

# Liqui Maxx<sup>™</sup> Sprayer Systems

## **Owner's Manual and Installation Instructions**

**Original Instructions** 



A CAUTION Read this document before operating or servicing the equipment.

This manual and instructions are for Liqui Maxx Sprayer Systems with serial numbers beginning with 170802 and higher.

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This manual has been prepared to acquaint you with the safety information, operation, and maintenance of your new machine. Improper installation and operation could cause personal injury and/or equipment and property damage. Read and understand the Owner's Manual before installing, operating, or making adjustments. Keep this manual accessible.

When service is necessary, call SnowEx<sup>®</sup> Technical Service at 1-800-SALTERS (725-8377).

# NOTE: This unit is designed to be used with salt brine; the use of additives may impact performance.

#### NOTE: Do not modify or alter the machine. Altering the unit in any way will void the warranty.

The Liqui Maxx<sup>™</sup> Sprayer System is designed to apply brine to pre-treat, anti-ice, and post-treat parking lots and roadways. Each Liqui Maxx unit consists of a holding tank, pumping system and control, and a spray boom.

#### **Standard Control**

The standard version of the control has the ability to turn the sprayers ON and OFF and increase or decrease the pressure of the system from the cabin.

#### **Deluxe Control**

The deluxe version of the control unit has many features that include: push-button controls, application rate adjustment and selection, automatic and manual control modes, visual and audio alarms, and a BLAST function for spot applications.

A separate GPS unit is offered that incorporates the vehicle speed to automatically adjust the flow rate and maintain the desired application rate. The deluxe control is also compatible with some vehicle speed sensors that can replace the GPS unit. Consult your vehicle owner's manual for more information.

## WARRANTY REGISTRATION

Warranty registration is available online at *www.snowexproducts.com*. Under "Support" select "Warranty Registration" and submit the form online.

OWNER'S INFORMATION			
Owner's Name:			
Date Purchased:			
Outlet Name:		Phone:	
Outlet Address:			
Vehicle Model:		Year:	
Equipment Model:		Serial #:	
Length:	Weight:	lb/kg:	

## SAFETY DEFINITIONS

#### **A** WARNING

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious personal injury.

## 

Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTE: Indicates a situation or action that can lead to damage to your sprayer and vehicle or other property. Other useful information can also be described.

## WARNING/CAUTION LABELS

Become familiar with and inform users about the warning and caution labels on the machine.

If labels are missing or cannot be read, call 1-800-SALTERS (725-8377).

#### Model TSA-300 Only

#### A WARNING

<u>Vehicles <10.000 lb GVWR</u> Obstructing the visibility from the vehicle's rear camera could result in serious injury or damage. An auxiliary camera system shall be installed if the vehicle's rear camera is removed or blocked.



#### SERIAL NUMBER LABEL





YYMMDDLLXXXXZZZZZZ 

Code	Definition
YY	2-Digit Year
MM	2-Digit Month
DD	2-Digit Day
LL	2-Digit Location Code
XXXX	4-Digit Sequential Number
ZZZZZZ	Model #

## SAFETY PRECAUTIONS

Improper installation and operation could cause personal injury and/or equipment and property damage. Read and understand labels and the Owner's Manual before installing, operating, or making adjustments.

#### **A** WARNING

- Before working with the equipment, secure all loose-fitting clothing and unrestrained hair.
- Before operating the sprayer system, verify that all safety guards are in place.
- Always shut vehicle OFF before attempting to attach, detach, or service sprayer system.
- Never attempt to take a unit off a truck with liquid in it.
- Do not climb into or ride on the machine.

## **A** WARNING



Overloading could result in an accident or damage. Do not exceed GVWR or GAWR ratings as found on the driver-side vehicle door cornerpost. See Filling section to determine maximum volumes of spraying material.

## **A** WARNING

Securely bolt and strap unit into place on the vehicle bed using the optional UMK-200 bolt kit and ratchet straps or similar. Unit must be strapped down and bolted into position before operating or transporting.

## 

Vehicle handling and characteristics will change with the unit installed. Avoid any sudden steering maneuvers, starts, or stops that could create sloshing and instability.

## **A** WARNING

Always make sure that personnel are clear of areas of danger when using equipment. Maintain 60' distance from all bystanders when operating the sprayer system.

## **A** WARNING

Do not install the control for this product in the deployment path of an air bag. Refer to vehicle manufacturer's manual for air bag deployment area(s).

## A WARNING

Inspect the unit periodically for defects. Parts that are broken, missing, or worn out must be replaced immediately. Do not alter any part of the unit without prior written permission from the manufacturer.

## **A**WARNING

Vehicles <10,000 lb GVWR: Obstructing the visibility from the vehicle's rear camera could result in serious injury or damage. An auxiliary camera system shall be installed if the vehicle's rear camera is removed or blocked.

## 

Brine is typically a clear to cloudy white liquid with no odor. It may be irritating to the eyes, skin, and respiratory system. For more safety information on brine and other de-icing materials, refer to the manufacturer's Safety Data Sheet (SDS).

## 

During the sprayer system installation we recommend the addition of an OSHA compliant Backup Alarm. This alarm is required for OSHA governed employers.

## 

- Do not operate a sprayer system in need of maintenance.
- Before operating the sprayer system, reassemble any parts or hardware removed for cleaning or adjusting.
- Before operating the sprayer system, remove materials such as cleaning rags, brushes, and hand tools from the unit.
- Before operating the sprayer system, read the engine owner's manual, if so equipped.
- While operating the unit, use auxiliary warning lights, except when prohibited by law.
- Tighten all fasteners according to the Torque Chart. Refer to Torque Chart for the recommended torque values.

## 

Disconnect electric and/or hydraulic power and tag out, if required, before servicing or performing maintenance.

## 

Do not leave material in the unit for long periods of time.

NOTE: Lubricate grease fittings after each use. Use a good quality multipurpose grease.

## FUSES

The electrical system contains several automotive-style fuses. If a problem should occur and fuse replacement is necessary, the replacement fuse must be of the same type and amperage rating as the original. Installing a fuse with a higher rating can damage the system and could start a fire.

## PERSONAL SAFETY

- Remove ignition key and put the vehicle in PARK or in gear to prevent others from starting the vehicle during installation or service.
- Wear only snug-fitting clothing while working on your vehicle or sprayer system.
- Do not wear jewelry or a necktie, and secure long hair.
- Wear safety goggles to protect your eyes from brine, battery acid, gasoline, dirt, and dust.
- Do not eat, drink, smoke, rub your eyes, or touch bare skin while spraying.
- Never point spray gun at people or animals.
- Avoid touching hot surfaces such as the engine, radiator, hoses, and exhaust pipes.
- Always have a fire extinguisher rated BC handy, for flammable liquids and electrical fires.

## FIRE AND EXPLOSION

#### **A** WARNING

Gasoline is highly flammable and gasoline vapor is explosive. Never smoke while working on vehicle. Keep all open flames away from gasoline tank and lines. Wipe up any spilled gasoline immediately.

Be careful when using gasoline. Do not use gasoline to clean parts. Store only in approved containers away from sources of heat or flame.

## **CELL PHONES**

A driver's first responsibility is the safe operation of the vehicle. The most important thing you can do to prevent a crash is to avoid distractions and pay attention to the road. Wait until it is safe to operate Mobile Communication Equipment such as cell phones, text messaging devices, pagers, or two-way radios.

## VENTILATION

#### **WARNING**

Vehicle exhaust contains lethal fumes. Breathing these fumes, even in low concentrations, can cause death. Never operate a vehicle in an enclosed area without venting exhaust to the outside.

## BATTERY SAFETY

#### **A** CAUTION

Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks, or lit tobacco to come near the battery. When charging or working near a battery, always cover your face and protect your eyes, and also provide ventilation.

- Batteries contain sulfuric acid, which burns skin, eyes, and clothing.
- Disconnect the battery before removing or replacing any electrical components.

## **TORQUE CHART**

## **A** CAUTION

Read instructions before assembling. Fasteners should be finger tight until instructed to tighten according to the Torque Chart. Use standard methods and practices when installing equipment, including proper personal protective safety equipment.

Recommended Fastener Torque Chart					
Inch Fasteners Grade 5 and Grade 8					
<u>.</u>	Torque	e (ft-lb)	Torque		e (ft-lb)
Size	Grade 5		Size	Grade 5	
1/4-20	8.4	11.9	9/16-12	109	154
1/4-28	9.7	13.7	9/16-18	121	171
5/16-18	17.4	24.6	5/8-11	150	212
5/16-24	19.2	27.3	5/8-18	170	240
3/8-16	30.8	43.6	3/4-10	269	376
3/8-24	35.0	49.4	3/4-16	297	420
7/16-14	49.4	69.8	7/8-9	429	606
7/16-20	55.2	77.9	7/8-14	474	669
1/2-13	75.3	106.4	1-8	644	909
1/2-20	85.0	120.0	1-12	704	995
Ν	/letric Fa	steners	Class 8.8	and 10.9	9
	Torque	e (ft-lb)		Torque	e (ft-lb)
Size	Class 8.8	Class 10.9	Size	Class 8.8	Class 10.9
M6 x 1.00	7.7	11.1	M20 x 2.50	325	450
M8 x 1.25	19.5	26.9	M22 x 2.50	428	613
M10 x 1.50	38.5	53.3	M24 x 3.00	562	778
M12 x 1.75	67	93	M27 x 3.00	796	1139
M14 x 2.00	107	148	M30 x 3.50	1117	1545
M16 x 2.00	167	231	M33 x 3.50	1468	2101
M18 x 2.50	222	318	M36 x 4.00	1952	2701
These torque values apply to fasteners except those noted in the instructions.					

This Owner's Manual covers vehicles that have been recommended for carrying the sprayer system. Please see your local dealer for proper vehicle applications.

## CERTIFICATION

#### **A** WARNING

New untitled vehicle installation of a sprayer system requires National Highway Traffic Safety Administration altered vehicle certification labeling. Installer to verify that full sprayer does not exceed GVWR or GAWR rating label and complies with FMVSS.

## **A** WARNING

Overloading could result in an accident or damage. Do not exceed GVWR or GAWR as found on the driver-side cornerpost of vehicle.

## 

Read and adhere to manufacturer's ice-control material package labeling, including Material Safety Data Sheet requirements.

#### **SPECIFICATIONS**

Liqui Maxx™ Sprayer System							
Tank Model		TSA-300	TSA-500	TSA-750	TSA-1250		
Capacity (gal)		300	500	750	1250		
Tault and Dump	Length	101	112	118	119		
Dimensions (in)	Width	53	59	75	85		
	Height	24	48	55	73		
Empty Unit Weight (Ib)		500	600	700	1000		
Full Unit Weight (lb)		3500	5600	8200	13500		
Suggested Gross Vehicle Weight Rating (GVWR) (Ib)		8,500–10,000	14,000–16,000	16,000–19,500	19,500–26,000		
Vehicle Class		Class 2B	Class 4	Class 5	Class 6		

## 

Overloading could result in an accident or damage. Do not exceed GVWR or GAWR ratings as found on the driver-side vehicle door cornerpost. See Specifications to determine maximum volumes of spraying material.

## A WARNING

New untitled vehicle installation of a sprayer system requires National Highway Traffic Safety Administration altered vehicle certification labeling. Installer to verify that full sprayer does not exceed GVWR or GAWR rating label and complies with FMVSS.

## A WARNING

Always shut vehicle OFF before attempting to attach, detach, or service sprayer system.

## A WARNING

Never attempt to take a unit off a truck with liquid in it.

## INSTALLATION AND REMOVAL

NOTE: To prevent leaks, use a thread-sealing compound on all threaded connections. Do not use Teflon<sup>®</sup> tape, as fragments will clog the spray nozzles. Clamped connections may require periodic retightening.

1. Bolt the pump and tank platforms together (six places).



Teflon<sup>®</sup> is a registered trademark of E. I. du Pont de Nemours and Company.

2. Connect the hose underneath the unit:

Securely fasten the 90° elbow connection to the tank bulkhead fitting underneath the unit. Make sure that the bulkhead fitting is securely fastened to the tank to prevent leaks. Run the 2" hose from the elbow to the shut-off valve below the pump. Clock the 90° elbow so that the hose remains free of kinks; cut it to length. Clamp the hose using two (2) clamps on each end to prevent leaks. In low temperatures, warming the hose may ease installation. Dip the hose in hot water or carefully use a heat gun for 20–40 seconds.



 Connect the servo valve to the 1-1/2" bulkhead fitting on the pump side of the brine tank with supplied 1-1/2" flexible hose. Insert 1-1/2" hose barb into bulkhead fitting with pipe dope. Tighten securely. Cut hose to length and attach with four provided hose clamps.



4. Lift the main tank and pump assembly using the fork lift pockets. Use caution when inserting forks. Improper insertion may puncture or damage the brine tank and tubing routed underneath the unit. Center the tank and pumping system from driver's side to passenger's side on top of the truck bed and lower into position.

5. Install any optional kits and equipment. To install the BRM-175 Adjustable Boom Receiver Mount, unfasten the rear brake light, install the kit, and re-install the light on the top rear face of the BRM bracket.



 Securely bolt and strap unit into place on the vehicle bed using the optional UMK-200 Universal Mounting Kit or similar brackets and ratchet straps. Hardware attaching the sprayer system directly to the vehicle is the responsibility of the end user.

NOTE: Pay special attention when drilling or clamping dissimilar metals to aluminum bodies. Galvanic corrosion can occur if not handled properly. Contact vehicle manufacturer for recommended attachment practices.

7. Measure the distance between the front of the truck bed and the tank base. Make a spacer to fill area between the tank base and the front of the truck bed. Failure to install this spacer could result in damage to the sprayer and/or vehicle.



Wood Spacer

## 

Ensure that nozzles have minimum 18 inches ground clearance. Low boom heights can cause accidental breakage from curbs, uneven surfaces, and other obstacles. Adjustment may require optional BRM-175 Adjustable Boom Mount.

 Install the boom so that the nozzles measure 18"–22" from ground to nozzle tip. This is to prevent damage and ensure optimal performance. Consider using the optional BRM-175 Adjustable Boom Receiver Mount if the tips of the nozzles lie outside this zone when using your stock receiver hitch.



9. Connect the boom to the pump. Clamp the quick disconnect attachments on the boom hoses to the manifold valves on the pumping unit. Route the hoses to the installed boom with adequate slack and cut the hoses to fit. Clamp the hose tightly to the boom to prevent leaks.



## CONTROL BOX MOUNTING

# NOTE: Use dielectric grease to prevent corrosion on all connections.

Before beginning the installation, remove all battery cables from the vehicle battery terminals.

 Route the vehicle harness (PN 72141) along the vehicle frame. Do not route it close to the exhaust system or engine, where extreme heat could melt the wiring insulation and short out the sprayer and vehicle electrical systems. Attach the harness to frame holes and frame supports. Do not attach to fuel or brake lines. Use heavy-duty cable ties or frame clamps to fasten the harness along the frame.

## **A** CAUTION

Before drilling holes, check to see that no vehicle wiring or other components could be damaged.

2. Route the control harness (PN 72143) using an existing access hole through the fire wall into the vehicle cab. If adding an access hole is necessary, check the area on the other side of the fire wall to make sure that you will not drill into vehicle wiring or other components. Attach securely with cable ties.

#### 

Do not install the control for this product in the deployment path of an air bag. Refer to vehicle manufacturer's manual for air bag deployment area(s).

## 

Do not mount the control close to any heater vents or in areas prohibited by the vehicle manufacturer for crashworthiness. See the vehicle's body builder's book, owner's manual, or service manual for details.

## 

Do not alter, modify, or install component in shaded areas shown below. Failure to comply may interfere with air bag deployment or cause injury to operator in an accident.



- Connect the harness to the back of the control (PN 72145) and mount the control in a suitable location within easy reach of the vehicle operator without restricting access to the vehicle controls and instruments.
- 4. Connect the harness to the battery. Refer to the wiring diagrams for battery connections.



## INSTALLATION

## Mounting the Display Console & Switches

Select a mounting location that is convenient to reach and highly visible to the operator. Do not install in a position that obstructs the view of the road or work area. Whenever possible, avoid locations that expose the console to direct sunlight, high temperature, strong chemicals, or rain.

Place the mounting bracket in desired location and secure with the self-tapping screws provided.



## INSTALLATION (CONT.)

## **Speed Sensor Installation**

**Installation Note:** The harness provides local connection for the speed sensor. For speed sensor installations on implements, add 3-pin extension cables as required.



**Please Note:** If you have purchased an Astro GPS Speed Sensor, a Vansco radar, or other radar or GPS speed sensor, install the Astro, the Vansco, or other radar as described in the instructions included with the unit.

#### **Speed Sensor Options**

In addition to the standard Hall-effect magnetic speed sensor, the deluxe control may be interfaced with a variety of other speed sensing equipment. Several options are listed below.

# Astro Series or Other GPS Speed Sensor Interfaces

The deluxe control may also be used with most GPS speed sensors that output a pulsed signal, such as the Micro-Trak Astro 5, SkyTrak, or Dickey-John GPS speed sensors. An adapter cable may be required.

#### Installing External BLAST Switch

An optional external **Momentary ON** BLAST switch can be connected to the two quick-connect terminals provided on the harness (**see Wiring Diagram**). The remote BLAST switch allows the operator to control the BLAST function from a switch mounted on an armrest or other convenient location.

## STANDARD CONTROL INSTALLATION

## Wiring Diagram



## **Battery Connections**

IMPORTANT: Attach the red wire to the NEGATIVE (-) post. The electrical system must be 12V. If the tractor has two 6V batteries, the red wire must be attached to the POSITIVE (+) post on the battery that has the power cable to the tractor electrical system. The brown wire can be attached to the NEGATIVE (-) post on the other battery or anywhere on the tractor frame. See wiring diagram.

## **A** WARNING

Overloading could result in an accident or damage. Do not exceed GVWR or GAWR as found on the driver-side cornerpost of vehicle.

## **A** WARNING

Always shut vehicle OFF before attempting to attach, detach, or service sprayer system.

Refer to the Specifications section to determine sprayer weights and capacities.

## FIRST TIME FILLING

- 1. Install the sprayer system and any optional equipment. See the Installation Instructions section of this manual for details.
- 2. Install or attach any other equipment that will be on the vehicle while the sprayer system will be in use (step bumper, trailer hitch, snowplows, etc.) and fill gas tanks.
- Obtain the Gross Vehicle Weight Rating (GVWR), Front Gross Axle Weight Rating (FGAWR), and Rear Gross Axle Weight Rating (RGAWR) from the certification label typically located inside the driver-side door.
- 4. With the occupants in the truck for normal sprayer operation, weigh the vehicle to obtain gross vehicle weight (GVW).
- Subtract the GVW from the GVWR to determine the available material payload. For reference, brine weighs approximately 10 lb/gal. For more weight information see the Specifications section of this manual or the material manufacturer's specifications.

## **ROUTINE FILLING**

#### Gasoline

Fill the motor with gasoline as needed.

## **Adding Brine**

Fill the brine tank to the desired level using the steps below. Use the markings on the tank for volume reference. If filling is slow, check the intake filter. For more information see the Maintenance and Troubleshooting sections of this manual.



Oil

The engine is shipped without oil in the crank case. Fill with oil prior to use in accordance with the enclosed Honda<sup>®</sup> service manual.

Before starting the engine, be sure that the oil level is within the limits on the dipstick. See the Honda service manual for correct oil types and SAE viscosity grades. The oil level should be checked before each use.

Honda® is a registered trademark of Honda Motor Co.

#### Filling with an external pump

- 1. Connect fill hose to the brine fill valve. (Opening the valves first will cause standing brine in the tank to flow out.)
- 2. Once hose is hooked up, open the brine fill and shut-off valves.
- 3. Once the valves are open, begin pumping brine from the holding tank using the external pump.
- 4. Fill to the desired level.
- 5. Close the brine fill valve. The shut-off valve must be open for spraying.

NOTE: After first time filling, remove the top port from the pump and wait for a good stream before replacing. This will remove any air blockages. Filling with the Liqui Maxx<sup>™</sup> sprayer pump

NOTE: This method only works when the brine reservoir level is above the tank level. The pump requires a gravity-fed start to remove standing air in the piping. Once the pump is primed it will function normally.

- Connect fill hose to the brine intake valve. Opening the valve first will cause standing brine in the mixing tank to flow out.
- 2. Once the hose is hooked up, open the brine fill, and close the shut-off valve.
- 3. Make sure that the servo valve is fully open.
  - a. HFS-100-2 (Manual Control): Decrease pressure to minimum with pressure toggle switch.
  - **b. HFD-200EX or HFD-200HYD (Auto Control):** Control should be in "HOLD" function.
- 4. Once brine begins to flow in, start the motor.
- 5. Fill tank to desired level.
- 6. Close the brine fill and open the shut-off valve.



## A WARNING

Always make sure that personnel are clear of areas of danger when using equipment. Maintain 60' distance from all bystanders when operating the sprayer system.

## A WARNING

Vehicle handling and characteristics will change with the unit installed. Avoid any sudden steering maneuvers, starts, or stops that could create sloshing and instability.

## A WARNING

Before operating the sprayer, verify that all safety guards are in place.

## 

Unit must be strapped down and locked into position before operating or transporting.

## **A** CAUTION

Starting the motor with no antifreeze will damage the seal in the pump. Check antifreeze levels before starting.

## CONTROL OPERATION

## Deluxe Control

Follow the steps below to get started using your deluxe control. Complete details and instructions follow in this section.

- 1. Before spraying, consider what speed range you wish to operate in and select and install the appropriate nozzles using the application rate charts in this manual. Note that the unit will not function as intended outside these ranges.
- Turn the power switch ON. The unit will display the software version and the total hours of operation for 1.5 seconds each. Be sure that the control is set to HOLD or the boom switches are set to OFF before starting the Liqui Maxx<sup>™</sup> sprayer's motor to prevent unintentional spraying.

The RUN/HOLD button is the master switch to turn all sections ON and OFF. For example, instead of using the individual section switches, simply use the RUN/HOLD switch.

3. Set the valves to the spray configuration. Start the Liqui Maxx sprayer's motor by turning the motor ON, setting the appropriate choke, and pulling the recoil start handle.

#### Spray configuration:

- Brine Fill Valve: Closed
- Shut-Off Valve: Open
- 4. Select the spray mode by pressing the AUTO/MAN button on the bottom left of the control until the desired mode is displayed on the top right of the control display. Select Automatic Mode if you wish to have the control automatically hold a target application rate and your unit has a compatible speed sensor installed. If you are doing driveways or other applications where it is difficult to stay within a target speed range, it may be desirable to use Manual Mode. If speeds of 4–6 mph are desired, Manual Mode is recommended.

#### Automatic Mode

 During normal operation, set the rotary switch to RATE to see the actual application rate per acre. The unit will automatically adjust to the target application rate which can be seen and adjusted using the Up (+) and Down (-) arrow buttons on the control. Use the RUN/HOLD button and the boom switches to control the boom as desired. The factory defaults below can be adjusted as desired. See "Entering Calibration Values" in this section.

#### Factory Defaults:

- Target Application Rate: 30
- Rate Increment: ± 5
- Units: gal/acre

The Automatic Mode has a BLAST function intended for spot application that requires a higher application rate like bridges or intersections. This can be changed to any value and it is not associated with the standard application rate. See "Entering Calibration Values" in this section.

#### **Factory Defaults:**

- BLAST Target Rate: 35
- BLAST Duration: 5 seconds
- Units: gal/acre

The control is also equipped with visual and audio alarms. The alarms will trigger if the actual application rate is above or below 10% of the target rate. For more information on the alarms and other control features see "Deluxe Console" in this section.

- 2. To avoid draining the vehicle battery, turn the control OFF when not in use.
- 3. When finished turn the motor OFF.

# NOTE: The unit cannot automatically adjust the application rate unless there is a compatible speed sensor installed.

#### Manual Mode

# NOTE: In this mode the control will not compensate for speed.

 During normal operation, set the rotary switch to VOLUME/MINUTE to see the flow rate. This value can adjusted using the Up (+) and Down (-) arrow buttons on the control. Use the RUN/HOLD button and the boom switches to control the boom as desired.

#### **Factory Defaults**

- Units: gal/acre
- 2. To avoid draining the vehicle battery, turn the control OFF when not in use.
- 3. When finished turn the motor OFF.

## **Standard Control**

Follow the steps below to get started using your standard control. See the Owner's Operating Manual for the control for complete details and instructions.

- 1. Before spraying, consider what speed range you wish to operate in, and select and install the appropriate nozzles using the application rate charts in this manual. Note that the unit will not function as intended outside these ranges.
- 2. Set the master switch to OFF and turn the power switch ON.
- 3. Set the valves to the spray configuration. Start the Liqui Maxx<sup>™</sup> sprayer's motor by turning the motor ON, setting the appropriate choke, and pulling the recoil start handle.

#### Spray Configuration:

- Brine Fill Valve: Closed
- Shut-Off Valve: Open
- Return Valve: Set pressure to 40 psi by opening and adjusting return valve.
- 4. During normal operation, use the master switch and boom switches to control the boom as desired. Increase or decrease the pressure of the system as desired using the pressure switch.
- 5. To avoid draining the vehicle battery, turn OFF the control when not in use.
- 6. When finished turn the motor OFF.

## DELUXE CONSOLE FUNCTIONS

# The deluxe control features a large, easy-to-read liquid crystal display, rotary dial, and lighted panel for night use.Rotary Switch Position FunctionsREMOTE BLAST SWITCH – Optional: The Optional

**KEYLOCK FUNCTION:** When locked allows the user to view calibration values but prevents changes; allows Data Set 1 to be cleared but prevents clearing Data Sets 2 & 3 (Volume, Area, Distance, Average & Highest Velocity).

**TANK ALARM:** Can be initiated by either the optional Tank Level Switch or the Tank Counter (if Tank Alarm is set in "Special" Calibration).

**REMOTE BLAST SWITCH – Optional:** The Optional Remote BLAST Switch can initiate the BLAST sequence in normal operation, the same as the console BLAST switch.

**AUDIBLE ALARM:** Alarm will sound for Rate errors over 10%, Tank Level below set point or Tank Empty (from Float input). The alarm can be temporarily shut OFF by setting rotary switch to MODE (Alarm Reset) and pressing RESET button.

NOTE: Setting ALARM ENABLE to OFF in "Special" Calibration will disable All Audible Alarms.

**VOLUME (1) (2) (3):** Displays total gallons (liters) of liquid applied. May be reset. SEE NOTE.

**VOLUME/MINUTE:** Displays total gallons (liters) of liquid applied per minute.

TANK LEVEL: Displays gallons (liters) of liquid remaining. If a FILL TANK SIZE has been set to a value in Calibration, pressing the "+" will make the Tank value jump to FILL TANK SIZE value. The value can be decreased but not increased above the FILL size. If the FILL TANK SIZE is set to Zero, Tank level can be adjusted to any value from 0 to 65,535 using the "+" or "-" (RESET) keys.

**RATE:** Displays application rate.

**WARNING LIGHT:** Indicates over- or underapplication of plus or minus 10% from the Target Rate or if the tank is low or minimum flow active. Also lit when in CAL and Unlocked.

## **Calibration Positions**

**FLOW CAL:** Enter the calibration value assigned to your flowmeter (see flowmeter tag).

**MIN FLOW:** Enter the minimum flow rate of the application system.

ADJUST RATE: Enter an amount of change for

on-the-go adjustments to the target rate.

TARGET RATE: Enter the target application rate.

## **Soft Key Functions**



#### Multi-Function Key:

- Used to enter and exit the calibration and "special" calibration modes.
- · Used to initiate BLAST sequence in normal operations.
- Overrides flowmeter input in case of an Emergency Stop.
- Toggles between SPEED CAL and Distance traveled while fine tuning the SPEED CAL factor or between FLOW CAL and Volume when fine tuning the Flow Cal factor.



**AREA (1) (2) (3):** Keeps a running count of the total area worked. May be reset. SEE NOTE.

**DISTANCE (1) (2) (3):** Displays distance traveled. May be reset. SEE NOTE.

**MODE:** Displays selected mode. User selects between Lane, Ag, Dust, and Turf Modes of operation. Allows Audible Alarm to be RESET by pressing the RESET button.

**SPEED (1) (2) (3):** Displays ground speed in miles per hour (kilometers per hour) or Average & Highest velocity. May be reset. SEE NOTE.

NOTE: VOLUME, AREA, DISTANCE & SPEED counters work in sets. If the VOLUME counter 1 is reset, it also resets AREA counter 1, DISTANCE counter 1, and Average & Highest Speed counter 1. This will be the same for resetting any counters in the set.

## **Calibration Positions**

**WIDTH CAL:** Enter the working width. **SPEED CAL:** Enter the speed calibration number in inches (cm) per pulse.

**MODE SELECT:** Allows the user to change the MODE SELECT between modes of operation: Lane, Ag, Dust, and Turf.

**TEST SPEED:** Simulates ground speed for system checkout.



**PROGRAM KEYS:** In normal operating modes, used to increase/decrease application rate. With Rotary Switch in the SPEED position, RESET key

is used to display Average and Maximum Speed. In Volume, Area, Distance, or Speed, the "+" key selects counter set.

- RESET: When in HOLD and not in CAL, clears the selected counter **set** when held for two seconds. When rotary switch is in the MODE position, Resets Audible Alarm.
- When in CAL, the "+" key increases and the "-" decreases the calibration value displayed.

BLAST

## CALIBRATION

## **Entering Calibration Values**

To enter or change any of the system's calibration values, you must enter calibration.

NOTE: UNITS (English or Metric) must be set in "Special" Calibrate before any other CALIBRATE or "SPECIAL" CALIBRATE values.

#### **Calibration Procedure:**

- 1. Turn the sections OFF or put the system in HOLD.
- 2. Hold the BLAST key for 1 second. The CAL icon will be visible and calibration values can be viewed and edited.
- 3. Select calibration position with rotary selector. Calibration positions are identified by the WHITE labeling on each side of the rotary selector.
- Edit calibration values by using the "+" or "-" buttons on the front panel. Switch between calibration positions as needed. (See Calibration Sequence section for recommended sequence.)
- Hold BLAST key for 1 second to save changes and exit calibration mode. The CAL icon will disappear and operations can resume. If you do not wish to save your changes, reboot console without pressing BLAST – original values will return.

If the Console is *unlocked*, the Warning LED will also turn ON and any of the CALIBRATE values can be adjusted.

If the Console is *locked*, the Warning LED will not turn ON and the CALIBRATE (except TEST SPEED) values can only be viewed and cannot be adjusted. TEST SPEED is active whether locked or unlocked.



be lit when in CAL and unlocked.

#### CALIBRATION SEQUENCE

Once in calibration mode, you may change any one, all, or none of the values, in any order, but it is very important to set MODE **first**. MODE SELECT defines the unit of measurement for all system calculations.

NOTE: TEST SPEED is NOT a calibration setting. It simulates vehicle speed during Pre-Application System Checkout. This procedure is described on page 23.

**MODE SELECT:** MODE SELECT allows the user to



change the MODE. Pressing the "+" or "-" (reset) will toggle between Lane, Ag, Dust, and Turf (except in Metric) MODE and the display will show LANE, Ag, USt, and turF.

**DEFINITIONS OF LANE, AG, DUST, AND TURF MODES: LANE:** Used for Highway Maintenance Applications, where Area is accumulated in units of lane miles (lane km). Distance is in units of miles (km) and Application Rate is in amount of liquid per lane mile (lane km). **AGRICULTURAL:** Mainly used for roadside spraying, where Area is in acres (hectares), Distance is in feet (meters), and Application Rates are in gal/acre (l/meter<sup>2</sup>).

**DUST CONTROL:** Used for controlling suspended particulates, where Area is in yd<sup>2</sup> (m<sup>2</sup>), Distance is in yd (m), and Application Rates are in gal/yd<sup>2</sup> (l/m<sup>2</sup>). **TURF (English Units Only):** Where Area is in 1000 ft<sup>2</sup>, Distance is in feet, and Application Rates are in gal/1000 ft<sup>2</sup>.

NOTE: A Mode change CLEARS the counters if Calibration is exited correctly. If power to the console is turned OFF before exiting Calibration, the counters are NOT cleared.

**TARGET RATE:** Selecting TARGET RATE (in English) displays the desired application rate in these units:

LANE mode – gal per lane mile AG mode – gal per acre DUST mode – gal per yd<sup>2</sup> TURF mode – gal per 1000 ft<sup>2</sup>

Selecting TARGET RATE (in Metric) displays the desired



application rate in I/lane km for LANE mode, I/hectare for AG Mode, and I/m<sup>2</sup> for DUST mode. TURF mode does not apply to Metric settings. This is the application rate that the console will lock onto when operating in AUTO. The Warning LED will flash and Audible Alarm will sound if enabled whenever the actual application rate is more than 10% from TARGET RATE.

## CALIBRATION (CONT.)

## Entering Calibration Values (cont.)

ADJUST RATE: In AUTO control with RATE selected, pressing "+" or "-" will change the TARGET RATE by the amount entered for ADJUST RATE.

This allows the operator to make changes to the

TARGET RATE



quickly. To disable this feature, simply enter "0" for a value.

MIN FLOW: The purpose of this calibration setting is to prevent the system from applying below the recommended minimum flow rate for the nozzles.

MIN

Enter the minimum flow rate in gal per min (liters per minute) based on



the nozzles being used, for the entire section width of the applicator. DO NOT

enter the target flow of your spray application. For example: If the minimum flow rate for the nozzle you are using is .22 gal/min at their minimum recommended pressure and your section has 20 nozzles, enter 4.4 as the MIN FLOW value  $(.22 \times 20 = 4.4)$ . The system WILL NOT apply at a rate lower than this value when spraying in AUTO. The Warning LED will FLASH whenever the system is applying at Minimum Flow Rate but the Audible Alarm will not sound. This value should be checked/changed for each different nozzle that you use.

FLOW CAL: This position is used to calibrate the flow meter for accurate liquid measurement. Enter the

Micro-Trak liquid cal number printed on the flowmeter tag (see below).



The Flow Cal number should not be changed during operation because a change in the Flow Cal number will also change some counter values.

## Flowmeter Tag



WIDTH CAL: Displays the Section WIDTH in inches for the Section selected (Unused Section must be set to zero). The total width (sum of all Section widths) must not exceed 65.535 inches or 65.535 meters. To

AREA

(1) (2) (3)



wIDTH adjust a particular section, turn that CAL Section switch ON and all others OFF. If no Sections are

turned ON, it will display "NO BOOM" to remind the user to turn a section ON.

NOTE: The system must be in RUN to display section numbers. Repeat this procedure for each section. Enter a value of "0" (.000) for any unused sections. Your "working" width per section will be the number of nozzles on the section times the nozzle spacing in inches (meters). For example, if you have 7 nozzles spaced at 20 inches, the working width of the section is 140 inches.

NOTE: The consoles are equipped with three Section switches. In Lane Mode the Center Section switch is always the Primary Section and is used to define the LANE WIDTH. Ag, Dust, or Turf Modes can use any Section switch. If the operator is only using one section. it must be the Primary Section.

## A CAUTION

If spray lines are pressurized, nozzles may spray during WIDTH calibration (below).

NOTE: When in Lane Mode, a lane mile/kilometer is defined as the area in a swath equal to the Center (Primary) Section width, that is one (1) mile/km long. The user defines a lane mile/kilometer by changing the Center Section width. For example, if the Center (Primary) Section Width is set to 12 feet, and the Left and Right Sections are set to 3 feet, one mile traveled will result in an Area of 1.5 lane miles covered.

## CALIBRATION (CONT.)

## **Entering Calibration Values (cont.)**

**SPEED CAL:** This position is used to calibrate the speed sensor for accurate speed and distance



DISTANCE (1) (2) (3) SPEED CAL measurement. When this position is selected, the display will show the SPEED

CAL value along with "CAL" on the display. In English units, the SPEED CAL

number is displayed in inches, in Metric it is displayed in centimeters. The SPEED CAL is factory-calibrated for use with an Astro GPS Speed Sensor. See the table below for SPEED CAL numbers for other types of GPS speed sensor or radars. TEST SPEED: Choose the value to be used for



simulating speed for performing Pre-Application System Checkout. The console will use this speed for simulating spraying operations. The TEST SPEED value

is only used while in calibration mode. Once CAL is exited, the TEST SPEED value is reset to zero.

**EXITING CALIBRATION:** Upon completion of the calibration process, exit calibration. Basic calibration is now complete. Please refer to Pre-Application System Checkout section to confirm overall system performance.

## "SPECIAL" CALIBRATION

## **Entering Calibration Values**

NOTE: UNITS (English or Metric) must be set in "Special" Calibrate before any other CALIBRATE or "SPECIAL" CALIBRATE values.

There are three pages of "SPECIAL" CALIBRATE values, total of 18 used for Standard Drive, selected by the rotary switch and BLAST key. To enter Special Cal, put the system in HOLD, turn the console power OFF, press and hold the BLAST button while turning console ON. The console will display SPEC for 2 seconds to show that the console is in the Special Calibration mode. Release the BLAST button.

*If the Console is unlocked, the Warning LED will also turn ON and any of the "Special" CALIBRATE values can be adjusted.* 

If the Console is locked, the Warning LED will not turn ON and the "Special" CALIBRATE values can only be viewed and cannot be adjusted.

NOTE: Press and release the BLAST key to alternate between SPECIAL CAL pages 1, 2, and 3 (number icons indicate page).

The desired Special Calibration parameter(s) can then be accessed with the rotary switch. To exit Special Calibration, press and hold the BLAST button for 1 second. The console will save any changes and revert to normal operation.

To exit without saving changes, simply turn the console power OFF without pressing BLAST.

Special Cal Page 3	Special Cal Page 2	Special Cal Page 1	
Manual Enable	Minimum Alarm Speed	Fill Tank Size	
	Start Time	Tank Alarm Set Point	
	Auto Shut-Off	BLAST Duration	
Alarm Enable	Auto Delay Time	BLAST Target Rate	

## **Special Calibration**

	SPE		
FLOW CAL	VOLUME (1) (2) (3)	AREA (1) (2) (3) WIDT CAL	'н -
MIN	VOLUME /	DISTANCE	D-
FLOW	MINUTE	(1) (2) (3)	
ADJUST		MODE	DE
RATE		(ALARM RESET)	CT
TARGET	RATE	SPEED	T
RATE		(1) (2) (3)	D
	AUTO MAN BLAST	RESET	

Special Cal Page 1	Special Cal Page 2	Special Cal Page 3
Units (Eng/Metric)	Set Year	
Vehicle Number	Set Month	
Valve Polarity	Set Date	
Valve Speed	Set Time	

## "SPECIAL" CALIBRATION (CONT.)

## Entering Calibration Values (cont.) **Special Calibration**, Page 1

NOTE: Changing UNITS will load defaults, so they should always be changed first and then all other CALIBRATE and "SPECIAL" CALIBRATE values may be set.

UNITS (English or Metric): Selecting the AREA position on page 1 WIDTH AREA allows the user to (1)(2)(3)CAL change the UNITS and load defaults. Pressing the "+" or "-" (Reset) keys will toggle between English and Metric UNITS and the display will show En9 or nnEt.

NOTE: Trying to select Metric Units in Turf Mode will cause the Error message to be displayed. Defaults will not be loaded until the Rotary Selector is moved away from AREA or the "Special" Cal page is changed or "Special" Cal is exited normally.

#### **VEHICLE NUMBER:**



DISTANCE SPEED Selecting the CAL DISTANCE (1)(2)(3)

position on page one (1) allows the user to change the VEHICLE NUMBER from 0 to 255 by

using the "+" or "-" (Reset) keys. The VEHICLE NUMBER is downloaded with the Total and Configuration data through the serial port.

#### **VALVE POLARITY:**



Selecting MODE position on page 1 allows the operator to install the flow control valve in either a By-Pass or In-Line configuration. MODE MODE

Pressing the "+" or SELECT "-" (Reset) key will

toggle the display between bYPAS and InLin.

VALVE SPEED: Selecting the SPEED position on



page 1 allows VALVE SPEED to be changed, to adjust system response speed (if required). Pressing the "+" or "-" (Reset) keys will adjust the VALVE SPEED from -4 to 3. Normal setting is -1.

SPEED (1)(2)(3)

TEST NOTE: Use caution SPEED when adjusting the Valve Speed setting.

Higher values used with a fast valve may cause system instability (hunting, oscillations).

## **BLAST TARGET RATE:**

Selecting the RATE position on page 1 allows the user to enter the desired BLAST TARGET RATE. The units and range are identical to the normal TARGET RATE but **BLAST TARGET** TARGET RATE RATE is only used RATE when the **BLAST** key is pressed.



## **BLAST DURATION:**

Selecting the TANK LEVEL position on page 1 allows the user to enter the

desired BLAST DURATION. If can be adjusted from 0 (OFF) to 255 seconds.

ADJUST TANK LEVE RATE

## TANK ALARM SET POINT:

Selecting the **VOLUME/MINUTE** position on page 1 allows a TANK

VOLUME MIN MINUTE FLOW ALARM SET POINT to be entered.

When enabled, the Warning LED flashes, the alarm sounds, and the

display alternates between FILL and normal when Tank Volume falls below the Set Point. When set to "OFF," the alarm is disabled.

FILL TANK SIZE: Selecting the VOLUME position

CAL

on page 1 allows the user to enter a FILL TANK SIZE which can be toggled to

OFF or 1 to 65535 using the "+" or "-" (Reset) keys. The FILL TANK SIZE is in gallons in English or liters if in Metric units. If a FILL TANK SIZE is

specified, then pressing "+" while set



to the TANK position (in Operation) will set the TANK value to FILL TANK SIZE for quick reloading.

## "SPECIAL" CALIBRATION (CONT.)

## Entering Calibration Values (cont.) **Special Calibration**, Page 2

"+" or "-" (Reset) keys will adjust the

MINIMUM ALARM SPEED from 0.1 to 99.9 mph or km/h. When the ground

MINIMUM ALARM SPEED: Selecting the VOLUME

FLOW

CAL

position on page 2 allows adjustment of the MINIMUM ALARM SPEED. Pressing the

VOLUME (1) (2) (3)

speed is below the MINIMUM ALARM SPEED, an Application Rate error will not generate an Audible Alarm. Tank empty and Float alarms are not disabled. Setting the MINIMUM ALARM SPEED to OFF will disable the function and allow audible warnings at any speed. This setting can be used to disable nuisance alarms while stopping and starting.

START TIME: Selecting the VOLUME/MINUTE position on page 2 allows the user to change the

START TIME for the control valve. The START TIME can be

**VOLUME** / MIN MINUTE FLOW

adjusted from OFF to 2.048 seconds. The START TIME runs the Control

Valve towards open for the amount of time (seconds) set, when a HOLD to RUN transition occurs. The control valve may be used to stop hydraulic

flow and can be the cause of an undesirable delay for the Servo to return to normal operating flow. The START TIME cal value can be used to reduce this delay.

**AUTO SHUT OFF:** Selecting the TANK LEVEL position on page 2 allows the user to turn the AUTO

SHUT OFF feature ON or OFF by using the "+" or "-" (Reset) keys. While

in AUTO with the AUTO SHUT OFF turned OFF

automatic control will "freeze" the



current flow when HOLD is pressed. With the AUTO SHUT OFF ON, the servo valve will run towards closed for 4 seconds each time HOLD is selected or ground speed is stopped. This is useful for stopping flow when using auger or belt delivery systems.

AUTO DELAY TIME: Used to delay adjustment of

the servo valve (in AUTO) until section or ON/OFF valves have completely opened. Selecting the RATE position on page 2 allows the user to change the AUTO DELAY TIME by using the "+" or "-" (Reset) keys to vary the delay time from 0 (no delay) to 1, TARGET RATE 2, 3, or 4 seconds. RATE



**SET YEAR:** Selecting the AREA position on page 2

WIDTH

CAL



allows the YEAR to be set from 07 to 99 for 2007 to 2099 using the "+" or "-"

**SET MONTH:** Selecting the DISTANCE position on



page 2 allows the MONTH to be set CAL from 01 to 12 (Jan to Dec) by using the

**SET DATE:** Selecting the MODE position on page 2



allows the DATE to be set from 01 to 31 by using the "+" or "-" (Reset) keys.

MODE MODE SELECT (ALARM RESET)

**SET TIME:** Selecting the SPEED position on page 2



allows the user to change the TIME from 00:00 to 23:59 by using the "+" or "-" (Reset) keys. The LCD does not include a colon so a decimal point is used.

SPEED TEST (1)(2)(3)SPEED

## "SPECIAL" CALIBRATION (CONT.)

#### Entering Calibration Values (cont.) Special Calibration, Page 3

## MANUAL ENABLE: Selecting the VOLUME

position on page 3 allows the user to turn the

MANUAL CONTROL ENABLE ON or OFF by using "+" or "-" (Reset) keys. Setting to OFF disables Manual Control. Pressing the AUTO/MANUAL key will not toggle between Auto and Manual when set to ON.



ALARM ENABLE: Selecting the RATE position

on page 3 allows the user to turn the audible ALARM ENABLE ON or OFF by using the "+" or "-" (Reset) keys. Setting ALARM ENABLE to "OFF" will disable all audible alarms under all conditions.



## **OPERATION (CONT.)**

## **CONSOLE SWITCHES & BUTTONS**

## **Section Switches**

The system monitors the status of the section switches to determine whether they are ON or OFF. The console accumulates area based on the calibrated section widths. When an individual section is turned OFF, the respective width is subtracted from the total width to accumulate area based on the new active application width. If the rotary switch is in the RATE position, the numbers 1, 2, or 3 on the display will light when their respective section is ON.

NOTE: Most consoles are equipped with three Section switches. In Lane Mode the CENTER Section switch is always the PRIMARY Section and is used to define the LANE WIDTH. Ag, Dust, or Turf Modes can use any Section switch. If the operator is only using ONE Section it must be the Primary Section.



#### Warning Device

The console is equipped with a RED warning light. The light will automatically turn ON and flash when the actual application is plus or minus 10% of the calibrated target rate, or if the TANK alarm feature is activated and the tank is below the set point (display will also flash "FILL" message). If the light stays ON while in AUTO, refer to the Troubleshooting section of this manual. The RED warning light will also be illuminated when calibration mode is active on the console.

#### Audible Alarm

The Audible Alarm is activated for the following conditions:

- 1. The Tank Level is below minimum level (TANK ALARM SET POINT).
- 2. Float switch is continuously active for 15 seconds or more.
- 3. The application Rate Error is greater than 10% for 3 seconds (continuously) after the Auto Delay and Start Up time have completed and the console is in AUTO, and the Ground Speed is above the Alarm Minimum Speed.

#### **Emergency Stop**

When in AUTO and in RUN with one or more Sections ON and the Speed is greater than zero, if the Flow signal ever stops, the servo will run to fully open. If Flow remains stopped for 5 seconds or more, it will automatically reduce the flow to a minimum (run servo closed for 4 seconds). "EStOP" will then display to notify the user of the Emergency Stop. The flow remains off (or reduced) and AUTO control will remain disabled until the system goes into HOLD, power is cycled, or CALIBRATE is entered. The Emergency Stop feature helps protect against chemical spills or over-application if the Flow signal is lost.

NOTE: VOLUME, AREA, DISTANCE & SPEED counters work in sets, if the VOLUME counter 1 is reset, it also resets AREA counter 1, DISTANCE counter 1, and SPEED counter 1. This will be the same for resetting any counters in the set. Do not use the "-" button to select counters because the button will clear them. (See Resetting System Counters on page 29). The active set of counters may be reset to zero independent of other sets of system counters.

#### Serial Port

The DB-9 connector on the back of the console provides access for serial communication. The serial configuration is RS-232, 9600 baud, in 8-N-1 half-duplex format. Data is sent and received in comma-delimited ASCII format. An external device (GPS/Mapping/AVL System) can change the application rate on-the-go and also receives and records data from the console.

## **OPERATING AND CALIBRATION INSTRUCTIONS**

## **OPERATION (CONT.)**

## **Resetting System Counters**

The VOLUME, AREA, DISTANCE & SPEED data counters maintain a running count during operation regardless of the position of the rotary switch. When any of these counters reach their maximum capacity, or when you want to start a new count, the value may be reset to zero by performing the following routine. Counter sets may be reset independently of each other.

# NOTE: If the console is locked, only Data Set 1 can be cleared.

- 1. Turn the sections OFF or put the system in HOLD.
- 2. Turn the rotary switch to VOLUME, AREA, or
- DISTANCE. 3. There are three independent VOLUME counters, paired with three AREA counters, paired with three DISTANCE counters, and with three SPEED Values (Average and Highest velocity). The active set of counters is indicated by the small numbers in the lower right area of the display (1, 2, or 3) when the rotary switch is in the VOLUME, AREA, or DISTANCE position. Select the set of counters you want to RESET by pressing the "+" button. The small number will increment each time the "+" button is pressed (from 1 to 3, then rolls back to 1). DO NOT attempt to select the counter number by using the "-" button, because that will clear the active set of counters if held for 2 seconds. If the "-" button is accidentally pressed, the console will display "CLEAr" to alert the user that the counters will be cleared. If the user continues to hold the "-" button for 2 seconds "CLEAr" will disappear and be replaced by 0.0, indicating that the selected set of counters has been cleared.



#### Display indicates that counter set #1 is selected



#### Display indicates that counter set #2 is selected



#### 0.055 HOLD 3 VOLUME (1) (2) (3) FLOW CAL AREA (1) (2) (3) WIDTH CAL MIN FLOW VOLUME / MINUTE DISTANCE (1) (2) (3) SPEED CAL ADJUST RATE TANK LEVEL MODE MODE SELECT SPEED (1) (2) (3) TEST SPEED TARGET RATE RATE AUTO BLAST ΜΔΝ RESET

#### Display indicates that counter set #3 is selected

## STANDARD SPRAYER CONTROL

## Sprayer Console



- 1. **Master Switch** Switches power to the boom switches. Always use this switch to cut off the entire boom.
- Boom Switches Three ON/OFF switches for individual boom sections. (Two, four, or five switches optional.)
- Regulator Switch Forwards or reverses the regulator motor, which raises or lowers the spraying pressure. Small pressure changes can be made by jogging the switch up or down.
- 4. **Pressure Gauge** It is recommended that the tubing to the pressure gauge be connected to the center of the boom.

## 

Before drilling holes, check to see that no vehicle wiring or other components could be damaged.

Find a convenient place to mount the console. Use the holes in the mounting bracket as a template to drill holes for the mounting screws.

The Standard Control System provides the freedom of mounting the control valves anywhere on the sprayer. This can eliminate long boom, pressure, and bypass hoses.

Quick disconnects permit permanent installation of the valve assembly on the sprayer and the control box in the tractor cab.

## **SPRAY BOOM OPERATION**



## Wing Spray Nozzle Selection

Select the nozzles to use by referring to the application rates charts. Open the desired nozzles on the wing by turning the valve handle so that it is parallel to the nozzle. Close the nozzles not being used by turning the valve handle perpendicular to the nozzle.



In some cases it is beneficial to increase or decrease the distance covered by the wing nozzles by rotating the nozzle(s) on the wing. Note that this will also affect the application rate for the spray zone. For details on how the distance affects the application rate of the nozzles, see "Calculations" in this section.

# Downward Spray Nozzle Selection PBA-300-1

Select the nozzles to use by referring to the application rates charts. Rotate the selection wheels so that the desired nozzle faces downward.



## Nozzle Alignment

For consistent brine application, make sure that the holes in the nozzles are aligned with the boom.



## **DEFAULT CONTROL SETTINGS**

## **Deluxe Control**

The values for the deluxe control unit below have been factory calibrated for the Liqui Maxx<sup>™</sup> Sprayer System and can be changed at any time through typical control calibration procedures. For more information on how to calibrate the control, refer to the control's Owner's Manual.

Factory Settings — Deluxe Control				
	ENGLISH			
Tank Set Point	OFF			
Fill Tank Size	OFF			
Control Speed	-1			
Vehicle Number	1			
BLAST Target Rate	35			
BLAST Duration	5			
Start Time	0 (OFF)			
Auto Delay Time	1 sec			
Valve Polarity	Bypass			
Auto Shut-Off	ON			
Minimum Alarm Speed	0 MPH			
Manual Control Enable	ON			
Alarm Enable	ON			
Default Calibration Values	English			
Mode	Acres			
Speed Cal	0.189			
Flow Cal	148			
Min Flow	0.0			
Target Rate	30.0			
Adjust Rate	5.0			
Section 1 Width	96.0			
Section 2 Width	96.0			
Section 3 Width	96.0			

## **APPLICATION RATES**

Application rates are to be selected and adjusted by the user according to ground conditions and temperatures. Initial market research suggests an application rate of approximately 30 gal/acre for use in de-icing and anti-icing. Application rates in the charts below are based on manufacturer's numbers. If your flow is uncharacteristically slow, see the Troubleshooting and Maintenance sections.

#### **Nozzle Selection**

Suggested Operating Range 30–40 ps					30–40 psi
Boom Nozzle†	Width (ft)	gal/min @30psi‡	Total gal/min <sup>‡</sup>	gal/min @40psi‡	Total gal/min <sup>‡</sup>
Brown (std)	8	0.38	3.0	0.42	3.4
Gray (acc)	8	0.45	3.6	0.50	4.0
White (std)	8	0.61	4.9	0.67	5.4
Lt Blue (acc)	8	0.76	6.1	0.84	6.7
Lt Green (std)	8	1.04	8.3	1.26	10.1
Black <i>(acc)</i>	8	1.47	11.8	1.68	13.4

Side Nozzle <sup>†</sup>	Width (ft)	gal/min @30psi‡	Total gal/min <sup>‡</sup>	gal/min @40psi <sup>‡</sup>	Total gal/min <sup>‡</sup>
Red (std)	8	0.37	3.0	0.42	3.4
White (std)	8	0.72	5.8	0.84	6.7

+ Application calculations assume boom set @ 18" from ground

‡ Application calculations adjusted with a factor of specific gravity for brine solution of 1.189

## Manual Mode Standard & Deluxe Control

Use the charts below to select the appropriate nozzles for your route when using the standard control or the manual mode on the deluxe control. These values are approximations based on manufacturer's data and should be replaced with actual tested values whenever possible.

#### Suggested Nozzle Configuration

Desired Speed (mph)	Center Nozzles	Boom Nozzles	Gallons Per Acre	Gallons Per Lane Mile
5–7	Brown	Red		
8–11	White	White	25-40	35-60
12–20	Green	Red & White	20 40	00 00

#### Application Rate Table

Desired Application Rate*	Gallons Per Acre	Gallons Per Lane Mile
50	22	32
60	26	38
70	31	44
80	35	51
90	39	57

\* Ib of NaCl active ingredient per acre @ 23.3% solution

## CALCULATIONS

Nozzle Flow Rates (gal/min)					
Wing Nozzles	Min	Max	Center Nozzles		
Red	2.9	4			
White	5.2	8	Blue		
Red & White	7.9	12	Green		
	11.3	16	Black		

## Equations

$$S\left(\frac{Miles}{Hour}\right) = G\left(\frac{Gallons}{Minute}\right) x \left(\frac{1}{A\left(\frac{Gallons}{Acre}\right)}\right) x \left(\frac{1}{B\left(8\ Feet^*\right)}\right) x \left\{\frac{60\ Minutes}{1\ Hour} x \frac{1\ Mile}{5280\ Feet} x \frac{43560\ Square\ Feet}{1\ Acre}\right\}$$
$$S\left(\frac{Miles}{Hour}\right) = G\left(\frac{Gallons}{Minute}\right) x \left(\frac{1}{A\left(\frac{Gallons}{Lane\ Mile}\right)}\right) x \left(\frac{1}{B\left(8\ Feet^*\right)}\right) x \left\{\frac{60\ Minutes}{1\ Hour} x \frac{1\ Mile}{5280\ Feet} x \frac{63360\ Square\ Feet}{1\ Lane\ Mile}\right\}$$

- A = Application rate in gallons per acre or gallons per lane mile
- S = Speed in miles per hour (mph)
- *G* = Flow rate of the nozzles in gal/min (See chart above for min and max values)
- B = Spray width in feet (\* 8 feet is the default width)

## Conversions

1 lane mile = 1.45 acres

1 acre = 43560 ft<sup>2</sup>

1 lane mile = 63360 ft<sup>2</sup>

## **Example Calculation**

What is the fastest I can travel if both the wing nozzles are adjusted to cover 5 feet instead of 8 feet, with an application rate of 30 gallons per acre? (Note that the boom application rate will not change.)

Using the equation to solve for speed, the variables are as follows:

 $S_{max} = Unknown$ 

A = 30 gal/acre

B = 5 feet

G = 12 gal/min (from chart\*)

\* The deluxe control will display the actual flow rate for your specific unit. For a more accurate max speed, use the flow rate from your control in this equation.

Here is the equation with these numbers:

$$S_{\text{Max}}\left(\frac{Miles}{Hour}\right) = 12\left(\frac{Gallons}{Minute}\right) x \left(\frac{1}{30\left(\frac{Gallons}{Acre}\right)}\right) x \left(\frac{1}{5(Feet)}\right) x \left\{\frac{60 \text{ Minutes}}{1 \text{ Hour}} x \frac{1 \text{ Mile}}{5280 \text{ Feet}} x \frac{43560 \text{ Square Feet}}{1 \text{ Acre}}\right\}$$

$$S_{Max}\left(\frac{Miles}{Hour}\right) = \left(\frac{12}{30 \ x \ 5}\right) x \ 495 \approx 40 \ Miles \ per \ Hour$$

## **A** WARNING

Inspect the unit periodically for defects. Parts that are broken, missing, or worn out must be replaced immediately. Do not alter any part of the unit without prior written permission from the manufacturer.

## 

Always shut vehicle OFF before attempting to attach, detach, or service sprayer system.

#### **A** WARNING

Do not operate a machine in need of maintenance.

NOTE: To prevent leaks, use a thread-sealing compound on all threaded connections. Do not use Teflon<sup>®</sup> tape, as fragments will clog the spray nozzles. Clamped connections may require periodic retightening

#### PERIODIC MAINTENANCE

- When servicing, you may need to close the shut-off valve and/or the return valve, to prevent stored brine from exiting the holding tank.
- Wash unit after each use to prevent material build-up and corrosion.
- Use dielectric grease on all electrical connections to prevent corrosion each time power or signal plugs are disconnected.
- Paint or oil all bare metal surfaces as needed.
- Inspect unit for defects: broken, worn, or bent parts, and similar.
- Inspect all tubing, hoses, and harnesses for cracks and leaks.
- Clean the brine filter as needed. Close the shut-off valve and access the filter by unscrewing the top cap, then unscrewing the filter cover.
- Retighten bolts, screws, and other connections after first use and as needed.

#### CLEANING

- Clean the unit as desired. When power washing, keep spray away from electronics.
- Use caution if you are flushing the pumping system with water as it will accumulate in the valves and can cause damage if the water inside freezes. Use antifreeze if unit is to be stored in freezing temperatures.

## END OF SEASON AND STORAGE

- Before long periods of storage, flush out the tank, pumping system, and boom to remove salt build-up and prevent corrosion.
- Do not leave unused material in the unit for a prolonged period of time.

#### NOZZLE MAINTENANCE

Remove nozzles by pushing in and rotating the nozzle cap counterclockwise and clean as necessary.

When reassembling nozzles, make sure that the nozzle holes are in line with the boom. Failure to align the nozzle holes will result in inconsistent brine application.



#### **PUMP MAINTENANCE**

- It is recommended that the pump seal assembly (PN 11712) be replaced after every 200 hours of use, or seasonally.
- It is recommended that the flywheel area (under the red cover) is cleaned out after every 40 hours of use to remove salt build-up.

Teflon<sup>®</sup> is a registered trademark of E. I. du Pont de Nemours and Company.

#### **A** WARNING

Always shut vehicle OFF before attempting to attach, detach, or service sprayer system.

#### **WARNING**

Do not operate a machine in need of maintenance.

NOTE: To prevent leaks, use a thread-sealing compound on all threaded connections. Do not use Teflon<sup>®</sup> tape, as fragments will clog the spray nozzles. Clamped connections may require periodic retightening.

Problem	Possible Cause	Suggested Solution
Brine pumps in slowly or not	1. Valve(s) are in closed position.	1. Rotate handle to open the valve.
at all.	2. Brine filter is clogged.	2. Remove and clean the brine filter.
	1. Control connector plug is loose.	1. Check plug connection at cab control.
No power to cab control	2. Switched accessory connection is poor.	2. Check accessory connection.
ON: no illumination of control	3. Faulty battery.	3. Check for low battery.
indicator lights).	4. Vehicle control harness is damaged.	4. Replace or repair damaged wires or
		harness as required.
	1. Nozzles have become clogged.	1. Remove and clean the affected nozzles.
Brine spray is inconsistent or	2. Control connection is loose.	2. Check harness connections.
no spraying occurs.	3. Brine tank empty.	3. Check brine tank level.
Ilnit is leaking	1. Hose connections are loose.	1. Retighten all hose connections; add
onit is loaking.		thread-sealing compound.

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## **TROUBLESHOOTING GUIDE**



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