PumpRight Hydraulic Pump Fertilizer System for John Deere GS2 Servo Control

Subject: Single and Multiple Section Liquid Fertilizer Application with hydraulic drive diaphragm pump

Controller Manufacturer: JOHN DEERE

The John Deere GS2 Controller can directly control a hydraulic servo valve, which regulates pump speed to apply liquid fertilizer. This can be a single section where the fertilizer flow is turned on or off for the entire machine. It can also use the John Deere Swath Pro feature to automatically turn off fertilizer flow for 2-5 sections using electric ball valves.

PumpRight pumps are available in 4 models to fit your implement size and application rate. At maximum flow, all pumps use 10-11 GPM of hydraulic oil. To minimize the oil requirement consider using the next larger size pump.

	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

John Deere
Components required: GS2 2600 Display
GS2 2600 Rate Controller with 37 Pin Connector

This bulletin provides important information for using a SureFire PumpRight pump with the John Deere GS2. Consult your GS2 operators manual for GS2 operating instructions.

System Components:

The SureFire PumpRight pump can be controlled from the John Deere GS2 display. A John Deere Rate Controller is required to do this. The rate controller is a black box which will be mounted outside the cab, usually on the implement. The John Deere GS2 will have a speed signal and in some cases uses an implement height switch to turn off fertilizer flow. The speed and height inputs are part of the GS2 system and not included in the SureFire kit.

The rate controller has a large round 37 pin connector for application equipment. The SureFire system contains an adapter to convert the 37 pin to a standard 16 pin connector used on application systems. Extension harnesses may be needed depending on equipment size. SureFire has 16 pin extensions to be used in the wiring immediately after the 37 to 16 pin adapter.

In a single section system, the next harness is a 16 pin final harness. This converts the 16 pin into the multiple connections that are hooked to all system components. The components the harness attaches to are the flow meter, the on/off valve mounted directly on the hydraulic motor and the hydraulic servo valve.

How the Electronics Work:

When the GS2 commands the fertilizer system to turn on, 12 volts is supplied to the on/off valve on the hydraulic motor. The flow meter output pulses are converted to a flow measurement based on the user entered flow calibration (see page 4). The hydraulic servo valve is provided a signal to increase or decrease flow to achieve the target application rate requested via the GS2.

How the pump system works:

The GS2 sends a signal to increase or decrease hydraulic flow from the servo valve. Varying hydraulic flow varies pump speed, which causes a change in pump flow. The pump flow is sent to the manifold system. Most commonly floating ball flow indicator manifolds are used. These divide the flow from a common inlet at the bottom to each individual column which sends flow to each row. At the top of each flow indicator is an orifice. Each row has an equal sized orifice to provide the same flow to each row. As pump speed increases, more flow is sent through each orifice. This increases the pressure drop across each orifice. A small orifice will cause a higher pressure. PumpRight pumps use a 100 psi pressure relief valve. Working pressures up to 80 psi are acceptable. An orifice must be chosen to supply the desired application rate. Cold fertilizer increases pressure at each orifice and must be considered when sizing orifices. See the flow indicator page for floating ball and orifice selection.

Multiple Section Liquid Fertilizer Systems:

SureFire systems can optionally include electric ball valves that will divide an implement into sections. Working with the John Deere GS2 Swath Pro feature, these ball valves will automatically open and close to minimize overlapping application.

SureFire systems will work with 2-5 sections. With the GS2, these sections can be of varying widths. For example on a 24 row front fold planter, 5 sections work well with two sections of 5 rows on each wing and 1 section of 4 rows in the center.

The wiring harnesses are different for a multiple section implement to provide a connection for each electric ball valve. The 37 pin connector from the rate controller is converted to a 16 pin connector by a short adapter harness. If extensions are needed, add 16 pin extensions as this point. Next, the 16 pin is converted to a 10 pin and 7 pin connector. These attach to the master switching module. This module monitors each section status (on or off) sent from the GS2. If any section is on, the module turns the pump on. When all sections are off the pump is turned off.

The master switching module has two outputs, a 10 pin and 7 pin. The 10 pin harness has connectors for the flow meter, hydraulic servo valve, and motor on/off control valve. The 7 pin harness breaks out into 5 connectors for up to 5 section valves.

The multiple section wiring schematic shows all the above harnesses, including part numbers for each item.

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.

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.

End of Season Cleaning & Winterization

SureFire recommends flushing your fertilizer pump and complete system with adequate amounts of water. 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.

System Setup & Calibration
From the Rate Controller Screen, push the up arrow button on the right hand side. This will take you to the system setup screens. The tabs on the top of the screen will guide you to each section listed below.

Implement Setup
Make the necessary settings for you implement width and each section width if using multiple sections.

System Setup
Section Valve Type: 3 Wire
Control Valve Type: Standard
Flow Return Box: NOT checked
Control Valve Cal: 2512

The GS2 Control Valve Calibration can be changed to optimize performance on your specific equipment. The 4 digit number is formatted XXYZ. Increase XX to make the system respond quicker. If set to high, the actual rate will oscillate around the target. Y is the output deadband and Z is the control deadband. Generally leave these two digits low. Read your GS2 Operators Manual for more information. For example, to slow your response speed, move the number from 2512 to 2012, changing the valve response from 25 to 20.

Flow Meter Calibration: see chart
Flow Meter Units: gal
The ion flow meters above require an adapter cable PN 201-17842.

Flow Range (GPM)	Raw Pulses / Gallon	John Deere GS2 Flow Calibration
0.6—13	4542	4542
1.3—26	2271	2271
2.6—53	1135	1135

Turbine flow meters also work well with the PumpRight pumps and GS2. The FM750 flow-meter is rated at 2-40 GPM. No adapter cable is required with the turbine flow meter.
GS2 Flow Calibration = number on tag (140 to 150) / 2

SureFire recommends you perform a Calibration Test on your Flow Meter. The ION flow meter is very accurate, but the only way to confirm that all information is setup correctly is to catch liquid product and verify the correct amount is dispensed. See Section 40 of your GS2 Manual for instructions on how to perform a "Calibration Test" on your flow meter.

Pressure Sensor: NOT checked
Agitator Valve: NOT checked

System Setup & Calibration (cont)

Alarms Setup
SureFire recommends you use the default alarm settings. Change according to operators preference.

Rates Setup
Up to 3 rates can be entered for quick changes between these rates. Check the Rate Smoothing box on this screen for best performance.

Initial System Operation Procedure

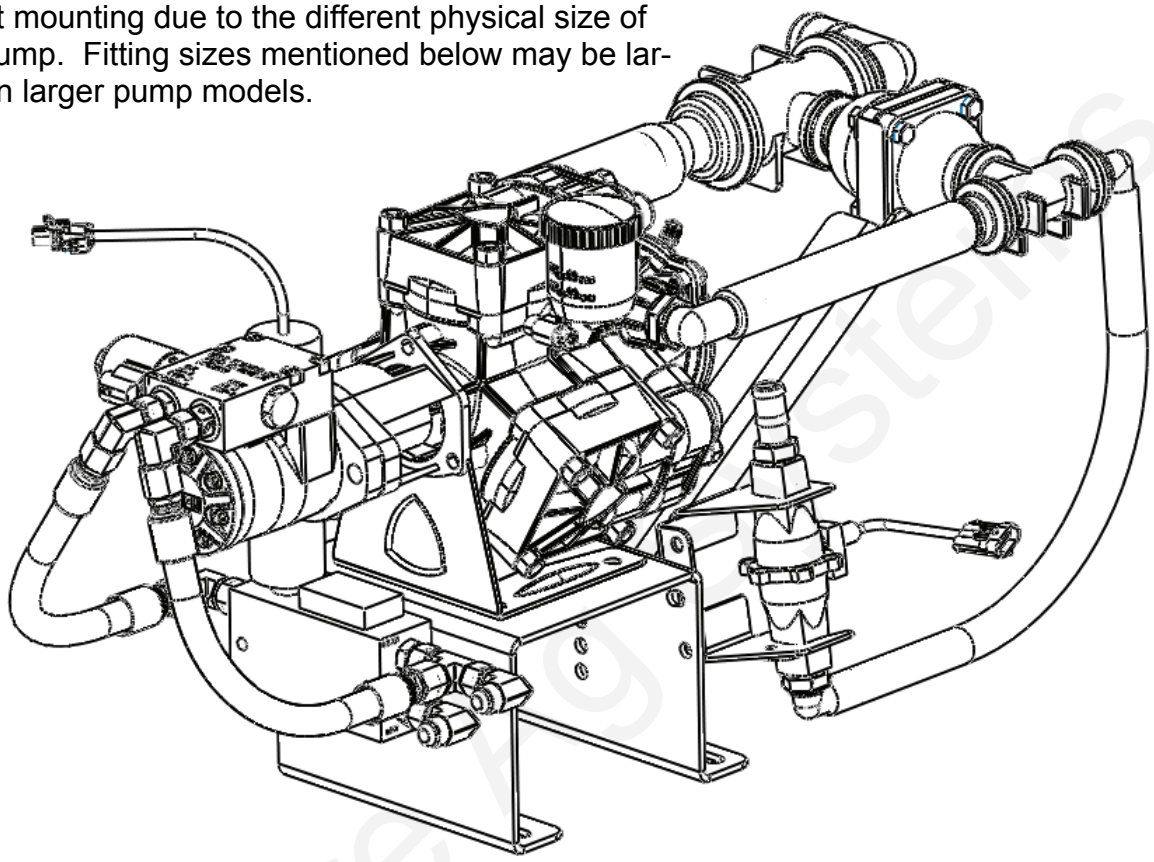
Thorough testing of the system at installation will prevent delays when field operation begins. All initial testing should be conducted with water. Enter all setup and calibration information prior to beginning testing.

1. From GS2 Rate Controller screen, choose the wrench on the right hand side.
2. Choose Tests tab at top of screen.
3. Choose Section Test from the drop down list
4. Turn hydraulic valve on and turn Master switch on
5. Push Start button with 1 or more section boxes checked
6. Pump should begin running and dispensing water once pump has primed. If pump is not running, push the (+)Open button to increase flow.
    A. If pump is still not running, check the hydraulic system. Try the valve in the opposite direction; the pump uses a check valve and will not run backwards.
    B. Check for 12 volts at the Pump On/Off connector plugged into the valve directly on the hydraulic motor. 12 volts will turn the pump on (0 volts is off).
    C. While a person is holding the (+)Open and (-)Close buttons, check for 12 volts at the servo valve connection. One direction should have 12 volts and the other –12 volts.
    D. Turn the tractor off, then listen & feel if the motor in the servo valve is turning when pushing the (+)Open and (-)Close buttons.
7. If pump is running but no water is being dispensed, check the pump inlet for obstructions or closed valves.
8. With water being dispensed, push the Rate Controller icon in top right corner. (Do NOT stop the test)
9. Read the flow in gallons / minute. If no flow is reported, check the flow meter wiring.
10. Push the wrench icon, then push the (-) close button 10-15 times.
11. Go back to the rate controller screen, did the pump flow in gallons / minute decrease.
12. Try the same with the (+) increase button.
13. When you can read an increasing and decreasing flow using the (+) and (-) buttons, the pump system is working correctly.
14. Finally, check and uncheck section boxes to test each section valve. Verify the valve is working properly by looking the on/off indicator on the valve and the floating ball flow indicators for each section.

When the system passes the above tests, you're ready to go to the field.

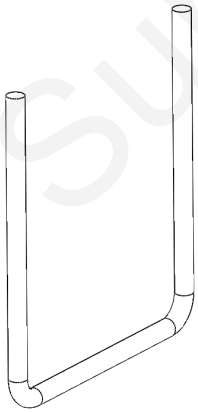
PumpRight Pump Assembly & Installation —With Hydraulic Servo Valve

3 Chamber , D115 Pump Shown. Other PumpRight sizes function identically, but will require slightly different mounting due to the different physical size of the pump. Fitting sizes mentioned below may be larger on larger pump models.



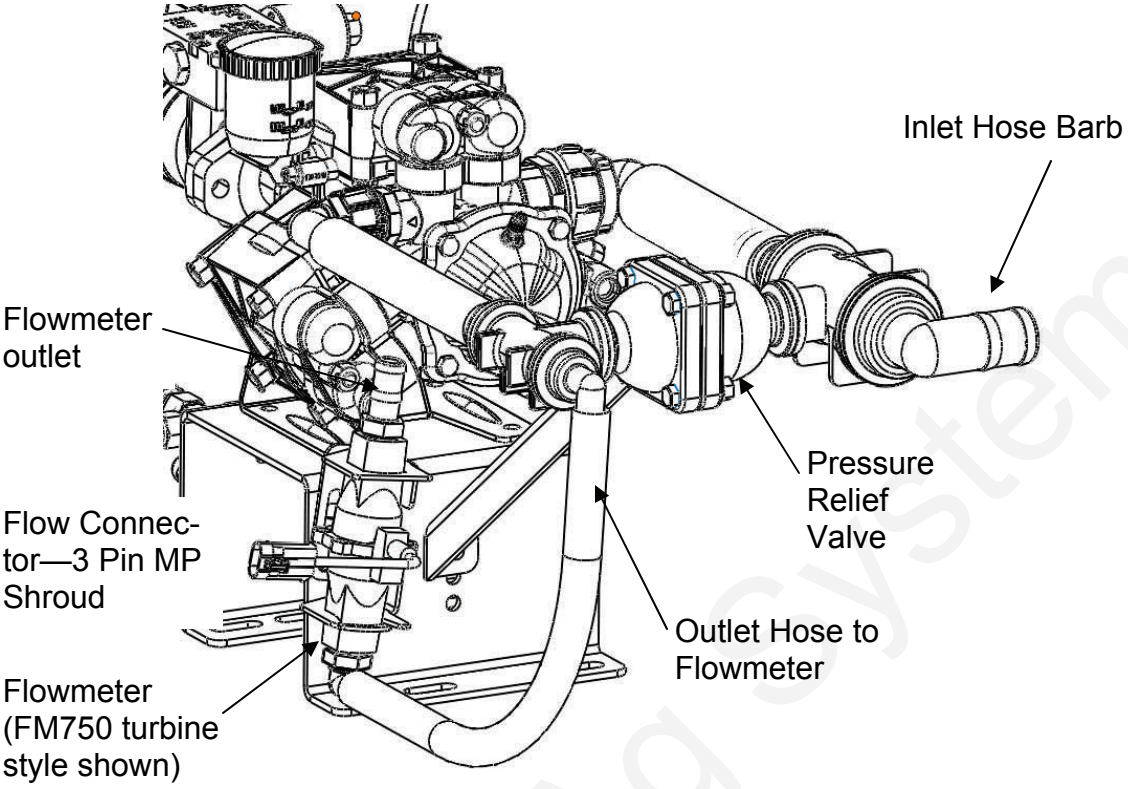
Mounting

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. If the U-Bolts will not work, order the universal backer plate, number 400-xxxxA1 which allows use of any bolts to clamp to any size tube up to 8” wide.



Mounting Bar Size	Item Number	Item Description
4" W x 4" T	301-0804000500-05	Square Bend U-Bolt - 1/2" x 4" x 5"
5" W x 7" T	301-0805000850-05	Square Bend U-Bolt - 1/2" x 5" x 8-1/2"
6" W x 4" T	301-0806000500-05	Square Bend U-Bolt - 1/2" x 6" x 5"
7" W x 7" T	301-080700-05	Square Bend U-Bolt - 1/2" x 7" x 8 -1/2"
7" W x 5" T	301-0807000600-05	Square Bend U-Bolt - 1/2" x 7" x 6"
8" W x 12" T	301-0808001350-05	Square Bend U-Bolt - 1/2" x 8" x 13 1/2"
8" W x 16" T	301-0808001750-05	Square Bend U-Bolt - 1/2" x 8" x 17 1/2"

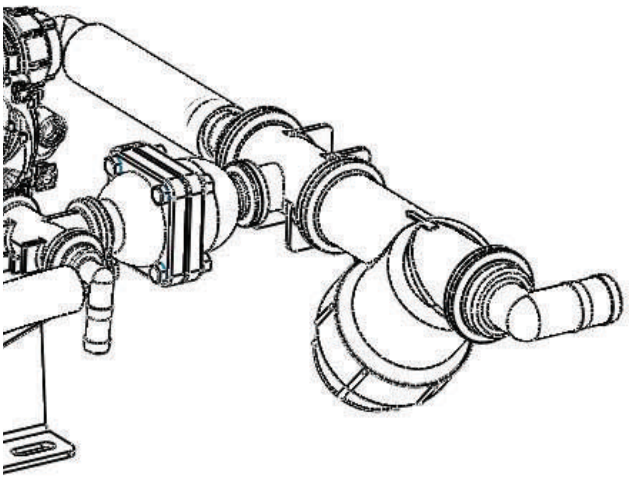
PumpRight Liquid Plumbing Connections



Inlet: The diaphragm pump 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.

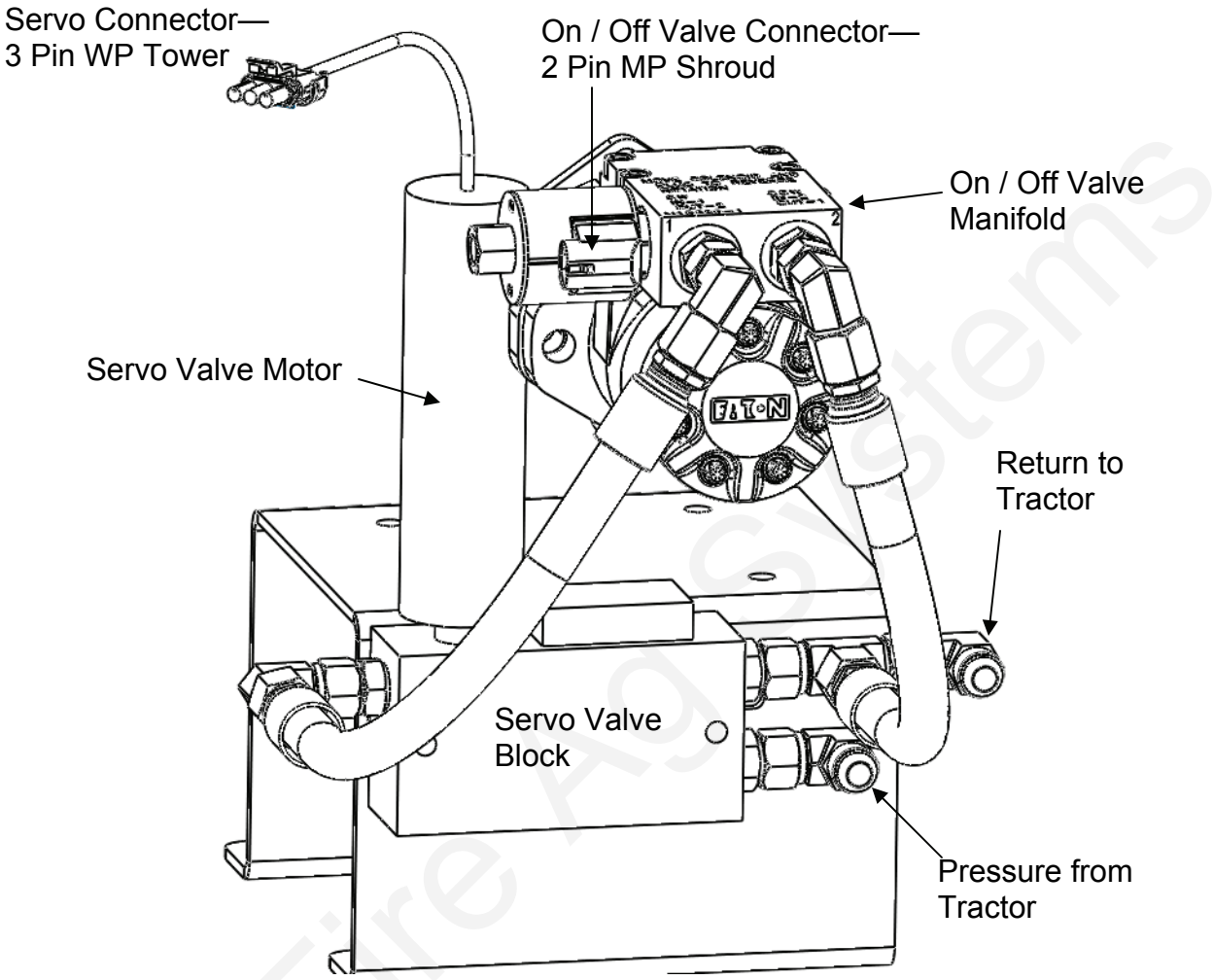
Inlet Strainer: A 50 mesh strainer is included in the pump kit. The manifold strainer includes two hose barbs so it can be mounted anywhere in the inlet line. If space allows, the strainer can be mounted directly to the inlet plumbing assembly as shown below.

Outlet: The outlet is plumbed directly to the flowmeter with 3/4" hose. As shown above, the flow meter may be mounted directly to the PumpRight pump. The flowmeter outlet is a 3/4" hose barb. The outet 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.

PumpRight Hydraulic Connections



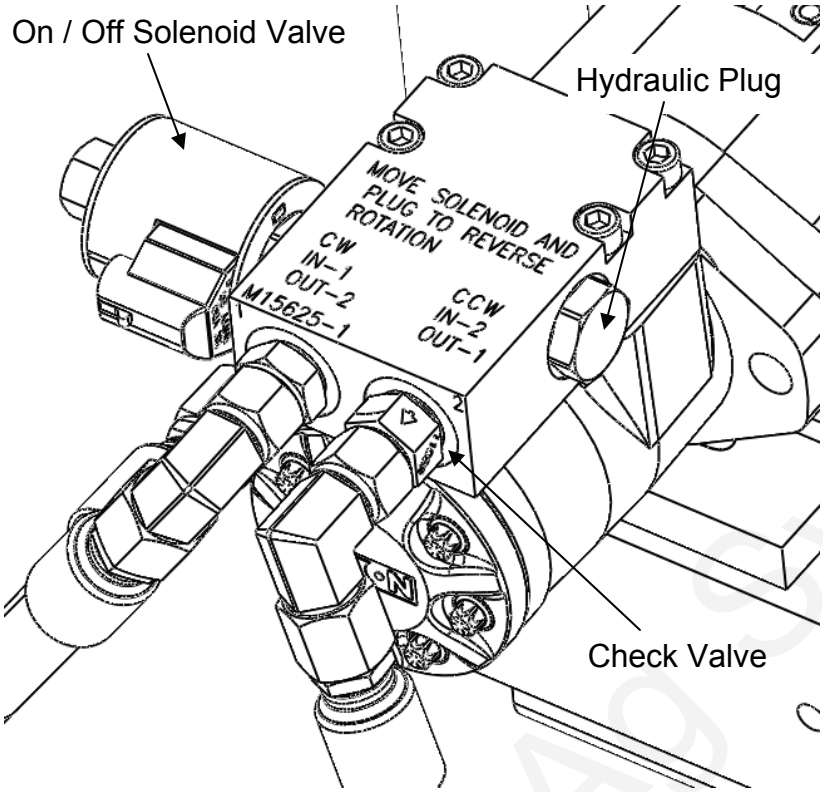
Hydraulic Connections

1. Two hoses will be required from tractor remote valve to PumpRight Pump. We recommend 1/2" hydraulic hose. The hoses will need a #8 (1/2") Female JIC Swivel to connect to the PumpRight pump.
2. Connect the hoses as shown in the pictures.

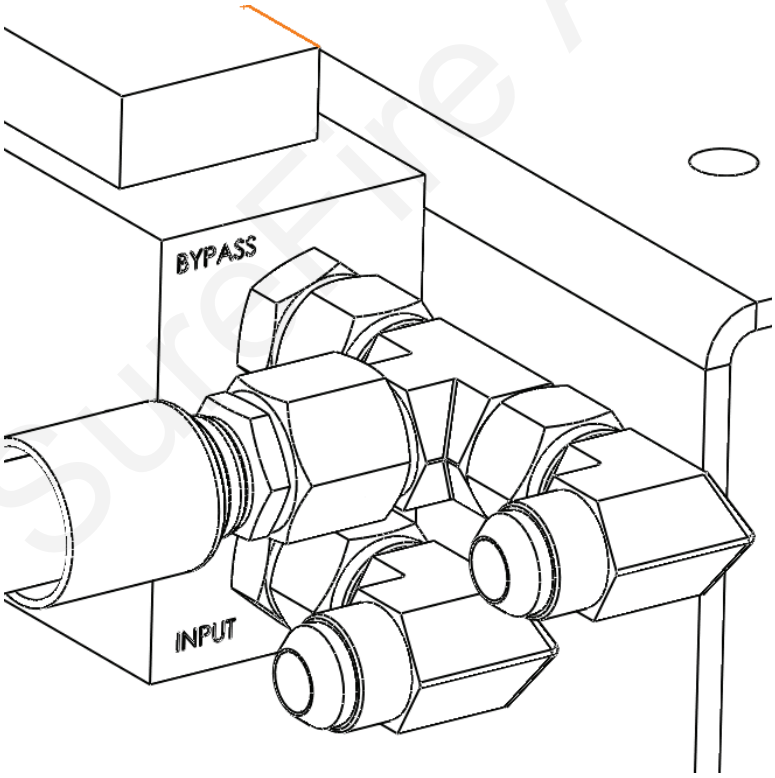
How it Works

The servo valve turns to vary a hydraulic passage which regulates how much oil flows out the "CONTROLLED" port. This oil is constantly flowing to the motor manifold. The On / Off Valve in the manifold closes to force the oil through the motor. At rest (zero volts), the On / Off Valve is open, this allows oil to flow freely from port 1 to port 2, and the motor is stopped. When energized with 12 volts, the On / Off valve closes, forcing the motor to rotate.

PumpRight Hydraulic Connections



The motor on the PumpRight pump turns in a clockwise rotation, looking at the shaft. The solenoid and plug should be installed as shown at left. A check valve is installed on the #2 (outlet) port. This prevents the motor from rotating backwards. The check valve can be identified by it's slightly larger size, flow arrow and the part number "1108R" stamped on it.



The servo valve block has labeled ports. The "BYPASS" port uses a tee to combine the valve bypass flow with the motor return flow. Then the combined flow is returned to the tractor.

The "INPUT" port is connected to the tractor pressure port.

The 3rd port on the opposite end of valve (not shown) is labeled "CONTROLLED" and is connected to the motor inlet, port #1.

PumpRight Hydraulic Oil Use & Management

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.

PumpRight pumps use a hydraulic bypass configuration that allows any extra oil sent to the pump to be returned to tractor. For maximum tractor efficiency, we want to limit the flow in the bypass loop. 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 PumpRight pump just enough oil for your application rates. It 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

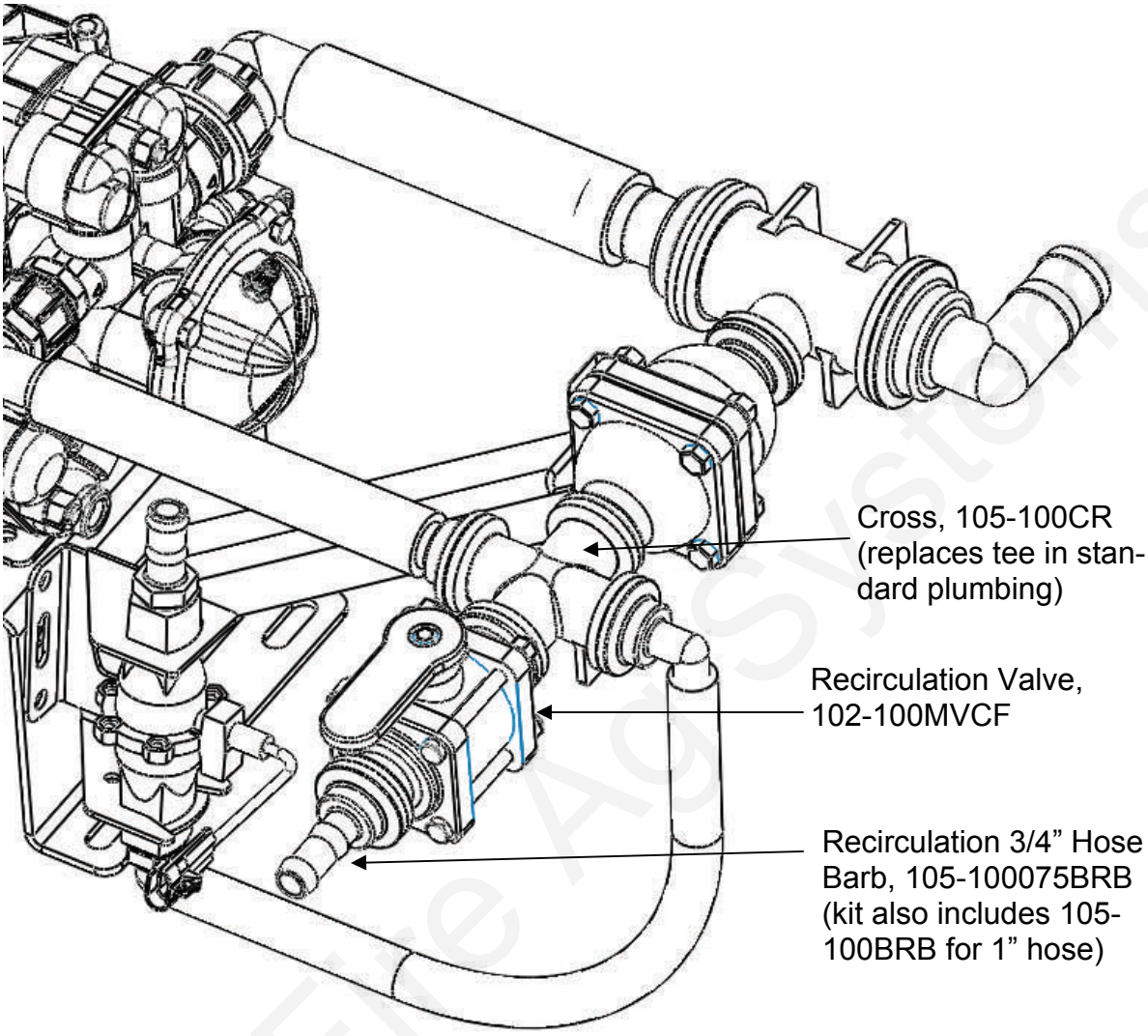
Model D160 - 4 Diaphragms

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

PumpRight Accessory - Recirculation Kit, Item Number 500-03-1100



Kit also includes: two 1" Manifold Gaskets (105-100G-H) and two 1" Manifold Clamps (105-FC100)

Applications:

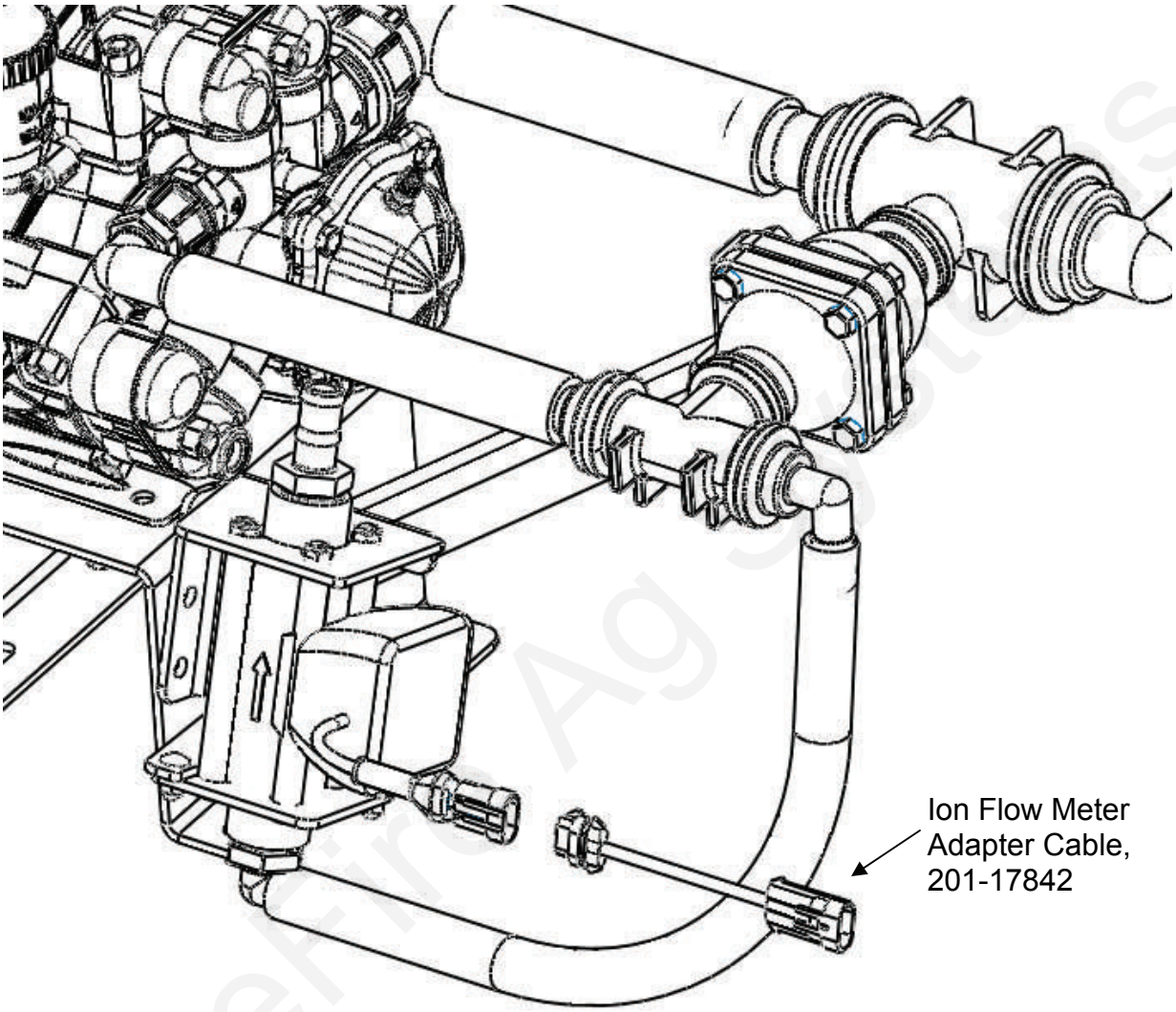
1. Recirculation flow is required for product agitation.
2. A very low flow rate is required. This kit will allow the pump to turn faster, while only applying a low rate of product. This makes the pump performance more stable under these circumstances. Make sure the flowmeter is capable of metering the flow rate you wish to apply to the ground.

How it Works:

The recirculation valve diverts some pump flow before the flowmeter. The application rate is still measured by the flowmeter and everything that passes through the flowmeter is applied to the ground. Open the valve partially to get the required recirculation. USE OF THIS KIT LOWERS THE MAXIMUM RATE THAT CAN BE APPLIED TO THE GROUND. Close the valve if a higher rate is required.

PumpRight Accessory - Ion Flow Meter Kits

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

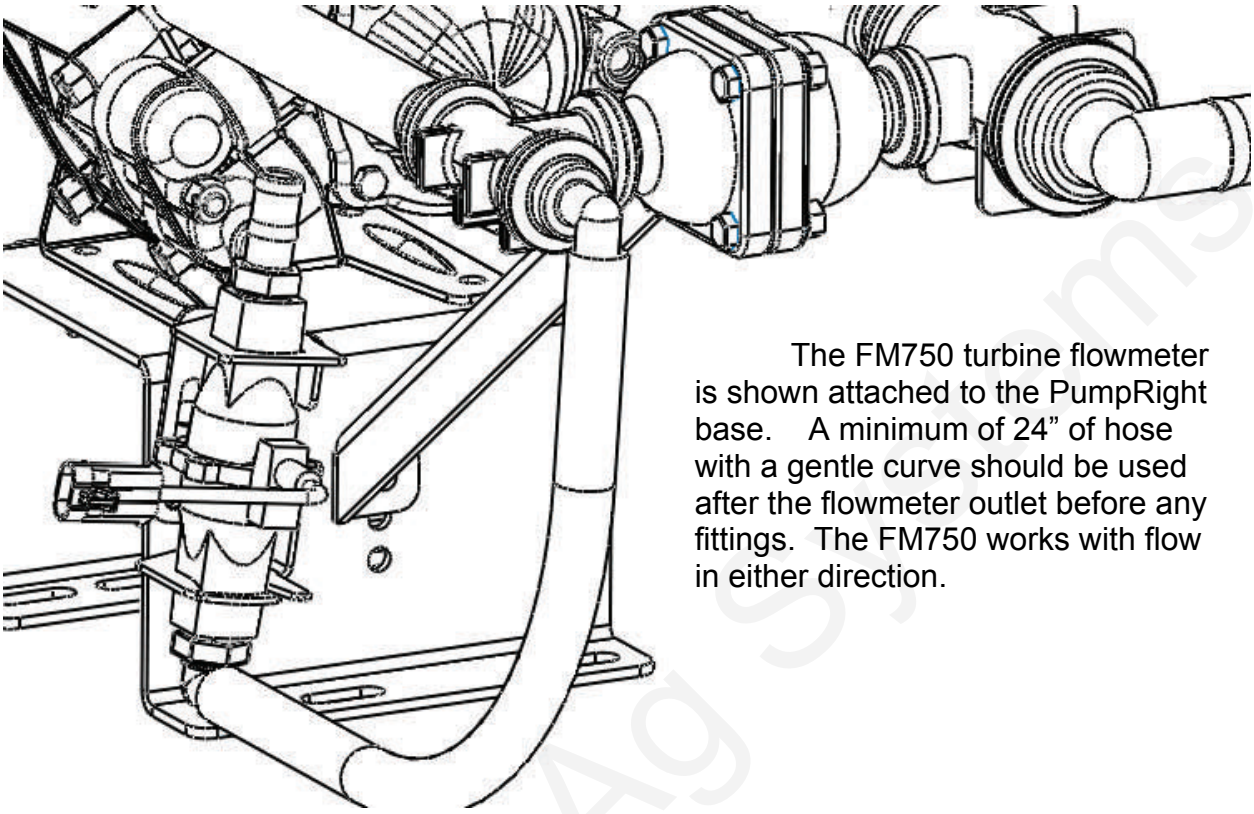


Ion flowmeters are superior to traditional turbine flowmeters in two basic ways. First, they have no moving parts. This translates into no wear items or potential for contaminants to jam a spinning turbine.

Second, Ion flowmeters detect the flow of ions 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.

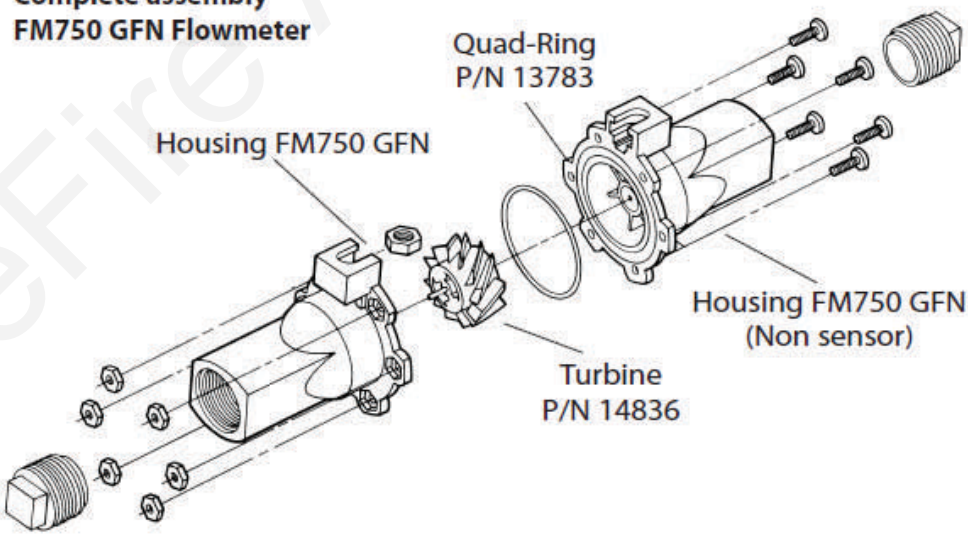
Flow Range	Pulses / Revolution	GS2 Flow Calibration
0-6 –13GPM	4542	4542
1.3 - 26 GPM	2271	2271
2.6 - 53 GPM	1135	1135

PumpRight Accessory - FM750 Flow Meter Kit
2—40 GPM Item Number 500-02-1000



The FM750 turbine flowmeter is shown attached to the PumpRight base. A minimum of 24” of hose with a gentle curve should be used after the flowmeter outlet before any fittings. The FM750 works with flow in either direction.

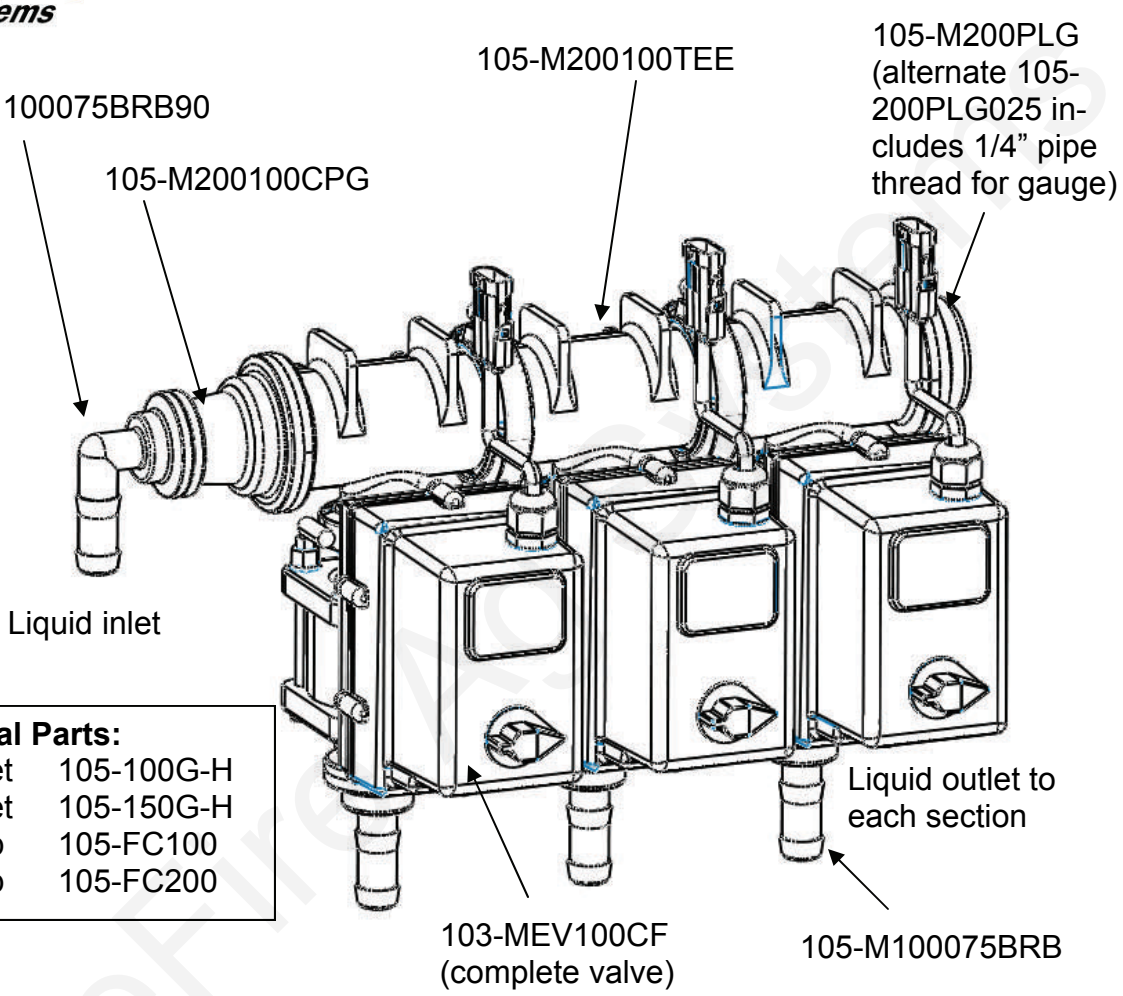
Complete assembly
FM750 GFN Flowmeter



The FM750 may need disassembled for cleaning or to remove an obstruction.

This diagram shows the components and proper location of each. If necessary use a mild detergent and brush to clean the flowmeter. The turbine should spin freely in the housing. After disassembly, recalibration of the flowmeter is recommended as it’s flow characteristics may change.

Electric Section Valves for Liquid Fertilizer Application



Additional Parts:

1" Gasket	105-100G-H
2" Gasket	105-150G-H
1" Clamp	105-FC100
2" Clamp	105-FC200

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 valves, however, more can be used where practical. Many alternate fittings can be used to accommodate different hose sizes and configurations.

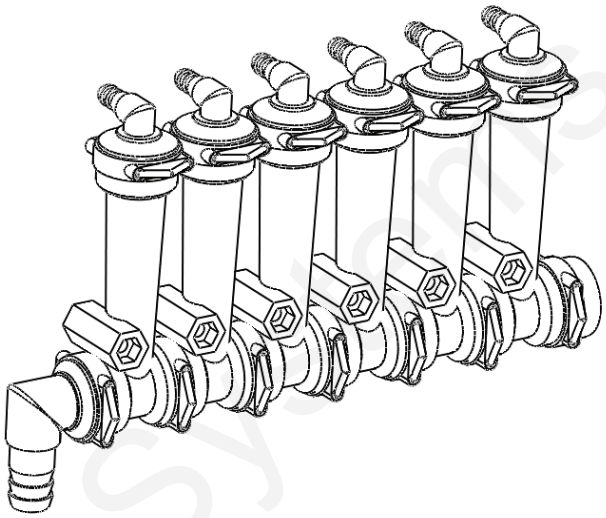
The valves have a 3 pin weather pack electrical connector. This has a power, ground, and switched wire. The power measured to ground should have 12 volts when the controller is on. The switched wire will have 12 volts to turn the valve on, and 0 volts to turn the valve off.

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

Mounting Hardware:

Two U-Bolt Kit	302-UB202
2 Valve Bracket	400-1196A1
3-5 Valve Bracket	400-1070A1

Floating Ball Flow Indicator and Manifold System



Flow Indicators

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. 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" Push To Connect Outlet

Fittings

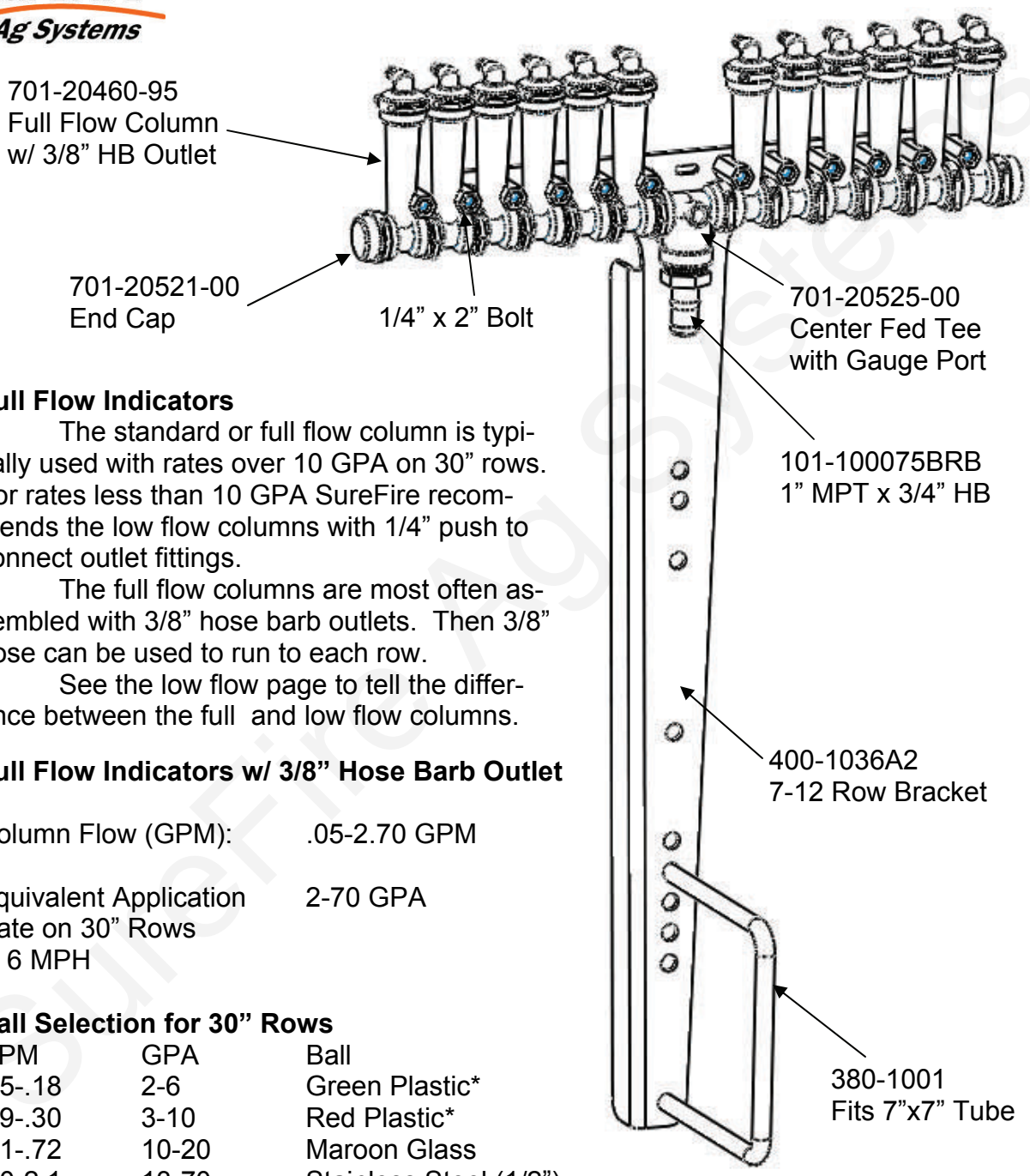
701-20503-00	ORS x 3/4" HB - Straight
701-20511-00	ORS x 3/8" HB - 90 Degree
701-20513-00	ORS x 3/4" HB - 90 Degree
701-20516-00	ORS x 1/4" QC - 90 Degree
701-20518-00	ORS x 1/4" FPT - 90 Degree
701-20519-00	ORS x 1/4" FPT - Straight
701-20520-00	ORS Male x ORS Female - 90 degree
701-20521-00	Wilger 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
701-20460-06	Flow Indicator Ball - Maroon Glass
701-20460-07	Flow Indicator Ball - Red Celcon
701-20460-08	Flow Indicator Ball - Green Poly
701-20460-09	Flow Indicator Ball - Black Poly
701-40225-05	Viton O-Ring for Orifice

Brackets & U-Bolts		Fits Tube Size
400-1037A1	3-6 Row Bracket	
400-1036A2	7-12 Row Bracket	
380-1018	1/2" x 4" x 5"	4" x 4"
380-1014	1/2" x 5" x 8-1/2"	5" T x 7" W
380-1017	1/2" x 6" x 5"	6" T x 4" W
380-1001	1/2" x 7" x 8 -1/2"	7" x 7"
380-1016	1/2" x 7" x 6"	7" T x 5" W

Floating Ball Flow Indicators- Full Flow Column



Full Flow Indicators

The standard or 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. Then 3/8" hose can be used to run to each row.

See the low flow page to tell the difference between the full and low flow columns.

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

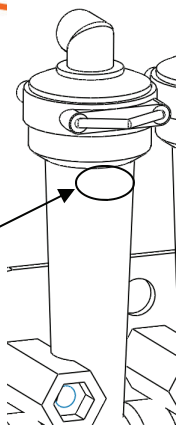
Column Flow (GPM):	.05-2.70 GPM
Equivalent Application Rate on 30" Rows at 6 MPH	2-70 GPA

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")

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

Floating Ball Flow Indicators- Low Flow Column

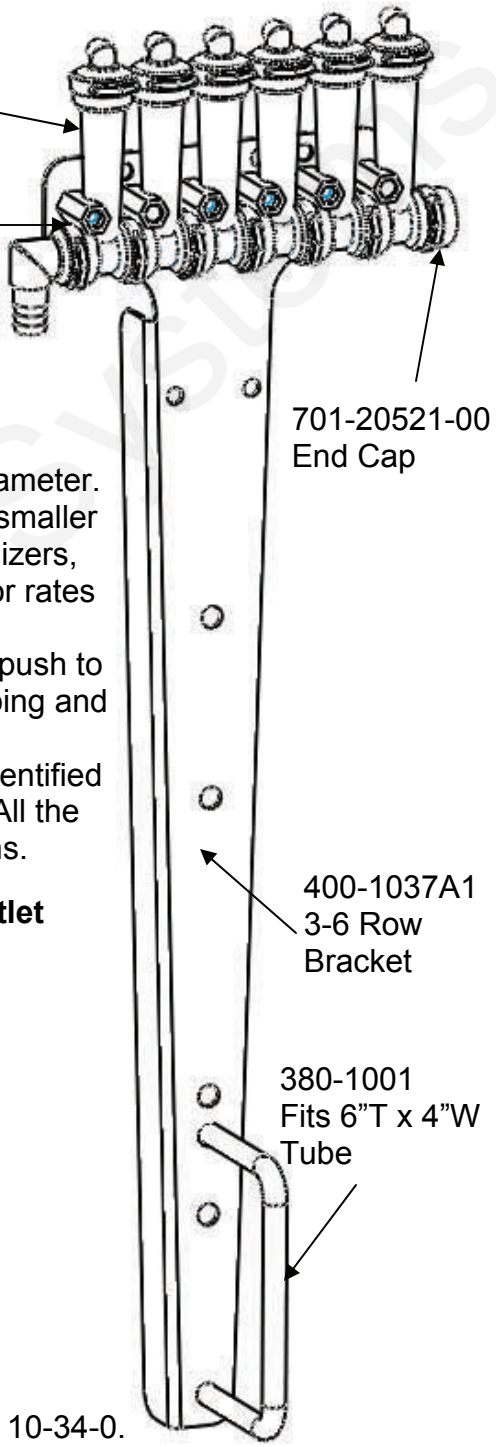


"Low Flow" molded into column on one side

701-20460-97
Low Flow Column w/ 1/4" Push to Connect Outlet

1/4" x 2" Bolt

701-20513-00
3/4" HB 90 degree inlet



701-20521-00
End Cap

400-1037A1
3-6 Row Bracket

380-1001
Fits 6"T x 4"W Tube

Low Flow vs Full Flow

The low flow column has a smaller internal diameter. This means a heavier ball can be used to monitor a smaller flow. Since the plastic balls will float on heavier fertilizers, such as 10-34-0, the low flow columns work better for rates under 10 GPA.

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.

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 flow flow and full flow columns.

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

Column Flow (GPM):	.03-.30 GPM
Equivalent Application Rate on 30" Rows at 6 MPH	1-10 GPA

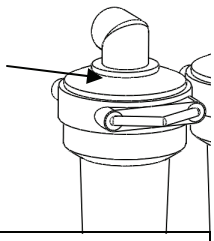
Ball Selection for 30" Rows

GPM	GPA	Ball
.03-.09	1-3	Green Plastic*
.05-.14	2-4	Red Plastic*
.10-.18	3-6	Maroon Glass
.15-.30	5-10	Stainless Steel (1/2")

*These balls may float on heavier fertilizers, such as 10-34-0.

Floating Ball Flow Indicators- Metering Orifice Selection

Metering orifices push into place underneath each outlet fitting



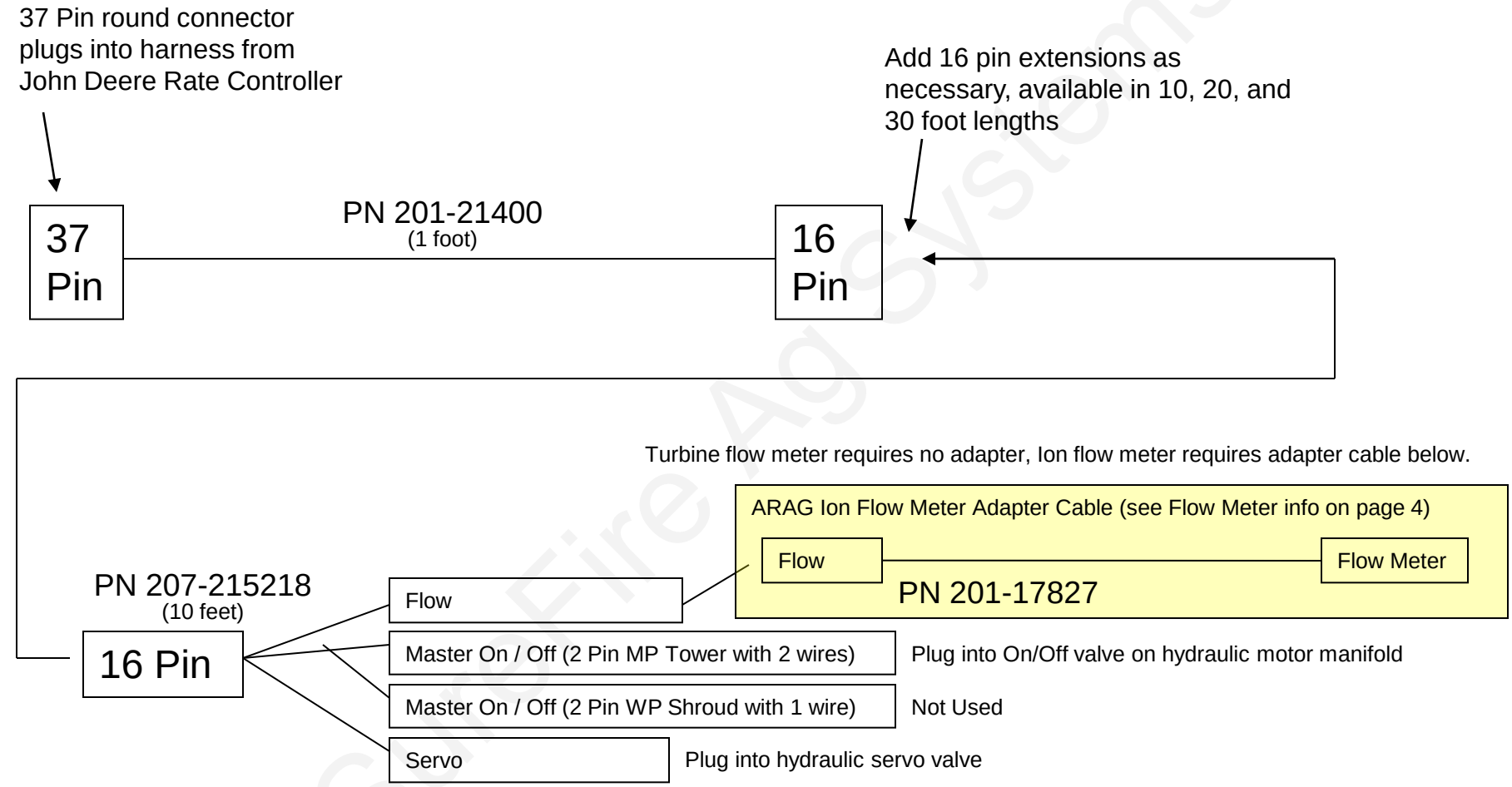
Application Rate (gal/ac) for Wilger Orifices on 30" Spacings

			MPH						
Orifice	**PSI**	**Gal/Min**	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**
35	5	0.056	2.45	2.18	1.96	1.78	1.64	1.51	1.40
	10	0.079	3.46	3.08	2.77	2.52	2.31	2.13	1.98
	20	0.111	4.86	4.32	3.89	3.54	3.24	2.99	2.78
PN 701-21035	30	0.136	5.96	5.30	4.77	4.33	3.97	3.67	3.40
	40	0.157	6.88	6.11	5.50	5.00	4.58	4.23	3.93
	50	0.176	7.71	6.85	6.17	5.61	5.14	4.74	4.41
40	5	0.072	3.15	2.80	2.52	2.29	2.10	1.94	1.80
	10	0.102	4.47	3.97	3.57	3.25	2.98	2.75	2.55
	20	0.144	6.31	5.61	5.05	4.59	4.21	3.88	3.60
PN 701-21040	30	0.177	7.75	6.89	6.20	5.64	5.17	4.77	4.43
	40	0.204	8.94	7.94	7.15	6.50	5.96	5.50	5.11
	50	0.228	9.99	8.88	7.99	7.26	6.66	6.15	5.71
46	5	0.095	4.16	3.70	3.33	3.03	2.77	2.56	2.38
	10	0.135	5.91	5.26	4.73	4.30	3.94	3.64	3.38
	20	0.191	8.37	7.44	6.69	6.08	5.58	5.15	4.78
PN 701-21046	30	0.234	10.25	9.11	8.20	7.45	6.83	6.31	5.86
	40	0.27	11.83	10.51	9.46	8.60	7.88	7.28	6.76
	50	0.302	13.23	11.76	10.58	9.62	8.82	8.14	7.56
52	5	0.118	5.17	4.59	4.14	3.76	3.45	3.18	2.95
	10	0.168	7.36	6.54	5.89	5.35	4.91	4.53	4.21
	20	0.237	10.38	9.23	8.31	7.55	6.92	6.39	5.93
PN 701-21052	30	0.29	12.70	11.29	10.16	9.24	8.47	7.82	7.26
	40	0.335	14.67	13.04	11.74	10.67	9.78	9.03	8.39
	50	0.375	16.43	14.60	13.14	11.95	10.95	10.11	9.39
63	5	0.174	7.62	6.78	6.10	5.54	5.08	4.69	4.36
	10	0.246	10.78	9.58	8.62	7.84	7.18	6.63	6.16
	20	0.347	15.20	13.51	12.16	11.05	10.13	9.35	8.69
PN 701-21063	30	0.425	18.62	16.55	14.89	13.54	12.41	11.46	10.64
	40	0.491	21.51	19.12	17.21	15.64	14.34	13.24	12.29
	50	0.549	24.05	21.38	19.24	17.49	16.03	14.80	13.74
78	5	0.272	11.92	10.59	9.53	8.67	7.94	7.33	6.81
	10	0.385	16.87	14.99	13.49	12.27	11.24	10.38	9.64
	20	0.544	23.83	21.18	19.06	17.33	15.89	14.66	13.62
PN 701-21078	30	0.667	29.22	25.97	23.37	21.25	19.48	17.98	16.70
	40	0.77	33.73	29.98	26.98	24.53	22.49	20.76	19.27
	50	0.861	37.72	33.53	30.17	27.43	25.14	23.21	21.55
98	5	0.442	19.36	17.21	15.49	14.08	12.91	11.92	11.06
	10	0.625	27.38	24.34	21.90	19.91	18.25	16.85	15.64
	20	0.884	38.72	34.42	30.98	28.16	25.82	23.83	22.13
PN 701-21098	30	1.08	47.31	42.05	37.85	34.41	31.54	29.11	27.03
	40	1.25	54.76	48.67	43.81	39.82	36.50	33.70	31.29
	50	1.4	61.33	54.51	49.06	44.60	40.88	37.74	35.04
130	5	0.774	33.91	30.14	27.12	24.66	22.60	20.86	19.37
	10	1.1	48.19	42.83	38.55	35.04	32.12	29.65	27.53
	20	1.55	67.90	60.35	54.32	49.38	45.27	41.78	38.80
PN 701-21130	30	1.9	83.23	73.98	66.58	60.53	55.49	51.22	47.56
	40	2.19	95.93	85.27	76.75	69.77	63.96	59.04	54.82
	50	2.45	107.32	95.40	85.86	78.05	71.55	66.04	61.33

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

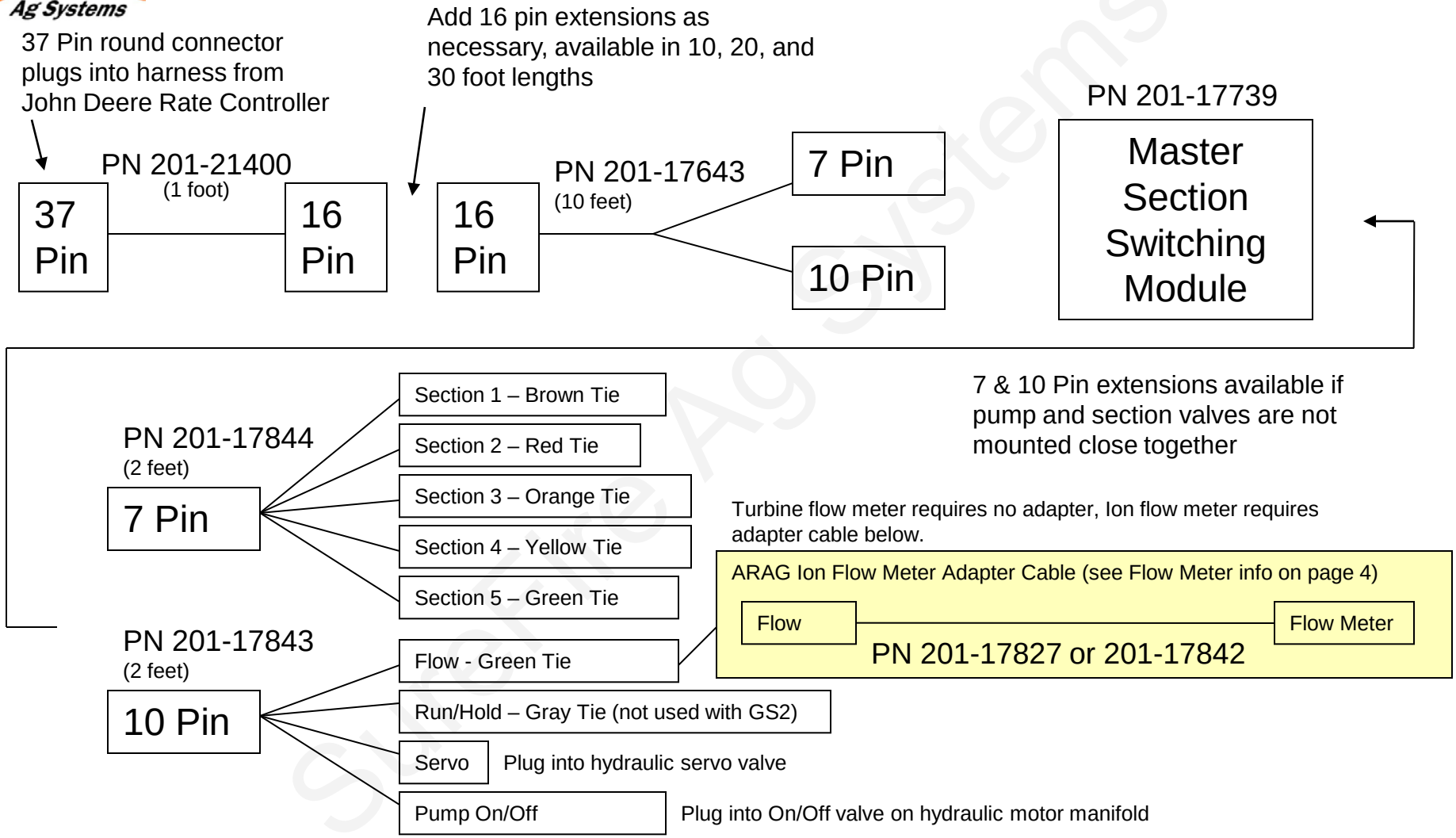
John Deere GS2 Wiring Schematic

Single Section for PumpRight Liquid Application



John Deere GS2 Wiring Schematic

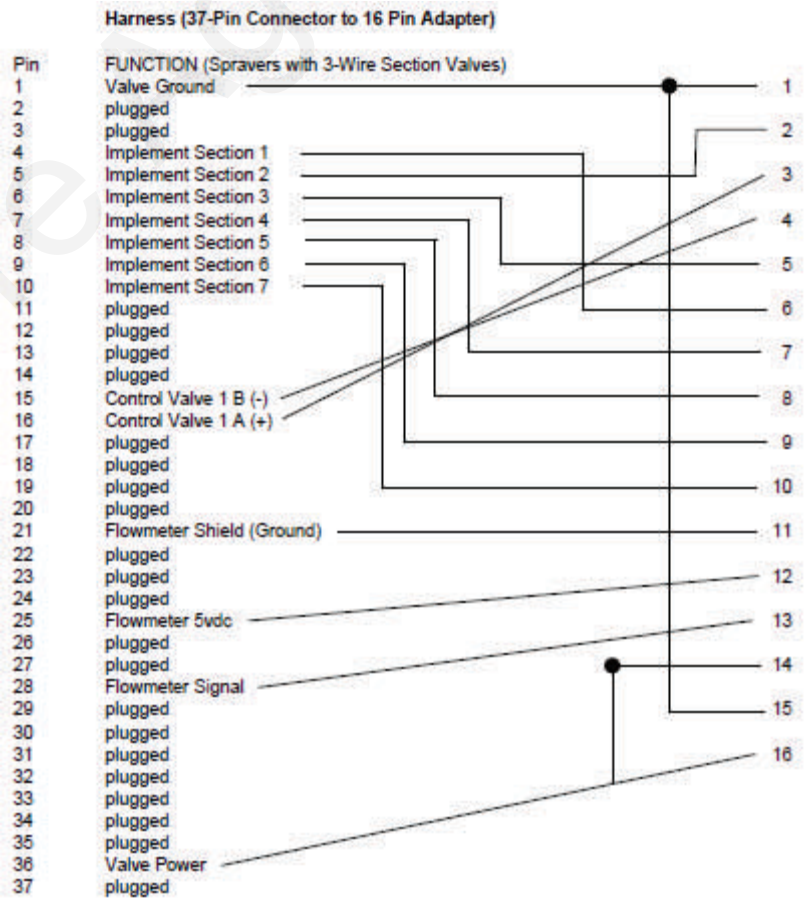
2-5 Sections for PumpRight Liquid Application



Wiring Harness Appendix for GS2 Compatible Systems

Pictures and schematics of wiring harnesses are attached. Use this information for troubleshooting if system is not functioning correctly.

Description: 37 Pin to 16 Pin Adapter
Part Number: 201-21400
Application: This harness converts the 37 pin connector that comes out of the GS2 Rate Controller to a 16 pin connector commonly used in application control systems.

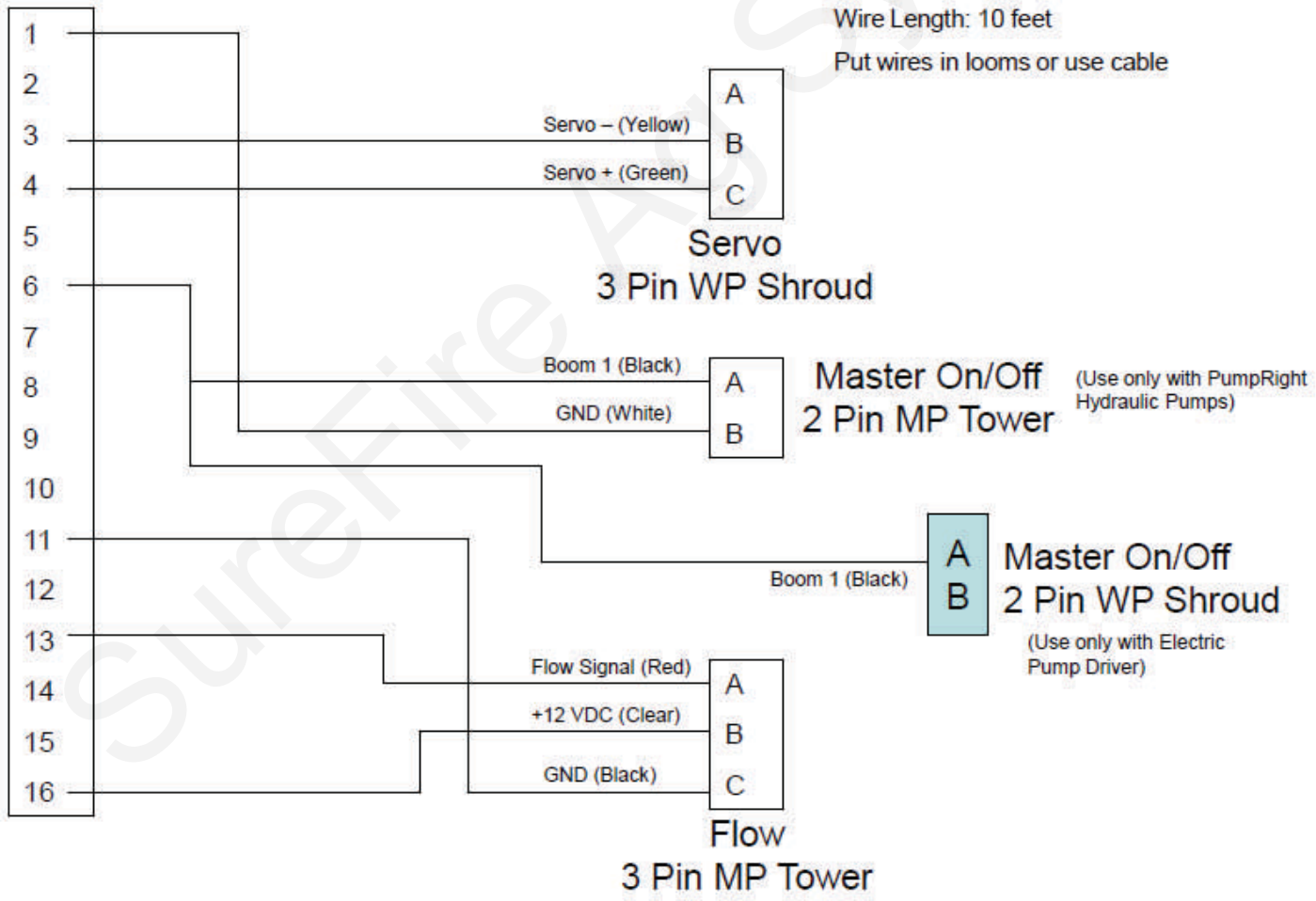


Wiring Harness Appendix

Description: GS2 Flow, Servo, Pump On/Off Cable
Part Number: 207-215218
Length: 10 feet
Application: Used in single section systems this harness goes from the 16 pin connector out to the fertilizer system components. On all systems, it attaches to the flow meter.

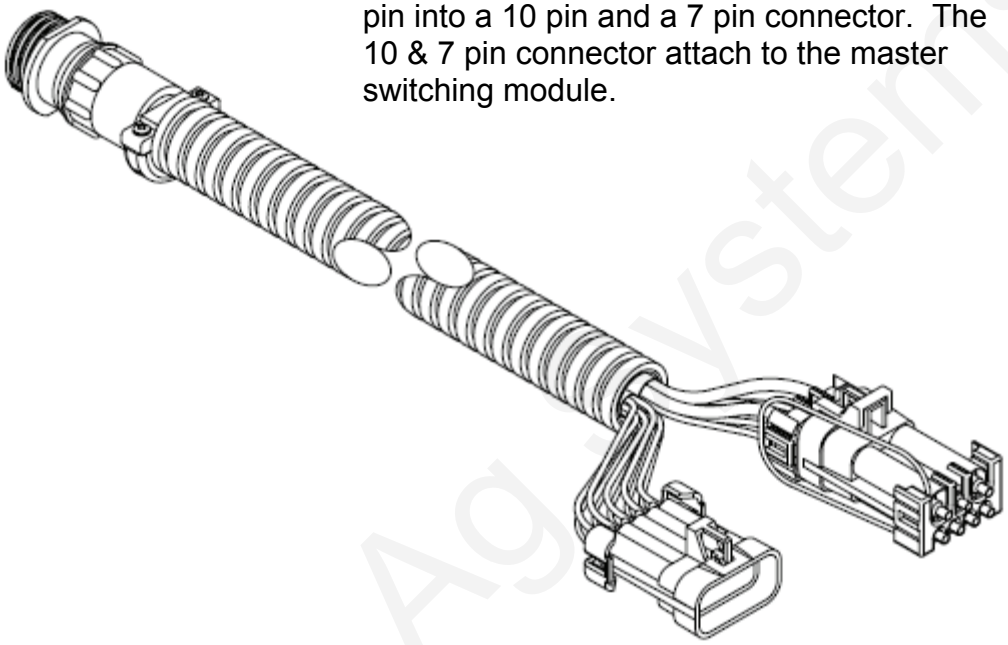
In electric pump systems the servo and Master On/Off attach to the EPD.

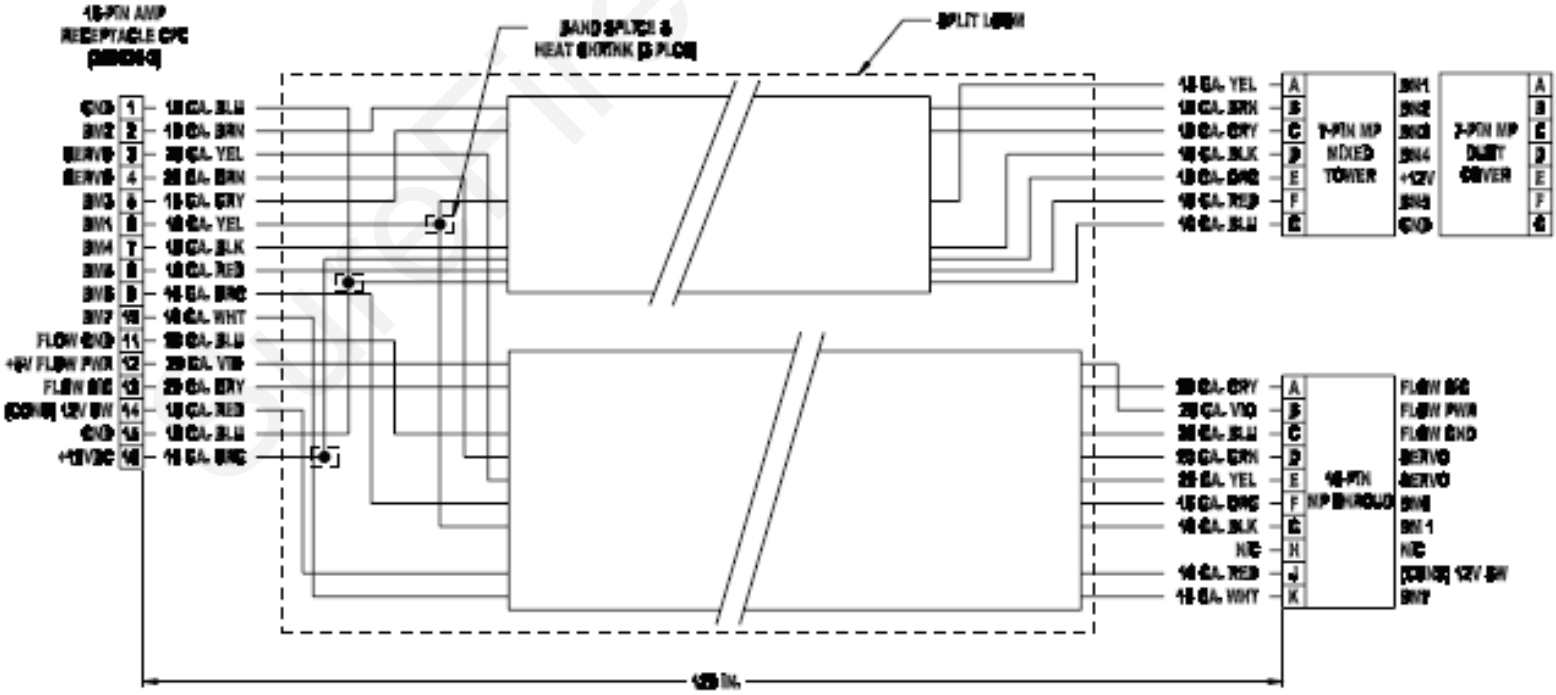
On PumpRight hydraulic pumps, servo wires attaches to the hydraulic servo valve. The Master On/Off attaches to the valve contained on the motor mounted



Wiring Harness Appendix

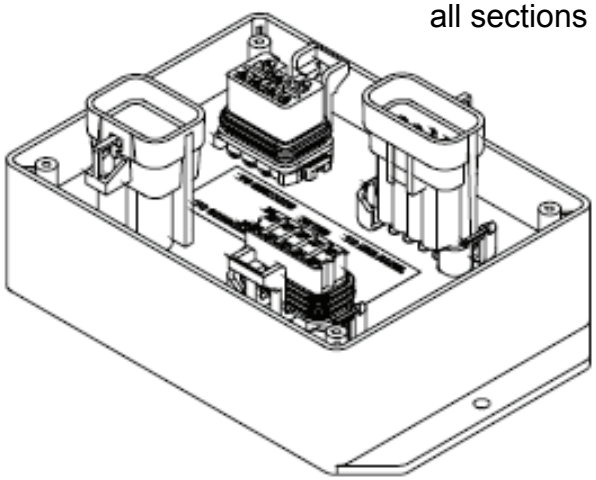
Description: 16 Pin to 10&7 Pin Adapter
Part Number: 201-17643
Length: 10 feet
Application: Used in multiple section systems (2-5 sections), this harness splits the 16 pin into a 10 pin and a 7 pin connector. The 10 & 7 pin connector attach to the master switching module.

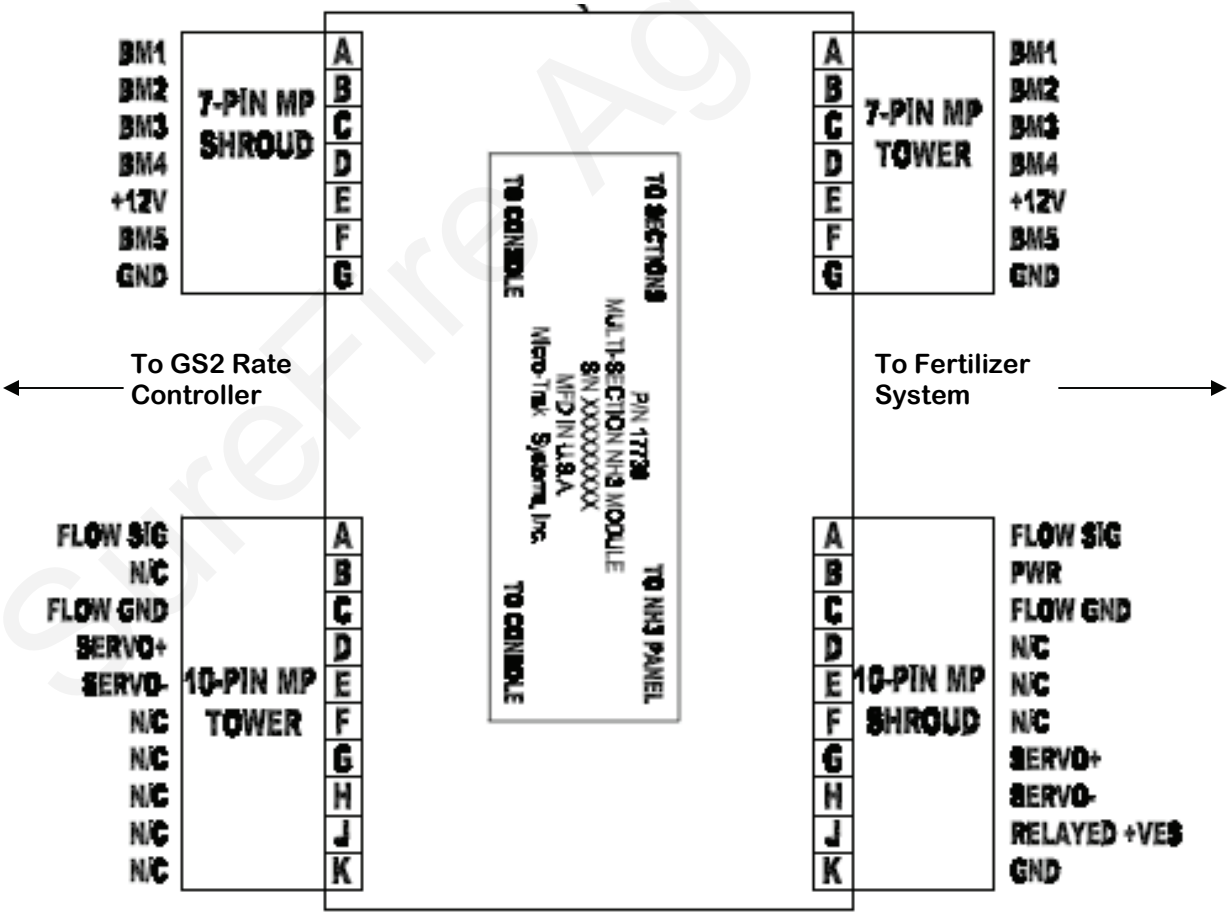




Wiring Harness Appendix

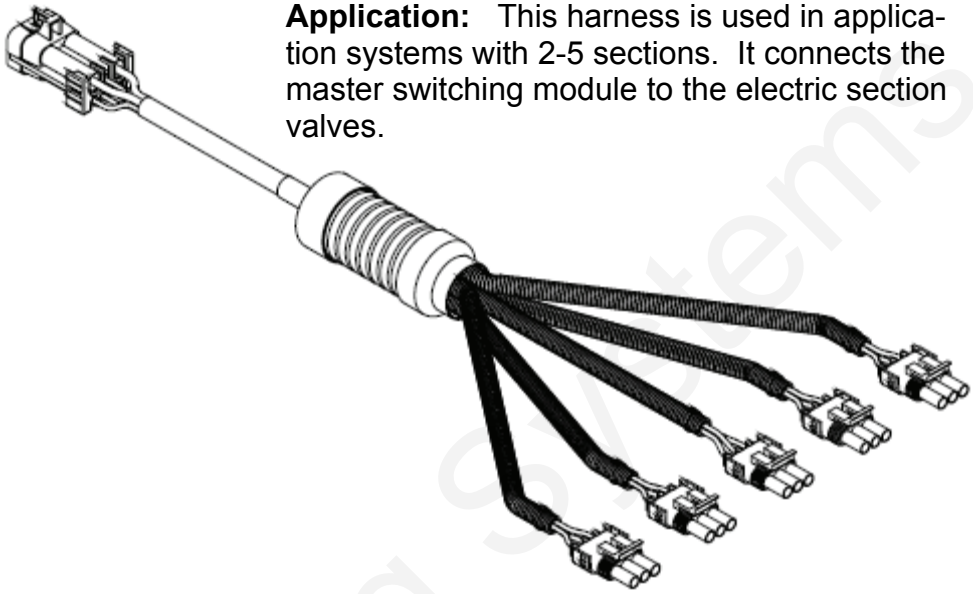
Description: Master Section Switching Module
Part Number: 201-17739
Application: Used in multiple section systems (2-5 sections), this module turns the pump(s) on and off. If any section is on, the pump is turned on. If all sections are off, the pump is turned off.

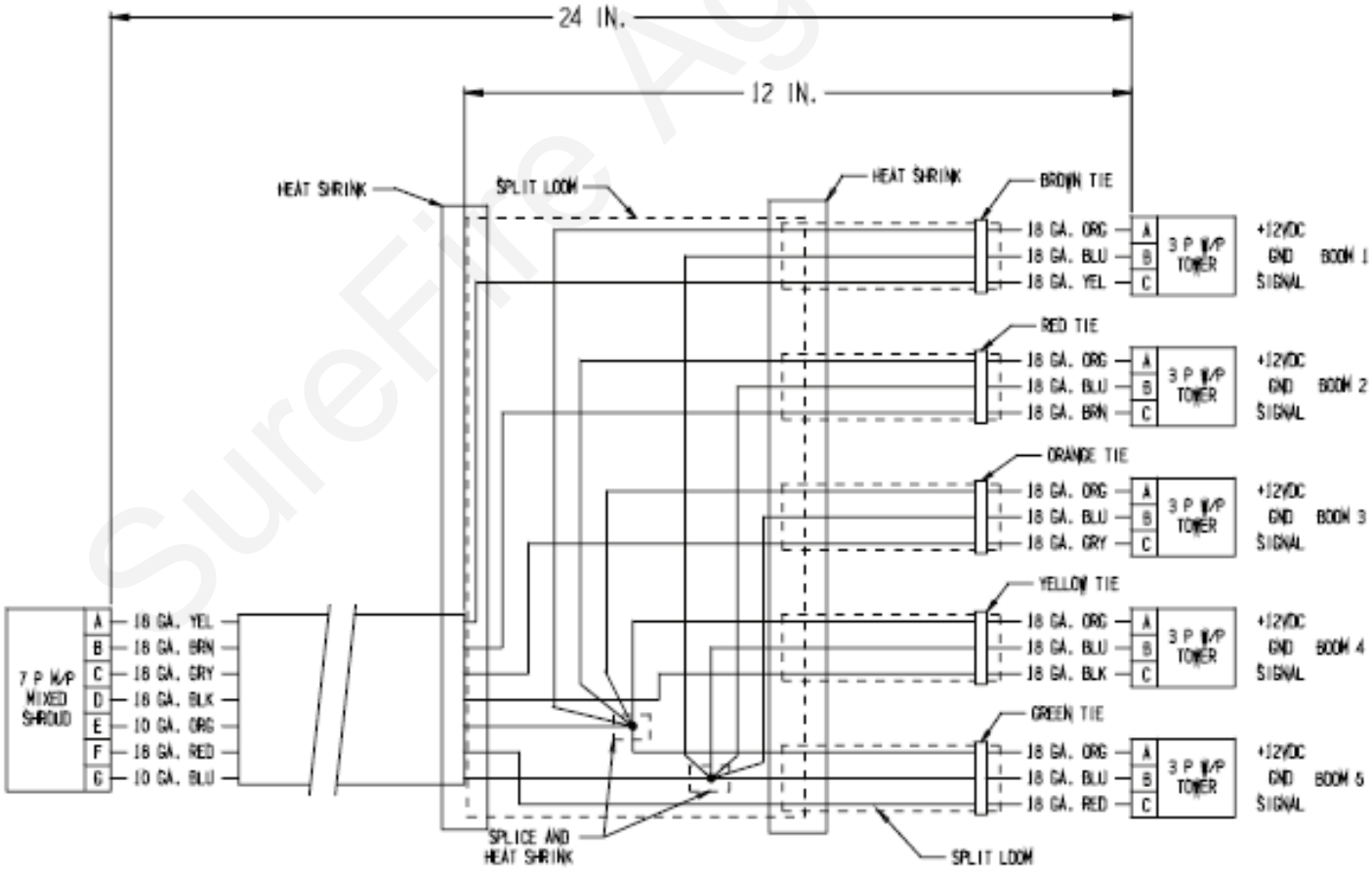




Wiring Harness Appendix

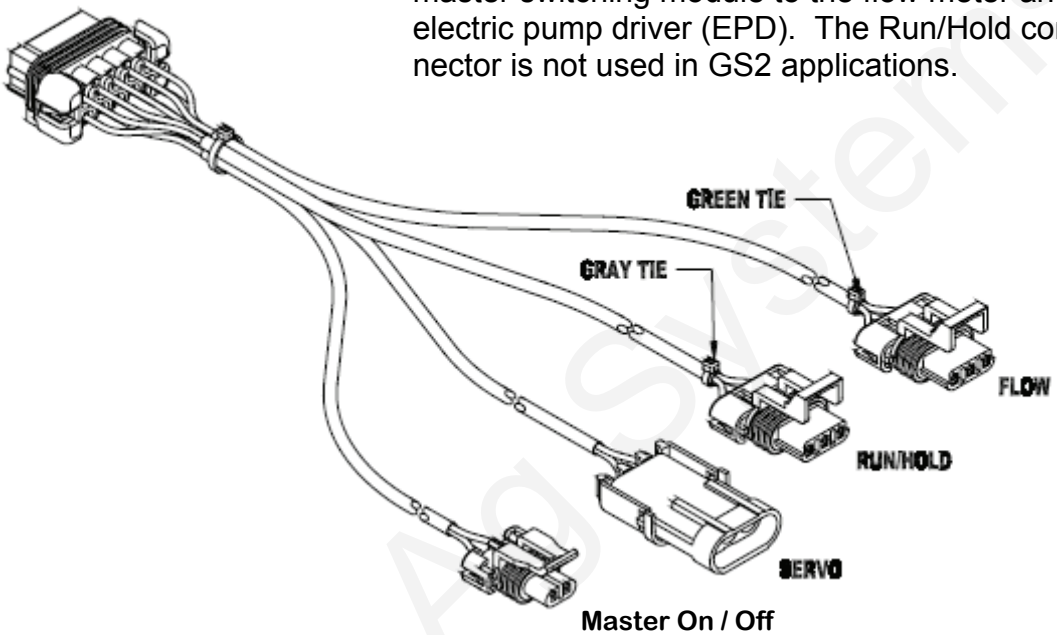
Description: 5 Section Branch Harness
Part Number: 201-17844
Length: 2 feet
Application: This harness is used in application systems with 2-5 sections. It connects the master switching module to the electric section valves.





Wiring Harness Appendix

Description:
Part Number: 201-17843
Length: 2 feet
Application: This harness is used in application systems with 2-5 sections. It connects the master switching module to the flow meter and electric pump driver (EPD). The Run/Hold connector is not used in GS2 applications.



Master On / Off