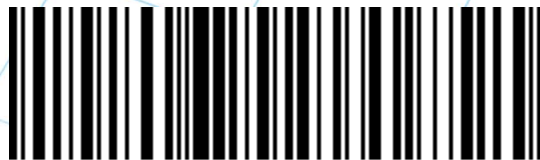




DirectCommand® L2 Rate Controller

REV. B



2006594-ENG

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DirectCommand® L2 Rate Controller

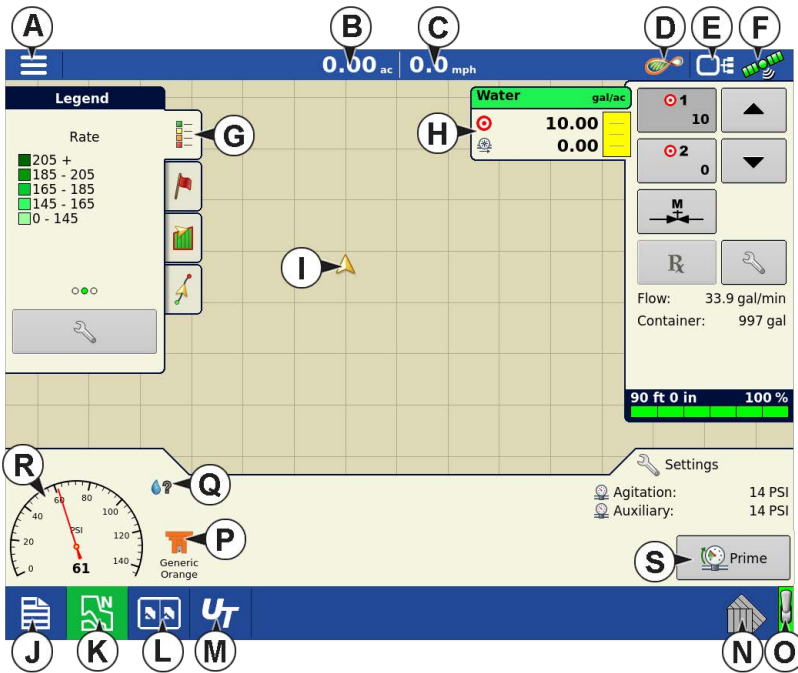
DirectCommand L2 monitors and controls variable rate application of up to 8 liquid products.

Load Configuration



Press the Application App from the home screen to load a configuration.

Map View



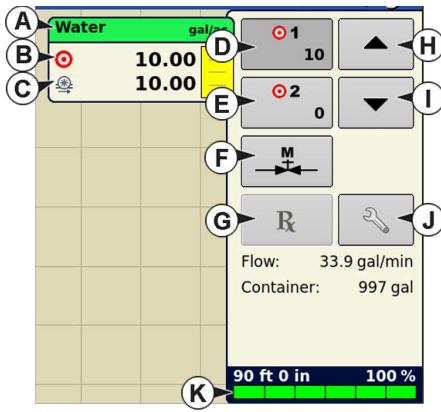
- A. Menu button
- B.Total Logged Field Area
- C.Ground Speed
- D.AgFiniti® Status
- E.Diagnostics
- F.GPS Signal Indicator
- G.Display Legend
- H.Product Control Toolbox
- I.Vehicle Icon
- J.Event Summary
- K.Map View
- L.Split Screen
- M.Universal Terminal
- N.AutoSwath Toggle Switch
- O.Master Switch Indicator
- P.Nozzle Indicator
- Q.Droplet Size Indicator
- R.Pressure Gauge
- S.Boom Prime



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.



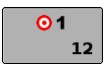
- A. Product
- B. Target Rate
- C. Actual Rate
- D. Rate 1 button
- E. Rate 2 button
- F. Manual Valve Control
- G. Prescription button
- H. Rate Increase button
- I. Rate Decrease button
- J. Rate Setup button
- K. Section Status Indicator


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.

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 — 

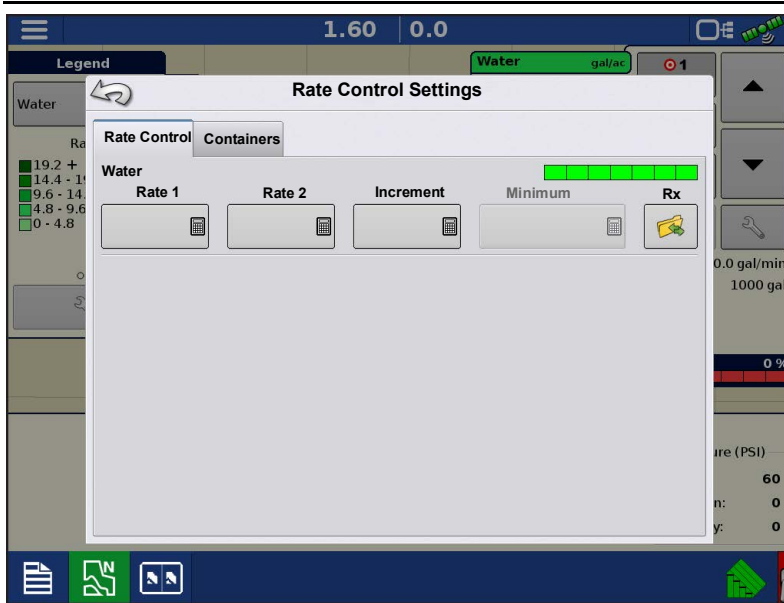
Boom Prime

 Boom Prime allows the boom to be pressurized with the master switch off prior to applying. To engage, select the Prime button in the bottom right corner of the run screen. To disengage select the boom prime button again or flip the master and begin applying. The master switch must be off for Prime to be accessible. When prime is selected it will prime to the boom valves.


NOTE! When using a Servo Valve, Rate Off setting must be set to Maintain Standby Pressure for Prime to be available.



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.

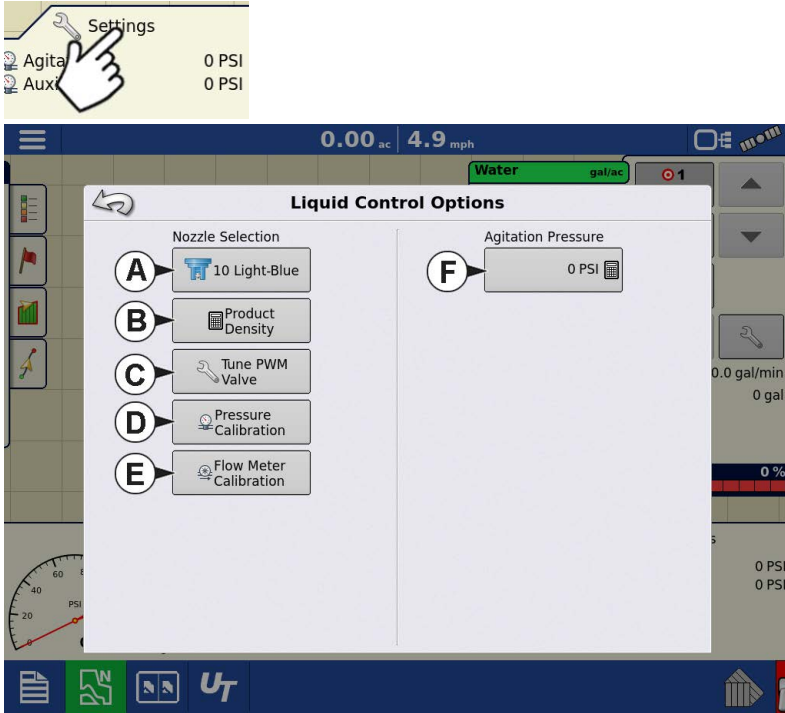
Increment — The Increment button allows operators to specify the increase or decrease amounts for a specified rate by using / on the Product Control to enter the desired.

Prescription — To load a map-based prescription file, press the Prescription button.

Refer to “Loading Prescriptions” on page 4 for further detail.

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. To adjust this setting, press  and enter the desired numeric value.

Liquid Control Options



- A.Nozzle Selection
- B.Product Density
- C.Tune Valve
- D.Pressure Calibration
- E.Flow Meter Calibration
- F.Agitation Pressure

Nozzle Selection – Click the icon to open the selection options. Select an existing nozzle that matches the nozzle you are using or create a custom nozzle. A nozzle selection is required for pressure-based control.

Product Density – Enter the products Density.

PWM Valve Tuning Utility — Easily tune PWM valve settings from the run screen.

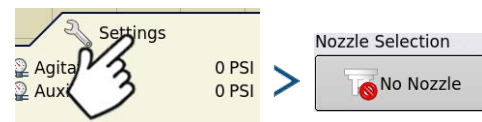
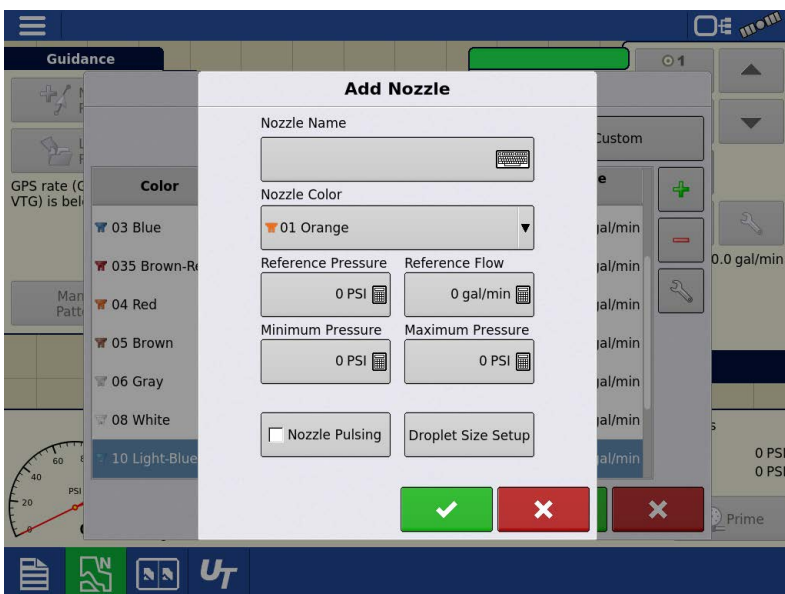
Pressure Calibration — Calibrate pressure sensor from the run screen.

Flow Meter Calibration — Calibrate flow meter from the run screen.


Agitation Pressure – Enter the pressure needed for agitation.

NOTE!: Agitation pressure control requires L2 to be connected to the sprayer agitation valve and an agitation pressure sensor.

Nozzle Selection



OR

 —located on Map screen


Nozzle selection is required. Generic nozzles are available to use for basic functionality.

Functionality Requiring a Custom Nozzle

The user must create a custom nozzle, and input the appropriate settings, to perform advanced functionality such as:

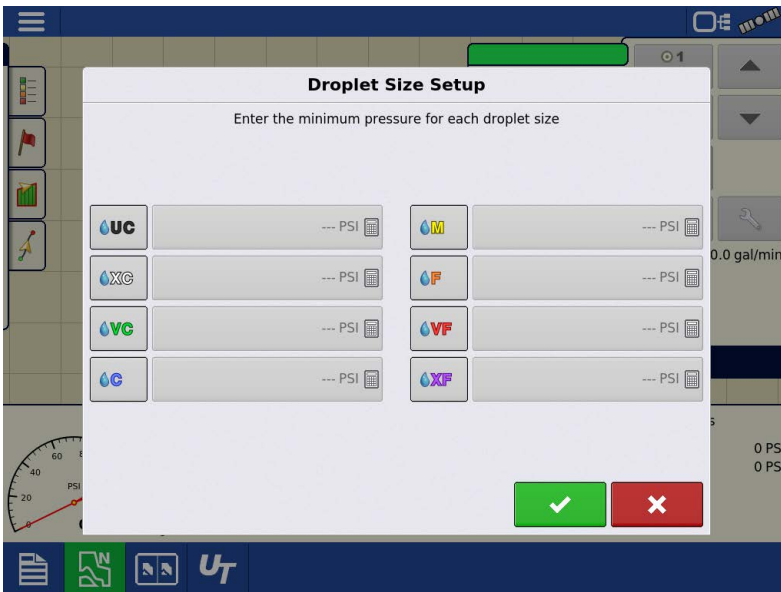
- Droplet size monitoring
- Minimum flow capabilities
- Custom values for flow capacity,
- Alerts when operating outside the effective pressure range of the nozzle

Creating a Custom Nozzle

1. Select 
2. Enter:
 - Nozzle Name
 - Nozzle Color
 - Reference Pressure
 - Reference Flow
 - Minimum Pressure
 - Maximum Pressure

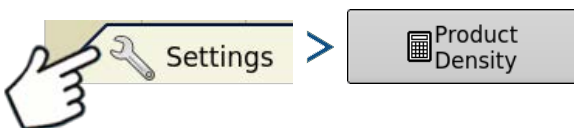
Nozzle Pulsing Nozzle Pulsing will never be checked with DirectCommand L2 only. This feature requires RightSpot to be installed.

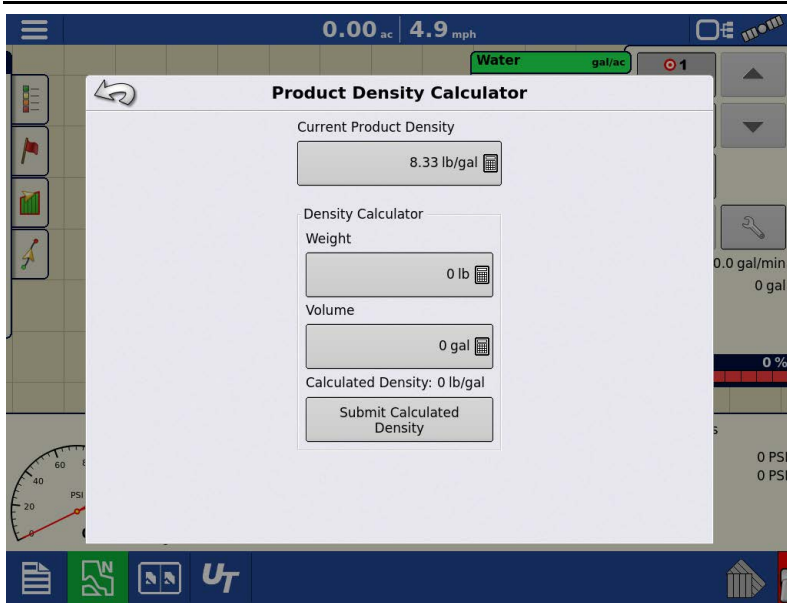
Droplet Size Setup Enables the droplet size reference to the pressure gauge on the map screen.



Enter the Minimum Pressure for each droplet size.

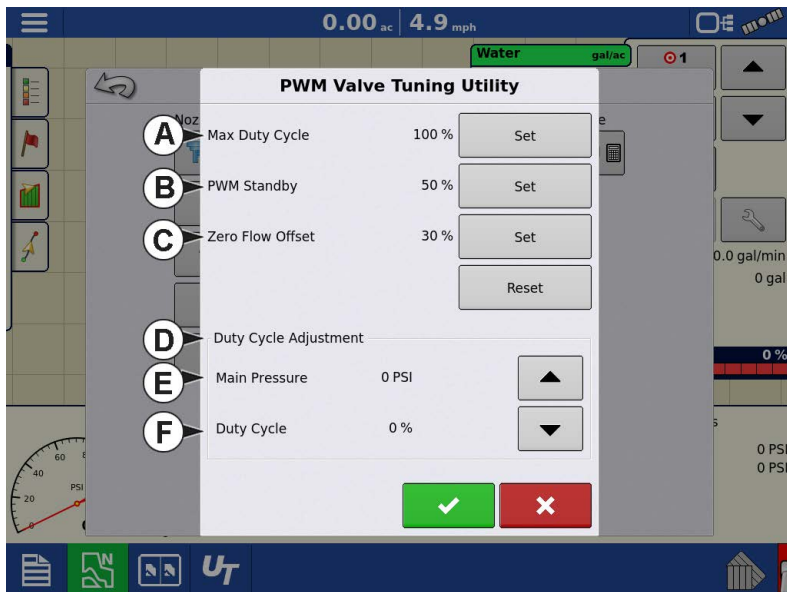
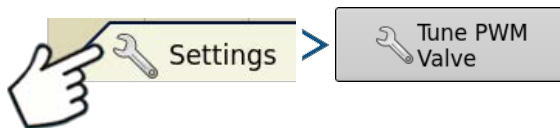
Product Density





Enter the product density. If density is not known, use the calculator to calculate the accurate density.

PWM Valve Tuning Utility



Easily adjust the PWM Flow Control Valve settings from the run screen.

A. Maximum Duty Cycle — Sets an upper limit for duty cycle. The valve will not operate at a higher duty cycle than the percent entered.

B. PWM Standby — User defined setting that determines the percent duty cycle the system uses when boom sections are all off. This setting must be greater than the Zero Flow Offset.

C. Zero Flow Offset — Maximum duty cycle that is sent to the control valve without producing flow from the product pump. Default value is 30. Use the Duty Cycle Adjustment tool achieve the correct setting.

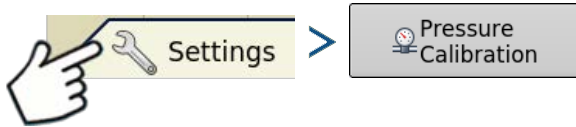
D. Duty Cycle Adjustment — ▲ / ▼ allow the user to command a duty cycle to the product control valve without dispensing product. This allows the user to increase or decrease the pump output and observe the resulting response to help set the desired duty cycle for the above settings.

E. Main Pressure — The current reading from the systems calibrated pressure sensor

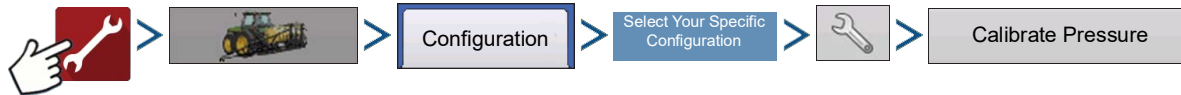
F. Duty Cycle — Percentage the L2 rate controller is sending to the valve.

i NOTE!: To fully adjust the Flow Control Valve access the Control Valve Settings. See [“Control Valve Settings”](#) on page 29.

Pressure Calibration:



OR



1. Choose Main, Agitation or Aux from Drop-down box. Press

2. Select Set Point Type and Sensor type. Press

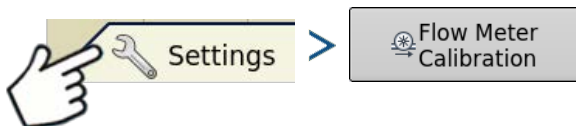
Single Set Point: Enter Voltage / Pressure Ratio Record Calibration Point (PSI must be zero before recording)

Single Set Point with Current Loop: Enter Voltage / Pressure Ratio With PSI of Zero, Record Calibration Point. Press

Multiple Set Point with Voltage: Set pressure to 0 Psi and select Record Calibration Point Enter the known boom pressure and Record Calibration Point. Press

Multiple Set Point with Current Loop: Set pressure to 0 Psi and select Record Calibration Point Enter the known boom pressure and Record Calibration Point. Press

Flow Meter Calibration



1. Select Calibration Type:

- Manual
- Field Dispense Volume
- Nozzle Catch Test.

Press

Manual

Enter the pls/gal for the product control flow meter 1.

- This value can typically be found on the flow meter tag.
- Raven Flow meter pls/gal must be divided by 10 prior to enter value in display.
- Flow meter 2 is ONLY used if there are two product control flow meters on your system. If there is not, leave it to zero.

Field Dispersed Volume

Apply product for a desired amount of time. Once complete, verify the volume applied. Enter the Actual Volume Dispersed in the flow meter calibration window.

- The Volume measured is based on Current Region. It is suggested to create a new region prior to beginning Field Dispense Volume Calibration.

Nozzle Catch Test

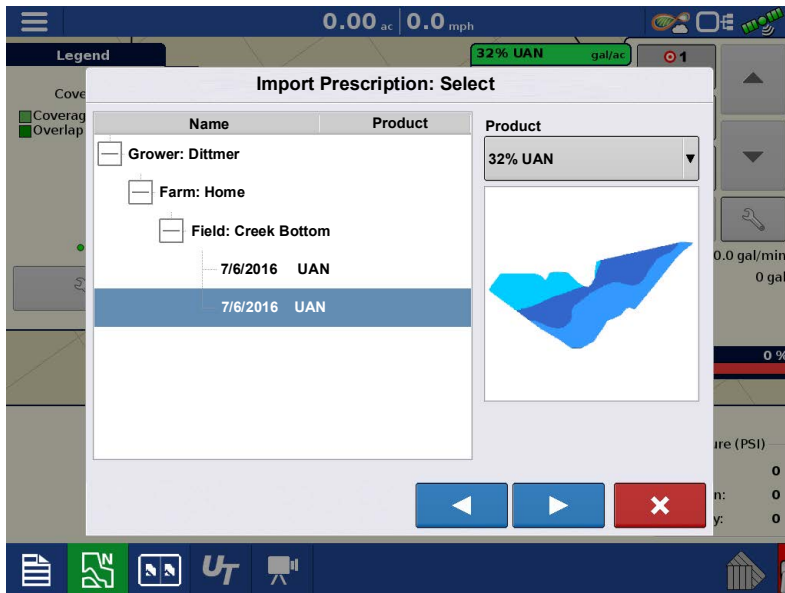
Equipment needed: Pitcher or device to catch water and stop watch.


Enter the target rate and manual speed. Select Start. Select stop once desired time has passed. Enter the volume of solution collected and the time measured.


Flow meter calibration will calculate.

Complete calibration by selecting the .

Loading Prescriptions




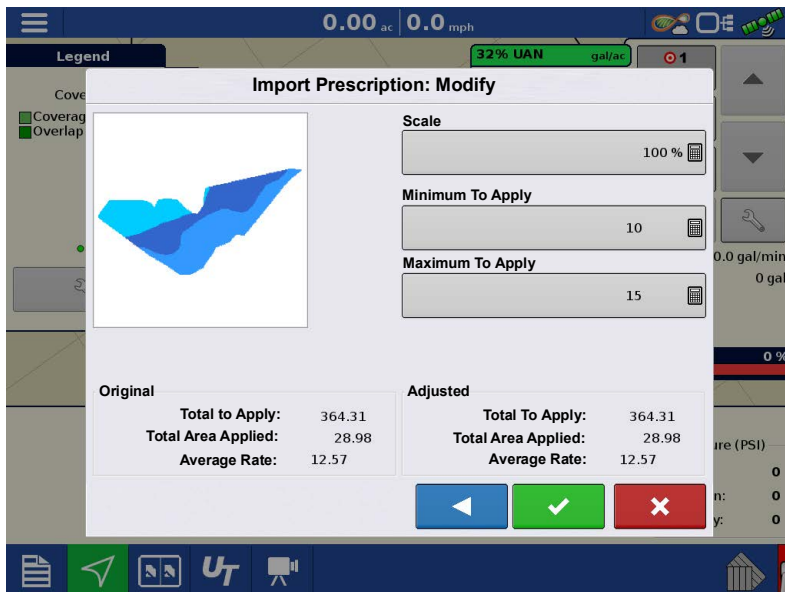
1.  Press the Rate Setup button on the Product Control Toolbox.

2. Press the Load Prescription button. 

3. Using an inserted USB or AgFiniti Cloud, search for and highlight the correct .agsetup, .irx, or shape file and press



4. Select the prescription in the Select Prescription screen, and select the correct controlling product from the Product dropdown box. A preview prescription map is displayed. Press .



5. In the Modify Prescription Screen the prescription scale, minimum to apply, and maximum to apply can be changed. As the three parameters are changed, the adjusted total to apply and average rate will update accordingly.

6. Press the .

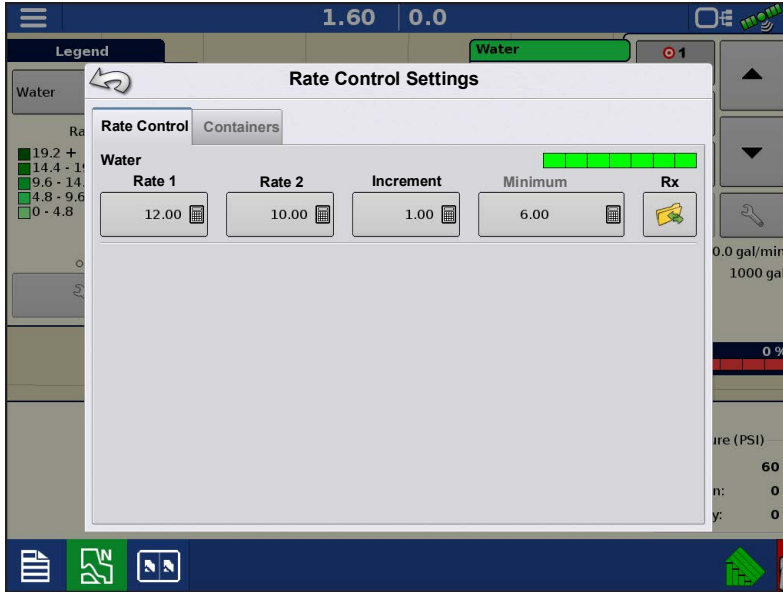
7. After returning to the Mapping Screen, the prescription will appear on the map while in a North Oriented view.

Shape File Conversion

What is commonly called a shape file is actually a collection of different files. All three of the files are required and must be present on the USB drive for the system to use shape files for variable rate product application. A single shape file can contain recommendation rates for multiple products.

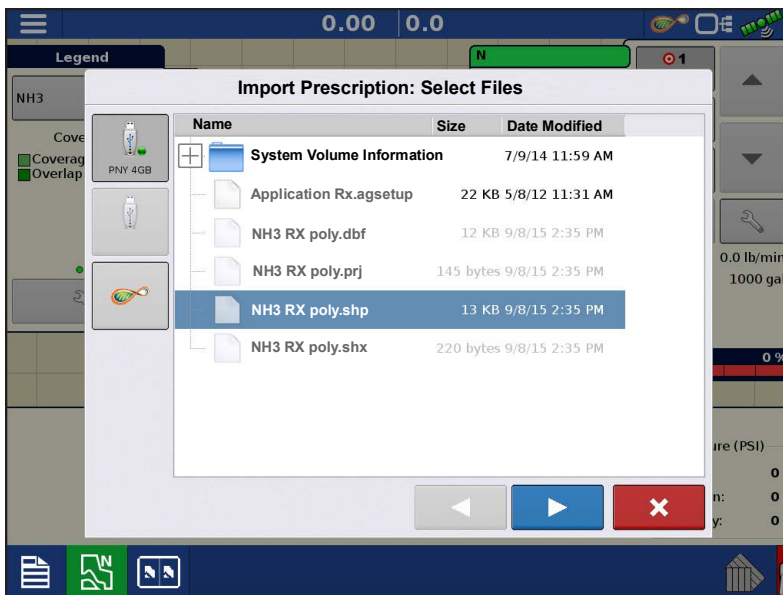



1. To begin, press the Rate Setup button on the Product Control Toolbox.

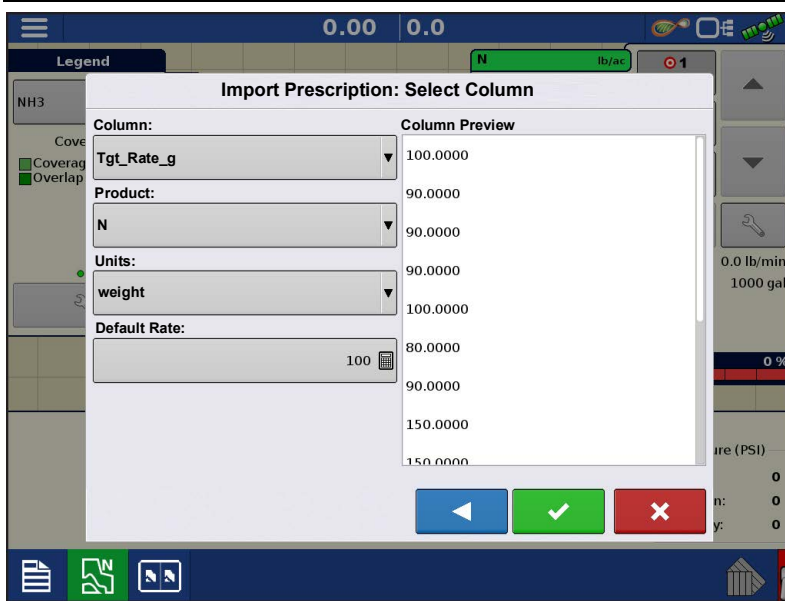


The Rate Control Settings screen appears

2. Press the Load Prescription button.



3. The Select File screen appears. Highlight desired .shp file and press .



4. Select Column From Shape File— Select the column that contains the product target 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 will 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. 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)




2. Enter a Base Amount or Base Rate and Units.
 - Total Amounts - Tank/Bin Size
 - Rate/Acre - For Rate Applied per Acre


3. Select Carrier
 - Press  to create a new carrier.


4. Press  by the Add Mix/Blend Contents box to start the process of adding components to the mix.

5. 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.



6. Press  to add an additional product.

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 mix/blend.

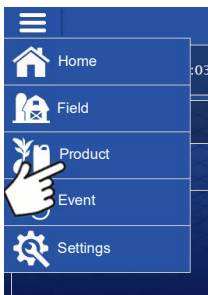
• Press  to complete the process of setting up the mix/blend, or press  to return to the Configuration Setup screen without adding a mix.

The product mix/blend appears under the Application heading located on the Product tab of the Configuration Setup screen.

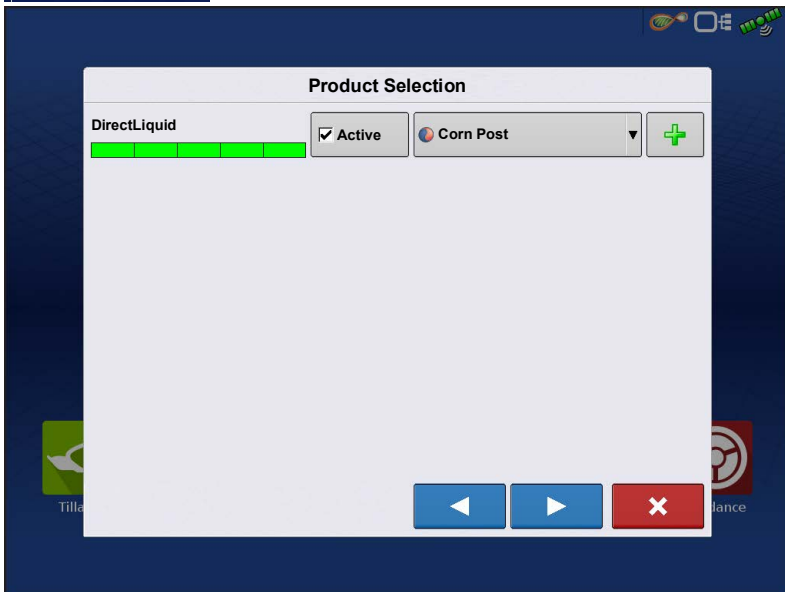



Represents Product Templates

Configure Product Mix

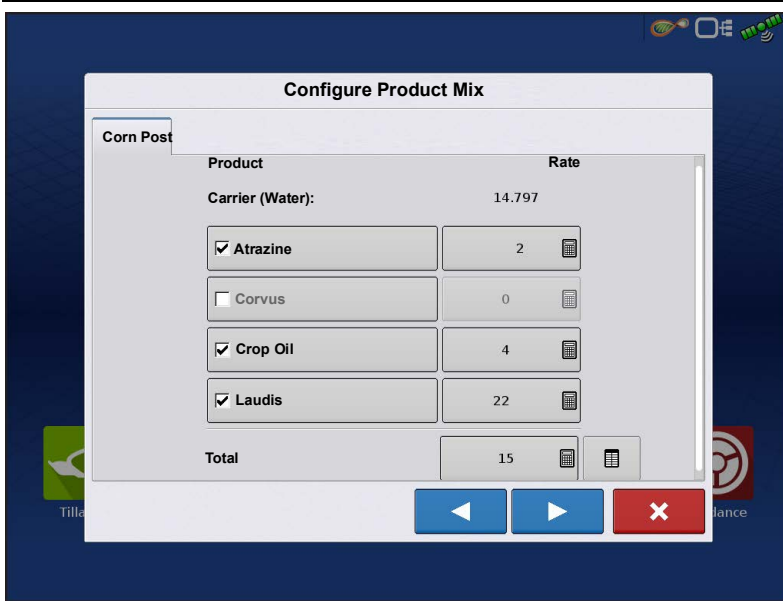


When using a product template, the mix contents and amounts are defined in the Configure Product Mix screen available in the Event Setup Wizard, or Product button in the main menu.




1. Select mix/blend from the drop-down list or press  to create a new mix/blend.

DirectCommand® L2 Rate Controller

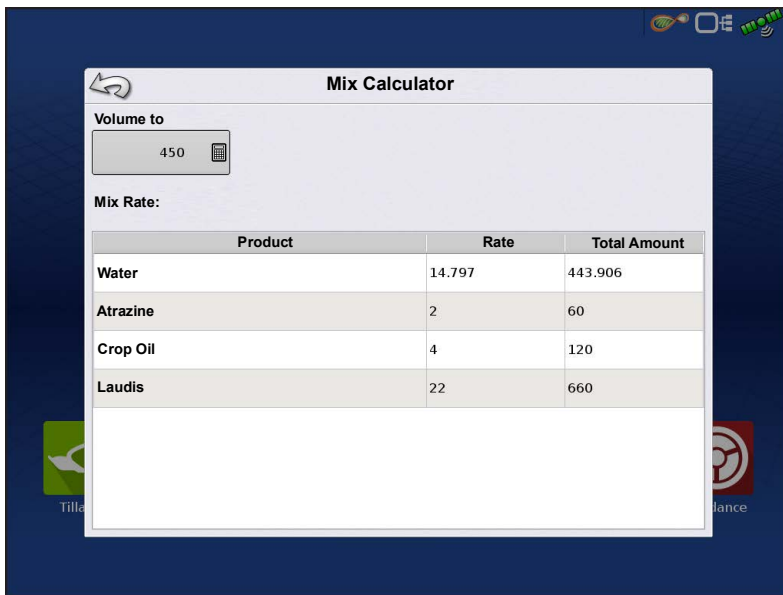


2. The product template mix contents and amounts are defined by:

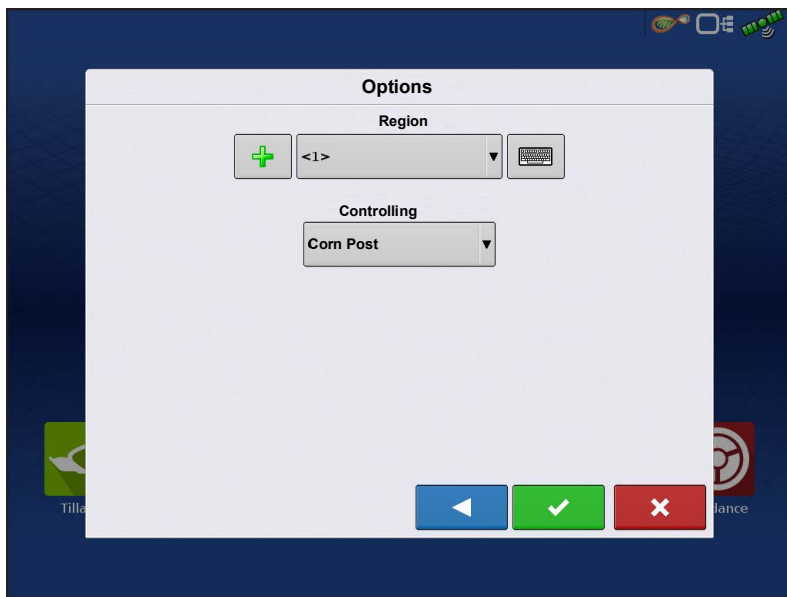
- A. activating or deactivating products
- B. changing rate or total amount of product
- C. changing total amount of the product or overall rate of product application


A product cannot 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.

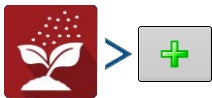


5. Select Region from the drop-down menu or press  to name region. Verify the Controlling Product for the Mix/Blend.

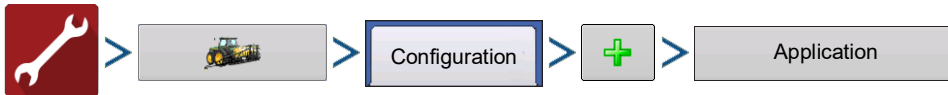
Press  to load the Event to the Map Screen, or press  to return to Home screen without setting up an Event.

Create Configuration

A wizard will step through the process of selecting or creating a configuration with application settings. The configuration can be started in two places:



OR

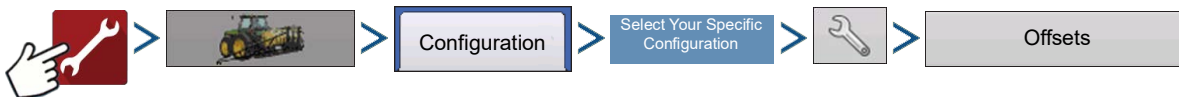


Operating Configuration will be viewable when starting a new Field Operation with the Application Wizard.

Manage Equipment button can also be used to create or edit specific vehicles and implements.

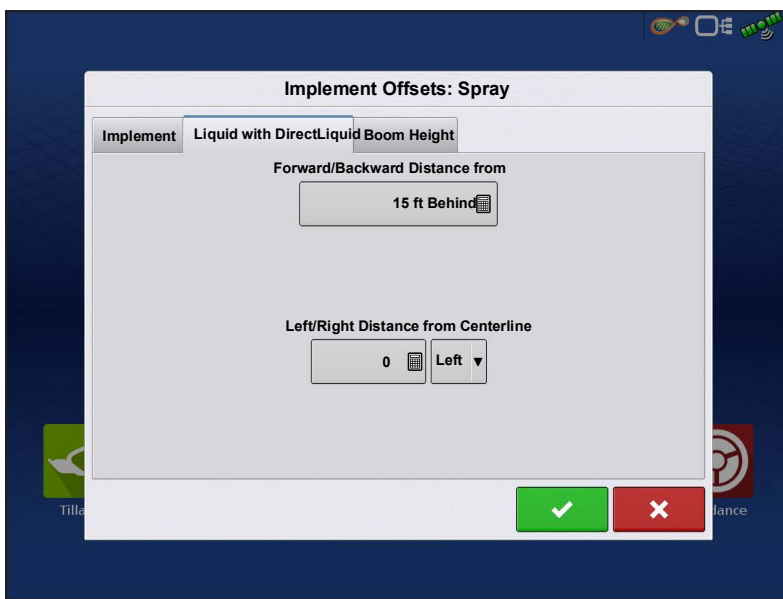
Implement Offsets

Offsets



OR

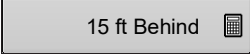


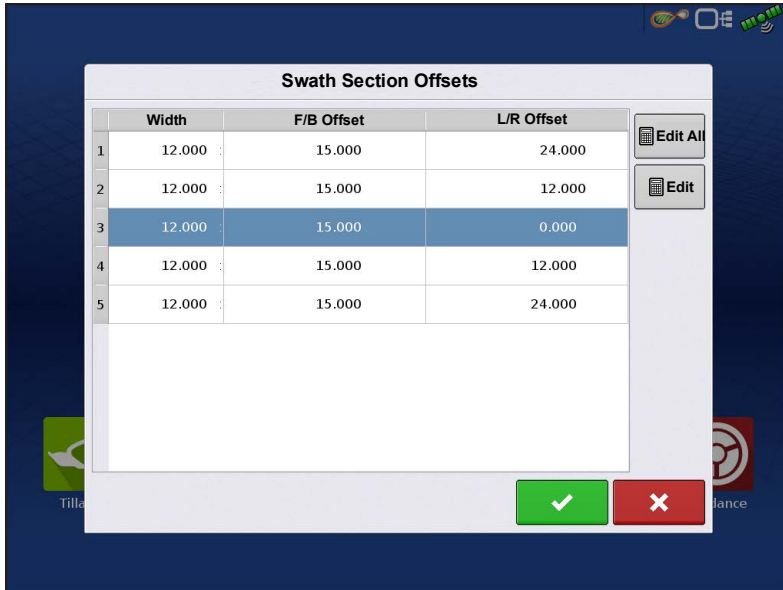


Implement Offsets screen appears, with each channel's settings shown on its own tab.

Defaults to the value entered during Configuration Wizard.

Boom sections can independently be offset forward or back (Application Operation Only).

Press  to access Swath Section Offsets screen.



1. Select Swath section to edit and press Edit button.

2. Enter Offset for that specific section and Forward/Backward from rear axle.

3. 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.

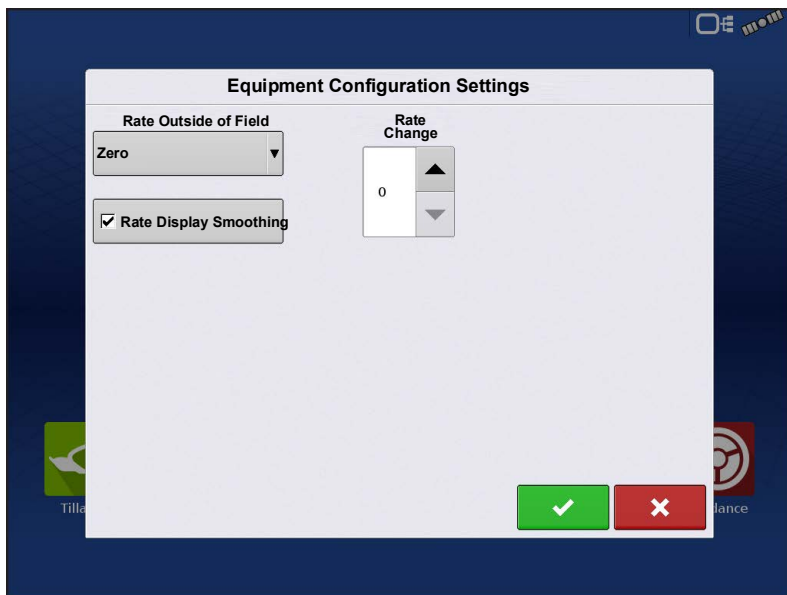


Runscreens reflect section offsets

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.

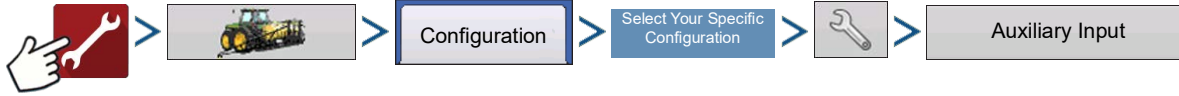
- Rx Default**—When using a prescription, this will apply at the Default Rate (or outside of boundary rate) as defined by the prescription file.

Rate Display Smoothing—Determines how the feedback from the control channel rate sensor will be displayed on the map screen. When not selected, the system will display raw feedback from the rate sensor. When checked, the system will display target rate when the application rate is

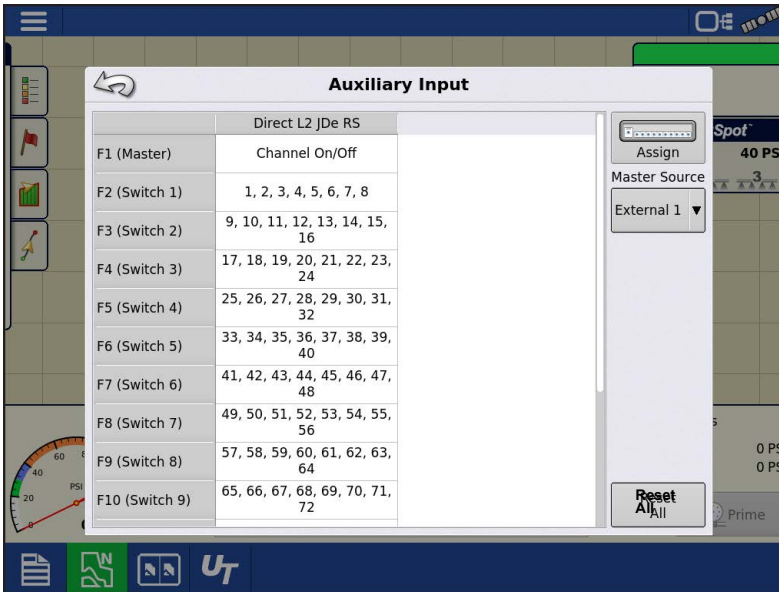
within 10% of the target rate setting.

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



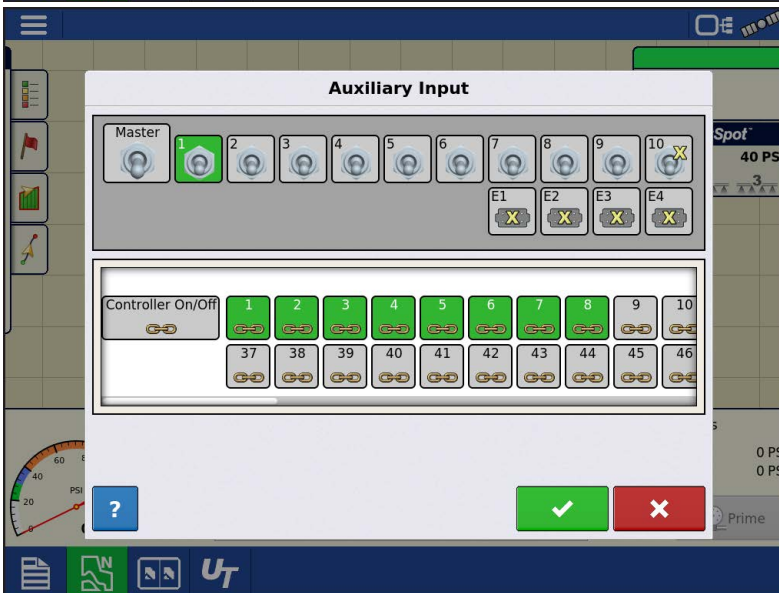
OR




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 

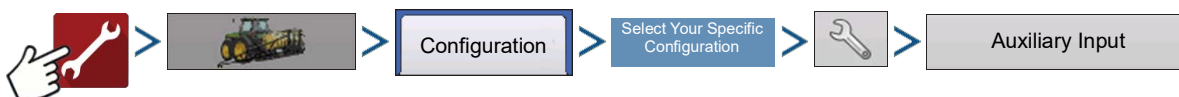
2. Highlight the desired switch to assign a function to it.



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 an "X" then it is not assigned to a function. Press  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 from the last swath module out of pin 11 for the left fence row nozzle, or pin 12 for the right fence row nozzle, for a 12V signal valve. When using polarity reversing valves, the left fence row nozzle is

controlled by pins 9 and 10 and the right fence row nozzle is controlled by pins 11 and 12. When using polarity reversing valves, the left fence row nozzle is controlled by pins 9 and 10 and the right fence row nozzle is controlled by pins 11 and 12.

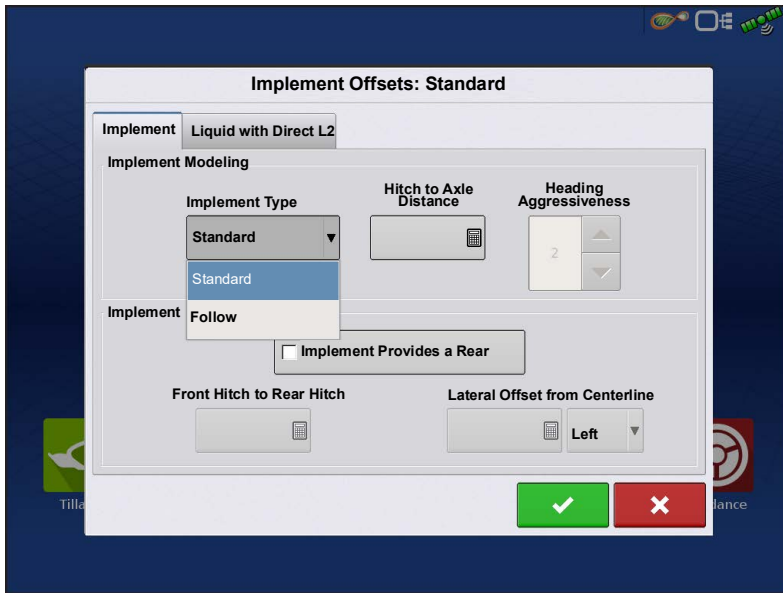
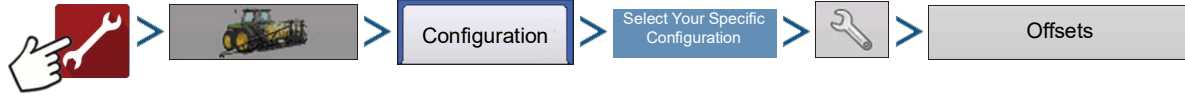


NOTE! The boom sections next to the fence row nozzles must be turned on before the fence row nozzle can be turned on.



NOTE! If multiple swath modules are needed for operation, left and right fence row nozzles are assigned to the last swath module with the same pin assignment stated above.

Implement Modeling



When using implement modeling, implement type can be set to Standard or Follow. This selection adjusts how the display models the path of the trailed implement.

If a trailed implement utilizes a steerable axle, the Follow feature can be used.

•Heading Aggressiveness

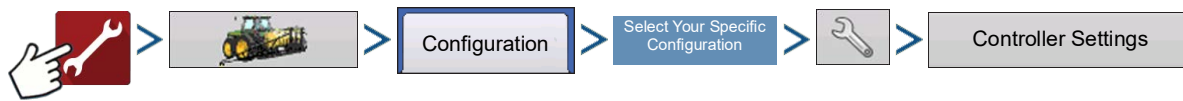
The Heading Aggressiveness setting can be used to fine tune mapping of a trailed implement that has a steerable axle or wheels. The setting ranges from 0 - 10. The default value is 2.

An aggressiveness setting near 0 or 1 will model an implement that follows the path of the vehicle.

As the aggressiveness setting is increased, the modeling resembles an implement that steers outside the path of the vehicle. The modeling becomes more exaggerated the closer the setting is to 9 or 10.

Liquid Application Controller Settings

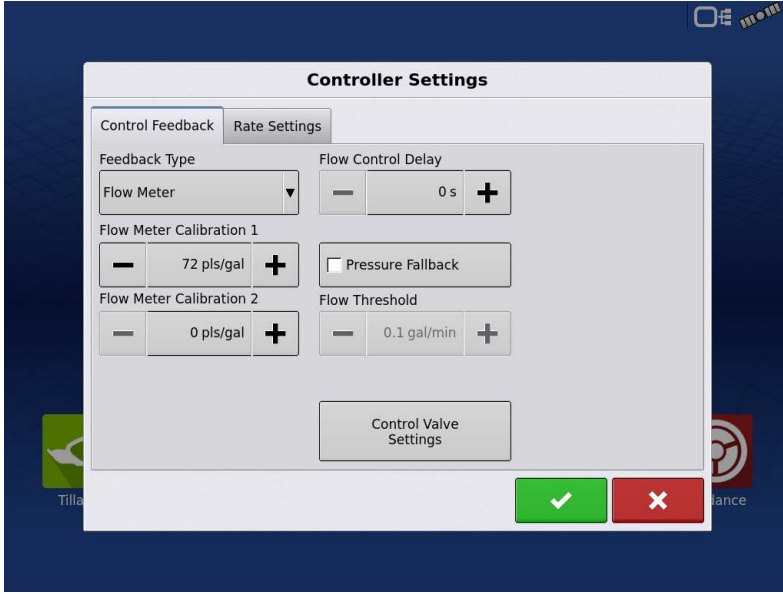
Controller Settings



OR



Control Feedback



Feedback Type – Select the sensor type being used. Flow meter or Pressure Sensor.

Flow Meter Calibration 1 — 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 entering it in the display.

Flow Meter Calibration 2 — This only needs entered if your system has two flow meters. 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 entering it in the display.)

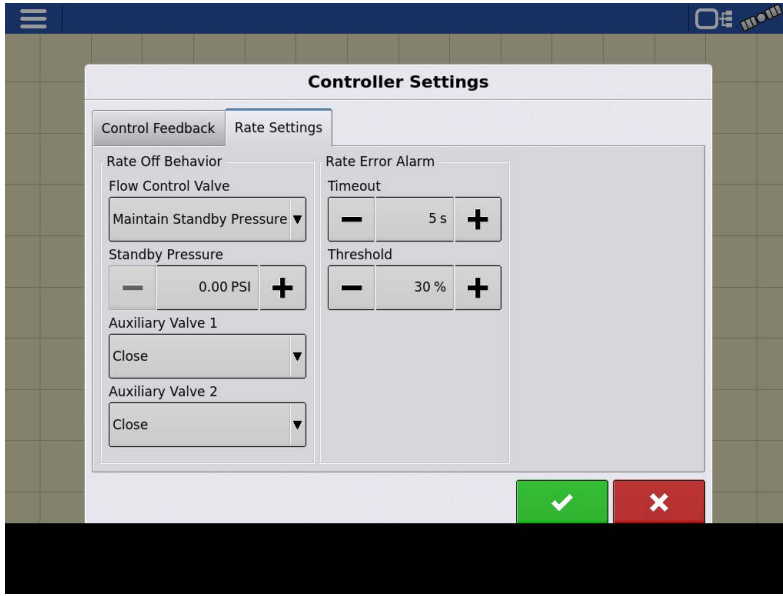
Flow Control Delay — Specifies the time delay from a commanded rate on to when the system actively begins flow control based on flow sensor feedback. This setting can be used to eliminate unwanted correction of flow control at the start of each pass. For RightSpot, typical values for flow control delay are 0-1 second.

Pressure Fallback – Pressure Fallback is a setting that allows the system to automatically switch between flow based and pressure based control. Pressure Fallback is beneficial in low flow situations where a flow meter may be less accurate or not provide the necessary resolutions to provide reliable flow control. In flow rates below the user defined Flow Threshold, the system will transition to Pressure Fallback and utilize pressure sensor feedback for flow control. Both a flow meter and a pressure sensor must be present on the machine to use Pressure Fallback.

Flow Threshold — Set the range of flow that will tell the system to switch between flow based or pressure based control. For example, setting the threshold to 10 gallons/minute will result in the system using the flow meter when flow is greater than 10 gallons/minute and using the pressure sensor when flow is less than 10 gallons/minute.

Control Valve Settings — Opens the Control Valve Settings screen, which displays control valve settings for PWM, Servo, Calibrated Reflow and Ramsey Valve Controls.

Rate Settings



Flow Control Valve

A.Hold: The product control valve remains in the last known state when all sections are shut off.

B.Close: The flow control valve shuts down when there is either a zero rate in the field or when entering an already-applied area.

C.Maintain Standby Duty Cycle: The controlling system remains in the Standby Duty Cycle set in the control valve settings for PWM Standby.

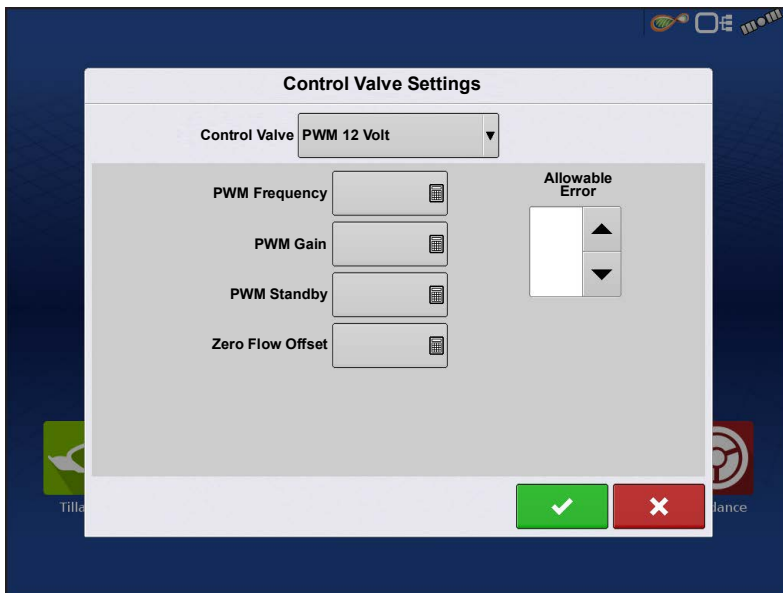
D.Maintain Standby Pressure: The flow control valve achieves the Standby Pressure defined by the user.

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.

Threshold —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 — Settings determined by 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 or pressure 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

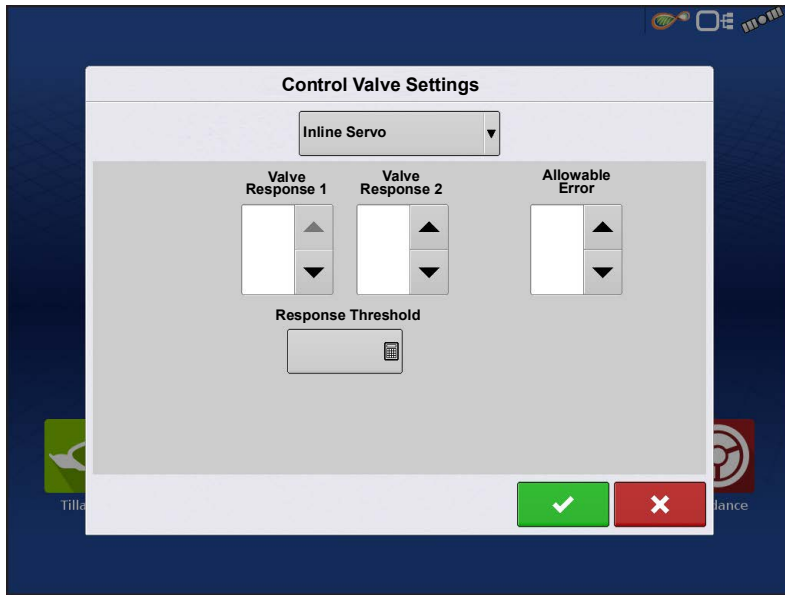
hydraulic flow from the PWM valve. Using too high of a Zero Flow Offset value can cause the product control system to not properly control low rates or shut off. Default Value is 30. See the PWM valve manufacturer information for recommended settings or use the PWM tuning tool to determine the correct zero flow offset.

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.

Allowable Error — This maximum allowable error before the control valve commands a change in flow.



NOTE! The current PWM Duty Cycle can be viewed at the Liquid Diagnostics screen.



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.

Container Level Settings

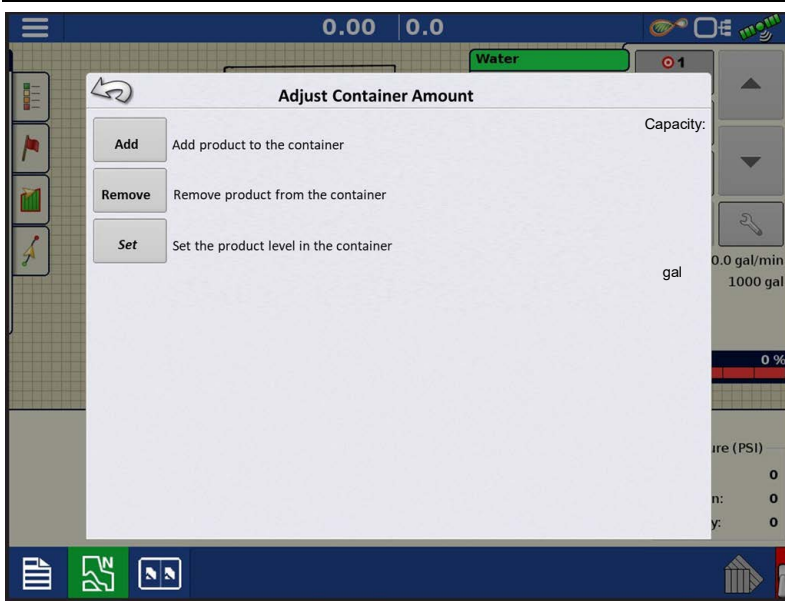
When filling or emptying container, use the Container Level portion of the Rate Control Settings screen to update the amount of product in the containers.

-  **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 changes the container level logged in the display to specific amount specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

Adjust Container Amount

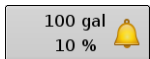
- **Add** — Adds product to the container.
- **Remove** — Removes product from the container.
- **Set** — Sets the product level in the container.

Adjust Container Amount

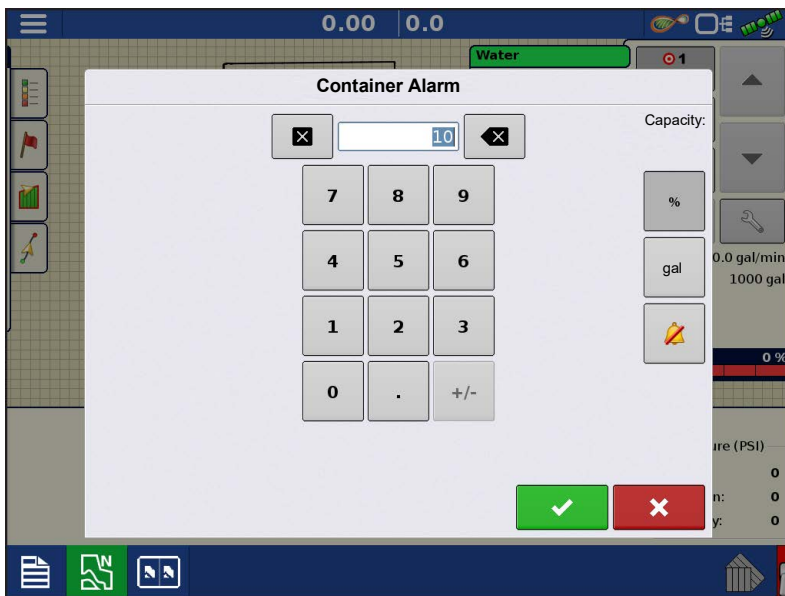


- Add** — Adds product to the container.
- Remove** — Removes product from the container.
- Set** — Sets the product level in the container.

Tank Alarms



The Container Alarm button, which appears on the right of the Container Level portion of the Rate screen, displays the capacity of the 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.



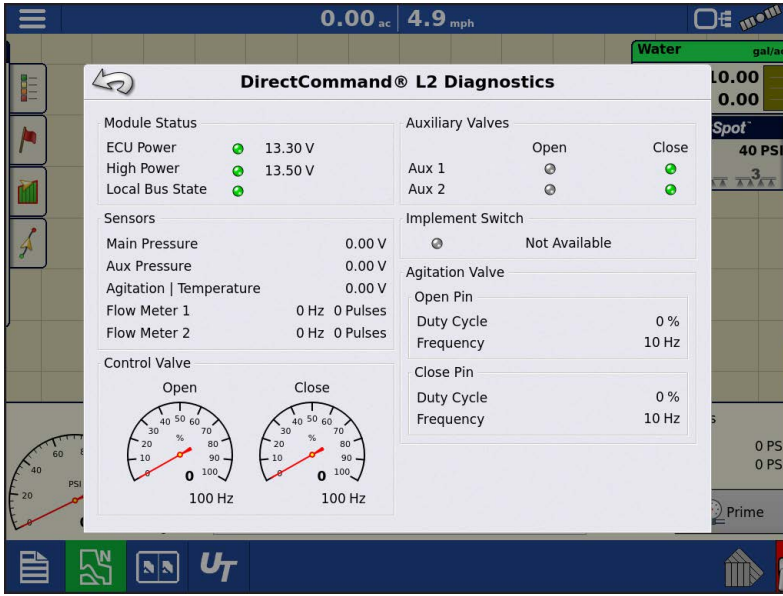
Adjust container level warnings using the following buttons on the right-hand side of the Container Alarm screen.

The **percentage (%)** button sets the warning threshold according to the percentage of solution left in the tank. In the example, to the left, 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 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.

Liquid Application Diagnostics



To go to the Liquid Diagnostics screen, press



At the Devices screen, highlight the item marked **DirectCommand L2 module** then press the **Diagnostics** button.

The L2 Diagnostics screen includes the Module Power, Sensors, Control Valve State, Auxiliary Valve State, Implement Switch, and Agitation Valve.

Control Valve:

PWM Valve

Open – The Open graphic will indicate the active commanded duty cycle

Closed – The Closed will remain zero

Servo Valve

Open – The Open graphic indicates what the system is commanding the product control valve to open.

Closed – The Closed graphic indicates what the system is commanding the product control valve to close.

Auxiliary Valves

Aux 1 – Displays the state of the valve

Aux 2 – Displays the state of the valve

Implement Switch – When Dot is green it is not available – need confirmation on that.

Module Power:

ECU – Displays voltage at the ECU

High Power – Displays voltage of the main power source

Sensors:

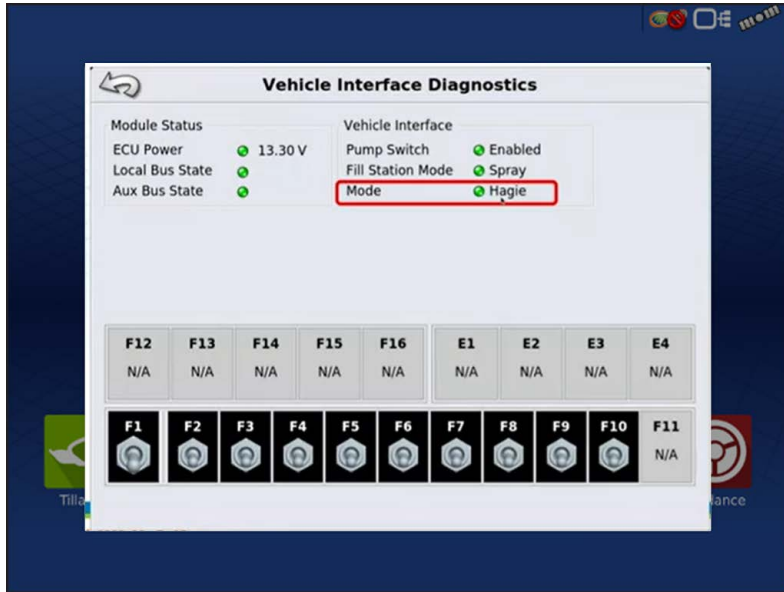
Main Pressure – Displays voltage of the Main pressure sensor.

Aux Pressure – Displays voltage of the Auxiliary pressure sensor.

Agitation Pressure or Temperature – Displays voltage of the pressure or temp sensor

Flow meter 1 and 2 – Displays the current frequency generated by the flow meter during application. Provides a running pulse count of the flow meter during application. Helpful to monitor feedback to the system from the flow meter.

Vehicle Interface Diagnostics



To go to the Vehicle Interface Diagnostics screen, press



NOTE!: Vehicle Interface Module (VIM) is not required for every machine.

ECU Power: Indicates the voltage from the VIM module.

- Green – 10V and higher
- Yellow – 9.9 and lower

Local Bus State: Indicates Local Bus communication

- Green – Communication present
- Red – No Communication

Check Cabling

- Yellow - Passive – no communication from the VIM

Check Cabling

Aux Bus State: Indicates Auxiliary communication

- Green – Communication present
- Red – No Communication

Check Cabling

- Yellow - Passive – No communication from the VIM

Check Cabling

Pump Switch:

- Green – Pump Switch Enabled
- Yellow – Pump Switch Disabled

Fill Station Mode

- Green – Spray
- Yellow – Fill

When in Fill mode an alarm will also sound, indicating Fill Station is in fill mode.

Mode:

- Red – Indicates switch box is unknown
- Green – Indicates switch box is known. It will also display the brand. (Ex, Hagie – indicating the Hagie Hydro Handle is the controlling switch box)

L2 Liquid Rate Controller

High Current LED

Status	Definition
Off	No Power
Solid Red	Low Voltage
Solid Green	Power OK

LED 1– Local CAN Communication

Status	Definition
Off	CAN Bus Idle
Solid Red	CAN Bus Off
Solid Yellow	Passive BUS Error when no other devices are acknowledging.
Blinking Yellow	Active BUS Error when other devices are transmitting/receiving.
Blinking Green	Local CAN Bus Communicating with swath module

LED 2– CAN Communication

Status	Definition
Off	CAN Bus Idle
Solid Red	CAN Bus Off
Solid Yellow	Passive BUS Error when no other devices are acknowledging.
Blinking Yellow	Active BUS Error when other devices are transmitting/receiving.
Blinking Green	CAN Bus Communicating

Liquid Swath Module

High Current LED

Status	Definition
Off	No Power
Solid Red	Low Voltage
Solid Green	Power OK

LED 1 – Local CAN Communication

Status	Definition
Off	CAN Bus Idle
Solid Red	CAN Bus Off
Solid Yellow	Passive BUS Error when no other devices are acknowledging
Blinking Yellow	Active BUS Error when other devices are transmitting/receiving
Blinking Green	Local CAN Bus Communicating with L2 Rate Controller

LED 2 – Local CAN Communication

Status	Definition
Off	Standard Working State

Troubleshooting DirectCommand L2 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 L2 Rate Control Module.
5. 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.

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:

Solution:

1. Check cabling from the channel connection of the L2 Rate Control Module to the flow meter.
2. Check flow meter for product buildup and proper operation.

Problem: Rate is erratic Solution:

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 are appropriate for the particular type of control valve being used.
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:

1. Before product application begins, select Boom Prime and flip master switch on when ready to apply, or 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 previously 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 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.

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.

DirectCommand® L2 Rate Controller

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.

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.

$$\frac{\text{Flow sensor constant (pulses/in}^3) \times 1728 \text{ (in}^3\text{/ft}^3) \times 5.11 \text{ (lbs of anhydrous/gal)}}{\text{Density (lbs. of anhydrous/ft}^3)}$$

Formula for flow meter calibration for Dickey John reading pounds of Nitrogen.

$$\frac{\text{Flow sensor constant (pulses/in}^3) \times 1728 \text{ (in}^3\text{/ft}^3) \times 4.22 \text{ (lbs of N/gal)}}{\text{Density (lbs. of N/ft}^3)}$$



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	Abbreviated name for display and predefined name for SMS™	Percentage (in terms of lbs. 100 lbs.)			Density
			N	P(P ₂ O ₅)	K (K ₂ O)	
Anhydrous Ammonia	Liquid under pressure	NH ₃	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.

Alarms

Alarm: Rate Not Responding

Trigger Condition: As-applied rate is outside user specified range for longer than user specified time

Clear Condition: As-applied rate is within "good" range

Alarm: Pressure Not Responding

Trigger Condition: Pressure is not within 10 psi for 5 seconds

Clear Condition: Pressure returns to within 10 psi

Alarm: Swath Module: High-Power Voltage Low

Trigger Condition: High Current power on swath module is below 10 volts

Clear Condition: High-Power returns to normal

Alarm: Liquid Control Disabled: Cycle Master Switch

Trigger Condition:

- Event is loaded and master switch is "ON" state

or

-
- System is controlling pump but pressure is not responding.

Clear Condition: Cleared when master switch is turned off.