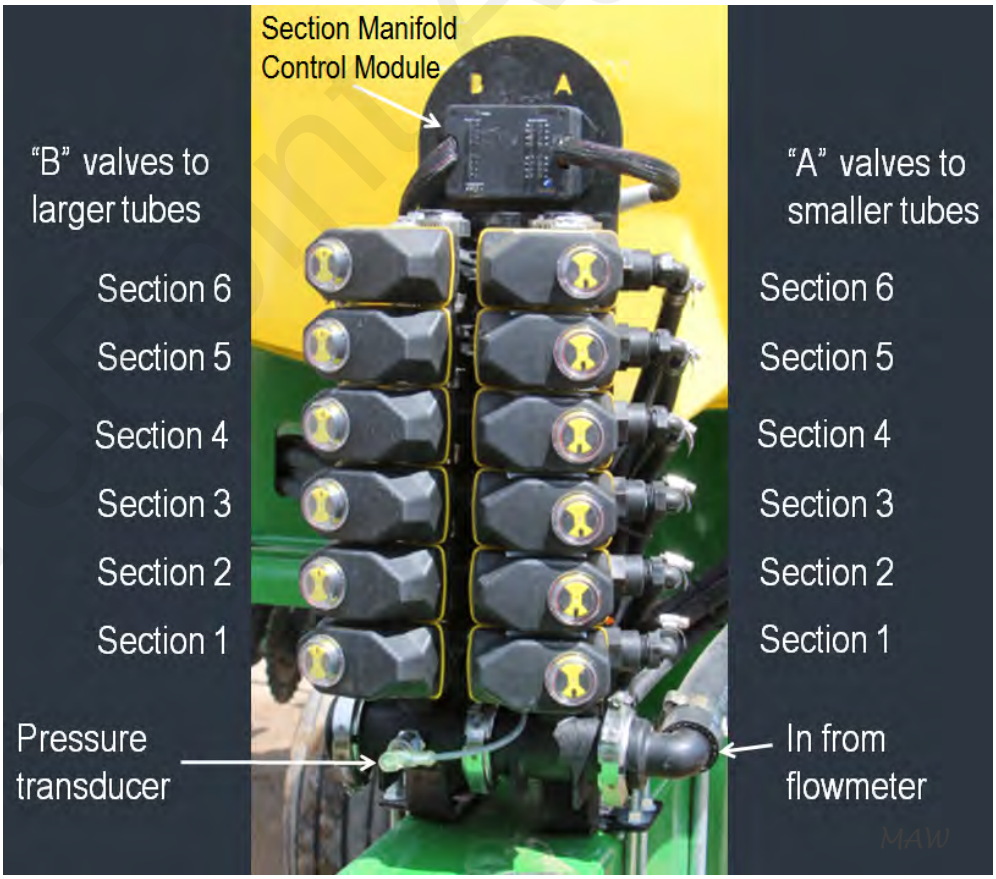
# 396-4063Y1

LIQUISHIFT®

# Gen 2

SurePoint Ag Systems



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# Safety

A

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

**THIS SYMBOL MEANS**

**ATTENTION!**

**BECOME ALERT!**

**YOUR SAFETY IS INVOLVED!**

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

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

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

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

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

**DANGER**

## Hydraulic Fluid and Equipment Safety

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

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

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

Check hydraulic hoses and fittings frequently. Loose, broken, and missing hardware can cause equipment to not perform properly and can result in serious injury or death.

Hydraulic systems can be hot and cause burns.  Before working on any system, wait until the fluid has cooled.

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

## A Word to the Operator

**WARNING**

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

SAFETY IS YOUR RESPONSIBILITY.

**NOTICE**

The SurePoint PumpRight hydraulic pump on the LiquiShift system is rated at a maximum of 550 RPM. Spinning the pump over 550 RPM may cause pump failure. See the SurePoint System manual for the PumpRight system for information about setting up the system to keep the pump from overspeeding.

**CAUTION**

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

# Gen 2 SurePoint LiquiShift®

***What is LiquiShift® and how does it work?***

LiquiShift® is technology from SurePoint Ag that allows a wide range of application rates and/or speeds. The system utilizes two metering tubes to each row to evenly distribute the product. The LiquiShift technology opens and closes valves to allow the product to flow through the small tube, through the large tube, or through both tubes, depending on the rate and speed at that time.

It works like this. At low flow rates, the product flows through the small tubes. As the flow increases, the pressure will increase. When the pressure reaches the top setpoint, the valve to the small tubes will close and the valve to the large tubes will open. When the flow and pressure increase in the large tube to the top setpoint, the valve to the small tubes will open, allowing product to flow through both tubes. As the flow and pressure decrease, the system will shift down to a smaller tube at each setpoint.

Rate control and section control are done by the rate control module and display as they are in any system. The LiquiShift technology handles all the adjustments to the tubes to deliver the right amount of product to the right rows.

A LiquiShift system is NOT an infinitely variable system. The system must be configured with the proper tube combination to match your rate range, speed range, product, and row spacing.

Gen 2 LiquiShift systems utilize a 14-pin round Deutsch section connector to connect to the main harness and a 23-pin round Deutsch connector to connect the LiquiShift manifold controller to the section valves.

**Harnesses and LiquiShift modules for SurePoint GEN 2 LiquiShift**

| | | |
|---|---|---|
| **ALL** systems have: | **218-2565Y1** | MultiTube Controller (LiquiShift Control Module) |
| **Single Section** system has: | 207-3575Y1 | 14-pin to Single Section LiquiShift |
| | (*Also use 207-3576Y1 if no 14-pin Section connector is available)* | |
| Systems with **two or more sections** have: | | |
| | **218-3454Y1** | Manifold Controller (LiquiShift Section Module) |
| Two, three, or four Sections | 201-3455Y1 | 23-pin to 4 Section A&B Valves |
| Five or six Sections | 201-3456Y1 | 23-pin to 6 Section A&B Valves |
| Eight Sections (for JDRC 2000) | 201-3457Y1 | 23-pin to 8 Section A&B Valves |
| | 213-00-3550Y1 | 47-pin Adapter harness to JDRC 2000 for 8-section LS |

**Critical Component—Pressure Transducer (521-05-050150 3-wire, 0-100 PSI, 0-5v, 3-pin MP 150 Tower)**

The pressure transducer on the LiquiShift valve stack is a critical component of the LiquiShift operation. It must be functioning properly in order for the LiquiShift A & B valves to work as needed to direct the flow through the appropriate tubes based on the quantity of flow. The MultiTube Controller (218-2565Y1) reads the voltage from the pressure transducer to determine which Valve Stack to open (A or B or both).

See the directions on page 18 for operation of the Manual Override feature in the event of a pressure transducer failure. Also, see information on page 25 about the SurePoint Pressure Signal Simulator (212-03-4094Y1).

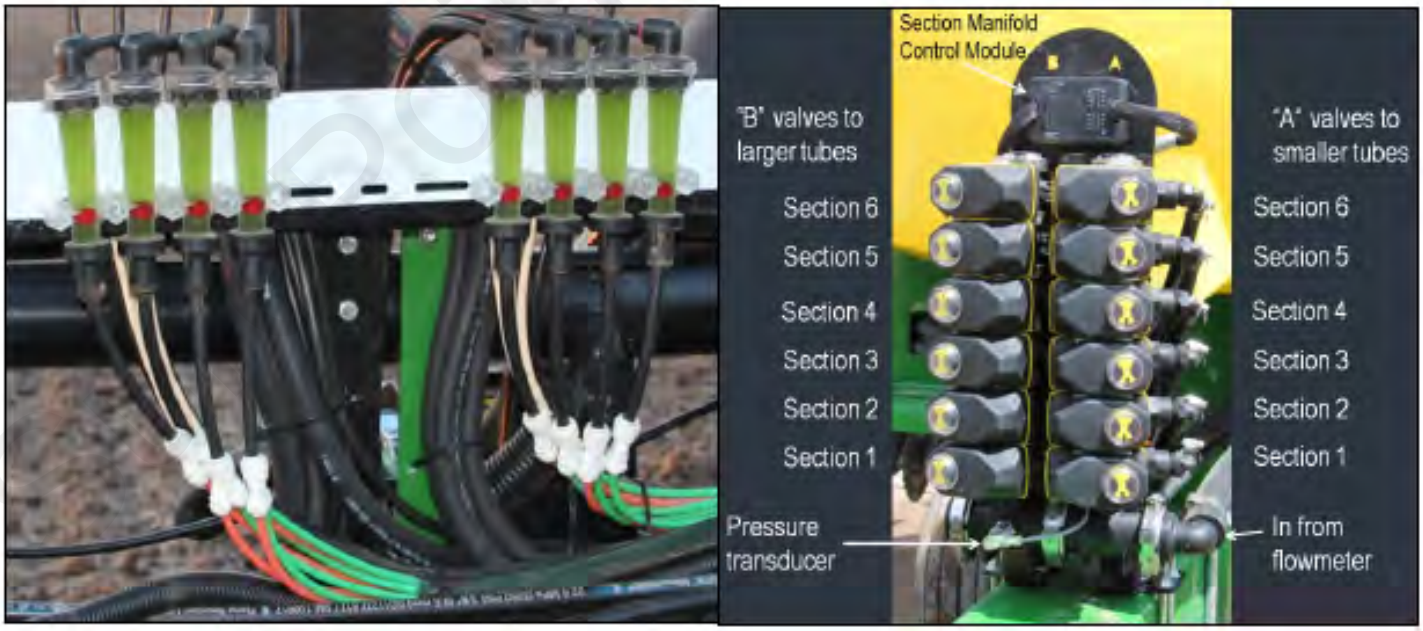
LIQUISHIFT
Variable Rate Technology

# What is LiquiShift and how does it work?

- There are 2 metering tubes to regulate and distribute the flow to each row.
- The product can flow through the small tube or through the large tube or through both tubes.
- The SurePoint LiquiShift module switches between tubes on the go as the speed and/or rate change.
- This allows the system to adjust to a wide range of apliction rates and/or speed changes for variable rate prescriptions and /or high speed planters/implements.

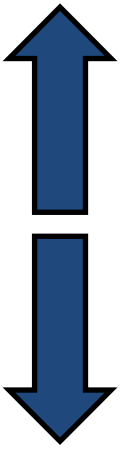
## Here's how it works:

- The flow starts in the small tube. As the flow increases due to increased rate and/or speed:
- When the pressure hits the High Setpoint, the flow switches to the large tube.
- As the speed and/or rate increase further, when the pressure hits the High setpoint again, the flow switches to both tubes.
- As the flow decreases due to lower speed and/or rate, and the pressure drops to the Low Setpoint, the flow switches from both tubes to the large tube, and then from the large tube to the small tube.
- All of this happens in an instant, on-the-go.



*LiquiShift Valve*

A



B

*LiquiShift Valve*

| Metering Tube Sizes | | |
|---|---|---|
| Color | | Size I.D. |
| White | | .047" |
| Grey | | .060" |
| Purple | | .080" |
| Brown | | .088" |
| Blue | | .096" |
| Green | | .110" |
| Tan | | .125" |
| Orange | | .150" |
| Yellow | | .170" |
| Black | | .187" |

**Note: Standard 1/4" Poly Tube (281-025) used for general plumbing has an I.D. of .170". DO NOT substitute Standard 1/4" Poly Tube for Black 'Metering' tube with I.D. of .187".**

## LiquiShift Dual Tube Combinations

| Low Viscosity Product (28-0-0) (10.6 lb/gal) | | |
|---|---|---|
| ML | OZ | 20-70 PSI |
| **Flow Range** | **Flow Range** | **Tubes** |
| 180-1475 | 6-50 | Purple/Blue |
| 240-2365 | 8-80 | Brown/Green |
| 295-2510 | 10-85 | Blue/Green |
| 295-3105 | 10-105 | Blue/Tan |
| 535-5025 | 18-170 | Green/Orange |
| *535-5765* | *18-195* | *Green/Yellow* |
| 740-6210 | 25-210 | Tan/Yellow |
| 740-7390 | 25-250 | Tan/Black |
| 1035-8870 | 35-300 | 5' Tan/Yellow |
| 1300-9165 | 44-310 | Orange/Black |
| 1035-9610 | 35-325 | 5' Tan/Black |
| 1625-10350 | 55-350 | Yellow/Black |
| 1685-11830 | 57-400 | 5' Orange/Black |
| 2070-13600 | 70-460 | 5' Yellow/Black |

| Medium-Low Viscosity (32-0-0) (11.0 lb/gal) | | |
|---|---|---|
| ML | OZ | 20-70 PSI |
| **Flow Range** | **Flow Range** | **Tubes** |
| 135-1180 | 4.5-40 | Purple/Blue |
| 165-1920 | 5.7-65 | Brown/Green |
| 220-2070 | 7.5-70 | Blue/Green |
| 220-2570 | 7.5-87 | Blue/Tan |
| 415-4495 | 14-152 | Green/Orange |
| *415-5175* | *14-175* | *Green/Yellow* |
| 590-5620 | 20-190 | Tan/Yellow |
| 590-6210 | 20-210 | Tan/Black |
| 830-7985 | 28-270 | 5' Tan/Yellow |
| 1035-8030 | 35-275 | Orange/Black |
| 830-9020 | 28-305 | 5' Tan/Black |
| 1300-9020 | 44-305 | Yellow/Black |
| 1420-10795 | 48-365 | 5' Orange/Black |
| 1775-12125 | 60-410 | 5' Yellow/Black |

*To calculate Flow (oz/min/row):* ***Speed (mph) X Rate (gpa) X Row Spacing (in) divided by 46.4***

*Calculate Minimum flow using Minimum Speed and Minimum Rate.*

*Calculate Maximum flow using Maximum Speed and Maximum Rate.*

*Find the Tube Combination that best covers the Flow Range needed.*

*10-34-0 gets thicker and harder to push when cold.* ***Use a larger tube combination when possible for 10-34-0*** *so it will flow OK when it is cold.*

| Medium Viscosity (N-P-K Blend, ProGerm-11.2 lb/gal) | | |
|---|---|---|
| ML | OZ | 20-70 PSI |
| **Flow Range** | **Flow Range** | **Tubes** |
| 75-885 | 2.5-30 | Purple/Blue |
| 105-1475 | 3.5-50 | Brown/Green |
| 150-1625 | 5-55 | Blue/Green |
| 150-2070 | 5-70 | Blue/Tan |
| 295-3990 | 10-135 | Green/Orange |
| *295-4435* | *10-150* | *Green/Yellow* |
| 415-5025 | 14-170 | Tan/Yellow |
| 415-5765 | 14-195 | Tan/Black |
| 590-7245 | 20-245 | 5' Tan/Yellow |
| 800-7100 | 27-240 | Orange/Black |
| 590-7985 | 20-270 | 5' Tan/Black |
| 975-7690 | 33-260 | Yellow/Black |
| 1125-9760 | 38-330 | 5' Orange/Black |
| 1360-10795 | 46-365 | 5' Yellow/Black |

| High Viscosity (10-34-0 at 60 deg) (11.65 lb/gal) | | |
|---|---|---|
| ML | OZ | 20-70 PSI |
| **Flow Range** | **Flow Range** | **Tubes** |
| 30-325 | 1-11 | Purple/Blue |
| 44-530 | 1.5-18 | Brown/Green |
| 53-590 | 1.8-20 | Blue/Green |
| 53-830 | 1.8-28 | Blue/Tan |
| 75-1480 | 2.6-50 | Green/Orange |
| *75-1920* | *2.6-65* | *Green/Yellow* |
| 118-2220 | 4-75 | Tan/Yellow |
| 118-2960 | 4-100 | Tan/Black |
| 180-3400 | 6-115 | 5' Tan/Yellow |
| 265-3400 | 9-115 | Orange/Black |
| 180-4230 | 6-143 | 5' Tan/Black |
| 385-3850 | 13-130 | Yellow/Black |
| 415-4730 | 14-160 | 5' Orange/Black |
| 530-5765 | 18-195 | 5' Yellow/Black |

*Tubes may need to be adjusted for best operation with a particular product.*

*If necessary, system can be operated at 70-90 PSI to achieve high flow rates.*

*Green/Yellow combination should only be used when maximum range is needed.*

*LiquiShift Mode Selection should be set at 20-80 PSI for Green/Yellow tubes.*

7/14/2020

## Metering Tubes to use to split the flow to both sides of the row:

*(Numbers indicate the **flow range through each tube** in oz/min with a pressure drop from 4 to 15 psi)*

| **LOW VISC** | 2’ | 32” | 4’ |
|---|---|---|---|
| Purple | 7-20 | 6-15 | 5-11 |
| Blue | 12-32 | 11-25 | 9-20 |
| Green | 24-55 | 20-47 | 18-36 |
| Tan | 31-73 | 27-64 | 24-48 |
| Orange | 56-125 | 47-110 | 41-83 |
| Yellow | 71-153 | 60-135 | 53-104 |
| Black | 91-205 | 76-175 | 68-133 |

| **MID VISC** | 2’ | 32” | 4’ |
|---|---|---|---|
| Purple | 4-11 | 3-9 | 2-6 |
| Blue | 7-20 | 5-15 | 4-11 |
| Green | 14-36 | 10-30 | 8-23 |
| Tan | 20-55 | 15-44 | 12-31 |
| Orange | 37-100 | 30-84 | 26-62 |
| Yellow | 46-120 | 36-102 | 30-75 |
| Black | 65-145 | 52-130 | 45-100 |

| **HIGH VISC** | 2’ | 32’ | 4’ |
|---|---|---|---|
| Purple | 1-4 | 0.9-3 | 0.6-2 |
| Blue | 2-8 | 1.8-6 | 1.6-4 |
| Green | 4-14 | 3-11 | 2.5-9 |
| Tan | 6-22 | 4.5-17 | 3.8-11.5 |
| Orange | 14-44 | 10.5-36 | 8-25 |
| Yellow | 19-61 | 15-49 | 12-34 |
| Black | 27-80 | 21-65 | 16-49 |

| **WATER** | 2’ | 32’ | 4’ |
|---|---|---|---|
| White | 3.5-7.5 | 3-5.8 | 2.5-5 |
| Gray | 7-15 | 6-13 | 5-11 |
| Purple | 13-26 | 11-23 | 9-18 |
| Blue | 22-40 | 19-39 | 16-31 |
| Green | 33-70 | 28-60 | 25-48 |
| Tan | 43-93 | 37-80 | 32-64 |

*(32” tube is an 8’ tube cut into 3 pieces)*

| VISC | EX | LB/ GAL | SP GR |
|---|---|---|---|
| LOW | 28-0-0 | 10.8 | 1.29 |
| MID | 9-24-3 | 11.2 | 1.34 |
| HIGH | 10-34-0 | 11.6 | 1.39 |

*As with all metering tube recommendations, these charts should provide a starting point, but adjustments may need to be made in the field.*

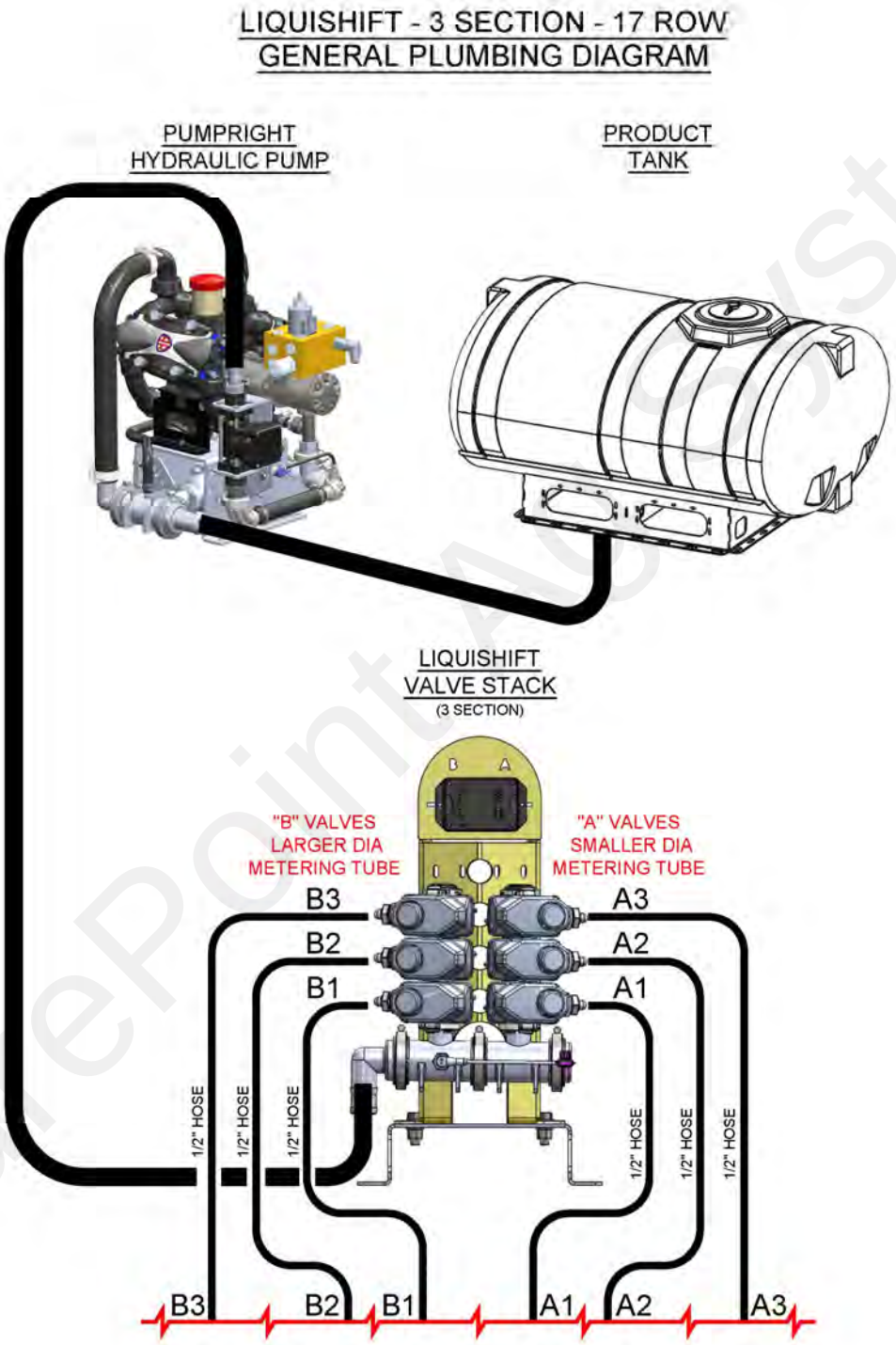
*When doing a split at the row, we are trying to provide paths of equal resistance (and equal flow) to each side of the row, while keeping the pressure drop in this step as small as possible.*

*In general, use as large a tube (and / or as short a tube) as possible to minimize the pressure drop caused by splitting the flow. In other words, if possible, use the tube that matches up best at the low end of the range on the chart, rather than at the high end.*

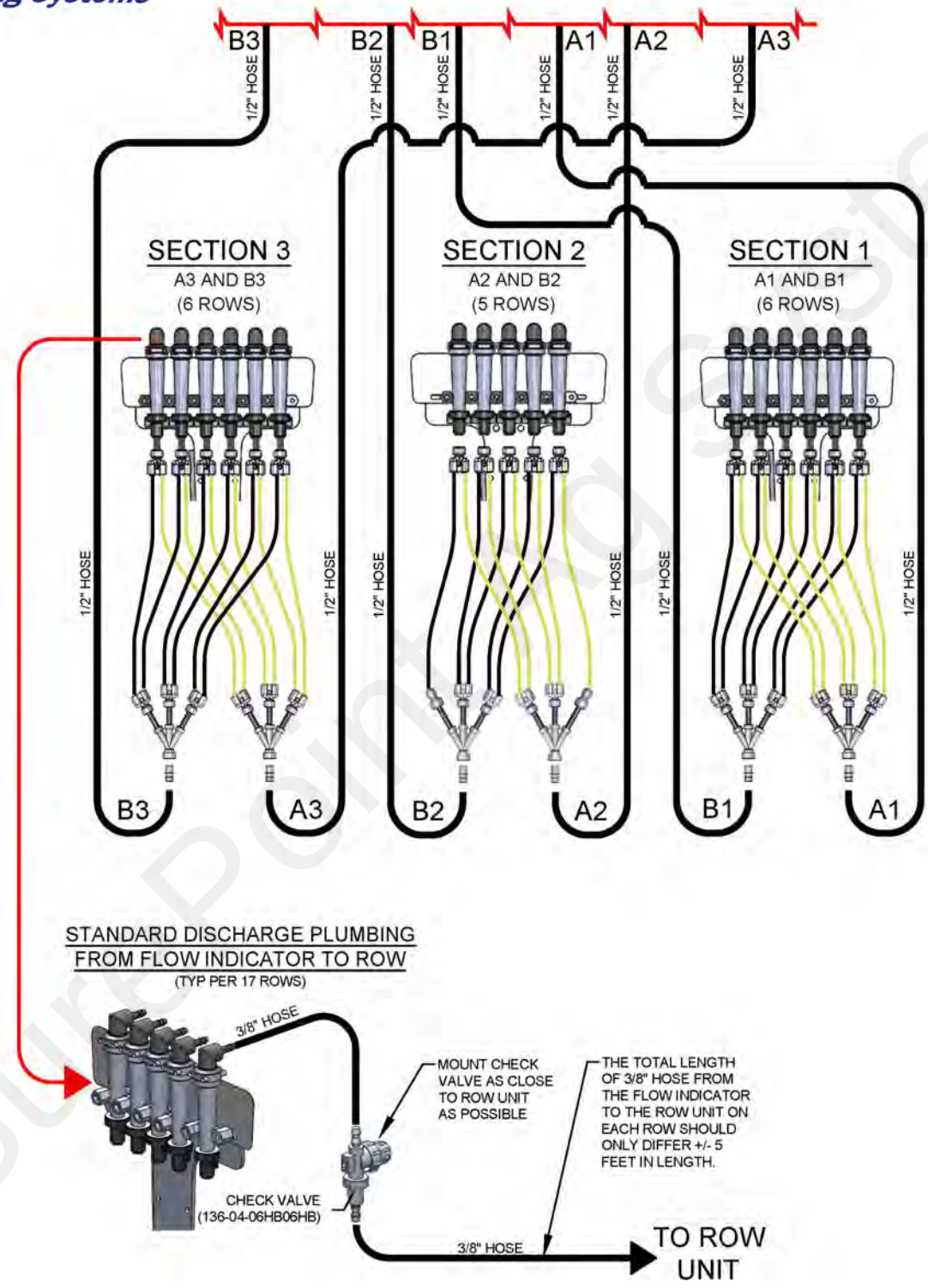
*A compromise may need to be made in LiquiShift systems that have a wide flow range that extends beyond a selection on the chart.*

Blank

**LiquiShift**
**Example Generic Planter Setup**
**Multiple Sections**

# LiquiShift
# Example Generic Planter Setup
# Multiple Sections
# Page 2 of 2



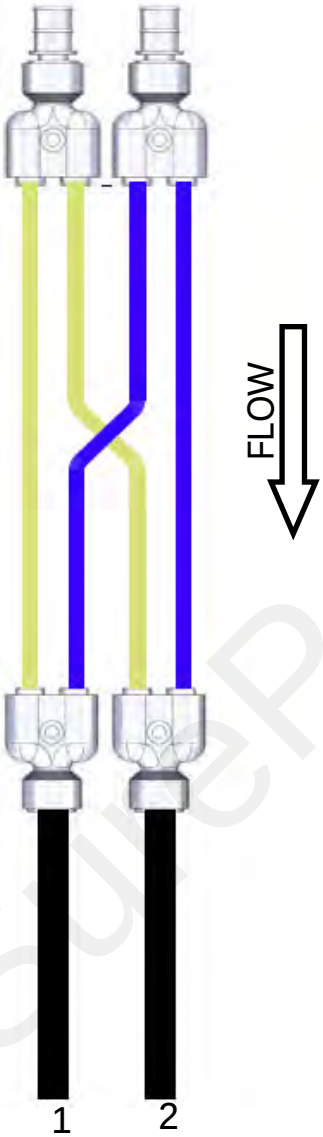
# LiquiShift Metering Tube Combo Kits for 2 to 6 rows

LIQUISHIFT Variable Rate Technology

Kit: 523-02-800500
**2 Rows**

Plumb to **"B"** Valves Larger DIA Metering Tubes

Plumb to **"A"** Valves Smaller DIA Metering Tubes



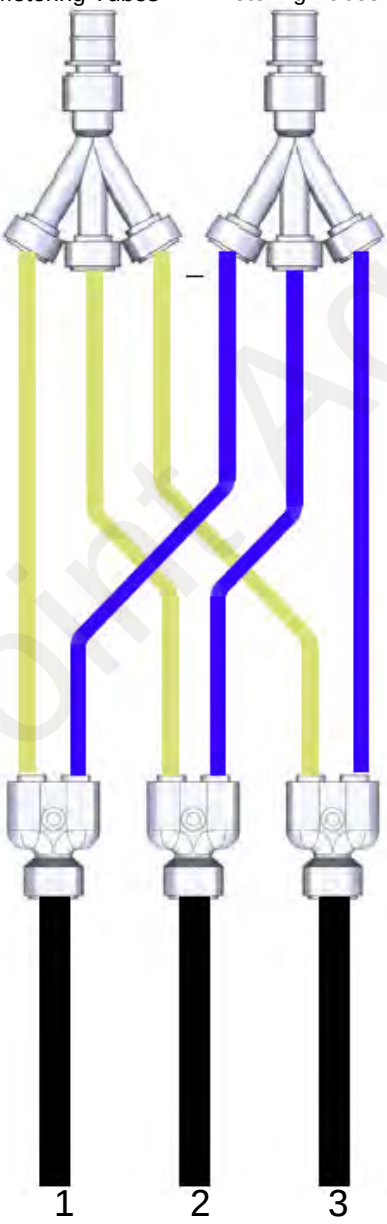

TO 2 ROW UNITS

FLOW

Kit: 523-03-800500
**3 Rows**

Plumb to **"B"** Valves Larger DIA Metering Tubes

Plumb to **"A"** Valves Smaller DIA Metering Tubes



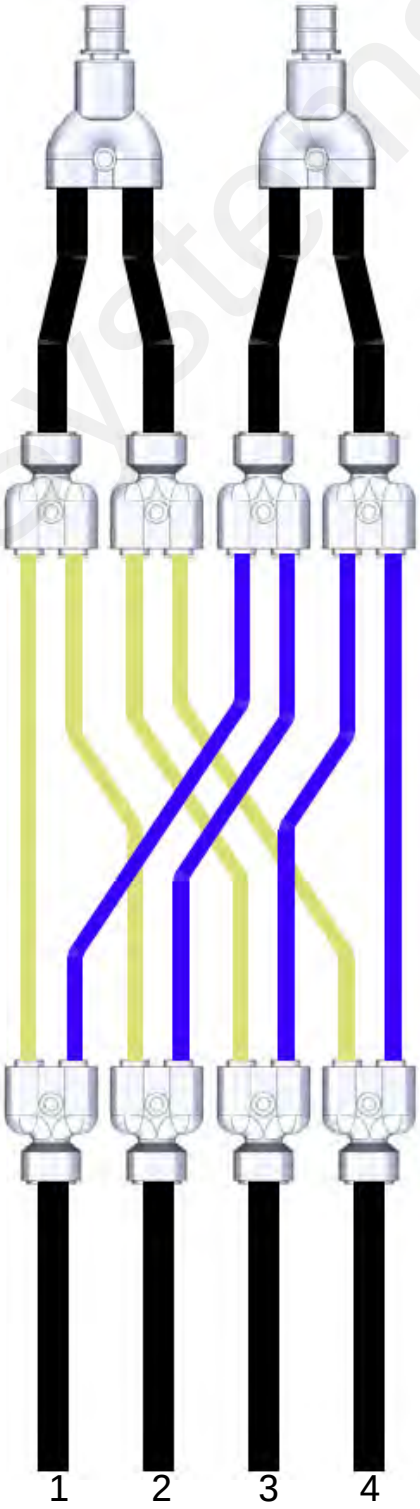

TO 3 ROW UNITS

FLOW

Kit: 523-04-800500
**4 Rows**

Plumb to **"B"** Valves Larger DIA Metering Tubes

Plumb to **"A"** Valves Smaller DIA Metering Tubes

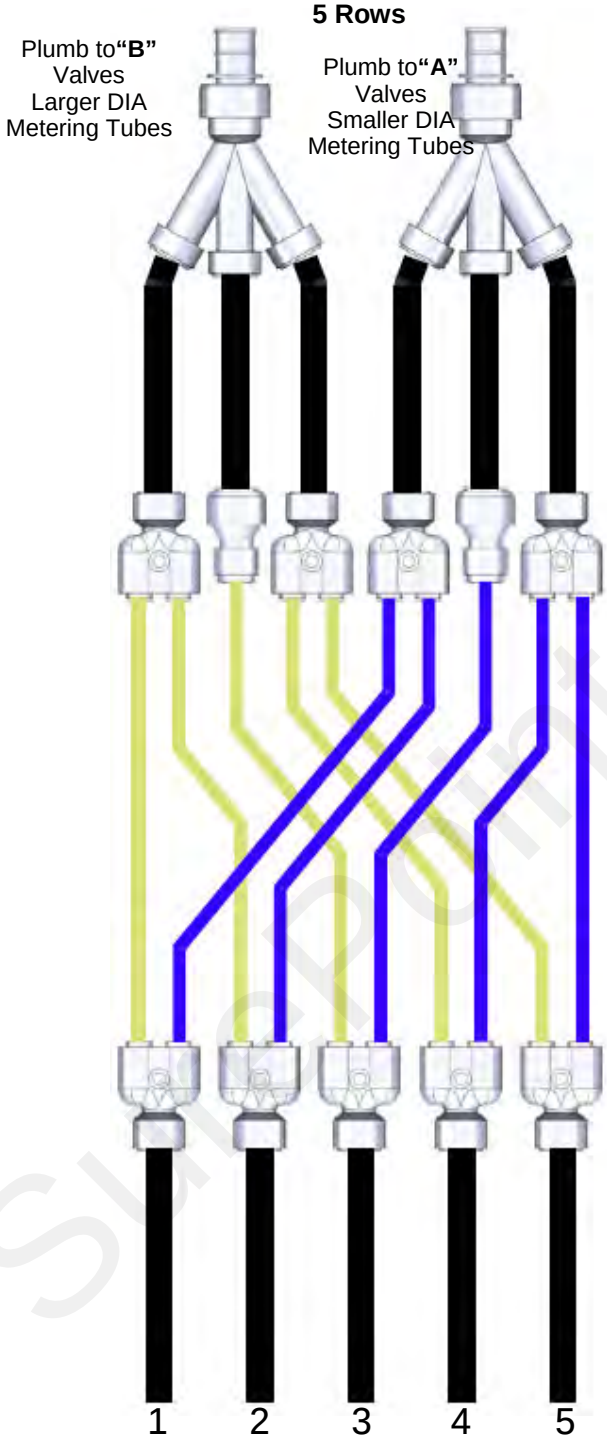



TO 4 ROW UNITS

# LiquiShift Metering Tube Combo Kits for 2 to 6 rows

Kit: 523-05-800500

**5 Rows**

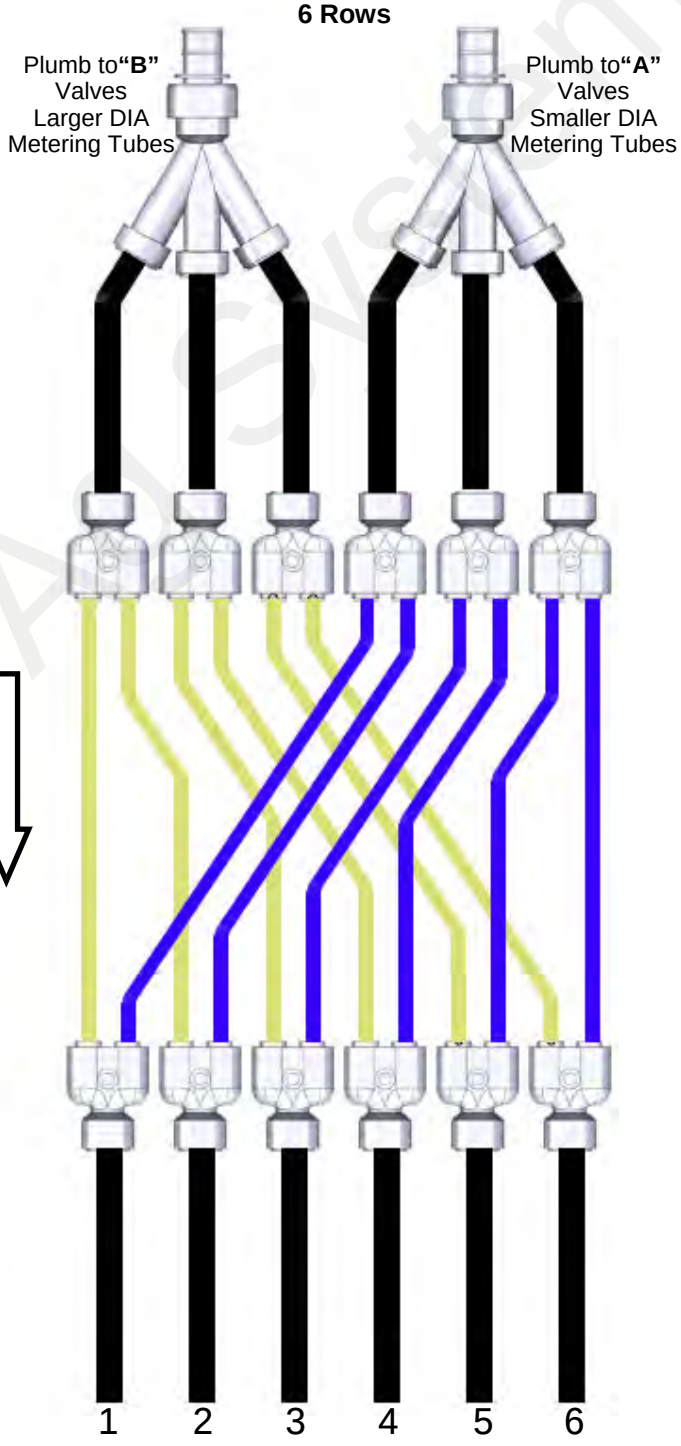



TO 5 ROW UNITS

FLOW

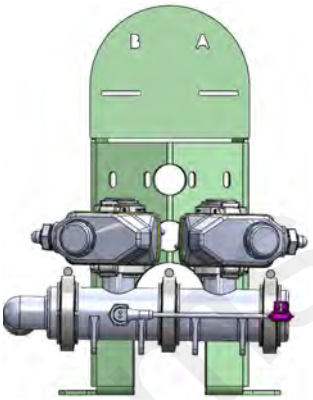
Kit: 523-06-800500

**6 Rows**




TO 6 ROW UNITS

# Single Section LiquiShift Overall Plumbing



**Single Section LiquiShift KZ Valves**

**Single Section LiquiShift Banjo Valves**

From Discharge of Pump

**Valve B**
Large DIA Metering Tubes

**Valve A**
Small DIA Metering-Tubes

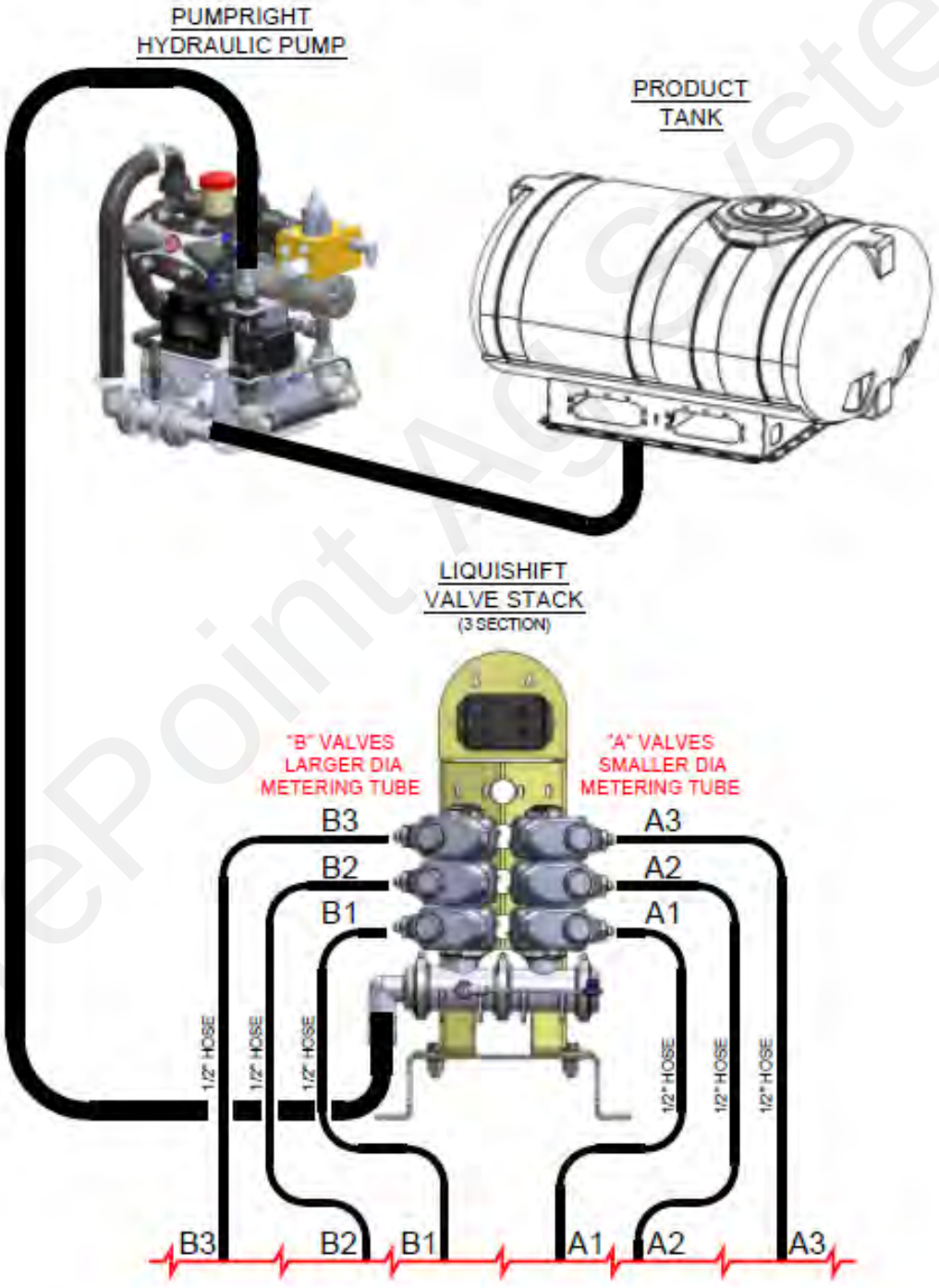
To Row (Typical ea. Flow Indicator)

**Note:** Each Flow Indicator needs a Blue (Smaller DIA) and Tan (Larger DIA) Metering Tube connected to it on the Inlet Side.

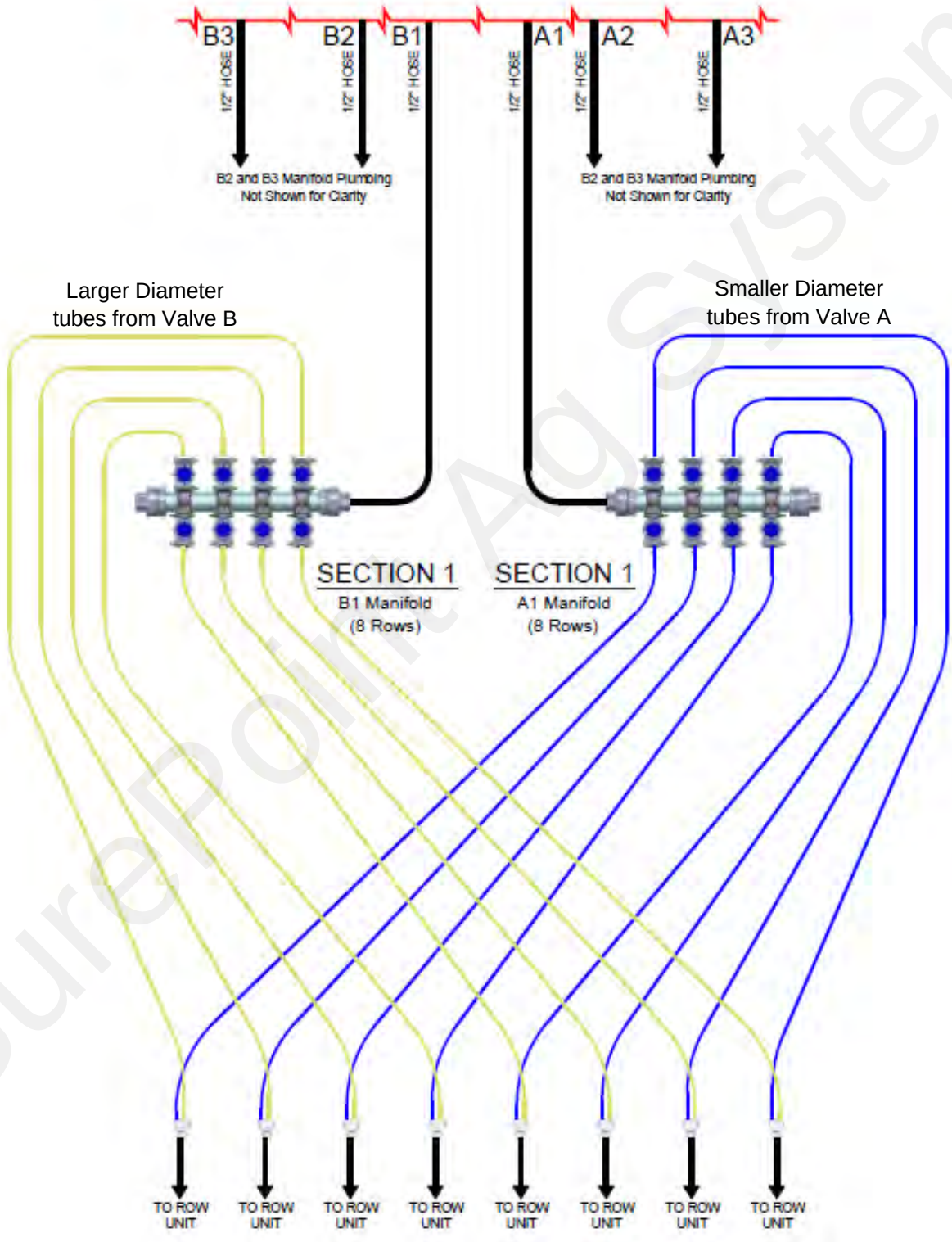
Use for Teejet Plumbing Equip

## Example Generic Drill W/ SS Manifolds
## Multiple Sections
## Page 1 of 2

LIQUISHIFT - 3 SECTION - DRILL
W/ SS MANIFOLDS
GENERAL PLUMBING DIAGRAM



## Example Generic Drill W/ SS Manifolds
## Multiple Sections
## Page 2 of 2



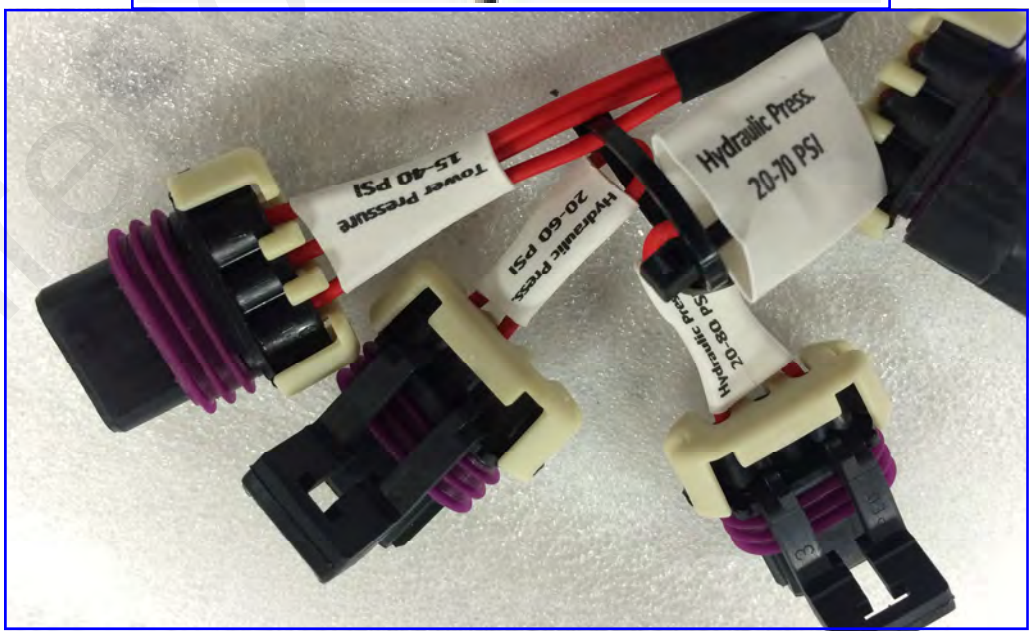
# SurePointt LiquiShift Mode Selection

## 218-2565Y1 LiquiShift MultiTube Control Module

The MultiTube controller decides which tube(s) should be in use at any given time based on the voltage reading from the pressure sensor. The controller will open Valve A for the small tube, or Valve B for the large tube, or both valves, depending on the flow needed.

The LiquiShift ships with default shifting pressure of 20 PSI and 70 PSI. For most tube combinations these pressure points provide adequate overlap when shifting from one tube to the other. If there is not enough overlap when shifting between tubes, the LiquiShift could shift back and forth repeatedly. The shifting points can be changed by unplugging the 20-70 PSI jumper and plugging in the desired range. ***Do not change this jumper without a thorough understanding of the pressure/flow range of each tube.*** There are 4 settings available:

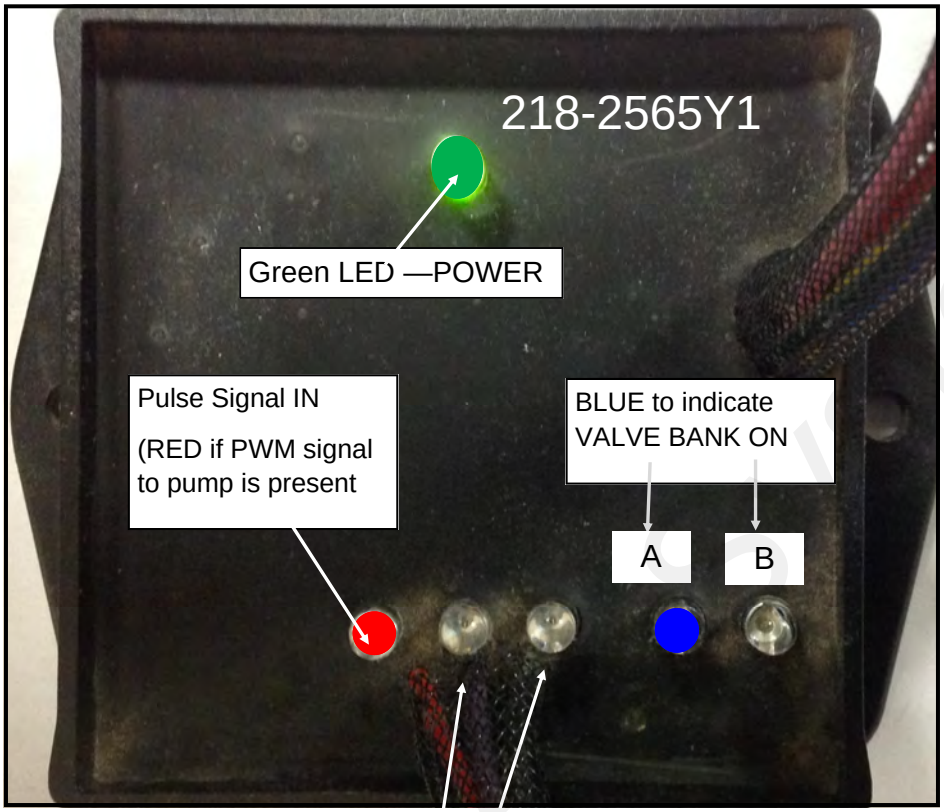
20-70 PSI (Default), 20-60 PSI, 20-80 PSI, and 15-40 PSI for Electric Tower systems (demo only).

# LiquiShift® MultiTube Control Module Lights

The lights on the MultiTube Control Module and the Manifold Controller Module provide valuable diagnostic information. Becoming familiar with the lights during normal operation will help in identifying issues when the system is not working as it should.




In **normal operation**, there should be a **Green** light, a **Red** light, and one or two **Blue** lights ON when the system is applying.

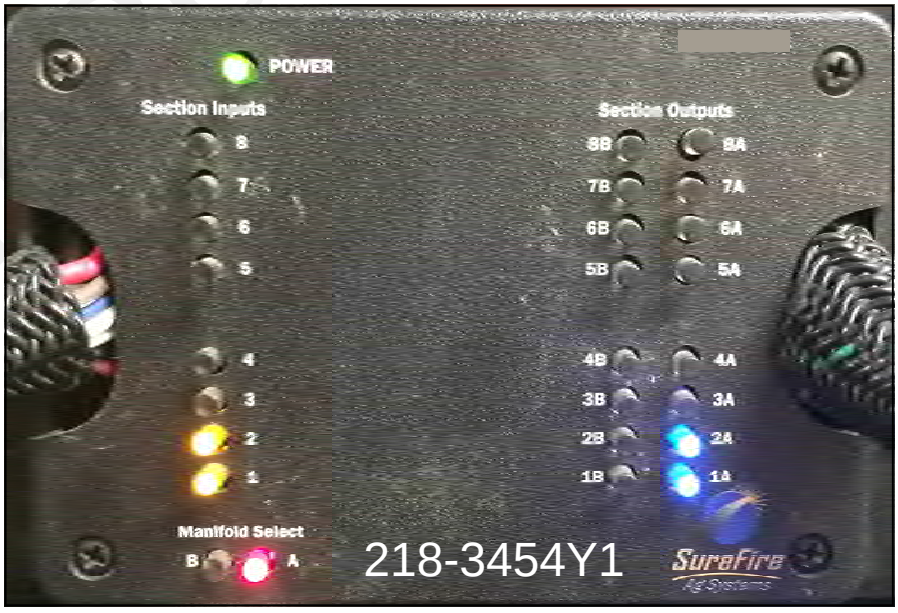
***LOOK AT THE LIGHTS***

# LiquiShift® Section Module Lights (Manifold Controller)

**Section INPUTS (YELLOW)** from system controller in cab are on left (from 14-pin connector)

**YELLOW** lights show that the system controller is sending the signal for Sections 1 & 2 to be ON.

**RED** light shows that LiquiShift control module is calling for Valve Bank A (small tubes) to be ON.




**Section OUTPUTS (BLUE)** to section valves are on right (to 23-pin connector to valves))

**YELLOW + RED**

**= BLUE**

**BLUE** lights show which valves should be **ON.**

**BLUE** lights show that the LiquiShift Manifold Controller is sending the signal for Sections 1 & 2 on Valve Bank A to be ON (1A & 2A).

# Toggle Switches for LiquiShift Manual Override

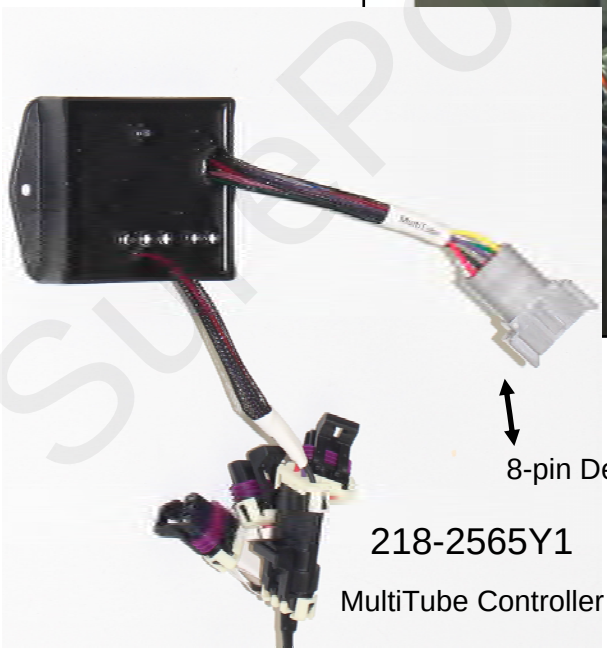
The manual override features allows the user to manually open both sets of valves (A & B) for testing, flushing, winterizing, or for running the system in the event of a pressure transducer failure.

***For normal operation, the manual override switches must be OFF (in the down position.)***

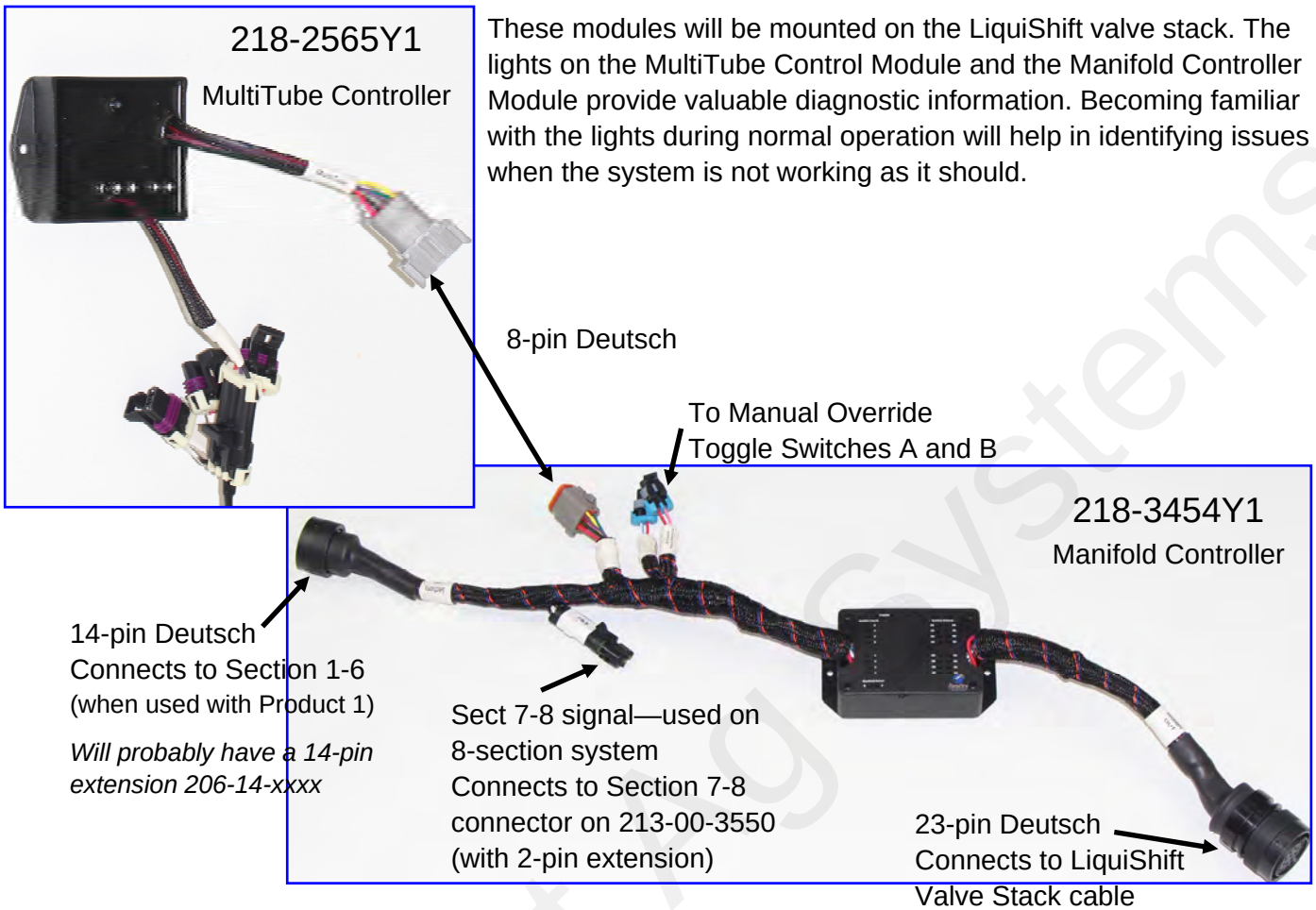
When running a normal Section Test, only the A valves will open, unless the pressure goes above 70 psi. To manually open both sets of valves, put the toggle switches in the Up position. The RED light for A and B will light up when that switch is ON. To open the valve, you must send a signal from the controller, such as with a Section Test, Nozzle Flow Check, Calibrate PWM Limits, Diagnostic Test, or other manual operating mode.

## *For Emergency operation*

In the event of a pressure transducer failure where the valves won't shift, you can use this feature to run the system with A or B or both sides open. (*If the pressure transducer fails, only side A will be on all the time.) To operate the system in a completely manual mode, unplug the 8-pin Deutsch connector on the MultiTube Control Module (218-2565Y1) on the back of the LiquiShift valve stack. Then use the A and B switches to turn on the small tubes (A) or the large tubes (B) or both sets of tubes.* When running in this manner, the system will not switch tubes, but will run all the time with the tube(s) you have selected. This may allow you to operate until you get replacement parts.

# MultiTube Controller and Manifold Controller layout




These modules will be mounted on the LiquiShift valve stack. The lights on the MultiTube Control Module and the Manifold Controller Module provide valuable diagnostic information. Becoming familiar with the lights during normal operation will help in identifying issues when the system is not working as it should.

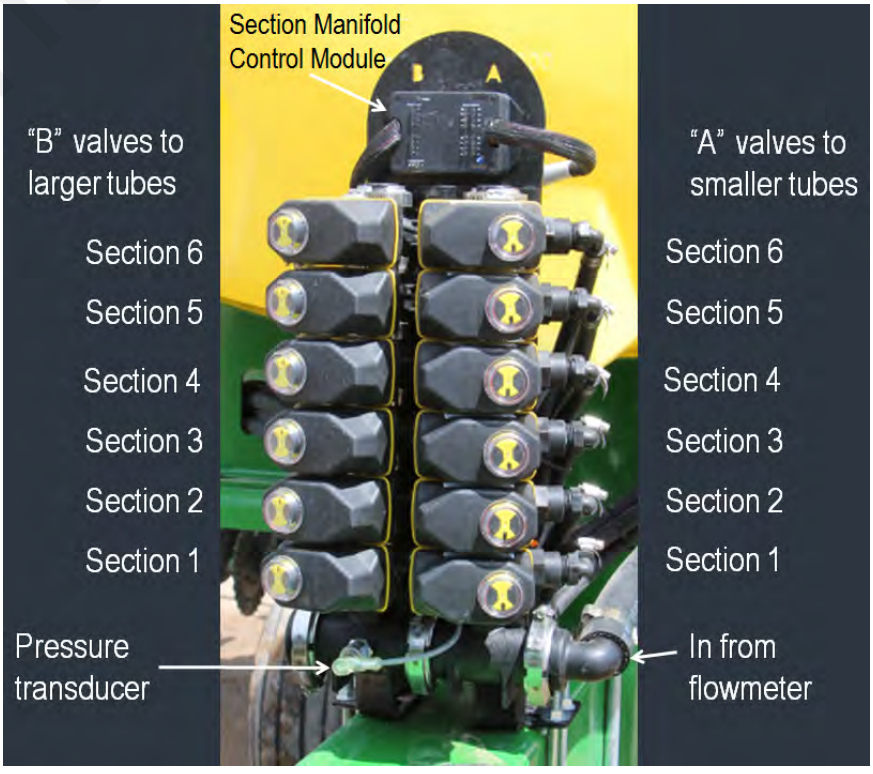
The **MultiTube Controller** (218-2565Y1) is mounted on the back of the LiquiShift tower, behind the **Section Manifold Control Module** (218-3454Y1).

The **"A" valves**, which are connected to the smaller tubes, are on the right side of the LiquiShift Tower.

The **"B" valves**, which are connected to the larger tubes, are on the left side of the LiquiShift Tower.

**Section 1** is at the bottom of the valve stack.

The **pressure transducer**, which is the key component for the system deciding when to change from one tube to the other, is located at the bottom of the LiquiShift tower. It is plugged into the **Control Pressure Connector** on 201-3455 (or 56 or 57).



# Troubleshooting the LiquiShift System

## Section Valve Operation: Electric Section Valve Basics:

On 3-pin WP connector at each electric valve:

Pin A: 12v constant power

Pin B : ground

Pin C: 12v signal for valve to open

**If an electric section valve will not open:**

1. Be sure the section valve is plugged into the correct connector and that the controller is telling that valve to open. Check the controller setup to be sure the sections are set up correctly. On the JDRC 2000 or the Raven RCM check to see which signal drivers are assigned to the sections on this product. This is important when the setup has more than one product and has more than one section group.
2. Unplug the connector to the valve that is not working and plug the connector into another valve that is working. If that valve opens, go to step 10 to check the valve. If not, go to step 3.
3. Plug the non-working valve into a different connector that is working. If the valve opens now, check the wiring beginning at step 4. If the valve does not open, go to step 10 to check the valve.
4. Do the following steps to check the voltage at the 3-pin connector that plugs into the valve.
5. Pin A to Pin B should be 12– 13v all the time. If this is 12-13v, the red light on a KZ valve should be on.
6. Pin B to Pin C should be 12-13 v when the valve should be open. This voltage will be 0 v when valve is closed. (*Note: Some controllers may have 4-6 v on the signal wire when the valve is closed*. *Some valves may not close if the signal voltage does not go to 0 v.*)
7. If the voltage is not correct in Step 5 or 6, check the voltage at the next harness connection. You will need a harness drawing to know which pins to check. At each connection, check for corroded, loose, pushed-back, or bent pins.
8. Keep checking the voltage at each connection until you find the correct voltage or get back to the rate controller. If you find the correct voltage at one point, inspect the pins and harness to identify the problem. You can do a continuity check from one end of the harness to the other to locate a bad wire. If a harness is bad, repair or replace that harness.
9. Plug all the harnesses back together and check the valve again.
10. If the voltages are OK, but the valve still won't open, remove the actuator from the valve. See if the actuator will turn when it is not coupled to the valve. If the actuator turns here, use a pliers or screwdriver to turn the valve mechanism and get it freed. In some cases, it may be necessary to disassemble the valve assembly so you can clean the valve.

**If more than one electric section valve will not open:**

1. Determine exactly which valves are working and which are not working. On most harnesses, even-numbered valves have one power source, odd-numbered valves have a different power source.
2. Follow the instructions above to determine whether it is the constant 12 v power that is missing or whether the signal power is not present.

## **Section Valve Operation**: (continued)

***Situation:***

*The valve opens, but nothing comes out. The light is green. The pump is running, pressure builds up, but it says NO FLOW. But, some product will flow when the valve is off.*

*Or: When I turn on Section 1, liquid comes out of Section 2. When I turn off Section 1 and turn on Section 2, liquid comes out of Section 1.*

Solution:

The KZ valve must be plumbed with the outlet that is going to the row coming from the port that is nearest the position indicator (the top of the picture below). Product flows through the top port when the valve is open. Product will flow through the bottom port when the valve is closed. (This can be used to return product to the tank when the system shuts off.) If the outlet to the row has been switched to the bottom port, the product will flow when the valve is closed, but will not flow when the valve is open.

Product flows through here when valve is ON.

Product will flow through bottom port when valve is OFF.

(*If product flows opposite of this, someone has changed the orientation of the valve.)*

### *Situation:*

***Valve is always lit up green and is open. It won't close—**

1. If the valve indicator stays green all the time and/or if the valve position indicator appears to be out of sync, the actuator probably needs to be replaced. Test the valve with another section connector
2. Sometimes an actuator comes that won't work on LiquiShift systems. The valve tests OK on a regular test, but won't function when plugged into LiquiShift. This is a problem with the internal board. The actuator must be replaced.
3. Some controllers send out 4-6 volts on the signal wire when the valve should be closed. This may cause some KZ valves to remain on all the time. Check the voltage between pins B and C of the 3-pin WP connector that plugs into the valve to see what the voltage is when the valve should be on and what the voltage is when the valve should be off.
4. Be sure the valve is plugged into the right connector and that the section setup in the display is configured correctly.
5. The actuator can be removed by pulling the gray clip (wiggle and pull) and lifting the actuator off.

# Troubleshooting the LiquiShift System

## Common LiquiShift Troubleshooting Scenarios

**Only the A valves will open:**

1. Are the A valves connected to the small tubes? Be sure this is correct.
2. Do you have the correct tube for the product and rate you are using? What is the typical low pressure that you see during application? If it regularly runs at 10 PSI or less, you may need a smaller tube.
3. The pressure must get up to 70 psi (on regular settings) before Valve B will open. What is the pressure? Is it going above 70 psi and still not shifting?
4. Is the *Control Pressure* connector on harness 201-3455 (or 56 or 57) plugged in to the pressure sensor on the LiquiShift valve stack?
5. Is the pressure sensor calibrated correctly? Check the calibration settings. Should be set at 50 mv/PSI. It must be calibrated with no pressure on the sensor. It is best to unplug the sensor while entering the calibration numbers. (*If the LiquiShift system is on Product 2 and connected to Sections 7-12 connector, the pressure will be shown on Pressure Sensor 2. Be sure this is what is displayed on your screen.)*
6. Go to Diagnostics > Pressure Sensors (*Sensors/Status on GRC)* >. See what the pressure sensor is reporting. 70 psi should be 3.5 v. The 0 PSI voltage should 0.00 v (may be 0.01, but shouldn't be more). If the pressure sensor does not report voltage, be sure the sensor is plugged in to the *Control Pressure* connector (see # 2 above). If the sensor is plugged in, but does not report voltage when liquid is pumped, the sensor is probably bad and needs to be replaced. *(It possibly could be a bad harness, but this is much less likely.)*
7. What do the diagnostic lights on the MultiTube Controller and Manifold Controller say? *See page 17 for information on these lights*. On the MultiTube Controller, there should be a green power light at the top. There should be a red light (bottom left) indicating that it is receiving a PWM signal. *(If there is one Yellow light immediately to the right of the red light, the system has been set to shift at 80 psi.)* There should be a blue light (or two—bottom right) indicating A or B or both valves should be on. On the Manifold Controller there should be a green power light. There should be a red light (or two) indicating A or B or both valves should be open. On the left side there should be some yellow lights indicating which sections should be on. There should be blue lights on the right side indicating all the valves that should be open (this should match what the blue and yellow lights say).
8. Turn on Manual Override Switch B. Do the valves open? You need to have a Section Test or some other test running so the controller is calling for the section valves to open. The A and B blue lights on the MultiTube Controller will not light up when the Manual Override switches are used.
9. If the pressure voltage is reaching 3.5 v (70 PSI) and the blue light for Valve B is not showing on the MultiTube Controller, the MultiTube Controller (218-2565Y1) is probably bad and needs to be replaced.
10. If the pressure transducer is bad or if the MultiTube Controller is bad, the system will not shift from Valve A to Valve B. Here is a workaround to use Valve B. While using this workaround, the valves will not switch from one set of tubes to the other, but you can set it to use either Tube B by itself or both Tube A and Tube B, based on what the system used most of the time when it was working. You can also look at a metering tube flow/pressure chart to see which tube or tubes may work the best until the broken part can be replaced.
11. To turn on Valve B, turn on the Manual Override Switch for Valve B. This will open the B valves. The A valves will also be on, so now both tubes are on. To turn off the A valves and use only the B valves, unplug each A valve from it's 3-pin WP connector or unplug the 8-pin Deutsch connector and use the toggle switches.
12. *A SurePoint Pressure Signal Simulator (212-03-4094Y1) allows very quick and easy LiquiShift diagnostics without running the pump and dispensing liquid. See page 25 for information on this simulator.*

# Troubleshooting the LiquiShift System

## Common LiquiShift Troubleshooting Scenarios

**Some valves will open, others won't:**

1. Specifically, which valves are open and which are not? The odd-numbered valves have a different power source than the even-numbered valves.
2. Are the red lights lit up on each valve? If not, you do not have power to the valves.
3. Are all the valves plugged in to the correct connector?
4. Check all the harness connections back to the rate control module.
5. Check the section setup in the display. Is the profile set up for the correct number of sections? Are the valves plugged in to the connector for the section driver that is assigned to that valve. Take note if you are plugged into a 14-pin section connector for Sections 1-6 or for Sections 7-12 so that you have the correct section drivers assigned.
6. Switch some valves and connectors around to see if the problem follows a specific connector or a specific valve.

**I may be running with Valve B open or with both valves open, but when I turn around, the system always goes back to Valve A, and starts there, and builds up a lot of pressure before it shifts back to Valve B or back to both valves.**

**Or**

**I may be running with just Valve A or just Valve B open, but when I turn around, the system always opens up both valves, so when I start back up, I have no (or very low) pressure, and it takes a few seconds for the valves to get back to Valve B or to Valve A only.**

1. Are you running with the Control Valve set to PWM (not PWM Close) so that the pump runs when you turn around to agitate the product back to the tank? If you are doing this, and the pressure drops below 20 PSI while you turn around, the LiquiShift MultTube Controller will shift back to Valve A. When you start applying, the pressure will build up quickly, and it will take a few seconds to shift back to Valve B, and a few more seconds to shift back to both Valves A and B.
2. The same would be true if you are running with the Control Valve set to PWM (not PWM Close) to keep the pump running for agitation while you turn around. If the pressure goes above 70 PSI while you are turning around, the MultiTube Controller will shift to both A & B, and the system will be set to open both A and B valves when application resumes. This would cause the pressure to be quite low when application resumes with both valves open. It would take a few seconds to return to Valve B, and, if needed, a few more seconds to return to Valve A.
3. With the Control Valve set to PWM Close, the PWM signal will be shut off and the pump will stop when you reach the end of the field. The pressure will drop because the pump Is not running, but the system will not switch from one Valve setting to another if there is no PWM signal present. With the Control Valve set to PWM Close, the same set(s) of valves that were open when the system shut down will be on when the system resumes application.

**In general, the controller must be configured for PWM Close, so the pump shuts off while turning around.** If agitation is desired when turning around, it may be possible to do a workaround to accomplish this. The LiquiShift system is not designed to work on Servo systems.

# Troubleshooting the LiquiShift System

## Common LiquiShift Troubleshooting Scenarios

**LiquiShift valves won't come on:**

1. Look at the valves. Are the red lights lit up on each valve? If not, you do not have power to the valves.
2. Go to Diagnositics > Tests > Calibrate PWM Limits. You can run this test without actually running the pump. Start Calibrate PWM Limits test, tap the (+) button once or twice to get a PWM signal. The section valves on the A side should open.
3. Look at the lights on the MultiTube Controller. There should be a green light, red light, and blue light.
4. Look at the Manifold Controller lights. There should be a green light at the top, a red light on A at the bottom, yellow lights for each section you have, and blue lights on the far right for each section on Bank A.
5. The MultiTube Controller must receive a PWM signal before it will pass on a signal for the valves to open. Verify that the controller is in a Run condition or Test mode where a PWM signal is being sent and where the sections are told to open. On a Section Test or Calibrate PWM Limits Test, or in a Manual Run mode, you must tap the (+) button a couple of times to start the PWM signal.
6. Use pressure signal simulator (212-03-4094Y1) to test MultiTube Controller switching from A to B, etc. See page 25 for discussion of pressure signal simulator.

**System is shifting back and forth repeatedly from A to B and back.**

1. What color of tubes are on the system? Blue/Tan and Tan/Black don't have as much overlap as the other tubes, and you may need to set the pressure change to 20/80 PSI. If they are running at a rate that is near the high end of A and the low end of B, this could happen.
2. Check the mode selection connectors on the MultiTube Controller (218-2565Y1). The standard (default) setting is 20-70 PSI. If this has been changed to 20-60 PSI or 15-40 PSI, the valves would switch from A to B at which time the pressure would be too low and the valves would switch back from B to A. As stated above, if this occurs when the selection is set at 20-70 PSI, you will have to switch to 20-80 PSI.
3. If the shifting back and forth continues, check the tubes to be sure the system is set up with a compatible tube combination and that the tubes have not been altered. The tube combination must be such that when the pressure reaches 70 PSI in the small tube and the flow switches to the large tube, the pressure in the large tube must be greater than 20 PSI (generally greater than 25 PSI). For example a system with blue and orange tubes would not work because when the pressure hits 70 PSI in the blue tube, and the flow switches to the orange tube, the pressure will be below 20 PSI, and the system will switch back to the blue. The system will shift back and forth like this.
4. The tube combination also must be chosen so that when the pressure drops to 20 PSI in the large tube, switching the flow to the small tube, the pressure must be less than 70 PSI (generally 60 PSI or less).
5. Be sure the small tube is connected to the "A" valve bank, and the larger tube is connected to the "B" valve bank. Also, be sure the "A" valves are plugged into the "A" connectors.
6. Be sure the pressure sensor is calibrated correctly at 50 mv/PSI. Also, be sure that the 0 PSI voltage is 0.00 v. If the calibration was set when there was pressure on the sensor, the display may read 70 PSI, but the pressure could actually be less. Always unplug the pressure sensor before entering the 50 mv/PSI calibration number.
7. Another possible scenario where valves can switch back and forth repeatedly is if one of the valves on the A side is actually not opening, so all of the product goes out through the other sections. This will make the pressure higher because the full amount of product is going through fewer rows. When the system switches to the B valves and all of the sections start applying, the pressure may drop enough that the system switches right back to the A valves. This could go back and forth.

**When the system switches from A to B, the pressure jumps even higher, and it shifts to both A and B. Then, it shifts back to B, and then back to A&B, back and forth.**

1. This sounds like the large tubes are connected to the A valves and the small tubes to the B valves.
2. Or the connectors for the A valves are connected to the B valves and vice versa.

# Common Pressure Sensor Troubleshooting Scenarios

**No pressure is showing on the display:**

1. Is the pressure sensor plugged in? Where is it plugged in? If it is on Product 2 or Section 7-12, it will be Sensor 2. If this is the case, be sure your display is showing Pressure Sensor 2.
2. If it is a liquid pressure sensor on an NH3 system, it will be Sensor 3.
3. If it is plugged into the pressure connection on the Section 1-6 connector on 213-02-3764**Y1** (Trimble), 213-00-3765**Y1** (JD), or 213-01-3768**Y1** (Ag Leader), it will be Pressure 2 (or Aux Pressure). **(Y2 version of these harnesses have Pressure 1 on the Section 1-6 connector.)**
4. Is the pressure sensor calibrated? The system must be set for Voltage Based Calibration at 50 mv/PSI. This must be entered while there is no pressure on the sensor. It is best to unplug the sensor while entering the calibration.
5. Go to Diagnostics > Pressure Sensor (*Sensors/Status)* >. The 0 PSI voltage should be 0.00 or 0.01. The sensor voltage should be reported when there is pressure on the sensor. 1.0 v is 20 PSI. 2.0 v is 40 PSI.
6. If no voltage is being reported, check to see if the green LED light is lit on the end of the sensor. *(This can be hard to see in the sun.)* Check for 12 v on the 3-pin pressure connector (pins B & C—red and black).
7. A simple pressure signal simulator can be made with a AA or AAA battery. Connect the top of the battery (+) to pin A of the 3-pin pressure connector. Connect the bottom of the battery (-) to pin C. This should show up as approximately 1.5 v and 30 psi on the Diagnostics > Readings > Pressure Sensor screen.

If all of the above check out OK, replace the sensor.

**SurePoint Pressure Signal Simulator (212-03-3910Y1)**

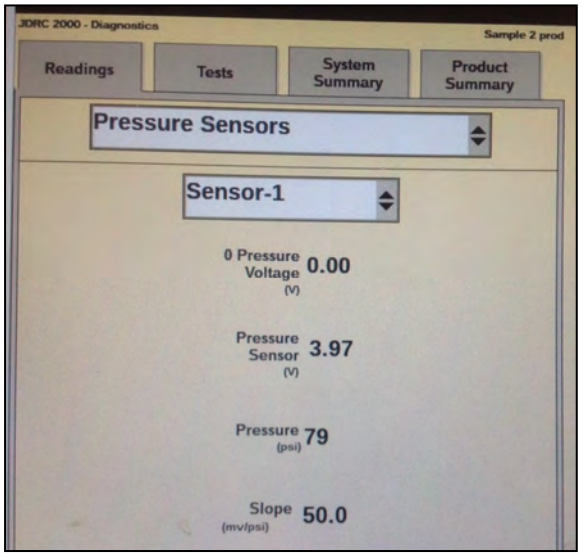
**A great troubleshooting tool:**


On a LiquiShift system, plug the Pressure Simulator into the Control Pressure connector.

On a regular system, plug the simulator into the pressure connector being used.

The light on the simulator should light up when it is plugged in. Plug in the 4.5 v connector and it should register about 90 PSI.

***This should cause the LiquiShift system to shift from A to B and then to both A&B. Unplug the connector to shift back.***




*Diagnostics > Readings > Pressure Sensors* will show this voltage and pressure if the harnessing is good.

Notice "*0 Pressure Voltage*" is 0.00 v. *(If this is not 0.00 or 0.01, unplug everything from the pressure connector and Calibrate the sensor again (reenter the 50 mv/PSI).*

The "*Pressure Sensor (V)"* should closely match the simulator.

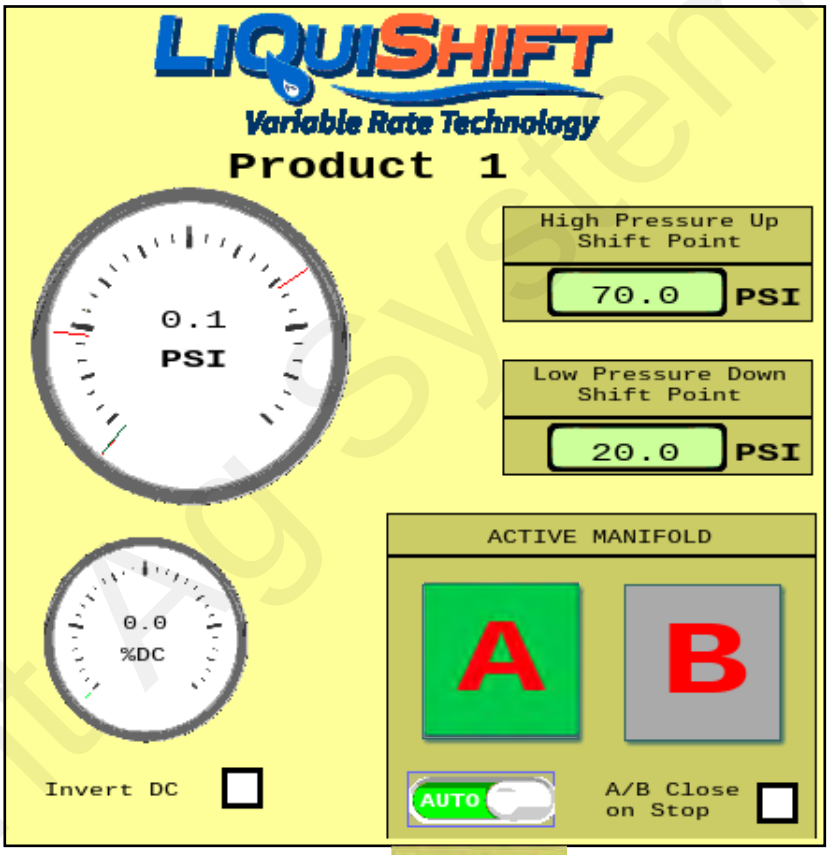
The "*Pressure*" should be equal to Voltage x 20 (when slope is 50 mv/PSI).

# Sentinel and SurePoint LiquiShift

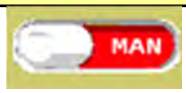
If your system includes SurePoint's LiquiShift variable rate technology, it can be controlled through the Sentinel ECU provided that the 8-pin harness extension (206-08-XXXX) is installed and plugged into the LiquiShift product connector on the main Sentinel adapter harness. To activate LiquiShift, follow these buttons:



The LiquiShift button will now be displayed on the HOME screen




Using Sentinel to control your LiquiShift eliminates the need for the LiquiShift Controller module (218-2565Y1). This is a black module that would be on the back side of the A-B LiquiShift valves. If this module is not there, an 8-pin harness extension (206-08-XXXX) is added from the Sentinel ECU harness to the LiquiShift. The Sentinel gives the operator absolute control over the LiquiShift's shift points, real-time pressure readings, and provides in-cab manual control. For more information regarding the use of Sentinel in controlling your SurePoint LiquiShift, refer to your LiquiShift system manual.




Switch to MAN to control A & B valve from here

## Setting LiquiShift shift points


Standard High Pressure Up Shift Point: 70 PSI

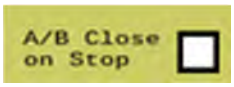
Standard Low Pressure Down Shift Point: 20 PSI

***If these shift points are not set correctly, the LiquiShift may not work or may work very erratically.***

***They must be set so that when the valves switch, there is appropriate pressure in the new tube to keep the system operating smoothly.***

*For example, if the shift points are set at 50 PSI and 25 PSI, the valves will switch from A to B when the pressure in tube A reaches 50 PSI. This flow in tube B may only build 15 PSI, so it will immediately switch back to A. Since the pressure there is 50 PSI or more, it will switch to B. The system will switch back and forth repeatedly causing wild pressure rate and pressure fluctuations.*

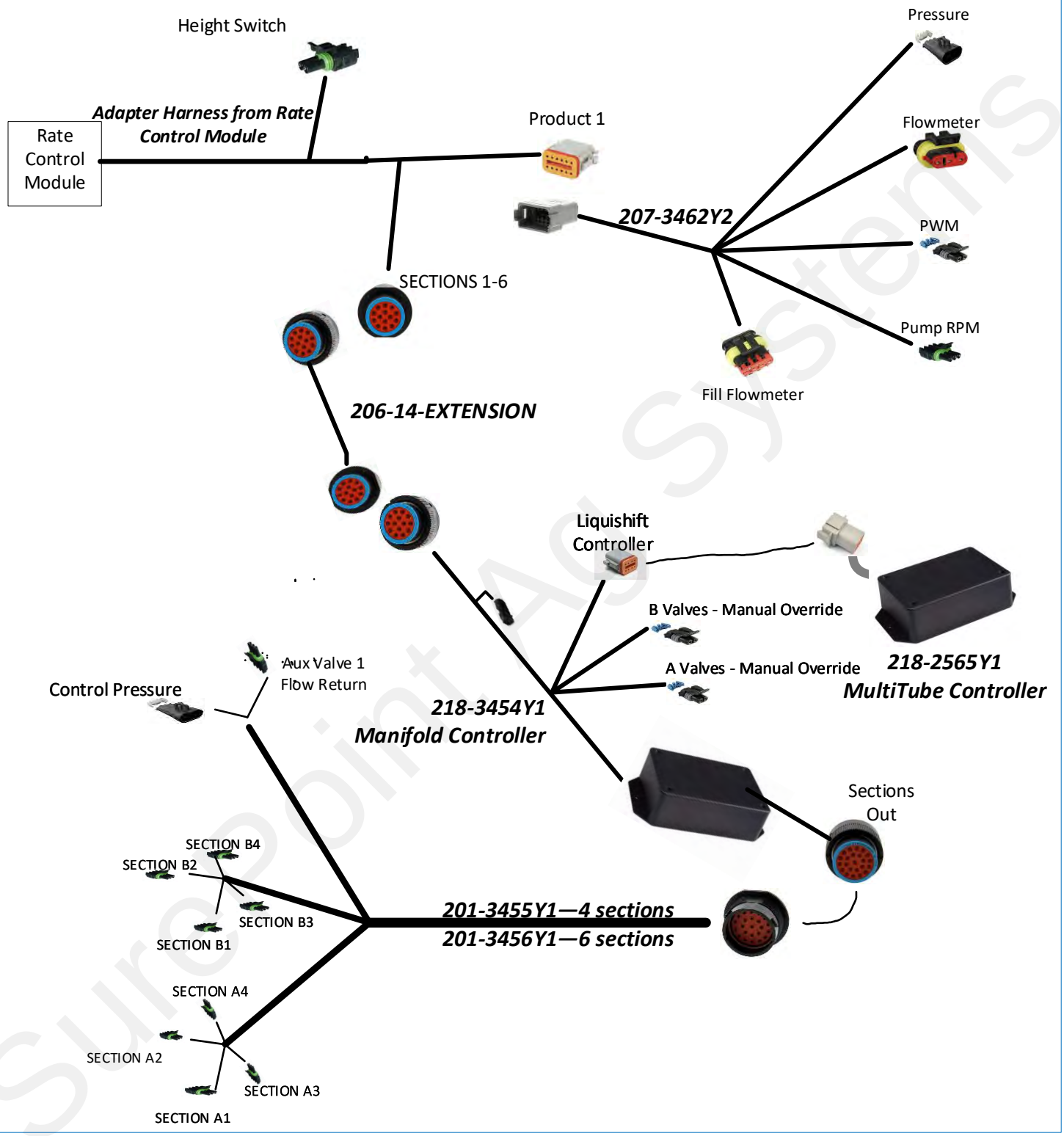
***There may be situations where it may work better to use something other than a 70/20 PSI setpoint, but don't set other numbers without knowing what you are doing.***



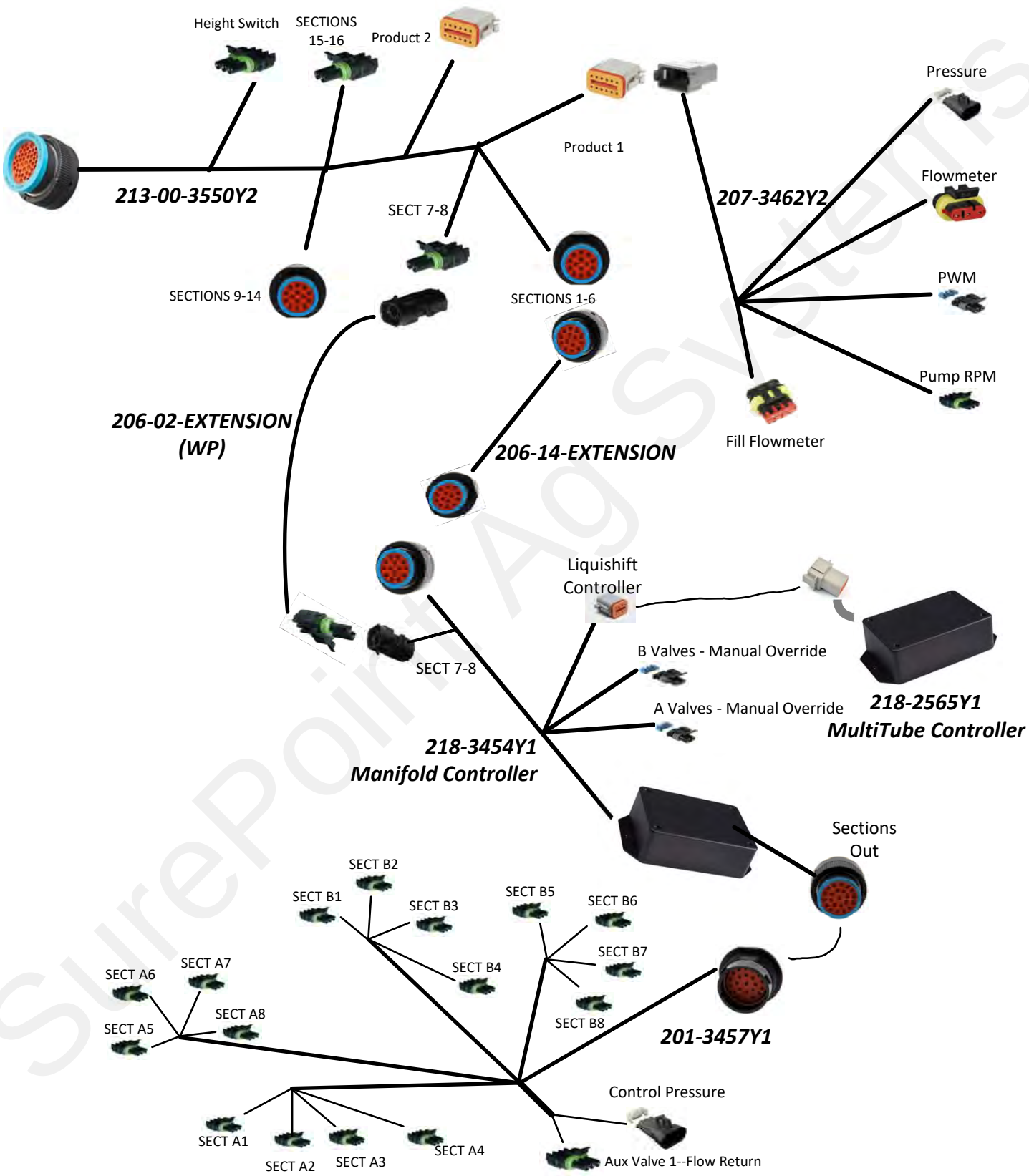

For typical operation, this box is NOT checked.


Green - Valve is ON.

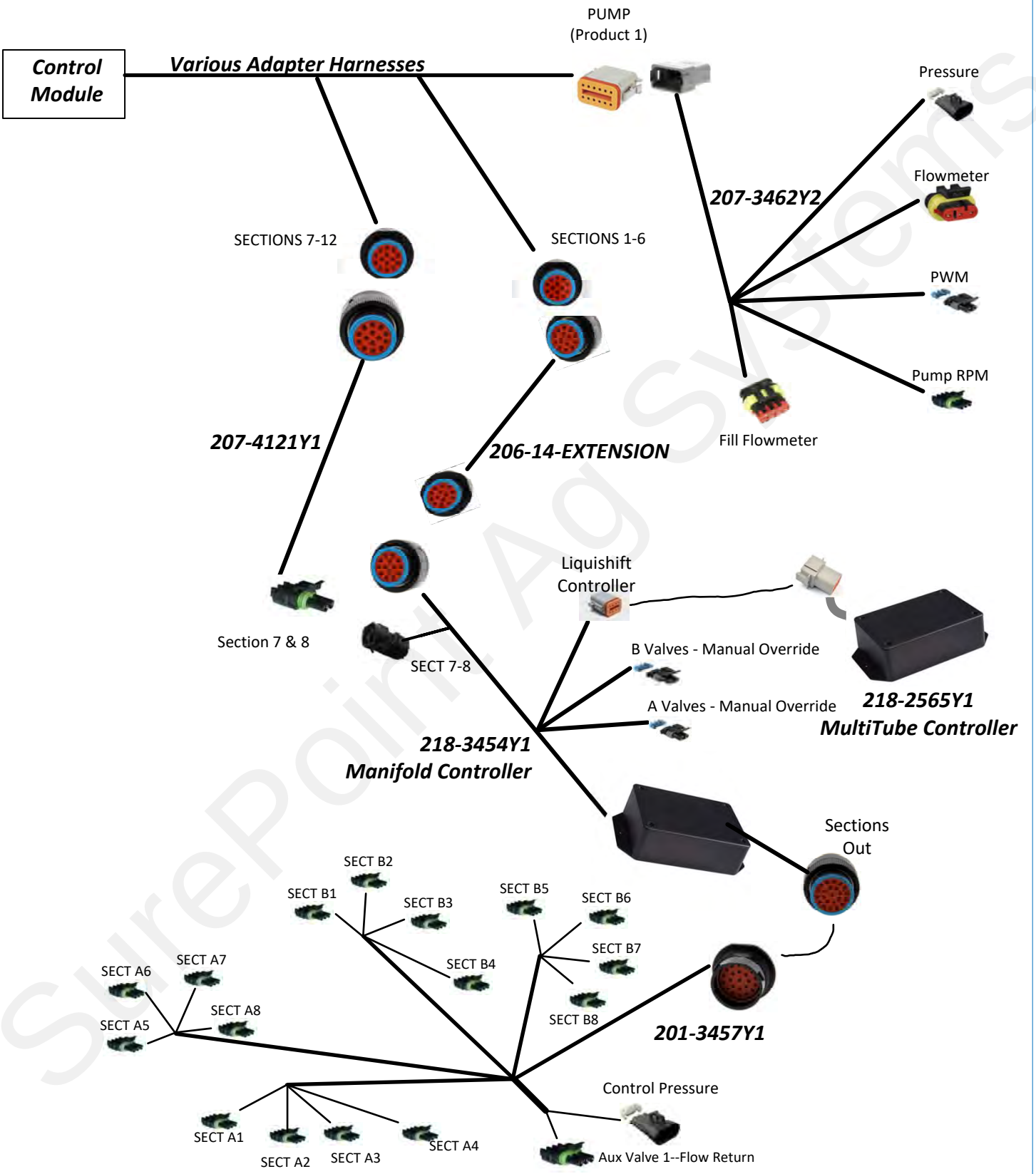
# Typical GEN 2 LiquiShift Harnessing Layout For 2 – 6 Sections



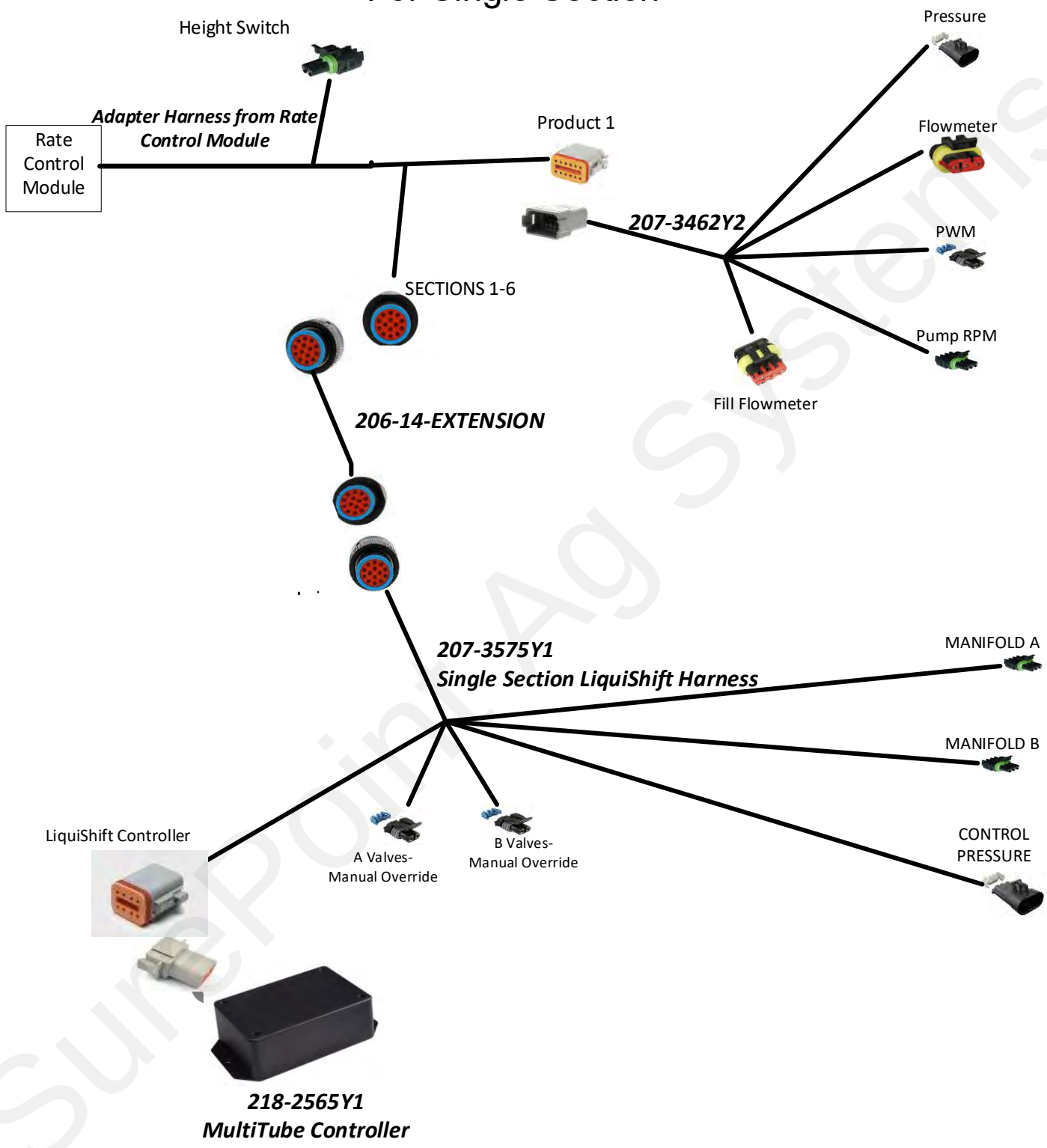
# GEN 2 LiquiShift Harnessing Layout
# For 8 Sections for JDRC 2000 with 47-pin



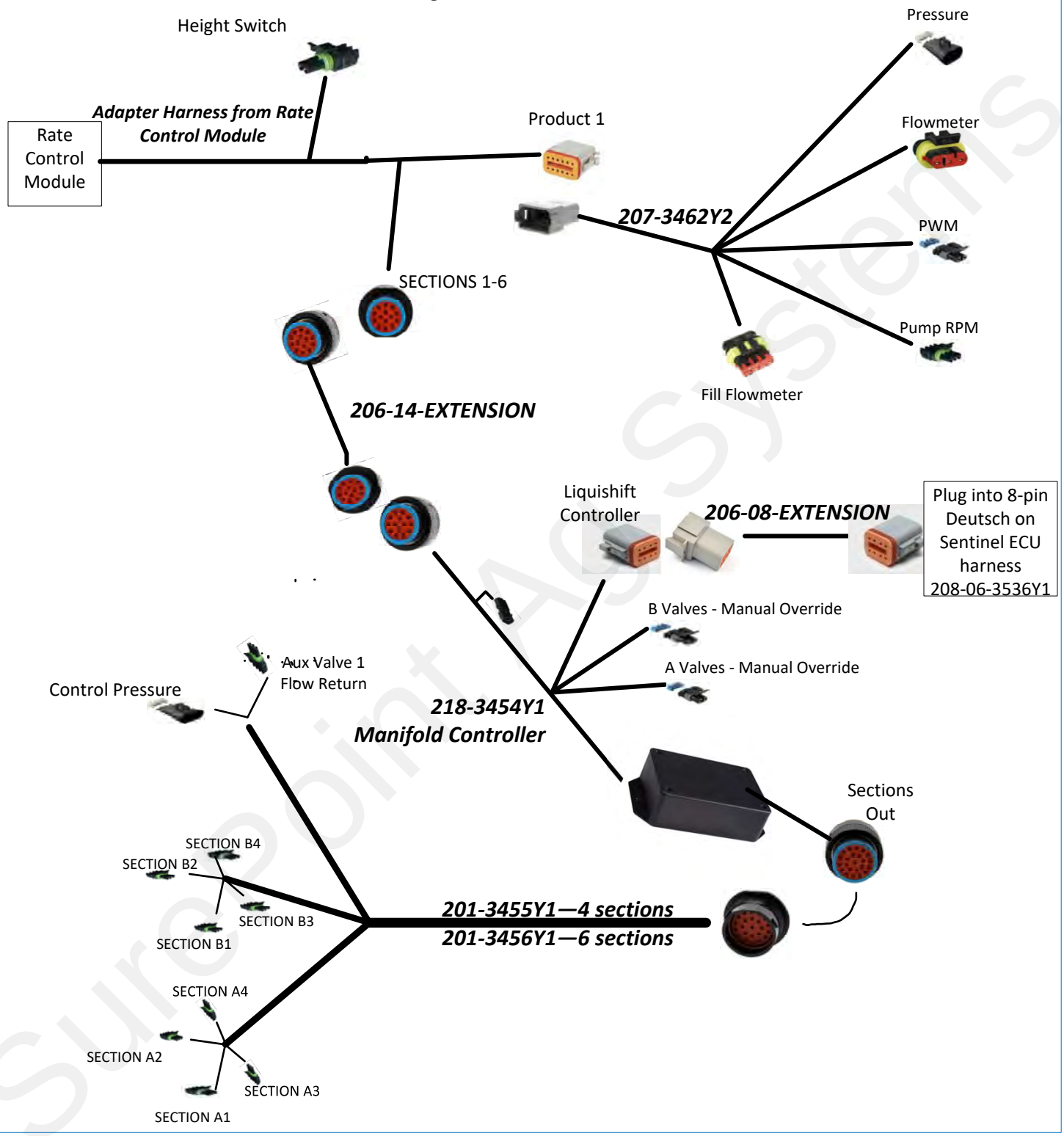
# Optional GEN 2 LiquiShift Harnessing Layout For 8 Sections



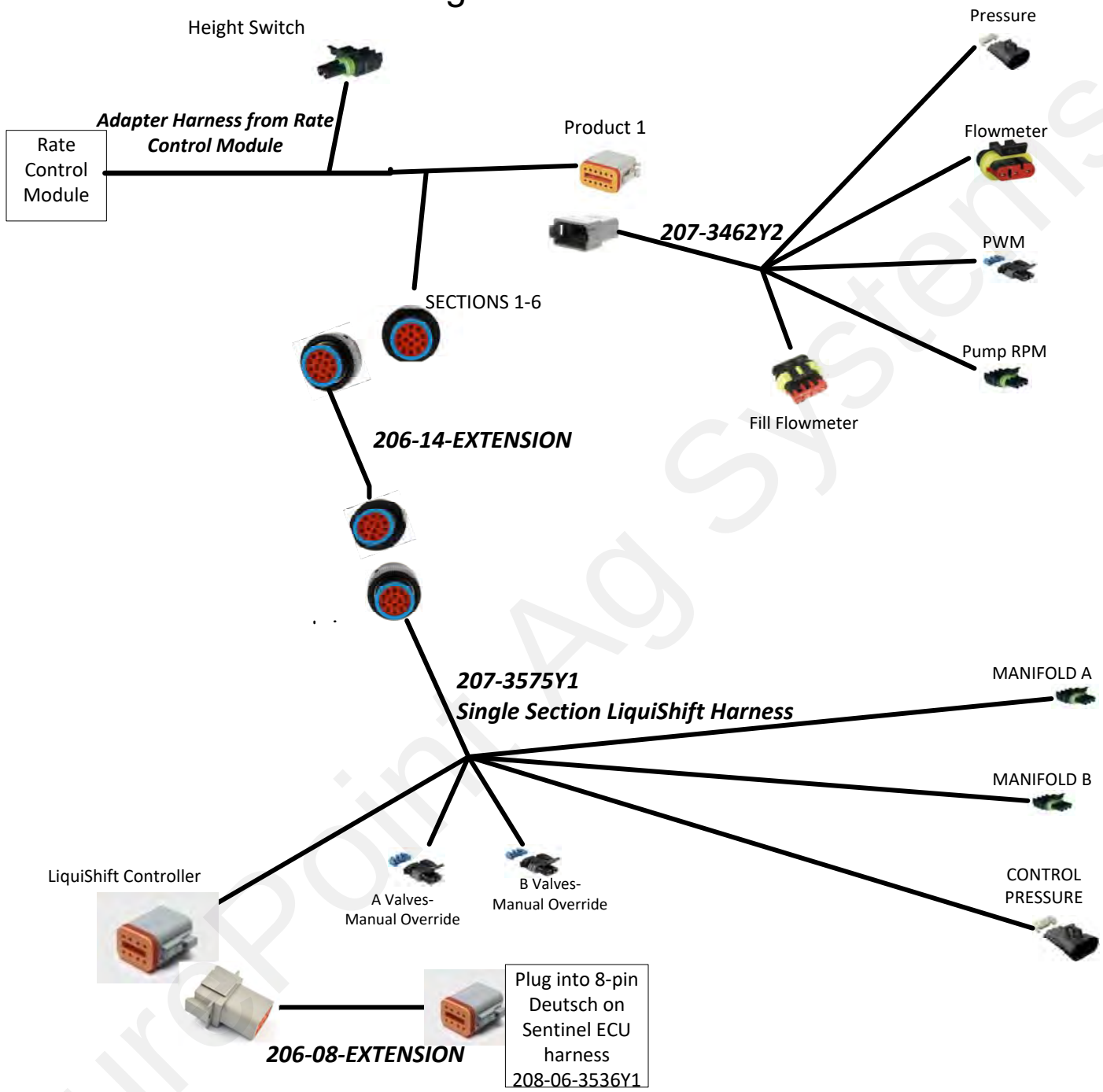
# Typical GEN 2 LiquiShift Harnessing Layout For Single Section



# Sentinel and GEN 2 LiquiShift Harnessing Layout for 2 – 6 Sections

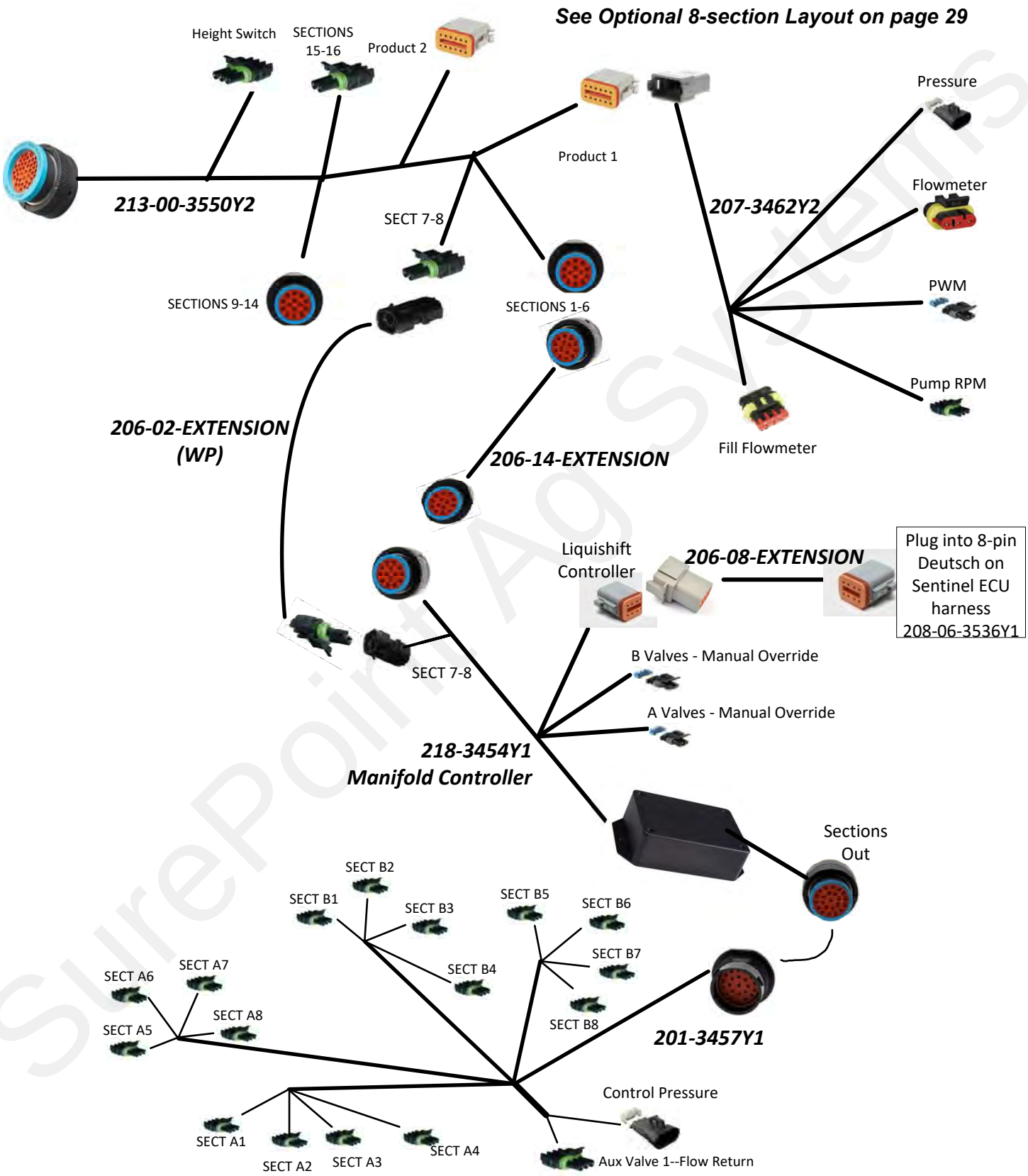


# Sentinel and GEN 2 LiquiShift Harnessing Layout For Single Section



# Sentinel and GEN 2 LiquiShift Harnessing Layout For 8 Sections for JDRC 2000 with 47-pin

*See Optional 8-section Layout on page 29*



## Pinouts for Main Connectors: Use these when troubleshooting electrical issues.

### SECTION VALVE

WP TOWER
3-PIN

| | | |
|---|---|---|
| RED | A | +12VDC |
| BLK | B | GND |
| vARIES | C | SIGNAL |

### CONTROL PRESSURE

150 MP SHROUD 3-PIN

| | | |
|---|---|---|
| PRP | A | Signal |
| RED | B | +12VDC |
| BLK | C | GND |

### Man. Override Switch A

150 MP Tower 2-PIN

| | | |
|---|---|---|
| WHT/BLU | A | Sect 9 |
| RED | B | +12V |

Connects to Toggle Switch A (217-3466Y1)

### B Valves-Man. Override

150 MP Tower 2-PIN

| | | |
|---|---|---|
| PNK | A | Sect 10 |
| RED | B | +12V |

Connects to Toggle Switch B (217-3466Y1)

### Product

12 pin Deutsch Female DT06-12SA

| | | |
|---|---|---|
| RED | 1 | +12V DC |
| BLK | 2 | GND |
| BLU | 3 | Flowmeter Signal |
| PUR | 4 | Pressure |
| YEL | 5 | PWM (+) |
| GRN | 6 | PWM (-) |
| BLU/WHT | 7 | Fill Flowmeter |
| ORG | 8 | Pump RPM |
| ORG/WHT | 9 | Bin Level Signal |
| | 10 | Open |
| BLK | 11 | Section 1 / 7 |
| BRN | 12 | Section 2 / 8 |

### Liquishift Controller

8 Pin Deutsch Female

| | | |
|---|---|---|
| +12VDC | 1 | RED 14 AWG |
| GND | 2 | BLK 14 AWG |
| Pressure 1 | 3 | PUR |
| PWM+ | 4 | YEL |
| PWM- | 5 | GRN |
| A Valves | 6 | WHT/BLU |
| B Valves | 7 | PNK |
| Empty | 8 | |

Mates with 218-2565Y1

### 23 Pin Deutsch HDP26-24-23SE Female Pins w/ Swivel Nut

| | | |
|---|---|---|
| BLK 14 AWG | A | Valve GND |
| BLK 14 AWG | B | Valve GND |
| RED 14 AWG | C | Valve Power |
| BLK | D | Section A1 |
| BRN | E | Section A2 |
| BLU | F | Section A3 |
| BLK/WHT | G | Section A4 |
| BRN/WHT | H | Section A5 |
| BLU/WHT | J | Section A6 |
| WHT/BLK | K | Section A7 |
| WHT/BRN | L | Section A8 |
| WHT/BLU | M | Section B1 |
| PINK | N | Section B2 |
| YEL | O | Section B3 |
| GRN | P | Section B4 |
| WHT | Q | Section B5 |
| WHT/YEL | R | Section B6 |
| ORG | S | Section B7 |
| WHT/GRN | T | Flow Return |
| ORG/WHT | U | Section B8 |
| | | |
| PUR | V | Pressure 1 Signal |
| | | |
| RED 14 AWG | W | Power |
| | X | Spare |

Label: Section OUT

Mates with 201-3455Y1, 3456Y1 or 3457Y1

### SECTIONS 1-6 (7-12)

14 pin Deutsch HDP24-18-14PE

| | | |
|---|---|---|
| RED | A | HC PWR 1 |
| RED | B | HC PWR 2 |
| BLK | C | HC GND 1 |
| BLK | D | HC GND 2 |
| YEL | E | PWM (+) |
| GRN | F | PWM (-) |
| PUR | G | Pressure |
| WHT/GRN | H | Flow Return Valve |
| BLK | J | Sect 1 / 7 |
| BRN | K | Sect 2 / 8 |
| BLU | L | Sect 3 / 9 |
| BLK/WHT | M | Sect 4 / 10 |
| BRN/WHT | N | Sect 5 / 11 |
| BLU/WHT | P | Sect 6 / 12 |