

WRANGLER 2016 AB

WRANGLER 2016 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.



WARNING: Orange Oil (D-limonene) is not compatible with the plastics used in NSS automatic scrubbers and the Sidekick Chemical Metering System. Use of D-limonene may result in damage to the machine.



WARNING: This product contains a chemical known to the state of California to cause cancer and birth defects or other reproductive harm.

INTENDED USE

This machine is intended for commercial use, 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 bumper guard 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.



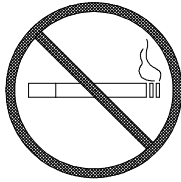
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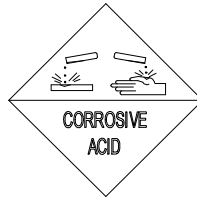
BATTERY POWERED EQUIPMENT WITH ON BOARD CHARGERS



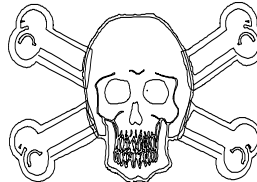
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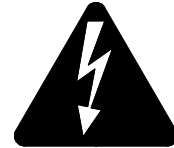
No smoking, open flames, or sparks while working with batteries.



Contains acid.
Avoid contact



Poison. Causes severe burns. Avoid contact.



Shock or electrocution hazard.



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

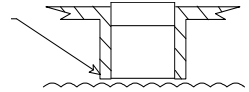
- **ALWAYS** read and understand all instructions before installing or charging batteries.
- **NEVER** attempt to install or charge batteries unless you have been trained to do so.
- **NEVER** allow an untrained person to install or charge batteries.
- **ALWAYS** remove all jewelry when working on or 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** 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 flooded lead acid batteries only (does not apply to AGM or Gel cell 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.
- For all battery types:**
- **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** 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.
 - **ALWAYS** keep flammable materials away from charger.



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GROUNDING OF ELECTRICAL EQUIPMENT - BATTERY CHARGER

WARNING: Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service person if you are in doubt as to whether the outlet is properly grounded. Do not modify the plug provided with the charger – if it will not fit the outlet; have a properly grounded outlet installed by a qualified electrician.

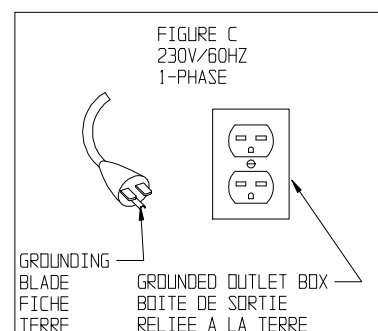
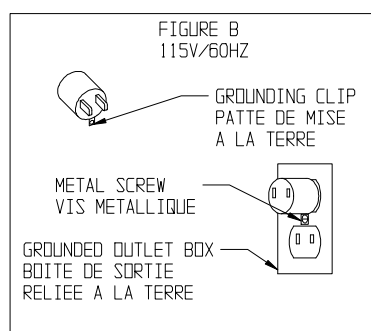
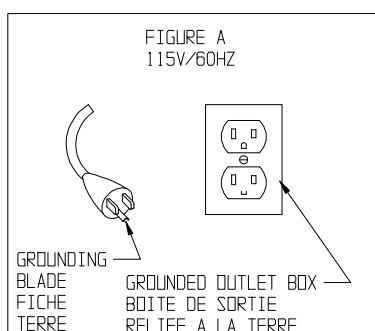
Always use a properly grounded 3-wire extension cord, which has male and female plugs. If 25 foot extension cords are used, the electrical carrying capacity should be no less than 14-3 ST., 50-foot extension cords no less than 12-3 ST

GROUNDING INSTRUCTIONS

This charger shall be grounded while in use to protect the operator from electric shock. The charger is provided with a three-conductor cord and a three-contact grounding type attachment plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances. The green conductor in the cord is the ground wire. Never connect this wire to other than the grounding pin of the attachment plug.

Check nameplate on the charger to be sure **voltage** and **cycle** stated is the same as the electrical outlet. Do not attempt to plug a 120-volt charger into a 240-volt outlet or a 240-volt charger into a 120-volt outlet. If the cord provided with the charger has an attachment plug as shown in Figure A. below, it is intended for use on a nominal 120-volt circuit. If a properly grounded receptacle as shown in Figure A is not available, an adapter may be installed as shown in Figure B if the outlet box that houses the receptacle is grounded. Be sure to fasten the grounding tab (the green colored rigid ear, lug or the like extending from the adapter) with a metal faceplate screw.

If the cord provided with the charger has an attachment plug as shown in Figure C, it is intended for use on a nominal 240-volt circuit (single phase only). No adapter is available for this plug.



NOTE: In Canada, the use of a temporary adaptor is not permitted by Canadian electrical code.

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SAVE THESE INSTRUCTIONS



NOISE AND VIBRATION

NOISE

Sound pressure level at Operator position 72 dB(A)

VIBRATION

Weighted RMS acceleration value (ISO 5349) .575 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 and has a capacity of **16 gal (60.5 l)**.

- The amount of water in the tank is measured in the plastic tube at the right rear of the tank. The solution tank is emptied through the clear plastic tube at the right rear of the tank.

Recovery Tank

The recovery tank is the upper part of the machine body and has a capacity of **17 gal (64.3 l)**.

- 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.

- The toggle switch on the left controls the brush motor.
- The toggle switch on the right controls the vacuum motor.
- The red button is the master power switch; it controls the power to all components. Power on, is indicated by the Battery Meter.

Battery Meter

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

The battery meter is equipped with a relay that will open, turning off the machine, when the battery voltage has dropped to its lowest permissible level.

- When the batteries are fully charged, all of the LED's are illuminated.
- As the batteries discharge, the LED's start to turn off, one at a time, from right to left.
- When the last yellow LED on the left starts blinking, there is only a few minutes of runtime left before the machine is automatically turned off. NOW is the time

to turn off the brushes and vacuum motor, and drive to the battery charging area.

- If the machine is operated until it is automatically shut off, turn off the master switch, the brush switch, and the vac switch. Then turn on the master switch, and the machine can be driven to a charging location (wheel drive models only).

Circuit Breaker

- The circuit breakers are located to the left of the handle grips.
- The right circuit breaker is for the vacuum motor.
- The left circuit breaker is for the brush motor.

Wheel Drive models:

- The center circuit breaker is for the drive motor.
- 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.

Solution Control (Valve) Lever

- The solution control lever is located on the left rear side of the machine. This lever controls the solution valve and the amounts of liquid put on the floor when cleaning. **Pull up** on the handle to **open** the valve. **Push down** on the handle to **close** the valve. The control lever can be placed in notches to maintain desired flow between the open and closed position.

Solution Filter Assembly

- Attached to the solution control valve is a canister strainer designed to stop debris from entering the solution solenoid valve.
- If the solution stops flowing to the brush, close the solution control valve and unscrew the canister bowl (by hand), remove and clean the screen.

Battery Compartment Drain Hose

This hose is tucked up under the lower right side of the control panel. The spilled liquids from the battery compartment collect in it. A pinch clamp is used to hold it closed.

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

Brush Gear Motor

This machine has a 24-volt brush motor located at the front of the machine. The motor is attached to a gearbox to turn the pad driver or brush.

- The right lift arm is used to raise or lower the brush motor to and from transport, float, or heavy scrub positions.
- 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.

Vacuum Motor

This machine has a 24-volt vacuum motor.

- The vacuum motor is mounted to the underside of the recovery (top) tank.
- This motor has carbon brushes that must be serviced on a regular basis. The carbon brushes have an expected life of 700 operating hours.

Wheel Drive models:

Drive Motor

This machine is powered forward and reverse by a 24-volt drive motor.

- The speed is electronically controlled for smooth increase and decrease in speed.
- The motor moves the drive wheels through a gearbox and transaxle 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.

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.

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 to the 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. Possible personal injury may occur.

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

- **Charge the batteries before use!**

Battery Charging

- To recharge the batteries plug the charger cord, located at the rear of the machine, into an electrical outlet (100/115/230 50/60HZ VAC).
- When the cord is plugged into an outlet the machine will become disabled.

See Battery Charger section for more details.

Preparing the Solution and Recovery tanks:

- **Never** use water over 140°F (60°C) degrees.
- Excessively hot water **may** damage components such as the tanks.
- Make sure the drain plug of the recovery tank is closed tightly and in its holding clip.
- 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.
- **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 of this machine. Consult your local NSS distributor for application recommendations.
- Turn the pad driver upside down on the floor and remove the pad holding cup.
- Remove the center cutout of the pad. 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 motor into the transport position.
- Align the slots of the pad driver with the lugs of the drive casting.
- Turn the pad driver until it stops and stays in place.

Install a Brush:

- Raise the brush motor into the transport position.
- Align the slots of the brush with the lugs on the drive casting.
- Turn the brush until it stops and stays in place.

Install the squeegee assembly:

- Place the squeegee lift handle in the storage (up) position.
- The squeegee assembly mounts to a metal bracket at the rear 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 “breakaway” 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.

Operating the Machine

The Wrangler 2016 has the brush motor offset to the right side of the machine. This offset allows you to clean the edge of a floor or an obstructed area (walls or shelving) with the right side of the machine.

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 “Wet Floor” warning signs in area.
- Turn on master switch.
- Turn on vacuum motor switch.
- Lower the brush motor and squeegee assembly into the operating position on the floor.
- AB Models - The brush motor is turned on and off with the brush switch on the control panel.
- DB Models - The brush motor will automatically turn on when moving either forward or backwards.
- Lift solution valve handle to start liquid flow to floor. Adjust amount of flow as needed. Close the solution valve completely 10 ft (3 m) before you turn at the end of your cleaning path. This will reduce the amount of liquid on the floor when you make your turn.
- Reopen the solution valve when starting the next pass. Repeat this procedure for each pass.
- NOTE: Solution will not flow until brush turns on.
- Watch the level of liquid in the recovery tank and listen for the float shut-off to change the sound of the vac 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.
- Pull the flexible rubber drain hose out from behind the brush motor. Raise the end of the hose above the level of the recovery tank, loosen and remove the hose drain plug. Carefully direct the drain hose into the drain.
- When the recovery tank is empty, replace and tighten the drain plug. Place the drain hose back behind the brush motor. **Do not** obstruct the lift mechanism or brush motor.

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 motor 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 brushes are used in this procedure.
- The stripper solution is applied to the floor with a mop and then double scrubbed as described 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 turning the wing nut on the squeegee mount.

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, and after every use. Read the battery meter while the machine is in use.
*225 AH batteries require 8-12 hours to fully charge.
- Determine which Battery Charger you have - then see the Operating Instructions for that Charger.
 - NSS-Pro Charging: LED's & metal housing
 - SPE – digital display and plastic housing.

Battery Electrolyte (liquid) Level (Flooded only)

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

- **NEVER** let the electrolyte level fall below the tops of the plates. This will damage the batteries immediately, and void the warranty.
- 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, this will cause electrolyte (acid) spill. Spilled electrolyte (acid) can cause machine damage and personal injury. Clean and dispose of spills immediately.
- **Every cell** of every battery must be checked and replenished once per week
- See the battery-warning sheet (page 2) for more details.

Battery Packages

The Wrangler 2016 is a 24-volt system and is available with two battery packages.

- Four (4) 6 volt, 225 Amp Hour Batteries – NSS-PCS.
- Two (2) 12 volt, 145 Amp Hour Batteries - SPE.

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 driver or brush

- Remove either pad driver or brush from the machine after use.
- Rinse with clean water to prevent chemical residue build-up.
- Allow to air dry on a peg or upside down on a shelf or rack.
- 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.
- Check for debris from squeegee hose at entrance to recovery tank.

Weekly Maintenance (20 hours)

- Verify all daily maintenance has been performed.
- Check battery terminals 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 driver and / or brush. Remove, inspect and clean solution filter assembly.

- Flush solution tank and hoses with a mixture of 8oz/250 ml white vinegar to 1 gal/4 l water.
- Repair or replace any worn or damaged components as needed.
- Inspect and clean float screen and small vac filter above float.

****CAUTION****

Inspect and replenish battery water in every cell in every battery weekly. Failure to maintain proper electrolyte level in every cell of every battery will cause premature battery failure, and void the warrantee.

Monthly Maintenance (100 Hours)

- Equalize your batteries (**Flooded only**). To equalize the batteries, after they have been fully charged, unplug the charger (from the wall outlet), and plug it back in. The charger will skip thru the first few phases of the charge cycle, and run thru the finish phase. This will balance out all the cells in the batteries, and provide maximum battery life. **THIS STEP IS ESPECIALLY IMPORTANT IF YOU PRACTICE OPPORTUNITY CHARGING.**
- Verify all daily and weekly maintenance has been performed.
- Lube the caster and swivel bearings. Spray with Silicone Lubricant.
- 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.
- 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.

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, component damage and failure. This procedure should be performed by an NSS authorized distributor or service center. Repairs not performed by an unauthorized company will void the machine warranty. If you require assistance finding an authorized service center, contact NSS Enterprises.

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

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

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

Battery Charger

The onboard battery charger supplied with this machine is capable of charging lead acid batteries from 185 to 350ah capacity. There is no need to change algorithms or settings based on battery manufacturer, or battery size.

The charger can also be set to charge flooded (wet) cell, AGM, or Gel batteries. LED's on the charger indicate which type of battery the charger is set to charge. One setting is for Flooded and AGM batteries, the other setting is only for GEL batteries.

The charger can operate on 100/115/230 VAC 1ph 50/60 HZ power, and will automatically detect these input voltages.

Determining Your Battery Type

CAUTION: DIFFERENT BATTERY TYPES HAVE DIFFERENT CHARGING REQUIREMENTS. FAILURE TO PROPERLY IDENTIFY YOUR BATTERY TYPE, AND SET THE CHARGER ACCORDINGLY WILL RESULT IN BATTERY DAMAGE, AND VOID THE WARRANTY.

Your machine may have been ordered with batteries installed at the NSS factory. The standard battery type, normally supplied by NSS, is the Flooded (wet) cell lead acid battery. Gel and AGM sealed batteries may also be available at customer request.

Flooded (wet) batteries can be easily identified by the removable cell caps. Removing the caps allows inspection of the liquid electrolyte (sulfuric acid) level in each cell.

AGM (Absorbed Glass Mat) batteries are sealed, maintenance free batteries. They do not have cell caps intended for removal. Look for "**AGM**" printed on the tops or sides of the batteries.

Gel (gelled electrolyte) batteries are also sealed, maintenance free batteries. They do not have cell caps intended for removal. Look for "**GEL**" printed on the tops or sides of the batteries.

Battery Charger Indicator LED's

Your battery charger is equipped with LEDs that indicate the following:

- Battery Type Setting. Either of these two LEDs will be illuminated, anytime the charger is plugged in, to signal which type(s) of batteries the charger is configured to charge. The two options available are:
 - Wet / AGM: When this LED is illuminated, the charger is configured to charge either flooded (wet), or AGM batteries.
 - Gel Cell. When this LED is illuminated, the charger is configured to charge Gel batteries ONLY. **EXCEPTION: Trojan AGMs are to be charged with the Gel setting.**
- State of Charge Indicators. Four additional LEDs provide information about the charge level of the batteries during charging.
 - 30%, 60%, 90% and 100%.
- Fault Indications. During charging, the charger provides feedback about the charge process and any problems detected. It will provide feedback and signal the type of problem by flashing LEDs as described below:

Wet/AGM (Red)	Gel Cell (Red)	30 (Red)	60 (Red)	90 (Red)	100 (Green)	Meaning
On	Off					Charger is set for Wet / AGM batteries
Off	On					Charger is set for Gel batteries
One light on*		Off	Off	Off	On	Charge cycle is complete.
One light flashing*		Off	Off	Off	Flashing	Charger nearing the end of the charge cycle
One light on*		Flashing	Off	Off	Flashing	Damaged battery detected. One or more batteries failed to complete the charge cycle. Check battery water levels. Batteries can be used, but will not provide full run time.
One light on*		Flashing	Off	Off	Off	No batteries detected. Check that the battery pack is plugged into the machine. Check wiring.
One light on*		Flashing	Flashing	Off	Off	Batteries failed to climb above 1.74 volts per cell within the first three hours of charging. The batteries are damaged and will need to be replaced.
One light on*		Flashing	Flashing	Flashing	Off	Charge cycle time out. The charge cycle did not finish in the allowed time. Check the battery water levels. Unplug the charger and plug it back in. Allow the batteries to charge again. If the code is repeated, then it is likely that the batteries are damaged.
One light on*		On	Off	On	Off	Internal over temperature. The charger's internal temperature exceeded the maximum permitted. If possible, move the machine to a cooler location. Unplug the charger and plug it back in. Allow the batteries to charge again.

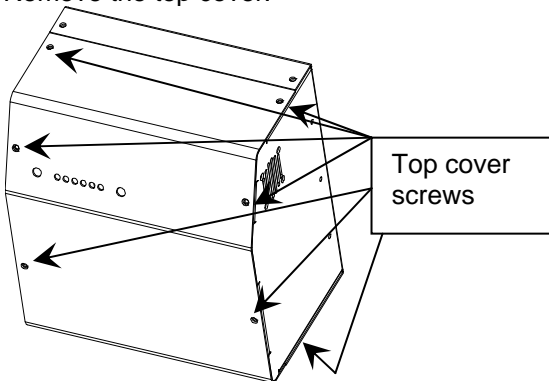
* The light that is on depends on the charger configuration (Wet/AGM or Gel Cell)

Changing the Battery Type Setting

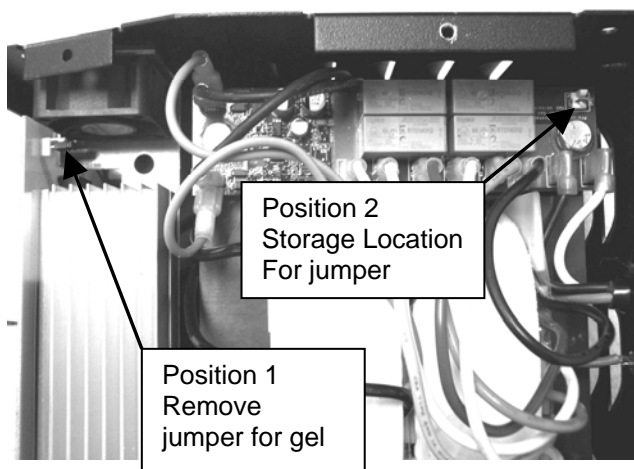
The standard setting for the onboard battery charger is Flooded/AGM. **EXCEPTION:** If your machine was ordered from NSS equipped with Gel batteries, then the charger was configured for Gel batteries at the factory.

Configuring the Charger for Gel batteries.

1. Remove the top cover.



2. Pull the jumper off the board (position 1), and then store the jumper for later use at position 2. See photo below.
3. Reinstall the top cover.



Configure the Charger for Flooded/AGM batteries

1. Remove the top cover
2. Pull the jumper from the storage location (position 2), and install the jumper at position 1.
3. Reinstall the top cover.

Operating the Battery Charger

CAUTION: DIFFERENT BATTERY TYPES HAVE DIFFERENT CHARGING REQUIREMENTS. FAILURE TO PROPERLY IDENTIFY YOUR BATTERY TYPE, AND SET THE CHARGER ACCORDINGLY, WILL RESULT IN BATTERY DAMAGE, AND VOID THE WARRANTY.

The battery charger is fully automatic. Simply plug the charger into a suitable wall outlet, and the charger will charge the batteries. The green 100% LED will

be continuously illuminated when the charge cycle is complete.

A bubbling, or boiling sound coming from the batteries during the last few hours of the charge is normal. The batteries may be warm, but not too hot to touch.

The charger will maintain the proper battery voltage as long as it is plugged in (maintenance mode).

Equalizing the batteries (Flooded only)

The batteries should be equalized once every 30 days for maximum battery runtime and life.

To equalize the batteries:

- Plug in the charger, and fully charge the batteries (until the green 100% LED is on continuously).
- Unplug the charger from the wall outlet, then plug it back in.
- The charger will run for 2hrs, holding the batteries at a constant voltage, and equalizing each cell.

Battery Do's and Don'ts:

- a. You do not have to fully discharge the batteries before charging. They do not have a "memory".
- b. Plug the charger in anytime the machine is not in use.
- c. NEVER let the electrolyte level fall below the tops of the plates (flooded cell batteries). This will damage your batteries almost immediately, and void the battery warranty. They can tell if this happened.
- d. NEVER refill the batteries with well water (flooded cell batteries).
- e. NEVER overfill the batteries (flooded cell batteries).
- f. NEVER let the batteries sit discharged overnight (or between shifts).
- g. ALWAYS check the electrolyte level about every 3 or 4 charge/discharge cycles **BEFORE CHARGING**.
- h. ALWAYS refill the batteries (if needed) **AFTER CHARGING**.
- i. ALWAYS fully recharge the batteries after use (until the green LED comes on).
- j. ALWAYS equalize the batteries (**Flooded only**) every 30 days.
- k. NEVER OVER DISCHARGE!
- l. NEVER charge GEL batteries with the charger set to FLOODED/AGM.
- m. NEVER charge FLOODED/AGM batteries with the charger set to GEL. **EXCEPTION-TROJAN AGM'S TO BE CHARGED WITH GEL SETTING.**

Opportunity Charging

Opportunity charging is charging the batteries when an opportunity presents itself, such as during breaks, and is done **in addition to a full charge cycle**.

Opportunity charging is recommended, as this extra charging time will help raise the operating voltage of the batteries, and will help ensure maximum runtime and cycle life.

NOTE: If battery charger is unplugged before the charging cycle is completed, it may take up to five minutes before the machine to be able to be turned on.

Battery Types

NSS Part Number	Crown Part Number	Battery Volts	System Volts	Amp Hour	Battery Type Setting
4491061	1-1470	12	36	210	Flooded/AGM
3390361	1-1435	6	24 & 36	225	Flooded/AGM
2392111	1-1427	12	24	115	SPE CURVE 0
6393651	1-1428	12	24	145	SPE CURVE 0
2392731	1-12145	12	24	100	SPE CURVE 1
6491931	1-1437	6	24 & 36	200	GEL
2691501	1-1450	6	36	325	Flooded/AGM

NOTE: Trojan AGM batteries should be charged with the GEL setting.

**The charger has been tested on batteries from the following manufacturers:

- Trojan flooded cell
- US Battery flooded cell
- Deka flooded cell
- Crown gel
- Concord gel
- Discover AGM

Battery Charger Operating Instructions - SPE

GENERAL INFORMATION AND WARNINGS

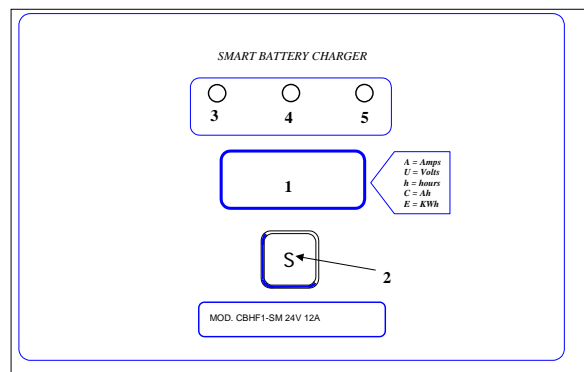
- NSS machines are delivered with the SPE charger set to Curve #0 for Crown batteries.
- Electronic automatic battery charger with microprocessor suitable for any battery type.
- Fully automatic charging cycle with electronic setting; protected against overload, short-circuit at clamps and reversed polarity.
- Before starting to charge, make sure the voltage of the equipment suits the voltage of the battery, that the charging current suits the capacity of the battery and that the selected charging curve (for lead-acid batteries or airtight gel batteries) is correct for the type of battery to be charged. In addition, make sure the rated input voltage of the charger suits the available supply voltage and the system is equipped with grounding.
- Pay attention to any remarks of the battery manufacturer.

CONTROLS (see figure below)

1. Three-digit display + symbol (1), to view **A** = the charging current, **U** = the battery voltage, **h** = the charging time, **C** = the charging ampere-hours [Ah], **E** = the energy used [KWh].
2. Button for the Selection of the display mode (2): **A, U, h, C, E**. After about 10 seconds the display returns to the visualization of the charging current.
3. Red control indicator (3): when it is on, the charging cycle has started.
4. Yellow control indicator (4): when it is on, the final phase of the charging cycle has started.
5. Green control indicator (5): when it is on, the charging cycle has finished.

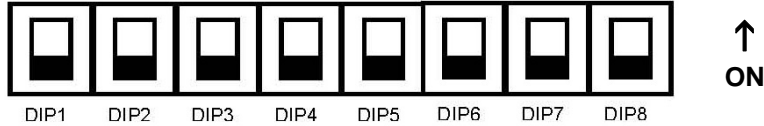
OPERATION INSTRUCTIONS

- Plug the cord into a socket.
- Now, the battery charger's display will show a sequence of details on the charger's internal programming: after the name "SPE", it will show the software release installed in the equipment, then, in sequence, the following parameters: battery voltage, charging current, charging curve number and, finally, the words "**GEL**" or "**Accd**" depending on the set up charging curve being suitable for airtight gel batteries or lead-acid batteries. Now, a test is run on the battery voltage to decide if the charging process should be started or not. If the battery is not connected to the battery charger, the display will show the word "**bat**". The word will stay on, even if the test is failed (for instance, reversed polarities or incorrect battery connection). If the test is passed, the display will show the battery voltage for approximately 5 seconds and the battery will begin to be charged. The charging cycle progress will be shown by red (3), yellow (4) and green (5) LED indicators. At the end of the charge, when the green indicator (5) is on, unplug the cord from the socket and operate the machine.



CBHF1-SM DIP SWITCH CONFIGURATION

Through the set of 8 dipswitches it is possible to change the charging curve (15 charging curves are available for Wet and Gel batteries and it is possible to customize the charging profile under the specifications of battery manufacturers), the battery voltage (12V or 24V) and the charging current (4A or 8A or 10A or 12A). The set of 8-dip switch is easy to find (is located under the front label of the charger, lifting the corner on the bottom-left) without opening the charger.



DIP1 DIP2 DIP3 DIP4 for the selection of the CHARGING CURVE

DIP1	DIP2	DIP3	DIP4	CHARGING CURVE
ON	ON	ON	ON	0 - Special Curve for charging CROWN Lead-Acid (wet) batteries. SETTING FOR NSS 2392111 - BATTERY, WET 12V, 115 AMP/HR 6393651 - BATTERY WET, 12V, 145 AMP/HR
OFF	ON	ON	ON	1 - Curve for charging AGM SEALED LEAD-ACID batteries w/float charge. SETTING FOR NSS 2392731 AGM BATTERY, 12V, 100AMP/HR
ON	OFF	ON	ON	2 - Curve for charging typical GEL sealed lead acid batteries
OFF	OFF	ON	ON	3 - Wet batteries with float, 3.5A finish, formerly curve #4.

DIP5 DIP6 DIP7 for the selection of the CURRENT

DIP8 for the selection of the battery voltage

*For batteries from manufacturers other than Crown, contact NSS Customer Service for a recommended algorithm. Not all other manufacturer's batteries are compatible with the chargers supplied on NSS equipment.

DIP5	DIP6	DIP7	CURRENT
ON	ON	ON	4A
OFF	ON	ON	8A
ON	OFF	ON	10A
OFF	OFF	ON	12A

DIP8	VOLTS
ON	12
OFF	24

PROBLEMS	SOLUTIONS AND CHECKS
The battery charger does not switch on	Check that the plug is connected to the supply mains and that the circuit breaker is efficient.
The charging cycle does not start, ' bat ' is displayed.	Check the connection to the battery and the polarity.
The yellow indicator (4) will not light up even 15 hours from the starting of the charging cycle, the display shows E03 .	Check the battery for possible faulty components.
The message E01 is displayed	This means that the maximum voltage admissible by the battery has been exceeded. The charging is interrupted.
The message E02 is displayed.	This means that the maximum temperature has been exceeded. The charging is interrupted.
The message SCt is displayed	SCt is a fault code indicating time out before charge cycle completed.
The message Srt is displayed	This signals a possible internal short circuit.
The message EdU is displayed	The batteries are damaged and need replaced.
The message EdI is displayed	The batteries are damaged and need replaced.

TROUBLE SHOOTING

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
No solution flow.	<p>Clogged filter. Low battery charge. The solution valve is closed. Obstruction in the solution hose. Solution valve or linkage damaged. Solution hose kinked. Solution tank is empty.</p>	<p>Clean filter. Charge the batteries. Open the solution valve. Remove the obstruction. Repair/replace the valve linkage. Check for kinks at valve. Fill the tank.</p>
Solution flow does not stop.	<p>The solution valve is open. Solution valve or linkage damage. Solution valve is dirty. Damaged seat and washer in valve. The valve stem is dirty. Hose disconnected or damaged between solution tank and valve.</p>	<p>Close the solution valve. Repair/replace the valve linkage. Clean the solution valve. Replace valve. Clean and lubricate valve stem. Reinstall or replace hose.</p>
Will not pick up any water from floor.	<p>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.</p>	<p>Lower squeegee. Reinstall hose. Turn vac motor switch "on". Empty tank. Open float valve/remove obstruction. Remove obstruction/repair damage.</p> <p>Remove old gasket/replace. Have an authorized serviceman repair. Install drain hose plug properly.</p>
Will not pick up all of the water from the floor.	<p>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.</p>	<p>Clean squeegee. Reverse/replace squeegee blade. Remove obstruction/repair damage.</p> <p>Adjust angle. Repair / replace vac motor. Repair / replace recovery drain hose.</p>
Low Runtime	<p>Electrolyte level is too low.</p> <p>Tops of batteries are dirty / wet. Battery terminals are dirty / damaged.</p> <p>Batteries are sulfated. Caused by not recharging fully, or by letting batteries sit discharged. Batteries are not fully charged.</p> <p>Battery(s) defective or worn out.</p> <p>Damaged Charger</p>	<p>Add water to cover plates and charge. Fill to correct level after charging. Clean / dry, and clean terminals. Clean terminals and connectors. Replace damaged cables. Check water & Charge.</p> <p>Batteries may recover if equalized two, or three, times in a row. Otherwise, replace bats. Charge batteries until charger indicates full charge cycle is complete.</p> <p>Have an authorized serviceman test the batteries (s.g./charged volts/load test). Have an authorized serviceman repair.</p>
Cleaning is not even.	<p>Brush / pad is worn. Damage to brush assembly, casters or solution valve.</p>	<p>Replace brush / pads. Have an authorized serviceman repair.</p>
Machine does not run.	<p>Circuit breaker tripped. Loose battery connection Check fuse at rear of machine. Batteries depleted</p> <p>Battery charger was unplugged before the charge cycle was completed.</p>	<p>Reset circuit breaker. Tighten battery connection. Replace if blown. Check electrolyte level & charge Wait (up to five minutes) and try again.</p>

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

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