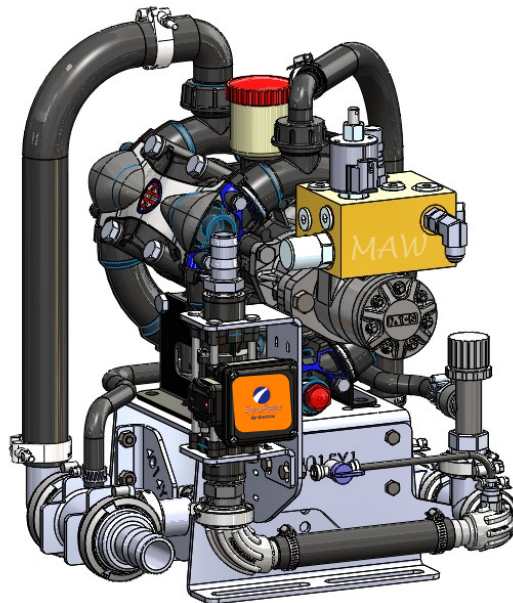


# 396-2861Y1



## ***PumpRight Fertilizer System for Case IH AFS® AccuControl With Pro 700 Display***



### **NOTICE**

*Operator should read this manual before operating the system.*

### **Maximum Pump Flow and Application Rates**

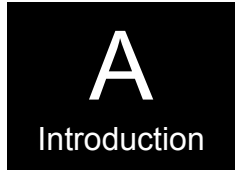
	Number of Diaphragms	Max Flow GPM	Max GPA on 40' at 6 MPH	Max GPA on 60' at 6 MPH
PR17	3	17	35	23.5
PR30	3	30	62	41
PR40	4	40	82	55
D250	6	55		75



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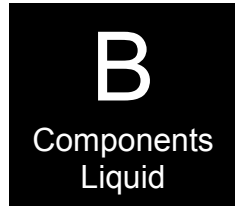
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# Safety

A

**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

This system uses hydraulic equipment with hydraulic fluid under extremely high pressure.

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.

Check out the SurePoint webstore.

<https://store.surepointag.com>

Anyone can look. Dealers with log-in credentials can see prices and place orders.



For support, go to:

<https://support.surepointag.com>

# General Description

You have purchased a SureFire fertilizer system for your equipment. This system will be controlled by your Pro 700 display and AccuControl control module. The rate controller will adjust the speed of the SureFire PumpRight hydraulic 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

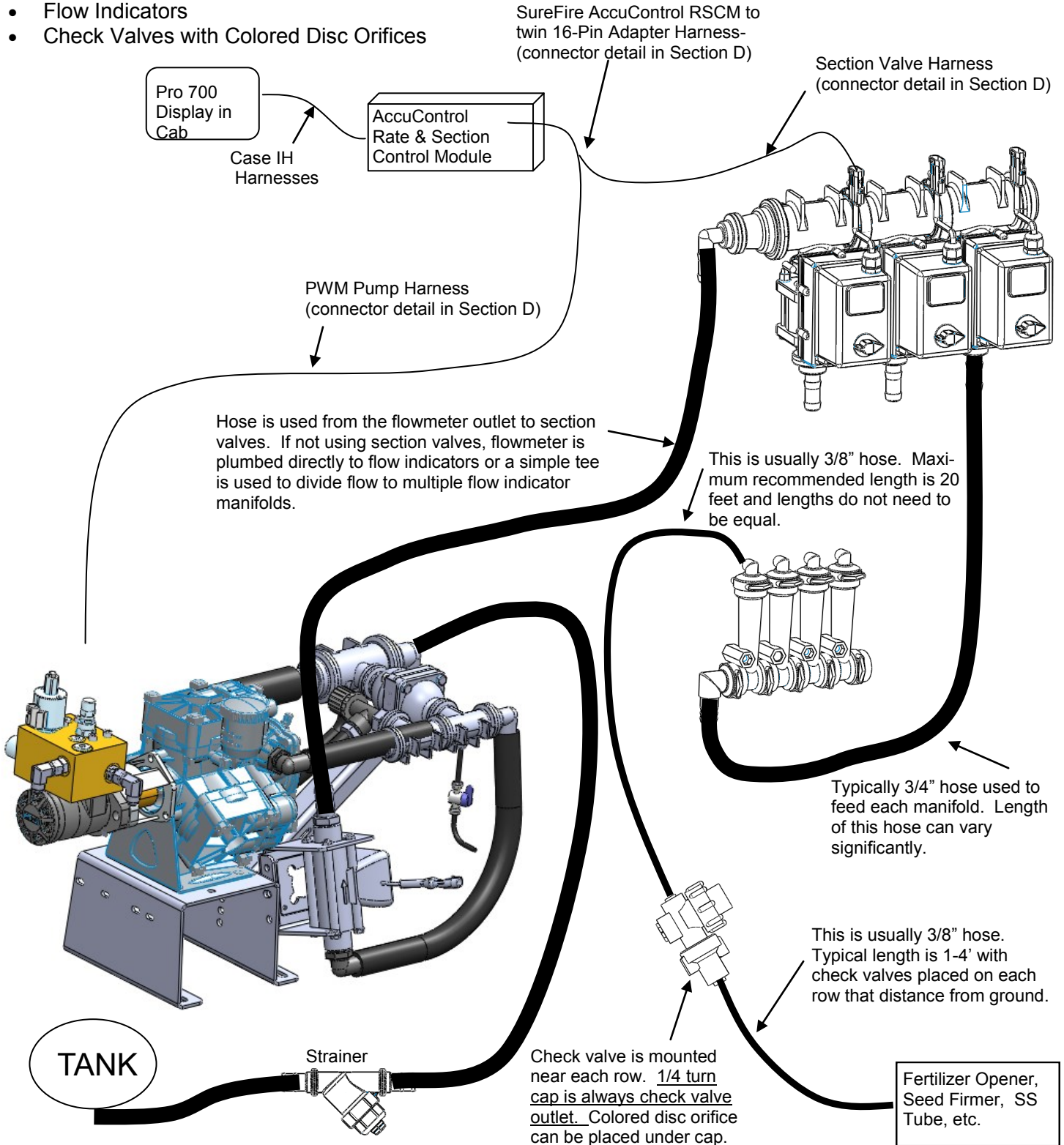
1. Install Pro 700 display, harnesses, and AccuControl™ Rate & Section Control Module.
2. Open the packages and familiarize yourself with the components. Refer to manual sections B, C & D for component information.
3. Mount the PumpRight pump and make hydraulic connections. See section E for hydraulic plumbing information.
4. Plumb the tank to the PumpRight 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 SureFire 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 AccuControl Manual for more information on the setup and operation of your Pro 700 AccuControl system.*

# System Overview Example

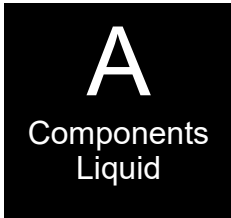
The following gives an example of a complete SureFire Fertilizer system with these components:

- Pro 700 Display
- AccuControl Field-IQ Rate & Section Control Module
- PumpRight D115
- Section Valves
- Flow Indicators
- Check Valves with Colored Disc Orifices



## PR17 & PR30 Electromagnetic Flowmeter Kits *Flowmeter only*

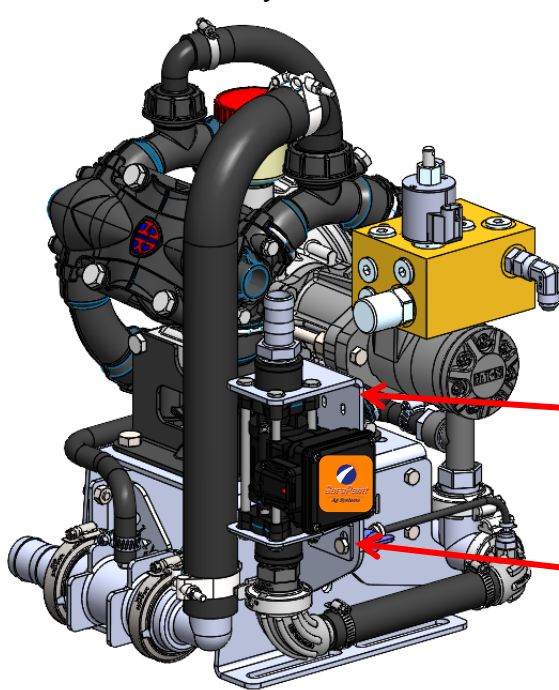
0.13 - 2.6 GPM	Item Number 500-02-2082 (PR17)	204-01-46211CUF00
0.3 - 5 GPM	Item Number 500-02-2085 (PR17)	204-01-46211CUF01
<b>0.6 - 13 GPM</b>	<b>Item Number 500-02-2090 (PR17 &amp; PR30)</b>	<b>204-01-46211CUF02</b>
<b>1.3 - 26 GPM</b>	<b>Item Number 500-02-2095 (PR30)</b>	<b>204-01-46211CUF03</b>



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

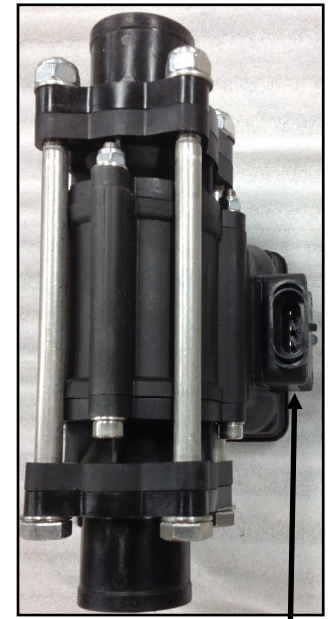
*-Before doing any arc welding on the implement, unplug the cable to the flowmeter, or damage to the flowmeter may result.*

*-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.*



Mounting Bracket,  
410-4015Y1 (QTY 1)  
(not used for PR40 and  
D250 Pump)

Mounting Bracket,  
400-3826Y1 (QTY 1)  
(not used for PR40 and  
D250 Pump)



The current version of the SurePoint Electromagnetic flowmeter has a black molded body and an orange sticker. The meter has a molded in 3-pin Superseal connector for improved sealing.

SurePoint has adapter harnesses available to adapt to other flow meter connections.

Amp SuperSeal 3-pin connector

*Use adapter 201-17842 to connect to 3-pin MP harness*

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 less sensitive to viscosity or density of the fluid measured. They are generally extremely accurate using the standard calibration number. **SurePoint still recommends you perform a catch test to verify the system is properly installed and configured. Adjust the flow cal as needed based on accurate catch tests with the actual product or observation of gallons applied and acres worked.**

Flowmeter Model	Pulses per gallon	FPT Size	Hose Barb In kit
0.13 - 2.6 GPM	3000	3/4"	1"
0.3 - 5 GPM	3000	3/4"	1"
<b>0.6 - 13 GPM</b>	<b>2000</b>	<b>3/4"</b>	<b>1"</b>
<b>1.3 - 26 GPM</b>	<b>2000</b>	<b>1"</b>	<b>1"</b>

The flowmeters will accurately read higher than the rated range.

Earlier model flowmeters (gray meters with white labels with black text) have different calibration numbers. The flow cal number (pulses per gallon) is printed on the serial number sticker on the side of the flowmeter.

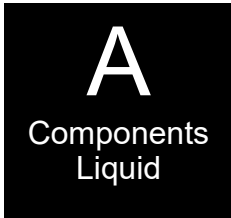


# PR40 & D250 Electromagnetic Flowmeter Kit Flowmeter Only

2.6 - 53 GPM

Item Number 500-02-2080

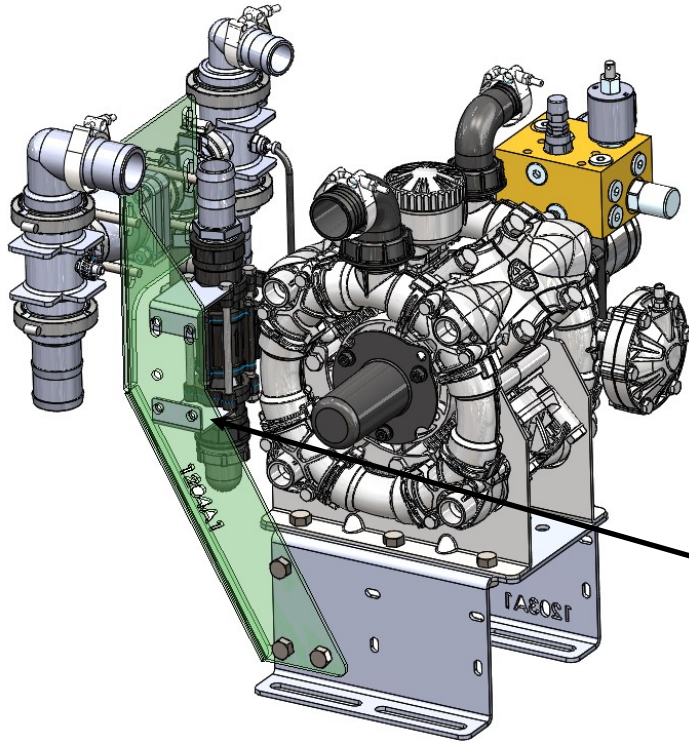
204-01-46211CUF04



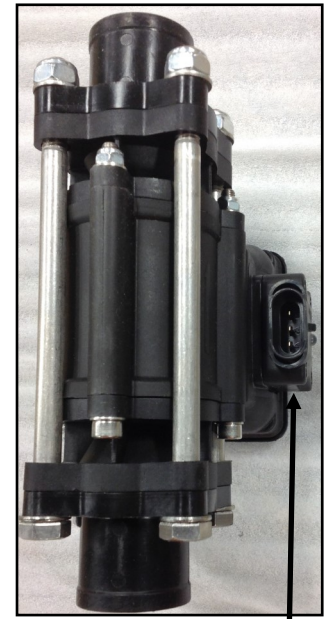
Kits include flowmeter, adapter harness, mounting bracket, hose barb fittings & hose clamps.

*-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.*



Mounting Bracket, 400-3335Y1 (QTY 2) (used for PR40, D250 and PR Pump)



Amp SuperSeal 3-pin connector  
Use adapter 201-17842 to connect to 3-pin MP harness

The current version of the SurePoint Electromagnetic flowmeter has a black molded body and an orange sticker. The meter has a molded in 3-pin Superseal connector for improved sealing.

SurePoint has adapter harnesses available to adapt to other flow meter connections.

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 less sensitive to viscosity or density of the fluid measured. They are generally extremely accurate using the standard calibration number.

**SurePoint still recommends you perform a catch test to verify the system is properly installed and configured. Adjust the flow cal as needed based on accurate catch tests with the actual product or observation of gallons applied and acres worked.**

Flowmeter Model	Pulses per Gallon	FPT Size	Hose Barb In kit
2.6—53 GPM	2000	1-1/4"	1-1/2"
1.3—26 GPM	2000	1"	1"

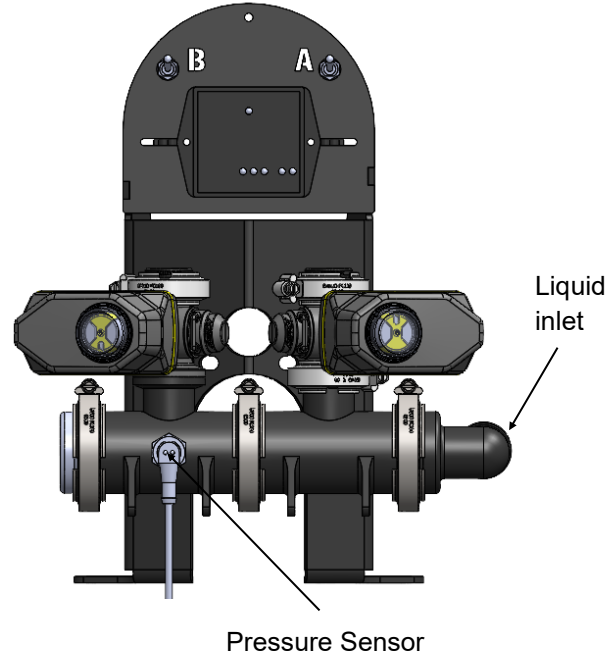
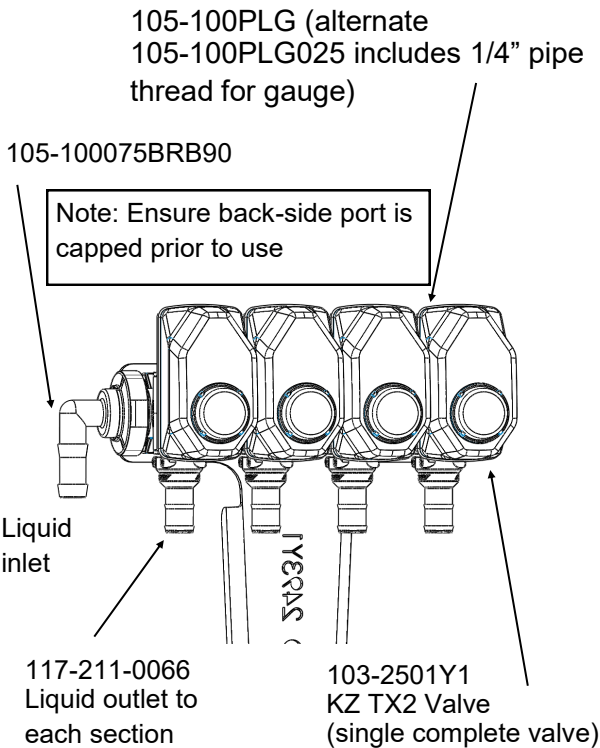
The flowmeters will accurately read higher than the rated range.

Earlier model flowmeters (gray meters with white labels with black text) have different calibration numbers. The flow cal number (pulses per gallon) is printed on the serial number sticker on the side of the flowmeter.

# Section Valves and LiquiShift Valves

# B

Components  
Liquid



### Additional Parts:

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

### How section valves work

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, however, more can be used where practical. 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

### How LiquiShift Works

LiquiShift is a two-valve manifold specifically built and controlled to provide the operator a very wide flow range for variable rate application. It is valuable for variable rate prescription application or high-speed implements, or variable rate between different fields. LiquiShift has an A and B valve that are opened based on the system pressure.

The valves themselves are identical to a regular section valve (KZ TX2) and have a 3-pin weather pack electrical connector.

The A Valve is connected to a smaller metering tube. The B Valve is connected to a larger metering tube. The LiquiShift controller automatically turns on the A valve, or the B valve, or both valves depending on the flow required.

Gen3 LiquiShift systems on the GRC are available with up to 12 sections depending on the implement.

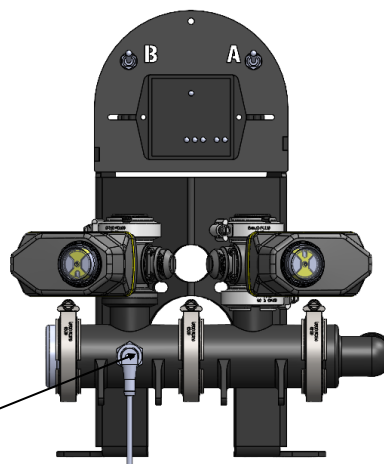
See also: [Gen3 LiquiShift Manual \(396-4608Y1\)](#)  
[Gen2 LiquiShift Manual \(396-4063Y1\)](#)

## Pressure Sensor

*The Pro 700 display with AccuControl currently does not have the ability to show fertilizer system liquid pressure on the display.*

The pressure reading is only for informational purposes and is **NOT** used in the flow control process. Flow control uses the flowmeter feedback only.

A pressure gauge would be helpful to optimize system performance and troubleshoot any issues.



Pressure Sensor for LiquiShift is mounted at the base of the valve stack. This sensor will control LiquiShift, but will not show up on the display.

## Pressure Sensor Hose Tap Kits

When electric section valves or LiquiShift is **not** used in the fertilizer system, the best location to install the pressure sensor is in the hose after it leaves the flowmeter. To use these kits, order the correct kit for your hose size. Then also order the kit above that includes the 2" Manifold x 1/4" MPT fitting.

3/4" Hose Pressure Tap	520-00-055800
1" Hose Pressure Tap	520-00-055850
1 1/2" Hose Pressure Tap	520-00-055900

# 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.

# B

Components  
Liquid

## Why use an air bleed valve:

Most fertilizer systems are equipped with a 4 lb or 10 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. PumpRight 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.

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

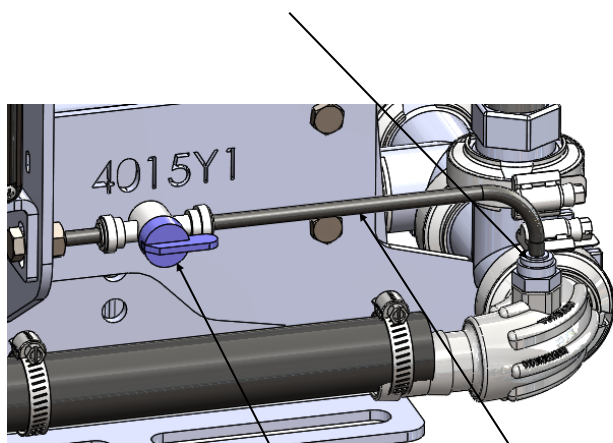
## How to install the air bleed valve:

Remove the 1/4" plug from the quick connect fitting on the pump outlet side (see pictures below). 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 air to bleed.***

### PR17 & PR30

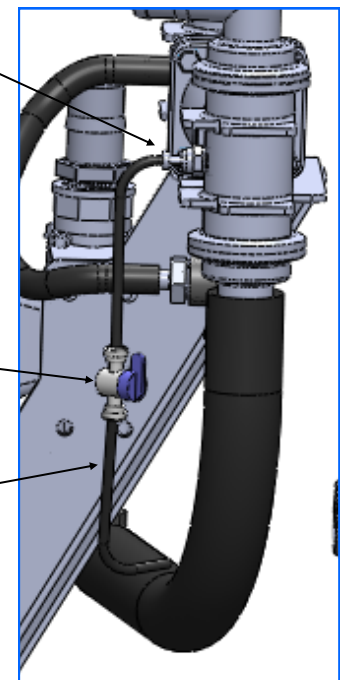
Attach 1/4" tubing to 1/4" QC on the 90 deg HB sweep gauge port



1/4" air bleed valve

### PR40 & D250

Attach 1/4" tubing to 1/4" QC on back side of 1" x 2" tee on outlet side of pump



1/4" air bleed valve

1/4" Tubing



# Recirculation & Agitation

A recirculation valve is standard on all 4 PumpRight models outlet plumbing assembly.

**B**

Components  
Liquid

## How Recirculation Works:

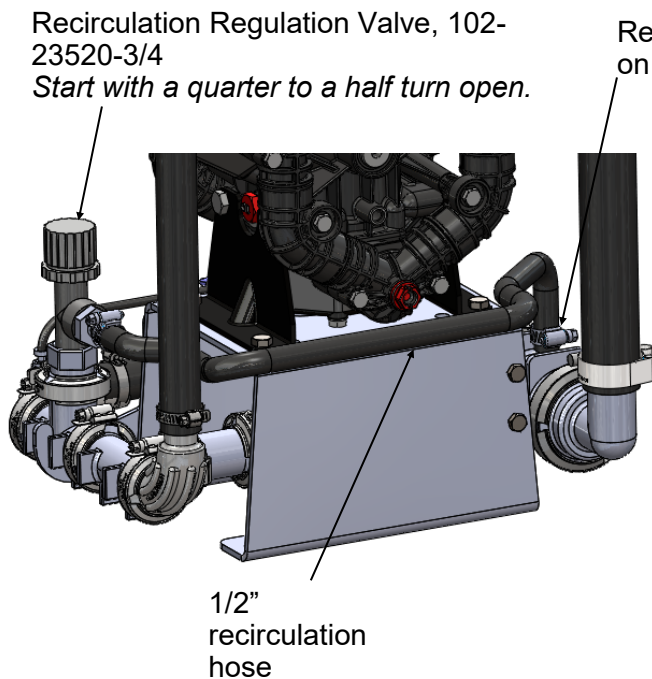
When running a PumpRight pump at less than 20% of its maximum flow, it sometimes improves system stability to allow the pump to run faster. Opening the recirculation valve diverts some pump flow before the flowmeter, causing the pump to run faster. The application rate is still measured by the flowmeter and everything that passes through the flowmeter is applied to the ground. If the pump is surging at a low flow rate, open the recirculation regulation valve slowly until the pump runs smoothly. Start with a quarter to a half turn. OPENING THE VALVE LOWERS THE MAXIMUM RATE THAT CAN BE APPLIED TO THE GROUND. Close the valve if a higher rate is required.

Generally, a quarter to a half turn open is a good setting for the recirculation valve.

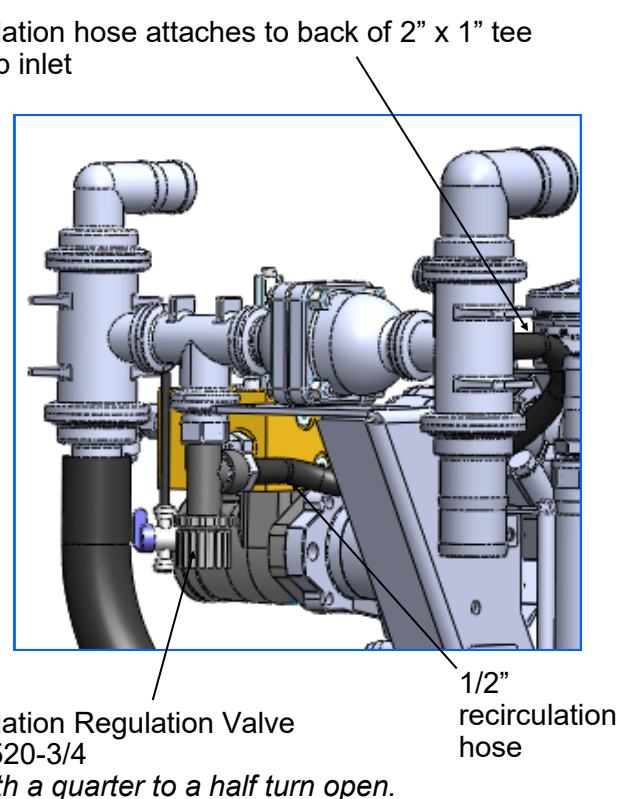
## How to modify for tank agitation:

If tank agitation is required, the recirculation valve can be re-plumbed to divert flow to the tank. All that is required is to remove the 1/2" recirculation hose from the pump. Then replace the 3/8" MPT x 1/2" HB on the inlet side of the pump with a 3/8" plug which is included in your PumpRight accessories bag. Finally, install a longer 1/2" hose from the recirculation valve back to the tank.

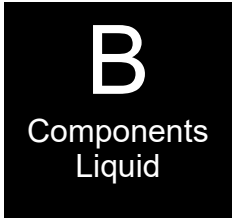
### PR17 & PR30



### PR40 & D250



# 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:**

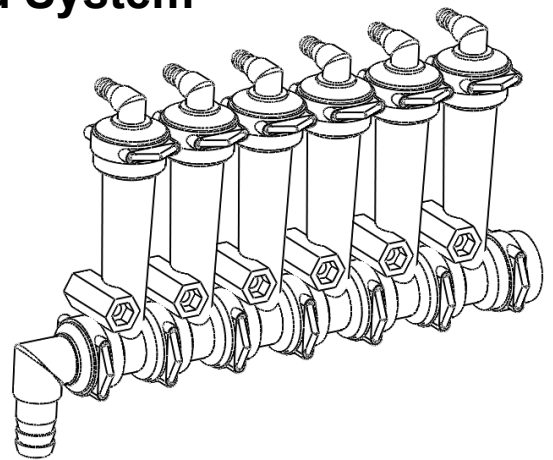
1. A metering orifice may be placed in the top cap of each floating ball flow indicator. (See photos on page 12. This is not used very often.)
2. A metering orifice may be placed in the check valve cap in the line that leads to each row. (See photo on page 14)
3. A dual metering tube kit with dual check valves may be used. (See pages 18-21)
4. A LiquiShift valve stack may be used that automatically selects which metering tube to use based on system pressure.

## Floating Ball Flow Indicator & Manifold System

Flow indicators give a clear visual signal that a fertilizer system is working and all rows are flowing. 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" 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" push to connect 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.

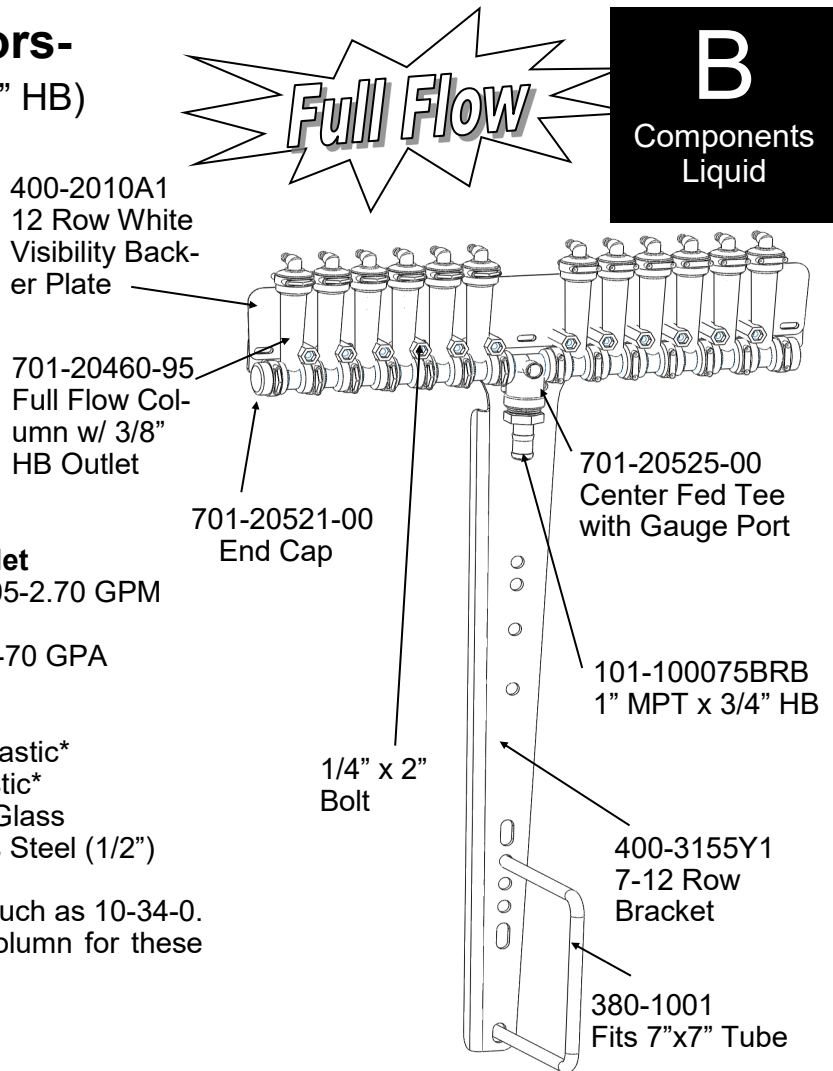
## Full Flow Indicators w/ 3/8" Hose Barb Outlet

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
.05-.18	2-6	Green Plastic*
.09-.30	3-10	Red Plastic*
.31-.72	10-20	Maroon Glass
.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.

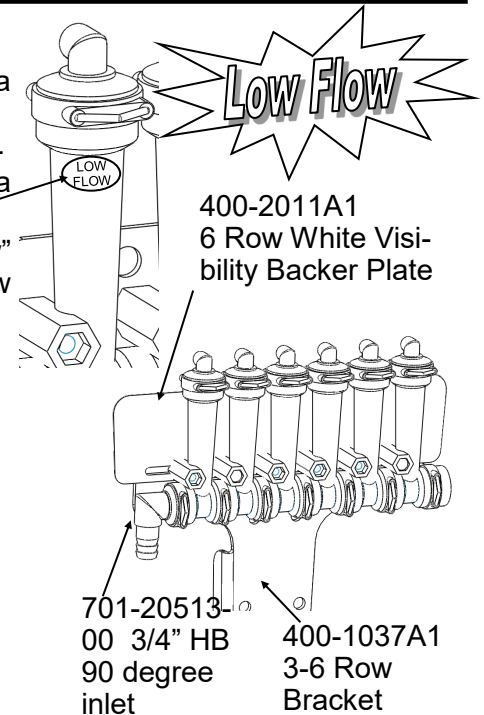
## Low Flow Indicators w/ 1/4" Push to Connect Outlet

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

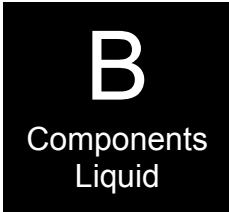
GPM	GPA	Ball
.03-.09	1-3	Green Plastic*
.05-.14	2-4	Red Plastic*
.10-.18	3-6	Maroon Glass
.15-.70	5-10	Stainless Steel (1/2")

\*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.surefireag.com](http://www.surefireag.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

**PumpRight Pressure Recommendations** (with 10 lb check valves):

- Minimum 20 PSI
- Maximum 80 PSI

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

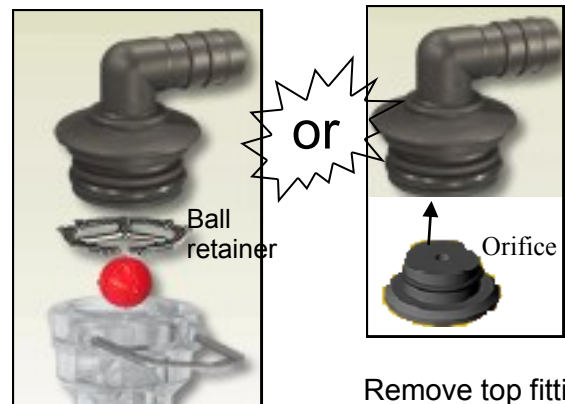
- Minimum 10 PSI
- Maximum 30 PSI

**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.

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

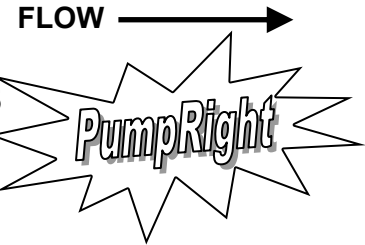
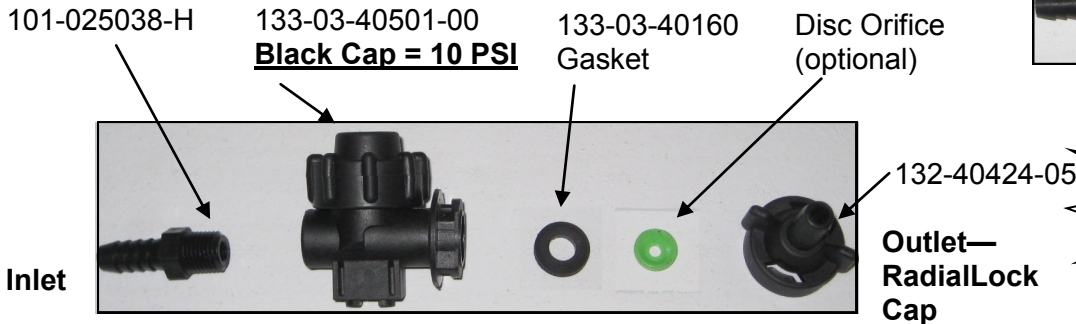


# Check Valves

## 10 lb check valve with 3/8" hose barbs

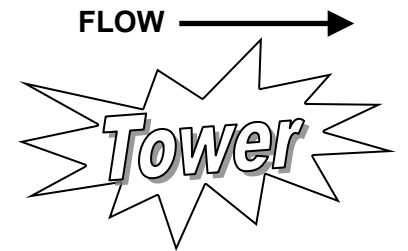
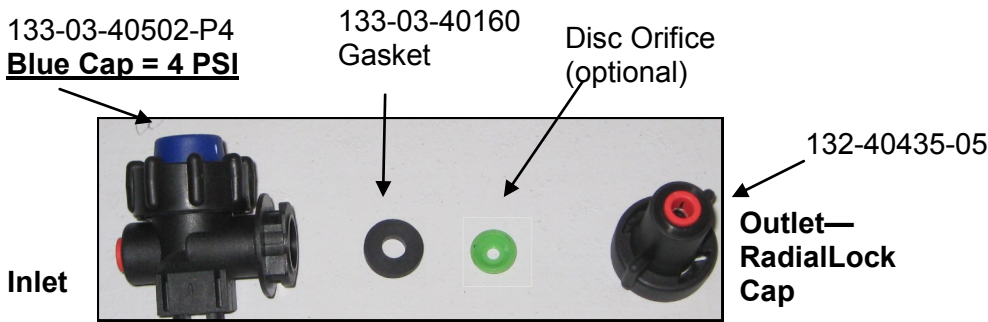
**B**  
Components  
Liquid

The recommended check valve for most PumpRight installations is the 10 lb check with 3/8" hose barbs. This works with 3/8" rubber hose which SureFire 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**. SureFire 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 <b>PumpRight</b> & 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 <b>Electric Pumps</b>
136-04-08HB08HB	1/2" HB x 1/2" HB 4 lb	> 50 GPA with <b>PumpRight</b>
136-10-08HB08HB	1/2" HB x 1/2" HB 10 lb	> 50 GPA with <b>PumpRight</b>

# 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

### PumpRight Pressure Recommendations (with 10 lb check valves):

- Minimum 20 PSI
- Maximum 80 PSI

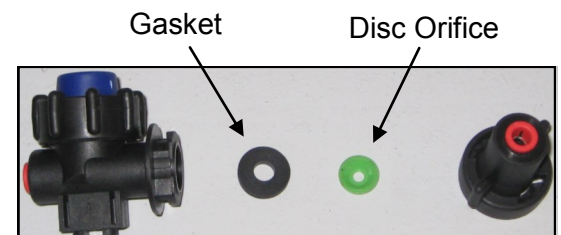
### Tower Electric Pump Pressure Recommendations (with 4 lb check valves):

- Minimum 10 PSI
- Maximum 30 PSI

### Chart is for 28-0-0 Fertilizer @ 70°

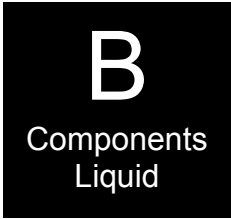
- Heavier fertilizers (like 10-34-0) will have 5-15% less flow than chart indicates for a certain pressure
- Cold fertilizers will cause system pressure to increase at a given application rate.
- Tower Electric Pump Systems will have reduced flow and increased electrical current draw due to cold fertilizer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

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

## 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

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**  
Components

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

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	4.4	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	



# 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
Pink (24)	10	0.033	2.2	2.0	1.8	1.6	1.5	1.4	1.3
	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

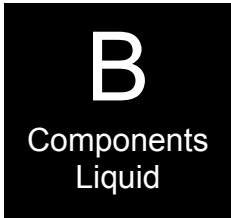
36" Spacing

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
Pink (24)	10	0.033	1.4	1.2	1.1	1.0	0.9	0.8	0.8
	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



# Dual Metering Tube Plumbing Kits with Dual Check Valve



SureFire 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.

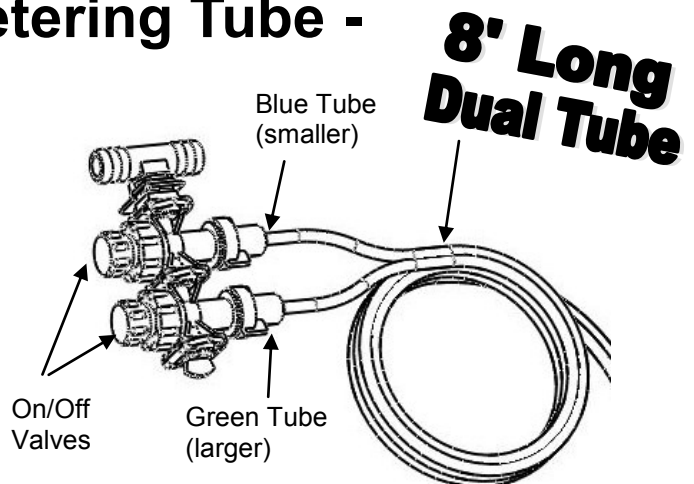
## Field Operation of Dual Metering Tube - Dual Check Valve System

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

**SureFire recommends you start with the Green 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 for electric pumps. 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 system will operate less efficiently and Black Label ZN fertilizer may react adversely. Pressures up to 80 PSI may be used with PumpRight hydraulic pumps.

**Start with green tube ON, blue tube OFF:**

- **Pressure below 8 PSI: Turn green tube OFF and blue tube ON.**
- **Pressure over 30 PSI: Turn BOTH green and blue ON.**



	GPA on 30" rows (approximately, 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 tubes are available if needed for different application rates.

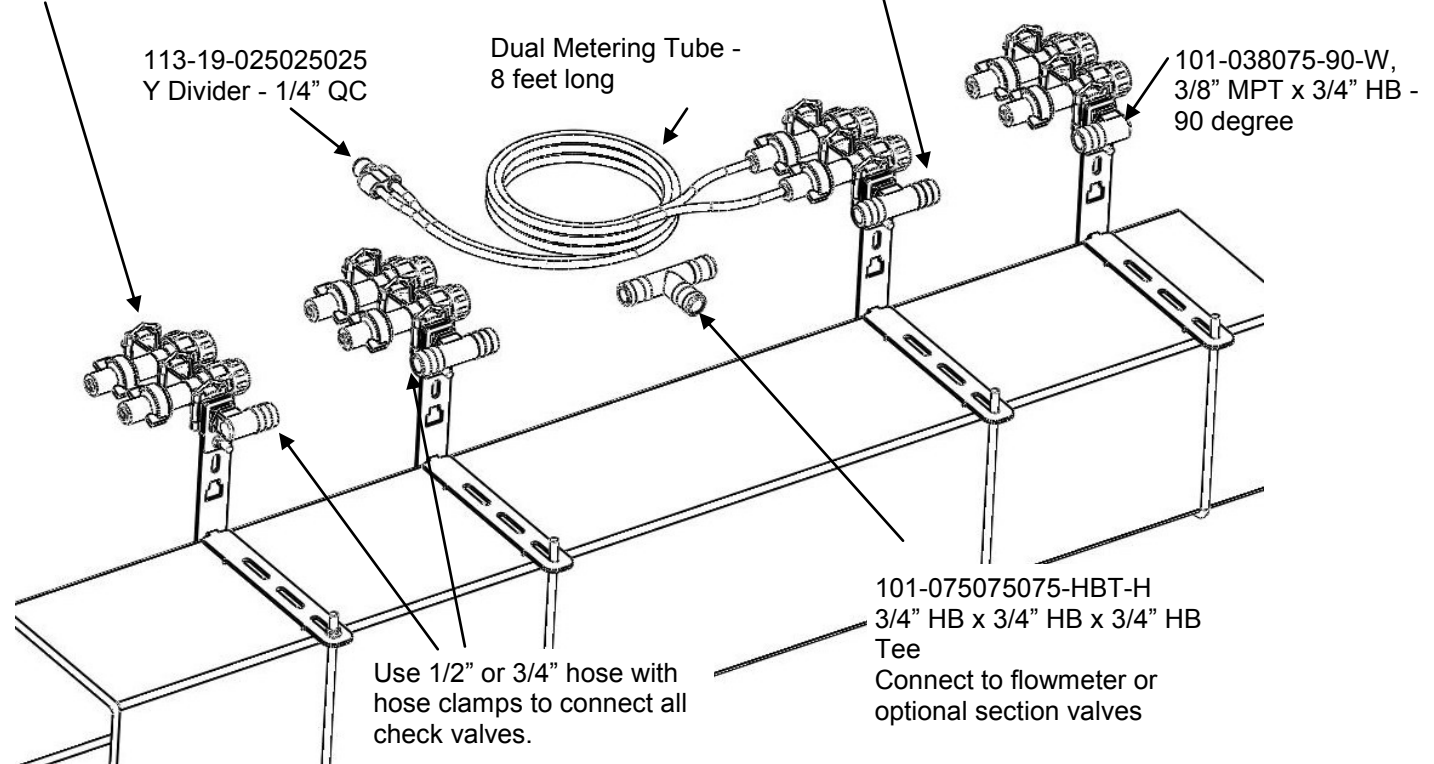
\*\* Ultra Low Rate Application –For rates from 2-5 oz/min/row use a 12 foot length of metering tube. To calculate oz/min/row:  $Oz/min/row = (GPA \times MPH \times spacing \text{ (inches)}) \div 46.4$

## 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

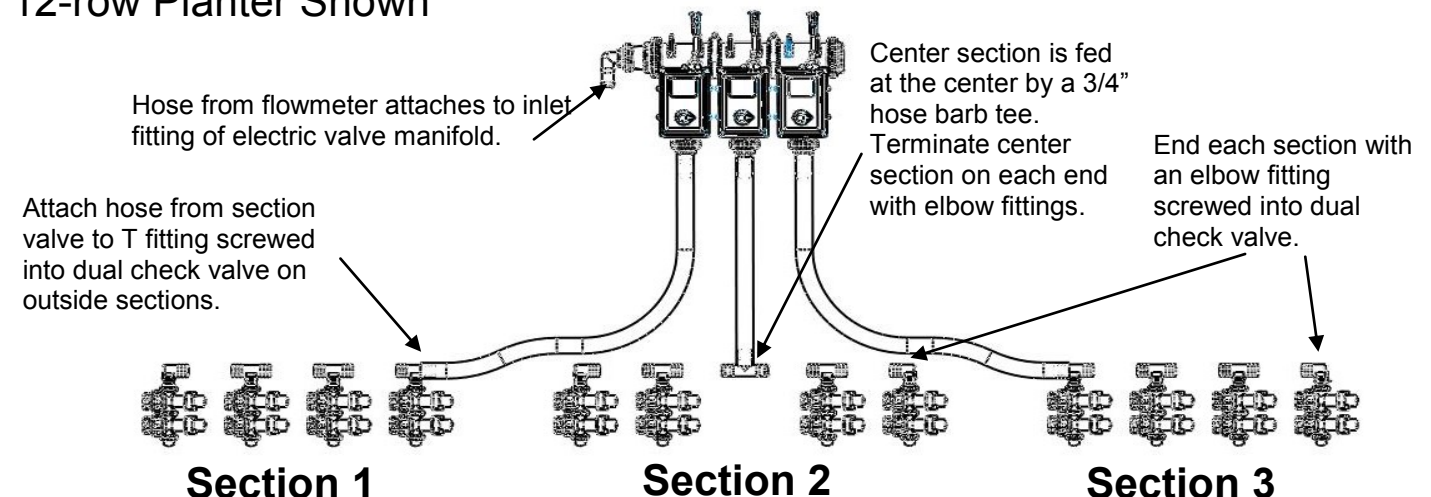
101-075075038-HBT-M-W 3/4" HB x 3/4" HB x 3/8" MPT Tee



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



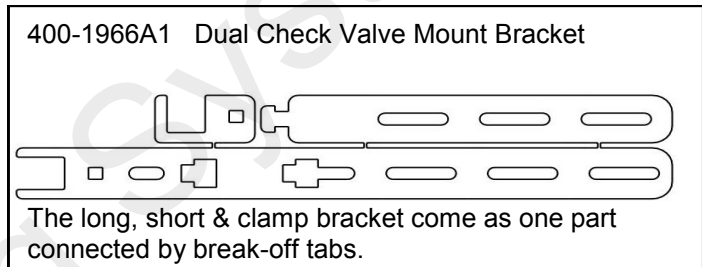
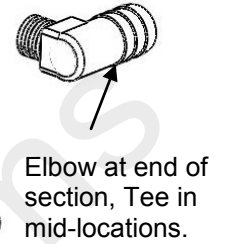
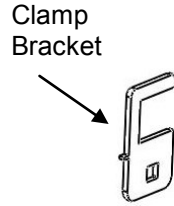
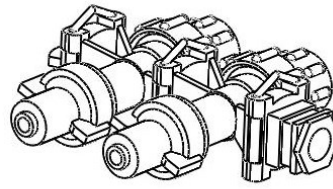
For a **2 section plumbing system**, omit the center section and plumb similar to the outside 2 sections.

# 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.



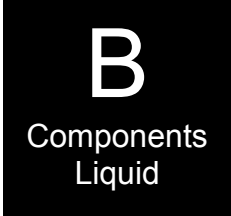
## Check Valve Mounting Options

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.

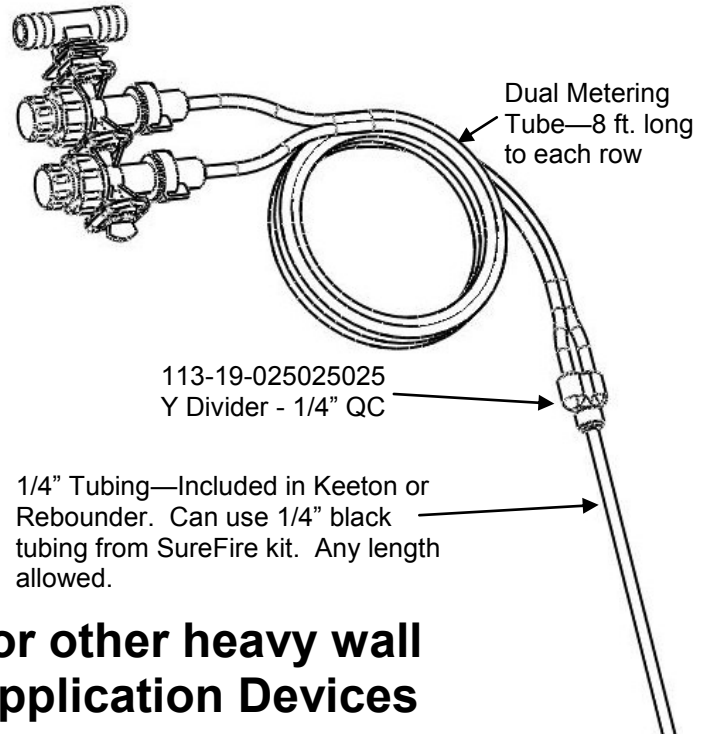
<p>Example 1. Use the long bracket on the top of a bar. The check valve is mounted vertically. The liquid supply hose is ran directly on the front side of the bar. The U-bolt is placed in slots to clamp on a 4x6 inch tube.</p>	<p>Example 2. Use the long bracket on the rear of a bar. The check valve is 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.</p>	<p>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.</p> <p>Short Bracket</p> <p>Long Bracket</p> <p>311-0408000800-05 1/4" L Bolt</p>
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# 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.

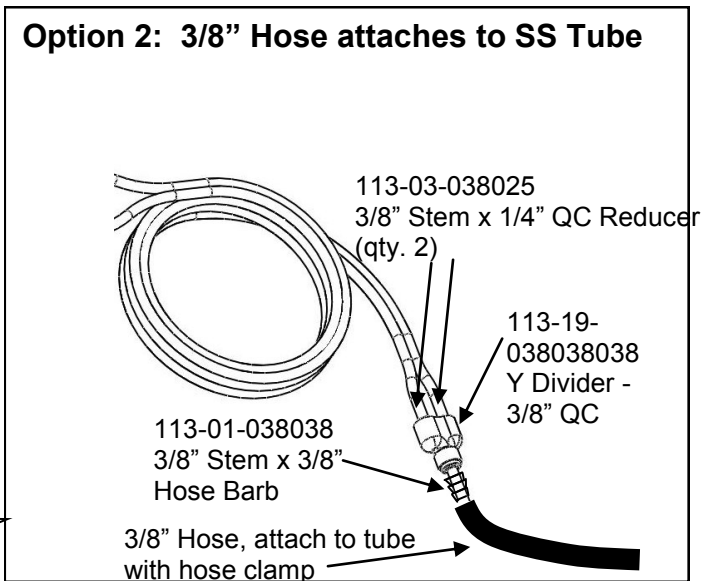
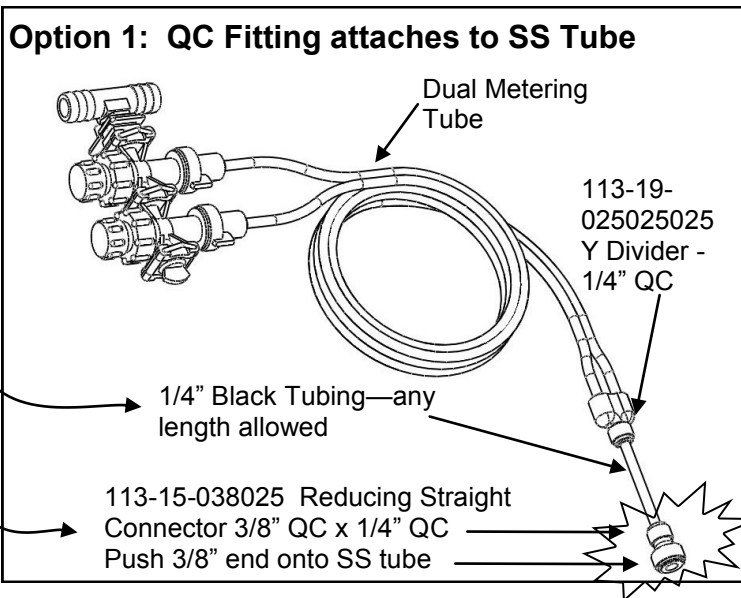


For thin wall stainless steel tubes, you can push the 1/4" black tubing all the way through the stainless steel tube so fertilizer will run directly from the tubing onto the ground.

# 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.



## 396-4116Y1 Metering Tube (8'), LiquiShift, and Split Flow Tube Charts

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	3.5-10	105-295	0.03 - 0.08	Gray	2.5-7.5	74-222	0.02-0.06
Purple	6-20	180-590	0.05 - 0.16	Purple	4.1-15.7	121-464	0.03-0.12
Brown	8-25	235-750	0.06 - 0.20	Brown	5.7-20	170-590	0.04-0.16
Blue	10-31	295-915	0.08 - 0.24	Blue	7.5-25	220-740	0.06-0.20
Green	18-55	530-1600	0.14 - 0.43	Green	14-46	415-1360	0.11-0.36
Tan	25-75	740-2220	0.19 - 0.59	Tan	20-64	590-1890	0.16-0.50
Orange	44-126	1300-3725	0.34 - 0.98	Orange	36-114	1065-3370	0.28-0.89
Yellow	55-154	1625-4555	0.43 - 1.20	Yellow	44-137	1300-4050	0.34-1.07
Black	72-205	2130-6060	0.56 - 1.60	Black	60-175	1775-5175	0.47-1.37
5' Tan	33-100	975-2960	0.26 - 0.78	5' Tan	27-85	800-2515	0.21-0.66
5' Orange	57-165	1685-4880	0.45 - 1.29	5' Orange	49-155	1450-4585	0.38-1.21
5' Yellow	70-200	2070-5915	0.55 - 1.56	5' Yellow	59-185	1745-5470	0.46-1.45
5' Black	95-260	2810-7690	0.74 - 2.03	5' Black	80-235	2365-6950	0.63-1.84

### 10-60 PSI 60°F

Medium Viscosity (Starter, N-P Blend, approx 11.2 lb/gal)				High Viscosity (10-34-0 approx 11.6 lb/gal) For 11-37-0, find the flow range here, and use next larger tube.			
	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	1.5-5.0	45-150	0.01-0.04	Gray			
Purple	2.2-11.5	65-340	0.02-0.09	Purple	1-4	30-118	0.008-0.03
Brown	3.5-15	105-445	0.03-0.12	Brown	1.4-6	41-177	0.011-0.05
Blue	5-19.5	150-575	0.04-0.15	Blue	1.8-8	53-237	0.014-0.06
Green	9.5-37	280-1095	0.07-0.29	Green	2.6-14	77-414	0.02-0.11
Tan	14-53	415-1565	0.11-0.41	Tan	4-22	120-650	0.03-0.17
Orange	27-102	800-3015	0.21-0.80	Orange	9-44	265-1300	0.07-0.34
Yellow	33-120	975-3550	0.26-0.94	Yellow	13-61	385-1805	0.10-0.48
Black	48-145	1420-4290	0.38-1.13	Black	18-80	530-2365	0.14-0.63
5' Tan	20-75	590-2220	0.16-0.59	5' Tan	6-31	165-910	0.04-0.24
5' Orange	38-140	1125-4140	0.30-1.09	5' Orange	13-62	375-1820	0.10-0.48
5' Yellow	46-170	1360-5030	0.36-1.33	5' Yellow	18-85	540-2525	0.14-0.67
5' Black	67-200	1980-5915	0.52-1.56	5' Black	25-112	745-3310	0.20-0.88

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

Water (8.34 lb/gal)				<p><b>These charts are typical flow rates from 10 to 60 PSI.</b></p> <p><b>Electric pumps typically won't operate at 60 psi. See charts on next page for 10 to 40 PSI for typical electric pump operating range.</b></p> <p><b>These charts are designed for typical N-P fertilizers. Suspension, granular, and/or clay-based products may not follow these charts.</b></p> <p style="text-align: center;"><b>These charts are for product at 60° F.</b></p> <p><b>Products will be thicker and pressure will be higher at lower temperatures (esp 10-34-0).</b> <small>MAW</small></p>
	oz/min	mL/min	gal/min	
Tube Color	Flow Range	Flow Range	Flow Range	
White	2.5-7.5	75-220	0.02-0.06	
Gray	5.8-15.5	170-460	0.045-0.12	
Purple	10-26	295-770	0.08-0.20	
Brown	12.5-34	370-1005	0.10-0.27	
Blue	17.5-45	520-1330	0.14-0.35	
Green	26-70	770-2070	0.20-0.55	
Tan	34-93	1005-2750	0.27-0.73	
Orange	60-159	1775-4700	0.47-1.24	
Yellow	75-196	2220-5800	0.59-1.53	

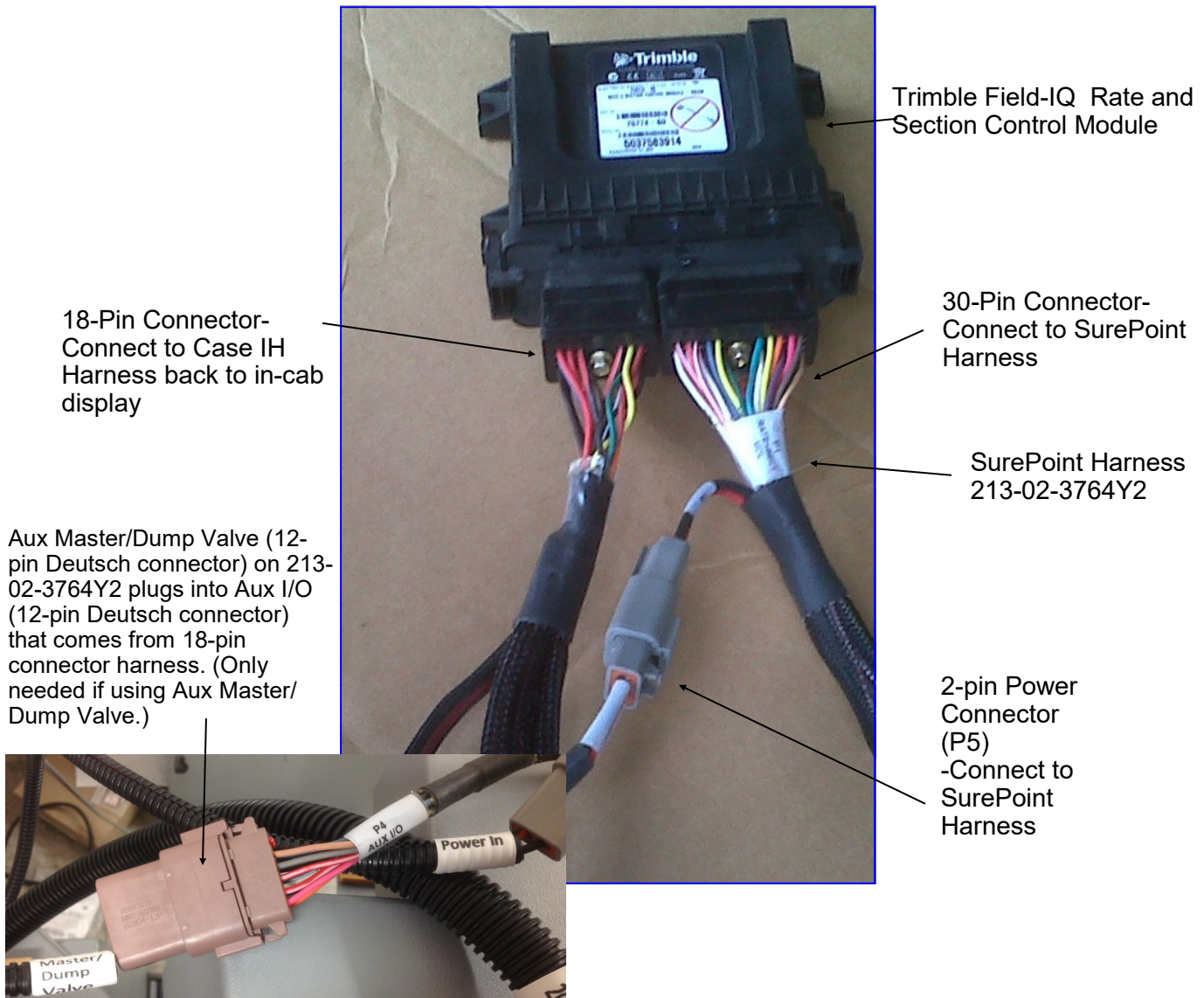


# Pro 700 AccuControl Field-IQ™ Rate and Section Control Module

SurePoint Fertilizer Systems begin at the AccuControl Rate and Section Control Module. The picture below shows this control module. You will need to purchase this module from your Case IH dealer. You will also need to purchase an unlock code for your Pro 700 display to enable AccuControl functions.

The rate controller has two harness connections. The first is the connection to the Case IH wiring harness that connects to the in-cab display. The second is where the SurePoint Fertilizer System harnesses begin. The following pages show system diagrams for single section, 2-6 section and 7-10 section configurations. Detailed harness drawings follow for information and troubleshooting.

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

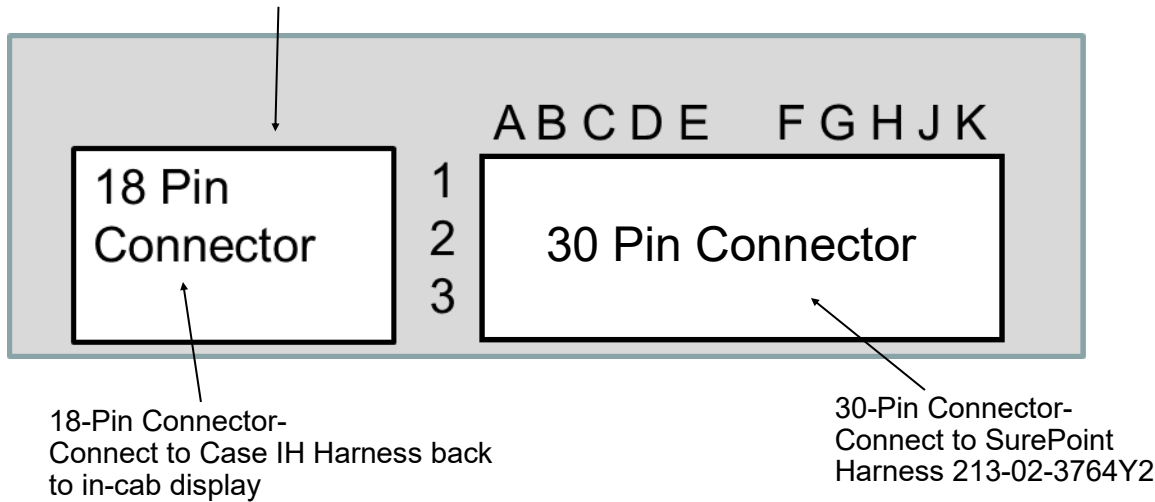


# Case IH AFS AccuControl Rate and Section Control Module



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

AccuControl (Trimble Field-IQ)  
Rate and Section Control Module



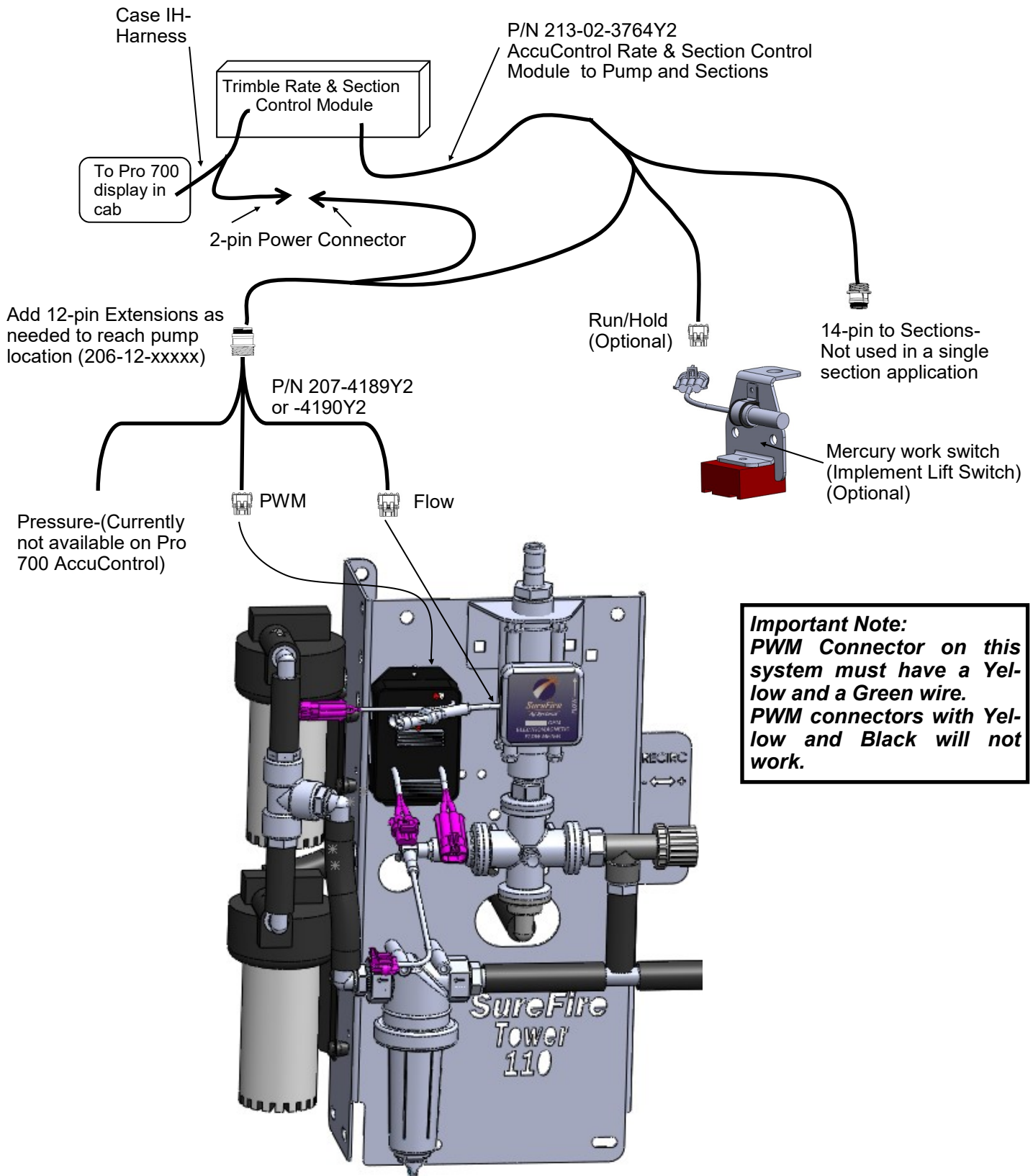
## Common Troubleshooting:

**PWM Signal to Pump:** Pins E1 to E2 should have 0-12 volts to energize the EPD (Electric Pump Driver) Module. Use manual mode to increase signal. Should get up to 12 volts after holding increase button.

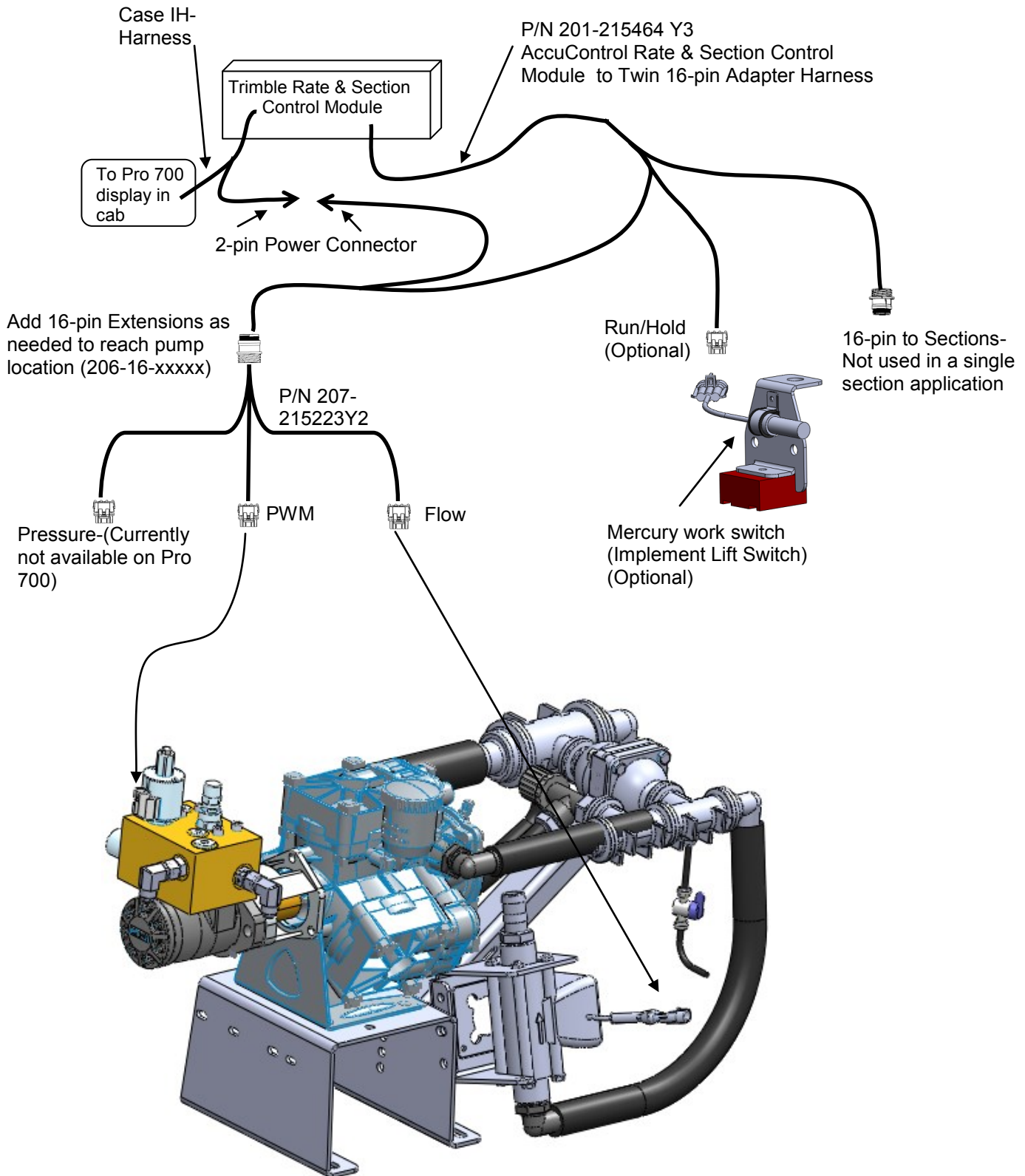
**Flowmeter Tap Test:** Pins C2 and C3 are Flow Ground and Signal. If no flow is registering on the display, you can tap between these two pins with a short wire. This produces a pulse. The display should indicate a flow when this is done rapidly. *(Note: To help register flow for the tap test, change 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.)*



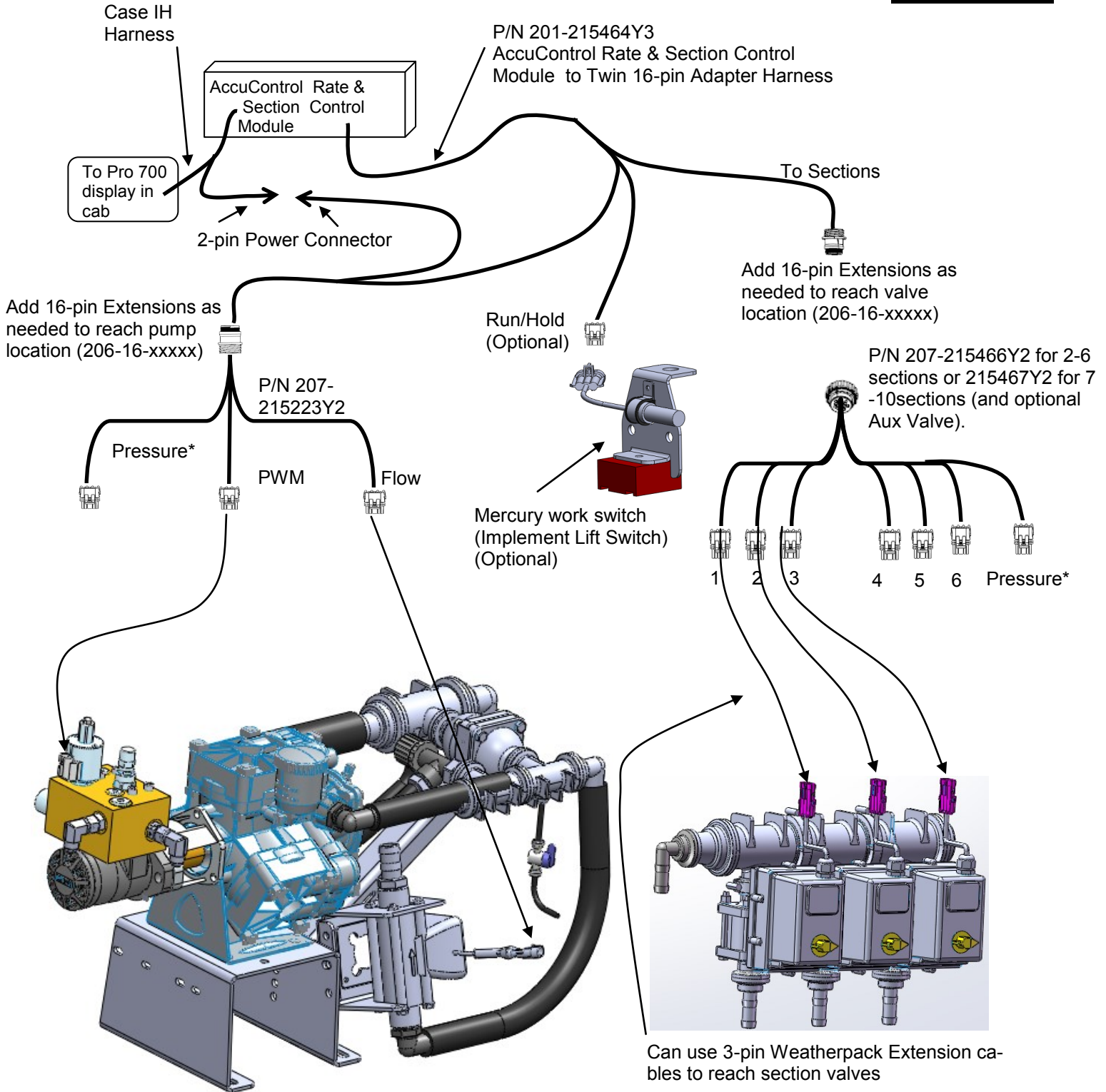
# Case IH AFS AccuControl PWM Wiring Schematic Single Section for Tower Electric Pump Liquid Application



# Case IH AFS AccuControl PWM Wiring Schematic Single Section for PumpRight Hydraulic Pump Liquid Application



# Case IH AFS AccuControl PWM Wiring Schematic 2-6 (or 7-10) Sections for PumpRight Hydraulic Pump Liquid Application



\* Pressure currently not available on Pro 700 AccuControl. The PUMP and the SECTION harness each have connectors for Pressure 1 and Pressure 2.

# Implement Lift Switch for Field-IQ™ (Mercury Run/Hold Switch)



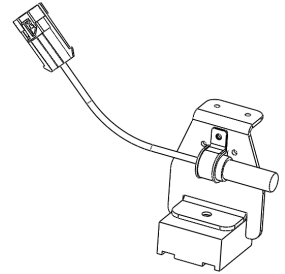
The Mercury Run/Hold Switch turns liquid application on and off automatically when the implement is raised or lowered. The switch is mounted on a component that rotates when the implement is raised and lowered. The switch is attached to a magnetic base for easy mounting to any metal part of your tractor hitch or implement.

### For mounted 3-point equipment:

- Mount the switch on the tractor 3 point arms.
- See the pictures below for switch orientation in run and hold positions.
- Connect the switch to the Run/Hold Switch connector on Harness 201-215464.

### For hitch drawn implements:

- Mount the switch on a wheel frame that rotates as it lifts the wheels up and down to raise and lower the implement.
- See the pictures below for switch orientation in run and hold positions.
- Connect the switch to the Run/Hold Switch connector on Harness 201-215464Y3.

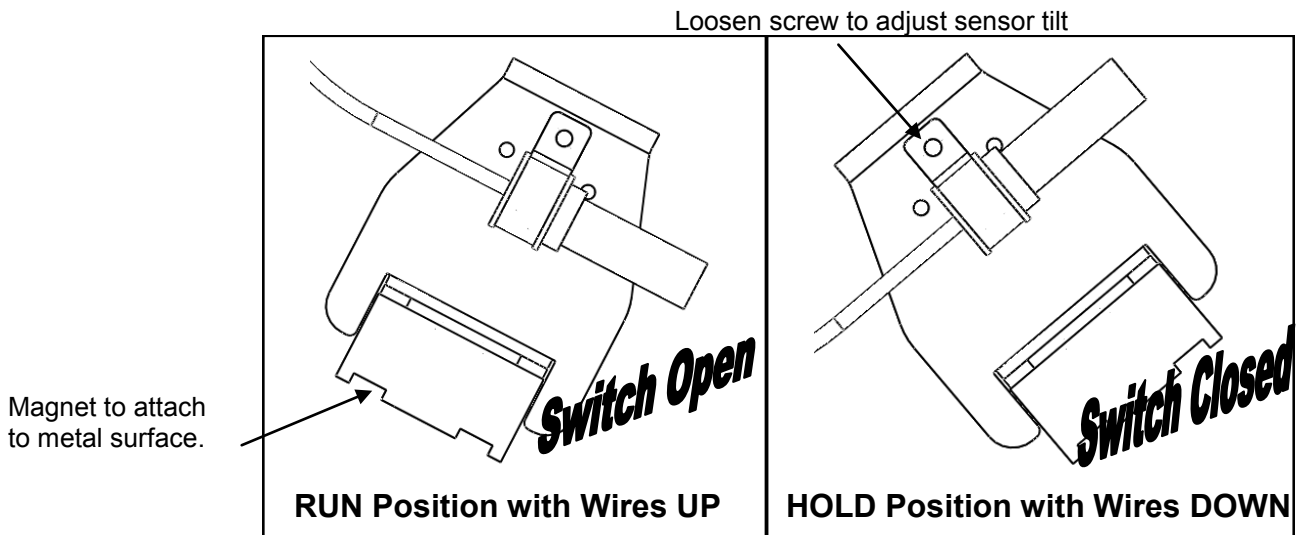


## Run/Hold Switch Logic

### How to Adjust:

If your controller is turning off product application before or after you want, tilt the switch. If it turns off after you want when lifting the implement, tip more to the HOLD position. If product application should begin sooner when you lower the implement, tip more to the RUN position.

You can adjust the switch by moving the magnet or by loosening the screw and rotating the mercury switch.



### How to Test:

To test the run / hold mercury switch you will need a volt meter. Set the meter to test continuity (or ohms). With the wires down, you should have continuity between the two pins in the connector. With the wires up, the switch should be open (no continuity).



213-02-3764Y2

Trimble Field IQ Adapter Cable 30-pin to 12-pin Product and 14-pin Sections

Wire 18AWG unless otherwise specified

30-pin Cinch Connector



+12V	A1
+12V	B1
+ 5V	C1
Impl Switch 5V	D1
Servo +/PWM	E1
Section 5	F1
Section 4	G1
Section 3	H1
Section 2	J1
Section 1	K1
Pressure 1 Signal	A2
Pressure 2 Signal	B2
Flow Signal	C2
Impl Switch Signal	D2
Servo -/PWM	E2
Section 10	F2
Section 9	G2
Section 8	H2
Section 7	J2
Section 6	K2
GND	A3
GND	B3
Flow GND	C3
	D3
	E3
	F3
GND	G3
POWER	H3
Section 12	J3
Section 11	K3

POWER IN

2 Pin Connector – Deutsch DTP04-2P Male



GND	1
+12VDC	2

Aux/Dump Valve Signal

12 Pin Connector Deutsch DTM04-12P



1	PNK
---	-----

Run/Hold



A	Imp Sw Signal
B	
C	Imp Sw 5V

Dust Cap



SECTIONS 1-6

14-pin Deutsch HDP24-18-14PE



A	HC PWR 1
B	HC PWR 2
C	HC GND 1
D	HC GND 2
E	PWM 1 (+)
F	PWM 1 (-)
G	Pressure 1
H	AUX/Dump Valve
J	Sect 1
K	Sect 2
L	Sect 3
M	Sect 4
N	Sect 5
P	Sect 6

PUMP

12-Pin Deutsch Female DT06-12SA



1	+12V DC
2	GND
3	Flow Signal 1
4	Pressure 1
5	PWM (+)
6	PWM (-)
7	
8	
9	
10	
11	Section 1
12	Section 2

SECTIONS 7-12

14-pin Deutsch HDP24-18-14PE



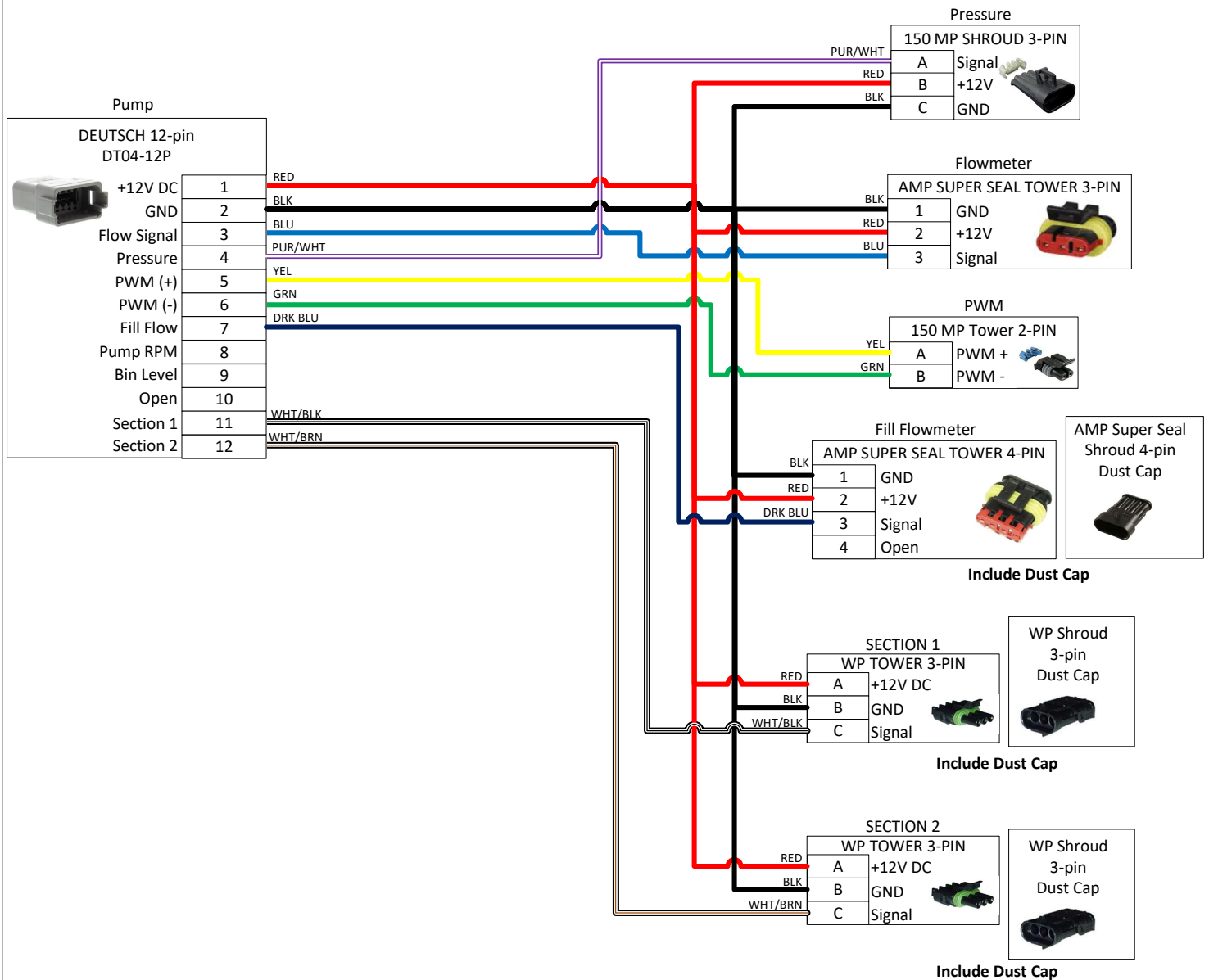
A	HC PWR 1
B	HC PWR 2
C	HC GND 1
D	HC GND 2
E	PWM 1 (+)
F	PWM 1 (-)
G	Pressure 2
H	AUX/Dump Valve
J	Sect 7
K	Sect 8
L	Sect 9
M	Sect 10
N	Sect 11
P	Sect 12

Part No:	213-02-3764Y2	Drawn By:	Mark Wolters		
Description:	Trimble Field IQ Adapter Cable 30-pin to 12-pin Product and 14-pin Sections	Last Edit Date:	10/12/2018	Revision	A-02
Copyright 2017 SureFire Ag Systems, Reproduction or other use of drawing without express written permission from SureFire Ag Systems is forbidden		29			

# 207-4189Y1

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

**Wire 18AWG  
unless otherwise  
specified**

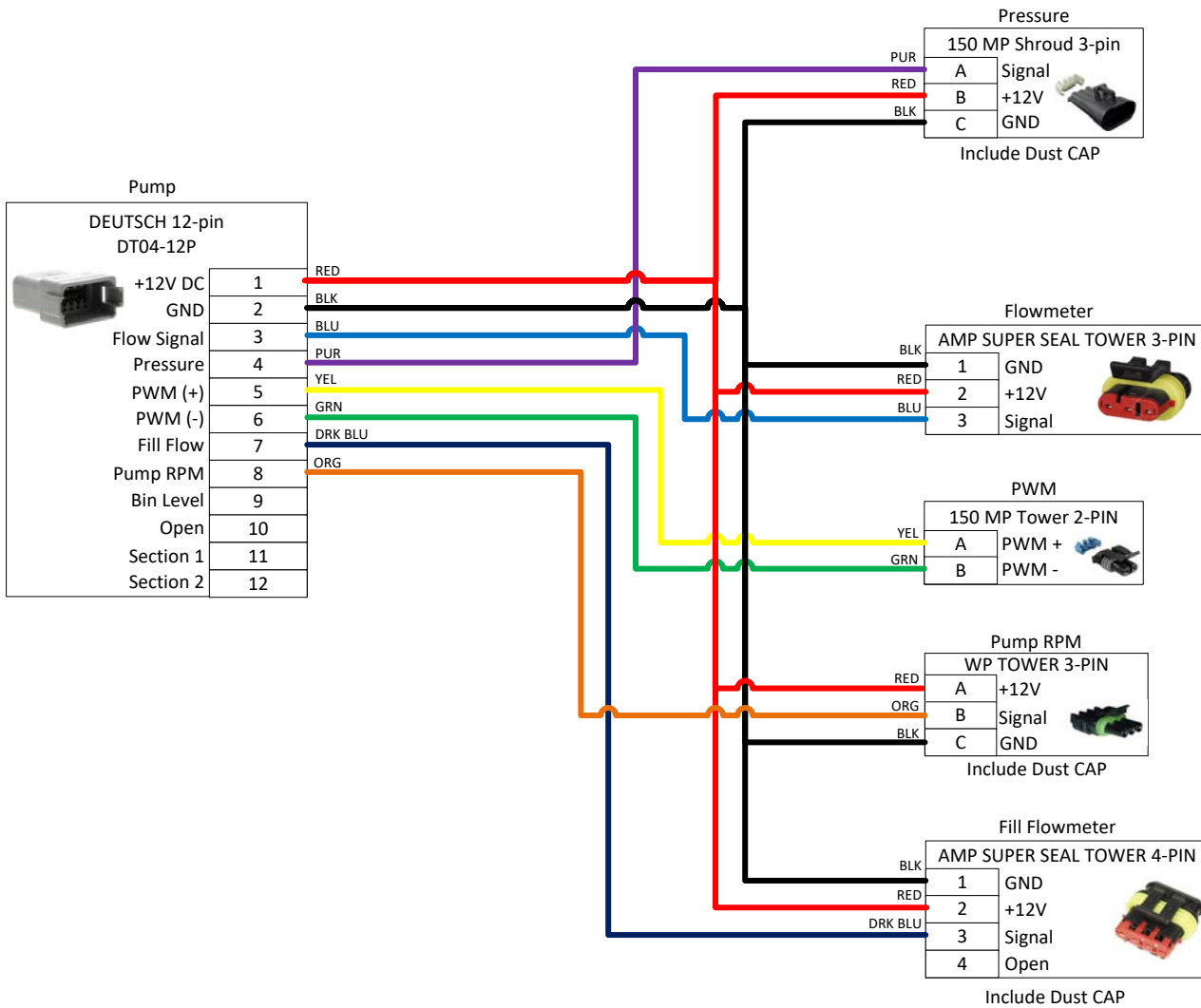


Part No:	207-4189Y1	Drawn By:	Brandon Cavenee		
Description:	Final Cable for Tower With 1-2 Section Valves (pwm, flow, pres., sec 1, sec 2, fill flow)	Last Edit Date:	4/3/2019	Revision	A-03
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# 207-4190Y1

## 12-pin Deutsch Final Cable-same as 3462Y1

**Wire 18AWG  
unless otherwise  
specified**

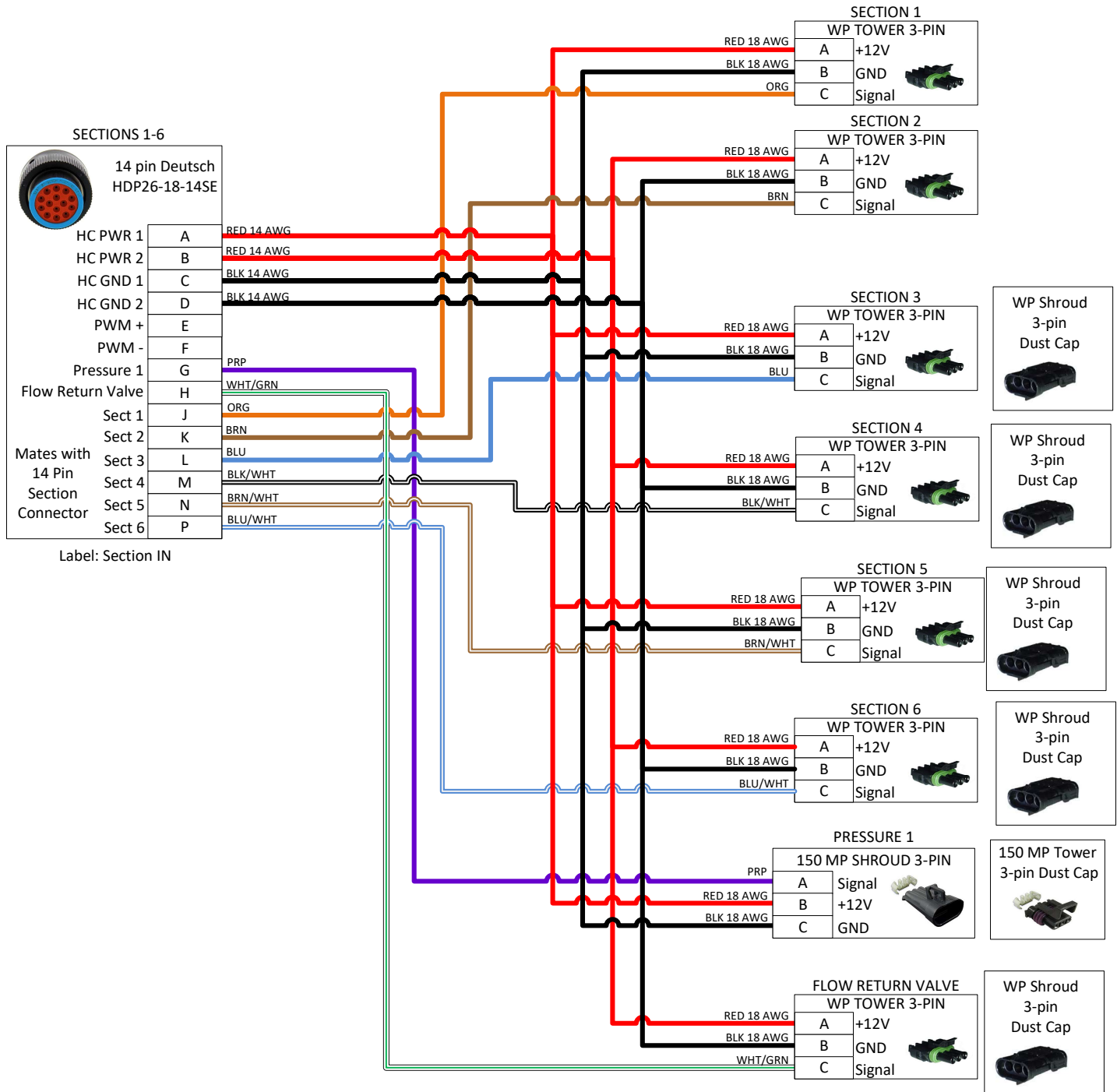


Part No:	207-4190Y1	Drawn By:	Brandon Cavenee		
Description:	12-pin Deutsch Final Cable-same as 3462Y1(pwm, flow, pres., pump rpm, fill flow)	Last Edit Date:	10/31/2016	Revision	A-02
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# 207-3463Y1

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

**Wire 18AWG  
unless otherwise  
specified**

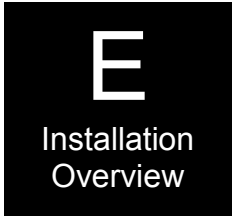


Part No:	207-3463Y1	Drawn By:	Brandon Cavenee		
Description:	14-Pin 6 Section Final Cable (6 sections, flow return, pressure)	Last Edit Date:	6/4/2021	Revision	A-02
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# Floating Ball Flow Indicators

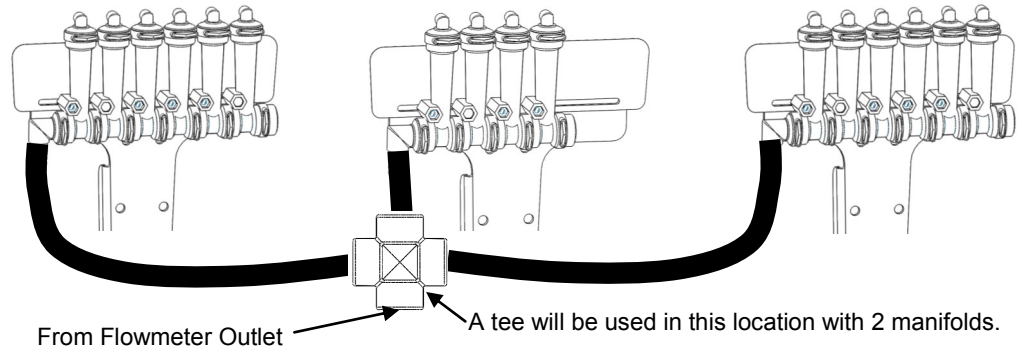
Flow Indicators are extremely flexible and can be mounted in hundreds of different configurations on various types of liquid application equipment. This page is to give you some ideas and let you customize the installation for what works best on your equipment.



## 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.

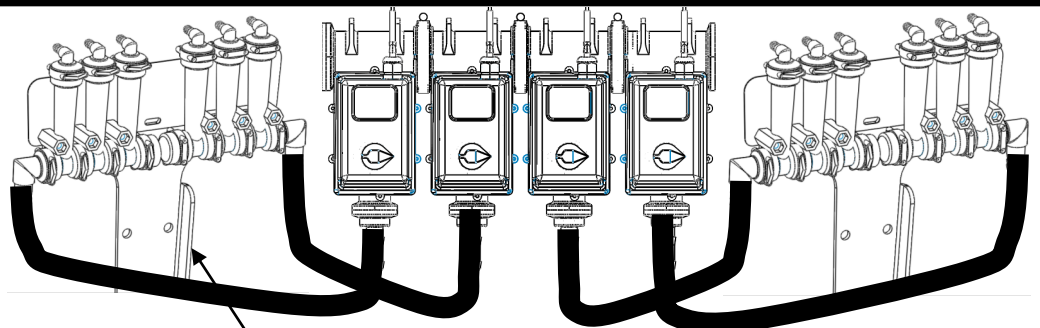


## 12-row

### 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.

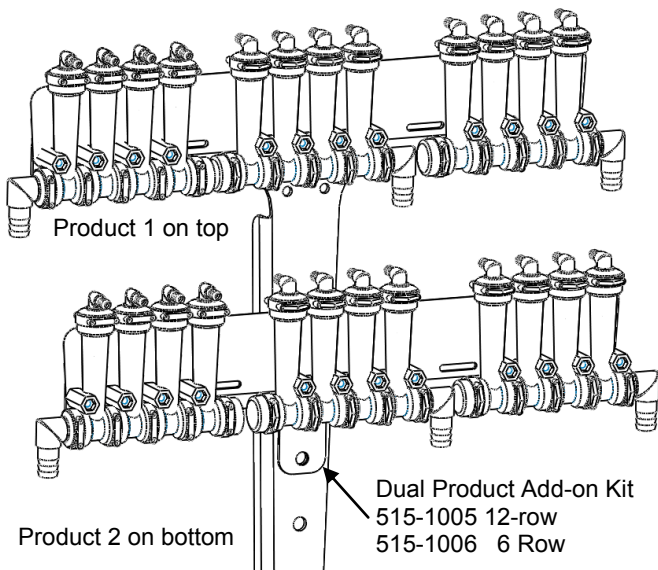
A 4 section 24 row could be similar with four 6 row manifolds on two large T-Brackets.



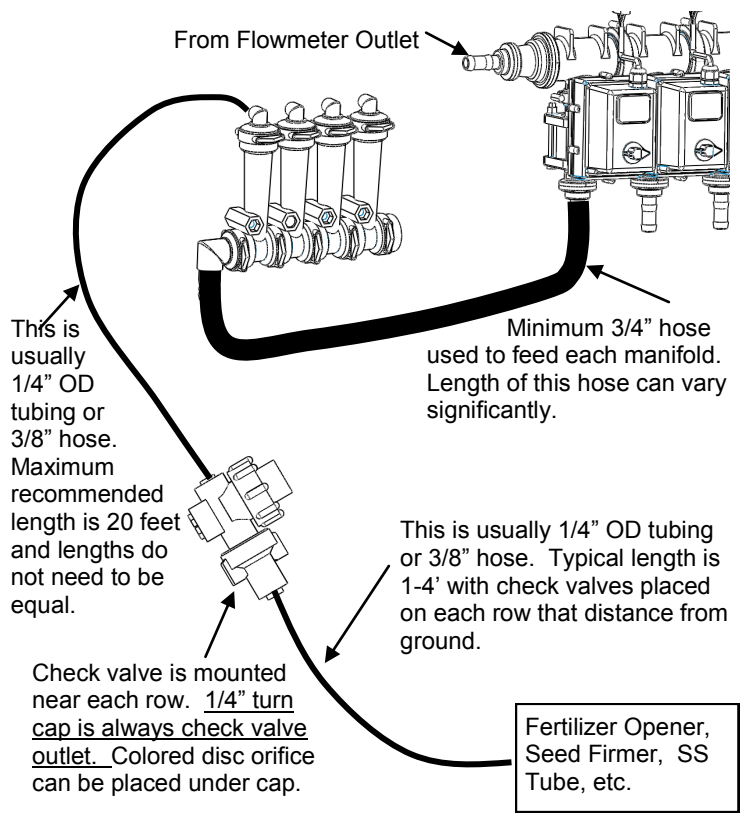
## 12-row Dual Product

### 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.



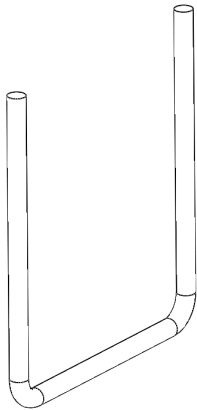
## General Plumbing Guidelines



# PumpRight Pump Installation

## Mounting

1. Mount pump in your preferred location. The PumpRight pump has excellent suction and priming ability, so it can be mounted away from or above fertilizer tanks.
2. SureFire has U-Bolts available to mount the pump directly to multiple bar sizes shown below. Each U-bolt kit includes 1 bolt and 2 flange nuts.
3. If the U-Bolts will not work, order the universal backer plate kit, number 515-203000 which will clamp to any size tube from 4" - 8" wide.



Item Number	Item Description
380-1001	1/2" U-bolt Kit - 1/2", fits 7" x 7" tube - (7" opening )
380-1014	1/2" U-bolt Kit - 1/2", fits 5" x 7" tube - (5" opening)
380-1015	1/2" U-bolt Kit - 1/2", fits 4" x 6" tube - (4" opening)
380-1016	1/2" U-bolt Kit - 1/2", fits 7" x 5" tube - (7" opening)
380-1017	1/2" U-bolt Kit - 1/2", fits 6" x 4" tube - (6" opening)
380-1018	1/2" U-bolt Kit - 1/2", fits 7" x 6" tube - (7" opening)
380-1019	1/2" U-bolt Kit - 1/2", fits 8" x 12" tube - (8" opening)
380-1020	1/2" U-bolt Kit - 1/2", fits 8" x 16" tube - (8" opening)
380-1021	1/2" U-bolt Kit - 1/2", fits 6" x 10" tube - (6" opening)

A Safety Tip from the Kansas Farm Bureau Safety Poster Program



# PumpRight Hydraulic Connections

## PWM Valve



**Manual Override** - Push down and turn 1/2 turn CCW to lift the valve for manual override to check for proper hydraulic operation. **Override will completely open valve, so limit tractor hydraulic flow to valve.**

(May need to clean packed dirt to allow movement of override knob.)

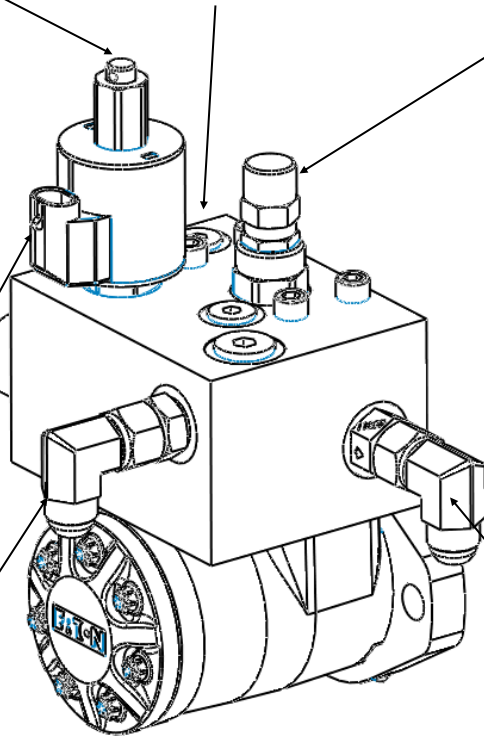
Push down and turn 1/2 turn CW to return to operating position.

PWM Valve Connector -2 Pin MP Shroud

*Troubleshooting Tip: To check coil, an ohmmeter placed on the two pins should show 7-9 ohms.*

Pressure line from Tractor

**Load Sense Port**—For power beyond hydraulic use only.



**Bypass Valve**—Remove the cap to access a bypass needle valve. This valve is shipped from the factory closed. **The only case when valve should be open is when running in series with other hydraulic motors.**

Depending on your tractor and exact hydraulic plumbing scenario your pump may turn very slowly when it should stop. To stop the pump completely, open the bypass valve slightly.

*To adjust the Bypass Needle Valve, first loosen the lock nut. Do not overtighten the needle valve.*

Return oil to Tank - Check valve included on return port

⚠ **DANGER**

*Hydraulic oil under extremely high pressure. Do not use hand or any other skin to check for or to stop hydraulic leaks. Be sure pressure is relieved before loosening hydraulic fittings. Replace worn hoses immediately. Seek medical care immediately if hydraulic oil is shot into the eye or the skin.*

### Pump Rotation Check Valve

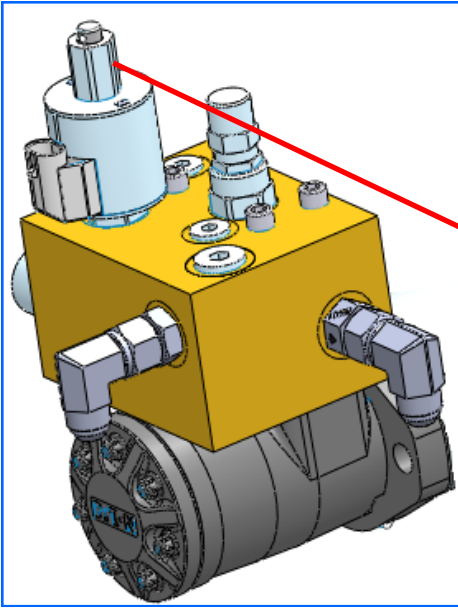
A check valve is included on the outlet port of the hydraulic valve. This prevents the pump from running in the wrong direction. If ran in the wrong direction, liquid will be pumped, however the hydraulic valve will not be able to control the flow. The check valve can be identified by the Part Number 1108R stamped on it and a flow direction arrow.

### How it Works with Power Beyond Hydraulics

This valve is designed to work with power beyond hydraulics. This configuration will not require a standard tractor remote hydraulic valve. The load sense port and hose described next will typically not be needed if other hydraulic ports are in use. If the load sense is needed, do this: First, remove the load sense plug and install a #6 male boss x #6 JIC adapter fitting, SurePoint PN 161-01-6MB-6MJ. Then run a 3/8" or 1/4" hydraulic hose back to the tractor. This hose will connect to the load sense port on the tractor. The load sense line will signal the tractor hydraulic system to supply the flow needed by the pump to meet your application rate. The SurePoint valve has an internal load sense check valve, which is required for power beyond hydraulics.. The bypass valve (see above) must be closed to use power beyond hydraulics or else an unlimited amount of oil will be continuously circulated.



# Hydraulic Manual Override

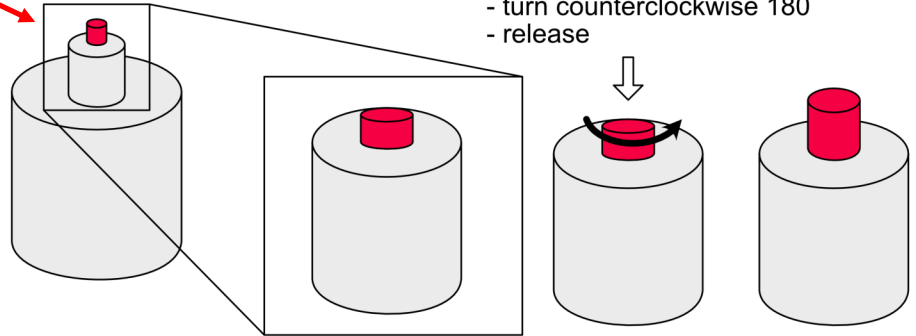


## Hydraulic Manual Override

Down - Normal Operation

Up - Override, valve 100% open

To Override:  
- push down  
- turn counterclockwise 180°  
- release



**Manual Override** - Override will completely open valve, so turn down the hydraulic flow in the cab.

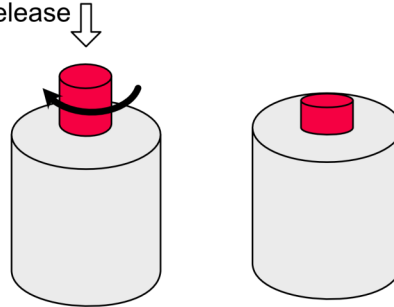
Push down and turn CCW and let the button pop up to open the manual override to check for proper hydraulic connections. (Spring-loaded, should pop up 1/4")

*(May need to clean packed dirt to allow movement of override knob. If it is packed with dirt, you can break the stem if you force it with a wrench.)*

Push down and turn 1/2 turn CW to return to operating position.

To Return to Normal Operation

- push down  
- turn clockwise 180°  
- release



# PumpRight Hydraulic Connections

# B

Installation  
Overview

## Hydraulic Hose

SurePoint recommends 1/2" hydraulic hose for both pump inlet and outlet. The hoses will need #8 JIC female swivel fittings.

## Where do I get hydraulic flow for my PumpRight?

This question is often asked as many implements use up all the hydraulic connections on a tractor. SurePoint has some recommendations as to what works best.

*Preferred*

### **Best Option - Dedicated PumpRight Circuit**

If you have a tractor remote available, attach the tractor remote valve directly to the PumpRight pressure and return ports. DO NOT try to avoid this method simply to save another set of hydraulic hoses running to the tractor. Operating the PumpRight on it's own circuit is the simplest for installation and operation. It guarantees the PumpRight won't negatively affect any other hydraulic components on your equipment.

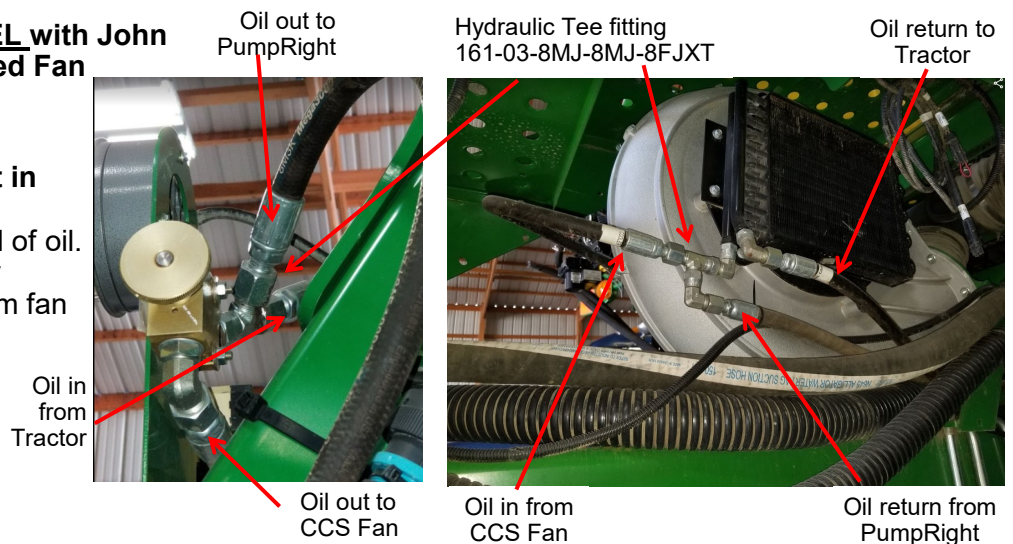
### **Alternate Option - In SERIES with John Deere CCS Fan or Bulk Fill Seed Fan**

If you do not have a tractor remote valve available, this may be your best method. You can plumb the PumpRight after the seed distribution fan. **If using this method, the SurePoint PWM bypass valve must be open** (see previous page for instruction & picture). If bypass is left closed, the SurePoint valve will limit the speed of the seed distribution fan.

For example, the John Deere CCS fan uses around 7 GPM of oil. This will limit the PumpRight maximum flow (8-9 GPM oil necessary for maximum flow). See the charts on the next page for adjusted maximum pump flow. See section G for flow charts to determine your necessary flow rate. If you absolutely need the maximum flow in this case, SurePoint has an alternate motor (smaller displacement) to increase pump speed at 7 GPM oil flow.

### **Alternate Option - In PARALLEL with John Deere CCS Fan or Bulk Fill Seed Fan (Shown Right)**

**DO NOT plumb the PumpRight in series with a vacuum fan.** The vacuum fan uses just a few GPM of oil. Also, problems will be caused by excessive pressure at the vacuum fan motor



## Two PumpRights

The preferred method is to plumb the two pumps in series. **DO NOT plumb two pumps after the CCS fan.** Excessive pressures may damage the CCS fan motor. Run the pressure line from tractor to first pump inlet. Plumb from the outlet of Pump 1 to the Inlet of Pump 2, then from Pump 2 outlet back to the tractor. Open the bypass needle valve on both pumps so each valve controls motor speed independently. Run the flow setting procedure on the next page to minimize the hydraulic flow based on the pump that requires more hydraulic motor flow.

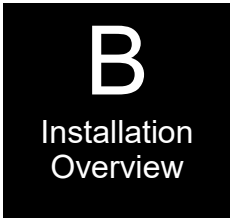
**⚠ DANGER**

*Hydraulic oil under extremely high pressure. Do not use hand or any other skin to check for or to stop hydraulic leaks. Be sure pressure is relieved before loosening hydraulic fittings. Replace worn hoses immediately. Seek medical care immediately if hydraulic oil is shot into the eye or the skin.*



# PumpRight Hydraulic Oil Flow Requirements

(Requirements for 4.0 CID Motor—standard SurePoint motor beginning in 2016—  
Earlier motor was 4.9 CID which uses 20% more oil)



## Setting Tractor Hydraulic Remote Speed

PumpRight pumps require a constant hydraulic oil flow from the tractor. The amount of oil needed varies with pump size and speed. The chart at right shows the necessary oil flow for each pump model at varying fertilizer flows.

Use this procedure to determine the correct setting on your tractor hydraulic flow.

1. Run the fertilizer system in the field at the maximum rate and ground speed.
2. Turn down the hydraulic flow slowly while watching the pump flow (Volume / Minute).
3. Observe when the Volume / Minute begins to drop.
4. Turn the hydraulic flow back up slightly.

This setting will provide the Pump Right pump just enough oil for your application rate.

If running with the bypass open (only recommended when 2 motors are operated in series) this process will minimize the oil circulated in the bypass loop, leaving more oil flow for other hydraulic functions.



The pump is rated at a maximum of 550 RPM. Spinning the pump over 550 RPM may cause pump failure.

The system will spin the pump faster than that if precautions are not taken to limit the speed. This could happen if the strainer becomes plugged or blocked and the controller attempts to speed the pump up to achieve the desired Rate. It could also happen if a high pressure situation occurs that opens the Pressure Relief Valve (PRV) and the pump speeds up to try to achieve the Rate.

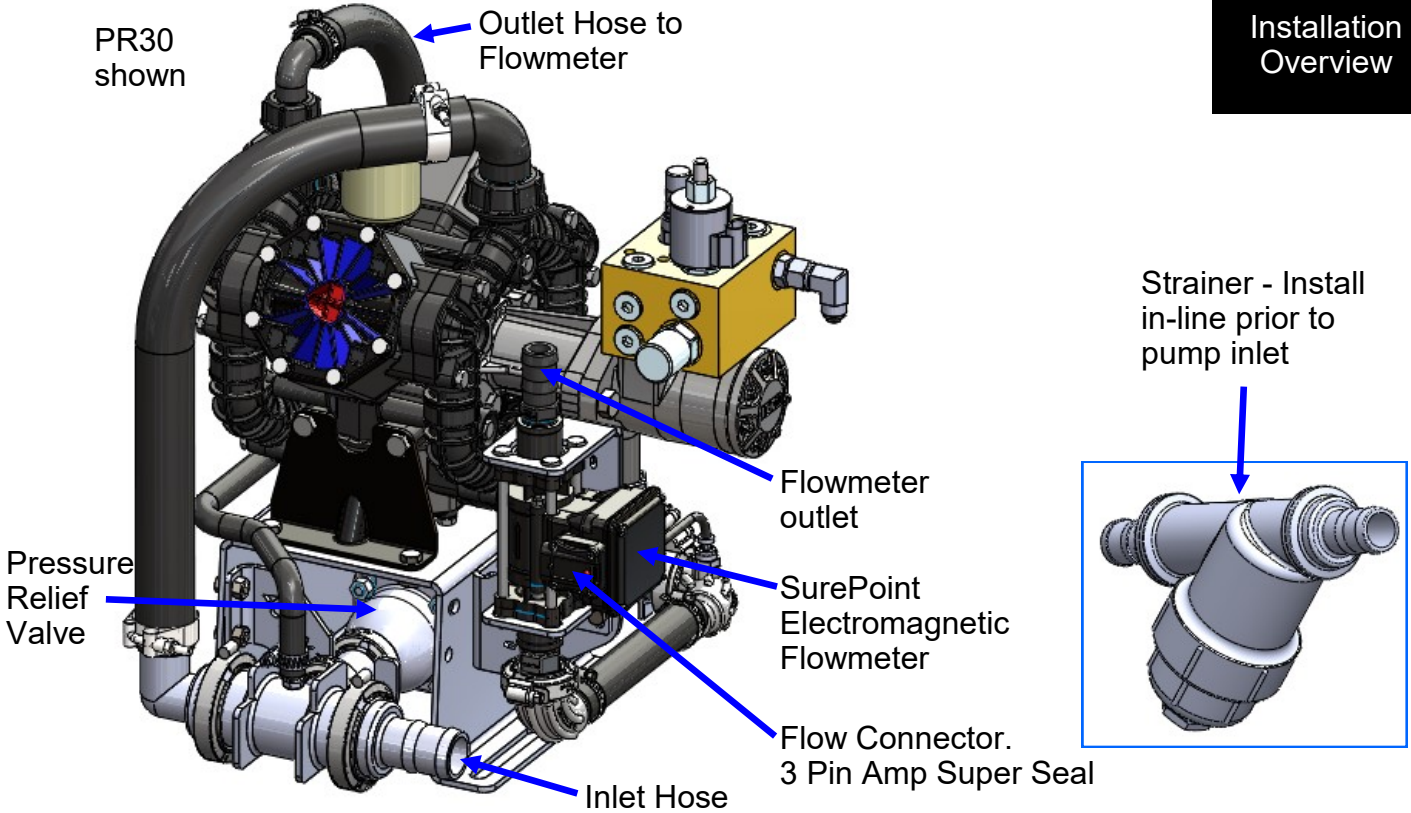
A way to limit the maximum pump speed is to set the High PWM Limit just above what is needed for regular operation. If the pump tries to speed up above that, check for blocked strainer or other issue.

<b>Model PR17 - 3 Diaphragms 0.036 gal/rev</b>		
Fertilizer Flow (GPM)	Pump Speed (RPM)	Hydraulic Oil Flow (GPM)
5	137	2.4
10	275	4.8
15	412	7.1
17	467	8.1
<b>Model PR30 - 3 Diaphragms 0.059 gal/rev</b>		
Fertilizer Flow (GPM)	Pump Speed (RPM)	Hydraulic Oil Flow (GPM)
5	85	1.5
10	170	2.9
15	255	4.4
20	340	5.9
25	425	7.4
30	510	8.8
<b>Model PR40 - 4 Diaphragms 0.087 gal/rev</b>		
Fertilizer Flow (GPM)	Pump Speed (RPM)	Hydraulic Oil Flow (GPM)
10	115	2.0
20	229	4.0
30	344	6.0
40	458	7.9
<b>Model D250 - 6 Diaphragms 0.117 gal/rev</b>		
Fertilizer Flow (GPM)	Pump Speed (RPM)	Hydraulic Oil Flow (GPM)
10	86	1.6
20	172	3.2
30	258	4.8
40	343	6.4
50	429	8.0
55	472	8.6
<b>Model PR80 - 4 Diaphragms 0.176 gal/rev</b>		
Fertilizer Flow (GPM)	Pump Speed (RPM)	Hydraulic Oil Flow (GPM)
10	57	1.0
20	114	2.0
30	170	2.9
40	227	3.9
50	284	4.9
60	340	5.9
70	397	6.9
80	454	7.9



# PR17 & PR30 Liquid Plumbing Connections

## E Installation Overview

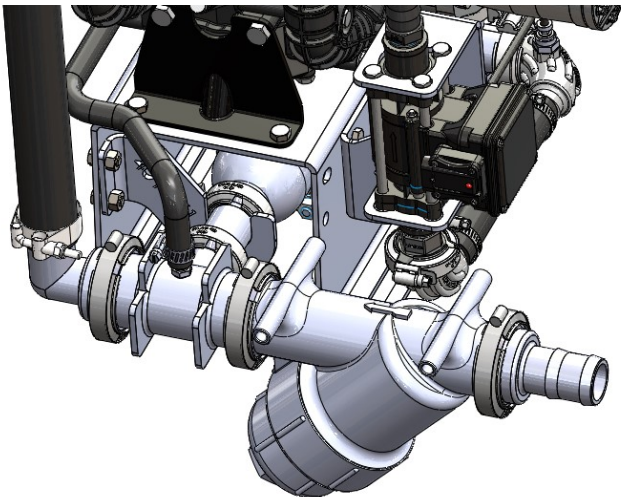



**Inlet:** The PR17 and PR30 PumpRight are shipped with a 1 1/2" inlet hose barb. Attach this to the hose from your supply tank and strainer. A 1 1/2" 90 degree hose barb is included and can be substituted.


**Inlet Strainer:** A 20 mesh strainer is included in the pump kit. The manifold strainer includes two hose barbs so it can be mounted anywhere in the inlet line. If space allows, the strainer can be mounted directly to the inlet plumbing assembly as shown below.

**Outlet:** The outlet is plumbed directly to the flowmeter with 1" hose. As shown above, the flowmeter may be mounted directly to the PumpRight pump. The flowmeter outlet is a 1" hose barb. The outlet hose should be a minimum of 24" long with a gentle curve prior to any fittings for optimum flowmeter performance. The flowmeter outlet will attach to your manifold(s) or section valves. A 3/4" hose barb is included in the bag of parts and can be substituted on the flowmeter outlet.

**Pressure Relief Valve (PRV):** The PRV is a 100 psi relief. If there is a restriction that creates over 100 psi in the system, the PRV will open allowing the excess flow to pass back to the inlet side of the pump. This protects the pump and fertilizer system from damage.






CAUTION

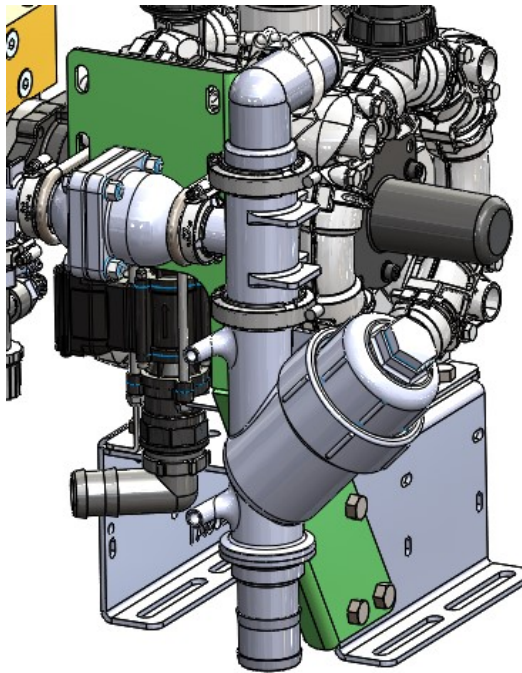
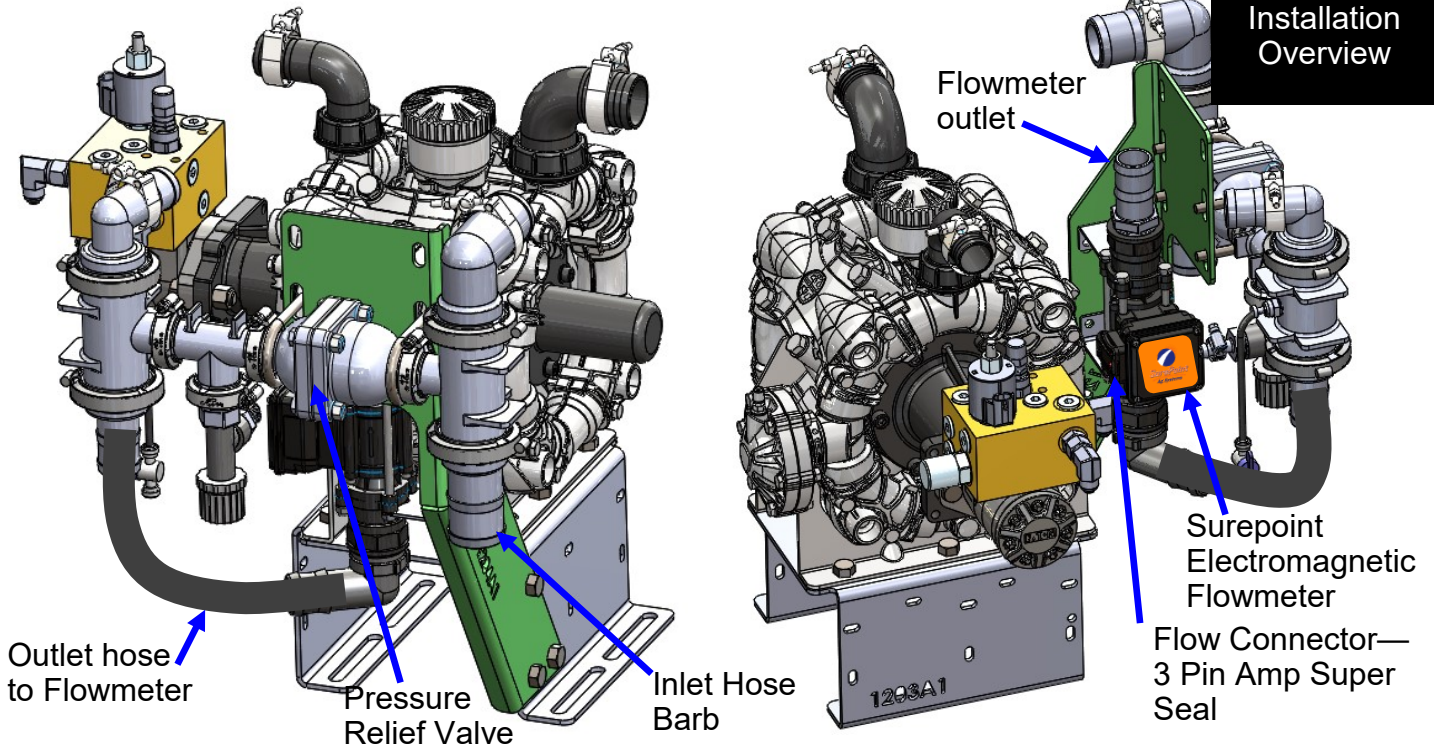
*These pumps can deliver liquid at high pressure (290 PSI ). Be sure the 100 PSI Pressure Relief Valve (PRV) is installed and functioning so system pressure will be kept under 100 PSI. Check hoses, hose clamps, and liquid fittings regularly and repair or replace loose connections.*



# PR40 & D250 Liquid Plumbing Connections

# E

Installation Overview



**Inlet:** The PR40 and D250 PumpRight are shipped with a 2" inlet hose barb. Attach this to the hose from your supply tank and strainer. A 2" 90 degree hose barb is included and can be substituted.

**Inlet Strainer:** A 20 mesh strainer is included in the pump kit. The manifold strainer includes two hose barbs so it can be mounted anywhere in the inlet line. If space allows, the strainer can be mounted directly to the inlet plumbing assembly as shown in image to the left.

**Outlet:** The outlet is plumbed directly to the flowmeter with 1 1/2" hose. As shown above, the flowmeter may be mounted directly to the PumpRight pump. The flowmeter outlet is a 1 1/2" hose barb. The outlet hose should be a minimum of 24" long with a gentle curve prior to any fittings for optimum flowmeter performance. The flowmeter outlet will attach to your manifold(s) or section valves.

**Pressure Relief Valve (PRV):** The PRV is a 100 psi relief. If there is a restriction that creates over 100 psi in the system, the PRV will open allowing the excess flow to pass back to the inlet side of the pump. This protects the pump and fertilizer system from damage.



*These pumps can deliver liquid at high pressure (290 PSI). Be sure the 100 PSI Pressure Relief Valve (PRV) is installed and functioning so system pressure will be kept under 100 PSI. Check hoses, hose clamps, and liquid fittings regularly and repair or replace loose connections.*

The AFS AccuControl system allows an operator to use the AFS Pro 700 display to control implements using clutches and hydraulic drives with Trimble® Field-IQ™ hardware including Rate and Section Control Modules, and optional implement switches, master switch boxes, and section switch boxes.

For complete setup and operation of the AFS AccuControl with the Pro 700 see the manuals available from Case IH, especially the *AFS Pro 300, AFS Pro 700 AFS AccuControl Rate Controller Software Operating Guide, Part number 47799615*, and the *Pro 700 Display Software Operating Guide*. The following pages in this manual summarize the setup required for the SureFire system, but for further information see the above Case IH manual or other documentation available from Case IH.

SureFire Liquid systems on the Case IH Pro 700 / AccuControl can be run from “*Planter Operation Mode*” (Planter Op Mode) or “*Liquid Operation Mode*” (Liquid Op Mode).

**Planter Op Mode** allows the control of seed and liquid fertilizer application.

**Liquid Op Mode** allows for control of liquid fertilizer application.

If the Pro 700 AccuControl is going to be controlling *both planter operation and liquid application* the AFS AccuControl would be set up in **Planter Op Mode**. On the screen below the **AccuCtrl Operation** would be set to **Plant**. The operation of the SureFire liquid application system would then be a secondary operation under Planter Op Mode.



The following pages show screen shots of setting up the SureFire Liquid System using the AccuControl Liquid Op Mode.

Setup screen when using Planter Op Mode with Liquid



For complete information about the configuration, setup, and operation of your Pro 700 and AccuControl system, see one of the following publications or others which are available from your Case IH dealer.



**AFS Pro 300**  
**AFS Pro 700**  
AFS AccuControl Rate Controller

**SOFTWARE OPERATING GUIDE**  
*Software Version 28.7.\**

fewer versions are available

Part number **47799615**  
1<sup>st</sup> edition English  
February 2015




**AFS Pro 700**  
Display  
Framework  
Precision Farming  
E-Notes  
Printer  
Virtual Terminal  
Telematics

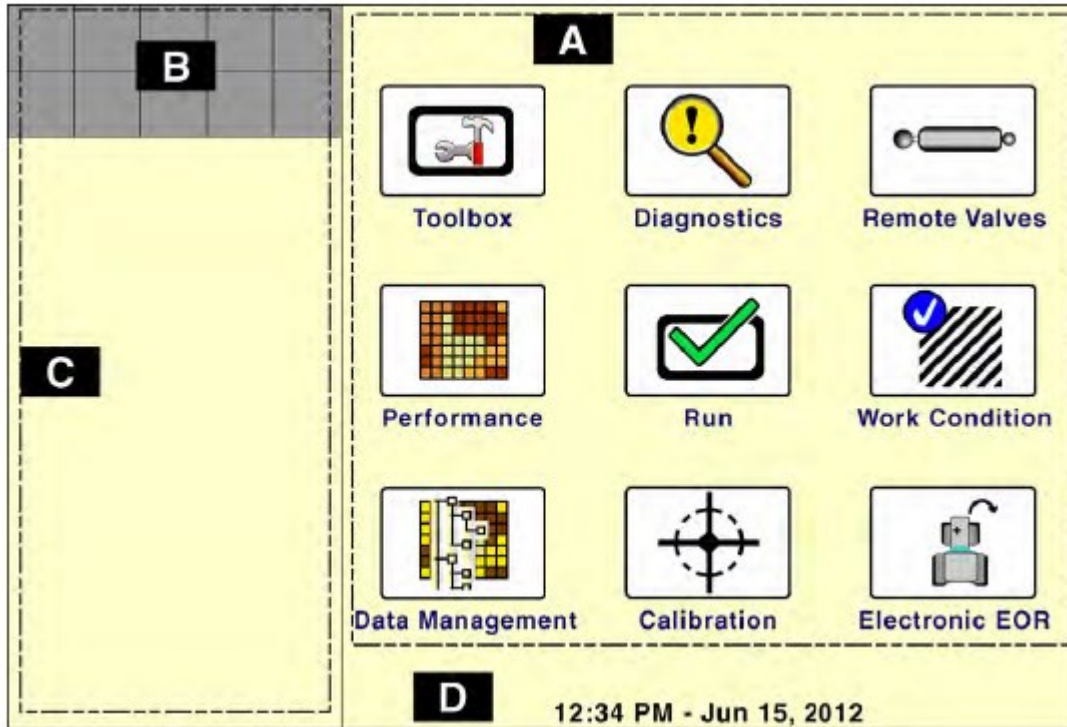
**SOFTWARE OPERATING GUIDE**  
*Software Version 30.\**

fewer versions are available


Part number **47466166**  
1<sup>st</sup> edition English  
January 2015







- A** Home Screen
- B** Status and Warning
- C** Left-hand Area—
  - Created by the vehicle
  - Is always displayed
  - Some parts may be configurable on the Layout screen
  - A window placed here has priority over the same window placed on a “Run” screen
- D** Current time and date



Items in **Toolbox** will vary according to the products that are installed and activated. They could include:

AccuCtrl	Activate	Contr	Display	GPS
Impl	Layout	Manual	Marks	NAV
Operator	Overlap	Precision Farming	Print	Product
TC	Vehicle	VT		



Items in **Work Condition** include:

Layer Assignment	Valve Calibration	Operation Setup	Controller Setup	Product Calibration
<b>Layer</b>	<b>Valve Cal</b>	<b>Operate</b>	<b>Control</b>	<b>Liquid Cal</b>

*You must create or select a Work Condition to complete the setup for product application.*



Items in **Run** include Run1 through Run6.



Items under the **Performance** icon could include:

Profile	Sum1	Sum2	Rx Setup
---------	------	------	----------



Items under the **Diagnostics** icon could include:

Version	CAN	Fault	Resource	GPS	GPS2
---------	-----	-------	----------	-----	------

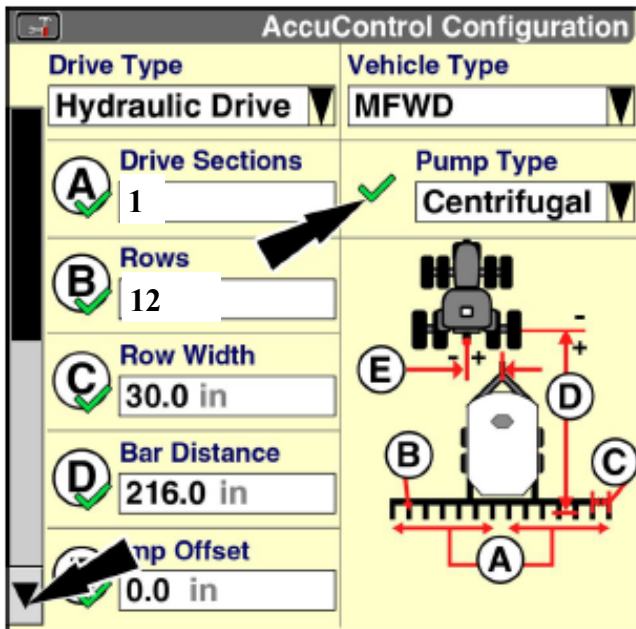
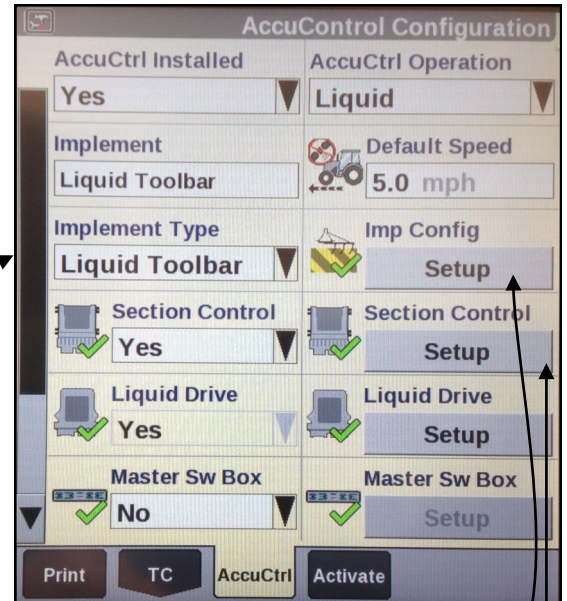


# Pro 700 AccuControl Setup for Liquid PWM Control

Your system may vary from the screens shown here. See the *AFS AccuControl Rate Controller Software Operating Guide* for additional information about configuring your system. The setup may not always happen in the order shown here.

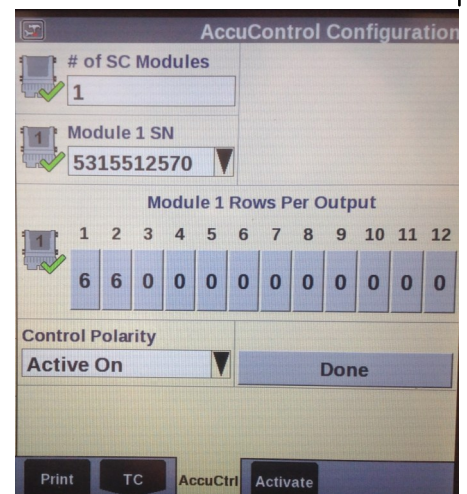
Be sure you have the latest software version for Pro 700, AccuControl, and the Field-IQ module. See your Case (NH) dealer for this.

1. Create an Operator (**Toolbox > Oper**)
2. Check GPS Status (**Toolbox > GPS**)
3. Create Implement (**Toolbox > Impl**)
4. Set up Product (**Toolbox > Product**)
5. Set up Container (Optional) (**Toolbox > Container**)
6. Basic Setup (**Toolbox > AccuCtrl**)
  - A. Select AccuCtrl Operation (Liquid)
  - B. Select AccuCtrl Installed (Yes)
  - C. Select Implement Type (Liquid Toolbar)



7. Implement Configuration (**Toolbox > AccuCtrl > Imp Config**)
  - A. Press 'Setup'
  - B. Select Drive Type (will be Hydraulic Drive)
  - C. Select Vehicle Type
  - D. Set Number of Drive Sections (A) **Always = 1**
  - E. Pump Type will be set at Centrifugal
  - F. Set Total Number of Rows (B)
  - G. Enter Row Width (C)
  - H. Enter Bar Distance in Inches (axle to knife) (D)
  - I. Measure Implement Right/Left Offset
  - J. Scroll down to Enter Rows per Drive Section (same as Total Number of Rows)
  - K. Press 'Done'

8. Section Control Setup (If equipped with Section Shutoff Valves) **Toolbox > AccuControl > Section Control**
  - A. Select Section Control (Yes)
  - B. Press 'Setup'
  - C. Assign Module Serial Numbers
  - D. Assign Rows per Output (number of rows per Section)
  - E. Select Control Polarity (Active On)
  - F. Select 'Done'
9. Overlap/ Boundary Control (**Toolbox > Overlap**)
  - A. Turn Overlap Control and Boundary Control ON.
  - B. Adjust values as desired



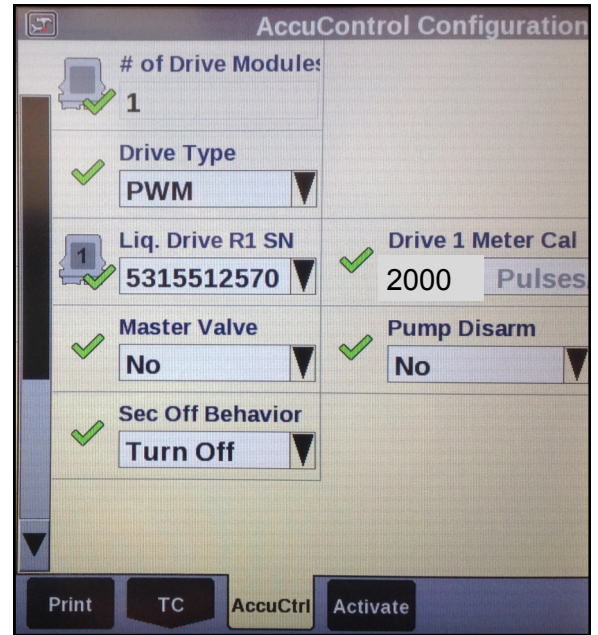


# AccuControl Setup for Liquid

## 10. Liquid Drive Setup *Toolbox > AccuControl > Liquid Drive*

- A. Select Liquid Drive (Yes)
- B. Press 'Setup'
- C. Assign Liquid Drive Serial Numbers
- D. Select Drive Type (**PWM**)
- E. Select Master Valve Type (**NO**)
- F. Select Pump Disarm (**No**)
- G. Select Sec Off Behavior (**Turn Off**)
- H. Enter Drive Meter Cal Number (**3000** pulses/gal for electric systems; **2000** pulses/gal for hydraulic systems)
- I. Press 'Done'

Optional Master Switch Box and Foot Switch



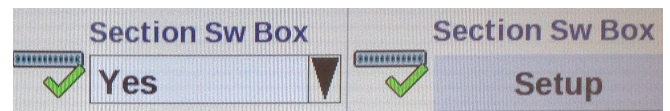
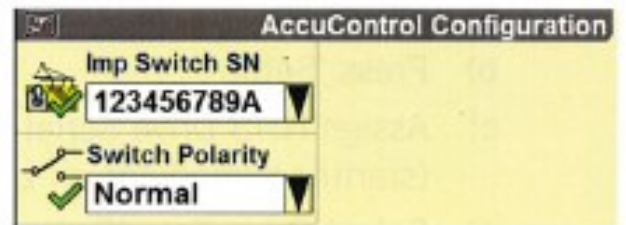
## 11. Master Switch Box (If equipped with External Switch Box)

- A. Select Master Sw Box (Yes or No)
- B. Press 'Setup'
- C. Verify Serial Number
- D. Select Foot Switch (if installed)
- E. Press 'Done'



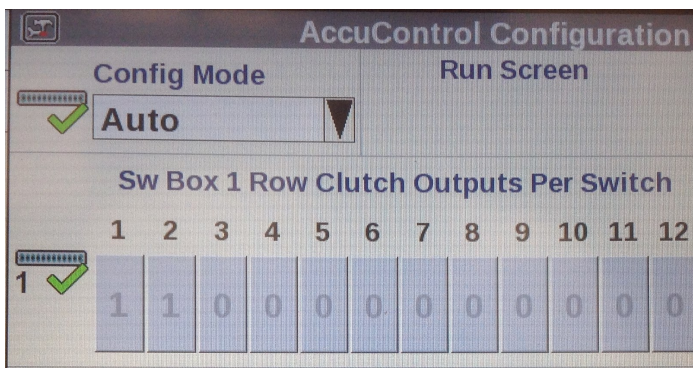
## 12. Implement Switch (if installed)

- A. Select Imp Switch (Yes)
- B. Press 'Setup'
- C. Select Imp Switch Serial Number
- D. Select Switch Polarity (Determine this by raising and lowering the implement and watch the Implement Status Arrow in Status/ Warning Area for proper operation.)
- E. Press 'Done'



## 13. Section Switch Box (If system is equipped with External Section Switch Box or desire Manual Valve Section Control through Run Screens).

- A. Select Section Switch Box (Yes)
- B. Press 'Setup'
- C. Select Config Mode (Auto)
- D. Verify Sw Box Serial Number (if equipped)



If no external switchbox is installed, User Defined Windows can be assigned to a Run Screen (Toolbox>Layout).

# Create A Layout

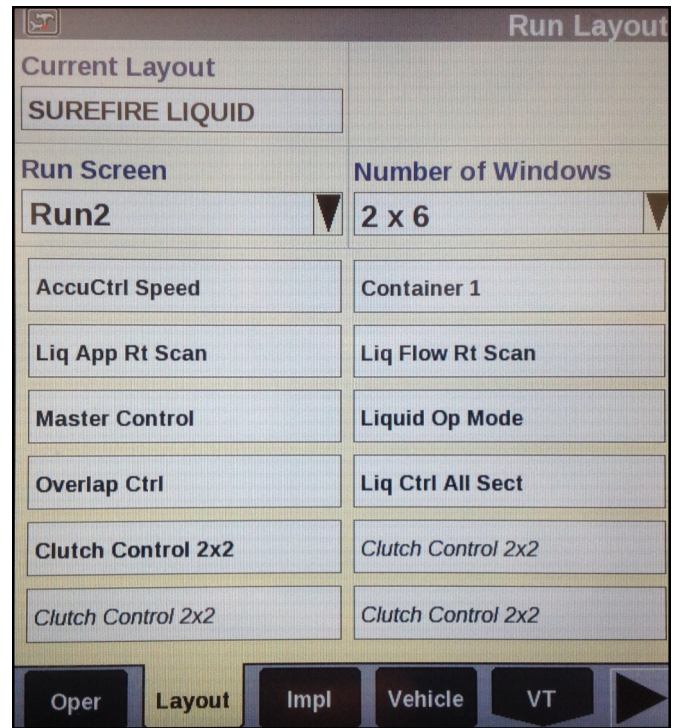
Go to **Toolbox>Layout**

Select Current Layout and then select New.

Name the Layout. Under Run Screen select a screen.

In the white boxes consider adding the following items to a **Run Screen**:

- AccuControl Speed
- Master Control
- Liquid Op Mode
- Liquid Control
- Liq App Rate Scan            Container
- Liq Flow Rt Scan
- Section Control
- Overlap Ctrl            Overlap Control
- Clutch Control (may want this if the system has electric section valves)



The Run Screen Layout is largely a matter of operator preference. Some of these items may be added to the Left Hand Area if space is available there, or more than one Run Screen can be set up.

## Valve Calibration

### *Work Condition > Valve Cal > Advanced Valve Calibration*

*The electric pump systems typically run well with the following default settings. There is more variation in hydraulic pump systems. The Valve Calibration procedure may give you the best settings for a hydraulic pump system. It may also give some settings that don't work well at times. Try the following default values as a starting point and make adjustments as needed for your system.*

See the pictures on the following pages for other values.

	Integral Gain	Breakout	DeadZone	Integrator Upper Limit	Integrator Lower Limit	Comparator Limit
<b>Electric</b>	0.5	3	1-2	100	-100	100
<b>Hydraulic</b>	0.2 (0.15 to 0.25)	10	2-3	.....%00	-100	100

## Additional Tips for Getting Started

1. Set the **Flow Error Timeout at 30—45 seconds** until you get the system adjusted and operating correctly. The default is 5 seconds. This may result in the application being shut down before you have a chance to see how it is operating. After the system is operating correctly, this can be set lower to give you a quicker warning if something is wrong. (**Work Condition > Valve Cal > Advanced Calibration > Scroll down to 2nd page and Flow Error Timeout**)
2. Set the **Fault Speed to Slow or Off** until you get the system adjusted and operating correctly. The default is Normal. (**Work Condition > Operate > Fault Speed**) After the system is operating correctly, this can be set back to Normal. You can run this at Slow if the system gives too many Fault Warnings at Normal.
3. With M T R ST LL error, try increasing **Integrator Upper Limit to 200 or higher. This may help.**



# Pro 700 & AccuControl Operation for Liquid Application

To start applying product:

Go to **Toolbox>AccuCtrl>Default Speed**

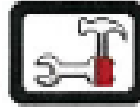
Enter a default speed. The applicator will default to this speed if all ground speed sources are lost.

The **Master Apply** button may need to be cycled twice to start the application.

## 1. Preparation

- A. Insert a data card in the display.
- B. Create or Select a Grower/Farm/Field/Task & Crop Type (Performance > Profile)

## 2. Product Setup: **Toolbox > Product**



- A. Name the product (28-0-0)
- B. Select the form for the product (Liquid)
- C. Select Usage (Fertilizer)
- D. Enter Default Application Rate
- E. Enter Minimum and Maximum Application Rate.

## 3. Product Layer Assignment: **Work Condition > Layer** to assign a product to a control section of the applicator



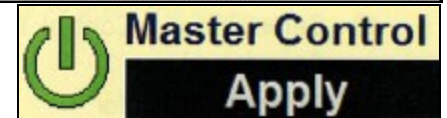
- A. Select or Create a Work Condition.
- B. Select Layer 1 Control Type (AccuControl Liquid)
- C. Select Product for Layer 1 Control
- D. Select Container if using the Container
- E. Assign additional layers if needed.

## 4. Controller Setup—Liquid: **Work Condition > Control**

- A. Verify Implement
- B. Verify Work Condition
- C. Select Controller—Liquid
- D. Product Delay-Default is 1 .0 sec.
- E. Enter the Minimum Speed (if the speed drops below this, the applicator will keep applying at this speed)
- F. Enter a value for Off-target Alarm Limit (probably 15-20%)

## 5. Enable Application: Run Screens

- A. Liquid Op Mode—Select Liquid
- B. Read the safety message and press Accept.
- C. Master Control—Press Apply on display or switch on Master Switch on switchbox (if equipped)



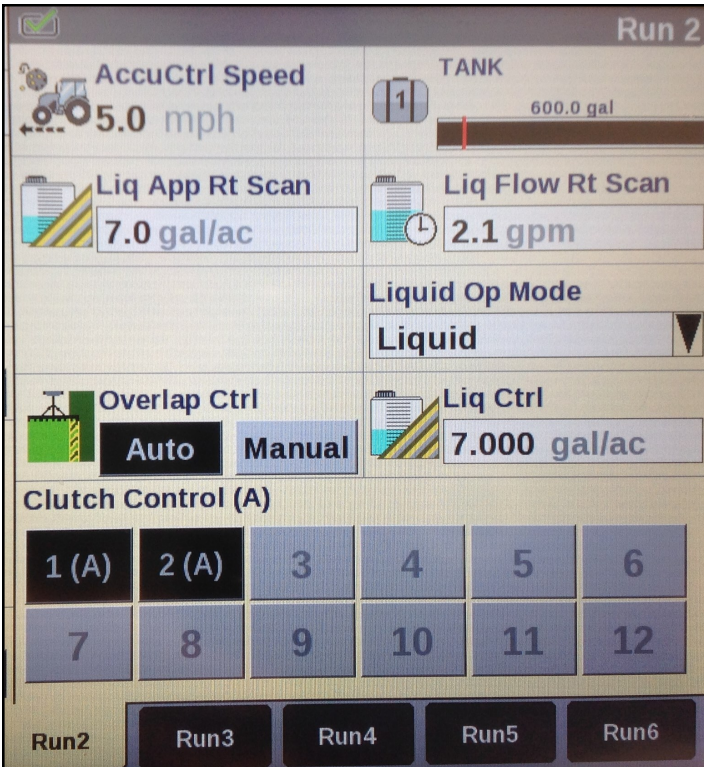
## 6. Liquid Rate Control

- A. Liquid Control defaulted to ON
- B. Increase or decrease rate if needed
- C. Automatic rate control (prescription) is assigned in

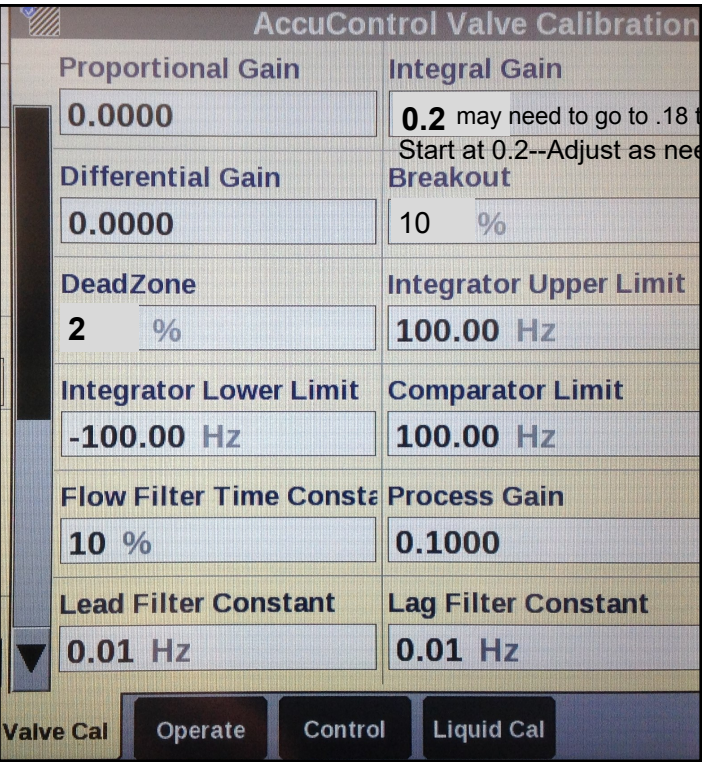
**Performance > Rx Setup.**



# Possible Run Screen Layout for system with 2 electric section valves

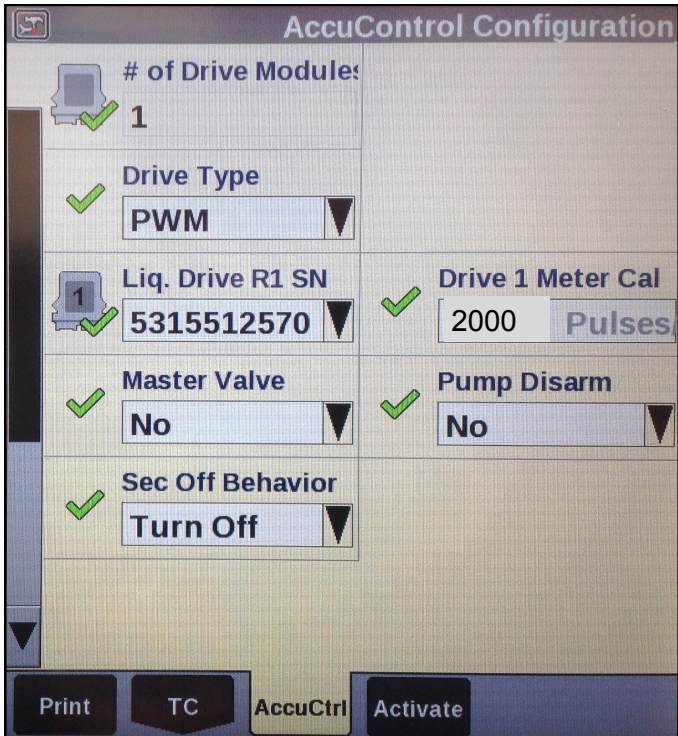


# Start with these Valve Cal settings Work Condition > Valve Cal > Advanced Calibration (For Hydraulic pumps)

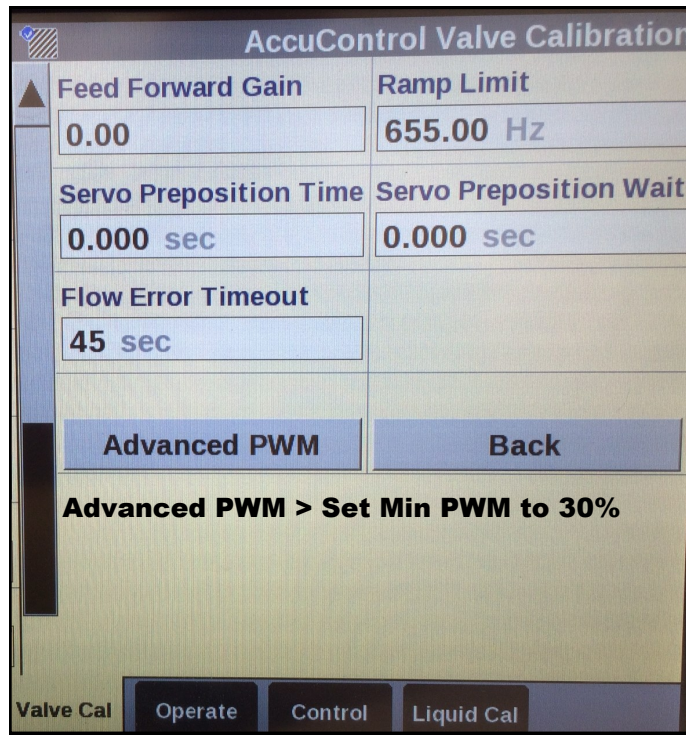


0.2 may need to go to .18 to .20  
Start at 0.2--Adjust as needed

To use default AccuCtrl speed, turn Radar off.  
Screen showing AccuControl Liquid Drive Setup  
**Toolbox > AccuCtrl > Liquid Drive Setup**



Screen showing Flow Error Timeout set to 45 sec  
**Work Condition > Valve Cal > Advanced Calibration > Scroll down to 2nd page and Flow Error Timeout)**



**Advanced PWM > Set Min PWM to 30%**



## Container Setup (Sample) Toolbox > Contr

Container Setup	
Container	Type
SFA	Volume
Capacity	Level
600.0 gal Units	600.0 gal
Warning Type	Warning Level
Value	60.0 gal
Time Tracking	
Disabled	
Container Override	
Info Reset	

PF Marks Manual Product Contr

## Fault Speed, Beeps, etc... Work Condition > Operate

Liquid Operation Setup	
Implement	Work Condition
Liquid Toolbar	Liquid
Auto Sec Enable	Prime Speed
Yes	3.0 mph
Fault Speed	Stop Beeps
Slow	1 beeps

Valve Cal Operate Control Liquid Cal

## Implement Setup (Sample) Toolbox > Impl

Implement Setup	
Implement	
Liquid Toolbar	
Implement Width	Swath Width
360.0 in	360.0 in
Implement Offset	Max Steer Angle
0.0 in	55 °

Oper Layout Impl Vehicle VT

Your system setup may vary from the screenshots shown here. There may be other setup items that need to be completed for your system. Your system may not require all the setups shown here. See the manuals from Case IH for the Pro 700 display and for AFS AccuControl for more information about setup and operation of your system.

If the suggested Valve Cal numbers don't work, try running the Valve Calibration procedure at **Work Condition > Valve Cal**.

AccuControl Valve Calibration

Ensure Implement Setup is complete and Implement is operational.  
Clear personnel from around the Implement.  
Press Start Button to initiate calibration.  
Press Advanced to manually enter values to fine tune operation.

Date	Mar 17, 2015 2:12 pm
Breakout	3.07
Gain	2
DeadZone	0

Drive Number  
5315512570

Valve Calibration  
Start

Advanced Calibration

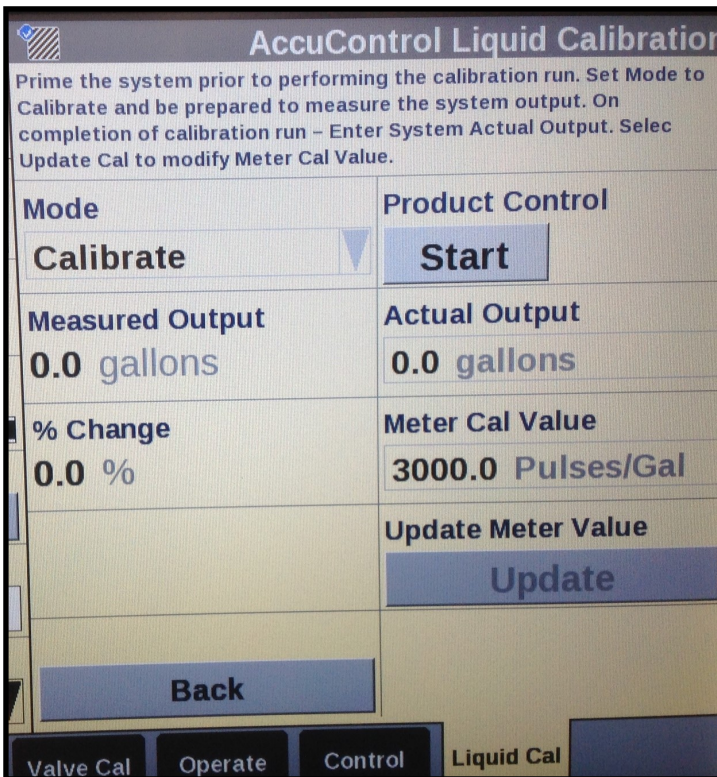
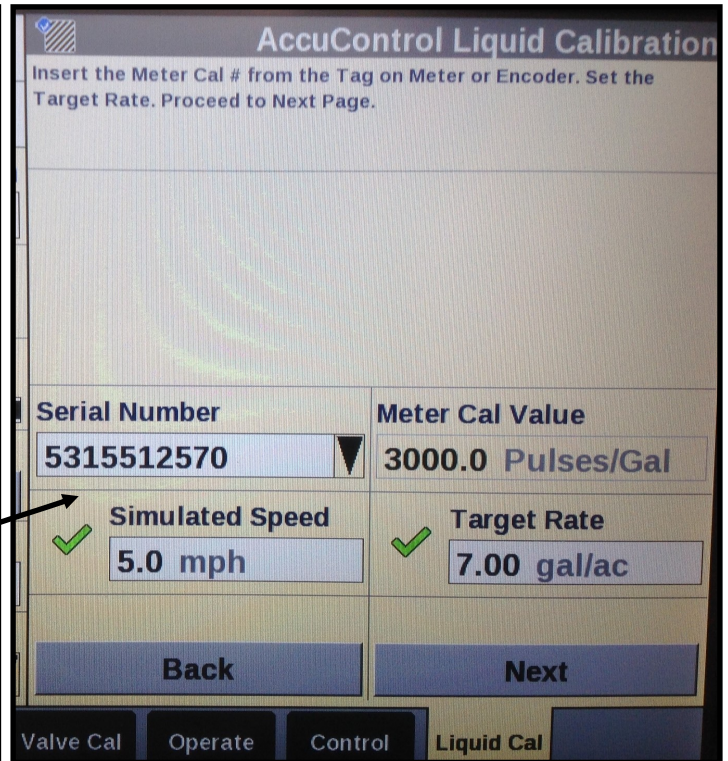
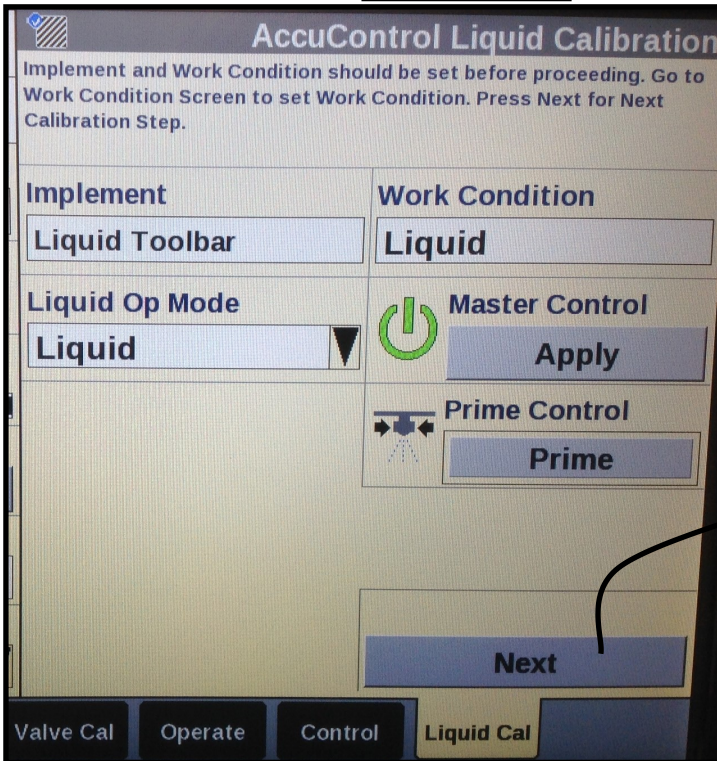
Valve Cal Operate Control Liquid Cal



## AccuControl Liquid Calibration

This is a good place to run the system for initial testing.

The following screenshots show the screens used in running a flowmeter calibration or catch test. Adjust the Speed or Rate to try different scenarios.



This is about the only place to run this system in a test mode.

The AccuControl platform does not provide good diagnostic or troubleshooting ability.

While this test is running, a catch test can be done to verify flowmeter calibration (Meter Cal Value).

Always compare Acres Worked and Gallons Applied. Adjust Meter Cal Value (Flowmeter Calibration) as needed for accurate measurement.

## NOTICE

Running these tests will dispense liquid. Be sure it is safe to dispense the liquid in your tank in this location.

# Troubleshooting

## Pump Will Not Turn

Turn hydraulics off, go to the SureFire PWM valve and use the manual override on top of the electric coil to manually open the valve (Manual Override UP = valve fully open. Push down on the red knob, turn a half turn to the left, it should come up. If you can't push it down, it is probably packed with dirt and will need to be cleaned out.). Turn hydraulics on **at a low flow only** as the valve is 100% open. If the pump doesn't turn, try hydraulic lever in opposite direction or reverse the hoses. Try a different remote. Does the pump turn? If pump is running now, your problem is electric / electronic. If the pump still does not turn, you have a hydraulic problem.

# G

## Troubleshooting

### Electric / Electronic Problem

See the next 2 pages for additional instructions:

1. Close manual override (lock down).
2. Verify hydraulics are on.
3. Make sure you have a Default Speed set up. Set Flow Error Timeout to 45 seconds.
4. Press Master Control-Apply to start pump.
5. Take a metal object and hold it next to the coil. If the coil is working, you will feel the magnetic pull.
6. If no magnetic force is felt, disconnect the PWM valve connector and check voltage. You will need 7-13 volts to get hydraulic valve to open.
7. If 7-13 volts is not present, check harnesses and review control valve type setup.
8. Go back to the 30-pin connector at the Field-IQ Rate and Section Control Module. Check voltage between pins E1 & E2, should be between 7-13 volts while in section test after holding increase button.
9. If you cannot get voltage at pins E1 & E2, contact your Trimble dealer for further assistance.

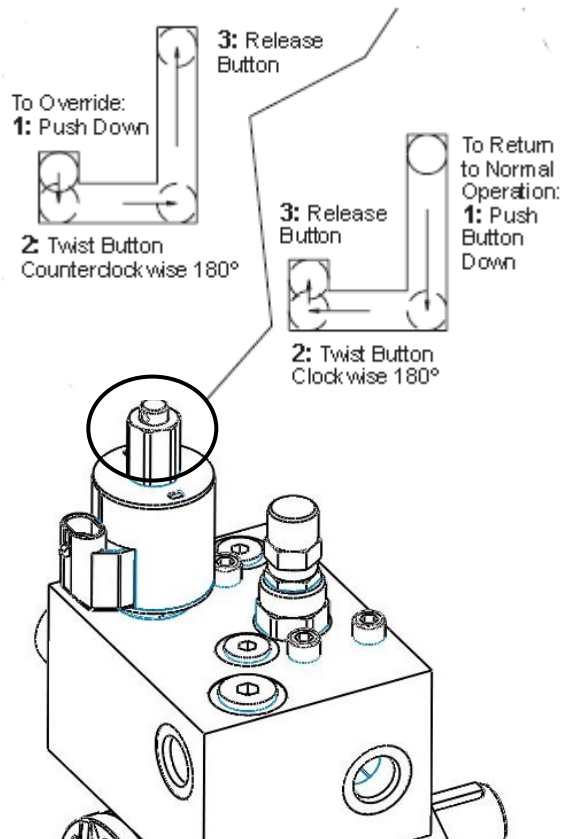
### Hydraulics Problem

1. Leave the manual override open on the SureFire valve.
2. Check the hose routings. The "P" port on the SureFire valve should hook to pressure. The "T" port is the return that should flow back to the tractor.
3. Try hoses in a different hydraulic remote. Inspect hydraulic connectors for damage or restrictions.

### Hydraulic Manual Override

Down - Normal Operation

Up - Override, valve 100% open





# Troubleshooting

# G

Troubleshooting

## Application Rate Fluctuates

**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.

You need to determine if the fluctuation is caused by the controller sending fluctuating signals to the valve.

OR

1. Turn the system on in Manual mode and watch the flow in GPM.
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 4-8 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? If the pump is surging reduce the PWM gain in controller settings.
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 Work Condition > Valve Cal > Advanced Calibration.
2. Change the settings by reducing the Integral gain.

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

1. You may need to increase the Gain setting. Go to Work Condition > Valve Cal > Advanced Calibration.
2. Change the settings by increasing the Integral gain.

## "Motor Stalled" warning

1. This means the system has not been able to reach the desired rate and has given up trying.
2. Increase the Integrator Upper Limit to 200 or higher. This seems to let the system keep trying longer.
3. The AccuControl system does not have many troubleshooting and diagnostic features built in.

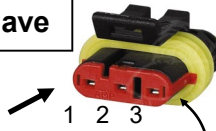
## No Flow shown on display but liquid is being pumped

1. Unplug flowmeter. With voltmeter, check for 12 volts between pins B&C of flowmeter connector (on main harness PN 215223Y2). 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 20. 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 of flowmeter connector (on 215223Y2 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.

# No Flow shown on display, but liquid is being pumped

## Flowmeter Tap Test

See which flowmeter connector you have



Remove red guard to reach pins. Don't break red side clips.

### Flowmeter pinout:

**3-pin MP Tower**      **A- Signal   B- 12V Power   C- Ground**  
**3-pin AMP SuperSeal**      **1- Ground   2- 12V Power   3- Signal**

1. Unplug the flowmeter. With voltmeter, check for **12 volts between Power & Ground** of flowmeter connector. Should have **4-5 volts between signal and ground**. If voltage is not present, inspect wiring harness and check for voltage at harness connection(s) nearer the Rate Controller (at 12-pin Deutsch connector, Power is 1, Ground is 2, Flow Signal is 3).
2. If 12 volts is present, then conduct a **tap test**. Change the flow cal to 1. Have a second person watch GPM on the screen while other person taps repeatedly (use a short piece of wire or a paper clip) between signal and ground pins of flowmeter connector. A flow value (gpm) should show up indicating the wiring is not damaged.
3. If the flow showed on the display during the tap test, your wiring to that point is good. If tap test did not work, go back to the next harness connection and do a tap test there between signal and ground.
4. If the tap test registers flow on the display, replace flowmeter. (*Sometimes, cleaning the inside tube of the flowmeter with soapy water and a soft brush will remove a film covering the electrodes.*)
5. Change Flow Cal back to appropriate Flow Cal when finished with Tap Test.
6. SurePoint has a Speed/Flow Simulator (PN 219-01462) or a Tap Tester (212-03-3912Y1) that can be used to confirm if the wiring is good between the flowmeter and controller.

## Field Verification of Flowmeter Calibration

*Always verify the flow cal setting by comparing the amount actually applied in the field (from weigh tickets) with the amount shown on the display. Adjust the flow cal as needed to get less than 1% difference between the actual amount applied and the amount shown on the display.*

### **In general:**

**Increase the Flow Cal number if not enough product is actually being applied.** (If you want more, increase the number)

**Decrease the Flow Cal number if too much product is being applied.** (If you want less, decrease the number)

### **Formula to Adjust Flow Cal Number**

**$(\text{Volume shown on display}) / (\text{Volume actually applied}) \times \text{flow cal number in display} = \text{new flow cal}$**

Example: Display shows 727 gallons was applied. Weigh ticket shows 750 gallons was actually applied. Flow cal number in display was 3000. (*We applied too much, so we will decrease the flow cal.*)

$$727 / 750 \times 3000 = 2908 \text{ (new flow cal number to set in display)}$$

*(Any adjustments to the flow cal number will only be as accurate as the measurements used in figuring it.)*

Do not power wash the flowmeter.

Unplug the flowmeter before welding on the implement.

# Recommended Care and Maintenance

# H

Maintenance  
& Parts

## Air Bladder

Legacy D-series PumpRight pumps and the PR40 have an air bladder to smooth the pump output flow. It is recommended to run this bladder at 20% of working pressure. So, if your system operates at 50 psi, charge the air bladder to 10 psi. Due to the small size of the air bladder, **very little air is needed**. SurePoint recommends charging a portable air tank to the correct pressure, then attach to the bladder valve to charge the air bladder to the same pressure as your air tank.

The PR17 and PR30 pumps do not have an air bladder.

## 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.

## Change Pump Oil Annually

PumpRight pumps use an internal oil lubricated crankshaft and connecting rod design. The oil is held in an external reservoir with level indicators. Hypro oil is recommended for the pump. This is a non-detergent SAE30 weight oil. If not available, hydraulic jack oils are a similar non-detergent formulation. Annual oil changes are recommended.

To fill or drain the pump completely, the pump shaft must be turned slowly by hand. The hydraulic motor will have to be removed to do this.

On some pump models, the pump will have to be removed from the mounting bracket and lifted slightly to allow access to the oil plug.

When refilling the pump with oil, the shaft will again have to be rotated to fill the pump to its required oil volume.

CRANKCASE OIL CAPACITIES				
Model	Capacity		Model	Capacity
PR17	13 oz		PR40	56 oz
PR30	28 0z		D250	98 oz

## Diaphragm & Valve Replacement



PumpRight pumps are designed to allow very simple replacement of the two main pumping components; the diaphragms and the inlet & outlet valves. It is a good practice to replace these every 3 or 4 years (or every 1000 hours). It is a small job that helps ensure reliable operation during the busy season.

## 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 (Section Test or Calibrate PWM Limits) to verify components and system are in working order. (May need to open air bleed valve to prime pump the first time. Be sure air bleed tube is not plugged.)
4. ***Clean out the dirt that may be packed in to the manual override knob on the hydraulic valve block.***
5. If necessary run pump in manual override mode to check hydraulic setup (see page 43).
6. 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. A loose clamp on the suction side can cause erratic flowmeter readings.*
7. Push in tubes at all Quick-Connect fittings so they are seated tightly. Tubes that are not fully seated are not always obvious, but may allow air in, which can cause check valves to leak.
8. 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.
9. Remove and clean the strainer. Be sure strainer is tightened securely so it will not suck air.
10. 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.)
11. Run the Nozzle Flow Check to verify that system will lock on to a Target Rate.
12. Check, and if necessary, tighten the tank straps.





***Hydraulic oil under extremely high pressure. Do not use hand or any other skin to check for or to stop hydraulic leaks. Be sure pressure is relieved before loosening hydraulic fittings. Replace worn hoses immediately. Seek medical care immediately if hydraulic oil is shot into the eye or the skin.***



***These pumps can deliver liquid at high pressure (290 PSI). Be sure the 100 PSI Pressure Relief Valve (PRV) is installed and functioning so system pressure will be kept under 100 PSI. Check hoses, hose clamps, and liquid fittings regularly and repair or replace loose connections.***



# PumpRight Valves & Diaphragms for D pumps



All PumpRight models use the same diaphragm and valve parts.

## Diaphragm Pump Service Kit Item Number 291-02-100500

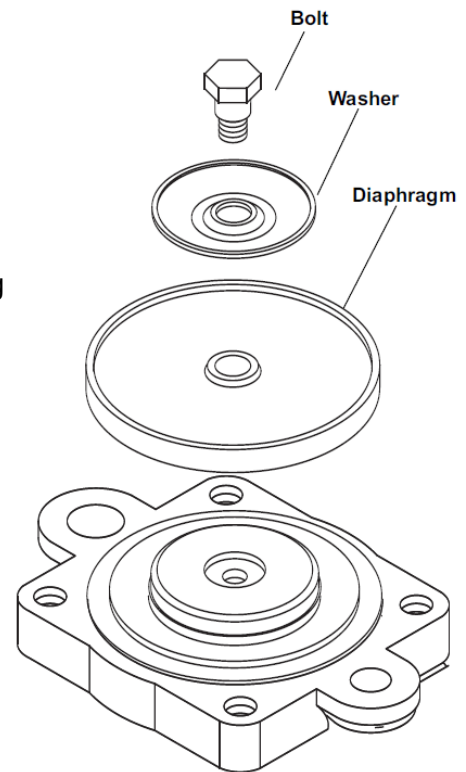
1 Kit contains 1 diaphragm and 2 valves to service a single pumping diaphragm. Order multiple kits to service all the diaphragms in your pump per chart at right.

Qty in Kit	Part Number (all begin 291-02-9910-xxxxxx)	Description
1	550081	Diaphragm (BlueFlex)
2	320030	O-Ring
2	759051	Valve Assembly

	Number of Diaphragms
D70	2
D115	3
D160	4
D250	6

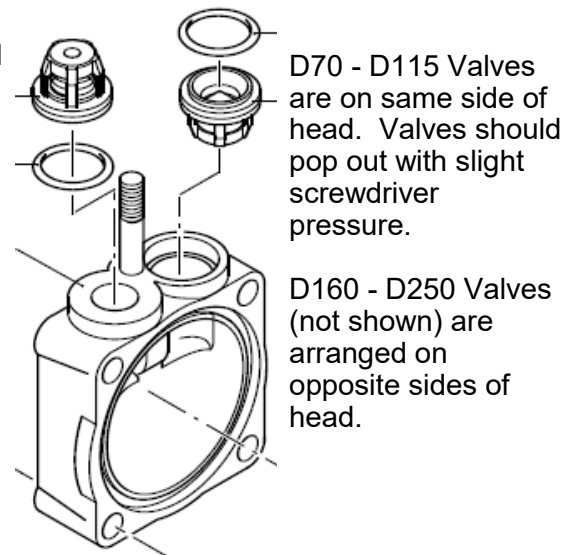
### Diaphragm & Valve Service Steps:

1. Remove inlet and outlet plumbing connections by unscrewing ring nut on inlet and outlet fitting.
2. Use extreme caution when removing and replacing drain plug, so that threads are not stripped and o-ring is not damaged. Remove drain plug from bottom of pump to drain oil from pump. Rotate pump shaft to remove all oil. Replace drain plug making sure o-ring is in place. Tighten plug to 171.4 In.Lbs.
3. Remove pump manifold(s) using a 17mm or 13 mm wrench.
  - D70 1 manifold 2 x 17 mm nuts (on top)
  - D115 1 manifold 3 x 17 mm nuts (on side)
  - D160 2 manifolds Each manifold has 4 sets of 2 x 13 mm nuts
  - D 250 2 manifolds Each manifold has 6 sets of 2 x 13 mm nuts
4. Remove and replace complete valve assembly.
5. Remove the pump head.
6. Remove the diaphragm bolt, support washer and diaphragm. Turn the pump shaft to up stroke to replace diaphragm.
7. Install new diaphragm (LIQUID side up), then replace washer and bolt.
8. Turn pump to downstroke to seat new diaphragm into the sleeve groove.
9. Replace pump head and manifold(s).
10. Refill crankcase with SAE30 non detergent oil (PumpRight Oil or hydraulic jack oil). Turn pump shaft and top off sight glass with oil.



## Other Service Parts D70, D115, D160, D250

Part Number (all begin 291-02-9910-xxxxxx)	Description
550080	Diaphragm (Buna, Optional)
550190	Accumulator Diaphragm



# PumpRight Valves & Diaphragms



## Diaphragm Pump Service Kits

1 Kit contains 1 diaphragm and 2 valves to service a single pumping diaphragm.

Order multiple kits to service all the diaphragms in your specific pump per chart below...

Visit <https://support.surepointag.com> or [PumpRight Diaphragm Pump Repair and Maintenance Video](#)

QTY in Kit	Part Number	Description
<b>PR17 Pump Service Kit - 3 Diaphragm</b>		
<b>KIT #: 291-13-100100 (pump requires 3 kits)</b>		
1	291-13-1040083	BlueFlex Diaphragm (PR17)
2	291-13-2429051	Valve
2	291-13-3460380	Gasket/O-ring

<b>PR30 Pump Service Kit - 3 Diaphragm</b>		
<b>KIT #: 291-13-100150 (pump requires 3 kits)</b>		
1	291-13-550081	BlueFlex Diaphragm
2	291-13-2429051	Valve
2	291-13-3460380	Gasket/O-ring

<b>PR40 Pump Service Kit - 4 Diaphragm</b>		
<b>KIT #: 291-13-100150 (pump requires 4 kits)</b>		
1	291-13-550081	BlueFlex Diaphragm
2	291-13-2429051	Valve
2	291-13-3460380	Gasket/O-ring

<b>D250 Pump Service Kit - 6 Diaphragm</b>		
<b>KIT #: 291-13-100200 (pump requires 6 kits)</b>		
1	291-13-550081	BlueFlex Diaphragm
2	291-02-9910-759051	Valve
2	291-02-680070	Gasket/O-ring

For other service parts, see individual Pump Part Breakout Diagrams in [396-4034Y1](#), the PumpRight manual that came with your pump.

Also see the manual and individual pump parts breakouts online here. ([store.surepointag.com](https://store.surepointag.com))

# PumpRight Valves & Diaphragms

## Diaphragm Pump Service Kit Replacement Instructions for PR Pumps

Visit <https://support.surepointag.com> or [PumpRight Diaphragm Pump Repair and Maintenance Video](#)

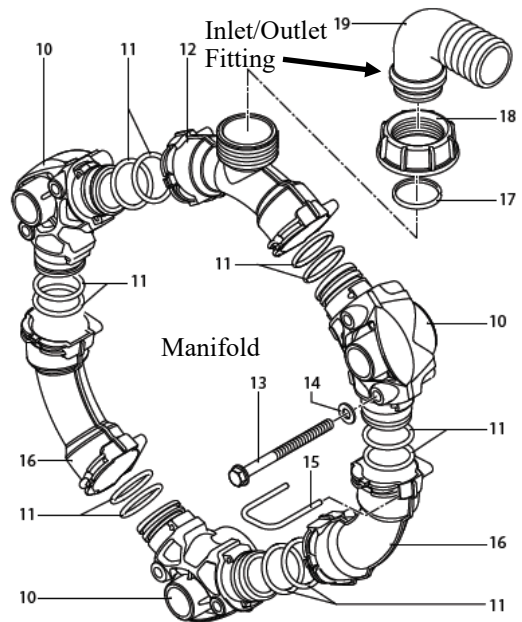


	Number of Diaphragms
PR17	3
PR30	3
PR40	4
D250	6

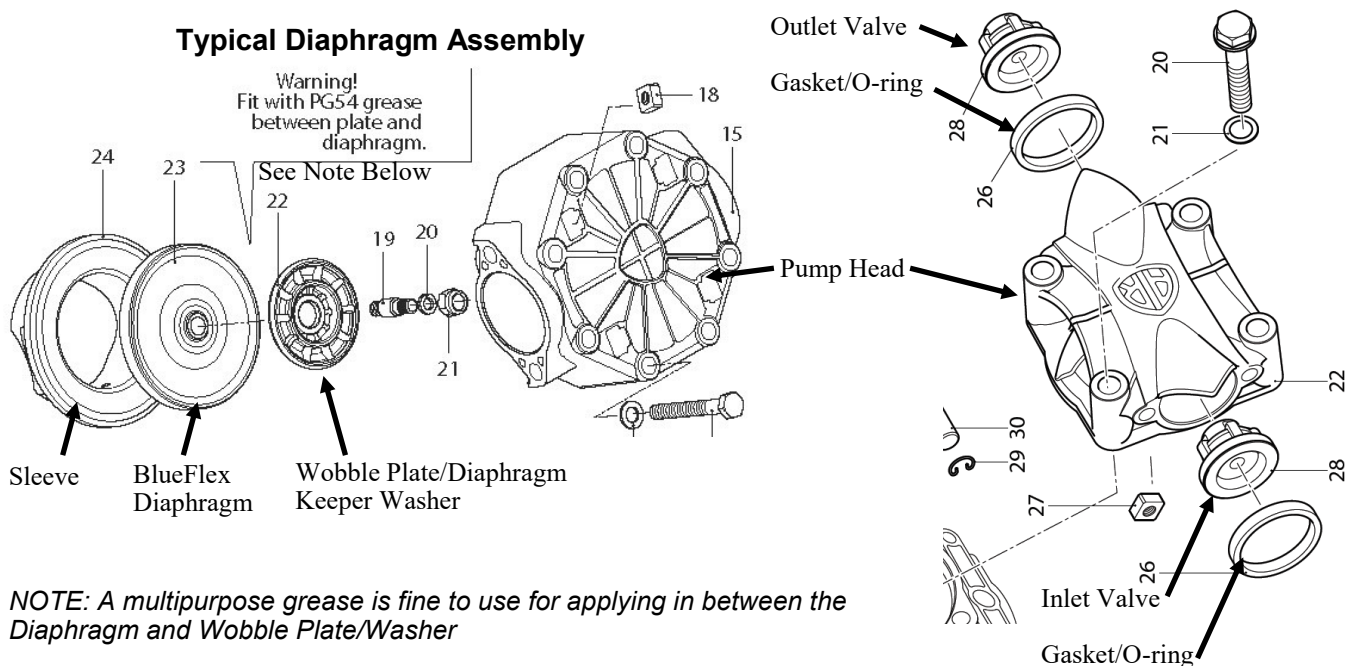
### Diaphragm & Valve Service Steps:

1. Remove inlet and outlet plumbing connections by unscrewing ring nut on inlet and outlet fitting.
2. Use extreme caution when removing and replacing drain plug, so that threads are not stripped and o-ring is not damaged. Remove drain plug from bottom of pump to drain oil from pump. Rotate pump shaft to remove all oil. Replace drain plug making sure o-ring is in place. Tighten plug to 180 In.Lbs.
3. Remove pump manifold(s) using a 13 mm wrench.
4. Remove and replace complete valve assembly.
5. Remove the pump head.
6. Remove the diaphragm bolt, support washer and diaphragm. Turn the pump shaft to up stroke to replace diaphragm.
7. Install new diaphragm (LIQUID side up), then replace washer and bolt.
8. Turn pump to downstroke to seat new diaphragm into the sleeve groove.
9. Replace pump head and manifold(s).
10. Refill crankcase with SAE30 non detergent oil (PumpRight Oil or hydraulic jack oil). Turn the pump shaft and top off sight glass.

Typical Manifold—2 per pump—  
inlet and outlet



Typical Valve Assembly



**NOTE:** A multipurpose grease is fine to use for applying in between the Diaphragm and Wobble Plate/Washer

**For other pump service parts, see individual Pump Part Breakout Diagrams in [396-4034Y1](#), the PumpRight manual that came with your pump.**

[Also see the manual and individual pump parts breakouts online here. \(store.surepointag.com\)](#)

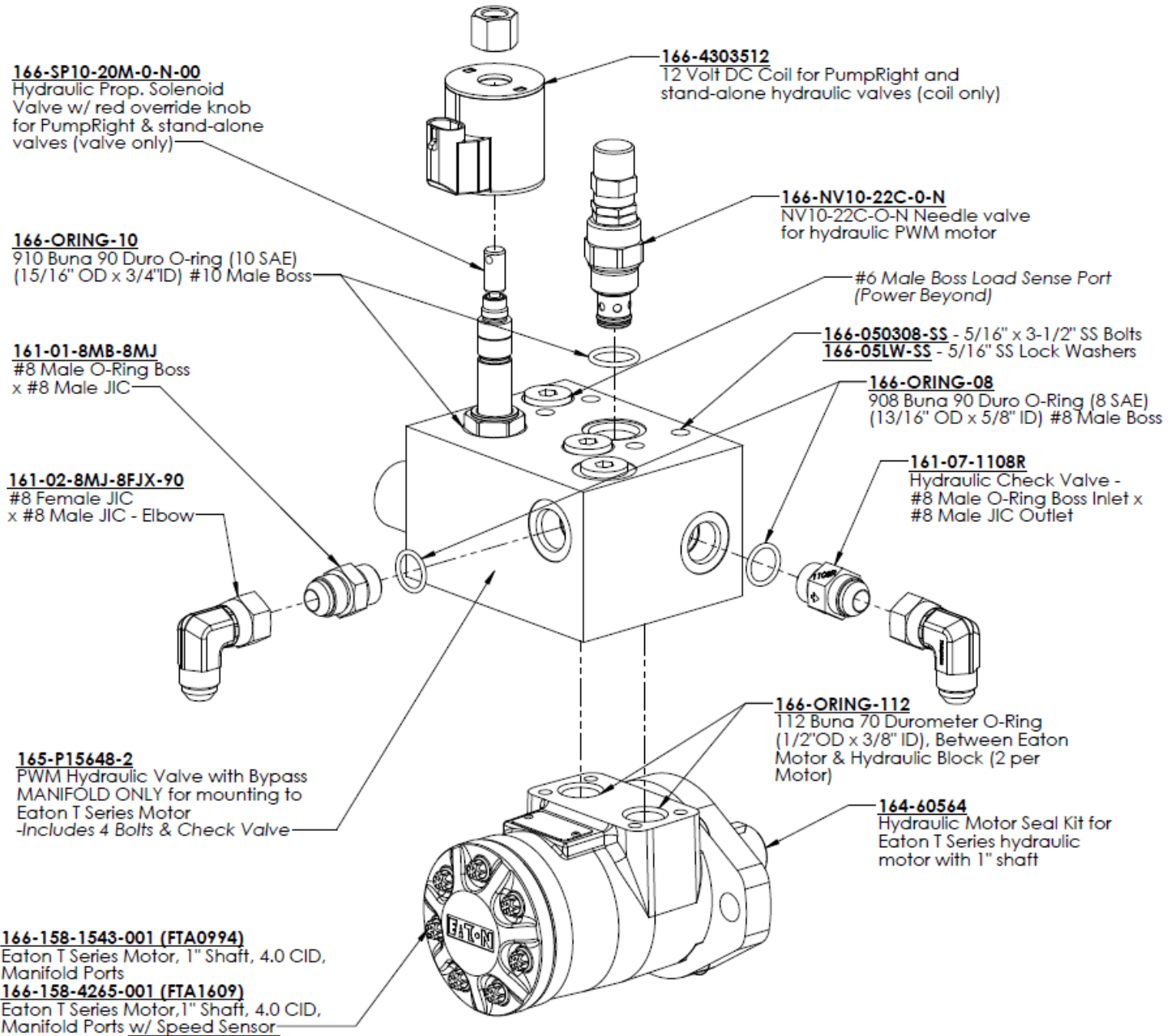
[Go to support.surepointag.com for pump information and parts breakdowns.](#)



# PWM Valve and Motor Parts



- 164-FTA0994 4.0 CID motor (this is the standard motor beginning in 2016)
- 164-FTA1609 Same as 164-FTA0994, but with RPM Speed Sensor-- GRC does not support a Pump RPM sensor.




# Addendum to 396-2860Y1 and 396-2861Y1 Setup and Troubleshooting the Pro 700 AccuControl Liquid PWM System (aka Intellivew IV Intellirate)

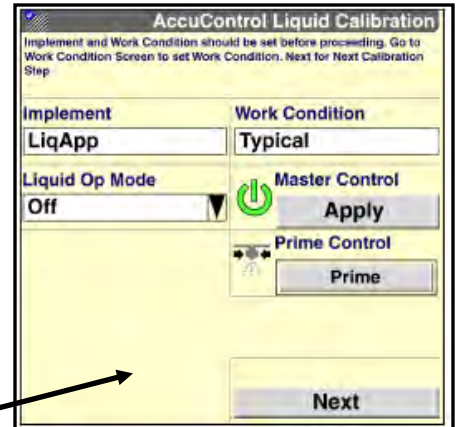
*Note to SureFire people:* The Default speed setting that works on our test stand does not work when the tractor is not moving when the Pro 700 is plugged into a tractor that has Radar, Wheel, or GPS speed capability. This makes testing the system in a Run mode impossible without driving the tractor. Use the method below, instead. On our test stand, set the Default Speed to 0 (Toolbox > AccuCtrl > Default Speed > 0) before doing this.

**To test the Pro 700 AccuControl on initial startup and in a troubleshooting situation, use the *Liquid Cal* mode. (Work Condition > Liquid Cal)**

1. Set up the **Toolbox > AccuControl** configuration page so all AccuControl items are set.
2. Set up the **Work Condition > Valve Cal > Advanced Calibration** screen to match the settings shown in the manual for Tower (3/3/2016 manual or later) or PumpRight systems. The Valve Calibration procedure is likely to give results that will not work. It may be fairly good except for an Upper Integrator Limit that is too low, or it may have totally unworkable numbers in Dead Zone and other fields.

3. Set the **Flow Error Timeout** (on page 2 of the Valve Calibration setup) to 45 sec. This will let the system run for a while before it shuts down if it is not detecting flow.

4. Go to **Work Condition > Liquid Cal** 
5. If the **Prime** button does not show up here:

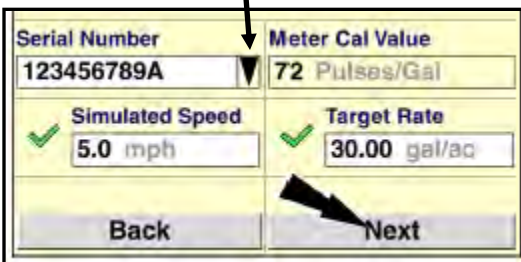



- Home > Toolbox > AccuControl > Imp Config > Setup > Scroll down > **Liquid Prime > Enabled**. (Pressing the Prime button will run the pump for 10 seconds. To keep the pump running, press and hold the Prime button.)

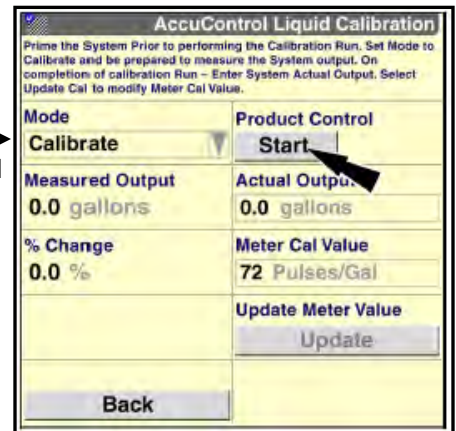
6. To run the system from here with a simulated speed and target rate:

**Liquid Op Mode > On      Master Control > Apply > Next** 

7. Enter a **Simulated Speed** and **Target Rate** (these can be changed while running in this mode to test other speeds or rates). Press **Next**.



8. Press **Start** to start the pump.  System should run at Simulated Speed and Target Rate. **Measured Output** should count up as product is pumped. To see actual flow in gpm, you need to set up a Layout for the Left Area with **Liq Flw Rt Scn**. This is very useful when diagnosing pump or system issues. It needs to be in the Left Area



so you can see it while running in this mode. (Remember, when testing with water, the pressure will be much less than it will be with a fertilizer product. If the pressure is too low, all the rows may not flow because there may not be enough pressure to open all the check valves. Increase the rate until all rows are flowing.)

9. If the pump does not run here, perform the other troubleshooting tests for hydraulic or electric pumps. You can start the system here and use a voltmeter to verify that there is PWM voltage at the EPD or hydraulic valve. (If it is not reading flow, it will quickly ramp up to maximum pump speed and shut off, giving a "Motor Stalled" error message. To make this happen more slowly, set the Integral Gain to 0.1 to allow time for diagnostic observation.)
10. If the pump runs and liquid is flowing but no flow is showing in the Liq Flw Rt Scn box, check for 12 v at the flowmeter connection (pins B & C) and do a tap test (pins A & C) to see if flow will register on the display (see note in #9 about setting Integral Gain).
11. If the pump runs, but is surging, lower the Integral Gain. If it is pumping, but getting to rate very slowly, raise this.
12. If the system has section valves, they should open when this test is started. If they don't open, check the AccuControl Configuration setup (Toolbox > AccuControl > Section Control > Setup {should have green checkmarks, Control Polarity is Active On}). Check Section Sw Box Setup > Config Mode > Auto (should say Run Screen in upper right corner). Set up a Run Screen layout with Clutch Control 2X2 to have section switches on the display. Be sure Boundary Control and Overlap Control are ON (Toolbox > Overlap). If they still don't open, check for constant voltage (pins A&B) and signal voltage (pins B&C) at valve.