



Operator's Manual

100SR

SUPERCHARGED

ESS

Electrostatic
Spraying Systems

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Toll-Free: 800-213-0518 • Fax: 706-769-8072
www.maxcharge.com

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SUPERCHARGED 100SR

Electrostatic Spraying Systems, Inc.
62 Morrison St. · Watkinsville, GA 30677-2749

CE certification applied for

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CONGRATULATIONS!

You have just purchased one of the most advanced spraying systems on the market today. Electrostatic Spraying Systems, Inc.¹ (ESS) is committed to providing you with powerful spraying systems that are easy to operate and maintain.

The products of ESS are the result of the efforts and creativity of many people. In addition to input from engineering, marketing and manufacturing personnel, suggestions from our customers have been implemented into the design of our equipment. We would like to hear your ideas also! If you have any suggestions or comments regarding the products or service of ESS write or call us at:

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62 Morrison St.
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Phone: 706-769-0025
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support@maxcharge.com

Please take time to read this manual before operating the ESS Supercharged 100SR™. The manual contains important instructions for the operation of this equipment. It includes helpful suggestions to maximize productive use. Several safety precautions are listed for your protection.

Thank you!

We appreciate your business and are proud that you have selected an ESS sprayer for your operation.

Your new sprayer has been thoroughly tested and calibrated at the factory. If you have any problems with it, please get in touch with us immediately. We will be glad to answer any questions you have concerning our equipment or service. ESS intends to support its customers with efficient, helpful and friendly service. We appreciate your business and sincerely hope that Electrostatic Spraying Systems can meet your present and future spraying equipment needs.

¹ ESS Supercharged 100SR™, MaxCharge™, and the ESS logo are copyrights or registered trademarks of Electrostatic Spraying Systems, Inc.



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Overview of the ESS 100SR Air-Assisted Electrostatic Sprayer

The heart of the 100SR sprayer is the patented MaxCharge™ nozzle. ESS air-assisted electrostatic sprayers produce 35 to 40 micron electronically charged spray droplets that are carried to the plant canopy in a 5.5 to 7 cfm air stream through each nozzle.

Air, liquid, and electricity enter separately at the rear of the nozzle. A positive charge is applied to the electrode in the tip of the nozzle inducing a negatively charged liquid flow. Just before leaving the nozzle, the liquid is sheared by the air atomizing the liquid into many thousands of 35 to 40 micron droplets trapping the negative charge. The charged droplets leave the nozzle and are carried by the 5.5 to 7 cfm air flow to the plant canopy.

The charged droplets are attracted to the plant material by electrostatic forces, up to 75 times the pull of gravity, evenly coat all the plant surfaces, front, back, underside of leaves and stems. The results is uniform spray coverage on hidden areas deep inside the plant canopy where other sprayers miss.

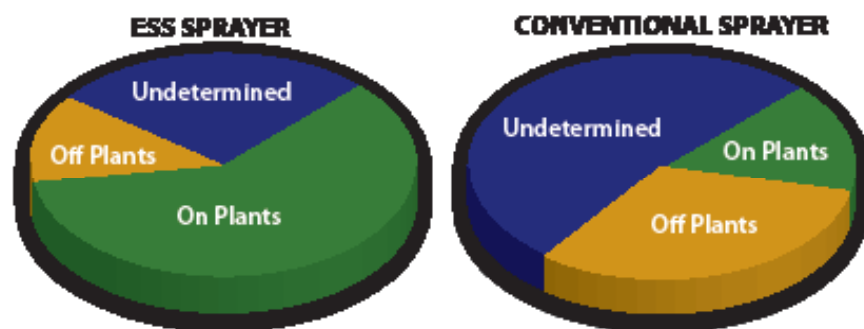
The MaxCharge™ nozzle is easy to clean and corrosion-proof. The interior ceramic outlet resists wear three times better than stainless steel outlets. These features combine to give the best spray coverage on the market.

The comparison of air-assisted electrostatic spraying versus conventional spraying is dramatic.



The MaxCharge™ spray nozzle is what makes ESS the industry leader in the production of electrostatic spraying equipment.

Where Does the Spray Go?



The University of California completed a series of tests to investigate what happens to spray liquid after it leaves the nozzle.

Conclusion: ESS technology places over 4 times the amount of spray onto the plant surface using 1/2 the amount of chemicals. Furthermore, they also reported that ESS sprayers send 2/3 less chemicals to the ground and into the air. Less chemical used overall, less waste and less drift than conventional equipment.

Imagine the environmental benefit!



Electrostatically charged droplets are attracted to plant surfaces.

Safety Information

OPERATOR RESPONSIBILITY AND SAFETY

-  Lack of attention to safety can result in accidents, personal injury or death.
-  Always watch for safety hazards and correct problems promptly.
-  When using any equipment, obey all manufacturers' safety information and labeling.

IMPORTANT!

Read the Operator's Manual! Failure to do so is considered a misuse of the equipment.

It is the responsibility of the user to read the Operator's Manual to understand the safe and correct operating procedures for the sprayer and to maintain the sprayer according to the manufacturer's recommendations. It is the operator's responsibility to ensure that all who are using this equipment read this manual.

The operator is responsible for inspecting the equipment and for repairing and replacing damaged or worn parts to prevent damage or excessive wear to other parts. It is also the operator's responsibility to deliver the machine for service or to replace defective parts which are covered by the standard warranty.

EQUIPMENT SAFETY

Use the following safety tips as a general guide when using the 100SR sprayer:

-  Before operating any equipment, become familiar with all safety guidelines, cautions and warnings including those provided by the tractor manufacturer.
-  Do not allow children to operate the sprayer. Do not allow adults to operate the sprayer without providing them proper instruction.
-  Do not allow riders on the sprayer or tractor during operation or transport.
-  Keep the area of operation clear of all persons and animals.
-  Sprayer is equipped with a Power Take Off (PTO) driveline. Failure to take proper safety precautions could result in serious injury or death.
-  Keep hands, feet, hair and clothing away from PTO driveline and other moving parts.
-  Do not operate machinery without all guards and shields in place.
-  Always disengage the PTO, stop tractor engine and wait for all moving parts to stop before servicing, adjusting or repairing the sprayer.
-  Do not apply chemicals when weather conditions favor drift from intended treatment area.
-  Never pump flammable or explosive liquids such as gasoline, fuel oil, kerosene, etc. through the ESS sprayer.
-  Turn off the sprayer whenever leaving it unattended.
-  Only unhitch the sprayer from the tractor on firm and level ground.

CHEMICAL SAFETY

Read and follow all instructions on the chemical manufacturer's label. Make note of the following requirements for:

-  **Personal Protective Equipment (PPE)** to be worn when handling, mixing and applying the chemical, including: protective clothing such as boots, gloves, apron or hat; eye protection such safety glasses, goggles or a face shield; and respiratory protection such as a mask, cartridge or respirator.
 -  **Directions for use.** This includes handling, mixing and applying as well as storage and disposal of the chemical.
 -  Environmental and physical or chemical **hazards**.
 -  **First aid** in case of chemical exposure.
 -  **Mandatory waiting periods** between application time and worker reentry (i.e. 'Re-entry Interval' - REI) and crop harvest (i.e. 'Pre-harvest Interval' - PHI).
 -  Proper visual and/or verbal **notification** to workers and/or the public regarding areas sprayed.
- Always follow the prevailing laws of the area in which chemicals will be used.

PLEASE NOTE:

Additional safety guidelines associated with specific operating and maintenance procedures are mentioned throughout this manual.

SAFETY DECALS

ESS places several decals¹ on the 100SR to remind equipment operators of proper equipment use and possible safety hazards. Even if these decals are missing or hidden from view always follow safe practices when operating ESS machinery. Replace them if they become worn or damaged and can no longer be read.

Please make sure to:

1. Note the original locations of the decals on the equipment.
2. Replace decals if they become worn or damaged and can no longer be read. Extra decals may be ordered from ESS or an authorized ESS dealer.



This warning is repeated several times in this manual. The decal is found on the front and rear of the spray tank.

PLEASE NOTE:

Running the pump without liquid voids the pump warranty.
This is an expensive repair.

¹ ESS is currently redesigning the warning labels for the sprayers. There may be minor changes in the layout and/or wording of the warning decals on your sprayer.



This warning decal is located near all the shield locations under which the PTO drive components are located.

Do not operate the 100SR without the proper safety shielding in place.



Do not operate the 100SR without the proper safety shielding in place.

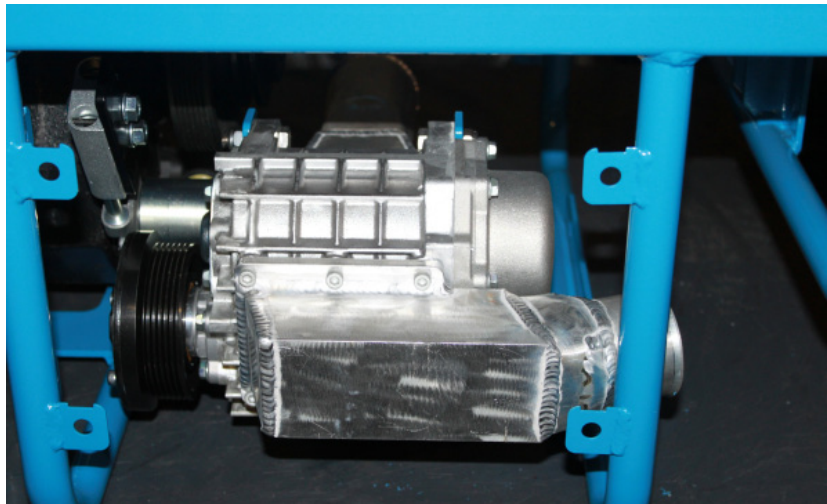


Store machine empty and on level ground . Due to the amount of liquid that the 100SR can hold, it is top heavy. There is a risk of tipping if not stored properly.

Sprayer Components

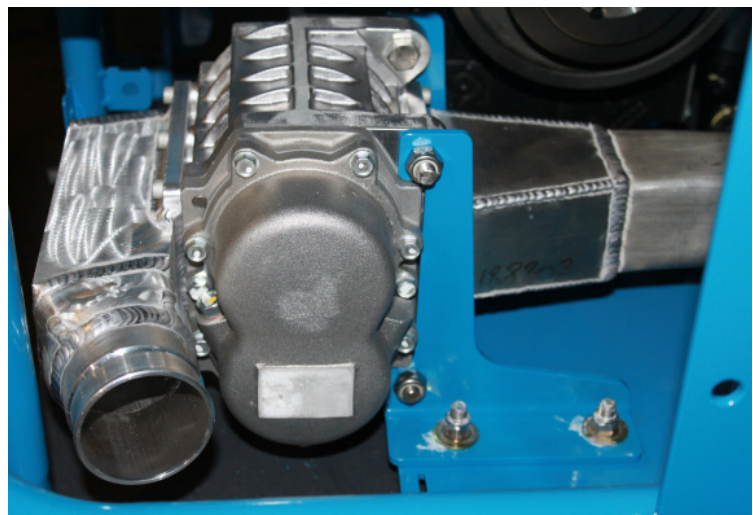
SUPERCHARGER

- The unit has a sealed timing gear and gearcase (no oil in air stream). It is lubricated for life; however **the oil level should be checked every 500 hours to ensure it is between the minimum and maximum marks on the dip stick. If it is not, add oil; DO NOT CHANGE OIL. Failure to check oil level will void your warranty.**
- **Maximum Temperature:** Please limit outlet gas temperature to 300°F(150°C)maximum or irreversible damage will occur to the blower.
- **Blocked Ports:** Never run with a blocked inlet or outlet as excessive temperatures will be reached almost immediately. Irreversible damage will occur.
- Standard operational pressure is 10 psi (0.7 bar). DO NOT EXCEED 12 PSI (0.8 bar) OR DAMAGE COULD OCCUR!
- Never put fingers or any objects into inports when pump is turning.
- Additional notes, comments
- The Supercharger contains permanently lubricated sealed ball bearings and timing gears. No maintenance is required or expected. There are no user serviceable parts inside the blower.
- The sealed blower gearcase contains KluberGH6-80oil, MSDS sheet available upon request.
- **FREEZING:** Please do not allow the Supercharger to fill with water and freeze, as freezing water can damage it.



Which is the left side?

In this manual, all references to left and right are with the viewer standing at the rear of the sprayer looking forward over the sprayer, as it would be mounted on the tractor.



Nozzles

ESS sprayers allow the operator maximum control when aiming nozzles. Adjustments to nozzles are often made to account for travel speeds, wind conditions and crop structure and density.

Nozzles are mounted onto the air tube with a brass nipple and two swivel connectors. Alternatively, as an added option, the nozzles may be attached to the air tube with flexible, stay-in-place, hoses.

The wiring harnesses and liquid lines leading to the nozzles are located inside of a PVC covering to protect these parts from chemical and physical damage. The labeled diagram to the right identifies individual nozzle parts and the air, liquid and electrical connections.

- | | |
|----------------------------------|---------------------------------------|
| 1. Hood (P/N AP5798) | 5. Nozzle Base (P/N NB 5808) |
| 2. External O-ring (P/N 5770) | 6. Liquid Inlet (P/N 7064) |
| 3. Nozzle Cover (P/N NL 5775) | 7. High Voltage Electrical Connection |
| 4. Insulator Ring (P/N AP 56794) | 8. Air Inlet Piping (P/N AS 1391) |



Installing the ESS Supplied Driveline

Your sprayer comes with an ESS supplied Bondioli & Pavesi driveline. This driveline connects the tractor PTO shaft to the sprayer input shaft. To prevent damaging the sprayer it is necessary to follow specific installation steps. In addition to reading the instructions below in this ESS 100SR operator manual, please make sure to read the Bondioli & Pavesi manual supplied with the driveline prior to beginning installation.



WARNING! DO NOT STAND BETWEEN TRACTOR AND SPRAYER WHILE TRACTOR IS BEING BACKED TO HITCH.



WARNING! ADDITIONAL BALLAST MAY BE NEEDED ON THE FRONT OF THE TRACTOR FOR STABLE OPERATION AND TRANSPORT OF THE SPRAYER. SEE TRACTOR OPERATOR'S MANUAL FOR RECOMMENDED WEIGHTS.



READ THE MANUAL SUPPLIED WITH YOUR BONDIOLI & PAVESI DRIVELINE BEFORE INSTALLING.

INSTALLATION STEPS:

FIRST: Determine proper driveline length

First, determine if the driveline is the correct length. Begin by mounting the sprayer on the tractor's 3-point hitch per the tractor operator manual, but **DO NOT** install the driveline at this time. Due to normal tractor equipment and implement variations the driveline may need to be shortened per the following steps:

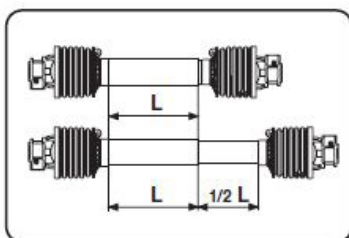
NEXT: Shorten the driveline (if needed)

1. **Determine shortest distance the driveline will span:** Raise the sprayer until the tractor PTO shaft and the sprayer shaft are level. This represents the shortest distance the driveline will span
2. **Determine tractor to sprayer distance:** Measure the distance from the groove on the tractor PTO shaft to the groove on the sprayer input shaft. Record this number.
3. **Determine driveline length:** Lay the fully collapsed driveline out on a flat, even surface and measure the distance from the center of the implement yoke retaining pin to the retaining ring (i.e. groove to groove). Record this number.

NOTICE

If the measurement taken in Step 3 is less than that of Step 2, the driveline WILL NOT HAVE TO BE CUT. Otherwise, proceed to Step 4.

4. **Determine length to cut:** Subtract the measurement from #2 (*tractor to sprayer distance*) from the measurement from #3 (*length of driveline*) and add 1 inch (25 mm) to insure there is adequate driveline movement allowance. This is the length of the driveline that will need to be cut. PLEASE NOTE: this length must be cut from **BOTH** sides of the driveline to shorten it for proper use.



NOTICE

Telescoping tubes must always overlap by at least 1/2 of their length in normal operation and at least 1/3 of their length in all working conditions. **VERIFY THIS BEFORE CUTTING DRIVELINE.**

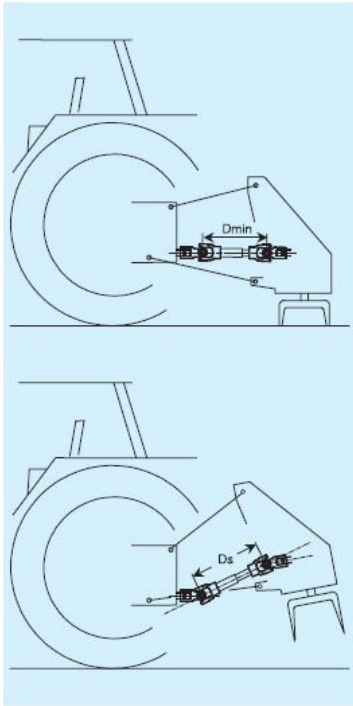
NOTICE

**FAILURE TO USE THE ESS
SUPPLIED DRIVELINE WILL
VOID THE WARRANTY**



Your Bondioli and Pavesi manual is fastened to the sprayer's driveline.

5. **Shorten the driveline:** Refer to the Bondioli & Pavesi manual (which comes fastened to the driveline) for instructions on the proper technique for cutting the driveline.
6. **Attach reassembled driveline** to tractor PTO shaft and sprayer input shaft and check fit. Note one end of the driveline shield tube is marked with a tractor symbol to indicate the end that attaches to the tractor.
7. **Install the driveline shield restraint chains** per the manual supplied with your Bondioli & Pavesi driveline.



Proper driveline angle



Driveline shield restraint chain installed

NOTICE

Driveline angles should not exceed 25 degrees.



Driveline holding cable

Installing the Control Box



Alternate Control Box Locations

The control box should be mounted in the tractor cab at a location within easy reach of the operator. Some common positions are overhead or to the right.

Attach the red wire directly to the tractor battery 12-volt terminal post and the green wire directly to the tractor ground post. Failure to ground the system properly can cause premature failure of the power supplies. Make sure that you are not operating on a 24-volt tractor system. Contact the ESS service representative for instructions in this case. Attach the electrical cables to the front of the Supercharged 100SR sprayer.



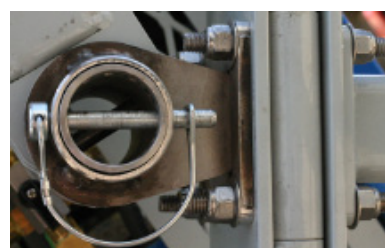
Adjusting the Rotating Spray Arms (Optional-NOT STANDARD**)**

In order to spray effectively, the nozzles need to be NO LESS than 18 inches (46 cm) from the crop. The overall height adjustment is accomplished by varying the height of the tractor's 3-point hitch. The 100SR sprayer has three ways to adjust the spray arms for maximum benefit. In addition there are 3 heights provided to bolt on the H. Frame for additional height adjustment.

Top and Bottom Spray Arm Rotation



Close up of top boom hinge with pin

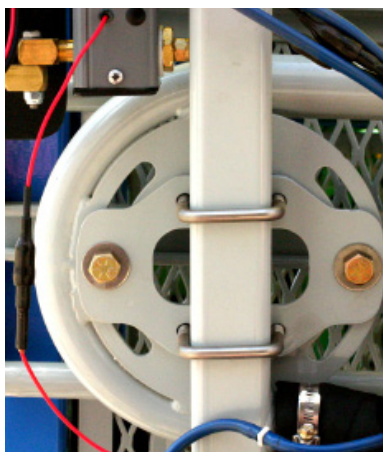


Close up of bottom boom hinge with pin

The top and bottom spray arms can be rotated from a nearly horizontal to a vertical position. Release retainer clasp, pull out the boom hinge pin, rotate the arms to the desired angle and replace boom hinge to secure the spray arm in place (see illustration above). Each spray arm can be rotated in 30 degree increments.

Make sure to replace the boom hinge pin and retainer clasp securely. Repeat for the other spray arm.

Middle Spray Arm Rotation and Vertical Adjustment



Close up of rotating plate with locking bolts and U bolts.

The middle spray arm can be rotated forward 45 degrees and backward 45 degrees. Loosen the locking bolts that secure the round rotating plate (see illustration above), then rotate the arms to the desired angle.

Make sure to tighten the locking bolts in a secure position. Repeat for the other spray arm.

Middle spray arm can be adjusted vertically by loosening the two square U bolts (as shown above)

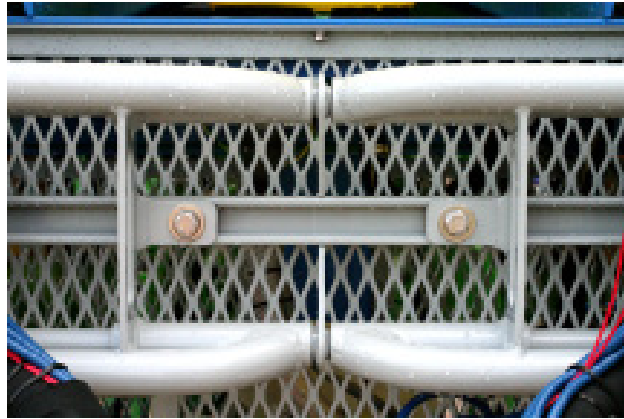
It's best to make these adjustments one at a time.

Take care to avoid straining the air and liquid connections.

Inspect all connections after adjusting the sprayer arms.

Make sure all bolts are secure before moving the sprayer.

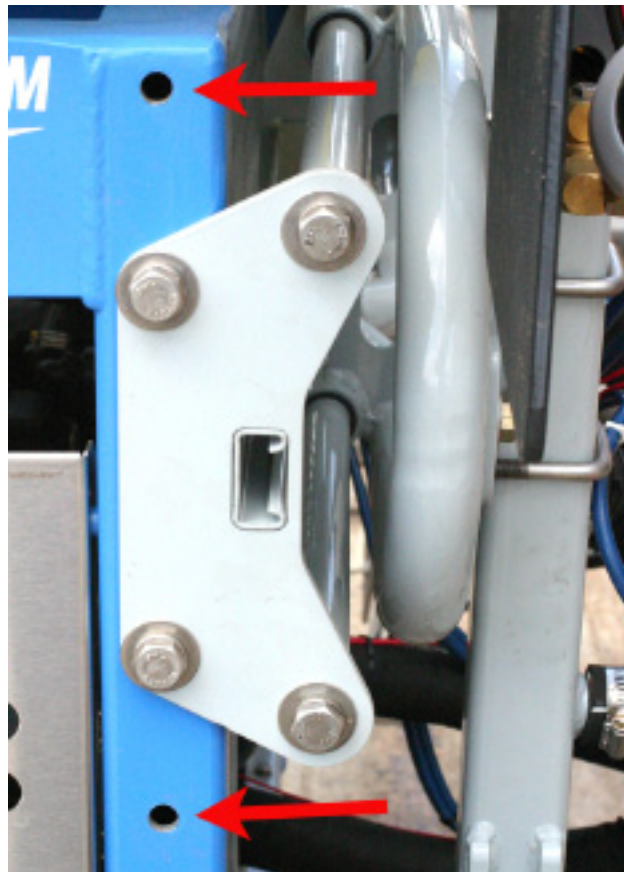
Width Adjustment



Close up of H Frame slide bolts

The spray arm's mount plate can slide the width of its frame. Loosen frame slide bolts from the back. The mount plate will then slide left or right as needed. Make sure to tighten the slide bolts to a secure position. Repeat for the other mount plate.

Middle Spray Arm Height Adjustment



Close up of H Frame height adjustment

There are 3 heights provided to bolt on the H. Frame for additional height adjustment. Be sure to replace the bolt securely.

NOTE: Boom system should be removed or supported before adjusting H Frame height.

Operating Instructions

Fill the main liquid tank with water. Wettable powder chemicals should be pre-mixed before adding to the tank; Liquid chemicals may be added directly to the main sprayer tank. Follow all instructions on the chemical or pesticide manufacturer's label

Operating the sprayer without water in the tank will cause damage to the centrifugal pump seals! This type of damage is not covered by your warranty.

NOTE



Shown with the optional 150 gallon tank



Correct sequence for turning on the Sprayer controls.

Setting the Air Pressure

With the tractor just above idle speed, engage the PTO and increase the tractor speed until a minimum air pressure of 18 PSI is reached. Based on certain conditions 19 - 21 PSI could be reached. If a higher PSI is achieved more penetration and further spray distance could occur.

Setting the Liquid Pressure

Turn on the "MAIN POWER" switch and verify that the hour meter is working. Now, turn on the "SPRAY" switch, which turns on the motorized ball valve that control the nozzles. The nozzles will begin to spray.

At the front of the sprayer, left of the Liquid Pressure gauge is a gate valve labeled "LIQUID PRESSURE VALVE." This valve restricts the return flow of liquid to the tank. Opening (turning counter-clockwise) the Liquid Pressure Valve will decrease pressure and closing it (turning clockwise) will increase pressure. There is a hole in the valve so that when it is fully closed, some liquid will still be able to return to the tank to maintain tank agitation. This is a safety precaution to keep the gauge from failing if the pressure becomes too high. Liquid pressure at the factory will be set between 20–30 PSI in order to achieve a nominal 150-ml/minute flow ($\pm 10\%$) out of each nozzle.



Nozzle Adjustment

Use the graduated cylinder found in the parts kit to check the flow from each before spraying. Any flashing or small pieces of debris that have broken loose testing or in transportation should be cleaned out at this time. Follow the procedure outlined in the Cleaning and Maintenance section (page 9).

Determine the average of the liquid volume readings over the entire sprayer to determine the nozzle flow rate to use when applying chemicals. Refer to the Calibration and Field Operation section for determining gallons per acre (GPA) based on your measured nozzle flow.

Utilizing the double swivels on the nozzle assemblies, direct the spray pattern towards the target as desired. For normal spray applications, the nozzles should be at least 18 inches (50 cm) from the plant canopy. Nozzles can be angled backward if necessary to achieve minimum spray distance. In some conditions it may be necessary to direct the nozzles slightly forward to combat wind.

Operating Electrostatics

With the main power switch in the ON position, activate the “CHARGE” switch to supply electricity to the spray boom. Once air pressure is present, the bank of LED lights on the control panel will glow for each power supply operating on the spray bars. If a LED does not illuminate, it may be an indication that there is a fault with a power supply. If replacement is necessary refer to page 13.

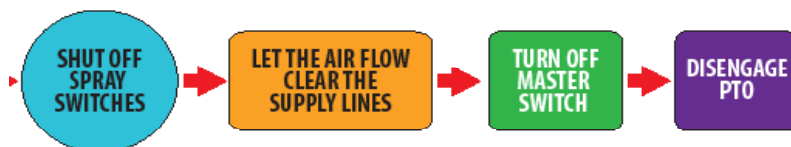
Following the procedure in the Cleaning and Maintenance section (page 10), set the voltage meter (provided with your sprayer) to measure current in the micro-amp (μA) range. Check the charge level of all nozzles. Readings will vary from 9 to 18 μA depending upon conditions. A reading of 0.00 μA indicates a nozzle that is not receiving voltage. A low reading from 2 to 6 μA indicates that the nozzle has some debris present or there is a blockage in the chemical supply line and needs to be cleaned. If all the nozzles read low, the sprayer is not grounded properly.



NOTE

Shutting Down the Sprayer

It is important to shut the sprayer down correctly so that the liquid lines will be purged of chemical.



First turn off the electrostatic system by switching the “CHARGE” switch. Then turn off the liquid flow by shutting off the ball valve controls. Allow the air flow to purge the remaining liquid from the supply lines in the boom. Wait a few seconds until the nozzles quit spraying. They may spit intermittently, but this is normal. When the liquid has cleared from the boom supply lines, turn off the sprayer’s main switch and power down the PTO.

NOTE: Failure to disengage the PTO before shutting down the tractor can cause damage to the supercharger.

NOTE

Follow the section on Draining and Flushing the Sprayer for additional post-use maintenance.

Calibration And Field Operation

The 100SR is a low volume sprayer. Therefore, tank mixes must be adjusted accordingly. Use the Calibration Guide (next page) to determine GPA (Gallons per acre). After determining the desired concentration of chemicals, mix the equivalent amount of active ingredients per acre per tank.

The average nozzle flow rate can be adjusted and operated from 120 to 200 ml/min. Outside this range, nozzle charging is poor and spray deposition is low. Optimum performance is achieved by setting the liquid flow of the nozzles from 120 to 180 ml/min. Adjust the liquid pressure using the Liquid Pressure Valve and, if necessary, the flow disks. A variety of flow disks have been provided in the Sprayer's Spare Parts Kit. A lower-valued disk will reduce the flow; a higher-valued disk will increase the flow.

Using the tractor's height adjustment for the three-point hitch, adjust the spray bar so that the nozzles are about 18 inches from the crop. At this distance, the nozzle air will push the charged spray into the plant canopy and provide adequate overlap of the spray cloud from each nozzle. If the boom is too close to the crop, there will not be enough room for the spray cloud to develop and coverage will be uneven. This is known as striping. If the spray bar is too far away, then spray may not reach into the canopies or spray drift may occur. In windy conditions, the nozzles can be angled forward and the spray bar moved closer to the crop.

When mixing chemicals for a low volume sprayer, it is good practice to conduct a jar test to determine if the chemicals to be mixed are compatible. If they are not, then investigate alternative chemicals or use a compatibility agent to maintain the chemicals in suspension. It is also a good idea to treat the water with a pH agent.

ESS does not recommend the use of wetting agents or spreader-stickers.

How to conduct a jar test

Needed:

Solutions of chemicals in approximate dilutions

Jar with lid

Gloves and Safety Glasses

After mixing solutions of the desired chemicals, place them in a large jar, cap it securely, and shake vigorously. Carefully observe the interaction between the chemical compounds. If the water becomes milky or cloudy, the combined solution may plug the nozzles. Let the jar sit for one to two hours. If there is precipitate on the bottom of the jar, then seek another combination of chemicals.

NOTE



Calibration Guide

Use the following formula to determine the total gallons per acre (GPA):

$$GPA = \frac{5940 \times GPM}{MPH \times W}$$

where the variables stand for:

1. *GPM* = Gallons per minute per nozzle. To determine gallons per minute per nozzle, first measure the flow rate of one nozzle in milliliters/minute with a graduated cylinder. Convert the volume of the flow rate from milliliters to gallons by dividing the volume by 3,800 (1 gallon = 3,800 milliliters). The normal flow rate of an ESS nozzle is between 120 and 200 milliliters per minute (0.0316 and 0.05263 gallons per minute). The flow rate can be varied by adjusting liquid pressure.

Conversion: 1 gallon = 3,800 milliliters

So,
120 ml/min = 0.0316 *GPM*
150 ml/min = 0.0395 *GPM*
180 ml/min = 0.0474 *GPM*
200 ml/min = 0.0526 *GPM*

2. *MPH* = Tractor speed in miles per hour

3. $W = \frac{\text{Total spray swath in inches (distance between the rows)}}{\text{Total number of nozzles}}$

EXAMPLE:

John's 150HT has 14 nozzles. The distance between the rows is 8 feet and he is spraying each row. The average flow rate is 180 milliliters per nozzle. The tractor on which the sprayer is mounted will travel at 5 miles per hour during spray application. How many gallons per acre will this sprayer apply?

$$GPM = \frac{180 \text{ ml/min}}{3800 \text{ ml/gal}} = 0.0474 \text{ GPM}$$

$$MPH = 5$$

$$\begin{aligned} \text{Total spray swath} &= 8 \text{ feet (2.5 meters)} \\ &= 96 \text{ inches (250 centimeters)} \end{aligned}$$

$$\text{Total number of nozzles} = 14$$

$$W = \frac{96 \text{ inches}}{14 \text{ nozzles}} = 6.86$$

$$\frac{5940 \times 0.0474 \text{ GPM}}{5 \text{ MPH} \times 6.86} = \frac{281.56}{34.3} = \mathbf{8.21 \text{ GPA}}$$

Example:

$$\frac{120 \text{ ml}}{3,800 \text{ ml/gal}} = 0.0316 \text{ GPM}$$

Cleaning and Maintenance

It is very important to follow all the maintenance and cleaning procedures to ensure that the electrostatic sprayer will function properly. Although the MaxCharge™ nozzle will outperform all electrostatic spray technology on the market, regular cleaning will ensure peak operating performance. The sprayer can be washed down with a pressure washer prior to any individual component being cleaned; take extreme caution around sensitive components. As a precaution, apply dielectrical silicone grease to all connections. This will prevent water damage to the electrical system.

Cleaning Nozzles

Disassemble the nozzle by unthreading the electrode cover. Pull the hood off. The nozzle consists of eight main components:

- | | |
|--------------------|-----------------------------|
| 1. Hood | 5. Nozzle Base |
| 2. External O-ring | 6. Liquid Inlet |
| 3. Nozzle Cover | 7. HV Electrical Connection |
| 4. Insulator Ring | 8. Air Inlet Piping |

The nozzles are mounted to the air tube using two brass nipples and two swivel connectors. This allows the operator to aim the nozzles in directions that are appropriate for travel speeds and wind conditions. The wiring harnesses and liquid lines are mounted inside PVC protective covering that protects parts from chemical and physical damage.

Disassemble the nozzle by unthreading the electrode cover. Pull the hood off. The nozzle consists of eight main components. The diagram on the right page identifies the nozzle components and the air, liquid, and electrical connections.

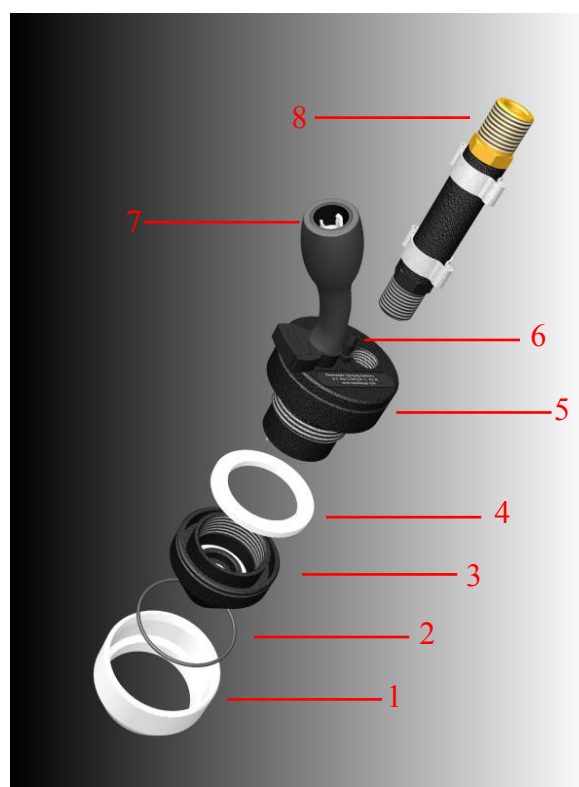
Simple cleaning of the nozzle interior and exterior with soap and water after each day of use is the most important thing you can do to ensure trouble free operation. Cleaning each day avoids long-term chemical buildup that eventually causes clogs, poor spray patterns and shortens nozzle life. After each day's use, remove the nozzle cover and clean any debris from around the nozzle tip. Clean the ceramic outlet and all interior and exterior surfaces. It is important to clean inside the hood and the two cavities. Wipe clean the exterior of the wires and all hoses and fittings connected to the nozzle. Put dielectric silicon grease on any electrical components.

After cleaning, make sure the internal (located in the nozzle base) and external o-rings are still in place. Put the insulator ring back on the nozzle base and screw the nozzle cover back. Replace the hood, pushing it up against the external o-ring.

The nozzle cover should be hand tight. Never use pliers or other tools to tighten it. The insulator ring should be loose.



Apply enough dielectric silicone grease to coat the metal pin and socket connections of the nozzles. Also use dielectric silicone grease to protect the low-voltage circular connectors.



NOTE

DRAINING THE WET BOOM

The sprayer is equipped with cam-lock couplings on the end(s) of the wet boom. These can be used for drainage or flushing the liquid system



FLUSHING AND CLEANING THE SPRAYER

Nutra-Sol cleaner is an excellent neutralizer of chemical deposits in your tank and liquid lines. The use of this product will keep your equipment operating at peak performance. The recommended mixing ratio is 4 ounces in 12.5 gallons of water (113 grams in 47 liters of water).

Chemical build up and clogging can drastically affect the performance of the unit. Therefore it is imperative that the flow discs and screens are checked and cleaned regularly. These are easily accessed by twisting the cap (ref P/N 18494) on the regulator assembly one quarter turn, being cautious not to lose the flow disc. After cleaning, reassemble in the orientation below. Note the flow disc should have numbers facing away from the strainer, in the direction of the liquid flow.



ESS recommends the use of NUTRA-SOL, a chemical neutralizer.

Disassembled flow regulator (with part numbers)



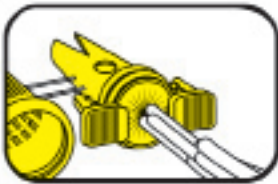
Repairing Power Supply Wires

Option 1: Using Blazing Wire Connectors

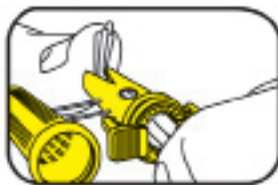
The red or black power supply wiring will occasionally break during normal field operation. The wiring can be repaired easily in the field. ESS recommends using Blazing Wire Connectors™; several are provided in your Spare Parts Kit. These connectors are waterproof and vibration-proof. Although you will need a pocketknife or wire stripper, no other tools are necessary to repair a broken wire.

Here are the instructions from www.blazingproducts.com/products/connectors/LV9/instructions.html.

Instructions

1.   1a.

Strip wires 1" and group bare wire ends together. Do not pre-twist solid wire. You must pre-twist **stranded** wire. If using both wire types, you must wrap stranded wire around untwisted solid wires (see illustration 1a).

2.   2a.  2b.

Insert wires through flexible sealing fingers and bend bare wire ends together into one "V-Channel." When connecting heavy solid wires, use bending sleeve / depth gauge on outer sleeve of connector (see illustration 2a). For larger connections (e.g. three #12 wires, or equivalent, or more), bend wires into the V-Channel with round hole at bottom (see illustration 2b); pull folded group of wires downward into this hole at bottom of "V."

3.   3a.

Separate connector, removing plastic "link" or "leg" from inner sleeve. Push inner sleeve into pre-filled outer sleeve until **double-locked**. Ensure that bending sleeve does not come down over either latch. Pre-filled silicone fully waterproofs the connection. Do not reuse.

Uses

Under-ground	• Lawn Irrigation Systems • Low-Voltage Lighting • Security Systems • Telephone Wire Splices
Vehicle	• Boats, Recreational Vehicles • Heavy Construction Equipment

Revolutionary Design
Keeps low-voltage connections dry and corrosion-free.

Wire Sizes	Tamaños de los cables
Min. 2 #18 AWG • Max. 3 #10 AWG STR with 1 #18	
Min. 2 del # 18 AWG • Máx. 3 del #10 AWG STR, 1 del #18	
Application	Aplicación
Maximum 30 Volts • 30 Amps. Copper wire, solid or stranded	Máximo 30 Voltios • 30 Amperios Cable de cobre, sólido / retorcido
Sealant Temperature	Temperatura del sellador
-40°F to 400°F	-40 grados F hasta 400 grados F -40 hasta 200 grados Celsius
WARNING!	ADVERTENCIA!
WARNING: Not for high-voltage connections.	ADVERTENCIA: No es para aplicaciones de alto voltaje.

MADE IN USA

Use only in accordance with local and national codes. Use solamente de acuerdo con los códigos vigentes en su país. U.S. Patent 6,051,791. All other appropriate trademarks, U.S. and Foreign Patents apply. Printed in USA. ©2004 Blazing Products, Inc.

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St. Louis, Missouri USA

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Option 2: Soldering

If you do not have one of the yellow Blazing Connectors, you will need to repair the broken wiring harness with more traditional methods.

Please note: It is important to use the heavy-walled heat shrink tubing (part # 6601) for repairs. Do not use the thin-walled heat-shrink tubing or electrical tape. These thinner insulating materials will break down under the harsh duty conditions your sprayer operates in. An imperfect repair will cause electrical current to “leak” and lower the performance of the nozzle-charging system.

First, strip back the ends of the broken wires by cutting the red outer casing, then carefully cut the inner casing to expose the wire itself.

Cross the wire ends in an “X” shape. Now, twist the right end away from you. Make sure you have good contact between the bare wires. Twist as tightly as you can.

Now, work with the left wire end. Twist it toward you. By reversing the twisting direction, you will make a stronger connection and the wire ends will be less likely to pull apart. Again, twist as tightly as you can.

If you have soldering equipment available, solder the wires together.

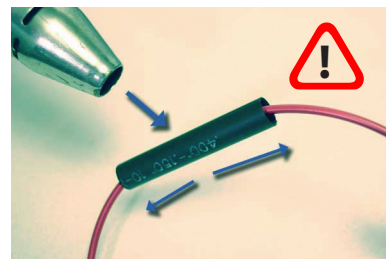
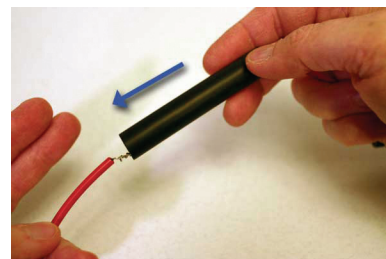
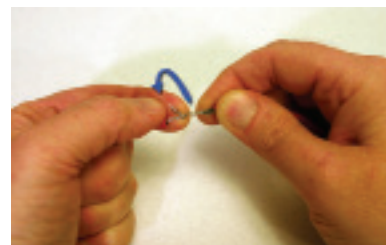
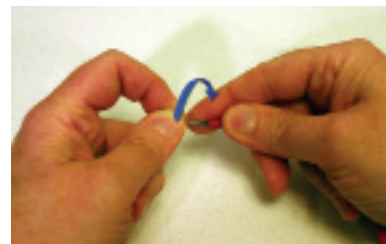
Caution! Always be careful with heated tools like soldering irons.

Remembering to use the thick-walled heat shrink tubing, slip the tubing over the open end of the wire and position it so that the bare wire is in the middle of the heat shrink tubing.

Use a heat gun or small butane torch to shrink the shrink tubing. Apply heat evenly, starting at the middle of the tube and working outward. Just before you finish shrinking the tubing, apply glue inside it to seal your repaired connection from moisture.

Caution! Always be careful with heated tools like heat guns.

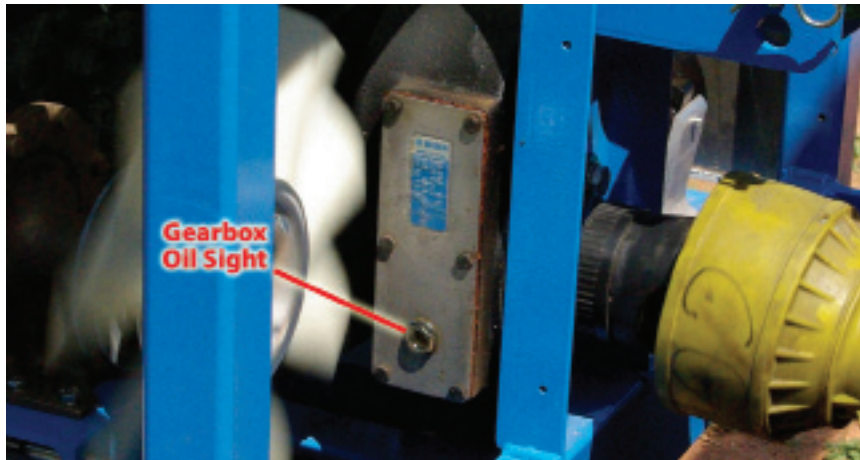
NOTE



Maintenance

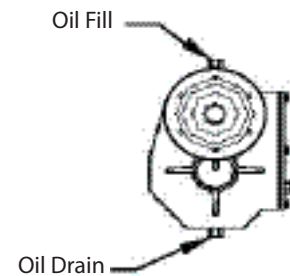
Gear Multiplier

Check oil in gearbox. Add **SAE90EP (extreme pressure)** gear oil through the oil fill inlet piping until the oil level reaches the middle of the sight glass (shown below).



(Please note: This photograph was taken with several panels removed for illustration purposes. DO NOT operate your 150SR sprayer without all panels and guards in place.)

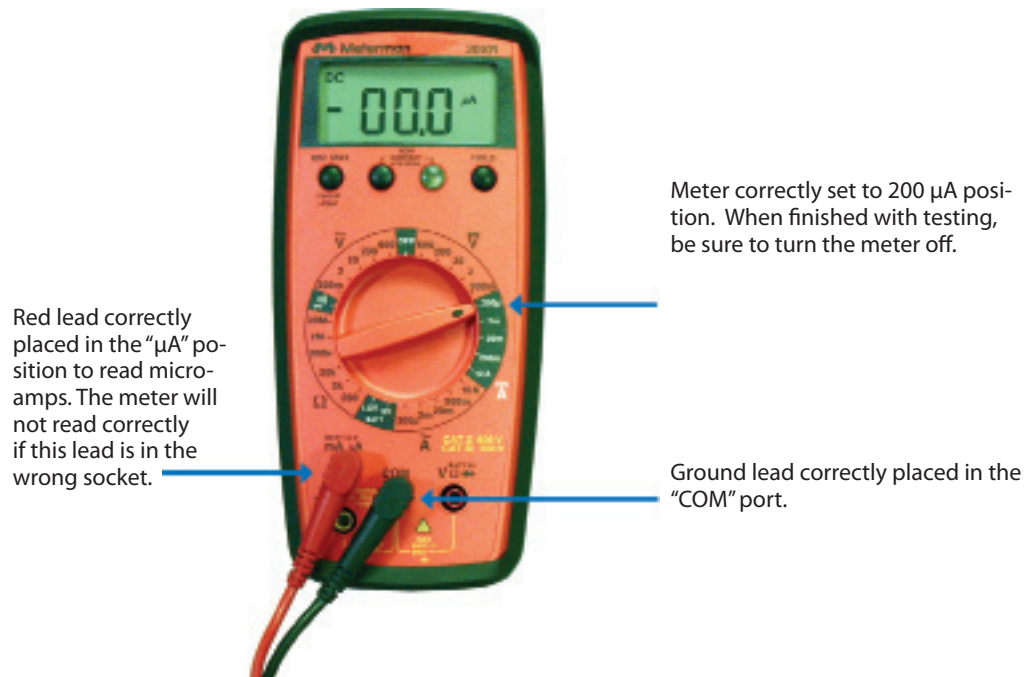
Change gearbox oil after the first 20 hours of operation. Then change the oil every 500 hours of operation. Use SAE90EP (extreme pressure) oil. The oil level should be checked each time the machine is taken out into the field.



BIMA M5 1:7 Gear Multiplier

TESTING NOZZLE CHARGES

Test the nozzle for charging using the image below to ensure that the meter is properly set to measure the current of the spray cloud in micro-amps (μA).



NOTICE

Make sure to test your nozzle liquid charges at standard operating liquid and air pressures.

To test your spray charge with the multimeter

1. Turn the meter on and set it to the 200 μA range.
2. Ground the multimeter's black lead to the spray bar or by pinching the metal probe between the forefinger and thumb of your hand.
3. Hold paddle on the red lead about 1 inch (2.4 cm) from the tip of nozzle outlet while it is spraying and the electrostatics are turned on. Read the charge on the meter.

Ideally the spray charge will be above 10 μA . In the image above the nozzle spray has an excellent reading of 26 μA . If the charge is below 10 μA you will not achieve good electrostatic 'wraparound'. For optimal performance, clean any nozzles that are below 6 μA by following the procedures outlined in the Cleaning and Maintenance section.

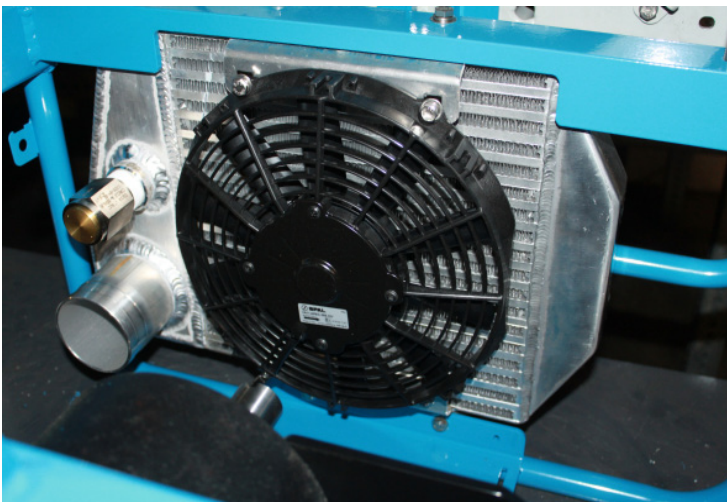
FILTER, PRE-CLEANER AND HEAT EXCHANGER



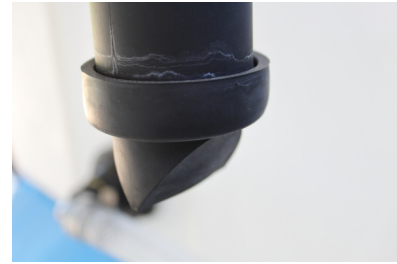
Pre-cleaner location

While the unit is running, inspect the restriction-service indicator on the filter housing. If indicator shows red, reset while equipment is running to verify accuracy. If indicator continues to show red replace the primary filter. Replace safety filter after every second primary filter (located in front of primary filter). Before replacing filters, clean the inside of the housing thoroughly as to not introduce debris into the air system. Due to the sensitive nature of the supercharger, cleaning the filter rather than replacing it will void the warranty. Examine the pre-cleaner drop tube before every work session. Empty the drop tube by squeezing the ends together. Collected dust and dirt will fall to the ground.

The unit utilizes an air-to-air heat exchanger to cool the compressed air produced by the supercharger. It is important keep the component clean, as it requires unobstructed air flow to function properly. Use a high pressure air supply to clean the heat exchanger. Be mindful not to damage the cooling fins.



Heat exchanger



Close-up of the pre-cleaner drop tube



Restriction service indicator

NOTICE

Rely on the restriction-service indicator for the most efficient and economical use of the filter.

Filters that appear very dirty may still contain a great amount of service life.

Sprayer Maintenance Warnings

Please take special note of the following maintenance precautions as they could adversely affect your sprayer performance, sprayer parts life and warranty guarantees.

Failure to disengage PTO or failure to use ESS-supplied driveline:

1. ALWAYS disengage the PTO before turning off the tractor.
 - If you fail to disengage the PTO before turning off the tractor, the motor has the potential to spin the supercharger in reverse. This can cause serious damage to the unit!
2. ALWAYS use the driveline supplied with this sprayer.
 - This driveline is equipped with an overrunning clutch to help prevent supercharger damage due to PTO backlash.
 - PLEASE NOTE: Failure to use the ESS supplied driveline will void the supercharger warranty.

Exposure to extreme heat:

1. Unchecked constant sprayer usage in excess of eight (8) hours per day could result in issues that may damage the supercharger.
 - Operating the sprayer in temperatures over 100 °F (37 °C) will require more frequent attention to the maintenance listed above.

Water Contamination:

1. ALWAYS replace the breather cap on the reservoir after checking the oil level.
2. When cleaning the unit, DO NOT spray water directly at the oil reservoir or into the air cleaner assembly.

Warranty Information:

- PLEASE NOTE: You *must* return the warranty card at the back of this Operator's Manual in order for the equipment to be covered by the warranty.

Yearly Maintenance

- ☐ Apply dielectric silicone grease to all wiring harness pin assemblies and all nozzle electrical connections.
- ☐ Drain and replace the main gearbox oil every 500 hours.
- ☐ Thoroughly clean all nozzles with Nutra-Sol™ by following the procedure outlined in the Cleaning and Maintenance section (p. 9). Use a soft bristle toothbrush and pipe cleaners to remove any chemical deposits. The nozzle parts may have to soak in the cleaning solution to soften hardened deposits. Using the soft bristle brush or a soft cloth, clean the interior and exterior of the nozzle base. Make sure the o-ring is replaced before reassembly of the nozzle cover.
- ☐ Thoroughly inspect all wiring harnesses and red high voltage wiring for cuts or abrasions that show black streaks. This is evidence of electrical arcing. Replace any wires that may show signs of cuts, abrasions or joints as this may indicate arcing. These wires should be repaired with thick-wall heat shrink tubing following the procedure outlined in the Repairing Power Supply Wires section (pgs. 11–12).
- ☐ If there is any evidence of leaking or unexplained loss of pressure output, inspect (and replace if necessary) the centrifugal pump seal following the exact instructions found in the Hypro operator's manual.
- ☐ Every 1000 operating hours, replace the oil and in-line oil filter in the supercharger oil system. It is important to use Rotrex SX 100 Traction Fluid. Do not substitute another brand or type of oil.



Apply enough dielectric silicone grease to coat the metal pin and socket connections of the nozzles. Also use dielectric silicone grease to protect the low-voltage connectors.

Oil Change Schedule

Gear reducer

Initial oil
change

performed at	Interval: 500 hours					
20 hours	520	1020	1520	2020	2520	3020

Supercharger oil system

Interval: 1000 hours					
1000	2000	3000	4000	5000	6000



It's important to keep your MaxCharge™ nozzles clean and working efficiently.

Troubleshooting Guide

Possible Problem(s)

Air pressure is low

PTO speed too low	Increase tractor RPM
Air fittings are loose	Spray fittings with soapy water—tighten ones that bubble
Air fittings are too tight causing washers or seals to be pinched crushed	Check fittings for damage. Replace damaged seals
Hoses unattached	Inspect for loose hoses and reattach
Hoses cracked or cut	Inspect for failed air lines—replace damaged lines
Pop off valve may be open	Inspect pop off valve for trash in inlet

Spray from nozzle is erratic or spits

Debris in the nozzle	Clean nozzle according to Operator's Manual
Liquid filters are clogged	Clean main filter and liquid filters in the flow setups
Low liquid level in the tank	Increase liquid level in tank above two or three gallons
Loose liquid fitting near nozzle	Inspect to see if black hose is pulled from back of nozzle. Reattach hose
Liquid control lever in 'OFF' position.	Verify that liquid control lever is in the 'ON' position to open ball valve
Ball valves not open	Verify that power supply switch is on

Liquid will not turn on or off

Main power switch turned off before liquid control switches	Verify that power supply switch is on so that ball valve will turn off correctly
Fuse blown on liquid control	Replace fuses found inside back of control box

Charging indicator (LED) light is out

Dirty nozzles	Clean nozzle according to instructions
LED bulb is blown	First, test to see if liquid is producing a charge reading. using the multimeter. If it is, you may need to replace the LED bulb.
Bad or loose ground wire	Ensure that green ground wires are connected to battery and sprayer
Bad power supply	Inspect power supply for electrical output. Replace if needed
Wire has been cut or broken	Inspect for cut or damaged wires. Replace if needed
Bad air switch	Jump air switch by putting the two wires together.

Low charge on one or more nozzles

Incorrect air flow	Adjust PTO speed
Incorrect liquid flow	Adjust Liquid Pressure
Leaky connections	Check all air, liquid connections
Dirty nozzles	Clean nozzle according to instruction-
Bad power supply	Inspect power supply for output
Cut or damaged wire	Inspect for cut or damaged wirescon-

Nozzle charging is low or zero on ALL nozzles

Bad or loose ground wire	Check that the green ground wires are connected to battery and sprayer
Bad Power Supply	Inspect power supply for electrical output. Replace if needed
Blown fuse	Replace power supply fuse inside control box and/or in power supply harness
No input power	Inspect for 12-volt DC current to power supplies
Bad multimeter or multimeter leads	Inspect meter for blown fuse or leads that have been cut or shorted. Change batteries
Dirty nozzles	Clean nozzles according to Operator's Manual

Nozzles drip when the sprayer is off

Turned off sprayer without following correct procedure	Restart unit and turn off liquid control then turn off main power switch
--	--

Liquid pressure too high

Throttle valve setting incorrect	Adjust pressure down by opening throttle valve
Blocked liquid return line	Inspect for blocked return line to tank

Principal Parts



P/N 11068: Gearbox 1:7 Multiplier



P/N 17686: Driveline (size 4)



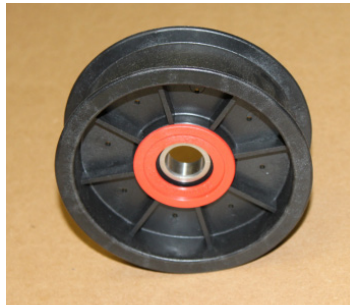
P/N: 17398: Blower Belt
PK Series Micro-V



P/N 7871: Gearbox to Pump
Belt 1/3VX400



P/N 4862: Centrifugal Liquid
Pump



P/N 17209: Backside Belt Idler
4-inch



P/N 17780: Oil Cooler



P/N 7865: Cooling Fan (13-inch)



P/N 17334: Rotrex Supercharger
with 70mm pulley



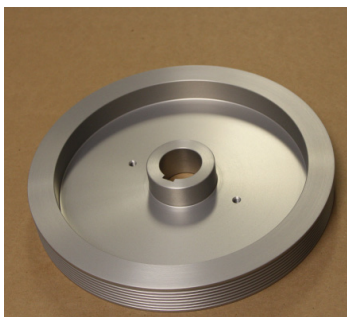
P/N 17553: Oil Filters



P/N 17552: Rotrex Traction Oil
A3-1



P/N 17661: Synthetic 75W-90(EP)
Gear Lubricant



P/N 17321: 35mm Pulley

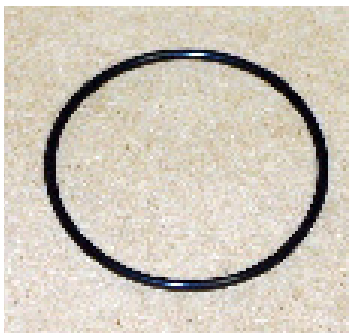
Nozzle Parts



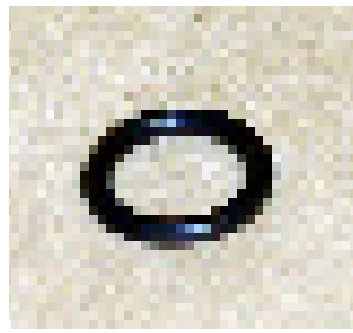
P/N NB-5784: Nozzle Base Assembly (RC)



P/N NB-5808: Nozzle Base Assembly (CG)



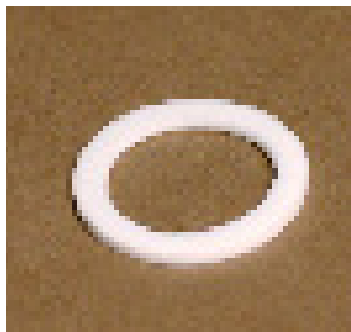
P/N 5770: O-ring, External



P/N 5771: O-ring, Internal



P/N NC-5775: Nozzle Cover Assembly



P/N 5694: Insulator Ring



P/N AP5795: Row Crop Nozzle Hood



P/N AP5798: Chile Grape Nozzle Hood



P/N 1298: Brass Swivel



P/N AS1391: Hose Assembly (Nozzle End)



P/N 725: 1/4" Hex Nipple



P/N 7064: Liquid Inlet Barb

Air System Parts



P/N 17399: Air Filter Assembly



P/N 17826: Primary Filter Element



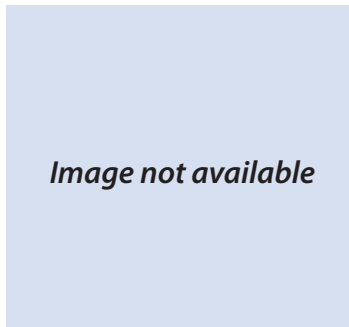
P/N 17827: Safety Filter Element



P/N 7869: Restriction-service Indicator



P/N 7892: Air Pressure Switch



P/N AW17379: Heat Exchanger



P/N 813: Worm Clamp #28



P/N 17338: 90 Degree Reducer
4 inch to 3 inch

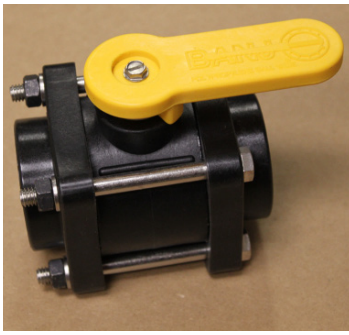


P/N 17336: Straight Reducer
3 inch to 2 1/4 inch



P/N 17337: Elbow 45 degree
1/2 inch

Liquid System Parts



P/N 7862: Main Tank Drain Valve



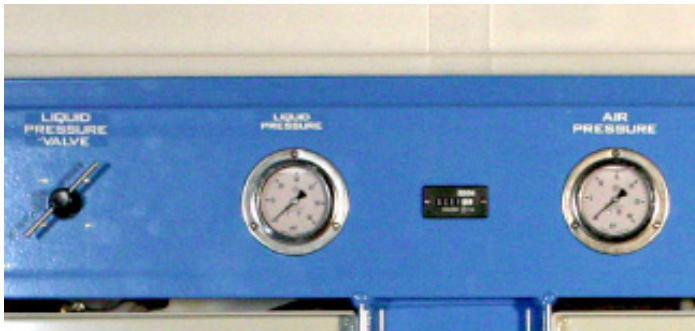
P/N 8235: Jet Agitator Nozzle with Inserts



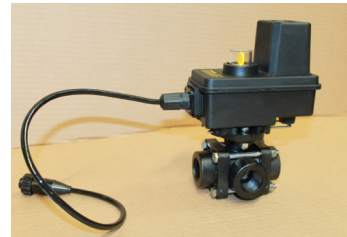
P/N PP16790: Tank Fill Strainer



P/N 3588: Tank Filter



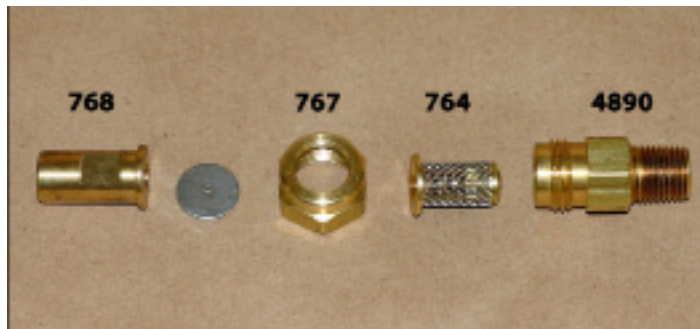
P/N 1039: Panel Mount Liquid Pressure Gauge (0 – 60 PSI)
P/N 1039-A: Panel Mount Air Pressure Gauge (0 – 30 PSI)
P/N 7851: Liquid Pressure Valve (see 150SR for correct valve image)



P/N 8425: Electric Spray Control Valve Assembly



P/N 9983: Electric Spray Control Valve (motor head only)



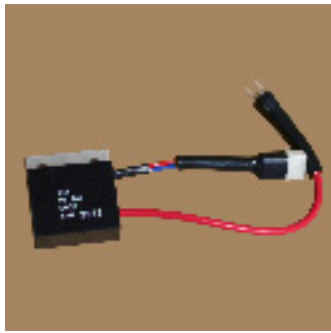
From the Left:

P/N 768: Flow Regulator Adaptor
P/N Various: Flow Disk (Specify size; see chart below)
P/N 767: Flow Regulator Cap
P/N 764: #24 Mesh Strainer
P/N 4890: Flow Regulator Body

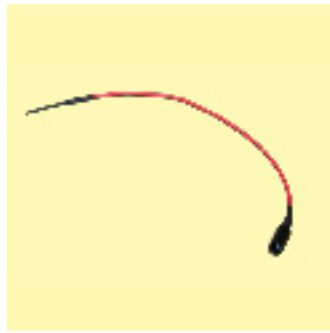
Flow disks are matched to the number of nozzles they control:

P/N 1293: #51 (0.051") 5 to 6 nozzles
P/N 4350: #59 (0.059") 7 to 8 nozzles

Wiring Parts



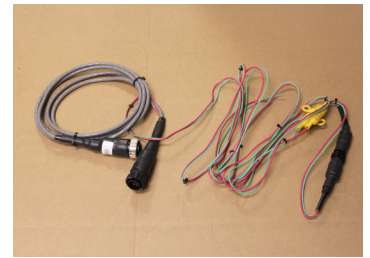
P/N PS-1071: Power Supply Assembly



P/N AS3608: HV Wire Assembly
P/N 16763: High Voltage Wire
(at specified length)



P/N 12182: High Voltage Electrical Connector



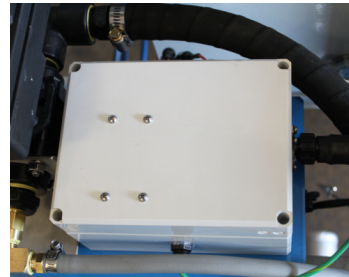
P/N AS16144: Control Box to Unit Harness



P/N AS16133: Unit Harness



P/N AS16137: Control Box



P/N AS16141: Power Supply Enclosure

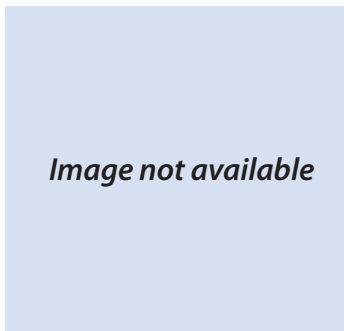
Miscellaneous Parts



P/N 3174: Dielectric Silicone Grease



P/N 1566: Nutrasol Tank Cleaner



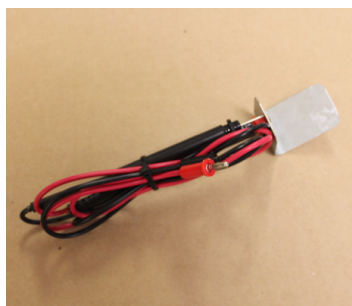
P/N PP17344-1: Side Panel



P/N 3249: Hour Meter



P/N AS2572: Multimeter Assembly



P/N AS7055: Test Leads for Multimeter



62 Morrison St. · Watkinsville, Georgia 30677-2749
706-769-0025 · 1-800-213-0518 · Fax: 706-760-8072
Email: support@maxcharge.com · www.maxcharge.com

ESS Warranty

Electrostatic Spraying Systems, Inc. warrants to the original purchaser of any Electrostatic Spraying Systems equipment that the equipment shall be free from defects in material and workmanship for a period of one year after date of delivery or 1000 hours of operation. The electrostatic power supply warranty form must be returned for verification of date of purchase.

Disclaimer of Implied Warranties and Consequential Damages

Electrostatic Spraying Systems' obligation under this warranty, to the extent allowed by law, is in lieu of all warranties, implied or expressed, including implied warranties of merchantability and fitness for a particular purpose and any liability for incidental and consequential damages with respect to the sale or use of the items warranted. Such incidental and consequential damages shall include, but not be limited to: transportation, charges other than normal freight charges, cost of installation other than cost approved by Electrostatic Spraying Systems, Inc., duty, taxes, charges for normal service or adjustments, loss of crops or any other loss of income, expenses due to loss, damage, detention or delay in the delivery of equipment or parts resulting from acts beyond the control of Electrostatic Spraying Systems, Inc.

THIS WARRANTY SHALL NOT APPLY:

1. To vendor items which carry their own warranties such as, but not limited to, engines, air compressors, and liquid pumps. Electrostatic Spraying Systems, Inc. shall supply replacement parts at list price pending the warranty investigation of the vendor item. Vendor item parts such as air compressors, liquid pumps, solenoids, and other such items must be returned before warranty credit.
2. If the unit has been subject to misapplication, abuse, misuse, negligence, fire or other accident.
3. If parts not made or supplied by Electrostatic Spraying Systems, Inc. have been used in connection of the unit, if, in the sole judgement of Electrostatic Spraying Systems, Inc. such parts affect its performance, stability or reliability.
4. If the unit has been altered or repaired in a manner which, in the sole judgement of Electrostatic Spraying Systems, Inc. such alteration or repair affects its performance, stability or reliability. This shall include but not be limited to opening of the handgun shell by anyone not authorized by Electrostatic Spraying Systems, Inc. to do so.
5. All drivelines and all input bearing and input seal failures on gearboxes
6. **If the supercharger care and maintenance is not followed to the satisfaction of Electrostatic Spraying Systems, Inc., as outlined on the "Supercharger Information" warning on page ii of this manual.**
7. **To normal maintenance, service and replacement items such as, but not limited to, engine lubricant, filters, or to normal deterioration of such things as, but not limited to, belts and exterior finish, due to use and exposure.**

NO EMPLOYEE OR REPRESENTATIVE OF
ELECTROSTATIC SPRAYING SYSTEMS, INC.
IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY
OR GRANT ANY OTHER WARRANTY
UNLESS SUCH CHANGE IS MADE IN WRITING
AND IS SIGNED BY A CORPORATE OFFICER OF
ELECTROSTATIC SPRAYING SYSTEMS, INC.