InCommand™

Ag Leader®

Operators Manual

Firmware Version 1.1

PN 2006395—ENG Rev. B

Operator Manual

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The display is a full-featured, year-round hub for any precision farming operation. A full-color, high-brightness, high-resolution touchscreen display is easy to read and offers powerful, year-round precision farming tools. Built-in manual guidance, full-screen mapping, planter and application control, yield monitoring, real-time data logging and automated steering make up the core functionality of the display.

Read user guide completely before operating display. Understand and follow all operating and safety instructions for proper use of this display. Failure to use display properly could result in an impairment of the safety features of this product.

Service and Support

There are no user-serviceable parts inside the display. Contact a local Ag Leader Dealer or Distributor to setup a return for repair. For Technical Support contact your local dealer or Ag Leader Support at the number below.

ph: (515) 735-7000

e-mail: support@agleader.com

This display has an internal lithium coin cell battery that is good for the life of the product and does not need to be replaced. There is a risk of explosion if the battery is replaced by an incorrect type. Dispose of used batteries according to the battery manufacturer's instructions.

Color Touch-Screen

Here are a few key things to remember if you are new to using a touch screen device:

- Do not use any sharp objects for running the touch screen device, this could result in damage to the display. Using the tip of a finger is the recommended method of operating the display touch screen.
- Do not use any harsh chemicals to clean the touch screen. Using a damp soft cloth or an anti-static wipe made specifically for cleaning computer displays is the correct way to clean the screen and the enclosure.
- The display uses a capacitive screen that is heat sensitive. It requires only a brief, gentle touch to operate correctly. A common mistake is to try to navigate too quickly through the system using firm taps instead of gentle presses.

Technical Specifications

Do not exceed the specifications below:

- Storage Temperature: -22 to +176 °F (-30 to +80 °C)
- Operating Temperature: -4 to +158 °F (-20 to +70 °C)
- Operating Input Voltage: 9 –16 V DC
- Max Current Rating: 7.5 amp
- Fuse: Blade Style (ATO/ATC)
- Environmental Protection Rating: IP64
- No Protective Grounding required
- Use 150V minimum insulation rating for external circuits

Exceeding these specifications may result in degraded operation and/or damage to the display.

System and Upgrades

Required software updates will be available free of charge for download from www.agleader.com. It is recommended that the user check for available updates at the beginning of each season.

General Information

Automated Module Firmware Upgrade

In the display, all display and module firmware upgrades are packaged in a single .fw3 file. The module firmware files are stored internally in the display. A warning alerts you when a module upgrade is required. You can upgrade all files in a single batch by using an upgrade screen.

Product Registration

When registering your Ag Leader Technology products by one of the following methods, you can elect to receive notice of any new product updates or features.

Register by mail:

Ag Leader Technology

2202 South Riverside Dr.

Ames, IA 50010

Register at the Ag Leader Web site:

http://www.agleader.com

Operator Safety

Symbols

These symbols are used throughout the user guide to designate where some sort of extra attention has to paid for the reader. The four symbols have following meaning.

DANGER!: This symbol means DANGER. Be very alert as your safety is involved.

WARNING!: This symbol means WARNING. Be alert as your safety can be involved.

ATTENTION!: This symbol means ATTENTION. This guides to better, easier and more safe operation.

NOTE: This symbol means NOTE.

Precautions

Note the following recommended precautions and safe operating practices before using the sprayer.

General info

DANGER!: Read and understand this user guide before using the equipment. It is equally important that other operators of this equipment read and understand this user guide also.

If any portion of this user guide remains unclear after reading it, contact your dealer for further explanation before using the equipment.

DANGER!: Keep children away from the equipment.

Service

DANGER!: Never service or repair the equipment while it is operating. Always replace all safety devices or shields immediately after servicing.

DANGER!: Turn electrical power off before connecting and disconnecting the display and transducers, servicing or using a battery charger.

DANGER!: If an arc welder is used on the equipment or anything connected to the equipment, disconnect power leads before welding.

DANGER!: Do not use a high pressure cleaner to clean the electronic components.

Display

Display Hardware

Front side

A. **Light sensitivity sensor**—Used to automatically dim the display during night-time or low-light situations.

B. **Power light**—The power light displays one of three states:

Green	= ON
Pulses amber	= Standby Mode
Solid amber	= Running on battery power

C. **Built in lightbar**—for guidance

Side

D. **Side mount USB media slots**

(2 slots for 1200, 1 slot for 800)

Used for data transfer in and out of the display.

Used to charge mobile devices up to 1.2 amps.

Rear

E. **WiFi**—802.11 communication

F. **Speaker**—The built-in speaker is used for audible warnings. The volume can be adjusted through the display setup routine.

G. **Mounting bracket**

H. **Power/Reset switch**

The Power/Reset switch is used for turning the display on and off in installations where the system is connected to a continuous power supply.

If the display ever stops responding, the manual power switch may be held in for five seconds to restart the system. Only do this as a last resort, data loss could occur during times of improper shutdown.

I. **19-pin auxiliary connection**—Used for camera input.

J. **19-pin plug**—The 19-Pin round display connector contains CAN, RS-232 serial, and system power and ground connections. It is compatible with some certain other displays.

K. **HDMI OUT (1200 only)**

L. **Ethernet Connection**—4-pin connection used for communication with ParaDyme, GeoSteer, SteerCommand, OnTrac3

General Information

Installation Instructions

All machine installation and mounting kits are shipped with instructions specific to that kit. Instructions include special details relating to mounting, wiring and display configuration.

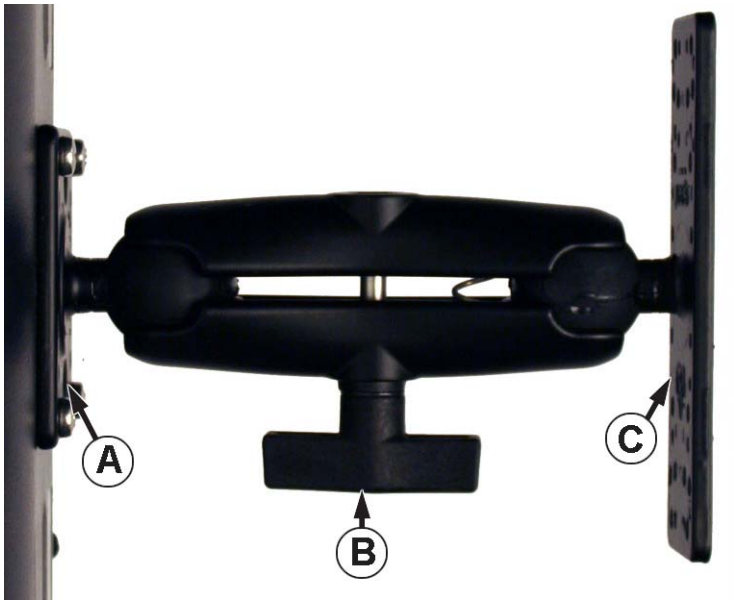
Mount the display securely inside the vehicle cab. The following must be considered when choosing a mounting location:

- The display must be readily accessible to the machine operator.
- The display must not obstruct the machine operator's normal driving view.
- The display must not interfere with or limit access to any of the existing machine controls.
- The CAN system cabling must be routed and secured without interfering with existing machine controls.

(A) RAM Base

(B) RAM Arm

(C) Base



⚠ DANGER!: If drilling holes is required during the mounting process, care must be taken to insure that damage is not done to existing vehicle wiring, mechanical, or cab structure. Refer to vehicle manufacturer documentation for specific details on your equipment. Follow all OEM instructions, cautions, and warnings when working around equipment.

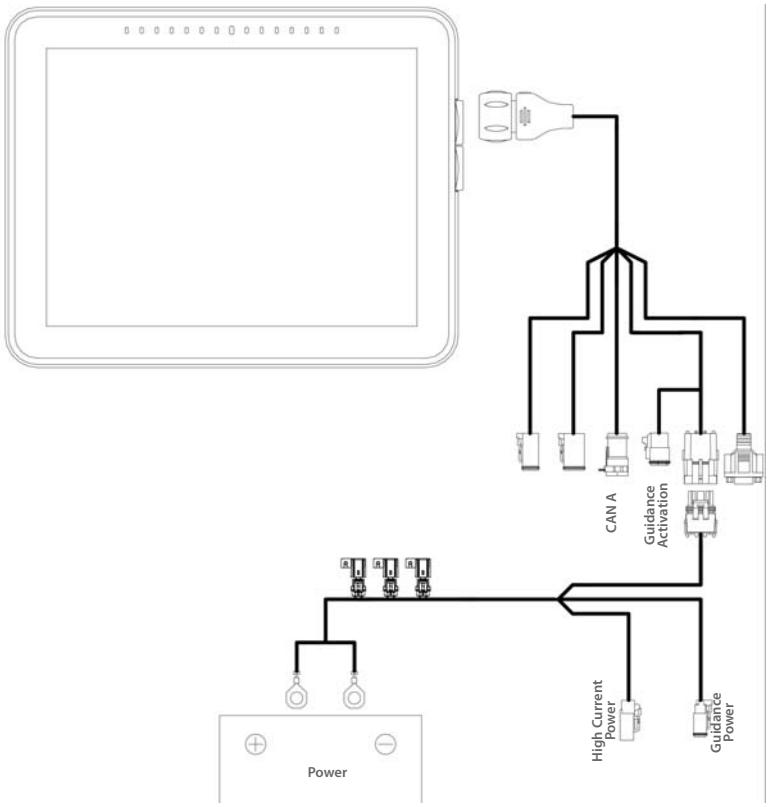
Fuse Installation and Replacement

Fuse Type: Blade Style (ATO/ATC)

Rating:

- Fuse Holder (orange wire) 7.5A, 250 VAC
- Fuse Holder (pink wire) 15A, 250 VAC
- Fuse Holder 30A, 250 VAC

The fuse is to be placed in the fuse holder in-line with the battery power cable and used with display only.



Initial Startup

General info

An Initial Setup wizard is presented on startup. The wizard is presented if the display is brand new out-of-the-box.

NOTE: Not all of the following parts may be required to follow - it depends on your specific setup.

Once the wizard is completed, it is not shown again unless the display memory is cleared.

Initial Setup Wizard

The Initial Setup wizard will take you through the following setup items:

Time\Date, Time Zone, Unit System, Language

- Advanced Options
  - Restore Backup—see "Restore Backup File" on page 31
  - Upgrade Firmware—see "Upgrade Firmware" on page 31
  - Unlock Display Features—see "Unlocking Features" on page 20

Single or Multiple Display Setup

- Single—use single display if this is the only display that is getting setup
- Multiple Display—use multiple display if there is more than one display in the operation and the plan is to share management data between displays. After initial setup is complete, enter management information and create an .agsetup file.

NOTE: Using the Restore backup option is not the proper method to get multiple displays set up to be the same. Use the .agsetup file.

It is acceptable to complete the Initial Setup wizard and then upgrade. Setup information will not change.

- On a "clean" display going out for service, to stand in for a failed display, the customer should use the Restore backup option in the Initial Setup wizard.

ATTENTION!: The business created on the first display, and any other management and equipment items, will be imported to the additional displays.

Homescreen Layout

Setup—Access display's setup items.

Summary—Used to access previously logged data, maps, reports.

Universal Terminal—Used to interact with UT based ECU's. It must be enabled in setup.

Camera—View cameras attached to the display. It must be enabled in setup.

Tillage—Create configuration or start operation specific to tillage.

Planting—Create configuration or start operation specific to planting.

Application—Create configuration or start operation specific to application.

Harvest—Create configuration or start operation specific to harvest.

Water Management—Create configuration or start operation specific to water management.

Guidance—Used to start guidance steering only operation.

AgFiniti Status Indicator

Devices Status Indicator

Satellites Status Indicator

Most of the functionality of the display is not available until the basic setup process is completed.

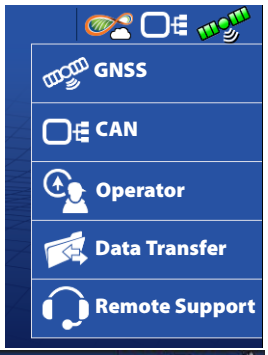
You must complete these initial configuration steps for the Run Time Environment to be active:

- Equipment Operating Configuration.

  You can access Configuration Setup by pressing or pressing an app specific to a field operation.
- Product setup.
- Start Field Operation.

Status Indicators

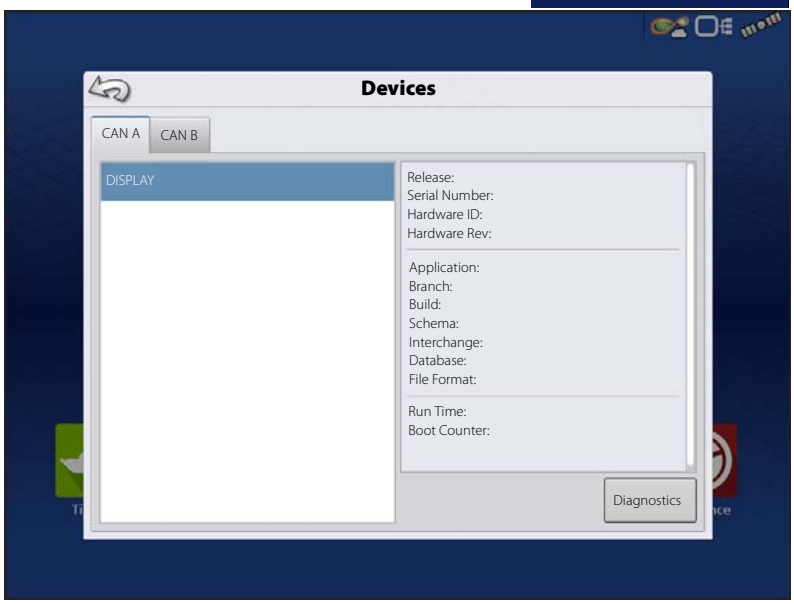
Status Indicators are used to show different states of external equipment connected to the display (for example: , , and) and provides easy access to data transfer and diagnostic features of the display.



CAN

> CAN >

Technical support may request that you look at these screens for help in diagnosing a problem.



The Devices screen displays the modules that are connected to the CAN A and CAN B bus (CAN B is for ISOBUS). Select a device to display its particular firmware and hardware information.

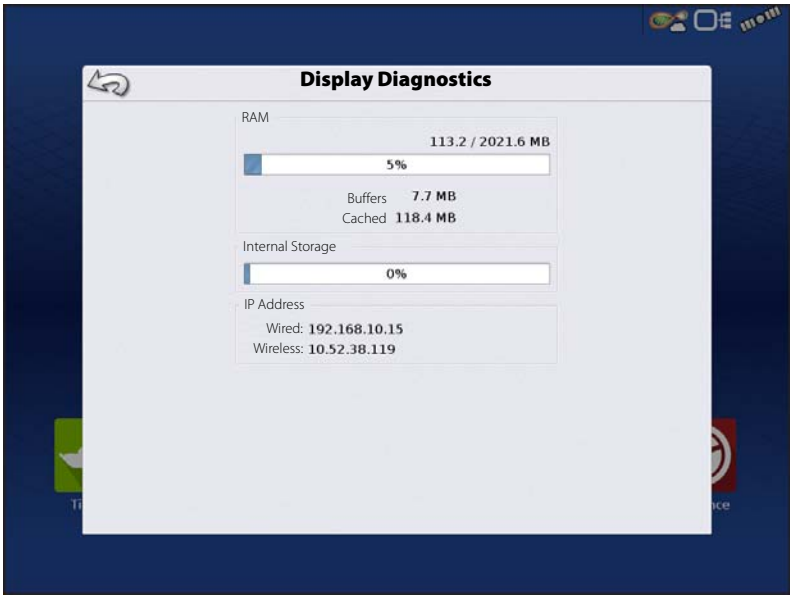
Device Information includes:

- Firmware Version
- Firmware ID
- Hardware ID
- Serial Number
- Revision
- Run Time shown in hours:minutes:seconds
- Display Boot Counter.

NOTE: Check the CAN device list to ensure that all hardware modules appear there.

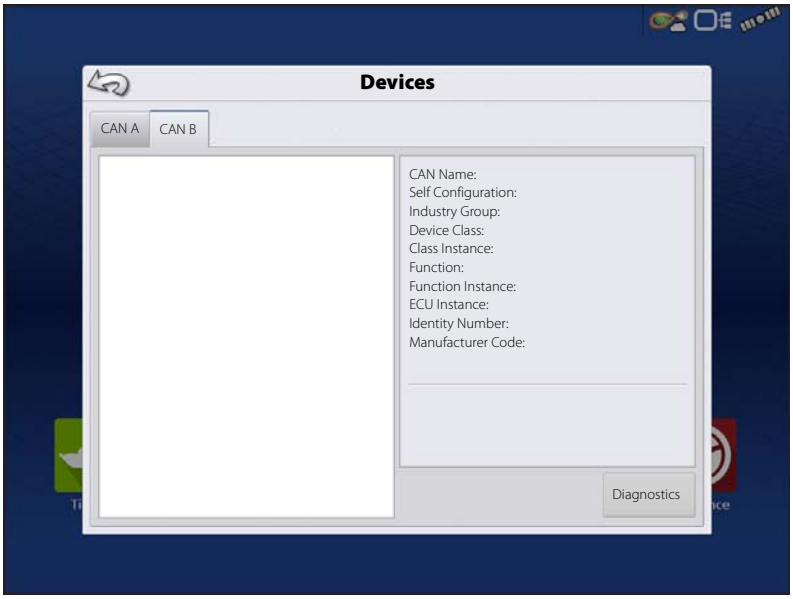
Diagnostics

Press “Diagnostics” button to open the Display Diagnostics screen. This screen includes information about the system memory usage and available memory.

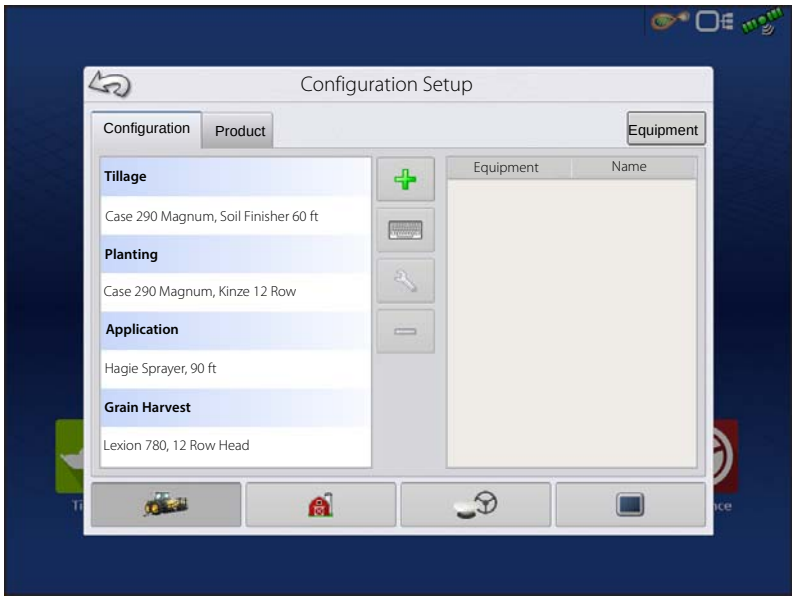


CAN B

If an ISOBUS ECU is connected to the system, the ECU description will populate on the CAN B tab.



The Setup buttons are shown at the bottom of the Setup screens. You can toggle between screens that adjust settings for Configuration, Management, GPS, and Display.



A. **Configuration button**

Press to adjust the configuration settings particular to your vehicle and equipment; as well as enter and edit product information.

B. **Management button**

Press to access and edit Grower, Farm, Field and Operator information.

C. **GPS button**

Press to adjust Guidance settings, GPS settings, and lightbar settings.

D. **Display button**

Press to adjust settings for time and date, brightness and volume settings, operating units, language, enable video, view features, and also create and restore backups.

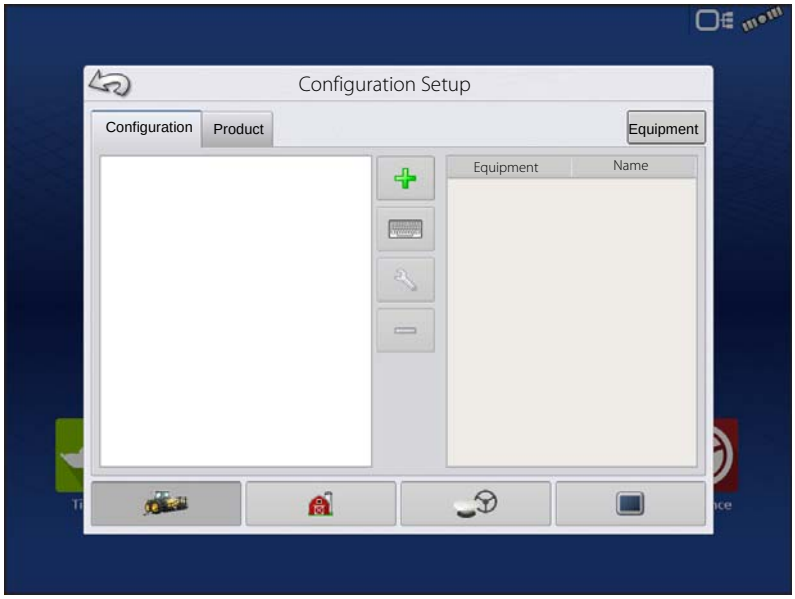
Equipment Setup

Configuration tab

The Configuration tab is where you can create, view and change configuration settings.

An operating configuration is a task-specific association of vehicle, implement, controller, and speed source that is saved for use over different seasons and on different displays.

- When finished, the new configuration appears in the list on the left side of the screen.
- When you highlight the configuration, the equipment in the configuration is listed in the box on the right side of the screen.



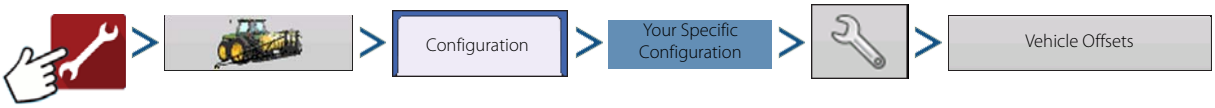
NOTE: Information regarding configurations for specific operations is given in each operations feature user guide.

Configurations

WARNING!: When you remove a configuration all data logged with that configuration will also be removed! However, all log files will remain in memory until exported to the USB drive.

- Equipment Press to add, edit, or remove information for a specific vehicle, implement or controller.

Vehicle Offsets



Vehicle offsets can be entered during configuration setup or later using configuration settings

Vehicle offsets define where the machine's rear axle and hitch is in relation to the GPS antenna. These settings are used for accurate mapping and autoswath.

When the process of setting up a Vehicle is completed, you can later re-configure vehicle offsets.

The vehicle offsets settings consist of two tabs: the Antenna tab and the Hitch tab.

NOTE: Accuracy when measuring for a specific setting is essential to ensure proper machine performance.

Antenna Offsets tab

At the Antenna tab, enter the distance from locations on the vehicle to the antenna.

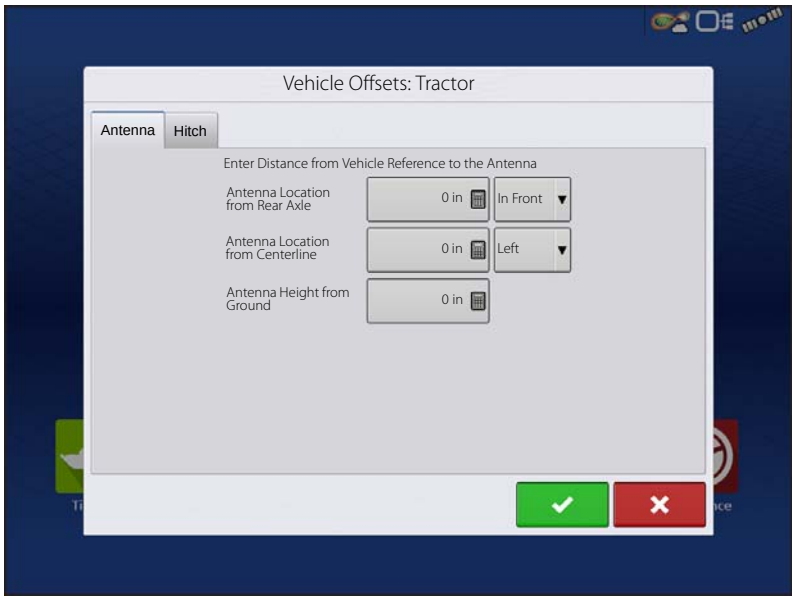
- Measure and enter the horizontal distance from the rear axle to the position of the GPS antenna.

  Select IN FRONT or BEHIND to indicate the position of the antenna in relation to the rear axle.

- Measure and enter the horizontal distance from the center line of the vehicle to the position of the GPS antenna.

  Select LEFT or RIGHT to indicate the position from the vehicle center line.

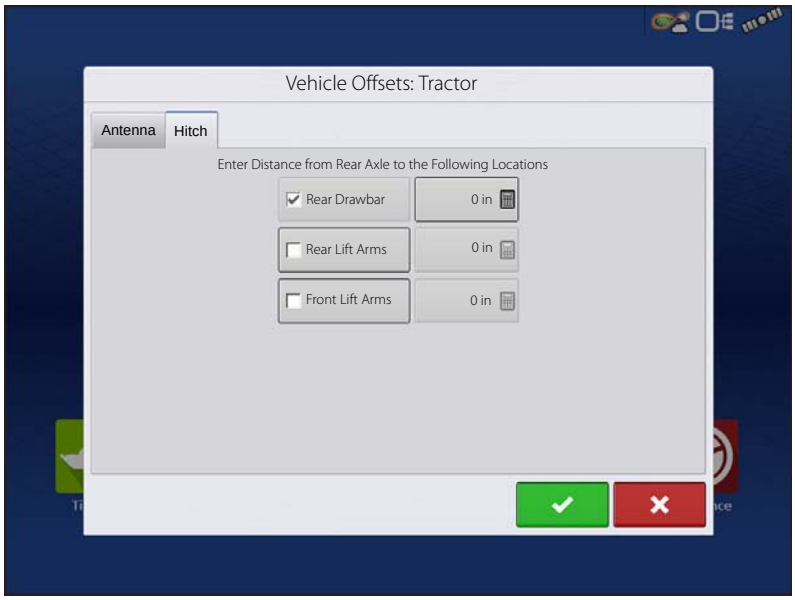
- Measure and enter the vertical height of the antenna above the ground.



Hitch Settings tab

The Hitch tab allows you to enter in the distance from three different mounting positions on the tractor to the rear axle.

Press to enter these values in if using the hitch point.



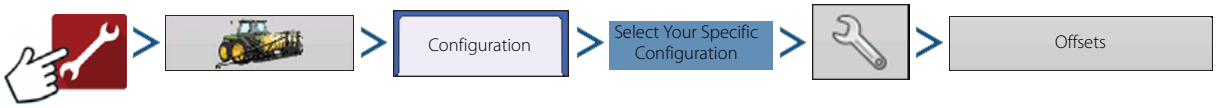
NOTE: Accuracy when measuring for a specific setting is essential to ensure proper machine performance.

Mount Tab Settings

The Mount tab will only be available when using a Self-Propelled sprayer.

This allows you to enter in the application location from the rear axle. Press to enter in the distance and the drop-down box to select if it is in front or behind of the axle.

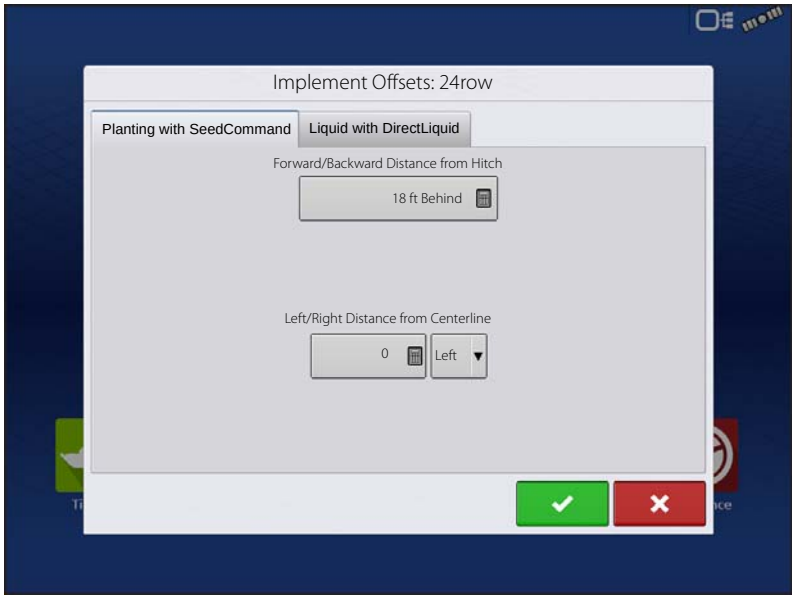
Implement Offsets



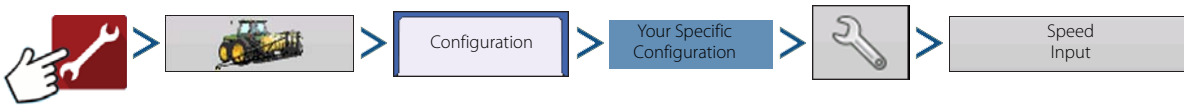
Implement offsets are used to accurately portray how equipment is setup and operating. An implement offset may be needed to account for incorrect guess rows and minimizing skip/overlap.

Section Offsets

- Press the first to enter the distance that the application point is located from the hitch point.
- Press the second to enter the distance from the mid-point of the swath section to the machine's centerline. Select to the left/to the right to indicate the direction the swath section is located from the vehicle centerline.
- Press when finished.
- Multiple tabs will appear across the top if different controller types are used in the configuration.



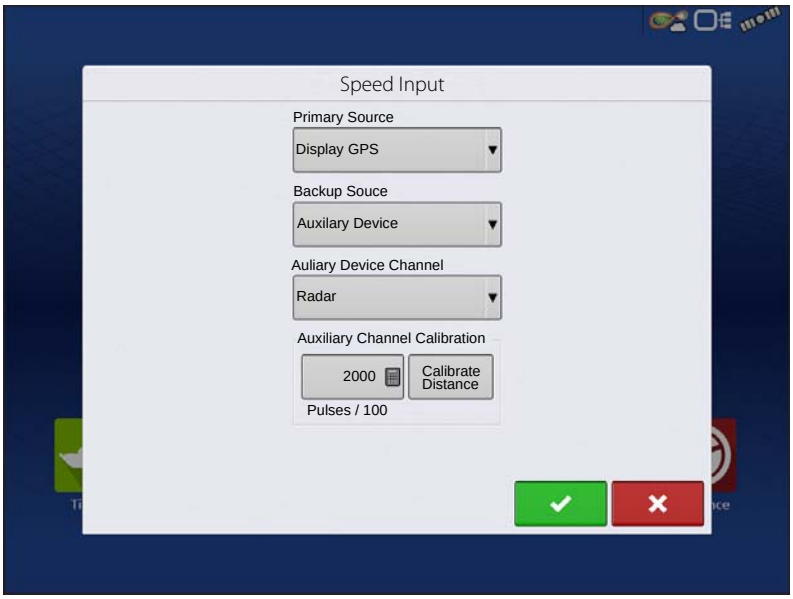
Speed Input Settings



This will show speed in the upper blue bar of the Map screen, when operating.

Choices for Primary Source include:

- Display GPS
- Auxiliary Device
- Manual Speed



Primary vs Secondary Speed Source—By default the display will use the primary speed source when operating on the Map screen. If for some reason the primary speed source is unavailable it will revert to the secondary speed source

Display GPS—The display will use the GPS receiver attached to the display via Serial or CAN (Intellislope) as the speed source

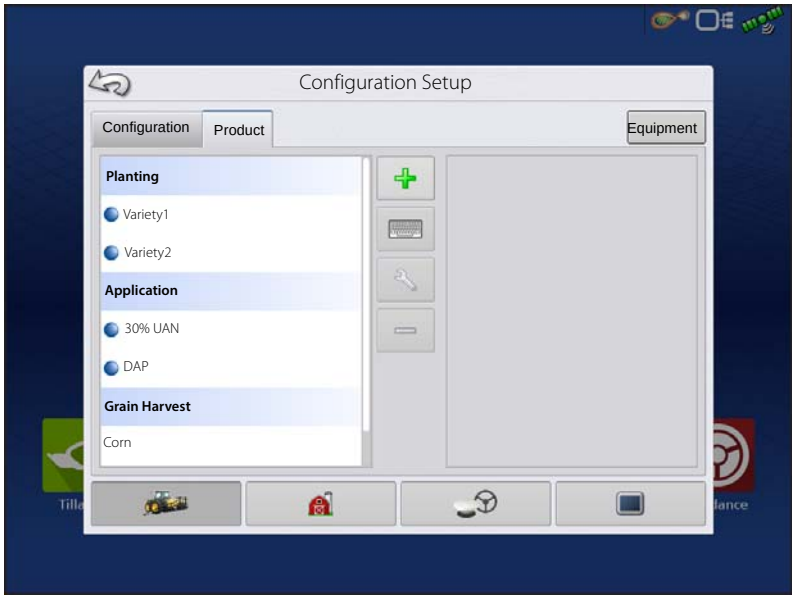
Auxiliary Device—An auxiliary device can be either radar or wheel speed (combine). When using an auxiliary device be sure to calibrate it for an accurate speed input.

Manual Speed—In the event GPS speed or an auxiliary device is unavailable the display can be set to manual speed. Manual speed only works for the region it is selected on.

Product tab

The Product tab is where you can perform the following tasks:

- Add or import Planting products.
- Add or import Application products.
- Add product template (such as a tank mix, or a dry blend of multiple products).
- Add or import Harvest products.



Add button

Press to add or import a product. At the following screen, choose a Product Option: Add Product, Import Product, or Add Product Mix (if in Application). From here, an on-screen wizard continues you through each step of the setup process.

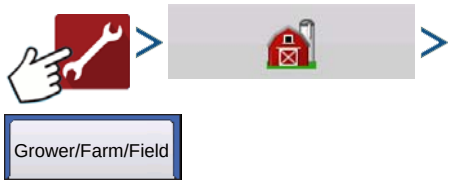
- When finished, the new product appears in the Product tab.
- When you highlight the product, information about the product appears on the right side of the screen.
- Specific planting and application product information can be viewed in those respective user guides.

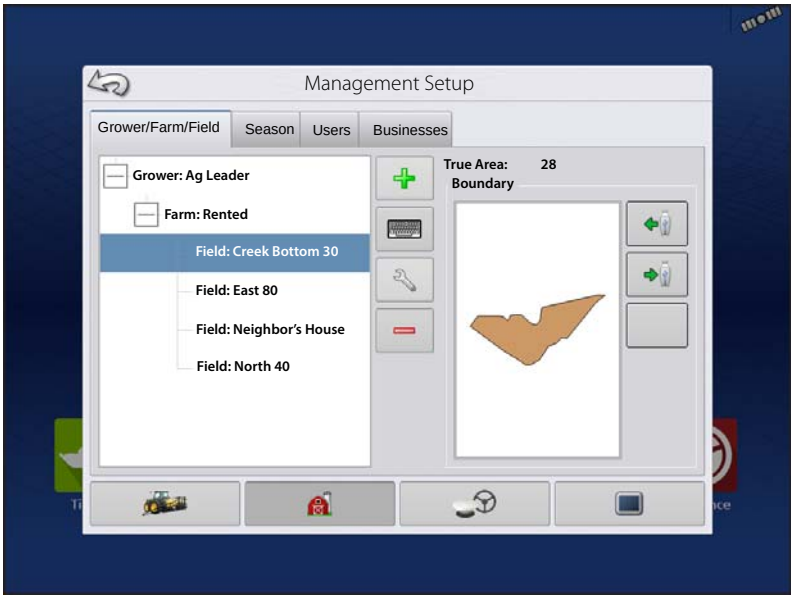
ATTENTION!: When you remove a product all regions using that product will also be removed.

Management Setup

Management button—from this screen the operator can access Grower/Farm/Field, Season, User, and Businesses tabs.

Grower/Farm/Field tab





Grower

The Grower refers to the business or person that the system is in operation for. Contact information can also be entered for each Grower. The Grower information will be passed into mapping software for automatic Grower setup within desktop software.

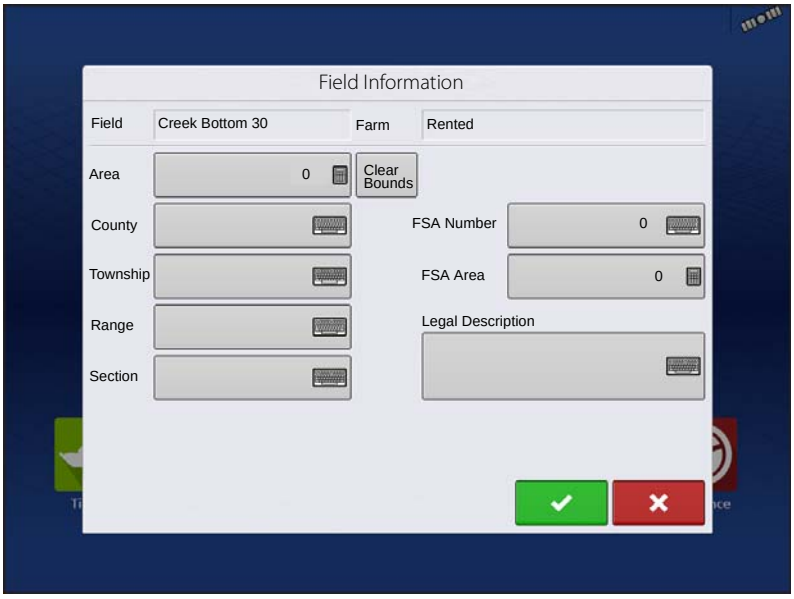
Personal Information entered at this screen can be added or edited at any time.

Farm and Field

In the display, farms are subdivided into fields. You can associate Field names with a particular Farm or Grower. If the display will be used for multiple Growers, enter each Grower business name and associate the Farm and Field names with the correct Grower when the fields are set up within the system.

To edit Field specific information, press after highlighting the field name.

The Field Information screen opens, showing the name of that field in the Title Bar. Field name information that can be added or edited by pressing including Farm, County, Township, Range, Section Number, Area, FSA Number, FSA Area and Legal Description.



Area—shown in the total acres (hectares) of the field. Used to calculate area remaining in field.

Clear Bounds button—press to center the map on the current GPS position.

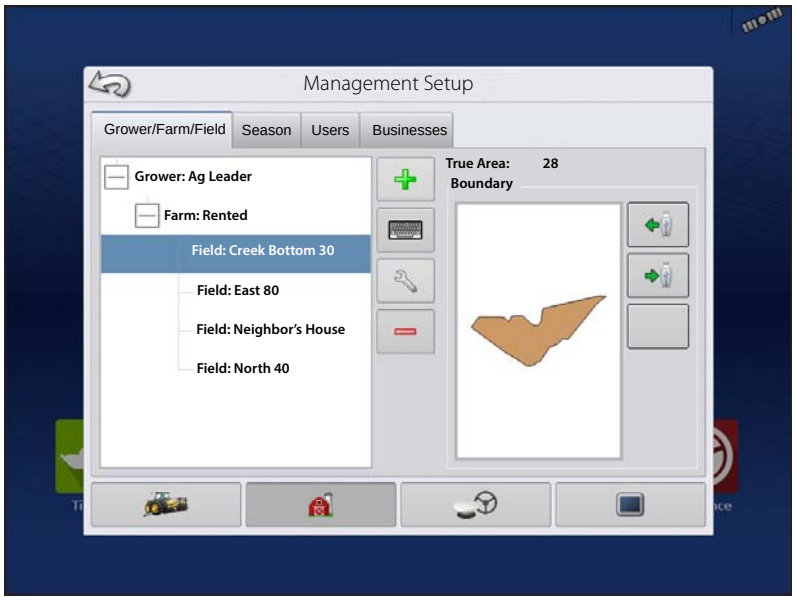
The Clear Bounds feature is particularly useful if you have flyer points or have logged a point outside the mappable range of your current location.

Importing and Exporting Field Boundaries

Boundaries can be created with the display or imported from desktop GIS software. Any boundary files present in the display can also be exported for use in desktop mapping software.

USB Import button

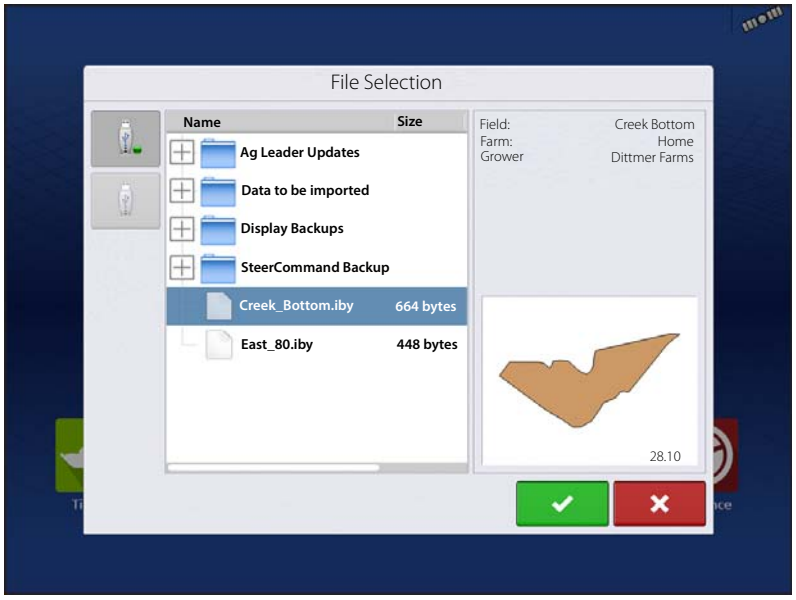
To import a boundary from the USB drive, first go to the Setup Field tab, highlight the correct field in the Farm/Field list and press the USB Import button.



The File Selection screen appears. Highlight the desired file to import.

Operator can import/export all fields and boundaries at once with an .AGSETUP file.

Press to complete the import process.



USB Export button

To export a boundary to the USB drive, highlight the correct field in the Farm/Field list and press the USB Export button. At the File Selection screen, highlight the desired field to export. A screen will appear telling you that the boundary was exported successfully. Press return to the field setup screen.

Season tab

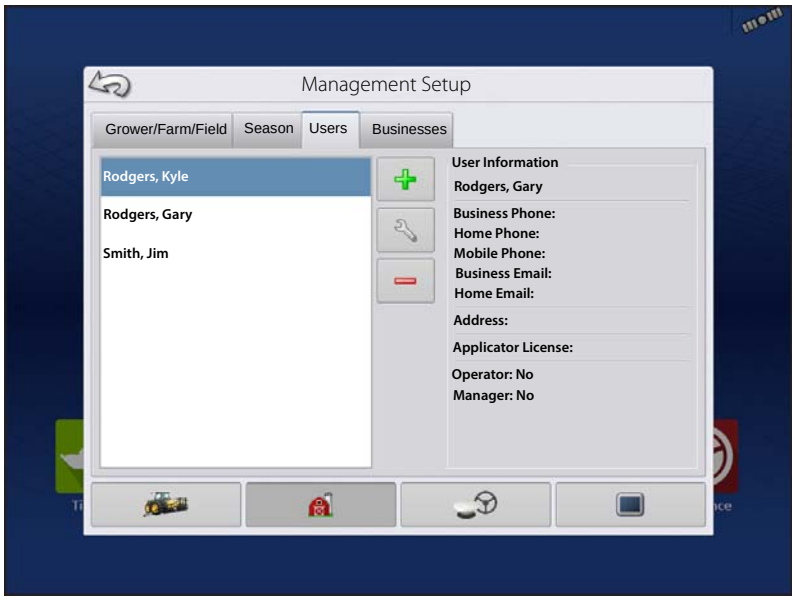
A Season is defined as the calendar year that the crop will be harvested. A Season has a start and an end date. Creating a Season and setting it to active is required prior to the system logging any data.

The seasons are displayed in lists, with the active season displayed in bold face type. All new data is logged to the active season; therefore a Season must be set as active before you can log any new data to it.

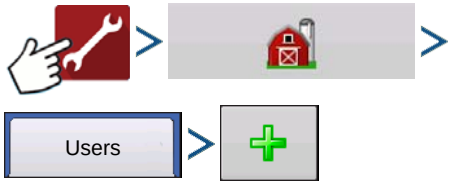
If a user would like to remove logged data from the display they can delete a season from the display. Before deleting a Season make sure that all logged data has been properly archived within management software or AgFiniti Mobile.

Users tab

User tab allows user to add, modify, or delete users from the display.

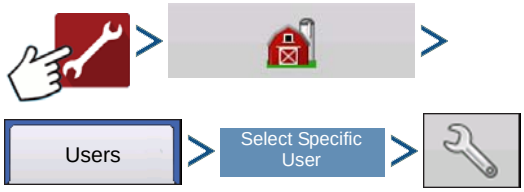


Add a User

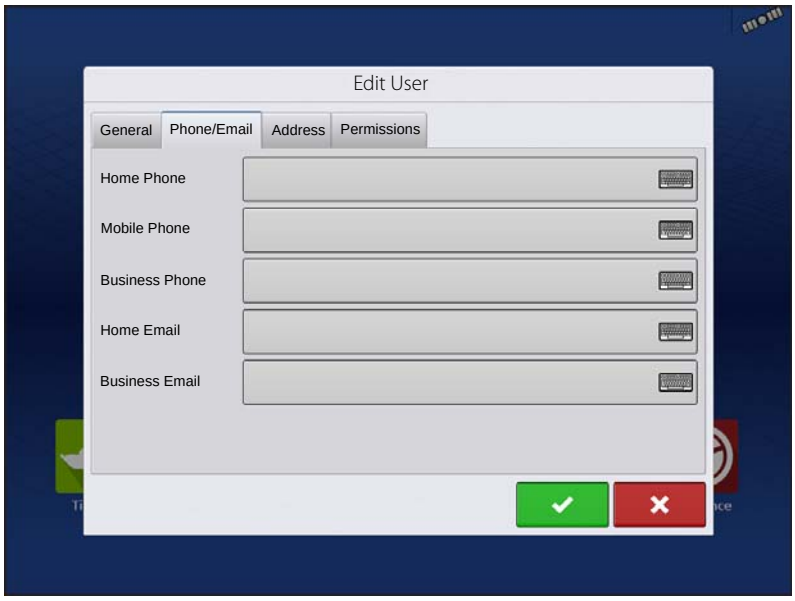


1. Enter first name and/or last name (have to enter a first or last name, recommend entering both).
2. Enter applicator license (optional). Press ▶ to continue.
3. Select Operator or Manager (can select either, none, or both). Press ▶ to continue.
4. Enter and verify password (optional).
   - Locks the displays ability to load/change operating configurations, access setup and USB, if Manager has a password set
   - Leaves display unsecured unless each manager sets a password
   - No restriction for password format (can be any combination of letters, numbers, and special characters)
   - Case sensitive
5. Press ✔ to accept.

Edit User Profile



"Edit User" screen allows user to edit information originally entered when profile was added. Edit button also allows access to more phone, email, and address information.



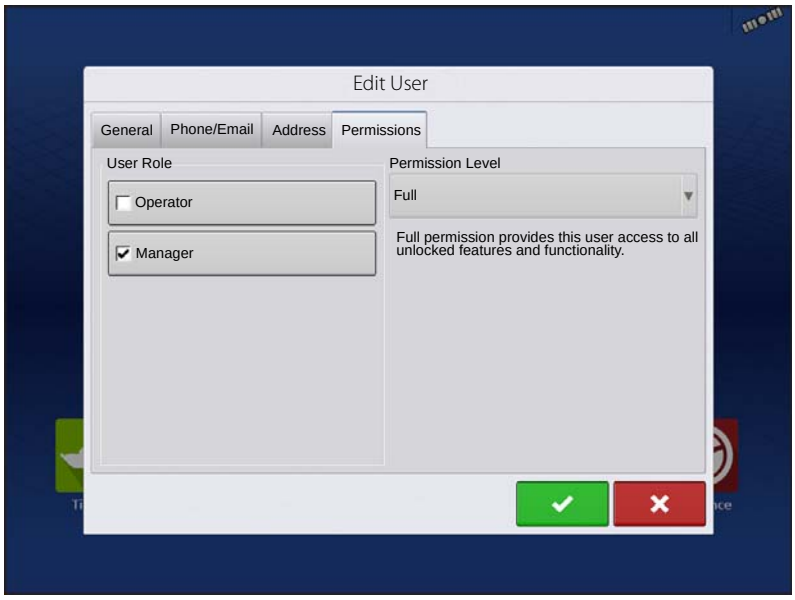
General tab
First and Last Name
Set and Clear Password
Applicator License
Memo

Phone/Email tab
Home Phone
Mobile Phone
Business Phone
Home Email
Business Email

Address tab
Address
Extended Address
City/Locality
State/Province
Country
Postal Code

Permissions tab

This is an optional function that defines what access the user will have in the display. Users are defined as Operator or Manager (can select either, none, or both).



Operators

- Have full or limited access
- No access to USB or Setup options, unless also set as a Manager
- Can import from USB from Map screen (RX, patterns, boundaries)
- Manager sets up privileges

Managers

- Full access to the display settings and functions
- Only user that can change the selected configuration
- Ability to log out of the display

System can be set up with operators only. Passwords are not used when set up this way.

Permission Level For Operators

Full Permission—Provides full access to features and functionality on the map and home screen. A user, set only as an Operator, cannot select a different configuration and cannot access data transfer or setup, when a manager is setup in the display.

Basic Permission—No access to:

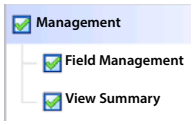
- Summary screen
- Legend tab on Map screen
- Marks tab on Map screen
- Boundary tab on Map screen

  Limits Guidance options to:

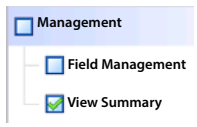
  - Creating & loading Straight AB or SmartPath patterns
  - Nudge
  - Remark A
  - Save or reset guidance line

Custom Permission—Can allow or deny the following options:

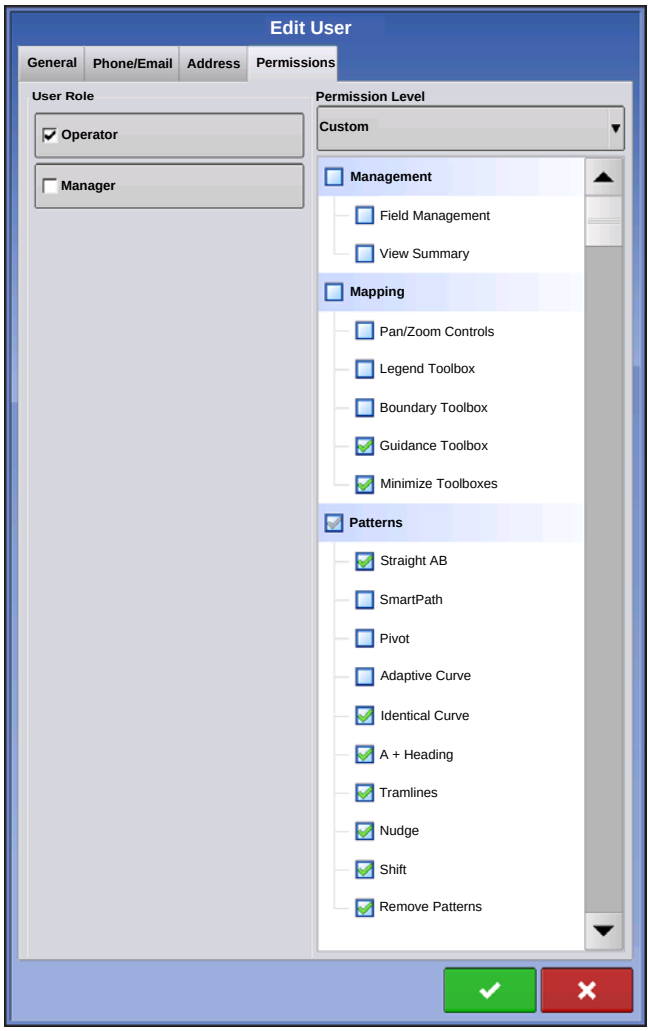
- Management screen
- Pan/Zoom controls
- Legend Toolbox
- Marks Toolbox
- Boundary Toolbox
- Guidance Toolbox
- Minimize Toolbox
- Each individual guidance pattern
- Ability to remove guidance pattern



Display uses Traditional mode when Field Management is checked. Events using the Traditional mode are tied to the Grower/Farm/Field structure.



Display uses Events Only mode when Field management is unchecked.



The Home and Map screen will appear different depending on how you assigned user permissions.

Basic Permissions - Home screen

- Summary screen locked
- Setup and Data Transfer are locked (as indicated by a padlock icon on those buttons)
- Operator Change - Option to continue or start new operation when operators change

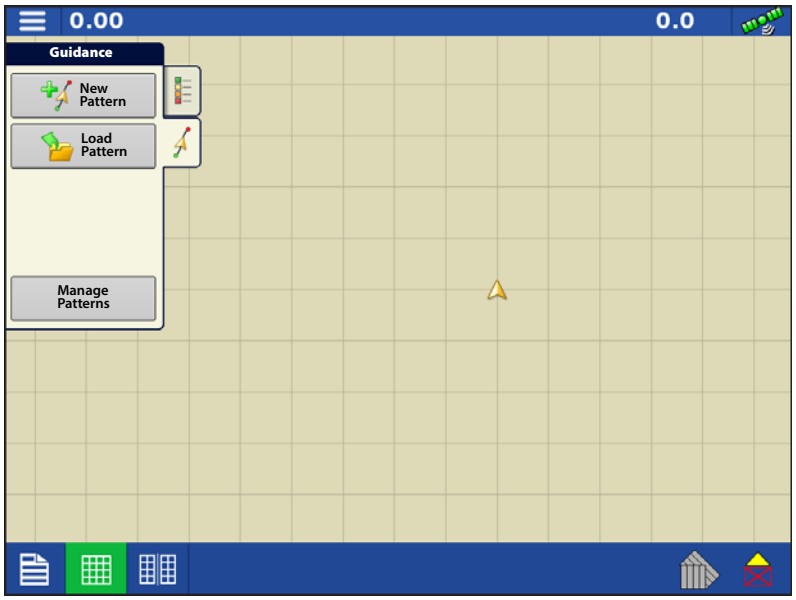
Full Permissions - Home screen

- Summary screen button is accessible.
- Setup and Data Transfer are locked.
- A manager can access these buttons by pressing the button and inputting their password.
- Configuration is locked when field operation is started.

Configurations

Basic Permissions - Map screen

- Guidance and Legend tab
- Create guidance lines
- Straight AB
- SmartPath
- Nudge
- Guidance setup



Accessing Setup Menus

A. Press Setup (wrench) button.

B. Select Manager from drop-down menu. Press .

C. Enter password. Press .

Now have complete access to the setup menus:

- Configurations Settings
- Grower management
- GPS settings
- Display settings

Do not have to be a Manager to create certain objects

- Grower
- Farm
- Field
- Product (can't change units)

Accessing Data Transfer

Data Transfer

A. Select Manager from drop-down menu. Press .

B. Enter password. Press .

Now have complete access to the USB functions:

- Networking
- AgFiniti Login
- Import/export
- AgSetup files

- Export data
- Upgrade firmware
- Advanced options
- Advanced Options with USB
- Ability to create/restore backups from USB
- Options for exporting log files
- Export by grower
- Export data at shutdown
- Export all log files

Forgotten Passwords

When a Manager forgets his password he won't be able to access Setup. Tech Support will be able to generate a password based on the serial number and firmware of the monitor.

Password generator will require the following information:

A. Display serial number

B. Major revision—First digit of firmware version

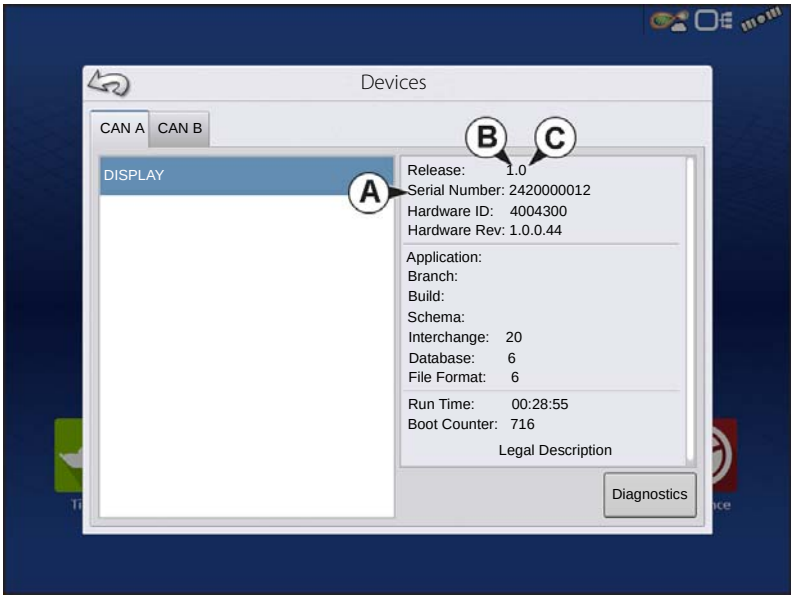
C. Minor revision—First digit of firmware version after decimal.

Example:

Version 4.5

Major = 4

Minor = 5



Only needed when a Manager forgets their password and works within the display until firmware is upgraded.

How will Tech Support identify if the person calling in is a Manager or not?

They will ask the caller, "Are you a Manager in the display?" If the customer answers yes, Tech Support will generate the password. If the customer answers no, Tech Support will require a Manager to authorize the display to be unlocked.

What if a customer doesn't want to risk forgetting passwords and generating new ones?

A display does not need to be locked with a password. The display can be operated without passwords. Operators can also be setup with limited or customized access without passwords.

Tips

- Managers, keep a record of all passwords set in the display.
- Operators, write down your personal password.
- To avoid Operators obtaining unwanted access to a display, instruct them to call a Manager for help with passwords before Tech Support.

Businesses tab

The businesses are displayed in lists, with the active business displayed in bold face type. All new data is logged to the active business; therefore a business must be set as active before you can log any new data to it.

Display Setup

The Display screen contains the following tabs:

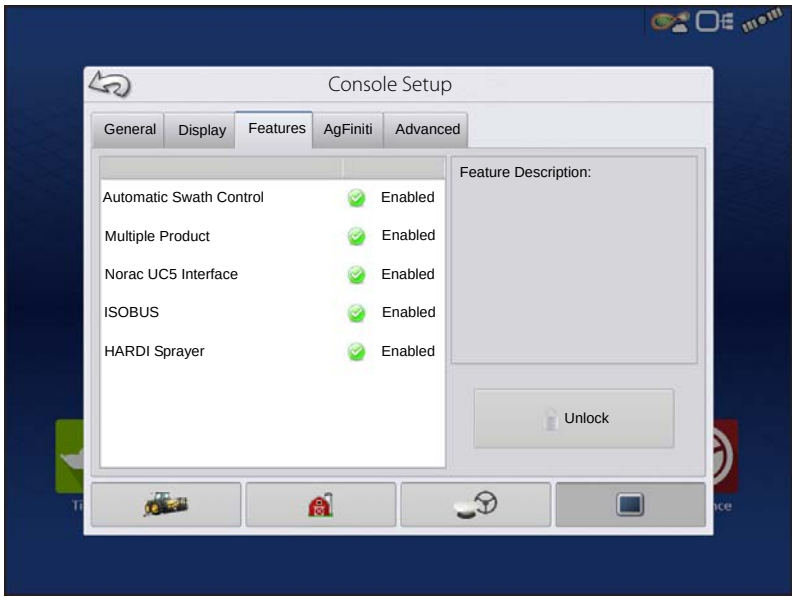
- **General tab** — Displays settings related to time, date, display screen settings, operating units, enabling video input, and ISOBUS settings. For ISOUBUS settings "ISOBUS Settings" on page 23.
- **Display tab** — Setting up and make any needed edits to the owner personal information.
- **Features tab** — Lists unlocks for display.
- **AgFiniti tab** — Access AgFiniti account settings and options. See "AgFiniti" on page 33.
- **Advanced tab** — Includes information related to log files and system backups. See "Display Backups" on page 31.

Features tab

Unlocking Features

The Features tab is where you can enter unlock codes. Unlock codes are unique to the serial number of each display and the feature registration number. You must supply these numbers to your dealer when purchasing any unlock codes.

Press to enter the unlock code and press to enable the feature.



NOTE: Once a feature is unlocked, that feature remains with that display and cannot be transferred to another.

Advanced tab

The tab allows to specify:

- Settings for copying log files.
- Specify Key Switch Standby settings.

- View and manually upgrade module firmware.
- Create and restore backup files.

WARNING!: The Export Diagnostic Files, Advanced Parameters, Copy Debug Files, Clear Debug Files and Service Mode functionality on the Advanced tab is reserved for use by the manufacturer. DO NOT change any of these settings without specific instruction from the manufacturer.

Key Switch Standby

This setting allows the display to remain powered up after the vehicle power has been shut down. The display will switch into standby mode and will appear to be shut off; however the power light will change to an amber color. Pressing the touch-screen while it is in standby mode will immediately turn the screen back on again. For this feature to work, the display must be connected to switched power.

Use ▲ / ▼ to specify a length of time that you wish the display to remain powered up in standby mode after the vehicle power has been shut down.

NOTE: When the time you specified in Key Switch Standby is nearly expired, then the amber-colored power light will flash on and off immediately preceding shutdown. If you wish the display to remain powered up for a longer period of time, touch the display to restart the Key Switch Standby countdown.

About button

Displays product licensing information and copyright information.

Memory

Adjusts information stored in the display's internal memory.

- Create Backup.

  Press to create a backup file of all configuration settings, products, and Grower-Farm-Field Management data structure on the USB drive. Backup files are stored using the .ibk3 file format.

- Restore Backup.

  Press to restore a backup file from the external data drive to the internal memory of the display.

- Clear Internal Memory.

  Press this button to clear the internal memory of the display. The system will present a warning dialogue box and ask if you would like to create a backup file prior to clearing the memory.

WARNING!: Once you clear the system's internal memory, this information is deleted and cannot be restored unless a backup has been made.

View Module Firmware

Displays the Module Firmware Management screen, which is a list of all firmware modules and firmware versions that are available for the display.

NOTE: The Module Firmware Management list includes module firmware that you may not be running.

- Import

  Imports any firmware stored on the USB drive into the display memory.

- Direct Upgrade

  Upgrades an individual module directly from the USB.

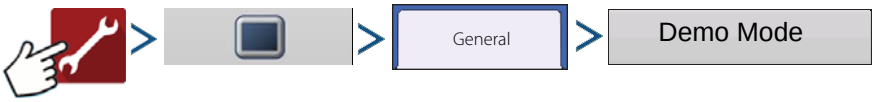
Remove Patterns

NOTE: Pressing this button permanently erases all guidance patterns from the display's memory.

Configurations

General Tab

Demo Mode



Demo Mode is used for training and demonstration purposes. Demo Mode gives the ability to show the display in a fully functioning environment without the need for a CAN or GPS simulator. Demo mode is a completely separate run environment from the normally operating mode. This keeps all customer data separate to remove the risk of data getting deleted. Any data that is added, removed or changed while in demo mode will be deleted upon power cycling the display and returning to a normal operating state.

How Demo Mode Works

1. Pressing the Demo Mode button will trigger a request to restart the display. Once restarted, the display will automatically begin an event in demo mode.

2. The event that automatically starts will be a 12 row planter running clutch control, seed tube monitoring, and three variety split logging.

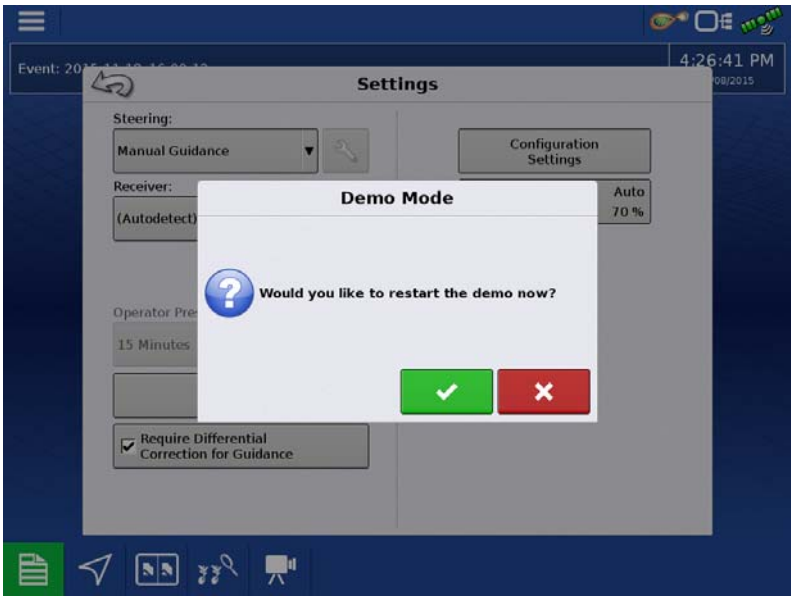
3. The event will continually run on the mapping screen. Users can interact will the menus and legends exactly like they would during a live operation.

4. The demo will continue to run until the field is completed. Once the field is completed the display will sit for 2minutes then restart demo mode over again repeating the loop.

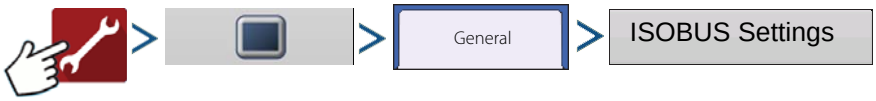
5. Coverage Logging can be manually toggled on an off by pressing the Master Switch icon in the lower right corner of the screen. With coverage logging off using can leave the mapping screen and go into all menus and setup screens normally. If they would like to continue the demo event it can be done by following the prompts via the Planting Operation Wizard.

6. Any time the display is not active on the mapping screen and left untouched for 2 minutes the display will prompt for demo mode to restart. If the prompt is not accepted within 30seconds demo mode will automatically restart.

7. To return to normal operation, restart the display. **Any data created in demo mode is automatically deleted on display restart.**



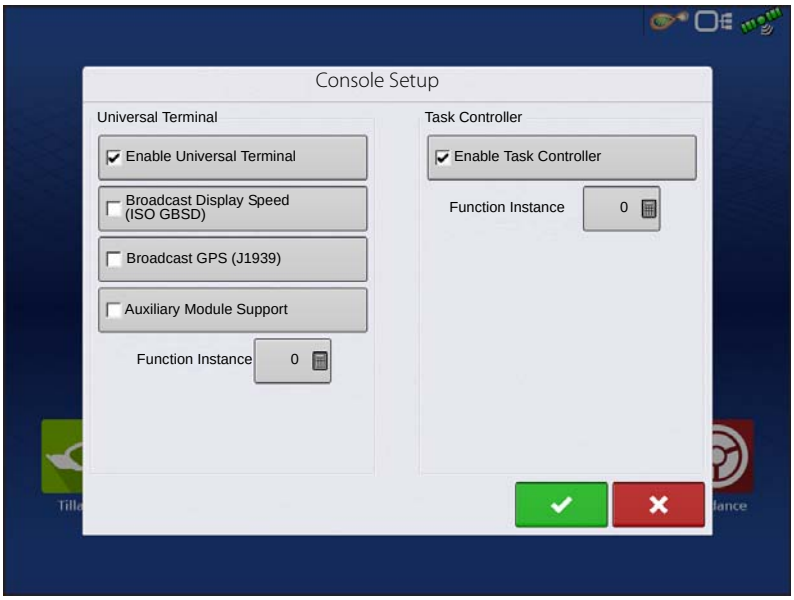
ISOBUS Settings



Universal Terminal

The display is compatible with the ISO 11783 (ISOBUS) Universal Terminal Standard. This enables support of many ISOBUS compliant implements on the display. Universal Terminal functionality enables the compliant implement's user interface to be viewed and controlled on the display.

Once Universal Terminal has been enabled, it will appear in the task bar. Toggle between the Universal Terminal screen and other display functions by pressing the UT button.



Task Controller

The InCommand displays have the ability to use ISOBUS Task Controller on compatible ECU's. This allows the InCommand display to control rate and sections of an ISOBUS ECU using Ag Leader's proprietary interface. A properly setup display configuration is required for this to work.

ISO Load and Go

With a properly setup ISO ECU, ISO Load and Go streamlines the configuration building process for task controller ECU configurations. The Load and Go feature automatically builds a controller during the configuration building process based on the ECU device description. For this to work it requires the device description to have proper sections, section offsets, and product type setup on the ECU.

Common Terminology

ISOBUS Working Set—One or more ISOBUS modules that control an implement's functionality

Working Set Master (WSM)—Main module responsible for coordinating all communication between the UT and the Working Set including loading of the Object Pool to the UT screen

Object Pool—The graphic image presented to the user on the UT display. The Object Pool is sent to the UT by the ISOBUS module.

ATTENTION!: Before operating an ISOBUS implement with the display, read the operator's manual provided by the implement's manufacturer and follow all safety information provided in the manual. When this display is used with an ISOBUS implement, the information and functions on the display are provided by the implement ECU and are the responsibility of the implement manufacturer.

Broadcast Display Speed (ISO GBSD)—Checking this box allows speed source currently being utilized by the display to be broadcast over the ISOBUS to the implement ECU.

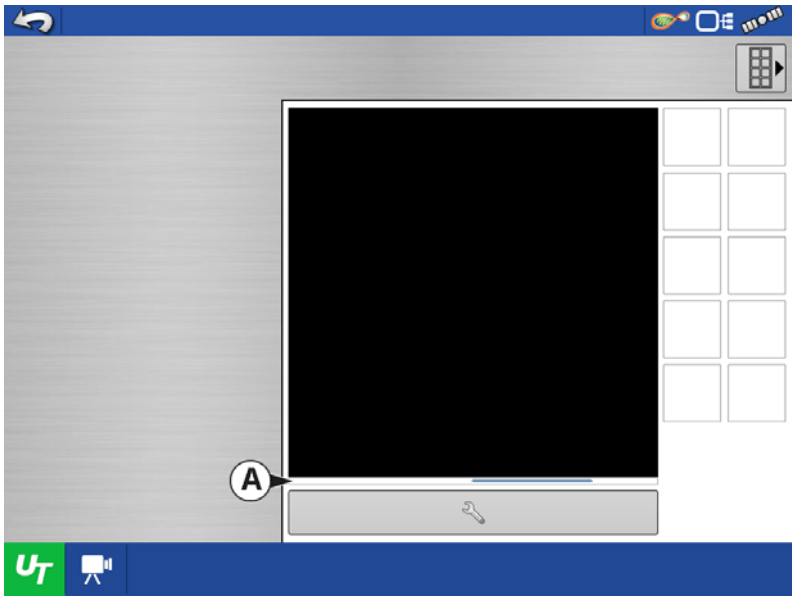
Broadcast GPS (J1939)—Checking this box allows GPS data being supplied by the GPS receiver to be broadcast over the ISOBUS to the implement ECU.

Auxiliary Module Support—Checking this box allows the Ag Leader Auxiliary Input Module or Smart Switchbox, to be used with ISOBUS ECUs that support AUX-N auxiliary functions.

Universal Terminal Functional Instance—Always set to 0 except when there are multiple UTs on the ISOBUS. Use to change instance. Reboot Display

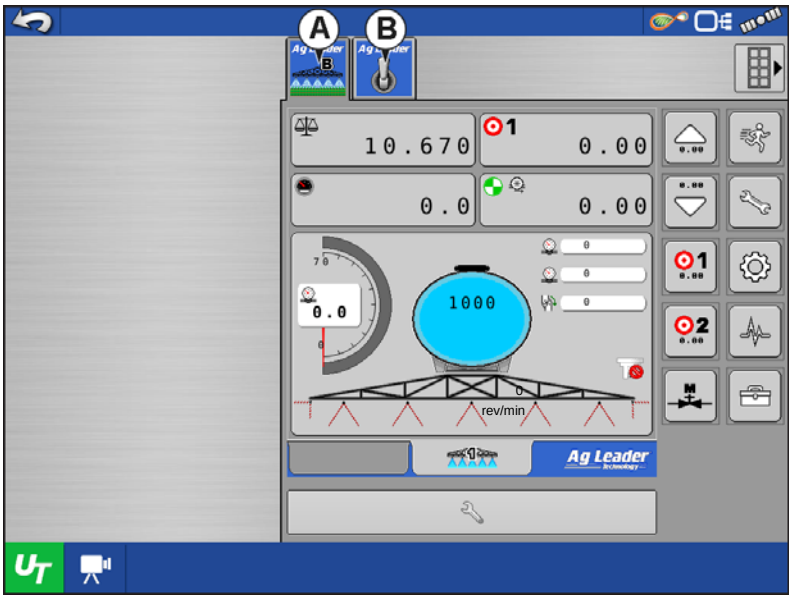
Task Controller Function Instance—Always set to 0 except when there are multiple TCs on the ISOBUS. Use to change instance. Reboot Display

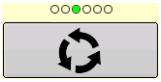
When an ISOBUS compliant implement is connected to the display for the first time, the implement WSM sends its graphic interface, called the Object Pool, to the display. The Status bar (**A**) appears while Object Pools are being loaded. This process might take several minutes depending on the number of Object Pools being loaded. Once loaded, object pools are stored in the display memory.



If there are multiple ISO implements connected, press the UT button to toggle between Working Sets.

The Working Sets can also be accessed by pressing tabs (**A**) or (**B**) individually.





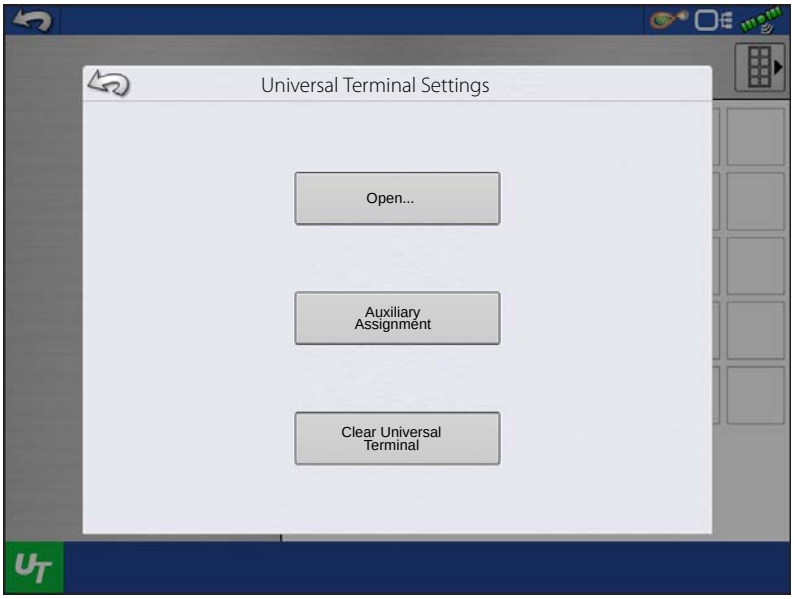
Advance through multiple screens of buttons. This button remains hidden unless more than 10 buttons are present.

Opens the Universal Terminal Settings screen.

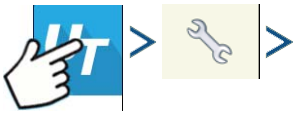
Auxiliary Assignment—assign implement functions to ISO compatible inputs.

Clear Universal Terminal—Allows operator to clear the Object Pools sent to the display from the implement WSM. After the object pools have been cleared, the next time the implement is connected the object pools will be transferred from the implements WSM to the display again. When this button is pressed, a warning dialogue box appears with the following message:

"All Universal Terminal interfaces saved in the display will be cleared. Do you want to continue?"



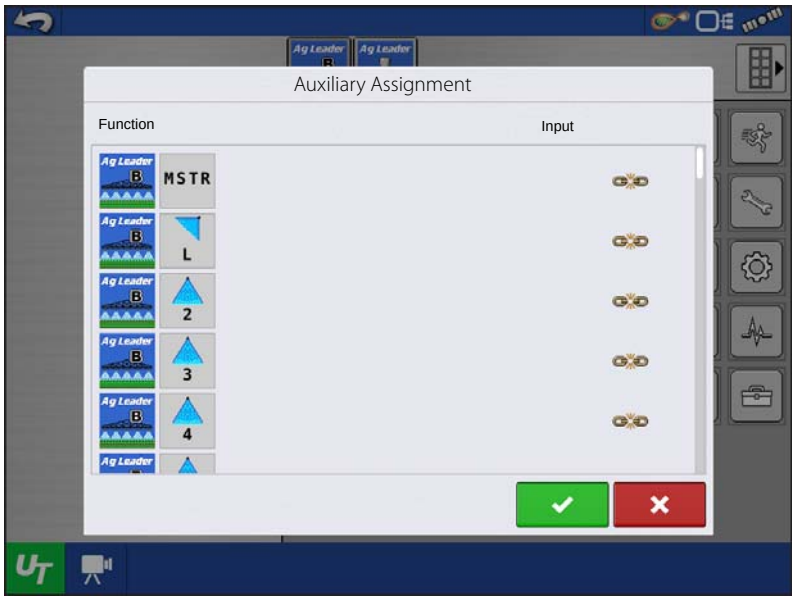
Auxiliary Assignment



Auxiliary Assignment

Assign implement functions to ISO compatible inputs.

The number of functions and inputs shown on the Auxiliary Map screens will vary depending on the implement and input devices connected to the display.



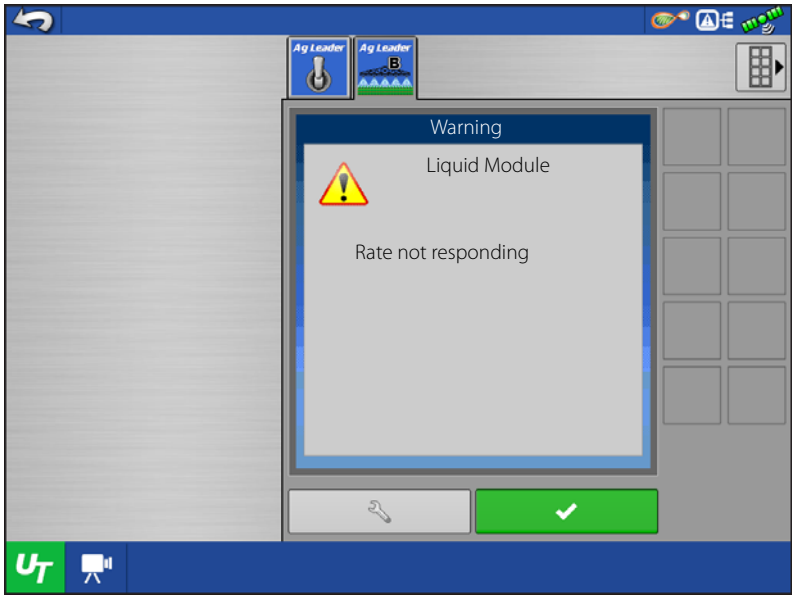
UT Alarms and Trouble Codes

If the display receives an active trouble code, the Universal Terminal Alarm will appear in the Status bar at the top of the screen.

When an alarm is activated on the UT, the display will indicate the alarm by flashing "Universal Terminal Alarm" in the status bar.

Alarms are acknowledged and cleared by pressing .

This button is only present when a Universal Terminal alarm has been activated.



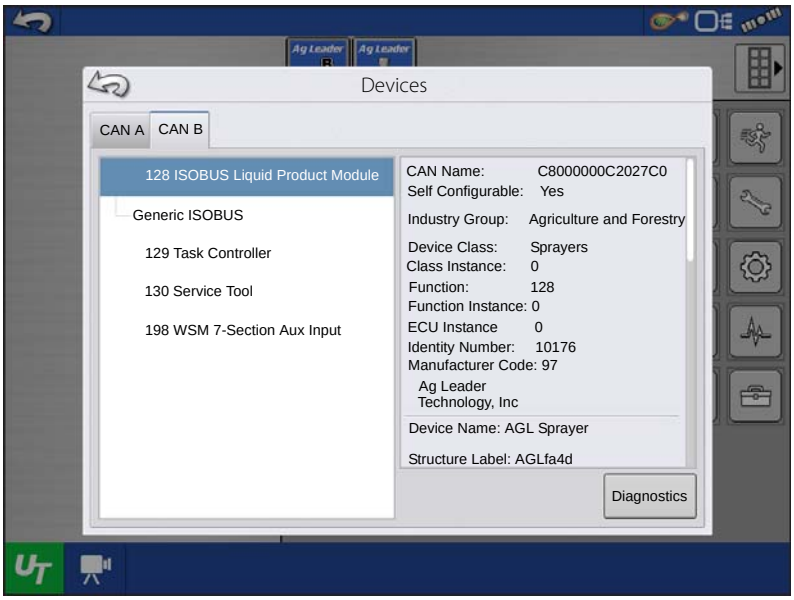
The Devices screen displays the following information:

A. Caution icon indicates module has active trouble codes (DTCs)

B. Device Class

C. ECU Serial Number

D. UT Manufacturer, name and code



Pressing the Diagnostics button on the Devices screen brings up the ISO Node Diagnostics screen which shows the following information.

SPN— "Suspect Parameter Number" = Error Number

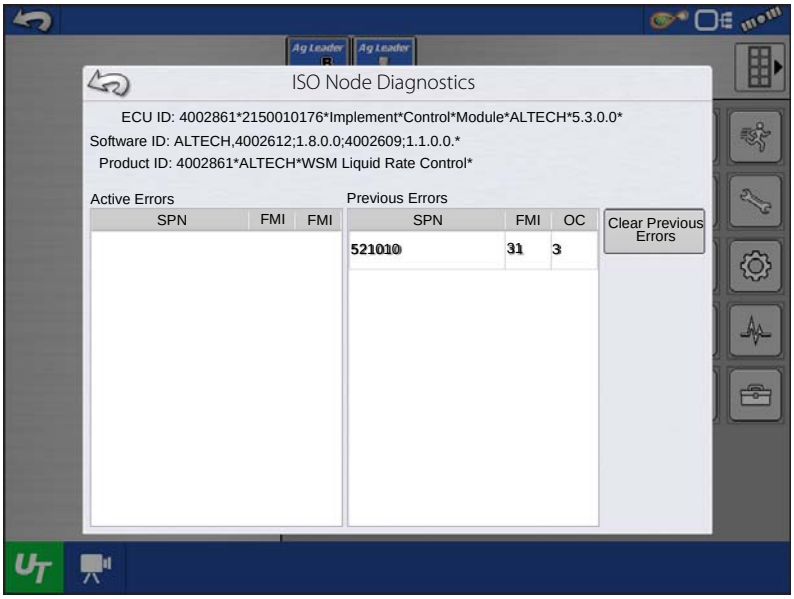
FMI—"Fault Mode Indicator" = Error State.

OC—"Occurrence Count"

DTC—Diagnostic Trouble Code

This is a combination of the SPN and the FMI (for example 522102.12).

Cross-reference DTC in equipment manufacturer's operator manual for description of error.

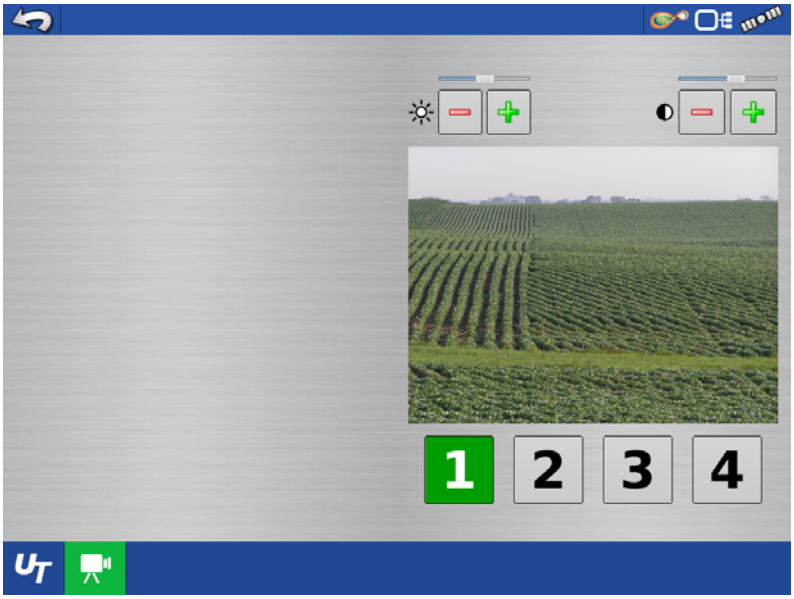


Video

Video button. Camera is available from the Home or Map screen. Press video button and the Video screen appears.

NOTE: Video is only available when enabled in the Display Setup menu.

- Brightness - increase or decrease the brightness of the video input.
- Contrast - increase or decrease the contrast of the video input.
- Camera Number Selection

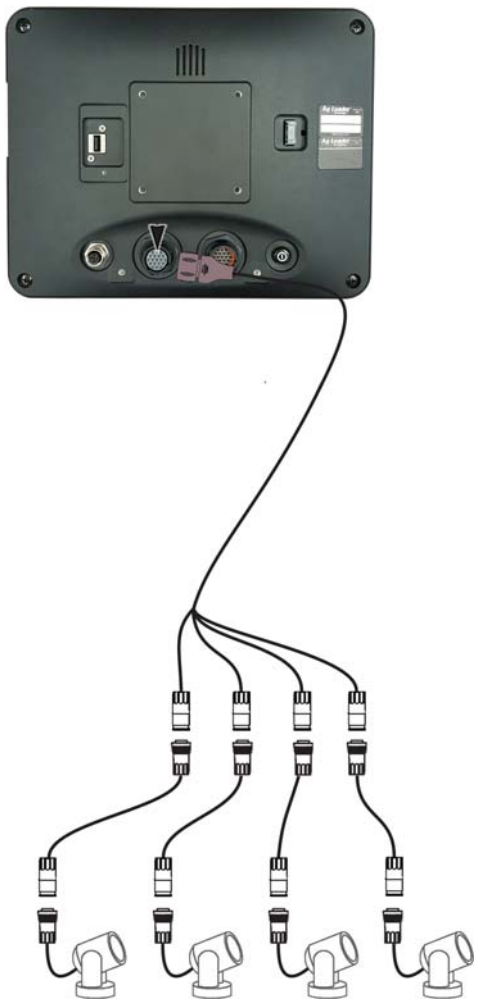


Configurations

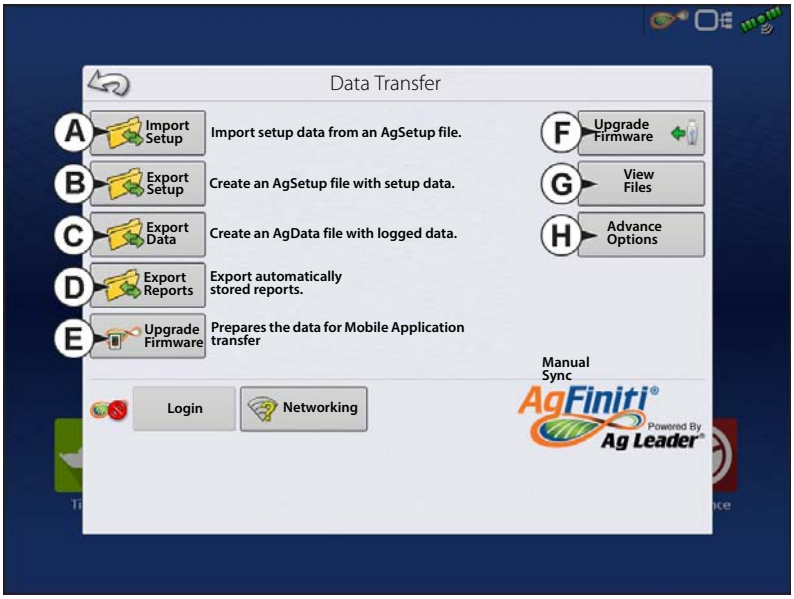
The display can receive input from up to four video cameras. Press the numbered buttons to switch views between video cameras.

NOTE: You can adjust the brightness and contrast of each input individually.

Camera Harness—A camera cable, sold separately, will plug into the aux port on the back of the display.



Data Transfer screen



A. **Import Setup**
B. **Export Setup**
C. **Export Data**
D. **Export Reports**
E. **Manual Sync**
F. **Upgrade Firmware**
G. **View Files**
H. **Advanced Options**
   - Create Backup
   - Restore Backup
   - Export by Grower
   - Export at Shutdown
   - Export all Logs

.AGSETUP Files

Used to transfer setup information from display to display or from SMS and display

- Allows full synchronization of the following file formats:
  - Management Data (Growers, Farms, Fields, Seasons, Operators)
  - Products and Product Mixes
  - Boundaries
  - Guidance Patterns
  - Marker Sets and Markers
  - Configurations

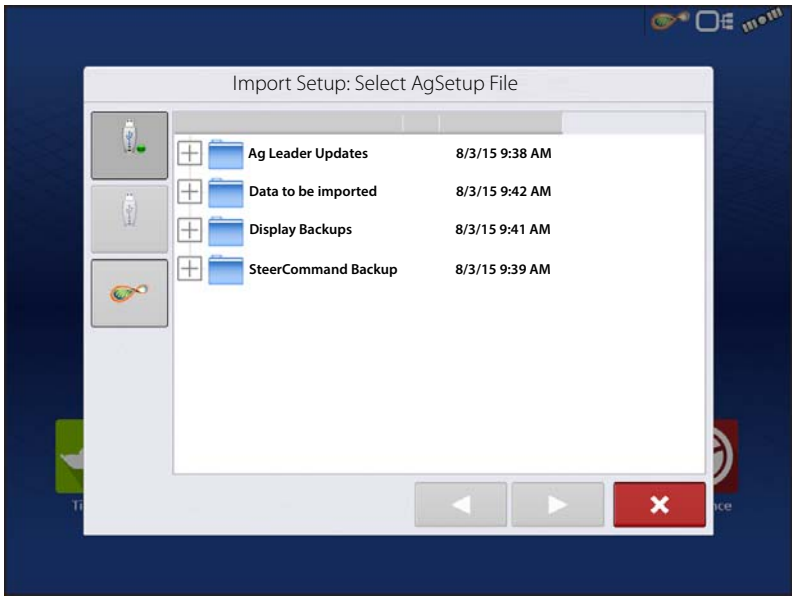
NOTE: Do not use the IBK to “clone” a display. Use AGSETUP or make a new setup.

Import .AGSETUP file from AgFiniti or USB

The File Selection screen opens. Use the scroll bar to find the file you wish to import.

Export .AGSETUP file to AgFiniti or USB

Use to transfer setup information from display to display or from SMS and display.



.AGDATA files

- Includes all the necessary data to fully archive in SMS
- Includes recorded operation data
- Equipment Used • Products Used
- Marks Logged • Boundaries
- Guidance Patterns
- Flexible export options
- Able to export by Grower

Exporting Logged Data

After a field operation is completed, data can be exported to USB or AgFiniti. This can be accomplished by pressing the "Export Data" button within the Data Transfer screen ("Data Transfer screen" on page 29) and selecting the export location. Under the advanced options menu within the Data Transfer screen users can also choose to export by grower and/or at display shut down.

- Pressing the "Export Data" button will trigger all data to be exported based on the last time the export button was pressed. After data has been exported to the external device, it is still retained within the displays memory.
- If previously exported data needs to be retrieved from the display it can be accomplished by pressing the "Export All Logs" button under advanced options within Data Transfer. Export all logs will export all logged data stored on the display.
- Data on the InCommand displays is not automatically deleted after any export operation. Users have the ability to delete old seasons("Season tab" on page 14), which includes the logged data, to free up memory on the display.

Export .AGDATA file

Use to transfer data information to management software from the display to AgFiniti or USB drive.

ISO XML export

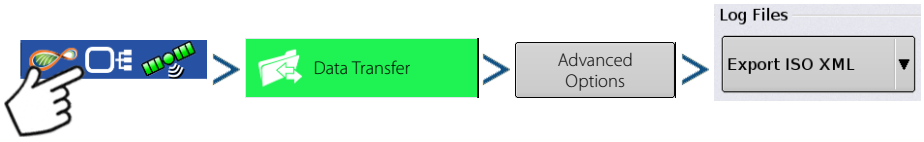
This function enables the export of data files in the TASKDATA.XML format.

Supported operations

- Multi-Product and Multi Channel liquid and Granular operations
- Rate Logged with ISO Modules

- Flow Logged with Proprietary Modules
- Single channel/drive planter
  - –Planter sections are mapped
- Site Verification
- Summary totals

Enable ISO XML Export



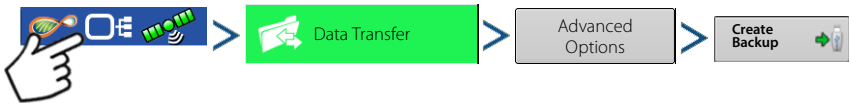
Display Backups

A display backup creates an exact clone of a display's current contents. This includes all management information, configurations, and logged data on the display. Backups should be taken at regular intervals through an operating season to minimize any data loss in the event of a display failure. Display backups can only be used on a like display with the same or newer firmware than the backup was created on. Example: a display backup from an InCommand 800 cannot be installed on an InCommand 1200 display or vice versa. When a display backup is restored onto a display it will overwrite all existing data on that display. Users moving data between multiple displays should use an .agsetup file instead of a backup file to accomplish this task. .Agsetup files have the ability to merge and add data to a secondary display so there will be no risk of data loss.

ibk3 files

- System backup file. Backup files are written to USB drive.

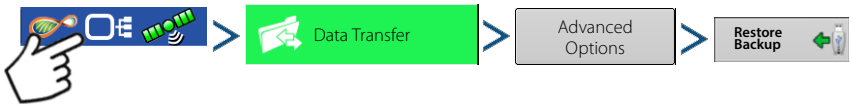
Create Backup File (USB drive Only)



Use to create backup file.

Ag Leader recommends backing up the display regularly to prevent/minimize data loss in the event of a display failure.

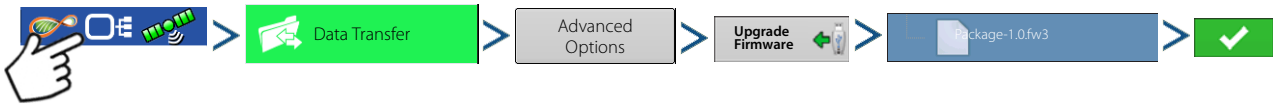
Restore Backup File



Upgrade Firmware

.fw3

- Firmware upgrade file for the display and control modules. Install firmware updates from USB drive.

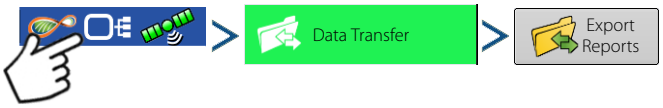


Pressing the Upgrade Firmware button allows you to upgrade the display firmware from the .fw3 file stored on the USB drive. At the File Selection screen, scroll through the list of files on the USB drive until you find the .fw3 firmware file. Highlight the .fw3 file and the box at the upper right-hand side of the File Selection screen shows the version of this file.

Press ✓ to continue, and the Upgrade screen informs you that the upgrade is beginning. At the Upgrade Ready screen, press ✓.

WARNING!: Do not disconnect display power when the upgrade is taking place.

Export Reports



Exports Reports saved on internal memory.

Manual Sync

The Manual Sync button is used when logged data needs exported to AgFiniti Mobile when the display operator is still in the middle of the field operation. Pressing the Manual sync button will prepare data from the active event to be sent to be AgFiniti Mobile. The display operator must disable logging on the Map screen to accomplish this. When the AgFiniti Mobile app is opened, new data from closed or suspended events is automatically checked for and transfers at regular intervals. The Manual Sync button only needs to be used if the customer needs data from the active event and does not want to suspend or close it.

AgFiniti

AgFiniti is Ag Leader's platform to provide users with the ability to quickly and easily transfer data, view their display remotely, and take logged data with you when you leave the cab.

AgFiniti Mobile

AgFiniti Mobile is Ag Leader's native iOS®[1] app. It provides the ability to take maps and summary information from the cab and access it on an iPad®[2] anywhere. The app allows for a wireless connection to the display, reducing the need for a modem or Wi-Fi hotspot in the cab and providing a simple, direct connection to access data. AgFiniti Mobile also allows for multiple display connections, allowing for operations with multiple displays to have their logged data all in one iPad. Data imported into Mobile will remain there until removed by the user or the app is uninstalled. See "AgFiniti Mobile" on page 36.

AgFiniti Essentials

AgFiniti Essentials is a suite of features that provides additional functionality when using AgFiniti Cloud, as well as providing connectivity between AgFiniti Cloud and AgFiniti Mobile. The main features of AgFiniti Essentials are listed below:

AgFiniti Essentials requires the purchase of an annual license.

- **File Transfer**—wireless transfer of data between the InCommand display and Ag Finiti Cloud. Export prescriptions and management information generated from SMS and have them accessible in the cab using AgFiniti Essentials. Three displays can be registered for each license purchased. This requires an active internet connection
- **Cloud Processing**—AGDATA files in AgFiniti Cloud will be processed without the need for a desktop mapping software, such as SMS. This allows you to view your maps online from any iOS, Andriod™[3], Windows®[4] device shortly after they have been transferred to AgFiniti.
- **Cloud Sync**—AgFiniti Cloud and AgFiniti Mobile sync data. Logged data is accessible on your iPad or on the web without having to go to each display. This also allows you to see SMS data on your iPad as well, such as prescriptions, soil types, soil sampling sites, and third-party display information (such as planting or harvesting data from a no Ag Leader display. AgFiniti Mobile does not require an active internet connection to view maps, just to download them.

Remote Support

AgFiniti Remote Support grants the ability to remotely view a display from the AgFiniti website on supported browsers. This allows for faster, more effective troubleshooting due to the user being able to view the display and not relying on second-hand descriptions. This can result in less downtime and fewer frustrations when issues do occur. This can also help when setting up displays for the first time and provides an avenue for getting help in a more efficient manner. Remote Support requires an annual license. See "Remote Support" on page 44.

AgFiniti Mobile Connection Types

Display Access Point Mode

This connection type turns your InCommand display into a wireless access point that all compatible iPads can connect to. When using this connection type, every time an iPad is within range of your InCommand display, AgFiniti Mobile will automatically download new data while the app is running.

See "Display Access Point connection type" on page 34 for step by step instructions to make this connection type

WI-FI Network

Connection

- Transferring information when both devices are connected to the same home/office Wi-Fi network
- A hotspot (such as a jetpack) device is used in the cab to provide internet

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2.iPad® is a registered trademark of Apple Inc.
3.Android™ is a tradmark of Google Inc.
4.Windows® is a registered trademark of Microsoft Corporation

When both the InCommand display and your iPad are connected to the same network, for example your home Wi-Fi network, they will be able to recognize one another and transfer data in the same fashion as the other two connection types. If you already have a Wi-Fi network present in the cab of your vehicle, this connection can be utilized. To use this connection type, the InCommand display and iPad need to be on the same wireless network.

See "Shared Wi-Fi Network Connection" on page 48 for step by step instructions to make this connection type

Cellular iPad as Personal Hotspot

Connection scenarios

- Only Cellular iPads when InCommand is accessing AgFiniti Cloud

Cellular based iPads have the ability to act as a personal hotspot. This allows InCommand to access AgFiniti and directly transfer information to AgFiniti Mobile, both through the iPad's cellular connection and Wi-Fi hotspot. This connection type would be used when needing to use AgFiniti Cloud and AgFiniti Mobile at the same time. For example, you may need to download an .AGSETUP file (for prescriptions) from AgFiniti cloud or to use remote support.

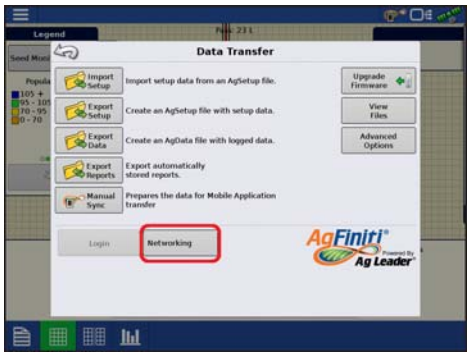
See "Cellular iPad as Personal Hotspot" on page 34 for step by step instructions to make this connection type

NOTE: Using this connection type to transfer data directly from the InCommand display to your iPad will not utilize your cellular data. The connection is over Wi-Fi and therefore not using cellular data. If you use your iPad to connect to AgFiniti Cloud to download data, cellular data will then be used at those times.

Display Access Point connection type

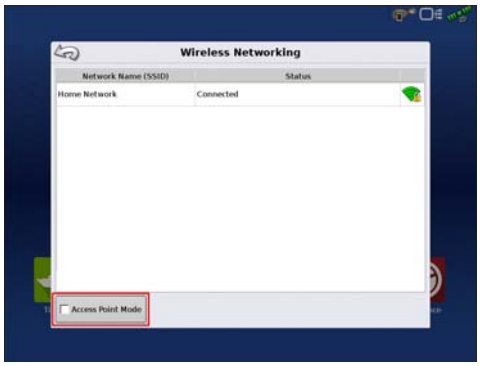
1. With the Wi-Fi adaptor installed in the display, the AgFiniti symbol will show a status indicator in the top right corner of the display. Press the Status Indicator button followed by pressing the Data Transfer button.

2. Press the Networking button

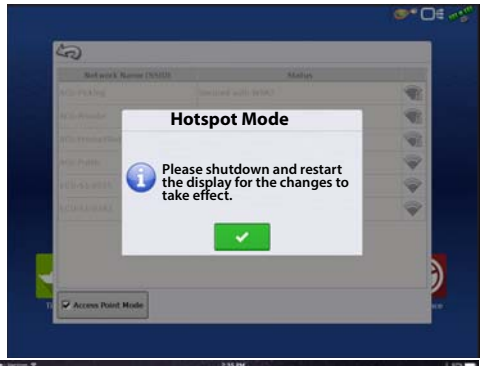


NOTE: If the login button is active, you may utilize one of the other connection types.

3. On the Wireless Networking page press the "Access Point Mode" button in the bottom left corner of the screen. This will turn on the Access Point mode and will allow your iPad to connect to this display.

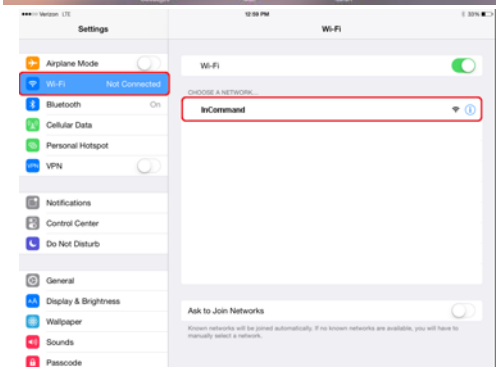


4. For Access Point mode to be enabled the display will prompt to be restarted. At this point restart the InCommand display by manually depressing the power button to shut down and then repeat to restart the display
5. After the restart the display will be broadcasting a Wi-Fi signal and can now be selected on the iPad.



6. To connect to the display Wi-Fi signal via the iPad, first go Settings button on the device.

7. Select the "Wi-Fi" tab from the left side menu, ensure that "Wi-Fi" on the iPad has been enabled then select the "InCommand" wireless network. This will connect the iPad and InCommand display together and ensure proper data transfer.



8. Once connected, proceed to open the AgFiniti Mobile app.

NOTE: Download AgFiniti Mobile from the Apple® App store.

9. Once AgFiniti Mobile is open, it will automatically attempt to connect to the InCommand display.

10. Once the InCommand display has been found the display will prompt user to allow connection to happen

NOTE: This should only happen once per device. (wait up to a minute after opening the app for this to occur)

11. After pressing the green check mark the mobile device will begin accepting data from the display as it becomes available. This is indicated by the device symbol within the AgFiniti status indicator on the top right corner of the screen.

At this point your InCommand display and iPad are connected and ready for data transfer. If there are any closed or suspended events present on the InCommand display, they will be transferred to the iPad once the app is opened.

AgFiniti Mobile

After connecting your InCommand display and iPad, you are now ready to start transferring and viewing data.

Once your connection has been established and you have granted access to the display you should see the display connection indicator go from red (not connected) to blue (downloading) to green (connected).

You should see an additional icon that indicates your maps are being built from the downloaded data.

This process will occur automatically and nothing has to be done on your part for data to be imported, just keep the app open while your data processes. Once the process is complete, your data will automatically be mapped.

Tap any of these icons for additional sync details.

Once data is present you should see the layout shown:

A. Menus (page 41)

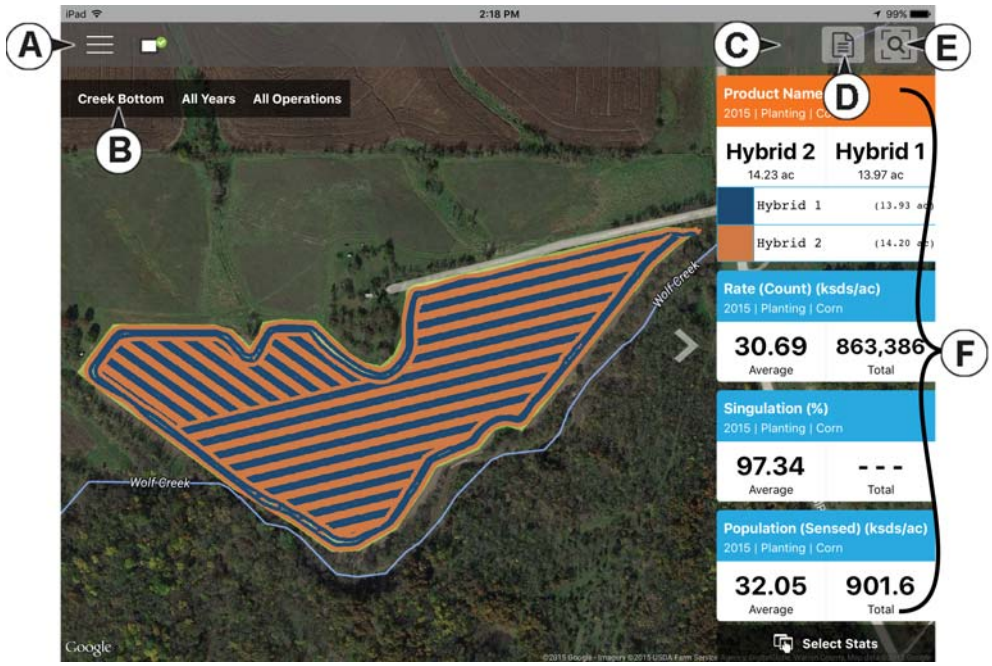
B. Filters (page 38)

C. Help button

D. Summary Reports ("Summary Reports" on page 40)

E. Zoom Options (page 40)

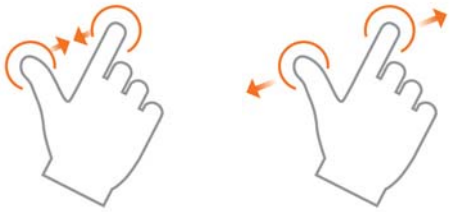
F. Stat Cards (page 39)



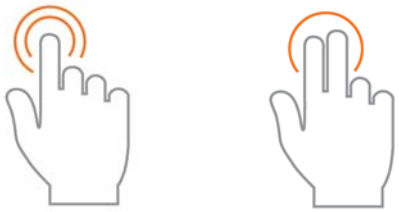
NOTE: An active internet connection is required to see satellite imagery.

Gestures

As with any iOS app, AgFiniti Mobile uses gestures. These gestures will allow you to navigate around the app, select items and make various changes. The most common gestures are outlined below.

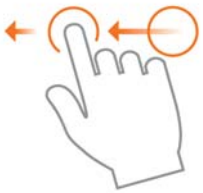


Pinch In and Out— Using two fingers touch the screen and pinch in and out to adjust the zoom level of your map. If zoomed out enough field coins will begin to appear which can be selected to see data for other fields.If zooming in far enough, you should begin to see row by row data on applicable fields.



Tap to Zoom—By tapping on the map you can quickly control the zoom level of your map. Quickly double tap with one finger to zoom in and single tap with two fingers together to zoom out.

Tap—Tap items in AgFiniti Mobile to select them. You can also tap on your map to set a manual location within the field and view its specific data in the Stat Cards



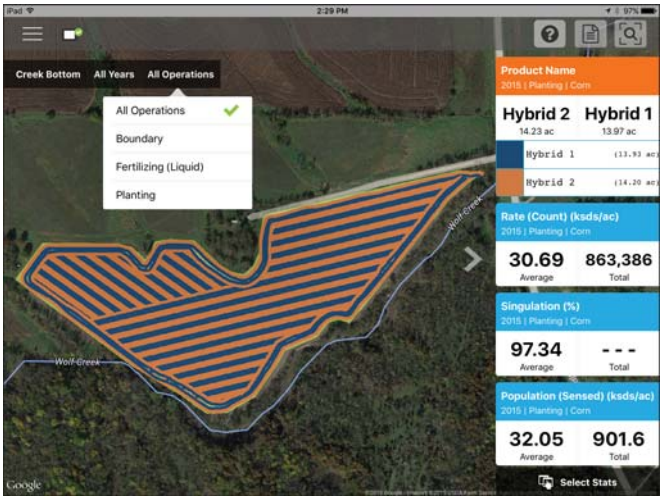
Swipe—Swipe your finger to see additional menus on certain items.

Pan—Tap and hold your finger on the screen to pan around your mapped data while maintaining the same zoom level

Filters

To choose different fields, years, or operations you will use the Field/Operation Filters present in the upper left.

To choose different options, tap on the area you would like to filter by and choose from the various options present. You can choose All for both the season and operation filters if you would like to have access to all data present for a chosen field. .



Use the tap gesture to make selections in the filter.

Use the pinch gesture to zoom your map in and out, and choose from other fields present in AgFiniti Mobile. If zoomed out far enough, field coins will appear, Tap a coin to see available fields.

Stat Cards

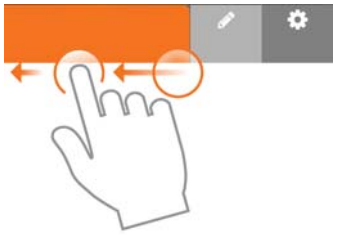
Along the right side of the app you will see Stat Cards. Stat Cards will contain information for data currently mapped. Tap on the Stat Card that you would like to view. The Stat Card that is currently mapped will appear orange in this list. The Stat Card will also indicate field average (if applicable), total and location specific values if a position is selected (as shown).

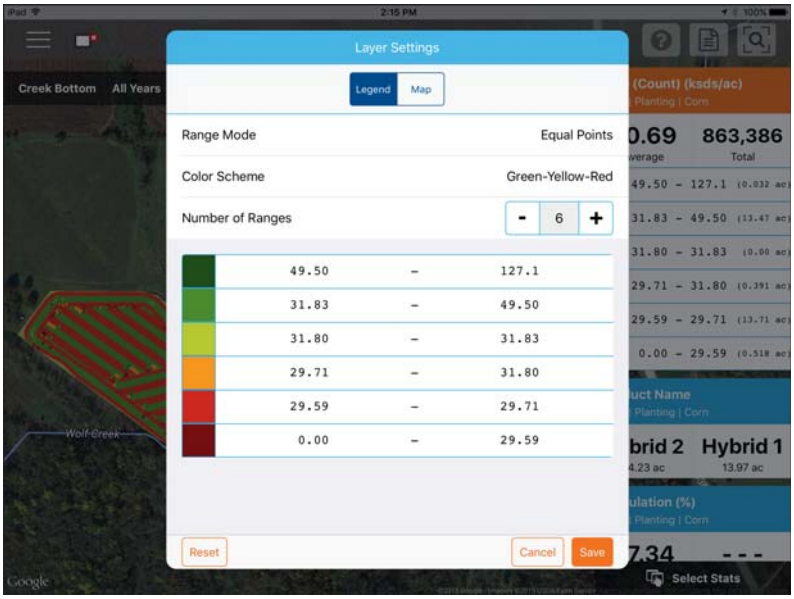
Use the tap gesture to select a location to view information on Stat Cards or select other card.

You can collapse the Stat Cards by tapping on the arrow present next to the Stat Cards and expand it out by tapping on the same arrow again.

NOTE: Tap on a Stat Card's average or current box to view additional details for that specific attribute.

If you wish to edit the legend or map present, you can access the stat options by swiping the Stat Card title. This will display two options, Edit Source and Edit Settings.





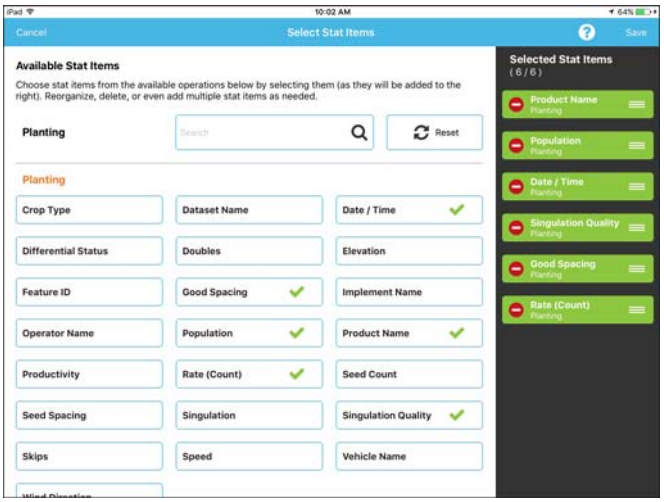
Edit Source will allow you to select multiple years, operations, or events—for example comparing two years of yield data.

Edit Settings will allow you to change the map and legend settings. Mode, number of ranges and the color scheme can all be adjusted here. You can also adjust various map settings such as the transparency, map type and drawing settings by tapping on the Map button present (shown).

By tapping on the Select Stats option

, you can choose which Stat Cards are displayed.

Tap on a Stat Card to add to the list on the right. To remove a Stat Card, tap on the red circle.



NOTE: When changing or resetting Stat Cards, AgFiniti Mobile will do so by mapped operations. For example, if Planting is selected and stats are changed, it will do so only for Planting.

Use the tap gesture to make selections.

Zoom Options

Use tap to make selection.

Access the various zoom options present in the app.

Zoom Current Location—Sets the zoom level to the location the app currently sees. This will only work if you have granted the app access to your location.

Zoom Field—Sets the zoom level to the currently mapped field shown in the Field/Seasons/Operations filter.

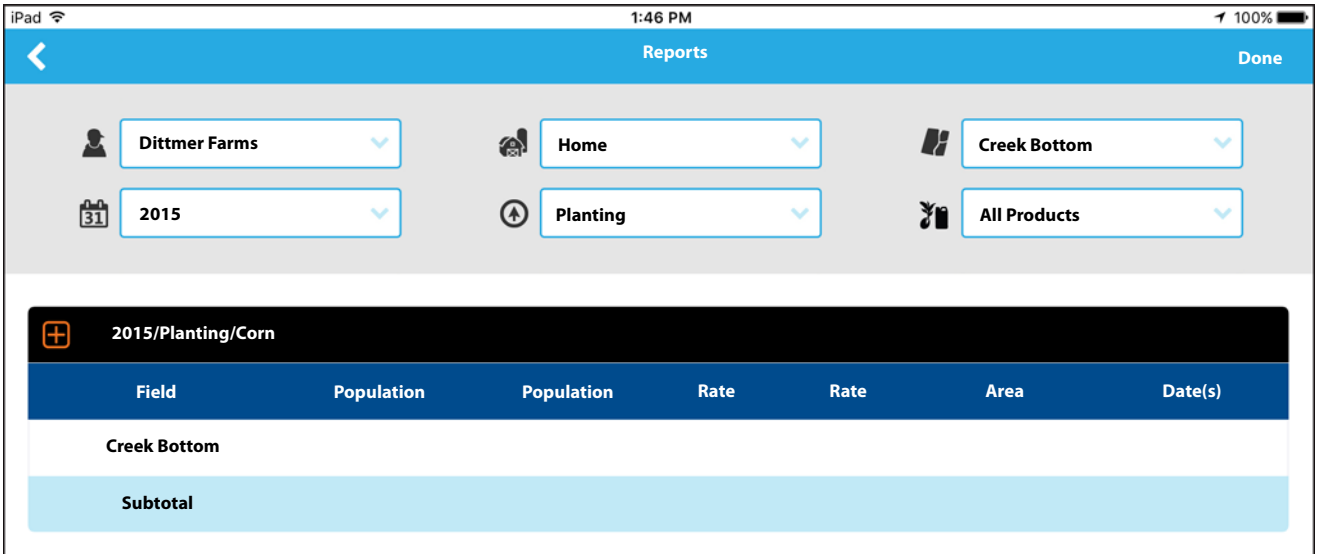
Zoom to World—Sets the zoom level to show you ALL fields in the app.

Summary Reports

AgFiniti Mobile provides a quick and easy process to view one or more field(s) data in tabular form. To view tap the Summary Reports button in the top bar.

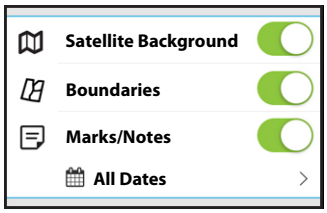
Here you can begin choosing which data you would like to include in your report. The reports can be as specific or broad as you would like. You can view a single fields planting information or look at the grain harvest information for all of your

fields currently imported into AgFiniti Mobile. To control this simply choose the desired management information in the filters and the report will automatically update.



Depending on the chosen data, you can expand the 'plus' sign and view product specific information. For example, when viewing a report containing spray mixes applied, the expanded area will include information on the various mix components present in the mix, or view average yield by variety if utilizing variety tracking.

Menu button



Toggle backgrounds—View just the roads

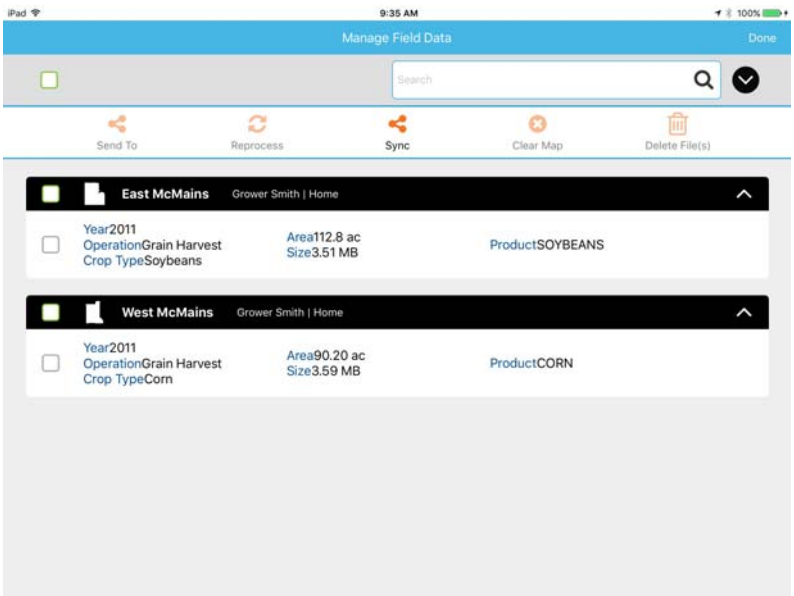
Toggle boundaries on/off—Turn on or off the boundary indicators

Toggle marks/notes on/off—Turn on or off imported marks and notes

Adjust date filter—Adjust date range of marks/notes that are received

Settings options—Change units of measure and cloud sync options

Manage Data—Share InCommand data, free up hard drive space, and manually sync items.



Use the tap gesture to make selection.

To send data via email or third party sharing app, click on the Send To button and choose the desired format you wish to send out to. Due to size limits, only one fields worth of information can be sent from within the app.

If you wish to view a previously cleared map, you will choose the desired layer and tap Reprocess.

To manually sync data present in AgFiniti Mobile to the AgFiniti Cloud, select the desired items then tap Sync. Can be set to automatically occur from within the Cloud Sync settings options, see "Ag Finiti Essentials - Cloud Sync" on page 42.

Maps are automatically processed and displayed upon import.If you wish to remove data from maps and reports to free up space but still keep it available for sharing, you will use this option.

The delete button will allow you to remove specific maps and data completely out of AgFiniti Mobile. To use this option, you will first need to use the Clear Map button first and remove processed maps.

NOTE!: Data brought in from AgFiniti Cloud cannot be sent out of AgFiniti Mobile using Send To or Sync tools. Use AgFiniti Cloud in this scenario.

Ag Finiti Essentials - Cloud Sync

With an AgFiniti Essentials license, all of your data and maps are synced so that your data is always available at your fingertips, regardless of whether you are using AgFiniti Cloud or AgFiniti Mobile. Data can come from:

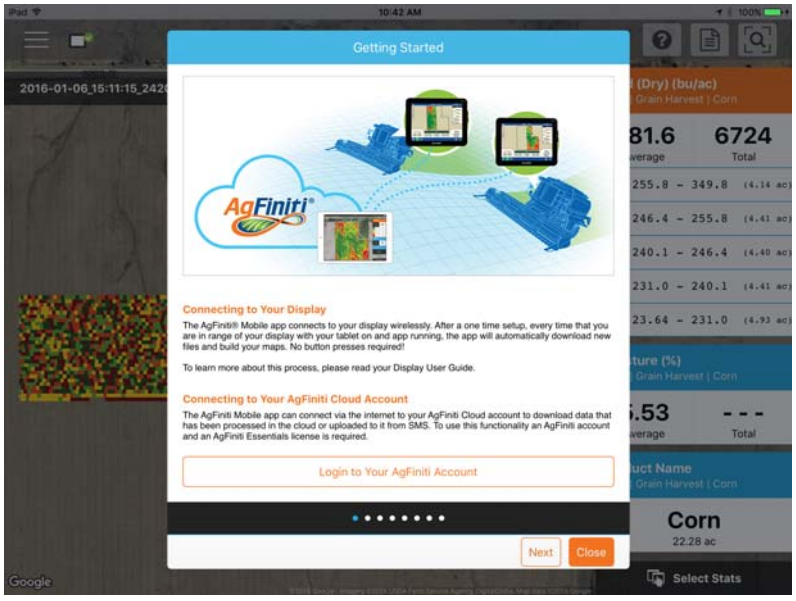
- InCommand data synced with AgFiniti Mobile
- InCommand, Integra, and Versa displays using wireless transfer
- Any *.AGDATA file manually loaded to AgFiniti Cloud
- SMS - Most SMS data can be exported to AgFiniti (including prescriptions, soil survey data, soil sampling sites, and data from 3rd party displays)

Once your data has been synced to AgFiniti Mobile, you will no longer need an active internet connection, giving you the freedom to view maps anywhere. Once the data is present in the app, it can be utilized just like data synced from an InCommand display.

To login you can go to the help icon

located on the main AgFiniti Mobile screen and tap "Login to Your AgFiniti Account"

or tap the menu button and "Log In" and use your AgFiniti login credentials to sign in.



NOTE: When logging in, all AgFiniti Mobile data on the device will be synced to the AgFiniti account used to log in. If you do not wish specific data to be connected to that account, this data will need to be deleted prior to logging in.

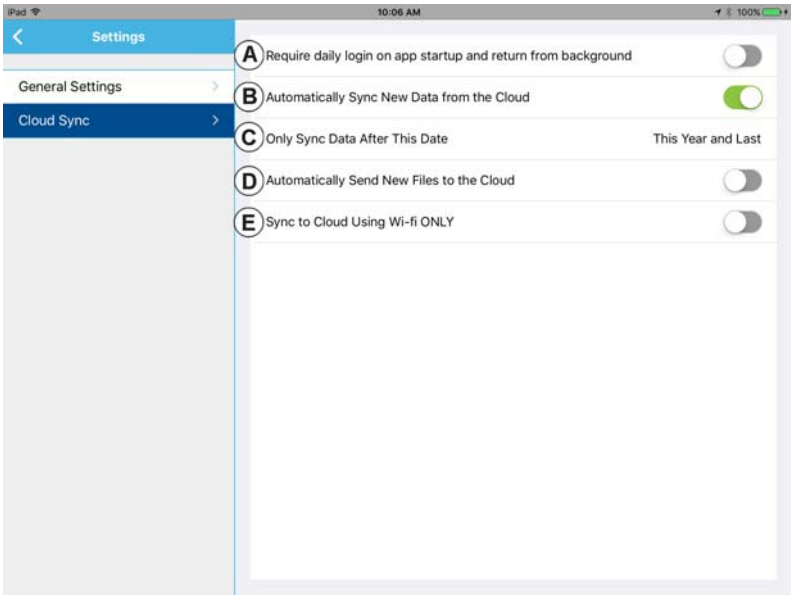
After logging in to the cloud, you will see some additional icons next to display connection icon indicating the status of both connection and syncing

Indicates a connection to AgFiniti Cloud has been made. At this time, AgFiniti Cloud is checking to see what data is not currently on your iPad and is preparing the necessary files to sync. By default, only the current and previous year will be synced.

Indicates that data is being synced to/from AgFiniti cloud. If data is being synced down to the app, once it has completed, you will see the icon indicating maps are being built (same as data imported from InCommand)

Tap any of these icons for additional sync details.

In order to adjust the cloud sync settings, tap on the Menu button - Settings - Cloud Sync



(A) Require daily login on app startup and return from background—If this option is left off, the logged in user will remain logged in until another user logs in. If this option is on, you will be required to login once daily when the app is started.

(B) Automatically Sync New Data from the Cloud—Allows for data present in AgFiniti Cloud to be automatically downloaded to the app once a connection is made. This provides the ability to see newly recorded data that has been transferred to the cloud by other supported displays or SMS.

(C) Only Sync Data After This Date—Allows you to choose what year(s) of data you wish to sync with AgFiniti Cloud. By default, only the current and previous year of data will be automatically synced down to AgFiniti Mobile. If you wish to only see data for a specific field, you can manually download by going to Manage Data in the menu.

(D) Automatically Send New Files to the Cloud—Allows for the automatic transfer of newly synced InCommand data to be automatically sent to the cloud. This will allow for instant access to newly recorded data to everyone on your AgFiniti account, providing quicker access to those that need it.

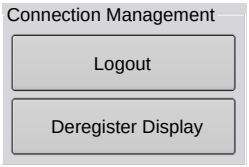
(E) Sync to Cloud Using Wi-Fi ONLY—By default, AgFiniti Mobile will sync with AgFiniti Cloud using a cellular connection if Wi-Fi is available. If this option is enabled, syncing will only occur over a Wi-Fi connection. Transferring over a cellular network could potentially use a large amount of data. Turning this option on prevents this from occurring.

AgFiniti Display Settings

Logging into an AgFiniti Account

Press the login button and enter in the AgFiniti account user name and password. After entering proper credentials the display will be logged into AgFiniti Cloud and the user can access services available on the account. Once logged into an AgFiniti account the display, the display becomes registered to the users AgFiniti account and will automatically login on display startup if internet access is available.

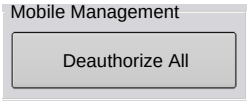
Logout and De-register Display



Logout—This will log the display out of the current AgFiniti Account. If the user does not want to automatically connect AgFiniti Cloud on startup they must logout. Logging out of an AgFiniti account does not deregister the display from an AgFiniti Account.

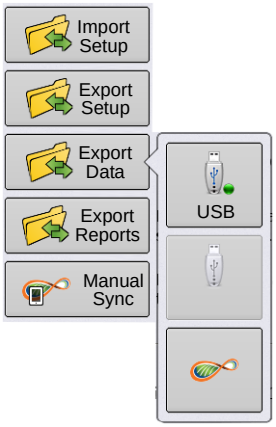
Deregister Display—When logged into AgFiniti Cloud the user can deregister the display from their Agfiniti account. This will unlink any AgFiniti licenses tied specifically to the display.

Mobile Management



The "Deauthorize All" button will deregister any mobile devices that have been authorized to access the display's logged data.

File Transfer



To use file transfer on the InCommand display, the following requirements need met:

1. User account created at www.agfiniti.com.
2. Annual license purchased and activated.
3. InCommand display connected to internet source via WI-FI adaptor.
4. Be logged into AgFiniti account on InCommand Display.
5. AgFiniti will become an available option when an import or export function is chosen from the data transfer page.
6. Press the AgFiniti Symbol to export to AgFiniti Cloud.

Remote Support

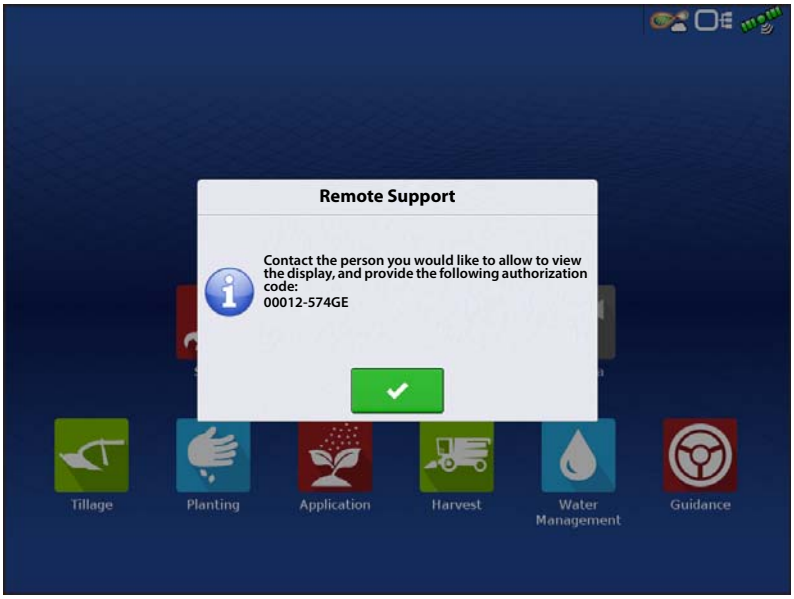
To use remote support on the InCommand display, the following requirements need met:

1. User account created at www.agfiniti.com.
2. Annual license purchased and active.
3. InCommand display connected to internet source via WI-FI adaptor.

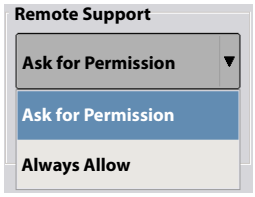
4. Be logged into AgFiniti account on InCommand Display.
5. From www.agfiniti.com a user can remotely view the display.

Remote Support Pre-authorization

Pressing the remote support button will generate a 10 digit code that can be verbally communicated to remote viewer to initiate the viewing session.

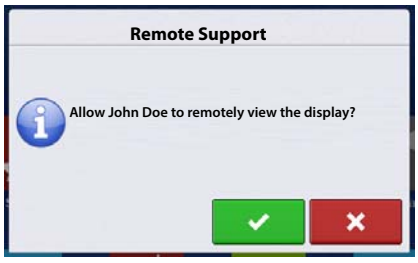


Remote Support Permissions Options



Ask for Permissions—This selection will require the display user to grant remote user permission to view the display.

Always Allow—Allows remote viewer to view display screens without display user having to give permissions.



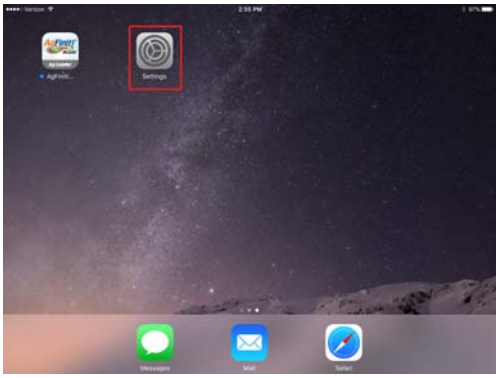
Allow remote viewer access to view the display.

Deny remote viewer access to view the display.

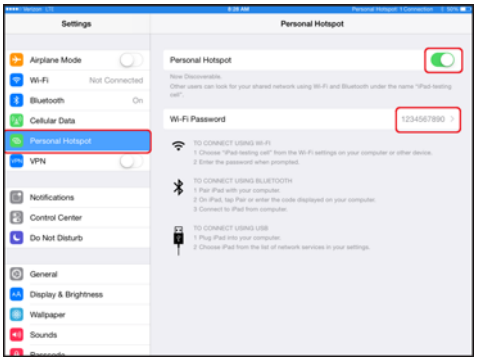
When a remote view session has been initiated the status bar at the top of the screen will turn from blue to green.

Cellular iPad as Personal Hotspot Connection

1. To enable Personal Hotspot mode on the iPad start by going to settings.



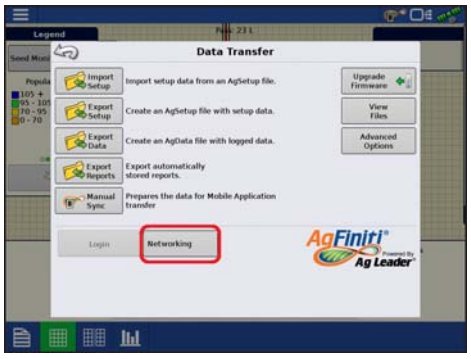
2. Select Personal Hotspot from the left side menu and enable by pressing the on/off switch from the top right side. Once enabled take note of the Wi-Fi password as it will be needed in the next step.



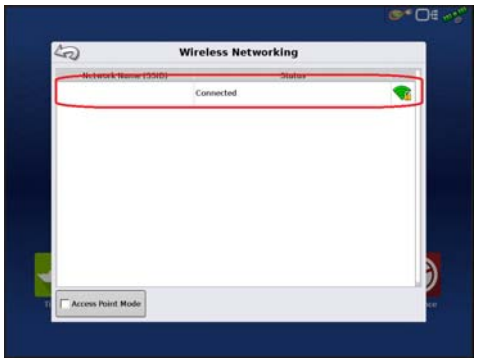
Note: This password can be changed if desired.

3. On the InCommand display, with the Wi-Fi adaptor installed, the AgFiniti symbol will show a status indicator in the top right corner of the home screen. Press the Status Indicator followed by Data Transfer.

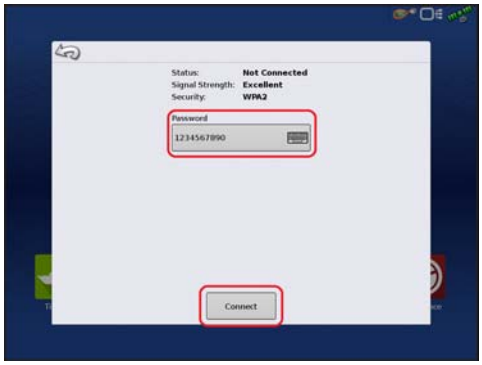
4. Press Networking.



5. On the Wireless Networking page select the iPad from the list. If the iPad isn't available from the list try turning the personal hotspot mode on the iPad off and then back on.



6. At this point you will be prompted for the password from step 2. Enter the password and press connect.
7. The display will then be connected to the iPad.



NOTE!: Repeat steps 1-6 each time the iPad is brought into the vehicle.

8. On the iPad, open the AgFiniti Mobile app. Once the AgFiniti Mobile is open, it will automatically attempt to connect to the InCommand display.

NOTE: Download AgFiniti Mobile from the Apple App store.

9. Once the InCommand display has been found the display will prompt user to allow connection to happen.

NOTE: This should only happen once per device.

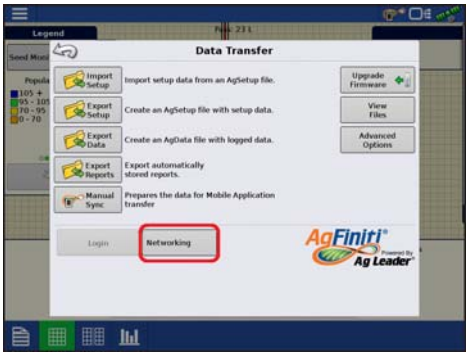
10. After pressing the green check mark the mobile device will begin accepting data from the display as it becomes available. The AgFiniti Status Indicator will show a device symbol within it on the top right corner of the screen. Note: If display is logged in to AgFiniti Cloud a cloud symbol will also appear in the AgFiniti Status Indicator.

At this point your InCommand display and iPad are connected and ready for data transfer. If there are any closed or suspended events present on the InCommand display, they will be transferred to the iPad once the app is opened.

Shared Wi-Fi Network Connection

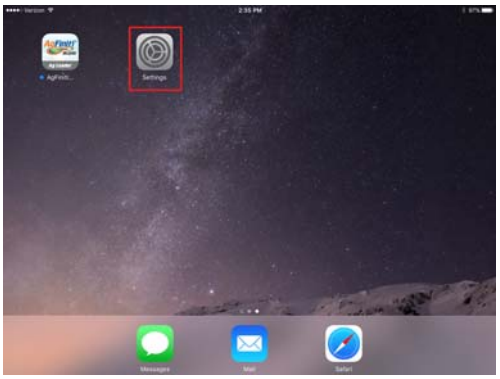
1. First connect the InCommand display to the wireless network. With the Wi-Fi adaptor installed in the display the AgFiniti symbol will show a status indicator in the top right corner of the display. Press the Status Indicator followed by Data Transfer.

2. Press Networking.

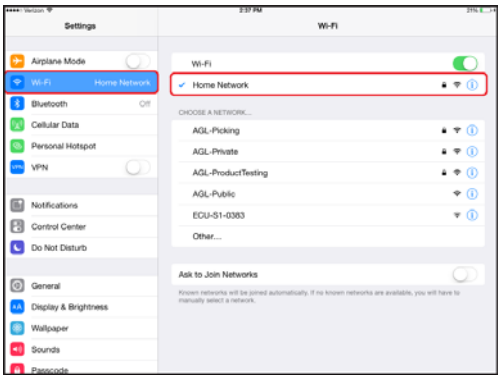


3. On the Wireless Networking page, press to select the desired network. This will prompt for a password, if needed, then allow you to connect to the network.

4. Connect the iPad to the same WiFi network by going to Settings.



5. Select the "Wi-Fi" tab from the left side menu followed by highlighting and connecting to the "Home Network" wireless network.
6. Both the display and the iPad should now be on the same network.



7. Open AgFiniti Mobile app on the iPad.

NOTE: Download AgFiniti Mobile from the Apple App store.

8. Once the AgFiniti Mobile is open, it will automatically attempt to connect to the InCommand display.

9. Once the InCommand display has been found the display will prompt user to allow connection to happen.

NOTE: This should only happen once per device.

10. After pressing the green check mark the mobile device will begin accepting data from the display as it becomes available. The AgFiniti Status Indicator will show a device symbol in the top right corner of the screen. Note: If display is logged in to AgFiniti Cloud a cloud symbol will also appear in the AgFiniti Status Indicator.

At this point your InCommand display and iPad are connected and ready for data transfer. If there are any closed or suspended events present on the InCommand display, they will be transferred to the iPad once the app is opened.

Events

Events are used to track field operations. New events can be created at anytime and therefore a physical field can be broken into many events or recorded under one. An event contains all coverage maps created while that event was active. Events are automatically named by date and time.

The display can be run in two different modes:

- **Traditional mode**—requires user to specify a Grower, Farm, and Field for the Event. The display associates this information with setup files and logged data. When these files are reviewed or utilized in the future, it provides the operator with a greater depth of information.
- **Events Only mode**—minimizes the setup process so that the display is ready to run in the field with the least amount of setup (just a few button presses).

Field Operations

To start a field operation, press one of the field operation apps from the home screen. This display has the ability to use guidance, tillage, and surveying configurations without extra equipment. Additionally. planting and application configurations can be created to track products without modules. The Field Operation wizard will walk through all the steps needed to begin a field operation.

Select Field Operation app and follow the Setup wizard.

Planting

Application

Harvest

Water Management

Guidance

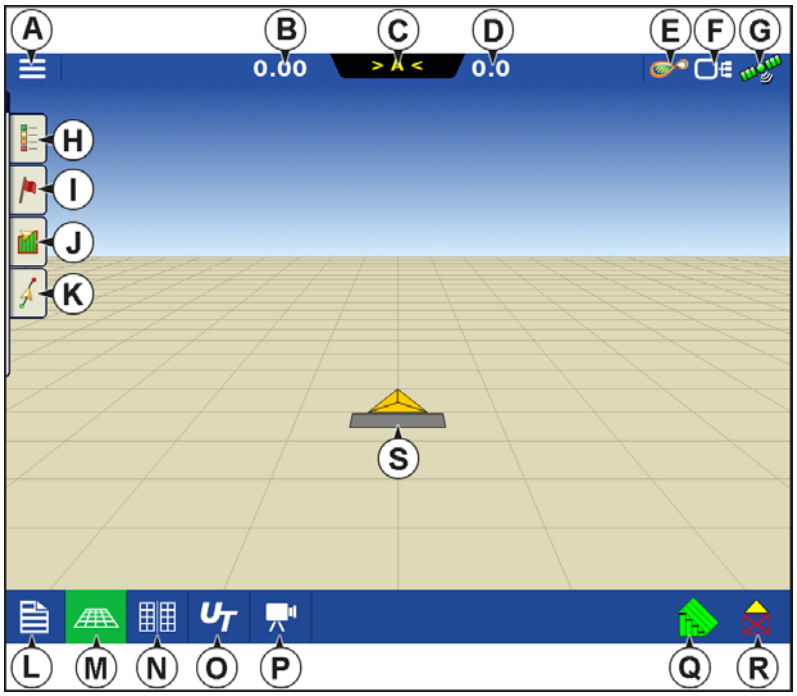
Tillage

You must have already created the following:

- Grower, Farm, and Field if "Enable Management" is checked, otherwise the display will track operations based only on events.
- A Season Setup within Management tab.
- A Product (if you are creating an Application or Planting Field Operation) at the Setup Product tab.
- An Operating Configuration at the Setup screen's Configuration tab. This Operating Configuration consists of Equipment, Vehicle, Implement, Controller (optional), Tank (in Application), and Ground Speed Source.

All of these are referenced by the Field Operation wizard during the Field Operation setup process.

Map screen

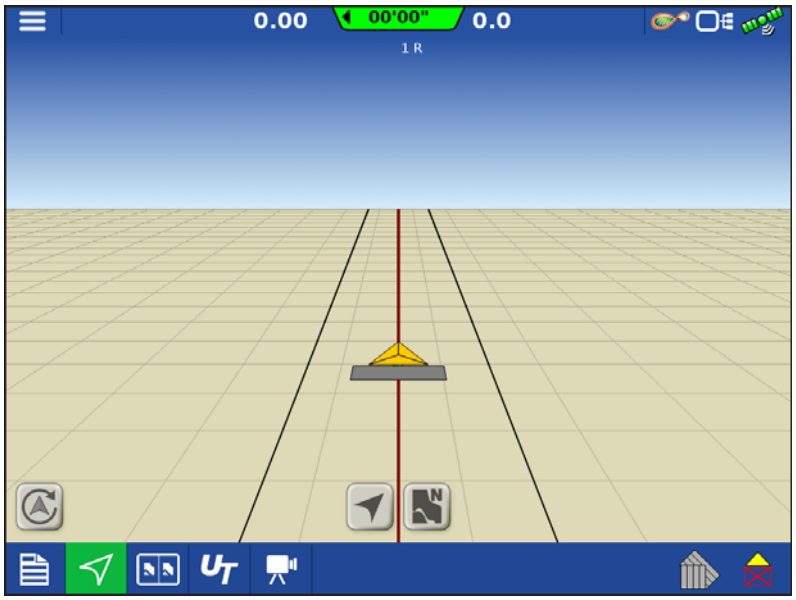


A. Menu
B. Area Covered
C. Path Indicator
D. Speed
E. AgFiniti Status
F. Diagnostics
G. GPS Signal Indicator
H. Legends
I. Markers
J. Field Operations
K. Guidance
L. Event Summary
M. Map Views
N. Split-Screen (InCommand 1200 Only)
O. Universal Terminal
P. Video button
Q. AutoSwath
R. Logging
S. Vehicle Icon

Heading Change Button

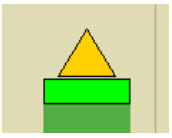
InCommand displays have built in functionality to establish and keep the correct direction of travel when using GPS receivers that do not have a trusted heading source from an internal compass or steering controller. For this functionality to work the user must first establish a forward direction of travel. The direction of travel is set automatically in the background, after acquiring GPS, based on the vehicles first movement after starting an event.

In an instance in which the vehicle icon appears to be upside down or rotated 180 degrees it can be fixed with the Heading Change button. The Heading Change button can be accessed by tapping anywhere on the center of the mapping screen and pressing the icon on the lower left corner of the screen.

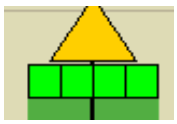


Vehicle Icon

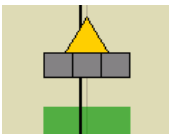
Vehicle Icon—When Zoomed Out—This gold colored triangle indicates the display is in zoom to extent mode. When in zoom to extent mode the vehicle implement does not appear but logged data will still populate on the map.



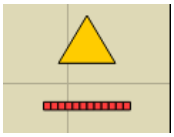
Vehicle Icon—logging—If the vehicle is logging, the implement icon appears as a green bar behind it.



Vehicle Icon—logging (with all sections ON)—If the vehicle is logging data from an implement split into sections, (for instance during a planting or application operation), then these sections appear in the implement icon.



Vehicle Icon—not logging—If the vehicle is not logging data, then the implement icon appears as a grey bar.



Vehicle Icon—Master Switch Off—When the master switch is off the vehicle will show a thinner red bar.

Master Switch Status

This button shows if the Master Switch is on or off. It is toggled by a master switch or a switch box.

Master Switch Status - ON (GREEN)

Master Switch Status - OFF (RED)

(O) AutoSwath button—turns the AutoSwath feature on and off.

AutoSwath - ON

AutoSwath - OFF

(P) Logging button

Logging - ON

Logging - OFF

AutoSteer button

The Engage icon status of the AutoSteer system. The appearance of this icon displays the following:

AutoSteer is ON and ready to use.

AutoSteer is OFF but ready to engage.

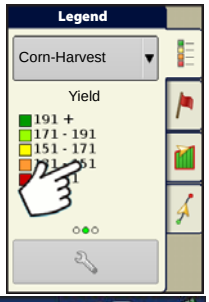
AutoSteer is OFF and unable to engage.

Map Legend tab

Press the Map Legend button at the top of the Mapping toolbox, and the Legend appears, either for rate, coverage, seed monitoring, previous operations, or other.

Map Toolbox

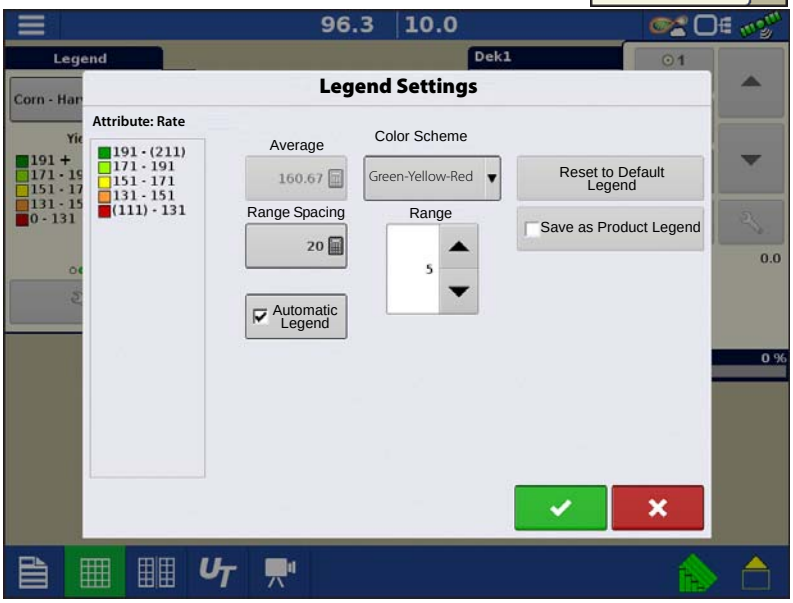
Legend Settings



The Legend Settings screen allows you to change the default legend. On the map legend tab, press anywhere on the legend and the legend settings screen appears.

NOTE!

- The Legend Settings screen can also be accessed by pressing the Edit Legend button on the Setup screen's Product tab.
- Legend settings changes that are made at the Legend Settings screen will affect all regions.



The Legend Settings screen includes the following items:

- Attribute

  Appears at the top left of the Legend Settings screen. Attributes shown for Harvest include Yield and Moisture. The Rate attribute is shown for Planting and Application operations. You can adjust the color scheme, spacing and ranges as they appear on the map screen, by using the buttons described below.

- Average

  The Average button changes the average rate for the legend. Press to specify the average of the ranges shown on the map legend.

- Range Spacing

  The Range Spacing button changes the difference between the rates in one color range. Press to edit the legend range spacing value, which is the total number of units represented by a particular color.

- Ranges

  The Ranges / change the number of range increments displayed in the legend.

- Color Scheme

  The Color Scheme can be modified by using the drop-down list. Choices include the following:

  - Green-Yellow-Red
  - Single Hue (blues or greens)
  - Rainbow

- Reset to Default Legend

Resets the legend to the default settings.

- Automatic Legend

  If the Automatic Legend check box is selected, the average automatically sets itself to the field average and updates as the field average changes.

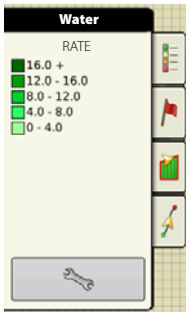
- Reset to Default Legend

  Press the reset legend to the system default.

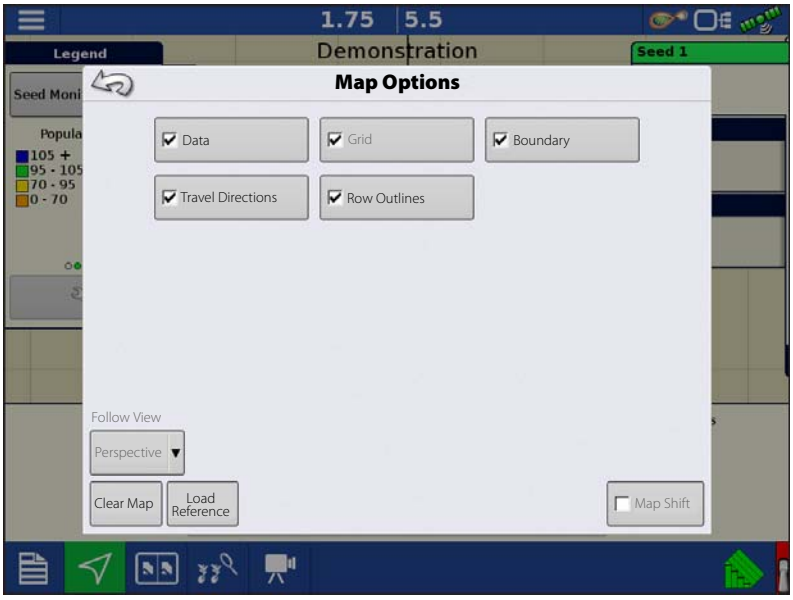
- Save as Product Legend

  Select the Save as Product Legend check box if you wish to set the current legend as the default legend for all regions of the same product.

Map Options



Here you can toggle mappable items, load references, or clear map. Press the Legend Setup and the Map Options screen appears.



•Clear Map

Permanently removes on-screen map from the active field operation, but the log data will still be exported to the USB drive.

WARNING!: Once you clear the map, this information cannot be retrieved.

- Load Reference

  Loads a list of maps of previous operations performed in that field. For each operation, you can view As-Applied or Coverage attributes; and Varieties if you are performing a Planting operation.

Map Shift

Map Shift is used to shift the onscreen map and account for time base inaccuracies with lower accuracy GPS receivers. This is done by doing a quick survey and creating a reference point. Any time the user would like to adjust the map to fix GPS drift inaccuracies they will go back to the reference point and perform a survey to shift to the current position.

Map Shift General Guideline

For Map Shift to be successful it is suggested that a reference point be set before beginning a field operation. That way any time the vehicle leaves the field or is shut down for an extended period of time the reference point can be used upon returning to the field operation.

Enable Map Shift

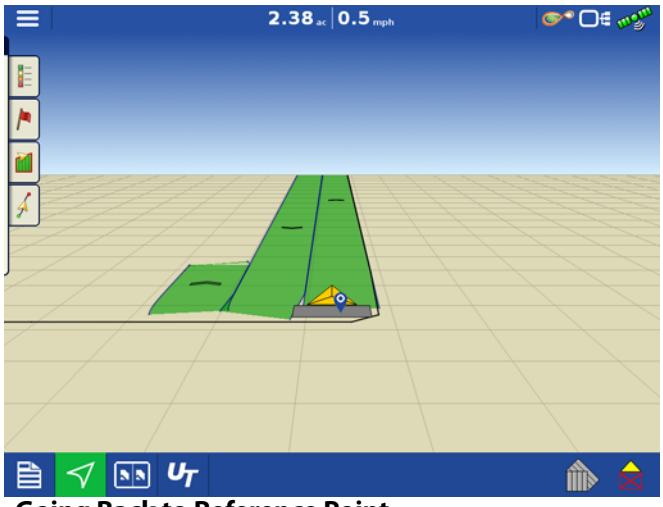
With the map shift option checked, the map shift icon will become available when in full screen view on the mapping screen.

Shifting the Map

1. Press the map shift icon to access Map Shift Options.
2. Determine a good location to create a reference point. For Map shift to work properly it is vital that the GPS receiver be able to get back to the exact same point each time a shift is required.
3. Once a spot is located press "Set" on the Map Shift options page to begin the 10 second survey
4. One the survey is complete the reference point will be set. On the Mapping Screen the reference point is show by the blue pin drop.

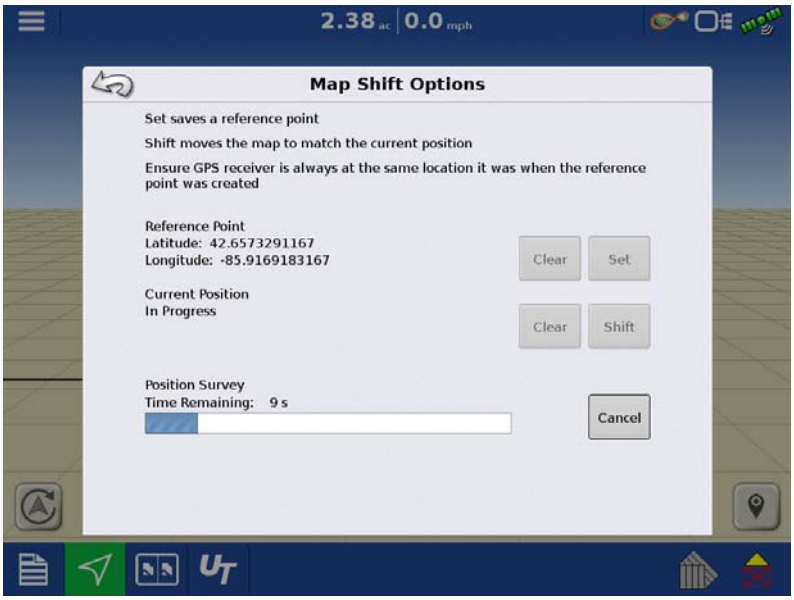
Reference Point Set

Map Shift Needed



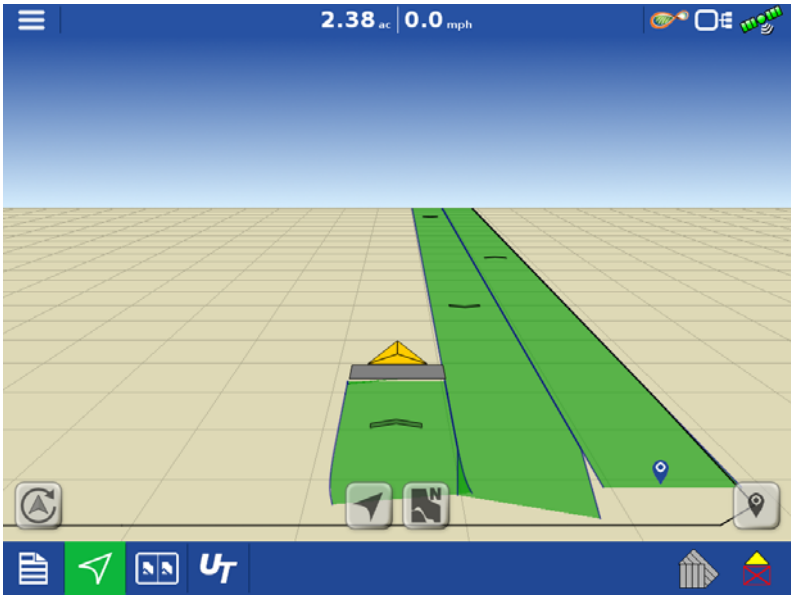
Going Back to Reference Point

5. When a map shift is required go back to the set reference point and make sure the GPS antenna is back in the original location.
6. Access the Map Shift Options menu and press the "Shift" button.



Shifting Map

7. "Shift" will start a 10second survey and update the map with the new current position
8. Any time a reference point or shift needs cleared it can be accomplished via Map Shift Options.



After Map Shift

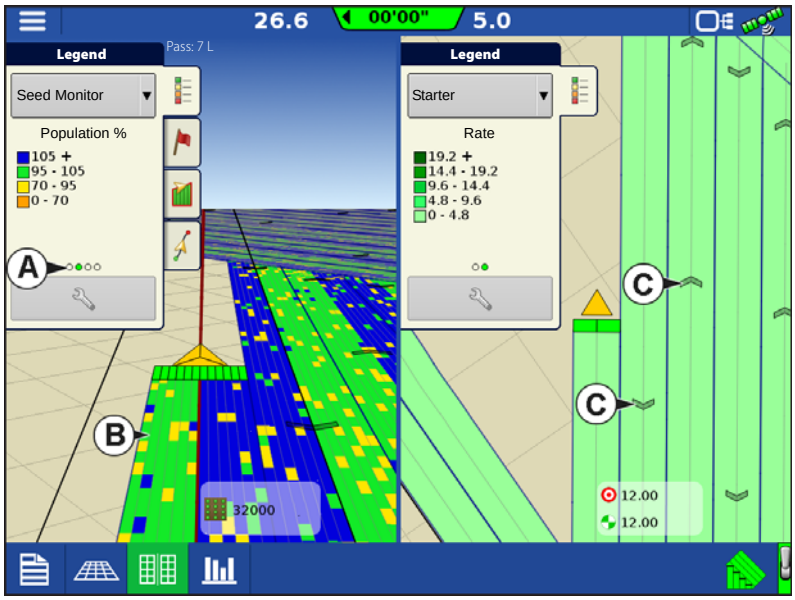
Mapping Features

In a planting operation the InCommand 1200 display is capable of mapping information based on individual rows.

A. Dots in the legend indicate other attributes are available to map. Swipe to show different attributes.

B. Screen shows row by row mapping. Display shows and logs row by row planting attributes in any view when paired with Ag Leader Seed Monitor Module.

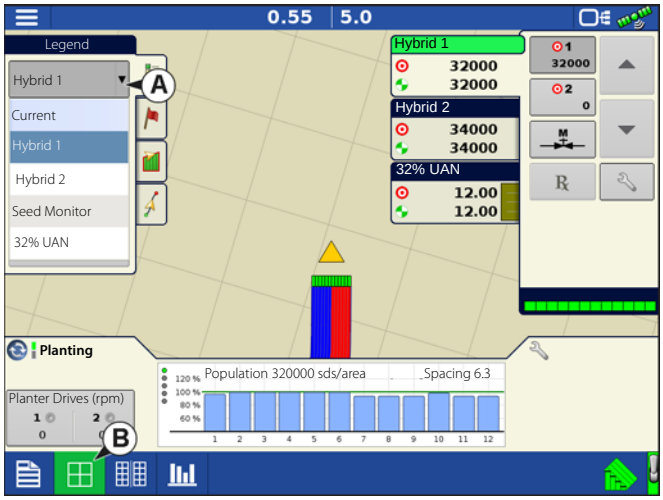
C. Travel direction indicators automatically populate at intervals when operating. This feature can be toggled on/off in Map Options.

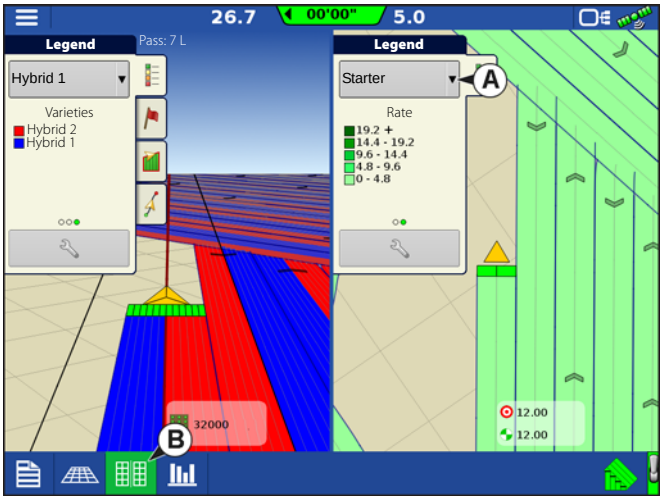


Map Views and Split Screen

The InCommand 1200 has the capability of showing multiple views at the same time from the map screen. This has multiple uses like showing guidance in perspective view and zoom extents view at the same time, splitting the screen between guidance and Universal Terminal, or watching two products at the same time like planting and liquid application.

- Maps can be selected individually from the legend drop-down **(A)**.
- Map view can be changed by tapping on the mapping icon **(B)** in the task bar.

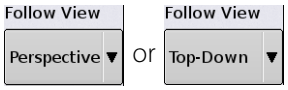




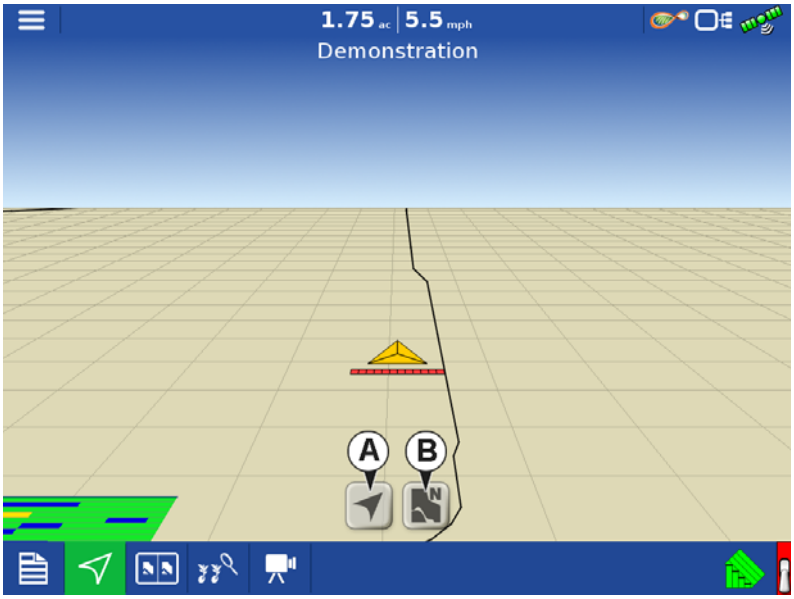
Map Views

Follow View(A)—Sets the map to follow the vehicle icon. The default Follow View can be set to either Perspective view or Top-Down view

Setting the Follow View mode

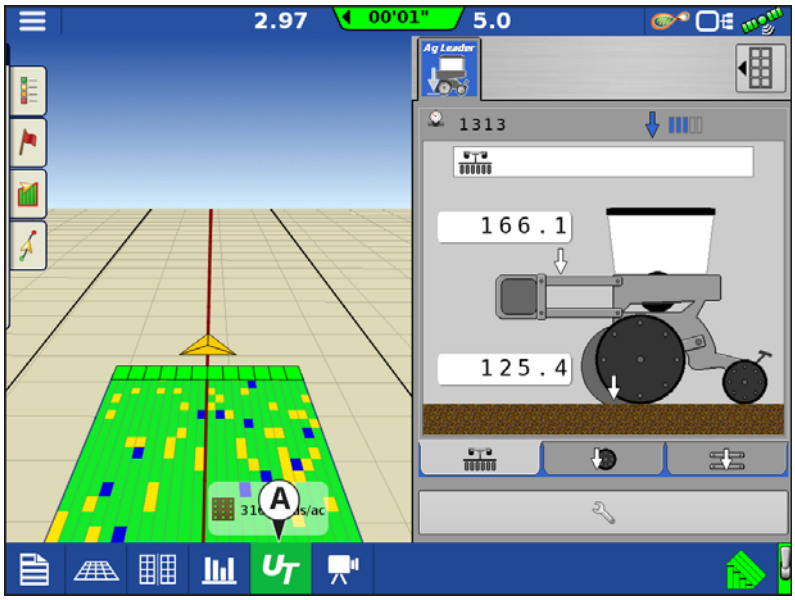


North Oriented View(B)—Zooms the map out to the full extends of the field boundary or mapped area and orients the map north regardless of the vehicles direction of travel.



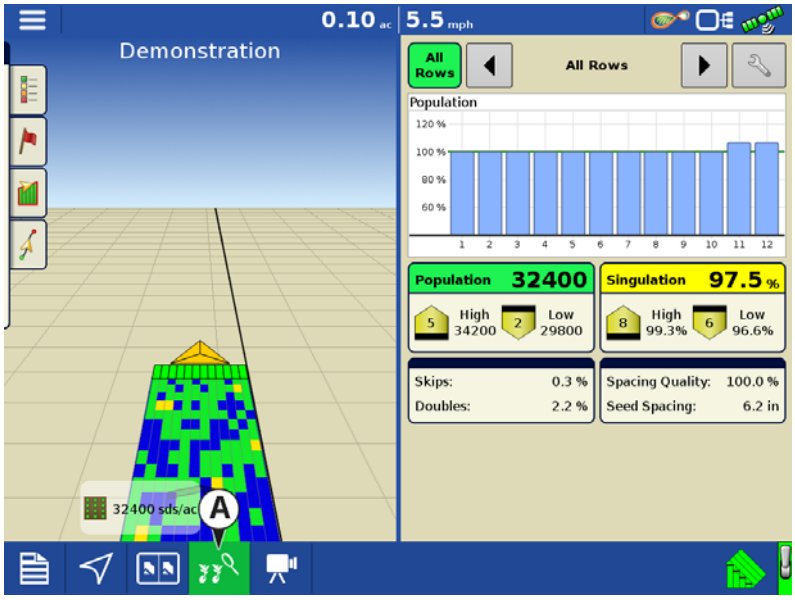
Universal Terminal Split Screen

By pressing the UT button (A) from the map screen the display will split the screen between Map screen and Universal Terminal.



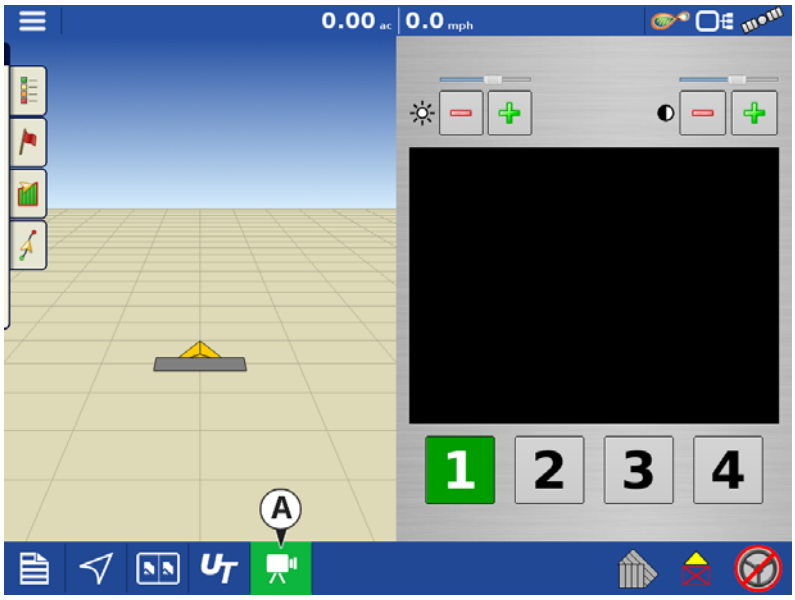
Split Screen Advanced Seed Monitoring

When using a Seed Monitoring Module, pressing the advanced seed monitoring button (A) will split the screen between the active map and the advanced seed monitoring page.

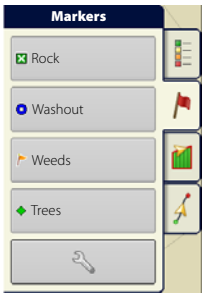


Split Screen Camera

With Cameras attached, pressing the video button (A) with split the screen between the active map and the video page.



Markers tab



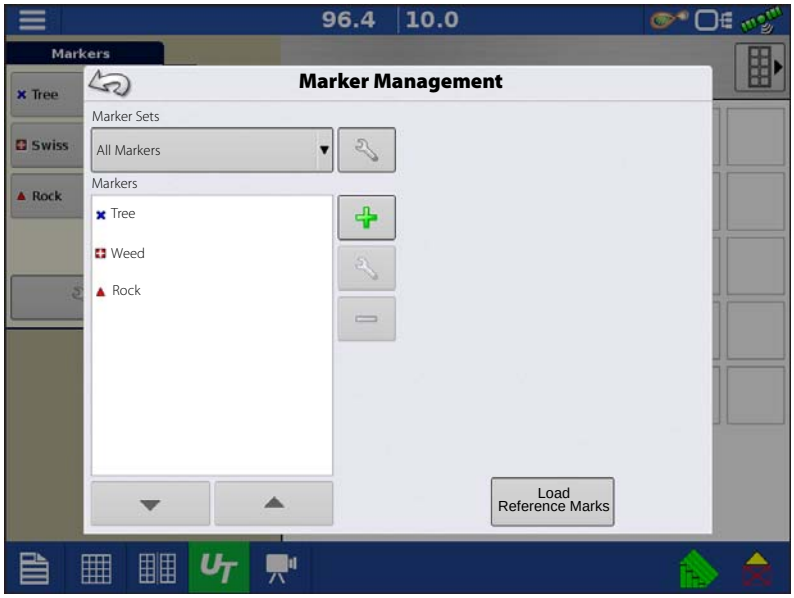
Markers are a collection of point objects that are available on the Map Markers tab of the Mapping toolbox. Map markers allow you to map points on the go in order to identify specific features within a field. Press an individual marker to indicate a Map Marker on the Map screen.

If all of the Markers that you created are not immediately visible in this screen, swipe the tab to view more that you created.

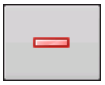
Edit Markers

Marker Sets:

Pressing allows operator to create, name, and delete marker sets.



Markers:

- Press to add a marker.
- Press to edit a marker.
- Press  to remove a marker.
- If you have numerous map icons, you can cycle through them by pressing .
- When creating or editing a marker, check the Georeferenced Note button if you wish to add a Field Note that is referenced to the current GPS position when that marker is used.

Operator Selection

1. Press Select Operator button.

   Allows you to select a machine operator from the drop-down list. Machine operator information is logged with all field operations. Operator information may be entered in Management Setup.

2. Choose the operator from drop-down menu.

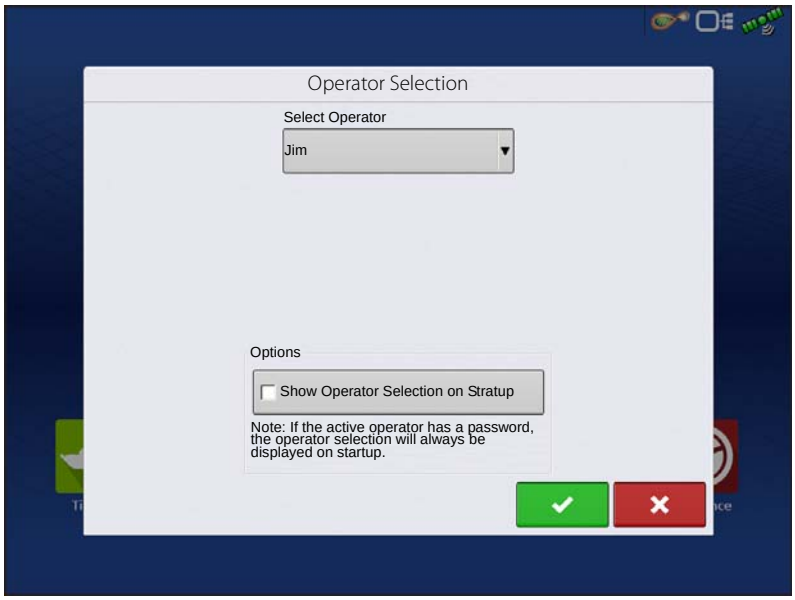
NOTE: Checkbox will require a password to be entered upon start up of the display.

Press ✔.

3. Enter password. Press ✔.

The operator will now be selected and permissions active.

- If operator is changed in mid operation, the user will be prompted to continue or suspend event.
- Operator selection will show each time at startup if the "Show Operator at Startup" button is check-marked.



Operator Log Out

Users that are both a Manager and Operator can logout which locks Setup and USB access and an operator must log in before an operation can be performed.

Menu Buttons

Menu button—Allows quick access the regularly used management and setup features without suspending an operation or leaving the map screen.

Home

Home button—Suspends the current event and returns to the Home screen.

Field

Field button—Used to change fields and events from the map screen. Takes user to the management selection portion of the Field Operation wizard.

Products

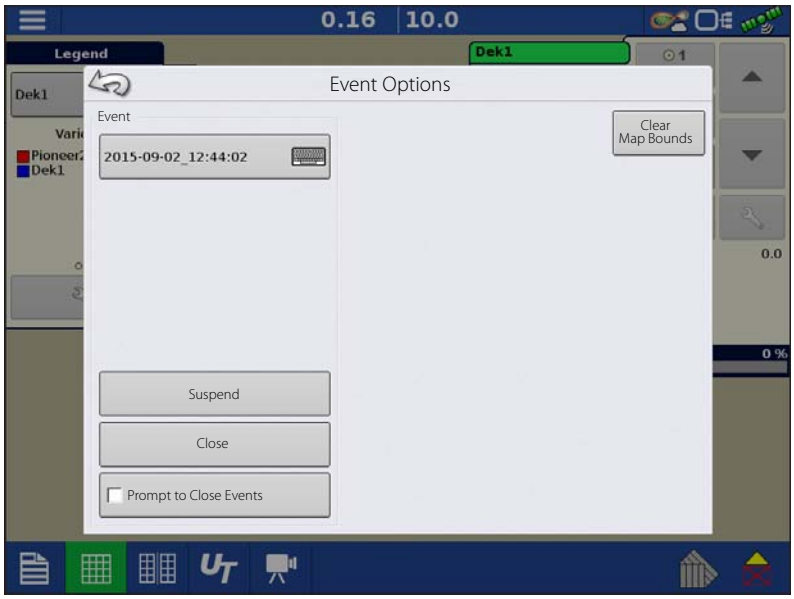
Product button—Used to change products or hybrids in the middle of a field operation. Takes user to the product selection portion of the Field Operation wizard.

Region

Region button—Used to subdivide a field into smaller sections. The region in which data is currently being logged is listed on the Region button. A new region can be created at any time as you are performing a field operation. To change between or add a new region to a field, press the Region button and follow the on-screen instructions.

Event

Event

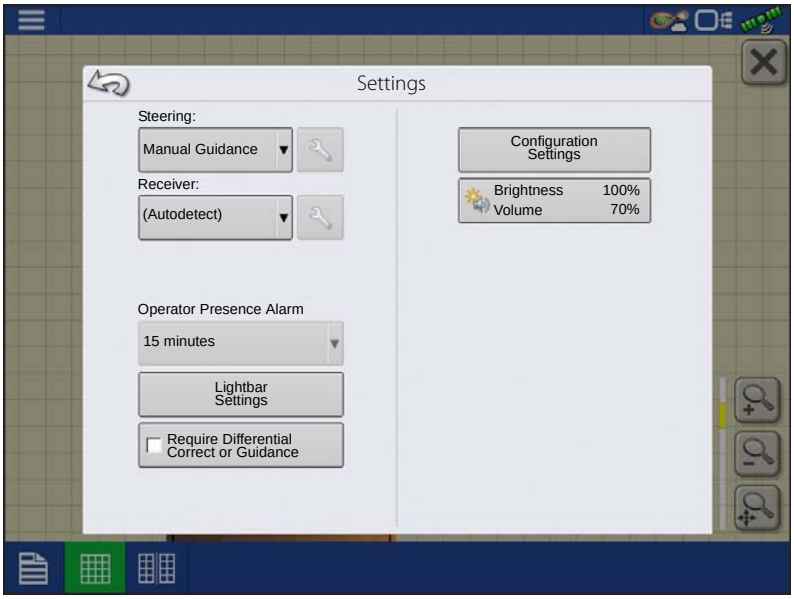


The Event Options screen allows operator to change:

- **Event Name**—Select the event to be edited in the drop-down menu. An active event will be preselected when the Event Options screen is opened.
- **Suspend Event**—Pressing this button suspends the current field operation. The Home screen then appears as before the creation of a field operation.
- **Clear Map Bounds**—Press to clear map bounds for the selected event.
- **Close Event**—Pressing this button ends the current field operation. The Home screen then appears as before the creation of a field operation.

  A closed event cannot be re-opened and will not show up in the Event Selection screen. A user can manually close Events or be prompted to close events.
- **Prompt to Close Events**—Check this to be prompted before an event is accidentally closed.

Settings



Settings button—provides quick access to:

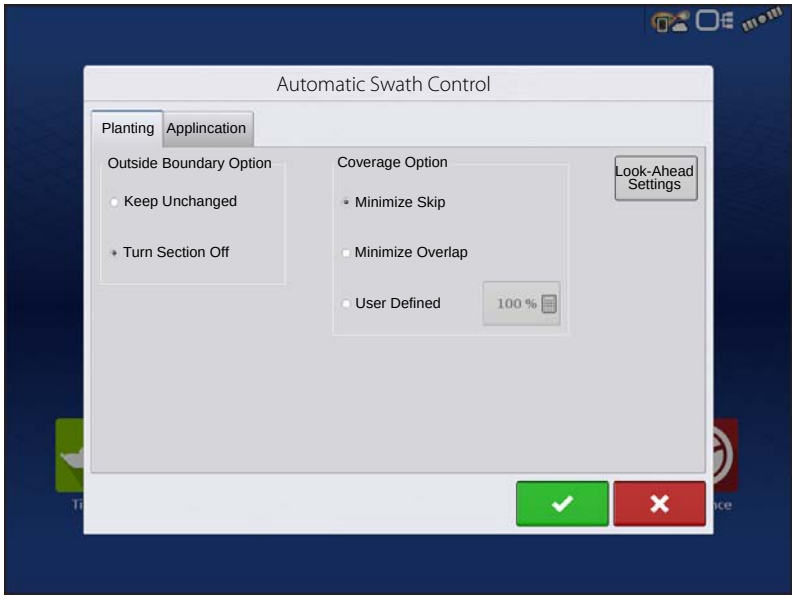
- GPS settings
- Steering settings
- Lightbar settings
- Configuration settings
- Brightness/Volume

Automatic Swath Control

Settings > Configuration Settings > Automatic Swath Control

The Automatic Swath Control feature turns sections off and on automatically based upon the following conditions:

- Entering and exiting internal and outer field boundaries.
- Entering and exiting previously-applied areas within a field.



Automatic Swath Control can be toggled on/off by the AutoSwath button on the lower right-hand side of the Map screen.

To adjust AutoSwath settings, go to the Configuration Settings screen, press the Automatic Swath Control button. At the screen that appears, options are:

- **Outside Boundary Option**

  Select one of the two options to determine system behaviour when a section exits a field boundary.

- **Coverage Option**

  In the Coverage Option area, you must choose between three options:

  - **Minimize Skip**

    Turns off the implement section after the entire section is fully inside your coverage area.

    This prevents the possibility of skips.

  - **Minimize Overlap**

    Turns off the implement section when that section first enters your coverage area.

    This prevents the possibility of overlaps.

  - **User Defined**

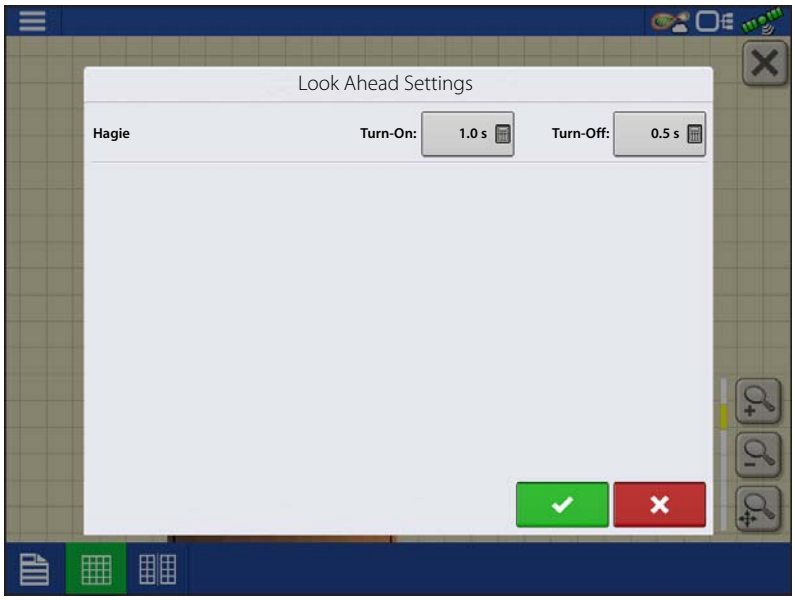
    Allows you to choose what percentage of the implement section is within the coverage area before that section turns off. For example, if you choose 50%, then the section will switch off when half of it is within your coverage area.

- **Turn-On Look Ahead**

  Determines how far ahead the system looks to turn the sections back on. This compensates for delay in the system when the implement sections are turned on.

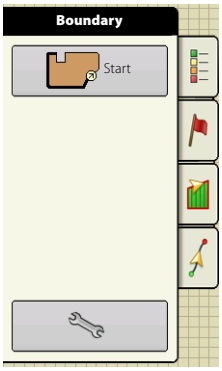
- **Turn-Off Look Ahead**

  Determines how far ahead the system looks to turn the sections off. This compensates for delay in the system when the sections are turned off.



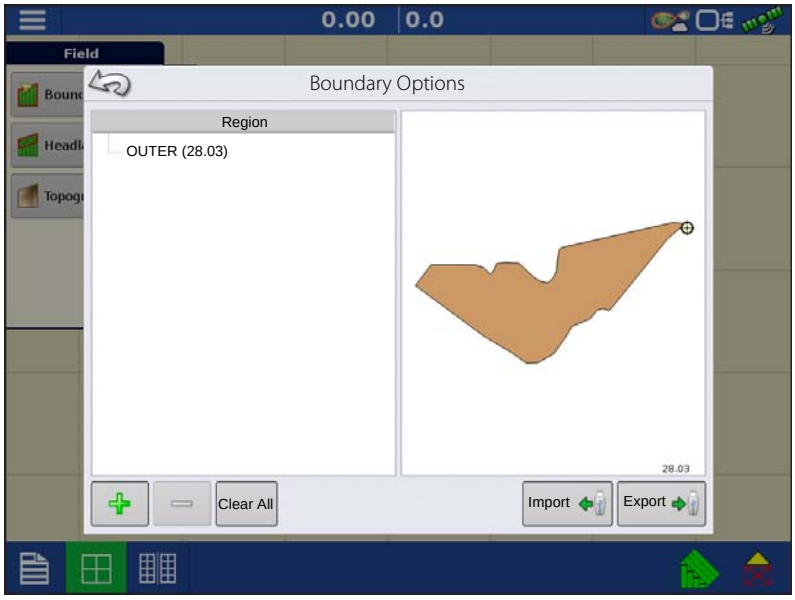
Boundary tab

Press the Boundary button on the Field tab to access the Boundary Options screen.



On the Boundary Options screen, you can Import Boundaries, Export Boundaries, and Clear All Boundaries.

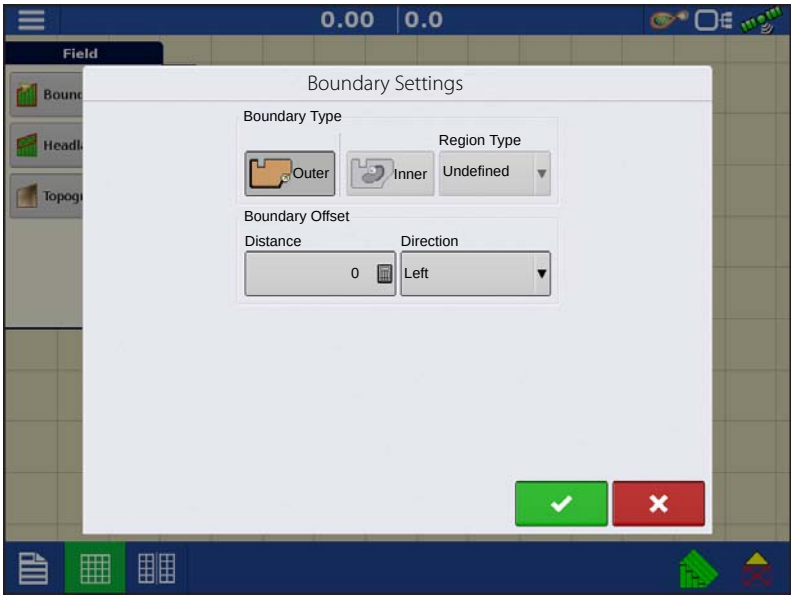
- Pressing [+] on the Boundary Options screen opens the Boundary Settings screen.
- Highlighting an existing region and pressing [−] on deletes that region.
- Use Import and Export buttons to move regions to and from USB drive.
- Press Clear All to permanently delete all Boundary information for that field.



WARNING!: Once you clear this information, it cannot be retrieved.

Create Boundary

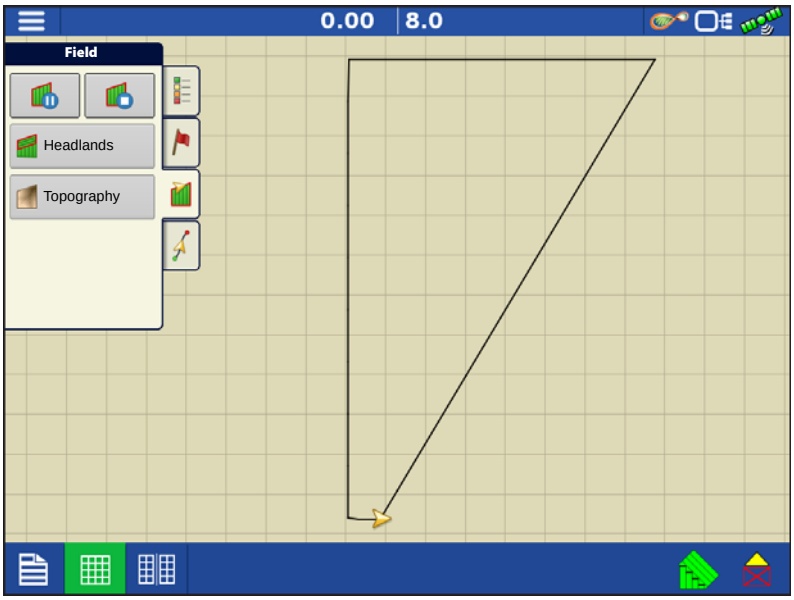
Boundary Settings



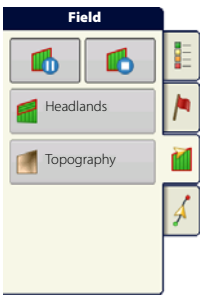
Pressing the Start button opens the Boundary Settings screen.

Underneath the Boundary Type area, you have the choice of creating either an Outer Boundary or an Inner Boundary.

- Outer boundaries delineate the borders of an entire field.
- Inner boundaries mark specific features within that field, such as waterways or buildings.



1. Choose whether to create either an Outer boundary or Inner boundary by pressing one of the two Boundary Type buttons.
2. If you chose to create an Inner Boundary, use the Region Type drop-down menu to choose the type of boundary. Choices include:
    - Roadway
    - Body of Water
    - Waterway
    - Buildings
    - Undefined
3. The Boundary Offset feature enables mapping a boundary at a user-defined distance to the left or right of the GPS antenna center line. If desired, specify a Boundary Offset distance by choosing a direction and distance from the GPS antenna center line.
4. Press to start the boundary.
5. During the creation of a boundary, the Pause/Resume button and Stop button appear at the top of the Field tab.
6. Press the Stop button to complete the boundary. At the Boundary screen, choose whether to Save, Resume or Discard the boundary.

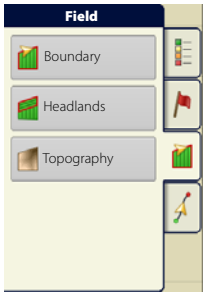


Pause Boundary

When creating a boundary, you can use the Pause Boundary button to create a straight line between two points. To do this, drive the vehicle to a point, press the Pause Boundary button, then drive to the second point. When you press the Resume Boundary button, a straight line is created between your current point and your pause location.

Headlands

Press the Headlands button on the Field tab to access the Headland Options screen.



ATTENTION!: A Field Boundary is required to create a headland.

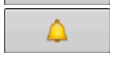
ATTENTION!: For headland alarms to work, a guidance line must be loaded.

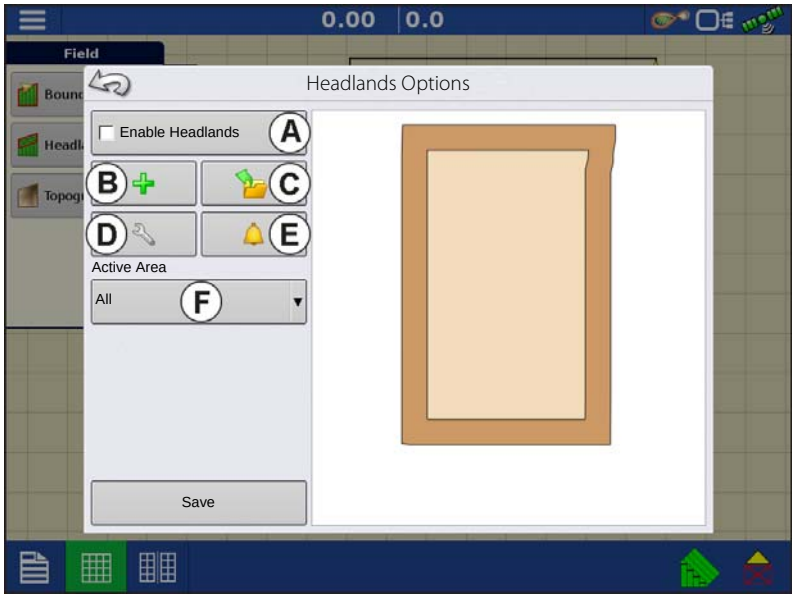
A. Enable Headlands: Use checkbox to turn Headlands functionality on and off.

B. Add Headland

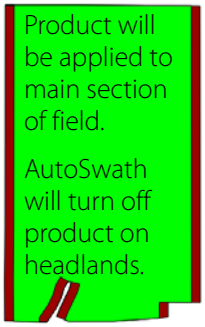
C. Load a Headland

D. Edit Headland

E.  Alarm Settings



F. Active Area



Work Area

Headlands

All

B. Add a Headland

Press on Headlands Options screen.

Select Headland Type from drop-down box.

Headland Types

All-Around

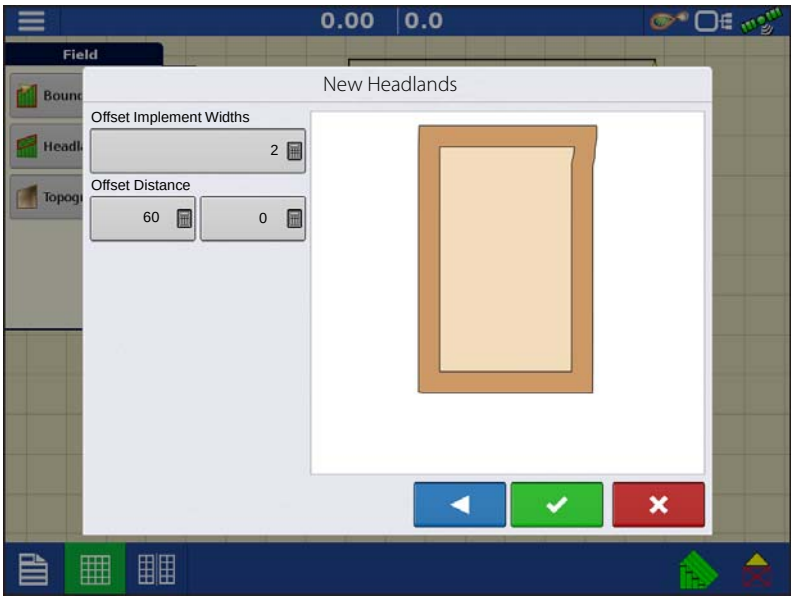
- Offset Implement Width

  Number of implement widths used to set the headland width.

- Offset Distance

  Distance used to set headland width.

Press ✔ to accept.



Top Bottom

- Offset Implement Width

  Number of implement widths used to set the headland width.

- Offset Distance

  Distance used to set headland width.

- Heading

  Used to generate boundary, headlands are created perpendicular to heading

- Scaling

  Sets the amount of variation that is allowed (from perpendicular) to include part of field boundary in the headlands.

- Use AB

  Select AB line to set heading for determining headlands.

- The ▲ shows the heading used for Headland creation.

Press ✔ to accept.

Driven

1. Select Driven from drop-down menu and press ▶ to continue.
2. Press ✚ on New Headlands screen.
3. Input Headland Offset Distance and Direction (Left or Right). Press ✔ to accept.
4. Drive Boundary:

   ⏸ pause.

   ▶ resume recording after pausing.

stop recording.

5. Save, Resume, or Discard

- Save
  - A. Press Save button.
  - B. Default name is time and date. Press to change name.
  - C. Press to accept or to discard boundary.
- Resume - resume creating boundary.
- Discard - discards boundary and returns display to map screen.

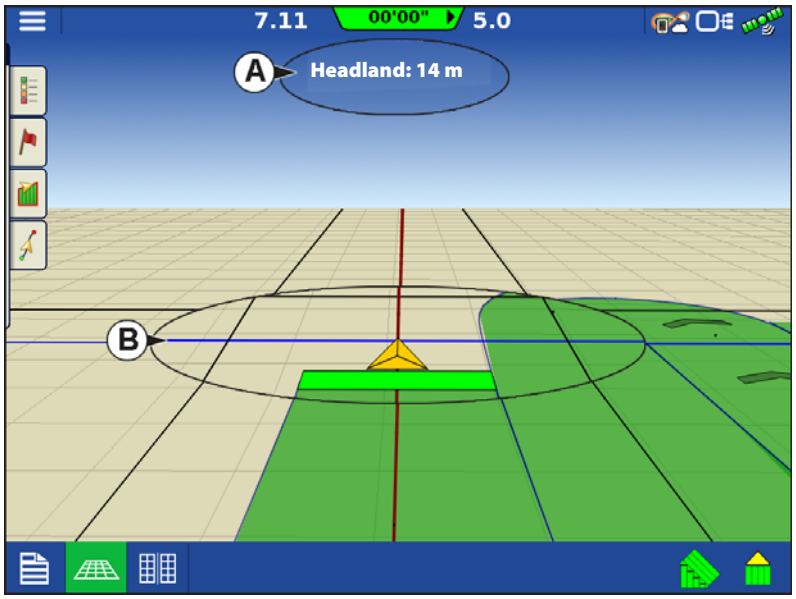
C. Load Headlands

Press button.

Select a headland from list. and press to load selected headland.

A. Distance to headland alarm

B. Headlands identified by blue line when active



D. Edit Headlands

Press Edit Headlands button.

Select a headland from list and press to load selected headland.

This screen will vary depending on type of headland.

E. Headland Alarm Settings

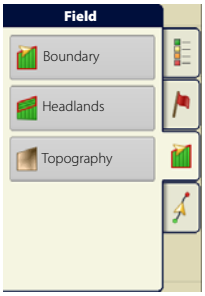
Press button.

- Alert Distance

  Distance from approaching headland at which display will warn user of upcoming headland.
- Alert Duration

  Time length from approaching headland at which display will warn user of upcoming headland.
- Audible Alarms
  - Approaching Headland.
  - Crossing Headland Boundary.

Topography



Press "Topography" button to enter the Topography screen which allows user to setup Topography functionality.

The display allows you to record points that can be used to make a reference layer that is relative to the elevation throughout the field. This can provide you with valuable information in regards to the highs and lows of a field when you may not be able to visually tell with the naked eye. Surveying and Tiling operations will probably benefit the most with respect of where to place the mains and laterals in a field.

ATTENTION!: Requires RTK GPS signal to collect the accurate elevation data.

You can also import data from mapping software such as SMS Advanced via .agsetup files.

Topography screen

You are allowed to have multiple topographical elevation surveys for the same field. This can be useful for different applications, for example:

- One topographical survey that is for the entire field. This will give you a greater perspective of the whole field.
- An additional topographical survey, driven at very dedicated portion of the field. This would allow you to have greater elevation detail in certain areas if you need it.

By default the naming that is generated in the display will be Date/Time based. You can export surface elevation data from software packages like SMS Advanced into the display, and those will be tagged with the field name and the date exported (both examples are in the screen shot).

You can also add points to existing topographical surveys and save them.

Only one topographical survey can be active at a time. When exported as an .agsetup or .agdata file, this will be the survey that is exported. Non-active surveys will stay in the display. At any time you can remove an topographical survey, and collect a new one.

- New Survey button

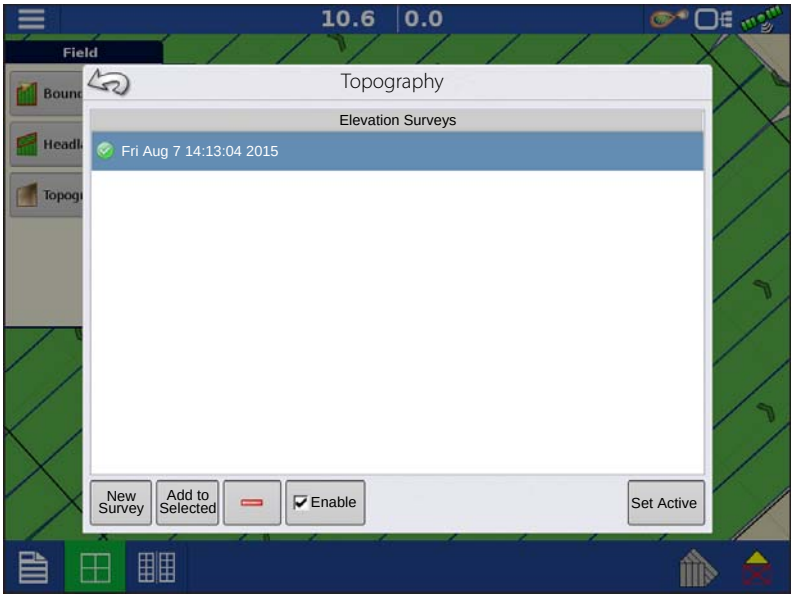
  Press to create a new topographical survey
- Add to Selected button

  Press to add to an topographical survey
- Minus (-) button

  Press to delete a topographical survey
- Enable checkbox

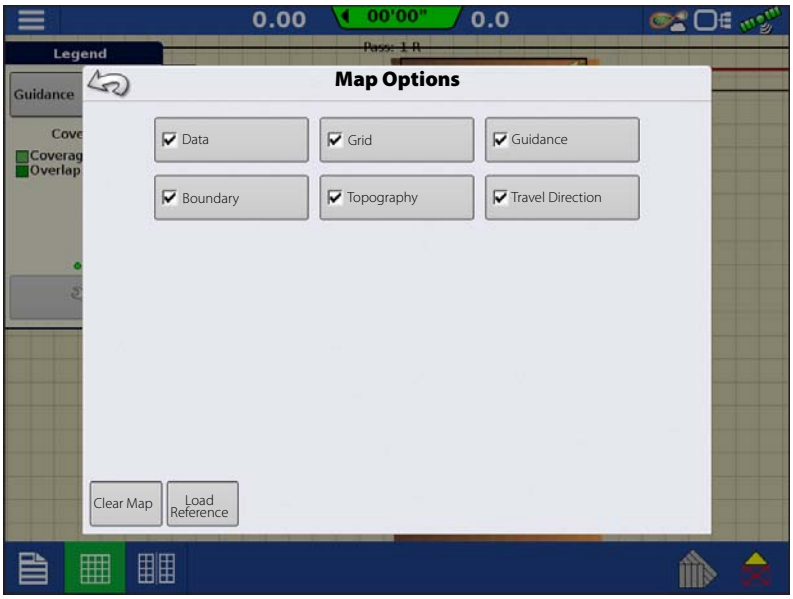
  Press to turn topographical reference layer on/off (Enable checkbox functions the same as Topography checkbox in Map Options screen - shown below.)
- Set Active

  Select the desired topographical survey from list and use button to set as active.



The topography layer can be turned on/off as a reference layer during any operation using:

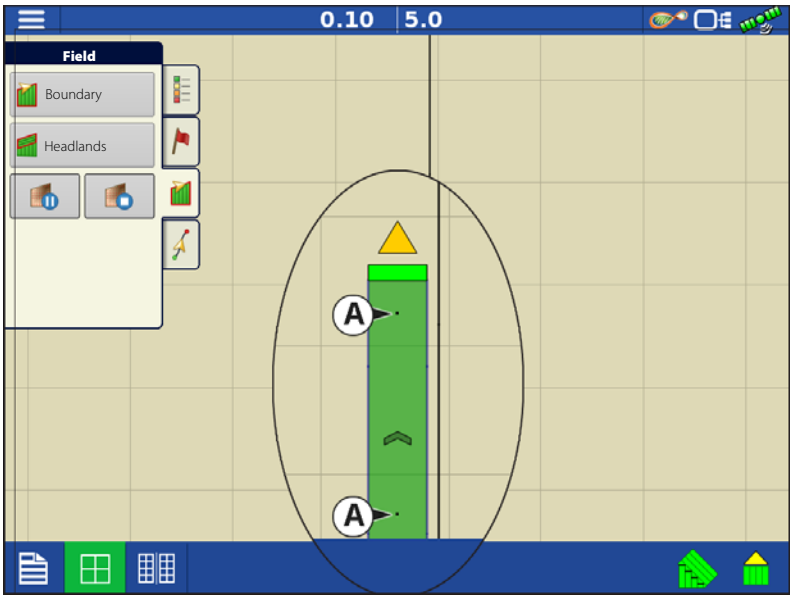
- Enable checkbox on Topography screen (shown above).
- Using the Topography checkbox on the Map Options screen.



If you have RTK GPS reception, you are allowed to collect an elevation survey. This will allow you to collect the Latitude/Longitude and elevation values as you traverse the field.

A point will be dropped every 10 ft as you drive regardless of speed, or direction. If you are collecting during operations like planting or application using autoswath, it will also log points outside the boundary of the field (i.e. through a grassed waterway) to get the most information throughout the field.

During collection of an elevation survey, points will be logged to the file every 10 ft. An on-screen visual will appear in the form of a single black dot (**A**) every 100 ft.



ATTENTION!: It is critical that the GPS Antenna to ground measurement is correct in your configuration, any error in this measurement, will add to the error in the data logged.

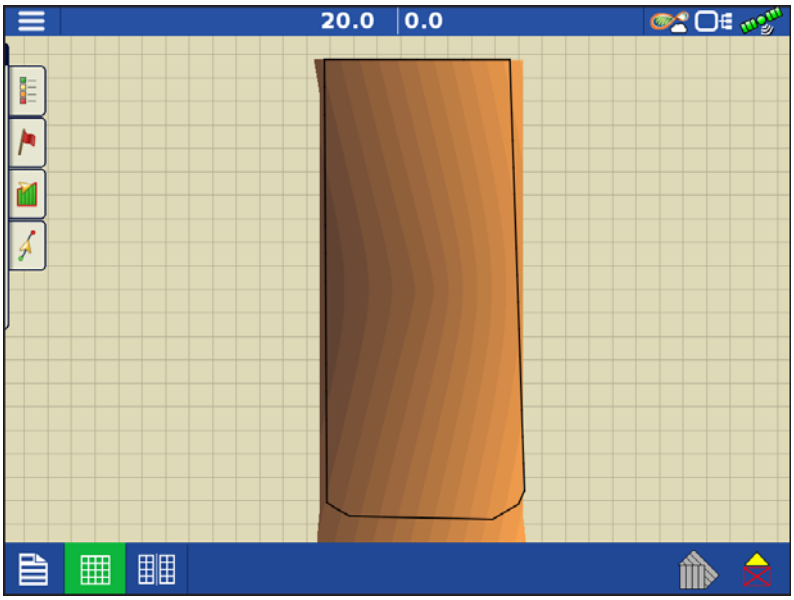
The following are suggestions to get the best possible elevation survey for a given field. Following these recommendations will provide the best results for your field.

- Keep swaths in the field to 62 ft or less, the closer the better.
- Driving a dedicated route at the lowest or highest points in a field (i.e. lengthwise of a grassed waterway, or at the top of a ridge) then traversing the field in regular swaths will provide the best detail of the field.
- If surveying with the tile plow antenna, ensure that the plow is in the fully raised position.
- Driving too fast with mounted plows, can cause bouncing and affect quality.
- Surveying with harvesting equipment can provide streaked maps as the hopper filling and unloading can affect the height of the vehicle, and therefore antenna.

After the survey points have been collected, they will be converted into a surface layer in which you can define the color scheme Red, White, Blue, or Brown-Tan.

You can select the number of legend ranges for your field that will show the areas desired. This theme will be used for each field until changed.

Hues will represent:



Red, white, blue scheme

Darker blue = Lower elevation.

Darker red = Higher elevations.

White will be a transition color between.

Brown-Tan scheme

Dark brown = Lower elevations.

Tan = Higher elevations.

If at any point during collection your GPS correction status changes out of RTK fixed, logging will be suspended.

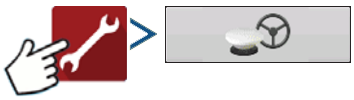
If you re-acquire the RTK signal, logging will automatically resume.

At any point you can ⏸ (pause) or ■ (stop) collection of the elevation survey, and then ▶ (resume) as needed.

If you forget to stop logging as you leave the field, you will be prompted with the message that data collection is still active, and be given the option to continue logging, or end operation.

In Odd-shaped fields, the surface rendering of the elevation will connect areas even if you haven't driven through that area.

GPS Setup



Steering

Manual Guidance—Select this to perform guidance by lightbar while manually steering the vehicle.

ParaDyme/GeoSteer—Integrated steering system that can be used with a wide range of machines.

OnTrac3—Assisted steering that is mounted on a machines steering wheel.

SteerCommand—Integrated steering system that can be used with a wide range of machines.

Pressing next to the Steering options opens the guidance system settings for the selected guidance system.

Pressing next to the Receiver options opens the selected receiver's specific settings. Populated settings vary from one reliever model to the next.

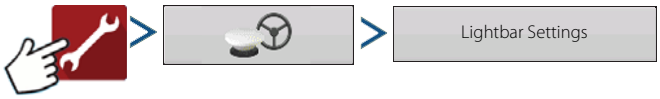
- **Receiver**—Set type of GPS interface protocol to Autodetect, Serial, or CAN.

  • **Break Detection**—Opens force GPS connection. This allows force connection in the display when a receiver is set to a higher baud rate than supported by the display. After selecting "force GPS6000/6500 connect", user must select reset to defaults in order to configure and use the receiver.

- **Operator Presence Alarm**—The Operator Presence Alarm disengages guidance control if the operator does not have any interaction with the display for a specified period of time. Use the dropdown menu to specify the period of time before guidance is automatically disengaged.
- **Lightbar Settings**—Set lightbar spacing, mode, and LED brightness.
- **Required Differential Correction for Guidance**—When unchecked allows guidance to operate without differential correction.

NOTE: In order to use guidance with the display, you must have a GPS receiver capable of a GPS output rate of 5 Hz or more.

Lightbar Settings



OR

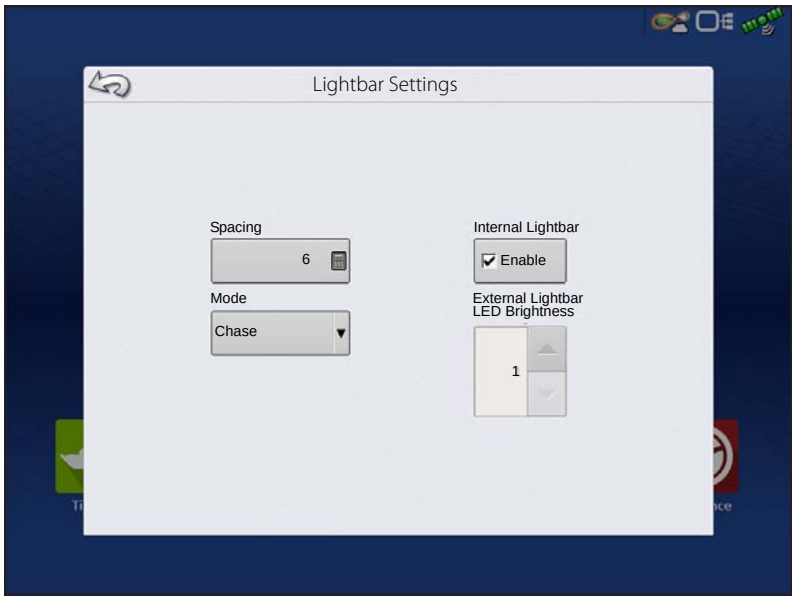
Spacing—Enter the distance represented by each square of the lightbar ½–6 ft (3–182 cm).

Mode

- **Chase**—Center the vehicle by following the indicator lights.
- **Pull**—Center the vehicle by turning in the opposite direction of the indicator lights on the lightbar.

Internal Lightbar—Check Enable to utilize the internal lightbar.

External Lightbar LED Brightness—If applicable, press ▲ / ▼ to enter in a number specifying the brightness of the LED lights on the optional L160 external lightbar. The number 1 is the dimmest setting and 10 is the brightest. Default setting is 5.

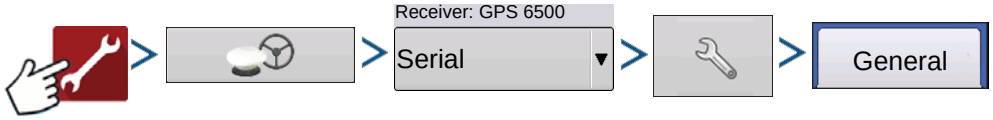


GPS Button

During your field operation, the GPS (Status Indicator) button in the upper right-hand side of the Status Bar should appear green, which means you are receiving a differential GPS signal. If this icon appears yellow, you are still receiving GPS but are not receiving a differential signal; and if it appears gray then you have lost GPS. In either case, you should check your GPS settings.

Guidance/Steering, Lightbar Settings, and Required Differential Correction for Guidance.

Serial GPS Settings



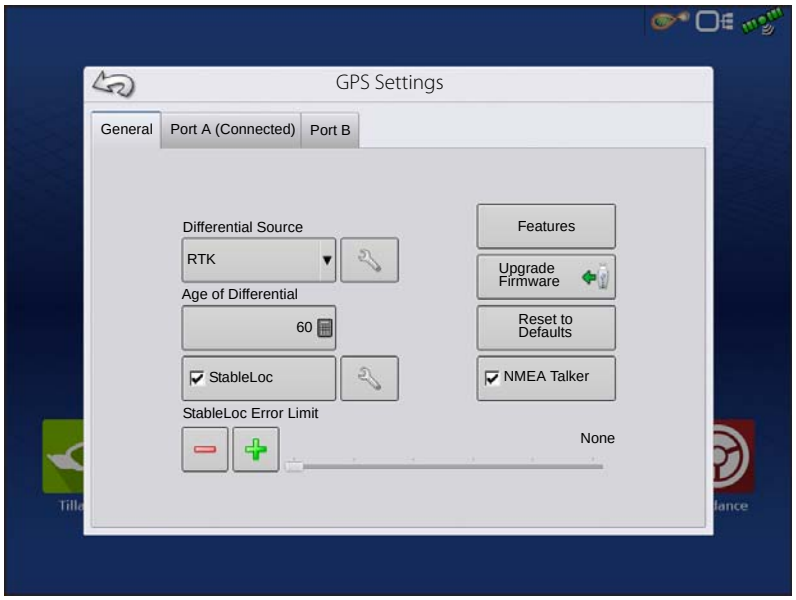
NOTE: Default settings for the 6000/6500 receivers should not need to be adjusted from factory settings.

Differential Source—Select choice of GLIDE, WAAS/EGNOS, TerraStar®, RTK External, RTK. Options available are based on receiver type and unlocks.

Differential Source Wrench Icon — Pressing the Differential Source Wrench button opens different settings screens, depending on the differential source selected.

Age of Differential—Displays the elapsed time since reception of last differential correction signal. The Age of Differential button is only functional when GPS is connected.

StableLoc checkbox—StableLoc maintains accurate steering – even when your correction signal is temporarily lost – by seamlessly transitioning to the next available signal source.



When the signal is restored, the system will then transition back to the higher accuracy source, eliminating position jumps. Press to enable.

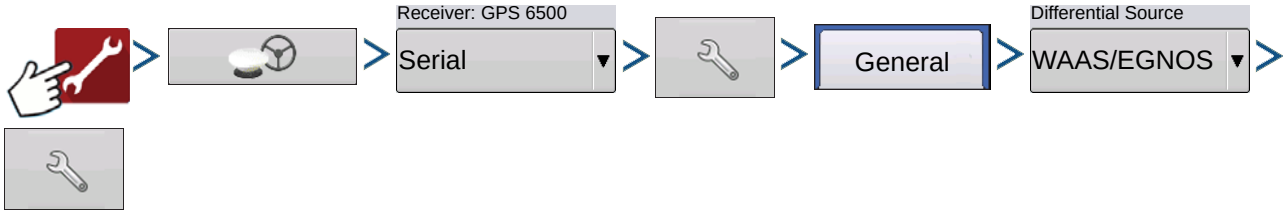
StableLoc Wrench Icon —Opens StableLoc "WAAS/EGNOS" fallback enable/disable setting.This allow SBAS correction to be used as fallback for StableLoc. Setting is enabled by default. Disable setting if region does not provide SBAS correction source (such as WAAS/EGNOS).

StableLoc Error Limit (RTK & TerraStar only)—When using StableLoc, select the error limit at which the system will no longer allow steering. Select **+** or **–** button to adjust the limit. If your error limit is "4 in (10 cm)" and the system accuracy reaches that limit, steering will no longer be allowed until the error decreases. If set to "none" accuracy of the differential source will not affect the ability to autosteer.

Reset to Defaults—Press the Reset to Defaults button to restore receiver settings to the factory default. This will remove all custom settings.

NMEA Talker—This button disables the GLONASS prefix in the NMEA messages. If using the GPS receiver with legacy displays or a device that does not support GLONASS messages, uncheck the box.

WAAS/EGNOS Settings

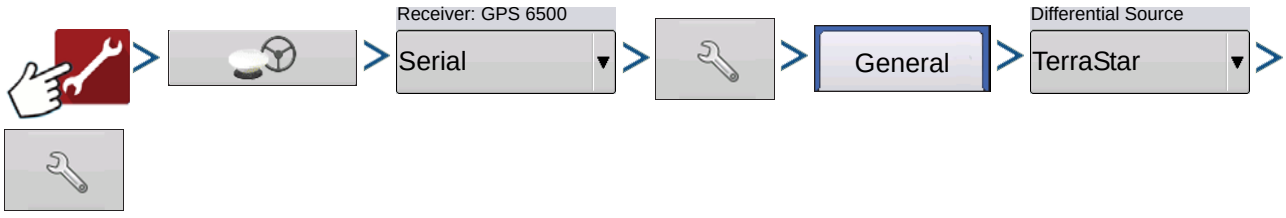


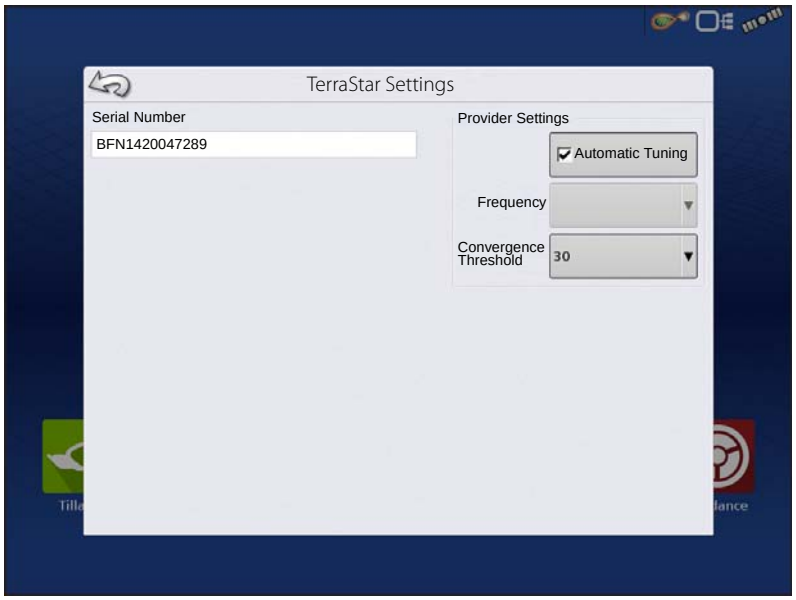
PRN

- Automatic
- WAAS
- EGNOS
- Custom

ATTENTION!: Should be let on Automatic unless otherwise told by support

TerraStar Settings





Serial Number—This box shows the serial number of your receiver - used to purchase TerraStar subscription.

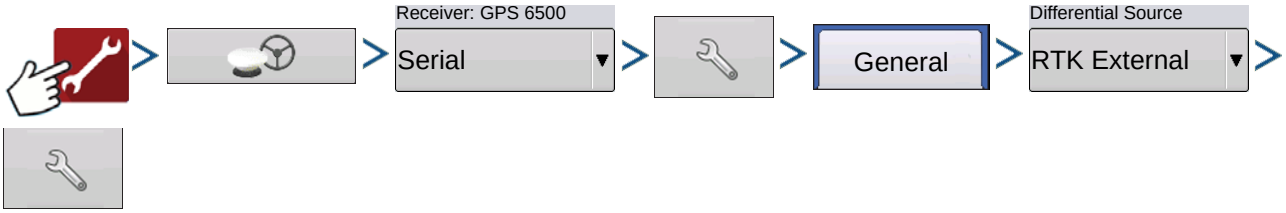
Automatic Tuning check box—Receiver will automatically select the strongest frequency. Frequency drop-down box will be grayed out when this is selected.

Frequency—In the Frequency drop-down list box, select the geographic region where you are located. Only uncheck automatic tuning when directed to by support (used to adjust tuning).

Convergence Threshold—The receiver uses the standard deviation of the solution to determine when the TerraStar position has converged. The receiver will label the TerraStar solution as "converged" when the horizontal standard deviation reaches the Convergence Threshold setting. Relaxing the convergence threshold shortens the time before a TerraStar solution is reported as converged. However, it does not alter the absolute behavior of the solution.

NOTE: The use of TerraStar® differential requires purchase of a subscription from your Ag Leader dealer. Settings related to using satellite differential correction vary based upon your geographic location. Setup details are explained on the following pages. More specific information can be obtained through you Ag Leader dealer. You will need to know serial number when contacting Ag Leader to set up the receiver.

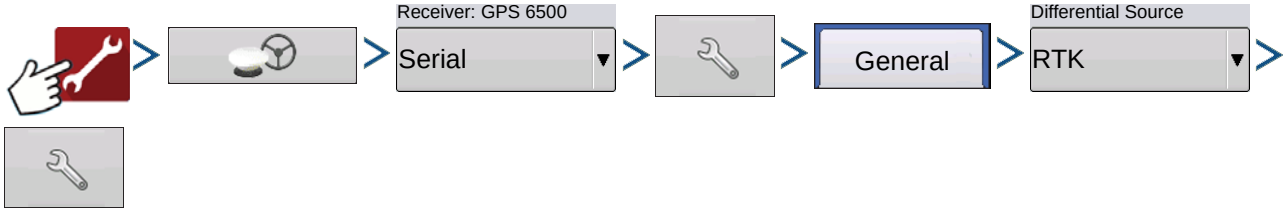
RTK External Settings



Setting the differential source to RTK External enables GGA NMEA message output on Port B at 1 Hz.

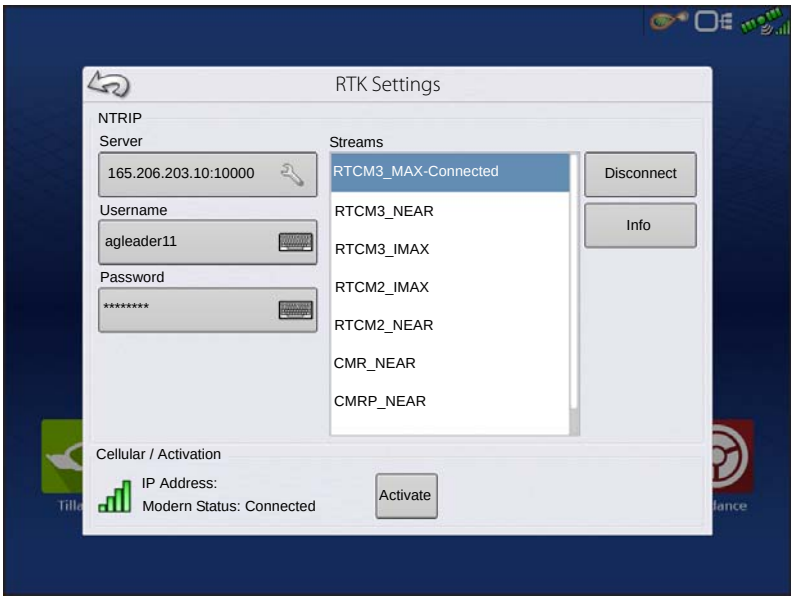
Change the Radio Baud Rate to match the External Radio connected to Port B.

RTK Settings - NTRIP



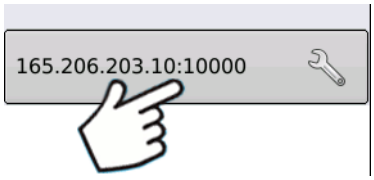
NTRIP

- Server
- Username
- Password
- Steams
- Disconnect/Connect - to the NTRIP Network
- Info - see “Info button” on page 65



Cellular

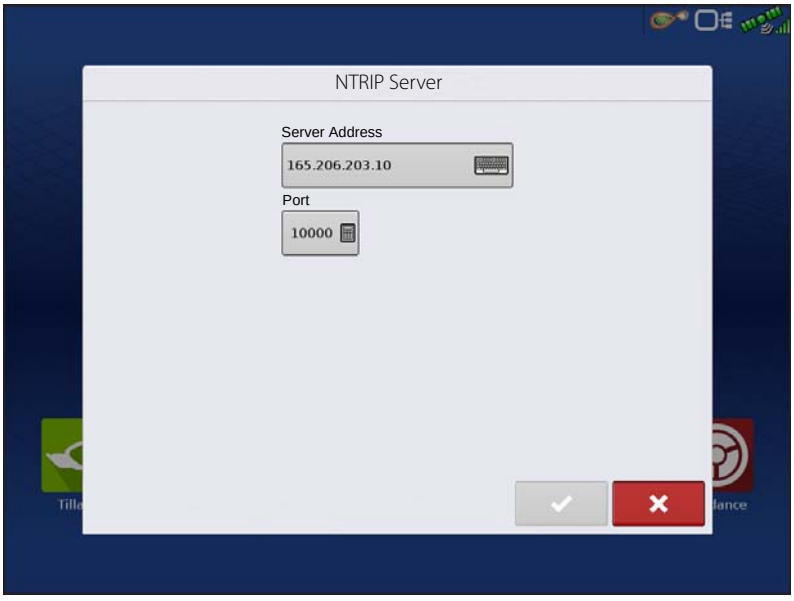
- IP Address - indicates a connection to the Internet
- Modem Status

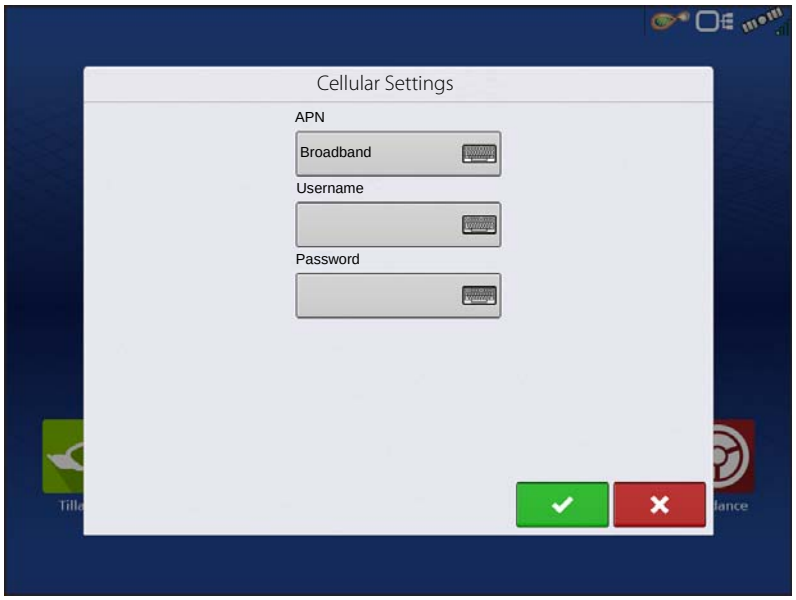


NTRIP Server

- Server Address
- Port

Server Address and Port are provided by the NTRIP Network.

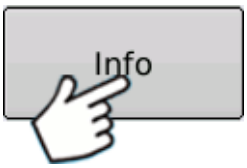


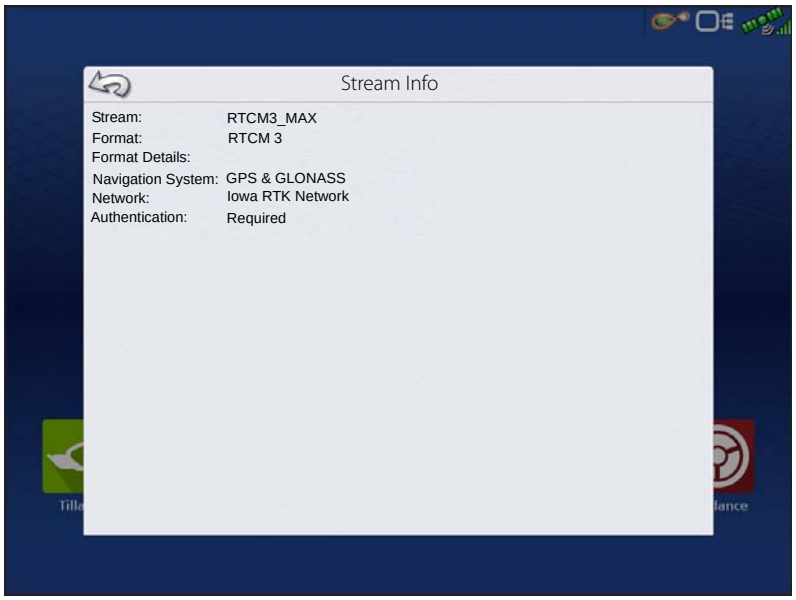


Cellular Settings

- APN
- Username
- Password

APN, Username and Password are Network provided settings. Contact the Cellular provider for this information.



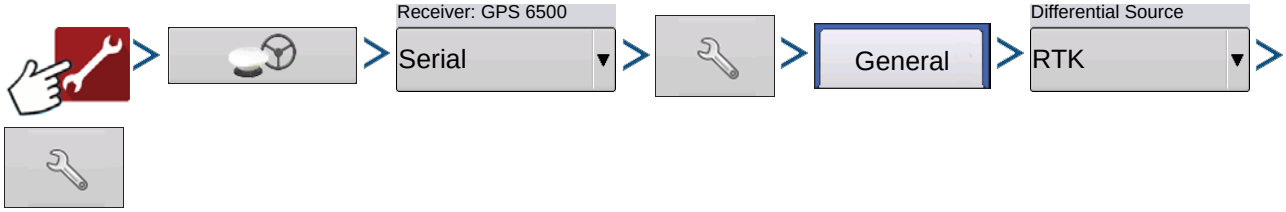


Info button

- Stream
- Format
- Format Details
- Navigation System
- Network
- Authentication

The information shown on this screen is provided by the NTRIP Network.

RTK Settings - 400 MHz



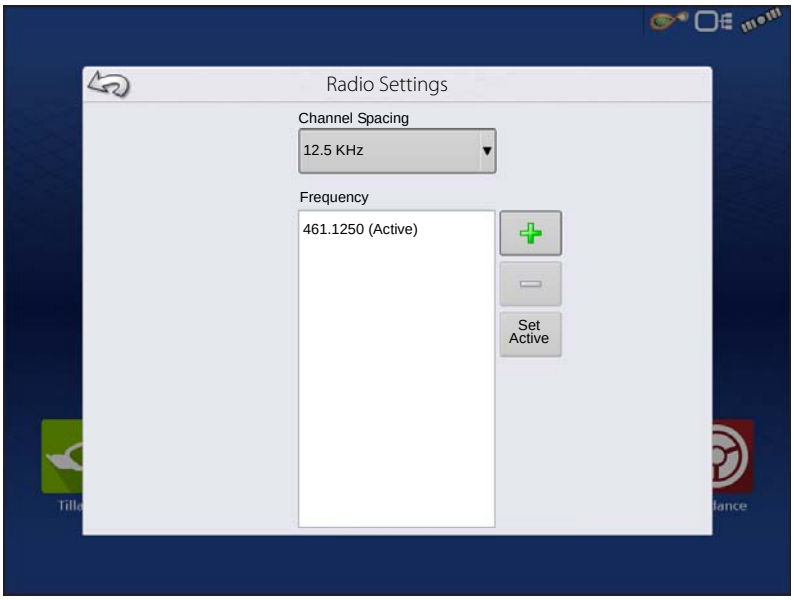
Channel Spacing—Use drop-down menu to select Channel Spacing

Frequency

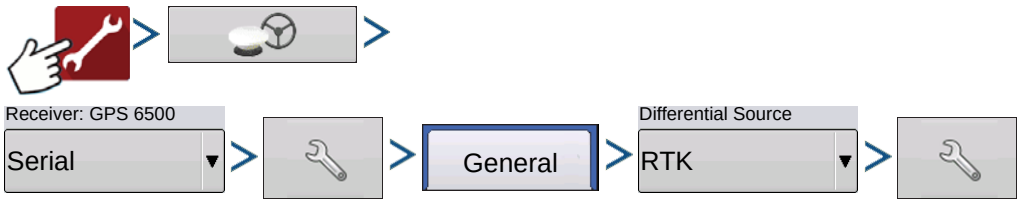
Press button to add a Frequency

Select frequency and press button to delete selected frequency.

Set Active — Select frequency and press button to make selected frequency active



RTK Settings - 900 MHz

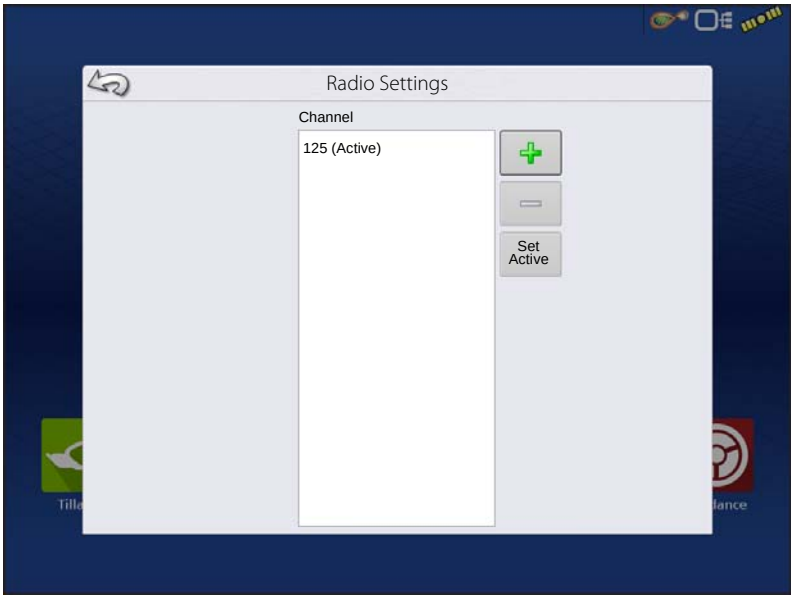


Frequency

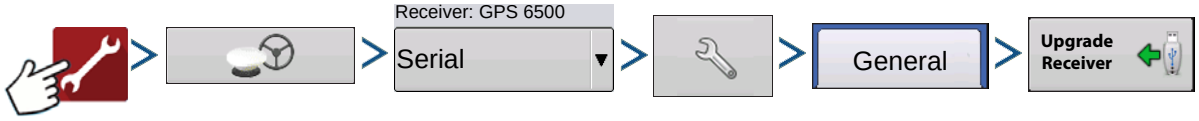
Press button to add a Channel

Select channel and press button to delete selected channel

Set Active — Select channel and press button to make selected channel active



Upgrade Receiver



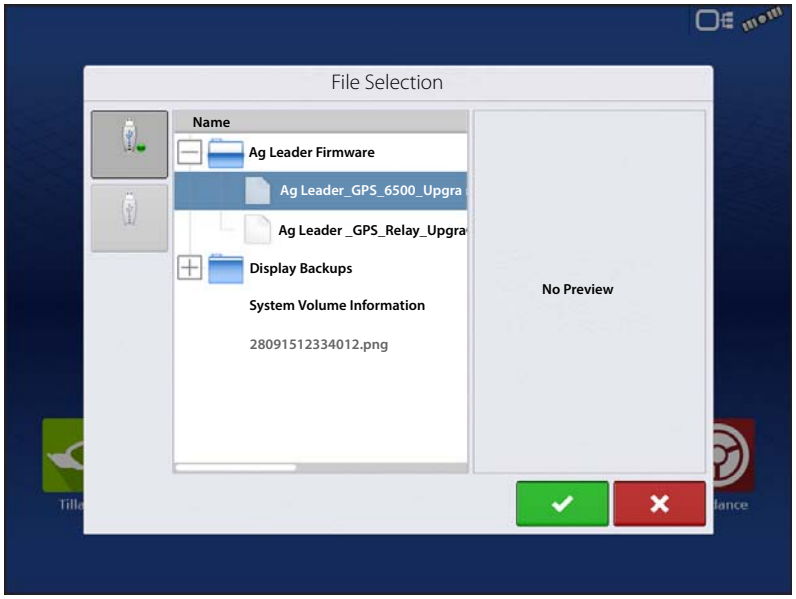
Select file downloaded from Ag Leader website

Select .fw3 file from USB drive.

Press to accept.

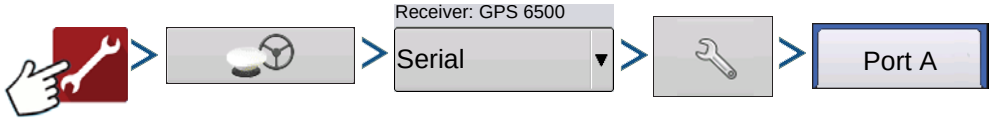
Display will upgrade receiver.

Press to return to previous screen without updating receiver.

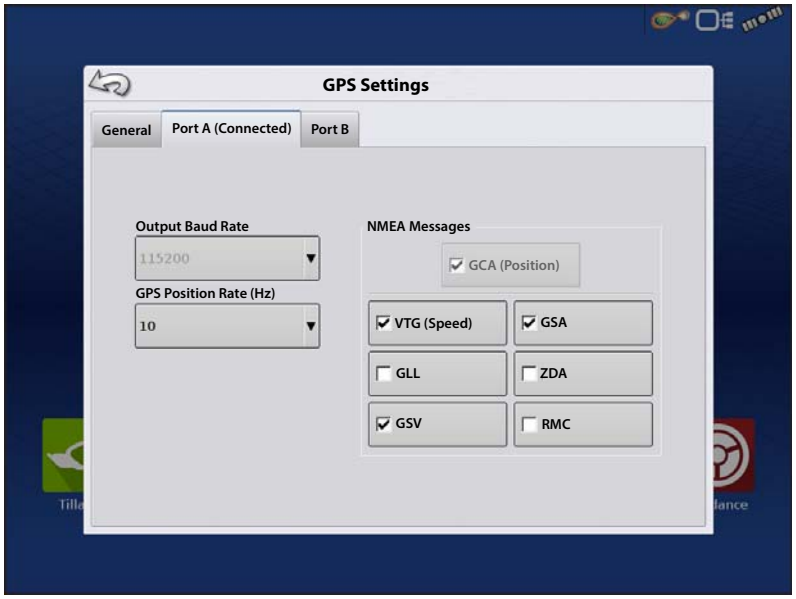


Serial Port Settings

Port A tab



The Serial Port Settings screen is the place where you can adjust GPS output. The appearance of the Serial Port Settings screen varies depending upon your model of GPS receiver.



Output Baud Rate—Displays the speed at which the receiver communicates with the display. For optimal performance, the GPS baud rate is set at 115200.

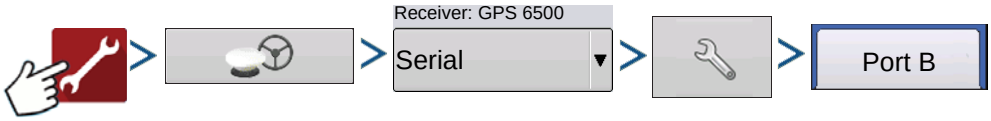
GPS Position Rate (Hz)—Represents the cycles per second (shown in Hz) that the display receives position information from viewable satellites (10 Hz minimum).

NMEA Messages—These checkboxes represent various communication protocols or formats that have been set by the National Marine Electronics Association (NMEA), and used in information "strings" or sentences output by the GPS Receiver. At present, the display only requires two NMEA Message formats: GGA and VTG.

- GGA: position in longitude and latitude.
- VTG: ground speed
- GSV, GSA: required to view the Satellite Plot, but are not required for GPS information.

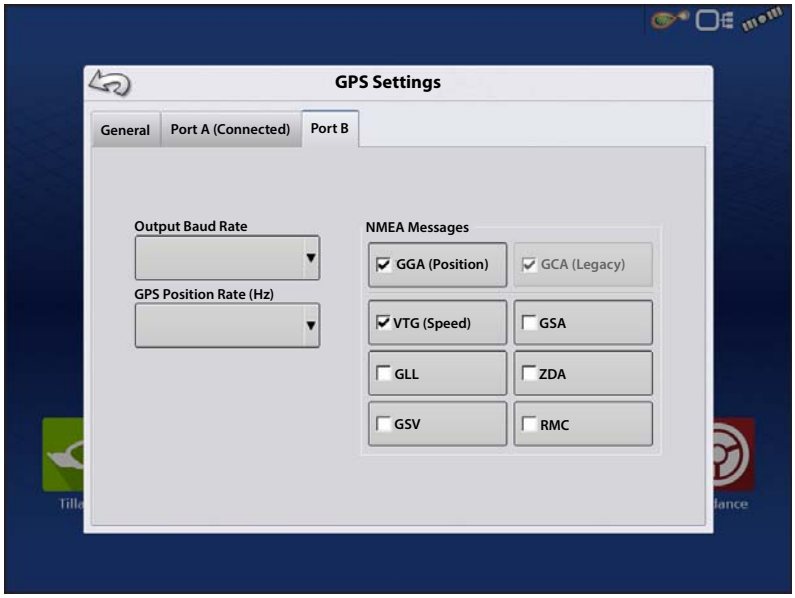
- GLL, ZDA, RMC, MSS: Leave these other NMEA message formats unchecked, unless you are connected to a third-party monitor and have been directed to do so.

Port B tab



The appearance of the Port B tab is similar to Ports A.

- **GGA(Legacy)** —Shortens the decimal precision of the GGA message for connection to legacy equipment.
- **GGA(Position)** —Gives increased precision to the GGA message. Most new displays require this turned on.

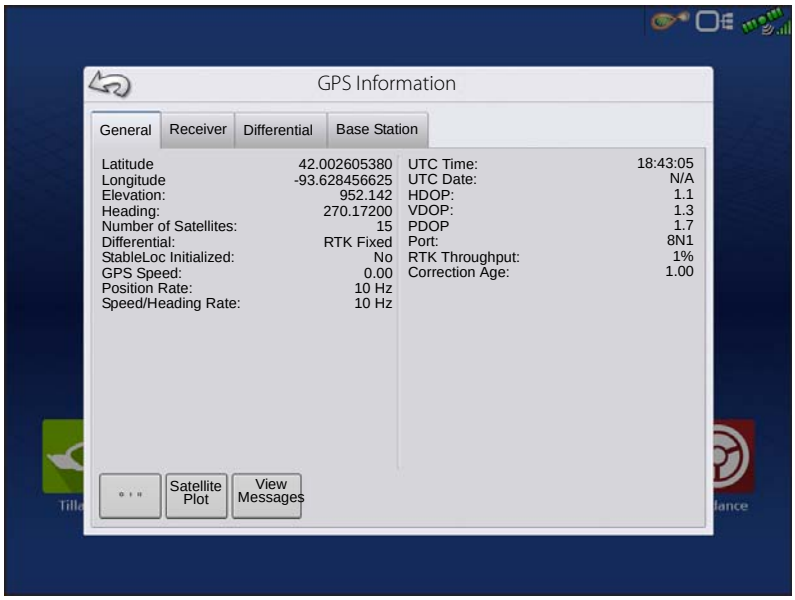


GPS Information

To access diagnostic information about the GPS signal, press the GPS (satellite) button that appears in the in the upper left-hand side of the Status Bar. GPS Information then appears on General, Receiver, and Differential tabs. Information on these GPS Information screens is described on the following pages.

GPS button with bars - bars indicate cellular signal strength

GPS Information - General Tab



Latitude, Longitude—Displays current position (in longitude and latitude) and elevation.

Elevation—Shows elevation of receiver.

Heading—Displays degree heading of travel.

Number of Satellites—Number of tracked satellites used in position fix.

Differential

- **No Diff**—Indicates the receiver is not receiving a differential GPS signal.
- **Diff On**—Indicates the receiver is receiving a differential GPS signal.
- **GLIDE**—GPS 6000/GPS 6500 Only.
- **WAAS/EGNOS**
- **TerraStar**—GPS 6500 Only.
- **RTK Fixed**—The receiver is receiving a valid RTK differential source.
- **RTK Float**—The receiver is receiving information from the Base Station, but the signal is not strong enough for an RTK fix.

GPS Speed—Real-time speed of travel.

Position Rate—The frequency that the receiver is sending the display your position in longitude and latitude (GGA). For example, at 10 Hz the display would be receiving a position message 10 times every second.

Speed/Heading Rate—The frequency that the receiver is sending the display your ground speed and heading (VTG)

NOTE: Position Rate and Speed/Heading Rate should both be set at a minimum of 5 Hz for guidance or steering.

Change Longitude/Latitude Format—Pressing this button changes the Longitude/Latitude format. These can either be shown in Degrees, Minutes and Seconds; or Decimal Degrees.

View Messages button—see "GPS Messages" on page 70.

UTC Time—UTC is an acronym for Coordinated Universal Time, a high-precision atomic time standard that defines local time throughout the world. If you are receiving information from satellites, then the UTC Time should automatically update.

UTC Date—If you are receiving information from satellites, then the UTC date should automatically update.

HDOP—Horizontal Dilution of Precision (HDOP) indicates the quality of the horizontal GPS position. Lower HDOP numbers are optimal, higher numbers are undesirable.

PDOP—Position Dilution of Precision (PDOP) is a unitless measure indicating when the satellite geometry can provide the most accurate results. When satellites are spread around the sky, the PDOP value is low and the computed position is more accurate. When satellites are grouped close together, the PDOP is high and the positions are less accurate. Lower PDOP numbers are optimal, higher numbers are undesirable.

Port—The connection between the display and the GPS as established at a message format and baud rate.

RTK Throughput—Indicates a percentage of information available from the RTK base station. Used for troubleshooting an RTK link between the base and rover.

Frequency—The Correction Frequency indicates the GPS satellite frequency used by the receiver.

NOTE: The Correction Frequency diagnostic does not show for WAAS connections.

Correction Age—The length of time since the GPS receiver has obtained its last update.

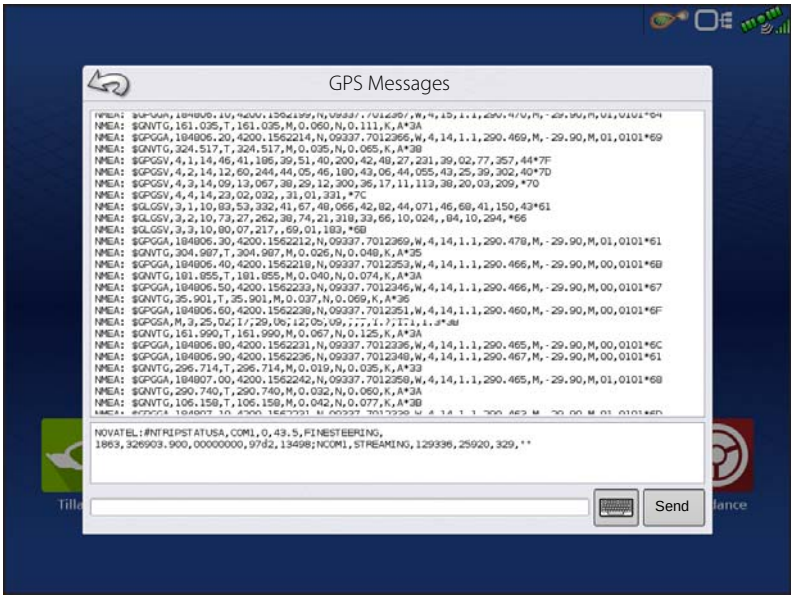
NOTE: The age of the DGPS corrections (as delivered to the GPS receiver) will vary from one second to several seconds, depending on the characteristics of the individual satellite signals.

GPS Messages

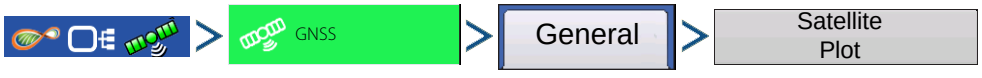
View the NMEA messages coming from the receiver.

Press and use keyboard screen to write a command to the receiver. Only send commands to the receiver when directed to by technical support.

Press Send to send message to the receiver.



Satellite Plot

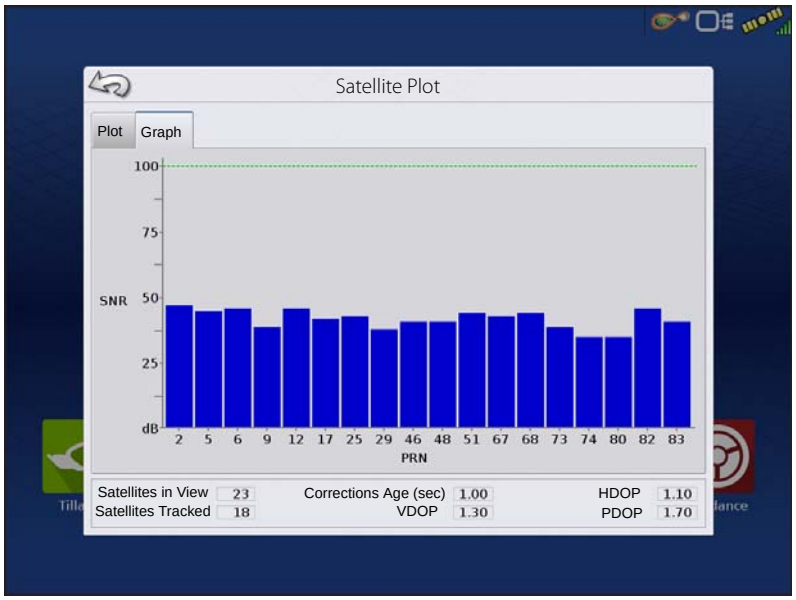


The Satellite Plot feature can display both a plot or a graph. The information on these screens is used as an advanced diagnostic tool for GPS satellite availability. In the event of GPS availability issues, technical support may request you to view these screens.

Satellite Plot - Graph

Satellite Plot requires GSV and GSA NMEA messages to be turned on from the GPS receiver.

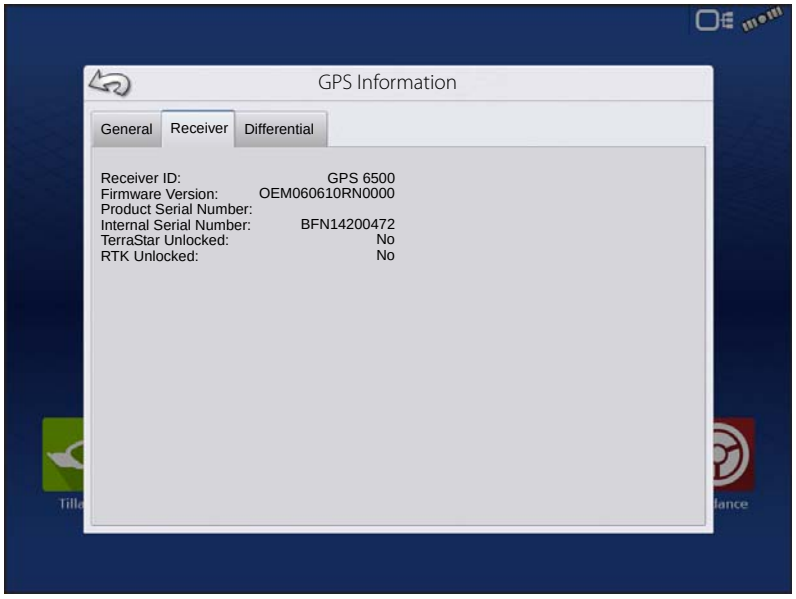
Graphically shows satellite PRN's and SNR.



GPS Information - Receiver Tab

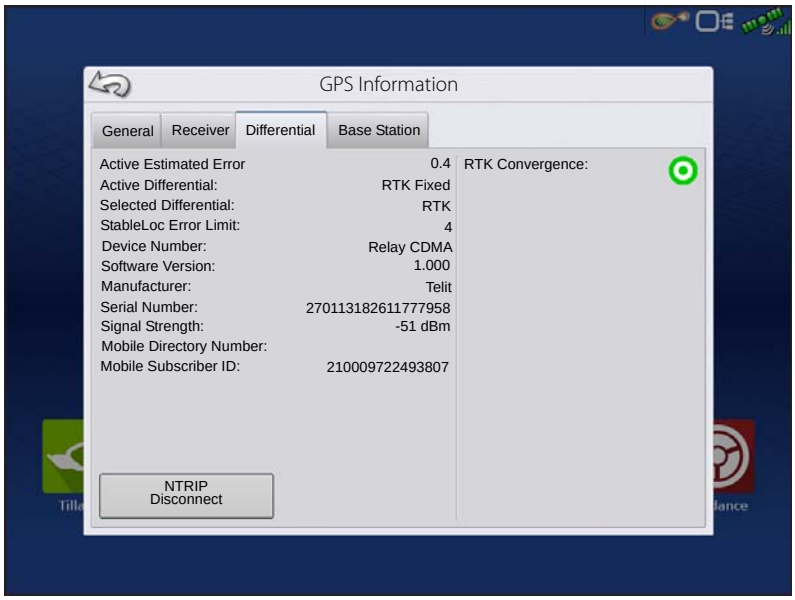
GNSS > Receiver

- Receiver ID
- Firmware Version
- Product Serial Number (enclosure)
- Internal Serial Number
- TerraStar Unlocked
- RTK Unlocked



GPS Information - Differential Tab

GNSS > Differential



Active Estimated Error—Estimated error of the active differential source.

Active Differential—Indicates the active differential source and will vary depending on the current state of StableLoc.

Selected Differential—Indicates the selected differential source (the source selected in the GPS setup).

StableLoc Error Limit—Indicates the error limit selected in the GPS setup.

Device Name—Indicates the connected Relay Module.

Software Version—Software version of the radio/modem within the Relay Module.

Manufacturer—Manufacturer of the Relay Module.

Serial Number—Serial number of the Relay Module.

Signal Strength—Shows cellular signal strength.

Mobile Directory Number—Relay CDMA/GSM Only, used for troubleshooting

Mobile Subscriber ID—Relay CDMA/GSM Only, used for troubleshooting

NTRIP Connect/Disconnect—Connect or Disconnect from NTRIP Source.

RTK Convergence—Three states to indicate the current convergence level.

Red Arrows, pointing out—The device is not currently converging on RTK. This may indicate a RTK link problem.

Green Arrows, pointing in—The device is currently converging, but not ready for RTK fix.

Green Bull's-eye—The device is converged on RTK.

Base Station

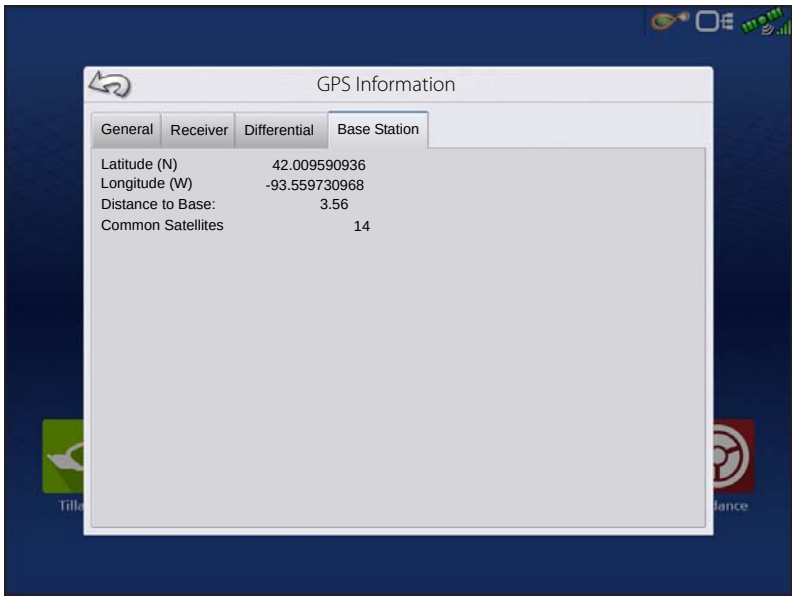
Displays base station specific information

Latitude—Latitude of Base Position.

Longitude—Longitude of Base Position.

Distance to Base—Distance to Base Station.

Common Satellites—Shows the number of Satellites the receiver has in common with the base station.



RTK/NTRIP Information (ParaDyme/GeoSteer Only)

The following information appears on the second GPS Information screen for RTK or NTRIP.

Convergence (%)—Successful communication between Base Station and ParaDyme Roof Module.

Radio Throughput—Displays percentage of data received from Base Station.

Distance to Base—Shows distance to Base Station in miles (kilometers).

Base Channel—Displays Channel ID of Base Station.

NTRIP—(NTRIP users only) Shows either Connected or Disconnected.

GPS Information - NTRIP

NTRIP Connect—Connects the display to the NTRIP correction source.

NTRIP Stream—Network mount point.

NTRIP Status—Displays NTRIP connection; either Connected or Disconnected.

Cellular Status—Displays status of ParaDyme cellular modem; either Connected or Disconnected.

Cellular Signal Strength (%)—Displays a number between 0 and 100%.

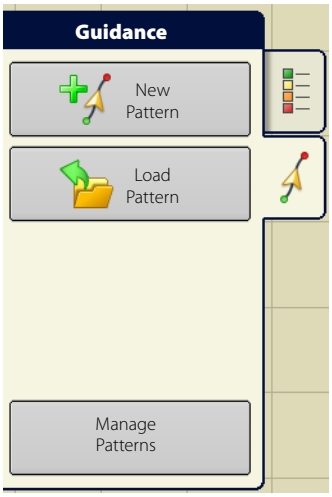
WiFi Status—Displays status of WiFi router; either Connected or Disconnected.

WiFi Signal Strength—Displays a number between 0 and 100%.

Guidance Tab on Map screen

The Guidance tab on the Map screen allows you to create a new pattern, load an existing pattern, or adjust Guidance Options and Guidance Settings. This tab changes its appearance after you create or load a pattern.

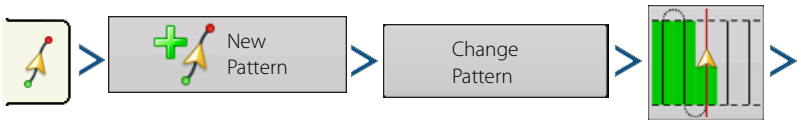
Before you create any patterns, the map screen's Guidance tab appears as shown.



NOTE: Guidance pattern will default to the one last used. Guidance patterns can be set to widths up to 2000 ft.

New Pattern—Straight

Select Pattern

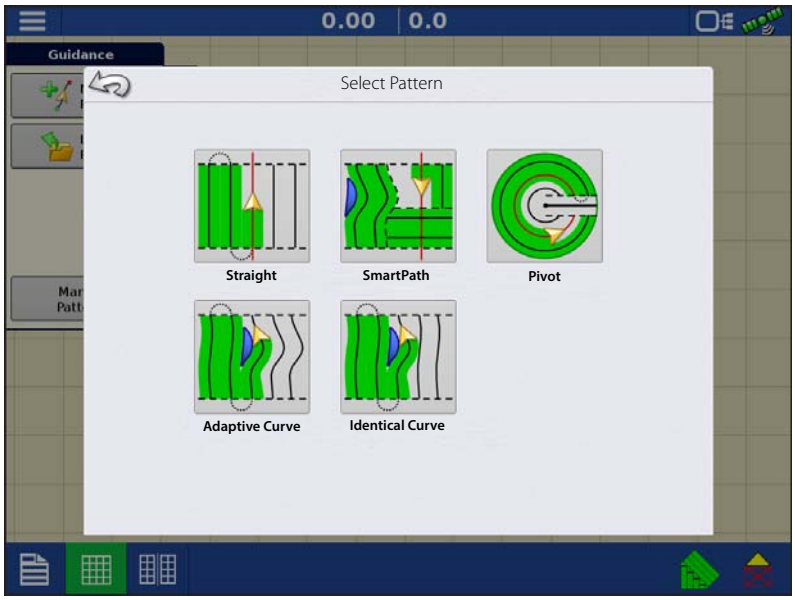


Press . You will automatically return to the Map screen.

System defaults pattern type to last used. Press the pattern icon to select a different pattern.

- Implement Width (from Implement Setup)
- Guidance Width input box
- Enable Tramlines checkbox. See "Tramlines" on page 103.

- Change pattern



Create AB line using 2 points

- A•—•B Press to mark A point. A green ball appears on the map screen where point was placed.
- A•—→B Button is greyed out until you drive a minimum of 100 ft.
  - Pause - Press ⏸ to pause path during path creation
  - Resume - Press ▶ to resume path during path creation
  - Cancel - Press ✕ to cancel path during path creation
- A•—•B Press to mark B point. The AB line appears on the map screen and point B is marked with a red ball.

Create AB line using Current Location and Heading

- 90.0 ° uses current location and heading, line extends 1 mile before and after the A point (recommend vehicle having forward motion to get a good heading).

Create AB line using Current Location and Inputting Heading

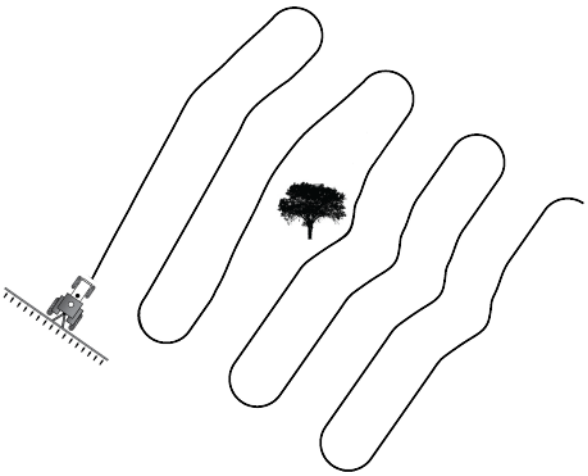
- 0.0 ° uses current location and input heading, line extends 1 mile before and after the A point

Patterns are automatically saved when the guidance pattern is created.

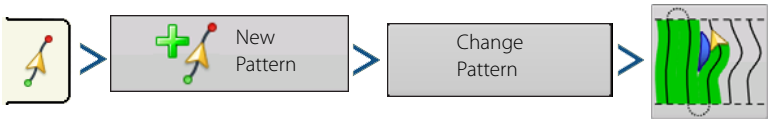
NOTE: On straight AB lines, if you complete a swath that is longer than the previous one, the display automatically extends the guidance path for the following swaths.

New Pattern—Adaptive Curve

Use the Adaptive Curve pattern to follow gentle contours in the field, or when you need to avoid obstacles. This pattern provides guidance based on the last curve driven.



Select Pattern



System defaults pattern type to last used. Press the pattern icon to select a different pattern.

- Implement Width (from Implement Setup)
- Guidance Width input box

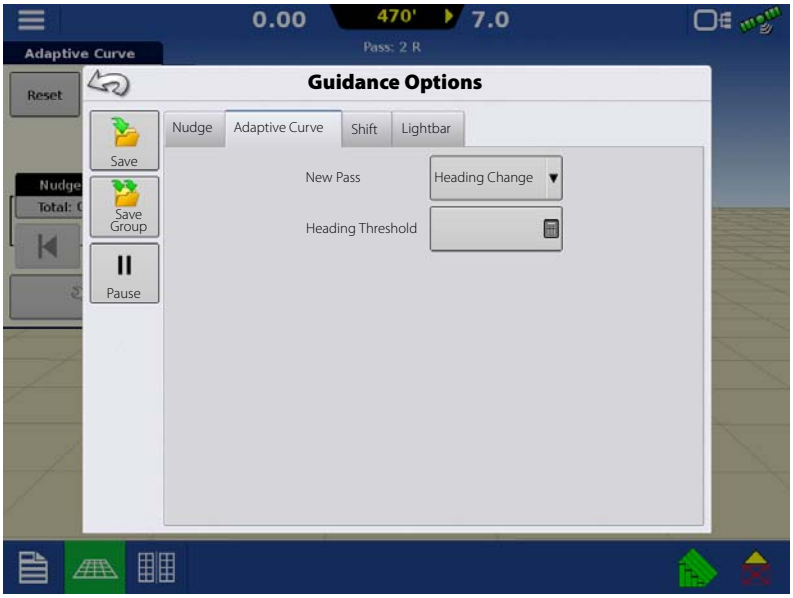
Press . You will automatically return to the Map screen.

NOTE: Guidance extends beyond the end of curved swaths. This makes it possible to get LED guidance back onto the swath if the vehicle drives past the end of a swath. The extended swath lines do not appear on screen.

You can adjust the degree heading at which the system generates the next pass by doing the following:

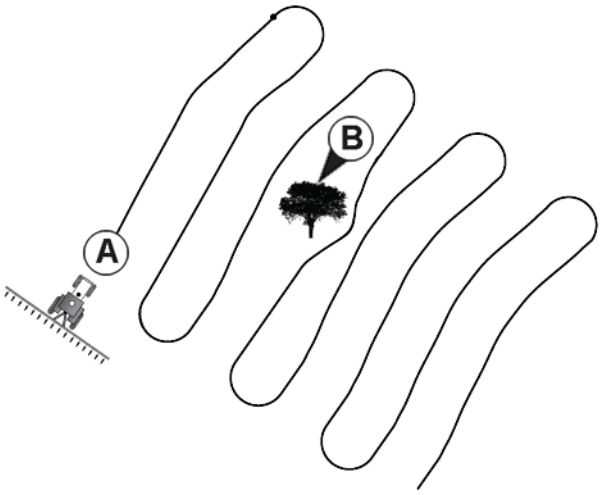
1. Go to the Guidance screen
2. Press the Options button.
3. The Guidance Options screen appears; press the Adaptive Curve button.
4. At the New Pass drop-down menu, select Heading Change
5. Use to enter in the degree number of your Heading Threshold.

Patterns are automatically saved when the vehicle turns for the first time.

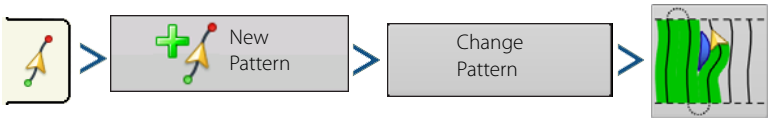


New Pattern—Identical Curve

Use the Identical Curve pattern to follow gentle contours in the field. This pattern provides guidance based on the original curve driven.



Select Pattern

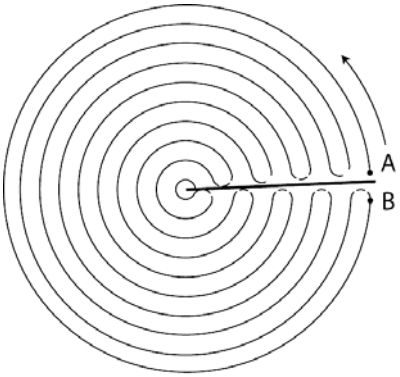


System defaults pattern type to last used. Press the pattern icon to select a different pattern.

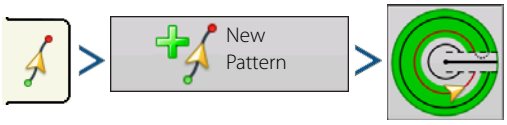
Press ✓. You will automatically return to the Map screen.

New Pattern—Pivot

Use the Center-pivot pattern for a field that is irrigated using a center-pivot. With this pattern, you can drive concentric circles around the center-pivot. The display will calculate the center point based on where you have driven. Otherwise, you can enter in the latitude and longitude of the center point, if known.



Select Pattern

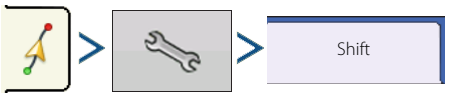


System defaults pattern type to last used. Press the pattern icon to select a different pattern.

- Implement Width (from Implement Setup)
- Guidance Width input box
- Manual Entry checkbox and Latitude and Longitude input boxes

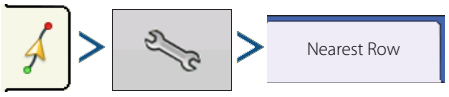
Press ✓. You will automatically return to the Map screen.

Pivot Shift

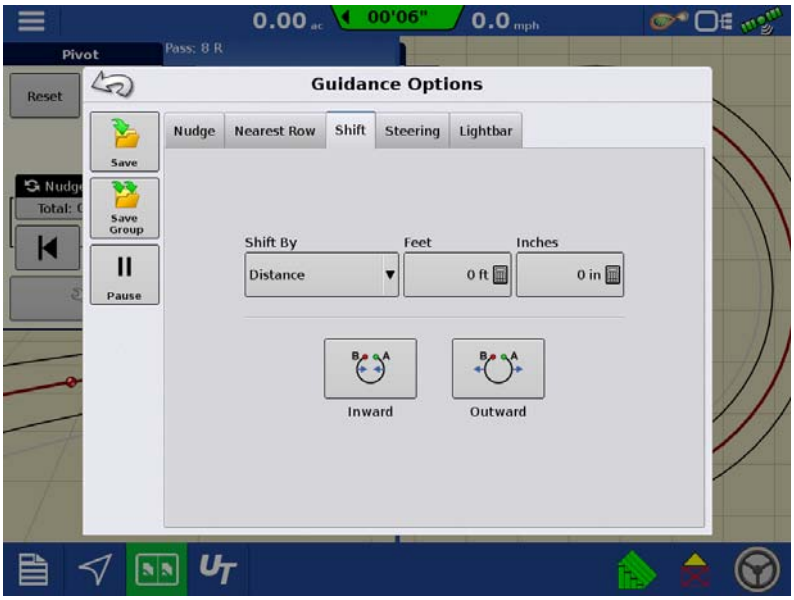


Shift by Distance—Shift the pivot pattern, inward or outward, by a desired distance.

Shift by Row—Shift the pivot pattern, inward or outward, by a desired number of rows.



Nearest Row—Shift pivot pattern to the nearest row based on current location. User must enter row spacing.



Create AB line using driven path

- Position one wheel of the vehicle in a pivot wheel rut, with the rear of the vehicle to the pivot arm.
- Press A→B to mark A point. A green ball appears on the map screen where point was placed.
- Drive desired path around the field. Keep the vehicle wheel in the rut.
- A→B is greyed out until you drive a minimum of 160 ft.
  - Pause - Press ⏸ to pause path during path creation
  - Resume - Press ▶ to resume path during path creation
  - Cancel - Press ✖ to cancel path during path creation
- When you are almost back to the pivot arm or the edge of the field, press A→B to mark B point, the AB line appears on the map screen and B point is marked with a red ball.

1. Next, you must set the Field Edge. You may do this when the Pivot Field Edge window appears on your display.

   From here, you may choose one of three options:

   Shift By Distance—This sets the field edge as the distance and direction in relation to the AB Line created. In the Pivot Field Edge Distance portion of the window, enter the distance in feet and inches.

   Shift By Rows—This sets the field edge as the number of crop rows multiplied by the number of spacing. In the Pivot Field Edge Distance portion of the window, enter the Number of Rows and Row Spacing.

   Cancel

   The vehicle uses the driven pass as the AB Line.

2. If you chose Shift by Rows in the previous step, use to enter the Number of Rows and Row Spacing. Choose the direction relative to the AB Line (either Outward or Inward), and press to continue.
3. Steer the vehicle so that you center the green lights in the lightbar as you drive forward along the path.

NOTE: To work from the center of the field outwards, the initial pivot must have:

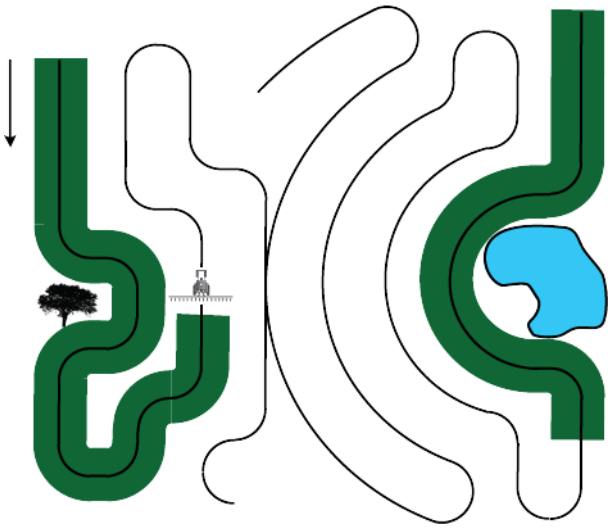
- A radius of at least two swath widths.
- An arc length of at least two swath widths.

New Pattern—SmartPath

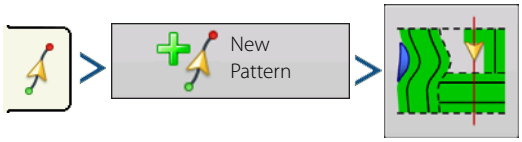
The SmartPath™ pattern is designed to give guidance from any previously-driven pass. This is used in irregular-shaped and terraced fields where you cannot run all passes parallel to the previous pass.

Instead, the SmartPath guidance allows you to move to a different area of the field, and then resume a previous guidance pattern later.

SmartPath can be used to create straight AB patterns within the SmartPath pattern. Cycle between Straight AB and SmartPath at any time within SmartPath guidance pattern.



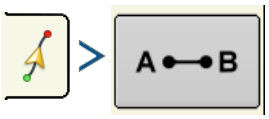
Select SmartPath



System defaults pattern type to last used. Press the pattern icon to select a different pattern.

Press . You will automatically return to the Map screen.

Inputting Paths into SmartPath



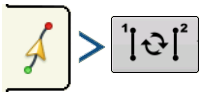
> AB Manager

The AB Manager screen allow user to create, edit, remove, and load paths into SmartPath.

You can create up to 10 different AB lines within SmartPath.

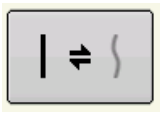
- Press the Back button to close the screen.

Cycle between Loaded Paths



Press to cycle through the paths loaded in SmartPath.

If you drive your vehicle onto the Projected Path, the system guidance uses this as the Followed Path.



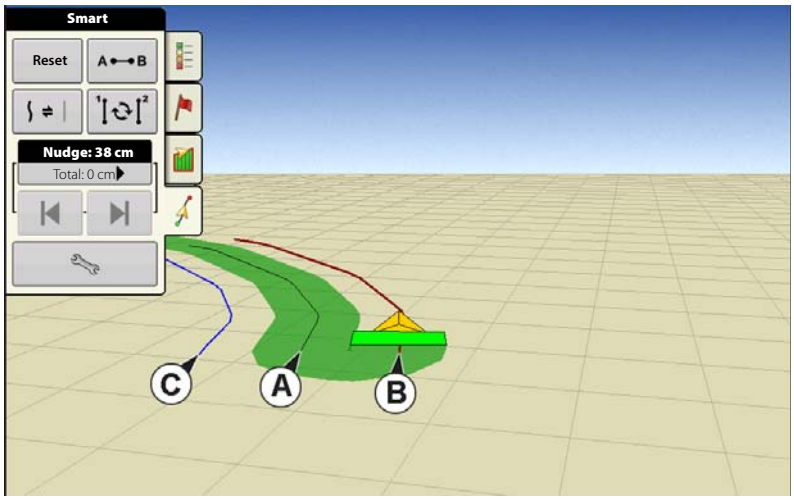
Once the AB line is created, you can switch between the AB line and SmartPath patterns by pressing the AB/SmartPath toggle.

The Map screen changes its appearance to Perspective View, and SmartPath settings are shown in the Mapping toolbox. Drive along the path that you wish to create.

NOTE: The display will not create an A point with SmartPath, unless you are mapping a Straight AB line within it.

After you turn around on your first pass, the system guidance will follow a maroon-colored line parallel to your previously-driven pass.

As you continue using the SmartPath, the map screen will display three lines:



- (A) The Base Path

  Appears as a black line, is the initial SmartPath that you created on the first pass.

- (B) The Followed Path

  Appears as a maroon-colored line, is the path that your vehicle is currently using.

- (C) The Projected Path

  Appears as a blue-colored line on the opposite side of the Base Path and is an alternate path parallel to the Base Path. The system guidance created this path while the base path was created.

  This is the path that your vehicle would have taken if you had turned it in the opposite direction.

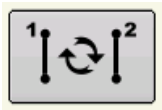
NOTE!

- The Projected Path and Base Path both remain in display memory, until you press the Reset button without saving the SmartPath pattern.

- Pressing the Save button saves all the SmartPath passes within the display's memory for future use.

Select a Previous SmartPath Pass

If you have specified SmartPath as your desired pattern, but you are not following an active guidance pattern, the Guidance System automatically begins searching for SmartPath patterns for your use.



If you wish to use a previously-created SmartPath pattern, you can do so by pressing on the Active Line Cycle button. This button allows you to cycle between available SmartPath patterns.

NOTE!

- When the guidance system looks for other available SmartPath patterns, it first displays the nearest-available pass.
- You can adjust the available area in which the Guidance System searches for previously-created SmartPath passes. To do this, adjust the Heading Threshold settings on the Smart tab of the Guidance Option screen.

SmartPath Guidance Options

SmartPath only creates a SmartPath pass when you are logging data in the field. However, you have the option of using it to create SmartPath passes continually during all field operations.

To adjust this setting, press the Guidance Options button on the Guidance tab. The Guidance Options screen appears. Press the Smart tab Wrench.

- The default setting is Logged Area. This setting only creates passes while you are logging field data.
- By selecting All Area Covered, you can create SmartPath passes even when not logging field data.
- The Heading Threshold setting is the available area that the Guidance System uses to search for previously-created SmartPath passes. The default setting is 20 degrees.

AutoSave

Patterns are automatically saved when a guidance pattern is complete.

- A screen will notify user that the patterns is being saved with a default name using the date and time.
- Patterns can be renamed or deleted.

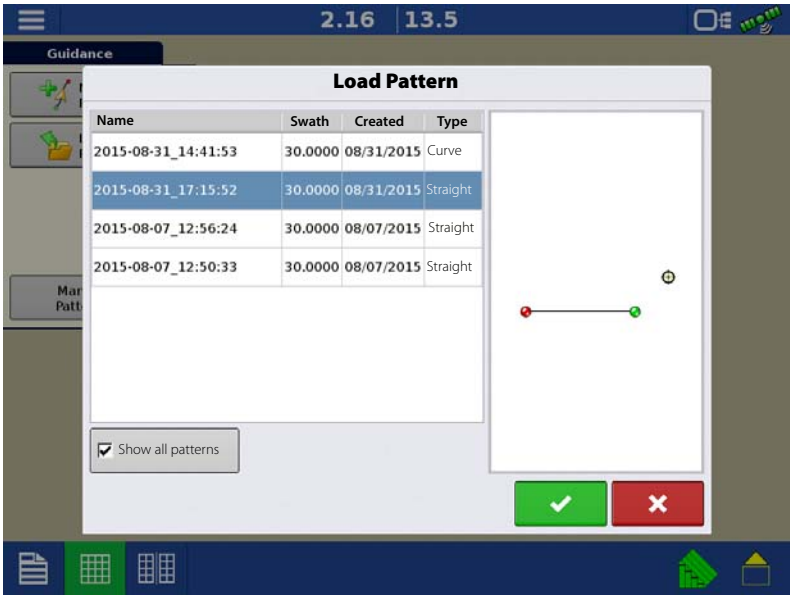
Manage Patterns

Spatial Sort

Spatial Sort allows the user to select any guidance pattern in the display, sorted by distance from the GPS location.

Pattern at the top of the list will be the closest to current GPS location.

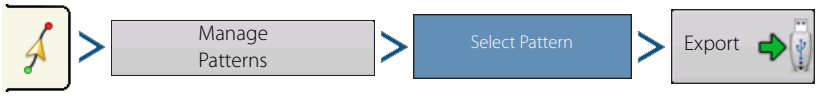
Check the box to show all patterns.



Import Pattern

Display informs you when file has been successfully copied.

Export Pattern



Display informs you when file has been successfully copied.

Edit Pattern

If you wish to rename a pattern, first press the Manage Patterns button on the Guidance tab of the Mapping toolbox. Press to enter a name for the pattern. The new pattern name now appears in the pattern list of the Manage Patterns screen.

Remove Pattern/Remove All Patterns

To remove a pattern from the display memory, first press the Manage Patterns button on the Guidance tab of the Mapping toolbox. At the Manage Patterns screen, press either:

- Remove button if you wish to delete one pattern file; or
- Remove All button if you wish to delete all of them for the current field.

Reset Pattern

If you have been using an already-saved pattern, and wish to switch over to a different pattern in the same field, you can use the Reset Pattern feature by following the steps below.

1. Press Reset

   Press the Reset button on the Guidance screen.

2. Confirm Reset

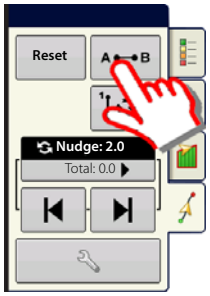
The Guidance screen appears, asking you to reset the current guidance pattern. Press to continue.

3. Create new pattern (optional)

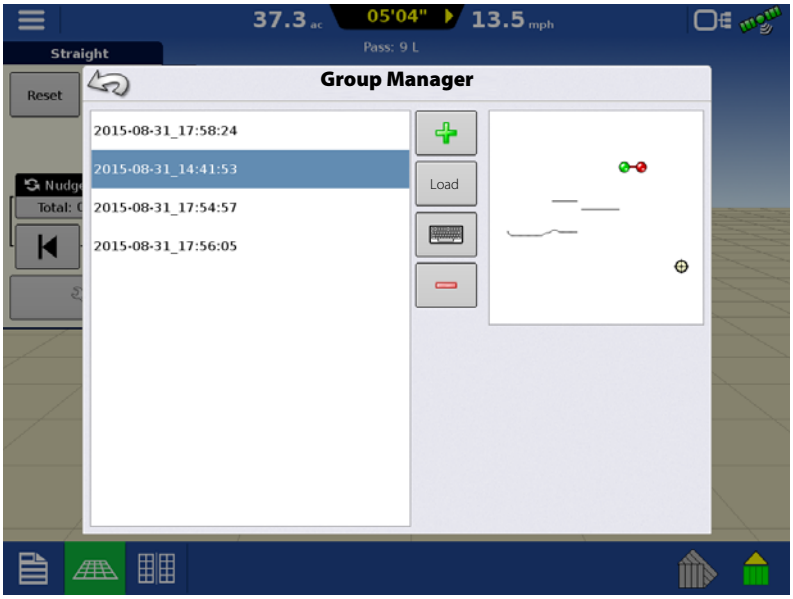
   The pattern is now reset. You may now create a new pattern, if desired.

Pattern Groups

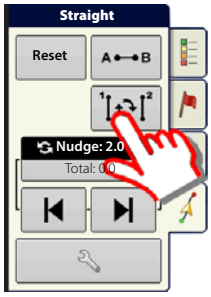
Pattern Groups allow the user to group up to 20 patterns per field, using the Group Manager.



The Group Manager allows the user to add a new pattern or load an existing pattern to a Group. Once a Group is created, it can be saved and reloaded.

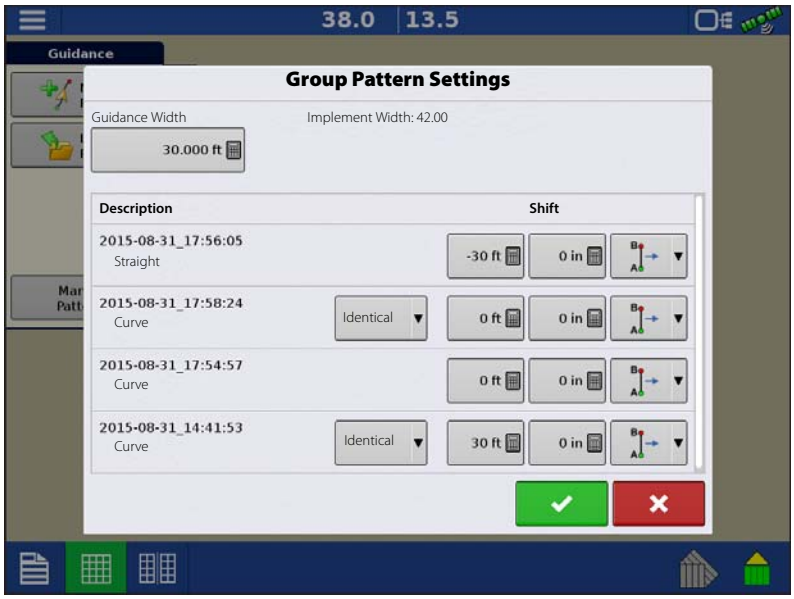


The Pattern Cycle button allows the user to easily cycle between patterns with a single button press. Patterns will cycle in the order they were created or added, starting back at the beginning of the list, once the last patterns is reached.



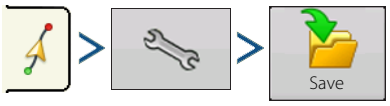
When loading a Pattern Group, the Group Pattern Setting dialog appears and allows the user to select the Guidance Width and any Shift that needs to be applied to each Pattern within the Pattern Group. User will also have the option to load Curve Patterns as Adaptive or Identical.

Straight AB, Identical Curve, Adaptive Curve and Pivot Patterns can be grouped. SmartPath cannot be grouped.



Guidance Options

Save



This allows you to save a pattern (.AGSETUP file) to the display's internal memory.

Press and enter a unique pattern name.

When finished, press .

Pause

The Pause button allows your display to stop logging points along an AB Line. Once this button is pressed, a Resume button will take its place until you press this button and Pause reappears.

NOTE: If you are using the display to follow a set AB Line and wish to temporarily deviate from this line, you can use the Pause button to pause the display's guidance logging activity. This feature could be used, for example, by a vehicle operator who must refill a sprayer. When paused, the display will continue to give the distance back to the original pause point position.

- Press on the Guidance screen. When you do so, the place where you paused appears on the Map screen as a yellow ball.

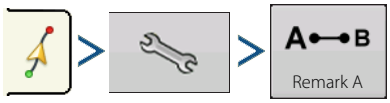
NOTE: You can pause a pattern even if you have not set the “B” point yet. If you do so, the message in the lightbar will read "Need B." If you pause the pattern after you have set your AB Line, then the lightbar will indicate the distance your vehicle must travel to return to the pause point.

- To resume your pattern, press

to resume creating the AB Line.

NOTE: If you press the Resume button before you have returned to the original AB Line, your display will select the closest AB Line to your vehicle.

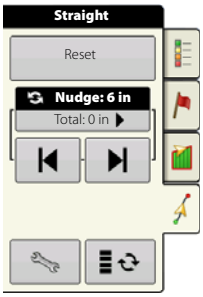
Remark A

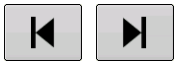


If you chose Straight patten, the Remark A button appears on the Guidance Options screen. The Remark A button "remarks" the A point by moving it to the current position of the vehicle while maintaining the same heading. A brief message appears in the on-screen lightbar, stating "Point A Remarked."

Nudge

NOTE: Only Straight patterns offer two Nudge settings. All other patterns have a single nudge setting.

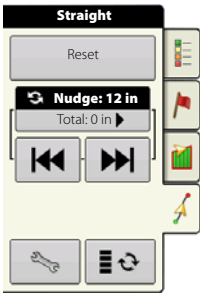


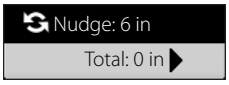


Nudge allows you to adjust the swaths by a specified distance for the direction of travel.

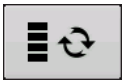
Small Nudge (single arrow) shown on left.

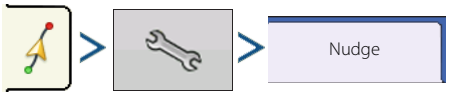
Large Nudge setting (double arrow) shown on right (Straight Patterns Only).



Use Nudge toggle button 

to switch between Small and Large Nudge setting.

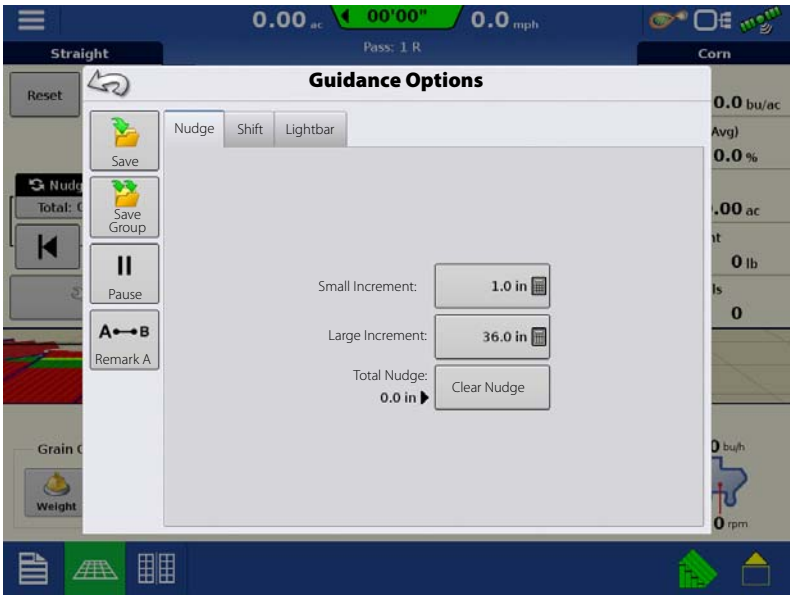
Use Mapping toolbox toggle button  to switch the menu between Tramline and Nudge on the Mapping toolbox, if Tramlines are enabled.



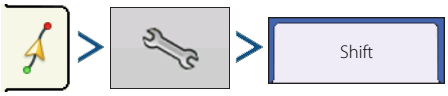
Press button then the Nudge tab to make adjustments to Nudge settings.

- Press to enter a distance for increment that the swaths will move with each successive press of the left or right arrows buttons on the Guidance tab.
- To clear out the adjustment and go to the original position, press Clear Nudge.

Screen shows Small and Large increment settings for Straight path. Other Patterns will only show the small increment setting.



Shift

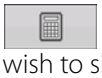


Shift moves all of the swaths by a specified distance to the left or right, (including the AB line). The swaths can be shifted by a distance or number of rows.

- Shift by Distance

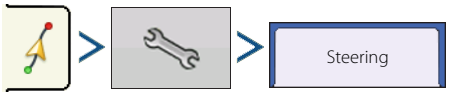
  Use to enter the distance that you wish to shift the pattern. Use the bottom drop-down menu to enter the direction, (either left or right). Press Apply button to accept change.

- Shift by Rows

  Use  to enter the number of rows you wish to shift the pattern. Use the second to select the row spacing. Use the drop-down menu to enter the direction to shift the pattern. Press Apply button to accept the change.

NOTE: The Shift setting is not available with the SmartPath patterns.

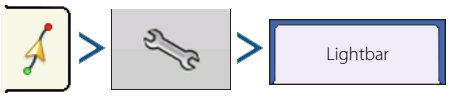
Steering



Steering allows users to make autosteer turning adjustments on the go.

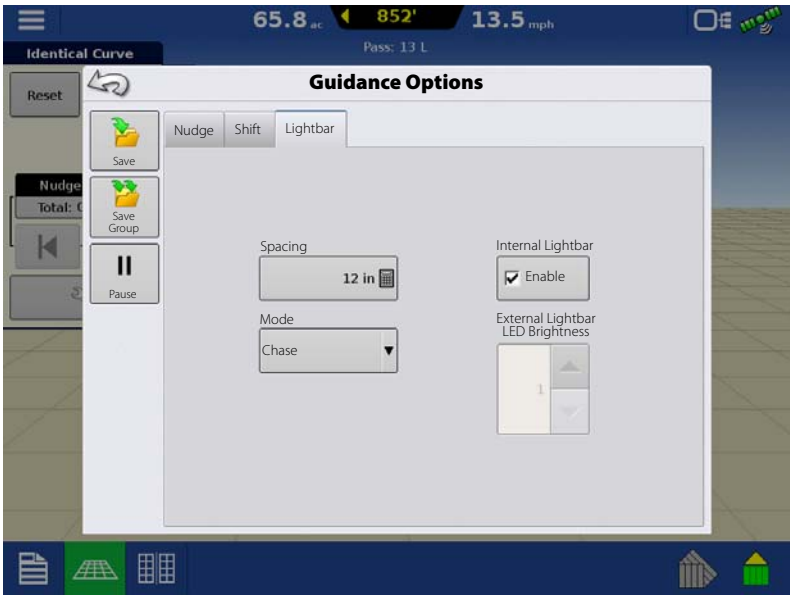
- **Line Acquisition**—Determines how aggressively the system steers onto the desired steering path. The ideal setting allows the system to take the shortest route without excessively sharp or sudden movements of the vehicle.
- **Steering Response**—Controls the oscillations of the vehicle when it is on the desired path.
- **Reverse Response**—Controls the oscillations of the vehicle when it is on the desired path in reverse.
- **Log coverage while AutoSteer is engaged**— checkbox (check for yes, un-check for no). Coverage while engaged is available when an AutoSteering system (SteerCommand, GeoSteer, ParaDyme) is connected. User can still manually control coverage logging with the on-screen coverage button. AutoSwath is unaffected by this selection.

Lightbar

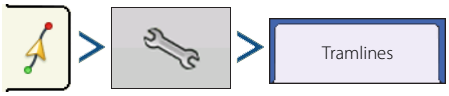


- **LED Spacing**—Enter the distance represented by each square of the lightbar, ½–6 ft (3–182 cm).
- Mode
  - **Chase**—Center the vehicle by following the indicator lights.
  - **Pull**—Center the vehicle by turning in the opposite direction of the indicator lights on the lightbar.
- External Lightbar LED Brightness

  If applicable, press ▲ / ▼ to enter in a number specifying the brightness of the LED lights on the optional L160 external lightbar. The number 1 is the dimmest and 10 is the brightest. Default is 5.



Tramlines



Tramlines only available with Straight AB and Identical Curve Pattern Types

- Paths Between Tramlines

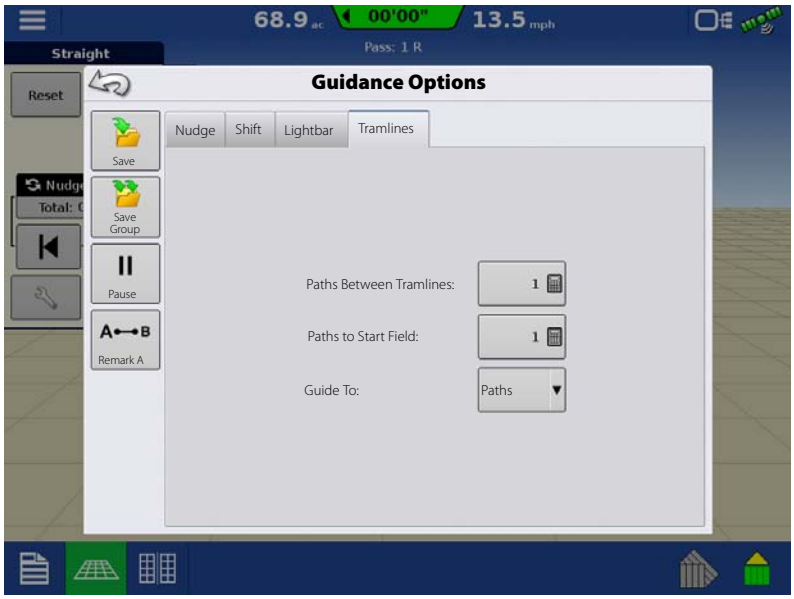
  Use to enter the number of passes between tramlines.

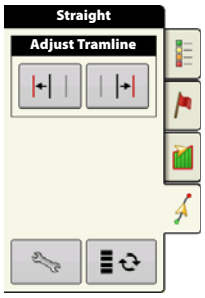
- Paths to Start Field

  Use to enter the number of passes at the beginning of the field before the first tramline.

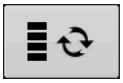
- Guide To

  Use drop-down menu to choose between Paths and Tramlines.





Adjust Tramline - move the placement of the tramline by one pass left or right .

 Use the toggle button to switch menu between Tramline and Nudge on the Mapping toolbox.

An audible warning is sounded to alert the operator a Tramline is reached when the vehicle is ½ a swath width away.

Tramlines are also numbered under the Pass Number. This number will flash multiple times when the Tramline is reached for a visual warning.

Summary Report

This screen shows you field totals and averages. Use the drop-down menus at the top to specify the information you would like to view. Specific information is shown in the list below for each:

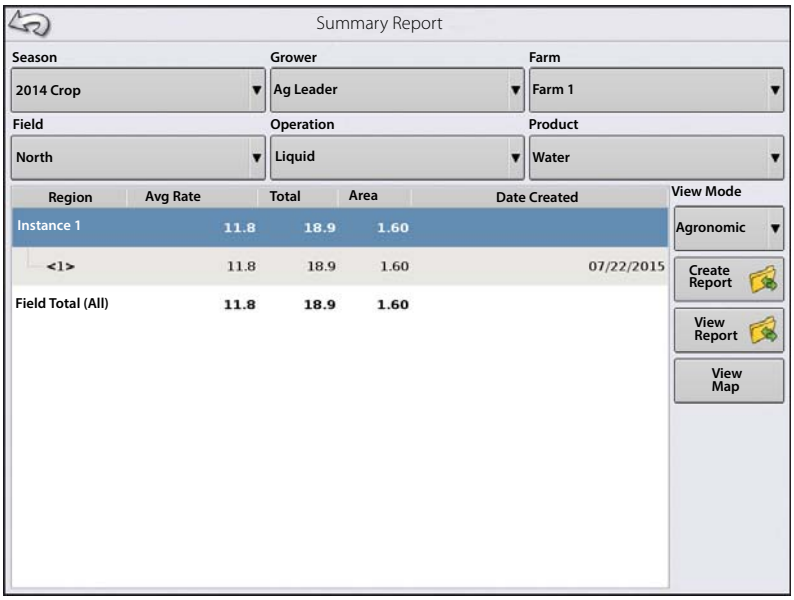
- Season
- Grower
- Farm
- Field
- Operation
- Product

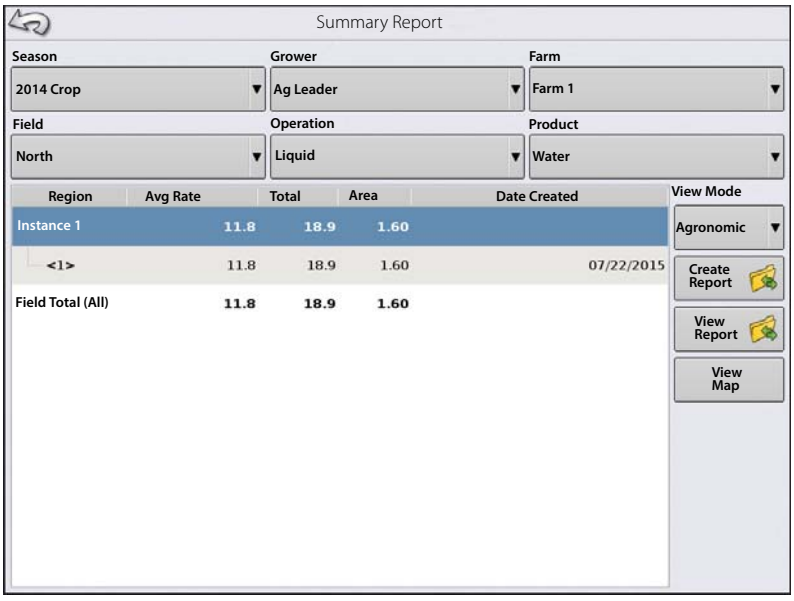
The list displays information for each Region and Instance.

There are four viewing modes:

- Agronomic
- Event
- Operator
- Configuration

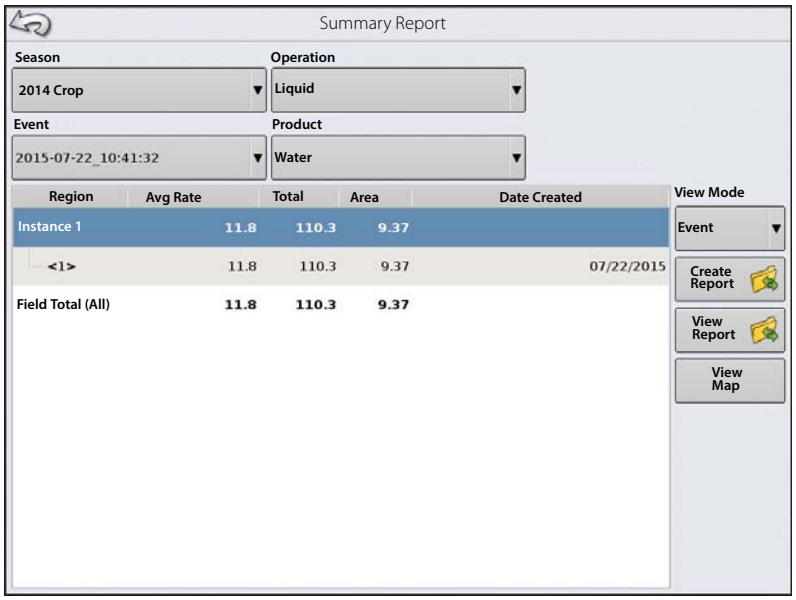
The Agronomic View shows data of a specific field.





Summary Reports

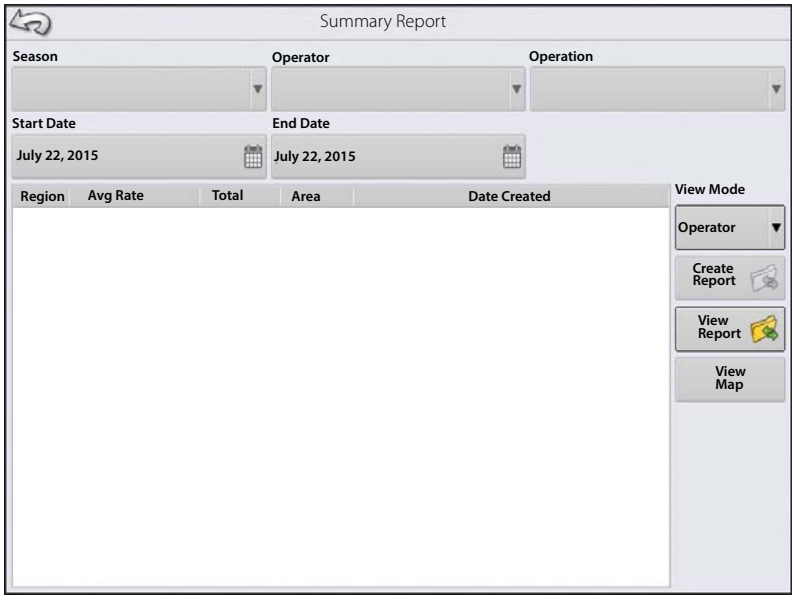
The Event View shows data of a specific Event.



Operator View

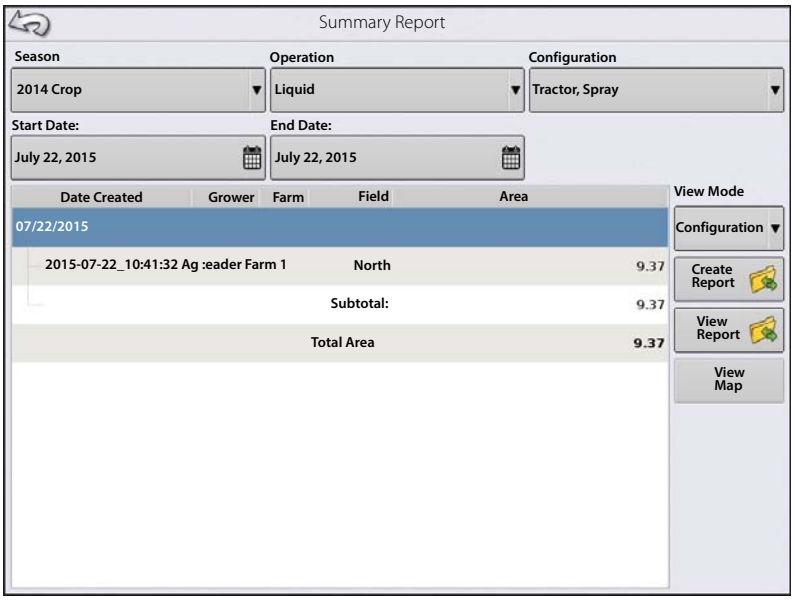
- Shows data of a specific Operator

  Filters data by each configuration used by the selected operator.
- Area Only
- Daily Subtotals
- Configuration Total
- Operator Total

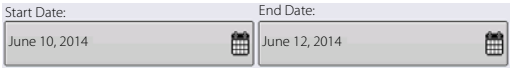


Configuration View

- Shows data of a specific configuration
- Area Only
- Daily Breakdown
- Daily Subtotals
- Configuration Total



Date Range

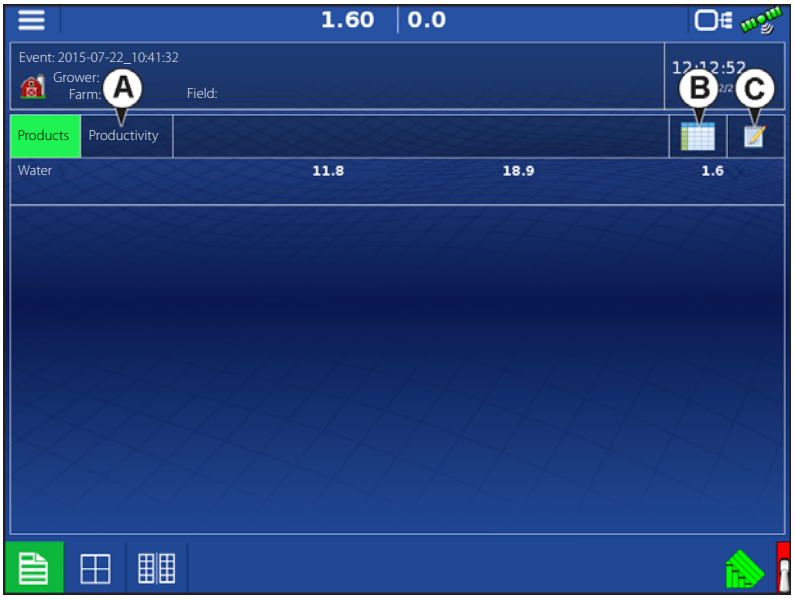


- View data in a certain date range.
- Only used in Operator or Configuration view.
- Defaults to first and last day of logged data in the season.
  - Can only select days within that date range.
- Create Report button will create all Smart Reports within the defined date ranges.

Event Summary

The event summary page allows the user to access productivity information specific to the current event as well as summary information, field notes, and Smart Reports.

The Event Summary page is available during any field operation.



A. Productivity Information

B. Summary Reports

C. Field Notes

Field Notes

The Field Notes button is where you can enter information such as the following:

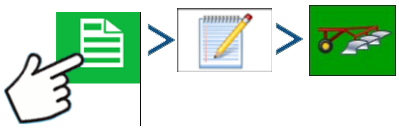
- Crop information
- Application timing
- Weather information
- Soil condition

Summary Reports

Conditions

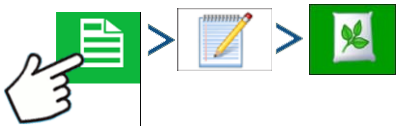
Weather	Soil Conditions	Crop Timing
Sky Condition	Tillage Type	Operation Timing
Wind Direction	Crop Residue Level	Target Crop Type
Wind Speed	Soil Condition	Growth Stage
Air Temperature	Soil Moisture	
Humidity	Soil Temperature	

Equipment



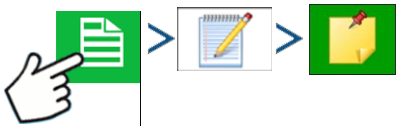
Equipment attributes specific to operation being performed

Product



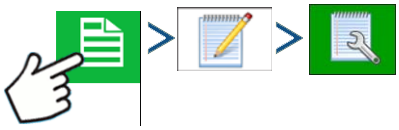
Product attributes specific to operation being performed

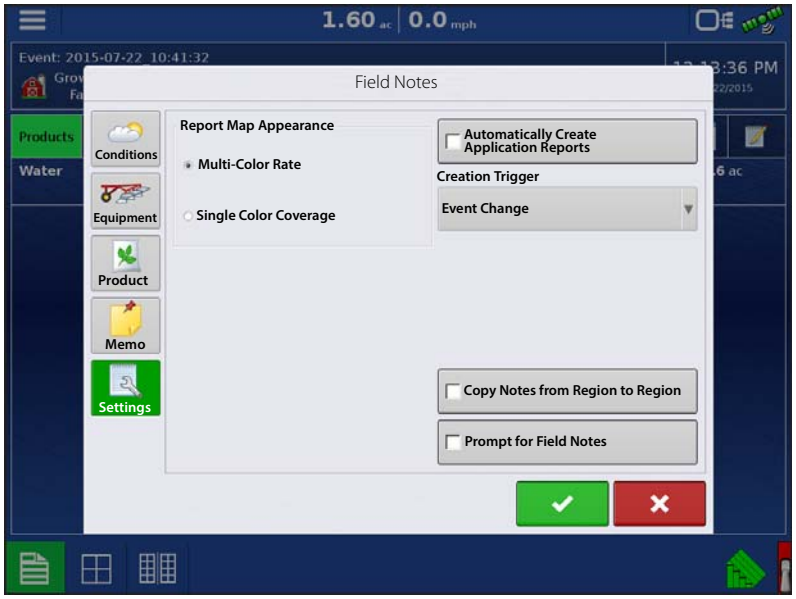
Memo



Press to input, edit, or delete Field Notes.

Settings





Change settings that affect the creation of application reports.

- Auto Generate Application Report

  Check this option to have the display automatically generate an application report each time you start a new field operation.

- Copy Notes from Previous Region

  Check this option if you wish to have the display copy all values already specified in Report Details for the previous region over to a new region.

- Prompt for Field Notes

  Check this option to have the display automatically launch the region summary data collection dialogue box each time a new region is created at the Work screen during application rate control.

- Report Map Appearance
  - Multi-Color Rate

Select this option to have application reports display the application maps using rate legend as displayed on the Work screen.

- Single Color Coverage

  Select this option to have the application reports display single color product coverage maps.

Smart Reports™

Smart Report™ creates documentation of all in-field product application events. This documentation is saved in a Portable Display Format (PDF) on your USB or AgFiniti. This PDF either can be viewed on the display screen, or printed later. Smart Reports provide information relating to location, product information, applied totals, field areas, as-applied maps and field boundaries.

NOTE: It is recommended that you enter any necessary information in field notes before creating a Smart Report.

Create Reports

To begin creating a Smart Report™, first highlight an item in the list on the Summary Report screen, then press the Create Report button.

1. The Create Report screen appears, which lists at top:
   - Grower
   - Field
   - Product

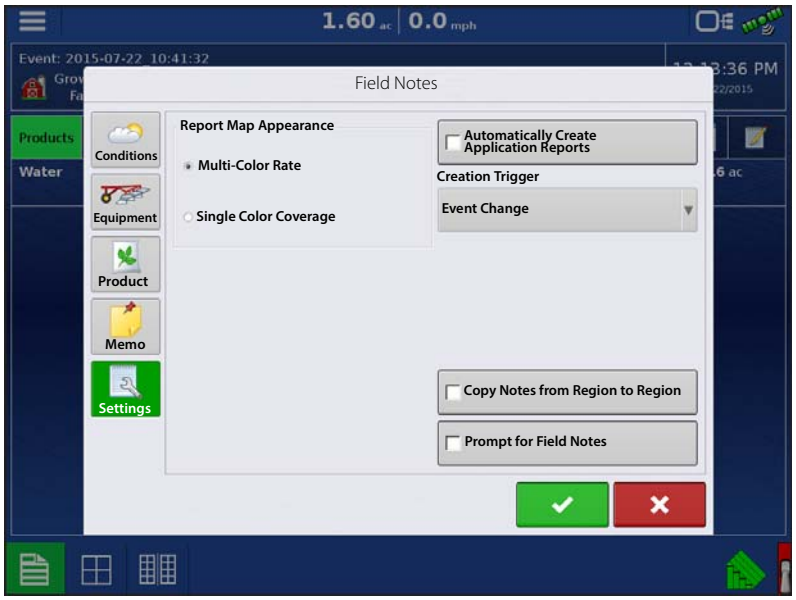
   Two drop-down menus list:
   - Operating Configuration
   - Product Group

   Use the drop-down menus to change these, if desired. Press ✓ when finished.
2. A scroll bar informs you of the progress made when the display compiles the Smart Report.
3. At the conclusion of the Smart Report creation process, a screen states "Report Creation Complete."

   Press ✓ or if you wish to view the report press the View Report button. A built-in PDF viewer displays your Smart Report. An example is shown at "Control Channel Report Content" on page 111.

NOTE: You can view subsequent pages in the Smart Report by pressing the blue right and left arrows at top right. Also, you can zoom in and out of the Smart Report by pressing on the magnifying glass icons at top left.

Smart Report Auto-Generation



This screen allows the user to change the settings that affect the creation of application reports.

- Automatically Create Application Report checkbox

  Check this option to have the display automatically generate an application report each perform the action in the Creation Trigger drop-down menu.

- Creation Trigger drop-down menu

  User can select to generate reports upon Event Change or Event Closed.

  If changing products through the field, it is recommended to set the Prompts to Close Event checkbox in Event Options.

Export Reports

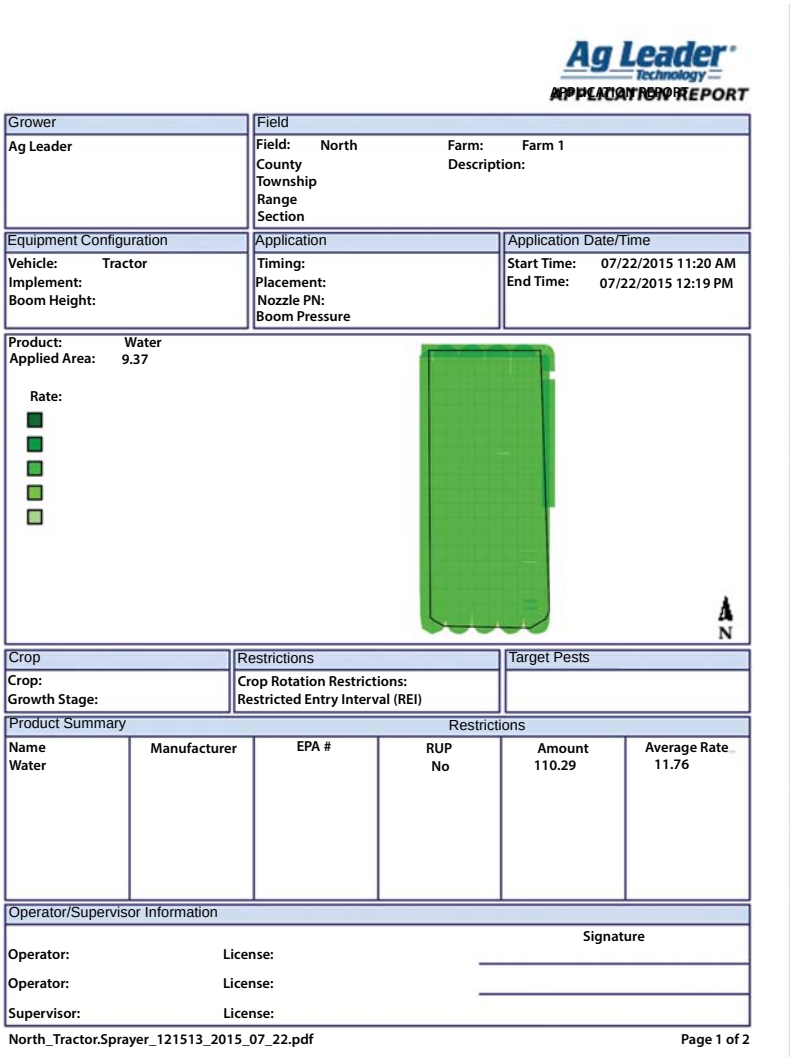
Reports are stored locally within the display and must be manually exported to a connected USB or AgFiniti. This can be done by pressing "Export Reports" on the Data Transfer page.

Control Channel Report Content

The content of all product application reports is divided into two distinct groups.

The first page(s) of the report represent field and product control channel specific information.

In cases of multiple product application, multiple pages will be generated, one for each channel of product control.



Ag Leader Technology

APPLICATION REPORT

Grower	Field		
Ag Leader	Field: North County Township Range Section	Farm: Farm 1 Description:	

Equipment Configuration	Application	Application Date/Time
Vehicle: Tractor Implement: Boom Height:	Timing: Placement: Nozzle PN: Boom Pressure	Start Time: 07/22/2015 11:20 AM End Time: 07/22/2015 12:19 PM

Product: Water
Applied Area: 9.37

Rate:

Crop	Restrictions	Target Pests
Crop: Growth Stage:	Crop Rotation Restrictions: Restricted Entry Interval (REI)	

Product Summary — Restrictions

Name	Manufacturer	EPA #	RUP	Amount	Average Rate
Water			No	110.29	11.76

Operator/Supervisor Information

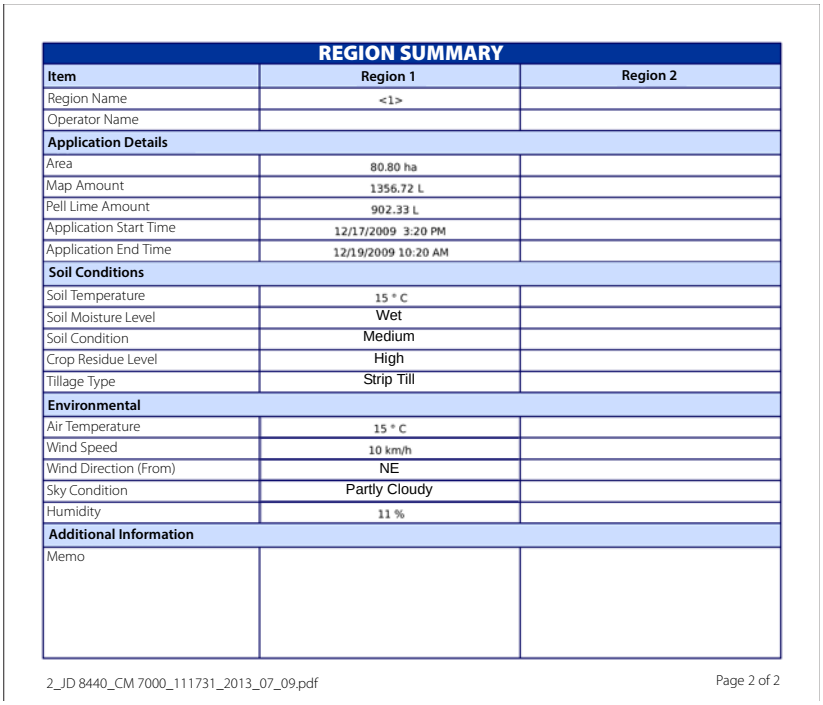
		Signature
Operator:	License:	
Operator:	License:	
Supervisor:	License:	

North_Tractor.Sprayer_121513_2015_07_22.pdf Page 1 of 2

Summary Reports

Control Channel Content includes the following:

- Service Provider Information
- Grower Information
- Field Information
- Farm Name and Description
- Equipment Configuration Information
- Application Information
- Date/Time Information
- Crop Information
- Rotation Restrictions and REI
- Multiple Target Pests
- Applied Product Information
- Operator and Supervisor Information



REGION SUMMARY		
Item	**Region 1**	**Region 2**
Region Name	<1>	
Operator Name		
Application Details		
Area	80.80 ha	
Map Amount	1356.72 L	
Pell Lime Amount	902.33 L	
Application Start Time	12/17/2009 3:20 PM	
Application End Time	12/19/2009 10:20 AM	
Soil Conditions		
Soil Temperature	15 * C	
Soil Moisture Level	Wet	
Soil Condition	Medium	
Crop Residue Level	High	
Tillage Type	Strip Till	
Environmental		
Air Temperature	15 * C	
Wind Speed	10 km/h	
Wind Direction (From)	NE	
Sky Condition	Partly Cloudy	
Humidity	11 %	
Additional Information		
Memo		

2_JD 8440_CM 7000_111731_2013_07_09.pdf Page 2 of 2

View Reports

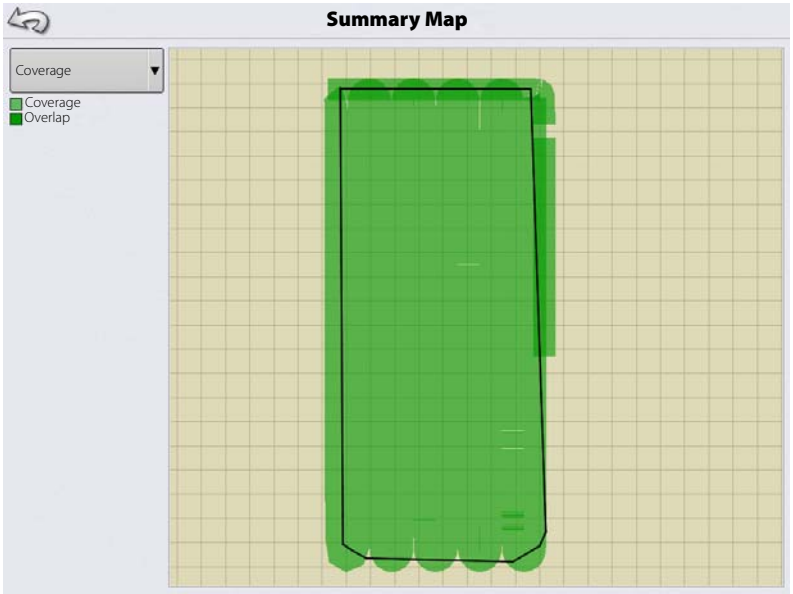
To view Smart Reports that have been saved on your USB drive, go to the Summary screen and press the View Reports button. At the File Selection screen, scroll down the list and select the PDF file of your Smart Report.

Press and the Smart Report will appear in the PDF viewer.

View Map

To view a Summary Map of a particular Field Total, Region or Instance shown in the Summary Report.

A Summary Map appears. This map shows the rate applied for Application operations and varieties for Planting operations.



Common Terminology

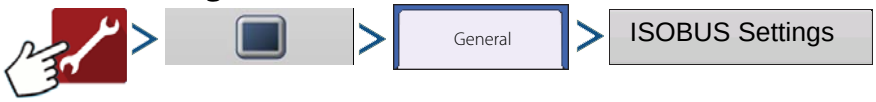
ISOBUS Working Set—One or more ISOBUS modules that control an implement's functionality.

Working Set Master (WSM)—Main module responsible for coordinating all communication between the UT and the Working Set including loading of the Object Pool to the UT screen.

Object Pool—Defines graphical components that ISOBUS modules present on a compatible display.

Enable the Universal Terminal

ISOBUS Settings



Once a Universal Terminal has been enabled will appear in the task bar. Toggle between the Universal Terminal run screen and other display functions by pressing the UT button.

Broadcast GPS Speed (ISO GBSD)—Checking this box allows the speed source currently being utilized by the display to be broadcast over the ISOBUS to the implement ECU.

Broadcast GPS (J1939)—Checking this box allows GPS data being supplied by the GPS receiver to be broadcast over the ISOBUS to the implement ECU.

Auxiliary Module Support—Checking this box allows the Ag Leader Auxiliary Input Module or Smart Switchbox, to be used with ISOBUS ECUs that support AUX-N auxiliary functions.

Universal Terminal Functional Instance—Always set to 0 except when there are multiple UTs on the ISO Bus. Use to change instance. Reboot Display.

Task Controller Function Instance—Always set to 0 except when there are multiple TCs on the ISO Bus. Use to change instance. Reboot Display.

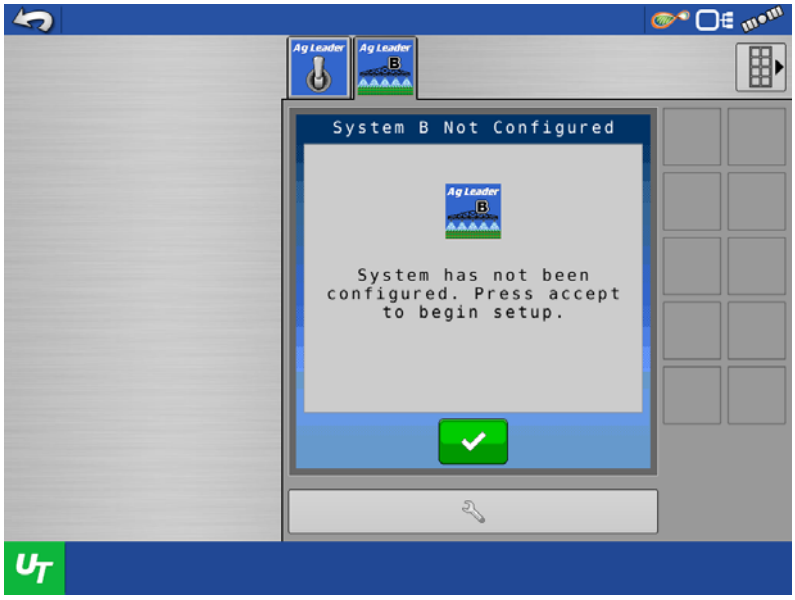
Auxiliary Assignments

Once modules and cabling are connected the system will load an object pool for the SC7 Switch Console and an object pool for the WSM Liquid Rate Control Module shown by pressing

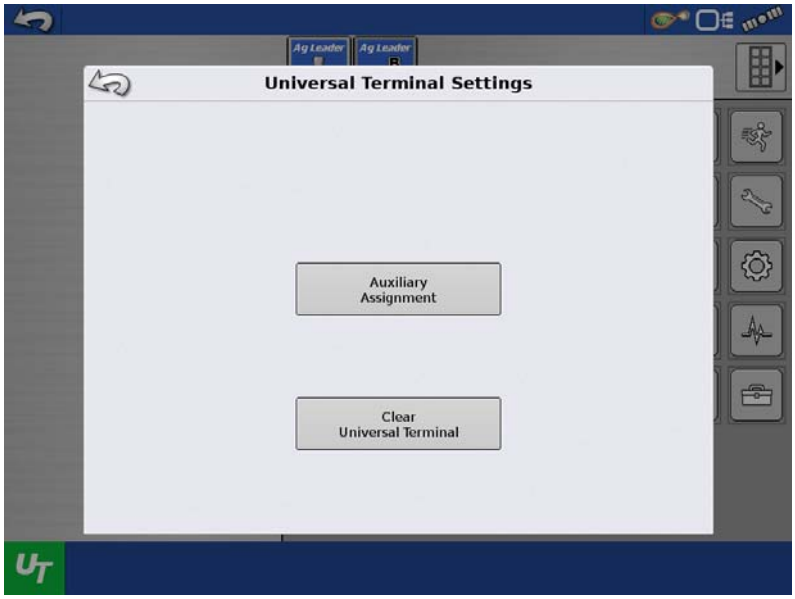
Once loaded the WSM Liquid Rate Control Module will first need to be configured for the implement the system is installed on.

Once configured the Auxiliary Controls will need to be Configured within the UT setup.

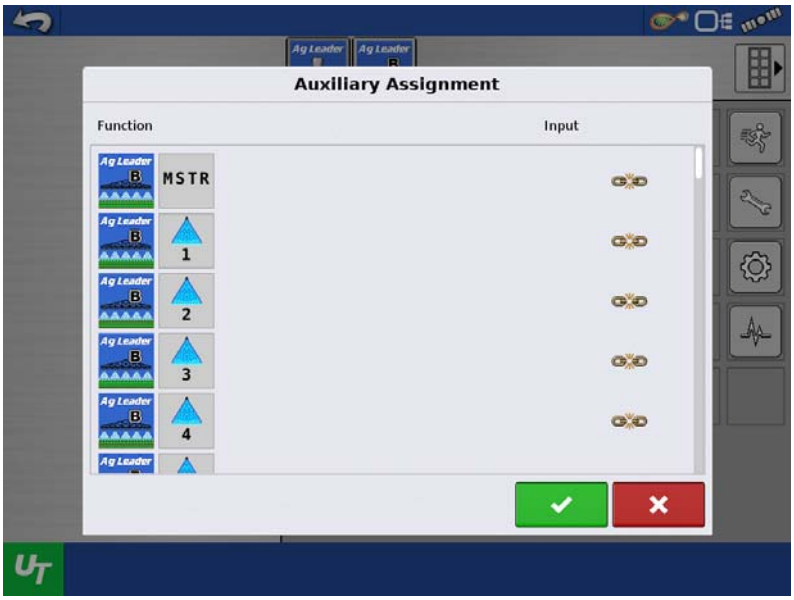
Select .



Select the Auxiliary Assignment Button.

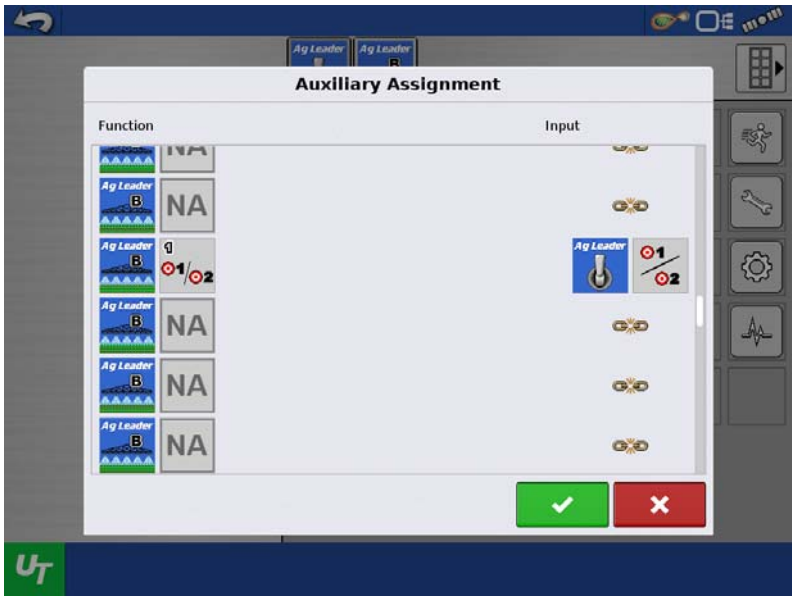


Select the disconnected chain button.

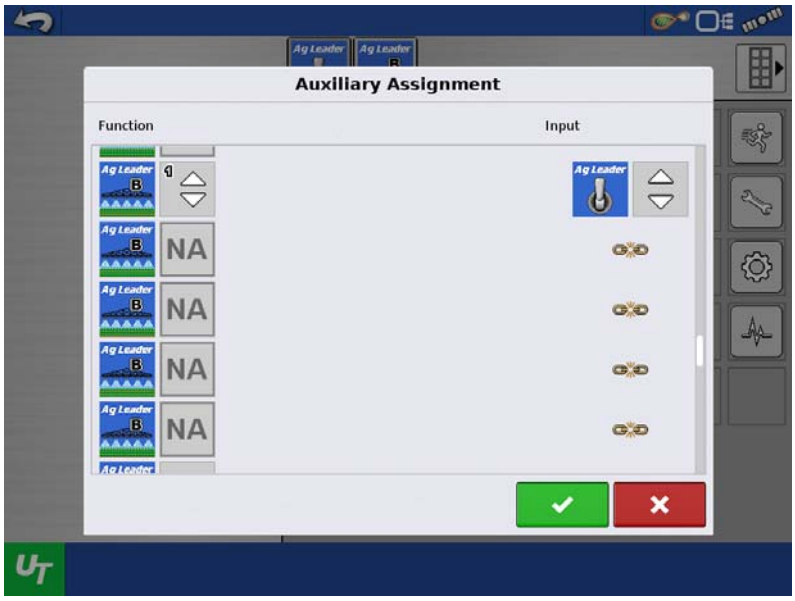


Select the appropriate input for the desired function.

The Auxiliary Controls should look like the following images when finished.



Press ✔ when finished.



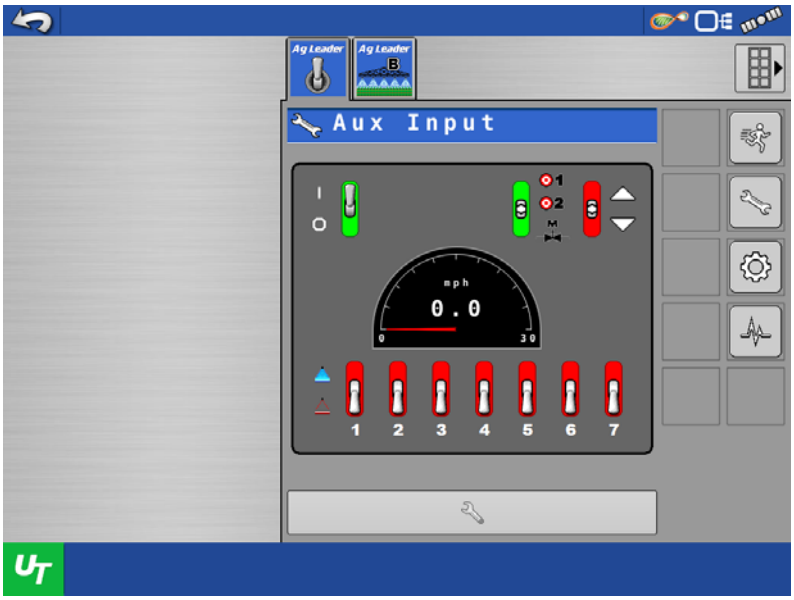
The system can be tested by accessing the SC7 Switch Console Object Pool.

- Press the UT Button.
- Press the Ag Leader Switch Button.

If the switches are configured properly the switch status in the SC7 Switch Console Object Pool will be as shown in this image.

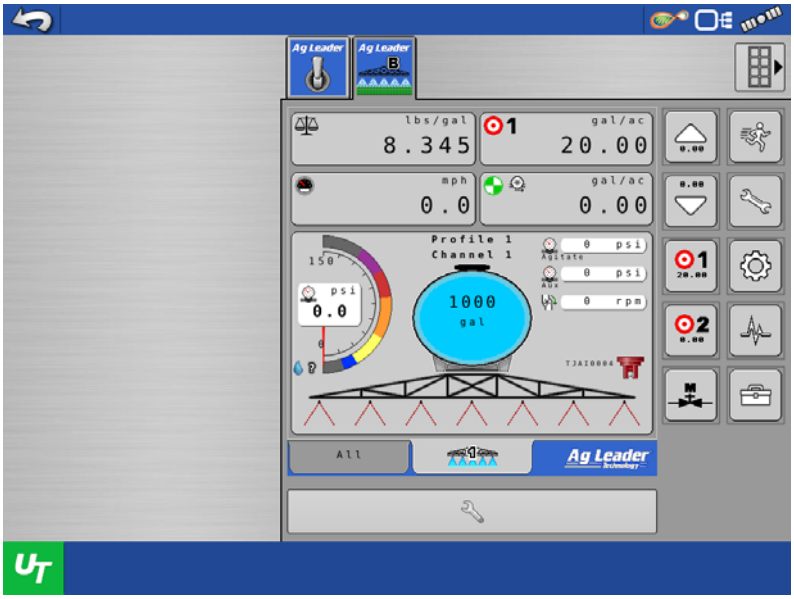
Red = Switch Off or in Neutral Position.

Green = Switch On or Activated by the Operator.

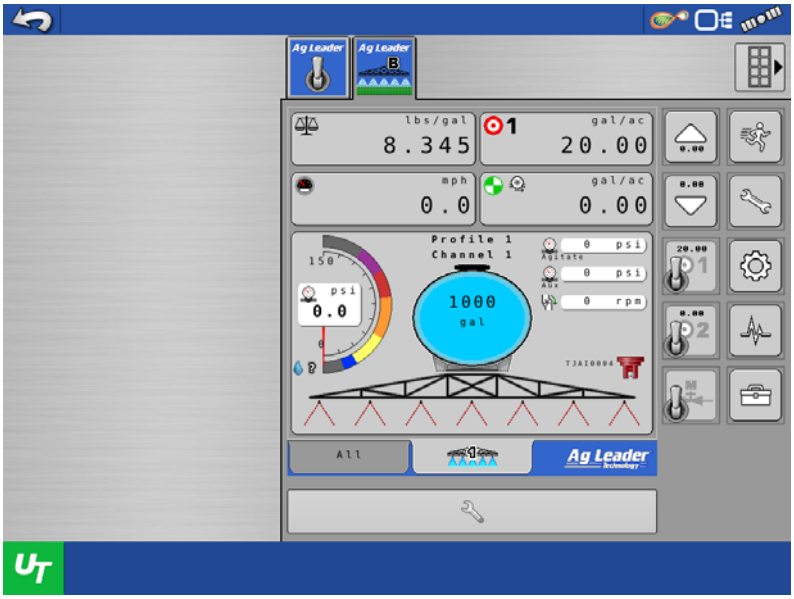


The system can also be tested by accessing the WSM Liquid Rate Control Object Pool.

Press the Ag Leader System A/System B Button to access the WSM Liquid Rate Control Object Pool.



The system will indicate functions are configured to the switch box by the buttons being grayed out and a switch icon placed within the button as shown in the following image.



Auxiliary Module Support

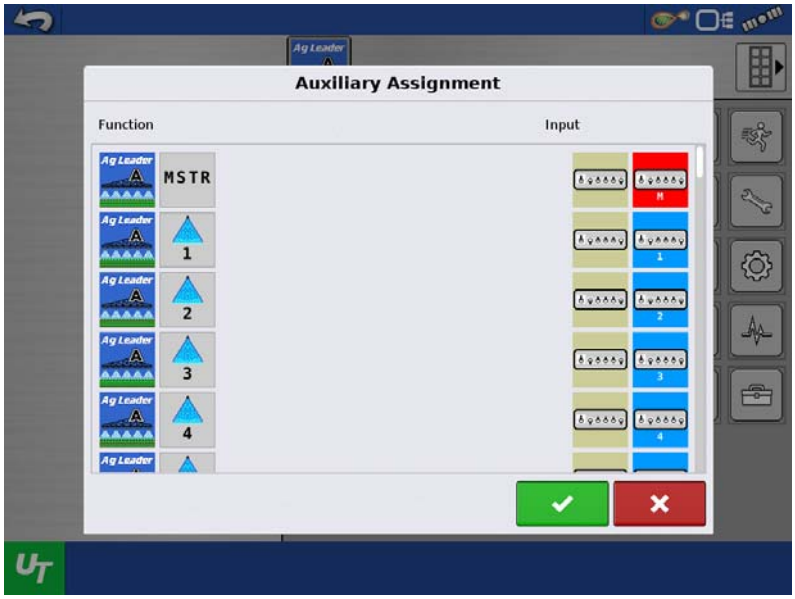
An Ag Leader display also supports the use of the CAN-A Auxiliary Input Module to control an ISOBUS ECU's Auxiliary Functions. The ISOBUS ECU needs to support AUX-N auxiliary functions. Follow the below steps to setup the Auxiliary Assignments for a WSM ISO Liquid Rate Control module.

In the ISOBUS Settings, checkmark the Auxiliary Module Support box.

- A System must first be setup for the WSM Liquid Rate Control.
- Then proceed to the Auxiliary Assignment screen on the UT screen.
- Select the disconnected chain buttons to assign an input to a function.

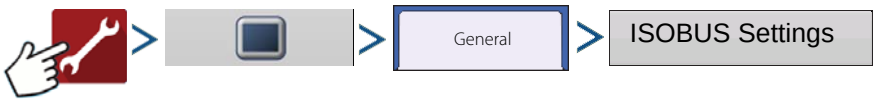
NOTE!: If the Auxiliary Assignment screen is blank, attempt to cycle power on the display.

Once the inputs (switches) are assigned, it will look similar to the screen shown on the left.

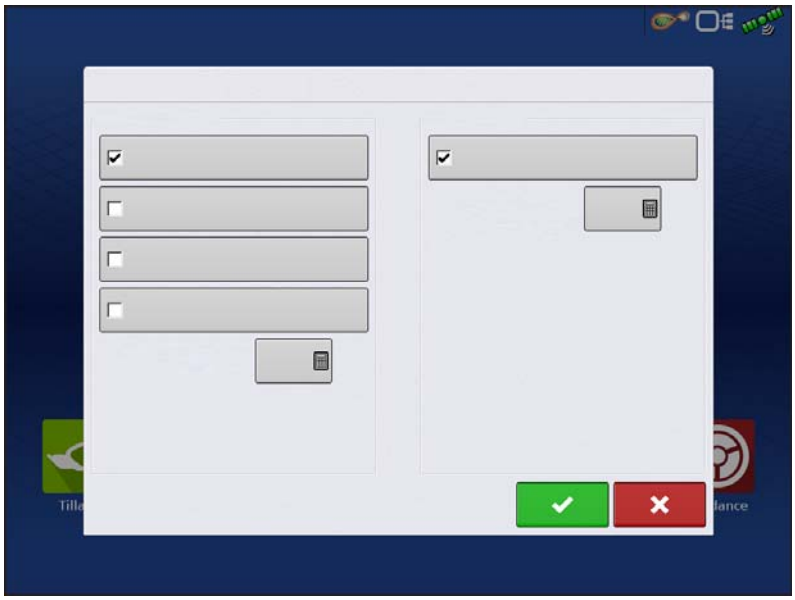


NOTE!: Auxiliary Controls (Rate 1 and Rate 2 function, increase/decrease toggle function) cannot be assigned to a switch on the Auxiliary Input Module.

ISOBUS Settings



Universal Terminal



The display is compatible with the ISO 11783 (ISOBUS) Universal Terminal Standard. This enables support of many ISOBUS compliant implements on the display. Universal Terminal functionality enables the compliant implement's user interface to be viewed and controlled on the display.

Once Universal Terminal has been enabled, it will appear in the task bar. Toggle between the Universal Terminal screen and other display functions by pressing the UT button.

Task Controller

The InCommand displays have the ability to use ISOBUS Task Controller on compatible ECU's. This allows the InCommand display to control rate and sections of an ISOBUS ECU using Ag Leader's proprietary interface. A properly setup display configuration is required for this to work.

ISO Load and Go

With a properly setup ISO ECU, ISO Load and Go streamlines the configuration building process for task controller ECU configurations. The Load and Go feature automatically builds a controller during the configuration building process based on the ECU device description. For this to work it requires the device description to have proper sections, section offsets, and product type setup on the ECU.

Common Terminology

ISOBUS Working Set—One or more ISOBUS modules that control an implement's functionality

Working Set Master (WSM)—Main module responsible for coordinating all communication between the UT and the Working Set including loading of the Object Pool to the UT screen

Object Pool—The graphic image presented to the user on the UT display. The Object Pool is sent to the UT by the ISOBUS module.

ATTENTION!: Before operating an ISOBUS implement with the display, read the operator's manual provided by the implement's manufacturer and follow all safety information provided in the manual. When this display is used with an ISOBUS implement, the information and functions on the display are provided by the implement ECU and are the responsibility of the implement manufacturer.

Broadcast Display Speed (ISO GBSD)—Checking this box allows speed source currently being utilized by the display to be broadcast over the ISOBUS to the implement ECU.

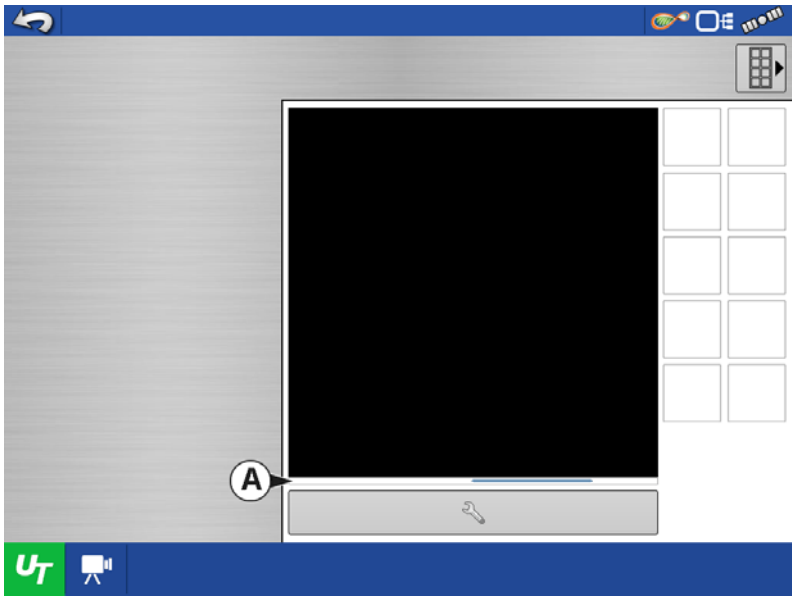
Broadcast GPS (J1939)—Checking this box allows GPS data being supplied by the GPS receiver to be broadcast over the ISOBUS to the implement ECU.

Auxiliary Module Support—Checking this box allows the Ag Leader Auxiliary Input Module or Smart Switchbox, to be used with ISOBUS ECUs that support AUX-N auxiliary functions.

Universal Terminal Functional Instance—Always set to 0 except when there are multiple UTs on the ISOBUS. Use to change instance. Reboot Display

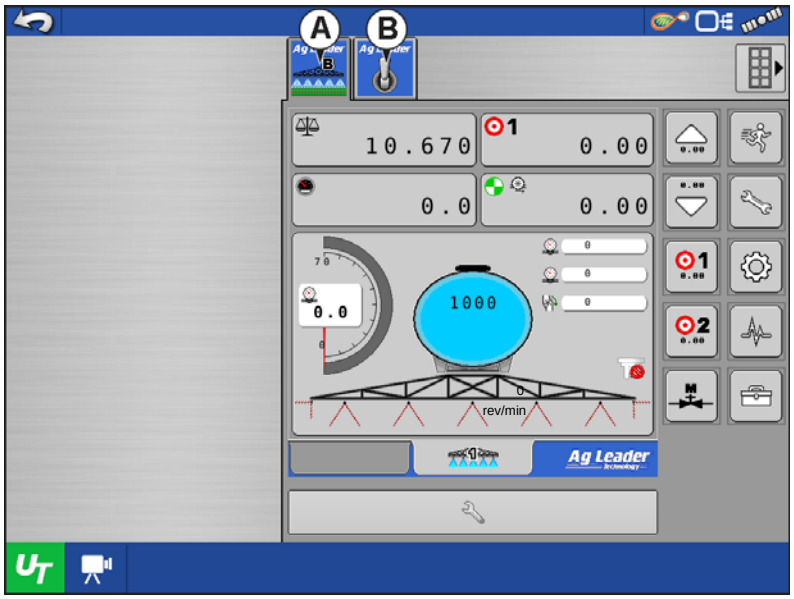
Task Controller Function Instance—Always set to 0 except when there are multiple TCs on the ISOBUS. Use to change instance. Reboot Display

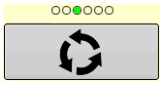
When an ISOBUS compliant implement is connected to the display for the first time, the implement WSM sends its graphic interface, called the Object Pool, to the display. The Status bar (**A**) appears while Object Pools are being loaded. This process might take several minutes depending on the number of Object Pools being loaded. Once loaded, object pools are stored in the display memory.



If there are multiple ISO implements connected, press the UT button to toggle between Working Sets.

The Working Sets can also be accessed by pressing tabs (**A**) or (**B**) individually.





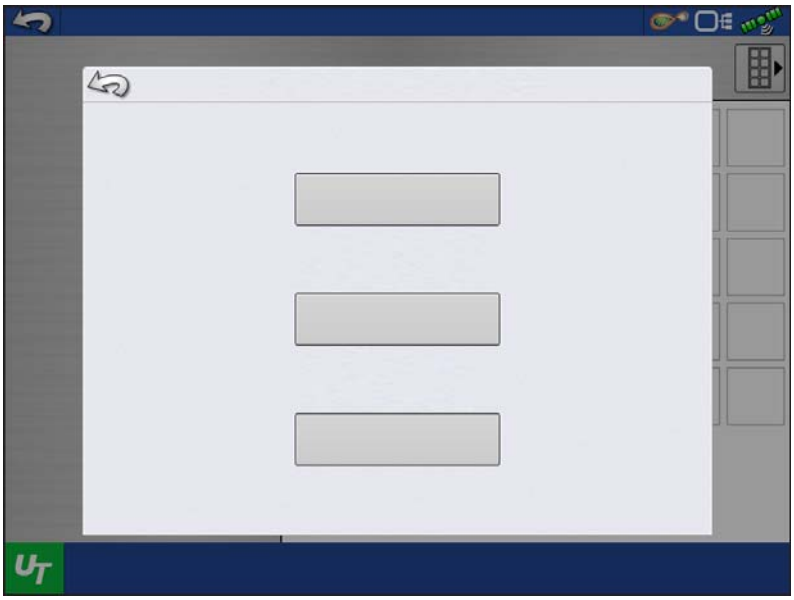
Advance through multiple screens of buttons. This button remains hidden unless more than 10 buttons are present.

Opens the Universal Terminal Settings screen.

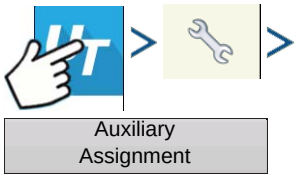
Auxiliary Assignment—assign implement functions to ISO compatible inputs.

Clear Universal Terminal—Allows operator to clear the Object Pools sent to the display from the implement WSM. After the object pools have been cleared, the next time the implement is connected the object pools will be transferred from the implements WSM to the display again. When this button is pressed, a warning dialogue box appears with the following message:

"All Universal Terminal interfaces saved in the display will be cleared. Do you want to continue?"

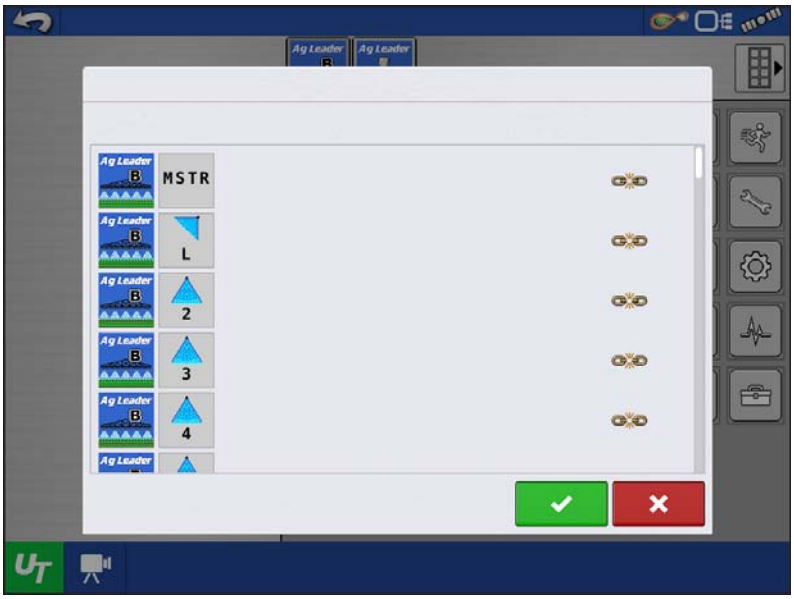


Auxiliary Assignment



Assign implement functions to ISO compatible inputs.

The number of functions and inputs shown on the Auxiliary Map screens will vary depending on the implement and input devices connected to the display.



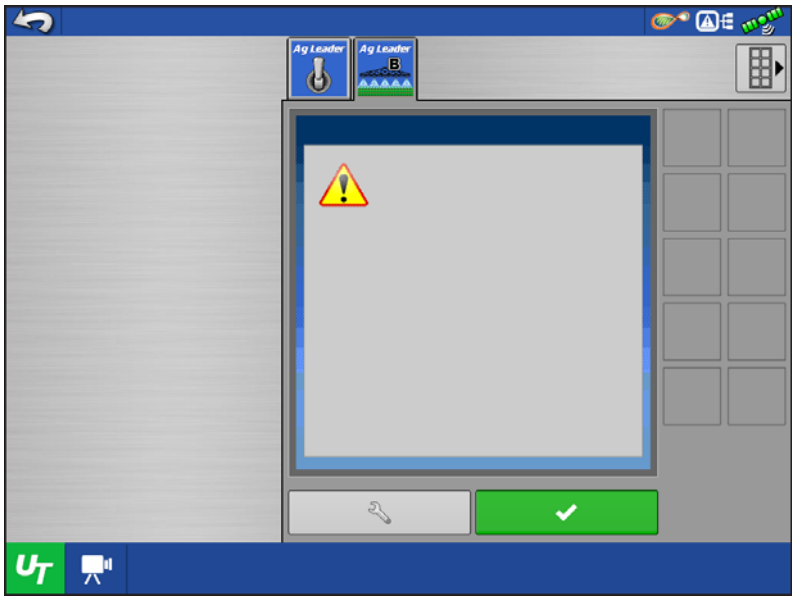
UT Alarms and Trouble Codes

If the display receives an active trouble code, the Universal Terminal Alarm will appear in the Status bar at the top of the screen.

When an alarm is activated on the UT, the display will indicate the alarm by flashing "Universal Terminal Alarm" in the status bar.

Alarms are acknowledged and cleared by pressing .

This button is only present when a Universal Terminal alarm has been activated.



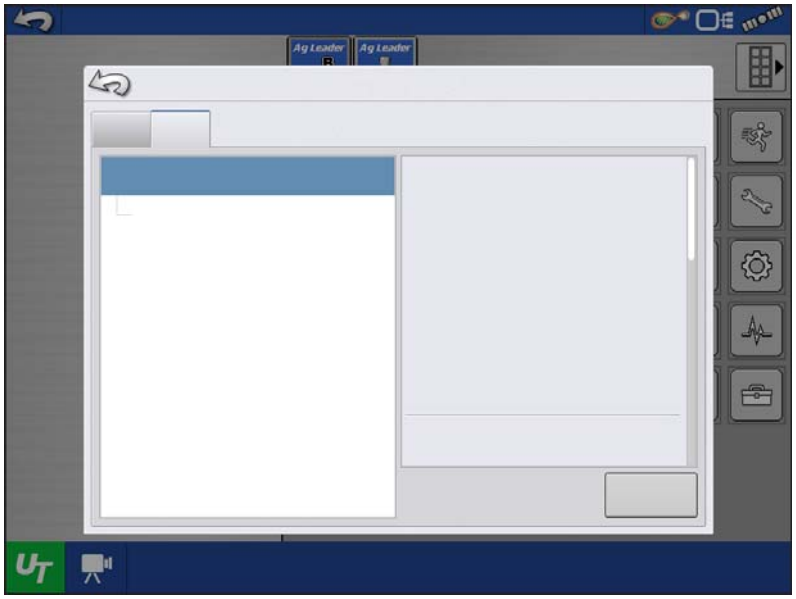
The Devices screen displays the following information:

A. Caution icon indicates module has active trouble codes (DTCs)

B. Device Class

C. ECU Serial Number

D. UT Manufacturer, name and code



Pressing the Diagnostics button on the Devices screen brings up the ISO Node Diagnostics screen which shows the following information.

SPN— "Suspect Parameter Number" = Error Number

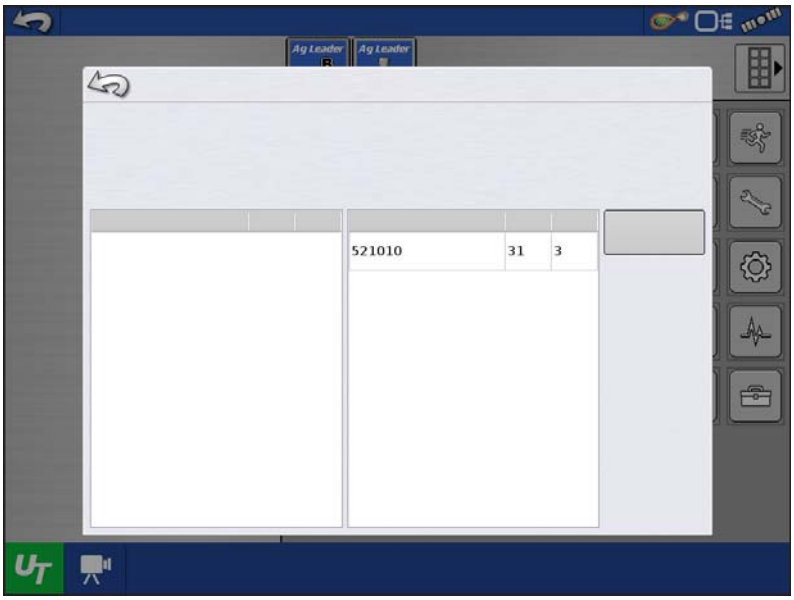
FMI—"Fault Mode Indicator" = Error State.

OC—"Occurrence Count"

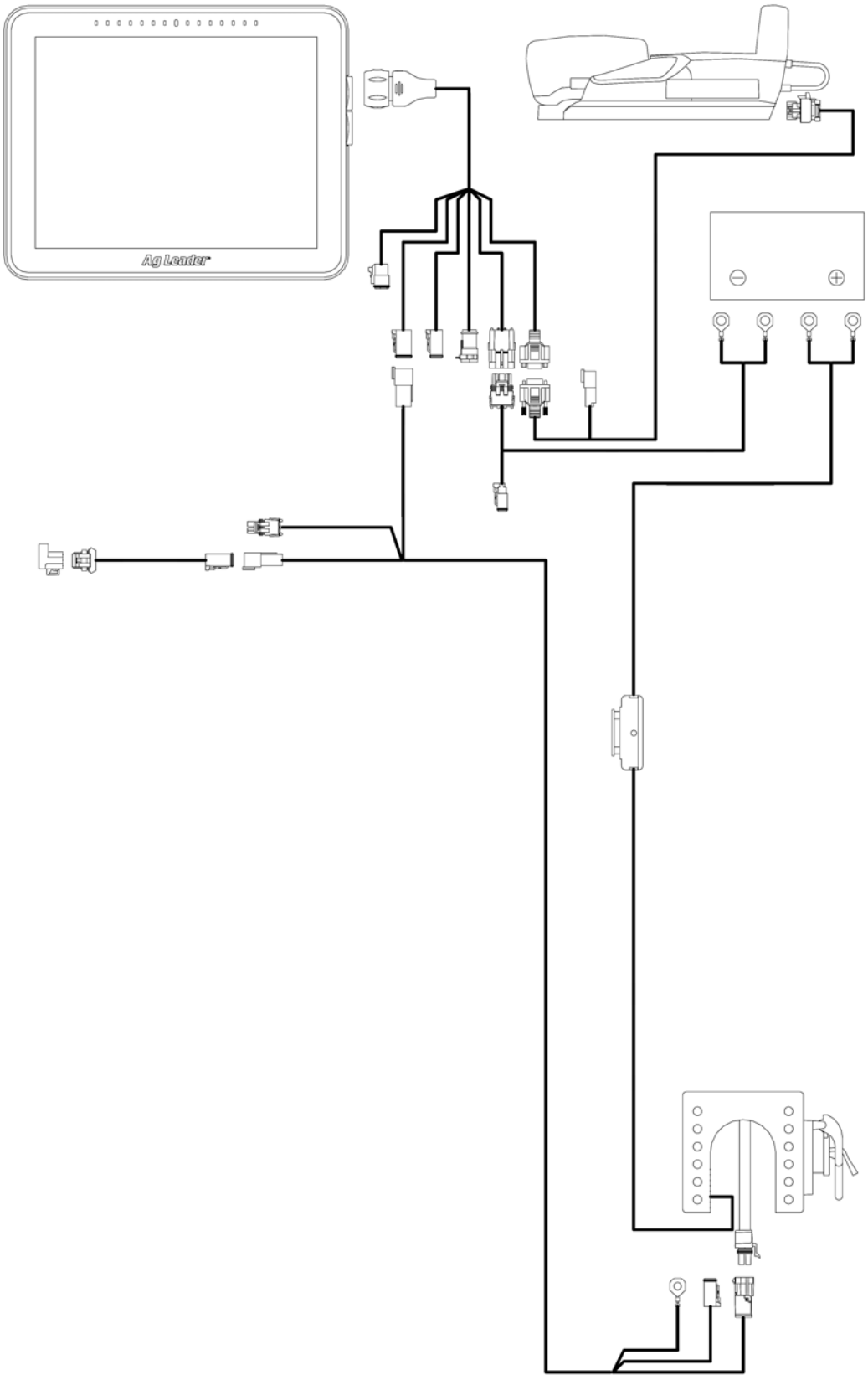
DTC—Diagnostic Trouble Code

This is a combination of the SPN and the FMI (for example 522102.12).

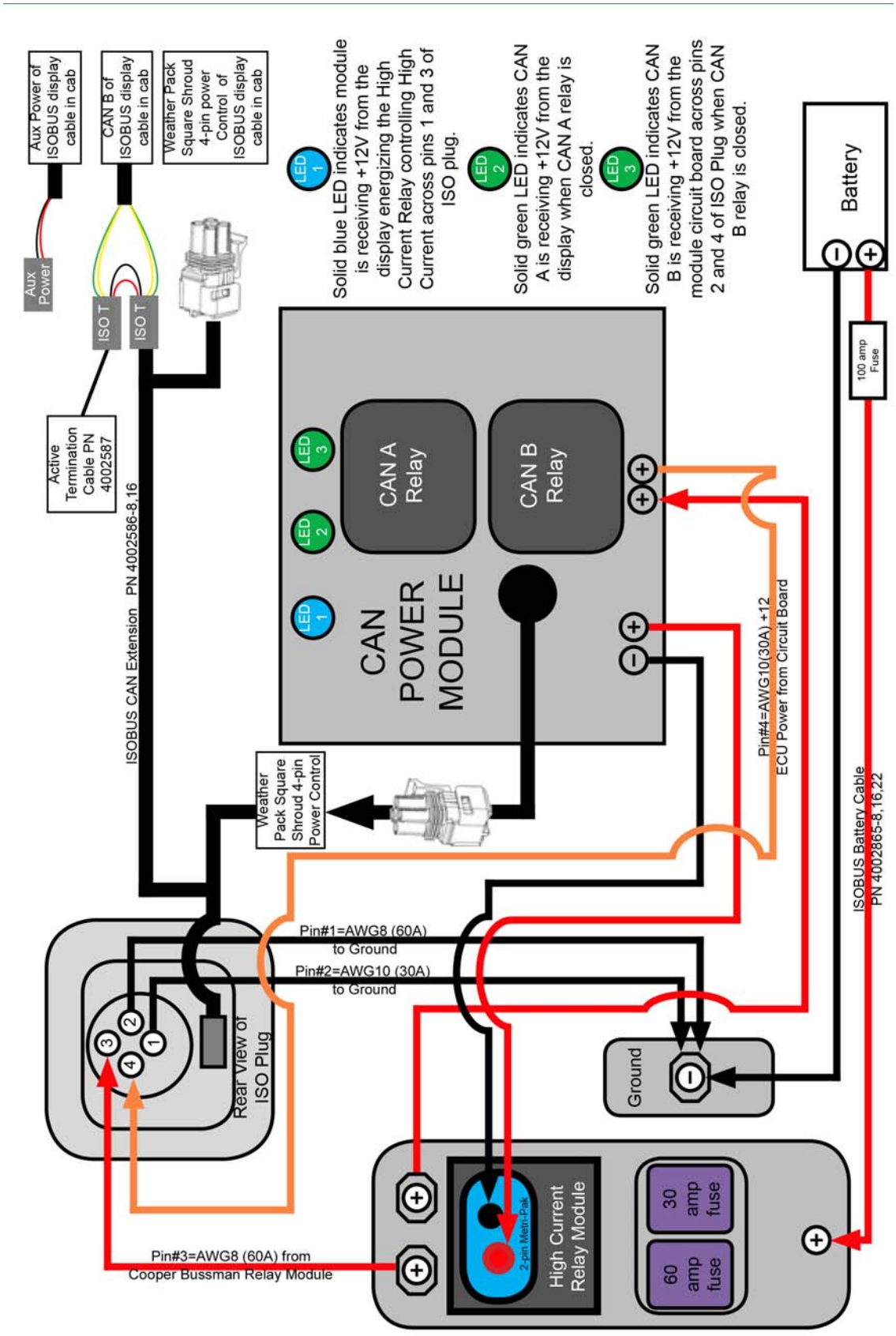
Cross-reference DTC in equipment manufacturer's operator manual for description of error.



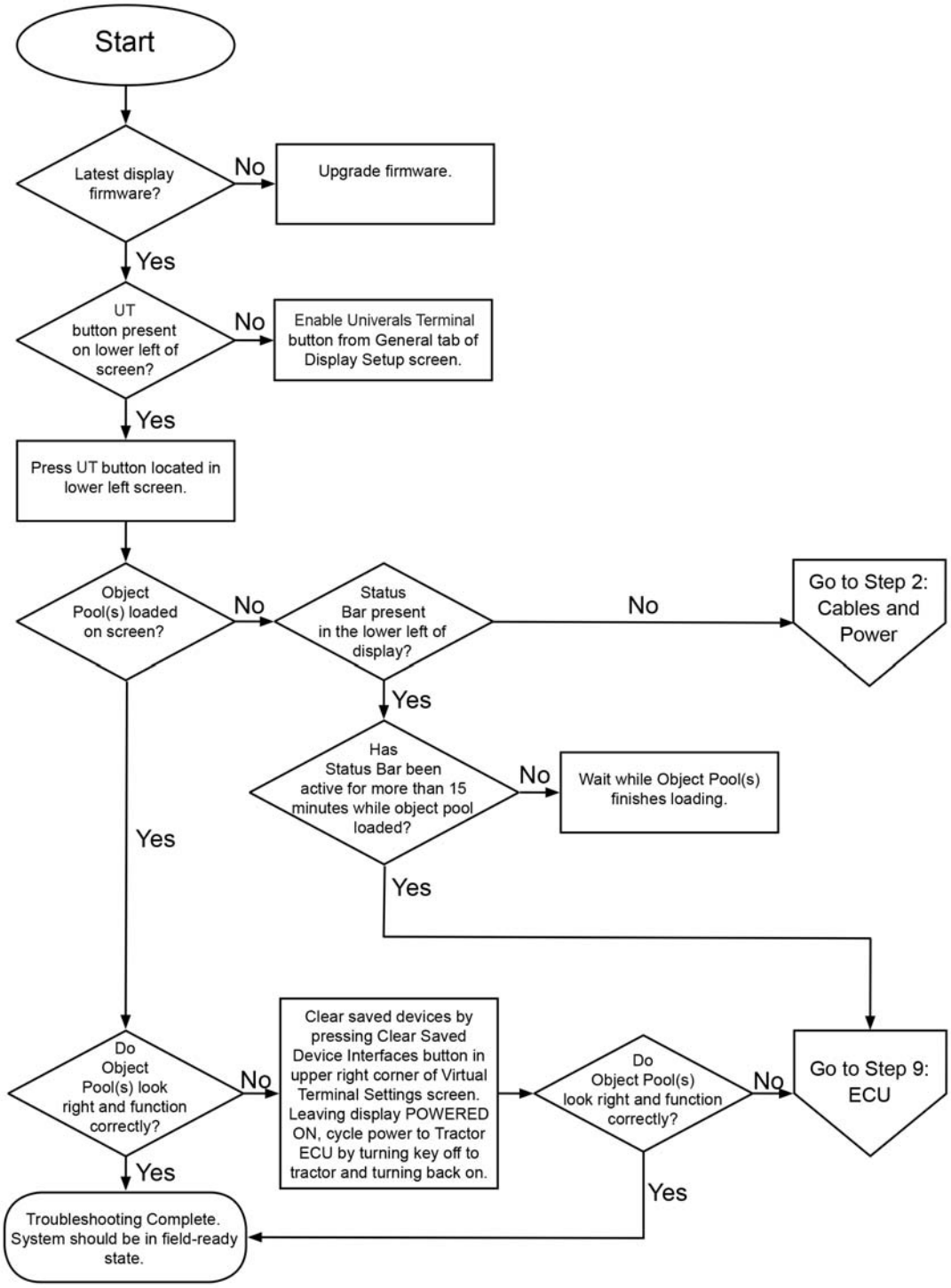
ISOBUS Retrofit—No Modules



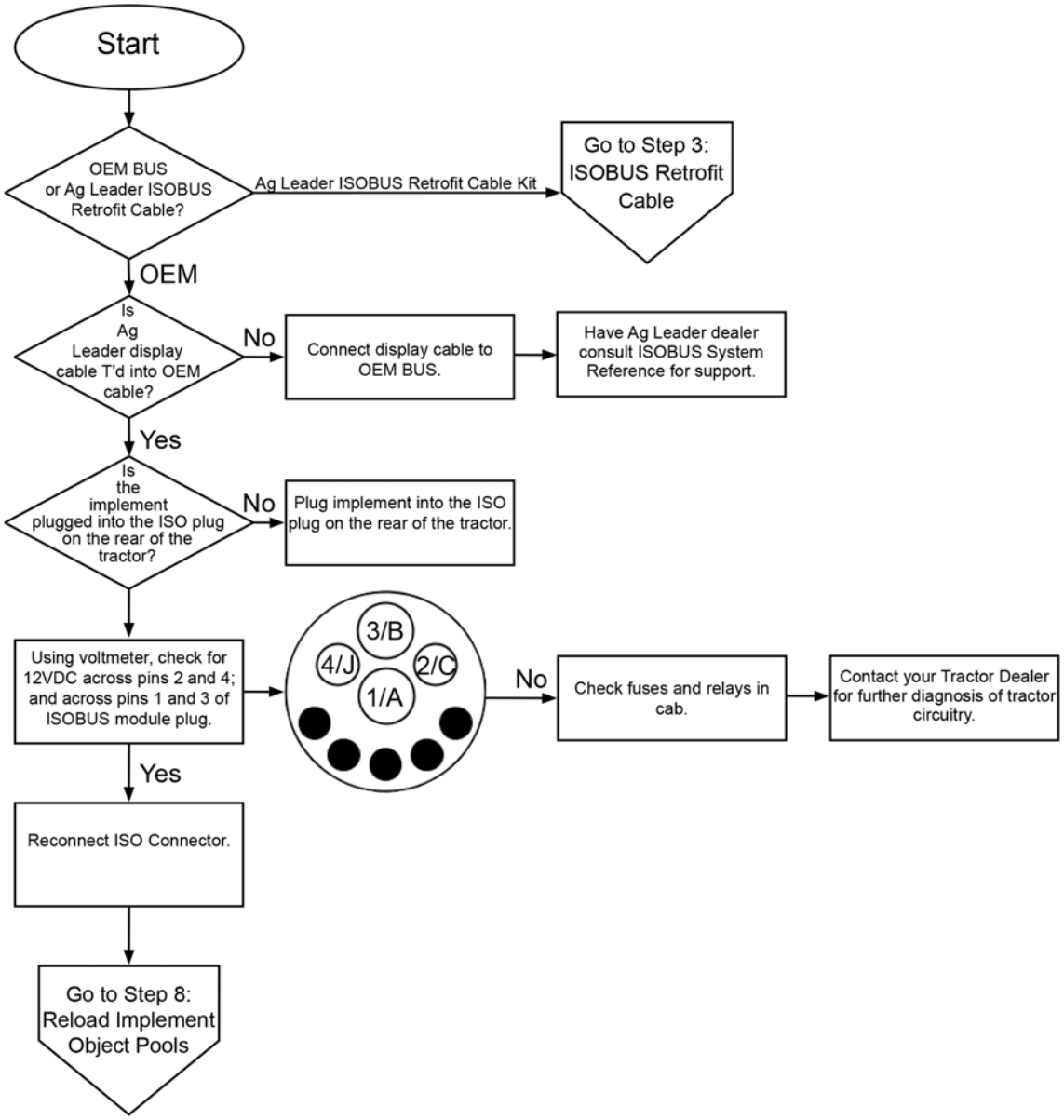
Retrofit Cable Kit (Generic Tractor) Wiring Diagram



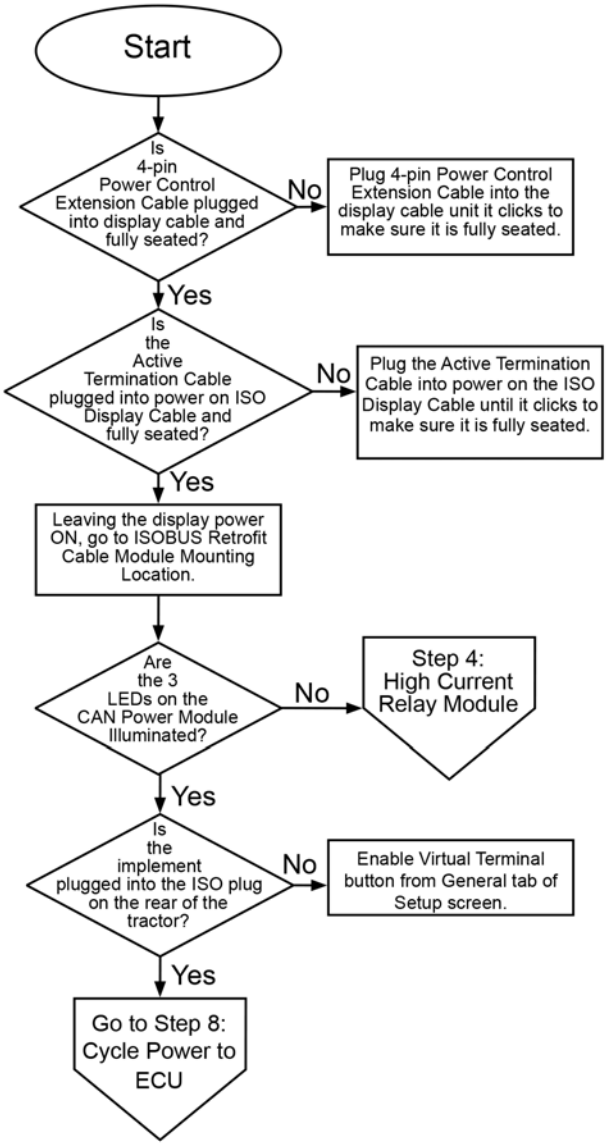
Troubleshooting Step 1: Universal Terminal



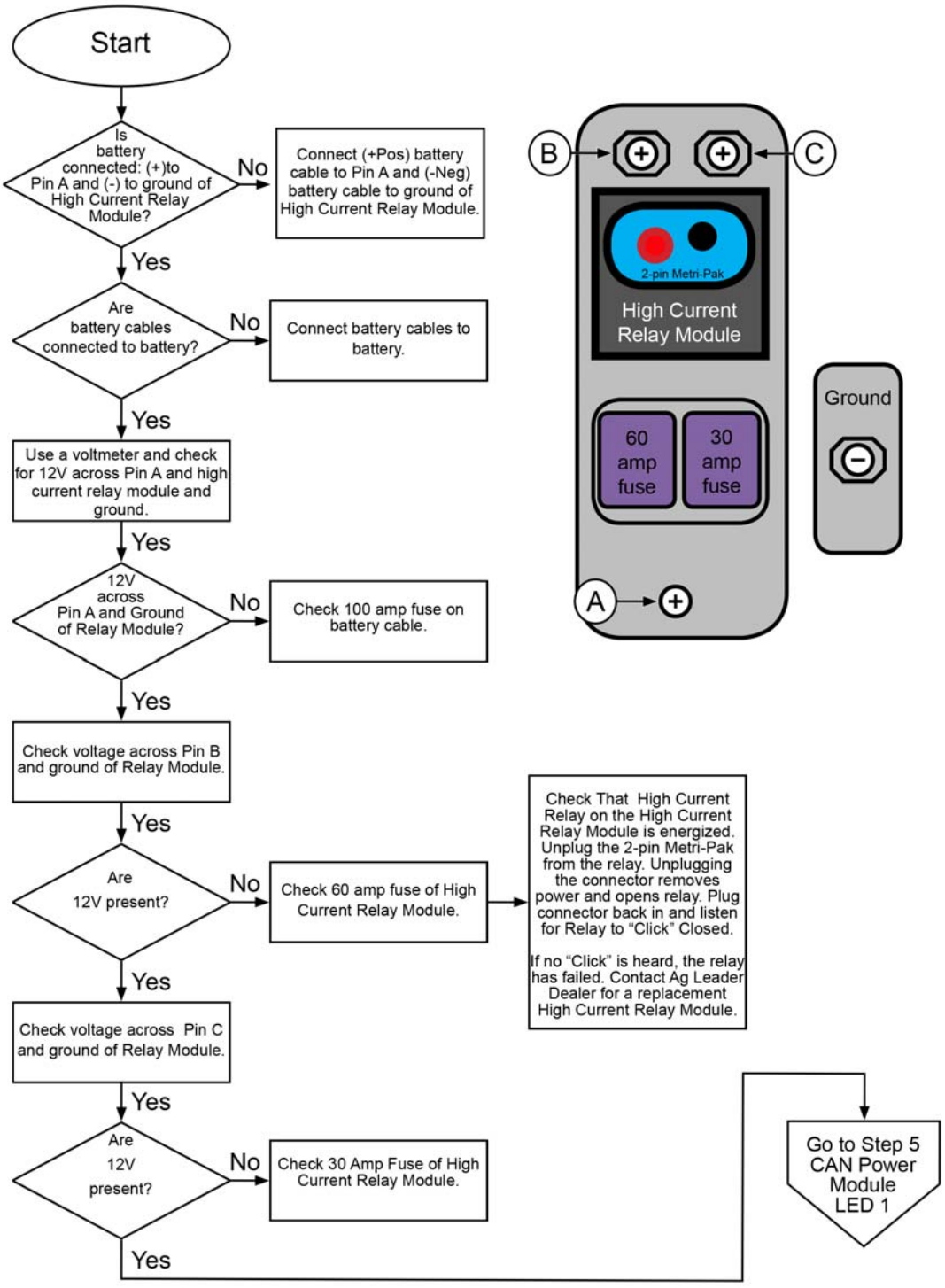
Troubleshooting Step 2: Cables and Power



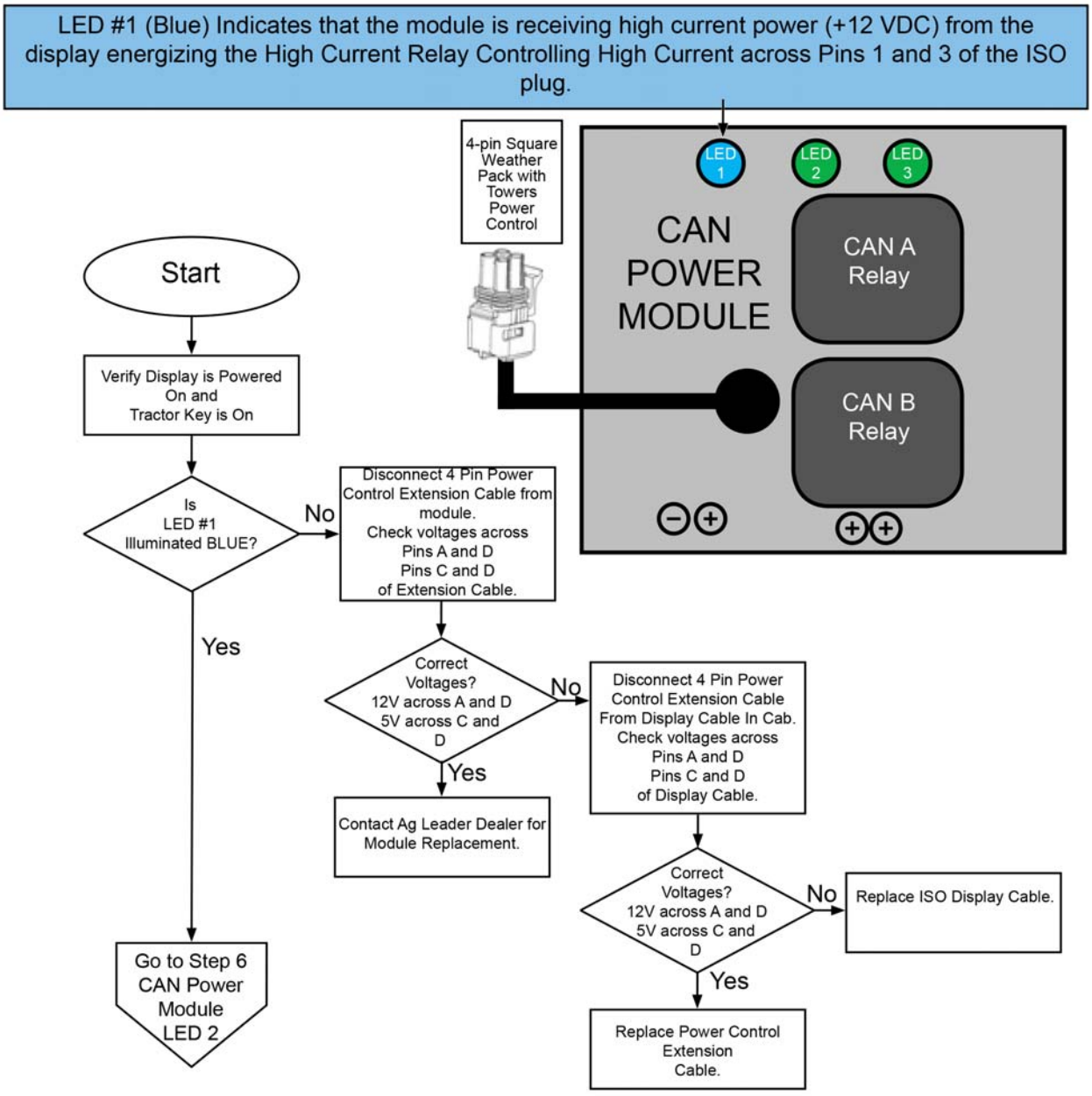
Troubleshooting Step 3: ISOBUS Retrofit Cable



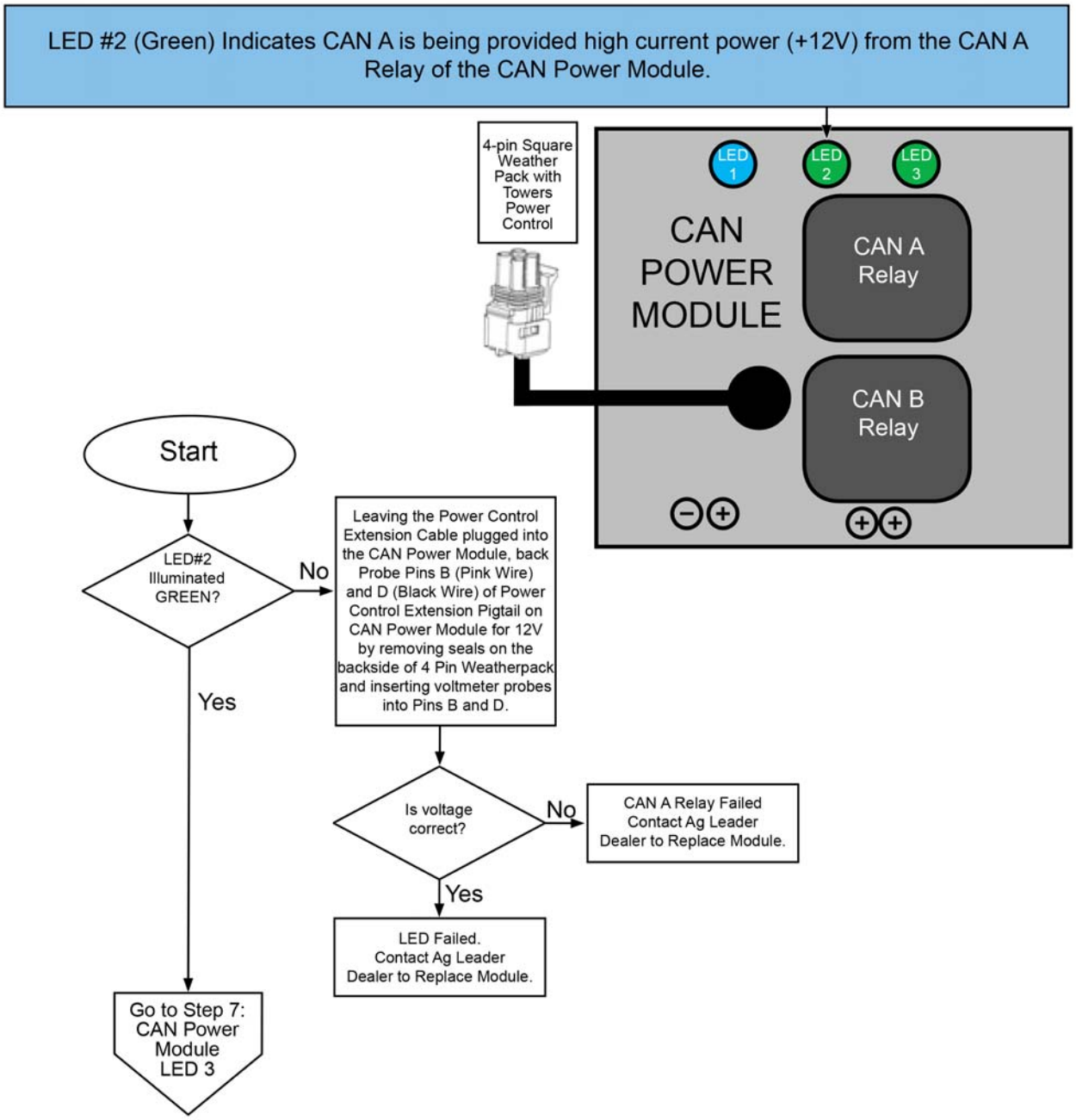
Troubleshooting Step 4: High Current Relay Module



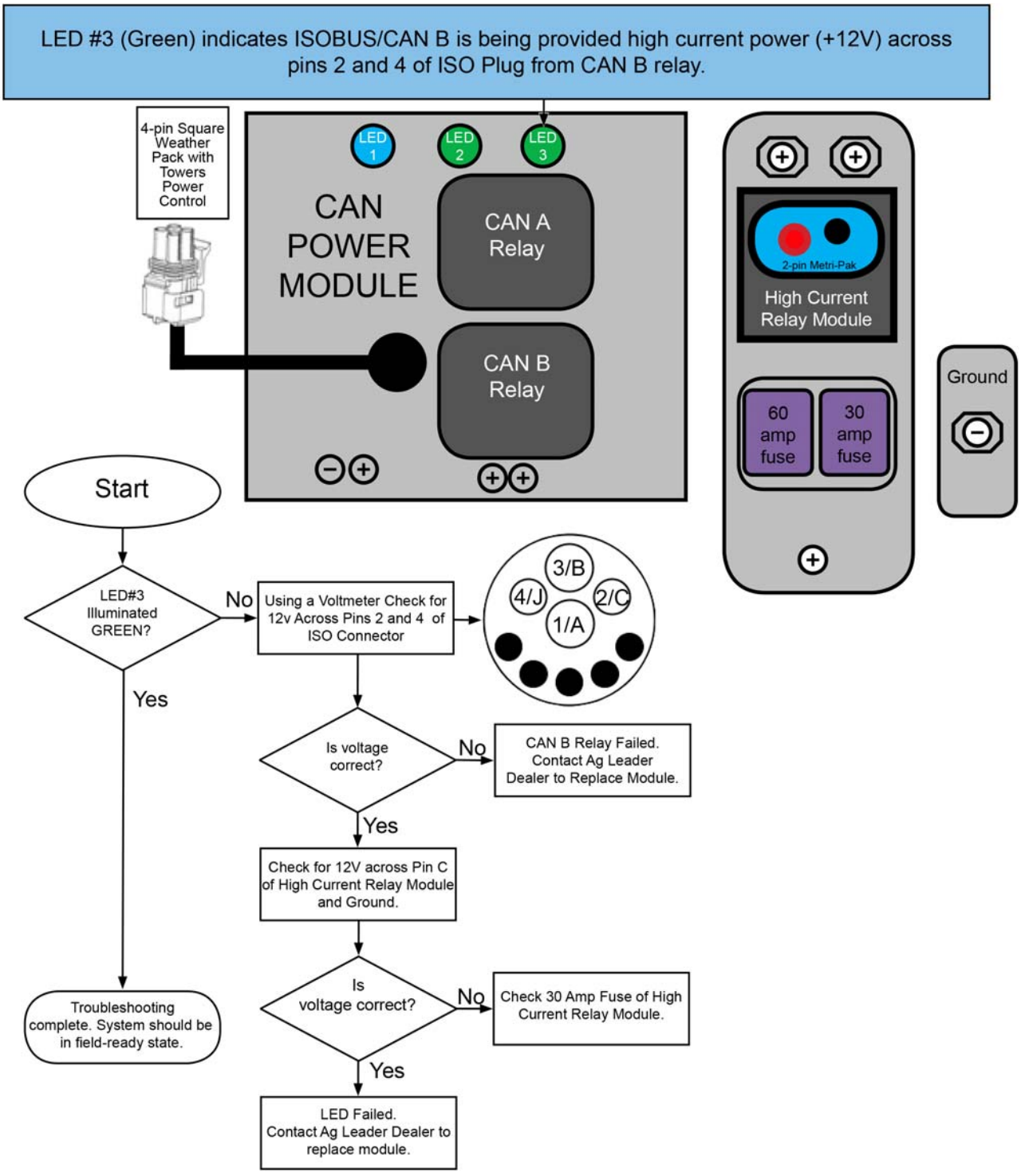
Troubleshooting Step 5: CAN Power Module LED 1



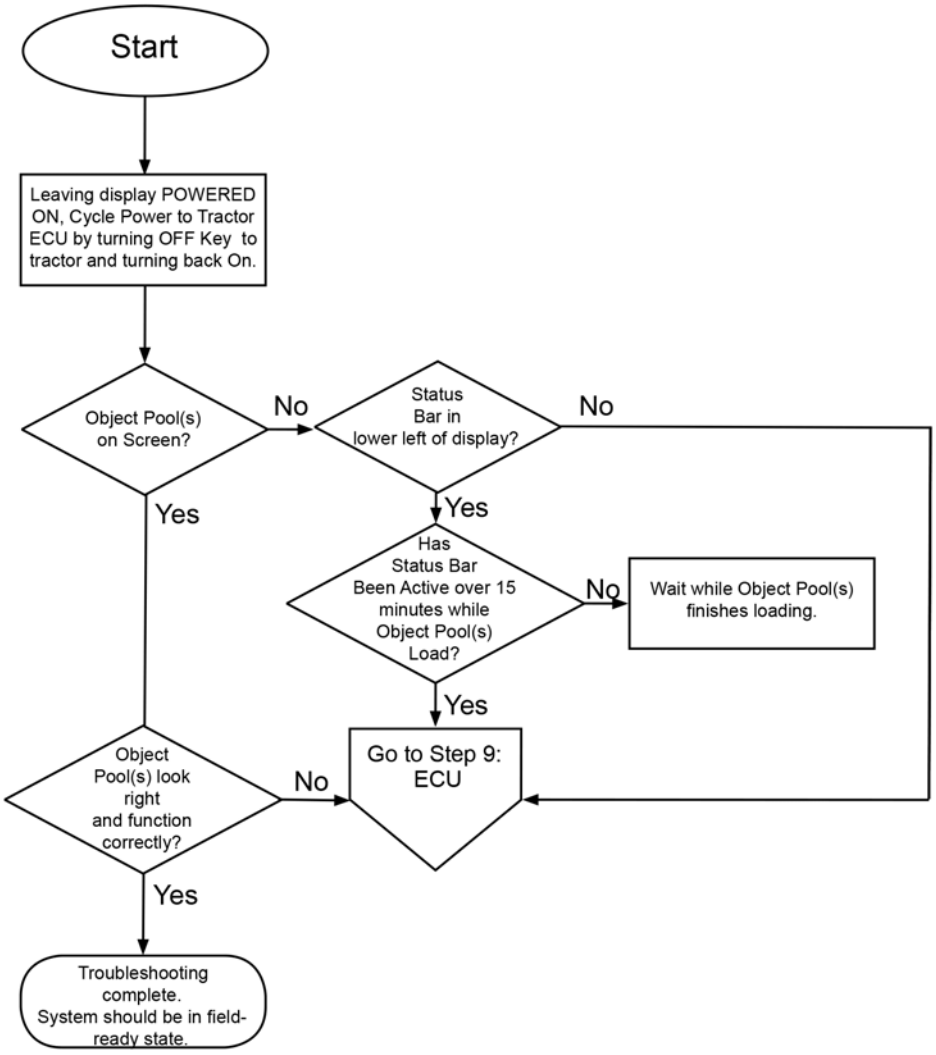
Troubleshooting Step 6: CAN Power Module LED 2



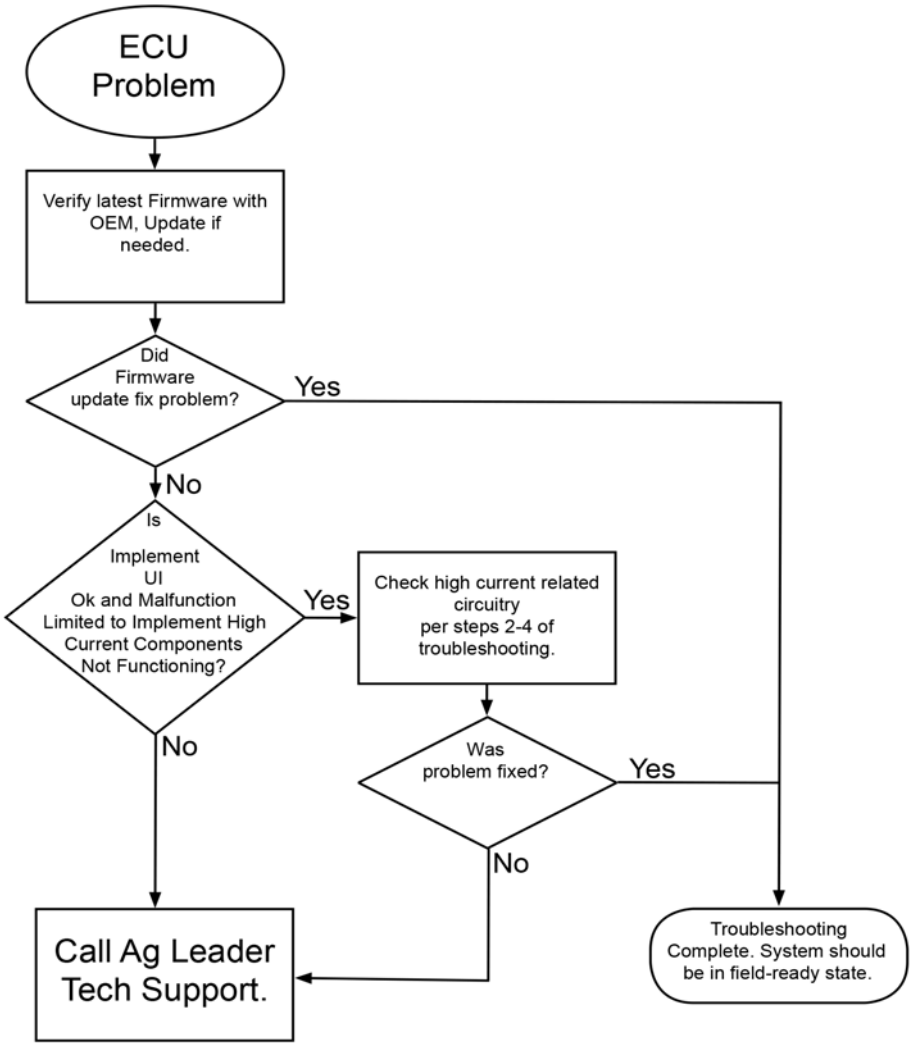
Troubleshooting Step 7: CAN Power Module LED 3



Troubleshooting Step 8: Reload Implement Object Pools



Troubleshooting Step 9: ECU Troubleshooting



Installation

Components and Identification

Display

The InCommand™ display will mount in the cab. Use the provided cables in the cable kit to install power direct to the battery terminals, routing them out of the way, and clear of moving parts. Use the provided zip ties, to secure the cables. If you have excess cabling, coil excess cables in an area that will not get caught on moving parts. A RAM mount is provided to mount the display in the cab, and allows for flexibility to install where windows and gauges are not obstructed.

Locate the 4001979-3 cable, and route this toward the back of the tractor. For most front wheel assist tractors this should reach to the plow harness that is installed on the tile plow. If you need additional length, extension cables are available from your dealer in 6, 12, and 24 ft lengths for 4-Wheel drive tractors.

Plow Harness

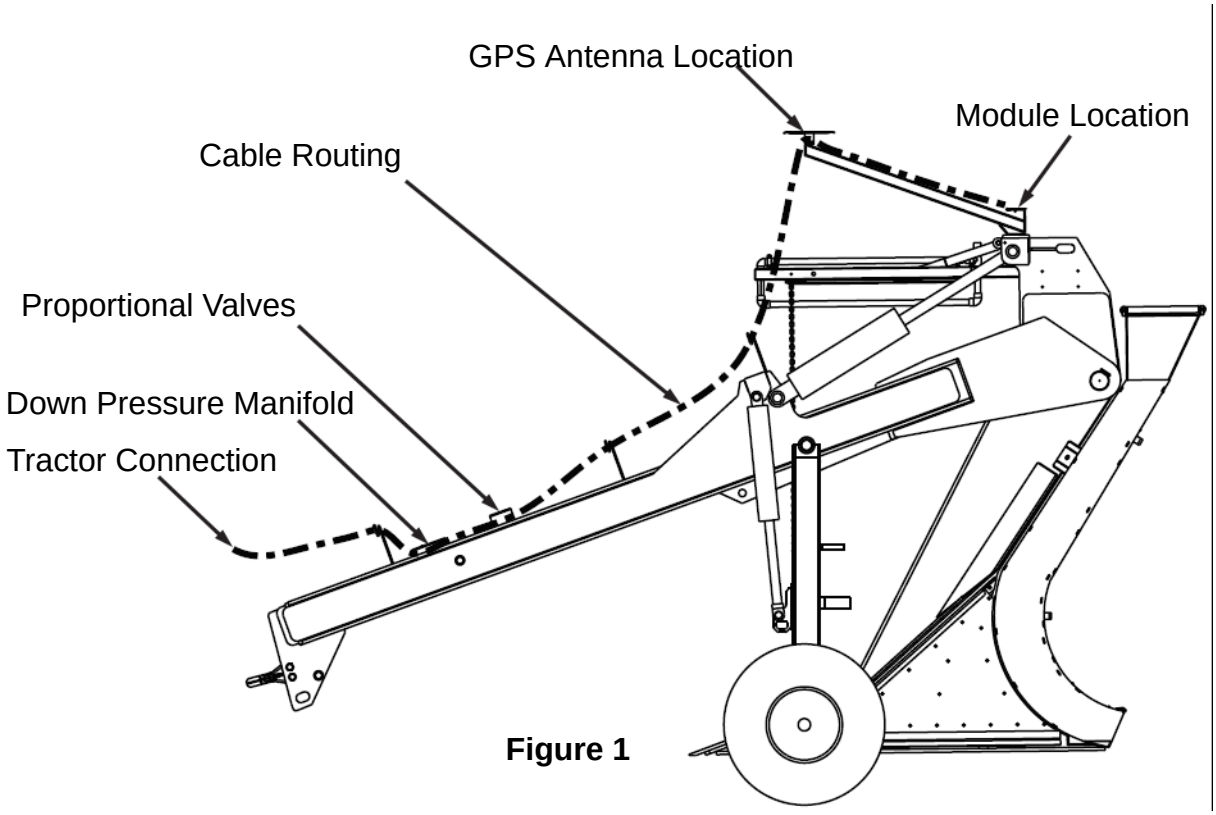
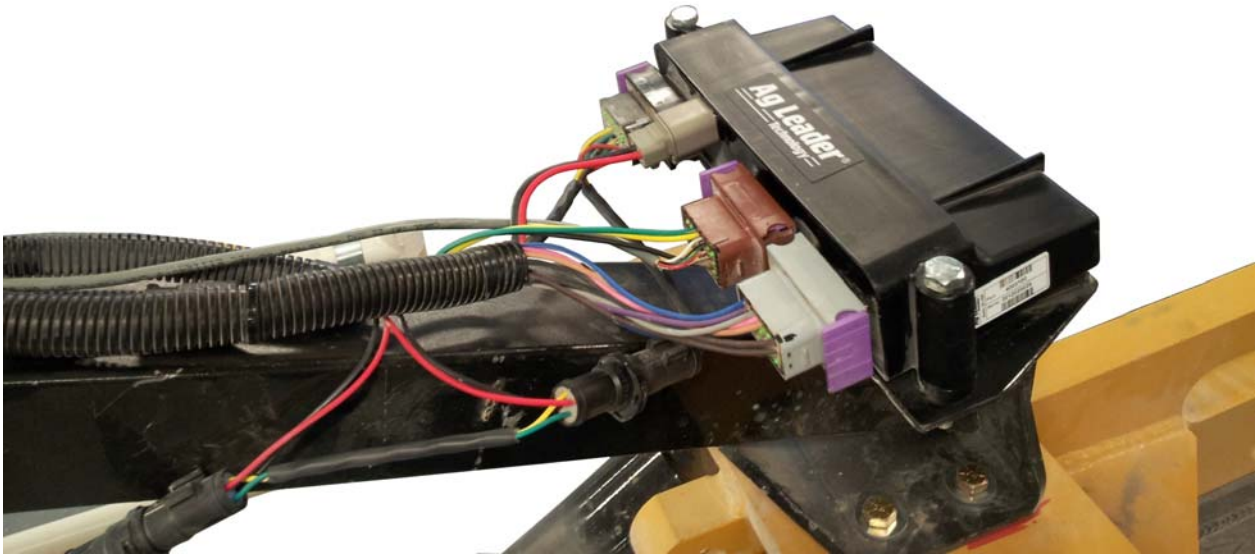


Figure 1

Locate cable PN 4003415. This will be mounted on the plow, with the single round cable connector at the hitch. There are 2 weather pack connectors that will connect to the Proportional valve. If you cannot route the cables to make these ends work, extensions can be ordered by your dealer to make the connections. Route the cable as shown below to ensure that moving parts do not pinch cables, extensions, or adapters.

Water Management Module

The module was designed to be oriented so the cable connections face the tractor. This is so the sensors are oriented correctly and work as they were designed. Use the provided module adapter plate and hardware to secure the module to the plow in the location as shown on the previous page. The label should also face up when installing. See below image.



Make sure that you color match the connections from the harness to the module and you don't force the connections, this can damage electrical pins. The round connections on the harness will be used to power the GPS receiver. The 3 large and 1 small square connections will connect to the module. The Brown connector will be used for the GPS signal input.

LED (1) and (2)

- Off—CAN BUS is idle
- Flashing Green—CAN BUS communicating
- Blinking Yellow—Active BUS error when other devices are transmitting/receiving
- Solid Yellow—Passive BUS error when no other devices are acknowledging
- Solid Red—BUS Off

LED (Power)

- Off – no power
- Solid Red – Low voltage
- Solid Green – Good power

GPS

Make sure the GPS receiver is mounted over the top of the cutting plane. There will be 2 cables that will connect the GPS receiver to the module, one will be specific to your specific GPS receiver. The other cable connects to the WMC and has a standard connection for all GPS adapters.

Double check to make sure that all connections are made and snug, and all cables are secured and not routed in areas that will be pinched.

GPS Receiver Configuration

For Intellislope to receive GPS information from the receiver, the receiver needs to be sending out NMEA GGA, VTG, and GSA messages. NMEA is a standardized output that virtually every GPS receiver supports. When connecting non-Ag Leader receivers for use with Intellislope, the customer is responsible for knowing which port they are connecting to the WMC for NMEA output and configuring the output of that receiver.

For all receiver types, make sure that the following messages are turned on and that the receiver has an RTK fixed position.

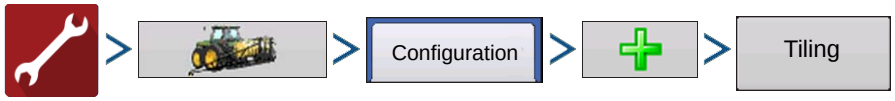
- **Baud**—19200 or 38400
- **Hz**—5 or 10 Hz
- **NMEA messages**—GGA, VTG, and GSA. Turn off all other messages.

Some Ag Leader receivers connect through different ports. See below for specific models:

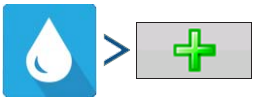
- **GPS 6500**—Configure the above settings on Port B. Use GGA (Position). Verify StableLock and NMEA Talker are turned off.
- **ParaDyme/GeoSteer/GPS2500**—Configure the above settings on Port A. ParaDyme and GeoSteer need to output GGA current. ParaDyme and GeoSteer antenna heights must be set to 0 in the steering vehicle profile.

Create Configurations

Configuration Wizard



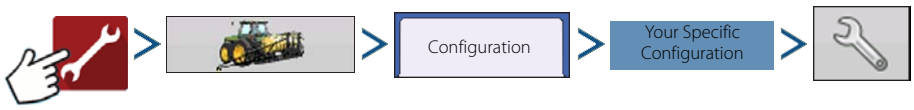
OR



The wizard will then guide you through the process of creating a configuration. After finishing the wizard, the complete configuration should now appear on the Configuration Setup screen and is now able to be selected when starting a new field operation.

Setup Tile Controller

Configuration Setup

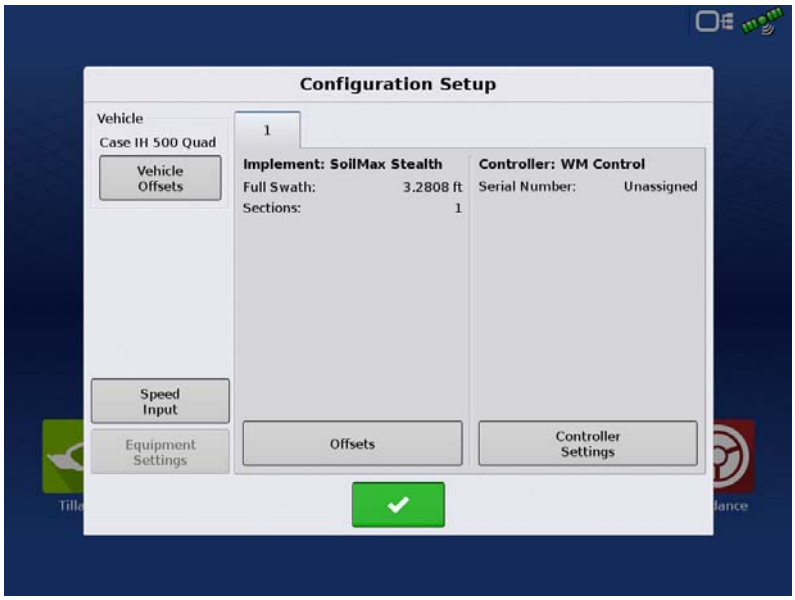


NOTE! Use the Manage Equipment button to view a list of specific vehicles and implements.

Implement Offsets

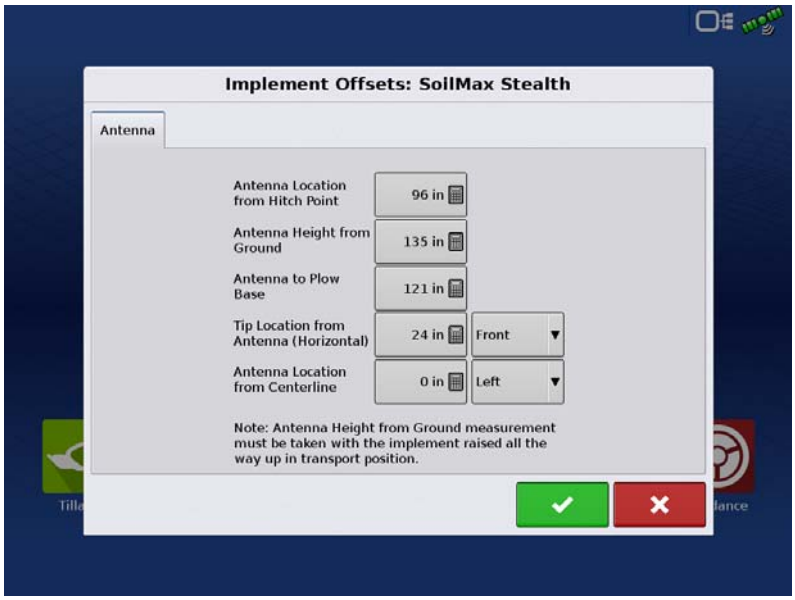
Press Vehicle Offsets to adjust vehicle offsets.

Press Speed Input to modify source of speed.

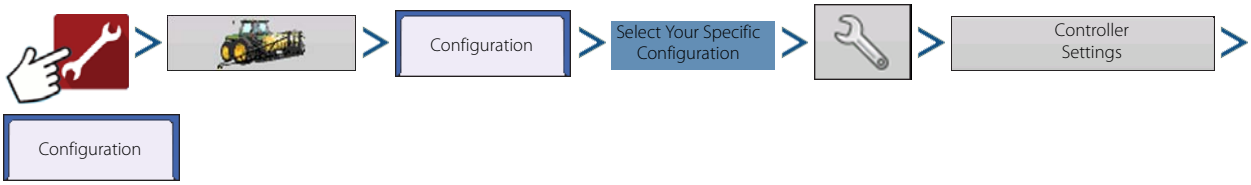


Press Offsets to adjust plow offsets that were setup when creating configuration.

Tip Location from Antenna (Horizontal) is the horizontal measurement of the tip to the Antenna. An example is if the tip is 24 inches front of the Antenna, you would enter 24 in. and Front (as shown).



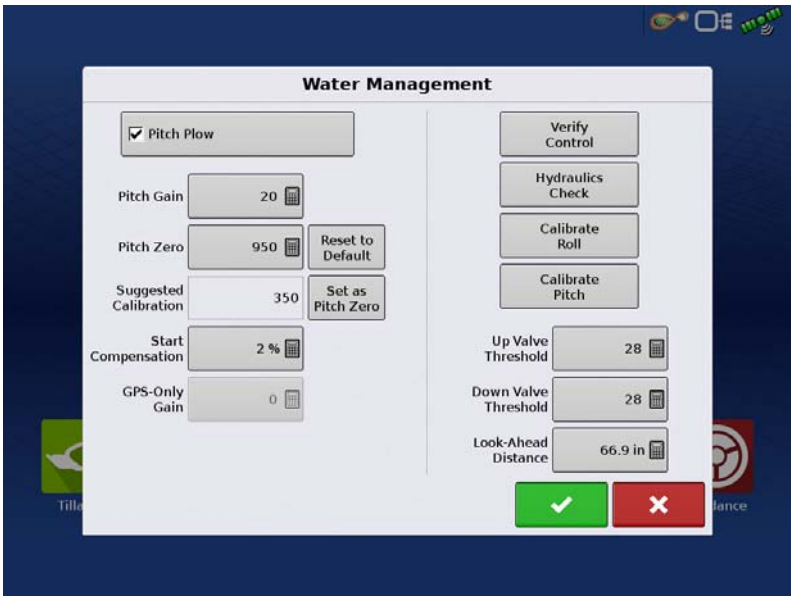
Water Management



Pitch Plow check box—Check this box only if the machine is a pitch plow (also called cantilever).

If this box is not checked, Pitch Gain, Pitch Zero, Suggested Calibration, and Start Compensation boxes will be grayed out and unavailable.

This setting effects the operation of Intellislope and it is crucial that it is set correctly. When check box is checked, it indicates that the machine being controlled is a pitch plow and the elevation of its cutting edge is determined by the pitch of the plow. This must be un-checked if the machine is not a pitch plow, such as a parallel linkage plow or trencher, where the elevation of the cutting edge of the machine is directly effected by the hydraulic cylinder displacement. In this case the GPS receiver must move with the cutting edge for proper control.



The following table summarizes the interaction between the pitch plow setting and adjustments on the Performance Setup screen

Adjustment	Pitch Plow Checked	Pitch Plow Un-checked	Comments
Pitch Gain	Yes	No effect	Pitch Gain only has effect when the system is controlling pitch, and thus only when configured as a pitch plow.
Look Ahead Distance	Yes	No effect	Look Ahead Distance only has effect when the system is using pitch to control elevation, and thus only has effect when configured as a pitch plow.
GPS-Only Gain	No effect	Yes	GPS-Only Gain only has effect when the system is directly controlling elevation in systems where the hydraulic cylinder directly controls elevation (not a pitch plow).
Pitch Zero	Yes	No Effect	Current calibration value to maintain grade
Start Compensation	Yes	No Effect	Setting to combat soil pressure at the start of a tile installation

Pitch Gain—Determines voltages necessary to effectively adjust pitch. It defaults to a value that works well for the Parker Proportional valve and most hydraulic system flows and pressure. The gain may be increased somewhat for tractors with lower flow and pressure. Beware of making it too large, as this will cause the plow to respond in an unstable and erratic way. The higher the value the more aggressive response you will have.

Pitch Zero—Sensor reading that corresponds to level installation. Value will be set automatically after running Pitch Calibration. See "Ongoing Pitch Zero Adjustment" on page 140.

Reset to Default—Resets Pitch Zero to value created by Pitch Calibration-See below section on Ongoing Pitch Zero Adjust.

Suggested Calibration—Every time a Grade Control or AutoTile run is completed the system updates this number to indicate the pitch zero during that run. If your plow tends to run low, this number will likely be higher than the pitch zero, so increase the Pitch Zero to match this number if your On Grade indicator signifies you are running low. Conversely if it runs high, then decrease the Pitch Zero to match this number. It is very important to watch this number to see if the Suggested Calibration number stays close (within 10) of the Pitch Zero. If it is more than 10 off either way, you should lower or raise the Pitch Zero to bring it to the Pitch Zero Suggested Calibration number. You can view the suggested value, and the current Pitch Zero, during operation under the diagnostics button for the Water Management module.

If for any reason the plow was operated in Grade Control or AutoTile mode with the plow out of the ground, then the Suggested Calibration number will be meaningless and should be ignored. Use the button beside the Suggested value and set the Pitch Zero to the Suggested value (the pitch number will be over written with suggested).

Set as Pitch Zero—Sets the Pitch zero to the number provided by the Suggested value.

Start Compensation—At the start of an installation, the cutting edge of the plow tends to drop slightly as the shank contacts the soil. Start Compensation allows the operator to specify an initial upward pitch to offsets this drop. The extra pitch is reduced to zero over the first 2 meters after which it has no effect. Setting Start Compensation to zero is equivalent to turning it off. A typical setting is 2%.

GPS-Only Gain—This gain only applies when the Pitch Zero box is un-checked. It determines how aggressively the system reacts to elevation errors when controlling machines that are not pitch plows.

Generally these numbers will be very low like 5 or less, trial and error may be required to get the results you are desiring.

Ongoing Pitch Zero Adjustment

The Pitch Zero may need to be manually adjusted from time to time so that it remains the setting for level installation.

The following may require it to be readjusted:

- Change in soil characteristics in which the plow operates, since soft or wet soil can cause the plow to "slip" relative to its pitch
- Substantial change in grade of the ground in which the plow operates
- Remounting of the module to the plow
- Change in ambient temperature.

The best strategy is to let the On Grade indicator guide any adjustment.

Plow Starting Numbers

Soil-Max Gold Digger Stealth ZD suggested Starting Values	
Pitch Plow	Checked
Pitch Gain	20
Pitch Zero	900-950**
Start Compensation	2%
Up Valve Threshold	28
Down Valve Threshold	28
Look-Ahead Distance	66.9 in
Minimum Recommended Pressure	2600 PSI
Recommended hydraulic Flow	10 gpm

Soil-Max Gold Digger 48 in. Plow suggested Starting Values	
Pitch Plow	Checked
Pitch Gain	15
Pitch Zero	900-950**
Start Compensation	2%
Up Valve Threshold	28
Down Valve Threshold	28
Look-Ahead Distance	45 in.
Minimum Recommended Pressure	2800 PSI
Average Flow Seen While Installing	2 gpm
Max Flow seen during Operation	6 gpm

**This is an average range seen after calibration is completed.

Rule of Adjustments

- If the plow is predominantly tracking below the target (too low), according to On Grade indicator, increase it.
- If the plow is predominantly tracking above the target (too high), according to On Grade indicator, decrease it.
- Otherwise leave it alone.

Even when the Pitch Zero is well adjusted, the on-grade indicator may reflect deviations from on grade, which is normal and expected. The plow tends to round off sharp corners in the target profile. This will cause either high or low indications as it does so.

There is also a certain amount of deviation within a channel about the target profile that is typical as the control system hunts for the target and responds to external disturbances such as driving over rough terrain. The operator should remain aware of the on-grade indicator, and if grade error starts becoming abnormally large or erratic, he should look for any of number of pitfalls which can be giving rise to the problem.

Noise or error in the GPS elevation, noise in the pitch signal, rocks, soft spots, some degree of control system hunting and overshoot, among other things, can cause brief deviations from on grade. Only when the plow is consistently high or low does the Pitch Zero need adjustment.

If any of the following occur, the Suggested Calibration should be ignored:

- Operating in the "Installing" state while the plow is out of the ground.
- Operating in the "Installing" state, while any external force is being applied to the shank, including any of the following:

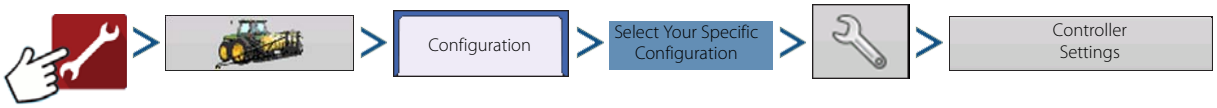
  -Lifting or lowering using the three-point hitch or wheel frame

  -Not placing the three-point hitch or wheel frame into float during installation

  -Exerting force on the shank by manually extending or retracting a hydraulic cylinder such as the diagonal lift cylinder on a Parallel link plow

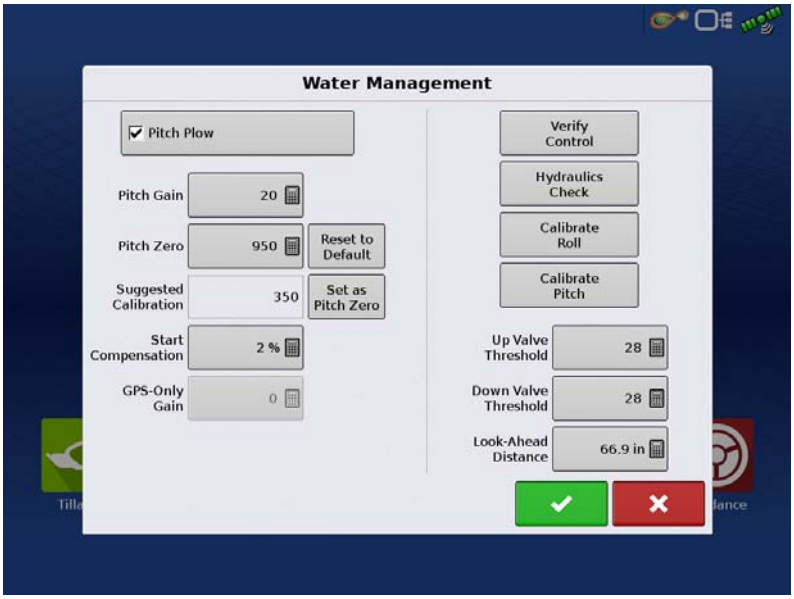
  -Operating a Soil-Max pull-type plow too shallow such that the wheel cylinder forces have too large a component in the vertical direction.
- Operating in the "Installing" state when GPS, GPS quality or GPS RTK correction is lost.
- Installing a tile run in Pre-Ripped ground
- Operating in the "Installing" state when the three-point hitch, wheel frame, or raise/lower diagonal cylinder on a parallel link plow is not fully in float.

If any is known to occur, the Suggested Calibration number should be ignored until after the next run.



Verify Control

Verify Control will check to make sure hydraulics are functioning correctly and determine the voltage necessary to move the cylinders.



NOTE! This may require that you move over a trench to allow the plow shank to move freely, and not overturn or interfere with the ground.

Adjust the Up/Down Valve Thresholds, and then go to the Verify control screen and use the Up/Down arrows. Adjust the up/down threshold values until moving the arrows makes the implement start to respond.

To run the Control Verification, press button and follow instructions on the display.

If the implement responds opposite of the commands (for example if the UP button makes the plow go down) change the Valve Polarity setting and try again.

Up Valve Threshold, Down Valve Threshold—These two settings control how much voltage needs to be applied to the valve to cause the cylinder to begin to move. The higher the number, the higher the voltage the system will apply to begin moving the cylinder, and the quicker the response. The lower the value, the more slowly it will move. On the previous screen, use the up and down buttons to see if those values improve response.

Hydraulic Pressure and Hose Hookup

It is critical to have hydraulic pressure when operating the plow. Take care that the hydraulic flow is in the correct direction. On the front of the hydraulic valve near the hydraulic lines you will see a P and T which stand for pressure and tank. The hose that has the pressure on it is the hose that goes into P or the pressure side of the valve. You can normally tell the pressure side by the stiffness and vibration feeling in the hose.

The tractor's accessory oil pressure should be set high and in the detent position. Pitch plows encounter large forces which must be overcome by the cylinders. High hydraulic oil pressure is required to generate these large forces. Setting the oil pressure too low will cause pitch control errors.

When using a Soil-Max Gold Digger tile plow, the minimum recommended pressure setting is 2,600 pounds per square inch and the minimum recommended flow setting is 10 gallons per minute.

If the cylinders neither retract nor extend then one of the following may be the cause:

Problem—No hydraulic pressure is available.

Solution—Tractor must be running, hydraulic detent engaged and hydraulics must be connected to Parker valve.

Solution—Hoses may be reversed or you may have a bad hose connection.

Problem—Harness is not securely connected to both module and hydraulic valve.

Solution—Check that module-side plug is completely inserted and the connector is locked.

Solution—Check that the valve solenoid connectors are fully seated and screwed down.

Hydraulics Check

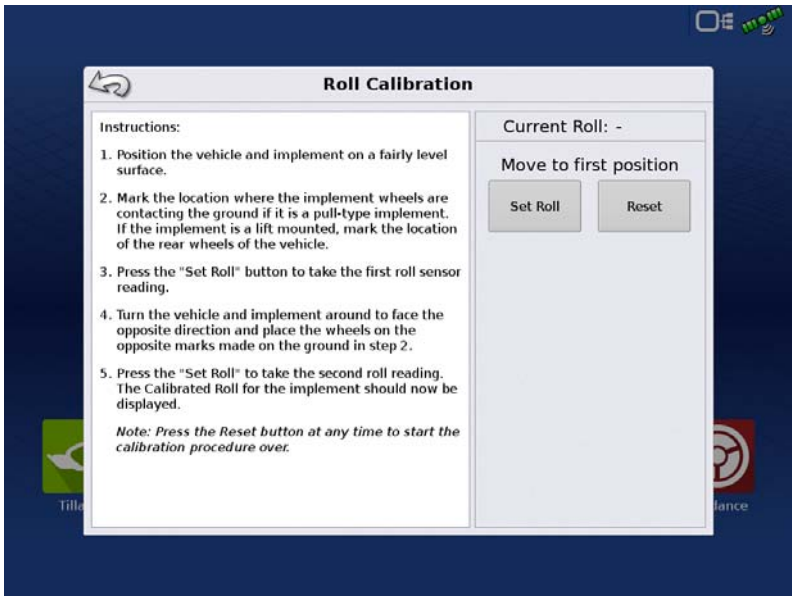
This is an automated exercise that only applies to implements configured as 'Pitch Plows' that will extend and retract the pitch cylinders in order to correctly set the valve polarity.

This requires that you detent your hydraulics and may require that you move over a trench to allow the plow to move freely, and not overturn or interfere with the ground (suggested to do this away from concrete). Several items are checked during this exercise:

- Module is connected properly
- Cables are secured to the hydraulic valves correctly
- Hydraulic flow is set high enough
- Solenoid connections are secured for operation

Roll Calibration

1. Position the vehicle and implement on a level surface.
2. Mark the location where the implement wheels are contacting the ground if it is a pull-type implement. If the implement is a lift mounted, mark the location of the rear wheel of the vehicle.
3. Press the “Set Roll” button to take the first roll sensor reading.



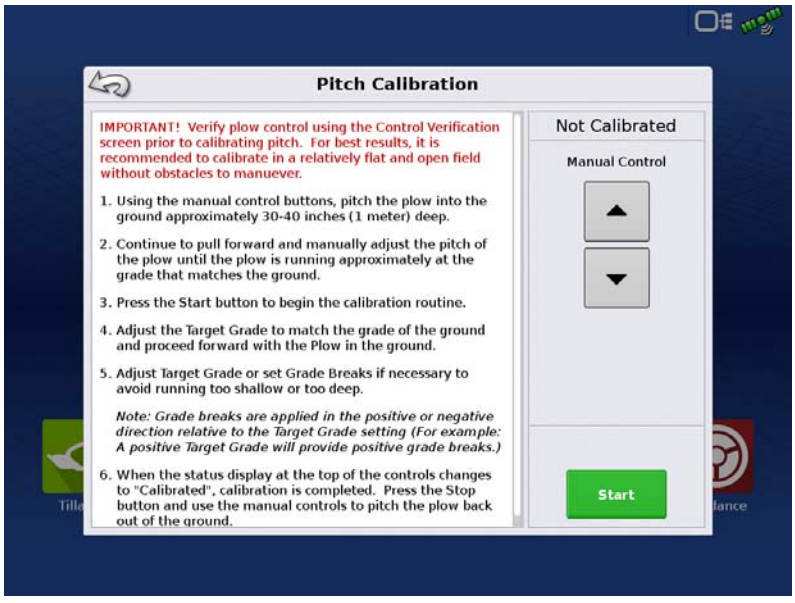
4.Turn the vehicle and implement around to face the opposite direction and place the same wheels on the marks made on the ground in step 2.

5.Press the “Set Roll” to take the second roll reading.

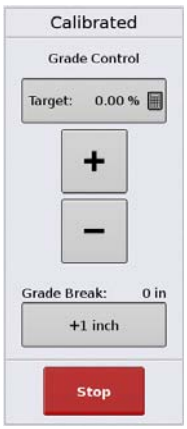
The Calibrated Roll for the implement should now be displayed.

NOTE! Press the Reset button at any time to start the calibration procedure over.

Pitch Calibration



Pitch calibration number determines sensor reading for level installation. Plow status will read “Not Calibrated” until Pitch calibration is ran. Only after having followed those instructions will you need to adjust this pitch zero number.



After this initial calibration run, the Pitch Zero will be set automatically. From then on, any changes to the Pitch Zero need to be made manually.

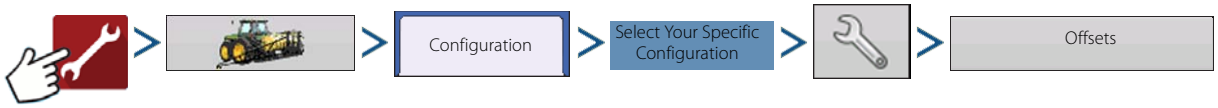
To run Pitch Calibration, Press Pitch Calibration button and follow instructions given on the display. When running a pitch calibration, it can take up to 600 ft of level or constant grade ground to complete.

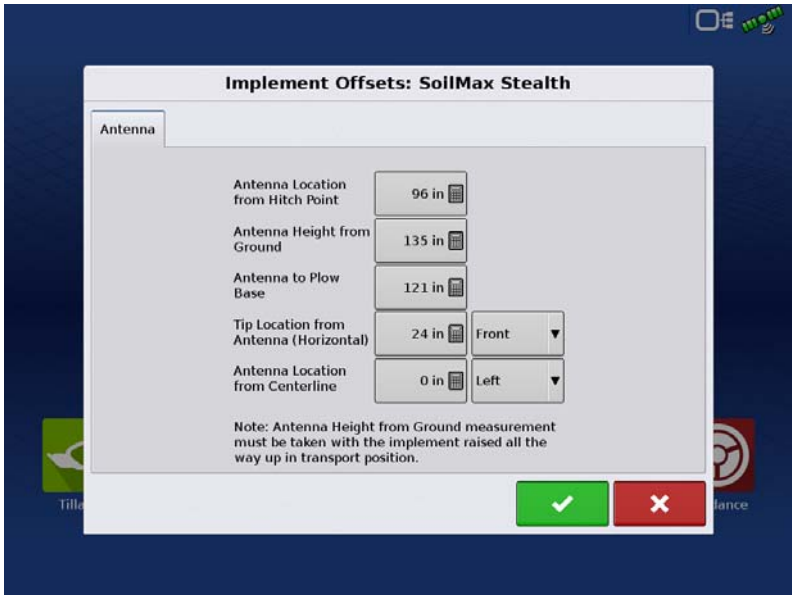
Look-Ahead Distance

This normally does not need to be adjusted on Gold Digger plows following the default value chart. On other plows, start by setting the horizontal distance (in inches) from the tile boot to the shear of the plow. If performance is not optimal, longer distance will smooth out the plow and make it less reactive. A shorter distance will make the plow react quicker but may cause oscillatory "hunting" about the target elevation.

NOTE! Current default valve 66.9 in. for Gold Digger Stealth ZD plows and 45 in. for Gold Digger 48 in. plows.

Antenna Offsets





Antenna to Plow Base—Distance affects the depth because it affects how far the plow shear is below the antenna as it is lowered.

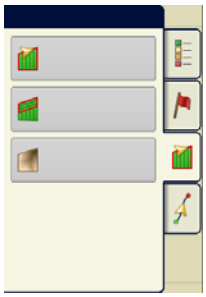
AutoTile uses this distance to compute the tile trench elevation from the GPS antenna's elevation. Measure the vertical distance straight down from the GPS antenna to the very bottom of the plow (bottom of the skid plate).

Antenna to Tip (Horizontal)—This is the distance from the Antenna to the tip of the plow or cutting edge. If you had a rope hanging straight down from the antenna, it would be the horizontal measurement from the tip to the rope. If the tip was 24 inches in front of the antenna, you would enter 24 in front.

Antenna To Ground—This measurement tells AutoTile how high the GPS antenna is above the ground when surveying. When measuring, verify the plow is completely lifted and plow boot is pitched all the way up.

Topography

Press "Topography" button to enter the Topography screen which allows user to setup Topography functionality.



The display allows you to record points that can be used to make a reference layer that is relative to the elevation throughout the field. This can provide you with valuable information in regards to the highs and lows of a field when you may not be able to visually tell with the naked eye. Surveying and Tiling operations will probably benefit the most with respect of where to place the mains and laterals in a field.

ATTENTION!: Requires RTK GPS signal to collect the accurate elevation data.

You can also import data from mapping software such as SMS Advanced via .agsetup files.

Topography screen

You are allowed to have multiple topographical elevation surveys for the same field. This can be useful for different applications, for example:

- One topographical survey that is for the entire field. This will give you a greater perspective of the whole field.

- An additional topographical survey, driven at very dedicated portion of the field. This would allow you to have greater elevation detail in certain areas if you need it.

By default the naming that is generated in the display will be Date/Time based. You can export surface elevation data from software packages like SMS Advanced into the display, and those will be tagged with the field name and the date exported (both examples are in the screen shot).

You can also add points to existing topographical surveys and save them.

Only one topographical survey can be active at a time. When exported as an .agsetup or .agdata file, this will be the survey that is exported. Non-active surveys will stay in the display. At any time you can remove an topographical survey, and collect a new one.

- New Survey button

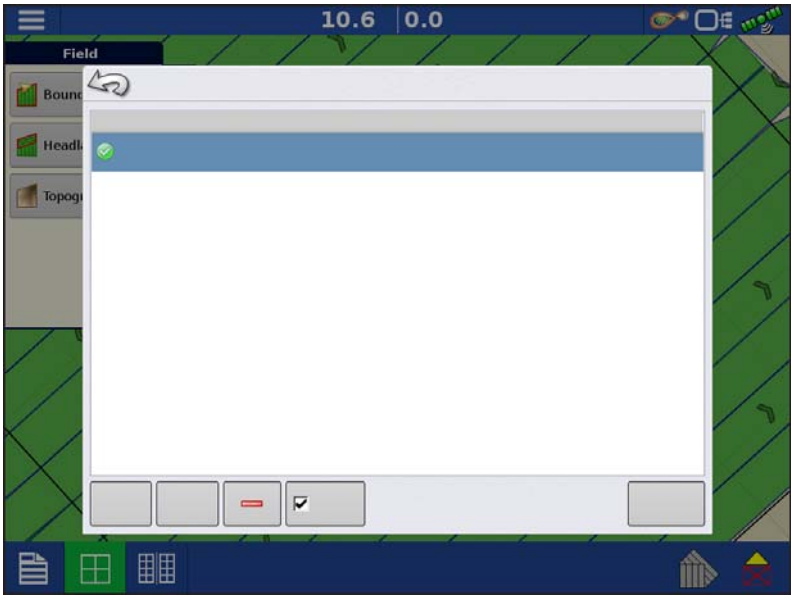
  Press to create a new topographical survey
- Add to Selected button

  Press to add to an topographical survey
- Minus (-) button

  Press to delete a topographical survey
- Enable checkbox

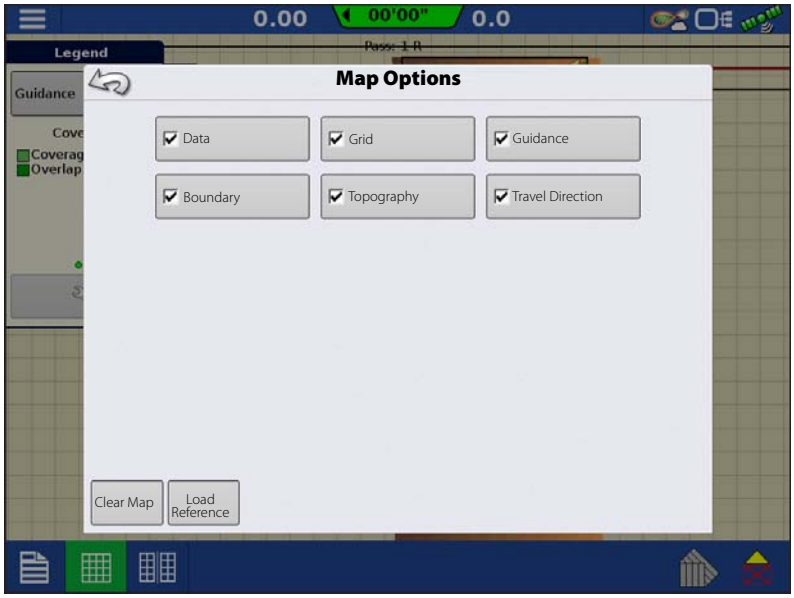
  Press to turn topographical reference layer on/off (Enable checkbox functions the same as Topography checkbox in Map Options screen - shown below.)
- Set Active

  Select the desired topographical survey from list and use button to set as active.



The topography layer can be turned on/off as a reference layer during any operation using:

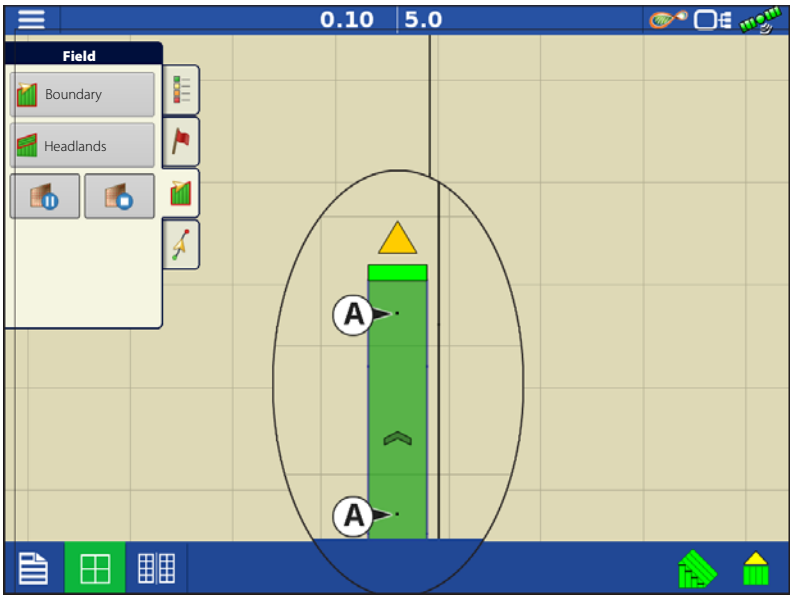
- Enable checkbox on Topography screen (shown above).
- Using the Topography checkbox on the Map Options screen.



If you have RTK GPS reception, you are allowed to collect an elevation survey. This will allow you to collect the Latitude/Longitude and elevation values as you traverse the field.

A point will be dropped every 10 ft as you drive regardless of speed, or direction. If you are collecting during operations like planting or application using autoswath, it will also log points outside the boundary of the field (i.e. through a grassed waterway) to get the most information throughout the field.

During collection of an elevation survey, points will be logged to the file every 10 ft. An on-screen visual will appear in the form of a single black dot (**A**) every 100 ft.



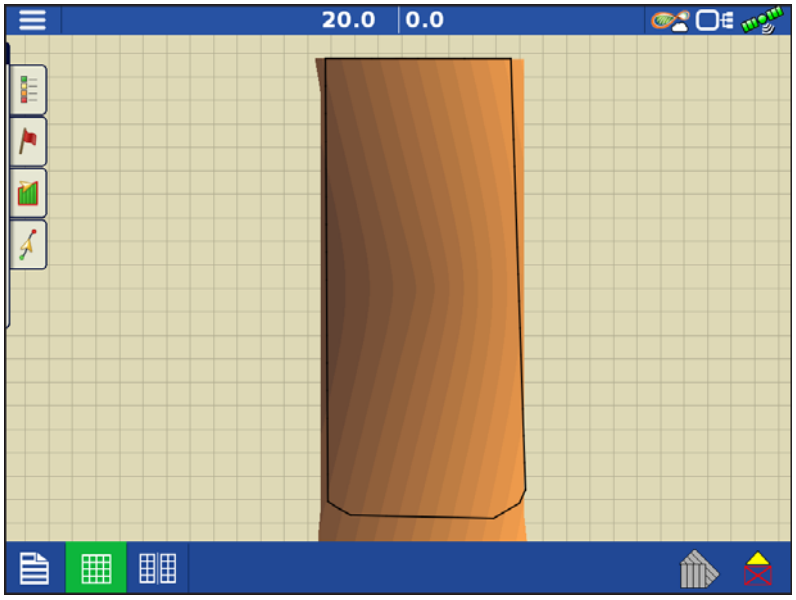
ATTENTION!: It is critical that the GPS Antenna to ground measurement is correct in your configuration, any error in this measurement, will add to the error in the data logged.

The following are suggestions to get the best possible elevation survey for a given field. Following these recommendations will provide the best results for your field.

- Keep swaths in the field to 62 ft or less, the closer the better.
- Driving a dedicated route at the lowest or highest points in a field (i.e. lengthwise of a grassed waterway, or at the top of a ridge) then traversing the field in regular swaths will provide the best detail of the field.
- If surveying with the tile plow antenna, ensure that the plow is in the fully raised position.
- Driving too fast with mounted plows, can cause bouncing and affect quality.
- Surveying with harvesting equipment can provide streaked maps as the hopper filling and unloading can affect the height of the vehicle, and therefore antenna.

After the survey points have been collected, they will be converted into a surface layer in which you can define the color scheme Red, White, Blue, or Brown-Tan.

You can select the number of legend ranges for your field that will show the areas desired. This theme will be used for each field until changed.



Hues will represent:

Red, white, blue scheme

Darker blue = Lower elevation.

Darker red = Higher elevations.

White will be a transition color between.

Brown-Tan scheme

Dark brown = Lower elevations.

Tan = Higher elevations.

If at any point during collection your GPS correction status changes out of RTK fixed, logging will be suspended.

If you re-acquire the RTK signal, logging will automatically resume.

At any point you can ⏸ (pause) or ■ (stop) collection of the elevation survey, and then ▶ (resume) as needed.

If you forget to stop logging as you leave the field, you will be prompted with the message that data collection is still active, and be given the option to continue logging, or end operation.

ℹ In Odd-shaped fields, the surface rendering of the elevation will connect areas even if you haven't driven through that area.

Survey

About Surveying

AutoTile can make tiling much easier by creating a sophisticated target profile that hugs the topography of the ground at a selected depth. AutoTile requires that a survey is taken, which records the soil elevation profile, before installing tile. The profile is created by driving over the path where the tile will be installed with the Intellislope system in Surveying Mode. The profile is used to create the target profile for tile installation.

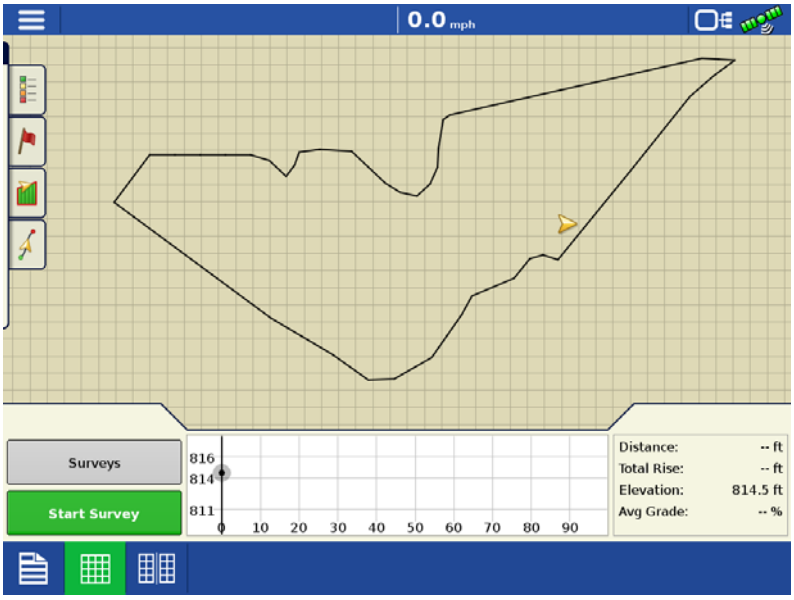
Surveying With a Vehicle (Not With Plow)

Surveys may be conducted prior to installation. This allows the flexibility of performing surveys with other vehicles such as ATVs, trucks or utility tractors. The survey log can be saved on a USB drive and transfered to a different vehicle or display for installation. Ensure that the GPS antenna is securely mounted, and that the Antenna Distance To Ground entered in the Machine Setup screen is correct. Survey logs record the elevation of the ground based on this setting. The log will reflect the setting at the time the survey was made. Any change to the Antenna Distance To Ground setting will not take effect until the next survey is performed.

It is also strongly recommended that if doing a survey days prior to installation that the GPS Base station is not moved, or is reset in exactly the same location as when the survey was collected. Failure to have the base in the same location can render the surveys inaccurate, requiring them to be redone.

Press the Water Management App to begin the field operation wizard. Be sure to choose the correct surveying configuration.

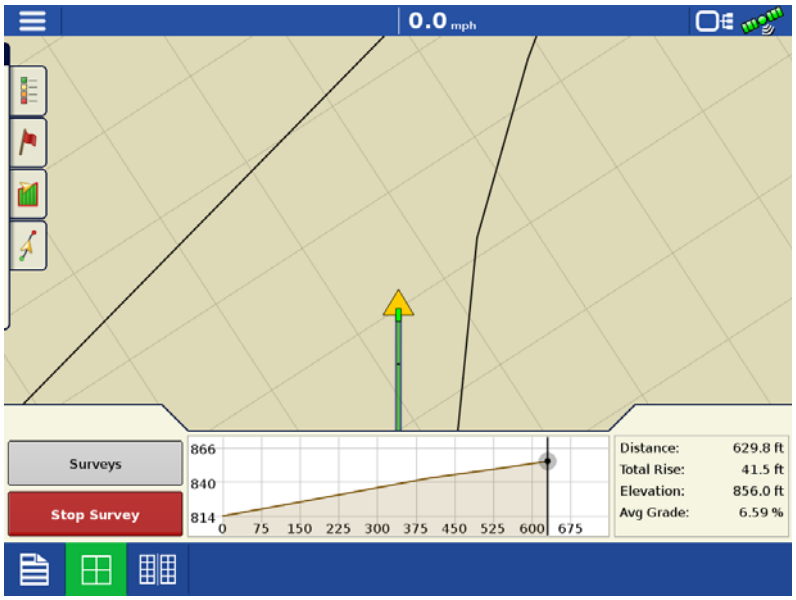
Drive to the location where you want to start the survey and press **Start Survey**.



Drive the path where tile will be placed. At the end of the path press Stop Survey.

Confirmation Screen will appear.

Press ✓ to end survey.



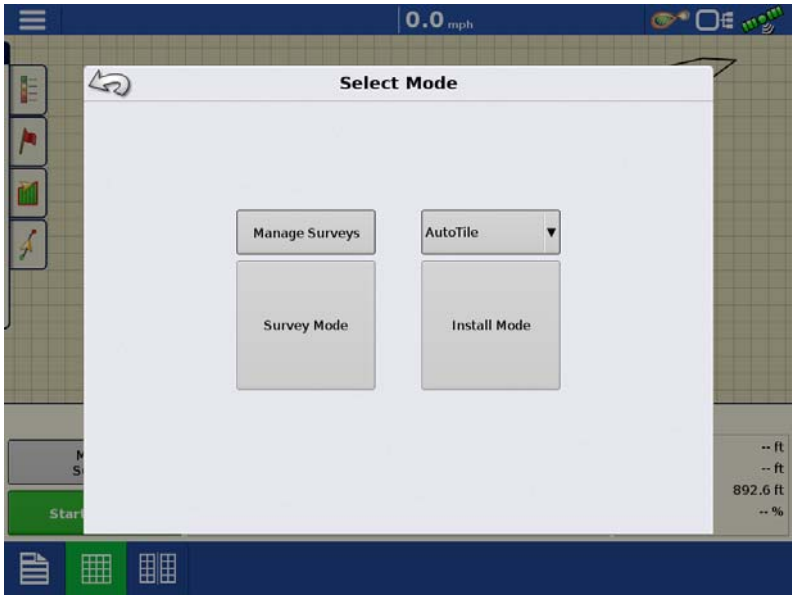
Surveying with Plow

When surveying with the installation tractor and plow, the plow must be completely raised so the GPS antenna distance to ground is consistent for every run and matches the Antenna Distance To Ground entered in the display.

For pull type plows, make sure the wheels are all the way down, and the plow shank is pitched up. For mounted, or 3pt mounted plows make sure the linkage is all the way up, and the plow shank is all the way up.

Press Mode to view Select Mode Screen.

Select Survey mode Survey Mode.

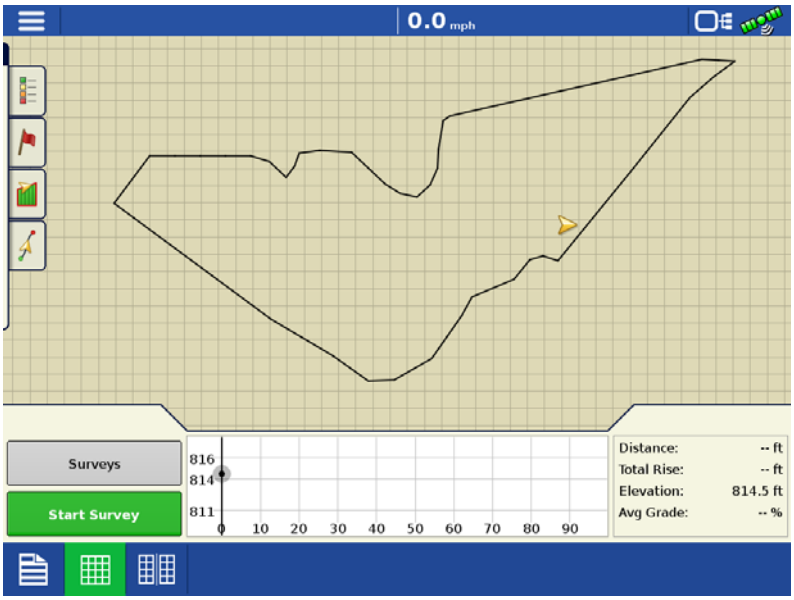


Drive to the location where you want to start the survey and press **Start Survey**.

"Start Survey" will change to "Stop".

As you drive, your path will be indicated with a green line.

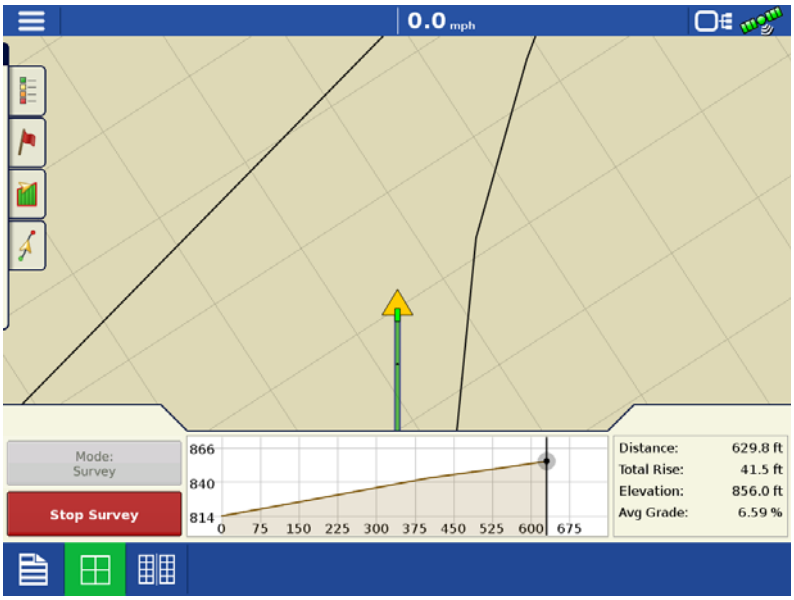
Try to get as close to the outlet or main connection as possible (whether at the start of the survey, or the end of the survey, doesn't matter), before ending the survey, but do not back up or make a loop around the starting hole while you are still surveying. Drive past the start of installation and near it if possible.



Drive the path where tile will be placed. At the end of the path press **Stop Survey**.

Confirmation Screen will appear.

Press ✓ to end survey.



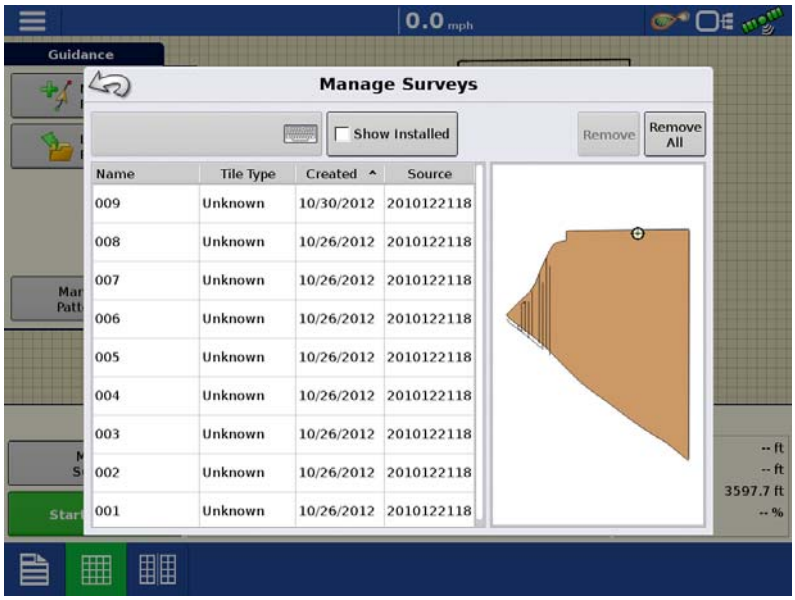
Managing Surveys

Press Manage Surveys to view Manage Surveys Screen.

Survey paths are automatically named but the names can be changed by choosing a survey and pressing ⌨. Type a name then press ✓ to enter it.

By checking ☑ Show Installed, you will display the installed tile.

An individual survey path can be removed individually using the Remove button or all survey paths can be removed using the Remove All button.



Operating Modes

AutoTile—Driving over the tile's path to survey it and then display creates optimal tile placement according to guidelines set by user.

Grade Control—Behaves like a laser control system, except that the grade can be changed without relocating or adjusting a laser tripod, and grade breaks are not limited by mast size.

Pitch Control—Fall-back mode for when GPS is temporarily unavailable. (Only available on configuration set to "Pitch Plows")

Each of these modes of operation are described in detail in its own subsection of this section.

WARNING! Hydraulic machinery can cause bodily injury or death!

The Intellislope control system is designed and tested with safety of operation in mind, however, the operators should never assume that they can anticipate the behavior of the system while it is powered. Follow these rules:

Stay away from the controlled machinery. Always ensure that no person is within the range of motion of the controlled machinery while the control system is powered.

If it should be necessary to work in proximity to the machinery, first power off the control system. The system may be powered off using the display or by removing the system harness.

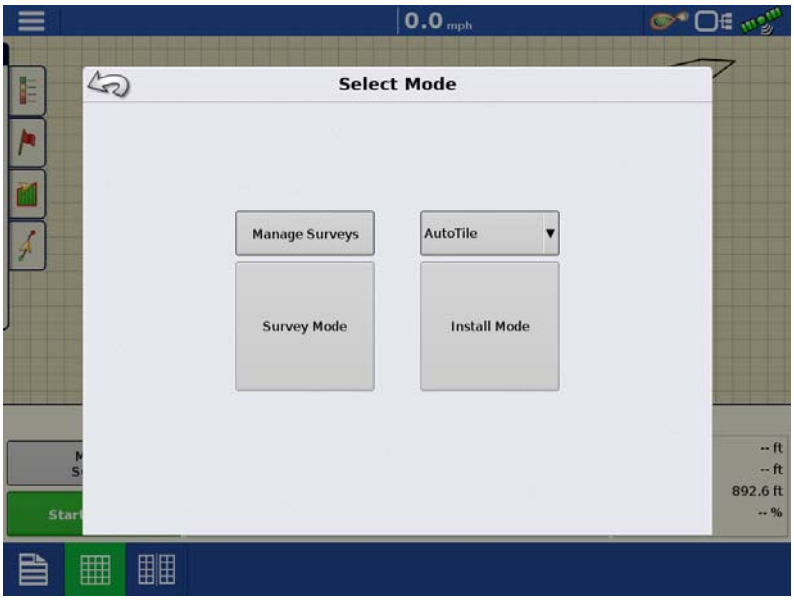
When controlling machinery other than a Gold Digger plow, the operator must exercise good judgment to ensure that the range of motion of controlled machinery is clear while the system is powered.

Turning off the display, or cutting the power by removing the accessory power plug, will remove power from the hydraulic valve solenoids. This will cause the Parker proportional valve, which is standard on the Gold Digger tile plows, to close.

Other components of the machinery, such as hydraulic system elements, have their own safety rules which are outside the scope of this manual, but which you should familiarize yourself with and follow.

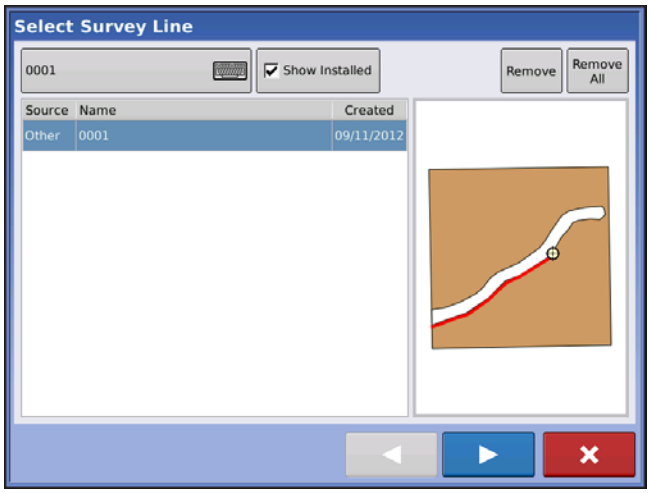
Installing with AutoTile

Press the Mode Survey button on the map screen and then on the Select Mode screen, select AutoTile and press the Install Mode.



Selecting Install Mode brings up the survey selection screen. The selected survey will be drawn as a red line on the over-head map shown on the right side of the screen. If a survey has just been completed, it will be selected by default.

Select the desired survey and press ▶ to continue.



Modify AutoTile Design

Minimum Grade—This is used by AutoTile to create target tile profiles. It specifies the minimum grade you wish AutoTile to maintain. 0.1% grade is a common minimum grade. Min Grade affects the target profile that the control system "aims" at. It is normal for some deviation about the target within a channel about the target profile.

Minimum Depth—This specifies the shallowest depth at which you want AutoTile to place tile, at any point in the tile run. Keep in mind that this depth is to the bottom of the trench. You might want to change this distance if you change to a pipe with a larger or smaller diameter.

Maximum Depth—This is used by AutoTile to know how deep the plow can go. You can either use the maximum depth of the plow or use this to limit the depth you wish the plow to run to lower the pull required if ground conditions are difficult.

Target Depth—This is the depth at which AutoTile aims to install the tile (as long as other constraints permit). This is usually in the 30-42 inch range. You should adjust this if necessary to keep your tile above impermeable clays. This depth is to the bottom of the trench.

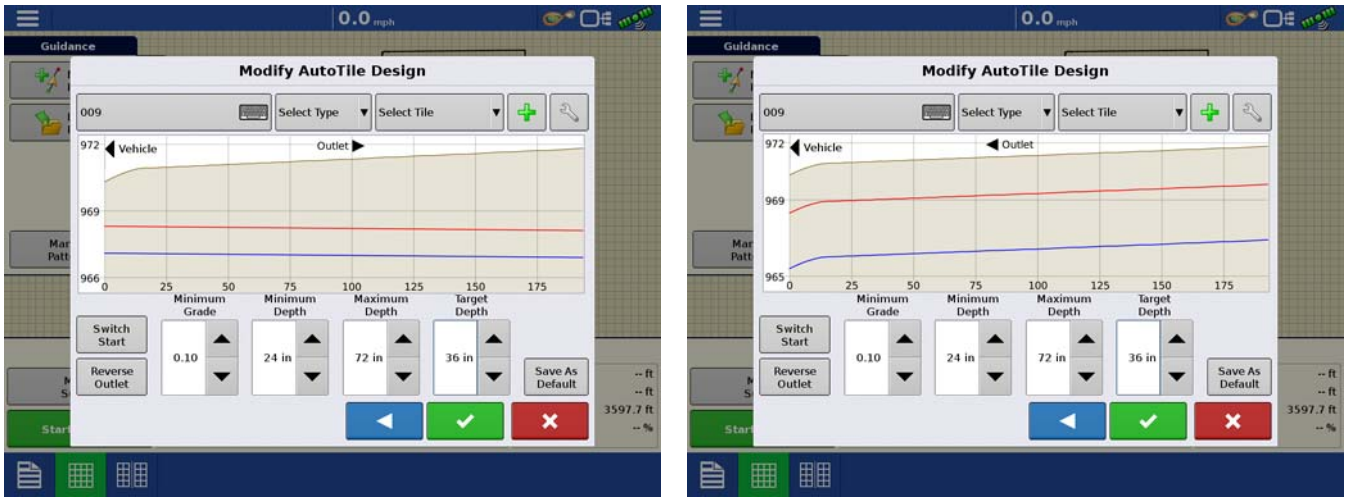
Switch Start Button

(Start at Top or Bottom of Run)

On the graph display screen, installation always proceeds from left to right. AutoTile assumes you will start at the lower end of the survey, and that the lower end is the outlet of the tile.

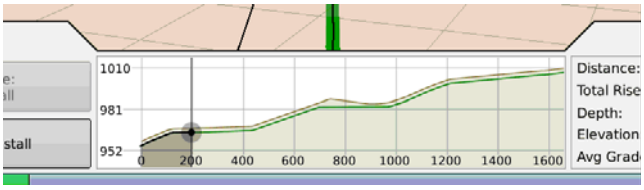
If Intellislope shows your vehicle location at the right side of the screen when you want to start installing, press "Switch Start". The "Switch Start" button switches the starting and ending locations.The ground's profile will be flipped, and your current position will now appear on the left side of the screen.

Reverse Outlet Command

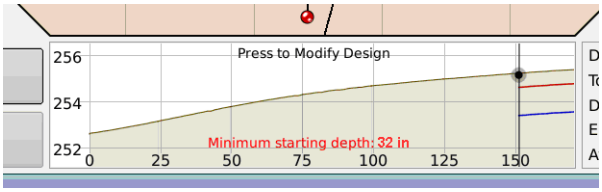


The "Reverse Outlet" button changes which end the outlet is on. The outlet end is the end of the path towards which the water drains. There is no effect on the ground profile, which remains unchanged. The difference appears in the shallowest and deepest installation profiles, which now are designed to drain in the opposite direction.

As you start installing, you should always progress from the left side of the profile graph to the right side. If your vehicle position indicator is at the right side, press on the profile graph and modify your outlet location and/or your starting location.



You are allowed to start installation at any point along the surveyed path. If the profile graph is as shown on the left, and you start installation, the tile will be placed at a 0.0 grade



Adjusting Profile to allow Tiling

When a solution exists (which depends on the topography and the constraints you have specified) ✓ will be displayed.

The profiles displayed will enforce the "Minimum Grade", "Minimum Depth" and "Maximum Depth" constraints that you select. The display will create a target profile that maintains Target Depth as much as possible. As you adjust these parameters, the profile will update.

This can be useful in a number of ways. For example, to make the plow easier to pull, you might wish to decrease the "Maximum Depth" constraint as much as possible.

It is possible that no solution exists given the topography and constraints. Here, the system displays the message "2 in of interference at 742 ft" Given the topography and user constraints there is no profile that can be installed that meets all these constraints.

Increase the "Maximum Depth" to 75 in. to create a solution. The shallowest solution requires us to start at least 2.2' deep. Start at this depth or any depth greater.

Press to accept target profile.

Tile Type

Select Tile Type from drop-down menu.

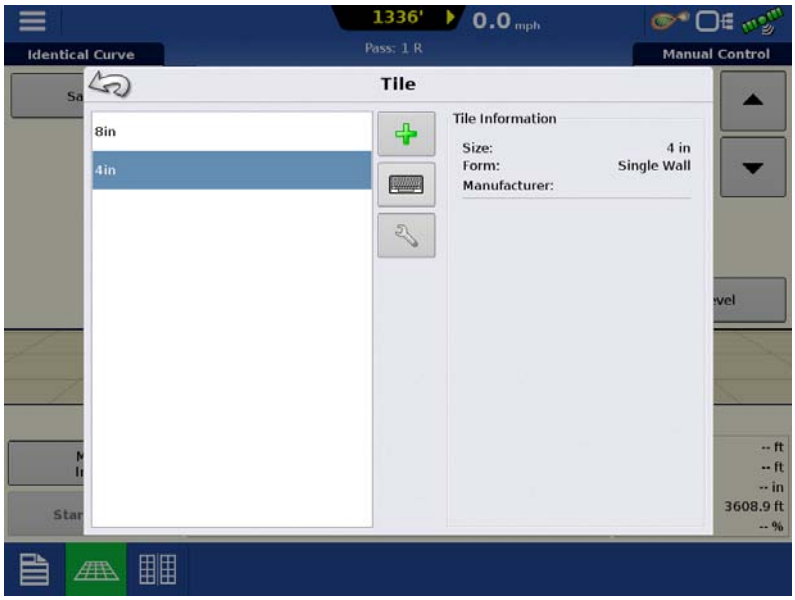
- Main
- Sub Main
- Lateral

Select Tile Product

Select Product from drop-down menu or create a new product by pressing and using the following steps.

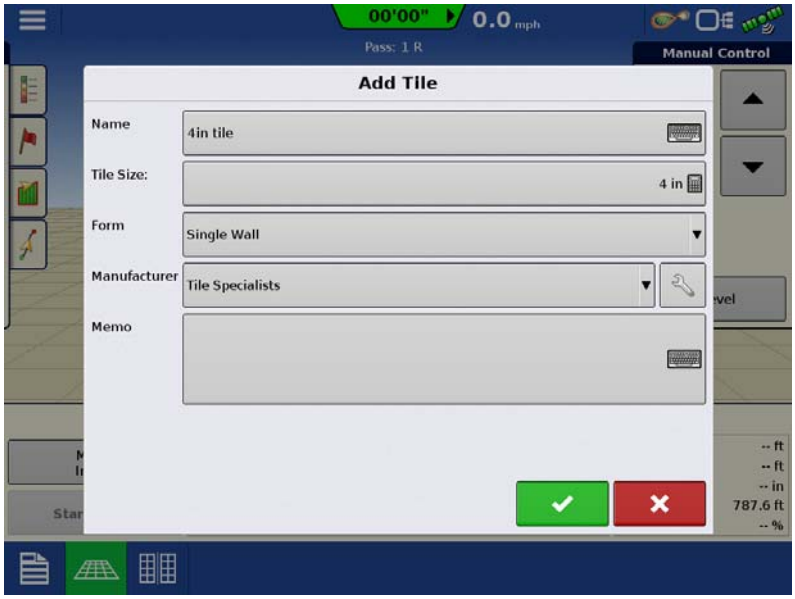
Creating Tile Products

Press on the AutoTile Design screen and then press .



Enter a name, tile size, form, manufacturer. Any notes can be added in the memo section.

Press when complete.



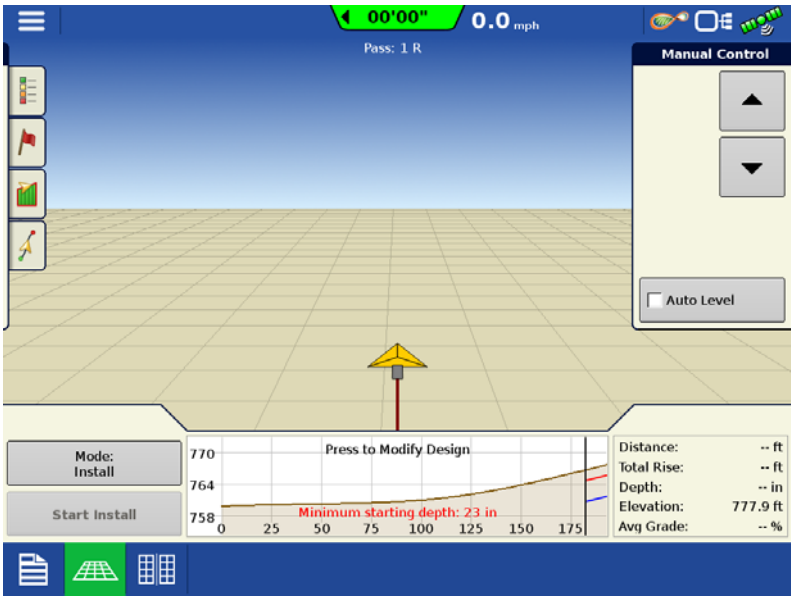
Start Depth Message

The plow may be lowered to any depth at or below the minimum starting depth, when installing from the outlet end, or uphill, as in most cases. Here the plow is still above the starting depth and a warning message, “Minimum starting depth: 23 in.” is given.

If your starting point for the install is in a location that is in front of your survey, the “Start Depth message” may be too shallow as it is reported based on the first point of the survey. For example - if the start depth is 34" but you are 30 ft away from the beginning of the survey, you may have to lower to 35" to maintain your grade from the start of install to the start of the survey.

You must be within 65 ft (20 m) of the start of the survey to be allowed to start installation.

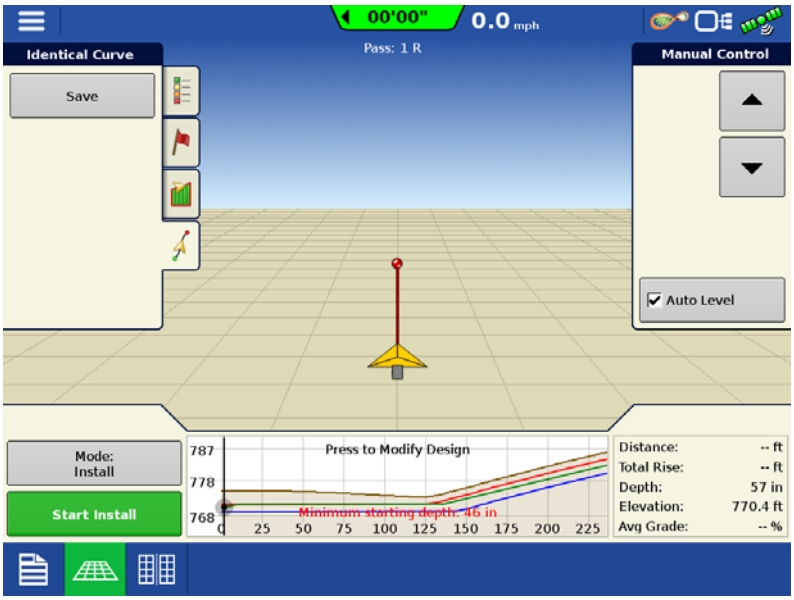
Start Install button will be grayed out until plow has been lower to proper depth.



Auto Level—Automatically levels the cutting edge of the plow as it is lowered to its starting position (pitch plow).

If the machine is not configured as a pitch plow, the “Up” and “Down” buttons are used to manually adjust the position of the machine's cutting edge.

Note that the plow depth indicated on the screen is relative to the elevation of the nearest surveyed point, which is not necessarily the same as the depth in the hole, since the surveyed path may have ended some distance from the starting hole.



WARNING! When the plow has been set into the hole, press the “Start Install” button to be ready to start installing.

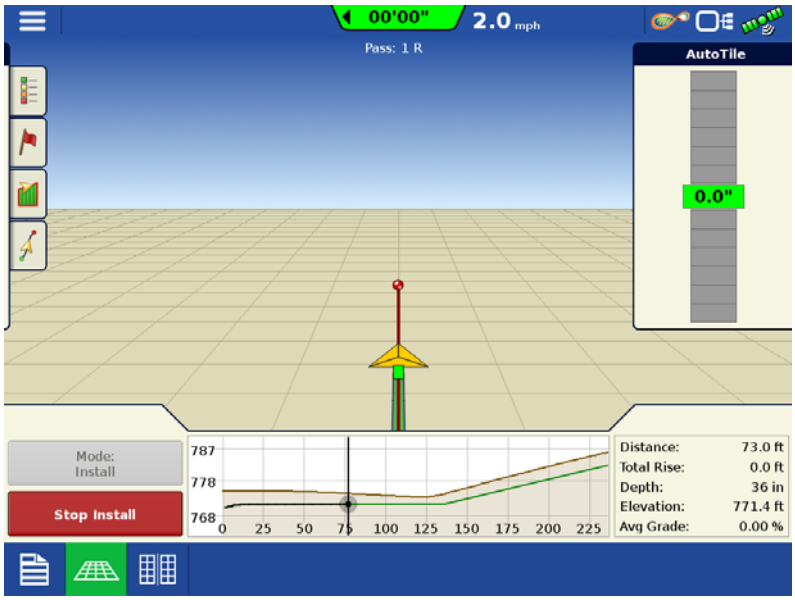
When pushing AutoLevel make sure people are clear, as the machine will move.

AutoTile in Process

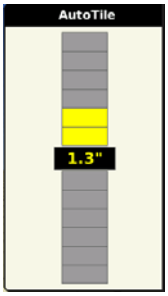
As installation progresses, the progress is marked by a shaded region under the target profile.

If the plow starts substantially below the target depth, the target profile will initially rise at an aggressive pitch to reach its target depth, and then level out.

The overhead map continuously updates to show your current location in relation to the path.



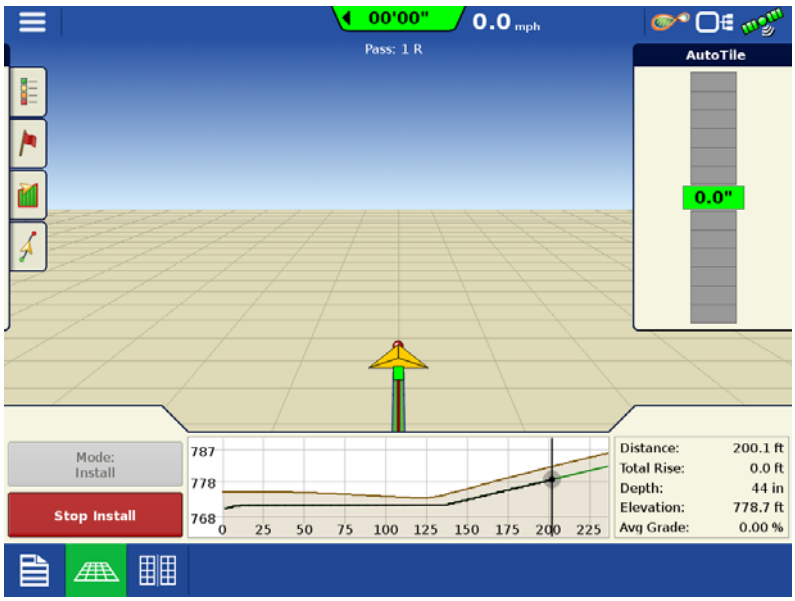
On-grade Indication—Intellislope displays how close the current installation point is to the target elevation.



This is similar to the arrows and on-grade signals displayed on laser masts. The distance off the target profile is indicated in inches shown as high or low. Otherwise "0.0"" is displayed on a background of green.

If this indication shows the plow running consistently too deep, or consistently too shallow, (and it is set up as a pitch plow) then the Pitch Zero needs to be adjusted on the Machine Setup screen. Please see the section "Ongoing Pitch Zero Adjustment" for detailed instructions. If you are using a non pitch plow, GPS Gain can be adjusted.

When reaching the end of the survey path, press the "Stop Install" button to finish the run and save the installation log.



To extract the plow, press the "Up" button to manually nose the plow up while pulling ahead to bring the plow out of the ground.

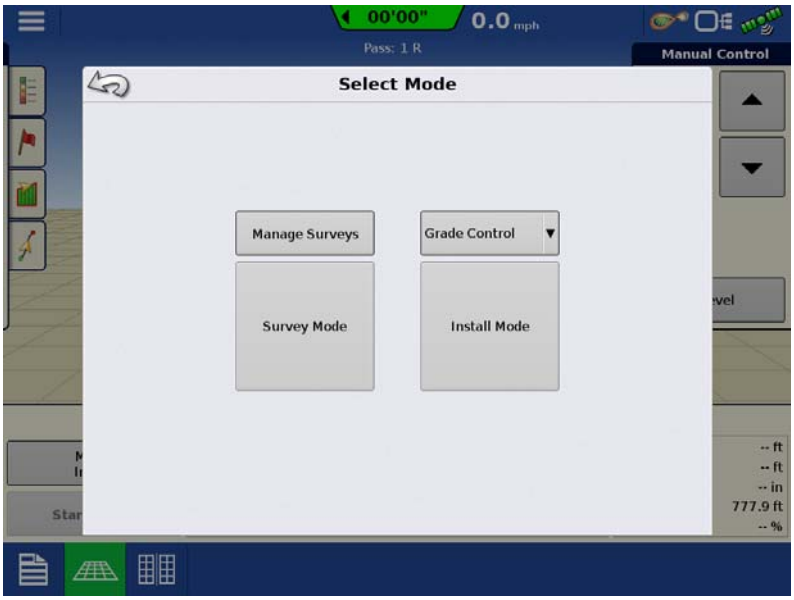
Never try to pick up the plow using the three-point hitch, or the wheel lift frame for a pull type, when it is in the ground. Always pitch the plow up and pull forward. When the cutting edge is close to the surface, use the wheel frame or three-point hitch to raise to transport position.

Grade Control

If you have tiled with a laser, Grade Control should be natural. You select grade and grade break the same as with a laser. Grade Control is very similar in operation. The key advantage is that all adjustments are made in the cab instead of at the transmitter and mast.

Running Grade Control

Press the Mode: Install button on the map screen and then on the Select Mode screen, select Grade Control and press the Install Mode.

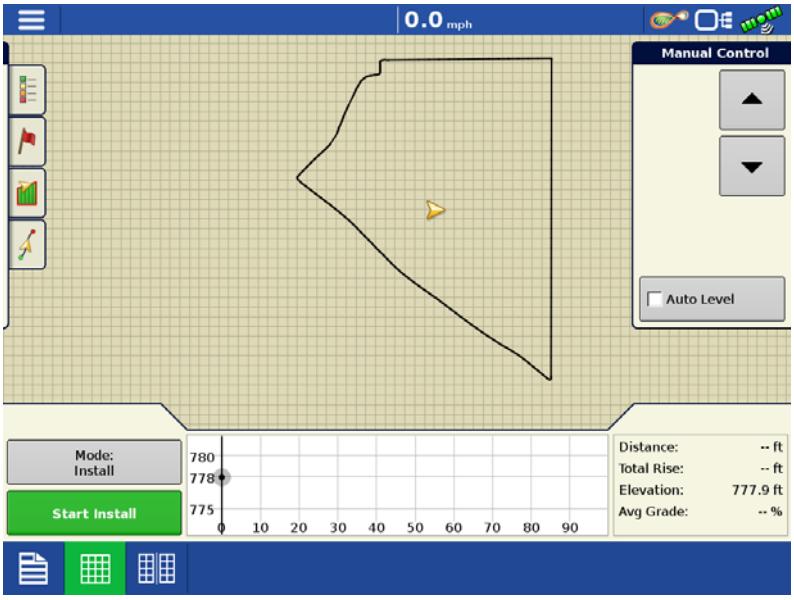


"Up" and "Down" buttons—used to raise or lower the cutting edge of the machine before engaging automatic control.

Auto Level—Automatically levels the cutting edge of the plow as it is lowered to its starting position (pitch plow).

Start Install button—Once the cutting edge of the machine has been lowered to its starting position, pressing this button will cause Intellislope to control the Target Grade and Grade Break as the vehicle progresses forward.

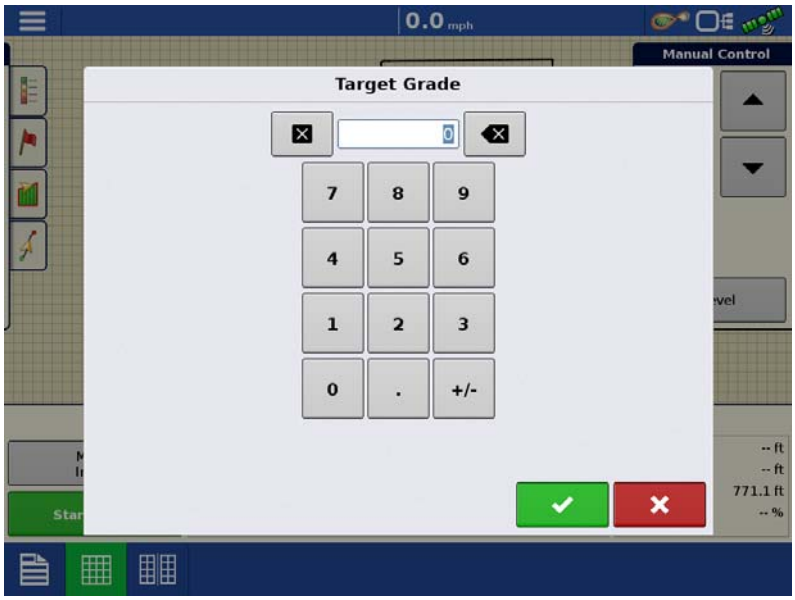
When pushing autolevel make sure people are clear, as the machine will move.

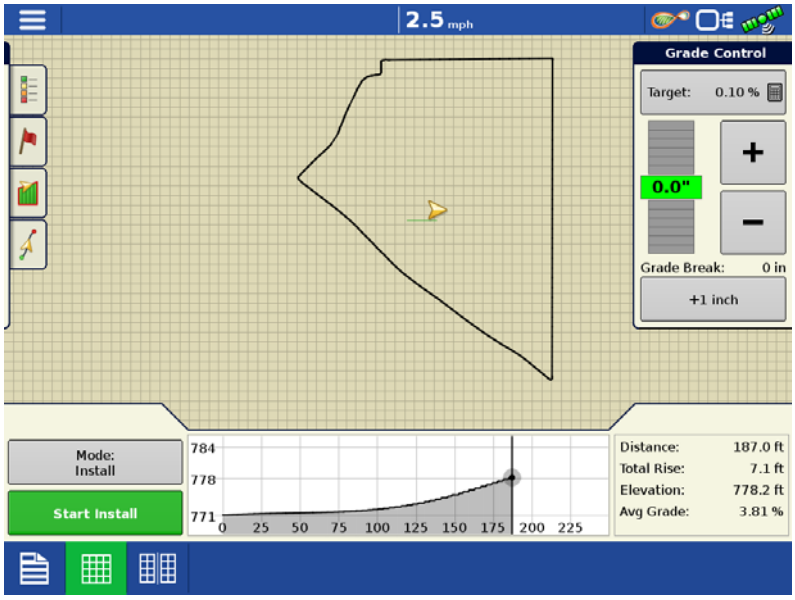


After pushing Start Install, a dialog box will appear to set the starting Target Grade.

Press ✓ to accept Target Grade.

Once grade is accepted, the machine will automatically adjust as it is driven forward.





Target—Use this button to select the grade you desire. You can change this setting on the fly, and Intellislope will follow the new grade starting at the point when the Target grade changed.

Use the + and - button to reach the desired value, or press the target button to enter the desired value on a keypad.

If you are installing uphill, you will need to set the target grade to a positive number, if you are driving downhill, use a negative value.

(The laser equivalent to changing this setting would be: stop the tractor, relocate the laser to the new location, adjust it to the new grade, and resume installing.)

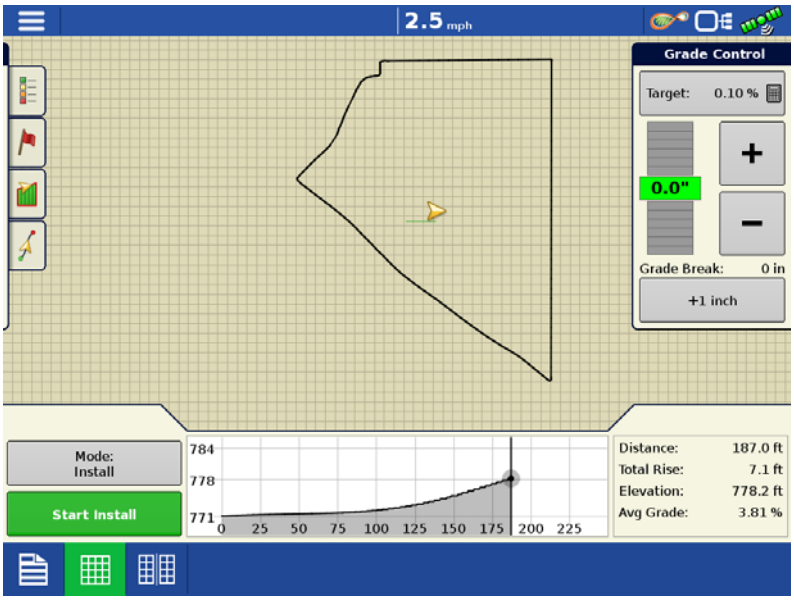
Grade Break—This gives you the ability to add a vertical offset to the tile profile which makes the plow run shallower. Use this if you are too deep. The current Target Grade is otherwise maintained. An example of a common use for this is if you had a flat run at 0.1% grade, went up a hill, and then flattened out again. You could leave the grade at 0.1% and then grade break up the hill until you get to where it flattens out.

On-grade Indication—Below the Target button, Intellislope displays how close the current installation point is to the target elevation.

This is similar to the arrows and on-grade signals displayed on laser systems. The distance off the target profile is indicated in inches shown as high or low. Otherwise "0.0"" is displayed on a background of green.

If this indication shows the plow running consistently too deep, or consistently too shallow, (and it is set up as a pitch plow) then the Pitch Zero needs to be adjusted on the Machine Setup screen. Please see the section "Ongoing Pitch Zero Adjustment" for detailed instructions.

If you are setup as a Non pitch plow, and you are running too high, you need to adjust the GPS gain as a lower value, if you are running too low, you need to adjust to a higher value.



Noise or error in the GPS elevation, noise in the pitch signal, rocks, soft spots, some degree of control system hunting and overshoot, among other things, can cause brief deviations from on grade. Only when the plow is consistently high or low does the Pitch Zero need adjustment.

Press Stop Install to end installation.

To extract the plow, press the "Up" button to manually nose the plow up while pulling ahead to bring the plow out of the ground.

Never try to pick up the plow using the three-point hitch, or the wheel lift frame for a pull type, when it is in the ground. Always pitch the plow up and pull forward. When the cutting edge is close to the surface, use the wheel frame or three-point hitch to raise to transport position

Pitch Control

Pitch Control mode is only applicable for pitch plows. Other types of machinery should not attempt to use this mode.

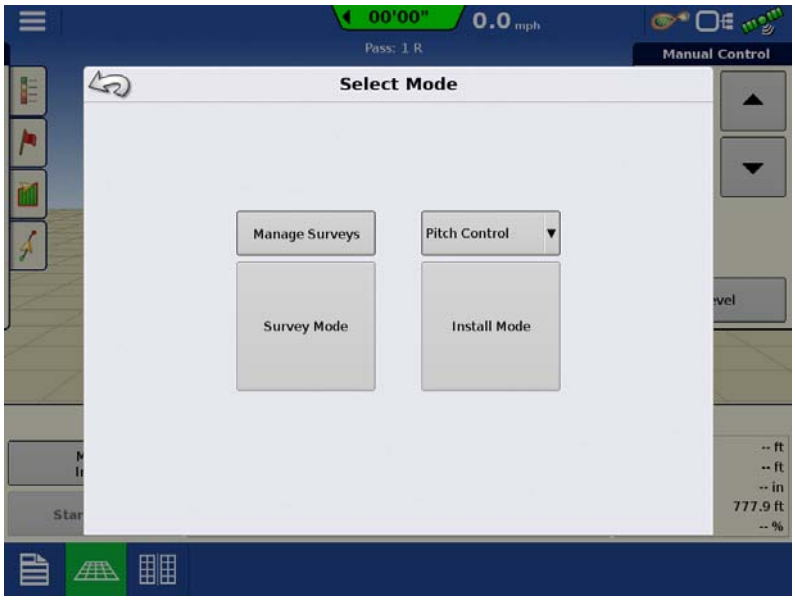
Pitch Control is a fall-back mode of operation which may be used when GPS is unavailable. Keep in mind that:

- The Pitch Zero must be calibrated and correctly adjusted.
- Always prefer Grade Control or AutoTile mode when GPS is available. Pitch Control mode does not use GPS. It merely holds the plow shank at a specified pitch based off the WMC.
- Do not depend on the installed grade matching the pitch with better than 0.5% accuracy.
- Entering the incorrect pitch with a pull type plow may result in the plow emerging from the ground, and be unsteady, possibly resulting in the plow tipping on its side.
- Always use visual depth and pitch to verify plow operation.

Running Pitch Control

Press the Mode button on the map screen and then select Pitch Control and Install on the Select Mode screen.

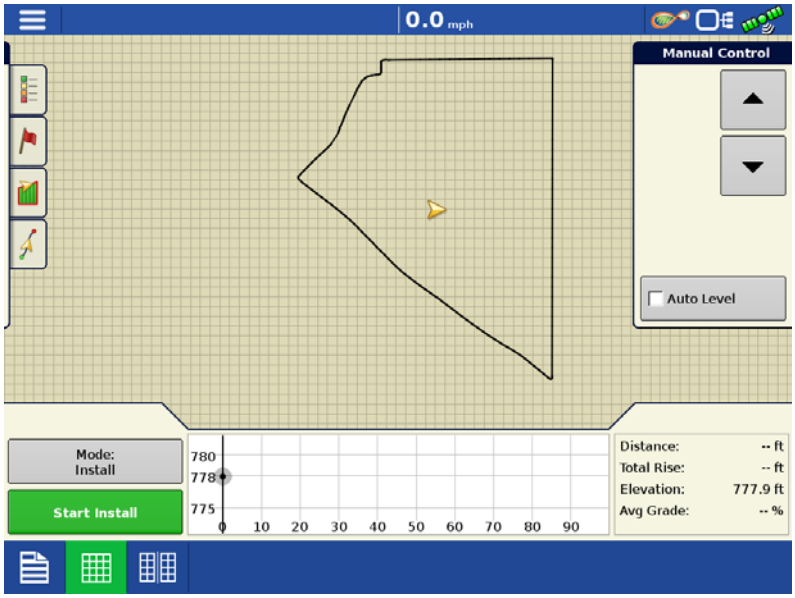
Press the Mode: Install button on the map screen and then on the Select Mode screen, select Pitch Control and press the Install Mode on the Select Mode screen.



Press Start Install button to begin Pitch Control.

A keypad will be displayed to enter the desired starting pitch. When you accept this starting value, the machine will respond to the display, so ensure by-standards are not in the way.

The "Up" and "Down" buttons will be visible and can be used to move the cylinders prior to starting install. Use AutoLevel to level the plow at the start of the run. If the implement is in the ground, do not use the AutoLevel.

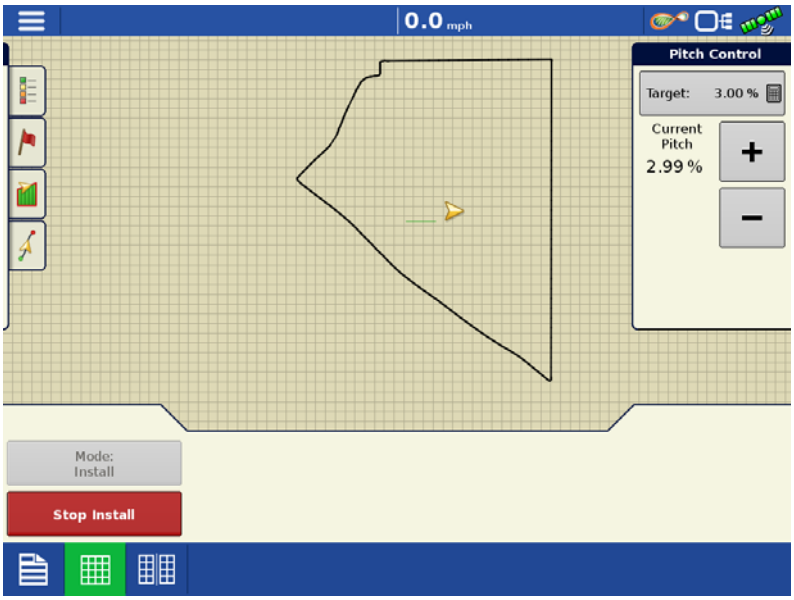


Use + and - buttons to raise and lower pitch or use Target button to enter a numeric value for pitch.

The installation grade will be approximate the plow shank's pitch.

The module slope sensor will match to the provided Target Pitch.

Press Stop Install to end Pitch Control.



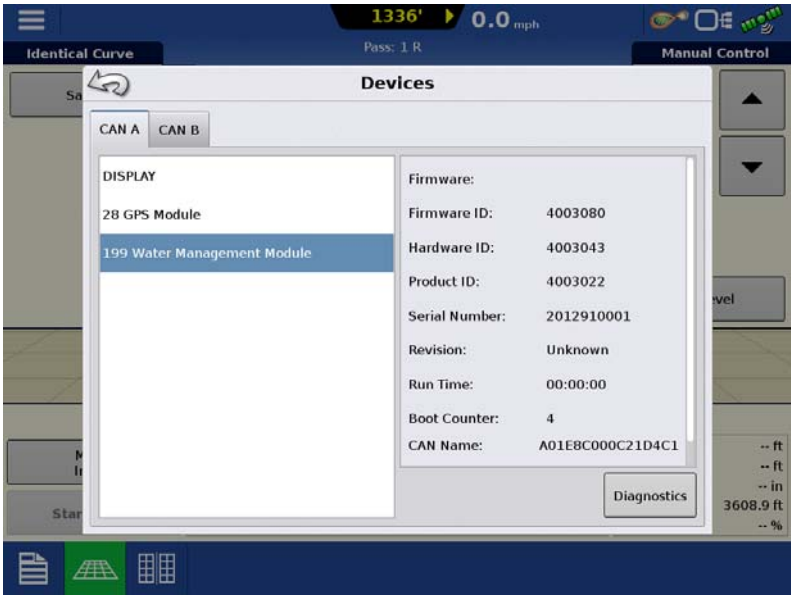
To extract the plow, press the "Up" button to manually nose the plow up while pulling ahead to bring the plow out of the ground.

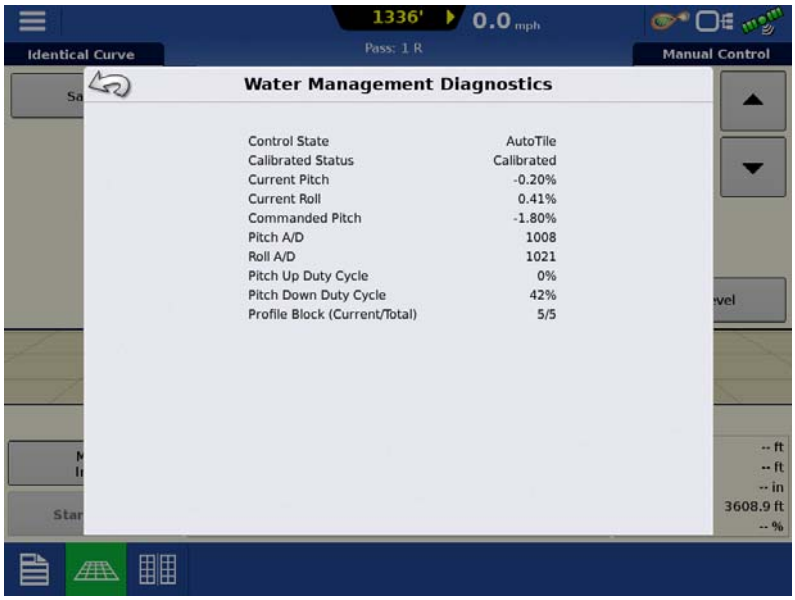
Never try to pick up the plow using the three-point hitch or the wheel lift frame for a pull type, when it is in the ground. Always pitch the plow up and pull forward. When the cutting edge is close to the surface, use the wheel frame or three-point hitch to raise the plow to transport position.

Diagnostics

Devices

Press to open the Devices screens. Technical support may request that you look at these screens for help in diagnosing a problem.

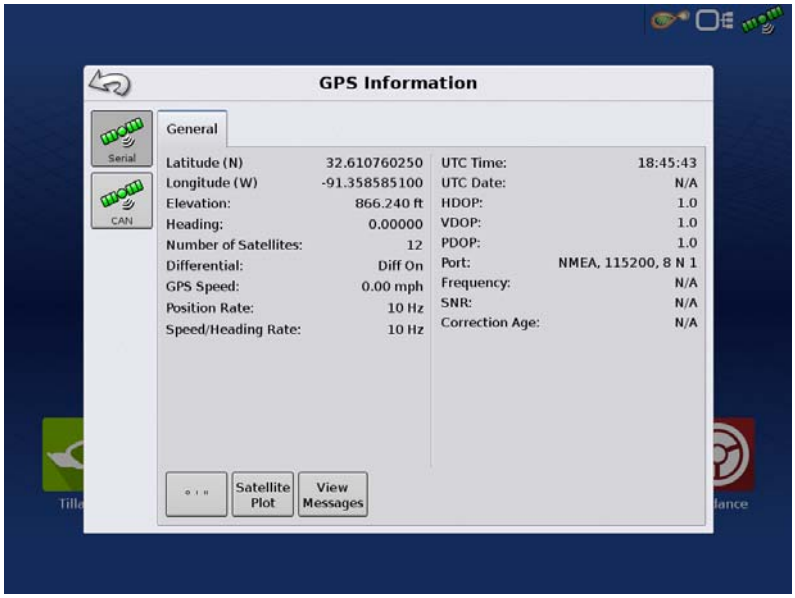




GPS

During your field operation, the GPS (satellite) button in the upper right-hand side of the Status Bar should appear as green, which means you are receiving a differential GPS signal. If this icon appears yellow, you are still receiving GPS but are not receiving a differential signal; and if it appears gray then you have lost GPS. In either case, you should check your GPS settings.

The two buttons on the top left will appear if the display is receiving GPS signals from two GPS receivers (one from plow-CAN, one from vehicle -serial, or Ethernet).



Lessons Learned and Pitfalls to Avoid

The following is a list of pitfalls that we've observed and can degrade performance. Operators should be aware of these to better avoid them, and should be alert to the on-grade indicator and installation profile to detect when these conditions arise. Some are under the control of the operator while others are not, such as hitting rocks and loss of GPS fix or quality. The list is provided on a best effort basis; it may not be exhaustive. Should an installation error occur, it is straightforward to correct by installing a bypass around the affected section of tile.

Extreme Soil Conditions—Hard clay soil, loose already-plowed soil or soft bottoms can interfere with the ability of the shank's trajectory through the ground to be controlled by the shank's pitch. Normal operation requires that the pitch of the shank guide the trajectory. Soil that has been overplowed and is loose does not generate sufficient force acting on the shank surfaces to allow pitch to control the elevation.

Tractor Effects—A tractor effect is an interaction between the tractor and plow that can push the plow off the target. One such effect occurs as the wheels of the tractor pass over a sharp hump, trash from previous plowing or any uneven surface, the plow hitch will be similarly raised or lowered, pulling the plow frame with it. Pitch control will compensate, however the hydraulics can only fill the cylinders so fast, and so they may not keep up. To allow the system to keep up, drive over any uneven surface as slowly as possible.

Low Hydraulic Pressure—Forces acting on the buried plow shank are large. In the face of these forces, the hydraulic cylinders actuating the plow shank must create large forces and thus high hydraulic pressure is required to displace them. Insufficient hydraulic pressure can leave the system unable to adequately control pitch. Lower pressure can also make the plow slower to respond as it slows down the rate at which the hydraulic cylinders fill.

Older tractors may have open-center hydraulic systems in which hydraulic pressure is proportional to engine RPM, so at low RPM there is insufficient pressure. Modern closed-center hydraulic systems are pressure regulated and are not subject to this problem.

Failure to Float the Three-point Hitch or Wheel Frame—The plow needs to float and freely pivot as it goes through the soil. Force exerted from the three-point hitch, or wheel frame on pull type plows will displace the plow from the target depth. Always ensure the three-point hitch, and wheel frame are in the "Float" setting before beginning installation.

Operating Too Shallow—(less than ~20 inches), and Pull-type Plow Down Pressure

Forces bearing upon the top of the shank allow it to drive deeper when required by control logic. When too shallow, this force can be insufficient.

Related to this issue is the down pressure in the wheel cylinders of a pull-type plow. When shallow operation of a pull-type plow is required, the valve setting on the down-pressure cylinders should be lowered. Too much up pressure can also lift the plow up from the target profile.

The down pressure, depth of operation and soil conditions may interact such that some soil may require deeper operation or lower down pressure than other soils.

Driving Too Fast—When an installation is started with the plow much deeper than the target profile, the system will schedule a target that rises rapidly towards the target profile. When this steep section meets the relatively-level target profile, driving too fast can cause the plow to overshoot the target, as the cylinders can only change the plow pitch so fast. Drive slowly when the target profile grade is changing rapidly.

Obstructions—If you encounter a rock or other obstruction in the field use the Stop Tiling button, and end the install. After you have freed the plow from the rock you are now able to continue tiling. If using Grade Control Mode, you can use the Grade Break to raise the target depth to prevent a flow reversal in the tile. If you were using Autotile, re-select the survey, and adjust the depth settings to create a new target depth. This may include lowering the Minimum depth value, lowering the grade, or lowering the max depth value.

Detuned Configuration Parameters—The pitch gain, look ahead distance, valve thresholds, start compensation and pitch zero settings are discussed in “Water Management” on page 10. Low gains and valve offsets can make the plow respond too lazily, and setting them too high can induce instability.

GPS Interruptions—The elevation control is only as good as the ability of GPS to report elevation. Loss of GPS fix or quality, or change in satellite constellation can cause the GPS to report erroneous elevations. If using a battery-powered RTK base station, the battery can run down leaving the unit without correction.

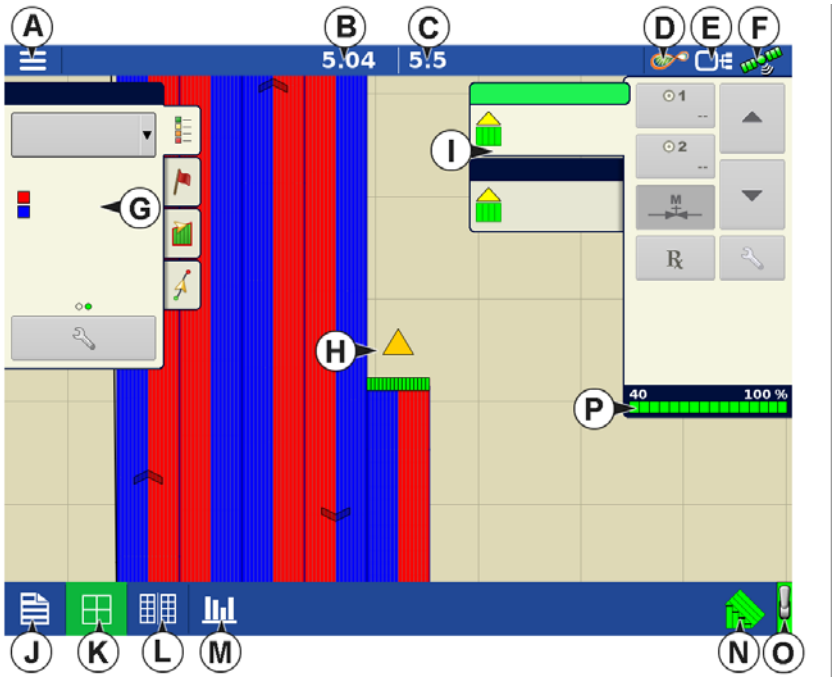
Defective Components—A rusty/dirty hydraulic valve is an example of a bad component that can degrade performance. Of course as with any electro-mechanical system. Ensure that when connecting hydraulic lines to the tractor, that the tips are clean before connecting them. Intellislope components are not immune to failure. Most component failures lead to the system being inoperative, not degraded performance.

By configuring your display with Planter Section Control, you can start and stop seed flow and control planter sections row-by-row, allowing AutoSwath Control to automatically turn planter row units on and off based on your planting map.

Map View

Once a configuration has been completed, the Map View screen appears.

A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Vehicle Icon
I. Product Control toolbox
J. Event Summary
K. Map View
L. Split screen
M. Advanced Seed Monitoring
N. AutoSwath
O. Master Switch Status
P. Section Status Indicator



NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:

OR

Your Operating Configuration will then be viewable when you start a new Field Operation with the Planting Operation Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

Load Configuration

Press the Planting App from the home screen. This will take you through the steps needed to load a configuration.

Creating Products

Creating planting products can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Follow described steps to create planting varieties during initial setup.

1. Select **Product Type** (Crop) and **Product Units** (seeds or pounds)
2. Enter **Variety** or **Hybrid** name

   Press to enter a unique name for the variety or hybrid.
3. Enter **Variety** or **Hybrid Manufacturer** is applicable

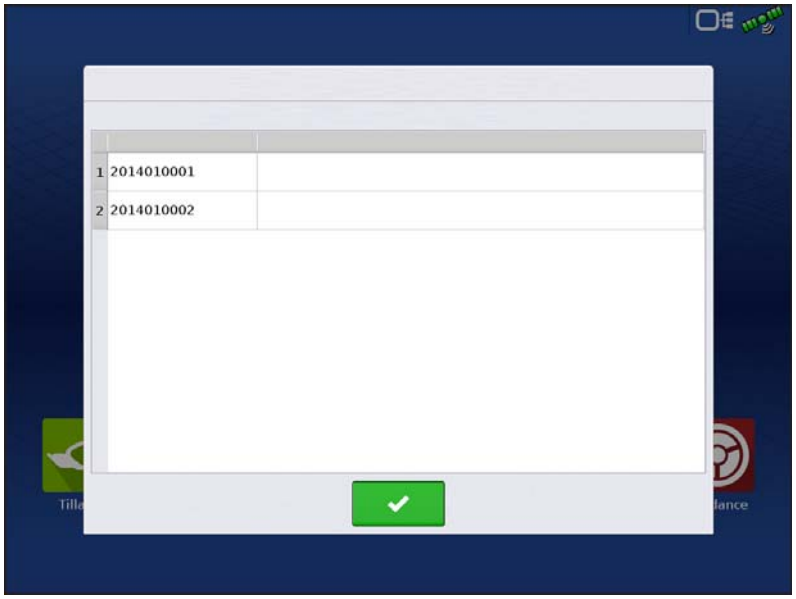
   Manufacturer name can be added to the drop-down menu by pressing .
4. Press to complete Product setup.

   Created variety or hybrid should appear under the Planting heading located on the Product tab of the Configuration Setup Screen.

Configuration Setup

Once the configuration is created and it appears on the Configuration Setup screen, AutoSwath should be configured correctly. However, if you cannot get the configuration to load on the Field Operation Wizard, or if your vehicle does not appear on the Map screen, you may wish to check if the row clutches have been correctly set up in Implement Setup. Use the following procedure to enable Seed Row Shutoff and/or configure the Clutch Module.

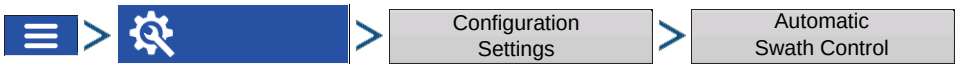
The Row Shutoff Module Configuration screen appears. This screen shows the number of Row Shutoff Modules and the sections that each module controls.



NOTE!: If you receive the message **"Configuration Failed. The number of detected module outputs does not equal the number of planter sections."** refer to the Troubleshooting section of this User Guide.

Automatic AutoSwath Control

OR



NOTE!: To use AutoSwath for planting operations, you are required to use a 5 Hz or higher GPS output rate. AutoSwath control will not allow sections to be turned on until the master and planting section switches are on. If you have less than a 5 Hz GPS output rate and you select AutoSwath, a warning appears, telling you that AutoSwath Control is not available at less than 5 Hz.

The Automatic Swath Control feature turns sections off and on automatically based upon the following conditions:

- Entering and exiting internal and outer field boundaries.
- Entering and exiting previously-applied areas within a field.

Outside Boundary Option—Select one of the two options to determine system behavior when a section exits a field boundary.

- **Keep Unchanged—**Clutch section on/off status will not change when exiting the field as defined by the outside boundary.
- **Turn Section Off**—Clutch section will cease planting when exiting the field as defined by the outside boundary.
- **Coverage Option**

  In the Coverage Option area, you must choose between three options:

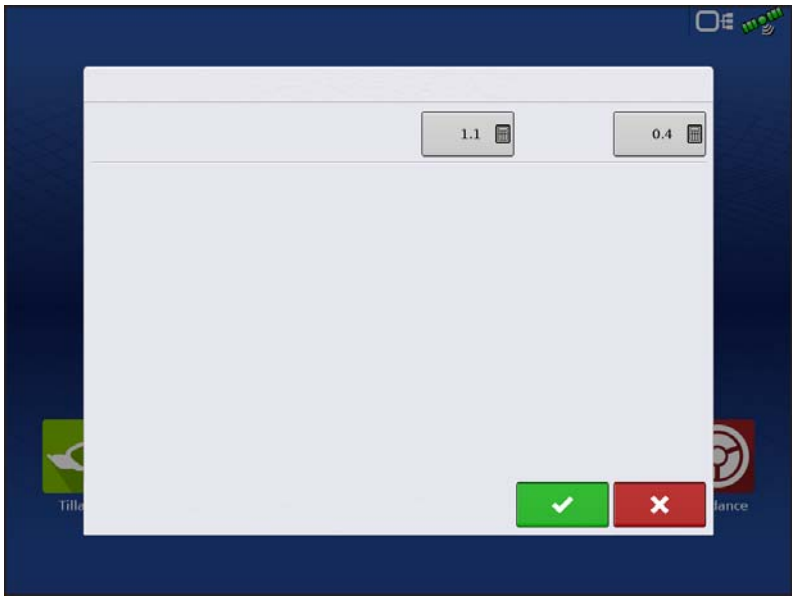
  - The **Minimize Skip** option turns off the implement section after the entire section is fully inside your coverage area. This prevents the possibility of skips.
  - The **Minimize Overlap** option turns off the implement section when that section first enters your coverage area. This prevents the possibility of overlaps.
  - The **User Defined** option allows you to choose what percentage of the implement section is within the coverage area before that section turns off. For example, if you choose 50%, then the section will switch off when half of it is within your coverage area.

Look-Ahead Settings

AutoSwath Control settings are saved per controller per configuration. There can be different Look-Ahead settings saved for equipment of the same operation. The Look-Ahead Settings screen will contain every controller's Look-Aheads.

On the AutoSwath Control screen, press the Look-Ahead button.

Turn-On—This setting determines how far ahead the system looks to turn the sections back on. This setting compensates for delay in the planting control system when the implement sections are turned on.



ATTENTION!: For best performance, do not change travel speed as you are entering the planted area. Accelerate either well before entering the planted area, or after all clutch sections have turned On.

Turn-Off—This setting determines how far ahead the system looks to turn the sections off. This setting compensates for delay in the product control system when the sections are turned off.

ATTENTION!: For best performance, do not change travel speed as you are nearing the unplanted area. Decelerate either well before entering unplanted area, or after all clutch sections have turned Off.

Row Shutoff Look-Ahead Numbers

This table references the Turn-On Look-Ahead and Turn-Off Look-Ahead numbers for both Electric Clutch and Air Row Shutoff Modules.

Planter Unit Seed Meter Type	On/Off	Electric Clutch	Air Clutch
Finger Units	Turn On	0.9	1.1
	Turn Off	0.3	0.3
Vacuum	Turn On	0.9	1.1
	Turn Off	0.4	0.4

NOTE!: Using the above settings should produce good field results. However, always take the time to check for proper seed placement in the field and make system setting adjustments as needed. Do not rely solely upon the appearance of the On-Screen map. The on screen map will not show gaps and overlaps caused by incorrect GPS Offsets or AutoSwath Look-Ahead settings.

Checking AutoSwath Performance for Row Shutoff

The settings given in the above AutoSwath Look-Ahead table shown previously have been tested with each clutch and seed meter combination to work for your planter. However, always take the time to check for proper seed placement in the field and make system setting adjustments as needed. Do not rely solely upon the appearance of the On-Screen map. The on screen map will not show gaps and overlaps caused by incorrect GPS Offsets or AutoSwath Look-Ahead settings. Verify settings with the following procedure:

1. Stop the planter within 20 feet of the planted headland.
2. Select one row unit from each planter swath section to observe.
3. Remove the down pressure from the closing wheel of each selected row unit.
4. Hold the closing wheels off the ground by attaching a chain or strap from the hopper support panel to the closing wheel arm. (This prevents the closing wheels from closing the seed trench).

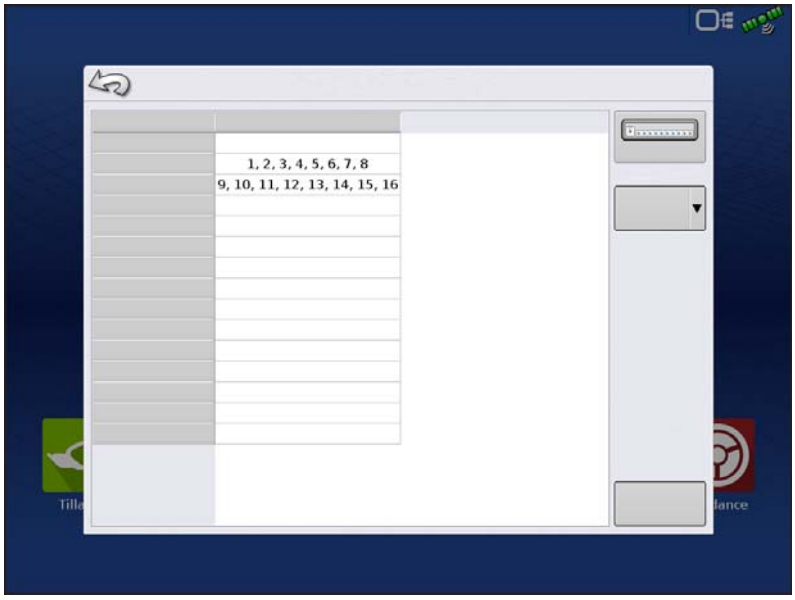
NOTE! Securing these closing wheels up allows you to observe the planted seed in the trench so that you can observe when the AutoSwath is turned off and on during the seed application.

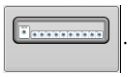
5. Resume planting in your normal fashion, then stop when you are 20 feet out of the headland of the next pass.

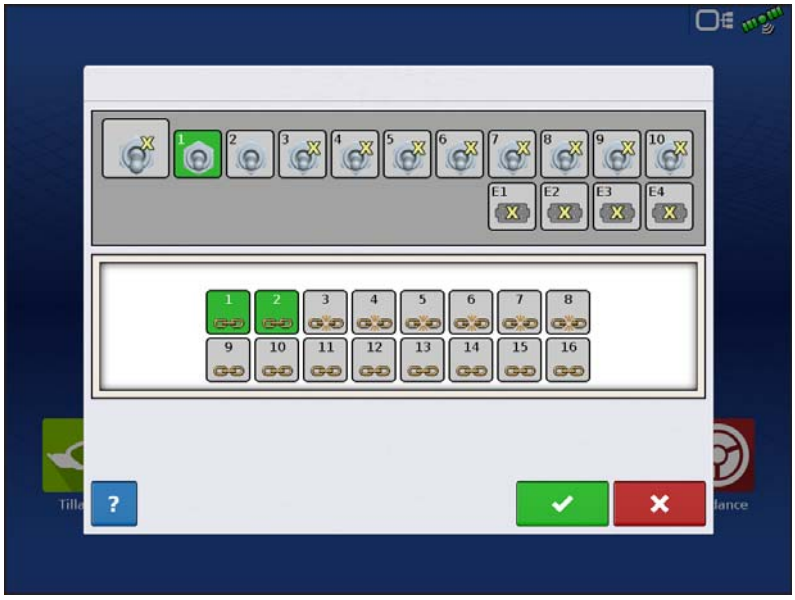
6. Stop the planter and observe the AutoSwath shutting off and turning on to see if the results are acceptable.
    - If the results are correct, then return the closing wheels to their previous operational state. Close the seed trench on the observed rows and return to planting.
    - If you suspect the results are incorrect, then adjust the appropriate Look-Ahead setting one-tenth (.1) second per trial. Larger adjustments can cause unintentional large changes in the AutoSwath's performance. When adjusting the Look-Ahead numbers from the suggested settings, it is recommended that you observe multiple trials to confirm the operations' accuracy.
    - If you encounter overplanting or underplanting problems, see "Fixing Overplanting and Underplanting in AutoSwath" in the TroubleShooting section.

Auxiliary Input

Clutch control planter sections will default to the first two switchbox switches with a planting operation. AutoSwath will still trigger sections on/off by each section in a planting application. If the operator would like to turn section(s) on/off by a single switch, the sections will need to be assigned.



1. Press  .



2. Highlight the desired switch to assign a function to it.
3. Select appropriate function(s) (clutch sections for this operation) to assign to the desired switch. Chain icons with in each function will "link" once pressed to indicate they are assigned. If a function has a "broken link" then it is not assigned. If a switch has a "X" then it is not assigned to a function. Press the to save the setup.

NOTE! Even if no specific functions are assigned to the Master switch, the Master switch will still serve as the total system on/off switch.

Clutch Diagnostics

> > highlight the item marked **Seed Clutch Module** > .

There will be a Seed Clutch Module in the CAN A tab for each module on the CAN BUS.

The Clutch Diagnostic screen includes section status for the module. If there are multiple clutch modules, there will be a tab for each identified by the Serial Number. This screen can be used to diagnosis section status, and what sections are mapped to specific switches. If a section is Off the indicators will be gray, if the section is On the indicators will turn green.

TroubleShooting Planter Section Control

Problem—Receiving the message "Configuration Failed. The number of detected module outputs does not equal the number of planter sections."

Solution—The number of detected clutch sections by the module(s) does not match the sections setup in the configuration.

1. Verify the configurations clutch sections is setup to match the planter setup. The number of clutch sections is determined by the clutch adapter cable plugged into the module.
2. If the number of sections detected is less than what it's supposed to be, check for wiring damage leading to the first failed section. (Ex: On an 8 row planter with 8 clutch sections, if sections 1-6 are detected, check the wiring going to section 7). A clutch may not be plugged in, or wires damaged.
3. If the number of sections detected indicates "0-0" verify high power (12V) going to the clutch control module. Also verify the high power "T" connection leading off the adapter cable is connected.

    - If 12V is verified at the clutch control module, check for wiring damage leading to the first clutch section.

NOTE!: Testing for 12V will be done at the 2-pin duetsch connections.

Fixing Overplanting and Underplanting in AutoSwath

AutoSwath Function—Turn Off Look Ahead

Problem—Underplanting

Recommended Action—Decrease Look-Ahead number

Result—The AutoSwath anticipates headlands later and turns the planter off later.

Problem — Overplanting

Recommended Action—Increase Look-Ahead number

Result—The AutoSwath anticipates headlands sooner and turns the planter off sooner.

AutoSwath Function—Turn On Look Ahead

Problem—Underplanting

Recommended Action—Increase Look-Ahead number

Result—The AutoSwath anticipates headlands sooner and turns the planter on sooner.

Problem—Overplanting

Recommended Action—Decrease Look-Ahead number

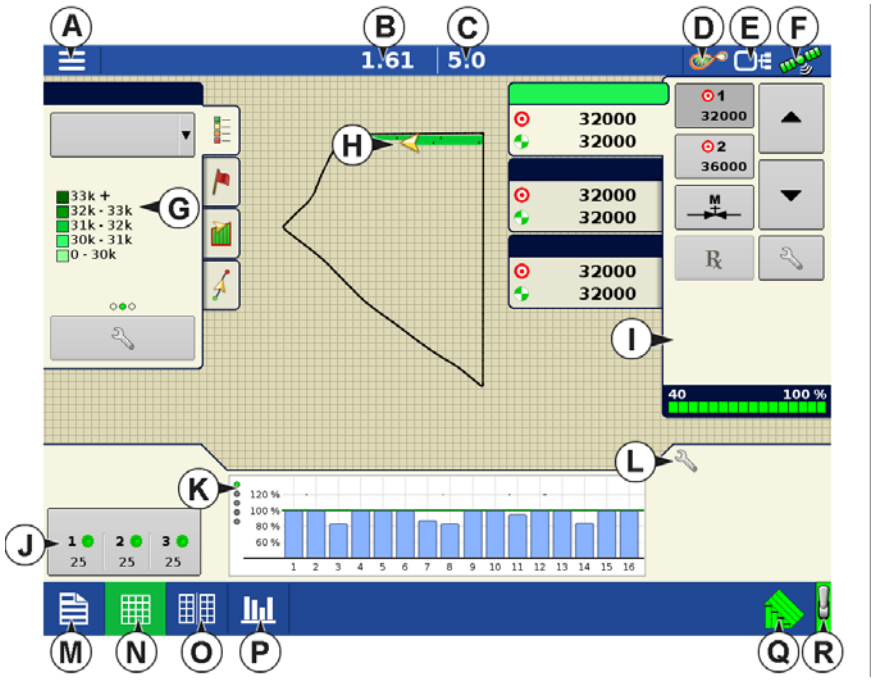
Result—The AutoSwath anticipates headlands later and turns the planter on later.

Load Configuration

Press the Planting App from the home screen. This will take you through the steps needed to load a configuration.

Map View

Once a configuration has been completed, the Map View screen appears.

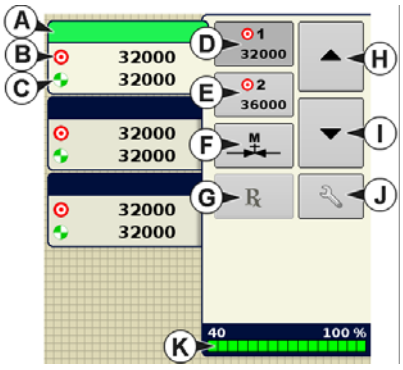


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status Indicator
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Vehicle Icon
I. Product Control toolbox
J. Planter Drive RPM
K. Bar Graph
L. Settings button
M. Event Summary
N. Map View
O. Split screen
P. Advanced Seed Monitoring
Q. AutoSwath
R. Master Switch Status

NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

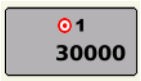
Product Control Toolbox

During SeedCommand Run Time operations, the Product Tabs are shown in the upper right-hand side of the Map screen. Press the Product Tabs, and an extended view shows the Rate buttons, Manual Valve Control button, Prescription button, Rate increase and decrease arrows, and the Rate Setup button, all of which are described below.



A. **Variety**—The Product Control Toolbox can show rates for multiple varieties, depending upon the particular planting configuration. Press the area of the box that shows a particular variety, and a green bar highlights that variety. The Rate 1 and Rate 2 are then shown on the Rate buttons.
B. **Target Rate**—The Target Rate is the desired planting rate.
C. **Actual Rate**—The Actual Rate is communicated by the shaft rotation sensor.

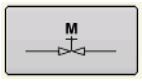
NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.



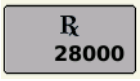
D.**Rate 1 button**

E.**Rate 2 button**

These only appear on Hydraulic Drive or Stepper Seed Meter configurations. The Rate 1 and Rate 2 settings represent preset planting rates that allow operators to quickly change between desired planting rates for each individual product. The active rate button appears with a gray background behind it. In the example above, Rate 1 is active.



F.**Manual Valve Control**—The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to clean out equipment at the end of the day.



G.**Prescription button**

H. **Rate Increase arrow**

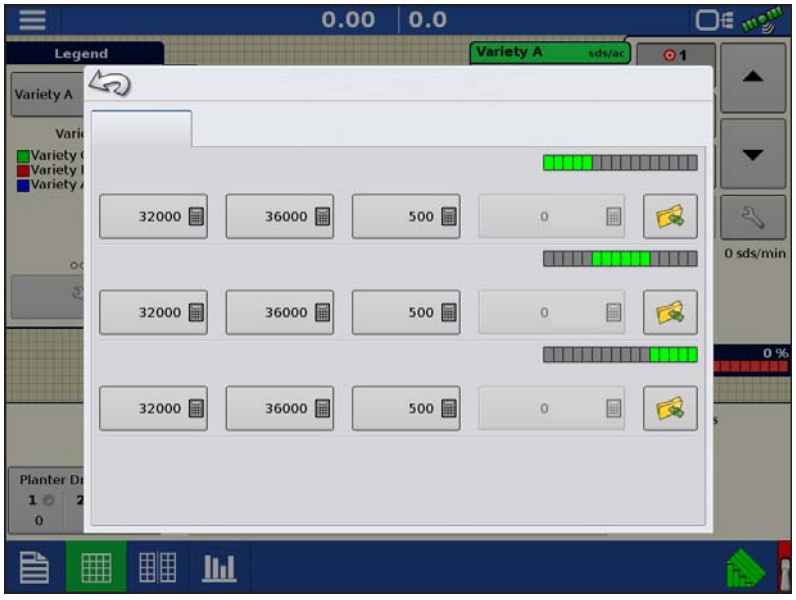
I. **Rate Decrease arrow**

Pressing once on / increments the rate according to the user-defined amount on the Rate Control Settings screen.

J.**Rate Setup button**—The Rate Setup button opens the Rate Control Settings screen.

K. **Section Status Indicator**

Rate Control Settings



Press to adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import planting prescriptions. To access the Rate Control Settings screen, press the Rate Setup button on the Product Control Toolbox.

The Rate Control Settings screen appears.

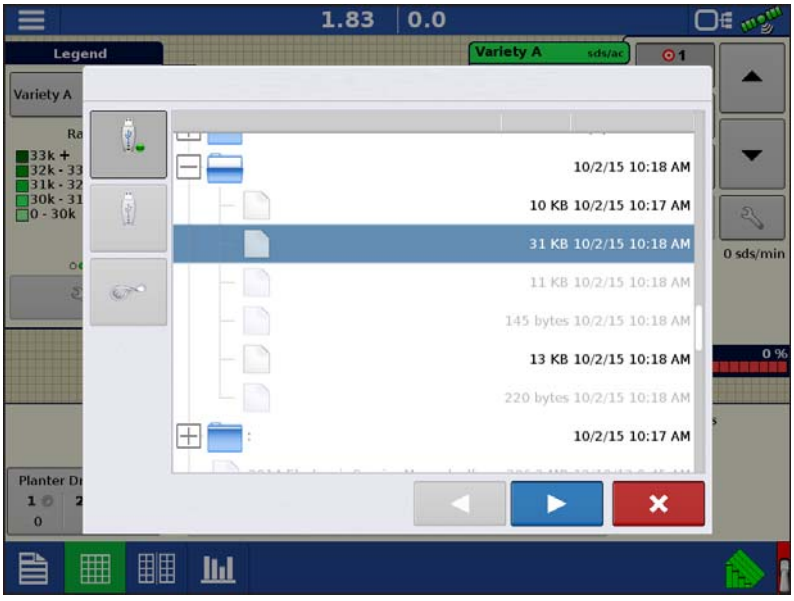
- The **Rate 1** and **Rate 2** settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product. Press to enter the desired amount.
- The **Increment** button allows operators to specify the increase or decrease amounts for a specified rate when using / on the Product Control Toolbox. Press to enter the desired increment.
- To load a map-based prescription file, press .

Loading Prescriptions

Press on the Product Control toolbox.

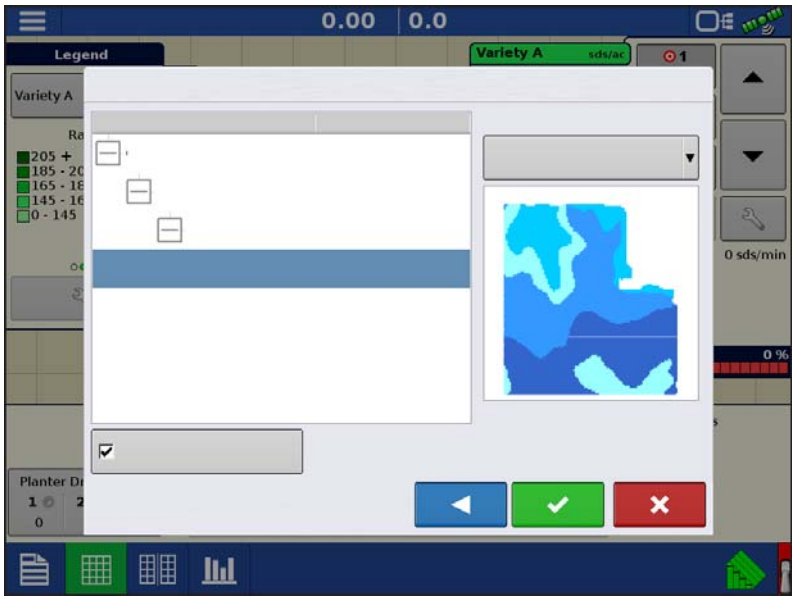
The Rate Control Settings screen appears.

1. Press .



2. The Select File screen appears.
3. Highlight the correct .AGSETUP (prescription) or .shp (shape) file and press .

4. Next select your prescription in the Select Prescription screen. A preview of the prescription map is displayed. The Product shown above the preview will be the variety the prescription is applied to. Select the "Use for all planted products checkbox" if you want the prescription applied to all controlling drives. Press .



NOTE! The ability to control a separate rate for multiple drives is only capable with a Multiple Product Unlock.

5. When you return to the Rate Control Settings screen, the prescription rate is now shown on the screen. The Load Prescription button has disappeared and in its place is the Remove Prescription button, which resembles a minus sign. Press the Remove Prescription button if you wish to remove the prescription from the field.
6. When you return to the Map Screen, the prescription is now shown on the map.

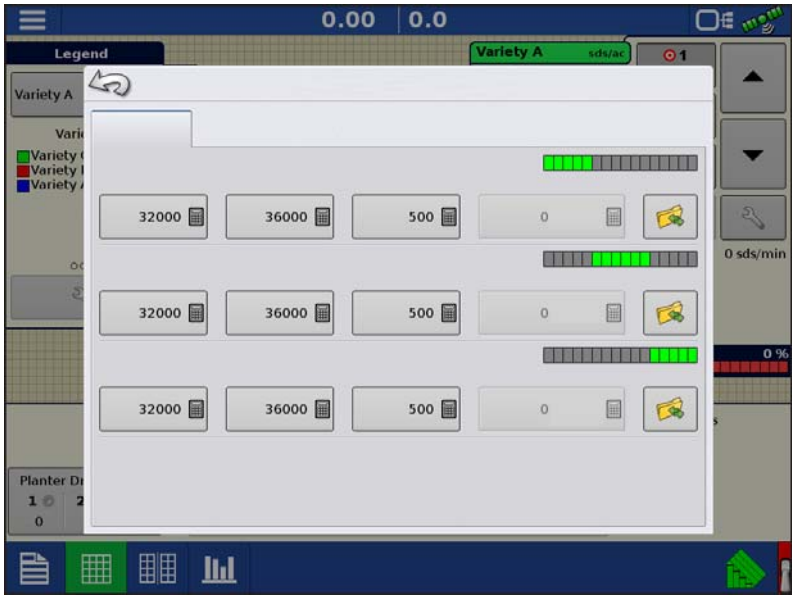
Shape File Conversion

What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple products.

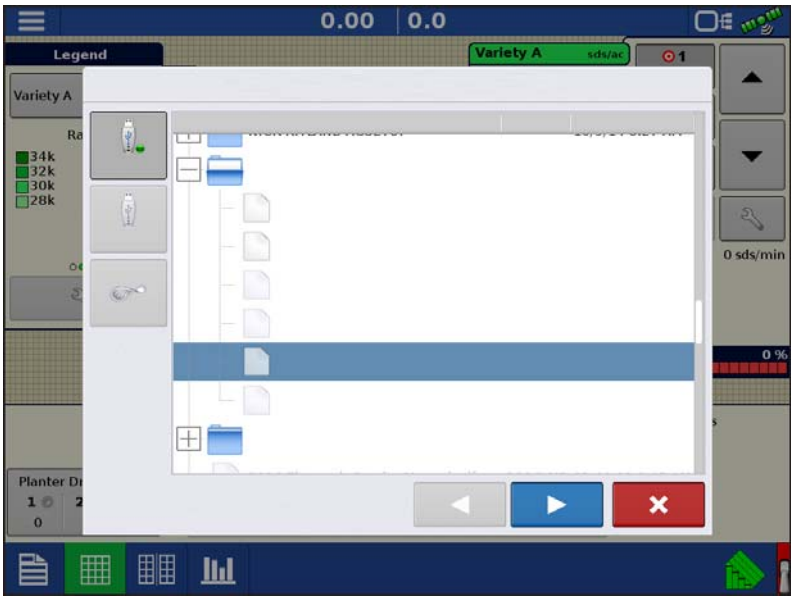
1. To begin, press on the Product Control Toolbox.

The Rate Control Settings screen appears

2. Press the Load Prescription button.



3. The Select File screen appears. Highlight your desired .shp file and press ▶.



4. Select Column From Shape File

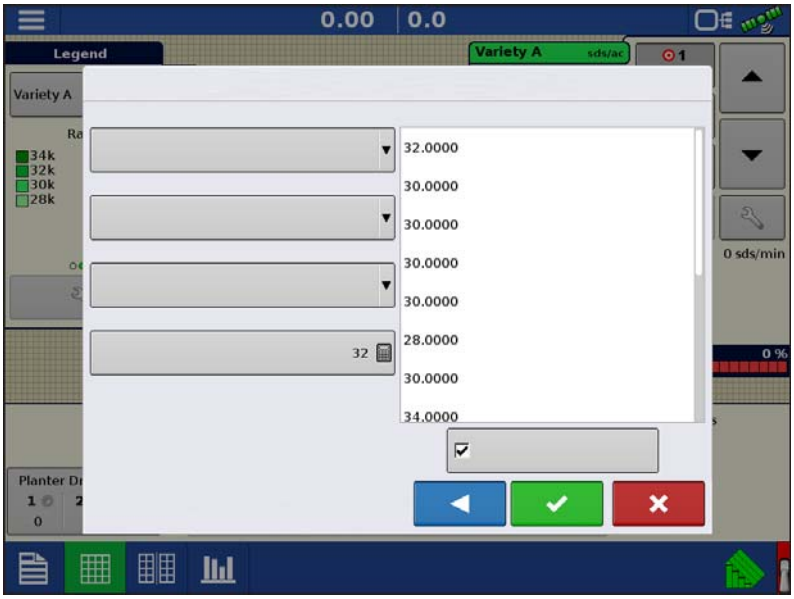
Select the column that contains the product recommendation rate. The list on the right side of the dialog shows sample data from the selected column.

5. Select Units

Select the controlling units for product application.

6. Default Rate Setting

The system assigns a default rate. Use the on-screen keypad to edit the value if desired.



NOTE!: Select the product and units that the shape file prescription was made for. Selection of the wrong data column or unit will result in misapplication of product.

ATTENTION!: The only time the default rate is used by the system during product application is if the Rate Outside of Field selection is set to " Rx default". This setting is located in the equipment configuration settings portion of configuration setup. If the Rate Outside of Field selection is set to "Rx default", the default target rate will be used when the vehicle exits the area covered in the prescription map.

Creating Products

Creating planting products can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Follow described steps to create planting varieties during initial setup.

> > Product > > Seed Variety

1. Select **Product Type** (Crop) and **Product Units** (seeds or pounds).

2. Enter **Variety** or **Hybrid** name.

   Press to enter a unique name for the variety or hybrid.

3. Enter **Variety** or **Hybrid Manufacturer** if applicable.

   Manufacturer name can be added to the drop-down menu by pressing .

4. Press to complete Product setup.

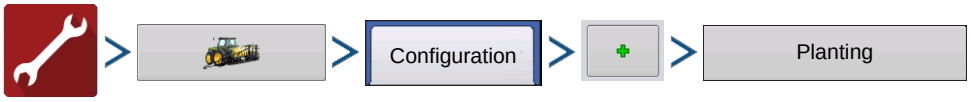
   Created variety or hybrid should appear under the Planting heading located on the Product tab of the Configuration Setup Screen.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:

OR



Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

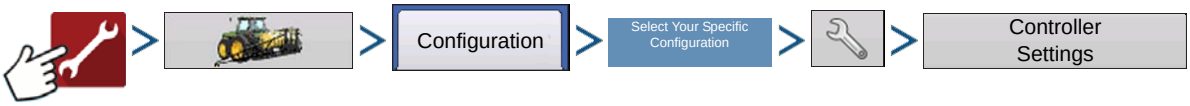
Hydraulic Seed Rate Control

The Hydraulic Seed Control Module allows operators to control up to three hydraulic motor drives with the display. Configure the Hydraulic Seed Rate Control module in the following order.

1. **Enter Controller Settings**—Include the Max Meter Speed, Gear Ratio and Minimum Allowable Ground Speed. See "Controller Settings for Hydraulic Seed Rate Motor Drives" on page 180 ".
2. **Prime the Hydraulic Seed Meter**—Fill seed meter with seed to avoid skips. See "Priming Seed Rate Meters" on page 189.
3. **Meter Calibration**
   A. Enter Meter Calibration Number. This number, representing seeds per revolution, is set according to the number of seed dropped per one revolution of the seed meter.
   B. Perform a Seed Meter Calibration. A new calibration should be performed if as-applied seed rate does not match actual population planted. See "Calibrating Seed Rate Meters" on page 189.

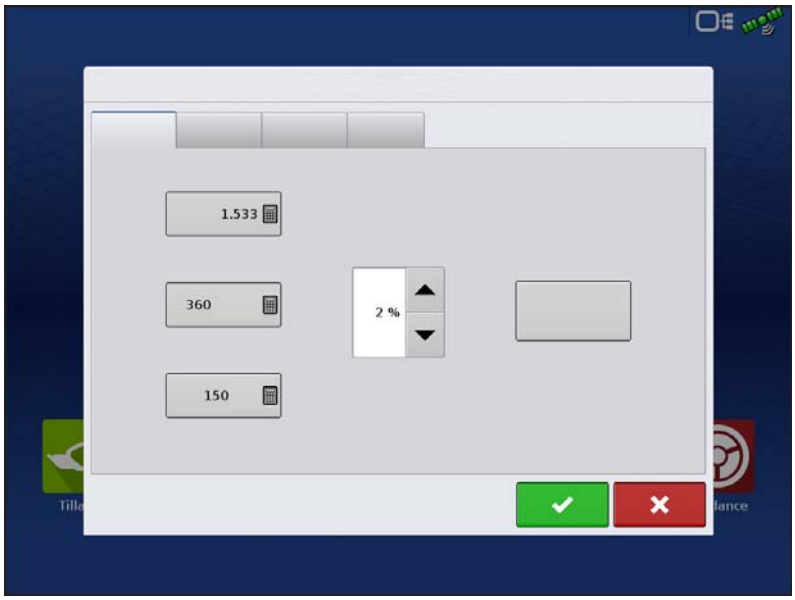
Controller Settings for Hydraulic Seed Rate Motor Drives

After creating an Operating Configuration for the Hydraulic Seed Meter Controller, make settings changes in the Controller Settings screen, which shows valve settings for hydraulic flow and pulses per revolution.



The Controller Settings screen consists of at least two tabs: the Channel Tabs, shown for each channel being controlled; and the Auxiliary Tab.

Channel Tab settings



Gear Ratio—The number of time the hydraulic drive sprocket turns to achieve 1 revolution of the seed meter. This ratio is typically provided by the planter manufacturer. Otherwise use the formula in the examples to calculate Gear Ratio. See "Gear Ratio Calculations for Seed Rate Motors" on page 185. Carry decimal to the nearest 0.001.

Shaft Speed Calibration—Calibration number representing the pulses that equal one revolution of the hydraulic motor.

Maximum Meter Speed—Setting determines the maximum RPM of the seed meter.

Allowable Error—Determines the percent of error that is allowed prior to the product control system making any flow rate changes.

Control Valve Settings—This button summons the Control Valve Settings screen. The appearance of the Control Valve Settings screen varies, depending upon whether planter's control valves are PWM Valves or Servo Valves.

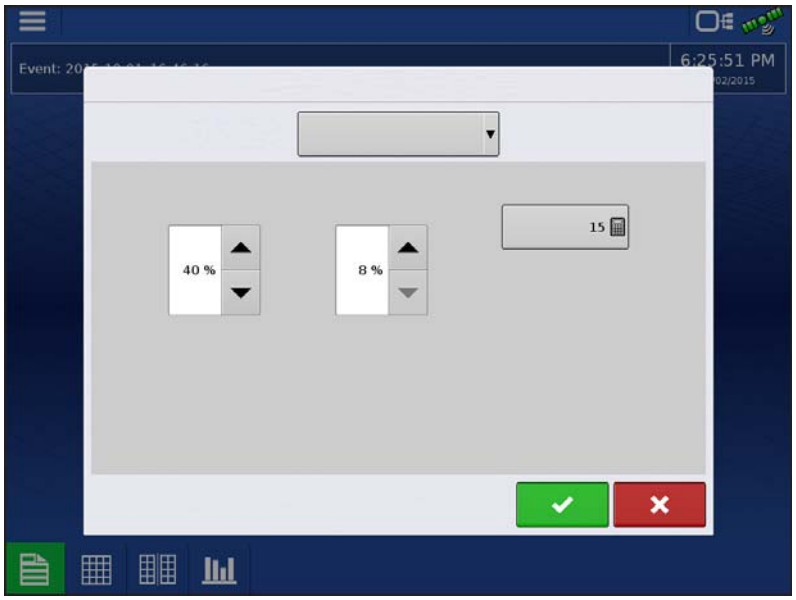
Control Valve Settings - PWM

PWM Frequency—The frequency at which the PWM control valve is pulsed. Settings can be found from the manufacturer of the valve.

PWM Gain—Determines how aggressively the control valve responds when making rate change adjustments. The higher the value the more aggressive the system response.

Zero Flow Offset—Represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero Flow Offset value can cause the product control system to not properly control flow rates at low rates. See the PWM valve manufacturer's information for recommended settings.

Control Valve Settings - Servo

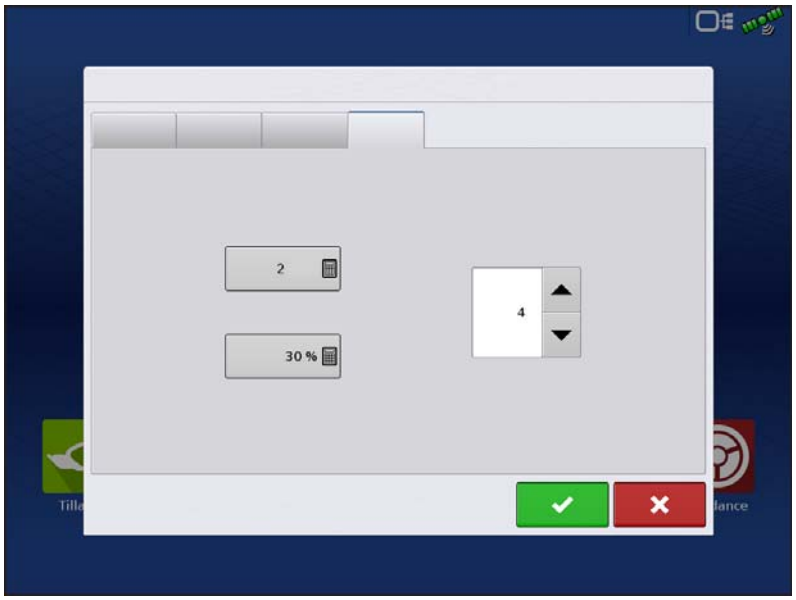


Valve Response 1—Determines the speed of the servo valve when product control error exceeds the Response Threshold setting.

Valve Response 2—Determines the speed of the servo valve when product control error is less than the Response Threshold setting.

Response Threshold—Determines the system responsiveness to rate change.

Auxiliary Tab settings



Minimum Ground Speed—The planter will plant at this simulated ground speed, until displayed ground speed is above this value. This fixed ground speed compensates for delays in acquiring an initial ground speed when starting from a stand still. Planting at the minimum ground speed will occur when either of the following conditions are met:

A. Wheel motion is detected. Requires wheel motion sensor.

B. Jump start switch is depressed. Required jump start switch kit.

Rate Not Responding Threshold—The percentage of seed rate error that triggers the alarms.

Rate Not Responding Time—The amount of time that the error occurs before the alarm sounds.

Hydraulic Seed Controller Settings for Specific Planters

NOTE!: The settings, provided below, should be a good starting point for control Look-Aheader settings. However, always take the time to calibrate the seed meters, check for proper seed placement in the field, and make system setting adjustments as needed. Do not rely solely upon the appearance of the On-Screen map. The on screen map will not show gaps and overlaps caused by incorrect GPS Offsets or AutoSwath Look-Ahead settings.

Planter brand	Control Valve Configuration	PWM Frequency	PWM Gain	Zero Flow Offset	Gear Ratio	Pulses/Rev.
John Deere Planters	PWM	175	110	40	2.374 (chain) 2.417 (ProShaft)	360
White Planters	PWM	200	90	30	5.5	360
Case IH Planters	PWM	100	90	40	6.803	360
Dickey-John Hydradrive	PWM	200	300	36	Need to Calculate	360
Kinze Mechanical Meter	PWM	200	130	33	1.533	360
Kinze EdgeVac Meter	PWM	200	60	45	2.947	360

Hydraulic Seed Meter Calibration Numbers

Prior to calibrating the Hydraulic Seed Meter, the numbers that appear in the Meter Calibration box in the Planter Control window should be similar to the numbers that appear below. If they are not, the seed meter may be working incorrectly, or the Gear Ratio may be incorrect. Contact Technical Support for further assistance.

NOTE!: Check the operator's manual for more specific information on other seed disk options.

Planter brand and type	Corn	Soybeans	Cotton Standard Rate	Sorghum
John Deere				
Vacuum: Standard	30	108	64	45
Vacuum: ProMAX™	40			
Vacuum: Precision Planting eSet®	30			
Vacuum: VenHuizen AccuVac Kit	40			
Mechanical: Finger	12			
Mechanical: Brush Meter		56		
Case IH				
Vacuum	48	130	80	80
Cyclo®	36	240		
KINZE				
EdgeVac®	39	60	54	60
Mechanical: Finger	12	60	30	60
White				
	30	60		
Great Plains				
Mechanical: Standard	12	110	120	102
Mechanical: Twin Row	6	100		135

Stepper Seed Rate Control

The Stepper Seed Control module allows Rawson ACCU-RATE Variable Rate Controller to control up to three hydraulic motor drives via the display. Configure the Stepper Seed Rate Control module in the following order.

1. **Enter Controller Settings**—Included the Max Meter Speed, Gear Ratio and Minimum Allowable Ground Speed. See "Controller Settings for Hydraulic Seed Rate Motor Drives" on page 180.
2. **Prime the Stepper Seed Meter**—This fills the seed meter with seed to avoid skips. See "Priming Seed Rate Meters" on page 189.
3. **Meter Calibration**
   A. Enter Meter Calibration Number. This number, representing seeds per revolution, is set according to the number of seeds dropped per one revolution of the seed meter.
   B. Perform a Seed Meter Calibration. A new calibration should be performed if the as-applied seed rate does not match the actual population planted. See "Calibrating Seed Rate Meters" on page 189.

Controller Settings for Stepper Seed Rate Motor Drives

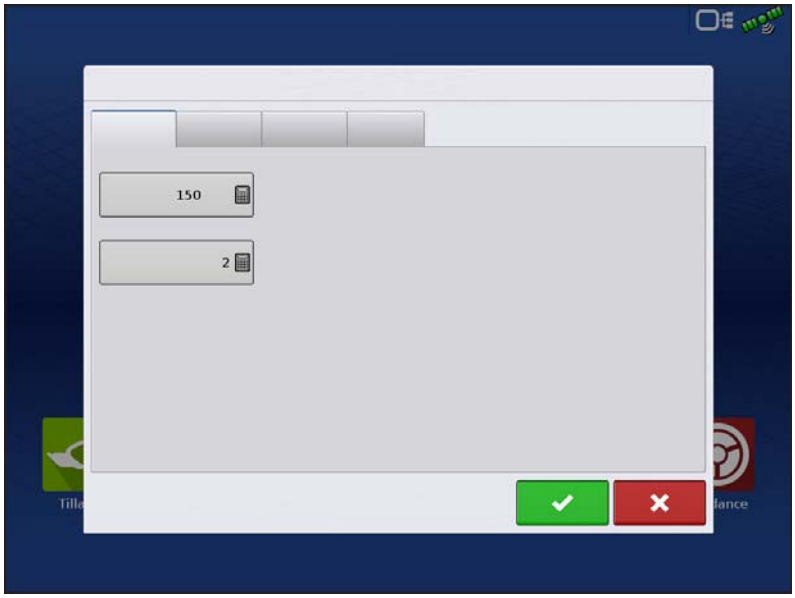
Stepper Controller Settings should be set before entering a meter calibration number or performing field operations.

Each channel is displayed with its own tab. Auxiliary Tab allows adjustment of the Minimum Allowable Ground Speed.

Channel Tabs

Max Meter Speed—This number represents the maximum recommended RPM of the seed meter, and is specified by the manufacturer. A warning appears if this threshold is exceeded.

Gear Ratio—The ratio of the revolutions of the hydraulic drive to turn the seed meter one revolution.

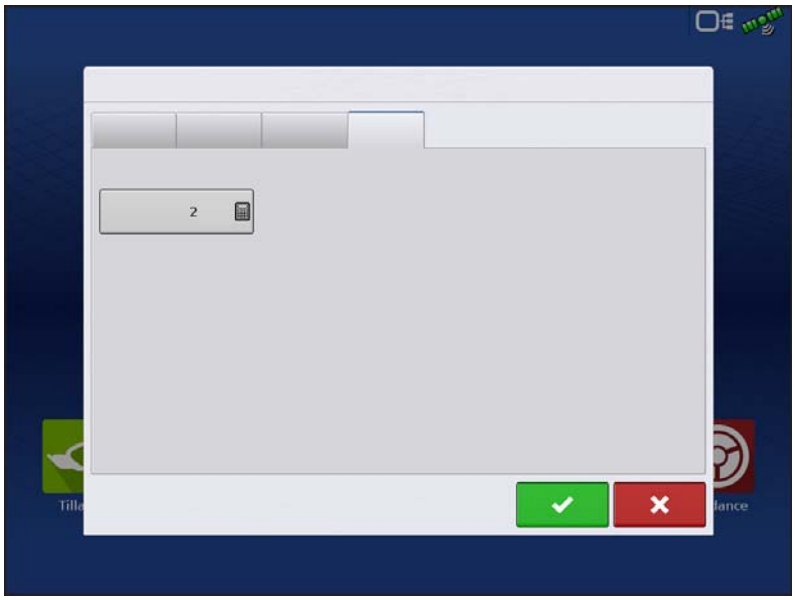


Auxiliary Tab

Minimum Ground Speed—The planter will plant at this simulated ground speed, until displayed ground speed is above this value. This fixed ground speed compensates for delays in acquiring an initial ground speed when starting from a stand still. Planting at the minimum ground speed will occur when either of the following conditions are met:

A. Wheel motion is detected. Requires wheel motion sensor.

B. Jump start switch is depressed. Required jump start switch kit



Gear Ratio Calculations for Seed Rate Motors

The Gear Ratio is a setting that appears on the Controller Tab for the Stepper Seed Control Module and Hydraulic Seed Control Module. It is the ratio of the revolutions of the hydraulic drive as compared to one revolution of the seed meter. This setting is used to determine how fast the Seed Rate Motor should operate to achieve the proper RPM of the seed meter during planting operations.

To manually enter a Gear Ratio in the Controller Settings window, calculate the Gear Ratio based on information provided below and on the following pages. The Gear Ratio number is calculated by multiplying all the gear ratio combinations, from the Seed Rate Drive Motor to the Seed Meter.

Seed Ratio Calculation Example Procedure

The example outlined below assumes a single planter drive motor.

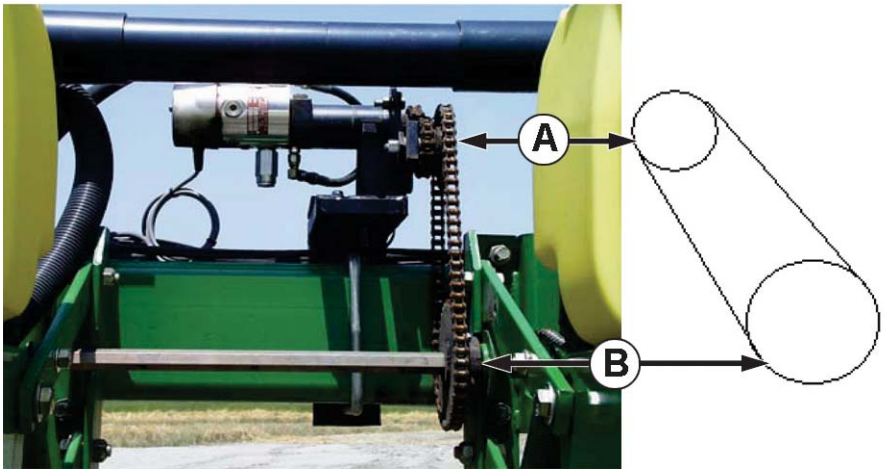
1. Beginning with the Seed Rate Motor, count the number of teeth on the drive sprocket. Then count the number of teeth on the driven sprocket.
2. Divide the number of teeth on the driven sprocket by the number of teeth on the drive sprocket. This is the ratio of the Seed Rate motor.
3. Repeat the process for each sprocket combination in the drive system back to the meter.
4. Take the ratio of the Seed Rate Motor and multiply it by the ratio of the other sprocket combinations.
5. Repeat this process for multiple hydraulic drives. Enter the gear ratio for each motor under the appropriate tab.

NOTE! Enter the number into the other channels for additional motor drives if they have the same total gear ratio.

NOTE! Gear Ratio is the number of revolutions of the motor to turn the seed meter one revolution.

Gear Ratio Drawing - For Single Motor Drive

Seed Rate Drive Setting (Calculating drive gear ratio)



A. Seed Rate Motor (Drive) 18 Tooth Sprocket

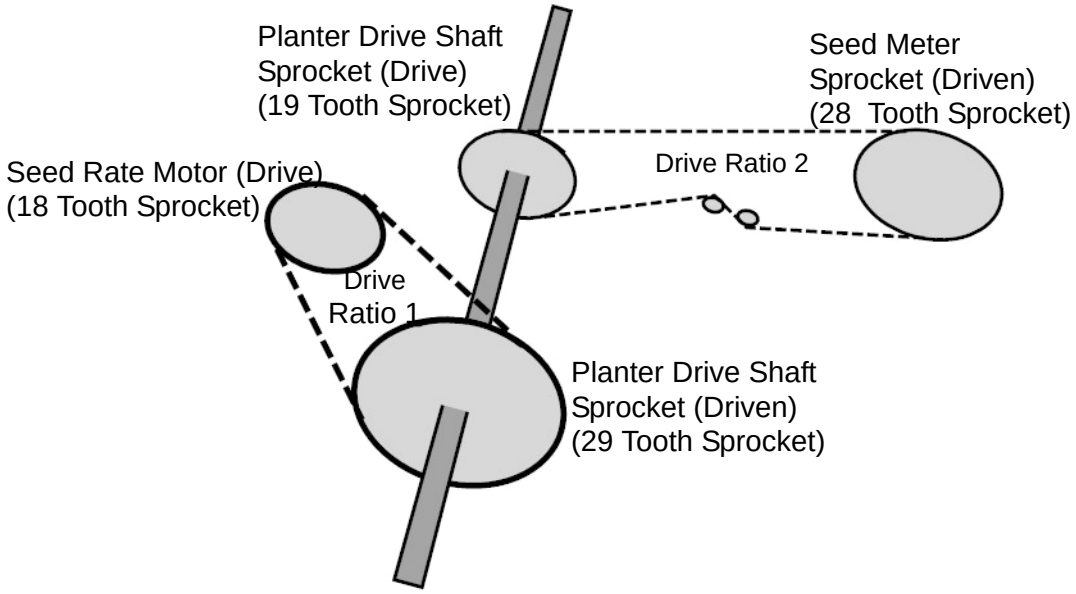
B. Planter Drive Shaft Sprocket (Driven) 29 Tooth Sprocket

$$\frac{\text{\# of Teeth on the Driven Sprocket Ratio}}{\text{\# of Teeth on the Drive Sprocket}} = \text{Gear Ratio}$$

$$\frac{29}{18} = 1.611$$

NOTE!: Each drive combination (Driven/Drive) from Seed Rate Motor Drive to Seed Meter shaft sprocket needs to be factored for the Total Gear Ratio.

Gear Ratio Drawing - For Multiple Drive Combinations



$$\frac{\text{Planter Drive Sprocket}}{\text{Seed Rate Motor}} \times \frac{\text{Seed Meter Shaft}}{\text{Planter Drive Shaft}} = \text{Gear Ratio}$$

$$\frac{29}{18} \times \frac{28}{19} = \frac{812}{342} = 2.374$$

Driven/Drive 1 **X** Driven/Drive 2 **=** Gear Ratio

Carry the Decimal place to the nearest 0.001 for accurate results.

Seed Ratio Calculation Example Procedure for Shaft Drives

This example assumes a single drive motor. Step 5 notes that this process has multiple steps for more than one hydraulic drive.

1. Beginning with the Seed Rate Motor, count the number of teeth on the drive sprocket. Then count the number of teeth on the driven sprocket.
2. Divide the number of teeth on the driven sprocket by the number of teeth on the drive sprocket. This is the ratio of the Seed Rate motor.
3. Repeat the process for each sprocket combination in the drive system back to the meter.
4. Take the ratio of the Seed Rate Motor and multiply it by the ratio of the other sprocket combinations.
5. Repeat this process for multiple hydraulic drives. Enter gear ratio for each motor under the appropriate tab.

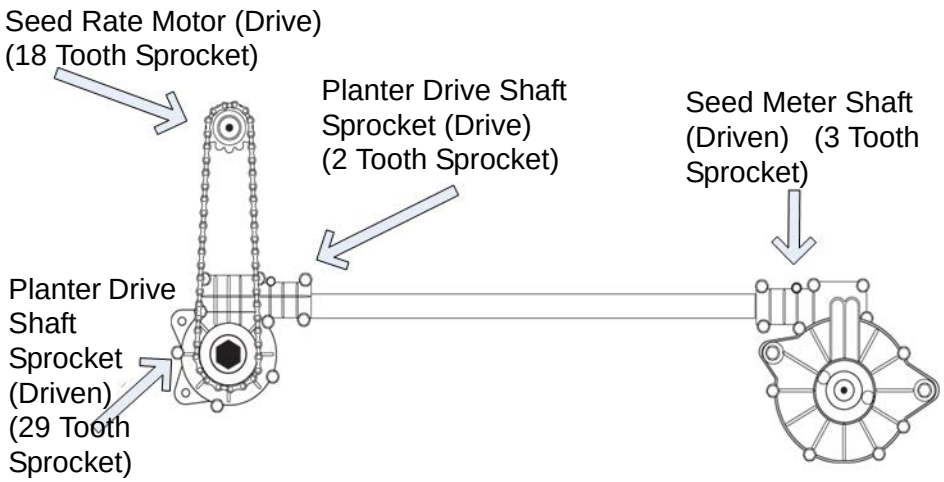
NOTE!: Enter the number into the other channels for additional motor drives if they have the same total gear ratio.

Drive Ratios		
Planter Brand	**Driven**	**Drive**
Case IH Planters	2	2
John Deere Planters	3	2
White Planters	11	5

NOTE! These values are for the shaft only. Drive/Driven value between the Seed Rate Motor and Planter Drive Sprocket must still be determined.

Gear Ratio Drawing Shaft Drives

John Deere Planter Example



$$\frac{\text{Planter Drive Sprocket}}{\text{Seed Rate Motor}} \times \frac{\text{Seed Meter Shaft}}{\text{Planter Drive Shaft}} = \text{Gear Ratio}$$

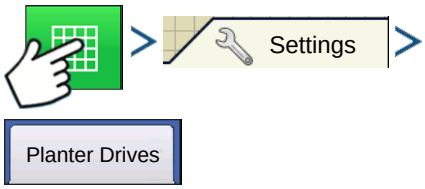
$$\frac{29}{18} \times \frac{3}{2} = \frac{87}{36} = 2.417$$

Driven/Drive 1 **X** Driven/Drive 2 **=** Gear Ratio

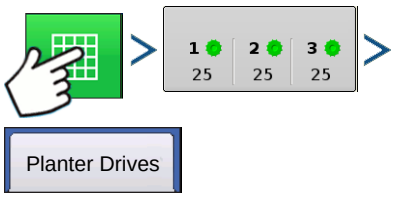
Carry the Decimal place to the nearest 0.001 for accurate results.

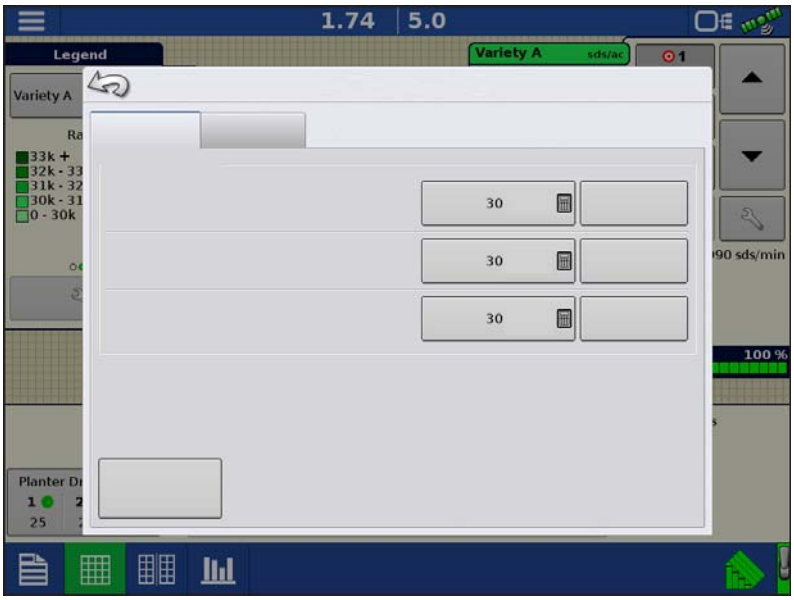
NOTE!: If determining shaft ratios for any shaft not listed in the table above, rotate input shaft (driver) 10 times. Count how many times the output (driven) shaft turns. Divide the number of turns of the input shaft by the number of turns of the output shaft.

Planter Options Screen



OR

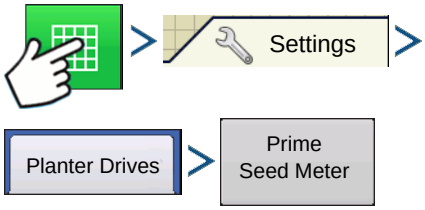




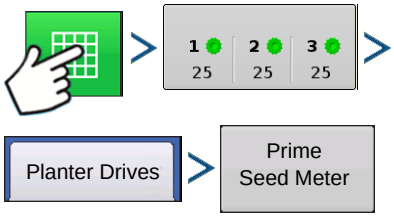
Represents the number of cells on a seed disk.

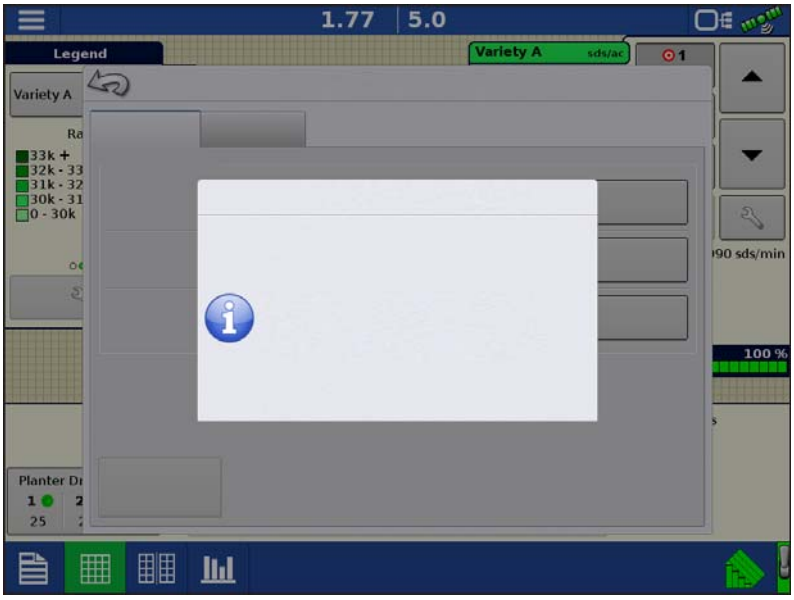
Priming Seed Rate Meters

The Seed Meter Prime is used to charge the seed meter when filling with seed.



OR





A message displays, stating "Seed Meter Prime in Progress." While this message displays, the seed meter will turn one (and only one) revolution automatically. When complete, return to the Planter Options screen.

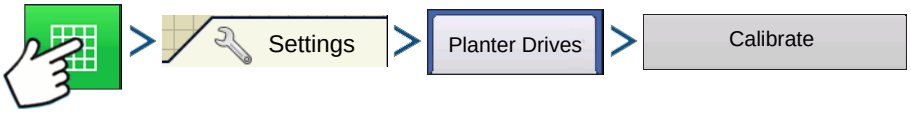
Calibrating Seed Rate Meters

The Meter Calibration number allows the seed meter to communicate the correct seed population to the display. Assuming the Controller Settings are correct for the seed rate, this Meter Calibration number, which is based on the number of cells on the seed disk should not need to be adjusted. However, you may wish to recalibrate after changing seed types and treatments. Recalibrate if the as-applied seed rate does not match the population shown on the planter monitor.

NOTES!

- The seed rate meter calibration does not recalibrate any previously-logged planting data.
- This recalibration number applies to a specific crop type, (for example: corn). Normally, there is no need to recalibrate when switching varieties within the same crop type.

- Make sure seed meter is primed before starting calibration.
- When catching dispensed seed during calibrations, it's advised to catch seed from multiple rows on the drive shaft in order to get a more accurate sample.



OR

1. **Acknowledge the Warning**—Acknowledge this warning by pressing .
2. **Select Drive to Calibrate**—The Meter Calibration Wizard appears. Select the drive to calibrate. Press to continue.
3. **Enter Simulated Ground Speed**—Enter the simulated ground speed for the calibration procedure. Press to continue.
4. **Enter Simulated Target Rate**—Enter the simulated target rate of the calibration procedure. Press to continue.
5. **Press Start**—Press the green Start button to begin dispensing the seed.

6. **Dispensing Seed**—The seed meter turns for **five** revolutions. As the seed meter dispenses seed, the button will change its color to red, and a message displays that seed dispensing is in process.
7. **Seed Dispensing Complete**—When the meter is finished dispensing seed. Press to continue.
8. **Enter Number of Dispensed Seeds**—Press to enter the number of dispensed seeds. Press to continue. The meter calibration will be calculated from the actual seed amount dispensed.
    - If catching dispensed seed from multiple rows, total the overall dispensed seed and average that value based on the number of rows being caught. (Example: catching 4 rows; 610 total dispensed seed; value entered will be 152.5)

NOTE! The value entered for dispensed seeds should ideally be very close to the number of cells on the seed disk multiplied by 5. If the new Meter Calibration (sds/rev) value differs by more than 1 or 2 of the original value, consider inspecting the Gear Ratio, Controller Settings, and/or overall meter performance. Contact Technical Support for further assistance.

Troubleshooting

Hydraulic Seed Control: Zero Flow Offset Variation

Zero Flow Offset is an operator-entered setting. Zero Flow Offset represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero Flow Offset value can cause the product control system to not properly control low rates. Zero Flow Offset may vary somewhat by system and by operating conditions. On the tables on the following pages, problems and causes relating to Zero Flow Offset are listed. Use the Confirmation Techniques to determine if this is a problem; and then follow the appropriate solution.

Problem: Hydraulic drive is not shutting off properly

Possible Cause: Zero Flow Offset is set too high

Confirmation Techniques:

A. Put the problematic drive in Manual Valve control from the Map screen.

- Master switch will need to be On and Implement Switch triggered in order for the drive to turn

B. Press the Up arrow once to start turning the drive, then press the Down arrow three times.

- If the Zero Flow Offset is set appropriately, the drive will shut off on the third down button press.

C. If the drive is still turning after the third Down button press, the Zero Flow Offset is too high.

D. Decrease the Zero Flow Offset setting by increments of 1 or 2.

E. Repeat the above steps until the drive stops turning on the third Down button press. The Zero Flow Offset will then be set once this is achieved.

Problem: Hydraulic drive is slow to begin turning

Possible Cause: Zero Flow Offset is set too low

Confirmation Techniques:

A. Put the problematic drive in Manual Valve control from the Map screen.

- Master switch will need to be On and Implement Switch triggered in order for the drive to turn

B. Press the Up arrow once to start turning the drive, then press the Down arrow three times.

- If the Zero Flow Offset if set appropriately, the drive will shut off on the third down button press.

C. If the drive stops turning before the third Down button press, or doesn't start on the Up button press, the Zero Flow Offset is too low.

D. Increase the Zero Flow Offset setting by increments of 1 or 2.

E. Repeat the above steps until the drive stops turning on the third Down button press. The Zero Flow Offset will then be set once this is achieved.

NOTE!: Zero Flow Offset should never be less than 25. If 25 still seems as if this number is too high, there must be some other problem. Contact Technical Support for further assistance.

Stepper Seed Control Meter Alarms

Error Message: "Drive Out of Synch Error Drive #"

Possible Cause: Not enough hydraulic fluid is flowing to the seed meter.

Solution: Examine the stepper seed drive's hydraulic components for restrictions. Make sure the tractor's hydraulic outlet is turned on. Make sure the hydraulic flow settings are correct.

Error Message: "Drive Stalled Drive #"

Possible Cause: The hydraulic drive motor has stopped rotating.

Solution: Check the stepper seed motor to see if it is restricted from turning, and that the hydraulic drive is working.

Error Message: "Meter Not Moving - Drive #"

Possible Cause: Either the Seed Meter Calibration failed, or the Seed Meter Prime failed

Solution: Make sure that the tractor's hydraulic outlet is turned on.

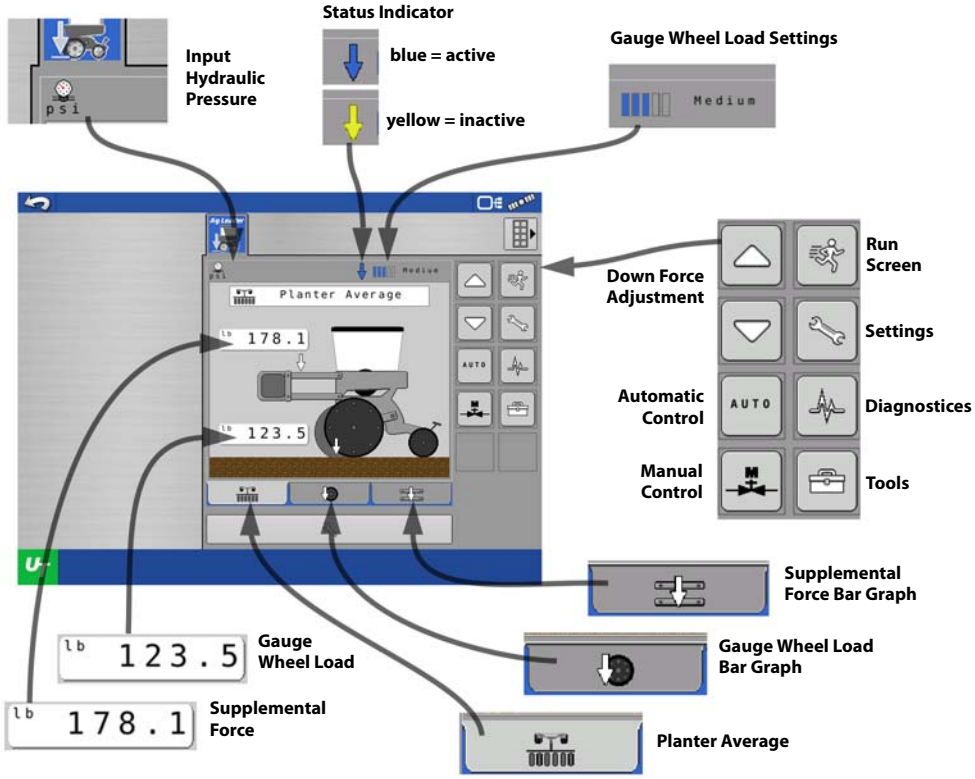
Error Message: "Seed Drive at Maximum RPM Drive #"

Possible Cause: Starting the priming routine when the hydraulic motor is not on

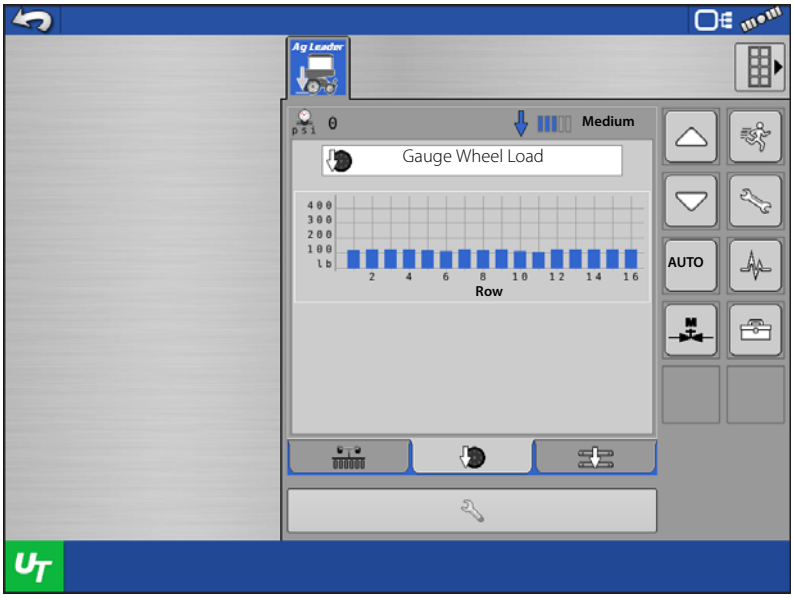
Solution: Slow the planter unit's ground speed. - Reduce the Planting Target Rate.

At a Glance—Universal Terminal

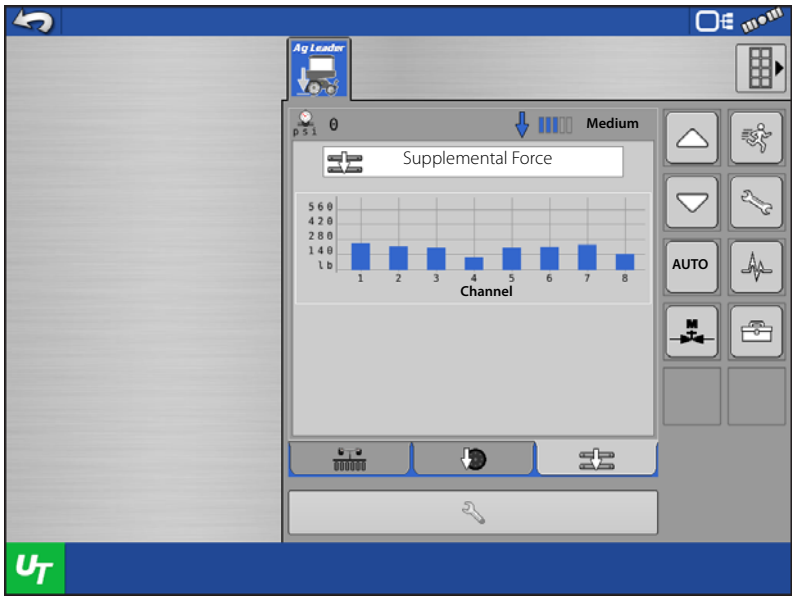
Planter Average Run Screen



Gauge Wheel Load Bar Graph



Supplemental Force Bar Graph



At a Glance – With Ag Leader InCommand 1200

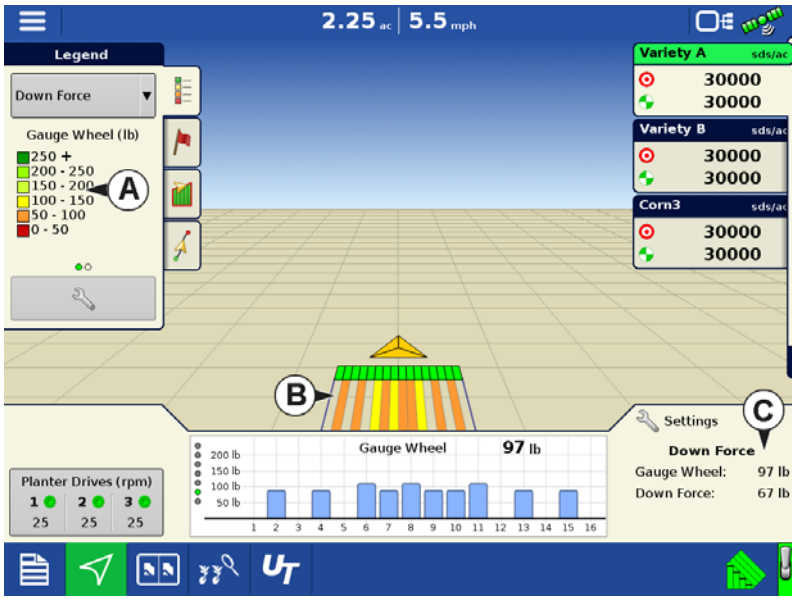
Gauge Wheel Load Map

(A) Gauge Wheel Load Legend

(B) Mapped Gauge Wheel Load

NOTE!: Planter rows that do not have a gauge wheel sensor installed will not map or log gauge wheel load for that row.

(C) Planter Average Gauge Wheel Load



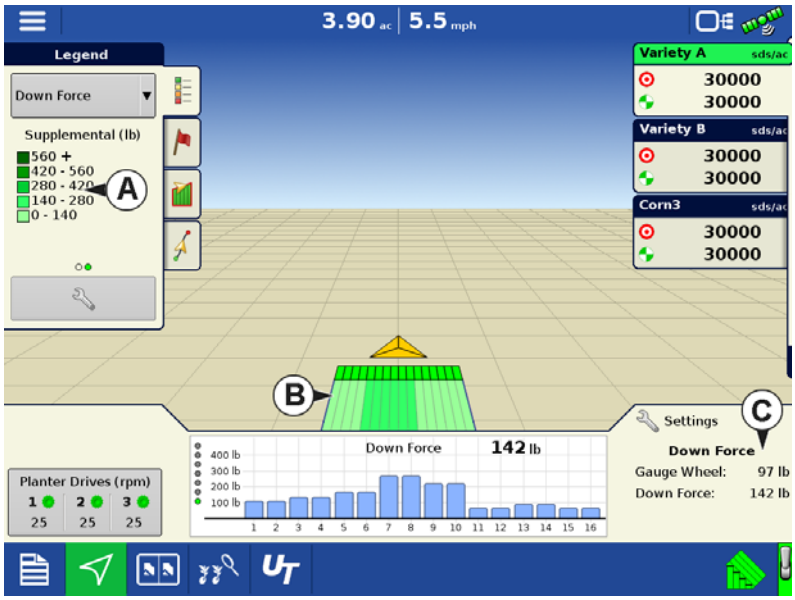
Supplemental Down Force Map

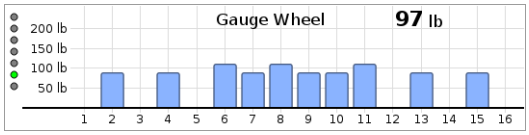
(A) Supplemental Down Force Legend

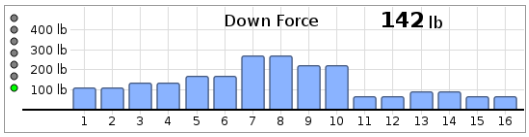
(B) Mapped Supplemental Down Force

NOTE!: Mapped Supplemental Force will reflect the ISOBUS Down Force configuration setup.

(C) Planter Average Down Force

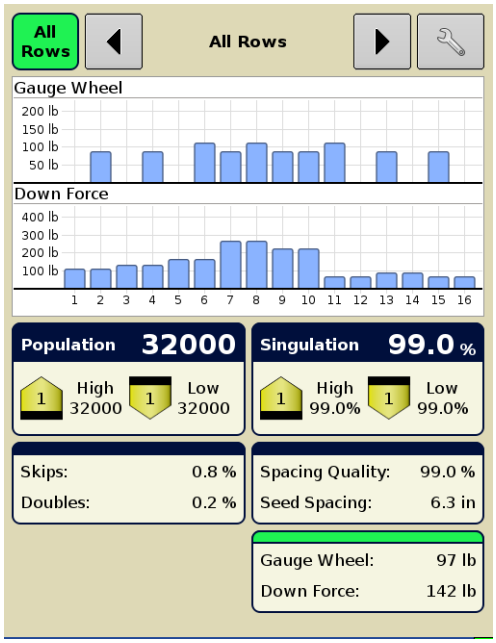






Bar Graph

Tapping subsequently will toggle the bar graph between the following graphs. (Seed placement performance graphs will also appear if a seed/planter monitor module is installed)

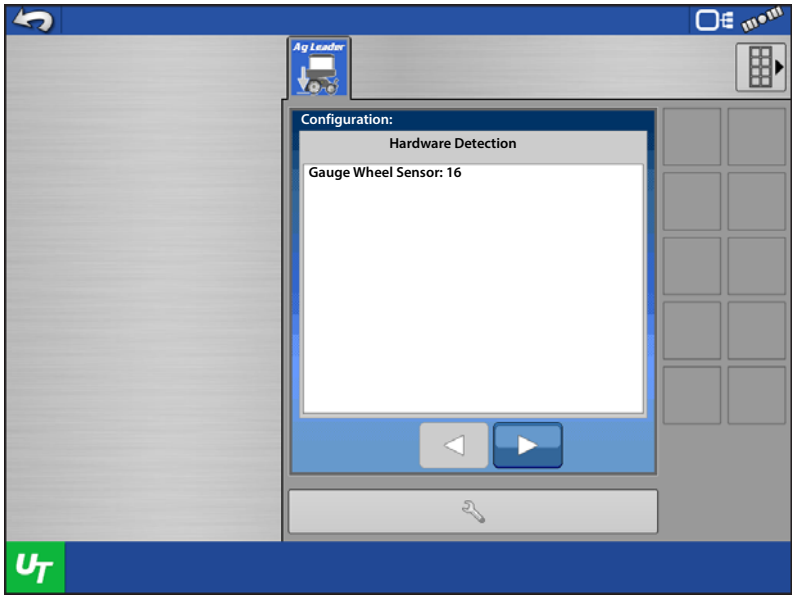


Supplemental Down Force and Gauge Wheel Load graphs are available in the Advanced Seed Monitoring screen. (This screen will only be available when a Seed Tube Monitor Module is installed).

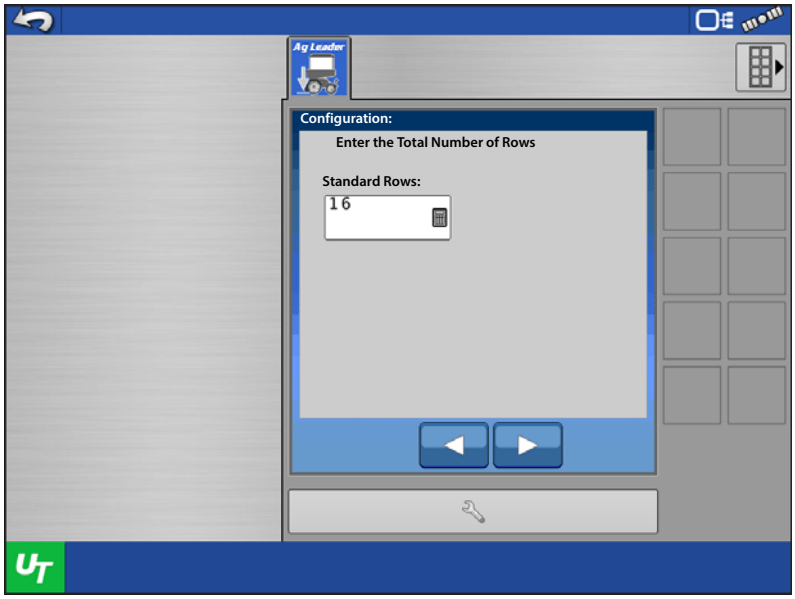
ISOBUS Down force Configuration

1. System automatically detects number of Gauge Wheel Sensors.

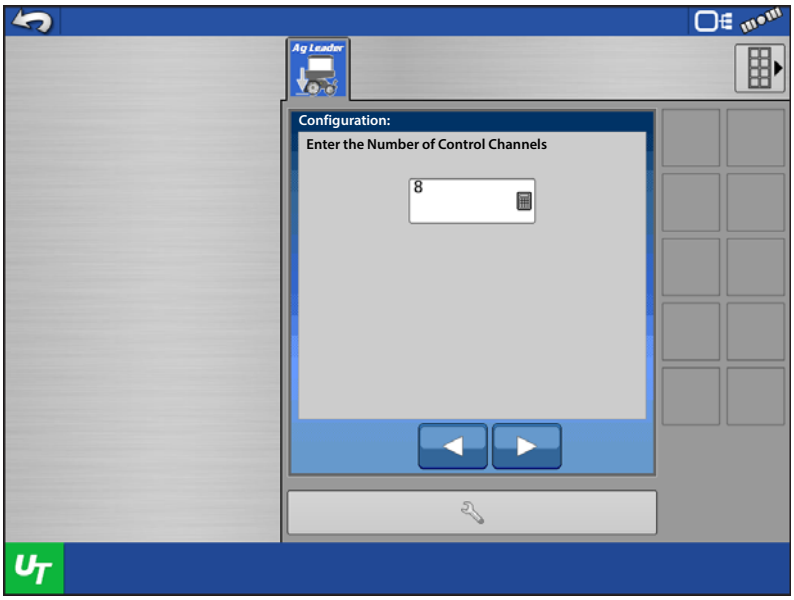
NOTE!: Module detection can take up to 30 seconds. If the number of detected row unit modules does not match what is installed, click the next arrow and then back again. If after 30 seconds have passed and the number of detected row unit modules does not match the number installed, check the LED status of each Row Unit Module (RUM). LED will blink green when connected and communicating properly.



2. Enter the number of standard row units.



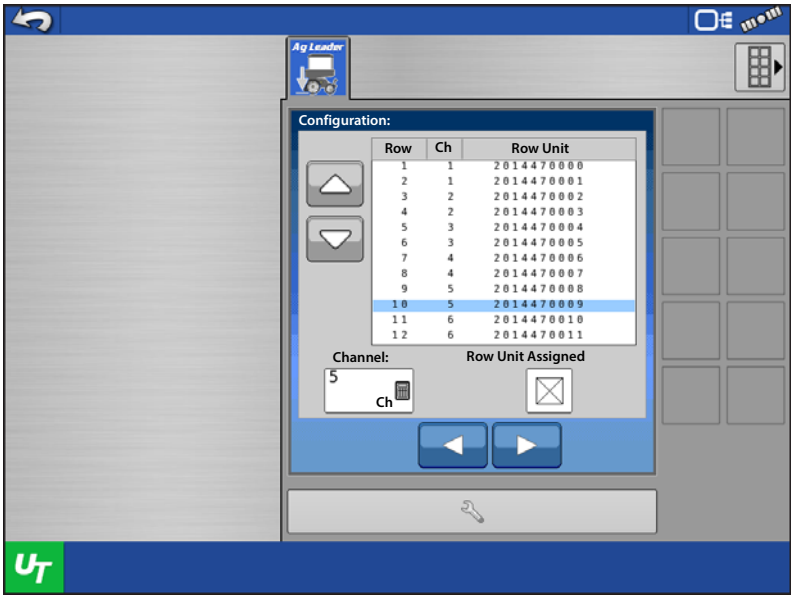
3. Enter the number of control channels. This will be equivalent to the number of valve sections. Typically this will range from 3 to 8 total sections.



NOTE!: Each section must contain at least 1 gauge wheel sensor.

4. Row Unit Module (RUM) Assignment:

   A. Each gauge wheel sensor must be assigned to a specific row. Assign a sensor to each row that has a sensor installed. The "Row Unit" column will contain a number once a sensor has been assigned. This is the serial number of the Row Unit Module (RUM)

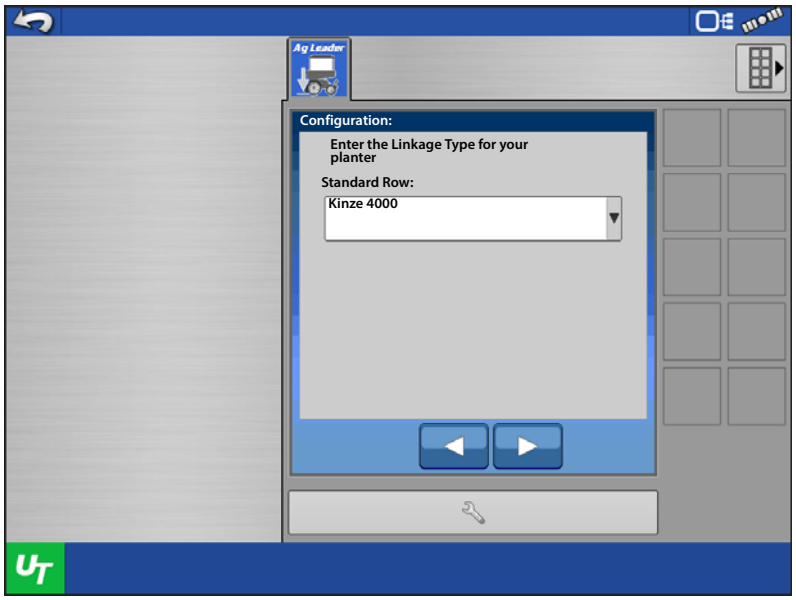


WARNING!: Verify the serial number of each assignment RUM with the serial number printed on the RUM. If these do not match, this indicates improperly connected wires.

   B. Each row of the planter can be assigned to a specific control channel. The selected control channel MUST coincide with hydraulic hose connection to the valve.

WARNING!: Failure to assign the correct control channel as dictated by the hydraulic hose connection to the valve will cause poor planting performance.

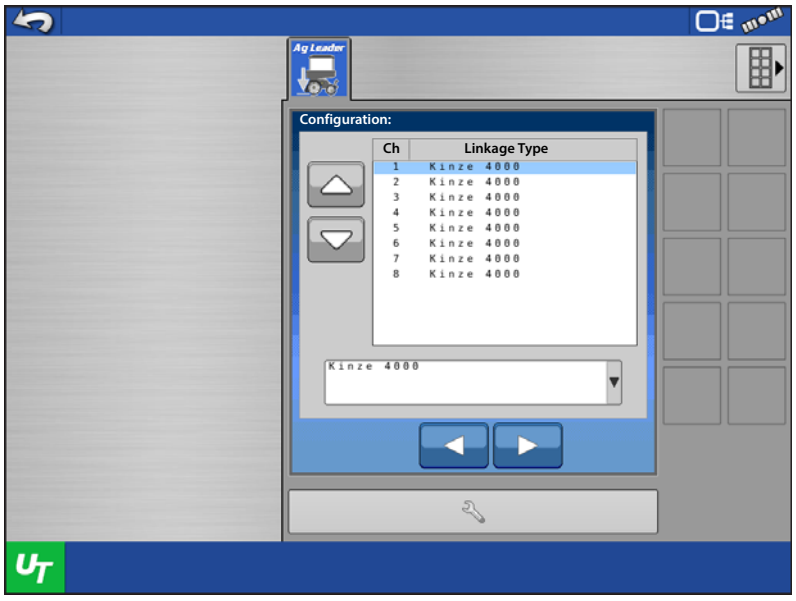
5. Enter the linkage type for your planter. Use the drop down menu to select the type of parallel arm your planter is equipped with.



NOTE!: John Deere Short parallel arms have an overall length of 15-3/4". John Deere Long parallel arms have an overall length of 23".

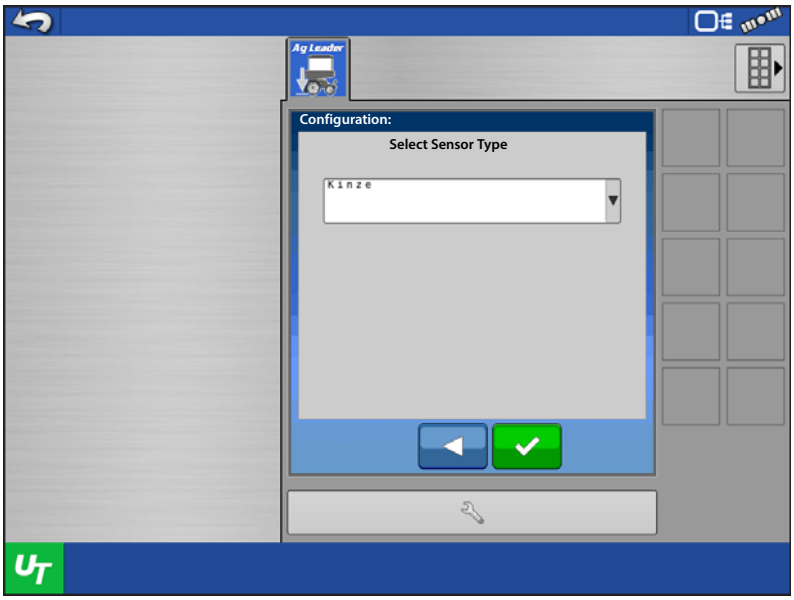
NOTE!: Planters may have a combination of short and long parallel arms. Linkage type can be selected independently for each channel, as explained in next step.

6. Select the linkage type for each channel. In most cases the planter will have only one type of linkage. If the planter has multiple linkage types, select the type of linkage for each channel.



- Each Channel may only be configured for 1 type of linkage.
- If it is not possible to divide sections so each section contains only one type of linkage, sections configured with more than 1 type of linkage may cause poor planting performance.

7. Select the type of gauge wheel sensor that is installed. The sensors are identified by the planter manufacturer and part number printed on the sensor or the label near the sensor connector.



WARNING!: Selecting the incorrect sensor type will cause poor planting performance.

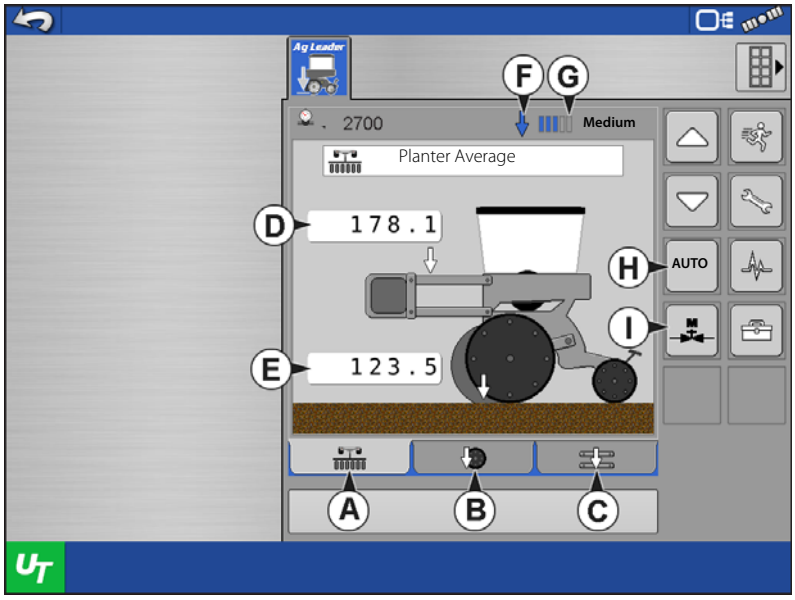
NOTE!: The entire planter must have only 1 type of sensor installed.

NOTE!: John Deere planters have 2 different sensor part numbers that could be installed. Be sure to select version in the drop-down menu matches the version installed on the planter.

8. Configuration is complete. Once completed, the module will reboot itself. This will cause a lost communication alarm.

ISOBUS Down Force Operation

1. User can choose to display 1 of 3 interface modes.



   A. Planter Average
      - Displays average supplemental down force.
      - Displays average gauge wheel load
   B. Gauge Wheel Load
      - Displays gauge wheel load of each row that has a sensor installed
   C. Supplemental Force
      - Displays supplemental down force being applied to each section
   D. Supplement Force
   E. Gauge Wheel Load
   F. Blue Arrow—Control is Active

      Yellow Arrow—Control is Inactive, or Holding down force
   G. Gauge Wheel Setting—Automatic Mode
   H. Automatic Control
   I. Manual Control

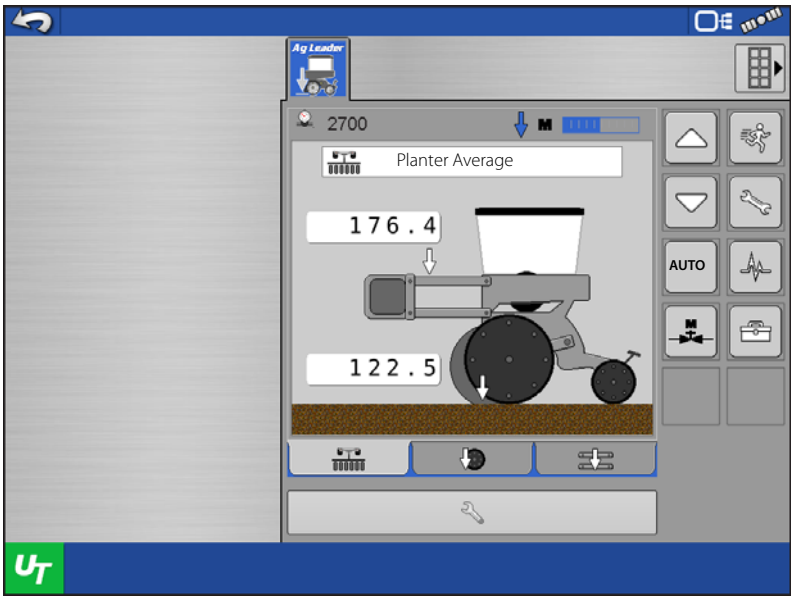
2. When in **Automatic Mode**, user can select 1 of 5 available gauge wheel load settings. Each available setting is an offset to the continuously calculated target gauge wheel load. Target Gauge Wheel Load is defined as: The amount of gauge wheel load necessary to acheive proper depth 100% of the time, while minimizing compaction as much as possible (without risking loss of proper planting depth).

Gauge Wheel Load Settings	Offset to Target Load
Minimum	-100 lbs (-45 kg)
Light	-50 lbs (-23 kg)
Medium	No offset
Heavy	+50 lbs (+23 kgs)
Maximum	+100 lbs (+45 kgs)

Example: Based on the ground conditions in a specific area of a field, the down force system applies 150 lbs of supplemental force. However, if the Gauge Wheel Load setting is set to **Heavy**, the supplemental force being applied is now 200 lbs in this specific area of the field.

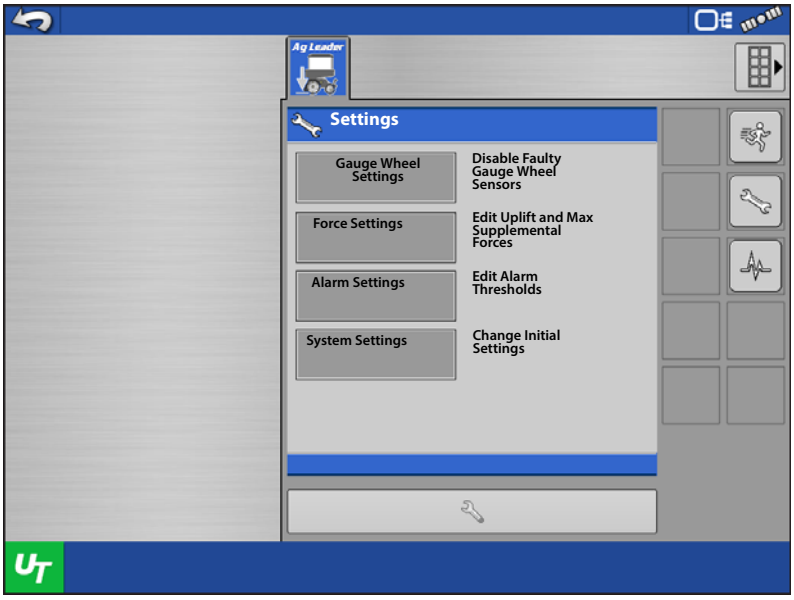
WARNING!: When operating on light or minimum, shallow planting can occur.

3. When in **Manual Mode**, user can select a supplemental down force by using the up and down arrows. Adjustments made in Manual Mode affect the entire planter. This cannot be set per channel.



ISOBUS Down Force Settings

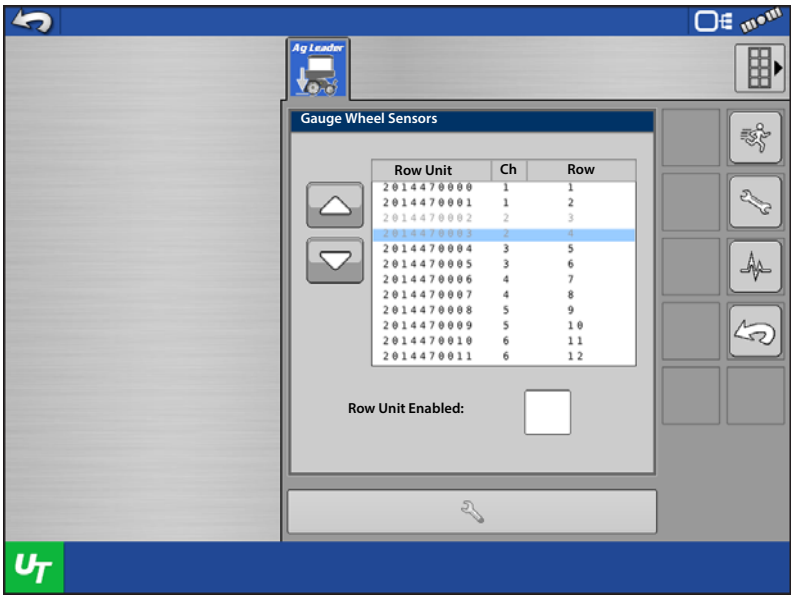
- Gauge Wheel Settings
- Force Settings
- Alarm Settings
- System Settings



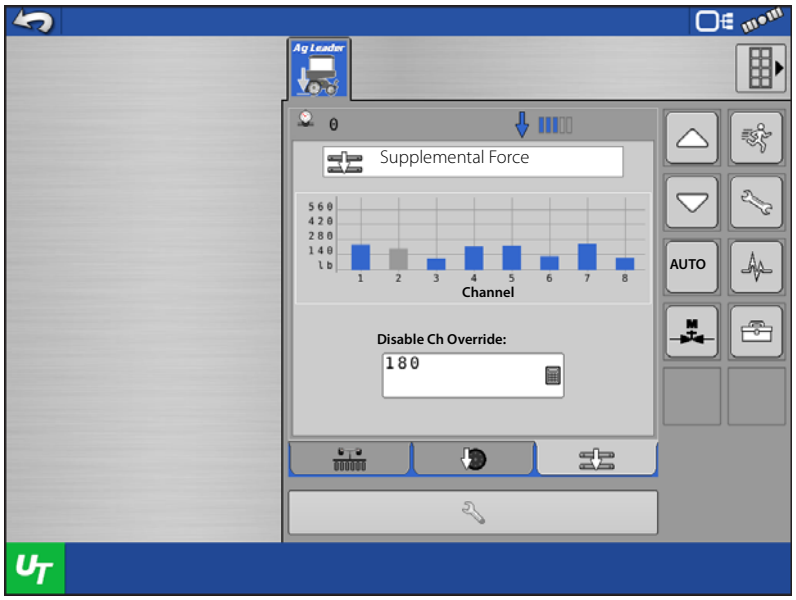
Gauge Wheel Settings

Failed Sensors can be disabled

If all sensors on an individual channel are disabled, the user may enter a Disabled Channel Override force for that channel, while allowing all remaining channels to continue functioning in automatic control mode.



NOTE!: A Disabled Channel Override only appears on this screen when all sensors for a channel are disabled.



Force Settings

Set uplift force for each channel if optional uplift springs are installed

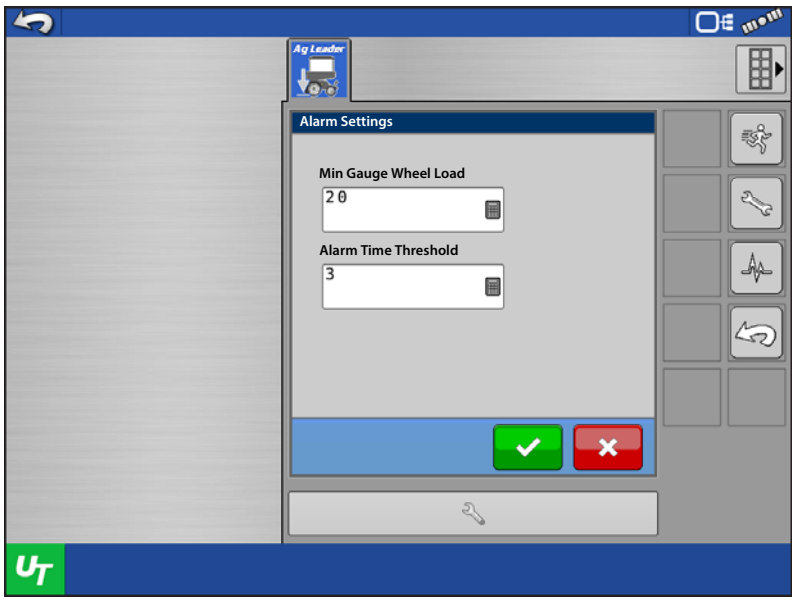
Uplift Force—usually 0 unless planter is equipped with uplift springs to provide an upward force on row units.

Uplift Force	
Parallel Linkage	**Uplift Force**
Deere Short Arm	140 lbs
Deere Long Arm	
4 spring design	160 lbs
2 spring design	100 lbs
Kinze 3000	140 lbs
Kinze 4000	130 lbs
White 8000/9000	100 lbs

Set a Maximum allowable Force—The system will not apply a force higher than this setting.

Alarm Settings

User will receive a "Low Gauge Wheel Load" alarm when load is below the selected gauge wheel load for duration of time set by the user.



System Settings

Reconfigure—Configuration wizard that was used the first time the planter was set up for ISOBUS hydraulic down force.

Reset—Restore factory defaults to module. After doing so, a new configuration must also be made.

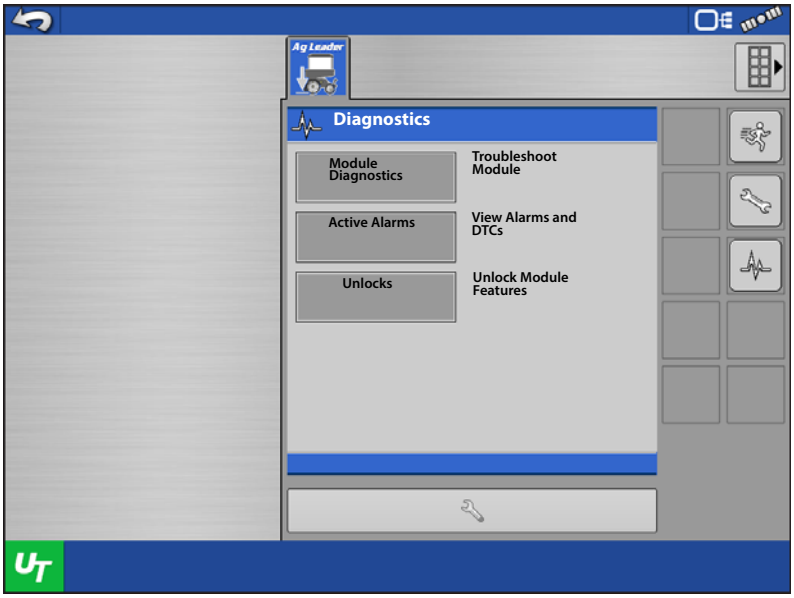
ISOBUS Down Force Diagnostics

1. Module Diagnostics

   -View control module firmware

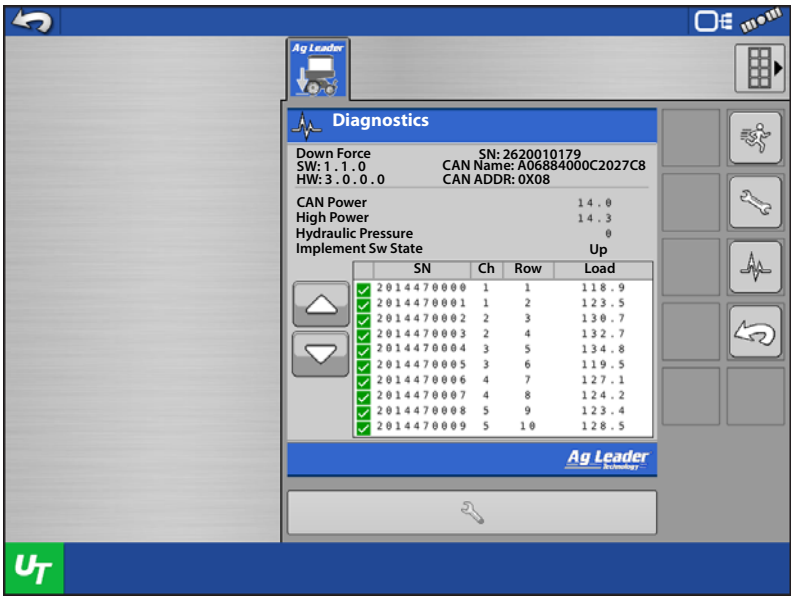
   -View individual sensor gauge wheel load

   -View implement switch state (Up or Down)



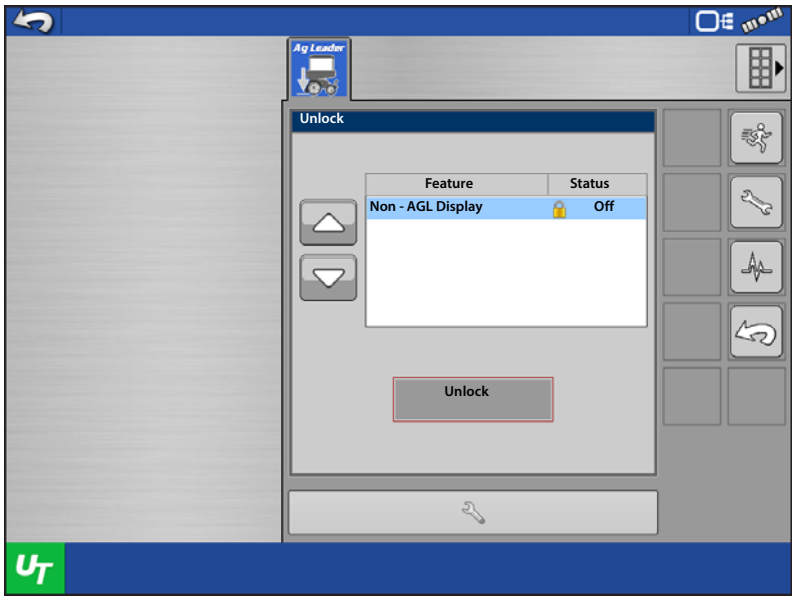
2. Active Alarms

   -Display currently active alarms



3. Unlocks

   -Enter Unlock code to allow use with non-Ag Leader ISOBus universal terminal display.



ISOBUS Down Force Tools

1. Speed Source

   Select from the available speed sources. When a speed source is available and selected, the system will not actively control down force at speeds slower than 0.5 mph (0.8 Km/h). The down force will hold below this speed.

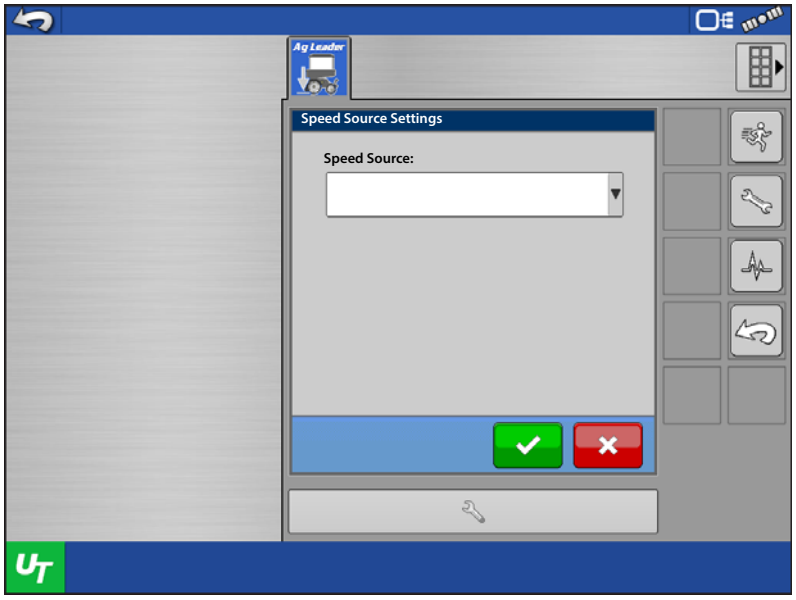
   A. CAN GPS (NMEA 2000)

   B. ISO GBSD (Ground Based Speed and Distance)

   C. No Speed Input—system is allowed to control planter anytime it is lowered with no minimum speed requirement.

2. Enable Automatic Control

   Uncheck this box to enter monitor only mode.



Down Force Alarms

Down Force Inadequate

System hydraulic pressure is at maximum pressure, but the Down Force system is not achieving acceptable gauge wheel load.

Recommendation—If supplemental force is at maximum, increase Maximum Force on the Down Force setup screen.

- Planter may not weigh enough to handle field conditions - toolbar may be lifting. Verify if the toolbar is lifting by checking parallel arms while planting. If weight needs to be added to the toolbar, contact planter dealer.

Low Gauge Wheel Load

Down force system does not achieve acceptable gauge wheel load

User defined alarm to signal operator if planter is losing planting depth.

Hydraulic Pressure too low

Down force system commanding more down force but hydraulics are not reacting

Recommendations:

- Check tractor remote is on
- Check that enough hydraulic fluid is directed to down force system

Pressure Sensor Failure

Problem—Pressure sensor is outside voltage range.

Resolution—Disable pressure sensor until a replacement is available.

Row Module Communication Lost

Problem—Row module communication lost.

Resolution—Inspect cabling of row module. Replace row module.

Row Module Failure

Problem—Row module is not sensing inputs. Row module is power cycling at intervals of less than 2 seconds

Resolution—Swap module with different row. If problem follows, replace module. If problem exists on same row, inspect or replace load sensor.

How to use Manual Override

Manual Override of the control valve may be needed if all electronic control of the Down Force System is lost, or the operating display becomes unusable. Manual Override allows the Down Force system to apply a constant force in order to achieve planting depth (similar to down force springs). If the need arises to put the control valve into Manual Override, follow these steps.

Steps:

1. Engage hydraulics for the Down Force system.
2. Locate the Down Force control valve. Unplug the 2-pin connection that's plugged into the problematic channel(s). (Connections are plugged into each channels PWM valve).
3. Locate the allen head adjustments just below electronic PWM valve.

ATTENTION!: For the next step you will need a quick connect pressure gauge to measure the pressure being sent to each channel. (Ag Leader Hydraulic Test Gauge Kit PN 4100164).

4. Connect pressure gauge to the quick connect port on the back of the valve block. Port will be located under each control channel's 3/8" hose.
5. Screw the allen head adjustment IN to increase pressure sent to actuators; screw OUT to decrease pressure. Pressure (PSI) sent to actuators is shown on the pressure gauge.
6. Refer to the table below and note the Hydraulic Pressure to Down Force Conversion ratio. Multiply this value by the desired down force; this will give you the appropriate pressure to adjust the valve to.

Parallel Linkage Pressure	Conversion Ratio
Deere Short Arm	4.5 psi/lb
Deere Long Arm	3.8 psi/lb

Kinze 3000	4.2 psi/lb
Kinze 4000	5.1 psi/lb
White 8000/9000	4.8 psi/lb

Example: Kinze 3000 planter = 4.2 PSI/lb. The desired down force is 250 lbs.

4.2 PSI/lb x 250 lbs = **1050 PSI**.

WARNING!: When in Automatic control, the allen head adjustment needs to be screwed all the OUT. Any pressure being sent through via Manual Override will be added to the pressure being sent by the PWM control, and will result in excessive down force being applied.

FAQ

-Where do I plug in an implement switch(s)?

Into the Implement Switch Module(s).

-What if I don't have any free SCV connections for the down force valve?

Teeing into existing lines is acceptable. Do not tee into the vacuum fan line if adjusting fan RPM on the tractor with a knob or dial. Teeing into the line before a flow limiter on the planter would be acceptable. Teeing into the hydraulic drive supply line would be the best option. Do not tee into Rawson Drive supply line.

-What if my hydraulic oil gets too hot?

Ag Leader sells a Load Sense kit (P/N 4101225) to help manage oil temperatures. Note: This system will not help if using SCV to control hydraulic drives. In this case, an auxiliary oil cooler may need to be installed.

-What if my hydraulic actuator does not extend far enough to reach the lower bracket with row unit at bottom travel?

Purchase one spacer kit (P/N 4101201) per row. This will install at the bottom of the ram. (Commonly used on John Deere long parallel arms)

-My Kinze 3000 planter has rows that are offset 4" back, causing the upper actuator bracket to not line up with the lower actuator bracket.

Purchase one spacer kit (P/N 4101204) per row. This will move the upper bracket 4" rearward.

-Why is the gauge wheel load bar graph constantly spiking and then going to 0?

This can happen if control channel lines are routed incorrectly. Ensure channel components (hydraulic hoses, control valve cable, gauge wheel sensor wiring) are installed per the instructions.

-Why does the system need 3 hydraulic lines (Pressure, Return and Tank)

Under normal operation, pressure in the down force system is increased through the Pressure line and relieved through the Return line. When the planter runs over a terrace or a water way, the access pressure is released through the Tank line. All three lines MUST be connected.

Troubleshooting

Problem: - Down Force will not adjust in Auto Control while planting (Down Force Holds)

- Down Force indicator arrow stays Yellow while planting.

Solution A:

- Verify implement switch(s) polarity is correct.
- Verify implement switch(s) are tripping when planter is lowered.

1. With planter lowered, verify implement switch(s) have tripped.
2. Check the polarity of the implement switch is correct. Implement switches can be swapped from Normally Open to Normally Closed by switching 3-pin weatherpack connections.

3. On the Implement Switch module verify the indicator light turns blue on the module when the switch is tripped.
4. Check mounting of implement switch(s).
5. While operating Down Force, verify the toolbar is not lifting causing the implement switch to trip.

ATTENTION! Gauge wheel sensors will "re-zero" when the planter is raised for 10 seconds. Re-zeroing provides more accurate gauge wheel data upon each planting pass. This is also a good troubleshooting measure to determine if a gauge wheel sensor is behaving appropriately. ***However, gauge wheel sensors will never re-zero to 0.0 lbs; once a sensor re-zeros the displayed load should be roughly anywhere from 0.1 to 5.0 lbs.***

Solution B: Check the Speed Source setting.

1. If CAN GPS or ISO GBSD is selected, those appropriate speed messages will need to be present on the ISOBUS for the Down Force to operate. These speed message will likely be available from the controlling display or GPS antenna.
2. If an Ag Leader display is being used, verify the "Broadcast Display Speed (ISO GBSD)" setting is checked in the ISOBUS Settings. Refer to the Display User Guide.

   Ag Leader displays do not utilize the CAN GPS (NMEA 2000) speed message. Other third party displays may utilize this message.

Problem: Supplemental Force and Gauge Wheel Load do not appear to reflect each other's responses. (Ex: High Gauge Wheel Load on Channel 1, with very little Supplemental Force being applied, or vice versa)

Solution: Verify installation of the Local CAN terminators.

1. The Local CAN is the communication wiring bus that transfers the gauge wheel load readings to the main control module. There needs to be a terminator on each end of this bus.
2. Terminator PN 4002870 will need to be installed on the wiring harness closest to row 1. Terminator 4002871 will need to be installed on the wiring harness closest to the end of the planter (right-hand side when looking at planter from the rear).

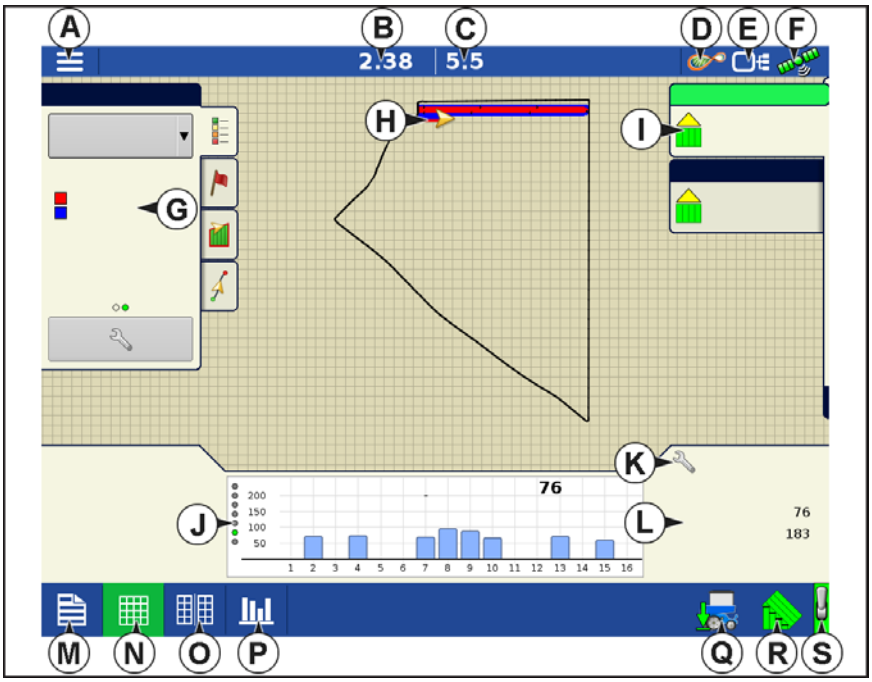
The gauge wheel sensors measure the weight carried by the gauge wheels. The system uses this information to adjust the down force so that the planter is firmly on the ground, to ensure correct planting depth, while trying to reduce any compaction risk.

Load Configuration

Press the Planting App from the home screen. This will take you through the steps needed to load a configuration.

Map View

Once a configuration has been completed, the Map View screen appears.

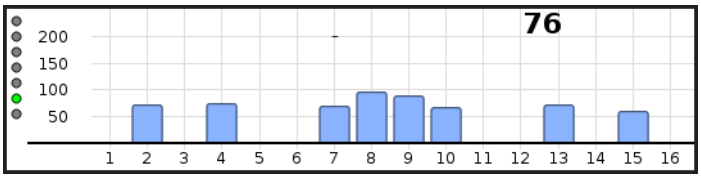


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status Indicator
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Vehicle Icon
I. Product Control toolbox
J. Bar Graph
K. Settings button
L. Average Down Force Readings
M. Event Summary
N. Map View
O. Split screen
P. Advance Seed Monitoring
Q. Down Force Icon
R. AutoSwath
S. Master Switch Status

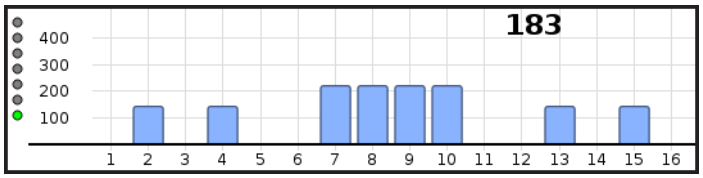
NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

Bar Graphs on Run Screen

Bar Graphs on Run Screen show **Gauge Wheel Load** and **Down Force** being applied to row unit. Press bar graph to advance to next graph. Bar graph may also contain graphs for Advanced Seed Monitoring.



Down Force is not shown when in Monitor Only mode.



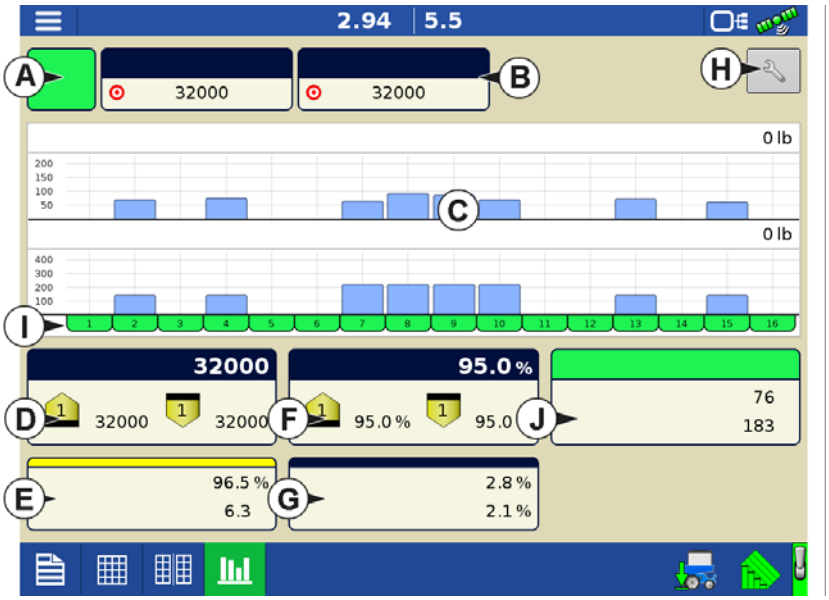
Planter Performance Screen

Press: Planter Performance button on the Map screen to go to the Advance Seed Monitoring screen.

NOTE!: The Planter Performance Screen will only be available if a seed monitor module is connected and configured.

Screen will show Gauge Wheel readings and Down Force across the row sections of the planter.

Down Force will not be shown when using Monitor Only



A. All Rows
B. Hydraulic Drive
C. Bar Graph
D. Population
E. Spacing Quality
F. Singulation
G. Skips/Doubles
H. Seed Monitor Options
I. Clutch Section Indicator
J. Down Force

Advanced Seed Monitoring provides planter performance monitoring of seed meter singulation, skips/doubles and spacing quality, along with population and spacing information for all rows when planting compatible crops.

Down Force Status

Icon on the lower right side of Map Screen shows the status of Down Force.

Active - Hydraulic Down Force is in an Active state - automatically controlling the down force per channel based on the gauge wheel load readings. To be Active, the implement switch needs to be in a planting state, speed needs to register on the display greater than 0.5 mph, and the tractor hydraulics engaged.

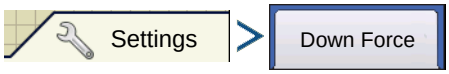
Inactive - Hydraulic Down Force is in an Inactive state or Hold state. Planter is either raised, the display is not registering speed, or Automatic Hold is active while planting in an AutoSwath area.

Manual Mode - Hydraulic Down Force is in Manual Mode. Manual Mode can be activated from the Planter Options screen.

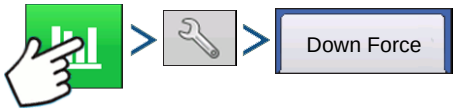
Manual Hold - Hydraulic Down Force is in a Hold state - this Hold state is activated by the operator by toggling the Down Force icon. The Hydraulic Down Force can be set to an Active state by toggling the Down Force icon again, or raising and lowering the planter.

NOTE!: Manual Hold can be a useful tool for operators who wish to Hold down force in certain areas of their fields, instead of letting the Hydraulic Down Force system actively control in these said areas.

Planter Options Screen



OR



Automatic Control — Selecting Automatic Control enables the system to control down force based on gauge wheel sensor readings.

Manual Control — Selecting Manual Control enables the operator to set the downforce as they see fit.

Status—Displays current status of control system.

- **Active**—System is actively controlling down force
- **Inactive**—System is not actively controlling down force
- **Hold**—Pressure is being held constant due to manual hold or automatic hold

Gauge Wheel—Instantaneous channel average gauge wheel load

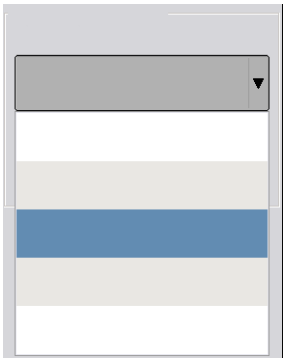
Down Force—Instantaneous supplemental down force

Pressure—Pressure reading from corresponding channel pressure transducer

Gauge Wheel By Row (table)—Instantaneous gauge wheel load for each monitored row

Gauge Wheel Load

Set offset to target gauge wheel load as calculated by the down force system.



ATTENTION! User can select 1 of 5 available gauge wheel load settings. Each available setting is an offset to the continuously calculated target gauge wheel load. Target Gauge Wheel Load is defined as: The amount of gauge wheel load necessary to achieve proper depth 100% of the time, while minimizing compaction as much as possible (without risking loss of proper planting depth).

Setting	Offset to Target
Minimum	-100 lbs
Light	-50 lbs
Medium (default)	0
Heavy	+50 lbs
Maximum	+ 100 lbs

Example: Based on the ground conditions in a specific area of a field, the down force system applies 150 lbs of supplemental force. However, if the Gauge Wheel Load setting is set to **Heavy**, the supplemental force being applied is now 200 lbs in this specific area of the field.

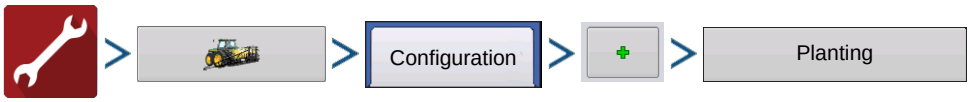
WARNING!: When operating on light or minimum, shallow planting can occur.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:

OR



Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

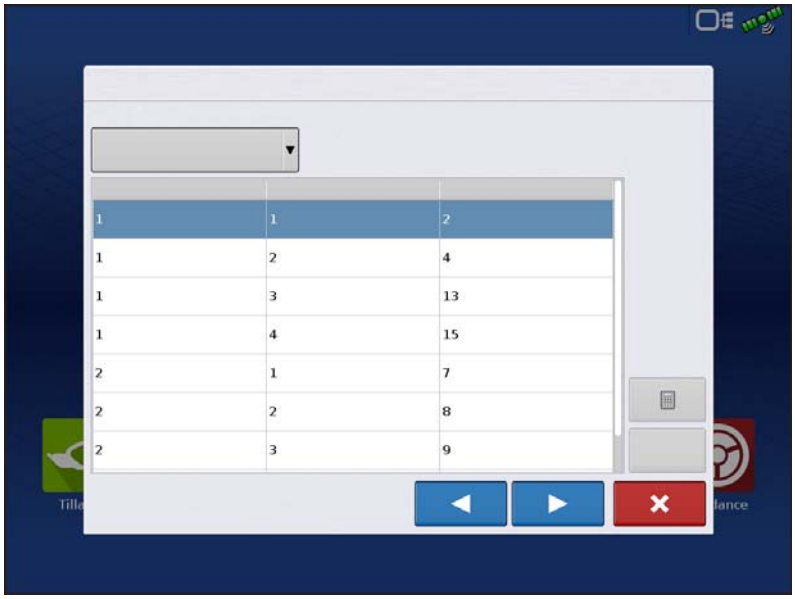
At the **Down Force Options** screen, the operator can choose a Down Force configuration from the drop down menu:

The rows listed are the recommended rows where the sensors should be installed.

The operator can assign rows if custom installed. (Select **Custom** from the drop-down menu.)

User can also unassign sensors from rows if a sensor is not installed there.

Row 1 is the on the left side of the planter (when standing behind the planter facing forward).



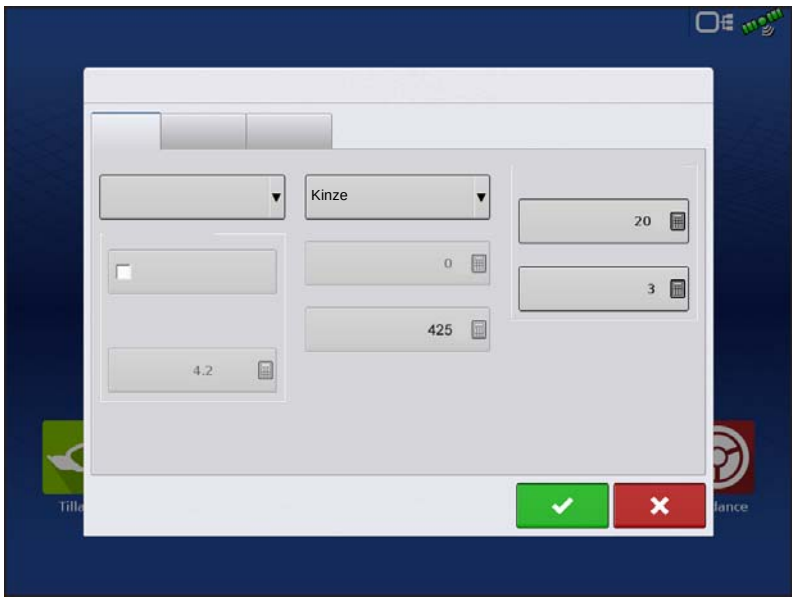
Setup Down Force Configuration

Down Force screen General tab

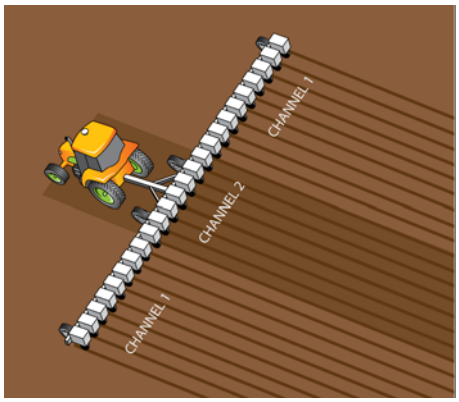
Down Force Mode

Monitor Only mode—provides the operator with information to determine if the row units are properly engaging the soil. If they are not, the operator needs to adjust the planter to correct the situation.

- Allows user to monitor the weight on the gauge wheels but does not adjust down pressure.
- Control Settings (Automatic Hold and Hydraulic Pressure to Down Force Conversion) are grayed out when using Monitor Only mode.

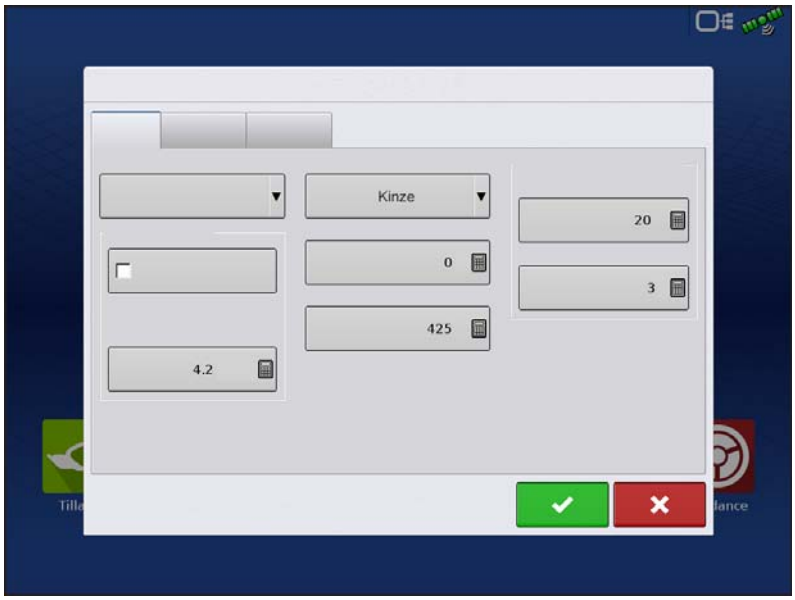


Control mode—as the planter travels across the field and encounters varying soil conditions (soil types, compaction zones, levels of debris) the display makes adjustments to the down force actuators on the row units, according to the operator's settings, to maintain the correct seed placement in the soil.



The system can be split between two channels to allow the down force to be adjusted separately on the planter wings and center section, where soil compaction is more likely to occur.

- Allows user to monitor the weight on the gauge wheels and have system automatically adjust down force.



Automatic Hold—Enabling this option will disengage active control (system will Hold), when any portion of the planter enters a no plant zone, such as boundaries, or previously planted areas. Use caution with this option if planting long point rows. Alarms will be disabled when system is in Hold.

Hydraulic Pressure to Down Force Conversion—adjusts system to accurately display changes to hydraulic down force. This setting is row unit specific.

Force Conversions	
Parallel Linkage	**Pressure Conversion**
Deere Short Arm	4.5 psi/lb
Deere Long Arm	3.8 psi/lb
Kinze 3000	4.2 psi/lb
Kinze 4000	5.1 psi/lb
White 8000/9000	4.8 psi/lb

Gauge Wheel Load Sensor—type of gauge wheel load sensor used. This is specific to the make of your planter.

Uplift Force—usually 0 unless planter is equipped with uplift springs to provide an upward force on row units.

Uplift Force	
Parallel Linkage	**Uplift Force**
Deere Short Arm	140 lbs
Deere Long Arm	
4 spring design	160 lbs
2 spring design	100 lbs
Kinze 3000	140 lbs
Kinze 4000	130 lbs
White 8000/9000	100 lbs

Maximum Force—used to limit the down force created by the actuator. The default is 425 lbs same as the factory airbag.

Gauge Wheel Load Alarm—sets alarm to notify operator when system goes below Minimum Gauge Wheel Load for a set amount of time (Time Threshold).

Down Force Channel 1 and Channel 2 tabs

The pressure and duty cycle settings are to help the display control the hydraulics. The defaults should be correct.

Hydraulic Pressure (Unavailable for Monitor Only)		
AgLeader Valve Block Calibration		
Operating Limits	**Pressure**	**Duty Cycle**
Minimum	100	0
Medium	550	20
Maximum	2800	65

PWM Frequency—The frequency that the PWM control valve is pulsed at should be set to 200.

Calibrate Pressure Sensor—Unavailable for Monitor Only

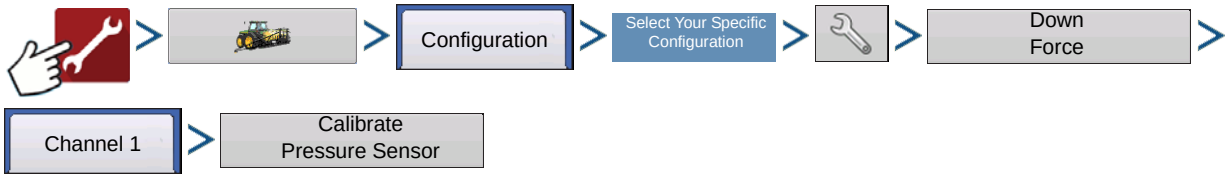
Pressure Sensor Enable—Unavailable for Monitor Only

Row Unit Sensors—Sensors 1-4 check boxes. These check box's allow the operator to disable gauge wheel sensors. If a sensor fails in-field, the failed sensor can be disabled from this screen.

ATTENTION!: Automatic Down Force can continue to operate as long as there is 1 active sensor on a channel.

Calibrate Pressure Sensor

(Only able to calibrate when Control Mode has been selected)



Setpoint—enter the current pressure of the system found on the mechanical pressure gauge on the valve block

Slope—pressure sensor calibration, do not adjust this value

Pressure to Force—Enter the specific pressure to force conversion ratio for the planters parallel linkage arm. Press the ✓. Pressure Sensor Calibration is complete.

NOTE!: Pressure Sensor must be enabled in order to display "Down Force" on the run screen for that specific channel of control.

Down Force Diagnostics screen

Pressing on the CAN button, located in the upper right corner of the display, opens the **Devices** screen. Highlight the **Down Force Module** in the CAN A tab and press the **Diagnostics** button in the lower right-hand corner. Technical support may request that you look at these screens for help in diagnosing a problem.

In this screen you can view the current **Operating Mode**, **Channel Status**, individual **Sensor Status**, individual **Sensor Readings**, and **Hydraulic Pressure**.

NOTE! Sensor Readings are the raw pound value being received by the Control Module. The value seen on Diagnostic screen is not dependent on the planter operational state, therefore making this a valuable tool to diagnosis sensor issues or inaccuracies.

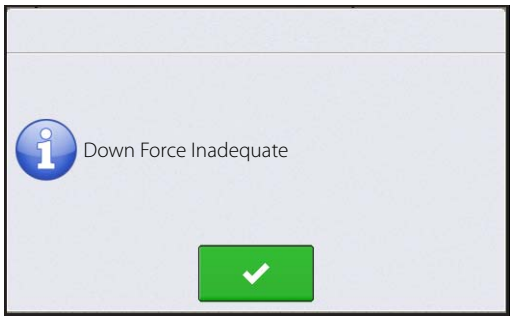
Down Force Alarms

Down Force Inadequate

System hydraulic pressure is at maximum pressure, but the Down Force system is not achieving acceptable gauge wheel load.

Recommendation—If supplemental force is at maximum, increase Maximum Force on the Down Force setup screen.

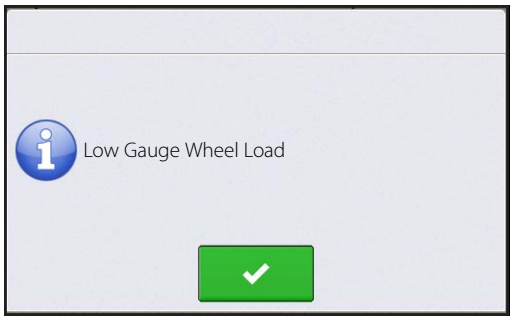
-Planter may not weigh enough to handle field conditions - toolbar may be lifting. Verify if the toolbar is lifting by checking parallel arms while planting. If weight needs to be added to the toolbar, contact planter manufacturer.



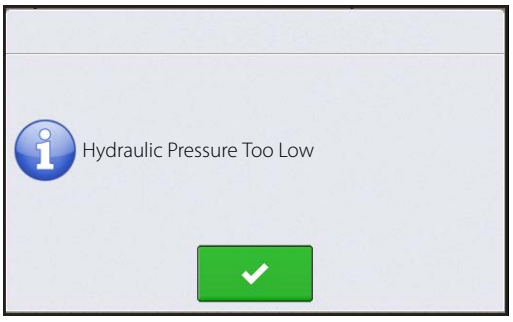
Low Gauge Wheel Load

Down force system does not achieve acceptable gauge wheel load

User defined alarm to signal operator if planter is losing planting depth.



Hydraulic Pressure too low



Down force system commanding more down force but hydraulics are not reacting

Recommendations:

- Check tractor remote is on
- Check that enough hydraulic fluid is directed to down force system

Pressure Sensor Failure

Problem—Pressure sensor is outside voltage range.

Resolution—swap cables with other channel (if applicable), re-zero pressure sensors. If problem persists on same channel, replace pressure sensor. If problem is now on other channel, inspect/replace cable.

Row Module Communication Lost

Problem—Row module communication lost.

Resolution—Inspect cabling of row module. Replace row module.

Row Module Failure

Problem—Row module is not sensing inputs. Row module is power cycling at intervals of less than 2 seconds

Resolution—Swap module with different row. If problem follows, replace module. If problem exists on same row, inspect or replace load sensor.

 # Row Modules does not match the display configuration

Problem—Configuration was set to a number of sensors that was not detected by the system.

Resolution—Create a configuration that matches the number of sensors used. Check that all row modules are communicating. Flashing green LED on the row module indicates proper communication.

How to use Manual Override

Manual Override of the control valve may be needed if all electronic control of the Down Force System is lost, or the display becomes unusable. Manual Override allows the Down Force system to apply a constant force in order to achieve planting depth (similar to down force springs). If the need arises to put the control valve into Manual Override, follow these steps.

Steps:

1. Engage hydraulics for the Down Force system.
2. Locate the Down Force control valve. Push the red knobs down and twist. The knobs will "pop out" to their outer position. (The inner positon is used for Auto Control).
3. Locate the allen head adjustments just above electronic PWM valve. Loosen the lock nuts on the allen head adjustments.
4. Screw the allen head adjustment IN to increase pressure sent to actuators; screw OUT to decrease pressure.

   Pressure (PSI) sent to actuators is shown on analog gauges on the valve block.
5. Refer to the Down Force setup screen and note the Hydraulic Pressure to Down Force Conversion ratio. Multiply this value by the desired down force; this will give you the appropriate pressure to adjust the valve to.

   Example: Kinze 3000 planter = 4.2 PSI/lb. The desired down force is 250 lbs.

   4.2 PSI/lb x 250 lbs = **1050 PSI.**

FAQ

Where do I plug in an implement switch?

Generation 1 modules will broadcast the implement switch status over the CAN bus. No additional implement switch is needed.

What if I don't have any other generation 1 modules?

You will use the Ag Leader CAN implement switch module P/N 4002911 and cable P/N 4002658 in conjunction with the standard implement switch.

What if my cables don't reach the rows for which I have installed gauge wheel sensors?

It may be acceptable to choose rows the cables will reach, as long as channel 2 sensors are on the center 6 rows, and channel 1 sensors are outside that.

What if I don't have any free SCV connections for the down force valve?

Teeing into existing lines is acceptable. Do not tee into the vacuum fan line if adjusting fan RPM on the tractor with a knob or dial. Teeing into the line before a flow limiter on the planter would be acceptable. Teeing into the hydraulic drive supply line would be the best option. Do not tee into Rawson Drive supply line.

What if my hydraulic oil gets too hot?

Ag Leader sells a Load Sense kit (P/N 4101225) to help manage oil temperatures. Note: This system will not help if using SCV to control hydraulic drives. In this case, an auxiliary oil cooler may need to be installed.

What if my hydraulic actuator does not extend far enough to reach the lower bracket with row unit at bottom travel?

Purchase one spacer kit (P/N 4101201) per row. This will install at the bottom of the ram. (Commonly used on John Deere long parallel arms)

My Kinze 3000 planter has rows that are offset 4" back, causing the upper actuator bracket to not line up with the lower actuator bracket.

Purchase one spacer kit (P/N 4101204) per row. This will move the upper bracket 4" rearward.

How does the system know the difference between the row modules on channel 1 and those on channel 2?

The Channel 1 row modules will connect to the cable labeled "Type 1" while channel 2 row modules will connect to "Type 2" cables.

Am I missing something to plug into the 3 pin connector on the master hydraulic down force module?

This connector is not used.

Why is the gauge wheel load bar graph constantly spiking and then going to 0?

This can happen if the Channel 1 pressure lines are routed to channel 2 sensors. Ensure channel 1 components (Down force pressure, and gauge wheel load sensor wiring) are on the wings, and channel 2 components are on the center 6 rows. Ensure channel hoses are going to correct channel of down force valve. Ensure PWM/pressure sensor cables are going to correct channel of Down Force Module and Down Force Valve.

What are the red knobs on the down force valve?

This allows for manual adjustment of down force in the event of electronics failure. Push and twist the knob to move between automatic adjustment (inner position) and manual adjustment (outer position).

Why does the system need 3 hydraulic lines (Pressure, Return and Tank)

Under normal operation, pressure in the down force system is increased through the Pressure line and relieved through the Return line. When the planter runs over a terrace or a water way, the access pressure is released through the Tank line. All three lines MUST be connected.

Troubleshooting

Problem—Down Force will not adjust in Auto Control while planting (Down Force Holds)

- Down Force indicator arrow stays Yellow while planting.

Solution:

- Verify implement switch(s) polarity is correct.

- Verify implement switch(s) are tripping when planter is lowered.

1. With planter lowered, verify implement switch(s) have tripped.
2. Check the polarity of the implement switch is correct. Implement switches can be swapped from Normally Open to Normally Closed by switching 3-pin weatherpack connections.
3. If Generation 1 SeedCommand modules are installed, verify the implement switch(s) is hooked to the correct module according to the hierarchy.

   If an Implement Switch module is installed, verify the indicator light turns blue on the module when the switch is tripped.
4. Check mounting of implement switch(s).
5. While operating Down Force, verify the toolbar is not lifting causing the implement switch to trip.

ATTENTION! Gauge wheel sensors will "re-zero" when the planter is raised for 10 seconds. Re-zeroing provides more accurate gauge wheel data upon each planting pass. This is also a good troubleshooting measure to determine if a gauge wheel sensor is behaving appropriately.

However, gauge wheel sensors will never re-zero to 0.0 lbs; once a sensor re-zeros the displayed load should be roughly anywhere from 0.1 to 5.0 lbs.

Problem—Supplemental Force and Gauge Wheel Load do not appear to reflect each others responses. (Ex: High Gauge Wheel Load on Channel 1, with very little Supplemental Force being applied, or vice versa)

Solution—Verify installation of the Local CAN terminators.

1. The Local CAN is the communication wiring bus that transfers the gauge wheel load readings to the main control module. There needs to be a terminator on each end of this bus.
2. Terminator PN 4002870 will need to be installed on the wiring harness closest to row 1. Terminator 4002871 will need to be installed on the wiring harness closest to the end of the planter (right-hand side when looking at planter from the rear)

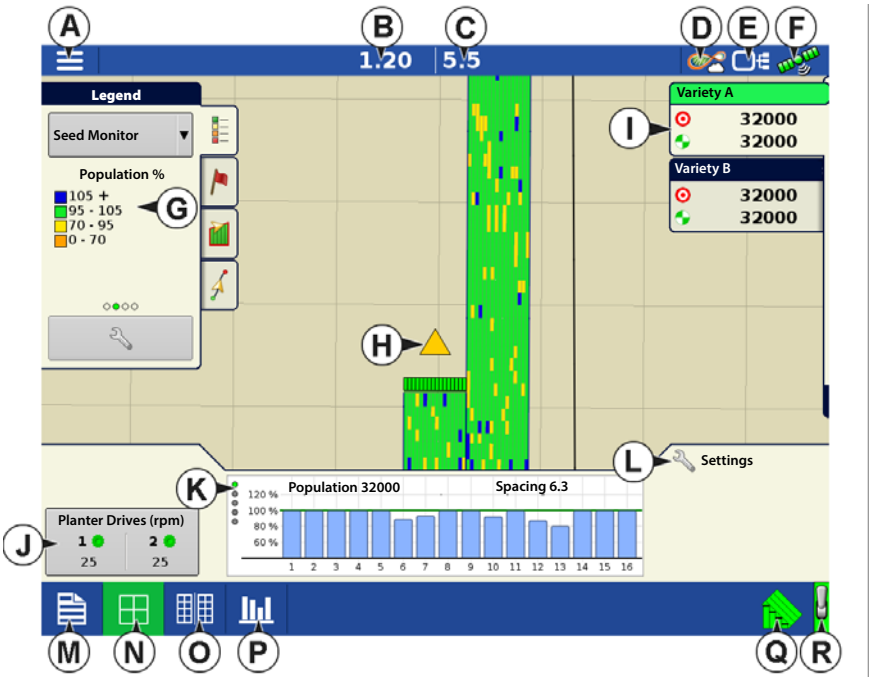
Load Configuration

Press the Planting App from the home screen. This will take you through the steps needed to load a configuration.

Map View

Once a configuration has been completed, the Map View screen appears.

A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Vehicle Icon
I. Product Control toolbox
J. Planter Drive RPM
K. Bar Graph
L. Settings button
M. Event Summary
N. Map View
O. Split screen
P. Advanced Seed Monitoring
Q. AutoSwath
R. Master Switch Status

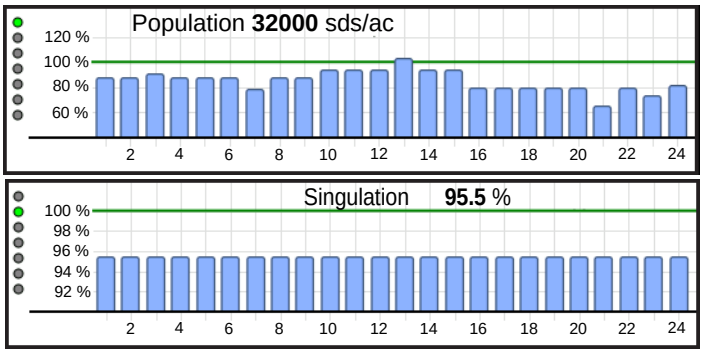


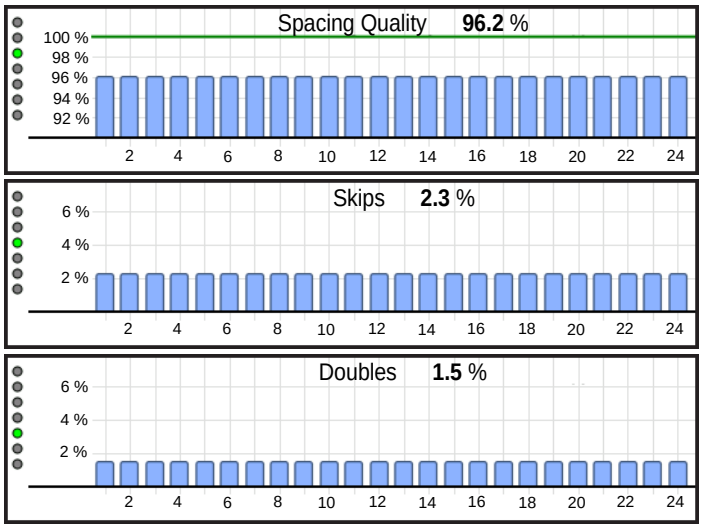
NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

Advanced Seed Monitoring

Bar Graph

Tapping subsequently will toggle the bar graph between all the following seed placement performance graphs.

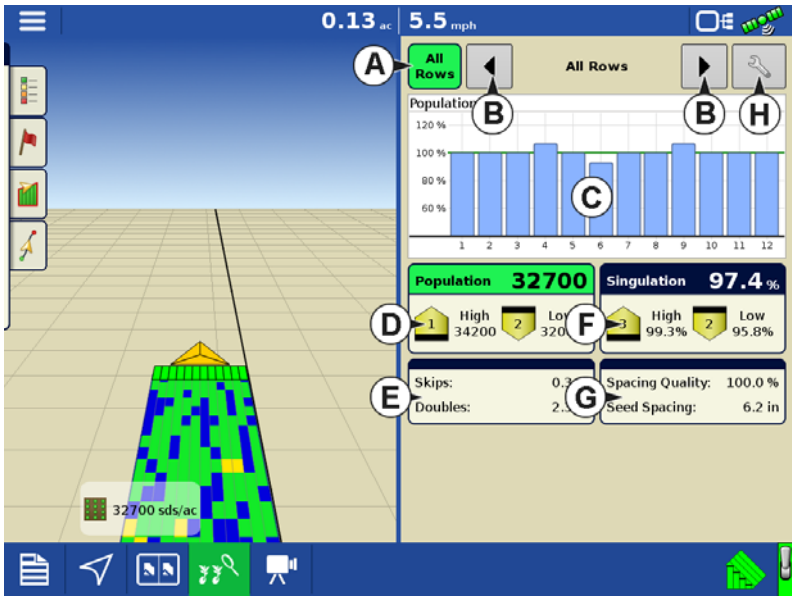




Advanced Seed Monitoring

Press: Advanced Seed Monitoring button

Planter Performance screen



A. All Rows
B. Previous/Next Row Toggle
C. Bar Graph
D. Population
E. Skips/Doubles
F. Singulation
G. Spacing Quality
H. Seed Monitor Options

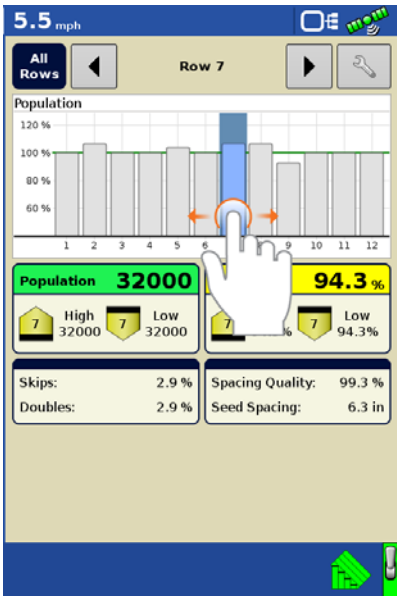
Advanced Seed Monitoring provides planter performance monitoring of seed meter singulation, skips/doubles and spacing quality, along with population and spacing information for all rows when planting compatible crops.

In addition, Advanced Seed Monitoring automatically determines and displays the rows operating at the highest and lowest levels for singulation and population. The screen also shows the averages for specific drive sections.

Bar graph can show individual row information for the averages shown on buttons (D-G).

A. **All Rows**—Displays the planter average for the four display items (D), (E), (F) and (G) at the bottom of the screen.
B. **Previous/Next Row Toggle**—Toggle through the rows using the arrow buttons or press on a specific row in the bar graph to show specific Advanced Seed Monitoring values for that row.

NOTE!: An operator may also touch the appropriate bar on the graph to show that specific rows Advanced Seed Monitoring values. To easily change between specific rows, tap and hold your finger on the bar graph, then drag left or right between rows. Release your finger from the screen when the desired row is highlighted.



C. **Bar Graph**—Displays population, singulation, spacing quality, skips, and doubles, as selected by the operator.

D. **Population**—Displays the average population for the planter, or sections of the planter, along with the highest and lowest population row.

E. **Spacing Quality**—Displays the average spacing quality for the planter, or selected sections of the planter, along with the highest and lowest.

- Spacing quality is a measure of the percent of seeds being properly placed so that the spacing is as expected in the seed trench.

F. **Singulation**—Displays the average Singulation for the planter, or selected sections of the planter, along with the highest and lowest rows.

- Singulation is a measure of the percent of seeds being properly metered so that one and only one seed drops from each seed cell of the seed meter.

G. **Skips/Doubles**—Displays the average skips and doubles for the planter

- Skips are a measure of the percentage of seed expected to be planted that are not due to a seed not being dropped by the seed meter.
- Doubles are a measure of the percentage of seed expected to be planted individually but instead two or more are dropped by the seed meter.

H.**Seed Monitor Setup**—Pressing this button brings up Seed Monitor Options screen.

NOTE!: If you are receiving Double, Skip, or Poor Spacing indicators while planting, refer to "Singulation Errors" on page 230 and "Spacing Quality Errors" on page 231.

Creating Products

Creating planting products can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Follow described steps to create planting varieties during initial setup.

1. Select **Product Type** (Crop) and **Product Units** (seeds or pounds).
2. Enter **Variety** or **Hybrid** name.

   Press to enter a unique name for the variety or hybrid.
3. Enter **Variety** or **Hybrid Manufacturer** is applicable.

   Manufacturer name can be added to the drop-down menu by pressing .
4. Press to complete Product setup.

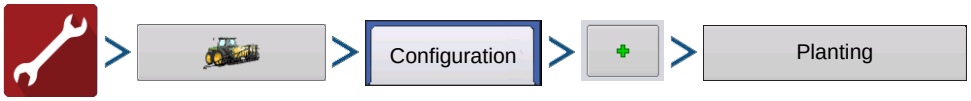
   Created variety or hybrid should appear under the Planting heading located on the Product tab of the Configuration Setup Screen.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:

OR



Your Operating Configuration will then be viewable when you start a new Field Operation.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

Seed Monitor Setup

- The **Split Rows** and **Standard Rows** settings show the number of rows found on the planter that the Seed Tube Monitor Module supports. Use ▲ / ▼ to enter the total number of rows found on the planter.
- The **Speed Source** shows the selected Ground Speed Source input for the Seed Tube Monitor Module.

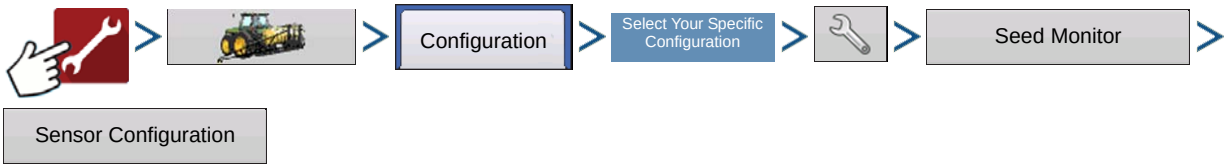
  -GPS: The STMM utilizes the speed from the GPS correction source that is connected to the display.

  -AUX: The STMM utilizes a speed source that is connected to the Auxiliary Input Module. This is typically a tractor wheel speed or radar source.
- Press **Sensor Configuration** to summon the Sensor Configuration window, which shows which rows are assigned to the individual pins on the Seed Tube Monitor Module.

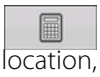
NOTE!: Press Sensor Configuration to perform the **AutoConfig** procedure, which is necessary for a Seed Tube Monitor Module configuration to become active.

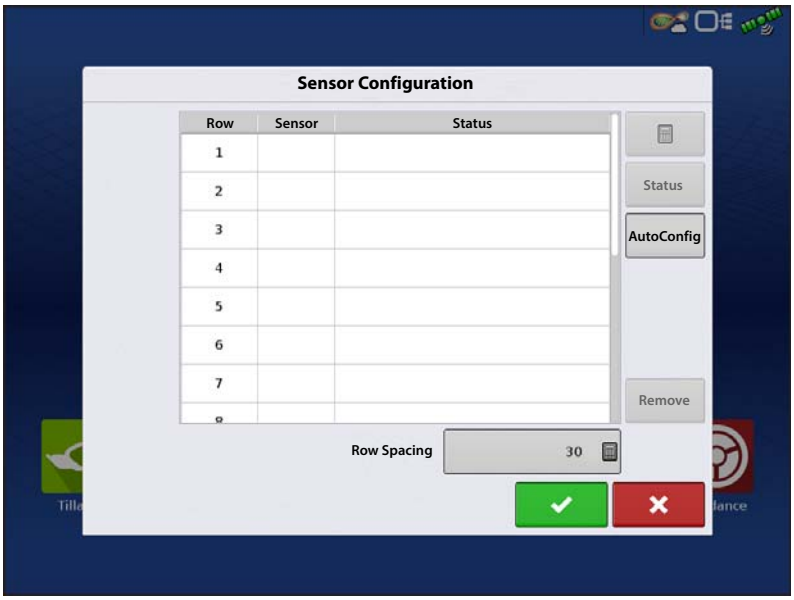
- Press the **Alarms** button to summon the Seed Monitor Alarms screen, which shows each row and the alarm threshold for that row.

AutoConfig Procedure



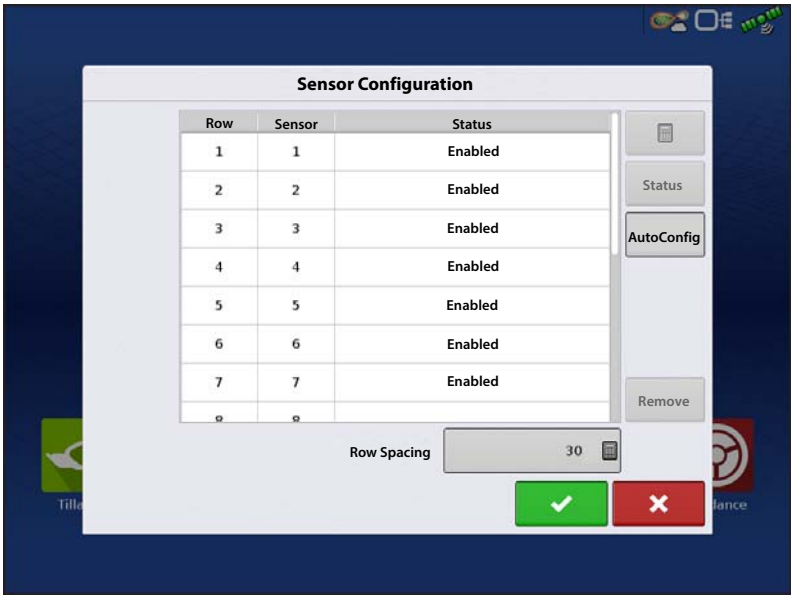
The Sensor Configuration screen shows which rows are assigned to the individual pins on the Seed Tube Monitor Module.

- The AutoConfig button sends the planter settings to the Seed Tube Monitor Module.
-  moves the sensor to a different location, to make configuration changes for custom planting operations.



NOTE!: To return to the default, press the AutoConfig button.

- Status—This button Enables and Disables a Seed Tube sensor.

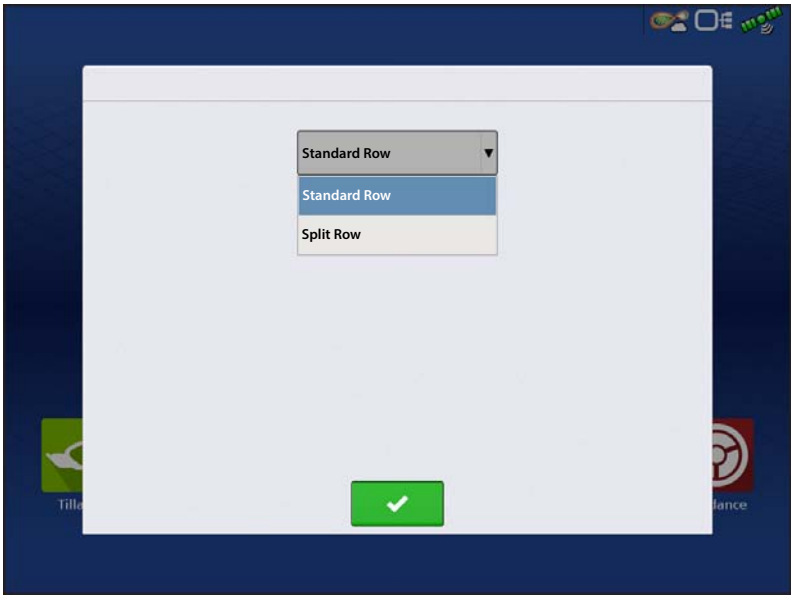


NOTE!: A row with a failed sensor can be ignored until a replacement sensor is installed.

- **Remove**—This button removes an individual Seed Tube sensor.
- **Row Spacing**—Use this keypad to enter in the row spacing.

STMM Split-Row Configurations

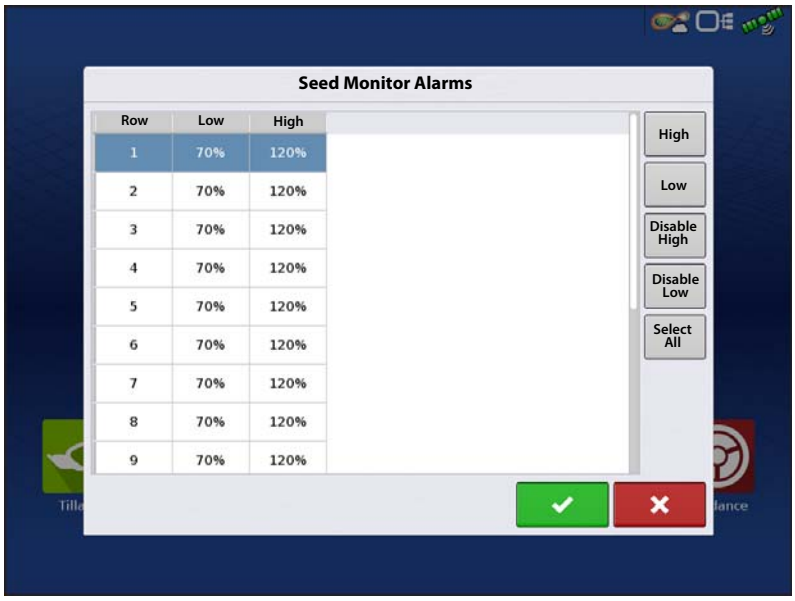
- If a split-row planting configuration is specified in the Seed Monitor Setup screen, then the Selection window will appear after the first time that you press the **Sensor Configuration** on the Seed Monitor Setup window. Choose between Standard Row or Split Row, and press .



- With a Split-Row Configuration the **AutoConfig Procedure** must be performed for BOTH the Standard and Split Rows. Both configurations are then saved in the display, and settings for each

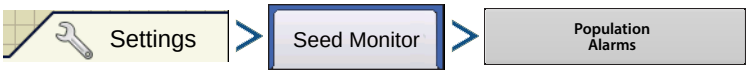
planting configuration are automatically applied when you specify the machine configuration at the Field Operation Wizard.

Seed Monitor Alarms



Adjust Seed Tube Monitor Module alarm thresholds. This screen can be accessed in one of two ways:

- Pressing the Alarms button at the Planter Option screen.



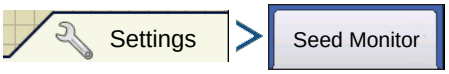
OR

- Pressing the Alarms button at the Seed Monitor Setup screen.

High and **Low** buttons assign a percentage of error that will trigger the rate alarm.

- The Disable High and Disable Low buttons deactivate the respective high or low rate alarms.
- The Select All button selects all rows to change the alarm threshold for the entire group.

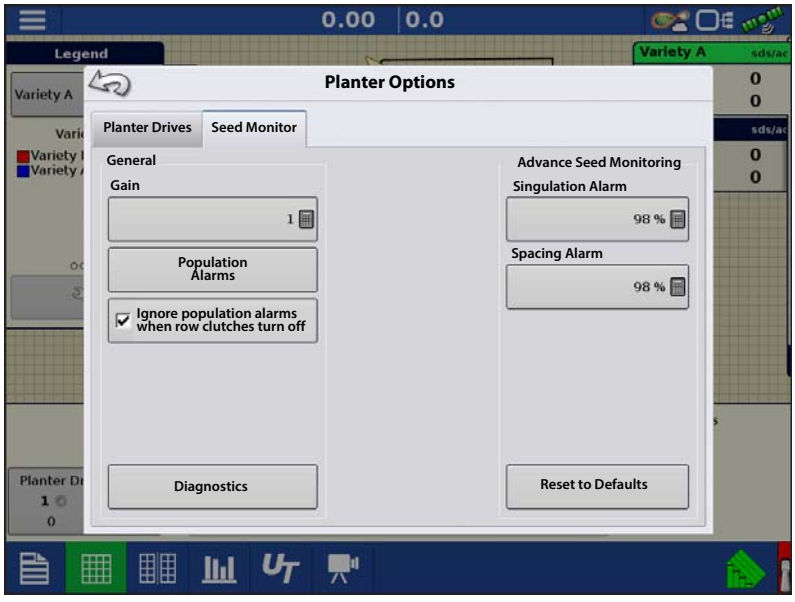
Planter Options



OR

The Planter Options screen adjusts Seed Tube Monitor Module alarm thresholds, Gain, and Advanced Seed Monitoring alarm thresholds. The screen also has access to module Diagnostics.

Gain shows the population multiplier used to adjust the population if the seed tube is not sensing the actual seed population.



- Always start with the Gain set to 1.
- Gain Setting is saved by crop type.
- For Corn, Gain values should **always** be set to **1**.

Gain adjust example: Planting soybeans at a target population of 150,000, the on-screen population readout is 140,000. First perform a dig check to verify the correct population is being planted; then check the seed tube sensors to make sure they are clean of dust and debris. Once the checks have been done, the Gain can be adjusted so the on-screen population readout reflects the true population. Divide the target population by the population readout (150,000 / 140,000 = 1.07). Enter 1.07 as the new Gain value.

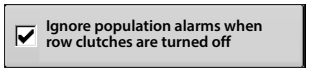
Advanced Seed Monitoring Thresholds

- Singulation Alarm
- Spacing Alarm

Crops that are supported by Advanced Seed Monitoring

- Corn
- Sorghum
- Cotton
- Sugar Beets
- Cucumber
- Vegetable (generic vegetable crop type)

WARNING! Do not change the Default Gain setting of 1 for any crops that are monitored by Advanced Seed Monitoring.

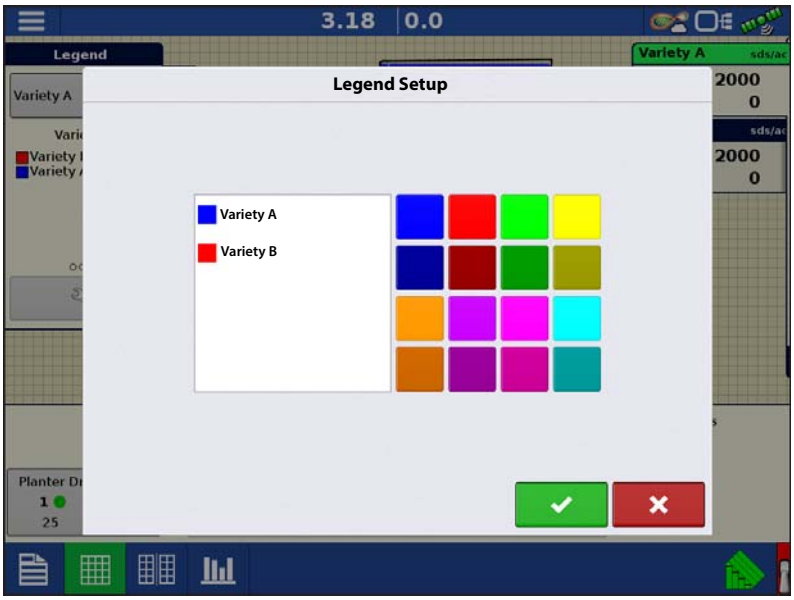


Ignore seed alarms when row clutches turned off check box

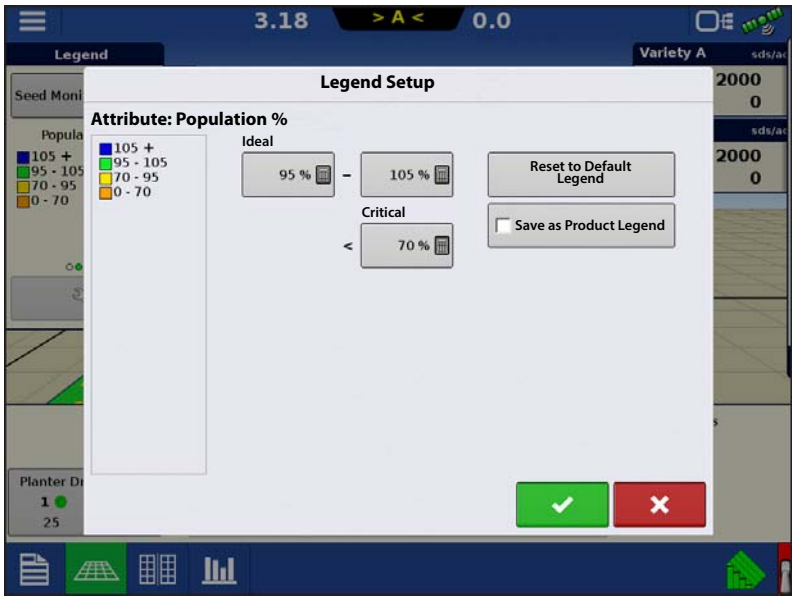
Legend Setup

Pressing the area under the seed varieties on the Map Legend Tab of the Mapping Toolbox opens the Legend Setup screen.

If a variety was selected, a list appears on the left-hand side of the Legend Setup screen. To change the color of one of these varieties, highlight that variety and then press a color on the color palette at right. Press when finished.



If Seed Monitor was selected, the Legend Settings screen appears (similar to the screen to the right). Use this screen to adjust the legends thresholds. Legend settings screen may differ depending on the legend that is displayed. Press when finished.



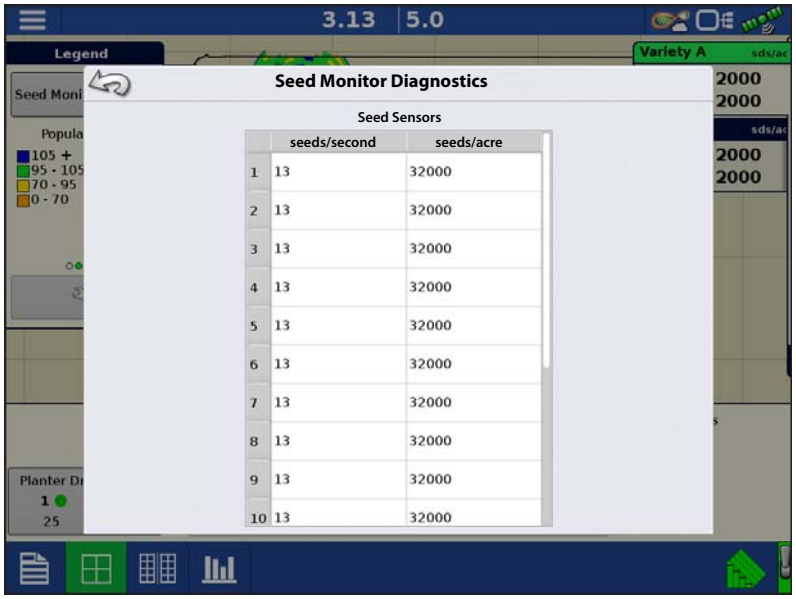
Seed Monitor Diagnostics

The **Seed Monitor Diagnostics** screen shows row data from rows monitored by the Seed Tube Monitor Module, including the following:

- Row unit seeds per second
- Row unit seeds per acre

NOTE!: This can also be accessed on the CAN device list under Diagnostics

ATTENTION! The seeds per second column provides instantaneous feedback from the matching seed tube sensor. This feedback is not dependent on operating state. This is a useful tool for troubleshooting seed tube sensors or performing pre-season checks to verify sensor operation.



Troubleshooting Seed Tube Monitor Module

Problem—Receiving the warning message "The row sensor map for this configuration has not been set. Configuration not loaded.

Solution—The STMM map requires setup. Perform an AutoConfig. Refer to "AutoConfig Procedure" on page 224.

Problem—Receiving the warning message "The number of rows in selected Operating Configuration does not match the Seed Monitor Module setup. Configuration not loaded."

Solution—The STMM Configuration was setup differently than the Operating Configuration.

1. Refer to the Configuraiton Setup screen for you specific vehicle/implement.
2. Verify the number of rows entered in the Planting Configuration matches the number of rows entered in the Seed Monitor setup.

3. If this is a Split Row configuration, verify that "Interplant" is enabled on the Configuration Setup screen.

   i. If it is disabled, create a new Planting Configuration and be sure to checkmark the "Split Rows Enabled" checkbox in the Implement Wizard.

Problem—Receiving a **"**Seed Monitor not Initialized**"** error message. Error message may be received when attempting to load an Event.

Solution—STMM may require a new AutoConfig.

1. Refer to the Seed Monitor setup screen.
2. Reset the number of Standard rows to a different value (ex: if the planter is a 12 row, enter 13 rows)
3. Enter the Sensor Configuration screen and press AutoConfig. Accept this sensor configuration by pressing the green check.
4. Change the Standard rows back to the correct number of rows.
5. Enter the Sensor Configuration screen and press AutoConfig. Accept this sensor configuratin by pressing the green check.
6. Attempt to load the Event.

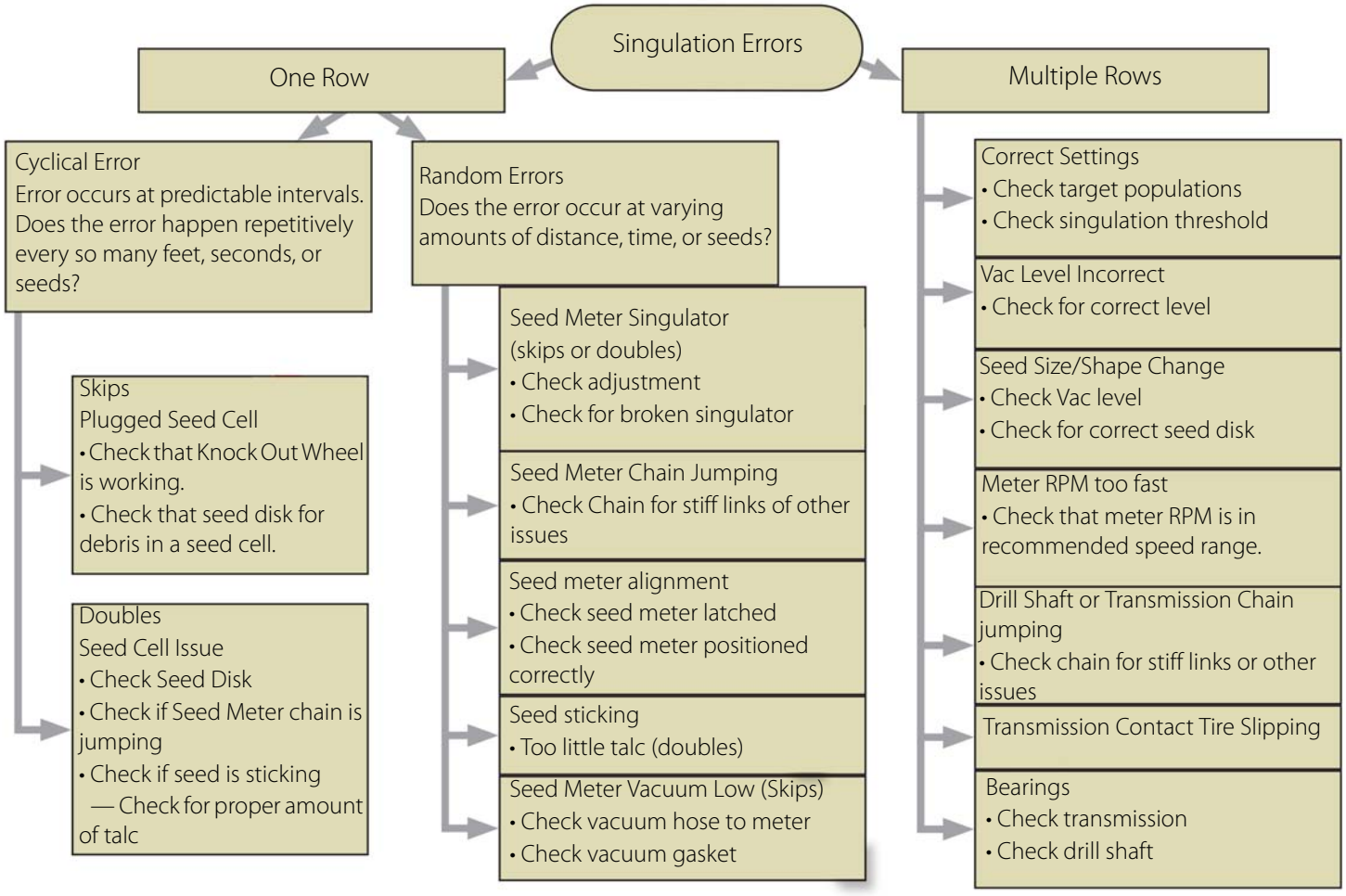
Problem—Not receiving population readings from all or certain planter rows.

Solution:

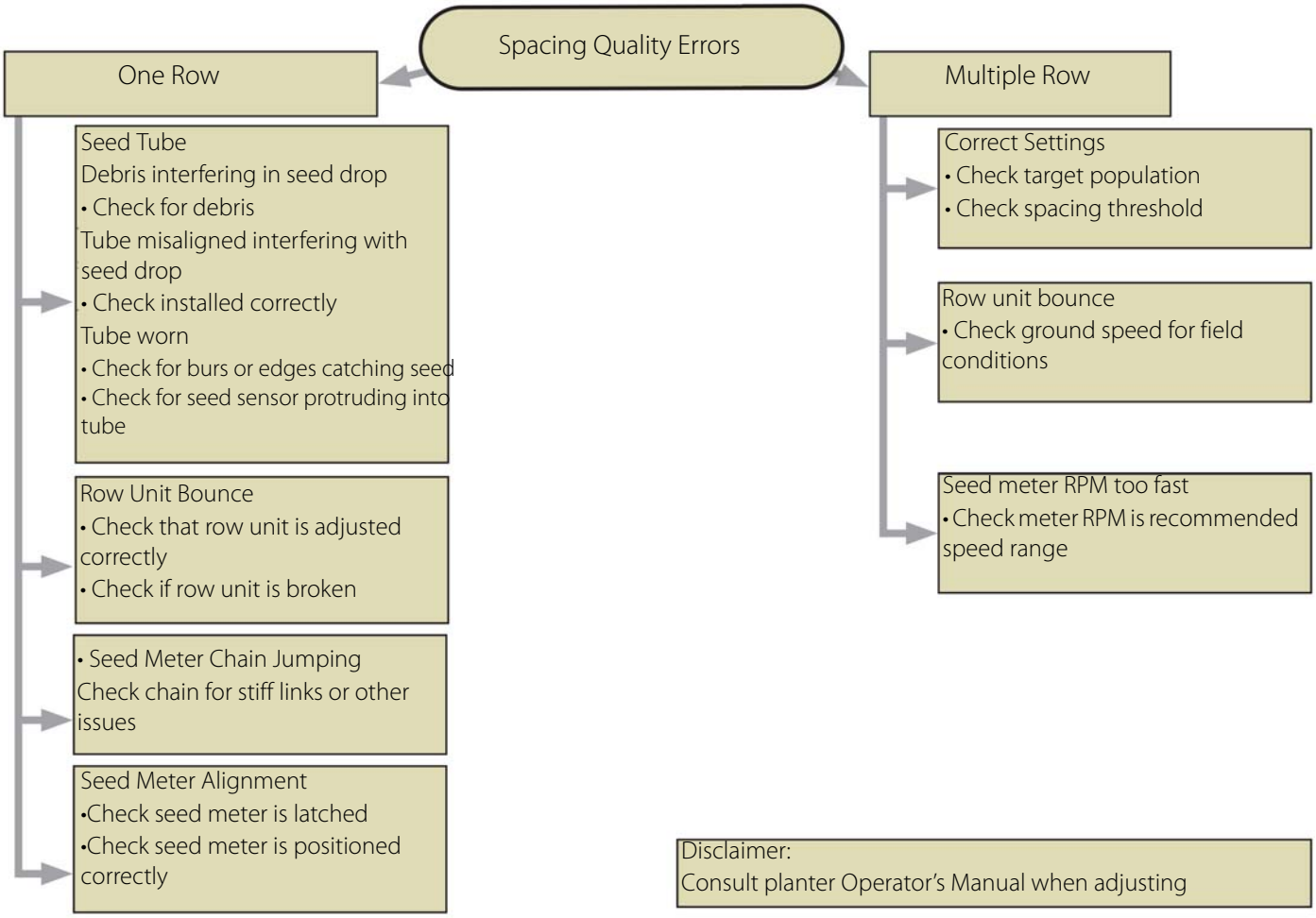
1. Refer to the STMM Diagnostics page. Verify there is no feedback on the failed rows in the seeds per second column when seed passes by the seed sensor.
2. Check for 12V on the 2 pin duetsch connection that provides high power to the module.
3. Check for 8V on the power and ground pins on the connection that plugs into the seed tube sensor.
4. Check for 8V on the sense and ground pins on the connection that plugs into the seed tube sensor.
5. If voltages are all proper, move the seed tube sensor to a functioning row to verify it is the problematic component.

NOTE! If incorrect voltage is received at any location noted above, trace down the power issue by rechecking for voltage at harness and module connection points. Refer to the Ag Leader Knowledgebase for cable schematics. Call/email Technical Support for further assistance.

Singulation Errors



Spacing Quality Errors



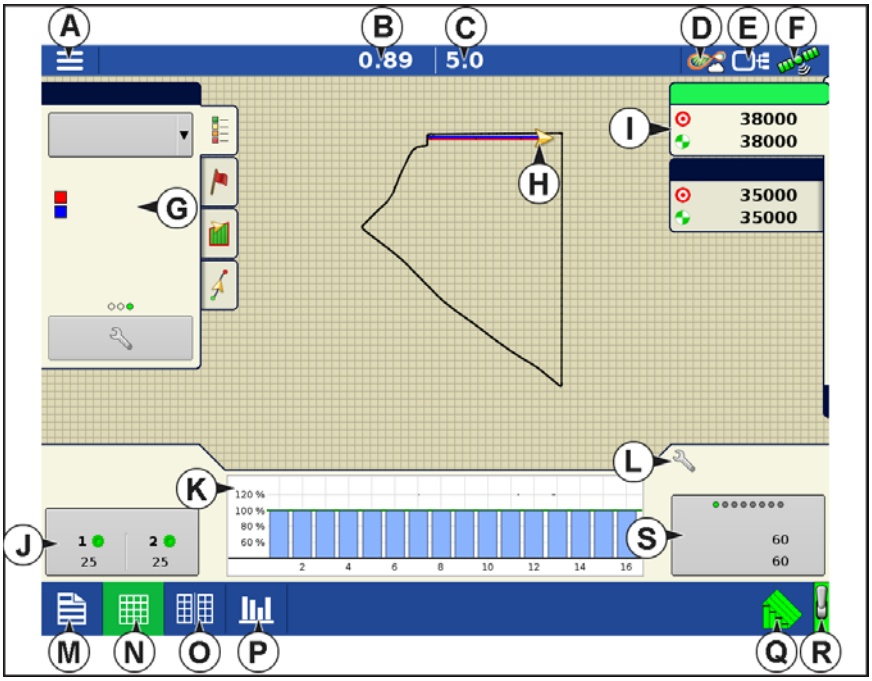
The KINZE Planter Monitor Module is a feature that displays planting data from a KINZE Population Monitor on the Map screen.

Load Configuration

Press the Planting App from the home screen. This will take you through the steps needed to load a configuration.

Map View

Once a configuration has been completed, the Map View screen appears.

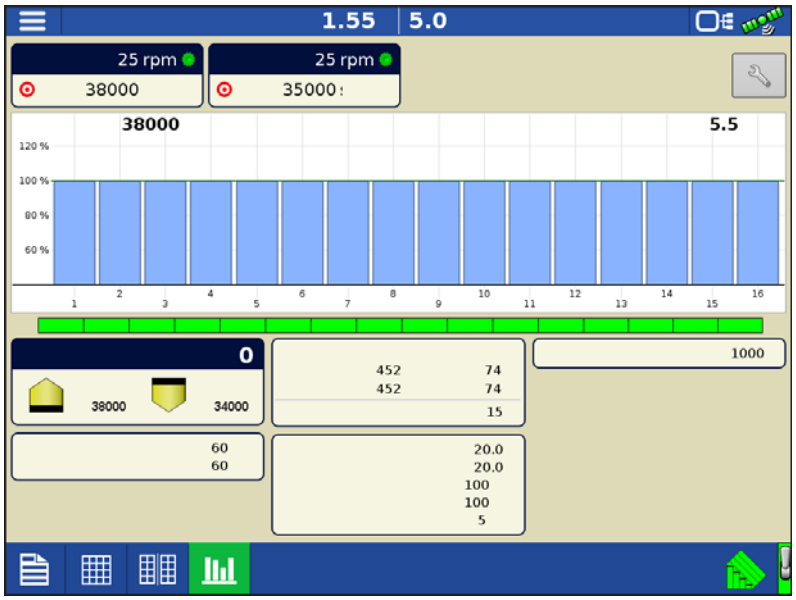


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Vehicle Icon
I. Product Control toolbox
J. Planter Drive RPM
K. Bar Graph
L. Settings button
M. Event Summary
N. Map View
O. Split screen
P. Planter Performance screen
Q. AutoSwath
R. Master Switch Status
S. Shaft Speed

NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

Planter Performance Screen

Press: Bar Graph button. The Planter Monitor Module screen displays information on machine performance.



Shaft Speed—The speed of the planter drive shafts, in RPM.

Tank Weight—The weight of seed in each tank of the ASD system.

Tank Area Left—The number of acres (hectares) that can be planted with the amount of seed remaining in the tanks of the ASD system.

ASD Tank Pressure—The air pressure level for the Air Seed Delivery (ASD) system.

EdgeVac Level—Measure of seed meter vacuum. This measurement, shown in inches of water, is displayed for each vacuum fan.

Pneumatic Down Pressure—Measure of down force the air bag places on the row unit.

Magnetic Pickup Speed—Speed registered according to the magnetic pickup.

NOTE! Seed tube sensors that communicate on the MUXBUS with Planter Monitor Module can calculate each individual rows population. The PMM calculates the target population (100% line on population bar graph) by averaging each individual rows population across the planter.

Creating Products

Creating planting products can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Follow described steps to create planting varieties during initial setup.

1. Select **Product Type** (Crop) and **Product Units** (seeds or pounds)
2. Enter **Variety** or **Hybrid** name.

   Press to enter a unique name for the variety or hybrid.
3. Enter **Variety** or **Hybrid Manufacturer** is applicable.

   Manufacturer name can be added to the drop-down menu by pressing .
4. Press to complete Product setup.

   Created variety or hybrid should appear under the Planting heading located on the Product tab of the Configuration Setup Screen.

Setup Steps

NOTE! Steps 1-4 must be performed by everyone who has purchased a KINZE Planter Monitor; steps 5-6 are performed by customers who have purchased those specific features.

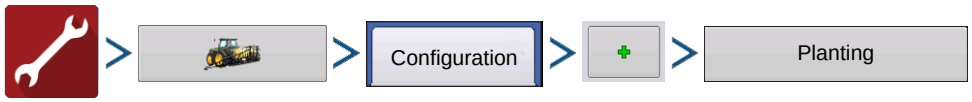
1. **KINZE Planter Monitor Module Configuration**—This creates a configuration that is used for KINZE Planter Monitor operations. See"Create Configuration" on page 235.
2. **Monitor Module setup**—Included front and rear unit settings, Shaft RPM sensor settings, and row spacing settings. This step allows the display to detect the physical KINZE Planter devices. See "KINZE Planter Configuration" on page 235.
3. **Sensor detection process**—This allows the display to detect the proper number of Muxbus sensors on the row units. See "Muxbus Sensor Detection" on page 237.
4. **Set alarm thresholds**—This allows user-defined level at which the seed monitor alarms will sound. See "KINZE Seed Monitor Alarms" on page 240.
5. **Calibrate the Magnetic Pickup Coil**—This step, which is performed by customers who have purchased the Magnetic Pickup Coil Speed Sensor allows the Monitor Module to receive data from this sensor, which measures the ground speed of the planter. See "KINZE Magnetic Coil Speed Sensor Calibration" on page 240.
6. **EdgeVac® calibration**—This step, which is performed by customers who have purchased the EdgeVac® seed meters, allows the display to receive accurate data from the meters. See "KINZE EdgeVac Calibration" on page 241.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration.

The configuration can be started in two places:

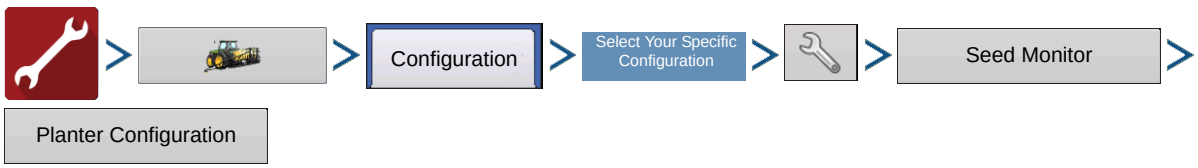
OR



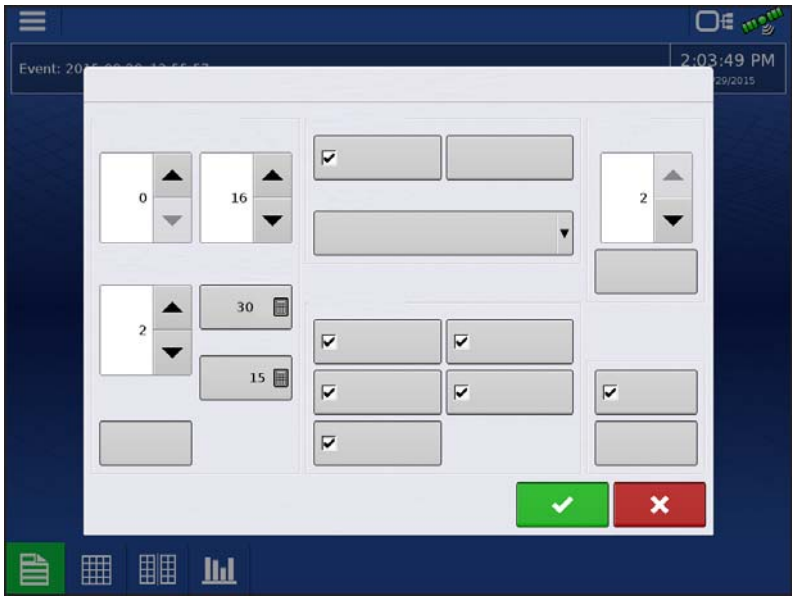
Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

KINZE Planter Configuration



- **Front Units and Rear Units**—Use ▲ / ▼ to adjust the number of front and rear planting units, if necessary.
- **Shaft RPM Sensors**—Use ▲ / ▼ to adjust the number of Shaft RPM Sensors, if necessary.
- **Row Spacing**—Shows the minimum row spacing of the planter. Press [calculator] to adjust the Row Spacing.
- **Sensitivity**—Changes automatically with product type selection. Press [calculator] to adjust.



NOTE!: Higher sensitivity is used for smaller seeds. Default values are; Soybeans = 15 and Corn = 10. Lower sensitivity if dust is affecting displayed population.

- **Reset**—Returns settings to factory defaults, which allows operator to run Muxbus Sensor Detection again.

Ground Speed Settings

- **Magnetic Pickup**—Check the Magnetic Pickup check box only if the planter is equipped with the Magnetic Pickup Sensor.

NOTE!: Customers who do not have the Magnetic Pickup sensor who check this box will see a window stating "Bad Configuration: No Magnetic Pickup sensor currently found."

- **Speed Source**—The Speed Source drop-down box selects the type of speed source for the planter monitor. Choose between GPS, AUX (Auxiliary Input Module) and PMM. This speed selection only affects the PMM. The display's ground speed source must still be selected.

  GPS—The PMM utilizes the speed from the GPS correction source that is connected to the display.

  AUX—The PMM utilizes a speed source that is connected to the Auxiliary Input Module. This is typically a tractor wheel speed or radar source.

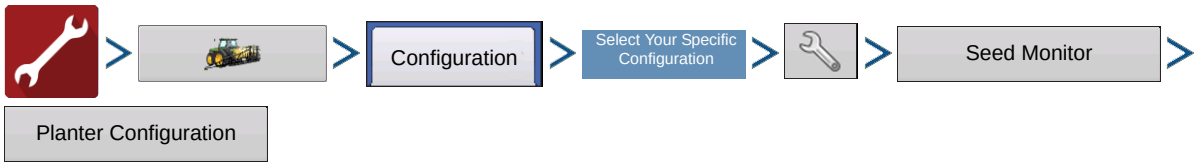
  PMM—The PMM utilizes the Magnetic Pickup Coil that is equipped on the planter to measure speed. This coil sensor will need to be calibrated.

Other Sensors

Other check boxes on the Planter Configuration window include:

- **Down Pressure**—Check this box if the planter has pneumatic down pressure.
- **Oil Sensor**—Leave this box unchecked.
- **SDS Sensors**—Leave this box unchecked.
- **Air Compressor**—Check this box if the planter has an air compressor installed.
- **Tank Weight**—Check this box if the planter has a tank weight sensor install.
- **EdgeVac Sensors**—Use ▲ / ▼ to enter the number of EdgeVac® sensors on the planter. Calibrate EdgeVac sensors once a year. To start process, press the Calibrate button.
- **Tank Pressure**—Check the box only if the planter is equipped with tank pressure sensor. Calibrate the sensor once a year. To start process, press Calibrate button.

Muxbus Sensor Detection



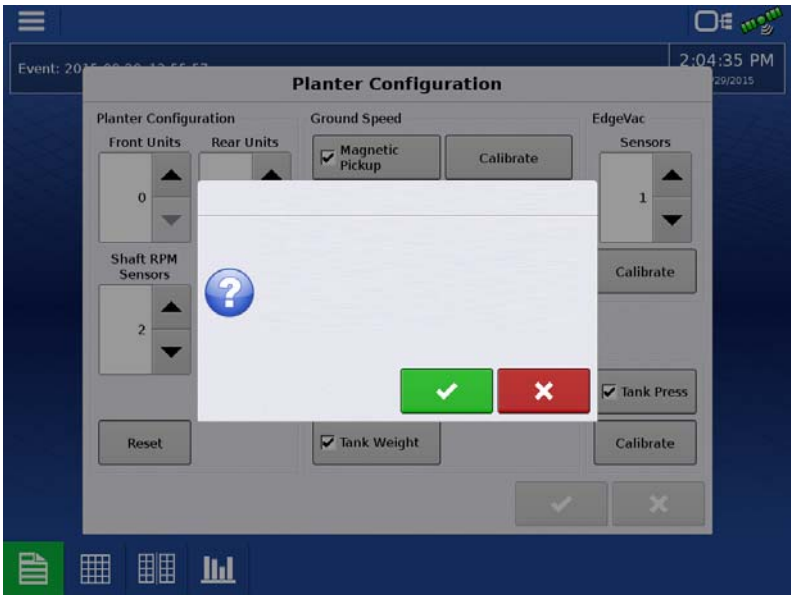
After initial configuration of the KINZE Planter Monitor, complete the Muxbus Sensor Detection process. This process allows the Muxbus to detect each sensor on the planter. In order for the display to show the correct Planter Monitor information, complete the detection process for each Muxbus sensor.

ATTENTION! Be sure that all sensors are **unplugged** before beginning the process. If any sensors are plugged in the sensor harness, the Muxbus Detection process will abort. If this occurs, unplug all sensors and retry procedure.

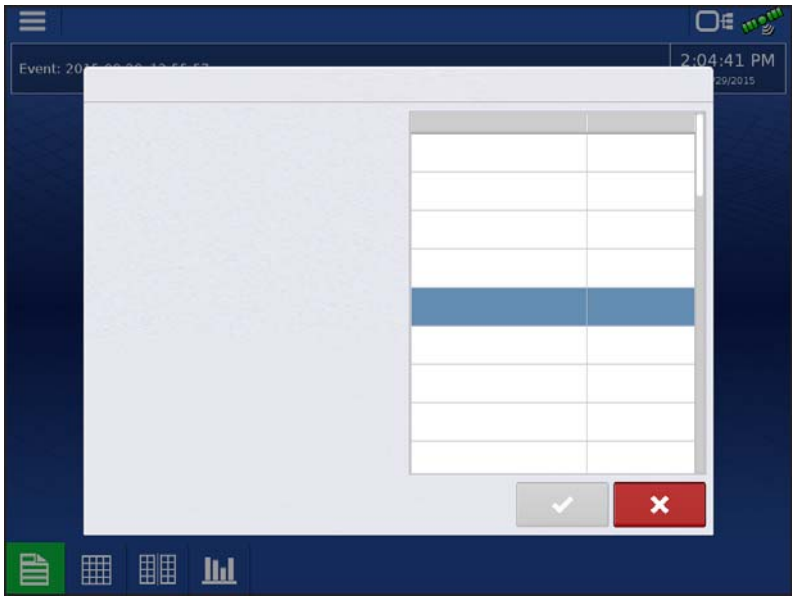
1. To start the Sensor Muxbus Detection process, make any settings changes necessary at the Planter Configuration screen and then press ✓. Make certain all planter sensors are disconnected from the planter harness.

NOTE!: The Muxbus detection process will only start if sensor configuration has changed.

1. **Accept the Muxbus Detection**—A screen appears, informing you that your configuration has changed and that it will require a Muxbus detection. Once all sensors are disconnected, press ✓ on the Configuration Changed screen. The Muxbus Detection Process then begins.



2. **Detect individual row units**—Plug in each physical sensor plug into the Muxbus wiring harness on the planter (from left to right). Follow the on-screen instructions.

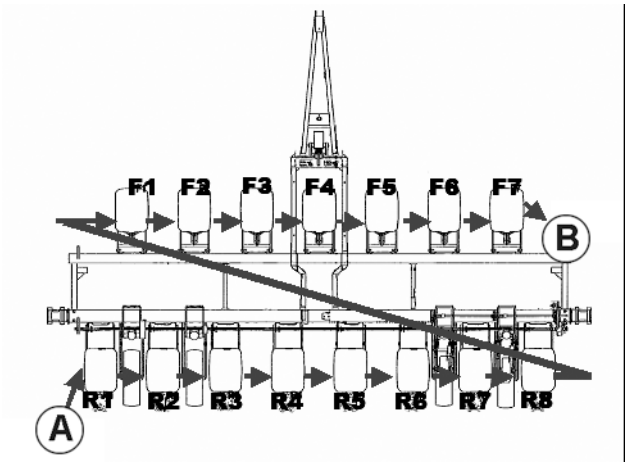


Order of Muxbus Sensor Installation

Install the Muxbus sensors in the following order:

- Rear Row Seed sensors from left to right.
- Front Row Seed sensors from left to right.

  As shown from **(A)** to **(B)**.
- Section Transmission sensors from left to right.
- Ground Speed Pickup Sensor.
- Auxiliary Sensors in the following order:
  - A. SDS Sensors
  - B. EdgeVac® Sensors
  - C. Pneumatic Down Pressure
  - D. Air Compressor Sensor
  - E. ASD Sensor
  - F. Seed Scale Sensor



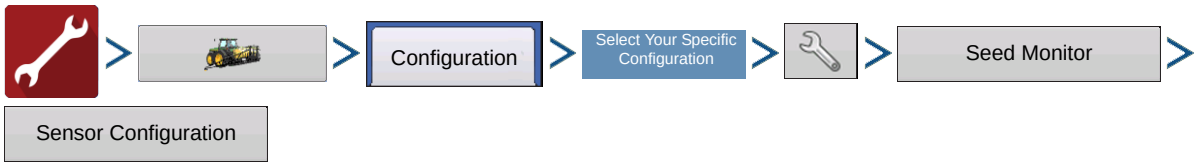
NOTE!: When the row unit sensor is plugged in, the display will beep three times and show the status as "Calibrating." When calibration is complete, the sensor will display either "OK" or "Slow".

3. **Resolve Any Possible Errors**—When the Muxbus Detection Process begins, each row unit will display "Not Installed" underneath the status. But as the Muxbus Detection process takes place, each row unit should state "Calibrating" for a time, then should indicate "OK". After calibration, the sensor status displays either one of two different states:
   - OK - The sensor is working and is communicating at 9600 baud.
   - Slow - The sensor is working, but is communicating at 2400 baud.

NOTE!: Some older KPM I, II, and III systems have slower sensors with black connectors, that communicate at a 2400 baud rate. The KPM I, II and III systems with blue connectors communicate at a 9600 baud rate. A slower baud rate does not result in decreased performance.

4. **Detect Complete**—When the Muxbus Detection process is complete, a message displays, stating "All sensors found".

KINZE Sensor Configuration



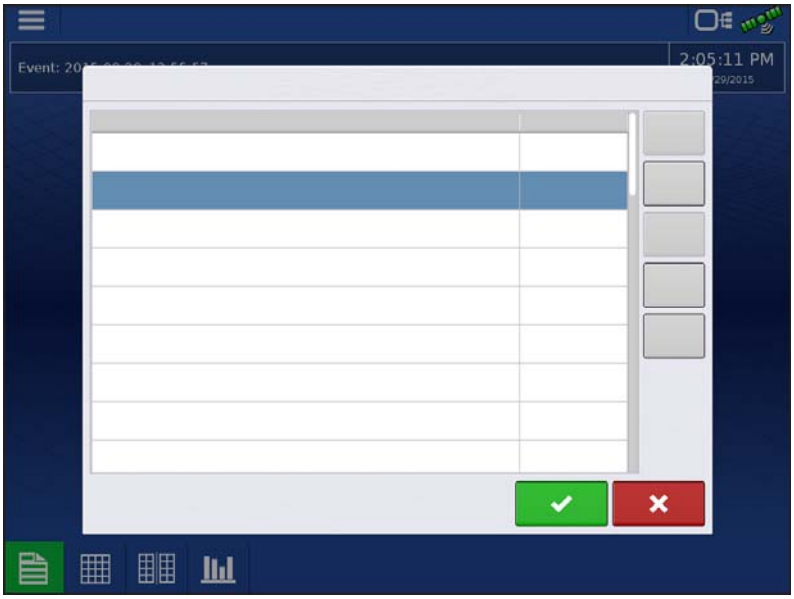
OR

The Sensor Configuration screen is for system maintenance of the KINZE Population Monitor.

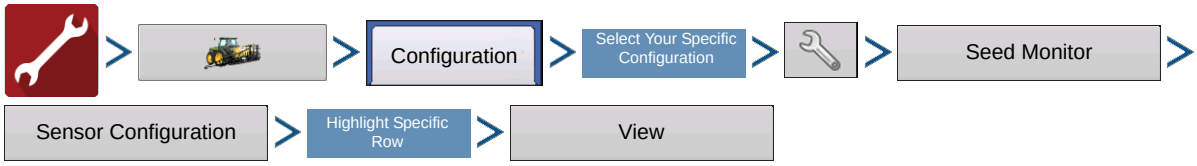
- **Install**—Installs a row sensor.
- **Remove**—Removes the highlighted sensor of any type.

NOTE! For steps to replace a failed sensor, refer to "Troubleshooting" on page 243.

- **Revive**—Allows the display to reattempt communication with the highlighted sensor of any type.
- **Ignore**—Tells the display to cease communications with a row sensor.
- **View**—Shows the Sensor Information screen.

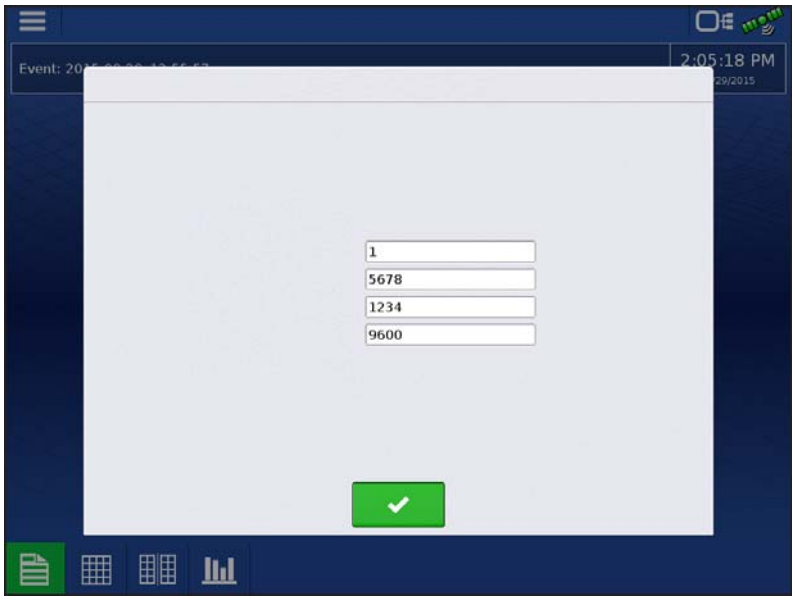


Sensor Information



The Sensor Information screen displays hardware information for each seed tube sensor and also other sensors. Technical Support may request that you look at this window for help in diagnosing a problem.

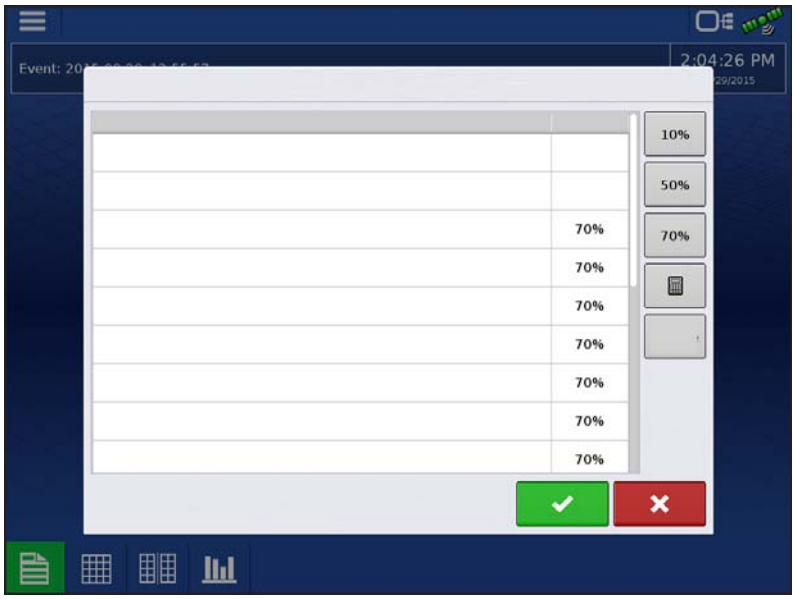
- **ID**—A unique number for each sensor on the Muxbus.
- **Serial Number**—Varies for each individual seed tube sensor.
- **Model Number**—Shared by each unit of the same model of seed tube sensor.
- **Baud Rate**—The speed of transmission between the Muxbus sensor and the PMM module.



KINZE Seed Monitor Alarms

> > Configuration > Select Your Specific Configuration > > Seed Monitor >
> Alarms

To view the Seed Monitor Alarms screen, press the Alarms button on the KINZE Planter Monitor Setup screen. To change the threshold of an alarm, highlight the row unit, then press either a given percentage number (10%, 50%, 70%, or use the to create a value). The alarm will then sound only when the individual seed sensor population drops below that numeric threshold value relative to the planter average population.



NOTE!: The default alarm setting is at 50%.

NOTE!: Press the Disable button to turn threshold of the alarm to zero.

KINZE Magnetic Coil Speed Sensor Calibration

> > Configuration > Select Your Specific Configuration > > Seed Monitor >
> Planter Configuration > Magnetic Pickup

KINZE Planter Monitor customers who have a magnetic coil speed sensor must check the Magnetic Pickup check box. This setting should then be left unchanged.

These customers will need to calibrate the Magnetic Coil Speed Sensor at least once per season. Press the Calibrate button located next to the Magnetic Pickup check box. The Magnetic Coil Speed Sensor Calibration wizard appears.

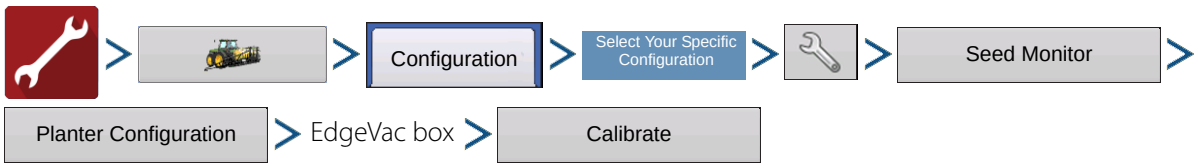
1. **Enter distance of calibration**—The default distance for calibrating the magnetic coil speed sensor is 100 feet (50 meters). If you wish to calibrate at another distance, enter the new distance. Press to continue.
2. **Drive from start to end points**—Position the vehicle at the start marker. Press the green-colored Start button and drive the vehicle for the predetermined distance.

NOTE!: The display must be set on 0.0 before driving the calibration distance.

3. **Stop at end of calibration distance**—When the vehicle crosses the end marker of the predetermined distance, press the red-colored Stop button. Press to continue to final step.
4. **Calibration complete**—The speed sensor calibration number has been calculated from the actual distance driven. Press to complete calibration and store the calculated value.

NOTE!: Calibration settings can be manually adjusted if desired by pressing Enter CAL Number and making small changes to the setting.

KINZE EdgeVac Calibration



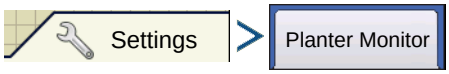
Customers who have purchased the EdgeVac® seed meters should perform an EdgeVac Calibration once a year to make sure that it is correct.

Press the Calibrate button.

Press to enter the actual value taken from the hand-held calibration sensor at the vacuum sensor.

NOTE!: The appearance of this screen varies, depending upon whether you have one or two EdgeVac sensors.

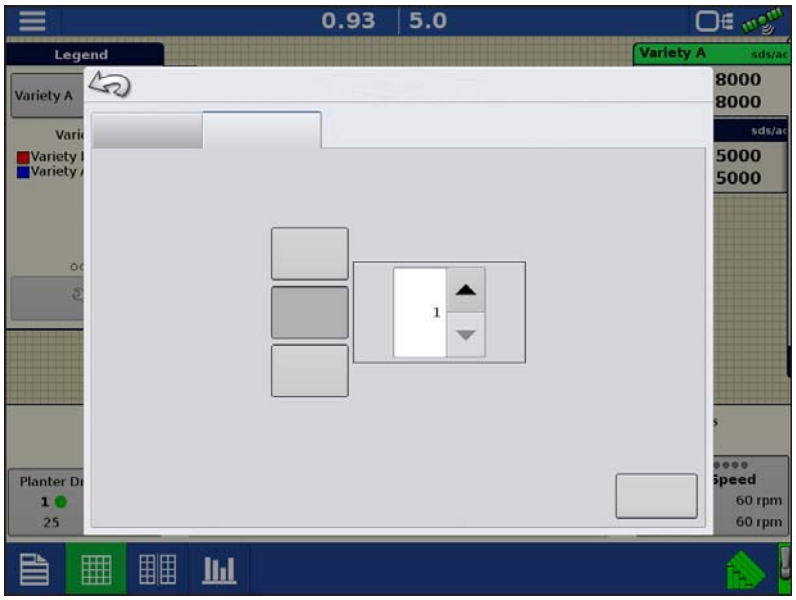
KINZE Planter Monitor Options



or

Make changes to the bar graph's rate/spacing display. Options include Planter Average, Freeze and Scan, explained below.

- **Planter Average**—Default setting for the Rate/Spacing Display. This setting specifies that the Rate/Spacing Display shows the instantaneous average population and seed spacing for the entire planter.
- **Freeze**—Specifies that the Rate/Spacing Display continuously shows only one specified row chosen by the operator. Use ▲ / ▼ to specify which row to "freeze".
- **Scan**—Specifies that the Rate/Spacing Display shows an automatic row-by-row scan on all the planter's row units, displayed in sequence from left to right.



Planter Monitor Diagnostics

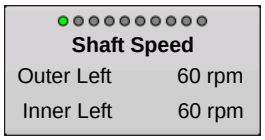
Settings > Planter Monitor > Diagnostics

The Planter Monitor Diagnostics shows row data from rows monitored by the KINZE Planter Monitor Module, including the following:

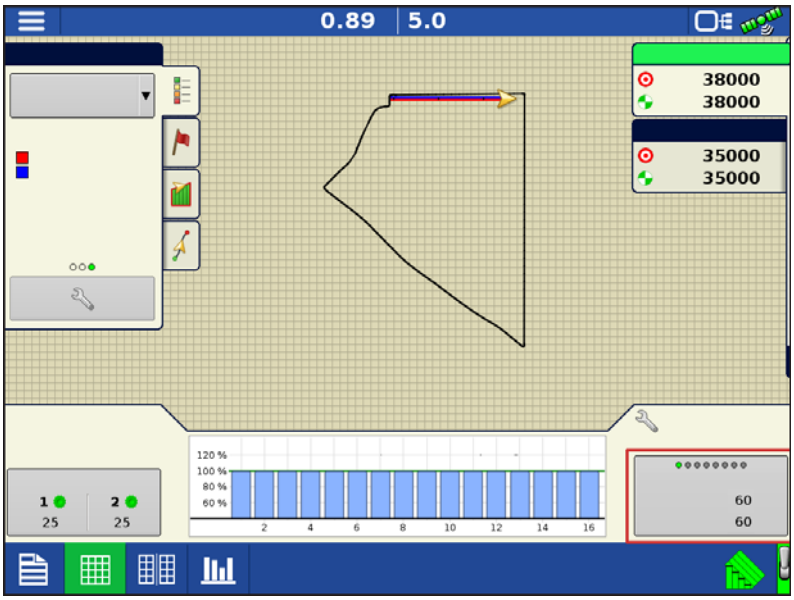
- Row unit seeds per second
- Row unit seeds per acre

NOTE!:This can also be accessed on the CAN device list under Diagnostics.

KINZE Display Items in Map View



The lower right-hand side of the Mapping screen's Equipment Tab includes a number of display items that will vary depending upon the particular KINZE Planter Monitor Module configuration.



Press button shown above to cycle through sensors.

Shaft Speed—Speed of the planter drive shafts, in RPM.

SDS—Speed of the planter seed delivery system (auger), in RPM.

EdgeVac Level—Seed meter vacuum. This measurement, shown in inches of water, is displayed for each vacuum fan.

Pneumatic Down Pressure—Down force the air bag places on the row unit.

Magnetic Pickup—Speed registered according to the magnetic pickup.

Tank Weight—Weight of seed in each tank.

Tank Area Left—Acres (hectares) that can be planted with the amount of seed remaining in the tanks.

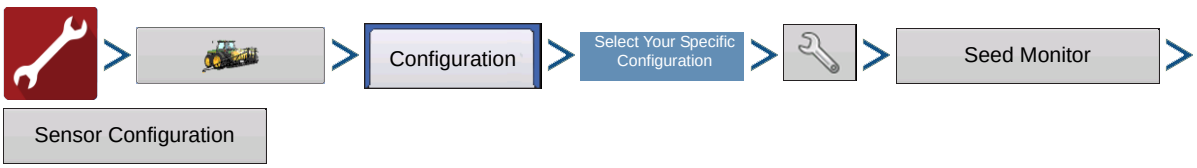
Tank Pressure—Air pressure level for the Air Seed Delivery (ASD) system.

Troubleshooting

How to replace a failed MUXBUS sensor

Follow these steps to properly replace a MUXBUS senor. Failure to follow these steps may require the user to perform entire MUXBUS Sensor Detection.

1. If a sensor fails, leave it plugged in and installed.
2. Proceed to the Sensor Configuration screen.



3. Select the failed sensor.
4. With the failed sensor highlighted, press the **Remove** button.
5. Proceed with unplugging and uninstalling the failed sensor.
6. Install the new sensor and plug it into the MUXBUS harness.
7. Return the Sensor Configuration screen on the display. Press the **Install** button. The sensor Status will change to **OK**.
8. Once the new sensors status changes to **OK**, the sensor replacement is complete. The process can be verified by pressing the **View** button and matching the displayed Serial Number with the physical Serial Number on the sensor label. Press .

NOTE! Users can take the above steps with a lone sensor in attempt to increase the baud rate of a SLOW sensor. Depending on the style of sensor installed and the number of sensors installed on a harness, not all SLOW sensors will communicate on a higher baud rate. A SLOW sensor does not decrease performance.

Alarms on KINZE Planter Monitor Module

When the Active Alarms window is shown, scroll through the list to locate the row units where the alarm is occurring.

Acknowledge the alarm by pressing . After dismissing the alarm, you may continue planting, however, the alarm will continue showing in the title bar. You may also review the Active Alarm information in the Planter Monitor Diagnostics.

The list below describes various alarms that may occur at system startup. The following pages describe errors that could occur during field operations.

Error Message: "Sensors calibrating wait for calibration"

Possible Cause: PMM startup

Solution: Wait for Planter Monitor Module (PMM) to finish before beginning operation.

Error Message: "(Row #) sensor not detected".

Possible Cause: Population sensor did not begin communicating with the PMM.

Solution: Acknowledge the error by pressing OK. Check the LED on the sensor to see if it is working properly. If it has failed, then replace the sensor. Refer to the KINZE Planter Operator's manual for further instructions.

Error Message: "Clean or replace sensor (Row #) as necessary".

Possible Cause: Population sensor dirty.

Solution: Press OK to dismiss the error. Then clean the sensor and restart the system.

Error Message: "(Row #) mux bus data line short to mux bus ground".

Possible Cause: Population sensor's mux bus signal wire is shorted to ground.

Solution: Press OK to dismiss the error. The display then replaces the message window with an alarm text on the header bar at the top of the Run screen. This alarm text continues until the wire is fixed or the sensor is disabled. Inspect the wire at the first opportunity.

Error Message: (Row #) mux bus data line short to mux bus power".

Possible Cause: Population sensor's mux bus signal wire is shorted to power wire.

Solution: Press OK to dismiss the error. The display then replaces the message window with an alarm text on the header bar at the top of the Run screen. This alarm text continues until the wire is fixed or the sensor is disabled. Inspect the wire at the first opportunity.

Error Message: "(Row #) communication lost".

Possible Cause: Seed tube sensor stops communicating with the PMM.

Solution: Press OK to dismiss the error. The display then replaces the message window with an alarm text on the header bar at the top of the Run screen. This alarm text continues until the wire is fixed or the sensor is disabled. Inspect the sensor at the first opportunity.

Error Message: "(Inner or Outer; Right, or Left) Shaft Communication Lost"

Possible Cause: Transmission sensor stops communicating with the PMM.

Solution: Press OK to dismiss the error. The display then replaces the message window with an alarm text on the header bar at the top of the Run screen. This alarm text continues until the wire is fixed or the sensor is disabled. Inspect the sensor at the first opportunity.

Error Message: "(Left or Right) Edge- Vac sensor communication lost".

Possible Cause: Edge-Vac sensor stops communication with the PMM.

Solution: Press OK to dismiss the error. The display then replaces the message window with an alarm text on the header bar at the top of the Run screen. This alarm text continues until the wire is fixed or the sensor is disabled. Inspect the sensor at the first opportunity.

Error Message: "(Left or Right) SDS shaft sensor communication lost".

Possible Cause: SDS shaft sensor stops communicating with the PMM.

Solution: Press OK to dismiss the error. The display then replaces the message window with an alarm text on the header bar at the top of the Run screen. This alarm text continues until the wire is fixed or the sensor is disabled. Inspect the sensor at the first opportunity.

Error Message: "Low hydraulic oil level".

Possible Cause: Hydraulic oil level drops.

Solution: Check oil level on the planter, add as necessary.

Error Message: "High hydraulic oil temperature"

Possible Cause: Hydraulic oil temperature level rises

Solution: Stop planter in order to cool down oil temperature. Inspect for cause of overheating.

Error Message: "Voltage Error Alarm".

Possible Cause: Occurs if the battery voltage drops below 10 volts, or rises above 15 volts.

Solution: Check tractor's electrical system.

Error Message: "(Row #) Seed Rate Alarm".

Possible Cause: The seed rate of one or more rows is less than the alarm threshold setting and the corresponding transmission shaft sensor detects rotation.

Solution: Press OK to dismiss the error. If the alarm state is still present, the graph will state the rows where the errors are occurring, and the Title Bar will flash the type of alarm. Inspect row units to confirm that each has seed, and that all mechanical drive shaft parts are working properly.

NOTE!: If desired, the alarm threshold for the row unit may be set to 0%, which will silence the seed rate alarm. However, the bar graph will continue to operate and the row will still be calculated in the planter average population. For instructions on changing the alarm threshold, see "KINZE Seed Monitor Alarms" on page 240.

Error Message: "Low Down Force Air Pressure"

Possible Cause: Low pressure in the pneumatic down pressure system.

Solution: Press OK to dismiss the error. Check for air leaks and compressor failure.

Error Message: "Left (or Right) Tank Seed Level Low.

Possible Cause: The Seed Scale weight has dropped below the entered threshold.

Solution: Press OK to dismiss the error. Refill the tank to clear the error completely.

Error Message: "Seed Tank Pressure Too Low."

Possible Cause: The minimum air flow for seed delivery is not present.

Solution: Press OK to dismiss the error. Check fan on the ASD system.

Error Message: Air Compressor Sensor Too Low."

Possible Cause: The minimum air compressor tank pressure is not present.

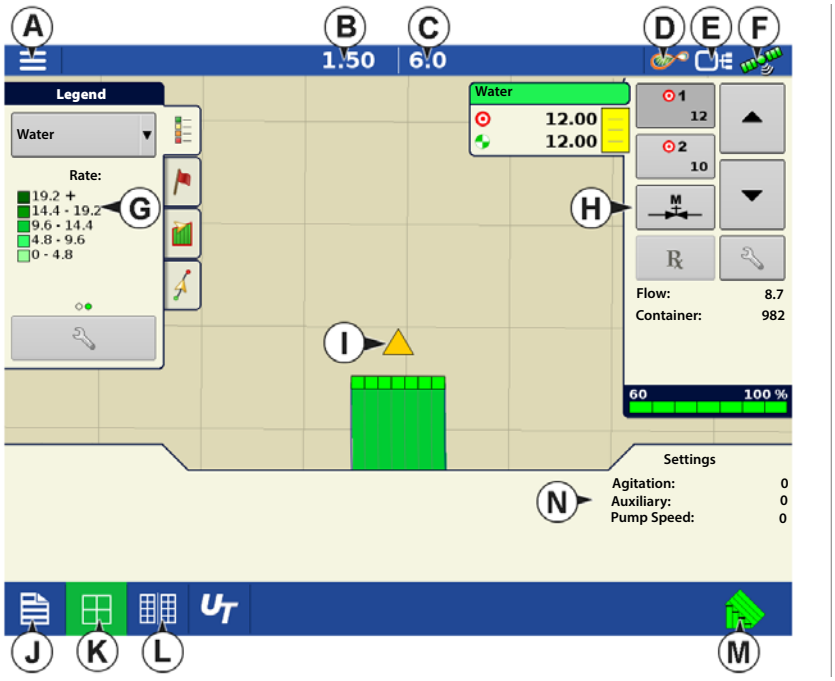
Solution: Press OK to dismiss the error. Check the air compressor.

DirectCommand allows the variable rate application of single or multiple liquid products. Once a configuration has been completed, the Map View screen appears.

Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

Map View

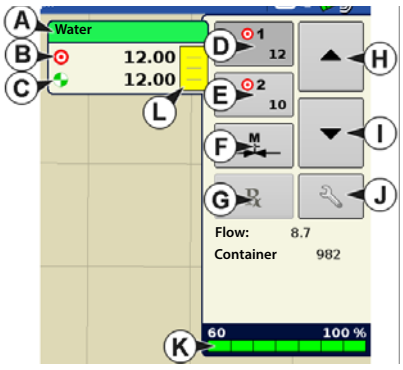


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Product Control toolbox
I. Vehicle Icon
J. Event Summary
K. Map View
L. Split screen
M. AutoSwath
N. Pressure Diagnostics

NOTE! Pressing the Map View button will cycle between the available Map screen views, and the appearance of the Map View button changes.

Product Control Toolbox

During DirectCommand Run Time operations, the Product Tabs are shown in the upper right-hand side of the Map screen. Press the Product Tabs, and an extended view shows the Rate buttons, Manual Valve Control button, Prescription button, Rate Increase and Rate Decrease arrows, and the Rate Setup button, all of which are described below.



A. Product
B. Target Rate
C. Actual Rate
D. Rate 1 button
E. Rate 2 button
F. Manual Valve Control
G. Prescription button
H. Rate Increase arrow
I. Rate Decrease arrow
J. Rate Setup button
K. Section Status Indicator
L. Container Level

Target Rate—The Target Rate is desired application rate.

NOTE: In some conditions, the Target Rate may increment more quickly than the Actual Rate.

Actual Rate—The Flow Sensor returns the actual rate being applied.

NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.

Container Level—The Container Level shows the amount of product in the container.

Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Manual Valve Control button — The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to prime the system before application or clean out the equipment at the end of the day.

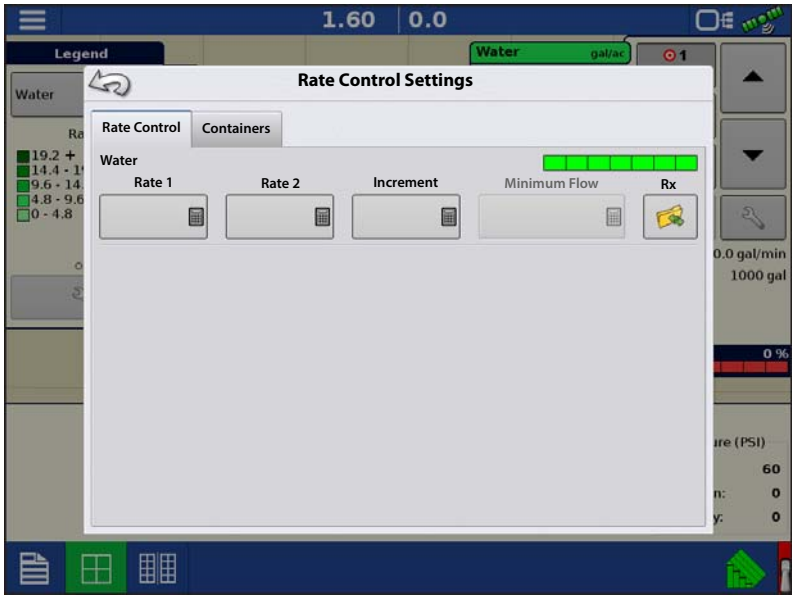
Rate Increase and Decrease Arrows — / allow Product Application Rate to be changed according to the Target Rate Increment. In using manual valve control, the increase and decrease buttons allow the position of the control valve to be defined by the operator.

Prescription button—

Rate Setup button—

Rate Control Settings

Adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import application product prescriptions. To access the Rate Control Settings screen, press the Rate Setup button on the Product Control Toolbox. The Rate Control Settings screen appears.



Rate 1 and Rate 2 — The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Press to enter the desired amount.

Increment — The Increment button allows operators to specify the increase or decrease amounts for a specified rate by using / on the Product Control Toolbox. Press to enter the desired increment.

Prescription — To load a map-based prescription file, press the Prescription button.

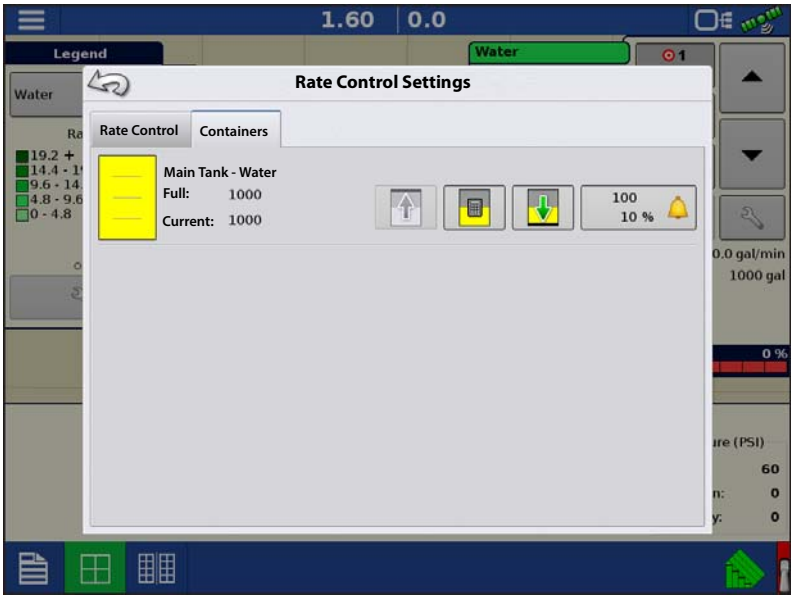
Refer to "Loading Prescriptions" on page 250 for further detail.

Minimum Flow — (Used for DirectCommand Liquid Applications only). This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying with one or more boom sections off, the system automatically reduces the Minimum Flow setting according to the reduced spray width. To adjust this setting, press and enter the desired numeric value.

Container Level Settings

When filling or emptying container, use the Container Level portion of the Rate Control Settings screen to update the amount of product in the containers.

Container Level screen



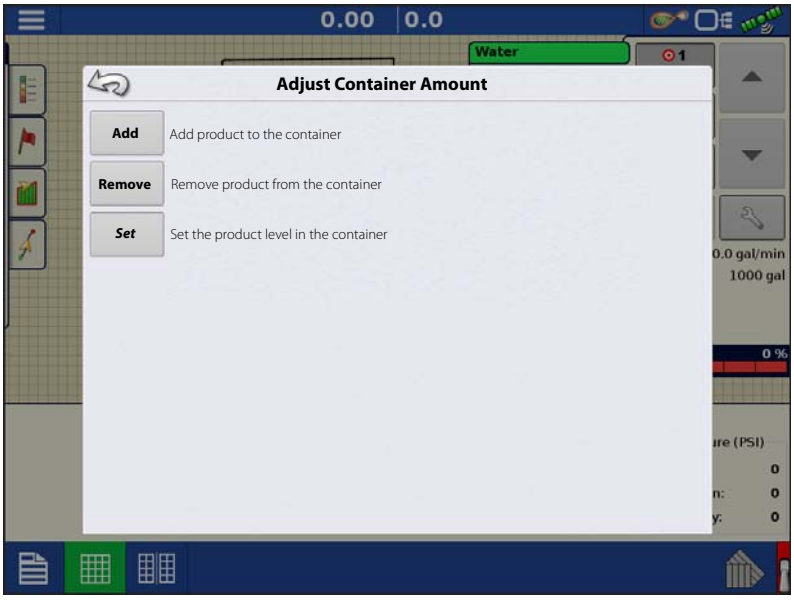
•**Tank Fill** — The Tank Fill button increases the container level logged in the display to the user-defined maximum volume (specified in the Container Setup Wizard).

•**Tank Empty** — The Tank Empty button decreases the container level logged in the display to zero.

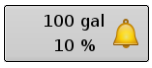
•**Tank Partial Fill** — The Tank Partial Fill button increases the container level logged in the display to specific amount that you specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

Adjust Container Amount

- **Add** — Adds product to the container.
- **Remove** — Removes product from the container.
- **Set** — Sets the product level in the container.



Tank Alarms



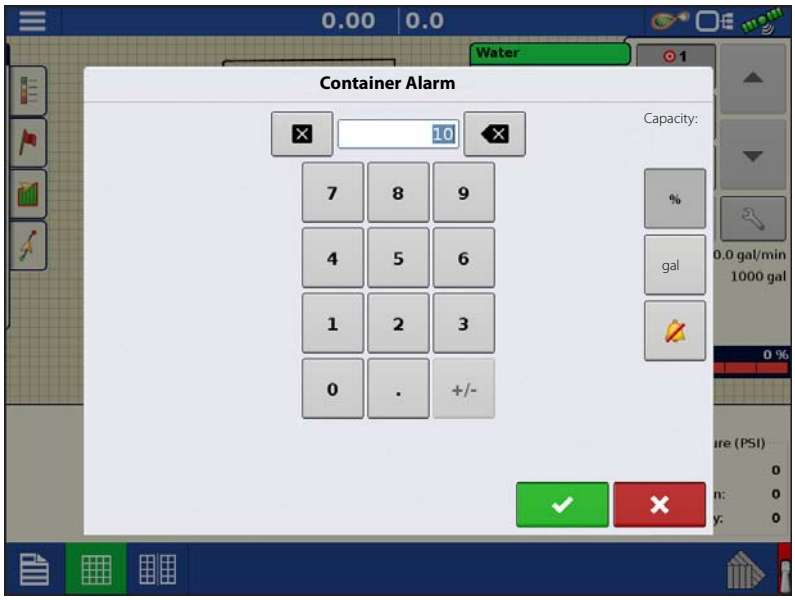
The Container Alarm button, which appears on the right of the Container Level portion of the Rate screen, displays the capacity of your tank as well as the percentage at which the Low Container Level warning will sound. To adjust these settings, press the button and the Container Alarm screen appears.

If you wish to adjust your container level warnings, use the following buttons on the right-hand side of the Container Alarm screen to make these adjustments.

The **percentage (%)** button sets the warning threshold according to the percentage of solution left in the tank. In the example above, the threshold is set at 10 percent.

The **units of measurement** icon sets the warning threshold according to the amount of solution left in the tank. This icon is named according to the container's units of measurement you specified during the Controller configuration procedure.

The **Disable Low Container Level** button, which appears as a bell with a red slash across it, disables the Low Container Level warning.

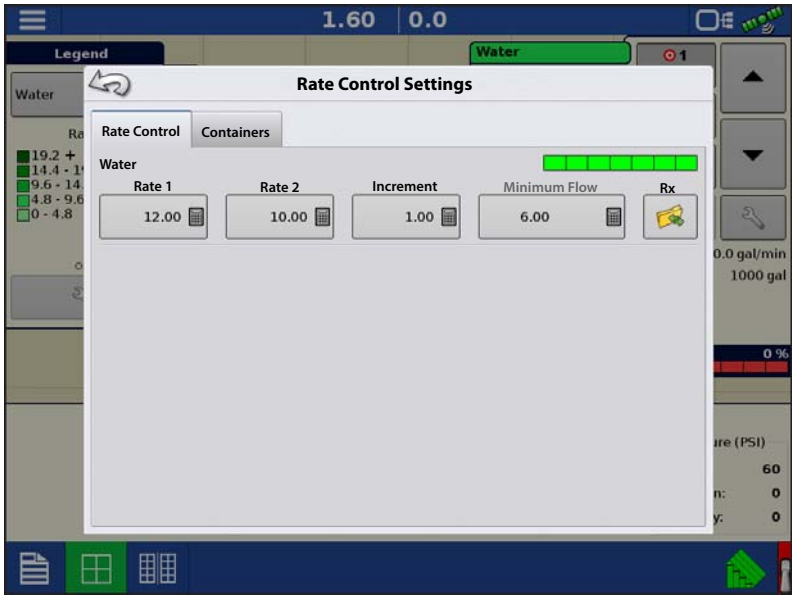


Loading Prescriptions

1. Press the Rate Setup button on the Control Toolbox.

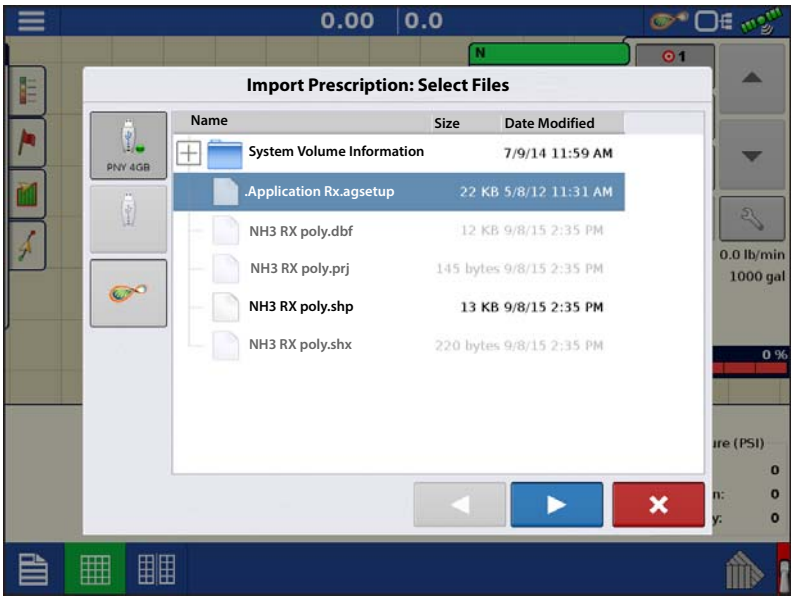
   The Rate Control Settings screen appears.

2. Press the Load Prescription button.

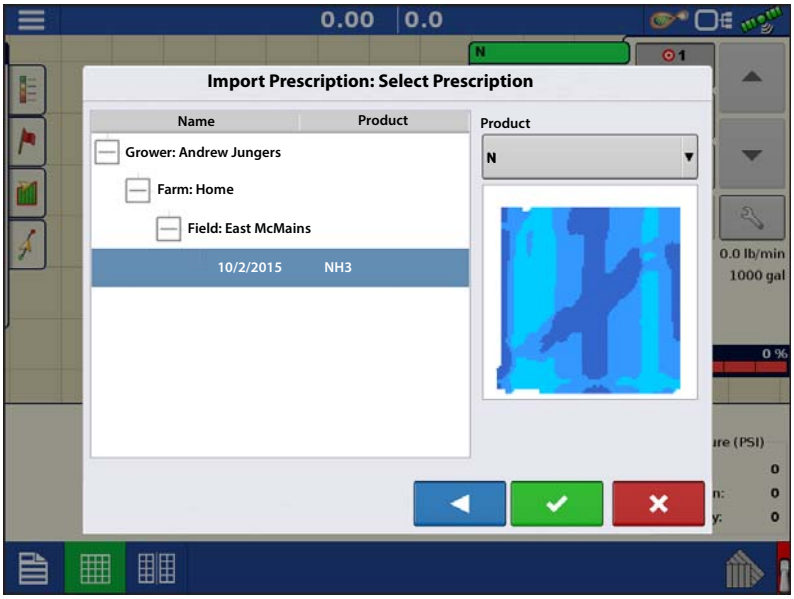


The Select File screen appears.

3. Highlight the correct .AGSETUP (prescription) or .shp (shape) file and press .



4. Next select your prescription in the Select Prescription screen, and select the correct controlling product from the Product drop-down box. A preview prescription map is displayed. Press the .
5. When you return to the Rate Control Settings screen, the prescription rate is now shown on the screen. The Load Prescription button has disappeared and in its place is the Remove Prescription button, which resembles a minus sign. Press the Remove Prescription button if you wish to remove the prescription from the field.
6. When you return to the Map screen, the prescription is now shown on the map.



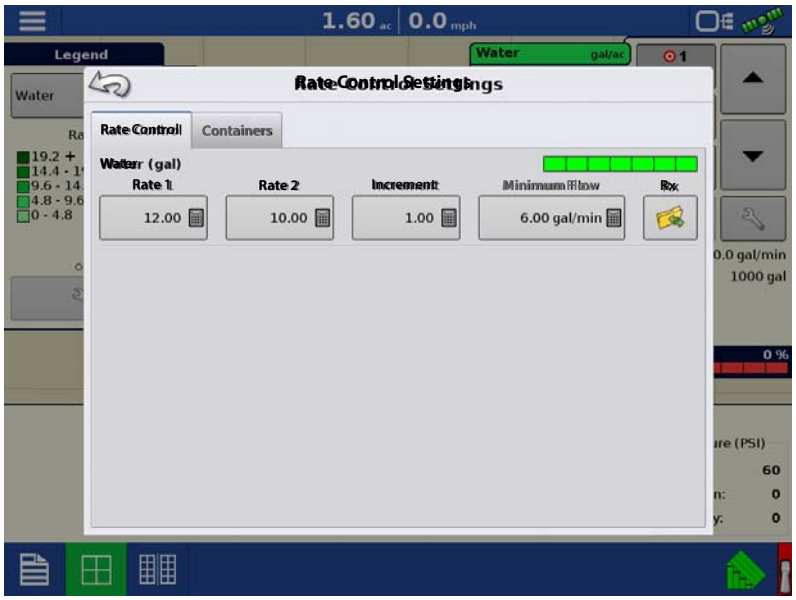
Shape File Conversion

What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple products.

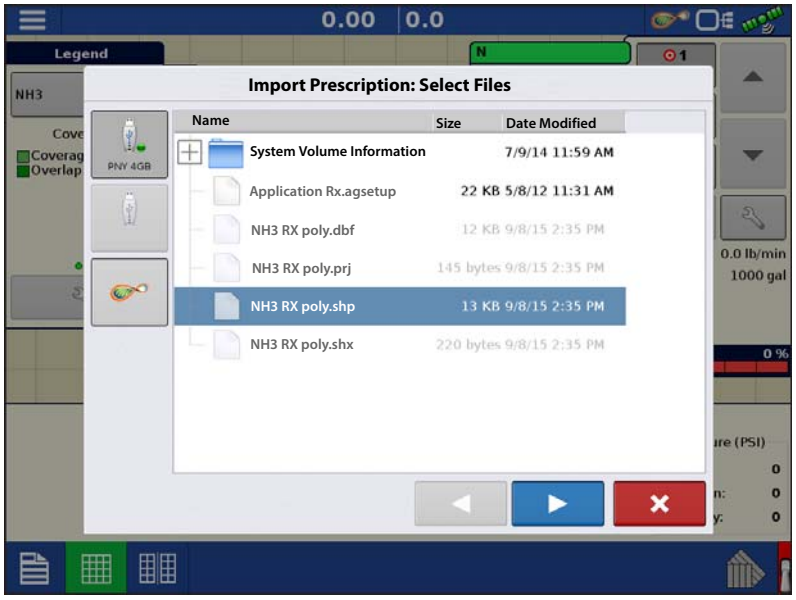
1. To begin, press the Rate Setup button on the Product Control Toolbox.

The Rate Control Settings screen appears

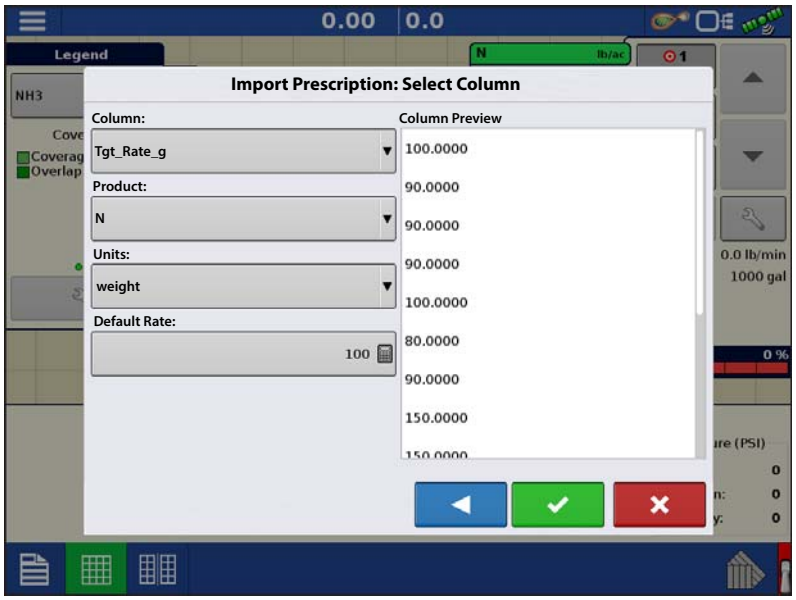
2. Press the Load Prescription button.



3. The Select File screen appears. Highlight your desired .shp file and press .



4. **Select Column From Shape File**—Select the column that contains the product recommendation rate. The list on the right side of the dialog shows sample data from the selected column.
5. **Select Units**—Select the controlling units for product application.
6. **Default Rate Setting**—The system assigns a default rate. Use the on-screen keypad to edit the value if desired.



NOTE!: Select the product and units that the shape file prescription was made for. Selection of the wrong data column or unit will result in misapplication of product.

ATTENTION!: The only time the default rate is used by the system during product application is if the Rate Outside of Field selection is set to " Rx default". This setting is located in the Equipment Settings portion of configuration setup. If the Rate Outside of Field selection is set to "Rx default", the default target rate will be used when the vehicle exits the area covered in the prescription map.

Creating Products

Creating application products and product templates can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Creating Single Products

To create a single product, to be added to a product template or to be applied by itself, use the on-screen wizard described in the following steps.

Select:

1. Product Type
2. Product Units
3. EPA Product Number (Optional)

   Check box if product is a Restricted Use Pesticide
4. Manufacturer name if applicable.

   Manufacturer name can be added to the drop-down menu by pressing .
5. Press to enter a unique name for the product.

Created product should appear under the Application heading located on the Product tab of the Configuration Setup screen.

NOTE: Some Fertilizer and Carrier product types are predetermined in the display. These product names cannot be edited. Their Manufacturer and EPA Numbers can be edited after the product is created. Examples are: Fertilizer>DAP or Carrier>30% UAN.

Creating Product Template

Product Templates are set up by using the on-screen wizard.

NOTE!: Prior to making a new product template, it is recommended to add the individual products to the list in the units recommended by the chemical label.

It is recommended to create product templates that contain the products applied for a crop type or time of the season.

Examples are:

- Pre-Emerge Burndown
- Post-Emerge Corn
- Post-Emerge Beans
- Insecticide
- Fungicide

In each template the products can be checked on/off for the mix when loaded at the run screen.

1.

2. Select Tank Mix

   Define By

   - Total amounts - mix/blend defined by amounts added to the tank (total of each product in tank)
   - Rate/acre - mix/blend defined by the amounts applied per acre (rate of each product applied/area)
3. Enter a Base Amount or Base Rate and Units.
   - Total Amounts - Tank/Bin Size
   - Rate/Acre - For Rate Applied per Acre
4. Select Carrier
   - Press to create a new carrier.
5. Press by the Add Mix/Blend Contents box to start the process of adding components to the mix.
6. Select the desired component from the drop-down menu.

NOTE! More than 7 products can be part of a template, but only 7 or fewer can be active at the same time.

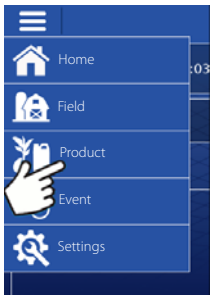
   - A new product can be set up at this time by pressing and following the Product Setup Wizard.
   - Press to add selected product, or press to return to Add Mix/Blend screen without adding a product.
7. Press to add an additional product.
8. When all components have been added press .
9. Enter Manufacturer name is applicable.
   - Manufacturer name can be added to the drop-down menu by pressing .
10. Press to enter a unique name for the mix/blend.
    - Press to complete the process of setting up the mix/blend, or press to return to the Configuration Setup screen without adding a mix.

The product mix/blend appears under the Application heading located on the Product tab of the Configuration Setup screen.

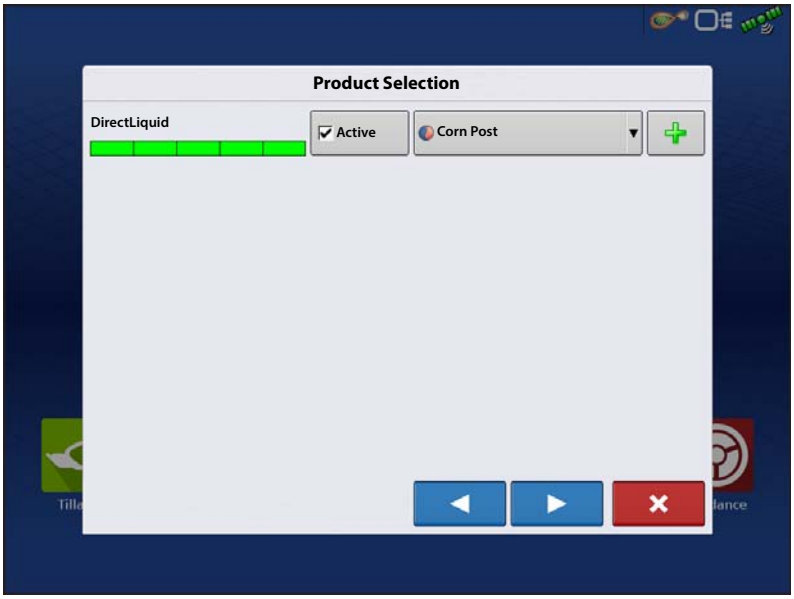
Represents Product Templates

Configure Product Mix

When using a product template, the mix contents and amounts are defined in the Configure Product Mix screen available in the Event Setup Wizard, or Product button in the main menu.

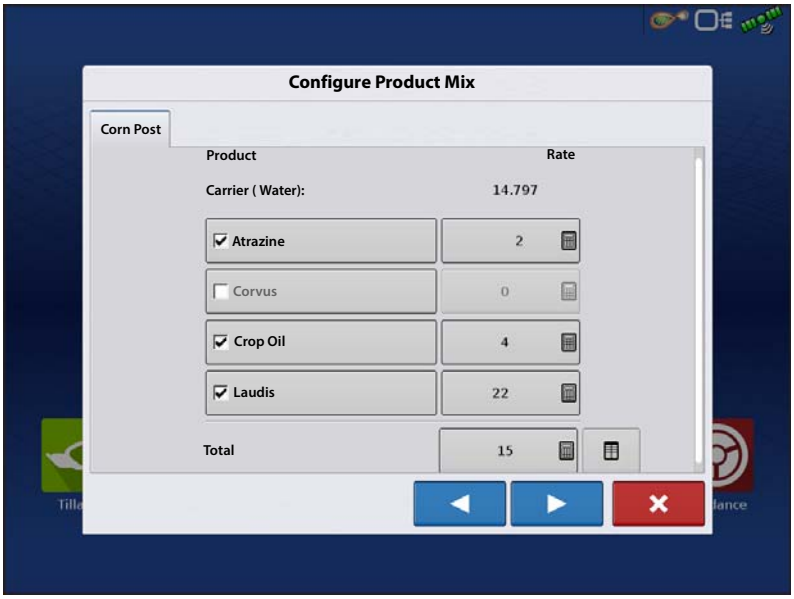


1. Select your mix/blend from the drop-down list or press to create and new mix/blend.

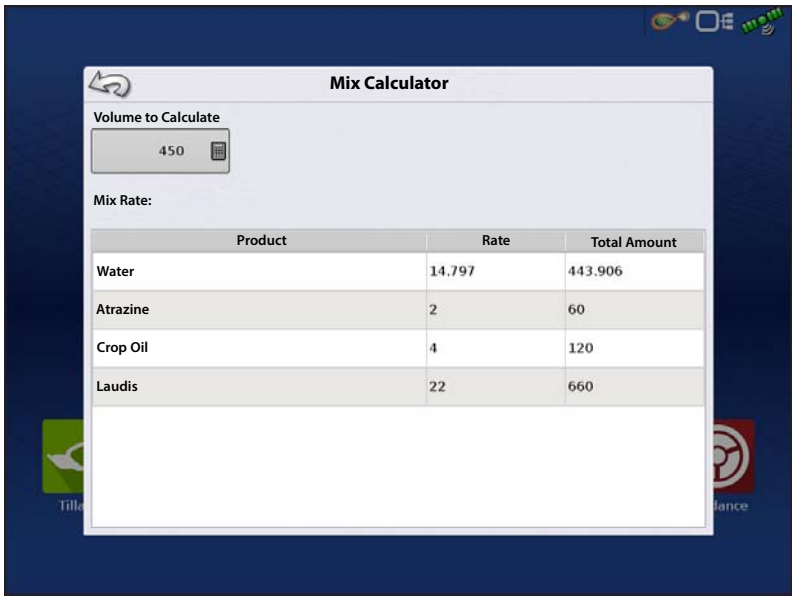


2. The product template mix contents and amounts are defined by:
   - A. activating or de-activating products
   - B. changing rate or total amount of product
   - C. changing total amount of the product or overall rate of product application

   A product can not be active with a rate of zero. Press to access the Mix Calculator.
3. When a product template is setup using rate/area, the Mix Calculator can be used to show how much of each product to put in the tank when the user enters the desired amount to fill.



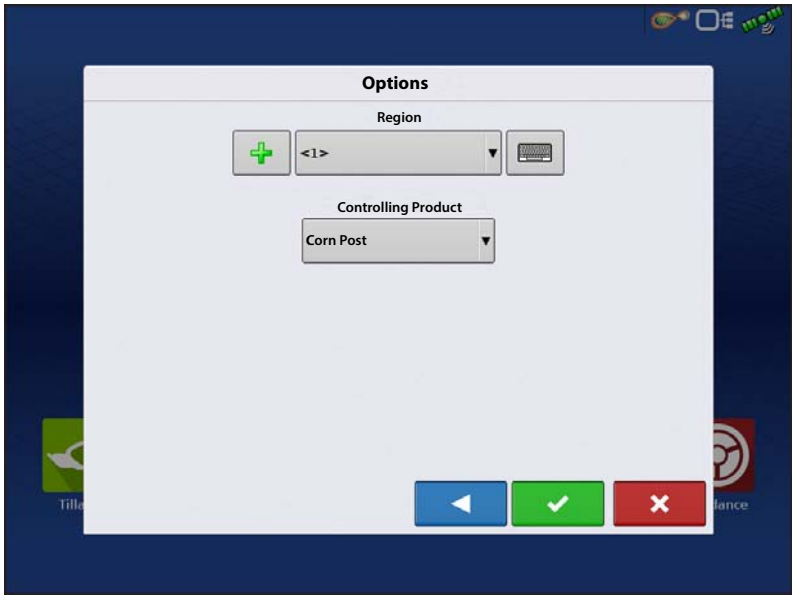
4. Press the Volume to Calculate button and input the total volume. Table will give the user the amount of each product to put in the tank.



5. Select Region from the drop-down menu or press to name Region

Verify the Controlling Product for the Mix/Blend.

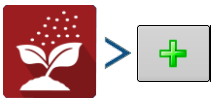
Press to load the Event to the Map Screen, or press to return to Home screen without setting up an Event.



Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:



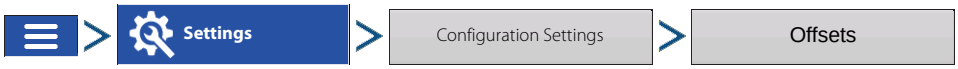
OR

Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

Implement Offsets

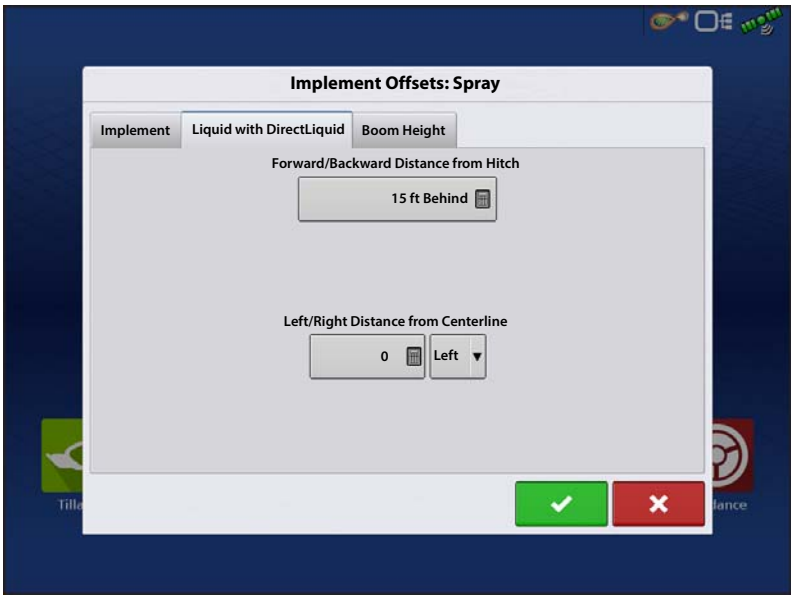
OR



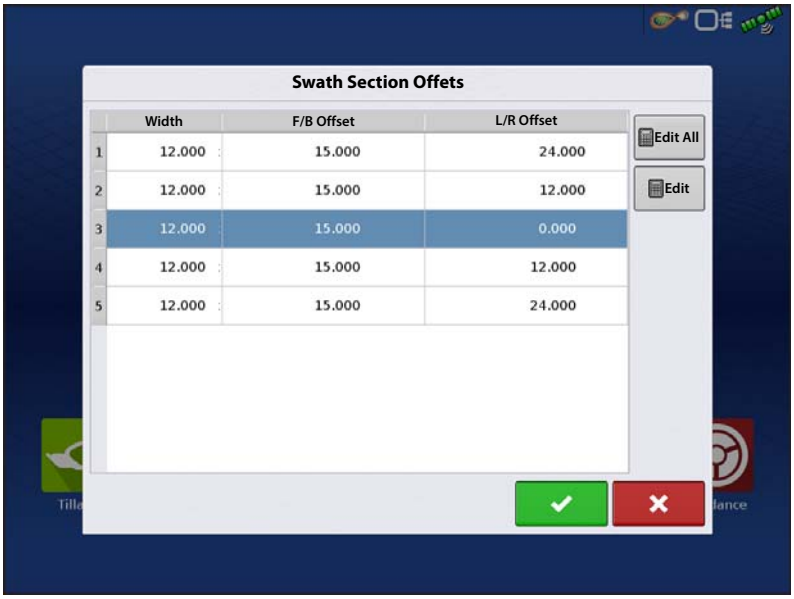
Implement Offsets screen appears, with each channel's settings shown on its own tab.

Defaults to the value entered during Configuration Wizard

Boom sections can independently be offset forward or back (Application Operation Only)



1. Press 15 ft Behind to access Swath Section Offsets screen.



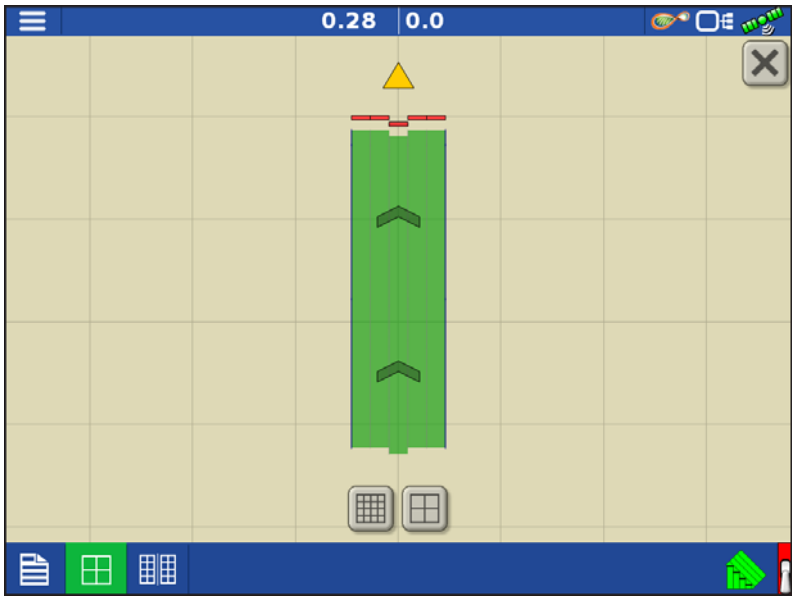
2. Select Swath section to edit and press Edit button.
3. Enter Offset for that specific section and Forward/Backward from rear axle.
4. Press ✓ to enter change.

Setup will indicate which offset is entered

15 ft Behind **Global**—All sections have the same offset.

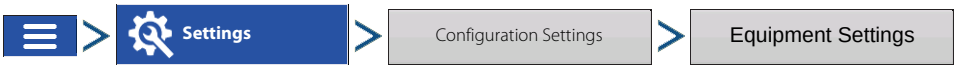
Independent Section Offsets **Individual**—At least one section has a different offset.

Runscreen reflects section offsets



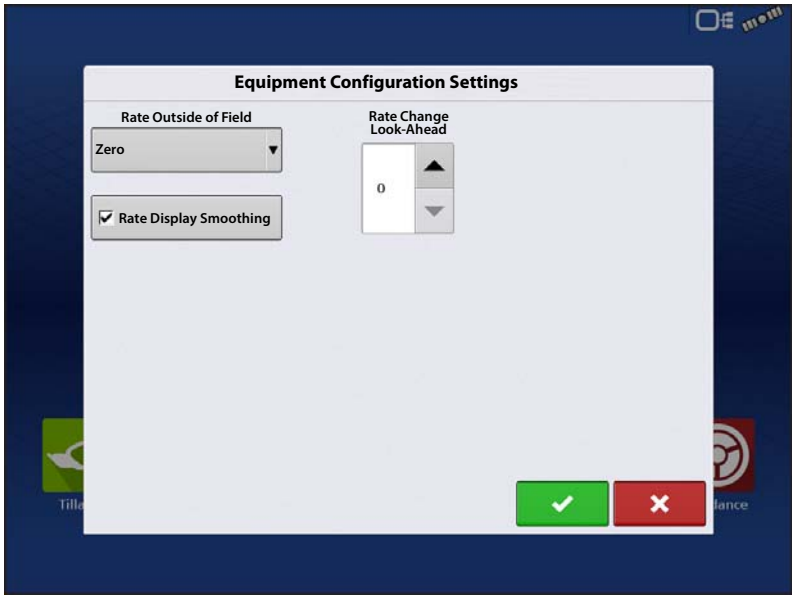
Equipment Settings

OR



Rate Outside of Field—This setting will define how product will be controlled when leaving a field boundary.

- **Zero**—This will stop application.
- **Last Good**—This will continue application at the last known rate.
- **Rx Default**—When using a prescription, this will apply at the Default Rate (or outside of boundary rate) as defined by the prescription file.

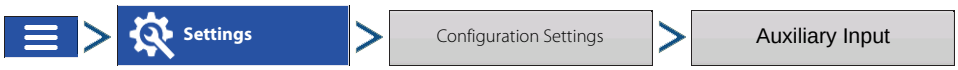


Rate Display Smoothing—Determines how the feedback from the control channel rate sensor will be displayed on the map screen. When de-selected, the system will display raw feedback from the rate sensor. When checked, the system will display target rate when the application rate is within 10% of the target rate setting.

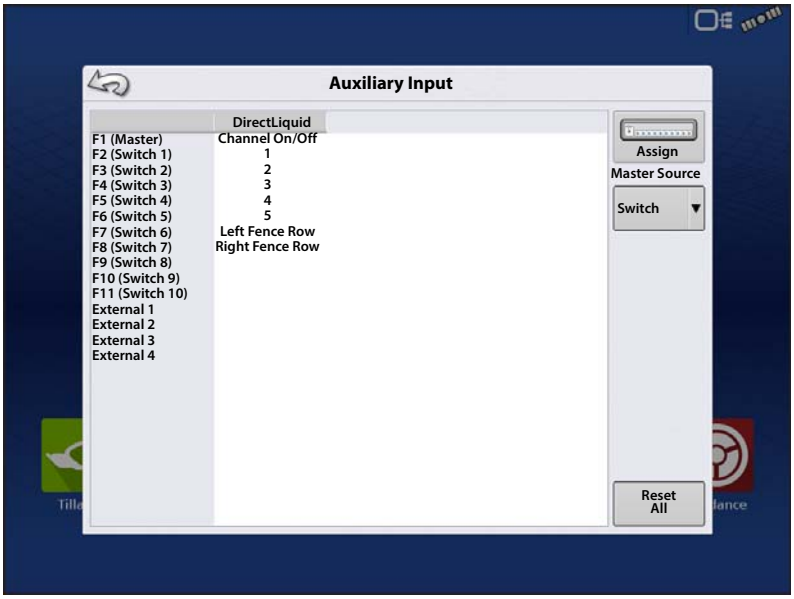
Rate Change Look-Ahead—This setting compensates for any latency in the control system when changing between different product flow rates during variable rate application. The typical setting range for this is 0-1 seconds. This setting can be thought of as a "look ahead" value when using a variable rate prescription. The display will send the signal to change rates before hitting a transition line so that the applied rate is correct when crossing into the new management zone.

Auxiliary Input

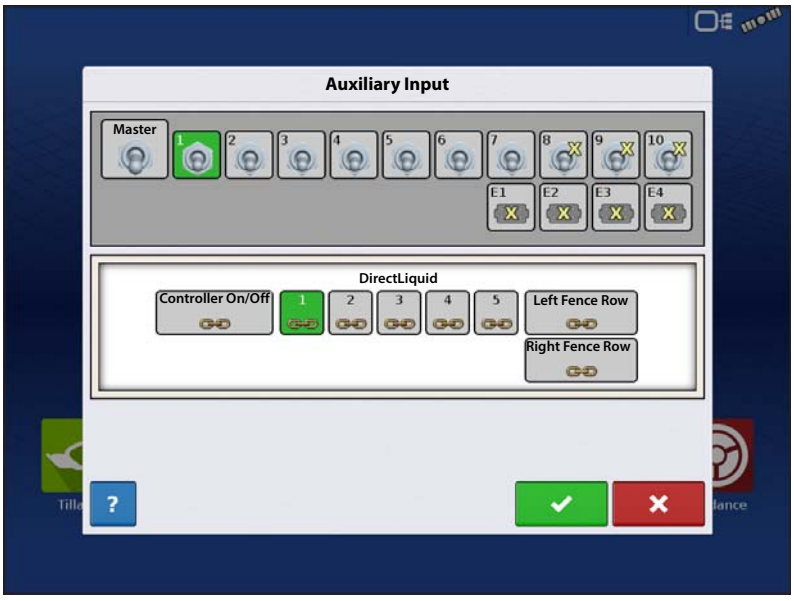
OR



DirectCommand applications default boom sections to the switchbox in order, starting with switch 1. From the Auxiliary Input screen, the operator can customize the switches to the boom sections, if desired; or assign left/right fence row nozzles.



1. Press Assign
2. Highlight the desired switch to assign a function to it.
3. Select appropriate function(s) (boom sections for this operation) to assign to the desired switch. Chain icons within each function will "link" once pressed to indicate they are assigned. If a function has a "broken link" then it is not assigned. If a switch has a "X" then it is not assigned to a function. Press the ✓ to save the setup.



NOTE! Even if no specific functions are assigned to the Master switch, the Master switch will still serve as the total system on/off switch.

Fence Row Nozzle Indicators

Control fence row nozzles through the DirectCommand system by mapping the switches in Auxiliary Input Settings. Fence row nozzles can be mapped to any switch.

After specifying Fence Row Nozzle settings at the Auxiliary Input Assignment screen, the **Fence Row Nozzle Indicators (A)**, which are shaped like triangles, appear on either side of the sections behind the vehicle icon.

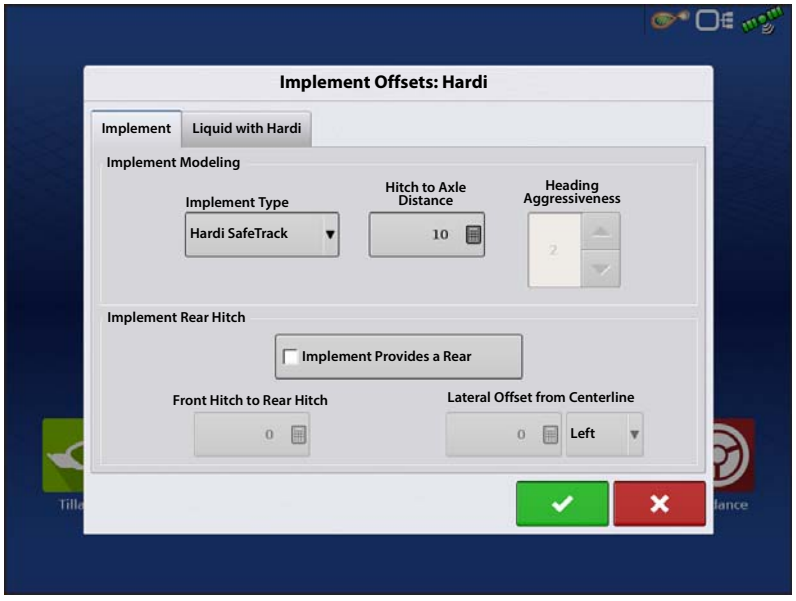
NOTE!: If a switch is selected as a Left or Right Fence Row Nozzle, the system sends power out of Boom Pin 11 for the left fence row, and Boom Pin 12 for the right fence row.

NOTE! The boom sections next to the fence row nozzles must be turned on before the fence row nozzle can be turned on.

Hardi Safe Track

When using Hardi ISOBUS, Implement Modeling can be set to Hardi SafeTrack. This allows display to accurately calculate path of sprayer.

Hardi SafeTrack Modeling is utilized by the display when SafeTrack is engaged on the machine.



NOTE! When a Hardi ECU is present and SafeTrack is in use, the Heading Aggressiveness will be grayed out in the Implement Offsets screen. The Heading Aggressiveness will need to be adjusted from the Hardi interface.

If a trailed implement utilizes a steerable axle, the Hardi SafeTrack feature can be used without a Hardi ECU. This will allow manual adjustment of the Heading Aggressiveness from the Implement Offsets screen.

- **Heading Aggressiveness**

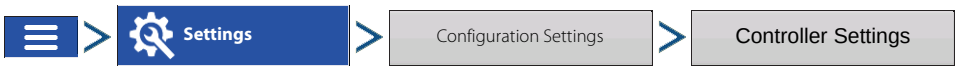
  The Heading Aggressiveness setting can used to fine tune mapping of a trailed implement. (Example: Pull type sprayer that has a steerable axle feature) The setting ranges from 0 - 10. The default value is 2.

  An aggressiveness setting near 0 or 1 will model similar of an implement that has a rigid axle. With the only pivot point being the implements attachment at the vehicles hitch.

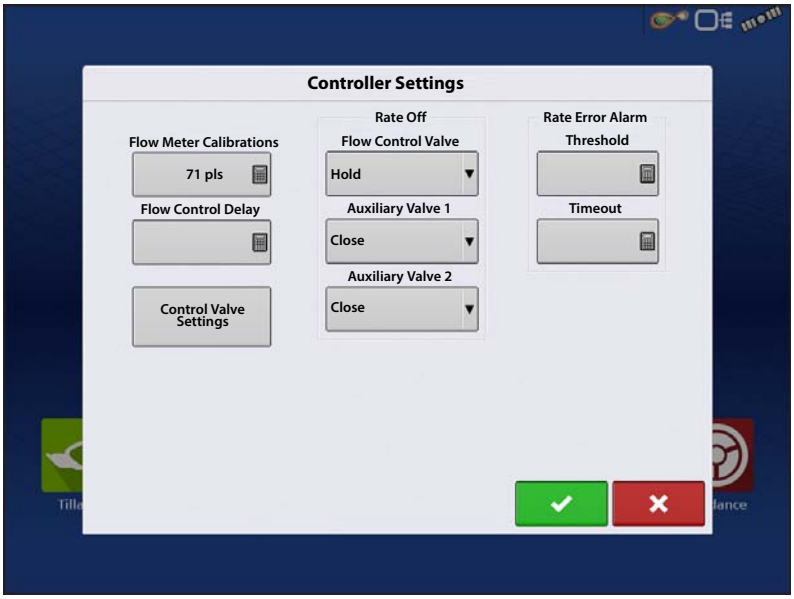
  As the aggressiveness setting is increased, the modeling will start to resemble an implement that "follows" the path of the vehicle. The modeling will become more exaggerated the closer the setting is to 9 or 10.

Liquid Application Controller Settings

OR



Make the following adjustments:



Flow Meter Calibration — Calibration value representing the number of pulses that equal one-gallon of product flow through the controlling system. This value can typically be found on the flow meter tag. (For Raven flow meters, divide this value by 10 before editing it in the display.)

Flow Control Delay — Setting that specifies a period of time from master switch on and the start of product application to the first flow control correction. This setting can be used to eliminate unwanted correction of flow control at the start of each pass. Typical setting values are 1 –2 seconds for liquid application control.

Control Valve Settings — Opens the Control Valve Settings screen, which displays control valve settings for PWM, Servo, Calibrated Reflow and Ramsey Valve Controls.

Rate Off

Flow Control Valve—When set to "Close," the controlling system shuts down when there is either a zero rate in the field or when entering an already-applied area. When set to "Hold," the controlling system remains in the last known state when all sections are shut off.

NOTE! If a PWM is the controlling system and the Flow Control Valve setting is set to "Hold," the valve will adjust to PWM Standby when all sections are shut off.

Auxiliary Valve 1 & 2 —When all boom sections are off, this setting closes or opens an auxiliary valve. Choose settings for up to two auxiliary valves.

Allowable Error —Determines the percent of error that is allowed prior to the product control system making any flow rate changes (found in the "Control Valve Settings" screen).

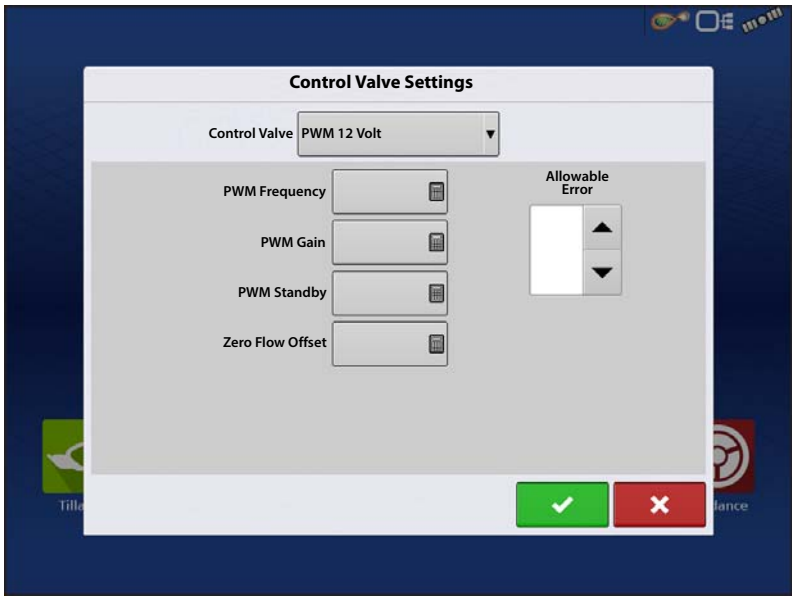
Default value for this setting is 2%. The normal dead band setting range is 2% - 3%.

- Too low of a setting value can cause the product control system to continually hunt for the target application rate.
- Too high of a setting will cause excessive product application error.

Threshhold —The user-defined percentage of actual rate error allowed before an alarm sounds.

Timeout —The number of seconds that an actual rate falls out of the error threshold before an alarm sounds.

Control Valve Settings - PWM



PWM Frequency — The frequency that the PWM control valve is pulsed at. Settings can be found from the manufacturer of the valve. Default Value is 100. Typical settings range from 100-125 Hz.

NOTE!: See PWM valve manufacturer information for recommended settings.

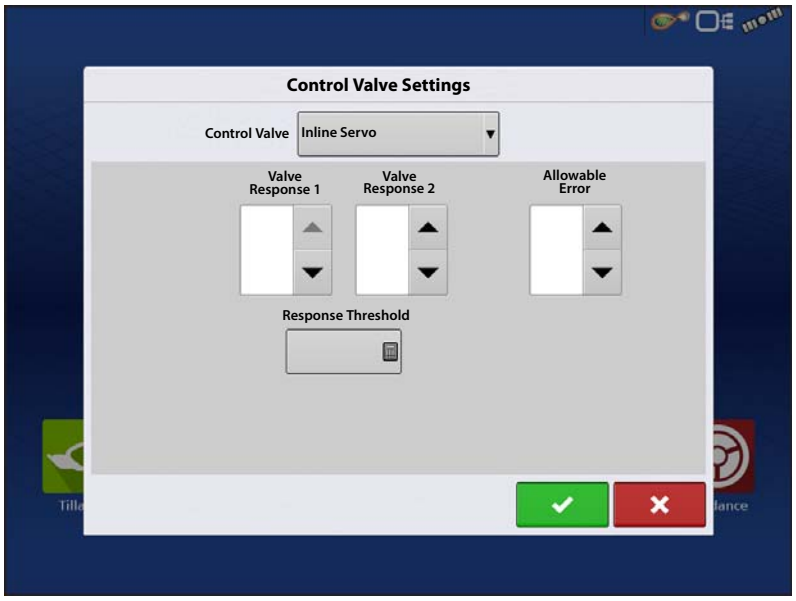
PWM Gain — Determines how aggressively the control valve responds when making rate change adjustments. The higher the value the more aggressive the system response is. Default Value is 800.

Zero Flow Offset — Represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero Flow Offset value can cause the product control system to not properly control low rates or shut off. Default Value is 30. See the PWM valve manufacturer information for recommended settings.

PWM Standby — This is a user-defined setting that determines the percent duty cycle the system uses when the boom sections are all off. The setting must be greater than the Zero Flow Offset.

NOTE!: The current PWM Duty Cycle can be viewed at the Liquid Diagnostics screen.

Control Valve Settings - Servo, Calibrated Reflow and Ramsey Valve



Valve Response 1 — Determines the speed of the servo valve when product control error exceeds the Response Threshold setting. The default for this setting is 100%. Decreasing the value will cause the servo valve to run slower. Valve Response 1 represents the fast speed of the servo valve.

Valve Response 2 — Determines the speed of the servo valve when product control error is less than the Response Threshold setting. The default for this setting is 24%. Decreasing the value will cause the servo valve to run slower. Valve Response 2 represents the slow speed of the servo valve.

Response Threshold — Determines where the control channel switches between using Valve Response 1 and Valve Response 2 speed settings. The default setting is 3. Leaving all other valve control settings at the default value and making a small adjustment to this setting is usually all that is required to fine-tune system performance.

- Decreasing this value will have the overall effect of speeding up servo valve response.
- Increasing this value will have the overall effect of slowing servo valve response.

Calibrate Pressure

1. Choose Main, Agitation or Aux from drop-down box.
2. Enter pressure value as a set point or press Reset to Default button.

   Enter voltage/pressure ratio.

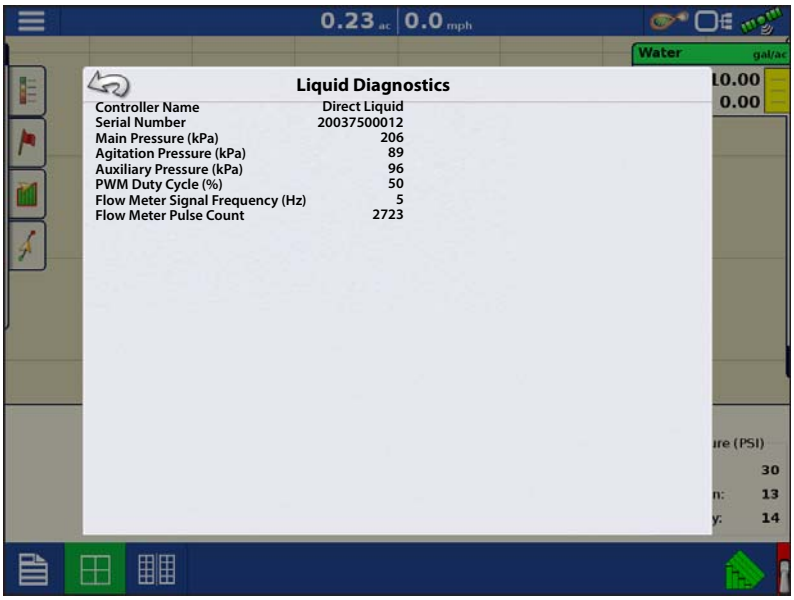
   - This is a constant per pressure sensor brand. Values are 16mV for Ag Leader and Raven, and 45mV for Dickey John. For other branded sensors, check with sensor manufacturer.
3. Press to finish process.

Liquid Application Diagnostics

To go to the Liquid Diagnostics screen, press

At the Devices screen, highlight the item marked **Liquid Product Module** then press the **Diagnostics** button.

The Liquid Diagnostics screen includes the Active Controller Name and the Serial Number of the module. Other information provided includes the Main Pressure, Agitation Pressure, and Auxiliary Pressure. These raw sensor readings are shown in kilopascals (kPa).



NOTE!: If you selected PWM as the Control Valve then the current PWM Duty Cycle is shown as a percentage number, in the PWM Duty Cycle (%) item on the Liquid Diagnostic screen.

Flow Meter Signal Frequency (Hz) — View the frequency generated by the flow meter during product application. Use this to make sure the flow meter is providing continuous feedback.

Flow Meter Pulse Count — Provides a rolling count of pulses generated from the flow meter during product application. This diagnostic item can be used to easily check that the flow meter is providing feedback to the system and also provides a way to check flow meter cabling without changing settings within the system setup.

Troubleshooting DirectCommand Liquid Applications

Problem: — Boom indicators on the run screen of the display do not turn green.

Solution:

1. Make sure ground speed is registering a value greater than zero on the display.
2. Verify a target rate greater than zero is entered into the display.
3. Check the switch status found on the Run screen under CAN and Input Diagnostics. As the boom switches are turned on and off, the Input Diagnostics window should change from black to green (if they do not, then refer to the installation instructions to verify boom switch connections).
4. Check high current connection into the Liquid Control Module.
5. Make sure the implement cable is plugged in. If plugged in, then test for 12 volts on pins A and B.

6. Turn AutoSwath off.

Problem: — Boom indicators on the Run screen of the display turn green, but the booms do not open.

Solution:

1. Check wiring connections for all of the boom valves.
2. Verify that the cabling is providing 12 volts to the boom valve on the signal pin.

You can also check for 12 volts on pins 1-10 on the boom connection of the liquid module.

Problem: — Boom valves pause up to 5 seconds before turning on by manual control.

Solution:

1. Verify that the display and Liquid Control Module are both updated to the latest available firmware.
2. The boom switch cable may be wired incorrectly. For details, refer to the installation instructions.

This issue should only occur on John Deere sprayers. Make sure the black wires in the switch cable are connected.

Problem: — Booms will not turn on when the foot pedal is on.

Solution: —Make sure the Master Switch Input is set to "External 2" under the Auxiliary Input Settings.

Problem: — AutoSwath turns on the boom too fast or too slow.

Solution:

1. Check GPS offsets in the vehicle setup to verify all the measurements are correct.
2. Verify implement offsets are appropriate for the sprayer.
3. Adjust the turn on look-ahead and turn off look-ahead to fine-tune Automatic Swath Control performance.
4. Verify Forward/Backward Section Offsets. If applicable - verify Section Offsets are correct if boom section(s) are independently offset.

Problem: — No "As Applied" rate

Solution:

1. Check cabling from the channel connection of the Liquid Control Module to the flow meter.
2. Check flow meter for product buildup and proper operation.

Problem: — Rate is erratic

Solution:

1. Verify that the rate display smoothing option is check marked in the Equipment Settings of the Configuration Setup.
2. Check the controller settings of the active configuration. Verify that the valve settings for your particular type of control valve are appropriate.
3. Use manual valve control to see if the rate stays constant.

Problem: — Erratic behavior from the flow meter and boom valves.

Solution:

1. Verify that the display firmware and module firmware are both current.
2. Verify that cabling has been installed correctly and that none of it has been pinched or damaged.

Problem: — No boom pressure at the start of the field.

Solution: — Before product application begins, use manual valve control to build boom pressure. Select either Rate 1 or Rate 2 once pressure is set to desired level. Enter the pass and allow automatic control to take over once the sections are turned on.

Problem: — AutoSwath checked on, but booms will not turn on.

Solution:

1. Make sure the ground speed is registering a value greater than zero on the display and not in the covered area.
2. Make sure there is a target rate greater than 0.
3. Make sure the applicator is inside of the field boundary.
4. Verify the implement switch (or implement switch jumper) is working appropriately.
5. Verify the Master Switch icon is indicating On (green) and Off (red) appropriately.

Problem: — Booms turn off in the middle of the pass.

Solution:

1. Check the display firmware and module firmware to see if they are the latest version released.
2. Make sure the ground speed does not go to 0.
3. Make sure the GPS is not losing the differential source.
4. Verify that cabling has been installed correctly and that none of it has been pinched or damaged.

Problem: — Rate not responding (error flashing)

Solution:

1. Make sure the flow meter calibration number matches the tag on the flow meter.

For Raven flow meters, divide the calibration number by 10.

2. Make sure that the flow being applied is not greater than the pump can produce.
3. Use manual valve control to see if the control valve will open or close.
4. Check the tip manufacturer's charts to make sure they are in the operating range of the application.
5. Check for any product buildup in the flow meter.
6. Check product filter for debris.

Problem: — Booms turn on when outside of the boundary.

Solution:

1. Make sure the Rate Outside of Field option is set to zero under the active configuration settings.
2. Make sure the Outside Boundary Option is set to Turn Section Off under the Automatic Swath Control options.
3. Make sure there is not a gap between the boundary and the first pass of the headlands.

Problem: — Booms turn on briefly (less than a second) in the headlands (previously covered area)

Solution:

1. Make sure that the turn on look-ahead is greater than the turn off look-ahead.
2. Make sure GPS offsets are correct.
3. Make sure look aheads are less than three seconds each.
4. Verify that the display and Liquid Control Module are both updated to the latest available firmware.

Troubleshooting Serial Control Applications

Problem: Rate changes on the display, but not on the controlled console.

Solution:

1. Verify the current firmware is running on the display and Application Rate module.
2. Check the settings specific to your controlled console.
3. Check cabling and all connections.
4. Disconnect the serial connection and determine if the controller is functioning properly without the display.

Problem: The display rate and serial-controlled rate do not match.

Solution:

1. Verify the current firmware is running on the display and the Application Rate Module.
2. Check the percent rate change.

John Deere Specific Instructions

Here are some tips to remember when operating the display in conjunction with a SprayStar control system. Refer to other sections of the operators manual for specific setup and operation instructions.

Master Source — After setting up a configuration in the display make sure to change the Master Source setting from switch to External2. This will tell the display to read the foot pedal for the master switch input status.

Master Switch Usage — When manually shutting off all boom sections in the field, use the foot pedal switch. Leave the OEM master switch on the hydro handle ON during field use. Using the hydro handle switch may lead to improper field coverage, poor AutoSwath performance, and inaccurate spray records. Only use the John Deere master switch when completely shutting down the sprayer to transport or service the machine.

Target Rate — The display must have a non-zero target rate entered in the display before the boom valves will open for product application. Ensure that the target rate entered into the display and SprayStar match to avoid any unwarranted alarms or warnings on the display.

Data Collection — The display will create a coverage map of all product application while logging actual application rate from the product control system flow meter.

AutoSwath Boom Section Control — The display will automatically control the boom section on/off status based upon previously applied area, field boundary, and internal boundaries.

SprayStar Application Rate — The display will not control the rate based upon the target rate value entered into the system. Application rate is controlled exclusively by the SprayStar display.

SprayStar Rinse Cycle — When using the rinse cycle feature on the SprayStar, the display must have the boom sections on to allow the SprayStar to properly run the rinse routine. To ensure that boom sections are on:

1. Enter a target rate into the display.
2. Turn the foot pedal master switch on.
3. Turn all boom switches on.
4. Boom indicators on the Run screen must be green showing that boom valves are on.

Control Valve Settings

Liquid Product Control Valve Configuration Options

Inline Servo — Rate control is achieved through actuating a butterfly or ball valve found in the solution hose that goes to the booms. When the valve opens, the flow increases and when the valve closes, the flow decreases.

Bypass Servo — Rate control is achieved through actuating a butterfly or ball valve found in the return line to the solution tank. When the valve opens, the flow decreases and when the valve closes the flow increases.

PWM 12 volt — Rate control is achieved through speed changes to the solution pump. The PWM 12 Volt setting is programmed to pulse the power to an electric solenoid valve used to adjust the hydraulic flow to the solution pump.

Pump Servo — Rate control is achieved through speed changes to the solution pump. The pump servo setting is programmed to control an electric motor used to actuate a hydraulic valve to adjust the hydraulic flow to the solution pump.

PWM Ground — Rate control is achieved through speed changes to the solution pump. The PWM Ground setting is programmed to pulse the ground to an electric solenoid valve used to adjust the hydraulic flow to the solution pump.

Calibrated Reflow — Three-way boom valves are used to return product back to the tank in the off state. The returned flow is calibrated with adjustment at each valve. Calibration is required any time the nozzles are changed.

Ramsey Valve — A pneumatically-operated bypass valve. When air is supplied to the valve the rate increases; when air is released from the valve the rate decreases.

Servo Control Valve Settings (By Manufacturer)

Flow Control Valve	Control Valve Configuration	Valve Response 1	Valve Response 2	Response Threshold
Raven Accu-Flow, 20 GPM Single Valve System (Fast Close Valve)	In-line servo	40%	10%	5
Raven Accu-Flow, 10 GPM Dual Valve System (Standard Valve)	In-line servo	100%	24%	5
Raven Accu-Flow, 30 GPM Single Valve System (Fast Close Valve	In-line servo	40%	10%	5
Raven Accu-Flow, 30 GPM Dual Valve System (Standard Valve)	In-line servo	100%	24%	5
Raven Flow Control Valve, 3/4" (Standard Valve)	In-line or Bypass Servo	100%	24%	1
Raven Flow Control Valve, 3/4" (Fast)	In-line or Bypass Servo	40%	10%	5
Raven Flow Control Valve, 1" (Standard)	In-line or Bypass Servo	100%	24%	2
Raven Flow Control Valve, 1" (Fast)	In-line or Bypass Servo	40%	10%	5
Raven Flow Control Valve, 1 1/2" (Standard)	In-line or Bypass Servo	100%	24%	3
Raven Flow Control Valve, 2" (Standard)	In-line or Bypass Servo	100%	24%	8
Raven Flow Control Valve, 2" (Fast)	In-line or Bypass Servo	40%	10%	15
Raven Flow Control Valve, 3" (Standard)	In-line or Bypass Servo	100%	24%	15
Mid-Tech, 3/4″	In-line or Bypass Servo	40%	10%	5
Mid-Tech, 1″	In-line or Bypass Servo	40%	10%	8
Mid-Tech, 1 1/2″	n-line or Bypass Servo	40%	10%	11
Mid-Tech, 2″	n-line or Bypass Servo	40%	10%	15
Dickey-john NH3 Heat Exchanger	In-line Servo	40%	10%	8

Flow Control Valve or Sprayer Model (and year if applicable)	Control System	PWM Frequency	Typical Gain Range	Zero Offset	Allowable Error	Valve Response 1	Valve Response 2	Response Threshold
Apache 510/710/ 1010/1210 (2006 and up)	In-line Servo				2%	100%	24%	Use a starting value of 5. See note below.
All Case IH sprayers when using AIM Command	AIM Command In-line servo				2%	100%	24%	3
Case IH Surveyor with A-post	Non-AIM Command Mode PWM 12-volt	122	**700-900	35	2%			
Case IH 3320	Non-AIM Command Mode PWM 12-volt	122	**700-900	35	2%			
Case IH 4420 with A-post	Non-AIM Command Mode PWM 12-volt	122	**700-900	35	2%			

Flow Control Valve or Sprayer Model (and year if applicable)	Control System	PWM Frequency	Typical Gain Range	Zero Offset	Allowable Error	Valve Response 1	Valve Response 2	Response Threshold
Case IH 3200 (KZKCO Valve)	Non-AIM Command Mode By-Pass Servo				2%	40%	10%	5
Case IH 4260 with Raven valve	Non-AIM Command Mode By-Pass Servo				2%	100%	24%	3
Case IH 4260 with KZKCO valve	Non-AIM Command Mode By-Pass Servo				2%	40%	10%	5
Case IH 3150 with Raven valve	Non-AIM Command Mode In-Line Servo				2%	100%	24%	3
Case 3185 with Raven valve	Non-AIM Command Mode In-Line Servo				2%	100%	24%	3
Case IH 3310	Non-AIM Command Mode PWM 12-Volt	122	**700-900		2%			
Case IH 4410	Non-AIM Command PWM 12-Volt	122	**700-900		2%			
GVM Prowler (2007)	Pump Servo				2%	100%	24%	10
GVM Predator	Servo				2%	100%	24%	**See Note below
Hagie 284, 284XP, DTS-8	Pump Servo				2%	100%	24%	3
Hagie 2100, 2101, DTS-10	Pump Servo				2%	100%	24%	3
Hagie STS 10, 12, (2000 to 2005)	Pump Servo				2%	100%	24%	20
Hagie STS 10, 12, 14, 16 (2006 and up)	PWM 12-volt	122	**350-600	20	2%			
Hagie 39-pin Spray II switch box (2006 and 2007)	Calibrated Reflow				2%	100%	40%	2
John Deere 4700, 47X0, 49X0	No rate control provided							
Miller Nitro N1 and N2	Pump Servo				2%	100%	24%	20
Miller Nitro N4	Pump Servo				2%	100%	24%	12
Montana Paruda	Calibrated Reflow				2%	100%	40%	2(Imperial) or 11.4 (Metric)
RoGator 864, 874, 1064, 1074	PWM Ground		**500-700	30	2%			
RoGator 1054	Pump Servo				2%	100%	24%	3
RoGator 1254	Pump Servo				2%	100%	24%	3
RoGator 1264, 1274 (up to 2006	PWM Ground		**500-700	30	2%			
RoGator 1274, 1286, and SS Series (2007 and up)	PWM Ground		**500-700	30	2%			
Spra-Coupe 3X40, 3X50, 4X40, 4X50	In-Line Ground				2%	100%	24%	3
Spra-Coupe 7000 with factory pump switch	PWM Ground	122	**500-700	30	2%			
Spra-Coupe without factory pump switch	PWM Ground	122	**500-700	30	2%			
TerraGator XX03, XX04, XX44	In-Line Servo				2%	40%	10%	15
Tyler Patriot, Patriot II, XL, 150, 150XL and WT	Check for In-line Servo or By-Pass Servo Control				2%	100%	24%	3
Walker	Pump Servo				2%	100%	24%	3

*Adjust this number to fit your particular configuration.

**If you are using a PWM control valve, some adjustment may need to be made to achieve optimal pump response to the PWM gain value. Increase the Gain value to make the system more responsive; decrease the Gain value to smooth the system response.

Dickey-John NH3 Conversions

Conversion Formulas

The following formulas can be used to convert the Dickey John flow sensor constant to a value that represents pulses/gallon of anhydrous ammonia for use by the display

Formula for flow meter calibration for Dickey John reading pounds of anhydrous.

$$\frac{\text{Flow sensor constant (pulses/in3) X 1728 (in3/ft3) X 5.11 (lbs of anhydrous/gal)}}{\text{Density (lbs. of anhydrous/ft3)}}$$

Formula for flow meter calibration for Dickey John reading pounds of Nitrogen.

$$\frac{\text{Flow sensor constant (pulses/in3) X 1728 (in3/ft3) X 4.22 (lbs of N/gal)}}{\text{Density (lbs. of N/ft3)}}$$

NOTE!: The flow sensor constant is tagged on the Dickey-John flow meter. The density setting comes from a chart in the Dickey-John documentation and is not provided in this user guide.

Fertilizer default Product Settings

Material	Type	Abbrevieated name for display and predefined name for SMS	Percentage (in terms of lbs. 100 lbs.			Density
			N	$P(P_2O_5)$	$K(K_2O)$	
Anhydrous Ammonia	Liquid under pressure	NH3	82	0	0	5.14 lbs./gal. (at 60°F)
28% UAN	Liquid	28% UAN	28	0	0	10.67
30% UAN	Liquid	30% UAN	30	0	0	10.86 lbs./gal.
32% UAN	Liquid	32% UAN	32	0	0	11.06 lbs./gal.
Ammonium polyphosphate (starter)	Liquid	Ammonium polyphosphate	10	34	0	11.73 lbs./gal.

Glossary of Application Settings

Configuration Settings

Rate Outside of Field—Rate that will be used outside of the field boundary. **Zero** stops product application. **Last Good** uses the previous rate before exiting the boundary. **Rx Default** uses the default rate written in the prescription file loaded.

Rate Display Smoothing—Determines how the feedback from the control channel's rate sensor will be displayed on the run screen. When checked, the system will display the target rate when the application rate is within 10% of the target rate setting. When unchecked the system will display the raw feedback from the rate sensor.

Minimum Flow—This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying with one or more boom sections off, the system automatically reduces the minimum flow setting according to the reduced spray width.

Rate Change Look-Ahead—Compensates for any delay in the control system when changing between different product flow rates during variable rate application. This setting can be thought of as a "look ahead" value when using a variable rate prescription. The display will send the signal to change rates before hitting a transition line so that the applied rate is correct when crossing into the new management zone. The typical setting range for this is 0-1 seconds.

Speed Input Settings

Primary Speed Source—Main speed input source used by the display.

Backup Speed Source—If the primary speed source fails, the display will use the backup if one is available.

Manual Speed—If both of the speed input sources are unavailable, manual speed can be used in order for the control channel to provide application. Manual speed setting is for use during static machine testing or by the control system in the absence of primary and backup speed signals.

Automatic Swath Control Settings

Turn-On Look-Ahead—Determines how far ahead the system looks to turn the swath sections back on. This setting compensates for any delay in the product control system when the sections are turned on.

Turn-Off Look-Ahead—Determines how far ahead the system looks to turn the swath sections off. This setting compensates for delay in the product control system when the boom sections are turned off.

Outside Boundary Option—Determines the behavior of the sections when exiting the field boundary or prescription-mapped area.

Coverage Option—Based on the coverage option selected, this setting determines the behavior of the swath section when entering/exiting an already applied area or field boundary. Options available include: Minimize Skip, Minimize Overlap, and User Defined Percentage.

Auxiliary Input Settings

Master Source — Switch that performs global master control of all rate control channels.

F1-F11 — Settings determine the switch(es) that will operate the controlling channel specified from the configuration setup.

Assign—Screen where switch(es) can be assigned to specific controlling channels. Single switches can be used to control multiple channels and swath sections.

Controller Settings

Flow Meter Cal — Calibration value representing the number of pulses that equal one-gallon of product flow through the controlling system.

Control Valve Settings — Setting specifies the type of control valve being used for the rate control functions of the controlling system.

Response Threshold — Determines where the control channel switches between using Valve Response 1 and Valve Response 2 speed setting.

Valve Response 1 — Determines the speed of the servo valve when product control error exceeds the Response Threshold setting. Valve Response 1 represents the fast speed of the servo valve.

Valve Response 2 — Determines the speed of the servo valve when product control error is less than the Response Threshold setting. Valve Response 2 represents the slow speed of the servo valve.

Allowable Error — Determines the percent of error that is allowed prior to the product control system making any flow rate changes.

Flow Control Delay — Setting for period of time from master switch on and the start of product application to the first flow control correction. This setting can be used to eliminate unwanted correction of flow control at the start of each pass. Typical setting values are zero for granular and 1 –2 seconds for liquid application control.

Flow Control Valve—When set to "Close," the controlling system shuts down when there is either a zero rate in the field or when entering an already-applied area. When set to "Hold," the controlling system remains in the last known state when all sections are shut off. If a PWM is the controlling system and the Flow Control Valve setting is set to "Hold," the valve will adjust to PWM Standby when all sections are shut off.

Auxiliary Valve 1 & 2—When all boom sections are off, this setting closes or opens an auxiliary valve. Choose settings for up to two auxiliary valves.

PWM Frequency — The frequency that the PWM control valve is pulsed at. Settings can be found from the manufacturer of the valve. Typical settings range from 100-125 Hz.

PWM Gain — Determines how aggressively the control valve responds when making rate change adjustments. The higher the value the more aggressive the system response is.

Zero Flow Offset — Represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero Flow Offset value can cause the product control system to not properly control low rates or to shut off. See the PWM valve manufacturer information for recommended settings.

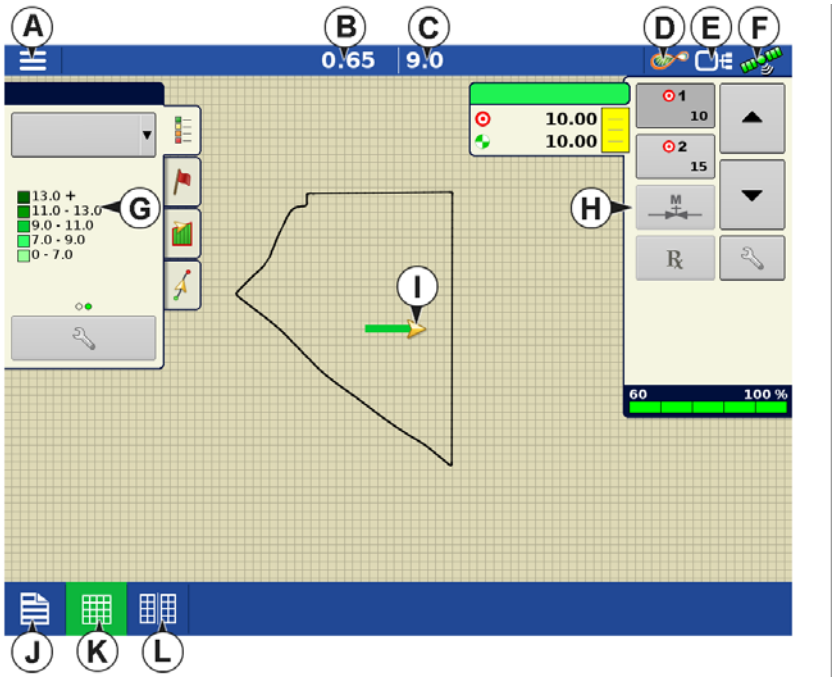
Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

Map View

Once a configuration has been completed, the Map View screen appears.

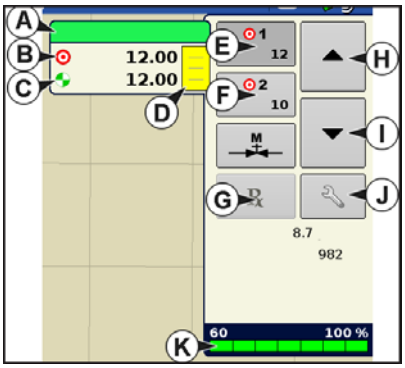
A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Product Control toolbox
I. Vehicle Icon
J. Event Summary
K. Map View
L. Split screen



NOTE! Pressing the Map View button will cycle between the available Map screen views, and the appearance of the Map View button changes.

Product Control Toolbox

During DirectCommand Run Time operations, the Product Tabs are shown in the upper right-hand side of the Map screen. Press the Product Tabs, and an extended view shows the Rate buttons, Manual Valve Control button, Prescription button, Rate Increase and Rate Decrease arrows, and the Rate Setup button, all of which are described below.



A. Product
B. Target Rate
C. Actual Rate
D. Container Level
E. Rate 1 button
F. Rate 2 button
G. Prescription button
H. Rate Increase arrow
I. Rate Decrease arrow
J. Rate Setup button
K. Section Status Indicator

Target Rate—The Target Rate is desired application rate.

NOTE: In some conditions, the Target Rate may increment more quickly than the Actual Rate.

Actual Rate—The Flow Sensor returns the actual rate being applied.

NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.

Container Level—The Container Level shows the amount of product in the container.

Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Manual Valve Control button — (Not Available for this Operation) The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to prime the system before application or clean out the equipment at the end of the day.

Rate Increase and Decrease Arrows — / allow Product Application Rate to be changed according to the Target Rate Increment. In using manual valve control, the increase and decrease buttons allow the position of the control valve to be defined by the operator.

Prescription button—

Rate Setup button—

Rate Control Settings

Adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import application product prescriptions. To access the Rate Control Settings screen, press the Rate Setup button on the Product Control Toolbox. The Rate Control Settings screen appears.

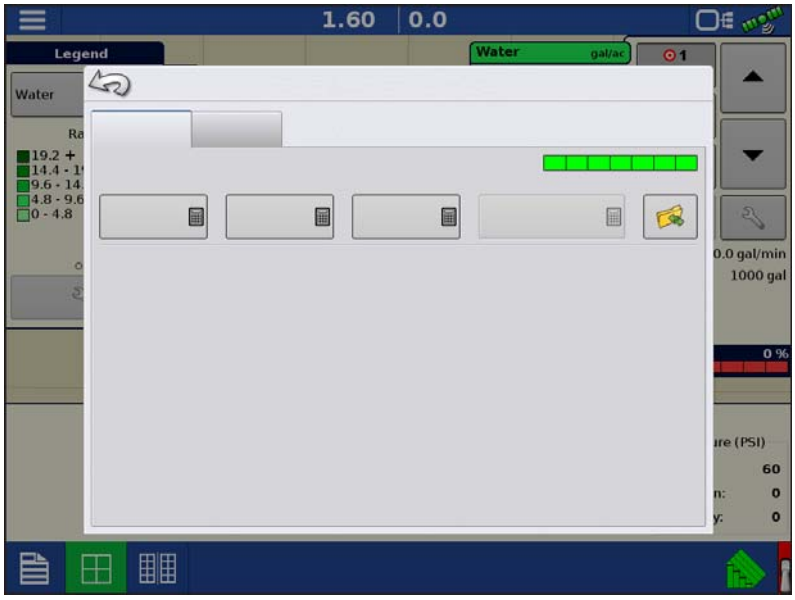
Rate 1 and Rate 2 — The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Press to enter the desired amount.

Increment — The Increment button allows operators to specify the increase or decrease amounts for a specified rate by using / on the Product Control Toolbox. Press to enter the desired increment.

Prescription — To load a map-based prescription file, press the Prescription button.

Refer to "Loading Prescriptions" on page 278 for further detail.

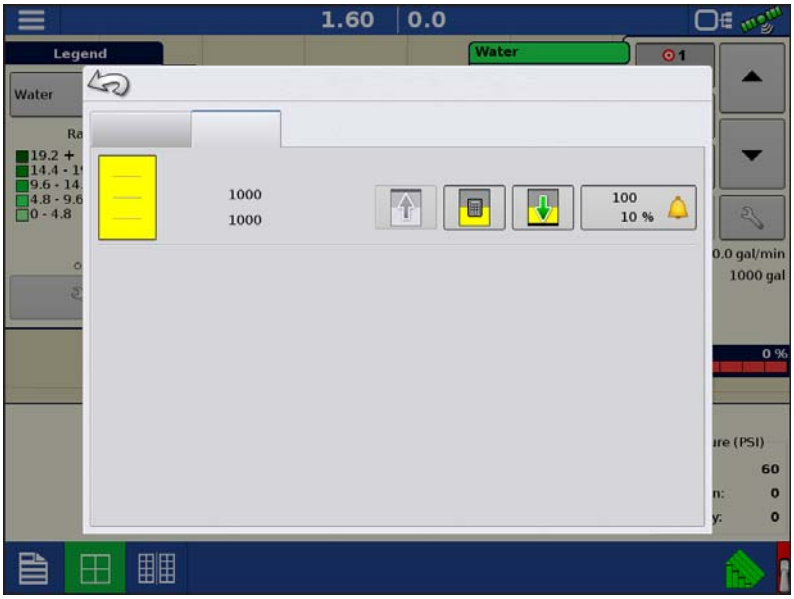


Minimum Flow — (Used for DirectCommand Liquid Applications only). This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying with one or more boom sections off, the system automatically reduces the minimum flow setting according to the reduced spray width. To adjust this setting, press and enter the desired numeric value.

Container Level Settings

When filling or emptying container, use the Container Level portion of the Rate Control Settings screen to update the amount of product in the containers.

Container Level screen



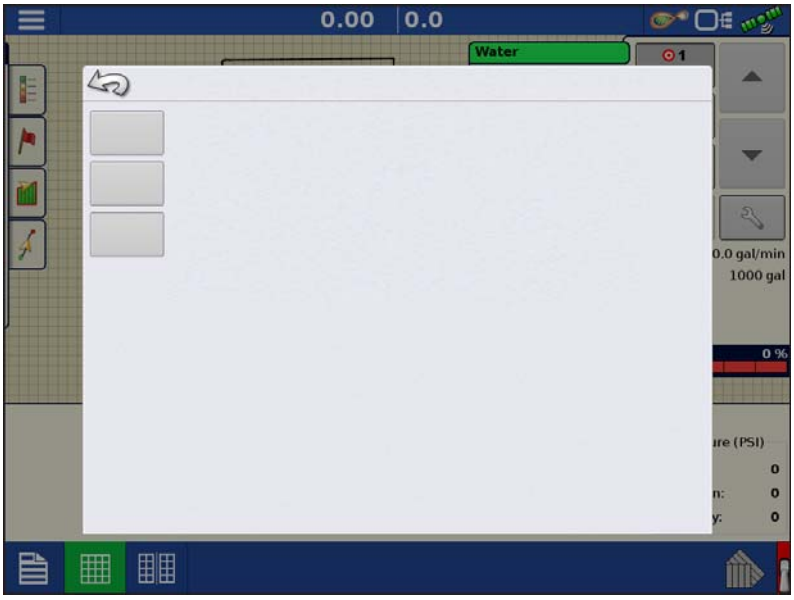
•**Tank Fill** — The Tank Fill button increases the container level logged in the display to the user-defined maximum volume (specified in the Container Setup Wizard).

•**Tank Empty** — The Tank Empty button decreases the container level logged in the display to zero.

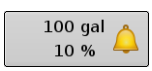
•**Tank Partial Fill** — The Tank Partial Fill button increases the container level logged in the display to specific amount that you specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

Adjust Container Amount

- **Add** — Adds product to the container.
- **Remove** — Removes product from the container.
- **Set** — Sets the product level in the container.



Tank Alarms



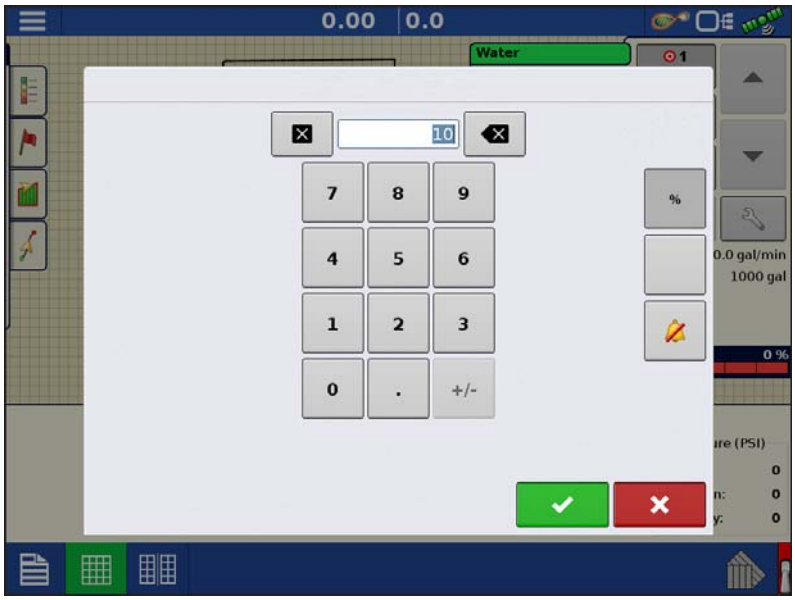
The Container Alarm button, which appears on the right of the Container Level portion of the Rate screen, displays the capacity of your tank as well as the percentage at which the Low Container Level warning will sound. To adjust these settings, press the button and the Container Alarm screen appears.

If you wish to adjust your container level warnings, use the following buttons on the right-hand side of the Container Alarm screen to make these adjustments.

The **Percentage (%)** button sets the warning threshold according to the percentage of solution left in the tank. In the example above, the threshold is set at 10 percent.

The **Units of Measurement** icon sets the warning threshold according to the amount of solution left in the tank. This icon is named according to the container's units of measurement you specified during the Controller configuration procedure.

The **Disable Low Container Level** button, which appears as a bell with a red slash across it, disables the Low Container Level warning.

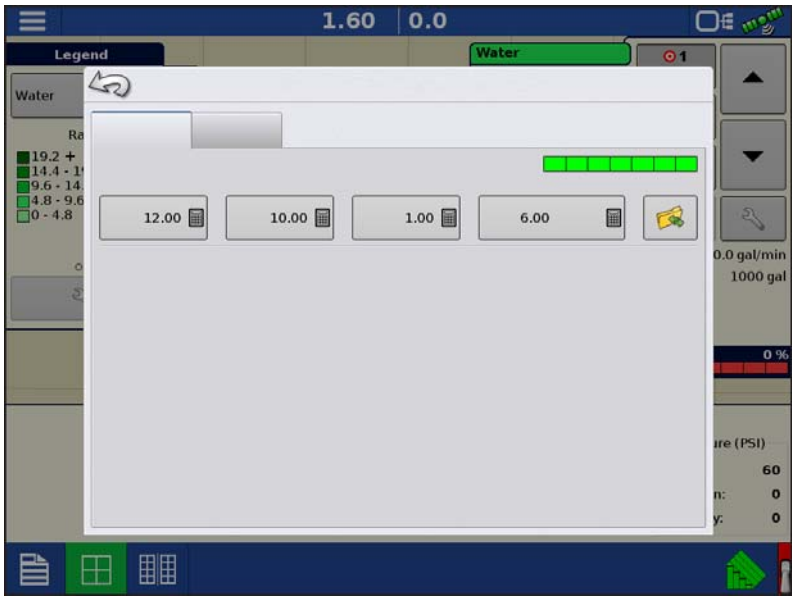


Loading Prescriptions

1. Press the Rate Setup button on the Control Toolbox.

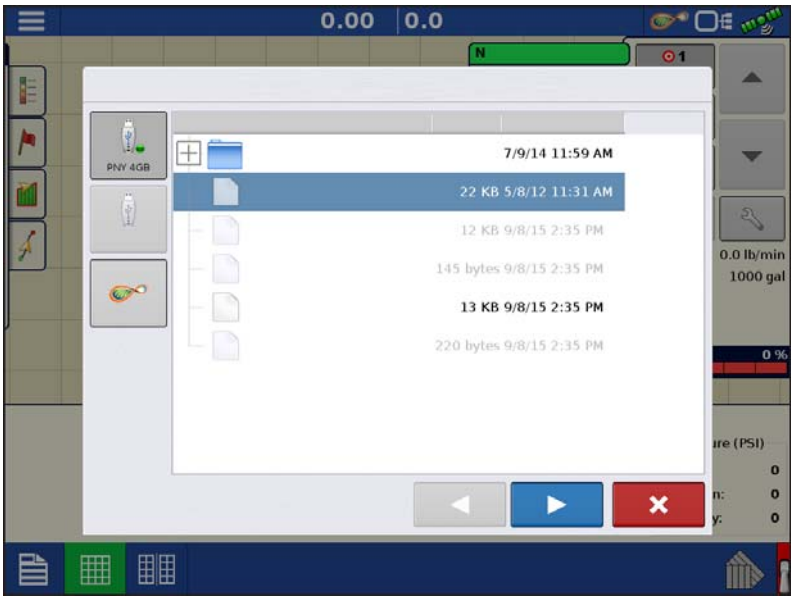
The Rate Control Settings screen appears.

2. Press the Load Prescription button.

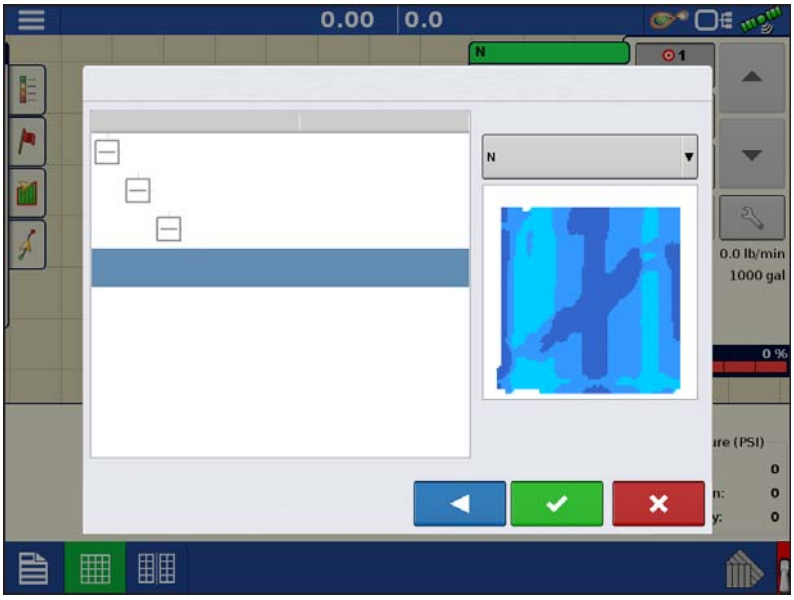


The Select File screen appears.

3. Highlight the correct .AGSETUP (prescription) or .shp (shape) file and press .



4. Next select your prescription in the Select Prescription screen, and select the correct controlling product from the Product drop-down box. A preview prescription map is displayed. Press the .
5. When you return to the Rate Control Settings screen, the prescription rate is now shown on the screen. The Load Prescription button has disappeared and in its place is the Remove Prescription button, which resembles a minus sign. Press the Remove Prescription button if you wish to remove the prescription from the field.
6. When you return to the Map screen, the prescription is now shown on the map.



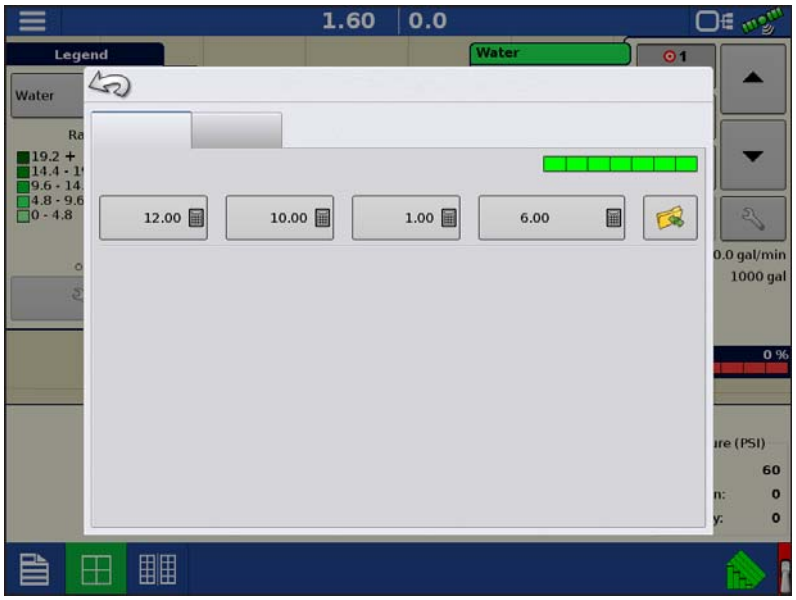
Shape File Conversion

What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple products.

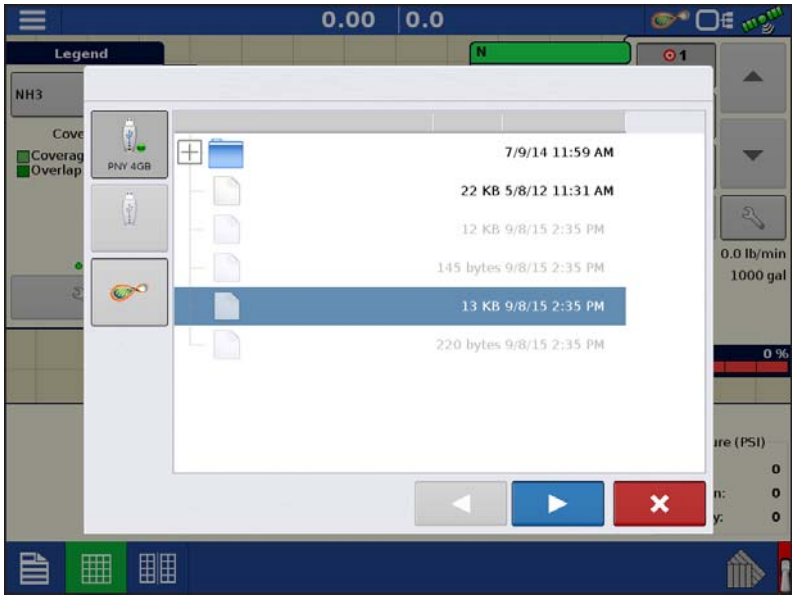
1. To begin, press the Rate Setup button on the Product Control Toolbox.

The Rate Control Settings screen appears

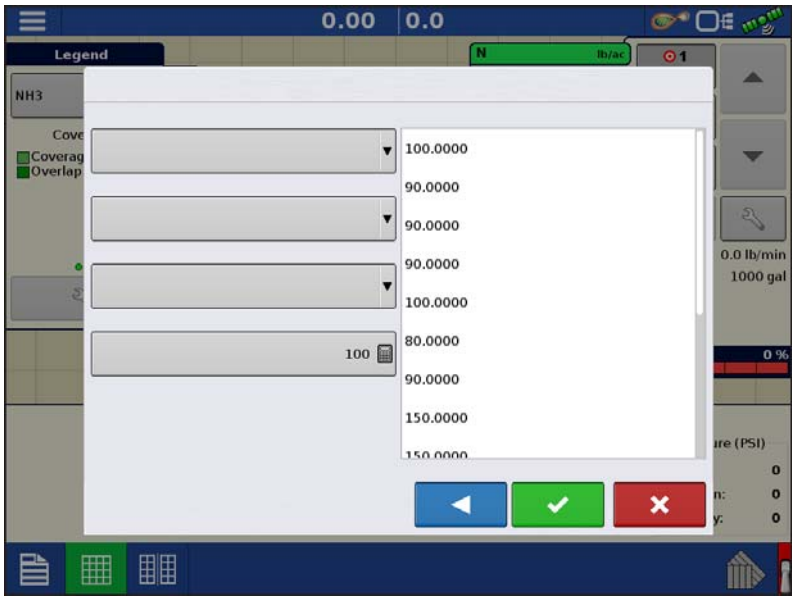
2. Press the Load Prescription button.



3. The Select File screen appears. Highlight your desired .shp file and press .



4. **Select Column From Shape File**—Select the column that contains the product recommendation rate. The list on the right side of the dialog shows sample data from the selected column.
5. **Select Units**—Select the controlling units for product application.
6. **Default Rate Setting**—The system assigns a default rate. Use the on-screen keypad to edit the value if desired.



NOTE!: Select the product and units that the shape file prescription was made for. Selection of the wrong data column or unit will result in misapplication of product.

ATTENTION!: The only time the default rate is used by the system during product application is if the Rate Outside of Field selection is set to " Rx default". This setting is located in the equipment configuration settings portion of configuration setup. If the Rate Outside of Field selection is set to "Rx default", the default target rate will be used when the vehicle exits the area covered in the prescription map.

Creating Products

Creating application products and product templates can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Creating Single Products

To create a single product, to be added to a product template or to be applied by itself, use the on-screen wizard described in the following steps.

Select:

1. Product Type
2. Product Units
3. EPA Product Number (Optional)

   Check box if product is a Restricted Use Pesticide
4. Manufacturer name if applicable.

   Manufacturer name can be added to the drop-down menu by pressing .
5. Press to enter a unique name for the product.

Created product should appear under the Application heading located on the Product tab of the Configuration Setup screen.

NOTE: Some Fertilizer and Carrier product types are predetermined in the display. These product names cannot be edited. Their Manufacturer and EPA Numbers can be edited after the product is created. Examples are: Fertilizer>DAP or Carrier>30% UAN.

Creating Product Template

Product Templates are set up by using the on-screen wizard.

NOTE!: Prior to making a new product template, it is recommended to add the individual products to the list in the units recommended by the chemical label.

It is recommended to create product templates that contain the products applied for a crop type or time of the season.

Examples are:

- Pre-Emerge Burndown
- Post-Emerge Corn
- Post-Emerge Beans
- Insecticide
- Fungicide

In each template the products can be checked on/off for the mix when loaded at the run screen.

1.

2. Select Tank Mix

   Define By

   - Total amounts - mix/blend defined by amounts added to the tank (total of each product in tank)
   - Rate/acre - mix/blend defined by the amounts applied per acre (rate of each product applied/area)
3. Enter a Base Amount or Base Rate and Units.
   - Total Amounts - Tank/Bin Size
   - Rate/Acre - For Rate Applied per Acre
4. Select Carrier
   - Press to create a new carrier.
5. Press by the Add Mix/Blend Contents box to start the process of adding components to the mix.
6. Select the desired component from the drop-down menu.

NOTE! More than 7 products can be part of a template, but only 7 or fewer can be active at the same time.

   - A new product can be set up at this time by pressing (+ icon) and following the Product Setup Wizard.
   - Press to add selected product, or press to return to Add Mix/Blend screen without adding a product.
7. Press to add an additional product.
8. When all components have been added press .
9. Enter Manufacturer name is applicable.
   - Manufacturer name can be added to the drop-down menu by pressing .
10. Press to enter a unique name for the mix/blend.
    - Press to complete the process of setting up the mix/blend, or press to return to the Configuration Setup screen without adding a mix.

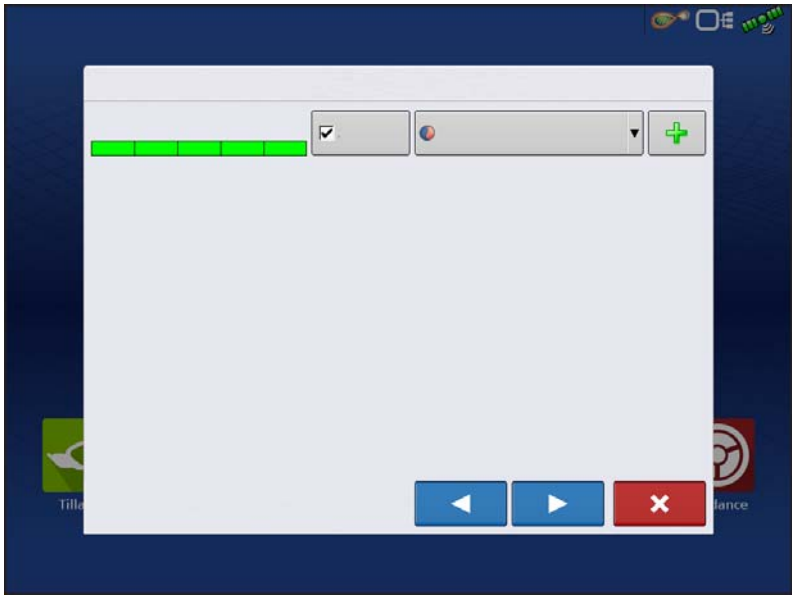
The product mix/blend appears under the Application heading located on the Product tab of the Configuration Setup screen.

Represents Product Templates

Configure Product Mix

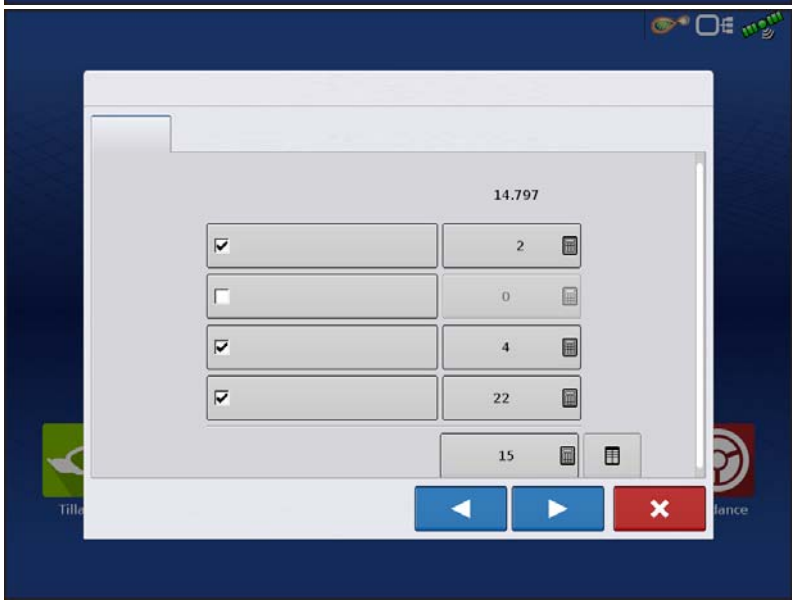
When using a product template, the mix contents and amounts are defined in the Configure Product Mix screen available in the Event Setup Wizard, or Product button in the main menu.

1. Select your mix/blend from the drop-down list or press to create and new mix/blend.



2. The product template mix contents and amounts are defined by:
   - A. activating or de-activating products
   - B. changing rate or total amount of product
   - C. changing total amount of the product or overall rate of product application

   A product can not be active with a rate of zero. Press to access the Mix Calculator.
3. When a product template is setup using rate/area, the Mix Calculator can be used to show how much of each product to put in the tank when the user enters the desired amount to fill.

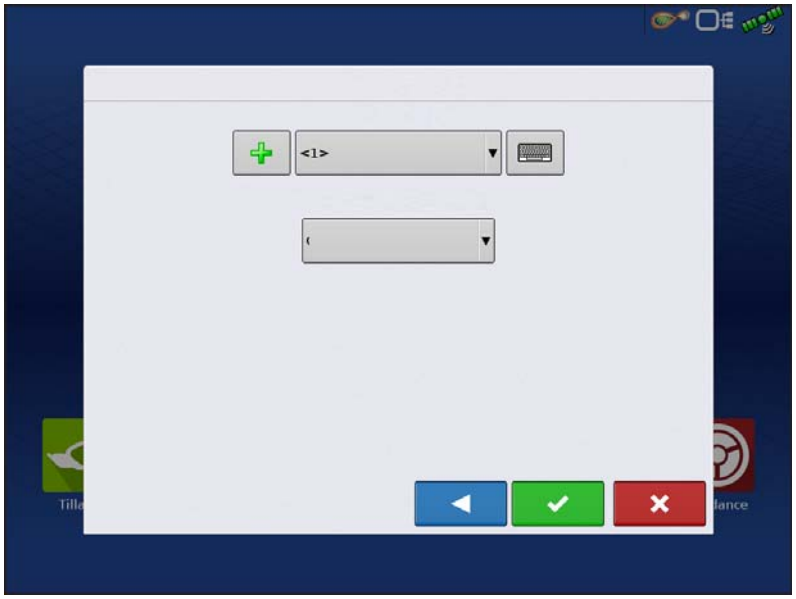


4. Press the Volume to Calculate button and input the total volume. Table will give the user the amount of each product to put in the tank.

5. Select Region from the drop-down menu or press to name Region

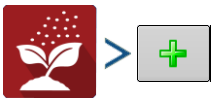
Verify the Controlling Product for the Mix/Blend.

Press to load the Event to the Map Screen, or press to return to Home screen without setting up an Event.

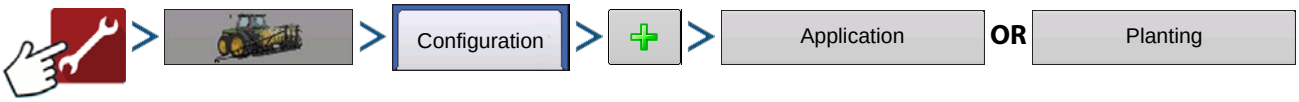


Create Configuration

To create a configuration, make the following button presses to start the Configuration Wizard and then follow the instructions given on the display. The configuration can be started in two places:

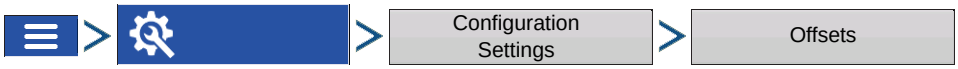


OR



Implement Offsets

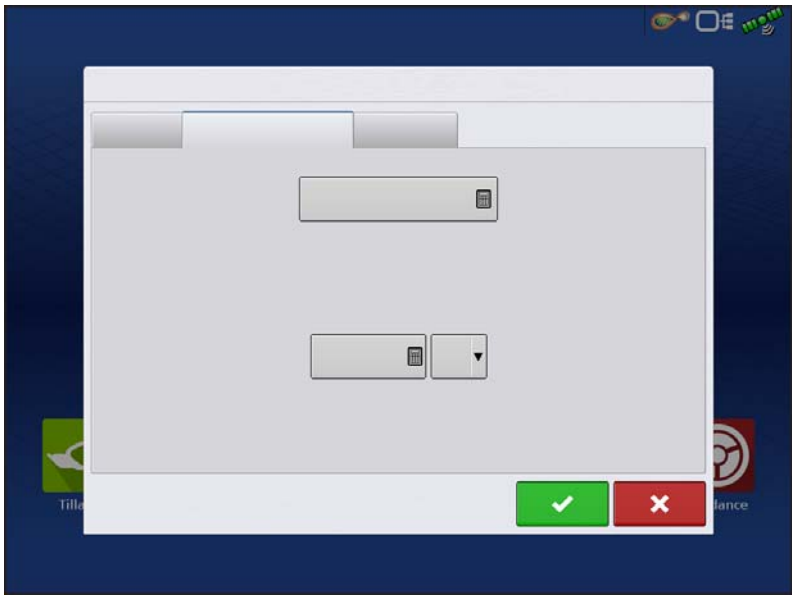
OR



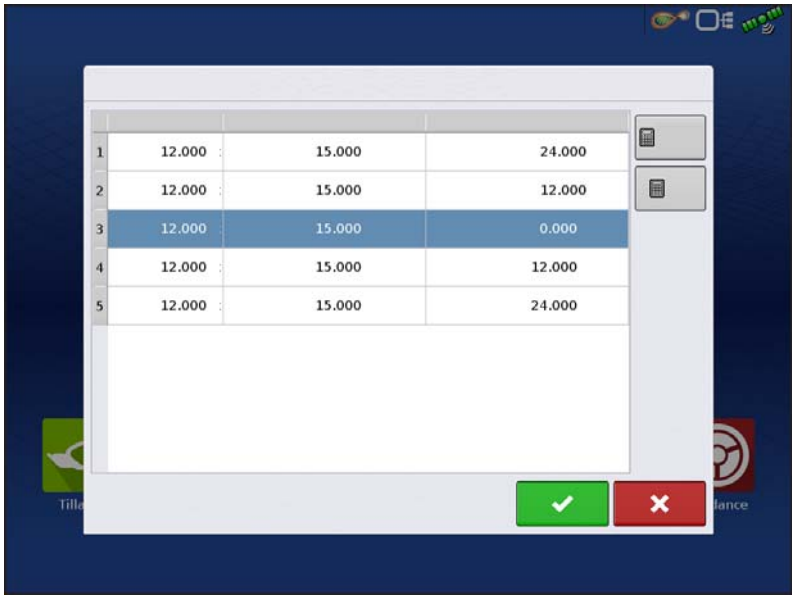
Implement Offsets screen appears, with each channel's settings shown on its own tab.

Defaults to the value entered during Configuration Wizard

Boom sections can independently be offset forward or back (application only)



1. Press to access Swath Section Offsets screen.



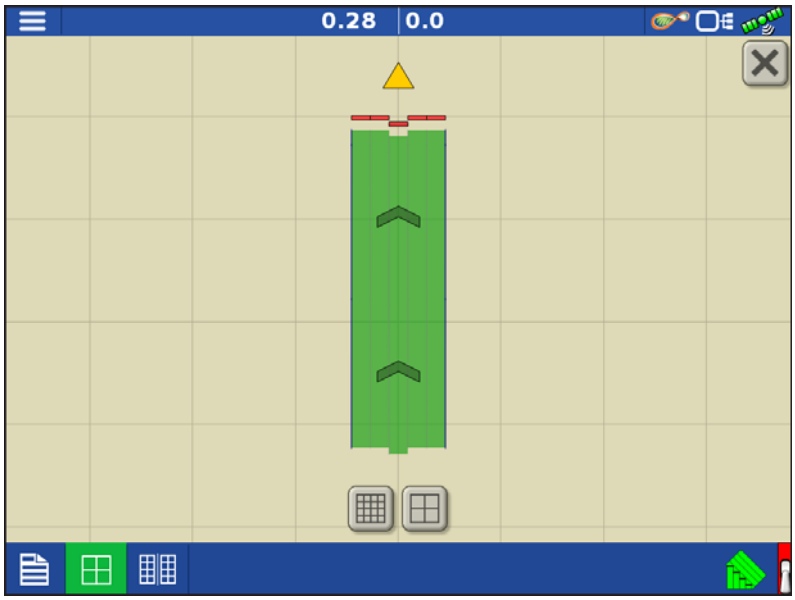
2. Select Swath section to edit and press Edit button.
3. Enter Offset for that specific section and Forward/Backward from rear axle.
4. Press to enter change.

Setup will indicate which offset is entered

Global—All sections have the same offset

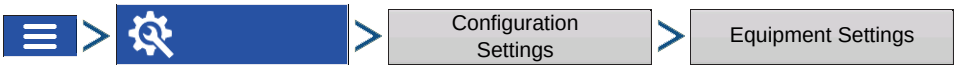
Individual—At least one section has a different offset

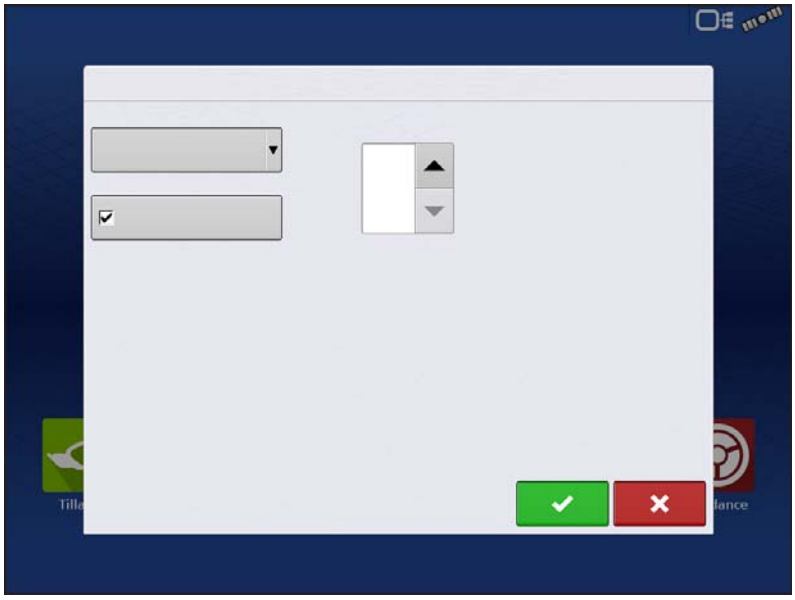
Runscreen reflects section offsets



Equipment Settings

OR





Rate Outside of Field—This setting will define how product will be controlled when leaving a field boundary.

Zero—This will stop application.

Last Good—This will continue application at the last known rate.

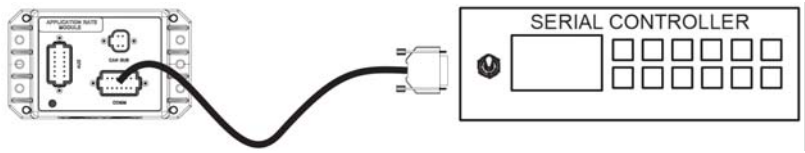
Rx Default—When using a prescription, this will apply at the Default Rate (or outside of boundary rate) as defined by the prescription file.

Rate Display Smoothing—Determines how the feedback from the control channel rate sensor will be displayed on the map screen. When de-selected, the system will display raw feedback from the rate sensor. When checked, the system will display target rate when the application rate is within 10% of the target rate setting.

Rate Change Look-Ahead—This setting compensates for any latency in the control system when changing between different product flow rates during variable rate application. The typical setting range for this is 0-1 seconds. This setting can be thought of as a "look ahead" value when using a variable rate prescription. The display will send the signal to change rates before hitting a transition line so that the applied rate is correct when crossing into the new management zone.

Module Layouts

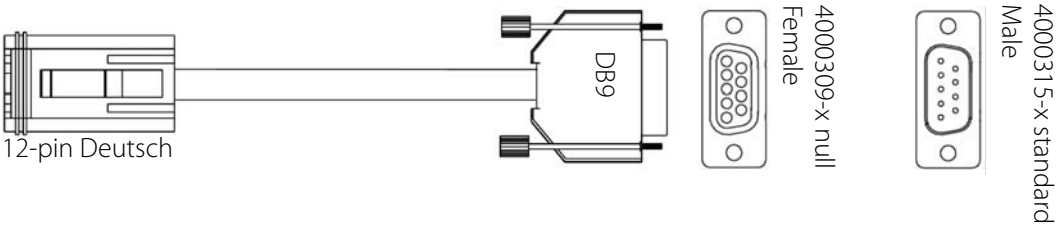
Application Rate Module with serial cable connecting to Controller.



Application Rate Module with serial cable connecting to cable supplied by manufacturer (needed if listed in following tables). Manufacturer supplied cable connects to controller.

To verify the correct harness, the DB9 connector is:

- female for the 4000309-x (null) cable
- male for the 4000315-x (standard) cable



Serial Control - Supported Controlle rs

Controller	Row Crop Planter	Seeders and Drills	Spreaders	Sprayer	Required Harness	Other Information
Raven						
440	X			X	4000309-X	Harness connects directly to Raven Controller. Baud Rate = 9600 Trig = 1 Unit = Sec DLog = On Setting found in the Data Menu Setup
450				X	4000309-X	
460				X	4000309-X	
660			X	X	4000309-X	
700				X	4000309-X	
710				X	4000309-X	
750			X	X	4000309-X	
760			X	X	4000309-X	
Sidekick	X			X	4000309-X	
Mid-Tech						
Ag-Logix			X	X	4000315-X	Harness connects directly to Mid-Tech controller Requires Additional DataLink Module PN:78-050007
TASC 6000			X	X	4000315-X	
TASC 6100			X	X	4000315-X	
TASC 6200			X	X	4000315-X	
TASC 6300			X	X	4000315-X	
TASC 6500			X	X	4000315-X	
TASC 6600			X	X	4000315-X	
Rawson						
Accu-Plant	X		X		4000315-X	Harness connects directly to Rawson Controller. Requires setting the Rawson controller to GPS mode to enable serial communication.
Accu-Rate	X		X		4000315-X	
New Leader						
Mark III			X		4000315-X	Harness connects directly to New Leader controller
Mark IV			X		4000315-X	
Mark V			X		4000309-X	
SP 6			X		4000309-X	
Flexicoil						
FlexControl		X		X		Requires additional Flexicoil cable PN:14927
Bogballe						
Calibrator Uniq			X		4000309-X	Harness connects directly to Bogballe controller
Calibrator 2003			X		4000309-X	
UNIA Group						
BRZEG			X		4000309-X	Harness connects directly to BRZEG controller
Amazone						
Amatron+		X	X	X	4000309-X	Harness connects directly to Amazone controller. Requires baud rate set to 19200 in the controller.
LH AGRO						
LH5000			X	X	4000309-X	Harness connects directly to LH controller.

Controller	Row Crop Planter	Seeders and Drills	Spreaders	Sprayer	Required Harness	Other Information
Kuhn						
Quantron			X	X	4000309-X	Requires Kuhn cable ZPN:1409955
Kverneland						
Focus II		X	X	X		Contact your Kverneland dealer for the correct cable
Vaderstad						
Control Station		X	X	X	4000315-X	Requires RDS cable PN:428017
RDS						
Pro			X	X	4000309-X	Requires RDS cable PN:CB268-1-032
Reco/Sulky						
Vision-X			X	X		Requires Reco/Sulky cable PN:CB268-1-032

Troubleshooting Serial Control Applications—Liquid

Problem: Rate changes on the display, but not on the controlled console.

Solution:

1. Verify the current firmware is running on the display and Application Rate module.
2. Check the settings specific to your controlled console.
3. Check cabling and all connections.
4. Disconnect the serial connection and determine if the controller is functioning properly without the display.

Problem: The display rate and serial-controlled rate do not match.

Solution:

1. Verify the current firmware is running on the display and the Application Rate Module.
2. Check the percent rate change.

Troubleshooting Serial Control Applications—Granular

Problem: Rate changes on the display, but not on the controlled console.

Solution:

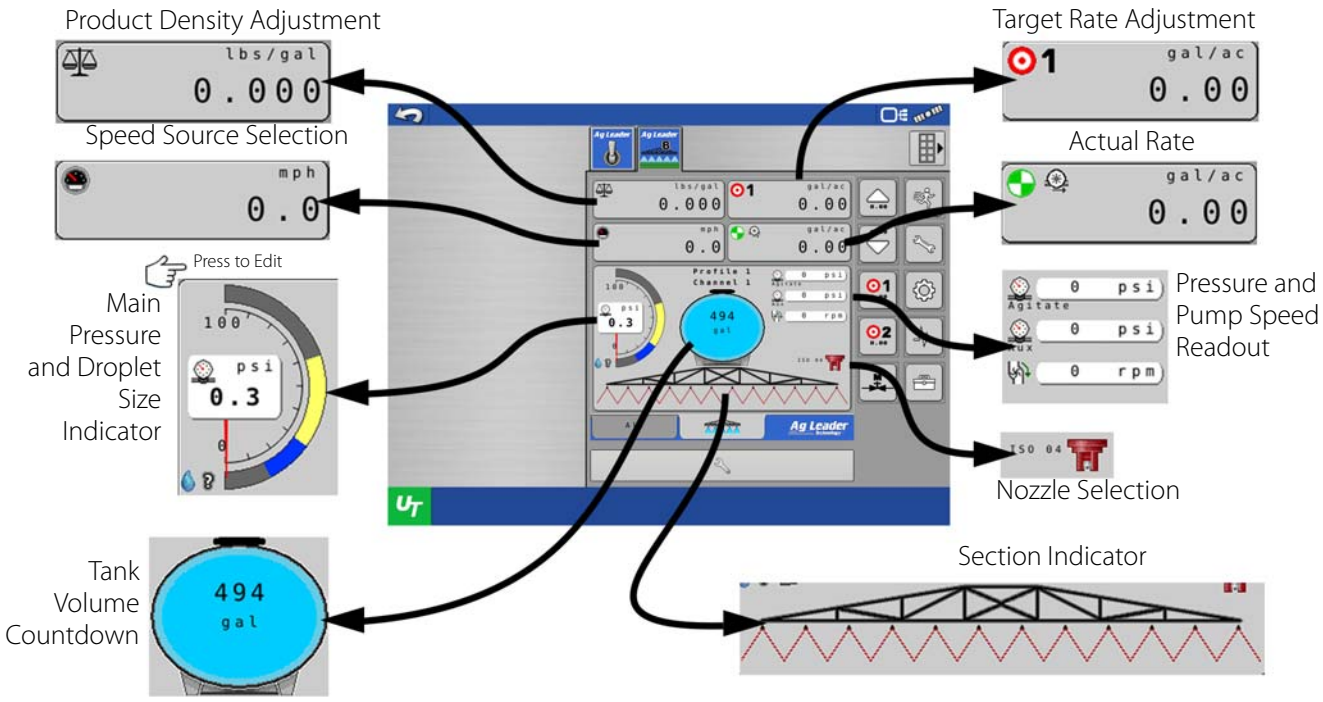
1. Verify the current firmware is running on the display and Application Rate module.
2. Check the settings specific to your controlled console.
3. Check cabling and all connections.
4. Disconnect the serial connection and determine if the controller is functioning properly without the display.

Problem: The display rate and serial-controlled rate do not match.

Solution:

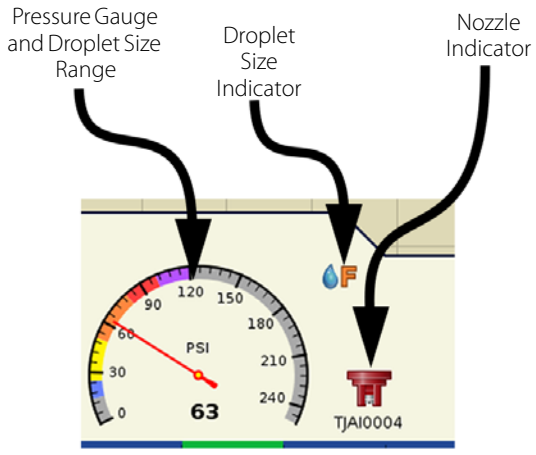
1. Verify the current firmware is running on the display and Application Rate Module.
2. Check to make sure the nominal rate in the display matches the nominal rate in the serial-controlled console.

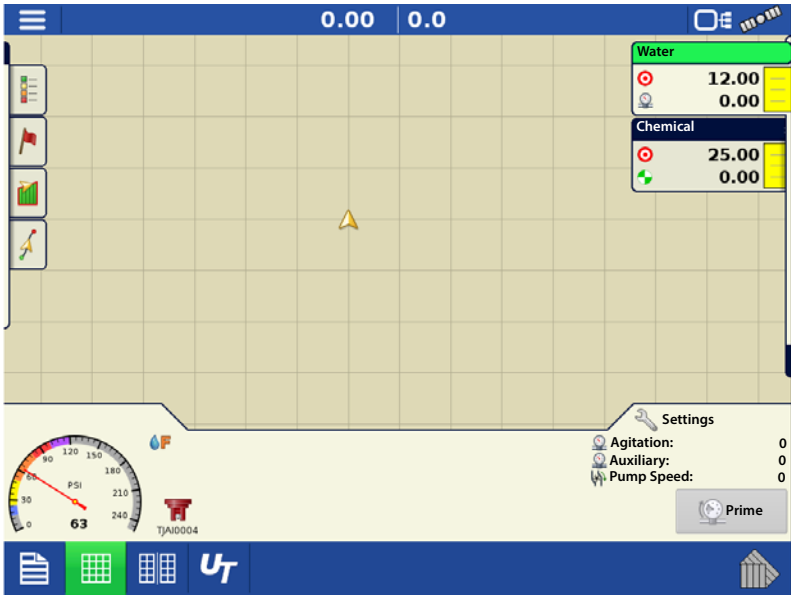
At a Glance—Universal Terminal



ATTENTION!: Pages 293 - 305 are specific to Ag Leader display functions. If the ISO Liquid Rate Control is being operated through another ISO display, refer to pages 306 - 349 for Universal Terminal specific functions.

At a Glance—With Ag Leader Display

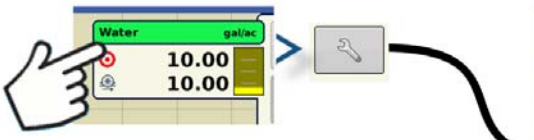


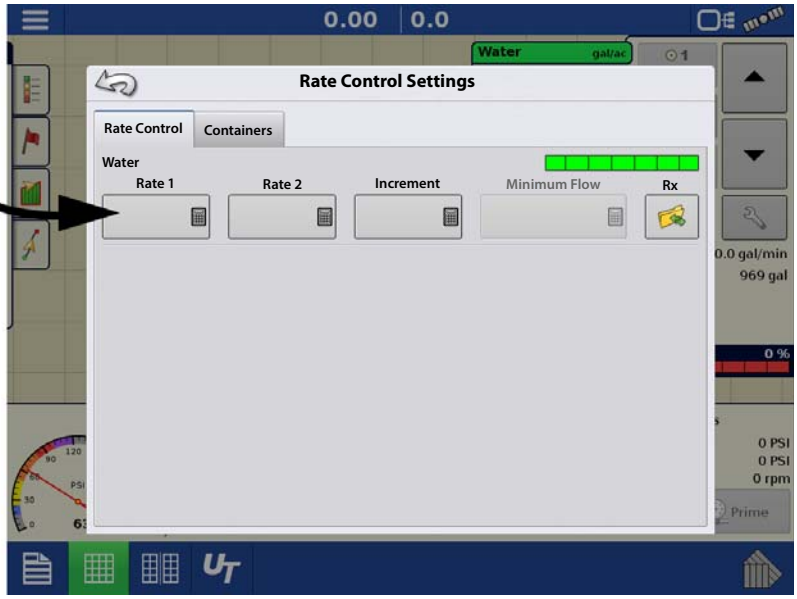


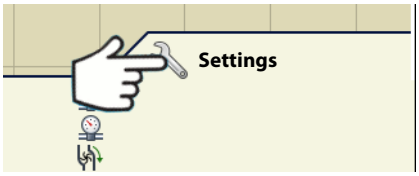
Pressing the **Prime** button will bring the system up to the defined Prime/Standby pressure and hold it. This feature is only available when a PWM control valve and pressure sensor are utilized.

At a Glance—With Ag Leader Display

Press Rate tab > **Settings** (wrench) button

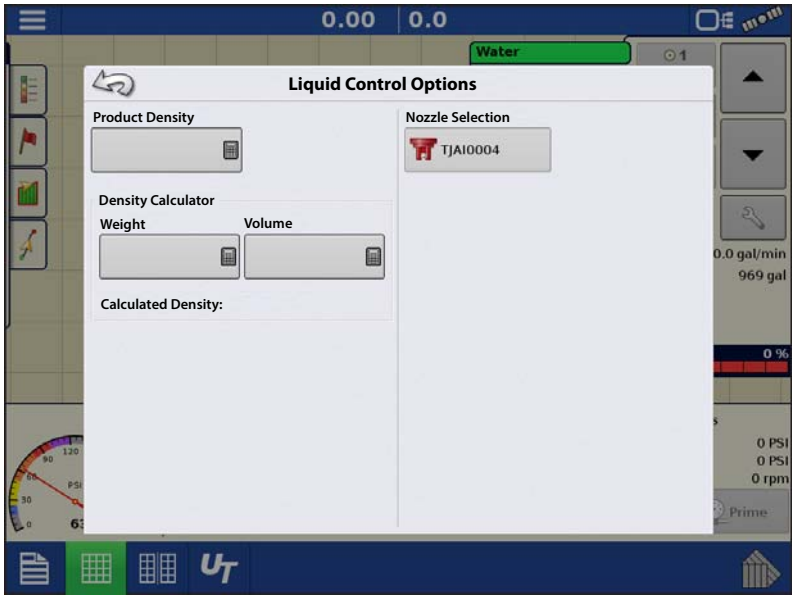






Press **Settings** tab to access Liquid Control Options screen.

Go to Liquid Control Options screen.



NOTE! The user can calculate the density by entering the known weight and volume.

Select the nozzle that will be used on the machine.

NOTE! Product Density and Nozzle Selection are required for pressure based control. If there is not a nozzle present to select, the user must add one in the module.

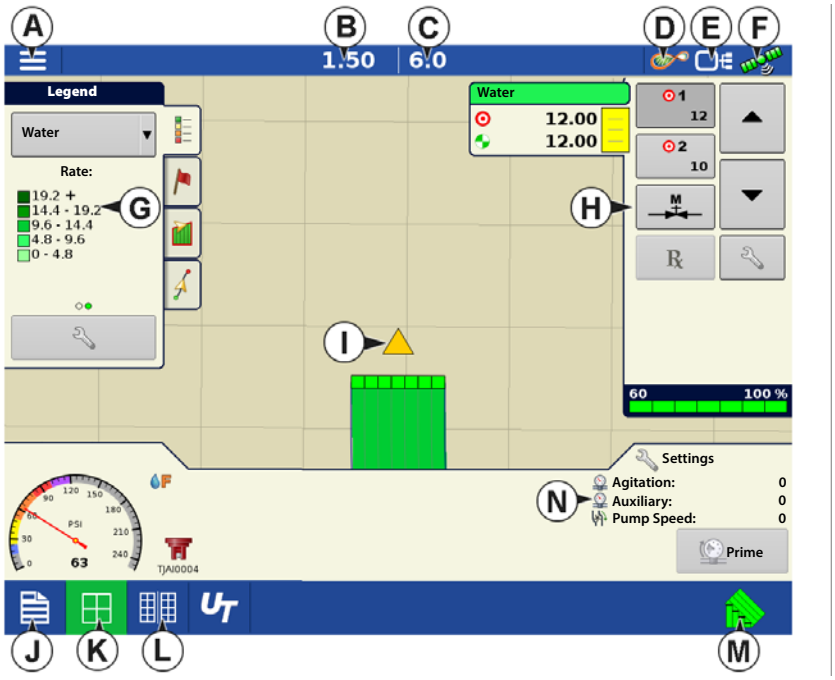
ATTENTION!: Pages 293 - 305 are specific to Ag Leader display functions. If the ISO Liquid Rate Control is being operated through another ISO display, refer to pages 306 - 349 for Universal Terminal specific functions.

Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

NOTE!: If a System or Profile has not been setup yet in the Universal Terminal, please refer to "System Settings" on page 323 and/or "Profiles" on page 313 before loading a configuration.

Map View

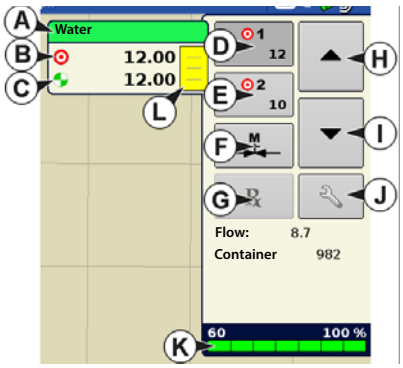


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Product Control toolbox
I. Vehicle Icon
J. Event Summary
K. Map View
L. Split screen
M. AutoSwath
N. Pressure Diagnostics

NOTE!: Pressing the Map View button will cycle between the available Map screen views, and the appearance of the Map View button changes.

Product Control Toolbox

During DirectCommand Run Time operations, the Product Tabs are shown in the upper right-hand side of the Map screen. Press the Product Tabs, and an extended view shows the Rate buttons, Manual Valve Control button, Prescription button, Rate Increase and Rate Decrease arrows, and the Rate Setup button, all of which are described below.



A. Product
B. Target Rate
C. Actual Rate
D. Rate 1 button
E. Rate 2 button
F. Manual Valve Control
G. Prescription button
H. Rate Increase arrow
I. Rate Decrease arrow
J. Rate Setup button
K. Section Status Indicator
L. Container Level

Target Rate—The Target Rate is desired application rate.

NOTE: In some conditions, the Target Rate may increment more quickly than the Actual Rate.

Actual Rate—The Flow Sensor returns the actual rate being applied.

NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.

Container Level—The Container Level shows the amount of product in the container.

Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Manual Valve Control button — The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to prime the system before application or clean out the equipment at the end of the day.

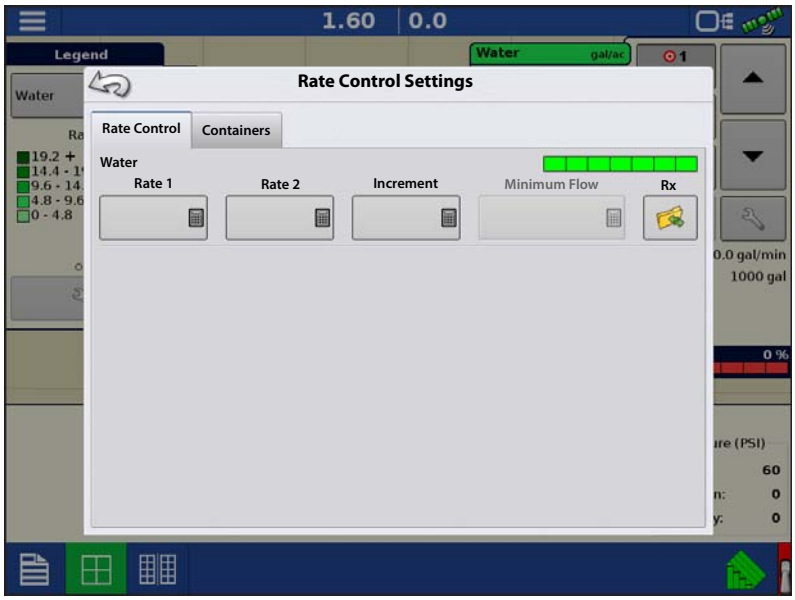
Rate Increase and Decrease Arrows — / allow Product Application Rate to be changed according to the Target Rate Increment. In using manual valve control, the increase and decrease buttons allow the position of the control valve to be defined by the operator.

Prescription button—

Rate Setup button—

Rate Control Settings

Adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import application product prescriptions. To access the Rate Control Settings screen, press the Rate Setup button on the Product Control Toolbox. The Rate Control Settings screen appears.



Rate 1 and Rate 2 — The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product. Press to enter the desired amount.

Increment — The Increment button allows operators to specify the increase or decrease amounts for a specified rate by using / on the Product Control Toolbox. Press to enter the desired increment.

Prescription — To load a map-based prescription file, press the Prescription button.

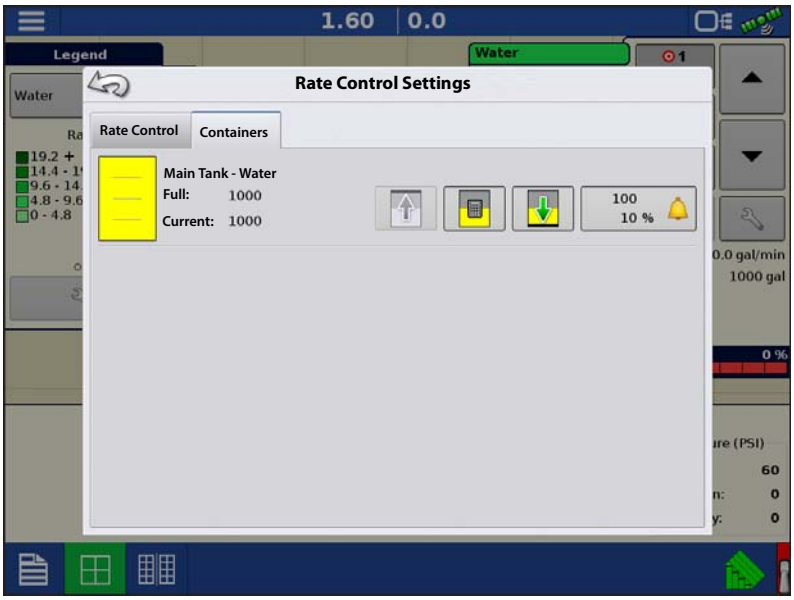
Minimum Flow — (Used for DirectCommand Liquid Applications only). This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying with one or more boom sections off, the system automatically reduces the minimum flow setting according to the reduced spray width. To utilize Minimum Flow, nozzles will need to be setup in the Universal Terminal. Once a nozzle is setup, Minimum Flow is calculated based off of the nozzles specifications. Refer to "Nozzles" on page 319 for further detail.

Container Level Settings

When filling or emptying container, use the Container Level portion of the Rate Control Settings screen to update the amount of product in the containers.

Container Level screen

Container Level may also be adjusted from the Universal Terminal.



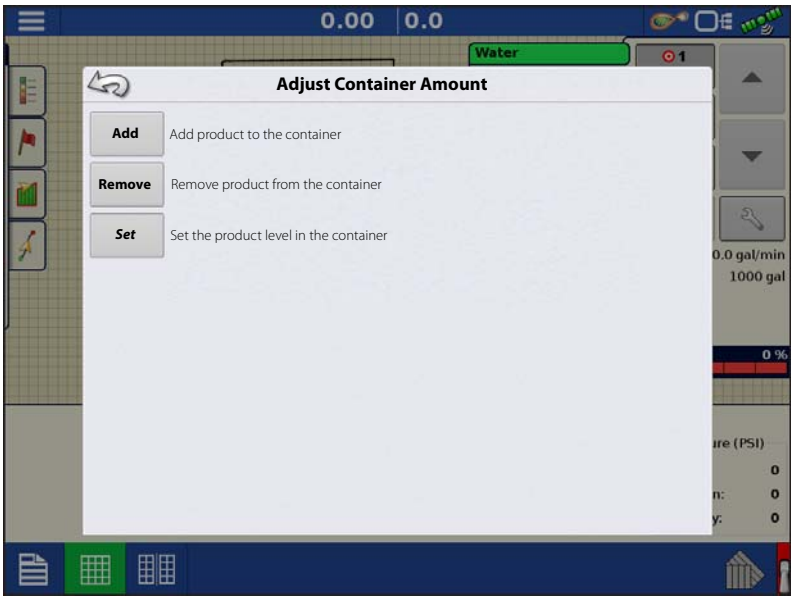
•**Tank Fill** — The Tank Fill button increases the container level logged in the display to the user-defined maximum volume (specified in the Container Setup Wizard).

•**Tank Empty** — The Tank Empty button decreases the container level logged in the display to zero.

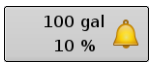
•**Tank Partial Fill** — The Tank Partial Fill button increases the container level logged in the display to specific amount that you specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

Adjust Container Amount

- **Add** — Adds product to the container.
- **Remove** — Removes product from the container.
- **Set** — Sets the product level in the container.



Tank Alarms



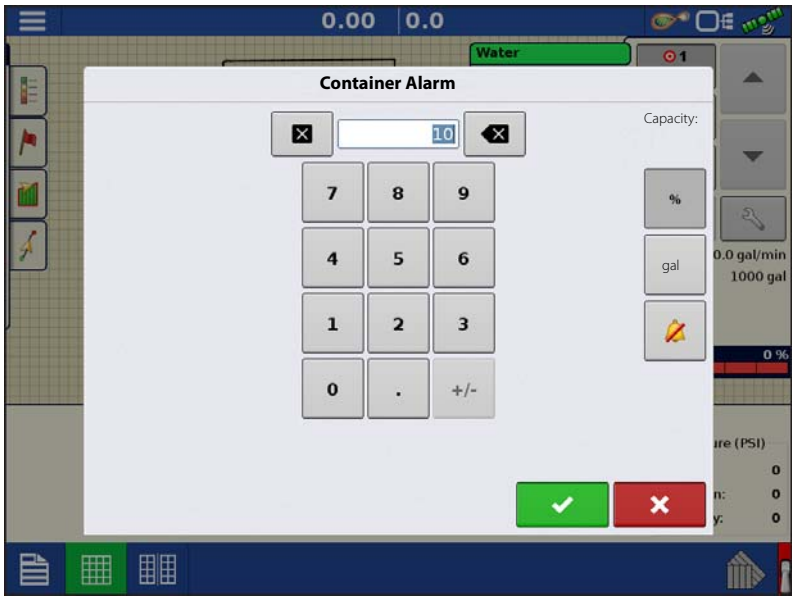
The Container Alarm button, which appears on the right of the Container Level portion of the Rate screen, displays the capacity of your tank as well as the percentage at which the Low Container Level warning will sound. To adjust these settings, press the button and the Container Alarm screen appears.

If you wish to adjust your container level warnings, use the following buttons on the right-hand side of the Container Alarm screen to make these adjustments.

The **percentage (%)** button sets the warning threshold according to the percentage of solution left in the tank. In the example above, the threshold is set at 10 percent.

The **units of measurement** icon sets the warning threshold according to the amount of solution left in the tank. This icon is named according to the container's units of measurement you specified during the Controller configuration procedure.

The **Disable Low Container Level** button, which appears as a bell with a red slash across it, disables the Low Container Level warning.

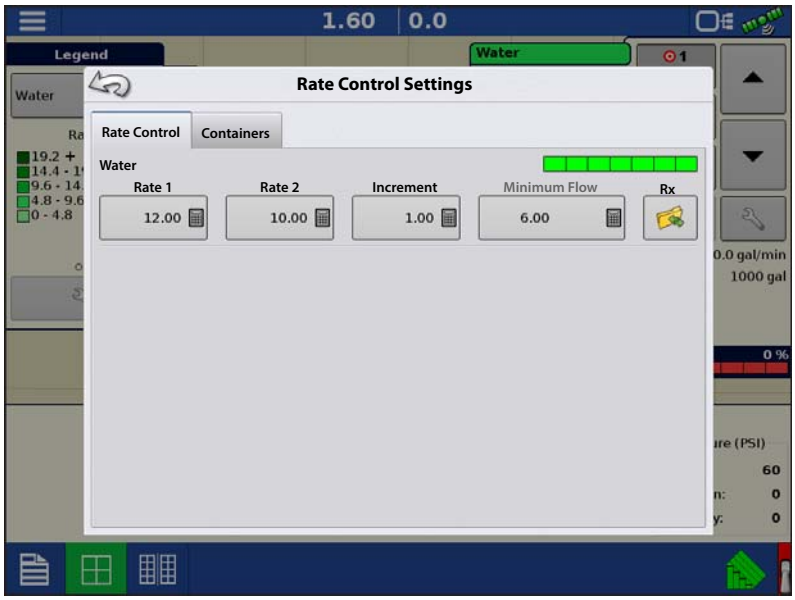


Loading Prescriptions

1. Press on the Product Control Toolbox.

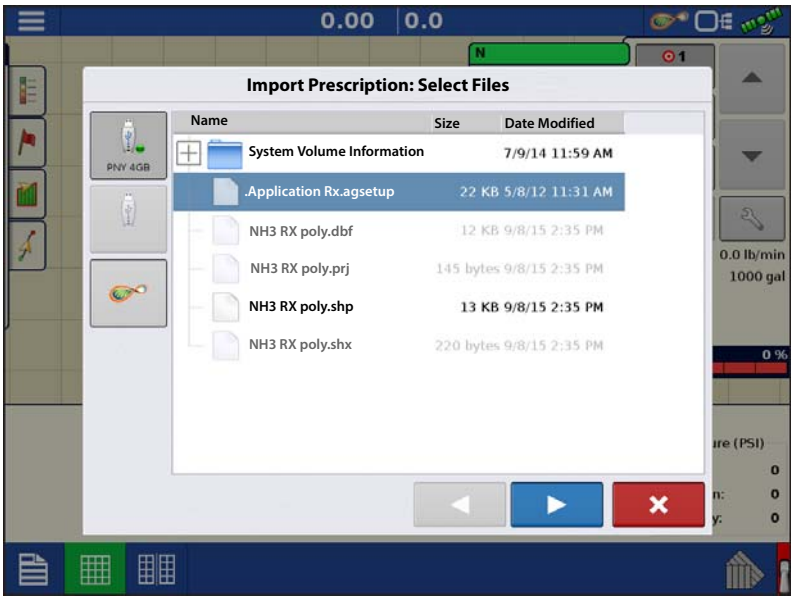
   The Rate Control Settings screen appears.

2. Press the Load Prescription button.



The Select File screen appears.

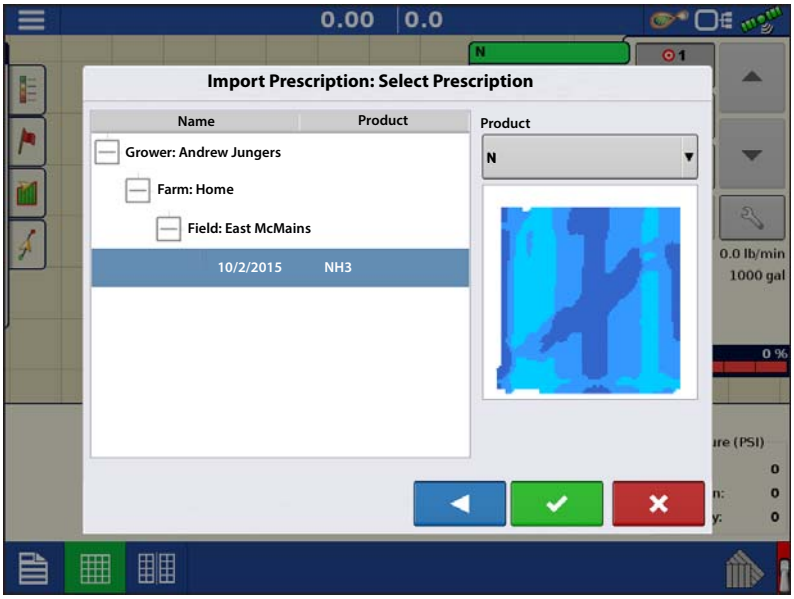
3. Highlight the correct .AGSETUP (prescription) or .shp (shape) file and press .



4. Next select your prescription in the Select Prescription screen, and select the correct controlling product from the Product drop-down box. A preview prescription map is displayed. Press the .

5. When you return to the Rate Control Settings screen, the prescription rate is now shown on the screen. The Load Prescription button has disappeared and in its place is the Remove Prescription button, which resembles a minus sign. Press the Remove Prescription button if you wish to remove the prescription from the field.

6. When you return to the Map screen, the prescription is now shown on the map.



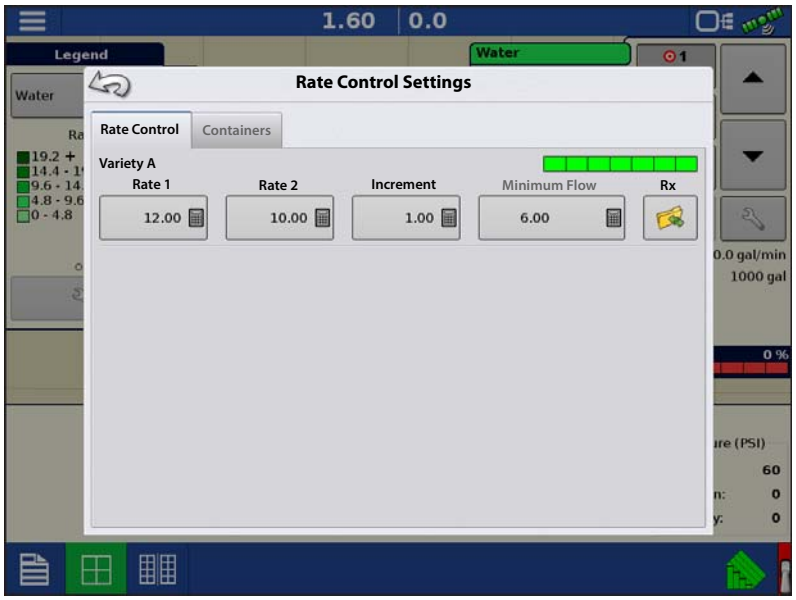
Shape File Conversion

What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple products.

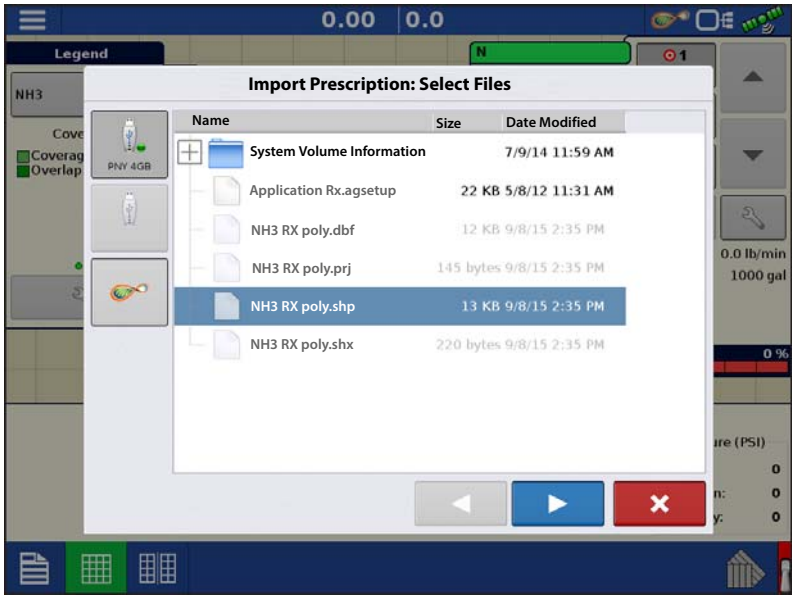
1. To begin, press on the Product Control Toolbox.

The Rate Control Settings screen appears

2. Press the Load Prescription button.



3. The Select File screen appears. Highlight your desired .shp file and press .



4. Select Column From Shape File

   Select the column that contains the product recommendation rate. The list on the right side of the dialog shows sample data from the selected column.

5. Select Units

   Select the controlling units for product application.

6. Default Rate Setting

   The system assigns a default rate. Use the on-screen keypad to edit the value if desired.

NOTE!: Select the product and units that the shape file prescription was made for. Selection of the wrong data column or unit will result in misapplication of product.

ATTENTION!: The only time the default rate is used by the system during product application is if the Rate Outside of Field selection is set to " Rx default". This setting is located in the equipment configuration settings portion of configuration setup. If the Rate Outside of Field selection is set to "Rx default", the default target rate will be used when the vehicle exits the area covered in the prescription map.

Creating Products

Creating application products and product templates can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Creating Single Products

To create a single product, to be added to a product template or to be applied by itself, use the on-screen wizard described in the following steps.

Select:

1. Product Type
2. Product Units
3. EPA Product Number (Optional)

   Check box if product is a Restricted Use Pesticide

4. Manufacturer name if applicable.

   Manufacturer name can be added to the drop-down menu by pressing .

5. Press to enter a unique name for the product.

Created product should appear under the Application heading located on the Product tab of the Configuration Setup screen.

NOTE: Some Fertilizer and Carrier product types are predetermined in the display. These product names cannot be edited. Their Manufacturer and EPA Numbers can be edited after the product is created. Examples are: Fertilizer>DAP or Carrier>30% UAN.

Creating Product Template

Product Templates are set up by using the on-screen wizard.

NOTE!: Prior to making a new product template, it is recommended to add the individual products to the list in the units recommended by the chemical label.

It is recommended to create product templates that contain the products applied for a crop type or time of the season.

Examples are:

- Pre-Emerge Burndown
- Post-Emerge Corn
- Post-Emerge Beans
- Insecticide
- Fungicide

In each template the products can be checked on/off for the mix when loaded at the run screen.

1.

2. Select Tank Mix

   Define By

   - Total amounts—mix/blend defined by amounts added to the tank (total of each product in tank)
   - Rate/acre—mix/blend defined by the amounts applied per acre (rate of each product applied/area)
3. Enter a Base Amount or Base Rate and Units.
   - Total Amounts—Tank/Bin Size
   - Rate/Acre—For Rate Applied per Acre
4. Select Carrier
   - Press [+] to create a new carrier.
5. Press [+] by the Add Mix/Blend Contents box to start the process of adding components to the mix.
6. Select the desired component from the drop-down menu.

NOTE! More than 7 products can be part of a template, but only 7 or fewer can be active at the same time.

   - A new product can be set up at this time by pressing [+] and following the Product Setup Wizard.
   - Press [✓] to add selected product, or press [✗] to return to Add Mix/Blend screen without adding a product.
7. Press [+] to add an additional product.

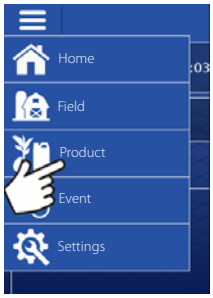
8. When all components have been added press .
9. Enter Manufacturer name is applicable.
    - Manufacturer name can be added to the drop-down menu by pressing .
10. Press to enter a unique name for the mix/blend.
    - Press to complete the process of setting up the mix/blend, or press to return to the Configuration Setup screen without adding a mix.

The product mix/blend appears under the Application heading located on the Product tab of the Configuration Setup screen.

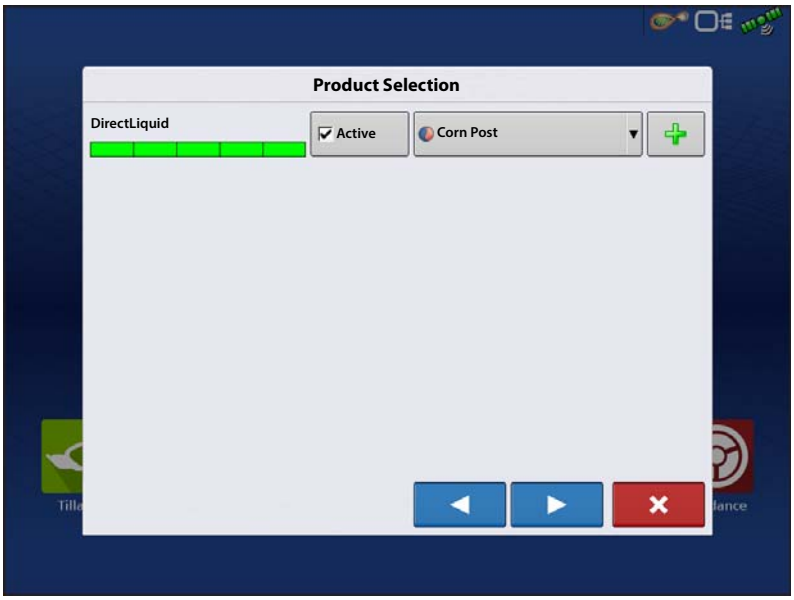
Represents Product Templates

Configure Product Mix

When using a product template, the mix contents and amounts are defined in the Configure Product Mix screen available in the Event Setup Wizard, or Product button in the main menu.



1. Select your mix/blend from the drop-down list or press to create and new mix/blend.



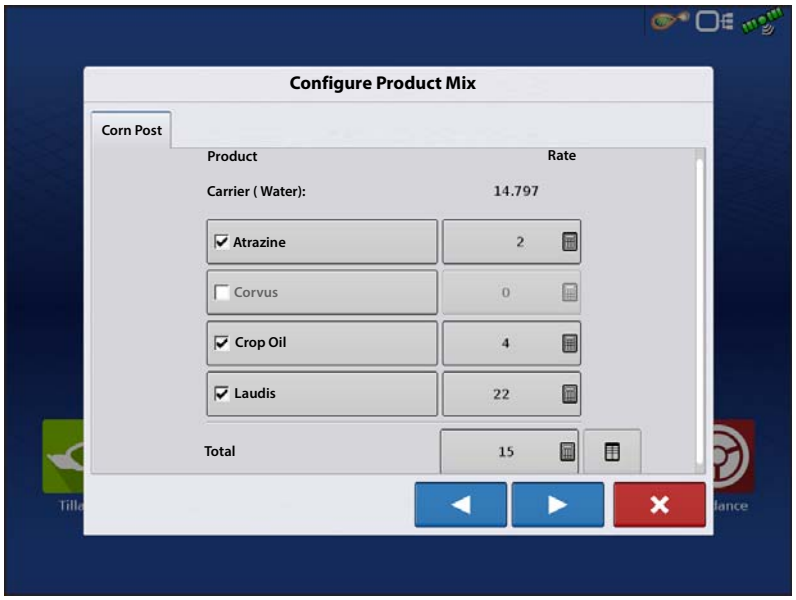
2. The product template mix contents and amounts are defined by:

   A. activating or de-activating products

   B. changing rate or total amount of product

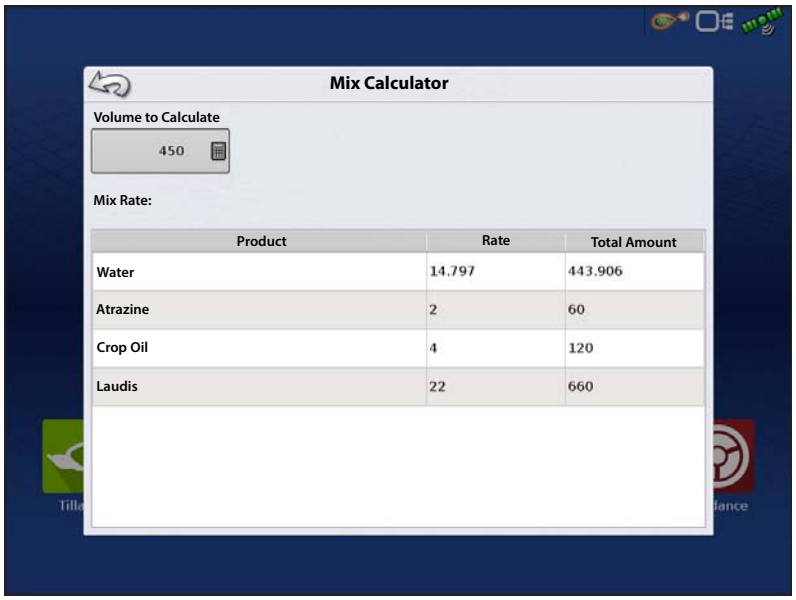
   C. changing total amount of the product or overall rate of product application

   A product can not be active with a rate of zero. Press to access the Mix Calculator.



3. When a product template is setup using rate/area, the Mix Calculator can be used to show how much of each product to put in the tank when the user enters the desired amount to fill.

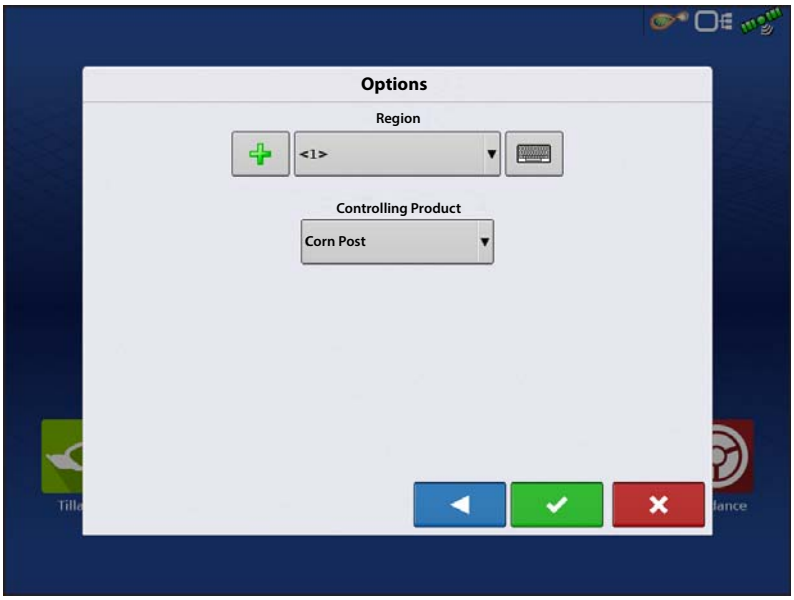
4. Press the Volume to Calculate button and input the total volume. Table will give the user the amount of each product to put in the tank.



5. Select Region from the drop-down menu or press to name Region

Verify the Controlling Product for the Mix/Blend.

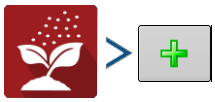
Press to load the Event to the Map Screen, or press to return to Home screen without setting up an Event.



Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:



OR

Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

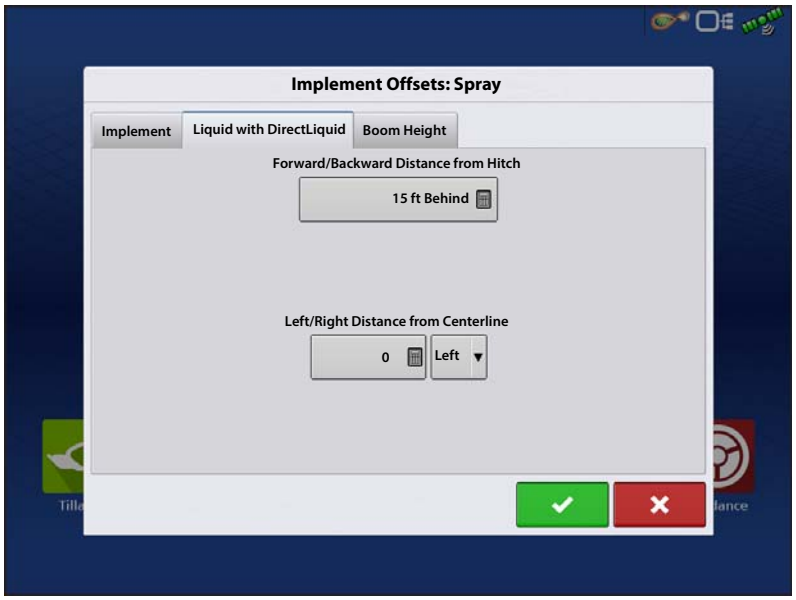
Implement Offsets

Implement Offsets screen appears, with each channel's settings shown on its own tab.

Defaults to the value entered during Configuration Wizard

Boom sections can independently be offset forward or back (application only)

Press 15 ft Behind to access Swath Section Offsets screen.



Select Swath section to edit and press Edit button.

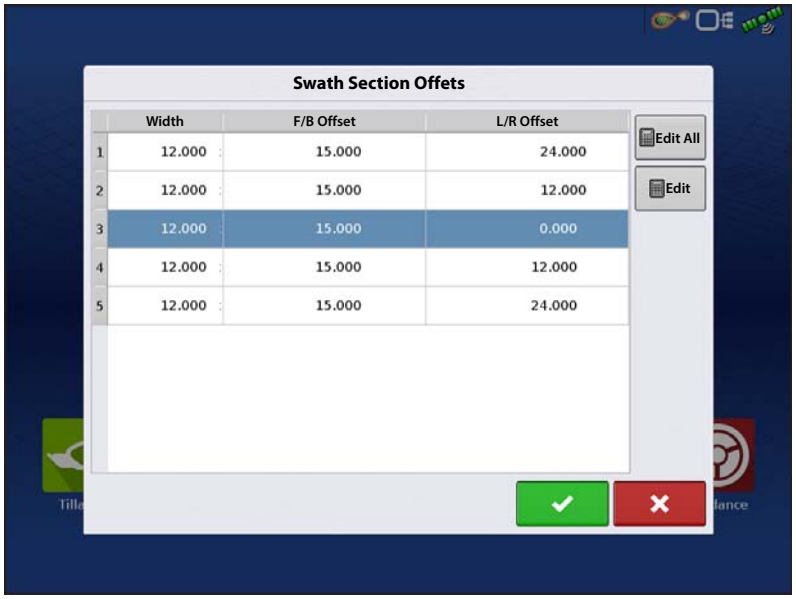
Enter Offset for that specific section and Forward/Backward from rear axle.

Press ✓ to enter change.

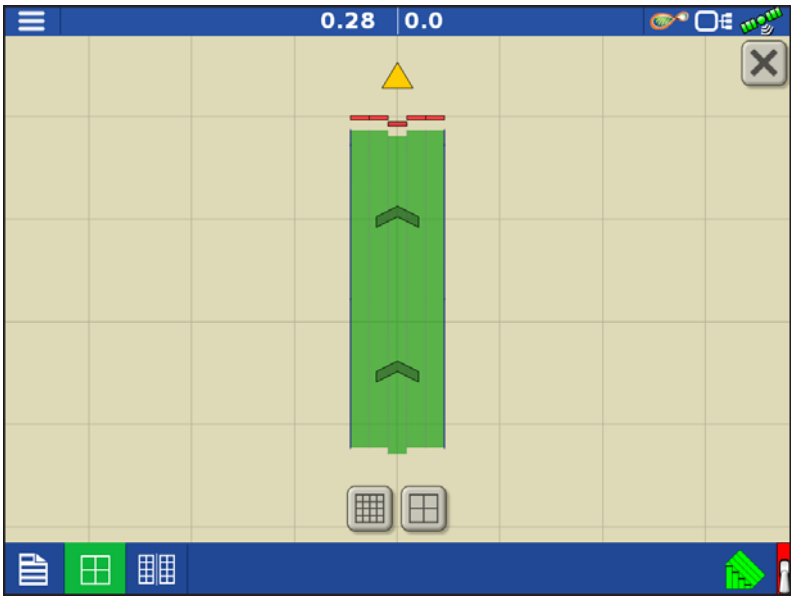
Setup will indicate which offset is entered

15 ft Behind **Global**—All sections have the same offset.

Independent Section Offsets **Individual**—At least one section has a different offset.



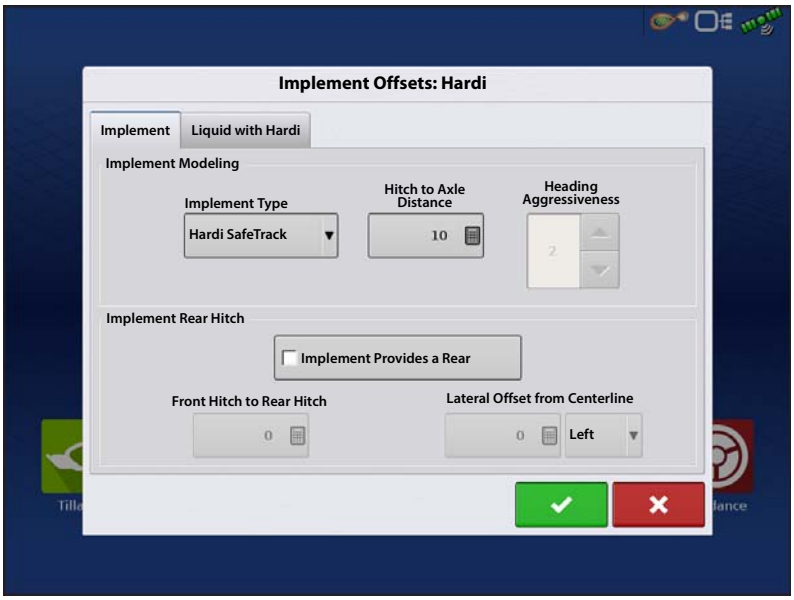
Runscreen reflects section offsets



Hardi Safe Track

When using Hardi ISOBUS, Implement Modeling can be set to Hardi SafeTrack. This allows display to accurately calculate path of sprayer.

Hardi SafeTrack Modeling is utilized by the display when SafeTrack is engaged on the machine.



NOTE! When a Hardi ECU is present and SafeTrack is in use, the Heading Aggressiveness will be grayed out in the Implement Offsets screen. The Heading Aggressiveness will need to be adjusted from the Hardi interface.

If a trailed implement utilizes a steerable axle, the Hardi SafeTrack feature can be used without a Hardi ECU. This will allow manual adjustment of the Heading Aggressiveness from the Implement Offsets screen.

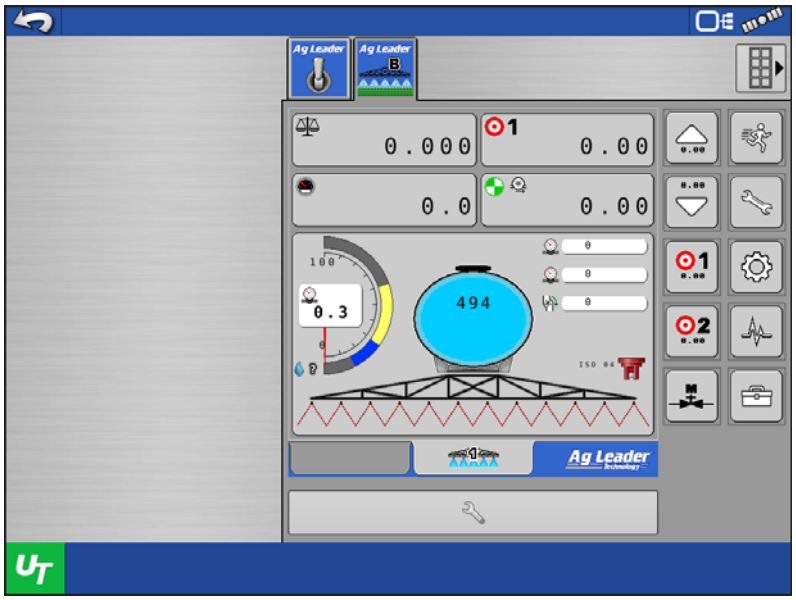
- **Heading Aggressiveness**

  The Heading Aggressiveness setting can used to fine tune mapping of a trailed implement. (Example: Pull type sprayer that has a steerable axle feature) The setting ranges from 0 - 10. The default value is 2.

  An aggressiveness setting near 0 or 1 will model similar of an implement that has a rigid axle. With the only pivot point being the implements attachment at the vehicles hitch.

  As the aggressiveness setting is increased, the modeling will start to resemble an implement that "follows" the path of the vehicle. The modeling will become more exaggerated the closer the setting is to 9 or 10.

UT Runscreen

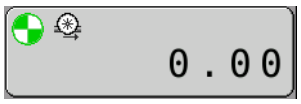


The runscreen has 4 readouts that will be presented regardless of the system type. .

Product Density

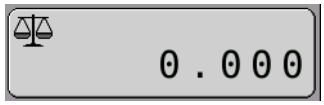
Rate Control Settings

Speed Source Settings

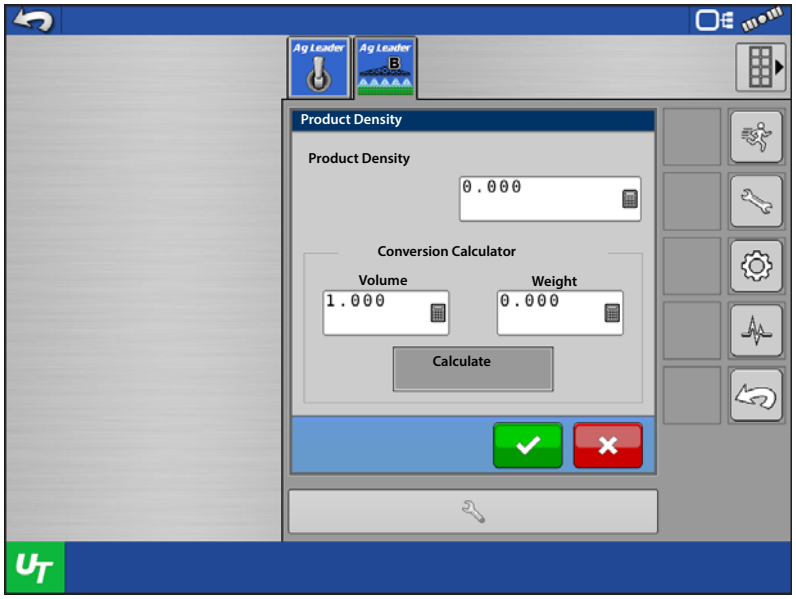


Actual Rate Settings

Product Density

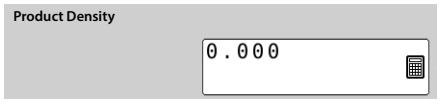


This displays the current product density. If connected to an Ag Leader display with an event loaded, this will need to be set on the map screen under settings.



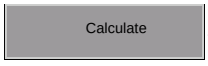
To enter a product density:

1. Press



.

2. Enter value.
3. Press to save or to cancel.

NOTE! The density can be calculated if the volume and weight of the product is known. Enter both values into the Conversion Calculator and press 

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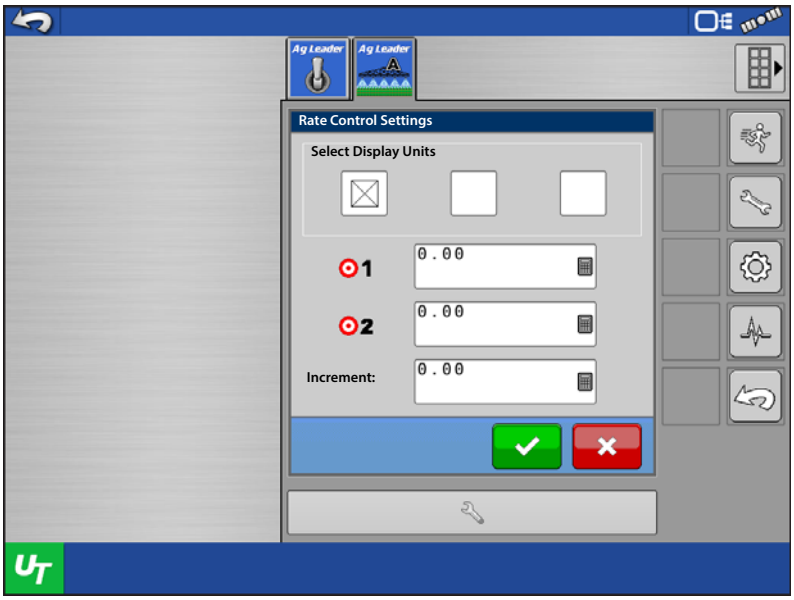
NOTE! Product density is disabled when an NH3 system is active.

Rate Control Settings



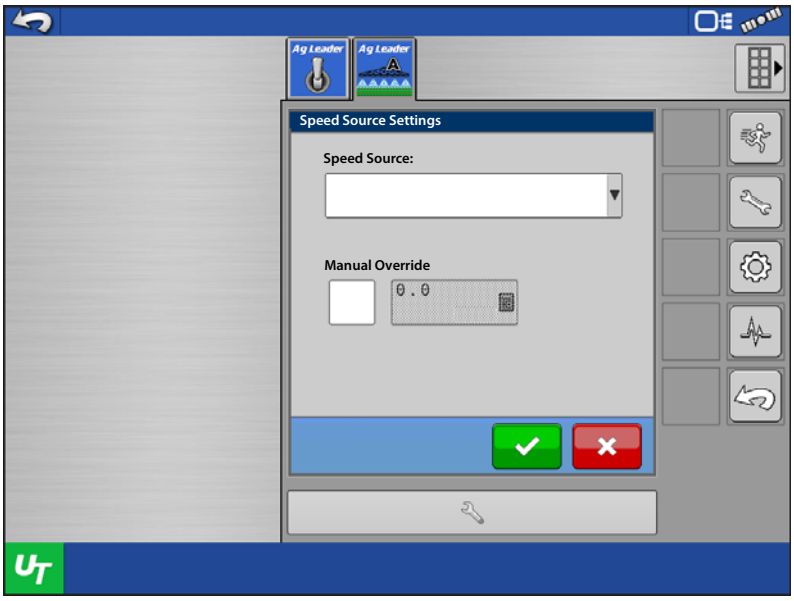
Rate Control Settings is where Target Rate 1 and 2 are set, as well as the increment value.

Enter each value and press ✓ to save or ✗ to cancel.

NOTE! An Anhydrous Ammonia system will also allow the user to define the controlling units as either lbs of N/ac, lbs of NH3/ac, or gallons/ac.

Speed Source Settings

This is where the user defines the speed source. The user can choose from the options below.



ISO GBSD—Ground Based Speed and Direction from a GPS source (ISO11783). Message is received on the ISO CAN bus.

ISO WBSD—Wheel Based Speed and Direction from a tractor ECU typically, could be radar (ISO11783). Message is received on the ISO CAN bus.

Module Wheel Speed—Module wheel speed input source. Wheel speed sensor on the implement.

CAN GPS—NMEA 2000 CAN GPS source. Could be direct from a GPS receiver or other ECU. Message is received on the ISO CAN bus.

Select the desired speed source from the combo box.

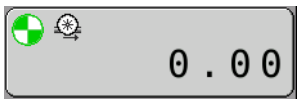
To set a manual ground speed:

A. Check Manual Override checkbox

B. Enter desired speed in input box

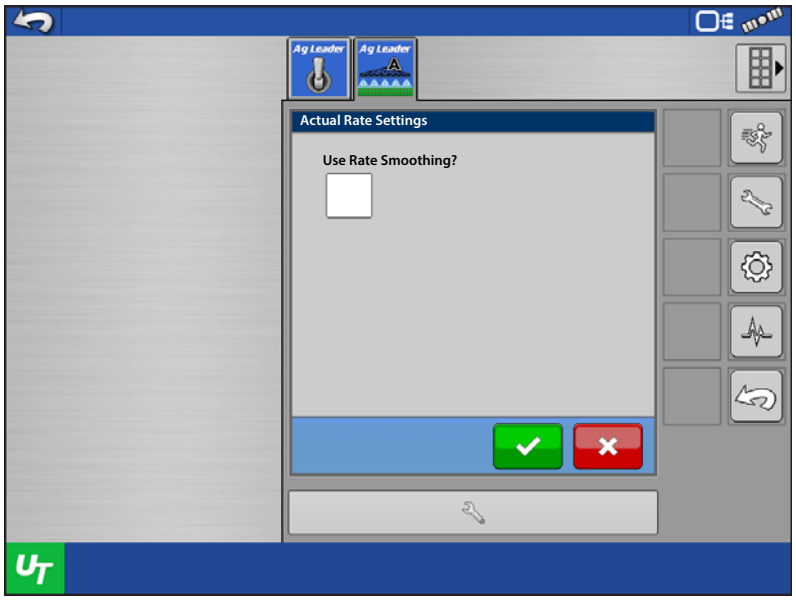
Press ✓ to save or ✗ to cancel.

Actual Rate Settings



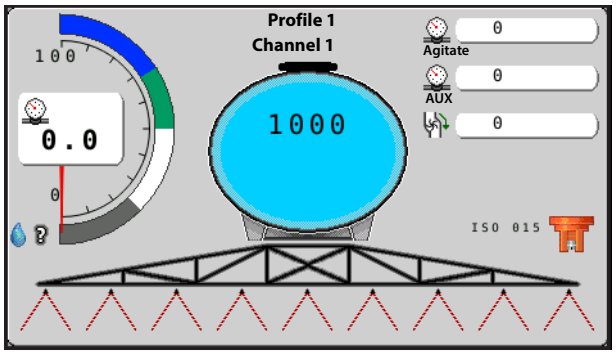
The Actual Rate Settings is where the user turns Rate Smoothing on and off.

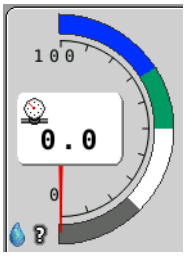
- Check this setting to smooth the displayed actual rate by 10%.
- Uncheck this setting to display the actual rate the flow sensor is reporting.



System Settings screen

This screen displays information about the implement.



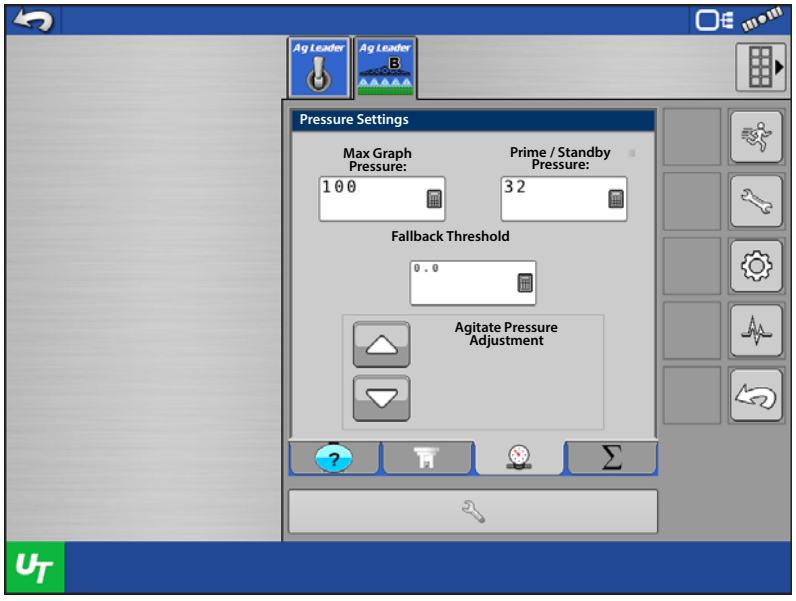


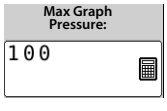
Universal Pressure Sensor

It displays the Universal Pressure sensor and Droplet Size indicator. This will display the current pressure read out from pressure sensor one. If a pressure sensor is not present the module will calculate the system pressure. A nozzle must be defined and selected for this.

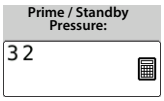
It will also display the droplet size ranges for the selected nozzle. A nozzle must be defined and selected for this to be present.

Pressing the Universal Pressure gauge will take the user to the Pressure Settings



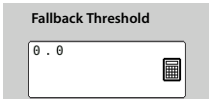


•**Max graph Pressure**—The user can define the range the Universal pressure gauge displays. The max is 250 psi (17 bar).



•Prime/Standby Pressure—The user can set the desired psi or bar for the system to hold when priming the system or when all sections are off.

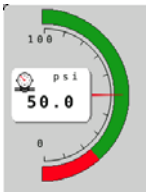
NOTE! Module will attempt to hold this pressure. If it cannot, it will default to the PWM Standby Duty Cycle.



•Fallback Threshold—The user can set the range of flow that the system will switch between flow based control or pressure based control. For example, setting the threshold to 10 gal/min will result in the system using the flow meter when flow is >10 gal/min and using the pressure sensor when flow is <10 gal/min.

NOTE! Fallback Threshold is only available if the pressure fallback setting was check marked when creating the profile.

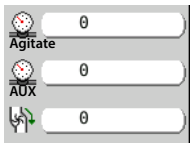
Vapor State Monitoring



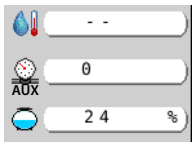
• When an Anhydrous Ammonia system is setup, NH3 state monitoring is capable. In order to use the on screen gauge for NH3 state monitoring, a temperature sensor and main line pressure sensor must both be installed and calibrated. Once both sensors are installed and calibrated, the UT pressure gauge will now display only RED and GREEN portions.

- When the UT pressure gauge needle is in the GREEN area, this indicates that the NH3 is being applied in a liquid state.
- When the UT pressure gauge needle is in the RED area, this indicates that the NH3 is being applied in a vapor state.

Pressure, Temperature, and RPM readings



System Settings screen also displays Agitate and Aux pressure, as well as Pump RPM. These will only display a readout if the sensor is present on the system, and is calibrated.

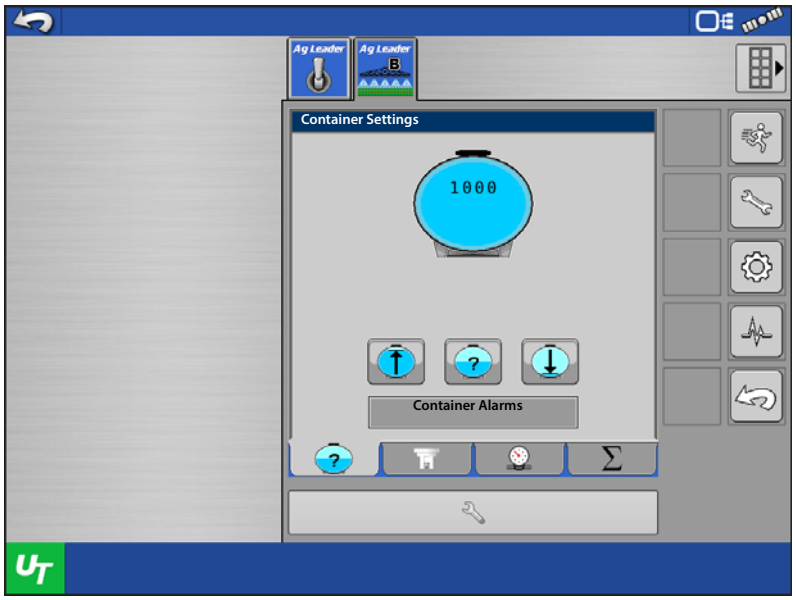


An Anhydrous Ammonia system will display Temperature, Aux Pressure, and the remaining tank percentage. Temperature and Aux Pressure require a sensor in order to provide a read out.

Tank Capacity

The tank capacity indicator will display the remaining tank volume.

Pressing the tank capacity indicator will take the user to Container Settings screen.



Fill, Set, or Empty Tank

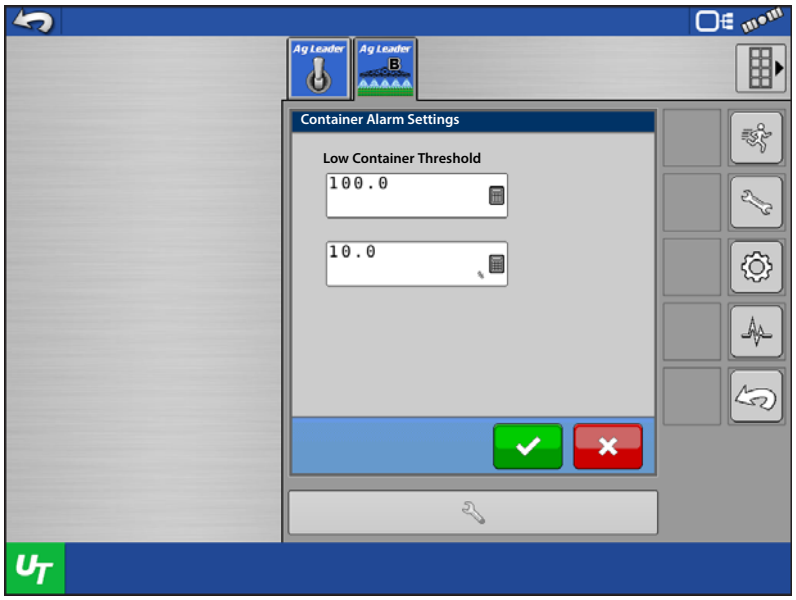
Pressing fill will fill the tank to its full capacity.

Pressing set will allow the user to enter a specific volume that is not completely full or empty.

Pressing empty will remove all volume from the tank.

Container Alarms

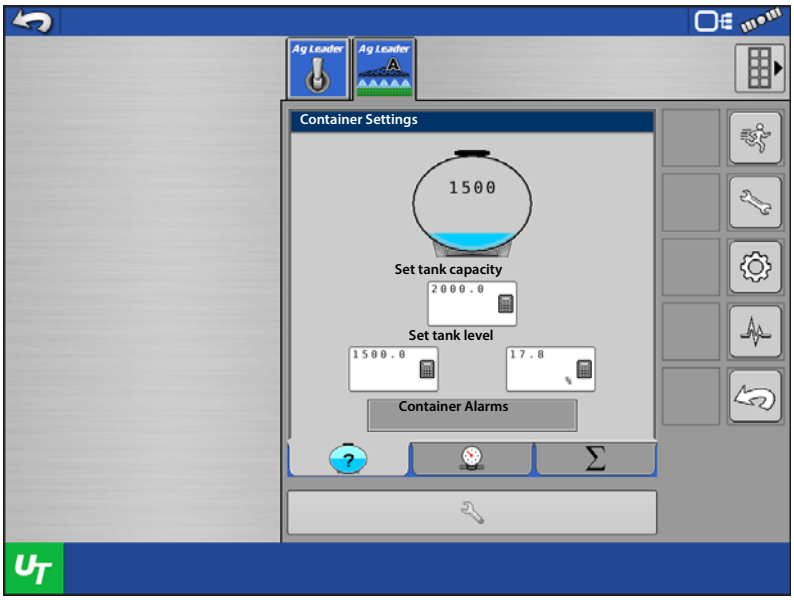
Pressing Container Alarms will allow the user to set the alarm threshold by either an amount of volume or by a percentage of the tank capacity.



NH3 Tank Capacity

When an Anhydrous Ammonia system is active the user gets a few more options with the tank capacity. NH3 tanks size vary depending on where the user gets them from or what's available. Because of this the user can redefine the tank capacity at any time.

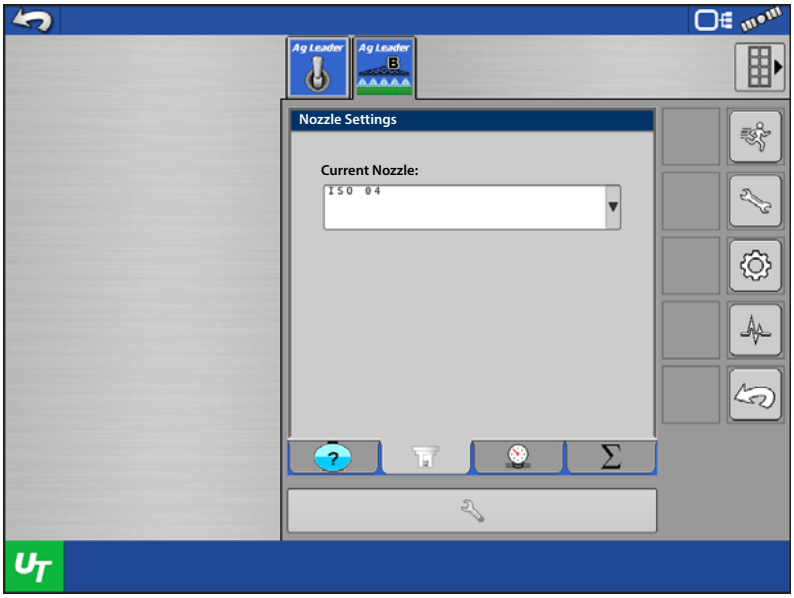
The user can also set the remaining capacity based on the controlling units or by a percentage. The user could tell the system there are 1500 lbs of N left in the tank or 17.8% left in the tank.



Nozzles

The user can change nozzle by pressing the nozzle indicator.

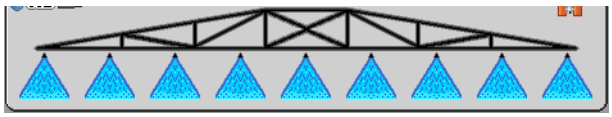
Select the current nozzle, that is present on the machine, from the available options.



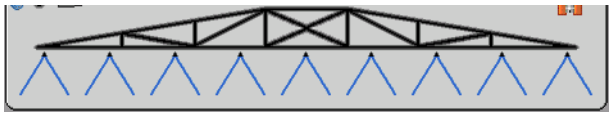
Section Indicators

The section indicators show the application state of each section on the sprayer.

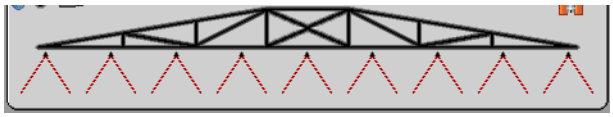
- Applying



- Not applying due to AutoSwath



- Not applying due to switches off



Toolbar section indicators are shown below:

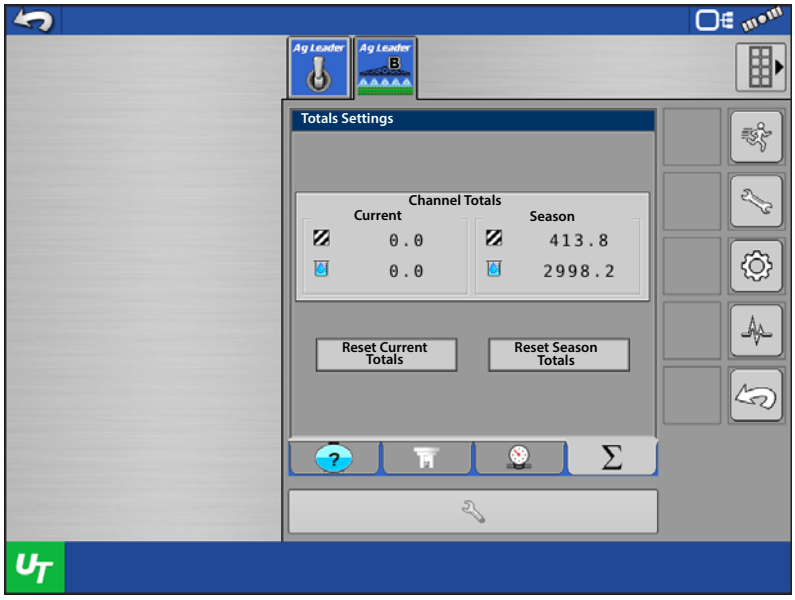
- Applying

- Not applying due to AutoSwath

- Not applying due to switches off

Pressing the section indicators will take the user to the Totals settings

Totals Settings shows the user the total area covered and product applied for the entire season or current event. Each can be reset at any time.

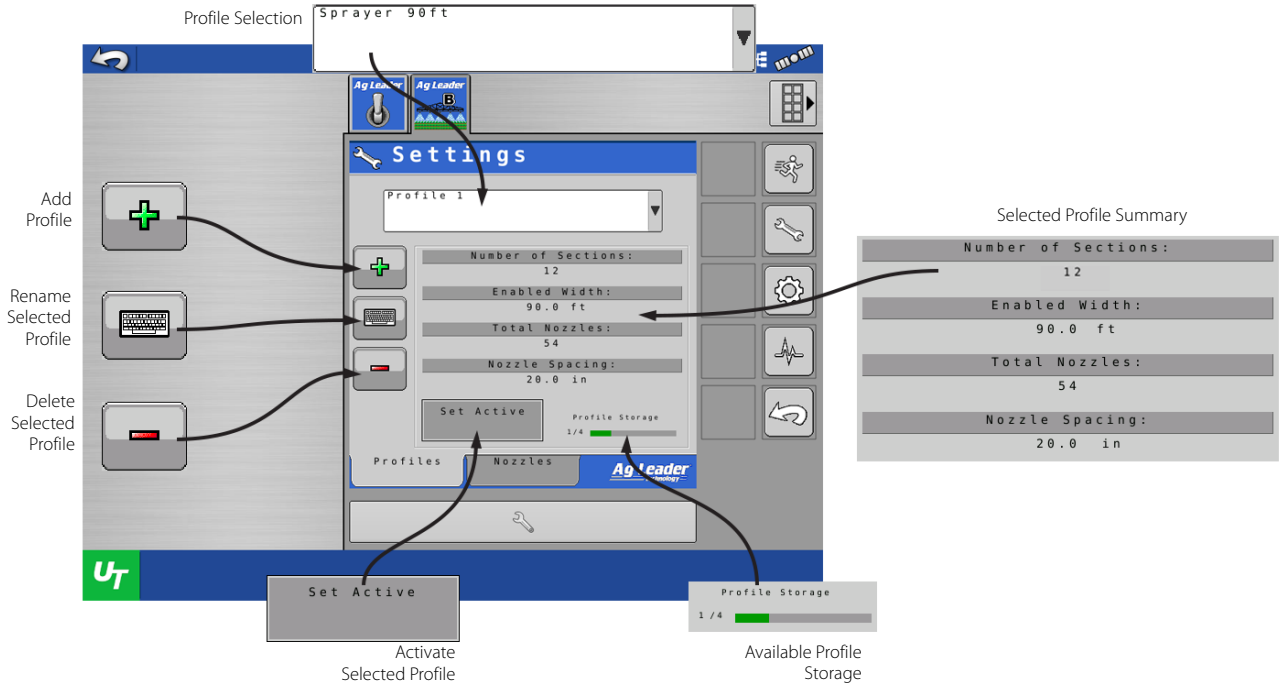


NOTE! If connected to an Ag Leader display, the current totals will reset with each new event created.

Manage Components

Manage Components is used to create machine profiles and nozzles.

Profiles

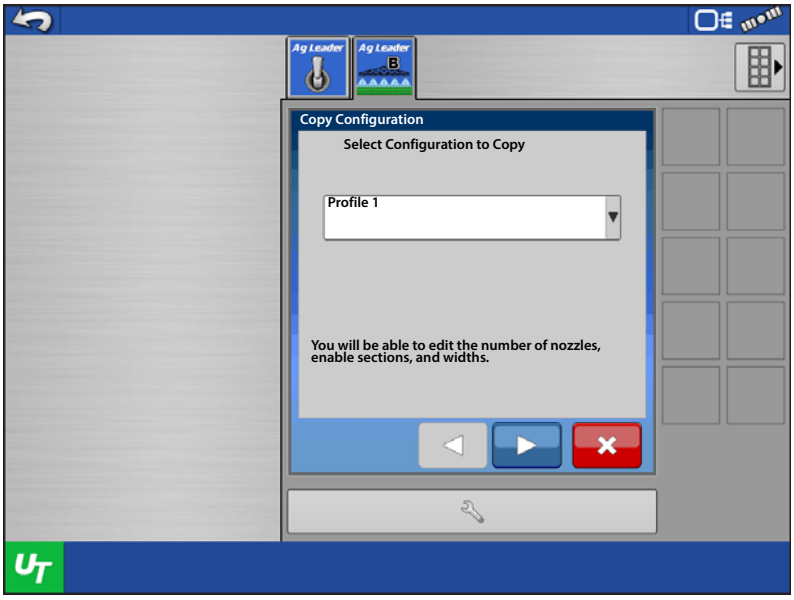


Creating machine profiles is useful when there is more than one possible configuration of the same machine. For example, if a user sprays with the entire 120ft boom of their sprayer on one field. On the next field they fold in their extensions to only spray using 90ft of the swath width. Creating a profile for each scenario will prevent accidental activation of sections that are folded causing over application. Each system can have up to 4 profiles saved.

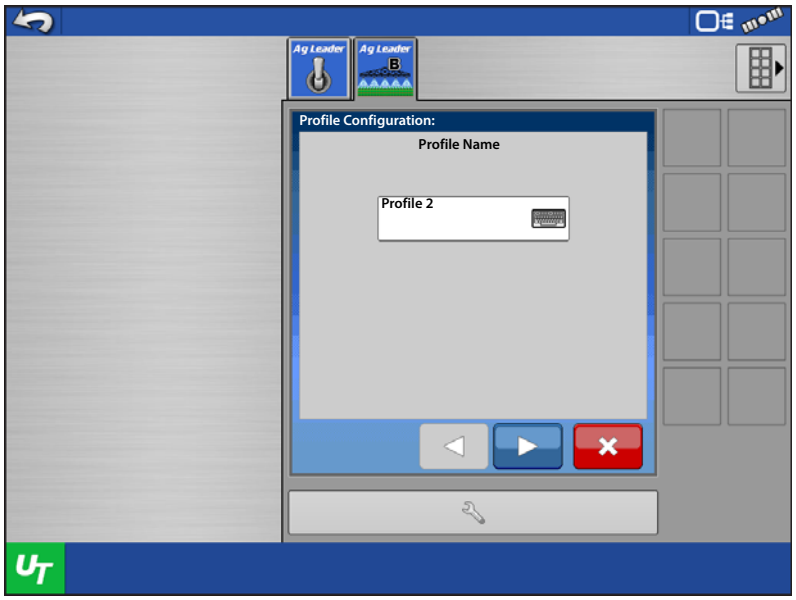
Add Profile

1.Select a configuration to copy for the base of your profile. Press

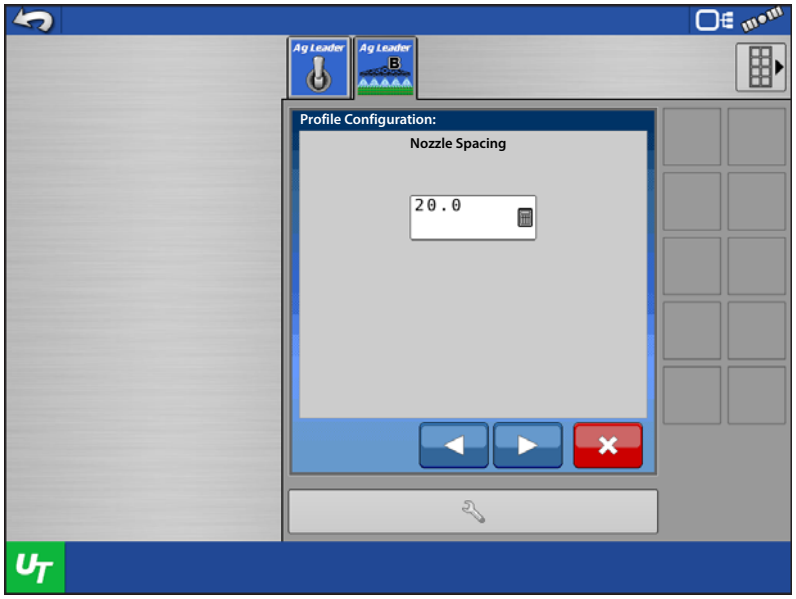
to continue.



2. Name the Profile. Press to continue.



3. Enter the Nozzle Spacing. Press to continue.



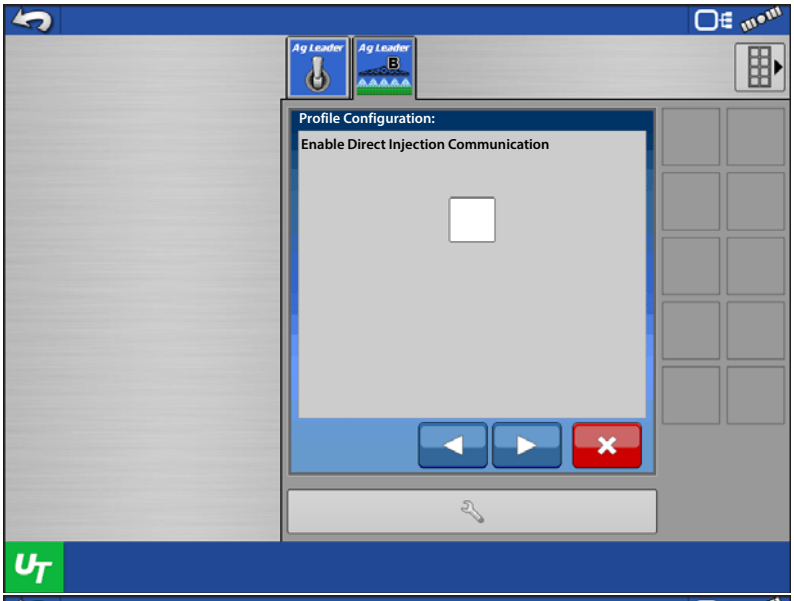
4. Enter the number of nozzles for each section.

Use and to select sections.

Use to disable sections that won't be used in this profile.

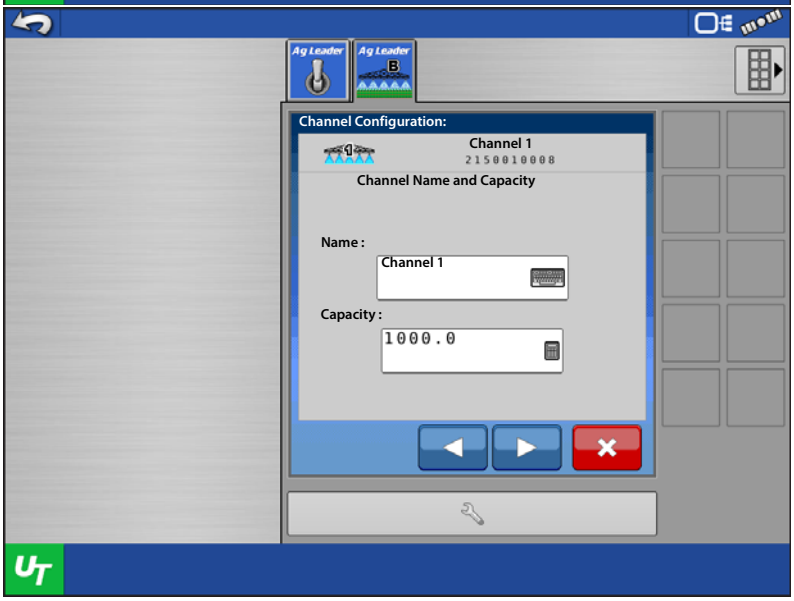
5. Verify that the swath and number of nozzles are correct.
6. Press to continue.

7. Place a checkmark in the box to enable Direct Injection Communication if a Raven ISO Injection Pump will be used. If one will not be used do not place a check mark in the box. Press to continue.

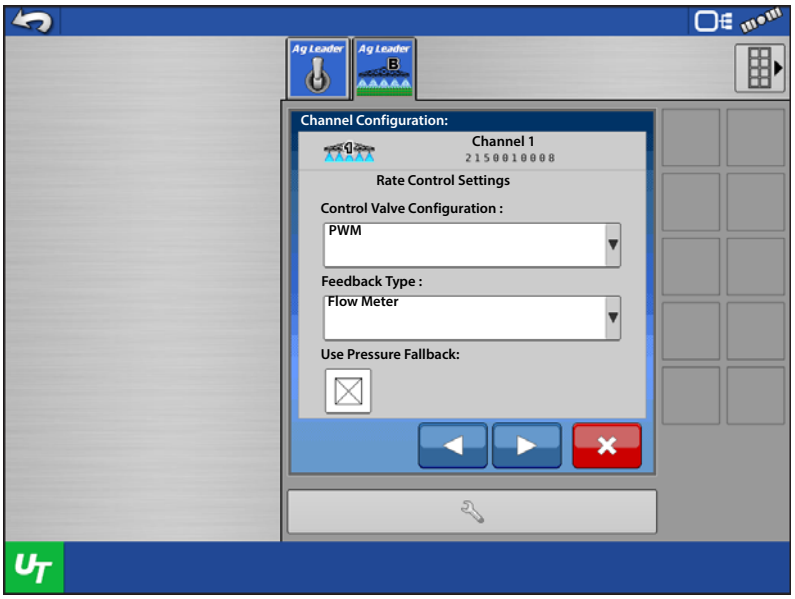


NOTE! This is only used for Raven ISO Injection Pump.

8. Name the channel and enter the tank capacity. Press to continue.



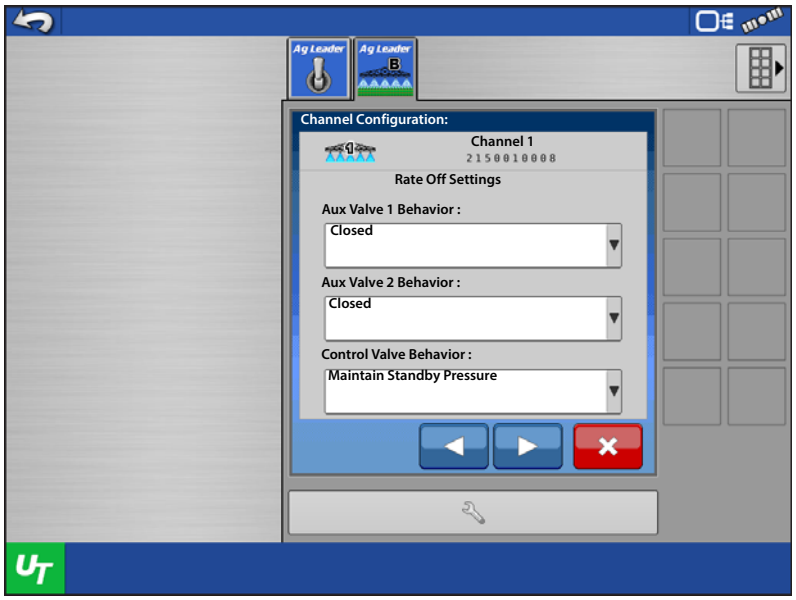
9. Select the Control Valve Configuration based on what is present on the vehicle.
10. Select the Feedback Type. This will determine if the system controls the rate using flow based control or pressure based control.
    - Select Flow Meter for flow based control. A flow meter must be present on the machine.
    - Select Pressure Sensor for pressure based control. A main pressure sensor must be present on the machine.



11. Place a check mark in the box to use Pressure Fallback, otherwise leave the box unchecked. Pressure Fallback is a setting that allows the system to automatically switch between flow based and pressure based control. It is very useful in low flow situations where a flow meter may not be accurate enough to read low flow rates. In that situation the system will activate Pressure Fallback (based on a user defined threshold) and switch from flow based control to pressure based control. Both a flow meter and a pressure sensor must be present on the machine to use Pressure Fallback.

Press ▶ to continue.

12. Select the behavior for Aux Valve 1, 2, and the Control Valve.
    - Selecting Closed or Open for Aux Valve 1 and 2, determines what state each valve enters when all sections are turned off
13. Selecting Hold or Closed for the Control Valve behavior determines what state the control valve enters when all sections turn off.
    - **Hold**—The control valve will hold the last known rate when all sections turn off.



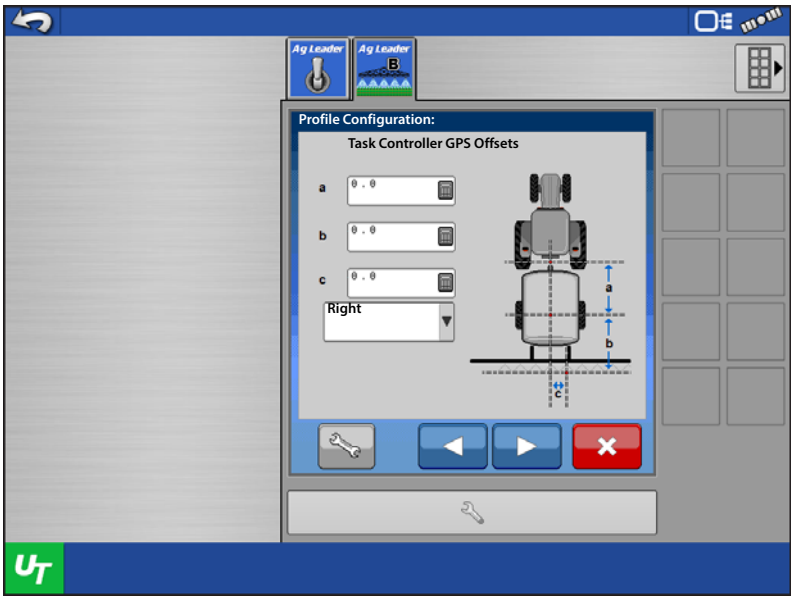
NOTE! When using a PWM control valve the option will change to Maintain Standby Pressure. With this setting the control valve will maintain the user defined standby pressure when all sections are off.

- **Close**—The control valve will close when all sections turn off. This is useful on implements that don't utilize boom sections or only have a single section, such as NH3 Toolbars or Liquid Manure Tankers.

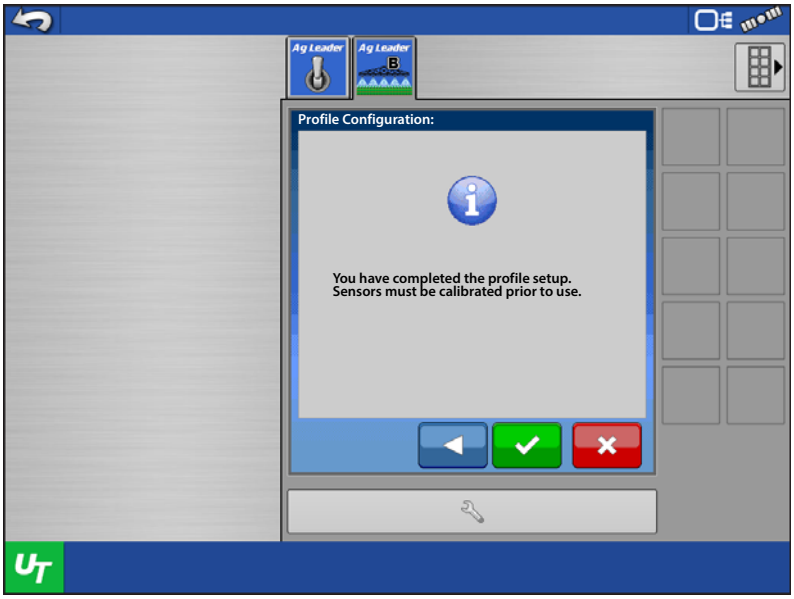
14. Once all behaviors have been selected, press ▶ to continue.

15. Enter the depicted GPS Offsets in inches.

    Press .



16. Profile Setup is now complete. Press .



NOTE! The module will have to reboot to save the configuration. Press .

Delete Profile

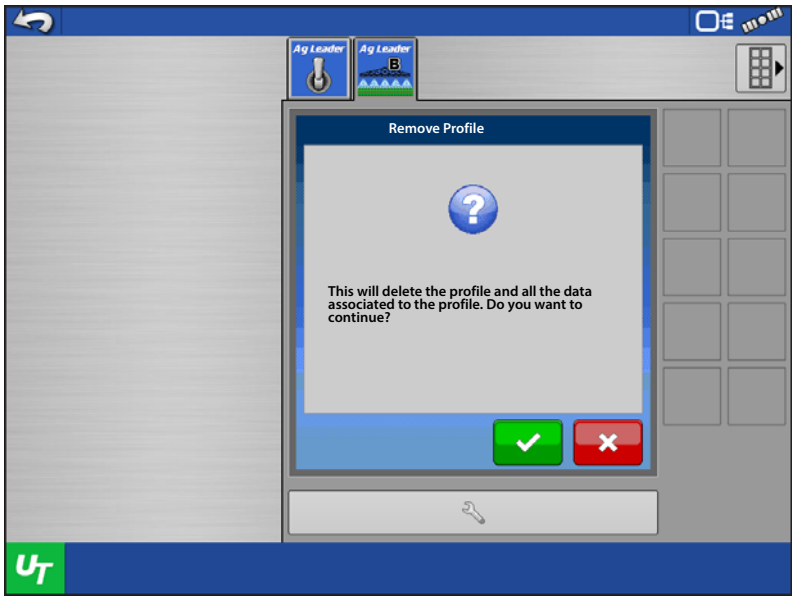
Use the Profile Selection box to select the profile you wish to delete.

Once the profile is displayed in the box, press .

NOTE! The active profile cannot be deleted. In the instance that all profiles are desired to be deleted, use the Reset Function. See System Settings.

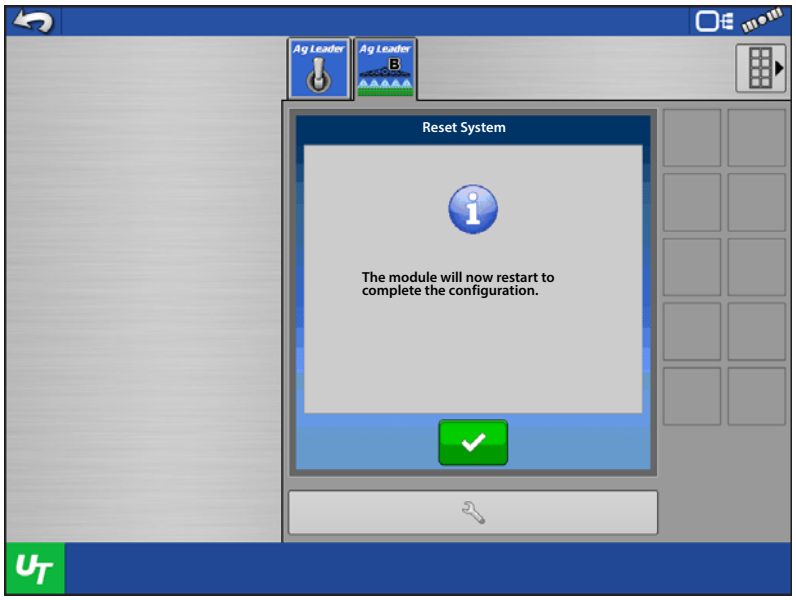
To confirm deleting the profile, press ✓.

To cancel deleting the profile, press ✗.

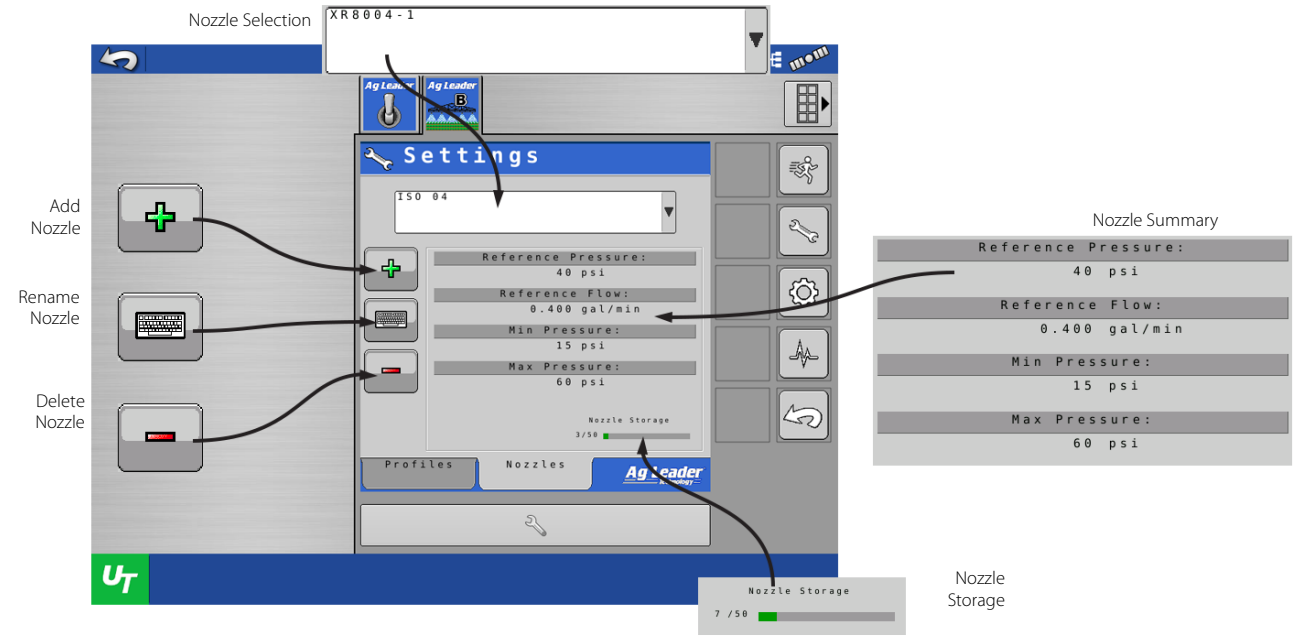


Set Active Profile

1. Select the profile to be set active from the Profile Selection and then press **Set Active**.
2. The module will have to reboot to activate the profile. Press ✓.
3. When the module reboots, the profile should be active.



Nozzles



Creating nozzles is required for pressure based control, pressure fall-back, and droplet size monitoring. A nozzle's specifications are needed to achieve each feature.

NOTE! Nozzles within Manage Components is only useful for creating and defining nozzles. A user will not set active nozzles here as they would with profiles. Active nozzles are selected on the runscreen.

Add Nozzle

Select a Nozzle Creation Method.

- **Select All Parameters manually**—This allows the user to create a new nozzle and enter in all of the nozzle specifications from a tip chart.
- **Select an ISO Nozzle**—There are 11 preloaded ISO nozzles entered with all required specifications already entered.

Press ▶.

NOTE! Pressure thresholds and Droplet size thresholds will still need to be defined.

- **Select a Previously Created Nozzle**—This allows the user to copy a previously created nozzle and modify it. This helps when creating nozzles with similar specifications.

Enter the nozzle Name, Reference Pressure, Reference Flow, Min Pressure, and Max pressure. Press ▶.

- **Reference Pressure**—One of the pressures listed for the nozzle on the tip chart. Recommend closest pressure to desired target rate and speed.
- **Reference Flow**—Corresponding flow to the selected reference pressure.
- **Min Pressure**—The minimum pressure the system will achieve when this nozzle is selected.
- **Max Pressure**—The maximum pressure the system will achieve when this nozzle is selected.

NOTE! **Reference Pressure**, **Reference Flow**, and **Min Pressure** are required for Minimum Flow and are required even if a pressure sensor is NOT installed.

Enter the base pressure for each droplet size supported by this nozzle. Press .

NOTE! Use a tip chart to find these values. If a droplet size is not achievable with a nozzle leave the psi value blank. Only droplets with psi values entered will be displayed on the digital pressure gauge.

Select the nozzle color. Press to save and finish.

Delete Nozzle

Use the Nozzle Selection box to select the nozzle you wish to delete.

Press .

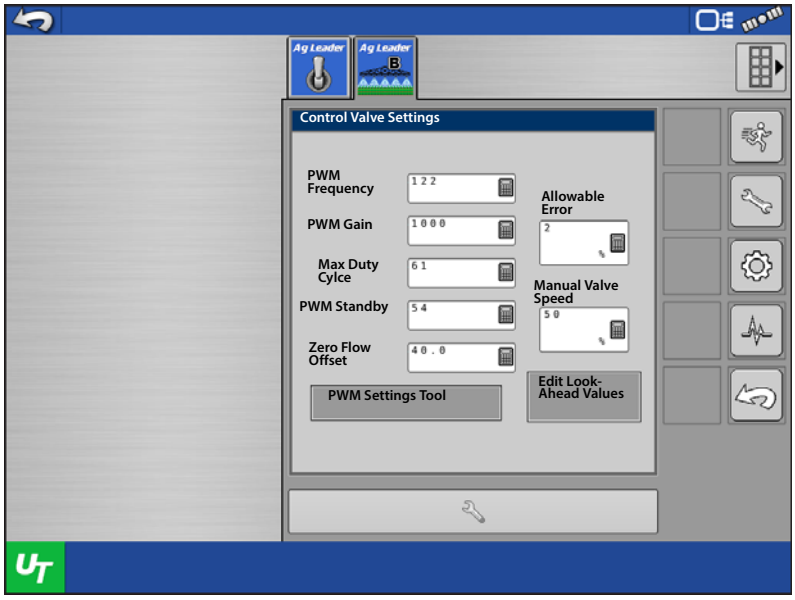
To confirm deleting the nozzle, press . To cancel deleting the nozzle, press .

Controller Settings

Control Valve Settings

This Control Valve Settings screen will be provided for profiles setup with the control valve types listed below.

- PWM 12 Volt
- PWM Ground



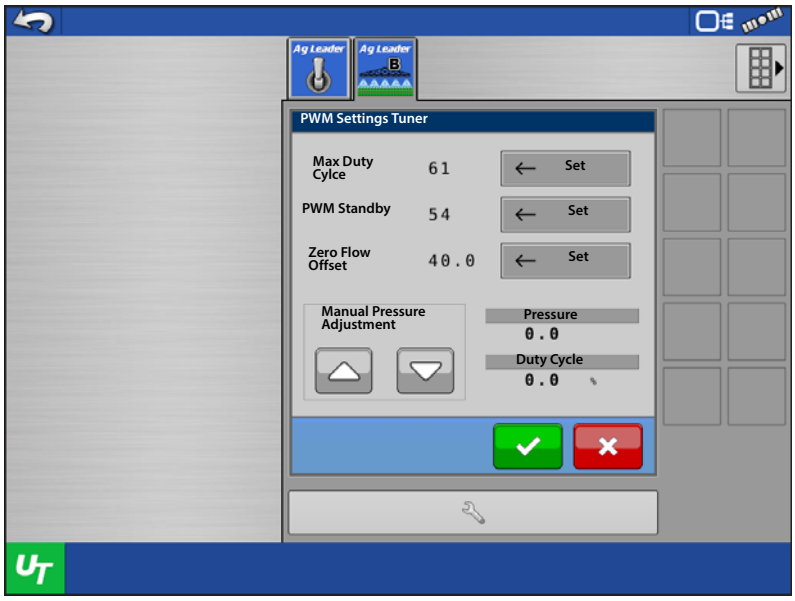
NOTE! If these settings show up and you do not have one of the listed control valves, verify the correct profile is selected. If the correct profile is active, the profile needs reconfigured.

- **PWM Frequency**—The frequency that the PWM control valve is pulsed at. Settings can be found from the manufacturer of the valve. Typical settings range from 100-125 Hz.
- **PWM Gain**—Determines how aggressively the control valve responds when making rate change adjustments. The higher the value the more aggressive the system response is.
- **Max Duty Cycle**—The maximum percent duty cycle the valve is allowed to achieve. The valve will not be allowed to achieve a higher duty cycle than the valve entered.
- **PWM Standby**—This is a user-defined setting that determines the percent duty cycle the system uses when the booms are all off. The setting must be greater than the Zero Flow Offset.
- **Zero Flow Offset**—The maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero Flow Offset value can cause the product control system to not properly control low rates. See the PWM valve manufacturer information for recommended settings.
- **Allowable Error**—The percent of error that is allowed prior to the product control system making any flow rate changes.

- **Manual Valve Speed**—Amount of change the manual increment / decrement will adjust the valve. This defines the amount of duty cycle change for PWM each time the manual increment or decrement is pressed.

PWM Settings Tool

The PWM Settings Tool allows a user to easily set the zero flow offset, PWM standby, and max duty cycle of the valve on implement. It allows the user to manually increase and decrease flow. The tool will display the current duty cycle of the valve and the current pressure on the system.



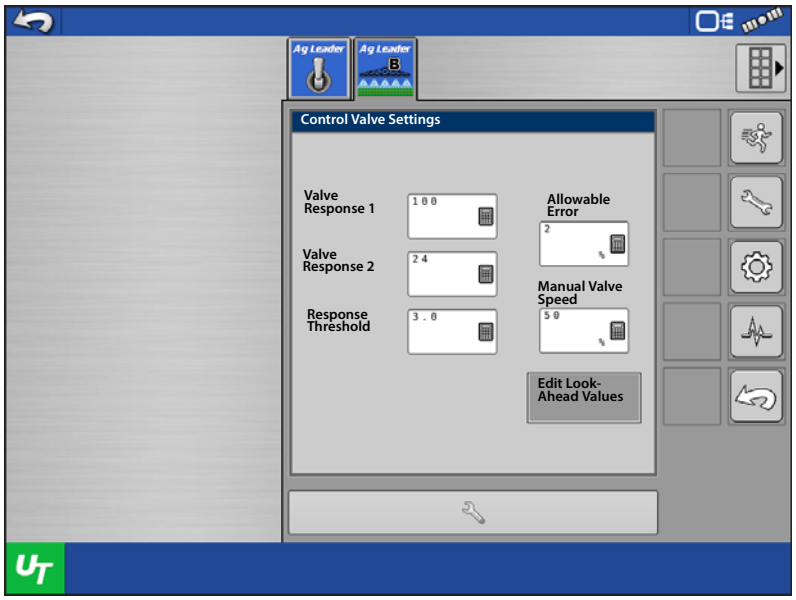
NOTE! A digital pressure sensor or analog pressure gauge is required to use this tool.

Enter the PWM Settings Tool.

1. Each press of will increase the duty cycle of the valve, and each press of will decrease the duty cycle of the valve.
2. Press until the system registers pressure. The minimum amount of pressure from zero pressure is desired.
3. Press and Zero Flow Offset Value should change to the current duty cycle shown for the valve.
4. Press until the system achieves the pressure that is desired for the system to hold when all sections are off.
5. Press and PWM Standby Value should change to the current duty cycle shown for the valve.
6. Press until the system achieves the maximum pressure desired.
7. Press and Max Duty Cycle Value should change to the current duty cycle shown for the valve.
8. Press to save these settings or press to discard these settings.

This Control Valve Settings screen will be provided for profiles setup with the control valve types listed below.

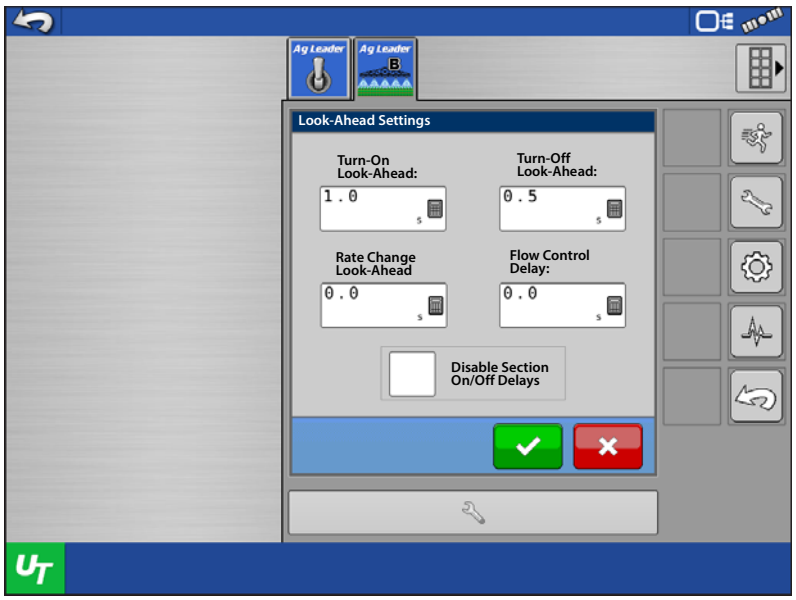
- Inline Servo
- Bypass Servo
- Pump Servo
- Ramsey
- Aim Command



NOTE! If these settings show up and you do not have one of the listed control valves, verify the correct profile is selected. If the correct profile is active, the profile needs reconfigured.

- **Valve Response 1**—The speed of the servo valve when product control error exceeds the Response Threshold setting. Valve Response 1 represents the fast speed of the servo valve.
- **Valve Response 2**—The speed of the servo valve when product control error is less than the Response Threshold setting. Valve Response 2 represents the slow speed of the servo valve.
- **Response Threshold**—Determines where the control channel switches between using Valve Response 1 and Valve Response 2 speed setting.
- **Allowable Error**—The percent of error that is allowed prior to the product control system making any flow rate changes.
- **Manual Valve Speed**—amount of change the manual increment / decrement will adjust the valve. Essentially this changes the amount of time the valve is driven for a servo valve.

Edit Look-Ahead Settings



- **Turn – On Look-Ahead**—Determines how far ahead the system looks to turn the swath sections back on. This setting compensates for any delay in the product control system when the sections are turned on.
- **Turn – Off Look-Ahead**—Determines how far ahead the system looks to turn the swath sections off. This setting compensates for delay in the product control system when the boom sections are turned off.
- **Rate Change Look-Ahead**—Determines the amount of time the system looks ahead to the next target rate zone of a prescription.
- **Flow Control Delay**—Period of time from master switch on and the start of product application to the first flow control correction. This setting can be used to eliminate unwanted correction of flow control at the start of each pass. Typical setting values are zero for granular and 1 –2 seconds for liquid application control.

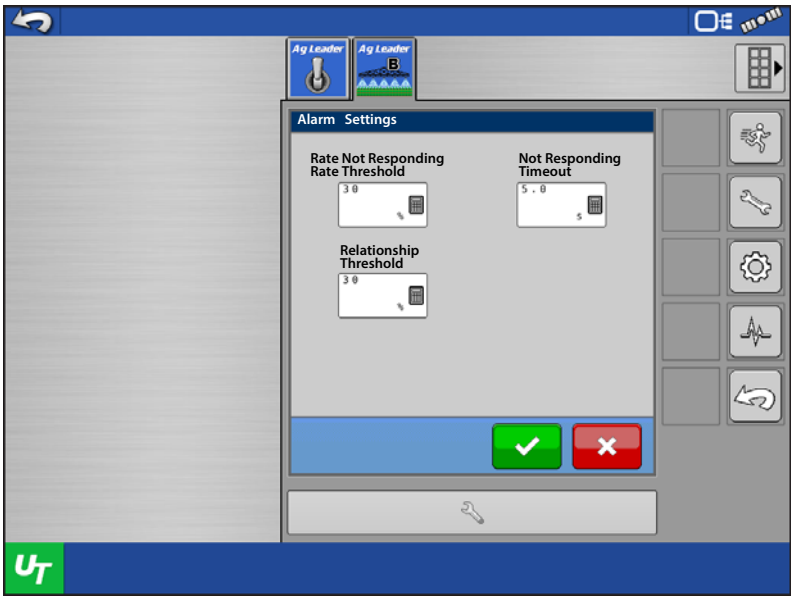
- **Disable Section On/Off Delays**—Disables the Turn-On and Turn-Off Look Aheads. Disable these when using a non-Ag Leader display that has its own look ahead settings.

Alarm Settings

The Rate Not Responding alarm is a user defined alarm that alerts the operator when the actual rate is off of the target rate by a define amount, for a certain amount of time.

Rate Not Responding Threshold—The percentage of rate error that triggers the alarms.

Rate Not Responding Timeout—The amount of time that the error occurs before the alarm triggers.



System Settings

Switch Systems

Switching systems can be useful with multi-purpose machines. It gives you the ability to switch between one of the below system types.

- Sprayer
- Anhydrous Ammonia
- Liquid Fertilizer
- Liquid Manure

ATTENTION!: Upon the first initial start up of the module, the user will be prompted with the message "System has not been configured. Press accept to begin setup." The user can then pick from one of the available system types listed above.

ATTENTION!: With all four system types, if only 1 section is the desired number of application sections, a swath module is not required. In order for a system to be utilized in this manner, the ISOBUS Liquid Product Module will need to be updated to version 1.9, or greater.

The system has the ability to set up two systems,

System A and

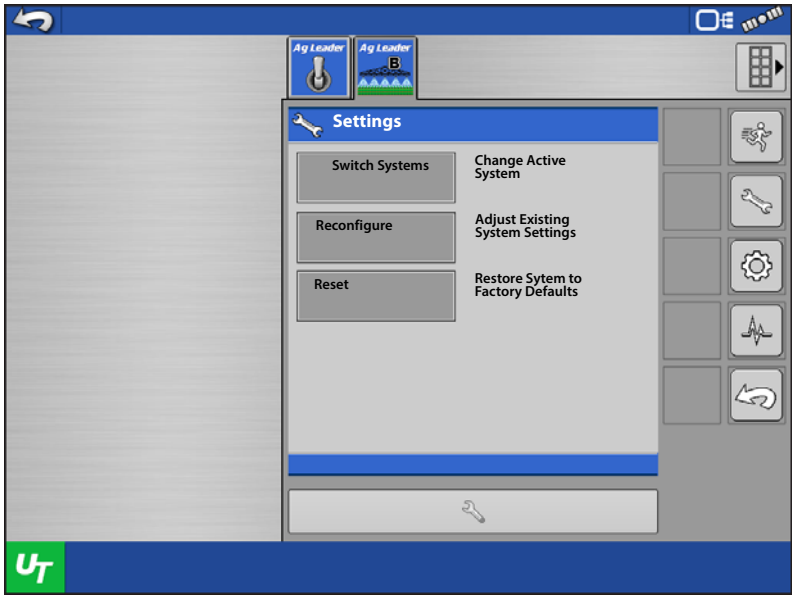
System B. The active system can be identified by the A or B shown on the object pool tab on the UT screen.

Once a system type is selected, each profile created under that system will be created as that system type.

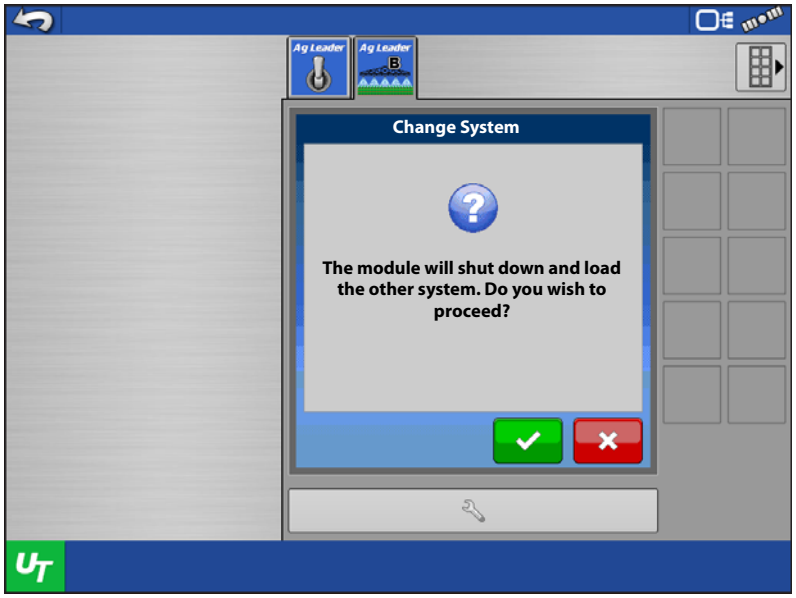
An example of using multiple systems would be a self-propelled sprayer that uses a spray boom, and can also use an injection toolbar for side dressing. In this case the user would set up a Sprayer system. The user could also have different profiles under that system for different swath widths and number of section, if they want to fold in boom extensions.

The user would set up system B as a Liquid Fertilizer system. This could also have profiles with different swath widths and number of sections. Then when the machine switches between spraying and side dressing the user simply needs to press **Switch Systems** and select which profile to activate.

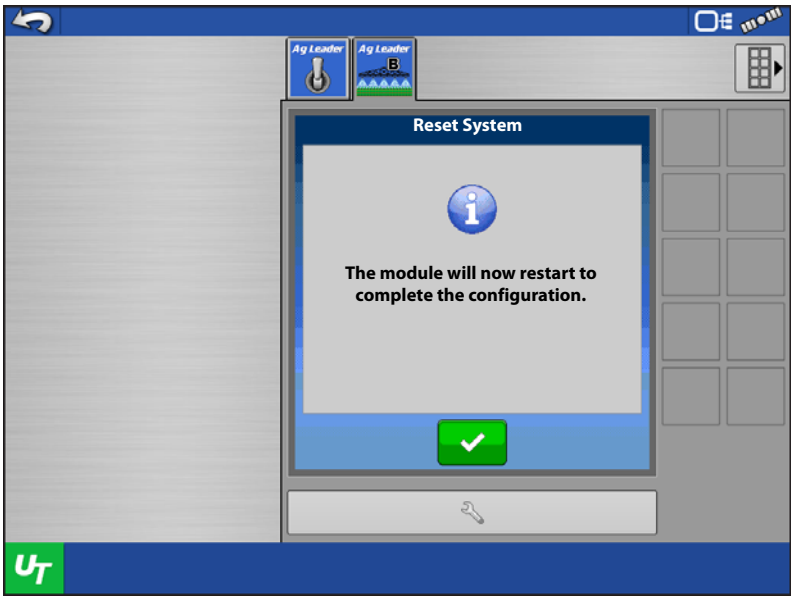
To switch systems, press **Switch Systems**.



The module must reboot to switch systems. To cancel switching systems, press ✕. Otherwise press ✓ to continue.



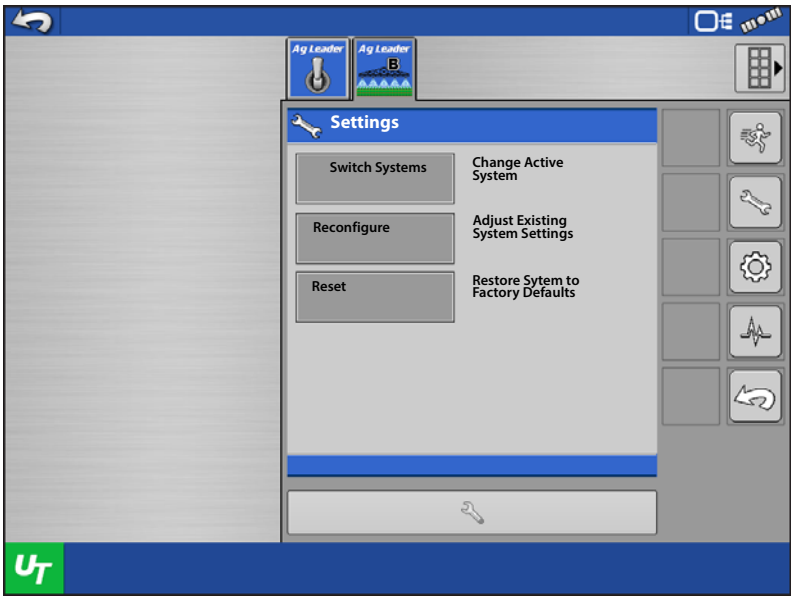
Press ✓ to finish switching systems.



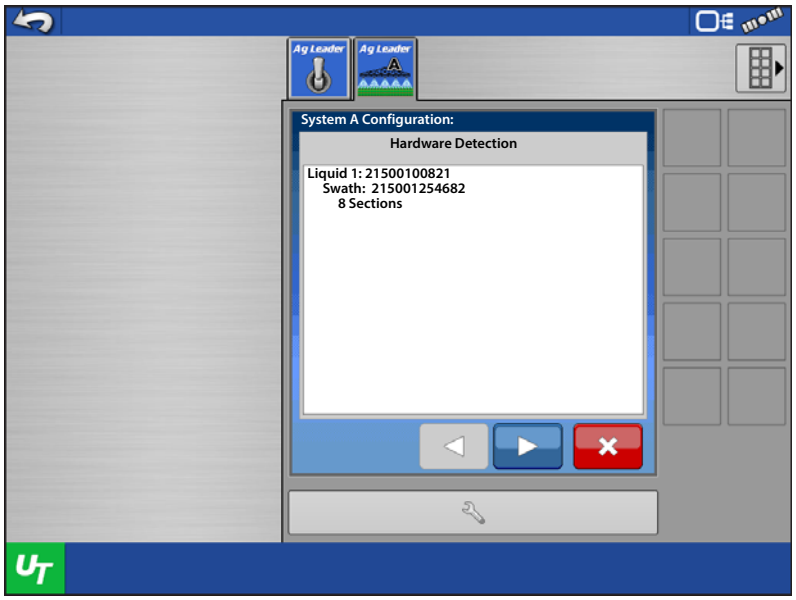
Reconfigure

Reconfigure allows the user to change edit configuration information regarding sections. This is handy if the user didn't know the number of sections when creating the configuration, if extra sections or end row nozzles are added to a machine, or disabling a section.

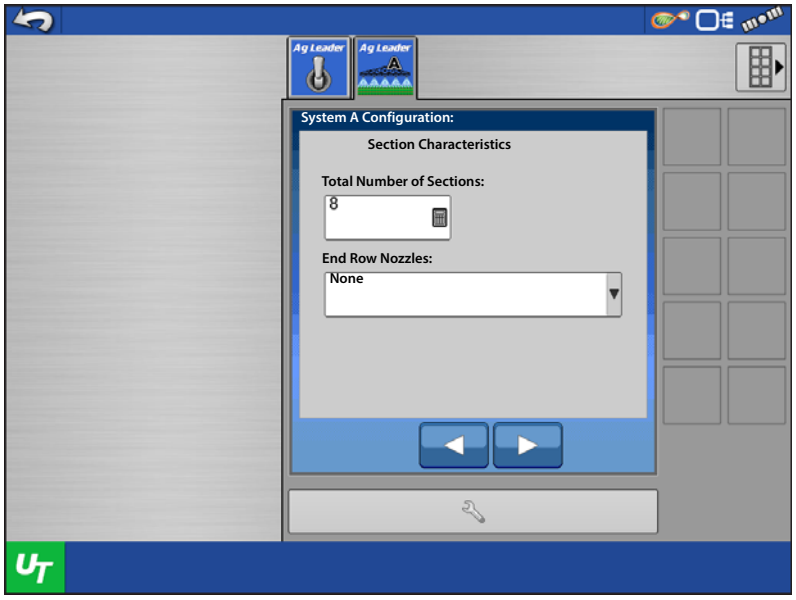
1. To edit the section information of the active profile, press **Reconfigure**.



2. The module will do a hardware detection, press .



3. Edit the number of sections or end row nozzles if necessary, press .

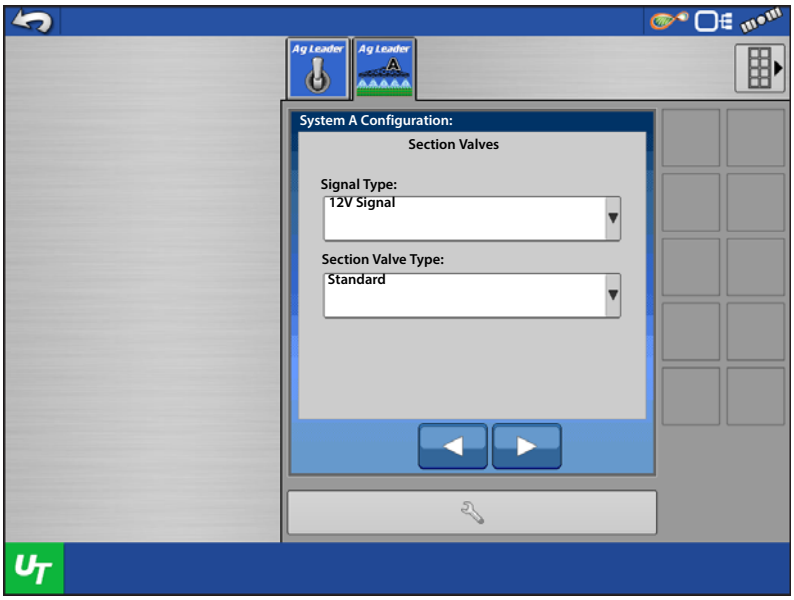


ATTENTION: Starting in version 1.9 of the ISOBUS Liquid Product Module support of up to 36 boom sections was implemented. The operating display must also support the desired amount of boom sections.

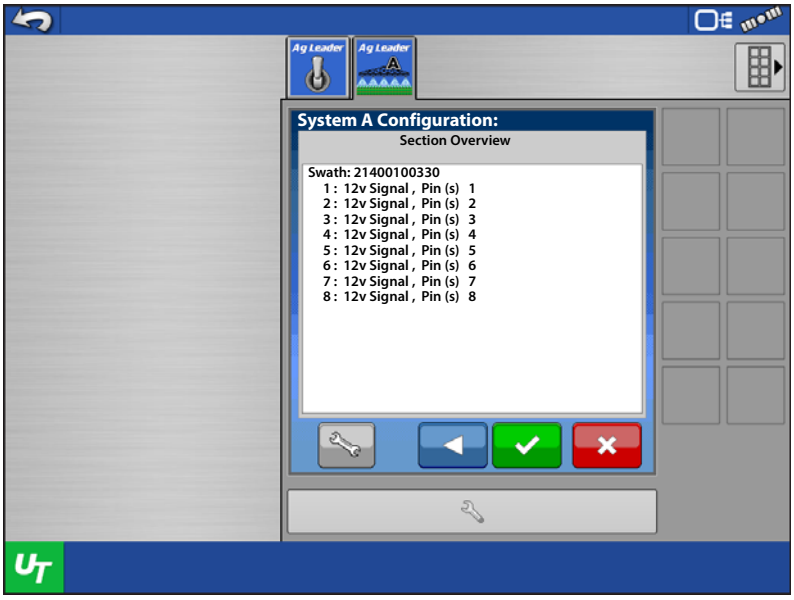
Ag Leader has recommended validation steps that need to be performed on a sprayer to determine if the liquid control system can support more than 24 sections. These validation steps will determine if the liquid control system can accurately control flow on small width boom sections at varying speeds and AutoSwath scenarios. If a boom section has too small of a width, the liquid control system may not have the ability to lock onto rate. This will be more prevalent with high capacity sprayers.

Ag Leader recommends these steps be taken for all sprayer control types, other than calibrated reflow. Through testing, calibrated reflow control systems can accurately control flow up to 36 boom/nozzle sections. Validation steps can be found on the Ag Leader Knowledgebase.

4. Edit the signal type or section valve type if necessary, press .



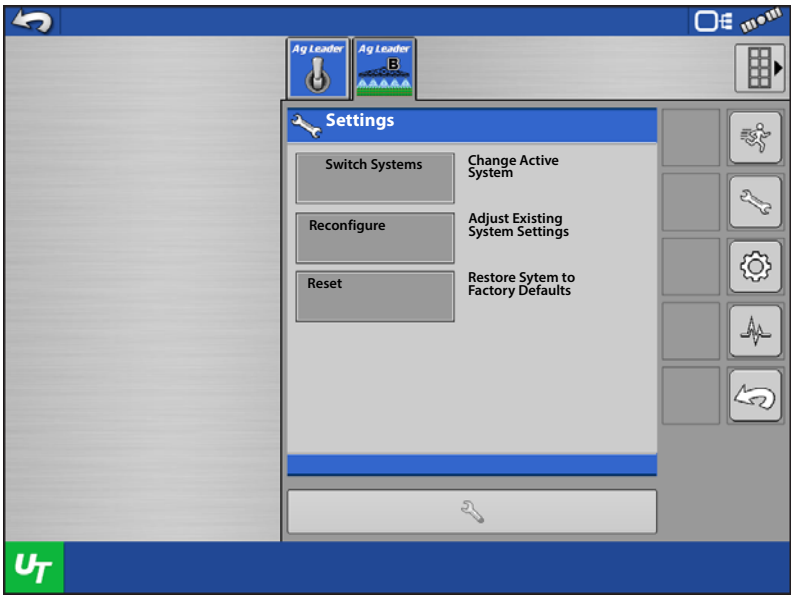
5. Verify the section overview is correct.
   - If it is correct, press to finish and save.
   - If it is not correct, press to edit.
   - Press to cancel.



Reset

Pressing Reset will delete all profiles and data stored in the module for active system. For example, resetting while system A is active will delete all profiles and date stored in the module for system A. Profiles and data for System B will still be intact.

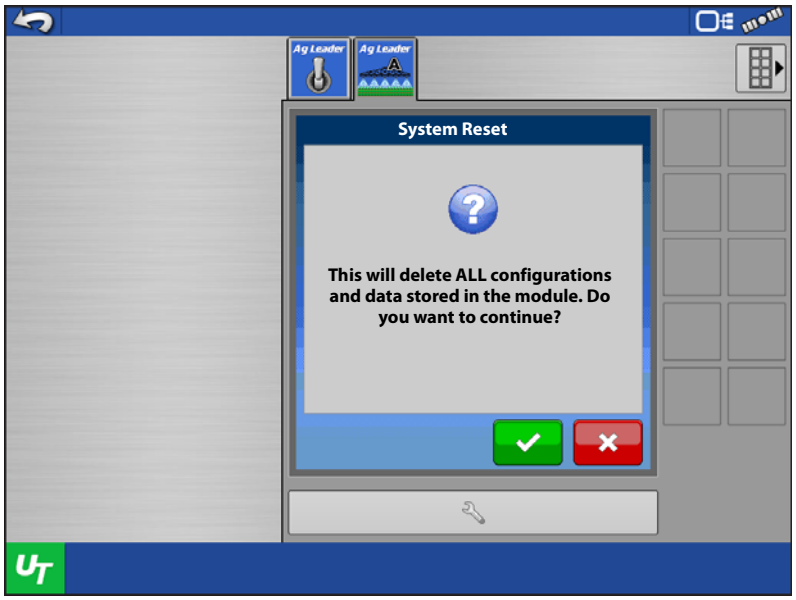
1. To reset the active system press .



2. A warning will appear on the screen.

   - To finish the reset, press .
   - To cancel the reset, press .

The module will reboot and require a profile to be setup.



Calibration

Flow Sensor Calibration

The system offers four types of calibration methods. The methods available will depend on which profile type is currently active system. The table below illustrates which methods are available for each system.

	Manual Calibration	Nozzle Catch Test	Field Dispense Volume	Static Dispense Volume
Sprayer	X	X	X	X
Anhydrous Ammonia Toolbar	X		X	
Liquid Fertilizer	X	X	X	X
Liquid Manure	X		X	

One of the methods will need to be performed in order to operate the system. Manual calibration is recommended to be performed before any others. Below provides an explanation of each method.

Manual Calibration—Entering the flow sensor calibration number. This value can typically be found on the flow sensor.

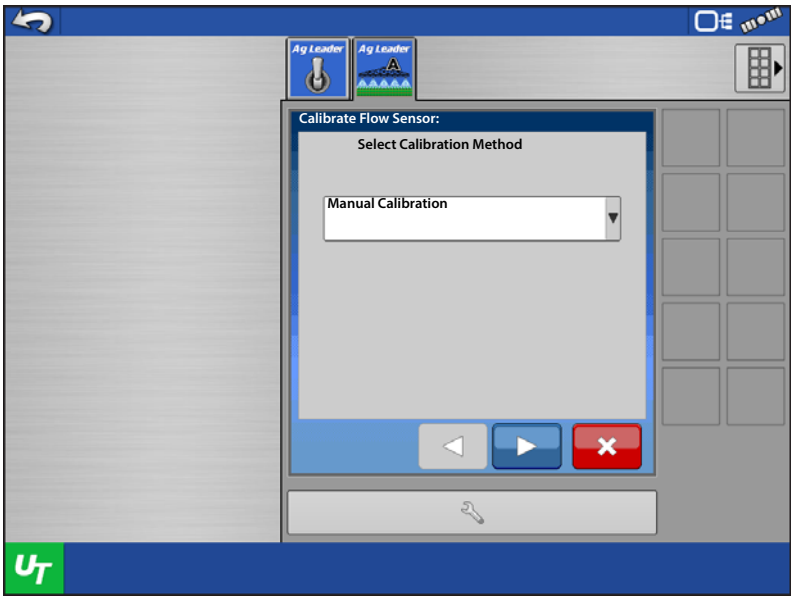
Nozzle Catch Test—Catching and measuring the amount of produce dispensed from a single nozzle for the duration of one minute. The user will enter actual amount dispensed and the flow sensor calibration number will be adjusted.

Field Dispense Volume—A load will be applied and recorded in the field, typically an entire tank or bin. The user will enter the actual amount of product applied (obtained from a scale ticket or weight system) and the flow sensor calibration number will be adjusted.

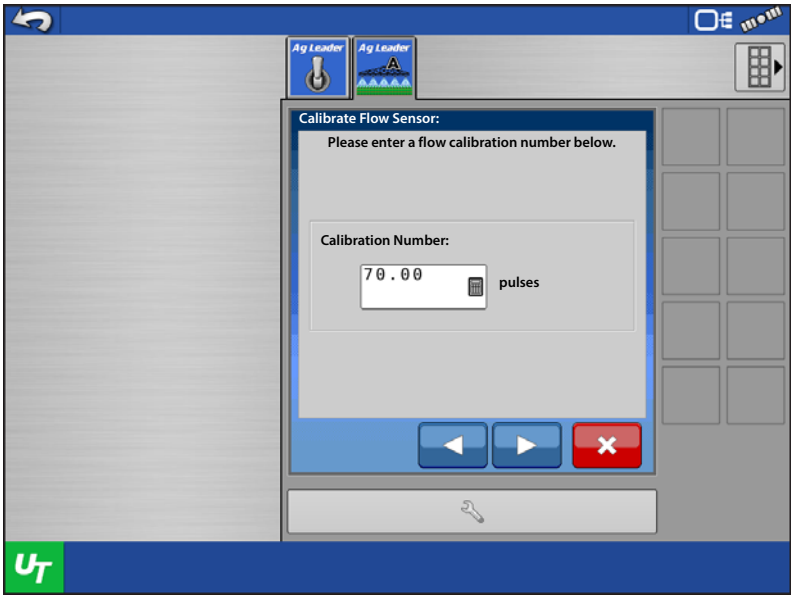
Static Dispense Volume—The user will apply product in a stationary position, catch and measure the amount of product, and input the amount of product that was dispensed. The flow sensor calibration will then be adjusted.

Manual Calibration

1. Select Manual Calibration from the combo box and press ▶.

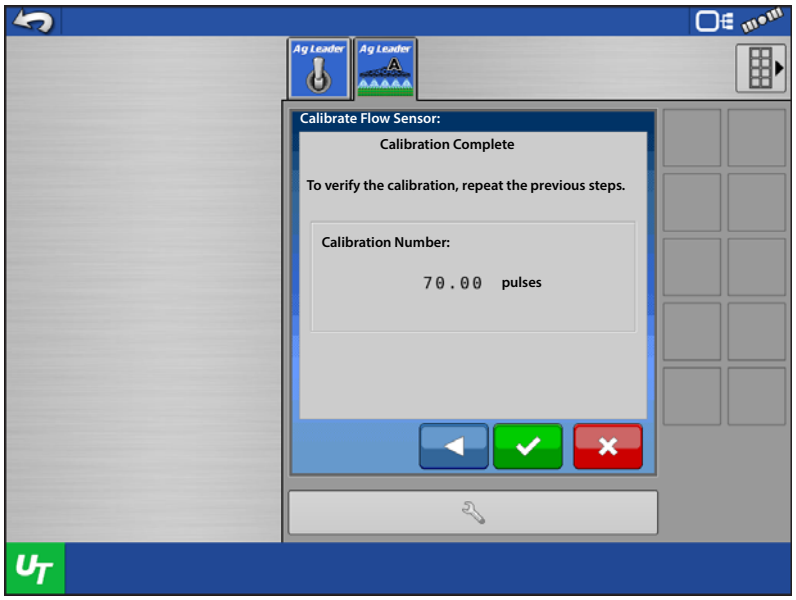


2. Enter the flow sensor calibration number.



NOTE! The system measures inpulses/gallon (liter). Some sensors measure in 10 or 2 pulses/gallon (liter). These calibration numbers will need to be altered. Example: A raven flow sensor reads 10 pulses/gallon. A calibration number of 720 would be entered as 72 into the system.

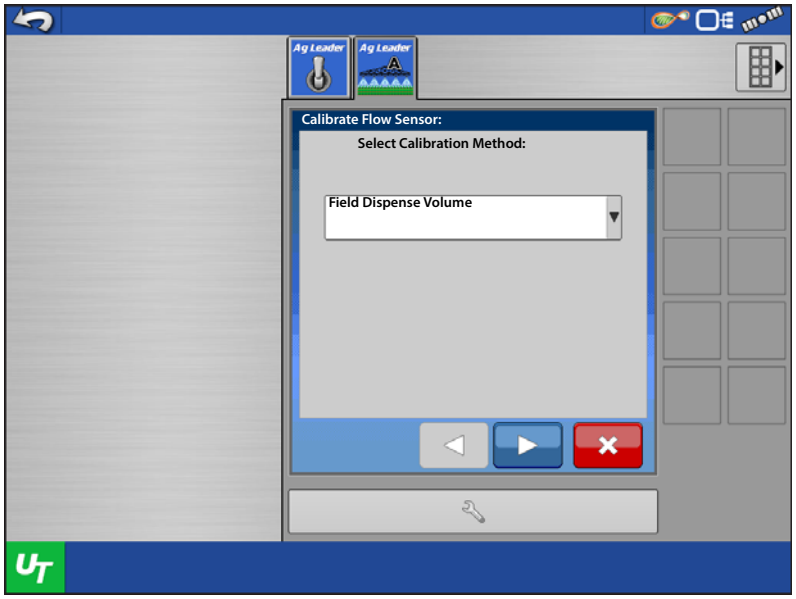
3. The calibration is complete and new calibration number sound be displayed. Press to finish.



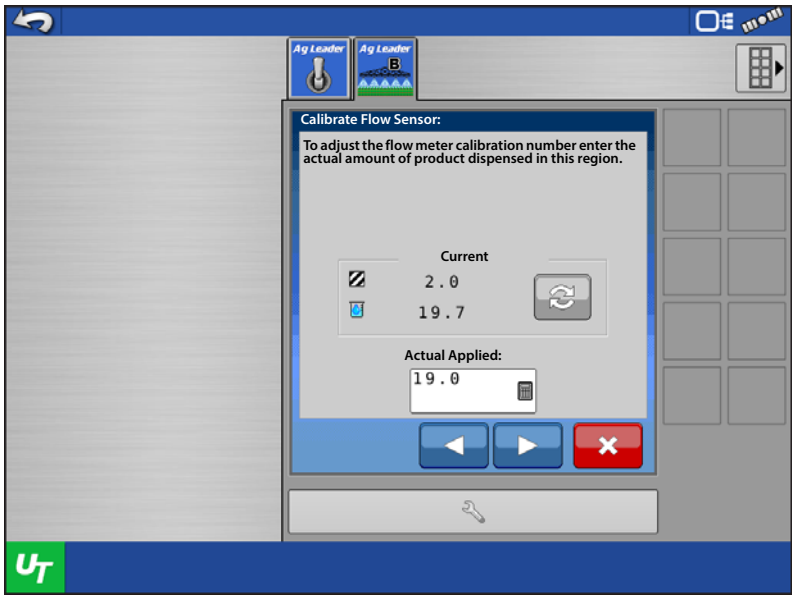
Field Dispense Volume

For this calibration method to work, product needs to be applied in the field before calibrating, preferably an entire tank or bin.

1. Select Field Dispense Volume form the combo box and press .

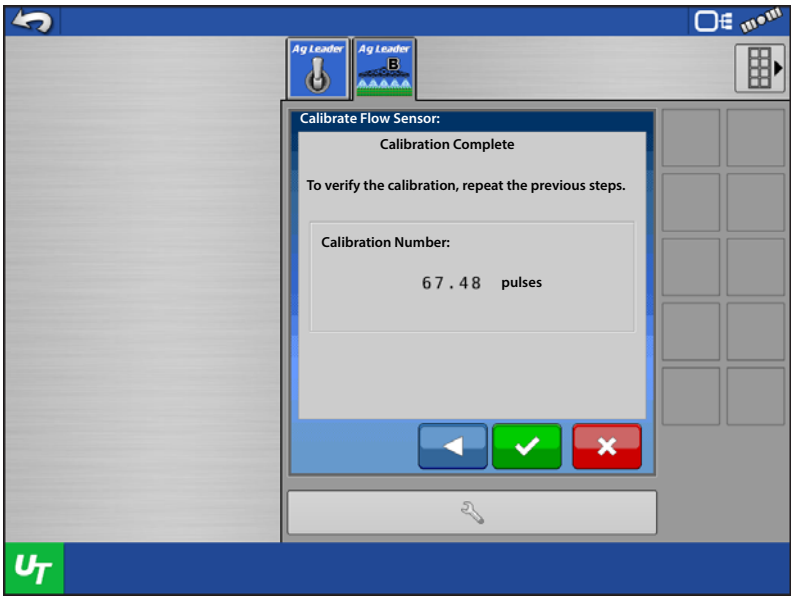


2. The recorded acres and total product will be displayed.
3. Enter the actual amount of product applied and press .



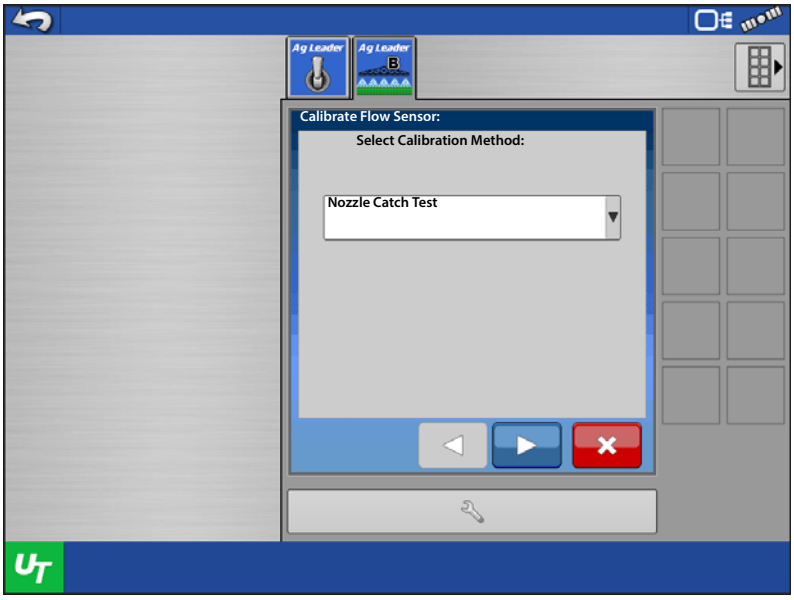
4. The calibration is complete and new calibration number sound be displayed.

   Press ✓ to finish.



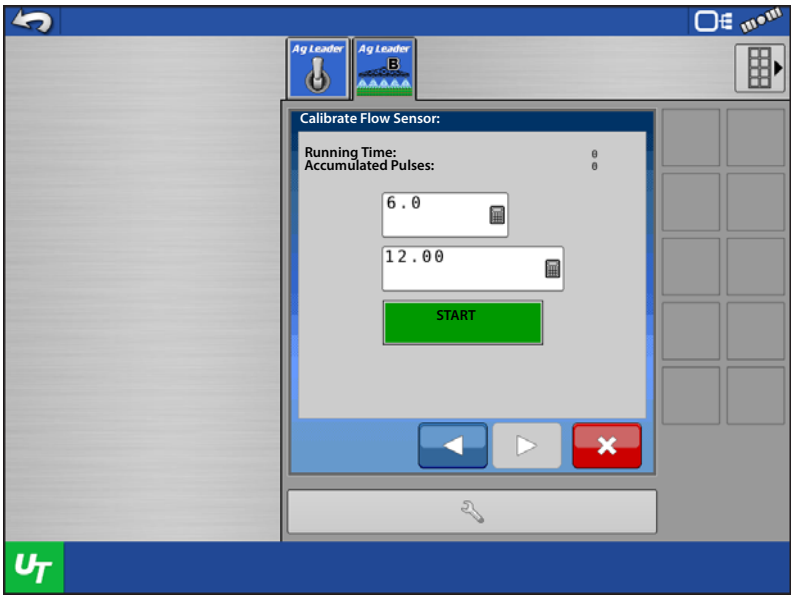
Nozzle Catch Test

1. Select Nozzle Catch test from the combo box and press ▶.



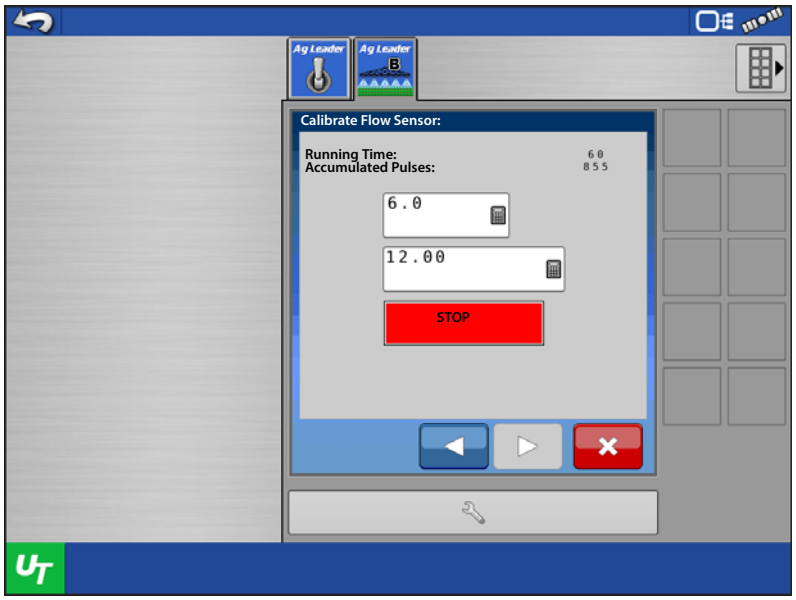
2. Enter a simulated speed and target rate.

3. Press START when product is ready to be dispensed and someone is in position to catch the product from a single nozzle.

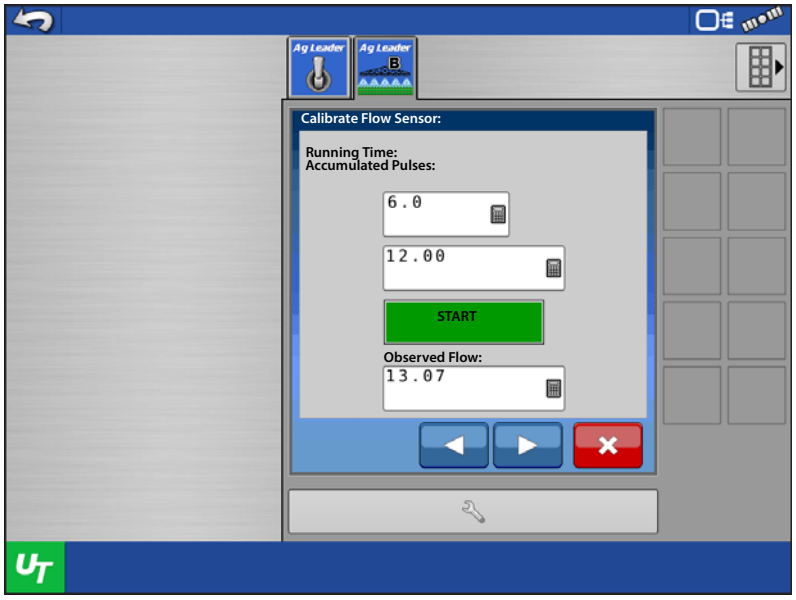


NOTE! It is recommended to enter a speed and rate similar to what the system will be operating at in the field.

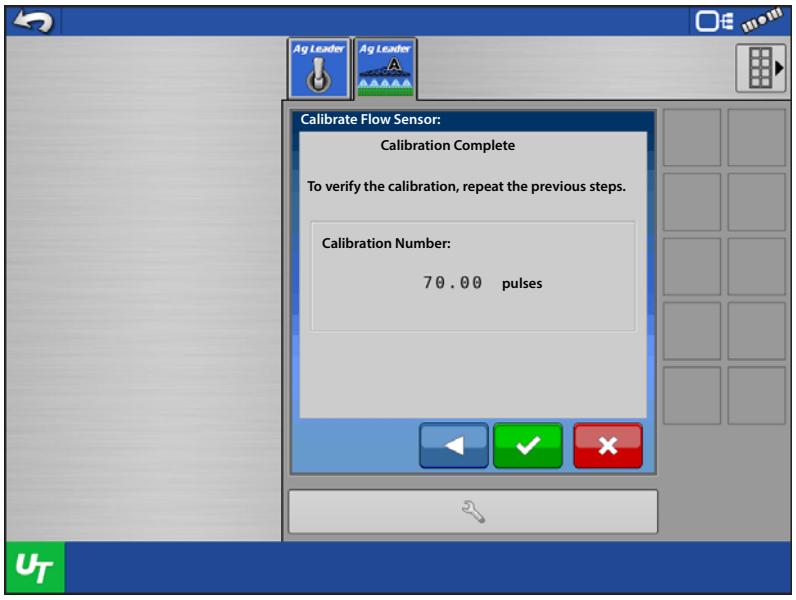
4. Press STOP when the Running Time has reached 60 seconds. A box to enter the Observed Flow will appear.



5. Enter the amount of product that was collected in units of gal/min. Press ▶.

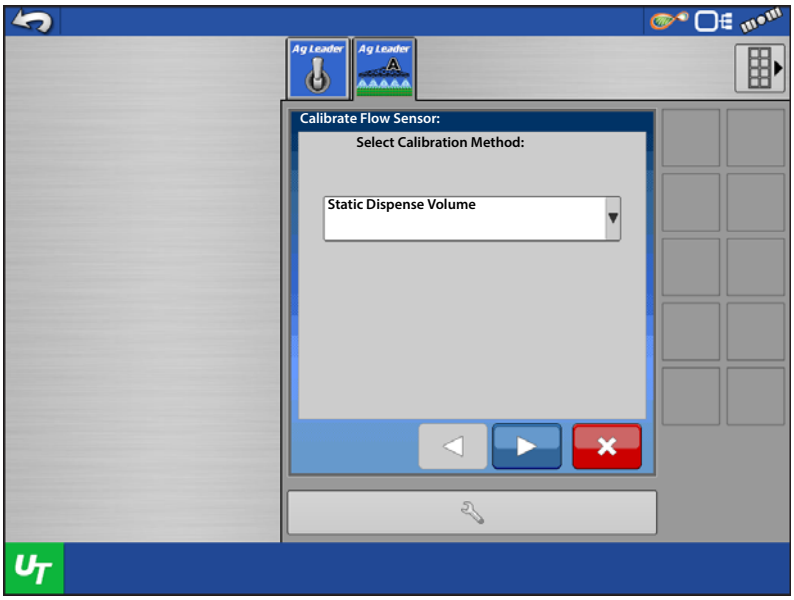


6. The calibration is complete and new calibration number sound be displayed. Press ✓ to finish.

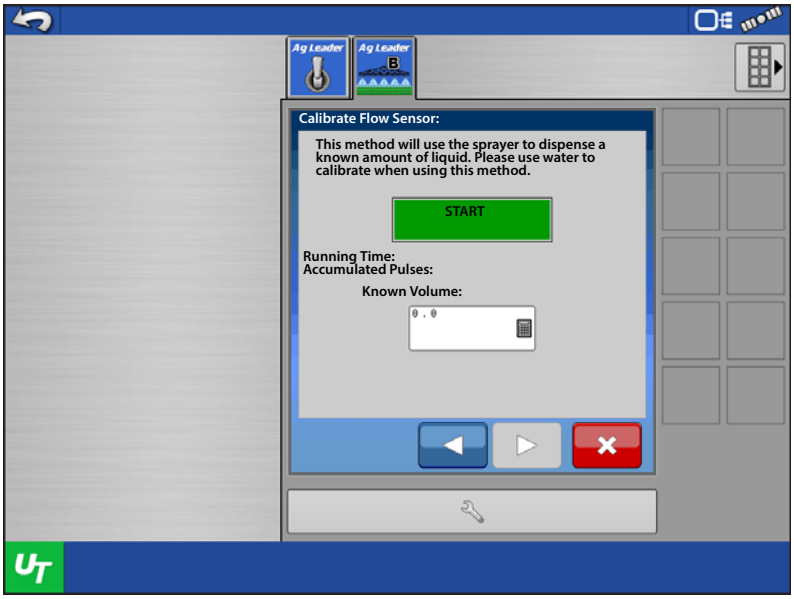


Static Dispense Volume

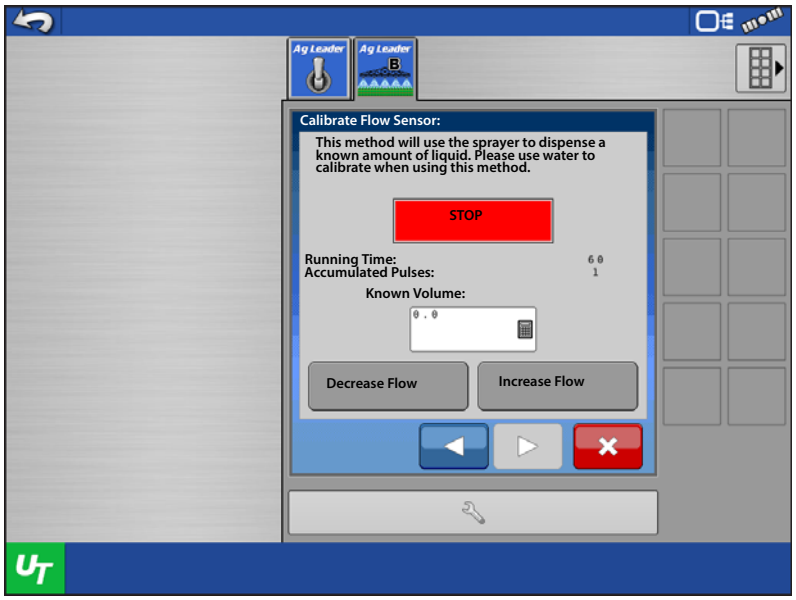
1. Select Static Dispense Volume from the combo box and press .



2. When the machine is ready to dispense product, press .



3. Decrease Flow and Increase Flow should appear and all section valves should open.



CAUTION: Make sure all personal are at a safe distance before dispensing product.

4. Press Increase Flow until product begins to dispense and a desired pressure is achieved.

NOTE! Pressing and holding Increase Flow or Decrease Flow will not continue to open or close the valve. The user must press the button each time they want the valve to open or close.

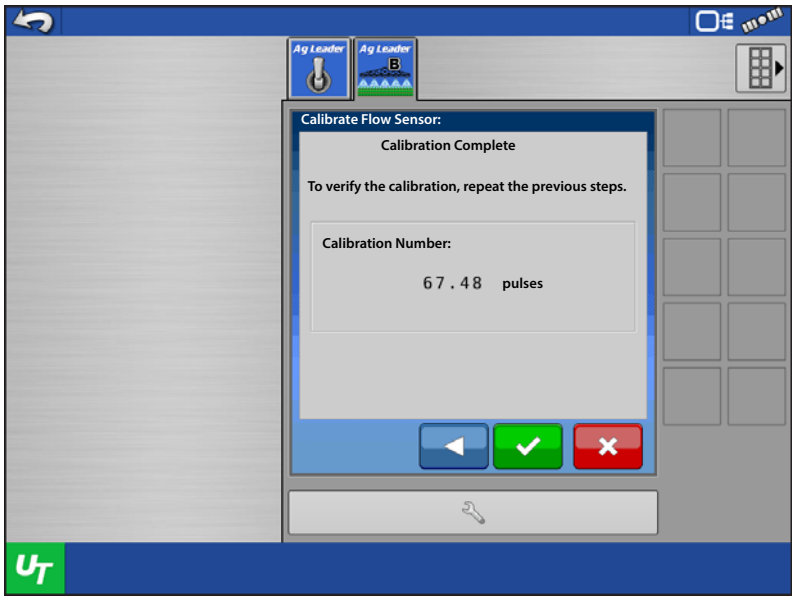
5. Allow the system to dispense a desired amount of product.

6. Press STOP once the desired amount has been dispensed.

7. Enter the amount of product that was actually dispensed into the Known Volume box and press ▶.

8. The calibration is complete and new calibration number sound be displayed.

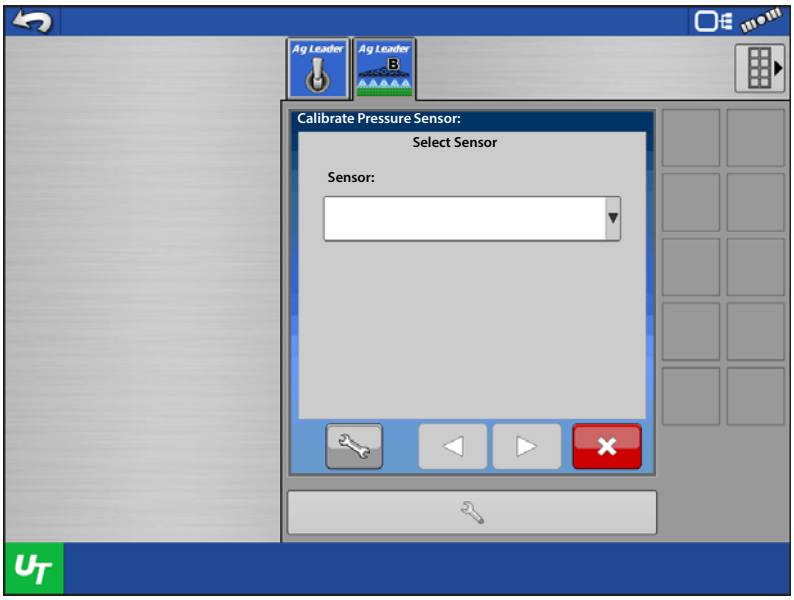
9. Press ✓ to finish.



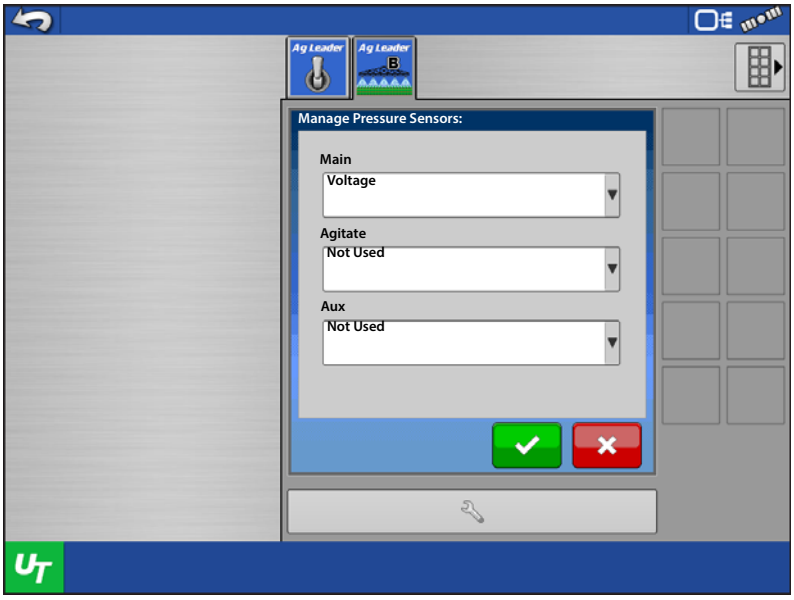
Pressure Sensor Calibration

1. Select which pressure sensor to calibrate from the combo box.

If none appear in the combo box, press in the lower left corner to activate pressure sensors.



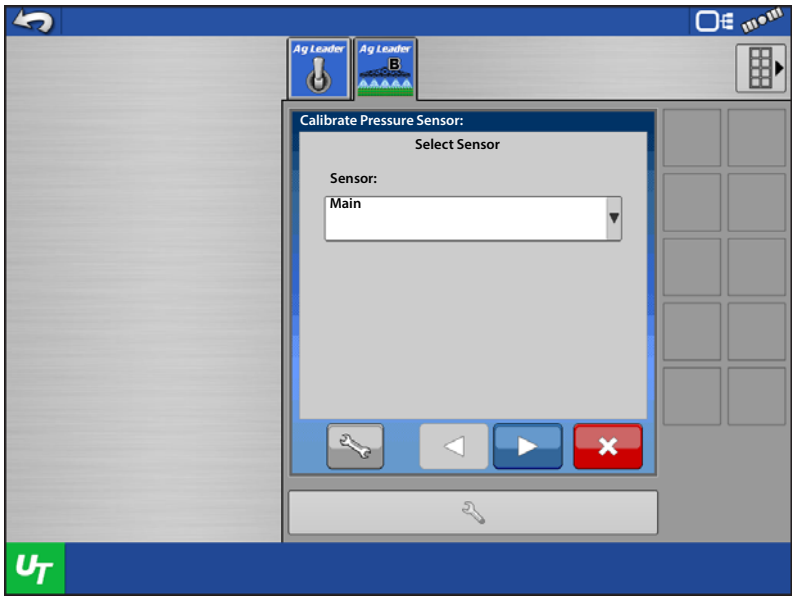
2. Define whether the sensor is a voltage or current loop sensor. Ag Leader sensors should be selected as Voltage.
3. Once all sensors are defined press .



4. Select a sensor to calibrate and press .
5. Each sensor can be calibrated using a Single Set Point or Multiple Set Points.

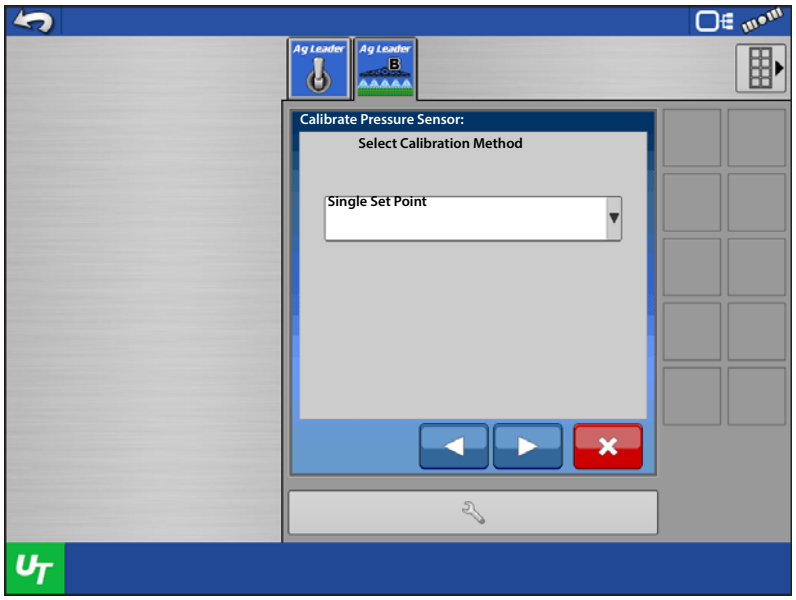
Single Set Point Method—Will record the mV the sensor is seeing at a single pressure reading. (Recommended to record mV value when the sensor is seeing 0 psi).

Multiple Set Point Method—Will record the mV the sensor is seeing at zero pressure and at a non-zero pressure. The system will require an analog gauge to be present in the system for this method.



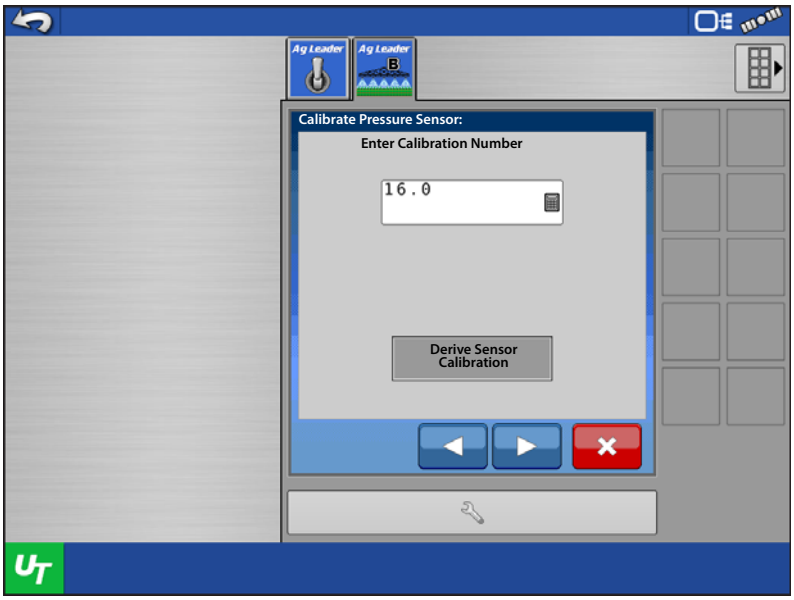
Single Set Point Calibration

1. Select Single Set Point Calibration from the combo box and press .



2. Enter the mV/psi calibration value of the sensor. A sensor provided by Ag Leader is 16 mV/psi. If the calibration number of the sensor is unknown, press

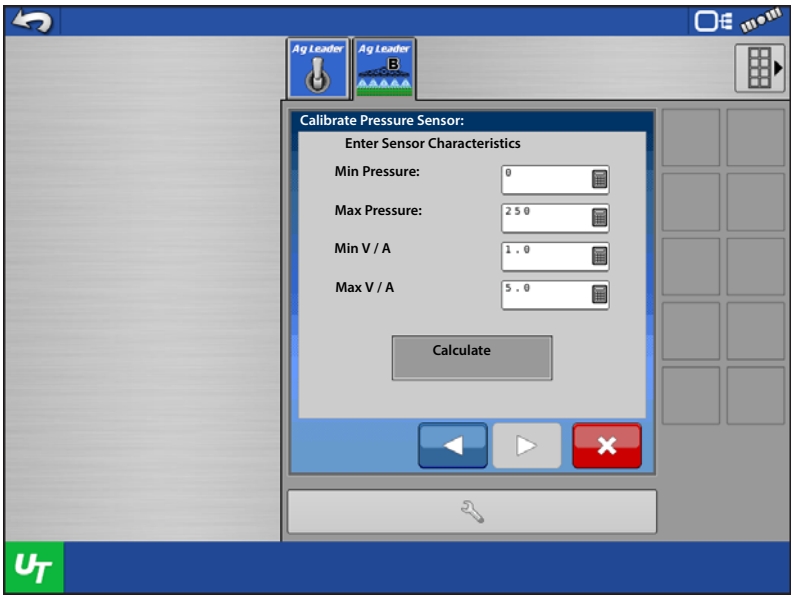
   Derive Sensor Calibration.



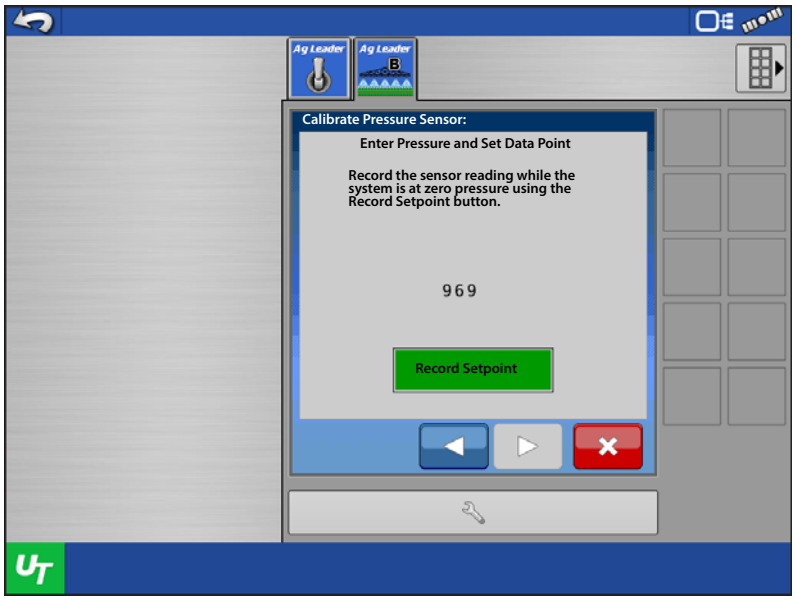
3. Enter the Min and Max Pressure, as well as the Min and Max voltage or milliamp values of the sensor. (Ag Leader's sensor is a Current Loop style sensor.) Sometimes these can be found on the sensor itself, otherwise contact the sensor's manufacturer.
4. Once the values are entered, press

   Calculate.

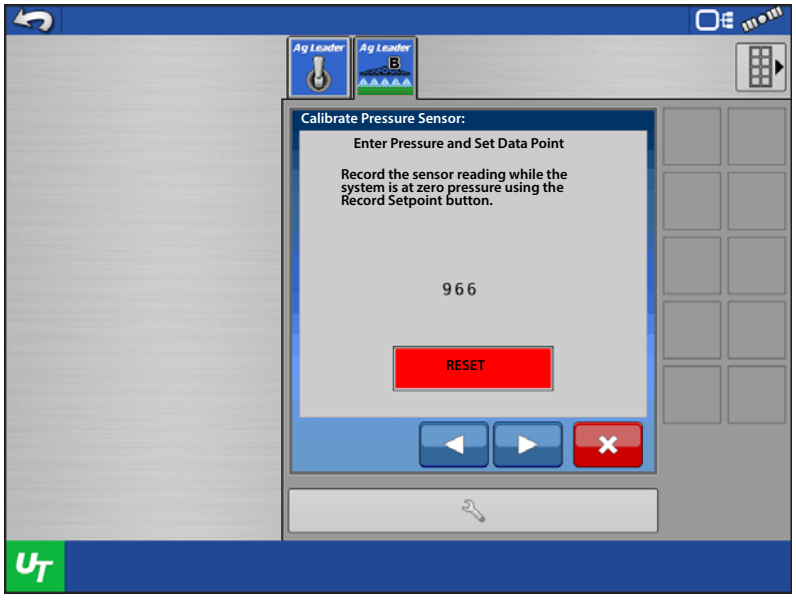
5. The derived Calibration Number should be present in the box. Press ▶.



6. Press Record Setpoint to record the current sensor reading once the system is at zero pressure.
7. Press ▶.

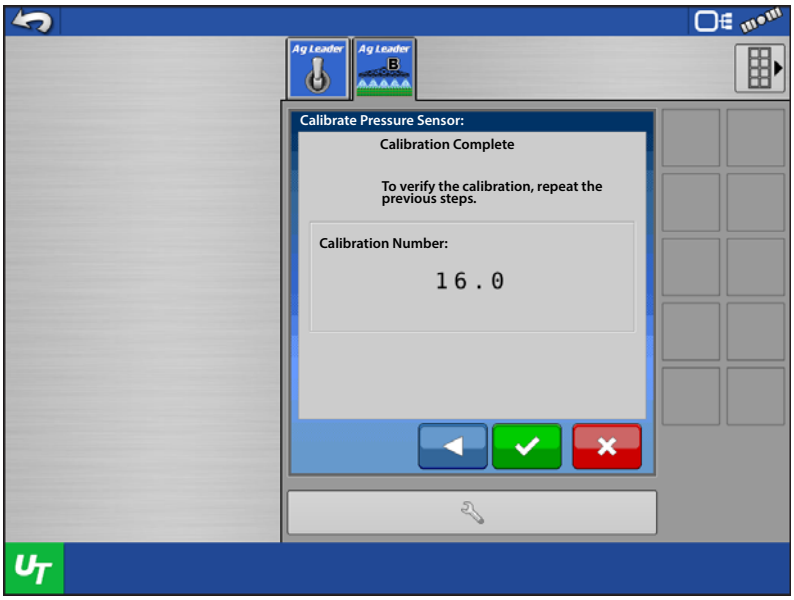


8. Press RESET to redo the calibration.



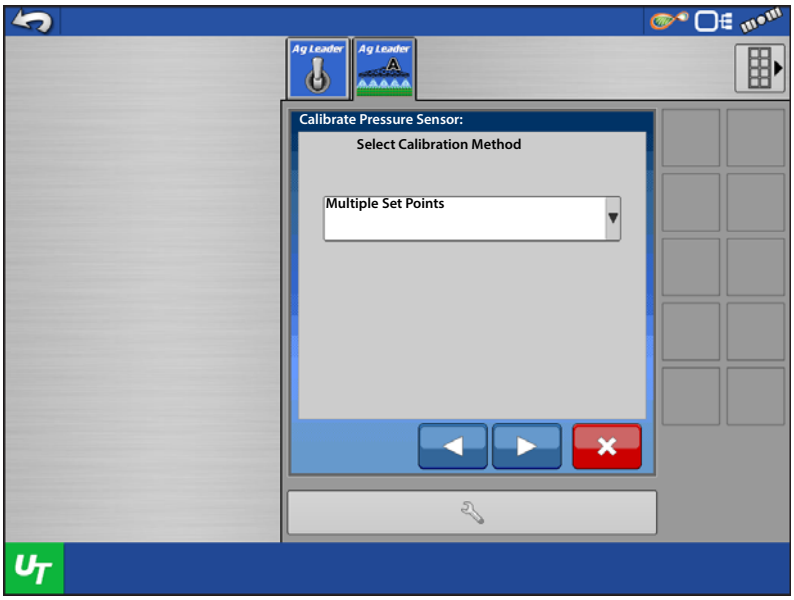
9. The calibration is complete and new calibration number sound be displayed.

   Press to finish.

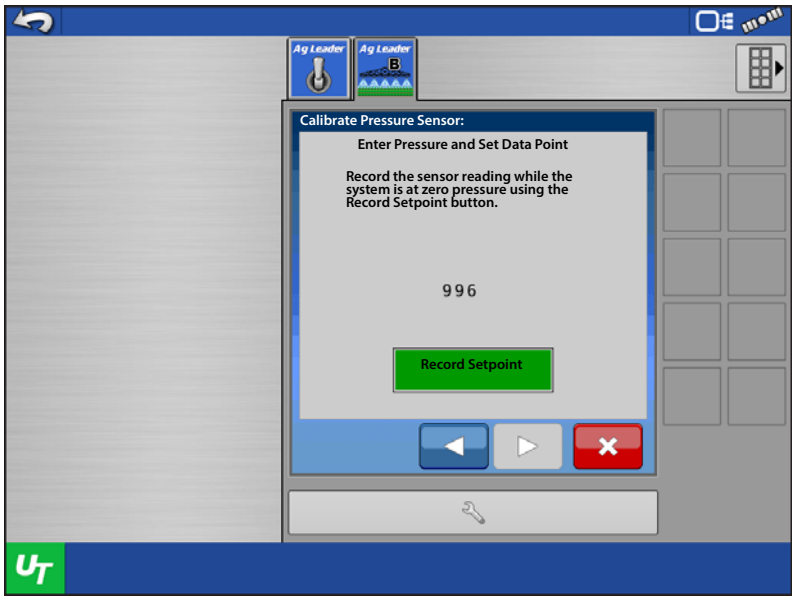


Multiple Set Point Calibration

1. Select Multiple Set Point Calibration from the combo box and press .

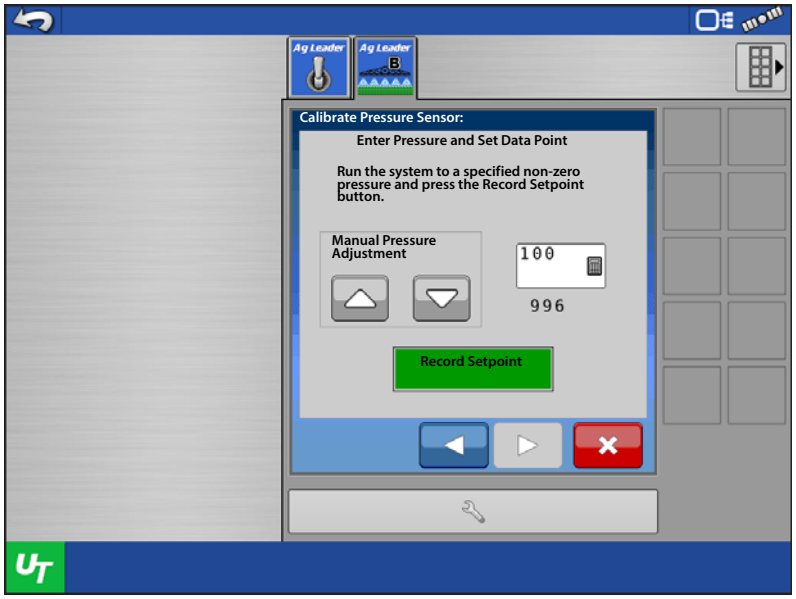


2. Press Record Setpoint to record the current sensor reading once the system is at zero pressure.
3. P.ress ▶.

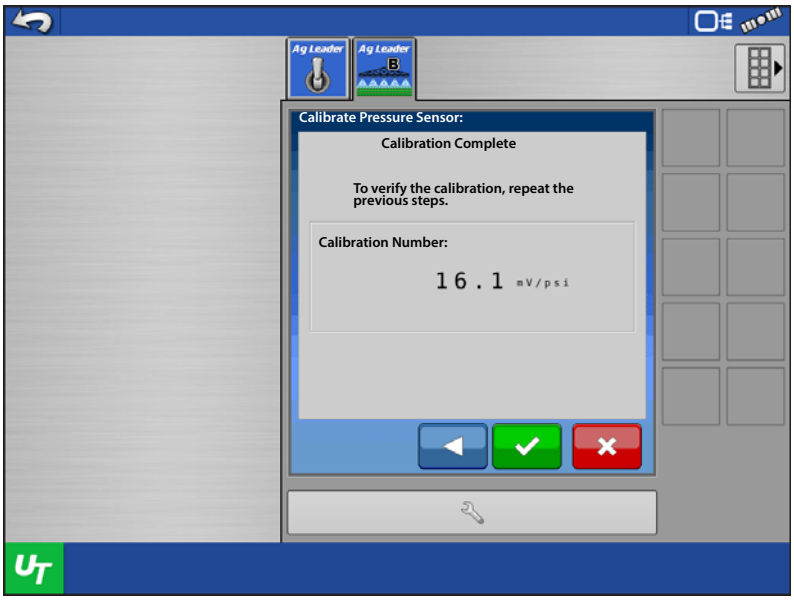


NOTE! Press RESET to redo the calibration.

4. Use ▲ and ▼ to apply pressure to the system. Enter the pressure that is displayed on the analog gauge into the psi box and press Record Setpoint.
5. Press ▶.

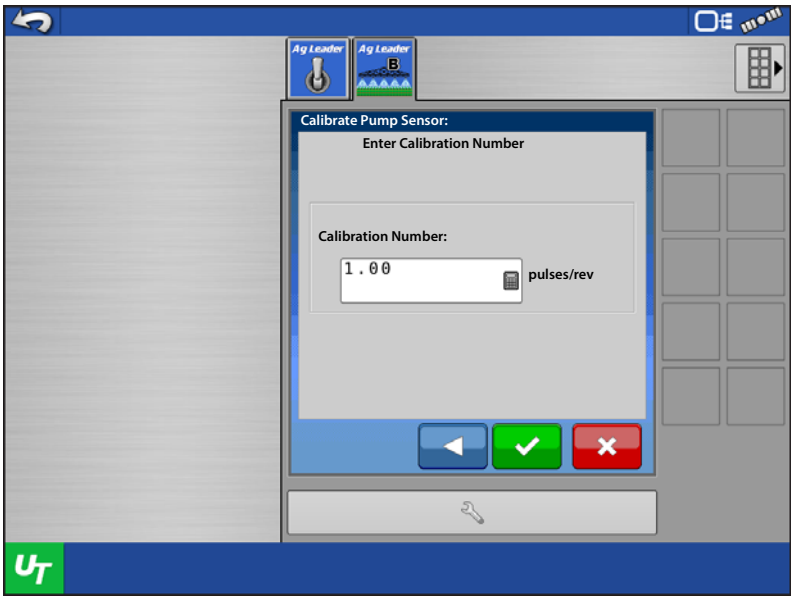


6. The calibration is complete and new calibration number sound be displayed.
7. Press the ✓ to finish.



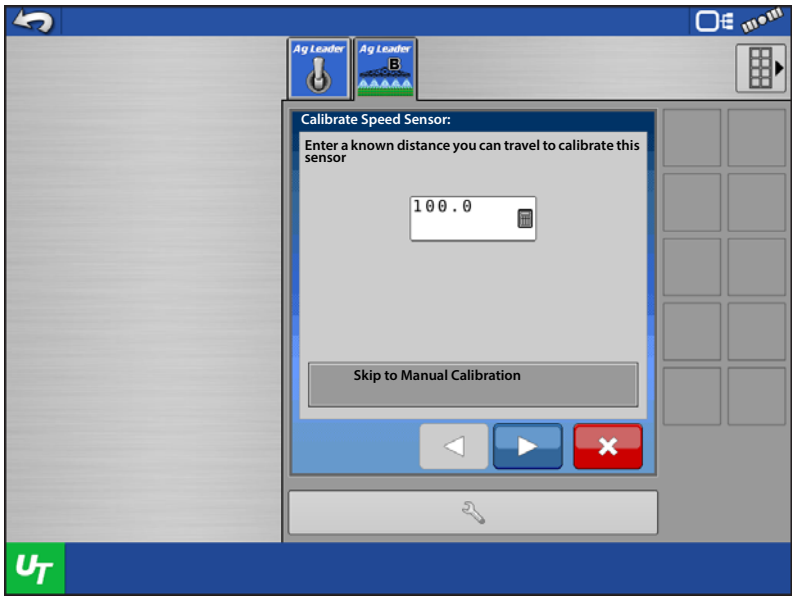
Pump Speed Sensor Calibration

1. Enter the pulse/rev calibration value of the sensor.
2. The calibration is complete.
3. Press ✓.



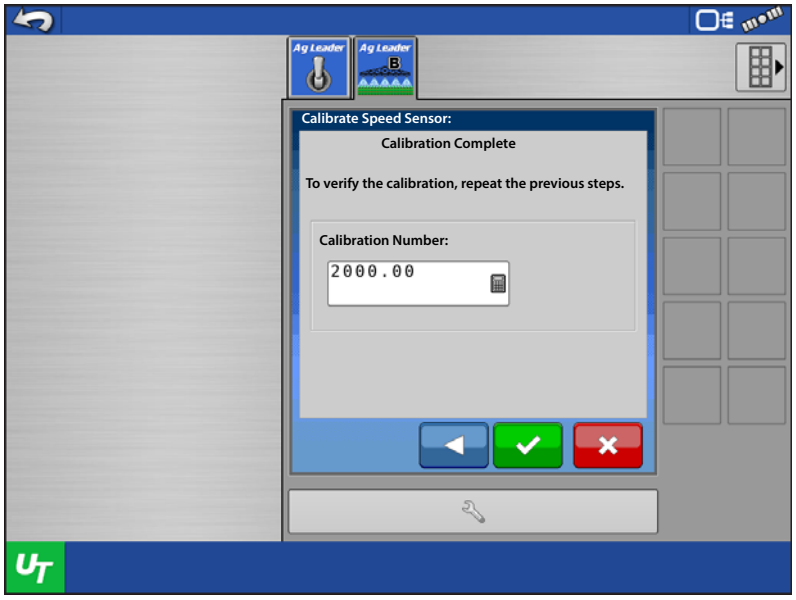
Speed Sensor Calibration

1. Enter the distance that will be traveled during the speed calibration.

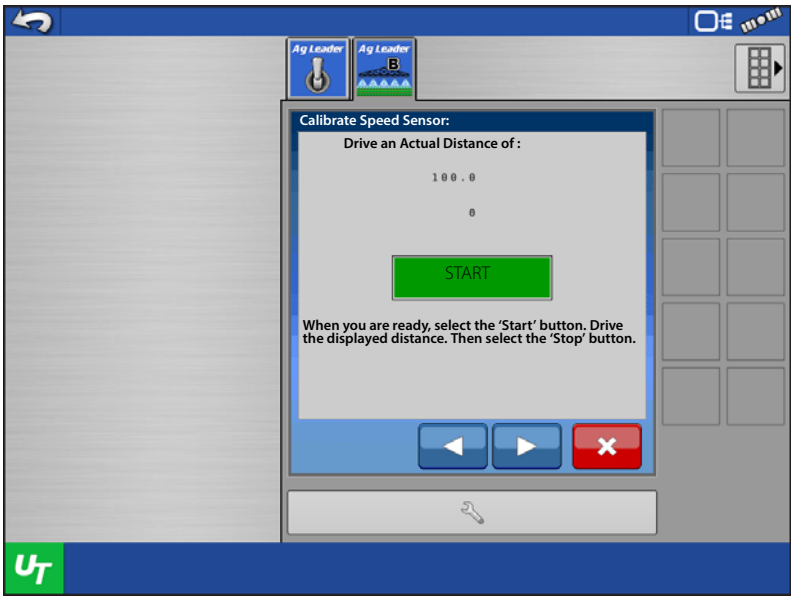


If the pulses/100ft calibration value of the sensor is already known, press Skip to Manual Calibration.

2. Enter the pulses/100ft calibration value of the sensor and press ✓.
3. Press ▶.



4. Once the vehicle is in position to drive the marked out distance, press START and begin driving the vehicle.
5. Press STOP once the vehicle has reached the end of the marked out distance.
6. Press ▶.
7. The calibration is complete and new calibration number sound be displayed.
8. Press ✔ to finish.



Temperature Calibration

A temperature sensor can be used on an Anhydrous Ammonia system type. The system can use a Voltage or Current Loop style sensor. The calibration routine will use a Single-Point calibration method.

1. Define whether the sensor is Voltage or Current Loop sensor.
2. Enter the mV/F calibration value of the sensor. If the calibration number of the sensor is unknown, press the Derive Sensor Calibration button.
3. Enter the Min and Max Temperature, as well as the Min and Max voltage or milliamp values of the sensor. (Ag Leader's sensor is a Current Loop style sensor.) Sometimes these can be found on the sensor itself, otherwise contact the sensor's manufacturer.
4. Once the values are entered, press the Calculate button.
5. The derived Calibration Number should be present in the box.
6. Press ▶.
7. Enter the current temperature in degrees F, then press Record Set Point. Press ▶.

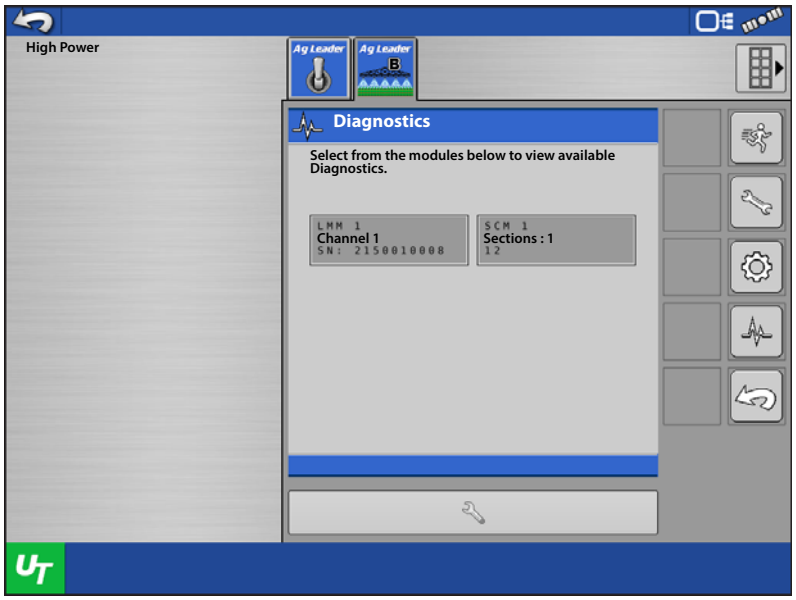
NOTE! Press the Reset button to redo the calibration.

8. The calibration is complete and new calibration number sound be displayed.
9. Press ✔ to finish.

Diagnostics

Module Diagnostics

The modules on the ISOBUS will be displayed here. The user will select the module they wish to view diagnostics of. There should be an ISO Liquid Control module and may be one ISO Swath module present. Each ISO Liquid Control module will display a channel and serial number. Each ISO Swath module will display the sections it controls and a serial number.

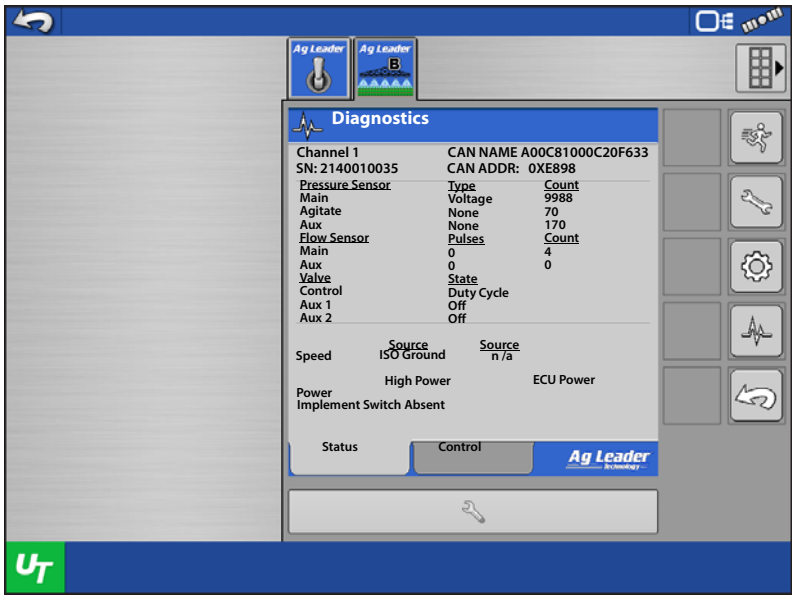


ISO Liquid Control Module Diagnostics (Status)

Pressure Sensors—The ISO Liquid Control Module Diagnostics shows a lot of useful information. It will show the pressure sensor defined type and number or counts the module sees from the sensor. If there was no pressure present, or the sensor was disconnected the count would show 0. The sensor type will show Current, Voltage, or None depending on what the user selected. If no sensors have been defined yet it will show none.

Flow Sensor—The flow sensor will show the current number of pulses they sensor is sending and the total count of pulses.

Valve—Valve will show the current state of the control valve as well as the auxiliary valves. The control valve will show Increasing, Decreasing, or Idle depending on its state. The auxiliary valves will show on or off.



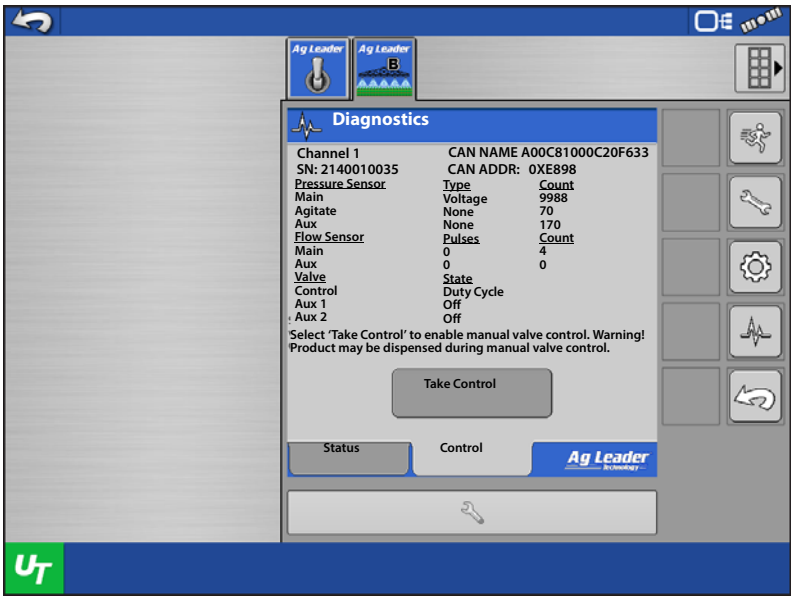
Speed—Speed will display the sources defined for the ISO Switchbox as well as the module. It will also display the current MPH.

Power—Power will display the current High Current power coming into the module as well as the ECU power.

Implement Switch—Implement switch will indicate if there is an implement switch module on the bus. If there is it will read Present, if not it will read Absent.

ISO Liquid Control Module Diagnostics (Control)

The Control tab will let the user take manual control of the control valve and auxiliary valve to diagnose any problems.

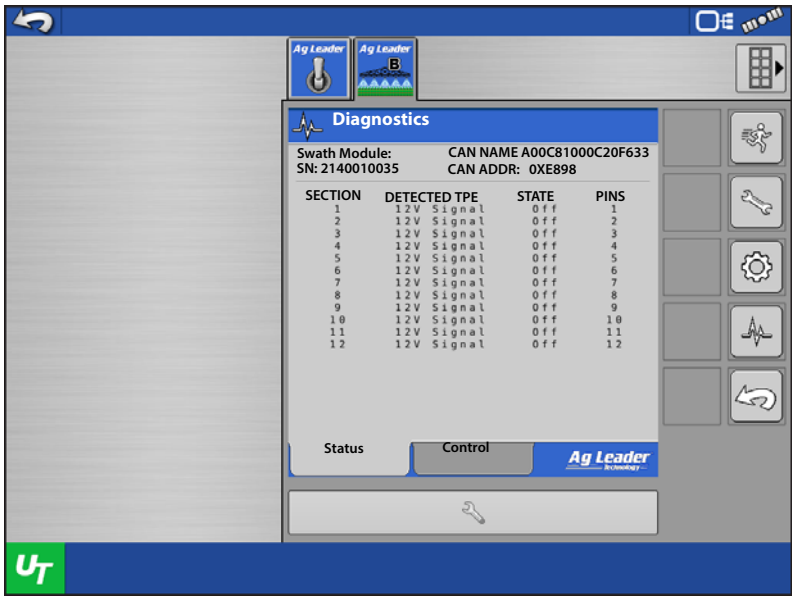


1. Press **Take Control**.
2. Press **Increase Flow** or **Decrease Flow** to run the control valve.

3. Press **Toggle Aux 1** or **Toggle Aux 2** to cycle the auxiliary valve. Press it again to return it to its original state.

ISO Swath Control Module Diagnostics (Status tab)

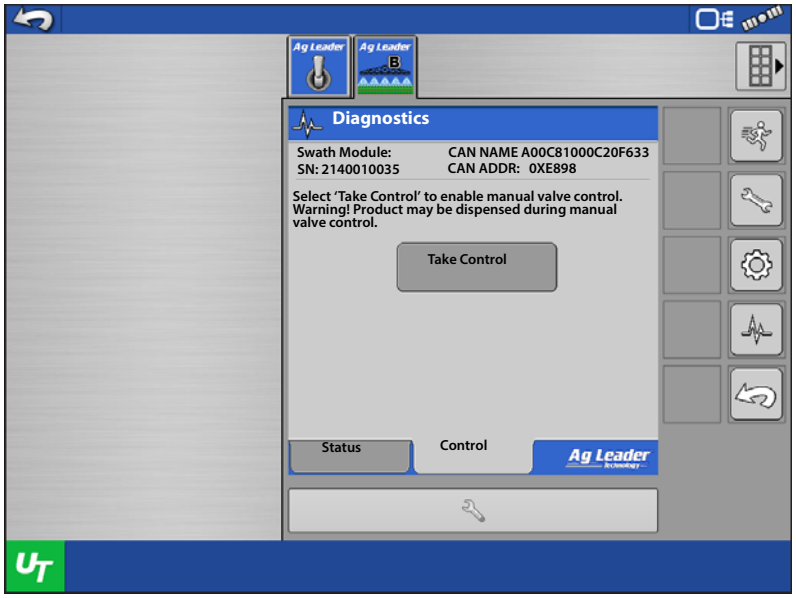
The ISO Swath Module Diagnostics shows a lot of useful information about the sections. It shows what each section type is defined as. It shows the current state, on or off. Finally, it shows what pin each section is set to.



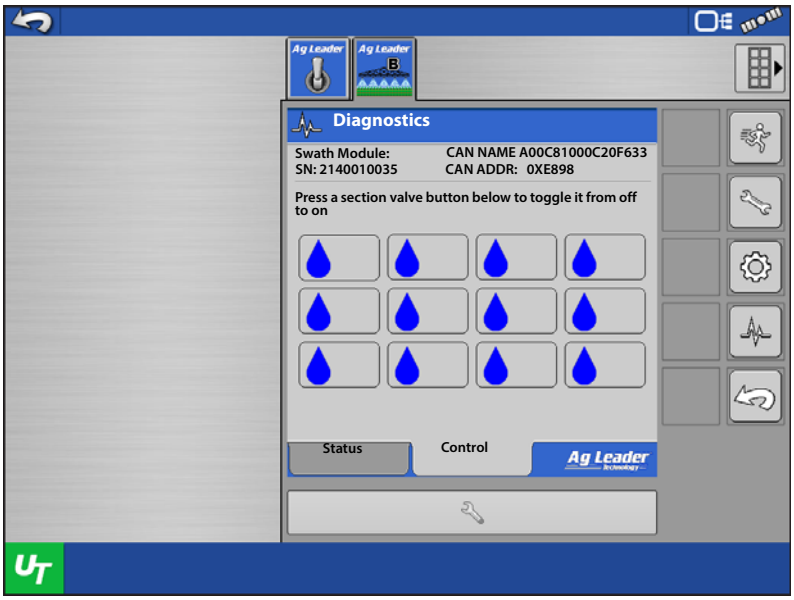
ISO Swath Control Module Diagnostics (Control tab)

The Control tab will let the user take manual control of section valves.

1. Press Take Control.

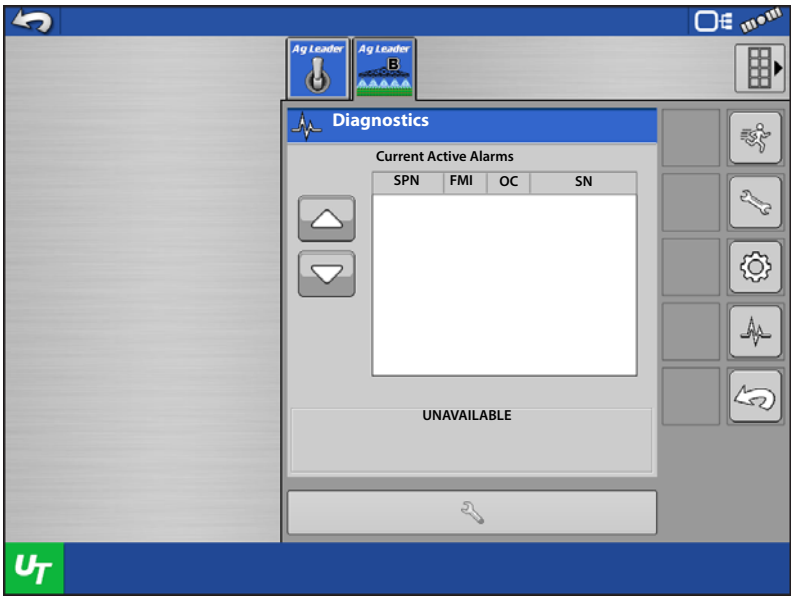


2. Press any of the section buttons to toggle them from off to on. Each section pressed should open and close as you do so.



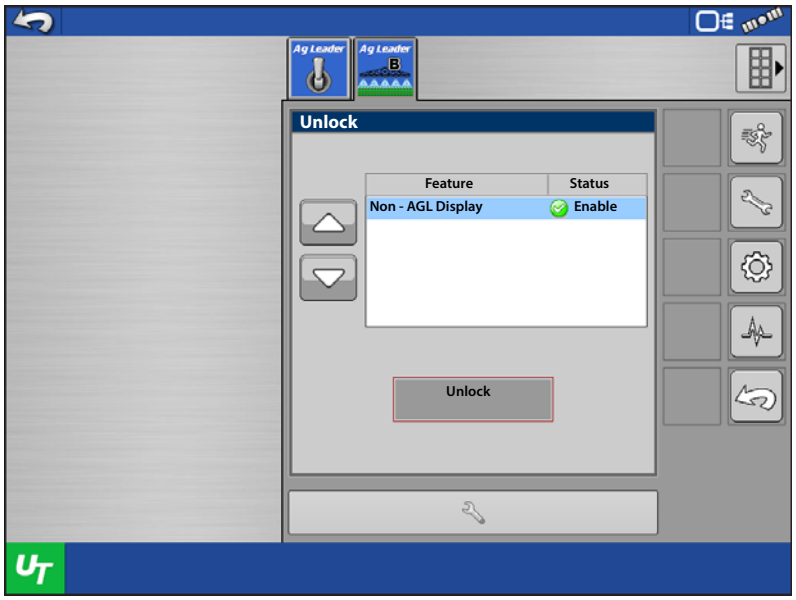
Alarms

Any trouble codes or module errors will be displayed here. If present select one and provide the diagnostic information below to Ag Leader Technology Technical Support.

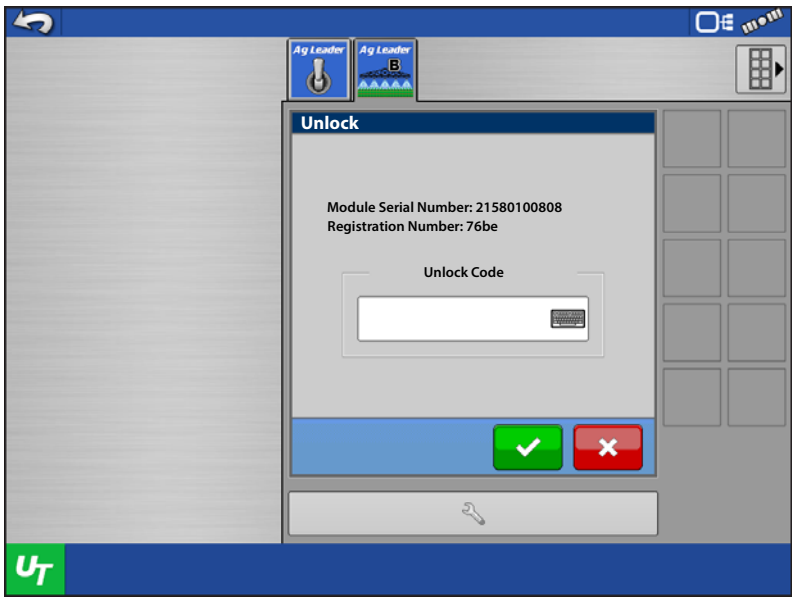


Unlocks

1. Select the unlock desired to be enabled.
2. Press **Unlock**.

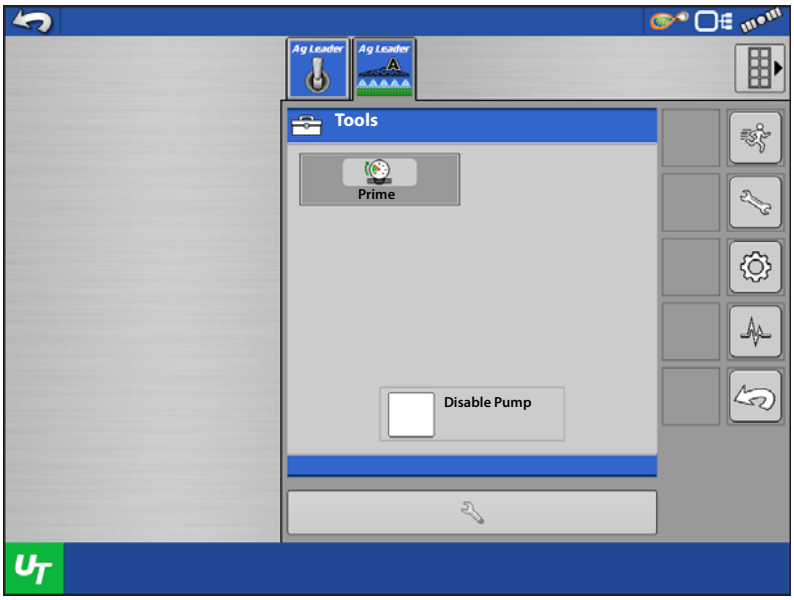


3. Provide the Module Serial Number and Registration Number to Ag Leader Technology Technical Support.
4. Enter the unlock code provided by technical support.
5. Press ✕ to cancel, otherwise press ✓ to save.
6. The unlock should now be displayed as Enabled.



Tools

Tools contains the Prime feature for sprayer systems, and the Tube Check feature for Anhydrous Ammonia systems. It also contains the Direct Injection Diagnostics when an ISO Injection Pump is connected, and the Disable Pump feature for PWM control valve types.



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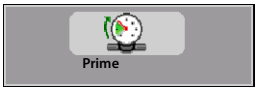


Prime—This feature is only available with a PWM Control Valve type. It can also only be used with a pressure sensor on the system. Pressing the prime button will bring the system up to the defined Prime/Standby Pressure and hold it.

NOTE! The user will need to define a Prime/Standby Pressure under Pressure Settings for this to work.

Disable Pump—When check marked the pump will remain off at all times. Unchecking will allow the system to control it normally.

Tube Check—This feature allows the operator to check for plugged knives or over-all obstructions with the toolbar raised. After pressing the Tube Check button, follow the on-screen instructions.

NOTE!: The Tube Check button will only be available for Anhydrous Ammonia systems.

Direct Injection—Button will navigate you to the Direct Injection Settings (see below) accessible from the module.

NOTE!: The Direct Injection button will only be available if a Raven ISO Injection pump is connected and setup in the active Profile.

The Pump Enable /Disable—Runs the Universal master switch for the pump. If it is checked the pump is enabled, unchecked the pump is disabled. This defaults to disabled at each power cycle.

NOTE! The ISO Liquid Switchbox master switch will turn the pump on and off while going through the field.

Pump Flow—Displays the current pump flow.

Pump Mode—Displays the mode the pump is set to (RX, Cal/Prime, Auto, Manual).

Pump Target & Actual Rate—Displays the pump's current Target and Actual Rate.

ISOBUS Liquid Control–Pull Type 3-Wire Boom Valves

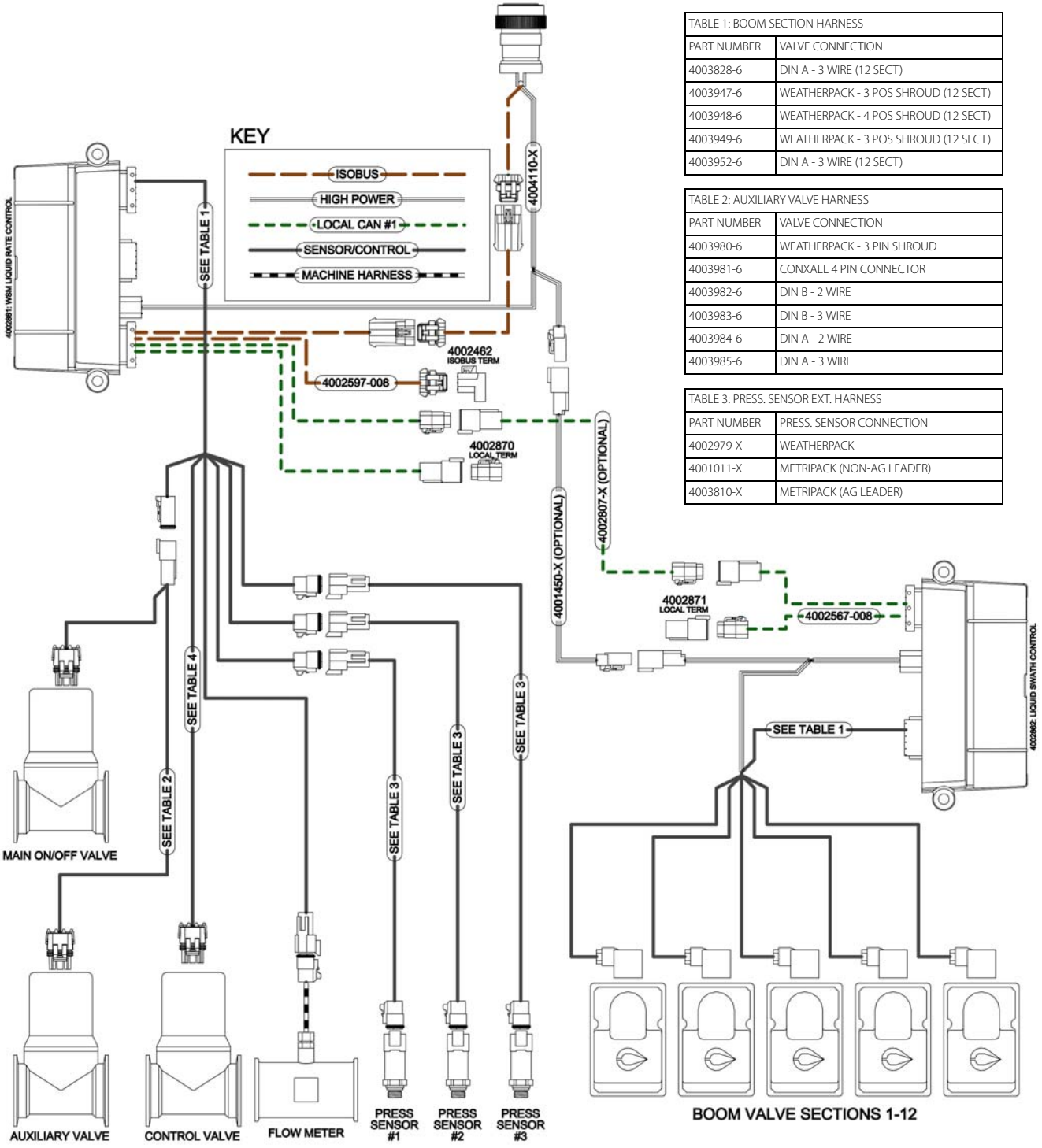


TABLE 1: BOOM SECTION HARNESS	
PART NUMBER	VALVE CONNECTION
4003828-6	DIN A - 3 WIRE (12 SECT)
4003947-6	WEATHERPACK - 3 POS SHROUD (12 SECT)
4003948-6	WEATHERPACK - 4 POS SHROUD (12 SECT)
4003949-6	WEATHERPACK - 3 POS SHROUD (12 SECT)
4003952-6	DIN A - 3 WIRE (12 SECT)

TABLE 2: AUXILIARY VALVE HARNESS	
PART NUMBER	VALVE CONNECTION
4003980-6	WEATHERPACK - 3 PIN SHROUD
4003981-6	CONXALL 4 PIN CONNECTOR
4003982-6	DIN B - 2 WIRE
4003983-6	DIN B - 3 WIRE
4003984-6	DIN A - 2 WIRE
4003985-6	DIN A - 3 WIRE

TABLE 3: PRESS. SENSOR EXT. HARNESS	
PART NUMBER	PRESS. SENSOR CONNECTION
4002979-X	WEATHERPACK
4001011-X	METRIPACK (NON-AG LEADER)
4003810-X	METRIPACK (AG LEADER)

TABLE 4: CHANNEL HARNESS		
PART NUMBER	CONTROL VALVE CONNECTION	FLOW METER CONNECTION
4003824-6	MATE-N-LOK 2-POS PLUG	DEUTSCH DT - 3-POS RECEPT>
4003825-6	DIN B - 2-WIRE	AMP SUPERSEAL 1.5-3 POS PLUG
4003953-6	MOLDED - 2-POSITION	CONXALL - 3 SOCKET REV PLUG
4003954-6	WEATHERPACK - 4-POS TOWER	WEATHERPACK - 3-POS TOWER
4003955-6	SURE SEAL - 3-PIN RECEPTACLE	SURE SEAL - 3-PIN RECEPTACLE
4003956-6	WEATHERPACK - 3-POSITION SHROUD	METRIPACK 150 - 3-POS TOWER
4003957-6	DEUTSCH DT - 2-POS PLUG	DEUTSCH DTM - 3-POS PLUG
4003970-6	CONXALL - 4 SOCKET REV PLUG	CONXALL - 3 SOCKET REV PLUG

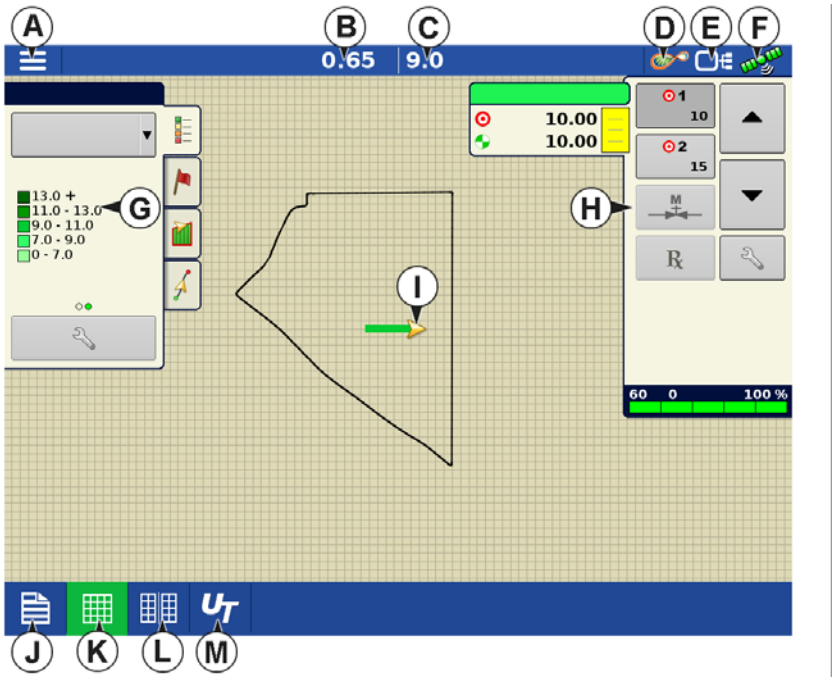
Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

NOTE!: For ISO Serial Application Rate module setup and settings, refer to pages page 364 - page 371.

Map View

Once a configuration has been completed, the Map View screen appears.

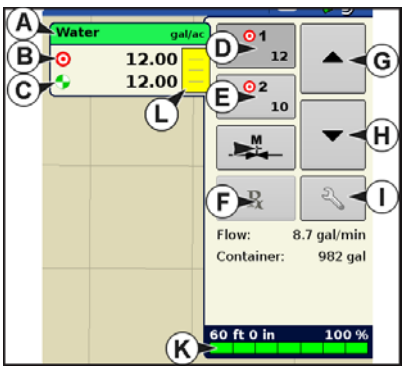


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Product Control toolbox
I. Vehicle Icon
J. Event Summary
K. Map View
L. Split screen
M. Universal Terminal

NOTE! Pressing the Map View button will cycle between the available Map screen views, and the appearance of the Map View button changes.

Product Control Toolbox

During DirectCommand Run Time operations, the Product Tabs are shown in the upper right-hand side of the Map screen. Press the Product Tabs, and an extended view shows the Rate buttons, Manual Valve Control button, Prescription button, Rate Increase and Rate Decrease arrows, and the Rate Setup button, all of which are described below.



A. Product
B. Target Rate
C. Actual Rate
D. Rate 1 button
E. Rate 2 button
F. Prescription button
G. Rate Increase arrow
H. Rate Decrease arrow
I. Rate Setup button
J. Section Status Indicator
K. Container Level

Target Rate—The Target Rate is desired application rate.

NOTE: In some conditions, the Target Rate may increment more quickly than the Actual Rate.

Actual Rate—The Flow Sensor returns the actual rate being applied.

NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.

Container Level—The Container Level shows the amount of product in the container.

Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Manual Valve Control button — (Not Available for this Operation) The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to prime the system before application or clean out the equipment at the end of the day.

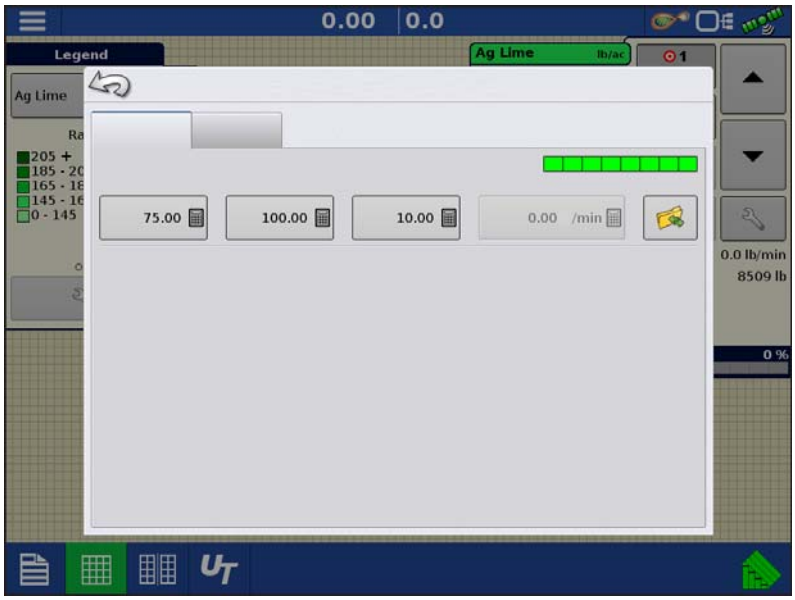
Rate Increase and Decrease Arrows — / allow Product Application Rate to be changed according to the Target Rate Increment. In using manual valve control, the increase and decrease buttons allow the position of the control valve to be defined by the operator.

Prescription button—

Rate Setup button—

Rate Control Settings

Adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import application product prescriptions. To access the Rate Control Settings screen, press the Rate Setup button on the Product Control Toolbox. The Rate Control Settings screen appears.



Rate 1 and Rate 2 — The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Press to enter the desired amount.

Increment — The Increment button allows operators to specify the increase or decrease amounts for a specified rate by using / on the Product Control Toolbox. Press to enter the desired increment.

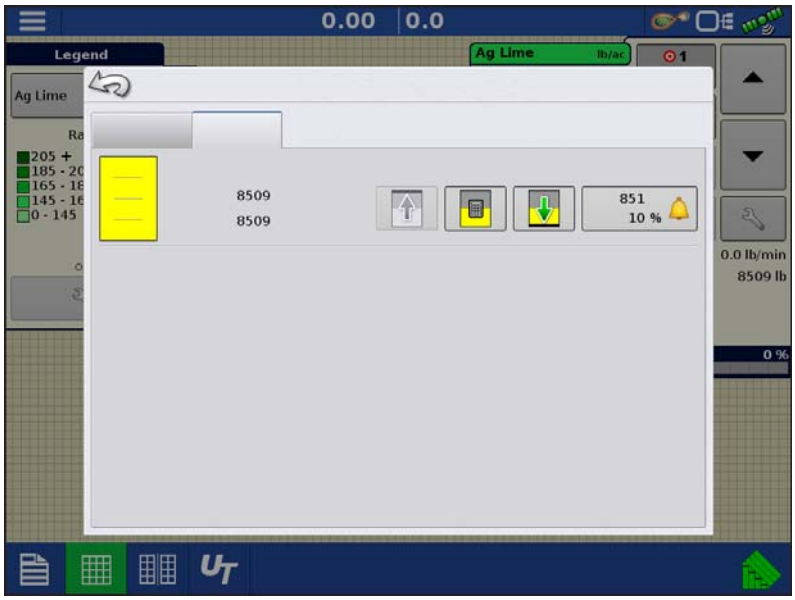
Prescription — To load a map-based prescription file, press the Prescription button.

Minimum Flow — (Used for DirectCommand Liquid Applications only). This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying with one or more boom sections off, the system automatically reduces the minimum flow setting according to the reduced spray width. To adjust this setting, press and enter the desired numeric value.

Container Level Settings

When filling or emptying container, use the Container Level portion of the Rate Control Settings screen to update the amount of product in the containers.

Container Level screen

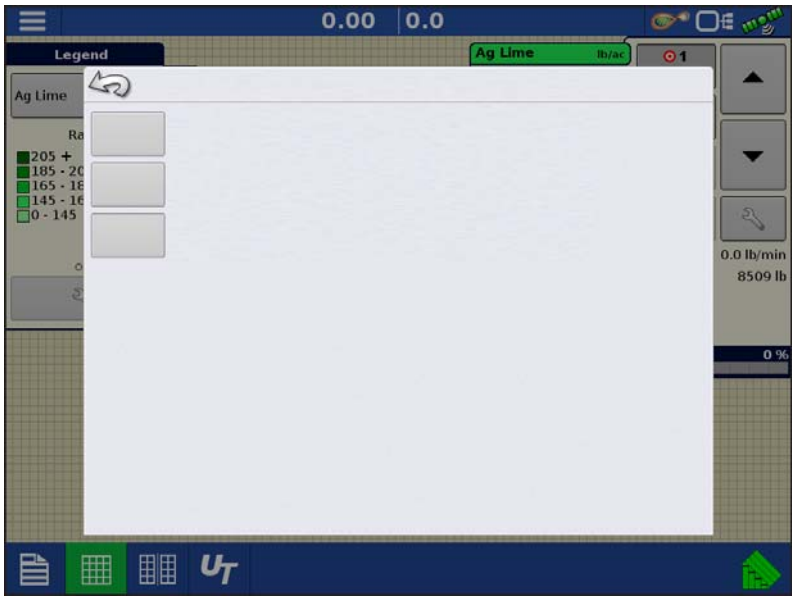


•**Tank Fill** — The Tank Fill button increases the container level logged in the display to the user-defined maximum volume (specified in the Container Setup Wizard).

•**Tank Empty** — The Tank Empty button decreases the container level logged in the display to zero.

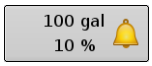
•**Tank Partial Fill** — The Tank Partial Fill button increases the container level logged in the display to specific amount that you specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

Adjust Container Amount



- **Add** — Adds product to the container.
- **Remove** — Removes product from the container.
- **Set** — Sets the product level in the container.

Tank Alarms



The Container Alarm button, which appears on the right of the Container Level portion of the Rate screen, displays the capacity of your tank as well as the percentage at which the Low Container Level warning will sound. To adjust these settings, press the button and the Container Alarm screen appears.

If you wish to adjust your container level warnings, use the following buttons on the right-hand side of the Container Alarm screen to make these adjustments.

The **percentage (%)** button sets the warning threshold according to the percentage of solution left in the tank. In the example above, the threshold is set at 10 percent.

The **units of measurement** icon sets the warning threshold according to the amount of solution left in the tank. This icon is named according to the container's units of measurement you specified during the Controller configuration procedure.

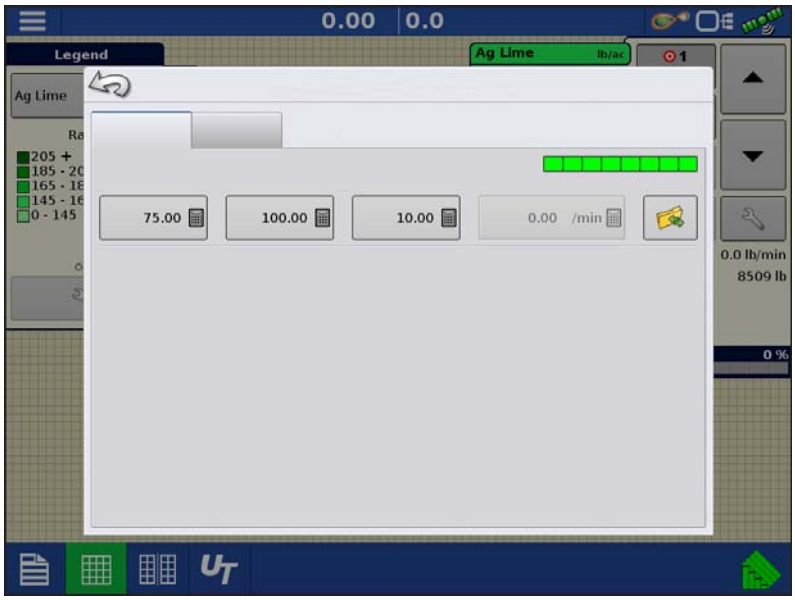
The **Disable Low Container Level** button, which appears as a bell with a red slash across it, disables the Low Container Level warning.

Loading Prescriptions

1. Press the Rate Setup button on the Control Toolbox.

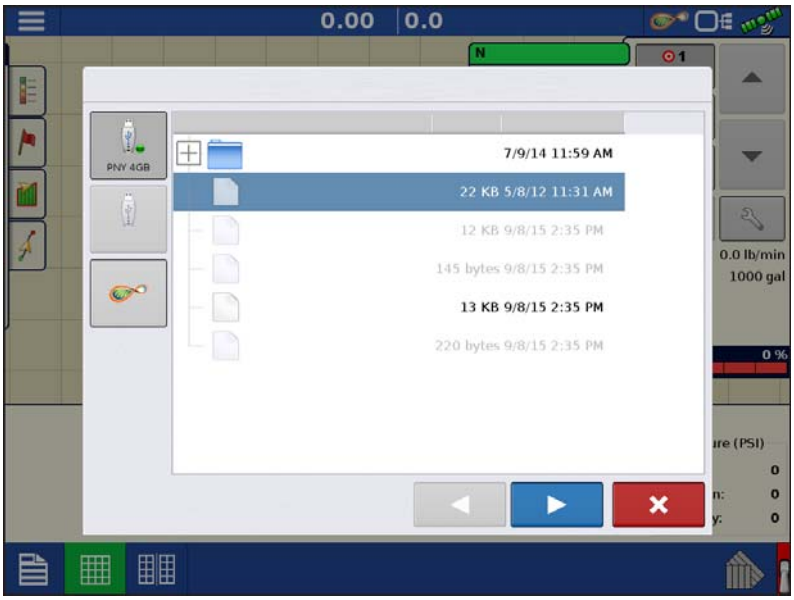
   The Rate Control Settings screen appears.

2. Press the Load Prescription button.

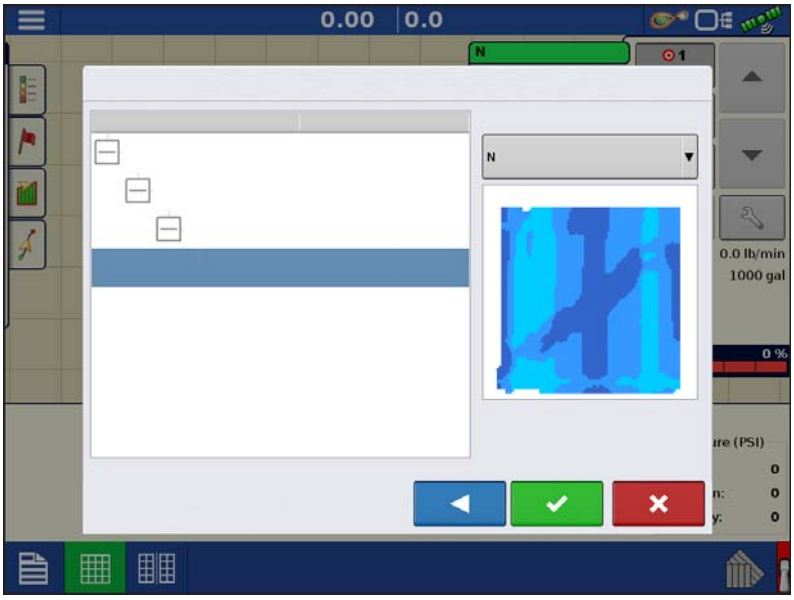


The Select File screen appears.

3. Highlight the correct .AGSETUP (prescription) or .shp (shape) file and press .



4. Next select your prescription in the Select Prescription screen, and select the correct controlling product from the Product drop-down box. A preview prescription map is displayed. Press the .
5. When you return to the Rate Control Settings screen, the prescription rate is now shown on the screen. The Load Prescription button has disappeared and in its place is the Remove Prescription button, which resembles a minus sign. Press the Remove Prescription button if you wish to remove the prescription from the field.
6. When you return to the Map screen, the prescription is now shown on the map.



Shape File Conversion

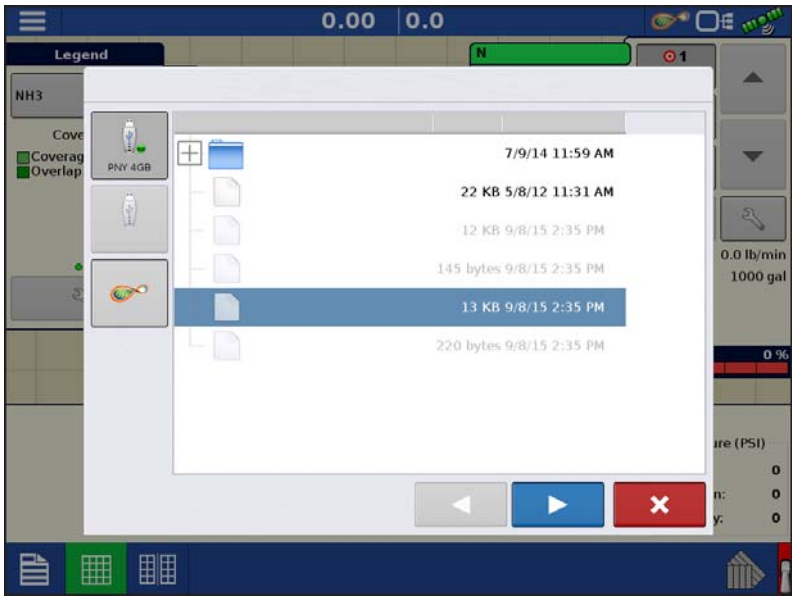
What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple products.

1. To begin, press the Rate Setup button on the Product Control Toolbox.

   The Rate Control Settings screen appears

2. Press the Load Prescription button.

3. The Select File screen appears. Highlight your desired .shp file and press .



4. Select Column From Shape File

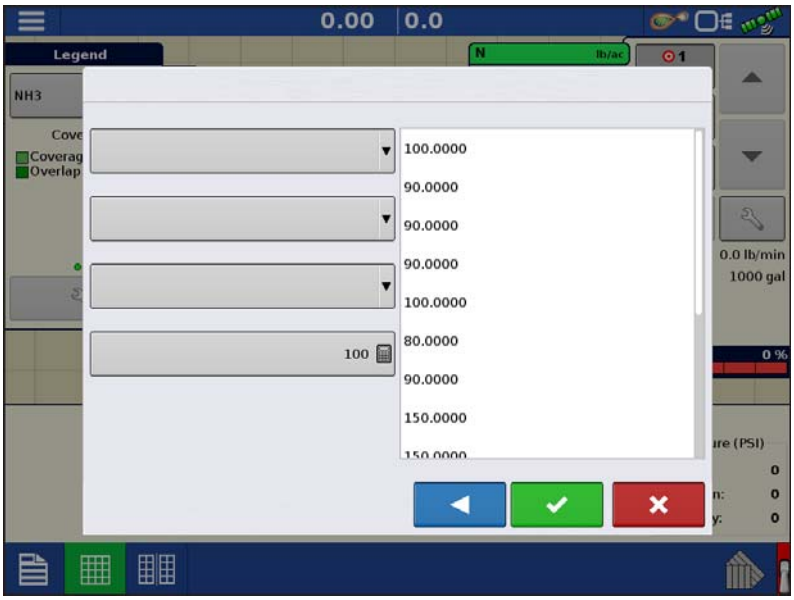
Select the column that contains the product recommendation rate. The list on the right side of the dialog shows sample data from the selected column.

5. Select Units

Select the controlling units for product application.

6. Default Rate Setting

The system assigns a default rate. Use the on-screen keypad to edit the value if desired.



NOTE!: Select the product and units that the shape file prescription was made for. Selection of the wrong data column or unit will result in misapplication of product.

ATTENTION!: The only time the default rate is used by the system during product application is if the Rate Outside of Field selection is set to " Rx default". This setting is located in the equipment configuration settings portion of configuration setup. If the Rate Outside of Field selection is set to "Rx default", the default target rate will be used when the vehicle exits the area covered in the prescription map.

Creating Products

Creating application products and product templates can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

NOTE! Creating products for your operation may differ than was it documented in this section. It will depend if you serial controlled application is liquid or granular.

Creating Single Products

To create a single product, to be added to a product template or to be applied by itself, use the on-screen wizard described in the following steps.

Select:

1. Product Type
2. Product Units
3. EPA Product Number (Optional)

   Check box if product is a Restricted Use Pesticide
4. Manufacturer name if applicable.

   Manufacturer name can be added to the drop-down menu by pressing .
5. Press to enter a unique name for the product.

Created product should appear under the Application heading located on the Product tab of the Configuration Setup screen.

NOTE: Some Fertilizer and Carrier product types are predetermined in the display. These product names cannot be edited. Their Manufacturer and EPA Numbers can be edited after the product is created. Examples are: Fertilizer>DAP or Carrier>30% UAN.

Creating Product Templates

Product Templates are set up by using the on-screen wizard.

NOTE!: Prior to making a new product template, it is recommended to add the individual products to the list in the units recommended by the chemical label.

It is recommended to create product templates that contain the products applied for a crop type or time of the season.

Examples are:

- Pre-Emerge Burndown
- Post-Emerge Corn
- Post-Emerge Beans
- Insecticide
- Fungicide

In each template the products can be checked on/off for the mix when loaded at the run screen.

1.

2. Select Tank Mix

   Define By
   - Total amounts - mix/blend defined by amounts added to the tank (total of each product in tank)
   - Rate/acre - mix/blend defined by the amounts applied per acre (rate of each product applied/area)
3. Enter a Base Amount or Base Rate and Units.
   - Total Amounts - Tank/Bin Size
   - Rate/Acre - For Rate Applied per Acre
4. Select Carrier
   - Press to create a new carrier.
5. Press by the Add Mix/Blend Contents box to start the process of adding components to the mix.
6. Select the desired component from the drop-down menu.

NOTE! More than 7 products can be part of a template, but only 7 or fewer can be active at the same time.

   - A new product can be set up at this time by pressing (+ icon) and following the Product Setup Wizard.
   - Press to add selected product, or press to return to Add Mix/Blend screen without adding a product.
7. Press to add an additional product.

8. When all components have been added press .
9. Enter Manufacturer name is applicable.
   - Manufacturer name can be added to the drop-down menu by pressing .
10. Press to enter a unique name for the mix/blend.
    - Press to complete the process of setting up the mix/blend, or press to return to the Configuration Setup screen without adding a mix.

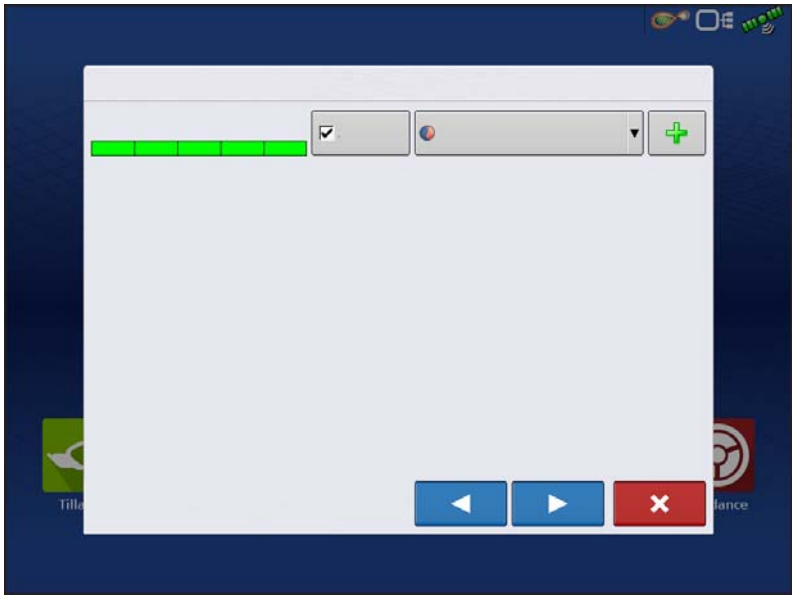
The product mix/blend appears under the Application heading located on the Product tab of the Configuration Setup screen.

Represents Product Templates

Configure Product Mix

When using a product template, the mix contents and amounts are defined in the Configure Product Mix screen available in the Event Setup Wizard, or Product button in the main menu.

1. Select your mix/blend from the drop-down list or press to create and new mix/blend.



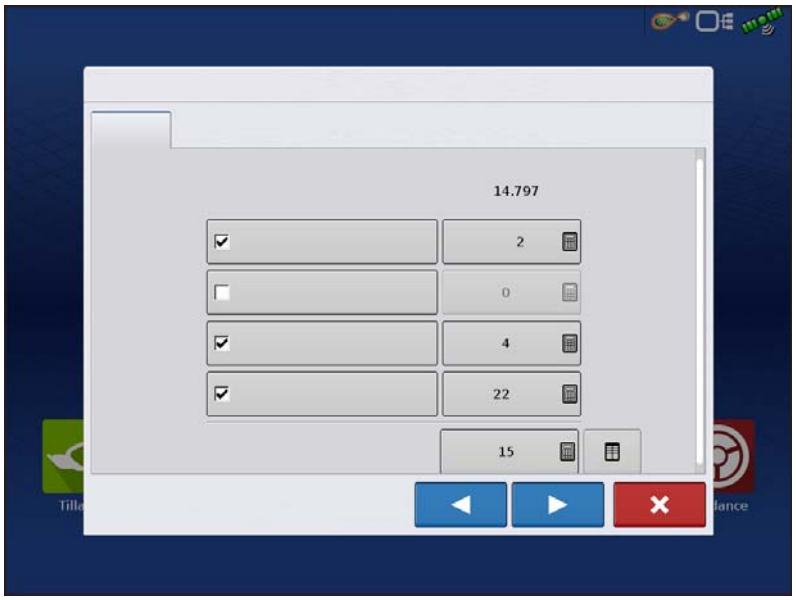
2. The product template mix contents and amounts are defined by:

   A. activating or de-activating products

   B. changing rate or total amount of product

   C. changing total amount of the product or overall rate of product application

   A product can not be active with a rate of zero. Press to access the Mix Calculator.



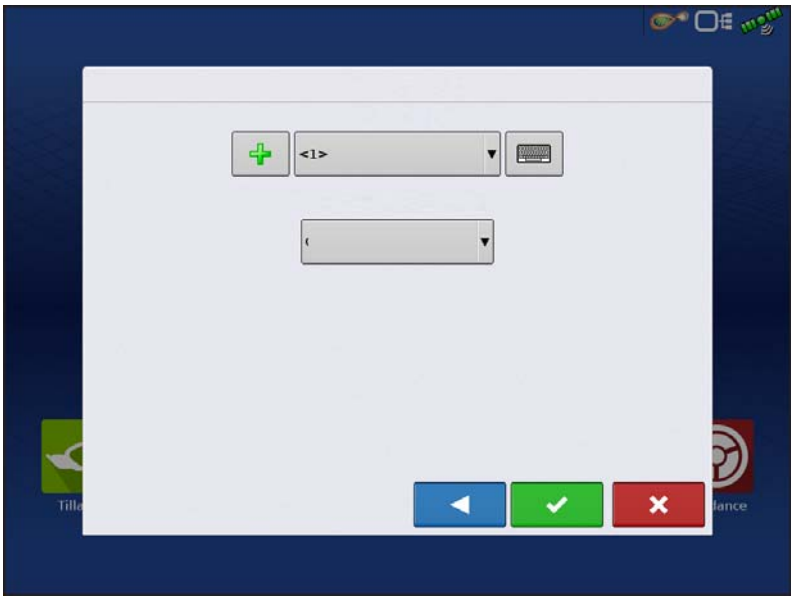
3. When a product template is setup using rate/area, the Mix Calculator can be used to show how much of each product to put in the tank when the user enters the desired amount to fill.

4. Press the Volume to Calculate button and input the total volume. Table will give the user the amount of each product to put in the tank.

5. Select Region from the drop-down menu or press to name Region

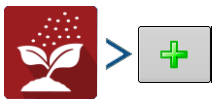
Verify the Controlling Product for the Mix/Blend.

Press to load the Event to the Map Screen, or press to return to Home screen without setting up an Event.

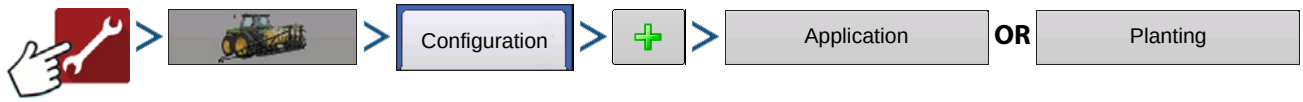


Create Configuration

To create a configuration, make the following button presses to start the Configuration Wizard and then follow the instructions given on the display. The configuration can be started in two places:



OR



WARNING! When setting up a Configuration for the Serial Application Rate module, on the Application Channels step of the Implement Wizard, a controller may default in this screen based on the displays Load-and-Go feature. DO NOT accept this controller for the configuration. Delete this controller by highlighting it and pressing Remove. Then create a new Liquid/Granular Application controller manually.

The predefined controller in the Application Channels screen may not be setup properly by the Load-and-Go feature. This Warning only applies to v1.0 of the InCommand 1200 and 8000.

Load Configuration

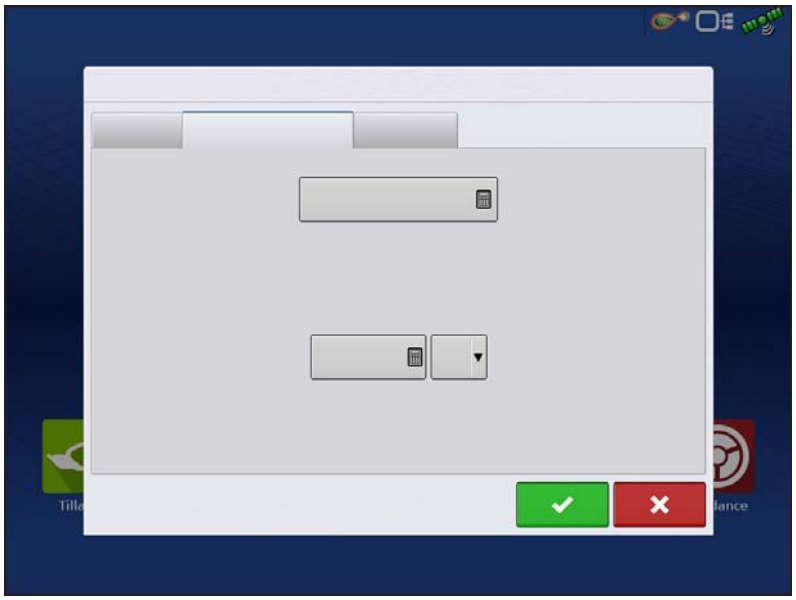
Press the Application operations button from the home screen. This will take you through the steps needed to load a configuration.

Implement Offsets

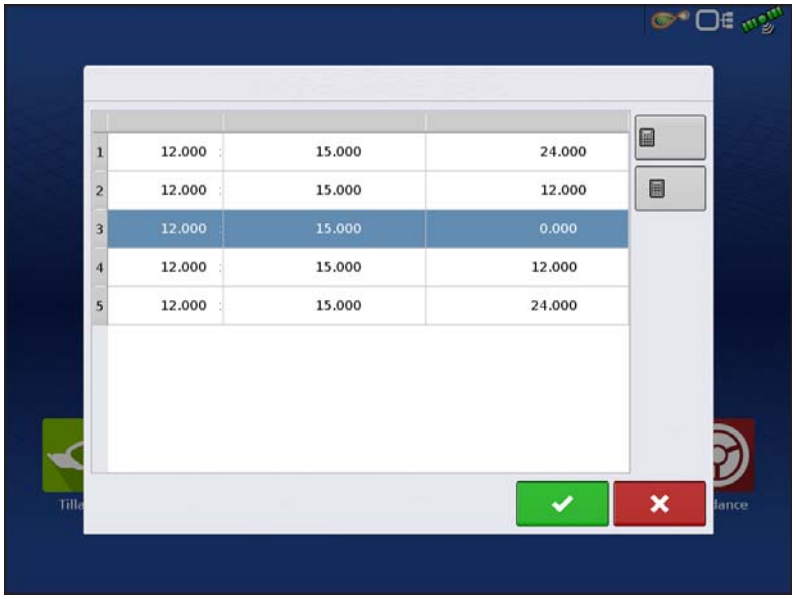
Implement Offsets screen appears, with each channel's settings shown on its own tab.

Defaults to the value entered during Configuration Wizard

Boom sections can independently be offset forward or back (Application Operation only)



1. Press [ ] to access Swath Section Offsets screen.



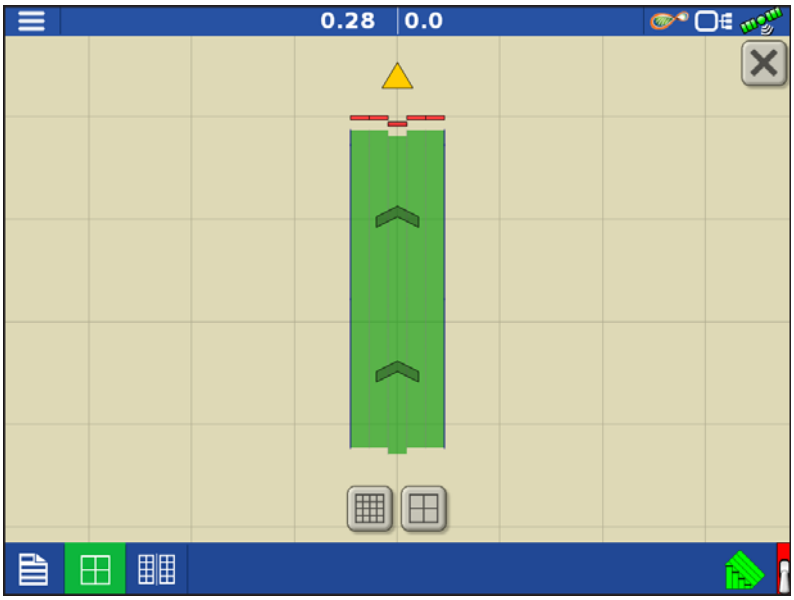
2. Select Swath section to edit and press Edit button.
3. Enter Offset for that specific section and Forward/Backward from rear axle.
4. Press [✓] to enter change.

Setup will indicate which offset is entered

[ ] **Global**—All sections have the same offset.

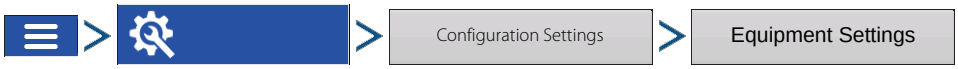
[ ] **Individual**—At least one section has a different offset.

Runscreen reflects section offsets



Equipment Settings

OR

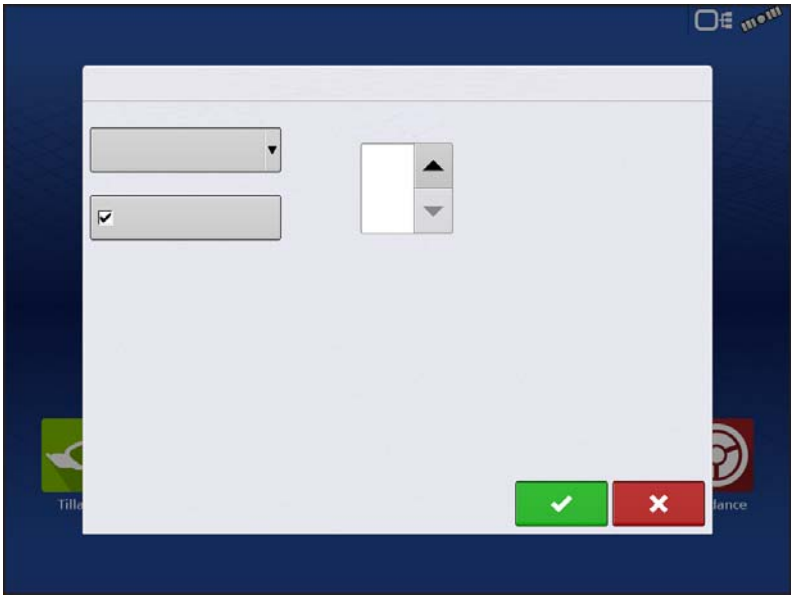


Rate Outside of Field—This setting will define how product will be controlled when leaving a field boundary.

Zero—This will stop application.

Last Good—This will continue application at the last known rate.

Rx Default—When using a prescription, this will apply at the Default Rate (or outside of boundary rate) as defined by the prescription file.



Rate Display Smoothing—Determines how the feedback from the control channel rate sensor will be displayed on the map screen. When de-selected, the system will display raw feedback from the rate sensor. When checked, the system will display target rate when the application rate is within 10% of the target rate setting.

Rate Change Look-Ahead—This setting compensates for any latency in the control system when changing between different product flow rates during variable rate application. The typical setting range for this is 0-1 seconds. This setting can be thought of as a "look ahead" value when using a variable rate prescription. The display will send the signal to change rates before hitting a transition line so that the applied rate is correct when crossing into the new management zone.

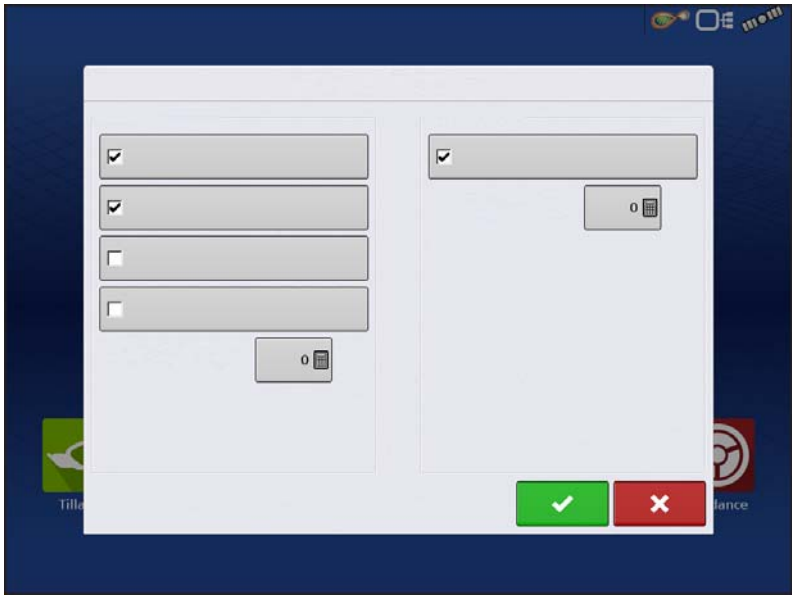
Enable Universal Terminal and Task Controller

To enable the Universal Terminal:

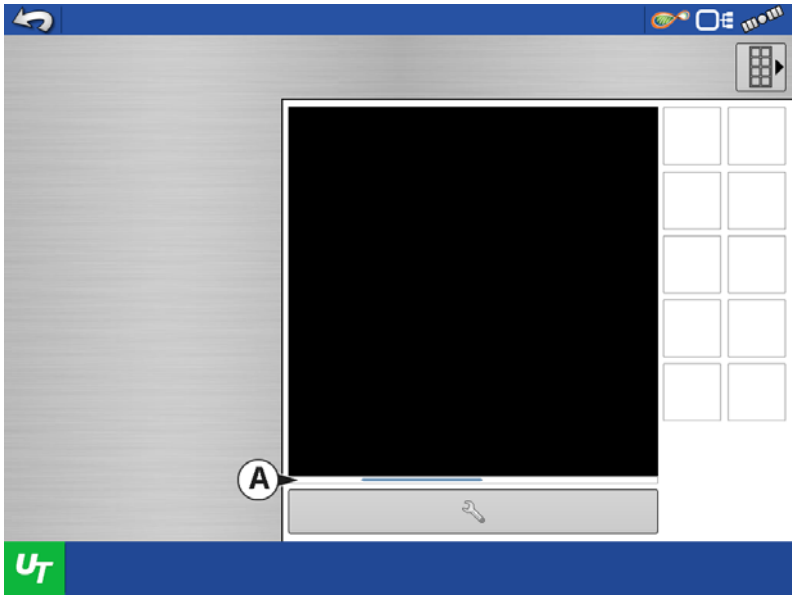
Once a Universal Terminal has been enabled

will appear in the task bar.

Toggle between the Universal Terminal run screen and other display functions by pressing the UT button.



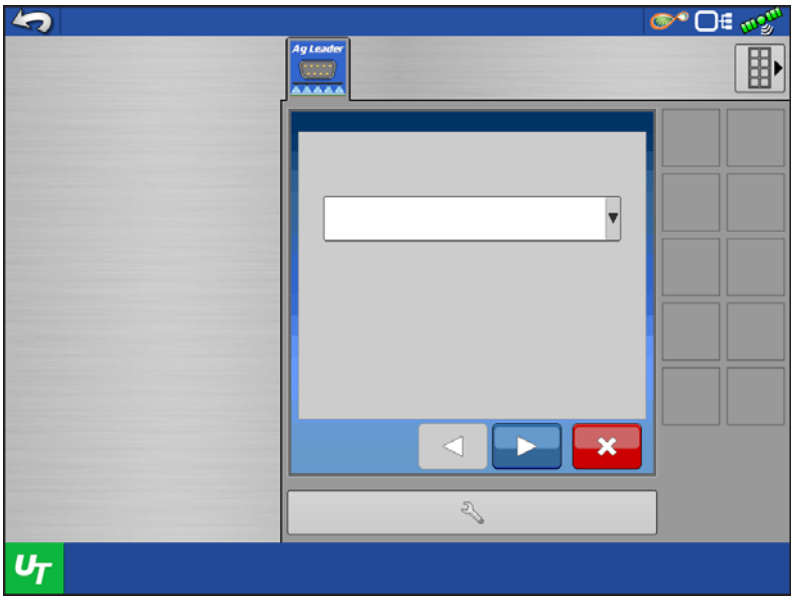
Status Bar (**A**) appears while Object Pool is in the process of loading.



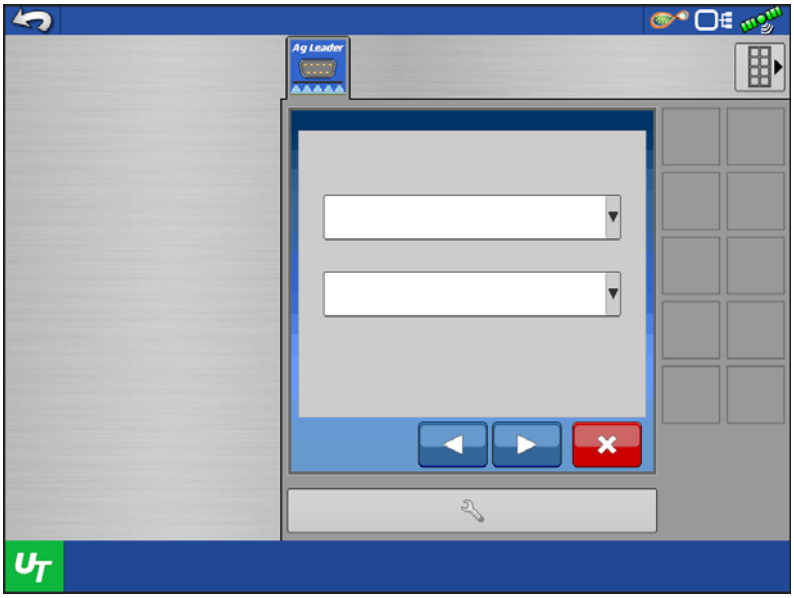
Configuration Setup

NOTE!: The user will have to setup a configuration for the Task Controller also.

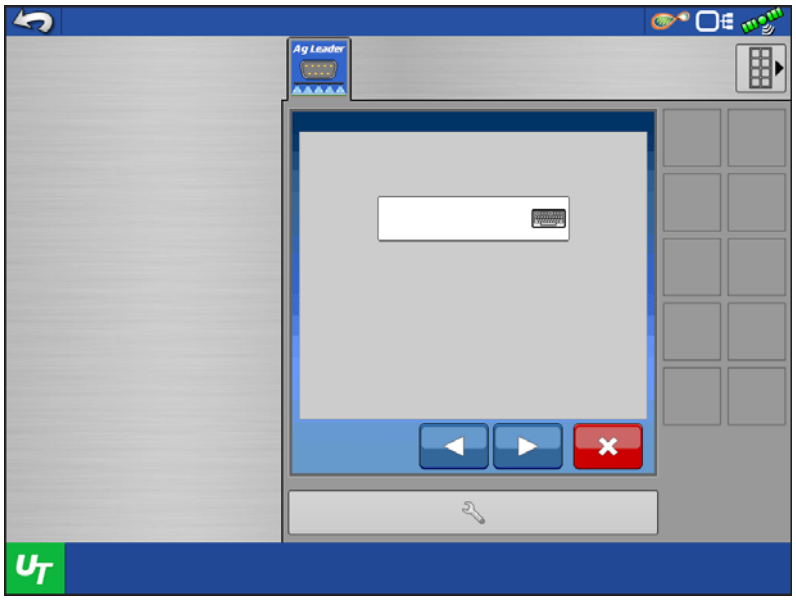
1. Use drop-down menu to select the System Type
    - Sprayer
    - Spinner Spreader
    - Seeder
    - Row Crop Planter



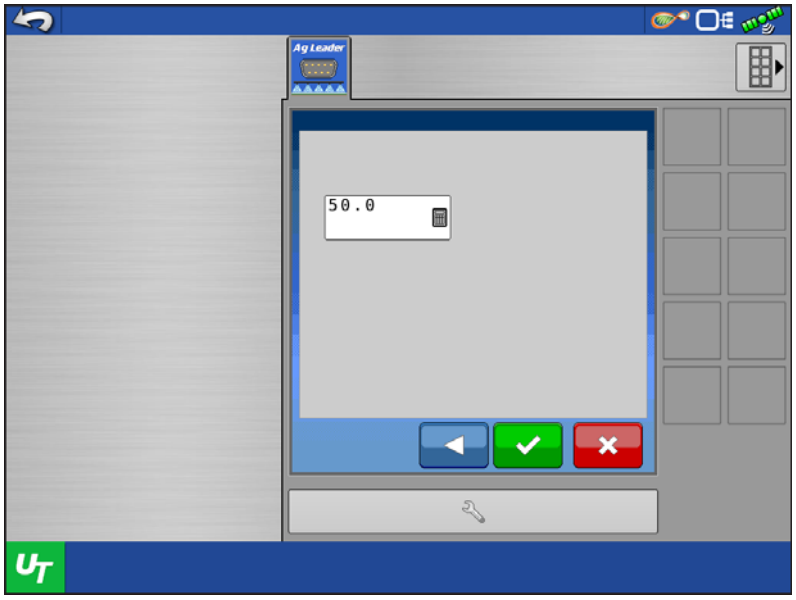
2. Use drop-down menu to select Controller Make and Model.



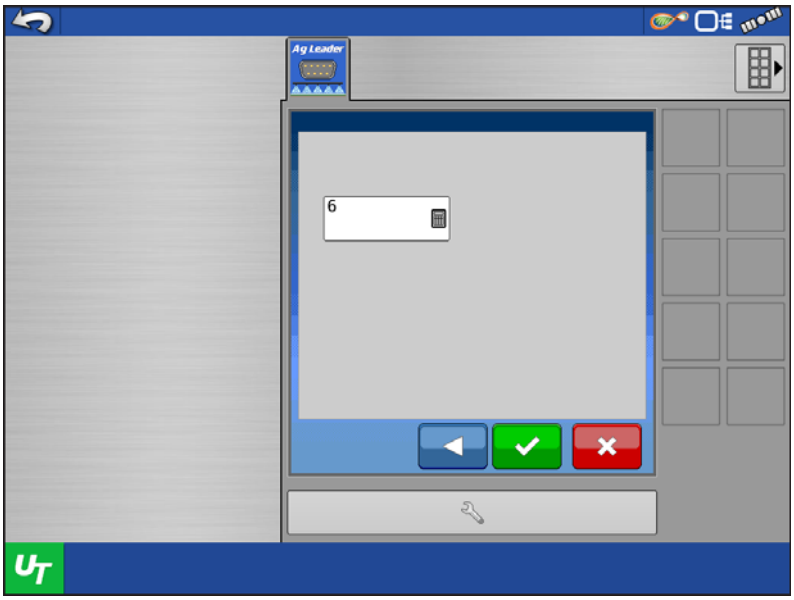
3. Use keyboard to enter the Configuration Name

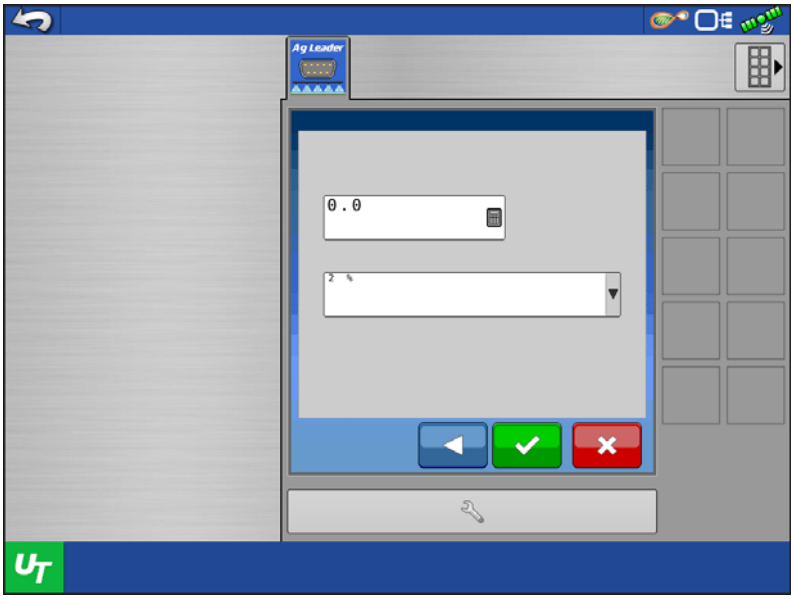


4. Use keypad to input the total swath width.



NOTE! Depending on the controller selected, user may be prompted to enter **Number of Sections** or **Nominal Rate** and **Percentage Rate Change**.



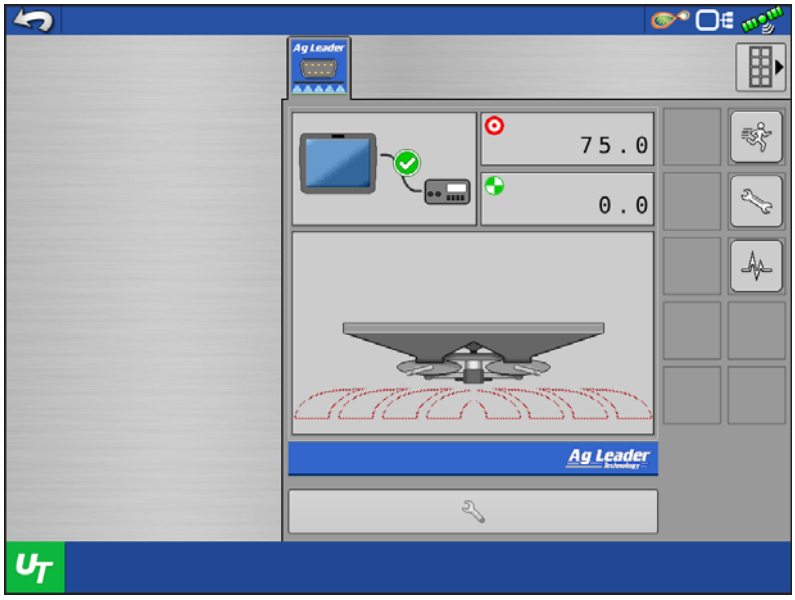


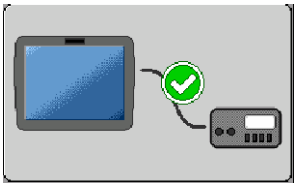
Status Screen

The status screen provides the user with readout of the connected controller's target rate, actual rate, section status, and connection status.

NOTE!: The target rate is not available for edit from the UT screen. Target rate can only be adjusted from the Run Screen.

NOTE! Some controllers allow users to increase the target rate by an increment amount of their own. The ISO Serial Bridge module will not know that the Target Rate has changed and may trigger a Rate Not Responding Alarm. To avoid this, use the increment increase/decrease function within the Ag Leader display.

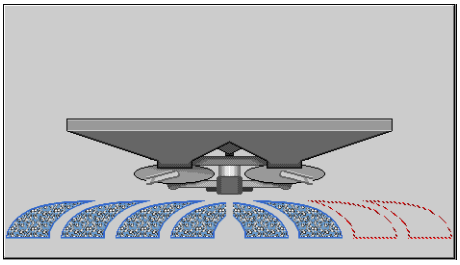




Serial Connection Status – Indicates if the ISOBUS Serial Application Rate module is communicating with the connected controller.

Target Rate Status – Indicates the target rate sent to the connected controller.

Actual Rate Status – Indicates the actual rate received from the connected controller.



Boom Section Status – Indicates the on/off status of the sections sent to the connected controller.

Red = section off

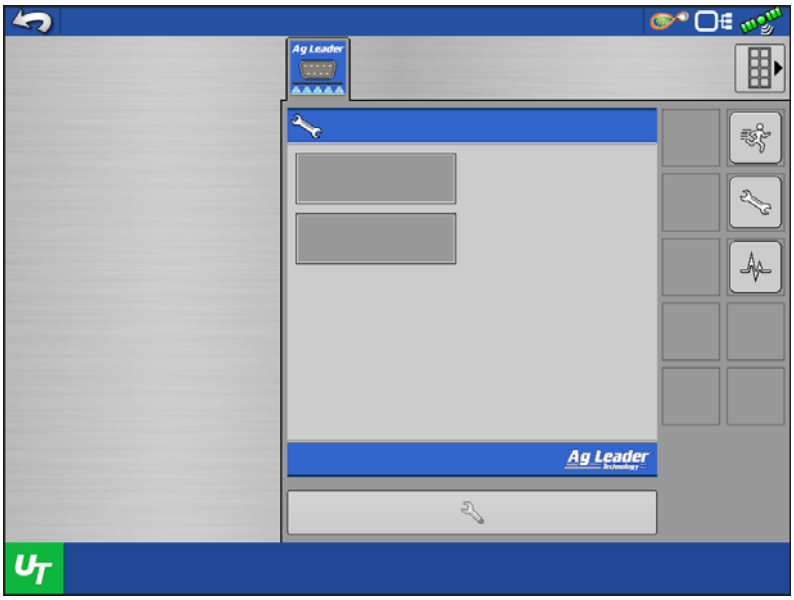
Blue = section on

Settings Screen

Press the Settings button.

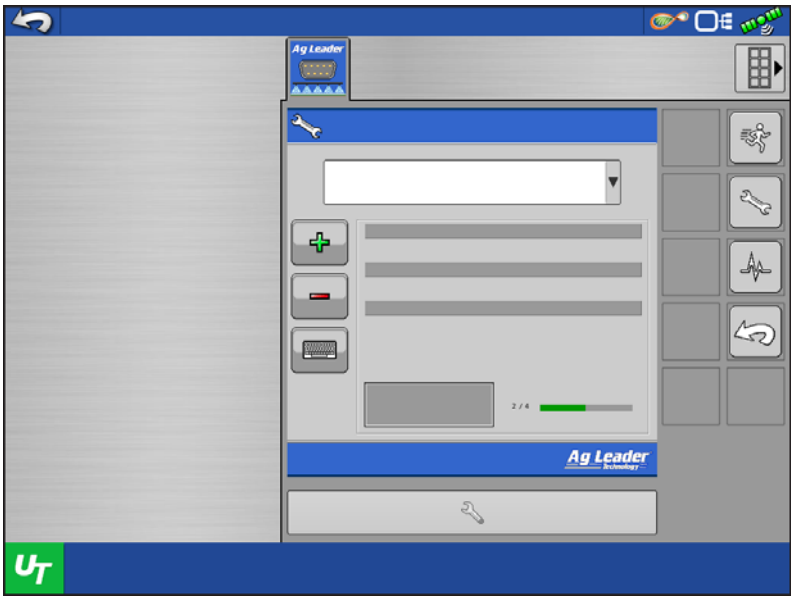
Manage Configurations

Press **Manage Configurations** button to edit system configurations.



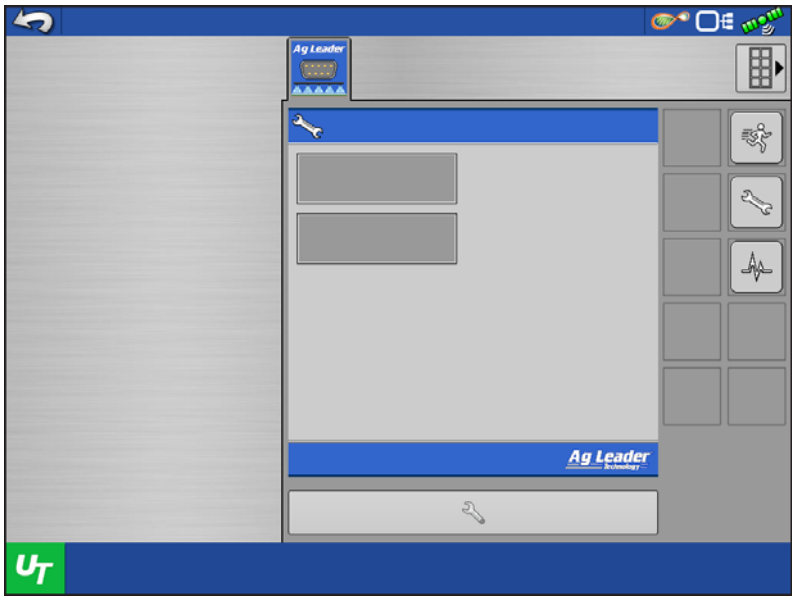
A user can add, remove, edit, or select an active configuration. The module will save up to 4 configurations.

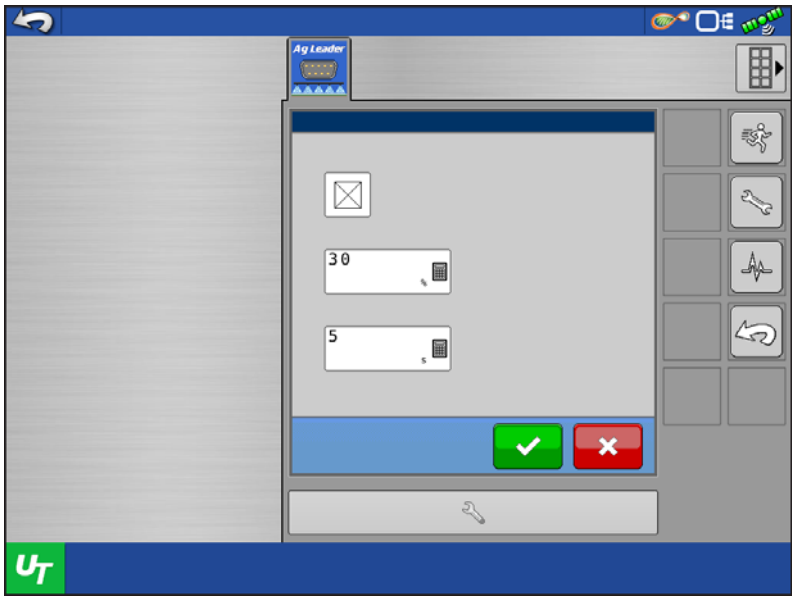
ATTENTION! Always verify that the Active controller in the Universal Terminal matches the configuration being utilized on the displays run screen.



Alarm Settings

Press **Alarm Settings** button to edit alarm thresholds.





Warning Enabled – With this setting enabled, the user will get a "Rate Not Responding" alarm when the actual rate does not fall within the threshold and timeout settings. The user will not receive an alarm if this setting is disabled.

Rate Not Responding Threshold – This setting defines the percent value the actual rate can be off from the target rate and not trigger the "Rate Not Responding Alarm" alarm.

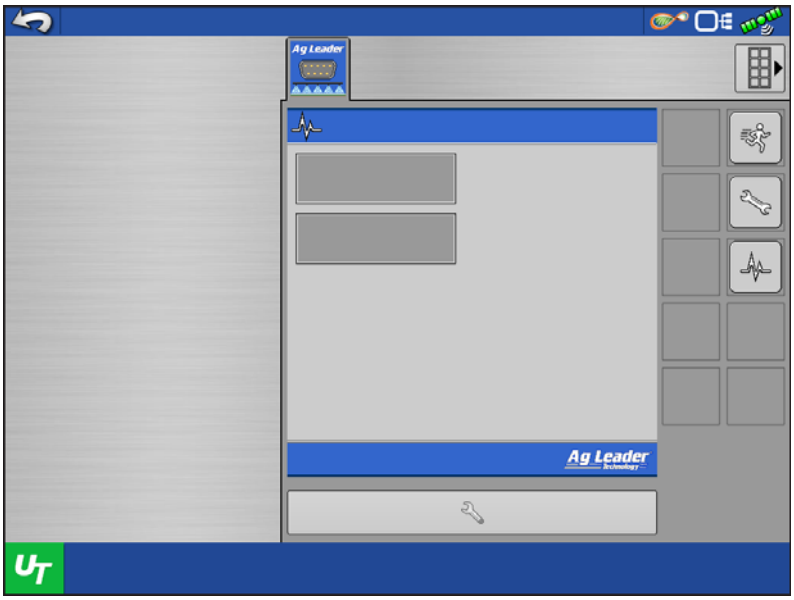
Rate Not Responding Timeout – This setting defines the amount of time the actual rate can fall outside the Rate Not Responding Threshold without triggering the "Rate Not Responding Alarm" alarm.

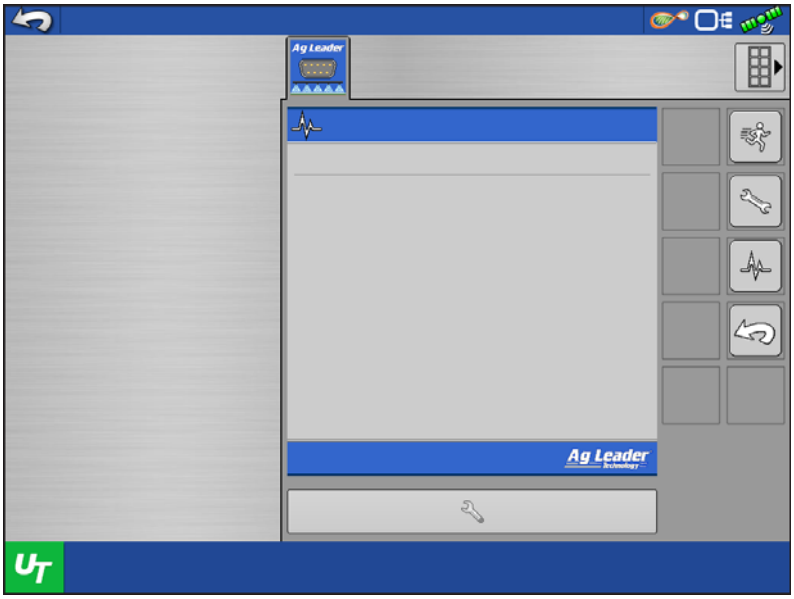
Diagnostics

Press Diagnostics button.

Module Diagnostics – Contains module diagnostic information to assist in troubleshooting.

Alarms – Contains any active alarms from the module.





Troubleshooting Serial Control Applications—Liquid

Problem: Rate changes on the display, but not on the controlled console.

Solution:

1. Verify the current firmware is running on the display and Serial Application Rate module.
2. Check the settings specific to your controlled console.
3. Check cabling and all connections.
4. Disconnect the serial connection and determine if the controller is functioning properly without the display.

Problem: The display rate and serial-controlled rate do not match.

Solution:

1. Verify the current firmware is running on the display and the Serial Application Rate Module.
2. Check the percent rate change.

Troubleshooting Serial Control Applications—Granular

Problem: Rate changes on the display, but not on the controlled console.

Solution:

1. Verify the current firmware is running on the display and Serial Application Rate module.
2. Check the settings specific to your controlled console.
3. Check cabling and all connections.
4. Disconnect the serial connection and determine if the controller is functioning properly without the display.

Problem: The display rate and serial-controlled rate do not match.

Solution:

1. Verify the current firmware is running on the display and Serial Application Rate Module.
2. Check to make sure the nominal rate in the display matches the nominal rate in the serial-controlled console.

ISO Serial Application–Support Controllers

Brand	Model	Additional Information	Controller Channel	Multiple Product Control	Automatic Swath Control**
Hardi	HC 5500 (with JobCom)	Multiple Section[1]	NA		X
Bogballe	Zurf	Multiple Section[1]	NA		X
	Calibrator ICON	Multiple Section[2]	NA		X
	Calibrator UNIQ	Multiple Section[2]	NA		X
	Calibrator 2003	Multiple Section[2]	NA		X
UNIA Group	BRZEG	Single Section	NA		X
Reco/Sulky	Vision-X	Single section	NA		X
Kuhn	Quantron	Single section	NA		X
LH Agro	LH5000	Single section	NA		X
RDS	Pro	Single section	NA		X
Amazone	Amatron+	Single section	NA		X
Rawson	AccuRate	Single Section or Split Planter[3]	NA		X
	AccuPlant	Single section	NA		X
Veris	Precision Controller	Single section	NA		X

1 Performs section control by decreasing the overall swath width based on machine and controller setup.

2 Performs section control by reducing the applied rate to match the new "section" width; overall swath width is not physically changed.

3 Dependent on number of motors operated by the controller.

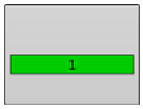
**Automatic Swath Control is dependent on the vehicle/implement and controllers capability. Ensure the vehicle or implement is physically capable of Automatic Swath Control.

Brand	Model	Sprayer	Row Crop Planter	Seed Drill	Spinner Spreader
Hardi	HC 5500	X			
Bogballe	Zurf				X
	Calibrator ICON				X
	Calibrator UNIQ				X
	Calibrator 2003				X
UNIA Group	BRZEG				X
Reco/Sulky	Vision-X	X			X
Kuhn	Quantron	X			X
LH Agro	LH5000	X		X	X
RDS	Pro	X			X
Amazone	Amatron+	X		X	X
Rawson	AccuRate		X		X
	AccuPlant		X		
Veris	Precision Controller		X		

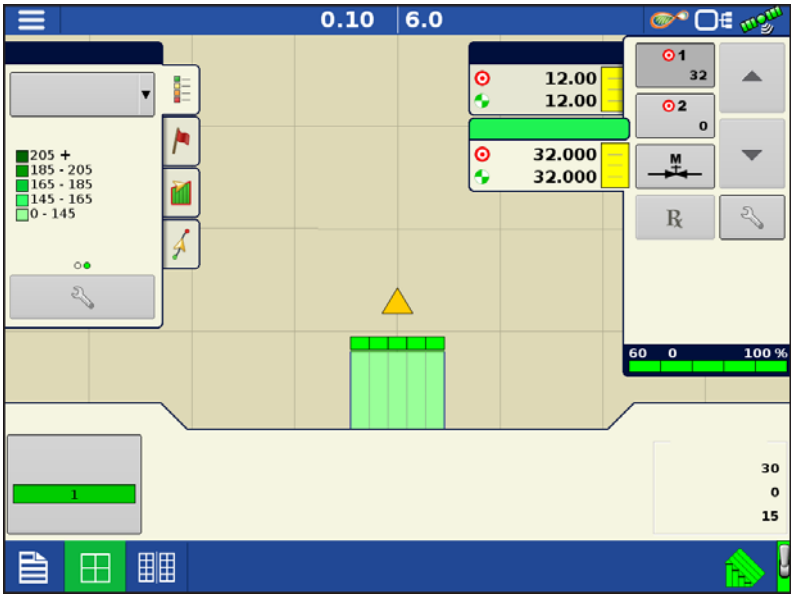
DirectCommand interfaces with the Raven SCS Sidekick™ for complete control over chemical injection applications. The display can support up to four Raven SCS Sidekick™ injection pumps plus a liquid carrier.

Map View

Once a configuration has been completed. the Map View screen appears.



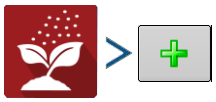
Number of injection controllers in the configuration. Bar turns green when product is being dispensed.



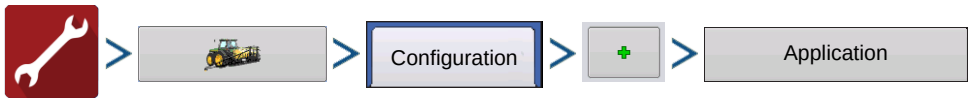
Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:



OR



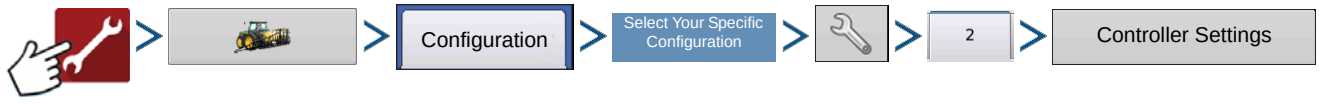
Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

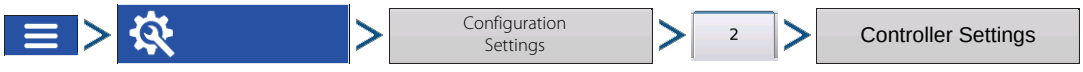
Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

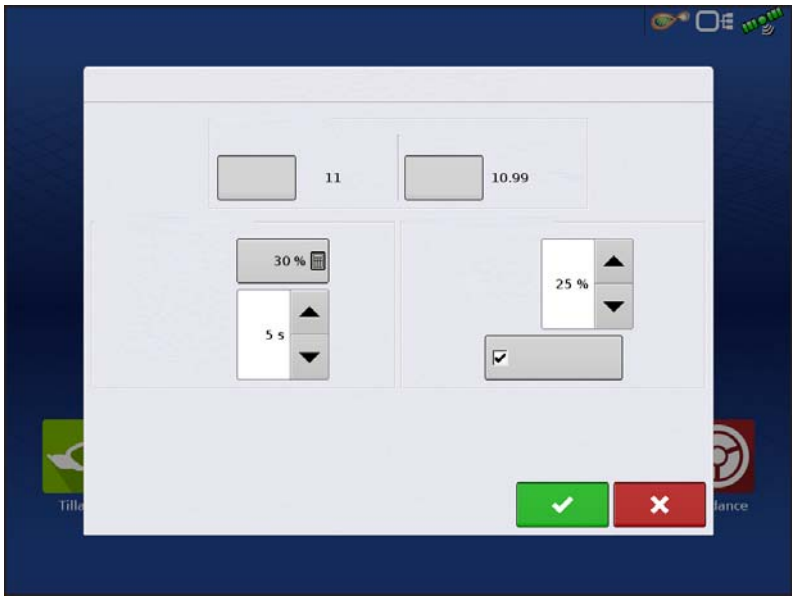
Setup Configuration



OR



Pump Calibration



- **Factory Calibration**—This number is found on the tag of the Digital Pump Speed Sensor. This tag number represents pulses per 10 fluid ounces. Divide the tag number by 10 and enter this number. Once entered, this number should not be changed.
- **Perform Calibration**—Press the Perform Calibration button to begin the calibration procedure for the Direct Injection pump. The pump will not run until this calibration has been performed.

Rate Response Warning

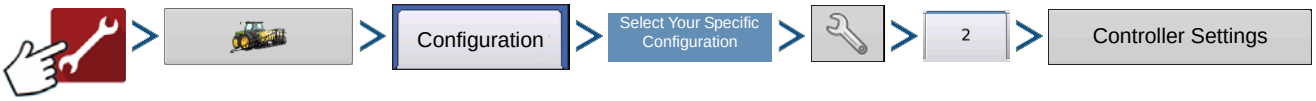
- **Error Threshold**—The user-defined percentage of actual rate error allowed before an alarm sounds.
- **Error Delay**—The number of seconds that the actual rate falls out of the error threshold before an alarm sounds.

Flow Monitor Warning

- **Error Threshold**—The percentage of perceived application error, based on the discharge flow sensor.
- **Enable Warning**—The Enable Warning check box allows you the option of displaying the Flow Monitor Warning.

Calibrating an Injection Pump

Calibrate each injection pump at the beginning of each season and any time repairs are made.



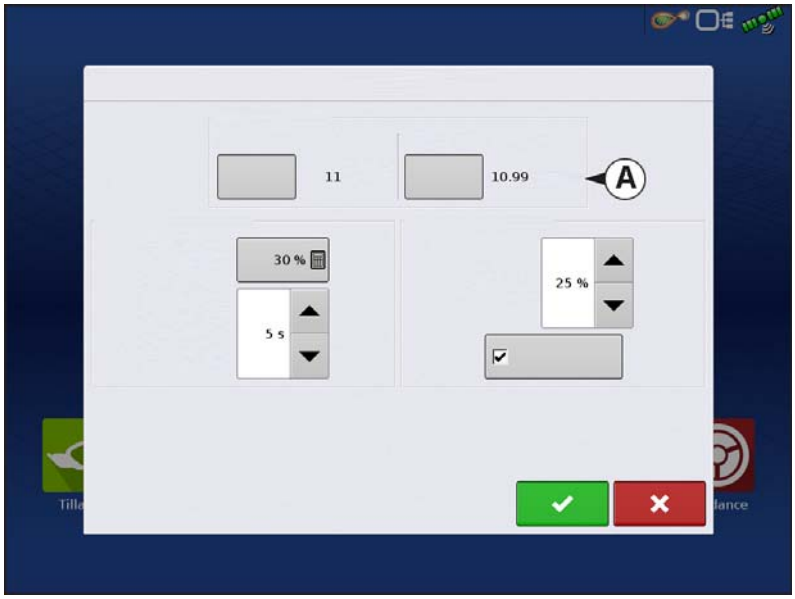
1. **Enter Factory Calibration**—Before entering a Direct Injection Calibration, a Factory Calibration must be entered. If you have not already done so, enter the Factory Calibration Number by pressing the Factory Calibration button. This number is found on the tag of the Digital Pump Speed Sensor. This tag number represents pulses per 10 fluid ounces. Divide the tag number by 10 and enter this number. Once entered, this number should not be changed.
2. **Press Perform Calibration**—Underneath Pump Calibration, press the Perform Calibration button.
3. **Prime the Direct Injection Pump**—The Pump Calibration Wizard appears. Before beginning this calibration procedure, it is recommended that you first prime the Direct Injection pump. Press the Prime button and continue along with the priming procedure as described in "Priming an Injection Pump" on page 377, beginning with Step 3.

   After the priming procedure is finished, you will return to this Pump Calibration Wizard window. Press to continue.
4. **Enter the Dispense Amount**—Enter the amount of product that you want dispensed. Press to continue.
5. **Acknowledge the Warning**—Prepare to catch any product dispensed in an appropriate container. Press to continue.
6. **Start Calibration**—Press the green-colored START button to begin the calibration procedure. The Pump Calibration Wizard automatically counts up to the amount that you specified in Step 4. The button will turn red and displays STOP while the product is being dispensed. When the procedure is finished, the button will display START and turn gray.

   Press to continue.

NOTE!: You may press the Reset button if you wish to start the calibration procedure over.

7. **Enter Actual Dispense Amount**—.Enter in the actual amount of the product that was dispensed. Press to continue.
8. **Calibration Complete**—The Pump Calibration number appears. The New Injection Pump Calibration Number now appears in the Pump Calibration screen. From this point, you may either:
   - Repeat the calibration by pressing the **Repeat Calibration** button.
   - Press to complete the calibration and exit the Pump Calibration Wizard.
9. **Calibration Displayed on Controller Settings screen**—The new Injection **Pump Calibration Number (A)** now appears in the Pump Calibration screen.

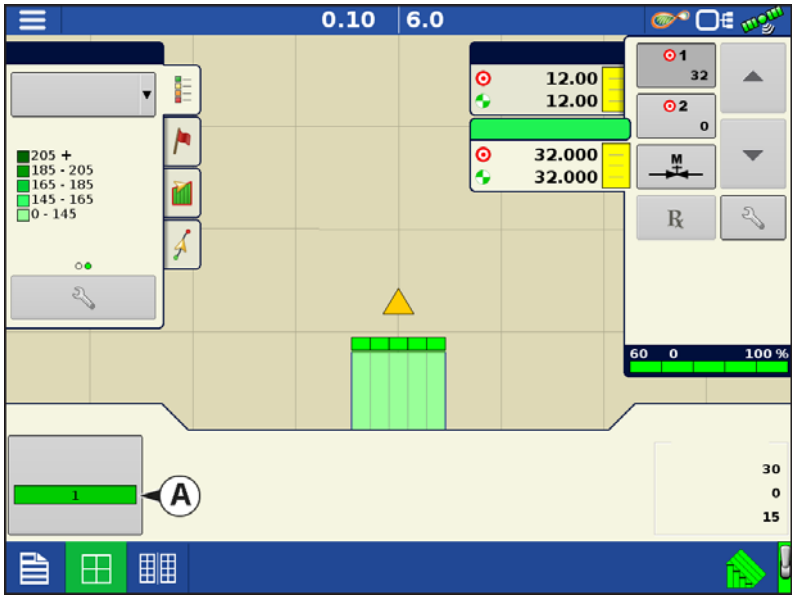


Priming an Injection Pump

If you are using a Direct Injection configuration, you must prime the Injection Pump each time you flush or refill a tank, or change products. This ensures that air is not in the product lines.

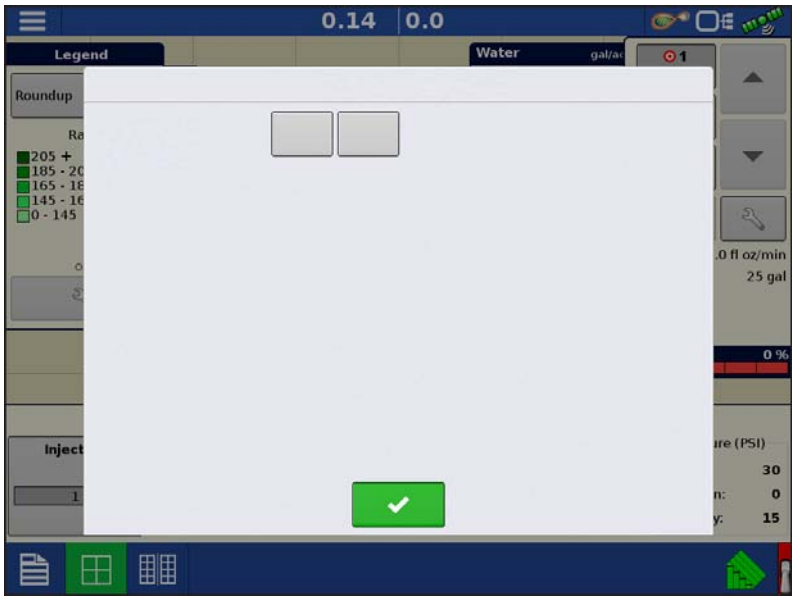
ATTENTION!: Failure to perform this priming procedure before beginning a Direct Injection application could result in skips at the start of field operations.

1. **Press Injection Control button (A)**—To prime the Injection Pump, first go to the Map screen. Press the Injection button. The Injection button is located at the left-hand side of the Equipment Tab. The Injection Controls screen appears.



2. **Press the Prime button**—At the Injection Controls screen, press the Prime button.

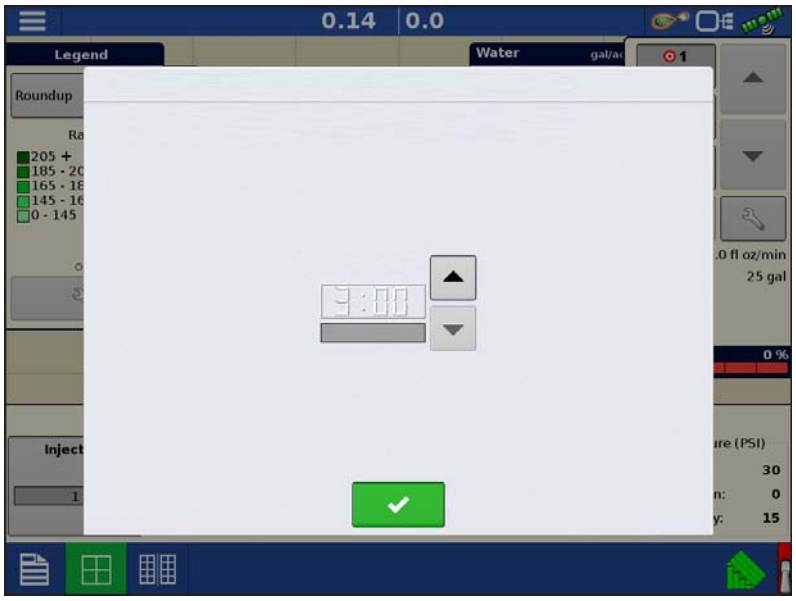
   - You may agitate the Direct Injection tank by pressing the **Agitate** button. Once pressed, this Agitate setting will continue even after the Priming process is finished, until you press a second time. To determine if a product should be agitated, check the product specifications.



NOTE! In order for a Direct Injection tank to agitate the product, you must set the agitator motor switch on **Run** (which agitates the product continuously) or **Pulse** (which agitates the product intermittently).

3. **Acknowledge the Warning**—A warning appears, stating that you must circulate the product back to the Direct Injection tank. Acknowledge the warning by pressing .

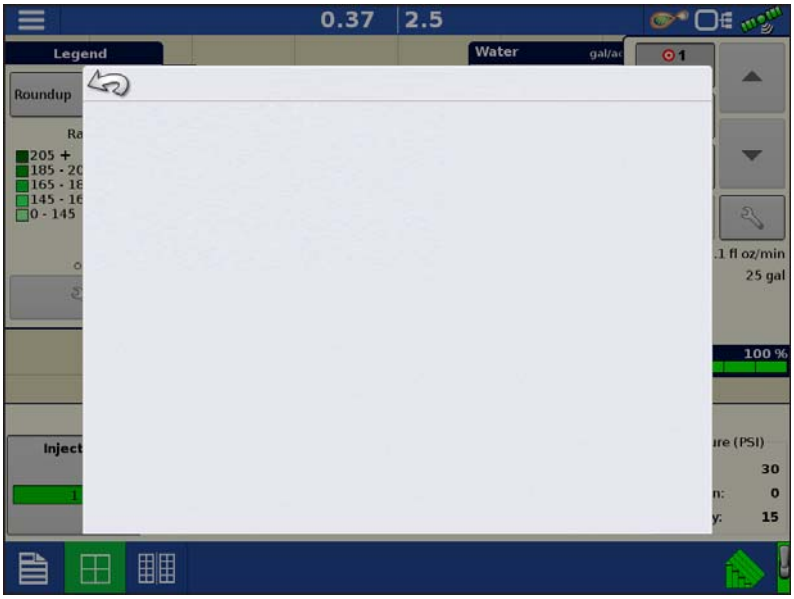
4. **Start Pump and Set Desired Speed**—The Injection Pump Prime screen appears. The countdown time remaining is shown in the black box. The bar underneath turns green when the pump is operating. Use to manually increase or decrease the pump speed.



NOTE!: The recommended priming time is three minutes (3:00), but the routine can be ended at any time by pressing .

5. **Acknowledge the Warning**—A warning appears, stating that you must return chemical injection plumbing to a field-ready state. Acknowledge the warning by pressing .

Injection Diagnostics



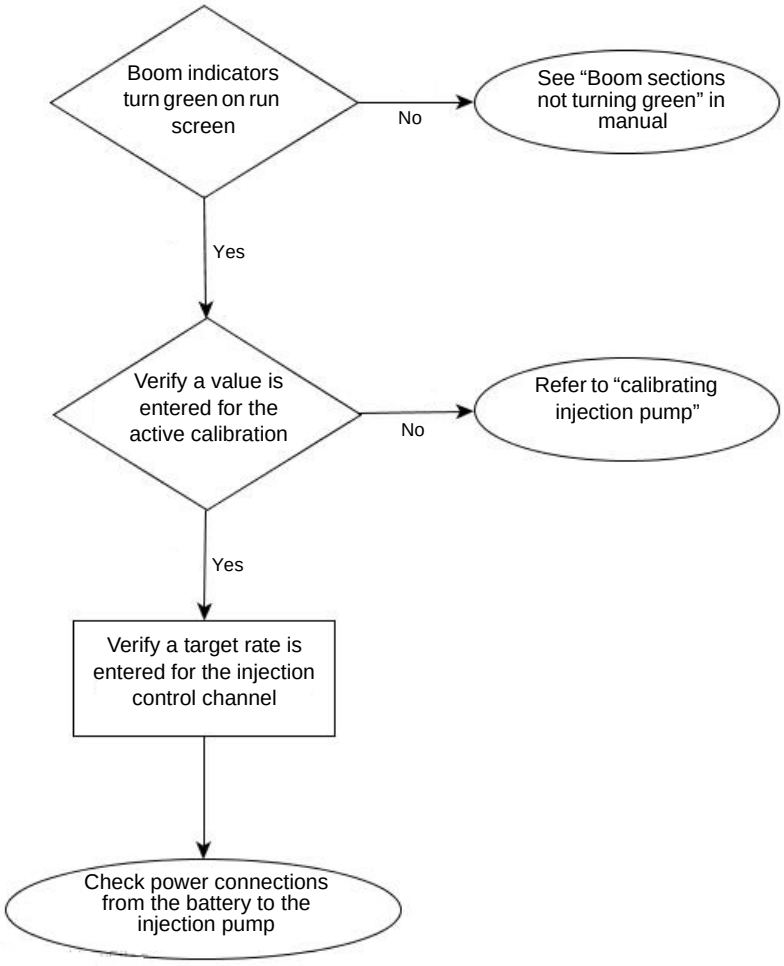
The Injection Diagnostics screen provides raw values from sensors verifying that the pump's output is working. To go to the Injection Diagnostics screen, press . At the Devices screen, highlight the item marked **Direct Injection Module** then press the **Diagnostics** button. The Injection Diagnostics screen appears. In addition to the Controller's Name and Serial Number, it provides the following information:

- **Digital Pump Speed**—Displays volume information, shown in Hz.
- **Analog Pump Speed**—Displays varying voltage as pump speed is increased or decreased.
- **Discharge Flow Monitor**—Displays information showing that flow is being discharged for every piston stroke.
- **Flow/Speed Sensor Ratio**—The ratio that the system derived for calibration.

Troubleshooting

When controlling a chemical injection pump using the Injection Module PN: 4000896, the configuration requires the use of a Liquid Module PN: 4000394. The injection control is based off of the vehicle that has been configured for the liquid DirectCommand control channel. Once configured, the Injection pump uses the same switch inputs and ground speed input that has been configured for the liquid system.

Direct Injection: Pump Doesn't Run

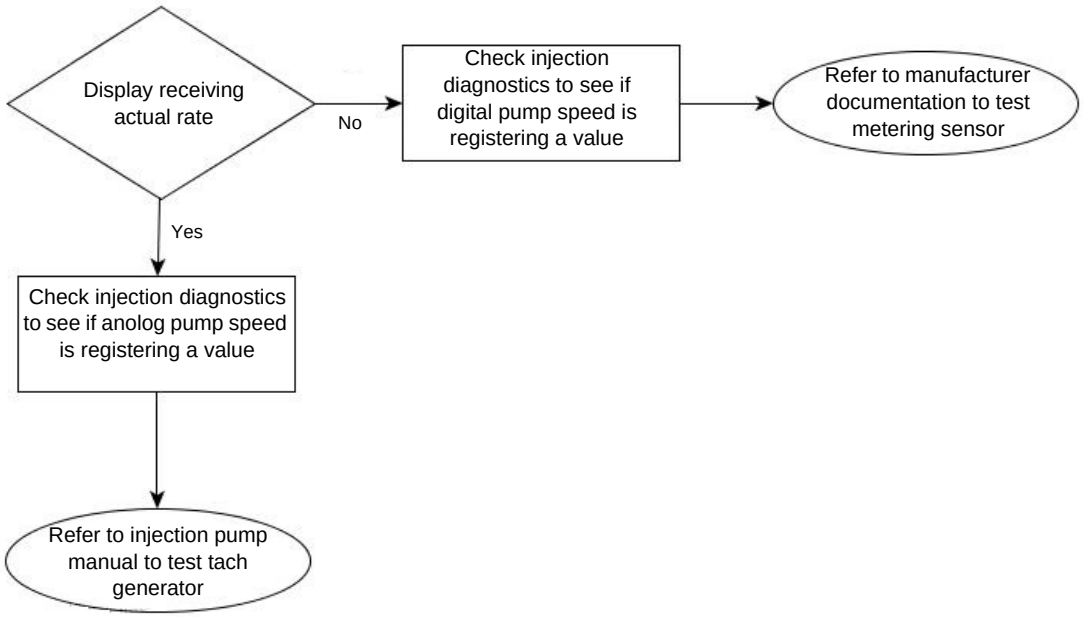


Power can be checked at multiple locations. First is the connection at the Injection module where the battery power cable plugs in. The second location is the output connection found on the injection module. The third is found at the 2 pin weather-pack tower found on the injection cable PN: 4000851-3. See table below.

BATTERY POWER PIN OUTS

	2 Pin Deutsch Plug	2 Pin Deutsch Receptacle	2 Pin WP Tower
Power 12V	1	1	A
Ground	2	2	B

Direct Injection: Pump Runs Full Speed



Digital Pump Speed Sensor - The injection pump's digital pump speed sensor is used to provide actual rate feedback to the display. If the display is not receiving an actual rate the pump will run full speed and provide a "Rate Not Responding" warning message. See Digital Pump Speed Pin out table below for pin locations. With the section valves On. the cabling can be tested by pulsing the signal and ground pins to verify the total applied increases. It is always best to pulse the pins at least 10 times to make sure the total applied will increase by a noticeable amount.

Digital Pump Speed Pin Outs

	Module Auxiliary Connection 12-Pin Socket	3-Pin Conxall
Power (5V)	12	2
Signal (5V)	3	3
Ground	6	1

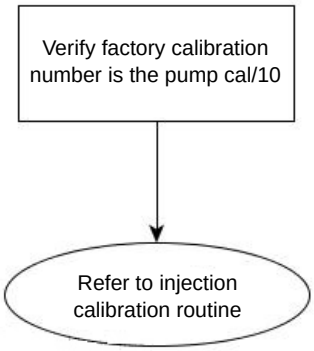
Analog Pump Speed Sensor

The injection pump's analog speed sensor is used in conjunction with the digital pump speed sensor to provide accurate rate feedback. The sensor is a generator that produces a varying voltage dependent on the speed of the pump. The injection module will only get feedback from this sensor when the pump is rotating. If the analog sensor is not providing a feedback to the module, the pump will run full speed and will not change speeds manually.

Analog Speed Pin Outs

	Module Auxiliary Connection 12-Pin Socket	3-Pin Conxall
Signal	A	>9V at max pump speed
Ground	B	

Direct Injection: Application Error

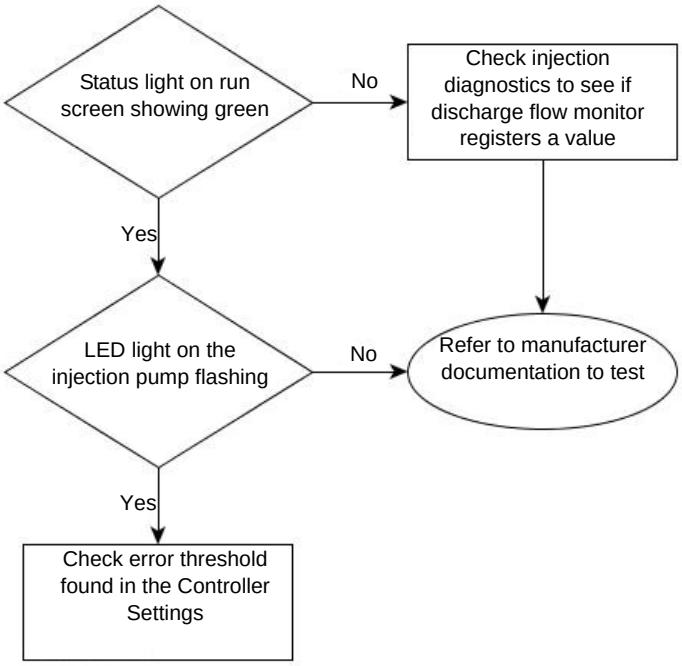


The injection module requires that a pump calibration be performed before actual application can occur. The calibration number found on the tag of the injection pump's digital speed sensor needs to be divided by a factor of 10 before entering it as the factory calibration number. If the factory cal number is entered wrong, the pump calibration routine will not finish due to a high application error.

NOTES!

- The pump calibration will fail if error is >10% from the factory calibration number.
- If the calibration fails, check pump and plumbing for physical damage or excess wear.

Direct Injection: Discharge Flow Sensor Error

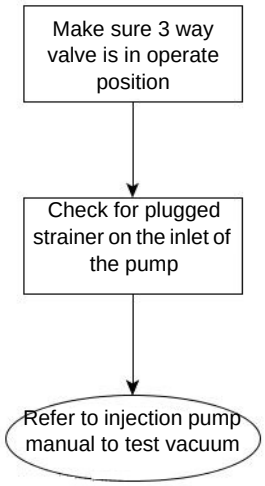


The discharge flow sensor is used as a system check to see if product is actually exiting the output of the pump. The sensor is a shuttle valve that allows feedback for every stroke of the pump. If Flow Monitor Warning is enabled, the display will provide a message if the discharge flow sensor falls out of its calibrated value. See table below for pin locations.

Discharge Flow Sensor Pin Outs

	Module Auxiliary Connection 12-Pin Socket	3-Pin WP Shroud
Power (12V)	11	A
Signal	9	B
Ground	8	C

Direct Injection: Inlet Restriction



The injection pump has a vacuum switch that is used to warn operators of any restriction at the inlet of the pump. The sensor is a normally closed switch that opens if a restriction is encountered in the injection system. A warning will be displayed for the operator if the vacuum switch opens due to restriction. See table below for pin locations. The operator can test the system by unplugging the sensor, which will trigger the warning. If the operator jumps pins A and C, the warning will end.

Vacuum Switch Pin Outs

	Module Auxiliary Connection 12-Pin Socket	3-Pin WP Shroud
Power (12V)	2	C
Signal	10	A

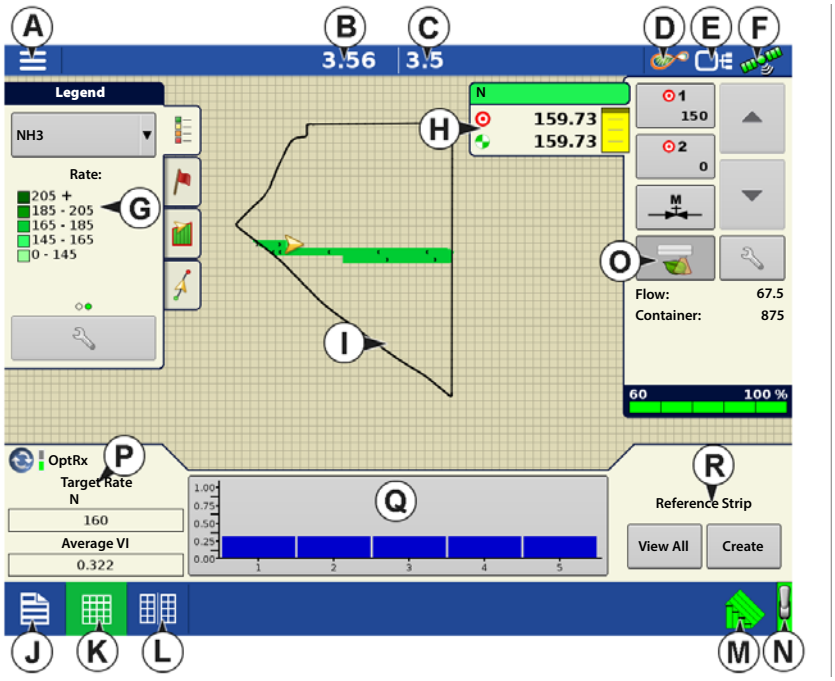
OptRx uses sensors, usually mounted on the sprayer's booms, to assess reflected light to determine plant vigor. It assigns numeric values to the varying levels of vigor to create a Vegetative Index (VI). Using the VI, OptRx calculates nitrogen application rates, to apply a variable rate on the go. OptRx creates nitrogen rates either by using the N Algorithm or by using the user defined Application Rate Table. OptRx can also be used for scanning purposes.

Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

Once a configuration has been completed, the Map View screen appears.

Map View

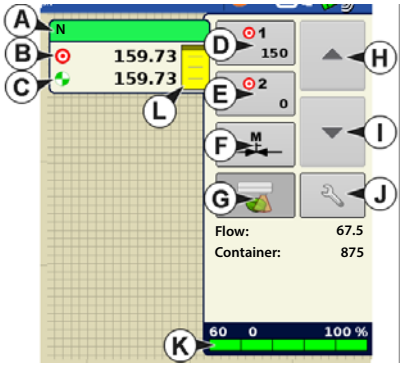


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Product Control toolbox
I. Vehicle Icon
J. Event Summary
K. Map View
L. Split screen
M. AutoSwath
N. Master Switch Status
O. OptRx button
P. Target Rate/Average VI
Q. Bar Graph
R. Reference Strip buttons

NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

Product Control Toolbox

During DirectCommand Run Time operations, the Product Tabs are shown in the upper right-hand side of the Map screen. Press the Product Tabs, and an extended view shows the Rate buttons, Manual Valve Control button, Prescription button, Rate Increase and Rate Decrease arrows, and the Rate Setup button, all of which are described below.



A. Product
B. Target Rate
C. Actual Rate
D. Rate 1 button
E. Rate 2 button
F. Manual Valve Control
G. OptRx button
H. Rate Increase arrow
I. Rate Decrease arrow
J. Rate Setup button
K. Section Status Indicator
L. Container Level

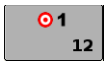
Target Rate—The Target Rate is desired application rate.

NOTE: In some conditions, the Target Rate may increment more quickly than the Actual Rate.

Actual Rate—The Flow Sensor returns the actual rate being applied.

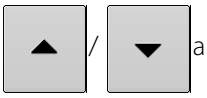
NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.

Container Level—The Container Level shows the amount of product in the container.



Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Manual Valve Control button — The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to prime the system before application or clean out the equipment at the end of the day.

Rate Increase and Decrease Arrows —  allow Product Application Rate to be changed according to the Target Rate Increment. In using manual valve control, the increase and decrease buttons allow the position of the control valve to be defined by the operator.

Prescription button—

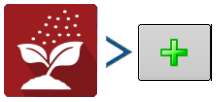
Rate Setup button—

Press the OptRx prescription button to engage the OptRx system to apply variable rate N, based on data received from the sensors. The OptRx button will not be selectable until a Reference Strip is made or Application Rate Table is in use.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:



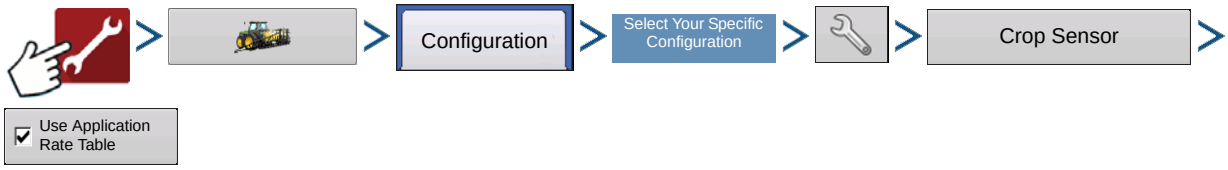
OR

Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

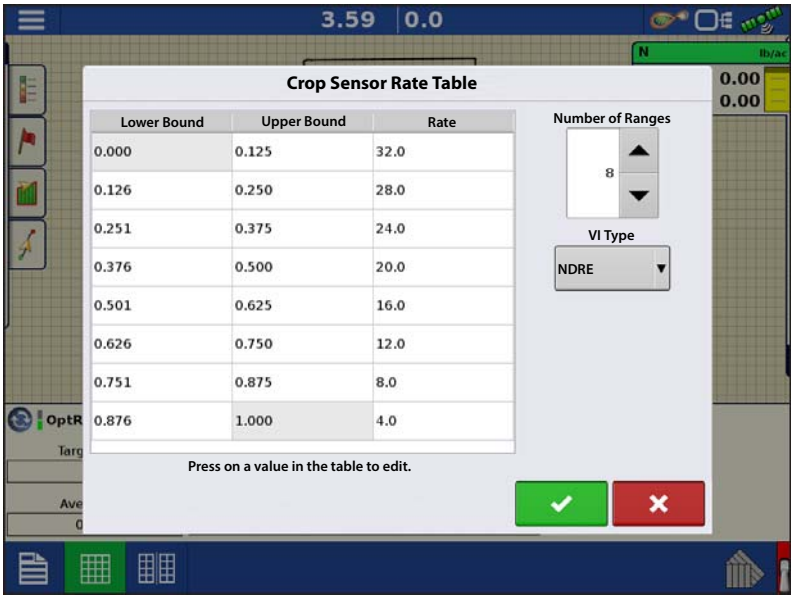
Application Rate Table

To use the Application Rate Table, you need to activate it by check marking the "Use Application Rate Table" box in the Crop Sensor setup. It can be accessed one of two ways:



OR

The Application Rate Table allows a user to define their desired rates to apply any product to any crop type, based on the vegetative index. You can create up to 16 ranges and assign a desired rate to these ranges. You also have the ability to select your VI type to NDRE or NDVI. (For more information about NDRE and NDVI, refer to the Glossary.) If you select to use the Application Rate Table you will not make a reference strip. You will set up the rate table and start applying. If you don't select to use the Application Rate Table you will have to make a reference strip before you apply. The exact values for these settings are up to the grower, ideally after consulting with an agronomist. Ag Leader Technology does not provide agronomic advice.



N Algorithm Setup

OptRx has a very powerful N Algorithm to calculate the optimal rate of nitrogen to apply to the crop. A product containing nitrogen must be selected for the N Algorithm to become active. In order for the OptRx Crop Sensor Module to use the N Algorithm to recommend an N rate, you must scan a portion of the field to create a V.I. Reference Value.

Create an OptRx V.I. Reference Value

In order for the OptRx Crop Sensor Module to use the N Algorithm to recommend an N rate, you must scan a portion of the field to create a V.I. Reference Value.

This V.I. Reference Value is a baseline that the system uses to evaluate the rest of the field.

When creating a reference strip you need to select one of the four Sensor Rx's:

Corn—Scan the most vigorous portion of your field for 300 seconds (5 minutes).

Wheat North America(Post-Tillering)—Scan the most vigorous portion of your field for 300 seconds (5 minutes).

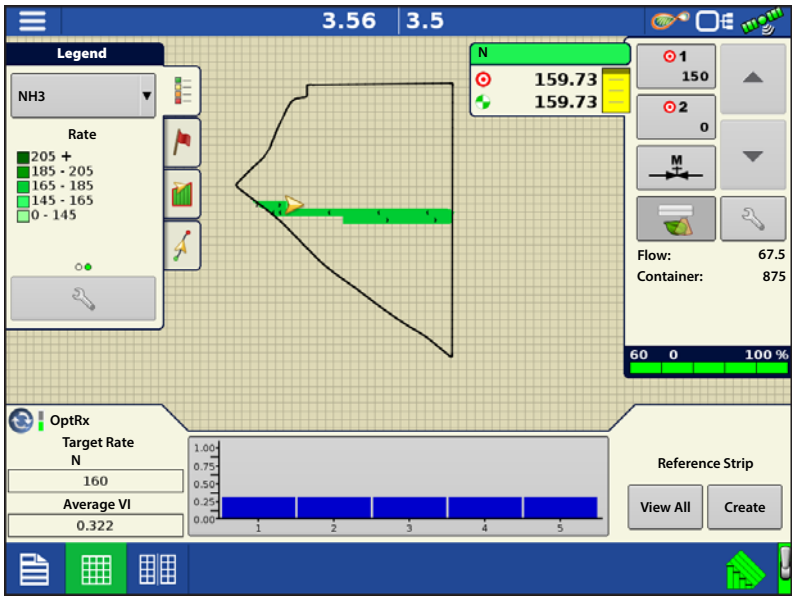
Wheat North America(Tillering)—Scan the most vigorous portion of your field for 300 seconds (5 minutes).

Europe—Scan the portion of your field where the plants show an average amount of vigor and growth. Scan this area for 150 seconds (2.5 minutes).

Scan a Reference Strip

This section describes how to scan a reference strip into the display. This reference strip determines the V.I. Reference Value. It assumes that you have already performed the following tasks:

- Chosen the appropriate part of your field to create a reference strip.
- Created an OptRx module configuration.
- Created a Field Operation Configuration.

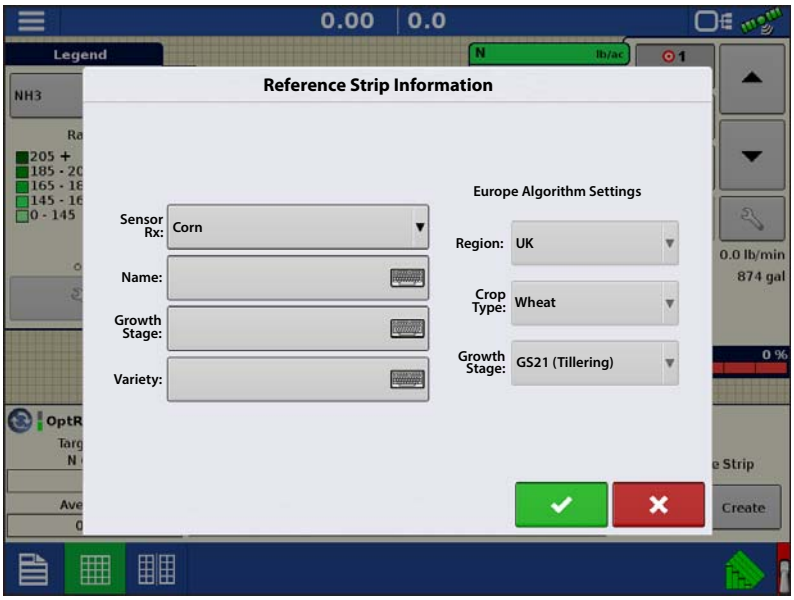


1. **Press Create Button**—Press the Create, located on the bottom right-hand side of the Map screen's Equipment Tab.

If a reference strip has already been created, a warning appears, notifying you that this will unload the current reference strip. Press ✓ to continue.

2. **Enter Reference Strip Information**—The Reference Strip Information screen appears.

   Select the correct **Sensor Rx**. Press to enter the Name, Growth Stage, and Variety. For Europe Algorithm Settings view below.



NOTE! For Corn, a growth stage of V5 or later is needed for accurate application.

When selecting Europe as Sensor Rx, the **Europe Algorithm Settings** become active. A region, a crop type and a Growth Stage need to be selected.

If your region is not noted in the drop-down menu, select the **Region** that reflects your current position best when comparing geographic location, climate, general soil types and farming practices. The region setting is used for fine-tuning and optimizing the N Algorithm.

Select the **Crop Type** on which you are applying fertilizer. For the crops Wheat, Barley and Rapeseed the N Algorithm is verified by independent field experiments.

Select the **Growth Stage** that reflects your current crop status. For Wheat and Barley the Growth Stage is used to select the most appropriate VI index, NDVI or NDRE, further it will be used for fine-tuning and optimizing the N-Algorithm.

Press ✓ when finished.

3. **Drive Reference Strip**—A screen appears, stating that you should drive the applicator to the start of the reference strip. When ready, press ✓ and drive the reference strip.

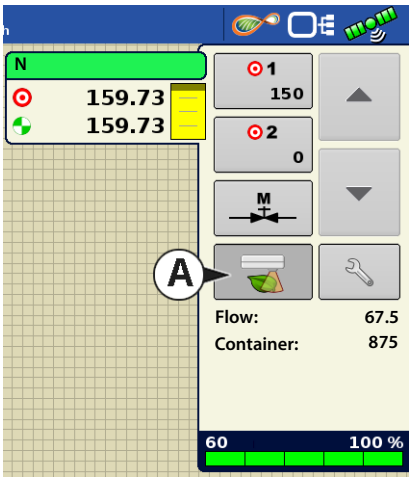
4. **Recording Reference Strip**—When you are driving the Reference Strip, Recording 303 appears in the Equipment Tab. This bar counts the number of seconds that you record the reference strip.

   For best results when driving the Reference Strip, it may be beneficial to Pause the Reference Strip when driving over parts of the field that are in a lower than average condition, such as the headlands.

   After the minimum required time elapses to create a Reference Strip, the "Cancel" button will change into Stop.

5. **File Name**—Press the Stop button when you wish to finish creating the Reference Strip. A dialog appears indicating the Reference Strip is saved. Press ✓ to accept.

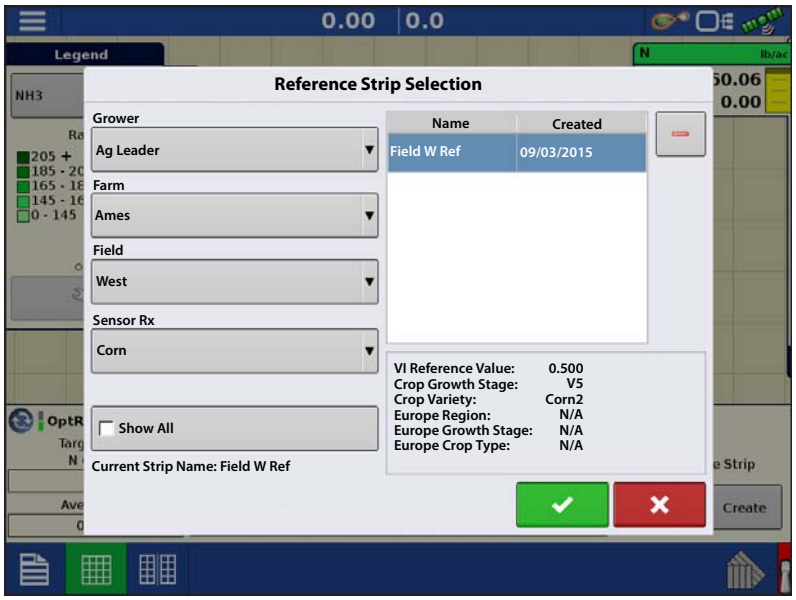
6. **OptRx Sensors Apply Variable Rate**—The OptRx sensors will apply variable rate N, based on data received from the sensors and the current N Algorithm settings. N Algorithm settings must be reviewed for each application to verify correct inputs are used. appears in the Product Control Toolbox. (**A**)



7. (OPTIONAL) **View Reference Strip**

If desired, you may review this reference strip by pressing the **View All** button, located on the bottom right-hand side of the Map screen's Equipment Tab. The file name of the new reference strip appears in the Reference Strip Selection screen.

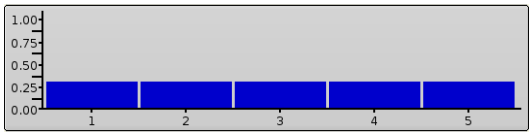
To delete a reference strip, highlight the file name and press .



Crop Sensor Settings

The Crop Sensor Settings screen is where you can adjust application rate settings specified by the OptRx Crop Sensor module. The VI Zero and VI Minimum settings are used as a buffer to prevent applying the wrong amount of N or applying it in areas where doing so would be ineffective.

To access the Settings screen, press the OptRx Crop Sensor button,



located in the box containing the Map screen's VI Bar Graph.

VI Zero — The threshold below which the Crop Sensor applies a zero rate. This setting is used to prevent applying N over bare ground or permanently damaged crops.You may enter in a value either by pressing , or you may enter in the current VI value by pressing Set to Current.

VI Minimum — The threshold below which the Crop Sensor applies the minimum rate. This setting is used to apply a minimum amount of N on ground with damaged crops.You may enter in a value either by pressing , or you may enter in the current VI value by pressing Set to Current.

The minimum rate may be adjusted at the Crop Sensor screen, which is accessed by pressing the **Algorithm Settings** button.

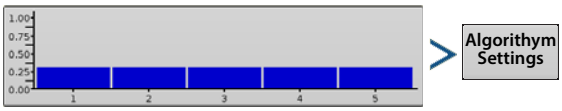
Reference Strip — The name of the Reference Strip that you entered during the scanning procedure.

VI Reference — Value of a healthy crop biomass used in reference for calculating the proper N application rate

Algorithm Settings — Press this button to access the Sensor Setup screen, where you can adjust the inputs used by the N Algorithm to calculate to optimal Nitrogen rate. Without a valid Reference Strip this button will not be active. Please refer to the Crop Sensor Setup section below for information on how to decide on what inputs to use for the N Algorithm.

Crop Sensor Setup

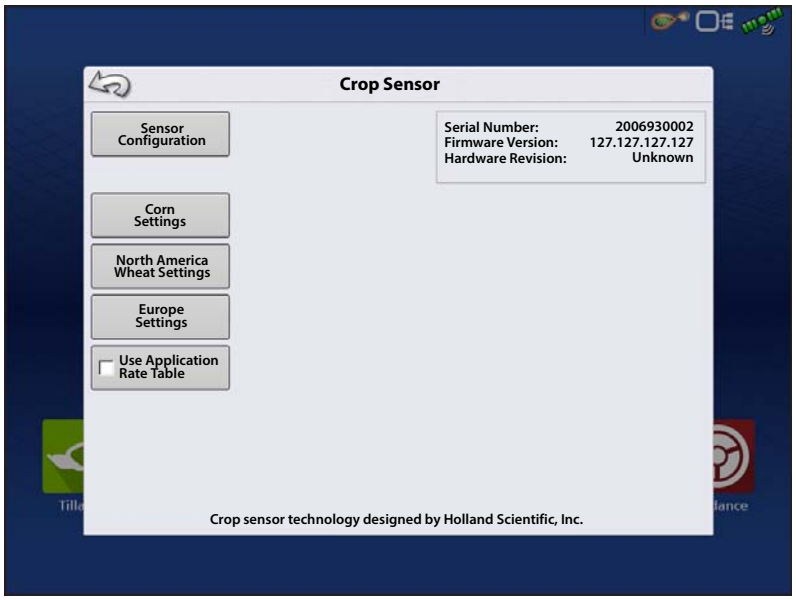
The Crop Sensor Setup screen is where you can adjust how OptRx calculates the nitrogen rate to apply. Here you can also select the usage of the Application Rate Table. You can access the Sensor Setup screen by:



OR

OR

You must have a Reference Strip loaded for the Algorithm Settings button to be active.



Depending on the Sensor Rx that was selected when making the Reference Strip you will use one of the three Algorithm Setup menus:

- Corn Settings
- North American Wheat Settings
- Europe Settings

All units represent pounds (kilograms) of nitrogen.

Corn Settings

Corn Settings

Minimum Rate—This input should be reviewed and set for each application.

Algorithm implication: The Minimum Rate is the amount of nitrogen the operator wants applied to the healthiest areas of a field. Keep in mind, OptRx may apply very low amounts or zero N if crop appears healthy at the time of application, however the N reserves in the soil may not be adequate to achieve target yield. This ensures some amount of N is applied in these healthy areas.

Maximum Rate—This input should be reviewed and set for each application.

Algorithm implication: This is the maximum amount of nitrogen the operator wants applied to the poor areas of a field. Keep in mind, OptRx may recommend a high rate if crop appears very unhealthy at the time of application, however the crop may not benefit from extremely high rates of nitrogen.

Rate Increment—This input is dependent on your controller and N-product; it can vary per application.

Algorithm implication: The Rate Increment will define the step size for the variable rate prescribed by the N Algorithm. The system will not change the application rate unless OptRx prescribes a new target that is greater than the Rate Increment. If your system is frequently changing target rates and the flow controller has a hard time responding appropriately, increase this setting.

Economic Optimal Rate—This input is dependent on the crop per field.

Algorithm implication: The Economic Optimal Rate reflects the estimated total amount of nitrogen uptake by the plant over the growing season. To calculate this, the operator should use a reasonable estimated yield after evaluating current crop conditions and the growing season leading up to application. Once that target yield is determined, multiply it by the nitrogen use efficiency (NUE) for your particular region and management practice. For this system, NUE is defined as the pounds of nitrogen needed to produce one bushel of corn. NUE can typically range from 0.85 to 1.2*.

N Credits—This input should be reviewed and set for each application.

Algorithm implication: The N Credits is the estimated amount of nitrogen that is available to the plant in the soil from previous year's crop.

Pre-Sidedress Rate—This input should be reviewed and set for each application.

Algorithm implication: The Pre-Sidedress Rate is the amount of nitrogen that has been applied for the current year's crop before side-dressing. Keep in mind, not all pre-sidedress nitrogen may be available to the crop due to environmental factors. You may need to adjust this input accordingly**.

* NUE can vary based on climate, soil organic matter range, form of N applied, timing of N applied, number of N applications, previous crop residue, etc. It is recommended to consult an agronomist if you are uncertain what the NUE should be for the current year's crop.

** Consider the weather and the form of N that was applied prior to your side-dress application. Out of the "X" lbs/acre of N that was applied earlier in the season, enter how much is believed to be available for that crop at the time of application. Talk to an agronomist or an adviser if there are questions about how to estimate this value for your fields.

NOTE!: The exact values for these inputs are up to the grower, ideally after consulting with an agronomist. Ag Leader Technology does not provide agronomic advice.

North American Wheat Settings

North American Wheat Settings

Minimum Rate—This input should be reviewed and set for each application.

Algorithm implication: The Minimum Rate is the amount of nitrogen the operator wants applied to the healthiest areas of a field. Keep in mind, OptRx may apply very low amounts or zero N if crop appears healthy at the time of application, however the N reserves in the soil may not be adequate to achieve target yield. This ensures some amount of N is applied in these healthy areas.

Maximum Rate—This input should be reviewed and set for each application.

Algorithm implication: This is the maximum amount of nitrogen the operator wants applied to the poor areas of a field. Keep in mind, OptRx may recommend a high rate if crop appears very unhealthy at the time of application, however the crop may not benefit from extremely high rates of nitrogen.

Rate Increment—This input is dependent on your controller and N-product; it can vary per application.

Algorithm implication: The Rate Increment will define the step size for the variable rate prescribed by the N Algorithm. The system will not change the application rate unless OptRx prescribes a new target that is greater than the Rate Increment. If your system is frequently changing target rates and the flow controller has a hard time responding appropriately, increase this setting.

Economic Optimal Rate—This input is dependent on the crop per field.

Algorithm implication: Economic Optimum N Rate (ENOR) as prescribed by regional agronomists or universities. This value will equal the total amount of nitrogen that is recommended for the crop over its entire life cycle. This will be a user defined value.

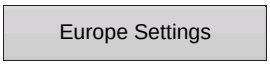
N Credits—This input should be reviewed and set for each application.

Algorithm implication: The amount of N credits from previous year's crops or manure applications. This will be a user defined value.

Pre-Topdress Fertilizer—This input should be reviewed and set for each application.

Algorithm implication: The amount of fertilizer that has already been applied. This includes pre-plant fertilizer, planting fertilizer and post-planting fertilizer that has been applied before topdressing. This will be a user defined value.

NOTE!: The exact values for these inputs are up to the grower, ideally after consulting with an agronomist. Ag Leader Technology does not provide agronomic advice.



Europe Settings

Planned Rate—This input should be reviewed and set for each application.

Algorithm implication: The planned rate will be the average rate that the OptRx N-algorithm will prescribe, considering that the reference strip reflects the field average and that the Minimum and Maximum Rate have an equal offset from the Planned Rate. The Planned Rate should be set to the intended flat rate to apply if the OptRx N-Algorithm was not used.

Minimum Rate—This input should be reviewed and set for each application.

Algorithm implication: For the Planned Rate to reflect the average OptRx rate prescription, the difference between the Minimum Rate and Planned Rate should be the same as the difference between the Maximum Rate and Planned Rate. The Minimum Rate is the lowest amount of nitrogen operator wants applied. If OptRx prescribes a lower rate system will default to the Minimum Rate.

Maximum Rate—This input should be reviewed and set for each application.

Algorithm implication: For the Planned Rate to reflect the average OptRx rate prescription, the difference between the Maximum Rate and Planned Rate should be the same as the difference between the Minimum Rate and Planned Rate. The Maximum Rate should be set to the highest amount of nitrogen operator wants applied. If OptRx prescribes a higher rate system will default to the Maximum Rate.

Rate Increment—This input is dependent on your controller and N-product; it can vary per application.

Algorithm implication: The Rate Increment will define the step size for the variable rate prescribed by the N Algorithm. The system will not change the application rate unless OptRx prescribes a new target that is greater than the Rate Increment. If your system is frequently changing target rates and the flow controller has a hard time responding appropriately, increase this setting.

Managed Rate—This input is dependent on the crop; it should not be changed during the season.

Algorithm implication: The Managed Rate reflects the total amount of nitrogen the crop will uptake throughout a single season. A higher Managed Rate will increase the algorithms aggressiveness, the target rate will show more variation.

Number of Applications—This input is dependent on your season planning; it should not be changed during the season.

Algorithm implication: The Number of Applications reflects the total amount on N-applications throughout a season, including pre-seeding applications. A higher Number of Applications will decrease the algorithms aggressiveness, and the target rate will show less variation.

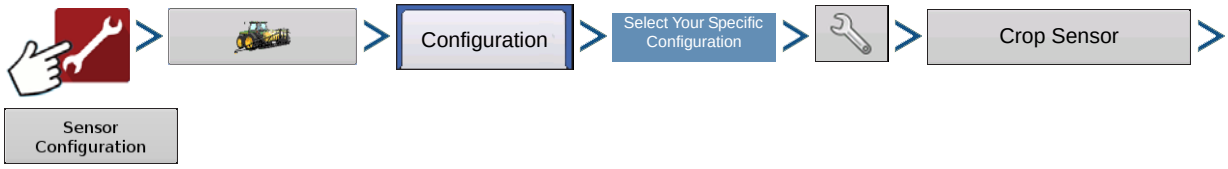
Application Trend—This input should be reviewed and set for each application.

Algorithm implication: The Application Trend setting decides whether good crops get a higher N rate, or if poor crops get a higher N rate. The Increase setting trends the N application rate towards the healthier crops. This could result in witnessing greater plant variance within a field. The Decrease setting trends the N application rate towards the unhealthy crops. This could result in witnessing little plant variance within a field.

NOTE!: The exact values for these inputs are up to the grower, ideally after consulting with an agronomist. Ag Leader Technology does not provide agronomic advice.

Sensor Setup

The crop Sensor Setup screen is where you can review and adjust sensor settings. You can access the Sensor Setup screen one of two ways:



OR

Sensor Setup

Sensor Setup screen appears. Each sensor is shown, with the status of "ON" or "OFF".

Enable—Turns On the individual OptRx sensor.

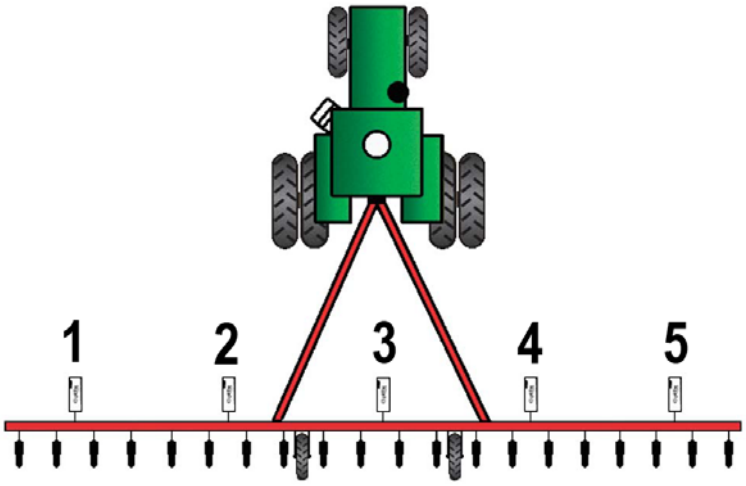
Disable—Turns Off the individual OptRx sensor.

Installation

The display supports up to 10 OptRx sensors. For swaths that are 80 ft (24 m) or larger, five sensors or more should be used. For swaths less than 80 ft (24 m), a minimum of three sensors is recommended.

When installing sensor cables, you must install them in the correct order from left to right.

If you do not install the sensors in their proper places, then the map created by the display will not accurately reflect actual field conditions according to row sensor placement.



Checklist

- Sensors should be equally spaced apart. Sensors should not be mounted on the ends of the booms.
- Each sensor should be mounted so that it is centered over the top of a crop row.
- Sensor can operate 20 - 50 in. (51 -127 cm) above the crop canopy. Sensors perform best at 30 - 36 in. (76-91 cm).

Glossary of OptRx Terminology

Active VI — The Vegetation Index (VI) that the OptRx sensors read instantaneously during field operations.

Max Rate (shown at Crop Sensor Setup) — The highest amount of N that should be applied.

Min Rate (shown at Crop Sensor Setup) — The lowest amount of N that should be applied.

N — Refers to Nitrogen being applied.

N Algorithm — The OptRx Crop Sensor Module uses an N algorithm to calculate an N rate through a Sufficiency Index reading.

$$\text{NDVI Normalized Difference Vegetation Index} = \frac{\text{Near Infared Reflective - Red Reflective}}{\text{Near Infared Reflective + Red Reflective}}$$

$$\text{NDRE Normalized Difference Red Edge} = \frac{\text{Near Infared Reflective - Red Edge Reflective}}{\text{Near Infared Reflective + Red Edge Reflective}}$$

NDRE vs. NDVI—Both are vegetation indices that compare scanned crop vigor and biomass (and algorithms) against the reference strip to assess plant health.

–NDVI is used in early growth stage crops as it picks up variances in small plant vigor better than NDRE

–NDRE does a better job at picking up variances in biomass at later growth stages

- NDRE is more effective in later growth stages or in larger plants such as corn because the algorithm provides more response at higher vegetation index (VI) rates.
- NDVI is more effective in earlier growth stages or in smaller plants where the algorithm is used to gain a more accurate reading at lower VI values. However, in later stages, NDVI's scanning tends to saturate at higher VI values which results in less response to changing VI values and recommended rates.

Rate Increment (shown in Crop Sensor Setup) — An optional increment that the display can use to round the N rate applied, if the operator desires. For example, if the operator enters the number 5 and the display is applying a rate of 27, the number will be rounded to 25.

Reference Strip — The healthiest portion of your field where you are satisfied that N is sufficient. This allows a baseline of optimum crop performance that the system can compare against other cropland.

Reflectance — The light reading of the plant measured by individual light spectral wavelength. The comparison of different reflectance values can be used to determine the health of the plant.

VI — Vegetation Index. The recorded value from remote sensing that displays a comparison of crop vigor and biomass of the scanned plant. This value, which is taken from a reference scan of a Reference Strip, uses a ratio that indicates the health of the plant. NDVI and NDRE are examples of different vegetation indexes.

VI Minimum (shown at Settings screen) — The threshold below which the Crop Sensor applies the minimum rate. This setting is used to apply a minimum amount of N on ground with damaged or diseased crops.

VI Reference (shown at Settings screen) — The value of a healthy crop biomass used in reference for calculating the proper N application rate. The VI Reference value is determined by the creation of a Reference Strip.

VI Zero (shown at Settings screen) — The threshold below which the Crop Sensor applies a zero rate. This setting is used to prevent applying N over bare ground or permanently damaged crops.

Troubleshooting OptRx Error Messages

The OptRx Crop Sensors have error messages to inform the user of complications in communication and performance. The following error messages are the most common ones. Follow the recommended troubleshooting steps to correct these errors.

Error Message: "Sensor Lost Communication"

Possible Cause: The cabling between the OptRx sensor and the ACS Master Module is disconnected.

Solution: Check all connections and cables for disconnections, cuts, breaks, or crimps in the line.

Error Message: "Bad Data"

NOTE!: The "Bad Data" error messages are disabled when user does not intend to log data or while the reference strip is being created.

Possible Cause: The sensors are either too far from the crop or too close to the crop.

Solution: Adjust the height of the sensor to approximately 30 inches (76 cm.) above the crop canopy by adjusting the boom height or the height on the crop sensor bracket

Error Message: "Sensor Failure"

Possible Cause: The sensors are either too far from the crop or too close to the crop.

Solution: Adjust the height of the sensor to approximately 30 inches (76 cm.) above the crop canopy by adjusting the boom height or the height on the crop sensor bracket.

Error Message: "Sensor Failure"

Possible Cause: There has been a drop in voltage to the OptRx Crop Sensors.

Solution: Check voltage on the high current power cable to ensure voltage provided to the sensors is approximately 12 V.

Error Message: "Too Few Sensors for Application"

Possible Cause: The OptRx configuration must have at least two working sensors to make an N rate recommendation.

1. There has been a drop in voltage to the OptRx Crop Sensors, or
2. The OptRx Crop Sensor is not detecting communication from the OptRx Crop Sensor Module

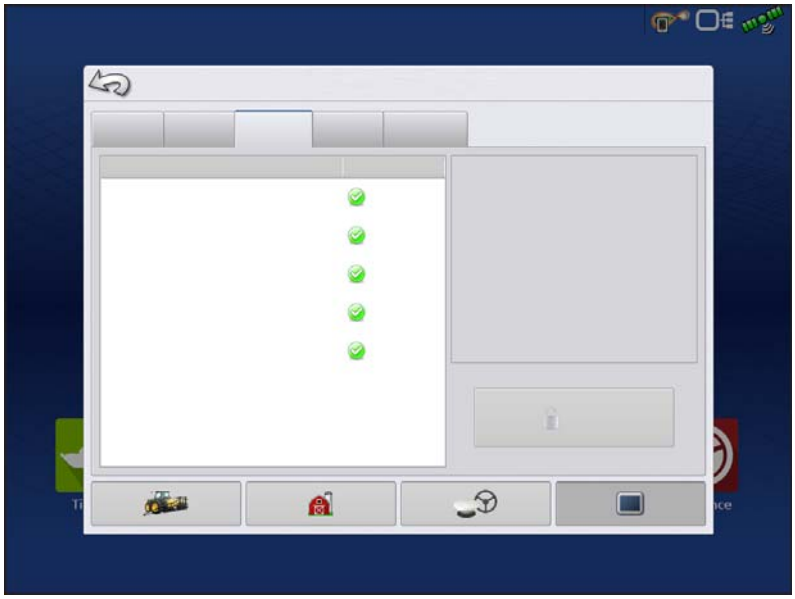
Solution: Perform the following actions, depending upon the possible cause of the error:

If 1), check cabling.

If 2), check the OptRx Diagnostic screen to determine if the OptRx Crop Sensors are still communicating.

Norac Unlock

The Features Tab is where you can enter unlock codes. Unlock codes are unique to the serial number of each display and the feature registration number. You must supply these numbers to your dealer when purchasing any unlock codes. Press to enter the unlock code and press to enable the feature.

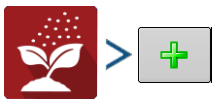


Norac UC5 can be used with or without an unlock but how you setup and run the system differs depending on whether the system is locked or unlocked and using CAN A or CAN B.

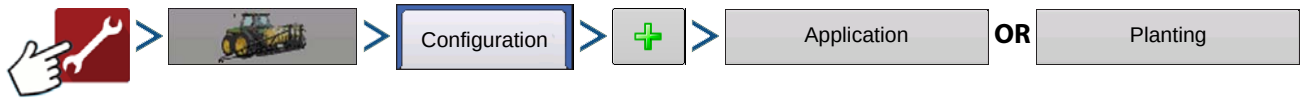
	Locked	UnLocked
CAN A	No Functionality	Setup using Ag Leader Screens Operate using Ag Leader Screens
CAN B	Setup using Universal Terminal Screens Operate using Universal Terminal Screens	Setup using Universal Terminal Screens Operate using Ag Leader Screens

Create Configuration

To create a configuration, make the following button presses to start the Configuration Wizard and then follow the instructions given on the display. The configuration can be started in two places:



OR

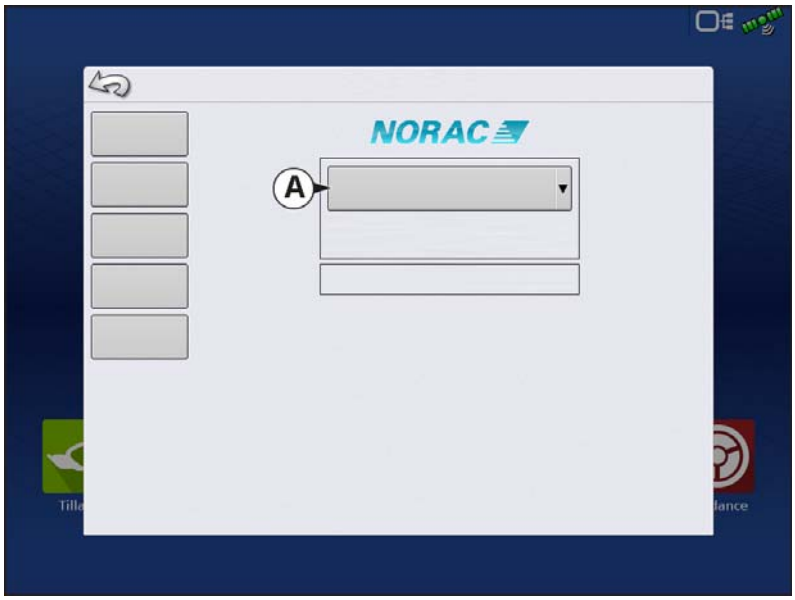


The wizard will guide you through the process of selecting or creating a vehicle, implement and controllers.

Your Operating Configuration will then be viewable when you start a new Field Operation with the Field Operation Wizard.

Setup Configuration

A. **Norac Devices drop-down menu**—The drop down menu shows the devices communicating on the NORAC UC5 CAN Bus along with the serial number of each device. The Firmware Version and Hardware Revisions of your NORAC UC5 devices are shown underneath.



- **Automatic Setup**—Automatic Setup walks through a series of steps that configures the NORAC UC5 electronics to the sprayer hydraulic functions. You must perform an Automatic Setup routine after the NORAC UC5 system is installed. The following items are configured during an Automatic Setup routine:
    - Sprayer Make and Model
    - Input module wiring and configuration
    - Number of sensors and location
    - Sensor zero point
    - Valve deadzone and gain values.

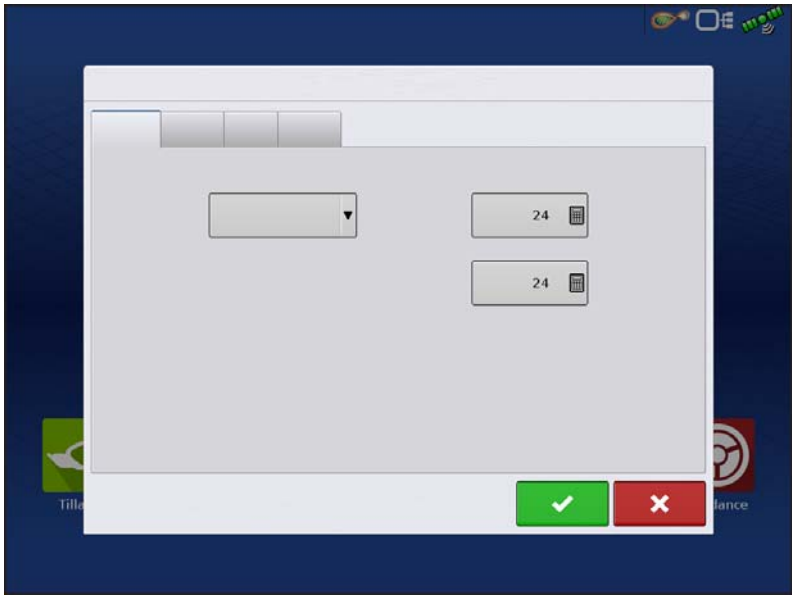
NOTE!: For detailed Automatic Setup information, see the NORAC UC5 manual.

- **Sensors and Valve Drivers**—Opens the Sensor and Valve Driver Settings screen (for more detail see the next page).
- **Boom Control Module**—Turn motion detection on/off, choose source as GPS or AUX.
- **Advanced Settings**—For use by a technician.
- **Retune**—From time to time it may be necessary to recalibrate (Retune) the UC5 electronics to your sprayer's hydraulics. Examples of such times are:
    - When a hydraulic solenoid valve is changed.
    - When the hydraulic pump is changed or adjusted.
    - When the normal working temperature of the hydraulic oil has shifted significantly from when the system was previously calibrated.

If you are running a pull type sprayer and use different tractors to operate the sprayer, you should run the Retune procedure each time the tractor is changed. If you have a flow control for the boom hydraulics, set it prior to tuning. If you change the flow setting by more than 20 percent, you should Retune.

Press [ ] to open the Norac UC5 Setup.

General Tab



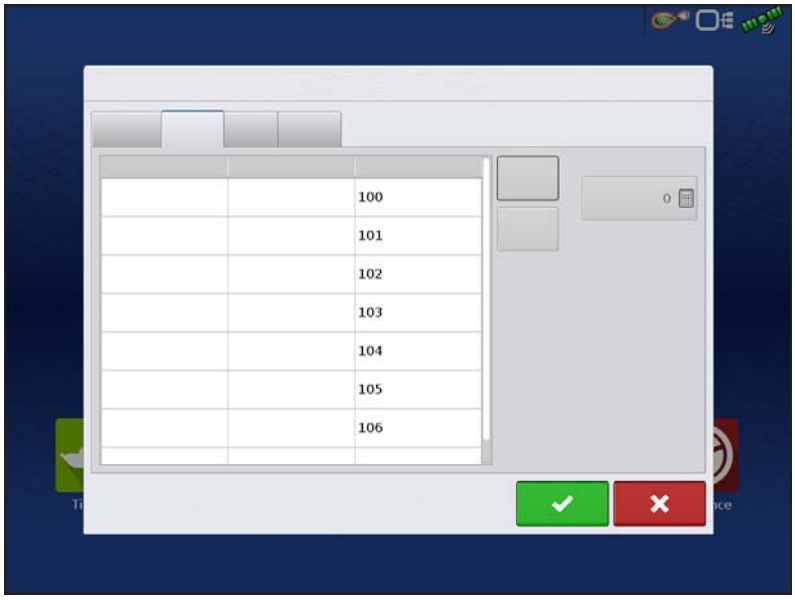
Minimum Height Mode includes three selections:

- **Absolute**—no sensors are allowed to move closer to the target than the minimum height setting.
- **Relative**—no sensors are allowed to move closer to the target than the distance of the target height minus the minimum height setting.
- **Disabled**—Disables the minimum height mode.

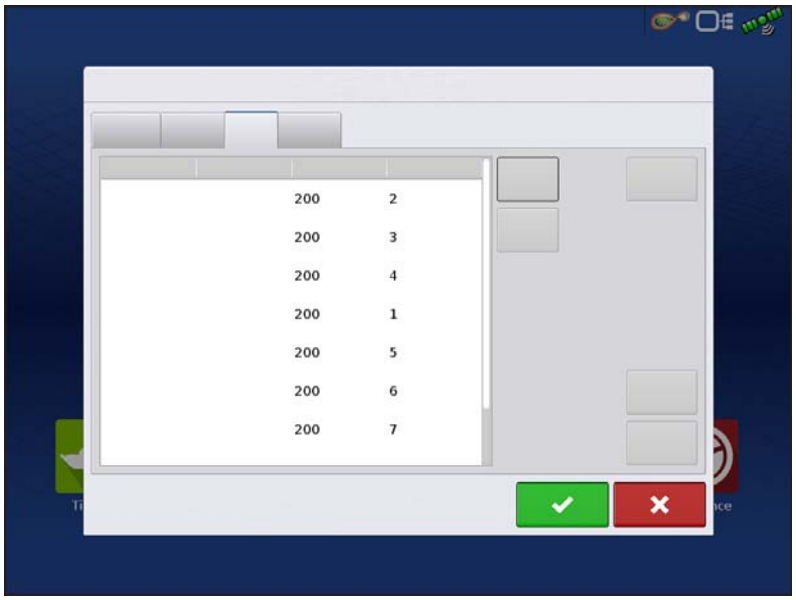
NOTE!: "Target" refers to the ground in Soil Mode, and the crop canopy in Crop Mode.

- **Minimum Height**—If desired, press [ ] to adjust the following settings.
  - **Soil Mode** - The minimum height setting when operating in Soil Mode.
  - **Crop Mode** - The minimum height setting when operating in Crop Mode. Also, consult the NORAC UC5 manual for more information.

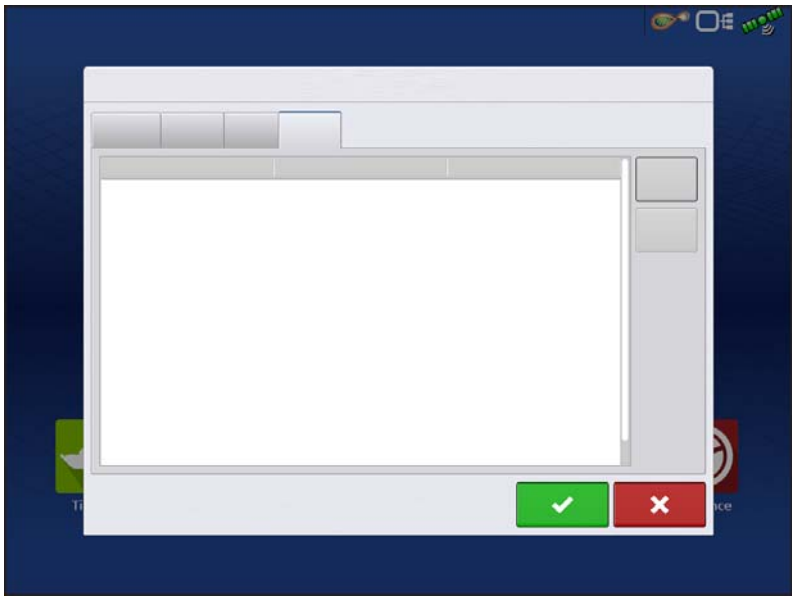
Sensor Tab—List of each sensor type and serial number, add or remove a sensor, input nozzle height.



Valve Tab—List of each valve, type, serial number, and output. Add or Remove a valve, test valve, adjust gain and deadzone.



Switch Tab—List of switches, functions, serial numbers, and input. Add or Remove a switch.



Load Configuration

Press the Application button from the home screen. This will take you through the steps needed to load a configuration.

Engage button

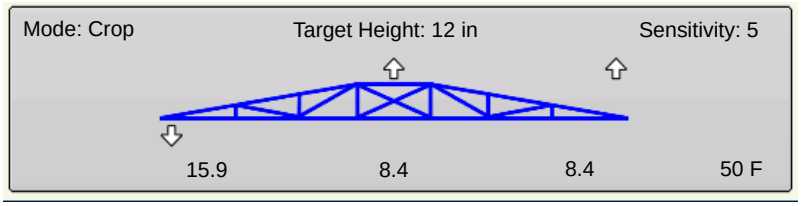
If the NORAC UC5 Boom Height Control is included in your Operating Configuration, then the NORAC Engage button appears on the display's Task Bar. The Engage button enables boom height control. This button is green when the NORAC UC5 system is engaged; and grey when disengaged. Press on this button to engage and disengage the NORAC UC5 Boom Height Control.

This button can be used to toggle back and forth between Automatic Mode and Manual Mode.

- When you enable **Automatic Mode**, this button turns green and the display beeps three times.

- When you disable **Automatic Mode** on any part of the boom and the display switches to **Manual Mode**, this button turns white and the display beeps twice. If less than the full boom remains in **Manual Mode**, the display will continue beeping twice every three seconds.

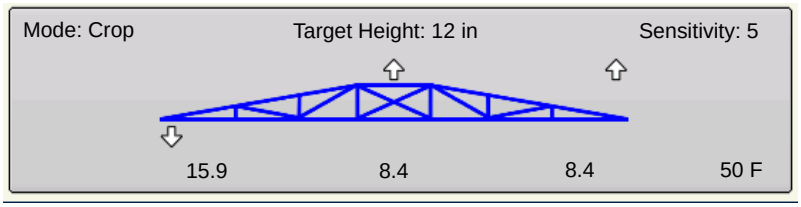
Boom Height Control Options Button



At the center of the Map screen's Equipment Tab, the Boom Height Control Options button displays data on NORAC UC5 Run Time performance.

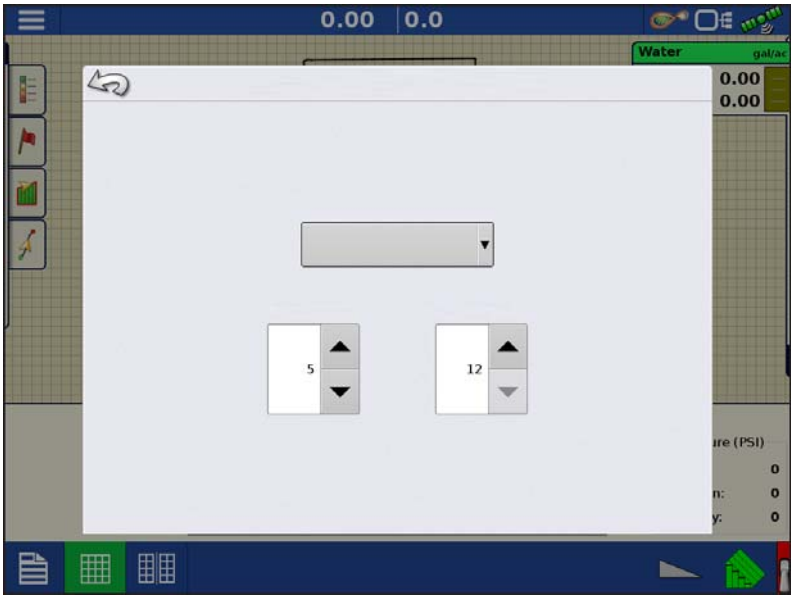
- The Boom Icon appears as blue when in Automatic Mode; and black when in Manual Mode. The right, left and center sections appear independently on this icon. Press the Boom Height Control Options button to open the Boom Height Control Options screen.
- The white arrows indicate the direction that the boom section is being commanded to move. The arrows shown around the boom appear either 1) In Automatic Mode, or 2) When the boom is in Manual Mode and the boom is moved by the operator.
- **Mode**—Indicates whether the Boom is in Crop Mode, Soil Mode, or Hybrid Mode.
- **Target Height**—The desired boom height above the ground (for Soil Mode), or the crop canopy (for Crop Mode).
- **Sensitivity**—Adjusts the boom response. Higher values make the height control more responsive.
- **Distance Between Boom and Target**—The numbers that appear below the Boom Icon show the distance between the boom section and the target.
- **Temperature**—Shows the measurement of the outside ambient air temperature.

Boom Height Control Options Screen



Pressing the **Boom Height Control Options button** opens the **Boom Height Control Options screen**.

At this screen, you can adjust the boom's Mode, Sensitivity and Target Height.



- **Mode**—The drop-down menu is where you can choose one of three modes:
  A. **Soil Mode**—the UC5 controls boom height relative to the distance from the soil.
  B. **Crop Mode**—the UC5 controls boom height relative to distance from the crop canopy.
  C. **Hybrid Mode**—The UC5 controls boom height using a combination of soil and crop readings. For detailed Hybrid Mode information, see the Norac UC5 manual.

- **Sensitivity**—Adjusts the boom response. Higher values make the height control more responsive; settings range from 0-10.
- **Target Height**—User-defined boom height in relation to the selected control mode.

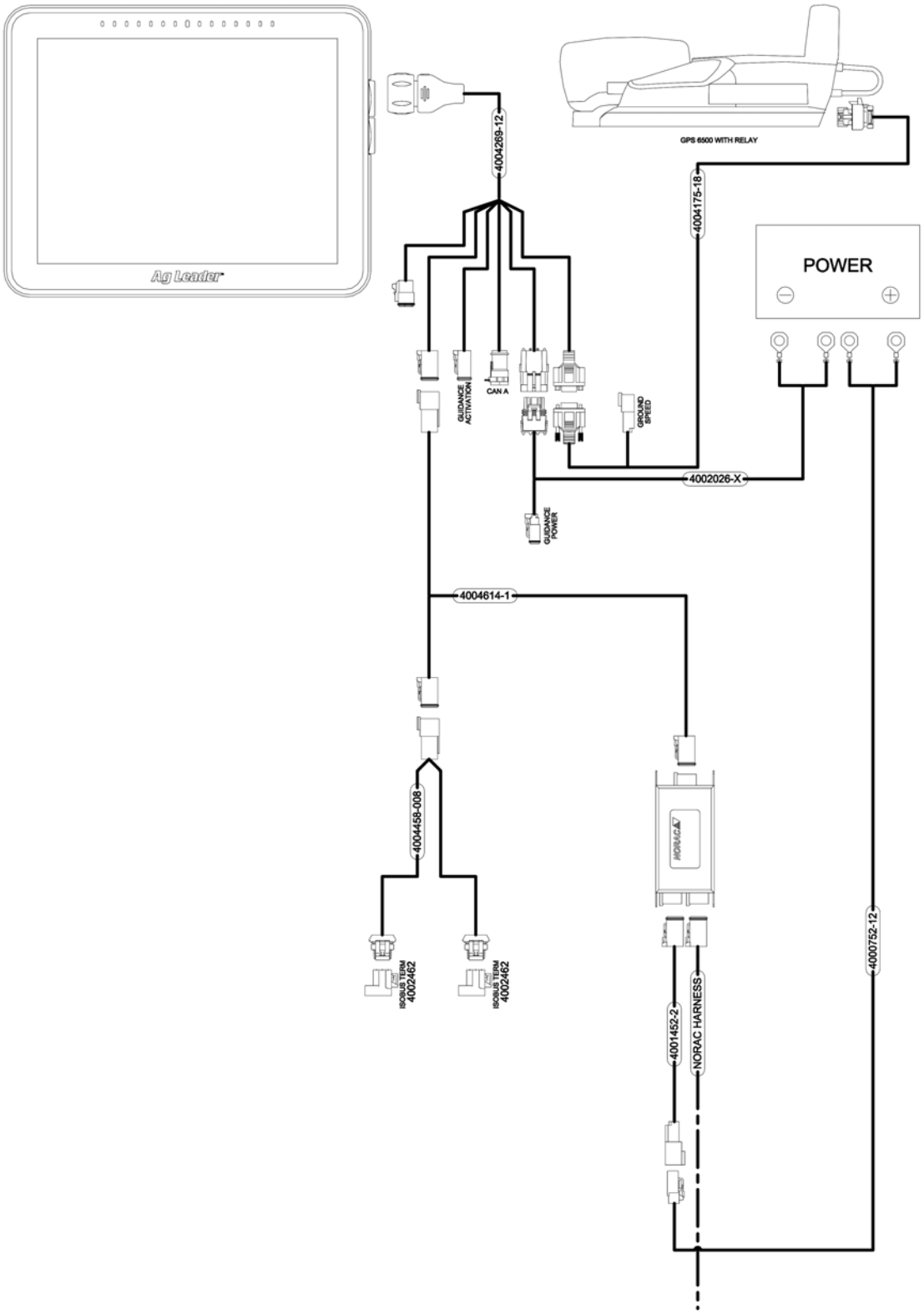
Boom Height Diagnostics

The Boom Height Diagnostics screen shows all data for individual sensors, including Height, Roll and Temperature.

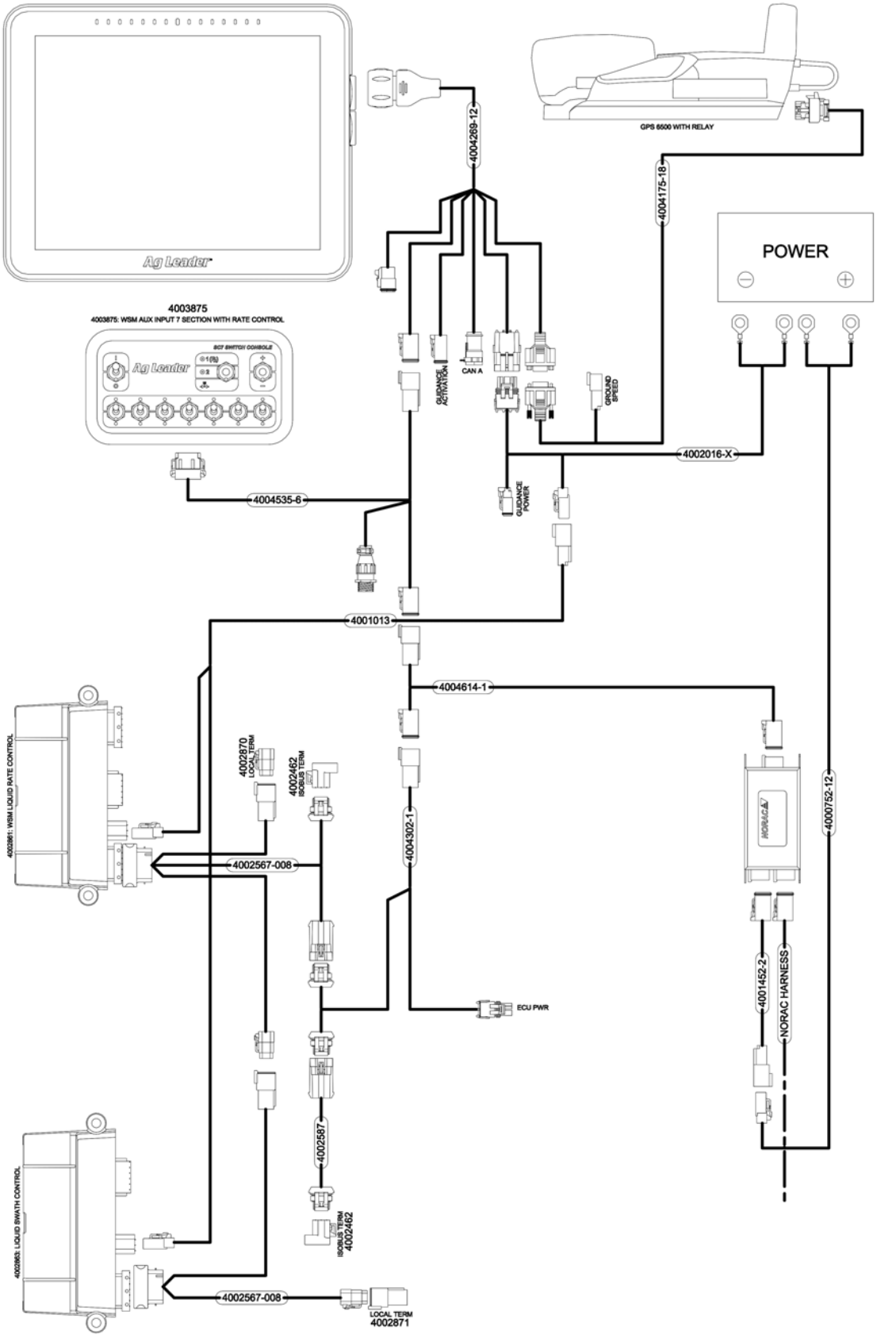
To go to the Boom Height Diagnostics screen, press on the **Device Information** button. At the **Devices** screen, highlight the item marked **NORAC UC5** then press the **Diagnostics** button.

The NORAC UC5 Diagnostics screen appears.

UC5 Stand-Alone System

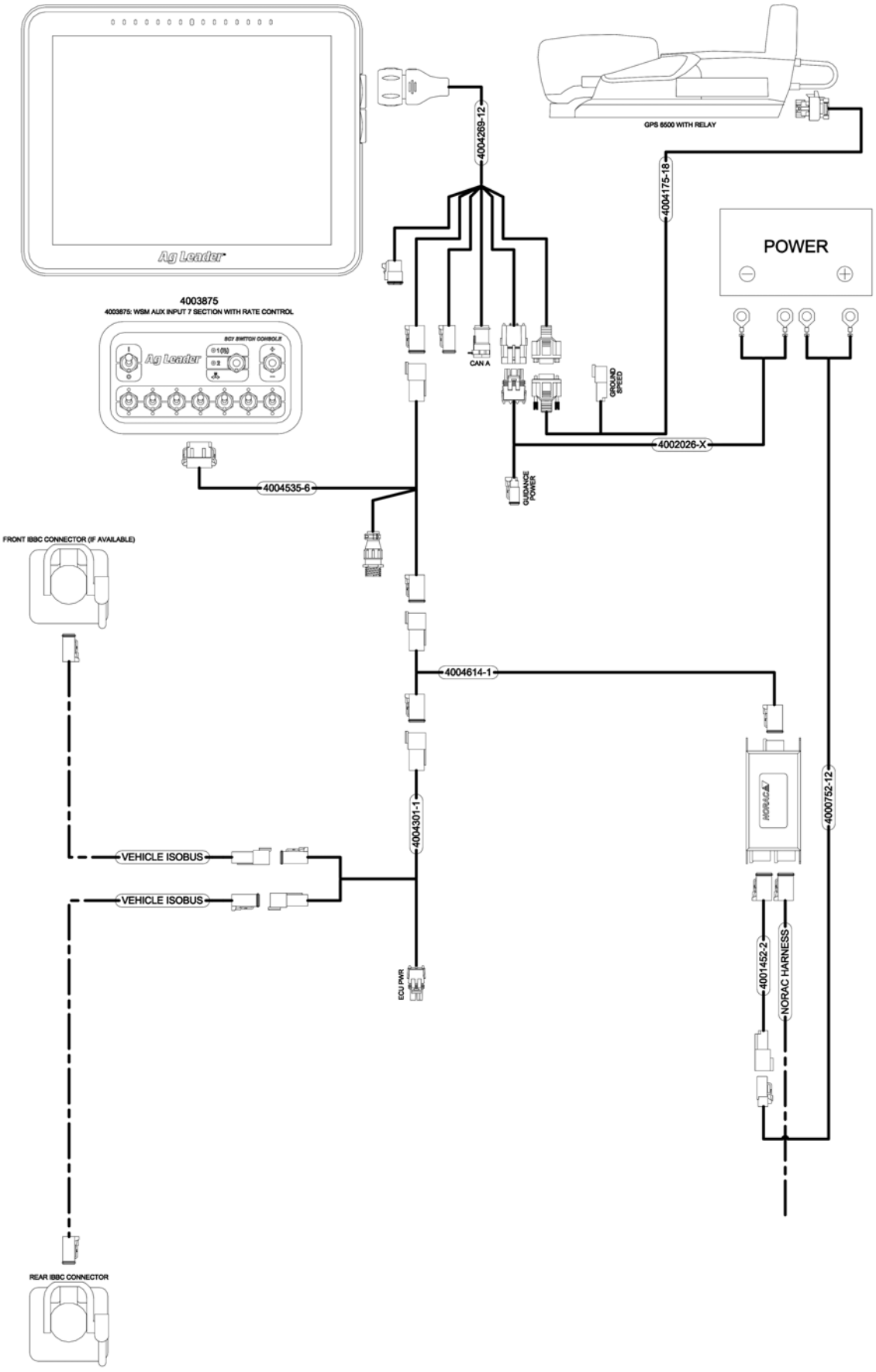


UC5 Self-Propelled with Modules



***NOTE - CAN CABLE PART NUMBER TO MODULES AND SWITCHBOX MAY DIFFER FROM CABLES SHOWN

UC5 ISOBUS Vehicle



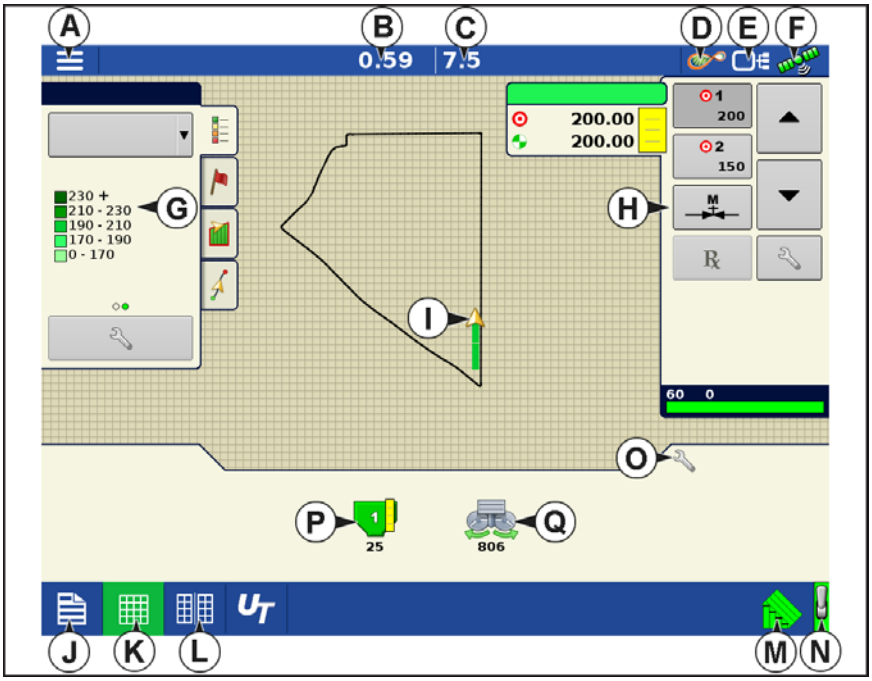
DirectCommand for spinner spreaders is capable of controlling the product conveyor, spinner speed, monitoring bin level, and providing multiple prescription rate control for up to five granular products. The control modules support PWM, motorized servo, Mark IV.2, Mark IV.4, and Mark V hydraulic control valves. DirectCommand granular application system also supports application control of multiple bin spreaders.

Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

Map View

Once a configuration has been completed, the Map View screen appears

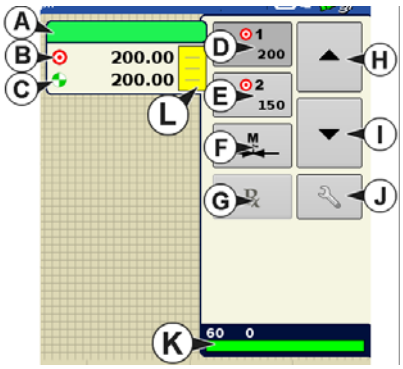


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Product Control toolbox
I. Vehicle Icon
J. Event Summary
K. Map View
L. Split screen
M. AutoSwath
N. Master Switch Status
O. Settings
P. Bin Level
Q. Spinner Speed

NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

Product Control Toolbox

During DirectCommand Run Time operations, the Product Tab(s) are shown in the upper right-hand side of the Map screen. Press the Product Tab(s), and an extended



view shows the Rate butons, Manual Valve Control button, Prescription button, Rate Increase and Decrease arrows, and the Rate Setup button.

A. Product
B. Target Rate
C. Actual Rate
D. Rate 1 button
E. Rate 2 button
F. Manual Valve Control
G. Prescription button
H. Rate Increase arrow
I. Rate Decrease arrow
J. Rate Setup button
K. Section Status Indicator
L. Container Level

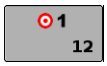
Target Rate—The Target Rate is desired application rate.

NOTE: In some conditions, the Target Rate may increment more quickly than the Actual Rate.

Actual Rate—The Flow Sensor returns the actual rate being applied.

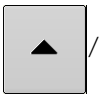
NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.

Container Level—The Container Level shows the amount of product in the container.



Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Manual Valve Control button — The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to prime the system before application or clean out the equipment at the end of the day.

Rate Increase and Decrease Arrows —  / allow Product Application Rate to be changed according to the Target Rate Increment. In using manual valve control, the increase and decrease buttons allow the position of the control valve to be defined by the operator.

Prescription button—

Rate Setup button—

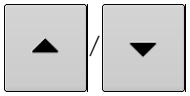
Rate Control Settings

Adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import application product prescriptions. To access the Rate Control Settings screen, press the Rate Setup button on the Product Control Toolbox. The Rate Control Settings screen appears.

Rate 1 and Rate 2 — The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

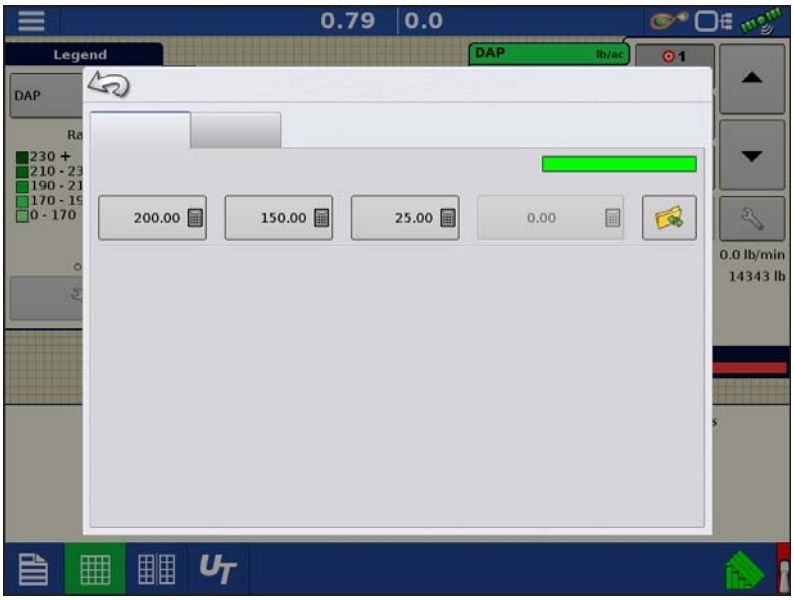
Press to enter the desired amount.

Increment — The Increment button allows operators to specify the increase or decrease amounts for a specified rate by using

 on the Product Control Toolbox. Press to enter the desired increment.

Prescription — To load a map-based prescription file, press the Prescription button.

Refer to "Loading Prescriptions" on page 413 for further details.



Minimum Flow — (Used for DirectCommand Liquid Applications only). This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying with one or more boom sections off, the system automatically reduces the minimum flow setting according to the reduced spray width. To adjust this setting, press and enter the desired numeric value.

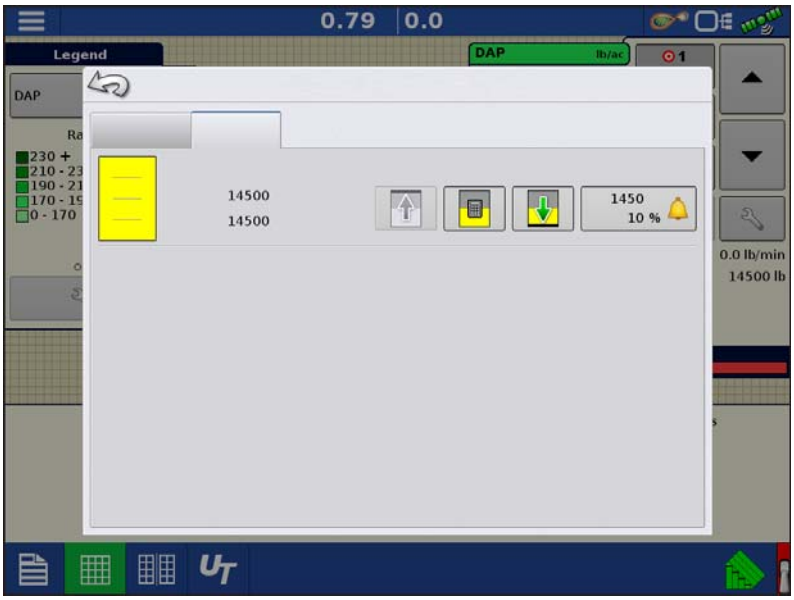
Container Level Settings

When filling or emptying container, use the Container Level portion of the Rate Control Settings screen to update the amount of product in the containers.

Tank Fill — The Tank Fill button increases the container level logged in the display to the user-defined maximum volume (specified in the Container Setup Wizard).

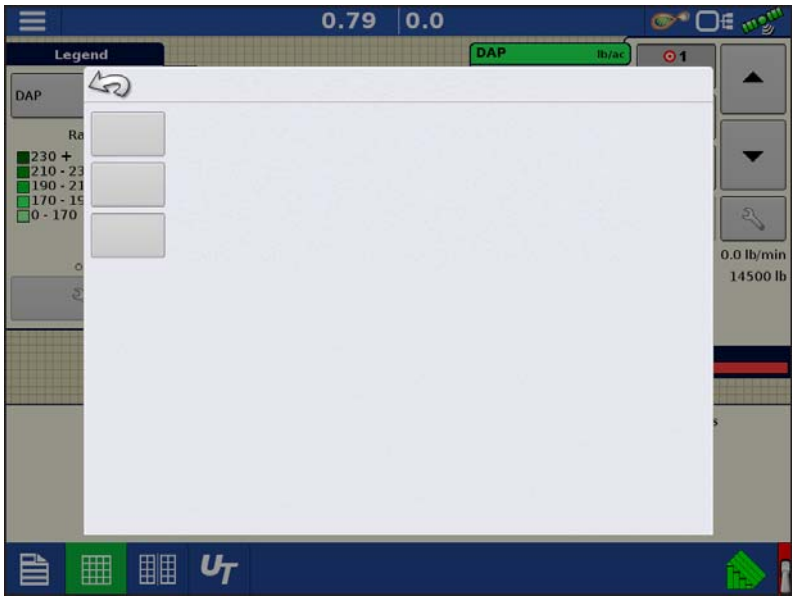
Tank Empty — The Tank Empty button decreases the container level logged in the display to zero.

Tank Partial Fill — The Tank Partial Fill button increases the container level logged in the display to specific amount that you specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

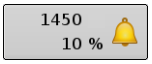


Adjust Container Amount

- **Add** — Adds product to the container.
- **Remove** — Removes product from the container.
- **Set** — Sets the product level in the container.



Tank Alarms



The Container Alarm button, which appears on the right of the Container Level portion of the Rate screen, displays the capacity of your tank as well as the percentage at which the Low Container Level warning will sound. To adjust these settings, press the button and the Container Alarm screen appears.

If you wish to adjust your container level warnings, use the following buttons on the right-hand side of the Container Alarm screen to make these adjustments.

The **Percentage (%)** button sets the warning threshold according to the percentage of product left in the tank. In the example above, the threshold is set at 10 percent.

The **Units of Measurement** icon sets the warning threshold according to the amount of product left in the tank. This icon is named according to the container's units of measurement you specified during the Controller configuration procedure.

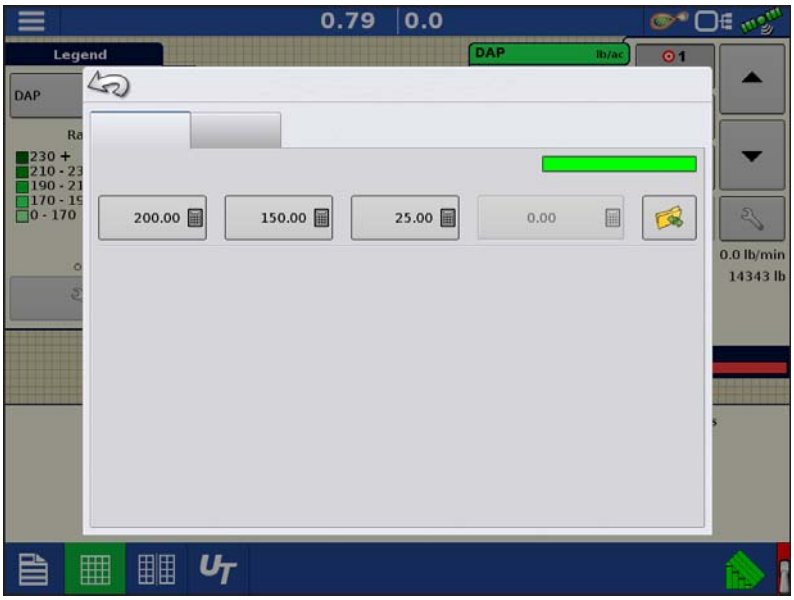
The **Disable Low Container Level** button, which appears as a bell with a red slash across it, disables the Low Container Level warning.

Loading Prescriptions

1. Press on the Product Control Toolbox.

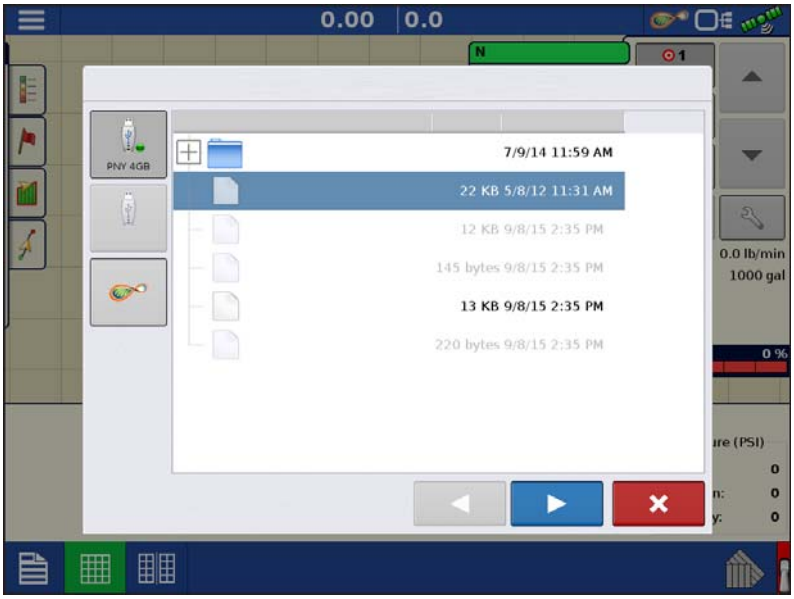
The Rate Control Settings screen appears.

2. Press the Load Prescription button.



The Select File screen appears.

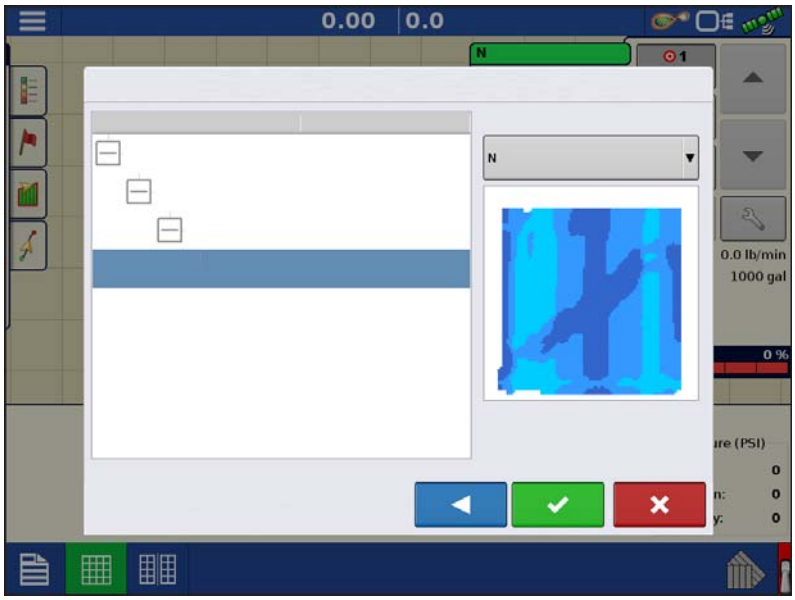
3. Highlight the correct .AGSETUP (prescription) or .shp (shape) file and press .



4. Next select your prescription in the Select Prescription screen, and select the correct controlling product from the Product drop-down box. A preview prescription map is displayed. Press the ✓.

5. When you return to the Rate Control Settings screen, the prescription rate is now shown on the screen. The Load Prescription button has disappeared and in its place is the Remove Prescription button, which resembles a minus sign. Press the Remove Prescription button if you wish to remove the prescription from the field.

6. When you return to the Map screen, the prescription is now shown on the map.



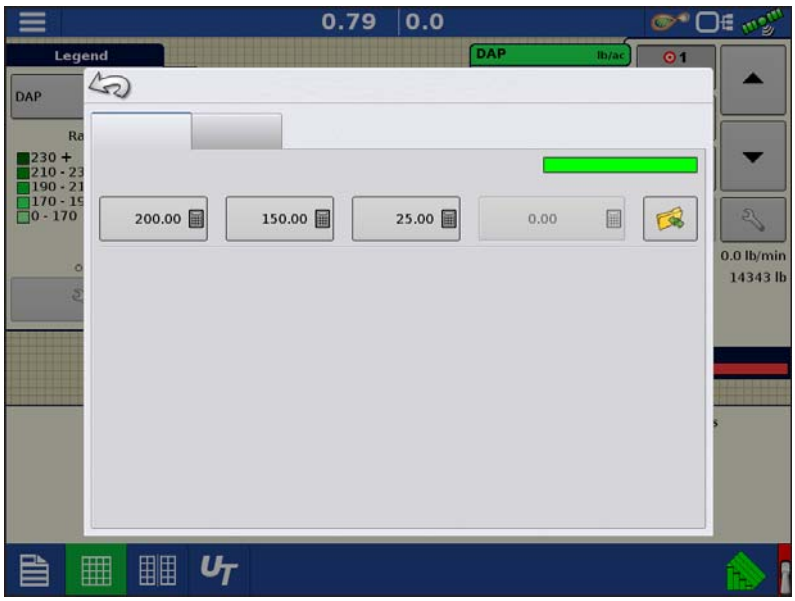
Shape File Conversion

What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple products.

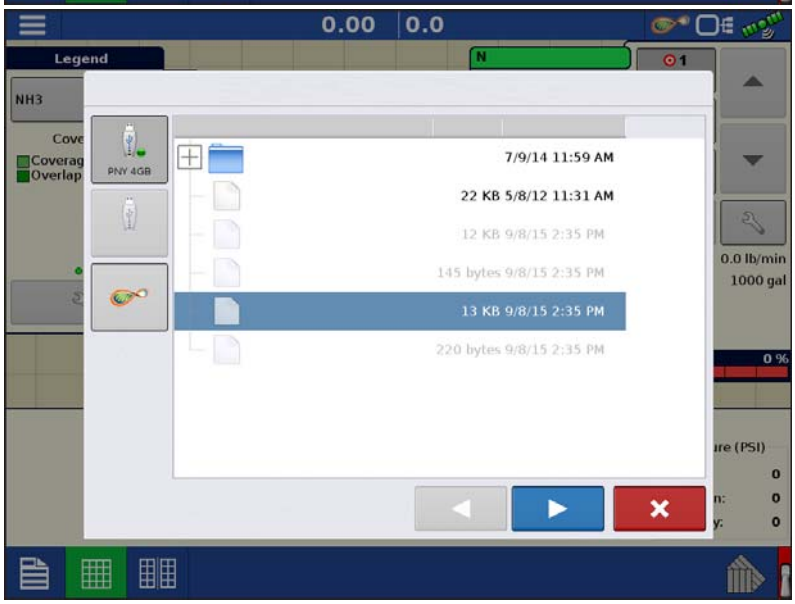
1. Press 🔧 on the Product Control Toolbox.

   The Rate Control Settings screen appears

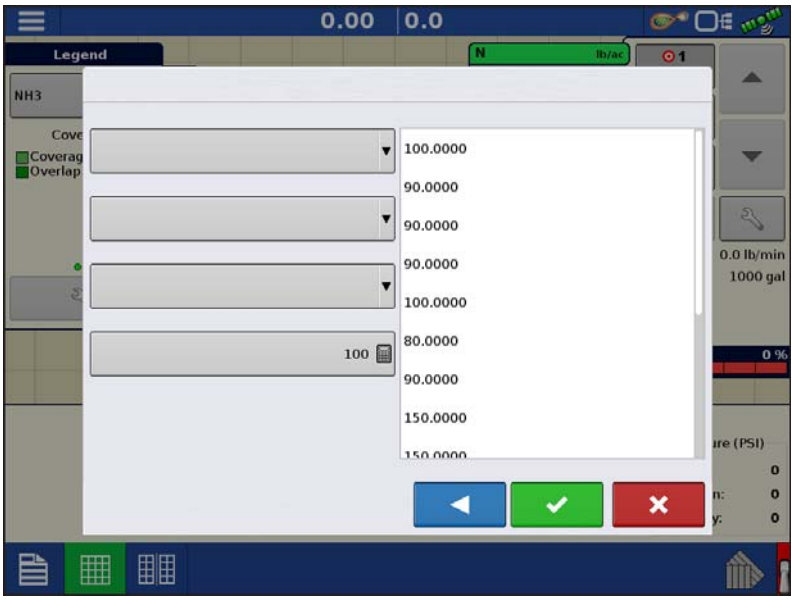
2. Press the Load Prescription button 📂.



3. The Select File screen appears. Highlight your desired .shp file and press ▶.



4. **Select Column From Shape File**—Select the column that contains the product recommendation rate. The list on the right side of the dialog shows sample data from the selected column.
5. **Select Units**—Select the controlling units for product application.
6. **Default Rate Setting**—The system assigns a default rate. Use the on-screen keypad to edit the value if desired.



NOTE!: Select the product and units that the shape file prescription was made for. Selection of the wrong data column or unit will result in misapplication of product.

ATTENTION!: The only time the default rate is used by the system during product application is if the Rate Outside of Field selection is set to " Rx default". This setting is located in the equipment configuration settings portion of configuration setup. If the Rate Outside of Field selection is set to "Rx default", the default target rate will be used when the vehicle exits the area covered in the prescription map.

Creating Products

Creating application products including dry fertilizer blends can be completed upon initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Creating Single Products

To create a single product, to be added to a blend or to be applied by itself, use the on-screen wizard described in the following steps.

1. **Select Product Type**—Use drop-down menu to select Product and press ▶ to continue.
2. **Select Product Units**

When selecting the following fertilizers, use drop-down menu to select the product units:

- Ag Lime
- Pell Lime
- User Defined Lime
- User Defined N-P-K
- User Defined Micronutrient
- Other

Press ▶ to continue.

3. EPA Product Number (Optional)

   Check box if product is a Restricted Use Pesticide
4. Manufacturer name if applicable

Manufacturer name can be added to the drop-down menu by pressing .

5. **Enter Product Name**

Default product name appears. Press to enter a new name.

Press to complete product setup or press to return to Configuration Setup screen without making a change.

Created product should appear under the Application heading located on the Product tab of the Configuration Setup screen.

NOTE!: Some Fertilizer and Carrier product types are predetermined in the display. These product names cannot be edited. Their Manufacturer and EPA Numbers can edited after the product is created. Examples are: Fertilizer>DAP or Carrier>30% UAN.

Creating Dry Fertilizer Blends

Dry fertilizer blends are set up using the on-screen wizard described in the following steps.

1.

2. From the Type drop-down menu select Dry Blend

   From the Define By drop-down menu select:

   - Total amounts - to define blend by amounts going into the bin
   - Rate/acre - to define blend by the amounts going on an acre

   Press to continue.

3. From drop-drown menu select base units.

   Press to continue.

4. Press to start the process of adding components to the blend.

NOTE!: Any liquid herbicides set up within the system can be added to create an impregnated blend product.

5. Select the desired component from the drop-down menu.

NOTE!: More than 7 products can be put part of a Mix/Blend but only 7 or fewer can be active at the same time.

- A new product can be set up at this time by pressing and following the Product Setup Wizard.
- Press to add selected product or press to return to Add Mix/Blend screen without adding a product.

6. Press to add an additional component.
7. When all components have been added press .
8. Enter Manufacturer name if applicable.

   - Manufacturer name can be added to the drop-down menu by pressing

9. Press to enter a unique name for the blend.

10. Press to complete the process of setting up the dry blend or press to return to Configuration Setup screen without adding a mix.

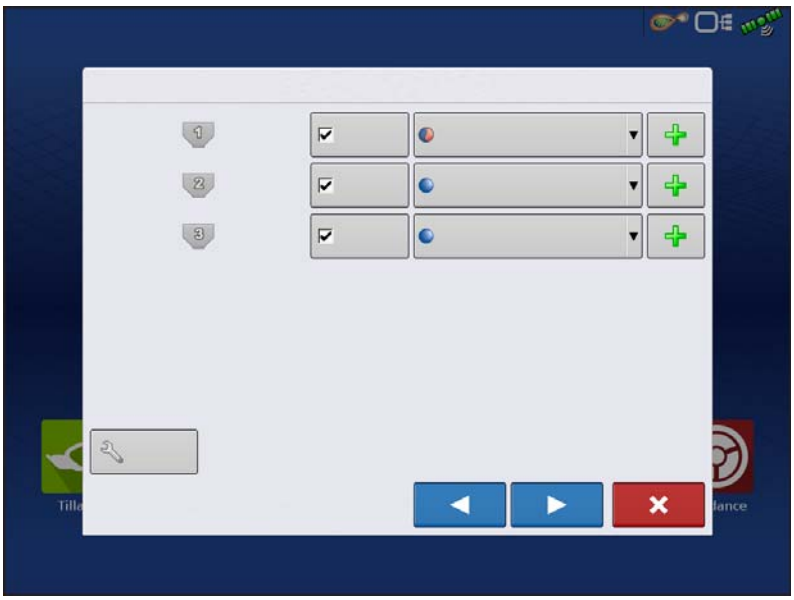
Created blend should appear under the Application heading located on the Product tab of the Configuration Setup screen.

Dry Blend/Product Template indicator.

Configure Product Mix

1. When using a Dry Fertilizer Blend, the mix contents and amounts are defined in the Configure Product Mix screen available in the Event Setup Wizard, or Product button in the main menu.

2. Select product from the drop-down list or press to create a new one.



More than 7 products can be part of a Mix/Blend but 7 or fewer can be active at the same time.

Press to continue.

3. Configure Product Mix

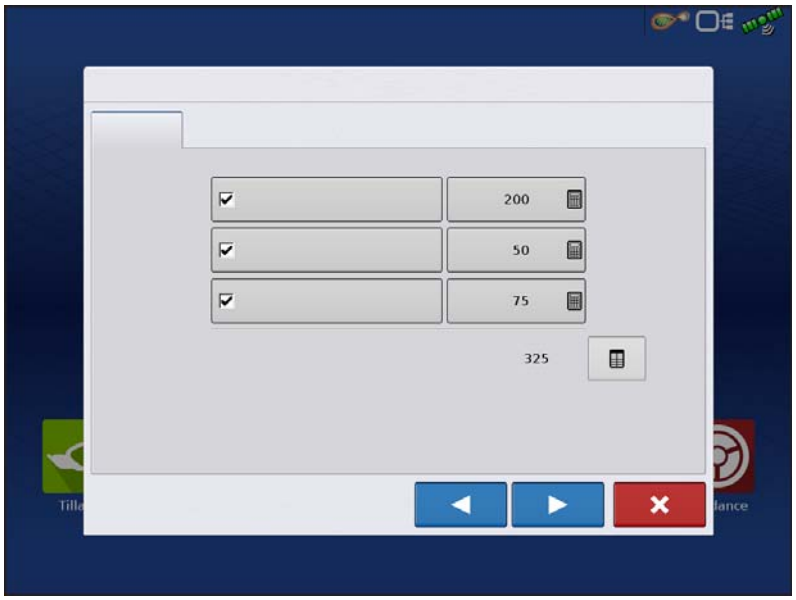
Product Blends can be adjusted after they are created by:

   A. Activating or de-activating products

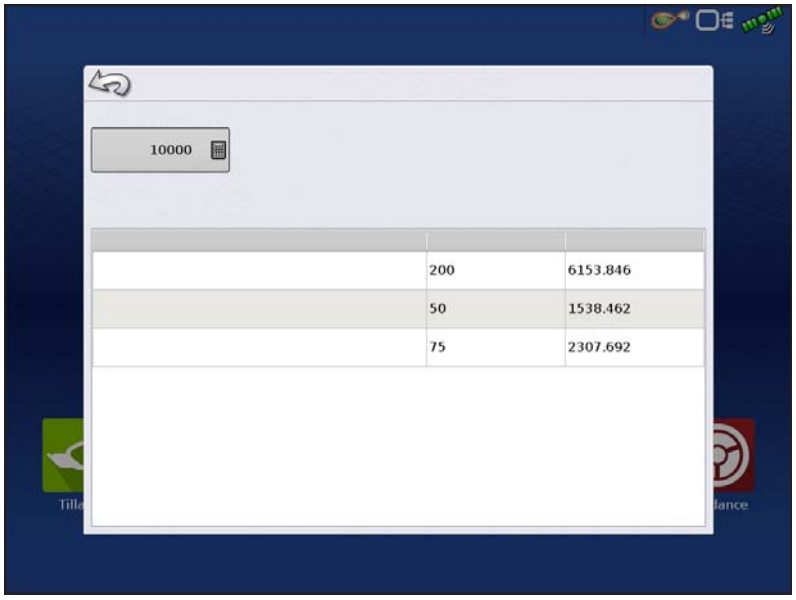
   B. Changing rate or total amount of a product

   C. Changing total amount of the product or overall rate of product application

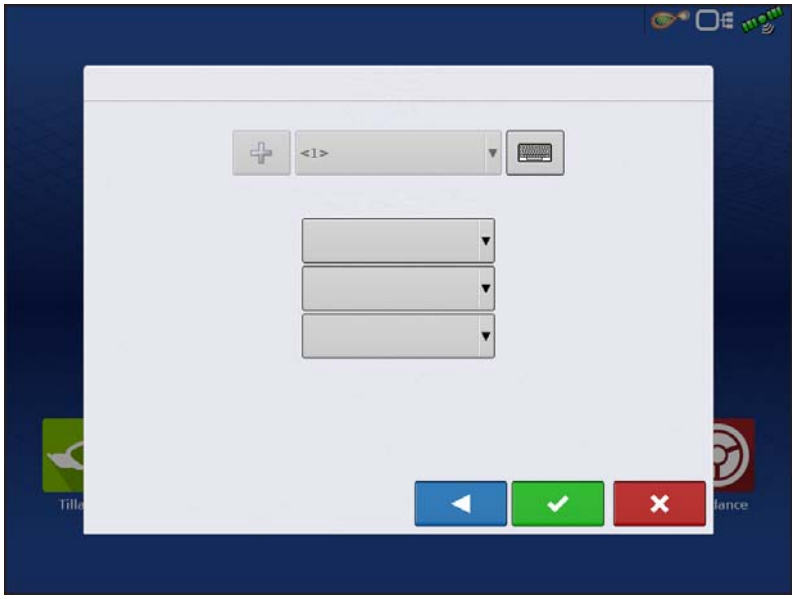
4. When a Product Blend is setup using rate/area, the Mix Calculator can be used to show how much of each product to put in the tank when the user enters the desired amount to fill.



5. Press the Volume to Calculate button and input the total volume. Table will give the user the amount of each product to put in the tank.



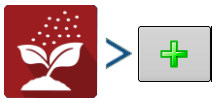
6. Select Region from the drop-down menu or press to name the Region. Verify the Controlling Product for the Product Blend. Press to load the Event to the Map Screen, or press return to Home screen without setting up an Event.



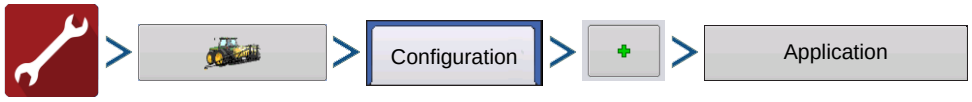
Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:



OR



Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

Container Sequencing

Container Sequencing functionality allows application of the same product (discrete products or blends) sequentially from multiple containers. When product container is low or empty, system automatically advances product application to the next designated container in the sequence.

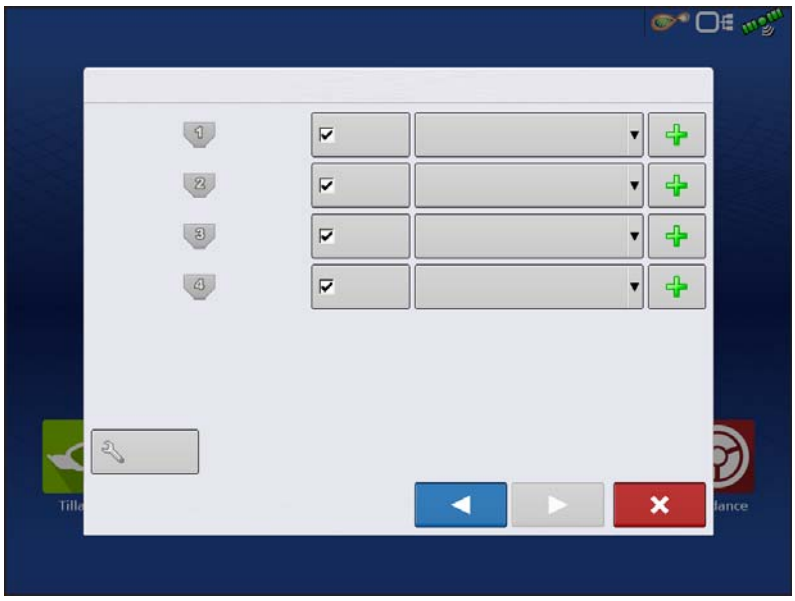
NOTE! Container Sequencing functionality is only supported in the InCommand 1200 display. The InCommand 800 display does not support sequencing functionality.

Container Sequencing Configuration

Complete the following steps to set up container sequencing.

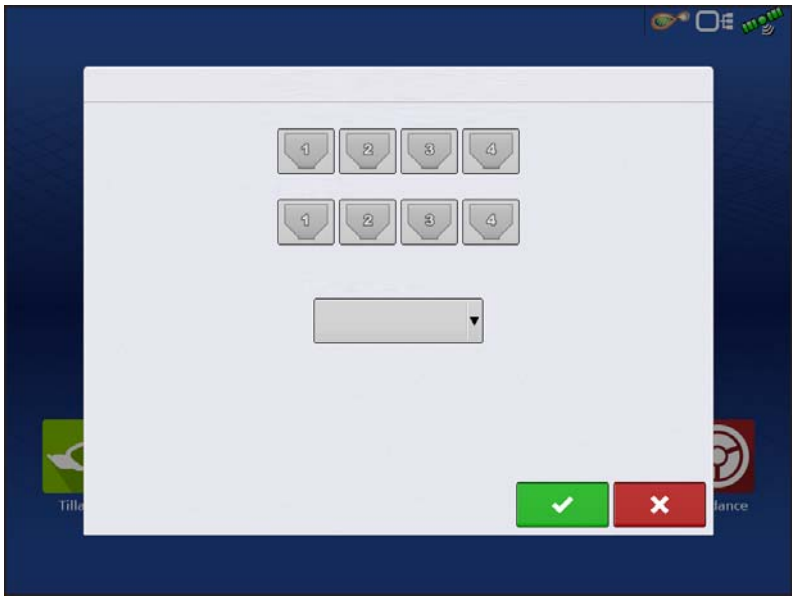
1. Select from Home screen.
2. Select Season, Grower, Farm, Field

   Press to accept and continue.
3. Press the **Container Sequence** button to add container sequencing to current configuration.



4. Press Container icon to select containers to be sequenced.

NOTE!: System defaults container sequence to ascending order during initial setup. User can select starting container when configuration loads to the Map Screen.



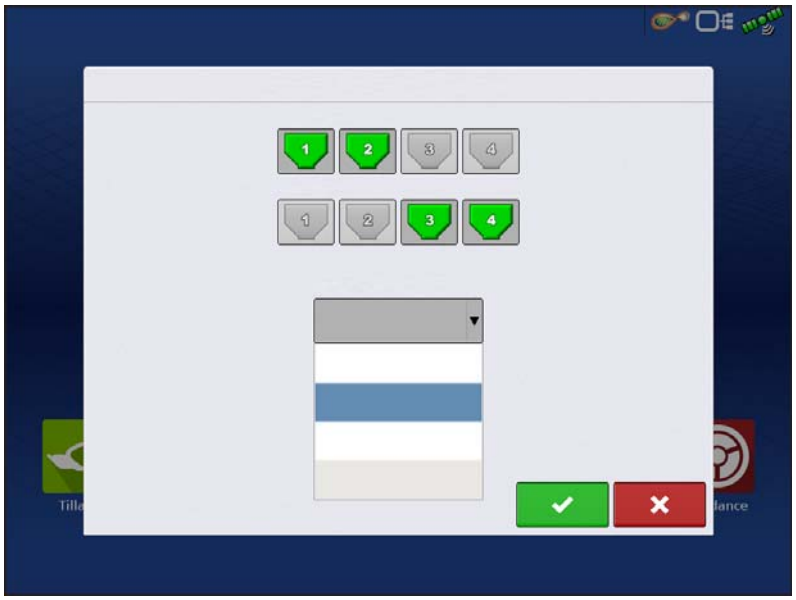
5. Use Sequence Trigger drop-down menu to select container advanced trigger method.

Manual Advance Only—Sequence is manually triggered by user pressing container icon on Map screen.

Low Container Sensor—Sequence automatically advances to next container in the sequence when low container level sensor is uncovered.

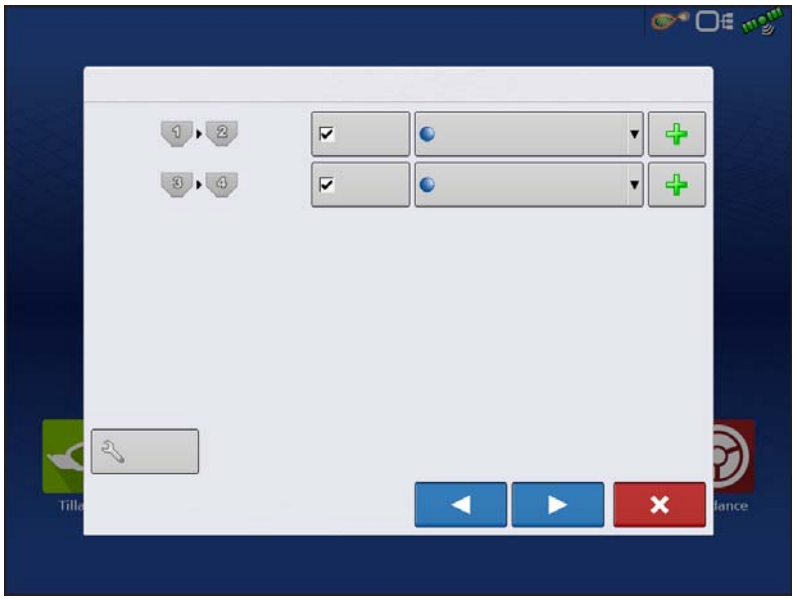
Container Low—Sequence automatically advances to next container in the sequence when system reaches low container level alarm countdown set point.

Container Empty—Sequence automatically advances to next container in the sequence when container level countdown reaches zero.



Press ✓ to accept and continue and return to the product selection screen.

System displays sequenced containers and defaults sequence direction in ascending order.

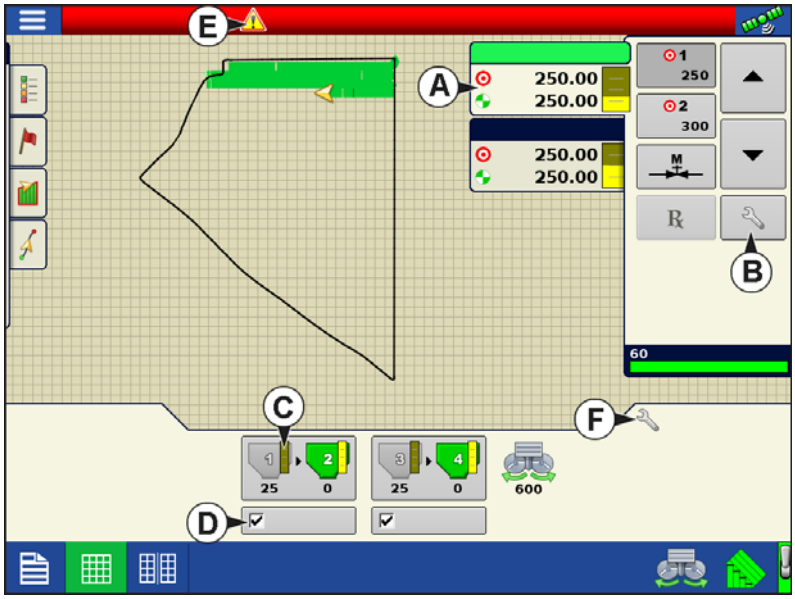


6. Use drop-down menu to select existing products or press to add products to active channels. To create new products see "Creating Products" on page 415.
7. Press to continue to the Event Selection screen.
8. From the Event Selection screen, Start a new event or select a previous event.
9. Press to continue to the Options screen. (Event Selection screen will be skipped if a Configuration is being loaded to a field for the first time.)
10. Use the drop-down menu to select controlling units for products to be applied.
11. Press to accept and continue to Map screen.

Map Screen

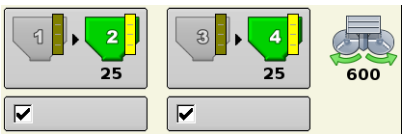
A. Single Rate control display for all containers in a sequence. Container level indicator displays the combined total for all containers in the sequence.

B. Manage individual container level edits for all containers when using container sequencing. (See below)



C. Container level indicator displays the independent container level for each application channel in the sequence.

D. Automatic Sequence Enable/Disable button must be checked for Automatic container sequencing to function. If Sequence Trigger is set to Manual Advance Only, Automatic checkbox will not be displayed.



E. Moving to the Next Container Warning alerts user when the user defined Automatic Sequencing Trigger condition has been met and system is advancing to next container in the sequence. This warning is not displayed when manually advancing sequence, system will automatically activate the next designated container in the sequence.

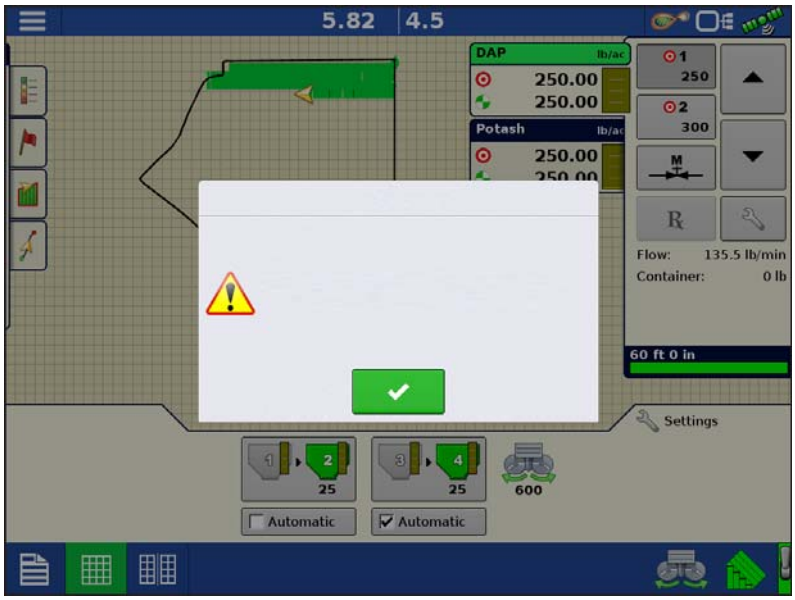
F. Press **Settings** to access standard Spreader Control settings including Static and In-Field calibration routines.

End of Automatic Container Sequence Warning—alerts user the last container in the sequence has met the user defined automatic sequence trigger conditions.

Press to clear warning dialog.

NOTE!: Control Channel will remain active and continue applying.

- User must manually reset system to the beginning of the sequence.
- The system disables Automatic sequencing. User is required to re-enable Automatic Sequencing for the appropriate container.

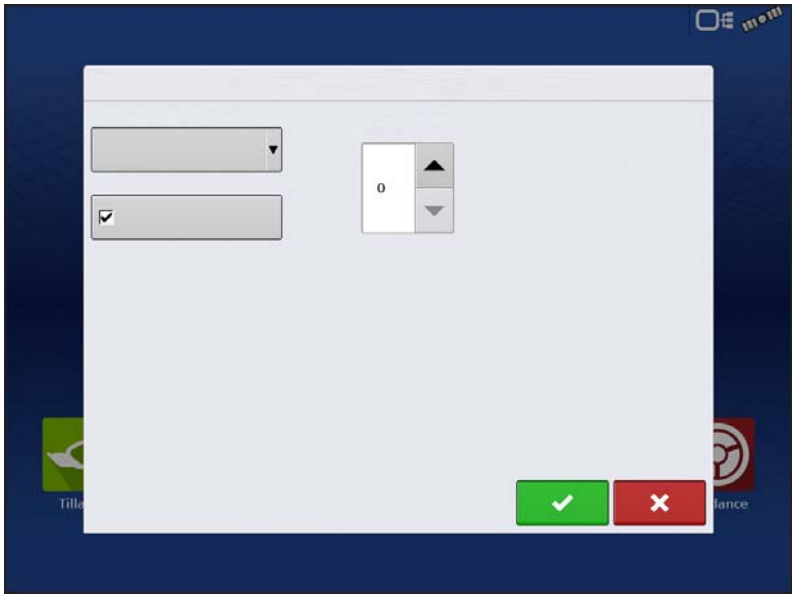


Equipment Settings

OR

Rate Outside of Field—This setting will define how product will be controlled when leaving a field boundary.

- **Zero**—This will stop application.
- **Last Good**—This will continue application at the last known rate.
- **Rx Default**—When using a prescription, this will apply at the Default Rate (or outside of boundary rate) as defined by the prescription file.

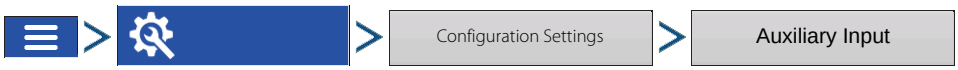


Rate Display Smoothing—Determines how the feedback from the control channel rate sensor will be displayed on the map screen. When de-selected, the system will display raw feedback from the rate sensor. When checked, the system will display target rate when the application rate is within 10% of the target rate setting.

Rate Change Look-Ahead—This setting compensates for any latency in the control system when changing between different product flow rates during variable rate application. The typical setting range for this is 0-1 seconds. This setting can be thought of as a "look ahead" value when using a variable rate prescription. The display will send the signal to change rates before hitting a transition line so that the applied rate is correct when crossing into the new management zone.

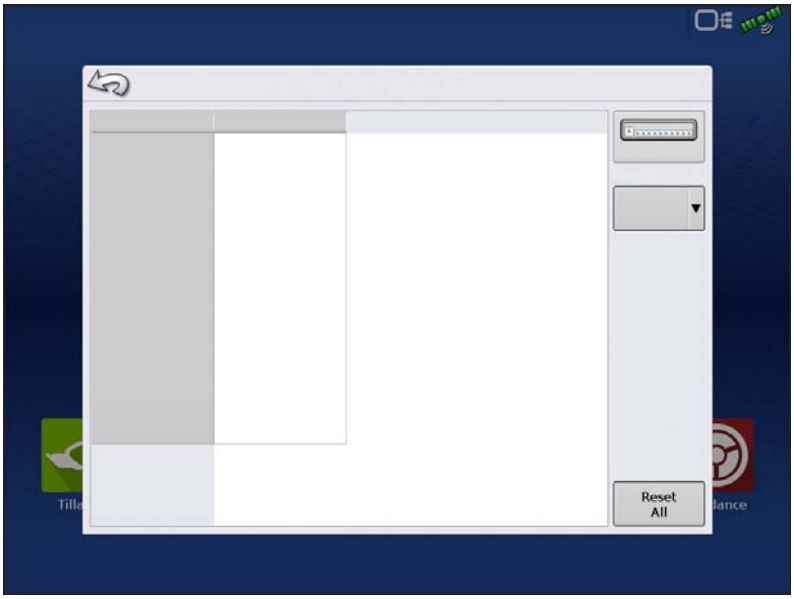
Auxiliary Input

OR

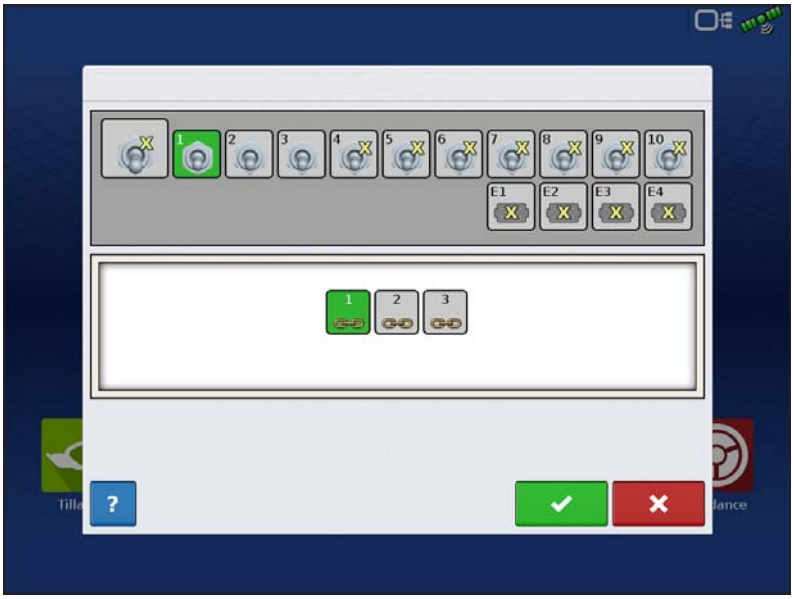


DirectCommand applications default boom sections to the switchbox in order, starting with switch 1. From the Auxiliary Input screen, the operator can customize the switches to the boom sections, if desired.

1. Press .
2. Highlight the desired switch to assign a function to it.



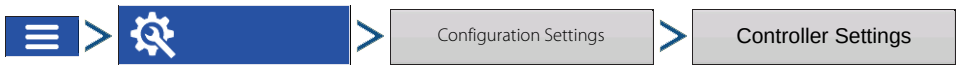
3. Select appropriate function(s) (bin channels for this operation) to assign to the desired switch. Chain icons within each function will "link" once pressed to indicate they are assigned. If a function has a "broken link" then it is not assigned. If a switch has a "X" then it is not assigned to a function. Press the to save the setup.



NOTE! Even if no specific functions are assigned to the Master switch, the Master switch will still serve as the total system on/off switch.

Controller Settings

OR

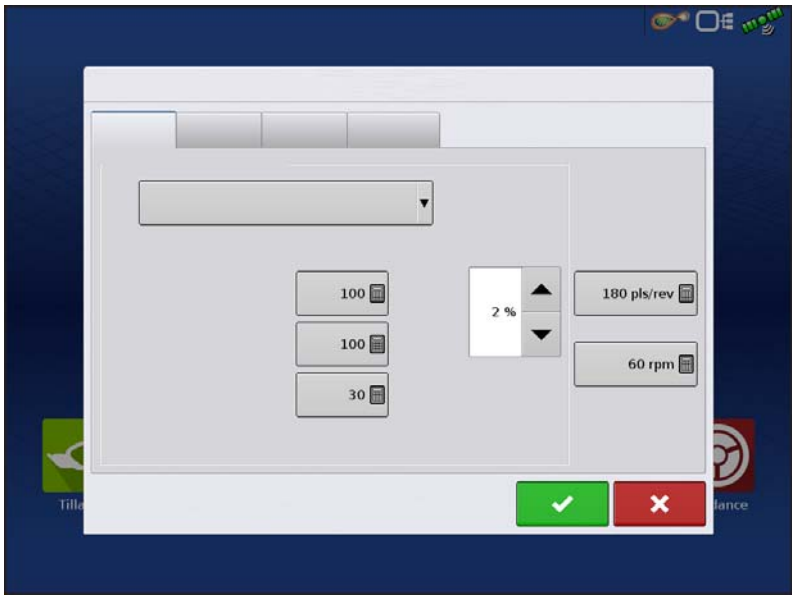


Controller Settings screen appears, with each channel's settings shown on its own tab.

The settings shown at this screen vary, depending upon whether your spreader uses a PWM Control Valve or a Servo Control Valve. Use the Control Valve Configuration drop-down menu to choose the appropriate configuration for your machine.

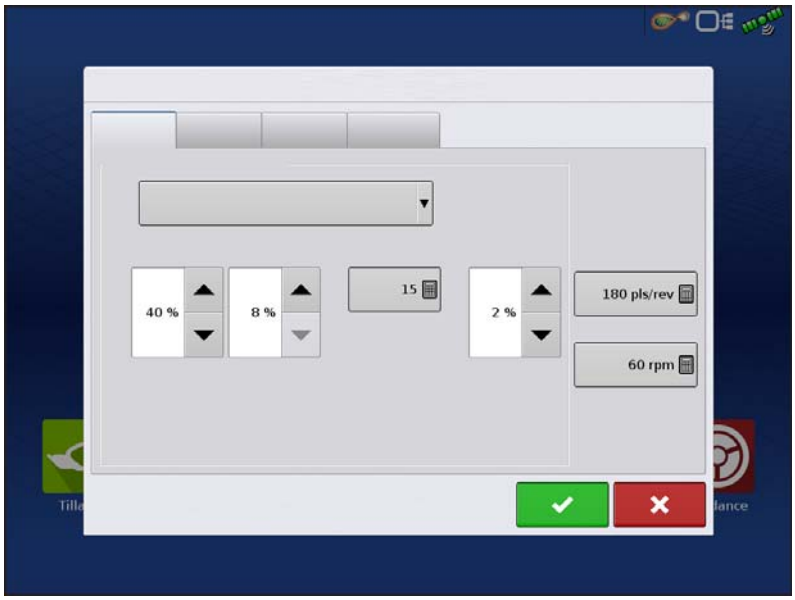
Spinner settings are accessed and adjusted in a dedicated tab. The Spinner Tab appears behind the channel tabs. The Spinner Tab is where Fan Speed settings are shown.

Spreader Control: PWM Control Valve



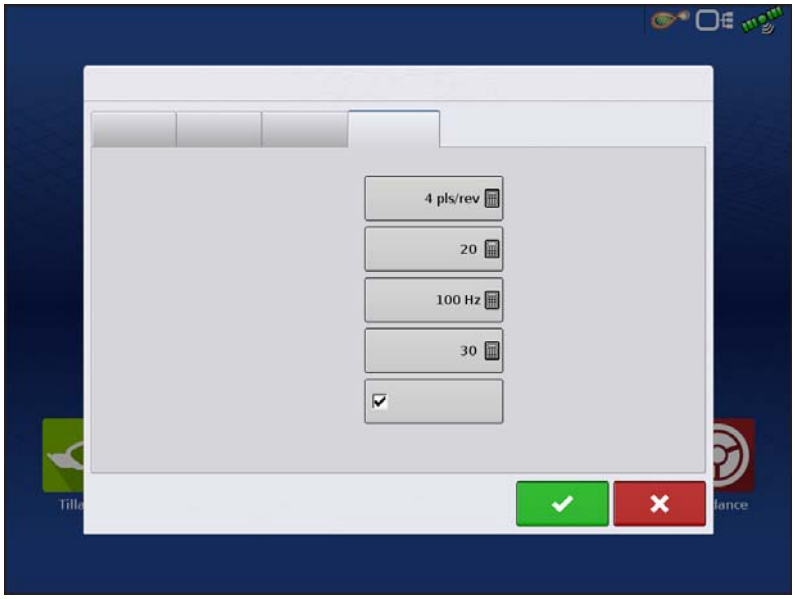
- **PWM Frequency**—The frequency that the PWM control valve is pulsed at. Settings can be found from the manufacturer of the valve. Typical settings range from 100-125 Hz. The default setting is 100.
- **PWM Gain**—Determines how aggressively the control valve responds when making rate adjustments. The higher the value the more aggressive the system response is. The default setting is 100.
- **Zero Flow Offset**—Represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero RPM Offset value can cause the conveyor to not properly shut off. See the PWM valve manufacturer information for recommended settings. The default setting is 30.
- **Allowable Error** —Determines the percent of error that is allowed prior to the product control system making any flow rate changes. 2% - 3% is the normal dead band setting range.
    - Too low of a setting value can cause the product control system to continually hunt for the target application rate.
    - Too high of a setting will cause excessive product application error.
- **Shaft Speed Calibration**—Calibration number representing the pulses that equal one revolution of the rate control metering system.
- **Max Speed**—The Maximum Conveyor Speed Setting determines the maximum RPM of the conveyor that controls product distribution to the application point.

Spreader Control: Servo Control Valve



- **Valve Response 1**—Determines the speed of the servo valve when product control error exceeds the Response Threshold setting. Represents the fast speed of the servo valve. Decreasing the value will cause the servo valve to run slower. The default setting is 40%.
- **Valve Response 2**—Determines the speed of the servo valve when product control error is less than the Response Threshold setting. Represents the slow speed of the servo valve. Decreasing the value will cause the servo valve to run slower. The default setting is 8%.
- **Response Threshold**—Determines where the control channel switches between using Valve Response 1 and Valve Response 2 speed setting. Leaving all other valve control settings at the default value and making a small adjustment to this setting is usually all that is required to fine-tune system performance. The default setting is 15.
    - Decreasing this value will have the overall effect of speeding up servo valve response.
    - Increasing this value will have the overall effect of slowing servo valve response.
- **Allowable Error** —Determines the percent of error that is allowed prior to the product control system making any flow rate changes. 2% - 3% is the normal dead band setting range.
    - Too low of a setting value can cause the product control system to continually hunt for the target application rate.
    - Too high of a setting will cause excessive product application error.
- **Shaft Speed Calibration**—Calibration number representing the pulses that equal one revolution of the rate control metering system.
- **Max Speed**—The Maximum Conveyor Speed setting determines the maximum RPM of the conveyor that controls product distribution to the application point.

Spreader Control: Spinner Tab



To view Fan Speed Calibration settings, press the Spinner Tab. Operators with Spinner Spreaders that use PWM valves will see additional active settings.

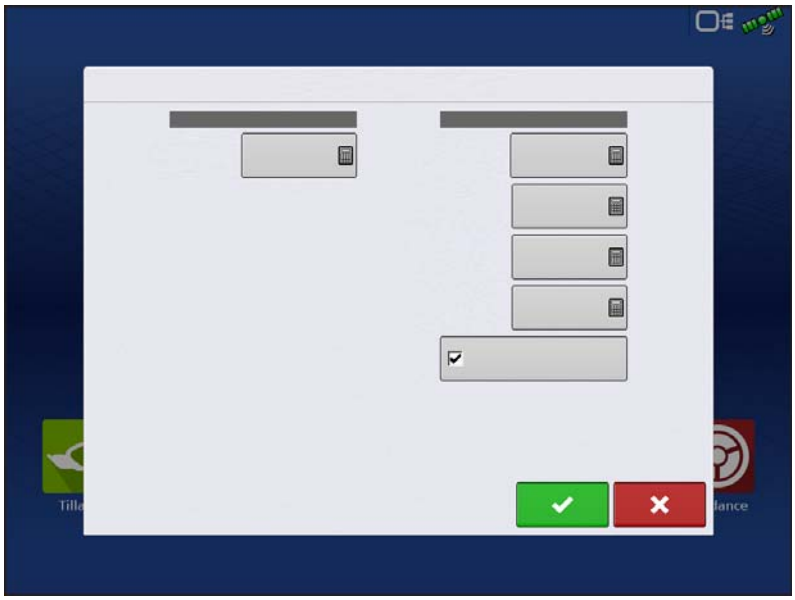
- **Fan Speed Calibration**—The number of pulses that are generated by the sensor during one revolution of the spinner dish. The default setting is 4.
- **PWM Gain**—Determines how aggressively the control valve responds when making spinner speed adjustments. The higher the value the more aggressive the system response is. The default setting is 20.

- **PWM Frequency**—The frequency that the PWM control valve is pulsed at. Settings can be found from the manufacturer of the valve. Typical settings range from 100-125 Hz. The default setting is 100.
- **Zero RPM Offset**—Represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero RPM Offset value can cause the spinner system to not properly shut off. The default setting is 30.

NOTE!: See the PWM valve manufacturer information for recommended settings.

- **Automatic Control**—Checking this box enables closed loop spinner control.

Stepper Spreader Control



- **Max Conv. Speed**—The Maximum Conveyor Speed setting determines the maximum RPM of the conveyor that controls product distribution to the application point.
- **Fan Speed Calibration**—The number of pulses that are generated by the sensor during one revolution of the spinner dish. The default setting is 4.
- **PWM Frequency**—The frequency that the PWM control valve is pulsed at. Settings can be found from the manufacturer of the valve. Typical settings range from 100-125 Hz. The default setting is 100.
- **PWM Gain**—Determines how aggressively the control valve responds when making spinner speed adjustments. The higher the value the more aggressive the system response is. The default setting is 20.
- **Zero RPM Offset**—Represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero RPM Offset value can cause the spinner system to not properly shut off. The default setting is 30.

NOTE!: See the PWM valve manufacturer information for recommended settings.

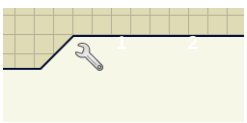
- **Automatic Control**—Checking this box enables closed loop spinner control.

Automatic Spinner Control

Turn Spinners on/off by pressing the Spinner Icon located in the Task Bar. After pressing the Spinner Icon, a warning will appear alerting user the spinners will turn on and to remain clear of equipment.

Press ✓ to turn spinners on and clear warning dialogue. Press ✗ to keep spinners from running and clear warning dialog.

Run Time Operations—Spreader Control



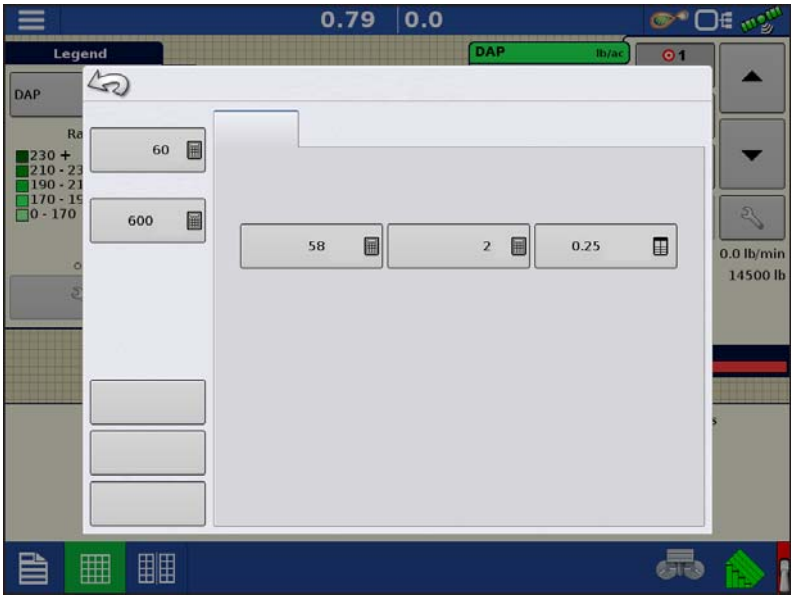
During Run Time Operations, Spinner Spreader operators can press the **Settings** button to open the Spreader Control screen. At this screen, you can adjust Spread Width, Spinner Speed, Product Density and other settings.

- Each of these settings described below must be set for each individual Product Channel (bin).

- Changed settings do not take effect until verified.
- The **Spread Width**, **Spinner Speed**, **Product Density**, **Feed Gate 1 Opening** and the **Conveyor 1 Rate** are all stored with each combination of product and control channel.

Spreader Control screen

- **Spread Width**—Press to edit the value.
- **Spinner Speed**—The spinner speed required for accurate product placement in relation to the spread width setting.
    - The spinner speed is controlled automatically based upon this setting when the system uses an optional PWM spinner speed control valve.
    - To accurately determine Spinner Speed settings you should perform a spread pattern catch test.
- **Product Density**—This density value (shown in pounds per cubic foot, or lb./ft.3), is stored with each product. Press to edit if needed.



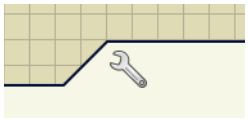
NOTE!: For proper machine performance and accuracy. Product Density should be measured for every application load.

- **Feed Gate 1 Opening**—Represents the Feed Gate opening for Conveyor 1. Measure the depth of product on the conveyor to ensure accurate feed gate setting value.
- **Conveyor 1 Rate**—This setting represents the volume of product dispensed by one revolution of the conveyor drive shaft (cubic foot per revolution, or ft3/rev.) This number is shown with the assumption that the conveyor shaft has a 1-inch gate opening. (When the display is in Metric units, this number is shown with the assumption that the conveyor shaft has a 2.54 cm gate opening.) This conveyor rate remains constant, regardless of the height of the feed gate opening.

ATTENTION!: You must either manually enter conveyor rate value or perform a CFR calibration routine for each product and channel combination, otherwise misapplication will occur.

Conveyor Rate Look-Up

A pop-up screen will display a warning when a product is assigned to a container or bin for the first time and has not been calibrated. The warning prompts the operator to review product density and conveyor rate settings.



Conveyor rates for previously applied products can be found by first pressing the **Settings** button which opens the Spreader Control screen.

The Spreader Control screen has a tab for each control channel/product being applied. Select the desired channel and press the **Conveyor Rate** button.

WARNING!: For proper machine performance and accuracy, Product Density should be measured for every application load.

The **Conveyor Rate** button opens a setup screen where the conveyor rate can be input, and a table of previously applied products and conveyor rates is shown.

Highlight desired product by pressing it and press to input desired conveyor rate.

Press to accept the new conveyor rate and return to the Spreader Control window.

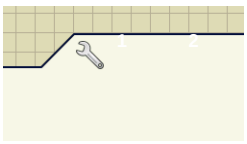
Spreader Control: Routine Operations

The Spreader Control screen has three buttons, Chain Oiler, Static Calibration and In-Field Calibration, which are described below and on the following pages.

Spreader Control: Chain Oiler

If you are using a Chain Oiler, you can automatically perform a chain oiling routine by pressing the Chain Oiler button on the Spreader Control screen and following the steps below.

NOTE!: Perform a chain oiling routine daily.



1.**Press Settings button**—To begin, press the Settings button to open the Spreader Control screen. At the Spreader Control screen, press the Chain Oiler button.

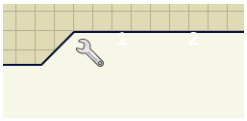
2.**Acknowledge the first warning**—Manually disable or shut off the spinner hydraulic circuit.

3. **Enter a Routine Duration**—Enter the routine time that it takes to turn the conveyor one revolution.
4. **Press Start**—Press the Start button, and when the routine is finished press .

5. **Acknowledge the second warning**—Return the spinner hydraulic control to a field-ready condition.

Spreader Control: Static Calibration

You must perform a conveyor discharge calibration for each granular product control channel (bin) for the equipment configuration. This process is outlined below and on the following page. The static calibration procedure is performed before applying in field conditions.



1.To begin, press the **Settings** button on the Map screen. The Spreader Control screen opens.

2.Press the **Static Calibration** button to start the Static Conveyor Rate calibration routine.

3.**Disable Spinner Hydraulic Circuit**—The system will present a warning to disable the spinner hydraulic circuit. Press ✓ after the hydraulic circuit is disabled.

⚠ DANGER!: Manually disable or shut off the spinner hydraulic circuit. If the spinner runs unexpectedly, injury could occur.

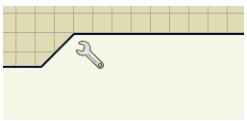
4. Select **Conveyor** to Calibrate
5. **Enter Dispense Amount**—Enter the desired target amount of product to dispense (the recommended amount is 500 pounds or 250 kilograms). Press ▶ to continue.
6. **Start Dispensing Product**—Press the **Start** button to begin dispensing the product. Dispensed product will need to be caught during calibration routine and weighed afterwards.
7. **Product Dispensing**—The conveyor will stop when the system perceives the target amount of product has been dispensed. The **Stop** button can be pressed at any time to manually shut off the conveyor.
8. **Product Dispensing Stops**—On the screen shown after dispensing the display's target amount, value can be reset and the process started again for a larger sample size, if desired. Press ▶ to continue.
9. **Enter Actual Dispense Amount**—Enter the actual weight of the product dispensed. Press ▶ to continue.
10. **Finish Calibration**—A screen displays, stating Calibration Complete and underneath is shown the newly-calibrated conveyor rate.
    - Press ✗ to exit the calibration without saving the value.
    - Press **Repeat Calibration** to begin the process again.
    - Press ✓ to save the value and exit the calibration routine.

⚠ DANGER!: Make sure the spinner is free of material before restarting the spinner hydraulic circuit.

11. A warning will appear when exiting the calibration wizard, instructing you to return the spinner control hydraulic circuit to a field-ready condition.

Spreader Control: In-Field Calibration

The In-Field Conveyor Calibration procedure performs an automated routine to adjust the calibration number for the selected spinner bin. This calibration is performed if there is a difference between the amount of product logged as compared to what was actually applied.



1.To begin, press the **Settings** button on the Map screen. The Spreader Control screen opens. Press the **In-Field Calibration** button on the Spreader Control screen. The In-Field Conveyor Rate Calibration Wizard appears.

2. **Select Conveyor to Calibrate**—Select the channel to calibrate, and press ▶ to continue.

3. **Enter Actual Weight**—The Accumulated Weight is shown in the top portion of the window. Press to enter the Actual Weight, and press to continue.

NOTE! Start a new Region to reset the Accumulated Weight to 0 lbs.

4. **Calibration Complete**—A message appears, stating that your calibration is complete, and showing the CFR amount in cubic feet per revolution. Press to finish.

Troubleshooting DirectCommand Granular Applications

Problem: Run screen Granular channel(s) green light spreader indicator will not turn on.

Solution:

1. Make sure ground speed is registered a value greater than zero on the display.
2. Verify a target rate greater than zero is entered into the display.
3. Check the switch status found on the Run screen under CAN and Auxiliary Input Diagnostics. As the master switch is turned on and off, the Auxiliary Input Diagnostics window should change from black to green (if they do not, then refer to the installation instructions to verify switch connections).
4. Check high current connection into the Granular Control Module.

Problem: Master switch will not turn on when the foot pedal is on.

Solution: Make sure the Master Source Input is set to "External 2" under the Auxiliary Input settings.

Problem: AutoSwath turns on the conveyor or drive too fast or too slow.

Solution:

1. Check GPS offsets in the vehicle setup to verify all of the measurements are correct.
2. For pulled implements - Verify implement offsets are appropriate for the spreader.
3. Adjust the turn on look-ahead and turn off look-ahead to fine-tune Automatic Swath Control performance.

Problem: AutoSwath feature is not shown.

Solution: The display must have the AutoSwath feature password-unlocked before the feature is available to the operator.

Problem: Conveyor drive turns on when outside of the boundary.

Solution:

1. Make sure the Rate Outside of Field option is set to zero under the active configuration settings.
2. Make sure the Outside Boundary Option is set to Turn Section Off under the Automatic Swath Control options.
3. Make sure there is not a gap between the boundary and the first pass of the headlands.

Problem: AutoSwath is checked on, but the spreader will not turn on.

Solution:

1. Make sure the ground speed is registering a value greater than zero on the display and not in covered area.
2. Make sure the applicator is inside of the field boundary.
3. Make sure there is a target rate greater then 0.
4. Verify the Master Switch icon is indicating On (green) and Off (red) appropriately.

Problem: Conveyor turns off in the middle of the pass.

Solution:

1. Check the display firmware and module firmware to see if they are running the latest version.
2. Make sure the ground speed does not go to 0.
3. Make sure the GPS is not losing the differential source.

Problem: Total Applied does not match Actual Weight Applied.

Solution:

1. Make sure the shaft speed pls/rev are set correctly in the Controller Settings.
2. Make sure the controlling product is set to the correct units.
3. Review Static or In-Field calibration procedures to ensure process was done appropriately.

Problem: Rate not responding.

Solution:

1. Make sure there is a ground speed registering on the display.
2. Make sure the shaft speed pls/rev are set correctly in the Controller Settings.

NOTE! You must make sure to account for sprocket ratios if chain driven..

$$\frac{\text{Driven Teeth}}{\text{Drive Teeth}} \text{ X Rate Sensor Pulses = True Pulses}$$

3. The CFR number may need to be adjusted.
4. Use Manual Valve control to see if the control valve will open or close.

Troubleshooting Serial Control Applications

Problem: Rate changes on the display, but not on the controlled console.

Solution:

1. Verify the current firmware is running on the display and Application Rate module.
2. Check the settings specific to your controlled console.
3. Check cabling and all connections.
4. Disconnect the serial connection and determine if the controller is functioning properly without the display.

Problem: The display rate and serial-controlled rate do not match.

Solution:

1. Verify the current firmware is running on the display and Application Rate Module.
2. Check to make sure the nominal rate in the display matches the nominal rate in the serial-controlled console.

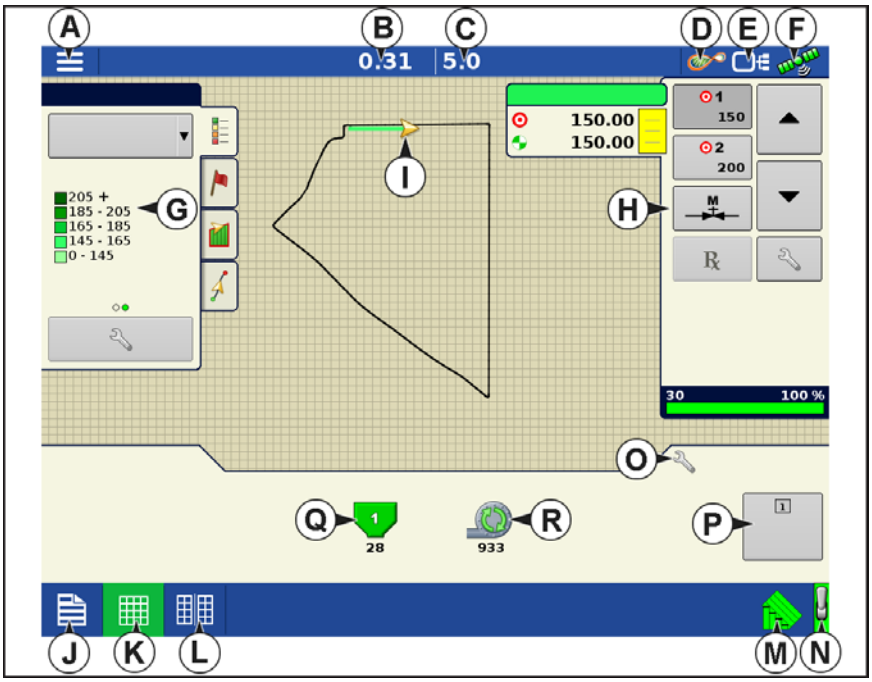
DirectCommand for Strip-Till applicators monitors bin level and fan speed sensors, maintains an accurate application rate and supports multiple product prescription rate control for up to three granular products. The Strip Till module supports PWM and Motorized Servo valves, as well as Electric Linear Actuators/Meter Clutches. System can be configured for Strip Till fertilizer application or Air Seeder (Planting) control. To create an Air Seeder (Planting) configuration continue to "Create Configuration" on page 443.

Load Configuration

Press the Application App from the home screen. This will take you through the steps needed to load a configuration.

Map View

Once a configuration has been completed. The Map view screen appears.

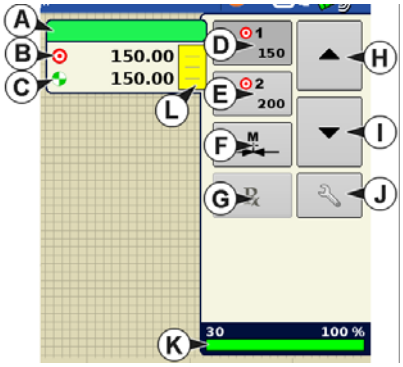


A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status
E. Diagnostics
F. GPS Signal Indicator
G. Display Legend
H. Product Control toolbox
I. Vehicle Icon
J. Event Summary
K. Map View
L. Split screen
M. AutoSwath
N. Master Switch Status
O. Settings
P. Start Prime button
Q. Bin Level
R. Fan Speed

NOTE! Pressing the Map View button will cycle between the available Map Screen views, and the appearance of the Map View button changes.

Product Control Toolbox

During DirectCommand Run Time operations, the Product Tab(s) are shown in the upper right-hand side of the Map screen. Press the Product Tab(s), and an extended view shows the Rate butons, Manual Valve Control button, Prescription button, Rate Increase and Decrease arrows, and the Rate Setup button.



A. Product
B. Target Rate
C. Actual Rate
D. Rate 1 button
E. Rate 2 button
F. Manual Valve Control
G. Prescription button
H. Rate Increase arrow
I. Rate Decrease arrow
J. Rate Setup button
K. Section Status Indicator
L. Container Level

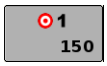
Target Rate—The Target Rate is desired application rate.

NOTE: In some conditions, the Target Rate may increment more quickly than the Actual Rate.

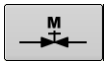
Actual Rate—The Flow Sensor returns the actual rate being applied.

NOTE!: In some conditions, the Actual Rate may increment slower than the Target Rate, or its numeric values may vary before matching the Target Rate.

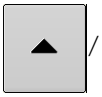
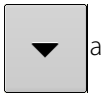
Container Level—The Container Level shows the amount of product in the container.



Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.



Manual Valve Control button — The Manual Valve Control button allows operators to specify the position of the control valve. Operators use this option to prime the system before application or clean out the equipment at the end of the day.

Rate Increase and Decrease Arrows —  /  allow Product Application Rate to be changed according to the Target Rate Increment. In using manual valve control, the increase and decrease buttons allow the position of the control valve to be defined by the operator.

Prescription button—

Rate Setup button—

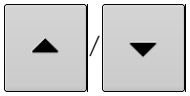
Rate Control Settings

Adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import application product prescriptions. To access the Rate Control Settings screen, press on the Product Control Toolbox. The Rate Control Settings screen appears.

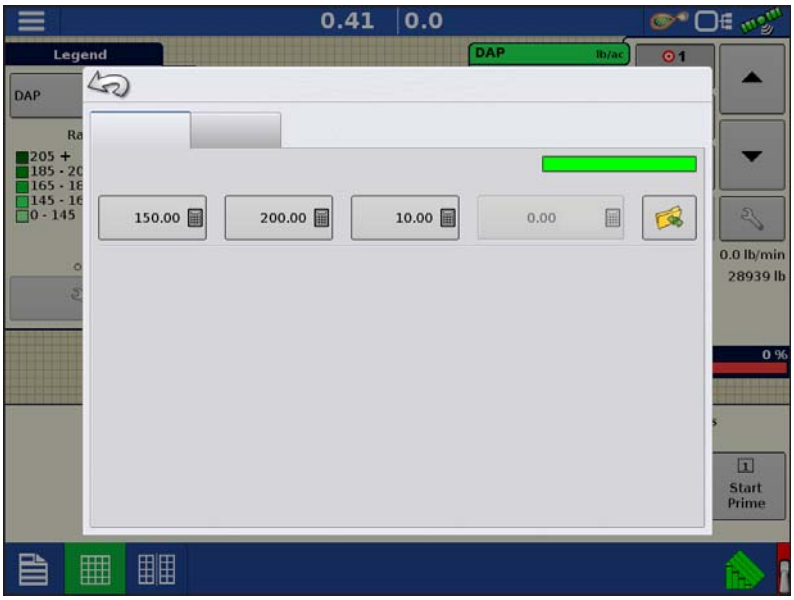
Rate 1 and Rate 2 — The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.

Press to enter the desired amount.

Increment — The Increment button allows operators to specify the increase or decrease amounts for a specified rate by using

 on the Product Control Toolbox. Press to enter the desired increment.

Prescription — To load a map-based prescription file, press the Prescription button. Refer to "Loading Prescriptions" on page 437 for further detail.

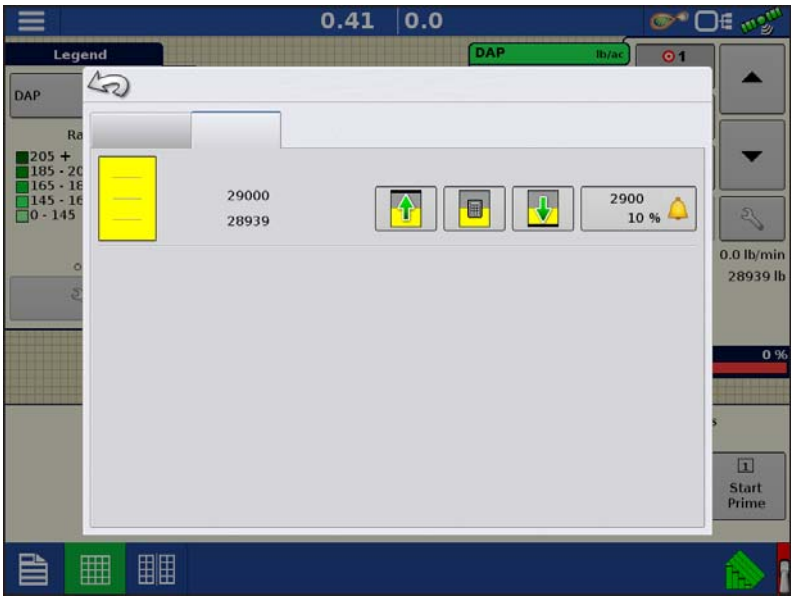


Minimum Flow — (Used for DirectCommand Liquid Applications only). This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying with one or more boom sections off, the system automatically reduces the minimum flow setting according to the reduced spray width. To adjust this setting, press and enter the desired numeric value.

Container Level Settings

When filling or emptying container, use the Container Level portion of the Rate Control Settings screen to update the amount of product in the containers.

Container Level screen



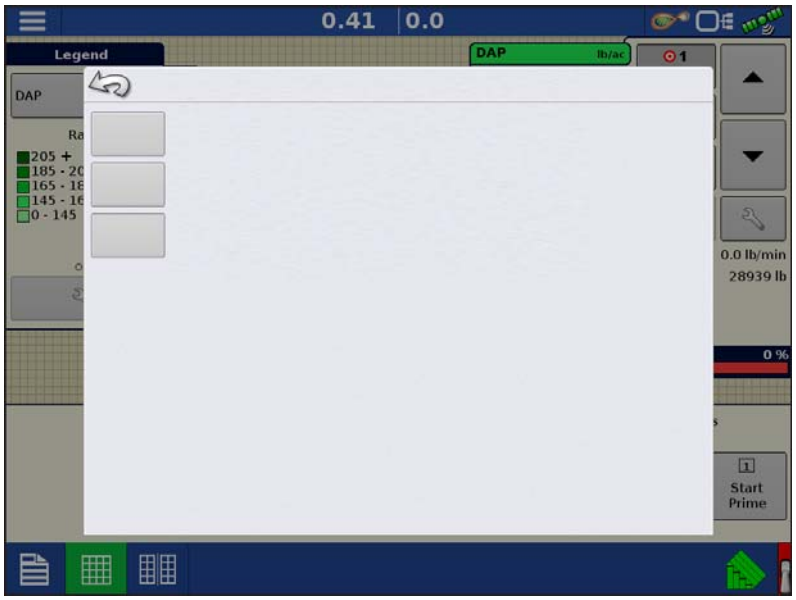
•**Tank Fill** — The Tank Fill button increases the container level logged in the display to the user-defined maximum volume (specified in the Container Setup Wizard).

•**Tank Empty** — The Tank Empty button decreases the container level logged in the display to zero.

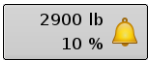
•**Tank Partial Fill** — The Tank Partial Fill button increases the container level logged in the display to specific amount that you specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

Adjust Container Amount

- **Add** —Adds product to the container.
- **Remove** —Removes product from the container.
- **Set** —Sets the product level in the container.



Tank Alarms



The Container Alarm button, which appears on the right of the Container Level portion of the Rate screen, displays the capacity of your tank as well as the percentage at which the Low Container Level warning will sound. To adjust these settings, press the button and the Container Alarm screen appears.

If you wish to adjust your container level warnings, use the following buttons on the right-hand side of the Container Alarm screen to make these adjustments.

The **Percentage (%)** button sets the warning threshold according to the percentage of product left in the tank. In the example above, the threshold is set at 10 percent.

The **Units of Measurement** icon sets the warning threshold according to the amount of product left in the tank. This icon is named according to the container's units of measurement you specified during the Controller configuration procedure.

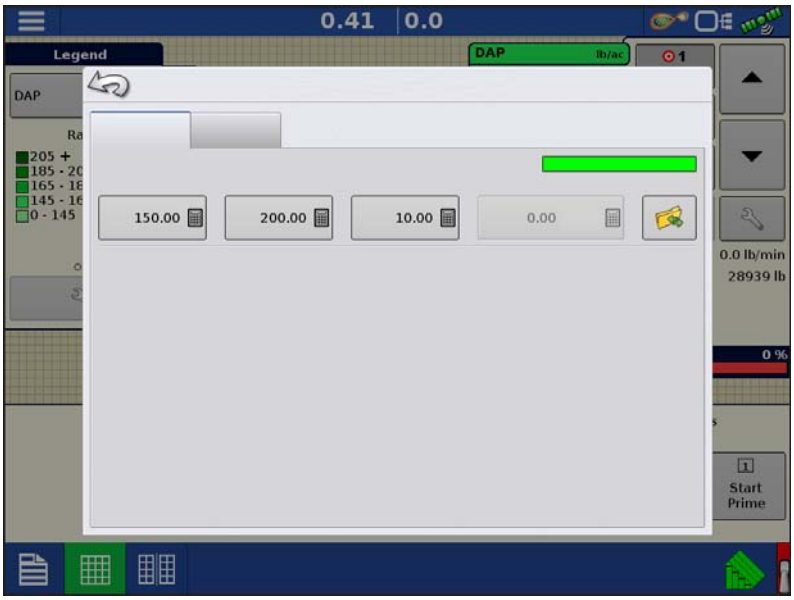
The **Disable Low Container Level** button, which appears as a bell with a red slash across it, disables the Low Container Level warning.

Loading Prescriptions

1. Press on the Product Control Toolbox.

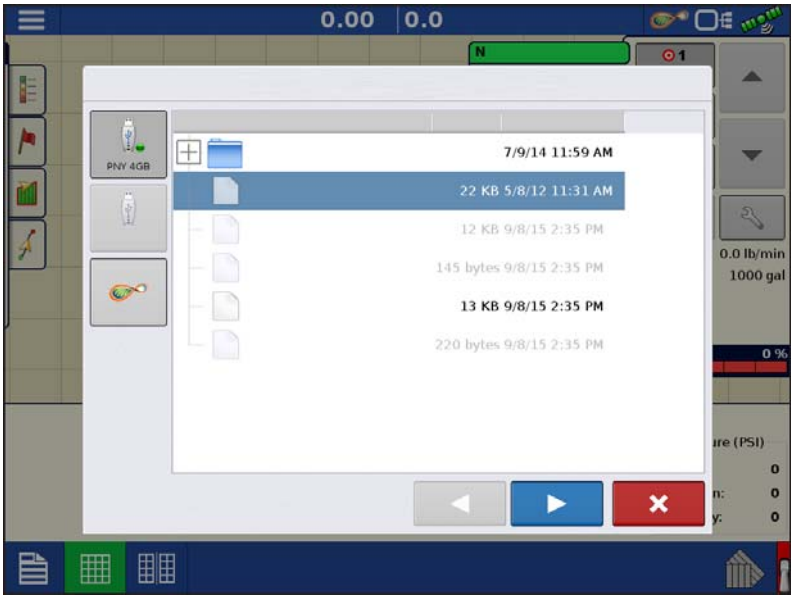
The Rate Control Settings screen appears.

2. Press the Load Prescription button.

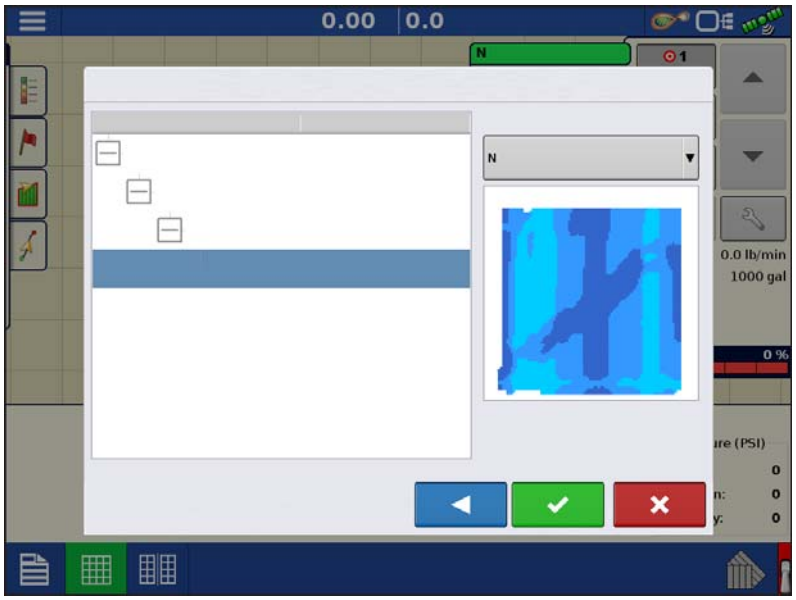


The Select File screen appears.

3. Highlight the correct .AGSETUP (prescription) or .shp (shape) file and press .



4. Next select your prescription in the Select Prescription screen, and select the correct controlling product from the Product drop-down box. A preview prescription map is displayed. Press the .
5. When you return to the Rate Control Settings screen, the prescription rate is now shown on the screen. The Load Prescription button has disappeared and in its place is the Remove Prescription button, which resembles a minus sign. Press the Remove Prescription button if you wish to remove the prescription from the field.
6. When you return to the Map screen, the prescription is now shown on the map.



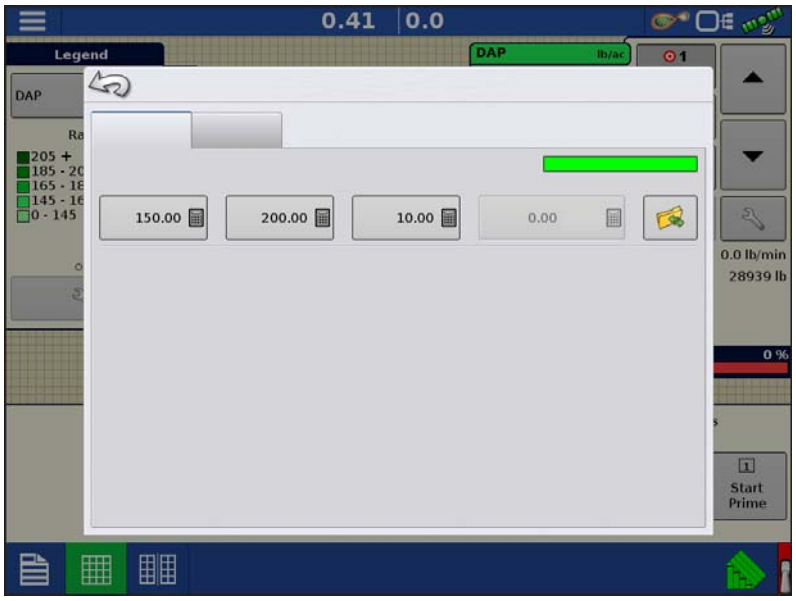
Shape File Conversion

What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple products.

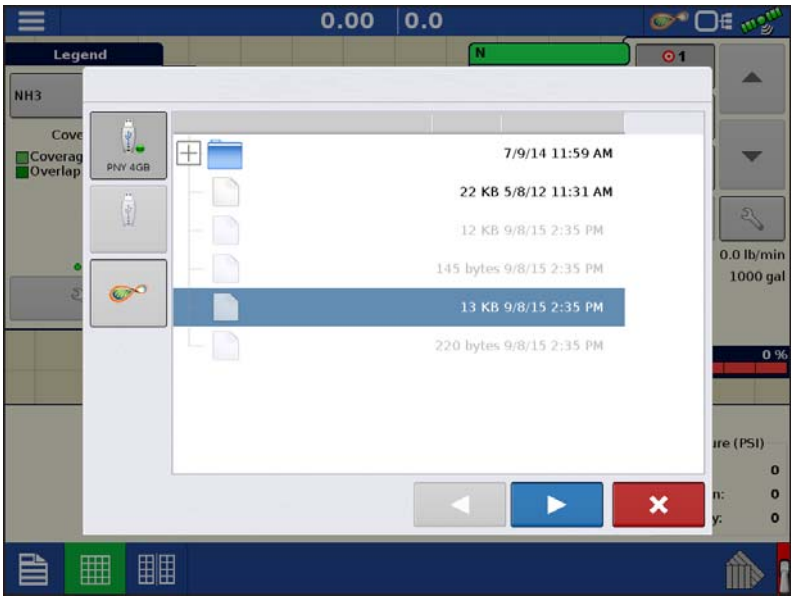
1. To begin, press on the Product Control Toolbox.

The Rate Control Settings screen appears

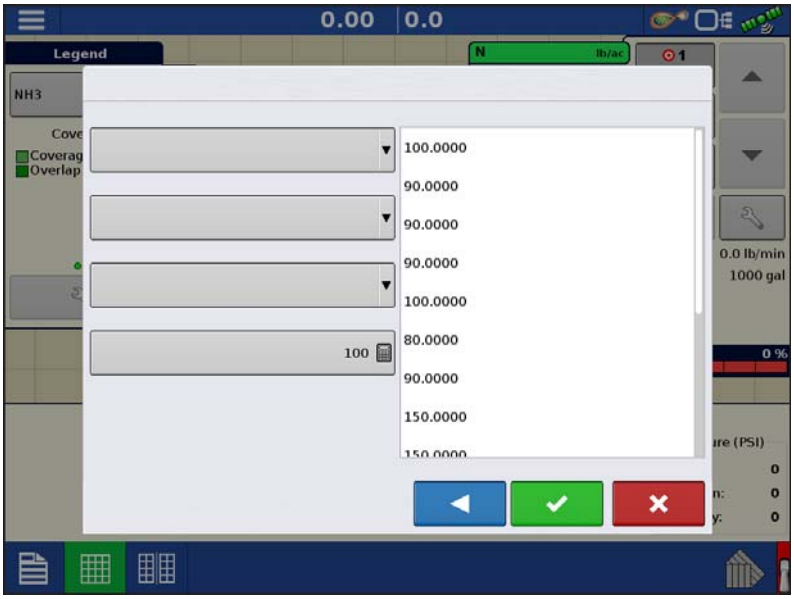
2. Press the Load Prescription button.



3. The Select File screen appears. Highlight your desired .shp file and press .



4. **Select Column From Shape File**—Select the column that contains the product recommendation rate. The list on the right side of the dialog shows sample data from the selected column.
5. **Select Units**—Select the controlling units for product application.
6. **Default Rate Setting**—The system assigns a default rate. Use the on-screen keypad to edit the value if desired.



NOTE!: Select the product and units that the shape file prescription was made for. Selection of the wrong data column or unit will result in misapplication of product.

ATTENTION!: The only time the default rate is used by the system during product application is if the Rate Outside of Field selection is set to " Rx default". This setting is located in the Equipment Settings portion of configuration setup. If the Rate Outside of Field selection is set to "Rx default", the default target rate will be used when the vehicle exits the area covered in the prescription map.

Creating Products

Creating application products and product templates can be completed during initial setup or from the Product Selection screen of the Field Operation Wizard when starting a field operation.

Creating Single Products

To create a single product, to be added to a product template or to be applied by itself, use the on-screen wizard described in the following steps.

Select:

1. **Product Type**
2. **Product Units**

   When selecting the following fertilizers, use the drop-down menu to select the product units:

   - Ag Lime
   - Pell Lime
   - User Defined Lime
   - User Defined N-P-K
   - User Defined Micronutrient
   - Other

3. **EPA Product Number (Optional)**—Check box if product is a Restricted Use Pesticide
4. **Manufacturer name if applicable**—Manufacturer name can be added to the drop-down menu by pressing .
5. **Enter Product Name**

   Press to enter a unique name for the product.

6. Press to complete product setup or press to return to Configuration Setup screen without making a change.

   Created product should appear under the Application heading located on the Product tab of the Configuration Setup screen.

NOTE: Some Fertilizer and Carrier product types are predetermined in the display. These product names cannot be edited. Their Manufacturer and EPA Numbers can be edited after the product is created. Examples are: Fertilizer>DAP or Carrier>30% UAN.

Creating Dry Fertilizer Blends

Dry fertilizer blends are set up using the on-screen wizard described in the following steps.

1.

2. From the Type drop-down menu select Dry Blend

   From the Define By drop-down menu select:

   - Total amounts - to define blend by amounts going into the bin
   - Rate/acre - to define blend by the amounts going on an acre

   Press to continue.

3. From drop-drown menu select base units.

   Press to continue.

4. Press to start the process of adding components to the blend.

NOTE! Any liquid herbicides set up within the system can be added to create an impregnated blend product.

5. Select the desired component from the drop-down menu.

NOTE!: More than 7 products can be put part of a Mix/Blend but only 7 or fewer can be active at the same time.

- A new product can be set up at this time by pressing and following the Product Setup Wizard.
- Press to add selected product or press to return to Add Mix/Blend screen without adding a product.

6. Press to add an additional component.
7. When all components have been added press .
8. Enter Manufacturer name if applicable.
   - Manufacturer name can be added to the drop-down menu by pressing
9. Press to enter a unique name for the blend.
10. Press to complete the process of setting up the dry blend or press to return to Configuration Setup screen without adding a mix.

Represents Product Templates

Created blend should appear under the Application heading located on the Product tab of the Configuration Setup screen.

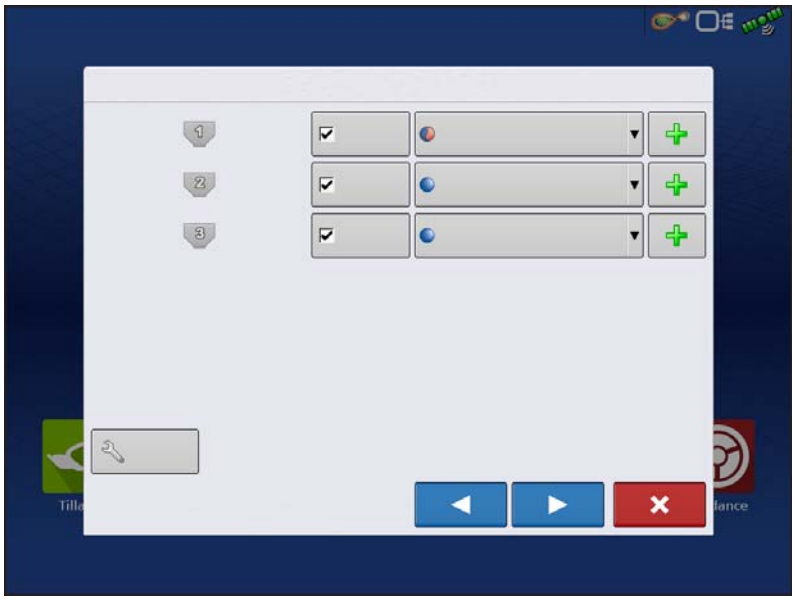
Configure Product Mix

1. When using a Dry Fertilizer Blend, the mix contents and amounts are defined in the Configure Product Mix screen available in the Event Setup Wizard, or Product button in the main menu.

2. Select product from the drop-down list or press to create a new one.

More than 7 products can be part of a Mix/Blend but 7 or fewer can be active at the same time.

Press to continue.



3. Configure Product Mix

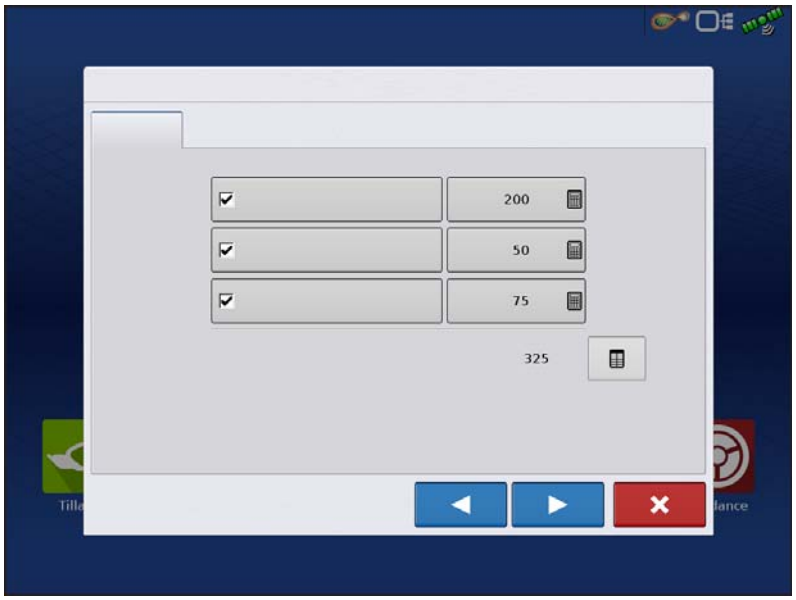
Product Blends can be adjusted after they are created by:

   A. Activating or de-activating products

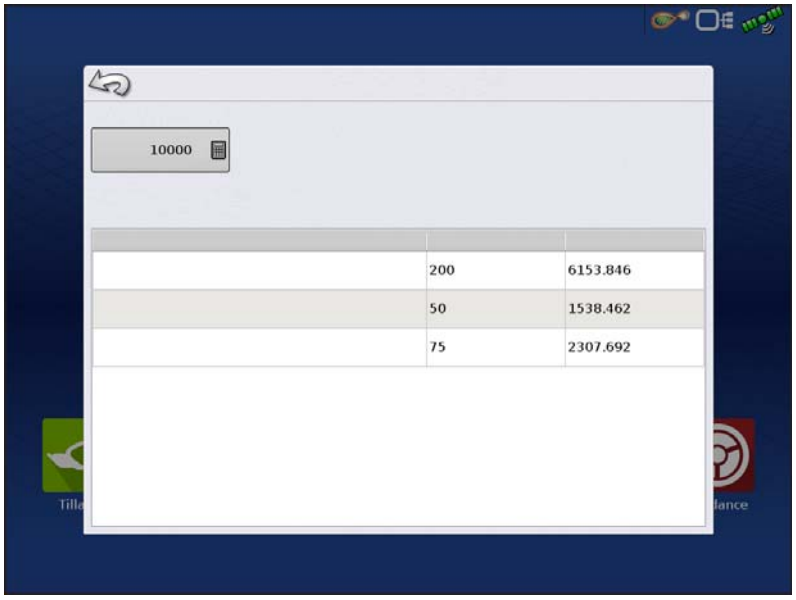
   B. Changing rate or total amount of a product

   C. Changing total amount of the product or overall rate of product application

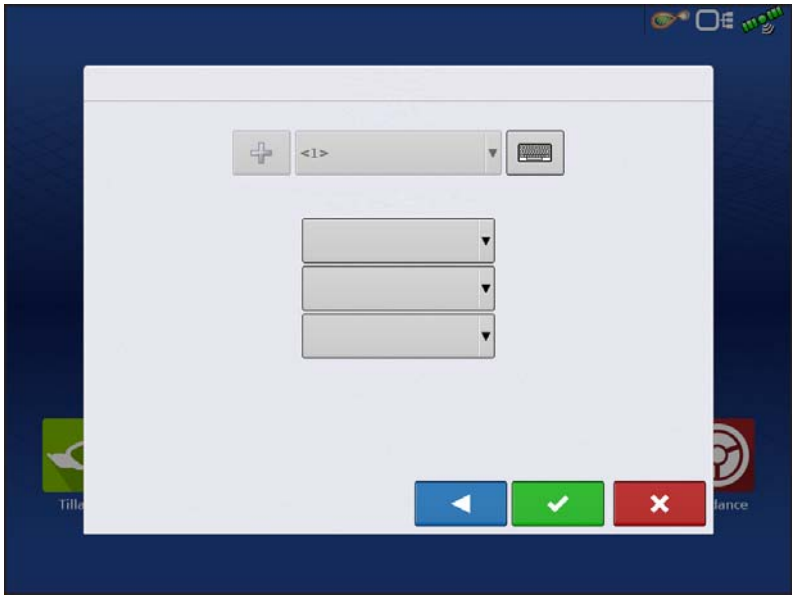
4. When a Product Blend is setup using rate/area, the Mix Calculator can be used to show how much of each product to put in the tank when the user enters the desired amount to fill.



5. Press the Volume to Calculate button and input the total volume. Table will give the user the amount of each product to put in the tank.



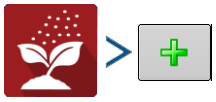
6. Select Region from the drop-down menu or press to name the Region. Verify the Controlling Product for the Product Blend. Press to load the Event to the Map Screen, or press return to Home screen without setting up an Event.



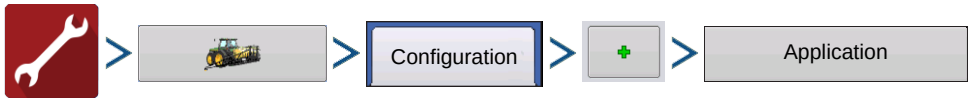
Create Configuration

A wizard will guide you through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:



OR



Your Operating Configuration will then be viewable when you start a new Field Operation with the Application Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

Create Air Seeder Configuration

To create a new planting operation configuration, which may also include application equipment:

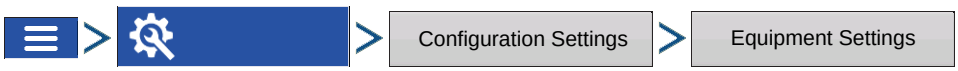
A wizard will guide you through the process of selecting or creating a vehicle, implement and controller. See additional notes below for creating this configuration.

1. Selecting **Planting** as the Operating Configuration
2. Select **Air Seeder** as the Implement Type
3. Select **Granular Strip-Till Control** as the Seed Rate Controller type (name appropriately)
4. In the Application Channel screen, select **Granular Application**
5. Select the **SAME** Rate Controller from the drop-down list that was created in Step 3.

Setup Bins 2 and 3 appropriately as the Application channels. Bin 1 (Channel 1) is automatically assigned as a Seeding Channel and is intentionally unavailable. Channel 1 will only accept crop types that have units in mass (pounds or kilograms), and is the only channel that is supported for Air Seeding.

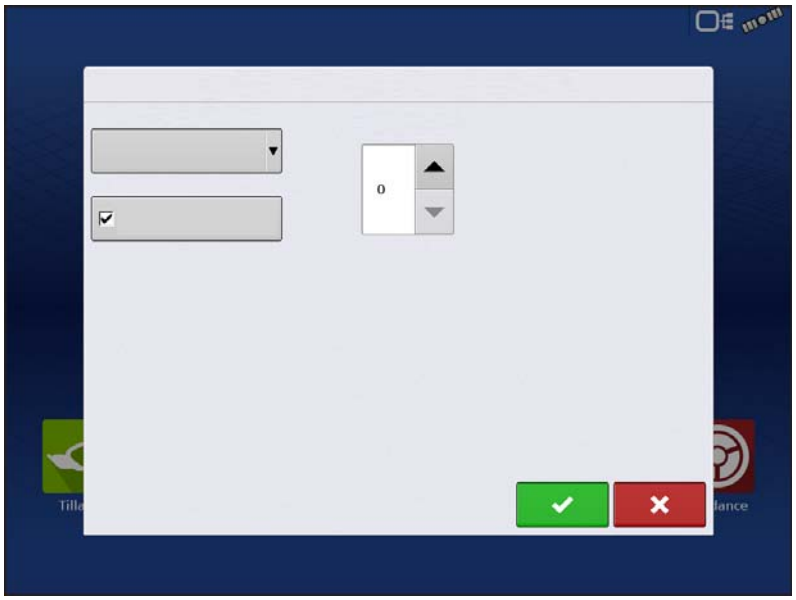
Equipment Settings

OR



Rate Outside of Field—This setting will define how product will be controlled when leaving a field boundary.

- **Zero**—This will stop application.
- **Last Good**—This will continue application at the last known rate.
- **Rx Default**—When using a prescription, this will apply at the Default Rate (or outside of boundary rate) as defined by the prescription file.

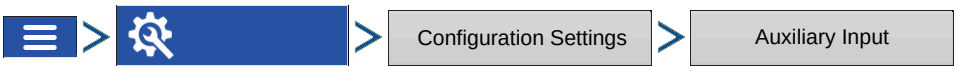


Rate Display Smoothing—Determines how the feedback from the control channel rate sensor will be displayed on the map screen. When de-selected, the system will display raw feedback from the rate sensor. When checked, the system will display target rate when the application rate is within 10% of the target rate setting.

Rate Change Look-Ahead—This setting compensates for any latency in the control system when changing between different product rates during variable rate application. The typical setting range for this is 0-1 seconds. This setting can be thought of as a "look ahead" value when using a variable rate prescription. The display will send the signal to change rates before hitting a transition line so that the applied rate is correct when crossing into the new management zone.

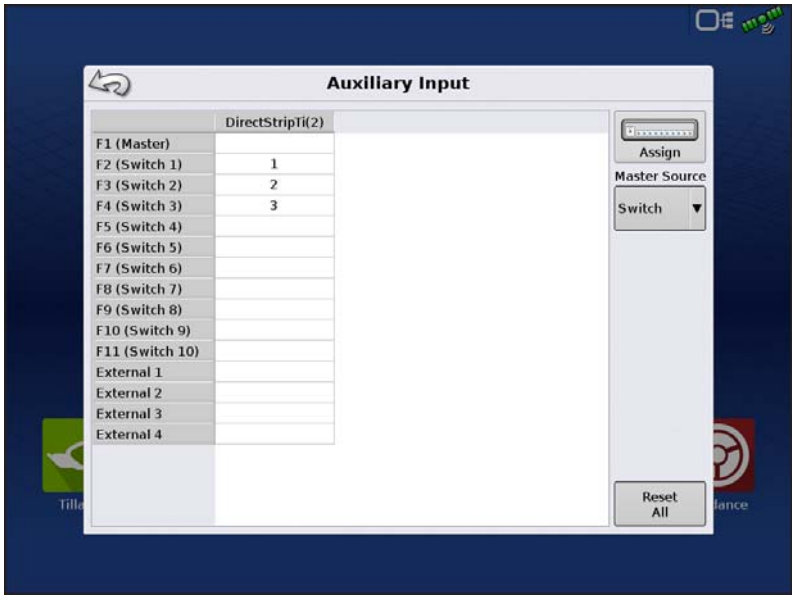
Auxiliary Input

OR

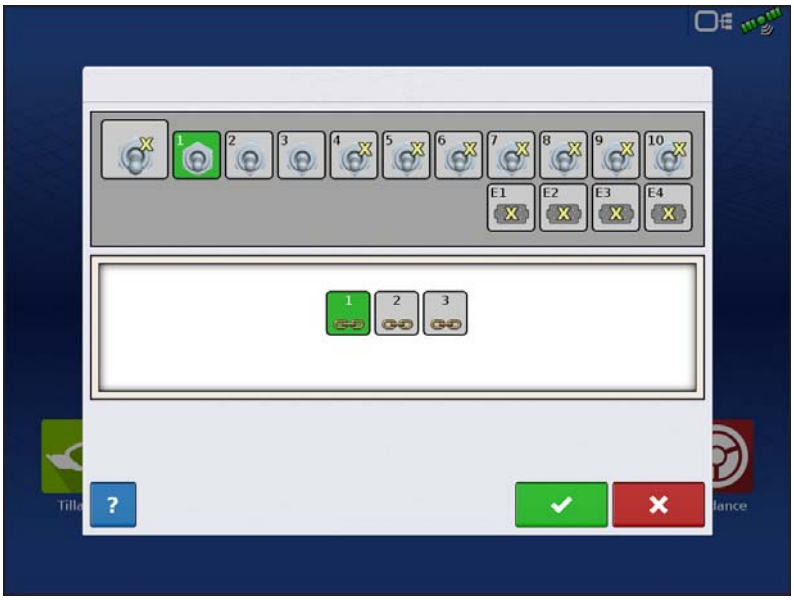


DirectCommand applications default Channels to the switchbox in order, starting with switch 1. From the Auxiliary Input screen, the operator can customize the switches to certain channels, if desired.

1. Press .
2. Highlight the desired switch to assign a function to it.



3. Select appropriate function(s) (bins for this operation) to be assign to the desired switch. Chain icons within each function will "link" once pressed to indicate they are assigned. If a function has a "broken link" then it is not assigned. If a switch has a "X" then it is not assigned to a function. Press the ✔ to save the setup.



NOTE!: Even if no specific functions are assigned to the Master switch, the Master switch will still serve as the total system on/off switch.

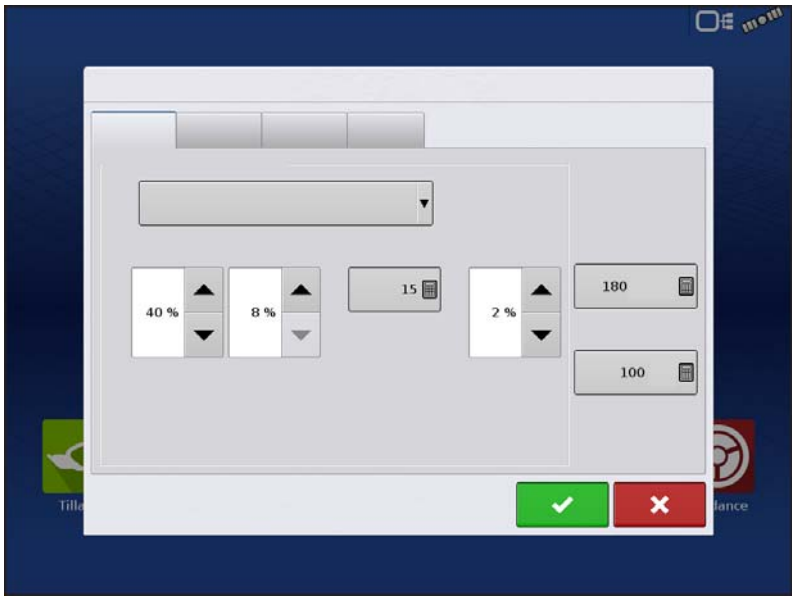
Controller Settings

OR

Controller Settings screen appears, with each channel's settings shown on its own tab.

Controller settings viewed at the Strip Till Control window vary depending on Control Valve Configuration type selected including PWM Control Valve, a Servo Control Valve, or a Linear Actuator configuration. Use the Control Valve Configuration drop-down menu to choose the appropriate configuration for your machine. Control valve configuration settings are described in the following section. The Auxiliary Tab allows for adjusting fan settings.

Strip Till Control: Servo Control Valve



Valve Response 1—Determines the speed of the servo valve when product control error exceeds the Response Threshold setting. Represents the fast speed of the servo valve. Decreasing the value will cause the servo valve to run slower. The default setting is 40%.

Valve Response 2—Determines the speed of the servo valve when product control error is less than the Response Threshold setting. Represents the slow speed of the servo valve. Decreasing the value will cause the servo valve to run slower. The default setting is 8%.

Response Threshold—Determines where the control channel switches between using Valve Response 1 and Valve Response 2 speed setting. Leaving all other valve control settings at the default value and making a small adjustment to this setting is usually all that is required to fine tune system performance. The default setting is 15.

- Decreasing this value will have the overall effect of speeding up servo valve response.
- Increasing this value will have the overall effect of slowing servo valve response.

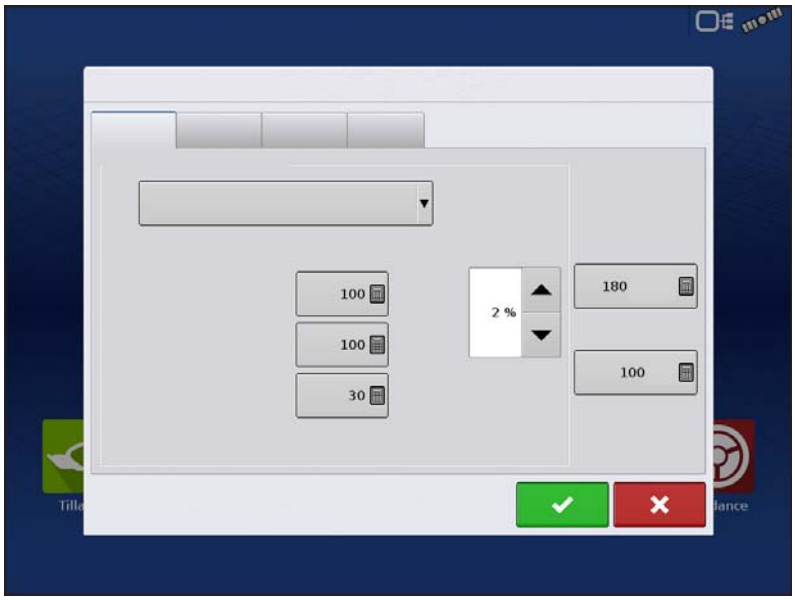
Allowable Error —Determines the percent of error that is allowed prior to the product control system making any flow rate changes. 2% - 3% is the normal dead band setting range.

- Too low of a setting value can cause the product control system to continually hunt for the target application rate.
- Too high of a setting will cause excessive product application error.

Shaft Speed Calibration—Calibration number representing the pulses that equal one revolution of the rate control metering system.

Max Metering Speed—Setting determines the maximum RPM of the metering shaft that controls product distribution to the application point. This setting is used when controlling a granular strip-till toolbar.

Strip Till Control: PWM Control Valve



PWM Frequency—The frequency that the PWM control valve is pulsed at. Settings can be found from the manufacturer of the valve. Typical settings range from 100-125 Hz. The default setting is 100.

PWM Gain—Determines how aggressively the control valve responds when making rate changes. The higher the value the more aggressive the system response is. The default setting is 100.

Zero Flow Offset—Represents the maximum duty cycle that is sent to the control valve without producing any hydraulic flow from the PWM valve. Using too high of a Zero RPM Offset value can cause the conveyor to not properly shut off. See the PWM valve manufacturer information for recommended settings. The default setting is 30.

Allowable Error—Determines the percent of error that is allowed prior to the product control system making any flow rate changes. 2% - 3% is the normal dead band setting range.

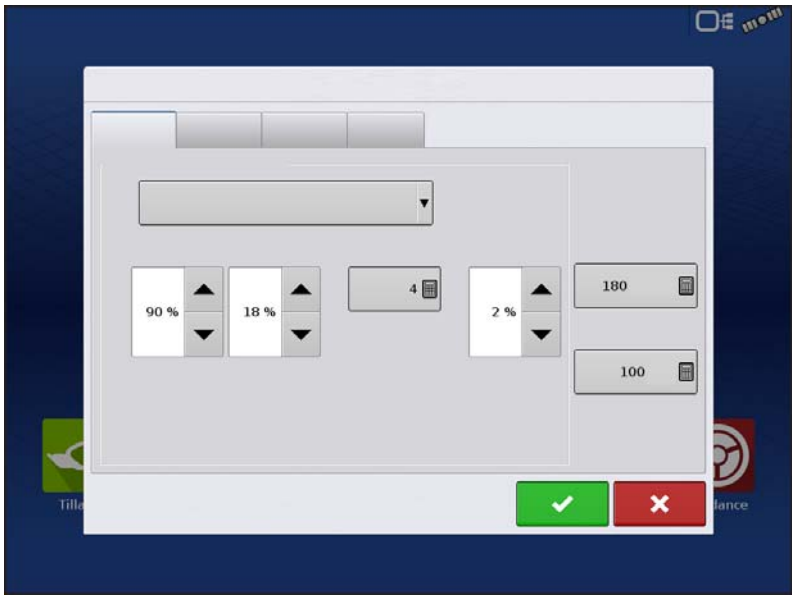
- Too low of a setting value can cause the product control system to continually hunt for the target application rate.
- Too high of a setting will cause excessive product application error.

Shaft Speed Calibration—Calibration number representing the pulses that equal one revolution of the rate control metering system.

Max Metering Speed—Setting determines the maximum RPM of the metering shaft that controls product distribution to the application point. This setting is used when controlling a granular strip-till toolbar.

Linear Actuator/Clutch Settings

NOTE! When using Linear Actuator Control, the system requires the Control Valve Configuration on all three channels to be set the same.



Actuator Response 1—Determines the speed of the actuator when product control error exceeds the Response Threshold setting. Represents the fast speed of the actuator. Decreasing the value will cause the actuator to run slower. The default setting is 90%.

Actuator Response 2—Determines the speed of the actuator when product control error is less than the Response Threshold setting. Represents the slow speed of the actuator. Decreasing the value will cause the actuator to run slower. The default setting is 18%.

Response Threshold—Determines where the control channel switches between using Actuator Response 1 and Actuator Response 2 speed settings. Leaving all other actuator control

settings at the default value and making a small adjustment to this setting is usually all that is required to fine-tune system performance. The default setting is 4.

- Decreasing this value will have the overall effect of speeding up actuator response.
- Increasing this value will have the overall effect of slowing actuator response.

Allowable Error—Determines the percent of error that is allowed prior to the product control system making any flow rate changes. 2% - 3% is the normal dead band setting range.

- Too low of a setting value can cause the product control system to continually hunt for the target application rate.
- Too high of a setting will cause excessive product application error.

Shaft Speed Cal—Calibration number representing the pulses that equal one revolution of the rate control metering system.

Max Conveyor Speed—Setting determines the maximum RPM of the conveyor that controls product distribution to the application point.

Actuator/Clutch Configuration—Selecting one of the three available actuator/clutch settings: [Single Bin Actuator], [Multiple Bin Actuator, Main Only], [Multiple Bin Actuator, Main + Channel] from the Control Valve Configuration drop-down menu (above) determines specific behavior of the actuators/clutches on zero rate.

Actuator/Clutch Logic

Determines Actuator/Clutch Behavior on Zero Rate

Control Valve Configuration	Control Component State	
	Control Channel RPM Commanded to Zero Other than by Master Switch Off	**Master Switch Off**
Single Bin Actuator	Main Clutch Output = Off Channel Clutch Output = Off Linear Actuator = Hold	Main Clutch Output = Off Channel Clutch Output = Off Linear Actuator = Hold
Multiple Bin Actuator, Main Only	Main Clutch Output = On Channel Clutch Output = Off Linear Actuator = Close	Main Clutch Output = Off Channel Clutch Output = Off Linear Actuator = Hold
Multiple Bin Actuator, Main + Channel	Main Clutch Output = On Channel Clutch Output = Off Linear Actuator = Hold	Main Clutch Output = Off Channel Clutch Output = Off Linear Actuator = Hold

Strip Till Control: Auxiliary Tab

Fan Speed Cal—Number of pulses that are generated by the sensor during one revolution of the blower fan shaft.

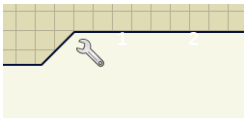
Min Speed—Setting represents the desired minimum speed of the blower fan. An alarm will sound if the blower fan speed falls below this value.

Max Speed—Setting represents the desired maximum speed of the blower fan. An alarm will sound if the blower fan speed exceeds this value.

Rate Threshold—Percentage difference between the Actual Rate and the Target Rate when the Rate Not Responding Message is displayed on the Run screen.

Low Fan Speed Shutoff—When selected, granular product application of a strip-till toolbar will be shut off if fan speed drops below the Min Speed setting.

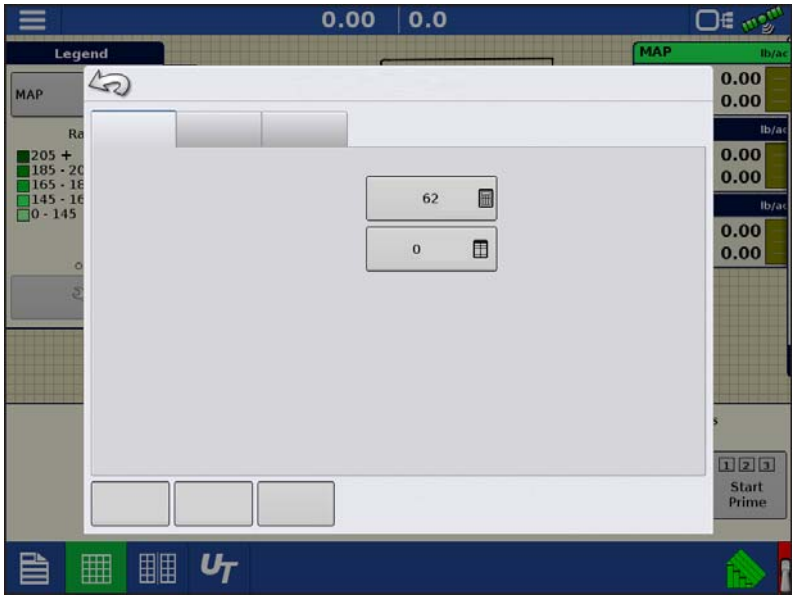
Run Time Operations



During Run Time Operations, Strip Till operators can press the Settings button to open the Strip Till Control screen. At this screen, you can adjust Product Density, Conveyor Rate and other settings.

- Each of these settings described below must be set for each individual Product Channel (bin).
- The **Product Density**, and the **Conveyor Rate** are all stored with each combination of product and control channel.

Strip Till Control Screen



Product Density—This density value (shown in pounds per cubic foot, or lb./ft.3), is stored with each product. Press to edit value.

NOTE! For proper machine performance and accuracy. Product Density should be measured for every application load.

Conveyor Rate—This setting represents the volume of product dispensed by one revolution of the conveyor drive shaft (cubic foot per revolution, or ft.3 /rev.) This number is shown with the assumption that the conveyor shaft has a 1-inch gate opening.

ATTENTION! You must either manually enter conveyor rate value or perform a CFR calibration routine for each product and channel combination, otherwise misapplication will occur.

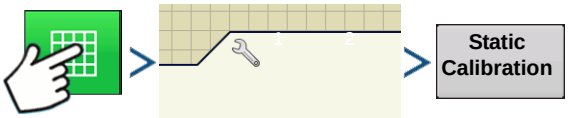
Static Calibration—Press the Static Calibration button to perform an automated routine to calibrate each metering circuit. This calibration is performed before applying in field conditions.

- For hydraulic drive systems, see "Static CFR Calibration Procedure for Hydraulic Drive systems" on page 450.
- For ground drive systems see "Static CFR Calibration Procedure for Ground Drive Systems" on page 451.

In-Field Calibration—Press the In-Field Calibration button to perform an automated routine to adjust the calibration number for the selected metering circuit. This calibration is performed if there is a difference between the amount of product logged as compared to what was actually applied. For more information, see "In-Field Calibration Procedure" on page 451.

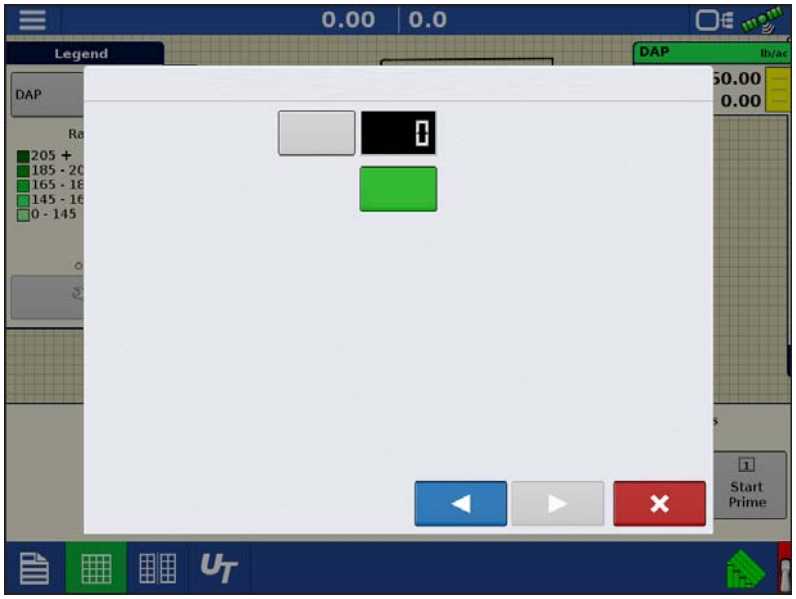
Static CFR Calibration Procedure for Hydraulic Drive systems

You must perform a calibration for each granular product control channel (bin) for the equipment configuration before applying in field conditions. This process is outlined below and on the following page. The Static CFR Calibration Procedure performs an automated routine to calibrate each metering circuit.



1. **Read Static Calibration warning**—A warning appears, advising to disable the blower fan circuit and prepare to catch any product dispensed in an appropriate container. Press ✓ to continue.
2. **Select Metering Circuit to Calibrate**—The CFR Calibration Wizard appears. Use the drop-down menu to choose the desired channel to calibrate. Press ▶ to continue.
3. **Enter Dispense Amount**—Press 🖩 to enter the amount of product to be dispensed into the container. Press ✓ to accept value. Press ▶ to continue.
4. **Enter Simulated Target Rate**—Press 🖩 to enter a simulated target rate, shown in pounds per acres. Press ✓ to accept value. Press ▶ to continue.
5. **Start Target Rate Countdown**—Press the start button to begin metering product. The metering circuit will stop automatically when the system perceives the simulated target rate has been dispersed.

   As the countdown is started, the button will turn red and state Stop. When the countdown is complete, press ▶ to continue.
6. **Enter Actual Dispense Amount**—Enter the actual dispense amount, in pounds. Press ▶ to continue.



NOTE! The CFR will be calculated from the actual product amount dispensed.

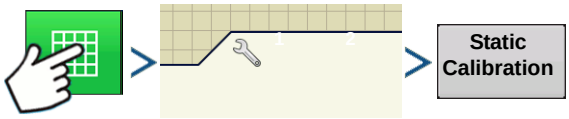
7. **Calibration Complete**

A message appears, stating that your calibration is complete, and showing the CFR amount, in cubic feet per revolution. Either:

- Press ✗ to exit the calibration without saving the value.
- Press **Repeat Calibration** to begin the process again.
- Press ✓ to save the value and exit the calibration routine.

Static CFR Calibration Procedure for Ground Drive Systems

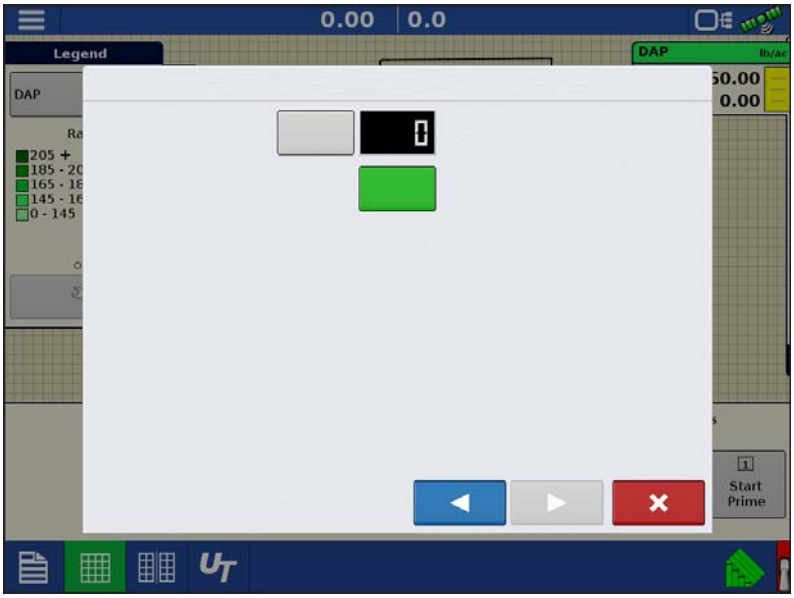
The Static CFR Calibration Procedure performs an automated routine to calibrate each metering circuit. This calibration is performed before applying in field conditions. This process is outlined below and on following page.



1. **Read Static Calibration warning**—A warning appears, advising to disable the blower fan circuit and prepare to catch any product dispensed in an appropriate container. Press ✓ to continue.
2. **Select Metering Circuit to Calibrate**—The CFR Calibration Wizard appears. Use the drop-down menu to choose the desired channel to calibrate. Press ▶ to continue.
3. **Start Target Rate Countdown**—Press the Start button and turn drive shaft a desired amount of revolutions. The system counts revolutions of the shaft encoder.

   Press the Stop button once finished.

   Press ✓ to continue.



4. **Enter Actual Dispense Amount**—Enter the actual dispense amount, in pounds.

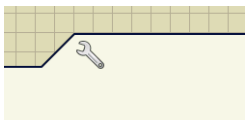
   Press ▶ to continue.

NOTE! The CFR will be calculated from the actual product amount dispensed.

5. **Calibration Complete**—A message appears, stating that your calibration is complete, and showing the CFR amount, in cubic feet per revolution. Either:
   - Press ✗ to exit the calibration without saving the value.
   - Press **Repeat Calibration** to begin the process again.
   - Press ✓ to save the value and exit the calibration routine.

In-Field Calibration Procedure

The In-Field CFR Calibration procedure performs an automated routine to adjust the calibration number for the selected metering circuit. This calibration is performed if there is a difference between the amount of product logged as compared to what was actually applied.



To begin, press the **Settings** button on the Map screen. The **Strip-Till Control** screen opens. Press the **In-Field Calibration** button. The **In-Field CFR Calibration** Wizard appears.

1. **Select Metering Circuit to Calibrate**—Use the drop-down menu to select the channel to calibrate, and press ▶ to continue.

2. **Enter Actual Weight**—The Accumulated Weight is shown in the top portion of the screen. Press to enter the Actual Weight applied, and press to continue.

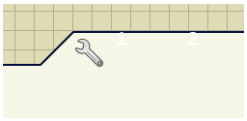
NOTE!: Start a new Region to reset the Accumulated Weight to 0 lbs.

3. **Calibration Complete**—A message appears, stating that your calibration is complete, and showing the CFR amount, in cubic feet per revolution. Press to finish the calibration.

Meter Prime

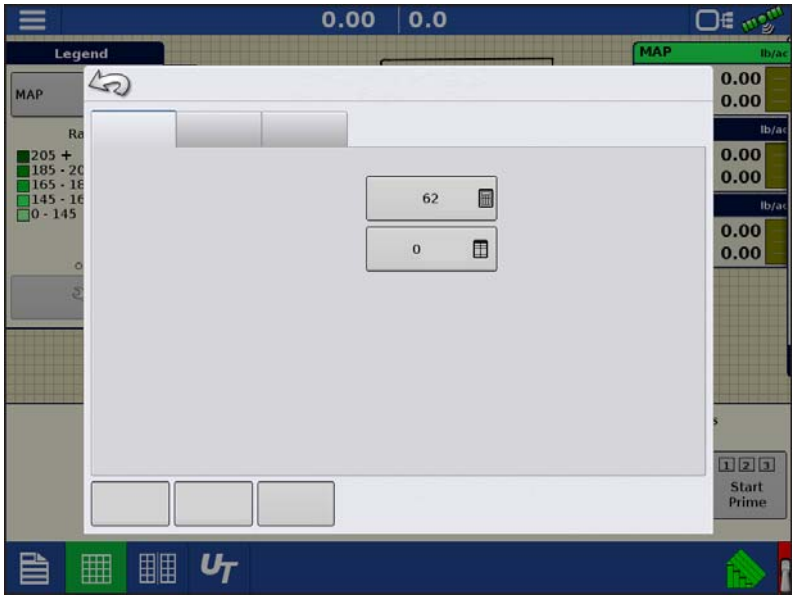
Meter Prime is for Hydraulic Drives ONLY.

1. Press the **Settings** button.



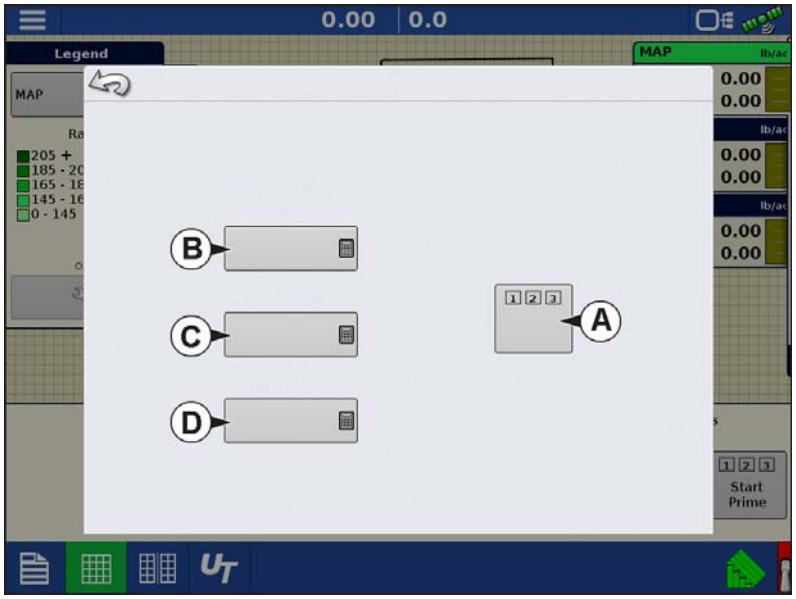
The Strip Till Control screen appears.

2. Press the **Prime** button to access the Air Cart Prime screen.



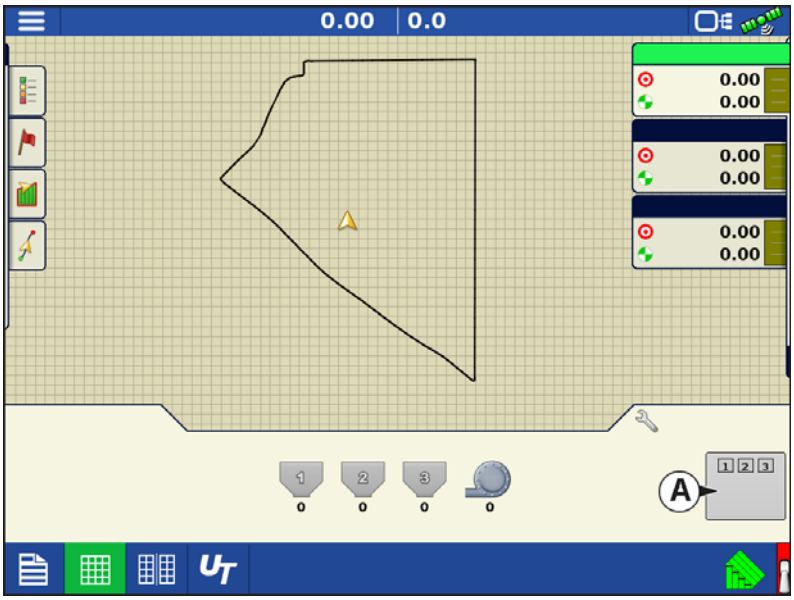
3. The Air Cart Prime screen appears with input buttons for each channel used. The setting determines the revolutions necessary to prime the meter shaft. Settings are independent by channel, and can be entered using .

   A. Start Prime
   B. Channel 1 Revolutions
   C. Channel 2 Revolutions
   D. Channel 3 Revolutions



NOTE! Meter Prime routine is not available and remains hidden for ground driven metering configurations.

The **Start Prime** button (**A**) begins the meter prime routine and each meter shaft will rotate the number of revolutions as defined on the Air Cart Prime Screen.



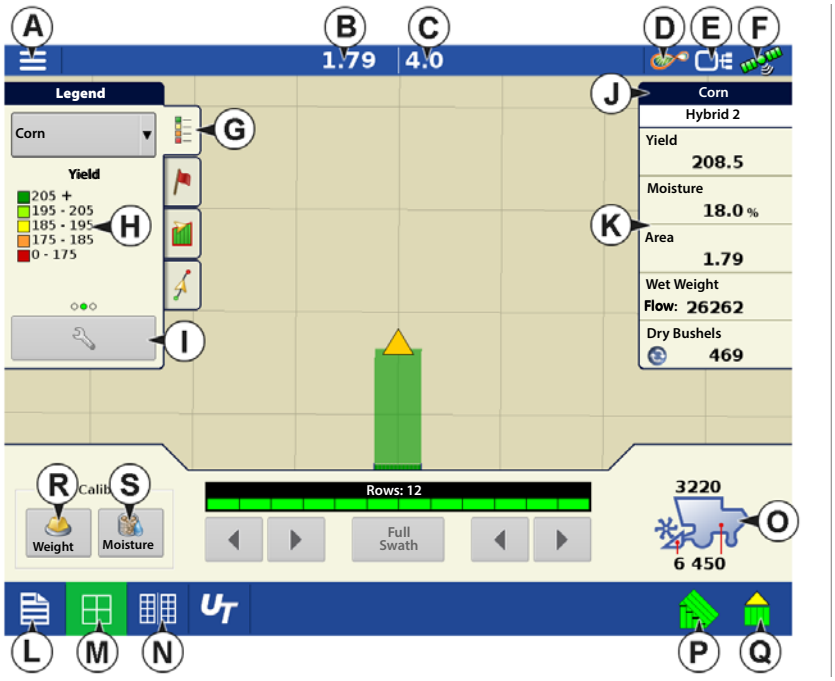
Fertilizer Default Product Settings

Material	Type	Abbreviated name for display and predefined name for SMS	Percentage (in terms of lbs.100 lbs.)			Density
			N	P (P2O5)	K (K2O)	
Ammonium nitrate	Dry	Ammonium nitrate	34	0	0	N/A
Ammonium phosphate	Dry	Ammonium phosphate	10	34	0	N/A
DAP	Dry	DAP	18	46	0	N/A
MAP	Dry	MAP	11	52	0	N/A
Ammonium sulfate	Dry	Ammonium sulfate	21	0	0	N/A
Urea	Dry	Urea	46	0	0	N/A
Potash	Dry	Potash	0	0	60	N/A
Triple superphosphate	Dry	Triple superphosphate	0	46	0	N/A
Ordinary superphosphate	Dry	Superphosphate	0	20	0	N/A
Potassium nitrate	Dry	Potassium nitrate	13	0	44	N/A

Map View

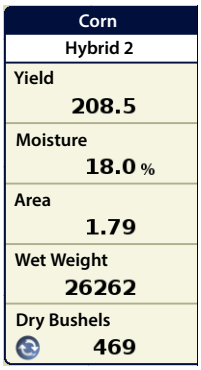
Once a configuration has been completed, and a field operation has been started, the Map View screen appears.

A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status Indicator
E. Diagnostics Status Indicator
F. GNSS Status Indicator
G. Legend Tab
H. Map Legend (varieties)
I. Legend Select
J. Crop
K. Status Items
L. Event Summary
M. Map View button
N. Split screen
O. Harvest Diagnostics
P. AutoSwath
Q. Logging Status
R. Weight Calibration, See "Grain Weight Calibration" on page 461.
S. Moisture Calibration, See "Moisture Calibration" on page 461.



Pressing the Map View button (M) will cycle between the available mapping screen views.

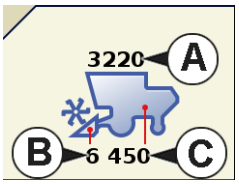
(K) Harvest Status Items



- **Yield** — Displays the instantaneous yield while there is grain flow and the average yield when grain flow is not present.
- **Moisture** — Displays the instantaneous moisture when there is grain flow and the average when there is no grain flow.
- **Area** — Shows the area harvested for the current region.
- **Wet Weight** — Shows the actual weight that has been harvested for the current region.
- **Wet Bushels** — Shows the actual bushels that have been harvested for the current region.
- **Dry Bushels** — Displays the actual number of bushels at the specified dry moisture percentage.
  - If the actual moisture is below the set dry moisture percentage and "Expand Bushels for All Grains Below Dry %" is not checked, it will show actual bushels.
  - If the actual moisture is below the set dry moisture percentage and "Expand Bushels for All Grains Below Dry %" is checked, it will display bushels as if the moisture of the grain is at the specified dry percentage.

The **Wet Bushels** and **Dry Bushels** Status Items do not appear if you are using metric system measurements.

(O) Harvest Diagnostic Button on Map Screen



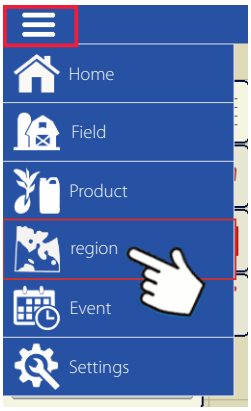
The Harvest Diagnostic button appears at the bottom right-hand portion of the Harvest Map screen. Pressing this button summons the Harvest Diagnostic screen.

A. **Bushels Per Hour** — displays the bushels harvested per hour (bu/hr).

B. **Header Height** — displays percentage of header height.

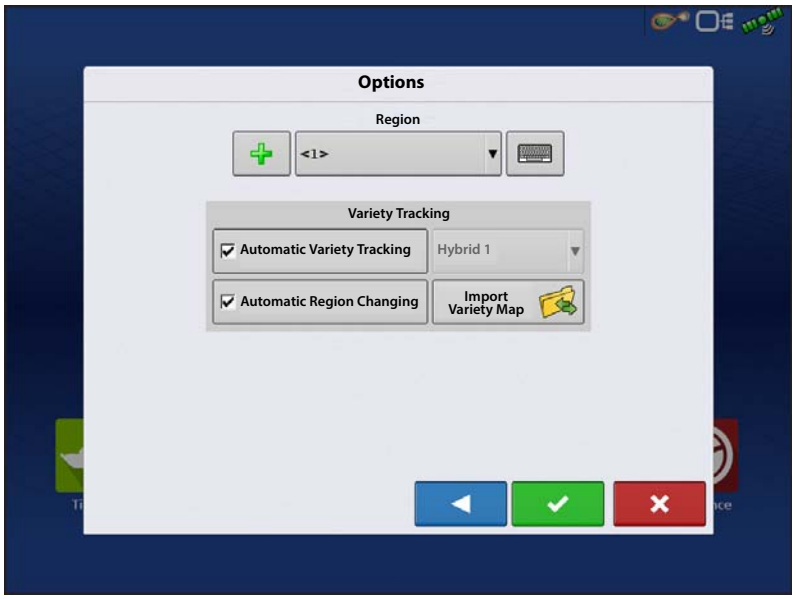
C. **Elevator Speed** — shown in Revolutions Per Minute (RPM).

Tracking Varieties and Changing Regions

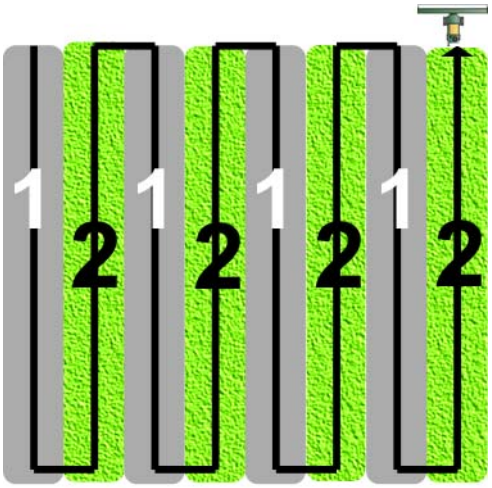


You can use the Options screen to enable the display to track varieties that you planted earlier and are now harvesting. You can also use two types of variety tracking: Automatic Variety Tracking and Automatic Region Changing.

The Options Screen is the last step before completing the harvest operational wizard. This can also be accessed from the mapping screen by pressing the menu button followed by region.



The illustrationon shows how the display could track two different varieties. In this example, when the harvester reaches the end of Variety 1, and moves to Variety 2, a message appears that either a new variety has been detected and the operator is notified to change regions (Automatic Variety Tracking,) or that a variety has been detected and the display is automatically changing regions. (Automatic Region Changing).



(A) Region Selection

Press + button to create new regions.

Use the drop-down to manually select or change regions.

(B) Automatic Variety Tracking

Automatic Variety Tracking gives users the ability to track hybrids from planting/seeding operation during harvest. This gives quick access to yield information based on hybrids planted in the summary screen. Enable by checking the Automatic Variety Tracking box.

A variety map must be present to enable Automatic Variety Tracking.

If no variety map is present, then you can either

- (E) Manually assign a variety from the Variety Tracking List, located to the right of the Automatic Variety Tracking check box.

  OR

- (D) Import a variety reference map.

(C) Automatic Region Changing

If you wish to enable the Automatic Region Changing feature, select both the Automatic Variety Tracking check box, and the Automatic Region Changing check box. Automatic Region Changing will auto-sort varieties into regions as you go through the field.

- Automatic Region Changing tracks both varieties and regions, so the display changes the region automatically.

In-Field Variety Tracking Messages

If you have selected either the Automatic Variety Tracking or Automatic Region Changing features, you will see one of the following messages as you harvest your field.

- If you have selected Automatic Variety Tracking, a message will tell you that the display has detected a different variety, and that you should manually change the region.
- If you have selected Automatic Region Changing, a message tells you that the display has detected a different variety, and that the display is automatically changing to a different region.

(D) Importing Variety Maps

Variety maps can be imported from SMS software. The SMS software uses planting data to create a variety reference map which is saved as an .AGSETUP file. This .AGSETUP file can then be exported to the display for use with the Automatic Variety Tracking and Automatic Region Changing features.

Importing Variety Map Procedure

Select Reference File

The File Selection screen appears. Use / to scroll through the files and select the desired reference (.AGSETUP) file. Press when finished.

Error Messages at Variety Map Import

If the display failed to import a variety map, it is likely that you saw one of three error messages on the display:

Error Message: "Crop type of Variety Reference Map does not match crop type of field."

Possible Cause: A different crop type was selected in the Harvest Operation Wizard than is shown in the variety reference map.

Solution: Either create a Harvest Operation with a different crop; or choose a variety reference map with an appropriate crop.

Errror Message: "Variety Reference Map does not match location of field."

Possible Cause: A different farm or field was selected in the Harvest Operation Wizard than is shown in the variety reference map.

Solution: Either create a Harvest Operation with a different field, or choose a variety reference map with an appropriate field.

Error Message: "Too many zones to show complete Variety Reference Map. Variety Tracking will work on all zones, even those not mapped on screen."

Possible Cause: The reference file selected exceeded the allowable memory limit used to load reference maps.

Solution: Continue harvest operations. All variety tracking and region information will be logged. However you will not be able to see the entire reference map on the display's map screen.

AutoSwath Sensitivity Settings

AutoSwath adjusts the swath width when crossing field boundaries and already-harvested areas. The display changes the swath width being harvested, even though no mechanical change takes place. AutoSwath is useful when harvesting point rows or where harvesting a full head width is not possible. When performing a Harvest operation, the AutoSwath feature includes sensitivity levels, which compensate for varying levels of GPS accuracy. If swath adjustments are performing inaccurately, adjust the sensitivity accordingly. Sensitivity 3 is the default setting. This setting is adjusted from the Configuration Setup menu.

Other settings include:

Sensitivity 5 — Use with RTK or DGPS (GPS6500 RTK or TerraStar with SteerCommand).

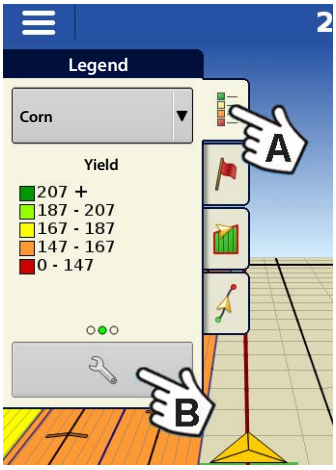
Sensitivity 4 — Use with RTK or sub-meter DGPS. Terrain compensation recommended (GPS6000 or GPS6500 with Steering).

Sensitivity 3 — Use with sub-meter accurate DGPS (most SBAS receivers like GPS6000).

Sensitivity 2 — Use with 1+ meter accurate GPS.

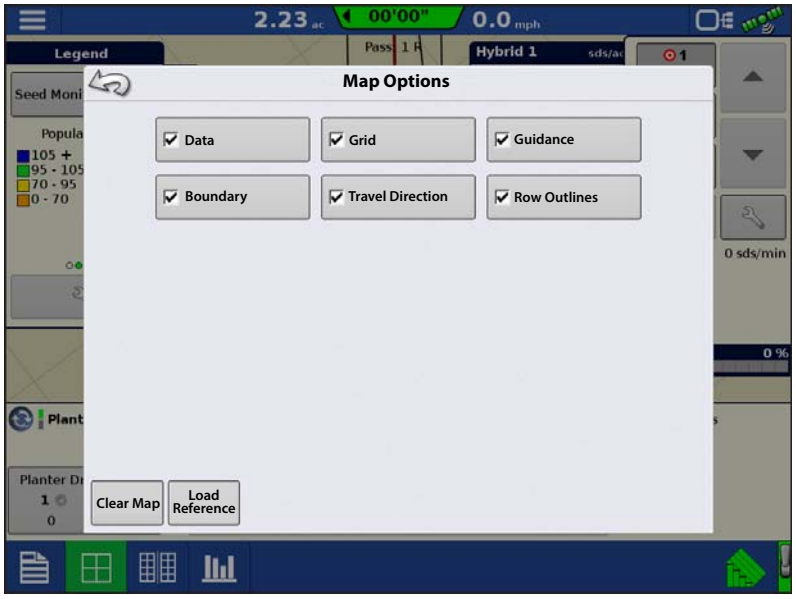
Sensitivity 1 — Swath sections are all on or all off. Use with 1+ meter accurate GPS.

Map Options



During Harvest operations, the Map screen displays three types of items in the Legend: Yield, Moisture, and Coverage.

The Legend Setup button on the Map Legend Tab of the Mapping Toolbox opens the Map Options screen.



- Press Data, Guidance, Boundary, Marker, Reference, Rx and Grid to show or hide those items on the Map screen.
- Press Clear Map to permanently remove all map data from the active field operation
- Press Load Reference to load a map from a previous operation performed in that field to view as a background map.

Flow Delay

The Flow Delay feature is used to account for the lag between when grain enters the combine through the header and is logged by the flow sensor in the clean grain elevator. The delay helps account for yield inaccuracies when you first enter or leave a pass. If very low or very high yield is seen for the first few seconds of a pass this setting can be adjusted.

The setting can be adjusted up and down in 1 second intervals for both entering a pass and leaving a pass.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration that includes Combine, Header and Crops settings.

The configuration can be started in two places:

Your Operating Configuration will then be viewable when you start a new Field Operation with the Harvest Operation Wizard.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

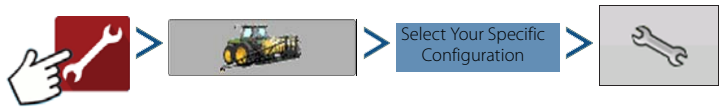
Load Configuration

Press the harvest operations button from the home screen. This will take you through the steps needed to load a configuration.

Calibration

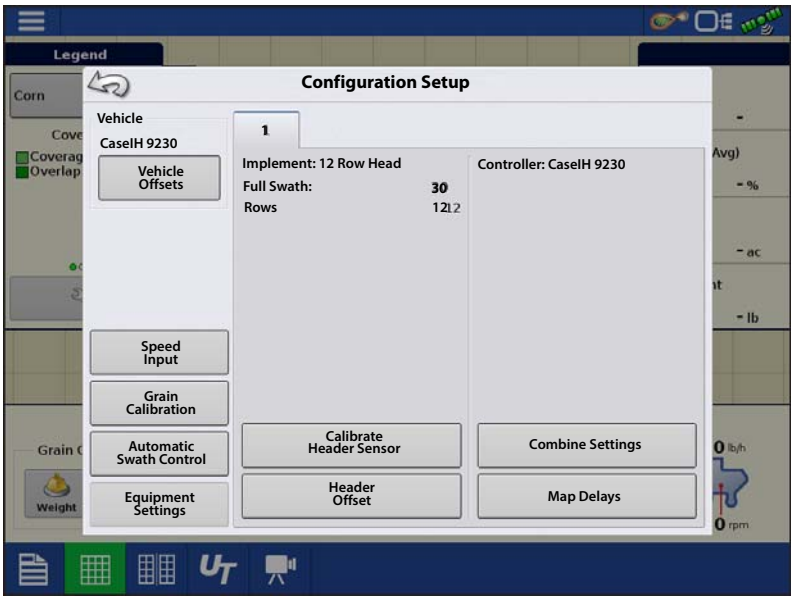
A configuration and calibration must be completed before operating. This section will work through the various steps involved.

The configuration setup page will show up as the last step of building a configuration using the operation wizard. If a configuration is built using the setup menu the configuration setup will need to be accessed using the following steps:



(A) Calibrate Distance

If you are not using GPS for ground speed, you must calibrate the ground speed input for accurate speed and area calculations. If you are using GPS, it is recommended to calibrate distance in the event of GPS loss. Follow the instructions shown on the screen.



Calibration settings can be manually adjusted if desired by pressing button above Pulses/100 ft and making small changes to the setting.

(B) Calibrate Header Sensor

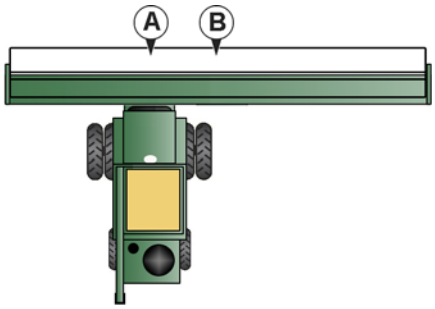
Prior to logging harvest data, you must calibrate the header sensor. Crops must be set up within the system to proceed with the calibration routine. Follow the instructions shown on the screen.

If Reset All is pressed the sensor will have to be calibrated for all headers!

(C) Input Header Offset

If the header of your vehicle is mounted offset to the vehicle's center, you can compensate for the distance between the center of the vehicle, and the center of the header's swath.

1. **Measure distance** — measure the distance between the center of the vehicle (A) and the center of the header's swath (B).



(A) Center of Vehicle

(B) Center of Swath

2. **Enter the distance amount** —The Header Offset screen appears. Enter the distance amount by using .

Select **to the left** or **to the right** from drop-down menu.

Press when finished.

(D) Vibration Calibration

Grain Calibration > > Perform Vibration Calibration

The vibration calibration must be performed with the correct head on the combine, and repeated for each crop harvested. This is prompted at the Home screen the first time a crop time is harvested. A harvest product must be in the system before vibration cal will be available.

1. **Run Separator** — Start the separator and feeder house with the proper header attached. Run at full speed.

Do not harvest a crop during the Vibration Calibration process.

2. **Press Start** — With the combine separator running at full operating speed with the header engaged, press the Start button. The display counts down 60 seconds.
3. **Calibration Number Displayed** — When the vibration calibration is complete, a message appears underneath the Start button stating "Calibration Complete." Next to this, the vibration calibration number is displayed. Press to return to the Calibration Tab. You may now turn off the separator

The rest of the calibration process is accessible from the mapping screen. See "Map View" on page 455.

Temperature Calibration

A Temperature Calibration only needs to be performed once per season. Changing this calibration will affect harvested data collected after the calibration.

Only calibrate the temperature before harvesting begins.

1. **Place Combine in Shady Spot** — Leave the combine parked in a shaded area or a shed for a few hours. The temperature calibration should not be performed if the sensor has been in direct sunlight.
2. **Take Air Temperature Reading** — Take an accurate air temperature reading using a thermometer in the same shaded area.
3. **Enter Outside Air Temperature** — Use ▲ / ▼ to enter the known outside air temperature. Make the proper adjustments until the Calibrated Temperature shown at the top of this screen reflects the correct air temperature.

   Press ✓ when finished.

Moisture Calibration

A moisture calibration only needs to be done once per crop, per season. Changing this calibration will affect all previously-harvested data.

1. **Measure Moisture on Grain Samples** — Randomly sample grain harvested into an active region, then measure moisture using an accurate moisture tester.
2. **Adjust Moisture** — On the Moisture Calibration screen, use ▲ / ▼ to adjust the moisture so that it matches the known moisture of the sample.

   Press ✓ when finished.

Manual Moisture Setting

If you wish to adjust moisture settings for a specific region, you can use the Use Manual Moisture setting. Unlike the Moisture Calibration, which affects all previously-harvested data, a Manual Moisture setting only affects data within a specified Region.

1. Check the Use Manual Moisture check box.
2. Use ▲ / ▼ to adjust the moisture to the desired value.

   Press ✓ when finished.

Grain Weight Calibration

Before the display can accurately measure harvested bushels, you must calibrate the display by entering in actual load weights into the display for each grain type. You must obtain these actual load weights by weighing the grain from a load on accurate scales. To obtain accurate results, you must harvest between four and six calibration loads. You can complete a weight calibration at any time during the season; however it is recommended that you calibrate grain weight at the beginning of the season.

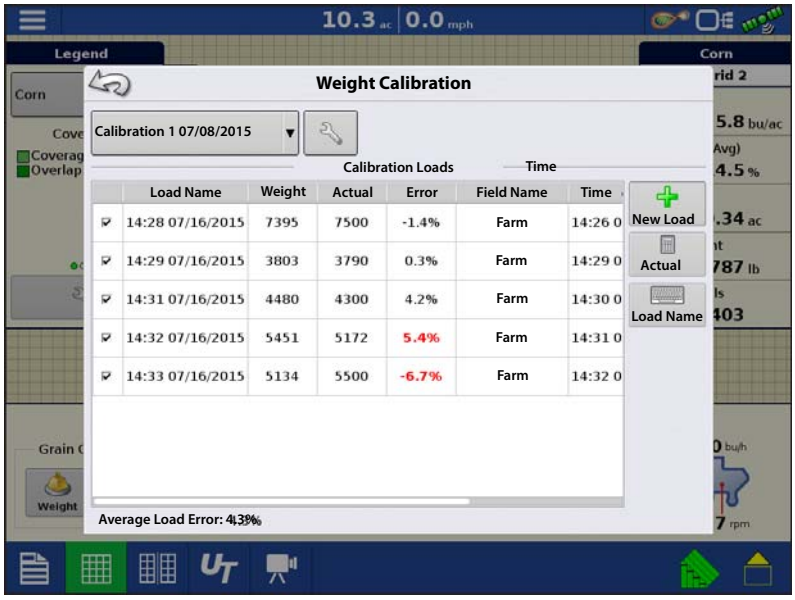
Each calibration load should be at a different grain flow rate through the combine, ranging from low flow through high flow. This can be accomplished by varying speed or swath width between calibration loads.

Start the calibration procedure with the combine stopped, the combine grain tank empty, and a hauling vehicle empty.

1. **Start New Load —**

   Weight > New Load

2. **Calibration Load warning** — Read warning, press ✓ when finished.
3. **Harvest Calibration Load** — Harvest a load - ideal load weights are between 3,000 and 6,000 pounds.
4. **End Load** — Press End Calibration.
5. **Calibration Load warning** — Read warning, press ✓ when finished.
6. **Name Load** — Display will give load a default name of time and date. Use ⌨ to change the load name.



7. **Empty Grain and Weigh Load** — Empty the grain tank completely onto a truck or wagon, and weigh it with an accurate scale. Record each individual load weight to be entered into the display. (No grain from any other combine should be unloaded into this hauling vehicle).
8. **Weigh and Record Load Weight** — highlight the load in the Weight Calibration screen and enter the actual value.

- If you are using a weigh wagon to weigh the grain, make sure the wagon has been calibrated properly.
- Only use one scale during this calibration process.
- Use the same vehicle for all calibration loads.
- Do not use a semi truck, as this vehicle's capacity is too large for a calibration load.

9. **Uncheck Loads With Excessive Error Percentages** — At the Grain Calibration screen, take note of any calibration loads that have excessive error percentages.

   You should be able to calibrate the display for grain weight to an average error of 1% to 3%. If the average error is more than 3%, uncheck the load with the maximum error.

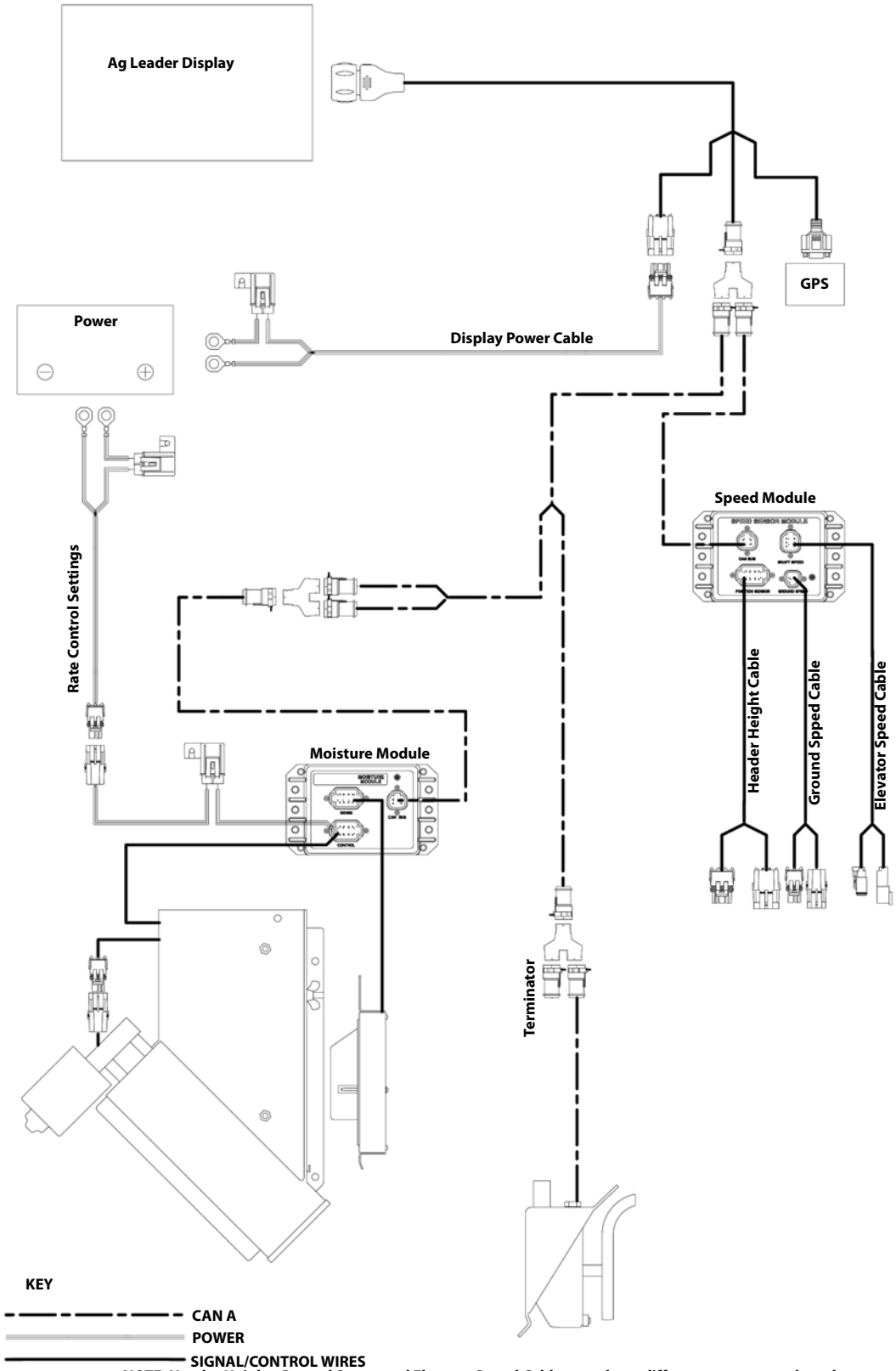
   Any load that is checked is automatically included in the calibration.

Turn On/Off Auto Calibration

The display defaults to AutoCal Weigh checked. AutoCal Weight can be turned off by unchecking the check box. The AutoCal weight feature will automatically adjust the calibration after each calibration load is finished. With AutoCal not checked, the user must press the calibrate button each time they would like to update the calibration with a new load.

Weight > 🔧 > ☑ AutoCal Weight

Harness Layout



NOTE: Header Height, Ground Speen and Elevator Speed Cables may have different connectors than shown.

Display Preparation

- Create a backup of your spring information. Go to the Setup/Display menu to create a backup. Select Copy All Files to save the spring data to the USB Flash Drive or AgFiniti.
- Make sure your display firmware and all connected modules are up to date.
- If you have purchased a new combine or new heads, create new configurations for any setup that is different from last fall. Remove all old configurations.

Removing old configurations will remove data logged by that configuration from the display.

Harvest Pre Season Checklist

When preparing your yield monitor system for harvest there are several items that need to be checked over before going to the field. Schedule time out well in advance so that replacement parts can be ordered and shipped before you have to go to the field. You may need to schedule services from your dealer or some equipment may need to be shipped to a central facility for repairs or upgrades.

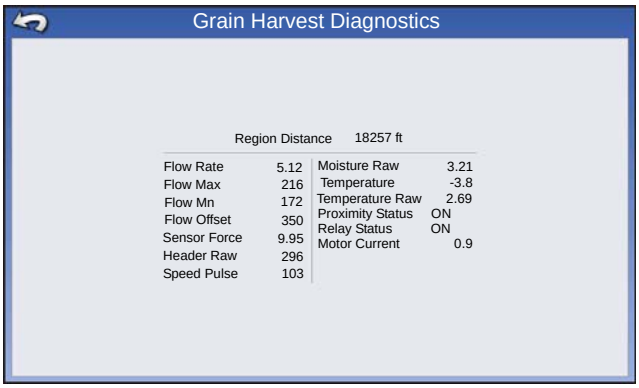
1. Ag electronics get power from the combines batteries so pay special attention to the power system on the machine with a well maintained alternator/generator, inspect for clean electrical ground connections all around.
2. There are several yield monitor components that are interconnected by a cable harness. The wires in the harness need to be inspected for wear damage that may cause a short circuit. Start with the main power cable at the battery up to the monitor in the cab, and then back to each of the sensors.
3. The flow sensor is mounted in the top of the clean grain elevator. Check the elevator deflector and impact plate for wear. Verify you have the proper clearance at the top of the clean grain elevator. Clearance should be between 3/8" and 5/8" (0.95 cm to 1.59 cm). Verify proper installation and paddle clearance. Check for worn out or broken deflectors that channel the grain towards the sensor. Make sure that the impact plate is not worn thin or broken. You may want to look at a picture of a new one in the installation instructions to verify that everything is like it should be. Also be on the lookout for rodent damage to flow sensor wires on the load cell.
4. Next is the grain moisture/temperature sensor. Check for excessive wear and make sure the sensor is clean and free of mud or crop residue, also verify that you have good clean electrical ground. The Ag Leader system uses a motorized auger to keep grain moving past the moisture sensor, check the fuse, switch and relay then verify that the auger turns free.
5. A header position sensor is mounted on the feeder-house of the combine. Check to make sure that the arm is attached properly so that it moves as the header is raised and lowered and that no wires are being pinched.
6. The elevator speed sensor is located on the end of the shaft that drives the clean grain elevator. Make sure that the tee cable is properly connected so that speed output is available to both the combine gauges and the yield monitor.
7. The ground speed sensor is located at the top of the transmission and also uses a tee cable to share speed output between the combine gauges and the yield monitor.
8. Check the Monitor/Display that it has the latest firmware (program) upgrades installed. Check for the proper date (this may indicate a problem with the internal battery) that it has the latest upgrades installed.
9. Make sure you have a working usb drive and that last years data is removed. Hook up the GPS receiver and get out in the open to verify that you are getting position and speed data to the yield monitor.

For more information: https://dealer.agleader.com/kbp/index.php?View=entry&EntryID=8

Grain Harvest Diagnostics

When performing a Harvest operation, you can also access the Harvest Diagnostic screen by pressing the Display Information button. Technical support may request that you look at this screen for help in diagnosing a problem. When the Devices screen opens, press and highlight the Moisture Module listing in the CAN Device list, then press the Diagnostics button. The Grain Harvest Diagnostics screen appears.

The Grain Harvest Diagnostics screen includes the following information:



- **Flow Rate** — Grain flow rate
- **Flow Max, Flow Min and Flow Offset** — Raw flow values used for diagnostic purposes.
- **Sensor Force** — Force of grain flow
- **Header Raw** — Raw value of header sensor.
- **Speed Pulses** — Number of ground speed pulses from the combine.
- **Moisture Raw** — Raw value of moisture sensor.
- **Temperature** — Air temperature
- **Temperature Raw** — Raw value of temperature sensor.
- **Proximity Sensor** — Shows if Elevator Mount Unit sensor is covered with grain.
- **Relay Status** — shows on or off.
- **Motor Current** — Measure of Elevator Mount Unit (EMU) current, shown in amps.

Troubleshooting Flow

No Flow

- Verify C1 value is between 0 and -100

  New vibration Calibration

- Verify C2-C11 is not zero

  Build new combine and configuration or use initial cal sheets to reset numbers.

- Check Elevator paddle clearance

  Should be 1/2in or 1.25in for Lexion Combines

- Check Cabling from Monitor to Flow Sensor
- Check for flow sensor damage from rodents
- Make sure deflector plate, impact plate, and flow sensor are installed correctly

For more information: https://dealer.agleader.com/kbp/index.php?View=entry&EntryID=1023

High/Low Flow

- Verify Correct crop type has been selected
- Check elevator speed- should be around 400RPM and stable
- Grain flow is too low for sensor- take larger swath or drive faster
- Acres not being counted- Verify header stop height for crop type and elevator speed
- Verify differential GPS and secondary speed source has been calibrated
- Moisture calibration is too far off

  Recalibrate moisture

- Verify Weight/Volume value is set correctly per the crop type
- "Expand Grain Below Dry" is set to Yes – change to No

For more information: https://dealer.agleader.com/kbp/index.php?View=entry&EntryID=613

Moisture Troubleshooting

Moisture is not changing

- Check to see if EMU motor is turning
- Check 5amp fuse near emu power connection
- Verify 12v power on EMU control cable 2pin connection on the fused line

  Verify 30 amp fuse on EMU battery cable
- Verify EMU is clean of debris and grain can flow freely
- Plug battery power connection directly into EMU motor

  This will verify that the emu motor Is still good
- Adjust proximity switch

  IF LED light on proximity switch comes on but the motor doesn't turn the moisture module may need replaced

Moisture is zero

- Check harvest diagnostics for raw moisture reading if value is present
- Verify temperature sensor is reading correctly

  If -460 degrees moisture sensor is either unplugged or bad

For more information: https://dealer.agleader.com/kbp/index.php?View=entry&EntryID=1036

Adjusting Proximity Switch

1. Remove the cover from the elevator mount protecting the wiring.
2. Locate the adjustment screw on the back of the proximity switch.

NOTE: This screw sets the sensitivity of the switch.

3. Plug the power cable back into the elevator mount.
4. Use the small screwdriver that came with the Elevator mount unit and turn the adjustment screw COUNTER CLOCKWISE until the adjustment screw turns freely.

IMPORTANT: Adjusting the proximity switch is critical for the accurate operation of the moisture sensor.

5. Turn the adjustment screw CLOCKWISE until the auger motor comes ON with no grain in elevator mount.
6. Turn the adjustment screw back COUNTER CLOCKWISE three full turns and leave it set there.

For more information: https://dealer.agleader.com/kbp/index.php?View=entry&EntryID=620

Elevator Speed Troubleshooting

No Speed

- Verify connection into proper sensor
- Check for cut or broken wires going from speed module to sensor
- Verify sensor is adjusted properly

  This may require the combine manual or consulting the OEM dealer
- Check for power on combine side of elevator speed connector
- Check elevator speed channel

Incorrect speed

- If A post speed and display speed are both incorrect

Ag Leader Tees into the elevator speed connector

Adjust elevator speed sensor

Remove Ag Leader connection to verify same issue with just combine cable connected

- If only Ag Leader sensor is incorrect

  Check pulses/rev and # of sprocket teeth within combine settings

  This should be set automatically based off of the combine chose within the configuration. Create new combine configuration and compare numbers between both configurations

Inconsistent speed

- Verify good connections between elevator speed sensor and speed module

  Many times poor system grounding or signal noise are causing for inconsistent elevator speed

- Verify sensor is adjusted properly

  This may require the combine manual or consulting the OEM dealer

Header Height Troubleshooting

- Verify Tee Cable connections are fully seated
- Header Height calibration has been completed
- If possible, verify header height sensor is appearing on the combine readout (A post)
- Header Channel is set properly

  Channel 1: New Holland and Lexion combines

  Channel 4: all other combines

- Check for Broken or binding header sensor rod (Utilizing AG Leader header height sensor)

  Manually move potentiometer rod

For more information: https://dealer.agleader.com/kbp/index.php?View=entry&EntryID=960

Ground Speed Troubleshooting

- Verify speed source 1 and 2 are set properly — In most cases speed source 1 is GPS and 2 is wheel speed
- If utilizing wheel speed verify it is properly calibrated — Check wheel speed connections and cabling out to sensor

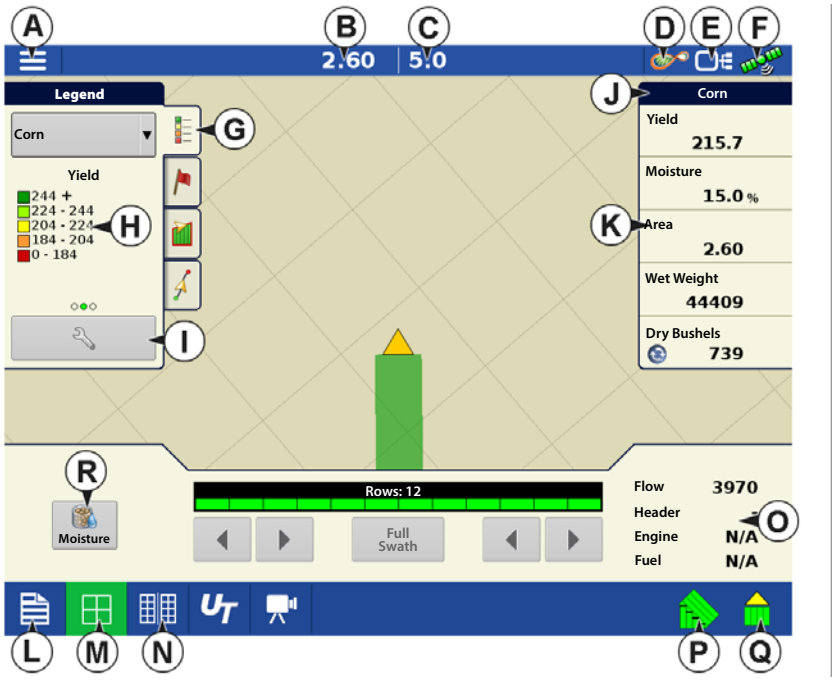
Claas Quantimeter

The CLAAS Quantimeter Optical Sensing System includes the option of interfacing with the display. This option is available for LEXION combines of the 670 model and above. The display communicates with a Bridge Module. This Bridge Module receives data from the combine via the CEBIS (CLAAS Electronic On-Board Information System) monitor which is then relayed to the display. The Bridge module can also interface with the ParaDyme Automated Steering system.

Map View

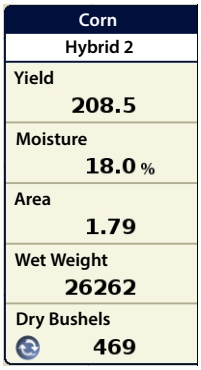
Once a configuration has been completed, and a field operation has been started, the Map View screen appears.

A. Menu button
B. Total Logged Field Area
C. Ground Speed
D. AgFiniti Status Indicator
E. Diagnostics Status Indicator
F. GNSS Status Indicator
G. Legend Tab
H. Map Legend (varieties)
I. Legend Select
J. Crop
K. Status Items
L. Event Summary
M. Map View button
N. Split screen
O. Harvest Diagnostics
P. AutoSwath
Q. Logging Status
R. Moisture Calibration



Pressing the Map View button (M) will cycle between the available mapping screen views.

(K) Harvest Status Items

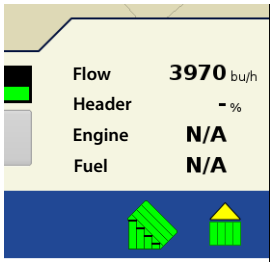


- **Yield** — Displays the instantaneous yield while there is grain flow and the average yield when grain flow is not present.
- **Moisture** — Displays the instantaneous moisture when there is grain flow and the average when there is no grain flow.
- **Area** — Shows the area harvested for the current region.
- **Wet Weight** — Shows the actual weight that has been harvested for the current region.
- **Wet Bushels** — Shows the actual bushels that have been harvested for the current region.
- **Dry Bushels** — Displays the actual number of bushels at the specified dry moisture percentage.
    - If the actual moisture is below the set dry moisture percentage and “Expand Bushels for All Grains Below Dry %" is not checked, it will show actual bushels.
    - If the actual moisture is below the set dry moisture percentage and "Expand Bushels for All Grains Below Dry %" is checked, it will display bushels as if the moisture of the grain is at the specified dry percentage.

The **Wet Bushels** and **Dry Bushels** Status Items do not appear if you are using metric system measurements.

(O) Harvest Diagnostic Button on Map Screen

The Harvest Diagnostic button appears at the bottom right-hand portion of the Harvest Map screen. Pressing this button summons the Harvest Diagnostic screen.



Flow—Displays current grain flow rate through the combine.

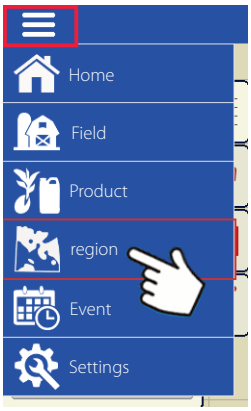
Header—Displays current header height.

Engine—Display current engine speed (RPM).

Fuel—Displays instantaneous fuel consumption.

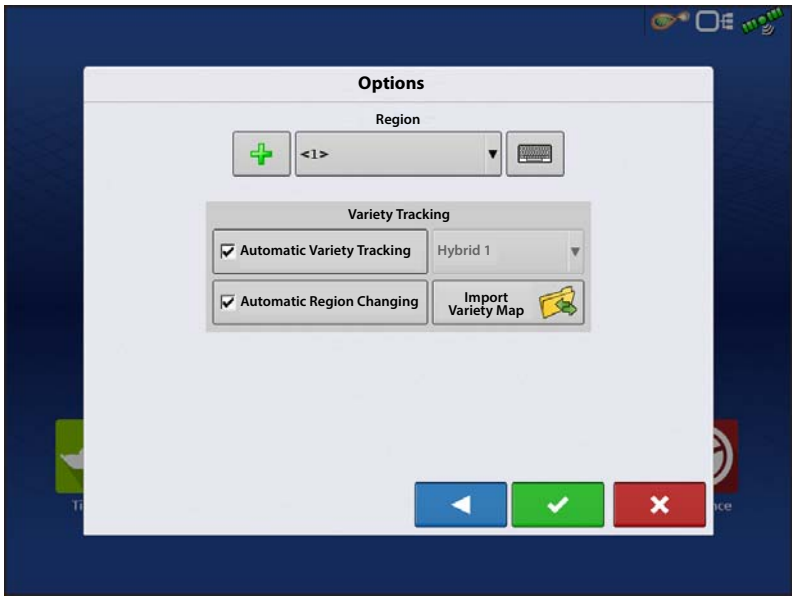
NOTE:! Elevator Speed information is not shown for CLAAS Quantimeter configurations.

Tracking Varieties and Changing Regions

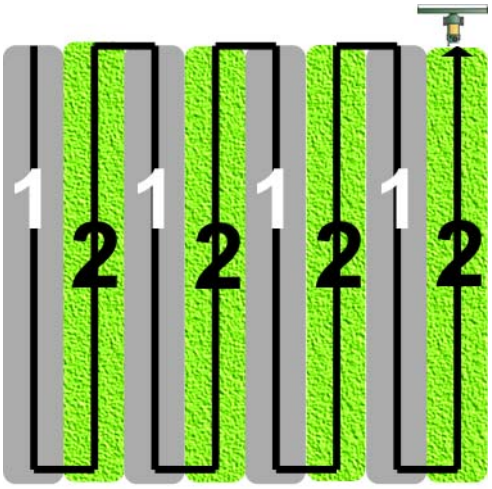


You can use the Options screen to enable the display to track varieties that you planted earlier and are now harvesting. You can also use two types of variety tracking: Automatic Variety Tracking and Automatic Region Changing.

The Options Screen is the last step before completing the harvest operational wizard. This can also be accessed from the mapping screen by pressing the menu button followed by region.



The illustration shows how the display could track two different varieties. In this example, when the harvester reaches the end of Variety 1, and moves to Variety 2, a message appears that either a new variety has been detected and the operator is notified to change regions (Automatic Variety Tracking,) or that a variety has been detected and the display is automatically changing regions. (Automatic Region Changing).



(A) Region Selection

Press + button to create new regions.

Use the drop-down to manually select or change regions.

(B) Automatic Variety Tracking

Automatic Variety Tracking gives users the ability to track hybrids from planting/seeding operation during harvest. This gives quick access to yield information based on hybrids planted in the summary screen. Enable by checking the Automatic Variety Tracking box.

A variety map must be present to enable Automatic Variety Tracking.

If no variety map is present, then you can either

- (E) Manually assign a variety from the Variety Tracking List, located to the right of the Automatic Variety Tracking check box.

  OR

- (D) Import a variety reference map.

(C) Automatic Region Changing

If you wish to enable the Automatic Region Changing feature, select both the Automatic Variety Tracking check box, and the Automatic Region Changing check box. Automatic Region Changing will auto-sort varieties into regions as you go through the field.

- Automatic Region Changing tracks both varieties and regions, so the display changes the region automatically.

In-Field Variety Tracking Messages

If you have selected either the Automatic Variety Tracking or Automatic Region Changing features, you will see one of the following messages as you harvest your field.

- If you have selected Automatic Variety Tracking, a message will tell you that the display has detected a different variety, and that you should manually change the region.
- If you have selected Automatic Region Changing, a message tells you that the display has detected a different variety, and that the display is automatically changing to a different region.

(D) Importing Variety Maps

Variety maps can be imported from SMS software. The SMS software uses planting data to create a variety reference map which is saved as an .AGSETUP file. This .AGSETUP file can then be exported to the display for use with the Automatic Variety Tracking and Automatic Region Changing features.

Importing Variety Map Procedure

Select Reference File

The File Selection screen appears. Use / to scroll through the files and select the desired reference (.AGSETUP) file. Press when finished.

Error Messages at Variety Map Import

If the display failed to import a variety map, it is likely that you saw one of three error messages on the display:

Error Message: "Crop type of Variety Reference Map does not match crop type of field."

Possible Cause: A different crop type was selected in the Harvest Operation Wizard than is shown in the variety reference map.

Solution: Either create a Harvest Operation with a different crop; or choose a variety reference map with an appropriate crop.

Errror Message: "Variety Reference Map does not match location of field."

Possible Cause: A different farm or field was selected in the Harvest Operation Wizard than is shown in the variety reference map.

Solution: Either create a Harvest Operation with a different field, or choose a variety reference map with an appropriate field.

Error Message: "Too many zones to show complete Variety Reference Map. Variety Tracking will work on all zones, even those not mapped on screen."

Possible Cause: The reference file selected exceeded the allowable memory limit used to load reference maps.

Solution: Continue harvest operations. All variety tracking and region information will be logged. However you will not be able to see the entire reference map on the display's map screen.

AutoSwath Sensitivity Settings

AutoSwath adjusts the swath width when crossing field boundaries and already-harvested areas. The display changes the swath width being harvested, even though no mechanical change takes place. AutoSwath is useful when harvesting point rows or where harvesting a full head width is not possible. When performing a Harvest operation, the AutoSwath feature includes sensitivity levels, which compensate for varying levels of GPS accuracy. If swath adjustments are performing inaccurately, adjust the sensitivity accordingly. Sensitivity 3 is the default setting. This setting is adjusted from the Configuration Setup menu.

Other settings include:

Sensitivity 5 — Use with RTK or DGPS (GPS6500 RTK or TerraStar with SteerCommand).

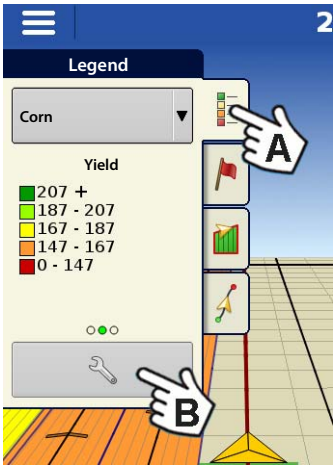
Sensitivity 4 — Use with RTK or sub-meter DGPS. Terrain compensation recommended (GPS6000 or GPS6500 with Steering).

Sensitivity 3 — Use with sub-meter accurate DGPS (most SBAS receivers like GPS6000).

Sensitivity 2 — Use with 1+ meter accurate GPS.

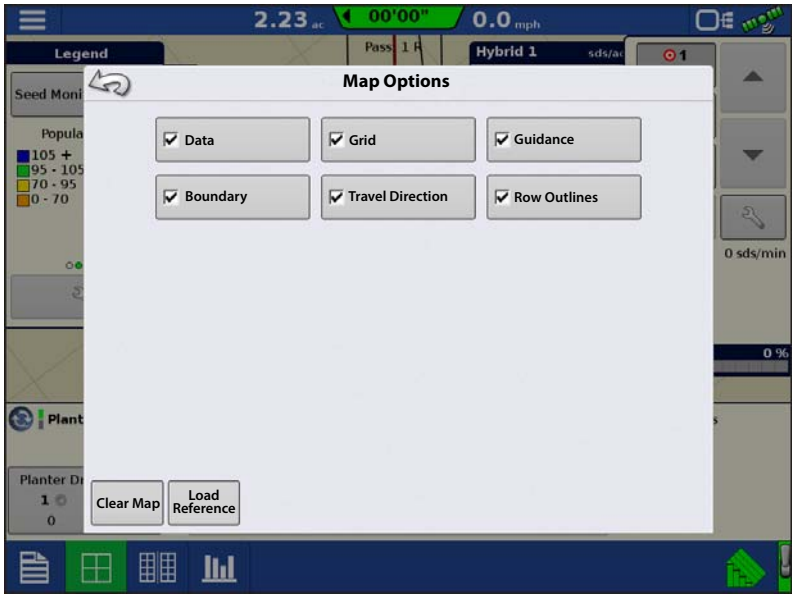
Sensitivity 1 — Swath sections are all on or all off. Use with 1+ meter accurate GPS.

Map Options



During Harvest operations, the Map screen displays three types of items in the Legend: Yield, Moisture, and Coverage.

The Legend Setup button on the Map Legend Tab of the Mapping Toolbox opens the Map Options screen.



- Press Data, Guidance, Boundary, Marker, Reference, Rx and Grid to show or hide those items on the Map screen.
- Press Clear Map to permanently remove all map data from the active field operation
- Press Load Reference to load a map from a previous operation performed in that field to view as a background map.

Flow Delay

The Flow Delay feature is used to account for the lag between when grain enters the combine through the header and is logged by the flow sensor in the clean grain elevator. The delay helps account for yield inaccuracies when you first enter or leave a pass. If very low or very high yield is seen for the first few seconds of a pass this setting can be adjusted.

The setting can be adjusted up and down in 1 second intervals for both entering a pass and leaving a pass.

Create Configuration

A wizard will guide you through the process of selecting or creating a configuration that includes Combine, Header and Crops settings.

The configuration can be started in two places:

Your Operating Configuration will then be viewable when you start a new Field Operation with the Harvest Operation Wizard.

NOTE!: When creating a configuration be sure to select "Quantimeter" as the harvest system type.

You can also use the **Manage Equipment** button to create or edit specific vehicles and implements.

Load Configuration

Press the harvest operations button from the home screen. This will take you through the steps needed to load a configuration.

Calibration Information

Most calibration information used in a CLAAS Quantimeter configuration is calculated in the CEBIS monitor and then relayed to the display. For CLAAS Quantimeter configurations, the CEBIS monitor performs calibrations for the Header Sensor, Yield Monitor, Moisture and Temperature.

NOTE:! The calibration created in the CLAAS Quantimeter is a linear calibration.

When a new calibration is started in the CEBIS monitor, a warning appears on the display, stating "A new grain calibration has been detected. Select an operating configuration to continue." At the same time, the display unloads the Field Operating Configuration that was collecting data with the old calibration. Acknowledge the New Grain Calibration warning by pressing .

After you have completed the grain weight calibration and a new calibration factor has been calculated in the CEBIS monitor, this new calibration is then sent to the display. The display then uses the new calibration to update all data collected since the time it detected the start of the new calibration. No further messages appear in the display.

NOTE!: The New Grain Calibration warning does not appear for the first calibration performed during the season. It only appears for calibrations performed thereafter.

NOTE!: The display does not update any previously-collected data collected prior to the time it detected the start of the new calibration.

Manual Moisture Setting

As with other calibration information, the Moisture Calibration is calculated in the CEBIS monitor and then relayed to the display. However, you can adjust moisture settings for a specific region with the displays Manual Moisture setting. The manual moisture setting will only be applied to the specified region.

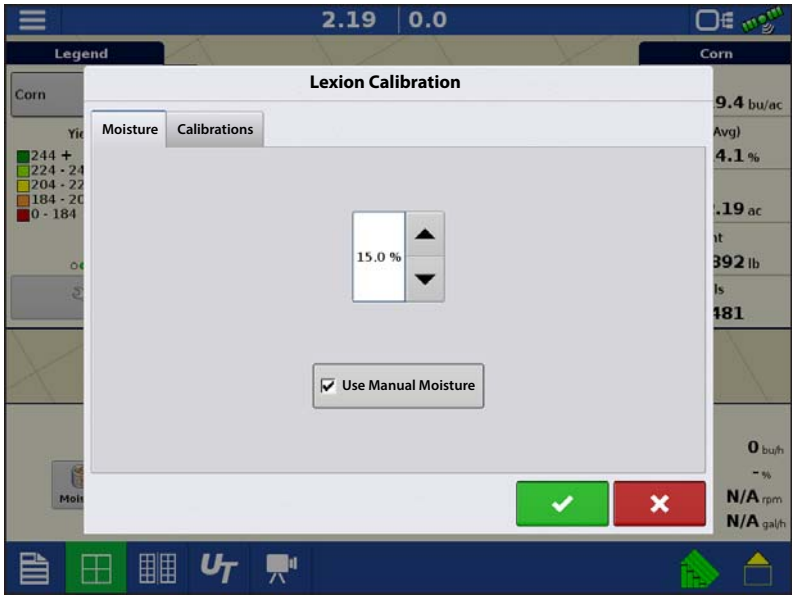
Moisture > Moisture

The CLAAS Calibration screen appears.

Check Use Manual Moisture.

Use ▲ / ▼ to adjust the Manual Moisture to the desired value. Press ✓ when finished.

NOTE!: The list shown in the CLAAS Calibration screen only shows loads harvested during the current season.



Diagnostics for CLAAS Quantimeter

When performing a Harvest operation, you can access the Grain Harvest Diagnostics screen by pressing > CAN. Technical support may request that you look at this screen for help in diagnosing a problem. When the Devices screen opens, press and highlight the AL Bridge listing in the CAN Device list, then press the Diagnostics button. The Grain Harvest Diagnostics screen appears.

NOTES!:

The Grain Harvest Diagnostics screen displays different information than the Diagnostics screen that appears for other Harvest configurations. This information is relayed from the CEBIS monitor.

For specific information regarding settings shown on this screen, contact Technical Support.

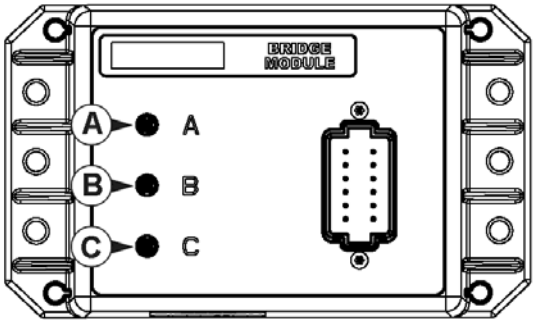
Bridge Module

The Bridge Module routes communication between

A. CAN-Bus

B. Steering CAN-Bus

C. CLAAS CAN-Bus



Three indicator lights verify communication received from these systems. A green light indicates good communication; an amber light indicates no communication.

When the Bridge Module is communicating with the display, it should appear on the display's Devices list.

Troubleshooting CLAAS Quantimeter Configurations

During the operation of a CLAAS Quantimeter field operation configuration, you may see the following error messages. Below is a table describing the cause and solution of the error messages that could appear.

Error Message—Warning: "Full header width doesn't match Quantimeter full header width"

Possible Cause—The full header width that was specified in the display's Header Setup Wizard does not match the header width in the CEBIS monitor.

Set the swath width in the CEBIS monitor to match the swath width of the operating configuration in the display.

Error Message—Crop Type Changed: "The current configuration is no longer valid"

Possible Cause—The display has detected that the crop type specified in the CEBIS monitor has changed to a crop type that is different than what is specified in the display's field operation configuration.

Either:

Solution 1—Change the crop type specified in the CEBIS monitor back to what is specified in the display. Then reload the display's field operation configuration.

Or

Solution 2—Create a new field operation configuration that includes the new crop type. If necessary, create a new Harvest Product in Product Setup with the Harvest Crop Wizard.

Error Message—Grain Calibration: "A new grain calibration has been detected. Select an operating configuration to continue."

Possible Cause—When a new calibration is started in the CEBIS monitor, the warning at left appears on the display. At the same time, the display unloads the Field Operating Configuration that was collecting data with the old calibration.

Solution—Acknowledge the warning by pressing . At the Home screen, press the Select Event button. Use the Field Operation Wizard to create a new field operation configuration. After receiving the new calibration from the CEBIS monitor, the display will calculate that field operation configuration's harvest data by using this new calibration that was sent from CEBIS.

Error Message—CLAAS Communication Error: "Cannot communicate with CLAAS bridge module."

Possible Cause—No communication between Bridge Module and CLAAS CAN-Bus. (Shown as Indicator Light C on Bridge Module).

Solution—Check cabling between Module and CLAAS Can-Bus.

Error Message—CAN Node Lost: "AL Bridge Node has stopped communicating."

Possible Cause—No communication between Bridge Module and display. (Shown as Indicator Light **A** on Bridge Module.)

Solution—Check cabling between Bridge Module and display.