

# 396-2861Y1



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

***CASE IH*** AFS® AccuControl  
AGRICULTURE

&

**SureFire PumpRight for PWM Control**



	Number of Diaphragms	Max Flow GPM	Max GPA on 40' at 6 MPH	Max GPA on 60' at 6 MPH
D70	2	15	30	20
D115	3	25	50	34
D160	4	35	70	48
D250	6	55		70

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## 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

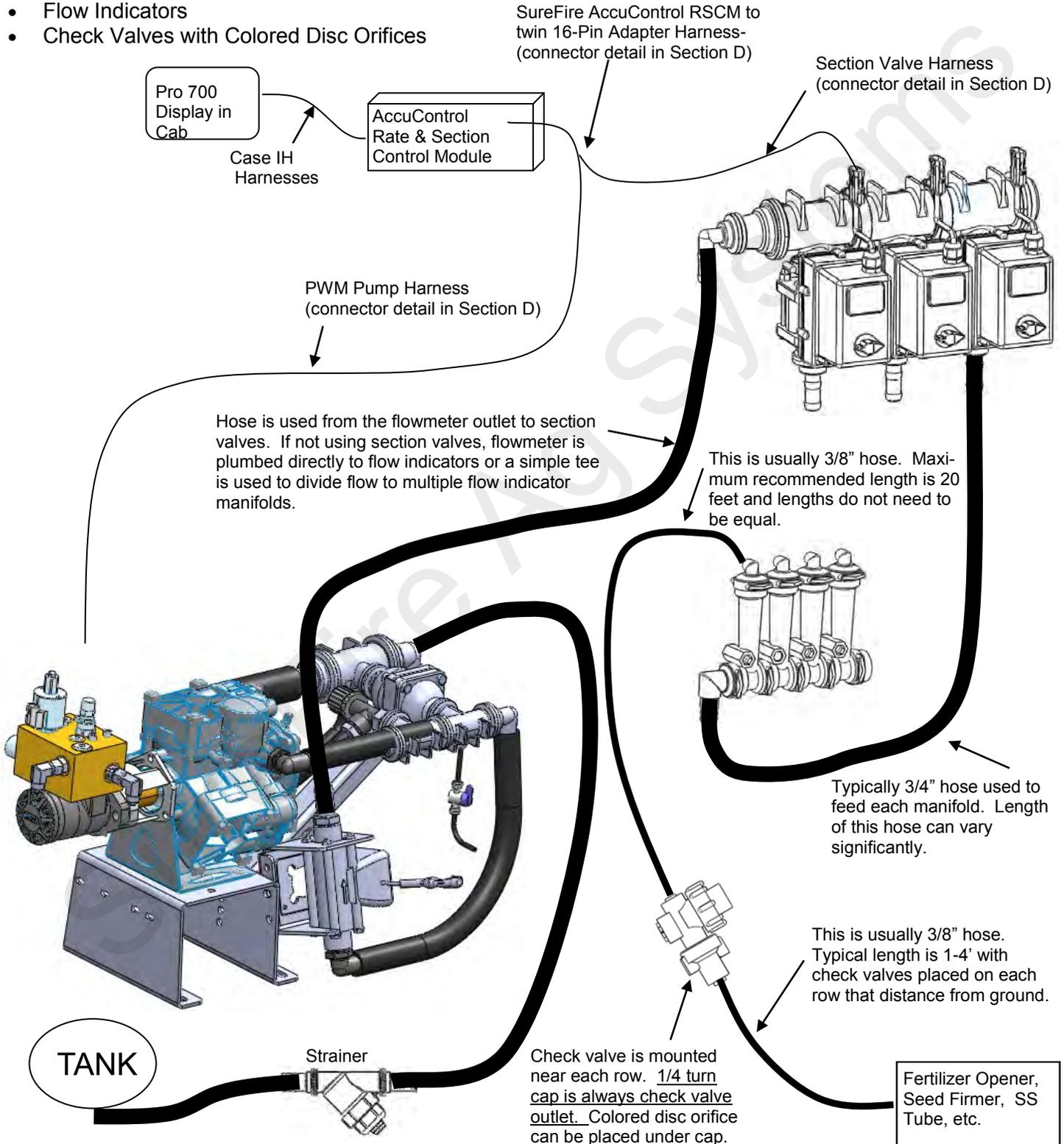
1. Install Pro 700 display, harnesses, and AccuControl™ Rate & Section Control Module.
2. Open the packages and familiarize yourself with the components. Refer to manual sections B, C & D for component information.
3. Mount the PumpRight pump and make hydraulic connections. See section E for hydraulic 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:

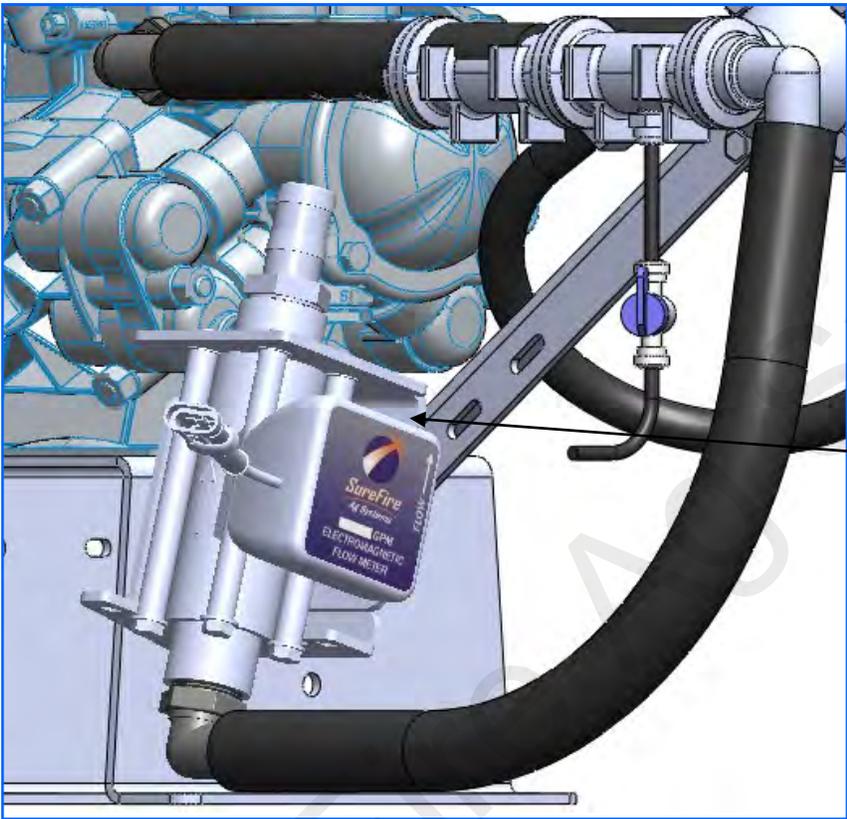
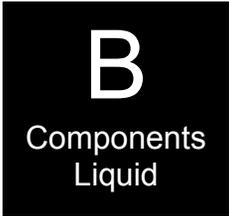
- Pro 700 Display
- AccuControl Field-IQ Rate & Section Control Module
- PumpRight D115
- Section Valves
- Flow Indicators
- Check Valves with Colored Disc Orifices



# Electromagnetic Flowmeter Kits

- 0-13 - 2.6 GPM      Item Number 500-02-2040**
- 0.3 - 5.0 GPM      Item Number 500-02-2050**
- 0.6 - 13 GPM        Item Number 500-02-2060**
- 1.3 - 26 GPM        Item Number 500-02-2070**
- 2.6 - 53 GPM        Item Number 500-02-2080**

Kits include flowmeter, universal twist tab 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.*

Mounting Bracket, 400-1208A1 (not used for 2.6-53 GPM flowmeter\*\*)

\*\* 2.6-53 GPM flowmeter uses quantity 2 of bracket 204-01-463911-100

Electromagnetic flowmeters (also known as mag meters) 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. The inside of the flowmeter is simply an open tube through which the liquid passes. Second, electromagnetic flowmeters use a principle of electromagnetic measurement to output a signal proportional to the liquid flow which goes through it, which makes them independent of viscosity or density of the fluid measured. They are extremely accurate using the standard calibration number.

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

Each flowmeter has a different diameter sensing element. Although the calibration numbers may be the same, the proper sized flowmeter must be used.

Earlier model flowmeters (meters with white labels with black text) have different calibration numbers. See the documentation for those meters to find the calibration numbers.

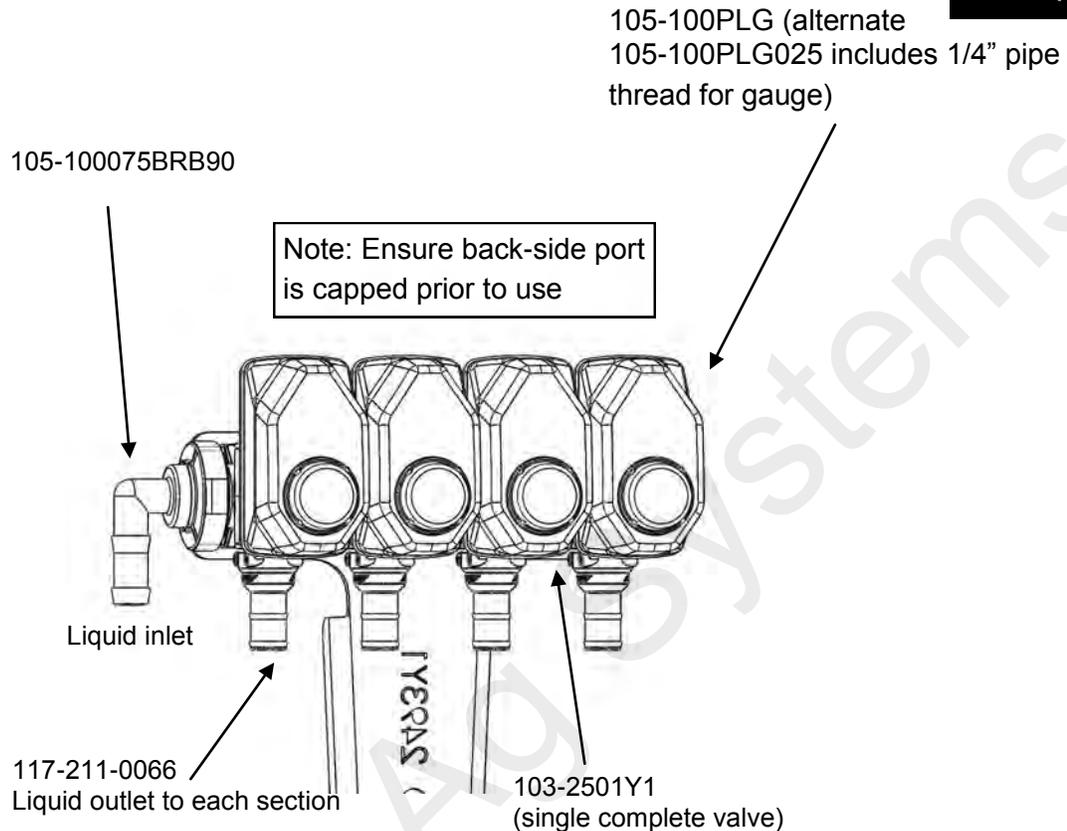
Flowmeter Model (blue label with white lettering)	Field-IQ™ Flow Calibration	FPT Size	Hose Barb In kit
0.13 - 2.6 GPM	3000	3/4"	3/4"
0.3 - 5.0 GPM	3000	3/4"	3/4"
0.6 - 13 GPM	2000	3/4"	1"
1.3 - 26 GPM	2000	1"	1"
2.6 - 53 GPM	2000	1 1/4"	1 1/2"



# Section Valves

# B

Components  
Liquid



### Additional Parts:

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

### How it Works

Section valves can be assembled into groups with a common inlet to control flow to each section. Common assemblies use up to 5-6 valves, 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

# Pressure Sensor

## 3 Wire Sensor with 2" Manifold x 1/4" MPT Fitting

Item Number 520-00-055100

B

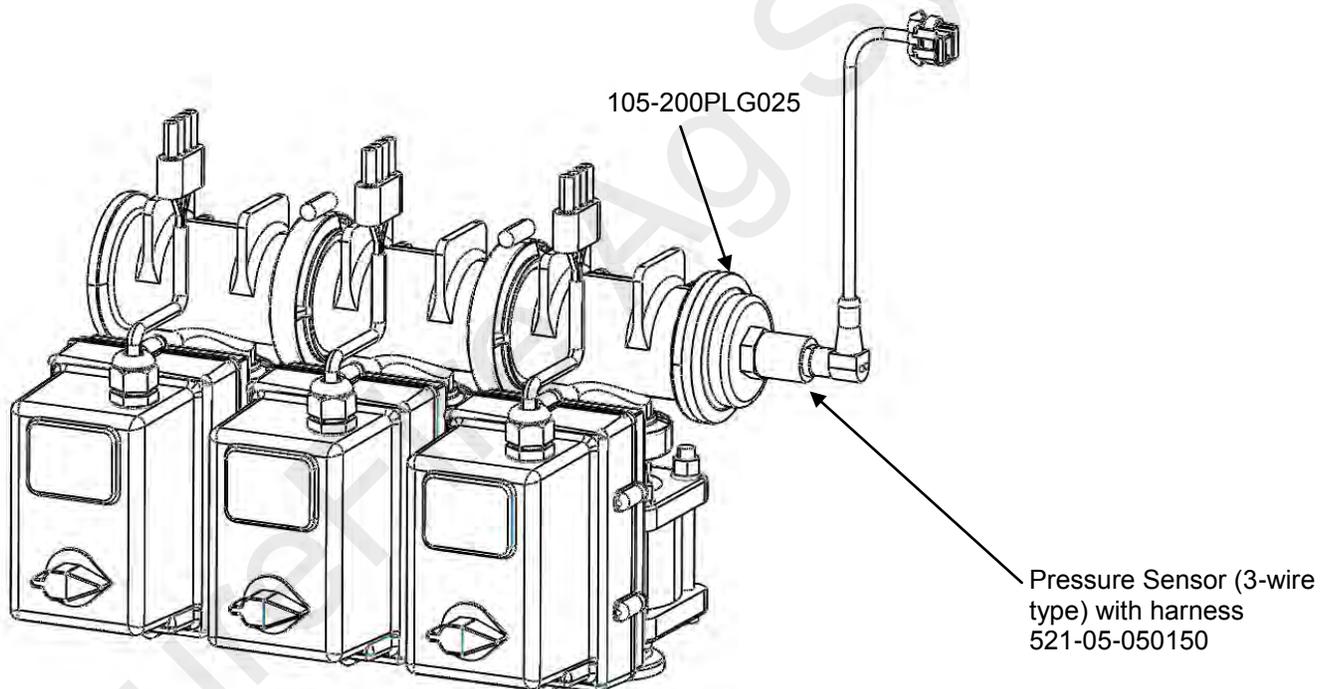
Components  
Liquid

*The Pro 700 display currently does not have the ability to show fertilizer system liquid pressure on the display.* The pressure sensor is most often mounted on electric section valves when used in PumpRight systems. The SureFire harnesses have Pressure 1 and Pressure 2 connectors on both the pump harness (207-215223Y2) and the section harness (207-215466Y2 or 467Y2). The pressure sensor is a 100 psi 3-wire type. The sensor has a 1/4" MPT fitting.

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

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

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



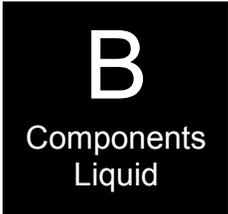
## Pressure Sensor Hose Tap Kits

When electric section valves are **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.



## 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.

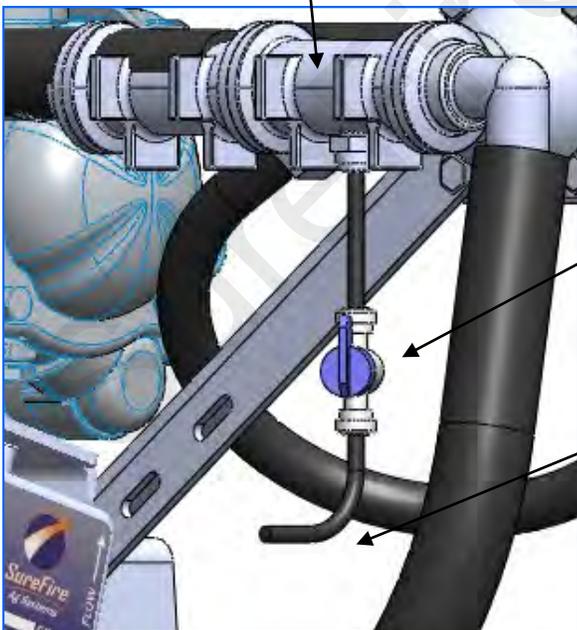
The air bleed valve is a small 1/4" valve that when opened lets air escape from the pump outlet at zero pressure. Open until liquid comes out and then close the valve.

## 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.

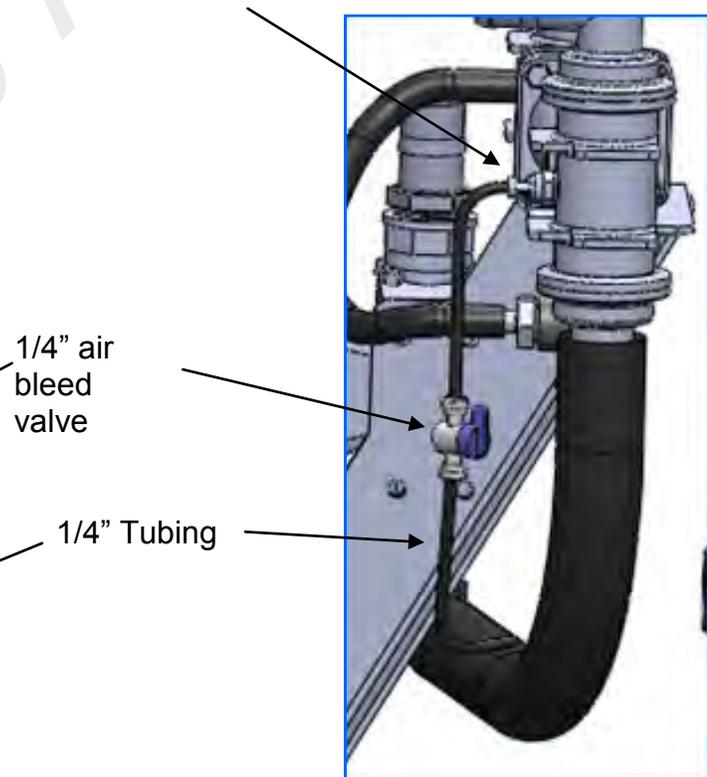
### D115 & D70

Attach 1/4" tubing to 1/4" QC on bottom of 1" Manifold Tee



### D160 & D250

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



## Recirculation & Agitation

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

### How Recirculation Works:

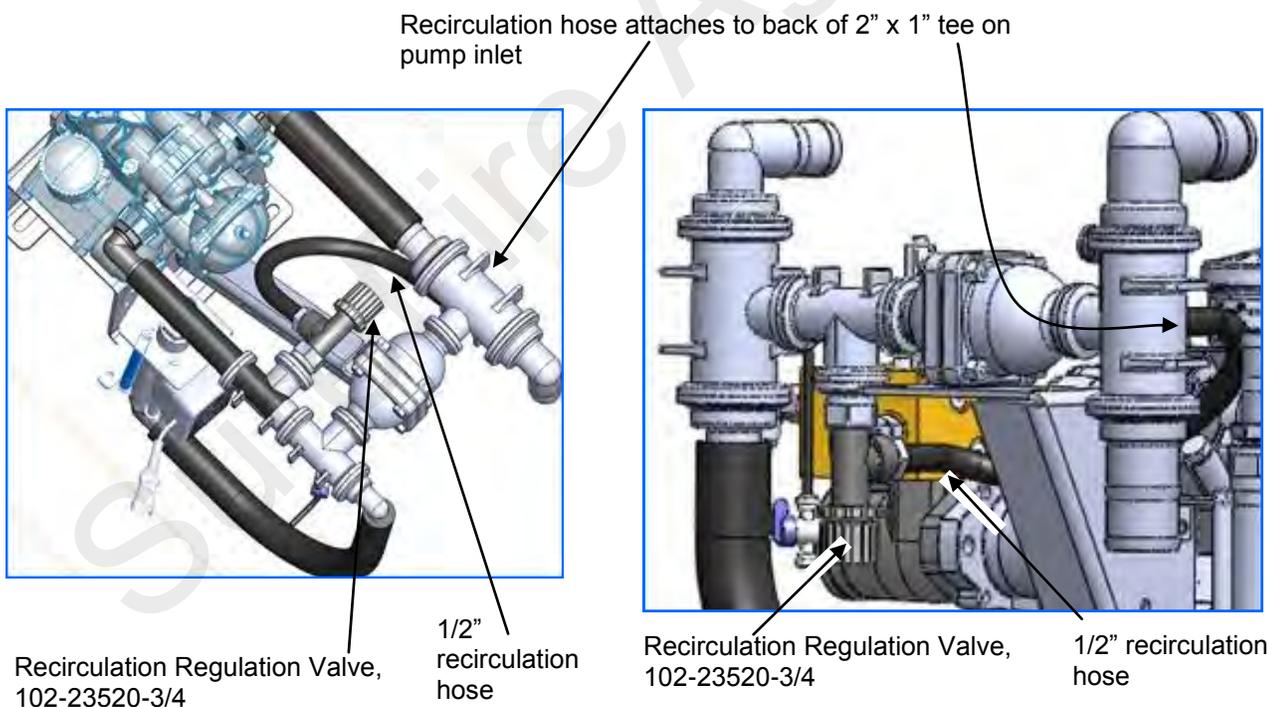
When running a PumpRight pump at less than 20% of it's maximum flow, it sometimes improves system stability to allow the pump to run faster. Opening the recirculation valve diverts some pump flow before the flowmeter, causing the pump to run faster. The application rate is still measured by the flowmeter 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 until the pump runs smoothly.** OPENING THE VALVE LOWERS THE MAXIMUM RATE THAT CAN BE APPLIED TO THE GROUND. Close the valve if a higher rate is required.

### 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.

#### D115 (D70 very similar)

#### D160 (D250 very similar)



# 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 11.)
2. A metering orifice may be placed in the check valve cap in the line that leads to each row. (See photo on page 13.)
3. A dual metering tube kit with dual check valves may be used. (See pages 18-21.)

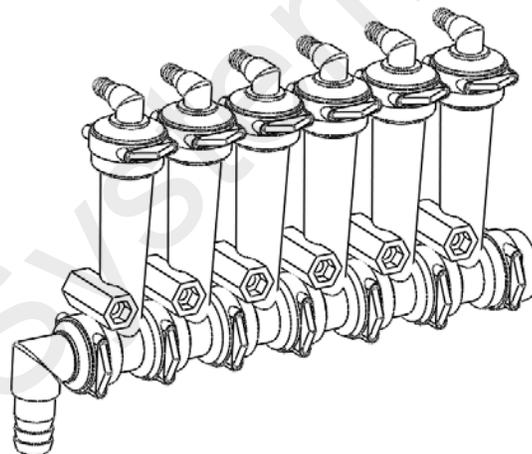


## Floating Ball Flow Indicator & Manifold System

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

SureFire 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

701-20460-95	Single Full Flow Column with 3/8" HB - 90 Degree Outlet
701-20460-96	Single Full Flow Column with 1/4" FPT - 90 Degree Outlet
701-20460-97	Single Low Flow Column with 1/4" QC - 90 Degree Outlet
701-20460-98	Single Full Flow Column with 3/8" QC - 90 Degree Outlet
701-20460-99	Single Full Flow Column with 1/2" HB - 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

701-20460-00	Full Flow Column
701-20470-00	Low Flow Column
701-20460-04	Wilger Lock U-clip
701-20460-05	Flow Indicator Ball - 1/2" SS Ball
	Flow Indicator Ball - Maroon
701-20460-06	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
	Viton O-Ring for column & fittings
701-20460-15	
701-40225-05	Viton O-Ring for Orifice

#### Brackets & U-Bolts

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

## 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** SureFire 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.

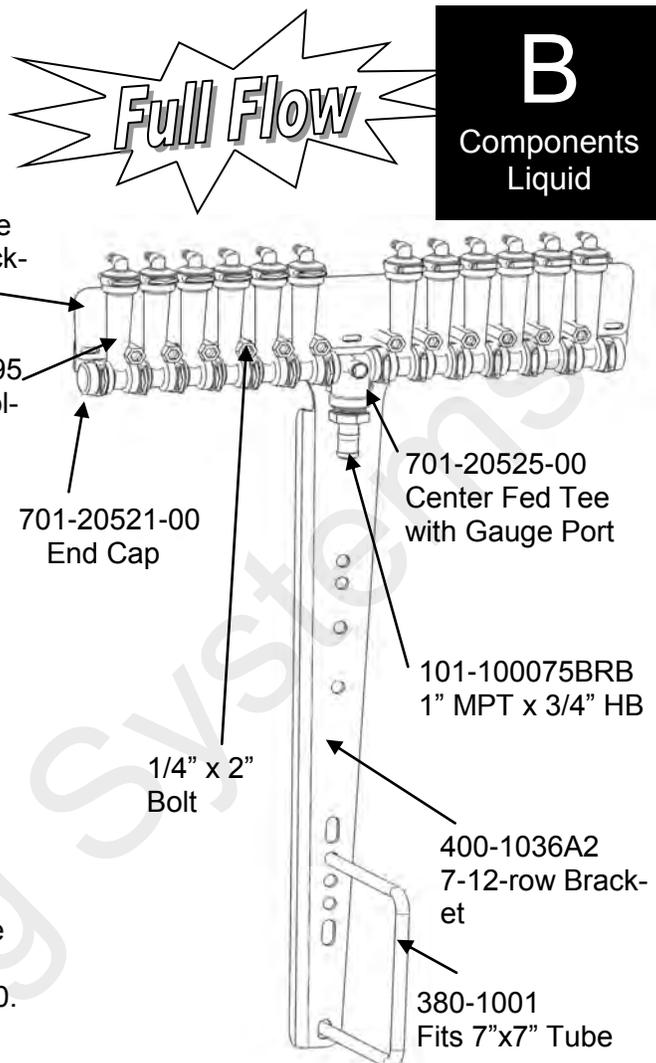
### Full Flow Indicators w/ 3/8" Hose Barb Outlet

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")

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



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

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

SureFire 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

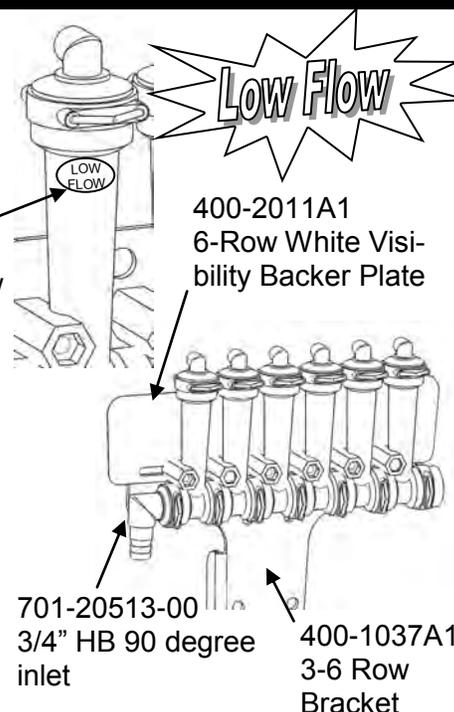
Equivalent Application Rate

On 30" Rows at 6 MPH (1/4" QC): 1-10 GPA

### Ball Selection for 30" Rows

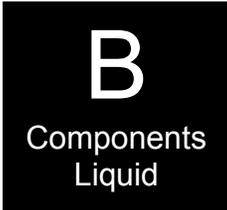
GPM	GPA	Ball
.03-.09	1-3	Green Plastic*
.05-.14	2-4	Red Plastic*
.10-.18	3-6	Maroon Glass
.15-.70	5-10	Stainless Steel (1/2")

\*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):

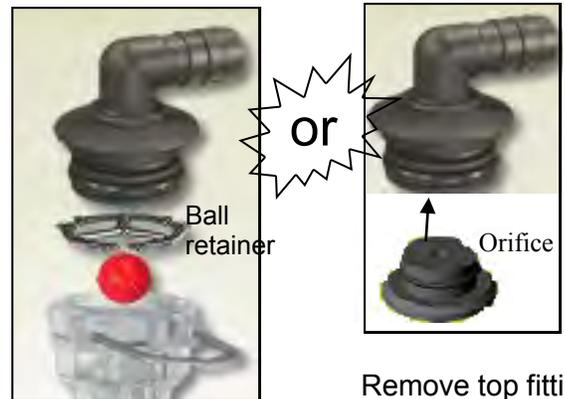
- Minimum 20 PSI
- Maximum 80 PSI

**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.

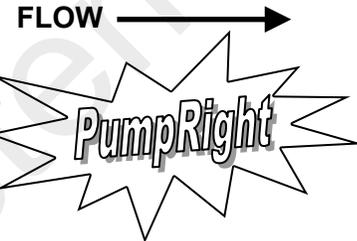
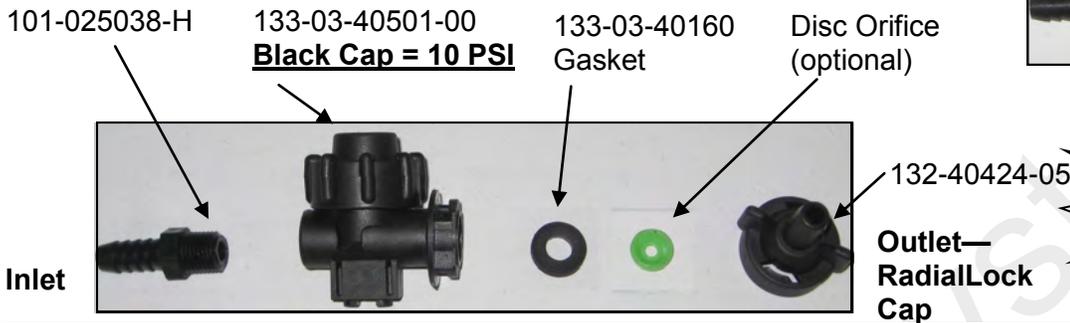


# Check Valves

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

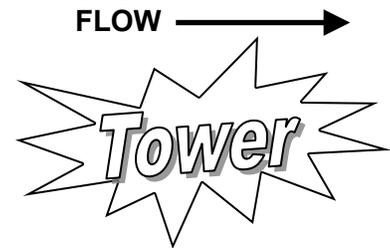
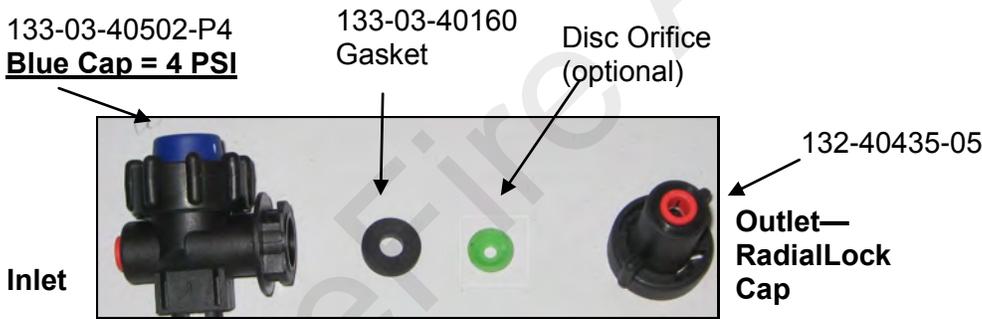
**B**  
Components  
Liquid

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

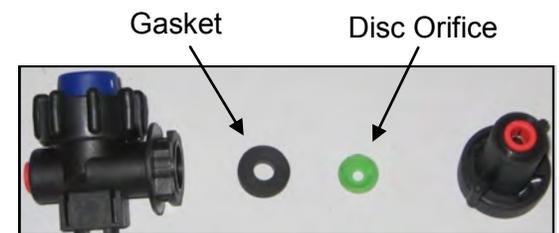
### Tower Electric Pump Pressure Recommendations (with 4 lb check valves):

- Minimum 10 PSI
- Maximum 30 PSI

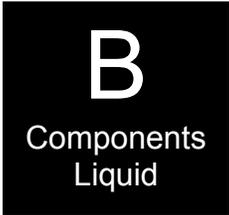
### Chart is for 28-0-0 Fertilizer @ 70°

- 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).



# 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

## 15" Spacing

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

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

## 20" Spacing

Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
Pink (24)	10	0.033	2.4	2.2	1.9	1.8	1.6	1.5	1.4
	20	0.046	3.4	3.0	2.7	2.5	2.3	2.1	2.0
	30	0.057	4.2	3.7	3.4	3.1	2.8	2.6	2.4
	40	0.065	4.9	4.3	3.9	3.5	3.2	3.0	2.8
	50	0.073	5.5	4.8	4.4	4.0	3.6	3.4	3.1
60	0.081	6.0	5.3	4.8	4.4	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

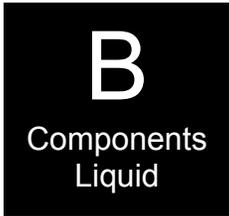
Orifice Color (Approx Size)	PSI	Gal/Min 28-0-0	MPH						
			4.0	4.5	5.0	5.5	6.0	6.5	7.0
Pink (24)	10	0.033	1.4	1.2	1.1	1.0	0.9	0.8	0.8
	20	0.046	1.9	1.7	1.5	1.4	1.3	1.2	1.1
	30	0.057	2.3	2.1	1.9	1.7	1.6	1.4	1.3
	40	0.065	2.7	2.4	2.2	2.0	1.8	1.7	1.5
	50	0.073	3.0	2.7	2.4	2.2	2.0	1.9	1.7
	60	0.081	3.3	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

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





# Dual Metering Tube Plumbing Kits with Dual Check Valve



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.

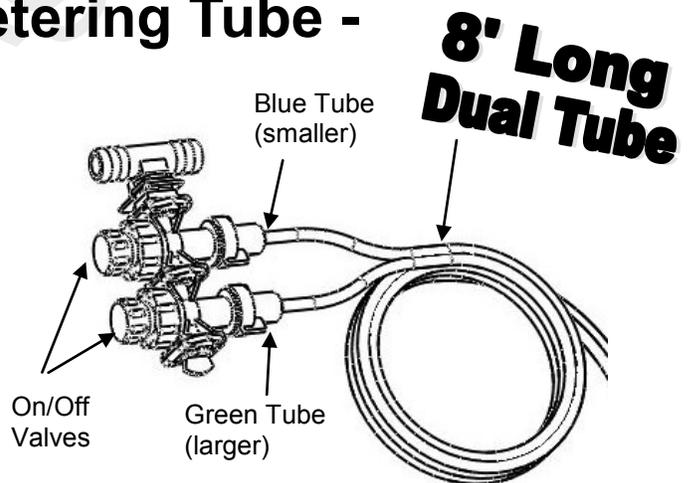
## Field Operation of Dual Metering Tube - Dual Check Valve System

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 x MPH x spacing (inches)) ÷ 46.4**

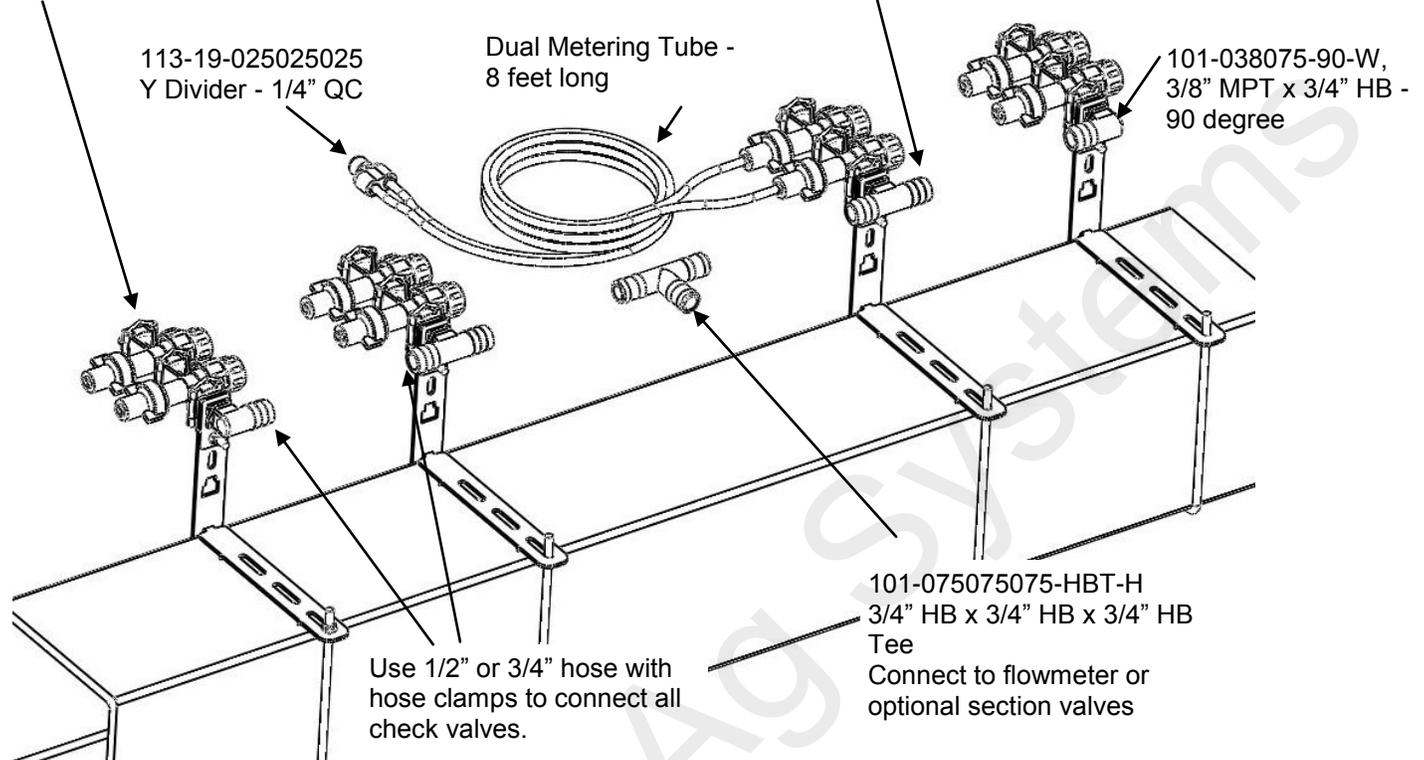


## Dual Check Valve Plumbing Diagram

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

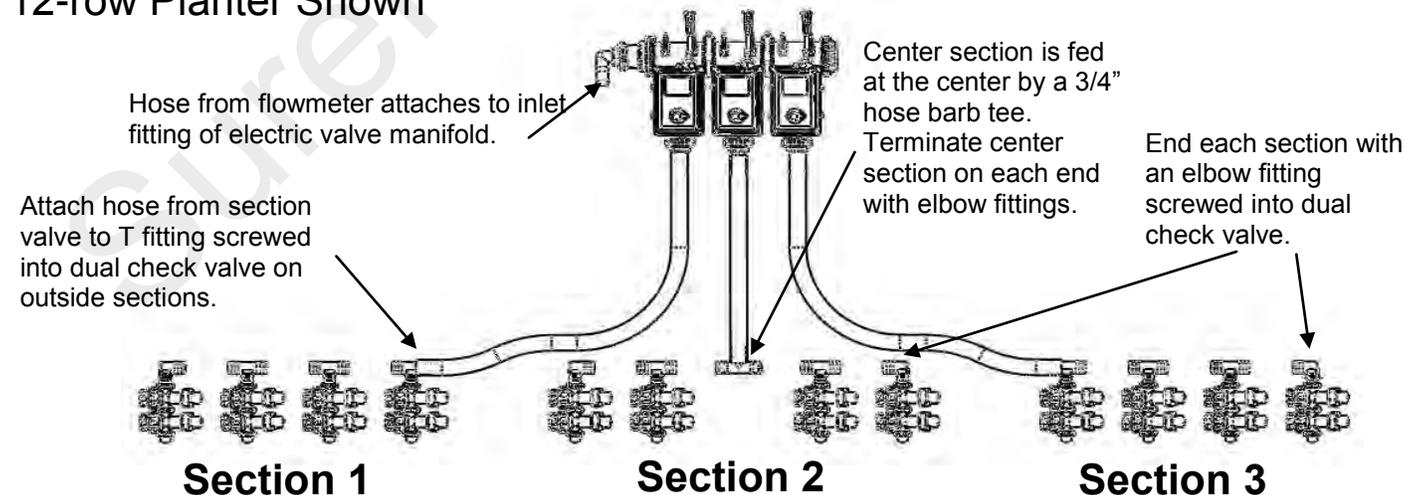
101-075075038-HBT-M-W 3/4" HB x 3/4" HB x 3/8" MPT Tee



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



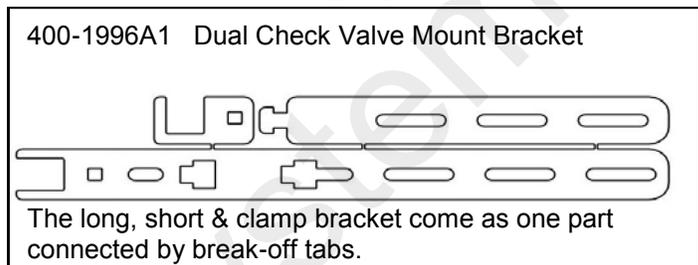
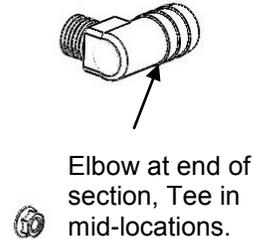
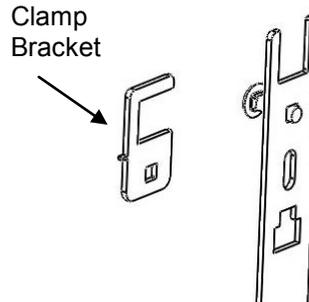
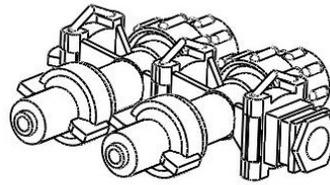
For a **2 section plumbing system**, omit the center section and plumb similar to the outside 2 sections.

# Dual Check Valve Assembly Steps

**B**  
Components  
Liquid

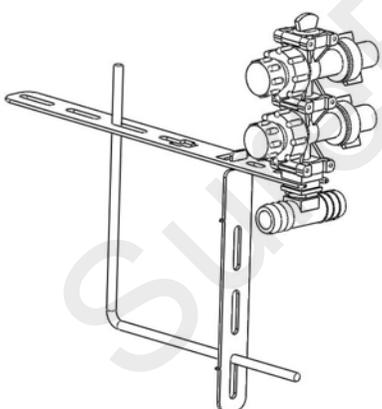
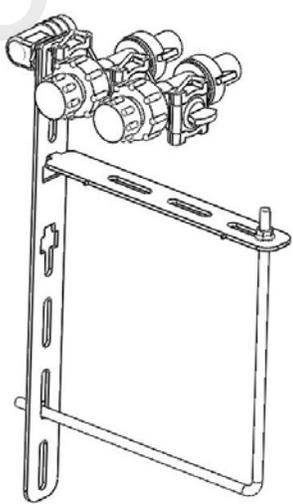
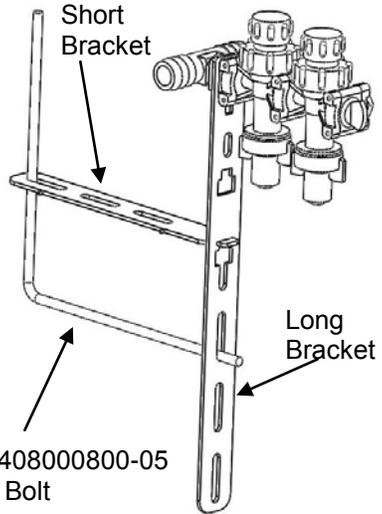
Follow these steps to mount each check valve to the steel bracket.

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.

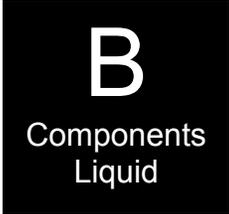


## Check Valve Mounting Options

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.

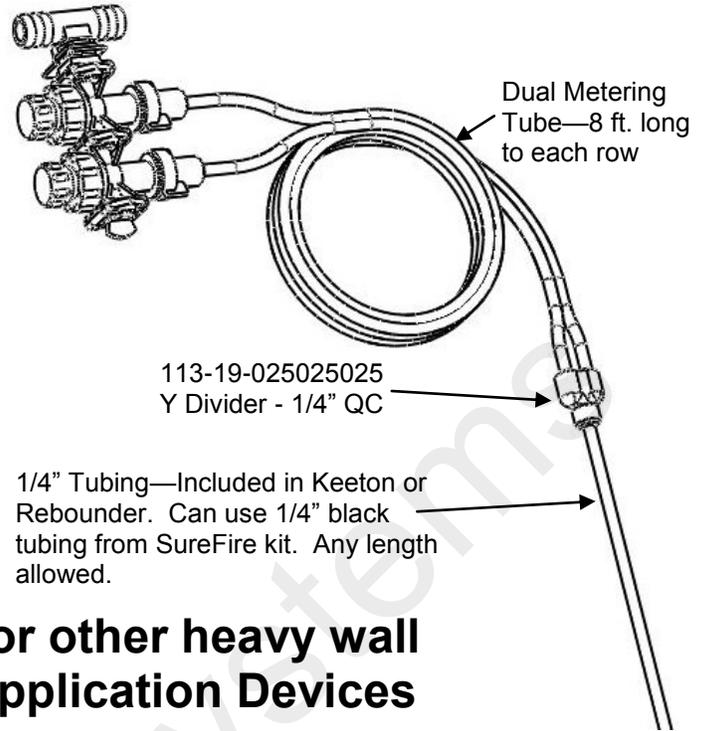
<p>Example 1. Use the long bracket on the top of a bar. The check valve is mounted vertically. The liquid supply hose is ran directly on the front side of the bar. The U-bolt is placed in slots to clamp on a 4x6 inch tube.</p> 	<p>Example 2. Use the long bracket on the rear of a bar. The check valve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

# 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.

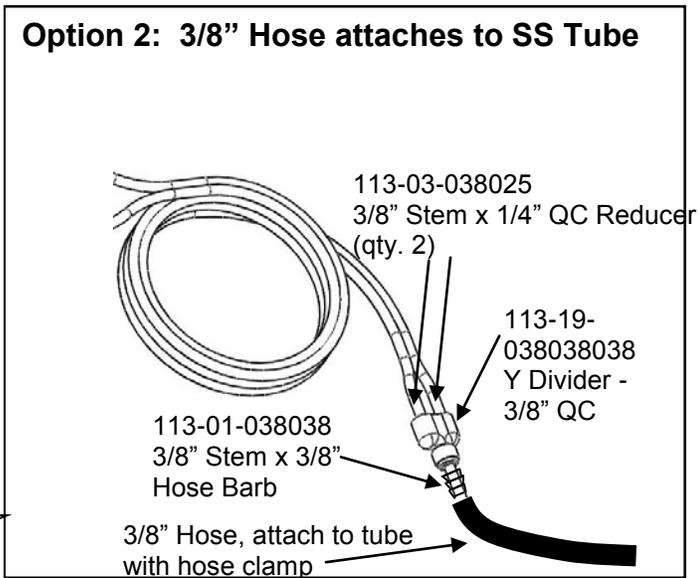
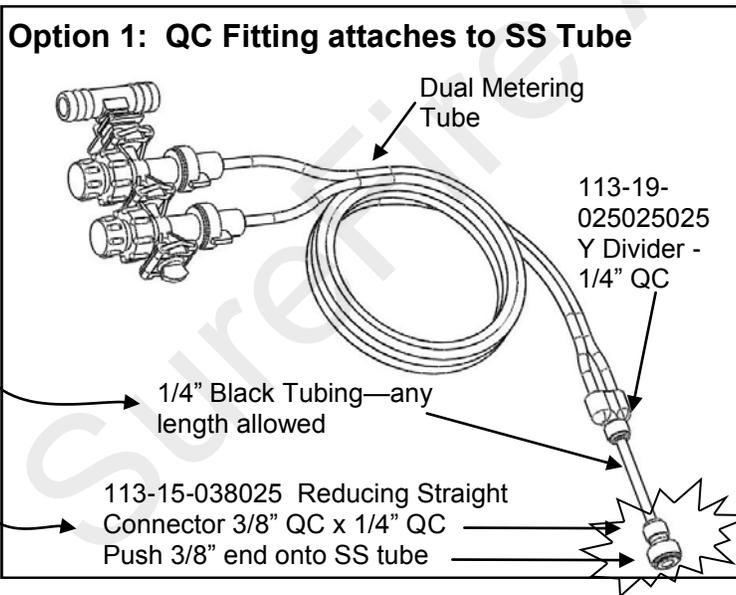
For thin wall stainless steel tubes, you can push the 1/4" black tubing all the way through the stainless steel tube so fertilizer will run directly from the tubing onto the ground.



# 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.



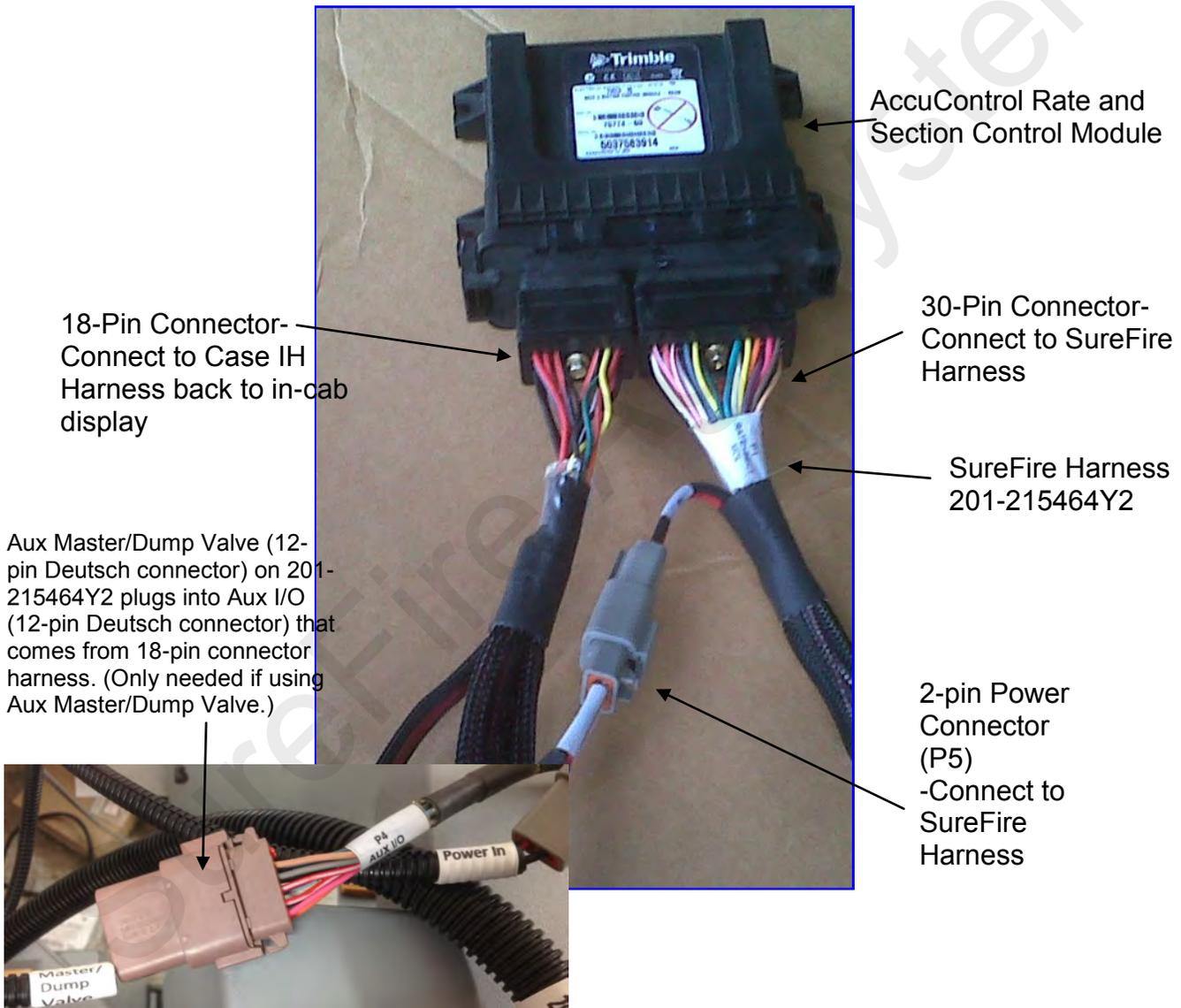
# AccuControl Field-IQ™ Rate and Section Control Module



SureFire 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 rate control 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 SureFire 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 SureFire Fertilizer Systems.

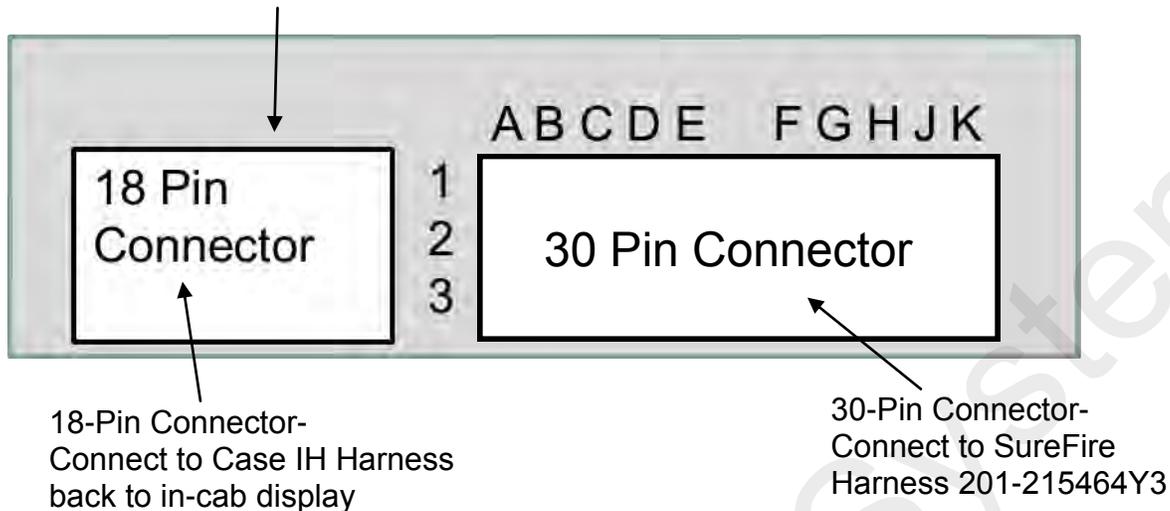


# Case IH AFS AccuControl Rate and Section Control Module



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 Rate and  
Section Control Module



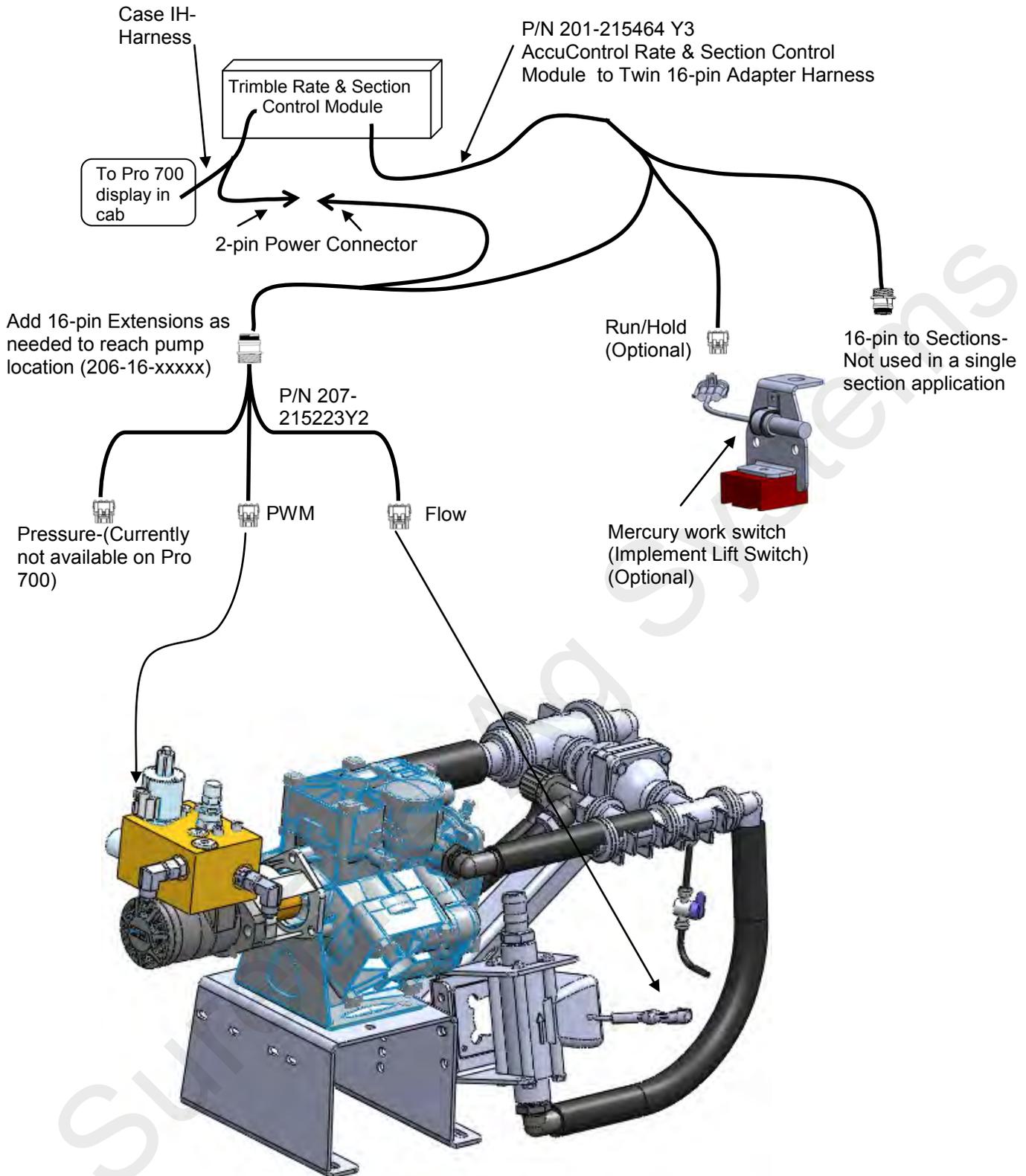
## Common Troubleshooting:

**PWM Signal to Pump:** Pins E1 to E2 should have 0-12 volts to energize the electromagnetic solenoid on the hydraulic valve block to open the proportional needle valve. Use manual mode to increase signal. Should get up to 12 volts after holding increase button.

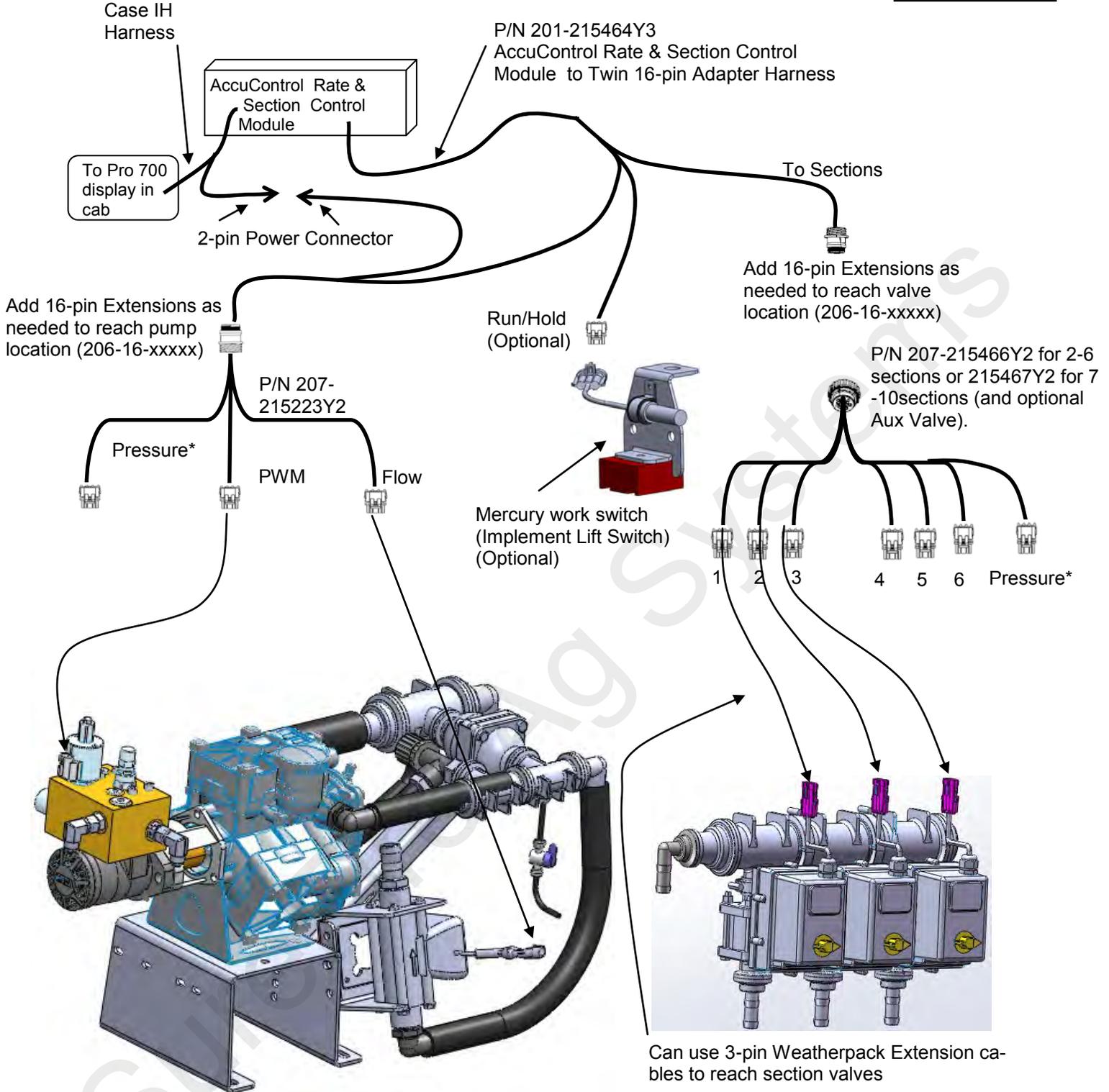
**Flowmeter Tap Test:** Pins C2 and C3 are Flow Ground and Signal. If no flow is registering on the display, you can tap between these two pins with a short wire. This produces a pulse. The display should indicate a flow when this is done rapidly. *(Note: To help register flow for the tap test, change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

See the drawing of harness 201-215464Y3 on page 27 for all pin locations on the 30-pin connector.

# 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)



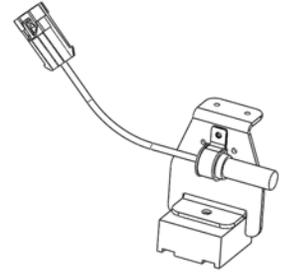
The Mercury Run/Hold Switch turns liquid application on and off automatically when the implement is raised or lowered. The switch is mounted on a component that rotates when the implement is raised and lowered. The switch is attached to a magnetic base for easy mounting to any metal part of your tractor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

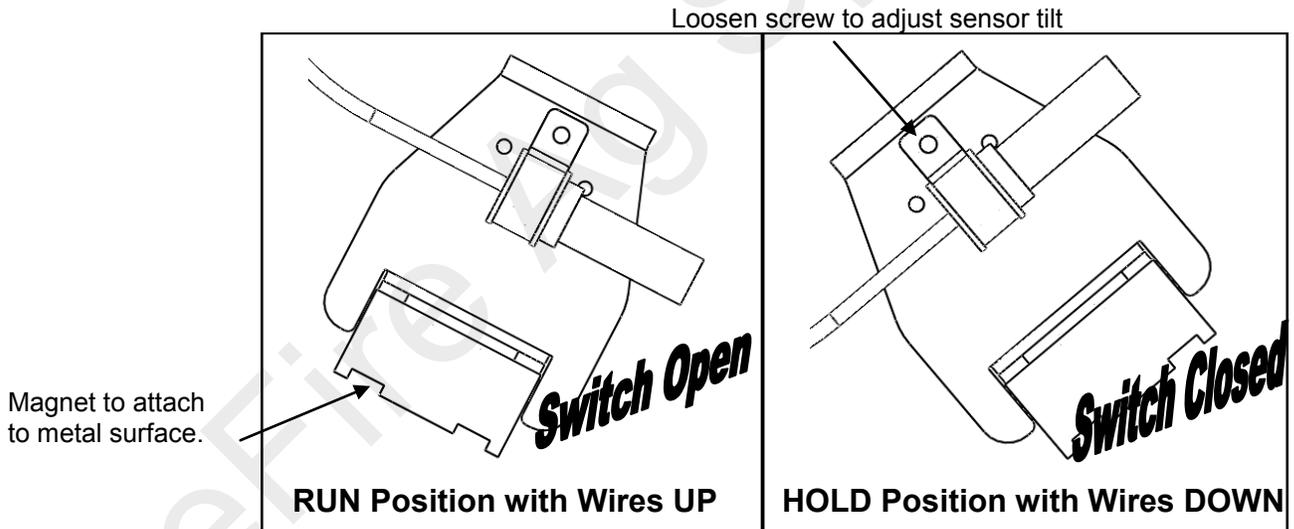


## Run/Hold Switch Logic

### 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:

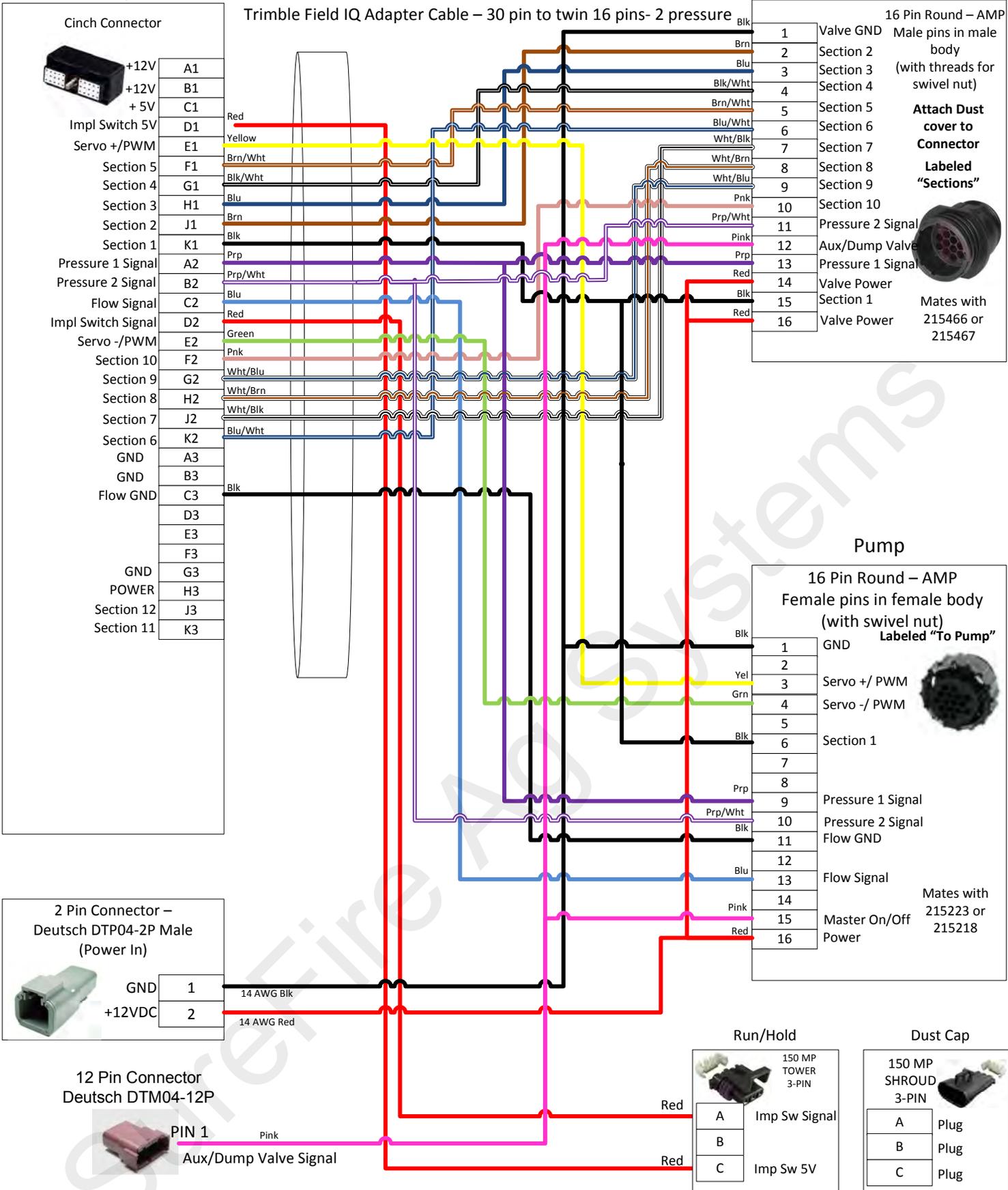
To test the run / hold mercury switch you will need a volt meter. Set the meter to test continuity (or ohms). With the wires down, you should have continuity between the two pins in the connector. With the wires up, the switch should be open (no continuity).

Wire Size: 18 AWG unless otherwise specified

# 201-215464Y3

Length: 3ft Sections

Trimble Field IQ Adapter Cable – 30 pin to twin 16 pins- 2 pressure



16 Pin Round – AMP  
Male pins in male body  
(with threads for swivel nut)  
**Attach Dust cover to Connector**  
**Labeled "Sections"**



Mates with 215466 or 215467

## Pump

16 Pin Round – AMP  
Female pins in female body  
(with swivel nut)  
**Labeled "To Pump"**



Mates with 215223 or 215218

**Run/Hold**

A	Imp Sw Signal
B	Imp Sw 5V
C	Imp Sw 5V

**Dust Cap**

150 MP SHROUD 3-PIN

A	Plug
B	Plug
C	Plug

**2 Pin Connector – Deutsch DTP04-2P Male (Power In)**

GND	1
+12VDC	2

**12 Pin Connector Deutsch DTM04-12P**

PIN 1	Pink
Aux/Dump Valve Signal	



Project:	201-215464Y3 Trimble Field IQ Adapter Cable – 30 pin to twin 16 pin—2 pressure, 10 section, aux/dump valve	Drawn By:	Brady Gragg Rev. by Mark Wolters, Ricker
Filename:	Trimble Field IQ Adapter Cable – 30 pin to twin 16 pin	Date:	10/23/12 Rev. 09/27/2013, 8/25/2014
Copyright 2012-2014 SureFire Ag Systems		Page of Pages	1 of 1

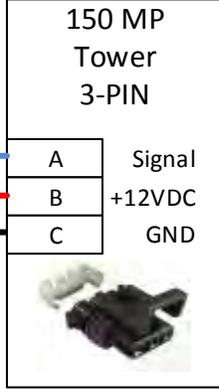
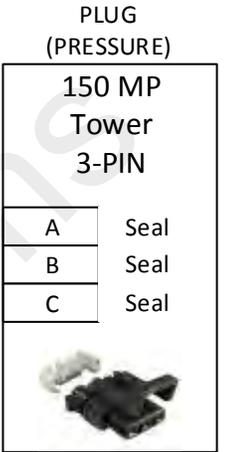
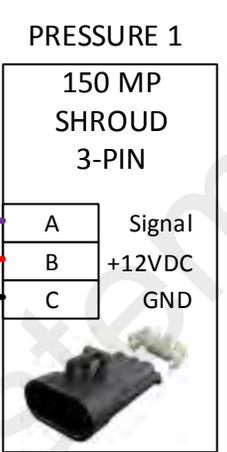
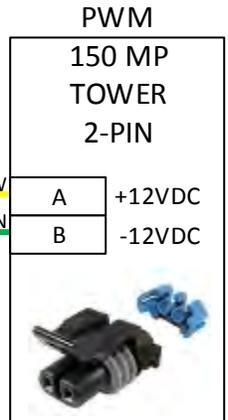
# 207-215223 Y2

PWM Pump Cable – Flowmeter, PWM & 2 Pressure

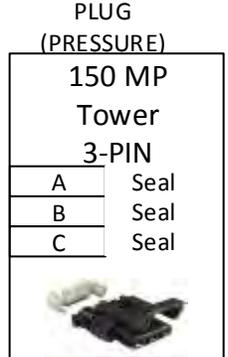
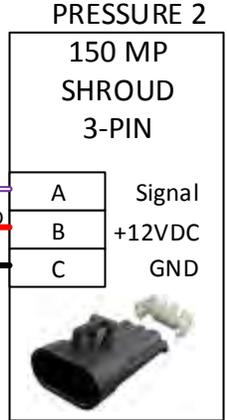
Wire Size: 18 AWG

Length: 10ft

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



FLOW  
Meter



Project:	207-215223 Y2
Filename:	PWM Pump Cable – Flowmeter, PWM & Pressure
Copyright 2012 SureFire Ag Systems	

Drawn By:	Brady Gragg Rev by Mark Wolters
Date:	5/17/12 08/19/2013
Page of Pages	1 of 1

# 207-215466 Y2

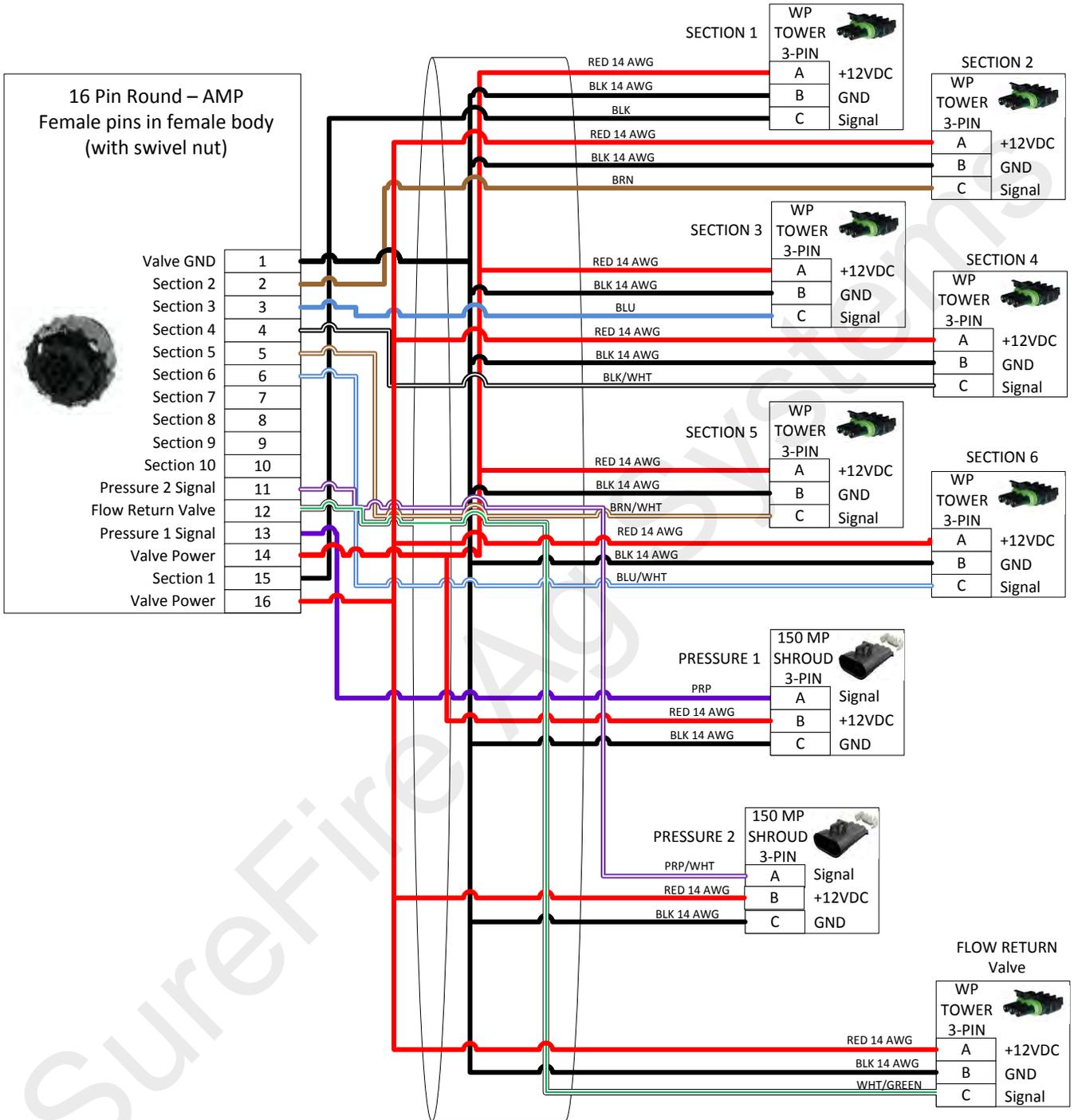
## 6 Section Boom Harness w/ 2 Pressure and Flow Return Valve

All wire gauge 18 AWG  
Unless Specified

Wire Length: 10'

Put booms 1-6, Flow Return and Pressure 1-2 in one loom 10' long

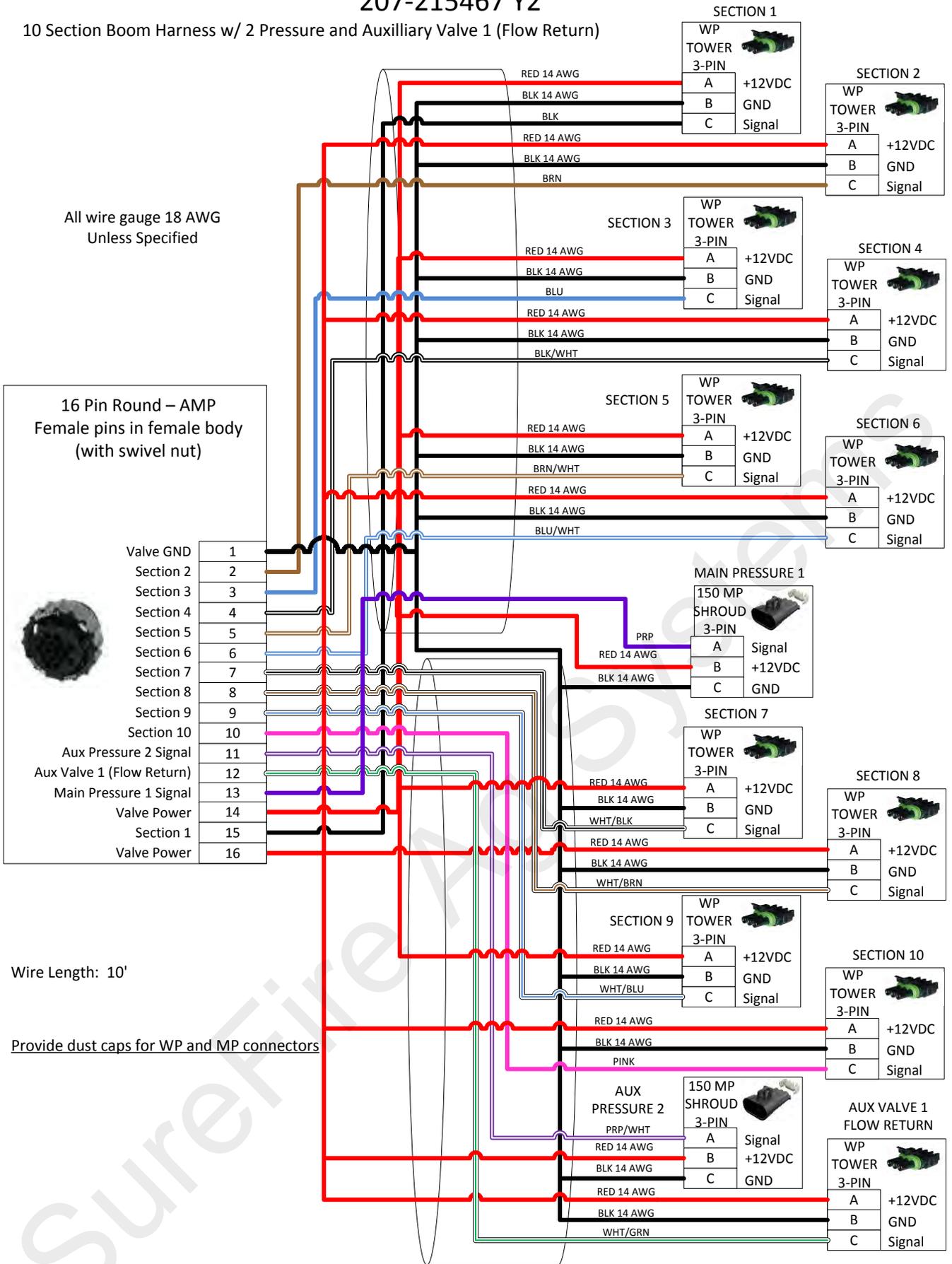
Provide dust caps for WP and MP connectors



Project:	207-215466 Y2	Drawn By:	Dirk Ricker Rev. by Mark Walters
Filename:	6 Section Boom Harness w/ 2 Pressure and Flow Return	Date:	9/12/2012 08/20/2013
Copyright 2012-2013 SureFire Ag Systems		Page of Pages	1 of 1

# 207-215467 Y2

10 Section Boom Harness w/ 2 Pressure and Auxillary Valve 1 (Flow Return)



All wire gauge 18 AWG Unless Specified

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



Wire Length: 10'

Provide dust caps for WP and MP connectors

	Project:	207-215467 Y2	Drawn By:	Dirk Ricker Rev. by Mark Wolters
	Filename:	10 Section Boom Harness w/2 Pressure and Aux Valve 1 (Flow Return)	Date:	9/12/2012 8/26/2013
	Copyright 2012-2013 SureFire Ag Systems		Page of Pages	1 of 1

# Floating Ball Flow Indicators

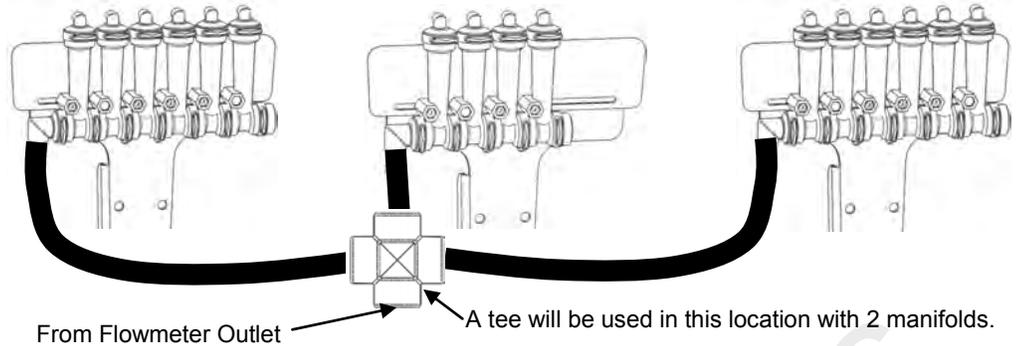
Flow Indicators are extremely flexible and can be mounted in hundreds of different configurations on various types of liquid application equipment. This page is to give you some ideas and let you customize the installation for what works best on your equipment.

## E Installation Overview

### 16-row

#### Split 6 - 4 - 6

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

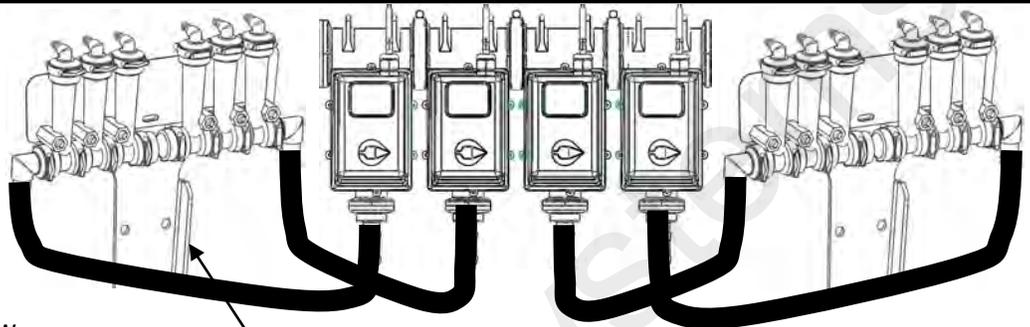


### 12-row

#### Split 3 - 3 - 3 - 3

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

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

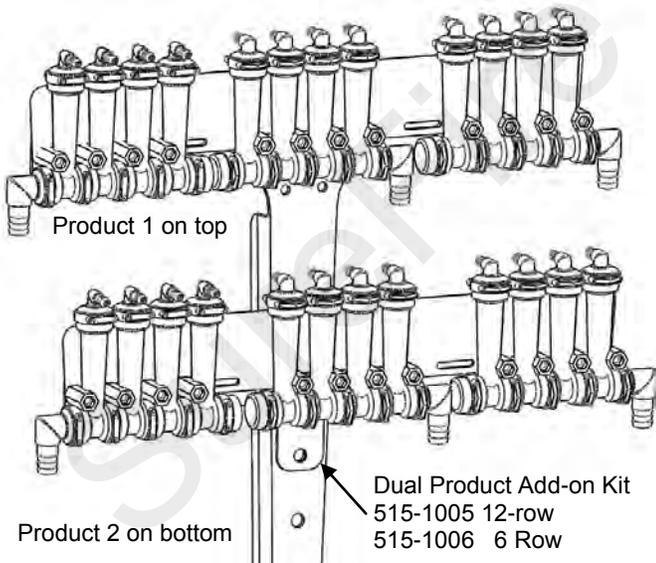


NOTE: Another option is the flange can face forward so the T-Bracket could be mounted on the front side of a bar.

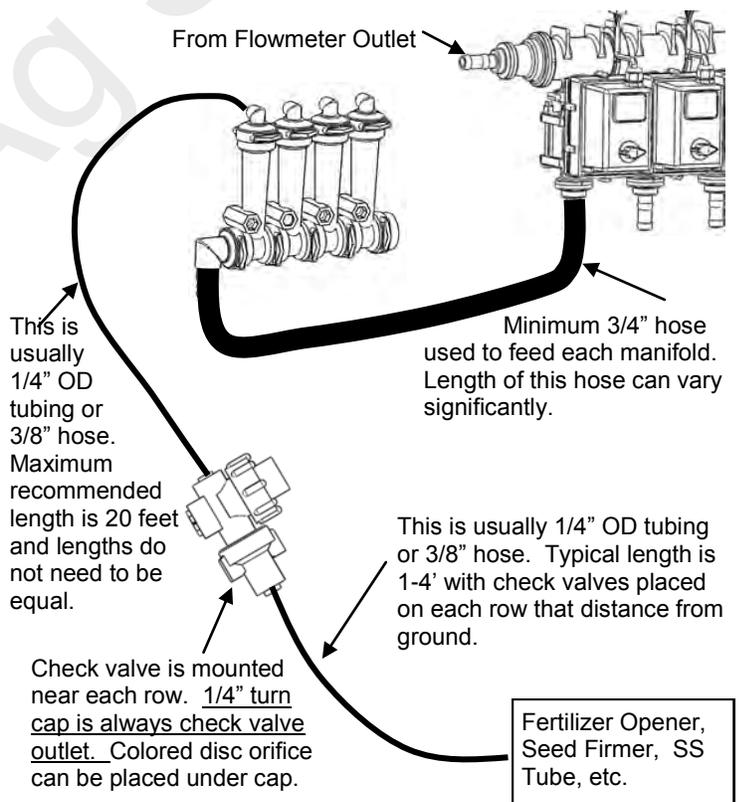
### 12-row Dual Product

#### 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.



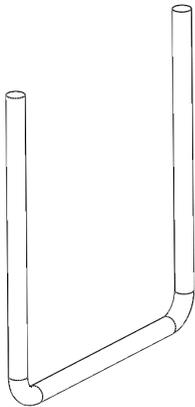
### General Plumbing Guidelines



# PumpRight Pump Installation

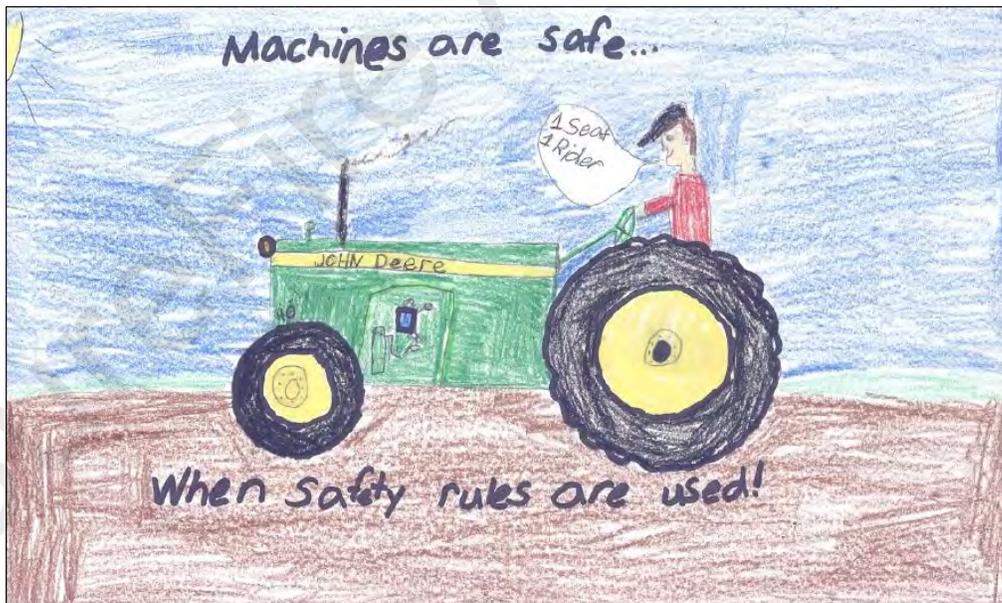
## Mounting

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

# E

Installation  
Overview

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

**Manual Override** - Turn and lift the manual override to check for proper hydraulic connections. **Override will completely open valve, so limit tractor hydraulic flow to valve.** (There may be dirt packed inside that needs to be cleaned out in order to move the button.)

PWM Valve Connector -2-pin MP Shroud

Pressure from Tractor

Return oil to Tank - Check valve included on return port

**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.*

### 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 run 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. First, remove the load sense plug and install a #6 male boss x #6 JIC adapter fitting, SureFire 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 bypass valve must be closed to use power beyond hydraulics.** The load sense line will signal the tractor hydraulic system to supply the flow needed by the pump to meet your application rate. The SureFire valve has an internal load sense check valve, which is required for power beyond hydraulics.

# PumpRight Hydraulic Connections

# E

Installation  
Overview

## Hydraulic Hose

SureFire 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. SureFire has some recommendations as to what works best.

### **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.

Preferred

### **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 SureFire PWM bypass valve must be open** (see previous page for instruction & picture). If bypass is left closed, the SureFire 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 (10 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, SureFire has an alternate motor (smaller displacement) to increase pump speed at 7 GPM oil flow.

**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.

# PumpRight Hydraulic Oil Flow Requirements

# E

Installation  
Overview

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.

## Model D70 - 2 Diaphragms

Fertilizer Flow (GPM)	Pump Speed (rpm)	Hydraulic Oil Flow (GPM)
5	156	3.5
10	313	7.0
15	469	10.5

## Model D115 - 3 Diaphragms

Fertilizer Flow (GPM)	Pump Speed (rpm)	Hydraulic Oil Flow (GPM)
5	94	2.1
10	189	4.2
15	283	6.3
20	377	8.4
25	472	10.5

## Model D160 - 4 Diaphragms

Fertilizer Flow (GPM)	Pump Speed (rpm)	Hydraulic Oil Flow (GPM)
10	135	3.0
20	270	6.0
30	405	9.1
35	473	10.6

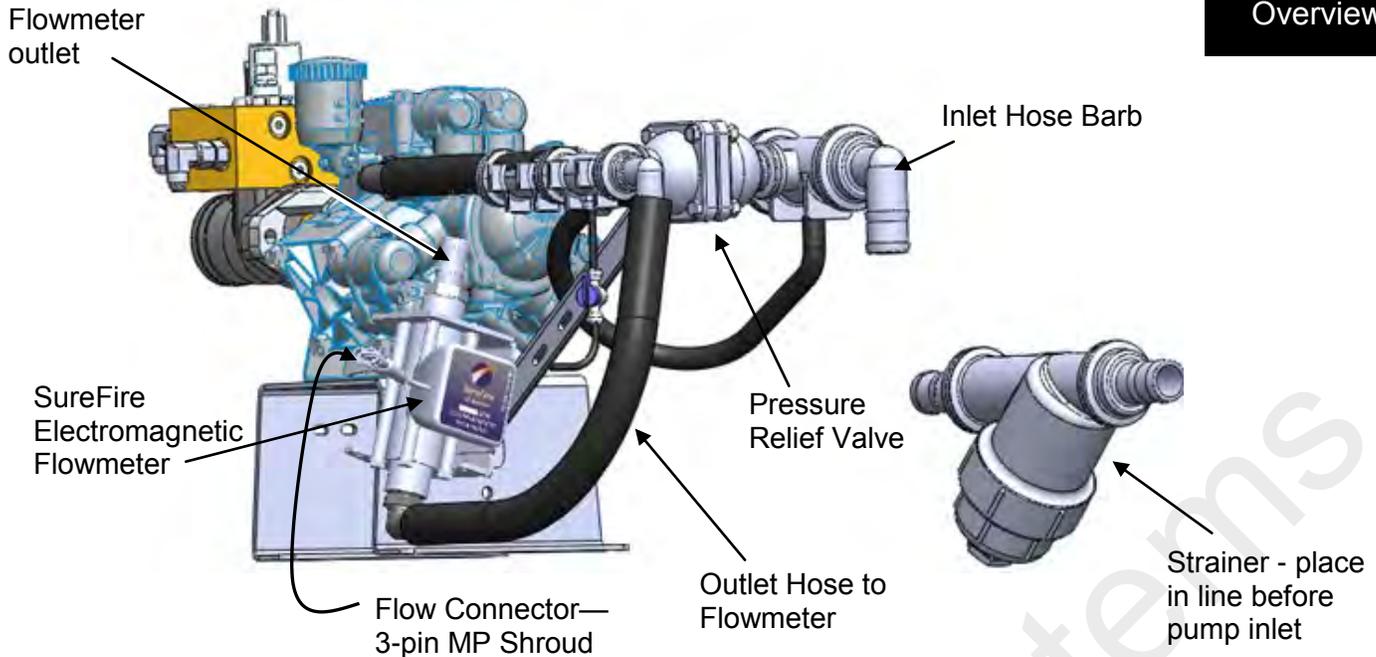
## Model D250 - 6 Diaphragms

Fertilizer Flow (GPM)	Pump Speed (rpm)	Hydraulic Oil Flow (GPM)
10	86	1.9
20	172	3.8
30	258	5.7
40	343	7.7
50	429	9.6
55	472	10.5

# D70 & D115 Liquid Plumbing Connections

# E

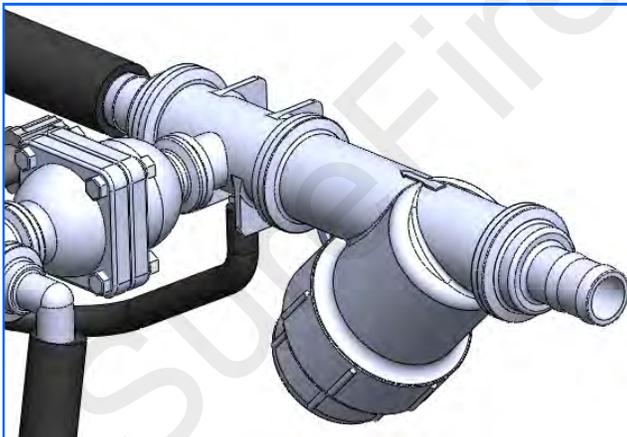
Installation  
Overview



**Inlet:** The D70 and D115 PumpRight is 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 50 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.

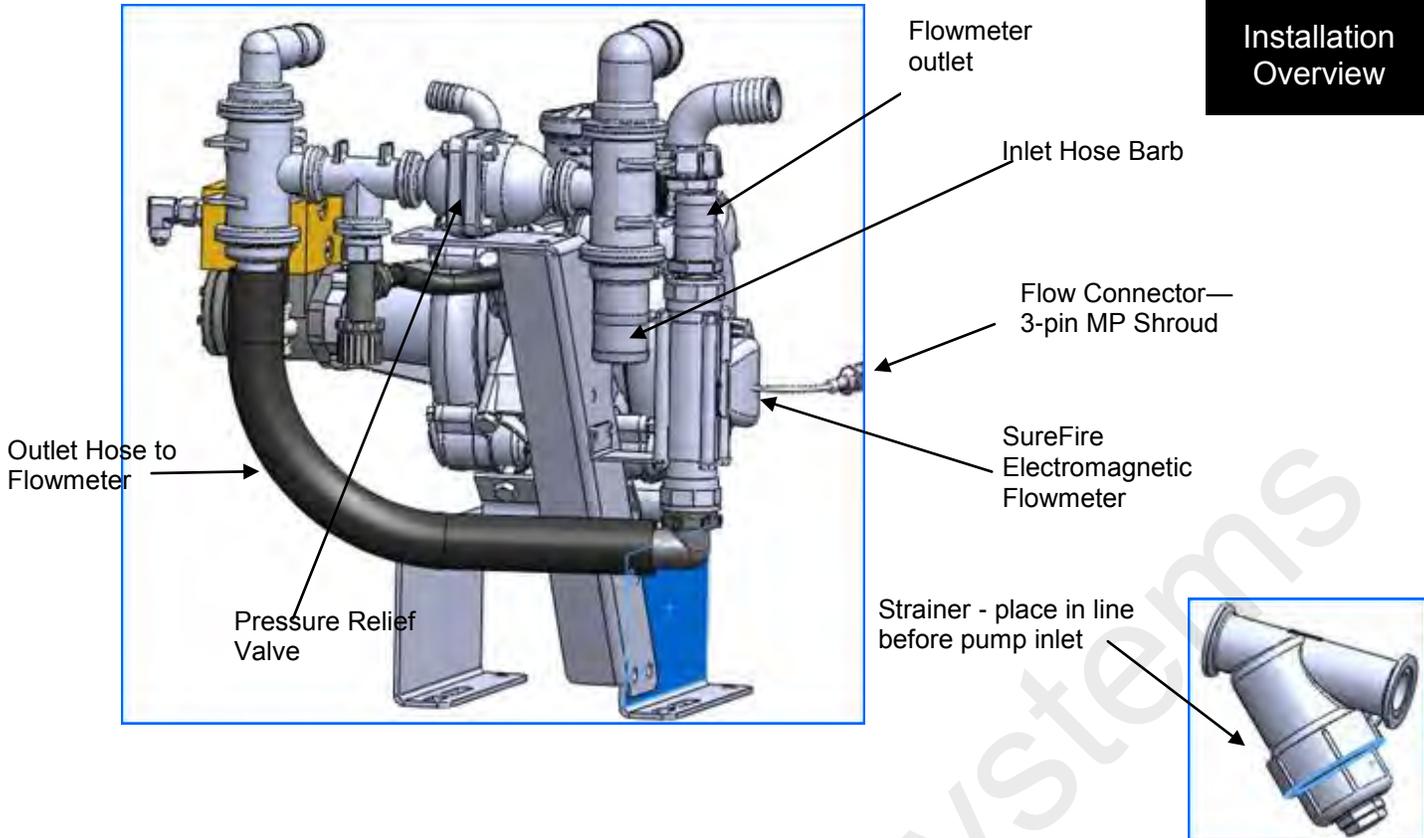


**Pressure Relief Valve (PRV):** The PRV is a 100 psi relief. If there is a restriction that creates over 100 psi in the system, the PRV will open allowing the excess flow to pass back to the inlet side of the pump. This protects the pump and fertilizer system from damage.

# D160 & D250 Liquid Plumbing Connections

# E

Installation  
Overview



**Inlet:** The D160 and D250 PumpRight is 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 50 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.

**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.

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.\**

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

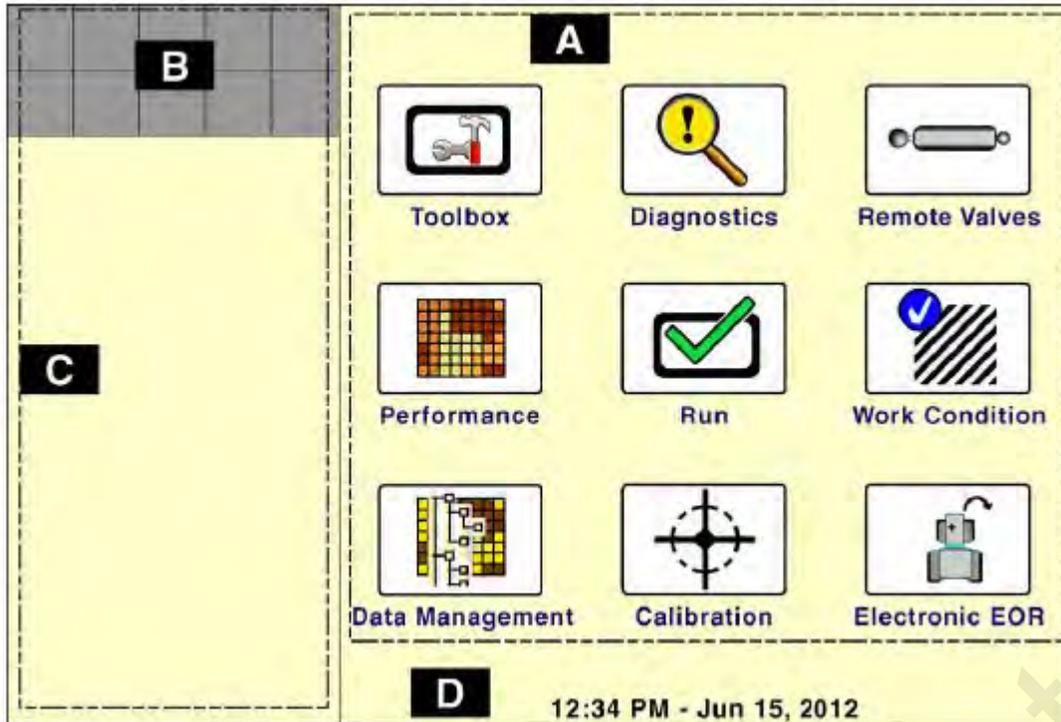


**AFS Pro 700**  
Display  
Framework  
Precision Farming  
E-Notes  
Printer  
Virtual Terminal  
Telematics

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

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



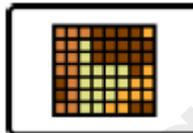
Items in **Work Condition** include:

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:

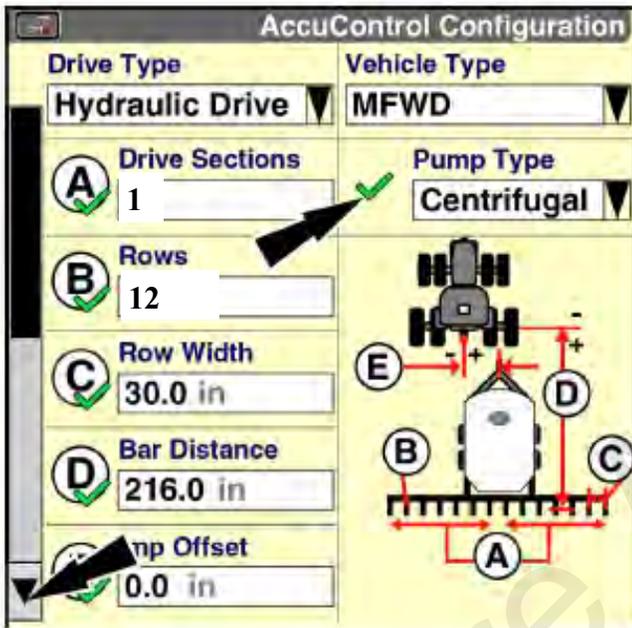
Version	CAN	Fault	Resource	GPS	GPS2
---------	-----	-------	----------	-----	------



# Pro 700 AccuControl Setup for Liquid PWM Control

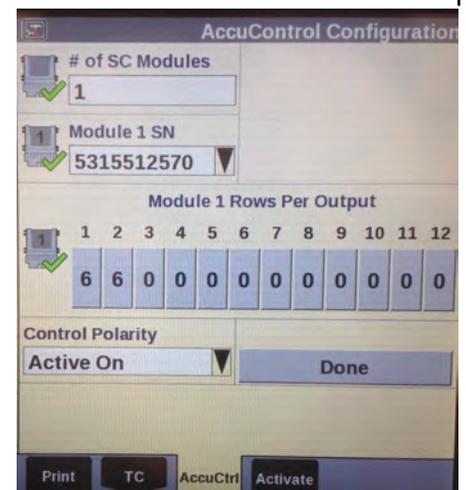
Your system may vary from the screens shown here. See the *AFS AccuControl Rate Controller Software Operating Guide* for additional information about configuring your system. The setup may not always happen in the order shown here.

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'

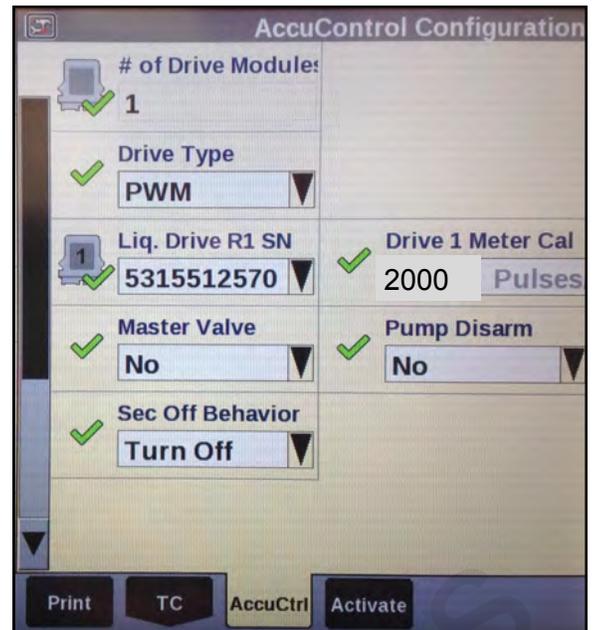
8. Section Control Setup (*If equipped with Section Shutoff Valves*) **Toolbox > AccuControl > Section Control**
  - A. Select Section Control (Yes)
  - B. Press 'Setup'
  - C. Assign Module Serial Numbers
  - D. Assign Rows per Output (number of rows per Section)
  - E. Select Control Polarity (Active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



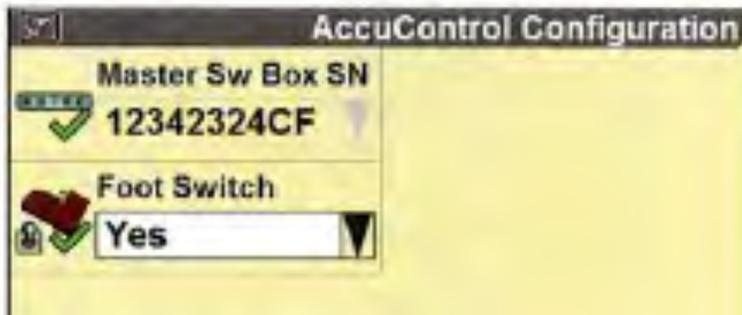
# AccuControl Setup for Liquid

## 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

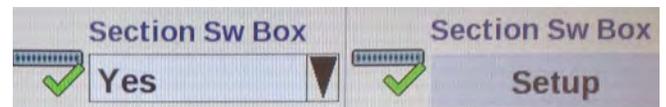


## 11. Master Switch Box (If equipped with External Switch Box)

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

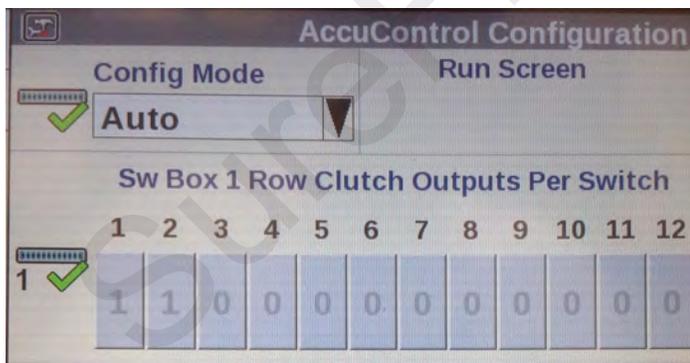
## 12. Implement Switch (if installed)

- 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

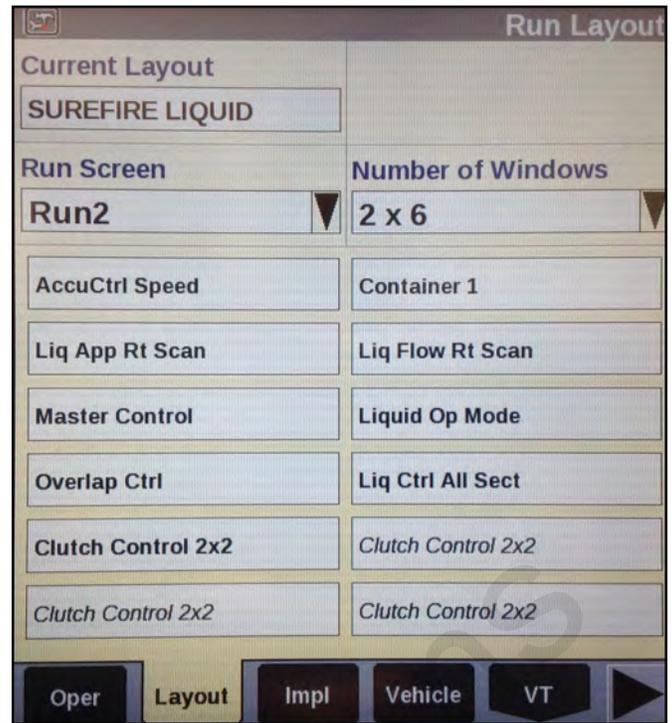
Go to **Toolbox>Layout**

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
Electric	0.5	3	2	100	-100	100
Hydraulic	0.2	10	2-3	100	-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. See page 65 for instructions on running Liquid Cal for initial setup.

# 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.



Product Setup	
Product Name	Form
28-0-0	Liquid
Usage	
Fertilizer	
Default App Rate	Delta App Rate
6.000 gal/ac Units	1.000 gal/ac
Min App Rate	Max App Rate
0.000 gal/ac	25.000 gal/ac

## 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.



Layer Assignment	
Work Condition	
Liquid	
Layer 1	
AccuControl Liquid	
Product 1	Container 1
28-0-0	TANK

## 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%)

AccuControl Controller Setup	
Implement	Work Condition
Liquid Toolbar	Liquid
Controller	
Liquid	
Default Rate	Alarm Limit
6.00 gal/ac	10 %
Delta Rate	
1.00 gal/ac	
Product Delay	
0.7 sec	
Minimum Speed	
3.0 mph	

## 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)

Liquid Op Mode
Liquid

Master Control
Apply

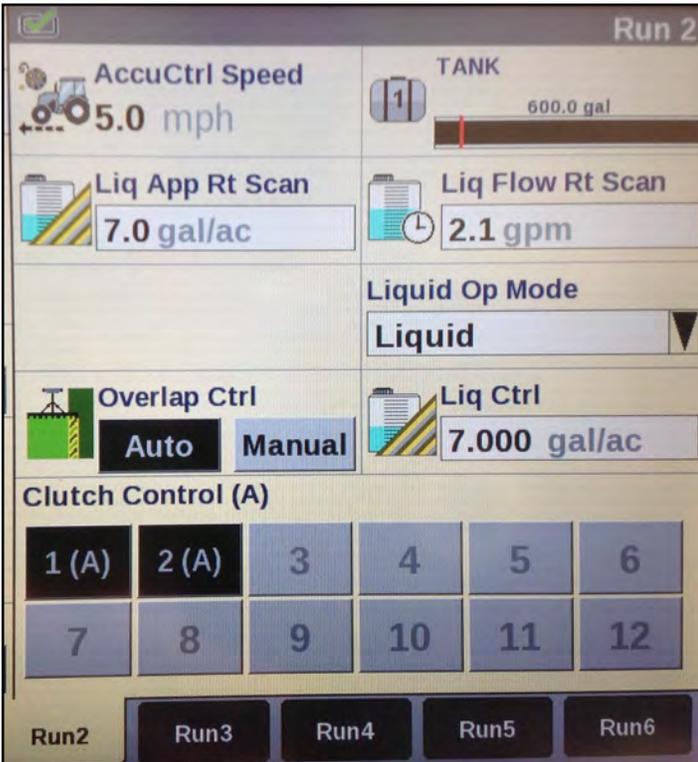
## 6. Liquid Rate Control

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

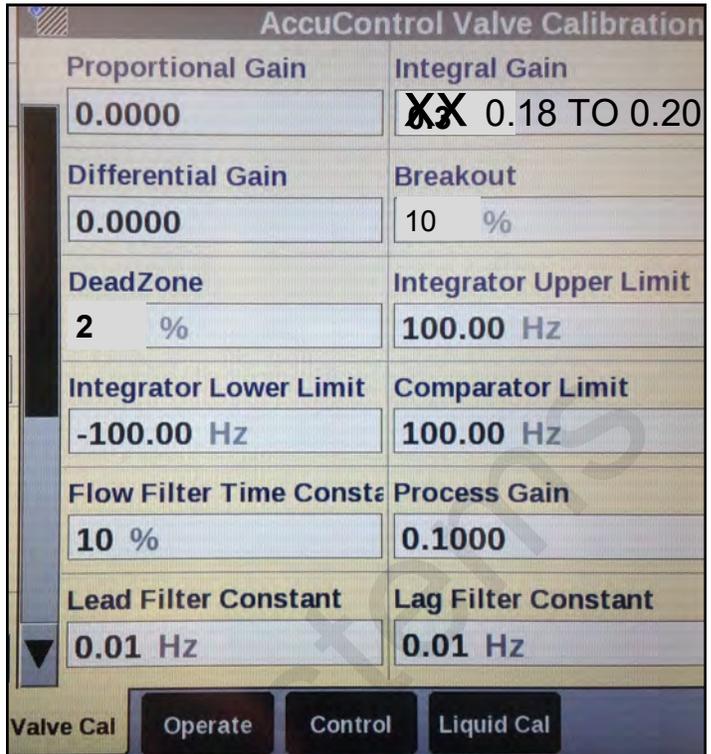
**Performance > Rx Setup.**

Liq Ctrl
6.000
Reset
On

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

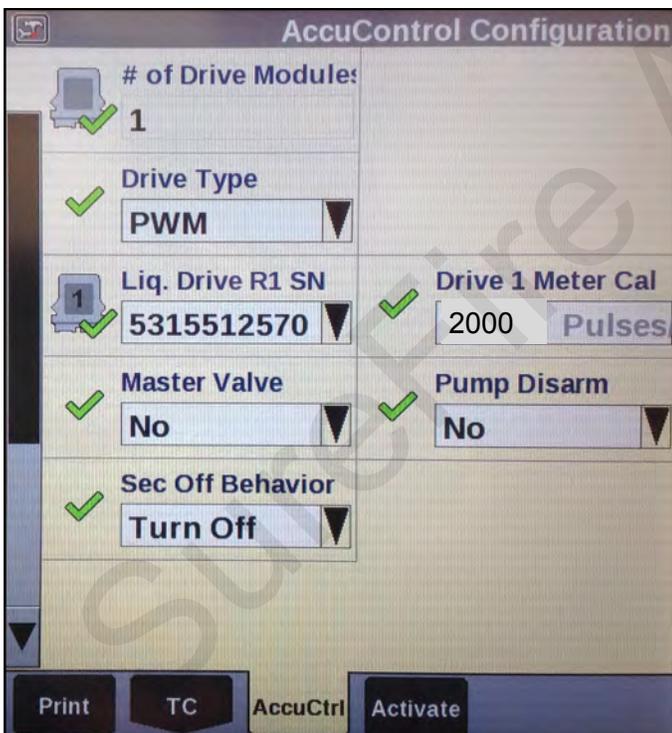


# Start with these Valve Cal settings Work Condition > Valve Cal > Advanced Calibration (For Hydraulic pumps)

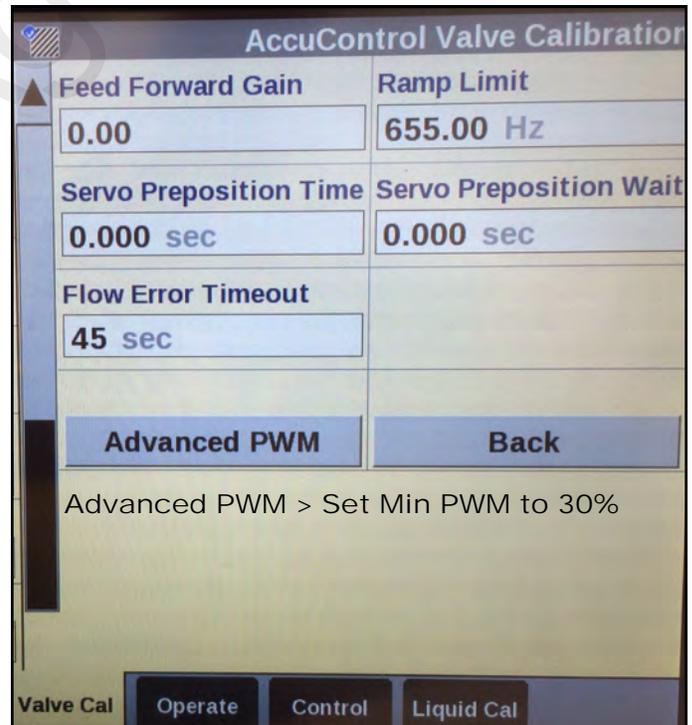


To use default AccuCtrl speed, turn Radar off.

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	

## 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

## 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 °

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

**IMPORTANT: SOFTWARE VERSION AND RATE & SECTION CONTROL MODULE UPDATES**

Keep your software up-to-date. Go to Diagnostics > Version to see the Software Version number for each piece of software( esp. AccuControl). Check with your CASE(NH) dealer to see what the latest versions are. Also, check and update the software/firmware for the Field-IQ module (Diagnostics > CAN > Scroll to find Rate & Section Control Module). Have dealer update all this once a year.

March 2017--Display and AccuControl version 30.16. Rate & Section Ctrl Module should be 3.19. Version 2.14 will NOT work.

For Initial Operation run Liquid Cal procedure described on page 65.



# 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.

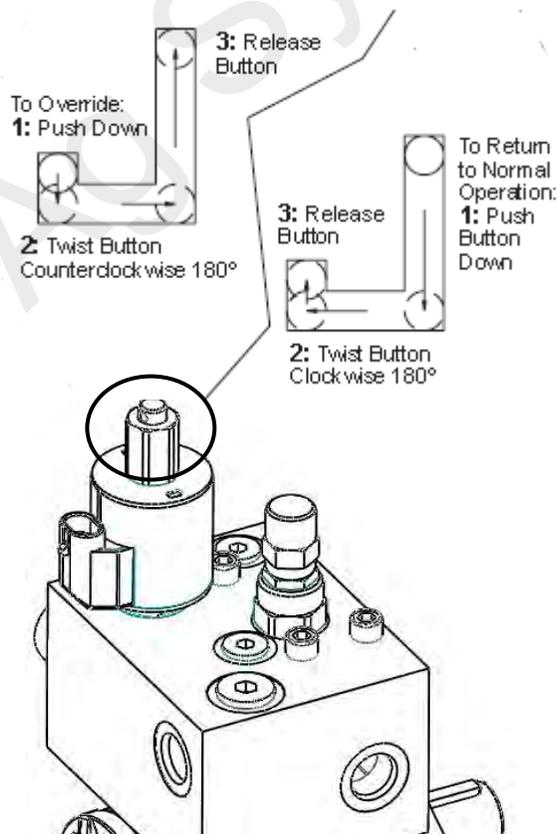
### Hydraulics Problem

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



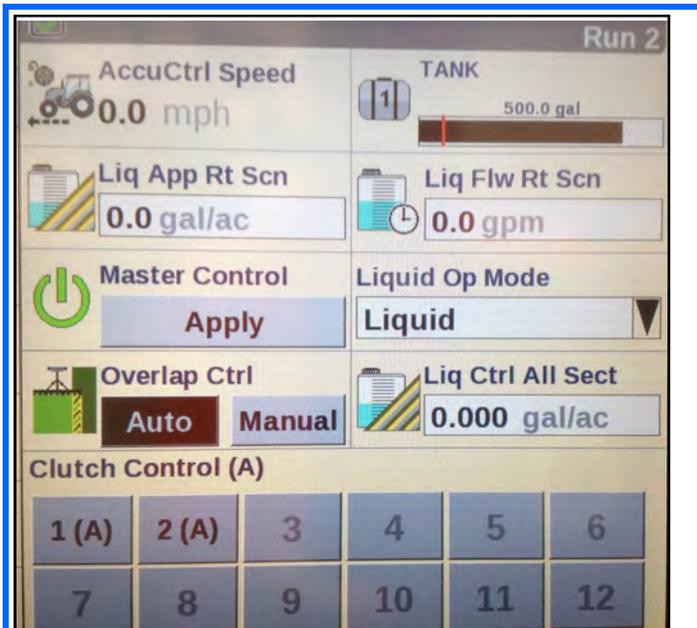
First, try Liquid Cal procedure described on page 65.

To troubleshoot Pump, PWM, or Section Valve issues, set **Flow Error Timeout** to 45 sec. Turn **Fault Speed** to OFF. Set **Default Speed** to 5 mph.

Set the **Default Application Rate or Target Rate to 0.00 GPA**. The Rate in **Liq Ctrl All Sect** should be 0.000. With this setting, you can turn on the Master Control—Apply to open the section valves and to begin testing the PWM voltage.

**To test PWM voltage** unplug the 2-pin PWM connector from the EPD module (on electric pump system) or from the hydraulic valve block.

If a harness problem is indicated, check the voltage at the end of each harness from there back to the Field-IQ module. See wiring schematics for pin outs.



**PWM Voltage**—Check at 2-pin PWM connector that plugs into EPD or hydraulic valve block.



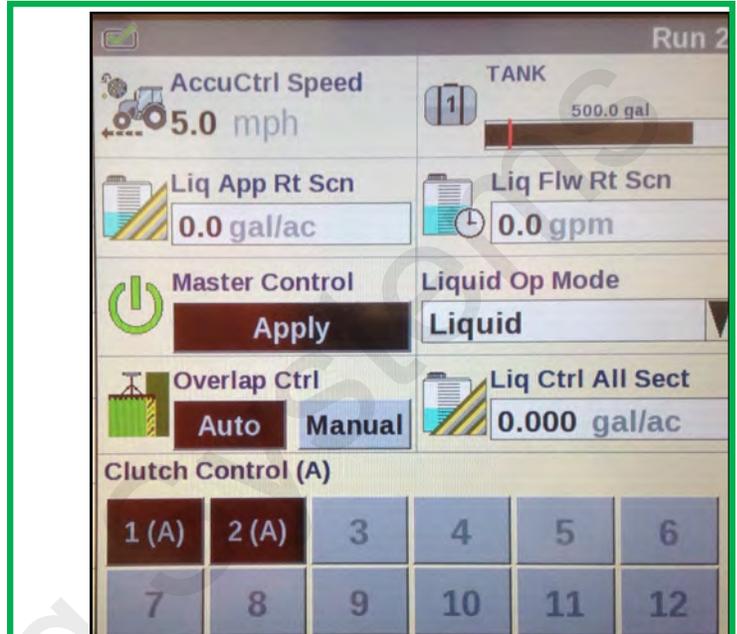
### Section Valves

In this setting, the section valves should be closed.

On each 3-pin section valve connector:  
 A to B (red to black) 12—14 volts  
 B to C 0.0 volts

Section Valve Connectors:

- Pin A Constant 12 v power
- Pin B Ground
- Pin C Boom Signal—should have 12 v when valve should be open, 0 v when valve should be closed



**PWM Voltage**—Unplug the 2-pin PWM connector from the EPD or hydraulic valve block to test voltage:



### Section Valves

In this setting, the section valves should be open.

On each 3-pin section valve connector:  
 A to B (red to black) 12—14 volts  
 B to C 12—14 volts

**If a section valve won't open:**

1. Plug another section connector that will open a valve into that valve.
2. Plug the section connector of the valve that won't open into a valve that is known to be working.
3. Check voltage at the end of each harness going back to the Field-IQ module to determine if there is a bad harness.
4. See wiring schematic for pin-outs of each harness.

## Testing PWM Voltage—continued from previous page.

With Master Control ON (APPLY) and Liq Ctrl All Sect at 0.000, have voltmeter connected to the 2-pin PWM connector that connects to the EPD Module (electric system) or to the hydraulic valve block. As a second person presses the arrow to raise the rate to 1.000 GPM the PWM voltage should increase steadily to 13+ volts.

# G

Trouble-shooting



PWM Voltage—should increase as target rate is changed from 0 to 1. Voltage should end up around 13 volts.



If the PWM voltage does not register here, check the voltage at each harness connection back to the Field-IQ module. PWM voltage will be between Pins 3 & 4 on the 16-pin connectors and between pins E1 and E2 on the 30-pin block on the back of the Field-IQ module.

# 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.

## 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.

# Fertilizer System Flow Verification

## Follow the steps below:

I can't get up to my desired rate. How much flow is required?  
Can I achieve a new application rate with my current system?



## Follow the steps below:

- Use the Fertilizer System Flow Charts on the next two pages to find your required flow. First, locate the chart for your implement size. Next, find your operating speed on the left side and your application rate on the top. Record the flow in gallons per minute for your maximum speed and rate and your minimum speed and rate.

A. Maximum Flow \_\_\_\_\_ GPM (Max Rate & Max Speed)

B. Minimum Flow \_\_\_\_\_ GPM (Min Rate & Min Speed)

- Locate your PumpRight model on the chart on this page. Will the pump model provide the maximum flow you need from above?
- Find your flowmeter model in the chart on this page. Will the flowmeter work at both the maximum and minimum flow your recorded in step 1? If not, a different flow meter is required.
- If using section valves you must complete this step.

A. Minimum Flow (from above) ÷ Total Rows = \_\_\_\_\_ GPM / Row

B. GPM / Row (from line above) x Rows per section = \_\_\_\_\_ GPM / Section

Will your flowmeter measure the minimum GPM / section?

## Tower (Electric Pump) Flow Table

	Max Flow GPM
1 Pump	3.0
2 Pump	5.0
Roller Pump	4.5

## PumpRight Flow Table

	Number of Diaphragms	Max Flow GPM
D70	2	15
D115	3	25
D160	4	35
D250	6	55

## Flowmeter Table

Model	Type	Min GPM	Max GPM
FM750LR	Turbine	0.3	12
FM750	Turbine	2	40
FlowMaster 270	Turbine	3.5	70
.13—2.6	ION	0.13	2.6
.3—5	ION	0.3	6.5
.6—13	ION	0.6	13
1.3—26	ION	1.3	26
2.6— 53	ION	2.6	53

# Fertilizer System Flow Charts

Use the correct implement width chart to find the required pump flow (in gallons per minute) based on travel speed and application rate

## Implement Width

15 feet

MPH	Application Rate in Gallons Per Acre												
	2	4	6	8	10	15	20	25	30	35	40	45	50
4	0.2	0.5	0.7	1.0	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.5	6.1
4.5	0.3	0.5	0.8	1.1	1.4	2.0	2.7	3.4	4.1	4.8	5.5	6.1	6.8
5	0.3	0.6	0.9	1.2	1.5	2.3	3.0	3.8	4.5	5.3	6.1	6.8	7.6
5.5	0.3	0.7	1.0	1.3	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3
6	0.4	0.7	1.1	1.5	1.8	2.7	3.6	4.5	5.5	6.4	7.3	8.2	9.1
6.5	0.4	0.8	1.2	1.6	2.0	3.0	3.9	4.9	5.9	6.9	7.9	8.9	9.8
7	0.4	0.8	1.3	1.7	2.1	3.2	4.2	5.3	6.4	7.4	8.5	9.5	10.6
8	0.5	1.0	1.5	1.9	2.4	3.6	4.8	6.1	7.3	8.5	9.7	10.9	12.1
9	0.5	1.1	1.6	2.2	2.7	4.1	5.5	6.8	8.2	9.5	10.9	12.3	13.6
10	0.6	1.2	1.8	2.4	3.0	4.5	6.1	7.6	9.1	10.6	12.1	13.6	15.2

## Implement Width

20 feet

MPH	Application Rate in Gallons Per Acre												
	2	4	6	8	10	15	20	25	30	35	40	45	50
4	0.3	0.6	1.0	1.3	1.6	2.4	3.2	4.0	4.8	5.7	6.5	7.3	8.1
4.5	0.4	0.7	1.1	1.5	1.8	2.7	3.6	4.5	5.5	6.4	7.3	8.2	9.1
5	0.4	0.8	1.2	1.6	2.0	3.0	4.0	5.1	6.1	7.1	8.1	9.1	10.1
5.5	0.4	0.9	1.3	1.8	2.2	3.3	4.4	5.6	6.7	7.8	8.9	10.0	11.1
6	0.5	1.0	1.5	1.9	2.4	3.6	4.8	6.1	7.3	8.5	9.7	10.9	12.1
6.5	0.5	1.1	1.6	2.1	2.6	3.9	5.3	6.6	7.9	9.2	10.5	11.8	13.1
7	0.6	1.1	1.7	2.3	2.8	4.2	5.7	7.1	8.5	9.9	11.3	12.7	14.1
8	0.6	1.3	1.9	2.6	3.2	4.8	6.5	8.1	9.7	11.3	12.9	14.5	16.2
9	0.7	1.5	2.2	2.9	3.6	5.5	7.3	9.1	10.9	12.7	14.5	16.4	18.2
10	0.8	1.6	2.4	3.2	4.0	6.1	8.1	10.1	12.1	14.1	16.2	18.2	20.2

## Implement Width

30 feet

MPH	Application Rate in Gallons Per Acre												
	2	4	6	8	10	15	20	25	30	35	40	45	50
4	0.5	1.0	1.5	1.9	2.4	3.6	4.8	6.1	7.3	8.5	9.7	10.9	12.1
4.5	0.5	1.1	1.6	2.2	2.7	4.1	5.5	6.8	8.2	9.5	10.9	12.3	13.6
5	0.6	1.2	1.8	2.4	3.0	4.5	6.1	7.6	9.1	10.6	12.1	13.6	15.2
5.5	0.7	1.3	2.0	2.7	3.3	5.0	6.7	8.3	10.0	11.7	13.3	15.0	16.7
6	0.7	1.5	2.2	2.9	3.6	5.5	7.3	9.1	10.9	12.7	14.5	16.4	18.2
6.5	0.8	1.6	2.4	3.2	3.9	5.9	7.9	9.8	11.8	13.8	15.8	17.7	19.7
7	0.8	1.7	2.5	3.4	4.2	6.4	8.5	10.6	12.7	14.8	17.0	19.1	21.2
8	1.0	1.9	2.9	3.9	4.8	7.3	9.7	12.1	14.5	17.0	19.4	21.8	24.2
9	1.1	2.2	3.3	4.4	5.5	8.2	10.9	13.6	16.4	19.1	21.8	24.5	27.3
10	1.2	2.4	3.6	4.8	6.1	9.1	12.1	15.2	18.2	21.2	24.2	27.3	30.3

# Fertilizer System Flow Charts



Use the correct implement width chart to find the required pump flow (in gallons per minute) based on travel speed and application rate

**Implement Width 40 feet**

MPH	Application Rate in Gallons Per Acre												
	2	4	6	8	10	15	20	25	30	35	40	45	50
4	0.6	1.3	1.9	2.6	3.2	4.8	6.5	8.1	9.7	11.3	12.9	14.5	16.2
4.5	0.7	1.5	2.2	2.9	3.6	5.5	7.3	9.1	10.9	12.7	14.5	16.4	18.2
5	0.8	1.6	2.4	3.2	4.0	6.1	8.1	10.1	12.1	14.1	16.2	18.2	20.2
5.5	0.9	1.8	2.7	3.6	4.4	6.7	8.9	11.1	13.3	15.6	17.8	20.0	22.2
6	1.0	1.9	2.9	3.9	4.8	7.3	9.7	12.1	14.5	17.0	19.4	21.8	24.2
6.5	1.1	2.1	3.2	4.2	5.3	7.9	10.5	13.1	15.8	18.4	21.0	23.6	26.3
7	1.1	2.3	3.4	4.5	5.7	8.5	11.3	14.1	17.0	19.8	22.6	25.5	28.3
8	1.3	2.6	3.9	5.2	6.5	9.7	12.9	16.2	19.4	22.6	25.9	29.1	32.3
9	1.5	2.9	4.4	5.8	7.3	10.9	14.5	18.2	21.8	25.5	29.1	32.7	36.4
10	1.6	3.2	4.8	6.5	8.1	12.1	16.2	20.2	24.2	28.3	32.3	36.4	40.4

**Implement Width 60 feet**

MPH	Application Rate in Gallons Per Acre												
	2	4	6	8	10	15	20	25	30	35	40	45	50
4	1.0	1.9	2.9	3.9	4.8	7.3	9.7	12.1	14.5	17.0	19.4	21.8	24.2
4.5	1.1	2.2	3.3	4.4	5.5	8.2	10.9	13.6	16.4	19.1	21.8	24.5	27.3
5	1.2	2.4	3.6	4.8	6.1	9.1	12.1	15.2	18.2	21.2	24.2	27.3	30.3
5.5	1.3	2.7	4.0	5.3	6.7	10.0	13.3	16.7	20.0	23.3	26.7	30.0	33.3
6	1.5	2.9	4.4	5.8	7.3	10.9	14.5	18.2	21.8	25.5	29.1	32.7	36.4
6.5	1.6	3.2	4.7	6.3	7.9	11.8	15.8	19.7	23.6	27.6	31.5	35.5	39.4
7	1.7	3.4	5.1	6.8	8.5	12.7	17.0	21.2	25.5	29.7	33.9	38.2	42.4
8	1.9	3.9	5.8	7.8	9.7	14.5	19.4	24.2	29.1	33.9	38.8	43.6	48.5
9	2.2	4.4	6.5	8.7	10.9	16.4	21.8	27.3	32.7	38.2	43.6	49.1	54.5
10	2.4	4.8	7.3	9.7	12.1	18.2	24.2	30.3	36.4	42.4	48.5	54.5	60.6

**Implement Width 90 feet**

MPH	Application Rate in Gallons Per Acre												
	2	4	6	8	10	15	20	25	30	35	40	45	50
4	1.5	2.9	4.4	5.8	7.3	10.9	14.5	18.2	21.8	25.5	29.1	32.7	36.4
4.5	1.6	3.3	4.9	6.5	8.2	12.3	16.4	20.5	24.5	28.6	32.7	36.8	40.9
5	1.8	3.6	5.5	7.3	9.1	13.6	18.2	22.7	27.3	31.8	36.4	40.9	45.5
5.5	2.0	4.0	6.0	8.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
6	2.2	4.4	6.5	8.7	10.9	16.4	21.8	27.3	32.7	38.2	43.6	49.1	54.5
6.5	2.4	4.7	7.1	9.5	11.8	17.7	23.6	29.5	35.5	41.4	47.3	53.2	59.1
7	2.5	5.1	7.6	10.2	12.7	19.1	25.5	31.8	38.2	44.5	50.9	57.3	63.6
8	2.9	5.8	8.7	11.6	14.5	21.8	29.1	36.4	43.6	50.9	58.2	65.5	72.7
9	3.3	6.5	9.8	13.1	16.4	24.5	32.7	40.9	49.1	57.3	65.5	73.6	81.8
10	3.6	7.3	10.9	14.5	18.2	27.3	36.4	45.5	54.5	63.6	72.7	81.8	90.9

# Recommended Care and Maintenance

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Maintenance  
& Parts

## Air Bladder

PumpRight pumps 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**. SureFire 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.

## Winterization

SureFire 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
9910-D70	24 oz.	9910-D160	56 oz.
9910-D115	32 oz.	9910-D250	98 oz.
9910-D135	32 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 annually. It is a small job that helps ensure reliable operation during the busy season.

# Diaphragm Pump Valves & Diaphragms



All PumpRight models use the same diaphragm and valve parts.

## Diaphragm Pump Service Kit

### Item Number 291-02-101500

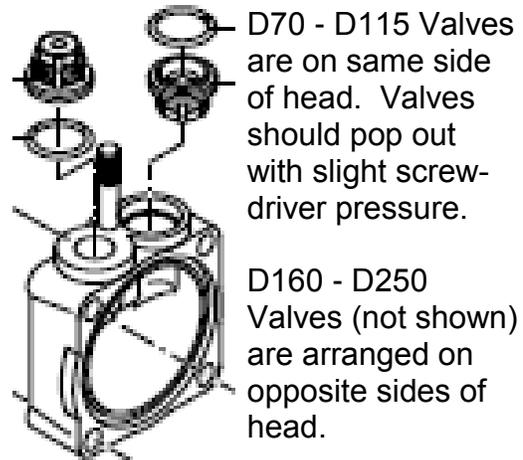
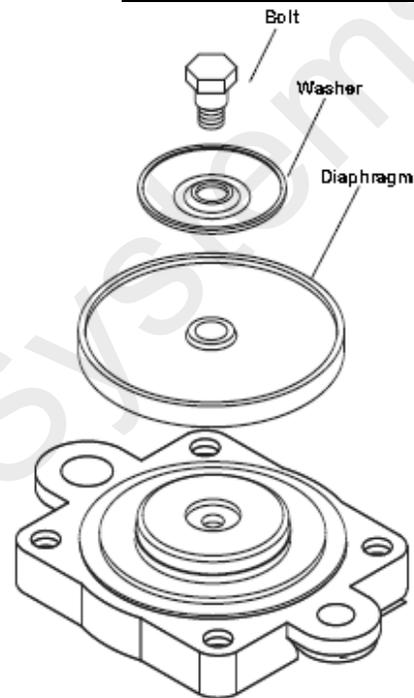
1 Kit contains 1 diaphragm and 2 valves to service a single pumping diaphragm. Order multiple kits to service all the diaphragms in your pump per chart at right.

Qty in Kit	Part Number (all begin 291-02-9910-xxxxxx)	Description
1	550085	Diaphragm (Desmopan)
2	320030	O-Ring
2	759051	Valve Assembly

	Number of Diaphragms
D70	2
D115	3
D160	4
D250	6

### Diaphragm & Valve Service Steps:

1. Drain oil from pump. Rotate pump shaft to remove all oil.
2. Remove pump manifold(s) using a 17mm or 13 mm wrench.
3. Remove and replace complete valve assembly.
4. Remove the pump head.
5. Remove the diaphragm bolt, support washer and diaphragm. Turn the pump shaft to up stroke to replace diaphragm.
6. Install new diaphragm, then replace washer and bolt.
7. Turn pump to downstroke to seat new diaphragm into the sleeve groove.
8. Replace pump head and manifold(s).
9. Refill crankcase with SAE30 non detergent oil (Hypro Oil or hydraulic jack oil).



### Other Service Parts

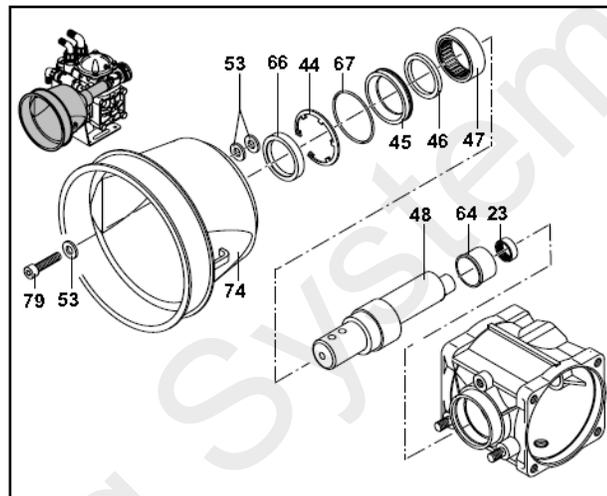
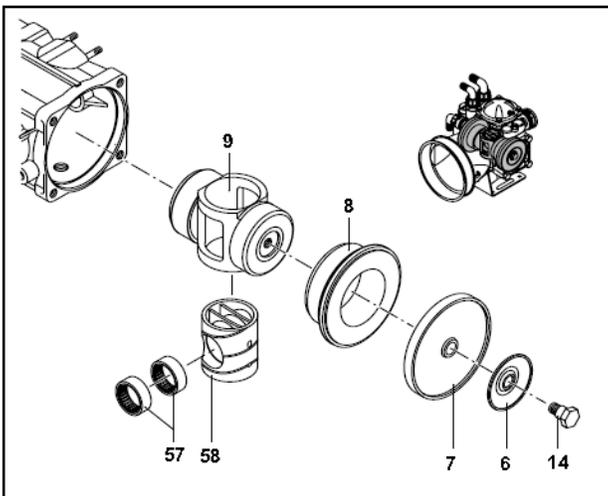
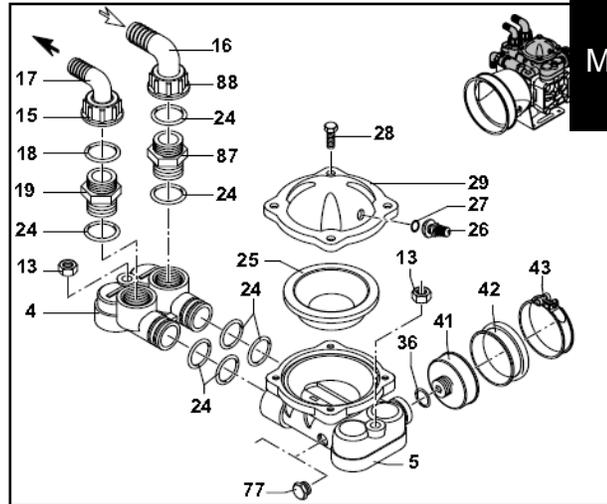
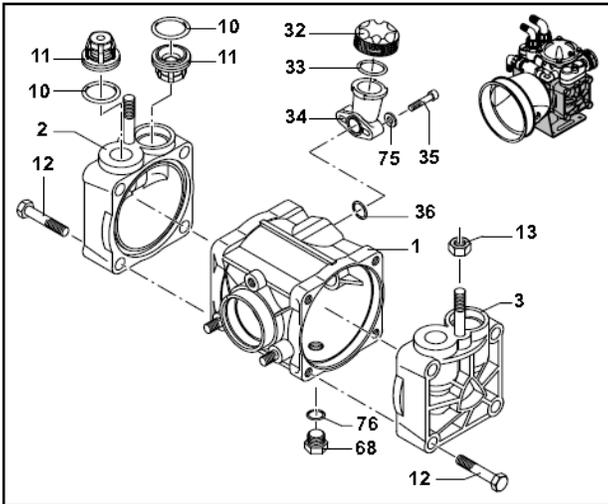
#### D70, D115, D160, D250

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

# D70 Diaphragm Pump Parts

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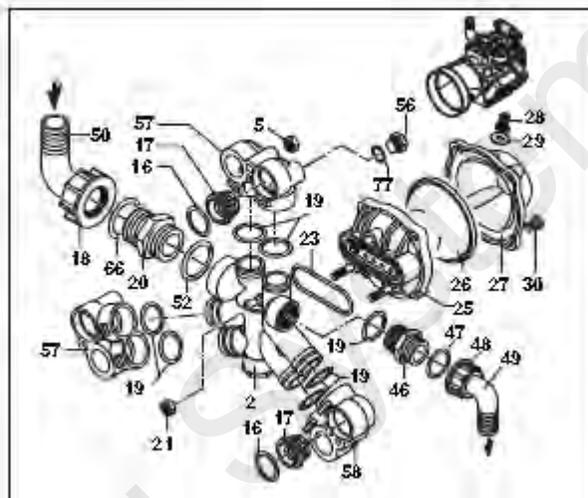
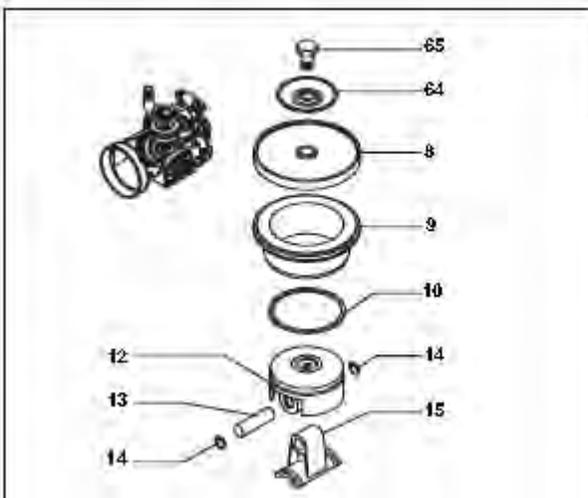
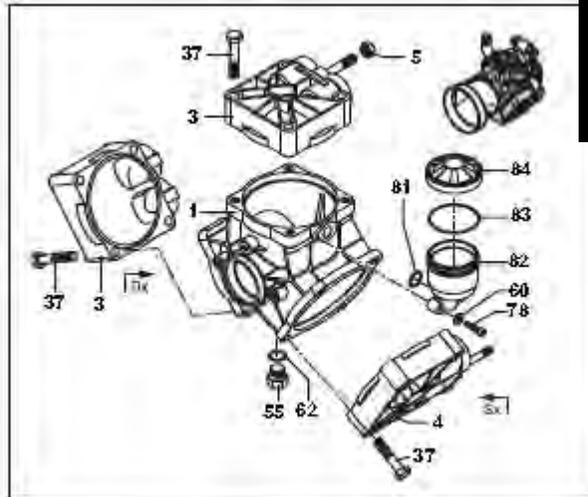
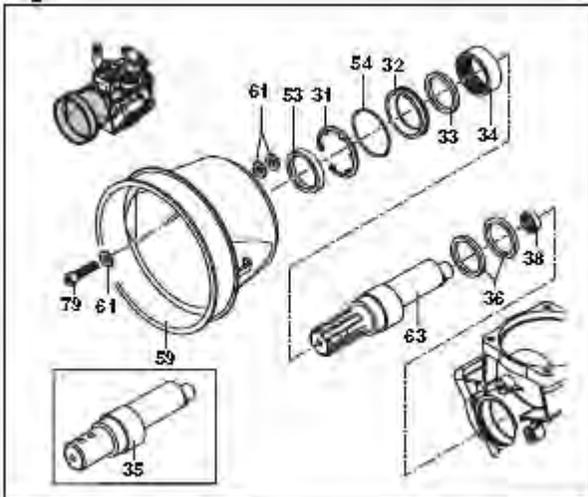
REF. NO.	PART NUMBER	DESCRIPTION	QTY. REQ'D
1	9910-550011	Pump Body with bolts	1
2	9910-550101	Right head DX	1
3	9910-550102	Left head SX	1
4	9910-550150	Manifold	1
5	9910-559200	Accumulator manifold	1
6	9910-580370	Plate	2
7	9910-550080	Diaphragm (Buna) Optional	2
7a	9910-550085	Diaphragm (Desmopan) Standard	2
8	9910-550110	Sleeve	2
9	9910-550120	Piston	1
10	9910-320030	O-ring	4
11	9910-759051	Complete valve assembly	4
12	9910-551040	M10 x 55 Bolt	8
13	9910-180152	Nut	4
14	9910-580360	Diaphragm bolt	2
15	9910-550880	Ring nut	1
16	9910-580040	Elbow 1-1/4"	1
17	9910-550370	Elbow 1"	1
18	9910-550350	O-ring	1
19	9910-550340	Threaded adapter	1
23	9910-550310	Roller bearing	1
24	9910-390290	O-ring	7
25	9910-550190	Accumulator diaphragm	1
26	9910-550300	Air valve	1
27	9910-650542	O-ring	1
28	9910-550680	Bolt	4
29	9910-559204	Upper air chamber	1

32	9910-550057	Sight glass cap	1
33	9910-550040	O-ring	1
34	9910-550030	Oil sight glass	2
36	9910-180101	O-ring	2
41	9910-650660	Diaphragm holder	1
42	9910-650670	Diaphragm	1
43	9910-650690	Clamp	1
44	9910-200391	Retainer ring	1
45	9910-550470	Seal ring	1
46	9910-550070	Spacer ring	1
47	9910-550060	Roller bushing	1
48	9910-550170	Shaft	1
52	9910-200233	Washer	2
53	9910-320621	Washer	5
57	9910-550280	Bearing	2
58	9910-550140	Cylinder	1
64	9910-550160	Spacer	1
66	9910-550491	Seal ring	1
67	9910-650920	O-ring	1
68	2406-0023	Oil drain plug	1
74	9910-1500350	Shield	1
75	9910-550332	Washer	2
76	9910-740290	O-ring	1
77	9910-330173	Plug	1
79	9910-620472	M10 x 20 Bolt	1
87	9910-450120	Threaded adapter	1
88	9910-550870	Ring nut	1

# D115 Diaphragm Pump Parts

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& Parts



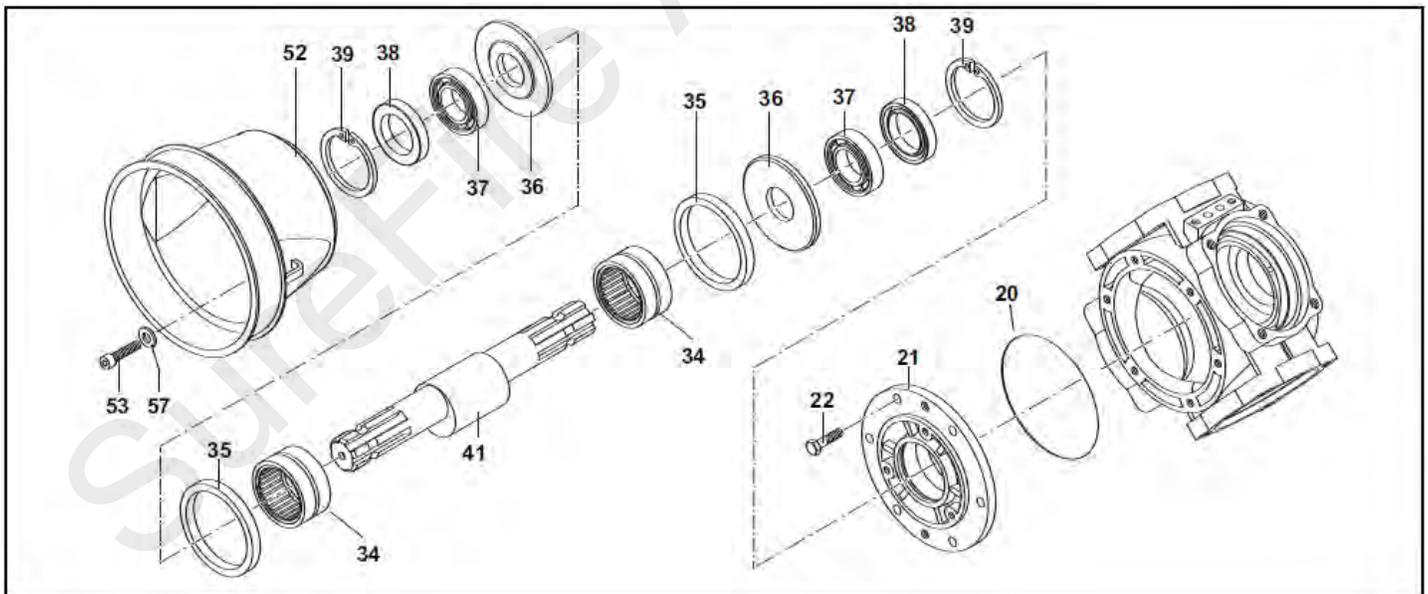
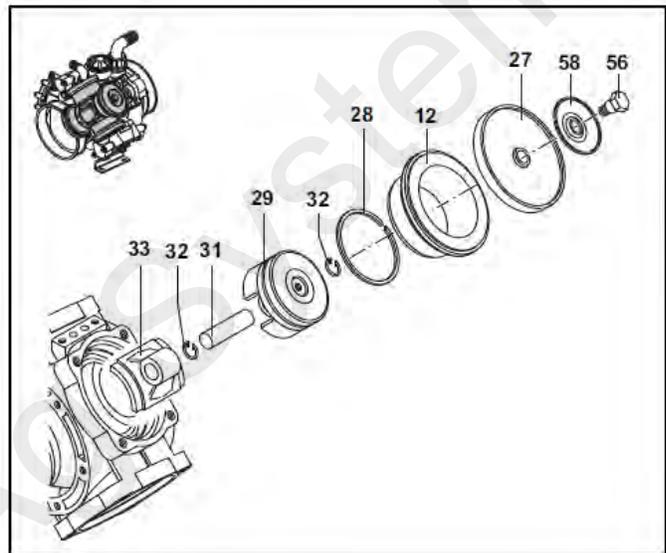
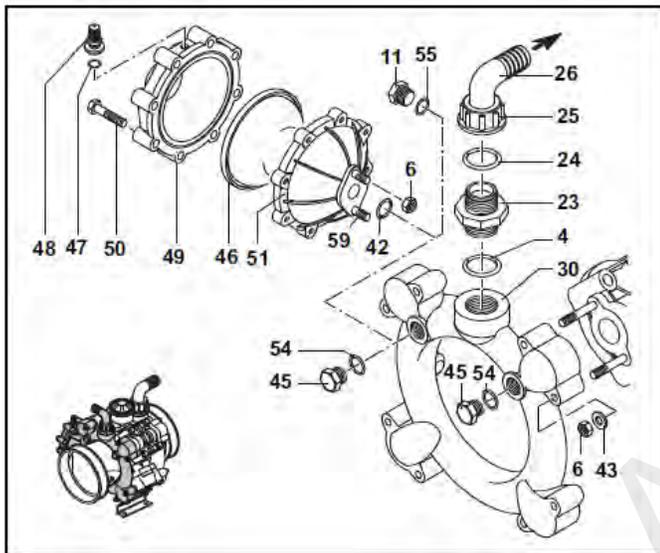
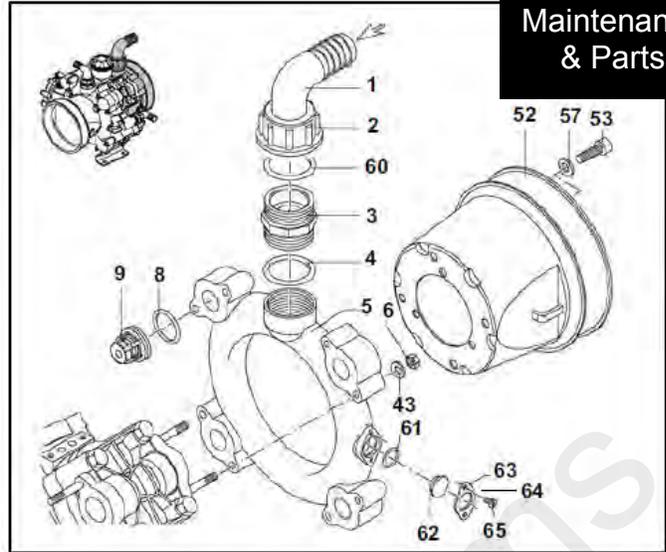
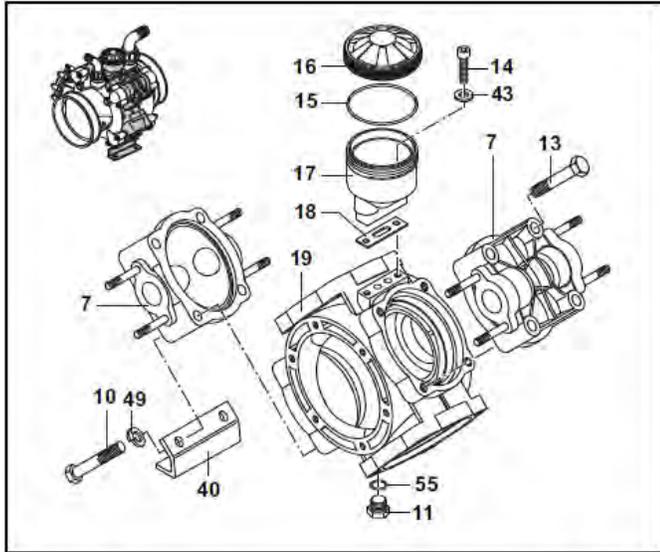
REF. NO.	PART NUMBER	DESCRIPTION	QTY. REQ'D
1	9910-580013	Pump body with bolts	1
2	9910-580150	Manifold	1
3	9910-550101	DX Right head	2
4	9910-550102	SX Left head	1
5	9910-180152	Nut	3
8	9910-550080	Diaphragm (Buna) Optional	3
8	9910-550085	Diaphragm (Desmopan) Standard	3
9	9910-580110	Sleeve (D115)	3
9	9910-580350	Sleeve (D135)	3
10	9910-500260	Piston ring	3
12	9910-580120	Piston	3
13	9910-380300	Pin	3
14	9910-380080	Pin ring	6
15	9910-580140	Connecting rod	3
16	9910-320030	O-ring	6
17	9910-759051	Complete valve	6
18	9910-540541	Ring nut	1
19	9910-390291	O-ring	7
20	9910-540530	Threaded adapter	1
21	9910-390271	Nut	3
23	9910-580050	Gasket	1
25	9910-580180	Accumulator manifold	1
26	9910-550190	Accumulator diaphragm	1
27	9910-559204	Accumulator head	1
28	9910-550300	Air valve	1
29	9910-650542	O-ring	1
30	9910-550680	M8 x 20 Bolt	4
31	9910-200391	Retainer ring	1
32	9910-550470	Gasket retainer	1
33	9910-550070	Spacer ring	1
34	9910-550060	Roller bearing	1
35	9910-550170	Shaft (D115)	1
36	9910-580470	Connecting rod ring	2

REF. NO.	PART NUMBER	DESCRIPTION	QTY. REQ'D
37	9910-551040	M10 x 55 Bolt	12
38	9910-550310	Roller bushing	1
46	9910-550340	Threaded adapter	1
47	9910-550350	O-ring	1
48	9910-550242	Ring nut	1
49	9910-550370	Elbow 1"	1
50	9910-540550	Elbow 1-1/2"	1
52	9910-250310	O-ring	1
53	9910-550491	Seal ring	1
54	9910-650920	O-ring	1
55	2406-0023	Oil drain plug	1
56	9910-330173	Plug	1
57	9910-589200	DX Right valve retainer w/plug/o-ring	2
58	9910-580072	SX Left valve retainer	1
59	9910-1500350	Shield	1
60	9910-550332	Washer	2
61	9910-320621	Washer	5
62	9910-740290	O-ring	1
63	9910-580330	Shaft (D135)	1
64	9910-580370	Plate	3
65	9910-580360	Diaphragm bolt	3
66	9910-250310	O-ring	1
69	9910-200233	Washer	2
77	9910-180101	O-ring	1
78	9910-850851	M6 x 30 Bolt	2
79	9910-620472	M10 x 20 Bolt	3
81	9910-390180	O-ring	1
82	9910-1040310	Oil sight glass	1
83	9910-650920	O-ring	1
84	9910-1040322	Black oil tank cap	1

# D160 Diaphragm Pump Parts

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Maintenance  
& Parts



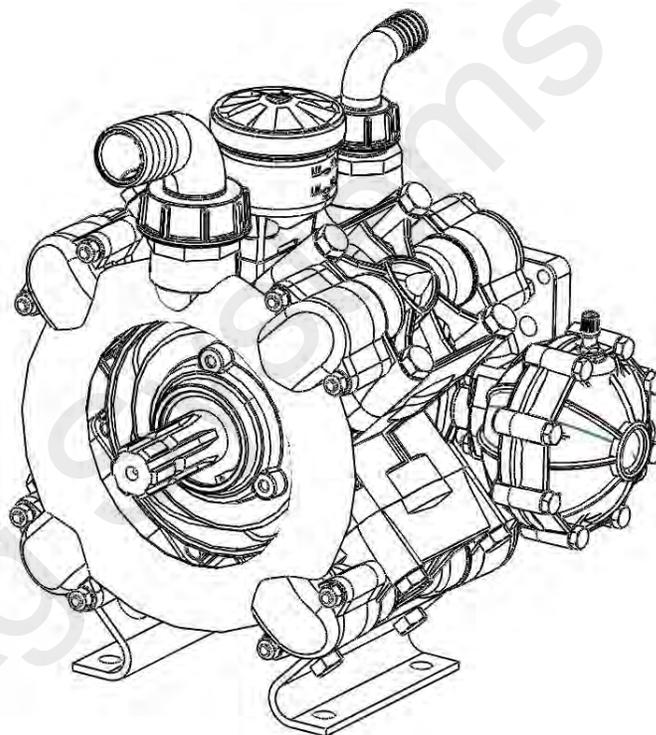
# D160 Diaphragm Pump Parts

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Maintenance  
& Parts

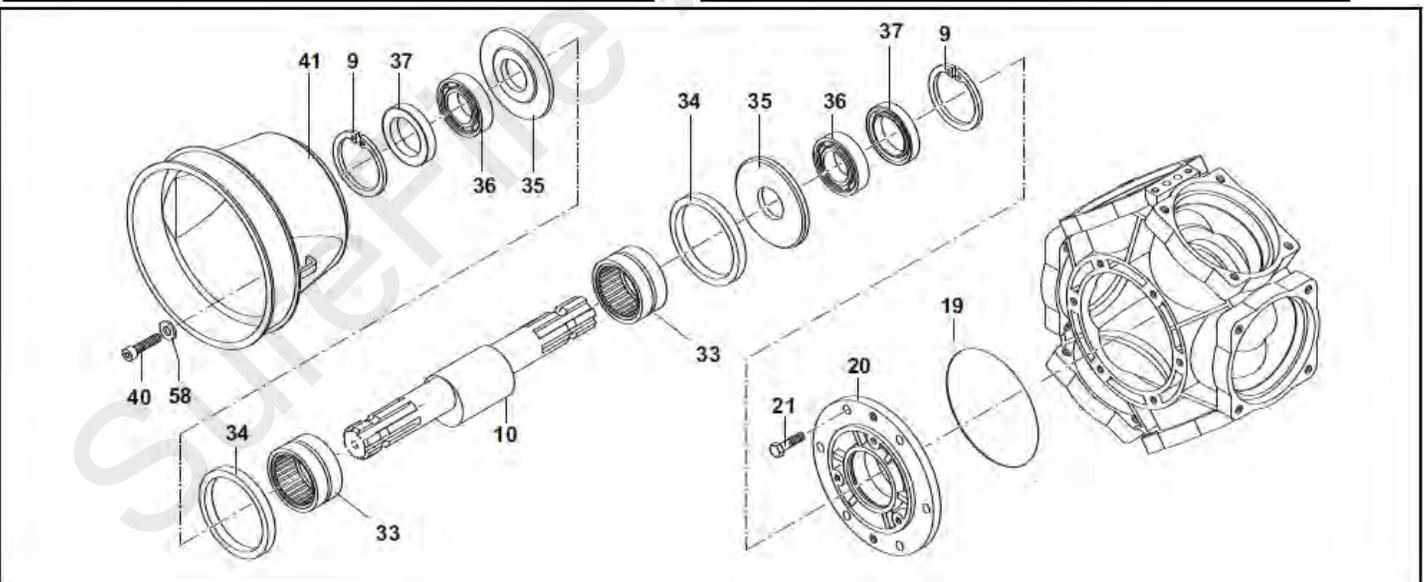
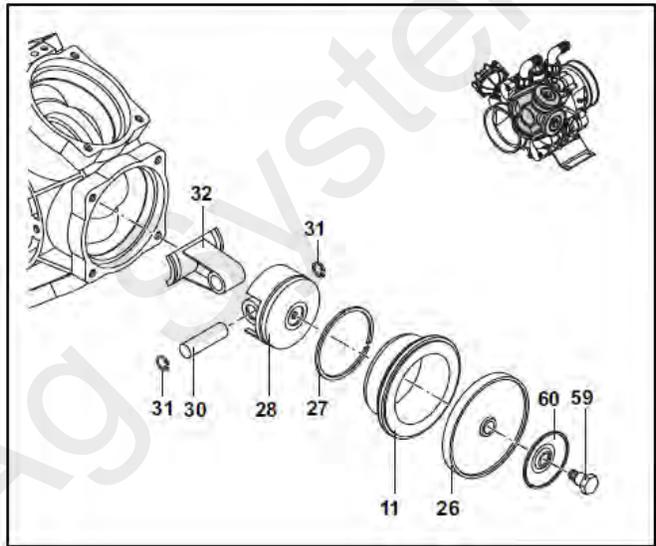
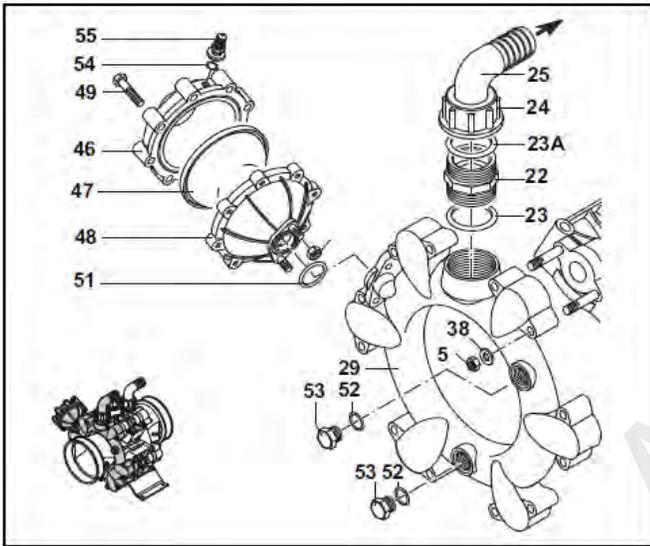
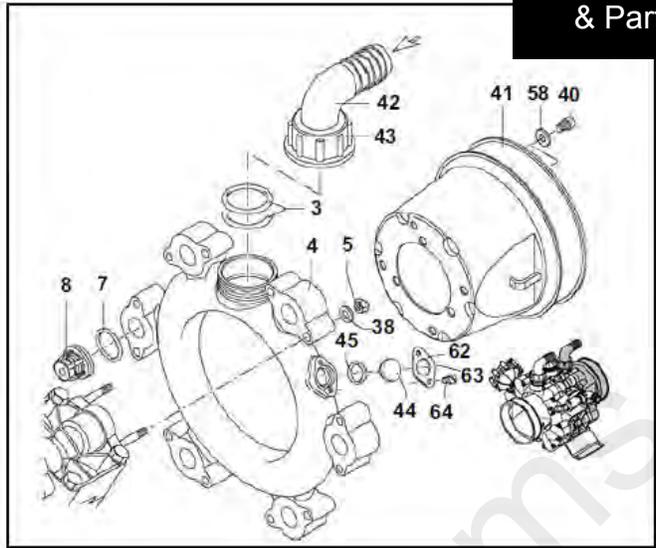
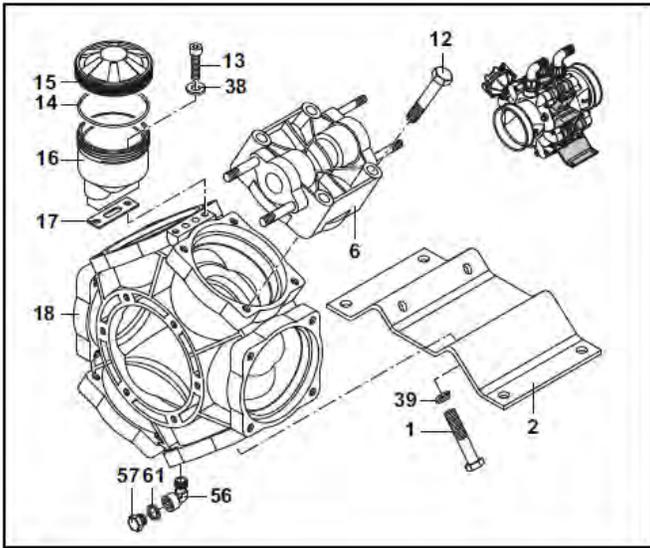
REF. NO.	PART NUMBER	DESCRIPTION	QTY. REQ'D
1	9910-760020	Elbow 2"	1
2	9910-760040	Ring nut	1
3	9910-760030	Threaded adapter	1
4	9910-250310	O-ring	1
5	9910-760220	Suction manifold	1
6	9910-380242	Nut	18
7	9910-750100	Head	4
8	9910-680070	O-ring	8
9	9910-759051	Complete valve	8
10	9910-750071	Bolt	4
11	2406-0023	Oil drain plug	2
12	9910-750110	Sleeve	4
13	9910-750061	M12 x 65 Bolt	12
14	9910-680350	M8 x 35 Bolt	2
15	9910-1040060	O-ring	1
16	9910-750057	Black oil tank cap	1
17	9910-750030	Oil sight glass	1
18	9910-750040	Gasket	1
19	9910-760010	Pump body	1
20	9910-851360	O-ring	1
21	9910-680020	Bearing support housing	1
22	9910-160672	M10 x 25Bolt	6
23	9910-540530	Threaded adapter	1
24	9910-250310	O-ring	1
25	9910-540540	Ring nut	1
26	9910-540550	Elbow 1-1/2"	1
27	9910-550085	Diaphragm (Desmopan) Standard	4
27a	9910-550080	Diaphragm (Buna) Optional	4
28	9910-500260	Piston ring	4
29	9910-750122	Piston	4
30	9910-760070	Manifold	1
31	9910-160700	Pin	4
32	9910-160691	Pin ring	8
33	9910-760140	Connecting rod	4
34	9910-750090	Roller bearing	2
35	9910-750130	Connecting rod ring	2
36	9910-540040	Spacer washer	2
37	9910-230350	Bearing	2
38	9910-160740	Seal ring	2
39	9910-200390	Retainer ring	2
40	9910-760201	Base	2
41	9910-750170	Crankshaft	1
42	9910-390290	O-ring	1
43	9910-380243	Washer	18
44	9910-250143	Washer	4
45	9910-330173	Plug	2
46	9910-550190	Accumulator diaphragm	1
47	9910-650542	O-ring	1
48	9910-180020	Air valve	1
49	9910-620232	Accumulator head	1
50	9910-621781	M8 x 40 Bolt	8
51	9910-680180	Accumulatorbody	1
52	9910-1500350	Shield	2
53	9910-850251	M8 x 12 Bolt	6
54	9910-180101	O-ring	2
55	9910-740290	O-ring	2
56	9910-580360	Diaphragm bolt	4
57	9910-390314	Washer	6
58	9910-580370	Retaining washer	4
59	9910-390670	Accumulator stud	1

REF. NO.	PART NUMBER	DESCRIPTION	QTY. REQ'D
60	9910-620210	Oring	1
61	9910-480440	Oring	1
62	9910-2420120	Flange Plug	1
63	9910-2420110	Flange	1
64	9910-2420290	Washer	2
65	9910-2420280	Bolt	2



# D250 Diaphragm Pump Parts

**H**  
Maintenance  
& Parts



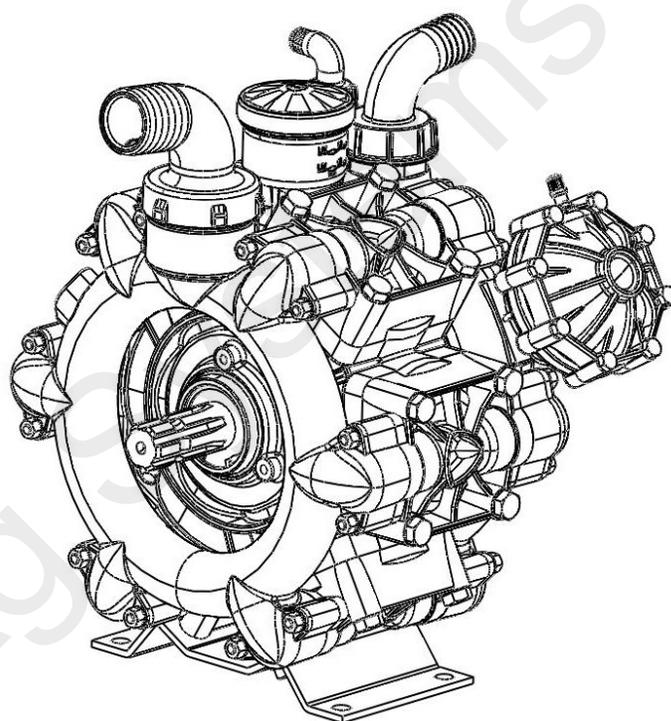
# D250 Diaphragm Pump Parts

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Maintenance  
& Parts

REF. NO.	PART NUMBER	DESCRIPTION	QTY. REQ'D
1	9910-750071	Bolt	4
2	9910-750200	Base	1
3	9910-750740	O-ring	2
4	9910-KIT2486	Suction Manifold Kit (Includes Ref. 3, 42, 43, 44, 45 and 62)	1
5	9910-380242	Nut	26
6	9910-750100	Head	6
7	9910-680070	O-ring	12
8	9910-759051	Complete valve	12
9	9910-200390	Retainer ring	2
10	9910-750170	Crankshaft	1
11	9910-750110	Sleeve	6
12	9910-750061	M12 x 65 Bolt	20
13	9910-680350	M8 x 35 Bolt	2
14	9910-1040060	O-ring	1
15	9910-750057	Black oil tank cap	1
16	9910-750030	Oil sight glass	1
17	9910-750040	Gasket	1
18	9910-750010	Pump body	1
19	9910-851360	O-ring	1
20	9910-680020	Shaft support	1
21	9910-160672	M10 x 25 Bolt	6
22	9910-751130	Threaded adapter	1
23	9910-751140	O-ring	1
23A	9910-390290	O-ring	1
24	9910-750670	Ring nut	1
25	FNE-112112	Elbow 1-1/2"	1
26	9910-550085	Diaphragm (Desmopan) Standard	6
26A	9910-550080	Diaphragm (Buna) Optional	6
27	9910-500260	Piston ring	6
28	9910-750122	Piston	6
29	9910-751080	Manifold	1
30	9910-160700	Pin	6
31	9910-160691	Pin ring	2
32	9910-750140	Connecting rod	6
33	9910-750090	Roller bearing	2
34	9910-750130	Connecting rod ring	2
35	9910-540040	Spacer washer	2
36	9910-230350	Bearing	2
37	9910-160740	Seal ring	2
38	9910-380243	Washer	26
39	9910-250143	Washer	4
40	9910-850251	M8 x 12 Bolt	6
41	9910-1500350	Shield	2
42	9910-750850	Elbow 2"	1
43	9910-750710	Ring nut	1
44	9910-2420120	Plug	1
45	9910-480440	O-ring	1
46	9910-620232	Accumulator head	1
47	9910-550190	Accumulator diaphragm	1
48	9910-680180	Accumulator body	1
49	9910-621781	M8 x 40 Bolt	8
51	9910-390290	O-ring	1
52	9910-180101	O-ring	2
53	9910-330173	Plug	2
54	9910-650542	Gasket	1
55	9910-180020	Air valve	1
56	9910-750370	Elbow	1
57	9910-880581	Oil drain plug	1
58	9910-390314	Washer	6
59	9910-580360	Diaphragm bolt	6

REF. NO.	PART NUMBER	DESCRIPTION	QTY. REQ'D
60	9910-580370	Retainer washer	6
61	9910-880820	Washer	1
62	9910-2420110	Flange	1
63	9910-2420290	Washer	2
64	9910-2420280	Bolt	2



# PWM Valve and Motor Parts



- 164-FTA0925 4.9 CID Hydraulic Motor with PWM Valve and Bypass Valve, CW Rotation (includes all parts below EXCEPT hydraulic adapter fitting and elbows.)
- 164-FTA0994 same as above EXCEPT smaller 4.0 CID motor

166-SP10-20M-0-N-00  
H/F Prop 2-W Solenoid Valve with Manual Override (cartridge valve only, does NOT include electrical coil)

166-NV10-22C-O-N  
Needle valve for hydraulic PWM motor

164-60564  
Hydraulic Motor Seal Kit for Eaton T Series hydraulic motor with 1" shaft

166-4303512  
Coil, 12 Volt DC EY Coil

166-050308-SS  
.312 (5/16) x 3 - 1/2" SS bolts for hydraulic motor  
166-05LW-SS  
5/16" SS lock washer for hydraulic motor

165-P15648-2  
PWM Hydraulic Valve with Bypass, Complete Manifold Only for mounting to Eaton T Series Motor

Qty 4 each

166-158-1042-001  
Eaton T Series Motor, 1" Shaft, 4.9 CID, Manifold Ports

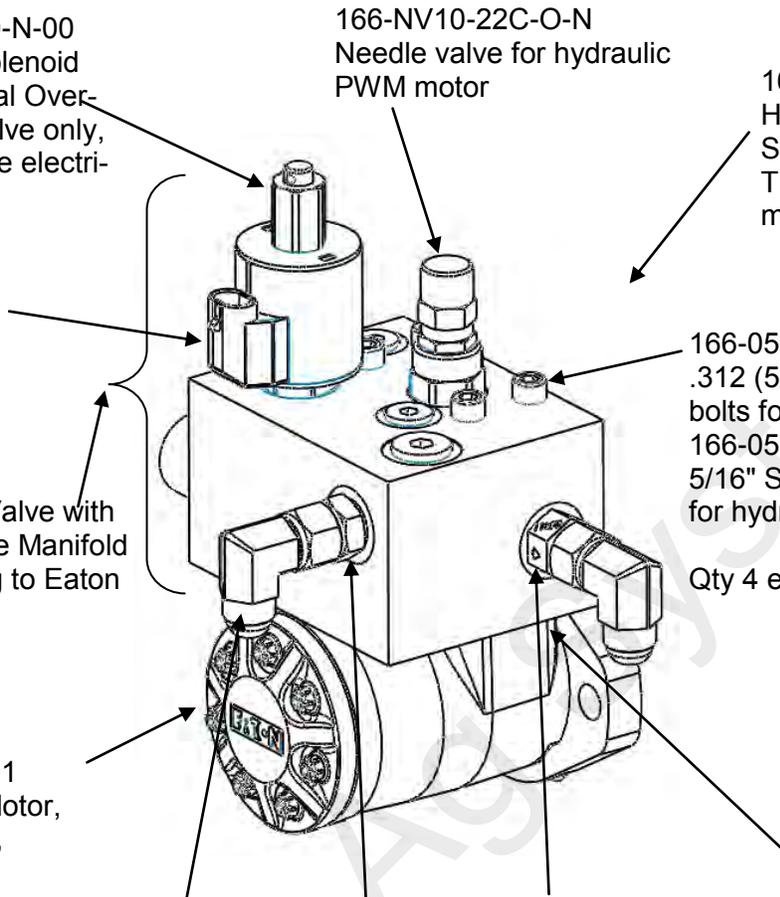
Alternate: 166-158-1543-001  
Eaton T Series Motor, 1" Shaft, 4.0 CID, Manifold Ports — The smaller 4.0 CID motor is used where hydraulic flow is limited, but full PumpRight output is necessary, an example is plumbed in series behind John Deere CCS Fan.

161-02-8MJ-8FJX-90  
Elbow - #8 Female JIC x #8 Male JIC - 90 (optional)

161-01-8MB-8MJ  
Adapter - #8 Male O-Ring Boss x #8 Male JIC

161-07-1108R  
Hydraulic Check Valve - #8 Male O-Ring Boss Inlet x #8 Male JIC Outlet

166-ORING-012  
O-ring for manifold ports between valve and motor  
Qty 2



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

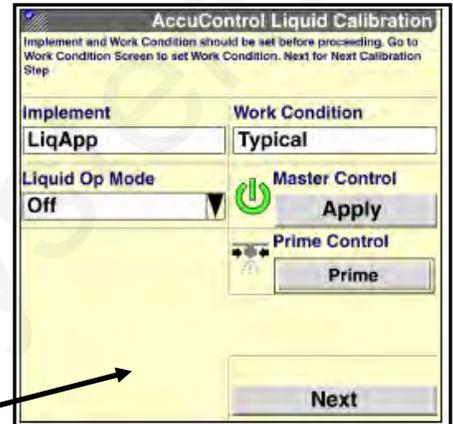
*Note to SureFire people:* The Default speed setting that works on our test stand does not work when the tractor is not moving when the Pro 700 is plugged into a tractor that has Radar, Wheel, or GPS speed capability. This makes testing the system in a Run mode impossible without driving the tractor. 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.