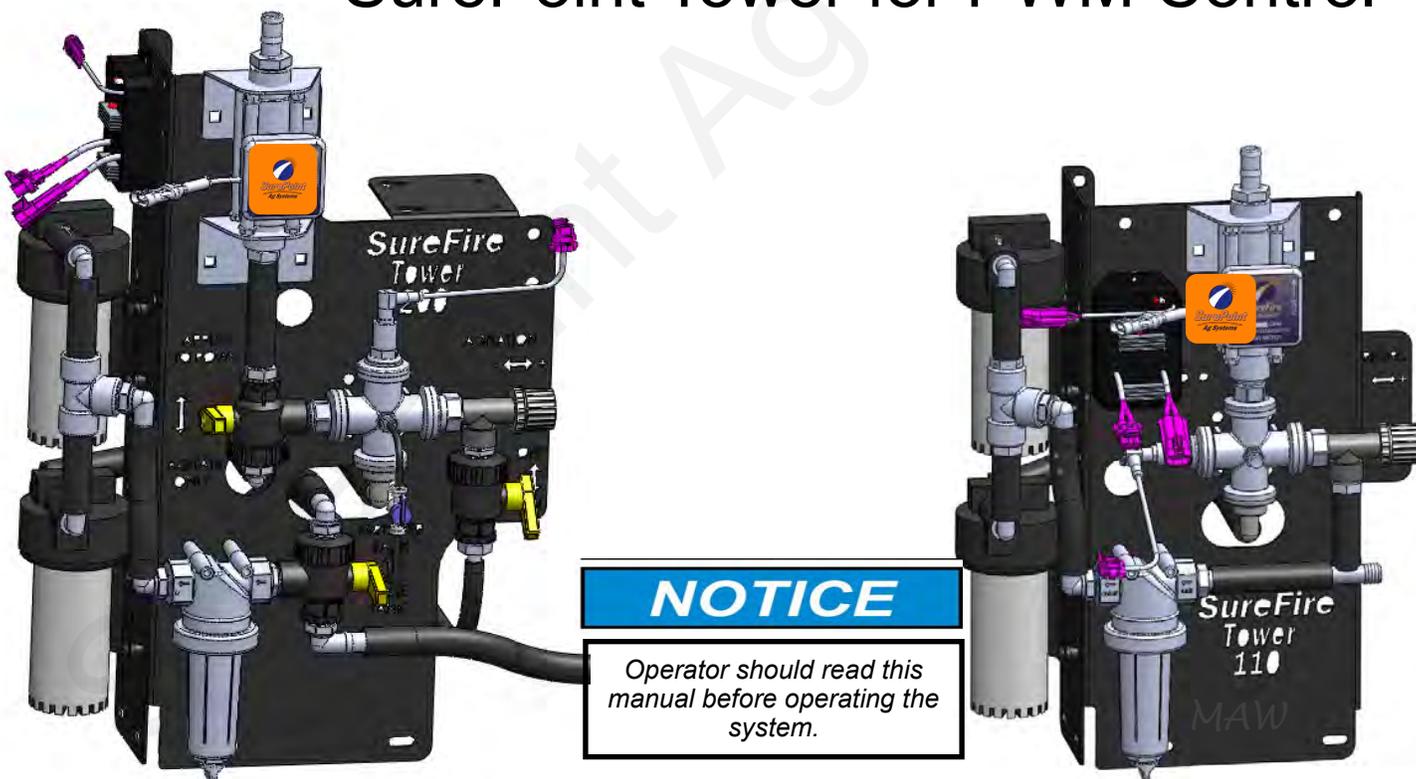


396-3293Y1



Tower Fertilizer System for Case IH AFS® 1200 Series Planter ECU With Pro 700 Display

& SurePoint Tower for PWM Control



NOTICE

Operator should read this manual before operating the system.

Maximum Application Rates with Two 5.3 GPM Electric Pumps

Maximum Application Rates in GPA on 30" Rows at 6 MPH (no agitation)				
Rows	8	12	16	24
Max GPA	20	12	9	5



SurePoint Ag Systems



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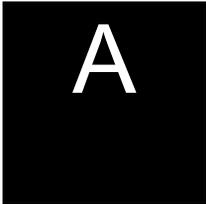
H

Maintenance
& Parts





Safety



TAKE NOTE! THIS SAFETY ALERT SYMBOL FOUND THROUGHOUT THIS MANUAL IS USED TO CALL YOUR ATTENTION TO INSTRUCTIONS INVOLVING YOUR PERSONAL SAFETY AND THE SAFETY OF OTHERS. FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN INJURY OR DEATH.



**THIS SYMBOL MEANS
ATTENTION!**

BECOME ALERT!

YOUR SAFETY IS INVOLVED!

Note the use of the signal words DANGER, WARNING and CAUTION with the safety messages. The appropriate signal word for each has been selected using the following guidelines:



DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations typically for machine components which, for functional purposes, cannot be guarded.



WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.



CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE is used to address safety practices not related to personal safety.





Hydraulic Fluid and Equipment Safety

If your system uses hydraulic equipment with hydraulic fluid under extremely high pressure, please note:

Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin causing serious injury. Keep all hoses and connections in good serviceable condition. Failure to heed may result in serious personal injury or death. Avoid the hazard by relieving the pressure before disconnecting lines or performing work on the system.

Make sure hydraulic fluid connections are tight and all hydraulic hoses and lines are in good condition before applying pressure to the system. Use a piece of paper or cardboard, **NOT BODY PARTS**, to check for suspected leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. **DO NOT DELAY!**

Check hydraulic hoses and fittings frequently. Loose, broken, and missing hardware can cause equipment to not perform properly and can result in serious injury or death. Hydraulic systems can be hot and cause burns. Before working on any system, wait until the fluid has cooled.

If an accident occurs, see a doctor familiar with this type of injury immediately. Any fluid injected into the skin or eyes must be treated within a few hours or gangrene may result.



A Word to the Operator

It is **YOUR** responsibility to read and understand the safety messages in this manual. **YOU** are the key to safety.
SAFETY IS YOUR RESPONSIBILITY.

This system may apply many different kinds of agricultural liquid products. Read and follow all label information and instructions related to the handling, storage, and application of the product you are using.

All electrical harnessing should be checked regularly and should be routed and secured so it will not be pinched, cut, or stretched.

Online Resources Available

[SurePoint support site](https://support.surepointag.com/products/32) <https://support.surepointag.com/products/32>

- Manuals
- Videos on setup, operation, and troubleshooting
- QuickStart Guides
- Troubleshooting Documents
- Support Bulletins

General Description

A

Introduction

You have purchased a SurePoint fertilizer system for your equipment. This system will be controlled by your Pro 700 display and the Planter Rate ECU. The Rate ECU will adjust the speed of the SurePoint electric pump based on feedback from the flowmeter and vehicle speed. The system is capable of section control to minimize overlap areas with optional section valves.

Basic Installation Steps

1. Install Pro 700 display and connect to Planter ECU modules.
2. Open the packages and familiarize yourself with the components. Refer to manual sections B, C & D for component information.
3. Mount the Tower or Accelerator Tank on your equipment and make harness connections.
4. Plumb the tank to the Tower inlet. See section E for details.
5. Install the plumbing kit including section valves, flow indicator columns / manifolds, check valves, plumbing to each row unit delivery point. See section B for information on these components.
6. Attach the flowmeter outlet to section valve or manifold inlet. Attach section valve outlets to flow indicator inlets.
7. Attach harnesses as shown in Section D.
8. Setup Controller for SurePoint fertilizer system as shown in Section F.
9. Fill system with water, conduct initial operation and tests per Section F.
10. Winterize system with RV Antifreeze if freezing temperatures are expected.

Consult your Pro 700 Display User Guide and planter operator's manual for more information on the setup and operation of your Pro 700 system.

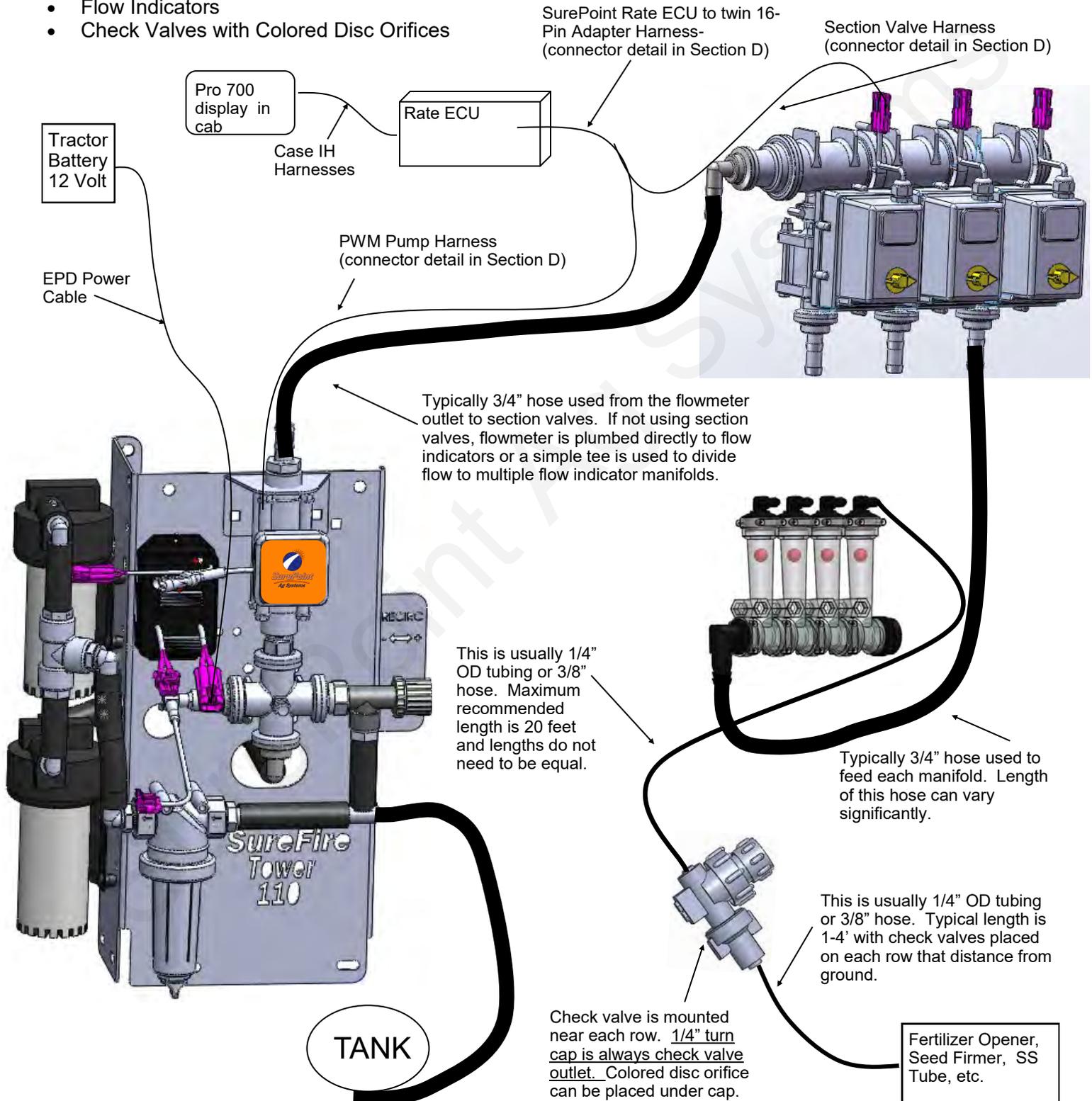
System Overview - Example 1

A

Introduction

The following gives an example of a complete SurePoint Fertilizer system with these components:

- Pro 700 Display
- Planter Frame and Rate ECU
- Tower 110
- Section Valves
- Flow Indicators
- Check Valves with Colored Disc Orifices



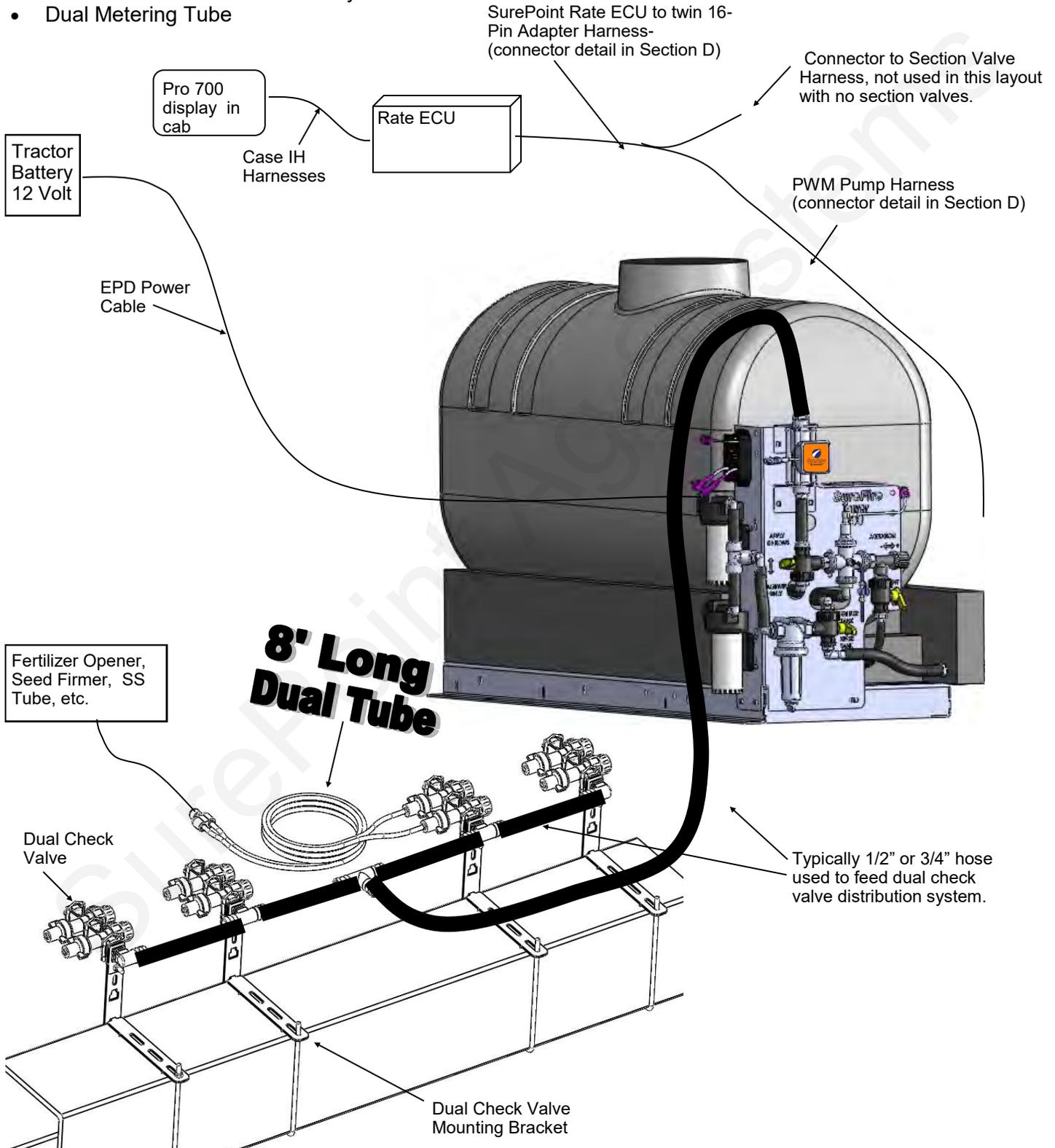
System Overview - Example 2

A

Introduction

The following gives an example of a complete SurePoint Fertilizer system with these components:

- Pro 700 Display
- Planter Frame and Rate ECU
- Accelerator with Tower 200
- Dual Check Valve Distribution System
- Dual Metering Tube

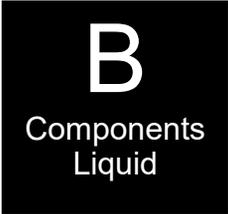


Electromagnetic Flowmeter Kits

0-13 - 2.6 GPM **Item Number 500-02-2040**

0.3 - 5.0 GPM **Item Number 500-02-2050**

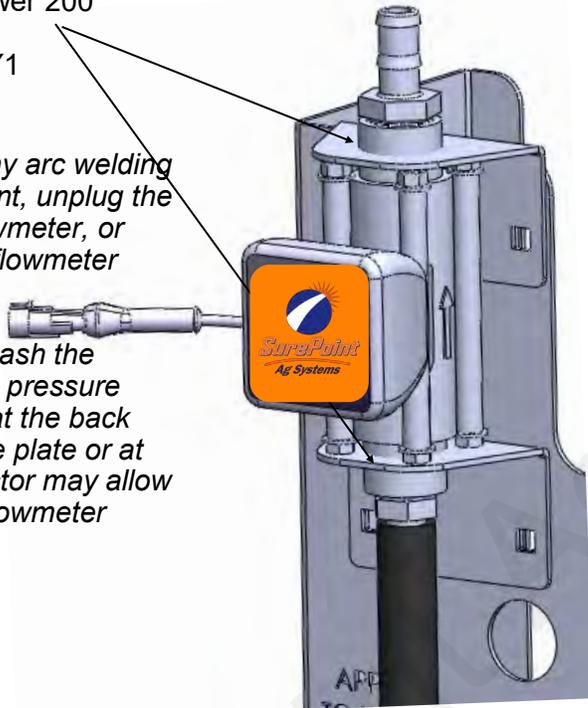
Kits include flowmeter, mounting bracket, hose barb fittings & hose clamps.



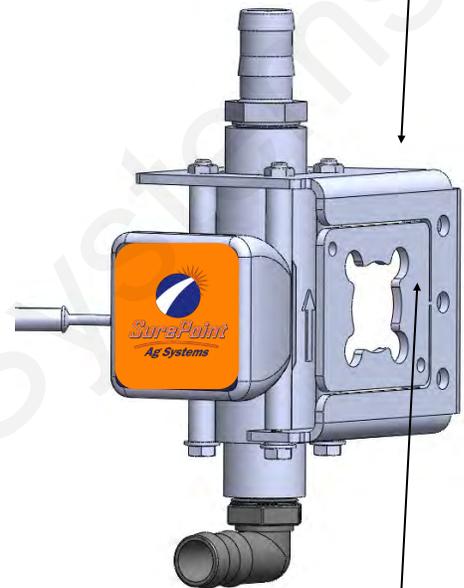
Mounting Bracket,
Used in Tower 110
& 200 (Tower 200
shown)
410-2106Y1

*Before doing any arc welding
on the implement, unplug the
cable to the flowmeter, or
damage to the flowmeter
may result.*

*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.*



Universal Twist Tab
Mounting Bracket
400-1208A1



Twist tab to detach. Plate
mounts to bottom of bracket
(with two 1/4"x1" carriage bolts)
to capture flowmeter.

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. SurePoint still recommends you perform a catch test to verify the system is properly installed and configured.

Flowmeter Model (meters have a blue label with white lettering)	GS2 / GS3 Flow Calibration * (Pulses/Gal)	FPT Size	Hose Barb In kit
0.13 - 2.6 GPM	3000	3/4"	3/4"
0.3 - 5.0 GPM	3000	3/4"	3/4"

*The software for this system with the Pro 700 and Planter ECU uses **pulses/10 L** instead of pulses/gallon. Because of this, you must use a divide-by-8 cable on the flowmeter (201-14226). The flow cal for the Tower system is **990 pul/10L**.*

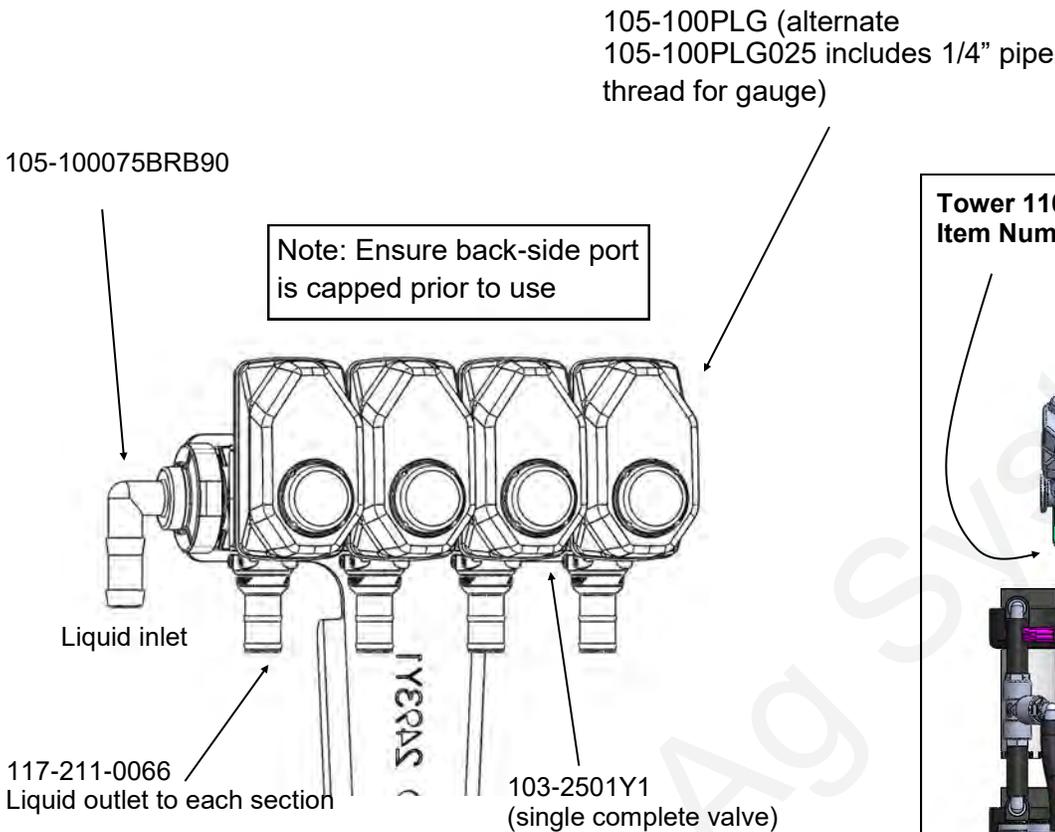
The flow cal (pul/L and pul/gal) is printed on the serial number label on the side of the flowmeter.



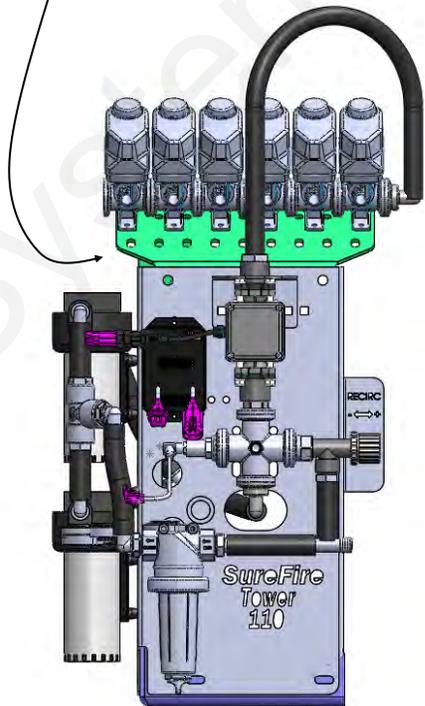
Section Valves

B

Components
Liquid



Tower 110 Section Valve Bracket
Item Number 410-2110Y2



The Tower 110 can have up to 6 section valves mounted directly to the top of it with this bracket.

Additional Parts:

1" Gasket	105-100G-H
1" Clamp	105-FC100

How it Works

Section valves can be assembled into groups with a common inlet to control flow to each section. Common assemblies use up to 5-6 valves. Many alternate fittings can be used to accommodate different hose sizes and configurations.

The valves have a 3-pin weather pack electrical connector. This has a power, ground, and switched wire. The power measured to ground should have 12 volts when the controller is on. The switched wire will have 12 volts to turn the valve on, and 0 volts to turn the valve off.

Wiring Connector:

Pin A—Red, 12 Volts +
Pin B—Black, Ground -
Pin C—White, Signal
12V=on ; 0V=off

Mounting Hardware:

2 Valve Bolt Kit	384-1100
Mounting Bracket	400-2493Y1

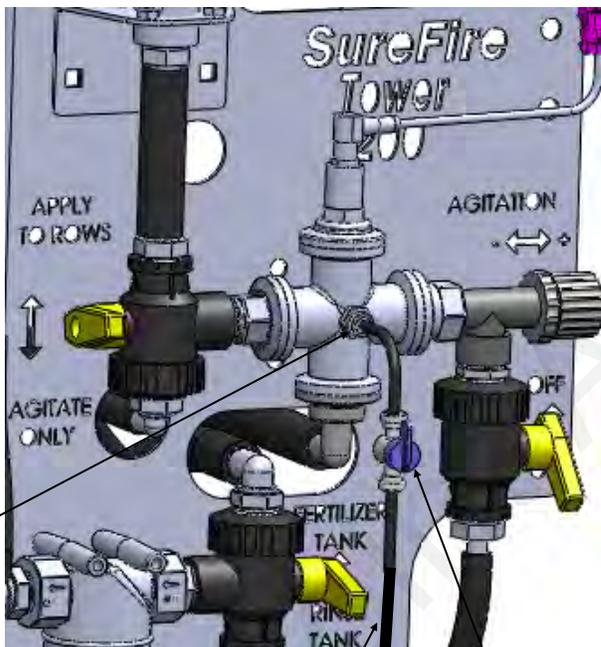
Pressure Sensor

B
Components
Liquid

The Pro 700 display currently does not have the ability to show fertilizer system liquid pressure on the display when using this planter software.

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.



Shipped from factory with plug installed.

1/4" Tubing

1/4" air bleed valve

Why use an air bleed valve:

Most Tower fertilizer systems are equipped with a 4 lb. check valve on the end of each hose delivering fertilizer to the ground. 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:

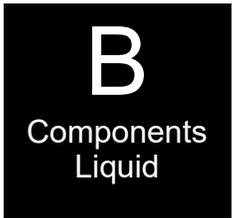
Remove the 1/4" plug from the quick connect fitting on the center cross on the Tower (see picture). Next, insert the 1/4" tubing in the quick connect fitting. Run the 1/4" tubing to an easily accessible spot on your equipment. Next, cut the tubing and push the 1/4" valve onto the tubing. Finally, run the tubing to a low location where any fertilizer 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 the 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 one of the 3 following methods which create back pressure so an equal amount of liquid is applied to each row.

1. A metering orifice may be placed in the top cap of each floating ball flow indicator. (See photos on page 10—this is not used very often.)
2. A metering orifice may be placed in the check valve cap in the line that leads to each row. (See photo on page 12)
3. A dual metering tube kit with dual check valves may be used. (See pages 13-17)

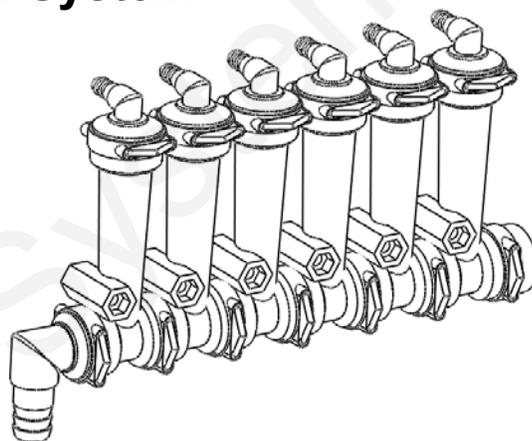


Floating Ball Flow Indicator & Manifold System

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.

SurePoint has simple tee brackets and U-bolts that will mount these to a variety of bar sizes.

Two main types of flow indicators are used. On 30" row spacing, the low flow column with 1/4" or 3/8" push to connect outlet is recommended for rates under 10 GPA. For rates over 10 GPA the full flow column with 3/8" hose barb outlet is preferred.



Parts List

Complete Columns

- 701-20460-950 Single Full Flow Column with 3/8" HB - 90 Degree Outlet
- 701-20460-940 Single Full Flow Column with 3/8" QC - 90 Degree Outlet
- 701-20460-960 Single Full Flow Column with 1/2" HB - 90 Degree Outlet
- 701-20460-935 Single Low Flow Column with 3/8" QC - 90 Degree Outlet
- 701-20460-920 Single Low Flow Column with 1/4" QC - 90 Degree Outlet

Fittings

- 701-20503-00 ORS x 3/4" HB - Straight
- 701-20511-00 ORS x 3/8" HB - 90 Degree
- 701-20512-00 ORS x 1/2" HB - 90 Degree
- 701-20513-00 ORS x 3/4" HB - 90 Degree
- 701-20516-00 ORS x 1/4" QC - 90 Degree
- 701-20517-00 ORS x 3/8" QC - 90 Degree
- 701-20518-00 ORS x 1/4" FPT - 90 Degree
- 701-20519-00 ORS x 1/4" FPT - Straight
- 701-20520-00 ORS Male x ORS Female - 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

- 701-20460-02 Wilger Flow Indicator Ball Retainer
- 701-20460-03 FKM O-Ring for indicator body & fittings
- 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
- 400-3155Y1 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



Floating Ball Flow Indicators- Full Flow Column (mostly 3/8" HB)

The full flow column is typically used with rates over 10 GPA on 30" rows. For rates less than 10 GPA SurePoint recommends the low flow columns with 1/4" or 3/8" push to connect (QC) outlet fittings.

The full flow columns are most often assembled with 3/8" hose barb outlets. See the low flow info below for the difference between full and low flow columns.

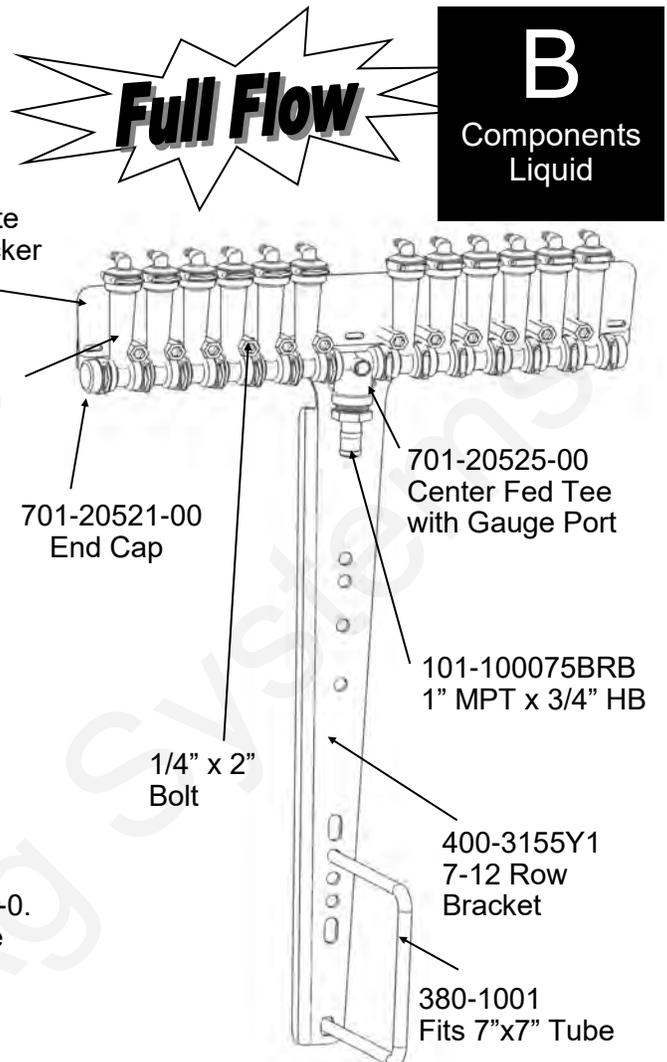
Full Flow Indicators w/ 3/8" Hose Barb Outlet

Column Flow (GPM):	.05-2.70 GPM
Equivalent Application Rate On 30" Rows at 6 MPH:	2-70 GPA

Ball Selection for 30" Rows

GPM	GPA	Ball
0.05 - 0.18	2-6	Green Plastic*
0.09 - 0.30	3-10	Red Plastic*
0.31 - 0.72	10-20	Maroon Glass
0.40 - 2.1	13-70	Stainless Steel (1/2")

*Plastic balls may float on heavier fertilizers, such as 10-34-0. SurePoint recommends using the low flow column for these flow rates.



Low Flow Column (mostly 1/4" QC or 3/8" QC)

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

SurePoint uses the low flow columns with 1/4" push to connect outlet fittings. The flow capability of 1/4" tubing and the low flow column are a great pair for rates on 30" rows under 10 GPA.

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.

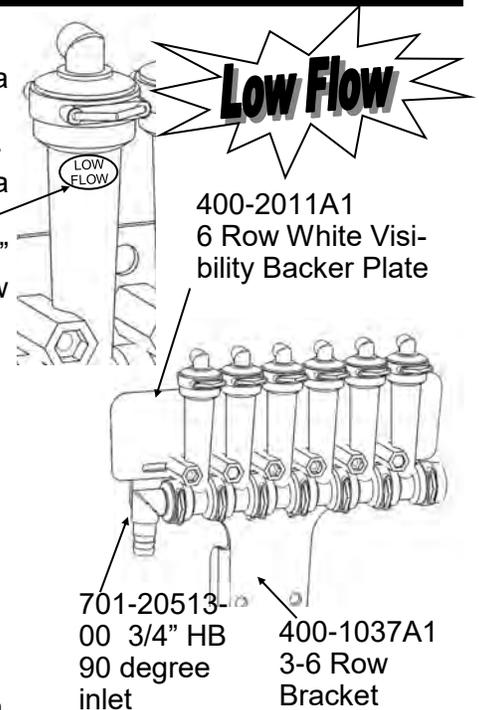
Low Flow Indicators w/ 1/4" Push to Connect (QC) Outlet

Column Flow (GPM):	.03-.30 GPM
*** Low Flow Column with 3/8" hose barb	.03 - .70 GPM
Equivalent Application Rate On 30" Rows at 6 MPH (1/4" QC):	1-10 GPA

Ball Selection for 30" Rows

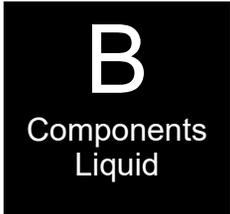
GPM	GPA	Ball
.03-.09	1-3	Green Plastic*
.05-.14	2-4	Red Plastic*
.10-.18	3-6	Maroon Glass
.15-.70	5-10	Stainless Steel (1/2")

*These balls may float on heavier fertilizers, such as 10-34-0. Use Maroon Glass in this case.



Floating Ball Flow Indicators– Metering Orifice Selection for 30” Rows

See www.SurePointag.com for other row spacings



30” Spacing

Orifice	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
28	10	0.043	2.15	1.91	1.72	1.56	1.43	1.32	1.23
	20	0.061	3.02	2.69	2.42	2.20	2.02	1.86	1.73
	30	0.075	3.72	3.31	2.98	2.71	2.48	2.29	2.13
	40	0.087	4.29	3.82	3.43	3.12	2.86	2.64	2.45
	50	0.097	4.82	4.28	3.85	3.50	3.21	2.97	2.75
	60	0.106	5.26	4.67	4.21	3.82	3.50	3.23	3.00
35	10	0.070	3.46	3.08	2.77	2.52	2.31	2.13	1.98
	20	0.098	4.86	4.32	3.89	3.54	3.24	2.99	2.78
	30	0.120	5.96	5.30	4.77	4.33	3.97	3.67	3.40
	40	0.139	6.88	6.11	5.50	5.00	4.58	4.23	3.93
	50	0.156	7.71	6.85	6.17	5.61	5.14	4.74	4.41
	60	0.170	8.41	7.48	6.73	6.12	5.61	5.18	4.81
40	10	0.090	4.47	3.97	3.57	3.25	2.98	2.75	2.55
	20	0.127	6.31	5.61	5.05	4.59	4.21	3.88	3.60
	30	0.157	7.75	6.89	6.20	5.64	5.17	4.77	4.43
	40	0.181	8.94	7.94	7.15	6.50	5.96	5.50	5.11
	50	0.202	9.99	8.88	7.99	7.26	6.66	6.15	5.71
	60	0.221	10.95	9.73	8.76	7.96	7.30	6.74	6.26
46	10	0.119	5.91	5.26	4.73	4.30	3.94	3.64	3.38
	20	0.169	8.37	7.44	6.69	6.08	5.58	5.15	4.78
	30	0.207	10.25	9.11	8.20	7.45	6.83	6.31	5.86
	40	0.239	11.83	10.51	9.46	8.60	7.88	7.28	6.76
	50	0.267	13.23	11.76	10.58	9.62	8.82	8.14	7.56
	60	0.293	14.50	12.89	11.60	10.55	9.67	8.92	8.29
52	10	0.149	7.36	6.54	5.89	5.35	4.91	4.53	4.21
	20	0.210	10.38	9.23	8.31	7.55	6.92	6.39	5.93
	30	0.257	12.70	11.29	10.16	9.24	8.47	7.82	7.26
	40	0.296	14.67	13.04	11.74	10.67	9.78	9.03	8.39
	50	0.332	16.43	14.60	13.14	11.95	10.95	10.11	9.39
	60	0.363	17.96	15.96	14.37	13.06	11.97	11.05	10.26
63	10	0.218	10.78	9.58	8.62	7.84	7.18	6.63	6.16
	20	0.307	15.20	13.51	12.16	11.05	10.13	9.35	8.69
	30	0.376	18.62	16.55	14.89	13.54	12.41	11.46	10.64
	40	0.435	21.51	19.12	17.21	15.64	14.34	13.24	12.29
	50	0.486	24.05	21.38	19.24	17.49	16.03	14.80	13.74
	60	0.532	26.33	23.40	21.06	19.15	17.55	16.20	15.04
78	10	0.341	16.87	14.99	13.49	12.27	11.24	10.38	9.64
	20	0.481	23.83	21.18	19.06	17.33	15.89	14.66	13.62
	30	0.590	29.22	25.97	23.37	21.25	19.48	17.98	16.70
	40	0.681	33.73	29.98	26.98	24.53	22.49	20.76	19.27
	50	0.762	37.72	33.53	30.17	27.43	25.14	23.21	21.55
	60	0.835	41.31	36.72	33.05	30.04	27.54	25.42	23.60
98	10	0.553	27.38	24.34	21.90	19.91	18.25	16.85	15.64
	20	0.782	38.72	34.42	30.98	28.16	25.82	23.83	22.13
	30	0.956	47.31	42.05	37.85	34.41	31.54	29.11	27.03
	40	1.106	54.76	48.67	43.81	39.82	36.50	33.70	31.29
	50	1.239	61.33	54.51	49.06	44.60	40.88	37.74	35.04
	60	1.354	67.02	59.58	53.62	48.74	44.68	41.24	38.30
107	10	0.649	32.11	28.54	25.69	23.35	21.41	19.76	18.35
	20	0.920	45.56	40.50	36.45	33.13	30.37	28.04	26.03
	30	1.124	55.63	49.45	44.51	40.46	37.09	34.24	31.79
	40	1.301	64.39	57.24	51.52	46.83	42.93	39.63	36.80
	50	1.451	71.84	63.86	57.47	52.25	47.89	44.21	41.05
	60	1.584	78.41	69.70	62.73	57.03	52.27	48.25	44.81
130	10	0.938	46.43	41.27	37.15	33.77	30.96	28.57	26.53
	20	1.319	65.27	58.02	52.22	47.47	43.51	40.17	37.30
	30	1.619	80.16	71.26	64.13	58.30	53.44	49.33	45.81
	40	1.867	92.43	82.16	73.94	67.22	61.62	56.88	52.82
	50	2.088	103.38	91.89	82.70	75.19	68.92	63.62	59.07
	60	2.292	113.46	100.85	90.76	82.51	75.64	69.82	64.83

Tower Electric Pump Pressure Recommendations (with 4 lb check valves):

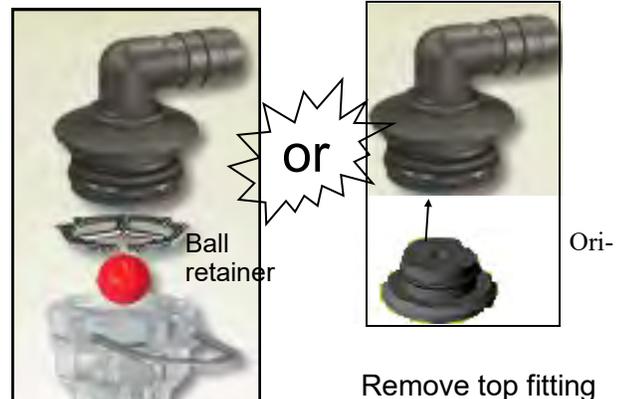
- Minimum 10 PSI
- Maximum 30 PSI

PumpRight Pressure Recommendations (with 10 lb check valves):

- Minimum 20 PSI
- Maximum 80 PSI

Chart is for 28-0-0 Fertilizer @ 70°

- Heavier fertilizers (like 10-34-0) will have 5-15% less flow than chart indicates for a certain pressure
- Cold fertilizers will cause system pressure to increase at a given application rate.
- Tower Electric Pump Systems will have reduced flow and increased electrical current draw due to cold fertilizer increasing operating pressure. **Use the largest orifice possible for cold weather operation.**



If using a metering orifice in the flow indicator, the orifice replaces the ball retainer. If not using an orifice here, the ball retainer must be in place.

Remove top fitting of each column. Then push metering orifice into bottom of each outlet fitting. *(This is not used very often.)*

All application rates (gallons/acres) are estimates based on 0-28-0 (10.65 lbs/gallon) at 70 degrees F.

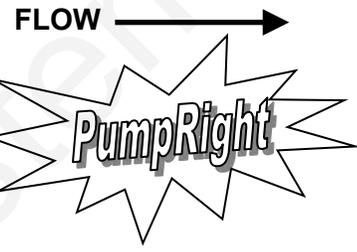
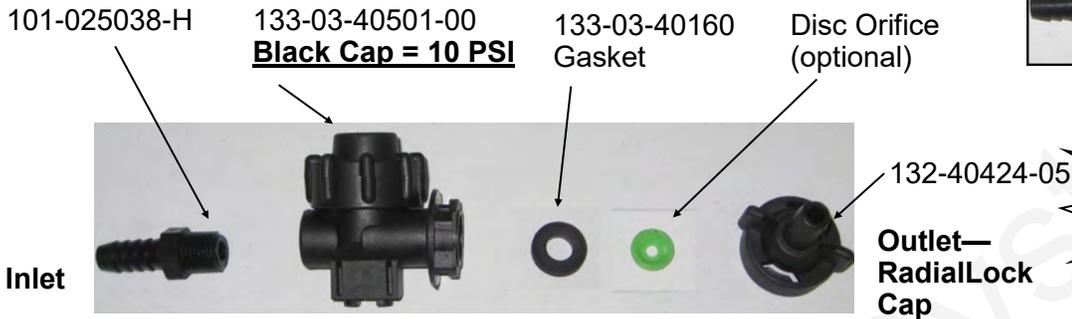


Check Valves

10 lb check valve with 3/8" hose barbs

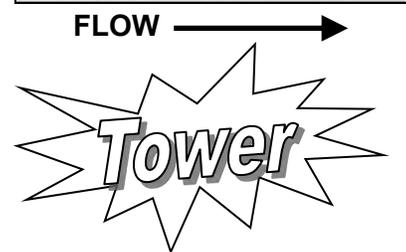
B
Components
Liquid

The recommended check valve for most **PumpRight hydraulic installations** is the 10 lb check with 3/8" hose barbs. This works with 3/8" rubber hose which SurePoint recommends for most applications over 10 GPA on 30" rows. The recommended minimum system operating pressure for this check is 20 psi, to ensure all checks open fully.



4 lb check valve with 1/4" quick connect fittings

4 lb check valves are typically used with **electric pump systems**. SurePoint recommends this valve for use with 1/4" tubing applying up to 10 GPA on 30" rows. The recommended minimum system operating pressure for this check is 10 psi, to ensure all checks open fully.



Special Purpose Check Valve Assemblies

Assembly Part Number	Description	Suggested Uses (30" rows)
136-10-04QC04QC	1/4" QC x 1/4" QC 10 lb	< 10 GPA with PumpRight & 1/4" Tubing
136-10-06QC06QC	3/8" QC x 3/8" QC 10 lb	With 3/8" tubing plumbing
136-04-06HB06HB	3/8" HB x 3/8" HB 4 lb	> 10 GPA with Electric Pumps
136-04-08HB08HB	1/2" HB x 1/2" HB 4 lb	> 50 GPA with PumpRight
136-10-08HB08HB	1/2" HB x 1/2" HB 10 lb	> 50 GPA with PumpRight

Colored Disc Orifice Chart for 30" rows

B

Components
Liquid

30" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
Pink (24)	10	0.033	1.62	1.44	1.30	1.18	1.08	1.00	0.93
	20	0.046	2.28	2.02	1.82	1.66	1.52	1.40	1.30
	30	0.057	2.80	2.49	2.24	2.04	1.87	1.73	1.60
	40	0.065	3.24	2.88	2.59	2.36	2.16	1.99	1.85
	50	0.073	3.64	3.23	2.91	2.64	2.42	2.24	2.08
	60	0.081	3.99	3.54	3.19	2.90	2.66	2.45	2.28
Gray (30)	10	0.050	2.50	2.22	2.00	1.82	1.66	1.54	1.43
	20	0.072	3.55	3.15	2.84	2.58	2.37	2.18	2.03
	30	0.088	4.34	3.85	3.47	3.15	2.89	2.67	2.48
	40	0.101	4.99	4.44	4.00	3.63	3.33	3.07	2.85
	50	0.112	5.56	4.95	4.45	4.05	3.71	3.42	3.18
	60	0.124	6.13	5.45	4.91	4.46	4.09	3.77	3.50
Black (35)	10	0.070	3.46	3.08	2.77	2.52	2.31	2.13	1.98
	20	0.098	4.86	4.32	3.89	3.54	3.24	2.99	2.78
	30	0.120	5.96	5.30	4.77	4.33	3.97	3.67	3.40
	40	0.139	6.88	6.11	5.50	5.00	4.58	4.23	3.93
	50	0.156	7.71	6.85	6.17	5.61	5.14	4.74	4.41
	60	0.170	8.41	7.48	6.73	6.12	5.61	5.18	4.81
Brown (41)	10	0.094	4.64	4.13	3.71	3.38	3.10	2.86	2.65
	20	0.132	6.53	5.80	5.22	4.75	4.35	4.02	3.73
	30	0.162	8.02	7.13	6.41	5.83	5.34	4.93	4.58
	40	0.187	9.24	8.22	7.39	6.72	6.16	5.69	5.28
	50	0.209	10.34	9.19	8.27	7.52	6.89	6.36	5.91
	60	0.228	11.30	10.05	9.04	8.22	7.53	6.95	6.46
Orange (46)	10	0.119	5.91	5.26	4.73	4.30	3.94	3.64	3.38
	20	0.169	8.37	7.44	6.69	6.08	5.58	5.15	4.78
	30	0.207	10.25	9.11	8.20	7.45	6.83	6.31	5.86
	40	0.239	11.83	10.51	9.46	8.60	7.88	7.28	6.76
	50	0.267	13.23	11.76	10.58	9.62	8.82	8.14	7.56
	60	0.293	14.50	12.89	11.60	10.55	9.67	8.92	8.29
Maroon (52)	10	0.149	7.36	6.54	5.89	5.35	4.91	4.53	4.21
	20	0.210	10.38	9.23	8.31	7.55	6.92	6.39	5.93
	30	0.257	12.70	11.29	10.16	9.24	8.47	7.82	7.26
	40	0.296	14.67	13.04	11.74	10.67	9.78	9.03	8.39
	50	0.332	16.43	14.60	13.14	11.95	10.95	10.11	9.39
	60	0.363	17.96	15.96	14.37	13.06	11.97	11.05	10.26
Red (63)	10	0.218	10.78	9.58	8.62	7.84	7.18	6.63	6.16
	20	0.307	15.20	13.51	12.16	11.05	10.13	9.35	8.69
	30	0.376	18.62	16.55	14.89	13.54	12.41	11.46	10.64
	40	0.435	21.51	19.12	17.21	15.64	14.34	13.24	12.29
	50	0.486	24.05	21.38	19.24	17.49	16.03	14.80	13.74
	60	0.532	26.33	23.40	21.06	19.15	17.55	16.20	15.04
Blue (80)	10	0.351	17.39	15.46	13.91	12.65	11.59	10.70	9.94
	20	0.496	24.57	21.84	19.66	17.87	16.38	15.12	14.04
	30	0.608	30.09	26.75	24.08	21.89	20.06	18.52	17.20
	40	0.702	34.74	30.88	27.79	25.26	23.16	21.38	19.85
	50	0.785	38.86	34.54	31.08	28.26	25.90	23.91	22.20
	60	0.859	42.53	37.81	34.03	30.93	28.36	26.18	24.31
Yellow (95)	10	0.506	25.06	22.27	20.05	18.22	16.70	15.42	14.32
	20	0.715	35.39	31.46	28.32	25.74	23.60	21.78	20.23
	30	0.876	43.37	38.55	34.69	31.54	28.91	26.69	24.78
	40	1.009	49.94	44.39	39.95	36.32	33.29	30.73	28.54
	50	1.133	56.07	49.84	44.86	40.78	37.38	34.51	32.04
	60	1.239	61.33	54.51	49.06	44.60	40.88	37.74	35.04
Green (110)	10	0.686	33.95	30.18	27.16	24.69	22.63	20.89	19.40
	20	0.973	48.19	42.83	38.55	35.04	32.12	29.65	27.53
	30	1.186	58.70	52.18	46.96	42.69	39.13	36.12	33.54
	40	1.372	67.90	60.35	54.32	49.38	45.27	41.78	38.80
	50	1.531	75.78	67.36	60.63	55.12	50.52	46.64	43.30
	60	1.681	83.23	73.98	66.58	60.53	55.49	51.22	47.56

Tower Electric Pump Pressure Recommendations (with 4 lb check valves):

- Minimum 10 PSI
- Maximum 30 PSI

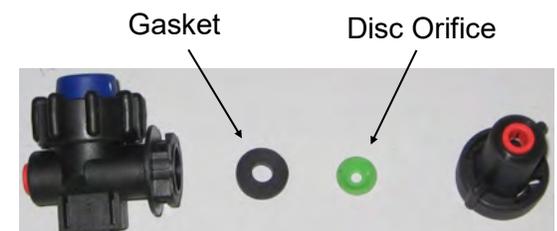
PumpRight Pressure Recommendations (with 10 lb check valves):

- Minimum 20 PSI
- Maximum 80 PSI

Chart is for 28-0-0 Fertilizer @ 70°

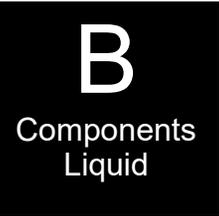
- Heavier fertilizers (like 10-34-0) will have 5-15% less flow than chart indicates for a certain pressure
- Cold fertilizers will cause system pressure to increase at a given application rate.
- Tower Electric Pump Systems will have reduced flow and increased electrical current draw due to cold fertilizer increasing operating pressure. **Use the largest orifice possible for cold weather operation. This is absolutely essential for 24-row systems using electric pumps.**

Colored Disc Orifice assemblies under the check valve cap in most cases. (Drop the orifice with the hole down into the cap, then put the gasket on top of it.) The orifice can also be installed in a manifold (common on grain drills).



FLOW → 1/4 Turn Cap is Outlet

Colored Disc Orifice Chart Common Grain Drill Row Spacings



7.5" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
Pink (24)	10	0.033	6.5	5.8	5.2	4.7	4.3	4.0	3.7
	20	0.046	9.1	8.1	7.3	6.6	6.1	5.6	5.2
	30	0.057	11.2	10.0	9.0	8.2	7.5	6.9	6.4
	40	0.065	13.0	11.5	10.4	9.4	8.6	8.0	7.4
	50	0.073	14.5	12.9	11.6	10.6	9.7	8.9	8.3
	60	0.081	15.9	14.2	12.8	11.6	10.6	9.8	9.1
Gray (30)	10	0.050	10.0	8.9	8.0	7.3	6.7	6.1	5.7
	20	0.072	14.2	12.6	11.4	10.3	9.5	8.7	8.1
	30	0.088	17.3	15.4	13.9	12.6	11.6	10.7	9.9
	40	0.101	20.0	17.8	16.0	14.5	13.3	12.3	11.4
	50	0.112	22.3	19.8	17.8	16.2	14.8	13.7	12.7
	60	0.124	24.5	21.8	19.6	17.8	16.4	15.1	14.0
Black (35)	10	0.070	13.8	12.3	11.1	10.1	9.2	8.5	7.9
	20	0.098	19.4	17.3	15.6	14.1	13.0	12.0	11.1
	30	0.120	23.8	21.2	19.1	17.3	15.9	14.7	13.6
	40	0.139	27.5	24.5	22.0	20.0	18.3	16.9	15.7
	50	0.156	30.8	27.4	24.7	22.4	20.6	19.0	17.6
	60	0.170	33.6	29.9	26.9	24.5	22.4	20.7	19.2
Brown (41)	10	0.094	19	17	15	14	12	11	11
	20	0.132	26	23	21	19	17	16	15
	30	0.162	32	29	26	23	21	20	18
	40	0.187	37	33	30	27	25	23	21
	50	0.209	41	37	33	30	28	25	24
	60	0.228	45	40	36	33	30	28	26
Orange (46)	10	0.119	24	21	19	17	16	15	14
	20	0.169	33	30	27	24	22	21	19
	30	0.207	41	36	33	30	27	25	23
	40	0.239	47	42	38	34	32	29	27
	50	0.267	53	47	42	38	35	33	30
	60	0.293	58	52	46	42	39	36	33
Maroon (52)	10	0.149	29	26	24	21	20	18	17
	20	0.210	42	37	33	30	28	26	24
	30	0.257	51	45	41	37	34	31	29
	40	0.296	59	52	47	43	39	36	34
	50	0.332	66	58	53	48	44	40	38
	60	0.363	72	64	57	52	48	44	41
Red (63)	10	0.218	43	38	34	31	29	27	25
	20	0.307	61	54	49	44	41	37	35
	30	0.376	74	66	60	54	50	46	43
	40	0.435	86	76	69	63	57	53	49
	50	0.486	96	86	77	70	64	59	55
	60	0.532	105	94	84	77	70	65	60
Blue (80)	10	0.351	70	62	56	51	46	43	40
	20	0.496	98	87	79	71	66	60	56
	30	0.608	120	107	96	88	80	74	69
	40	0.702	139	124	111	101	93	86	79
	50	0.785	155	138	124	113	104	96	89
	60	0.859	170	151	136	124	113	105	97
Yellow (95)	10	0.506	100	89	80	73	67	62	57
	20	0.715	142	126	113	103	94	87	81
	30	0.876	173	154	139	126	116	107	99
	40	1.009	200	178	160	145	133	123	114
	50	1.133	224	199	179	163	150	138	128
	60	1.239	245	218	196	178	164	151	140

All application rates (gallons/acres) are estimates based on 0-28-0 (10.65 lbs/gallon) at 70 degrees F

10" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
Pink (24)	10	0.033	4.9	4.3	3.9	3.5	3.2	3.0	2.8
	20	0.046	6.8	6.1	5.5	5.0	4.6	4.2	3.9
	30	0.057	8.4	7.5	6.7	6.1	5.6	5.2	4.8
	40	0.065	9.7	8.6	7.8	7.1	6.5	6.0	5.6
	50	0.073	10.9	9.7	8.7	7.9	7.3	6.7	6.2
	60	0.081	12.0	10.6	9.6	8.7	8.0	7.4	6.8
Gray (30)	10	0.050	7.5	6.7	6.0	5.4	5.0	4.6	4.3
	20	0.072	10.6	9.5	8.5	7.7	7.1	6.6	6.1
	30	0.088	13.0	11.6	10.4	9.5	8.7	8.0	7.4
	40	0.101	15.0	13.3	12.0	10.9	10.0	9.2	8.6
	50	0.112	16.7	14.8	13.4	12.1	11.1	10.3	9.5
	60	0.124	18.4	16.4	14.7	13.4	12.3	11.3	10.5
Black (35)	10	0.070	10.4	9.2	8.3	7.6	6.9	6.4	5.9
	20	0.098	14.6	13.0	11.7	10.6	9.7	9.0	8.3
	30	0.120	17.9	15.9	14.3	13.0	11.9	11.0	10.2
	40	0.139	20.6	18.3	16.5	15.0	13.8	12.7	11.8
	50	0.156	23.1	20.6	18.5	16.8	15.4	14.2	13.2
	60	0.170	25.2	22.4	20.2	18.4	16.8	15.5	14.4
Brown (41)	10	0.094	14	12	11	10	9	9	8
	20	0.132	20	17	16	14	13	12	11
	30	0.162	24	21	19	17	16	15	14
	40	0.187	28	25	22	20	18	17	16
	50	0.209	31	28	25	23	21	19	18
	60	0.228	34	30	27	25	23	21	19
Orange (46)	10	0.119	18	16	14	13	12	11	10
	20	0.169	25	22	20	18	17	15	14
	30	0.207	31	27	25	22	21	19	18
	40	0.239	35	32	28	26	24	22	20
	50	0.267	40	35	32	29	26	24	23
	60	0.293	43	39	35	32	29	27	25
Maroon (52)	10	0.149	22	20	18	16	15	14	13
	20	0.210	31	28	25	23	21	19	18
	30	0.257	38	34	30	28	25	23	22
	40	0.296	44	39	35	32	29	27	25
	50	0.332	49	44	39	36	33	30	28
	60	0.363	54	48	43	39	36	33	31
Red (63)	10	0.218	32	29	26	24	22	20	18
	20	0.307	46	41	36	33	30	28	26
	30	0.376	56	50	45	41	37	34	32
	40	0.435	65	57	52	47	43	40	37
	50	0.486	72	64	58	52	48	44	41
	60	0.532	79	70	63	57	53	49	45
Blue (80)	10	0.351	52	46	42	38	35	32	30
	20	0.496	74	66	59	54	49	45	42
	30	0.608	90	80	72	66	60	56	52
	40	0.702	104	93	83	76	69	64	60
	50	0.785	117	104	93	85	78	72	67
	60	0.859	128	113	102	93	85	79	73
Yellow (95)	10	0.506	75	67	60	55	50	46	43
	20	0.715	106	94	85	77	71	65	61
	30	0.876	130	116	104	95	87	80	74
	40	1.009	150	133	120	109	100	92	86
	50	1.133	168	150	135	122	112	104	96
	60	1.239	184	164	147	134	123	113	105

All application rates (gallons/acres) are estimates based on 0-28-0 (10.65 lbs/gallon) at 70 degrees F



Colored Disc Orifice Chart

B

15" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
Pink (24)	10	0.033	3.2	2.9	2.6	2.4	2.2	2.0	1.9
	20	0.046	4.6	4.0	3.6	3.3	3.0	2.8	2.6
	30	0.057	5.6	5.0	4.5	4.1	3.7	3.5	3.2
	40	0.065	6.5	5.8	5.2	4.7	4.3	4.0	3.7
	50	0.073	7.3	6.5	5.8	5.3	4.8	4.5	4.2
60	0.081	8.0	7.1	6.4	5.8	5.3	4.9	4.6	
Gray (30)	10	0.050	5.0	4.4	4.0	3.6	3.3	3.1	2.9
	20	0.072	7.1	6.3	5.7	5.2	4.7	4.4	4.1
	30	0.088	8.7	7.7	6.9	6.3	5.8	5.3	5.0
	40	0.101	10.0	8.9	8.0	7.3	6.7	6.1	5.7
	50	0.112	11.1	9.9	8.9	8.1	7.4	6.8	6.4
60	0.124	12.3	10.9	9.8	8.9	8.2	7.5	7.0	
Black (35)	10	0.070	6.9	6.2	5.5	5.0	4.6	4.3	4.0
	20	0.098	9.7	8.6	7.8	7.1	6.5	6.0	5.6
	30	0.120	11.9	10.6	9.5	8.7	7.9	7.3	6.8
	40	0.139	13.8	12.2	11.0	10.0	9.2	8.5	7.9
	50	0.156	15.4	13.7	12.3	11.2	10.3	9.5	8.8
60	0.170	16.8	15.0	13.5	12.2	11.2	10.4	9.6	
Brown (41)	10	0.094	9.3	8.3	7.4	6.8	6.2	5.7	5.3
	20	0.132	13.1	11.6	10.4	9.5	8.7	8.0	7.5
	30	0.162	16.0	14.3	12.8	11.7	10.7	9.9	9.2
	40	0.187	18.5	16.4	14.8	13.4	12.3	11.4	10.6
	50	0.209	20.7	18.4	16.5	15.0	13.8	12.7	11.8
60	0.228	22.6	20.1	18.1	16.4	15.1	13.9	12.9	
Orange (46)	10	0.119	11.8	10.5	9.5	8.6	7.9	7.3	6.8
	20	0.169	16.7	14.9	13.4	12.2	11.2	10.3	9.6
	30	0.207	20.5	18.2	16.4	14.9	13.7	12.6	11.7
	40	0.239	23.7	21.0	18.9	17.2	15.8	14.6	13.5
	50	0.267	26.5	23.5	21.2	19.2	17.6	16.3	15.1
60	0.293	29.0	25.8	23.2	21.1	19.3	17.8	16.6	
Maroon (52)	10	0.149	15	13	12	11	10	9	8
	20	0.210	21	18	17	15	14	13	12
	30	0.257	25	23	20	18	17	16	15
	40	0.296	29	26	23	21	20	18	17
	50	0.332	33	29	26	24	22	20	19
60	0.363	36	32	29	26	24	22	21	
Red (63)	10	0.218	22	19	17	16	14	13	12
	20	0.307	30	27	24	22	20	19	17
	30	0.376	37	33	30	27	25	23	21
	40	0.435	43	38	34	31	29	26	25
	50	0.486	48	43	38	35	32	30	27
60	0.532	53	47	42	38	35	32	30	
Blue (80)	10	0.351	35	31	28	25	23	21	20
	20	0.496	49	44	39	36	33	30	28
	30	0.608	60	54	48	44	40	37	34
	40	0.702	69	62	56	51	46	43	40
	50	0.785	78	69	62	57	52	48	44
60	0.859	85	76	68	62	57	52	49	
Yellow (95)	10	0.506	50	45	40	36	33	31	29
	20	0.715	71	63	57	51	47	44	40
	30	0.876	87	77	69	63	58	53	50
	40	1.009	100	89	80	73	67	61	57
	50	1.133	112	100	90	82	75	69	64
60	1.239	123	109	98	89	82	75	70	
Green (110)	10	0.686	68	60	54	49	45	42	39
	20	0.973	96	86	77	70	64	59	55
	30	1.186	117	104	94	85	78	72	67
	40	1.372	136	121	109	99	91	84	78
	50	1.531	152	135	121	110	101	93	87
60	1.681	166	148	133	121	111	102	95	
White (125)	10	0.867	86	76	69	62	57	53	49
	20	1.230	122	108	97	89	81	75	70
	30	1.504	149	132	119	108	99	92	85
	40	1.735	172	153	137	125	114	106	98
	50	1.938	192	171	153	140	128	118	110
60	2.124	210	187	168	153	140	129	120	
Lime Green (156)	10	1.372	136	121	109	99	91	84	78
	20	1.947	193	171	154	140	128	119	110
	30	2.381	236	209	189	171	157	145	135
	40	2.752	272	242	218	198	182	168	156
	50	3.071	304	270	243	221	203	187	174
60	3.363	333	296	266	242	222	205	190	

All application rates (gallons/acre) are estimates based on 0-28-0 (10.65 lbs/gallon) at 70 degrees F.

20" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
Pink (24)	10	0.033	2.4	2.2	1.9	1.8	1.6	1.5	1.4
	20	0.046	3.4	3.0	2.7	2.5	2.3	2.1	2.0
	30	0.057	4.2	3.7	3.4	3.1	2.8	2.6	2.4
	40	0.065	4.9	4.3	3.9	3.5	3.2	3.0	2.8
	50	0.073	5.5	4.8	4.4	4.0	3.6	3.4	3.1
60	0.081	6.0	5.3	4.8	4.3	4.0	3.7	3.4	
Gray (30)	10	0.050	3.7	3.3	3.0	2.7	2.5	2.3	2.1
	20	0.072	5.3	4.7	4.3	3.9	3.5	3.3	3.0
	30	0.088	6.5	5.8	5.2	4.7	4.3	4.0	3.7
	40	0.101	7.5	6.7	6.0	5.4	5.0	4.6	4.3
	50	0.112	8.3	7.4	6.7	6.1	5.6	5.1	4.8
60	0.124	9.2	8.2	7.4	6.7	6.1	5.7	5.3	
Black (35)	10	0.070	5.2	4.6	4.2	3.8	3.5	3.2	3.0
	20	0.098	7.3	6.5	5.8	5.3	4.9	4.5	4.2
	30	0.120	8.9	7.9	7.1	6.5	6.0	5.5	5.1
	40	0.139	10.3	9.2	8.3	7.5	6.9	6.3	5.9
	50	0.156	11.6	10.3	9.3	8.4	7.7	7.1	6.6
60	0.170	12.6	11.2	10.1	9.2	8.4	7.8	7.2	
Brown (41)	10	0.094	7.0	6.2	5.6	5.1	4.6	4.3	4.0
	20	0.132	9.8	8.7	7.8	7.1	6.5	6.0	5.6
	30	0.162	12.0	10.7	9.6	8.7	8.0	7.4	6.9
	40	0.187	13.9	12.3	11.1	10.1	9.2	8.5	7.9
	50	0.209	15.5	13.8	12.4	11.3	10.3	9.5	8.9
60	0.228	17.0	15.1	13.6	12.3	11.3	10.4	9.7	
Orange (46)	10	0.119	8.9	7.9	7.1	6.5	5.9	5.5	5.1
	20	0.169	12.6	11.2	10.0	9.1	8.4	7.7	7.2
	30	0.207	15.4	13.7	12.3	11.2	10.3	9.5	8.8
	40	0.239	17.7	15.8	14.2	12.9	11.8	10.9	10.1
	50	0.267	19.8	17.6	15.9	14.4	13.2	12.2	11.3
60	0.293	21.7	19.3	17.4	15.8	14.5	13.4	12.4	
Maroon (52)	10	0.149	11	10	9	8	7	7	6
	20	0.210	16	14	12	11	10	10	9
	30	0.257	19	17	15	14	13	12	11
	40	0.296	22	20	18	16	15	14	13
	50	0.332	25	22	20	18	16	15	14
60	0.363	27	24	22	20	18	17	15	
Red (63)	10	0.218	16	14	13	12	11	10	9
	20	0.307	23	20	18	17	15	14	13
	30	0.376	28	25	22	20	19	17	16
	40	0.435	32	29	26	23	22	20	18
	50	0.486	36	32	29	26	24	22	21
60	0.532	39	35	32	29	26	24	23	
Blue (80)	10	0.351	26	23	21	19	17	16	15
	20	0.496	37	33	29	27	25	23	21
	30	0.608	45	40	36	33	30	28	26
	40	0.702	52	46	42	38	35	32	30
	50	0.785	58	52	47	42	39	36	33
60	0.859	64	57	51	46	43	39	36	
Yellow (95)	10	0.506	38	33	30	27	25	23	21
	20	0.715	53	47	42	39	35	33	30
	30	0.876	65	58	52	47	43	40	37
	40	1.009	75	67	60	54	50	46	43
	50	1.133	84	75	67	61	56	52	48
60	1.239	92	82	74	67	61	57	53	
Green (110)	10	0.686	51	45	41	37	34	31	29
	20	0.973	72	64	58	53	48	44	41
	30	1.186	88	78	70	64	59	54	50
	40	1.372	102	91	81	74	68	63	58
	50	1.531	114	101	91	83	76	70	65
60	1.681	125	111	100	91	83	77	71	
White (125)	10	0.867	64	57	52	47	43	40	37
	20	1.230	91	81	73	66	61	56	52
	30	1.504	112	99	89	81	74	69	64
	40	1.735	129	114	103	94	86	79	74
	50	1.938	144	128	115	105	96	89	82
60	2.124	158	140	126	115	105	97	90	
Lime Green (156)	10	1.372	102	91	81	74	68	63	58
	20	1.947	145	128	116	105	96	89	83
	30	2.381	177	157	141	129	118	109	101
	40	2.752	204	182	163	149	136	126	117
	50	3.071	228	203	182	166	152	140	130
60	3.363	250	222	200	182	166	154	143	

All application rates (gallons/acre) are estimates based on 0-28-0 (10.65 lbs/gallon) at 70 degrees F.



Colored Disc Orifice Chart

B
Components
Liquid

22" Spacing

22" Spacing

22" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
			10	0.033	2.2	2.0	1.8	1.6	1.5
20	0.046	3.1	2.8	2.5	2.3	2.1	1.9	1.8	
30	0.057	3.8	3.4	3.1	2.8	2.5	2.4	2.2	
40	0.065	4.4	3.9	3.5	3.2	2.9	2.7	2.5	
50	0.073	5.0	4.4	4.0	3.6	3.3	3.1	2.8	
60	0.081	5.4	4.8	4.3	4.0	3.6	3.3	3.1	
Gray (30)	10	0.050	3.4	3.0	2.7	2.5	2.3	2.1	1.9
	20	0.072	4.8	4.3	3.9	3.5	3.2	3.0	2.8
	30	0.088	5.9	5.3	4.7	4.3	3.9	3.6	3.4
	40	0.101	6.8	6.1	5.4	5.0	4.5	4.2	3.9
	50	0.112	7.6	6.7	6.1	5.5	5.1	4.7	4.3
	60	0.124	8.4	7.4	6.7	6.1	5.6	5.1	4.8
Black (35)	10	0.070	4.7	4.2	3.8	3.4	3.1	2.9	2.7
	20	0.098	6.6	5.9	5.3	4.8	4.4	4.1	3.8
	30	0.120	8.1	7.2	6.5	5.9	5.4	5.0	4.6
	40	0.139	9.4	8.3	7.5	6.8	6.3	5.8	5.4
	50	0.156	10.5	9.3	8.4	7.6	7.0	6.5	6.0
	60	0.170	11.5	10.2	9.2	8.3	7.6	7.1	6.6
Brown (41)	10	0.094	6.3	5.6	5.1	4.6	4.2	3.9	3.6
	20	0.132	8.9	7.9	7.1	6.5	5.9	5.5	5.1
	30	0.162	10.9	9.7	8.7	8.0	7.3	6.7	6.2
	40	0.187	12.6	11.2	10.1	9.2	8.4	7.8	7.2
	50	0.209	14.1	12.5	11.3	10.3	9.4	8.7	8.1
	60	0.228	15.4	13.7	12.3	11.2	10.3	9.5	8.8
Orange (46)	10	0.119	8.1	7.2	6.5	5.9	5.4	5.0	4.6
	20	0.169	11.4	10.1	9.1	8.3	7.6	7.0	6.5
	30	0.207	14.0	12.4	11.2	10.2	9.3	8.6	8.0
	40	0.239	16.1	14.3	12.9	11.7	10.8	9.9	9.2
	50	0.267	18.0	16.0	14.4	13.1	12.0	11.1	10.3
	60	0.293	19.8	17.6	15.8	14.4	13.2	12.2	11.3
Maroon (52)	10	0.149	10	9	8	7	7	6	6
	20	0.210	14	13	11	10	9	9	8
	30	0.257	17	15	14	13	12	11	10
	40	0.296	20	18	16	15	13	12	11
	50	0.332	22	20	18	16	15	14	13
	60	0.363	24	22	20	18	16	15	14
Red (63)	10	0.218	15	13	12	11	10	9	8
	20	0.307	21	18	17	15	14	13	12
	30	0.376	25	23	20	18	17	16	15
	40	0.435	29	26	23	21	20	18	17
	50	0.486	33	29	26	24	22	20	19
	60	0.532	36	32	29	26	24	22	21
Blue (80)	10	0.351	24	21	19	17	16	15	14
	20	0.496	34	30	27	24	22	21	19
	30	0.608	41	36	33	30	27	25	23
	40	0.702	47	42	38	34	32	29	27
	50	0.785	53	47	42	39	35	33	30
	60	0.859	58	52	46	42	39	36	33
Yellow (95)	10	0.506	34	30	27	25	23	21	20
	20	0.715	48	43	39	35	32	30	28
	30	0.876	59	53	47	43	39	36	34
	40	1.009	68	61	54	50	45	42	39
	50	1.133	76	68	61	56	51	47	44
	60	1.239	84	74	67	61	56	51	48
Green (110)	10	0.686	46	41	37	34	31	28	26
	20	0.973	66	58	53	48	44	40	38
	30	1.186	80	71	64	58	53	49	46
	40	1.372	93	82	74	67	62	57	53
	50	1.531	103	92	83	75	69	64	59
	60	1.681	113	101	91	83	76	70	65
White (125)	10	0.867	59	52	47	43	39	36	33
	20	1.230	83	74	66	60	55	51	47
	30	1.504	102	90	81	74	68	62	58
	40	1.735	117	104	94	85	78	72	67
	50	1.938	131	116	105	95	87	81	75
	60	2.124	143	127	115	104	96	88	82
Lime Green (156)	10	1.372	93	82	74	67	62	57	53
	20	1.947	131	117	105	96	88	81	75
	30	2.381	161	143	129	117	107	99	92
	40	2.752	186	165	149	135	124	114	106
	50	3.071	207	184	166	151	138	128	118
	60	3.363	227	202	182	165	151	140	130

All application rates (gallons/acres) are estimates based on 0-28-0 (10.65 lbs/gallon) at 70 degrees F.

36" Spacing

36" Spacing

36" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
			10	0.033	1.4	1.2	1.1	1.0	0.9
20	0.046	1.9	1.7	1.5	1.4	1.3	1.2	1.1	
30	0.057	2.3	2.1	1.9	1.7	1.6	1.4	1.3	
40	0.065	2.7	2.4	2.2	2.0	1.8	1.7	1.5	
50	0.073	3.0	2.7	2.4	2.2	2.0	1.9	1.7	
60	0.081	3.3	3.0	2.7	2.4	2.2	2.0	1.9	
Gray (30)	10	0.050	2.1	1.8	1.7	1.5	1.4	1.3	1.2
	20	0.072	3.0	2.6	2.4	2.2	2.0	1.8	1.7
	30	0.088	3.6	3.2	2.9	2.6	2.4	2.2	2.1
	40	0.101	4.2	3.7	3.3	3.0	2.8	2.6	2.4
	50	0.112	4.6	4.1	3.7	3.4	3.1	2.9	2.6
	60	0.124	5.1	4.5	4.1	3.7	3.4	3.1	2.9
Black (35)	10	0.070	2.9	2.6	2.3	2.1	1.9	1.8	1.6
	20	0.098	4.1	3.6	3.2	2.9	2.7	2.5	2.3
	30	0.120	5.0	4.4	4.0	3.6	3.3	3.1	2.8
	40	0.139	5.7	5.1	4.6	4.2	3.8	3.5	3.3
	50	0.156	6.4	5.7	5.1	4.7	4.3	4.0	3.7
	60	0.170	7.0	6.2	5.6	5.1	4.7	4.3	4.0
Brown (41)	10	0.094	3.9	3.4	3.1	2.8	2.6	2.4	2.2
	20	0.132	5.4	4.8	4.4	4.0	3.6	3.3	3.1
	30	0.162	6.7	5.9	5.3	4.9	4.5	4.1	3.8
	40	0.187	7.7	6.8	6.2	5.6	5.1	4.7	4.4
	50	0.209	8.6	7.7	6.9	6.3	5.7	5.3	4.9
	60	0.228	9.4	8.4	7.5	6.8	6.3	5.8	5.4
Orange (46)	10	0.119	4.9	4.4	3.9	3.6	3.3	3.0	2.8
	20	0.169	7.0	6.2	5.6	5.1	4.6	4.3	4.0
	30	0.207	8.5	7.6	6.8	6.2	5.7	5.3	4.9
	40	0.239	9.9	8.8	7.9	7.2	6.6	6.1	5.6
	50	0.267	11.0	9.8	8.8	8.0	7.3	6.8	6.3
	60	0.293	12.1	10.7	9.7	8.8	8.1	7.4	6.9
Maroon (52)	10	0.149	6	5	5	4	4	4	4
	20	0.210	9	8	7	6	6	5	5
	30	0.257	11	9	8	8	7	7	6
	40	0.296	12	11	10	9	8	8	7
	50	0.332	14	12	11	10	9	8	8
	60	0.363	15	13	12	11	10	9	9
Red (63)	10	0.218	9	8	7	7	6	6	5
	20	0.307	13	11	10	9	8	8	7
	30	0.376	16	14	12	11	10	10	9
	40	0.435	18	16	14	13	12	11	10
	50	0.486	20	18	16	15	13	12	11
	60	0.532	22	20	18	16	15	14	13
Blue (80)	10	0.351	14	13	12	11	10	9	8
	20	0.496	20	18	16	15	14	13	12
	30	0.608	25	22	20	18	17	15	14
	40	0.702	29	26	23	21	19	18	17
	50	0.785	32	29	26	24	22	20	19
	60	0.859	35	32	28	26	24	22	20
Yellow (95)	10	0.506	21	19	17	15	14	13	12
	20	0.715	29	26	24	21	20	18	17
	30	0.876	36	32	29	26	24	22	21
	40	1.009	42	37	33	30	28	26	24
	50	1.133	47	42	37	34	31	29	27
	60	1.239	51	45	41	37	34	31	29
Green (110)	10	0.686	28	25	23	21	19	17	16
	20	0.973	40	36	32	29	27	25	23
	30	1.186	49	43	39	36	33	30	28
	40	1.372	57	50	45	41	38	35	32
	50	1.531	63	56	51	46	42	39	36
	60	1.681	69	62	55	50	46	43	40
White (125)	10	0.867	36	32	29	26	24	22	20
	20	1.230	51	45	41	37	34	31	29
	30	1.504	62	55	50	45	41	38	35
	40	1.735	72	64	57	52	48	44	41
	50	1.938	80	71	64	58	53	49	46
	60	2.124	88	78	70	64	58	54	50
Lime Green (156)	10	1.372	57	50	45	41	38	35	32
	20	1.947	80	71	64	58	54	49	46
	30	2.381	98	87	79	71	65	60	56
	40	2.752	114	101	91	83	76	70	65
	50	3.071	127	113	101	92	84	78	72
	60	3.363	139	123	111	101	92	85	79

All application rates (gallons/acres) are estimates based on 0-28-0 (10.65 lbs/gallon) at 70 degrees F.



Dual Metering Tube Plumbing Kits with Dual Check Valve



SurePoint dual metering tube plumbing kits are a great way to plumb a planter to apply starter fertilizer. They'll also work on other implements when applying low rates of fertilizer.

These plumbing kits will contain everything you need to distribute fertilizer from the flowmeter outlet down to the ground application device of your choice (not included).

These instructions will show you where all the pieces go. It will provide guidance on how much metering tube to use. There are some optional fittings included in each plumbing kit. These instructions will show you where and why you'd want to use the optional pieces.

The dual check valve assembly is a key piece in the dual metering tube design. In addition to a check valve to stop fertilizer from draining when the system is shut off, each check valve has an on/off valve on top of it. These on/off valves allow the operator to turn on only tube 1, only tube 2, or both tube 1 and 2. This provides for three different application ranges, which is especially helpful when using Black Label Zn fertilizer (or any other liquid) which has a highly variable viscosity based on temperature changes.

Dual Advantage of Dual Metering Tube

Metering tube provides a larger passage way diameter than a comparable orifice. For a 5 GPA rate on 30" rows, a size 0.046" orifice would be used. For the same rate a 0.110" meter tube that is 8' long would be used. This 8' tube with more than twice the diameter creates a fertilizer system resistant to plugging while providing excellent row to row distribution.

By using two metering tubes, the fertilizer system can handle Black Label ZN (or most other liquid solutions) and provide the proper system pressure as the fertilizer properties change due to temperature, mixtures and other factors.

Not actual size

Standard Orifice Metering Tube

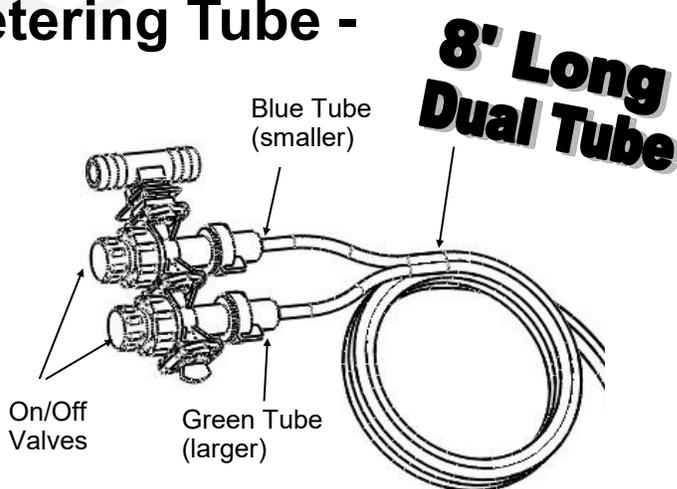
Field Operation of Dual Metering Tube - Dual Check Valve System

The dual metering tube allows for three application rate ranges. Some products have a widely variable viscosity. Therefore, based on temperature, tank mixing and fertilizer batch, the best tube to use will change.

SurePoint recommends you start with the larger tube ON only. This is the middle size and is a good starting point. Conduct a test using the test speed mode to determine your system pressure. Recommended pressure is between 8- 30 PSI. If pressure is below 8 psi, some check valves may not open and row to row distribution will be uneven. If pressure is too high the pump may be working harder than is necessary.

Start with larger tube ON, bluesmaller tube OFF:

- **Pressure below 12 PSI: Turn larger tube OFF and smaller tube ON.**
- **Pressure over 30 PSI: Turn BOTH tubes ON.**



	GPA on 30" rows (approx, will vary)
Blue Tube	1.5 - 3
Green Tube	3 - 6
Blue & Green Tube	6 - 10
Minimum Recommended flow for Blue Tube (8 ft)	4 - 5 oz/min

Other size tubes are available if needed for different application rates.

** Ultra Low Rate Application –For rates from 2-5 oz/min/row use a 12 foot length of metering tube. To calculate oz/min/row: $Oz/min/row = (GPA \times MPH \times spacing \text{ (inches)}) \div 46.4$

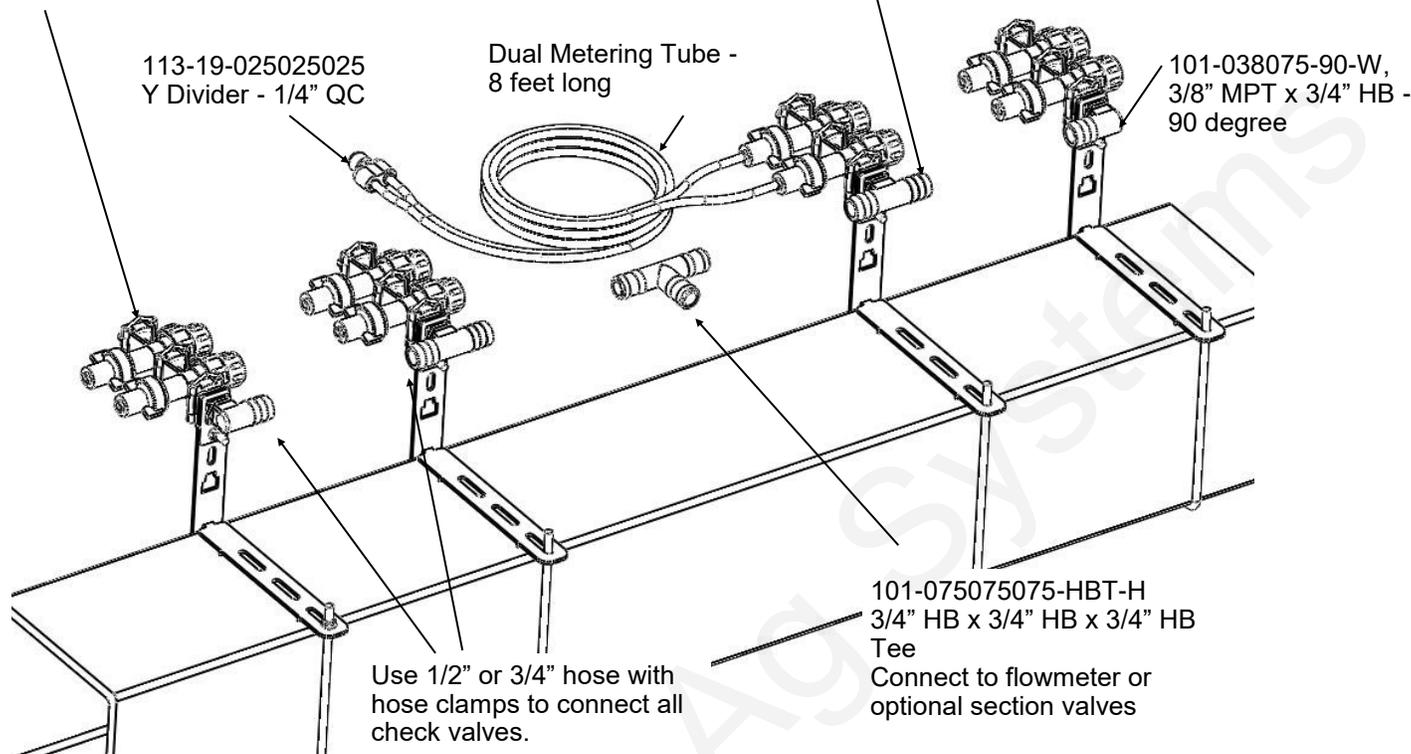


Dual Check Valve Plumbing Diagram

4 Row Planter Shown, add rows as necessary

136-04-200400, Dual 4 PSI check valve with 1/4" QC caps and 3/8" FPT inlet

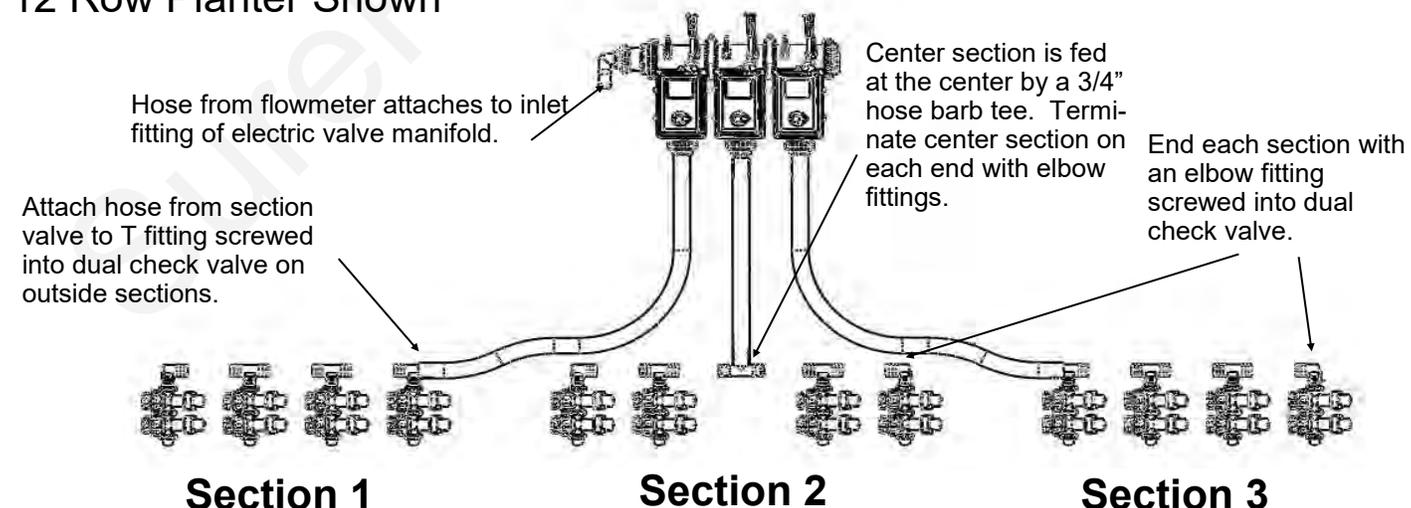
101-075075038-HBT-M-W 3/4" HB x 3/4" HB x 3/8" MPT Tee



This is a general diagram showing the dual check valve assembly mounted on a planter toolbar. The check valve and bracket are very flexible in their mounting. The check valve can mount behind, directly over, or in front of the toolbar. The check valve can be put in the bracket facing up & down or sideways (shown). In addition the steel bracket could be rotated 90 degrees and clamp around the bar. The multiple slots in the bracket are used to mount to any tube 7x7 inches or smaller.

Sectional Plumbing Diagram with Dual Check Valves

12 Row Planter Shown



For a **2 section plumbing system**, omit the center section and plumb similar to the outside 2 sections.

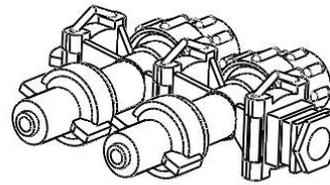
Dual Check Valve Assembly Steps

B

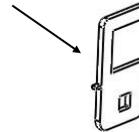
Components
Liquid

Follow these steps to mount each check valve to the steel bracket.

1. Screw the 3/8" MPT x 3/4" HB tee or elbow into the check valve using blue thread sealer. Orient the hose barb to run the 3/4" hose down the planter toolbar.
2. Insert the check valve into the "C" notch in the end of the bracket, according to how you want the check valve to be mounted on your planter. Orient the wire clips up or to the side for easiest access.
3. Slide the small "C" clamp bracket around the check valve to lock it in place.
4. Install the 1/4" carriage bolt and flange nut to secure the "C" clamp plate around the check valve.
5. Now, mount the check valve on the bar. Hold the check valve and long bracket assembly on the toolbar. Slide the tab on the front of the short bracket into the upper or lower notch on the long bracket.
6. Slide the L bolt into the appropriate slots on the brackets for your tube size. Tighten the 1/4" flange nuts to hold the bracket in place.

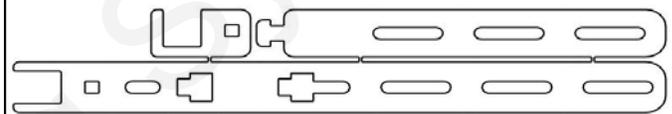


Clamp Bracket



Elbow at end of section, Tee in mid-locations.

400-1966A1 Dual Check Valve Mount Bracket

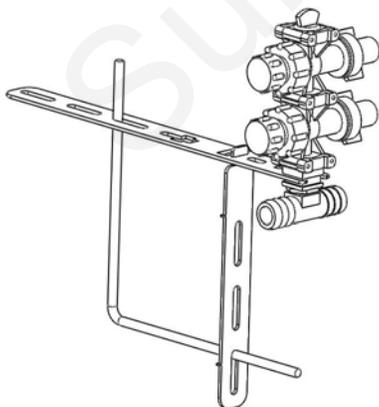


The long, short & clamp bracket come as one part connected by break-off tabs.

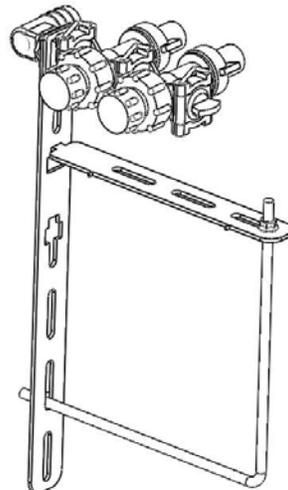
Check Valve Mounting Options

The dual check valve mounting bracket is very flexible to fit many different planter configurations. Three options are shown here to illustrate some of the possibilities.

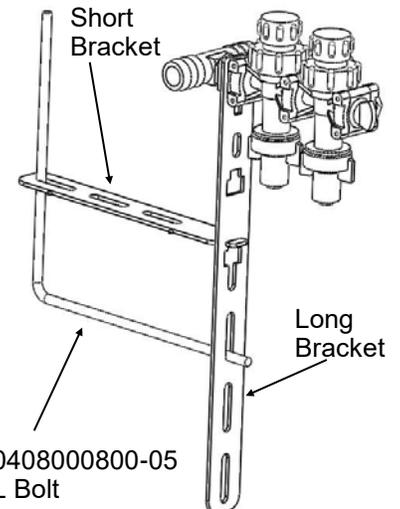
Example 1. Use the long bracket on the top of a bar. The check valve is mounted vertically. The liquid supply hose is ran directly on the front side of the bar. The U-bolt is placed in slots to clamp on a 4x6 inch tube.



Example 2. Use the long bracket on the rear of a bar. The check valve is mounted over the top of the bar. The supply line would run above and behind the bar. The short bracket is placed in the notch to mount the check valve closer to the bar.



Example 3. Use the long bracket on the front of a 3x7 bar (vacuum tube on some planters). Mount the check valve hanging forward of the bar. The supply line will run directly over the bar. The excess bolt and bracket length can be cut off.

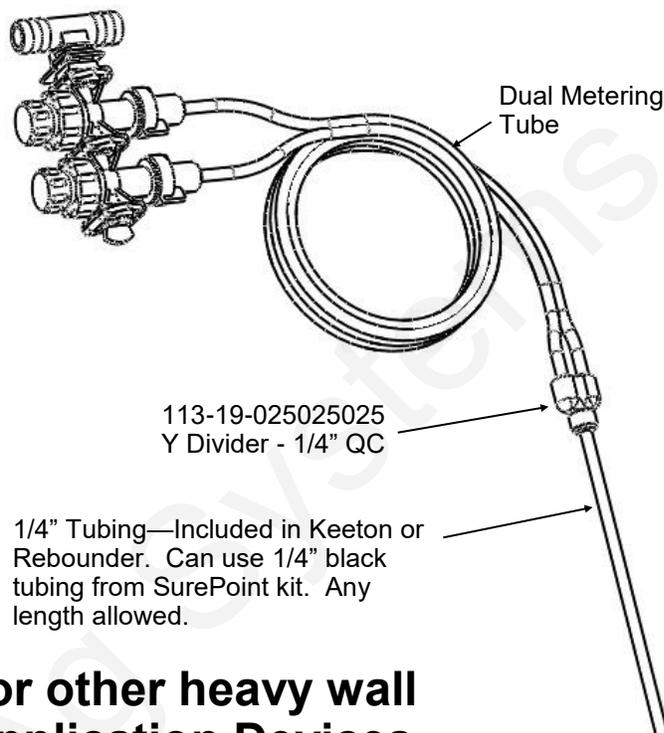


311-0408000800-05
1/4" L Bolt

Connection to Keeton Seed Firmer, Rebounder Seed Covers or through thin wall stainless steel tubes

1. Mount the Keeton Seed Firmer or Rebounder Seed Cover.
2. Route the tube included in the above kit as instructed.
3. Attach the 1/4" tube to the 1/4" QC Y divider fitting.
4. Zip all tubing to the planter and row unit in as many locations as possible.

For thin wall stainless steel tubes, you can push the 1/4" black tubing all the way through the stainless steel tube so fertilizer will run directly from the tubing onto the ground.

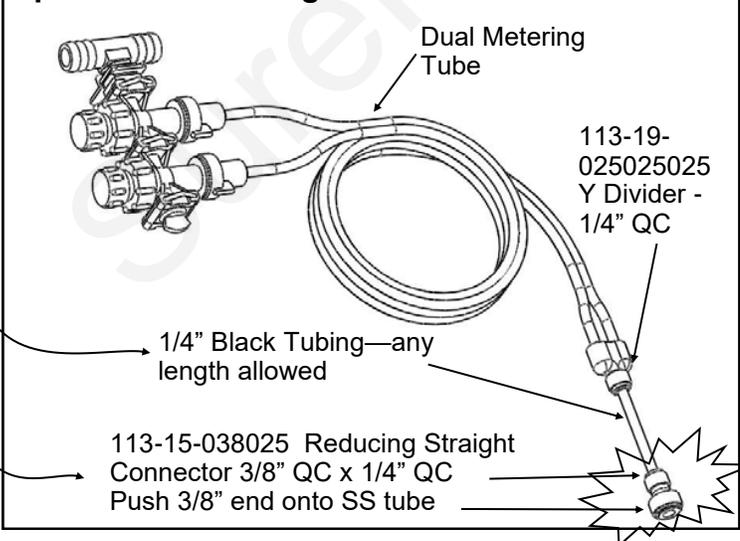


Connection to Totally Tubular or other heavy wall Stainless Steel Tube Ground Application Devices

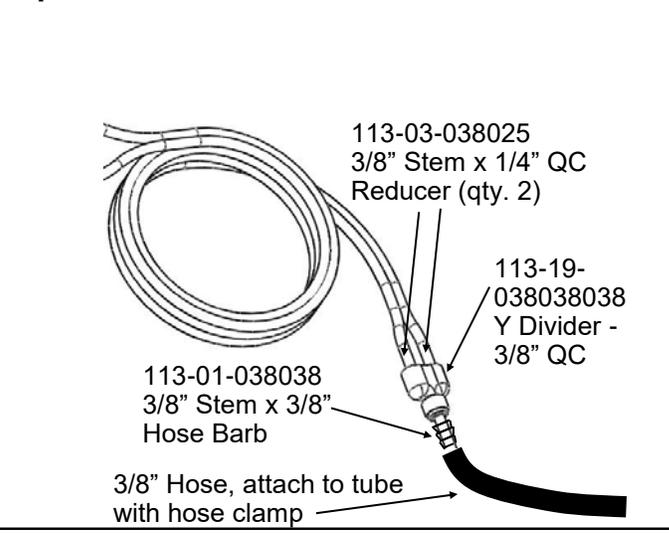
When using a 3/8" OD stainless steel tube to apply fertilizer to the ground, there are two options for the delivery tube plumbing. If the tube ID is less than 1/4" (tubing will not fit inside tube) this attachment method must be used. The description following is for Option 1. See bottom right picture for Option 2.

1. Use the 1/4" x 3/8" QC fitting shown. Push the 3/8" end onto the stainless steel tube. (Hint: if the fitting slips off the stainless steel tube, use sandpaper or a file to roughen the end of the tube slightly)
2. Use a short piece of 1/4" black tubing to connect the Y fitting to the reducer fitting on the stainless steel tube.
3. Zip all tubing to the planter and row unit in as many locations as possible.

Option 1: QC Fitting attaches to SS Tube



Option 2: 3/8" Hose attaches to SS Tube



Electric Pump (Tower) Systems--10-40 PSI (Tubes 8' unless noted)

Low Viscosity (28-0-0 approx 10.7 lb/gal)				Medium-Low Viscosity (32-0-0 approx 11.0 lb/gal)			
	oz/min	mL/min	gal/min		oz/min	mL/min	gal/min
Tube Color	Flow Range	Flow Range	Flow Range	Tube Color	Flow Range	Flow Range	Flow Range
Gray	3.5-7.4	105-220	0.03 - 0.06	Gray	2.5-5.5	74-163	0.02-0.04
Purple	6-14.4	175-415	0.05 - 0.11	Purple	4.1-11.1	121-328	0.03-0.09
Brown	8-18.2	235-540	0.06 - 0.14	Brown	5.7-14.3	170-425	0.04-0.11
Blue	10-22.6	295-670	0.08 - 0.18	Blue	7.5-18	220-530	0.06-0.14
Green	18-40.2	530-1190	0.14 - 0.31	Green	14-33.2	415-980	0.11-0.26
Tan	25-55	740-1625	0.19 - 0.43	Tan	20-46.4	590-1370	0.16-0.36
Orange	44-93.6	1300-2770	0.34 - 0.73	Orange	36-83	1065-2455	0.28-0.65
Yellow	55-114.4	1625-3380	0.43 - 0.89	Yellow	44-100	1300-2955	0.34-0.78
Black	72-152	2130-4495	0.56 - 1.19	Black	60-129	1775-3815	0.47-1.01
5' Tan	33-73	975-2160	0.26 - 0.57	5' Tan	27-63	800-1865	0.21-0.49
5' Orange	57-121	1685-3580	0.45 - 0.95	5' Orange	49-113	1450-3340	0.38-0.88
5' Yellow	70-145	2070-4290	0.55 - 1.13	5' Yellow	59-134	1745-3965	0.46-1.05
5' Black	95-200	2810-5915	0.74 - 1.56	5' Black	80-172	2365-5085	0.63-1.34

10-40 PSI 60°F

Medium Viscosity (Starter, N-P Blend, approx 11.2 lb/gal)				High Viscosity (10-34-0 approx 11.6 lb/gal)			
	oz/min	mL/min	gal/min		oz/min	mL/min	gal/min
Tube Color	Flow Range	Flow Range	Flow Range	Tube Color	Flow Range	Flow Range	Flow Range
Gray	1.5-3.7	45-110	0.01-0.03	Gray			
Purple	2.2-7.8	65-230	0.02-0.06	Purple	1.0-2.8	30-83	0.008-0.02
Brown	3.5-10.4	105-310	0.03-0.08	Brown	1.4-4.2	41-124	0.011-0.03
Blue	5-13.7	150-405	0.04-0.11	Blue	1.8-5.5	53-163	0.014-0.04
Green	9.5-26	280-770	0.07-0.20	Green	2.6-9.4	77-280	0.02-0.07
Tan	14-37.4	415-1105	0.11-0.29	Tan	4-14.8	120-440	0.03-0.12
Orange	27-72	800-2130	0.21-0.56	Orange	9-30	265-885	0.07-0.23
Yellow	33-85	975-2515	0.26-0.66	Yellow	13-42	385-1240	0.10-0.33
Black	48-106	1420-3135	0.38-0.83	Black	18-55	530-1625	0.14-0.43
5' Tan	20-53	590-1565	0.16-0.41	5' Tan	6-22.2	165-655	0.04-0.17
5' Orange	38-101	1125-2985	0.30-0.79	5' Orange	13-43	380-1270	0.10-0.34
5' Yellow	46-118	1360-3490	0.36-0.92	5' Yellow	18-58	540-1715	0.14-0.45
5' Black	67-148	1980-4375	0.52-1.16	5' Black	25-76	740-2250	0.20-0.59

10-40 PSI 60°F--For 10-34-0 select a tube with additional capacity for cold weather.

Water (8.34 lb/gal)			
	oz/min	mL/min	gal/min
Tube Color	Flow Range	Flow Range	Flow Range
White	2.5-5.5	75-165	0.02-0.04
Gray	5.8-11.6	170-340	0.045-0.09
Purple	10-20	295-590	0.08-0.16
Brown	12.5-25	370-740	0.10-0.20
Blue	17.5-35	520-1040	0.14-0.28
Green	26-52	770-1540	0.20-0.40
Tan	34-68	1005-2010	0.27-0.54
Orange	60-120	1775-3550	0.47-0.94
Yellow	75-150	2220-44400	0.59-1.18

These charts are typical flow rates from 10 to 40 PSI.

The capacity of electric pumps declines as the pressure increases. If total pump output is low enough, they can operate at 50 psi or more.

These charts are designed for typical N-P fertilizers. Suspension, granular, and/or clay/based products may not follow these charts.

These charts are for product at 60° F. Products will be thicker and pressure will be higher at lower temperatures (esp 10-34-0). *MAW*

Rate ECU Module

D

Wiring & Elec

SurePoint Fertilizer Systems begin at the Rate ECU. The picture below shows this control module.

The SurePoint harness 201-2149Y4 has a 12-pin Delphi connector that plugs into the Rate ECU on the planter. The other end of this harness has a 12-pin connector that plugs into SurePoint final pump harness and a 14-pin connector for the section harness.

Instructions for setting up the Pro 700 Planter with Rate ECU on the in cab display are in Section F. Detailed screen shots of the displays are included showing exactly what settings are required and recommended for SurePoint Fertilizer Systems.



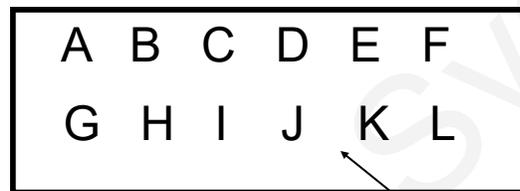
Case Planter Rate ECU Module

D

Wiring & Elec

This chart shows you the output functions by pin location on the Rate ECU. Use this information to verify if the Rate ECU is providing the correct output. If the module is not providing the correct output, contact your Case dealer to repair the problem. Also review any applicable settings on the display to verify the system is properly set up.

Rate ECU Module



12-Pin Connector-
Connect to SurePoint
Harness 201-2149Y4

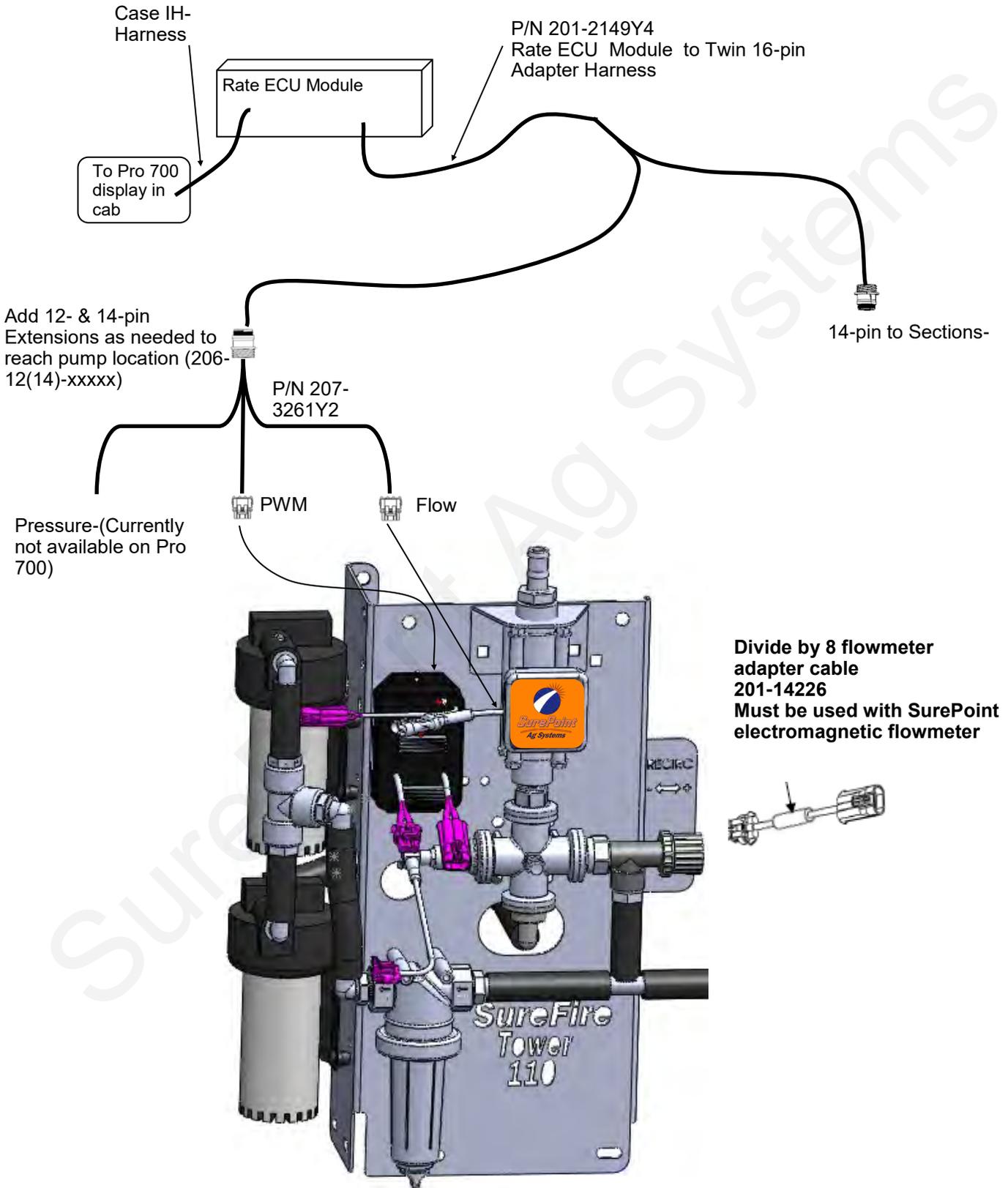
Common Troubleshooting:

PWM Signal to Pump: Pins E to H should have 0-13 volts to turn pump on. Use manual mode to increase signal. Should get up to 13 volts after holding increase button.

Flowmeter Tap Test: Pins B and C are Flow Ground and Signal. If no flow is registering on the display, you can tap between these two pins with a short wire. This produces a pulse. The display should indicate a flow when this is done rapidly. *(Note: To help register flow for the tap test, change the flowmeter calibration to 10, so it will show a flow with fewer taps. Be sure to reset the flow cal to the proper number after the test.)*

See the drawing of harness 201-2149Y4 for all pin locations on the 12-pin connector.

Case IH AFS Pro 700 Planter ECU PWM Wiring Schematic Single Section for Tower Electric Pump Liquid Application



PWM EPD Module (Pulse Width Modulated Electric Pump Driver) - 205-3770Y1

This new SurePoint EPD was released in April 2023.

It replaces 205-19024.

One Anderson connector plugs into Power from the battery.

Another Anderson connector plugs into the adapter cable to the pumps.

A 2-pin MP150 connector plugs into the PWM connector on the pump final harness.

A 2-pin WP connector can be used to do a voltage test while the pumps are running.



The **EPD** powers 1 or 2 electric pumps by providing a PWM (pulse width modulated) signal from the controller 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.** SurePoint recommends 8 gauge wire (or heavier) if extending harnesses in the field.

Troubleshooting Tip:

If the pumps won't run, unplug the Anderson connectors from the EPD and connect the **Power** from the battery directly to the **pumps**. This will tell you if the pumps are the problem or if something else is wrong. The pumps will be running at full speed, so don't leave them connected this way for long.

Use the **Test** connector on the **Power** pigtail to test the voltage under load.



The **Green Power light** should be on when the EPD is receiving power from the battery.

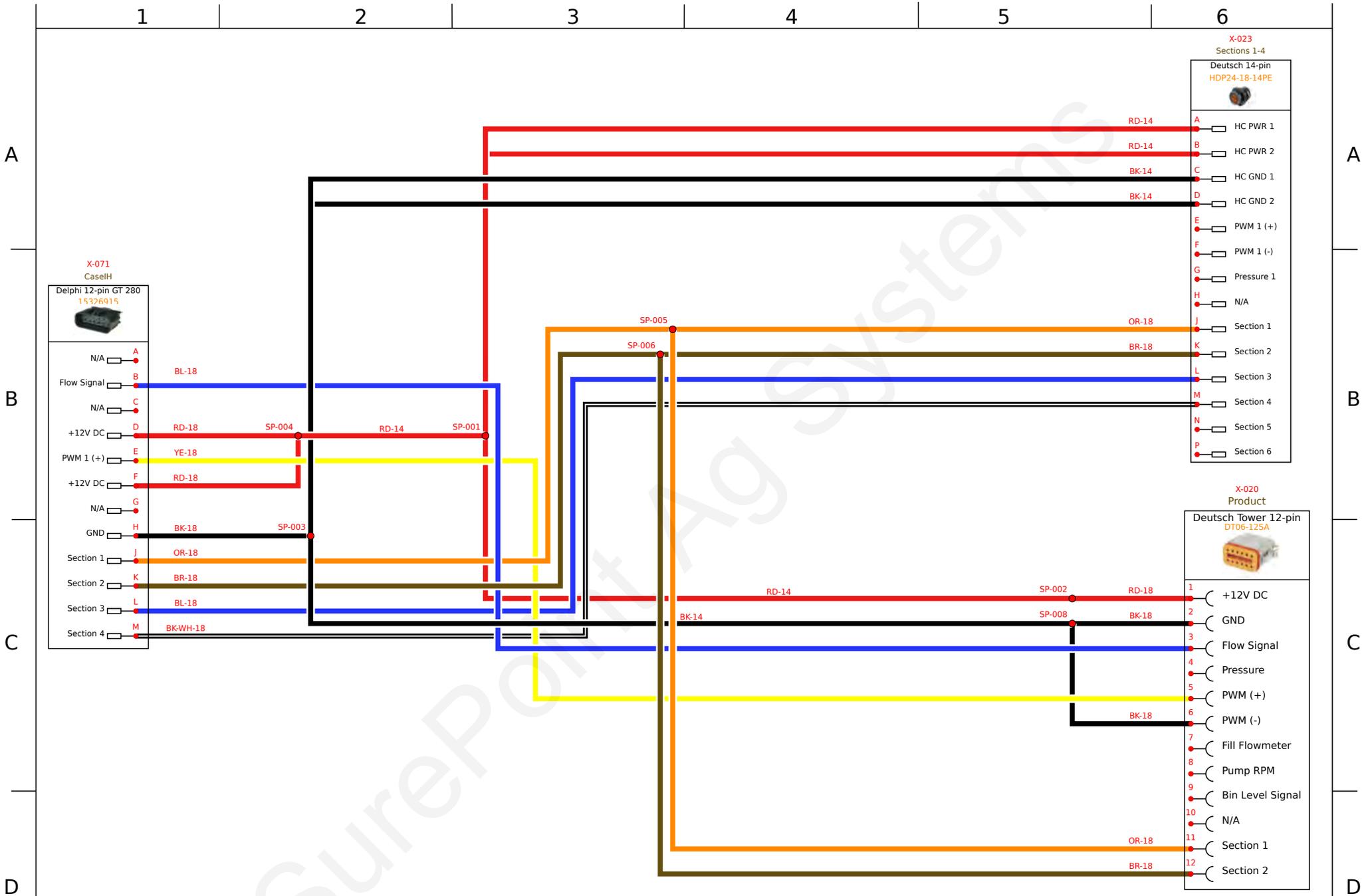
The **Blue PWM light** should be on when the EPD is receiving a PWM signal from the controller.

EPD Power Harness PN 205-3118Y1 (20 feet) - **connect to tractor battery.** This is 6 AWG wire. This has a 40 AMP fuse.

Use **EPD Power Harness Extensions** as needed

(These have Anderson Connectors)		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	





DESCRIPTION
 CaselH 1200 Series Planter ECU Fertilizer Adapter 12-Pin Product and 14-Pin Sections

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PART NUMBER
 201-2149Y4

MODIFIED BY
 Matthew Fritz

REV
 A-02

MODIFIED DATE
 2022-06-30

DRAWN BY
 mfritz

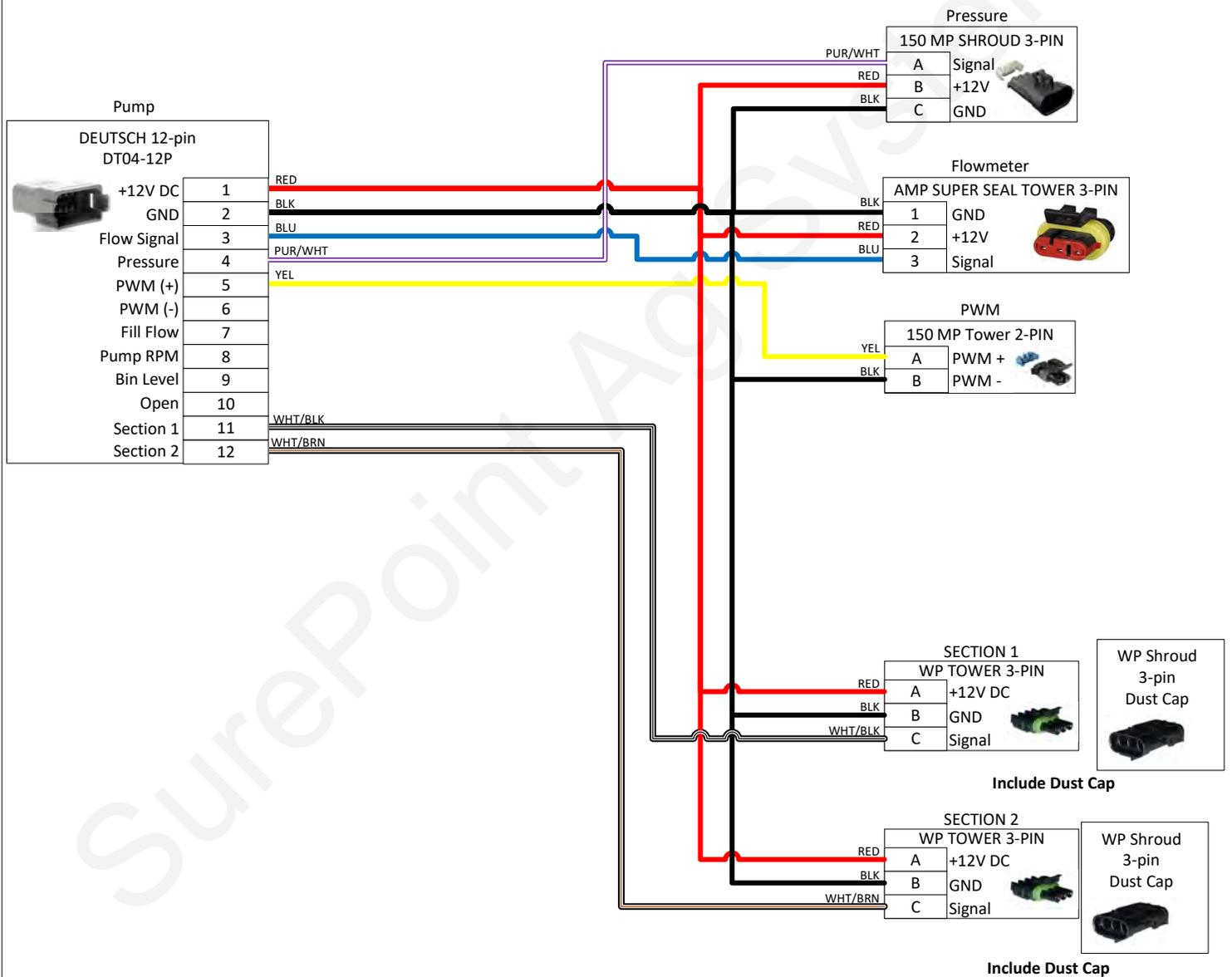
SIZE
 A

DRAWN DATE
 2021-11-17

207-3461Y2

Final Cable for Tower With 1-2 Section Valves (pwm, flow, pres., sec 1, sec 2)

**Wire 18AWG
unless otherwise
specified**

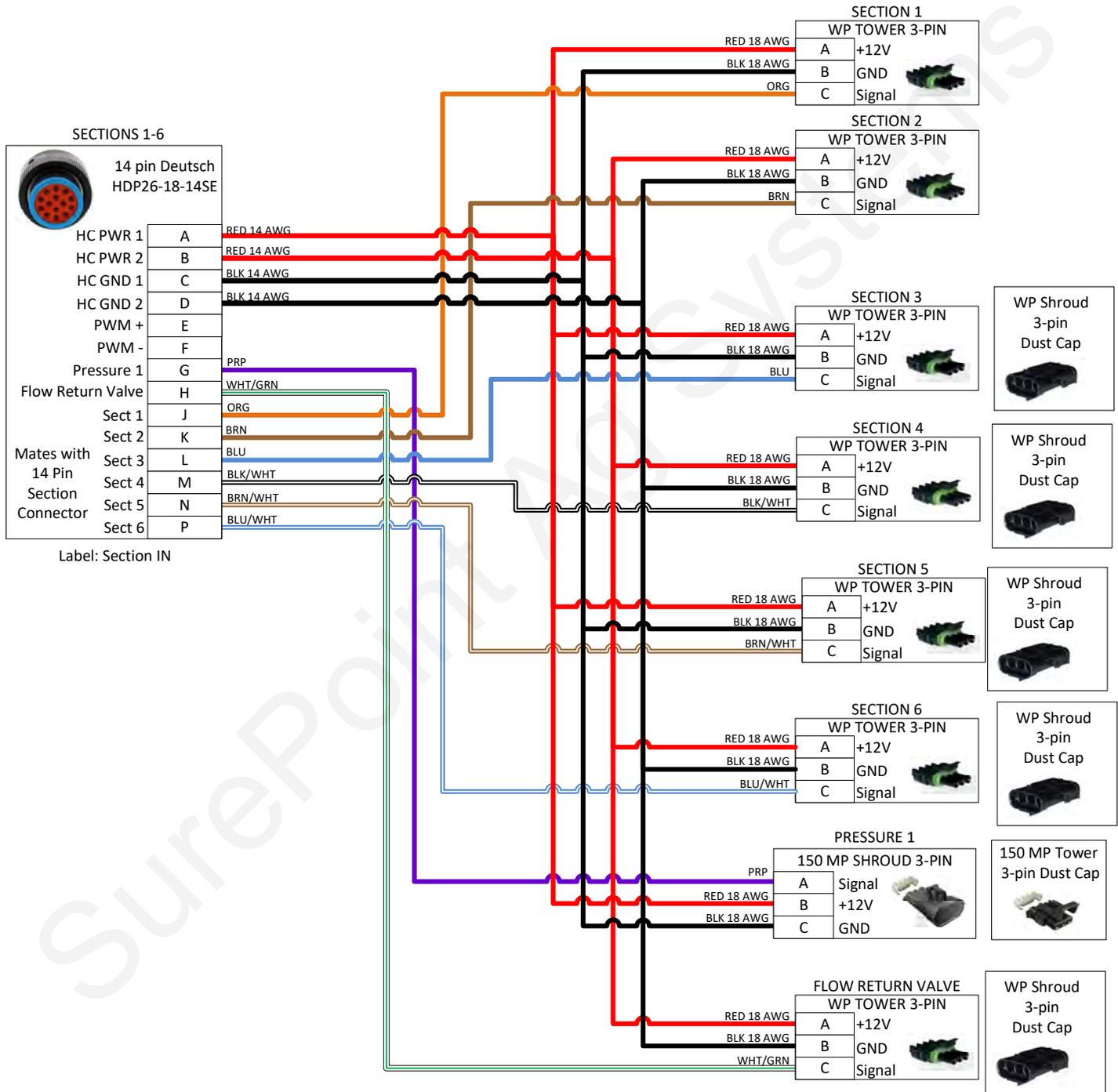


	Part No:	207-3461Y2	Drawn By:	Brandon Cavenee		
	Description:	Final Cable for Tower With 1-2 Section Valves (pwm, flow, pres., sec 1, sec 2)	Last Edit Date:	6/4/2021	Revision	A-04
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207-3463Y1

14-Pin 6 Section Final Cable (6 sections, flow return, pressure)

**Wire 18AWG
unless otherwise
specified**



	Part No:	207-3463Y1	Drawn By:	Brandon Cavenee		
	Description:	14-Pin 6 Section Final Cable (6 sections, flow return, pressure)	Last Edit Date:	6/4/2021	Revision	A-02
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Floating Ball Flow Indicators

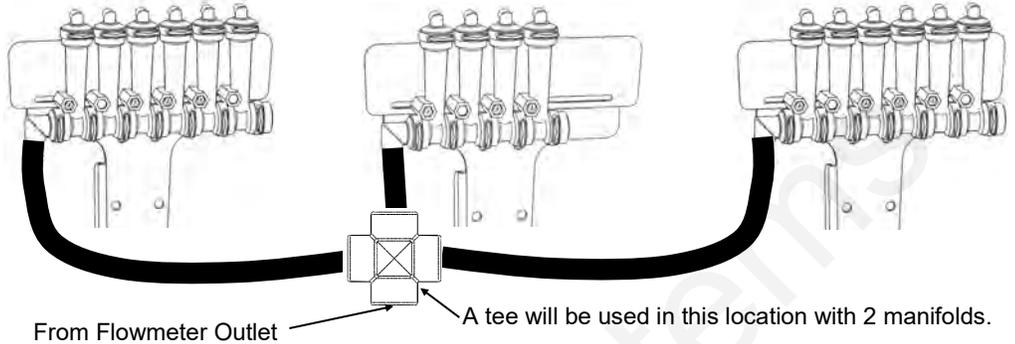
Flow Indicators are extremely flexible and can be mounted in hundreds of different configurations on various types of liquid application equipment. This page is to give you some ideas and let you customize the installation for what works best on your equipment.

E Installation Overview

16 Row

Split 6 - 4 - 6

This configuration works well on a 16 row front fold planter. Each flow indicator manifold is shown fed by a cross in a single section installation. Each manifold could be fed by a section valve if desired.

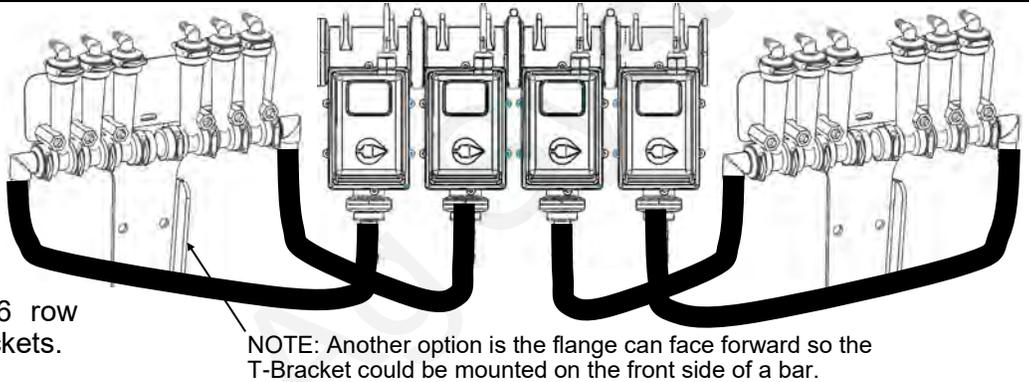


12 Row

Split 3 - 3 - 3 - 3

Shown here is a 12 row with four 3 row sections controlled by four section valves. Note each 6 row T-Bracket can hold two separate 3 row manifolds.

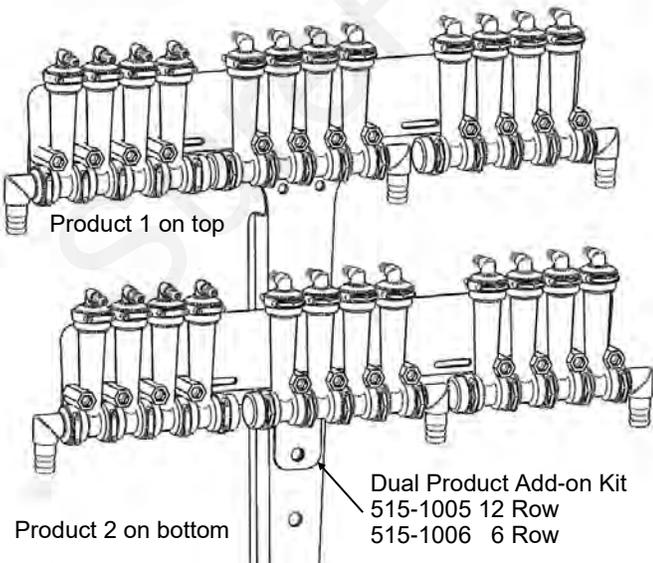
A 4 section 24 row could be similar with four 6 row manifolds on two large T-Brackets.



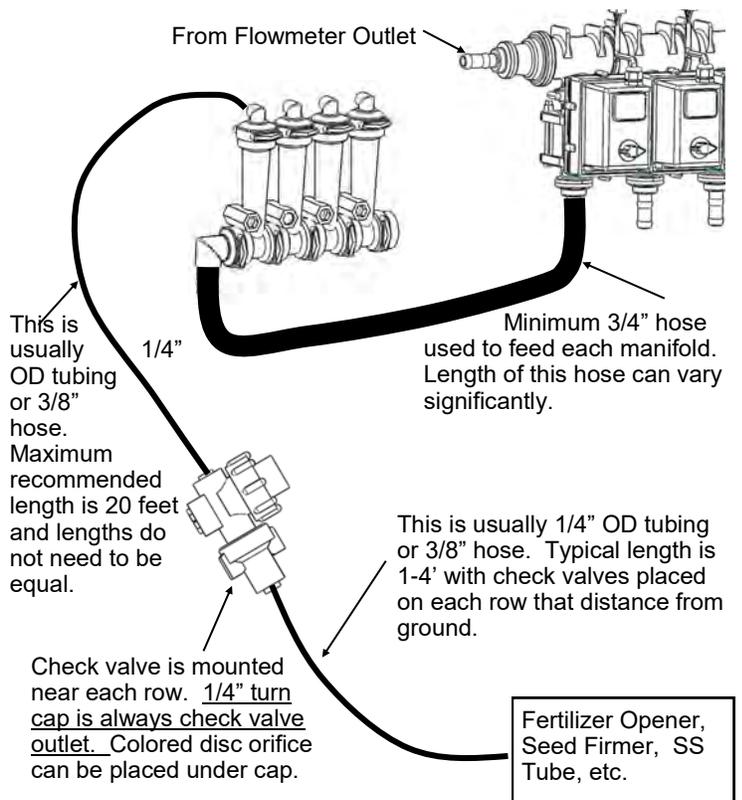
12 Row Dual Product

Product 1 Split 4 - 4 - 4 / Product 2 Split 4 - 4 - 4

In this case each manifold would be fed by a section valve. There would be 6 total section valves (3 sections X 2 products). Most often one set (top) of flow indicators would be Full Flow for high rate fertilizer and 2nd set (bottom) would be Low Flow for starter.

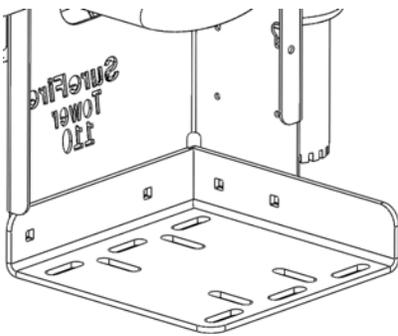


General Plumbing Guidelines

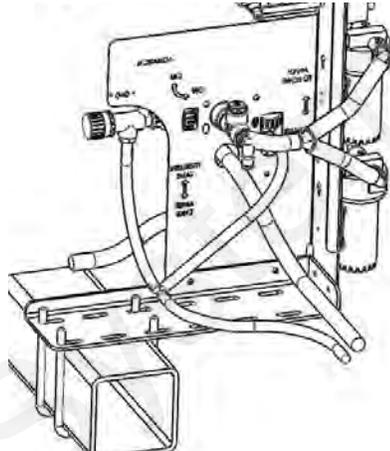


Tower 110 & 200 Mounting Options

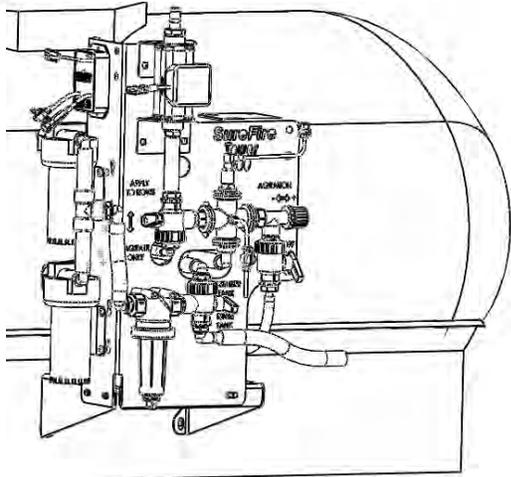
Tower Basic Mounting Bracket
Item Number:
511-1007 (8x16 hitch)
511-1008 (8x12 hitch)
 This kit includes a bracket to mount to the top side of a bar or hitch and mount the tower directly over that bar. It is often used on front fold planter hitches. U-bolts to mount to two common hitch sizes are included in the kits as labeled above.



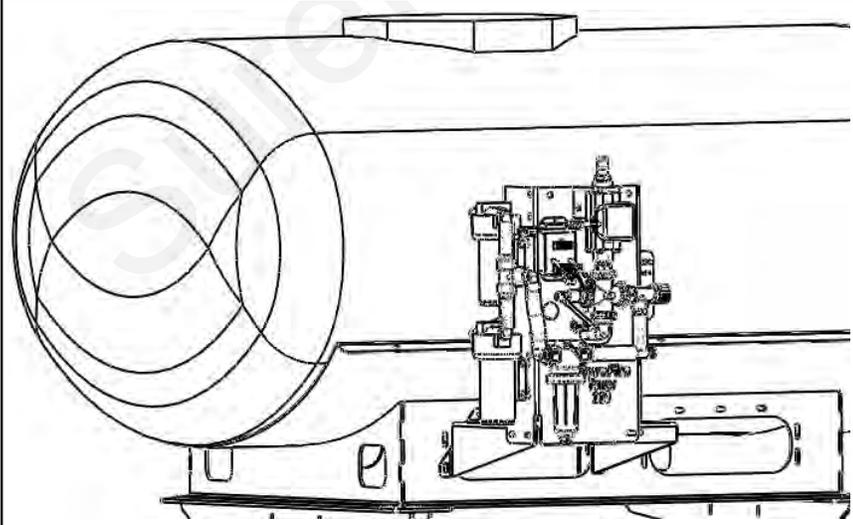
Tower Offset Mounting Bracket
Item Number 511-1010
 The Tower is available as a stand alone item. This kit includes a bracket to mount to the top side of a bar and hold the Tower. U-bolts are NOT INCLUDED. They must be ordered separately based on mounting bar size. Multiple slots allow the Tower to be mounted away from or directly over the bar.



Tractor Front Mount Elliptical Cradle Tower Mounting Bracket
Item Number 511-1009
 Mounts a Tower directly to the front of tractor front mount 200 & 300 gallon elliptical tank cradles. This bracket will mount the back of the tower just over 4 1/2" forward of the flat bracket mounting face. When using a tractor mounted tank, SurePoint recommends mounting the Tower near the tank, not back on the implement. Electric pumps work better to push the liquid than to suck the liquid a long distance into the pump inlet.



500 Gallon Elliptical Cradle Tower Mounting Bracket
Item Number 526-10-200500
 Mounts a Tower directly to the side of the SurePoint 500 gallon elliptical tank cradle. This bracket will mount the back of the tower just over 9" forward of the flat bracket mounting face.



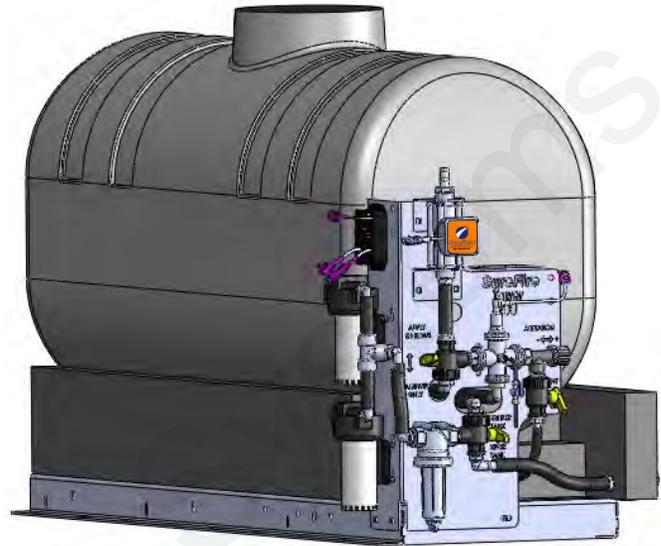
Accelerator with Tower 200 Pump Panel



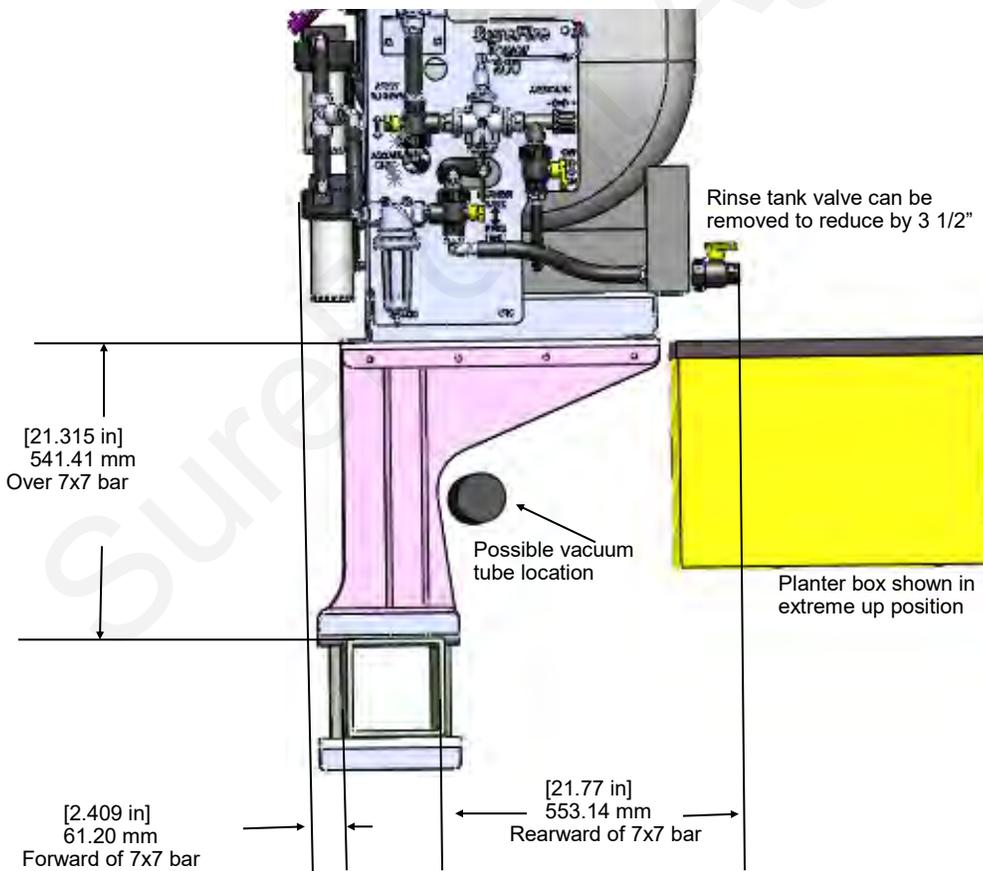
The Accelerator is a completely assembled and tested fertilizer system. It has a 55, 110, or 155 gallon tank resting in a custom molded tank base that doubles as a rinse water tank. This bolts to a steel frame with eighteen 5/8" mounting slots for flexible mounting to fit many situations. The Tower 200 is often used with the accelerator to work with the rinse tank base.

Dimensions:

- 55 Gallon: 27" W x 54" L x 36" T
- 110 Gallon: 28" W x 72" L x 36" T
- 155 Gallon: 28" W x 72" L x 46" T



Accelerator Z Mount Kit (fits 5" to 7" wide bars, included bolts fit 7" tall bar) Item Number 526-01-100300

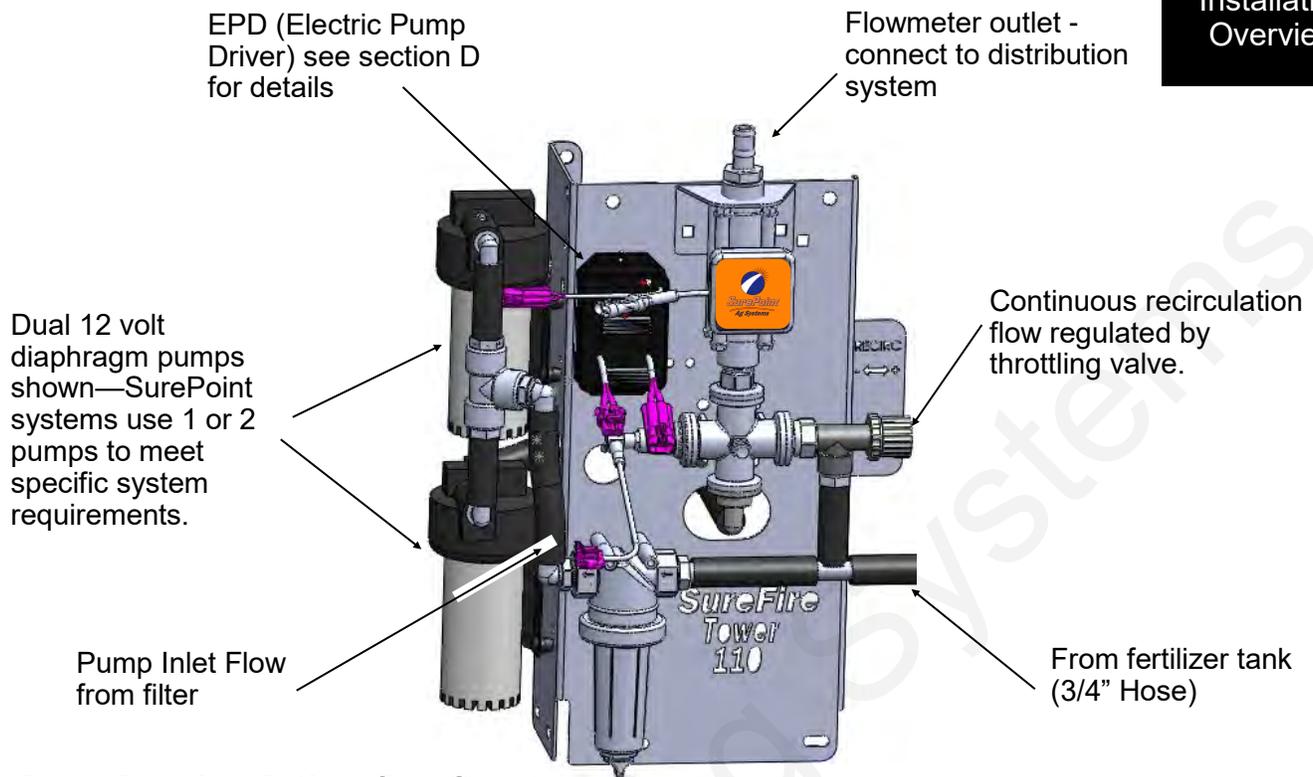


This mount kit includes two welded brackets to mount any of the 3 sizes of accelerator tanks above and offset from the 7x7 planter toolbar as shown.

Tower 110 Plumbing Overview & Valve Operation

E

Installation
Overview



Do I need recirculation flow?

Recirculation flow allows the pump(s) to run faster than if the total pump flow was applied to the ground. This is helpful when operating at very low flow rates. On a Tower 110 equipped with two 5.3 GPM pumps, you likely will NOT open the recirculation valve if applying over 1.5 GPM to the ground.

How to use the Recirculation Adjust Valve:

Follow these steps to set the agitation adjust valve after your system is primed and tested:

1. On the Pro 700 display enter your field operating speed (default speed) and target rate. Turn your master switch on. The system will now operate at your Target Rate and Test Speed.
2. Start with the recirculation adjust valve completely closed and note the slow pump speed (by pump noise).
3. Open the agitate adjust valve slowly and note the increased pump speed and noise. The system is applying the same amount to the ground, the pumps are now running faster due to more recirculation flow.
4. Set the valve to somewhere in the middle based on visual observation of agitation flow needed.
5. On your display, verify the system has locked on to application rate at your agitation valve setting.

Troubleshooting:

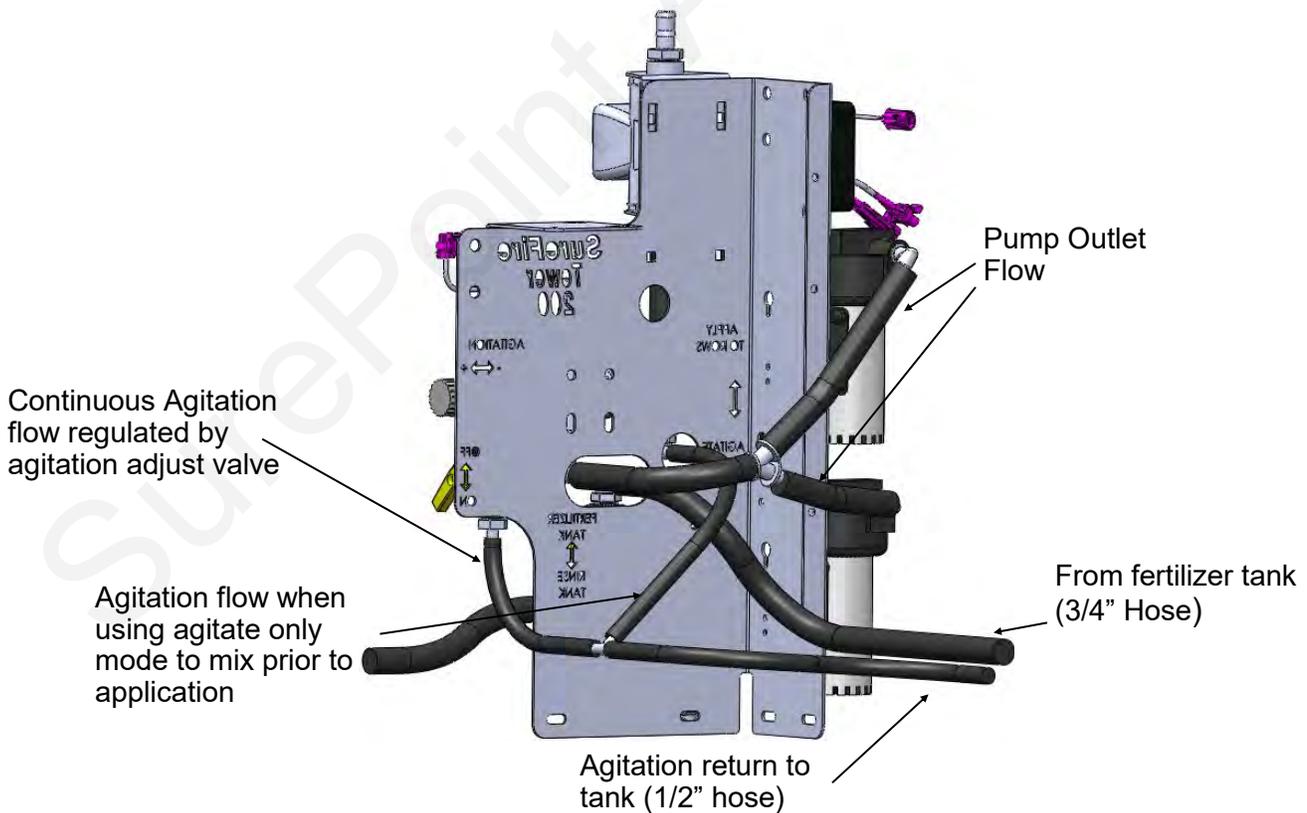
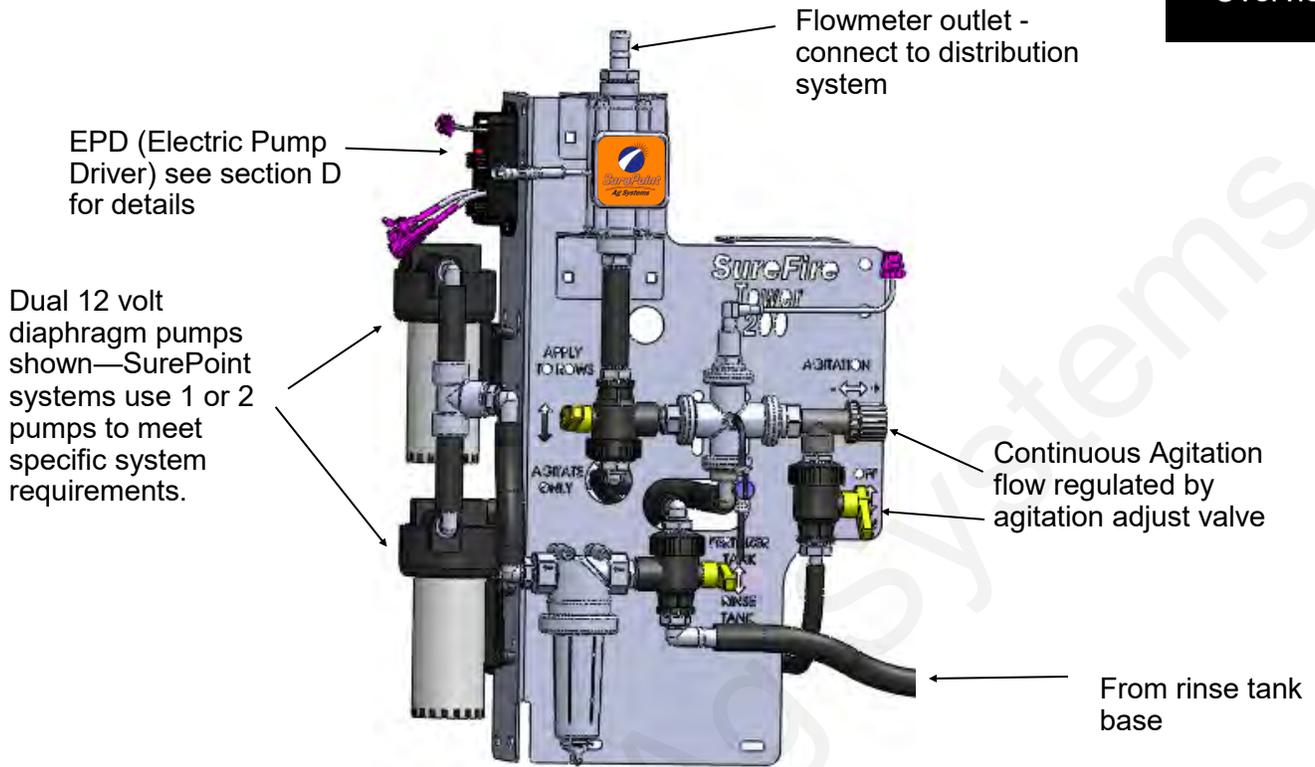
- If the system is applying a rate lower than your target, you need to close the agitation adjust valve some.
- If the system is applying a rate higher than you want and will not lock on rate, you need to open the agitation adjust valve some.
- If the rate is still fluctuating around your target and you have a two pump system, unplug one pump. At low flows, one pump may deliver the needed rate and produce a more stable flow.

What if my product needs agitation?

- Tower Electric Pump systems can provide minimal agitation. On the Tower 110, simply remove the tee located below the recirculation valve. Connect the main hose from product tank to the filter and connect the tank agitation hose to the recirculation valve.

Tower 200 Plumbing Overview

E Installation Overview



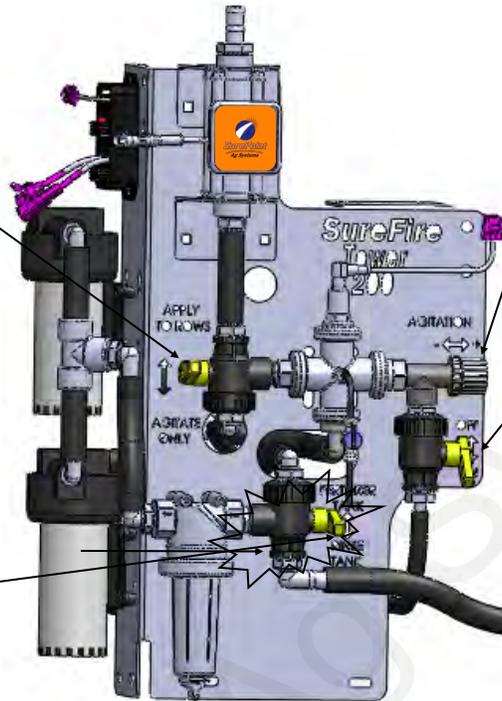
Tower 200 Valve Operation

E

Installation
Overview

System Mode Valve: This valve selects if you will apply to the rows. Valve must be in the **up position for field operation**. Move down to Agitate Only for tank mixing prior to field operations.

Tank Selection Valve: This valve selects if product is pulled from the fertilizer tank or rinse tank. **For field operation the valve must be up**. Move down to Rinse Tank to flush fertilizer system.



Agitation Adjust Valve: This valve adjusts how much flow returns to the tank while working in the field.

Agitation On/Off Valve: This valve will shut off agitation flow without the need to move the agitation adjust valve. **This valve must be closed when rinsing the system with product still in the fertilizer tank. If not closed, the rinse water will be injected into the fertilizer tank through the agitation line.**

How to use the Agitation Adjust Valve:

Agitation or recirculation flow serves two purposes. First, it mixes products that will separate. Second, it allows the pump(s) to run faster than if the total pump flow was applied to the ground. The pump(s) will become difficult to control if they are operated at the slowest speed possible. By circulating product back to tank, the pump(s) will run faster, producing a more stable flow.

Follow these steps to set the agitation adjust valve after your system is primed and tested:

1. On the display enter your field operating speed and rate. Turn your master switch on. The system will now operate at your Target Rate and Test Speed.
2. Open the Agitation On/Off valve.
3. Start with the recirculation adjust valve completely closed and note the slow pump speed (by pump noise).
4. Open the agitate adjust valve slowly and note the increased pump speed and noise. The system is applying the same amount to the ground, the pumps are now running faster due to more recirculation flow.
5. Set the valve to somewhere in the middle based on visual observation of agitation flow needed.
6. On your display, verify the system has locked on to application rate at your agitation valve setting.

Troubleshooting:

- If the system is applying a rate lower than your target, you need to close the agitation adjust valve some.
- If the system is applying a rate higher than you want and will not lock on rate, you need to open the agitation adjust valve some.
- If the rate is still fluctuating around your target and you have a two pump system, unplug one pump. **At low flows, one pump may deliver the needed rate and produce a more stable flow.**

Liquid Setup with Pro 700 Planter ECU Software

F Setup & Operation

See the AFS Pro 700 Planter Software Operating Guide for additional screenshots and full explanation of all these items. This information covers a typical setup. Your setup may differ. Always use the latest software versions. See your Case (New Holland) dealer for information on this.

This page is a summary setup guide. The following pages provide more screenshots.

1. Liquid Product Setup (Home > Toolbox > Product)

A. Product Name

B. **Form**—must be **Liquid**

C. **Usage**—Select the appropriate usage (such as Fertilizer)

D. **Default App Rate—Units** (probably gal/ac)

E. **Default App Rate**—set your normal **Target Rate**

F. **Delta App Rate**—how much you want the rate to change if you press the increase or decrease arrows

G. **Min App Rate**—Can set this at 0 or can set it at a rate you do not want to go below.

H. **Max App Rate**—Set at a rate you do not want to go above.

I. That is all the numbers that need to be set for most liquid product applications.

2. **Work Condition > Planter Operation Setup > Boost Level > set at 150%** (this gives the pump a “kick-start” for 4 seconds when starting. If this seems to be too much, lower it.)

3. **Liquid Controller Setup—Work Condition > Control > Controller > Liquid** (some of the rate information may have been set up in the Liquid Product Setup earlier)

A. **Cal Value (L)** —for SurePoint hydraulic pumps with electromagnetic flowmeters use **660**.
—for SurePoint electric pumps with electromagnetic flowmeters use **990**.

(Explanation—This is looking for a flow calibration number in pulses per 10 liters. Your system should have a 201-14226 Divide by 8 harness plugged into the flowmeter. This is necessary to get the flowmeter pulses in a range that this controller can work with.)

B. Leave **Product Delay at 0.7 sec** unless field use dictates a change.

4. **Liquid Fertilizer Calibration (Test the system from these screens, also) Work condition > Liquid**

A. Scrolling through these screens, confirm Liquid Cal Value, Row Width, Section Rows. Can Prime the system here. Follow the instructions on the screens, enter a Liquid Default Rate and Speed, press Run, press and hold the button on the calibration tether. The fertilizer pump should start running. A catch test can be done here to verify proper setup, or the system can be run from here to test different speed and rate setups. (Note: If testing with water, the pressure will be much less than it will be with fertilizer. With water there may not be enough pressure to open all the check valves, so flow may be uneven or some rows may not be flowing.)

5. **Planter Advanced Setups—Toolbox > Config > Advanced Setups > Yes**. Then press the **Adv.Set** icon on the navigation bar. **Liquid Gain >** for hydraulic pump, set at 8. Leave at 15 for electric pumps. Adjust as needed in the field.

6. Items for **Run Screen (Home > Toolbox > Layout)—Liquid Ctrl** —This has the Target Rate. Pressing on this brings up arrows to decrease or increase the rate. Also, can toggle liquid application ON or OFF here.

7. Also for **Run Screen—Liquid**—reports continuous applied rate for the entire planter.

Liquid Flow—to monitor the average flow rate (gpm) for the entire planter.

Master Control—needs to be placed somewhere on Run Screen of Left Area. This controls all product application for the planter—seed, liquid, and granular fertilizer.

Section Control (1-2, 3-4, as needed)

8. Layer and Prescription Assignment—**Work Condition > Layer**—set up as desired. (Typical setup—Layer 1—Seed, Layer 2—Liquid)

Planter Configuration Setup

Check with your Case (New Holland) dealer about the latest software versions available.

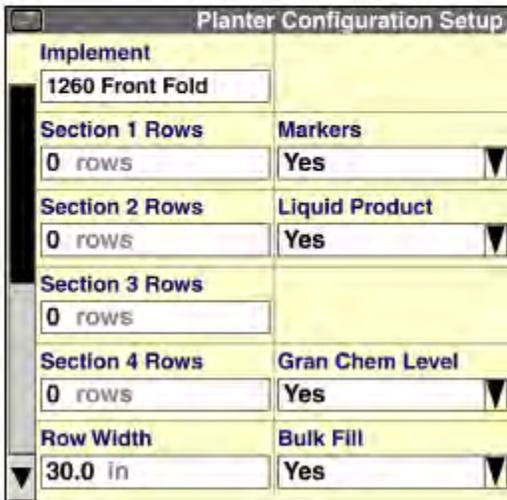


Config.

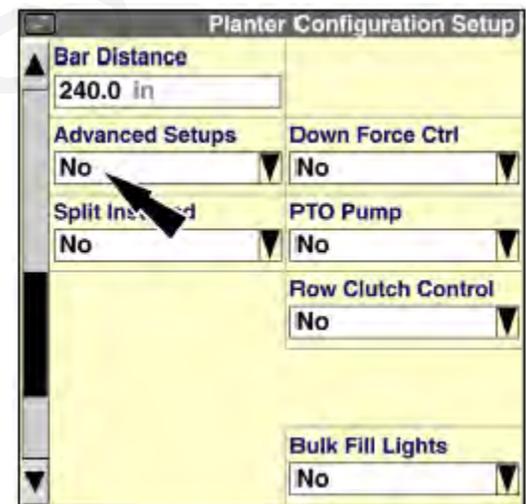
Liquid Section arrangement must be the same as Seed arrangement. See chart below for various planter section configurations.

Table 1: Hydraulic drive planters

	Sect 1 rows	Sect 2 rows	Sect 3 rows	Sect 4 rows
8 row trailing rigid	8	-	-	-
12 row front fold *	6	6	-	-
16 row front fold *	8	8	-	-
24 row front fold *	12	12	-	-
36 row front fold (508 mm (20 in) and 559 mm (22 in) spacing) *	18	18	-	-
12 row 76.2 cm (30 in) pivot-transport *	6	6	-	-
16 row 76.2 cm (30 in) pivot-transport *	8	8	-	-
12 row mounted stacker **	6	6	-	-
16 row mounted stacker **	4	8	4	-
12/23 split row pivot-transport ***	5	7	6	5
16/31 split row pivot-transport ***	7	9	8	7
24 row 50.8 cm (20 in) pivot-transport ***	6	6	6	6
32 row front fold	8	8	8	8
36 row front fold (762 mm (30 in) spacing)	9	9	9	9



Advanced Setups will need to be set to YES if it is necessary to adjust the GAIN setting. This will be necessary on the hydraulic system; probably not necessary on an electric system. Advanced Setups will be explained later.



Overlap



Overlap Control and **Boundary Control** must be ON for automatic section control on overlap and boundaries.

Refer to the AFS Pro 700 Planter Software Operating Guide or other Case IH publication for complete setup and operating instructions. Screenshots shown here are for typical liquid setups. Your setup may vary. Adjust as necessary in the field.

Product Setup

F

Setup & Operation



Product



Either Select a Product from the list or create a NEW product.

Product Setup	
Product Name	Form
18-10-10	Liquid
Usage	
Fertilizer	
Default App Rate	Delta App Rate
18.000 gal/ac Units	0.000 gal/ac
Min App Rate	Max App Rate
0.000 gal/ac	0.000 gal/ac
Package Size	RX Scale Factor
0.000 gal Units	1 : 1.0000
Product Density	
0.000 lb/gal Units	

Typical Product Setup Entries for Liquid Product

Form

Liquid

Usage

Fertilizer

Units

gal/ac

Default App Rate

set as desired

Delta App Rate

how much the rate changes each time you press the increase or decrease arrow on a Liquid Control window

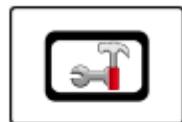
Min App Rate

Set the range as desired for Min and Max

Max App Rate

On most setups, Package Size, RX Scale Factor, and Product Density are not needed.

Container Setup—Optional



Contnr

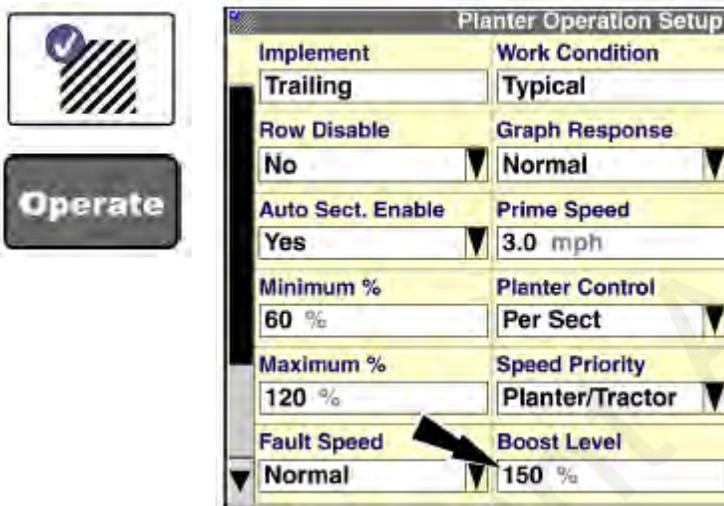
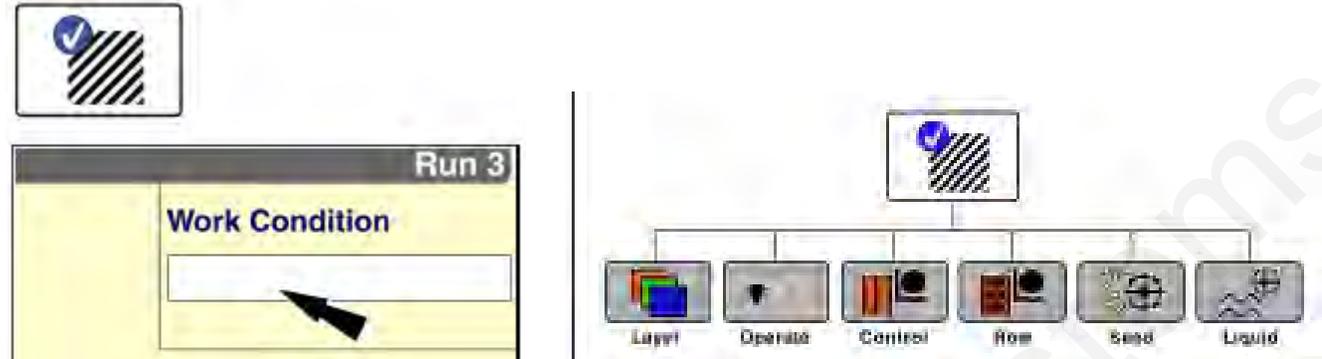
Layer Assignment	
Work Condition	Typical
Layer 1	Seed
Product 1	Container 1
Corn	Bulk hopper
Layer 2	Liquid
Product 2	Container 2
18-10-10	Front tank

Refer to the AFS Pro 700 Planter Software Operating Guide or other Case IH publication for complete setup and operating instructions.

Screenshots shown here are for typical liquid setups. Your setup may vary. Adjust as necessary in the field.

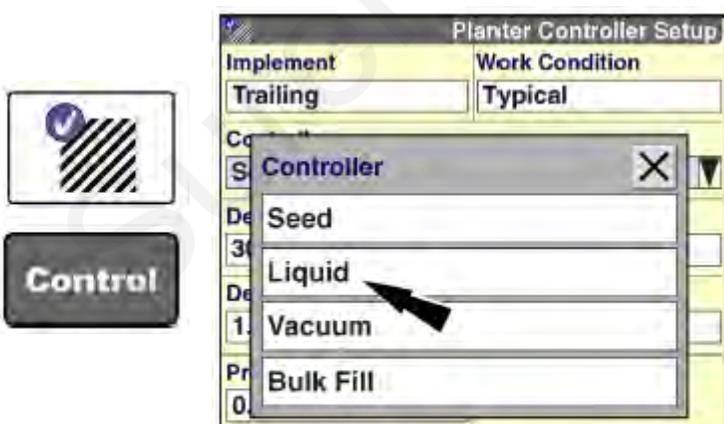
Work Condition

There must be a Work Condition set for each operation. The Work Condition stores the Layer Assignment, Planter Operation Setup, Planter Controller Setup, Row Setup, Seed Calibration, and Liquid Calibration setups for that operation. Changing from one Work Condition to another can instantly change a few or most of the selections for all windows on the screens.



Boost Level determines the startup boost level for the liquid fertilizer pump. This is a 4-second boost on startup to fill the lines and get to target rate. 150% is a good starting point. With this setting, the controller briefly brings the pump to 150% of the target rate and then returns to the target. Adjust as desired in the field.

Liquid Controller Setup—see below. The Cal Value is for pulses per 10 liters. The numbers listed are for the SurePoint electromagnetic flowmeters typically used with hydraulic and electric systems. **The number listed requires having a 201-14226 “Divide by 8” adapter plugged into the flowmeter.**



Cal Value (L)
660 for hydraulic
990 for electric

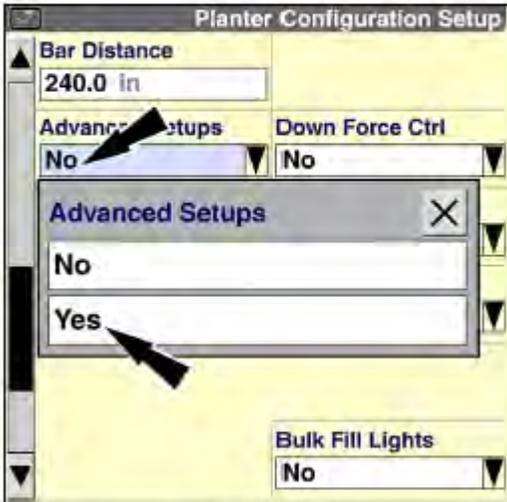


Refer to the AFS Pro 700 Planter Software Operating Guide or other Case IH publication for complete setup and operating instructions. Screenshots shown here are for typical liquid setups. Your setup may vary. Adjust as necessary in the field.

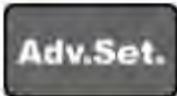
Advanced Setups — Liquid Gain



Advanced Setups— This is needed to adjust the Gain on the liquid pump. This is typically not needed on electric pump systems. It will be needed on hydraulic pump systems.



Toolbox > Config > Advanced Setups > Yes > Adv.Set. > Liquid Gain



Planter Advanced Setups	
Implement	Clutch Output Offset
Trailing	0
Seed Sect 1 Gain	Liquid Gain
15	15
Seed Sect 2 Gain	Vacuum 1 Gain
15	15
Seed Sect 3 Gain	Vacuum 2 Gain
15	15
Seed Sect 4 Gain	Bulk Fill Gain
15	15

Liquid Gain

Hydraulic system 8

Electric system 15

Adjust as needed in the field.

Refer to the AFS Pro 700 Planter Software Operating Guide or other Case IH publication for complete setup and operating instructions.

Screenshots shown here are for typical liquid setups. Your setup may vary. Adjust as necessary in the field.



Liquid Fertilizer Calibration Procedure



Work Condition > Liquid (Set Liquid Cal Value, Vacuum Control and Bulk Fill Ctrl)

Planter Liquid Cal

Select or create a Work Condition. A Work Condition is a group name for setup and calibration values. You can also manually enter the Cal Value here.

Implement	Work Condition
Planter	Typical

Liquid Cal Value (L)

660 or 990

Start with 990. Test, verify, and adjust as needed.

Help Next

Planter Liquid Cal

Turn on the vacuum and bulk fans (if equipped). Use the Prime button to fill the applicator lines with liquid. Run fans at intended speed.

Vacuum Ctrl

20.0 in h2o

Bulk Fill Ctrl (A)

3000 rpm

Help Main Back Next

Press and Hold PRIME to run the pump and fill the lines

Enter Default Rate and Speed



Planter Liquid Cal

Enter the intended planting rate and speed. Enter the Cal Value from the tag found attached to the flow meter or stamped on the flow meter itself.

Liquid Default Rate	Speed
18.0 gal/ac	5.0 mph

Liquid Cal Value (L)

660 or 990

Help Main Back Next

Navigate through the screens. Confirm or enter information as needed.

Planter Liquid Cal

Press the Run button. Press the tether switch until measured flow is displayed and stable. Collect 1 minute samples from several nozzles. Press Run button when done.

Start/Stop

Run

Target Per Nozzle	Measured
0.455 gpm	0.478 gpm

Help Main Back Next

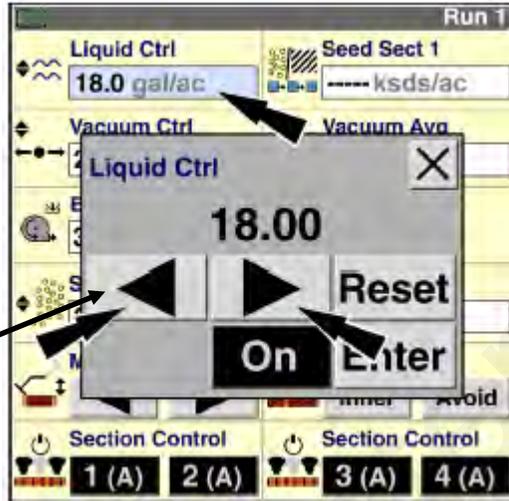
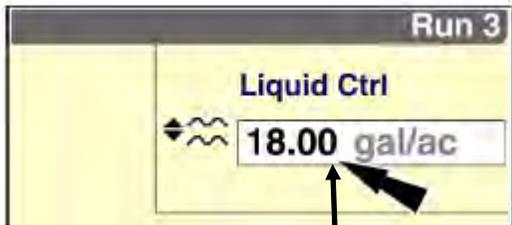
The pump should be running. Liquid should be flowing. A catch test can be done to verify flowmeter setup and operation.
Note: If testing with water, the pressure will be much less than it will be with a fertilizer product. With water, there may not be enough pressure to open all the check valves. Rows may be flowing unevenly or some rows may not be flowing at all. Increase the rate with water to increase the pressure and get more even flow.

Refer to the AFS Pro 700 Planter Software Operating Guide or other Case IH publication for complete setup and operating instructions.

Screenshots shown here are for typical liquid setups. Your setup may vary. Adjust as necessary in the field.

Run Screen Items (Run Screen can be set to operator's preference)
 Home > Toolbox > Layout (to set up items on a Run Screen)

Liquid Control Window



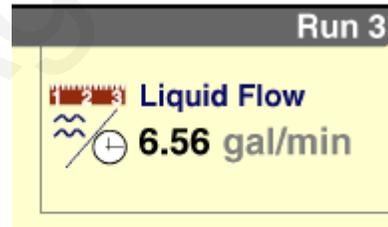
Press the window on Liquid Ctrl to bring up this box.
 Press left arrow to decrease rate.
 Press right arrow to increase rate.
 Press Reset to return to Default rate.

Press the On button to toggle liquid application ON or OFF.
 Press the Enter button to save the change and close the window.

Liquid Fertilizer Application Monitoring

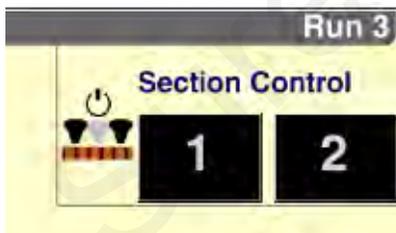


“Liquid” reports the continuous average applied rate.



“Liquid Flow ” reports the average liquid flow rate.

Section Control Windows



BLACK — ON
GRAY — OFF



The number of sections available is determined by the planter type.
 Liquid application sections must match planter seed sections.

Refer to the *AFS Pro 700 Planter Software Operating Guide* or other Case IH publication for complete setup and operating instructions.
 Screenshots shown here are for typical liquid setups. Your setup may vary. Adjust as necessary in the field.

Troubleshooting—Fault Codes (from Pro 700 Planter Software Operating Guide)

G

Troubleshooting

These are some of the more common codes that apply to the liquid system. See that publication for more Fault Code explanations.

nn—(typically 01) for example, 14nn1 will probably show on your screen as 14011.

7nn1—Liquid PWM Fault—Rate ECU detected a problem and disabled the liquid controller—review the fault log for details.

8nn1—Liquid Rate Fault—Liquid application rate is out of range. Possible issues:

1. Distance calibration is not correct.
2. Liquid metering calibration is not correct.
3. Hydraulic demand has exceeded the supply. Driving too fast or too slow. Commanded rate is too high or too low.
4. Bad liquid fertilizer flowmeter.
5. Faulty rate controller.

14nn1—Liquid max duty fault—Liquid controller is at maximum (100%) output. Possible issues:

1. Hydraulics not engaged.
2. Target rate is too high.
3. Driving too fast.
4. Indicated ground speed is incorrect.
5. Faulty flowmeter (or flow cal or width setting).
6. Inadequate hydraulic supply to the pump motor.
7. Faulty rate ECU.
8. Strainer is plugged or “slimed” over, or input to the pump is otherwise restricted.
9. Pressure is too high and pressure relief valve is opening.
10. Recirculation valve is open too far allowing too much recirculation and not enough flow to the flowmeter.
11. Weak hydraulic valve block solenoid or sticky proportional valve on hydraulic valve block is not allowing enough hydraulic flow to pump.
12. Faulty harnessing is not delivering PWM signal to hydraulic valve block or EPD.

15nn1—Liquid min speed fault—Liquid controller is at minimum design limit. Possible issues:

1. Target rate is too low.
2. Driving too slow.
3. Indicated ground speed is incorrect.
4. Faulty ground speed sensor.

16nn1—Liquid max speed fault. Liquid fertilizer controller at maximum design limit. Possible issues:

1. Liquid tank is empty.
2. Target rate is too high.
3. Driving too fast.
4. Indicated ground speed is incorrect.

22nn5—Rate ECU PWM output current below normal.

This may show up on electric pump systems with EPD. The EPD draws less current than the system is expecting to be drawn by a PWM valve. There is not a problem here if the system otherwise appears to be operating properly.

26192—Liquid valve cal lost—Rate ECU memory value lost. Default value used. Possible issues:

1. Low battery voltage (less than 9.8 v)
2. Poor power supply connections to the rate ECU.
3. Faulty internal rate ECU memory.

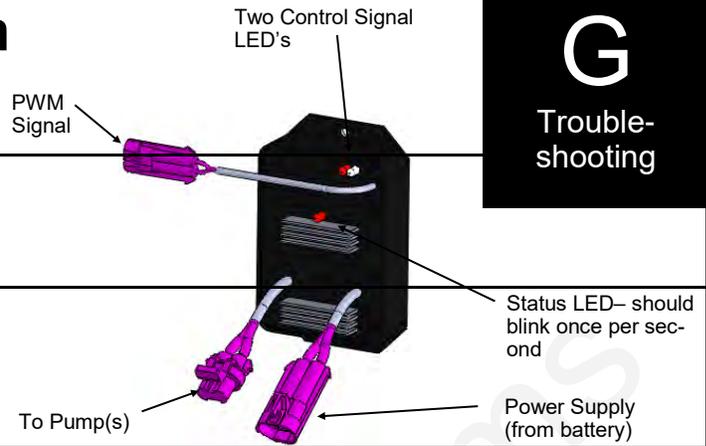
26232—Liquid gain lost—Rate ECU memory gain value lost. Default value used. See 26192 above.

Electric Pumps Won't Run

EPD Status Lights on Legacy 205-19024

G

Troubleshooting



Status LED	Status Description	Troubleshooting Steps
On Steady	Power input is good and PWM input Signal is detected	No Problem, Typical operating condition.
Steady Blink (1 hz— 1 blink/sec)	Power input is good and PWM signal is not detected.	Typical 'Off' Condition. If pumps should be on: 1. Inspect wiring and connectors 2. Check voltage at PWM connector to EPD, should be 1-12 volts to turn on. 3. Check voltage on PWM wires at 37 pin connector, pins 15&16.
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"> Check motor wiring
Three blinks, pause, three blinks, pause	Overcurrent condition	<ul style="list-style-type: none"> Check total load Clean cooling fins on EPD
Four blinks, pause, four blinks, pause	Input power fault. Low voltage condition in power to EPD.	Unplug battery power from EPD to reset. Check power cables and connections for quality. Must have clean solid connections directly to battery and harness wire must be heavy enough. Pump operating pressure and/or flow may be too high. 1. Check that flow required for application rate is within pumps capability. 2. Reduce System Pressure by: <ul style="list-style-type: none"> Look for any unintended restrictions or plugged rows Increase orifice size Open up larger tube or orifice if using dual check valve. Reduce ground speed or application rate
Five blinks, pause	Input frequency out of range.	Check PWM Settings on Rate Controller.
Control Signal LEDs (top corner)		
Light intensity varies	Off - No PWM Signal 100% brightness - Maximum PWM input signal	Red light in top corner should be on when PWM signal is received (system is applying product)

Electric Pumps Won't Run (continued)

G

Troubleshooting

Electric pumps will not turn on (Legacy EPD - 205-19024)

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 pumps 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 pumps).
2. Do the pumps run? If not, check the 40 amp fuse in the EPD harness near the tractor battery. Inspect harnesses and connections. If 2 pump system, plug pumps in by themselves to check both.

Electric pumps only run with 12 volts direct from battery

1. The Pro 700 does not allow for true Manual operation. The system can be run in Liquid Cal mode to test for PWM signal. Should be 6-13 volts at the PWM connector to the EPD module when the pump is being commanded to run. Use the wiring diagrams to check for voltage at the connections back to the Rate ECU Module.

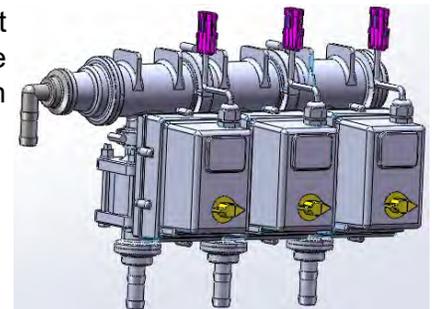
Section Valve(s) will not move

1. Use a voltmeter to check for constant 12 V power between pins A & B at the connector to the section valve. When the valve is commanded OPEN, there should be 12 V between pins B & C (ground and signal).

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

2. If one valve won't open, connect that valve to another section valve harness to see if the valve will open when the other section should open.

3. Connect the harness



Application Rate & Flow Troubleshooting

G

Troubleshooting

Application Rate Fluctuates

First, you need to determine if the fluctuation is caused by the controller sending fluctuating signals to the valve. The Pro 700 does not allow for true manual operation to help with this diagnosis.

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. Turn the system on and watch the flow in GPM on the 1,2,3 screen.
2. Is the flow steady within a very small range? For example a fluctuation from 2.3 to 2.5 GPM would be considered normal. A fluctuation from 2-3 GPM is a problem. If only a small normal fluctuation is seen, skip steps 3-6 and proceed to "Application Rate Fluctuates in Field " below.
3. If there is a large fluctuation, observe the system flow. Is the discharge a steady stream? Are the flow indicator balls floating steady?
4. If visually the flow is steady, but the display reports a fluctuation in GPM, inspect the flowmeter. See section B for flowmeter information.
5. If visually the flow is unsteady, the flowmeter is working correctly reporting a flow problem. Is the pump turning steady or surging?
6. Look for any type of obstruction in the pump inlet. Clean the strainer. If continually plugging the strainer, investigate fertilizer quality and necessary strainer size.

Application Rate fluctuates in field, but flow in manual mode is stable.

This problem indicates the PWM gain needs changed. The system is surging because the Control Module is "hunting" for the correct flow.

1. Go to Toolbox > Config > Advanced Setups > Yes > Adv.Set > Liquid Gain
2. Change the settings by reducing the Liquid Gain (move the gain 1 at a time; use smaller changes if needed).

Application Rate fluctuates in field, but flow in manual mode is stable.

This problem indicates the Liquid Gain needs changed. The system is surging because the Control Module is overshooting and "hunting" for the correct flow.

1. Go to Toolbox > Config > Advanced Setups > Yes > Adv.Set > Liquid Gain
2. Change the settings by reducing the Liquid gain.

No Flow shown on display but liquid is being pumped (Tap Test)

1. Unplug flowmeter. With voltmeter, check for 12 volts between pins B&C (red and black wires) of flowmeter connector (on main harness PN 3461Y2). 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 display while other person taps (use a short piece of wire or a paper clip) between pins A&C (blue and black wires) of flowmeter connector (on 3461Y2 harness). A flow value should show up indicating the wiring is not damaged.
3. If flow display 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.

Recommended Care and Maintenance

H

Maintenance
& Parts

Winterization

SurePoint recommends flushing your fertilizer 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.

Each individual pump should be able to produce more than 4 gpm of water flow with an open outlet (zero pressure). If pump falls short of this specification, replace to ensure a trouble-free fertilizing operation.

You can test the operation of each pump individually by unplugging one pump and running one pump at a time. Compare the output of each pump to each other and to the standard above.

Pre-season Service

(A little time spent here may prevent some downtime when you want to be rolling.)

1. Visually check entire system (hoses, fittings, harnesses, etc.) for any signs of wear or trouble.
2. On the display, recheck all setup screens (see Section F) to verify correct setup.
3. Fill system with water and run in Manual mode to verify components and system are in working order. (May need to open air bleed valve to prime pump the first time.)
4. Unplug one pump at a time to verify that each pump is operating as it should.
5. 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.
6. 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.
7. Remove and clean the strainer. Be sure strainer is tightened securely so it will not suck air.
8. Be sure all rows are flowing and that all metering tubes/orifices are open. (Note: It will take a higher flow rate with water to create enough pressure to open all the check valves.)
9. Run the system with a Default Speed and Target Rate to verify that system will lock on to a Target Rate.

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