CONGRATULATIONS!

You have just purchased one of the most advanced spraying systems on the market today. Electrostatic Spraying Systems, Inc. (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:

Electrostatic Spraying Systems, Inc.
62 Morrison St.
Watkinsville, Georgia 30677-2749
Phone: 706-769-0025
1-800-213-0518
Fax: (760) 769-8072
support@maxcharge.com

Please take time to read this manual before operating the 350VA32 Orchard Sprayer™. 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 350VA32 Orchard Sprayer™, 350VA™, 350VA32™, MaxCharge™, and the ESS logo are copyrights or registered trademarks of Electrostatic Spraying Systems, Inc.
# TABLE OF CONTENTS

Overview of ESS 350VA32 Air-Assisted Electrostatic Sprayer ..................... 1
Operator’s Responsibility ............................................................................. 2
Chemical Precautions ................................................................................. 2
Safety Precautions ..................................................................................... 2
Safety Decals .............................................................................................. 3–4
Installing The Sprayer For The First Time ................................................. 5
   Air Cleaner Assembly ............................................................................ 5
   Spray Bar Assembly .............................................................................. 5
   Installing the Driveline ........................................................................ 6
   Making the Hydraulic Connection ..................................................... 6
   Installing the Control Box .................................................................. 6
Operating Instructions ................................................................................. 7
   Setting the Air Pressure ..................................................................... 7
   Setting the Liquid Pressure ............................................................... 7
   Turning On Charging ......................................................................... 8
   Shutting Down the Sprayer ............................................................... 8
Calibration and Field Operation ................................................................. 9
   Calibration Guide ............................................................................... 10
Cleaning and Maintenance ......................................................................... 11
   Cleaning Nozzles .............................................................................. 11
   Flushing the Sprayer ....................................................................... 12
   Cleaning the Main Tank .................................................................. 12
   Flow Disks ....................................................................................... 13
   Repairing Power Supply Wires ..................................................... 14–15
Before Operation ....................................................................................... 16
Routine Inspection ................................................................................... 17
Testing Nozzles ....................................................................................... 18
Adjusting Spray Bars ............................................................................... 19
Yearly Maintenance ................................................................................ 20
Troubleshooting Guide ............................................................................ 21
Spare Parts Kit Parts List .......................................................................... 22–23
Service Parts ............................................................................................ 24
   Air System Parts ........................................................................... 24
   Liquid System Parts ...................................................................... 25
   Control Box Parts .......................................................................... 26
   Nozzle Parts .................................................................................... 27
   Wiring Parts ..................................................................................... 27
   Miscellaneous Parts ....................................................................... 28
Warranty ..................................................................................................... 29
Warranty card ........................................................................................... 29a
Drawing: Boom Assembly Layout ............................................................ 30
Overview of the ESS Model 350VA 32 Air-Assisted Electrostatic Sprayer

Air-assisted electrostatic sprayers produce electrically charged spray drops that are carried to the plant canopy in a low pressure, gentle, air stream. The heart of the 350VA32 Sprayer is the patented MaxCharge™ nozzle.

Air and liquid enter separately at the rear of the nozzle. Just before leaving the nozzle, the air hits the liquid stream to make many thousands of tiny spray droplets that pass through the charging ring. An electrical charge is applied to the spray droplets by the charging ring. Then the charged spray droplets are blown out of the nozzle and move into the plant canopy where they are attracted to plant material by electrostatic forces. The electrostatic charge induced by the MaxCharge™ nozzle is strong enough to allow the droplets to move in any direction to cover all plant surfaces, even defying gravity to coat the underside of leaves and the back side of fruits and vegetables. The result is uniform spray coverage on hidden areas deep inside of 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. This quality product is virtually maintenance-free, and assures you of savings in the application of chemical.

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

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 ½ the amount of chemicals. Furthermore, they also reported that ESS sprayers send ⅔ 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!**
OPERATOR’S RESPONSIBILITY

*Read the Owner’s Manual.*

It is the responsibility of the user to read the Owner’s Manual, to understand the safe and correct operating procedures which pertain to the operation of the product, and to maintain the product according to the Owner’s Manual. It is the owner’s responsibility to ensure that all who are using this equipment read this manual.

The user 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 the user’s responsibility to deliver the machine for service or replacement of defective parts which are covered by the standard warranty.

---

CHEMICAL PRECAUTIONS

Read and follow all instructions on the chemical or pesticide manufacturer’s label for the following:

- Protective clothing, eye protection, rubber boots, rubber gloves, rubber apron, hat, and cartridge respirator to be worn when handling, mixing, and applying the chemical or pesticide.
- Handling, mixing, applying, storing, and disposing methods of the chemical or pesticide.
- Decontamination methods for chemical or pesticide removal from persons, clothing and equipment.
- Avoiding potential health hazards and environmental hazards.
- Medical treatment for poisoning symptoms
- Length of time needed to pass before going into the sprayed area.
- Proper positioning or notification of sprayed areas.

---

SAFETY PRECAUTIONS

Lack of attention to safety can result in reduction of efficiency, accident, personal injury, or death. Watch for safety hazards and correct deficiencies promptly. Use the following safety precautions as a general guide when using this machine. Additional safety precautions are mentioned throughout this manual for specific operating and maintenance procedures.

- Read the operator’s manual. Failure to read the operator’s manual is considered a misuse of the equipment.
- Before operating equipment, become familiar with all caution and warning decals affixed to the machine.
- Do not allow children to operate the sprayer. Do not allow adults to operate the sprayer without proper instruction.
- Keep the area of operation clear of all persons and animals.
- Do not apply chemicals when weather conditions favor drift from treated areas.
- Turn off the sprayer when leaving it unattended.
Safety Decals

ESS places several decals\(^1\) on the 350VA32 sprayer to remind the operators of safety and proper techniques. Always follow good, safe practices when operating this machinery. Note the locations on the equipment where these decals may be found. Replace them if they become worn or damaged and can no longer be read.

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

---

\(^1\) 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.
DO NOT PUT YOUR HAND BEHIND THIS SHIELD!
There is dangerous machinery behind the guard.

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.
Installing the Sprayer for the First Time

The 350VA32 sprayer is fully assembled and tested at Electrostatic Spraying Systems before it is shipped. After testing, the unit is partially disassembled for shipment. When you have unloaded the sprayer, several parts must be reassembled before operation.

Air Cleaner Assembly

Cut away all tape, strapping material and transportation coverings on all hoses, cylinders and wire assemblies. Dismantle all wood packing material from the spray bars.

Reinstall the Air Cleaner assembly on the front of the 350VA32 sprayer.

It consists of a 5” aluminum nipple in a rubber elbow, black plastic air filter body with element, and pre-cleaner. Three ¾” bolts with washers and nuts are included as well as two hose clamps. Mount the air cleaner assembly on the mounting flange weldment using the three bolts. Slide the hose clamps over the 5” ID hose. Place them in opposite directions. Insert the 5” aluminum nipple into the 5” ID hose and tighten the hose clamps.

Spray Bars Assembly

In some instances, the 350VA32 sprayer will be shipped with the spray bars detached. They will be marked “L” or “R” indicating a left or right wing assembly. 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. Left and right wings are virtually identical, but an inspection of the wiring harness connections that are different on the left and right wings can identify them.

Mount the spray bar assembly on the rear frame of the sprayer. Refer to Drawing 17021 at the back of this manual.
Installing the Driveline

Mount the sprayer on the tractor and cut the driveline to fit. Follow the directions from the Bondioli and Pavesi Manual, paying particular attention to the length guideline on page 6.

One end of the driveline shield tube is marked with a tractor symbol to indicate the end that attaches to the tractor PTO.

Installing the Control Box

The control box mounts in the tractor cab at any 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 cable to the front of the 350VA32 sprayer as shown in the photograph at right.
Operating Instructions

ESS recommends that the sprayer be operated with only water the first time after initial installation. This will allow the operator to get comfortable with all controls and operation of the sprayer. Fill the main liquid tank with water.

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.

Setting the Air Pressure

With the tractor just above idle speed, engage the PTO and increase the tractor speed until the air pressure reading is around 15 PSI. The blower is equipped with a pop off valve that protects the blower from overpressure. The noise created by the pop off valve will alert the operator to slow the tractor PTO speed until the pop off shuts. At this point, the blower will be operating at its maximum potential for correct spraying.

It is normal for a small amount of air to leak from the pop-off valve during routine operation.

Setting the Liquid Pressure

Turn on the main power switch (1) and verify that the hour meter is working. Now, turn on the Left and Right Spray switches (2). Both spray bars will begin to spray.

On the front panel of the sprayer is a gate valve next to the liquid pressure gauge. Opening this valve will decrease pressure and closing the valve will increase pressure. This valve restricts the return flow of liquid to the tank. There is a hole in the valve so that when it is fully closed, some liquid always returns to the tank to maintain tank agitation. Also, this keeps the gauge from failing in an overpressure situation. Liquid pressure will be set at the factory between 20 & 30 PSI in order to achieve a nominal 180-ml/minute flow ±10% out of each nozzle.
Use the graduated cylinder found in the parts kit to check all nozzle flows before spraying. Any flash or small piece of material that has broken loose after ESS’ own testing or in transportation can be cleaned at this time following the procedure outlined in the maintenance section. Average the readings over the entire sprayer to determine the nozzle flow rate to use when applying chemicals.

**Turning On Charging**

After checking that all nozzles are spraying properly, turn on the Electrostatic Charging System (toggle switch 3, labeled CHARGE). One of the four LED lamps in the center of the Control Box will glow for each power supply operating on the sprayer.

Using the meter supplied by ESS, check the charge level of all nozzles. Follow the procedure in the maintenance section to correctly set the meter for measuring current. Readings will vary from 9 to 18 depending upon various conditions. Any reading of 0.00 indicates a nozzle that is not receiving voltage. Any low readings from 2 to 6 indicate that the nozzle has some flash present and needs to be cleaned. If all the nozzles read low, the sprayer is not grounded properly. Please see the maintenance section for troubleshooting guidelines.

**Shutting Down the Sprayer**

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

1. Turn off the Electrostatic Charging System first (1).
2. Then turn off the liquid flow to the nozzles, left and right (2). Wait a few seconds until the nozzles quit spraying. The nozzles will “spit” intermittently as the air flow purges the liquid supply lines in the spray bars. After the nozzles have stopped spitting, turn off the main power switch (3).
Calibration and Field Operation

The model 350VA32 is a low volume sprayer. Tank mixes must be adjusted accordingly. The average nozzle flow rate can be adjusted and operated from 100 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 in the nozzles around 180 ml/min. Adjust the liquid pressure using the Liquid Pressure valve. Adjust the spray bars 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, then the spray will be moving too fast to have enough time to be attracted to the top leaf surfaces. This is known as striping. If the spray bars are too far away, then spray may not reach into the canopies or spray drift will occur. In windy conditions, the nozzles can be angled forward and the spray bars moved closer to the crop. Take care to observe that there is no overlapping of the spray before it enters the plant canopy and adjust accordingly.

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.
**Calibration Guide**

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

\[
GPA = \frac{0.13 \times \text{(Average nozzle flow rate)} \times \text{(Number of nozzles)}}{\text{(Tractor speed)} \times \text{(Boom Length)}}
\]

- Average nozzle flow rate is the calculated average flow from the nozzles in ml/min. Use the graduated cylinder to measure all the nozzles on initial setup.
- Tractor speed is ground speed in miles/hour.
- Boom length is the ESS boom length in feet.

**Example**

A 350RC with 49 nozzles on a 38-foot boom has been tested following the initial operating setup and found to have an average liquid flow rate from the nozzles of 175 ml/min. The operator wishes to travel at 5 miles/hour. What is the GPA?

\[
GPA = \frac{0.13 \times 175 \times 32}{5 \times 38} = 5.87 \text{ GPA}
\]
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. As a precaution, apply Sil-Glyde electrical grease to all connections that will be exposed to pressure washing. This will prevent water damage to the electrical connections.

Cleaning Nozzles

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

1. Nozzle Body
2. Electrode Cover
3. Hood
4. Insulating Ring

The nozzles are mounted under 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. The diagram (right) 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 electrode 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 Sil-Glyde silicon grease inside the nozzle electrical connections whenever you have disconnected the nozzle.

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

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

Apply enough Sil-Glyde to coat the metal pin and socket connections of the nozzles. Also use Sil-Glyde to protect the low-voltage connectors.
Flushing the Sprayer

After spraying and after properly disposing of any remaining spray solution, flush the 350/450RC sprayer with a mixture of water and a cleaning agent. **ESS recommends the use of NUTRA-SOL cleaner which can be purchased from ESS.**

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). Mix the cleaner with water in the 10-gallon (37.9 liter) stainless steel rinse tank.

To flush the sprayer, first make sure the main tank has at least 5 gallons of water and that the rinse tank has been filled with either clean water or a Nutra-Sol solution. The brass rinse valve that controls the flow from the rinse tank is on the left side of the sprayer. Rotate the rinse handle down and open all ball valves. Operate the sprayer and run the entire contents of the rinse tank through the liquid system to thoroughly flush all lines.

**Do not perform this procedure without at least 5 gallons of water in the main tank. The centrifugal pump is operating during this procedure and damage to the seal will occur if the pump is operated dry for even a short time.**

Disassemble the main bowl filter and clean the screen. If heavy wettable powders have been sprayed, disassemble the flow disk assemblies and clean the enclosed screens.

Please note: the 350RC does not have a separate rinse tank. Instead, fill the main tank with either clean water or a Nutra-Sol solution.

Cleaning the Main Tank

The main sprayer tank can be cleaned by rinsing it with clean water. Empty the rinse water through the dump valve on the right side of the sprayer.

*Location of Dump valve lever.*
Flow Disks

The above drawing shows an exploded view of the disassembled flow disk assembly. Please take note of the correct order. The assembly is on the outlet side of the ball valve that controls the flow of liquid to the nozzles. You’ll find them in between the spray bars and protected by the spray bar mounting frome.

Be careful not to lose the flow disks or mix them up from one assembly to another (they can be different from spray bar to spray bar).
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. 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. 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. 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.

**Instrucciones (también vea las ilustraciones)**

1. Quitar la envoltura del cable hasta una altura de 2.5cm y juntar las extremidades descubiertas de los cables. No es necesario torcer los cables sólidos. Los cables retorcidos tienen que ser enredados. Si usa los dos tipos de cables juntos, necesita torcer el cable retorcido alrededor del cable sólido no retorcido (vea la ilustración 1a). 2. Introduzca los cables a través de los dos selladores flexibles y doble los cables en uno de los dos canales tipo “V”. Conectando cables pesados y sólidos, utilice un manguito doblador/calibre de profundidad sobre el manguito exterior del conector (vea la ilustración 2A). Para conexiones más grandes (ej. 3 cables del número 12, o equivalente, o más), doble los cables adentro del canal tipo “V”, con el agujero redondo en el fondo (vea la ilustración 2B); jale el grupo de cables hacia abajo adentro de este agujero en el fondo del canal “V.” 3. Empuje el manguito interior adentro del manguito exterior llenado con silicona, hasta que se sean cerrados (bloqueados) doblemente. Verifique que el manguito doblador no quede encima de ninguna de las conexiones. El silicona pre-llenada hasta que la conexión sea completamente impermeable. No re-utilizar el conector.

**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**
- Minimum 2 #18 AWG
- Maximum 10 #18 AWG

**Application**
- Maximum 30 Volts
- Copper wire, solid or stranded

**Sealant Temperature**
- -40°F to 400°F

**WARNING!**
- No use para aplicaciones de alta voltaje.

**MADE IN USA**
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St. Louis, Missouri USA
www.BlazingProducts.com

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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.
Before Operation
Check oil in gearbox. Add 90-weight gear oil through the oil fill inlet piping (on the sprayer’s front panel) until the oil level reaches the middle of the sight glass.

Gearbox oil level inspection port (sight glass).
(Photo taken with shield off for illustration purposes.
DO NOT operate sprayer without all protective shields and guards in place.)

Check oil in blower. Maintain at port inspection level. Use either mineral oil or synthetic oil as specified in the blower operator’s manual. OmegaSB-220 oil is recommended.
**Routine Inspection**

While the unit is running, inspect the vacuum restriction gauge on the inlet side of the blower. Clean or replace the air filter if the gauge shows red.

![Location of the Vacuum Restrictor Gauge](image)

Clean or replace the filter immediately if the gauge shows red. This must be checked while the blower is running.

Check the blower drive belts and the pump drive belt for the correct tension and also for any signs of wear.

![Location of the Vacuum Restrictor Gauge](image)

(Left) View of one belt-tensioning rod on the gearbox weldment located under the 350VA32 frame. The other is directly behind it. In order to tension the drive belt, loosen the nut on top of the plate and then turn the nut on the bottom of the plate up against the plate. This pivots the gearbox weldment down and results in tightening of the drive belts. Tighten the front and rear adjustment in equal increments alternating between them so that the gearbox weldment is not twisted.

(Right) View of the pump belt assembly. Loosen the nut on the belt tensioner, pull it back to loosen belt. The main drive belts must be removed to replace a liquid pump belt.
Nozzle testing

Test the nozzle for charging using the diagram above to ensure that the meter is set correctly to measure micro-amps (µA). To test the nozzles, turn the meter on and set it to the 200 µA range. Ground the black lead against the spray bar or pinch the metal probe between the forefinger and thumb of your hand. Insert the paddle on the red lead into the spray stream about 1 inch from the outlet of the nozzle. Read the charge on the meter. Clean any nozzles that are below 6 µA by following the procedures outlined in the Cleaning and Maintenance section.

- Ground black lead between fingers.
- Hold paddle 1 inch from nozzle outlet.
Spray Bar Adjustment

Adjust spray bars so that they are approximately 18 inches away from the crop. Check that all spray bar hinges are secure and the cotter pins are firmly in place before moving or operating your 350VA32 Sprayer.


**Yearly Maintenance**

- Apply Sil-Glyde electrical grease to all wiring harness pin assemblies and all nozzle electrical connections.
- Drain and replace the main gearbox oil.
- Verify hours of operation of the sprayer to determine if the blower oil should be changed. For mineral oil, change every 1500 to 2000 hours. For synthetic oil, change every 6000 to 8000 hours.
- Thoroughly clean all nozzles with Nutra-Sol™ by following the procedure outlined in the Cleaning and Maintenance section (p. 12). 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. Any cuts, abrasions or joints that show this arcing should be repaired with thick-wall heat shrink tubing following the procedure outlined in the Repairing Power Supply Wires section (pgs. CHECK PAGE REF).
- In critical applications, replace the centrifugal pump seal following the exact instructions found in the Hypro operator’s manual.

*Sil-Glyde will keep all the electrical connections free from corrosion. Apply enough Sil-Glyde to coat the metal pin and socket connections of the nozzles. You can also use Sil-Glyde to protect the low-voltage connectors.*
## TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Problem(s)</th>
<th>Corrective Action</th>
</tr>
</thead>
</table>
| Air pressure is low | • PTO Speed too low  
• Air fittings are loose  
• Hoses cut or unattached  
• Pop off valve may be open | • Increase tractor RPM  
• Spray fittings with soapy water — tighten ones that bubble  
• Inspect for loose hoses or failed air lines — replace  
• Inspect pop off valve for trash in inlet |
| Spray from nozzle is erratic or spits | • Debris in the nozzle  
• Liquid filters are clogged  
• Low liquid level in the tank  
• Loose liquid fitting near nozzle  
• Ball valves not open | • Clean nozzle according to instructions  
• Clean main filter and liquid filters in the flow setups  
• Increase liquid level in tank above 2 or 3 gallons  
• Inspect for black hose pulled from back of nozzle  
• Verify that power supply switch is on |
| Liquid will not turn off | • Main power switch turned off before liquid control switches  
• Fuse blown on liquid control | • Verify that power supply switch is on so that ball valve will turn off correctly  
• Replace fuses found inside back of control box |
| Charging indicator (LED) light is out | • Dirty nozzles  
• Bad or loose ground  
• Bad power supply  
• Cut wire | • Clean nozzle according to instructions  
• Ensure that green ground wires are connected to battery and sprayer  
• Inspect power supply for output  
• Inspect for cut or damaged wires |
| Nozzle charging is low or zero on ALL nozzles | • Bad or loose ground  
• Blown fuse  
• No input power  
• Bad meter or leads | • Check that the green ground wires are connected to battery and sprayer  
• Replace power supply fuse inside rear of control box  
• Inspect for 12-volt DC current to power supplies  
• Inspect meter for blown fuse or leads cut or short |
| 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 | • Gate valve setting wrong  
• Blocked liquid return line | • Adjust pressure down by opening gate valve  
• Inspect for blocked return line to tank |
Spare Parts Kit Parts Listing

Every 350/450RC sprayer is shipped with a spare parts kit that contains an assortment of small parts that may be needed during initial setup and operation. These parts are ones that may be broken during normal operation and would need immediate replacement to continue spraying. The kit also contains the owner’s manuals, charging meter and graduated cylinder for calibration of the sprayer.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12182</td>
<td>1</td>
<td>Connector, Black, Blazing Products</td>
</tr>
<tr>
<td>1285</td>
<td>1</td>
<td>Graduated Cylinder</td>
</tr>
<tr>
<td>1293</td>
<td>10</td>
<td>Orifice disk, #51</td>
</tr>
<tr>
<td>1391</td>
<td>3</td>
<td>Hose Assembly, Row Crop Nozzle</td>
</tr>
<tr>
<td>1464</td>
<td>1</td>
<td>Box, Small Parts, (Grainger Over/Under)</td>
</tr>
<tr>
<td>1566</td>
<td>1</td>
<td>Tank Cleaner, Nutra-Sol</td>
</tr>
<tr>
<td>16197</td>
<td>2</td>
<td>Connector Ring, #10 — Ground</td>
</tr>
<tr>
<td>1662</td>
<td>5</td>
<td>Hose Clamp, Worm, Size 4.5S</td>
</tr>
<tr>
<td>209</td>
<td>20</td>
<td>Hose, 1/8” × 1/4” OD, Vinyl, Black, 500’</td>
</tr>
<tr>
<td>2572</td>
<td>1</td>
<td>Multimeter assembly</td>
</tr>
<tr>
<td>2578</td>
<td>4</td>
<td>Fuse, 5 Amp, 250 V, AGC, 1-1/4” × 1/4”, Main Power Control Box</td>
</tr>
<tr>
<td>3174</td>
<td>1</td>
<td>Silicon Grease, 4oz. Tube</td>
</tr>
<tr>
<td>396</td>
<td>15</td>
<td>Hose, 1/4” ID, 500’, Grey</td>
</tr>
<tr>
<td>4350</td>
<td>10</td>
<td>Orifice Disk, #59</td>
</tr>
<tr>
<td>4890</td>
<td>2</td>
<td>Body, 1/4” – 18 MPT</td>
</tr>
<tr>
<td>5694</td>
<td>5</td>
<td>Insulator Ring</td>
</tr>
<tr>
<td>5771</td>
<td>5</td>
<td>O-Ring, Buna N, #209</td>
</tr>
<tr>
<td>6270</td>
<td>1</td>
<td>Attached Lid Container</td>
</tr>
<tr>
<td>6601</td>
<td>1</td>
<td>Heat Shrink, Black Polyolefin, 0.400–0.150, W/ADH</td>
</tr>
<tr>
<td>7064</td>
<td>10</td>
<td>18” HB × #10-32 Taper, Black Nylon</td>
</tr>
<tr>
<td>7476</td>
<td>5</td>
<td>Ell, 3/16” HB × 3/16” HB White Nylon</td>
</tr>
<tr>
<td>764</td>
<td>10</td>
<td>Strainer, #24 Mesh</td>
</tr>
<tr>
<td>767</td>
<td>2</td>
<td>Cap, Flow Regulator</td>
</tr>
<tr>
<td>7853</td>
<td>3</td>
<td>3/16” HB × 1/8” MPT, BR</td>
</tr>
<tr>
<td>7857</td>
<td>5</td>
<td>Tee, 3/16”HB × 3/16”HB × 1/8” HB, WN</td>
</tr>
<tr>
<td>7858</td>
<td>5</td>
<td>Reducing barb, 1/8” HB × 3/16” HB, WN</td>
</tr>
<tr>
<td>7859</td>
<td>5</td>
<td>Tee, 3/16”HB, WN</td>
</tr>
<tr>
<td>7875</td>
<td>10</td>
<td>Hose, 3/16” ID, Blue Conductive</td>
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<tr>
<td>7892</td>
<td>1</td>
<td>Pressure Switch, NO, 5 psi, Two Lugs</td>
</tr>
<tr>
<td>8246</td>
<td>1</td>
<td>Seal Kit, 9203 Polypro Pump, Silicone carbide</td>
</tr>
<tr>
<td>8253</td>
<td>5</td>
<td>Hose Mender, 3/16” HB, WN</td>
</tr>
<tr>
<td>915</td>
<td>5</td>
<td>Hose Clamp, Two Ear, 3/4”SS</td>
</tr>
<tr>
<td>9981</td>
<td>1</td>
<td>Coupling Ring, Size 11 Shell</td>
</tr>
<tr>
<td>9994</td>
<td>2</td>
<td>Coupling Ring, Size 13, TYCO</td>
</tr>
<tr>
<td>9995</td>
<td>2</td>
<td>Coupling Ring, Size 17 Shell</td>
</tr>
<tr>
<td>NA-11298</td>
<td>1</td>
<td>Nozzle Assembly, RC, 180 Assembly</td>
</tr>
<tr>
<td>PS-1071</td>
<td>1</td>
<td>Power Supply Assembly 1999 For RC</td>
</tr>
<tr>
<td>14271</td>
<td>3</td>
<td>Nylon Brushes</td>
</tr>
<tr>
<td>3608</td>
<td>5</td>
<td>High Voltage Wires, Red</td>
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<tr>
<td>5770</td>
<td>5</td>
<td>O-ring, Viton</td>
</tr>
<tr>
<td>1592</td>
<td>3</td>
<td>Brass Nipples</td>
</tr>
<tr>
<td>12181</td>
<td>3</td>
<td>Connector, Blazing, Yellow</td>
</tr>
<tr>
<td>4705</td>
<td>6</td>
<td>Nylon Flat Washer</td>
</tr>
<tr>
<td>4706</td>
<td>3</td>
<td>Nylon O-ring</td>
</tr>
<tr>
<td>3250</td>
<td>2</td>
<td>Fuse, 15 Amp. AGC1 ¼ × ¼</td>
</tr>
<tr>
<td>3379</td>
<td>2</td>
<td>Fuse, 20 Amp. AGC1 ¼ × ¼</td>
</tr>
</tbody>
</table>
## Spare Parts Kit Parts List, Continued

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3380</td>
<td>2</td>
<td>Fuse, 8 Amp. AGC, 1 ¼ × ¼</td>
</tr>
<tr>
<td>7871</td>
<td>1</td>
<td>Belt VX 400 1-Groove — Pump</td>
</tr>
<tr>
<td>7872</td>
<td>2</td>
<td>Belt 3VX560 3-Groove — Blower</td>
</tr>
<tr>
<td>9946</td>
<td>2</td>
<td>Belt 3 VX600 3-Groove — Blower</td>
</tr>
</tbody>
</table>

**Please note:**
The number of spare belts sent with your sprayer may vary depending on the number of spray nozzles on the sprayer.

## Notes
Service Parts

The following service parts are available from ESS.

P/N 6811: Gearbox

P/N 5834: Driveline

P/N 7872: Drive Belt

P/N 7871: Drive Belt

P/N 7871: Pump Belt

P/N 7873: Liquid Centrifugal Pump

Air System Parts

P/N 7870: Air Filter Assembly
P/N 8244: Assembly with Pre-cleaner

Replacement Air Filter for 350/450RC

P/N 7869: Vacuum Indicator

P/N 7850: Pop-off Valve

P/N 7892: Pressure Switch

P/N 7884: Hot Air Blower Hose, 3"
P/N 7861: T-Bolt Clamp

P/N 7885 Flexible Hot Air Hose, 3"
P/N 7861: T-Bolt Clamp

Exhaust Air Hose
P/N 813 Worm Clamp
Liquid System Parts

P/N 7862: Dump Ball Valve, 1”
P/N 7863: Tank Outlet Ball Valve, 1 1/2”
P/N 5068: Line Strainer with Parts

P/N 6600: Replacement Screen for Filter
P/N 6599: Replacement O-ring for Filter

P/N 1039: Gauge, 21/2” 0 – 60 PSI
P/N 7851: Gate Valve

P/N 7906: Ball Valve, Manual Three-way
P/N 8432: Ball Valve Assembly 12-volt Electric

From the Left:
P/N 768: Adaptor
P/N Various: Flow Disk (Specify size; see chart below)
P/N 767: #24 Mesh Strainer
P/N 770: Body, 1/4” NPT

Flow disks are matched to the number of nozzles they affect.
P/N 1293 #51 For 5 to 6 nozzles
P/N 4350 #59 For 7 to 8 nozzles
Control Box Parts

P/N 716: LED Holder

P/N 129: LED Light

P/N 896: DPDT Switch

P/N 3252: Rubber Boot

Remove screws on back of the Control Box to access fuses.

P/N 3379: 20 Amp Fuse
P/N 3379: 20 Amp Fuse
P/N 3250: 15 Amp Fuse
P/N 3250: 15 Amp Fuse
P/N 2578: 5 Amp Fuse
P/N 2578: 5 Amp Fuse

ELECTOSTATIC SPRAYING SYSTEMS, INC.

Main Power Indicator Light
Main Power Switch
Power Supply Indicator Lights One for Each Power Supply
Left Boom Spray Switch

Main Fuse
Fuse for Electrostatic Charging System
Electrostatic Charging System ON/OFF
Right Boom Spray Switch
Nozzle Parts

P/N NB-5784: Nozzle Base
P/N 5770: O-ring, External
P/N 5771: O-ring, Internal
P/N 5775: Electrode Cover Assembly
Specify 0.180 Port Size

P/N 5770: O-ring, External
P/N 5770: O-ring, External
From the left:
P/N 7900: Hose Assembly
P/N 1298: Brass Swivel
P/N 1391: Hose Assembly (Boom End)

Wiring Parts

P/N 1071 A: Row Crop Power Supply
P/N 3609: Wire Assembly for Nozzle Repair
P/N 1512: Bare Wire for Nozzle Repair
P/N 6601: Heavy Wall Heat Shrink Tubing
**Miscellaneous Parts**

- P/N 7303: Breakaway Hinge Assembly
- P/N 4132: Spring Assist Shock
- P/N 3174: Sil-Glyde Silicon Grease
- P/N 8235: Jet Agitator Nozzle
- P/N 7934: Hydraulic Valve Assembly
- P/N 7864: Anti-Vortex Fitting with Insert
- P/N 7866: Nutrasol tank Cleaner
- P/N 7930: Lock Valve
- Order (2) P/N 8285 O-rings when replacing this valve.
- P/N 6732 Stack Valve
  Order (2) P/N 8285 O-rings and (1) P/N 8284 O-ring plate when replacing this valve.
- P/N 7942: Hydraulic Valve Wiring Control Harness
- P/N 7865: Fan
- P/N 7918: Hub Spacer
- P/N 7887: Belt Tensioner
- P/N 6732 Stack Valve
  Order (2) P/N 8285 O-rings and (1) P/N 8284 O-ring plate when replacing this valve.
- P/N 7934: Hydraulic Valve Assembly
- P/N 7942: Hydraulic Valve Wiring Control Harness
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. 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. 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.