

Optimum TW160, TW225 and TW300

Sprayer Instruction and Operation Manual



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General Specifications—All Models

Tank/Agitation/Color:

All tanks are constructed from multiple layers of isophthalic resin and chopped fiberglass, hand rolled for maximum density and strength. The exterior is a high-gloss color gel coat with UV inhibitor. The interior is sealed with chemical resistant isophthalic resin for long life and easy, complete cleaning. Each tank is equipped with an offset 16" screw-in lid with spring assisted bullet venting and c-pillow perimeter ring gasket sealing system. A nylon mesh strainer basket with reinforcement rib is also standard.

A horseshoe sump design on the low profile solution tank directs fluid from the center of the tank to the pick-up sump for continuous pump priming. There is a custom anti-vortex sump plate and v-6 hydro mix ceramic orifice venturi-jet mounted agitation system. Six venturi agitator jets with long wearing ceramic orifices provide a steady 3-1 liquid output exchange through the nozzle discharge orifice.

There is an external liquid level sight tube with calibration marks in gallons on the front corner of the tank. Reinforced nylon fittings and SST hardware are also standard. Custom color-match red gel coat on tank's exterior. The tank is secured to carrier frame by four tank anchor assemblies.

Frame/Pump/Plumbing:

The TW sprayer frame is fabricated from high strength welded steel then epoxy coated for long life. The sprayer frame pin mounts directly to the vehicle frame in place of the cargo box. The hydraulic rams on the vehicle connect to the sprayer frame to allow for easy access to the engine compartment.

There are two pumps available, a positive displacement diaphragm pump or a stainless steel centrifugal pump with silicon carbide seal.

Plumbing is reinforced nylon, brass, SST and hoses are rubber or reinforced plastic/nylon/PVC blends.

Optimum Turf Booms (Standard and Convertible):

The SDI Optimum Turf Booms feature a heavy duty welded frame with epoxy coating for long life. The bi-directional heavy duty breakaway hinge has a swag style cable level anchor system. You have the ability to add 12-volt actuators for remote wing section raise and lower. The Optimum Turf Booms come standard with a gauge wheel. There is a ground contour wheel kit available which maintains a constant spray boom height. The 3-way nozzle body assemblies with cap, gasket, slotted strainer and polymer test tip are standard. Additional nozzles and adapters are available upon request for an additional charge.

The SDI Convertible style spray boom uses flip-out wing extensions to easily increase the spray width to 21 feet.

Spray Controls and Optional Accessories

Spray boom controls can be electric with motorized valves or computerized with motorized valves. Optional accessories, i.e. hose reel, turf walker spray booms, spray guns, foam marking system and spray hose—refer to individual product data sheets for their respective operating instructions.

Pump/Drives/Specifications/Capacities—All Models:

The with diaphragm pump features 3 pistons with desmopan diaphragms. It will flow at up to 30gpm and develop pressure up to 290psi. The diaphragm pump is conveniently mounted to a reinforced zone on the top of the spray tank and is powered by the vehicle's auxiliary hydraulic system.

The stainless steel centrifugal pump features silicon carbide seals and is powered by the vehicle's auxiliary hydraulic system. This pump will flow at up to 72gpm and pressures up to 120psi depending on engine rpm.



Safety Data:

This symbol is a safety warning and appears next to information which may help keep you and others from being injured. Watch for SAFETY WORDS and the CHEMICAL MATERIAL DATA SHEETS (know what you are spraying and safe handling techniques).

Recommended Safety Equipment:

The following Personal Protective Equipment (PPE) may be required to prevent accidental exposure or poisoning. (Consult the chemical label for complete information).

Spray Suit—Full coverage (arms and legs) must be free of rips and/or tears.

Shield—To prevent accidental facial contact with chemicals.

Goggles—To cover eyes (glasses for better protection).

PVC/Nylon Gloves—Protects hands and sleeve openings.

Mask/Respirator—Approved canister type with appropriate filter cartridges for chemicals being used.

Work Area Safety Recommendations:

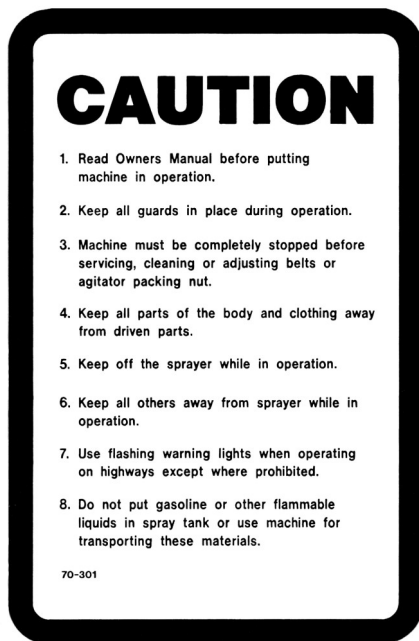
- Chemical Storage—check local regulations—varies by region.
- Sprayer Storage—check local regulations—varies by region.
- Fill/Mix and Load Station—area should not be high traffic and should have run-off containment. DO NOT allow non-spray personnel to enter mix area. All mix should be performed with proper safety gear in place.
- Water Supply—if using public water system, it is recommended to use anti-back flow protection on fill hoses and water source outlets. Air gap filler (anti-siphon) is available as an option.
- Fill Hose—should never be put into spray tank, you could contaminate hose (a habit that should be avoided).
- Overflow/Over Filling—recommend recovery or containment system. If not available, be certain run-off does not contaminate public sewers or natural wetland areas. See local regulations.
- Moving Mechanical System Parts—keep hands away from rotating pump shaft and restrain loose clothing. Use caution around system when in operation.

- Broken or Worn Components—follow recommended safety and repair/maintenance schedules. DO NOT operate without wearing proper safety gear or operate if machine is not in proper working order. Proper operation is not only safer, but it can save you money by properly applying the desired chemicals at the correct rate.
- Accidents/Problems—in case of injury, accident or unprotected exposure, notify your supervisor of incident and if necessary, contact the poison control board, EPA and/or local fire department to help with the situation.
- Record Keeping—proper records showing chemical being used, batch size, time, date, areas treated, weather conditions and unusual occurrences can protect you and others should any problem occur after a turf application has been made.
- Local/State Regulations—request, read and follow all local and state regulations for your area. These will vary by region. Be informed—not a victim!
- Licensing—it is recommended that all spray technician operators secure proper CPA (Certified Pesticide Applicators) license or equivalent. Check your local regulations.

Warning: SDI strongly recommends that you read and understand completely, the Operator’s Manual for the specific truck you mount the sprayer to—be confident and sure of your skills before operating the truck with the sprayer attached. The large liquid payload reacts differently during vehicle movement, than an equal size dry load!

Please Use Caution!

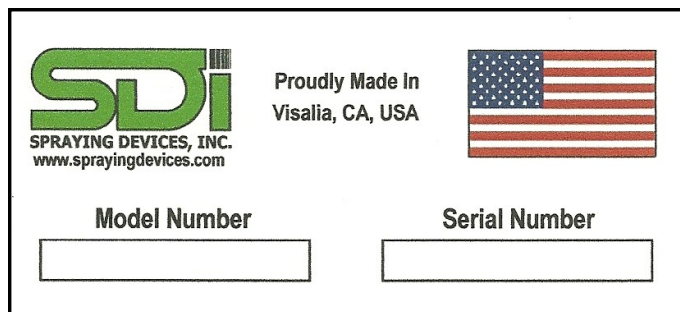
Decals/Serial Tag Locator:



Part #70-301-"Caution"
located on the upper
left corner of the rear
of the sprayer tank



Warning Decal located on tank sump.



SDI Model Number and Serial Number Decal located on the sprayer frame.

Pre-System Maintenance Checks:

See Vehicle's Operation/Maintenance Manual for specific instructions. SDI recommends you read it completely. Typical checks: fuel, oil and tire pressure.

Spray Tank Checks:

- Frame hold down hardware—tight and unbroken.
- Visually inspect fiberglass spray tank for leaks or cracks.
- Visually inspect sprayer frame for cracks or broken welds.
- Check all fasteners for tightness—replace worn items as needed.

- Lid and gasket—lid threads—inspect for leaks or warping. Wipe off dirt from threads and gasket. Apply light lubricant to gasket, such as silicone spray. Check operation of spring-assisted bullet vent in lid center. Remove any debris and clean or replace broken and/or missing springs (spring is critical to leak-free lid design). Replace any c-pillow perimeter lid gasket if damage is present. Some repairs can be made with a vulcanizing adhesive application. Consult factory for options.
- With lid open and basket removed, visually inspect the inside of the spray tank for flaking or residue build-up. Check anti-vortex plate (black circle in sump area), and sump box for debris, i.e. rags, instructions, etc. Remove as needed. Blocked suction can result in poor performance and pump problems.
- Check agitator venturi nozzle position and correct as necessary.
- Periodically check ceramic orifice discs in venture nozzles for cracks or blockages. These problems can lead to reduced agitation and possible products mixing problems. Replace or clean as required.

Pump and Power Checks:

- Inspect all hoses for wear, cracks or any damage that could result in a leak of fluid—repair or replace as needed.

CAUTION: Normal vehicle engine RPM operating range for sprayer use is 1500 to 3500 RPM's and 1st, 2nd and 3rd gears in the low range. Consult factory if you need to operate the machinery at settings other than those specified.

- Inspect exterior of pump, drive motor and hydraulic supply hoses for damage or leaks that could cause problems later. Consult manuals for repair options.
- With each fill-up of solution tank, inspect the diaphragm pump's see-through oil reservoir for evidence of diaphragm failure. Oil will appear milky or cloudy if one or more diaphragms have structural damage, allowing chemical into the pump's lubrication environment. Replace damaged diaphragms and replace oil in pump body with proper non-detergent oil. Diaphragms and pump seals are not warranted items.
- Inspect and clean pump suction strainer screen.
- Inspect bowl and gasket. Improper gasket seating can result in poor pump performance. Replace with correct size gasket only. During bowl replacement, only hand tighten! DO NOT USE ANY TOOLS!
- Remove black nylon suction strainer and clean SST screens of debris. 20 mesh is factory standard size. Using 40 mesh or finer will require more checks for trapped debris in SST screen. Plugged mesh can result in decreased fluid availability to the pump (starved suction condition). Resulting effects can range from poor output performance to the extreme-diaphragm surface ruptures and/or tears.

- Check bottom load 3-way suction ball valve and turn handle to pump suction (arrow points up), arrow points to direction of fluid flow through valve.
- Check to see that agitation control valve is fully open. Turn knob to the left (counter clockwise) to open. Because of the unique design of the tank bottom suction and anti-vortex area, turning the agitation down or off when the tank is low on gallons, is not required. The tank will pump down to dry with the agitation fully open.

Spray Boom Checks:

- Inspect mounting hardware and support frame for fastener tightness and worn or broken components. Repair as needed.
- With vehicle tires properly inflated and tank full of water, check boom for levelness and proper height. See Set-up Manual for proper adjustments.
- Grease boom hinges (breakaways). Be sure to remove any debris (i.e. grass, sand, dirt, etc.) from greased area on pivot plates. Dirt affects the proper operation of the breakaways.
- Adjust return spring tension to stiffer or looser action. See Set-Up Manual for details.
- With booms in the down (operational) position, check section level again.
- Between sprays, check and clean all boom nozzle assemblies. Inspect check valve diaphragms for tears or warping. Check and clean tips with a soft nylon tip brush (DO NOT use hard or metal items—tip damage will occur)! Clean strainer screens and tip gaskets also. Replace worn or defective items as needed. Proper tip maintenance will result in optimum performance and pattern development.
- Inspect boom tube end caps for cracks or leaks. Repair as needed.

Motorized Boom Control Checks:

- Check battery connections and alligator clips for proper pole (+/-) hook up. Check wire fastener screw on clips for tightness. Remove any corrosive terminal build-up with a mixture of baking soda and white vinegar. Apply with an old toothbrush. Brush away build-up,, but be very careful and protect eyes and clothing from acid splashes. Use caution during this cleaning. ALSO—NO SMOKING—flammable hydrogen gas is normally present

USE EXTREME CAUTION!

- Check control box mount and console wing nuts for tightness. Clean dirty console with a damp cloth with mild soap. DO NOT USE any solvents.
- Check all toggle switches for play and replace as needed. If switches are rubber booted, check boots for tears and replace any worn ones.
- Check control console pressure gauge bezel (clear plastic ring that holds gauge into console). Raised tabs should be at 6 and 12 o'clock positions.
- Check back side of console and make sure power and control cable assemblies are locked into multi-pin connectors. Then replace protective rubber boots.
- Check fuse and rubber boot.
- Check plastic pressure gauge tube for kinks, breaks or blockages. To clean a blocked tube (packed with dry powder):
 1. Put some clean water in the spray tank, 25 gallons.
 2. Turn sprayer on and set RPM's to 3000 on truck.
 3. A metal tube receiver with 1/8" tube engaged is located on the back side of the console. Push tube and top of metal coupler with your thumb and index finger.
 4. While holding metal ring in, pull tube out with your other hand.
 5. Point disengaged tube away from box and your face, and allow debris to clear from tube.
 6. If unsuccessful, stop and shut sprayer off.
 7. Disengage other end of the tube from boom valve inlet.
 8. Use rubber tipped air nozzle to force high pressure air through tube.
 9. If unsuccessful, replace with new tube and start flushing after each spray application.
- Move to rear of sprayer— spray boom area.
- Inspect motorized valve harness connector plugs. They should be tight against valve body. Be sure to screw tight with no prongs showing from valves.
- Check valve mating joints (seams) for product leakage. If leakage is detected, tighten nuts on the 4 guide rod bolts and bring valves closer together. Not too tight, there are on-rings in each joint area. If leak persists, separate valve bodies and replace O-rings with new ones.
- Check that all horse shoe clips on boom feed barbs and metered by pass valves are pushed in and secure. Leakage can result if u-clips are not in place.
- Follow boom hoses from each motorized valve to the corresponding boom section. Nylon split-eyelet feed saddle with nylon hose barb adapter should fit tight against SST tubing. If saddle rotates on tubing (alignment nipple most likely is broken), replace as needed.
- Move back to control console—LISTEN carefully as you perform the

- Push up on pressure adjust toggle switch. Servo motor on yellow striped valve should run. Reverse toggle position and verify the motor works in both directions. If failure occurs, See Troubleshooting Section.
- Push master power toggle to on position—now one switch at a time, try each boom, 1-2-3 in both directions. Slowly verify the working in both directions of each blue striped valve. If failure occurs, See Troubleshooting Section.

Computerized Boom Control Checks:

- Procedures are similar to Motorized Valves—refer to supplied Computerized Manual for test procedures.
- Inspect and wipe debris from console with a damp cloth.
- Verify your pre-set calibration numbers—DO THEY MATCH YOUR RECORD'S SHEET IN THE MANUAL? Modify any numbers that do not match.
- Check all harness connectors on the back of the box.
- Inspect speed sensor assembly, especially the magnets if that style is in use. Clean any debris from the face of the magnet and check the alignment/orientation to the center of the pick-up sensor. If radar is in use, check orientation to ground and wipe sensor face of any debris. Consult Manual for additional information.
- Place control box power switch to manual position.
- Check motorized valve operation— same procedures as standard controls. The exception—NO metered by pass.

Electric Boom Lift—Optional:

- For set-up and complete instructions, refer to Boom Lift Owner's Manual.
- Check both actuator mounting bolts for tightness and for wing down position parallel to ground position. Adjust level to ground with swag cable anchor eyebolts.
- Periodically spray a penetrating lubricant onto pivot points and hinge bushing assemblies.
- Check control harness fuse—30 amp rating.
- Check control console toggle switch for play and proper operation.
- Check harness connectors at control box pigtail and each actuator pigtail hook up.

Foam Marker—Optional:

- For set up and complete instructions, refer to Foam Marker Owner's Manual.
- Inspect solution tank for leaks or cracks.
- Check cap assembly for cracks or leaks.
- Check fuse in control harness—10 amp rating.
- Be sure to only use SDI Foam Concentrate. Other brands will cause adverse performance. AVOID!
- Activate power switch to left and then to right positions and verify the compressor will start up. If the container has fluid, liquid should flow to feed blue tube on corresponding foam generator cone and foam should start or liquid will drip from outlet steadily.
- Foamer uses two solenoids per side activation. One for air and one for solution. Both are inside of turtle shell cover with a matching pair for the other side and the main compressor unit. White hoses carry air to system, blue hoses carry the solution. Hose connections are color coded white or blue as well as the fly nuts and hoses. Just match the colors and make sure to get adequate hose on bib contact before tightening down on fly nut fastener. If system fails to start, check 12 volt power supply first. System is tested at the factory prior to shipping to your dealer for installation. A running system will not foam with water only—160:1 ratio (water to concentrate), or similar solution must be added to the solution tank's water. SDI's Foam Concentrate is recommended for best machine performance.
- Check supply hose fasteners on boom tubes for proper position, tightness and routing. These should not interfere with tips or nozzle check valves—loom (black smooth cover), should run along the top of boom tube fastened with nylon zip ties.
- Check foam generator cone position. Should be at boom wing end and clear of spray pattern distribution area. Keep cones out of spray by tilting up (required for raindrop style tips).

Hose Reel (Optional):

- Check supply hose from pressure side of pump to swivel inlet on reel drums for cuts, scrapes, kinks or leaks.
- Lubricate reel swivel at grease zerk if equipped.
- Check reel to tank fastener hardware for tightness and evidence of leaks. Rubber well nuts and fender washers should be used with SST bolts. See Hose Reel Mounting Instructions and fastener use sequence.
- If electric rewind, check battery and all power harness connections. 40 amp circuit breaker should also be part of electrical hook up.

**System Dynamics—How our System Works -
Why they call it a Sprayer:**



POWER—Utility Vehicle's auxiliary hi output hydraulics provides fluid to sprayer's pump drive motor. On/off control is located on the center lower dash (push top of button to turn auxiliary hydraulics on).

TRANSPORTATION—Sprayer/truck mounting style makes the two systems act as one complete machine.

Fluid path through sprayer—Items 1 through 12:

1. **Spray Tank**—containment for fluid and product mix changer—made of fiberglass and resin compound. Unique bottom shape has raised bottom attached to directional side gutters to effectively direct solution to the tank's rear sump. This design allows sprayer to maintain performance even at low liquid levels. Design also works as a damper (anti-slosh control), for fluid levels less than full tank.
2. **Anti-Vortex Plate**—located in sump (lowest part of tank interior), facilitates complete liquid draining without causing pump cavitations (suction loss) or prime break. Attaches to suction flange.
3. **Suction Flange**—external hose barb assembly on tank sump area—connects tank to main suction hose.
4. **Suction/Off/Drain "Button Load Valve"** - large 1-1/2" 3-way ball valve (all in one design). Arrow on handle points in direction of fluid flow—up (suction/pump) - side (Off) - down (drain). Off allows cleaning of suction's strainer screen with loaded tank. Pump should only be running when arrow points up (suction open) - pump diaphragm damage can occur when valve is off or drain position while running (starved suction conditions).
5. **Suction Strainer**—filters out particulate matter and debris from supply tank. Extends pump life and eliminates foreign objects which may disrupt normal boom or gun operations.
6. **Diaphragm Pump**—piston/diaphragm design uses desmophan diaphragm attached to the piston's top and supported by trapped oil from pump's main case—SST and nylon spring valves control fluid during suction and discharge strokes. Pump has 3 cylinders and discharge pulsation damper on outlet-controls pulsations of fluid upon exit to pressure regulator.

7. **Pressure Regulator**—controls peak allowable pressure to system's accessories. T-handle turns clockwise to raise system pressure and counter clockwise to lower system pressure. Once desired pressure is reached, tighten lock nut on base of T-handle to fix the setting. Once system is charged to set limit, an internal spring and seat releases the excess pressure and fluid for low pressure recirculation back to the tank through the by pass hose.
8. **Agitation Control Gate Valve**—controls amount of tank agitation by amount of liquid through Venturi nozzle multiplier orifice. Recommend you leave full open at all times. No need to close with low tank liquid level.
9. **V-6 Jet Agitation**—mounted on top of tank's tunnel bottom on raised bracket. 6 Venturi style nozzles with ceramic metering orifice disc multiply the exiting fluid and disperses materials throughout the solution tank—for hydraulic mixing.
10. **Hose Reel**—hose holding reel which allows hook-up of spray system to a spray hand gun or walking type spray boom. Holds and organizes supply/spray hose for repeated organized uses.
11. **Boom-Boom Controls**—supplies liquid to boom control valve (manual) or motorized valve assemblies for dispersal (through the spray boom).
12. **Boom Tubes**—SST pipe/tubing with nozzle bodies attached, evenly distributes spray liquid to target (ground, turf area) with an overlapping pattern. Nozzle bodies are diaphragm check (drip-free) and supply the nozzle (tips) when liquid pressure exceeds 10 PSI. When boom shuts off, the diaphragm keeps the tips from dripping product and also allows a quick air-free (hiss-free) resumption of the spray pattern.

Notes on System Dynamics:

Diaphragm Pump Lubrication—internal mechanical components operate in a flooded oil bath environment. The pump's cylinder diaphragms keep contaminants/spray solution from entering the oil's environment. Diaphragms should be inspected yearly and replaced when wear or abnormalities are discovered. Case mounted see-through oil reservoir will cloud or be cloudy if spray has entered the oil's environment. Pump can handle all materials and run dry (no solution), without damage.

Venturi-Jet Agitator Nozzles—installed with ceramic metered orifice disc (long wearing vs. plastic). Long lasting ceramic discs provide stable agitation flow rates for trouble-free fluid mixing.

Suction Strainer—provides liquid filtering of particulate matter in spray material. Should be cleared daily or more often as the need arises.

Non-Corrosive Plumbing—all spray plumbing is SST, nylon, PVC or polypropylene for all liquid handling parts.

System Dynamics—Materials' Compatibility

- SDI's diaphragm pump is capable of pumping almost any non-flammable liquid without trouble or damage to the pump. On extremely thick or gritty suspensions, it is advisable to operate the sprayer with the suction strainer screen removed. Clogging up the screen can starve the pump and cause pre-mature diaphragm damage. For materials with high residue, it is advisable to rinse pump and plumbing as soon as you return to the sprayer fill area. Do not wait until after a long lunch break—just add a few gallons of clean water to the tank and run pump for 2-3 minutes to dilute the previous residues in the system.
- Spray Liquid Viscosity—the addition of certain WP, WDG, EC's etc. may cause the viscosity (thickness) of the water to increase. This can sometimes affect the calibration of the spray nozzle output at pre-calibration water numbers. Consult chemical supplier for recommended modifications to your system.
- Specific Gravity of Sprayed Suspension—water on average weighs 8.34 lbs./gallon—when you add mix to the water, the weight will change. Sometimes the solution gets less than 8.34 lbs./gallon and sometimes it gets heavier than 8.34 lbs./gallon. Weight of solution changes the output calibrations of nozzles. See Tables and Formulas to make necessary adjustments to compensate. Especially critical when using computer controlled rate systems.

Getting Started:

Practice with water—after you have followed all recommendations, it is advisable to familiarize yourself with the operation of the new truck and sprayer package. Practicing with plain water before the addition of expensive and destructive chemical formulas (when miss-applied), can be smart and cost effective.

Practice and calibrate before you spray dollars away! Know your machine and its' operation.

Calibration—First Step to Spaying:

To spray and spray accurately, you must have a set of standards to spray by. They are:

- Desired Application Rate (GPA or G/1000 FT²).
- Nozzle spacing (W") - distance between spray tips.
- Desired ground speed—recommend a fixed (governed) speed/MPH to maintain accurate calibration. Tip style—type of pattern for particle distribution for applicable chemical to be applied, i.e. FL, XR, TT.
- Tip Size—determines volume per nozzle and desired droplet (micron) size of spray carrier particles.

When used in the following formulas, the application rate can be maintained by fixing the constants for each category. See Technical Information Section.

The easiest method of calibration is to use as many fixed constants that can be controlled, and then modify the tip size and output pressure to lock in your desired application rate.

Technical Information:

Useful formulas:

$$\text{GPM (per nozzle) = } \frac{\text{GPA} \times \text{MPH} \times \text{W}}{5,940}$$

$$\text{GPM (Per nozzle) = } \frac{\text{GAL/1000 FT}^2 \times \text{MPH} \times \text{W}}{136}$$

$$\text{GPA = } \frac{5,940 \times \text{GPM (per nozzle)}}{\text{MPH} \times \text{W}}$$

$$\text{GAL/1000 FT}^2 \text{ = } \frac{136 \times \text{GPM (per nozzle)}}{\text{MPH} \times \text{W}}$$

Measuring Travel Speed
 Measure a test course in the area to be sprayed or in an area with similar surface conditions. Minimum lengths of 100 and 200 feet are recommended for measuring speeds up to 5 and 10 MPH, respectively. Determine the time required to travel the test course. To help ensure accuracy, conduct the speed check with a partially loaded (about half full) sprayer and select the engine throttle setting and gear that will be used when spraying. Repeat the above process and average the times that were measured. Use the following equation or the table at right to determine ground speed.

$$\text{Speed (mph)} = \frac{\text{Distance (ft.)} \times 60}{\text{Time (seconds)} \times 88}$$

Speed in mph (Miles Per Hour)	Time Required in SECONDS to travel a Distance of:		
	100 Ft.	200 Ft.	300 Ft.
0.5	136	272	409
1.0	68	136	205
1.5	46	92	136
2.0	34	68	103
2.5	27	54	82
3.0	23	46	68
3.5	20	40	58
4.0	17	34	52
4.5	15	30	46
5.0	13	28	41

GPM—Gallons per Minute
 GPA—Gallons per Acre
 Gal/1000 FT²—Gallons per 1000 square feet
 MPH—Miles per Hour
 W—Nozzle spacing (in inches)

A—Nozzle volume required to obtain desired GPA rate at desired speed and spacing. See Tee Jet Catalog for style and size of tip to complete job.

B—Nozzle volume required to obtain desired GAL/1000/FT² rate at desired speed and spacing. See Tee Jet Catalog for style and size of tip to complete job.

Specific Gravity Adjustments (When you spray more than water):
 typical US gallon weighs 8.34 lbs. Most manufacturer's nozzle charts show performance with water only. Example: target application rate—50 GPA (water specific gravity 1.0), add 28% nitrogen to the solution, typical weight per gallon is 10.65 lbs. (28% nitrogen in water specific gravity is 1.28).

The formula (new method)
 GPA (solution) x conversion factory = GPA from table

$$50 \times 1.12 = 56.5 \text{ GPA corrected}$$

This new output could require a large nozzle or more PSI if previous nozzle has the range. Specific gravity can be determined by weighing a measured gallon of your solution once mixed. Then use the table to find your conversion factor.

Spraying Solutions Other Than Water—New Method:

Example:

All the tabulations in this catalog are based on spraying water, which weighs 8.34 lbs. per US gallon, conversion factors must be used when spraying solutions which are heavier or lighter than water. To determine the proper nozzle size for the solution to be sprayed, first multiply the desired GPM or GPA of solution to the water rate conversion factor. Then use the new converted GPM or GPA rate to select the proper nozzle size.

Desired application rate is 20 GPA of 28% N. Determine the correct nozzle size as follows:

$$\text{GPA (solution)} \times \text{Conversion Factor} = \text{GPA (from table)}$$

$$20 \text{ GPA (29\%)} \times 1.13 = 22.6 \text{ GPA (water)}$$

The application should choose a nozzle size that will supply 22.6 GPA of water at the desired pressure.

<u>Weight of Solution</u>	<u>Specific Gravity</u>	<u>Conversion Factor</u>
7.0 lbs. per gallon	.84	.92
8.0 lbs. per gallon	.96	.98
8.34 lbs. per gallon-WATER	1.00	1.00
9.0 lbs. per gallon	1.08	1.04
10.0 lbs. per gallon	1.20	1.10
10.65 lbs. per gallon-28% nitrogen	1.28	1.13
11.0 lbs. per gallon	1.32	1.15
12.0 lbs. per gallon	1.44	1.20
14.0 lbs. per gallon	1.68	1.30

Ground Speed:

The Workman® Vehicle offers 3 speeds forward, one in reverse and two ranges (high/low). This gives 6 speeds forward. For safety and best performance, most spraying is done in low range using gears 1, 2 or 3.

The hydraulic drive pump will operate in this range but will have reduced output at RPM's below 2500 on the engine. High volume outputs should be done at the 3500 RPM setting.



Use the "Measure Travel Speed" formula to gauge your exact speed for calibration formulas and tip selection. See Tachometer/Speedometer picture.

Miscellaneous Conversion Factors

One Acre = 43,650 square feet
= 43.56 1000 FT² blocks

One Acre—0.405 Hectares

One Hectare = 2.471 Acres

One Gallon per Acre = 2.9 Fluid Ounces per 1000 FT²
= 9.35 Liters per hectare

One Gallon per 1000 FT² = 43.56 Gallons per Acre

One Gallon = 128 Fluid Ounces
= 8 Pints
= 4 Quarts
=3.79 Liters
=0.83 Imperial Gallons

One Mile = 5,820 Feet
=1,610 Meters
=1.61 Kilometers

One Pound per Square Inch = 0.069 Bar
= 6,896 Kilopascal

The chart below is from Page 12 of TeeJet Catalog 51A. For a complete listing of tip options and charts, contact SDI or your local dealer for a new TeeJet Catalog

	PSI	Drop Size 80° 110°	Capacity One Nozzle In GPM	Capacity One Nozzle In Oz./Min.	Capacity										Gallons Per 1000 Sq. Ft.				
					GPA					20					3				
					4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH	15 MPH	20 MPH	2 MPH	3 MPH	4 MPH	5 MPH	2 MPH	3 MPH	4 MPH
XR8001 XR11001 (100)	15	M	F	0.061	7.8	4.5	3.6	3.0	2.3	1.8	1.5	1.2	0.91	0.21	0.14	0.10	0.08		
	20	F	F	0.071	9.1	5.3	4.2	3.5	2.6	2.1	1.8	1.4	1.1	0.24	0.16	0.12	0.10		
	30	F	F	0.087	11.0	6.5	5.2	4.3	3.2	2.6	2.2	1.7	1.3	0.30	0.20	0.15	0.12		
	40	F	F	0.10	13.0	7.4	5.9	5.0	3.7	3.0	2.5	2.0	1.5	0.34	0.23	0.17	0.14		
Orange	50	F	VF	0.11	14.0	8.2	6.5	5.4	4.1	3.3	2.7	2.2	1.6	0.37	0.25	0.19	0.15		
	60	F	VF	0.12	15.0	8.9	7.1	5.9	4.5	3.6	3.0	2.4	1.8	0.41	0.27	0.20	0.16		
XR80015 XR110015 (100)	15	M	F	0.092	12.0	6.8	5.5	4.6	3.4	2.7	2.3	1.8	1.4	0.31	0.21	0.16	0.13		
	20	M	F	0.11	14.0	8.2	6.5	5.4	4.1	3.3	2.7	2.2	1.6	0.37	0.25	0.19	0.15		
	30	F	F	0.13	17.0	9.7	7.7	6.4	4.8	3.9	3.2	2.6	1.9	0.44	0.29	0.22	0.18		
	40	F	F	0.15	19.0	11.1	8.9	7.4	5.6	4.5	3.7	3.0	2.2	0.51	0.34	0.26	0.20		
Green	50	F	F	0.17	22.0	12.6	10.1	8.4	6.3	5.0	4.2	3.4	2.5	0.58	0.39	0.29	0.23		
	60	F	F	0.18	23.0	13.4	10.7	8.9	6.7	5.3	4.5	3.6	2.7	0.61	0.41	0.31	0.24		
XR8002 XR11001 (50)	15	M	M	0.12	15.0	8.9	7.1	5.9	4.5	3.6	3.0	2.4	1.8	0.41	0.27	0.20	0.16		
	20	M	F	0.14	18.0	10.4	8.3	6.9	5.2	4.2	3.5	2.8	2.1	0.48	0.32	0.24	0.19		
	30	M	F	0.17	22.0	12.6	10.1	8.4	6.3	5.0	4.2	3.4	2.5	0.58	0.39	0.29	0.23		
	40	F	F	0.20	26.0	14.9	11.9	9.9	7.4	5.9	5.0	4.0	3.0	0.68	0.45	0.34	0.27		
Yellow	50	F	F	0.22	28.0	16.3	13.1	10.9	8.2	6.5	5.4	4.4	3.3	0.75	0.50	0.37	0.30		
	60	F	F	0.24	31.0	17.8	14.3	11.9	8.9	7.1	5.9	4.8	3.6	0.82	0.54	0.41	0.33		

Based on the chart, a tip pressure of 45 PSI with the Yellow XR8002 TeeJet tips, will apply the proper amount based on speed, spacing, rate constants.

Example:

$$\frac{\text{GPM/Nozzle}}{\text{Gal/1000 Ft.}^2} = \frac{(1) \times \text{MPH} (2.9) \times W'' (10)}{2.13}$$

Suggested Minimum Spray Heights—Turf Nozzles:

<u>Tip Style</u>	<u>Spray Angle/ Degrees</u>	<u>Pressure Range</u>	<u>Nozzle Height/20" Spacing Tip to Grass Top</u>
XR Extended Range	80°	15-60 PSI	17" to 19" 30% overlap minimum
TT Turbo TeeJet	110°	15-90 PSI	15" to 18" 30% overlap minimum
TF Turbo FloodJet	120°	10-40 PSI	14" to 16" 30% overlap minimum
FL FullJet	120°	15-40 PSI	10" to 18" 30-100% overlap

Note: TP11008VP test tips are supplied with SDI Booms. Order other sizes or styles from your local SDI Dealer.

**Mixing and Loading Pesticides' Product Active Ingredient
Formulas or How Much Pesticide Do I Add to My Spray Tank?**

To determine the amount of pesticide to add to the spray tank, you need to know the recommended application rate of pesticide, the capacity of the spray tank and the calibrated output of the sprayer.

The recommended application rate of the pesticide is given on the label. The rate is usually indicated as pounds per acre for wettable powders, and pints, quarts or gallons per acre for liquids.

Sometimes the recommendation is given as pounds of active ingredient (lb. per active ingredient) per acre rather than the amount of produce per acre. The active ingredient must be converted to actual product.

Dry Formulation:

Example 1: A carbaryl recommendation calls for 2 pounds of active ingredient (a.i.) per acre. You have purchased Seven (80% wettable powder). Your sprayer has a 200 gallon tank and is calibrated to apply 20 gallons per acre. How much Seven should be added to the spray tank?

Step 1: Determine the number of acres that you can spray with each tankful.

$$\begin{array}{r} \text{Tank Capacity (gallon per tank)} \quad \frac{200}{20} \\ \text{Spray Rate (gallon per acre)} \quad \frac{20}{20} \\ = 10 \text{ acres sprayed per tankful} \end{array}$$

Step 2: Determine the pounds of pesticide product needed per acre. Because not all of the Sevin in the bag is an active ingredient, you will have to add more than two pounds of the product to each "acre's worth" of water in your tank. How much more? The calculation is simple: Divide the percentage of active ingredient (80) into the total (100).

$$2 \text{ lb. a.i. per acre} \times \frac{100\%}{80\%} = 2.5$$

$$= 2.5 \text{ lbs. of product per acre}$$

You will need 2.5 pounds of product for each "acre's worth" of water in the tank to apply 2 pounds of active ingredient per acre.

Step 3: Determine the amount of pesticide to add to each tankful. With each tankful, you will cover 10 acres (Step 1), and you want 2.5 pounds of product per acre (Step 2). Add 25 pounds (10 acres x 2.5 pounds per acre = 25 pounds) of Sevin to each tankful.

Example 2: The insecticide Diazinon recommendation calls for 4 lbs./acre. Your 5 gallon air-compression sprayer applies 1.25 gallons/1000 square feet. How many ounces should you add to your spray tank?

Step 1: Convert the recommended rate to oz./1000 square feet.

$$\text{Oz./1000 sq. ft.} = \frac{\text{recommended lb./A} \times 1000 \text{ Sq. Ft.}}{*2,722}$$

$$= \frac{4 \times 1000}{2,722} = \frac{4,000}{2,722} = 1.5 \text{ oz./1000 Sq. Ft.}$$

*2,722 = a constant arrived at by dividing the number of square feet in 1 acre (43,560) by the number of ounces in one pound (16).

Step 2: Determine the amount of pesticide to add to each tankful.

$$\text{oz. pesticide/tankful} =$$

$$\frac{\text{gal./tank} \times \text{oz. pesticide/1000 sq. ft.}}{\text{gal applied/1000 sq. ft.}}$$

$$= \frac{5 \times 1.5}{1.25} = 6 \text{ oz./tankful}$$

Liquid Formulation

Example 1: A trichlorfon recommendation calls for one pound of active ingredient per acre. You have purchased Dylox 4E (4 lbs. per gallon formulation). Your sprayer has a 150 gallon tank and is calibrated at 15 gallons per acre. How much Dylox should you add to the spray tank?

Step 1: Determine the number of acres that you can spray with each tankful. Your sprayer has a 150 gallon tank and is calibrated for 15 gallons per acre.

$$\begin{aligned} \frac{\text{Tank capacity (gallons per tank)}}{\text{Spray Rate (gallons per acre)}} &= \frac{150}{15} \\ &= 10 \text{ acres sprayed with each tankful} \end{aligned}$$

Step 2: Determine the amount of product needed per acre by dividing the recommended a.i. per acre by the concentration of the formulation.

$$\frac{1 \text{ lb. a.i. per acre}}{4 \text{ lb. a.i. per gallon}} = \frac{1}{4} \text{ gallon per acre}$$

One fourth gallon or 1 quart of product is needed for each “acre’s worth” of water in the tank to apply 1 pound of active ingredient (a.i.) per acre.

Step 3: Determine the amount of pesticide to add to each tankful. With each tankful, you will cover 10 acres (Step 1) and you want 1/4 gallon (1 quart) of product per acre (Step 2). Add 10 quarts (10 acres x 1 quart= 10) of trichlorfon to each tankful.

Example 2: The insecticide Malathion recommendation calls for 1 gallon of product per acre. You have a 4 gallon knapsack sprayer that has been calibrated to apply 1/2 gallon per 1000 sq. ft. How many ounces should you add to the spray tank?

Step 1: Convert the recommended rate to pints/acre.

$$\text{Pints/acre} = \frac{\text{gal}}{\text{acre}} \times \frac{8 \text{ Pt.}}{\text{gal}} = 1 \times 8 = 8 \text{ Pts/acre}$$

Step 2: Convert the requires pints/acre to oz./1000 sq. ft.

$$\begin{aligned} \frac{\text{oz./1000 sq. ft.} = \text{recommended pt./A} \times 1000 \text{ sq./ ft/}}{2,722} \\ = \frac{8 \times 1000}{2,722} = 2.94 \text{ oz./1000 sq. ft.} \end{aligned}$$

Step 3: Determine the amount of pesticide to add to each tankful.

$$\text{oz./1000 sq. ft.} \frac{\text{gal./tank} \times \text{Oz./1000 sq. ft.}}{\text{gal applied/1000 sq. ft.}}$$

$$= \frac{4 \times 2.94}{.5} = 23.5 \text{ oz./1000 sq. ft.}$$

Adjuvants

The manufacturer may recommend that you add a small amount of adjuvant (spreader-sticker, surfactant, etc.), in addition to the regular chemical. This recommendation is often given as “percent concentration.” If you use an adjuvant at a rate of ½% concentration by volume, how much should you add to a 300 gallon tank?

Solution 1: 1% of 100 gallons = 1 gallon
(0.01 x 100 = 1)
½% of 100 gallons = ½ gallon

You will need ½ gallon per 100 gallons or 1½ gallons for 300 gallons (½ x 3 = 1½).

Solution 2: ½% = 0.005
0.005 x 300 gal.—1.5 gal.

System Pressure Adjustment

Pressure adjustment procedures vary by control style.

Set Pump Output Pressure and Agitation—set speed limiter on vehicle’s throttle to a RPM that corresponds to desired MPH with selected gear and range of spraying. Open suction valve on sprayer, then press auxiliary hydraulics switch on vehicle’s center dash. Go to pump assembly and close all outlet valves (agitation, boom supply and hose reel). This will give the system a closed loop for proper setting of the system’s pressure relief. Adjust relief valve by loosening lock nut, then turn T-handle to right to increase (raise) pressure or to the left to decrease (lower) system pressure shown on the liquid dampened gauge. Set pressure in closed loop to 90-100 PSI. This setting is below the pressure rating for boom components. Once system is set to fixed pressure, you can open and set the tank agitation output. The gate valve will allow a full range of settings by turning the knob left for more agitation or turn the knob right for less. The maximum allowable flow is metered by ceramic orifice discs inside the Venturi jet nozzles. System pressure may drop but should remain above the maximum needed for boom spraying (15—60 PSI).

12-Volt Motorized Boom Valves—follow the same set-up procedures on pump and relief valve adjustment to set system pressure to 90-100 PSI. The electronic controller has switches in lieu of levers to control boom functions. Turn all switches on console box to off position and hold down on pressure adjust switch until pressure will go no lower (motorized regulator in full by pass/open setting). Again, turn all metered by pass knobs on motorized valves to the right until closed. Push up on pressure adjust switch until the console mounted gauge reads 40 PSI, then stop. Push boom switches 1, 2 and 3 to up/on position and activate the boom master switch to the up/on position. All three boom sections should be spraying and console gauge will probably show less than 40 PSI. Use the pressure adjust switch to raise the boom pressure to 40 PSI. With system at 40 PSI, turn boom switch 1 to off—pressure should rise above 40 PSI. Move to motorized valve and open metered by pass knob on/of valve until pressure drops back to 40 PSI. Position yourself so you can see the electronic console's gauge or have someone help you by calling out, when you have adjusted back to 40 PSI. Cycle the #1 boom switch on and off as you watch the pressure gauge reading. Except for a short bounce of the gauge's needle, the final pressure should read 40 PSI. If it is ok, repeat these same steps for boom #2 and then for boom #3. Advanced users will notice a live boom pressure when console master control is off. Now it is possible to change speeds and also correct the nozzles' output volume/pressure while the boom sections are off (no more puddles under a stopped boom). Remember, as long as the tip sizes in the boom remain the same as during the metered by pass set-up, you can run the nozzles in the full pressure range.

Computerized—equipped sprayers can operate in the manual mode and follow the same guidelines as standard motorized adjustment (no metered by pass to adjust when computer is used). Computer should be in manual mode to adjust pressure on the system. Note: Computer System works on flow, not pressure. To operate the computer by pressure vs. flow, it will be necessary to install a pressure gauge kit (available from your dealer). The computer system will still show flow rate field if the speed sensor and flow meter are operational. You will not be able to keep the rate exactly on target because the machine will respond to every little system change. When the computer is in control, it makes corrective adjustments many times faster than the operator could even think about. Do not let this worry you. Run in manual with a gauge and you will see the information.

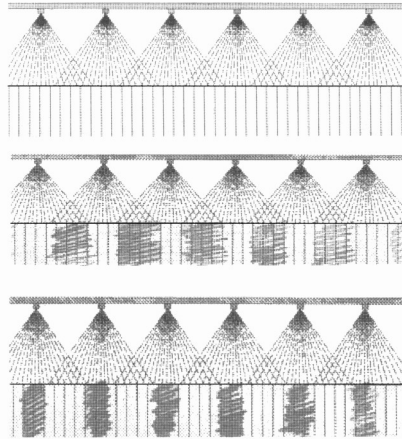
Pressure adjustment is important to obtain the proper nozzle output based upon the standards given in the boom calibration formulas. See Technical Information Section.

Boom Spray Tip Overlap Checks

To verify the boom is properly set up and the tip/nozzle height is correct, a water only pass over a dry concrete or asphalt parking area, can reveal much information about your system's set-up.

With water only in tank, operate machine and spray with boom full on and drive and apply a pattern on the dry area. After the first pass, watch the spray dry and look for uneven areas of extra wet or dry zones.

Uniform and even drying indicates the system is applying a uniform pattern. Checks of each nozzle with a calibration catch container can assist your data on the system. Uneven drying or wet stripes can identify overlap problems.



Wet stripes between nozzle tips can mean the boom is too high-striped under the nozzles may indicate the boom is too low. Proper tip height and overlap are found in the Set up section.

The supplied TP11008VP polymer test tips are a tapered flat fan design and require a minimum of 30% overlap when mounted on 20" spacing (this is a tip to ground height of 18" minimum). Consult the manufacturer's recommendations for the style of tip you plan to use. Patterns, overlaps, sizes, materials, droplet size and pressure range can change with the tips selected. Test with water if you have no experience with new nozzles.

Spray Operation

The sprayer was designed to operate at an engine speed of 1500 RPM's to 3500 RPM's. The hydraulic drive diaphragm pump reaches full volume at 2500 RPM's on vehicle's tachometer.

- Park on level ground with parking break on-truck in neutral and engine off.
- Safety equipment should be used during all sprayer operations as a rule. Safety equipment should be in good condition with no rips, holes or tears. Your spray suit, neoprene/PVC gloves, goggles/face shield and approved breathing device (respirator).

- Sprayer mix and load area should not be a high traffic area or visited by workers who are not properly protected with safety equipment.
- To open the 16" filler lid, grasp the lateral raised ribs on the lid—pull with the left hand and push with the right hand—rotate left until lid unthreads.
- If equipped with an anti-siphon device (air gap filler) for the back flow protection, rotate and lock gooseneck filler into position.
- Attach water feed hose and slowly turn on water source and bring up to full stream (without splashing out).
- We recommend the strainer basket be left in place and used to strain all materials being put into the fiberglass tank.
- Pump suction strainer should be installed if not already in place. Also, open the bottom load valve to the pump at this time.
- Determine amount of spray mix to be used for your application. If required amount is less than full tank capacity, fill tank to desired level.
- If required amount is a full load (tank topped off), then only fill to a $\frac{3}{4}$ liquid level. This leaves room for adding chemical to be mixed and applied. (The balance of the fill water will be added later.
- Place truck in neutral with parking brake engaged.
- Start engine according to procedures outlined in Truck Owner's Manual.
- Using throttle lock (manual or electric), set engine speed to 2500 RPM's.
- On vehicle's center dash, press auxiliary hydraulics switch at top and turn the pump drive on. If not operating, review the Trouble Shooting Section for ideas.
- A quick look into the open lid assembly will verify if the pump is working, through the movement of the tank's contents. Agitation control valve is located with the pump and relief valve on the back of the spray tank. Adjust to level of agitation required as described earlier. *NOTE* - if system fails to work as described, shut auxiliary hydraulics to pump off, and check Trouble Shooting Section for possible cures.
- Once system is operational, a quick system test should be performed before adding product to the mix tank.
- Lower boom wings to the operational position. Be sure area is clear of non-authorized spray personnel.
- Turn on Master Boom Control, switch or lever, and adjust pressure to 40 PSI on the controller pressure gauge.
- Check boom assembly for leaks. Inspect hose fittings, nozzle assemblies, end caps and the complete system. Repair and/or re-tape any leaking fittings. STOP all drips!
- All nozzles should come on and develop a full pattern. Clean or repair all non-working assemblies.

NOTE: System Calibration and Product Active Ingredient formula calibration sections should already be completed. If not, refer to the appropriate sections and compute your application data before continuing.

- With calibration formulas completed, tips sized, dry run calibration and nozzle pressure set, you are now ready to proceed.
- Re-start truck and activate the pump switch and agitation.
- Slowly add the chemical to be applied to the agitating tank water. The addition of some products all at once, may cause damage by plugging the in-line suction strainer screen, which can cause a starved suction condition. Product labels (WP, EC, WDG, etc.), are abrasive in nature and need extra mix time in the tank. Pre-packaged dissolvable gag types are also difficult to mix rapidly. The slow dissolving of the wrapper may lead to clogged suction strainers under certain “hasty” conditions. Liquid products can mix easier than most dry formulations, but can be difficult to mix in cold water areas. Consult with your chemical supply representative for any precautions or “mix-it-up” suggestions for any unfamiliar products.



WARNING: The mixing of non-compatible materials or formulations not previously tested by chemical professionals, should be avoided. Volatile “brews” can be damaging and costly to repair and dispose of. Leave the burden of mixing compatibility to the people who manufacture and sell the products to you!

Sprayer damage from misuse of chemicals is not covered under Warranty.

- Mix times may vary by chemical, load size, water temperature and operator experience.
- Normal mix times can be 20 to 30 minutes per tank. This allows enough time to provide complete particle distribution throughout the complete mixable liquid in the tank.
- Just because the water is murky and clouded, does not mean all of the chemical is mixed. Give it enough time to completely mix.
- Haste during critical mixing phase by spraying too soon, may cause severe damaging rate changes from what your original rate was suppose to be.

Example:

1st 1/3 of tank could apply more than the desired rate when heavy products are not fully suspended in the carrier water. the 2nd 1/3 could apply close to the right rate while the final 1/3 would be light on active ingredients. This is only a possible scenario—adequate mix times will eliminate these costly errors from happening!

- At the completion of the chemical mixing phase, you are ready to apply the chemical mix to your turf areas.
- If the machine is equipped with the SDI Quick Foam Marking System, refer to Operation's Manual for application techniques.
- Foamer use should be restricted to fairway and rough areas with longer turf grass heights. Use on green and tee areas, can cause browning under slow dissipating foam balls during high air temperatures.
- Be sure to allow enough spray overlap on end nozzle to cover the foam ball with a dissipating spray. This technique allows for proper pattern overlap and the water from the spray speeds up the foam ball's disappearing from the turf area.

Troubleshooting

Cannot get enough pressure:

- Settings exceed pump capacity
- Vehicle's auxiliary hydraulics not working or not switched on
- Spray tips too large
- Tank empty
- Hydraulic fluid in system at low level
- Bottom load valve on pump suction off or partially closed
- Liquid foaming in tank
- Suction vacuum leak and/or crack in hose
- Suction strainer screen clogged

***Operational Checks During Extended
Product Applications:***

- Frequently check your control pressure gauge for any changes from original calibration set. A rise in the pressure should alert you to a clogged or partially blocked spray tip orifice output. Routine nozzle screen cleanings and use of all factory standard strainer screens, will greatly reduce clogged or blocked tips from happening. Another possible cause for pressure rise could be the increase of engine speed. Recommend the use of the truck's governor or throttle lock set for accurate speed (maintains power accurately under variable load conditions).
- One last cause for a system pressure increase could be from the increase in hydraulic oil temperature. As the hydraulic oil's temperature goes up, the viscosity gets thinner. Under ideal conditions, thinner oil can pass through the hydraulic flow limiting valve on the hydraulic motor and increase the number of RPM's. This small increase can be managed through the use of the pressure adjust feature on the sprayer's boom controls.
- Pressure loss can also occur during a spray application. Loss of engine speed, loss of a spray tip or excessive wear on all tips as compared to a non-current calibration check. Frequent checks of system calibration, will result in better system performance.
- The use of SDI's Motorized Valves with metered by pass can also affect the system pressure if not properly adjusted. Refer to Motorized Valve adjustment procedure for more information. The metered by pass affects the system pressure only when one or more sections are turned off. Loss or gain of pressure should not occur when all sections are on at once because the metered by pass option in non-operational (when valve is on), only bleeds the system by pass during valve shut down (off position).
- Another possible cause of pressure loss on the system could be the result of a clogged suction strainer. Your system uses a self-priming diaphragm pump. If the suction strainer screen becomes clogged, it restricts the flow of water to the pump. Under high liquid requirement applications, the output could drop enough to cause the system to lose pressure. Keep your strainer screen clean and protect your diaphragms too!

- Also, be sure the strainer bowl is properly tightened with the gasket in place. An improperly tightened bowl can result in a suction leak, which will result in loss of fluid to the pump.
- Another pressure loss cause could be the loss of system hydraulic fluid. this is rare and would require a large fluid loss to affect the PTO speed of the pump.

If any other problems arise, consult your local dealer or the factory.

More Operational Checks:

- If equipped with a speedometer, occasionally verify speed. The use of the ground speed governor or throttle lock control can maintain ground speed to keep your application rate on target. Stable speed is one of your necessary spraying constants.
- Boom wing orientation (levelness to the ground). The ground contour wheel option can assist over uneven terrain.
- While stopped after turning around, visually check the tank liquid level sight tube for the amount of spray left in the tank. DO NOT do this procedure during forward movement. Keep your eyes forward to avoid collision accidents.
- If using a Raven computer controller, periodically check the data/ rate screen for proper flow rate output. If it is not holding the desired rate, consult Raven's User Manual or contact your local dealer or the factory.

Between Tank Loads (Refills):

- Check vehicle fuel level and fill as needed.
- Check solution tank on Foam Marker and fill as needed.
- If using wetttable powders or equivalent, check suction strainer and nozzle tip strainers for possible debris build up. Clean as needed. Avoid costly and messy "in field" service of plugged nozzle screens by checking and cleaning often.
- Refer to your calibration charts and area measurements to verify your application coverage is as planned. Make any necessary adjustments to obtain the correct rate. A 10% error in application rate can cost you hundreds of dollars in los time and chemicals, not to mention the possibility of turf grass damage.

When the Job is Done

Sprayer Clean-Up:

Sprayers are often neglected during the winter, at the cost of valuable time and money in the spring to fix cracked or broken fittings, hoses or pumps that have seized.

A sprayer is a long term investment. All sprayer's components, from tank to tips, should be checked. Items that need replacement should be listed. Replacement parts should be purchased during the off-season.

Sprayers should be protected against the harmful affects of now, rain, sun and strong winds. Moisture in the air, whether from snow, rain or soil, corrodes metal parts of unprotected equipment.

The sun helps reduce moisture in the air, but it also causes damage. Ultraviolet light softens and weakens rubber materials such as hoses. The best production from the environment is to store sprayers in a dry building. Storing sprayers provides an opportunity to work on them any time during the off season, regardless of weather conditions.

Clean Up:

Prior to storage, clean the sprayer thoroughly with a cleaning solution. Which solution to use will depend on the pesticides used during the season. Always check the pesticide label for specific cleaning instructions. During cleaning, follow these general tips:

- Use a cleaning solution containing two pounds of detergent for each 30-40 gallons of water. This should be sufficient for removing most pesticides.
- Flush the sprayer clean with clean water first. Then add the cleaning solution to the tank. Agitate thoroughly and allow the water/detergent solution to circulate through the system for several minutes.
- Remove nozzles and flush the system twice with clean water.
- Clean nozzle tips and screens in a strong detergent solution or kerosene using a soft brush—like an old toothbrush.

- Some pesticide combinations (especially if oil is used), may produce a putty type paste in the tank. Flushing out the residue of such chemicals after each load prevents an accumulation.
- If water alone does not dissolve the residue build-up-, add Stoddard solvent, kerosene or diesel fuel (1 gallon solvent for each 25 gallons of water). Allow paste to dissolve, then agitate and flush. When cleaning tanks which have carried some phenoxy herbicides such as 2,4-D, first rinse the sprayer with clean water and a tank cleaning compound that will neutralize any residues.

Circulate this solution and let a small amount flow through the nozzles. Keep the remainder of the solution in the system overnight and then pump it out the next morning.

During the final cleaning, examine the hoses, clamps, connections, no-drip valve, nozzle tips and screens for needed replacement.

Winterize:

After the final cleaning, follow these tips to get the most out of your sprayer's life:

- Remove no-drip valve, nozzle tips and strainers and dry them thoroughly. Clean tips with a toothbrush only. Store metal tips in a can of light oil, diesel fuel or kerosene.
- Store tips constructed of plastic and nylon in a dry place.
- Make a special effort in storing tips so the orifices are not damaged by contacting each other or other parts such as loose screws.
- Drain water from all parts to prevent freezing. To insure the hoses are completely drained of water, purge them with compressed air.
- Pump requires special care—place automotive anti-freeze with rust inhibitor in the pump and other sprayer parts. This also protects against corrosion and prevents freezing in case all water is not drained.

- Tape or cover all openings so that insects, dirt and other foreign material cannot get into system.
- Check the sprayer for scratched parts. Touch up these areas with point to eliminate corrosion.
- Store sprayer in a clean, dry location within a building. If storage in a building is not possible, provide some type of cover.
- Remove hoses, wipe them clean of oil and store them inside a building. DO NOT hang them over a nail or sharp object. This will cause a permanent crease that reduces flow through the hose. Coil hoses around a basket or other large round object to prevent sharp bends.



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