CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

If this product contains a gasoline engine:

⚠️ WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

The State of California requires the above two warnings.

Additional Proposition 65 Warnings can be found in this manual.

John Deere Ag Management Solutions
(This manual replaces OMPFP11705)
PRINTED IN U.S.A.
**Foreword**

READ THIS MANUAL carefully to learn how to operate and service your system correctly. Failure to do so could result in personal injury or equipment damage. This manual and safety signs on your machine may also be available in other languages. (See your John Deere dealer to order.)

THIS MANUAL SHOULD BE CONSIDERED a permanent part of your system and should remain with the system when you sell it.

MEASUREMENTS in this manual are given in both metric and customary U.S. unit equivalents. Use only correct replacement parts and fasteners. Metric and inch fasteners may require a specific metric or inch wrench.

RIGHT-HAND AND LEFT-HAND sides are determined by facing in the direction of forward travel.

WRITE PRODUCT IDENTIFICATION NUMBERS (P.I.N.) in the Specification or Identification Numbers section. Accurately record all the numbers to help in tracing the components should it be stolen. Your dealer also needs these numbers when you order parts. File the identification numbers in a secure place off the machine.

WARRANTY is provided as part of John Deere’s support program for customers who operate and maintain their equipment as described in this manual. The warranty is explained on the warranty certificate which you should have received from your dealer.

This warranty provides you the assurance that John Deere will back its products where defects appear within the warranty period. In some circumstances, John Deere also provides field improvements, often without charge to the customer, even if the product is out of warranty. Should the equipment be abused, or modified to change its performance beyond the original factory specifications, the warranty will become void and field improvements may be denied.
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Safety

Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

Follow Safety Instructions

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this operator's manual.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.
**Practice Safe Maintenance**

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (−) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.

**Handle Electronic Components and Brackets Safely**

Falling while installing or removing electronic components mounted on equipment can cause serious injury. Use a ladder or platform to easily reach each mounting location. Use sturdy and secure footholds and handholds. Do not install or remove components in wet or icy conditions.

If installing or servicing a RTK base station on a tower or other tall structure, use a certified climber.

If installing or servicing a global positioning receiver mast used on an implement, use proper lifting techniques and wear proper protective equipment. The mast is heavy and can be awkward to handle. Two people are required when mounting locations are not accessible from the ground or from a service platform.
Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.

Operate Safely

Never allow children on or near machine.

Before operating, make sure air has been bled from wing-fold hydraulic system.

Be sure area around machine is clear before raising or lowering machine frame or wings.

Do not operate close to a ditch or creek.

Do not operate with wings folded.

Slow down when turning and traveling over rough ground.

Always shut off tractor and shift to PARK or set brakes when leaving tractor. Remove key when leaving tractor unattended.

Always have tractor stopped on level ground when raising or lowering wings.

Operate machine from tractor seat only.

If chemicals are used, follow manufacturer’s recommendations for handling and storage.

Tow machine behind a properly equipped tractor only.

Read and Understand MSDS

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Follow all recommended procedures.

(See your John Deere dealer for MSDS’s on chemical products used with John Deere equipment.)
Handle Agricultural Chemicals Safely

Chemicals used in agricultural applications such as fungicides, herbicides, insecticides, pesticides, rodenticides, and fertilizers can be harmful to your health or the environment if not used carefully.

Always follow all label directions for effective, safe, and legal use of agricultural chemicals.

Reduce risk of exposure and injury:

- Wear appropriate personal protective equipment as recommended by the manufacturer. In the absence of manufacturer's instructions, follow these general guidelines:
  - Chemicals labeled 'Danger': Most toxic. Generally require use of goggles, respirator, gloves, and skin protection.
  - Chemicals labeled 'Warning': Less toxic. Generally require use of goggles, gloves, and skin protections.
  - Chemicals labeled 'Caution': Least toxic. Generally require use of gloves and skin protection.
- Avoid inhaling vapor, aerosol or dust.
- Always have soap, water, and towel available when working with chemicals. If chemical contacts skin, hands, or face, wash immediately with soap and water. If chemical gets into eyes, flush immediately with water.
- Wash hands and face after using chemicals and before eating, drinking, smoking, or urination.
- Do not smoke or eat while applying chemicals.
- After handling chemicals, always bathe or shower and change clothes. Wash clothing before wearing again.
- Seek medical attention immediately if illness occurs during or shortly after use of chemicals.
- Keep chemicals in original containers. Do not transfer chemicals to unmarked containers or to containers used for food or drink.

- Store chemicals in a secure, locked area away from human or livestock food. Keep children away.
- Always dispose of containers properly. Triple rinse empty containers and puncture or crush containers and dispose of properly.
Working With Anhydrous Ammonia

Any person required to handle, transfer, transport or otherwise work with ammonia shall be trained to understand the properties of ammonia, to become competent in safe operating practices and to take appropriate action in events of a leak or emergency. These notes are a supplement to a thorough understanding of the Material Safety Data Sheets (MSDS), state and local regulations, and safety training from your local anhydrous ammonia supplier. They are not intended to replace other sources of safety information. Read safety instructions from anhydrous ammonia supplier and equipment supplier.

1. Anhydrous ammonia poses three distinct hazards to humans.
   a. It is desiccant and will aggressively attract water from whatever it comes in contact with. Eyes are particularly vulnerable to damage. Any exposed skin surface can also be damaged.
   b. Anhydrous ammonia is typically stored under pressure. When exposed to atmospheric pressure, it boils at -33° C (-28° F). The vaporization will freeze whatever the liquid anhydrous ammonia comes in contact with. Each 0.5 kg (1 lb.) of Anhydrous Ammonia that vaporizes is capable of freezing about 1.8 kg (4 lb.) of water.
   c. Danger to the respiratory system may occur if high concentrations of anhydrous ammonia is inhaled.

2. Reduce risk to exposure and injury.
   a. Wear PPE (Personal Protective Equipment).
      • ALWAYS WEAR REQUIRED and APPROVED PPE when working with anhydrous ammonia and anhydrous ammonia equipment.
      • PPE includes but is not limited to CHEMICALLY-PROTECTIVE, SPLASH-PROOF GOGGLES and RUBBER GLOVES. An approved full face shield may be worn to protect the face but only as secondary eye protection.
   b. Take Precautionary Measures.
      • Plan your work with safety in mind. Plan escape routes from any working position and know the location of emergency water sources if they are needed.
      • Always have a container with no less than 19 L (5 gal) of readily available clean water for emergency usage. Carry a squeeze bottle of water at all times.
      • Never fill tank past 85% capacity.
      • Before activating the application system, know the location of bystanders and/or coworkers.
      • If modifying anhydrous ammonia system using a section control system to allow control of flow to individual sections of machine, additional safety measures MUST be taken. These measures include placement of bleed valve(s) at distribution lines between the main control valve and the section control valves. In addition, all anhydrous ammonia hoses NOT OPEN to atmosphere MUST be high pressure rated to ensure safety.
   c. Transport and Store Safely.
      • Do not park applicator and/or nurse tank in an enclosed area as toxic or flammable conditions can result.
      • Verify anhydrous ammonia wagons and/or applicators are safe for road travel and securely attached to vehicles drawing them.
      • NEVER tow anhydrous equipment into public places without authorization.
      • When transporting anhydrous ammonia, verify discharge hoses are securely fastened to both ends. Some states require supply hoses to be secured to nurse tank before transporting. Check state and local laws.
      • Turn off all hose end and tank valves prior to transporting, servicing, and storing.
      • Properly bleed system to remove pressure and liquid anhydrous ammonia before servicing and storing. Verify all shut-off ball valves are operating and have released all trapped anhydrous ammonia inside ball. Follow all original equipment manufacturer’s instructions.
   d. Service Equipment Safely.
      • Turn off all hose end and tank valves prior to transporting, servicing, and storing.
      • Properly bleed system to remove pressure and liquid anhydrous ammonia before servicing and storing. Verify all shut-off ball valves are operating and have released all trapped anhydrous ammonia inside ball. Follow all original equipment manufacturer’s instructions.
      • NEVER attempt to connect or disconnect coupling until all flow from open bleed valves is stopped and all lines are completely bled.
      • Disconnected hoses may still have liquid anhydrous in them.
      • Never look directly into hoses, quick couplers, meters, and shut-off valves.
      • Stay upwind of the fitting you are working on.
      • Never attempt to clear blockage from any hose until pressure has been bled from the system. Plugged fertilizer tubes may have pressurized ammonia behind the plug.

3. If you come in contact with anhydrous ammonia:
   a. Get away from the exposure.
   b. IRRIGATE THE AFFECTED AREA WITH WATER IMMEDIATELY AND CONSTANTLY. Eyes receive first attention with eyelids held open for flushing.
   c. Seek medical assistance.
Emergency Procedure For Anhydrous Ammonia

**CAUTION:** Only personnel trained for and designated to handle emergencies should attempt to stop a leak.

In the event of an anhydrous ammonia leak, it is vital the following steps are taken to insure the safety of you and others.

1. Position machine heading into the wind and lower shanks into ground.
2. **IMMEDIATELY** go to a safe distance upwind from vapor cloud and warn others in proximity to machine.
3. Determine possibility of safely closing shut-off valve (A) by pulling emergency rope (B) at front of machine or closing tank withdrawal valve (C). **DO NOT** attempt to close by other means. **DO NOT** reenter anhydrous ammonia vapor cloud.
4. Contact authorities as necessary and report released ammonia to environmental protection or other authorities as required by law.
5. Retrieve equipment **ONLY AFTER** all traces of anhydrous ammonia are gone.
6. Close all tank valves and open bleed valves.
7. Determine cause of leak and take following actions:
   - If leak is tank related, return to supplier.
   - If leak is from knife supply line, replace (refer to implement manual).
   - If leak is from any other part of machine, see John Deere dealer.

Dispose of Waste Properly

Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth’s atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.
Malfunction of Implement Height Switch Detected

⚠️ CAUTION: Malfunction of Implement Height Switch Detected.

To avoid serious injury or death from exposure to chemicals or anhydrous ammonia, verify height switch is operating properly.

Raise and lower implement. If the indicator below does not match machine operation, service height switch.

This message will be displayed on a NH3 system when the system detects the implement is down for an extensive period of time, which can indicate a failure in the height switch. To verify correct operation, follow the instructions. If the height switch indicator does not match machine operation, service height switch.

Unexpected NH3 Flow Detected

⚠️ CAUTION: Unexpected anhydrous ammonia flow detected.

To avoid serious injury or death from exposure to anhydrous ammonia, select button to turn off control valve.

This message will be displayed if the GreenStar Rate Controller has attempted to close the On/Off valve but still detects flow. If the Control Valve OFF button is selected, the system will also attempt to shut off the control valve.

NOTE: This message will only be displayed when using a dual valve system (i.e. the control valve type is Standard or Fast).
Unexpected NH₃ Flow Detected

⚠️ CAUTION: Unexpected anhydrous ammonia flow detected.

To avoid serious injury or death from exposure to anhydrous ammonia:
1. Face machine into wind.
2. Lower and engage applicator into soil.
3. Exit machine. Go to a safe distance upwind from vapor cloud.
4. Warn others in proximity to machine.
5. If possible, close shut-off valve.

This message will be displayed if the GreenStar Rate Controller has attempted to close all valves but still detects flow. To reduce risk of injury, follow the instructions on the screen.

Unexpected Chemical Flow Detected

⚠️ CAUTION: Unexpected chemical flow detected.

To avoid injury from exposure to chemicals, shut off solution pump.

This message will be displayed if the GreenStar Rate Controller has attempted to close the section valves but still detects flow on a sprayer or liquid fertilizer system.

NH₃ Diagnostic Tests

⚠️ CAUTION: Running this test will discharge anhydrous ammonia.

To avoid serious injury or death from exposure to anhydrous ammonia, ensure there are no bystanders and sound horn before pressing Start.

If necessary, use the master switch to stop application.

This message will be displayed when any diagnostic test is selected on NH₃ systems that discharges anhydrous ammonia.
Diagnostic Tests

⚠️ CAUTION: Running this test will discharge liquid from the nozzles.

To avoid injury from exposure to chemicals, use clean water and appropriate personal protective equipment.

If necessary, use the master switch to stop application.

This message will be displayed when any diagnostic test is selected on sprayer or liquid fertilizer applications that will discharge liquid.
Safety Features

GreenStar Rate Controller™: In addition to the safety features shown here, other components, systems, safety signs on the unit, safety messages and instructions in the operator’s manual contribute to the safe operation of this product when combined with the care and concern of a capable operator.

Read and follow the instructions in all related manuals for implements and application equipment.

Implement Height Switch

The implement height switch is REQUIRED for NH3 and planter applications. These applications will not operate without an implement height switch correctly installed. This height switch prevents the GreenStar Rate Controller from discharging product unless the implement is lowered into the ground.

To verify the height switch operates correctly, raise and lower the implement while observing the height switch indicator (see MAIN SCREEN INDICATIONS in the OPERATION sections).

When operating NH3, an alert will appear if the system detects the implement has been down for an extensive period of time (see MALFUNCTION OF IMPLEMENT HEIGHT SWITCH DETECTED in “Safety Signs” section).

Planter applications use the implement height switch for documentation purposes only. Planters will not map correctly without the height switch properly installed.

Sprayer applications do NOT require or allow an implement height switch.

The use of a height switch with Liquid Fertilizer applications is optional.

If using GreenStar Rate Controllers in a Multi-Product configuration, a single height switch can be shared among multiple GreenStar Rate Controllers. The height switch must be connected to one GreenStar Rate Controller and that GreenStar Rate Controller must be configured to “Send” the height switch status to the other GreenStar Rate Controllers. Each additional GreenStar Rate Controller must be configured to “Receive” the height switch status. There is an additional option of “Do Not Share” that can be used if multiple height switches are desired in the application.
System Overview

The GreenStar™ Rate Controller system controls product application on pull-type sprayers, self-propelled sprayers, NH3 applicators, liquid fertilizer systems, and planters. It is designed to work seamlessly with Swath Control Pro in order to turn implement sections on and off according to coverage, boundary, and GPS location.

NOTE: See GS2 Basics operator's manual for further details on Swath Control Pro.

The system is comprised of the following hardware components:

- GreenStar 2100, 2600, 2630 Display. (For compatibility with GreenStar 1800 display, see the GreenStar 1800 Operators manual.)
- GreenStar Rate Controller Flexbox.
- Foot Switch.
- Wiring Harnesses.
- Switch Box Controller PF90514 (optional).
- GreenStar cab harness.
- StarFire GPS receiver (optional).
- Implement Height Switch (required for NH3 and planter applications).

The GreenStar Rate Controller controls flow and individual implement section valves or planter clutches based upon display settings, vehicle speed, foot switch status, signals from a flowmeter, and the status of switches on the optional Switch Box Controller.

The Switch Box Controller (SBC) monitors the status of ten section switches plus a master switch and broadcasts the switch messages to the GreenStar Rate Controller(s). This allows the operator to manually enable or disable sections rather than rely solely upon the display for these settings. The master switch permits the operator to shut off all sections on all GreenStar Rate Controllers in the system. The master switch on the switch box serves the same purpose as the foot switch and only one of the two is required for system operation.

In order for the system to control individual sections under normal operating conditions, the following conditions must be met:

- Master switch must be on.
- Section switch must be on (if Switch Box is present).
- Operator must have turned on the respective section on the display.
- Swath Control must have commanded the section to be on (if applicable) or Swath Control Pro is deactivated.
- Vehicle speed must be greater than 0 km/h (0 mph) for planting/seeding implement types and 0.5 km/h (.3106 mph) for all other implement types.
- The implement is lowered into the ground, activating the implement height switch (not required for sprayers and liquid fertilizer applications).

IMPORTANT: When setting up a GreenStar Rate Controller in a system containing multiple GreenStar Rate Controllers, ensure the setup being performed is applied to the intended GreenStar Rate Controller. Verify the serial number on the GreenStar Rate Controller matches the GreenStar Rate Controller serial number selected on the GS2 Display.

NOTE: Turning the master switch on/off affects all GreenStar Rate Controllers in the system.
Component Overview and Compatibility

The following component configurations are compatible with the GreenStar Rate Controller. See Main Harness (37-Pin Connector) Table at the end of the manual for additional pin out information.

Section Valves

- Section Valves with 3 wire SPST (Single Pole Single Throw)

A 3-Wire valve is considered a valve with a solenoid-like operation. There is one signal wire controlling operation of the valve. When the signal wire is high (12 V), the valve is opened. When the signal wire is low (0 V), the valve closes. This can sometimes be referred to as a single pole single throw (SPST) valve. There may be configurations where a valve with this operation only has two wires, a signal wire and a ground wire.

- Section valves with 2-wire DPDT (Double Pole Double Throw). Not Compatible on NH3 systems.

A 2-Wire valve is considered a valve with reversing capabilities. This valve needs two outputs to control its operation. When the (+) signal wire is high (12 V) and the (-) signal wire is low (0 V), the valve opens. Likewise, when the (-) signal wire is high (12 V) and the (+) signal wire is low (0 V), the valve closes. When both signal wires are low (0 V), the valve does not move. This type of valve can sometimes be referred to as a double pole double throw (DPDT) valve.

- Section Valves must require less than 2.5 amps of current

Section Valve Supplemental Information

IMPORTANT: Valve power and valve ground pins are not reverse-voltage protected. Precautions should be taken to prevent them from being connected backwards or the GreenStar Rate Controller may be damaged.

3 Wire SPST Section Valves

- Valve power and valve ground must be used for all section valves. If valve power and valve ground are not connected, section valves will not open or close.
- Section valves must be evenly split among available valve power and valve ground pins to disperse electrical load evenly through those terminals.

Raven Sidekick™ Pro Direct Injection Pump Compatibility

GreenStar Rate Controller is compatible with the Raven Sidekick Pro direct injection pump for applying product using the following implements:

- Sprayers
- Liquid fertilizer tools
- NH3 applicators

Raven Sidekick Pro injects varying amounts of product into the main solution line of the implement. This eliminates the need to mix chemicals in the main tank. GreenStar Rate Controller can be configured with up to three Raven Sidekick Pro direct injection pumps.

IMPORTANT: If multiple GreenStar Rate Controllers are being used, only one GreenStar Rate Controller should be configured to communicate with all direct injection pumps on the system.
## Sections

- Sprayers and Liquid Fertilizer
- NH3 (Anhydrous Ammonia)
  - 1 to 10 section(s) available for NH3 applications.

The number of implement sections the GreenStar Rate Controller can control depends on:
- Section valve type
- Agitator
- Fence row nozzles (optional for pull-behind sprayer and self-propelled sprayer ONLY)

### Maximum Number of Sections by Configuration

**NOTE:** Agitator Valve and Flow Return Valve presence do not affect the section availability for 3-wire section valves.

<table>
<thead>
<tr>
<th>Fence Row Valve</th>
<th>Maximum Number of Section Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10</td>
</tr>
<tr>
<td>Left Only</td>
<td>8</td>
</tr>
<tr>
<td>Right Only</td>
<td>8</td>
</tr>
<tr>
<td>Both Left &amp; Right</td>
<td>8</td>
</tr>
</tbody>
</table>

### Valve Type: 3-Wire (Such as RAVEN®, TEEJET®, KZCO™ and BANJO®)

<table>
<thead>
<tr>
<th>Fence Row Valve</th>
<th>Maximum Number of Section Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10</td>
</tr>
<tr>
<td>Left Only</td>
<td>8</td>
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<tr>
<td>Right Only</td>
<td>8</td>
</tr>
<tr>
<td>Both Left &amp; Right</td>
<td>8</td>
</tr>
</tbody>
</table>

### Maximum Number of Sections by Configuration

<table>
<thead>
<tr>
<th>Fence Row Valve</th>
<th>Agitator Valve</th>
<th>Flow Return Valve</th>
<th>Maximum Number of Section Availability</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Right Only</td>
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<td>5</td>
</tr>
<tr>
<td>Both Left &amp; Right</td>
<td>No</td>
<td>Does not affect</td>
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</tr>
<tr>
<td>Does not affect</td>
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<td>Does not affect</td>
<td>4</td>
</tr>
</tbody>
</table>

### Valve Type: 2-Wire (Such as HARDI®)

<table>
<thead>
<tr>
<th>Fence Row Valve</th>
<th>Agitator Valve</th>
<th>Flow Return Valve</th>
<th>Maximum Number of Section Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No</td>
<td>No</td>
<td>7</td>
</tr>
<tr>
<td>None</td>
<td>No</td>
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<tr>
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<td>Does not affect</td>
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<tr>
<td>Does not affect</td>
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<td>Does not affect</td>
<td>4</td>
</tr>
</tbody>
</table>

**RAVEN** is a trademark of Raven Industries Inc.
**TEEJET** is a trademark of Spraying System Co.
**KZCO** is a trademark of KZCO, Inc.
**BANJO** is a trademark of Alsco Industrial Products, Inc.
**HARDI** is a trademark of HARDI International A/S
Flow Control Valves

<table>
<thead>
<tr>
<th>NH3</th>
<th>Liquid Fertilizer</th>
<th>Sprayers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fast</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fast Close</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PWM</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PWM Close</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- Flow Control Valves that require 12V power to open.
- Flow Control Valves that require less than 2.5 amp of current.

Flow Control Valve Types

IMPORTANT: For PWM and PWM Close Control Valve systems, it is recommended that an external solution pump on/off switch is wired into the cab, if not already present, allowing the operator to shut off the solution pump. Solution pump damage could occur if it is run without solution in it.

PWM Control Valve System: When the master switch is shut off on a PWM Control Valve System, it will close the section on/off valve(s) stopping product flow. The PWM Valve will remain at its current position allowing hydraulic flow to continue to the solution pump which will allow the solution pump to continue running. An external solution pump on/off switch will allow the operator to shut off the solution pump.

PWM Close Control Valve System: When the master switch is shut off on a PWM Close Control Valve System, it will shut off the solution pump. An external solution pump on/off switch can be more user-friendly and familiar for a sprayer operator to shut off the solution pump if the solution tank runs empty.

Refer to the solution pump manufacturer’s Operators Manual for more information.

- Standard Control Valves
Standard control valves are used in dual-valve systems and are used in conjunction with an on/off valve. The on/off valve closes in order to stop product flow and the standard control valve remains in its current position. Upon re-opening the on/off valve, the standard control valve should need little to no adjustment, assuming the target flow rate has not changed dramatically.

- Fast Close Control Valves
Fast Close control valves are used in single-valve systems. Due to its quick response time, a fast close valve eliminates the need for an additional on/off valve. The fast close valve serves as the rate control valve and will also completely close when it is necessary to stop product flow. To start product flow once again, the fast close valve opens and quickly ramps flow back up to achieve the target application rate.

- Fast Control Valves
Fast control valves are used in dual-valve systems and are used in conjunction with an on/off valve. The on/off valve closes in order to stop product flow and the fast control valve remains in its current position. Upon re-opening the on/off valve, the fast control valve should need little to no adjustment, assuming the target flow rate has not changed dramatically.

- PWM Control Valves
PWM Control Valves are used in dual-valve systems and are used in conjunction with an on/off valve. The on/off valve closes to stop flow and the PWM Valve remains in its current position. Upon reopening the on/off valve, the PWM Valve should need little to no adjustment, assuming the target flow has not changed dramatically.

- PWM Close Control Valves
PWM Close Control Valves are used in single-valve systems. Due to its quick response time the PWM Close Valve eliminates the need for an additional on/off valve. The PWM valve serves as the rate control valve and will also completely close when it is necessary to completely stop flow. To start product flow once again, the PWM close valve opens and quickly ramps flow back up to achieve the target application rate.

NOTE: Fast and Fast Close or PWM and PWM Close Valves are physically the same with the only difference being how the GreenStar Rate Controller controls them.

Flowmeters

- Flowmeters requiring 5V or 12V power supply.
- Flowmeters with square wave signal type.

Flowmeter Supplemental Information

- For a Flowmeter requiring a 5V power supply, use power provided through the pin labeled Flowmeter #1 5vdc.
- For a Flowmeter requiring a 12V power supply, use power provided through the pin labeled ECU Power.

Pressure Sensors

- Pressure sensors requiring 5V or 12V power supply
- Pressure sensors that are voltage based with an output voltage range of 0V to 5V

Planter Compatibility

The GreenStar Rate Controller can communicate with SeedStar controllers to control engagement of hydraulic variable rate motors on the following John Deere planter configurations:

- John Deere planters with Hydraulic Variable Rate Motors will have 2 to 4 sections available.
- John Deere planters with Non-CAN based frame control.
The GreenStar Rate Controller can control engagement of electric clutches or solenoids on the following ground drive configurations:

- Planters with individual row clutches (Tru Count) will have 1 to 16 sections available.
- Planters with Non-CAN based frame control.
- Planters with existing ½, ⅓, or ¼ electric disconnect clutches will have 2 to 4 sections available dependent on the disconnect sections.

### Implement Height Switch

- An implement height switch is REQUIRED for NH3 and planter applications.
- An implement height switch is OPTIONAL for liquid fertilizer applications.

---

**GreenStar Rate Controller**

To access the GreenStar Rate Controller main page, select the menu button followed by the GreenStar Rate Controller button. Each GreenStar Rate Controller will be identified by the controller serial number and implement name once the setup procedure has been completed.

**NOTE:** The GreenStar Rate Controller icon will appear upon power up after the harness is installed and the GreenStar Rate Controller is connected.

---

**Offsets**

It is necessary to set up machine and implement offsets and Swath Control parameters to optimize GreenStar Rate Controller performance. Refer to GS2 Basics and Guidance manuals.

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**Rate Controller performance. Refer to GS2 Basics and Guidance manuals.**
Sprayers and Liquid Fertilizer Tool Setup

Implement Setup
Select Setup menu button to enter GreenStar Rate Controller setup.

NOTE: Master switch must be off to change most settings or values.

Implement Setup

Select the Implement tab (A) to enter implement setup.

NOTE: Switchbox switch numbers (N) will only be available if a switchbox is connected.
Implement Selection

1. Select desired implement type (pull-behind sprayer, self-propelled sprayer, liquid fertilizer tool) from the drop-down menu.

2. Select implement name from drop-down.

   If no name has been added yet:
   1. Select new.
   2. Type new name on keypad.
   3. Select enter.

   If name needs to be revised:
   1. Select implement name to be revised from drop-down.
   2. Select rename.
   3. Type new name on keypad.
   4. Select enter.

   If equipment name is no longer needed:
   1. Select implement name to be deleted from drop-down.
   2. Select remove.
   3. Accept pop-up notification.

   NOTE: If GRC will not be used but remain connected, check Disable this GRC check box to eliminate connection to display for Documentation, Swath Control, and controller warnings.

   NOTE: A maximum of three implement configurations/names may be saved per controller.

   NOTE: Rename does not affect System tab, Alarm tab, and Rates tab previously configured. Existing calibrations remain valid.

   NOTE: Implement name must be defined before the System tab, Alarm tab, and Rates tab are enabled.

Setup Implement Sections

To setup implement sections:

- Initial implement width may be entered into the implement width input box. The width entered is evenly distributed among the sections.

- If implement sections are different widths or associated switches are different, select setup sections button and follow on screen instructions. Fence row nozzles are also included under setup sections.

   NOTE: It is recommended that the section valve type be determined prior to completing section setup.

   NOTE: Switchbox information will be hidden when no switchbox is connected.

Continued on next page
Sprayers and Liquid Fertilizer Tool Setup

Setup Sections

Enter number of sections, then continue to the next page.

1. Enter number of sections.
2. Select fence row nozzle enable/disable check boxes as required.
3. Indicate switch number associated with each fence row nozzle.
4. Select page forward to enter each individual section width and associated switch box number.

Dual Boom

Dual boom allows for a second rank of nozzles to activate when high speeds and/or application rates are required. This allows for pressure and nozzle pattern to remain consistent.

To setup Dual Boom:
1. Select the Dual Boom ON/OFF check box (A) to enable Dual Boom.
2. Enter speed value in the Dual Boom Activation input box (B). When speed value is reached, Dual Boom becomes active.

NOTE: Dual Boom is only available for sprayers with 3-wire section valve type.

If current speed is above threshold indicated, the Dual Boom will be activated. When speed drops 10% below value, Dual Boom will be deactivated.
**Setup Height Switch CAN Message**

- Select Send Status, Receive Status, or Do Not Share.
- If using GreenStar Rate Controllers in a Multi-Product configuration, a single height switch can be shared among multiple GreenStar Rate Controllers.
- The height switch must be connected to one GreenStar Rate Controller and that GreenStar Rate Controller must be configured to SEND the height switch status to the other GreenStar Rate Controllers.
- Each additional GreenStar Rate Controller must be configured to RECEIVE the height switch status.
- There is an additional option of DO NOT SHARE that can be used if multiple height switches are desired in the application or operating with a single GreenStar Rate Controller.

**System Setup**

Select System tab (B) to enter system setup.

- A—Implement Tab
- B—System Tab
- C—Alarms Tab
- D—Rates Tab
- E—Section Valve Type Drop-Down Menu
- F—Constant Flow Enable/Disable Box
- G—Control Valve Type Drop-Down Menu
- H—Tank Capacity Input Box
- I—Control Valve Calibration Input Box
- J—Flowmeter Calibration Input Box
- K—Flowmeter Units Drop-Down Menu
- L—Calibrate Flowmeter Button
- M—Flow Return Enable/Disable
- N—Pressure Sensor 1 Enable/Disable
- O—Pressure Sensor 2 Enable/Disable
- P—Calibrate Pressure Sensor Button
- Q—Agitator Valve Enable/Disable
- R—Agitator Duty Cycle Drop-Down Menu
- S—Do Not Share
- T—Send Status
- U—Receive Status
- V—Flow Return Enable/Disable
- W—Pressure Sensor 1 Enable/Disable
- X—Pressure Sensor 2 Enable/Disable
- Y—Calibrate Pressure Sensor Button
- Z—Agitator Valve Enable/Disable
- AA—Agitator Duty Cycle (%) Drop-Down Menu
Sprayers and Liquid Fertilizer Tool Setup

**Initial Settings**

**NOTE:** Please refer to the COMPATIBILITY section for components compatible with the GreenStar Rate Controller.

1. Select Section Valve type (A) from the drop-down menu. See MAXIMUM NUMBER OF IMPLEMENT SECTIONS table and valve type descriptions.

2. Select the Constant Flow enable/disable box to configure the GreenStar Rate Controller to operate with section valves that have a continuous flow bypass. Steps for calibrating section bypass valves are described in the SECTION TEST section of this manual.

**CAUTION:** Selecting the wrong valve type can result in valves opening unexpectedly. To avoid injury from exposure to chemicals, verify the correct valve is selected. Review control valve type before moving GreenStar Rate Controller between implements.

**IMPORTANT:** For PWM and PWM Close Control Valve systems, it is recommended that an external solution pump on/off switch is wired into the cab if not already present, allowing the operator to shut off the solution pump. Solution pump damage may occur if pump is run without solution in it.

**PWM Control Valve System:** When the master switch is shut off on a PWM Control Valve System, it will close the section on/off valve stopping product flow. The PWM Valve will remain at its current position allowing hydraulic flow to continue to the solution pump which will allow the solution pump to continue running. An external solution pump on/off switch will allow the operator to shut off the solution pump.

**PWM Close Control Valve System:** When the master switch is shut off on a PWM Close Control Valve System, it will shut off the solution pump. An external solution pump on/off switch can be more user-friendly and familiar for a sprayer operator to shut off the solution pump if the solution tank runs empty.

Refer to the solution pump manufacturer’s Operators Manual for more information.

3. Select Control Valve type from the drop-down menu.
4. Enter maximum volume of tank in input box labeled tank capacity. Tank capacity range is 0 to 17,000 and it will default to 1000 gal or 3785 liters.

5. **Standard, Fast, and Fast Close Control Valves**

   Enter the Control Valve Calibration number in the input box (B). Continue to Step 9.

   **PWM and PWM Close Control Valves**

   Press the PWM Setup Button (D) and enter the Control Valve Calibration number in the input box (E). Continue to Step 6.

   **NOTE:** For PWM and PWM Close control valves, the Raven calibration number of 0043 is **NOT** optimal for GreenStar Rate Controller System. If the PWM or PWM Close control valve is not referenced in the chart below start with 1533 and use the process below to fine tune the calibration value for optimal performance.

**Fine tuning the Control Valve Calibration Number for Optimal Performance.**

Use recommended values in Control Valve Calibration table to initially set control valve number. Evaluate machine behavior during operation, and if necessary, adjust value to attain optimum system performance.

The Control Valve Calibration number is a 4 digit number used to fine tune control characteristics. The number is in the form XXYZ, and is defined as follows:

- **XX** - Valve Speed.
  - The higher this value, the quicker the valve responds. If it is set too high, actual flow rate will oscillate continuously around target rate. If it is set too low, target rate will never be reached.

- **Y** - Output Deadband.
  - Sets the minimum speed that the valve will ramp down toward before stopping. The higher this value, the sooner the valve will become stationary.

- **Z** - Control Deadband:
  - Sets how close actual flow rate must be to target rate to be considered acceptable. When actual and target rates are within this range, the valve will remain stationary. A higher value allows for a larger disparity between actual and target rate.

**NOTE:** Look for low variance in the lpm (gpm) operating range that the system applies in the field when completing the Configuration Test.

### Standard Valve Type Valve Calibration Number (XXYZ)

<table>
<thead>
<tr>
<th>Standard Valve Type</th>
<th>Valve Calibration Number (XXYZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAVEN 165</td>
<td>2513</td>
</tr>
<tr>
<td>RAVEN 894</td>
<td>2513</td>
</tr>
<tr>
<td>RAVEN 125</td>
<td>2513</td>
</tr>
<tr>
<td>TEEJET 344B</td>
<td>1003</td>
</tr>
<tr>
<td>HARDI</td>
<td>7051</td>
</tr>
</tbody>
</table>

**Example of tuning the control valve for optimal response:** After entering the initial starting value for the control valve (e.g. 2513) and run a configuration test, the variance runs high (at or near 100%) and the valve response seems sluggish. The next step in tuning may be to increase the valve speed number (first 2 digits) from 25 to 35 and also increase the output deadband number (third digit) from 1 to 2 and retry the configuration test. Running a nozzle flow check is also a good way to obtain a better feel for valve speed and response time of the system.
Sprayers and Liquid Fertilizer Tool Setup

<table>
<thead>
<tr>
<th>Fast Valve Type</th>
<th>Valve Calibration Number (XXYZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAVEN 177</td>
<td>0753</td>
</tr>
<tr>
<td>HINIKER Servo Valve (8160 Monitor Compatible)</td>
<td>0433</td>
</tr>
<tr>
<td>KZCO Servo Valve (JD 2510 Liquid Fertilizer system)</td>
<td>1031</td>
</tr>
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<table>
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</tr>
</tbody>
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<table>
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<tr>
<th>PWM Valve Type</th>
<th>Valve Calibration Number (XXYZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sauer Danfoss Hagie MFG T540</td>
<td>1533</td>
</tr>
<tr>
<td>Command Controls Corporation FV1501</td>
<td>1411</td>
</tr>
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<td>1411</td>
</tr>
</tbody>
</table>

NOTE: On a RAVEN valve, the last three numbers of the model number are used to identify the valve type (Example: RAVEN XXX894).

6. Enter the Coil Frequency for the PWM/PWM Close valve in input box (F). Refer to control valve manufacturer's Operator's Manual to attain the proper Coil Frequency value. The Coil Frequency will default to 122.

7. Define PWM Limits to control the minimum/maximum desired flow or pressure to prevent machine damage and ensure quick system response. Defining limits can be done by manually entering the high and low limits into the input boxes (G & H) or by using the Calibrate PWM Limits Test (I). The high and low limits range is 0-255. See Calibrate PWM Limits Test in the Tests Section for details on how to perform the test.

8. Check Pump Enable Checkbox (J) if there is no hardwired pump On/Off switch installed. Enable Pump (K) will override the PWM signal to shut off the pump anytime it is unchecked.

NOTE: Check Pump Enable Checkbox if there is no hardwired Pump On/Off switch installed.
9. Enter Flowmeter Calibration number as stamped on valve.

Most flowmeters have an attached tag indicating the recommended calibration number. Enter this number as the initial Flowmeter Calibration value. The Calibrate Flowmeter test must be run to attain a more accurate flowmeter calibration number (see Calibrate Flowmeter test).

**NOTE:** If the tag is no longer attached, start with a low calibration number such as 60. Conduct a Calibrate Flowmeter test, and the system will adjust the value accordingly.

10. Choose unit of measurement from flowmeter units drop-down.

**NOTE:** The number on the RAVEN tag is pulses per 10 units of fluid. Ensure the 10 gal / 10 L unit is used when using the number straight off the RAVEN tag.

**NOTE:** For manure applications using a Krohne Flowmeter, ensure the pulses/gallon are set to 2 or higher. Please see the Krohne Operators Manual for further detail.

11. To calibrate Flowmeter, select button and follow on screen instructions. See Test section for details.

12. **Flow Return**— A Flow Return option is available for liquid systems equipped with a positive displacement pump. With this feature selected, the GreenStar Rate Controller will open a flow return valve whenever all section valves are closed in order to reduce system pressure. The flow return valve will remain closed if one or more section valves are open. Refer to the TROUBLESHOOTING section to determine which driver numbers and connector pins are associated with the flow return valve.

13. Check the pressure sensor box if sensor is installed. If using more than one pressure sensor, check the second box as well. Pressure indicator will be displayed on main menu instead of flow rate when pressure sensor is checked.

14. To calibrate pressure sensor(s), select button and follow on screen instructions. See Test section for details.
15. Check the agitator valve box to enable agitator.

NOTE: Agitator valve selection may reduce the number of implement sections the GS2 can control. See maximum number of implement sections table.

16. Set agitator duty cycle percent from drop-down menu. Agitation Rate is based on runtime in ten minute intervals. Example: at 20% agitator runs for 2 minutes and is off for 8 minutes.

If the tank volume is at or below 20% of the total volume of the tank the agitation will reduce to half the set run time. Example: at the 20% setting from the example above, the agitation will now run for 1 minute and is off for 9 minutes.

A—Pressure Sensor 1
Enable/Disable Box
B—Pressure Sensor 2
Enable/Disable Box
C—Calibrate Pressure Sensor
Button
D—Agitator Valve
Enable/Disable Box
E—Agitator Duty Cycle
Drop-Down Menu

Alarm Setup
Select Alarms tab (C) to enter alarm setup.

Low tank level, high alarm, low alarm, minimum pressure, and maximum pressure alarms can be toggled on or off via the enable/disable boxes.

Values for the seven alarms may be defined by entering values in the boxes.

NOTE: Minimum and Maximum Pressure alarms are disabled if not configured with a pressure sensor.
Sprayers and Liquid Fertilizer Tool Setup

Rates Setup

Select Rates tab (D) to enter rates setup.

Up to three target rates may be defined (E, F, G). Values entered on this page will be available on the home page.

Minimum Flow Rate input box (H) may be used to enter the minimum amount of flow to maintain while applying. If current machine speed and desired application rate demand a flow rate less than this value, the entered value will be applied. Minimum Flow Rate is useful for maintaining constant pressure when making headland turns where speed is lower than normal and changes drastically over a short period of time.

Minimum Flow Rate applies to entire boom width. If one or more boom sections are turned off, the actual minimum flow rate will be adjusted to account for the reduced working width.

**NOTE:** Minimum Flow Rate feature will cause over-application in areas where vehicle speed is low enough to activate the specified Minimum Flow Rate. The degree of over-application depends on specified minimum rate and speed of machine. A minimum flow rate of 0 disables this feature.

**NOTE:** Speeds below 0.5 km/h (.3 mph) will shut off all flow regardless of specified Minimum Flow Rate value.

Rate Smoothing (J) shows actual rate as target rate when actual rate is within user defined percentage (K). Rate Smoothing percentage range is 3-15% and system defaults to 3%.

Raven Direct Injection Pump Setup

Pump Setup

1. Select the menu softkey.
2. Select Raven Pump softkey (B).

3. If multiple pumps are used, the operator must set up each pump individually. Refer to the Raven Sidekick™ Pro operator’s manual for pump setup.

**NOTE:** Master switch must be off to change most settings or values.

**NOTE:** If more than one pump is being used, be sure that the pumps are NOT classified with the same pump number.

B—Raven Pump Softkey

---

**System Setup**

1. After the pump(s) have been set up, select the menu softkey, followed by the GreenStar Rate Controller softkey.

2. Select the Setup softkey to enter GreenStar Rate Controller setup.

**NOTE:** Master switch must be off to change most settings or values.

3. Select System tab (B).

4. If the Raven Sidekick Pro is being used on a sprayer or liquid fertilizer tool, Constant Flow (F) must be unchecked.

A—Implement Tab
B—System Tab
C—Alarms Tab
D—Rates Tab
E—Constant Flow Enable/Disable Box

---

Continued on next page
5. Select the direct injection pump softkey.

6. On the Setup tab (B), check Enable Direct Injection Communication checkbox (C).

7. Run tab (A) displays values based on initial setup done in Raven setup screens:
   - Target rate (D)
   - Applied rate (E)
   - Flow rate (F)
   - Pump mode (H)

   **NOTE:** Use the Raven Pump softkey to adjust values.

8. Pumps can be enabled or disabled by checking or unchecking the Pump Master checkboxes (G).

Continued on next page
9. Rates can also be viewed on the GreenStar Rate Controller main run page and homepages by selecting the desired rate from the totals list.
GreenStar Rate Controller Main Page

NOTE: Pressure (F): Pressure from pressure sensor 1 will be displayed instead of flow if system is configured for a pressure sensor.

Enable Pump (R): Information drop-down menu will be displayed if Pump Enable was not selected in PWM Settings.

A—Actual Rate
B—Target Rate
C—Manual Spray Button
D—Master Switch Indicator/Implement Height Switch Indicator
E—Travel Speed
F—Flow (Volume per Time)
G—Left Fence Row Nozzle On/Off Button
H—Right Fence Row Nozzle On/Off Button
I—Estimated Volume Remaining/Tank Refill Button
J—Left Side Section On/Off Buttons
K—Right Side Section On/Off Buttons
L—Implement Sections
M—Section Status Indicators
N—Rate Selection Drop-Down Menu
O—Predefined Rate 1
P—Predefined Rate 2
Q—Predefined Rate 3
R—Enable Pump
S—Agitator Enable/Disable
T—Agitator Status Icon

Main Screen Indications

NOTE: Pressure (F): Pressure from pressure sensor 1 will be displayed instead of flow if system is configured for a pressure sensor.

The Manual Spray button (C) will force the controller to apply product at the present application rate, or the minimum flow rate (whichever is greater). It will override Swath Control Pro and vehicle speed threshold for a duration of five seconds when pressed. A countdown indicator will appear when this function is enabled. It may be pressed any time during the countdown period to reset the counter back to five seconds. Minimum flow rate will be controlled until speed and target rate warrant a higher flow rate. The Manual Spray button will be disabled if the minimum flow rate is zero.

The height switch indicator may be either in an up or down position to give a visual indication relative to the implement.

NOTE: To verify the height switch operates correctly, raise and lower the implement while observing the height switch indicator.
**Malfunction of Implement Height Switch Detected**

**CAUTION: Malfunction of Implement Height Switch Detected.**

To avoid serious injury or death from exposure to chemicals or anhydrous ammonia, verify height switch is operating properly.

Raise and lower implement. If the indicator below does not match machine operation, service height switch.

This message will be displayed on a NH3 system when the system detects the implement is down for an extensive period of time, which can indicate a failure in the height switch. To verify correct operation, follow the instructions. If the height switch indicator does not match machine operation, service height switch.

---

**Implement Rate Control**

Choose one of three available rate types.

- **A—Predefined**
- **B—gal/ac (US Units)**
- **C—Map-Based**
- **D—gal/min (US Units)**

---

Predefined rates are limited to a maximum of three. These rates can be set up on the setup page under rates tab.

The letters located on the top left corner of each Rate button (B, C, D) represent the short-cut buttons that are available when using a Display Control. For additional information on a Display Control, refer to the GS2 Basics Operator's Manual >> Getting Started Section.

---

A Rate based on volume per unit of area can be set by choosing one of the below items from the rate selection drop-down menu. This rate mode will ensure a consistent application rate per acre as working width and vehicle speed are adjusted.

- gal/ac (US Units)
- L/ha (Metric Units)
- 1 Gal/ac (Imperial Units)
In order to run map-based rates, a prescription must be selected in GS2 Documentation. Map-based only appears in the drop-down if a prescription selected.

A—Rate Selection Drop-Down Menu

A Rate based on flow can be set by choosing one of the below items from the rate selection drop-down menu. This rate mode will ensure a constant flow rate regardless of changes in vehicle speed. A decrease in rate maybe visible when sections are disabled.

- gal/min (US Units)
- L/min (Metric Units)
- I Gal/min (Imperial Units)

Implement Section States
Implement sections can be in one of three states:
- Off—Section is off.
- Enabled—Section is enabled.
- Active—Section is spraying.

Section on/off buttons (E) enable or disable one section at a time from left to right or right to left. The operator can also enable/disable sections with the switch box in the cab.

The fence row nozzle buttons (F) enable or disable the fence row nozzles. The operator can also enable/disable fence row nozzles with the switch box in the cab.

Active sections have blue fill color triangle indication under the section.

Enabled fence row nozzles have purple fill colored indication.

Section and fence row nozzles have colored triangle indications under implement sections to show active status.

Enabled sections have black fill color indication. Sections that are in the off state will be clear.

Dual Boom
Open triangles indicate dual boom is configured, but not spraying. Light blue triangles indicate dual boom is spraying.
Refilling Tank

Reset estimated tank level after refilling.
Select estimated volume remaining/refill button.

If volume after refilling is full, select full refill button. This will set the tank level to the defined tank capacity.
When partially filling the tank, enter new level by pressing new tank level button and input estimated value.

A—Full Refill  B—New Tank Level Input Box

Main Page Display

The Information drop-down menu includes:
- Productivity (Area per hour).
- Estimated time remaining on current tank level.
- Estimated area remaining on current tank level.
- Flow per minute.
- Area Covered.
- Total Product Applied.
- Average Application Rate.
- Speed
- Pressure Sensor 2

The estimated time and area values are an instantaneous calculation based on current tank level. Estimated time and area values can be expected to fluctuate due to changes in flow rate, working width, or speed while operating.

NOTE: Flow per minute is only an option when pressure sensor is installed.

Area Covered, Total Product Applied, and Average Application Rate can be zeroed on the Reports and Totals Softkey H >> Current Tab.

Pressure Sensor 2 is only an option when two pressure sensors have been configured.
**Unexpected Chemical Flow Detected**

⚠ **CAUTION:** Unexpected chemical flow detected.

To avoid injury from exposure to chemicals, shut off solution pump.

This message will be displayed if the GreenStar Rate Controller has attempted to close the section valves but still detects flow on a sprayer or liquid fertilizer system.
Limp Home Mode

If communications between the GS2 Display and the GreenStar Rate Controller fail for any reason, the user can elect to operate the system in a limited functionality mode in order to finish a field.

By removing the in-line fuse located in the main harness, the GreenStar Rate Controller will enter limp-home mode. While in limp-home mode, the system will do the following:

- Enable all implement sections.
- Disable fence row nozzles.
- Calculate flow rate based upon the standard limp home speed of 8 km/h (5 mph), predefined Rate 1, and the full implement width.

Limp Home mode assumes all CAN/Bus communications have been lost, thus it defaults to Rate 1, the original operating width, and a fixed speed number of 8 km/h (5 mph).

NOTE: It is the operator’s responsibility to keep the tractor at 8 km/h (5 mph) to ensure the proper rate is being dispensed.

If the operator is using the Switch box Controls, only the master switch on the switch box will work.

If the Limp Home fuse is lost or destroyed, it can be replaced by a common automotive type 10-Amp fuse.

NOTE: Limp Home mode does not function when NH3 Tool or planter is the selected implement type.
Sprayers and Liquid Fertilizer Tool Reports and Totals

Reports and Totals

Select the Reports and Totals button to show the following page.

The current page will display instant values.
The job summaries page will keep track of totals listed on the job page. Only values for the currently selected job summary will be incremented.

Job summaries are stored on the controller. The controller can store up to 6 different jobs for each configuration.

To create a new job follow these steps:
1. Select the “New” button and a keypad will appear.
2. Type in a name for the current job on the key pad.
3. Select enter.

Jobs that are no longer needed may be deleted by selecting the job and pressing the remove button.

Totals can be reset to zero by pressing the zero button.

The job summaries page will keep track of totals listed on the job page. Only values for the currently selected job summary will be incremented.

Job summaries are stored on the controller. The controller can store up to 6 different jobs for each configuration.

To create a new job follow these steps:
1. Select the “New” button and a keypad will appear.
2. Type in a name for the current job on the key pad.
3. Select enter.

Jobs that are no longer needed may be deleted by selecting the job and pressing the remove button.

Totals can be reset to zero by pressing the zero button.

The lifetime page keeps track of all totals for the lifetime of the implement selected.

The lifetime page keeps track of all totals for the lifetime of the implement selected.
Sprayers, and Liquid Fertilizer Tool Diagnostics

Diagnostic Page
Select the Diagnostics button on the right-hand side to enter the diagnostics page.

Readings
Select the Readings tab to display GreenStar Rate Controller readings.

A—Readings Tab
B—Tests Tab

C—Reading Type Drop-Down Menu

Hardware/Software Readings

A—Readings Selection Drop-Down Menu
B—Hardware Part Number
C—Hardware Serial Number
D—Software Part Number
E—Software Version Number
Switchbox Readings

A—Readings Selection
Drop-Down Menu
B—Switchbox Present Status
C—Switches 1 Through 5
Status on Switchbox
D—Switches 6 Through 10
Status on Switchbox

Delivery System Readings

PWM Duty Cycle—This number represents the current position of the PWM / PWM Close Control Valve. The number will be between the current High and Low Limit settings previously defined by the operator.

A—Readings Selection
Drop-Down Menu
B—Flow Meter Frequency
C—Flow Rate
D—Spray Rate
E—Control Valve Current
F—PWM Duty Cycle
Section Status Readings

NOTE: Section valve current will be displayed for 2-wire section valve.

A—Readings Selection
B—Section Status
C—Dual Boom Status

System Voltagess Readings

NOTE: Sensor Power 4 is not currently used, expected value is 0.

NOTE: Valve Power will be "None" if Valve Power is not connected.

A—Readings Selection
B—ECU Power
C—Sensor 1 Power
D—Sensor 2 Power
E—Sensor 3 Power
F—Sensor 4 Power
G—Valve Power
H—Valve 1 Power
I—Valve 2 Power
J—Valve 3 Power
K—Valve 4 Power
Sprayers, and Liquid Fertilizer Tool Diagnostics

**Working Parameters Readings**

- A—Readings Selection
- B—Working Width
- C—Speed
- D—Speed Source

**Switches/Status Readings**

- A—Readings Selection
- B—Master Switch Status
- C—Height Switch Status
- D—Height Switch Voltage

**NOTE:** Height switch is only available on liquid fertilizer tools.
Sprayers, and Liquid Fertilizer Tool Diagnostics

Sensors/Status Readings

NOTE: This option will only be available if a pressure sensor has been configured.

A—Readings Selection
   Drop-Down Menu
B—Pressure Sensor Voltage
C—Calibration Points
D—Pressure
E—Slope

Tests

A—Readings Tab
B—Tests Tab
C—Test Type Drop-Down Menu

Calibrate Flowmeter - Catch

CAUTION: Running this test will discharge liquid from the nozzles.

To avoid injury from exposure to chemicals, use clean water and appropriate personal protective equipment.

If necessary, use the master switch to stop application.

This message will be displayed when any diagnostics test is selected on sprayer or liquid fertilizer applications that will discharge liquid.

WARNING

Running this test will discharge liquid from the nozzles.

To avoid injury from exposure to chemicals, use clean water and appropriate personal protective equipment.

If necessary, use the master switch to stop application.
Calibrate Flowmeter - Catch

The Calibrate Flowmeter - Catch test allows the operator to catch product and enter the exact amount caught to calibrate the flowmeter.

Catch Test Description (B) - Adjusts the calibration valve by dispensing product into a container without moving the machine and entering amount collected.

Place containers (such as calibration container) under up to 7 nozzles to capture volumes sprayed during the test. Only 7 samples may be entered into the sample volumes popup screen. Calibrating Flowmeter may be repeated as many times as needed if all nozzles are to be tested. By measuring these samples and entering the values into the system, an accurate flowmeter calibration value can be attained. Follow the on-screen instructions as described.

1. Configure the control valve and flowmeter in Setup (Softkey G).
2. Select Calibrate Flowmeter - Catch from the Tests drop-down menu.
3. Be sure the flowmeter is clean.
4. Enable the sections to spray and select the Calibrate Flowmeter button.
   IMPORTANT: Always fill the solution tank with clean water to do a proper calibration test.
5. Enter calibration test parameters.
   NOTE: Use conditions in this test that are comparable to normal operation. Larger dispense volumes will result in longer, but more accurate, calibration tests.

A—Enter the values below.
B—Number of nozzles that will spray
C—Test Speed
D—Rate
E—Volume to dispense per nozzle
F—Estimated test time
G—Next Page
6. Turn Master Switch on, Enable Pump (G), start test, and collect samples.

NOTE: Enable Pump checkbox (G) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.

- Ensure sample containers are properly positioned.
- Turn the Master Switch on.
- Check Enable Pump checkbox (G) if it is displayed.
- Select the "Start" button (D) on the screen.

A—Turn Master Switch ON.
B—Select Start to begin test.
C—Master Switch Indicator
D—Start Button
E—Test Progress
F—Note: Turn Master Switch OFF to cancel the test.
G—Enable Pump Checkbox
H—Previous Page

7. Enter the collected sample volumes on the popup screen.

- Enter the measured amounts collected from each container.
- If fewer than 7 samples were collected, leave remaining values set to 0.
- Select "Take Another Sample" if additional samples are desired.

8. Repeat steps 4—7 as necessary.

- If it is desired to collect samples from other sprayer sections and/or nozzles in order to further confirm test results, select the cancel button and repeat steps 4—7.


- Select the accept button to accept the New Calibration Value.

10. Turn Master Switch OFF at any time to cancel test.

A—Enter Sample Values
B—Accept New Calibration Value
C—Take additional samples as necessary
D—Sample Amounts
E—Average Sample Size
F—Old Calibration Value
G—New Calibration Value
H—Take Another Sample
Calibrate Flowmeter - Applied

The Calibrate Flowmeter - Applied test allows the operator to apply a known amount of product and enter the known amount to calibrate the flowmeter.

Applied Product Test Description (B) - Adjusts the calibration value by comparing the rate controller’s amount applied to the actual amount applied.

1. Configure the control valve and flowmeter in Setup (Softkey G).

NOTE: Master Switch must be off to enter data.

2. Select Calibrate Flowmeter - Applied from the Tests drop-down menu.

3. Be sure the flowmeter is clean.

4. Press Start to begin accumulating applied product.

NOTE: While product is being applied the operator can navigate away from this page and return when he has applied a sufficient amount of product to complete the calibration.

5. Apply Product to field.

6. Press Stop to end accumulation.

A—Tests Drop-Down Menu  B—Applied Product Test Description  C—Start Button  D—Calibrate Flowmeter Button  E—Stop Button
7. Once amount is known, press Calibrate Flowmeter button.

8. Enter the actual amount applied into the input box and press the Enter button.

**A**—Tests Drop-Down Menu

**B**—Applied Product Test Description

**C**—Start Button

**D**—Calibrate Flowmeter Button

**F**—Actual Amount Applied Input Box

---

**Calibrate Flowmeter - Applied**

**Applied Product Test Description:** Adjusts the calibration value by comparing the rate controller's amount applied to the actual amount applied.

1. Configure the control valve and flowmeter in Setup.
2. Be sure the flowmeter is clean.
3. Press Start to begin accumulating applied product.
4. Apply product to field.
5. Press Stop to end accumulation.

---

**Calibration Test**

Enter amount of product applied and accept new calibration value.

Amount Accumulated by Rate Controller

Actual Amount Applied

Old Calibration Value

New Calibration Value

---
**Configuration Test**

⚠️ **CAUTION:** Running this test will discharge liquid from the nozzles.

To avoid injury from exposure to chemicals, use clean water and appropriate personal protective equipment.

If necessary, use the master switch to stop application.

This message will be displayed when any diagnostic test is selected on sprayer or liquid fertilizer applications that will discharge liquid.
The operator can run a configuration test to ensure that the system is functioning properly.

**IMPORTANT:** Always fill the solution tank with clean water to do a proper configuration test.

**NOTE:** Turn Master Switch OFF at any time to cancel test.

To begin configuration test:
1. Select Configuration test from the tests drop-down menu (A).
2. Turn the Master Switch ON.
3. Enable Pump checkbox (D) if it is displayed.
   
   **NOTE:** Enable Pump Checkbox (D) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.

4. Select Start button (C) on the screen.

When the test is started, the following procedures are automatically performed in sequence:

1. The agitator valve (if equipped) is opened for 15 seconds.

2. Each boom section valve is individually cycled on/off for approximately 6 seconds, starting with the left-most boom, and moving from left to right then back from right to left. All boom section valves are then turned on for approximately 10 seconds.

3. The flow control valve is tested across the entire range of flow. The results are displayed on in the Flow / Variance table on the screen. A low Variance % indicates a properly functioning flow control valve.

If the system does not control rate accurately, there are a few things to look for and adjust. (A high variance number in the desired flow range indicates inaccurate rate control.)

- Ensure to enter the correct calibration value for the control valve type (or a similar valve type) that is being used. This value is a starting point and can be tuned specific to your system.

• The lower the Variance (%), the better the GreenStar Rate Controller is able to control at a desired flow rate. There are a few issues that might cause the variance on the configuration test to be inconsistent:

  - Low pump speed (low flow through SCV).

  - The amount of liquid in the sprayer tank. For example, if the liquid in the sprayer tank is low and the back of the sprayer is on a downhill slope, it may not be able to draw in enough liquid to achieve the higher flow rates.

• System operating parameters (example: tractor speed, pump speed, etc.) may need to be adjusted to increase performance at certain levels.
Nozzle Flow Check Test

CAUTION: Running this test will discharge liquid from the nozzles.

To avoid injury from exposure to chemicals, use clean water and appropriate personal protective equipment.

If necessary, use the master switch to stop application.

This message will be displayed when any diagnostic test is selected on sprayer or liquid fertilizer applications that will discharge liquid.

Nozzle Flow Check is a procedure to check your application rate at a desired speed while the machine is not moving. The following items can be determined:

- If the actual application rate can meet the target application rate at a given speed.
- The actual flow rate in lpm (gpm) out of the implement section.
- Whether the nozzles are worn.
- The pressure at the spray control valves given a desired speed and application rate.

IMPORTANT: Always fill the solution tank with clean water to do a proper nozzle flow check.

NOTE: Turn Master Switch OFF at any time to cancel test.

1. Select Nozzle Flow Check from the tests drop-down menu.
2. Enter a Test Speed such as 10 km/h (6.2 mph).
3. Enter a desired spray "Rate" such a 94 lhec (10 gal/ac).
4. Set pump to normal operating speed.
5. Turn the Master Switch ON.
6. Check Enable Pump checkbox (D) if it is displayed.

NOTE: Enable Pump Checkbox (D) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.

7. Select the Start button on the screen.

NOTE: Speed and rate can be changed while test is running.

8. If the volume is higher than expected and pressure is lower than expected, nozzle tips could be worn.

If the pressure is higher than expected for the given output, nozzle tips could be partially plugged. Also, a pressure drop could be occurring from the section shut-off valves to nozzle tips (normally only associated with high flow rates.)
Rinse Cycle

**CAUTION:** Running this test will discharge liquid from the nozzles.

To avoid injury from exposure to chemicals, use clean water and appropriate personal protective equipment.

If necessary, use the master switch to stop application.

This message will be displayed when any diagnostic test is selected on sprayer or liquid fertilizer applications that will discharge liquid.

The operator can select a Rinse Cycle test, which will open all of the section and fence row valves and the flow control valve fully. After pressing the Start button, the system will run until the flow meter detects reduced flow.

**IMPORTANT:** Always fill the solution tank with clean water to do a proper rinse cycle.

To begin Rinse Cycle:
1. Select Rinse Cycle from the tests drop-down menu.
2. Turn the Master Switch ON
3. Check Enable Pump checkbox (C) if it is displayed.
   
   **NOTE:** Enable Pump checkbox (C) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.

4. Select Start to begin rinse cycle.
Section Test

CAUTION: Running this test will discharge liquid from the nozzles.

To avoid injury from exposure to chemicals, use clean water and appropriate personal protective equipment.

If necessary, use the master switch to stop application.

This message will be displayed when any diagnostic test is selected on sprayer or liquid fertilizer applications that will discharge liquid.
To begin Section test:
1. Select Section Test from the tests drop-down menu.
2. Select the section/fence row nozzle outputs to be activated.
3. Turn the Master Switch ON.
4. Check Enable Pump checkbox (K) if it is displayed.
   NOTE: Enable Pump checkbox (K) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.
5. Select Start button on the screen.
6. Toggle sections/fence row nozzles on or off using the checkboxes.
   NOTE: Turn Master Switch OFF at any time to cancel test.

HARDI Section Bypass (Constant Flow) Valves

To set up HARDI Section Bypass (Constant Flow) Valves, follow these instructions:
1. Ensure all sections are turned on and fence row nozzles are turned off
2. Set a normal operating flow rate/pressure using the + and – buttons.
3. Note the pressure on the HARDI pressure gauge located near the section bypass (Constant Flow) valves.
4. Switch off the 1st section (left-most section).
5. Adjust the flow bypass on the first (left-most) valve to restore the gauge pressure to the pressure noted in Step 3.
6. Repeat the process by switching off the next section and restoring the pressure.
   NOTE: Sections that are selected will open while the test is in progress. Non-selected sections will remain closed.

NOTE: Dual boom box will be hidden if dual boom is not configured.
NOTE: Fence row nozzle boxes will be hidden if not configured.
**Control Valve Test**

This test operates the control valve without dispensing product.

*NOTE: This test is not available with Fast Close and PWM Close control valves.*

Enable Pump Checkbox (E) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.

Press and hold the - or + button to operate the valve.

A—Tests Drop-Down Menu  B—- Button  C—+ Button  
D—Control Valve Test Status  E—Enable Pump Check Box  F—

---

**Calibrate Pressure Sensor**

The Calibrate Pressure Sensor option is only available in the Tests drop-down menu when at least one Pressure Sensor Enable/Disable box is checked on the Setup >> Systems Tab.

There are two options for calibrating a pressure sensor. The Operation Based Calibration requires that two calibration points be entered and is used when the slope of the pressure sensor is not known. The Voltage Based Calibration can be used when the slope of the pressure sensor is known and only requires a zero point.

1. Ensure there is zero pressure at the sensor to be calibrated.
2. Enable the sections to spray.
3. Press the Calibration button for the desired type of calibration to begin test and set zero point.

Voltage-based Calibration

1. Ensure the sensor has 12V power supply.
   
   NOTE: Check with sensor manufacturer to ensure that sensor can accept 12V power.

2. Enter the slope as reported by the implement pressure gauge manufacturer in the box below.

3. Select Accept.

   NOTE: Sensor power can be connected to the ECU Power pin (pin 26 of 37-pin connector) to provide 12V.

   NOTE: For Raven pressure sensors with a 12V power supply the slope will be 16 mV/psi.

   A—Sensor Slope Input Box

Operation-based Calibration

1. Set the pump to the normal operating speed.

2. Turn master switch on.

3. Check Enable Pump checkbox (B) if it is displayed.

   NOTE: Enable Pump checkbox (B) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.

4. Proceed to the next step. This will commence product application.

   A—Master Switch Indicator  B—Enable Pump Checkbox
1. Enter the pressure in the box below as reported by the implement pressure gauge.

2. Turn master switch off.

3. Select Accept.

   **NOTE:** The system will spray for 30 seconds maximum. Once the system has stabilized the value from the gauge, it must be entered during this period of time.

   A—Master Switch Indicator    B—Pressure Input Box

---

**Calibrate PWM Limits**

**NOTE:** Turn Master Switch OFF at any time to cancel test.

1. Turn Master Switch On.

2. Check Enable Pump (J) if it is displayed.

   **NOTE:** Enable Pump (J) will only be displayed if control valve type is PWM and Pump Enable checkbox was selected in PWM settings.

3. Press the Start Button.

4. Adjust setting until minimum acceptable flow/pressure is achieved, press Set Low Limit.

5. Adjust setting until maximum acceptable flow/pressure is achieved, and press Set High Limit.

   A—Tests Drop-Down Menu    F—Set Low Limit Button
   B—Master Switch Indicator  G—Set High Limit Button
   C—Start Button            H—Pressure
   D—Decrease Button         I—Flow
   E—Increase Button          J—Enable Pump
Implement Setup

Select the Setup menu button to enter GreenStar Rate Controller setup.

NOTE: Master switch must be off to change most settings or values.

Select the Implement tab at the top to enter implement setup.

NOTE: Switchbox switch numbers (M) will only be available if a switchbox is connected.

| A—Implement Tab   | I— Remove Button     |
| B—System Tab      | J— Disable Rate Controller |
| C—Alarms Tab      | K—Implement Width Input Box |
| D—Rates Tab       | L—Setup Sections Button |
| E—Implement Type Drop-Down Menu | M—Implement Section Widths |
| F—Implement Name Drop-Down Menu | N—Associated Switchbox |
| G—New Button      | O—Height Switch Enable/Disable |
| H—Rename Button   | P—Height Switch Message Drop-Down Menu |
**Implement Selection**

1. Select NH3 Tool from the implement type drop-down menu.
2. Select implement name from drop-down menu.

If no name has been added yet:
1. Select new.
2. Type new name on keypad.
3. Select enter.

If name needs to be revised:
1. Select implement name to be revised from drop-down.
2. Select rename.
3. Type new name on keypad.
4. Select enter.

If equipment name is no longer needed:
1. Select implement name to be deleted from drop-down.
2. Select remove.
3. Accept pop-up notification.

NOTE: A maximum of three implement configurations/names may be saved per controller.

NOTE: Rename does not affect System tab, Alarm tab, and Rates tab previously configured. Existing calibrations remain valid.

NOTE: Implement name must be defined before the System tab, Alarm tab, and Rates tab are enabled.

NOTE: If GRC will not be used but remain connected, check Disable this GRC check box to eliminate connection to display for Documentation, Swath Control, and controller warnings.

**Setup Implement Sections**

To setup implement sections:

- Initial implement width may be entered into the implement width input box. The width entered is evenly distributed among the sections.

- If implement sections are different widths or associated switches are different, select setup sections button and follow on screen instructions.

NOTE: It is recommended that the section valve type be determined prior to completing section setup.

NOTE: Switchbox information will be hidden when no switchbox is connected.
Setup Height Switch CAN Message

- Select Send Status, Receive Status, or Do Not Share.
- If using GreenStar Rate Controllers in a Multi-Product configuration, a single height switch can be shared among multiple GreenStar Rate Controllers.
- The height switch must be connected to one GreenStar Rate Controller and that GreenStar Rate Controller must be configured to SEND the height switch status to the other GreenStar Rate Controllers.
- Each additional GreenStar Rate Controller must be configured to RECEIVE the height switch status.
- There is an additional option of DO NOT SHARE that can be used if multiple height switches are desired in the application or operating with a single GreenStar Rate Controller.
System Setup

Select Systems tab to enter system setup.

A—Implement Tab
B—System Tab
C—Alarms Tab
D—Rates Tab
E—Control Valve Type
   Drop-Down Menu
F—Control Valve Calibration
   Input Box
G—Tank Capacity Input Box
H—Tank Capacity Displayed
   Drop-Down Menu
I—Tank Capacity Units
   Drop-Down Menu
J—Flowmeter Calibration Input
   Box
K—Flowmeter Units
   Drop-Down Menu
L—Calibrate Flowmeter Button
M—Pressure Sensor 1
   Enable/Disable
N—Pressure Sensor 2
   Enable/Disable
O—Calibrate Pressure Sensor
   Button

Initial Settings

⚠️ CAUTION: Selecting the wrong valve type may result in valves opening unexpectedly.
To avoid injury from exposure to chemicals, verify the correct valve is selected. Review
control valve type before moving GreenStar Rate Controller between implements.

1. Select Control Valve type from the drop-down menu.
   See the following valve type descriptions.

   NOTE: Valve type must be selected for system to work.

   Select STANDARD or FAST for valve configurations
   with a control valve and separate downstream
   on/off valve(s). Select FAST CLOSE for valve
   configurations with one valve that combines control
   and on/off. Selecting the wrong valve type may result
   in unexpected behavior and degraded performance.
2. Enter Control Valve Calibration number into control valve calibration input box.

<table>
<thead>
<tr>
<th>Standard Valve Type</th>
<th>Valve Calibration Number (XXYZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAVEN 165</td>
<td>2513</td>
</tr>
<tr>
<td>RAVEN 894</td>
<td>2513</td>
</tr>
<tr>
<td>RAVEN 125</td>
<td>2513</td>
</tr>
<tr>
<td>TEEJET 344B</td>
<td>1003</td>
</tr>
<tr>
<td>HARDI</td>
<td>7051</td>
</tr>
<tr>
<td>Fast Valve Type</td>
<td>Valve Calibration Number (XXYZ)</td>
</tr>
<tr>
<td>RAVEN 177</td>
<td>0753</td>
</tr>
<tr>
<td>HINIKER Servo Valve (8160 Monitor Compatible)</td>
<td>0433</td>
</tr>
<tr>
<td>Fast-Close Valve Type</td>
<td>Valve Calibration Number (XXYZ)</td>
</tr>
<tr>
<td>RAVEN 177</td>
<td>0753</td>
</tr>
<tr>
<td>HINIKER Servo Valve (8160 Monitor Compatible)</td>
<td>0433</td>
</tr>
</tbody>
</table>

NOTE: On a RAVEN valve, the last three numbers of the model number are used to identify the valve type (e.g. RAVEN XXX894).

Use the recommended values in the Control Valve Calibration table to initially set the control valve number. Evaluate machine behavior during operation, and if necessary, adjust the value to attain optimum system performance.

The Control Valve Calibration number is a 4 digit number used to fine tune control characteristics. The number is in the form XXYZ, and is defined as follows:

- **XX** - Valve Speed.
  - The higher this value, the quicker the valve responds. If it is set too high, the actual flow rate will oscillate continuously around the target rate. If it is set too low, the target rate will never be reached.

- **Y** - Output Deadband.
  - Sets the minimum speed that the valve will ramp down toward before stopping. The higher this value, the sooner the valve will become stationary.

- **Z** - Control Deadband:
  - Sets how close the actual flow rate must be to the target rate to be considered acceptable. When the actual and target rates are within this range, the valve will remain stationary. A higher value allows for a larger disparity between actual and target rate.

Example of tuning the control valve for optimal response: After entering the initial starting value for the control valve (e.g. 2513) and run a configuration test, the variance runs high (at or near 100%) and the valve response seems sluggish. The next step in tuning may be to increase the valve speed number (first 2 digits) from 25 to 35 and also increase the output deadband number (third digit) from 1 to 2 and retry the configuration test.

3. Enter maximum volume of tank in input box labeled tank capacity.
4. Select tank capacity displayed units from drop-down menu
5. Select tank capacity units from drop-down menu.
6. Enter Flowmeter Calibration number as stamped on valve.
   - Most flowmeters have an attached tag indicating the recommended calibration number. Enter this number as the initial flowmeter calibration value. It is not necessary to enter an additional product mass conversion value as the controller does it automatically.

   **NOTE:** If the tag is no longer attached, start with a low calibration number such as 60, and change the value accordingly from that point.

   **NOTE:** The number on the RAVEN tag is pulses per 10 units of fluid. Ensure the 10 gal / 10 L unit is used.

7. Choose unit of measurement from flowmeter units drop-down.

8. Check the pressure sensor box if sensor is installed. If using more than one pressure sensor, check the second box as well. Pressure indicator will be displayed on main menu instead of flow rate when pressure sensor is checked.

9. To calibrate pressure sensor, select button and follow on screen instructions. See TEST section for details.

---

**Alarms Setup**

Select the Alarms tab to enter Alarms setup.

Low tank level, high alarm, low alarm, minimum pressure, and maximum pressure alarms can be toggled on or off via the enable/disable boxes.

Values for the seven alarms may be defined by entering the figure in the numeric entry boxes.

**NOTE:** Minimum and Maximum Pressure alarms are disabled if not configured with a pressure sensor.

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A—Implement Tab
B—System Tab
C—Alarms Tab
D—Rates Tab
E—Low Tank Level Input Box
F—Low Tank Level Alarm Enable/Disable
G—High Alarm Input Box (% Above Target Rate)
H—High Alarm Enable/Disable
I—Low Alarm Input Box (% Below Target Rate)
J—Low Alarm Enable/Disable
K—Pressure Sensor 1 Minimum Pressure Input Box
L—Pressure Sensor 2 Minimum Pressure Input Box
M—Pressure Sensor 1 Maximum Pressure Input Box
N—Pressure Sensor 2 Maximum Pressure Input Box
Rates Setup

Select Rates tab to enter Rates setup.

Up to three target rates may be defined on this page by entering a value into the input box. Values entered on this page will be available on the home page.

Rate Smoothing shows the actual rate as the target rate when the actual rate is within the user defined percentage. Rate Smoothing percentage range is 3—15%.

When Actual Nitrogen is enabled, the Percent Nitrogen input box will appear. Entering a percent Nitrogen value converts application rates to mass of Nitrogen rather than mass of total product applied.

- A—Implement Tab
- B—System Tab
- C—Alarms Tab
- D—Rates Tab
- E—User Rate 1 Input Box
- F—User Rate 2 Input Box
- G—User Rate 3 Input Box
- H—Rate Smoothing Check Box
- I—Percent Smoothing Input Box
- J—Actual Nitrogen Check Box
- K—Percent Nitrogen Input Box

Raven Direct Injection Pump Setup

Pump Setup

1. Select the menu softkey.

2. Select Raven Pump softkey (B).

3. If multiple pumps are used, the operator must set up each pump individually. Refer to the Raven Sidekick™ Pro operator’s manual for pump setup.

**NOTE:** Master switch must be off to change most settings or values.

**NOTE:** If more than one pump is being used, be sure that the pumps are NOT classified with the same pump number.

- B—Raven Pump Softkey
**System Setup**

1. After the pump(s) have been set up, select the menu softkey, followed by the GreenStar Rate Controller softkey.

2. Select the Setup softkey to enter GreenStar Rate Controller setup.

   *NOTE: Master switch must be off to change most settings or values.*

3. Select the direct injection pump softkey.

4. On the Setup tab (B), check Enable Direct Injection Communication checkbox (C).

   - A—Run Tab
   - B—Setup Tab
   - C—Enable Direct Injection Communication Checkbox

Continued on next page
5. Run tab (A) displays values based on initial setup done in Raven setup screens:
   • Target rate (D)
   • Applied rate (E)
   • Flow rate (F)
   • Pump mode (H)

   NOTE: Use the Raven Pump softkey to adjust values.

6. Pumps can be enabled or disabled by checking or unchecking the Pump Master checkboxes (G).

   A—Run Tab
   B—Setup Tab
   C—Raven Pump
   D—Target Rate
   E—Applied Rate
   F—Flow Rate
   G—Pump Master Status
   H—Pump Mode

7. Rates can also be viewed on the GreenStar Rate Controller main run page and homepages by selecting the desired rate from the totals list.
**GreenStar Rate Controller Main Page**

**NOTE:** **Pressure (E):** Pressure from pressure sensor 1 will be displayed instead of flow if system is configured for a pressure sensor.

- **A**—Actual Rate
- **B**—Target Rate
- **C**—Master Switch
  - Indicator/Implement Height Switch Indicator
- **D**—Travel Speed
- **E**—Flow (Volume per Time)
- **F**—Left Section On/Off Buttons
- **G**—Estimated Volume Remaining/Tank Refill Button
- **H**—Right Section On/Off Buttons
- **I**—Implement Sections
- **J**—Rate Selection Drop-Down Menu
- **K**—Predefined Rate 1
- **L**—Predefined Rate 2
- **M**—Predefined Rate 3
- **N**—Information Drop-Down Menu
- **O**—Information Drop-Down Menu

**Main Screen Indications**

**NOTE:** **Pressure (E):** Pressure from pressure sensor 1 will be displayed instead of flow if system is configured for a pressure sensor.

The height switch indicator may be either in an up or down position to give a visual indication relative to the implement.

**NOTE:** To verify the height switch operates correctly, raise and lower the implement while observing the height switch indicator.
Malfunction of Implement Height Switch Detected

**CAUTION:** Malfunction of Implement Height Switch Detected.

To avoid serious injury or death from exposure to chemicals or anhydrous ammonia, verify height switch is operating properly.

Raise and lower implement. If the indicator below does not match machine operation, service height switch.

This message will be displayed on a NH3 system when the system detects the implement is down for an extensive period of time, which can indicate a failure in the height switch. To verify correct operation, follow the instructions. If the height switch indicator does not match machine operation, service height switch.

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Implement Section and Rate Control

Choose one of three available rate types.

- **A**—Predefined
- **B**—lb NH3/ac (US Unit)
- **C**—Map-Based
- **D**—gal/min (US Unit)

---

Predefined Rates

Predefined rates are limited to a maximum of three. These rates can be set up on the setup page under rates tab.

The letters located on the top left corner of each Rate button (B, C, D) represent the short-cut softkeys that are available when using a Display Control. For additional information on a Display Control, refer to the GS2 Basics Operator's Manual >> Getting Started Section.

---

Rates Based On Mass Per Unit Of Area

A Rate based on mass per unit of area can be set by choosing one of the below items from the rate selection drop-down menu. This rate mode will ensure a consistent application rate per acre as working width and vehicle speed are adjusted.

- Ib N/ac or lb NH3/ac (US Units)
- kg N/ha or kg NH3/ha (Metric Units)
- lb N/ac or lb NH3/ac (Imperial Units)

For lb N/ac or kg N/ha, ensure that you have the Actual Nitrogen box checked under Setup >> Rates Tab.
Map-Based Rates

In order to run map-based rates, a prescription must be selected in GS2 Documentation. Map-based only appears in the drop-down menu if a prescription is selected.

- Rate Selection Drop-Down
- Map-Based Rate Input Box

Rates Based on Flow

A rate based on flow can be set by choosing one of the below items from the rate selection drop-down menu. This rate mode will ensure a constant flow rate regardless of changes in vehicle speed. A decrease in rate may be visible when sections are disabled.

- gal/min (US Units)
- L/min (Metric Units)
- l Gal/min (Imperial Units)

Implement Section States

Implement sections can be in one of three states:

- Off—Section is off.
- Enabled—Section is enabled.
- Active—Section is applying.

Section on/off buttons (A) enable or disable one section at a time from left to right or right to left. The operator can also enable/disable sections with the switch box in the cab.

Section nozzles have colored triangle indications under implement sections to show active status.

Enabled sections have black fill color indication. Sections that are in the off state have white fill color indication.

Active sections have blue fill color triangle indication under the section.

Refilling Tank

Reset estimated tank level after refilling.
Select estimated volume remaining/refill button.
If volume after refilling is full, select full refill button. This will set the tank level to the defined tank capacity.

If only partially filling the tank, enter new level by pressing new tank level button and input estimated value. If tank size has changed, enter new tank capacity.

A—Full Refill  
B—New Tank Level Input Box

C—Tank Capacity Input Box

Refill tank

Main Page Display

The drop-down menu includes:
• Productivity (Area per hour).
• Estimated time remaining on current tank level.
• Estimated area remaining on current tank level.
• Flow per minute.
• Area Covered.
• Total Product Applied.
• Average Application Rate.
• Speed
• Pressure Sensor 2

The estimated time and area values are an instantaneous calculation based on current tank level. Estimated time and area values can be expected to fluctuate due to changes in flow rate, working width, or speed while operating.

NOTE: Flow per minute is only an option when pressure sensor is installed.

NOTE: Area Covered, Total Product Applied, and Average Application Rate can be zeroed on the Reports and Totals Softkey H >> Current Tab.

NOTE: Pressure sensor 2 is only an option when two pressure sensors have been configured.

Unexpected NH3 Flow Detected

CAUTION: Unexpected anhydrous ammonia flow detected.

To avoid serious injury or death from exposure to anhydrous ammonia, turn off control valve.

This message will be displayed if the GreenStar Rate Controller has attempted to close the On/Off valve but still detects flow. If the Control Valve OFF button is selected, the system will also attempt to shut off the control valve.

NOTE: This message will only be displayed when using a dual valve system (i.e. the control valve type is Standard or Fast).
Unexpected NH3 Flow Detected

⚠️ CAUTION: Unexpected anhydrous ammonia flow detected.

To avoid serious injury or death from exposure to anhydrous ammonia:

1. Face machine into wind.
2. Lower and engage applicator into soil.
3. Exit machine. Go to a safe distance upwind from vapor cloud.
4. Warn others in proximity to machine.
5. If possible, close shut-off valve.

This message will be displayed if the GreenStar Rate Controller has attempted to close all valves but still detects flow. To reduce risk of injury, follow the instructions on the screen.
Reports and Totals

Select the Reports and Totals button to show the following page.

The current page will display instant values.

A—Current Tab
B—Job Summaries Tab
C—Lifetime Tab
D—Actual Rate Per Area
E—Target Rate Per Area
F—Area Per Hour
G—Area Remaining on Current Tank Level
H—Traveling Speed
I—Pressure Sensor 1
J—Volume Remaining
K—Flow Per Minute
L—Area
M—Amount of Product Applied
N—Area/Reset Button

Current Tab

Continued on next page
The job summaries page will keep track of totals listed on the job page. Only values for the currently selected job summary will be incremented.

Job summaries are stored on the controller. The controller can store up to 6 different jobs for each configuration.

To create a new job follow these steps:
1. Select the “New” button and a keypad will appear.
2. Type in a name for the current job on the keypad.
3. Select enter.

Jobs that are no longer needed may be deleted by selecting the job and pressing the remove button.

Totals can be reset to zero by pressing the zero button.

The lifetime page keeps track of all totals for the lifetime of the implement.

A—Current Tab
B—Job Summaries Tab
C—Lifetime Tab
D—Total Area
E—Time Spent Applying
F—Total Volume
G—Total Hours
NH3 Tool Diagnostics

Diagnostic Page
Select the Diagnostics button on the right-hand side to enter the diagnostics page.

Readings
Select Readings tab to display GreenStar Rate Controller readings.

A—Readings Tab
B—Tests Tab
C—Reading Type Drop-Down Menu

Hardware/Software Readings

A—Readings Selection Drop-Down Menu
B—Hardware Part Number
C—Hardware Serial Number
D—Software Part Number
E—Software Version Number
Switchbox Readings

A—Readings Selection
B—Switchbox Present Status
C—Switches 1 Through 5 Status on Switchbox
D—Switches 6 Through 10 Status on Switchbox

Delivery System Readings

Actual Rate - The Actual Nitrogen Check Box on the Rates Tab will determine the units that are referenced for the Actual Rate. Check this box for lb N/ac. Uncheck this box for lb NH3/ac.

A—Readings Selection
B—Flow Meter Frequency
C—Flow Rate
D—Spray Rate
E—Control Valve Current

PC12289 —UN—06OCT09
JS56696,0000732 -19-13MAY10-1/1
**Section Status Readings**

A—Readings Selection  
B—Section Status

**System Voltages Readings**

NOTE: Sensor Power 4 is not currently used, expected value is 0.

NOTE: Valve Power will be "None" if Valve Power is not connected.

A—Readings Selection  
B—ECU Power  
C—Sensor 1 Power  
D—Sensor 2 Power  
E—Sensor 3 Power  
F—Sensor 4 Power  
G—Valve Power  
H—Valve 1 Power  
I—Valve 2 Power  
J—Valve 3 Power  
K—Valve 4 Power
NH3 Tool Diagnostics

Working Parameters Readings

A—Readings Selection
Drop-Down Menu
B—Working Width
C—Speed
D—Speed Source

Switches/Status Readings

A—Readings Selection
Drop-Down Menu
B—Master Switch Status
C—Height Switch Status
D—Height Switch Voltage

Master Switch: Off

Height Switch Status: Down
Height Switch: 5.0
Sensors/Status Readings

NOTE: This option will only be available if a pressure sensor has been configured.

- A—Readings Selection
- B—Pressure Sensor Voltage
- C—Calibration Points
- D—Pressure
- E—Slope

Tests

- A—Readings Tab
- B—Tests Tab
- C—Test Type Drop-Down Menu
Calibrate Flowmeter - Applied

The Calibrate Flowmeter - Applied test will allow you to apply a known amount of product and enter the known amount to calibrate the flowmeter.

Applied Product Test Description (B) – Adjusts the calibration value by comparing the rate controller’s amount applied to the actual amount applied.

1. Configure the control valve and Flowmeter in Setup (Softkey G).

NOTE: Master Switch must be off to enter data.

2. Select Calibrate Flowmeter – Applied from the Tests drop down menu.

3. Be sure the Flowmeter is clean.

4. Press Start to begin accumulating applied product.

NOTE: While product is being applied the operator can navigate away from this page and return when he has applied a sufficient amount of product to complete the calibration.

5. Apply product to field.

6. Press Stop to end accumulation.

A—Tests Drop-Down Menu  D—Calibrate Flowmeter Button
B—Applied Product Test  E—Stop Button
Description
C—Start Button

6. Once amount is known, press Calibrate Flowmeter.
7. Once amount is known, press Calibrate Flowmeter.
8. Enter the actual amount applied into the input box and press the Enter button.

A—Tests Drop-Down Menu  D—Calibrate Flowmeter Button
B—Applied Product Test  F—Actual Amount Applied
    Description
C—Start Button  Input Box

Calibrate Flowmeter - Applied

Applied Product Test Description:
Adapts the calibration value by comparing the rate controller's amount applied to the actual amount applied.

1. Configure the control valve and flowmeter in Setup.
2. Be sure the flowmeter is clean.
3. Press Start to begin accumulating applied product.
4. Apply product to field.
5. Press Stop to end accumulation.

Start  Ready to Calibrate

6. Once amount is known, press Calibrate Flowmeter.

Calibration Test

Enter amount of product applied and accept new calibration value.

Amount Accumulated by Rate Controller  130 lb NH3

Actual Amount Applied  125 lb NH3

Old Calibration Value  New Calibration Value
    70         74
Energize System

**CAUTION:** Running this test will discharge anhydrous ammonia.

To avoid serious injury or death from exposure to anhydrous ammonia, ensure there are no bystanders and sound horn before pressing Start.

If necessary, use the master switch to stop application.

This message will be displayed when the Energize System test is selected on NH3 systems.

The Energize System procedure is used to test for flow at the openers, purge air and vapor from the NH3 delivery system and fill the cooler and hoses with liquid anhydrous. Upon pressing the start button, the control valve and section valve(s) will be fully opened for a few seconds, after which time they will automatically close. The Master Switch can be turned off at any time to immediately force the valves to return to the closed position.

**NOTE:** Turn Master Switch OFF to stop flow immediately.

To begin Energize System test:
1. Select Energize System from the tests drop-down menu.
2. Ensure the area is clear of people, pets, and livestock.
3. Turn vehicle into the wind.
4. Turn the Master Switch ON
5. Override the implement height switch sensor by checking the override box.
6. Select the Start button. Valves will stay open for a few seconds.
7. Repeat as necessary.
8. Turn Master Switch OFF to stop flow immediately.

**NOTE:** The override height switch box must be checked each time the test is run.
Control Valve Test
This test operates the control valve without dispensing product.
Press and hold the - or + button to operate the valve.
NOTE: Not available for Fast Close control valve type.

A—Tests Drop-Down Menu  B—- Button  C—+ Button  D—Control Valve Test Status

Bleed Section Test

⚠️ CAUTION: Running this test will discharge anhydrous ammonia.

To avoid serious injury or death from exposure to anhydrous ammonia, ensure there are no bystanders and sound horn before pressing Start.

If necessary, use the master switch to stop application.

This message will be displayed when the Energize System test is selected on NH3 systems.
The Bleed Section Test allows the operator to bleed trapped anhydrous ammonia from high pressure lines between section valves and the control valve while remaining seated in the cab.

**NOTE:** Turn Master Switch OFF to stop flow immediately.

1. Select Bleed Section Test from the tests drop-down menu.
2. Ensure the area is clear of people, pets, and livestock.
3. Turn vehicle into the wind.
4. Select the section outputs to be activated.
5. Turn the Master Switch on.
6. Override the implement height sensor by checking the override box.
7. Press the Start button.
8. Toggle sections on or off using the checkboxes.

**Master Section On/Off Check Box -** This check box is displayed when the control valve type is Standard or Fast. The operator can check this box if a Master Section Valve is present and it needs to be activated for the test.

---

**Calibrate Pressure Sensor**

The Calibrate Pressure Sensor option is only available in the Tests drop-down menu when at least one Pressure Sensor Enable/Disable box is checked on the Setup >> Systems Tab.

There are two options for calibrating a pressure sensor. The Operation Based Calibration requires that two calibration points be entered and is used when the slope of the pressure sensor is not known. The Voltage Based Calibration can be used when the slope of the pressure sensor is known and only requires a zero point.

1. Ensure the NH3 tank is disconnected from the control valves and the pressure sensor is at atmospheric pressure.
2. Press the Calibration button for the desired type of calibration to begin test and set zero point.
Voltage-based Calibration
1. Ensure the sensor has 12V power supply.
    NOTE: Check with sensor manufacturer to ensure that sensor can accept 12V power.
2. Enter the slope as reported by the implement pressure gauge manufacturer in the box below.
3. Select Accept.
    NOTE: Sensor power can be connected to the ECU Power pin (pin 26 of 37-pin connector) to provide 12V.
    NOTE: For Raven pressure sensors with a 12V power supply the slope will be 16 mV/psi.

   A—Sensor Slope Input Box

Operation-based Calibration
1. Connect the NH3 tank to the control valves.
2. Energize the system.
3. Permit the sensor to come to tank pressure.
1. Enter the pressure in the box below as reported by the implement pressure gauge.

2. Select Accept.

A—Pressure Input Box
Planter Setup

Implement Setup

Select the Setup menu button to enter GreenStar Rate Controller setup.

NOTE: Master switch must be off to change most settings or values.

NOTE: The System tab, Alarm tab, and Rates tab are not enabled while planter is the selected implement.

NOTE: Switchbox switch numbers (M) will only be available if a switchbox is connected.

A—Implement Tab
B—System Tab
C—Alarms Tab
D—Rates Tab
E—Implement Type Drop-Down Menu
F—Implement Name Drop-Down Menu
G—New Implement Button
H—Rename Implement Button
I—Remove Implement Button
J—Disable Rate Controller Check Box
K—Implement Width Input Box
L—Setup Sections Button
M—Implement Sections Switch Numbers
N—Associated Switchbox
O—Height Switch Check Box
P—Height Switch Message Drop-Down Menu

Planter Setup

CZ76372.0000205 -19-28OCT10-1/2
Implement Selection

1. Select planter from the implement type drop-down menu.
2. Select implement name from drop-down menu.

If no name has been added yet:
1. Select new.
2. Type new name on keypad.
3. Select enter.

If name needs to be revised:
1. Select implement name to be revised from drop-down.
2. Select rename.
3. Type new name on keypad.
4. Select enter.

If equipment name is no longer needed:
1. Select implement name to be deleted from drop-down.
2. Select remove.
3. Accept pop-up notification.

NOTE: A maximum of three implement configurations/names may be saved per controller.

NOTE: If GreenStar Rate Controller will not be used but remain connected, check Disable This GRC check box to eliminate connection to display for Documentation, Swath Control, and controller warnings.

Setup Planter Sections

To setup implement sections:

- Initial implement width may be entered into the implement width input box. The width entered is evenly distributed among the sections.

- If implement sections are different widths or associated switches are different, select setup sections button and follow on screen instructions.
Setup Planter Sections

1. Enter the number of sections on the planter.
2. Enter the row spacing distance.
3. Select the next page button.

A—Number of Sections Input Box
B—Row Spacing Input Box
C—Sections
D—Next Page

4. Enter the rows associated with each section by inputting a row number into input box (B). For example, entering a value of 2 will designate rows 1 and 2 as the first planter section.
5. Select the associated switchbox switch number from the drop down menu.
6. Define the remaining sections by pressing the next page button and entering the row numbers into the input box.

A—From Row Input Box
B—To Row Input Box
C—Switchbox Switch Association menu
D—Previous Page
E—Next Page
Planter Setup

Setup Height Switch CAN Message

- Select Send Status, Receive Status, or Do Not Share.
- If using GreenStar Rate Controllers in a Multi-Product configuration, a single height switch can be shared among multiple GreenStar Rate Controllers.
- The height switch must be connected to one GreenStar Rate Controller and that GreenStar Rate Controller must be configured to SEND the height switch status to the other GreenStar Rate Controllers.
- Each additional GreenStar Rate Controller must be configured to RECEIVE the height switch status.
- There is an additional option of DO NOT SHARE that can be used if multiple height switches are desired in the application or operating with a single GreenStar Rate Controller.

SeedStar ™ Generation 2 Planters

Some planters may be equipped with SeedStar Gen 2. The GreenStar Rate Controller will automatically recognize SeedStar Gen 2 is present.

The Implement Setup page for SeedStar Gen 2 planters will include an extra check box on the bottom of the page labeled “USE SEEDSTAR” The box has a check in it by default. With this box checked, the GreenStar Rate Controller will use setup information from the SeedStar Gen 2 Controller.

**NOTE:** In order for the GreenStar Rate Controller to recognize the SeedStar Gen 2 and use its configuration information, it must be connected to the CAN bus and running when the GreenStar Rate Controller planter configuration is created.

To customize the SeedStar 1 configuration, remove the check from the box and setup the sections manually.

A—Use SeedStar Check Box
When disabling SeedStar, a confirmation screen will appear.

**SeedStar Confirmation**— You are about to override the configuration from the SeedStar controller, select Enter to continue or Cancel to abort.

Select enter to continue.

Refer to SETUP PLANTER SECTIONS.

---

**SEEDSTAR 2 PLANTERS**

Some planters may be equipped with SeedStar 2. The GreenStar Rate Controller will not recognize that SeedStar 2 is present. The operator must configure the GreenStar Rate Controller sections to match the setup information in the SeedStar 2 controller.

**NOTE:** If the GreenStar Rate Controller was previously installed on a SeedStar 1 planter, a NEW planter configuration / name will need to be created for a SeedStar 2 planter. Do not modify the SeedStar 1 configuration.
Planter Operation

Planter Home Page

NOTE: The seed rate input box is for documentation purposes. This box will not be documented if connected to a SeedStar controller.

A—Area Per Hour  F—Left Sections ON Button
B—Total Area      G—Right Sections ON Button
C—Travel Speed    H—Right Sections Off Button
D—Master Switch   I—Section Indicator
                  Indicator/Implement Height
E—Left Sections OFF Button  J—Seed Rate Input Box

Main Screen Indications

The height switch indicator may be either in an up or down position to give a visual indication relative to the implement.

NOTE: To verify the height switch operates correctly, raise and lower the implement while observing the height switch indicator.

A—Area Per Hour  C—Travel Speed
B—Total Area     D—Master Switch
                Indicator/Implement Height
                Switch Indicator

Implement Section States

Implement sections can be in one of three states:
• Off—Section is off.
• Enabled—Section is enabled.
• Active—Section is planting.

Section on/off buttons (A) arm or disarm one section at a time from left to right or right to left. The operator can also enable/disable sections with the switch box in the cab.

Sections that are in the enabled state have black fill color indication.

Active sections have a green rectangle indication under the section.

Sections that are in the off state are transparent.
Reports and Totals

Select the Reports and Totals button to show the following page.

The current page will display instant values.
Planter Diagnostics

Diagnostic Page
Select the Diagnostics button on the right-hand side to enter the diagnostics page.

Readings
Select the Readings tab to display planter readings.

A—Readings Tab
B—Tests Tab
C—Reading Type Drop-Down Menu

Hardware/Software Readings

A—Reading Type Drop-Down Menu
B—Hardware Part Number
C—Hardware Serial Number
D—Software Part Number
E—Software Version Number
Planter Diagnostics

Switchbox Readings

A—Reading Type Drop-Down Menu
B—Switchbox Present Status
C—Switches 1 Through 5 Status on Switchbox
D—Switches 6 Through 10 Status on Switchbox

Section Status Readings

A—Reading Type Drop-Down Menu
B—Section Status
Planter Diagnostics

System Voltages Readings

NOTE: Sensor Power 4 is not currently used, expected value is 0.

NOTE: Valve Power will be "None" if Valve Power is not connected.

A—Reading Type Drop-Down Menu  G—Valve Power
B—ECU Power  H—Valve Power 1
C—Sensor Power 1  I—Valve Power 2
D—Sensor Power 2  J—Valve Power 3
E—Sensor Power 3  K—Valve Power 4
F—Sensor Power 4

Working Parameters Readings

A—Reading Type Drop-Down Menu  C—Speed
B—Working Width  D—Speed Source
Switches/Status Readings

A—Reading Type Drop-Down Menu
B—Master Switch Status
C—Height Switch Status
D—Height Switch Voltage
E—Planter Feedback 1
F—Planter Feedback 2
G—Planter Feedback 3
H—Planter Feedback 4

Tests

Select Tests tab to display planter tests.

A—Readings Tab
B—Tests Tab
C—Test Type Drop-Down Menu

Section Test

To begin Section test:
1. Select Section test from the tests drop-down menu.
2. Select the section outputs to be activated.
3. Turn the Master Switch ON.
4. Select Start button on the screen.
5. Toggle sections on or off using the checkboxes.
6. Turn Master switch off any time to cancel test.

NOTE: Sections that are selected will not plant. Non-selected sections will plant while the test is in progress.

A—Tests Drop-Down Menu
B—Section 1 through 12 ON/OFF Checkboxes
C—Master Switch Indicator/Implement Height Switch Indicator
D—Test Status
E—Start Section Test Button

PC12306 —UN—06OCT09
PC12295 —UN—13MAY10
PC12296 —UN—13MAY10
PC12297 —UN—13MAY10
PC12298 —UN—13MAY10
The purpose of the Optional Switch Box Controller (SBC) is to allow the operator to manually enable or disable individual implement sections rather than rely solely upon the display for these settings. Only ONE Switch Box Controller is needed even if using more than one GreenStar Rate Controller on an implement. The GreenStar Rate Controllers can share one switch box.

The master switch permits the operator to shut off all of the implement sections. The master switch on the switch box serves the same purpose as the foot switch, and only one of the two is required for system operation.

Each switch will either control an implement section and/or fence row nozzle. Each switch controls sections assigned to it during section setup procedure. Even if the master switch and implement section switches are on, implement sections must still be armed with the display in order to activate.

See SECTION SETUP for further details.

NOTE: More than one section can be assigned to the same switch number.
System Speed Signal

The GreenStar Rate Controller System requires an approved speed signal.

If the vehicle has no John Deere GPS receiver, the GreenStar Rate Controller can utilize a speed source (radar or wheel speed) on CAN or CCD Bus. If no speed source is available, it will be necessary to install a radar based speed sensor.

Use wire 211 (brown wire) in the 2-pin connector (A) to interface to the radar sensor.

A—2-Pin Connector
# Main Harness (37-Pin Connector) Table

<table>
<thead>
<tr>
<th>PIN #</th>
<th>FUNCTION (Sprayers with 3-Wire Section Valves)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Valve Ground</td>
</tr>
<tr>
<td>2</td>
<td>Valve Ground</td>
</tr>
<tr>
<td>3</td>
<td>Valve Power</td>
</tr>
<tr>
<td>4</td>
<td>Driver 1</td>
</tr>
<tr>
<td>5</td>
<td>Driver 2</td>
</tr>
<tr>
<td>6</td>
<td>Driver 3</td>
</tr>
<tr>
<td>7</td>
<td>Driver 4</td>
</tr>
<tr>
<td>8</td>
<td>Driver 5</td>
</tr>
<tr>
<td>9</td>
<td>Driver 6</td>
</tr>
<tr>
<td>10</td>
<td>Driver 7</td>
</tr>
<tr>
<td>11</td>
<td>Driver 8</td>
</tr>
<tr>
<td>12</td>
<td>Driver 9</td>
</tr>
<tr>
<td>13</td>
<td>Driver 10</td>
</tr>
<tr>
<td>14</td>
<td>Disconnect Switch 4 (for use in planter applications only)</td>
</tr>
<tr>
<td>15</td>
<td>Driver 16</td>
</tr>
<tr>
<td>16</td>
<td>Driver 15</td>
</tr>
<tr>
<td>17</td>
<td>Driver 14</td>
</tr>
<tr>
<td>18</td>
<td>Driver 13</td>
</tr>
<tr>
<td>19</td>
<td>Driver 12</td>
</tr>
<tr>
<td>20</td>
<td>Driver 11</td>
</tr>
<tr>
<td>21</td>
<td>Flowmeter Shield</td>
</tr>
<tr>
<td>22</td>
<td>Future Use</td>
</tr>
<tr>
<td>23</td>
<td>Future Use</td>
</tr>
<tr>
<td>24</td>
<td>Disconnect Switch 3 (for use in planter applications only)</td>
</tr>
<tr>
<td>25</td>
<td>Flowmeter #1 5vdc</td>
</tr>
<tr>
<td>26</td>
<td>ECU Power (Only use for a Flowmeter/Pressure Sensor requiring a 12 V power supply)</td>
</tr>
<tr>
<td>27</td>
<td>ECU Ground</td>
</tr>
<tr>
<td>28</td>
<td>Flowmeter #1 Signal</td>
</tr>
<tr>
<td>29</td>
<td>Pressure Sensor Ground</td>
</tr>
<tr>
<td>30</td>
<td>Pressure Sensor #1 5vdc</td>
</tr>
<tr>
<td>31</td>
<td>Pressure Sensor #1 Signal</td>
</tr>
<tr>
<td>32</td>
<td>Disconnect Switch 1 (for use in planter applications only)</td>
</tr>
<tr>
<td>33</td>
<td>Disconnect Switch 2 (for use in planter applications only)</td>
</tr>
<tr>
<td>34</td>
<td>Pressure Sensor #2 5vdc</td>
</tr>
<tr>
<td>35</td>
<td>Pressure Sensor #2 Signal</td>
</tr>
<tr>
<td>36</td>
<td>Valve Power</td>
</tr>
<tr>
<td>37</td>
<td>Valve Power</td>
</tr>
</tbody>
</table>

# Connector Information for Adapter Harness

<table>
<thead>
<tr>
<th>Description</th>
<th>John Deere Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>37 Pin Connector Body (Female side)</td>
<td>57M9834</td>
</tr>
<tr>
<td>Cable Clamp for 37 Pin Connector Body</td>
<td>57M9870</td>
</tr>
<tr>
<td>Terminal Pin (14-18 gauge / 0.8 – 2.0 mm²)</td>
<td>57M9439</td>
</tr>
</tbody>
</table>

NOTE: Ensure proper crimp tools are used when assembling a harness.
## Recommended Wire Sizes

<table>
<thead>
<tr>
<th>Minimum Recommended Wire Size—Metric (mm²)</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>2500</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>5000</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>7500</td>
<td>0.8</td>
<td>0.8</td>
<td>1.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>10000</td>
<td>0.8</td>
<td>1.0</td>
<td>2.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

## Minimum Recommended Wire Size—SAE (gauge)

<table>
<thead>
<tr>
<th>Length (in.)</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
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<td>98</td>
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<tr>
<td>197</td>
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<td>18</td>
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<td>16</td>
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<tr>
<td>295</td>
<td>18</td>
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<td>394</td>
<td>18</td>
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<tr>
<td>591</td>
<td>18</td>
<td>16</td>
<td>14</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

## Driver Outputs Table

<table>
<thead>
<tr>
<th>Driver Number</th>
<th>Standard Sprayer (3-wire)</th>
<th>Hardi Sprayer (2-wire)</th>
<th>NH3 Tool</th>
<th>Planters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver 1</td>
<td>Section 1</td>
<td>Section 1 (+)</td>
<td>Section 1</td>
<td>Clutch 1</td>
</tr>
<tr>
<td>Driver 2</td>
<td>Section 2</td>
<td>Section 1 (-)</td>
<td>Section 2</td>
<td>Clutch 2</td>
</tr>
<tr>
<td>Driver 3</td>
<td>Section 3</td>
<td>Section 2 (+)</td>
<td>Section 3</td>
<td>Clutch 3</td>
</tr>
<tr>
<td>Driver 4</td>
<td>Section 4</td>
<td>Section 2 (-)</td>
<td>Section 4</td>
<td>Clutch 4</td>
</tr>
<tr>
<td>Driver 5</td>
<td>Section 5</td>
<td>Section 3 (+)</td>
<td>Section 5</td>
<td>Clutch 5</td>
</tr>
<tr>
<td>Driver 6</td>
<td>Section 6</td>
<td>Section 3 (-)</td>
<td>Section 6</td>
<td>Clutch 6</td>
</tr>
<tr>
<td>Driver 7</td>
<td>Section 7</td>
<td>Section 4 (+)</td>
<td>Section 7</td>
<td>Clutch 7</td>
</tr>
<tr>
<td>Driver 8</td>
<td>Section 8</td>
<td>Section 4 (-)</td>
<td>Section 8</td>
<td>Clutch 8</td>
</tr>
<tr>
<td>Driver 9</td>
<td>Section 9 or Left Fence Row</td>
<td>Section 5 (+) or Agitator (+)</td>
<td>Section 9</td>
<td>Clutch 9</td>
</tr>
<tr>
<td>Driver 10</td>
<td>Section 10 or Right Fence Row</td>
<td>Section 5 (-) or Agitator (-)</td>
<td>Section 10</td>
<td>Clutch 10</td>
</tr>
<tr>
<td>Driver 11</td>
<td>Agitator Valve</td>
<td>Section 6 (+) or Left Fence Row</td>
<td>Clutch 11</td>
<td></td>
</tr>
<tr>
<td>Driver 12</td>
<td>Return Valve</td>
<td>Section 6 (-) or Right Fence Row</td>
<td>Clutch 12</td>
<td></td>
</tr>
<tr>
<td>Driver 13</td>
<td>Section 7 (+) or Return (-)</td>
<td>Master On/Off Valve</td>
<td>Clutch 13</td>
<td></td>
</tr>
<tr>
<td>Driver 14</td>
<td>Section 7 (-) or Return (+)</td>
<td>Clutch 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver 15</td>
<td>Control (+)</td>
<td>Control (+)</td>
<td>Control (+)</td>
<td>Clutch 15</td>
</tr>
<tr>
<td>Driver 16</td>
<td>Control (-)</td>
<td>Control (-)</td>
<td>Control (-)</td>
<td>Clutch 16</td>
</tr>
</tbody>
</table>

**NOTE:** Enabling optional features such as fence rows, nozzles and agitators will reduce the number of section controls. For example, configuring a Hardi sprayer to use an agitator valve will limit the number of boom section controls to four. Refer to table in the GreenStar Rate Controller Overview section.
## Troubleshooting

### GreenStar Rate Controller Trouble Codes

<table>
<thead>
<tr>
<th>Fault Code Number</th>
<th>Description</th>
<th>Recommended Initial Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRC 158.03</td>
<td>Switched Supply Voltage High</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 158.04</td>
<td>Switched Supply Voltage Low</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 628.12</td>
<td>Control Unit Programming</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 629.12</td>
<td>Control Unit Fault</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 630.13</td>
<td>Configure System</td>
<td>See owners manual and calibrate system.</td>
</tr>
<tr>
<td>GRC 630.14</td>
<td>SeedStar Configuration Conflict</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 639.14</td>
<td>CAN Communications Error</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 1871.02</td>
<td>No Height Switch data</td>
<td>Check settings on Implement tab.</td>
</tr>
<tr>
<td>GRC 1871.14</td>
<td>Multiple Height Switches</td>
<td>Check settings on Implement tab.</td>
</tr>
<tr>
<td>GRC 3130.17</td>
<td>Low Tank Volume</td>
<td>Check tank level shown on display. Adjust if necessary.</td>
</tr>
<tr>
<td>GRC 3132.03</td>
<td>Pressure Above Maximum Level - Sensor 1</td>
<td>Check settings on the Alarms tab. Adjust if necessary.</td>
</tr>
<tr>
<td>GRC 3132.04</td>
<td>Pressure Below Minimum Level - Sensor 1</td>
<td>Check settings on the Alarms tab. Adjust if necessary.</td>
</tr>
<tr>
<td>GRC 3133.01</td>
<td>Solution Pump Dry</td>
<td>Check actual tank level and flow meter.</td>
</tr>
<tr>
<td>GRC 3133.31</td>
<td>Solution Pump Not On</td>
<td>Check Enable Pump checkbox to turn on pump.</td>
</tr>
<tr>
<td>GRC 3509.03</td>
<td>Sensor Supply Voltage for Pressure Sensor High</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 3509.04</td>
<td>Sensor Supply Voltage for Pressure Sensor Low</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 3510.03</td>
<td>Sensor Supply Voltage for Flow Meter High</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 3510.04</td>
<td>Sensor Supply Voltage for Flow Meter Low</td>
<td>Contact dealer.</td>
</tr>
<tr>
<td>GRC 521529.03</td>
<td>Pressure Above Maximum Level - Sensor 2</td>
<td>Check settings on the Alarms tab. Adjust if necessary.</td>
</tr>
<tr>
<td>GRC 521529.04</td>
<td>Pressure Below Minimum Level - Sensor 2</td>
<td>Check settings on the Alarms tab. Adjust if necessary.</td>
</tr>
<tr>
<td>GRC 523350.30</td>
<td>Implement Height Switch Malfunction</td>
<td>Verify implement height switch is installed.</td>
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<td>SBC 000639.14</td>
<td>CAN Communication Error</td>
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Technical Information

Technical information can be purchased from John Deere. Some of this information is available in electronic media, such as CD-ROM disks, and in printed form. There are many ways to order. Contact your John Deere dealer. Call 1-800-522-7448 to order using a credit card. Search online from http://www.JohnDeere.com. Please have available the model number, serial number, and name of the product.

Available information includes:

- PARTS CATALOGS list service parts available for your machine with exploded view illustrations to help you identify the correct parts. It is also useful in assembling and disassembling.
- OPERATOR’S MANUALS providing safety, operating, maintenance, and service information. These manuals and safety signs on your machine may also be available in other languages.
- OPERATOR’S VIDEO TAPES showing highlights of safety, operating, maintenance, and service information. These tapes may be available in multiple languages and formats.
- TECHNICAL MANUALS outlining service information for your machine. Included are specifications, illustrated assembly and disassembly procedures, hydraulic oil flow diagrams, and wiring diagrams. Some products have separate manuals for repair and diagnostic information. Some components, such as engines, are available in separate component technical manuals.
- FUNDAMENTAL MANUALS detailing basic information regardless of manufacturer:
  - Agricultural Primer series covers technology in farming and ranching, featuring subjects like computers, the Internet, and precision farming.
  - Farm Business Management series examines “real-world” problems and offers practical solutions in the areas of marketing, financing, equipment selection, and compliance.
  - Fundamentals of Services manuals show you how to repair and maintain off-road equipment.
  - Fundamentals of Machine Operation manuals explain machine capacities and adjustments, how to improve machine performance, and how to eliminate unnecessary field operations.
John Deere Service Keeps You on The Job

John Deere Is At Your Service

CUSTOMER SATISFACTION is important to John Deere. Our dealers strive to provide you with prompt, efficient parts and service:

–Maintenance and service parts to support your equipment.
–Trained service technicians and the necessary diagnostic and repair tools to service your equipment.

CUSTOMER SATISFACTION PROBLEM RESOLUTION PROCESS

Your John Deere dealer is dedicated to supporting your equipment and resolving any problem you may experience.

1. When contacting your dealer, be prepared with the following information:
–Machine model and product identification number
–Date of purchase
–Nature of problem

2. Discuss problem with dealer service manager.

3. If unable to resolve, explain problem to dealership manager and request assistance.

4. If you have a persistent problem your dealership is unable to resolve, ask your dealer to contact John Deere for assistance. Or contact the Ag Customer Assistance Center at 1-866-99DEERE (866-993-3373) or e-mail us at www.deere.com/en_US/ag/contactus/.