



SPIKER – OPERATORS MANUAL

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Version 1.0



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ABOUT THIS MANUAL

This manual includes instructions for installation, operation, maintenance and troubleshooting of the Liquid Systems (SA) Spiker Pump and Control Module.

All dimensions shown in this manual are in millimetres.

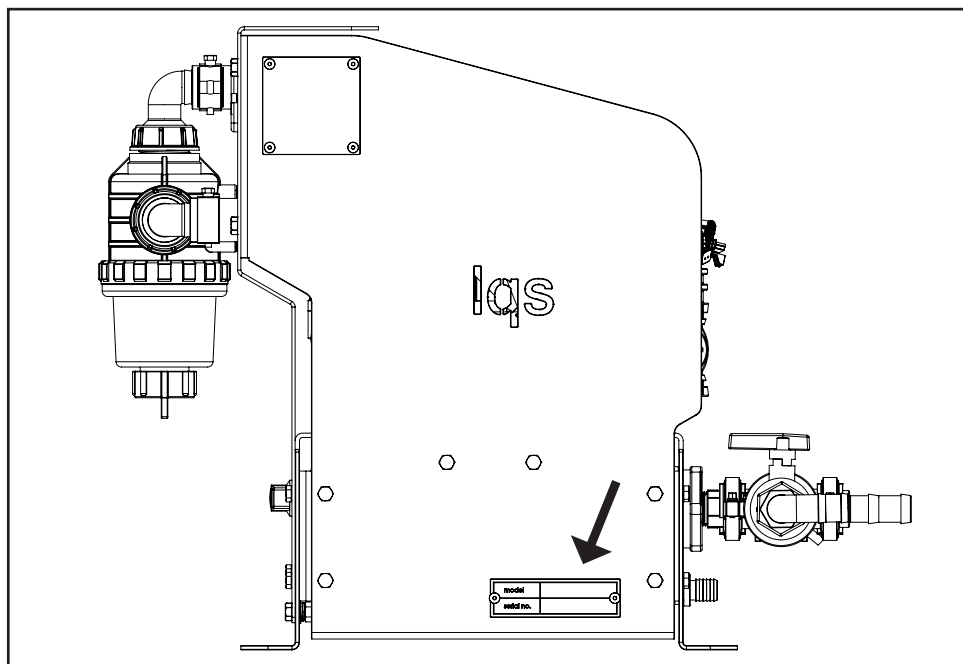
PRODUCT IDENTIFICATION

To enable identification of your product for parts, service and support, each Liquid Systems (SA) module has a model no. and serial no. inscribed on a plaque on the side of the module.

For quick reference, we suggest writing your model no. and serial no. in the spaces below.

Model No. _____

Serial No. _____



WARRANTY

Liquids Systems (SA) provides a 12 month Warranty from the date of installation provided that a Warranty Registration Form has been returned to Liquid Systems (SA) within 30 days of installation.

SAFETY AND DAMAGE WARNINGS

The terms WARNING, CAUTION and NOTE are used throughout this manual to stress the importance of personal safety, potential machinery damage and useful operating information.

Term description and usage is shown below.

⚠ WARNING: Indicates the strong possibility of severe personal injury or damage to machinery if instructions are not followed.

⚠ CAUTION: Highlights hazards, unsafe or unwise practices which could cause personal injury, property damage, damage to your machinery or loss of potential crop yield if instructions are not followed.

👉 NOTE: Refers to important and useful information which should not be overlooked.

⚠ WARNING:

Always wear protective gloves, eyewear and clothing when dealing with liquid fertilizers and other liquid agricultural products.

Do not disconnect any hose lines while the pump is running.

Ensure power is switched off or disconnected when connecting or disconnecting any electrical components of the system.

Always ensure the tank lid or a vent/overflow valve is open to allow air to escape when filling product tank.

⚠ WARNING:

Use of phosphoric acid with this equipment will void the warranty.

ABOUT THE SYSTEM

The Spiker Pump and Control Module has been designed to provide accurate rate control of liquid nutrients and crop care products that are to be injected at low flow rates into the output of a primary liquid rate control module.

This allows independent rate control of the primary liquid carrier and the injected product.

Currently supported electronic control systems include:

- John Deere Greenstar™ displays with Greenstar Rate Controller or Rate Controller 2000
- Ag Leader Versa, Integra and InCommand 800 or 1200 displays
- Topcon Eagle 15, X20, X30 and X35 displays via MDECU or Apollo ECU
- Trimble FmX, CFX-750 and TMX-2050 and GFX-750 displays via Field IQ module
- Dickey John IntelliAg ISOBUS controllers
- Liquid Systems (SA) L2 dual liquid controller

Options are also available for ISOBUS VT capable displays. Contact Liquid Systems (SA) for advice on integration with other brands of controller.

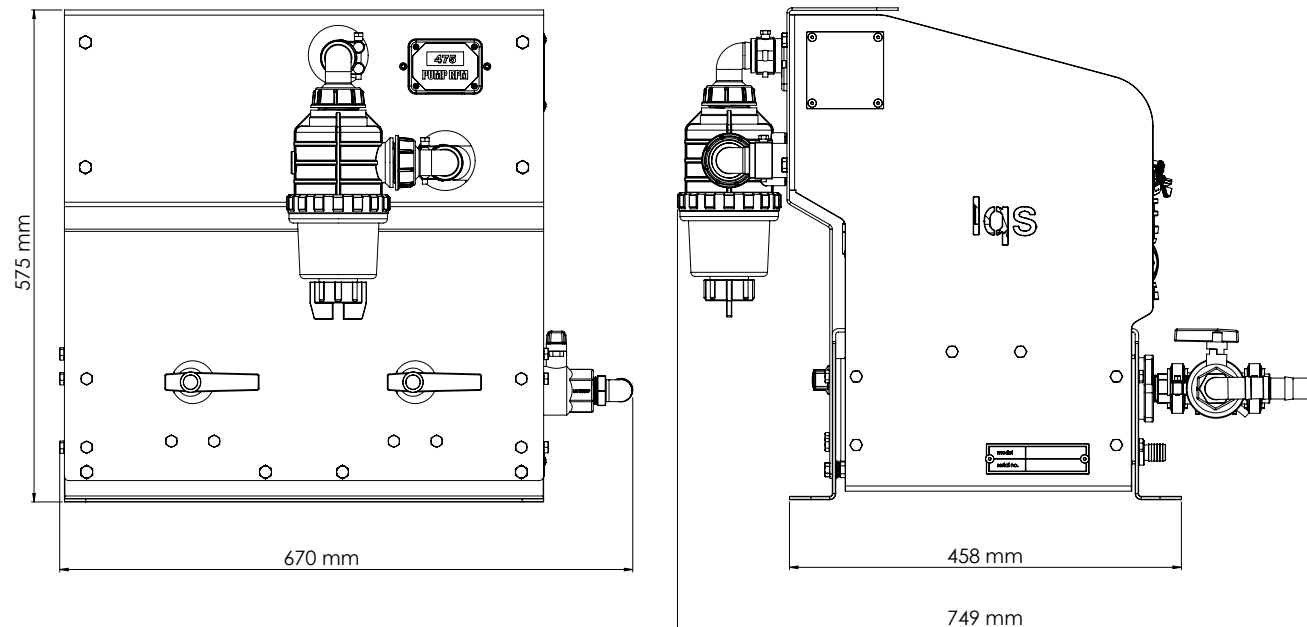
This manual provides instructions for integration with Greenstar™ Rate Controllers and display.

SYSTEM COMPONENTS

Module

Cabinet material 4 mm (base and stand), 3 mm (cabinet). All made from 304 stainless steel

Weight 50 kg



Tank Plumbing Kit

The tank plumbing kit provides all tank fittings, components and lines for connecting the module to product and flush tanks and the downstream distribution system.

Suction Lines x 2



Servo Bypass & PRV Line



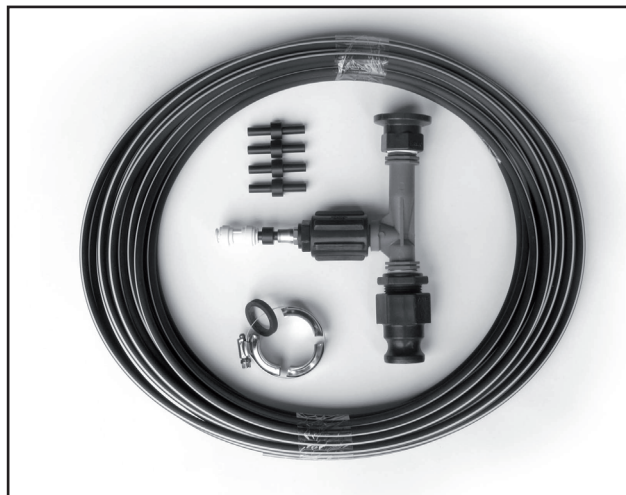
Purge Line



Product Suction Drain Kit



Venturi Induction Kit



Tank Agitation Kit



HYDRAULIC REQUIREMENTS

The Bertolini 2025 pump in this system is driven by a speed protected hydraulic motor. The hydraulic requirements are specified below:

Displacement per Revolution	32cc/revolution
Max Operating Speed	650 rpm
Max Hydraulic Pressure	1500 psi
Max Hydraulic Flowrate	20.8 L/min, 5.5US Ga/min, 4.6 Imp.Ga/min

ELECTRICAL REQUIREMENTS

The Spiker Pump and Control Module requires 12V electrical power for the Auto-Rate Control Valve Set and digital Pump Speed readout. The Spiker draws power through it's connection to an electronic control system.

Nominal Voltage	12V
Maximum Current	1.3A

Hydraulic Sandwich Block

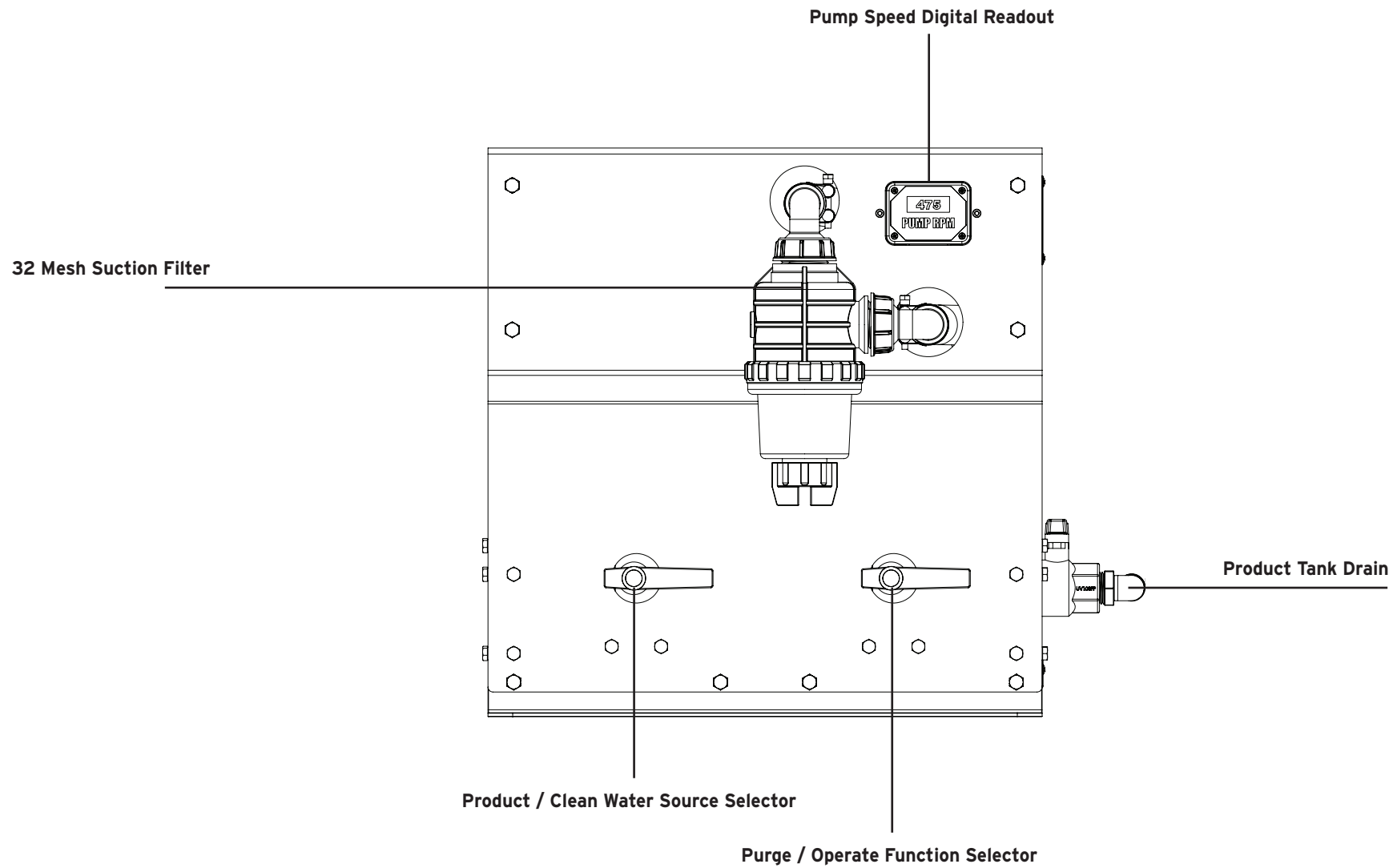


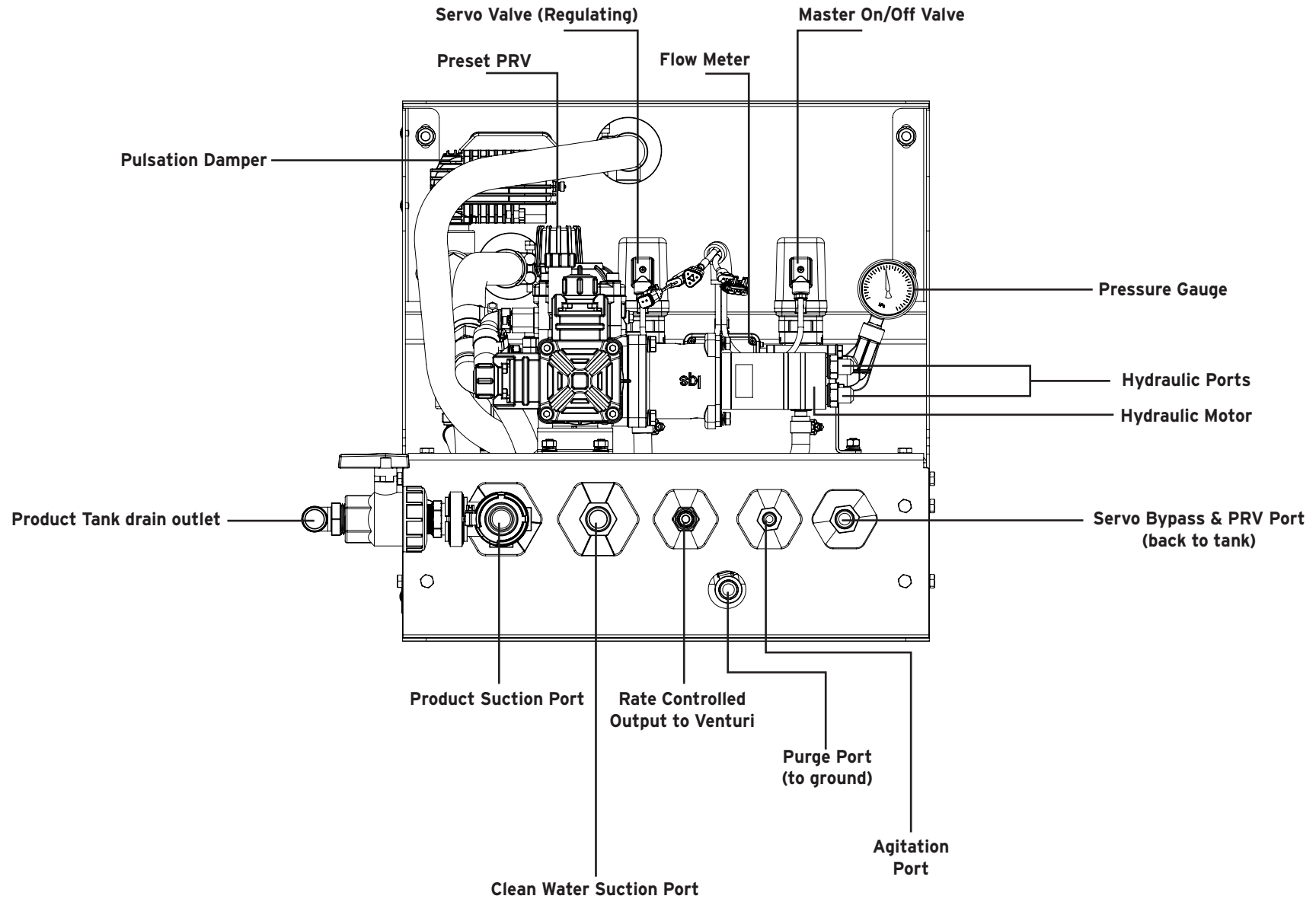
Hydraulic Hose Kit



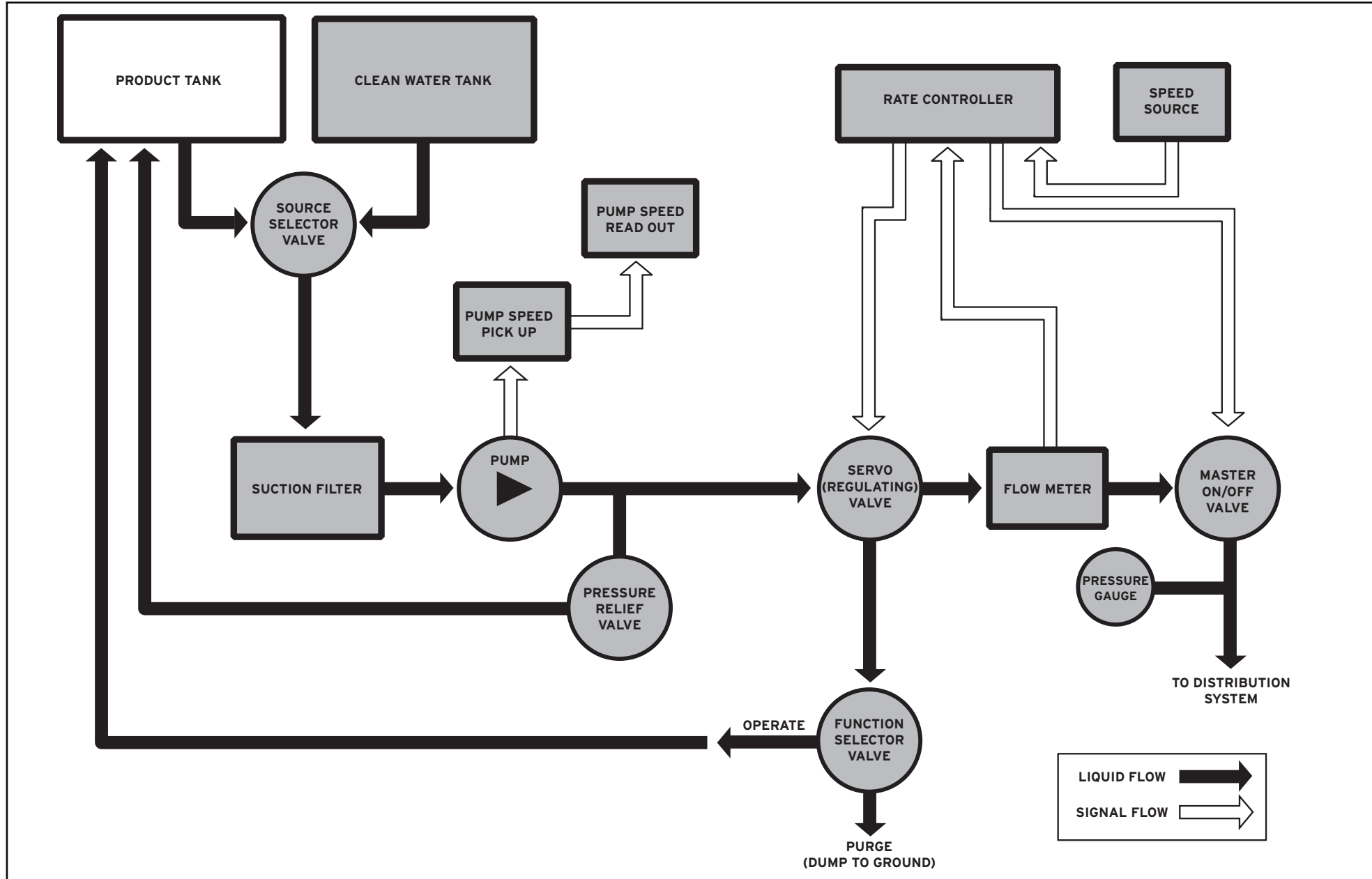
MODULE COMPONENTS

FRONT VIEW





Spiker SYSTEM LAYOUT



MOUNT MODULE

The Spiker module needs to be mounted on an existing implement such as an air seeder cart or dedicated liquid cart. The most suitable location for mounting the module will depend on the configuration of implements being used.

Factors to consider when selecting a mounting location.

- Ensure the mounting of the module does not interfere with functionality of implement. E.g. Steering, Augers, fans.
- Lengths of hydraulic hose required to connect to the module.
- Location of electronic controller components and lengths of electrical cabling required. (Liquid Systems can provide extensions harnesses if required.)
- Distance from product and fresh water tanks for suction and return lines.
- Routing of suction and return lines.

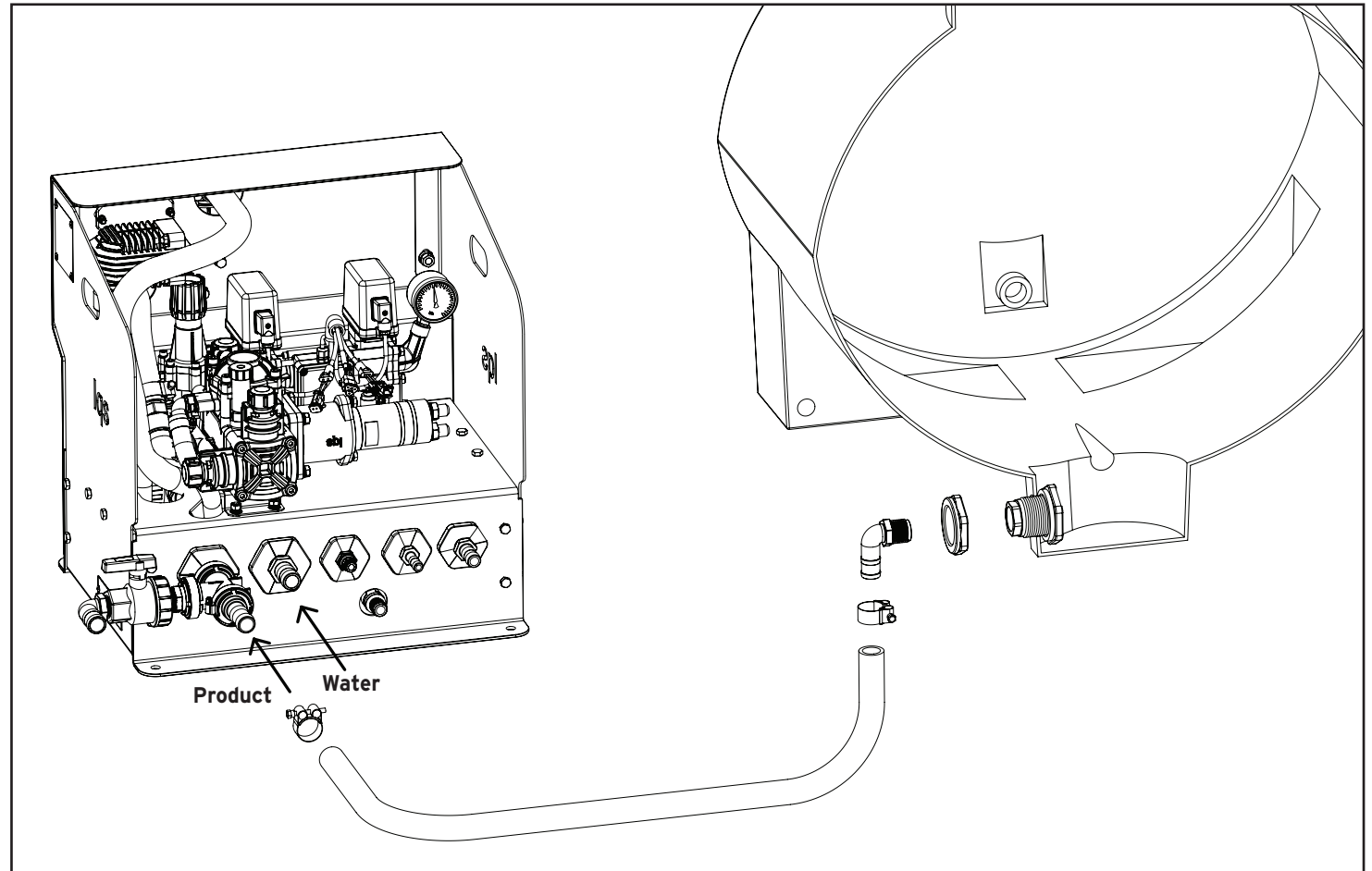
Ensure hardware used for mounting will support the weight of the module. Slots for fasteners exist in the base of the module for attaching to support beams.

INSTALL TANK PLUMBING

Suction Lines x 2

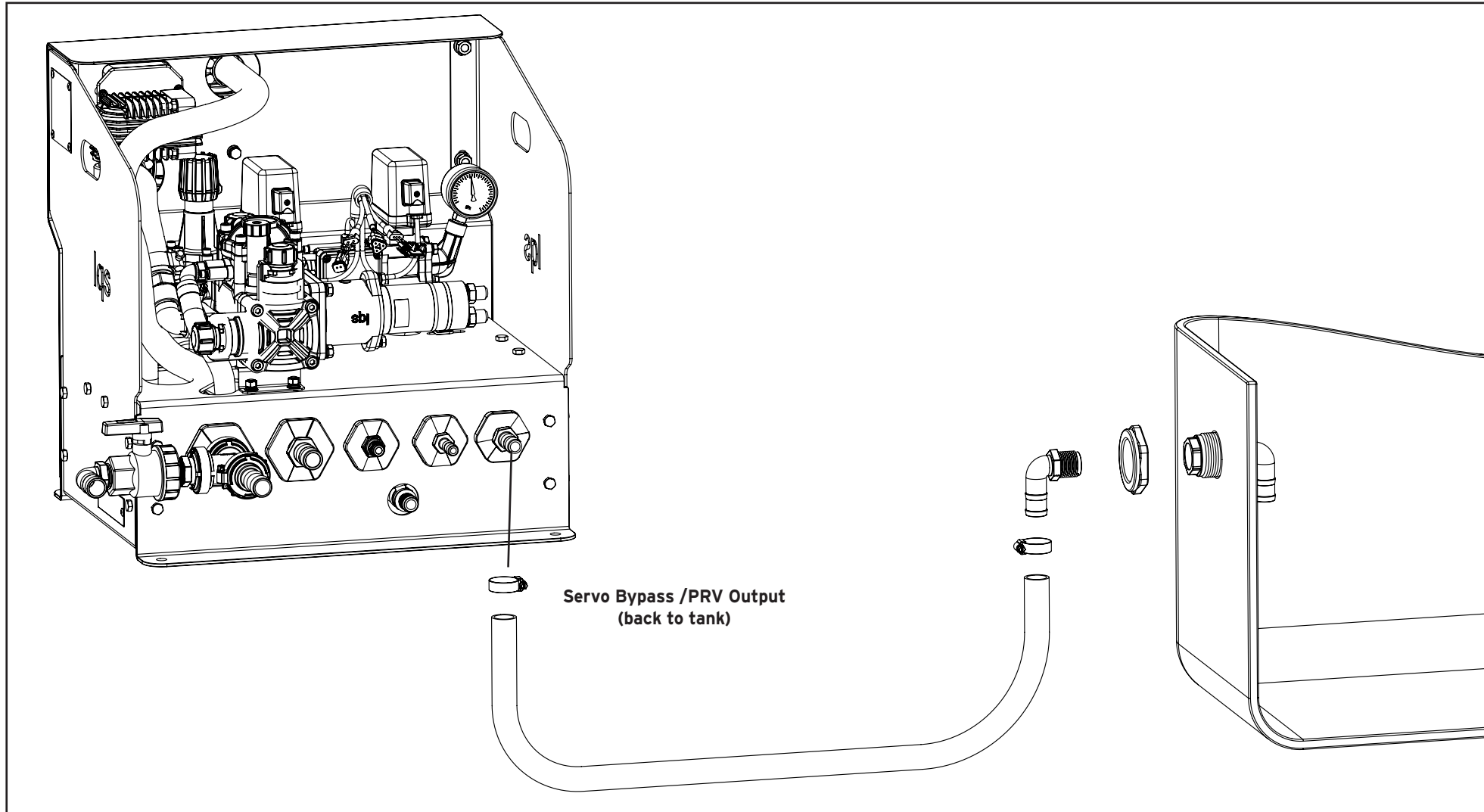
Hose fittings for 2 suction lines are included for connecting the module to product and clean water tanks.

1. Cut 57mm diameter hole in sump or base of tank. It must be on a flat surface and requires 13mm clearance around the hole internally and 20mm externally.
2. Install tank outlet assembly and assemble suction line as shown. Cut 25mm suction hose to suitable length for routing from tank to module.
3. Attach suction line to appropriate suction port on rear of module.



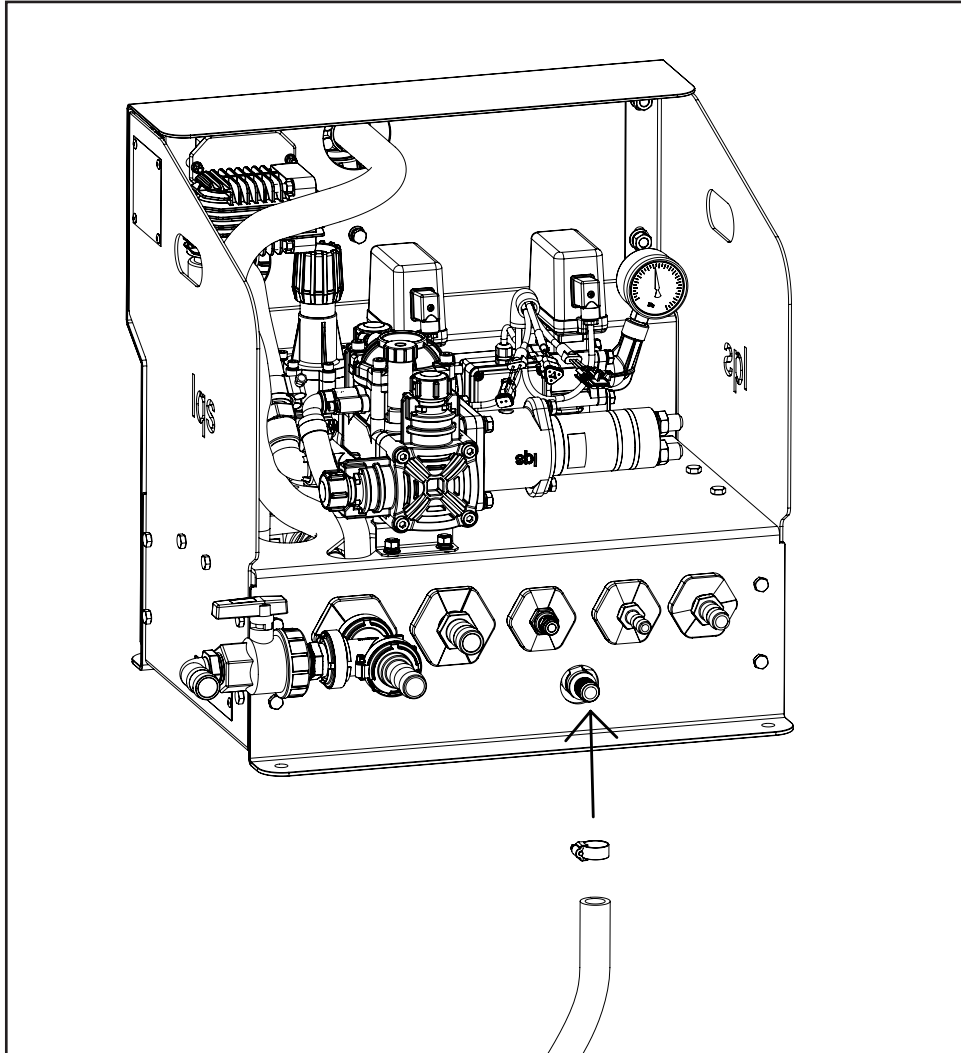
Servo Bypass /Pressure Relief Valve Return Line

1. Cut 44mm diameter hole in tank. It must be on a flat surface and requires 13mm clearance around the hole internally and 20mm externally.
2. Install tank fitting and assemble Servo bypass return line as shown. Cut 20mm pressure hose to a suitable length for routing from tank to module.
3. Attach line to servo bypass/PRV dump outlet on rear of module



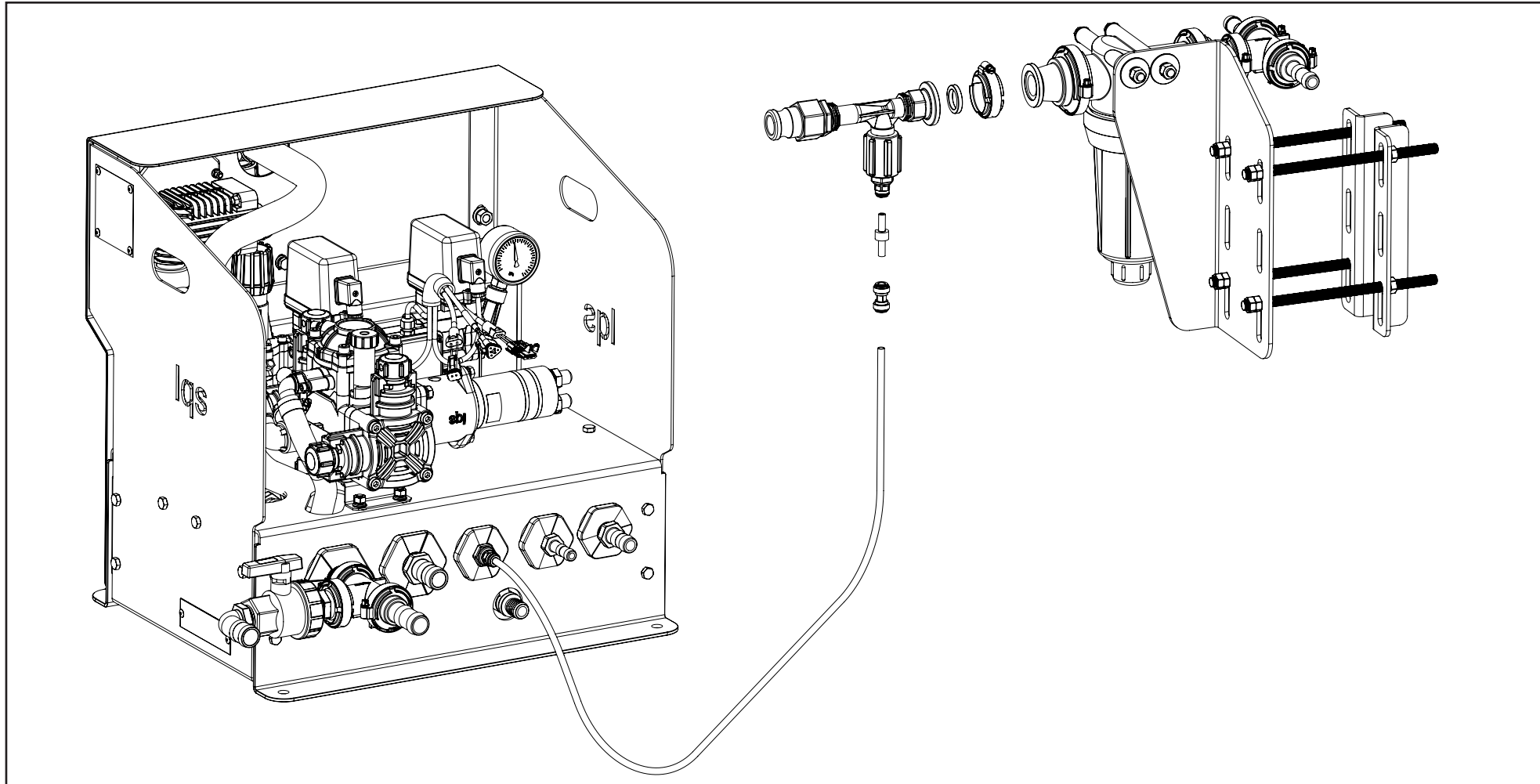
Purge Line

1. Assemble and attach Purge line as shown.



Venturi Induction Kit

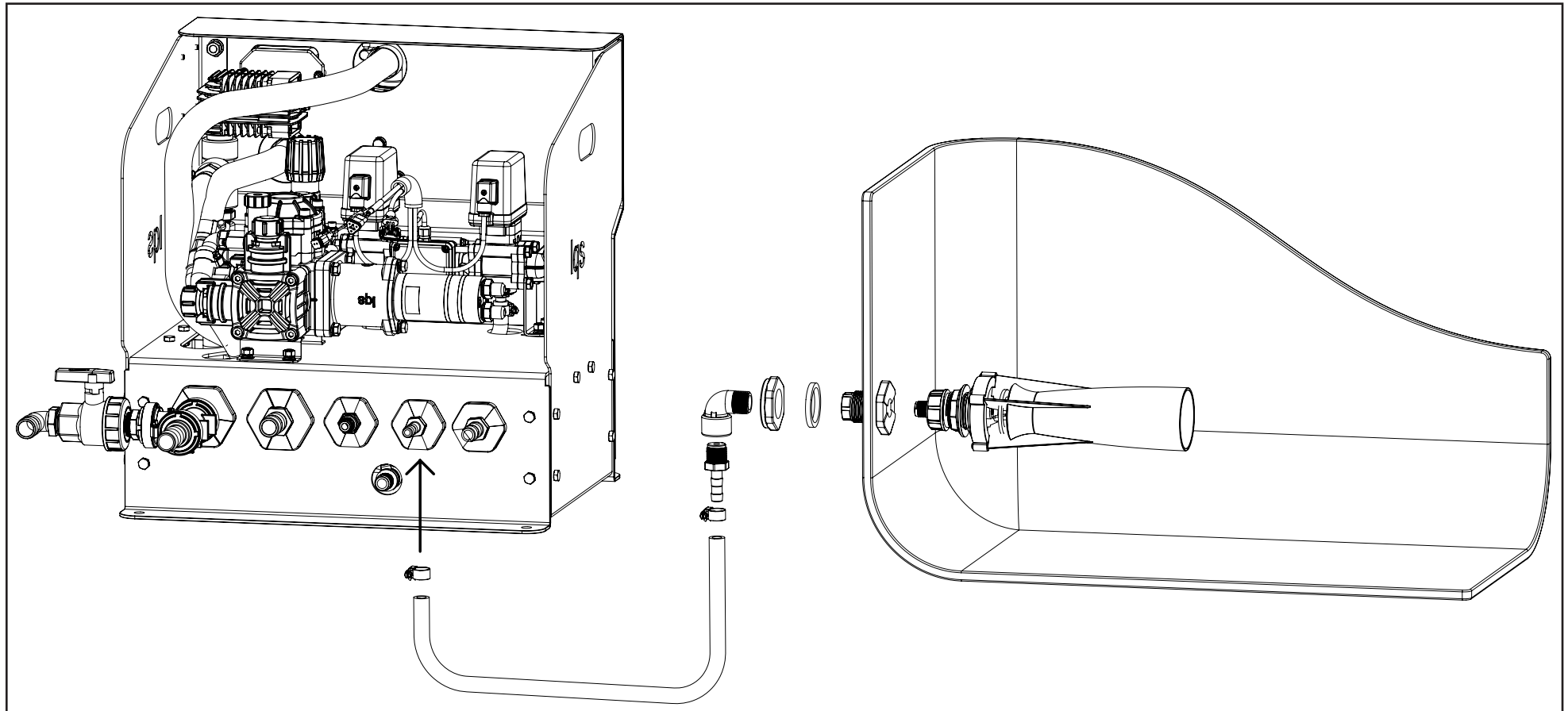
1. Connect 8mm tubing to metered output port on rear of Spiker module
2. Route 8mm tubing to Induction Filter Assembly of Stacker Distribution System.
3. Cut 8mm tubing to length required with tube cutters.
4. Attach Venturi Induction Assembly to Induction Filter Assembly of Stacker Distribution System with flange clamp and gasket provided.
5. Connect umbilical line to Stacker Distribution System mounted on bar.
(Mounting bracket may differ from image shown.)



Tank Agitation Kit

Install the tank agitation kit as follows.

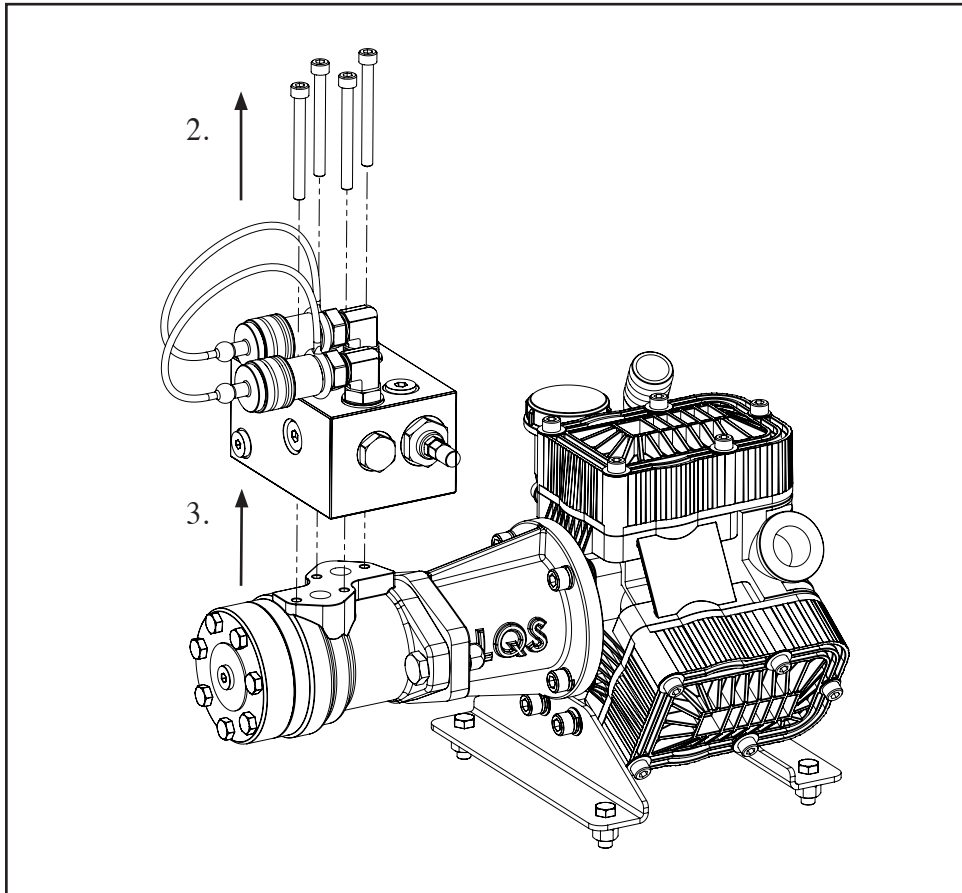
1. Select a mounting location for the agitator in the tank. The location should be close to the bottom of the tank.
2. Cut a 44mm diameter hole in the tank at the selected location. It must be on a flat surface and requires 13mm clearance around the hole internally and 20mm externally.
3. Assemble and install tank agitation kit as shown in diagram. Agitator should point towards the bottom of the tank.
4. Connect agitation line to agitation port on rear of module.



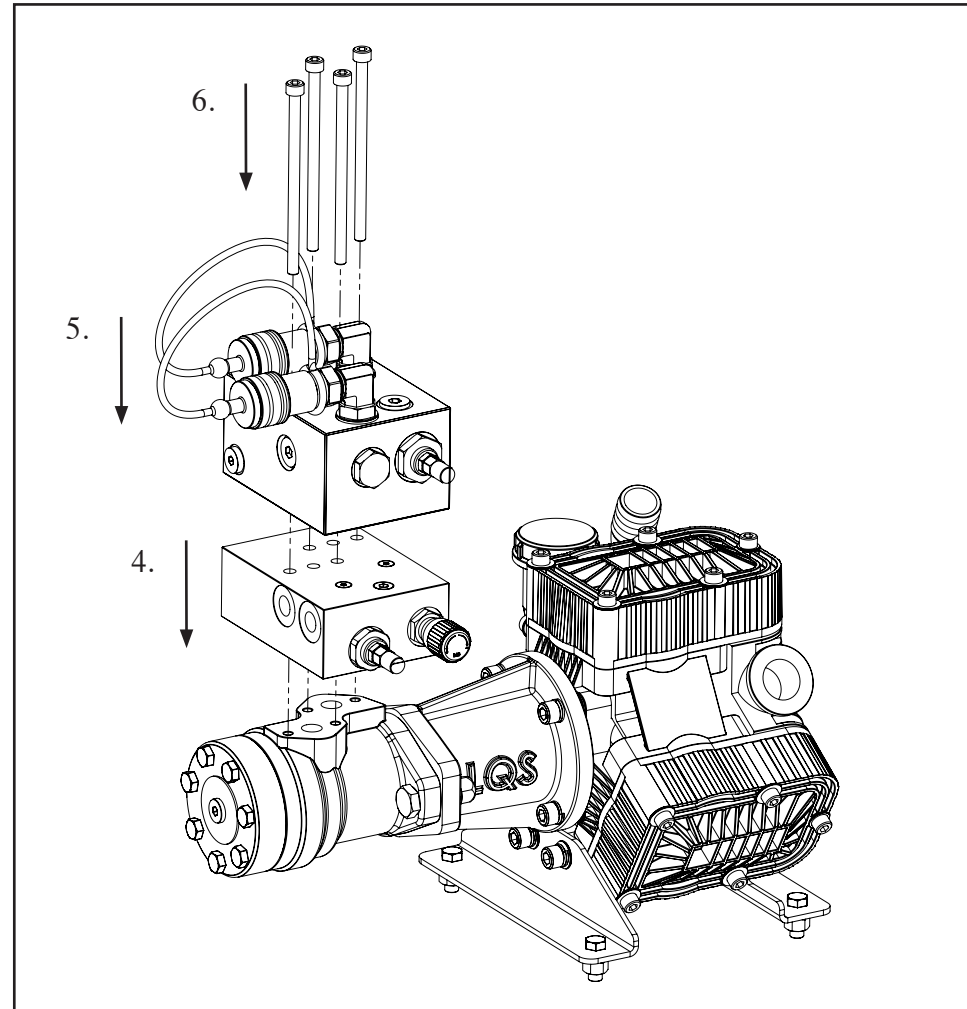
Install Spiker Hydraulic Sandwich

The hydraulic sandwich needs to be installed on the primary rate control module in the setup. It allows the Spiker pump to be hydraulically driven in series with a pump on the primary module.

1. Disconnect hydraulic lines from flow control block on primary module.
2. Undo socket head cap screws on hydraulic flow control block.
3. Remove hydraulic flow control block from hydraulic motor.

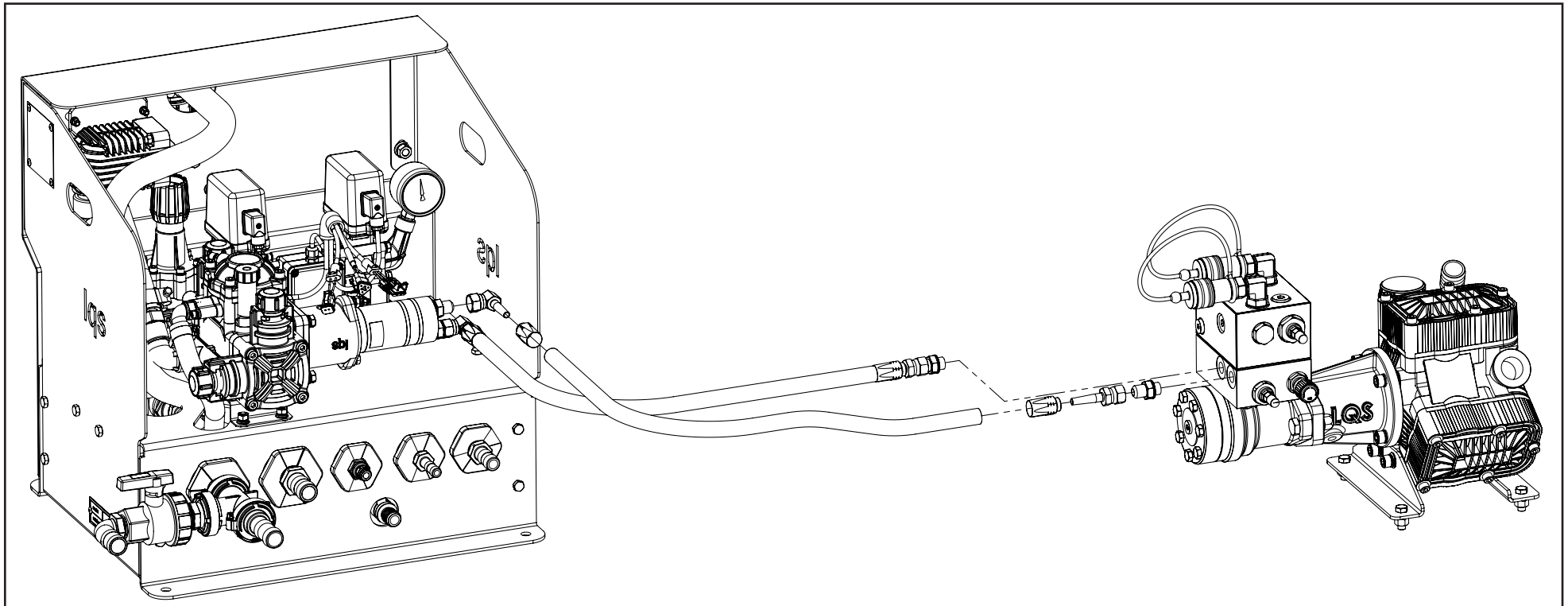


4. Place Spiker Series Sandwich block in position on hydraulic motor.
5. Place Flow Control Block in position on top of Spiker Series Sandwich.
6. Use 140mm socket head cap screws to secure primary Flow Control block and Spiker Series Sandwich to hydraulic motor of primary module.



Install Spiker Hydraulic Sandwich Cont.

Use hydraulic hose and fittings supplied to connect the Spiker hydraulic motor to the Spiker series sandwich.



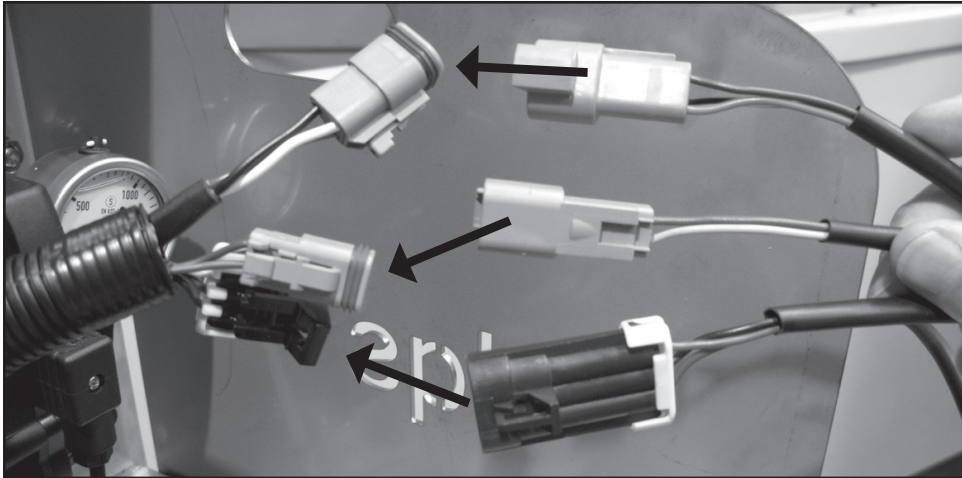
⚠ WARNING: Do not connect Spiker hydraulics in series with any other equipment unless specifically instructed to by Liquid Systems (SA).

CONNECT ELECTRONICS

Refer to manufacturer's documentation for installation of precision ag displays and electronic control modules.

Use a Liquid Systems adaptor loom to connect the Spiker Module to the installed control system.

Liquid Systems adaptor looms will have matching connectors to connect to devices on the Pump and Rate Control Module - flow meter, master on-off valve, regulating valve.



⚠ WARNING: Ensure electrical power is disconnected before connecting electronic components.

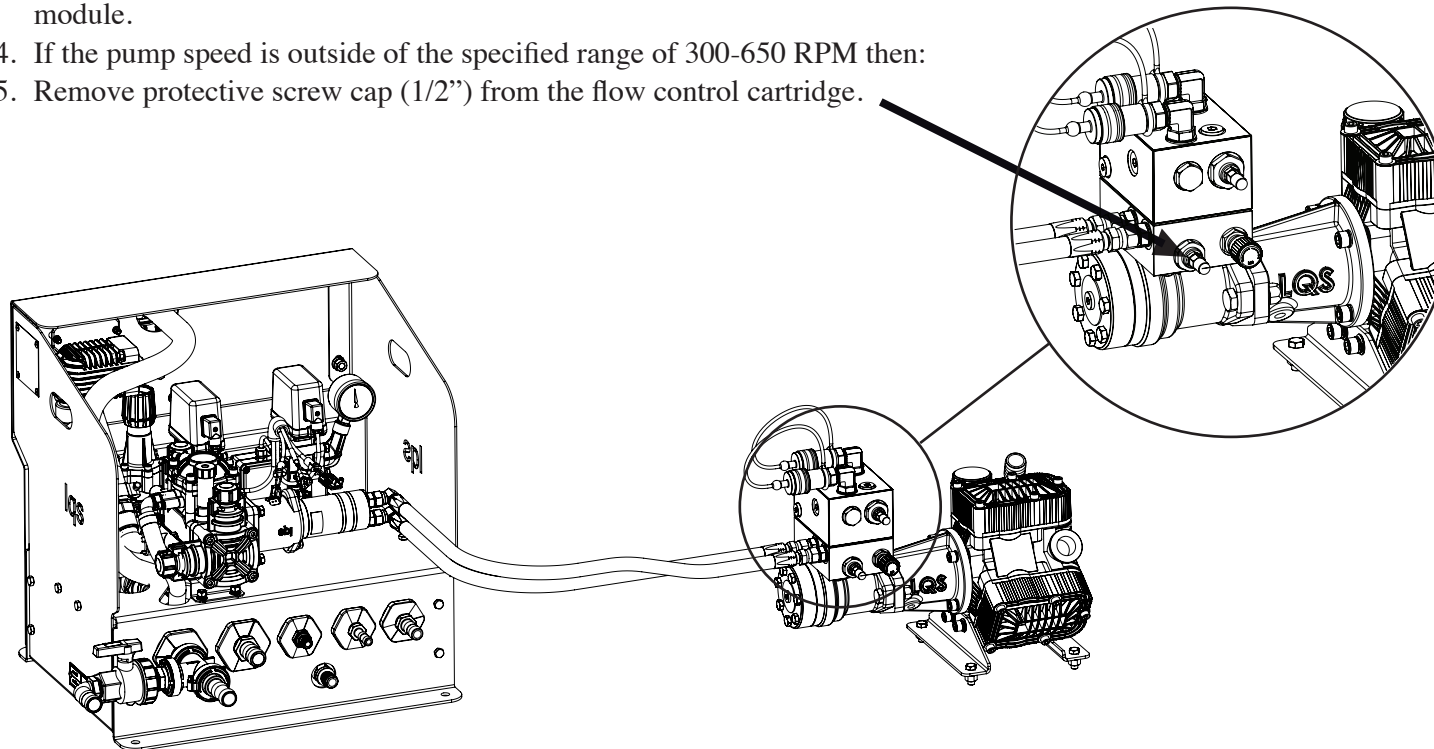
CHECK AND ADJUST PUMP SPEED

The module has been wet-tested at the factory. Pump speed has been pre-set via the hydraulic flow control block to 500 RPM as part of the test procedure.

Due to differences in hydraulic sources, in some cases, the pump speed after installation may be different to the factory setting. In rare cases, the hydraulic flow may be temporarily blocked.

Use the following procedure to check and adjust the pump speed.

1. Ensure a source tank is selected which contains either water or liquid product.
2. Apply hydraulic power to the pump.
3. Check pump speed on the digital pump speed readout on the front of the module.
4. If the pump speed is outside of the specified range of 300-650 RPM then:
5. Remove protective screw cap (1/2") from the flow control cartridge.
6. Loosen locking nut (9/16")
7. Use an Allen key (3/16") to turn the adjusting screw – **anti-clockwise** to **increase** the speed.
8. Set pump speed between 300 and 650 RPM (check speed on digital readout).
If the hydraulic oil has not reached its usual operating temperature, do not set the pump speed above 590 RPM.
9. Tighten locking nut.
10. Replace and tighten aluminium screw cap.
11. Monitor pump speed after initial adjustment to confirm that it remains stable and within the specified range of 300 to 650 RPM.



! CAUTION: Pump may run up to 50 RPM faster when hydraulic oil temperature increases with use so allow for this when setting up with cold oil.

! CAUTION: Higher pump speed will deliver greater liquid flow for application and tank agitation but do not exceed the maximum specified speed.

CONTROLLER SETUP

Refer to manufacturer's documentation for instructions on setup of liquid rate control in the Precision Ag system being used. The following information will assist.

Control Type	Servo valve in bypass configuration with separate master shutoff valve.
Servo Valve	12V, 2 wire input
Shutoff Valve	12V, 3 wire positively switched
Flow Meter	Cal. Factor = 6000 pulses/litre, 22712 pulses/US Gal

FLOW METER CALIBRATION

The Arag Flowmeter used in the Spiker Valve Set has a standard calibration factor of 6,000 pulses/litre (22,712 pulses/US Gal). This will usually provide reasonable accuracy when entered into an electronic controller. However, Liquid Systems (SA) recommends conducting a flowmeter calibration test of each flowmeter to ensure optimal system accuracy.

Applied Method

This method requires the operator to apply a known amount of liquid. Liquid Systems recommends using this method at a paddock scale when applying actual product. Measurement of actual amount applied can be achieved by various methods such as:

- Measure the amount applied by marking a start level on the tank and then measuring with a separate high volume flowmeter the volume it takes to refill the tank to this level.
- Measure the amount of liquid into an empty tank with a separate high volume flowmeter. Apply all the liquid in the tank for the calibration run.
- Apply a complete tank of liquid and use the tank's specified volume for calibration.

Catch Method

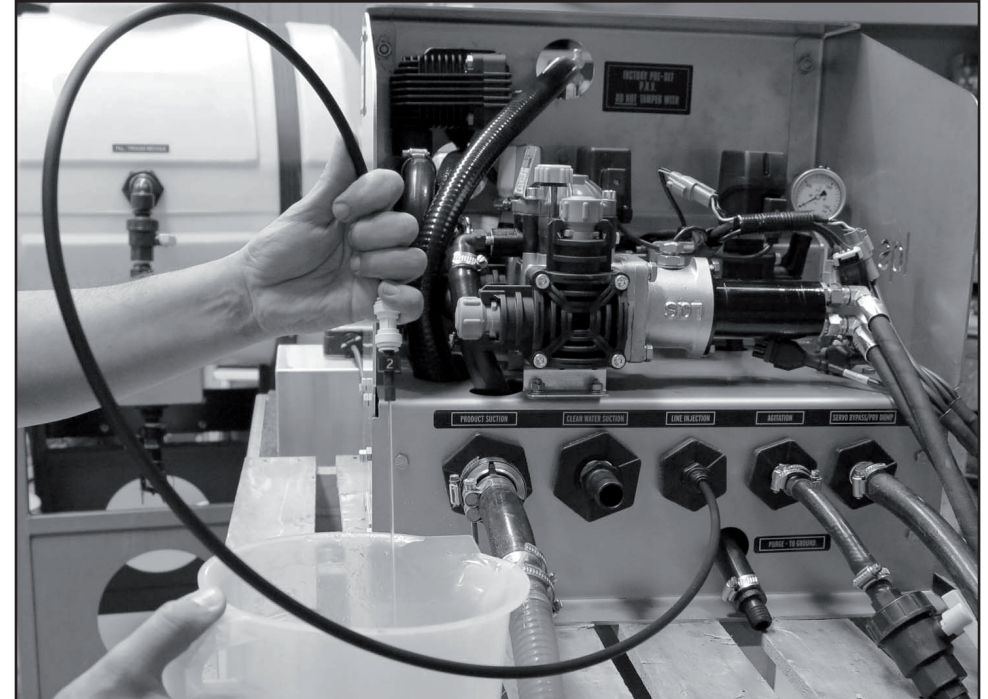
This method involves catching and measuring an amount of liquid that the system outputs. Collect the output of the Spiker module in a large bucket and accurately measure the amount collected.

For either method, calculate the revised calibration factor use the following equation:

$$\text{New Cal Factor} = \frac{\text{Old Cal Factor} \times \text{Volume Applied (screen)}}{\text{Volume Applied (measured)}}$$

Alternatively some controllers have in built calibrate functions that perform this calculation.

NOTE: Depending on the physical properties of the product being applied, it may be more accurate to calibrate the flow meter using the actual product rather than water.





STARTUP

1. Turn source selector valve to “Product” and function selector valve to “Operate”.
2. Check hydraulic lines are connected to the Spiker module.
3. Check electric power is connected to the electronic control system.
4. Setup rates to be applied in electronic control system. Refer to your electronics supplier manuals for instructions.
5. Start hydraulic flow to Spiker module.
6. Enable liquid application in the electronic rate control system and commence planting & fertilizing operation.

MONITORING

Monitor liquid application via your electronic controller display.

Things to look out for are:

- Sudden changes in actual rate applied.
- Low tank level.
- Sudden changes in pressure.
- Fluctuating application rates.

Refer to Troubleshooting Section of this manual to resolve issues.



⚠ CAUTION: Flushing the system at a pressure above 5 bar (73 psi) may put water into the product tank via the pressure relief valve.

Liquid will flow from the purge dump line when function selector valve is set to “Purge”.

FLUSH SYSTEM (STATIC)

1. Stop tractor. Ensure brakes are effectively applied.
2. Stop hydraulic power to the Spiker module.
3. Switch source selector valves to “Clean Water” and function selector valve to “Purge” on the front of the module.
4. Enter a manual ground speed or use a diagnostic function (eg. Greenstar Nozzle Flow Check) in controller to pump clean water through system. Select a ground speed and rate that creates a pressure of approximately 5 bar.
 - Test speed = use normal operating speed
 - Rate = select a rate that creates a pressure of approximately 5 bar (73 psi).
6. Start pump just prior to initiating flow in the controller.

SHUTDOWN

When planting and fertilising operation is complete.

1. Drain Product Tank
2. Drain Product Suction Line.
3. Rinse Product Tank with clean water
4. Flush the module and Distribution System with clean water.
5. Drain Clean Water Tank
6. In climates where temperatures drop below freezing, fill Clean Water Tank with pre-mixed automotive antifreeze and perform a static System Flush.

FLUSH SYSTEM

Frequency - When in use once daily and when the system is to be shut down for an extended period.
Refer to Flush System (Static) instructions in Section 5.

CHECK & CLEAN SUCTION FILTER

Frequency - twice daily when system is in operation.



1. Remove yellow end cap. Catch any escaping liquid in a bucket.



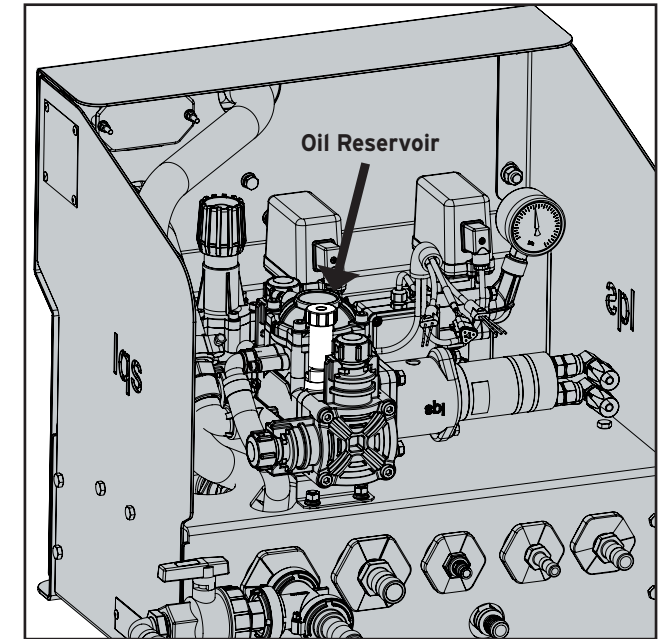
2. Unscrew filter bowl from body.
3. Inspect and clean screen. Replace screen if damaged.
4. Check seating of O ring.
5. Replace screen and screw bowl back into place
6. Replace end cap.

Refer to the spare parts section of this manual for replacement parts.

⚠ WARNING: Liquid will escape from the filter during this process. Ensure suitable protective gloves and clothing are worn when performing this task.

CHECK PUMP OIL LEVEL

Frequency – daily when system is in operation.
Pump oil level can be checked in reservoir on top of tank. If oil level is low, top up with SAE 30 oil.
Discoloured oil or loss of oil indicates a problem.



Refer to Bertolini 2025 Pump Manual for Maintenance instructions.

⚠ CAUTION: It is important when reassembling the suction filter that the screen bowl assembly be re-located correctly to the filter body. The pin location is crucial to operation of the filter. The pin activates a valve that will prevent the pump from sucking liquid if it is not seated correctly.

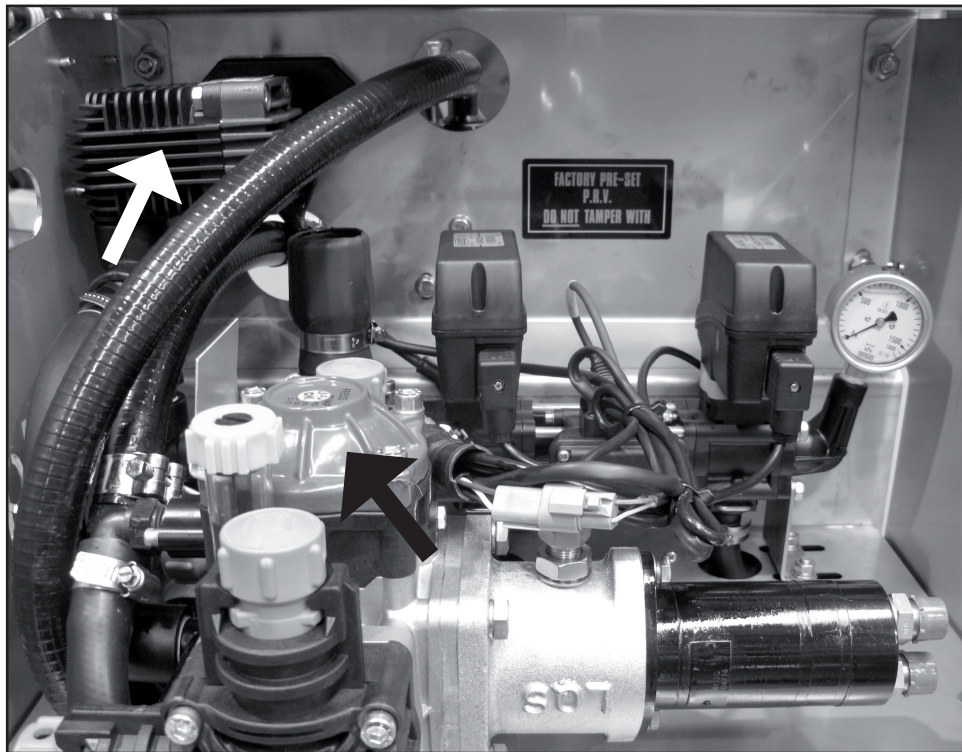
CHECK AIR ACCUMULATORS

Pulsing from the Spiker pump can induce a false flow signal in the electromagnetic flowmeter used in the Spiker system.

If this occurs then the actual output of the Spiker system may be much lower than the rate set in the control system.

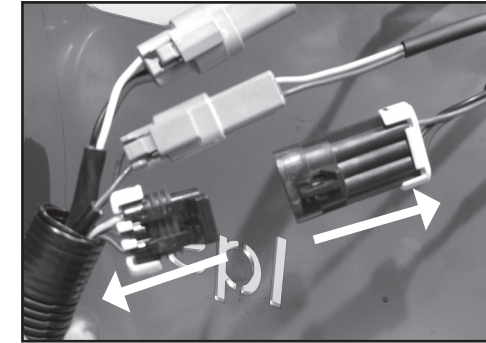
To prevent this from happening there are 2 pressurised air chambers in the Spiker system that soften the pulsing produced by the Spiker pump.

Air Accumulators



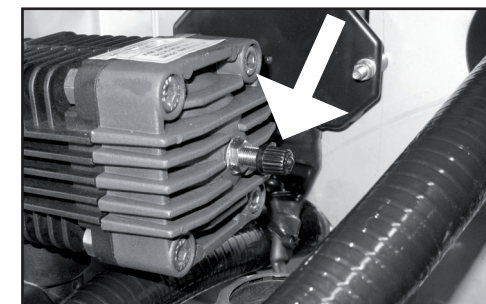
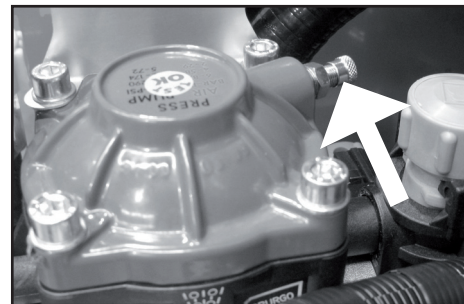
To check for Pulsing:

1. Start the Spiker pump with tractor hydraulics.
2. Run your control system in a test mode.
3. Switch off Spiker output.
4. After checking that flow has stopped. Disconnect Shutoff Valve. (See image on right)

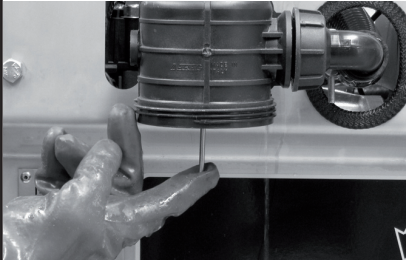


5. Restart Spiker output from control system simulating a typical application rate and ground speed.
If the control system shows that flow is occurring, then this is being caused by pump pulsations.
6. Use an air compressor to adjust pressure in accumulators until flow reading in control system returns to zero. A good starting point is to set the accumulator pressure to 1 bar (15psi).












Air Inlets



7. Reconnect shutoff valve and perform flowmeter calibration (Refer Pg 4.3) to ensure system is operating correctly. Flowmeter Cal Factor should be close to factory setting 6000.

PROBLEM	POSSIBLE CAUSE	RESOLUTION
<p>Pump Won't Suck</p>	<p>Air in suction line.</p> 	<p>Air in the suction lines may prevent the pump from sucking liquid. Air can be vented on the suction side via the suction filter.</p> <ol style="list-style-type: none"> 1. Undo yellow end cap and unscrew filter bowl. 2. Press up against valve pin to vent air from suction lines. 3. When liquid starts flowing out of the suction filter, release pressure on valve pin. 4. Replace filter bowl and yellow cap.
	<p>Blocked Suction Filter</p>	<p>Check and Clean Suction Filter. Refer to Maintenance section for instructions.</p> <p>It is important that after the suction filter screen has been inspected and cleaned that the screen bowl assembly be re-fitted correctly to the filter body (The valve pin location is crucial to operation of the filter).</p>
	<p>Air Leak on Suction Side of Pump</p>	<p>Check hoses and fittings for splits and correct seating.</p>
	<p>Obstruction on Suction Side of Pump</p>	<p>Check all hoses fittings. Check source selector valve is in correct position. Check tank suction outlet valve is open.</p>
	<p>Pump Fault</p>	<p>Pump faults that may occur include broken valve springs, debris in valves or damaged diaphragms. Overhaul pump to check valves and diaphragms.</p>
<p>Pump Noisy / Banging</p>	<p>Excessive hydraulic flow from tractor.</p>	<p>The pump is speed protected via a flow control block fitted to the pump's hydraulic motor. Excessive hydraulic flow from the tractor may trigger its own hydraulic relief system into play causing 'hammering'. This can be difficult to diagnose as it may appear that the hammering is coming from the pump itself.</p> <p>Reduce hydraulic flow from the tractor - (a flow of approx. 20-22lpm. should provide sufficient pump speed)!</p>
<p>Rapid loss of pump oil</p>	<p>Split diaphragm or leaking end seal.</p>	<p>Check to see if oil is leaking around end seal. Check diaphragms for splits. Replace seal or diaphragms as necessary. Refer to Bertolini pump manual for details.</p>

PROBLEM	POSSIBLE CAUSE	RESOLUTION
No Rate Control Actual Rate Too HIGH	Restrictive devices in distribution system are too large. This will also be indicated by low system pressure.	Metering system (on tillage bar) restrictive devices too large. - (This causes excessive leakage within the metering system downstream from the servo valve). When this happens (usually when the operator is attempting very low rates), there is insufficient back pressure to stabilise the system. Under these circumstances the servo will attempt to compensate by fully opening back to tank when in reality the liquid has already escaped - consequently there is no system control. Fit smaller restrictors in the distribution system.
	Tank agitation line switched off or too restricted.	Check agitation valve at rear of module. If valve is closed, open it up and retest system with target rates. Check size of nozzle in agitator, install a larger nozzle or remove the nozzle altogether. Different agitator nozzle sizes are available from your dealer. Agitators should be installed so as to provide agitation at bottom of tank.
	Excessive Flow from Pump	If actual rate is still too high, reduce flow from pump. Refer to 4.1 CHECK AND ADJUST PUMP SPEED for instructions.
No Rate Control Actual Rate Too LOW	Restrictive devices in distribution system are too small. This will also be indicated by high system pressure.	If the restrictive devices are too small then the pressure will exceed the PRV setting. The PRV will bypass liquid back to tank and the regulating control valve then becomes ineffective. Fit larger restrictors in the distribution system.
	Inadequate restriction on tank agitation line	Check tank agitator is installed on end of tank agitation line. Install a smaller size agitator nozzle to increase restriction. Different agitator nozzle sizes are available from your dealer. Agitators should be installed so as to provide agitation at bottom of tank.
	Insufficient Flow from Pump	If actual rate is still too low, increase flow from pump. Refer to 4.1 CHECK AND ADJUST PUMP SPEED for instructions.
No Rate Control or Wildly Fluctuating Rates	Servo valve polarity is incorrect.	Check Servo valve polarity - (servo valve opens when it should be closing). Use the Control Valve Test function of the Greenstar™ Rate controller. Pressing the “+” button should close the valve and “-” should open it.
	Pump not functioning properly.	Pump may not be performing properly. This could be due to suction, discharge or speed problems. Suction Filter may be blocked or inlet to pump impaired (broken valve spring, debris in valve etc.). Pressure side of pump may be impaired - (broken valve spring, debris in valve etc.). Pump may not be operating at a constant speed due to erratic hydraulic flow from tractor. Check and Clean Suction Filter / Check hydraulic flow to pump.
	Incorrectly fitted, faulty or damaged speed sensor.	Test the speed sensor against tractor speedometer.
	Faulty Flowmeter	Perform repeat flowmeter calibrations. Check for consistency of results
	Faulty Servo Valve	Use the Control Valve Test function or manual override in control system to check servo valve is working.
	Over-responsive Servo Valve	Adjust responsiveness of servo valve in control system configuration.

PUMP	PART NO.	DESCRIPTION	SUCTION FILTER CONT.	PART NO.	DESCRIPTION
	BE-94.9871.97.3	Set of 2 Buna Diaphragms for 2025 Pumps		AG-G10061	O'-Ring for 1 1/2" Fly Nut
	BE-94-9888.97.3	Set of 4 valves for 2025 Pumps		AG-2002060	1 1/2" Fly Nut
	BL-MM32C	31.8cc Hydraulic Motor inc mounting flange		AG-314002.030	1 1/2" Suction Filter 32 Mesh Screen
	BE-94.8609.97	Bertolini 2025 Poly PM- VF 2020 outlet	SELECTOR VALVES		
SUCTION FILTER				AG-45531115	1 1/4" 3 Way Ball Valve (Continuous Flow)
	AG-3142462	1 1/2" 32 mesh Suction Filter		AG-454235H.020	1 1/4" 3 Way Ball Only (Continuous Flow)
	AG-116625	1 1/2" - Hose Tail 90 Degree			

VALVE SET	PART NO.	DESCRIPTION
	AG-8630001	Spiker Shut-off Valve
	AG-8630026S	Spiker Regulating Valve
	AG-4621AA00000	Orion Flowmeter 0.5-10 LPM
	AG-465521	Pressure Relief Valve
	WK-505.7731079.10	Spiker Pressure Gauge
	TF-VENT 20	Venturi 20MM Injector

PART	PART NO.	DESCRIPTION
	LQS-liq12	Venturi Pressure Restrictor Kit
	AG-5022043	Small Tank Agitator 3mm
	L03037	Pulsation Damper

The Liquid Systems (SA) Spiker system can also be bought in a Banding Buddy configuration.

This configuration is designed for ultra low rate application or normal application on small implements.

BANDING BUDDY DIFFERENCES

Hydraulics

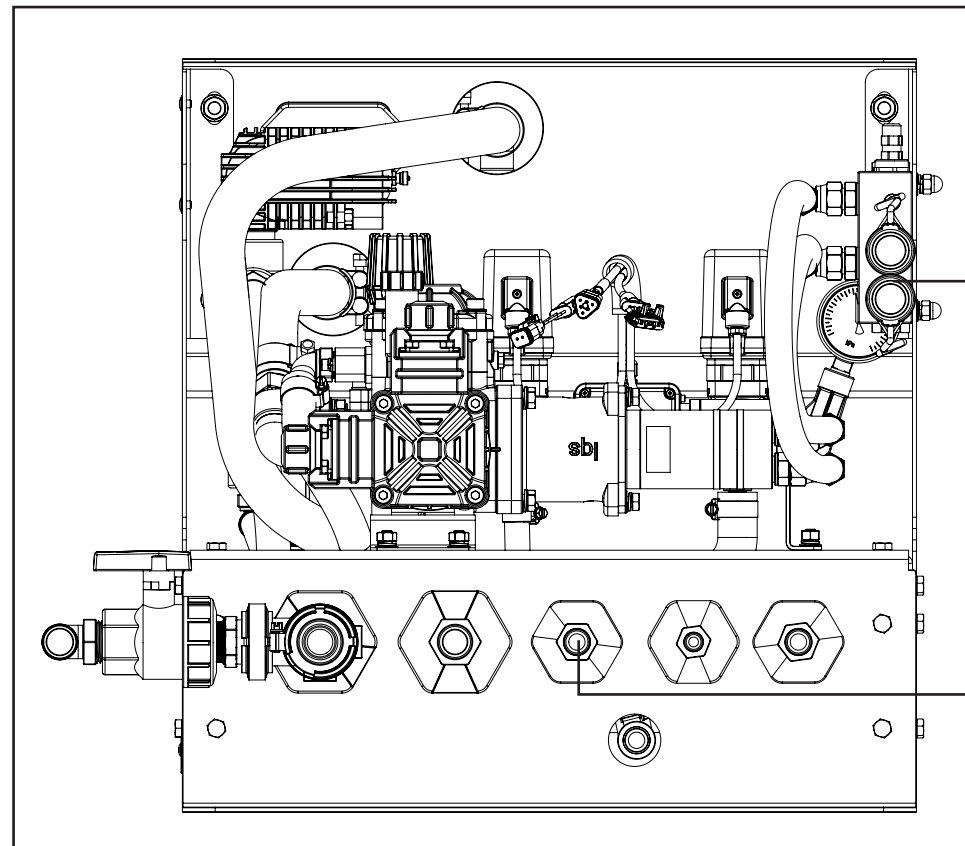
The Banding Buddy has its own hydraulic flow control block set to limit pump speed to 550 RPM. Hydraulic Sandwich block and hose kit of the standard Spiker kit is not included.

Plumbing

Rate Controlled Output port changes from 8mm push-in fitting to 3/4" hose tail.

Venturi Induction Kit is not included. A 3/4" umbilical line is included for connecting rate controlled output to Stacker Distribution Kit.

Male hydraulic quick releases are provided for making direct connection to tractor hydraulics.



Male Hydraulic quick releases



