



ESS

Owner's Manual Conveyor Test Unit

ESS

Electrostatic
Spraying Systems

62 Morrison St. • Watkinsville, GA 30677-2749
Toll-Free: 800-213-0518 • Fax: 706-769-8072
www.maxcharge.com

OWNER'S MANUAL

CONVEYOR TEST UNIT

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

CE certification applied for

Copyright © 2008, Electrostatic Spraying Systems, Inc. – All Rights Reserved
This manual last updated December 4, 2009



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:

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

Please take time to read this manual before operating your new Conveyor Test Unit. The manual contains important instructions for the safe operation of this equipment. It also includes helpful suggestions to maximize productive use of the Conveyor Test Unit. Essential cleaning instructions should be followed to maintain your sprayer at peak efficiency. Please carefully read and follow all instructions for your own safety and the safety of others around you.

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, Inc. can meet your present and future spraying equipment needs.

¹ ESS TRG-5 Sprayer™, TRG™, MaxCharge™, and the ESS logo are copyrights or registered trademarks of Electrostatic Spraying Systems, Inc.

Notes

TABLE OF CONTENTS

Overview of the Conveyor Test Unit.....	1
Safe operation	2
Operator's responsibility.....	2
Safety precautions	2
Chemical safety precautions	2
Safety decals	3
Unit Installation.....	4
External Air Supply Setup.....	5
Operating Instructions	6
Setting Liquid Pressure.....	6
Flow Regulator	6
Stainless Steel Tank	7
Operating Electrostatics.....	7
Testing the Nozzles.....	8
Shutting Down Spray Systems....	8
Cleaning and Maintenance	9
Troubleshooting Guide	10
Warranty card	10a
Warranty	11

Overview of the Conveyor Test Unit Air-assisted Electrostatic Sprayer

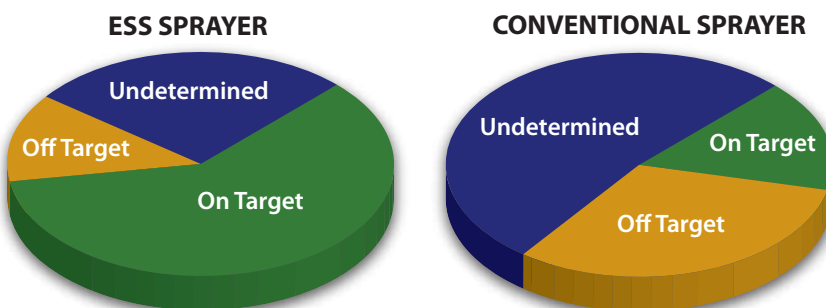
Air-assisted electrostatic sprayers produce electrically charged spray drops that are carried to the plant canopy in a low pressure, gentle, air stream. The heart of the Conveyor Test Unit is the patented MaxCharge™ nozzle.

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?



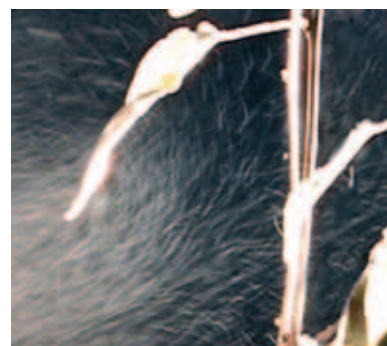
The University of California completed a series of tests to investigate what happens to spray liquid after it leaves the nozzle.

Conclusion: ESS technology places over 4 times the amount of spray onto the plant surface using $\frac{1}{2}$ the amount of chemicals. Furthermore, they also reported that ESS sprayers send $\frac{2}{3}$ 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!



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



Electrostatically charged droplets are attracted to plant surfaces.



Flourescent dye test

The left knob was sprayed with the electrostatic system ON; the right knob was sprayed with the same sprayer, but with the electrostatic system OFF. Note how even the coverage is on the electrostatic knob.

Safe operation of the Conveyor Test Unit

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.

SAFETY PRECAUTIONS

Lack of attention to safety can result in reduced efficiency, accident, personal injury, or death. Watch for safety hazards and correct deficiencies promptly. Use the following safety precautions as a guide when using this machine.

- ♦ Read the Owner's Manual. Failure to read the manual is considered a misuse of the equipment.
- ♦ Use the Conveyor Test Unit ONLY for its intended use as described in this manual.
- ♦ Before operating equipment, become familiar with all caution and warning decals affixed to the sprayer.
- ♦ Do not allow a child to operate the Conveyor Test Unit 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.
- ♦ Store sprayer in a dry place. Do not expose to freezing temperatures.

CHEMICAL SAFETY PRECAUTIONS

Read and follow all instructions on the chemical or pesticide manufacturer's label.

- ♦ Use protective clothing, eye protection and gloves when mixing chemicals and while spraying with the Conveyor Test Unit sprayer.
- ♦ Always use a cartridge respirator, protective clothing and eye protection when spraying with the Conveyor Test Unit
- ♦ Follow the chemical manufacturer's recommendations in handling, mixing, applying, storing and disposing of chemicals.
- ♦ Be aware of decontamination methods in case a person, clothing, or equipment is accidentally sprayed.
- ♦ Be aware of poisoning symptoms and know the appropriate first aid.
- ♦ Know the length of time needed to pass before allowing people and pets to go back into the sprayed area.

Safety decals

Appropriate safety decals are placed on ESS equipment in order to alert the operator to possible dangers. If decals are missing, please contact ESS immediately for replacement decals.

! WARNING!	! ¡PRECAUCIÓN!
<p>AGRICULTURAL CHEMICALS CAN BE DANGEROUS. IMPROPER SELECTION OR USE CAN SERIOUSLY INJURE PERSONS, ANIMALS, PLANTS, SOIL OR OTHER PROPERTY.</p> <p>BE SAFE:</p> <ul style="list-style-type: none"> • SELECT THE RIGHT CHEMICAL FOR THE JOB. • HANDLE IT WITH CARE. • FOLLOW THE INSTRUCTIONS ON THE CHEMICAL MANUFACTURER'S LABEL. 	<p>LOS PRODUCTOS QUÍMICOS AGRÍCOLAS PUEDEN SER PELIGROSOS. LA SELECCIÓN O EL USO INAPROPIADOS PUEDEN LESIONAR SERIAMENTE A LAS PERSONAS, LOS ANIMALES, LAS PLANTAS, LA TIERRA U OTRA PROPIEDAD.</p> <p>TENGA CUIDADO:</p> <ul style="list-style-type: none"> • SELECCIONE EL PRODUCTO QUÍMICO CORRECTO PARA EL TRABAJO. • MANÉJELO CON CUIDADO. • SIGA LAS INSTRUCCIONES DE LA ETIQUETA DEL FABRICANTE DEL PRODUCTO QUÍMICO.

READ AND FOLLOW THE CHEMICAL MANUFACTURER'S INSTRUCTIONS CAREFULLY.

It is extremely important for the owner/operator's safety as well as the safety of other people in the vicinity that all chemical safety precautions are followed.

! WARNING!	! ¡PRECAUCIÓN!
<ul style="list-style-type: none"> • DO NOT REMOVE TANK LID OR RELEASE TANK PRESSURE WHILE COMPRESSOR IS RUNNING. • RELEASE TANK PRESSURE BEFORE REMOVING LID OR TANK HOSE CONNECTIONS. • KEEP FACE AWAY WHEN RELEASING PRESSURE AND WHILE REMOVING TANK LID. • DO NOT OVERFILL TANK. • FILL TO 4 INCHES (10 CM) FROM TOP OF TANK WHEN USING TANK AGITATOR SYSTEM. 	<ul style="list-style-type: none"> • NO RETIRE LA TAPA DEL TANQUE NI LIBERE LA PRESIÓN DEL TANQUE MIENTRAS LA COMPRESORA ESTÉ FUNCIONANDO. • LIBERE LA PRESIÓN DEL TANQUE ANTES DE RETIRAR LA TAPA O LAS CONEXIONES DE LA MANGUERA DEL TANQUE. • MANTENGA EL ROSTRO ALEJADO CUANDO LIBERE LA PRESIÓN Y MIENTRAS RETIRA LA TAPA DEL TANQUE. • NO SOBRELLENE EL TANQUE. • LLÉNELO HASTA 10 CENTÍMETROS (4 PULGADAS) DE LA PARTE SUPERIOR DEL TANQUE CUANDO USE EL SISTEMA AGITADOR DEL TANQUE.

CAUTION:

The stainless steel tank operates under pressure.

This decal describes important information on correct use of the tank and its agitator.

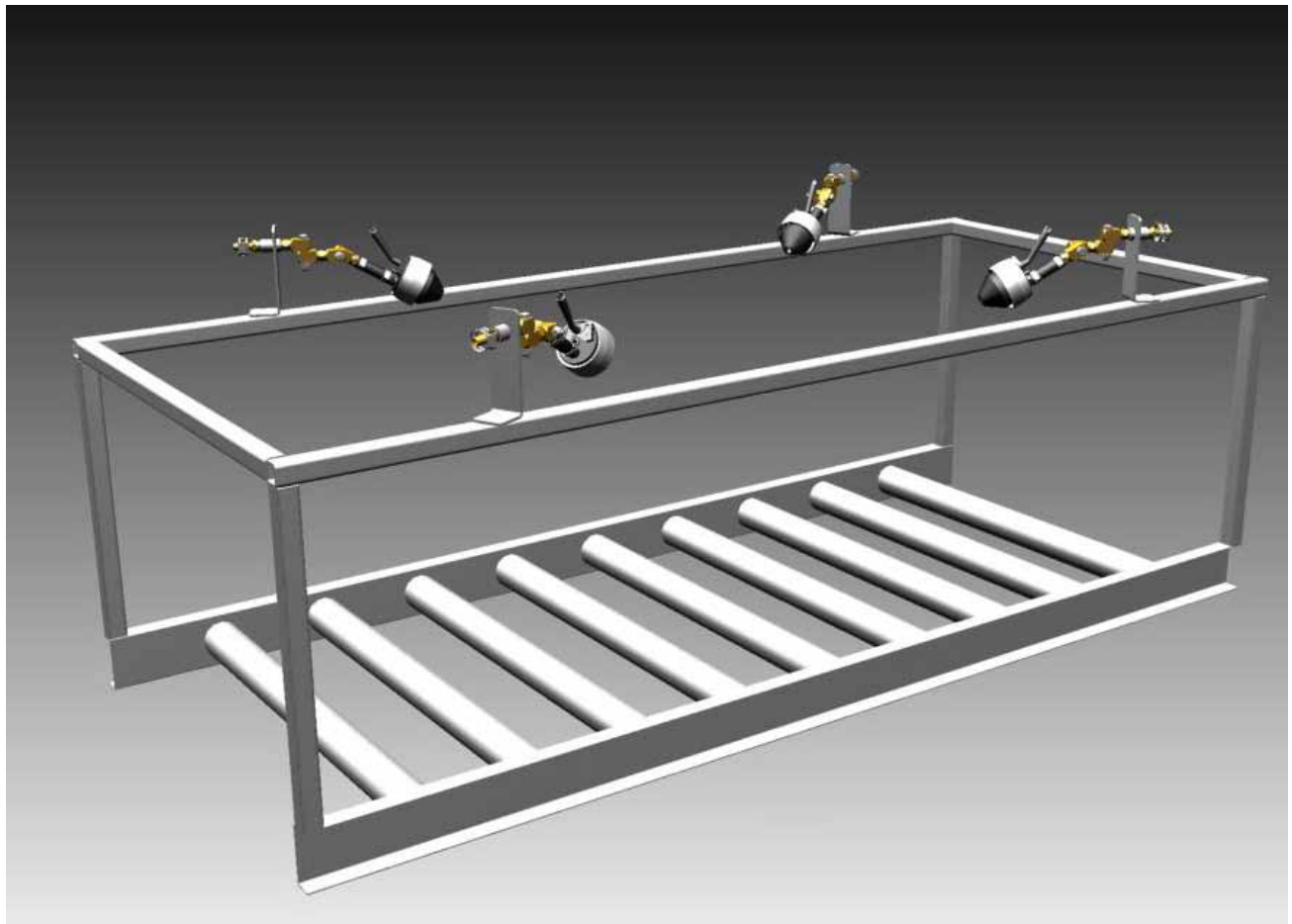


If you use a pacemaker, use our electrostatic sprayer at your own risk.

Unit Installation

Since the nozzles can be placed anywhere, it is important to understand the problems that can result from their placement. When installing an individual nozzle, be careful not to place the nozzle too close to the target, as striping can occur. If striping does occur, the operator can do one of two things, either distance the nozzles further from the intended target or reduce the air pressure through the system. Also remember that the electrostatic coating process is very effective and any grounded component will fight for spray attraction; although once these surfaces are coated, they will no longer attract droplets. Once an orientation is decided on, make sure to route your air, liquid, and electrical lines in such a way that they are not kinked, excessively tight, or pulled across sharp edges.

The Conveyor Test Unit has a uniquely high demand for air volume. When setting up the application be mindful of the fact that this air will have to go somewhere. If you are working within a confined environment, make sure to take the necessary health precautions as well as provide adequate ventilation; refer to chemical warning labels for more information.



*Recommended minimum spray distance
of no less than 3 feet, depending on
pressure output.*

External Air Supply Setup

The Conveyor Test Unit has a uniquely high air flow requirement for operation. It is important to understand the requirements mentioned and whether a sufficient supply is available. ESS recommends the installation of an air dryer, or water trap, with sufficient flow capabilities to remove condensation produced by the heating and cooling of compressed air. If moisture is allowed to enter the spray system it may adversely affect the performance of the unit. Contact ESS if you have any questions or concerns regarding your air system.

The supply connection provided with your air manifold is sized so that the operator can sufficiently provide the air flow requirement without having to use excessively high pressures. Although the nozzle can operate over 100PSI, the spray distance produced may be undesirable for close targets. When restricting pressure outputs it is important to use an appropriately sized air regulator. Failure to do so will drastically reduce the air volume produced by your initial air supply. Once connected, ESS recommends an air flow reading is taken from each nozzle head. If a CFM meter is not available the operator can take charge readings, with the multi-meter supplied, of all nozzles supported on the manifold; the charges should read at least 12 micro amps. If a lower reading is recorded, the operator can manually shut off the air supply to each nozzle, reducing the CFM requirement for the system, and take individual readings. The diagram below outlines a basic system layout.

Nozzle Air Requirement (SCFM)

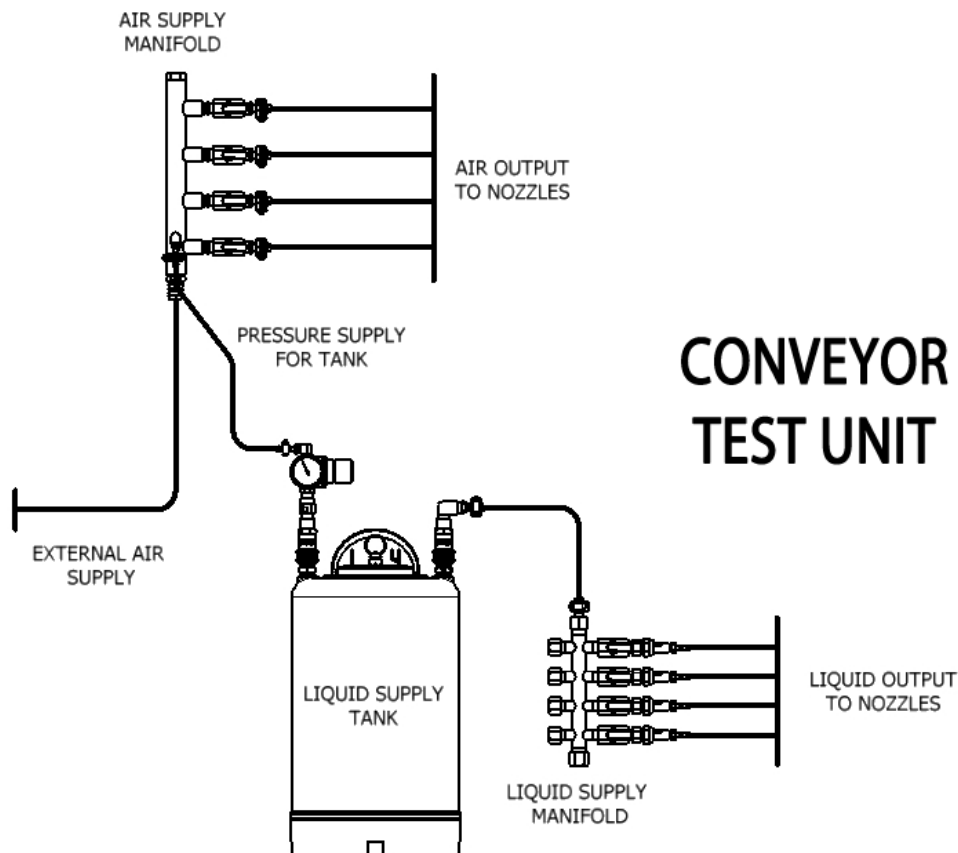
1 Nozzle: 4-8

2 Nozzles: 8-16

4 Nozzles: 16-24

8 Nozzles: 32-64

at 15 PSI and above



Operating Instructions

Setting Liquid Pressure

The Conveyor Test Unit system is provided with a 3, 5 or 15 gallon pressure vessel. The tank uses a small portion of the provided air supply to push liquid to the spray heads. The tank will come assembled with an air pressure regulator installed inline of the "inlet" port.

Adjusting the air pressure allowed into the tank effectively reduces or increases the liquid output at the nozzle heads.

It is important to understand that flow rates can be affected by two ways: first by increasing or decreasing the pressure allowed into the tank and then secondly by changing the flow disk size in the Flow Regulator assemblies (refer to illustration below). The system will be calibrated at the factory to achieve a nominal 150 mL/min flow ($\pm 10\%$) out of each nozzle. Adjusting the liquid rate excessively will negatively effect electrostatics. If lower rates are desired, air rates can be reduced.

To set the tank pressure:

Turn the external air source on. Locate the tank pressure regulator and gauge assembly. Pull adjustment knob outward to adjust pressure.

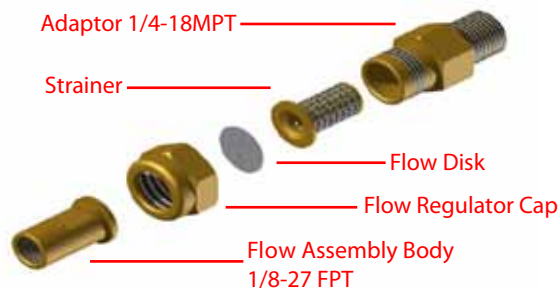
Turn left (counter-clockwise) to decrease pressure.

Turn right (clockwise) to increase pressure.

For an accurate setting start with the regulator below the desired rate, then adjust to a higher pressure. Once the desired pressure is set, push the adjustment knob inward to lock

Flow Regulator Assembly

The illustration below shows the flow regulator assembly. Located on the liquid manifold, the assembly is used to regulate the liquid supply to the spray heads. Since chemical build up and clogging can drastically effect the performance of the unit it is imperative that these assemblies are checked and cleaned regularly. Using a 13/16" and 11/16" wrench, separate the regulator cap from the adaptor, being cautious not the lose the flow disk. After cleaning reassemble in the orientation shown below; be cautious not to over-tighten, as you may damage the assembly.



Stainless Steel Tank

Since the Conveyor Test Unit uses a stainless-steel pressure vessel for its liquid supply, it is important for the operator to understand how to safely use this component. Before attempting to open, the operator should always check for pressure inside the tank. Located on top of the tank lid is a pressure release valve, with a key ring attached. To release pressure, pull up on the key ring, and then twist to lock in the upright position; the tank is depressurized when no hissing sound is heard. Once depressurized, pull up on the latch to release the tank lid; it may be necessary to bump the lid to release the seal from the inside of the tank. To remove the lid, rotate the handle and allow the end of the lid to drop slightly. After filling the tank and affixing the lid, pull the latch down centered and flush with the top of the tank. Restore the pressure release valve to its original orientation. The tank should be thoroughly cleaned after each use with warm soapy water or tank cleanser.



DO NOT OVERFILL THE TANK

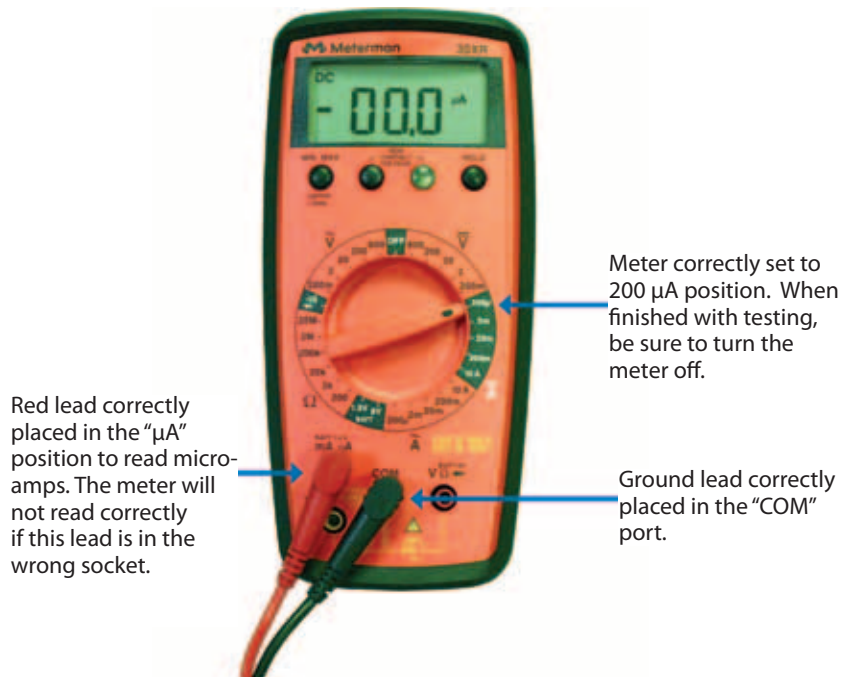
ESS recommends that the tank not be filled past the full level mark, since the force of agitation may cause liquid to escape through the air bleed hole in the tank lid.

Water temperature must be at least 10° C (50° F). When the liquid and air meet in the nozzle, the temperature of the liquid decreases. As a result, water at temperatures below 10° C (50° F) may freeze and clog the nozzle.

Operating Electrostatics

Operating the electrostatics is as simple as plugging the power supply into the wall connection. Make sure all HV connection leads are plugged into each nozzle before plugging into the power source. An LED will illuminate to indicate correct operation; if the LED does not illuminate it may be an indication that there is a power supply fault. If replacement is necessary please contact ESS for further information. Be careful not to touch the HV connection as injury may result.

Testing Nozzles

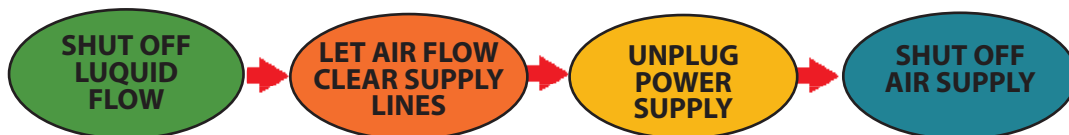


- Ground black lead between fingers
- Hold paddle 1 inch from nozzle outlet
- Ground lead

To test the nozzles, turn the meter on and set it to the 200 µA range. Ground the black lead against the liquid manifold, the grounding lead 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 with an uneven spray pattern with a charge below 12 µA by following the procedures outlined in the Cleaning and Maintenance section (page 10). A reading of 0 µA indicates that a nozzle is not receiving voltage. If all nozzles read low, the liquid supply is not grounded properly.

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 liquid flow by shutting off the individual liquid control lever. Let the air flow purge the remaining liquid from the supply lines. Wait a few seconds until the nozzles quit spraying. They may spit intermittently, but this is normal. When the liquid has cleared from the supply lines, unplug power supply and shut off air flow. Follow the section on Cleaning and Maintenance (page 9) for additional post-use instructions.

Cleaning and Maintenance

Although the MaxCharge™ nozzle will outperform all electrostatic spray technology on the market, regular cleaning will ensure peak operating performance. As a precaution, apply dielectrical silicone grease to all connections. This will prevent water damage to the electrical system. Flushing the liquid system with warm water is most beneficial for lasting performance. Depending on the product sprayed through the system, it may be necessary to flush more or less frequently; contact the chemical manufacturer for additional information. General cleaning of the nozzle heads is also recommended as they will become coated during the spray process. Take the necessary safety precautions outlined by the chemical manufacturer.

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 |

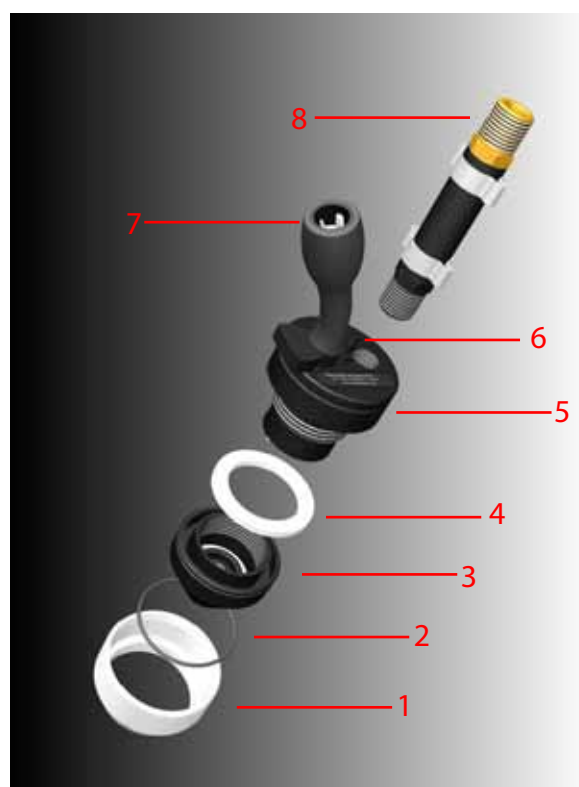
The diagram (right) identifies the nozzle components and the air, liquid, and electrical connections.

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 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. Apply 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.



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.



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

NOTE

Troubleshooting guide

When you encounter the problems listed below, use the suggested trouble-shooting methods. If you cannot solve the problem or have a problems that not addressed in this manual, contact ESS at (706) 769-0025.

Symptom	Possible Problem(s)	Corrective Action
Air/liquid output appears low	<ul style="list-style-type: none"> • Inadequate compressor • Fittings are loose • Liquid fittings are loose • Air fittings are loose • Clogged Liquid Strainer 	<ul style="list-style-type: none"> • Make sure that the air compressor is rated for the required air flow. See page 5 for air flow requirements. • Make sure that the air compressor is supplying the correct air pressure. See page 5 for air pressure requirements. • Make sure that all quick connect sockets are properly seated. • Make sure the Flow Regulator Assembly is installed correctly Spray fittings with soapy water – tighten ones that bubble replace if necessary • Clean the Flow Regulator Assembly on spray gun (See the <i>Flow Regulator Assembly</i> section of this manual)
No spray from nozzle or the spray from nozzle is erratic or spits	<ul style="list-style-type: none"> • Debris in the nozzle • Spray is freezing due to evaporative cooling • Incorrect tank pressure • Liquid strainer are clogged • Low liquid level in the tank • Loose liquid or air fitting • Overtightened nozzle cover • Suspect tank pressure regulator • Inconsistent air supply 	<ul style="list-style-type: none"> • Clean nozzle according to instructions. • Make sure that water temperature is at least 50° (10°C). Make sure that the tank pressure regulator is set at 12+ PSI. Make sure the tank lid is sealed. • Clean the Flow Regulator Assembly. (See the <i>Flow Regulator Assembly</i> section of this manual). • Refill tank. • Inspect hose quick connects at tank or air supply. Make sure that all liquid fittings and air fittings are properly seated. • Loosen cover. It should only be finger-tight. • Verify that the tank pressure regulator functions properly. • Verify that there are no problems with air supply.
Power supply indicator (LED) blinks or goes out during operation	<ul style="list-style-type: none"> • Suspect outlet • Power supply failure 	<ul style="list-style-type: none"> • Inspect fuse box for tripper breaker. Verify voltage is present. • Contact ESS



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. 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 judgment 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 judgment 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 spray gun 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.