



SLIMLINE MANUFACTURING LTD.

Your Wind & Water Specialists

Common Questions / Procedures

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TROUBLESHOOTING

Piston Diaphragm Pumps

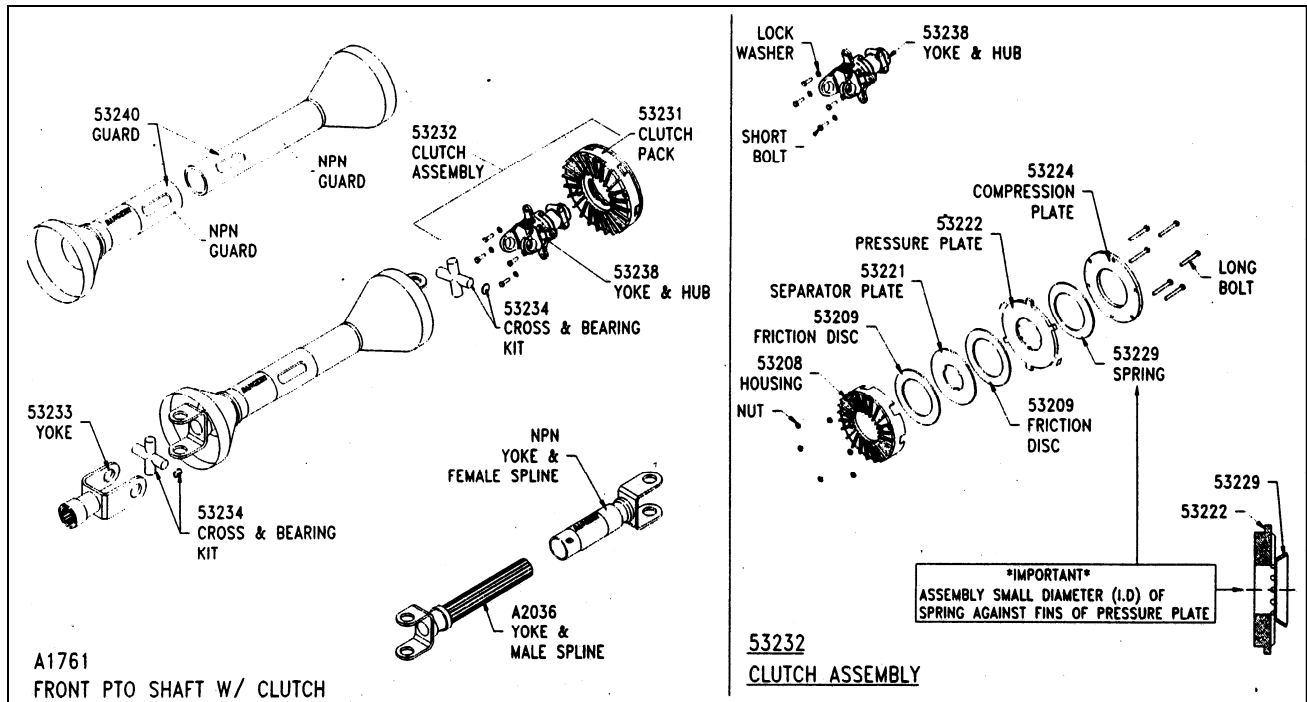
	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Water in the oil	Diaphragm failure	Replace and clean—review examples of diaphragm failures in this manual	Replace pump	Not cover by warranty
2	Irrregular pressure (pulsations)	Worn or dirty suction/delivery valves or valve seats	Clean or replace complete component	Replace pump	Repair
3	Excessive delivery vibrations	Air pressure too low in accumulator chamber	Inflate to 90 psi (do not check with tire gauge)	Repair	Repair
4	Noisy and low oil level	Restricted suction	Check suction system (check to make sure that the suction line in tank is secure)	Repair	Repair
5	Pump will not prime or losing pressure	Sucking air	Check suction system (if pressure is not lost during water test then problem is foaming of chemicals)	Repair	Repair
6	Maintaining or reaching maximum pressure	Worn regulator valve	Replace or clean	Repair	Repair
		Worn or dirty suction/delivery valves or valve seats	Replace or clean	Not covered by warranty	Not covered by warranty
		Belts are loose	Retighten belts to correct tension 7.2 lbs. at 1/8" deflection	Repair	Repair
		Insufficient RPM	Check tractor tack or increase RPM	Not covered by warranty	Not covered by warranty
		Delivery GPM higher than pump capacity	Replace worn nozzles or recalibrate	Not covered by warranty	Not covered by warranty
7	Low oil level	Inspect for leaks	Add to the oil level with good quality 10w—30w motor oil	Not covered by warranty	Not covered by warranty
8	Pump heads cracked	Excessive tension on belts	Set belts in accordance with procedure in Owner's Manual	Replace pump	Repair
		Improper torque on head bolts	Replace parts retorque to the correct torque	Replace pump	Repair
9	Drive pulley is moved	Pulley was not installed with shim	Increase shim thickness between bushing and pulley	Repair	Repair
Note: Winterizing freezing condition, flush pump with a 50/50 mixture of antifreeze and water.					

Run-In Procedure TQM (Modular) Clutch—55 Series PTO

- used on "30 turbines with M60 gearbox
- used on "38 turbines with M55 series gearbox

If the machine has never been used or has not been operated for one (1) season, the following procedure is recommended:

Read all of the instructions before starting this procedure.



Tools required: 1/2" box wrench or socket and torques wrench

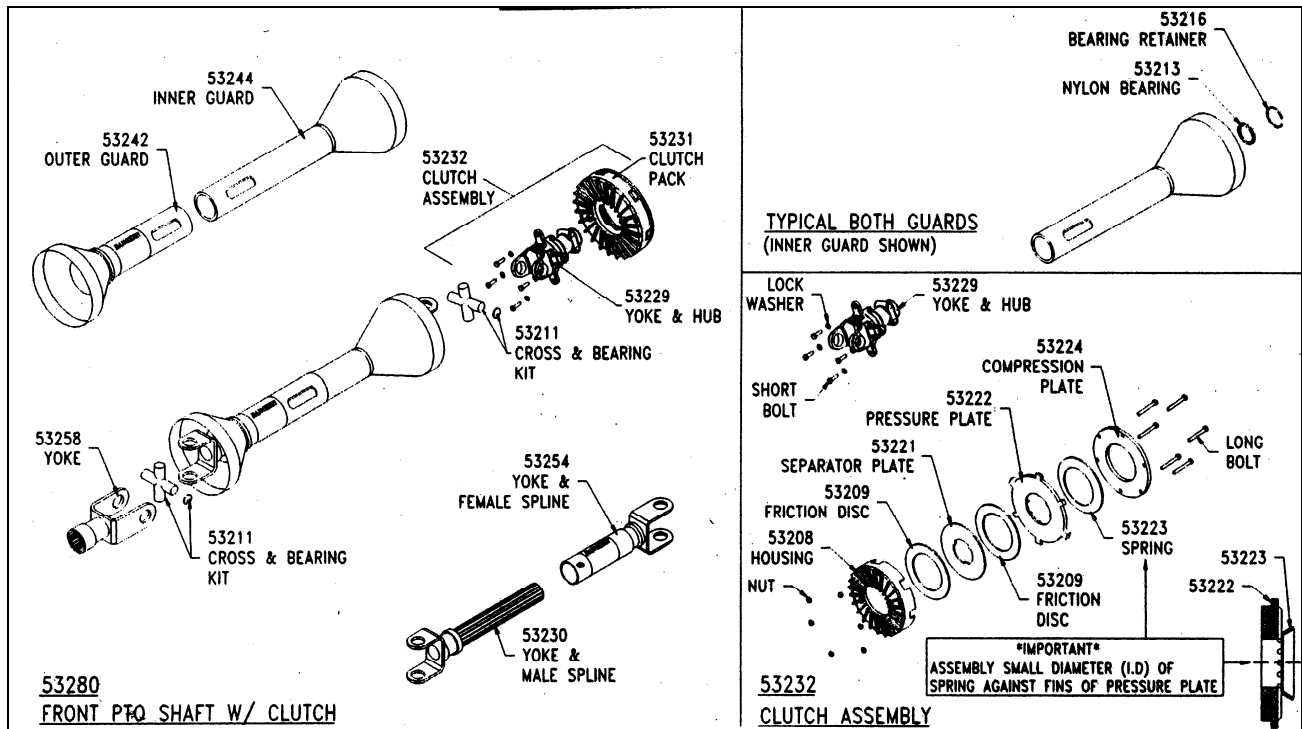
1. Make sure the tractor is off and the PTO is disengaged.
2. Disconnect the driveline from the tractor.
3. Locate the six (6) long bolts on the O.D. of the clutch pack. Loosen the bolts until they rotate freely, finger tighten each bolt and then tighten each bolt one-half turn.
4. Attach the implement to the tractor at the hitch pin and the driveline to the tractor PTO shaft.
5. Start the tractor.
6. Engage the tractor PTO and run for a few seconds or until the friction clutch visibly smokes, at which time disengage the PTO.
7. Turn the tractor off.
8. Disconnect the driveline from the tractor.
9. Tighten the six (6) long bolts on the O.D. of the clutch pack until the compression plate (53224) is in contact with the housing (53208), and then keep tightening each bolt to **30 ft-lbs**.
10. Locate the four (4) short bolts that attach the yoke and hub (53229) to the clutch pack and check that each bolt is tightened to **30 ft-lbs**.

Run-In Procedure TQM (Modular) Clutch—35 Series PTO

- used on "19 turbines with M47 gearbox
- used on "24 turbines with M47 gearbox
- used on "30 turbines with M55 gearbox

If the machine has never been used or has not been operated for one (1) season, the following procedure is recommended.

Read all of the instructions before starting this procedure.

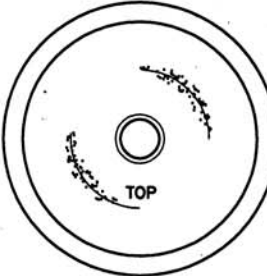


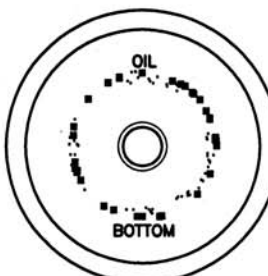
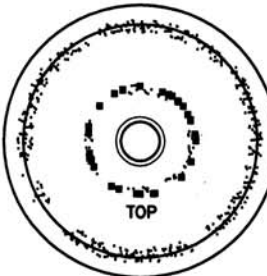
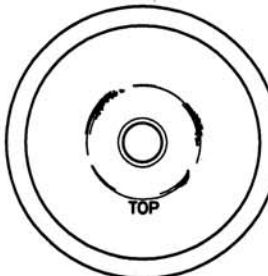
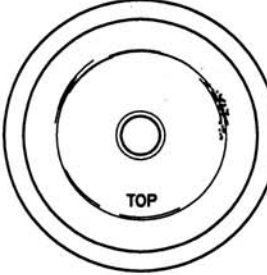
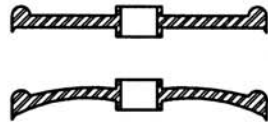


Tools required: 1/2" box wrench or socket and torques wrench

1. Make sure the tractor is off and the PTO is disengaged.
2. Disconnect the driveline from the tractor.
3. Locate the six (6) long bolts on the O.D. of the clutch pack. Loosen the bolts until they rotate freely, finger tighten each bolt and then tighten each bolt one-half turn.
4. Attach the implement to the tractor at the hitch pin and the driveline to the tractor PTO shaft.
5. Start the tractor.
6. Engage the tractor PTO and run for a few seconds or until the friction clutch visibly smokes, at which time disengage the tractor PTO.
7. Turn the tractor off.
8. Disconnect the driveline from the tractor.
9. Tighten the six (6) long bolts on the O.D. of the clutch pack until the compression plate (53224) is in contact with the housing (53208), and then keep tightening each bolt to **30 ft-lbs**.
10. Locate the four (4) short bolts that attach the yoke and hub (53229) to the clutch pack and check that each bolt is tightened to **30 ft-lbs**.

SLIMLINE MANUFACTURING LTD.

SERVICE

EXAMPLES OF DIAPHRAGM FAILURE	
<p>Pump with opposite valves.</p>  <p>TWO SMALL FRACTURES (Corresponding to valve position)</p> <p>CAUSE</p> <ol style="list-style-type: none"> 1. Restricted suction. Blocked suction strainer. Suction hose blocked or kinked. Suction lift too high. Spray mixture too thick (dense). 2. Pump RPM above specification. 3. Suction Valve not sending. 4. Cylinder Sleeve holes not in correct position. 5. Chemical incompatible with diaphragm material. 	 <p>CIRCULAR FRACTURE ON PISTON SIDE OF DIAPHRAGM WHICH IS THE SAME DIAMETER AS THE PISTON</p> <p>CAUSE</p> <ol style="list-style-type: none"> 1. Excessive wear between the piston and sleeve. 2. Suction has too much pressure. 3. Low pump RPM. 4. Cylinder sleeve holes not in correct position. 5. Delivery valve not sealing. 6. Low oil level in pump. 7. Pump over pressurized.
<p>Pump with valves side by side.</p> 	
 <p>FRACTURE ON EXTERNAL DIAMETER, FATIGUE AND WORN UNDERNEATH PISTON RETAINING DISC.</p> <p>CAUSE</p> <p>Fatigue breakage – diaphragm worn out.</p> <p>NOTE: diaphragm must be checked once a year.</p>	 <p>CHEMICAL INCOMPATIBLE WITH DIAPHRAGM MATERIAL</p> <p>CAUSE</p> <ol style="list-style-type: none"> 1. Fatigued and worn underneath piston retaining disc. 2. Diaphragm swollen and soft. 3. Diaphragm soft and spongy. (Below 60 shore) 4. Diaphragm profile distorted. 5. Increase in external diameter. 6. Diaphragm shape distorted. 7. Diaphragm swollen.
 <p>A STRAIGHT FRACTURE</p> <p>CAUSE</p> <ol style="list-style-type: none"> 1. Incorrect air bleeding, air trapped under diaphragm. 2. Blocked suction. 	 <p>STANDARD SHAPE</p> <p>DIAPHRAGM SWOLLEN AND DISTORTED</p>

Myers Centrifugal

	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Water coming out of oil tube	Seal failure	Replace pump	Replace pump	Replace pump
2	Irregular pressure (pulsations)	Belt slippage	Retension belt 9 lbs. at ¼" deflection	Repair	Repair
3	Belt will not stay on the pulleys	Pulleys are misaligned	Realign pulleys as per Owner's Manual	Replace belt	Repair
4	Pump losing pressure during spray operation	Restricted suction	Check suction system (check to make sure that the suction line in tank is secure)	Repair	Repair
5	Pump will not prime or losing pressure	Sucking air	Check suction system (if pressure is not lost during water test then problem in foaming of chemicals)	Repair	Repair
		No water	No water or intake valve closed	Not covered by warranty	Not covered by warranty
		Filter is plugged	Clean filter	Not covered by warranty	Not covered by warranty
6	Maintaining or reaching maximum pressure	Belt slippage	Retension belt 9lbs. at ¼" deflection	Repair	Not covered by warranty
		Plugged filters or impellor blockage	Clean	Not covered by warranty	Not covered by warranty
		Insufficient RPM	Check tractor tack or increase RPM	Not covered by warranty	Not covered by warranty
		Delivery GPM higher than pump capacity	Replace worn nozzles or recalibrate	Not covered by warranty	Not covered by warranty
		Nozzle worn check calibration	Recalibrate the unit (note maximum pressure is 150 psi)	Not covered by warranty	Not covered by warranty
Not enough pressure	Excessive volume being bypass	Close bypass	Not covered by warranty	Not covered by warranty	
7	Low oil level	Inspect for leaks	Add to the oil level with good quality 10w—30w motor oil	Not covered by warranty	Not covered by warranty
Note: Winterizing freezing condition, flush pump with a 50/50 mixture of antifreeze and water.					

Hyd Valves

Note: Hyd valves cannot be diagnosed on the bench. They must be tested for the style of failure on the unit.

Warning—When diagnosing hyd valve failure two people are required—one to operate the sprayer controls and the other to observe the results. This is best done on the unit with a tank of fresh water.

Step #1

Partially fill tank with fresh water.

Step #2

Disconnect the hose from the valve to the booms.

Step #3

Place gearbox in neutral position.

Step #4

Engage Pto increase RPM to Operating RPM

Step #5

Have the second person activate controls to turn booms off and on. Take note where the water is coming from and the delay between on and off.

Step #6

Diagnose the problem with the Troubleshooting chart.

	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Valves will not shut off	Ball valve is not closing/stroke too short Plugged hydraulic hose Plugged port in hydraulic cylinder	Disconnect clevis from ball valve handle, move handle until water flow is stopped. Adjust clevis to match. Replace faulty hose Replace faulty cylinder	Not covered by warranty Replace hose Replace cylinder	Not covered by warranty Not covered by warranty Not covered by warranty
2	Valve will not open or close	Hydraulic lines hve become disconnected	Check quick connectors to ensure that they are connected	Not covered by warranty	Not covered by warranty
3	Valve open once but now it will not open or close	Hydraulic supply lines are crossed	Reverse hydraulic lines	Not covered by warranty	No covered by warranty
4	Valve is leaking from stem	Cylinder stroke is too long	Disconnect clevis and shorten stroke so the cylinder does over extended pushing on valve handle “then” tighten packing nut	Replace ball valve	Replace vall value

Electric Valves

Note: Electric valves cannot be diagnosed on the bench. They must be tested for the style of failure on the unit.

Warning—When diagnosing electric valve failure two people are required—one to operate the sprayer controls and the other to observe the results. This is best done on the unit with a tank of fresh water.

Step #1

Partially fill tank with fresh water.

Step #2

Disconnect the hose from the valve to the booms.

Step #3

Place gearbox in neutral position.

Step #4

Engage Pto increase RPM to Operating RPM

Step #5

Have the second person activate controls to turn booms off and on. Take note where the water is coming from and the delay between on and off.

Step #6

Diagnose the problem with the Troubleshooting chart.

	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Electric valves will not shut off	Exceeding maximum pressure rating	Test by reducing tractor RPM while failure is occurring. If valve suddenly closes then recalibrate at a reduced pressure.	Not covered by warranty	Not covered by warranty
	Large volume of water continuously coming out of valve	Broken diaphragm	Replace diaphragm	Replace valve electric	Not covered by warranty
	Small amount of water continuously deep inside valve	Regulator is sticking	Test by reducing tractor RPM while failure is occurring if valve suddenly closes then disassemble, clean and lubricate components	Replace regulator	Replace regulator
		Internal spring has lost its strength. It is unable to overcome internal pressures.	Clean internal components and replace spring Part Number 31112	Replace valve electric	Repair
		Diaphragm guide forks are broken or damaged	Replace diaphragm guide Part Number 31131	Replace valve electric	Repair
		Plunger sticking	Disassemble solenoid and plunger, clean components, lubricate spring area with WD40 and lubricate plunger shaft with electrical grease	Replace valve electric	Repair
2	Electric valves will not shut off	Dirt has contaminate internal components	Clean and lubricate components	Repair	Repair
3	Electric valves will not turn on	Battery dead or poor connection	Start at battery and test for power from battery through the switch box back to electric valves		
		Plunger is contaminated	Remove solenoid and clean plunger, lubricate	Repair	Repair
		Electric valve is installed backwards	Solenoid should be on the same side as spray booms	Not covered by warranty	Not covered by warranty
		Broken switch/wiring harness	Replace switch remembering that this is an on/on switch	Replace switch or wiring harness	Replace switch or wiring harness

Vibration Problem and Possible Causes Fan and Drive Shafts

	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Outlets and boom mount cracking	Fan is not square to the shaft	Check alignment of fan with a dial gauge measuring on the outside ring under the nose cone. Allowable run out ten one thousands of an inch.	Repair	Repair
		Fan has lost its balance weight	Remove the fan and send it back to the factory for rebalancing	Replace	Replace
		Fan has been damaged by a foreign object entering the turbine	Remove fan and send back to the factory for rebalancing	Not covered by warranty	Not covered by warranty
2	Cracks are appearing in tank or PTO covers	U joint has excess wear	Replace U joint	Repair	Repair
		Yoke clamp bolt has become loss	Tighten bolt and check fit	Repair	Repair
		Worn spline in yoke or shaft	Replace worn component	Repair	Repair
3	Knocking at low speed in clutch	The clutch is designed with movement to allow the turning of the PTO shaft when attaching the unit to the tractor	Increase PTO Rpm until noise stops—this is normal and acceptable	Not covered by warranty	Not covered by warranty
4	During operation clutch began to smoke	Overgreasing of the internal bearing—this has contaminated the clutch	Replace clutch pads and spring lubrication of the joint 1 once/year	Not covered by warranty	Not covered by warranty
		If grease contamination is not apparent then spring tension is below manufacturer's recommendation	Replace clutch pack	Replace clutch pack	Replace clutch pack
5	Yoke or cross is broken	Tractor to sprayer hook up is not equal distance	Refer to PTO hook up decal on sprayer or in Owner's Manual	Not covered by warranty	Not covered by warranty
6	Pillow block is cracked or side is broken out	Tractor to sprayer hook up is not equal distance	Refer to PTO hook up decal on sprayer or in Owner's Manual	Not covered by warranty	Not covered by warranty
		Operator is turning too sharp and fully collapsing the PTO shaft	Refer to PTO hook up decal on sprayer or in Owner's Manual Remove the PTO from tractor and manually collapse the shaft. Note where it stops on the cover so the operator will understand that shaft is totally collapsed.	Not covered by warranty	Not covered by warranty

TurboSteer Gearbox System

	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Oil leaking out of vent	Too much oil	Remove excess oil/oil level to top of side port. Remember each gear has its own individual oil reservoir.	Repair	Repair
2	Oil leaking from seal of PTO shaft	Seal torn or vent not working	Inspect vents and replace seal	Repair	Repair
3	Top bearing in top gearbox extremely hot	Lack of lubrication in top greasebox	Grease top bearing. When the bearing assembly dry 60 pump with a standard grease gun	Repair	Repair
4	Oil leaking between gearboxes	Vent plugged Seal failure	Clean and inspect vents Replace complete assembly Order Part number A1726	Replace vent Replace gearbox assembly	Replace vent Replace gearbox assembly
5	Front stainless cover cracking	Procedural welding error	Replace complete assembly	Replace	Replace

Fan Gearboxes

	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Fan is coming out of gear	Internal or external detent is not tight enough	Adjust increase spring load on detent	Replace gearbox cover assembly	Replace gearbox cover assembly
2	Unable to shift gearbox	The shaft connecting the gear shift lever to shifter fork is frozen	Remove shift plate cover and disassemble the shifting mechanism, clean and lubricate	Replace gearbox cover assembly	Repair
3	Leaking seal between fan and turbine	Check to see if the vent is operational	If the vent is not operating	Replace vent	Replace vent
		Seal has failed	Replace the complete gearbox assembly	Replace gearbox	Replace gearbox
	Leaking seal between pump drive and gearbox	Seal failure	Replace seal	Repair	Repair
4	Gearbox is making a scraping sound or rubbing	Shift fork is rubbing against gear	Remove cover and free up the shift finger	Repair	Repair
5	Gearbox bearing has failed	Lack of lubrication or premature	Replace gearbox	Replace gearbox	Replace gearbox
		bearing failure caused by improper fan bearing installation		Replace gearbox	Replace gearbox
6	Gearbox is noisy	Chipped tooth on gearbox	Replace gearbox	Replace gearbox	Replace gearbox
7	Gearbox does not change gears	Internal shift finger is broken	Replace complete gearbox shift cover	Replace gearbox	Replace gearbox

Ip 246 Regulator

	Problem	Cause	Solution	Warranty First 90 Days	Warranty 91 Days to 1 Year
1	Regulator will not maintain pressure	Diaphragm broken in valve	Replace diaphragm	Replace	Replair
2	Irregular pressure	Dirt has contaminated internal components	Clean and lubricate components	Repair	Repair
3	Pressure will not reduce low enough	Regulator unable to bypass enough water	Change the regulator seat to allow bypass more water	Not covered by warranty	Not covered by warranty
		Nozzle too small	Recalibrate unit	Not covered by warranty	Not covered by warranty
		Diaphragm badly deformed	Clean components and replace diaphragm	Repair	Not covered by warranty
4	Unable to achieve high enough pressure	Regulator bypass too much water	Internal components are badly worn replace	Replace regulator	Not covered by warranty
		Nozzles are too big or worn	Recalibrate unit to match pump output	Not covered by warranty	Not covered by warranty
		No water	No water or intake valve closed	Not covered by warranty	Not covered by warranty
		Filter is plugged	Clean filter	Not covered by warranty	Not covered by warranty
5	Maintaining or reaching maximum pressure	Belt slippage	Retension belts	Repair	Not covered by warranty
		Plugged filters or impellor blockage	Clean	Not covered by warranty	Not covered by warranty
		Insufficient RPM	Check tractor tack or increase RPM	Not covered by warranty	Not covered by warranty
		Delivery GPM higher than pump capacity	Replace worn nozzles or recalibrate	Not covered by warranty	Not covered by warranty
		Nozzle worn check calibration	Recalibrate the unit (note: maximum pressure is 150 psi)	Not covered by warranty	Not covered by warranty
	Not enough pressure	Excessive volume being bypassed	Close bypass	Not covered by warranty	Not covered by warranty