

2730 DB WRANGLER 3330 DB

IMPORTANT SAFETY INSTRUCTIONS



WARNING: Failure to observe these instructions can cause personal injury to machine operator or bystanders.



WARNING: Fire or explosion hazard. **NEVER** operate this machine in an explosive atmosphere (grain dust, flammable liquids or fumes, etc.).



WARNING: Fire or explosion hazard. **NEVER** attempt to pick up flammable or combustible materials or use such materials in tank.

INTENDED USE

This machine is designed for scrubbing floors in an indoor environment. NSS does not recommend using this machine for any other purpose.

FOR SAFETY:

- **ALWAYS** read and understand all instructions before operating or servicing machine.
- **ALWAYS** use this machine **ONLY** as described in this manual.
- **NEVER** attempt to operate this machine unless you have been trained in its operation.
- **NEVER** allow an untrained person to operate this machine.
- **NEVER** attempt to operate this machine if it is not working properly or has been damaged in any manner.
- **NEVER** disconnect or modify any switches or safety devices (circuit breaker).
- **NEVER** drop or insert any object into any machine opening.
- **NEVER** operate this machine with any air opening blocked. Keep all air openings free of dust, lint, hair, etc.
- **NEVER** pick up anything that is burning or smoking, such as cigarettes, matches or hot ashes.
- **NEVER** spray this machine with water or any liquids.
- **NEVER** allow the vacuum motor or battery-charging plug to get wet or a short may occur.
- **NEVER** operate this machine when the battery charger is plugged in.
- **NEVER** operate this machine with the side skirt removed.
- **NEVER** allow this machine to be used as a toy. Close attention is necessary when used by or near children.
- **ALWAYS** wear clean tennis shoes or “non-slip” shoes. Leather soled shoes will become extremely slippery when wet.
- **ALWAYS** keep face, fingers, hair or any other body part or loose clothing away from any machine opening or moving part (revolving brush, pad driver, or vacuum motor).
- **ALWAYS** turn the machine off when attaching pads or brushes.
- **ALWAYS** remove keys when this machine is left unattended.
- **ALWAYS** be sure that the ramp is secured to the vehicle before attempting to load / unload.
- **ALWAYS** use extreme caution when operating the machine on a ramp or loading / unloading this machine into or out of a truck / trailer. Use extreme caution if the ramp is wet, oily, or covered with cleaning chemicals.
- **NEVER** stop or turn the machine on a ramp or incline.
- **NEVER** attempt to climb a grade or operate this machine on a ramp or incline of more than 8 degrees.
- **NEVER** park or store the machine near a dock, on ramps, near a furnace, boiler, open flame, or other high heat source.
- **NEVER** allow this machine to freeze.
- **NEVER** expose the machine to rain, snow, or extreme temperatures.
- **NEVER** store any items on this machine.
- **ALWAYS** store this machine indoors in a dry, cool area.

ALL REPAIR SERVICE MUST BE PERFORMED BY AN NSS AUTHORIZED DISTRIBUTOR/ SERVICE STATION USING ONLY NSS ORIGINAL EQUIPMENT PARTS.

SAVE THESE INSTRUCTIONS

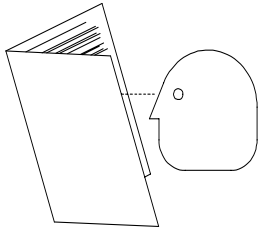


IMPORTANT SAFETY INSTRUCTIONS

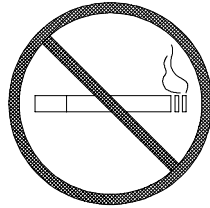


BATTERY POWERED EQUIPMENT WITH ON BOARD CHARGERS

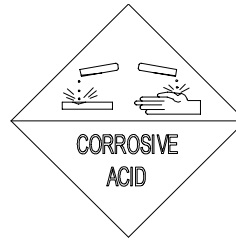
WARNING: Failure to observe these instructions can cause personal injury to machine operator or bystanders.



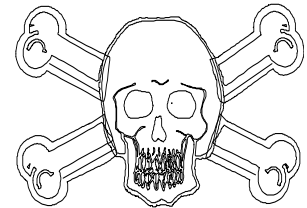
Read and understand all instructions before installing or charging batteries.



No smoking, open flames, or sparks while working with batteries.



Contains acid. Avoid contact



Poison. Causes severe burns. Avoid contact.



WARNING: Batteries emit hydrogen, which can cause fire or explosion. **NEVER** smoke, light a match, or cause a spark during operation or charging. **ALWAYS** charge in a well-ventilated area away from open flame.

GENERAL

- **ALWAYS** read and understand all instructions before installing or charging batteries.
- **NEVER** attempt to install or charge batteries unless you have been trained to do so.
- **NEVER** allow an untrained person to install or charge batteries.
- **ALWAYS** remove all jewelry when working on or near the batteries.
- **ALWAYS** turn off all switches during installation and service.
- **ALWAYS** disconnect the battery leads before performing any service or repair.
- **ALWAYS** wear eye protection and protective clothing to avoid contact with battery acid.
- **NEVER** lay anything on top of batteries as arcing may occur.
- **IF CONTACT WITH BATTERY ACID OCCURS**, follow these instructions:
 - SKIN – rinse area with water.
 - EYES – Flush with water for 15 minutes.
 - INTERNAL – Drink water or milk. Follow with Milk of Magnesia, beaten egg or vegetable oil. Call a physician immediately.

BATTERY INSTALLATION

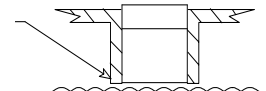
- **ALWAYS** use two people to install, as batteries are heavy.
- **ALWAYS** turn off all machine switches.
- **ALWAYS** position batteries as shown on the machine installation decal to maintain machine balance.
- **ALWAYS** connect batteries as shown on the machine installation decal to avoid shorting out the batteries and the electrical system.

BATTERY CHARGING

- **ALWAYS** read instructions on charger carefully.
- **ALWAYS** use the NSS supplied charger with proper voltage rating.

For lead acid batteries only, (does not apply to gel cell or maintenance free batteries).

- **ALWAYS** check to ensure the battery water level covers the battery plates before charging.
- **ALWAYS** check water level after charging and add water if necessary to bring level to the bottom of the fill hole.
- **NEVER** overfill batteries as battery and machine damage may result.
- **ALWAYS** wipe any acid from the top of batteries using a soap solution.
- **ALWAYS** study battery manufacturers' specific precautions such as recommended rates of charge.
- **ALWAYS** reattach caps to batteries. Do not charge with caps loose or removed.
- **ADD** only distilled or treated city water. Not well water.
- **NEVER** charge a frozen battery.
- **ALWAYS** plug the charger into an earthed socket outlet.
- **NEVER** touch uninsulated portion of output connector or uninsulated battery terminal.
- **ALWAYS** disconnect the AC supply before making or breaking the connections to the battery while charging.
- **NEVER** open or disassemble charger.
- **NEVER** operate charger if the AC supply cord is damaged or if the charger has received a sharp blow, been dropped, or otherwise damaged in any way.



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NOISE AND VIBRATION

NOISE

Sound pressure level at Operator position 72 dB(A)

VIBRATION

Weighted RMS acceleration value (ISO 5349) .367 m/s²

MACHINE INSPECTION

- Now that the machine is unpacked remember to recycle all packing materials.
- Inspect the machine for damage or missing components. If damage is found, contact the local freight company to file a freight claim.

MACHINE COMPONENTS

Solution Tank

The solution tank is the lower part of the machine body. It has a capacity of **30 gallons (114 liters)**.

- The amount of water in the tank is measured by the solution gage, which is located in the clear plastic tube at the right rear corner of the tank. This tube is also used to empty the tank.

Recovery Tank

The recovery tank is the upper part of the machine body. It has a capacity of **33 gallons (125 liters)**.

- A round clearview lid assembly closes off the recovery tank's opening.
- The recovery tank has a foam sensitive float shut-off assembly. As the water level rises, the float ball will rise into the tube and shut off the airflow of the vacuum. NOTE: The float shut-off assembly does not shut off the vacuum motor.

Operator Control Panel

The operator control panel is located at the upper rear area of the machine. This panel has components that control various machine functions.

- In the middle of the panel are two (2) rubber twist grips. These grips rotate forward and backward to control the direction and speed of the machine. The farther the grips are rotated, the faster the machine will move. These twist grips have a feature that returns the machine to the neutral position when the handles are released.
- The left *toggle switch* turns on and off the vacuum motor.
- The red button is the master power switch; it controls the power to all components. Power on is indicated by the green light.
- Key Switch Option. Turns all components off / on.

Battery Meter

The battery meter is located on the right side of the operator control panel and shows the state of charge of batteries during operation and recharge.

- Work Range - This is the green area in the middle of the meter. It shows the approximate amount of "power" available in the batteries. Observe this reading when operating the Wrangler.

- Recharge Range - This is the red area on the left of the meter. It shows when the batteries need to be recharged. Continued machine operation in this area will cause battery damage and potential machine damage.

Rear Panel

- The solution control lever is located on the left of the rear panel. This lever controls the solution valve and the amount of liquids put on the floor while cleaning. **Pull up** on the handle to **open** the valve. **Push down** on the handle to **close** the valve.
- The top circuit breaker (25 A) is for the drive motor.
- The next circuit breaker (25 A) is for the vacuum motor.
- The next two circuit breakers (25 A) are for the brush motors.
- The bottom circuit breaker (2 A) is for the power deck lift option.
- The **right** lift arm is used to raise and lower the brush motor assembly. Brushes automatically turn on when lowered.

Power Deck Lift Option.

- The first switch left of center sets the deck position. Set the position switch for either Float or Heavy while the deck is in the up position.
- The center left switch raises and lowers the deck, the lift is off when in the middle position.
- The **center** lift arm is used to raise and lower the squeegee.

Battery Compartment Drain Hose

This hose is located on the left side of the machine inside the rear panel. The hose uses a pinch clamp to hold the hose closed. This hose collects any spilled liquids from the battery compartment area.

- Inspect hose for liquid level on a weekly basis.
- Dispose of liquids according to local your EPA Regulations.

Canister / Strainer Assembly

Attached to the valve, under the left side of the solution tank is a canister strainer. It is designed to stop debris from entering the solution solenoid.

If the water and chemical stops flowing during operation:

- Turn off solution control valve on rear panel.
- Remove the canister and screen, and remove all debris.
- Replace the screen and canister. Check for any liquid leaks.

Solution Solenoid

Attached to the top of the brush deck is a solenoid valve designed to stop *solution flow when the machine is not moving*. *If the water and chemical stops flowing:*

- Check canister / strainer assembly for debris.
- Check manual lever.

Drive Motor

This machine is powered forward and reverse by a 36-volt drive motor.

- The speed is electronically controlled for smooth increase and decrease of speed.
- The motor moves the drive wheels through a chain and sprocket system.
- This motor has carbon brushes that must be serviced on a regular basis. The carbon brushes have an expected life of 2,000 operating hours. Refer to the maintenance section later in this book.

Brush Gear Motor

This machine has two (2) 36-volt brush motors located at the front of the machine. The motors are attached to a gearbox to turn the pad drivers or brushes.

- The left motor rotates *clockwise*.
- The right motor rotates *counterclockwise*.
- These motors have carbon brushes that must be serviced on a regular basis. The carbon brushes have an expected life of 2,000 operating hours. Refer to the maintenance section later in this book.

Vacuum Motor

This machine has a 36-volt vacuum motor.

- The vacuum motor is attached to the underside of the top tank.
- This motor has carbon brushes that must be serviced on a regular basis. The carbon brushes have a maximum expected life of 700 operating hours. Refer to the maintenance section later in this book.

Squeegee Assembly

The squeegee assembly is available in both straight and curved. The straight squeegee uses a dual (2) urethane blade system. The "curved" squeegee has gum rubber or "Linatex" rear blades and neoprene front blades.

Side Skirt Assemblies

This machine is equipped with left and right side skirt assemblies. The side skirt assemblies are designed to contain the liquids in the cleaning area *under the machine*; they channel the liquids toward the squeegee, and prevent splashing on the *outside of the machine*.

PREPARING THE MACHINE

Installing the Batteries:

- Turn off all switches and tilt the recovery tank open to expose the battery compartment.
- Batteries are heavy - use two people to install.
- Refer the to wiring diagram inside the battery compartment. Align batteries in the compartment as shown on the diagram.
- Install battery cables as shown on the wiring diagram.
- Tighten bolts and hex nuts with a wrench.

Caution: Do not short across two terminals with a wrench.

- Loose or improper battery connections will cause battery or machine damage and possible personal injury.

Battery Charging

- To recharge the batteries plug the charger cord, located at the rear of the machine, into an electrical outlet.
- When the cord is plugged into an outlet the machine will become disabled.

See charging instructions for more details.

Preparing the Solution and Recovery Tanks:

- **Never** use water over $140^{\circ}F$ ($60^{\circ}C$) degrees.
- Excessively hot water may damage components such as the tanks.
- Put 1 to 2 gallons of clean water into the solution tank first to help dilute the chemicals and prevent excess sudsing. Dilute the cleaning chemicals according to the manufacturer's instructions.
- Fill the tank by pouring the water and cleaning chemicals through the mesh filter that covers the opening at the front of the solution tank, or you may use the hose holder cutout.
- Make sure the drain plug of the recovery tank is closed tightly and in its holding clip.
- **Always** use a defoamer to protect the vac motor.
- Consult your local distributor for complete chemical advice.

Install a Pad Driver and Pad:

- There is a wide range of pads or brushes available for the many cleaning applications. Consult your NSS authorized distributor for recommendations.
- Turn the pad drivers upside down on the floor and remove the pad holding cup.
- Remove the center cutout of the pad, 14" (35.5 cm.) Wrangler 2730, 17" (43 cm) pad Wrangler 3330. Place the pad on the face of the pad driver.
- The pad **must** be centered on the driver to prevent wobbling or bouncing.
- Install and secure the pad holding cup to the pad driver. Turn the pad driver over so that the pad faces the floor.
- Raise the brush motors into the transport position.
- Align the lugs of the pad driver with the slots of the drive casting.
- Turn the lugs of the pad driver toward the latch; close the latch around the lugs to lock them onto the drive casting.

Install a Brush:

- Raise the brush motors into the transport position.
- Align the lugs of the brush with the slots on the drive casting.
- Turn the lugs of the brush toward the latch; close the latch around the lugs to lock them onto the drive casting.

Install the Squeegee Assembly:

- Place the squeegee lift arm in the storage (up) position.
- The squeegee assembly mounts to a metal bracket at the bottom center of the machine, using two (2) mounting knobs. Loosen the mounting knobs and slide the squeegee assembly onto the mounting plate.
- The squeegee assembly has two (2) small wheels to prevent “rollover” while in reverse. The roller wheels must face the operator. Hand tighten the mounting knobs. **Do not** use pliers to tighten knobs, as this will defeat the “break-away” design.
- **Do not** add any weights or other pressure to the squeegee mechanism. This will not improve the performance and will shorten the life of the blades.

Install the Side Skirts:

- Position the skirts at the front left and right sides of the machine.
- Remove the skirt retaining pins from the mounting bracket.
- Align the side skirt holes with mounting bracket holes, insert and secure with retaining pins. Close side skirts around machine and secure with skirt retaining latch.

Operating the Machine

The Wrangler 2730 has the brush motors offset to the right side of the machine. This offset allows you to clean the edge of the floor or obstructed areas (walls or shelving) with the right side of the machine. The 3330 have the brush motors centered but the offset feature is part of the skirt design.

Normal Cleaning

- Sweep and dust mop the floor to remove dirt and debris before scrubbing. Accumulations of dirt or debris on the floor will reduce cleaning performance.
- You may also need to preclean some types of spills or stains before scrubbing.
- Plan your work so that you make long, straight paths with the fewest amount of turns possible, overlapping each cleaning path about 2 in. (5 cm.) to prevent streaking and dirty areas.
- Move machine to area to be cleaned.
- Place warning signs “Wet Floor” in area.
- Turn on master switch.
- Turn on vacuum motor switch.
- Lower the brush motors and squeegee assembly into the operating position on the floor. Brush motors will automatically turn on when lowered and moving in forward or reverse.
- Lift solution valve handle to start liquid flow to floor. Adjust amount of flow as needed. Close the solution valve completely 10 ft. (3m.) before turning at the end of each cleaning path. This reduces the amount of liquid on the floor when you make the turn.

- Reopen the solution valve when you have started your next cleaning path. Repeat this procedure on each path.
- NOTE: Solution will not flow until brushes turn on.
- Watch the level of liquid in the recovery tank and listen for the float shut-off to change of the sound of the vacuum motor. When the vacuum airflow stops, you must turn off the vacuum motor, and empty the recovery tank.
- Take the machine to an approved disposal drain and turn off all switches.
- Raise the rubber flap at the front of the machine and pull out the flexible rubber drain hose. Raise the end of the hose above the level of the recovery tank, loosen and remove the hose drain plug. Carefully lower and direct the drain hose into the drain.
- When the recovery tank is empty, replace and tighten the drain plug. Place the drain hose back into the machine and secure the plug end in the clamp. **Do not** obstruct the lift mechanism or brush motors.

Special Cleaning

This machine may be used to perform special cleaning jobs other than “normal” scrubbing.

Double Scrubbing

- This procedure provides deeper cleaning on heavily soiled floors. One or more cleaning passes are made before picking up the chemicals with the squeegee. This allows dwell time. Best results are achieved by placing the brush motors in the heavy scrub position.

Caution: The floor surface becomes extremely slippery in this operation. This machine should be operated only in slow to medium speed and great care should be taken when walking on this wet surface.

Stripping

- This procedure is used to remove moderate build-up of floor finish from the floor. The most aggressive pads or grit brushes are used in this procedure.
- The stripper solution is applied to the floor with a mop and then double scrubbed as above. Stripping solution should not be put into the solution tank. Clean water from the solution tank is applied to the floor to keep the chemicals and finish in a “liquid” condition. The floor surface becomes extremely slippery in this operation. This machine should be operated only in slow to medium speed and great care should be taken when walking on this wet surface.

MACHINE MAINTENANCE

Routine maintenance is critical to ensure proper machine operation and cleaning performance. Perform all maintenance procedures as follows.

Always turn OFF all machine switches before performing any maintenance.

Adjusting the Squeegee Assembly:

- Turn the vacuum motor ON and open the water valve slightly.
- Squeegee blades should lie over slightly (like a window squeegee) when the machine is moving.
- If adjustment is required adjust the blade angle by removing the rear bolt of the top squeegee arm, turn the arm into or out of the ball joint to change the angle as needed.

Adjust Side Skirt Wiper Blades:

- Install the side skirts on the machine.
- Loosen the retaining strip screws.
- Pull down evenly on the entire length of the wiper blade so that it firmly touches the floor.
- Tighten all screws and test run machine for splashing under the blades.
- **Do not** adjust blades too low, as it will cause damage and excessive wear to the blades.

Replace Side Skirt Wiper Blades:

- Remove the side skirt assembly from the machine.
- Remove the retaining strip and screws.
- Remove the old wiper blade and replace with a new blade.
- Replace the retaining strip, and screws, do not tighten.
- Pull down evenly on the entire length of wiper blade so that it firmly touches the floor.
- Tighten all screws and test run the machine for liquid splashing under the blades.
- **Do not** adjust blades too low, as it will cause damage and excessive wear to the blades.

Daily Maintenance

Battery Charging

- **The master power switch and all other switches must be turned OFF.**
- You must recharge the batteries when indicated by the battery meter. Read the battery meter while the machine is in use.
- If the batteries have been discharged (used) too deeply, the battery charger will not start.
- Consult your local authorized NSS distributor or service center for assistance.
- When the recharge cycle is complete, the battery charger will turn off automatically. The amp meter will register "0" or the light will be off.
- Recharge the batteries at the end of every shift or when indicated by the battery meter.

Battery Electrolyte (Liquid) Level

Inspect the electrolyte level of at least one cell in each battery before charging. The liquid must be visible above the internal plates. Do not charge the batteries if the liquid is below the plates.

- Add only water to the cell of a battery to adjust the liquid level. Distilled water preferred, **Do Not** use well water. Before charging, add only enough water to cover the top of the internal plates. After charging add only enough water to bring the level to the bottom of the fill tube.
- **Do not** overfill the battery liquid level, this will cause electrolyte (acid) spill. Spilled electrolyte (acid) can cause machine damage and personal injury. Clean up and dispose of all spills immediately.
- See the battery-warning sheet (page 2) for more details.
- If machine is equipped with battery Auto-Fill system fill batteries prior to charging.

Battery Packages

The Wrangler 2730 or 3330 is a 36 volt system and is available with three battery packages:

- Six (6) 6 volt, 225 Amp Hour Batteries.
- Six (6) 6 volt, 325 Amp Hour Batteries.
- Six (6) 6 volt, 395 Amp Hour Batteries.

Consult your local NSS authorized distributor for application recommendations

Solution and Recovery Tanks

- The recovery tank is emptied through a large rubber hose at the front of the machine. Remove the plug and drain the liquids according to your local EPA regulations.
- **Every time** you empty the recovery tank, we recommend that you add at least 4 to 6 ounces of defoamer chemical into the recovery tank before resuming work. Vacuum the defoamer into the empty recovery tank through the squeegee vac hose.
- At the end of the day empty all liquids from both solution and recovery tanks. Rinse both tanks with clean water to prevent chemical residue build-up, allow to air - dry to prevent odors.
- Remove any residue from screen and float ball to ensure proper operation. Replace float assembly in recovery tank.
- Check clear lid for airtight seal.
- Check the drain hose for damage.
- Inspect and clean the vac filter located under the top metal plate. Every 50 hours.

Pad Drivers or Brushes

- Remove either pad drivers or brushes from machine after use.
- Rinse with clean water to prevent chemical residue build-up.
- Allow to air-dry by installing in drying position on front of solution tank, on a peg or upside down on a shelf.
- Inspect for wear or damage. Repair or replace as needed.

Squeegee Assembly

- Remove squeegee assembly from machine.
- Rinse with clean water to prevent chemical residue build-up.
- Allow to air dry, it can be stored on top of the machine for drying.
- Inspect the squeegee assembly, linkage, and vacuum hose, for wear, damage or obstruction. Repair or replace as needed.
- Remove debris from squeegee hose and entrance to recovery tank.

Weekly Maintenance (25 Hours)

- Verify all daily maintenance has been performed.
- Check all battery terminal and cable connections. Tighten as needed. Loose connections are dangerous and can cause personal injury and machine damage.
- Clean any corrosion from battery terminals and cables.
- Drain all liquids from battery compartment. Dispose of according to local EPA regulations.
- Check solution flow to pad drivers / brushes. Remove, inspect and clean the solution filter assembly.
- Flush clean solution tank and hoses with a mixture of 8 oz. (250ml.) white vinegar to one-gallon (4 liter) warm water.
- Repair or replace any worn or damaged components as needed.

Monthly Maintenance (100 Hours)

Verify all daily and weekly maintenance has been performed.

- Inspect vacuum motor filter under metal plate on top of recovery tank. Clean or replace as necessary. Check casters for wear or damage.
- Grease both pillow block bearings on the drive axle and the caster swivel bearings. Use a hand held grease gun and a high grade of water resistant lithium base grease.
- Lubricate the drive chain and sprockets with a foaming spray type lubricant. A motorcycle spray type chain lube would be appropriate.
- **Do not** use your finger to apply lubricant.
- Check chain tension, and adjust as needed. Check chain tension by squeezing the chain midway between the sprockets. The chain should flex 1/4" (6mm) on each side.
- Adjust chain tension by removing the chain guard and loosening the four (4) hex bolts of the drive motor mount. Slide the drive motor toward the drive wheel to loosen chain. Slide drive motor away from the drive wheel to tighten the chain. Tighten all four hex bolts. Reinstall the chain guard.
- Inspect all mechanical linkages, pivot points and ball joints for freedom of movement. Use a penetrating spray lubricant that is water resistant. **Do not** use WD 40 lubricant.

- Check Return Spring of the twist grip handles. If it appears weak or does not return the twist grips to the neutral position, replace spring.
- Inspect all fasteners (bolts, screws, nuts) at mechanical linkages, pivot points and ball joints for tightness. Tighten as needed.
- Clean polyethylene body components to remove chemical and liquid residue and maintain a "like new" appearance.
- Remove top cover plate and clean the filter. Replace filter as required.
- Repair or replace any worn or damaged components.
- Tighten and Lube the drive motor chain.

Mandatory Periodic Maintenance

It is **mandatory** that the following maintenance procedure be performed at the described interval. Failure to perform this procedure may result in poor machine performance, machine component damage and failure. This procedure should be performed by an NSS authorized distributor or service center. Repairs performed by an unauthorized company will void the machine warranty. If you require assistance finding an authorized service center, please contact NSS Enterprises, Inc.

After every **450-500 hours** of operation you must inspect vacuum motor carbon brushes for wear. Replace the vacuum motor carbon brushes when they are 7/16in. (11mm) in length.

After every **650-700 hours** of operation you must inspect drive motor carbon brushes for wear. Replace the drive motor carbon brushes when they are 3/8in. (9mm) in length.

After every **650-700 hours** of operation you must inspect brush motor carbon brushes for wear. Replace the brush motor carbon brushes when they are 1/2in. (13mm) in length.

ACTIVATION OF DRY CHARGED BATTERIES

NSS supplies some batteries in a “dry charged” condition without any acid (electrolyte) in the battery. The batteries cannot be used in this condition; they must be activated by the addition of the battery acid (electrolyte). Failure to follow this procedure will cause severe damage to the batteries.

Materials Required

- 1.220 specific Gravity, Sulfuric Acid, to fill batteries.
- Rubber gloves and safety eye protection handling Sulfuric acid.
- Plastic funnel to pour Sulfuric acid into batteries.
- Adjustable wrench and pliers to install battery cables.

Filling Procedure

- Remove the cap from each cell of the batteries.
- Fill each cell with Sulfuric acid fully to the bottom of the access hole.
- Allow the batteries to absorb the acid for a period of one hour. During this time the acid level in each cell will drop and the batteries will become warm.
- Refill each cell with Sulfuric acid to a point 1/4” (6mm) below the bottom of the access hole.
- Replace the cap in each cell of the batteries.
- Neutralize any spilled acid with bicarbonate of soda. Rinse the battery case clean with clean water and dry the battery case.
- Batteries are heavy - use two people to install.
- Refer to wiring diagram inside the battery compartment. Align batteries in compartment as shown on diagram.
- Install battery cables as shown on wiring diagram
- Tighten bolts and hex nuts with a wrench.
- **Caution:** Do not short across two terminals with a wrench.
- Loose or improper battery connections will cause battery or machine damage and possible personal injury.
- Connect the charger to the machine and allow it to perform one complete charging cycle, (8 – 12 hours).
- Liquid level adjustment during the life of the batteries should be made with distilled water or clean drinking water.

If dry charged batteries have been filled with acid (electrolyte) and are placed in storage, the batteries must be recharged every 30 days to prevent damage.

BATTERY AUTO-FILL INSTRUCTIONS

WARNING: When working with Lead-Acid batteries and Battery Acid observe all battery manufacturers’ safety precautions.

Caution: This option is not for well water.

- Connect the regulated hose system to water supply. Aim the purge into drain or bucket and turn on water supply. When air is removed from the system disconnect quick coupler by pushing the button labeled CPC.
- Check the system for leaks by connecting the regulated hose system quick connect to the Auto-Fill quick connect. After connection the red balls in the flow indicator will spin indicating water flow. When the balls stop spinning check the system for leaks and IMMEDIATELY disconnect the quick coupler.
- Place the dust cover over the male quick coupler on the Auto Fill system. Turn off water supply and remove the regulated hose system. Reinstall the purge quick coupler and store in a safe place.
- We recommend you remove the hose swivel and valve from one cell to check the electrolyte level after the first fill.

Battery charger

Operating instructions

1. Connect charger power cord to a properly grounded outlet. When using an extension cord, avoid excessive voltage drop and extended charge times by using a grounded 3-wire 12 AWG cord for 50' lengths or shorter and 10AWG for greater than 50' lengths.
2. If a minimum battery voltage is not detected, a trickle current will be applied until a minimum voltage is reached.
3. Once a minimum battery voltage is detected, the charger will enter the bulk charging constant-current stage. The current bar graph will indicate the current to the battery as the charger moves through its charge profile. The length of charge time will vary by how large and how depleted the battery pack is.
4. When the yellow 80% LED is lit, the charger has completed the bulk stage of the charge and the battery is at approximately 80% of charge. The charging could be terminated at this point if the machine requires immediate usage, however, it is highly recommended to wait until the green 100% charge LED illuminates to ensure maximum battery capacity and battery life.
5. When the green 100% LED is continuously on, the batteries are completely charged. The charger may now be unplugged from AC power (always pull on plug and not cord to reduce risk of damage to the cord). If left plugged in, the charger will automatically restart a complete charge cycle if the battery pack voltage drops on average below 2.1 volts-per-cell or 30 days has elapsed.
6. If a fault occurred anytime during charging, the red FAULT LED will flash with a code corresponding to the error. To indicate which error, the FAULT LED will flash a number of times at a rate of two times per second, pause 0.5 seconds, then repeat.
[1 FLASH] Battery Voltage High: auto-recover
[2 FLASH] Battery Voltage Low: auto-recover
[3 FLASH] Charge Timeout: the charge did not complete in the allowed time. This may indicate a problem with the battery pack (voltage not attaining the required level), or that the charger output was reduced due to high ambient temperatures.
[4 FLASH] Check Battery: the battery pack could not be trickle charged up to the minimum level required for the charge to be started. This may indicate that one or more cells in the battery pack are shorted or damaged.
[5 FLASH] Over-Temperature: auto-recover. Charger has shutdown due to high internal temperature. Charger will restart and charge to completion if temperature comes within accepted limits, but the fault LED indication will remain until the charger has been reset (AC removed).
[6 FLASH] QuiQ Fault: an internal fault has been detected. If Fault 6 is again displayed after interrupting AC power for at least 10 seconds, the charger must be brought to a qualified service depot.

Maintenance Instructions

1. For flooded lead-acid batteries, regularly check water levels of each battery cell after charging and add water as required to level specified by battery manufacturer. Follow the safety instructions recommended by the battery manufacturer.
2. Make sure charger connections to battery terminals are tight and clean.
3. Do not expose charger to oil or to direct heavy water spraying when cleaning machine.

DC Battery Connection Procedure:

1. The green wire outputs a battery voltage when the charger is not plugged in to AC to provide an Interlock function.
2. Securely fasten the black ring terminal from the charger to the negative terminal ("-", "NEG", "NEGATIVE") of the battery pack.
3. Select Charge Algorithm if battery type is other than factory default.

Check / Change Charging Algorithm:

The charger comes pre-loaded with nine algorithms for Lead Acid batteries as detailed in Table 1. Each time AC power is applied with the battery pack NOT connected, the charger enters an algorithm select/display mode for approximately 11 seconds - this is the only time the algorithm can be changed. In this mode, the present algorithm is displayed on the LED bar graph or 80% LED as shown in Table 1. If the algorithm # is from one to six, it will be displayed on the bar graph with the lowest LED indicating that Algorithm 1 is selected; the second lowest LED indicates that Algorithm 2 is selected, etc. For all algorithm #'s, the algorithm number is also indicated on the 80% LED by the number of blinks separated by a pause. *** Note- algorithms 7-9 is indicated only with the 80% LED indication - no bar graph indication is given.*

Check or change the charging algorithm:

- a. Disconnect the positive connector from battery pack. Apply AC power and after an up/down flash of the LEDs, the algorithm # will display for 11 seconds.
- b. To change algorithm, touch connector during the 11-second display period to the battery pack's positive terminal for 3 seconds and then remove- the algorithm # will advance after 3 seconds. Repeat until desired algorithm # is displayed. A 30 second timeout is extended for every increment. Incrementing beyond algorithm 9 moves back to algorithm 1.
- c. After desired algorithm is displayed, touch the charger connector to the battery positive until the output relay is heard to click (~10 seconds)- algorithm is now in permanent memory.
- d. Remove AC power from the charger and reconnect the charger positive connector to the battery pack. It is highly recommended to check a newly changed algorithm by repeating the above steps a) and c).

Delta-Q Battery Charger - Battery Types

NSS Part Number	Crown Part Number	<u>Battery Volts</u>	<u>System Volts</u>	<u>Amp Hour</u>	Recommended Algorithm
4491061	1-1470	12	36	210	# 1
3390361	1-1435	6	24 & 36	225	# 1
2392111	1-1427	12	24	115	# 5
6393651	1-1428	12	24	145	# 5
2392731**	1-12145	12	24	100	# 6
6491931**	1-1437	6	24 & 36	180	# 6
2691501	1-1450	6	36	325	# 7
7691401	1-1460	6	36	395	# 7

TROUBLE-SHOOTING

PROBLEM	CAUSE	SOLUTION
No Solution Flow.	Solution tank is empty. Low battery charge. Clogged filter. The solution valve is closed. Obstruction in the solution hose. Solution valve or linkage damaged. Solution hose kinked.	Fill the tank. Charge the batteries. Clean filter. Open the solution valve. Remove the obstruction. Repair / replace the valve linkage. Check for kinks and remove.
Solution Flow Does Not Stop.	Solution solenoid is damaged. Solution valve or linkage damage. Damaged seat and washer in valve. The valve stem is dirty. Hose disconnected or damaged.	Inspect wire connections and valve, repair / replace the solenoid. Repair / replace the valve linkage. Replace valve. Clean and lubricate valve stem. Reinstall or replace hose.
Will Not Pick Up Any Water From Floor.	Squeegee is up. Squeegee hose is off. Vac motor switch is off. Recovery tank is full. Vacuum shut-off float is stuck. Obstruction / damage in the squeegee, squeegee hose or standpipe. Leaking over gasket. Vac motor is not running. Recovery drain hose not plugged properly.	Lower squeegee. Reinstall hose. Turn vac motor switch "on". Empty tank. Clean screen and remove obstruction. Remove obstruction / repair damage. Remove old gasket / replace. Have an authorized serviceman repair. Install drain hose plug properly.
Will Not Pick Up All Of The Water From The Floor.	Debris on squeegee blades. Squeegee blade is worn / damaged. Obstruction / damage in the squeegee, squeegee hose, or standpipe. Squeegee angle needs adjustment. Vacuum motor worn out. Recovery tank drain hose damaged. Vac filter clogged.	Clean squeegee. Reverse / replace squeegee blade. Remove obstruction / repair damage. Adjust angle. Repair / replace vac motor. Repair / replace recovery drain hose. Clean vac filter under top metal plate.
Batteries Do Not Seem To Run Long Enough.	Over charging batteries. (Charging too frequently). Tops of batteries are dirty / wet. Battery terminals are dirty / damaged. Electrolyte level is too low. Batteries are not fully charged. Charger is damaged. Battery is defective or worn out.	Monitor run time, and adjust charging frequency accordingly. Clean / dry, charge batteries. Clean terminals and connectors, replace damaged cables. Charge. Add distilled water and charge. Charge batteries for 8 hours. Have an authorized serviceman repair. Check cell voltage while discharging.
Cleaning Is Not Even.	Brush / pad is worn. Damage to brush assembly; casters or solution valve. Hoses may be kinked or obstructed	Replace brush / pads. Have an authorized serviceman repair. Repair / remove obstruction
Machine does not run.	Battery cables loose or not connected. Circuit breaker tripped. Batteries not charged.	Check and connect or tighten. Reset circuit breaker. Charge batteries.
Brushes will not shut off.	Brush deck switch arm may be bent or broken.	Bend the arm on the switch upward, or replace the switch.

NOTE: If any problems remain after taking the above steps, contact your local authorized distributor / service station for further evaluation and repair.



NSS® Enterprises, Inc.

3115 Frenchmens Road, Toledo, Ohio 43607

PHONE (419) 531-2121 FAX (419) 531-3761

NSS® Enterprises, Inc. European Distribution Centre

Unit II, Pinfold Trading Estate * 55 Nottingham Road

STAPLEFORD, NOTTINGHAM NG9 8AD ENGLAND U.K.

PHONE: (44) 0115 939 1568 * FAX: (44) 0115 949 0615