USER GUIDE

*Ag*GPS® FieldManager™ Display

Trimble®

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*Ag*GPS® FieldManager™ Display

Version 2.00
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Trimble®

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c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

Safety

In this chapter:

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.

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 *Ag*GPS 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 *Ag*GPS 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.

Contents

CHAPTER

1

Introduction

In this chapter:

Welcome

This manual describes how to install, configure, and use the Trimble® *Ag*GPS® FieldManager™ display.

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 *Ag*GPS FieldManager display, which consists of software and hardware for use with an *Ag*GPS Autopilot™ automated steering system, provides easy-to-use advanced field management. The software runs on a 26.4 cm (10.4 ") touch-sensitive, color LCD screen.

The *Ag*GPS FieldManager display offers a better visual representation of *Ag*GPS Autopilot system navigation than that which appears on the EZ-Guide® Plus lightbar guidance system or the *Ag*GPS 170 Field Computer.

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

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.

Technical assistance

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1. Go to the Trimble website (www.trimble.com).
2. Click the **Support** button at the top of the screen. The Support A–Z list of products appears.
3. Scroll to the bottom of the list.
4. Click the **submit an inquiry** link. A form appears.
5. Complete the form and then click **Send**.

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.

CHAPTER

2

Features and Functions

In this chapter:

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

System components

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

- The display unit, see page 7.
- The *Ag*GPS Autopilot harness, see page 10.
- The 128 MB CompactFlash card, see page 11.
- The mount bracket and screws, see page 22.
- This User Guide

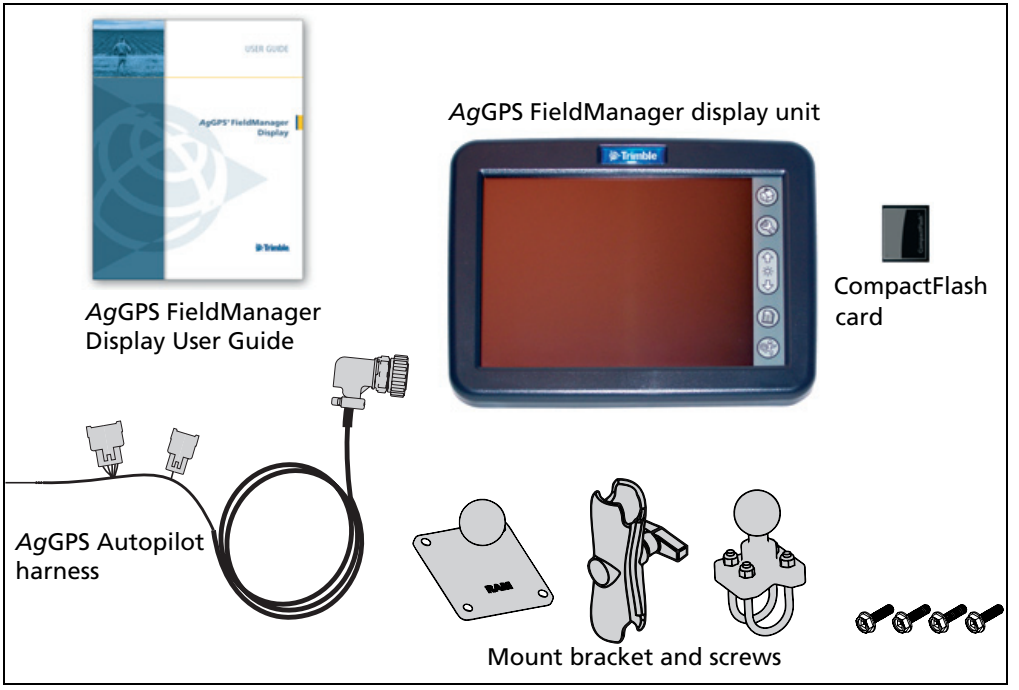


Figure 2.1 Components in the box

System hardware

The system hardware consists of:

- The display unit itself
- The *Ag*GPS Autopilot harness
- The 128 MB CompactFlash card

Display unit

Figure 2.2 The front of the *Ag*GPS FieldManager display unit

Item	Description
1	Touch-sensitive screen
2	Touch screen buttons

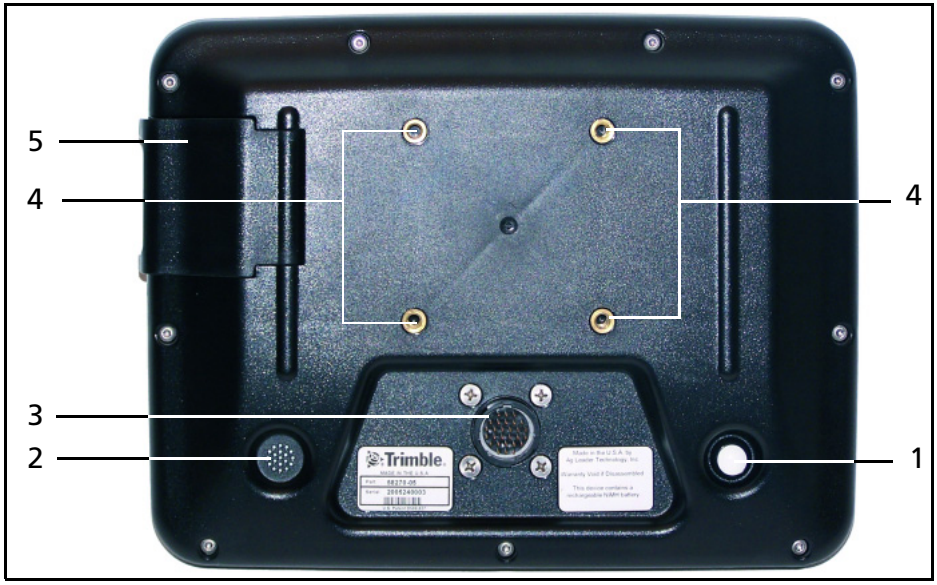


Figure 2.3 The back of the *Ag*GPS FieldManager display unit

Item	Description
1	Power button
2	Speaker
3	*Ag*GPS 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 7.

Press this button ...	To ...
	access the Home screen (see page 25)
	access the Configuration screen (see page 26)
	increase the screen brightness
	decrease the screen brightness
	access the Summary screen (see page 27)
	access the Run screen (see page 28)

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

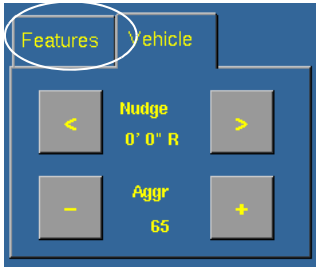
For example, if you press the Configuration button  , the *Configuration* screen appears. From here you can configure the whole system.

Screen

In the field, the easiest way to interact with the system is to tap 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.

Tap a screen item to select it. For example, to change from the *Vehicle* tab to the *Features* tab, tap the *Features* tab.



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.

*Ag*GPS 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.

*Ag*GPS Autopilot harness

The cable that attaches to the system is called the *Ag*GPS 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 SWIN0 - 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 *Ag*GPS 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 23.

System software

The *Ag*GPS 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 switching
- Logging of topographic mapping data
- Output of information for analysis in office-based Geographic Information System (GIS) software

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

Table 2.1 Directory terms

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: - 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

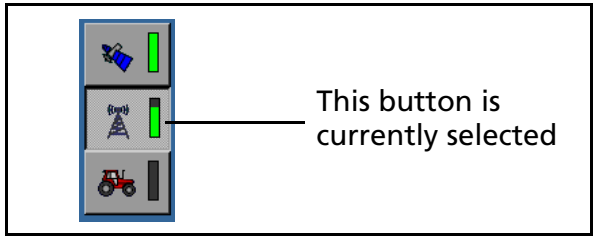
See also Slide-out tabs, page 67.

Virtual buttons

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

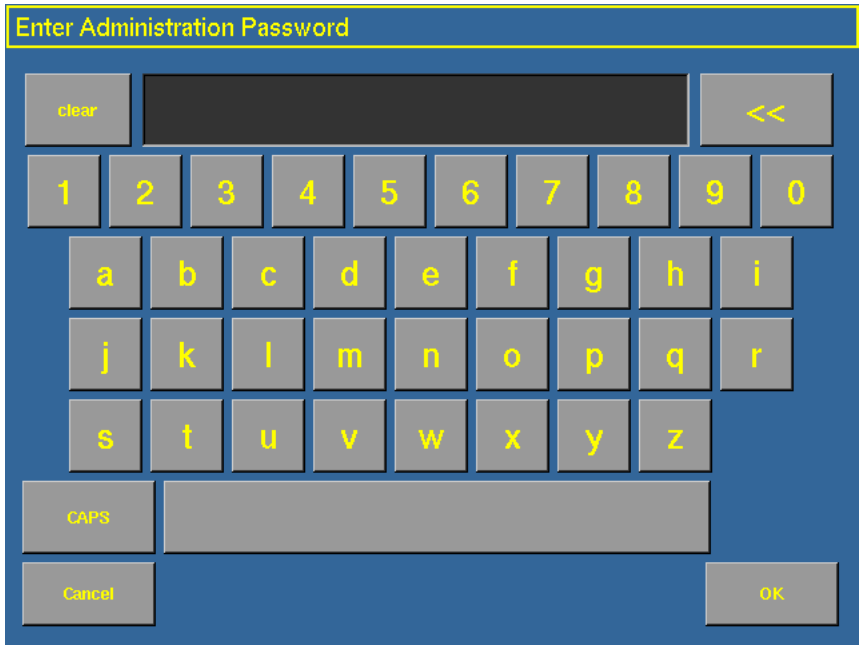
Treat a virtual button as you would a normal button. To press the button, press (tap) the area of the screen where it appears.

Some *Ag*GPS 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.

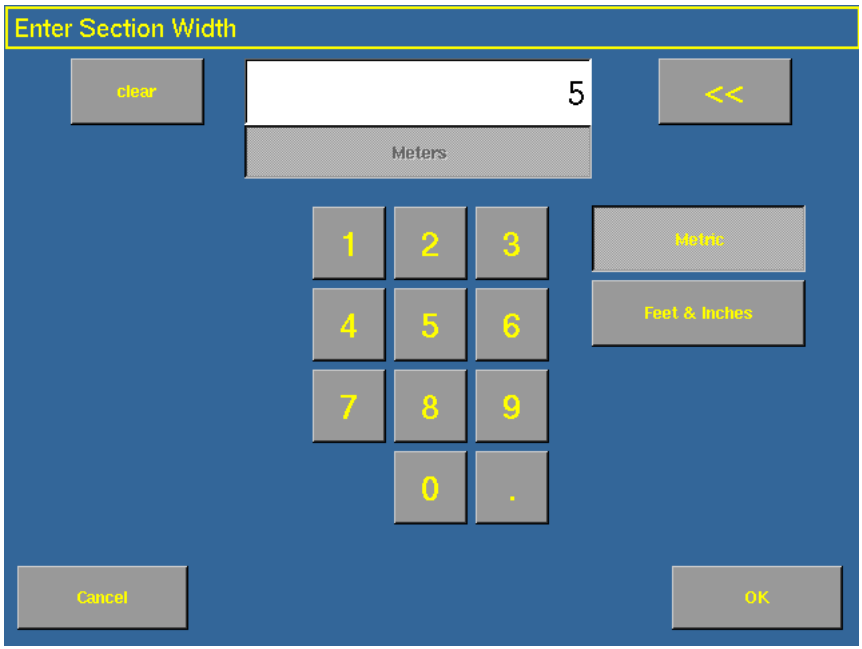


To ...	Tap ...
enter a letter or number	the appropriate button
enter caps mode	the CAPS button
leave caps mode	the CAPS button again
erase a letter that you have typed by mistake	the backspace (<<) button
clear all the text you have entered	the Clear button
finish entering text	the OK button

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:



Tap the **Metric** or **Feet & Inches** button to change the units. The number value in the window is converted to the new unit.

Drop-down box

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

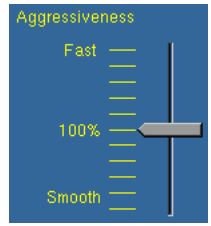
To select an item:

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.



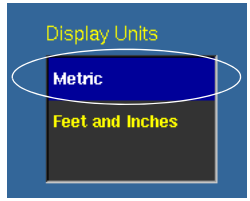
A slider bar shows how extreme a selection is. In the example above, you could enter an *Aggressiveness* value of 140% in a text window without being aware of what that meant. If you use a slider bar to select the value, it is apparent that you are nearing the extreme value.

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 *Ag*GPS 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.
- 3D 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:

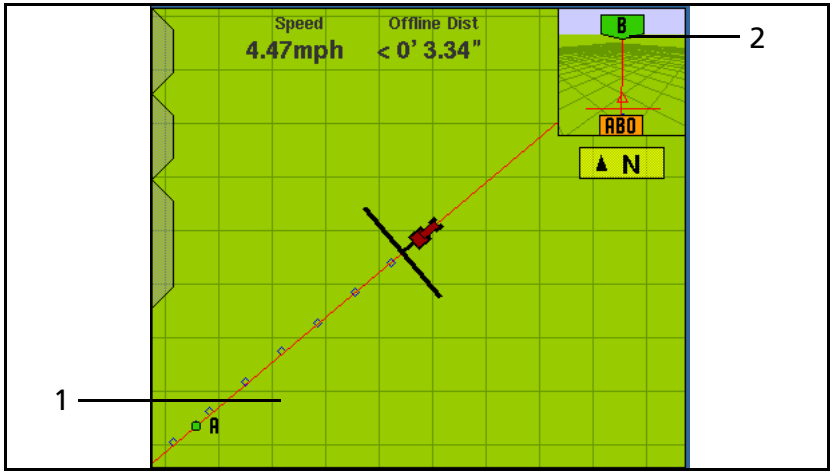


Figure 2.4 The Run screen

Item	Description
1	Main view (in this example, Plan view)
2	Auxiliary view (in this example, 3D view)

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

Zooming

The *Ag*GPS FieldManager has four zoom modes. A close-up view of the vehicle allows you to navigate more accurately, while a long view allows you to see more of the field.

Note – *It is only possible to zoom in the Plan view.*

To zoom the screen out, tap the main view.

There are four levels of zooming before you return to the original screen size.

CHAPTER

3

Getting Started

In this chapter:

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

Installing the display

Mount the *Ag*GPS FieldManager display in the vehicle cab, in a position that is easily accessible.

1. Select where you would like the display to be.
2. Use the included M6 x 1" screws to lightly screw the mounting plate to the back of the display.
3. Hold the mounting plate and display in the location that you have selected, to ensure that it is comfortably accessible from the driver's seat.
4. Remove the display from the mounting plate.
5. Use the RAM mount to attach the mounting plate to the vehicle.
6. Re-attach the display to the mounting plate. Tighten the screws.

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 *Ag*GPS 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.

Inserting the CompactFlash card in the socket

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

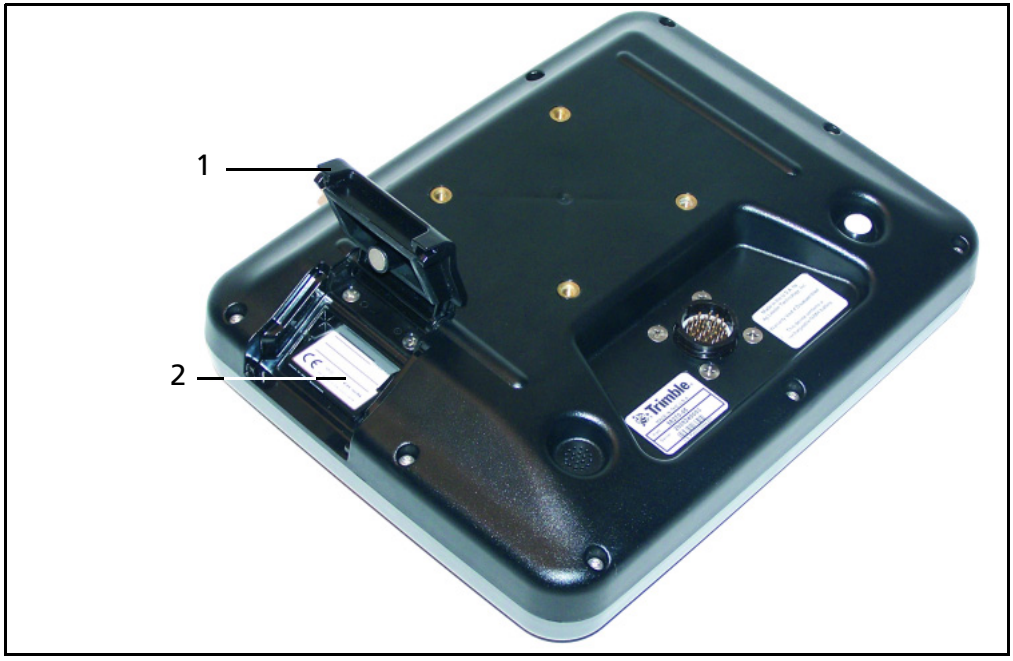


Figure 3.1 The reverse of the display with the card socket open

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 the system is turned on, a message appears on screen to confirm that the card has been removed.

Turning on the display

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

The *Ag*GPS FieldManager display has four main screens:

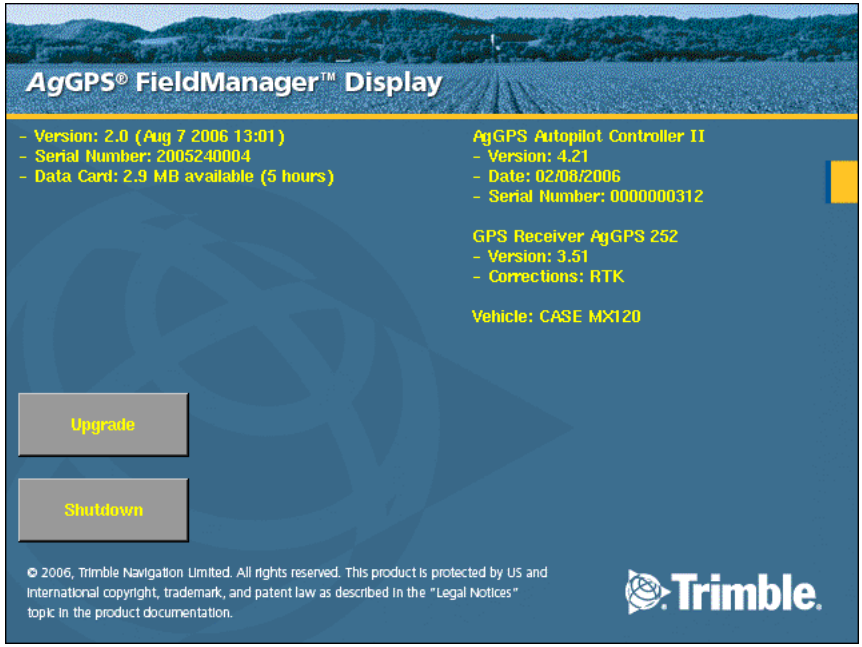
- Home screen
- Configuration screen
- Summary screen
- Run screen

You can access each of these screens by pressing the appropriate button to the right of the display. See page 9.

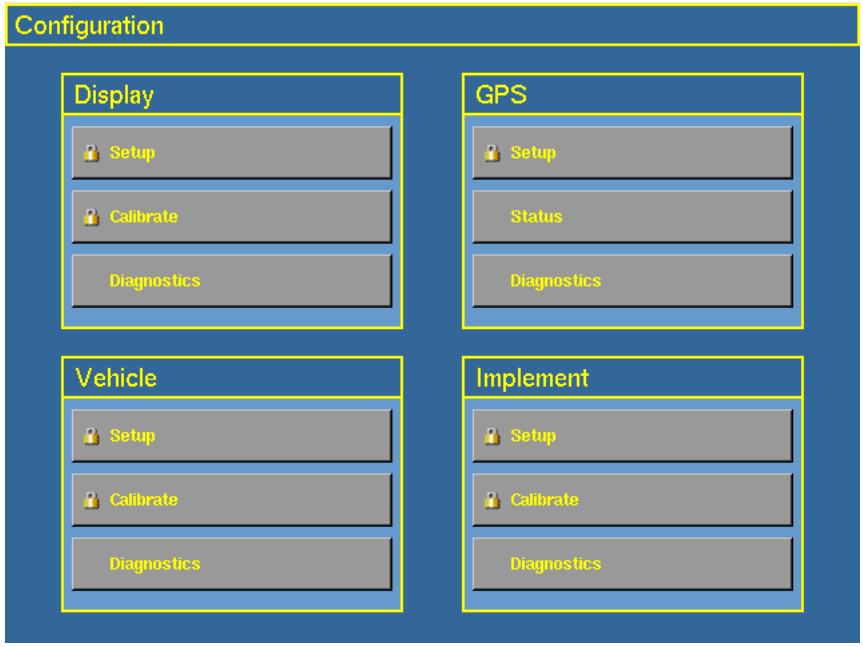
Home screen

The Home screen lists the following information about the system:

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

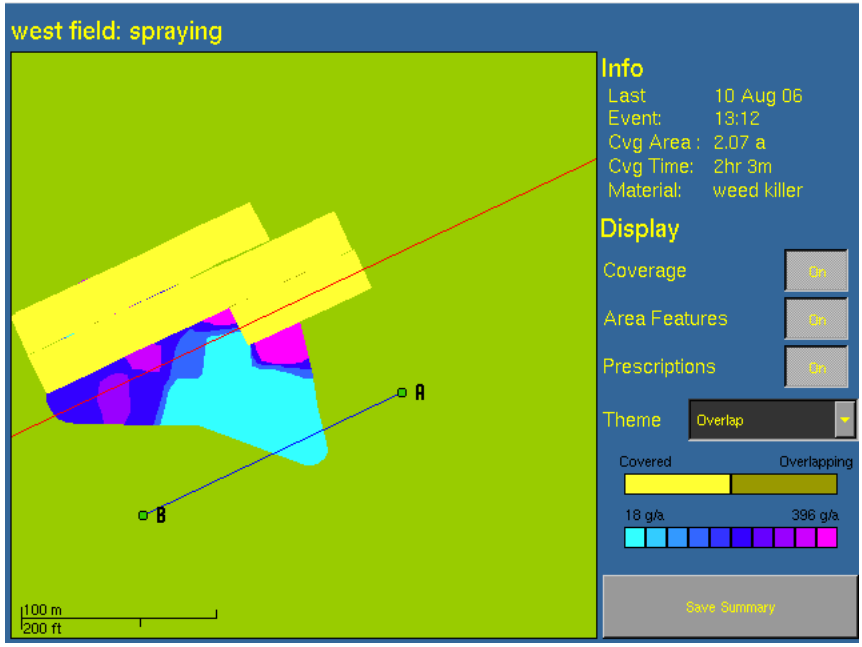


Configuration screen



From the *Configuration* screen you can access most of the system settings that can be changed. To access the *Configuration* screen, press the Configuration button.

Summary screen



The Summary screen displays information about the current field.

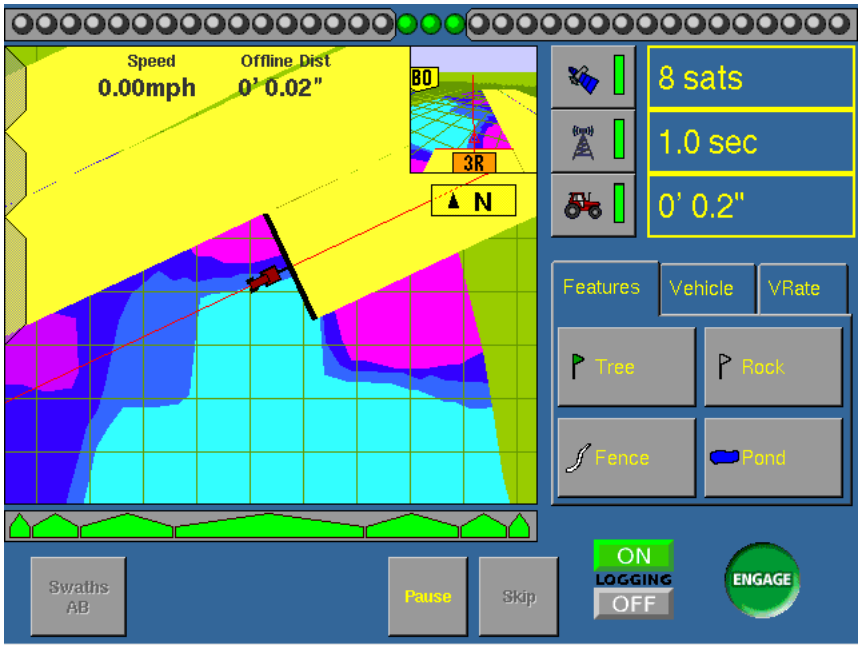
By tapping the appropriate buttons, you can show or hide coverage area and/or area features. If any Prescriptions are available, a prescriptions button will also be available.

You can show different information by selecting one of the options from the *Theme* drop-down list:

Item	Description
Overlap	Shows the coverage and any overlaps.
Applied Rate	Shows the volume at which the spray boom has applied solution.
Height	Shows the vertical height of the GPS position.
GPS Quality	Shows the quality of the GPS signal.

To save an HTML version of the Summary screen, tap the **Save Summary** button. See Saving an HTML version of the current field, page 124.

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, from the Run screen press the Home button and then tap Yes.*

There are several ways to turn off the system:

- Press the Home button. From the Home screen, tap the **Shutdown** button.
- 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.

CHAPTER

4

Basic Configuration

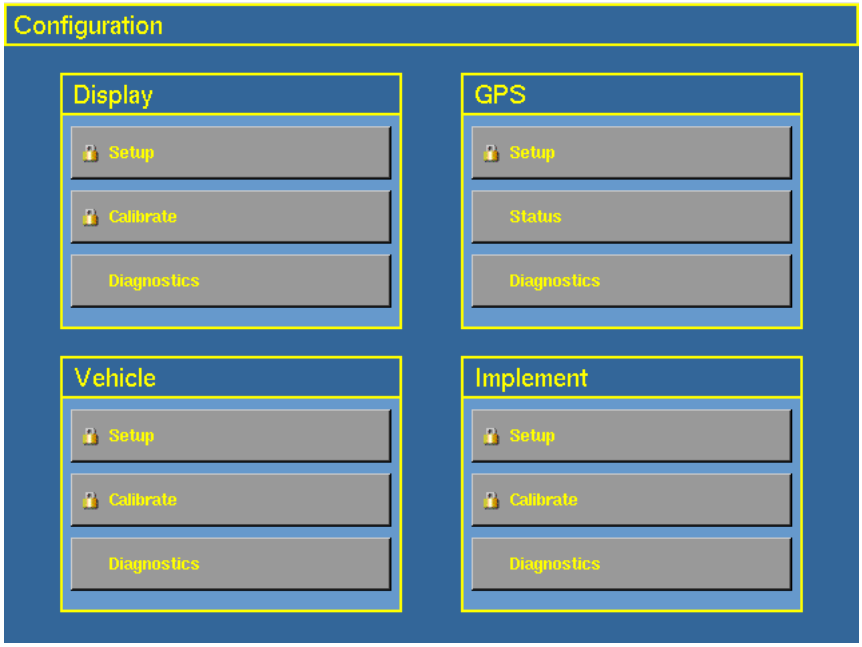
In this chapter:

This chapter describes the basic configuration steps required before you can perform tasks using the display. See also Chapter 5, Advanced Configuration.

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. Tap Yes to close the field.*

Accessing the Configuration settings

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



A padlock indicates that the button is password protected.

Password access

Any setting accessed from a **Setup** or **Calibrate** button marked with a padlock icon is protected by two 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.*

Locking the display

To re-enter the password if you have already entered the Administration password:

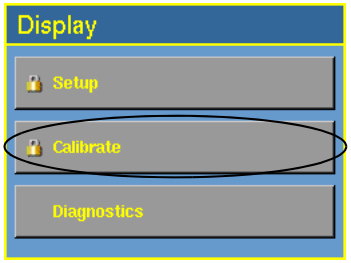
1. From the Home screen, tap the **Lock Configuration** button.
2. Press the Configuration button. The *Configuration* screen appears.
3. Tap a **Setup** or **Calibrate** button. The *Enter Administration Password* screen appears.

Calibrating the touch screen

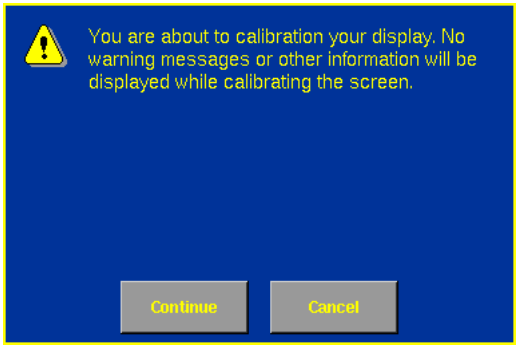
Tip – To begin your system configuration, calibrate the touch screen. This ensures that the touch screen reads your selections accurately.

To calibrate the touch screen:

1. From the *Configuration* screen, tap the **Calibrate** button in the *Display* group.

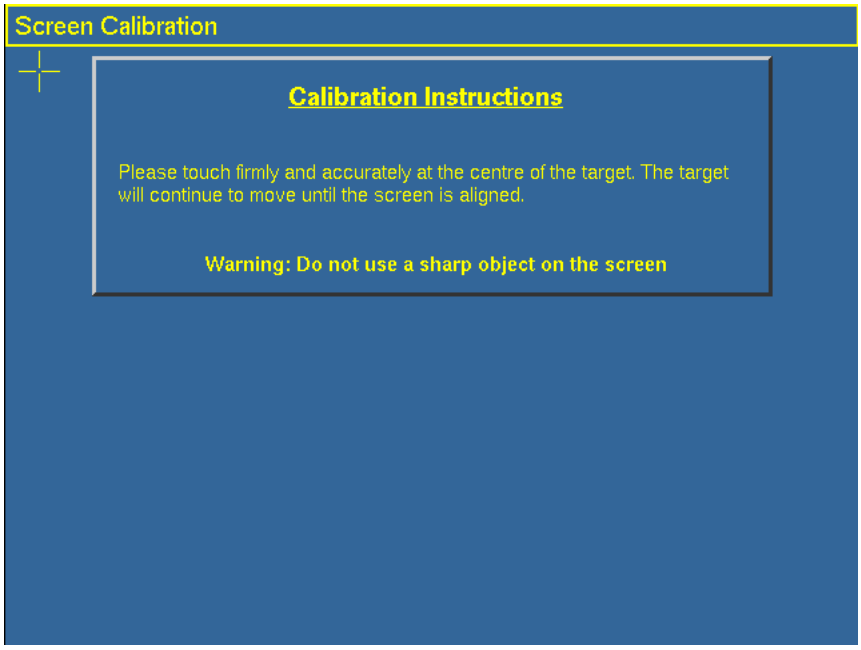


A warning message appears.



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

The *Screen Calibration* screen appears.



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

3. 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.

4. Repeat Step 2 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:

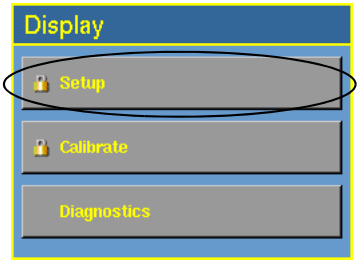
Your screen calibration failed. The difference between actual and calculated points was too large.

5. Tap the **OK** button. You are returned to the *Configuration* screen.
6. If the calibration was successful, proceed to Configuring the display. If the calibration failed, tap the **Calibrate** button again and then repeat Steps 2 through 4 until calibration is successful. If display calibration continues to fail, consult your local Trimble reseller.

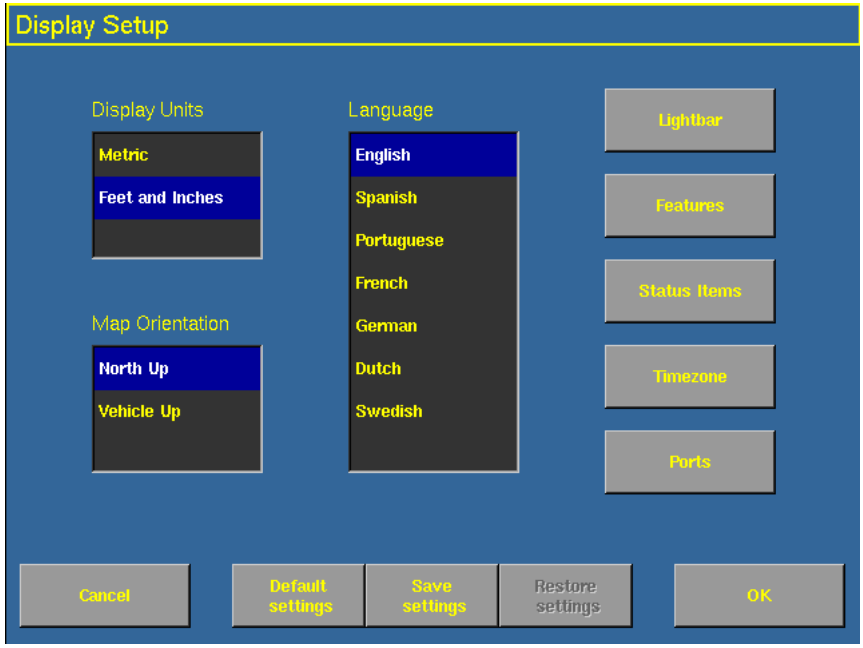
Configuring the display

The *Display Setup* screen controls the look and feel of the display. For example, use the screen to choose the units of measure and to determine which status items are displayed on the Run screen.

1. From the *Configuration* screen. tap the **Setup** button in the *Display* group.



The *Display Setup* screen appears.



2. Configure the:
   - ports
   - units of measure
   - map orientation
   - language
   - field features

   These steps are described in more detail below.

Configure the ports

The default port settings should be correct. If they are not, reassign the ports as follows:

1. On the *Display Setup* screen, tap the **Ports** button.

   The *Assign Ports* screen appears.

2. Select one of the following:
   - To configure a GPS source (a receiver or the Autopilot system):
     a. Select the item from the Guidance list.
     b. Tap the **Edit...** button.

        The *Select port* screen appears.

     c. Tap the port that the receiver is connected.
   - To connect an external device (for example, a variable rate controller or remote data input) to the system:
     a. Select the device from the Devices list.
     b. Tap the **Edit...** button.

        The *Select port* screen appears.

     c. Tap the port that the device is connected to.

Note – *If you select Remote Data Input and P4 or P5, a number of other fields will appear on the Select Port screen. This allows you to configure the communication settings of the remote device.*

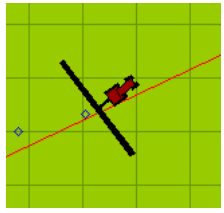
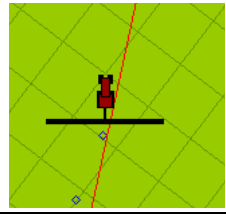
d. Tap **Exit**.

Select the units of measure

From the *Display Units* list, select your preferred units (either Metric or Feet and Inches).

Select the map orientation

From the *Map Orientation* list, select the map orientation that you prefer:

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.

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

Select the language

Make your selection from the *Language* list. The default language is English.

If you change the language, a warning message appears. It warns that the display must restart for the change to take effect.

Configure the field feature(s)

Field features are used to define:

- points of interest
- areas to avoid

There are three types of field feature:

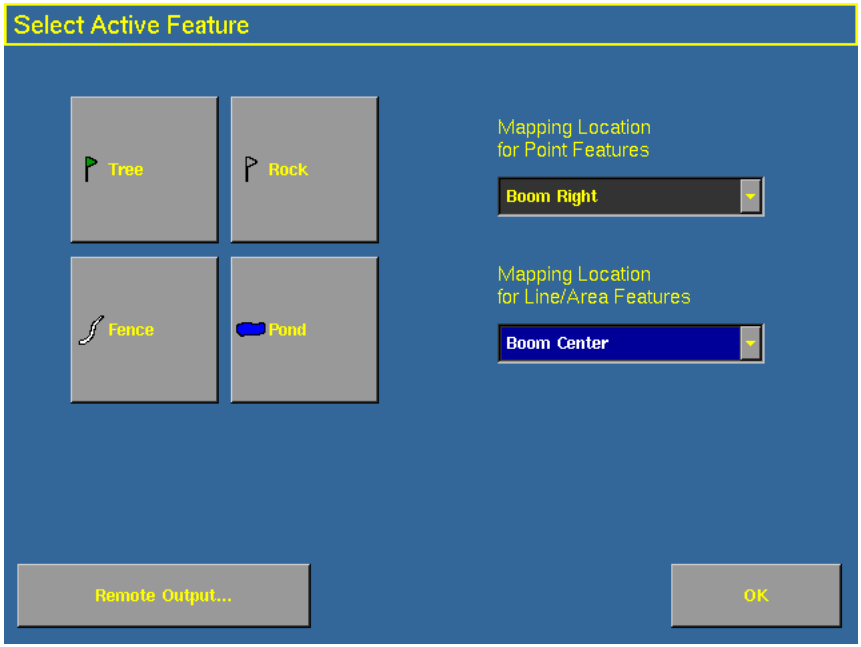
Feature type	What it defines	Example
Point	a single point in a field	Tree
Line	a straight or curved line in a field	Fence
Area	an area of land	Pond

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 *Features* tab on the Run screen. You can use the buttons to add field features to your map while driving.

To set up a field feature:

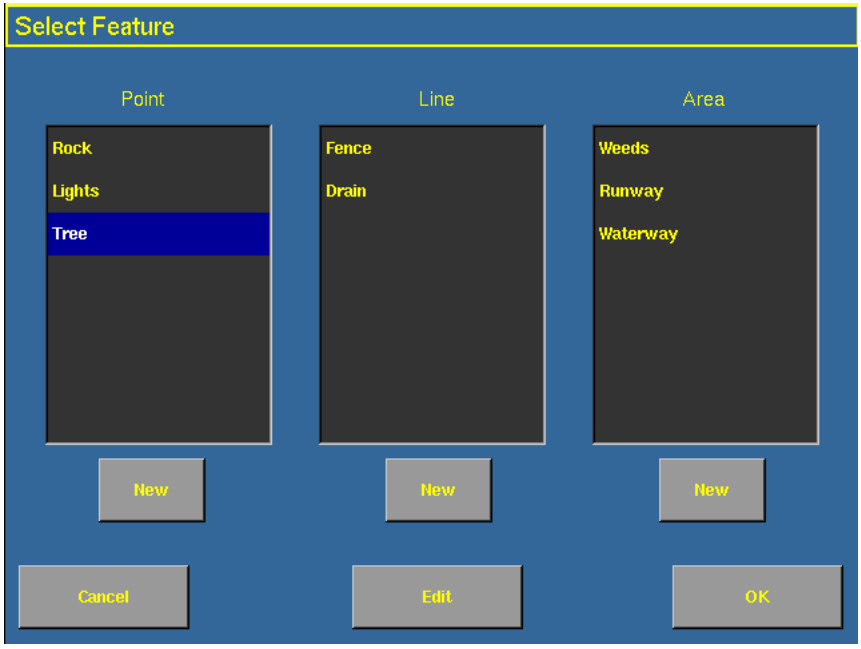
1. From the *Display Setup* screen, tap the **Features** button.

   The *Select Active Feature* screen appears.



2. 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.
3. Select one of the four feature buttons.

The *Select Feature* screen appears.



4. To add a new feature, 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 in the three 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.

2. Select the feature appearance color.
3. Tap the **OK** button 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 the **OK** button to return to the *Select Active Feature* screen.

   The new feature appears on the button you selected.
5. Tap the **OK** button to exit.

Creating a line feature

1. Enter a name for the feature in the *Name* window.
2. Select the feature appearance color.
3. Tap the **OK** button 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 the **OK** button to return to the *Select Active Feature* screen.

   The new feature appears on the button you selected.
5. Tap the **OK** button.

Creating an area feature

1. Enter the name of the feature.
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. 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* drop-down 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 appear with this type of area feature. It does not apply to any of your other area features. Set the warning for each type of Area Feature individually.*

6. Tap the **OK** button 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 the **OK** button to return to the *Select Active Feature* screen.

   The new feature appears on the button you selected.
8. Tap the **OK** button.

For more information on applying field features during navigation, see Placing field features on screen, page 141.

Editing an existing feature

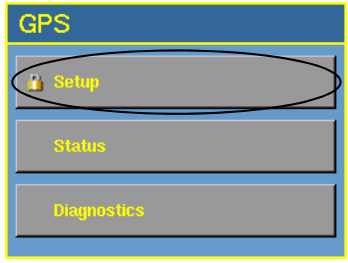
To edit an existing feature:

1. From the *Select Feature* screen, select the feature from the list and then tap the **Edit** button.
2. Change any settings required and then tap the **OK** button.

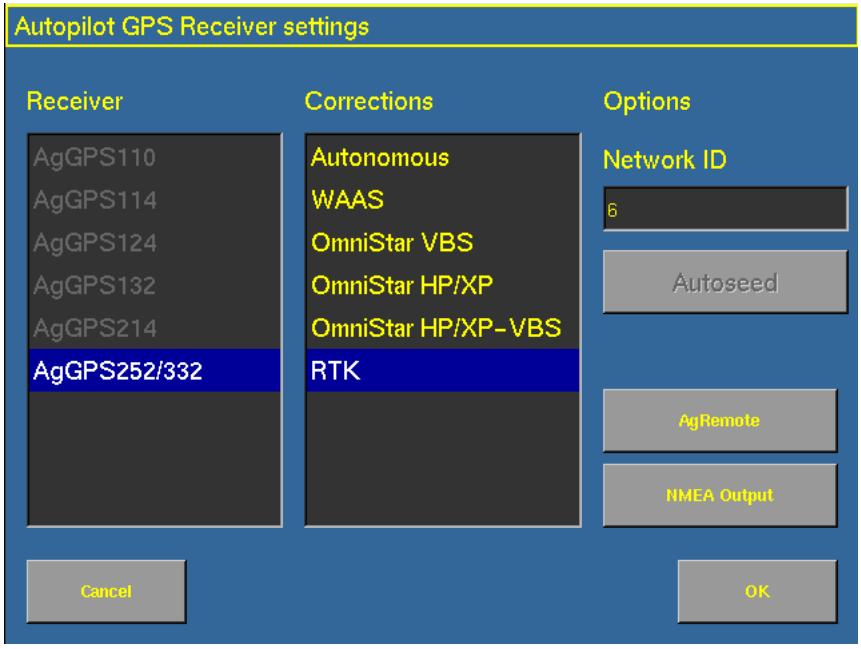
Configuring the GPS settings

Configure the display to work with your GPS receiver and correction source.

1. From the *Configuration* screen, tap the **Setup** button in the *GPS* group.



The *Autopilot GPS Receiver settings* screen appears.



The *Ag*GPS Autopilot system automatically detects the attached GPS receiver. The receiver appears in the *Receiver* list.

2. Select the correction type from the *Corrections* list.
   - The OmniSTAR correction types require paid subscription. RTK requires extra equipment.
   - If you have an *Ag*GPS 252 or 332 receiver and select either "OmniSTAR HP/XP" or "OmniSTAR HP/XP-VBS" as the corrections, see AgGPS Autoseed fast restart technology, page 112.

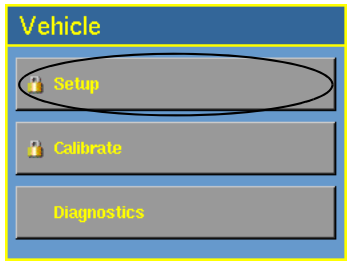
Configuring the vehicle make and model

Your vehicle make and model were selected when your *Ag*GPS Autopilot system was installed. Ensure that the make and model that are displayed are correct. If they are correct, skip this step and proceed to Configuring the AgGPS Autopilot system vehicle settings. Otherwise, configure the vehicle as described here.

Note – *When you configure the vehicle 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.*

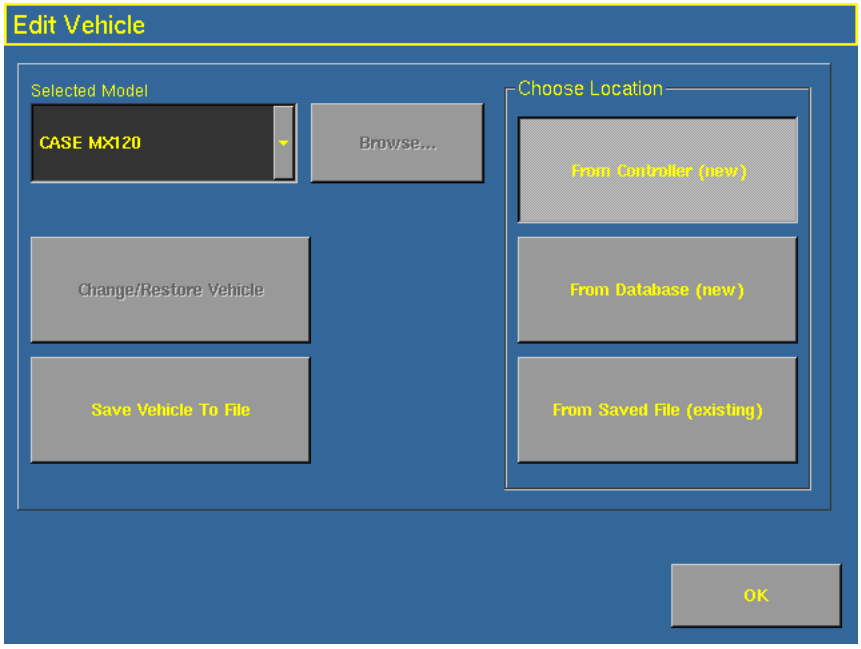
To configure your vehicle:

1. From the *Configuration* screen, tap the **Setup** button in the Vehicle group.



The *Vehicle Setup* screen appears.

2. Tap the **Edit...** button in the *Vehicle Settings* group. The *Edit Vehicle* screen appears.



3. 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 *Ag*GPS Autopilot controller firmware.	4
From Database (new)	Select a new make and model from a database of vehicles (.vdb) on the *Ag*GPS FieldManager display CompactFlash card. If you need to obtain a .vdb file, contact your local reseller.	5
From Saved File (existing)	Select an existing vehicle from a previously saved file (.cfg) on the card.	6

4. To select from the list on the *Ag*GPS Autopilot controller:
   a. Tap the **From Controller (new)** button.
   b. Tap the Selected Model drop-down box and then select the make and model that you require from the list.
5. To select from a database on the display card:
   a. Tap the **From Database (new)** button.
   b. Tap the **Browse** button.
   c. Select the .vdb file that you want to open and then tap the **Open** button.
6. To select a saved vehicle make and model from the card:
   a. Tap the **From Saved File (existing)** button.
   b. Tap the **Browse** button.
   c. Select the file that you require and then tap the **Open** button.
7. Tap the **Change/Restore Vehicle** button. 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.*
8. Tap the **OK** button to load the new configuration, or **Cancel** to abort.

   A dialog with the message Upload completed appears.
9. Tap **OK**.

   Warning text appears. The file is now loaded.

Configuring the *Ag*GPS Autopilot system vehicle settings

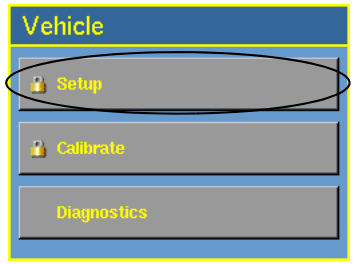
Configure the *Ag*GPS Autopilot system settings to ensure maximum possible accuracy with automated steering guidance.

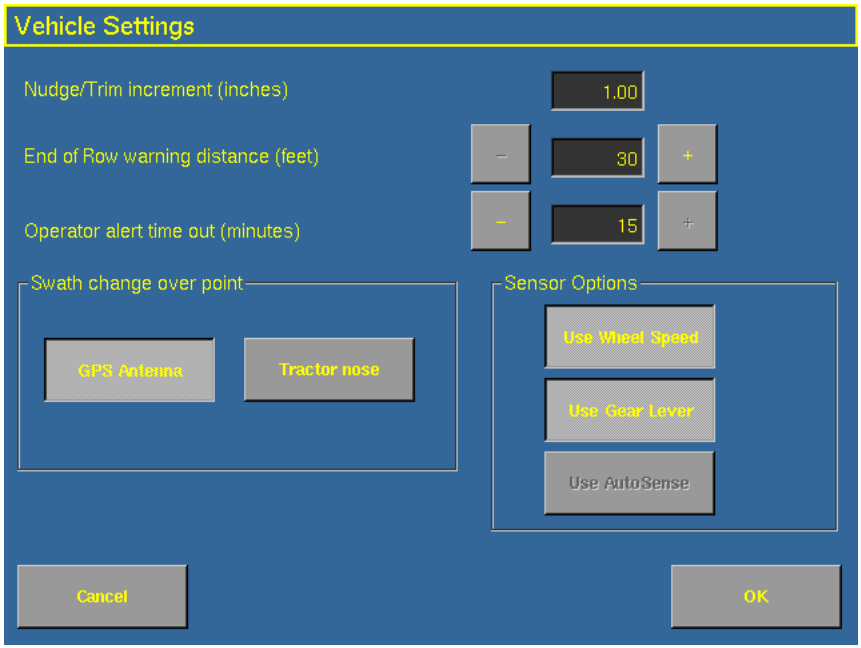
1. From the *Configuration* screen, tap the **Setup** button in the *Vehicle* group.

   The *Vehicle Setup* screen appears.

2. Tap the **Settings** button in the Autopilot Settings group.

   The *Vehicle Settings* screen appears.





3. Enter a value in the *Nudge/Trim Increment (unit)* 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* ***Trim*** *buttons become* ***Nudge*** *buttons in RTK mode.*

4. If necessary, change 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, change 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.

Configuring an implement

Configure an implement so the system can tell:

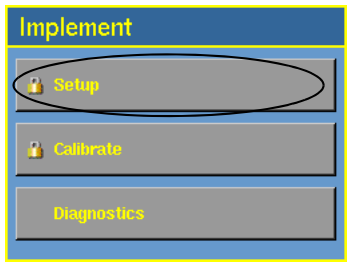
– which type of implement is attached

– how much area it covers

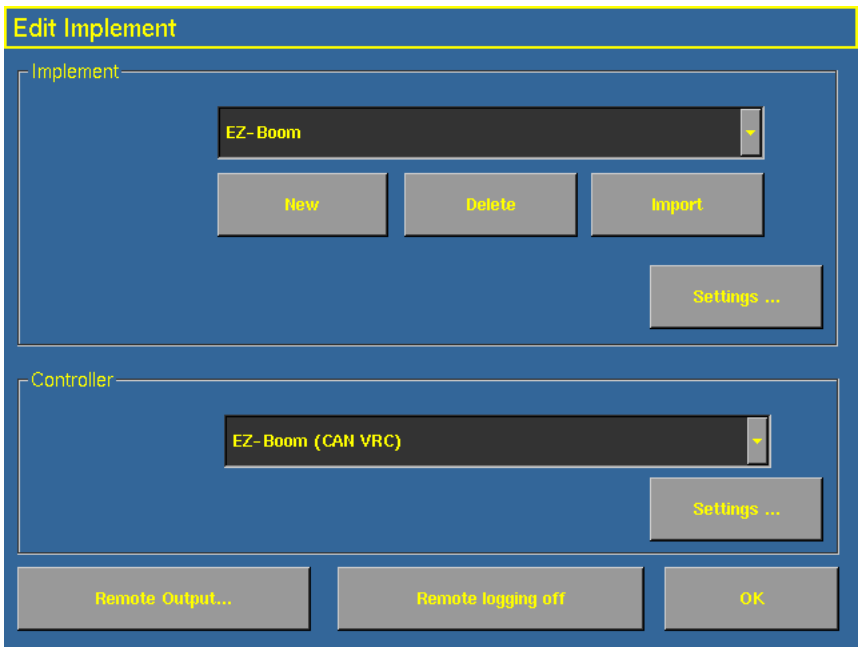
– how far offset it is

To configure an implement:

1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.



The *Edit Implement* screen appears.

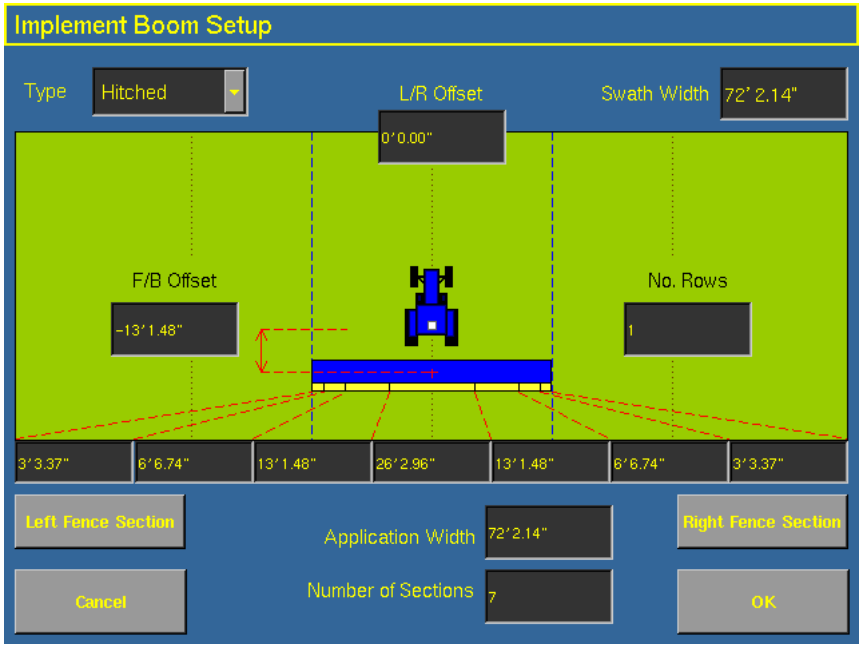


Any previously configured implements appear in the *Implement* drop-down list at the top of the screen.

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

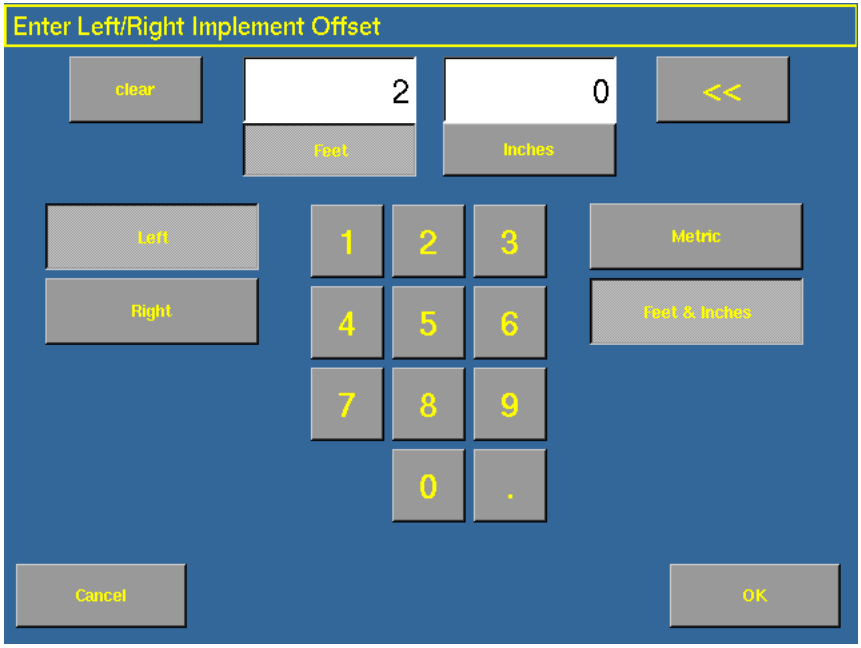
2. Do one of the following:
   - Select an existing implement from the drop-down list.
   - Create a new implement, see page 58.
   - Import an implement, see page 59.
3. Tap the **Settings ...** button.

   The *Implement Boom Setup* screen appears.



4. If the implement boom 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 either the **Metric** or the **Feet & Inches** button to select the units that the offset is measured in.

   c. Enter the offset distance.

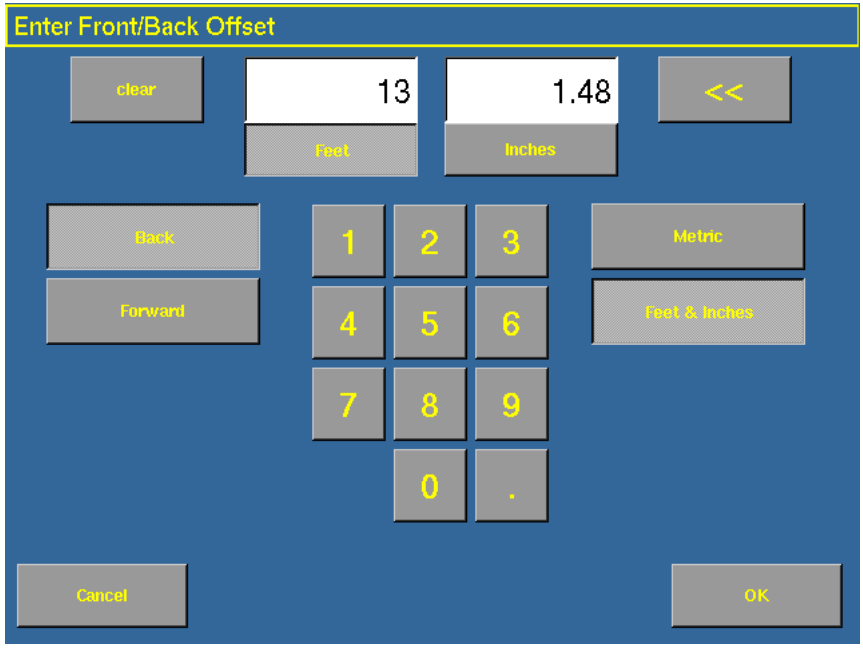
   d. Tap either the **Left** or the **Right** button to select the direction of the offset. An offset to the left indicates the implement extends to the left of the driver when seated in the vehicle.

   e. Tap the **OK** button.

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

5. If the implement boom is offset forward of or behind the location of the antenna, set the front/back offset:

   a. Tap the **F/B Offset** button. The *Enter Front/Back Offset* screen appears.



   b. If necessary, tap either the **Metric** or the **Feet & Inches** button to change the units that the offset is measured in.

   c. Enter the offset distance.

   d. Tap either the **Back** or the **Forward** button to select the direction of the offset. A forward offset indicates that the implement is located ahead of the antenna position.

   e. Tap the **OK** button.

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

6. Tap the *No. Rows* text box to enter the number of rows that span across the boom, which are used for navigation.

   Note – *When you press the Skip button to adjust the guidance line, the guidance line can move across by rows.*

7. If the implement has a left fence section, tap the **Left Fence Section** button.

   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. 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.

8. If the implement has a right fence section, tap the **Right Fence Section** button.

9. Enter the number of implement sections:

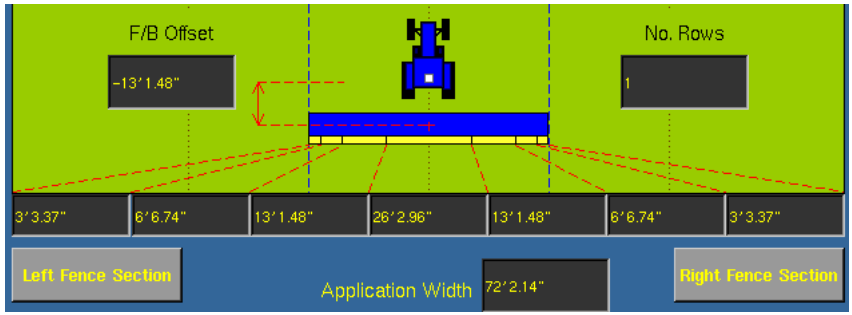
   a. Tap the *No. Sections* text box.

      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 appears. The graphic and the number of buttons along the base of the graphic will show the new number of sections.



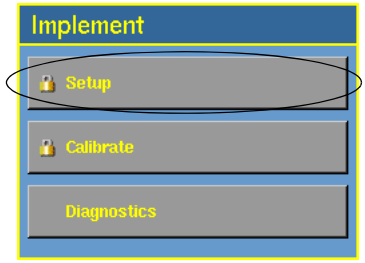
Note – *The EZ-Boom controller supports up to 10 boom sections. If one fence section is enabled, you can have a maximum of 9 boom sections. If both fence sections are enabled, you can have a maximum of 8 sections.*

10. Tap the *Application Width* text box and then enter the distance from one end of the spray boom to the other. When you return to the *Implement Boom Setup* screen, the graphic will show the new application width.
11. 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).
12. Change the *Swath Width* text box, if necessary. To create an overlap, set the Application Width to slightly more than the Swath Width.
13. Tap **OK**. The *Edit Implement* screen appears.

Creating an implement

1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.

   The *Edit Implement* screen appears.



2. Tap the **New** button.

   The virtual keyboard appears.

3. Enter a name for the new implement and then tap **OK**.

   The *Edit Implement* screen appears.

4. Tap the **Settings...** button (that is under the **Import** button).

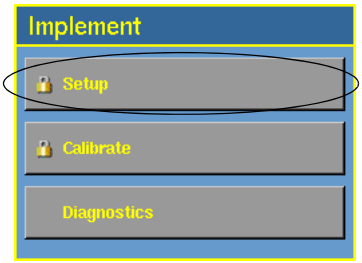
Importing an implement from the *Ag*GPS 170 Field Computer

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

To import an *Ag*GPS 170 Field Computer implement:

1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.

   The *Edit Implement* screen appears.



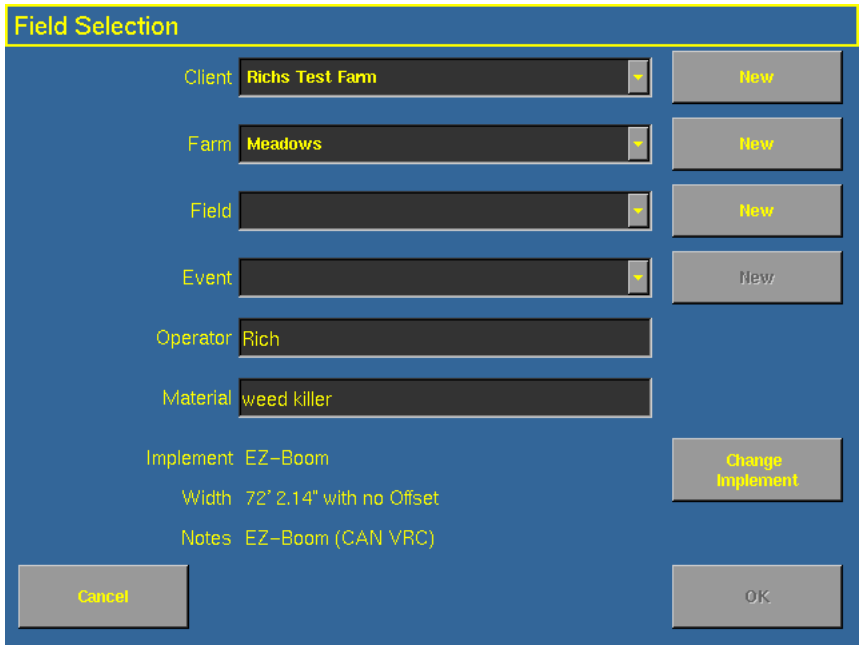
2. Tap the **Import** button.

   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 *Ag*GPS 170 Field Computer now appear in the drop-down list.

Starting to drive

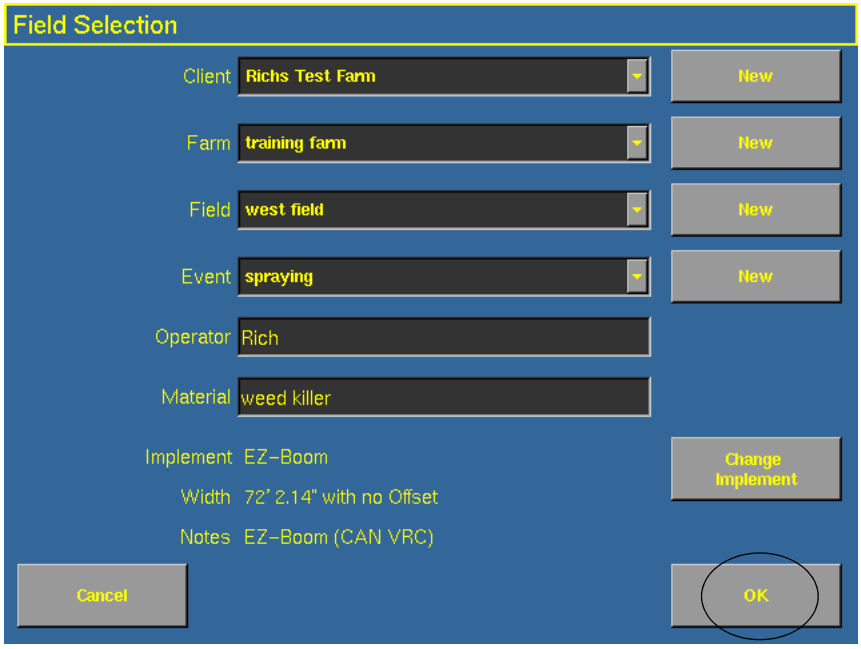
1. Tap the **Run** button. The first time that you do this, the *Field Selection* screen appears.



2. Enter a name in each field in turn, starting with *Client*. To add a name, tap the **New** button.

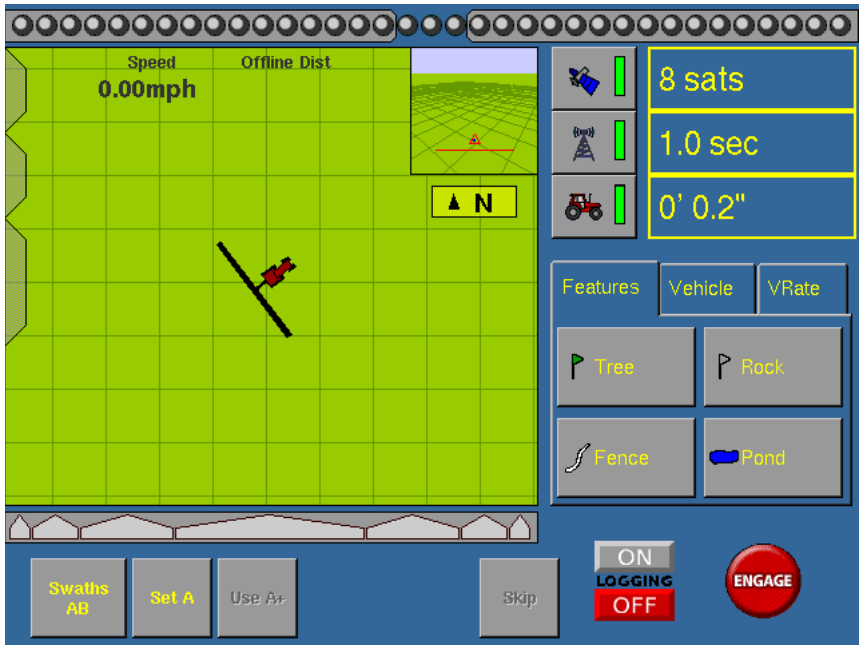
   All four windows are required. If you want to include the name of the vehicle operator or the material that is being used, tap the **More** button.

When you have entered the options, the **OK** button becomes available.



3. Tap the **OK** button.

The Run screen appears.



You can now begin driving. See Chapter 6, Steering Navigation.

CHAPTER

5

Advanced Configuration

In this chapter:

When you have completed the basic configuration steps, you can either:

- Use this chapter to configure more advanced features for higher accuracy or better performance
- Begin driving. See Chapter 6, Steering Navigation.

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. Select Yes to close the field.*

Configuring the lightbar

The display has two lightbar options:

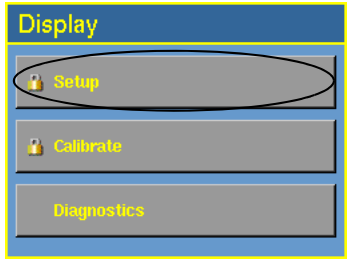
- the virtual lightbar at the top of the display
- a peripheral EZ-Guide Plus lightbar attached to the *Ag*GPS Autopilot system (emulating an *Ag*GPS 21A lightbar).

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.*

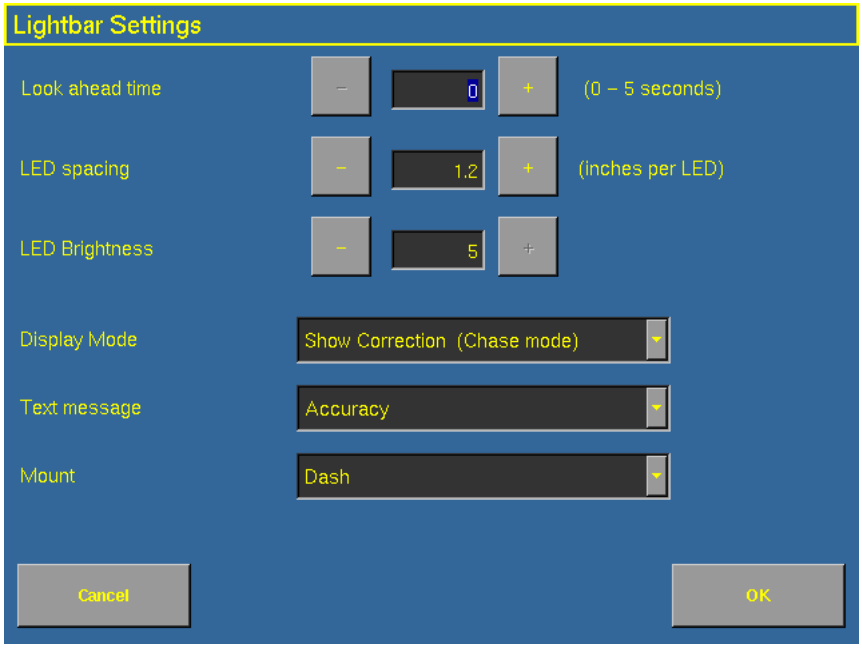
The *Ag*GPS FieldManager display has default settings for the lightbar which should suit most drivers. If the settings are not appropriate, use the instructions below to configure the lightbar:

1. From the *Configuration* screen, tap the **Setup** button in the *Display* group.



The *Display Setup* screen appears.

2. Tap the **Lightbar Setup** button. The *Lightbar Settings* screen appears.



The following settings are available for configuration:

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 LEDs on the lightbar. This is a value from 1–5.

Setting	Affects ...	Default setting	This setting determines...
Display Mode	Virtual lightbar and EZ-Guide Plus lightbar	show error (center 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	offline distance	which text is displayed while online.
Mount	EZ-Guide Plus lightbar	dash	which way up the display is mounted. If the lightbar is suspended upside down, set the Mount option to ceiling.

3. Update any fields that you require and then tap the **OK** button to accept the changes, or tap **Cancel** to exit.

Configuring status text messages

You can configure the display to show various ***status text messages*** on the screen while you drive. The messages can be displayed:

- At the top of the Run screen: the message is visible whenever the appropriate information is available.
- On a slide-out tab on the left of the Run screen: you must extend the tab to see the message.

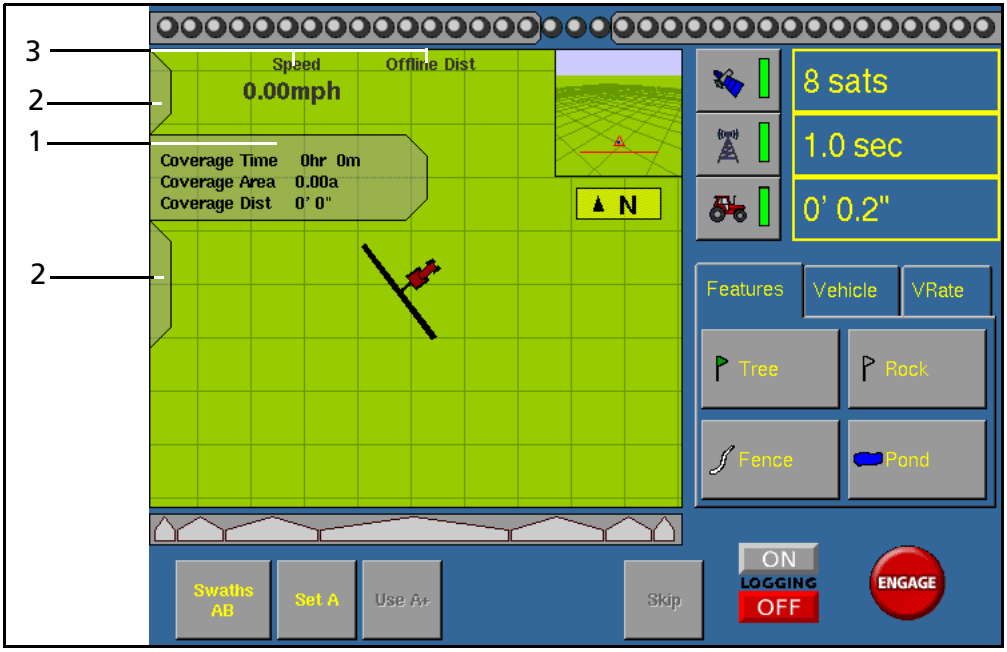


Figure 5.1 Status text on the Run screen

Item	Description
1	Slide-out tab: extended
2	Slide-out tab: not extended
3	Status text messages

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

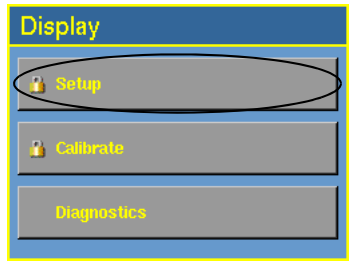
The slide-out tabs automatically slide back in when the specified timeout value is reached. To close the tab before then, tap the tab.

To set the timeout value:

1. From the *Configuration* screen, tap the **Setup** button in the *Display* group.

   The *Display Setup* screen appears.

2. Tap the **Status Item** button.



The *Select Status Items* screen appears.

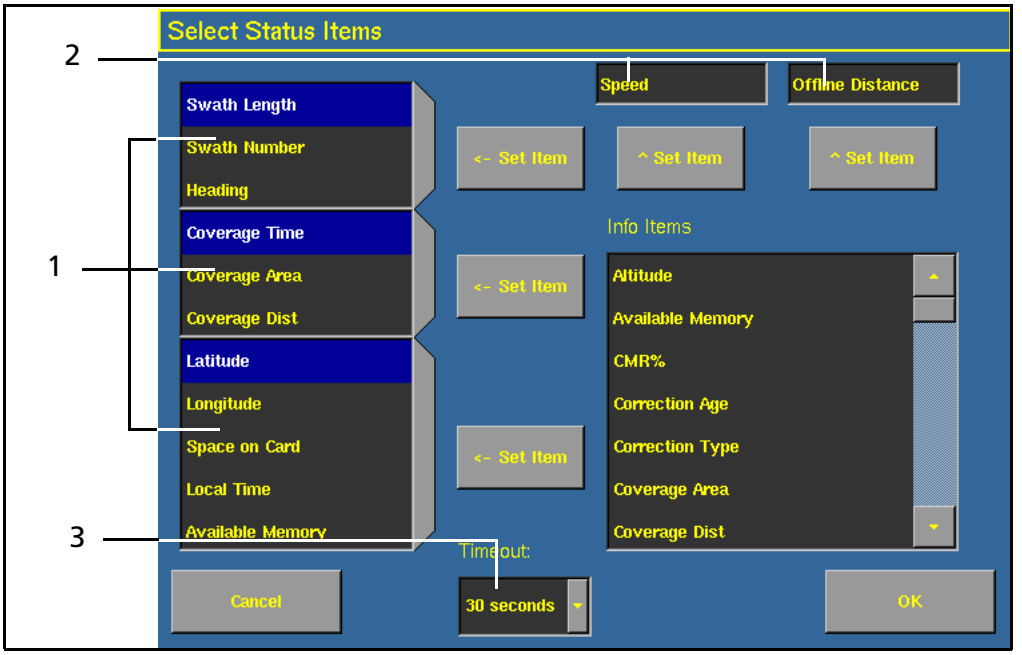


Figure 5.2 Elements of the *Select Status Items* screen

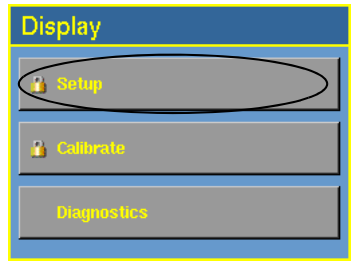
Number	Feature location
1	The three slide-out tabs
2	The two onscreen status text messages
3	The slide-out tab timeout value

3. Tap the *Timeout* drop-down list.
4. Select the timeout value that you would like, or None to have slideout tabs displayed until you close them manually (by tapping them).

To configure onscreen status text:

1. From the *Configuration* screen, tap the **Setup** button in the *Display* group.

   The *Display Setup* screen appears.



2. Tap the **Status Item** button. The *Select Status Items* screen appears.
3. From the *Info Items* list, select the status text item to display.
4. To add the status text item to one of the onscreen status text options which appear at the top of the screen, tap the appropriate **Set Item** button.

   To add the status text item to a slide-out tab:

   a. Select the position on the slide-out tab from one of the three lists on the left of the screen.

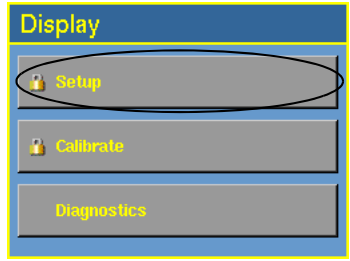
   b. Tap the appropriate **Set Item** button, depending on which of the three slide-out tabs you would like it to appear on.

Configuring the time

To synchronize the display time to the GPS signals:

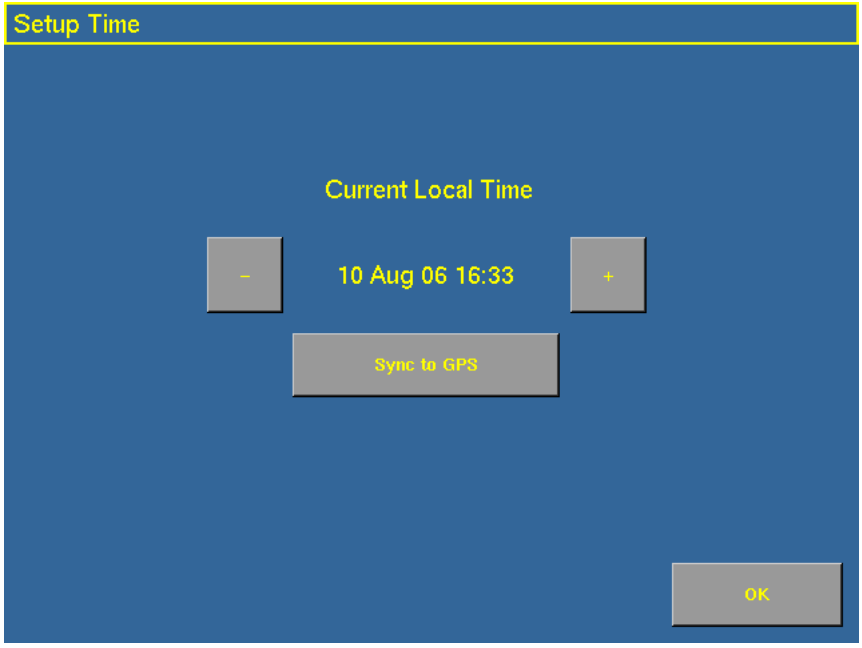
1. From the *Configuration* screen, tap the **Setup** button in the *Display* group.

   The *Display Setup* screen appears.



2. Tap the **Timezone** button.

The *Setup Time* screen appears.



3. Tap the **Sync to GPS** button.
4. 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.*

Calibrating the *Ag*GPS Autopilot system

When you calibrate the *Ag*GPS Autopilot system for your vehicle, the system records additional details about your vehicle. These help the system to steer the vehicle more accurately. This is especially important for high accuracy systems (for example, the *Ag*GPS Autopilot automated steering system).

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

Notes on calibration

- Before you perform vehicle calibration, select the vehicle make and model on the *Vehicle Setup* screen. See Configuring the vehicle make and model, page 47.
- 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.

Three 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 *Ag*GPS 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 function is unacceptable.
Roll/Antenna Compensation	Compensates for antenna height and static roll caused by minor variations in the *Ag*GPS 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.*

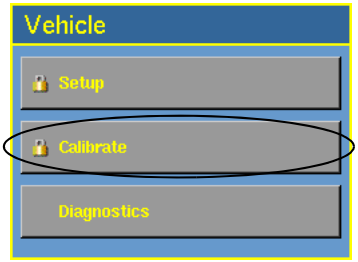
Option	Description
Steering Sensor	Converts the sensor output into commands for steering full left, full right, and any position in between.
Automated Steering Deadzone	Required to learn the vehicle's steering deadzones.
Steering Gain (proportional steering gain)	only if system steering performance is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

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

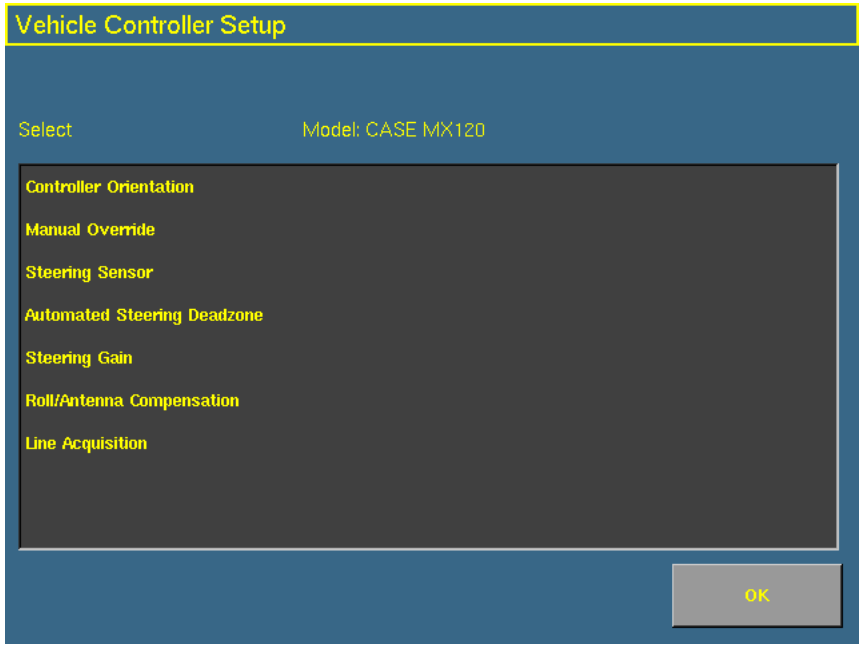
To configure this vehicle type ...	See ...
Hydraulically-steered tracked tractors	Page 104
Fly-by-wire tracked tractor	Page 107
Tracked tractor	Page 103

To configure your vehicle:

1. From the *Configuration* screen, tap the **Calibrate** button in the *Vehicle* group.



The *Vehicle Controller Setup* screen appears.



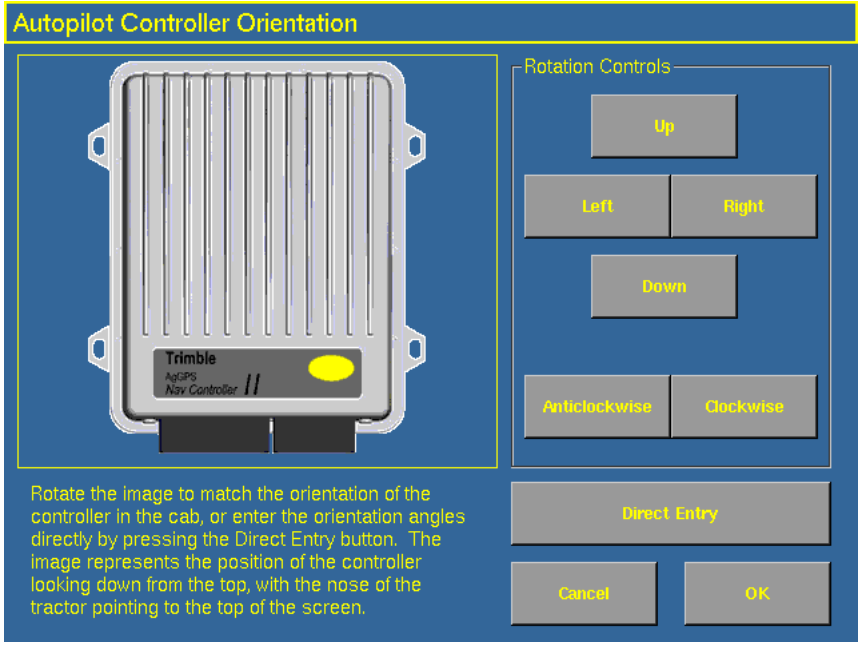
2. Select an item to configure and tap **OK**.

3. Configure the selected item.

To configure ...	See page ...
Controller orientation	page 75
Manual override	page 76
Steering sensor	page 79
Automated steering deadzone	page 84
Steering gain	page 89
Roll/antenna correction	page 96
Line acquisition	page 102

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 the **Direct Entry** button 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 *Ag*GPS Autopilot system is to turn the steering wheel. The manual override detects this movement and stops steering the vehicle. However, during steering navigation it is common for there to be a small amount of steering wheel movement that you do not want to cause override (for example, when you drive on rough ground). The manual override sensitivity setting is the measure of how much steering wheel movement is required to trigger the manual override.

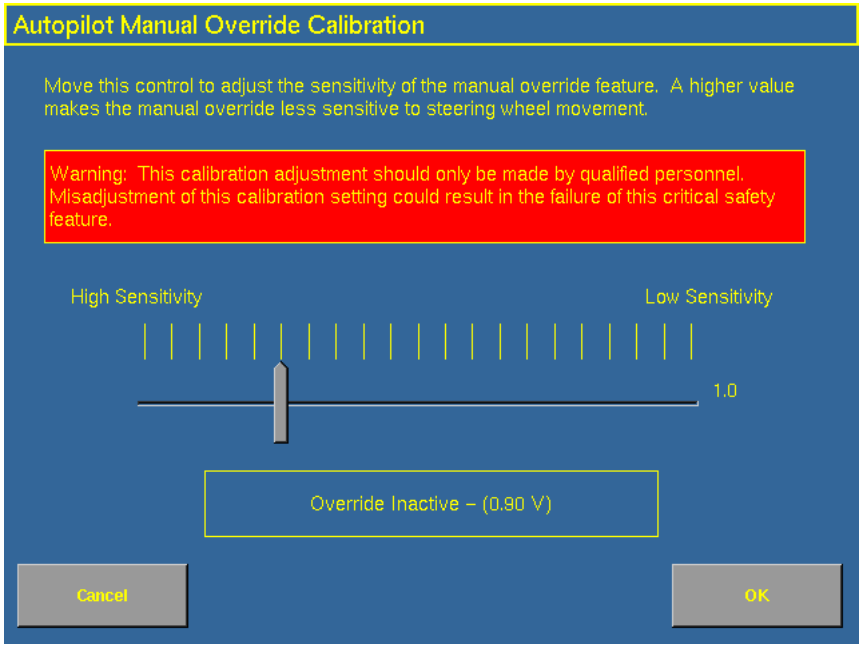
WARNING – Incorrect adjustment of the Manual Override Sensitivity calibration setting could cause this critical safety feature to fail, resulting in personal injury or damage to the vehicle. Any adjustment to this setting should only be made by an experienced user.

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 72).

   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 the **OK** button.

      The *Vehicle Calibration* screen appears.

   d. Select Manual Override again.

      The *Autopilot Manual Override Calibration* screen appears again.

   e. Repeat Steps 2, 3, and 4 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.*

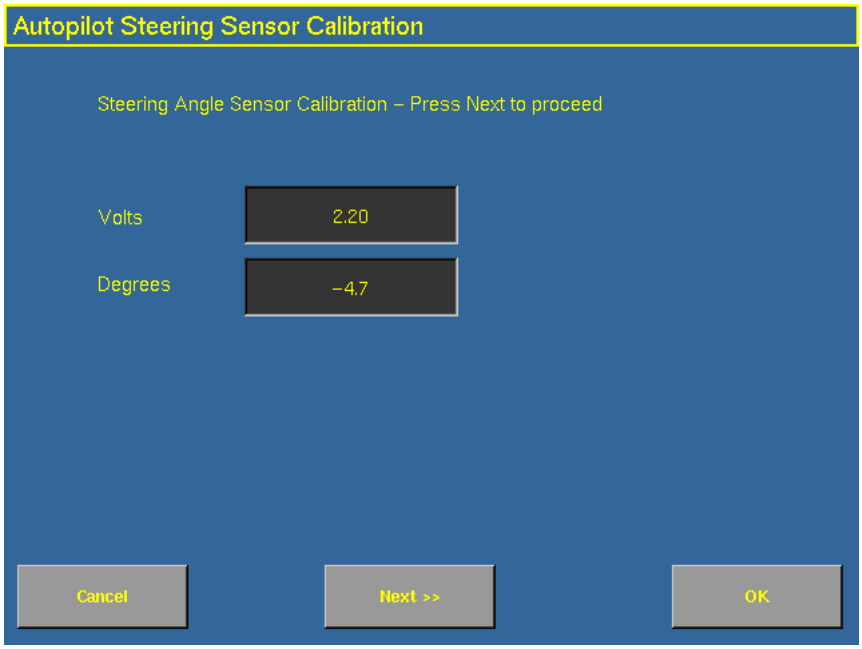
This calibration requires the vehicle to be in motion. Ensure that you:

- 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:

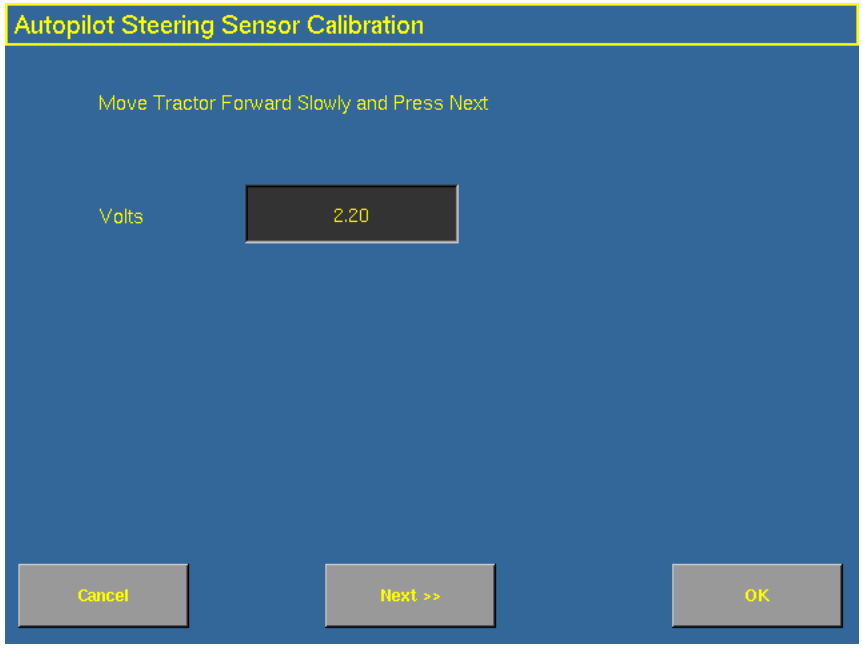
1. Select the *Steering Angle* procedure from the calibration list. See Calibrating the AgGPS Autopilot system, page 72.

   The first *Autopilot Steering Sensor Calibration* screen appears.



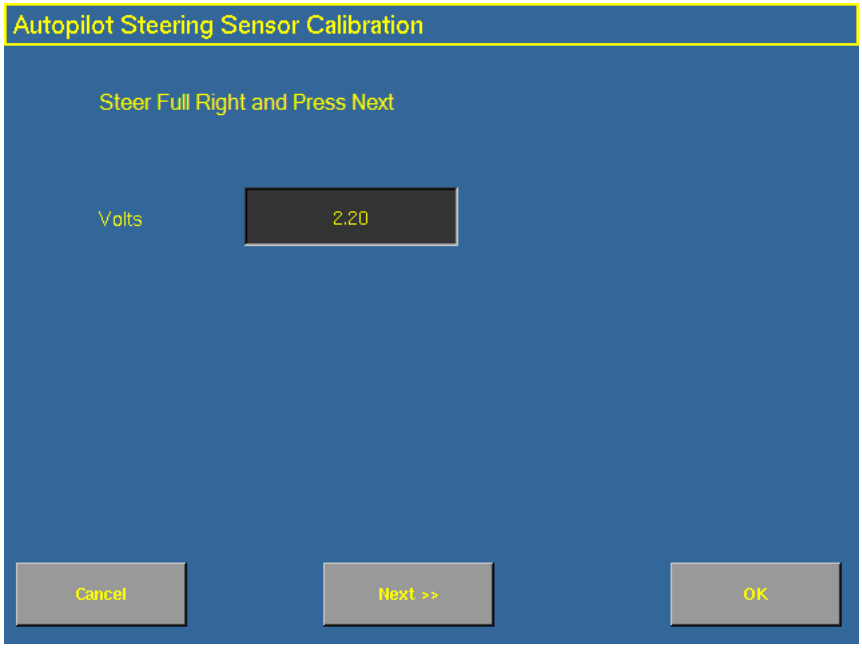
2. Move the tractor forward slowly.

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



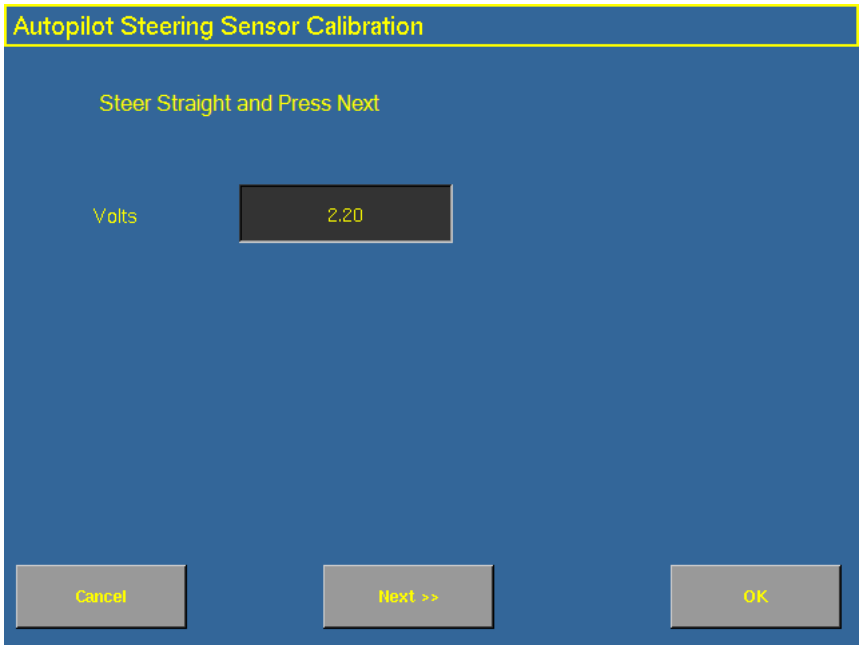
4. Turn the steering wheel completely to the left and then tap **Next**. If the steering wheel is not turned completely to the left or if the steering sensor requires adjustment or replacement, an error message appears.

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



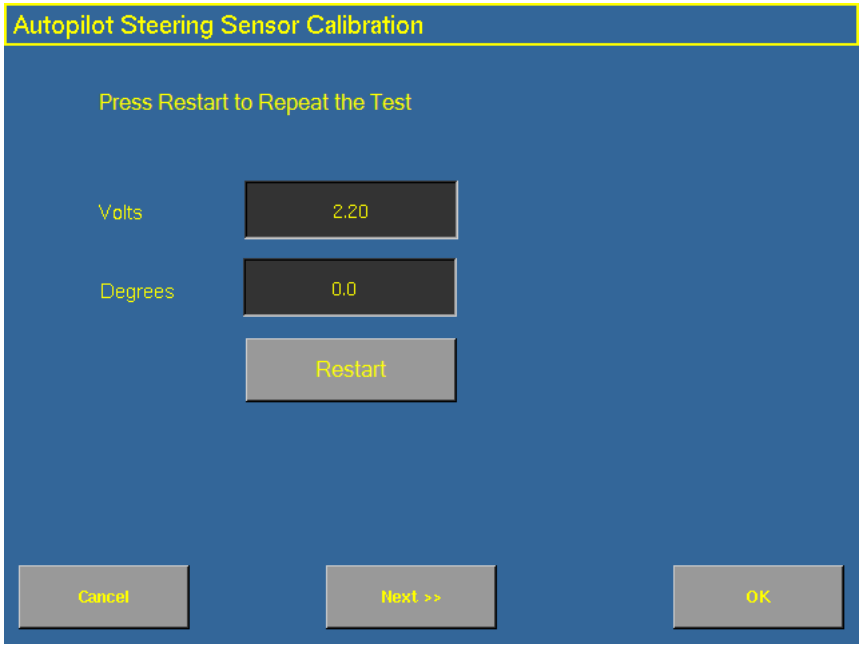
5. Turn the steering wheel completely to the right and then tap **Next**. If the steering wheel is not turned to the full right position or if the steering sensor requires adjustment or replacement, an error message appears.

The following screen appears.



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

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



7. Tap the **Next >>** button 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.

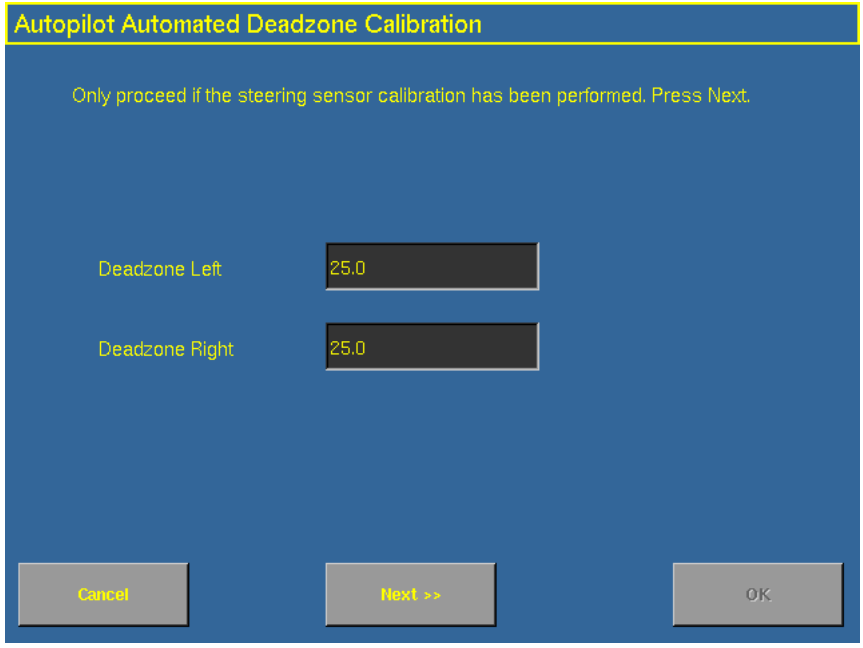
Notes on calibrating the automated steering deadzone

- 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:

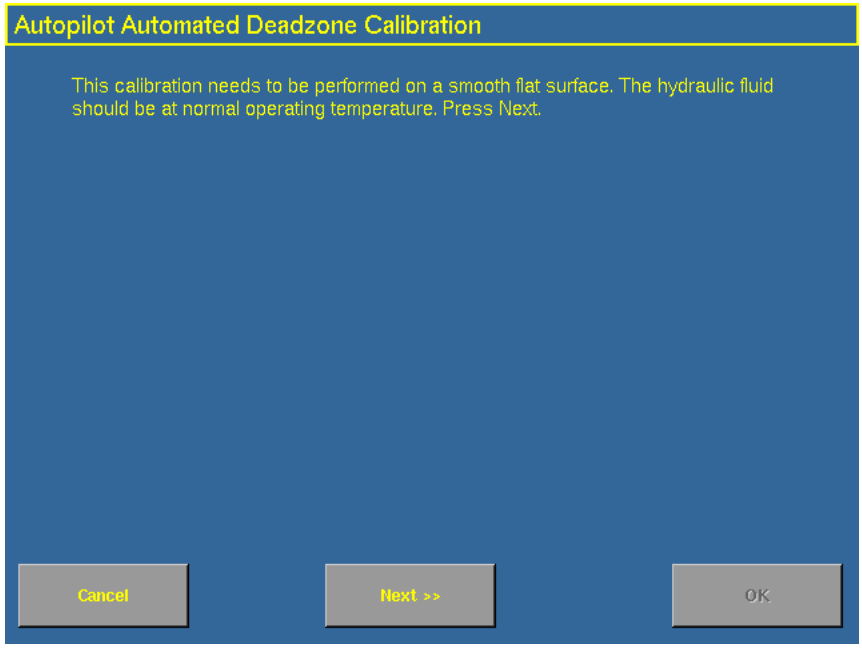
1. Place the vehicle in a large field that is free of hazards. To minimize the effect of the ground conditions, the field should have smooth soil that is loose but firm.
2. Select the Automated Steering Deadzone procedure from the calibration list. See page 84.

The *Autopilot Automated Deadzone Calibration* screen appears.



3. Tap the **Next** button to continue.

The second *Autopilot Automated Deadzone Calibration* screen appears.



4. Tap the **Next** button 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 injury 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.

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 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.

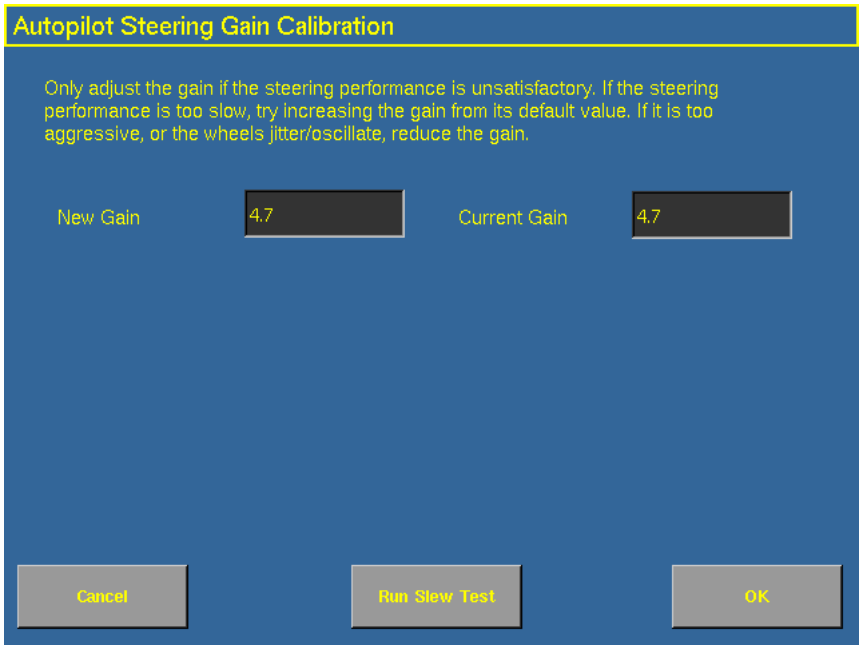
Increase the proportional gain up to the point just before any one of the following occurs:

- 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:

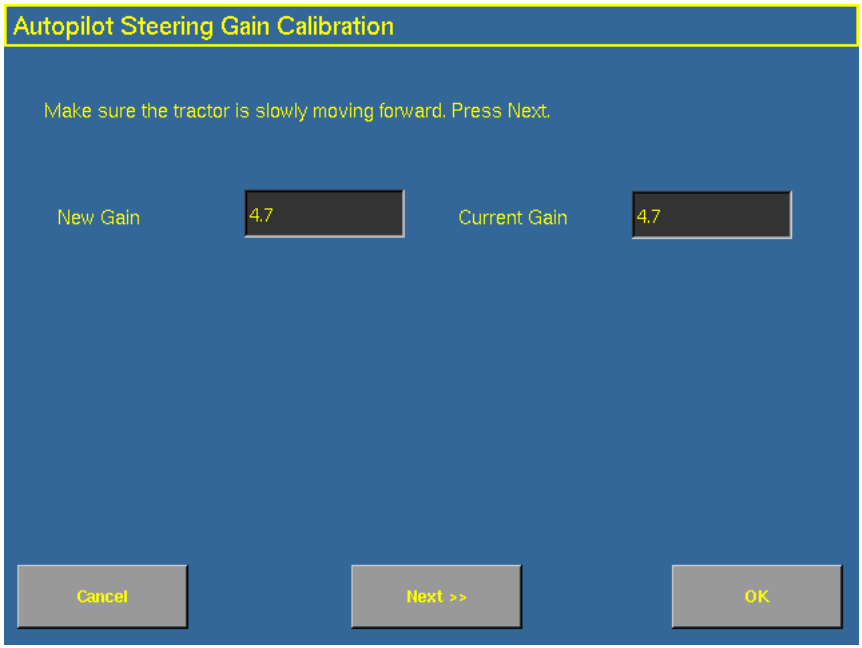
1. Select the Valve P-gain procedure from the calibration list. See Calibrating the AgGPS Autopilot system, page 72.

   The first *Autopilot Steering Gain Calibration* screen appears.



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

The third *Autopilot Steering Gain Calibration* screen appears.



CAUTION – The wheels can move abruptly during the Proportional Steering Gain procedure while the *Ag*GPS 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 the **Next** button.

   The fourth *Autopilot Steering Gain Calibration* screen appears.

5. Tap the **Next** button to continue.

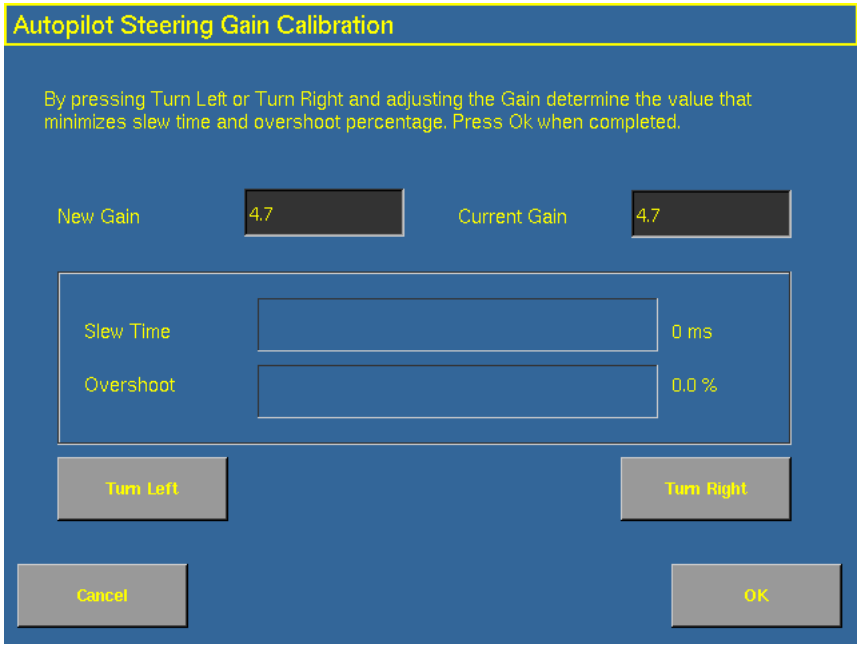
   The fifth *Autopilot Steering Gain Calibration* screen appears.

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 the **Turn Left** button. Both turn buttons are unavailable while the wheels slew.



Note – *The optimum gain setting has short slew time (short millisecond reading) and low overshoot percentage (less than 7%).*

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

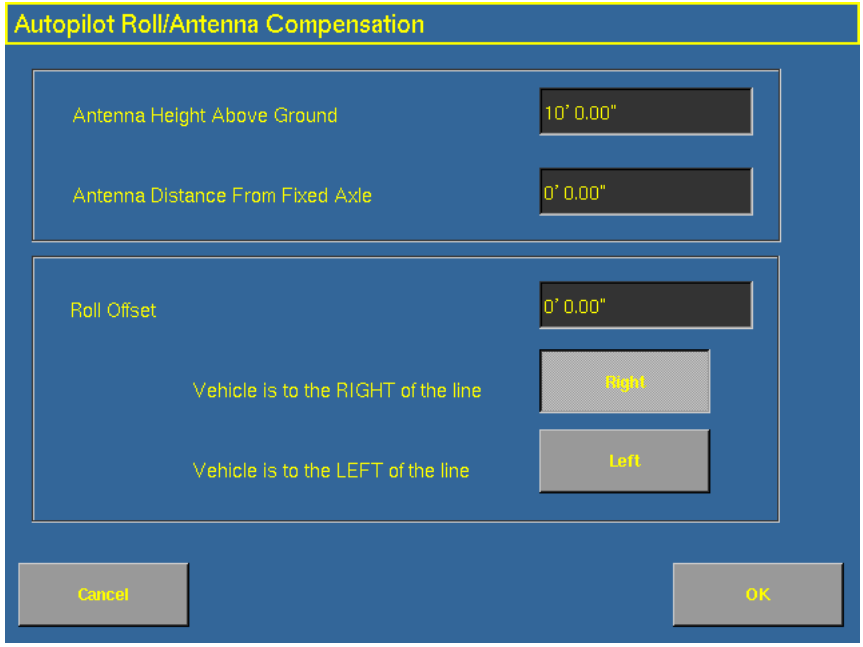
   Note – *The optimum gain setting has a short slew time (short millisecond reading) and a low overshoot percentage (less than 7%).*

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

Configuring the antenna position and roll offset correction

1. Select *Roll/Antenna Correction* from the calibration list. See page 72.

   The *Autopilot Roll/Antenna Compensation* screen appears.



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 *Ag*GPS Autopilot system is completely set up
  - the Autopilot software is properly configured
  - the correct GPS corrections are enabled

  before you can configure the Antenna Compensation procedure. Read this section carefully before you attempt the configuration.
- 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 402 m (1320 ft) in length.
3. Reset the roll offset value to 0 (zero).
4. Create an AB Line. You do not have to store the job file.
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 *Ag*GPS 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. At the end 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 in inches. Also note whether the return pass is to the left or the right of the original pass. Record the results in Table 5.1 on page 101.

    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 5.1 on page 101 to record the offset distance in inches and the left or right direction of offset for each test run.

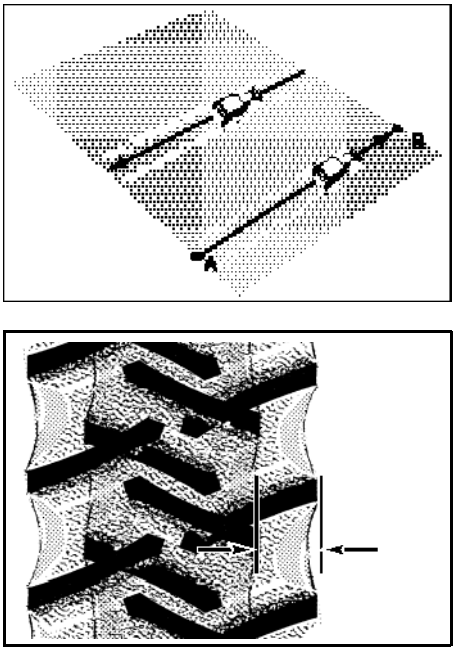


Figure 5.3 Right offset shown

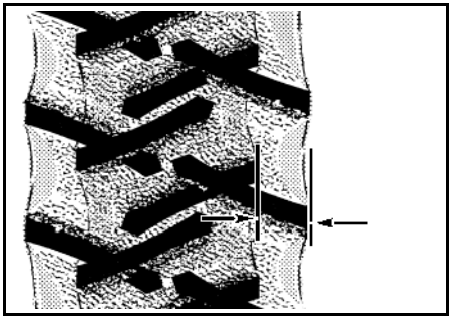
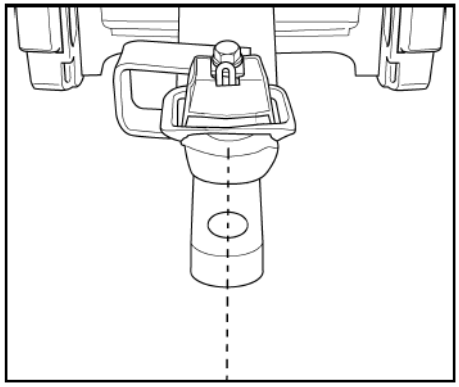


Figure 5.4 Left offset shown

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 402 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 96.
4. Create an AB Line. (You do not have to store the job file).
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 ***in inches***. Also record whether the return pass is to the left or the right of the original pass. Record the results in Table 5.1 on page 101.

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

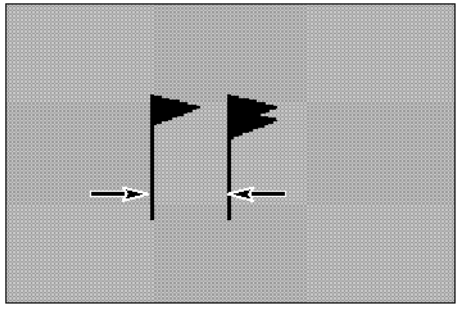


Figure 5.5 Right offset: Measure the distance between the flags

11. Repeat Steps 5 to 10 two more times for a total of three test runs. Use Table 5.1 on page 101 to record the offset distance in ***inches*** 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 5.1 Table for recording the roll correction results

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

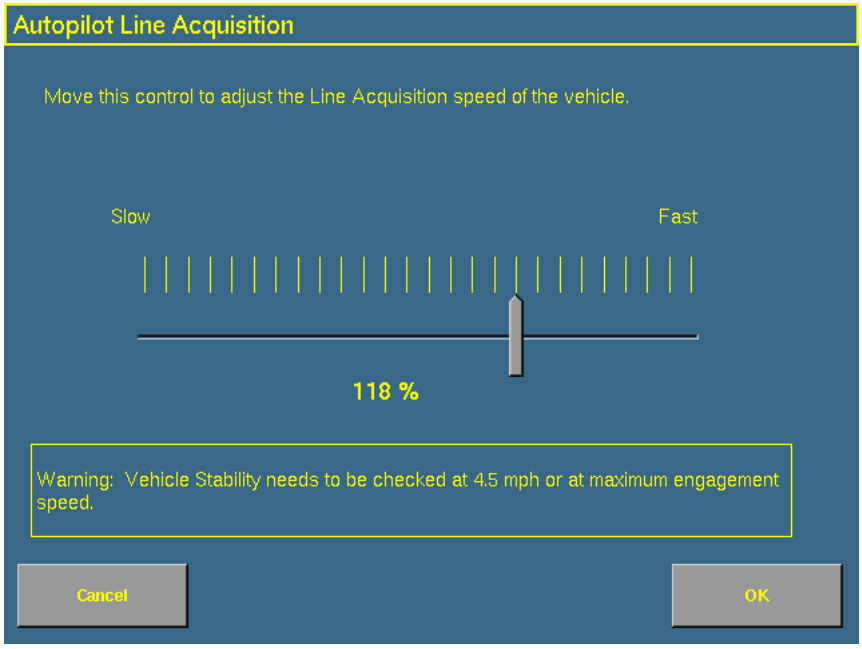
Entering the roll offset

1. Enter the average offset value in the *Roll Offset* field. See Configuring the antenna position and roll offset correction, page 94.
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 72.

   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.*

Tracked tractor calibration

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 74).

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.

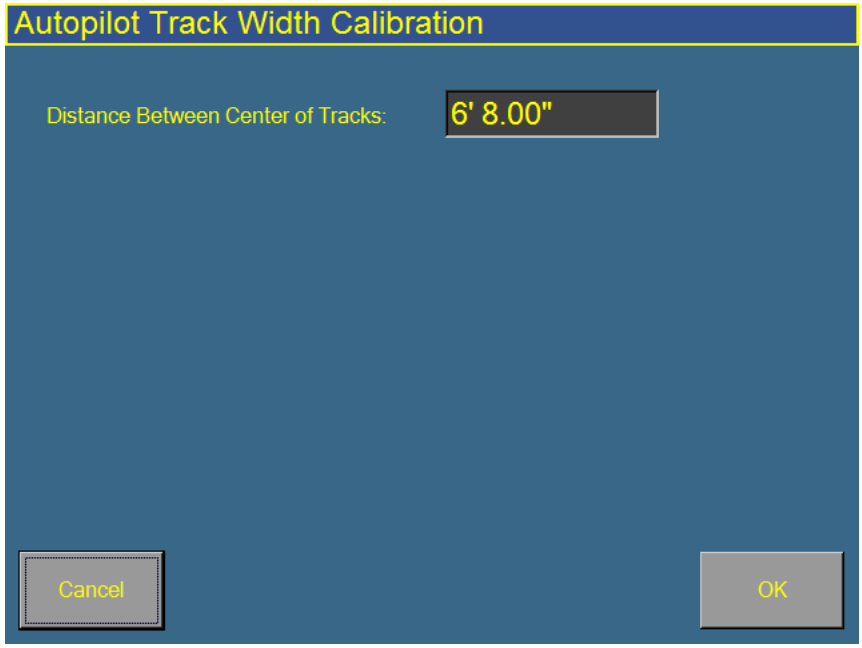


Figure 5.6 Track Spacing calibration screen

Hydraulically-steered tracked tractors

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.

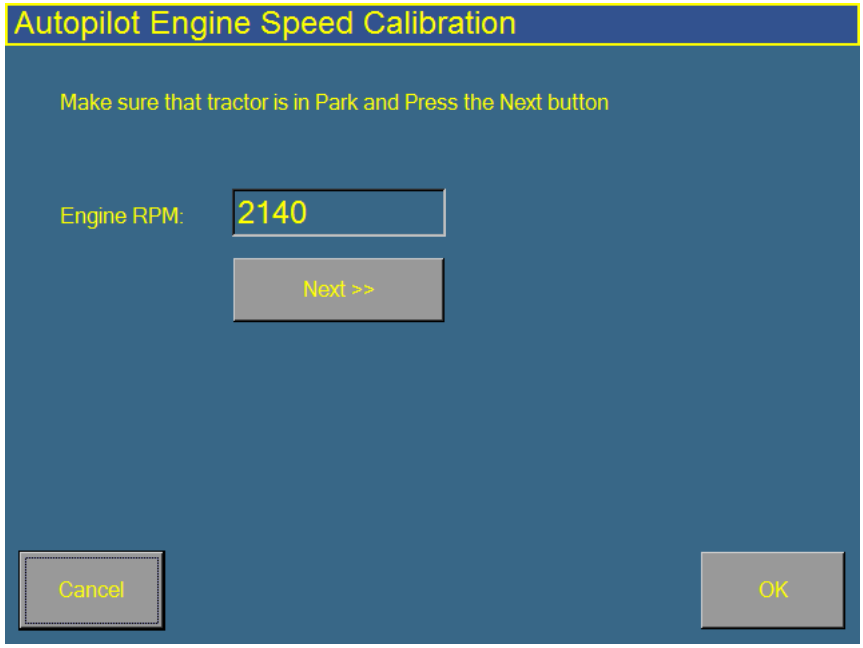


Figure 5.7 Engine speed calibration screen

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.

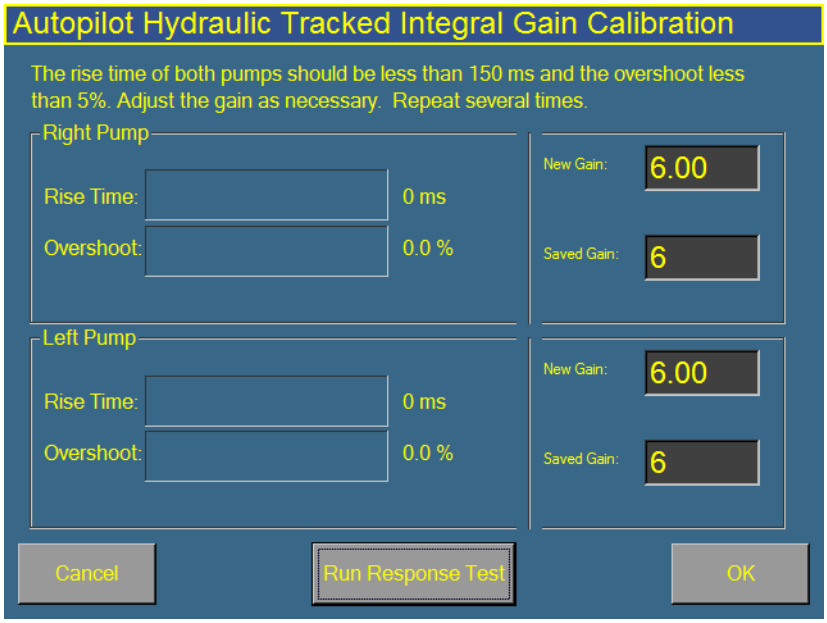


Figure 5.8 Pump Response calibration screen

Autopilot Hydraulic Tracked Pump Knees Calibration screen

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

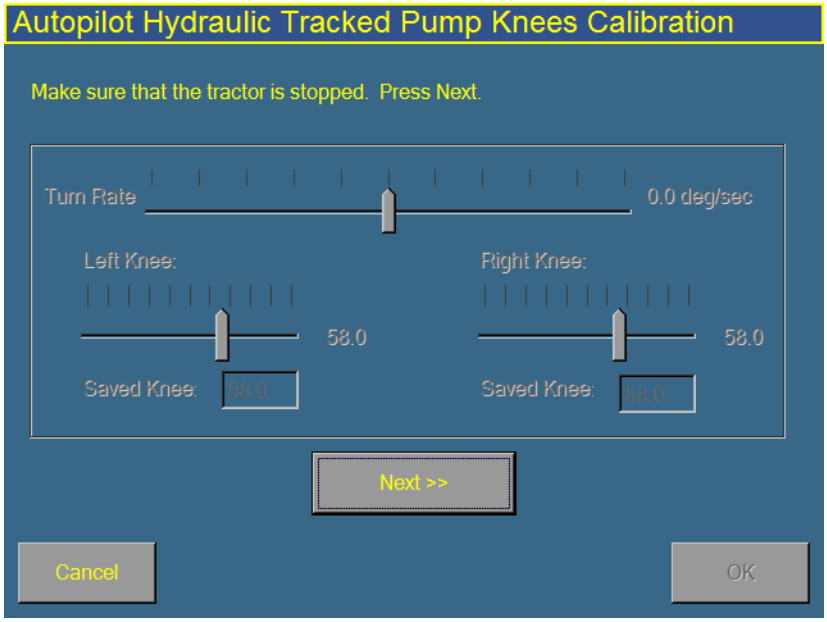


Figure 5.9 Pump Knee calibration screen

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.

Fly-by-wire tracked tractor calibration

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.

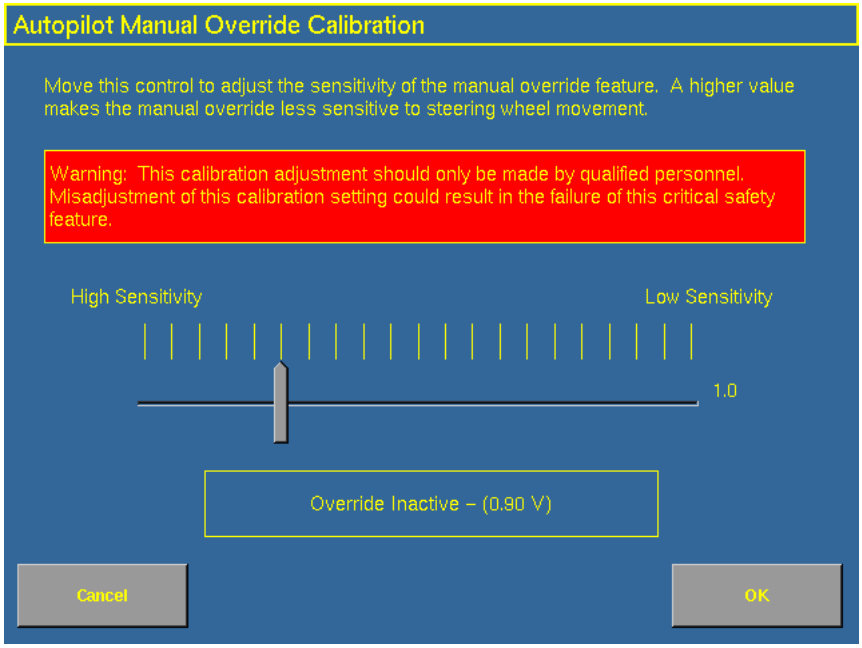


Figure 5.10 Manual Override calibration screen

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.

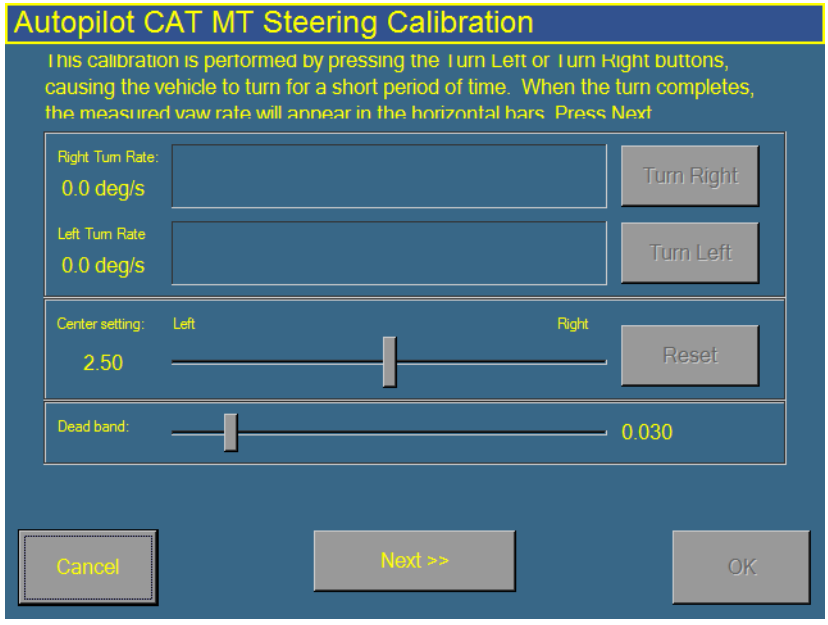


Figure 5.11 Steering center bias calibration screen

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.

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 5.12 shows the wiring for connecting an external boom switch to the system.

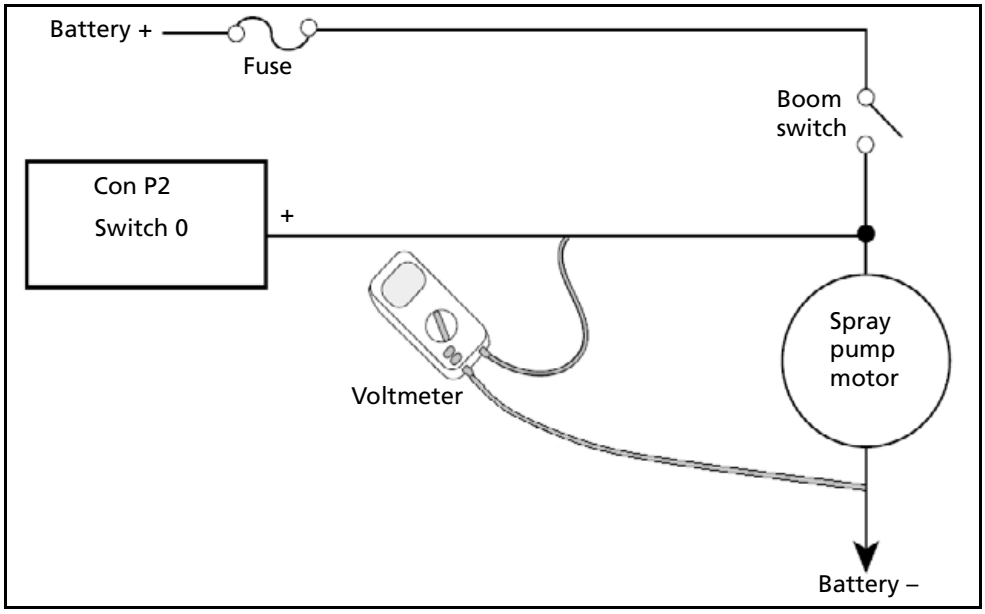


Figure 5.12 External boom switch connection

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 5.13 shows the wiring for connecting an external pressure switch to the system.

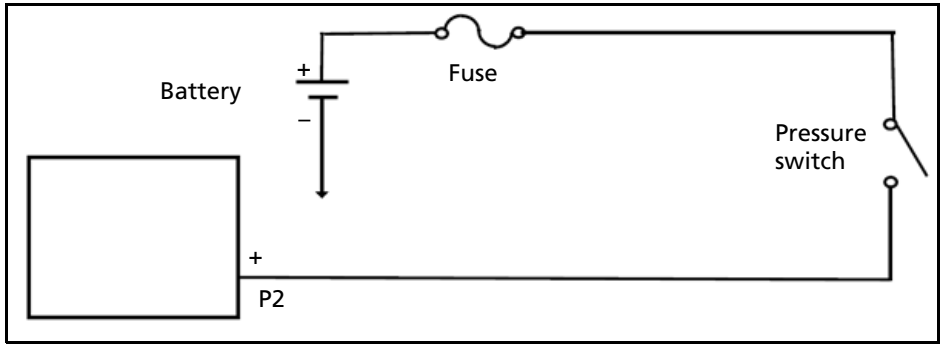


Figure 5.13 External pressure switch connections

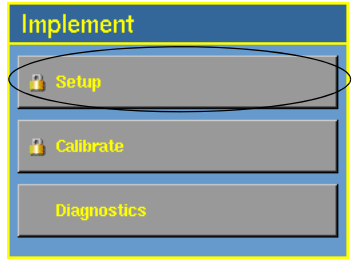
Enable the external switch

To enable the external switch:

1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.

   The *Implement Setup* screen appears.

2. Tap the **Remote Logging Off** button so it changes to **Remote Logging 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.*

Using the virtual AgRemote interface

The display includes a virtual AgRemote interface for manually adjusting the receiver settings. This is recommended for advanced users only.

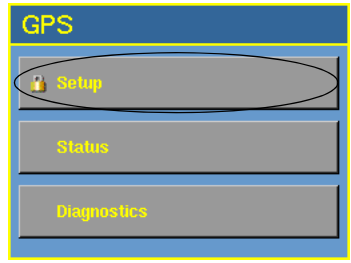
To access the virtual AgRemote interface:

1. From the *Configuration* screen, tap the **Setup** button in the *GPS* group.

   The *Autopilot GPS Receiver settings* screen appears.

2. Tap the **AgRemote** button.

   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.

*Ag*GPS Autoseed fast restart technology

*Ag*GPS 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 *Ag*GPS Autoseed technology:

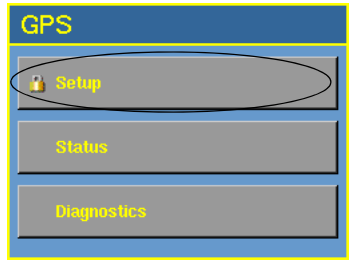
- you must have an *Ag*GPS 252 or 332 GPS receiver
- you must use OmniSTAR HP or XP corrections
- the receiver must be shut down
- the vehicle must not be moved before you turn the receiver on again
- the GPS receiver must have a clear view of the sky

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

To enable the *Ag*GPS Autoseed technology:

1. From the *Configuration* screen, tap the **Setup** button in the *GPS* group.

   The *Autopilot GPS Receiver settings* screen appears.



2. Ensure that *Ag*GPS 252/332 is selected.
3. In the Corrections list, select either OmniSTAR HP/XP or OmniSTAR HP/XP-VBS.

   The **Autoseed** button becomes available.
4. Select the **Autoseed** button and then tap **OK**.

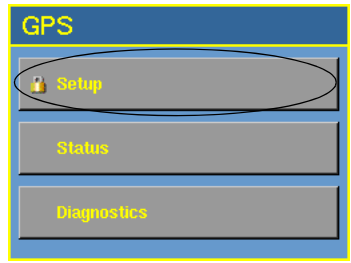
Configuring NMEA message output

The NMEA message formats are a standard format through which GPS receivers can communicate. If you have an external device connected to the *Ag*GPS Autopilot controller, you can enable NMEA messages to allow the device to receive NMEA GPS positions.

To enable NMEA messages:

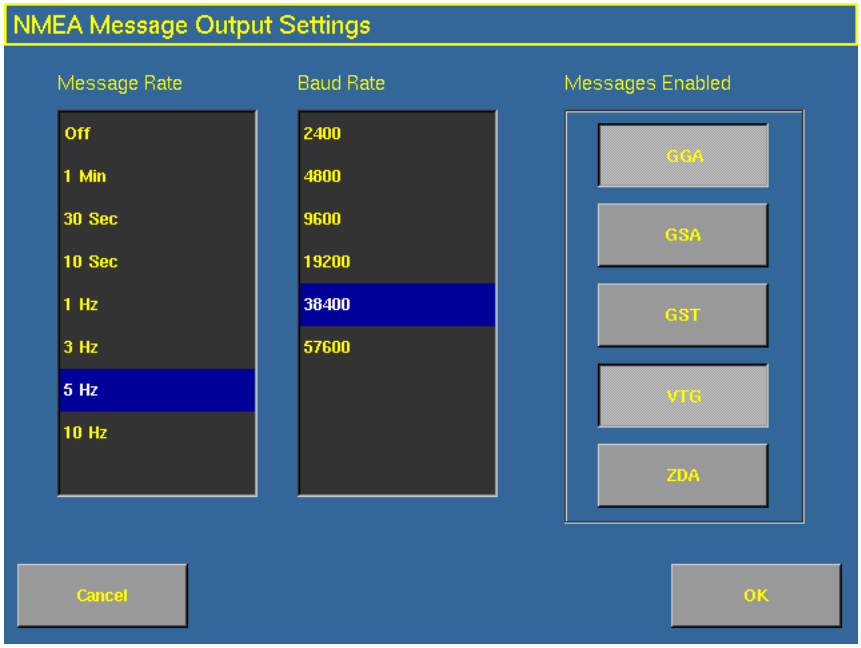
1. From the *Configuration* screen, tap the **Setup** button in the *GPS* group.

   The *Autopilot GPS Receiver settings* screen appears.



2. Tap the **NMEA Output** button.

   The *NMEA Message Output Settings* screen appears.



3. Select the appropriate Message Rate and Baud Rate settings.
4. In the Messages Enabled group, select the appropriate NMEA message types to output.
5. Tap the **OK** button to continue.

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 32*.

1. Do one of the following:
   - If you have not entered the password during the current session, from the *Configuration* screen tap one of the **Setup** or **Calibrate** buttons.
   - If you have already entered the password during this session, press the Home button and then tap the **Lock Configuration** button. On the *Configuration* screen tap one of the **Setup** or **Calibrate** buttons.

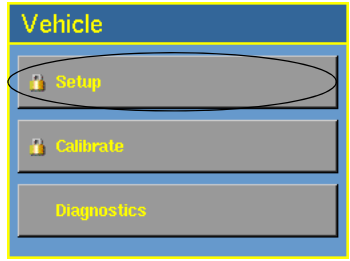
   The *Enter Administration Password* screen appears.
2. Enter an ***incorrect*** password.

   The *Wrong Password* screen appears.
3. Tap the **Enter Master Password** button.
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.

Saving the vehicle configuration



1. From the *Configuration* screen, tap the **Setup** button in the *Vehicle* group.

   The *Edit Vehicle* screen appears.

2. Tap the **Save Vehicle to File** button.

   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:

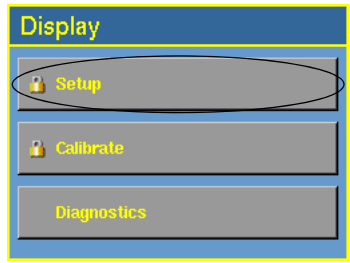
   File Download Complete.

Saving or restoring the display settings

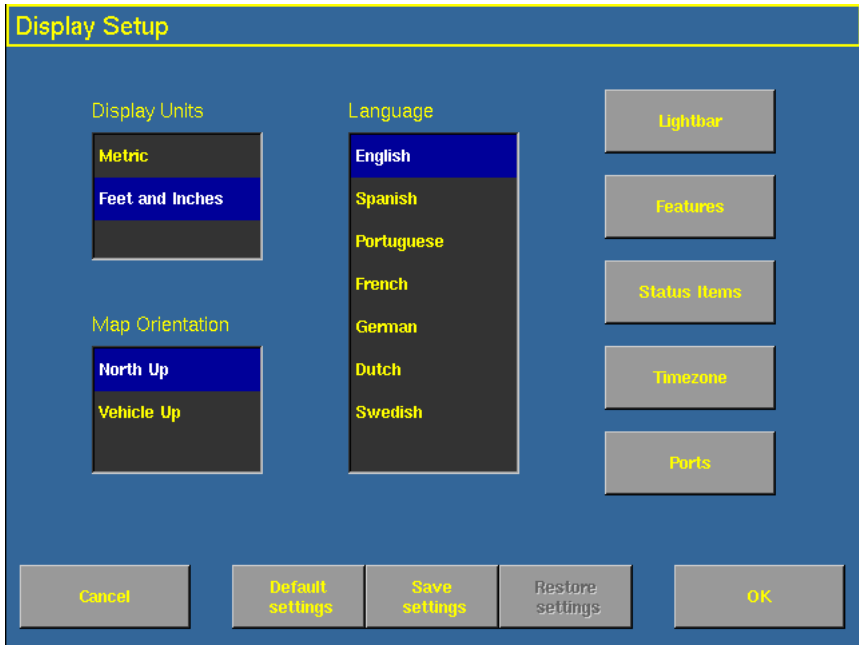
Note – *The FieldManager display saves only one settings file. When you save the current display settings, they overwrite any configuration that you previously saved.*

To save your current FieldManager display settings:

1. From the *Configuration* screen, tap the **Setup** button in the *Display* group.



   The *Display Setup* screen appears.



2. Do one of the following:
   - To save the current settings, tap the **Save settings** button.
   - To load a configuration that you previously saved, tap the **Restore settings** button.
   - To reload the default settings for the display, tap the **Default settings** button.

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. Inset the CompactFlash card into the second display.
3. Restore the settings on the second display (see above).

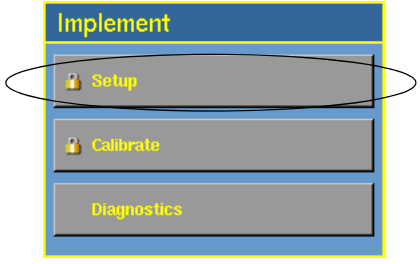
   For any additional displays, repeat Steps 2 and 3.

Enabling remote output

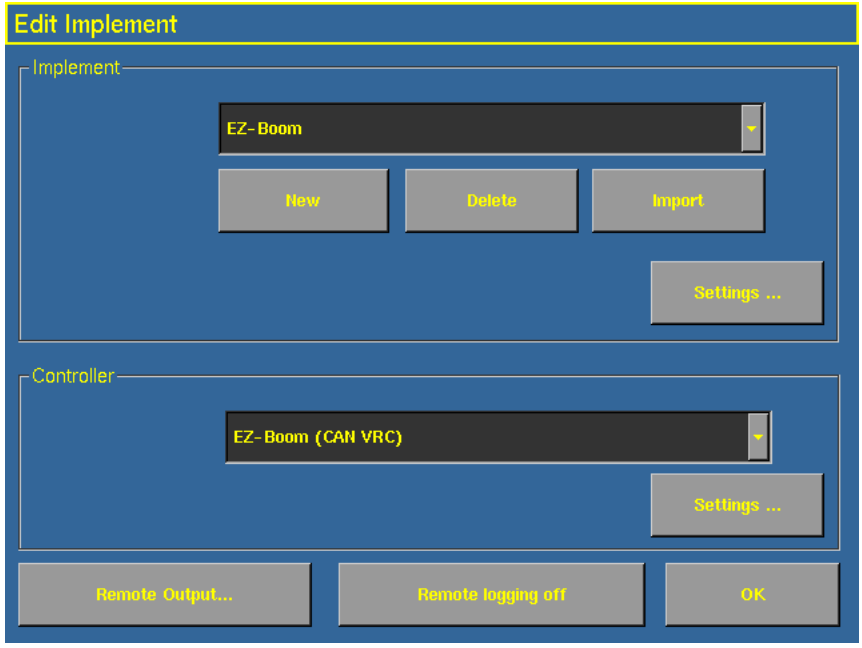
Note – *Pulse output only occurs when the vehicle is online and logging.*

To enable pulse remote output:

1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.



The *Edit Implement* screen appears.



2. Tap the **Remote Output...** button.
3. From the Pulse Remote Output drop-down list, select one of the following:
   - Time Based Pulse
   - Distance Based Pulse
   - Feature Signal
4. If you selected Time Based Pulse:
   a. Enter the pulse interval in seconds.
   b. Enter the pulse duration in milliseconds.

If you selected Distance Based Pulse:

a. Enter the distance in meters (or feet and inches) in the *Distance* field. The pulse will occur at each increment of this distance.

   Note – *The first pulse will occur at the A point. Pulse remote output is not recommended for Headland patterns.*

b. Enter the duration of the pulse in milliseconds (ms) in the *Duration* field.

c. Enter the distance in the *Within Distance* 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 will occur.

d. Enter the lead time for the pulse in the *Lead Time* 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.

If you selected Feature Signal, there are no options to set.

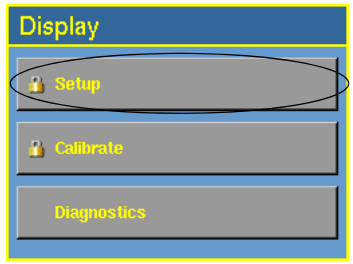
Note – *The pulse will only occur for area features where Remote Output is enabled. Each Feature must have Remote Output enabled individually.* *See Configure the field feature(s), page 40.*

Enabling remote sensor input

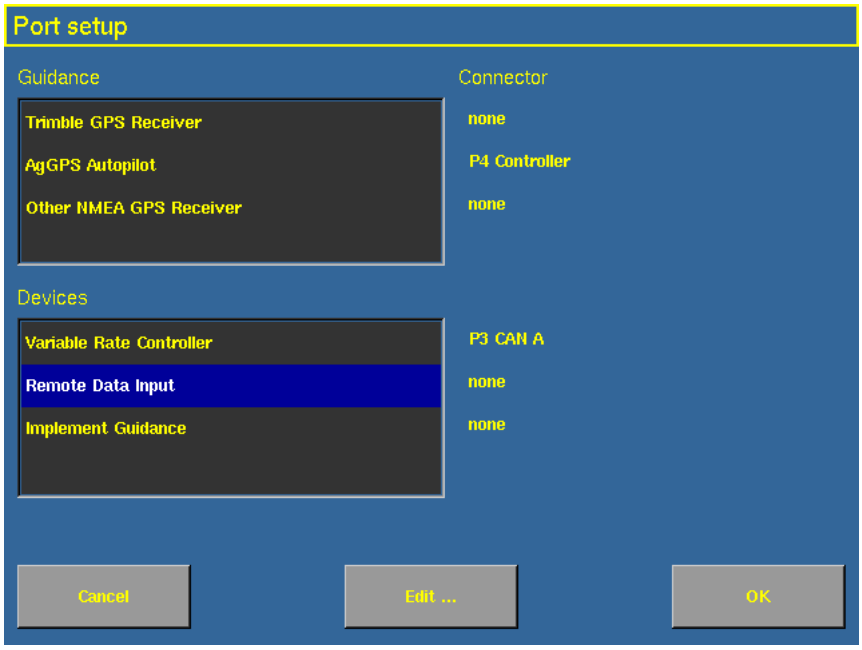
You can configure the FieldManager display to log data from a remote sensor input (for example, an infra-red sensor):

1. From the Configuration screen, tap the **Setup** button in the *Display* group.

   The *Display Setup* screen appears.

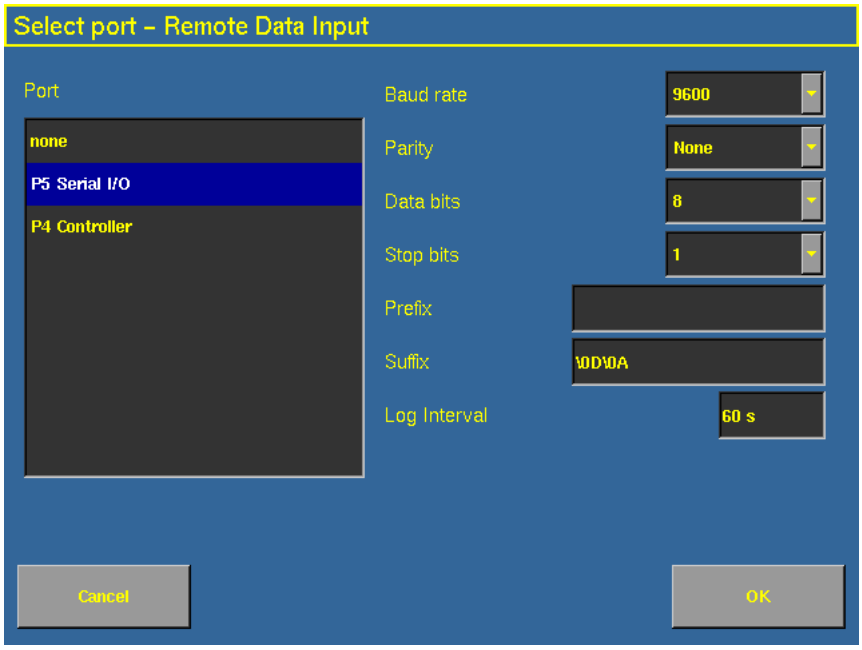


2. Tap the **Ports** button. The *Port setup* screen appears.



3. From the *Devices* list, select Remote Data Input.
4. Tap the **Edit...** button. The *Select Port - Remote Data Input* screen appears.

5. 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.

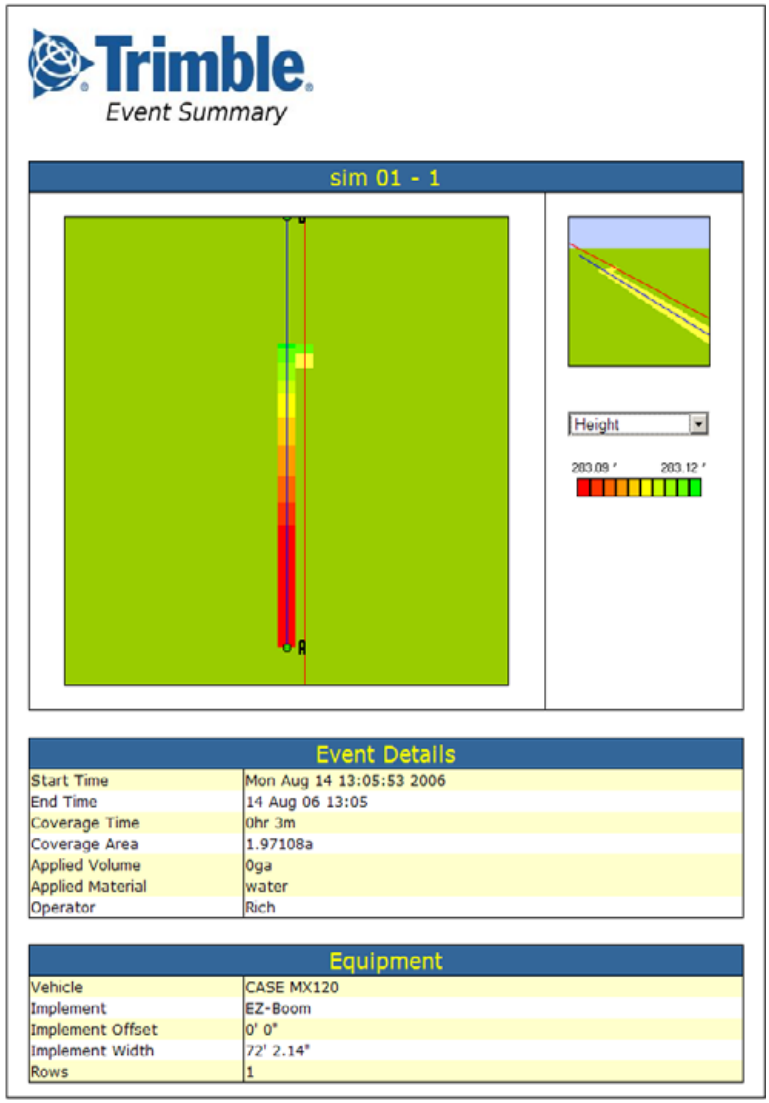


6. Set the following drop-down boxes to the settings at which the sensor outputs data:
   - Baud rate
   - Parity
   - Data bits
   - Stop bits
7. The *Prefix* and *Suffix* fields are the start and end points of the data you want to collect.
   - To log data from the start of the line, leave the *Prefix* field empty.

- To drop introductory characters, enter them in the *Prefix* field. For example, if you receive data that begins "$GPGGA...", enter "$GP" in the *Prefix* field. The logged data will begin "GGA..."
- To log to the end of the line, keep the default *Suffix* field ("\0D\0A").

Saving an HTML version of the current field

1. Press the Summary button. The Summary screen appears.
2. Press the **Save Summary** button. 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
- Height
- Applied rate
- GPS quality

The file also displays information about:

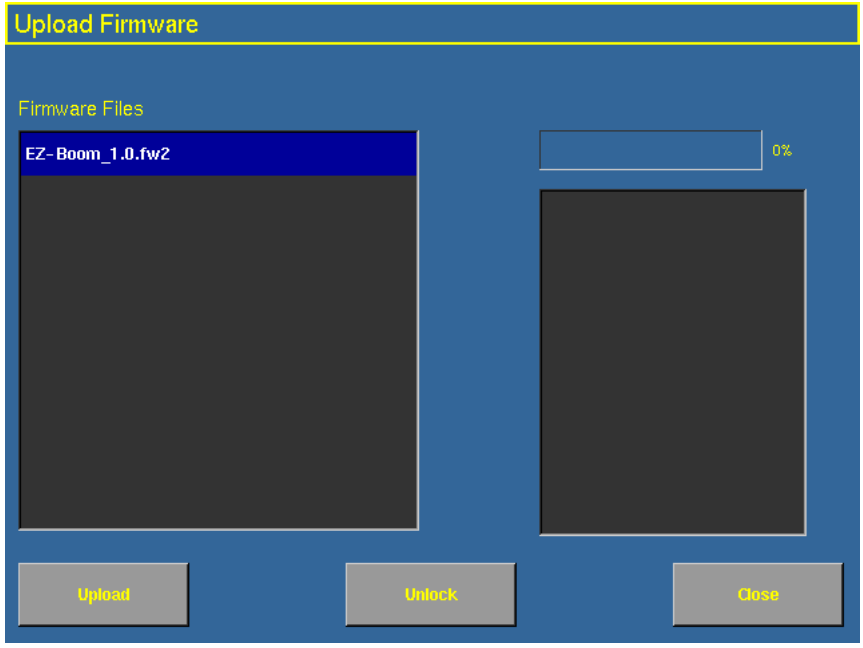
- The event
- the vehicle setup

Upgrading the EZ-Boom controller firmware

To upgrade the EZ-Boom controller 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 *Ag*GPS 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 the **Upgrade** button. The *Upload Firmware* screen appears.



Available firmware upgrade files appear in the *Firmware Files* list.

7. Tap the appropriate firmware file.
8. Tap the **Upload** button. System messages appear in the box on the right of the screen and progress is displayed on the progress bar.

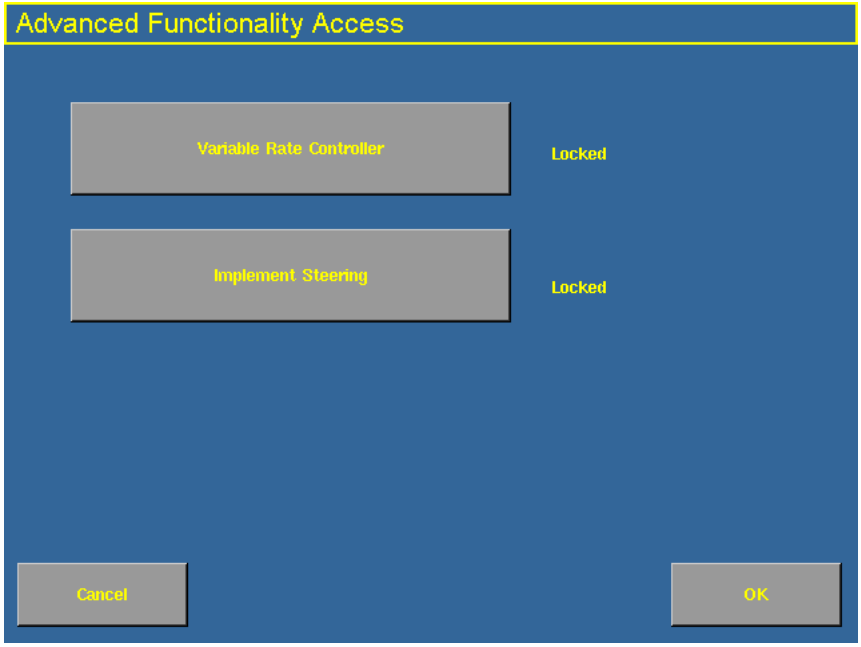
   The EZ-Boom firmware is updated.

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 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 the **Upgrade** button. The *Upload Firmware* screen appears.
3. Tap the **Unlock** button. 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.

CHAPTER

6

Steering Navigation

In this chapter:

This chapter describes how to perform steering navigation.

Starting a field

1. Tap the **Run** button.

   The *Field Selection* screen appears.

2. Select one of the following options:

   – Create a new client. See Starting to drive, page 60.

   – Select an existing client:

   Select the appropriate drop-down box and then select the client that you require.

   The *Farm* list now shows only the farms for 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 the **More** button.
7. Tap the **OK** button to enter the Run screen.

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

Selecting a swath pattern

The *Ag*GPS FieldManager display has four swath pattern types to provide guidance.

To select a swath pattern:

1. From the Run screen, tap the **Swaths AB** button.

   The *Swath Management* screen appears.

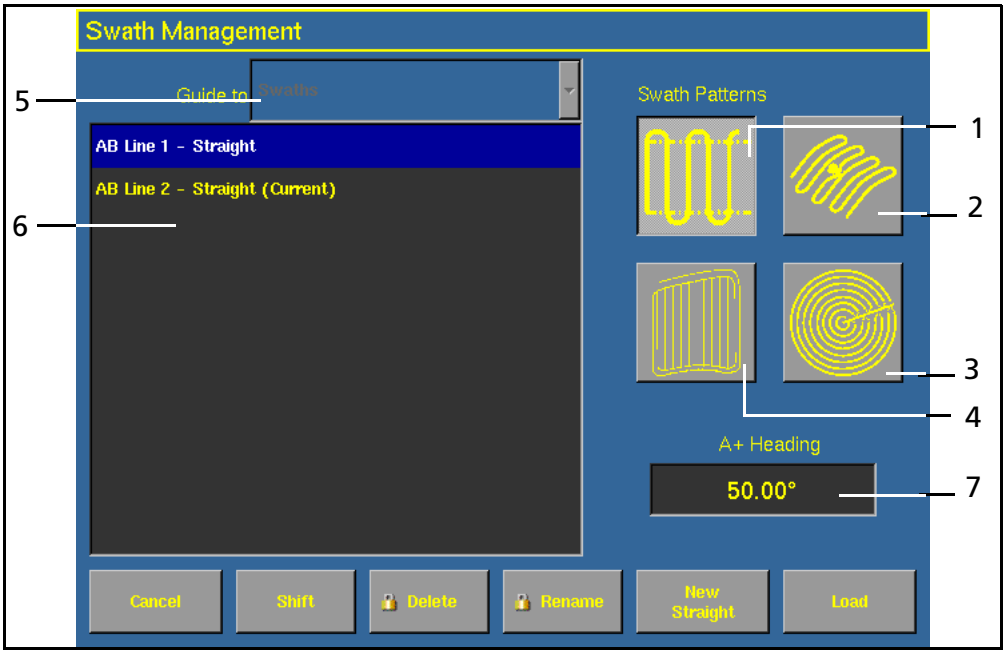


Figure 6.1 The *Swath Management* screen

Item	Description
1	AB Line pattern
2	Curve pattern
3	Pivot pattern
4	Headlands pattern
5	Swath or line guidance

Item	Description
6	Select previous swaths list
7	A+ Heading window

2. Tap the appropriate swath 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

To create a straight AB Line:

1. From the *Swath Management* screen, select the AB Line field pattern.
2. Tap the **New Straight** button.

   The Run screen appears.
3. To create the start point of the line, tap the **Set A** button.
4. Drive to the end of the line. The end (B) point must be at least 50 meters (160 feet) from the A point.
5. Tap the **Set B** button.

   The new AB Line appears on the screen.

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. 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.
3. Tap the **New Straight** button.

The Run screen appears.

4. Drive to a point on the line and then tap the **Set A** button.
5. Tap the **Use A+** button.

   The new A+ line appears.

Creating a curved line

1. From the *Swath Management* screen, tap the Curve field pattern.
2. Tap the **New Curve** button.

   The Run screen appears.
3. Drive to the start point of the curve and then tap the **Set A** button.
4. Drive the curve until you reach the end point and then tap the **Set B** button.

   The new curve appears.

Creating a headland

1. From the *Swath Management* screen, select the Headlands field pattern.
2. In the *# Headlands* window, enter the number of headlands you wish to drive.
3. Tap the **New Headland** button.

   The Run screen appears.
4. Drive to the start point of the headland and then tap the **Record Headland** button.
5. When you get to the point where you want the A point, tap the **Set A** button.

6. When you get to the point where you want the B point, tap the **Set B** button. This AB Line will be used for the infill swaths after you have completed the selected number of headland swaths.
7. When there is a straight distance from the last point you set back to the beginning of the headland, tap the **Headland Complete** button.

   The new headland appears.

Creating a pivot

1. From the *Swath Management* screen, tap the Pivot field pattern.
2. Tap the **New Pivot** button.

   The Run screen appears.
3. Drive to a point on the outermost rut of the pivot and then tap the **Set A** button.
4. Follow the pivot rut around to the end and then tap the **Set B** button.

   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 the **Swaths Pivot** button.

   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 Map button

When you create a line in a curve or headland field, the **Map** button is available. The **Map** button allows 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 (depress) the **Map** button, the line you are driving is mapped. When you deselect the **Map** button, the display stops directly mapping your path. Instead, a dotted line spans from the vehicle to the point where you deselected the **Map** button. When you select the button again, the line becomes solid and your path is mapped again.

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. Select the line from the list on the left of the screen.
3. Tap the **Load** button. 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. Changing to Summary screen.

Engaging automated steering

The **Engage** 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

When you have created a line, you can engage the *Ag*GPS Autopilot system to drive it.

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

To disengage the vehicle:

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

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

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.

Deleting a swath

To be able to delete swaths, you need to have entered the Administration password on the *Configuration* screen.

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 the **Delete** button.

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 on the *Configuration* screen.

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 the **Rename** button.

   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

To shift a swath:

1. From the *Swath Management* screen, select the swath to shift from the list on the left.

2. Tap the **Shift** button.

   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.*

6. Tap the **OK** button. The *Swath Management* screen appears.

   The new shifted swath appears in the swath list on the left of the screen.

Using the Guide to drop-down box

The Guide to drop-down box allows automated steering along a line feature or swath.

To use the Guide to drop-down box:

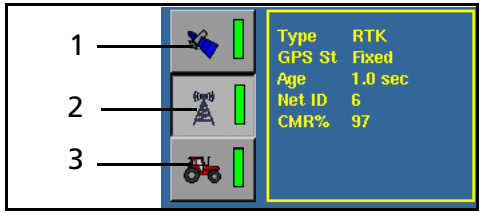
1. On the Run screen, create a line feature.
2. Tap the Swaths button.

   The *Swath Management* screen appears.
3. From the Guide to drop-down box, select:
   - *Swaths* for guidance along a swath.
   - *Features* for guidance along a line feature.
4. If you selected:
   - *Swaths*, select the appropriate swath from the list on the left and then tap **OK**. The list show the types and numbers of line features in the current field.
   - *Features*, guidance will automatically occur on the nearest feature. Tap **OK**.

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

Viewing GPS information on the Run screen

Three buttons in the top right of the Run screen provide information about GPS.



Item	Description
1	GPS
2	Corrections
3	Vehicle

Tap a button to view the information on it.

If the preset limit for Satellites, Correction Age, or Horizontal GPS Accuracy is reached, the relevant button starts to flash.

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 this information:

1. Tap the **Change Implement** button. The *Edit Implement* screen appears.
2. To select from predefined implements, select the *Implement* drop-down boxes.

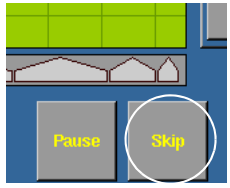
   For more information, see Configuring an implement, page 51.

Using Skip to fine-tune navigation

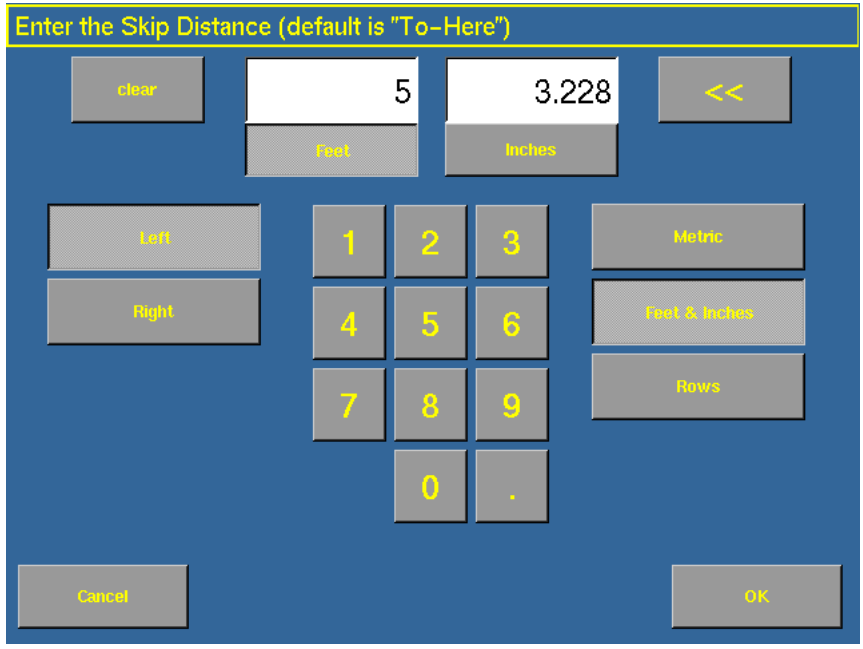
The software uses the original swath that you have driven to automatically generate the position of the other swaths. Occasionally, these new onscreen swaths do not perfectly reflect where your swaths are. For example, you might need to skip to the other side of a road.

To correct the spacing of the automatically generated swaths in a field, use the Skip function. When the swaths are generated:

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



The *Enter the Skip Distance* screen appears.



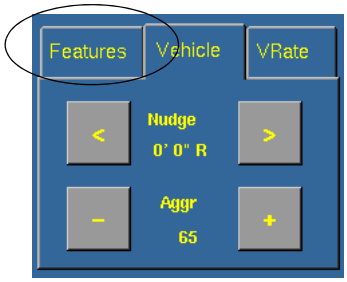
2. Enter the Skip distance and then tap **OK**. The guidance line moves the required amount. The default is your current position.

Placing field features on screen

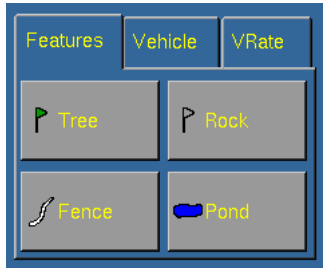
For a description of field features and how to configure the field feature buttons, see Configure the field feature(s), page 40.

To add a field feature to the map:

1. If it is not already selected, select the *Features* tab on the Run screen.



The *Features* tab, showing the features that you have defined, appears.



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.*

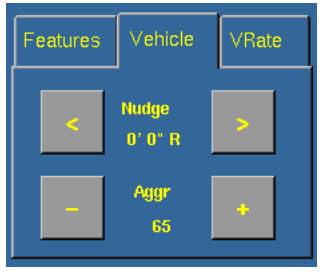
Adjusting the Aggressiveness setting

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 *Vehicle* tab.



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

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

Pausing guidance

You can pause guidance and return to your position later.

- To pause guidance, from the Run screen tap the **Pause** button. See Figure 2.2 on page 7.

  A vehicle 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 the **Resume** button.

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.

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 (See Figure 2.2 on page 7) as a solid yellow area (or as a gray area if you have overlapped and covered an area twice).

To activate coverage logging, press the ON button on the Run screen so it changes from gray to green (if the button is red, see page 136). Press the OFF button to stop it again.

CHAPTER

7

Variable Rate Controllers

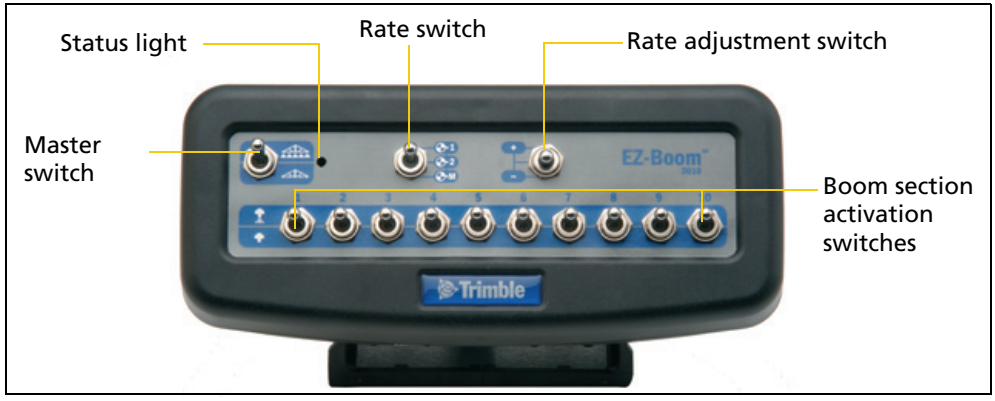
In this chapter:

The *Ag*GPS FieldManager display supports a number of variable rate controllers, including the *Ag*GPS EZ-Boom™ 2010 automated application control system. This chapter describes how to connect and use variable rate controllers with the FieldManager display.

*Ag*GPS EZ-Boom 2010 automated application control system

The *Ag*GPS EZ-Boom® 2010 automated application control system is a variable rate and automated boom switch controller. It enables you to control application rate sprayers, both on self-propelled vehicles or on towed sprayers.

This figure shows the front panel of the EZ-Boom controller:



Note – *To unlock an EZ-Boom controller for use, see* *Unlocking additional devices, page 127**.*

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 Manger display:

1. Connect the FieldManager display, see Installing the display, page 22.
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.*

Configuring the EZ-Boom system

To use the EZ-Boom controller to operate a spray boom:

1. Select the port for the variable rate controller.
2. Configure the spray boom in the FieldManager display.
3. Enable the EZ-Boom controller in the FieldManager display.
4. Calibrate the valve.
5. Calibrate the flow meter.
6. Calibrate the pressure sensor.

These steps are described in greater detail below.

Step 1: Selecting the port for the variable rate controller

1. From the *Configuration* screen, tap the **Setup** button in the *Display* group. The *Display Setup* screen appears.
2. Tap the **Ports** button. The *Port setup* screen appears.
3. From the *Devices* list, select Variable Rate Controller.
4. Tap the **Edit ...** button.

   The *Select port - Variable Rate Controller* screen appears.
5. From the *Port* list, select P3 CAN A.

Step 2: Configuring the spray boom (in the FieldManager display)

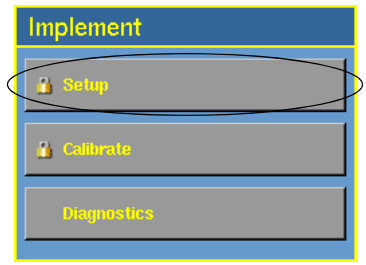
See Configuring an implement, page 51.

Step 3: Enabling the EZ-Boom controller (in the FieldManager display)

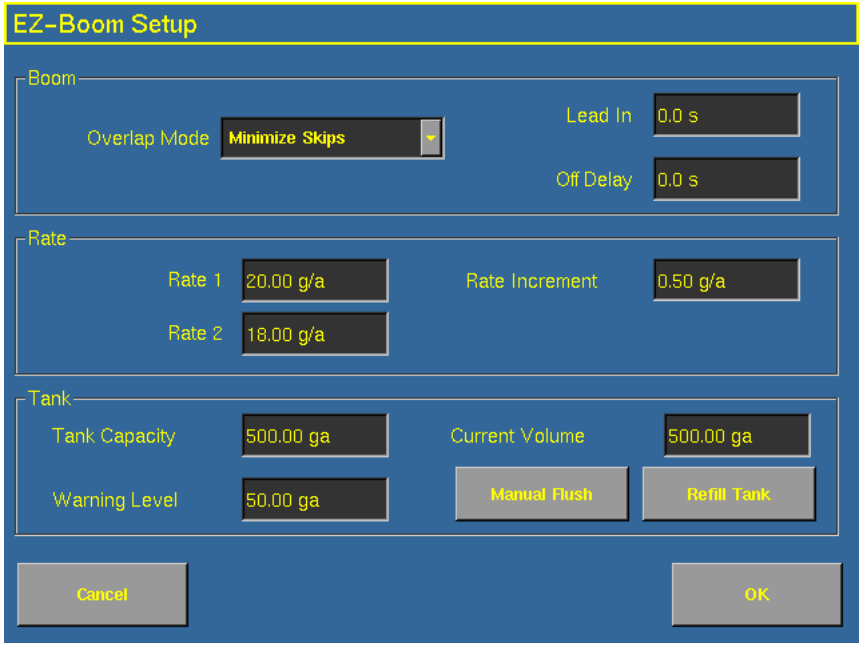
Note – *If you need to unlock the EZ-Boom controller for use, see* *Unlocking additional devices, page 127*.

1. From the FieldManager display *Configuration* screen, tap the **Setup** button in the *Implement* group.

   The *Edit Implement* screen appears.



2. From the *Controller* drop-down list, select EZ-Boom (CAN VRC).
3. Tap the **Settings...** button that is under the *Controller* drop-down list. The *EZ-Boom Setup* screen appears.



4. Select the overlap mode:

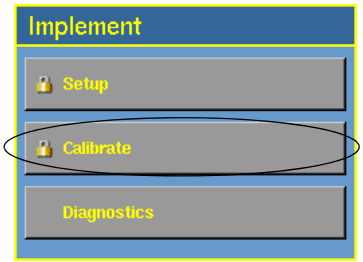
Item	Description
No boom switching	Boom switching is turned off.
Minimize skips	The system will make sure that the whole coverage area is covered.
Minimize overlaps	The system will try to avoid any coverage overlaps.

5. Enter the appropriate values in the eight text boxes:

Item	Description
Lead In	The boom sections will activate this many seconds before you reach an unsprayed area.
Off Delay	The boom sections will deactivate this many seconds after you leave an unsprayed area.
Rate 1 Rate 2	The EZ-Boom controller has a switch to select between two preset application rates (and manual rate). Use the Rate 1 and Rate 2 settings to control application rates. (g/a or L/Ha)
Rate Increment	The EZ-Boom controller Increment/Decrement switch enables you to increase or decrease the application rate by a set amount. Use the Rate Increment setting to select the amount of change (g/a or L/Ha).
Tank Capacity	The volume of the spray tank (g/a or L/Ha).
Warning Level	A warning message will pop up when the tank reaches this level.
Current Volume	The current volume of the spray tank (g/a or L/Ha).

Step 4: Calibrating the valve

1. From the FieldManager display *Configuration* screen, tap the **Calibrate** button in the *Implement* group.



   The *Implement Calibration* screen appears. It has a list with three options:

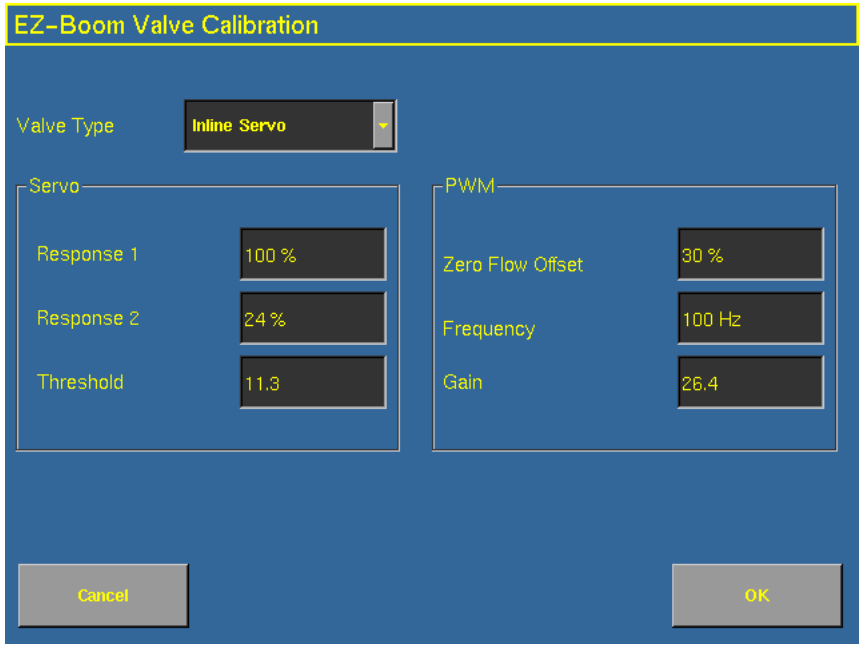
   – Valve Calibration

   – Flow Calibration

   – Pressure Calibration

2. Tap *Valve Calibration*.

   The *EZ-Boom Valve Calibration* screen appears.



3. Select the valve type from the drop-down list:
   - Inline Servo
   - Bypass Servo
   - Pump PWM
   - Pump Servo
   - 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 *Valve Response 1* to *Valve Response 2.*

If you selected Pump PWM, 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.

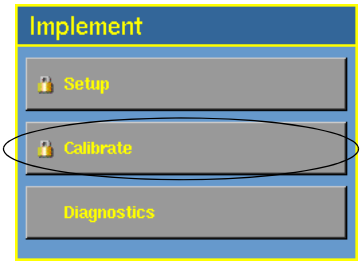
Step 5: Calibrating the flow meter

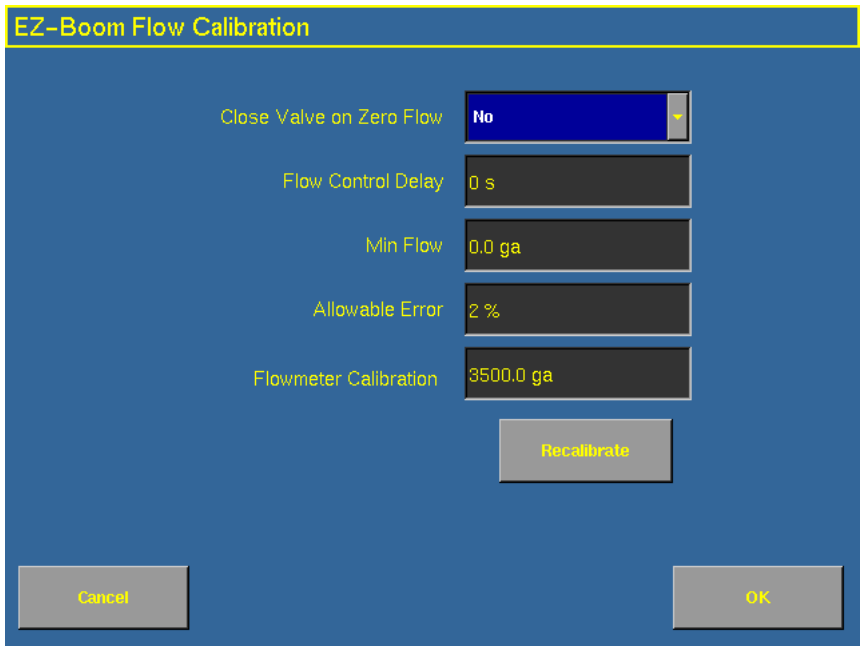
1. From the *Configuration* screen, tap the **Calibrate** button in the *Implement* group.

   The *Implement Calibration* screen appears.

2. Tap *Flow Calibration*.

   The *EZ-Boom Flow Calibration* screen appears.





3. 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.

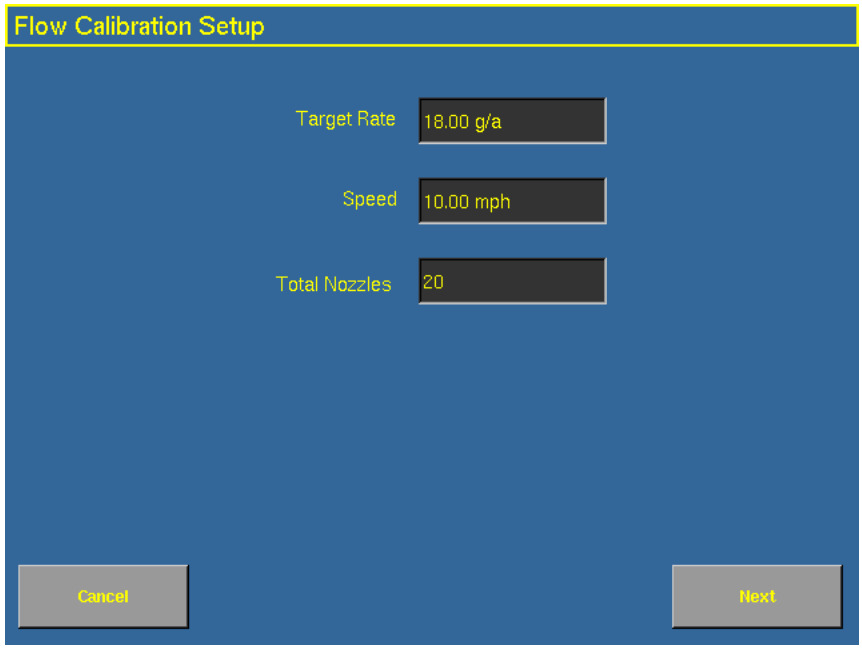
4. Enter values in the four text boxes:

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	– 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.

5. To run the flowmeter calibration, tap the **Recalibrate** button.

The *Flow Calibration Setup* screen appears.



a. Set the *Target Rate* field to your normal operating rate.

b. Set the *Speed* field to your normal operating speed.

c. 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. (For a description of what fence nozzles are, see Configuring an implement, page 51.)

d. Tap the **Next** button. The *Flow Calibration Test* screen appears.

e. 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.

f. Tap the **Start Flow** button to begin the test.

g. 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.*

h. After one minute has passed, stop collecting. Tap the **Stop Flow** button.

i. Tap the **Next** button. The **Flow Calibration Result** screen appears.

j. Tap the Measured Flow/Nozzle text box. The *Enter Measured Flow/Nozzle for Calibration* screen appears.

k. Select the units and then enter the volume that you have collected.

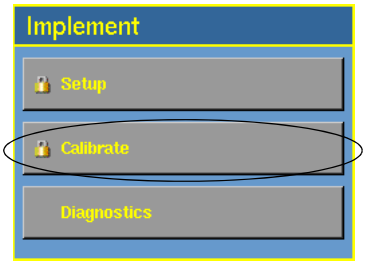
l. Tap the **OK** button.

m. Tap **OK** again.

Step 6: Calibrating the pressure sensor

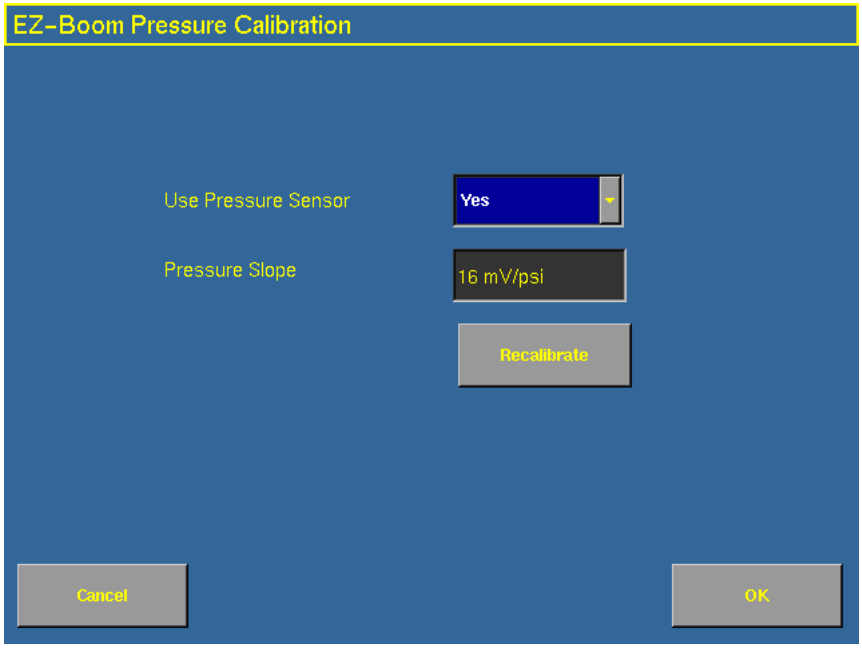
1. From the FieldManager display *Configuration* screen, tap the **Calibrate** button in the *Implement* group.

   The *Implement Calibration* screen appears.



2. Tap *Pressure Calibration*.

   The *EZ-Boom Pressure Calibration* screen appears.



3. Set the *Use Pressure Sensor* drop-down list:

   – If your system does not have a pressure sensor, select No. The pressure sensor calibration is complete.

   – If your system has a pressure sensor, select Yes.

If you selected Yes, the *Pressure Slope* field and the **Recalibrate** button become available.

4. Tap the *Pressure Slope* text box 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. Tap the **Recalibrate** button to run the pressure calibration sequence. The *EZ-Boom Pressure Calibration* screen appears. See below.

Pressure calibration sequence

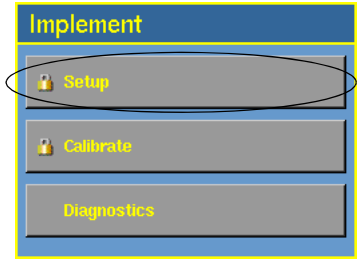
1. Read the pressure off the pressure gauge.
2. Enter the pressure value in the *Actual Pressure* text box.
3. Tap the **Send Calibration** button. The screen updates to show the current pressure.
4. Tap **OK**.

Other features of the EZ-Boom system

Manual flush

1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.

   The *Edit Implement* screen appears.



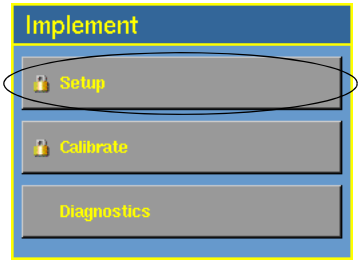
2. Tap the **Settings ...** button in the Controller group.

   The *EZ-Boom Setup* screen appears.
3. To manually flush the tank, tap the **Manual Flush** button.

The display will connect to the EZ-Boom controller. The tank will flush until it is empty, or you press **OK**.

Refill tank

When you refill the tank, set the tank volume to full:



1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.

   The *Edit Implement* screen appears.

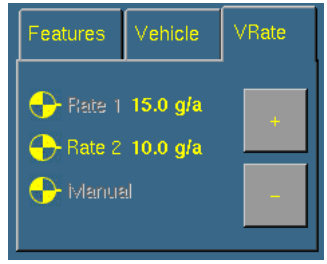
2. Tap the **Settings ...** button in the Controller group.

   The *EZ-Boom Setup* screen appears.

3. To set the tank volume to full, tap the **Refill Tank** button.

   The *Current Volume* value will increase to match the *Tank Capacity* value.

VRate tab



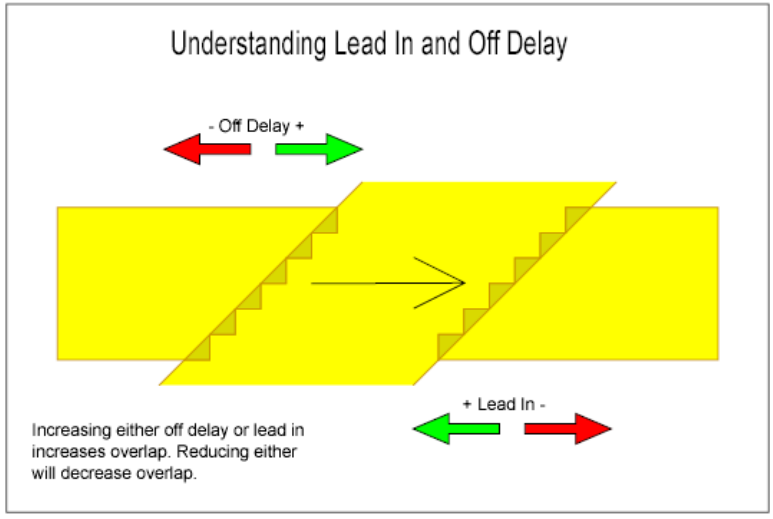
The *VRate* tab is located on the Run screen. It shows your Rate 1, Rate 2, and Manual rates. The rate that is currently active is animated.

The **+** and **–** buttons on the *VRate* 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.

Compensating for sprayer delays (Lead In and Off Delay)

When you set the EZ-Boom system to automatically start and stop the boom sections (“auto boom-switching”), the coverage map displays the current state of the boom sections. Because there can be delays between the time when spraying is started and the time when the sprayer actually begins spraying, the coverage map may not exactly reflect the actual coverage on the ground.

The EZ-Boom system has two settings that take into account the delays in the system:



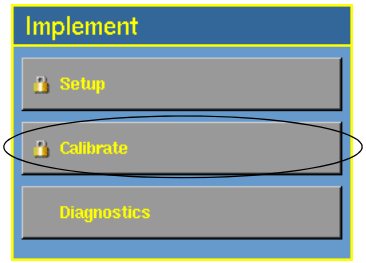
Item	Description
Lead In	This is the number of seconds before leaving a sprayed area and entering an unsprayed area that the boom sections will turn on.
Off Delay	This represents the number of seconds after you enter a sprayed area before the boom sections turn off.

Disabling variable rate control

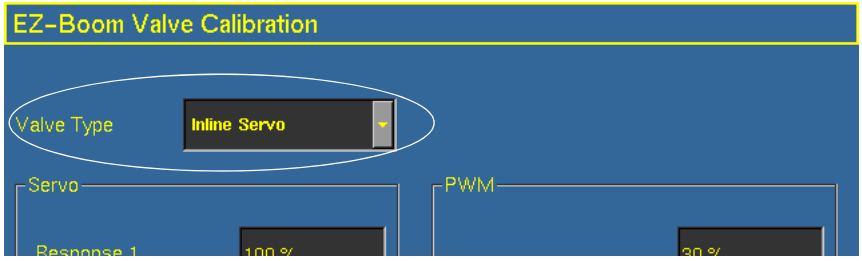
To disable the variable rate control of the EZ-Boom system (and just use the automatic boom-switching function):

1. From the FieldManager display *Configuration* screen, tap the **Calibrate** button in the *Implement* group.

   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.



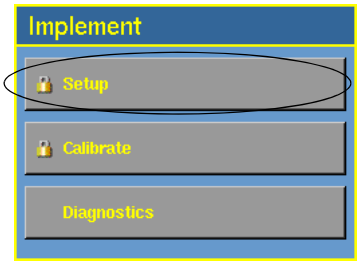
4. Tap **OK**.

Disabling boom switching

To disable automatic boom switching for the EZ-Boom system:

1. From the FieldManager display *Configuration* screen, tap the **Setup** button in the *Implement* group.

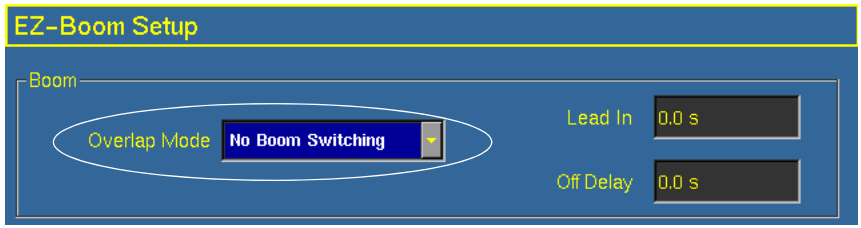
   The *Edit Implement* screen appears.



2. Tap the **Settings ...** button (in the Controller group).

   The *EZ-Boom Setup* screen appears.

3. Set the *Overlap Mode* drop-down menu to No Boom Switching.



4. Tap **OK**.

Automatic boom switching is disabled. You can now manually control the boom sections.

Non-Trimble variable rate controllers

The *Ag*GPS FieldManager display supports the following non-Trimble variable rate controllers:

- Mid-Tech: TASC 6000, 6100, 6200, 6300, 6500, 6600
- 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
- DICKEY-john PCS, Land Manager I and Land Manager II
- TeeJet 844 and 855

The *Ag*GPS 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. Select the port for the variable rate controller.
3. Configure the spray boom in the FieldManager display.
4. Enable and configure the variable rate controller in the FieldManager display.
5. Configure the variable rate controller.
6. 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.

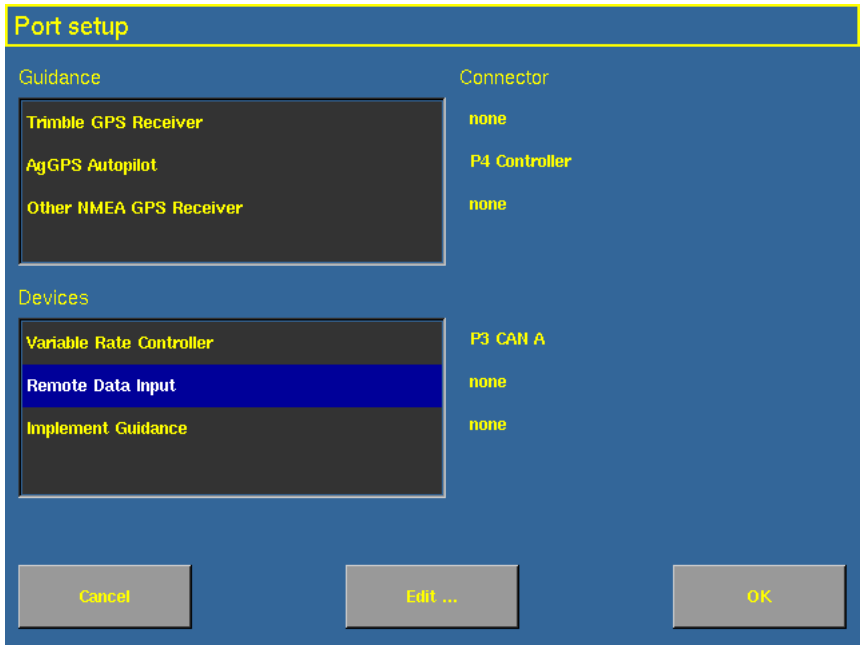
To use a variable rate controller you need to connect it to P5–Serial on the Autopilot harness. Your controller may need a special adaptor cable to work correctly. If so, see your local Trimble reseller.

Most controllers will also need to be configured to accept input data from the *Ag*GPS 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. Selecting the port for the variable rate controller

1. From the *Configuration* screen, tap the **Setup** button in the *Display* group. The *Display Setup* screen appears.
2. Tap the **Ports** button. The *Port setup* screen appears.



3. From the *Devices* list, select Variable Rate Controller.
4. Tap the **Edit ...** button.

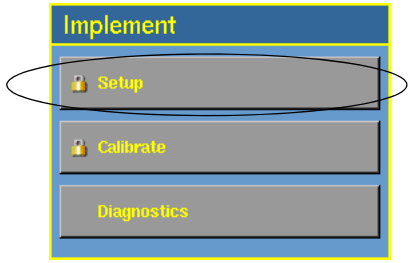
   The *Select port - Variable Rate Controller* screen appears.
5. From the *Port* list, select P5 Serial I/O.

Step 3. Configuring the spray boom in the FieldManager display

Configure the spray boom. See Configuring an implement, page 51.

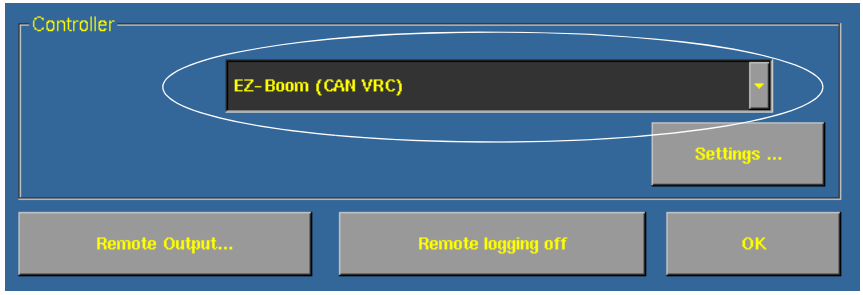
Step 4. Enabling and configuring the variable rate controller in the FieldManager display

1. From the *Configuration* screen, tap the **Setup** button in the *Implement* group.



The *Implement Setup* screen appears.

2. Select the variable rate controller from the drop-down list in the Controller group.



3. Tap the **Settings ...** button. The *Edit Variable Rate Controller settings* screen appears.

   The text boxes that appear on the screen depend on which controller you selected.

4. Enter the default rate for the controller in the *Default Rate* text box.

5. Enter the lead time in the *Lead Time* field. See Controller lead time, page 182.

6. If the *Active Channel* text box appears, enter the active channel name.
7. 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 *Ag*GPS FieldManager display initiates communications with the controller each time a field is opened. Communications are terminated when the field is closed.

If the *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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

Controller	Minimum software version
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 *Ag*GPS FieldManager display to a Mid-Tech controller you need a DataLink interface (Mid-Tech part number 78-05007). This DataLink allows communication with the *Ag*GPS 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 *Ag*GPS FieldManager display can send and receive rates to and from the controller.
- When the switch is set to *Local Control*, the *Ag*GPS 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 *Ag*GPS FieldManager display is connected to a Mid-Tech controller, the *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS FieldManager display harness to the Raven controller. You can also make your own cable, as shown:

Raven (M)	(F)	Adapter Cable	(F)	(M)	*Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS FieldManager display will not communicate with the controller.

The *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 Accu-Rate controller, you can only vary one channel at a time using the *Ag*GPS FieldManager display. Connect the serial port for the desired channel on the controller to P5 on the FieldManager display harness.

Configuring the controller

To allow the *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS 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 *Ag*GPS FieldManager display has no way of knowing when communication with a Rawson controller is lost.

DICKEY-john

The *Ag*GPS FieldManager display can send rates to and receive rates from the following DICKEY-john controllers:

- Precision Control System
- Land Manager I
- Land Manager II

Configuring the controller

You need to connect the *Ag*GPS 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.

TeeJet

The *Ag*GPS FieldManager display can send rates to and receive rates from the following TeeJet controllers:

- 844
- 855

Time-outs can sometimes occur, especially with the 855 controllers, if the controller fails to respond to the rate sent to it.

The *Ag*GPS FieldManager display sends the current rate to a TeeJet controller after one second, even if the controller does not send back an applied rate. If the applied rate is still not received back after two seconds, the *Ag*GPS FieldManager display attempts to re-establish the connection. If this fails, a timeout message is displayed, and coverage logging stops. The *Ag*GPS FieldManager display continues to send the current rates.

Application rates

You can only control and log rates on channel one on TeeJet variable rate controllers.

TeeJet controllers return zero rates in manual mode.

The ability of the controller to correctly apply the target rates depends on the speed of travel.

The carrier application rate is limited to 99.9 gallons / acre (or 999 liters / hectare) for the 844 controllers, and 999 gallons / acre (or 9999 liters / hectare) for the 855 controllers.

Configuring the controller

You need to connect the *Ag*GPS FieldManager display to the controller via a null modem cable.

Communications

The baud rate used by the controller is automatically set to 9600 baud, 8 data bits, 1 stop bit, no parity.

Application width

When the *Ag*GPS FieldManager display is connected to a TeeJet controller, the total boom section width must be set to match the *Application Width* setting in the *Implement Boom Setup* screen.

The *Ag*GPS FieldManager display does not vary the width of the coverage polygons when you turn off boom sections.

Using the controller

If you are using a TeeJet controller the units must be set to the units in the prescription file. This table lists the units options for the TeeJet controllers.

Units	Carrier application rate
Metric	liters / hectare
US	US gallons / acre
Turf	US gallons / 1000 ft^2
NH3	pounds of NH3 / acre
Imperial	Imperial gallons / acre

Step 6. Setting any other features of the variable rate controller

Coverage mapping

The *Ag*GPS 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 *Ag*GPS 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 EZ-Boom system and 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 *Ag*GPS 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 it 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:

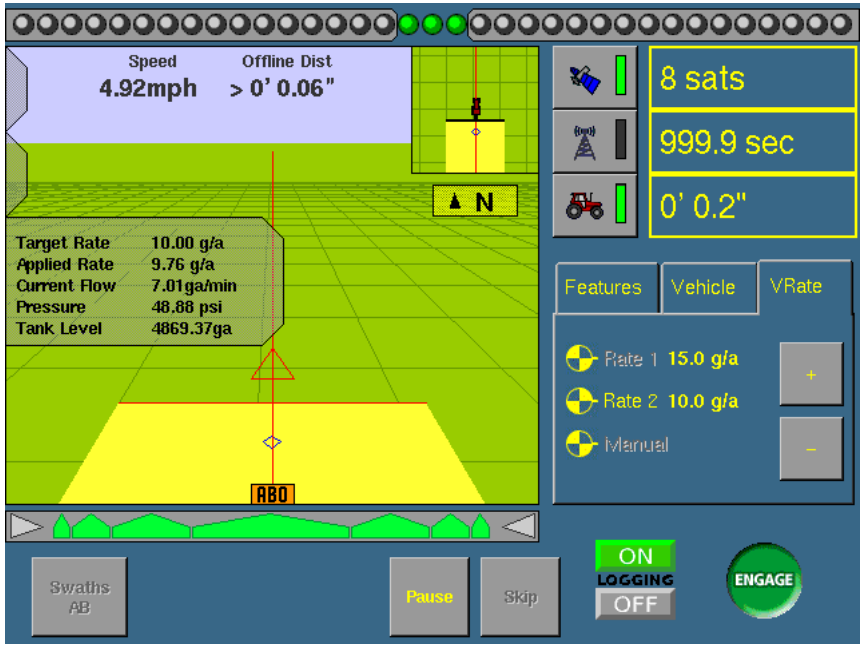
For this type of field ...	Prescriptions must ...
Boundary	overlap the field boundary
AB Line	overlap the AB Line
	be within 1 km of the field

If you load a shapefile prescription, select the rate column.

If you use complex contoured prescriptions, loading the prescriptions can take some time. The *Ag*GPS 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 Items. An example with as-applied rates displayed is shown below:



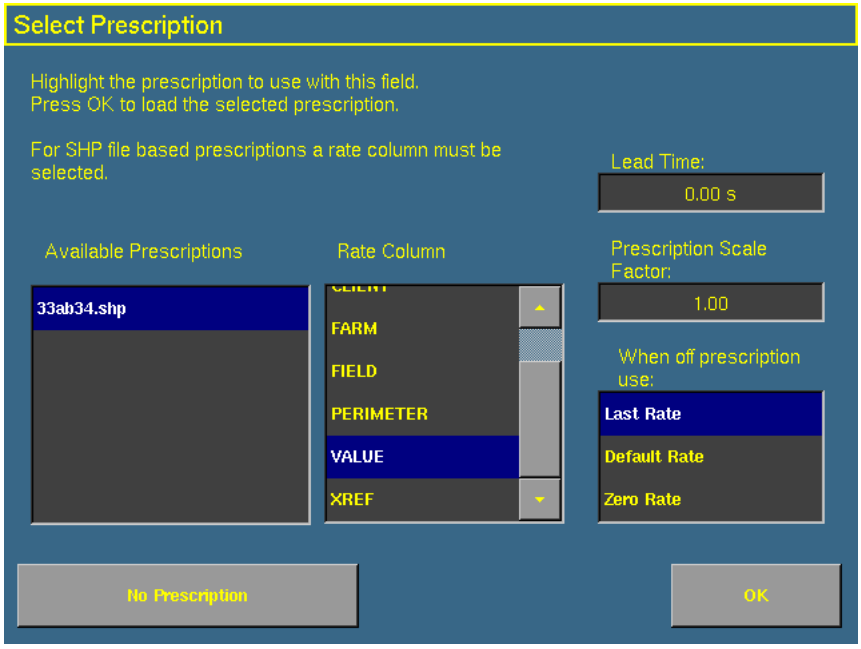
See Configuring status text messages, page 67.

To load a prescription file:

1. Map a new field or select an existing field.

   The *Ag*GPS 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.

2. If any prescription files are within the specified limits, the following screen appears:



3. Select a prescription file.

Note – *If an AgInfo GDX prescription has an incorrect format, it will not be listed in the Available Prescriptions list.*

4. 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 183.
8. Press **OK** to load the prescription file.

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 *Ag*GPS 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. This setting is also used to control the output rate if the GPS signal is lost.

Varying the active boom sections

Some variable rate controllers report to the *Ag*GPS 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 ArcView 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

CHAPTER

8

Data Management

In this chapter:

This chapter describes the files and directories on the FieldManager display CompactFlash card.

Transferring data to the 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 *Ag*GPS FieldManager display.
2. Insert the CompactFlash card into your office computer using an appropriate adaptor (for example, a card reader).
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 such as ArcView or ArcExplorer 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 *Ag*GPS 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 *Ag*GPS 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

Data collected by the FieldManager display can be opened directly into the ESRI ArcExplorer or ESRI ArcView 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.

Alternative software

ESRI shape (.shp) and attribute (.dbf) files can be used in many other software packages that can import or use .shp and .dbf formats. Examples of these software packages are:

- SSToolbox (SST Development Group, Inc)
- FarmGIS, MapInfo Professional (Red Hen Farming Systems)
- Site Pro, Farm Site (FarmWorks)
- Patchwork Office (Patchwork Technology Limited)
- SMS Advanced, SMS Basic (AgLeader)

To view these files in MapInfo, you need to convert the .shp /.dbf file formats to .mif /.mid formats using the MapInfo ShapeLink utility. 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 8.1 lists the names and types of files containing mapping and logging information, and the directory where the *Ag*GPS FieldManager display saves these files on the CompactFlash card.

Table 8.1 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 194.
Field boundary	Polygon	Boundary.shp Boundary.dbf Boundary.shx	
Event history	Event information	EventHistory.dbf	
Point features	Attribute ID and lattitude, 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 196.
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>* For more information, see Event directory, page 196.

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 *Ag*GPS FieldManager display. See Prescriptions, page 179 and Directories on the CompactFlash card, page 189.

Figure 8.1 shows system utility files and the data directories in the *\AgGPS* directory saved on a CompactFlash card by the *Ag*GPS FieldManager display.

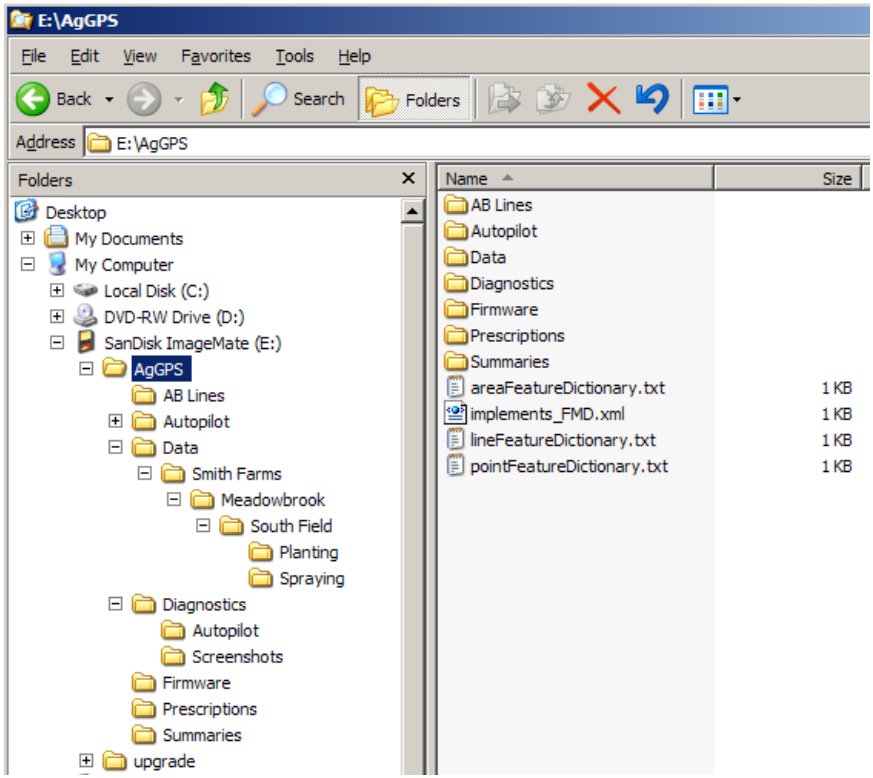


Figure 8.1 AgGPS directory on a CompactFlash card

Client directory

The *Client*\ directory stores a subdirectory for each farm defined for the client.

Figure 8.2 shows the *Client*\ directory and file organization.

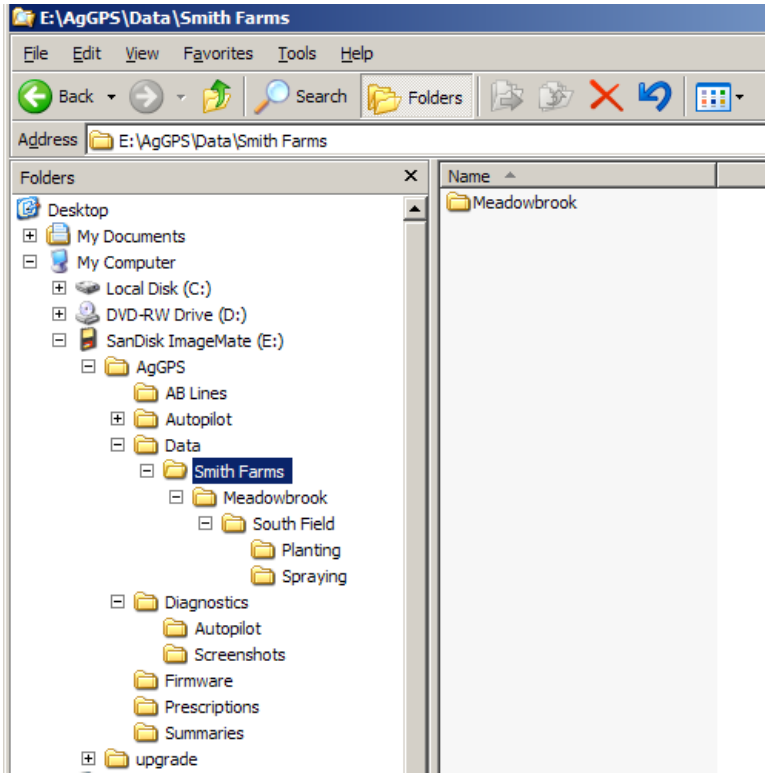


Figure 8.2 Client directory and file organization

Farm directory

The *Farm*\ directory stores a subdirectory for each field defined for the farm.

Figure 8.3 shows the *Farm*\ directory and file organization.

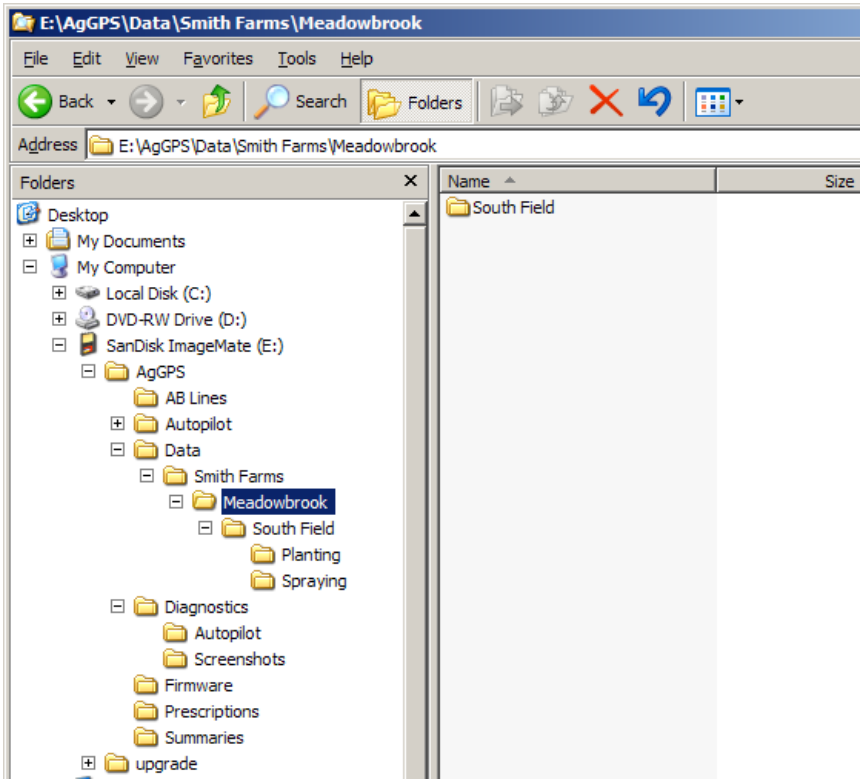


Figure 8.3 Farm directory and file organization

Field directory

Each *Field*\ directory stores the following:

- A subdirectory for each event performed on the field. See Event directory, page 196.
- Three Swaths files.
- If it is a bounded (headland) field, three Boundary files. See Field boundary and AB Line files, page 197.
- 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 201.
- Any paused files. See Pausing guidance, page 143.
- The field event history file: EventHistory.dbf. It contains information about each event carried out in the field. See EventHistory file, page 200.

Figure 8.4 shows a *Field*\ directory and file organization.

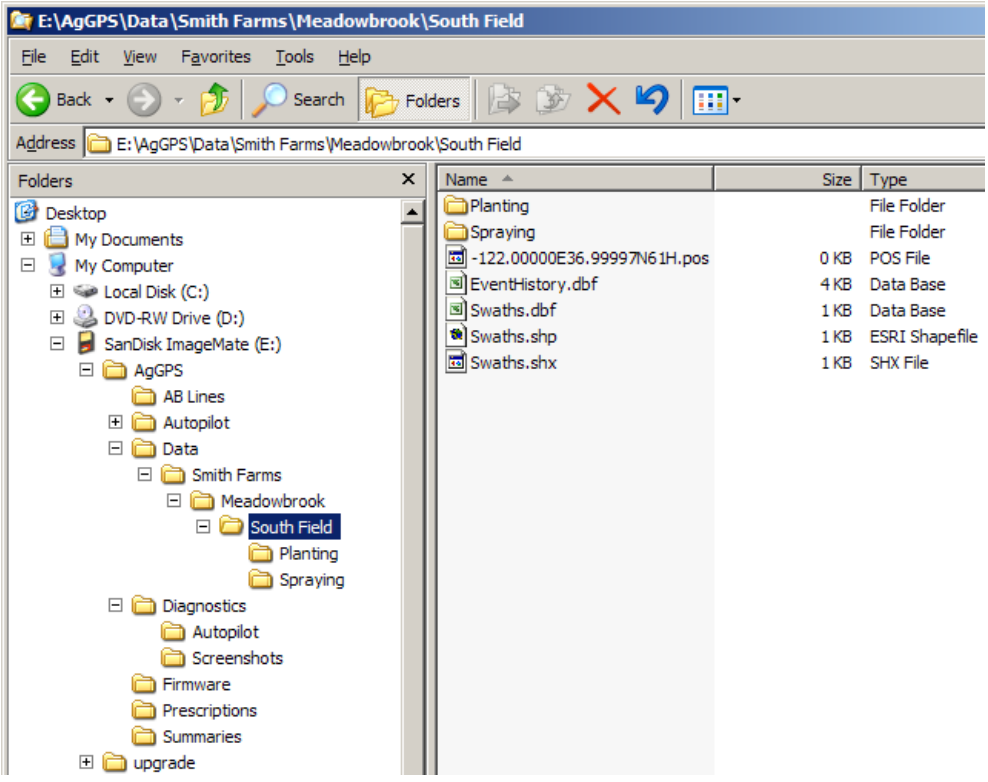


Figure 8.4 Field directory and file organization

Event directory

Each *Event*\ directory stores:

- coverage logging shapefiles that are recorded during the event, called Coverage.*. See Coverage logging data, page 198.
- track logging shapefiles that are recorded during the event, called Track3D_<*date time*>.*.

Figure 8.5 shows an *Event*\ directory and file organization.

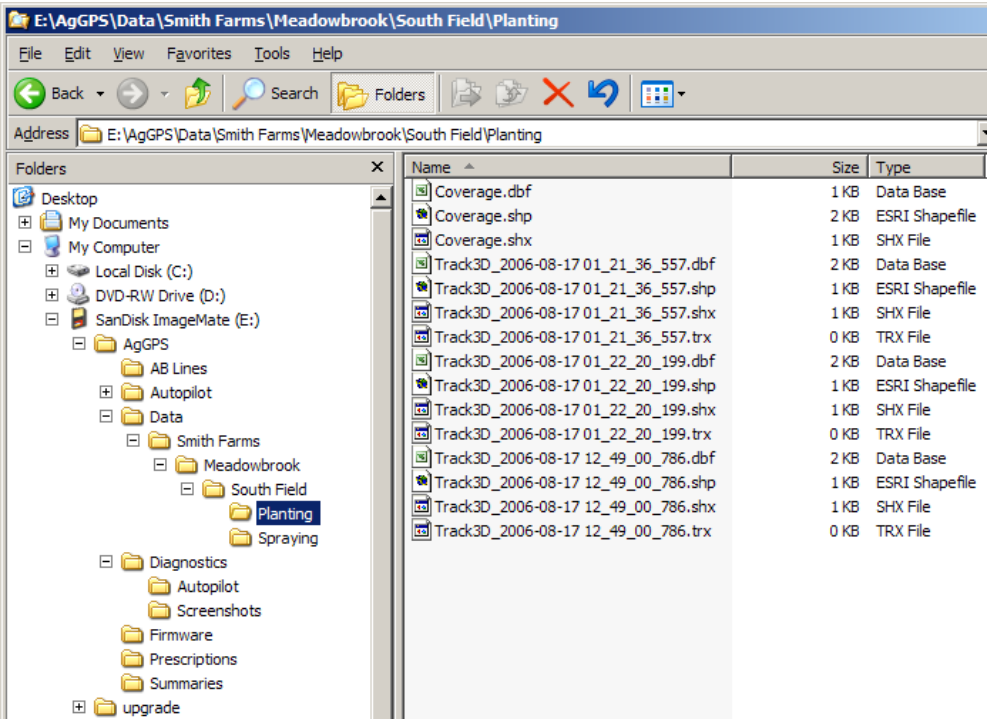


Figure 8.5 Event directory and file organization

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 8.2 lists the information stored in the boundary and ABLine attribute files.

Table 8.2 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 8.3 lists the information stored for each coverage polygon in the coverage logging attribute file.

Table 8.3 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. The track file records points at a maximum rate of one every 5 seconds. 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 8.4 lists the information stored for each point, in the track logging attribute file.

Table 8.4 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_wdth	Swath width	meters
Appln_Wdth	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 – *Not currently implemented.*	
Total_Qty	Total volume of material as applied for the current field. Only supported for the *Ag*GPS 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 8.5 lists the information stored in the <*type*>.dbf file for each feature.

Table 8.5 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 *Ag*GPS 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 *Ag*GPS FieldManager can load field boundaries and AB Lines, created by an *Ag*GPS 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 *Ag*GPS FieldManager display:

1. Attach the CompactFlash card to an office computer (for example, via a card reader).
2. Open the *\AgGPS\Data* directory on the CompactFlash card.
3. Do one of the following:
   - Create a new client by creating a new directory
   - Open an existing client by opening an existing directory

4. In the client directory, do one of the following:
   - Create a new farm by creating a new directory
   - Open an existing farm by opening an existing directory
5. In the farm directory, create a new field directory with the same name as the field you are importing. For example, if your existing files are called:
   - south_field_ABLine.shp
   - south_field_ABLine.shx
   - south_field_ABLine.dbf

   create a new field directory called "south_field".

   Note – *Ensure that you use identical spacing and capitalization in the field name. Otherwise, the Display will not recognize the imported field.*
6. Open the new directory.
7. Copy the three "_ABLine" files to the new directory.
8. If you are importing a boundary, also copy the three "_Boundary" files to the new directory.

   The following table shows which files you should copy to import "south_field" as either an AB Line or a boundary:

AB Line	Boundary
South_field_ABLine.shp	South_field_ABLine.shp
South_field_ABLine.shx	South_field_ABLine.shx
South_field_ABLine.dbf	South_field_ABLine.dbf
	South_field_Boundary.shp
	South_field_Boundary.shx
	South_field_Boundary.dbf

Note – *If the "_ABLine" files are from the RDL folder, rename the three files to "filename_ABLine.shp", "filename_ABLine.shx", and "filename_ABLine.dbf" where "filename" matches the name of the new directory.*

If you only copy the "_Boundary" files and not the "_ABLines" files, you will not get any infill swaths. Only the headland will be generated.

9. Start the *Ag*GPS FieldManager display and then select the Run button.
10. Select the client, farm, and field in the drop-down lists.
11. Create a new event and then select **OK**.
12. If the AB Line or the boundary does not load the first time that you open the field:
    a. Press the Swaths button. The *Swath Management* screen appears.
    b. Do one of the following:
       – If you are importing an AB Line, select the AB Line from the list. There will be an AB Line called "ABLine1– Straight".
       – If you are importing a boundary, select the headland from the list. It will be called something similar to "Headland 3 – Headland".

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 8.6 lists the names and types of files that are used to supply input information to the *Ag*GPS FieldManager display, and the directory where these files must be located on the card.

Table 8.6 Input files

Data	Description	Files	Directory
Prescription files	Polygons ESRI shapefiles	*<prescriptionname>*.shp *<prescriptionname>*.dbf *<prescriptionname>*.shx	*\AgGPS\Prescriptions* For more information, see Prescriptions, page 179.
	AgInfo GDX	*<prescriptionname>*.gdx	

Figure 8.6 shows the contents of a *\Prescriptions* directory.

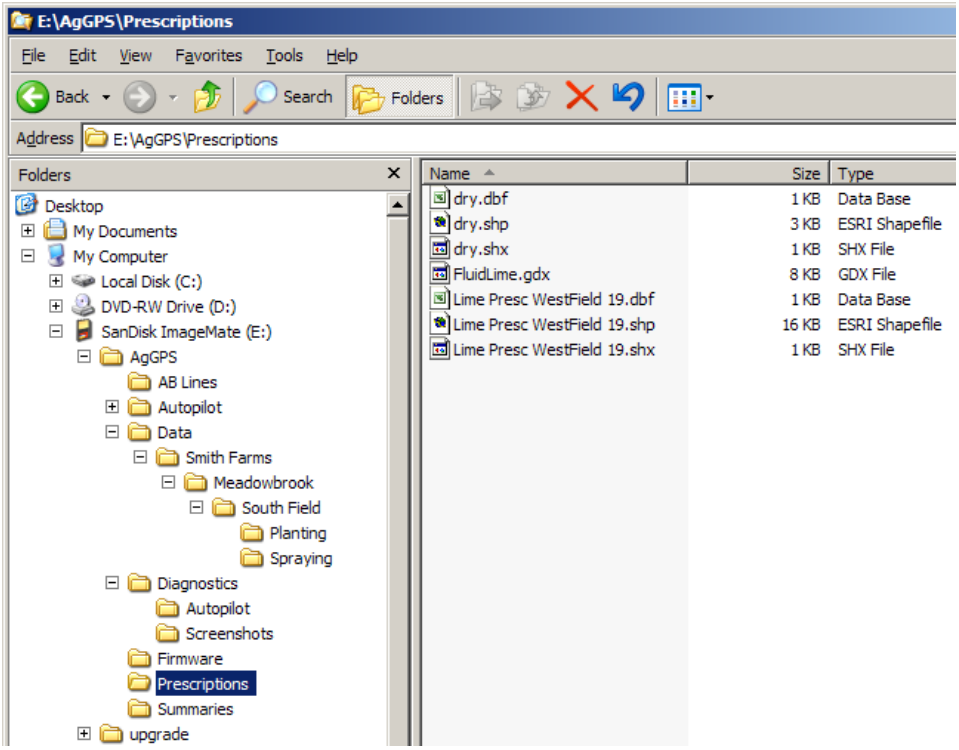


Figure 8.6 Prescriptions directory

CHAPTER

9

Troubleshooting

In this chapter:

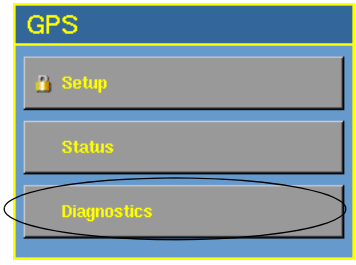
This chapter describes how to analyze problems that occur with the *Ag*GPS FieldManager display.

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, tap the **Diagnostics** button in the *GPS* group.



The *Raw serial data* screen appears.

The screen displays either ASCII text or Hex code, depending on which button is selected. Tap the **ASCII** button to view incoming data from the NMEA data string.

The Hex code is for engineering use only.

You can view the raw GPS data that is received via either the P4 port (Controller) or the P5 port (Serial I/O) on the FieldManager display harness. Tap the **P4** or **P5** button to select either one.

Restoring default settings

The system can be reset to the 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 – *Trimble recommends that you save any vehicle configuration before you restore the default settings. See* *Saving the vehicle configuration, page 116*.

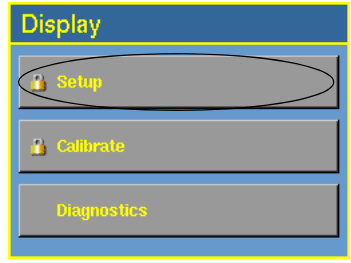
To restore the default settings:

1. From the *Configuration* screen, tap the **Setup** button in the *Display* group.

   The *Display Setup* screen appears.

2. Tap the **Restore default settings** button. A confirmation screen appears.

3. Tap the **Yes** button.



Viewing *Ag*GPS FieldManager 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
- *Ag*GPS Autopilot controller information
- GPS receiver and correction method information
- Vehicle make and model

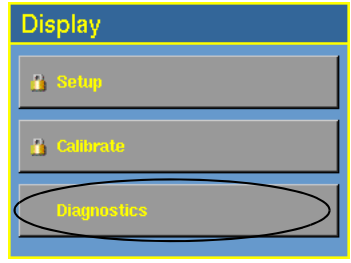
CompactFlash card information

To view information about the CompactFlash card that is in the display:

1. From the *Configuration* screen, tap the **Diagnostics** button in the *Display* group.

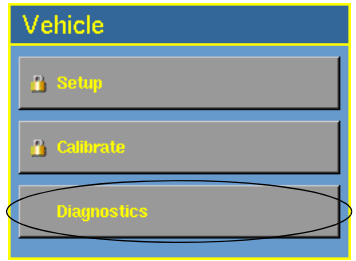
   The *Display Diagnostics* screen appears.

2. When you have finished viewing the diagnostic information, tap the **OK** button to return to the *Configuration* screen.



Viewing vehicle diagnostic information

From the *Configuration* screen, tap the **Diagnostics** button in the *Vehicle* group.

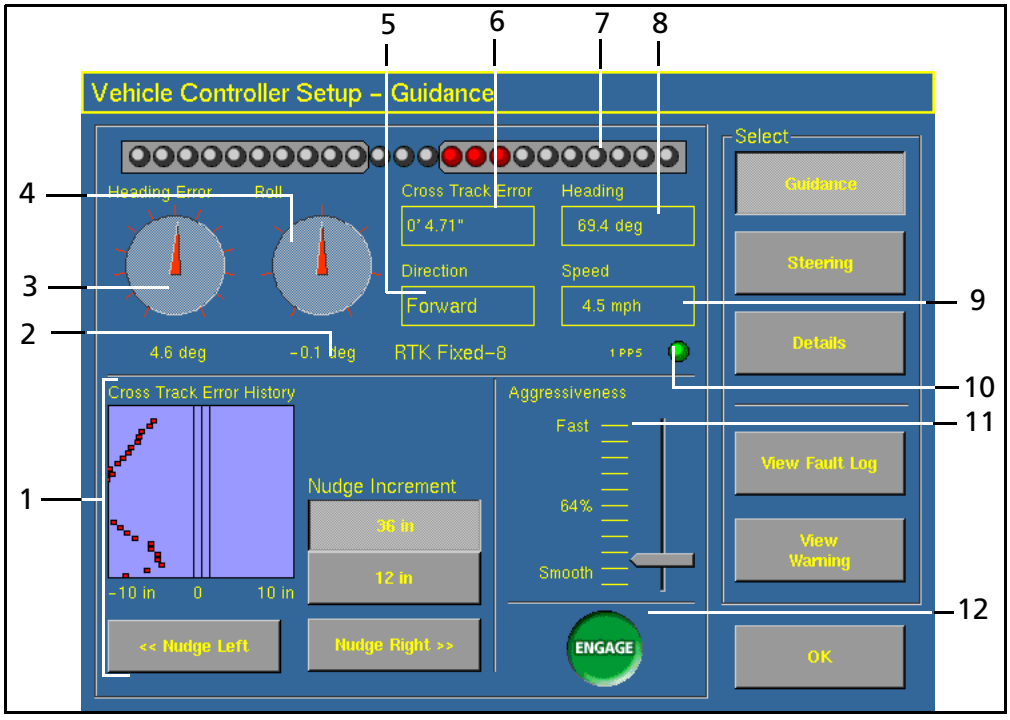


The *Vehicle Diagnostics - Guidance* screen appears.

There are five parts to the Vehicle Diagnostics menu:

- Guidance screen
- Steering screen
- Details screen
- Fault log screen
- View warning screen

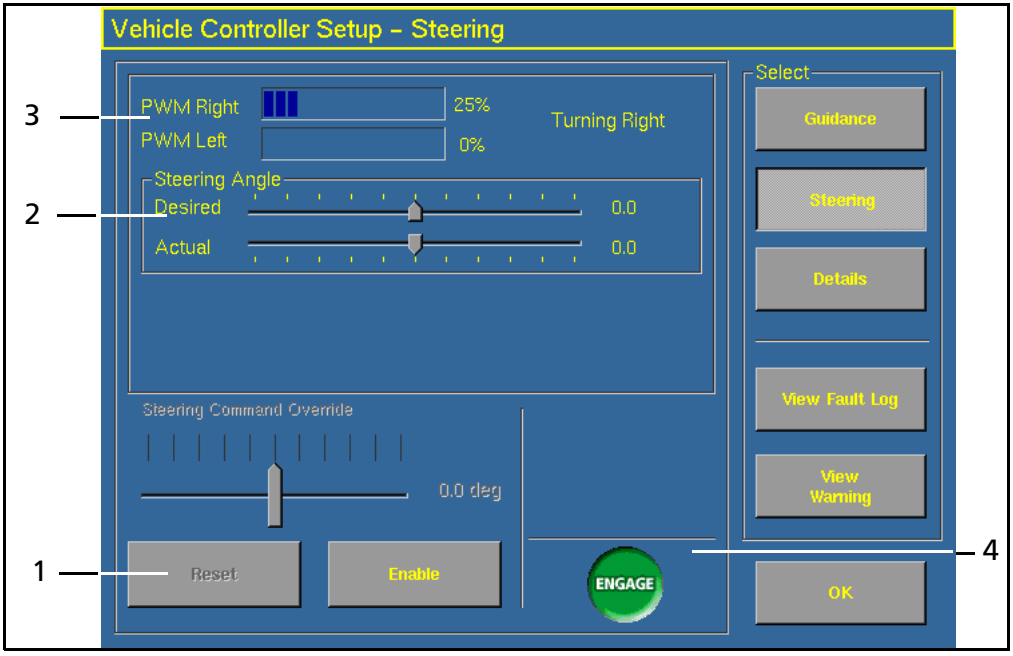
Vehicle Diagnostics – Guidance screen



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

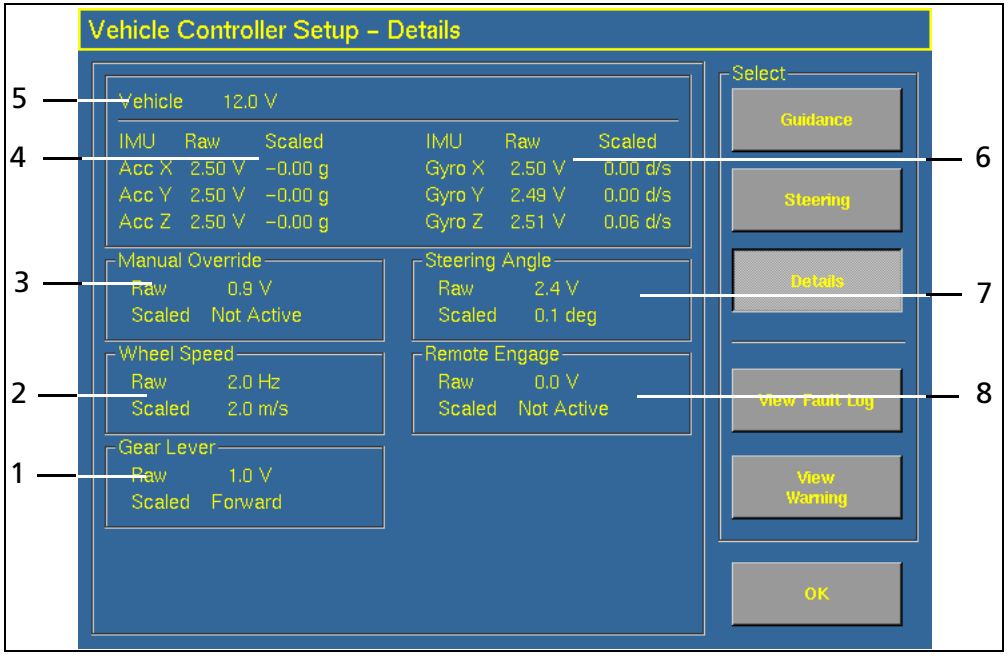
Item	Section	Description
8	Heading	The current vehicle heading calculated by the system
9	Speed	The current vehicle speed calculated by the system
10	1PPS	Shows whether the 1PPS signal from a GPS receiver is detected
11	Aggressiveness	A slider for adjusting the Aggressiveness of the steering system
12	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

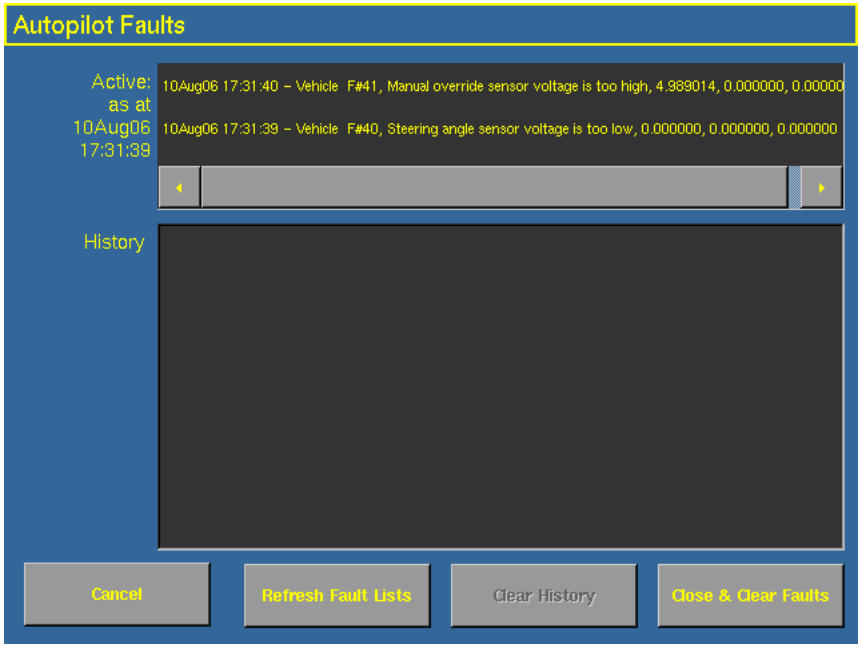


Item	Name	Description
1	Gear Lever	The raw voltage and current vehicle direction of the gear lever sensor
2	Wheel Speed	The raw voltage and scaled meters per second of the wheel speed sensor
3	Manual Override	The raw voltage and current state of the manual override sensor
4	Accelerometers	The raw voltage and scaled G force for each of the system's accelerometers
5	Vehicle voltage	The input voltage currently being fed into the *Ag*GPS 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

Item	Name	Description
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 *Ag*GPS Autopilot controller.



Two separate lists show:

- Any faults that are currently active
- A history of faults that have occurred

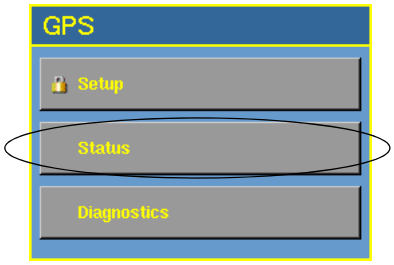
View Warning screen

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.

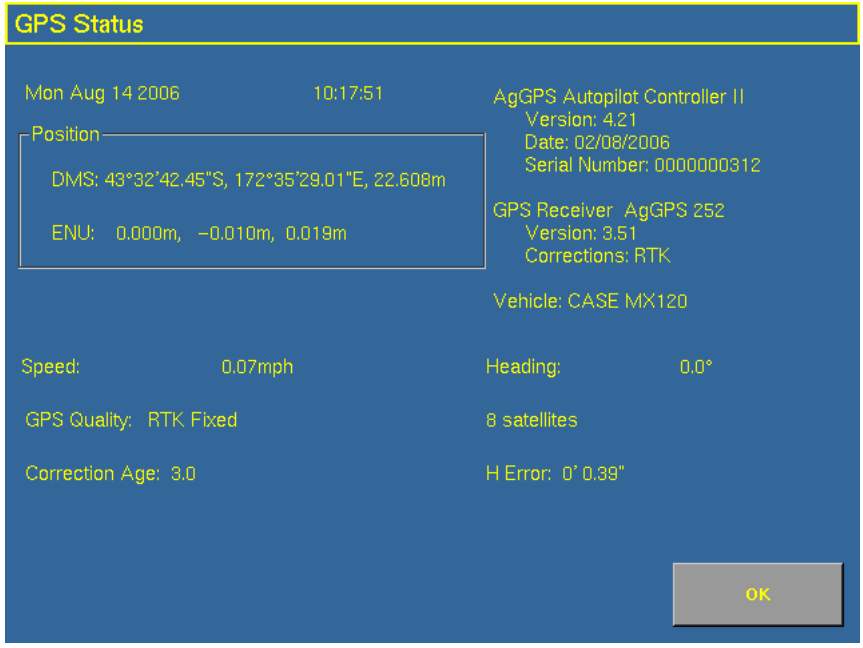
GPS Status screen

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.

1. From the *Configuration* screen tap the **Status** button in the *GPS* group.



The *GPS Status* screen appears.



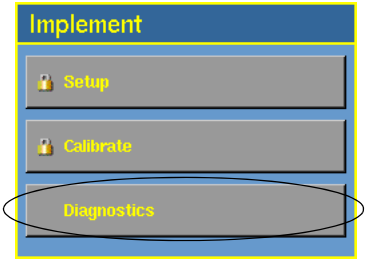
This screen displays:

- your current GPS position
- number of satellites
- GPS quality
- Autopilot system and receiver version numbers

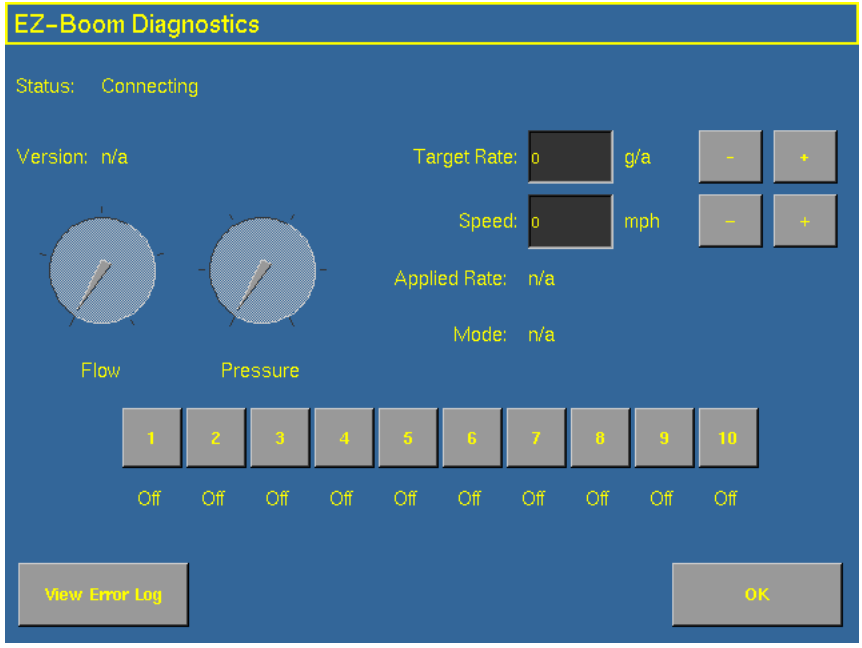
Implement diagnostics

When an EZ-Boom system is connected, you can view EZ-Boom system diagnostic information:

1. From the *Configuration* screen, tap the **Diagnostics** button in the the *Implement* group.



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 the **View Error Log** button.

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.

APPENDIX

A

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 *Ag*GPS 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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