

# 396-2974Y1



## *SureFire* Ag Systems

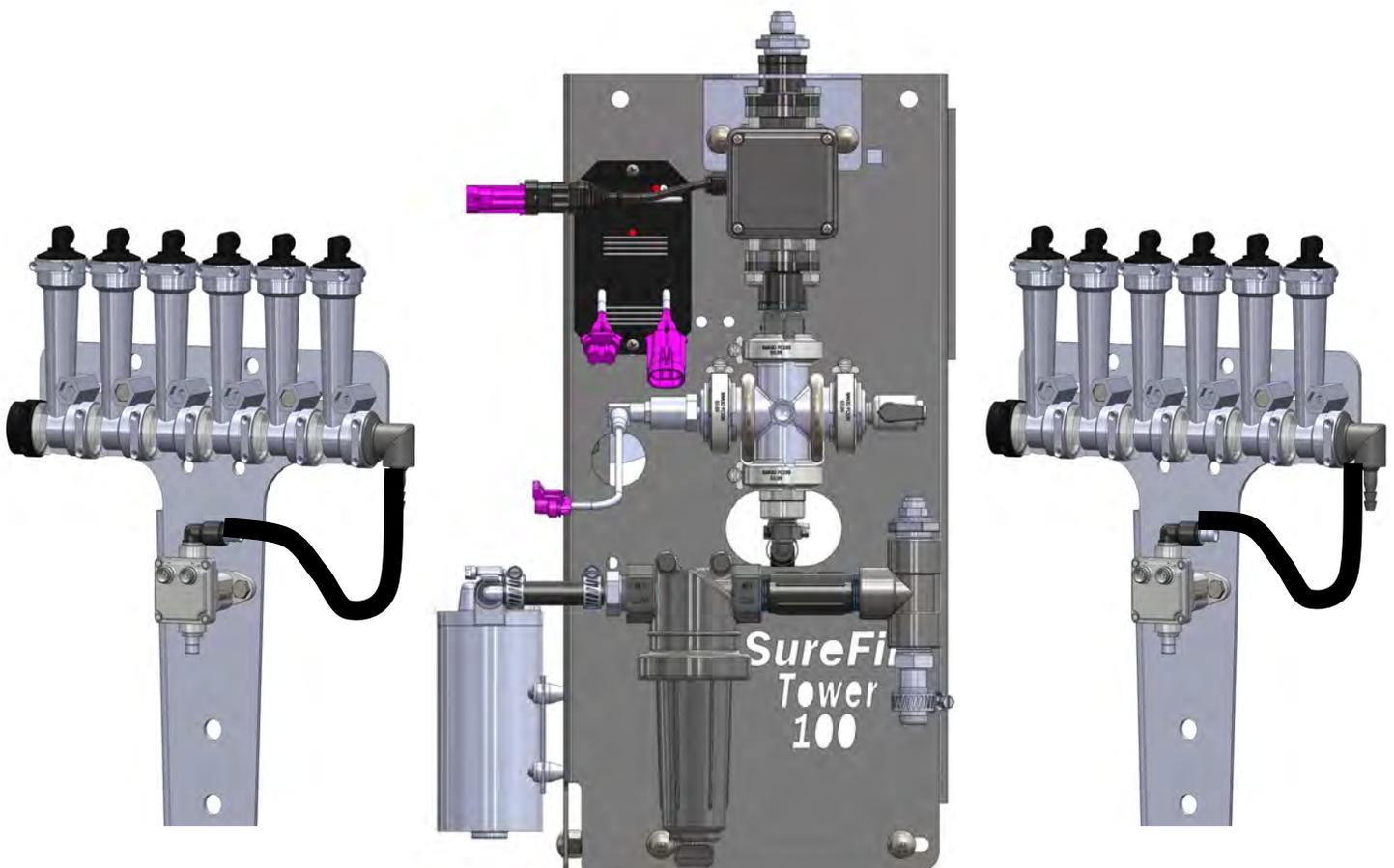


## **NUTRISPHERE-N<sup>®</sup>** Nitrogen Fertilizer Manager



## **VERDESIAN**

### *SureFire Catalyst™ Electric Pump System* *for NutriSphere-N<sup>®</sup> NH3 & John Deere*





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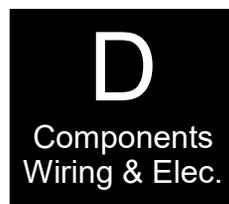
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# Read Me First

The SureFire *Catalyst™* system is designed to give accurate and even row-to-row distribution of NutriSphere-N NH<sub>3</sub> at a normal rate of 32 oz/acre. It has the capacity to deliver higher rates if desired.

## **Note: Ounces/acre, not gallons/acre.**

On the John Deere display, the flowmeter will be calibrated to measure this product in ounces, not in gallons. The display is programmed to show gallons, so be aware that the numbers that show for this product will actually be in ounces.

Ounces per acre means a very small amount of liquid is being pumped and distributed. At 6 mph on 30" row spacing, a rate of 32 oz/acre means that each row has a flow of just under 1 oz/min. On a 12-row implement, the total amount being pumped, therefore, is less than 12 oz/min. The SureFire *Catalyst™* system is engineered to accurately and evenly distribute this flow.

## **Low Flow Electromagnetic Flowmeter**

The SureFire *Catalyst™* system utilizes an electromagnetic flowmeter (with no moving parts) that is designed and built to accurately measure flows down to 10 oz/min. SureFire has proven the reliability and accuracy of the electromagnetic flowmeter by years of use in the field with thousands of flowmeters.

## **Dual Metering Tube Distribution**

The low flow to each row will be evenly distributed through metering tubes that have an opening of 0.080" in diameter. An orifice that could distribute this flow would be 0.015" or less in diameter. An orifice of that size is easy to plug. The 4 to 5 times larger diameter of the tube greatly reduces the risks of plugging.

The use of two tubes to each row (dual tube system) means that this system has the ability to handle a wide variation of rates and speeds (from 5 to 10 mph) and to do this under a wide range of temperature changes where the viscosity of the product changes.

## **Flow Indicators**

The flow for each row will pass through a flow indicator that has one or two balls that will float to indicate flow to that row. This will give an immediate visual indication of flow to each row. While the flow indicators give a good indication of the flow to each row, they are not always an indicator of the exact flow to each row. Only a catch test will verify the evenness of the row-to-row distribution.

## **Tool Box**

Each *Catalyst™* system comes with a built-in tool box that contains mission-critical spare parts to reduce equipment downtime.

## **Product Tank**

The *Catalyst™* comes with either a 55 gallon or a 110 gallon tank. The large tank would allow over 400 acres of application at the 32 oz/acre rate.

## **Rinse Tank**

Each system comes with a 3-gallon rinse tank that can be filled with RV anti-freeze to allow the system to be flushed when it will not be used for a few days and to be protected from freezing after the rinse.

## **Electric Section Valves**

Implements that are 60' wide or wider can be split into 2 sections to allow section control. Standard single section setups are equipped with electric row-shutoff valves on each flow indicator manifold set that will allow the pump to continue running when application stops at the end of the field to allow for a quicker return to Target Rate when application resumes. Two-section systems will have the same manifold shutoff valves but can be configured so the valves on the left half of the implement will function as Section 1 and the valves on the right half as Section 2.



# Getting Started

# A

## Introduction

This manual contains the information for the SureFire Tower 100 *Catalyst* system for NutriSphere-N NH3 that is being introduced in 2015.

Changes to components or configuration settings may be made to improve the operation of the system.

Go to Section F for the instructions on setting up your display.

## General Information

You have purchased a SureFire NutriSphere NH3 application system for your equipment. This system can be controlled by:

- John Deere Rate Controller
- Ag Leader Liquid Product Control Module
- Trimble Field-IQ Rate and Section Control Module
- Case IH Pro 700 with AccuControl
- SureFire Commander II controller

*Note: SureFire Ag Systems also has the SureFire Torpedo system, a complete anhydrous ammonia application system. See [www.surefireag.com](http://www.surefireag.com) for more information.*

## Basic Installation Steps

1. Have your control module and display in the cab connected and set up by the dealer for your display and controller. To apply anhydrous ammonia and NutriSphere-N NH3 you will need 2 Rate Controllers, one for the anhydrous ammonia and one for the NutriSphere-N NH3.
2. Open the packages and familiarize yourself with the components. See the System Overview Examples on the following pages to see the big picture of how SureFire systems are installed. Refer to manual sections B & D for component information.
3. Mount the Tower and tank on your equipment.
4. Install the plumbing kit including flow indicator columns, electric ZIP valves, and metering tube plumbing to each row unit delivery point. See sections B & E for information on these components.
5. Attach harnesses as shown in Section D.
6. Setup Controller for SureFire system as shown in Section F.
7. Fill system with water, conduct initial operation and tests per Section F.
8. Winterize system with RV Antifreeze if freezing temperatures are expected.

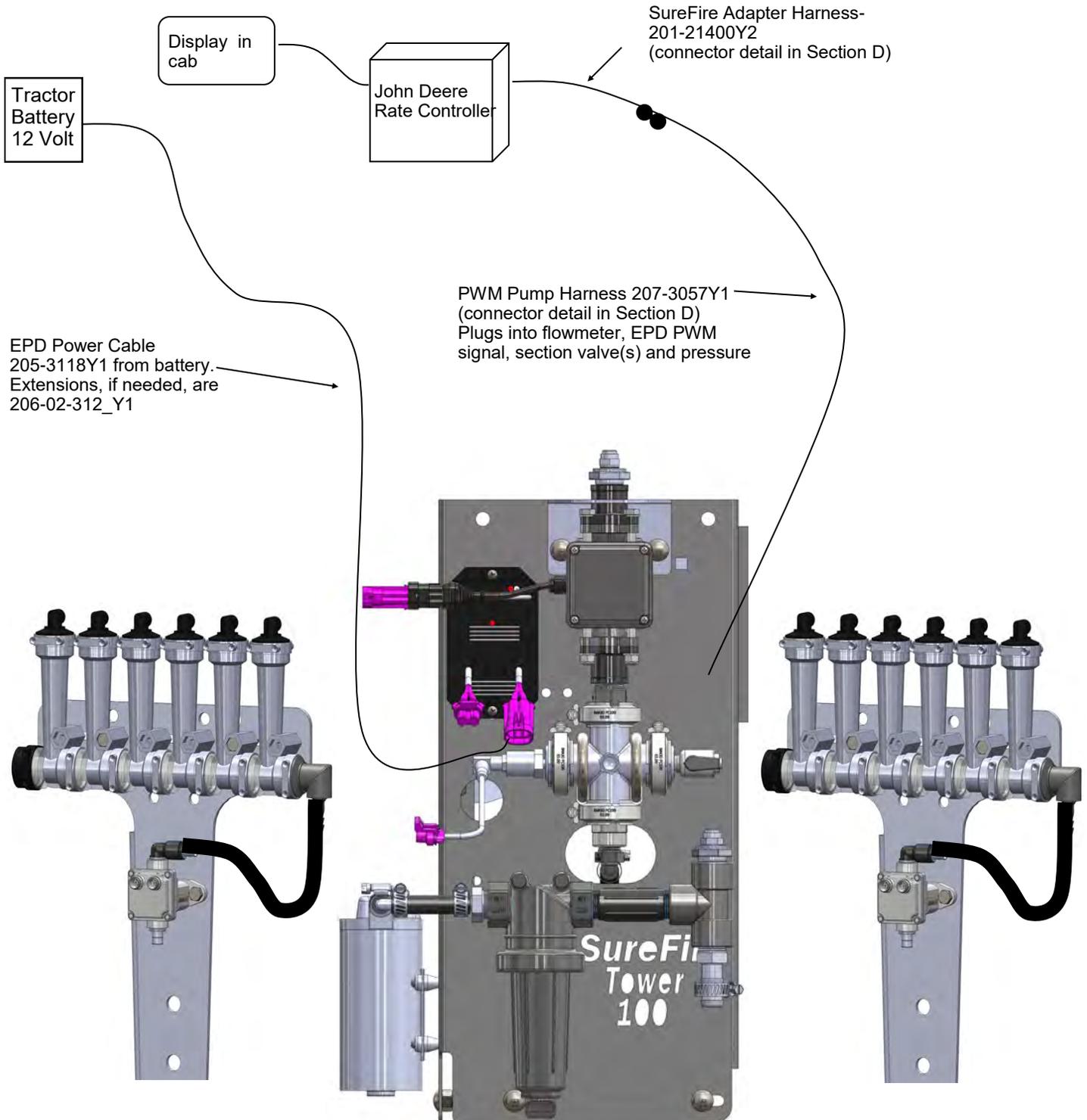
# System Overview

# A

Introduction

The following gives a layout of the SureFire Tower 100 *Catalyst* system with these components:

- Controller display in cab
- John Deere Rate Controller
- Tower 100
- Flow Indicators with ZIP valve



# Electromagnetic Flowmeter

204-01-4621CUF05

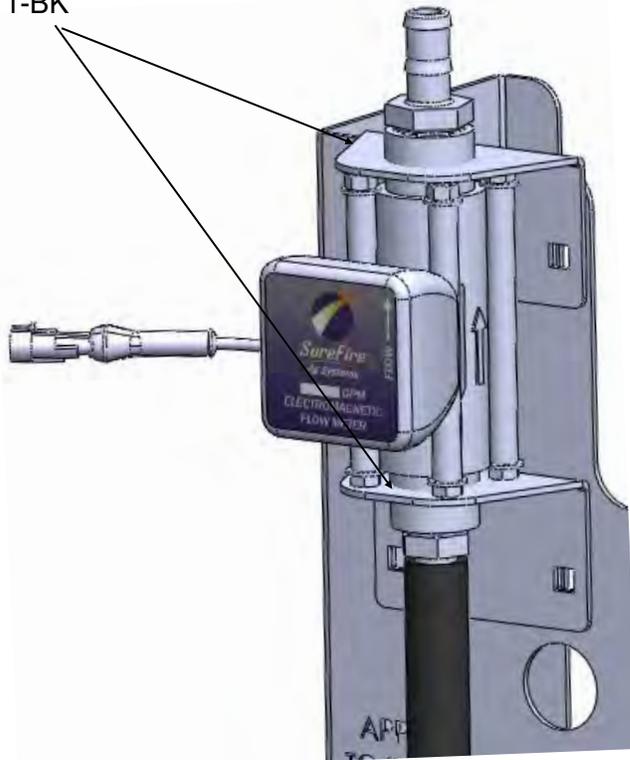
0.08 to 1.6 GPM (10 oz/min to 1.6 GPM)

*The flowmeter will read accurately down to 8 oz/min. Readings may go in and out below that.*

B

Components  
Liquid

Mounting Bracket,  
Used in Tower 100  
410-2106Y1-BK



Electromagnetic flowmeters are superior to traditional turbine flowmeters in two basic ways. First, they have no moving parts. This translates into no wear items or potential for contaminants to jam a spinning turbine.

Second, electromagnetic flowmeters detect the flow by electrically measuring the velocity of the liquid, which makes them independent of viscosity or density of the fluid measured. They are extremely accurate using the standard calibration number. SureFire still recommends you perform a catch test to verify the system is properly installed and configured.

*This flowmeter is rated down to 10 oz/min, but will accurately measure flows down to 8 oz/min. Below that rate, the flowmeter may not give a continuous pulse output.*

*The flowmeter for this setup on the John Deere display will be calibrated to read in ounces, not gallons. The display may say gallons, but it will be measuring in ounces.*

**Caution: Before welding on the implement, disconnect the flowmeter or damage to the flowmeter electronics may occur.**

**Do not power wash the flowmeter. High pressure spray directed at the back edge of the face plate or at the wire connector may allow water into the flowmeter electronics.**



## Section Valves and Flow Indicator Manifold Shutoff Valves ZIP Valves

# B

Components  
Liquid



ZIP valve on right shown with both electrical connectors plugged (if daisy-chaining from one to the next).

Outlets can be plumbed with a variety of fittings depending on the particular scenario.



### Flow Indicator Manifold Shutoff Valves

Single-section systems will have electric shutoff valves (ZIP Valves) on each bank of flow indicators. These valves will be controlled by the Section 1 Connector. A 4' Y Adapter Cable (201-215604) will be plugged into the Section 1 connector on the Pump harness (207-3057Y1). One end of the Y will connect to the valves on the left side of the machine, the other end of the Y will connect to the valves on the right side of the machine.

### Section Control

Some systems (60 ft. and wider) may be set up as 2-section implements, so half of the applicator can be shut off in an overlap situation.

These systems will still have the flow indicator shutoff valves, but the valves on the left half of the machine will be plugged into the Section 1 connector on the harness and the valves on the right half of the machine will be plugged into the Section 2 connector.

Implements less than 60 feet wide need to be configured as one section for the NutriSphere N-NH3 product, since the output for narrower sections will drop below the range of the flowmeter at lower speeds.

### 3-Pin Wiring Connector:

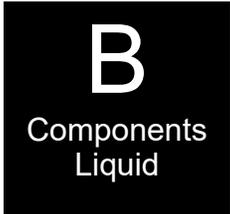
Pin A—Red, 12 Volts +

Pin B—Black, Ground -

Pin C—White, Signal

12V=on ; 0V=off

# Pressure Sensor



The Tower 100 comes equipped with a 100 psi pressure sensor to work with your controller. This sensor for the John Deere Rate Controller is a 3-wire type sensor. The Commander II uses a 2-wire sensor. The sensor has a 1/4" MPT fitting.



Your display will show the system pressure on the in cab screen. **The pressure reading is only for informational purposes and is NOT used in the flow control process.** Flow control uses the flowmeter feedback only.

The pressure sensor is very helpful to optimize system performance and troubleshoot any issues.

The pressure transducer is factory calibrated and will display a very accurate pressure reading on your display. No manual gauge is required.

*When attaching connector to pressure sensor, make sure pins are aligned so they are not bent.*

Pressure Sensor (3 wire type) with harness  
521-05-050150

3-wire sensor  
Pressure Calibration:  
50 mv/psi

# Pump Priming and Air Bleed Valve

An air bleed valve is included with each pump to aid in system priming. It is shipped in the pump accessories bag and must be installed during system installation.

## Why use an air bleed valve:

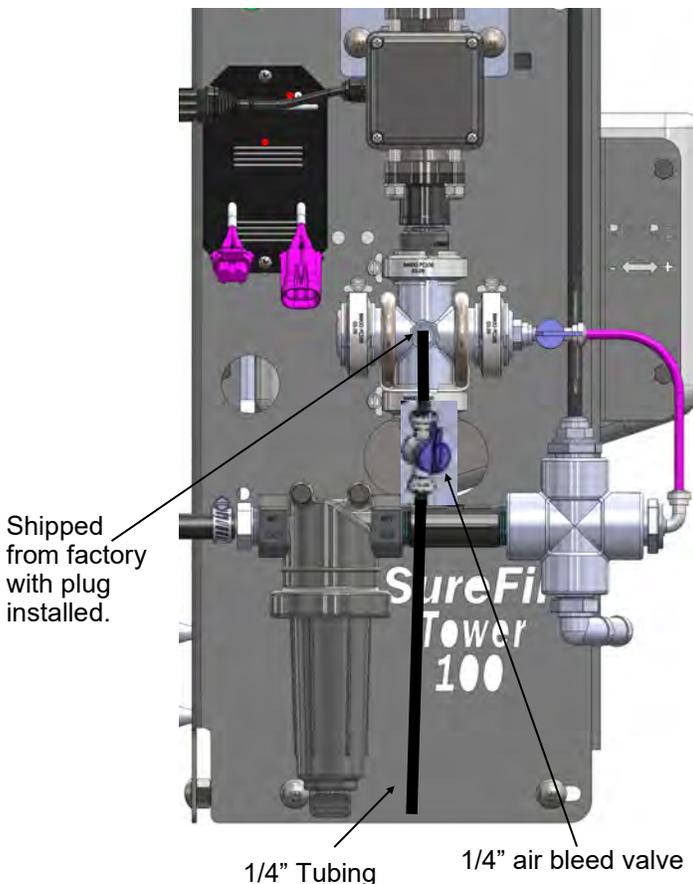
Your system is equipped with a 4 lb. check valve on each metering tube. These valves do not let air escape from the system unless it is pressurized. 12 volt liquid pumps are not good air compressors. Therefore, the pump can struggle to prime due to air trapped on the outlet side of the pump.

The air bleed valve is a small 1/4" valve that when opened lets air escape from the pump outlet at zero pressure. Open until liquid comes out and then close the valve.

## How to install the air bleed valve:

Remove the 1/4" plug from the quick connect fitting on the center cross on the Tower (see picture). Next, insert the 1/4" tubing in the quick connect fitting. Run the 1/4" tubing to an easily accessible spot on your equipment. Next, cut the tubing and push the 1/4" valve onto the tubing. Finally, run the tubing to a low location where any product that escapes will run on the ground.

**Be sure the air bleed valve tube does not become plugged with dirt or it will not allow air to bleed.**



# Product Distribution



**To assure proper and even distribution to each row, the product being applied must be metered to each individual row. This metering is done by using metering tubes which create back pressure so an equal amount of liquid is applied to each row.**

## Floating Ball Flow Indicator & Manifold System

Flow indicators give a clear visual signal that a fertilizer system is working. These indicators use an o-ring and wire clip connection to snap together in any configuration necessary.

The flow for each row will pass through a flow indicator that has one or two balls that will float to indicate flow to that row. This will give an immediate visual indication of flow to each row. While the flow indicators give a good indication of the flow to each row, they are not always an indicator of the exact flow to each row. Only a catch test will verify the evenness of the row-to-row distribution.

*For most applications of NutriSphere-N NH3 at 32 oz/acre, the Green Plastic ball gives a good flow indication. If a heavier ball is needed, use the Red ball.*

*On this low-flow system, the flow appears to be more stable if only one ball is used.*



### Parts List

#### Complete Columns

701-20460-920-GR-V Single Low Flow Column with 1/4" QC - 90 Degree Outlet

#### Fittings

701-20516-00 ORS x 1/4" QC - 90 Degree

701-20521-00 Wilger End Cap  
701-20523-00 ORS Male x ORS Female x 3/8" FPT - Isolator  
701-20525-00 ORS Male x ORS Male x 1" FPT - Tee

#### Service Parts Only

701-20470-00 Low Flow Column  
701-20460-04 Wilger Lock U-clip  
701-20460-05 Flow Indicator Ball - 1/2" SS Ball  
701-20460-06 Flow Indicator Ball - Maroon Glass  
701-20460-07 Flow Indicator Ball - Red Celcon  
701-20460-08 Flow Indicator Ball - Green Poly  
701-20460-09 Flow Indicator Ball - Black Poly  
701-20460-15 Viton O-Ring for column & fittings  
701-40225-05 Viton O-Ring for Orifice

#### Brackets & U-Bolts

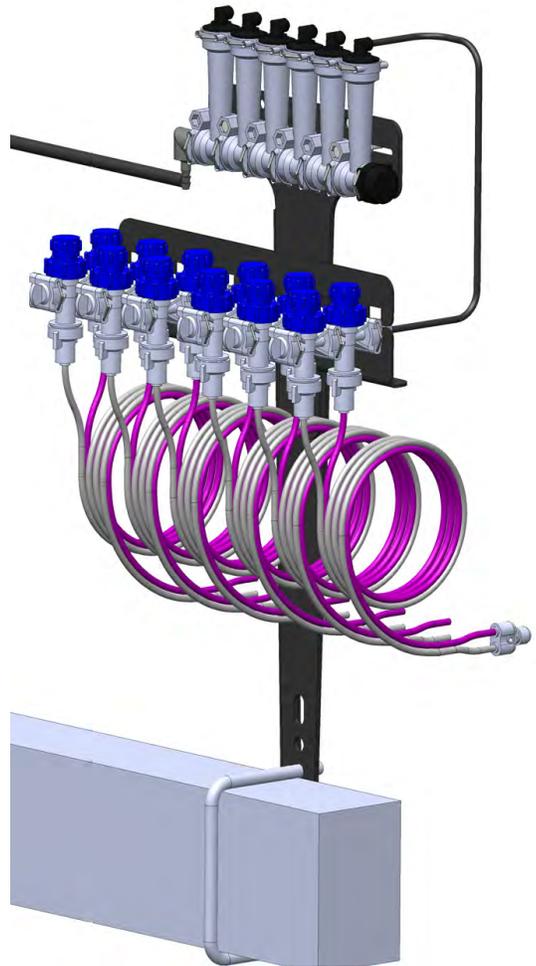
400-1037A1 3-6 Row Bracket  
400-1036A2 7-12 Row Bracket  
400-2011A1 White Backer Plate for 3-6 Row Bracket  
400-2010A1 White Backer Plate for 7-12 Row Bracket  
400-1315A2 Flow Indicator Bracket, 6-8 in wide hitch mount



# Flow Indicators and Dual Check Valves

**B**  
Components  
Liquid

Some systems may have a dual check valve system with two metering tubes as shown at the right. On this system, flow can be directed to the small tube, or to the large tube, or to both tubes by opening or closing the valves by twisting the blue caps.



Ball retainer—If top is removed, be sure that the ball retainer is in place when top is reinstalled.

Assembly of top of flow indicator tube

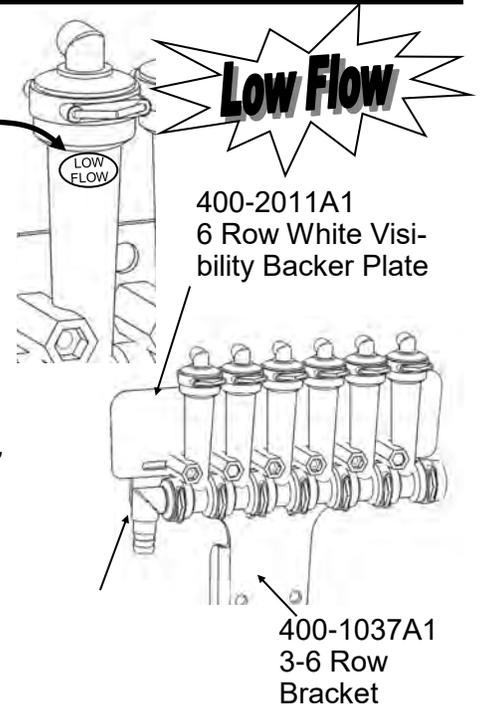
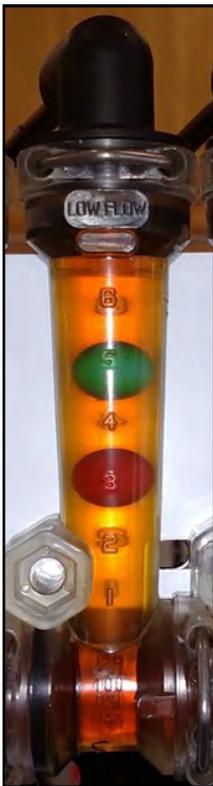
## Low Flow Column (mostly 1/4" QC)

The low flow column has a smaller internal diameter. This means a heavier ball can be used to monitor a smaller flow.

Externally, the low flow column can only be identified by "Low Flow" molded into one side of the column. All the same fittings work with low flow and full flow columns.

## Floating Balls

*For most applications of NutriSphere-N NH3 at 32 oz/acre, the Green Plastic ball gives a good flow indication. If a heavier ball is needed, use the Red ball. On this low-flow system, the flow appears to be more stable if only one ball is used.*



# Metering Tube Plumbing Kits

# B

Components  
Liquid

The SureFire *Catalyst* Tower 100 NutriSphere-N NH3 system comes with a dual metering tube distribution system. These plumbing kits will contain everything you need to distribute product from the flowmeter outlet down to the ground application device.

For most applications of NutriSphere-N NH3 at 32 oz/acre on 30" rows, the purple tube will be the tube that is used. When applying in cold weather and/or at high speeds, it may be necessary to use the blue tube. The system will work at pressures up to 50 PSI, but for prolonged use above 45 PSI, consider switching to a larger tube.

## Dual Advantage of Dual Metering Tube

Metering tube provides a larger passage way diameter than a comparable orifice. Typical NutriSphere-N NH3 applications apply around 1 to 1.5 oz/min/row. An orifice for this rate would have a 0.015" diameter opening. The SureFire system uses metering tubes with diameters of 0.080" (Purple) and 0.096" (Blue). This 12' tube with more than three times the diameter creates a system resistant to plugging while providing excellent row to row distribution.

By using two metering tubes, the system can provide the proper system pressure as the product properties change due to temperature, mixtures and other factors.



Standard Orifice      Metering Tube

## Field Operation of Dual Metering Tube

The best tube to use may change, based on temperature, application speed, and product batch,

**SureFire recommends you start with the Purple tube** (for typical 32 oz/ac and 30" row spacing). Conduct a test using the Nozzle Flow Check to determine your system pressure. Recommended pressure is between 10-40 PSI. If pressure is less than 8 psi, some check valves may not open and row to row distribution may be uneven.

The system will operate up to 50 PSI. If prolonged application with pressures above 45 PSI is anticipated, consider changing to the blue tube.

*Note: Flow tests with water will have very different pressure readings than what the system will have with NutriSphere-N. The pressure will be much less with water for a given flow than with NutriSphere-N.*



## Typical plumbing setup

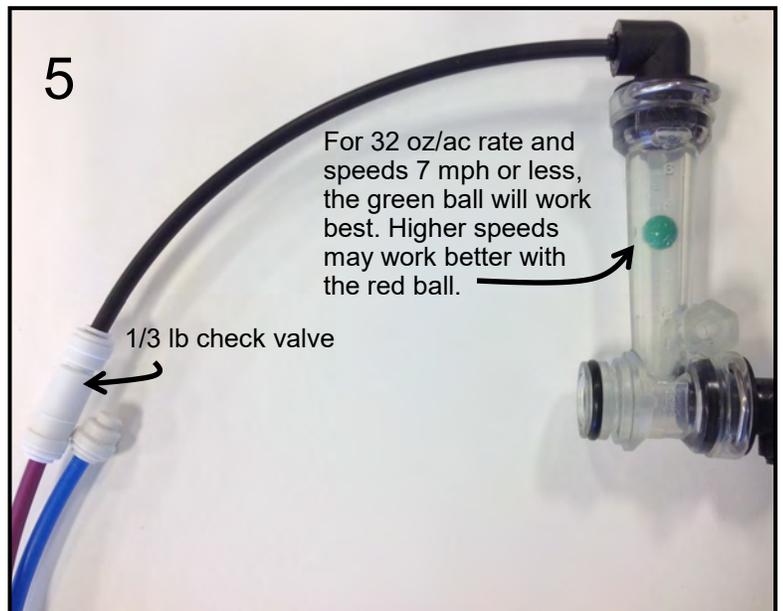
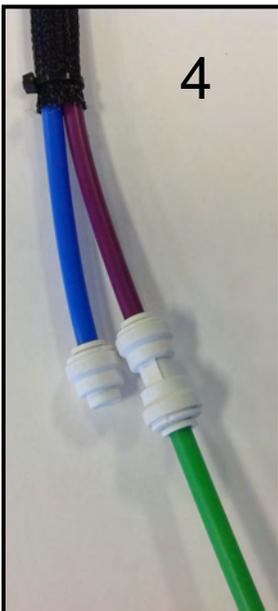
Your shanks and plumbing setup may vary from those shown here.

The 4' green tube delivers the product to the shank.

1. Slide a 2' piece of 3/8" hose over the green tube along with 2 clamps.
2. Slide the green hose in the tube on the shank as far as it will go.
3. Slide the 3/8" hose down over the tube. Clamp 3/8" hose at the top and at the bottom.
4. Connect purple tube to green tube with 1/4" QC x 1/4" QC. Cap both ends of the blue tube. Blue tube will be used when cold weather and/or high speeds create too high pressure in purple tube.
5. Connect purple tube to appropriate length of black tube with 1/3 lb 1/4" QC check valve. Connect this black tube to top of flow indicator.

# B

Components  
Liquid



# Shanks and Knife Points available from SureFire Ag Systems

SureFire Ag Systems and Verdesian have worked closely with an established shank manufacturer to develop a shank and knife points that will deliver the anhydrous ammonia and NutriSphere-N NH3 where it needs to go. They will be able to advise users on the best setup for their application scenario. *More ground engagement options are available than what are shown here.*



The knife on the left is for no-till conditions. On the right is a less aggressive point for tilled soil.

Anhydrous tube

NutriSphere tube

Insert a piece of green 1/4" tube inside the NutriSphere tube and push it down so the end of the green tube is at the top of the outlet hole. (See instructions on previous page.)  
To protect the green 1/4" tube, slide a 2-foot long piece of 3/8" hose over the green tube and clamp this hose to the top of the NutriSphere tube.

*Your application setup may be different. Generally, insert the green 1/4" tube into the tube through which the NutriSphere-N NH3 will be applied.*



## Toolbox (no tools, just spare parts)

B

Components  
Liquid

A toolbox containing critical items will be included with each system. The toolbox will contain:

### QTY

- 1 12 volt electric pump
- 2 flow indicator columns
- 10 size 6 hose clamps
- 1 3/8" HB 90 degree electric pump fitting
- 1 3/8" HB straight electric pump fitting
- 2 40 Amp fuses
- 1 1" Tee Strainer gasket-FKM
- 2 Clips for electric pump
- 4 QC 1/4" End Stop White Poly Cap
- 6 QC to QC—1/4" QC x 1/4" QC
- 2 Check Valve—1/3 lb—1/4" QC x 1/4" QC



# John Deere Rate Controller for GS2 & GS3

D

Wiring & Elec.

SureFire systems begin at the John Deere Rate Controller, which you will need to purchase from your John Deere dealer. The picture below shows the John Deere Rate Controller. A John Deere Rate Controller can control one product. *One Rate Controller will be needed for the anhydrous ammonia control and one Rate Controller will be needed for the NutriSphere-N NH3.* The John Deere Rate Controller communicates with the John Deere GS2 or GS3 display in the cab.

The harness coming from the rate controller is a 37-pin Amp connector. SureFire system harnesses begin at this 37-pin connector. The following page shows a system layout to illustrate how the harnessing is connected to all components. Detailed harness drawings follow for information and troubleshooting.

Instructions for setting up the GS2 or GS3 display are in Section F. Detailed screen shots of the display are included showing exactly what settings are required and recommended for SureFire systems.

**See your John Deere Rate Controller Operator's Manual for more setup and operating instructions.**

John Deere Rate Controller- Will need one Rate Controller for anhydrous control and one Rate Controller for NutriSphere control



37 Pin Connector (on John Deere Harness)

SureFire adapter for John Deere Rate Controller - 37 pin to 16 pin, SureFire PN 201-21400Y2

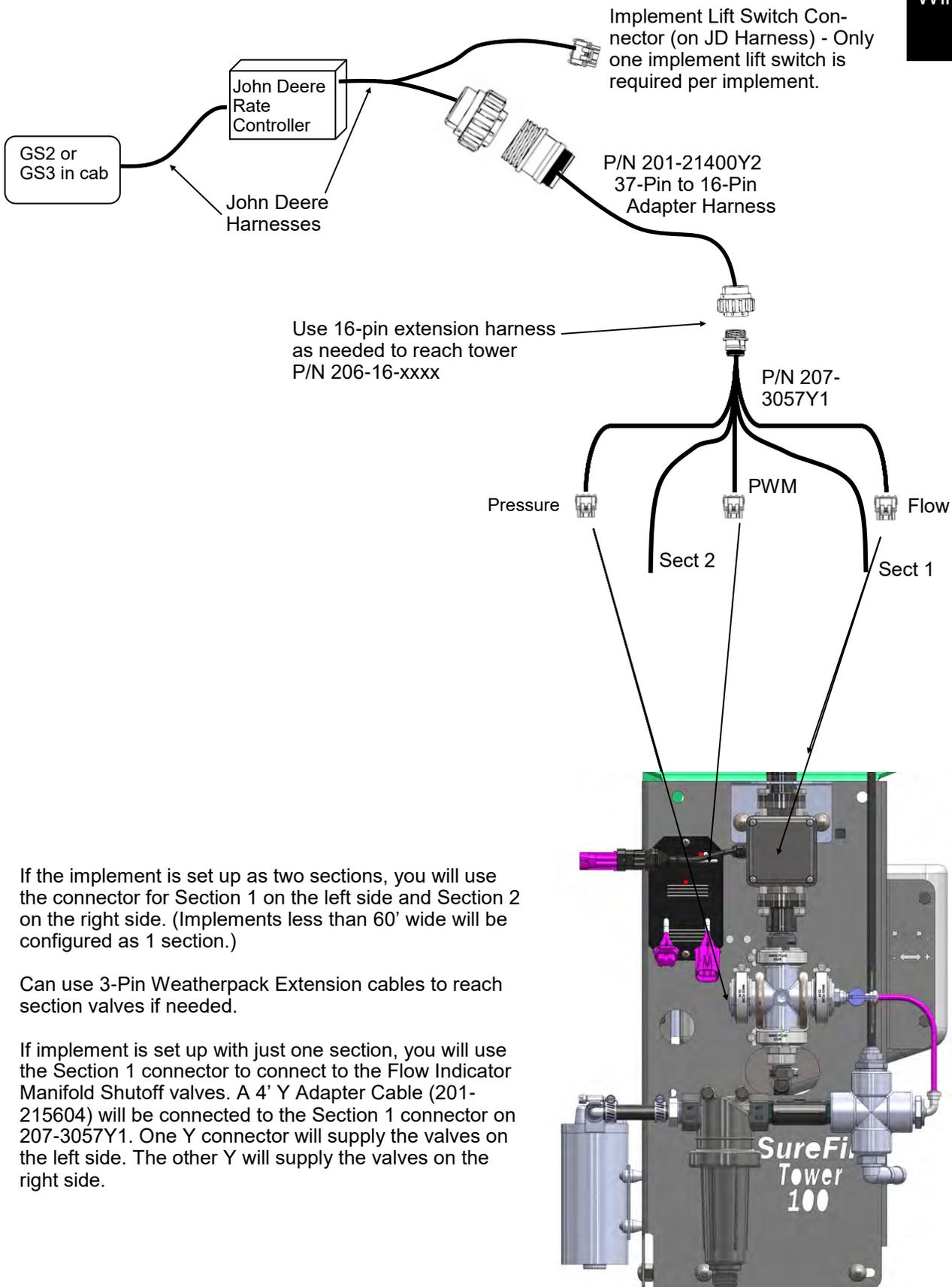
Pump Connection Attaches to 207-3057Y1



# Tower & John Deere Rate Controller Layout

Control: PWM EPD

Sections: 2



If the implement is set up as two sections, you will use the connector for Section 1 on the left side and Section 2 on the right side. (Implements less than 60' wide will be configured as 1 section.)

Can use 3-Pin Weatherpack Extension cables to reach section valves if needed.

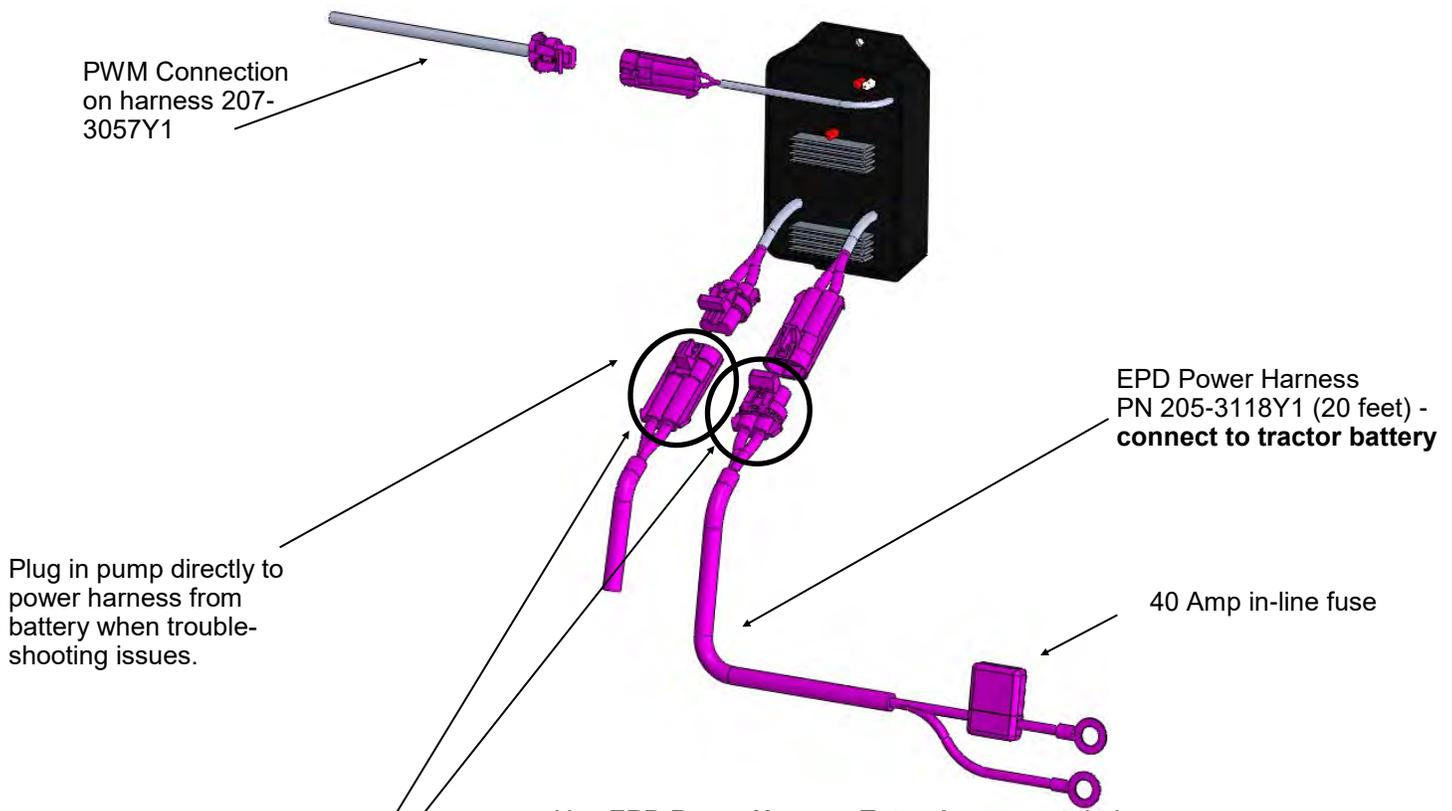
If implement is set up with just one section, you will use the Section 1 connector to connect to the Flow Indicator Manifold Shutoff valves. A 4' Y Adapter Cable (201-215604) will be connected to the Section 1 connector on 207-3057Y1. One Y connector will supply the valves on the left side. The other Y will supply the valves on the right side.

# 40 Amp PWM EPD (Pulse Width Modulated Electric Pump Driver)

Item Number: 205-19024 with Anderson connectors  
Replaces 205-18385 with 480 connectors



The Electric Pump Driver powers the electric pump by providing a pulse width modulated signal to control pump speed. It needs to have a power connection and wiring capable of carrying up to 40 amps of current. **It must be connected directly to the tractor battery.** SureFire recommends 10 gauge (or heavier) wire if extending harnesses in the field.



**Troubleshooting Tip:**  
If the pump won't run, connect the power and pump connector directly together to give pump full 12 volts directly from battery. This will tell you if the pump is the problem or if something else is wrong. The pump will be running at full speed, so don't leave it connected this way for long.

Use EPD **Power Harness Extensions** as needed (These have Anderson Connectors)

Part Number	Extension Length	Wire Size
206-02-3120Y1	1' Extension	10 gauge
206-02-3121Y1	5' Extension	10 gauge
206-02-3122Y1	10' Extension	8 gauge
206-02-3123Y1	20' Extension	8 gauge
206-02-3124Y1	30' Extension	30' and longer—6 gauge
206-02-3125Y1	40' Extension	
206-02-3126Y1	50' Extension	
206-02-3127Y1	60' Extension	
206-02-3128Y1	2' Anderson Ext w/ Power Switch-8 AWG	

SureFire recommends a single long extension harness as multiple connectors will reduce voltage, increase current and hurt performance of your electric pump system.

Wire Size: 18 AWG unless otherwise specified

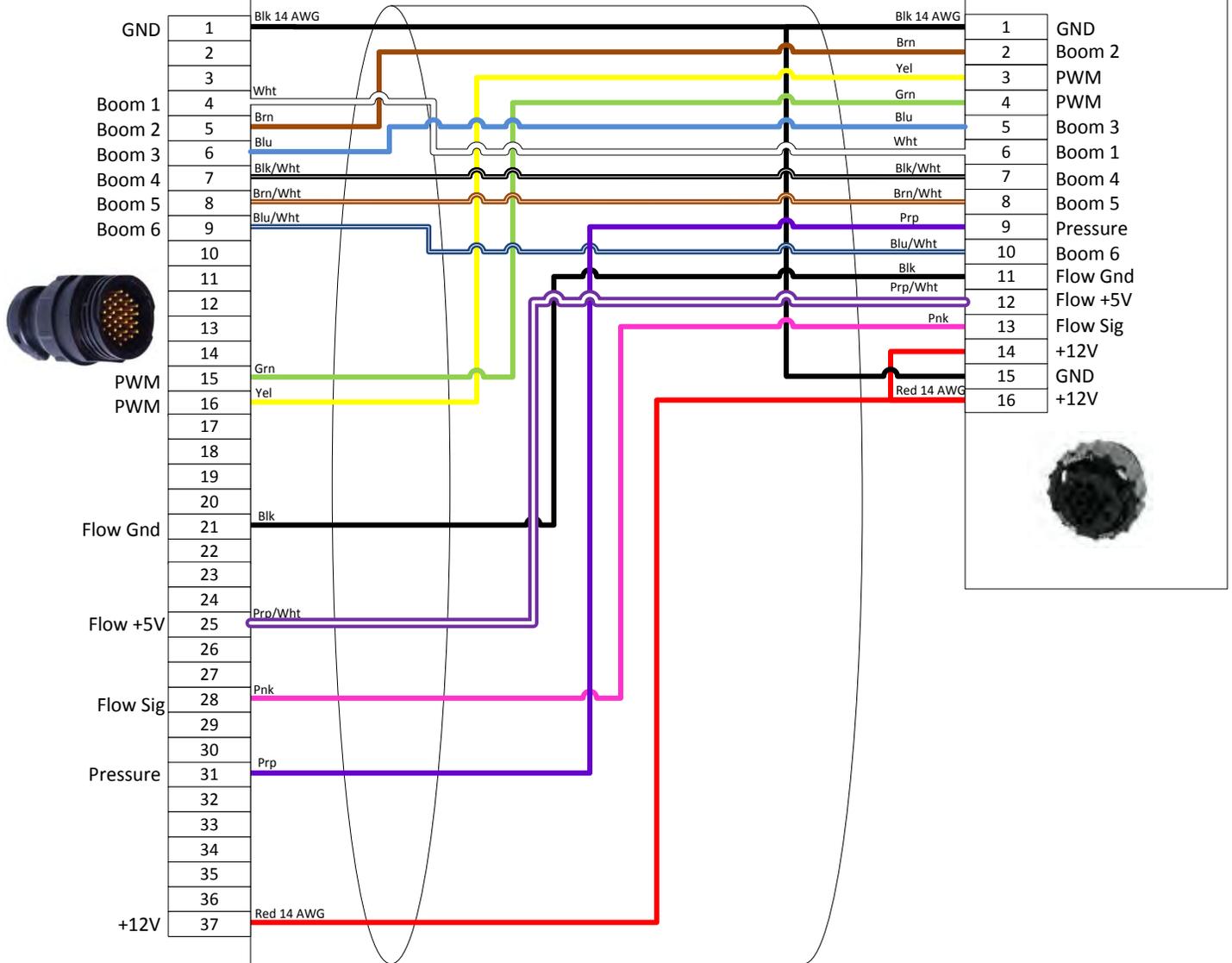
# 201-21400Y2

## 37 Pin to 16 Pin Adapter

Length: 2'

37 Pin Round – AMP  
Male pins in male body (with threads for swivel nut)

16 Pin Round – AMP  
Female pins in female body (with swivel nut)



Project:	201-21400Y2	Drawn By:	Dirk Ricker Y2 by Mark Wolters
Filename:	37 Pin to 16 Pin Adapter	Date:	4/2/2013 Y2 07/30/2015
Copyright 2013-2015 SureFire Ag Systems		Page of Pages	18
			1 of 1

# 207-3057Y1 Tower Final harness w 2 sections

PWM Pump Cable – Flowmeter, PWM & Pressure

Length: 10ft

Wire Size: 18 AWG

Section 1  
WP Tower  
3-PIN

A	+12VDC
B	GND
C	Signal

Section 2  
WP Tower  
3-PIN

A	+12VDC
B	GND
C	Signal

PWM  
150 MP  
TOWER  
2-PIN

A	+12VDC
B	-12VDC

PRESSURE

150 MP  
SHROUD  
3-PIN

A	Signal
B	+12VDC
C	GND

150 MP  
Tower  
3-PIN

A	Signal
B	+12VDC
C	GND

FLOW

16 Pin Round – AMP  
Male pins in male body  
(with threads for swivel nut)

Ground	1	BLK 14 AWG
Sect 2	2	BRN
+12VDC	3	YLW
-12VDC	4	GRN
Sect 1	5	
	6	BLK
	7	
Pressure Signal	8	
	9	PRP
	10	
Ground	11	BLK
	12	
Flow Signal	13	BLU
	14	
	15	
+12VDC	16	RED 14 AWG



Project:

207-3057Y1 Tower Final harness w 2 sections

Drawn By:

Mark Wolters

Filename:

PWM Pump Cable – Flowmeter, PWM & Pressure & 2 sections

Date:

07/30/2015

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## SureFire Catalyst Verdesian NS-N NH3 and John Deere—Harness hookup

Harnesses for your particular system may vary from the list here. Not all of these harnesses will be used on all systems.

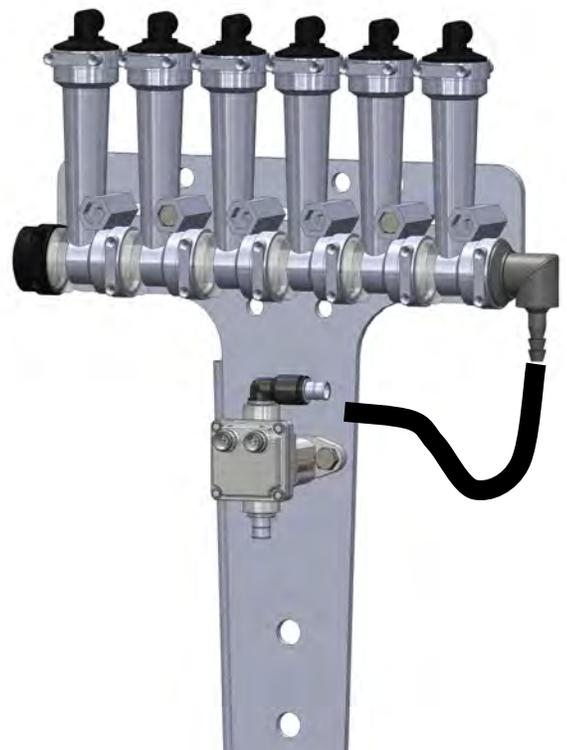
# E

Installation  
Overview

205-3118Y1	Anderson 40 Amp Fused Power Harness (connect to battery)
206-02-312_Y1	Anderson Extension Cable (to extend harness from battery to Tower)
206-03-1_____	3-pin Extension Cable
206-16-_____	16-pin Extension Cable
201-21400Y2	37-pin to 16-pin Connects to 37-pin connector from Rate Controller and 16-pin on 207-3057Y1.
207-3057Y1	Tower Final Harness to pump, flowmeter, EPD, etc...
201-3130Y1	480 MP Tower x Anderson Adapter Cable—Connect EPD to pump
201-215604	4' Y Adapter Cable—1 WP Shroud to 2 WP Tower To connect Boom 1 connector to Left side and right side Zip valves (On 1-section implement, all Zip Valves run from Boom 1 connector—this harness splits that harness to go the left side and to the right side of the implement)
201-3158Y1	Zip Valve WP Section Cable—Connect to Boom 1 or Y adapter from Boom 1 and then to Zip Valve (on 2-section implement could be Boom 2 to Zip Valve)
201-3161Y1	Zip Valve Termination Plug. Screw this onto open connectors on ZIP Valve.
201-3193Y1	Boom 1 WP connector to 2 Zip Valve MP12 connectors
201-3200Y1 to 3203Y1	Zip Valve to Zip Valve Connector cable (used if daisy-chaining Zip Valves)

### Zip Valve Mounting

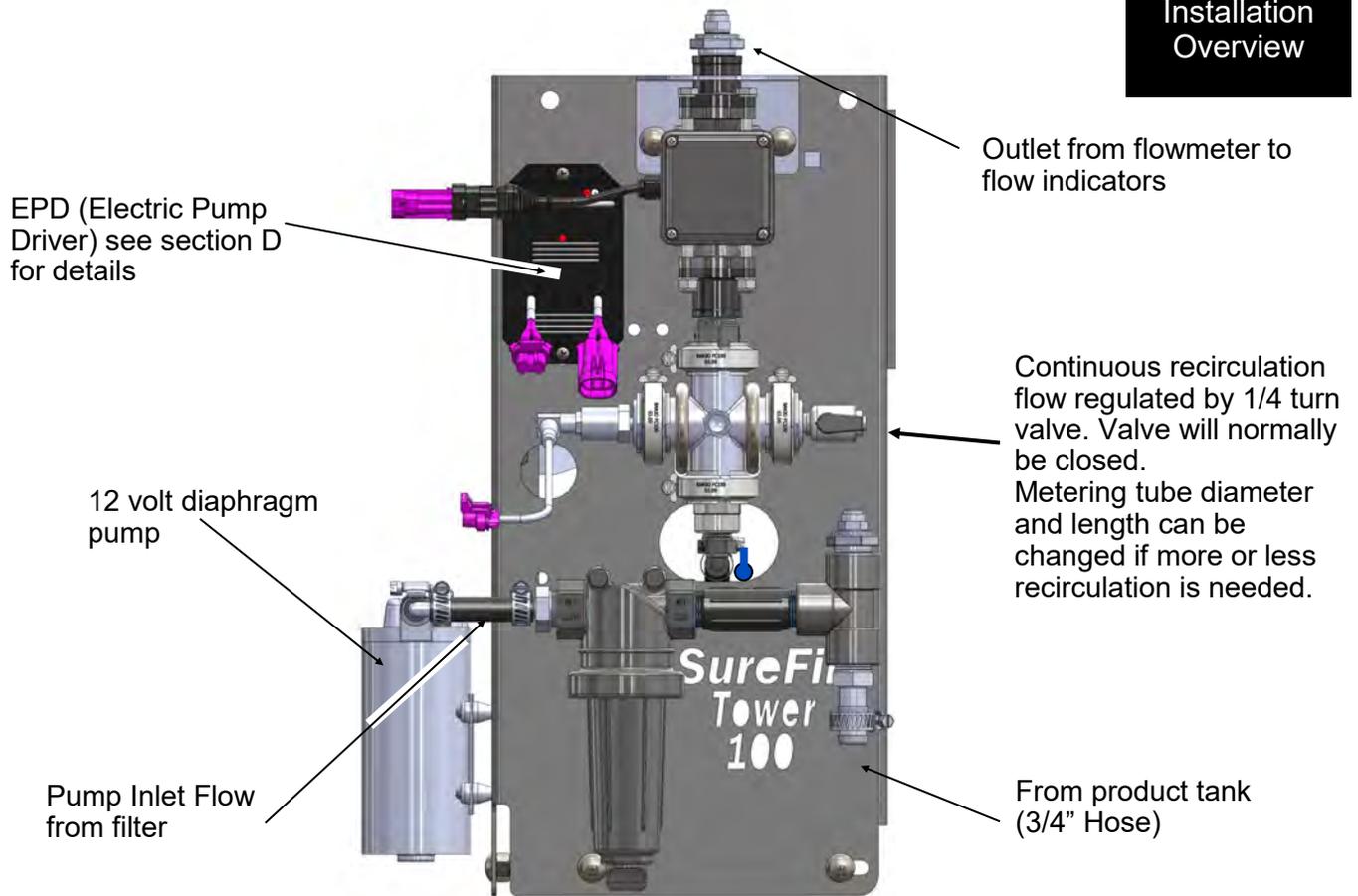
Picture at right shows ZIP Valve mounted on Flow Indicator Bracket.  
Mount ZIP Valve to Flow Indicator Bracket with 1/4" bolts. Use washer and nylock nut.  
Plumb flow from flowmeter into bottom of valve. From top of valve plumb to flow indicator with 3/8" hose.  
Connect wiring harness to valve. Wiring harness connectors are keyed so they only fit on one of the connectors.



# Tower 100 *Catalyst* Plumbing Overview & Valve Operation

# E

Installation  
Overview

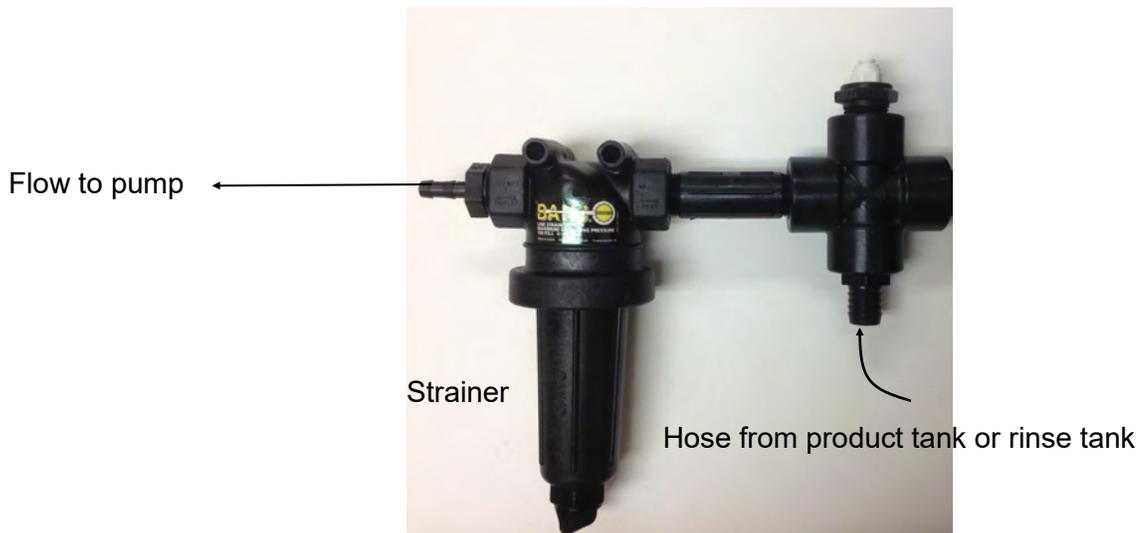
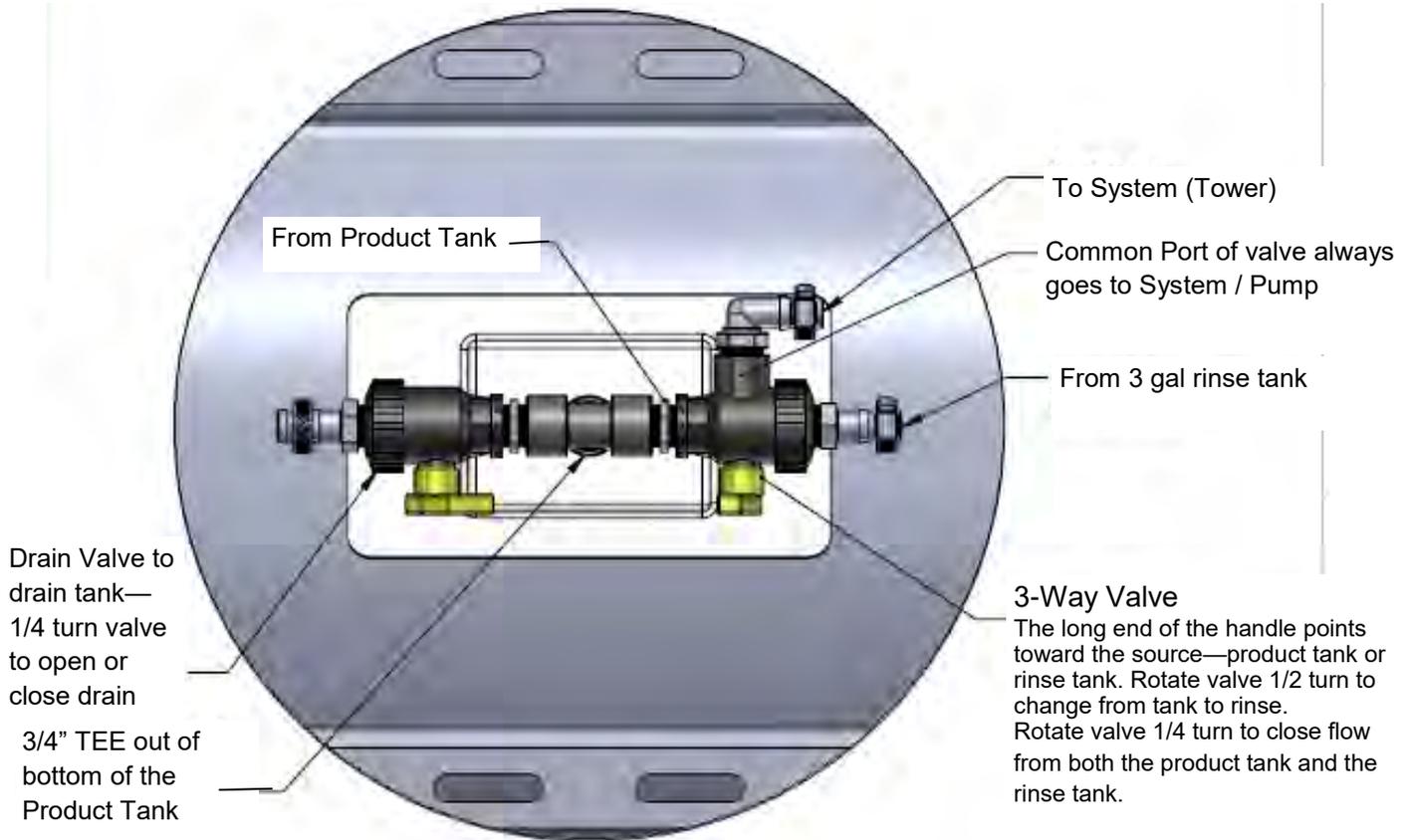


## Do I need recirculation flow?

Recirculation flow allows the pump to run faster than if the total pump flow was applied to the ground. This may be helpful when operating at very low flow rates. This system will typically operate with the recirculation valve closed. The metering tube on the recirculation loop can be changed to allow for more or less recirculation. Too much recirculation can result in unstable flow reading on the display.

# Tower 100 *Catalyst* Plumbing Detail

(Bottom of Product Tank)



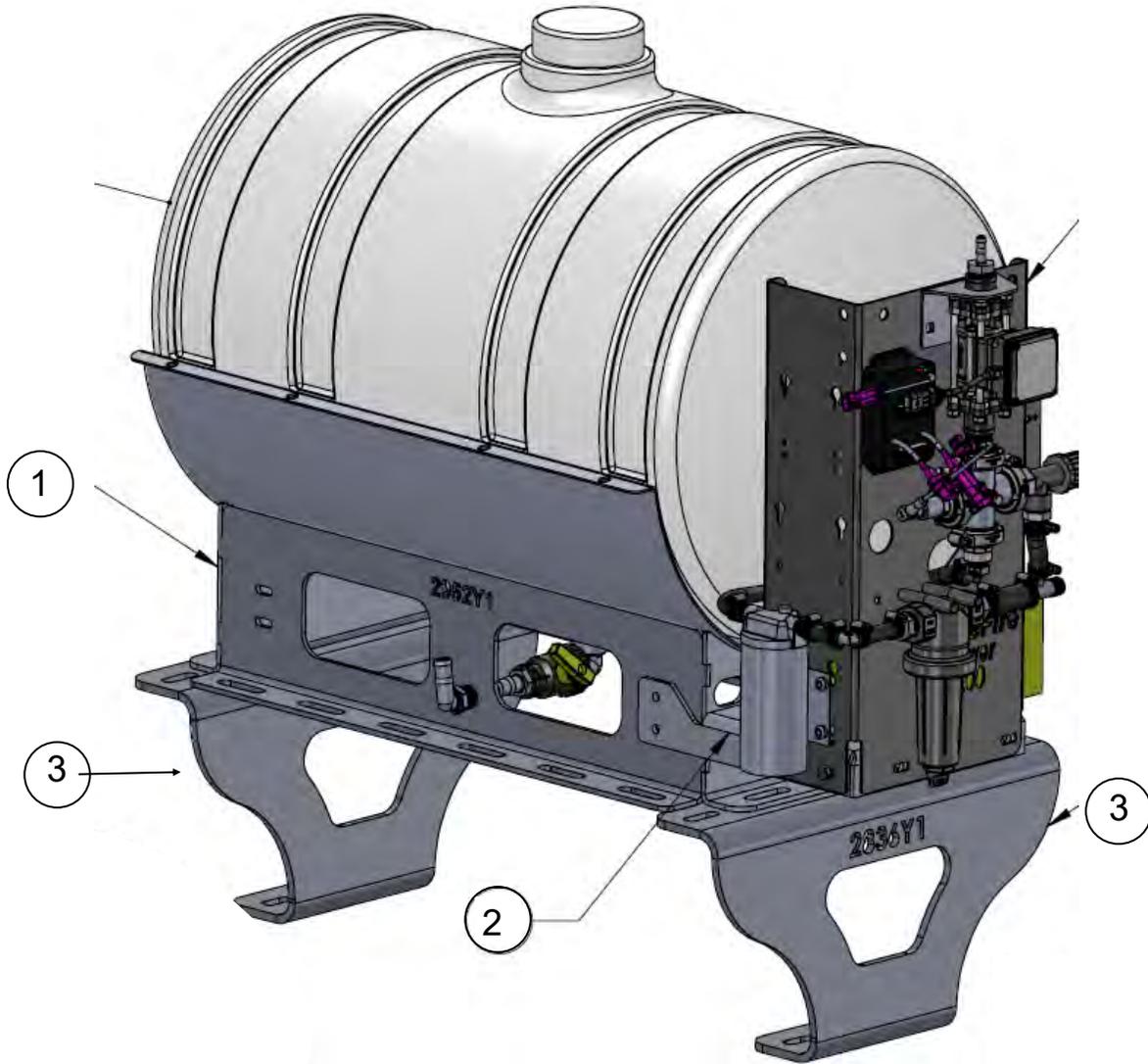
# Tower 100 Mounting Options

# E

Installation  
Overview

Various brackets and u-bolts are available to provide a way to mount the Tower 100 to almost any implement.

Your SureFire configuration specialist will get your implement information at ordering time and make sure that all of the hardware needed for your system is included.



ITEM NO.	Part Number	Description	QTY
1	421-2952Y1	55 gal/24" DIA tank cradle	1
Or	421-2956Y1	110 gal tank cradle	1
2	420-2957Y1	Tower 100 Mount Bracket	1
3	420-2836Y1	Tank Stand (12" tall)	2
Or	420-2986Y1	Tank Stand (6" tall)	2

A variety of U-bolts are available to fit various sized bars.

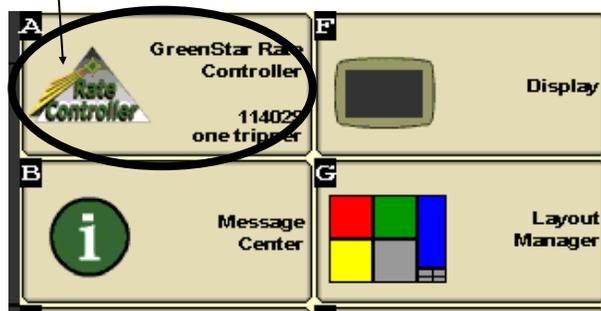
# John Deere Rate Controller Setup



Your system will need one Rate Controller to control the anhydrous ammonia and a separate Rate Controller to control the NutriSphere-N NH3.

To access the GS2/GS3 Rate Controller Functions, push this softkey. If this button is not present the Rate Controller is not communicating with the GS2/ GS3 display. See your John Deere operators manual or your John Deere dealer for assistance.

This button will take you to the Main Rate Controller Screen below.



**Note: When applying NutriSphere NH3, the flowmeter will be set to measure ounces. All screens that say gallons will actually be showing ounces, not gallons.**

## Main Rate Controller Screen

**Actual Rate (this will be oz/acre)** → 0.0 gal/ac

**Target Rate (this will be oz/acre)** → 32.0 gal/ac

**Implement Height Switch Indicator, Arrow will point up or down to indicate implement position if height switch is used.** → 98 (gal)

**Estimated Volume Remaining / Tank Refill Button (press to refill tank).** (Note: if using this, it must be set to indicate ounces, since the flowmeter will be measuring ounces, not gallons.)

**Pressure** → 0.0 psi

**Tractor Speed** → 0.0 mi/h

**Navigation Buttons:**

- F Rate Controller
- G Setup
- H Totals
- I Diagnostics

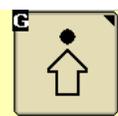
**Enable Pump** → [ ]

**Rate (gal/ac):** Predefined, A Rate 1 32.0, B Rate 2 48.0, C Rate 3 0.0

**Flowmeter:** 0.0 gal/min

**Time:** 13:12

## Menu Structure



### Setup

- Implement
- System
- Alarms
- Rates



### Totals

- Current
- Job Summaries
- Lifetime Totals



### Diagnostics

- Readings
- Tests

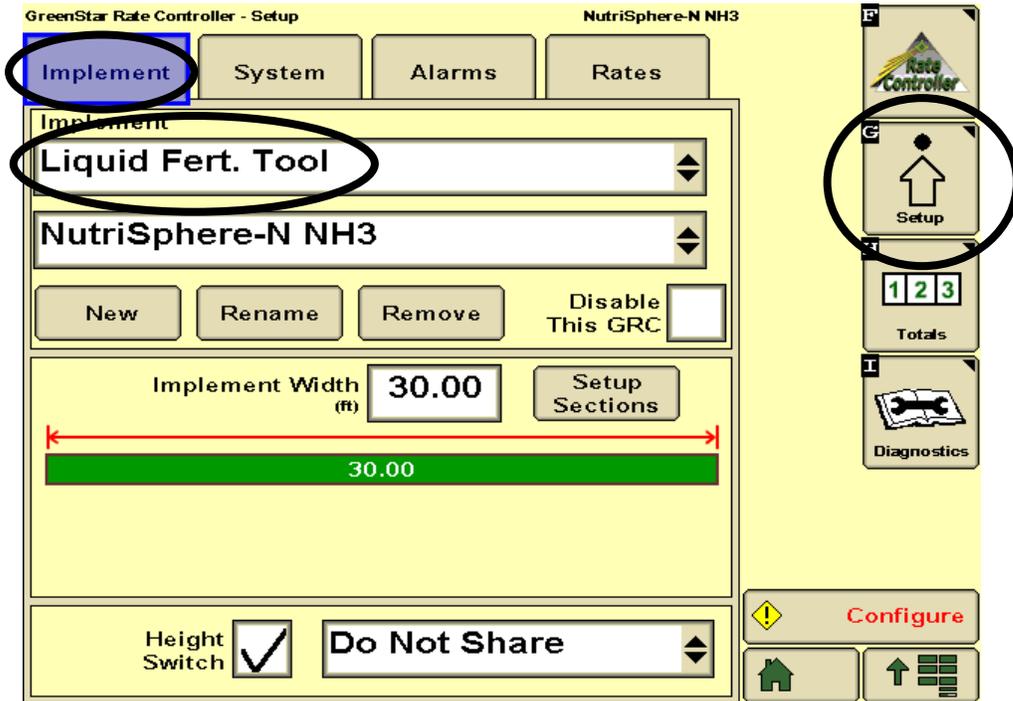
## Enable Pump

Tap this box to turn the pump ON or OFF when PWM Setup is set to PWM.

# Setup - Implement



Here you will enter the **type**, **name**, **total width** and **section width** for the implement you will be using for this operation.



## Implement Type, Name & Width

1. Choose **Implement Type** “Liquid Fert Tool”
2. Enter a **Name** for the Implement where “NutriSphere-N NH3” is shown above.
3. Enter your **implement width** in feet.
4. Push **Setup Sections** button if dividing the implement into sections. (When applying NutriSphere-N NH3, if the implement is less than 60’ wide, it will be set up with one section. Implements 60’ wide or wider may be set up with either 1 or 2 sections.)
5. Set up the **width of each section** on the new screen that pops up.

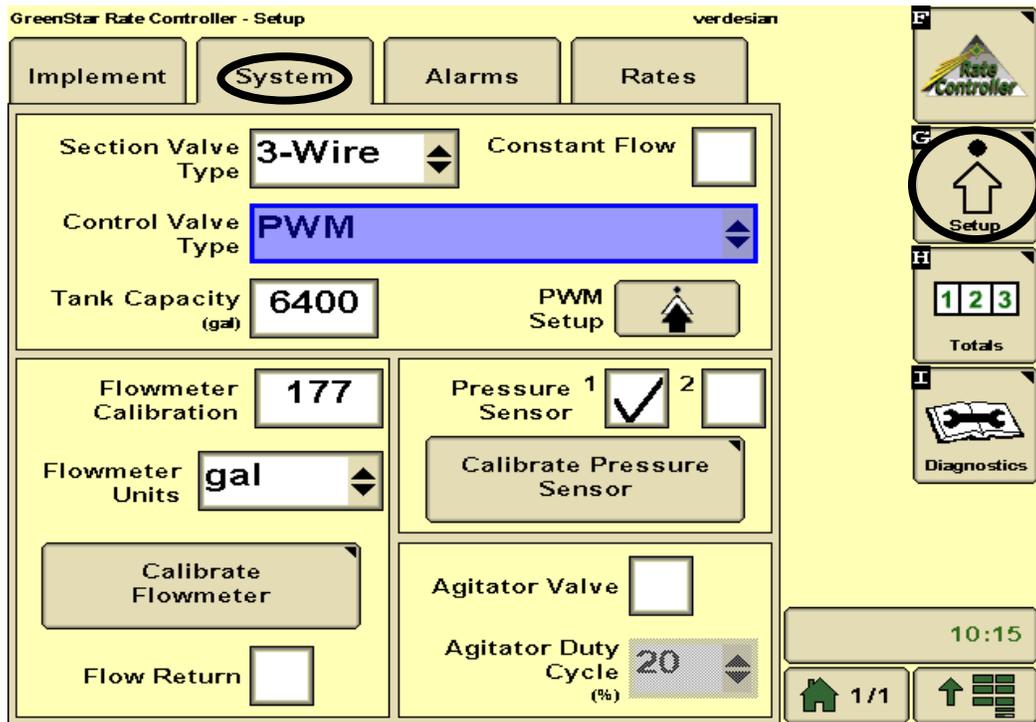
## Height Switch

If using a height switch on your implement, check the box at the bottom of this screen. You must then choose one of the choices below.



# Setup - System

System Setup is where you will set the John Deere Rate Controller to be compatible with the SureFire system components.



1. **Section Valve Type:** 3-Wire
2. **Constant Flow:** Do not check this box.
3. **Control Valve Type:** PWM (See next page for PWM Setup.) With the Control Valve Type set at PWM, the pump will continue running when application stops at the end of the field. This will help flow resume more quickly on startup. The system can also be run as PWM Close, so the pump will stop each time application is stopped.

4. **Tank Capacity**—This can be used, but this system is measuring ounces, not gallons. Therefore, to use this, you

must multiply tank capacity by 128 oz/gal and enter that number here. Tank Capacity and Amount Remaining in tank will show in ounces, not gallons. (6400 = 50 gal x 128 oz/gal)

5. **Flowmeter Calibration:** 177 (Flowmeter counts 22,710 pulses per gallon. We will set it to count in ounces (although the screens will still say gallons). (22710 / 128 = 177 pulses/oz)
4. **Flowmeter Units:** gal (Even though we will be measuring ounces, we must set gallons, not fluid ounces, here to make the system think we are measuring gallons. On the John Deere controller, rates may only be set in gal/acre. 32 oz/acre is 0.25 gal/acre, but the system will not allow 2 numbers after the decimal on the rate. We will later enter the rate as 32, which will be oz/ac, even though the screen will say gal/ac)
5. **Flow Return:** Not checked.
6. **Pressure Sensor:** Check #1 . See next page for instructions to calibrate pressure sensor.
7. **Agitator Valve:** NOT Checked
8. See next page for instructions on “PWM Setup” & “Calibrate Pressure Sensor”

# Setup - System (continued)

F

Setup & Operation

## PWM Setup

From **System Setup** screen, push “**PWM Setup**” to open this screen.

### 1. Control Valve Calibration: 533

*The John Deere Rate Controller Control Valve Calibration can be changed to optimize performance on your specific equipment. The 4 digit number is formatted XXYZ. Increase XX to make the system respond quicker. If set too high, the actual rate will oscillate around the target. Y is the output deadband. Y adjusts overshoot when controlling to a speed change. If the system overshoots the target, increase this number. Z is the control deadband. Setting this at 3 means the controller will allow a 3% deviation from Target Rate before attempting to correct. If this is too low, the controller may be constantly adjusting and actually get further away from the target. Read your JD Rate Controller Operators Manual for more information.*

2. **Coil Frequency:** 150
3. **High Limit:** 255
4. **Low Limit:** 16
5. Check the **Pump Enable Checkbox** box.

The “Calibrate PWM Limits” button is not necessary after you enter the numbers above. SureFire recommends you NOT use that procedure, and use the settings shown here for optimum performance.

Push the lower right button to return to the System Setup screen.

## Calibrate Pressure Sensor

From System Setup screen, push “**Calibrate Pressure Sensor**” to open this screen.

1. Select **Voltage-based Calibration**
2. On the screen that opens up, enter 50.0 mv/psi.
3. Push the lower right button to return to the System Setup screen.

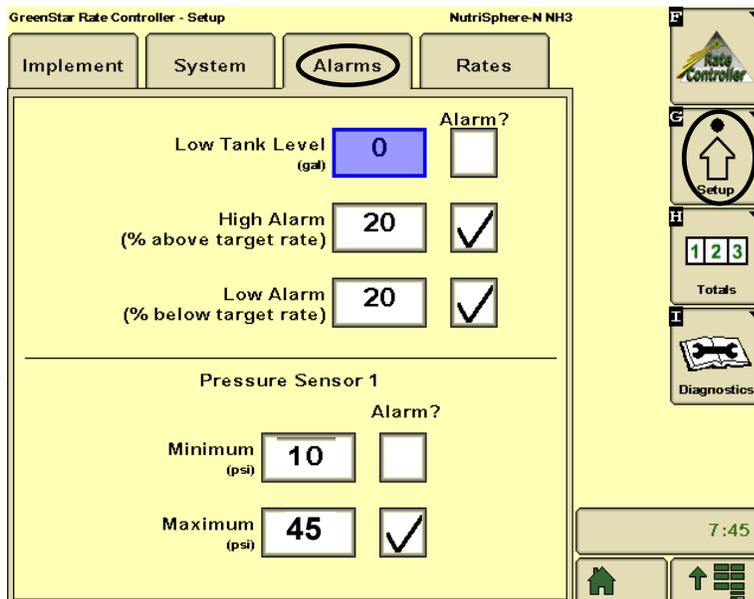
*Tip: If the system has been running, there may be pressure in the system due to the check valves. In that case, simply unplug the sensor while this setup is being done so it will calibrate the zero point correctly.*

# Setup - Alarms



Customize your alarms and settings on this page.

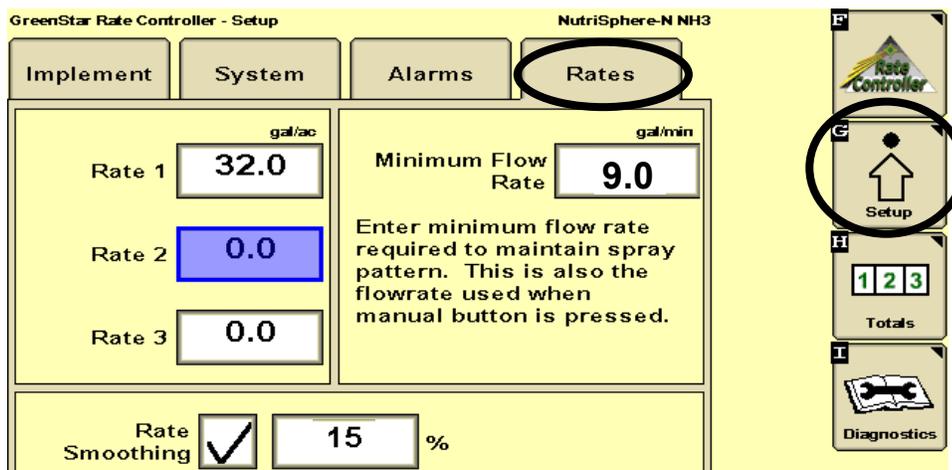
- Low Tank Level** can be used by the customer if they desire, but is not required. *Reminder: Tank Level for NutriSphere-N NH3 will be in ounces, not gallons.*
- High and Low Alarm:** 20% is the John Deere default and SureFire recommended setting. SureFire recommends these alarms be enabled (checkmark in the box).
- Minimum Pressure:** 10 psi is a safe minimum pressure to ensure all check valves are fully opening and equal flow will go to every row. SureFire recommends turning this alarm off as each time the system turns on & off it will activate, being a nuisance.
- Maximum Pressure:** 45 psi is the recommended setting. **If pressure is over 45 psi, consider changing to a larger tube.** In cold weather and at high speeds the pressure will run higher. There is not a problem in running at 50-55 PSI. If this will be long-term operating conditions, consider a larger diameter tube or making the current tube shorter. Turn this alarm on so you are warned when system pressure increases for some reason (cold morning operation may trigger this alarm). The pump has a built-in bypass which opens at 60 PSI.



# Setup - Rates

Enter your desired application rate(s) here.

- Enter up to 3 rates (set this in oz/acre, even though it will say gal/acre. The flowmeter will be measuring ounces, not gallons.)
- Check the **Rate Smoothing** and set at **15%**. **Any system will have minor rate fluctuations going across the field. The Rate Smoothing feature on the John Deere controller allows these normal variations to occur without showing on the display. With the Rate Smoothing set at 15% the system should show that it is locked onto the Target Rate most of the time.** (Due to the extremely low flow volume of this system, even small variations in pump output or flowmeter pulses can appear to be large fluctuations in application rates. Repeated catch tests by SureFire have shown that even when the rate shown on the screen appears to be varying, the output to the rows is still very smooth and very accurate. Row-to-row variation and total output variance have consistently been less than 2%.)
- Set the **minimum flow rate** at **9.0** (this will be oz/min, even though it says gal/min).

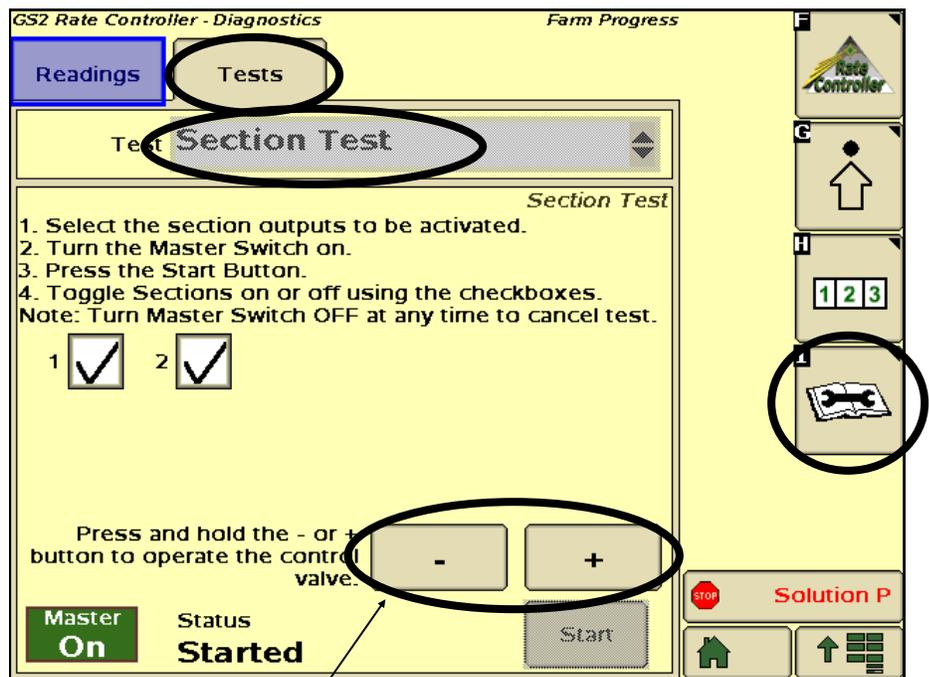


# Initial Operation Instructions - Step 1



**SureFire highly recommends you perform these exact steps with water to verify system is correctly installed and ready for field use.** Note: System pressure will be much lower with water than it will be with the NutriSphere product.

1. Go to the **Section Test** (Diagnostics, Tests, Section Test). Section Test essentially functions like a MANUAL mode where you have direct control of pump and valves.
2. Turn the Master switch on and press START.
3. Test section valves by checking and unchecking boxes. Check boxes to open all valves.
4. Push the “+” button and **hold it**. Electric pump should begin running. (It takes lots of individual taps of this button to cause a visible effect).
5. Is water being pumped? If system is not primed, open the priming air bleed valve. This will allow air to be expelled and the pump to prime.
6. With pump running and water flowing, push “1,2,3” button. Look at flow in GPM. Is there a reading there? If not, is the system primed with water flowing to every row? If water is flowing, but no reading, check flowmeter calibration and wiring harness connections.
7. Push wrench button, now push the “-” button. Go back to the “1,2,3” screen. Did the flow in GPM decrease?
8. **Make sure the GS2/GS3 flow readout in GPM can be increased and decreased with the plus & minus buttons.**



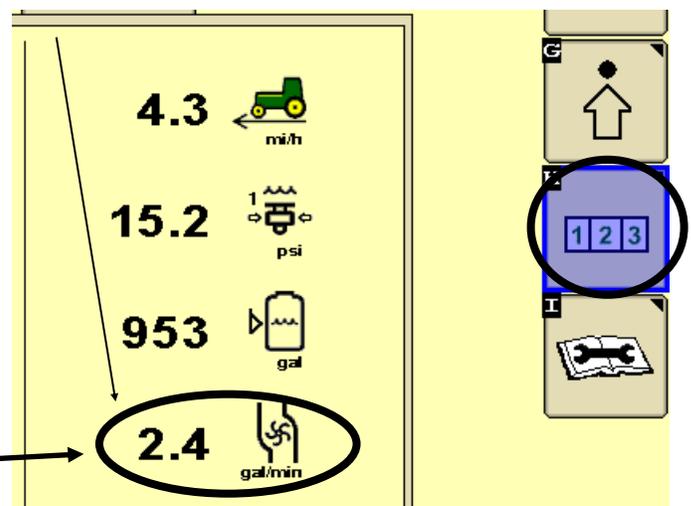
Go to Step 2 on the next page when you can increase and decrease the GPM reading using the + and - buttons.

## Helpful Tip

The **Section Test** is the first and most basic test to make sure that the system is set up and hooked up correctly. This test verifies that you can run the pump and control the speed of the pump.

**If there is a problem with the operation of the system, start with the Section Test.**

On the Catalyst system, screens that say **gal/min** are actually showing **oz/min**.



# Initial Operation Instructions - Step 2



1. Go to the **Nozzle Flow Check** (Diagnostics, Tests, Nozzle Flow Check ). This test will operate the system as if it were running in the field at a speed and application rate you enter. **(Note: When testing with water, the system will operate much differently than it will with the actual product. It will take much higher rates with water to build pressure and it may not lock on to rate as well.)**

2. **Test Speed:** Enter your typical field operating speed.

3. **Rate:** Enter your typical application rate. (32 oz/ac. Ignore gal/ac)

4. Turn the Master switch on and press START.

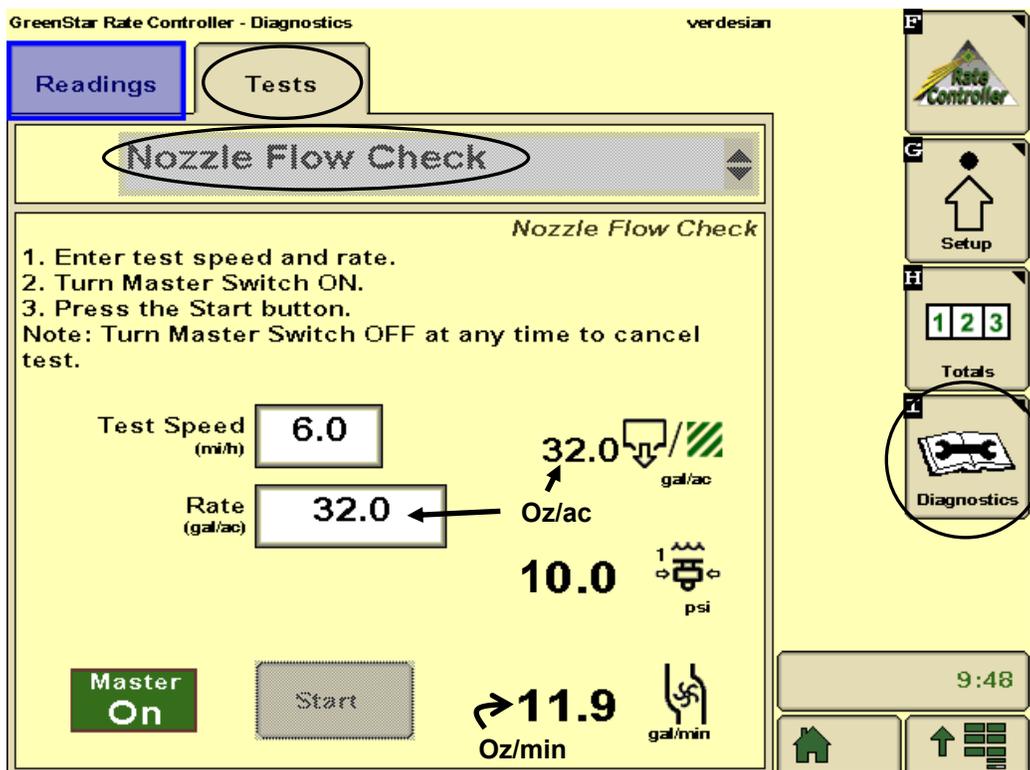
5. Pump will turn on and begin applying the entered rate.

6. Observe the system. Are the flow and pressure on the screen stable and reasonable? Is the flow reasonable and equal from each application point?

7. **Repeat this test at minimum and maximum values for both Test Speed and Rate.**

Remember heavier, thicker products such as NutriSphere will have higher pressures at a given flow than water.

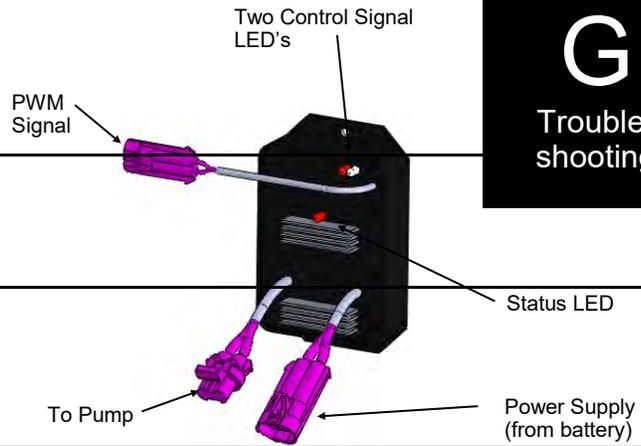
8. You can use this procedure with product (instead of water) to verify your minimum pressure is at least 10 psi (to ensure all check valves open). Also check the maximum speed and rate to make sure pressure is under 50 psi.





# Electric Pump Won't Run

## EPD Status Lights



Status LED	Status Description	Troubleshooting Steps
<b>On Steady</b>	<b>Power input is good and PWM input Signal is detected</b>	<b>No Problem, Typical operating condition.</b>
<b>Steady Blink</b>	<b>Power input is good and PWM signal is not detected</b>	<b>Typical 'Off' Condition. If pumps should be on:</b> <ol style="list-style-type: none"> <li><b>1. Inspect wiring and connectors</b></li> <li><b>2. Check voltage at PWM connector to EPD, should be 1-12 volts to turn on.</b></li> <li><b>3. Check voltage on PWM wires at 37 pin connector, pins 15&amp;16.</b></li> </ol>
Blink once, pause, blink once, pause	Open circuit between motor output and motor.	Check harness and connectors to motor. If using two motors, plug each in separately directly to EPD (bypassing Y-harness)
Blink twice, pause, blink twice, pause	Output short circuit detected.	<ul style="list-style-type: none"> <li>• Check motor wiring</li> </ul>
Three blinks, pause, three blinks, pause	Overcurrent condition	<ul style="list-style-type: none"> <li>• Check total load</li> <li>• Clean cooling fins on EPD</li> </ul>
<b>Four blinks, pause, four blinks, pause</b>	<b>Input power fault. Low voltage condition in power to EPD.</b>	<b>Unplug battery power from EPD to reset. Check power cables and connections for quality. Be certain that power cable connects directly to battery and has a solid clean connection.</b>
Five blinks, pause	Input frequency out of range.	Check PWM Settings on Rate Controller.
<b>Control Signal LEDs</b>		
<b>Light intensity varies</b>	<b>Off - No PWM Signal 100% brightness - Maximum PWM input signal</b>	

# Electric Pumps Won't Run (continued)

# G

Trouble-shooting

## Electric pump will not turn on

### EPD flashing 4 times

1. Find the EPD (electric pump driver) shown above. Should have a steady blinking light in the middle when pumps should be off. If Status LED is flashing 4 times, then pausing, EPD has tripped due to low voltage condition. Unplug the Power Supply to the EPD to reset. If condition persists, change to larger orifices to reduce pressure, slow down, or lower application rate. Check Power Supply cables to EPD to insure solid connections and good electrical path.

### No Lights on EPD

1. There should be a steady blinking light in the middle of the EPD. If no light is ON, check the 40-amp fuse in the EPD harness near the battery. Use a voltmeter to verify that there is 12-13 volts at the Power Supply connector that plugs into the EPD.

### Will the pump run?

1. Connect the two large connectors that are plugged into the bottom of the EPD to each other (bypass the module and supply 12 volts directly to pump).
2. Does the pump run? If not, check the 40 amp fuse in the EPD harness near the tractor battery. Inspect harnesses and connections.

## Electric pump only runs with 12 volts direct from battery

1. Connect pumps and power harness back to EPD.
2. Go to **Diagnostics, Section Test** to investigate this issue.
3. In Section Test, hold down "+" button for a few seconds. A single tap of this button produces a very small change in signal to the valve, so you must hold it.
4. Remove PWM valve connector and check voltage. You will need 1-12 volts to turn pumps on.
5. If 1-12 volts is not present, check harnesses and review control valve type setup.
6. Go back to the 37 pin connector at the John Deere Rate Controller. Check voltage between pins 15 & 16, should be between 6-12 volts while in section test after holding "+" button.
7. If you cannot get voltage at pins 15 & 16, contact your John Deere dealer for further assistance.

## Section Valve(s) will not move

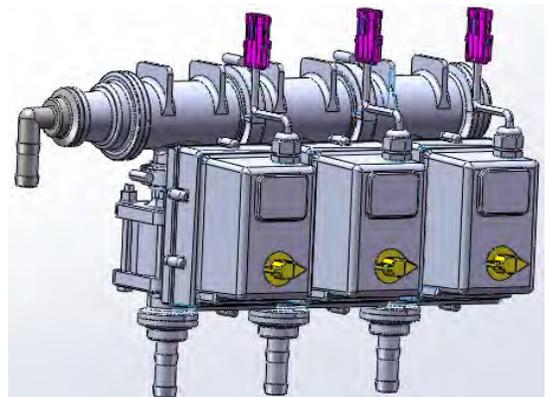
1. Go to **Diagnostics, Section Test** to investigate this issue.
2. In Section Test, check and uncheck the boxes. With the box checked the valve should turn on. The valve should be off with the box not checked.

Pin	Function
A	+ 12 V Constant
B	Ground
C	+ 12 V Signal

3. Check the harness connection to that valve. It is a 3 Pin Weather Pack connector. See Section D for wiring diagrams

4. Check voltage pin A to Pin B. Must be 12 volts, if not, go back to 37 pin and check voltage (pins 36 & 37 are +12V, pins 1 & 2 are ground).

5. If voltage is present on pins A&B of 3 pin connection to valve, then check pin C to Pin B. This should be 12 volts when the valve is commanded on or open, this should be zero volts when valve is off or closed.
6. If signal voltage is not present to open valve, use diagrams to check at the 16 pin, then the 37 pin for voltage on the proper pin for that section.
7. If constant voltage (Pins A&B) and switched voltage (Pins C&B) are present, inspect, repair or replace the valve.



# Application Rate & Flow Troubleshooting

# G

Trouble-  
shooting

## Application Rate Fluctuates

*Due to the very low application rate used on this system, pump speed changes must be made very slowly since even small changes in pump speed will result in a relatively large change in flow. The John Deere controller needs to be set with a very low Valve Calibration number so that it can lock onto the rate without continually overshooting and undershooting. This means that the controller will react slower on startup and on larger speed changes.*

*Any system will have minor rate fluctuations going across the field. The Rate Smoothing feature on the John Deere controller allows these normal variations to occur without showing on the display. With the Rate Smoothing set at 15% the system should show that it is locked onto the Target Rate most of the time. (Due to the extremely low flow volume of this system, even small variations in pump output or flowmeter pulses can appear to be large fluctuations in application rates. Repeated catch tests by SureFire have shown that even when the rate shown on the screen appears to be varying, the pump is still running smoothly and the output to the rows is still very smooth and very accurate. Row-to-row variation and total output variance have consistently been less than 2%.)*

First, you need to determine if the fluctuation is caused by the controller sending fluctuating signals to the valve.

1. **Inspect & clean pump inlet strainer.** Strange flow rate fluctuations are very often due to an obstruction to the pump inlet. Inspect plumbing from tank to pump.

OR

1. Go to **Section Test** as shown in Initial Operation, Section F.
2. Turn the system on and watch the flow in GPM on the 1,2,3 screen.
3. Is the flow steady within a very small range? For example a fluctuation from 28-36 oz/min ( $32 \pm 4$ ) would be considered normal. If only a small normal fluctuation is seen, skip steps 4-8 and proceed to "Application Rate Fluctuates in Field ..... " below.
4. If there is a large fluctuation, observe the system flow. Is the discharge a steady stream? Are the flow indicator balls floating steady?
5. If visually the flow is steady, but the display reports a fluctuation in GPM, inspect the flowmeter. See section B for flowmeter information. *As explained above, it is typical for this system to show more variation in flow on the display. To verify accurate and consistent output to the rows, observe the flow at the rows and do a catch test of several rows to verify accuracy.*
6. If visually the flow is unsteady, the flowmeter is working correctly reporting a flow problem. Is the pump turning steady or surging?
7. Look for any type of obstruction in the pump inlet. Clean the strainer. If continually plugging the strainer, investigate product quality and necessary strainer size.

## Application Rate fluctuates in field, but flow in Section Test mode is stable.

This problem indicates the valve calibration needs changed. The system is surging because the Rate Controller is moving the pump driver or hydraulic valve too much.

1. Go to **Setup - System - PWM Setup**.
2. Change the **Valve Calibration** by reducing the valve speed (first two digits in XXYZ format). For example reduce the number for 533 to 433, which changes valve speed from 05 to 04.

## Application Rate is slow to get to the Target Rate

*(Due to the very low application rate used on this system, the John Deere controller needs to be set with a very low Valve Calibration number so that it can lock onto the rate without continually overshooting and undershooting. This means that the controller will react slower on startup and on larger speed changes.)*

1. You may need to increase the **Valve Calibration**. Go to **Setup - System - PWM Setup**.
2. Change the **Valve Calibration** by increasing the valve speed (first two digits in XXYZ format). For example, increase the number from 533 to 633, which changes valve speed from 05 to 06.

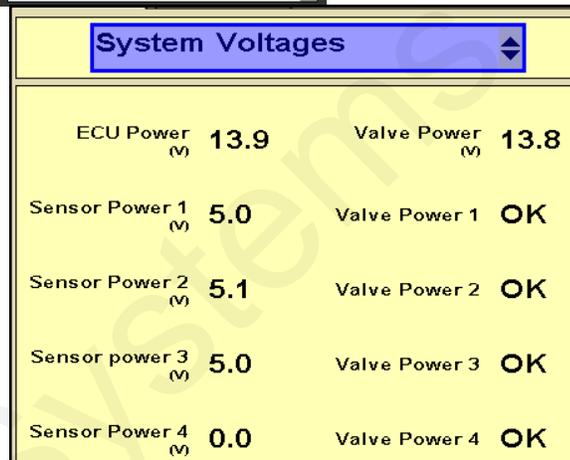
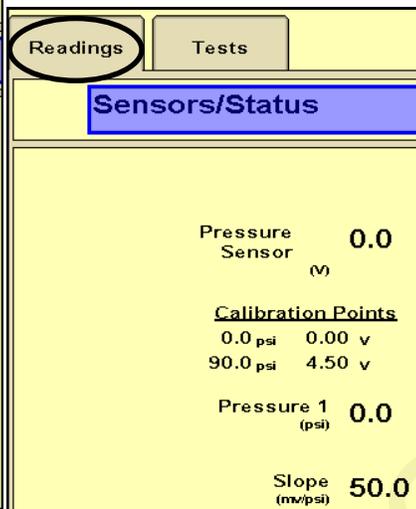
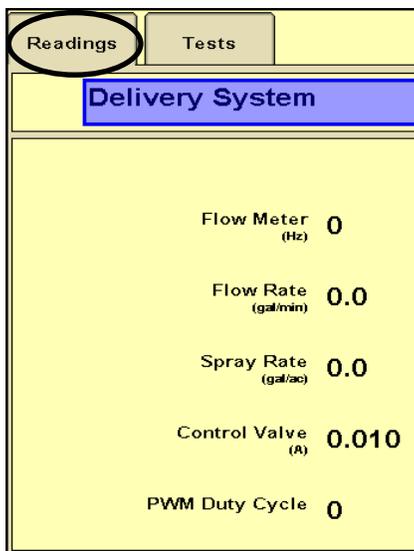
*(Note: Increasing the Valve Calibration number to speed up control changes may result in the system being unstable at normal operating speed.)*

## No Flow shown on GS2/GS3 but liquid is being pumped

1. Unplug flowmeter. With voltmeter, check for 12 volts between pins B&C of flowmeter connector (on main harness 207-3057Y1). If 12 volts not present, inspect wiring harness and troubleshoot all connections per schematic (see Section D).
2. If 12 volts is present, then conduct a **tap test**. Go to setup and change the flow cal to 10. Have a second person watch GPM on the 1,2,3 screen while other person taps (use a short piece of wire or a paper clip) between pins A&C of flowmeter connector (on 215223 harness). A flow value should show up indicating the wiring is not damaged.
3. If GS2/GS3 responded to the tap test, your wiring to that point is good. If still not fixed, inspect adapter harness and test continuity per schematic (see Section D).
4. Replace flowmeter.

## Troubleshooting Tip

- Useful information is available at **Diagnostics—Readings**. The screenshot at the right shows which Readings are available.
- Below are examples of some of the screens available:



### Delivery System

Check the operation of the **flowmeter** and **PWM Duty Cycle** here. The **PWM Duty Cycle** gives an indication of how fast the pump is running. The range is from 0 to 255. If the Duty Cycle is changing it means the controller is attempting to adjust the speed of the pump.

### Sensors/Status

Check the operation of the **pressure sensor** here. The top number (V) will be between 0 and 5.0. The **Calibration Points** should indicate that 0.0 psi is 0.00 volts. The **Slope** should be 50.0 mv/psi.

Flow Information at 32 oz/acre rate and 30" row spacing									
Pump Output (gal/min and oz/min)									
MPH	Oz/min/ row	20' GPM	20' OPM	30' GPM	30' OPM	40' GPM	40' OPM	60' GPM	60' OPM
4	.65	.04	5.2	.06	7.8	.08	10.4	.12	15.6
5	.81	.05	6.5	.08	9.7	.10	13	.15	19.4
6	.97	.06	7.8	.09	11.6	.12	15.5	.18	23.2
7	1.13	.07	9.0	.11	13.6	.14	18.1	.21	27.2
8	1.29	.08	10.3	.12	15.5	.16	20.6	.24	31.0
9	1.45	.09	11.6	.14	17.4	.18	23.2	.27	34.8
10	1.62	.10	13.0	.15	19.4	.20	25.9	.30	38.8
		Below flowmeter rated range							

# Recommended Care and Maintenance

# H

Maintenance  
& Parts

## Winterization

SureFire recommends flushing your product pump and complete system with adequate amounts of water first. Next, use RV antifreeze to winterize your system by pumping an adequate amount through all components. At the beginning of the next season, begin with water to verify the system is in working order with no leaks.

## Inspect Electric Pumps

The electric pump and motor is a completely sealed component. Over time the electric motor will lose efficiency. The entire pump and motor will need replaced when it won't efficiently produce the flow required.

## Pre-season Service

1. Fill system with water and run in Manual mode (Section Test) to verify components and system are in working order.
2. Tighten all clamps. Loose clamps may be evident by leaks on the output side of the system. Loose clamps from the tank to the pump are not always apparent, but can be sources of air getting into the system which can create issues.
3. Remove the black cap from the top of each check valve. Check the diaphragm to be sure it is intact and not gummed up with residue. Look under the diaphragm for debris. Compress the spring in the cap to be sure it moves freely. Carefully replace diaphragm and tighten cap.
4. Be sure all rows are flowing and that all metering tubes are open. (Note: It will take a higher flow rate with water to create enough pressure to open all the check valves.)
5. Run the Nozzle Flow Check to verify that system will lock on to a Target Rate.



## Torpedo™ NH3 Precision Anhydrous Ammonia Application

SureFire's Torpedo™ NH3 Systems are a "one-stop-shop" for all components needed to get Anhydrous Ammonia from the tank to the soil. SureFire will work with you to ensure all necessary components are supplied as part of the complete kit.

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