

DirectCommand™ allows the variable rate application of single or multiple liquid products. Once a configuration has been completed, the Map View screen appears.

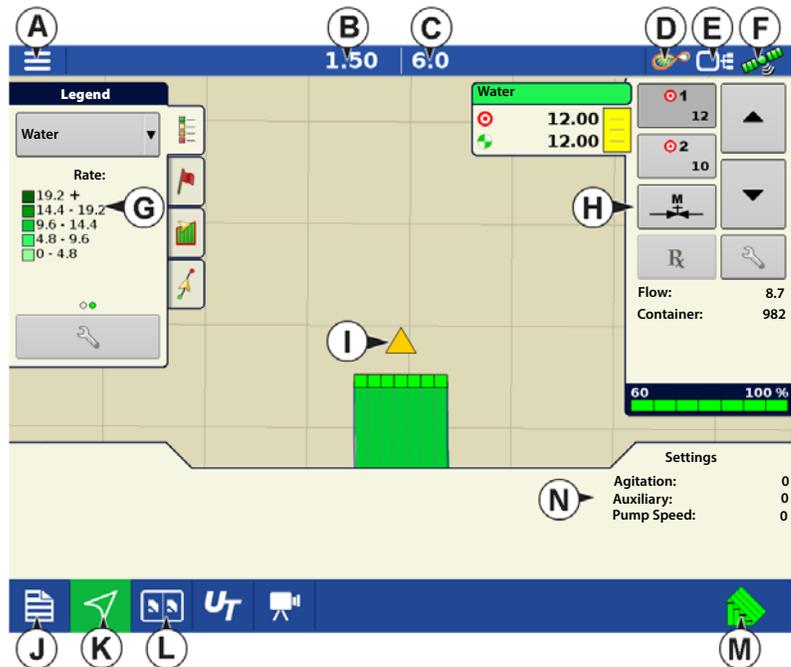
Load Configuration



Press the Application App from the home screen 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

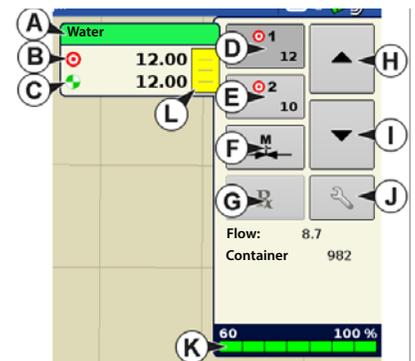


NOTE! Pressing the Map View button will cycle between the available Map screen views, and the appearance of the Map View button changes.

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

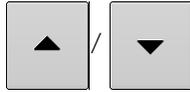


Rate 1 and Rate 2 buttons—The Rate 1 and Rate 2 settings represent preset application rates that allow operators to quickly change between desired target rates for each individual product.



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

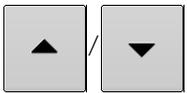


Adjust the Rate 1 and Rate 2 settings shown at the Product Control Toolbox on the Map screen, as well as import application product prescriptions. To access the Rate Control Settings screen, press the Rate Setup button on the Product Control Toolbox. The Rate Control Settings screen appears.

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



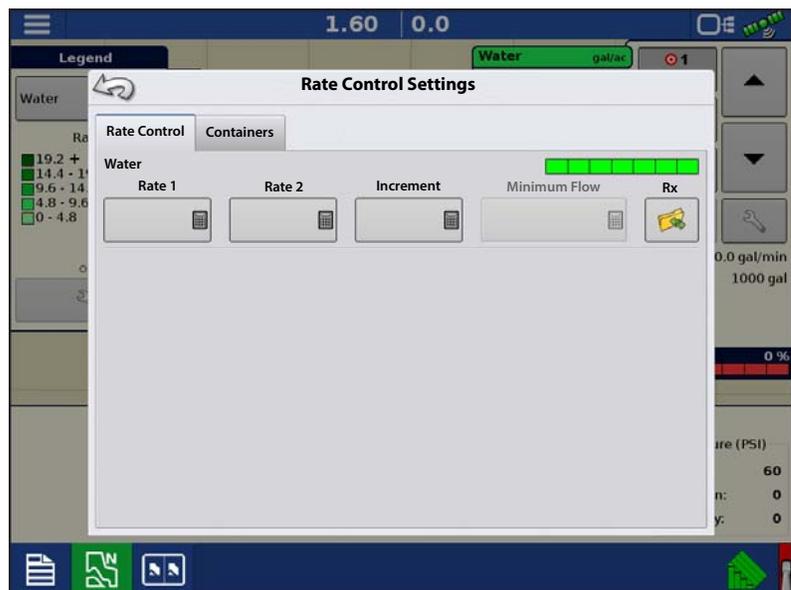
on the Product Control

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 4](#) for further detail.

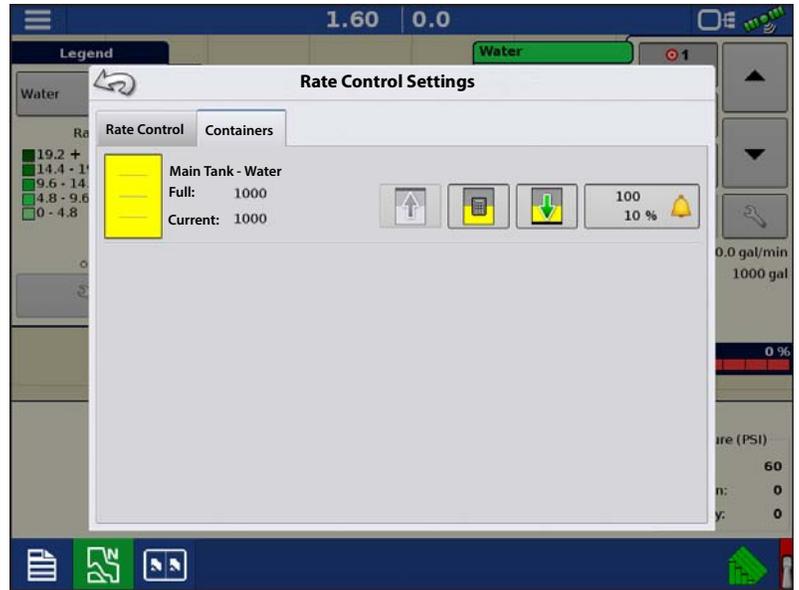
Minimum Flow — (Used for DirectCommand Liquid Applications only). This setting is used to maintain a consistent spray pattern. The display will not allow flow to drop below the entered setting. Set to flow at the lowest operating pressure for the selected spray tips with all sections on. When spraying 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.



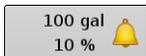
• **Tank Partial Fill** — The Tank Partial Fill button increases the container level logged in the display to specific amount specify by pressing calculator icon. Pressing the Partial Fill button summons the Adjust Container Amount screen.

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 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 above, the threshold is set at 10 percent.

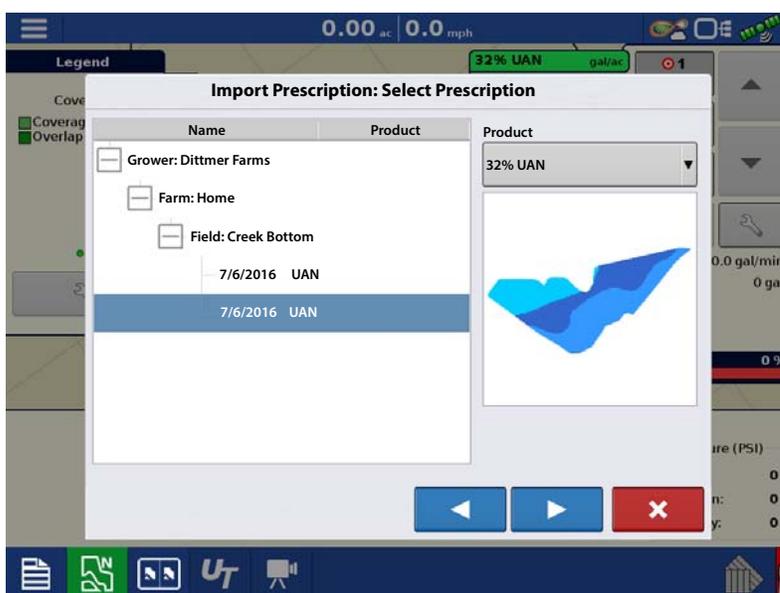
The **units of measurement** icon sets the warning threshold according to the amount of solution left in the tank. This icon is named according to the container's units of measurement specified during the Controller configuration procedure.

The **Disable Low Container Level** button, which appears as a bell with a red slash across it, disables the Low Container Level warning.

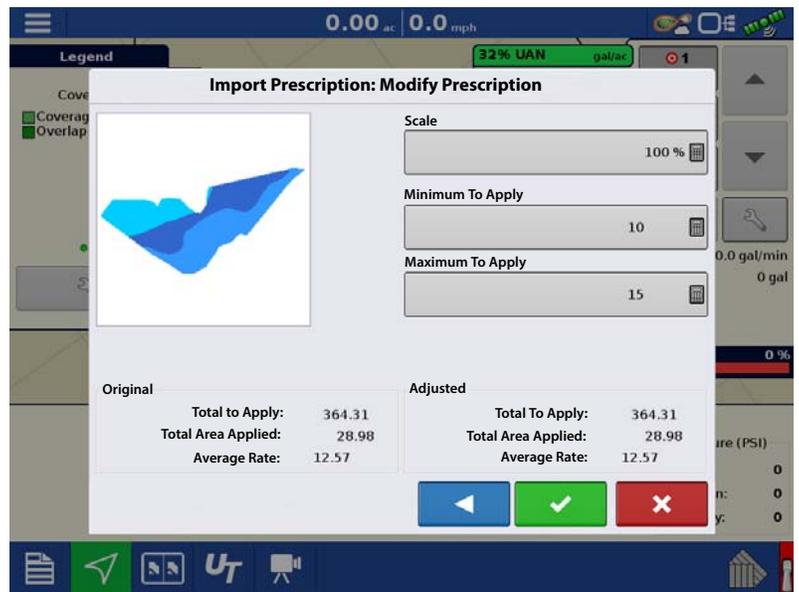


Loading Prescriptions

1.  Press the Rate Setup button on the 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 .



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



Shape File Conversion

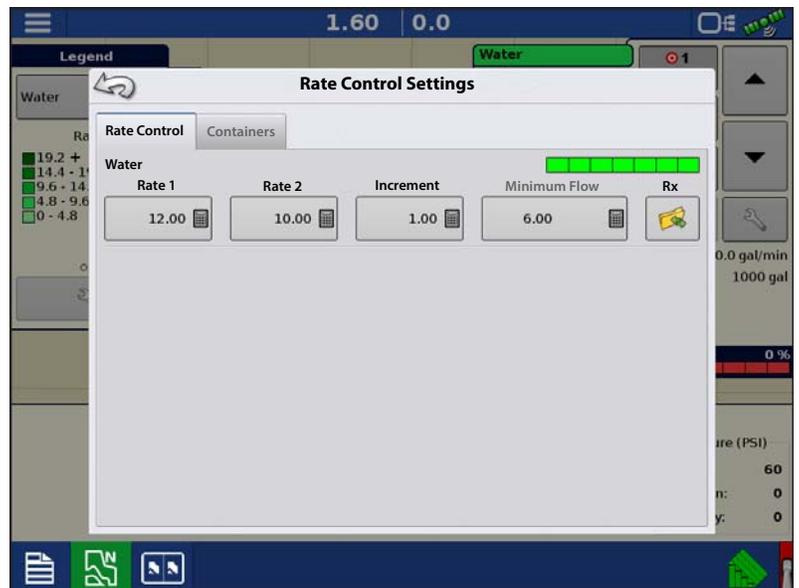
What is commonly called a shape file is actually a collection of three different files. All three of the files are required and must be present on the USB drive for the system to use shape file groups for variable rate product application. A single "shape file" can contain recommendation rates for multiple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



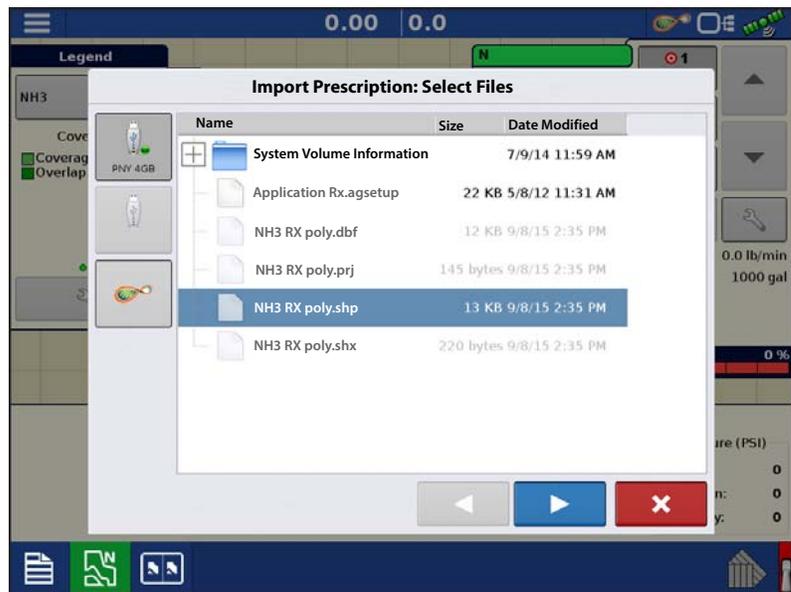
- To begin, press the Rate Setup button on the Product Control Toolbox.

The Rate Control Settings screen appears

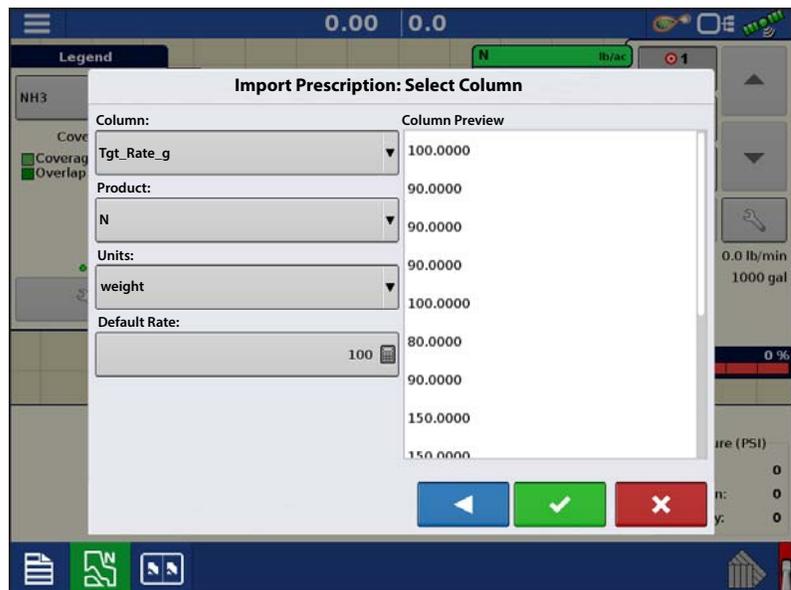
- Press the Load Prescription button.



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



- 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.
- Select Units**—Select the controlling units for product application.
- 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.



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.



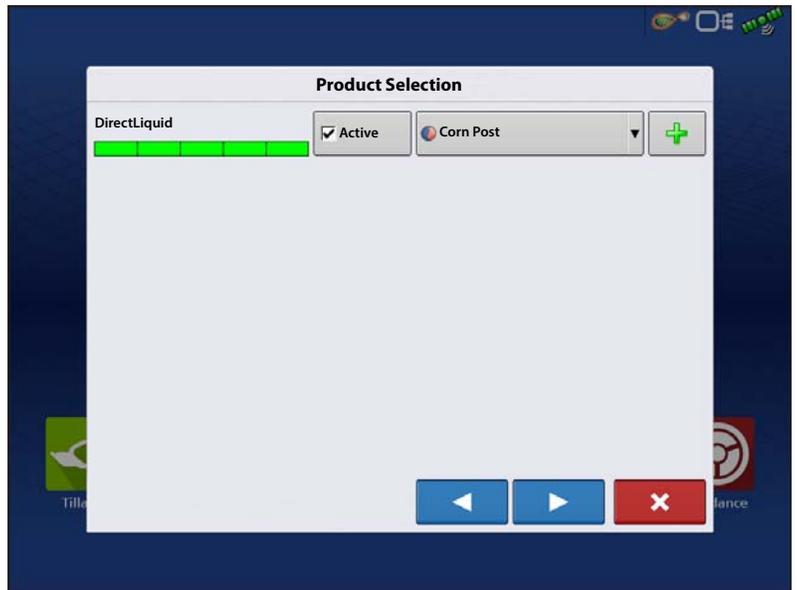
Represents Product Templates

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.



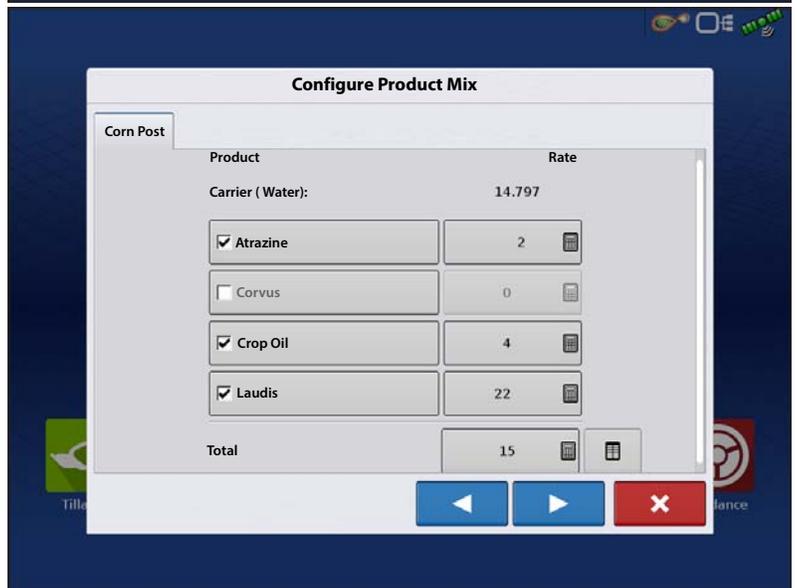
1. Select mix/blend from the drop-down list or press  to create a new mix/blend.



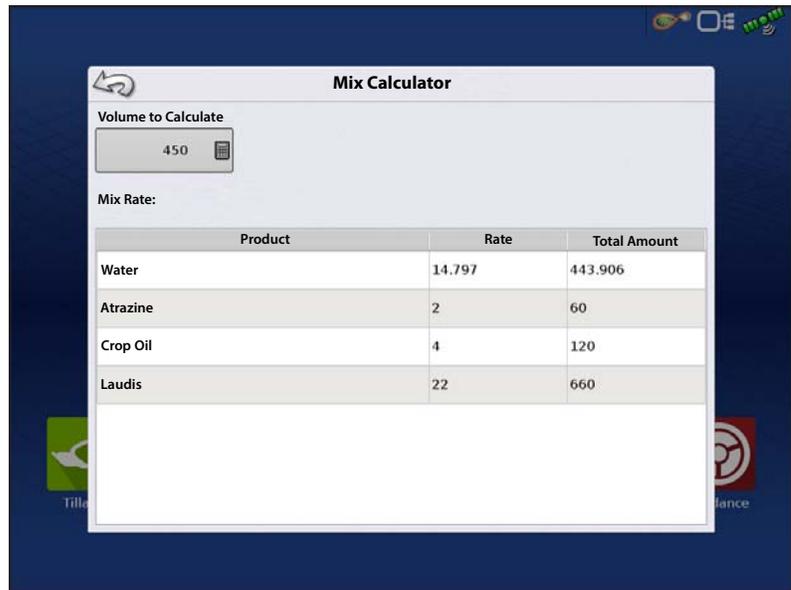
2. The product template mix contents and amounts are defined by:
 - A. activating or de-activating products
 - B. changing rate or total amount of product
 - C. changing total amount of the product or overall rate of product application

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.

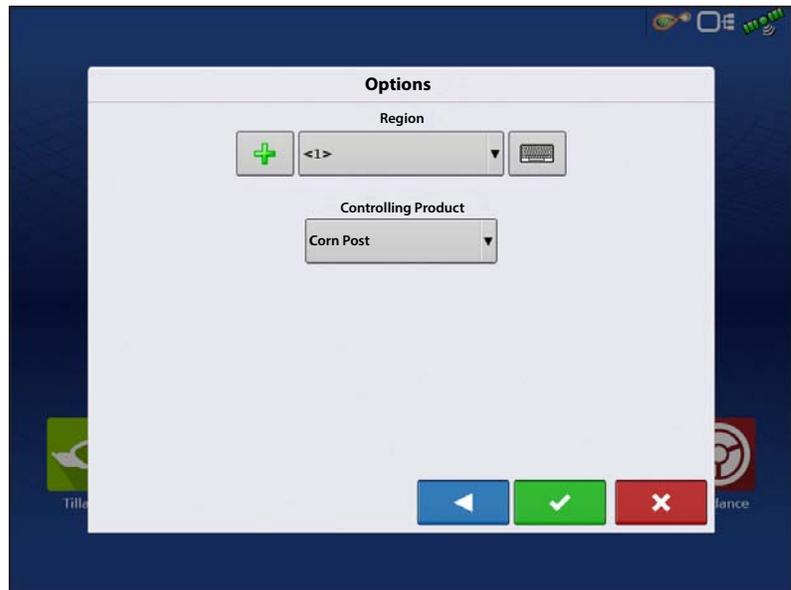


5. Select Region from the drop-down menu or press  to name Region

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 step through the process of selecting or creating a configuration with application settings.

The configuration can be started in two places:



OR

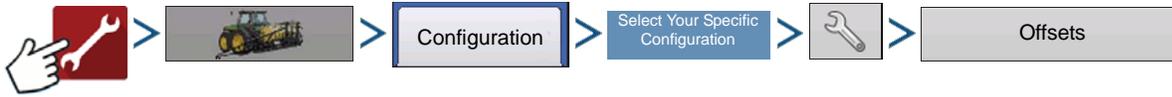


Operating Configuration will be viewable when starting a new Field Operation with the Application Wizard.



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

Implement Offsets



OR

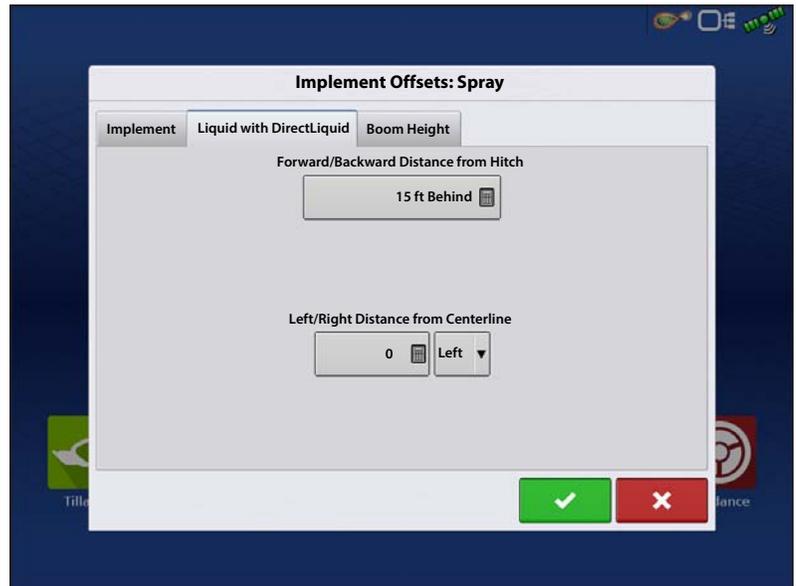


Implement Offsets screen appears, with each channel's settings shown on its own tab.

Defaults to the value entered during Configuration Wizard

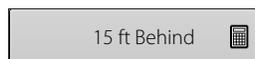
Boom sections can independently be offset forward or back (Application Operation Only)

1. Press  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.

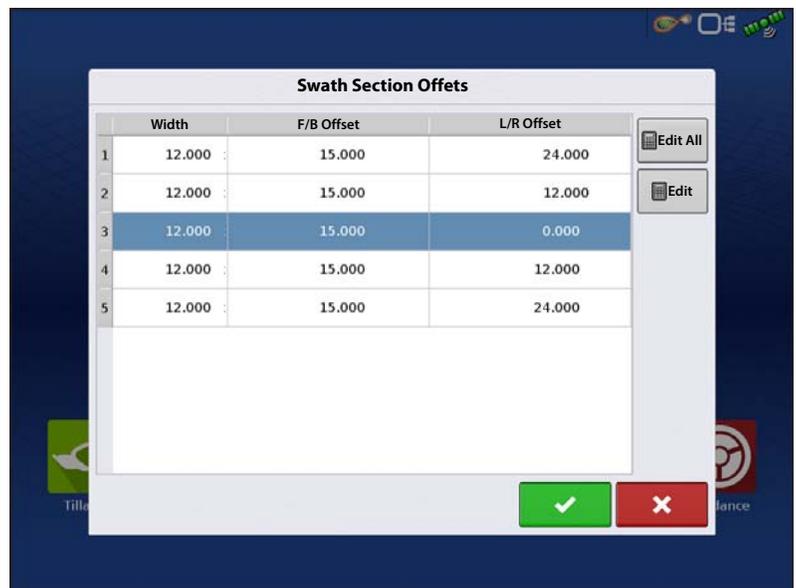
Setup will indicate which offset is entered



Global—All sections have the same offset.



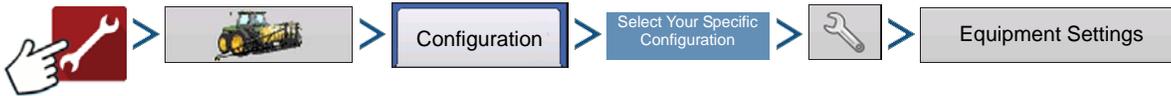
Individual—At least one section has a different offset.



Runscreens reflect section offsets



Equipment Settings



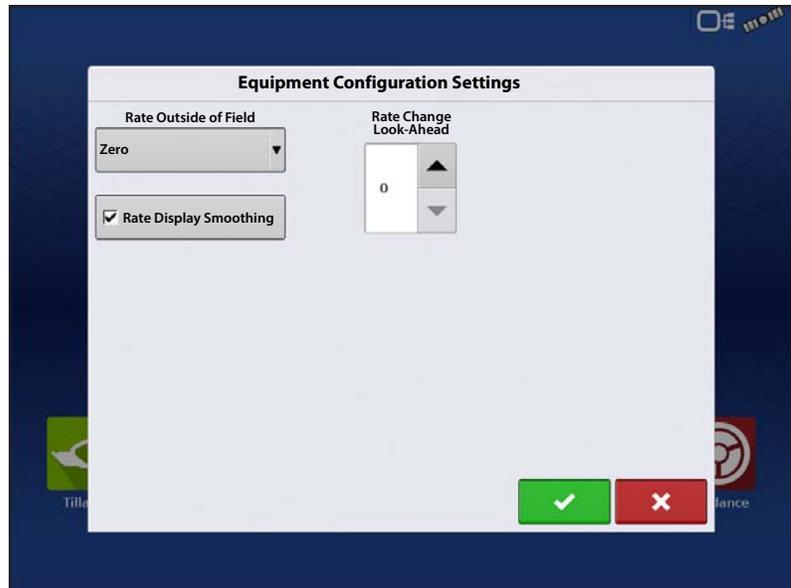
OR



Rate Outside of Field—This setting will define how product will be controlled when leaving a field boundary.

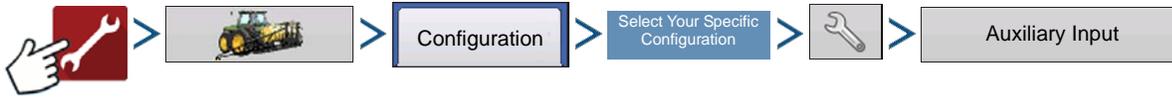
- **Zero**—This will stop application.
- **Last Good**—This will continue application at the last known rate.
- **Rx Default**—When using a prescription, this will apply at the Default Rate (or outside of boundary rate) as defined by the prescription file.

Rate Display Smoothing—Determines how the feedback from the control channel rate sensor will be displayed on the map screen. When 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.

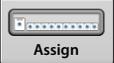
Auxiliary Input

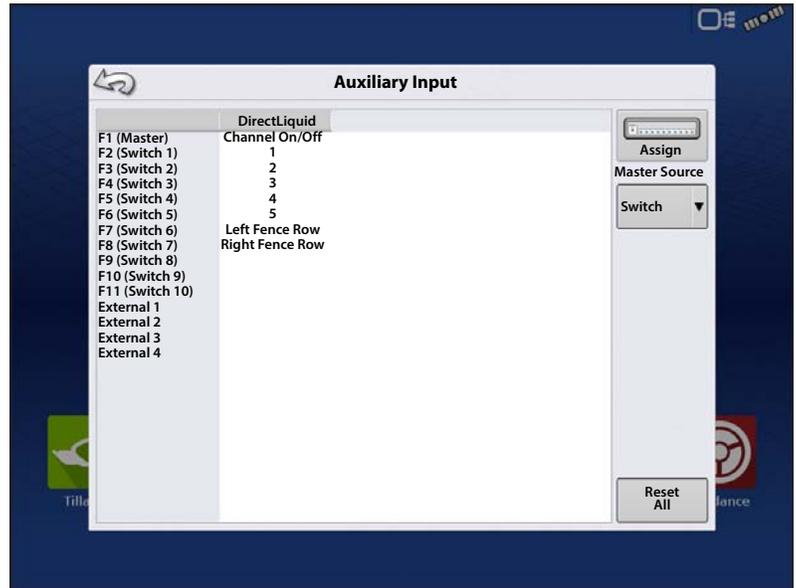


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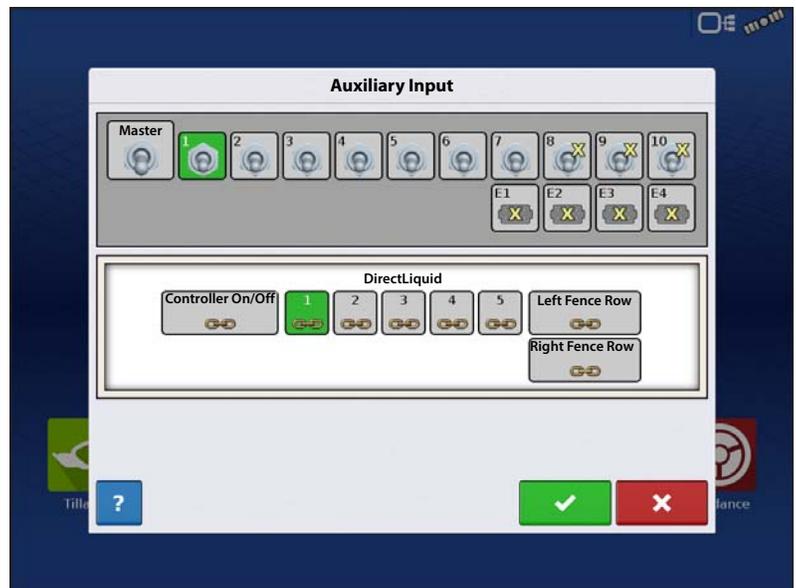
DirectCommand applications default boom sections to the switchbox in order, starting with switch 1. From the Auxiliary Input screen, the operator can customize the switches to the boom sections, if desired; or assign left/right fence row nozzles.

1. Press  Assign
2. Highlight the desired switch to assign a function to it.

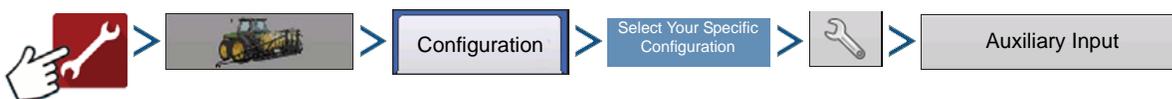


3. Select appropriate function(s) (boom sections for this operation) to assign to the desired switch. Chain icons within each function will "link" once pressed to indicate they are assigned. If a function has a "broken link" then it is not assigned. If a switch has a "X" then it is not assigned to a function. Press the  to save the setup.

i 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.

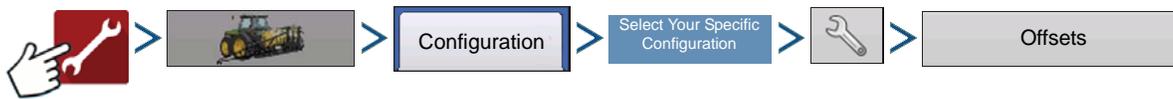
After specifying Fence Row Nozzle settings at the Auxiliary Input Assignment screen, the **Fence Row Nozzle Indicators (A)**, which are shaped like triangles, appear on either side of the sections behind the vehicle icon.

i 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.

i 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

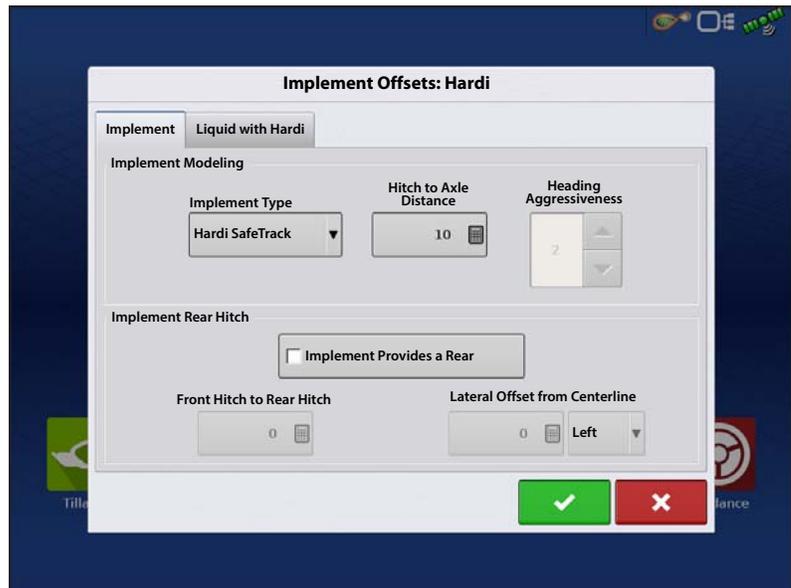


When using Hardi ISOBUS, Implement Modeling can be set to Hardi SafeTrack. This allows display to accurately calculate path of sprayer.

Hardi SafeTrack Modeling is utilized by the display when SafeTrack is engaged on the machine.

i 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.



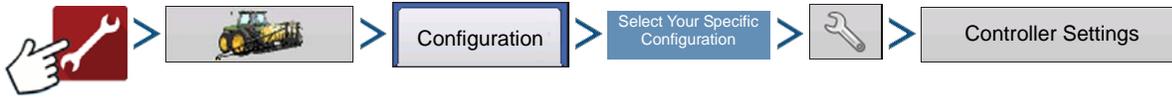
• Heading Aggressiveness

The Heading Aggressiveness setting can be 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 to an implement that has a rigid axle. With the only pivot point being the implement's attachment at the vehicle's 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:

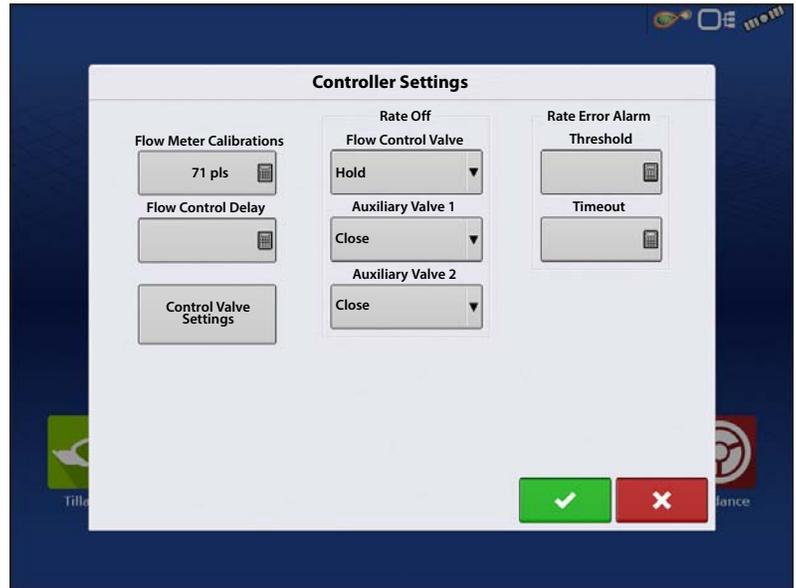
Flow Meter Calibration — Calibration value representing the number of pulses that equal one-gallon of product flow through the controlling system. This value can typically be found on the flow meter tag. (For Raven flow meters, divide this value by 10 before editing it in the display.)

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.



i 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.

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 — 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.

i 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.

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

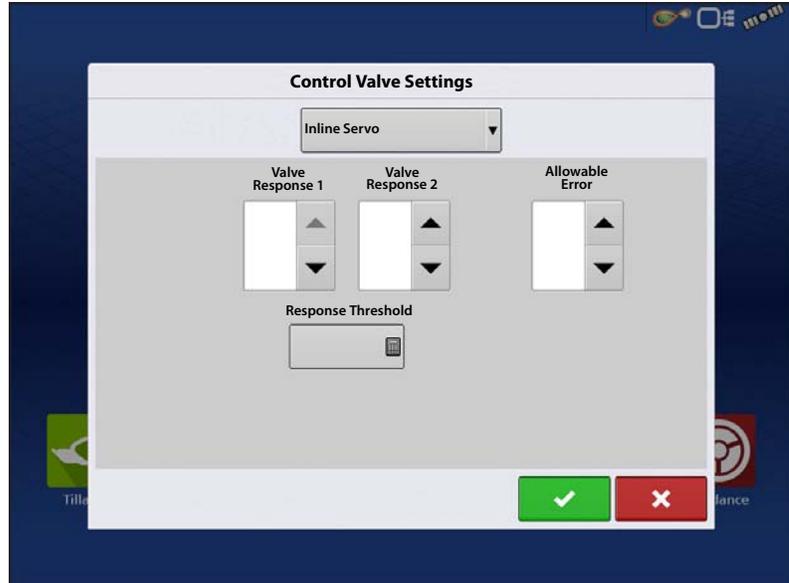
Control Valve Settings - Servo, Calibrated Reflow and Ramsey Valve

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.

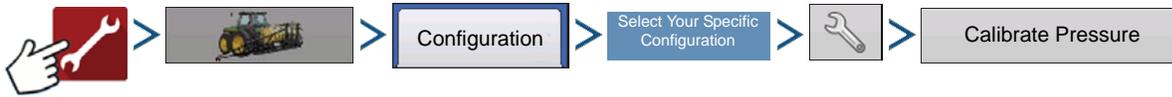
Valve Response 2 — Determines the speed of the servo valve when product control error is less than the Response Threshold setting. The default for this setting is 24%. Decreasing the value will cause the servo valve to run slower. Valve Response 2 represents the slow speed of the servo valve.

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 PWM is selected 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.



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 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: — 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 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" | In-line or Bypass Servo | 40% | 10% | 11 |
| Mid-Tech, 2" | In-line or Bypass Servo | 40% | 10% | 15 |
| Dickey-john NH3 Heat Exchanger | In-line Servo | 40% | 10% | 8 |

Liquid Rate Control

| 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 particular configuration.

** Some adjustment may needed, if using a PWM control valve, 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.

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

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

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



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.
