SOFTWARE OPERATING GUIDE

Patriot[®] 50 Series

AIM Command FLEX[™] II (if equipped) Auto Rinse Sidekick Pro[™] Direct Injection (if equipped) AutoBoom[®] XRT (if equipped)



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1 - GENERAL

Manual scope

This software operating guide covers product control and automatic boom control (if equipped) with a compatible ISOBUS universal terminal in your vehicle.

This software operating guide does not cover general display usage or vehicle functions such as Heating, Ventilation, and Air Conditioning (HVAC) or automatic axle adjustment setup. You should read the vehicle operator's manual to fully understand basic machine operation before you read this software operating guide.

This manual is organized so that an operator can quickly begin using the machine for standard or variable-rate spray control, as well as other options installed on the machine.

This manual contains setup and calibration instructions for the installed features on your vehicle. However, your display was configured at the factory with the settings for your machine. You or your CASE IH dealer may need to perform setup and calibrations in some cases, so the instructions for doing so are given in this manual.

2 - SAFETY INFORMATION

Safety rules

Personal safety



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual and on machine safety signs, you will find the signal words DANGER, WARNING, and CAU-TION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

A DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury. The color associated with DANGER is RED.

A WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury. The color associated with WARNING is ORANGE.

A CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury. The color associated with CAUTION is YELLOW.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: Notice indicates a situation that, if not avoided, could result in machine damage or property damage. The color associated with Notice is BLUE.

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine damage or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: Note indicates additional information that clarifies steps, procedures, or other information in this manual.

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Safety

NOTICE: Follow the operation and safety instructions included with the sprayer and read this manual carefully before operating this system.

- Follow all safety information presented within this manual and the sprayer operator's manual. Review sprayer operation with your local dealer.
- Contact a local CASE IH dealer for assistance with any portion of the installation, service, or operation of this equipment.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. Contact a local CASE IH dealer to obtain replacements for safety labels.

Observe the following safety measures when operating the system:

- Do not operate this system or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Be alert and aware of surroundings and remain in the operator seat at all times when operating this system.
 - $_{\odot}$ Disable this system before exiting the operator seat.
 - Determine and remain a safe working distance from obstacles and bystanders. The operator is responsible for disabling the system when a safe working distance has diminished.
 - $_{\odot}$ Disable this system prior to starting any maintenance work on the components of this system.
- Do not attempt to modify or lengthen any of the system control cables. Extension cables are available from a local CASE IH dealer.

Displays and control consoles

- If the display will not be used for an extended period, it is best to remove the display from the machine and store it in a climate controlled environment. This may help to extend the service life of electronic components.
- To prevent theft, secure the display and GPS antenna when leaving the machine unattended.

Agricultural chemical safety

Follow all federal, state, and local regulations regarding the handling, use, and disposal of agricultural chemicals, products, and containers. These include but are not limited to pesticides, herbicides, and fertilizer. Triple-rinse and puncture or crush empty containers before properly disposing of them. Contact a local environmental agency or recycling center for additional information.

- Always follow safety labels and instructions provided by the chemical manufacturer or supplier.
- Always wear appropriate personal protective equipment as recommended by the chemical and/or equipment manufacturer.
- When storing unused agricultural chemicals:
 - Store agricultural chemicals in the original container and do not transfer chemicals to unmarked containers or containers used for food or drink.
 - $_{\odot}\,$ Store chemicals in a secure, locked area away from human and livestock food.
 - $_{\odot}$ Keep children away from chemical storage areas.
- Fill, flush, calibrate, and decontaminate chemical application systems in an area where runoff will not reach ponds, lakes, streams, livestock areas, gardens, or populated areas.
- Follow all label instructions for chemical mixing, handling, and disposal.
- Avoid direct contact with agricultural chemicals or inhaling chemical dust or spray particulate. Seek immediate medical attention if symptoms of illness occur during, or soon after, use of agricultural chemicals or products.
- After handling or applying agricultural chemicals:
 - $_{\rm O}$ Thoroughly wash hands and face after using agricultural chemicals and before eating, drinking, or using the restroom.
 - Thoroughly flush or rinse equipment used to mix, transfer, or apply chemicals with water after use or before servicing any component of the application system.

NOTE: You can find information about safety standards for agricultural chemicals at https://www.iso.org/standard/70623.html.

Hydraulic safety

When servicing a hydraulic system or hydraulic components, be aware that hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.

- Always wear appropriate personal protective equipment when installing or servicing hydraulic systems.
- Never attempt to open or work on a hydraulic system with the implement running.
- Any work performed on the hydraulic system must be done in accordance with CASE IH approved maintenance instructions. For assistance, see your CASE IH dealer.
- Care should always be taken when servicing or opening a system that has been pressurized.
- The sprayer must remain stationary and switched off with booms or implement sections unfolded and supported during installation or maintenance.
- Take precautions to prevent foreign material or contaminants from being introduced into the sprayer hydraulic system. Contaminants that are able to bypass the hydraulic filtration system will reduce performance and may damage hydraulic components.
- Stand clear of hydraulically-powered equipment when starting the system for the first time after installing or servicing hydraulic components in case a hose has not been properly connected or tightened.

Caution

Electrical safety

- Always verify that power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to any of the electrical systems or other components.
- Never attempt to open or work on an electrical system with the sprayer running.
- To prevent personal injury or fire, replace defective or blown fuses with only fuses of the same type and amperage.
- Do not connect the power leads to the battery until all system components are mounted and all electrical connections are completed.
- Always start the machine before initializing this system to prevent power surges or peak voltage.
- To avoid tripping and entanglement hazards, route cables and harnesses away from walkways, steps, grab bars, and other areas used by the operator or service personnel when operating or servicing the equipment.

Touch screen

- Only touch the touch-screen with your finger or by using a special touch-screen stylus/pen. Operating the touch-screen with sharp objects may cause permanent damage to the screen.
- Only clean the screen using a damp cloth. Never use caustic or other aggressive substances.

3 - SETUP

Rate Control Module (RCM) setup and calibration

Introduction

Overview

The Rate Control Module (RCM) is designed to provide rate control via an ISOBUS universal terminal (UT).

Adding the **AIM Command FLEX™ II** nozzle control system to the RCM allows the machine operator to monitor and control pressure independently from the application rate without additional displays, controllers, or consoles.

NOTE: Prior to using the control features with any UT display, the RCM and **AIM Command FLEX™ II** Electronic Control Unit (ECU) must be calibrated for the control system. See "Initial start up and calibration wizard" (**3-5**) and "Functional inspection" (**3-11**) for assistance with completing the initial calibration wizard. This manual assumes that the required control hardware is already installed on supported equipment and is properly connected. Contact a local CASE IH dealer for additional information on supported equipment configurations.

Operation modes

The Rate Control Module (RCM) with the **AIM Command FLEX™ II** nozzle control system can be configured in several different modes to fit the application.

Operation modes and compatible features

		Modes of operation					
		Conven- tional /Bypass	On / Off	Standard	Variable Pressure (VP)	High flow	High flow VP
	Nozzle Used	Bypass	NCV	NCV	NCV	NCV + Bypass	NCV + Bypass
	Recommended NCV Tip Size ¹	NA	02-15	02-15	02-15	02-15	02-15
	Speed Range	NA	NA	Good	Best	Good	Best
	Turn Compensation	NA	NA	Good	Best	Good	Best
	Pressure Control ²	Range	Range	Target	Range	Target	Range
	Coverage	Best	Best	Good	Better	Good	Better
	Direct Injection ³	Yes	Yes	Yes	Yes	Yes	Yes
Compatible	Wireless Diagnostics	Yes	Yes	Yes	Yes	Yes	Yes
Features	Automated Priming ⁴	Yes	Yes	Yes	Yes	Yes	Yes
	Product Recirculation (if equipped) ⁵	No	Yes	Yes	Yes	No	No
	Droplet Indicator	Yes	Yes	Yes	Yes	Yes	Yes
	Air Induction Tip Compatiblity 6	Yes	Yes	No	No	No	No
	Operating Frequency ⁷	NA	NA	20 Hz	20 Hz	20 Hz	20 Hz
	Nozzle Flow Offsets ⁸	No	No	Yes	Yes	Yes	Yes
	Individual Nozzle Control and Manual Override NCV Off ⁹	No	Yes	Yes	Yes	No	No

1. Use Bypass, High Flow, or High Flow VP modes if calculated target flow requirements per tip exceed **5.30 L/min** (**1.40 US gpm**).

- 2. "Target" indicates the user sets a target pressure. "Range" indicates the user sets a min/max pressure range.
- 3. Maximum of five ISOBUS Client Device (ICD) injection pumps may be connected with the **AIM Command FLEX™** II control system.
- 4. Automatically primes the main product only.
- 5. Recirculates the main product only. Requires a feature unlock, and separately available components to be installed.
- 6. Unless otherwise stated by the tip manufacturer, air induction tips are not recommended when using Pulse-Width Modulation (PWM) nozzle control.
- 7. Adjustable between 20, 15, or 10.
- 8. There exists four pre-set profiles and two user-set profiles of eight nozzles per profile. Two profiles may be run simultaneously.
- 9. Requires individual nozzle control unlock or an **AIM Command FLEX™ II** unlock for operation. Can only be used in the presented modes of Nozzle Control Valve (NCV) operation.

Bypass (Conventional) Mode – The RCM with **AIM Command FLEX™ II** mode will control to a target flow, but the nozzle control valves on the system are disabled. A secondary flow outlet must be made available at each tip.

NOTE: If NCVs are not detected, the RCM - Sprayer system will automatically configure in Bypass mode. Bypass mode may also be selected to revert a system with **AIM Command FLEX™ II** NCVs to conventional spray control.

Only select bypass mode if the nozzle bodies on the applicator are set to bypass the **AIM Command FLEX™ II** NCVs during operation.

On/Off Mode – The RCM with **AIM Command FLEX™ II** System will hold the NCVs **100%** open during application or fully closed when not applying. This mode can be used with air induction tips and stream bars.

Standard Mode – The RCM with **AIM Command FLEX™ II** mode will control to a target flow rate and maintain a constant target pressure for maintaining droplet size.

Variable Pressure (VP) Mode. This RCM - Sprayer with **AIM Command FLEX™ II** mode will control to a target flow rate and target NCV duty cycle by varying the pressure range. This is useful for scenarios where having a wide speed and coverage range while maintaining a pressure range is a priority such as liquid fertilizer application or where droplet size can be maintained over a wide pressure range.

High Flow Mode – This RCM with **AIM Command FLEX™ II** mode allows both a conventional nozzle and a **AIM Command FLEX™ II** NCV to run simultaneously to achieve higher flow rates while maintaining a constant target pressure.

High Flow VP Mode – This mode allows both a conventional nozzle and a NCV to run simultaneously to achieve higher flow rates. High Flow VP varies pressure and NCV duty cycle to control the target flow rate.

Operation mode features

Turn Compensation – Turn compensation helps ensure an even flow rate while applying around curves and corners, even when operating with the largest of application equipment sizes on the market. Turn compensation automatically reduces or stops the flow rate of NCVs toward the inside of the curve, while increasing the flow rate at the outside, to help ensure an even, efficient application to address crop conditions, minimize crop damage, and improve yields. See "System settings tab" (**3-19**) for additional assistance with enabling the Turn Compensation feature.

Pressure Nozzle Control – The RCM with **AIM Command FLEX™ II** control system provides the same spray pattern and coverage as conventional spray systems. Pressure-based nozzle control allows the operator to maintain the same target pressure and operate over a larger application speed or flow range while maintaining droplet size. This may help manage spray drift. Pressure based control also allows better rate control at lower target flow rates than the flow meter can detect.

Direct Injection – The direct chemical injection system allows efficient and accurate application of liquid chemicals applied from an injection module. A separate injection module or tank eliminates mixing chemicals in the main tank, reduces chemical waste, and simplifies equipment care and maintenance.

Connect up to five Direct Chemical Injection ISO Client Device (ICD) injection systems to the **Viper**® 4+ display and ISOBUS to control the whole system through the **AIM Command FLEX™ II** user interface screens on the universal terminal. Select a high flow injection system to control a wide range of chemical flow rates from **147.87 – 5914.71 mL/ min (5.00 – 200.00 US fl oz/min)**. Select a low flow injection system to provide chemical flow rates from **29.57 – 1182.94 mL/min (1.00 – 40.00 US fl oz/min)**. See "System settings" (**3-44**) for additional information on setting up the direct injection system.

Wireless Diagnostic Control – Wireless diagnostic control allows the user to control the system and perform diagnostics by using a wireless remote. The user can turn on and off boom sections, or turn the pump on or off, for troubleshooting or demonstration purposes from outside of the cab.

NOTE: See "Section control remote operation" (4-9) for additional assistance with the wireless remote.

Automated Boom Priming – This feature streamlines the conventional boom priming process, where product is sprayed out of the boom until consistent product application is achieved at all spray tips. Whether removing air, chemical, or rinse water, the Automated Boom Priming feature makes sure the priming process is consistent. Boom Priming requires no additional cabling or plumbing, may be used in any mode of operation, and allows the user to adjust the Section Auto-Operation times to fine-tune the priming process.

Boom Recirculation (if equipped) – Boom Recirculation allows the user to circulate product from the tank, to the boom, and back. A machine operator may prime the spray system, re-suspend chemicals that may have separated within the boom, and minimize chemical deposit buildup, all without dispensing product from the boom spray tips.

Boom recirculation may be enabled and disabled automatically or manually from the UT when not spraying. Users can adjust the Section Auto-Operation times to perfect the amount of circulation happening per section. Enabling this feature requires NCV installation and cannot be active when direct injection is in use.

Boom Reclaim (if equipped) – Boom reclaim allows the user to initiate a process that uses air from the boom purge system to push product from the boom back to the product tank. This will start a single pass index through the sections from outer to inner and recover most of the product.

The operator will be prompted to raise the center section and boom tips if it is safe to do so for best performance. After Boom Reclaim has been performed, Boom Purge can be performed to empty any remaining product, along with opening flush valves (if equipped).

Flow Offsets – The flow offset feature allows the operator to adjust the flow rate of a set of NCVs anywhere on the boom by $\pm 50\%$ from the rest of the boom to maintain optimal coverage.

The flow offset may be activated on up to two configured NCV Flow Offset profiles simultaneously. Four factory preset NCV Flow Offset profiles, as well as two user configurable profiles, are available. Each profile may contain up to eight NCVs.

Nozzle Level Control. This mode turns each NCV into an individual boom section and offers maximum product savings. Contact a local CASE IH dealer for more information.

NCV Override Off. If an Individual Nozzle Control feature is unlocked, the user can override any number of individual NCVs off while spraying. This can be done with or without showing coverage for that area. Actual application rates are automatically adjusted to ensure remaining NCVs are apply correctly.

NOTE: Any additional direct injection products on the system would need to be independently primed.

Care and use

Always follow recommended maintenance procedures for storing equipment. Perform the following maintenance procedures before storing equipment with the control system:

1. Empty product from the chemical supply tank and flush the application system with water or an approved tank cleaner following the recommended procedures in the sprayer operating guide.

NOTE: A tank cleaner compatible with **Viton**[®] seal materials is recommended for use with the **AIM Command FLEX™ II** NCVs.

- 2. Remove hardened chemical residues or build up by flushing the system with soap and water.
- 3. Prime the system plumbing with a **50%** water and automotive antifreeze mixture to prevent freezing of NCV components. Freezing can result in damage to plumbing components on the system. Follow the procedures in the sprayer operating guide.

See "System maintenance" (5-34), "System testing" (5-36), and "Flow meter maintenance" (5-37) for additional assistance with maintaining the AIM Command FLEX[™] II nozzle control valves.

System calibration

Calibration: Rate Control Module (RCM)

The calibration wizard must be completed the first time that the system is powered up on the **ISO 11783** network or if the default system settings are reset. The calibration wizard allows the operator to quickly configure the Rate Control Module (RCM) and **AIM Command FLEX™ II** Nozzle Control Valves (NCV) if detected.

Review the following sections for assistance with completing the calibration wizard for the **AIM Command FLEX™ II** control system.

RCM home page







Advanced display mode

Transfer universal terminals



The Universal Terminal (UT) button appears if more than one UT is detected on the **ISO 11783** network. Use this button to switch the RCM working set menu to the **Pro 1200** display UT or other UT at any time.

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If the working set is not available on the desired UT, check the other display and use the UT transfer button to transfer the RCM working set.

By default, the working set will load to the first UT detected by the **ISO 11783** network, or to the available UT if UT number one is not present. When using the "Transfer UT" button, the working set will automatically load to the last UT selected unless the system requires calibration or the last UT cannot be detected within **2 min**.

Unlocks

NOTE: If features are unlocked after the initial calibration wizard is completed, a new profile must be created and the calibration wizard must be completed before the feature will be available.



An "Unlocks" button is appears during the calibration wizard and allows the operator to activate and enable features on the system prior to completing the wizard. This will allow the operator to properly calibrate all features available on the system, such as individual nozzle control, boom recirculation (if equipped), and others before creating and completing a profile.

See "Feature unlocks tab" (3-39) for assistance with entering unlock codes.

Calibration wizard

The following steps may help with completing the initial setup of the RCM control system:

1. Turn the UT power on and allow the display to initiate the **ISO 11783** network system.

NOTE: If properly connected and powered, the UT will automatically detect the RCM. If the RCM is not detected by the display terminal, troubleshoot the ECU and restart the system. See "Rate Control Module (RCM) Light-Emitting Diode (LED) status" (**5-1**) for assistance with connection issues or contact a local CASE IH dealer for additional troubleshooting assistance.

- 2. Once the RCM is detected, the RCM working set icon will display in the UT Menu.
- 3. Press the "Menu" button to access the control system user interface.
- 4. The first time that the system is started on the UT, or if a new profile is created, the calibration wizard prompt will be displayed.

Make, model, and boom configuration

NOTE: Some sections in the calibration wizard may be pre-populated or skipped depending upon the machine type selected or configurations automatically detected.

For factory installed systems with no field modifications, Auto should be selected to automatically configure most machine settings.

If not using the Auto configuration, select the correct machine make, machine model, and the boom configuration to automatically load machine specific settings and skip some setup items. Use the "Other" option only if the specific machine make and model information is not available within the drop down options. Select "Custom" option if the specific boom configuration is not available within the drop-down options.

Systems with direct chemical injection pumps

- 1. Locate the direct chemical injection ECU serial number. The serial number is typically located on the front or top of the direct injection pump.
- 2. Assign the desired direct chemical injection ECU to the desired product channel ECU number.

NOTE: The RCM is factory-configured as ECU number 1 and cannot be changed.

3. Press the Next button.



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Tip setup, and tip size

When setting up an RCM without AIM Command FLEX™ II NCVs, or if the "Skip NCV Setup" option is selected:

Enter the "Bypass Tip Spacing" and "Bypass Tip Size."

NOTE: If no spray tips are installed, or if the installed tip size is not available in the drop down menu, select NA as the tip size.

When setting up the AIM Command FLEX™ II NCV control system:

- 1. Verify that the actual number of **AIM Command FLEX™ II** NCVs on the system matches the value shown in the Total NCVs field detected by the ECU.
- 2. Verify the actual number of NCVs connected to the left boom (center of the boom to the tip of the left boom) circuit matches the value shown in the Left NCV Count field detected by the ECU.

NOTE: Press the Redetect NCVs button to allow the system to detect NCVs connected to the nozzle bus.

If the total number of NCVs, or the left NCV count, displayed does not match the actual number of nozzle control valves connected to the system, press the Redetect NCVs button to allow the system to re-detect NCVs connected

to the nozzle bus. See "Nozzle Control Valve (NCV) offline troubleshooting" (**5-23**) for assistance with the **AIM Command FLEX™ II** nozzle control valve circuit.

To bypass nozzle control valve configuration and operate the system without the **AIM Command FLEX™ II** NCVs, press the Skip NCV Setup button. If Nozzle Control Valves are installed on the machine, the NCVs will remain closed and must be manually bypassed at the boom by opening a secondary flow outlet or removed from the machine to apply product. The system will then operate as a conventional sprayer with the RCM.

- 3. Select the NCV Spacing field and enter the distance between nozzle bodies in the units displayed. A nozzle body spacing value must be entered to continue with the calibration.
- 4. Select the NCV Tip Size field and select the orifice size of the tips currently installed on the nozzle bodies.
 - NCV is the tip connected to the AIM Command FLEX™ II NCV.

NOTE: If no tips are installed, or the installed tip size is not available in the drop down menu, select NA as the Tip Size.

5. Select the Next button to proceed to the NCV Indexing prompt.

Automatic NCV indexing

The automatic NCV indexing process allows the **AIM Command FLEX™ II** system to automatically configure the location of each nozzle control valve on the left and right boom circuits and may detect issues with system connection or NCV setup.

- The system will begin indexing AIM Command FLEX[™] II NCVs from the center of the implement boom and move out to the end of the left boom. The indexing process automatically repeats for the right boom circuit, starting from the center and working toward the end of the boom. If an error is detected on either the left or right boom circuits, the RCM ECU will halt the indexing process and prompt the machine operator to correct the error before continuing with the calibration wizard. If an error occurs, troubleshoot the issue and press retry.
- 2. Select the Next button to continue.

Sections and fence row setup

Set up the number of sections and fence rows on the application equipment:

- 1. Confirm the value in the "Number of Sections" field matches the number of section on/off valves available for controlling product application across the boom width.
- 2. Enable the fence row option if fence row valves are controlled by the system. Select one of the following options for fence row control from the drop-down menu:

Fence Valve. Select when the sprayer is equipped to use a ball or solenoid to project spray beyond the working width of the of the sprayer. This feature is typically used near fence lines, field borders, and boundaries where the outside spray sections cannot otherwise cover. When Fence Valve is selected, additional parameter options for adjusting tip size, coverage width, using on-screen activation buttons, and mapping application are presented.

NOTE: Both the desired fence row button/switch and the adjacent section or NCV must be turned ON for the fence row valve to apply product. In nozzle level control mode the fence row valve will turn OFF if the outermost NCV turns OFF. In section control mode the fence row valve will turn ON or OFF when the section is turned ON or OFF.

This setting is only accessible via the profile calibration wizard.

Contact your CASE IH dealer to enable the fence row switches on the section valve controller.

3. Enter the additional width covered when only one of the fence row sections is activated, and the spray boom is at the target height.

NOTE: This measurement assumes that both left and right fence row coverage patterns are equal. This setting is only accessible via the profile calibration wizard.

4. Set the tip size used for the fence row nozzles.

NOTE: Both left and right fence row tip sizes must be the same.

5. Select the "Next" button to continue to the "Switch Mapping" page.

Switch setup

1. Confirm switch number assignment for each section.

NOTE: Each section must be assigned to a switch before the Next button will be displayed.

Section setup

1. Confirm the width of each section configured for product control.

NOTE: The section widths are auto-populated, unless you selected a custom boom.

2. Select the "Next" button to continue to the "Section Offsets" page.

Calibrate inertials

NOTE: If the **AIM Command FLEX[™] II** system is not installed, the inertials calibration process will not be available. Skip to the "Pressure Sensor Setup" to proceed with the calibration wizard.

Only calibrate inertials when the ECU is securely mounted to the machine and the machine is stationary. It is important to minimize any movement or vibration caused by the engine, boom movement, wind, etc. which may cause a false sensor reading.

- 1. Review the on-screen instructions and confirm the arrow number pointing toward the ground.
- 2. Press the "Redetect Orientation" button if any of the following occur:
 - $_{\odot}$ If the "Detected Orientation" number does not match the actual downward direction number of the controller.
 - $_{\rm O}\,$ If the displayed "Yaw Rate" is a constant, non-zero number.
 - $_{\odot}$ If the displayed "Yaw Rate" varies by more than +/-3° per second with the machine stationary.
- 3. When the "Detected Orientation" field matches the RCM ECU orientation, select the "Next" button to continue to the "Pressure Sensor Setup" page.

Pressure sensor setup

1. Use the "Boom," "Sparge," "Pump," and "Center 1 and 2 Pressure" drop-down fields to select the type of pressure sensor or transducer connected to the **AIM Command FLEX™ II** system.

NOTE: A boom pressure sensor must be installed on the machine for proper system operation. Other pressure sensor options will display if they are detected. Select the "None" option to disable or skip setup of the other pressure sensors.

2. Select the "Next" button to continue.

Control valve type

Select the control valve type from the drop down list. A PWM control valve type is preferred for proper operation of the control system. Fast and standard liquid control valve types are also available, but system performance may be affected.

Pulse-Width Modulation (PWM) setup

If a PWM control valve is selected as the control valve, complete the following steps:

- 1. Enter the coil frequency of the hydraulic PWM pump control valve.
- 2. Enter the desired PWM high limit percentage for the PWM pump control valve. Enter a value less than **100%** to optimize pump performance.
- 3. Enter the PWM low limit percentage for the PWM pump control valve. Enter a value above 0% to prevent delayed pump output when spraying.

NOTE: See: "System diagnostics" (5-3) to test the PWM control valve.

- 4. Select the desired pump standby mode for when the product switch is on, but the system is not spraying:
 - Boom The system will maintain a target pressure in the boom. This option is not available if direct chemical injection ICD injection pumps are detected.

- Pump The pressure system will maintain a target pressure at the pump. Enter a standby pressure offset to increase or decrease the standby pump pressure by that amount. This option is only available if a pump pressure sensor has been configured.
- Pump PWM The system will maintain a target pump PWM percentage.
- Hold System will maintain last control valve or pump PWM percentage when not spraying.

NOTE: When direct chemical injection ICD injection pumps are detected, Standby Pump PWM is automatically selected. If a check valve is present on the main product line, Standby PWM should be enabled to prevent delayed pump output when toggling the application ON and OFF. You are turning the boom ON and OFF in headlands or border passes.

 Enter the "Standby Pressure Offset" value. A positive (+) value increases the system pressure over what the target or minimum pressure is when not spraying. Standby PWM percentage should be between the PMW low and high limit values.

Rate sensor setup

- 1. Select the "Flow Meter Calibration" field and enter the calibration value for the flow meter used to monitor the product flow.
- 2. Select the units field and use the drop-down options to select the flow meter units.

NOTE: The flow meter calibration value and units are typically found on a tag or label affixed to the flow meter. Flow meters use a meter cal in pulses per **37.85 L** (**10.00 US gal**). Other manufacturers may use different meter cal units.

- 3. Enter the Flow Meter Low Limit value. This is the lowest specified reading of the flow meter and can be obtained from the manufacturer. Flow meter low limit values are as follows:
 - o RFM 5 0.38 L/min (0.10 US gpm)
 - o RFM 15 1.89 L/min (0.50 US gpm)
 - o RFM 60 5.68 L/min (1.50 US gpm)
 - RFM 100 11.36 L/min (3.00 US gpm))
 - o RFM 200 56.78 L/min (15.00 US gpm))
- 4. If available, select the Tank Fill/Level Sensor that is currently installed. If a tank fill flow meter is selected, enter the meter cal and units for the sensor before proceeding with the calibration.
- 5. Select the Next button to continue to the Tank Fill Setup page.

Tank fill setup

- 1. Press the Tank Capacity field and enter the full volume of the main product tank.
- 2. Press the "Current Tank Level" field and enter the current product volume in the tank.
- Press the "Low Tank Level" field and enter the volume at which the operator should be alerted to a low tank condition. Enable the "Alarm" option to allow the system to activate an audible alarm when the "Low Tank Level" is reached during field applications.
- 4. Press the "Max Tank Fill" PWM field and enter the maximum duty cycle for the pump to refill the product tank.
- 5. Press the "Next" button to continue to the "Rates Setup" page.

NOTE: Additional tank fill setup pages will be displayed for any additional direct chemical injection ICD products detected on the system.

Recirculation setup (if equipped)

NOTE: The "Recirculation Setup" option is only displayed when the recirculation feature is unlocked and when injection is not detected by the RCM ECU.

- 1. Enable the "Boom Recirculation" check box if the boom is equipped with recirculation plumbing. See "System settings tab (**3-19**) for additional information regarding the recirculation feature.
- 2. Enable the "Auto Recirculate" check box to allow the system to automatically activate the boom recirculation feature when all boom sections are toggled off.

Rates setup

1. Enter "Rate and Pressure Preset" values that will be used during field applications to quickly change target application rate or pressures.

NOTE: Pressure preset values may only be entered if the **AIM Command FLEX™ II** system is detected.

2. Press the "Rate Selection" drop-down field and select the desired method for setting rates during field applications.

NOTE: This option may be changed after the initial calibration is complete. See "Rates setup tab" (**3-37**) for additional assistance.

- 3. If desired, press the "Rate Selection" window to enter desired application rates. These rates may be selected from the home screen.
- 4. Enable the "Display Smoothing" feature to allow the system to smooth the product application rate display during field applications. See "Rates setup tab" (**3-37**) for additional information about the display smoothing feature.
- 5. Press the "Next" button to complete the initial setup and calibration of the AIM Command FLEX™ II system.
- 6. If additional injection products are detected, select the "Radio Rate" option to control the ratio of injected product volume to the carrier product volume, e.g., oz/gal or mL/L. If not selected, the injection product will control the injected product volume to the coverage area, e.g., oz/acre or mL/ha.

NOTE: Additional rate setup pages may be displayed for any additional products detected on the system.

Functional inspection

Refer to the following sections for assistance with validating that the Rate Control Module (RCM) - Sprayer and **AIM Command FLEX™ II** systems have been installed and calibrated properly.

System function

To verify that the system is functioning properly after installation:

- 1. Flush the main product tank and boom plumbing with clean water and verify the tank contains at least **379 L** (**100 US gal**) of clean water.
- 2. Park the equipment in an area with enough space to unfold the booms and allows for visual inspection of the spray pattern from a moderate distance (e.g. **6 m** (**20 ft**)).
- 3. If present, toggle the **AIM Command FLEX™ II** nozzle control system to manual mode and set both the control valve and NCV duty cycle (DC) to **50%**.
- 4. Access the manual Control Valve setting by pressing the PR1 tab on the Home screen. Access the Nozzle Control Valve (NCV) DC% setting by pressing the pressure tab on the Home screen.
- 5. If necessary, open the tank sump valve.
- 6. If present, turn on the machine pump switch.
- 7. Toggle the on-screen product on/off button to engage the product pump.
- 8. Toggle all section switches and the master switch.
- 9. While maintaining a safe distance away from any spray and spray drift, visually check that all spray tips are spraying and, if present, all nozzle control valves are pulsing with a uniform pattern. Adjacent nozzle control valves should alternate pulsing. If adjacent NCV's are pulsing at the same time, see "Nozzle Control Valve (NCV) offline troubleshooting" (5-23) for additional assistance.
- 10. On the Universal Terminal (UT), set the control valve to about **30%**. For systems without NCV's, turn off the master switch and close section valves. For systems with NCV's, set the NCV DC to **0%** to close the nozzle control valves and maintain a safe pressure in the boom.
- 11. Visually check that none of the tips are spraying or dripping. See "System testing" (**5-36**) for additional assistance and troubleshooting if leaks are observed.

Turn compensation feature

NOTE: Turn compensation is only available for systems with the **AIM Command FLEX™ II** system.

To verify the Turn Compensation feature is enabled and operating:

NOTE: Complete the procedure outlined in the System Function to validate the nozzle control valve function prior to performing the following procedure.

Turn Compensation is automatically calibrated during the calibration wizard. If the feature is not operating as described below, see "System settings tab" (3-19) for assistance with calibrating the turn compensation feature if necessary.

- 1. Move the implement to an open area where the equipment may be driven in quick, tight turns.
- 2. Verify that the turn compensation feature is enabled.
- Set the system to automatic mode and toggle the section and master switches to the on positions. See "Operation checklist" (4-1) and "Universal Terminal (UT) definitions" (4-2) for additional assistance with operation of the nozzle control system.
- 4. While driving at a speed between 8.05 16.09 km/h (5.00 10.00 mph) and maintaining a safe working distance, observe the inner-most and outer-most spray tips while the implement is turning sharply.

NOTE: The NCV Pulse Width Modulation (PWM) percent value may also be used to monitor the operation of nozzle control valves across the spray boom. See "Nozzle Control Valve (NCV) diagnostics" (**5-19**) for additional assistance with on-screen nozzle control valve diagnostics.

When turn compensation is enabled and the machine is turning, the nozzle control valves toward the outside of the corner will output a higher flow rate PWM percent), while valves toward the inside of the corner will output a reduced flow rate (lower PWM percent) or may shut off. Average, Minimum, and Maximum NCV DC % output can be viewed

by pressing the "Pressure" tab on the Home screen. NCV diagnostics and performance may be viewed in the NCV Readings display shown in the NCV Information menu. The difference between inner and outer flow rates will vary depending upon the machine speed, yaw rate, and implement width. Turn compensation may also be observed on the Diagnostics Info page. Electronic Control Unit (ECU) Yaw Rate will be zero while stationary. The displayed yaw rate will be positive when the machine is turning to the right and negative when the machine is steering to the left.

5. If the operator is able to observe a difference in the spray pulsing, or the on-screen PWM percent, the turn compensation feature is working correctly. If there is no difference between the PWM percent values across the implement width, re-calibrate the turn compensation feature and repeat the test.

System setup

Tools menu overview

System settings and options may be viewed by selecting the tabs displayed along the top of the Tools Menu (A). *NOTE:* Your display was configured at the factory with the settings for your machine.



- 1. Applicator Setup (1). Access the Applicator Setup page to perform the following items. See "Applicator Setup Tab" (3-14) for additional assistance with the Applicator Setup menu.
 - o Edit or remove the Rate Control Module (RCM) profile.
 - $_{\odot}$ Review the section and precision farming setup information
 - $_{\odot}\,$ Configure other application system settings such as tip size.
- 2. System Settings (2). Adjust the following product control settings and features:
 - $_{\odot}$ Control Valve Setup
 - o Rate Sensor Setup
 - o Tank Fill Settings
 - Display Setup
 - o Pressure Setup
 - NCV Information¹
 - o User Settings

NOTE: ¹. Not available in Bypass NCV control mode.

- 3. Alarm Settings (3). Access alarm settings for each product control channel on the system.
- 4. Rates Setup (4). Enter product Rate and Pressure preset values, rate selection or enable the display smoothing feature.
- 5. Feature Unlocks (5). Activate optional features of the Rate Control Module (RCM) control system. Contact a local dealer for additional information regarding available features and to purchase feature unlocks.



Help menu icon – Pressing the help menu icon displays the help menu. The help menu contains additional information about the settings contained within that screen.

Applicator setup tab

Profile and machine type

To review the current profile name and machine type:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.



The name entered for the machine profile and the type of equipment selected during the initial system calibration will be displayed at the top of the Applicator Setup page.

- o Use the Change/New button to select a different profile or create a new profile for the machine in operation. Up to eight unique profiles may be saved on the RCM.
- Use the Edit button to edit the selected profile.

NOTE: Some calibration settings are only available through the Machine Profile wizard and will require the equipment operator to edit the Machine Profile.

Some settings entered into a specific profile (such as tip information) will not be available if a different profile is selected.

o Use the Remove button to remove the selected profile from the system.

NOTE: A new profile must be created if a profile is deleted and there are no other profiles remaining in the selection list.

Section setup summary

To review the current section setup:

- 1. Open the Universal Terminal (UT) Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu button (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.
- 4. Select the Section Setup Summary button. The Section Summary page will be displayed.



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Page 1 of the Section Setup Summary screen displays the following section information for each product control channel configured on the system:

NOTE: See "Initial Start Up and Calibration Wizard" (3-5) and "Functional Inspection" (3-11) to change the following section configuration.

Liquid Section Width. The width of each section associated with a boom valve, displayed in inches [centimeters].

Wired Signal Driver. Displays the "wired as" signal driver that controls the section.

Switch Number. The number of the switch to which the section is assigned.

Tip Spacing. The value and units set for nozzle body spacing is displayed in this field.

Page 2 of the Section Setup Summary screen displays the Section Auto-Operation Times. These values set the time each section will run for automated priming and recirculation functions. The maximum auto-operation time is **180 s**.

Fence row settings

To review the current section setup:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.
- 4. Select the Section Setup Summary button. The Section Summary page will be displayed.
- 5. Select the Fence Row Settings icon (4). The following features and options will be displayed:



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Enable On-Screen Fence Row Buttons. Select the Enable On-Screen Fence Row Buttons to allow the operator to toggle fence rows on and off via buttons displayed on the UT screen. When this option is disabled, fence rows must be activated via another switch or button on the machine.

NOTE: This feature may only be changed in the profile wizard.

Map Fence Rows as Sections. Select the Map Fence Rows as Sections to show additional applied area on the coverage map when fence rows are activated. When left disabled, fence row area will not be mapped or calculated in the coverage area when fence rows are activated.

NOTE: This feature may only be changed in the profile wizard.

Fence Row Width. Enter the width covered when one of the fence rows is activated and the spray boom is at the target height.

NOTE: This value may only be edited in the profile wizard.

Fence Row Tip Size. If a spray tip is equipped on the fence row nozzles, select the tip size from the drop down list.

Fence Row Switch Assignments. If the On-Screen Fence Row Buttons is not used, select the switch number to which the left and right fence rows are assigned.

NOTE: These options are only editable when you select "Fence Valve" for custom boom setups.

Precision farming setup wizard

Precision Farming Setup offers advanced section settings and features such as section overlap, on/off look-ahead values, and individual section fore/aft measurements for unconventional boom configurations.

To start the Precision Farming Setup:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.
- 4. Select the Precision Farming Setup button.

NOTE: Some UT displays or task controllers may not be compatible with precision farming settings.

See "Precision farming setup" (3-40) for additional assistance with completing the Precision Farming Setup Wizard.



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Nozzle Control Valve (NCV) Control mode (systems with AIM Command FLEX™ II)

NOTE: The NCV Control Mode is only available for the RCM with **AIM Command FLEX[™] II** systems and may only be changed outside of an active job. To change modes in the field, the operator will need to close the job, change the NCV control mode, and then reopen the job.

NOTE: When bypassing **AIM Command FLEX™ II** nozzle control system: NCVs will remain closed.

Be sure to open manual shut off valves on each nozzle body and enter the appropriate tip size.

To change the NCV Control Mode:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.
- 4. Use the drop-down list to select the appropriate NCV control mode. See "Operation modes" (**3-2**) for information regarding the available options.

NOTE: Section and NCV control modes are also available via the Active Control Mode readout on the home page. See "System settings tab" (**3-19**) for additional assistance with the available Display Settings.



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Section control mode display

To view the Section Control Mode configured during the System Calibration:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display. The following section control modes may be displayed:
 - Boom Valve
 - Virtual Section
 - Nozzle Level

NOTE: The highest available system nozzle resolution will be displayed based upon the operating mode and features unlocked.

Select tip

Setup new tip profile

NOTE: Up to 10 spray tip profiles may be saved. Spray tip profiles are available in all modes of NCV operation for a machine profile. Profiles entered in one machine profile are not available in other machine profiles. Tip profiles must be entered for each configured machine profile.

To setup a new spray tip profile for the RCM system:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.
- 4. Press the Select Tip button. The Tip Selection page will be displayed. Use the following options and settings to assist with monitoring the droplet size during field applications.
- 5. Use the following options and settings to configure the control system to assist with droplet size monitoring.

NOTE: The NCV tip size is required. A bypass tip size is optional, depending upon the nozzle configuration installed on the machine. Refer to the NCV Control Mode (Systems with **AIM Command FLEX**TM **II**) section for additional details.

NCV or bypass tip size options may not be available in some NCV control modes. When set to bypass mode, the NCV tip size is not editable.

Select Tip and Tip Name. Use the drop-down list to:

- A. Set up a new spray tip that will be used with the system.
- B. Select a spray tip previously set up.

Enter a name of up to 12 characters for the tips to allow the operator to quickly select the appropriate spray tips for the field application.

NOTE: The tip size profile will display as "---" if the NCV or bypass tip size is not editable based upon the selected NCV control mode.





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Press the "X" button to delete the selected tip and to remove it from the Select Tip and Tip Name drop-down list.

NCV Tip Size. Select the size of the spray tips installed on the AIM Command FLEX™ II NCVs.

Droplet Size. Enter the published droplet size information available from the tip manufacturer for the tip size and series.

Minimum/Maximum Pressures. Enter the pressure range (minimum and maximum) for the spray tips installed to help maintain the desired droplet sizing.

NOTE: When entering pressure ranges for different droplet size classifications, ensure that the values entered are within the overall minimum and maximum spray pressure range set in the Pressure Setup Menu.

Test speed and turn compensation

The Test Speed feature allows the operator to enter a simulated speed for the system and allows the operator to check and verify system operation and functionality while the equipment remains stationary.

NOTE: Test speed will be disabled when ground speed exceeds 1 mph (1.6 kph) or power is cycled on RCM-S.

NOTE: A test speed may also be entered via the Speed Readout on the Home page. See "System settings tab" (**3-19**) for assistance with customizing the Home tab displays.

To enter a test speed:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.
- 4. Select the Test Speed button (4). The Test Speed page will be displayed.
- 5. Either enter the desired simulated speed or select the Resume Last Speed button to set the speed for testing system operation.

NOTE: Enter a test speed that is within the acceptable speed range for the system as setup. Entering a test speed above or below the recommended speed range may result in alarms or product shut down.

To use Test Turn Compensation:

- 1. Ensure a test speed is entered. The Test Turn Compensation option will appear.
- 2. Enter a turn compensation turn rate or use the left and right arrow buttons to simulate a left or right turn. The arrow buttons will increase or decrease the turn rate by 0.1 degrees/second. Positive values indicate a right turn and negative values indicate a left turn.

NOTE: The Turn Compensation Test value will return to 0.0 and turn off when a speed test is set to 0.0 or normal driving resumes.



System settings tab

Control valve settings and tuning

To tune the control valve or enable additional features and options:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the System Settings tab (3) along the top of the display.
- 4. Select the Control Valve Setup button (4) on the System Settings page. The following settings and options are available to help tune the control valve for the specific application system and to help improve applicator efficiency:



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Control valve type

Displays the type of control valve selected for product control operations.

NOTE: The operator will have to either create a new machine profile or edit the existing profile to change the control valve type or enable some features of the product control system. See "Initial start up and calibration wizard " (3-5) and "Functional inspection" (3-11) for additional assistance with completing the Machine Profile.

A Pulse-Width Modulation (PWM) type control valve is preferred for proper operation of the RCM with the AIM Command FLEX™ II system.

NOTE: This setting can only be changed during system calibration and cannot be changed from PWM unless a Custom Boom profile is selected.

Valve response rate

The valve response rate determines how aggressively the system will adjust to changes in pressure, flow, and speed. This value has a range from 1 to 100.

If the system adjusts to rate control changes too slowly, increase the value to speed up the system response. If the system consistently overshoots the target rate or oscillates around the target rate, decrease the value to help stabilize the system.

NOTE: Avoid setting both the Valve Response Rate and Nozzle Control Valve (NCV) Response Sensitivity values above 70. Refer to the NCV Response Sensitivity section on below for more information.

Control deadband

Enter a value between 0 and 9 to set the allowable difference between the target application rate and the actual rate. Rate correction is not performed as long as the application rate is within the allowable range.

Enter a value of 1 to set a $\pm 1\%$ tolerance between the target and actual application rates. A value of 9 equals a $\pm 9\%$ tolerance. The default rate control deadband value is 0%.

Control valve PWM setup

- 1. UT Menu
- 2. RCM working set icon (1)
- 3. Tools Menu (2)
- 4. System Settings (3)
- 5. Control Valve Setup (4)
- 6. PWM Setup (5)



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The PWM Setup page allows the operator to tune PWM control and system response for the specific application system.

Coil Frequency. The default coil frequency is **50 Hz**. Set the frequency of the PWM valve coil. Refer to the PWM control valve manufacturer specifications for the recommended PWM frequency.

PWM High Limit. Set the maximum desired output for a pump controlled by a pulse width modulated (PWM) hydraulic control valve. This setting limits how far the PWM valve will open.

With the machine section and master switches in the on position, increase this value until the maximum desired pressure is reached in a liquid system.

NOTE: The maximum operating pressure of the **AIM Command FLEX**TM **II** NCVs is **690 kPa** (**100 psi**). Adjusting the PWM high limit beyond the maximum response point of the valve will significantly reduce the expected service life of NCVs on the system and result in control response delays at the upper end of the system capacity range. Performing a PWM health test will automatically determine the correct values for optimum performance. See: "System diagnostics" (5-3) for more imformation on performing a health test.

PWM Low Limit. Set the minimum desired output (zero point or shutoff point) for a pump controlled by a pulse width modulated (PWM) hydraulic control valve.

NOTE: Adjusting the PWM low limit below the minimum response point of the valve will result in control response delays at the low end of the system capacity range.

PWM High Side Drive. When enabled, this feature allows the system to modulate the high side (+) of the driver while providing a constant ground return. Most commonly used when a PWM boost box is installed.

Minimum NCV PWM

NOTE: Minimum NCV PWM is not available when operating in the Bypass NCV control mode.

Enter a minimum PWM percent to set the minimum desired output (zero point or shutoff point) for the **AIM Command FLEX™ II** nozzle control valves.

With the machine master switch in the on position, decrease this value until the minimum desired spray pattern is reached in the liquid system.

NOTE: To help avoid under application or skips in coverage, see "Avoiding skips and overlaps" (4-14) and maintain the recommended application conditions.

NCV response sensitivity

NOTE: Not available in NCV Bypass or On/Off control mode.

The NCV response sensitivity controls how sensitive the system is to changes in pressure, flow, and speed. Decrease sensitivity if system pressure and rate oscillate slightly. Increase sensitivity if control is unresponsive. Avoid setting sensitivity above 70.

Standby mode

Select the desired Standby Mode and Standby Pressure Offset for when the product switch or pump is on, but the system is not spraying, to maintain a boom or pump pressure in the system for agitation, recirculation, or to ensure boom pressure does not drop when spraying resumes.

Boom Pressure. System will maintain a target boom pressure. When in Standard or High Flow NCV Control modes, the target spray pressure value from the home screen will be used as the standby pressure when not spraying. When in any other control mode, the minimum pressure will be used as the target boom pressure when not spraying. Any value entered in for Standby Pressure Offset will add to the target pressure, and the system will maintain that pressure when not spraying.

NOTE: For example, if the target spray or minimum pressure is **206.84 kPa** (**30.00 psi**), and a **34.47 kPa** (**5.00 psi**) Standby Pressure Offset is entered, the boom pressure will be maintained at **241.32 kPa** (**35.00 psi**) when not spraying.

Pump Pressure. System will maintain a target pump pressure. This option is not available if a pump pressure sensor is not configured. When in Standard or High Flow NCV Control modes, the target spray pressure value from the home screen will be used as the standby pressure when not spraying. When in any other control mode, the minimum pressure will be used as the target pump pressure when not spraying. Any value entered in for Standby Pressure Offset will add to the target pressure, and the system will maintain that pressure when not spraying.

NOTE: For example, if the target spray or minimum pressure is **206.84 kPa** (**30.00 psi**), and a **34.47 kPa** (**5.00 psi**) Standby Pressure Offset is entered, the pump pressure will be maintained at **206.84 kPa** (**30.00 psi**), and a **241.32 kPa** (**35.00 psi**) when not spraying.

Pump PWM. System will maintain a target pump PWM% when not spraying. This is the default standby mode when direct injection or boom recirculation (if equipped) are configured on the system. For best results when spraying resumes, adjust the pump PWM to be no less than the pump PWM readout when actively spraying.

Hold. System will hold the last control valve position or PWM% when not spraying.

Rate sensor setup

To adjust rate sensor and tank fill sensor calibration values and units:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the System Settings tab (3) along the top of the display.
- 4. Select the Rate Sensor Setup button (4) on the System Settings page. The following settings and options are available to help improve applicator efficiency.





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Flow meter calibration

Enter the calibration value for the flow meter used to monitor the flow of product to boom sections.

The flow meter calibration value and units are typically found on a tag or label affixed to the flow meter.

NOTE: Be sure to select the appropriate units for the flow meter calibration to ensure proper calibration of the application system.

Flow meter pulse/units

Select the units for the flow meter from this drop-down list. The pulses/units is the number of pulses that the flow meter will generate for a given amount of product measured by the flow meter.

For example, a flow meter calibration value of 710 and a Pulse/Units value of 37.85 L (10.00 US gal) indicates that 37.85 L (10.00 US gal) of product is measured through the flow meter for every 710 pulses of the flow meter.

NOTE: The flow meters uses a meter cal in pulses per 37.85 L (10.00 US gal). Other manufacturers may use different meter cal units.

Flow meter low limit

The minimum flow rate which the flow meter can read accurately. When the flow rate is below this setting, the flow will be calculated based off the pressure and tip size.

NOTE: Refer to the flow meter manufacturer's specifications when setting the low limit. Flow limits for the RFM flow meter can be found in "Rate Sensor Setup" on the above section.

Tank fill flow meter calibration

NOTE: The optional tank fill system is not required for AIM Command FLEX™ II operation and may not be installed on all equipment with these application control systems.

The fill system flow meter calibration value and units may be found on the tag attached to the flow meter installed in the fill system plumbing.

NOTE: Be sure to select the appropriate units for the flow meter calibration to ensure proper calibration of the tank fill system.

Tank fill flow meter pulse/units

NOTE: This feature is not available with injection product control channels.

Select the units for the flow meter from this drop-down list. The pulses/units is the number of pulses which the flow meter will generate for a given amount of product measured by the flow meter. The fill meter calibration, or meter cal, value and units may be found on the tag attached to the flow meter installed in the tank fill system.

For example, a flow meter calibration value of 710 and a Pulse/Units value of **37.85 L** (**10.00 US gal**) indicates that **37.85 L** (**10.00 US gal**) of product is measured through the flow meter for every 710 pulses of the flow meter. Be sure to select the appropriate units for the flow meter calibration to ensure proper calibration of the tank fill system.

NOTE: The flow meter uses a meter cal in pulses per **37.85 L** (**10.00 US gal**). Copy the information from the tag for future reference as tags may fade or be lost during operation.

Tank fill settings

To adjust tank fill system settings:

- 1. Open the UT Menu (1) and select the RCM working set icon (2).
- 2. Select the Tools Menu softkey (3) along the right side of the display.
- 3. Select the System Settings tab (4) along the top of the display.
- 4. Select the Tank Fill Settings button (5) on the System Settings page. The following settings and options are available to configure tank settings for the main product or injection products.



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Tank capacity



Enter the maximum tank capacity. The tank level indicator on the home screen uses the maximum tank capacity and current tank level values to display the level of product remaining in the tank.

NOTE: Tank capacity value cannot be changed during an active job.

Current tank level

Manually set or adjust the product volume in the tank. This feature may be useful to manually set the tank level if products are added through the top of the tank, to correct the volume for a known amount of product added to the tank, or to adjust the tank level to a different value other than the full tank capacity.

Either enter the current tank level manually upon refilling the tank or use the tank fill flow meter to automatically measure the amount of product added to the tank.

Low tank level and low tank alarm

Enter the low tank threshold to provide an indicator at the level which the tank is nearing empty. If the Alarm option is enabled for the low tank threshold, an audible alarm will be activated when the calculated volume remaining in the tank reaches the set threshold.

Product type

Select Water-Based or Fertilizer for the type of product applied. The system will compensate for the different flow characteristics of each liquid.

NOTE: The meter cal may need to be adjusted when changing product types. See "Flow meter re-calibration" (5-33).

Max tank fill PWM

Set the maximum desired output for the tank fill pump controlled by a pulse width modulated (PWM) hydraulic control valve. This setting limits how far the PWM valve will open.

Display setup menu

Home page display tabs

The machine operator may customize the readouts displayed on each product rate control tab (1) and the pressure tab (2) shown on the Home page.

NOTE: When viewing tabs on the Home page, tapping the selected tab again will display the "Rates Setup" options for that product.

1				
PI	A Sprayer-M	Dis tasl/ac)	± 4350 T4 1200 ⊕/≝ (mal/at) 5.0	-
	0) 0 0FF RZ, 0.0	DCe.e	800 8000 910 200 0.0	¢°
(2)				

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To customize the information displayed on the Home page of RCM system:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the System Settings tab (3) along the top of the display.
- 4. Select the Display Setup button (4) on the System Settings page. The following settings and options are available to configure tank settings for the main product or injection products.





Display setup page

- (1) Product 1 tab selected
- (2) Selected readout area
- (3) Customizable readout area



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5. Use the Tab Selection buttons starting in the upper, left area of the Display Setup page to select which Home page tab to customize.

NOTE: Slots for the Product 1 (1) and Pressure tabs (2) are reserved and will display readouts regardless of control mode. Additional products (e.g. injection) will take up slots in the left column and bottom of the "Display Setup" page.

- 6. Next, select the readout area and use the drop down list to set the readout to display in the selected area.
- Enable Advanced Mode view to display up to 9 configurable readout area buttons. The default display mode is the Basic view, which only allows 3 configurable readout buttons. Basic display view is not available when chemical injection is configured.
- 8. Enable the Analog Gauges option to toggle product information on the rate control tabs as gauges.
- 9. Press the Accept button in the lower, right corner of the page to accept the current readout selections and return to the System Settings tab.



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Readout descriptions

	No Readout. Select the No Readout option to leave the selected area empty.
1 8.9 (ac/h)	Area per Hour. Uses the implement width and current implement speed to calculate the rate at which field area is covered.
83.9	Area Remaining. The field area remaining for the current job in progress.
-9-30 (pet)	Boom Pressure. Monitored pressure of the spray boom. This pressure is used as the control system pressure for spraying and alarm conditions.
·@*(;;;;;	Sparge Pressure. The current pressure of the sparge or tank agitation system.
DC 30.0	PWM Readout. The control duty cycle of the PWM control valve which controls the product pump.
60 10 0	Speed Readout. The current speed over ground of the machine. NOTE: Press and hold the machine button to enter a self test speed. Review the "Test Speed" on "Applicator setup tab" (3-14) for additional information on using this feature.
teen) 1/8 - 4.7	Recommended Speed. The optimal speed range to maintain the target rate and pressure settings. If the equipment speed is outside of the optimal speed range, an alarm condition may be encountered and the control system may be unable to maintain the desired application rate or pressure.

3 - SETUP

вд	Tank Level Percentage. Percentage of the total tank volume remaining in the product tank.
∭1 .3	Area. The field area covered during the current field application.
₩ 13.1	Total Volume Applied. The total product volume applied for the specific product displayed.
9 29.5	Volume per Minute. The instantaneous rate of product applied during field applications.
S fériaum	NCV Max Duty Cycle. Highest duty cycle percentage for NCVs on the system. NOTE: Max Duty Cycle is not available in the Bypass NCV control mode.
Territoria Territoria Territoria Si Si Si Si	NCV Min Duty Cycle. Lowest duty cycle percentage for NCVs on the system. NOTE: Min Duty Cycle is not available in the Bypass NCV control mode.
중 Average 帝 自	NCV Avg Duty Cycle. The average duty cycle for all NCVs on the system. NOTE: Avg Duty Cycle is not available in the Bypass NCV control mode.
100 100	NCV Efficiency. The NCV Efficiency value compares the expected and actual system values for a tip size for the following parameters: NCV duty cycle, flow rate, and pressure. NOTE: NCV Efficiency is not available in the Bypass NCV control mode.
Standard Nozele Lovel	Active Control Mode. The active system NCV Control Mode and Section Control Mode. NOTE: Press the Active Control Mode display to access the control mode and section control mode options.
20 14p (0+1)	Estimated Tip Pressure. The estimated pressure at the spray tips when spraying. This pressure will be less than or equal to the displayed boom pressure due to pressure losses through the system plumbing, nozzle body, and PWM valve if equipped. May be used to compare and adjust the target boom pressure to achieve the desired spray pattern and tip performance.
(psi) 20 40	Pressure Presets. Shows the first two of three pressure presets from the Rates Setup menu. NOTE: Pressure presets are not available in Bypass NCV control mode.
-49 (ps1)	Pump Pressure. The current pressure at the outlet of the solution pump. NOTE: Not available if a pump pressure sensor is not configured.

Pressure setup

To adjust pressure settings:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the System Settings tab (3) along the top of the display.
- 4. Select the Pressure Setup button (4) on the System Settings page. The following pressure settings will be available:



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Boom, sparge, pump, and center 1 and 2 pressure sensors

Use the drop-down menus to select the proper operating range of the installed pressure transducer sensors. Disconnecting the sensor and selecting None will disable the sensor and any alarms associated with it.

NOTE: A boom pressure transducer is required for system operation.

Minimum boom pressure

The minimum boom pressure feature sets the lowest allowable boom pressure to which the product system will control during applications. If the application system reaches the minimum pressure setting, the system will maintain the flow rate to keep the monitored pressure consistent. This feature may be used to help maintain boom pressure and the nozzle spray pattern if product application rates and equipment speeds are close to the low end of the suggested ranges.

NOTE: Default minimum is 137.90 kPa (20.00 psi).

The minimum pressure feature may result in higher than desired application rates. If the minimum pressure feature will be used during field applications, be sure to enter a value that will not interfere with normal target rates or target pressures.

NOTE: Enable the minimum boom pressure alarm to enable an audible alarm when the minimum boom pressure threshold is reached.

Maximum pressure

The maximum boom pressure feature sets the highest allowable boom pressure to which the product system will control during applications. If the application system reaches the maximum pressure setting, the system will maintain the flow rate to keep the monitored pressure consistent at or below the maximum pressure.

NOTE: The maximum pressure feature may result in lower than desired application rates. If the maximum pressure feature will be used during field applications, be sure to enter a value that will not interfere with normal target rates or target pressures.

3 - SETUP

NOTE: Enable the maximum boom pressure alarm to enable an audible alarm when the maximum boom pressure threshold is reached.

The maximum recommended boom pressure for AIM Command FLEX™ II NCVs is 690 kPa (100.00 psi).

NCV information

NOTE: NCV information and readings are not available in the Bypass NCV control mode.

To view NCV information:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the System Settings tab (3) along the top of the display.
- 4. Select the NCV Information button (4) on the System Settings page. The following items and menu options will be available:





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Select section

Entered the desired section number to inspect or scroll through the sections with the arrow buttons.

Select NCV

Enter the desired NCV number to inspect or scroll through NCVs with the arrow buttons.

Section status

Reflects the current operating status of the NCVs in the selected section.

- Green All NCVs in the section are operating normally.
- Yellow One or more of the NCVs in the section have an error and may require inspection.
- Red One or more of the NCVs in the section are offline and may require inspection.

Select NCV

Enter the desired NCV number to inspect or scroll through the NCVs with the arrow buttons.

NCV status

- Green NCV is operating normally.
- Yellow NCV has an error and may require inspection.

Red - NCV is offline and may require inspection. May also indicate that the system is set to the NCV Bypass control
mode.

NCV readings

NOTE: Not available in the Bypass NCV control mode.

Displays readings from the selected NCV as well as software and hardware information.

NCV settings

Override NCV Off. Enable for the selected NCV to turn off flow from the NCV. The NCV will still show coverage to prevent future application in that area. Actual applications rates and volumes are accounted for to ensure correct rates on active NCVs.

Override Coverage Off. Enable after enabling Override NCV Off to turn off the covered area by the individual NCV. The affected area may show up as a strip on the coverage map. If the system passes over that area later for headlands of border passes, NCV will turn on and attempt to fill in that strip. Actual application rates and volumes are accounted for to ensure correct rates on active NCVs.

NCV errors

NOTE: Not available in the Bypass NCV control mode.

Displays any active NCV errors detected on the system.

NCV heat map

NOTE: Not available in the Bypass NCV control mode.

Shows an error status chart of the individual NCVs. Review the NCV Status section on above for details about the NCV status displayed on the heat map.

Section heat map

Shows an error status chart of the sections. Review the Section Status section on above for details about the section status displayed on the heat map.

User settings

To access additional operating and diagnostic features:

- 1. Open the UT Menu (1) and select the RCM working set icon (2).
- 2. Select the Tools Menu softkey (3) along the right side of the display.
- 3. Select the System Settings tab (4) along the top of the display.
- 4. Select the User Settings button (5) on the System Settings page. The following options are available:



Wireless control mode

The wireless control mode enables the machine operator to perform system checks and maintenance outside of the cab using the Section Control Remote 2.0. Select one of the following modes for the wireless control feature:

Off. (Default) Turn off wireless control and disable remote access to the RCM system.

Section. The operator may use a connected wireless remote device to control boom section valves and NCVs associated with each boom section.

NCV. This mode will allow a compatible wireless remote device to control individual NCVs.

Auto section control

Enable the Auto Section Control option to allow the ISO task controller to automatically control boom sections based upon previous coverage maps to turn an active section when the section enters into an area where product has already been applied. As a section leaves previously applied area, the section control feature will automatically turn the section back on. When this option is disabled, section control commands from the task controller will be ignored.

NOTE: A task controller capable of automatic section control is required to allow the RCM system to control sections automatically. If the Auto Section Control is not enabled, section control commands from the task controller will be ignored.

- If the task controller is capable of automatic section control and the section control feature is available in the RCM Tools Menu, select the feature by placing a check mark in the corresponding box to enable the feature.
- If the task controller is capable of automatic section control, but the section control feature is not available in the RCM Tools Menu, the feature must be enabled from a different UT menu.
- If the task controller is not capable of automatic section control, **AIM Command FLEX™ II** will not automatically control sections regardless of the state of the section control feature on this screen. It is recommended to deselect or disable this feature when operating the **AIM Command FLEX™ II** system without automatic section control.

Group end NCV's

NOTE: Not available in the Bypass NCV control mode.

Enable this option to link the three NCVs at the end of the boom to the NCV immediately beside them. When one of the NCVs are turned on, all linked NCVs will turn on. This feature may be helpful in areas with poor GPS coverage to prevent the end NCVs from flickering on and off.

NCV frequency

NOTE: Not available in Bypass NCV control mode.

Select the desired NCV frequency for when NCVs are actively pulsing. Higher frequencies will reduce overall speed and flow range of the NCVs, but may result in better coverage at low operating speeds and duty cycles. The default PWM frequency for **AIM Command FLEX™ II** is **20 Hz**.

Enable turn compensation

NOTE: Not available in the Bypass NCV control mode.

The turn compensation feature allows for even application while the machine is negotiating curves and turns in the field. This feature automatically adjusts individual **AIM Command FLEX™ II** NCVs duty cycles to compensate for the yaw rate while the operator is steering the vehicle around obstacles, curved swath paths, or turns in the field.

The lowest NCV duty cycle may match the Minimum Nozzle PWM value for the innermost operating **AIM Command FLEX™ II** NCV in a turn. The highest NCV duty cycle may not be **100%** due to maximum output capabilities of the **AIM Command FLEX™ II** NCV with a given tip size and system efficiency.

To enable the turn compensation feature:

- 1. Open the UT Menu and select the RCM working set icon (2).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the System Settings tab (3) along the top of the display.
- 4. Select the User Settings button (4).
- 5. Press the check box to toggle the Enable Turn Compensation.







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Turn Compensation Calibration – If the RCM mounting position is modified or adjusted, re-calibrate turn compensation to ensure the feature correctly adjusts **AIM Command FLEX™ II** NCV rates during applications and ensure that the ECU orientation is configured properly.

NOTE: The ECU orientation is calibrated during the initial system calibration wizard. To re-calibrate the ECU gyro, edit the profile or perform the following procedure.

To re-calibrate the turn compensation feature:

- 1. Move the equipment to a known level location.
- 2. Open the UT Menu and select the RCM working set icon (1).
- 3. Select the Tools Menu softkey (2) along the right side of the display.
- 4. Select the System Settings tab (3) along the top of the display.
- 5. Select the User Settings button (4).
- 6. Select the Calibrate button **(5)**, and then select the Redetect Orientation button. The system will re-calibrate the ECU and set the ECU orientation.



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Boom recirculation (if equipped)



NOTE: The boom recirculation feature can be set to keep your boom at your operating pressure. The boom recirculation feature requires boom plumbing and electrical harnessing to be compatible with this feature. The system alerts you that boom recirculation and direct injection are incompatible if direct injection products are detected on the system. The system will tell you to ensure the injected product plumbing is closed off from the main plumbing before attempting to recirculate. This feature must be unlocked and enabled by editing or creating a new machine profile through the profile wizard.

The recirculation button is displayed in the lower portion of the home page for product 1 for the main product tank.

When this feature is enabled, a recirculation valve will allow product to circulate from the main product tank, through the boom system, and back to the main tank using the main product pump. The recirculation can be manually or automatically enabled when no sections are enabled for applying product (active section width is zero).

When enabled, each section valve opens sequentially in left-hand and right-hand pairs, beginning with the outermost section valves and progressing toward the center of the boom. Once all sections have recirculated for the set autooperation time for each section group, the recirculation sequence will repeat until the recirculation system is shut off or active product application resumes.

Select the Section Auto-Operation Time button to enter or adjust the section recirculation times as needed to ensure each section is recirculated adequately.

When this feature is enabled, the product pump is enabled, and the active section width is zero (no sections applying product), select recirculation button in the lower portion of the home page to initiate boom recirculation.

Auto-recirculation

Enable the auto recirculate option to allow the system to automatically start the recirculation sequence when the active section application width is zero (all sections turned off). If the auto recirculate feature is not enabled, the operator must activate recirculation manually through a button on the UT.

NOTE: Whether set for manual or automatic recirculation, recirculation will automatically turn off when spraying resumes.

What to expect while recirculation is active

NOTE: When operating in Auto Recirculation Mode, it is recommended to adjust the Standby PWM% value so that recirculation pressure is close to the application pressure used during application.

When recirculation is active:

- The main product pump runs at the "Standby PWM%" value.
- Section valves will cycle "On" sequentially in pairs from the outermost to innermost sections for the user defined recirculation time.

NOTE: NCVs on each section will remain off.

- The system will continue to monitor the main flow meter to ensure product is circulating. If the product recirculation is less than the low limit of the flow meter, the system will display an alert, but recirculation will continue.
- The boom pressure transducer is monitored to ensure the system pressure stays within the minimum and maximum allowable pressures. The main product pump will shutdown if the boom pressure falls below the minimum pressure of **137.9 kPa** (**20 psi**) or above the maximum pressure of **690 kPa** (**100 psi**) pressure.
- Section valves will continue to cycle sequentially unless spraying or shutdown conditions are met.
- The drain valve will be used to drain out any product in the recirculation line when rinsing the boom.

NOTE: It is recommended to rinse the system with the boom unfolded to prevent circulating with pinched supply hoses.

Alarm settings tab

To access the Alarm Settings tab:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Alarm Settings tab (3) along the top of the display.
- 4. Use the Product Channel buttons along the top of the page to select the desired product for the following alarm options and settings:

NOTE: Alarm settings must be set for each product channel on the system.



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Off pressure alarm

Toggle the check box option at the far right to enable or disable the Off Rate Alarm.

When enabled, enter a value between 1 - 100% for the allowable difference between the target and actual product pressure. If the difference between the actual and target pressure exceeds the set percentage for more than 5 s, the system will display the off pressure alarm for the product.

Off rate alarm

Toggle the check box option at the far right to enable or disable the Off Pressure Alarm.

When enabled, enter a value between 1 - 100% for the allowable difference between the target and actual product application rate. If the difference between the actual and target rate exceeds the set percentage for more than 5 s, the system will display the off rate alarm for the product.

System efficiency % alarm

NOTE: Not available for Bypass or On/Off Nozzle Control Valve (NCV) control modes.

System efficiency compares the NCV duty cycle to flow rate and pressure. Toggle the check box and enter a nonzero value to enable the System Efficiency alarm. Typical range is **90 – 105%**.

For higher values:

- Check pressure and flow meter calibration
- Check tip selection
- Inspect for leaks in boom plumbing, fence rows left on, or for NCVs stuck open

For lower values:

- Check pressure and flow meter calibration
- Check tip selection
- Inspect for NCVs stuck closed or a flow restriction

Unexpected system flow change

NOTE: This alarm is only available in Bypass and On/Off operation modes.

When enabled, the system change detection alarm allows the system to notify the operator if the calculated system output flow is modified from learned values. Common situations that might cause this alarm to display are if the tips have been changed recently on the system or if an unexpected leak or restriction has been introduced in the system plumbing.

Stuck poppet

NOTE: This function is not available in the Bypass or ON/OFF NCV operation modes.

You can choose settings of **10 Hz** or **20 Hz**.

AIM Command FLEX[™] II equipped units use a setting of 20 Hz. The 20 Hz setting disables the stuck poppet feature.

When enabled, the stuck poppet alarm option allows the system to notify the operator if an **AIM Command FLEX™ II** NCV on the system does not detect movement of the poppet. The system will display an alarm and indicate which **AIM Command FLEX™ II** NCV is affected.

When additional products are detected, injection-specific alarms may be present for those additional product.

DI Efficiency Limit – When enabled, the injection pump detects the actual vs. expected output and notifies the user when the pumping efficiency is out of range. Typical values are from 60 - 90% and can vary based on chemical used. Low efficiency values may indicate that maintenance is required, a flow restriction exists, or the chemical is thick. High values may indicate calibration or maintenance is required.

High Inlet Vacuum – When enabled, the injection pump detects when the maximum pump inlet vacuum has been exceeded. If triggered, there may be a restriction in the plumbing between the injection pump inlet and the supply tank such as a plugged strainer, closed valve, or a supply hose issue. Some thick chemicals may also trigger the alarm.

Rates setup tab

To access the Rates Setup tab:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Rates Setup tab (3) along the top of the display.
- 4. The following options and features are available on the Rates Setup page:



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Preset rate values

Enter non-zero rate presets to allow the equipment operator to quickly switch between user defined rates during field operations. While operating in the automatic product control mode, the rate preset buttons are displayed within the product rate tab view on the Home page.

NOTE: In manual control mode, the rate preset buttons will be replaced with the control valve ± buttons.

Preset pressures

NOTE: Pressure presets are disabled or not available in some nozzle control modes or on any direct injection product rates.

Enter non-zero pressure presets to allow the equipment operator to quickly switch between user defined pressures during field operations. While operating in the automatic product control mode, the pressure preset buttons are displayed within the pressures tab view on the Home page.

NOTE: In manual control mode, the pressure preset will be replaced with the Nozzle Control Valve (NCV) Pulse-Width Modulation (PWM) percent ± buttons.

Rate selection

Use the drop-down option to select between the following options:

Predefined or Rx (Prescription). Use predefined application rate values or a prescription (Rx) map to input rate changes.

UT Rate Entry. Use this setting when not using Rx or Predefined application rate maps. Input the rate directly into the field.

Rate Bump. Use this setting to increase or decrease the rate and pressure by a predefined amount each time the plus or minus button is selected on the home screen.

Display smoothing

The Display Smoothing feature allows the system to smooth the actual rate display during operation. When enabled, the actual rate display will show the target rate as long as the actual rate is within $\pm 10\%$ of the target rate. The actual rate will be displayed if the rate controller does not reach the control deadband within 10 s.

Ratio rate

NOTE: The ratio rate feature is available only when direct injection is detected.

Enable the Ratio Rate feature to maintain a ratio of direct injection flow into the carrier flow based on the carrier flow meter reading. When the ratio rate is disabled, the direct injection flow is based upon the target application rate of the direct injection product, independent of the carrier target application rate.

NOTE: The Ratio Rate option should only be checked when the injected chemical label specifically calls out a volume per volume ratio of chemical to carrier (e.g. oz/gal or mL/L) instead of volume of chemical per applied area (e.g. oz/acre or mL/Ha).

Feature unlocks tab

The Feature Unlocks tab in the **Viper**® 4+ display for Rate Control Modules (RCM) allows the operator to review the status of optional features of the nozzle control system or activate additional features using an activation key. Unlocked features are visible on the Feature Unlocks screen.

NOTE: Contact a local CASE IH dealer for additional information regarding available features or to acquire activation keys.

Enter activation keys

To start the Precision Farming Setup:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Feature Unlocks tab (3) along the top of the page.
- 4. Press the Activation Key field and use the on-screen keyboard to enter the code purchased from your local dealer.

NOTE: The screen also displays features already unlocked for use with the RCM system.



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Precision farming setup

The precision farming setup allows the user to modify configurations that may not be available through the universal terminal.

To adjust precision farming settings after performing a machine configuration:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Select the Tools Menu softkey (2) along the right side of the display.
- 3. Select the Applicator Setup tab (3) along the top of the display.
- 4. Select the Precision Farming Setup button. Review the instructions on screen. To proceed with the wizard, press the Next button. The Product Delay Setup page will be displayed.

NOTE: Press the Previous button to return to previous pages in the Precision Farming Wizard as needed.

Setup product delay

- 1. Enter a Product Delay value for each product control channel. The Product Delay value is the time required for the product control system to adjust when changing rate zones using a prescription map.
- 2. Press Next. The Section Offsets page is displayed.





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Section offsets

Self-propelled sprayer

- 1. Enable the Left of Center option if the boom is offset to the left of the centerline of the sprayer. If the boom is centered on the sprayer or is offset to the right, leave the Left of Center option unchecked.
- 2. If boom section spray tips are offset from the center section, enable the Individual Section Fore/Aft Offsets to allow Section Fore/Aft Offsets to be configured for each section along the spray boom.

NOTE: This feature is not supported by all task controllers.

It is recommended to enter the "B" measurement (distance from the pivot point to the center of the spray boom) before enabling the Individual Section Fore/Aft option. Initially, the individual section offsets should be equal to the B value.

A negative fore/aft value indicates that the section is behind the machine pivot point with respect to the direction of forward vehicle travel. Increase the fore/aft value to move individual sections forward. Decrease values to move individual sections rearward.



1. Measure the distance from the center of the boom to the centerline of the sprayer. Enter the measurement in the A field in inches [centimeters].

NOTE: This value is automatically populated. If the machine dimensions change, perform the measurement and enter the new value. The value entered for the A distance must be measured perpendicular to the direction of vehicle travel.

- 2. Enable the Rear Implement option if the boom is mounted over or behind the rear axle of the machine or the pivot point of a pull-type sprayer. If the boom is mounted at the front of the sprayer, or in front of the rear axle, leave the Rear Implement option unchecked.
- 3. Measure the distance from the sprayer pivot point to the boom. For example, the center of the sprayer axle or the rear axle on a self-propelled sprayer to the boom. Enter the measurement in the B field in inches [centimeters].

NOTE: The value entered for the B distance must be measured parallel with the direction of vehicle travel.

- 4. Press Next.
 - o If the option for individual fore/aft values was enabled, proceed to step 14 to continue with the system calibration.
 - $_{\odot}\,$ If the individual fore/aft values is disabled, skip to step 16.
- 5. Set the fore/aft values for individual sections.

Setup product delay

- 1. Select the Next button.
- If desired, enter values for Section Group On/Off Times. Section Group On/Off Times will open or close sections prior to reaching the target area. These values can help make up for delays due to system plumbing.



Section turn On/Off times

1. Press the Accept button to complete the Precision Farming Wizard.



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AutoRinse setup

Calibration: AutoRinse sparge valve

Before using the AutoRinse system you must manually calibrate the sparge valve so that the system knows the minimum and maximum position of the valve. This allows for more accurate control of the sparge valve.

Sparge valve: main calibration

To enter sparge valve calibration:

- 1. Press the menu shift button (1) until you get to the screen displaying the manual mode symbol (2).
- 2. Press the gear button (3).



 Press the "0" in the center of the screen, outlined in red here, to open the Universal Terminal (UT) window.

2. Enter 137353 (1) into the "UT Input" popup window. Press the "OK" button (2).

NOTE: You must enter this number once per power cycle.



With the machine running, perform the following steps:

- 1. Press the "Sparge valve maximum" (1) button.
- 2. Press the "Sparge valve minimum" (2) button.
- 3. Press the "Return to spraying" (3) button to complete the process.



Sparge valve: Auto calibration

Each time the sparge valve is commanded to fully open or fully close, the system automatically recalibrates the valve and records the position.

To perform a calibration at any time after the main calibration has been completed, with the machine running, use the soft keys on the display or the switch on the right-hand console to:

1. Hold the valve to fully open until the valve percentage stops increasing and then an additional **3 s** to record the maximum position.

NOTE: After you release the valve, the percentage reading will change to "100."

2. Hold the valve to the fully closed position until the valve percentage stops decreasing and then an additional **3 s** to record the minimum position.

NOTE: After you release the valve, the percentage reading will change to zero.

Direct chemical injection setup (if equipped)

System settings

NOTE: Your display was configured at the factory with the settings for your machine.



Open the Universal Terminal (UT) menu and select the desired direct injection ISO Client Device (ICD) menu button.



Press the product setup button.



Press the settings button.

System settings page information

Display	Additional Setting Information
Tank capacity	Displays the capacity of the direct injection chemical supply tank in liters or gallons.
Tank level	Displays the volume of product currently in the injection chemical supply tank. This volume is used to calculate the volume remaining in the tank and for the low tank alarm if enabled.
Flow correction	Used to adjust the actual amount pumped by the injection pump for a given target amount. A positive value will increase the amount pumped. A negative value will decrease the amount pumped. If the volume caught during a catch test or pumped during normal operation is less than the desired volume pumped, increase the Flow Correction percentage by the percentage difference. If the volume caught is greater than the desired volume pumped, decrease the Flow Correction percentage by the percentage difference. Typical error should be no more than +/- 3 .
Function instance number	Each injection pump connected to an ISO 11783 system will have a unique number from 1 to 8 assigned.
Agitator duty cycle	This displays the amount of time during a 10 min cycle the agitator is on. For example, a 20% duty cycle would turn on the agitator for 2 min and off for 8 min .
Agitator equipped	Enables the agitator feature. Check the box to enable the feature if agitation is required and the system is equipped with the direct injection chemical supply tank agitation system.
Rinse assist equipped	Enables the rinse assist feature. Check the box to enable the feature if the injection system is equipped with the direct-injection automated rinse system.

Rate settings



Open the Universal Terminal (UT) menu and select the desired direct injection ISO Client Device (ICD) menu button.



Press the product setup button.



Press the rate settings tab.

NOTE: The following rate settings options appear when connected to a rate per area device:

Rate settings

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Display	Additional Setting Information
Preset rate values	Use the rate presets to set three target rate settings. With preset rate values set, you can quickly select a different target rate by selecting the rate preset buttons on the run screen while operating in the field.
Rate bump	Set the increment by which the target rate either increases or decreases when using the bump during an active application.
Rate selection	Use the drop-down list to select the method for changing the injected product target rate on the run screen and home pages.

Alarm settings



Open the Universal Terminal (UT) menu and select the desired direct injection ISO Client Device (ICD) menu button.



Press the product setup button.



Select the alarm settings.

Alarms	Description
Direct Injection (DI) efficiency limit	The minimum allowable efficiency for the DI pump. Typical values range from 60 – 99% . The alarm triggers if actual efficiency is below the limit for 10 s . Higher efficiency values can cause alarms to trigger more often. Lower efficiency values might not trigger the alarm enough.
Off rate limit	The allowable difference between the target and actual product application rates. If the difference between the target and actual rate exceeds the set percentage for more than 5 s, the system displays an off rate alarm.
Low tank limit	The volume below which the chemical supply tank alarm activates. Enter a value of zero or deselect enable to disable the low tank alarm.
Pop up alarms	Pop Up Alarms notify the user of system errors by displaying an alarm on the home screen.
High inlet vacuum	Notifies the user that the maximum pump inlet vacuum has been exceeded. There may be a restriction in the plumbing between the injection pump inlet and the chemical supply tank.

Injection pump priming

Prime the injection pump before operation to ensure the system is full of fluid and there is no air in the injection system plumbing. Before starting an application using the injection system, perform the following procedures to ensure the system is properly calibrated and ready for chemical application:

- Inspect the plumbing for proper installation from the chemical tank to the injection pump and from the injection pump to the point of injection.
- Ensure the chemical tanks for the pump or pumps have liquid in them for priming functions.

NOTE: Use 11 – 19 L (3 – 5 US gal) of liquid to ensure to properly prime the system.

Prime the injection pump

Open the hand valve or valves between the supply tank and injection pump so that the valves direct flow from the tank towards the pump. Ensure any tank valves, fill station valves, rinse valves, and drain valves are in the correct position.

If the vehicle has a pump calibrator, lift the plunger handle on the pump calibrator to the top of the calibration cylinder.

Verify the following conditions exist:

- The injection pressure is less than 82.7 kPa (12.0 psi).
- The pump is turned off.
- The vacuum pressure is less than **29.2 cm Hg** (**11.5 in Hg**).

NOTE: The vacuum switch on the pump engages and a flow alarm displays if the system cannot draw the product into the pump. In this state the vacuum pressure is at or above **29.2 cm Hg (11.5 in Hg)**. Inspect screens, chemical tank lids, hose diameter and any hand valves between the chemical tank and pump inlet. Verify that the product flows freely. Cold temperatures and high viscosity products can cause high vacuum pressures and cause the pump to operate improperly.



Open the Universal Terminal (UT) menu and select the desired direct injection ISO Client Device (ICD) menu button (1).



Press the diagnostics button (2).



Select the test tab (3).

Press the drop-down (4).



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Select "Pump Prime" from the drop-down list.

Follow the on-screen prompts to complete pump priming. Allow the pump to prime. The priming procedure runs until the controller detects that the pump is in the primed state. If the pump is unable to prime, the system will end the priming procedure after **2 min** and display an error.

NOTE: If the display shows an error message during the priming process, verify that the conditions listed above exist. Press the stop button at any time to stop the priming procedure. If the pump fails to prime after the first attempt, restart the priming procedure. If the pump is till unable to prime successfully, check the system for leaks. Verify the valves are turned ON. Verify the hoses are filled with product. It may not be necessary to recalibrate the pressure transducer.



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Calibration: Direct injection pump

Before starting a chemical injection application, verify the pump is calibrated and operational.

- 1. Prime the pump. See "Injection pump priming" (**3-47**) for instructions to prime the pump.
- 2. Set the hand valve on the injection pump outlet to recirculate the product back to the supply tank.
- 3. Remove the cover (1) from the injection pump calibrator (2).
- 4. Press the plunger (3) all the way down.
- 5. Gently replace the calibrator cover (1).

NOTE: Do not overtighten the calibrator cover.

Verify the following conditions exist:

- Injection pressure is less than 82.7 kPa (12.0 psi)
- The pump is OFF.
- Vacuum pressure is less than 29.2 cm Hg (11.5 in Hg).



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NOTE: The vacuum switch (1) on the pump engages and a flow alarm appears if the product cannot be drawn into the pump. In this condition the vacuum pressure is at or above 29.2 cm Hg (11.5 in Hg). Check the screens, hose diameters, and hand valves between the chemical tank and the pump inlet. Verify that the product is flowing freely. Cold temperatures and low viscosity products can cause high vacuum pressures and cause the pump to operate improperly.



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Test

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Diagnostic Test

Please select a Diagnostic Test the list above to continue

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Open the Universal Terminal (UT) menu and select the desired direct injection ISO Client Device (ICD) menu button (1).



Press the diagnostics button (2).



Select the test tab (3).

Press the drop-down (4). The test menu appears.

Press the "Pump Calibration" menu item.

Follow the on-screen prompts to complete the pump calibration. The pump will run until the Electronic Control Unit (ECU) detects **0.3 dL** (**1.0 US fl oz**) of chemical has been passed through the pump and the "Calibration Complete" message appears.

NOTE: If the display displays an error message during the calibration process, verify that the conditions listed above exist. If the problem continues, See the diagnostic information starting on (**5-50**).



Verify the calibrator plunger on the injection pump. The black ring should stop within the window markings (1) on the calibrator cover if calibration was successful. If the black ring stops outside of the calibration window, adjust the "Flow Correction%" value to compensate.



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Perform a catch test. See "Tests" (**5-51**) for instructions on performing a catch test.

4 - OPERATION

Rate Control Module (RCM) operation

Operations

Operation checklist

To begin applying product using the Rate Control Module (RCM) control system:

- 1. Verify the proper control mode (Standard, Bypass, On/Off, High Flow, High Flow VP, or Variable Pressure) is enabled.
- 2. Verify the tip size selection for the nozzle control system.
- Verify the product type (Water-Based or Fertilizer). Refer to the Product Type section on "System settings tab " (3-19).
- 4. Set the desired target rate and pressure. Refer to the Status and Control Inputs section on "Universal Terminal (UT) definitions" (4-2) for additional information.

NOTE: Target pressure is not available when operating in the Variable Pressure, High Flow VP, ON/OFF, or Bypass modes.

- 5. Use the AutoRinse application to operate the product pump. The AutoRinse application automatically turns the product pump ON when it is needed for various operations. See "Spraying" (**4-27**) for more information.
- 6. Press the main product status button or switch the pump button on the armrest to toggle the product pump on. Refer to the (4) Main Product section on "Universal Terminal (UT) definitions" (**4-2**) for additional information.
- 7. Prior to field operation, ensure all spray boom sections are primed with new product and all air and residual or old product has been exhausted from the boom.
 - $_{\odot}\,$ Excess air in the boom may cause unstable control, resulting in mis-application.
 - Excess residual or old product can result in misapplication and "W" pattern application until the correct mix of new product is in all boom sections.
- Use the Boom Prime, or the Recirculation if equipped, feature to prime the boom with new product. Refer to Boom Recirculation section on "System settings tab " (3-19) and the Automated Boom Prime section on "Universal Terminal (UT) definitions" (4-2) for more information.
- 9. Set the product rate mode to Auto for field operations and begin driving.

NOTE: If testing the system outside of field operations or while stationary, set the Self Test Speed to the typical field operation speed or change the product rate mode to Manual and adjust the control valve setting to adjust system output. Bypass will need to be run through the diaphragm valves.

10. Toggle the equipment master switch to the on position.

Universal Terminal (UT) definitions

To access the Rate Control Module (RCM) home screen (3), select the RCM working set icon (2) on the Universal Terminal (UT) menu (1).



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The RCM home screen is comprised of the following sections:

- Primary RCM operation area (1)
- Quick access buttons (2)



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Quick access buttons

The buttons displayed along the right side of the RCM working set allow quick access to commonly used features, calibration settings, and options. Review the following sections for additional information about the RCM buttons:



Home – Press the Home button to quickly return to the Home screen and access the primary RCM operation information. Use these pages to monitor the **AIM Command FLEX™ II** system during field operations.

Tools – Select the Tools Menu button to access the calibration prompts. See "Tools menu overview" (**3-13**), "Applicator setup tab" (**3-14**), "System settings tab" (**3-19**), "Alarm settings tab" (**3-35**), "Rates setup tab" (**3-37**) and "Feature unlocks tab" (**3-39**) for additional assistance with system calibration, features, and settings.



Totals – Select Totals button to view the distance, volume, and area tallies calculated by the RCM. See "Using totals" (4-13) for additional assistance with the Totals features.

The totals button provides options to access a Current Totals, Device totals, and Distance totals tabs.



Diagnostics – Select the Diagnostics button to access system information, tests, and fault codes. See "Nozzle Control Valve (NCV) diagnostics" (5-19) for additional assistance with the AIM Command FLEX[™] II NCV diagnostics prompts.

The fault code status indicator is displayed on the Diagnostics button and provides a visual indicator of the system status during field applications. The status indicator provides the following display states:

>	OK – The system status is normal and no alarm conditions are currently present.
	Caution – A minor alarm condition has been detected. The control system is operating normally, however, the system has detected that a condition exists which could impact the current application.
×	Critical – A critical system condition has been encountered. The control system is not responding as expected and the operator should cease application and troubleshoot the issue before resuming operations. The system will not apply in this state

See "System diagnostics" (5-3) for additional assistance with diagnostic trouble codes and using the fault code list.

Transfer universal terminals



Transfer Universal Terminal (UT) – The Transfer UT button will be displayed if more than one UT is detected on the ISOBUS. Use this button to swich the RCM working set menu to an alternate UT at any time.

If the working set is not available on the desired UT, check the other displays and use the Transfer UT button to transfer the RCM working set.

RCM home screen features

Depending upon the mode and system options, the following display areas, information prompts, and features may be accessible via the RCM home page:

Home page displays with injection or advanced mode activated

- (1) Tabs
- (2) Readouts
- (3) Operation and performance display data
- (4) Status and control inputs



Home page displays without injection or basic view

- (1) Readouts
- (2) Operation and performance display data



Tabs

Tab views are available on the RCM home page. Tabs allow the operator to quickly toggle between different information displays and user configurable readouts during field operations.

The UT offers tabs for each product (1) controlled by the RCM system as well as a tab to assist with monitoring system pressure (2) information.

NOTE: See "System settings tab" (**3-19**) for additional assistance with the available readouts.

Status and control inputs

The upper, right corner of the Home page provides the operator with access to the following important status displays and system control features:

- Actual Rate/Pressure (1). Depending upon the tab selected, the actual rate or actual pressure is displayed in this area.
- Target Rate/Pressure (2). Depending upon the tab selected, the target rate or target pressure is displayed in this area. Press this field to enter a new target rate or pressure as needed during field applications.

NOTE: Target pressure is not available for VP, On/Off, High Flow VP, and Bypass modes.



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Product Rate Control Mode (M/A) (3). Press the rate control mode button to toggle the selected product between automatic and manual control modes.

When the system is toggled to the manual control mode, the preset buttons will be replaced with ± bump buttons. Review the (5) Presets on below and the (6) Manual Control on below.



Main Product (4). The status of the product is displayed on the upper portion of the Home page. Select the product status button to toggle the main product ON or OFF during field applications.

NOTE: Both the master switch and the product must be toggled on to apply product.

If the machine has an additional switch to open a master tank valve and/or turn on the main product pump, ensure the machine switch is turned on before the on-screen main product button is toggled on and that the master switch is toggled on to prevent pressure spikes in the system when starting application.

• Presets (5). Rate or pressure preset buttons are shown toward the upper, right corner of the display below the target rate or target pressure fields.



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Press the rate or pressure preset buttons (A) to manually toggle between preset rates or pressures.

See "Rates setup tab" (**3-37**) for additional assistance with the rate and pressure preset values.

NOTE: Double tap the rate or pressure tab to quickly access the Rates Setup page and change the set preset values.

Manual Control – When the system is toggled to the manual control mode, the preset buttons are replaced with plus and minus buttons (1).

• The plus and minus buttons on the Rates tab manually increase or decrease the main product pump output.

NOTE: The main product pump manual control buttons are replaced by the injection pump manual control buttons when the injection pump product is selected.

 The plus and minus buttons on the Pressure tab increase or decrease the NCV Pulse-Width Modulation (PWM) duty cycle.

The system continues to monitor and display the actual application rate on the home screen.



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Readouts

The readouts area of the RCM Home page is user configurable to allow the operator to set up the information to be displayed for each product or pressure tab. See "System settings tab" (**3-19**) for additional assistance with customizing the information displayed on each tab and for details about the available readouts.

Pressure gauge

When the RCM product is selected, the pressure gauge provides a visual representation of the actual boom pressure and displays the allowable pressure deadband during field applications.

NOTE: When an injection product is selected, the pressure gauge displays the pressure at the injection pump.

RCM lower home screen

The lower portion of the home screen provides on-screen indicators for switch status and remaining tank volume. Refer to the following sections for additional information regarding the information provided in this area of the home display.

Tank volume indicator

The system provides a calculated volume of product remaining in the tank as a tank indicator in the application information area. Select this indicator to access the Tank Fill Config prompt.

NOTE: A tank capacity value must be entered to allow the tank volume indicator to display the tank level.

Section status display

The **AIM Command FLEX™ II** system provides the status of each configured section on the home display.

Section On/NCVs On (1). The section is on and all NCVs are actively applying.

Section On/Mixed NCV Status (2). The section is enabled and at least 1 NCV assigned to the section is applying. The task controller may automatically control NCVs as needed to cover field area.

Section On/NCVs Off (3). The section is enabled and ready for application. The task controller may automatically turn on NCVs assigned to this section.

Flow Offset Enabled (4). A flow offset is active in that section.

Section Off (5). the section is manually disabled. NCVs assigned to this section cannot be enabled or turned on by the task controller.

NCV flow offset percentage

The Flow Offset feature allows a limited number of NCVs to provide additional flow. For example, NCVs in line with the sprayer wheel tracks may need increased flow to ensure complete coverage. The NCV Flow Offset percentage value sets how much the offset NCV will deviate from nominal flow.

Flow offsets may be ±50% and the machine operator may enter profiles for left, right, narrow, wide, offset 1, and offset 2 with up to eight AIM Command FLEX[™] II NCVs and hardware.

NOTE: When offset profiles are active, the triangle for the affected section will display purple and the Offset button will display green.



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Relieve pressure

NOTE: The relieve pressure button is displayed when the main product is toggled off.

Select the Relieve Pressure button and toggle the master spray switch on. All section valves and NCV valves will open briefly to relieve excess boom pressure. This feature is useful to reduce boom pressure and allow system and boom maintenance. If recirculation is configured, the recirculation valve opens instead of the NCV valves, and no product is dispensed.

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Chemical hazard!

Make sure that there is no pressure in the product system before you service the unit. In particular, make sure that there is no pressure in the sprav bars.

Failure to comply could result in minor or moderate injury.

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Performance data display

Toggle to the performance data display to monitor various system performance statistics and recommended operation ranges in one view.

This view displays the user defined tank volume and volume remaining in the tank, the recommended speed range and current speed, current application rate and off rate limits, current pressure and allowable pressure range, as well as the droplet size settings and monitoring options previously entered by the operator.



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Tank (1). Displays the current tank level, overall tank capacity, and low tank alarm set point. Values change when apply, filling, or when entered in the Tank Fill settings menu.

Speed (2). Displays current speed and recommended speed range. Overall range is **0 – 30 mph**(**0 – 48 km/h**).

Values change when applying or when target rate, target pressure, tip size, or operating mode are adjusted.

Rate (3). Displays current application rate and Off Rate Alarm percentage range values. Values change when applying or when actual rate, target rate, or Off Rate Alarm percentage values are adjusted.

Pressure (4). Displays current application pressure, minimum and maximum pressure range, and color scale for droplet size range information entered in the Select Tip menu.

Tip (5). Displays user-entered tip name and any droplet size information from the tip that was selected in the Select Tip menu.

NOTE: The pressure color scale, tip name, and droplet size information options are not available in High Flow NCV Control mode

Automated boom prime

WARNING Chemical hazard! Chemical will be discharged during the boom prime procedure. Make sure that the boom is fully unfolded and in a location safe for chemicals to be dispensed. Failure to comply could result in death or serious injury.

Automated Boom Prime will automatically turn on the main product pump and control valve to the set Tank Fill control valve duty cycle and each configured spray section for the assigned Auto-Operation time, starting from the outermost section and working inward, until each section has turned on once.

NOTE: Ensure the main product tank has sufficient product to fully fill the spray boom and have some visibly remaining in the tank to prevent from getting air in the pump and system plumbing. Ensure all machine values are in the spray position. Move the machine to an area safe for the application system to spray and be fully unfolded.

- 1. Select Begin to enter the Boom Prime Menu.
- Enter in the Section Auto Operation Time for each section. Sections will operate automatically in pairs from outermost to innermost sections. Auto-Operation times do not need to be equivalent for pairs, and can be adjusted up to a maximum of **180 s**.
- 3. Turn on the machine master switch, and press the accept button to proceed with priming.

NOTE: Section valves and NCVs will open and product will be dispensed during this process.

Automated boom prime page

When each section has operated once, the priming process is complete. The process can be interrupted at any time by turning off the master switch, or pressing the back or exit button. By turning off the master switch or pressing the back button, you can adjust the Section Auto-Operation Times. By pressing the exit button, the test will be canceled and you will return to the Tests menu. Turn off the master switch when Priming is complete.

For systems equipped with chemical injection, stationary priming must be done for each product using a selftest speed in Automatic mode with all products on.

If your system is equipped with recirculation, use the recirculation process to prime the booms.


Section control remote operation

The section control remote allows you to wirelessly turn the product pump, sections, and individual nozzles ON and OFF.

The section control remote provides a keypad and several functional buttons:

- **(1)** Off
- **(2)** On
- (3) Left
- (4) Right

The Light-Emitting Diode (LED) indicator (5) shows the current status of the section control remote.

LED	Cycle	Description	
Red	5 Hz	Scanning for Electronic Control Unit (ECU)	
Red / Green	1 Hz	Connected – Waiting for passcode	
Green	1 Hz	Connected – Passcode entered successfully	
Yellow	1 Hz	Low battery	



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Getting started

Install two AA batteries into the section control remote.

NOTE: Use lithium batteries for optimal performance.

To enable communication with the Rate Control Module (RCM):

- 1. Open the Universal Terminal (UT) and select the RCM working set icon (1).
- 2. Select the Tools Menu (2) along the right-hand side of the display.
- 3. Select the System Settings tab (3) along the top of the display.



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4. Use the "Wireless Control Mode" drop-down menu and select either the Section or Nozzle Control Valve (NCV) option.



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5. Take note of the Wireless ID and passcode on the prompt displayed on the UT. This information will be necessary to connect to the RCM - Sprayer ECU.

NOTICE: Do not attempt to connect the remote and RCM - Sprayer devices yet.

- 6. Turn ON the boom section switches and the master switch.
- 7. With the section control remote in-hand, exit the cab and go to the back of the machine until you have a clear view of the RCM.
- 8. Connect the section control remote to the RCM:



Press the ON button to turn the section control remote ON.

Use the keypad on the section control remote to enter the pass code (1) that displays on the Universal Terminal (UT).



Press the ON button again.



Example: 1 2 1 9

NOTE: The flashing green LED indicates a successful connection.

Once paired, the passcode is stored on the remote and does not need to be re-entered.



To turn the remote OFF, press and hold the button for 3 s.

Basic operation

To turn the pump ON or OFF, enter "00" and then press the ON or OFF button.

Example: 001 (Pump ON) / 000 (Pump OFF)

To turn sections/nozzles ON, either:

- Press the ON button to turn all of the sections/nozzles on.
- Enter the section and nozzle number, and then press the ON button.

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Example: 11
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Press the left or right-arrow buttons with all sections and nozzles OFF.

To turn sections and nozzles OFF, either:

- Press the OFF button to turn all of the nozzles OFF.
- Enter the section or nozzle number, and then press the OFF button.





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Totals

Using totals

To access the Rate Control Module (RCM) - Sprayer Totals pages:

- 1. Open the Universal Terminal (UT) Menu (1) and select the RCM Sprayer Menu button (2).
- 2. From the home screen, select the Totals softkey (3) along the right side of the display. The following tally information tabs are available:



Lifetime Totals (4). Provides application tally information for each product control channel.

Depending upon your reporting or data needs, application tallies for each control channel may be accumulated for the day or week of operation, or may be reset after each field. This information is available to the UT (e.g. Viper 4) and can be included with the application or coverage reports.

NOTE: Each product control channel must be reset separately.

Device Totals (5). Displays a running tally of the operating life of the RCM - Sprayer system. This includes the runtime of the Electronic Control Unit (ECU), the runtime of the Nozzle Control Valves (NCV), and the total area covered. This tally cannot be reset by the machine operator.

Distance Totals (6). Provides the operator with operation information such as current equipment speed and distance traveled since the Distance Totals were last reset.

The distance registers may also be helpful when fine tuning the RCM - Sprayer system or to assist with troubleshooting procedures.

Reset a register

To reset the Lifetime Totals or Distance Totals register:

- 1. Open the UT Menu (1) and select the RCM Sprayer Menu button (2).
- 2. From the home screen, select the Totals softkey (3) along the right side of the display.
- 3. Select the Lifetime Totals (4) and the desired product channel or Distance totals tab (5) along the top of the page.

NOTE: The Device Totals cannot be reset by the machine operator.

- 4. Select the Reset button **(6)** to reset all the Totals displayed on the page.
- 5. Accept the confirmation prompt to proceed with resetting the selected registers.
- 6. Repeat the above process to reset other Totals as desired.



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Avoiding skips and overlaps

Overview

When added to the Rate Control Module (RCM) - Sprayer control system, the **AIM Command FLEX™ II** nozzle control system is designed to pulse each spray tip using an alternating pattern across the boom width. This alternating nozzle spray pattern relies upon an overlapping spray tip pattern and droplet dispersion to achieve complete and even coverage during field applications.

Recommendations for AIM Command FLEX™ II nozzle control operation

Maintaining the following application system conditions will help to ensure consistent, even coverage during field applications using the **AIM Command FLEX™ II** nozzle control system:

1. Use the appropriate tip size for the desired droplet size, application speeds, target rates, and system pressures.

NOTE: See the latest spray tip information available from the tip manufacturer for specific applications, compatibility with Pulse-Width Modulation (PWM) control technology, and droplet size information.

NOTE: Read the label for the product being applied. Then use the information provided by the tip manufacturer to get the proper nozzle recommendation. Based upon the nozzle, they then provide a recommendation for use, with an online calculator. Find the online calculator at https://www.wilger.net/tip-wizard-frame/#/tipwizard/home. A useful online instruction is available at https://sprayers101.com/broadcast-boom-nozzle-spacing.

- 2. Use wide-angle spray tips and appropriate spray tip height to achieve approximately 150% pattern overlap. You can find an online calculator to determine the spray tip height at https://sprayers101.com/boom-height-chart/.
- 3. Maintain a system pressure sufficient to fully develop the intended tip spray pattern.
- 4. To ensure uniform spray coverage when using only pulsing NCV's, avoid operating NCV's below **40%** duty cycle when driving straight. During a turn, avoid operating NCV's below **25%** duty cycle.
 - $_{\odot}$ Stay within the displayed speed range for a selected tip size, application rate, and pressure.
 - $_{\odot}$ Avoid application speeds in the bottom 1/3 of the recommended speed range.
 - $_{\odot}$ Avoid target flow rates in the bottom 1/3 of the recommended application rate range for each spray tip.
 - _o When turn compensation is active, make gradual turns to avoid operating the NCV's at their limits.
- 5. Target application rates, speeds, tip sizes, and operating pressures so the NCVs operate at approximately **70%** ±10% duty cycle on average.

For example:

NOTE: This example is for illustration purposes only. It is not intended to be a specification for a spraying operation. Use parameters that meet the needs of your spraying operation.

Consistent and even field coverage could result under the following application conditions:

- An applicator with 50.80 cm (20.00 in) NCV spacing
- 110° fan spray tips at 344.74 kPa (50.00 psi)
- An application speed of 24.14 km/h (15.00 mph)
- A spray tip height of 53.34 cm (21.00 in)



RAIL22TR00168FA 1 Alternating spray pattern and even area coverage

ID	Description	ID	Description
А	Alternating nozzle spray pattern	3	Spray tip height 53.34 cm (21.00 in)
В	Alternating spray tip pattern coverage view from above	4	110°
1	Nozzle spacing 50.80 cm (20.00 in)	5	Direction of travel
2	Vehicle travel 24.14 km/h (15.00 mph)		

NOTE: In Automatic control mode, the **AIM Command FLEX**TM **II** nozzle control system will adjust the system to maintain the optimal application coverage within operational ranges.

Causes of skips using AIM Command FLEX[™] II nozzle control

Operating the **AIM Command FLEX™ II** nozzle control system at or outside of the recommended operational ranges may result in under-application or banding.

For example:

Under-application or horizontal banding may be observed if the operator from the previous example were to toggle the application mode from Automatic to Manual and then increase the application speed from 24.14 – 35.41 km/h (15.00 – 22.00 mph) without manually increasing the nozzle control valve duty cycle.



RAIL22TR00169FA 2 Conditions resulting in under application and horizontal banding

ID	Description	ID	Description
А	Alternating nozzle spray pattern	3	Spray tip height 53.34 cm (21.00 in)
В	Alternating spray tip pattern coverage view from above	4	110°
1	Nozzle spacing 50.80 cm (20.00 in)	5	Direction of travel
2	Vehicle travel 24.14 km/h (15.00 mph)	6	Horizontal banding

For example:

Under-application with diagonal banding may be observed if the following modification to the initial example is made:

- Using 80° fan spray tips at a height of 53.34 cm (21.00 in).
- Boom pressure is too low resulting in the NCV tip not being able to achieve full spray pattern.

NOTE: Refer to the "Recommendations for **AIM Command FLEX**TM **II** Nozzle Control Operation" section above and recall the recommended spray height for **80**° spray tips. See the product and tip manufacturer data for boom and spray tip pressure recommendations.



RAIL22TR00170FA 3 Conditions resulting in under application and diagonal banding

ID	Description	ID	Description
А	Alternating spray pattern	3	Spray tip height 53.34 cm (21.00 in)
В	Alternating spray tip pattern coverage view from above	4	80°
1	Tip spacing 50.80 cm (20.00 in)	5	Direction of travel
2	Vehicle travel 24.14 km/h (15.00 mph)	6	Diagonal banding

AutoRinse operation

Product overview

The AutoRinse system maintains a clean, accurate sprayer and helps to greatly reduce the chances of contamination when changing from one product to another.

The AutoRinse system automatically places the correct valves in the right position for sprayer operations. The system controls the valves in the performance of several common spraying and rinsing functions.

These functions include:

- Spraying
- Filling the machine with an external pump
- · Filling the machine with the product pump
- · Chemical eductor use
- Sparge control (agitation)
- Tank rinse
- Boom rinse
- Tank draining

Follow the operators manual for your sprayer when operating the AutoRinse system.

Valve locations

The following images show the location of all valves, both electric and manual.

Fill station – Manual valves



NHPH23PLM1681FA 1

1	Rinse water fill valve	6	Product tank sump valve
2	Chemical eductor valve	7	Fill station remote box
3	Chemical eductor hopper rinse valve	8	Hand rinse water valve
4	Intake flowmeter display (if equipped)	9	Tank rinse valve
5	Fill port valve		

Fill station – Electronic valves



NHPH23PLM1680FA 2

1	Rinse water fill valve	5	Fill port valve
2	Chemical eductor valve	6	Fill station display
3	Chemical eductor hopper rinse valve	7	Fill station remote box
4	Intake flowmeter display (if equipped)	8	Hand rinse water valve

Additional valve locations





RAIL24SP00162AA 4

1	Main sump valve	4	Manual sparge valve
2	Sparge valve (electric valve)	5	Front fill station with optional front fill reclaim
3	Quick fill valve (electric valve, if equipped)		

Display locations

During operation, the displays will show which process is active and the state of each valve so the operator can see the process at a glance. There are two display locations on which to operate the AutoRinse system. Although there are small differences in layout, operation on either display remains the same.

Pro 1200 display

Access the AutoRinse application through the Universal Terminal (UT) screen.



Fill station display

- 1. Located at the fill station.
- 2. Contains hard keys on either side of the display.



RAIL22SP01715AA 2

Step by step directions are provided on screen so the operator is aware of progress and is prompted when operator intervention is required. An operator could start an operation on the display in the cab and finish it on the display at the service center or vice versa.

See your machine operators manual for instructions on using the display at the fill station.

Display icon descriptions

Function icon	Description
	Spraying function
OFF	Pressing this key will shut all valves off
ŐN	Pressing this key will instruct all valves to go to the defined running function
	The transparent valve indicates all valves are in the Off mode
	The grey valve indicates all valves are in the On mode and can go to the position as defined by the running function
	Blinking red indicates valve is blocked or disconnected
	Filling with external pump function
	Filling with product pump function
\bigtriangledown	Chemical eductor function
000	Menu shift
	Rinse tank filling function
(23)	Tank cleaning function
(2300)	Tank cleaning function heavy
(2300)	Tank cleaning function medium
(23:00)	Tank cleaning function light
	Tank draining function

Function icon	Description
	Rinse boom function
٢	Manual mode
3	Parameter area
	Valve #3 (rinse tank fill/rinse): position 0 (closed), position 1 (filling hose), position 2 (rinse tank)
	Valve #4 (chemical eductor/rinse tank): position 0 (closed), position 1 (chemical eductor), position 2 rinse tube
	Valve #5 (product tank sump): position 0 (closed), position 1 (open)
	Valve #6 (optional quick fill): position 0 (closed), position 1 (open)
	Valve #7 (sparge): position 0 (closed), position 100 (full open)
\bigcirc	Cleaning mode phase 1 fresh water
B	Cleaning mode phase 2 re-circulation
	Acknowledgement key
	Hook up, un hook fill hose
	Open, close valve #1
品に見か	Open, close valve #3

Display navigation

- The menu shift button (1) navigates between the four screen selections.
- The Spraying function screen (A) is the default function screen.

- The remaining three screen selections, **(B)**, **(C)**, and **(D)** show the functions available within each individual screen selection. See next page.
- The side function menu (2) within each screen shows the active icons available within that screen selection. The display defaults to the "Spraying" function screen (A) if no selection is made after 12 s of pressing the menu shift button (1).
- Pressing an icon within the side function menu on any screen selection will take you directly to the first step on that selected function.





The remaining three screen selections, **(B)**, **(C)**, and **(D)** show the functions available within each individual screen selection. See previous page.

Press the "OFF" button (1) to turn all valves OFF. When you press the "OFF" button, the button changes to an "ON" button (2). When in the OFF mode, all valves appear transparent (3). Press the ON button (2) to return all valves ON. The valves will go to the position defined by the running function.



NHIL22PLM207AA 4



Spraying

The Automated Rinse system defaults to the "Spraying" function **(1)**. However, before spraying can begin you must:

- 1. Turn the roading switch to the field position with the top of the switch depressed. See; your vehicle operators manual for more information on the roading switch.
- 2. Press the ON/OFF button (1) to turn the system valves ON. Once you press the button, the button will change from "ON" to "OFF" and the system places the valves in the correct position to begin the spraying operation.



NHIL22PLM204AA 1

To spray:

1. Turn the boom valve switches (2) ON.



Press the button (3) to increase engine speed from the current setting in increments of **50 RPM**.

2. Turn the Master Spray switch (4) ON.





RAIL21SP00590FA 3

From the spraying screen you can adjust the sparge valve position. The sparge pressure readout is visible in the Rate Control Module (RCM) object pool, or in a User-Defined Window (UDW). Each time you quit spraying, the sparge level will be stored and the valve will return to this position when you return to the spraying function. See your operators manual for more information on sparge control.



NHIL22PLM204AA

Filling with an external pump

Selecting the "Filling" function displays the screens shown below. Use the following steps to fill the sprayer:

- 1. Connect the fill hose and open valve #3.
- 2. Press the acknowledgement key.
- 3. Fill the sprayer as normal.
- 4. Press the acknowledgement key.
- 5. Close valve #3.
- 6. Disconnect the product fill hose.
- 7. Press the acknowledgement key to return to the "Spraying" function.



NHIL22PLM253AA 3

Pump operation - fill station

Many of the sprayer functions require the use of the onboard product pump. Many operations of the AutoRinse system turn the pump ON automatically when it is needed.

It is not required to turn the pump ON or OFF manually outside of the AutoRinse screen. A button is present in the display to turn the pump OFF. if needed during a function.

Using the remote load station at the fill station

When filling or rinsing with the on-board product pump in manual mode, follow the on-screen prompts to begin the process:

NOTE: When tank rinsing, if the engine speed does not match the chart, the desired volumes may not be accurate.

- 1. Enable the fill station remote box by placing the S1 (1) switch in the ON position
- 2. Increase the engine speed using the engine speed switch (2).

The engine RPM displays on the instrument cluster in the cab.



RAIL17SP01170AA

Once the fill or rinse function has completed, ensure the pump is in automatic mode in the "RCM" screen. If the pump is placed in manual mode, system control of rate and pressure will be lost and, because the pump is commanded to the maximum duty cycle, the actual rate could be greater than desired.

Pump operation - universal terminal

Many of the sprayer functions require the use of the onboard product pump. Many operations of the AutoRinse system turn the pump ON automatically when it is needed.

Using the In-cab display

To turn the pump ON or OFF:

- 1. Increase the engine speed.
- 2. Press the acknowledgement button (1). The pump turns ON automatically.
- 3. Use the pump button (2) to turn the pump OFF if required during a function.



RAPH22PLM0302AA 2

Once the fill or rinse function has completed, ensure the pump is in automatic mode in the "RCM" screen. If the pump is placed in manual mode, system control of rate and pressure will be lost and, because the pump is commanded to the maximum duty cycle, the actual rate could be greater than desired.

Filling with the product pump

When filling with the on-board product pump, follow the on-screen prompts to begin the process.

- 1. Turn on the light switch (1).
- 2. Connect the fill hose and open valve #1. Press the acknowledgement button (3) on the display.
- 3. Increase the engine speed using the engine speed button (2) or in the cab.
- 4. Press the acknowledgement button (3) on the display.
- 5. Once the product tank has been filled to the desired level, press the acknowledge button (4) on the display.

NOTE: You can stop the product pump any time by pressing the pump "OFF" button (5). The button turns from "ON" to "OFF". You can then press this button to turn the product pump ON again.



7. Reverse the process above, following the on-screen prompts (7).

NOTE: After acknowledgement of the final step the system will automatically return the valves to the spraying function.



NHIL22PLM222AA

Chemical eductor

If the machine is equipped with a chemical eductor, selecting the chemical eductor function allows the operator to load chemicals from the ground. Follow the on-screen prompts in the display to load chemicals.

To load chemicals using the chemical eductor:

 Increase the engine speed using the engine speed switch (1) on the remote load station or in the cab. Press the acknowledgement button (2) in the display.





NHIL22PLM224AA 2

- 1. Open valve #2 located on the bottom of the chemical eductor. Press the acknowledgement button (3).
- 2. Once all of the chemicals have been added to the eductor, press the acknowledgement button (4).
- 3. Reverse the process above following the on-screen prompts.

NOTE: You can stop the product pump any time by pressing the pump "OFF" button (5). The button turns from "ON" to "Off". You can then press this button to turn the product pump ON again.



5. Reverse the process above, following the on-screen prompts (6).

6 Tank Control III alts Chemical Inductor Post operation e) Decrease ÖFF engine RPMs Close valve #2 E

NHIL22PLM227AA 5

NOTE: After acknowledgment of the final step the system will automatically return the valves to the spraying function.

Loading chemicals into the product tank of a Patriot® series sprayer has never been easier when using the automated rinse system. This tutorial demonstrates the process and shows the on-screen, step-by-step instructions which can be performed on the in-cab display or from the service center of the machine. Click to watch. Video duration: 3:15 min., https://youtu.be/4rTHQCRO9BA



RAIL24SBA0145PA 6

Filling rinse tank

To fill the rinse tank:

- 1. Connect the fill hose.
- 2. Open the #3 valve from the fill station.
- 3. Follow the on-screen prompts to finish the process.

NOTE: After you acknowledge the final step in the process, the system will automatically return the valves to the spraying function.



NHIL22PLM253AA 3

Tank cleaning

Properly cleaning the product tank and plumbing helps minimize the risk of contamination as products are changed throughout the application season. The automated rinse system available on Patriot® series sprayers and Trident[™] 5550 Liquid Systems allows you to properly clean the spray system from the cab or service center, leading to increased productivity and efficiency. What the following video to see this procedure in action. Video duration: 7:30 min., https://youtu.be/aFJQfk9Ezal





1

The AutoRinse system provides a process to clean the tank and the product plumbing. The process begins when the operator sets the cleaning parameters. The level of cleaning is configured in Step 1. The operator determines the amount of rinse water used in step 2 and step 3. Once the parameters are set by the operator, the system automatically moves clean water from the rinse tank to the product tank. The water circulates in the product tank and through the plumbing to clean the product system. The display shows a countdown time for each operation as the process progresses.

 Select a cleaning option: Light Cleaning (1), which rinses the tank for one minute; Medium Cleaning (2), rinses for two minutes; and Heavy Cleaning (3), rinses the tank for three minutes. This selection should be made based on the label of the chemical(s) being used and the condition of the product tank.

Tank Control III	
Tank	্যা ব
Heavy (2)	
Medium	
Light 01m	

NHIL22PLM229AA 2

- 2. Select the amount of water, in gallons, required for rinsing by pressing the measuring cup icon (1) repeatedly until the desired gallons are highlighted at the bottom of the screen.
- 3. Increase the engine speed.

NOTICE: The engine must run at the selected RPM to get the specific amount of water moved from the rinse tank to the product tank. For example, the "38" (2) highlighted in the chart is the number of seconds the system needs at least **1700 RPM** to move **76 L** (20 US gal) of water from the rinse tank to the product tank.

- 4. The pump automatically turns ON.
- 5. Press the acknowledgement button (3) to confirm and begin the process.



- 6. Decrease the engine speed.
- 7. The progress bar (1) gives the countdown time.



NHIL22PLM232AA 5

After tank cleaning has finished, there are three different post operations that you can perform:

- Recirculate the rinse water additional times (1) as needed, to further rinse the tank.
- Drain the rinse water into an external container by selecting the "Unload tank" function (2).
- Spray the rinse water through the boom onto a target area. To spray the rinse water through the boom, select the "Boom flush" function (3). Doing so returns the system to the "Spraying" function.

NOTE: Repeat the entire tank cleaning function two additional times if the chemical that you used requires a triple rinse process.

8. Press the acknowledgement button (1) when the rinse cycle is complete.



NHIL22PLM235AA 6



NHIL22PLM236AA 7

Boom cleaning

It is a good practice to perform the "Boom Cleaning" function at the end of each day. During this process the system directs clean rinse water through the boom without first passing through the tank, cleaning the booms even if mixed chemical remains in the product tank.

- 1. Increase the engine speed. Press the acknowledgement button (1).
- 2. Turn on the boom section valve switches (2) on the right-hand console.
- 3. Follow the on-screen prompts to complete the boom cleaning process, returning to the spraying function.



RAIL21SP00487FA 2

4. Turn on the Master Spray switch **(3)** or use the **Raven**[™] app to open the section valves.

NOTE: Section switches must be in the ON position for the master spray switch to open the section valves.

NOTE: Open the boom flush valves (if equipped).

5. Press the acknowledgement button (4).



NHIL22PLM238AA 4

- 6. Press the acknowledgement button **(5)** when the procedure completes.
- 7. Close the flush valves. Turn OFF the spray switch or use the **Raven**[™] app to close the section valves.



NHIL22PLM239AA 5

8. Decrease the engine speed. Press the acknowledgement button (6).



NHIL22PLM242AA 6

Tank draining

After you rinse the tank, you can drain the rinse water into a suitable container instead of sending it through the boom. To drain the tank:

- 1. Connect the fill hose.
- 2. Open valve #1.
- 3. Follow the on-screen prompts to finish the process.

Once the tank draining process is complete, the system returns to the spraying function.



NHIL22PLM247AA 3
Manual mode

The AutoRinse system can be placed into manual mode, allowing the operator to directly manage each motorized valve. You can use this mode when winterizing the spray system, or when troubleshooting the valves in the event of an issue. The available valve positions appear on the right-hand side of the display, depending upon the selected valve.

To enter the manual mode:

- 1. Press the menu shift button (1) until you get to the screen displaying the manual mode symbol (2).
- 2. Press the manual mode button (2).
- 3. Use the manual mode screen (3) to control the valves manually.



NHIL22PLM254AA 2

AutoFold and AutoBoom® XRT (if equipped) operation

Care and maintenance

• If the system does not allow you to engage while using radar sensors, inspect and clean them. Use a rag or cloth to clean the radar sensors and allow for better solution quality.

Home screen

Home screen

AutoBoom® XRT is a Universal Terminal (UT) based application.



- To access AutoBoom® XRT screens:
- 1. Press the UT icon.
- 2. Select the XRT working set icon.

Home screen navigation

- (1) AutoBoom® XRT object pool
- (2) Home
- (3) Settings
- (4) Diagnostics
- (5) Totals



NHIL22PLM0378AA

XRT home screen operation

Home screen overview



NHIL22PLM0377AA 1

- (1) Sensitivity settings
- (2) Master switch
- (3) Sensitivity
- (4) Target height
- (5) Target height settings
- (6) Target type
- (7) Manual/auto
- (8) Sensor reading

Master switch



Press the Master Switch button to toggle between enabled and disabled states. If enabled, the system is ready to transition to auto mode. If disabled, auto mode is locked out.

NOTE: The Master Switch status will automatically toggle On after completing an AutoFold Out cycle to the spray position. The status will automatically toggle to Off when AutoFold begins to fold booms to the transport position.

Sensitivity settings



Use the Sensitivity Settings buttons to increase or decrease the system sensitivity. Increasing the sensitivity will increase how quickly the boom responds to the sensor target. Increasing the sensitivity too high may result in unnecessary or excessive movement. Decreasing the sensitivity will result in less boom movement but will make the booms slower to respond to an error in boom height.

Target height settings



Press the Target Height button, and then select the Target Height (1) to set the distance from the boom to the target. This information can also be changed on the XRT Home screen using the +/- buttons or typing the value into the Target Height field.

This screen also allows the user to select the Height Sensor Sensitivity (2). The Height Sensor Sensitivity This value affects the ability of the radar sensor to distinguish between spray, crop, and ground.

- A Height Sensor Sensitivity range of 1-20 is ideal for reduced canopy detection or high spray drift suppression.
- A Height Sensor Sensitivity range of 20-100 allows the sensor to be more sensitive in detecting a canopy, however, as the Height Sensor Sensitivity value increases, drift suppression decreases.
- The Height Sensor Sensitivity value is set to 45 by default.



Target type

Press the Target Type to select between the ground and canopy as the desired measurement target.



Ground – This target type will use the ground signal as the primary target, but will use the canopy signal if it has a higher confidence level.

Ground locked – This target type will only use the ground signal as a target.

Canopy – This target type will use the canopy signal as the primary target, but will use the ground signal if it has a higher confidence level.

Canopy locked – This target type will only use the canopy signal as a target.

Manual/auto

Depending on the machine configuration, there can be up to three Manual/Auto toggle buttons. Each Manual or Auto toggle button controls a boom (left/right) or the center rack. If the center rack only displays a Manual button, center rack control is not enabled. Pressing this button will still transition the left and right booms into Auto mode. When in Auto mode, the XRT system will continually move the boom position to reach the target position. When in Manual mode with the Master Switch on, the system is ready to engage. Another way to switch from Manual/Auto is to press on the desired boom section.



Manual

Auto

NOTE: The XRT system for the center section is automatically in manual mode.

Sensor reading

Sensor Height displays the height for each of the sensors. The number of sensors displayed will match the number of sensors on the machine. The table below describes the Sensor Height reading in more detail.

Icon	Status	Description
()	Sensor Working/Reading	Indicates the sensor is functioning properly and reading the desired target.
*	Sensor Not Reading/ Malfunctioning	If there is an X through the sensor, the sensor is not reading a target or is malfunctioning.
F	Sensor Offline/Disabled	If there isn't a number below the sensor location, the sensor may be offline or was disabled by the user.

AutoBoom® XRT operation

Run screen operation

To control the **AutoBoom**® XRT system through the **Viper**® 4+ display:

- 1. Press the desired boom on the XRT widget to enable or disable **AutoBoom**® XRT.
- 2. Press and hold the desired widget to open additional boom information. Pressing and holding also allows the user to turn on or off the master switch.

NOTE: The **AutoBoom**® XRT system arms automatically when the boom is deployed by the AutoFold system. See "Machine settings" (**4-74**) for additional information.





NHIL22PLM0019AA 2

Universal Terminal (UT) operation

Pressing the UT widget on the run screen will open the UT interface. From this screen it is possible to adjust machine settings, view diagnostic information, and adjust Sensitivity and Target Height.



NHIL22PLM0378AA 3

AutoFold operation

NOTE: Make sure that the machine is stationary and the roading switch is set to "Off Road". AutoFold is disabled if these conditions are not met.



RAIL21SP00685BA 1
AutoFold rocker switch location



AutoFold out to spray position

To automatically fold the booms out:

1. Press and hold the AutoFold switch in the down and rearward position.

NOTE: Release the AutoFold switch at any time to abort the AutoFold cycle.

2. Release the AutoFold switch after the boom has reached the spray position.

AutoFold out to spray position – Hands free operation

To automatically fold the booms out:

1. Press and hold the service brake pedal and then press and release the AutoFold switch in the down and rearward position.

NOTE: Release the service brake pedal at any time or press the AutoFold switch again in the same direction requested to abort the AutoFold cycle.

2. Release the service brake pedal after the boom has reached the spray position.

AutoFold in to transport position

To automatically fold the booms in:

1. Press and hold the AutoFold switch in the up and frontward position.

NOTE: Release the AutoFold switch at any time to abort the AutoFold cycle.

2. Release the AutoFold switch after the boom has reached the transport position.

AutoFold in to transport position – Hands free operation

To automatically fold the booms in:

1. Press and hold the service brake pedal and then press and release the AutoFold switch in the up and frontward position.

NOTE: Release the service brake pedal at any time or press the AutoFold switch again in the same direction requested to abort the AutoFold cycle.

2. Release the service brake pedal after the boom has reached the transport position.

NOTE: It is not necessary to view the AutoFold operation main screen to perform automatic folding or unfolding functions.

Access the following settings on the AutoFold operation screen:

- Update Boom Height Limit (1) Adjusts the boom height limit above the cradle to prevent contacting the mirrors.
- Update Spray Position (2) Saves the current boom tilt position as the new target for folding OUT operation. This setting affects tilt only. The target positions for inner/outer fold joints and the center rack position are not updated.
- Update Cradle Position (3) Re-calibrates the boom tilt cradle position based on current boom position. Boom should be resting in cradle. The target positions for inner/outer fold joints and the center rack position are not updated.

NOTE: If you select this function, an additional pop-up appears with instructions. Make sure that the area is clear. Raise the booms above the cradle lip and move the booms inward until they are in contact with the cradle vertical stops. Press the check mark button when complete.



NHIL22PLM0374AA 2

Calibration

First time configuration

NOTE: Depending upon configuration settings and installed unlocks, the following steps may vary.

To perform the initial setup of the AutoBoom® XRT system:

- 1. Park the machine on a level surface.
- 2. Confirm the Machine Make (1), Machine Model (2), and Machine Configuration (3).
- 3. Press the next button (4).
- 4. Verify the number of height sensors installed on the booms and center rack. This will be three, five, or seven sensors depending upon the number of sensors installed.
- 5. If there are no Height Sensors Detected, press refresh the button (1) to re-detect the number of sensors.
- 6. Press the next button (2).

NOTE: The AutoFold feature will be calibrated at this time. See the "AutoBoom fold calibration" procedure in the "Machine Settings" section (4-74) for assistance with calibrating the AutoFold system. Once the AutoFold calibration is complete, proceed with the next step to continue the AutoBoom® XRT calibration.

- 7. The "Height Sensors Detected" window appears. It gives the serial numbers and distance to the ground of each height sensor.
- 8. Press the Next button to continue.

9. Press the Next buttons in the "ABM Orientation" screens. There is no need to change this setting, as this is a factory installation.







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NOTE: Many of the next screens will populate with default settings based on the machine configuration selected earlier.

- 10. If required, press the Location button (1) to rotate the machine view on the ABM Orientation page.
- 11. Press the next button (2).

Terrain compensation setup

- 12. Verify the machine is parked on a level surface.
- 13. Press the Calibrate Terrain Compensation button (1).
- 14. After terrain calibration compensation is complete, press the next button **(2)** to continue.



- 15. Review the information in the "ABM Hardware/Software" screen.
- 16. Press the Next button (1) to continue.



RAPH22PLM0277AA 7

- 17. Fold the boom completely into the cradle.
- 18. Press the next button to continue the fold calibration.

- 19. Raise the booms above the cradle lip. This is the height the booms will move to when returning to the cradle.
- 20. Press the Next button to continue.

- 21. Unfold the left and right inner fold joints until the inner booms are fully unfolded. Do not unfold the outer boom joints at this time.
- 22. Lower the left and right booms to their minimum position. Raise the center if necessary.
- 23. Press the Next button to continue.
- 24. Unfold the left and right outer fold joints until the booms are fully unfolded. If necessary, you can raise the booms during this procedure.
- 25. Press the Next button to continue.







RAPH22PLM0269AA 9



RAPH22PLM0270AA 10



- 26. Raise the center rack, left boom, and right boom until they are at their maximum position.
- 27. Press the next button to continue.

- 28. Lower the center rack to its minimum position.
- 29. Press the next button to continue.

- 30. Move the booms to a typical spray position. The center rack should be well below the travel stops and the inner booms unfolded.
- 31. Press the Next button to continue.

32. Enter the Center Rack Width (1). The center rack width is measured from the left boom pivot point to the right boom pivot point. The pivot point is where the boom rotates as it is raised/lowered. The pivot point is generally a horizontal steel pin.

NOTE: For **27** *m* (**90** ft) and **30** *m* (**100** ft) enter a value of **310** cm (**122** in). For **37** *m* (**120** ft), **40** *m* (**132** ft), and **41** *m* (**135** ft) booms, enter a value of **356** cm (**140** in).

- 33. Press the next button.
- 34. After center rack angle calibration is complete, press the Next button.





RAPH22PLM0273AA 13



RAPH22PLM0274AA 14



NHIL22PLM0030AA 15

- 35. Enter the Z offset from the bottom of the spray tips to the bottom of the sensor lens for the identified sensor into the Offset Z field (1). See the tables below for values.
- 36. Enter the X offset from the boom pivot point (not the machine center line) to the sensor mounting location into the Offset X field (2). See the tables below for values.
- 37. Press the next button (3).
- 38. Repeat Steps **35** through **37** for the remaining sensors.



NHIL22PLM0031AA 16

Height sensor configuration

27 m (90 ft)/ 30 m (100 ft)/ 37 m (120 ft) – 3 Sensor, / 40 m (132 ft)/ 41 m (135 ft) – 5 sensor								
Z Offset								
Boom Size	Left Outer	Left Mid	Center	Right Mid	Right Out			
27 m (90 ft)/ 30 m (100 ft)	0 cm (0 in) below	Not applicable	0 cm (0 in) above	Not applicable	0 cm (0 in) below			
37 m (120 ft) (steel)	0 cm (0 in) above	Not applicable	0 cm (0 in) above	Not applicable	0 cm (0 in) above			
37 m (120 ft) (aluminum)	2.5 cm (1 in) below	Not applicable	2.5 cm (1 in) below	Not applicable	2.5 cm (1 in) below			
40 m (132 ft)/ 41 m (135 ft)	2.5 cm (1.0 in) below	5.1 cm (2.0 in) below	5.1 cm (2.0 in) below	0 cm (0 in) above	5.1 cm (2.0 in) below			
		X Of	fsets					
Boom Size	Left Outer	Left Mid	Center	Right Mid	Right Out			
27 m (90 ft)/ 30 m (100 ft)	1179 cm (464 in)	Not applicable	0 cm (0 in)	Not applicable	1179 cm (464 in)			
37 m (120 ft) (steel)	1552 cm (611 in)	Not applicable	0 cm (0 in)	Not applicable	1552 cm (611 in)			
37 m (120 ft) (aluminum, 15 in)	1648 cm (649 in)	1179 cm (464 in)	0 cm (0 in)	1179 cm (464 in)	1648 cm (649 in)			
37 m (120 ft) (aluminum, 20 in)	1626 cm (640 in)	1181 cm (465 in)	0 cm (0 in)	1179 cm (464 in)	1626 cm (640 in)			
40 m (132 ft)	1788 cm (704 in)	772 cm (304 in)	0 cm (0 in)	772 cm (304 in)	1788 cm (704 in)			
41 m (135 ft)	1862 cm (733 in)	841 cm (331 in)	0 cm (0 in)	841 cm (331 in)	1862 cm (733 in)			

27 m (90 ft)/ 30 m (100 ft)/ 37 m (120 ft) – 5 Sensor, 37 m (120 ft)/ 40 m (132 ft)/ 41 m (135 ft) – 7 sensor							
Z Offset							
Boom Size	Left Outer	Left Mid		Center		Right Mid	Right Out
27 m (90 ft)/	0 cm (0 in)	Not	0 cm (0 in)	0 cm (0 in)	0 cm (0 in)	Not	0 cm (0 in)
30 m (100 ft)	below	applicable	below	above	below	applicable	below
37 m (120 ft)	0 cm (0 in)	0 cm (0 in)	0 cm (0 in)	0 cm (0 in)	0 cm (0 in)	0 cm (0 in)	0 cm (0 in)
(steel)	above	above	above	above	above	above	above
37 m (120 ft)	2.5 cm (1 in)	7.6 cm (3 in)	5.1 cm	0 cm (0 in)	5.1 cm (2 in)	7.6 cm (3 in)	2.5 cm
(aluminum)	below	below	(2 in) below	below	below	below	(1 in) below
40 m (132 ft)/	2.5 cm	5.1 cm	5.1 cm	0 cm (0 in)	5.1 cm	5.1 cm	2.5 cm
41 m (135 ft)	(1.0 in)	(2.0 in)	(2.0 in)	above	(2.0 in)	(2.0 in)	(1.0 in)
	below	below	below		below	below	below
	-	-			-		

			-	-		-		
X Offsets								
Boom Size	Left Outer	Left Mid	Left Main	Center	Right Main	Right Mid	Right Out	
27 m (90 ft)/	1179 cm	Not	701 cm	0 cm (0 in)	701 cm	Not	1179 cm	
30 m (100 ft)	(464 in)	applicable	(276 in)		(276 in)	applicable	(464 in)	
37 m (120 ft)	1552 cm	1143 cm	777 cm	0 cm (0 in)	777 cm	1143 cm	1552 cm	
(steel)	(611 in)	(450 in)	(306 in)		(306 in)	(450 in)	(611 in)	
37 m (120 ft)	1626 cm	1179 cm	780 cm	0 cm (0 in)	777 cm	1179 cm	1626 cm	
(aluminum, 15 in)	(640 in)	(464 in)	(307 in)		(306 in)	(464 in)	(640 in)	
37 m (120 ft)	1648 cm	1181 cm	790 cm	0 cm (0 in)	777 cm	1181 cm	1648 cm	
(aluminum, 20 in)	(649 in)	(465 in)	(311 in)		(306 in)	(465 in)	(649 in)	
40 m (132 ft)	1788 cm	1278 cm	772 cm	0 cm (0 in)	772 cm	1278 cm	1788 cm	
	(704 in)	(503 in)	(304 in)		(304 in)	(503 in)	(704 in)	
41 m (135 ft)	1862 cm	1349 cm	841 cm	0 cm (0 in)	841 cm	1349 cm	1862 cm	
	(733 in)	(531 in)	(331 in)		(331 in)	(531 in)	(733 in)	

NOTE: If using a **37** *m* (**120** *ft*) boom in a 5 sensor configuration, left-mid and right-mid values are not applicable.

- 39. Set the booms parallel and under 2.4 m (8 ft) from the ground.
- 40. Press the next button to continue.

- 41. Raise the left boom until there is at least a 101.6 cm (40 in) change in height.
- 42. Press the next button when it appears.

- 43. Raise the right boom until there is at least a 101.6 cm (40 in) change in height.
- 44. Press the next button to continue.

- 45. If an Inertial Measurement Unit (IMU) is installed on the machine, skip to Step 48.
- 46. Lower and level the booms.
- 47. Have an assistant manually rock the boom up and down until the Next arrow appears. The Next button only appears when the voltage is more than 0.25 V apart.
- 48. Press the Next button.













NOTE: The boom will move on its own for the next few steps. Verify nobody is standing near the booms.

- 49. Raise the center rack and set the booms level.
- 50. Press the Next button. The system then performs an automatic calibration sequence to determine the duty cycle required to keep the boom stationary.
- 51. If prompted, manually raise or lower booms and press the Next button to continue calibration.
- 52. Review the information on the height sensor setup page.
- 53. Press the next button.
- 54. Review the information on the system summary page.
- 55. Press the next button. The XRT home screen will be displayed.

NOTE: If features are not visible on the XRT home screen, it means those features are locked. To unlock these features, follow the directions on "Feature unlock codes" (**4-81**).



NHIL22PLM0036AA 21

Calibrations: AutoFold and AutoBoom® XRT(if equipped)

From the Universal Terminal (UT), press the button (1) on the right-hand pane to access the machine settings screen.



Select the "Calibrations" button on the "Machine Settings" screen to access the available calibrations for the Auto-Fold and **AutoBoom**® XRT (ife quipped) system.

The following operations are available:

- Auto-index of height sensors (4-62)
- Base control effort calibration (4-64)
- Terrain compensation calibration (4-66)
- AutoFold calibration (4-68)
- Boom angle calibration (left-hand, center, right-hand) (4-71)
- Reset to defaults (4-73)



Calibration — Auto-index of height sensors

The "Auto-Index of Height Sensors" calibration allows the user to verify the number of height sensors and update the location of the sensors. The user will be prompted to raise the left-hand and right-hand booms. By observing which sensors had the greatest increase in height at each step, the system learns which sensor is at each location on the boom.

From the "Machine Settings > Calibration" screen, select the "Auto-Index of Height Sensors" button.



- 1. Verify the number of height sensors detected matches the number installed on the machine.
- 2. If all sensors are detected, press the next button to continue.



NHIL22PLM0049AA 2

- 3. Unfold the boom and set the booms to level and less than **2.4 m** (**8 ft**) above the ground.
- 4. When both booms are unfolded and level, press the Next button to continue.



- 5. Raise the left-hand boom.
- When all sensors on the left-hand boom have been raised above 2.4 m (8 ft), the Next button will appear. Press the Next button to continue.

- 7. Raise the right-hand boom.
- When all sensors on the right-hand boom have been raised above 2.4 m (8 ft), the Next button will appear. Press the Next button to continue.

9. The location and offsets for each sensor are displayed on a summary page. Press the next button to complete the calibration.



Height Sensor

 Setup

 Raise Right Boon
 Image: Construction of the provide above the provide



NHIL22PLM0390AA 6

Calibration — Base control effort

Accurate base control effort values are necessary for successful advanced tuning. Only perform a Base Control Effort Calibration after warming the hydraulic oil. If possible, engage AutoBoom and drive slowly for two minutes prior to performing Base Control Effort calibration. This will ensure the Solenoid coils are at operating temperature and will give the most accurate Base Control Effort.

From the "Machine Settings > Calibration" screen, select the "Base Control Effort Calibration" button.



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Ensure the area is clear. Raise the center rack to the full extent and set the booms to a level position within 5° of parallel.

1. Verify the master switch (1) is ON. Press the Next button (2) to continue.

NOTE: The booms will begin to move.



2. The system proceeds through the calibration.



3. When the calibration is complete, the new values will be displayed.



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Calibration — Terrain Compensation Calibration

From the "Machine Settings > Calibration" screen, select the "Terrain Compensation Calibration" button.



NHIL22PLM0048AA

- 1. The ABM orientation procedure allows the user to verify or update the Electronic Control Unit (ECU) orientation and re-calibrate the inertial sensors in the ABM module.
- 2. Make sure the machine is parked on a level surface. Press the "Redetect Orientation" button.
- 3. The modules are factory installed on this sprayer. Press the Next button to continue.



- 1. Verify the machine is parked on a level surface.
- 2. Press the Calibrate Terrain Compensation button (1).
- 3. After terrain calibration compensation is complete, press the next button (2) to continue.



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Calibration: AutoFold

The AutoFold calibration re-calibrates the sensors used for performing automatic folding operations. This should be performed if sensors have been adjusted or replaced, or if AutoFold is not completing an AutoFold IN or AutoFold OUT sequence.

From the "Machine Settings > Calibration" screen, select the "AutoFold Calibration" button.



- 1. Fold and lower the booms completely into the cradle.
- 2. Press the next button to continue the fold calibration.



- 3. Raise the booms above the cradle lips. Move the booms inward until they are in contact with the vertical stops. This is the height the booms will move to when returning to the cradle.
- 4. Press the Next button to continue.



RAPH22PLM0289AA 3

- 5. Unfold the left-hand and right-hand inner fold joints until the booms are fully unfolded. Do not unfold the outer boom joints.
- 6. Carefully lower the left and right booms to their minimum position. Raise the center if necessary.

NOTE: Do not allow the booms to hit the ground.

- 7. Press the Next button to continue.
- 8. Unfold the left-hand and right-hand outer joints fully.

NOTE: The booms may be raised up to complete this step.

9. Press the next button to continue.

- 10. Raise the center rack to the maximum height and tilt the booms up to the full travel extent.
- 11. Press the next button to continue.



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NHIL22PLM0064AA 5



NHIL22PLM0065AA 6



- 12. Lower the center rack to its minimum travel position.
- 13. Press the Next button to continue.

- 14. Move the booms and center rack to the desired spray position. This is the position the boom will move to when unfolding out. Note that the center rack height will be re-learned each time an AutoFold in operation is performed. The left-hand and right-hand tilt will not be re-learned.
- 15. Press the next button to finish the calibration.



NHIL22PLM0066AA 8

Calibration — Boom angle calibration

From the "Machine Settings > Calibration" screen, select the appropriate button (Left, Center, or Right) for boom angle calibration.



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Boom angle calibration (left-hand or right-hand)

- 1. Set the booms parallel and under **2.4 m** (**8 ft**) from the ground.
- 2. Press the next button.



- 3. Raise the right-hand boom until there is at least a **101.6 cm (40 in)** change in height.
- 4. Press the next button.



5. Raise the left-hand boom until there is at least a **101.6 cm** (**40 in**) change in height.



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Calibration — Reset to Defaults

Selecting the "Reset to Defaults" button allows the user to reset AutoBoom® XRT to factory default settings.

From the "Machine Settings > Calibration" screen, select the "Reset to Defaults" button.



Press the Accept button to acknowledge the changes. **NOTE:** Unlocks will not be erased during the reset.



Settings

Machine settings

NOTE: Configuration from within the "Machine Settings" screen is the same, regardless of if the sprayer is equipped with three, five, or seven height sensors.

From the Universal Terminal (UT), press the button (1) on the right-hand pane to access the machine settings screen.



BM-Setup

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Machine Settings

Boom

Display

Presets

Machine Settings Home

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2

Ξ

Boom

Fold

From the machine settings home screen, you can access:

- Boom configuration
- Display configuration
- Height sensor configuration
- Presets configuration
- Boom tuning
- Fold tuning
- Calibrations

Boom configuration

The "Boom Configuration" screen allows the user to adjust the center rack width (1), enable or disable center rack control (2), and enable or disable the variable damper system (if equipped). If the "Center Rack Control" check box is blank, the system will not automatically raise or lower the center rack based upon height sensor readings.



Display configuration

The "Display Configuration" screen allows the user to create a customized view of the **AutoBoom**® XRT home screen. This may be useful for diagnostics and troubleshooting.

- 1. Select "Display Configuration" from the machine settings screen. A window will open that represents the editable sections of the **AutoBoom**® XRT home screen.
- 2. Press "Selected Readout" (1) in the desired area.
- 3. Select the desired value for that location from the dropdown (2) at the bottom of the screen.

AutoFold percentage position display

4. Select the "AutoFold Percentages" option at the bottom of the screen to view the current joint fold positions instead of the "AutoBoom sensor readouts" on the **AutoBoom**® XRT home screen.





Toggle Auto/Manual

- Select the "Enable/Disable Readout" option at the bottom of the screen to replace sensor readings on the AutoBoom® XRT home screen with large "Auto/Manual" toggle buttons. This can help the operator more easily confirm whether a boom fold section is engaged or not during AutoBoom operation.
- 6. After all the selected readouts are configured, press the checkmark button.

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NHIL22PLM0041AA 6

Height sensor configuration

The "Height Sensor Configuration" screen allows the user to change the sensor offset, review software information, or select "Sensor Enable" (4). This screen also allows the user to swap the sensors by pressing the "Swap Sensors" button (5) and update sensor software by pressing the "Height Sensor Update" button (6).

"Offset X" (1) is the horizontal distance from the pivot point of that boom (near the left-hand or right-hand shoulder). "Offset Z" (2) is the vertical distance between the spray tip and the lens of the height sensor. If the sensor is below the spray tip, the "Mount" field (3) should be set to "Below".

Select the different sensors shown on the sprayer boom to modify the configuration of the selected sensor. See the table, "Height sensor configuration" in "First time configuration" (**4-53**) for specifications.

If you physically swap sensors on the machine, press the "Swap Sensors" button **(6)** to open the "Height Sensor Swap" window.

If you physically swapped sensors on the machine, select the two sensors that were swapped. Once both are selected, press the Swap button (1).





Height sensor configuration

The "Height Sensor Updates" screen allows the user to update software on the height sensors. The sensors may be updated individually by selecting each sensor and pressing the "Reprogram Selected" button **(1)**. Alternatively, all sensors my be programmed by pressing the "Reprogram All" button. Height sensor software is bundled with the AutoBoom Module (ABM) software. No external file is needed for updating height sensor software.



NHIL22PLM0043AA 9

Presets configuration

The Presets Configuration window allows the user to select the desired Preset Mode, select the number of Taps to enable the mode, and select the Joysticks checkbox if using the joystick will enable the mode.

Boom control switches can be configured to perform certain functions depending on the number of joystick presses. For example, the user can configure the system to raise the boom to a higher position (e.g. for end of row turnaround) when the switch on the joystick is quickly tapped up three times.

To configure presets:

- 1. Select "Presets Configuration" from the "Machine Settings" screen.
- 2. Select the desired boom (1). Each boom will have its own settings from each preset selected.
- 3. Select the desired "Preset Mode" (2).
 - Spray Mode Standard XRT operation mode
 - Preset 1 User-customizable mode
 - Preset 2 User-customizable mode
- 4. Select the "Trigger Method".
 - $_{\odot}\,$ There is one trigger method per Preset mode.
- 5. Select the "Control To" option.
 - Height The preset will control to a user-selected height.
 - $_{\odot}$ Angle The preset will control to a user-selected angle.
 - Spray Height The preset will control to the height in the Spray mode.
 - Transport The preset will control to a max height and disable the wing when it reaches the height.
- If desired, select the "Joysticks" check box (3). Selecting Joystick enables or disables joystick shortcuts for mode changing.
- 7. To activate the preset, press the joystick button in the direction selected as the trigger type and press it the number of times selected as number of taps (4).



Boom tuning

Boom tuning displays boom settings based on machine configuration (Make, Model, Boom Width) options selected during initial calibration. If needed, the user can adjust "Speed to Duty Cycle", "Down Speed Ratio", "Base Duty Cycle", "Height Deadband", and PID gain settings. Use the "Boom Gains" and "Boom Speed Tuning" buttons (1) to toggle between the two screens.

NOTE: Pressing the "Reset Tuning" or "Reset Gains" buttons (2) only reset the values displayed on that screen. The values are reset to defaults specific to your machine Make, Model, and Boom Width.

For more information, see the "AutoBoom® XRT advanced tuning" section starting on **4-82**.

Fold tuning

NOTE: In some software versions fold tuning is found in "ABM Diagnostics" in the "System Information" screen under ."Manual Fold Settings."

The "Fold Tuning" screen displays fold settings based on machine configuration (Make, Model, Boom Width) options selected during initial calibration. If needed, the user can adjust sensitivity, base duty cycle, and the minimum/maximum values.

- "Fold Sensitivity" (1) Sensitivity can be set independently for Up/In and Down/Out. Higher sensitivities correspond to faster movements during manual boom movement.
- "Base Duty Cycle" (2) Base duty cycle (lift only) is the duty cycle required to hold the booms level/stationary. Changing this value does not effect the equivalent value for AutoBoom.
- "Min"/"Max" (3) The minimum and maximum values set the maximum and minimum duty cycle that will be applied to the specified joint when the system is Auto-Folding In or Out. The minimum and maximum values do not affect manual folding operations.

NOTE: These settings are only available for boom joints that have proportional hydraulic cartridges.



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Fore/aft tuning

The "Fore/Aft Tuning" screen allows you to make adjustments for when the system will attempt to adjust the booms to be square.

• The "Position Engage Deadband" setting (1) is the point at which the AutoYaw system activates and moves the booms back to a square position.

NOTE: This setting cannot be less than the "Position Disengage Deadband" setting.

• The "Position Disengage Deadband" setting (2) is the point at which the AutoYaw system deactivates and the booms are considered square to the machine.

NOTE: This setting must be greater than zero.

Both the "Position Engage Deadband" and "Position Disengage Deadband" settings are displayed as a "percentage from square" value.

Calibrations

See "Calibrations: AutoFold and AutoBoom® XRT(if equipped)" (4-61).



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Alarm settings

The "Alarm Settings" tab provides the option to

- Sound audible beeps from the display when AutoBoom transitions from Auto mode to Manual, and from Manual mode to Auto.
- Disable audible beeps for alarms when the boom is folded.

Press the check box to toggle the audible beeps ON or OFF.



NHIL22PLM0393AA
Feature unlock codes

Press the machine settings button on the home screen.



Press the "Feature Unlocks" tab (1).

The "Feature Unlocks" tab displays a green padlock next to features that are already unlocked. A red padlock is displayed next to features that are not unlocked.

To enter a feature unlock code, press the padlock icon (2) next to the feature to be unlocked, and then enter the unlock code. Press the check box to submit the entered code.

NOTE: Dashes may be omitted, letters may be entered in either upper or lower case.

NOTE: A message will display indicating whether or not the unlock code that was entered is valid. If the code is valid, the padlock icon next to the feature will turn green and indicate that it is unlocked. After unlocking a feature, a calibration is required before any **AutoBoom**® XRT function can be used. NHIL22PLM0378AA 1



NHIL22PLM0394AA 2

AutoBoom® XRT advanced tuning

Preparation

Sensor dimensions

Verify the system dimensions are entered correctly for height sensor offsets and center rack width.

Boom angle sensor

Make sure that the automated calibration sequence is performed over flat ground. If the sensor dimensions were updated, re-perform the boom angle sensor calibration.

Base control effort calibration

Accurate base control effort values are necessary for successful advanced tuning. Only perform a base control effort calibration after warming the hydraulic oil. If possible, engage AutoBoom and drive slowly for two minutes prior to performing the base control effort calibration. This will ensure the solenoid coils are at operating temperature and will give the most accurate base control effort.

Hydraulic oil

For best results, perform tuning with the hydraulic oil at normal operating temperature.

Boom speed to control effort scale

The boom speed to control effort scale value correlates the required Pulse Width Modulated (PWM) duty cycle to the hydraulic valve to create the desired boom speed.

To determine the boom speed to control effort scale:

- 1. Press the "Diagnostics" button on the left-hand pane of the home screen.
- 2. Select the "Tests" tab (1).
- 3. Select "Target Velocity Test" (2).
- 4. Press "Begin" (3).

Select a boom section and test type, and then enable the master switch and press play to begin the test.

NOTE: Press the stop button or any joystick button to stop the test.



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NOTE: The "Target Velocity" value (1) is set to a default value and cannot be modified.

- 5. Raise the center rack with one boom lowered near the ground (but at least **61 cm (24 in)** above the ground).
- 6. Press the "Start Test" button. The boom should raise. When the test is complete, the average velocity will display.
- 7. Press the settings (small gear) button on the tab.
 - If the boom moved faster than the desired 2 °/s, decrease the boom speed to control effort value.
 - If the boom moved slower than the desired 2 °/s, increase the boom speed to control effort value.
- 8. Repeat Step 3 through Step 8 until the speed matches the target velocity (+/- 20%).
- 9. Repeat Step 3 through Step 9 for the other boom.

NOTE: Test results are affected by solenoid coil temperature. Perform the tests three or more times in rapid succession for best results. NHIL22PLM0395AA 2





NHIL22PLM0397AA 4

Down speed ratio

Because of different flow restrictions and the affect of gravity, booms generally lower faster than the raise for the same change in control effort. Down speed ratio accounts for this difference.

To determine if down speed ratio must be adjusted:

- 1. Press the "Diagnostics" button on the left-hand pane of the home screen.
- 2. Select the "Tests" tab (1).
- 3. Select "Target Velocity Test" (2).
- 4. Press "Begin" (3).
- 5. Set the "Target Velocity" value (1) to -2 °/s (degrees per second).
- 6. Raise the center rack and tilt one boom so the boom is approximately **5°** above horizontal.
- 7. Press Start Test. The boom should lower. When the test is complete, the average velocity will display.
- 8. Press the settings (small gear) button on the tab.
 - If the boom moved faster than the desired 2 °/s, decrease the down speed ratio.
 - If the boom moved slower than the desired 2 °/s, increase the down speed ratio.
- 9. Repeat Step 3 through Step 8 until the speed matches the target velocity (+/- 20%).
- 10. Repeat Step 3 through Step 9 for the other boom.

NOTE: Test results are affected by coil temperature. Perform the tests three or more times in rapid succession for best results.

NOTE: At this point, most machines should be performing optimally. If further tuning is necessary, test the machine performance in the field before adjusting boom gains, outlined on **4-85**.



NHIL22PLM0072AA



NHIL22PLM0398AA 2

Boom gains

After verifying all of the previous configuration steps and boom speed tuning is complete, the following values may be adjusted by going to "Machine Settings", and then to "Boom Tuning".

Proportional gain

Larger proportional gain (P-gain) values result in higher velocity for the same error in height. Typical values are 1.0 to 1.8. Too high of value will make the boom twitchy or unstable. Too low of a value and the boom will not move quickly enough to changes in ground/crop height.

Integral gain

Integral gain (I-gain) compensates for changes in base control effort over time. This could be caused by oil temperature, valve coil temperature, boom weight, or other system changes. This is generally set between 0.001 and 0.003. To disable this feature, set the value to 0.000.

Derivative gain

Derivative gain (D-gain) prevents overshoot when moving the boom from one target position to another. If D-gain is too low the boom will overshoot the target position. A D-gain that is too high may cause a ratcheting (stop and go) effect until the target position is reached.

System gain

System gain (S-gain) makes the complete system more or less responsive. This is equivalent to the "Sensitivity" value on the **AutoBoom**® XRT home screen.

Direct chemical injection operation (if equipped)

Home screen



Open the Universal Terminal (UT) menu and select the direct chemical injection ISO Client Device (ICD) menu button.



Press the home button. The following information appears:

Direct chemical injection ICD main screen information

Display	Icon	Description
Actual Flow	\sqrt{N}	Displays the actual flow rate of the pump during operation.
Target Flow	⊕/⊠	Displays the target flow rate of the pump.
Actual Pump State		Shows if the actual state of the pump is ON or OFF.
Pressure	ş,	Displays the pressure at the injection pump pressure transducer.
DI Efficiency	×	Displays the efficiency value of the pump during operation. Typical values range from 60 – 100% and vary depending upon ambient temperature, product viscosity, system plumbing, and system pressure.
Current Volume	-0-	Displays the volume of product dispensed during field operation. The user can reset the value.
Motor PWM	DC	Displays the motor Duty Cycle (between 0 – 100%) value during operation.
Motor Voltage	4	The voltage for the high current bus circuit. High current power is provided to system components such as the motor.
Motor RPM	0	Displays the Motor RPM of the injection pump during operation.
Rinse Assist	No icon	Allows the user to toggle the state of the Rinse Assist feature if equipped. If ON, the pump will ignore target rate messages and will allow the user to perform rinse cycles. If OFF, the pump returns to normal operation.
Agitation		Allows the user to toggle the state of the agitator to ON or OFF if an agitator is equipped.

Current totals



Open the Universal Terminal (UT) menu and select the direct chemical injection ISO Client Device (ICD) menu button.



Select the totals data icon.



Select the current totals tab. The following information appears:

Current totals

Display	lcon	Description
Actual Flow	\sqrt{N}	Displays the actual flow rate of the pump during operation.
Target Flow	⊕/⊠	Displays the target flow rate of the pump.
Tank Percentage		Displays the current percentage of the tank volume to the tank capacity.
Pressure	÷\$\$	Displays the pressure at the injection pump pressure transducer.
Current Volume	-0-	Displays the volume of product dispensed during field operation. The user can reset the value.
Actual Rate	5/1/	Displays the actual rate of injection during operation.
Target Rate	⊕/⁄/	Use this field to enter the target rate of injection for field operation.
Area per Hour		Displays the current rate at which area is covered.
Area Remaining	1/2	Displays the calculated area that can be covered with the volume of product remaining in the tank.
Speed	, and	The speed of the machine reported via the ISOBUS system.
Area		The total area covered since the last time the tally was reset.

Device totals



1 2 3

Open the Universal Terminal (UT) menu and select the direct chemical injection ISO Client Device (ICD) menu button.



Select the device totals tab. The following information appears:

Select the totals data icon.

Device totals

Display	Icon	Description
Device volume	-0-	Running tally of the operating life of the system. Cannot be reset by the machine operator.
Engaged hours		Amount of time the pump has actively pumped product.
Software hours	X	Amount of time the software has been running.
Area		The total area covered by the system.

5 - TROUBLESHOOTING

Rate Control Module (RCM) diagnostics and troubleshooting

Rate Control Module (RCM) Light-Emitting Diode (LED) status

There are four Light-Emitting Diodes (LED) on the front of the Rate Control Module (RCM). Each LED color and flash rate indicates different information as detailed in the table below. If multiple states are true for a given LED, the first active state listed in the table will be the state displayed. After addressing the displayed state (if needed), the next LED state will be indicated.

- **(A)** A
- **(B)** B
- (**C**) C
- (D) Power



LED status indicator

LED	Color	State	State
Power	Green	Solid	The RCM is powered on
	Off	Solid	The microprocessor is not powered.
	Any	Solid	The microprocessor has stopped functioning.
	Yellow	1 Hz	Active when the boot loader enters boot hold mode.
A	Pod	5 Hz	Active when the microprocessor is being programmed.
	Reu	1 Hz	Active if the ISOBUS is offline.
	White	1 Hz	Active if the Universal Terminal (UT) is offline.
	Green	1 Hz	Active when linked with UT and system is normal.
	Red	Solid	The PCB subsystem not running (FPGA).
		1 Hz	The system has lost RCM power.
	Blue	1 Hz	Signal is present on 1 or more rate sensors.
	Yellow	1 Hz	One or more fault codes are active.
В	White	1 Hz	The system voltage is below 11.5 V.
	Purple	1 Hz	The system voltage is above 16 V .
	Blue	Solid	One or more product switches have been set to On.
	Purple	Solid	Signal is present on one or more RPM sensors.
	Green	Solid	All product switches have been set to Off.
	Red	Solid	The PCB subsystem not running (FPGA).
	Blue	1 Hz	Bluetooth® command has been received.
0	Blue	Solid	Bluetooth® communication is active.
ر د	Green	1 Hz	The Auxiliary CAN channel is active.
	Red	1 Hz	Active if the Auxiliary CAN channel was active and is now offline.
	Green	Solid	LED C is functional and there are no other LED C states to report.

Nozzle Control Valve (NCV) Light-Emitting Diode (LED) status

Each Nozzle Control Valve (NCV) provides a diagnostic Light-Emitting Diode (LED) (1).



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State	Rate	Color	State	Before calibration	After calibra- tion	Profile detected, not calibrated	Description
		Green	NCV Ready to Apply		х		Normal State - Will flash when system is fully calibrated.
Flashing		Yellow	NCV Missing Calibration or Active fault code		х	х	Normal State - Will flash after NCVs have been indexed, but calibration is not complete. Error State - Active fault code for the system.
	1 Hz	Red	Lost communication between RCM-S ECU and NCV or NCV has <9 V HC power.	х	х	x	Normal State - Will flash when NCVs are not calibrated or when editing a profile until the NCVs have been detected.
		Blue	NCV has not claimed a CAN address or no CAN communication received by NCV.	х	x	x	Normal State - Quick blue flash after calibration has been initiated, then will start flashing red. Error State -Will flash slow blue if it has lost communication with upstream NCV.
	4 11-7	Green	NCV Commanded to Apply		х		Normal State - Will flash when NCV is commanded to apply or when active width is non-zero.
	4 NZ	Blue	NCV CAN Channel Errors		×		Error State - Will flash fast blue if it has lost communication with downstream NCV.
	5 Hz	Red	NCV in Bootloader Mode		х		Normal State -Flashes during software update.
Solid	_	Blue	CAN Pass-Through Disabled		x		Error State - Will be solid blue for a short time, then will begin flashing to indicate a communication error with a nearby NCV.
	_	White	NCV Selected on UT info Page		Х		Normal State - Solid when a specific NCV is selected on the UT screen.
Off	-	 -	No Power		х		Normal State - Will be off when NCV is not powered or the vehicle is in motion.

System diagnostics

System and Nozzle Control Valve (NCV) information, diagnostics, and tests are accessible via the Diagnostics softkey displayed along the right side of the page.

To access System or NCV Diagnostics:

- 1. Open the Universal Terminal (UT) menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Press the Diagnostics button (2).

Refer to the following sections for additional system or NCV diagnostics information:

- System Diagnostics section below
- "Nozzle Control Valve (NCV) diagnostics" (5-19)
- "Nozzle Control Valve (NCV) updates" (5-22)



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System information

To review information about the AIM Command FLEX $^{\rm TM}$ II :

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Diagnostics softkey (2).
- 3. Select the System Information button (3). The following information is displayed on the page:



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Hardware/Software. Displays hardware and software information for the Electronic Control Unit (ECU).

Delivery System. Displays application information for the product when active and applying.

System Voltages. Displays voltage and current information for the ECU and attached sensors.

Tank Fill Monitor. Displays fill rate, fill volume, and fill meter frequency from fill flowmeter.

Speed Source. Displays any detected speed sources and options to select. "Auto" is recommended for most applications.

Switch Box. Displays detected section control switch status information.

Section Status. Displays section driver status information.

Working Parameters. Displays the implement width, current speed, speed source, speed source ISO name, and address.

Pressure Sensors. Displays voltages and pressure information for each pressure sensor.

Task Totals. Displays the area covered and volume applied for the current task.

Inertial Sensors. Displays the detected ECU yaw rate and downward direction.

CAN Network. Displays Busload for ISO CAN network and NCV CAN network, which can be helpful to identify excessive CAN traffic. Also displays status of CAN 3 and CAN 4.

Tests

Run diagnostic tests to check system operation, for help locating components requiring service or replacement, and other information to assist with keeping the **AIM Command FLEX™ II** working at maximum efficiency.

To access available tests:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Diagnostics softkey (2) along the right side of the page.
- 3. Select the Tests Tab (3) at the top of the page. The following diagnostic tests are available:



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NCV Communication Test. Scans the NCV CANbus communication and assists in locating where issues may be present. Boom graphics show indexing order from leftmost to rightmost NCVs. No Communication After and Communication Resumes At values will be shown. When only a few NCVs are noted, inspect nearby NCVs, connections, pins, and cabling for corrosion, visible damage, or pinching between those NCVs. In some instances, splices or wiring may be damaged underneath cable sheathing. Inspect those items along with fuses, connectors, and terminators when large sections of NCVs are not communicating.

NOTE: See "Nozzle Control Valve (NCV) offline troubleshooting" (5-23) for additional assistance with NCV.

Controller Statistics. This process allows you to view detailed product controller performance and health statistics including Boom Pressure, Target Pressure, Pump Control Effort, Actual Flow per Area, and Target Flow per area over a user-defined amount of time. You may start the test immediately or press delayed start to start the test later. The test will record up to two parameters, and provide a graph of performance.

NCV Statistics. Allows access to view NCV statistics including Driver Temperature, Logic Temperature, Open Hold Current, Powered Time, and HC Voltage Minimum. Press Start Data Visualization to generate an on-screen graph of each NCV. Arrow over to see data for a specific NCV.

NCV Updates. Scans all NCVs for potential updates. If an update is detected, an option will be given to update the software. This test requires the engine to be running and the NCV bus to be communicating and properly terminated.

Calibrate NCVS. This test will allow you to recalibrate your NCVs. This process is recommended after replacing one or more NCVs.

Reboot Product Controller. Allows you to reboot the product controller ECU. This will reset the controller and reinitialize communication with the CANbus without resetting controller parameters.

Boom Pressure Relief. This procedure will activate the NCVs or section valves or open the recirculation valve for **10 s** to relieve pressure to the product tank when the product pump is turned off. System pressure may be monitored on the screen. Ensure the machine is in a safe area and the master switch is on prior to beginning this procedure.

NOTE: When recirculation is configured, Boom Pressure relief will relieve pressure to the product tank through the recirculation valve instead of dispensing product through the NCVs.

Boom Prime. This procedure will prime the boom with product by opening the section valves and NCVs. Each section valve switch must be on, and the master switch must be turned on. The product pump will turn on and product will dispense out the boom for the entered Section Auto-Operation Times, beginning from the outermost and progressing inward.

Pulse-Width Modulation (PWM) Health Test. This test analyzes the performance and control range of the PWM pump control valve when equipped.

During the test, the system will automatically increase PWM duty cycle and monitor system boom pressure and provide the control range and system output parameters. The minimum and maximum control effort values will be calculated, and overall health will be determined. For best control, the PWM control range should be greater than **20%** and the graphed line should not have large steps where the displayed pressure is constant during the test.

NOTE: A narrow overall range, large steps in control, or high response hysteresis (significant differences between increasing and decreasing duty cycle performance) may result in erratic system performance. Consult with your CASE IH dealer if the test repeatedly shows these types of errors.

Demonstration Mode. Allows you to simulate typical operating pressure and system flow. This is only intended for bench-top simulation and not for use on a live machine. Failure to comply may result in product being dispensed as the control valve may be actuated based on the simulation conditions.

Service Menu. Allows access to enhanced diagnostics and features.

Perform the PWM health test

NOTE: For this test, park the sprayer in a safe area. The test can be run without turning on the master switch and spraying product for systems that do not have injection systems installed. Product should be in the tank, and the sparge should be closed to prevent system flow losses. Engine RPM should be at least 1800. Ensure system plumbing is not pinched and strainers are clean. If the system has a check valve for direct injection, the system must spray product to determine valve performance. Park the sprayer in a safe area and turn on master switch and all boom switches while performing this test.

- 1. Ensure there is product in the main product tank.
- 2. Close all open agitation or sparge lines.
- 3. Ensure all machine control valves are directed to the spray position.
- 4. Press Begin under the PWM Health test.
- 5. Set engine RPM to approximately **1800 RPM** during the test.

NOTE: If the test cancels due to system over-pressure, you may need to slightly decrease engine RPM and run the test again.

- 6. Turn on the system master spray switch.
- 7. Press the Next button to start the test. The test will start running the product PWM control valve at the minimum duty cycle, up to the maximum duty cycle, and back to the minimum. The system flow and pressure will change while this test is happening and product will spray out of the nozzles.

NOTE: Press the Cancel button to stop the test at any time.

- 8. Once the test is complete, the PWM valve will turn off.
- 9. Turn off the master spray switch and return the engine RPM to idle. If the PWM cartridge has sufficient range, a green check mark will display on the page.
- 10. Press Apply Suggested Settings to accept the suggested changes to the PWM range or Ignore to keep the previous values.
- 11. Press the Accept button to return to the previous page.

PWM health test - Example results

Good Control Performance. Example of PWM control valve performing well with good response hysteresis. Curves do not have significant areas of flat spots, and go over a large portion of the Control Effort Duty Cycle % range.



Good Control Range. Example of PWM valve having good overall control range and a large difference (**>20%** overall range) between minimum and maximum Control Effort Duty Cycle %. Apply suggested changes to optimize control range for the system.

Poor Performance - Steps in Control. Example of poorly performing PWM control valve. Curves have large control steps, which will result in unresponsive control and poor system performance. PWM control valve may need to be cleaned or replaced.

Poor Performance - Narrow Control Range. Example of very narrow PWM valve control range. Pressure reaches maximum in a very narrow Control Effort Duty Cycle % range (<20% overall range). Target Rate, Pressure, Speed, and Tip selection must be carefully chosen to ensure control is adequate. Increasing agitation may help in some cases if possible.

Poor Performance - Narrow Control Range. Example of very narrow PWM valve control range. Pressure reaches maximum in a very narrow Control Effort Duty Cycle % range (**<20%** overall range).



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Fault codes

Displays active and inactive fault codes and provides the ability to clear active fault codes:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Diagnostics softkey (2) along the right side of the page.
- 3. Select the Diagnostic Trouble Code (DTC) tab (3).
 - Current trouble codes are displayed in the Active table. The fault code number and occurrence count is listed.
 - Resolved trouble codes are displayed in the Inactive table. The fault code number and occurrence count is listed.
- 4. Use the up and down arrows to scroll through the list of trouble codes. A description of the highlighted code is shown below each table.
- 5. If desired, press the Clear button to erase all the trouble codes listed in the Inactive table.



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The following trouble codes may be displayed by the control system and should help the operator to identify and correct issues with system during field operations:

NOTE: Before taking any of the following Recommended Actions, it is suggested to check for any available software updates for components on the system, cycle machine power, reboot the controller, edit/ create a machine profile, re-calibrate the system, or check all wiring for damage, as these are common remedies and can potentially solve several issues. If none of the following Recommended Actions solve the issue, consult your CASE IH dealer.

Code ID		Description	R	ecommended actions
4985	.13 .2	Yaw sensor calibration error Yaw sensor erratic	•	Park machine on level ground and disable any boom height controls. Go to Tools -> System Settings -> User Settings -> Calibrate Turn Compensation and verify the detected orientation is accurate, and ensure Yaw Rate is not varying by +/5 deg/sec while the engine is running. If needed, select Redetect Orientation to recalibrate.
			•	Cycle power to RCM by going to Diagnostics -> Tests -> Reboot Product Controller.
	.3	Supply voltage high Supply voltage low	•	Go to Diagnostics -> System Information -> System Voltages drop-down and verify RCM Power is between 8 V and 16 V with engine running.
			•	Cycle power to RCM by going to Diagnostics -> Tests -> Reboot Product Controller.
			•	Check power and ground at RCM connections. (Grey connector pins PWR 1 - 3, GND 4 - 6). Repair or replace as necessary.
520194			•	Check power and ground on chassis cable connectors. Repair or replace as necessary.
			•	Check RCM power at fuse panel. Repair or replace as necessary.
			•	Check RCM cables and connections for damage. Repair or replace as necessary.
			•	Check power and ground at battery terminals and connections. Repair or replace as necessary.
			•	Check machine battery and charging system. Repair or replace as necessary.

Code ID	1	Description	R	ecommended actions	
520453	31	EPGA error	•	Cycle power to RCM by disconnecting and reconnecting RCM gray connector.	
520455	.51	FF GA entit	•	 Update or re-load RCM software and create a new machine profile. 	
520454	.31	NCV subnet offline	•	Go to Diagnostics -> Tests -> NCV Communication Test and	
520455	.31	Left boom NCV subnet offline		perform NCV Communication test to determine if any NCVs are communicating.	
			•	Inspect NCV lights for power. If all NCV lights are off on one or both sides, check power circuit. If all on, check NCV CAN circuits.	
			•	Cycle power to RCM by going to Diagnostics -> Tests -> Reboot Product Controller.	
			•	Check power to NCV relays at RCM connections. (Black center connector pins 7 LT and 8 RT). Repair or replace as necessary.	
			•	Check power and ground at left and right NCV relays and connectors. Repair or replace as necessary.	
			•	Check HC power and ground on NCV boom cables (round 19-pin connector pins PWR 8, 12, 16, GND 10, 14, and 18). Repair or replace as necessary.	
520456	.31	Right boom NCV subnet offline	•	Check NCV power across NCV fuses. Repair or replace as necessary.	
			•	Check NCV power at fuse box panel. Repair or replace as necessary.	
			•	Check NCV chassis and boom cables and connections for damage. Repair or replace as necessary.	
			•	Check NCV chassis cable power and ground at battery. Repair or replace as necessary.	
			•	Check NCV CAN circuits at RCM connections (black center connector pins 11 LO and 12 HI).	
			•	Check NCV CAN circuits at boom cables (round 19-pin connector pins 4 LO and 6 HI).	
523008	.13	No NCV tip size selected	•	Go to Tools -> Applicator Setup -> Select Tip and verify a tip size other than "NA" is selected for either NCV or Bypass or both, depending on mode. Select a tip size again, even if the same.	
	-		•	Cycle power to RCM by going to Diagnostics -> Tests -> Reboot Product Controller.	
522941	.31	NCV missed status message – single	•	Go to Diagnostics -> Diagnostic Trouble Codes -> NCV Errors -> NCV Heat Map and locate the NCV(s) that are not green.	
522942	.31	NCV misses status message – multiple		Their numerical locations are labeled referencing the forward travel direction, from leftmost to rightmost NCV along the boom.	
522943	.31	NCV corrupt message contents – single		Note their location for future reference and troubleshooting as necessary.	
522944	.31	NCV requires message	•	Cycle power to RCM by going to Diagnostics -> Tests -> Reboot	
523014	.13	NCV requires message		Product Controller.	
523016	.31	Inconsistent nozzle control valve software version	•	Check NCV software by going to Diagnostics -> Tests -> NCV Updates to scan and update software on affected NCVs.	
523017	.31	NCV programming out of date (NCV update)	•	Replace affected NCV's. Then recalibrate NCV's by going to Diagnostics -> Tests -> Calibrate NCVs. If necessary, check NCV software by going to Diagnostics -> Tests -> NCV Updates to scan and update software on affected NCV's.	
523128	.0	High NCV temperature - single	•	May result from high ambient temperature or running NCVs without flowing liquid. Allow NCVs to cool.	
523129	.0	High NCV temperature - multiple	•	Replace NCV and Recalibrate NCVs by going to Diagnostics -> Tests -> Calibrate NCVs	

Code ID		Description	R	ecommended actions
523136	.4	NCV voltage low single	•	Check wiring, fuses, and connections before the left and right cable circuit branches. When only a few NCVs are noted, inspect nearby NCVs, connections, pins, and cabling for corrosion, visible damage, or pinching between those NCVs. In some instances, splices or wiring may be damaged underneath cable coverings. Repair or replace as necessary.
523137	.4	NCV voltage low multiple	•	Check power and ground on chassis cable connectors. Repair or replace as necessary.
			•	Check power and ground at battery terminals and connections. Repair or replace as necessary.
			•	Check machine battery and charging system. Repair or replace as necessary.
523076	.31	NCV offline - single	•	Go to Diagnostics -> Diagnostic Trouble Codes -> NCV Errors
523077	.31	NCV offline - multiple		-> NCV Heat Map and locate the NCV(s) that are not green.
500070	.2	NCV invalid index single	Their numerical locations are labeled referencing travel direction, from leftmost to rightmost NCV Note their location for future reference and trou	Their numerical locations are labeled referencing the forward
523076	.31	NCV not indexed single		travel direction, from leftmost to rightmost NCV along the boom.
500070	.2	NCV invalid index multiple		Note their location for future reference and troubleshooting as
523079	.31	NCV not indexed multiple		necessary.
523082	.2	NCV CAN error limit - single	 Go to Diagnostics -> Tests -> NCV Communication Test. Displayed NCVs are numbered on screen from left to right. These are referenced from the left side of the machine, faci the normal forward direction of travel. If No CAN Error Dete is displayed, that means that the test has found no detectat communication errors. Left, right, and tip-to-tip latency times be displayed. If an error occurs, note the "No Communication" 	Go to Diagnostics -> Tests -> NCV Communication Test.
523083	.2	NCV CAN error limit multiple		Displayed NCVs are numbered on screen from left to right.
523084	.31	NCV unexpected reset - single		the normal forward direction of travel. If No CAN Error Detected is displayed, that means that the test has found no detectable
523085	.31	NCV unexpected reset - multiple		communication errors. Left, right, and tip-to-tip latency times will be displayed. If an error occurs, note the "No Communication
523138	.31	NCV bus shutdown - single		After NCV" number, and the "Communication Resumes At NCV"
523139	.31	NCV bus shutdown - multiple		number. The issue is likely between, and possibly includes, these NCVs. Inspect NCVs on the boom, wiring, connections, or fuses related to the circuit between and including these NCVs. If there is no communication after the #1 NCV, there may be a power loss between the battery connection and the NCV cable connections, or a CAN communication problem between the RCM RCM and the NCV cable connections. Inspect wiring, fuses, and connections before the left and right cable circuit branches. When only a few NCVs are noted, inspect nearby NCVs, connections, pins, and cabling for corrosion, visible damage, or pinching between those NCVs. In some instances, splices or wiring may be damaged underneath cable coverings. When large sections of NCVs are not communicating, inspect those items along with fuses and large electrical connections. If intermittent power to the NCVs is the cause of the issue, or if NCVs are disconnected and re-connected during the troubleshooting process, NCVs will appear back online after repairing the system, but fault codes will still exist until the system power is cycled off then back on. Cycle power to RCM by going to Diagnostics -> Tests -> Reboot Product Controller.

Code ID		Description	Recommended actions
523140	.13	NCV poppet health limit - single	 Check NCV for debris, damaged or worn poppet or spring, corrosion, and any sort of contamination. Clean or rebuild NCV as pecessary.
	.31 .13	NCV poppet health limit - multiple	 Check system strainer size. Ensure a 80 mesh or finer is being used.
523141			 Check plumbing system and strainers for debris, particle deposits, metal filings or any material that may cause plugging. Clean out system plumbing or strainer.
	.31	Stuck poppet - multiple	Check that correct tip size is selected and installed. Consider increasing tip size.
			 Check for error to extinguish at different NCV duty cycles or product flow rates
		Unexpected system flow decrease	 Check sprayer plumbing for any major blockage in system or a major leak ahead of flowmeter.
	.31		• Check that any sump, master valves, electric boom valves, hand valves, throttling valves, check valves, and drain valves are open, not obstructed, or in correct positions.
522142			Check for pinched hoses.
525142			Check strainers for obstructions. Clean if necessary.
			Check that correct tip size is selected and installed.
			Check for empty product tank.
			Check for correct flowmeter calibration value.
			Check system pump for proper operation.
			Check sprayer plumbing for a major leak downstream of flowmeter.
523143	.31	Unexpected system flow	• Check that correct tip size is selected and installed on all tips and fence row nozzles.
		Inclease	Check that electric or manual valves are in correct positions.
			Check for correct flowmeter calibration value.
523102	.13	Sparge pressure sensor not calibrated	Select correct sparge pressure sensor calibration value.
020102	.4	Sparge pressure sensor not detected	Check the sparge transducer connection and cabling for damage. If necessary, replace the cable or pressure sensor.

Code ID		Description	Recommended actions			
			• N e	Aeans that NCV duty cycle is LOWER [<90%] than expected for entered tip size, current flow, and pressure.		
			• C ti	Check that correct tip size is selected and installed. Decrease ip size if needed.		
			• 0	Check if NCVs are sticking open. Clean if open		
			• C c	Check flowmeter calibration. May need to increase flowmeter calibration number.		
			• C b	Check if fencerows, boom sections, flush or drain valves are open by mistake.		
	.16	High system efficiency	• C a fl	Go to Diagnostics -> System Information -> Delivery System and check actual amount sprayed against amount reported by lowmeter or tank level.		
			• • v A	Go to Tools -> Applicator Setup -> Section Setup Summary and rerify that section and tip spacing calibration values are correct. Adjust if necessary by editing the machine profile.		
523193			• 0	Check sprayer plumbing for major leak downstream of flowmeter.		
			• 0	Check system efficiency alarm limit.		
			• C s	Check if boom transducer is functioning correctly in pressure sensor readings.		
	.18	Low system efficiency	• N fo	Neans that NCV duty cycle is HIGHER [>105%] than expected or entered tip size, current flow, and pressure.		
			• C ir	Check that correct tip size is selected and installed. May need to ncrease tip size.		
			• 0	Check if spray tips or NCVs are partially blocked. Clean if blocked.		
			• C d	Check flowmeter calibration or possible blockage. May need to lecrease flowmeter calibration number.		
			• C a fl	Go to Diagnostics -> System Information -> Delivery System and check actual amount sprayed against amount reported by lowmeter or tank level.		
			• 0 v A	Go to Tools -> Applicator Setup -> Section Setup Summary and rerify that section and tip spacing calibration values are correct. Adjust if necessary by editing the machine profile.		
			• C fl	Check sprayer plumbing for major leak between pump and lowmeter or a blockage past flowmeter.		
			• 0	Check strainers for blockage. Clean if needed.		
			• 0	Check system efficiency alarm limit.		
			• C s	Check if boom transducer is functioning correctly in pressure sensor readings.		
			• C	Check system pump for proper operation.		
		Center section pressure 1	• C fa	Check center section valve for proper operation. Valve may have ailed to open when commanded on.		
	.31	low (center or center left	• 0	Check center section strainer for blockage. Clean if necessary.		
523235			• C p	Check if center section transducer 1 is reading correctly in pressure sensor readings.		
	.4	Center section pressure 1 sensor not detected (center or center left sensor)	• C d	Check the pressure transducer connection and cabling for lamage. If necessary, replace the cable or pressure sensor.		

Code ID	1	Description	R	ecommended actions
502026	.31	Center section pressure 2 low (center right sensor)	•	Check center section valve for proper operation. Valve may have failed to open when commanded on. Check if center section transducer 2 is reading correctly in
523230	.4	Center section pressure 2 sensor not detected (center right sensor)	•	Check the pressure transducer connection and cabling for damage. If necessary, replace the cable or pressure sensor.
523232	.4	Boom pressure sensor not detected	•	Check the boom pressure transducer connection and cabling for damage. If necessary, replace the cable or replace the pressure sensor.
	.13	New injection pump detected	•	Edit existing or create a new profile and calibrate injection pump. Cycle system power.
500050			•	Cycle system power.
523252	.31	Injection pump lost communication	•	Check fuses and cabling and power, ground and CAN to injection pumps. Repair or replace as necessary.
			•	Replace injection pump ECU.
			•	Select correct pump pressure sensor calibration value.
	.13	Pump pressure sensor not calibrated	•	Check the pump pressure transducer connection and cabling for damage. If necessary, repair or replace cable or replace pressure transducer.
	.16	Pump/boom pressure differential	•	Check strainers between pump and boom pressure sensor for blockage. Clean if necessary.
			•	Check for electric or manual valves between pump and boom pressure sensors opening properly.
523234			•	Check if pump transducer is functioning correctly in pressure sensor readings.
			•	Check if boom transducer is functioning correctly in pressure sensor readings.
			•	Check the pressure transducer connections and cabling for damage. If necessary, replace the cable or replace pressure sensor.
	.4	Pump pressure sensor not detected	•	Check the pump pressure transducer connection and cabling for damage. If necessary, replace the cable or replace pressure sensor.
523338	.31		•	Check tip for any blockage and clean tip.
			•	Check for error to extinguish at different NCV duty cycles or product flow rates.
523339	.31	lip blockage	•	Check plumbing system and strainers for debris, particle deposits, metal filings, or any material that may cause plugging.
			•	Clean out system plumbing or strainer.
			•	Cycle system power.
524082	.31	UT display is offline	•	Check cabling and power, ground, and CAN connections to UT. Repair or replace if necessary.
			•	Cycle system power.
524083	.31	AUX-N Input Offline	•	Check cabling and power, ground, and CAN connections to AUX-N device. Repair or replace if necessary.

NOTE: If any fault code or the following notifications appear and are not expected during normal operation, follow the listed recommended actions.

Notifications

Description	Recommended actions						
	 Cycle power to system and check unlocked features. 						
Activation required	Consult dealer for desired unlock.						
	Replace ECU.						
Boom purge in							
progress	Cycle system power.						
Boom rinse in	Check tank boom rinse status.						
progress	Cycle system power. Cycle system Deuter Deuter Deuter Marken deuter "Off"						
Diagnostic	• Go to Tools -> System Settings -> User Settings -> Wireless Control Mode and set to "Off."						
application control	 Iurn off wireless remote by pressing and holding Red 0 button for 3 s on handheld remote 						
	 Cycle power to RCM by going to Diagnostics -> Tests -> Reboot Product Controller. 						
Hardware init error	Check hill switch position.						
- multiple	Cycle power to system.						
Hardware init error	Replace affected NCVs.						
- single	Check for ninched boom supply or recirculation bases						
	Check that any sump master values, cleatric beam values, hand values, throttling values						
	 Check that any sump, master values, electric boom values, nand values, throttling values check values, and drain values are open, not obstructed, or in correct positions. 						
	 Check strainers for obstructions. Clean if necessary. 						
low recirculation	Check that recirculation valve is opening.						
flow	Check for empty product tank.						
	 Check that pump is on and standby PWM is >30. 						
	 Check that low flow limit is <37.85 L/min (<10.00 US gpm). 						
	 Check for obstructions in strainers, flowmeter, and check valves. 						
	Check for correct flowmeter calibration value.						
	 Check if tank sump is closed. Open if closed. 						
	Check if tank is empty.						
	 Check if master valve by flowmeter is opening. Open if closed. 						
	 Check if pump transducer is functioning correctly in pressure sensor readings. 						
Low pressure	 Check if boom transducer is functioning correctly in pressure sensor readings. 						
shutdown	 Check wiring to pump pwm valve. Make sure connections are secure. 						
	 Check to see if pump is turning on when product turns on. (Go to manual mode and ramp up DC to see if pump is working and pressure builds with increasing control effort.) 						
	 Check PWM MAX value is >30. 						
	 Check PWM control range using PWM Health Test. Overall range should be >20%. 						
	 Check actual vs displayed Current Tank Level. Adjust if necessary. 						
	 Check Low Tank Level limit and alarm value. Adjust if necessary. 						
Low tank	 Check Flow Meter operation, Calibration value, and Meter Pulse/Units. Repair or recalibrate if necessary. 						
	 Check Fill Flow Meter or Fill Level Sensor operation, Calibration value, and Units if installed. Repair or re-calibrate if necessary. 						

Description	Recommended actions
	Decrease operation or turning speed.
	Check for correct target rate and pressure.
	 Check for low NCV efficiency number Should normally be between 90 and 105.
	 Check for correct tip size for desired rate, speed, and pressure.
NCV high flow limit	 Check flowmeter calibration value, as it may be too low.
- multiple	Check poppets for obstructions.
	 Ensure all boom valves or electronic valves are opening correctly.
	Check strainer for plugging.
	Check for leaks.
	Check for pinched hoses.
NCV high flow limit	Decrease operation or turning speed.
- single	Check for correct target rate.
	Increase operation speed or turning rate.
	Check for correct target rate and pressure.
NCV low flow limit	 Check for high NCV efficiency number. Should normally be between 90 and 105.
- multiple	 Check for correct tip size for desired rate, speed, and pressure.
	 Check flowmeter calibration value, as it may be too high.
	Check poppets for excessive wear.
NCV low flow limit	Increase operation speed or turning rate.
- single	Check for correct target rate.
nev retransmission - multiple	 Go to Diagnostics -> Diagnostic Trouble Codes -> NCV Errors -> NCV Heat Map and locate the NCV(s) that are not green. Their numerical locations are labeled referencing the forward travel direction, from leftmost to rightmost NCV along the boom. Note their location for future reference and troubleshooting as necessary.
NCV	 Cycle power to RCM by going to Diagnostics -> Tests -> Reboot Product Controller.
retransmission - single	 Replace affected NCVs. Then recalibrate NCVs by going to Diagnostics -> Tests -> Calibrate NCVs. If necessary, check NCV software by going to Diagnostics -> Tests -> NCV Updates to scan and update software on affected NCVs.
NCV zero flow target - multiple NCV zero flow target - single	Check for correct target rate.
	Check for correct target pressure.
Off pressure high	 Check for electric or manual valves are opening correctly.
	 Check strainers and check valves for obstructions.
	 Check for damaged pressure sensor or cabling.
	Check for correct tip size.
	Check pump for proper operation.
	Check Off Pressure Alarm % value.

Description	Recommended actions
	Check for low tank level.
	Check for correct target pressure.
	Check for electric or manual valves and sump are opening correctly.
	Check strainers and check valves for obstructions.
Off pressure low	Check for damaged pressure sensor or cabling.
	Check for correct tip size.
	Check for system leak.
	Check pump for proper operation.
	Check Off Pressure Alarm % value.
	Increase operation speed.
	Check for correct target rate.
	Check NCV efficiency number Should be between 90 and 105.
	Check for correct tip size for desired rate, speed, and pressure.
Off rate high	Check flowmeter calibration value May be too low.
	Check poppets for excessive wear.
	Check for leaks.
	Turn on more sections.
	Check Off Rate Alarm % value.
	Decrease operation speed.
	Check for correct target rate.
	Check NCV efficiency number Should be between 90 and 105.
	Check for correct tip size for desired rate, speed, and pressure.
	Check flowmeter calibration value May be too high.
Off rate low	Check poppets for obstructions.
	Ensure all boom valves or electronic valves and sump are opening correctly.
	Check strainer for plugging.
	Check for pinched hoses.
	Turn off more sections.
	Check Off Rate Alarm % value.
	Check for electric or manual valves and sump opening properly.
	Check tip sizes and target rates and pressures.
	Increase engine RPM.
Droduct 1: volvo	Decrease operation speed.
Product 1: valve PWM max	Check pressure and flow sensor operation.
	Check sparge or recirculation system valve positions.
	Check PWM MAX value.
	Check PWM control range using PWM Health Test. Overall range should be >20%.
	Check target flow or pressure against machine pump and delivery system specifications.

Description	Recommended actions
	 Check for electric or manual valves opening properly.
	 Check tip sizes and target rates and pressures.
	Decrease engine RPM.
	Increase operation speed.
Product 1: valve	 Check pressure and flow sensor operation.
	 Check sparge or recirculation system valve positions.
	Check PWM MIN value.
	 Check PWM control range using PWM Health Test. Overall range should be >20%.
	Check target flow or pressure against machine pump and delivery system specifications.
Road mode active	Check road position switch for "On" condition.
Tank rinse in	Check tank rinse status.
progress	Cycle system power.
Zero speed shutoff	 Increase vehicle speed and cycle master switch.
Tank level sensor	Calibrate tank level sensor.
not calibrated	Cycle system power.
Tier overlap error	Check target rates and pressure. Adjust if necessary.
	 Check installed and recommended tip sizes. Adjust if necessary.
	Check engine RPM. Increase if necessary.
	 Check max pump RPM value. Increase if necessary
	 Check target rate and pressure. Decrease if necessary.
Pump PPM above	 Check max pump PVM value. Decrease if necessary.
maximum	Check if tank is empty.
	Check if pump is primed with product.
	 Check if tank sump is closed. Open if closed.
	 Check pump health and operation using PWM Health Test. Additionally troubleshoot pump or PWM valve if necessary.
	 Check pump RPM sensor and cabling. Repair or replace if necessary.
	Check engine RPM. Increase if necessary.
Pump RPM below minimum	 Check target rate and pressure. Increase if necessary.
	 Check min pump PWM value. Increase if necessary.
	 Check pump health and operation using PWM Health Test. Additionally troubleshoot pump or PWM valve if necessary.

Description	Recommended actions
•	Check if tank is empty.
	 Check if strainer is blocked. Clean if necessary.
	 Check for system leak. Repair as needed.
	 Check target pressure and rate. Increase if necessary.
	Increase travel speed.
	 Check if tank sump is closed. Open if not.
	 Check if master valve is closed. Open if not.
Minimum pressure	 Check minimum pressure setting. Decrease if necessary. Valve should be greater than 6 psi.
	 Check if boom transducer is functioning correctly in pressure sensor readings.
	 Check the boom pressure transducer connection and cabling. If necessary, replace cable or pressure sensor.
	 Check wiring to pump PWM valve. Make sure connections are secure.
	 Go to manual mode and increase DC to see if pump is working and pressure builds with increasing control effort.
	 Check PWM max value is greater than 30.
	 Check PWM control range using PWM Health Test. Overal range should be greater than 20%.
	 Check entered and installed spray tip size and target rate, pressure, and desired speed. Adjust any parameters as necessary. Consult tip manufacturer for sizing proper spray tip.
	 Check recommended PWM control range using PWM Health Test.
	 Check that PWM max is less than or equal to 82% and tank fill and standby PWM are less than or equal to 75%. Decrease PWM setting or engine RPM during pump operation for spraying, filling, or standby as needed.
	Check strainers for blockage. Clean if necessary.
. .	Check for electric or manual valves between pump and spray tips are opening properly.
Maximum pressure	 Check if pump transducer is functioning correctly in pressure sensor readings.
	 Check if boom transducer is functioning correctly in pressure sensor readings.
	 Check the pressure transducer connections and cabling for damage. If necessary, replace the cable or replace the pressure sensor.
	 Check maximum pressure setting against desired operating or target pressure. Increase if nedessary. Maximum recommended pressure in bypass mode is 120 psi and standard mode is 105 psi. System will shut down if pressure exceeds 150 psi.
	Check standby pressure setting. Decrease if necessary.
	Check strainers between pump and boom pressure sensor for blockage. Clean if necessary.
Pump/boom pressure differential	 Check for electric or manual valves between pump and boom pressure sensors opening properly.
	 Check if pump transducer is functioning correctly in pressure sensor readings.
	 Check if boom transducer is functioning correctly in pressure sensor readings.
	 Check the pressure transducer connections and cabling for damage. If necessary, replace the cable or replace the pressure sensor.

System summary

The system summary screen displays information configured during the setup process but does not provide the option to modify the configuration:

- 1. Open the UT Menu and select the RCM working set icon (1).
- 2. Select the Diagnostics softkey (2) along the right side of the page.
- 3. Select the System Summary tab (3).



Nozzle Control Valve (NCV) diagnostics

NOTE: Nozzle Control Valve (NCV) Diagnostics are not available in Bypass NCV operation mode.

To access **AIM Command FLEX™ II** nozzle control valve diagnostics information by configured section:

- Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) - Sprayer Menu button (1).
- From the home screen, select the NCV Diagnostics button (2) in the lower portion of the screen. The following settings and information may be displayed for each configured section:

NOTE: The NCV Diagnostics button is displayed on the Home page in the lower portion of the page. It may be necessary to toggle the lower display to either the tank level or analog gauge view.

- 1. Section select
- 2. Close diagnostics
- 3. NCV Status

NOTE: Selecting an NCV with a green or yellow status will display the NCV Readings page while selecting an NCV with a red status will display the NCV Errors page.





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NCV select

Press the NCV select arrow to cycle through each individual NCV status.

Current section diaplay

The current section for which diagnostic information is being displayed is shown at the top of the NCV diagnostics prompt. Select the left or right section select arrow buttons to cycle through sections configured for use with the **AIM Command FLEX™ II** nozzle control system.

Section NCV status

The status of each NCV configured for control on the section is displayed at the bottom of the section diagnostics prompt. The following NCV statuses may be displayed while viewing the section diagnostics prompt:

Normal. The NCV is functioning normally and no alarm conditions are currently present.
Caution. A minor NCV alert condition has been detected. The control system and NCV PWM is operating normally, however, the system has detected that a condition exists which could impact the current application.
Critical. A critical NCV condition has caused the NCV to shut down. The NCV is not responding as expected and the operator should cease application and troubleshoot the issue before resuming operations.

Not Calibrated. The NCV section is not calibrated.
NOTE: See "System diagnostics" (5-3) for additional assistance with fault codes and using the fault code list.

Individual NCV diagnostics

To access individual **AIM Command FLEX™ II** diagnostic information:

- 1. Open the UT menu and select the RCM working set icon (1).
- 2. Select the Diagnostics softkey (2).
- 3. Select the NCV Errors button in the lower right-hand corner of the page to access the following diagnostic information for each NCV:



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NCV Information

NOTE: Use the section and NCV left and right arrow buttons at the top of the NCV Information page to view different NCVs.

1. Toggle Section/ NCV



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NCV Readings

Current and Voltage. Each nozzle control valve provides the measured current, in amperes, and voltage at the NCV to the RCM ECU for display. The NCV Current should display as **0.0 A** when the selected NCV is not operating and should be **0.3 – 0.7 A** during normal operation. Voltage should be **10.5 – 16.0 V** during normal operation.

NCV Duty Cycle. Each NCV reports the current NCV duty cycle over the communication network. Values should increase or decrease as expected for changes in speed, target rate, in a turn, and when a flow offset is enabled. Values go to zero when master switch or all boom switches are off.

Driver Temp and Micro Temp. Component temperatures on the **AIM Command FLEX™ II** nozzle control valve circuit board.

System Pressure. The monitored system pressure reported by the **AIM Command FLEX™ II** spray boom pressure transducer.

Pump Duty Cycle. The current pump effort.

Runtime Hours. The total time which the NCV has been active.

Powered Hours. Total time the NCV has been powered on.

NCV Serial. Serial number of the NCV for which the information is being displayed.

Hardware Rev. This is the PCB hardware revision level of the NCV. This is not the same as the assembly revision level which is shown on the NCV label.

NOTE: The PCB hardware revision may differ from the revision displayed on the NCV assembly. The NCV assembly revision shown on the NCV label will be most helpful when seeking technical support.

Program Version. The version of software loaded on each NCV. This information may be helpful to troubleshoot individual NCVs or to ensure proper operation of the nozzle control system.

CAN Address. The unique location of the NCV on the nozzle bus.

Nozzle Control Valve (NCV) updates

To update **AIM Command FLEX™ II** Nozzle Control Valves (NCV) on the nozzle bus:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set icon (1).
- 2. Select the Diagnostics softkey (2).
- 3. Select the Tests tab (3) along the top of the page.
- 4. Select the NCV Updates in the drop down list and follow the on-screen instructions to update NCVs on the nozzle bus.



Nozzle Control Valve (NCV) offline troubleshooting

If a Nozzle Control Valve (NCV) Offline error occurs with the system, there are several ways to diagnose where the problem may exist.

Always have the engine running when performing the NCV diagnostic tests to ensure there is sufficient electrical power available to the system. If NCVs are moved around, disconnected, or replaced, it may be necessary to cycle power to the system and re-calibrate to clear any errors and properly reestablish communication.

When making wiring or connection repairs, turn off the engine and disconnect battery power to safely work on the equipment. When wiring repairs are completed, it may be necessary to cycle power or re-calibrate the system to ensure communication is re-established properly to the system.

Nozzle Control Valve (NCV) alarms

When an NCV Offline alarm happens, whether due to loss of power, loss of communication, or another error, an alarm will display on screen.

Select the Accept (check) button to accept the error and return to the previous screen.

Note that the NCVs affected by the alarm are displayed on the alarm prompt. An ellipsis (...) is displayed if more NCVs are affected by the alarm condition. In this instance, just note the range of NCV IDs visible (e.g. 1-17, etc.).



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Nozzle Control Valve (NCV) diagnostics

To display active and inactive fault code information:

- 1. Open the Universal Terminal (UT) menu and select the Rate Control Module (RCM) working set (1).
- 2. Select the Diagnostics softkey (2) along the right side of the page.
- 3. Select the Diagnostic Trouble Code (DTC) tab (3).
 - Current fault codes are displayed in the Active table. The fault code number and occurrence count is listed.
 - Resolved fault codes are displayed in the Inactive table. The fault code number and occurrence count is listed.
- 4. Use the up and down arrows to scroll through the list of fault codes. A description of the highlighted fault code is shown below each table.
- 5. If desired, press the Clear button to erase all the fault codes listed in the Inactive table.
- 6. Select the Info button to review available diagnostic information for the fault code.

The following information is shown:

- (A) Fault code and count
- (B) Fault description







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Other related errors

NCV Unexpected reset

An NCV Unexpected Reset error is encountered when an NCV was offline, then came back online.

This may be due to an intermittent power connection to NCV(s) from intermittent power or fuse connection, intermittent 19-pin connection, loose NCV connection or an NCV that is failing.

NOTE: Once the issue is resolved, the system may require a power cycle to clear this error.

NCV CAN error limit

This error is encountered when CAN communication is poor.

If many NCVs are affected, the problem may be with intermittent connections at 19-pin connectors, corrosion, or damage to splices or wiring harnesses where several circuits come together which would affect more than one NCV.

If only a few NCVs are affected, the issue is likely with a single NCV, NCV connection, or section of wiring in between NCVs.

NCV errors and NCV information menu

Select the NCV Errors button to view the NCV Information menu where other active errors for selected NCVs may be viewed.

In the NCV Errors menu, select any section or specific NCVs to inspect. The drop down menu allows the operator to select the following information displays:

- NCV Readings
- NCV Settings
- NCV Errors
- NCV Heat Map
- Section Heat Map



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Heat Map – The heat map is a graphical representation of the error status for specific NCV's or sections. Green NCV buttons represent no error for that NCV. Yellow or Red NCV buttons represent an error.

Press the NCV button of interest to see NCV readings for that specific NCV. In some cases, several red buttons may precede a yellow NCV. In that case, the red NCVs are likely not communicating with the system, and the first yellow NCV is the first NCV recognized by the system. This condition may be due to an issue between the last red and first yellow NCV, such as an NCV failure, wiring issue, or fuse issue affecting the red section of NCVs.

NCV communication diagnostic test

The NCV communication test can be used to locate the area of the system to inspect. To run the communication test:

- 1. Open the UT Menu and select the RCM working set (1).
- 2. Select the Diagnostics softkey (2).
- 3. Select the Tests tab (3) along the top of the page.
- 4. Select the NCV Communication Test in the drop down list
- 5. Select the Begin button to start the test. The system will attempt to find CAN communication errors on the NCV CAN bus.

Displayed NCVs are numbered on screen from left to right. These are referenced from the left side of the machine, facing the normal forward direction of travel. If "No CAN Error Detected" is displayed, that means that the test has found no detectable communication errors. Left, right, and tip-to-tip latency times will be displayed

NCV communication test - No CAN Error Detected

If an error occurs, note the "No Communication After NCV" number, and the "Communication Resumes At NCV" number. The issue is likely between, and possibly includes, these NCVs. Inspect NCVs on the boom, wiring, connections, or fuses related to the circuit between and including these NCVs.

If there is no communication after the #1 NCV, there may be a power loss between the battery connection and the NCV cable connections, or a CAN communication problem between the RCM and the NCV cable connections. Inspect wiring, fuses, and connections before the lefthand and right-hand cable circuit branches.

General troubleshooting

When only a few NCVs are noted, inspect nearby NCVs, connections, pins, and cabling for corrosion, visible damage. or pinching between those NCVs. In some instances, splices or wiring may be damaged underneath cable coverings.

When large sections of NCVs are not communicating, inspect those items along with fuses and large electrical connections.

If intermittent power to the NCVs is the cause of the issue, or if NCVs are disconnected and re-connected during the troubleshooting process, NCVs will appear back online after repairing the system, but fault codes will still exist until the system power is cycled off then back on.

Other useful tests

Calibrate NCVs should be used after swapping NCVs around to locate problems, or after replacing NCVs. This will ensure the NCVs are properly numbered in the system for turn compensation, section shutoff, and error detection.

Reboot Product Controller can be used instead of cycling key power to reboot and re-initialize communication to the NCV CAN bus.





Flow meter cable troubleshooting

To test the flow meter cable:

- 1. Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) working set (1).
- 2. From the home screen, change the product rate control mode to Manual.

NOTE: Make sure that the control valve output is zero.

- Access the Tools menu (2) and select the Rate Setup (3). Set the Flow Meter Calibration value to 1.
- 4. Change the Flow Meter Pulse/Units to 1 (not 10 pulses per unit).



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- 5. Return to the Home screen and note the existing volume in the tank.
- 6. Toggle at least one section switch and the master switch to the on position.
- 7. Use a small jumper wire to temporarily short the ground and signal pins together in the connector. Disconnect the jumper. Repeat the procedure. Each time the short is made, the total tank volume value should change by increments of one or more.
- 8. If the tank volume does not change, disconnect the flow meter extension cable, if installed, and repeat this test at the next connector closest to RCM Sprayer Electronic Control Unit (ECU). Replace defective cable as required.
- 9. If all cables test good, replace the flow meter.
- 10. After testing is complete, re-enter correct meter cal value, units, and tank level.

General troubleshooting

Problem	Action
Rate reads "0."	 Verify SPEED is registering accurately. If SPEED is zero, refer to the UT display troubleshooting procedure.
	 Verify TOTAL VOLUME is registering flow.
	 Confirm the boom section status shows on the display changes when section switches are activated in manual operation.
Cannot connect to wireless remote	 Verify desired wireless control mode is selected.
for diagnostics	 Verify wireless remote is within line of sight to the RCM. See: "Section control remote operation" (4-9) for a visual representation.
	 Verify wireless remote is turning on and batteries are charged.
	 Verify a device passcode entered into wireless remote matches passcode shown on system alert.
Intermittent connection to BLE wireless remote	 Verify wireless remote is within line of sight to the RCM. See: "Section control remote operation" (4-9) for a visual representation.
	 Verify wireless remote is turning on and batteries are charged.
Cannot control with the wireless remote	 Verify wireless remote is within line of sight to the RCM. See: "Section control remote operation" (4-9) for a visual representation.
	 Verify the desired wireless control mode is selected in user settings screen on RCM.
	 Verify all boom section switches and master switch on the machine control panel or joystick are toggled ON.

Problem	Action
Pressure or rate inaccurate or unstable.	 Verify that all calibration numbers and settings are correct. Verify SPEED is registering accurately. If SPEED is inaccurate, refer to the Universal Terminal (UT) display troubleshooting procedure.
	 Verify that all air has been removed from the boom by priming the boom or recirculating. See "Automated Boom Prime" on "Universal Terminal (UT) definitions (4-2) or "Boom Recirculation" on "System settings tab" (3-19) for more information.
	 Verify the pressure transducer is selected correctly.
	 Verify Flow Meter calibration value and target rate is within overall flow range.
	 Verify control valve is operating correctly. Perform the Pulse-Width Modulation (PWM) health test described in "Perform the PWM Health Test" on "System diagnostics" (5-3) to inspect control range.
	 In MAN (manual) operation, verify that Pressure and Rate display holds constant.
	Confirm that boom section status shown on the display is not changing.
	 Verify Electronic Control Unit (ECU) Inertial sensors are calibrated and performing correctly. Refer to "Enable Turn Compensation" on "System settings tab" (3-19) or "Turn Compensation Feature Inspection" for more information. Disable Turn Compensation if necessary to see if pressure or rate stabilizes.
	 Perform a self-test with boom master switches on to verify the rate, pressure, and area/hour are steady while sitting still.
	 In MAN (manual) operation, check low end and high end pressure and flow range.
	 In the Control Valve menu, decrease the Valve Response Rate if pressure and rate oscillate greatly in AUTO mode. Increase the valve response rate if control is unresponsive.
	 In the Control Valve Settings menu, decrease the Nozzle Control Valve (NCV) response sensitivity if system pressure and rate oscillate slightly in AUTO mode. Increase if the system is unresponsive. Avoid setting both the Valve Response Rate and NCV Response Sensitivity above 70.
Cannot adjust rate or pressure in	 Verify the pump switch is turned on in the UT or machine console.
automatic or manual operation.	 Verify the pump and NCV PWM values are increasing or decreasing in the diagnostic screen.
	 Check cabling to control valve for breaks.
	Check connections in cabling for cleanliness.
	 Verify that there is voltage at the valve connector by toggling master switch on and setting the system to Manual. Manually change pump PWM and verify voltage changes at the valve.
	 If voltage to the valve is changing smoothly when actuating in Manual mode, but the control valve or pump are not adjusting pressure, inspect or replace the control valve or pump.
Sprayer pressure is correct but	 Verify that strainer screens or check valves are not plugged.
	 Verify that pressure at each boom is the same.
	 Verify all spray tips are correctly sized on the sprayer and entered correctly in the Select Tip menu.
	 Verify correct flow meter and pressure transducer calibration values.
Problem	Action
-------------------------------------	--
Total volume does not register or	Check flow meter cable for damaged wires or corroded connections.
registers flow inaccurately.	• Check the internal components of the flow meter; clean and adjust. See "Flow meter maintenance" (5-37) for flow meter cleaning and adjustments.
	Replace flow meter.
	 Verify that arrow on flow meter is pointing in direction of flow.
	• Verify the flow meter calibration value and units and adjust as necessary. See "Flow meter maintenance" (5-37) for additional flow meter calibration information.
Boom valve(s) will not operate.	Check boom valve cables and connections for damaged wires or corroded connections.
	Check boom valve fuses.
	 Verify the switches and boom valves are mapped correctly.
	Check connectors near the center rack and at the RCM for cleanliness or corrosion.
	 Check BOOM switch and MASTER switch for operation.
	 Replace boom valve(s).
Individual NCV will not communicate	Verify power to the NCV.
with Raven Service Tool Action	Verify the NCV cable connection voltages fall within the desired range.
	Cycle power to the system.
	Re-calibrate the system.
	Replace the NCV.

Calibration Values

Section widths

Use the following formulas to help calculate the section widths.

Calculate the section width with the formula:

 $T \times S = SW$

Where T = the number of Tips in each section, S = the Spacing between tips, and SW = the Section Width.

For example:

7 tips in a section with spacing of 50.80 cm (20.00 in) would yield:

7 X 20 =140

or a Section Width of 355.60 cm (140.00 in). Enter 355.60 cm (140.00 in) as the width for this section. (EQ 1)

Target rate calibration

The following information must be known in order to determine which spray nozzles to use with the sprayer:

- Nominal Application Pressure _____ PSI [kpa]
- Target Application Rate_____ GPA [L/ha]
- Target Speed_____ MPH [kph]
- Nozzle Spacing _____ inches [cm]

From this information, calculate the volume per minute per nozzle as follows:

NVPM = Rate × Speed × NS 5, 940[60, 000]

NVPM = Nozzle Volume per Minute (Gal/Min [L/Min]), Rate = Target Application Rate, Speed = Target Speed of Application, and NS = Nozzle Spacing.

For example:

Application Pressure = 206.84 kPa (30.00 psi), Target Application Rate = 186.92 L/ha (20.00 gal/ac), Target Speed = 8.37 km/h (5.20 mph), and Nozzle Spacing = 50.80 cm (20.00 in)

NVPM =
$$\frac{20 \times 5.2 \times 20}{5,940}$$
 = 0.35

Using the calculated nozzle volume per minute of 0.35 at an application pressure of 30, select a boom nozzle which comes closest to providing the desired output.

Product calibration settings

Review the Control Valve Settings and Tuning section on "System settings tab" (3-19) for assistance with calibrating and tuning the product control valve.

Flow meter re-calibration

- 1. Enter a meter cal number of 10 [38].
- 2. Enter a total volume of 0.
- 3. Switch all booms off.
- 4. Remove a boom hose and place it in a calibrated container greater than 37.85 L (10.00 US gal).
- 5. Turn on the boom and master switches.
- 6. Pump exactly **37.85 L** (**10.00 US gal**).
- 7. The readout in total volume is the new meter cal number. This number should be within ±3% of the number stamped of the flow meter tag.
- 8. Zero out the total volume.
- 9. Repeat the calibration procedure several times to confirm the reading accuracy.

NOTE: For greatest precision, set the meter cal to **378.54** L (**100.00** US gal) and pump **378.54** L (**100.00** US gal) of water.

10. To verify the flow meter calibration, fill the applicator tank with a predetermined amount of measured liquid (e.g. 946.35 L (250.00 US gal)]). Do not rely on the graduation numbers on the tank level decal. Empty the applicator tank under normal operating conditions. If the number displayed under the total volume is different from the predetermined amount of measured liquid by more than ±3%, complete the following calculation.

For example: A meter cal of 720 [190], total volume of 260 [983], and a predetermined amount of measured liquid equaling 250 [946]:

US Units:

CorrectedMotorCal	MeterCal × Total Volume	 720 × 260	- 740 0
	Measured Volume	 250	- 740.0

Metric Units:

Corrected MotorCol -	MeterCal × Total Volume		[190] × [983]	- 107 /
	Measured Volume		[946]	- 197.4

Enter a corrected meter cal of 749 [198].

11. Enter the corrected meter cal before resuming application.

Specifications based on water

Flow Meter Size	RFM 15P (M200)	RFM 60P (M200)	RFM 100P (M220)	RFM 200P (M300)
	Flange	Flange	Flange	Flange
Pressure Rating	1206.58 kPa	1206.58 kPa	1034.21 kPa	861.84 kPa
	(175.00 psi)	(175.00 psi)	(150.00 psi)	(125.00 psi)
Normal Flow Range	1.89 – 56.78 L/min	5.68 – 227.12 L/min	11.36 – 378.54 L/min	56.78 – 757.08 L/min
	(0.50 – 15.00 US	(1.50 – 60.00 US	(3.00 – 100.00 US	(15.00 – 200.00 US
	gpm)	gpm)	gpm)	gpm)
Pressure Drop	20.68 kPa (3.00 psi)	34.47 kPa (5.00 psi)	20.68 kPa (3.00 psi)	27.58 kPa (4.00 psi)
	@ 56.78 L/min	@ 227.12 L/min	@ 378.54 L/min	@ 757.08 L/min
	(15.00 US gpm)	(60.00 US gpm)	(100.00 US gpm)	(200.00 US gpm)
Max Flow Range ¹	1.89 – 151.42 L/min	5.68 – 567.81 L/min	11.36 – 946.35 L/min	56.78 – 1211.33 L/
	(0.50 – 40.00 US	(1.50 – 150.00 US	(3.00 – 250.00 US	min (15.00 –
	gpm)	gpm)	gpm)	320.00 US gpm)
Pressure Drop	103.42 kPa (15.00 psi) @ 151.42 L/min (40.00 US gpm)	241.32 kPa (35.00 psi) @ 567.81 L/min (150.00 US gpm)	110.32 kPa (16.00 psi) @ 946.35 L/min (250.00 US gpm)	62.05 kPa (9.00 psi) @ 1211.33 L/min (320.00 US gpm)
¹ May reduce flow met	er service life.			

Maintenance schedule and replacement parts

System maintenance

Nozzle control valve maintenance procedure

AIM Command FLEX™ II nozzle control valves are designed to provide maintenance free operation with proper equipment maintenance. However, the seals may become worn or swollen due to chemical compounds, chemical formulations, or high operating pressures. This may cause accelerated wear to the sealing surfaces. The following nozzle control valve maintenance procedures should be performed on the nozzle control system or on individual Nozzle control valve (NCVs) if leaks are observed at a specific spray tip.

- Loosen the fly nut (1) and remove the AIM Command FLEX™ II nozzle control valve (A) from the nozzle body.
- 2. Inspect the large O-ring (6) on the face of the valve body (4). Replace if necessary.
- 3. Inspect the small O-ring **(5)** on the tip of the valve body. Replace if necessary.
- Using a valve body removal tool (B), loosen and remove the valve body (4) from the AIM Command FLEX™ II nozzle control valve.
- 5. Inspect the O-ring **(3)** on the inside of the valve body. Replace if necessary.
- 6. Clean and inspect the plunger assembly (2). Replace the plunger assembly if the rubber seal is worn or damaged. Refer to Fig. 3 below for reference to plunger seal condition.
- 7. Inspect fly nut (1). Replace if worn or damaged.



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Nozzle control valve exploded view

- A. Nozzle control valve
- 1. Fly nut
- 2. Plunger assembly
- 3. O-ring
- 4. Valve body
- 5. Small O-ring
- 6. Large O-ring

Plunger inspection detail

- A. New plunger assembly
- B. Worn plunger assembly

NOTE: Extreme duty plunger kits are standard for AIM Command FLEX™ II systems.



RAIL22TR00175AA

AIM Command FLEX[™] II nozzle control valve assembly procedure

To reassemble a nozzle control valve (A) after inspection and maintenance:

- 1. Replace fly nut (1) over valve body (4).
- 2. Replace O-ring (3) inside valve body.
- Place plunger assembly (2) into nozzle control valve 3. cavity.
- Thread the valve body onto the nozzle control valve 4. and finger tighten.
- Using a valve body removal tool, turn valve body 1/4 5. to 1/3 turn to secure to the valve body.
- Verify small O-ring (5) is seated into groove on valve 6. body tip.
- 7. Place large O-ring (6) onto valve body face.
- 8. Thread fly nut onto nozzle body on the spray boom.
- Hand tighten the fly nut to the nozzle body or use the 9. fly nut wrench if necessary. Do not over tighten.
- 10. Prior to filling the tank with chemical or starting a field application, refer to the Testing for Leaks section on 5-36 to test the AIM Command FLEX[™] II system.



System testing

Testing for leaks

NOTE: The section control remote may be helpful when testing system function or testing spray tips and Nozzle Control Valves (NCV).

- 1. Fill the applicator tank with clean water.
- 2. Toggle the implement master switch to the on position.
- 3. Select the pump softkey to activate the product pump.
- 4. Toggle one section switch to the on position.
- 5. Inspect the AIM Command FLEX™ II nozzle control valves for leaks around the fly nut.
- 6. If leaks are observed:
 - A. Toggle the section and master switches to the off position.
 - B. Use the AIM Command FLEX[™] II fly nut wrench to carefully tighten the fly nut until leaking ceases.
 - C. If leaking continues after tightening the fly nut more than half a turn, perform the procedures outlined in the Nozzle Control Valve Maintenance Procedure section on **5-34** to inspect the nozzle control valve, O-rings, and plunger assembly.
 - D. Repeat this procedure to verify leak has stopped. Contact a local CASE IH dealer for additional assistance if leaks persist.
- 7. Repeat this process to check nozzle control valves on each section of the equipment.

Flow meter maintenance

NOTE: Remove system pressure and chemical from the hoses and all other system lines prior to disassembling the flow meter, fittings, or hoses.

- 1. Remove flow meter from the equipment and flush with clean water to remove any chemicals.
- 2. Remove flange bolts or clamp from the flow meter.
- 3. Remove the turbine hub and turbine from inside flow meter.
- 4. Clean turbine and turbine hub of metal filings or any other foreign material, such as wettable powders. Confirm that the turbine blades are not worn. While holding the turbine hub in your hand, spin turbine. The turbine should spin freely with very little drag inside the hub.
- 5. If transducer assembly is replaced or if turbine stud is adjusted or replaced, verify the turbine fit before reassembling. Hold turbine hub with turbine on transducer. Spin turbine by blowing on it. Tighten turbine stud until turbine stalls. Loosen turbine stud 1/3 turn. The turbine should spin freely.
- 6. Re-assemble flow meter.
- 7. Using a low pressure (approximately **34.47 kPa** (**5.00 psi**) jet of air, verify the turbine spins freely. If there is drag, loosen hex stud on the bottom of turbine hub 1/16 turn until the turbine spins freely.
- 8. If the turbine spins freely and cables have been checked per Troubleshooting Flow Meter Cables section, but flow meter still is not metering properly, replace flow meter transducer.

Re-calibrating the flow meter

To calibrate the flow meter:

- 1. Fill the applicator tank with clean water.
- Open the Universal Terminal (UT) Menu and select the Rate Control Module (RCM) - Sprayer menu button (1).
- From the home screen, select the Tools Menu button
 (2) along the right side of the display.
- Select the System Settings tab (3) along the top of the display and select the Rate Sensor Setup button (4).
- 5. Enter a value of 10 [38] for the meter cal.
- 6. Select the Totals softkey (5), then the Lifetime Totals tab.
- 7. Reset the amount applied counter.



Setting:

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- 8. Toggle the master switch and all boom sections to the off positions.
- 9. Remove a section hose and place it in a calibrated container greater than **37.85 L** (**10.00 US gal**).
- 10. Toggle the master switch and the boom switch corresponding to the hose that was placed in the container.
- 11. Pump exactly **37.85 L** (**10.00 US gal**) of water to fill the container twice.
- 12. Check the total volume registered on the Lifetime Totals tab. The reading displayed is the new meter cal value. This value should be within ± 3% of the calibration number stamped on the tag of the flow meter.

4

Fill Setting Display Setup 13. Repeat this procedure several times to confirm accuracy. Always "zero out" the total volume display before retesting.

NOTE: For increased precision, set meter cal to 100 [378] and pump 100.00 L (26.42 US gal) of water.

To verify the flow meter calibration, the fill applicator tank with a predetermined amount of measured liquid (i.e. 946.35 L (250.00 US gal)]).

NOTE: Do not rely on graduation marks on the tank level decal.

15. Empty the applicator tank under normal operating conditions. If the total volume displayed is different from the predetermined amount of measured liquid by more than ± 3%, complete the following calculation:

Where CMC = the Corrected Meter Cal, MC = the Meter Cal used to apply the known volume, and VM = the Volume measured by the Lifetime Totals tab, and VA = the predetermined volume applied.

For example

The UT displays a Total Volume of 260 [984] when a Meter Cal of 720 [190] was used to apply a measured volume of **946.35 L** (**250.00 US gal**). Therefore:

English			Metric	
720 × 260	- 740		[190] × [984]	- [109]
250	= 749	CINC -	[946]	- [190]

the Corrected Meter Cal is 749 [198]

16. Return to the Rate Sensor Setup menu and enter a value of 749 [198] for the meter cal.

Cable and connector maintenance

Power and Rate Control Module (RCM) harness maintenance

- 1. Disconnect the Rate Control Module (RCM) Sprayer Electronic Control Unit (ECU) harness connector and inspect for signs of moisture or corrosion.
- 2. If moisture or corrosion is detected, use brushes and compressed air to clean and dry the connector.
- 3. When clean, apply a coating of corrosion preventative compound to the connector mating surfaces and contacts.
- 4. Reattach the connectors.

AutoFold and AutoBoom® XRT diagnostics and troubleshooting

System information

To access the "System Information" screen:

- 1. Press the "Diagnostics" button on the left-hand pane of the home screen.
- 2. Select the "System Information" tab.

Boom outputs

The "Boom Outputs" screen displays the base PWM (%) (1), blocker (status) (2), and control effort (%) (3).

NOTE: In AutoBoom mode the boom height is controlled by a blocker valve and a proportional valve for lifting. The blocker valve is open to allow a flow path. The control effort is applied to let the boom lower or make it raise. Base duty cycle is calibrated to a point where the boom remains stationary when the blocker is activated. A lower control effort than the base duty cycle lets the boom lower.



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Fold outputs

The "Fold Outputs" screen displays control effort (%) (1) for each joint on the boom.



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Boom readings

The "Boom Readings" screen displays the boom position (1), angular velocity (2), and the sensor voltage (3) of the selected boom. Press the desired boom or center rack boom to view the information for that section. Voltage and angular position should change smoothly through the range of movement. Angular position should be close to zero when the boom section is horizontal.



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CAN bus information

The "CAN Bus Information" screen displays information about the **AutoBoom**® XRT Controller Area Network (CAN) system.



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Fold controls

The "Fold Controls" screen allows you to manually control each section of the boom.

NOTE: Depending upon the machine configuration, not all sections may be available to control on this screen and some displayed sections may not be controlled via the displayed buttons.

You can perform the following fold actions for troubleshooting purposes:

- Center Fold
- Left Lift
- Left Fold 1
- Left Fold 2/3
- Right Lift
- Right Fold 1
- Right Fold 2/3

Fold sensor readings

The "Fold Sensor Readings" screen displays the voltage reading for each fold joint. When AutoFold is unlocked, a percent position is also displayed. A value of 0% is fully folded and 100% is fully unfolded.





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Hardware/software versions

The "Hardware/Software (ABM)" window screen displays the AutoBoom Module (ABM) hardware and software number and versions.



Height sensor readings

The "Height Sensor Readings" screen displays the sensor serial number (1), distance to canopy (2), distance to ground (3), canopy confidence (4), and ground confidence percentages (5) for the selected sensor.

The sensor also provides a Light-Emitting Diode (LED) indicator to display the current status.

LED status	LED color
Sensor is in bootloader	Flashing red, 10 Hz
mode	
Sensor is reprogramming	Flashing red, 1 Hz
No CAN communication	Flashing yellow, 10 Hz
CAN communication but	Flashing yellow, 1 Hz
no ABM detected	
ABM detected, but not	Flashing pink, 1 Hz
indexed	
Sensor has been indexed	Flashing green, 1 Hz
Boom with sensor is	Flashing blue, 1 Hz
enabled	

Machine readings

The "Machine Readings" screen displays the current machine speed (1) chassis roll position (2), chassis pitch position (3), and chassis roll rate (4).







System hours

The "System Hours" screen displays the current version hours (1), version engaged hours (2), lifetime hours (3), and lifetime engaged hours (4).



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System voltages

The "System Voltages" screen displays the ECU power and the regulator voltages.



Variable damper outputs (if equipped)

The "Variable Damper Outputs" screen displays the control effort (1) for the variable damper.



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Tests

The following tests are available for the AutoBoom® XRT system:

- Target control effort test
- Target velocity test
- Target position test
- Target height test
- Terrain compensation test
- Manual valve control test

To access the tests:

- 1. Press the "Diagnostics" button on the left-hand pane of the home screen.
- 2. Select the "Tests" tab (1).



Target control effort test



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The target control effort test tests boom function with a static control effort. Entering a control effort value equal to the base duty cycle should result in no, or very slow boom movement. Higher values will cause the boom to raise and lower values will cause the boom to go down.

Target velocity test



The Target velocity test tests the velocity control parameter by either manually entering the angular velocity or by using predefined options. Tests are generally performed at +/- 2° /s. Before starting the test, manually move the boom to a position where it can travel up (or down) for five seconds. After running the tests, an average velocity will display. This should be within 20% of the target velocity. If additional adjustments are required, see the "AutoBoom® XRT advanced tuning" section starting on **4-82**.

Target position test

		de la companya de la comp	
Tests		10	
AutoBoom	=	The shade of the local section	
Target Position Test	=	Hanual Test	Test Results
This screen is designed to te	st the	Angle 3.00	Delay Tise 0.35
PID loop for been control. Th target angle can be entered	•	Current 2 04	Rise 1 20
manually or by using predefin options for lowering and rais	ed ing.	Angle 2.94	Time 1.20 (sec)
		Velocity 0.19	Settling 4.65
		(000 5)	overshoot 0.0
		10	
the game			

The target position test is designed to test the boom control PID loop. Enter a target position several degrees away from the current position in the "Target Angle" field. After running the test, various values will be reported. These values represent how quickly the boom moved to the target position. Ideally, the delay, rise, settling, and overshoot values are low.

Target height test

(1) 🗄 🖺 🖇	-3		A
Tests	1.		100 mm
AutoBoom	=		Statistical states
Target Height Test	=	Hervel Test	Test Results
This screen is designed to	a test the	Height 50	Delay Time 0.45
PID loop for boom control.	. The	(in) Left	(see)
manually or by using prede options for lowering and r	efined raising.	Height 47	Time 0.85 (set)
		Height 45	Settling 4.25
		Center 40	Overshoot A D
		Height 4d	4.8
No. of Lot.		9	() F
megan			

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The target height test is similar to the target position test but incorporates all of the sensors on the machine to control the ground height.

Terrain compensation test



The terrain compensation test analyzes data from the inertial sensors in the AutoBoom Module (ABM).

At the start of the test, the user is asked to have the engine idling at low speed. Next the user is asked to run the engine at typical operating RPM. The test reports a pass or fail for each engine speed. If the test fails, engine vibrations may be having a negative impact on system performance.

NOTE: If the test fails, check the node installation. Verify the node is mounted securely and has not come loose during operation. For troubleshooting assistance, see your CASE IH dealer.

NOTE: The **AutoBoom**® XRT system will still operate if the test fails, however, terrain compensation features may not offer optimal boom height adjustments for all terrain features.

Manual valve control test



The manual valve control test allows the user to manually move the sprayer booms to validate hydraulic valve function.

Diagnostic Trouble Code (DTC) screen

To access the fault codes for the **AutoBoom**® XRT system:

- 1. Press the "Diagnostics" button on the left-hand pane of the home screen.
- 2. Select the "Diagnostic Trouble Codes" tab (1).

To view information on the fault code, select the desired fault code (2) and press the "Info" button (3).

Press the "Clear" button (4) to clear all inactive fault codes.



System summary

The "System Summary" screen displays the machine configuration information.

To access the system summary, for the **AutoBoom**® XRT system:

- 1. Press the "Diagnostics" button on the left-hand pane of the home screen.
- 2. Select the "System Summary" tab (1).



Totals

The "Totals" screen allows you to view short-term performance data.

To access this summary data for the **AutoBoom**® XRT system, press the totals button (1) on the left-hand pane of the home screen.



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The "Short-Term Performance" screen (1) displays deviation of heights, average terrain, average error, and average speed.

The "Resettable Performance" screen (2) shows the same information as the short-term performance tab, but allows the user to reset the information by pressing the reset button (3).

NOTE: Press the "Report Issue" button to send out diagnostic information on the ISOBus. You may be asked to do this if working with your dealer support personnel or CASE IH technical support.

Direct chemical injection diagnostics and troubleshooting

System information



Open the Universal Terminal (UT) menu and select the direct chemical injection ISO Client Device (ICD) menu button.



Press the diagnostics button.



Select the product information tab.

Menu item	Definition
Hardware/Software	Includes the hardware part number, hardware serial number, hardware revision, software part number.
System Readings	Gives the Electronic Control Unit (ECU) Power, Motor Power, and ECU Temperature.
System Hours	Gives the software hours and engaged hours.
CAN Bus Information	Gives the CAN address, instance number, and extended identify number.
Reset Defaults	Select the reset defaults icon to restore the default system settings.

Tests

Catch test

- 1. Ensure that the pump and injection plumbing are primed. See "Injection pump priming" (**3-47**).
- 2. Verify that the catch test vessel is large enough to catch the desired volume.
- 3. Ensure that the end of the hose going from the pump to the catch vessel has a check valve to prevent excess fluid from exhausting when the pump has stopped pumping.
- 4. Set the hand valve on the injection pump outlet port to pump the fluid to the catch vessel through the recirculation line.





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- 5. Verify the following conditions:
 - The injection pressure is less than 82.7 kPa (12.0 psi).
 - $_{\odot}\,$ The pump is OFF.
 - The vacuum pressure is less than 29.2 cm Hg (11.5 in Hg).

NOTE: The vacuum switch on the pump engages and a flow alarm appears if the product cannot be drawn into the pump. In this condition the vacuum pressure is at or above **29.2 cm Hg** (**11.5 in Hg**). Inspect the screens, chemical tank lids, hose diameter, and any hand valves between the chemical tank and pump inlet. Verify that the product is flowing freely. Cold temperatures and high viscosity products can cause high vacuum pressures and cause the pump to not operate properly.

6. Disconnect the coupler from the top of the chemical tank. Place the recirculation hose into the catch test vessel.

7. In the Universal Terminal (UT) select the injection product to calibrate according to the following instruction:



Open the UT menu and select the desired direct chemical injection ISO Client Device (ICD) menu button **(1)**.



Press the diagnostics button (2).



Select the test tab (3).

Select the "Catch Test" item (4) in the drop down menu.

Press the "Begin" button (5).



8. Enter the volume (1) of injected chemical to use for the catch test. Press the "Next" button.

NOTE: Press the "X" button to stop the catch test at any time.

Check the amount caught in the catch vessel after the catch test is complete. The caught volume should be within +/- 3% of the desired amount. If the caught volume is off by more than +/- 3%, adjust the Flow Correction percentage value. Increase the Flow Correction percentage to pump more fluid. Decrease the Flow Correction percentage to pump less fluid.

NOTE: If an error message appears during the catch test, verify the conditions that are listed in steps 1 through 3 above. If the problem persists, see "Injection pump troubleshooting" (**3-1**) for assistance.



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Demonstration mode

Use the "Demonstration Mode" to simulate pressure with a specified value and to stimulate flow. To operate the Direct Chemical Injection ISO Client Device (ICD) in demonstration mode:



Open the Universal Terminal (UT) menu and select the direct chemical injection ISO Client Device (ICD) menu button **(1)**.



Press the diagnostics button (2).





Select the test tab **(3)**. Select the "Demonstration" mode menu item.

Press the "Begin" button (4) to begin the demonstration.

Diagnostic Trouble Code (DTC) screen

The Diagnostic Trouble Code (DTC) list provides a list of recent fault codes for the equipment operator. Access the fault code list to review the previous error conditions, the tally for each condition, during operation. See the Fault Code section in "Injection pump troubleshooting" (5-57) for additional information on diagnostic trouble codes.

The "Diagnostic Trouble Codes" screen gives the following fault codes:

- · All the active fault codes (1) and the number of times (2) the fault occurred
- Inactive fault codes (3) and the number of times the fault occurred

Press the "Clear" button (4) to clear the fault codes.



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Code	ID	Description	Recommended actions
520192	3	ECU voltage high	1. Verify battery connections.
			2. Inspect cable for defects.
	4	ECU voltage low	1. Verify high current breaker is not tripped.
			2. Verify battery connections.
			3. Inspect cable for defects.
520194	3	High Motor Voltage	1. Verify battery connections.
			2. Inspect cable for defects.
520194	4	Low motor voltage	1. Verify high current breaker is not tripped.
			2. Verify battery connections.
			3. Verify speed sensor and signal. 523175
523154	31	Lost communication	Verify the communication setup. Shutdown alarm.
	16	Target flow too high	1. Reduce the equipment speed.
			2. Reduce the target application rate.
	18	Target flow too low	1. Increase the equipment speed.
			2. Increase the target application rate.
523160	1	Chemical tank is empty	Refill the product to continue field applications.
	17	Low tank volume remaining	Refill the product to continue field applications.
523167	2	Injection pressure sensor	1. Verify good connection to the pressure sensor on the pump.
		disconnected	2. Verify the sensor is getting supply voltage.
			3. Verify the signal voltage is getting back to the pump ECU.
	16	High injection pressure	1. Verify the communication setup/shutdown alarm.
			 Check for an obstruction in the injection system discharge hose.
			3. Verify the carrier pressure is not exceeding 1034 kPa (150 psi).

Code	D	Description	Recommended actions
523175	18	Low pump efficiency	Check for:
			1. Fouled pump check valves.
			2. Air leaks on the injection pump inlet plumbing.
			3. Air in the chemical.
			4. Plugged inlet strainer.
			5. Chemical too thick to flow through the pump.
			6. Calculate the volume per minute for the application and verify the rate is within the range of the injection pump.
			7. Check the flow monitor sensor.
			 Follow the "Injection Pump Troubleshooting Steps (If Pump Does Not Calibrate)" procedure below.
523176	16	Off rate high	1. Check the calibration for the correct data entry.
			2. Calculate the volume per minute for the application and verify the rate is within the range of the injection pump.
	18	Off rate low	Inspect for:
			Fouled pump check valves.
			Air leaks on the injection pump inlet.
			Air in the chemical.
			Plugged inlet strainer.
			 Chemical too thick to flow through the pump.
			• Calculate the volume per minute for the application and verify the rate is within the range of the injection pump.
523188	16	DI high vacuum error	1. Disconnect the vacuum switch from the product cable. Test for continuity between pins A and C. If the ohmmeter reads a short, the switch is good. If it reads open, the vacuum switch is bad.
			2. Inspect for obstructions from the inlet of the tank. There can be debris in the inlet, a plugged filter/strainer, a hand valve turned in the wrong direction, or an obstruction in the outlet of the chemical tank.
523189	7	Injection pump fault	Return pump to a local CASE IH dealer for service.
504000	13	Invalid pump calibration	Adjust the flow correction offset.
524082	31	Display is not online	1. Inspect cable for defects.
	1	1	2. Check CAN termination.

Direct chemical injection Light-Emitting Diode (LED) status

Flow monitor sensor

The flow monitor sensor has a single red Light Emitting Diode (LED) (1). Power is present when the LED is illuminated. The LED will pulse dwhen the flow monitor is sensing the flow monitor magnet shuttle assembly.

The flow monitor sensor registers the magnet shuttle assembly passing the sensor to provide an output signal.



Motor control Electronic Control Unit (ECU)



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Injection pump troubleshooting

Required tools

- Vacuum gauge with a 6.35 mm (0.25 in) National Pipe Thread (NPT) male port and a range of 0 762 mm Hg (0 30 in Hg).
- Calibrated container that reads in fluid milliliters or ounces and holds at least 1000 mL (32 US fl oz).

NOTICE: For testing purposes it is best to use water for pumping. Make sure the pump has been flushed of chemical properly before beginning the following procedure. Wear proper protective equipment. See the product label of the chemicals in use.

Troubleshooting procedure

- 1. Set the hand valves in position so water recirculates back to the chemical tank.
- Run the pump in recirculate at a medium rate for 5 min to verify there is water being pumped back to the tank. If water is being recirculated, skip to the next step. If water is not being recirculated, inspect and clean the pump check valves before performing the next step.
- 3. If the Light Emitting Diode (LED) on the flow monitor sensor is not blinking, but the pump is running, verify the pump is installed correctly and all parts are present. If or when the red light on the flow monitor is blinking, perform the next step.
- 4. Verify the FER (on the Diagnostics Page) or pump efficiency (on Home Page) read above 95%.
- 5. Perform a catch test. If the pump did not calibrate correctly, inspect and clean the check valves. Verify the pump check valves are assembled correctly, verify the intake valve spring is the lighter spring, and verify the discharge valve spring is the heavier spring. See "Tests" (5-51) for instructions on performing the catch test.
- 6. If performing the above steps does not fix the issue, there can be a vacuum leak on the intake pump. Use the vacuum gauge and perform the following steps.
- 7. Install the vacuum gauge in place of the vacuum sensor.
- 8. Run the pump at a high RPM.
- 9. Verify if the pump is pumping water back to the tank.
- 10. Close the valve at the bottom of the supply tank.
- 11. Turn the pump OFF.
- 12. Verify the reading on the vacuum gauge maintains at least **508 mm Hg** (**20 in Hg**). If the vacuum gauge does not hold the required minimum pressure, see the steps below to identify the leak location.
- 13. Open the supply valve at the bottom of the supply tank. This is the valve you closed in step 10.

14. Operate the pump in the recirculate mode. Verify the vacuum gauge reads less than 304.8 mm Hg (12 in Hg). If the gauge displays a reading higher than the maximum value, verify the strainer screen is at least 20 mesh, the strainer is clean, and that the inlet plumbing size is correct.

NOTE: The inlet plumbing size on the 1 - 40 oz./min pump should be 1/2" ID minimum. Inlet for the 5 -200 oz./min pump should be 3/4" ID minimum.

Vacuum gauge does not hold the required minimum pressure

Perform these steps if step 12 above fails:

- A. Verify all O-rings are present.
- B. Check for loose clamps.
- C. Inspect for damaged hose barbs or loose fittings.
- D. Verify pipe sealant has been used on all fittings.
- E. Check for cracked pump heads and fittings.
- F. If using quick disconnect couplings, verify those couplings are not leaking.

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