read with a text editor such as Notepad.

Importing AB Lines or boundaries

The AgGPS FieldManager can load field boundaries and AB Lines, created by an AgGPS 170 Field Computer, RDL, or a Geographic Information System (GIS).

To load GIS boundaries, files must be in WGS-84 latitudes, longitudes, and heights in decimal degrees.

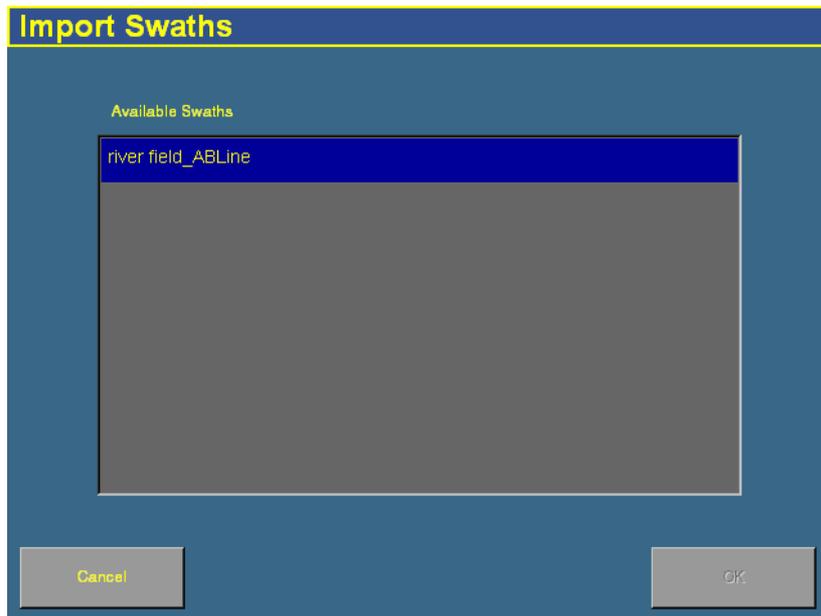
Use the following method to import an AB Line or a boundary into the AgGPS FieldManager display:

1. Attach the CompactFlash card to an office computer (for example, via a card reader).



CAUTION – The 3 files that define a line or field (.shp, .shx, and .dbf) must have identical names. If they do not have identical names, they will not be recognized. If you put multiple sets of files in the directory, ensure that you do not have more than one set of files with each name or your files will be overwritten.

2. Copy the following files to the `\AgGPS\AB Lines\` directory on the CompactFlash card:
 - `<field name>.shp`
 - `<field name>.shx`
 - `<field name>.dbf`
3. Start the *AgGPS FieldManager* display and then select the Run button.
4. Do one of the following:
 - Open an existing field.
 - Start a new field.
5. Press **Swaths**.
6. Press **Import**. The *Import Swaths* screen appears:



7. Select the field or AB Line to import from the list of available swaths and then tap **OK**. The field or AB Line is imported.



Note – If the AB Line file contains more than one AB Line, all AB Lines in the file are imported.

8. Select the AB Line that you want to use from the list and then tap **Load**. A warning message appears.
9. Tap **OK**.

The imported field or AB Line is ready to use. For best results, close the field and then reopen it.

The Prescriptions directory

For each prescription you generate, the `\AgGPS\Prescriptions\` directory stores three prescription files in ESRI shapefile format, or a single .gdx file.

The shapefiles required are the .dbf, .shp, and .shx files. Some GIS software packages generate other files and include different contents in the files; if they are on the CompactFlash card, they are ignored.

Table 21.6 lists the names and types of files that are used to supply input information to the AgGPS FieldManager display, and the directory where these files must be located on the card.

Table 21.6 Input files

Data	Description	Files	Directory
Prescription files	Polygons	<prescriptionname>.shp	\\AgGPS\\Prescriptions\
	ESRI shapefiles	<prescriptionname>.dbf <prescriptionname>.shx	For more information, see Prescriptions, page 279 .
	AgInfo GDx	<prescriptionname>.gdx	

Figure 21.6 shows the contents of a *|Prescriptions|* directory.

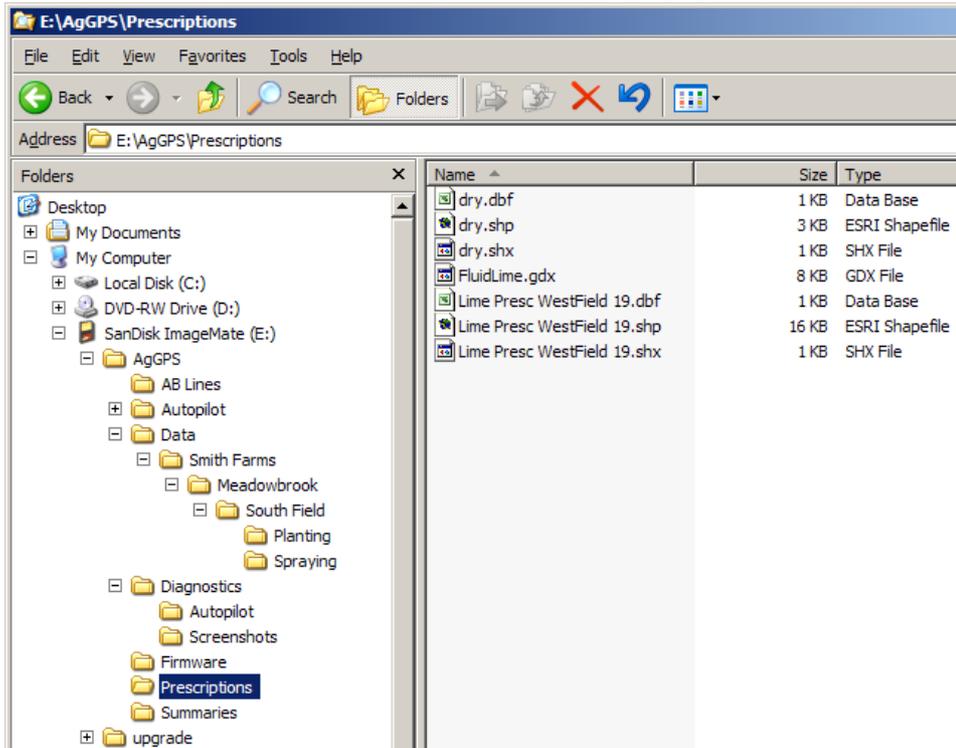
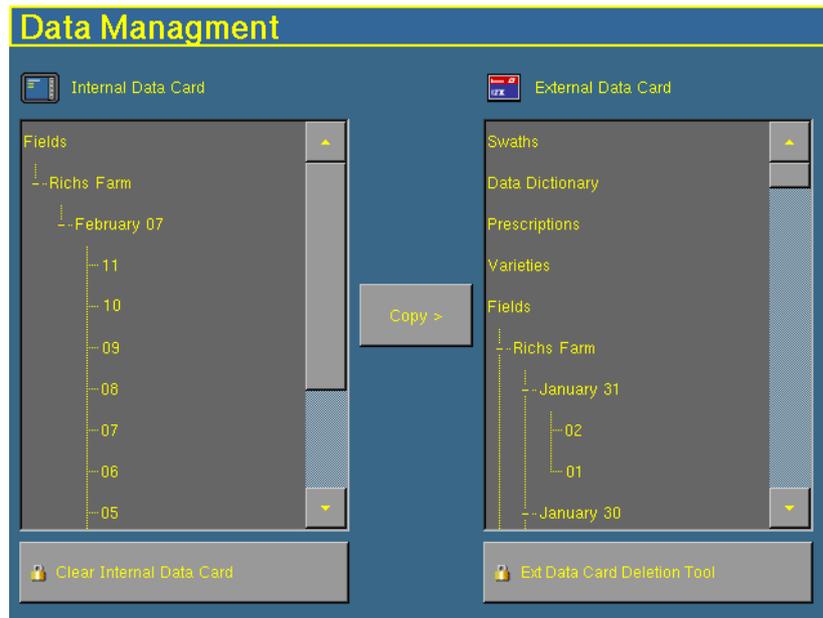


Figure 21.6 Prescriptions directory

Copying or deleting card data

The *Data Management* screen enables you to copy or delete card data. It shows the fields, varieties, prescriptions, and data dictionaries that are in the internal memory and on the CompactFlash card (the external data card).

To access the *Data Management* screen, press the Data Management button  to the right of the display.



Copying card data

To copy data either from the CompactFlash card to the internal memory, or from the internal memory to the CompactFlash card:

1. Select the item from the list that you want to copy. To expand or contract a list entry, double-tap it.
 - If the item is in the *External Data Card* list, the **< Copy** button becomes available.
 - If the item is in the *Internal Data Card* list, the **Copy >** button becomes available.
2. Tap the copy button. The data is copied to the other column.

To copy data from the current CompactFlash card (the source card) to another CompactFlash card (the destination card):

1. Copy all of the data from the source card to the internal memory.

Note – *If the data card is larger than 128 MB and you have used more than 128 MB of data, Trimble recommends that you do **not** copy the entire card all at once. Copy each client individually. If there is only one client, copy each farm individually.*

2. When copying is complete, remove the source card from the card slot and then insert the destination card.
3. Copy all of the data from the internal memory to the destination card.

Deleting card data

If you need to create more space, you can use the FieldManager display to:

- Delete all of the data in the internal memory
- Delete any unused clients, farms, fields or events on the CompactFlash card

Deleting all of the data from the internal memory



CAUTION – Deleting data is permanent. You cannot undo the deletion or restore the data.

1. From the *Data Management* screen, tap **Clear Internal Data Card**.
2. If necessary, enter the administration password and then tap **OK**. A dialog appears with the message:
Are you sure you want to clear all fields from the internal card?
3. Tap **Yes**. The data in the internal memory is deleted.

Deleting data from the CompactFlash card



CAUTION – Deleting data is permanent. You cannot undo the deletion or restore the data.

1. From the *Data Management* screen, tap **Clear External Data Card**.
2. If necessary, enter the password. The *Delete Data Card* screen appears:

Delete Data Card

Client: John Smith [Delete]

Farm: Meadowbrook [Delete]

Field: Soy [Delete]

Event: Harvesting [Delete]

Delete is permanent and non-reversible

Format External Datacard

OK

Note – If you want to exit without deleting anything, tap **OK**.

3. From the drop down lists, select the data that you want to delete.
 - To delete only the Event data (such as coverage and track logging) and keep all AB Lines and features, select the client, farm, field, and event from the drop down list and then tap the **Delete** button beside the *Event* drop down box.

- To delete an entire Client, Farm, or Field, select the required client, farm, or field from the drop down list and then tap the corresponding **Delete** button for the level at which you want to delete.
- 4. When prompted, enter the administration password and then tap **OK**.
- 5. Tap **Close**.

Formatting the CompactFlash card



CAUTION – The following action will permanently remove all your data.

To format the card, from the *Delete Data Card* screen, tap **Format**.

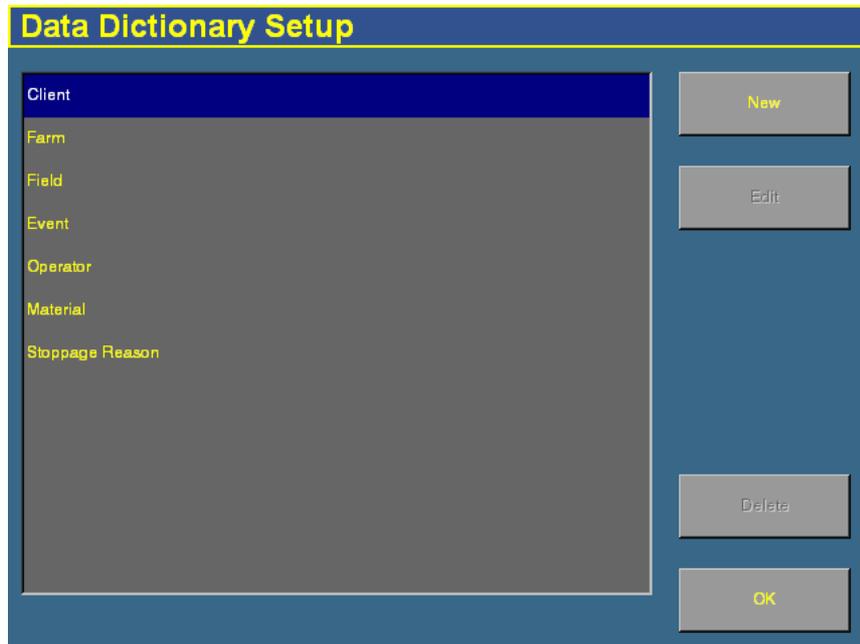
Data dictionaries

The AgGPS FieldManager display can load data dictionaries in the AgGPS 170 Field Computer format. These data dictionaries enable you to select field entry data (for example, Client, Farm, Field, and Event) from a list of predefined values, which saves you from having to retype commonly used items.

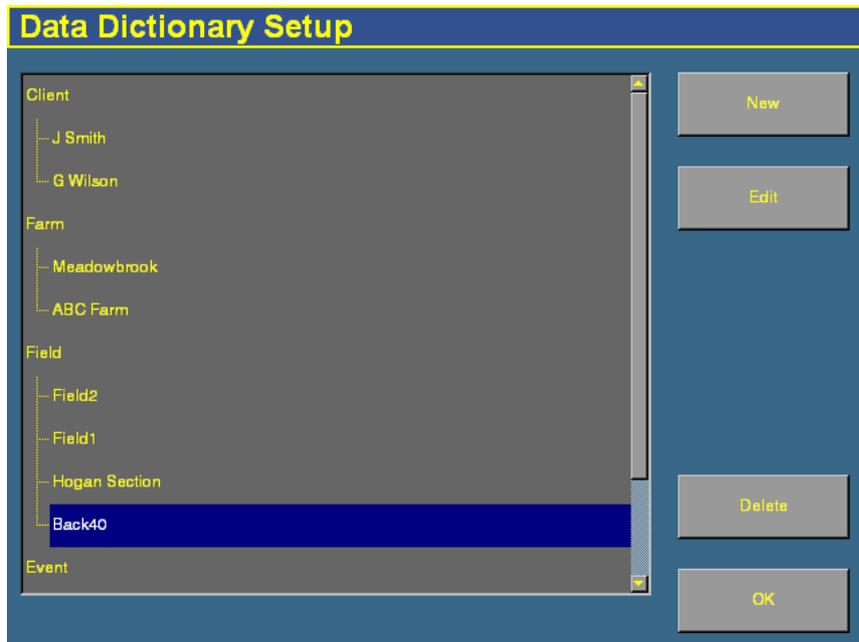
You can create a data dictionary either through the display, or on an office computer.

To create a data dictionary through the display:

1. Press the Configuration  button to the right of the screen. The *Configuration* screen appears.
2. Select the System plugin and then tap **Setup**. The *Display Setup* screen appears.
3. Tap **Data Dictionary**. The *Data Dictionary Setup* screen appears:



4. Select a category and then tap **New**. The *Enter a New Client* screen appears.
5. Enter the name and then tap **OK**. The *Data Dictionary Setup* screen reappears with the new entry added under the heading you selected.
6. Repeat this process to add additional entries:



To edit an entry, select it and then tap **Edit**.

To delete an entry, select it and then tap **Delete**.

To create a data dictionary on an office computer:

1. On an office computer, create a text file. The text file can have any name, but the file extension **must** be .txt.
2. Enter the body text.
3. Copy the .txt file to the `\AgGPS\Data Dictionary\` directory on the FieldManager display CompactFlash card.

On screen (for example, in the *Client* screen) the file entries appear as shown below:

```
[Client]
J Smith
G Wilson

[Farm]
MeadowBrook
ABC Farms

[Field]
Field 1
Field 2
Back 40
Hogan Section

[Event]
Feature mapping
Tillage
Fertilization
Strip-till
```



To access the entries in the dictionary:

1. In the *Field Setup* screen, tap **New**.
2. To view the available items, tap the down arrow.
3. Select the appropriate item from the list.
4. Tap **OK**.

You can still enter new information as before, but these entries are not added to the data dictionary. To add items to the data dictionary, edit the .txt file on an office computer.

Troubleshooting

In this chapter:

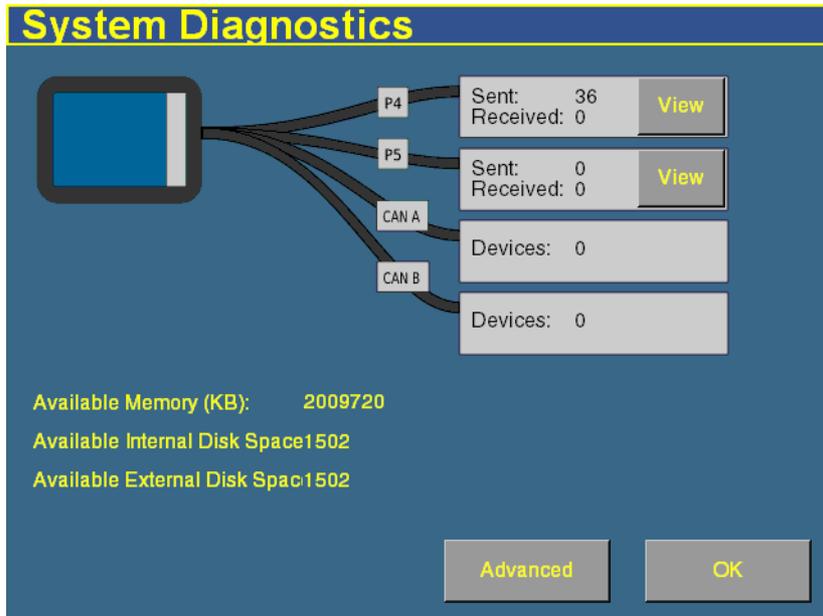
- [Advanced diagnostics](#)
- [Viewing raw serial data](#)
- [Restoring default settings](#)
- [Viewing AgGPS FieldManager display diagnostic information](#)
- [GPS Status screen](#)
- [Screen snaps](#)
- [Forcing the system to turn off](#)

This chapter describes how to analyze problems that occur with the AgGPS FieldManager display.

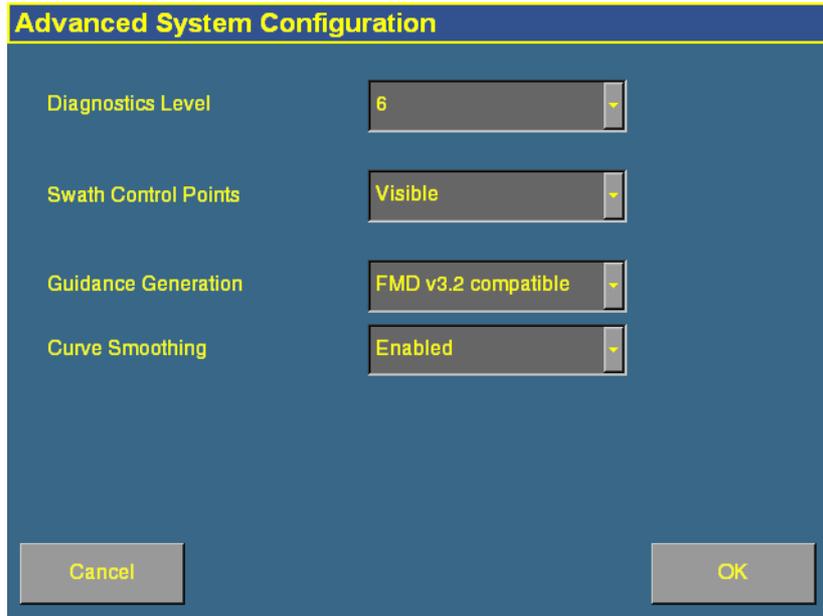
Advanced diagnostics

The System plugin's Diagnostics mode enables you to configure advanced guidance settings. Most users will not need to adjust these settings.

1. From the *Configuration* screen, select the System plugin and then tap **Diagnostics**. The *System Diagnostics* screen appears:



2. Tap **Advanced**. The *Advanced System Configuration* screen appears:



3. Select the diagnostics level. This determines how much debugging information is logged in the program files:

Item	Description
1	Minimal level of information
6 (default)	Medium level of information
9	Highest level of information

- Select whether or not swath control points appear onscreen. When your guidance line is a curve, it actually appears onscreen as a series of short straight sections joined together. The Swath Control Points appear where these line segments meet:



Item	Description
Hidden (default)	Normal guidance lines
Visible	Guidance lines show the control points

- Select the guidance generation mode. Guidance line files used to be recorded in the FieldManager display version 3.2 format where the distance between points increases on curves. Starting in version 5.0 of the firmware, guidance generation is based on constant point spacing, which gives you more points on a line:

Item	Description
FMD v3.2 compatible	The former format. The distance between points varied.
FMD v5 (default)	The new format. The distance between points is constant.

Note – If you are using an old guidance line from an AgGPS 170 Field Computer, set the guidance Generation option to FMD v3.2 compatible. Otherwise, the location of your line might move.

- Select whether or not curve smoothing is enabled. When it is enabled, if the master line has a tight turn in it, guidance lines based on the master line will be smoothed to make them easier to drive. This can result in coverage gaps. Disabling curve smoothing will result in guidance line not being smoothed out:

Item	Description
Enabled (default)	Curves are smoothed to make them easier to drive.
Disabled	Curves are not smoothed.

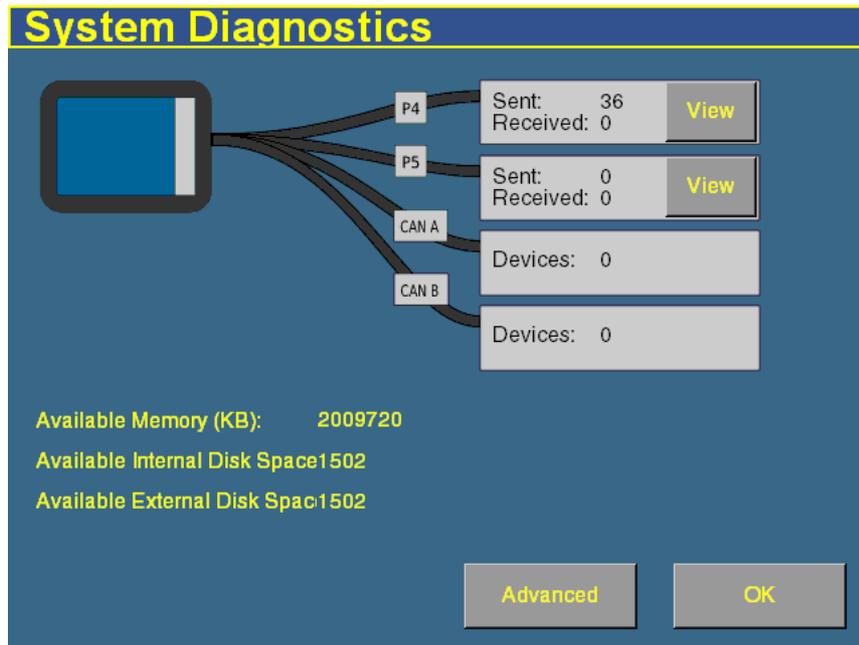
You can also use the *System Diagnostics* screen to view raw port data. For more information, see [Viewing raw serial data, page 597](#).

Viewing raw serial data

You can view raw serial data as the display receives it. This can be useful for analyzing the GPS signal.

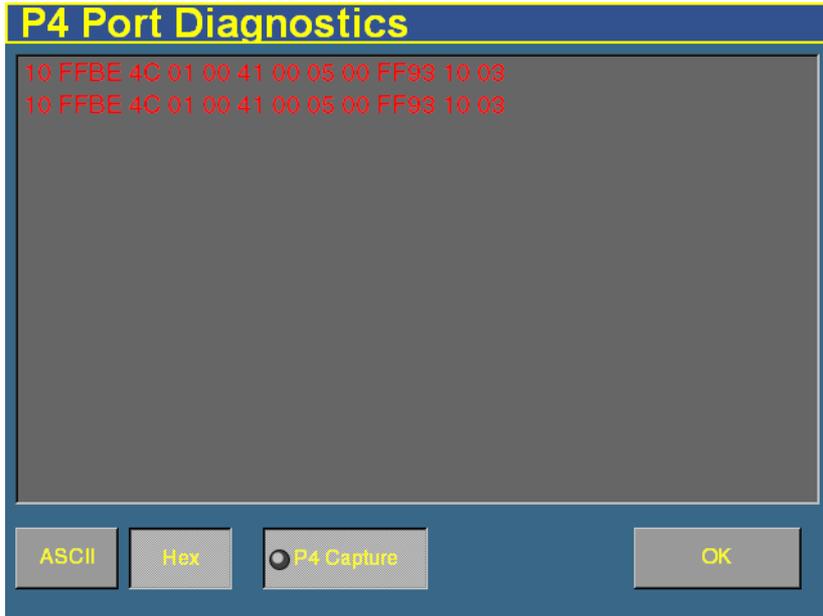
To view the raw serial data:

1. From the *Configuration* screen, select the System plugin and then tap **Diagnostics**. The *System Diagnostics* screen appears:



This screen shows each of the connectors (ports) on the FieldManager harness and the number of data packets that have been sent and received.

- To view the raw data from a port, tap the appropriate **View** button. The port diagnostics screen for that port appears:



The screen displays either ASCII text or Hex code, depending on which button is selected. Tap **ASCII** to view incoming data from the NMEA data string.

The Hex code is for engineering use only.

The data only appears when the capture button is selected.

Virtual LEDs on the **P4 Capture** and **P5 Capture** buttons flash to show that data is being sent or received on that serial port.

To view the data, select the way in which you would like to see the data with the **ASCII** or **Hex** buttons. Then tap either **P4 Capture** or **P5 Capture**. Approximately 5 seconds of serial data will be captured and presented on the screen. You can review the data or capture another snapshot.

Note – Data shown in green is incoming data; data shown in red is outgoing data.

Restoring default settings

You can reset the display to its default values. This can be useful if:

- you have made changes to the display settings; the results are poor, but you cannot determine which setting was the cause.
- you move the display from one vehicle to another.

Note – *If you restore the defaults, the Autopilot vehicle setup information will not be reset. See [Using settings files](#), page 108.*

To restore the default settings:

1. From the *Configuration* screen, select the System plugin and then tap **Setup**. The *Display Setup* screen appears.
2. Tap **Default**. A confirmation screen appears.
3. Tap **Yes**.

The default settings are restored.

Viewing AgGPS FieldManager display diagnostic information

Display configuration information

To view display configuration information, press the Home button  at the top right of the display.

The Home screen lists:

- Display firmware information
- AgGPS Autopilot controller information
- GPS receiver and correction method information
- Vehicle make and model

CompactFlash card information

To view information about the CompactFlash card that is in the display, select the System plugin and then tap **Diagnostics** on the *Configuration* screen.

The card information tab appears on the *System Diagnostics* screen.

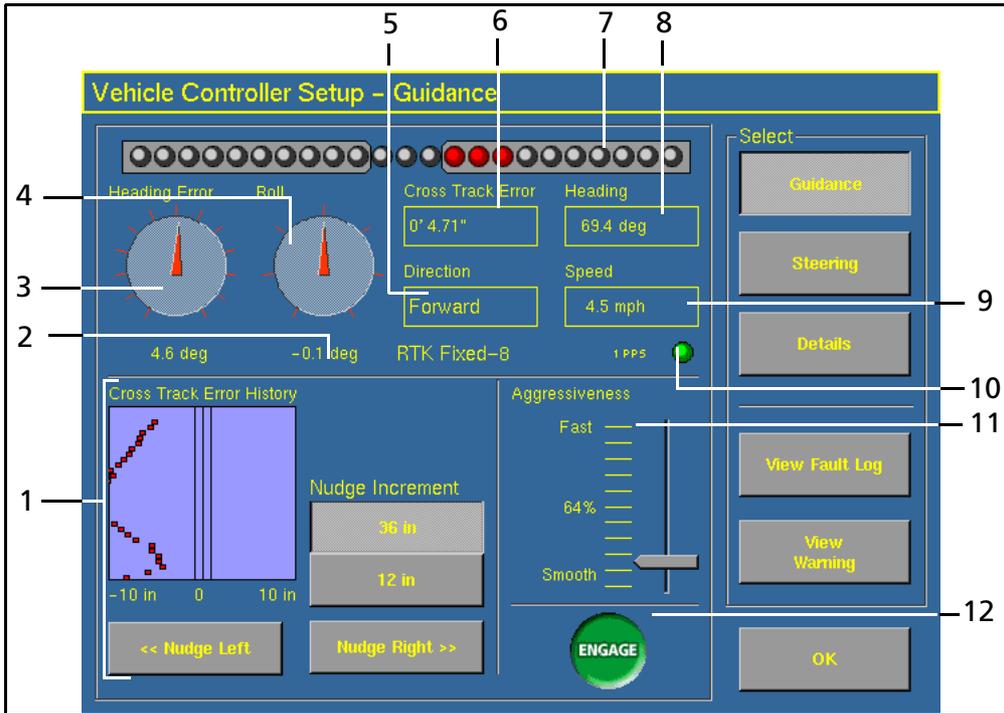
Viewing vehicle diagnostic information

From the *Configuration* screen, select the Autopilot plugin and then tap **Diagnostics**. The *Vehicle Controller Setup - Guidance* screen appears.

There are five parts to the Vehicle Diagnostics menu:

- Guidance screen
- Steering screen
- Details screen
- Fault log screen
- View warning screen

Vehicle Diagnostics – Guidance screen

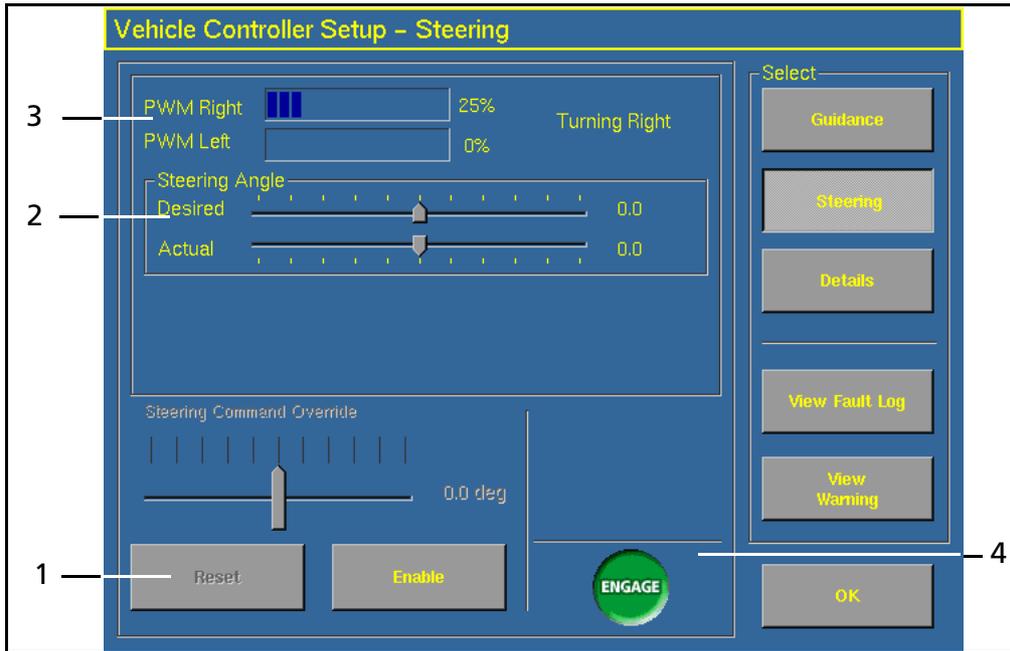


Item	Section	Description
1	Offline distance graph	A graph of offline distance over time. It is useful for diagnosing problems with the vehicle coming online and staying online
2	GPS status	The current GPS position fix quality and number of satellites
3	Heading error	Shows the difference between vehicle heading and path heading
4	Roll	Shows the current roll value calculated by the system
5	Direction	The current vehicle direction – forward, backward, or stopped
6	Cross Track Error	A numeric value of the offline distance
7	Virtual lightbar	Visual representation of offline distance

22 Troubleshooting

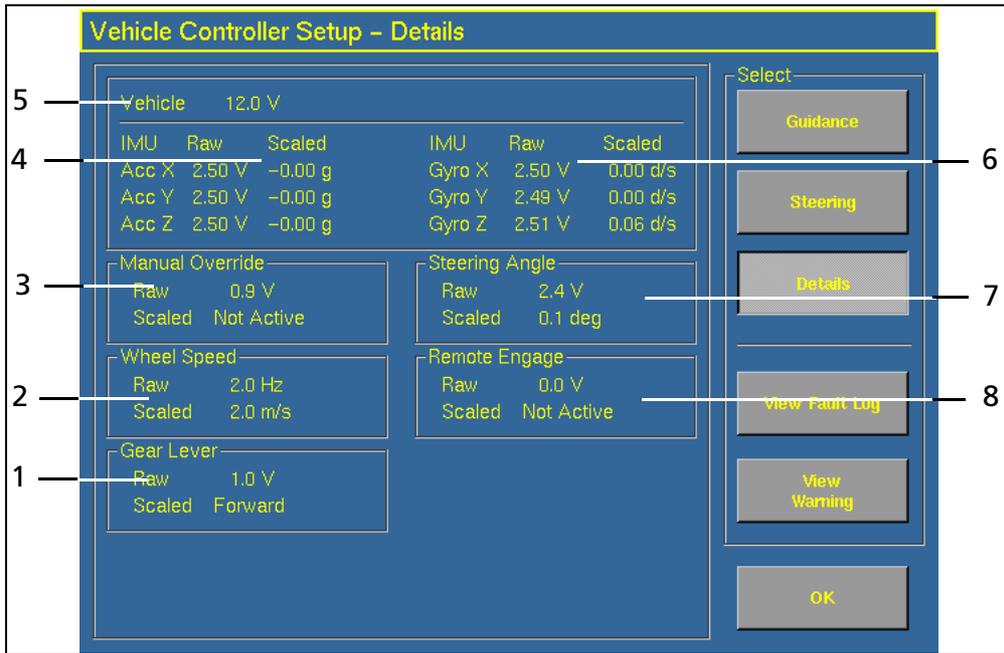
Item	Section	Description
8	Heading	The current vehicle heading calculated by the system
9	Speed	The current vehicle speed calculated by the system
10	1PPS	Shows whether the 1PPS signal from a GPS receiver is detected
11	Aggressiveness	A slider for adjusting the Aggressiveness of the steering system
12	Engage button	Engages/disengages the system and shows the current engage state. Press this button when red to see the fault preventing automatic mode.

Vehicle Diagnostics – Steering screen



Item	Section	Description
1	Steering command override	This is used to bypass the normal steering command to the wheels. With this feature, you can force a certain angle of turn and make sure that the system responds as expected.
2	Steering angle	Shows the desired and actual steering angles. The desired angle is that which the system is trying to attain and the actual is where the system calculates the wheels are pointing.
3	PWM status	Shows the current PWM signals being sent to the electro-hydraulic valve. This is an indication of whether the system is attempting to turn left or right.
4	Engage button	Engages/Disengages the system and shows current engage status.

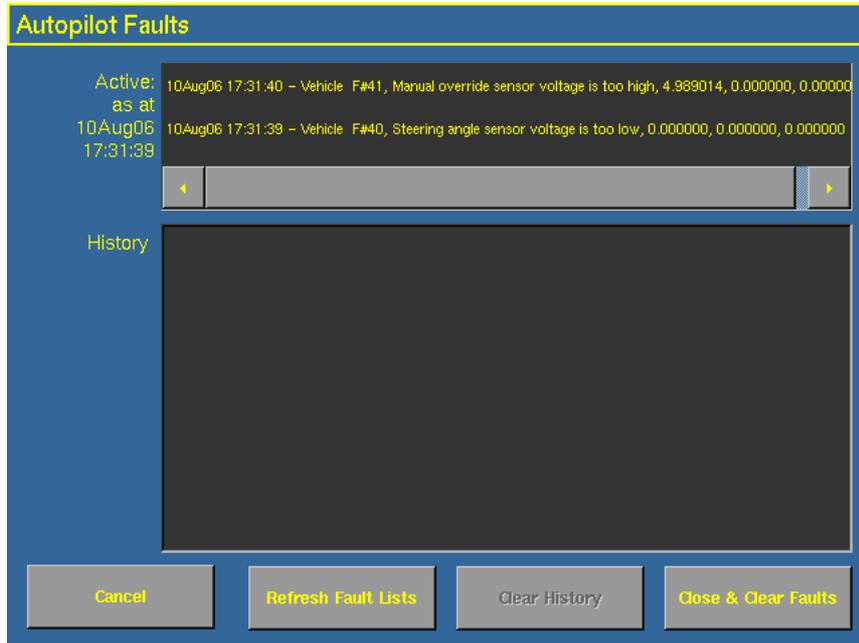
Vehicle Diagnostics – Details screen



Item	Name	Description
1	Gear Lever	The raw voltage and current vehicle direction of the gear lever sensor
2	Wheel Speed	The raw voltage and scaled meters per second of the wheel speed sensor
3	Manual Override	The raw voltage and current state of the manual override sensor
4	Accelerometers	The raw voltage and scaled G force for each of the system's accelerometers
5	Vehicle voltage	The input voltage currently being fed into the AgGPS Autopilot system from the vehicle's electrical system
6	Gyroscopes	The raw voltage and scaled degrees per second of each of the system's gyroscopes
7	Steering Angle sensor	The raw voltage and scaled angle of the steering sensor
8	Remote Engage	The raw voltage and current state of the remote engage switch

Autopilot Faults screen

The *Autopilot Faults* screen lists all faults that have occurred on the AgGPS Autopilot controller.



Two separate lists show:

- Any faults that are currently active
- A history of faults that have occurred

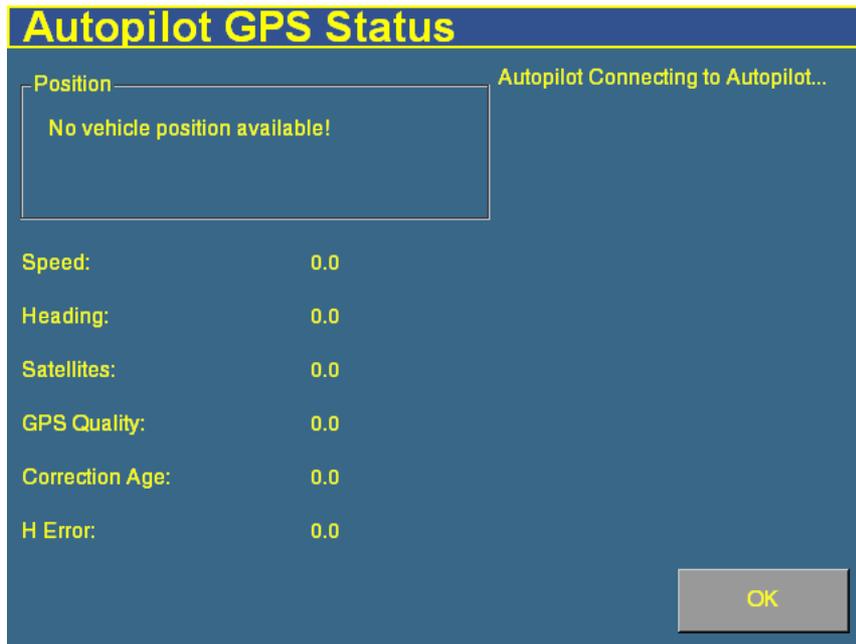
View Warning screen

When you are viewing the vehicle diagnostics screens, the **View Warning** button will flash red if there is an active warning on the display. To view any active warnings, tap the button.

GPS Status screen

The *GPS Status* screen provides information on the current GPS data from the GPS receiver. Use this screen to check that the GPS receiver is outputting the expected data.

- From the *Configuration* screen, select the *Autopilot GPS Receiver* plugin and then tap **Diagnostics**. The *Autopilot GPS Status* screen appears:



This screen displays:

- your current GPS position
- number of satellites
- GPS quality
- Autopilot system and receiver version numbers

Screen snaps

To save images in the FieldManager display, press the button on the right of the screen that matches the screen you are already in.

For example, to create a screen snap of the Run screen:

1. Press the Run button. The Run screen appears.
2. Press the Run button again. The screen snap is saved in the `\AgGPS\Diagnostics\Screenshots\` directory. A warning sounds to indicate that you have created a screen snap.

***Note** – The screen snap is only of the lowest level directory under each button. Therefore, if you take a screen snap while in the Implement Setup screen, you will get a screen snap of the Configuration screen. The screen snap feature is most useful for capturing images of the Run screen.*

Forcing the system to turn off

If the display stops responding, hold down the Power button for 10 seconds to turn it off.



CAUTION – Avoid turning off the display by holding down the Power button for 10 seconds unless it is absolutely necessary. If the display is writing to the Compact Flash card, this method of shutdown can corrupt the data on the card. If possible, use one of the other shutdown methods instead.

Technical Specifications

Note – This information is subject to change without notice.

Item	Specification
Case:	
Size	295 mm W x 226 mm H x 60.5 mm D (11.6" x 8.9" x 2.4")
Weight	2.18 kg (4.80 lb)
Material	High impact polycarbonate
Seal	Sealed to IP55 and ANSI/ASAE EP455 with cable connected
Operating temperature	-10 °C to 65 °C
Storage temperature	-30 °C to 70 °C
Display:	
Display	264.2 mm (10.4") diagonal 640 x 480 color LCD
Touch screen	285.8 mm (11.25") diagonal
Processor:	
Intel PXA255 x-scale arm	400 MHz
Memory:	
RAM	64 MB
CompactFlash RAM	32 MB (type 1 only)
Solid state drive	256 MB
Electrical:	
Full function range	8–18 V
Operating range	6–19 V
Absolute range	0–60 V
Battery	Internal NiMH
Mounting:	
Mounting layout	75 mm square mounting hole pattern
Mounting inserts	M6 x 1 threaded inserts
Interface:	
Main connector	28 pin AMP (mates to AgGPS Autopilot harness)
8 pin Deutsch connector	x1
12 pin Deutsch connector	x2
4 pin Deutsch (CAN)	x1
Power connector pin	x1
CompactFlash RAM slot	x1, type 1 only

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