ANDERSON
INNOVATIONS

User Manual

ES 2000 Ride On Floor Scraper

US Patent # 10273700, 10619365

EU Patent # EP3642429

READ BEFORE USING EQUIPMENT

Anderson Innovations

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1 SAFETY

1.1 Manual

This manual guarantees the safe and efficient use of the ES 2000 "machine". This manual is part of the machine, and must always be kept near the machine and be accessible for the operating personnel at all times.

The operating personnel must carefully read and understand this manual before any work begins. Prerequisite for safe working is compliance with all the safety and handling instructions in this manual.

Furthermore, this machine is to be used in compliance with all local regulations and the general safety requirements set forth by the Occupational Safety and Health Administration (OSHA).

Illustrations in this manual are for the purpose of explanation, and may differ from the actual design of the machine.

When passing the machine on to third parties this manual must be included.

In the following cases the manufacturer does not accept any liability:

- Non-compliance with these instructions
- Improper use
- Operation by untrained personnel
- Unauthorized modifications
- Use of unauthorized replacement parts

1.2 Explanations of symbols and instructions

Safety instructions in this manual are marked by symbols. Instructions are introduced by signal words which express the scale of the hazard.

It is essential that these instructions are adhered to and the machine is operated with caution to avoid accidents, injuries and material damage.

WARNING!
Indicates a potentially dangerous situation which if not avoided can lead to death or serious injuries.

CAUTION!
Indicates a potentially dangerous situation which if not avoided can lead to minor or light injuries.

PROHIBITION!
Indicates an immediate dangerous situation which if not avoided can lead to death or serious injuries.

Safe Practices
Emphasizes tips and recommendations as well as information for efficient and failure-free operation.

1 SAFETY

1.3 Intended use

The machine is used for the removal of all sorts of floor-coverings for example PVC, linoleum, carpets, rubber floors as well as tiles, coatings, adhesives and wood flooring.

The machine is NOT to be used to pull things, or for non flooring related demolition work.

Any utilization of the product beyond the intended use described above is considered misuse.

WARNING! Danger due to misuse!
Misuse can lead to dangerous situations.
- Operation outside the specified limit values of the technical data.
- Bypassing or overriding of safety installations.
- Remodeling, refitting or changing the construction or individual parts with the intention to alter the area of application or use of the machine.
- Use of the machine when not in perfect mechanical condition.
- Use of the machine in potentially explosive areas.

Claims of any sort of damages following improper use:

1.4 Owner's obligations

The owner is a person who operates the machine for personal, commercial or economic use or leaves it to a third party for use/application and during its use carries the legal responsibility for the protection of the user, personnel or a third person. The machine is used in the commercial sector. The owner of the machine is therefore obliged to comply with the legal responsibilities for health and safety.

The local regulations of the place of use as well as accident prevention measures of the local trade association must be adhered to.
It requires in particular that the owner:

- is informed about current health and safety regulations.
- determines during a risk assessment additional hazards which occur through specific working conditions on the operating site of the machine.
- implements in a job control statement the necessary compliance requirements for the operation of the machine on the operating site.
- regularly examines during the entire operating time that the operating instructions comply with the current status of regulations.
- that the operating instructions-if necessary- are adjusted to new regulations, standards and conditions of use.
- clearly regulates the responsibilities for the installation, operation, maintenance and cleaning of the machine.
- ensures that all staff working near or with the machine have read and understood the operating instructions. Furthermore the owner will train all personnel as needed to adequately inform them about possible hazards.

Additionally the owner is responsible for:
- safe operating condition of the machine.
- the servicing of the machine in the recommended maintenance intervals.
- the regular inspection of all safety installations ensuring that they are complete and in working order.

1 SAFETY

1.5 Operating personnel

QUALIFICATION
The different tasks described in this manual request various qualifications from the persons dealing with the machine.

WARNING! Danger for persons with insufficient qualifications!
Insufficiently qualified persons cannot judge the risks when operating the machine and put themselves and others at risk of serious injuries or death.
- All work must only be performed by qualified personnel.
- Insufficiently qualified persons must be kept away from the operating area.

In this manual the necessary qualifications for the persons and the different tasks are listed:

OPERATOR:
the operator has been instructed by the owner and been given the assigned tasks and has been informed about the possible hazards in case of improper behavior. Tasks which go beyond regular operation tasks can only be executed by the operator if listed in this manual and have been explicitly authorized by the owner.

TRAINED PERSONS
have been instructed by the owner and been given the assigned tasks and have been informed about the possible hazards in case of improper behavior.

QUALIFIED PERSONNEL
Qualified personnel is able to carry out assigned tasks and recognize and avoid independently possible hazards given their specialist training, knowledge, and experience as well as their knowledge of relevant norms and regulations.

MANUFACTURER
Certain work can only be carried out by trained personnel of the manufacturer. Other personnel are not authorized to carry out this work. Please contact customer service for required work.

UNAUTHORIZED PERSONS
WARNING! Danger for unauthorized persons in the operating area!

– Unauthorized persons have to be kept away from the operating area.
– If in doubt remove persons from the operating area.
– Interrupt the work as long as unauthorized persons are in the operating area.

INSTRUCTION
The owner of the machine must regularly instruct all personnel. For better documentation an instruction protocol with the following minimum content has to be kept:
- date, content of the instruction
- name of the instructor
- signatures of the instructed and instructor

1 SAFETY

1.6 Personal protective equipment

When operating the machine personal protective equipment must be worn in order to minimize health hazards.

The following protective clothing must be worn by anyone in the operating area.

Protective work clothing.
Wear appropriate work clothing! Work clothing should fit tightly and loose garments should be avoided since they can get caught in the machine.

Protective gloves
Protective gloves to protect your hands when changing blades.

Ear protection + Protective goggles
Ear protection offers you protection from hearing damage through noise. Protective goggles protect your eyes from flying debris.

Safety shoes
Safety shoes protect your feet from bruising and from sharp objects and from slipping on slippery ground.

Respirator mask
Regular and prolonged exposure to dust can lead to chronic and debilitating lung disorders. When working for a long time or on dusty ground a minimum of a NIOSH N95 dust mask has to be worn to protect your respiratory tract from dust and from small particles.

1.7 Signage

WARNING! Danger with illegible signage!
With time labels and signage can become dirty or illegible so that hazards cannot be recognized and necessary instructions adhered to. This causes an increased risk of injury.

- Keep all safety, warning and operating instructions always in legible condition.
- Damaged labels or signage must be replaced immediately.

The following symbols and signs can be found in the operating area.
They refer to the immediate area where they have been placed.

WARNINGS
sharp blade,

Sharp Object / Wear

Pinch Point

Danger to hands

Electrical Hazard

1.8 Safety installations

WARNING! Danger through defective safety installations!
Defective or disabled safety installations can cause severe injuries and death.

- Before work can start all safety installations have to be inspected to see whether they are functioning properly and have been correctly installed.
- Never disable safety methods or override them.
- Make sure that all safety methods are always accessible.

1 SAFETY

1.9 Occupational safety and special risks

The following paragraph explains residual risks which might be present even if the machine is used correctly.

To reduce the risk for persons and material damages and to avoid dangerous situations the listed safety information in this paragraph and in the remaining manual has to be adhered to.

Improper use

WARNING! Danger through improper use!

Make sure:
– Only use machine when in good operating condition.
  Broken parts must be repaired or replaced immediately.
– Modifications to the machine are not permitted and can impair safety.
– Before regular maintenance, cleaning and repairs, the power must be switched off and secured against unintentional start-up.
– Never override, remove or switch off safety devices.
– All work on the machine and/or its electrical components must be carried out by trained personnel.
– Repair or maintenance work must only be carried out when the machine is switched off. The machine must also be secured against unintentional start-up.

Axis movements

WARNING! Danger of struck by injury!
Collision of persons with the machine or its tools can lead to severe injury.

Make sure:
– Unauthorized persons in the operating area are strictly prohibited!
– Safety installations and/or functions must not be switched off or overridden.
- Do not hold any body parts between moving components.
- Blades must only be changed when the machine is idle, secure, and disconnected from power.
- Wear personal protective equipment in the operating area.
- Assistants must always maintain a safety distance of a minimum radius of 3 feet from the machine.

Removed materials

WARNING! Injuries through removed materials!
The removed floor-covering can fracture causing flying debris to be thrown unexpectedly which can cause serious injury or damage to the surrounding area.

Make sure:
- Wear face protection or fully closed and tight fitting goggles, protective clothing, protective gloves and safety shoes.
- Seek medical attention immediately if particles have entered your eyes.
- Assistants must always keep a safety distance of a minimum radius of 3 feet from the machine.
- Use protective coverings on delicate surfaces near the work area

1.9 Occupational safety and special risks

Sharp edges and sharp corners

CAUTION! Danger of injury from sharp edges and sharp corners! Sharp edges and sharp corners can scratch and cut into skin.

Make sure:
- Be careful when working near sharp edges and sharp corners.
- Wear protective gloves when in doubt.

Cutting tools (knives/blades)

CAUTION! Danger of injury through improper use of tools! Scraping blades and associated tooling can cause severe injuries if handled improperly. Always wear protective clothing. Make sure blades are securely mounted when transporting, during maintenance and when in use. When installing blades never push a wrench toward the cutting edge.

- Use tools carefully and as intended.
- Consider the weight of tools in transport.
- Wear protective gloves and safety shoes.

Working environment

CAUTION! Avoid dangerous conditions!

Do not operate machine in rain, extreme humidity, wet areas or in explosive environments (gaseous vapors, dust or flammable materials). Remove any material or debris which can be ignited by sparks.

Keep your working area clean and well lit.
Untidy and dark working areas increase the danger and potential for accidents.

Keep spectators away from the working area.
Children and spectators must keep a safe distance from the working area to keep from distracting the operator and not come in contact with the machine. The operator must always be aware of who is nearby.

Protect other persons in the working area.
Provide safety screens and protective shields to protect others from the movement of the machine and debris.

Always be aware of the position of your coworkers when the machine is in operation. Close off working area from unnecessary foot traffic.
Personnel in proximity must never be in front or behind the running machine. Non-compliance can lead to serious injuries or death.

Keep working area clean! Unsecured, scattered components and tools are a potential source for accidents.

1.9 Occupational safety and special risks

Start-up and operation

WARNING! Danger of injury through improper start-up and operation Improper start-up and operation can lead to personal injury or material damage.

Make sure:
– Start-up and operation can only be executed by sufficiently trained personnel, authorized and instructed by the owner of the machine.
– Before work commences all safety installations have to be inspected to check whether they are functioning properly and have been correctly installed.
– Keep working area tidy and clean! Unsecured, scattered components and tools are a potential source for accidents

WARNING! Non-stop work; Incorrect handle height, vibrations and machine movements cause pain and fatigue

Make sure:
- Take regular breaks

Maintenance and troubleshooting

WARNING! Danger of injury through improper maintenance and troubleshooting! Improper maintenance and troubleshooting can lead to severe personal injury and material damage.

Make sure:
– Any maintenance work and troubleshooting must only be carried out by sufficiently qualified and instructed personnel.
– Secure machine from unintentional start-up.
– Provide sufficient space before starting maintenance work.
– Keep working area clean and tidy! Unsecured, scattered components and tools are a potential source for accidents.

When components need to be replaced:
- Contact manufacturer or authorized representative.

1 SAFETY

1.9 Occupational safety and special risks

ELECTRICAL CONNECTIONS / Charging /ELECTRICAL COMPONENTS

WARNING! Risk of death due to electric current!

Only connect the machine / charger to a power source that matches the the rating plate. Check before startup.

Only connect the machine to an approved power cable and outlet. Cables / extension cords must be at least 12AWG, not exceed 25ft, and have molded plugs with ground lugs. Using the machine with cables of insufficient gauge and / or excessive length may result in poor performance, overload, tripped breakers and personal injury or property damage.

Have electrical equipment such as breakers, power cord, and extension cables checked by an authorized electrician. If the circuit breaker trips or trips repeatedly, it is a sign of a problem. Never use equipment on unprotected circuits.

Never work with a damaged cable or plug. Worn or damaged cables or plugs should be replaced by an electrician or authorized service personnel.

Do not use damaged electrical cords. Do not pull on the cable to unplug from the wall. Using the machine charger with a damaged cable can cause an electric shock.

Never remove or make unusable a ground lug from machine or cords. Using the machine in a non-grounded circuit may result in electrocution. Consult an electrician if the grounding wire is missing or if you believe that the circuit does not have adequate grounding.

The machine may only be operated on circuits with current protective device (I.E. fuse or circuit breaker).

When working on the machine always unplug the battery!
Maintenance, replacement or adjustment of components may result in personal injury to the operator and / or bystanders if the machine is started accidentally.

Work on electrical components of the machine may only be carried out by a qualified electrician.

Driving over or damaging the power cables with the machine may result in electric shock.

The machine is only suitable for operating in dry conditions. Do not expose the machine to water including Rain, pressure washers, or hoses.

2 PRODUCT INFORMATION

2.1 Technical Description

SPECIAL FEATURES

The ES 2000 is a ride-on floor scraper capable of removing all types of floor coverings including difficult ceramic, tough glued down carpet, vinyl, and coatings. Its patented Forward Slope Technology design gives it big machine performance in a smaller package. The integrated cargo deck provides a convenient place to keep accessories. The dual function slide plate allows the operator to set the desired blade height and angle without getting out of the seat. With 10kw of power provided by maintenance free AGM batteries the ES 2000 is capable of running up to 8 hours.

2.2 Technical Specifications

Technical Data
Power Supply: 48 VDC

Drive System: Hydraulic
Motor Size: 5 HP
Speed: Up To 155 Feet/Min
Total Weight: 1970lbs
Length: 60”
Width: 27”
Height: 49”

U.S. Patent # 10273700, 10619365
E.U. Patent Granted

2.3 Scope of delivery

- **ES 2000**
- **6" Blade Holder**
- **12" Blade Holder**
- **27" Blade Holder**
- **2" Carbide**
- **Blade Assortment**
- **Safety Glasses and Cut resistant gloves**
- **Battery Charger (on board)**
- **Retaining Pins**
- **Safety Manual**
- **Blade and Slide Plate Adjustment Wrench**

2 PRODUCT INFORMATION

2.4 Controls and equipment

3 TRANSPORT

3.1 Lifting

Before using lift-gates, elevators or other powered lifting tools make sure the lift equipment is in good operating condition, and is properly sized for use with this machine. Refer to product specifications in this manual for weight and dimensions.

The machine can me moved without power by opening the hydraulic valves in the intended direction of travel and then pushing the machine. DO NOT push the machine by applying force to the control handles. Pushing or pulling the machine by the control handles will cause damage to the handles and control linkages.

FORKLIFT:
Placing the machine on a skid/pallet is the safest way to transport with a forklift. If using a forklift to move the machine without a skid / pallet, special attention must be given to fork placement to keep the machine stable.

1. Set the forks to the inside width of the tires
2. Pickup the machine from the back getting as close as possible to the mast of the lift truck
3. Ensure the forks are completely under the machine and not catching on the front caster
4. Slowly lift the machine and tip the mast back

32 Ramps

USING RAMPS:

Extra care must be taken to ensure the safe use of a ramp. The ramp MUST be rated for the weight of the machine and the operator. The operator is responsible for adhering to any safety regulations that apply in their area of work.

OSHA regulation 29 CFR 1926.451(e)(5)(ii)
No ramp or walkway shall be inclined more than a slope of one (1) vertical to three (3) horizontal (20 degrees above the horizontal).

- Ramps can be dangerous to use
- Make sure ramp is rated to hold machine and operator
- Ramp must be secured so it cannot slip off on the high side
- Be sure ramp is free of debris and is not slippery
- ALWAYS back up a ramp, keeping the front of the machine "down hill"
- ALWAYS drive down a ramp keeping the front of the machine "down hill"

4 SETUP

4.1 Blade

Choice of blade

Using the correct blade size and style for various floor coverings and sub-floors will provide the best performance of your machine.

The principles described are to help operators choose the best type of blade for each job. There is not a "one size fits all" option with blade choice.

Blade size

For harder jobs it is better to use narrow blades,
for easy jobs you can select wider blades.

Narrow blades can increase production on tough jobs as the machine will have less resistance and faster travel speed compared to using a wider blade and will allow for longer run time and a cleaner subfloor. Start with a narrow blade, switch to a wider blade if the material is coming up easily.

Blade bevel

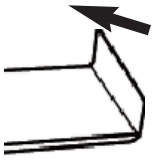
Bevel up blade is for hard substrate like concrete.

Bevel down for wood or soft sub-floors.

Self-scoring blades

When using self-scoring blades for soft floors, pre-scroring the flooring material is unnecessary. Depending on the type of flooring to be removed and the sharpness of the blade, it will be more difficult to control the machine.

Keep the blade and the side wings/edges sharp.



Insert / replace blade

Dull blades reduce the capacity and cutting performance of the machine. Sharpen or replace the blades on a regular basis as needed.

Remove the power plug

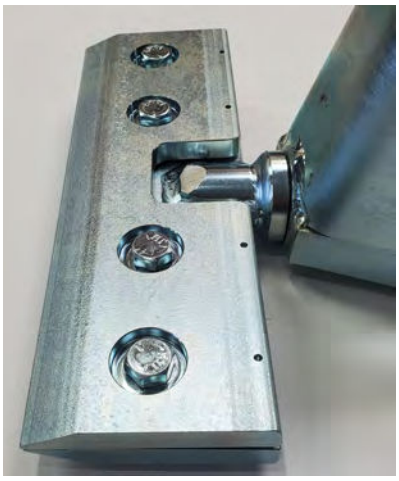
CAUTION ! Even "dull blades" can cut you. Wear protective gloves

Use supplied extended wrench to keep hand safely away from the edge of the blade. When installing or removing blade **NEVER** use a short wrench that puts hand in-line with the blade or push toward the cutting edge.

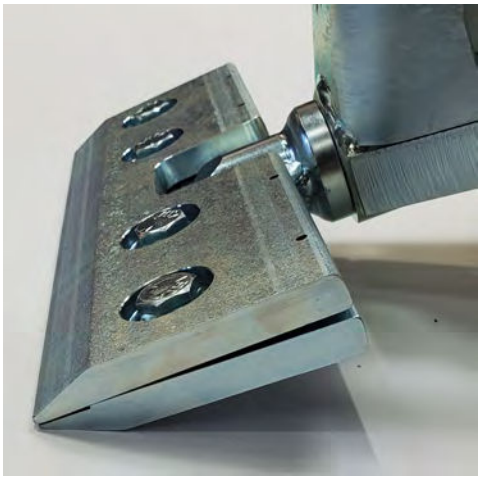
4 SETUP

4.2 The ES 2000 has 2 blade adjustments. One for the height of the slide plate assembly off of the floor, and a second for the angle of the blade. In general, a low to medium angle will work best for removing materials such as glued down carpet, VCT and ceramic tile. A high angle is better suited for re-scraping adhesive and removing thin coatings. Blade height is adjusted using the short controls handles. Typically it is best to use a high slide plate for a high blade angle and a low slide plate for a low blade angle. The blade angle is adjusted with the control lever on the low right hand side of the machine.

Low Blade Angle

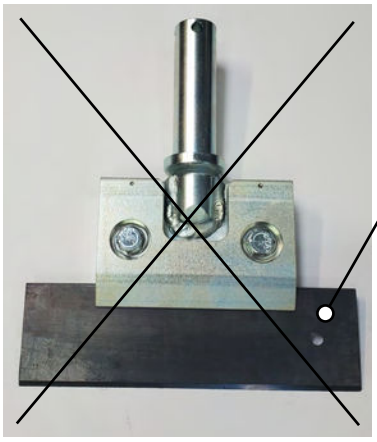


Medium Blade Angle



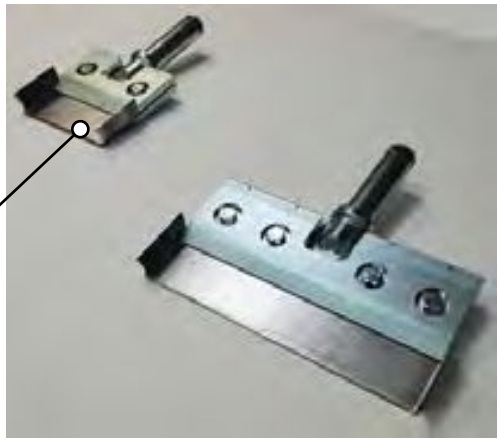
High Blade Angle

When choosing a blade it is best to match the size of the blade to the holder. A large blade extending past the sides of the holder will be unsupported, and less effective at cleaning the floor. A small blade in a large holder can allow material to catch on the edges of the holder. For the best performance and efficiency match the size of the blade with the holder



This blade is too big for the holder

These blades are matched to the size of the holder

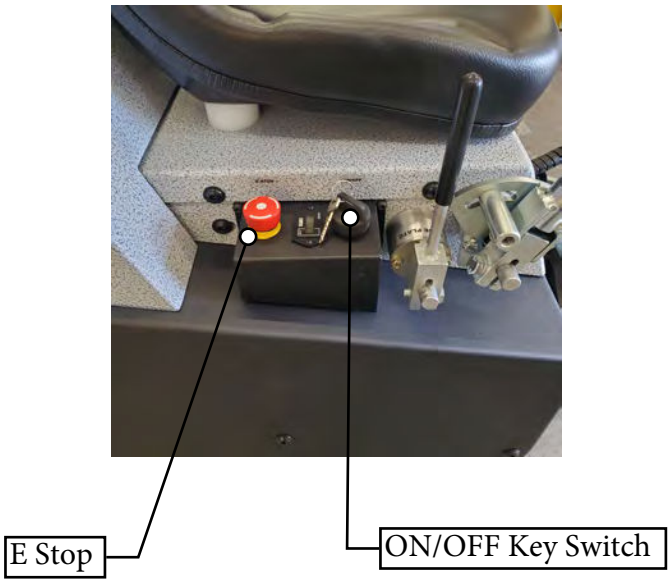


5 OPERATION

5.1 Start-up and Shut Down

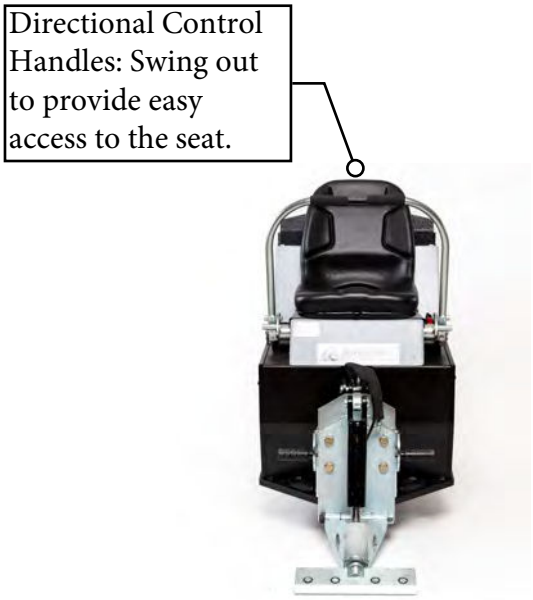
To start the machine follow this procedure:

1. Inspect the machine for any signs of hydraulic leaks for other damage
2. Spread the handles apart and sit on the seat with feet on the foot pegs
3. With the handles in the center/neutral position twist the red cap on the E-Stop to make sure it is in the "up" position
4. Turn the key switch fully to start the machine.



To shut down the machine follow this procedure:

1. Allow the control handles to return to the center / neutral position
2. Make sure the machine is on a flat, level surface. Do not park the machine on a ramp or inclined surface.
3. Use the blade angle adjustment to lower the blade so the cutting edge is on the floor.
4. Turn the key switch to the off position
5. Remain in the seat until the motor has completely stopped
6. Step off of the machine



5.2 Safe operation

To move the machine use the control handles. Pushing both handles forward will move the machine straight forward. Pulling both handles backward moves the machine straight back. Use the handles independently to turn the machine. Use slow smooth movements with the control handles for the best control. Operator must keep good situational awareness avoiding people and job site hazards.

5 OPPERATION

5.3
Removal of floor coverings

VCT Tiles

Keep blades sharp! Keep your work area clean and clear of debris. Always wear eye protection when working with the machine.

Never use a blade wider than the size of the tile being removed. If material being removed will not come up clean or the machine jumps out of the work continuously, reduce blade size to a smaller blade until proper blade size is found or use a smaller portion of the blade.

Vinyl-, Rubber, PVC, Direct Glued Carpet

Before starting the machine, cut the flooring into strips approximately the same width as the blade. Then use the machine to take up the strips. Pre-scoreing carpet / sheet goods makes removed material easier to handle and extends the runtime of the machine. For best results use a stand-up scoring tool

If removing soft flooring with a strong bond, the self-scoring blade can also be used. Cut ditches into the floor then demo perpendicular to the ditch to make strips that are easy to handle. Keep debris cleaned off the floor and out from under the machine. This will reduce the chance of carpet scrap getting wrapped around the wheels and tangling with the machine.

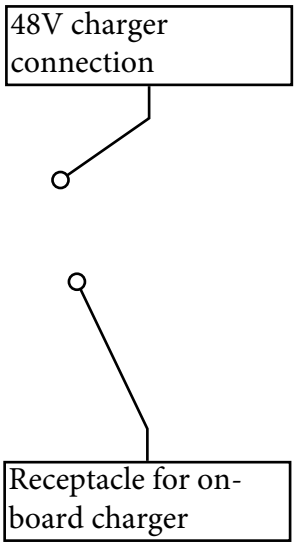
Ceramic and other types of floor tiles

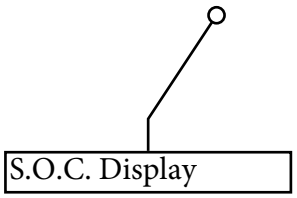
Everyone in the area must be wearing safety glasses before removing tile. Use a durable sheet material such as hard board to protect delicate wall surfaces like glass or finished wood. Using a hammer and chisel or electric demo hammer, remove a tile in a clear area of the work space to open up the floor. Beginning at a doorway with an open edge is another way to start removing tile, but can be more difficult to maneuver then opening a space in the middle of the room. Use a small heavy blade or preferably a carbide shank at a low angle to remove tile. Avoid removing tile at a high angle as this is less efficient, and will shorten the life of your tooling. Open a line of tile across the room and then work perpendicular to that line in short passes along the line. Keep debris cleaned out from under the machine. Use a stiff broom to push debris out of the way. Debris is more easily pushed on the floor not yet removed. It is best to stop and clean the floor regularly rather creating a large volume of debris and working on top of the mess. Use a water sprayer to mist debris before pushing to reduce dust. After removing the tile use a water sprayer to mist any remaining thin-set or mortar until it has the consistency of damp sand then re-scrape at a high angle with a sharp carbide. DO NOT over-water the floor. Too much water will create a slippery mess.

5 OPERATION

5.4
Battery System

Charging:
The ES 2000 uses



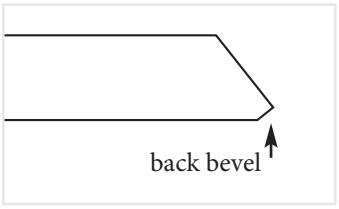


6 MAINTENANCE

6.1 Blade Sharpening

Dull blades greatly reduce machine performance.
Sharpen or replace the blade if/when necessary.

Standard blades
When used continuously, the blades develop a back bevel on the edge



The blade is only truly sharp
when the back bevel is completely removed.

- Always wear gloves and safety glasses.
- Grind the blade with a grinding wheel of 120 grit or finer.
- Move the grinder along the edge of the blade and hold the grinder at the correct angle to the blade.
- Grind until the blade is sharp.
- Be careful not to catch the grinding disc on the edge or corner of the blade.

WARNING! Risk of injury!
Blades are sharp. Be extremely careful.

NOTE! Recommendation for optimal use of blades

- Thinner blades are easier to sharpen, but are easier to break.
- It is easier to sharpen the dull blades on a bench grinder or with a belt sander.
- If using an angle grinder be careful to avoid catching the disc on self scoring wings or grinding toward the sharp edge.

1. To sharpen the blade while mounted to the machine follow these instructions:
   - Keep the blade secured in the machine.
   - Block up front of machine so blade is off the floor and the machine is stabl.
   - Sharpen the blade with a 5" diameter disk with 120 or finer grit.
   - Be careful not to catch disk on edge or corner of blade.

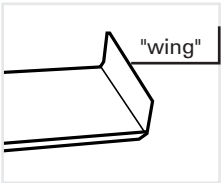

bevel down


bevel up

2. A fine tooth file can be used to sharpen some blades but is considerably slower then using a grinder.


Sharpening with a fine-toothed file

Self-scoring blade
It is important to keep the "wings" of the self-scoring blades sharp. Use a file at the "wing" edge. Sharpen the flat end of the blade as described above.



Shanks with carbide tip
To sharpen carbide tipped shanks, a green silicon carbide grinding wheel or a diamond wheel is required. Wear a mask to protect from the hazardous dust caused by grinding carbide.

6 MAINTENANCE

6.2 Maintenance schedule

Perform maintenance outside of hazardous areas. Maintenance work must be carried out with the machine switched off and disconnected from the battery to prevent accidental start-up of the machine:

- Disconnect the battery

Maintenance by the user

Daily before you start work

- Clean the wheels, they need to be free of accumulated debris.
- Check the wheels and castor for damage, they must have sufficient rubber and no flat spots.
- Check if all safety devices are working and are installed.
- Check for hydraulic oil leaks with the machine off.

WARNING! Risk of injury by hydraulic fluid!
Never inspect hydraulic components while the machine is running. Never feel pressurized hose assemblies to find leaks with the machine running.
Leaking pressurized hydraulic fluids may develop a mist or fine spray liquid that squirts or explodes on ignition and is capable of injecting into flesh and causing serious injury.

If hydraulic fluid leaks

- Keep ignition sources away
- With machine off look for the source of the leak
- A loose fitting is the most common source of a leak
- Use an absorbent pad and degreaser to clean up spilled oil.
- Residual oil can be found after fixing a leak for a period of days if it gets under panels and other components.
- If the source of a leak cannot be fixed contact the manufacturer or a hydraulic repair shop.
  Replacement of hydraulic oil and oil filter- see chapter 6.3

Manufacturer Recommended Maintenance

- Check oil level at sight gauge before operating
- Inspect hardware on panels and controls and tighten when required
- Check torque on wheel motor castle nut and lug nuts regularly
- Inspect electrical cables and hydraulic lines every 6 months, replace if there are any signs of wear or damage
- Change oil and filter anually
- Use only original equipment manufacturer parts for replacement.

6.3 Hydraulic oil

Dangers for people and the environment

Hydraulic oils are flammable. Vapors released when exposed to very high temperatures and spray can form explosive mixtures with air.
There is a risk of ignition of oil-soaked clothing.
Frequent or prolonged contact with the products, even through oil-soaked clothing, can cause skin diseases, e.g. inflammation, rash, oil acne. Products exposed to high temperatures may accumulate with hazardous substances. Water pollutant.

Protective measures and rules of conduct

Drain hydraulic fluid into a drip pan, avoid splashing. Do not overfill drip pans and do not use to store other materials.
Keep away from ignition sources, do not smoke. Do not mist lubricants.
Keep container closed and protected from heat.
Keep soaked cloths in non-combustible, closed containers.
Replace cleaning rags regularly.
Mark filled containers, replace defective markings.
Never use food containers or containers to be confused with them.

Hand protection: for long-term use resistant chemical protective gloves
Skin protection: Avoid contact with skin and clothing.

Immediately change soaked clothing and put on only after cleaning. Do not put smeared cloths in the pockets of work clothes. Do not use solvents, thinner, or other harsh chemicals for cleaning hands or body.

Procedures in case of incidents

leak:	After leakage, immediately use an absorbant mat or material to contain the spill. Pickup this contaminated material and dispose in a proper container. Clean the floor thoroughly so there is no slippery surfaces.
fires:	Have a fire extinguisher available for fire class B. Do not extinguish with water. In case of fire, there is a risk of the hydraulic reservoir bursting due to the boiling liquid and expanding vapors.
escape route:	See marking of escape routes and emergency exits

First aid

after skin contact:	Thoroughly wash with soap and water, remove previously soaked clothes.
after eye contact:	Rinse with an open eye and toward the outer eye for ten minutes in running water, visit a eye specialist.
after swallowing:	Do not induce vomiting, consult a doctor.
after penetration of oil:	After penetration of oil under the skin immediately consult medical attention!

Proper disposal

Collect waste in labeled non-combustible containers; Keep waste containers and empty containers closed, empty at the end of the shift (at the latest) or remove them from the work space.

6 MAINTENANCE

6.3 Replacement of hydraulic oil

Resources

Hydraulic oil: Shell Tellus S2 MX 46

Capacity: 6 Gallons

ATTENTION !

Keep the hydraulic fluid clean and at the specified level. Incompatible fluids can damage the unit or cause serious injury.

Level of hydraulic fluid

The machine is ready for operation when delivered, and is filled with hydraulic oil.

The full level is shown by the presence of oil in the site gauge shown on page 13 of this manual.

Check the hydraulic fluid level if there is a leak, damaged or broken hose or loose fitting.

Draining / Filling Hydraulic Fluid

To drain the hydraulic follow this procedure:

1. Disconnect the motor from power by unplugging the blue plug on the back of the machine
2. Place a large capacity oil catch pan under the drain plug on the bottom of the frame behind the castor. If possible use a lift to raise the machine for easy access to the drain plug.
3. Remove the drain plug and allow oil to drain.

To fill the reservoir follow this procedure:

1. Make sure drain plug is installed
2. Remove the dipstick / breather under the seat.
3. Place a funnel into the stand pipe .
4. Carefully fill the reservoir allowing air to escape as you pour.
5. Use the dipstick to check oil level as you approach 6 gallons. There is a reference mark on the dipstick.
6. Replace dipstick / breather

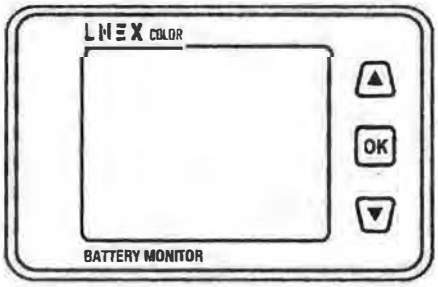
7 Attachments:

1. LNEX Battery Monitor (S.O.C. Display)
2. Hydraulic Oil SDS
3. Battery Data Sheet
4. Battery SDS
5. Manufacturer Information
6. On-board Charger Manual

7 Attachments

7.1

LNEX COLOR



BATTERY MONITOR

USER MANUAL

Notice

- Please read this guide carefully to avoid incorrect connections that can cause the battery monitor to malfunction and/or create a fire hazard. Disconnect the negative pole of the battery before installation.
- LNEX Battery Monitor can't be exposed in the sun for a long time or in the environment with large amounts of ultraviolet radiation when using or storing, in winter (＜-10℃) and summer (>60℃) otherwise the life span of the LCD will be shortened.
- Do NOT let the positive (+) and negative (-) terminals of the battery touch each other.
- Never connect a load to a battery without using fuses or circuit breakers.

Compatibility

The LNEX Battery Monitor is suitable for lithium batteries, lead acid batteries and nickel-metal hydride batteries that have voltage from 10V to 120V.

1

7 Attachments

About

The LNEX Battery Monitor is a high precision device (also known as coulometer), which can test the voltage, current, and capacity of a battery to help users know the state of charge at any time. The LNEX Battery Monitor has a memory function which allows users to set a low voltage capacity alarm. It is suitable for RV, electric vehicle, portable power station, e-bike, electric wheelchairs, and so on.

Package List

LCD Interface*1
10ft (3m) Shielded Wire*1
hand wrench*1

500A Shunt/Sampler*1
10ft (3m)20 AWG B+ Wire*1
250A Battery Terminals *2

Parameter

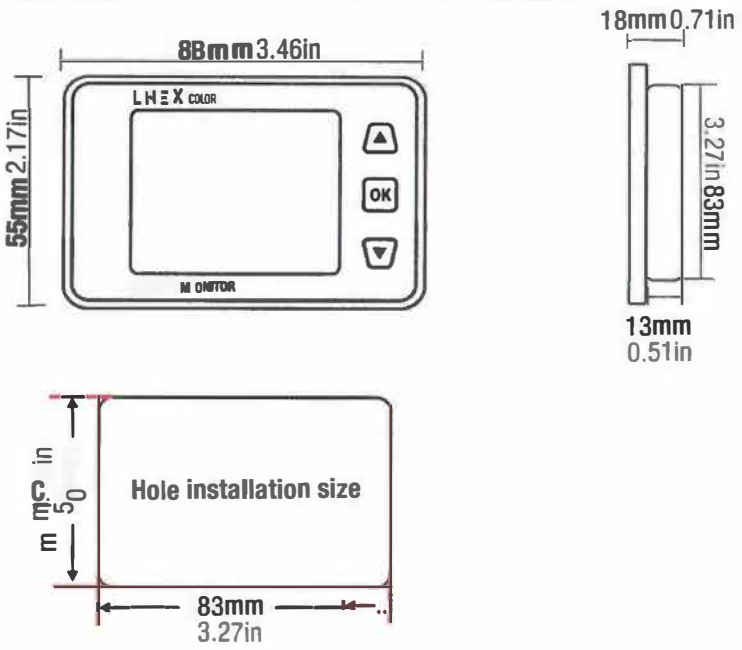
2

Model		VA9810	
Measuring range	Voltage	8V~100V	
	Current	0.2A~500A	
	Capacity	0.1AH~99999AH	
	Power value	60KW	
Accuracy	Voltage	±1%	
	Current	±1%	
Display		2.4 inch color LCD display	
Power consumption		Working：0.3W	Static：0.2W
Communication baud rate		9600bps	
Measurement rate		20 times/sec	
Display board size		88*18*55mm	
Shunt size		86*37*50mm	

3

7 Attachments

Dimension



4

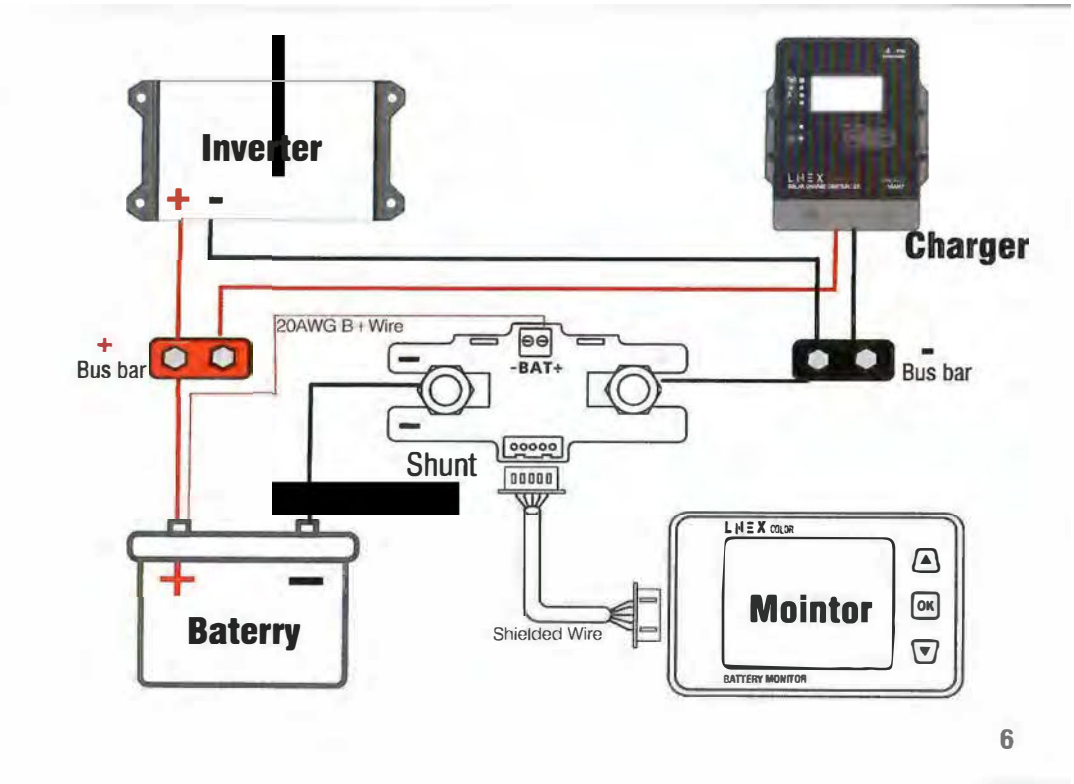
Installation

- First, connect the Shunt in series to the negative circuit of your battery. B- of shunt connects to B- of the battery. P- of shunt connects to P- of output and C- of charge.
- Then take a wire of 0.3-0.75 mm². One end of the wire connects to positive of battery,another end connects to B+ of Shunt .
- Finally connect the Shunt to the LNEX Battery Monitor by the shielded wire and the screen of the LNEX Battery Monitor display should turn on.

Attention: Please connect as shown. The shunt must be series connected to the negative circuit, DO NOT connect to the positive circuit.

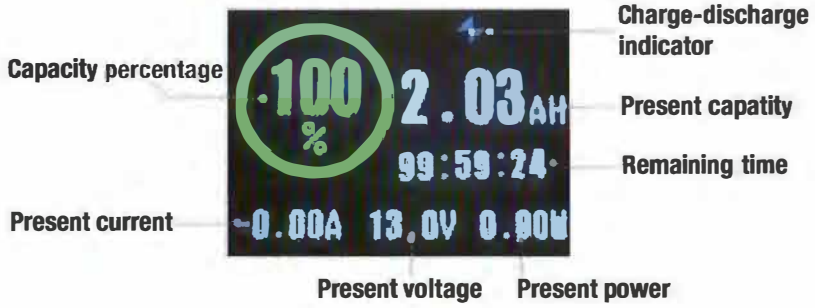
5

7 Attachments



6

Operation



use steps

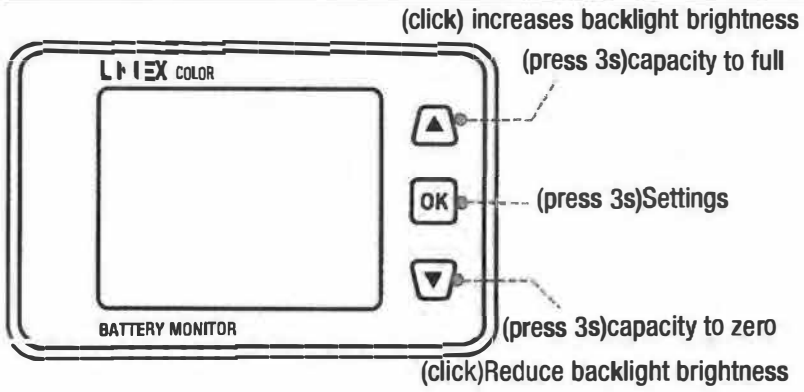
1. Connect and check the current: Power on after completing the connection as shown, the screen should display capacity percentage.If the screen has no response, please check the connection. Then charge or discharge the battery and check whether the display current is equal to the actual current. If the deviation is large, please check the connection.

7

2. Capacity calibration: On first use, the percentage and capacity are not the actual value,you need to calibrate the capacity to either 100% or 0%.
First set the usable AH capacity of the battery as the preset AH capacity.For Lithium and Sealed Lead Acid batteries to calibrate to 100% charge the battery fully and hold the "up" key for 3s to set the capacity to 100%.For Lithium batteries to calibrate to 0%discharge the battery completely and hold the"down" button key for 3s to set the capacity to zero.
This will only have to be done on initial installation of the LNEX Battery Monitor or if the Battery Bank is replaced.
3. Check and reset the actual capacity: If you find the displayed capacity doesn't match the actual capacity during use, please check and reset the actual capacity.
For Lithium batteries discharge the battery to 0% and hold the "down" key for 3s to set the capacity to 0, then set the preset capacity as large as possible.
Now charge the battery fully and the displayed AH capacity should be the actual usable capacity. Then set the displayed AH capacity as the preset AH capacity.
For Sealed Lead Acid batteries it is recommended to set the AH lower than the usable rating after conducting a capacity test or consulting the battery manufacturer.

8

User settings



Enter the parameter setting function, short press the ▼ or ▲ key to switch the setting parameters, short press the OK key to select the adjustment parameter, short press the ▼ key to switch the step value of the adjustment parameter, short press the ▲key to change the parameter value, long press the "OK" key for 5 seconds The above exits the parameter setting function and saves the data.

9

7 Attachments

Setting lists

01."CLR" current clearing function, when the no-load current is not zero, enter this option, click the up button to clear the no-load current.

02."BAT" sets the capacity of the battery, An initial capacity has been set at the factory, please set it according to the real capacity of your battery.

03."BPC" sets the percentage of remaining capacity,please set it according to the real capacity of your battery.

04."LED" sets the backlight brightness of the LCD display, 0-10 is set according to the needs. The higher the level, the higher the brightness.

05. "STE" sets the value of the LCD screen entering sleep standby time. When the running time is greater than the set value, the LCD screen will turn off.

06. "STI" sets the sleep standby current value, when the measured current is less than the set value , the LCD will go into a low power sleep mode, When the battery current rises over set value the LCD will wake up.**("STE"must be turned on, otherwise the setting is invalid).**

07."BKC" sets the color model of the LCD interface, with black and white and color

options available;

08."LBR" backlight breathing light alarm effect switch, when the remaining power is less than 20% or the voltage is lower than LVP, it will flash and alarm, and it will also display breathing when the charging current is greater than STI.

09."PAI" current is corrected to 0; after the no-load current is cleared, the shunt has a temperature drift so that the current value is not zero;Parameter setting can be performed, the current value is lower than the set value, and the current current value is zero.

10. "LVP" battery low voltage alarm value; When the voltage is lower than the set value, the capacity will be automatically set to 0%.

7 Attachments

Troubleshooting

- When the battery current is low the LNEX Battery Monitor will enter a low power (sleep mode) and the backlight will turn off, press any button and the backlight will turn on .
- When the current changes frequently the data acquisition may produce an error, and it may affect the accuracy.
- When charging or discharging. The LNEX Battery Monitor will be working and the capacity displayed will be real-time numbers.
- When the battery is charging, the monitor shows a negative amp reading, and when using the battery, it shows positive amps, the B- and P- of the shunt are wired inversely.

12

SAFETY DATA SHEET

According to OSHA Hazard Communication Standard, 29 CFR 1910.1200

Shell Tellus S2 MX 46

Version	Revision Date:	SDS Number:	Print Date: 05/01/2018
1.1	04/30/2018	800010026152	Date of last issue: 04/11/2016

SECTION 1. IDENTIFICATION

Product name : Shell Tellus S2 MX 46

Product code : 001F8439

Manufacturer or supplier's details

Manufacturer/Supplier : **Shell Oil Products US**
PO Box 4427
Houston TX 77210-4427
USA

SDS Request : (+1) 877-276-7285

Customer Service :

Emergency telephone number

Spill Information : 877-504-9351

Health Information : 877-242-7400

Recommended use of the chemical and restrictions on use

Recommended use : Hydraulic oil

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with 29 CFR 1910.1200

Based on available data this substance / mixture does not meet the classification criteria.

GHS label elements

Hazard pictograms : No Hazard Symbol required

Signal word : No signal word

Hazard statements : PHYSICAL HAZARDS:
Not classified as a physical hazard under GHS criteria.
HEALTH HAZARDS:
Not classified as a health hazard under GHS criteria.
ENVIRONMENTAL HAZARDS:
Not classified as an environmental hazard under GHS criteria.

Precautionary statements :

Prevention:

No precautionary phrases.

Response:

No precautionary phrases.

Storage:

No precautionary phrases.

Disposal:

No precautionary phrases.

Other hazards which do not result in classification

Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.
Used oil may contain harmful impurities.
High-pressure injection under the skin may cause serious damage including local necrosis.
Not classified as flammable but will burn.
The classification of this material is based on OSHA HCS 2012 criteria.
Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Highly refined mineral oils and additives.
The highly refined mineral oil contains <3% (w/w) DMSO-extract, according to IP346.

* contains one or more of the following CAS-numbers: 64742-53-6, 64742-54-7, 64742-55-8, 64742-56-9, 64742-65-0, 68037-01-4, 72623-86-0, 72623-87-1, 8042-47-5, 848301-69-9.

Hazardous components

Chemical name	Synonyms	CAS-No.	Concentration (% w/w)
Interchangeable low viscosity base oil (<20,5 cSt @40°C) *		Not Assigned	0 - 90

SECTION 4. FIRST-AID MEASURES

If inhaled : No treatment necessary under normal conditions of use.
If symptoms persist, obtain medical advice.

In case of skin contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available.
If persistent irritation occurs, obtain medical attention.

When using high pressure equipment, injection of product under the skin can occur. If high pressure injuries occur, the casualty should be sent immediately to a hospital. Do not wait for symptoms to develop.
Obtain medical attention even in the absence of apparent wounds.

In case of eye contact : Flush eye with copious quantities of water.
Remove contact lenses, if present and easy to do. Continue rinsing.
If persistent irritation occurs, obtain medical attention.

If swallowed	:	In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.
Most important symptoms and effects, both acute and delayed	:	Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the skin of exposed areas. Ingestion may result in nausea, vomiting and/or diarrhoea. Local necrosis is evidenced by delayed onset of pain and tissue damage a few hours following injection.
Protection of first-aiders	:	When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.
Indication of any immediate medical attention and special treatment needed	:	Treat symptomatically. High pressure injection injuries require prompt surgical intervention and possibly steroid therapy, to minimise tissue damage and loss of function. Because entry wounds are small and do not reflect the seriousness of the underlying damage, surgical exploration to determine the extent of involvement may be necessary. Local anaesthetics or hot soaks should be avoided because they can contribute to swelling, vasospasm and ischaemia. Prompt surgical decompression, debridement and evacuation of foreign material should be performed under general anaesthetics, and wide exploration is essential.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use water in a jet.
Specific hazards during fire-fighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Special protective equipment for firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to

relevant Standards (e.g. Europe: EN469).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Avoid contact with skin and eyes.
Environmental precautions	:	Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Local authorities should be advised if significant spillages cannot be contained.
Methods and materials for containment and cleaning up	:	Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
Additional advice	:	For guidance on selection of personal protective equipment see Chapter 8 of this Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Safety Data Sheet.

SECTION 7. HANDLING AND STORAGE

Technical measures	:	Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Advice on safe handling	:	Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Avoidance of contact	:	Strong oxidising agents.
Product Transfer	:	This material has the potential to be a static accumulator. Proper grounding and bonding procedures should be used during all bulk transfer operations.
Further information on stor-	:	Keep container tightly closed and in a cool, well-ventilated

age stability		place. Use properly labeled and closable containers. Store at ambient temperature.
Packaging material	:	Suitable material: For containers or container linings, use mild steel or high density polyethylene. Unsuitable material: PVC.
Container Advice	:	Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Oil mist, mineral	Not Assigned	TWA (Mist)	5 mg/m3	OSHA Z-1
Oil mist, mineral		TWA (Inhalable fraction)	5 mg/m3	ACGIH

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.
National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/
Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/
Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/
Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp
L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

Engineering measures	:	The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is

greater potential for airborne concentrations to be generated.

General Information:
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or subsequent recycle.
Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.

Personal protective equipment

Respiratory protection : No respiratory protection is ordinarily required under normal conditions of use.
In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material.
If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation.
Check with respiratory protective equipment suppliers.
Where air-filtering respirators are suitable, select an appropriate combination of mask and filter.
Select a filter suitable for the combination of organic gases and vapours [Type A/Type P boiling point >65°C (149°F)].

Hand protection
Remarks : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.
Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for >

480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model.

Eye protection : If material is handled such that it could be splashed into eyes, protective eyewear is recommended.

Skin and body protection : Skin protection is not ordinarily required beyond standard work clothes.
It is good practice to wear chemical resistant gloves.

Protective measures : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Thermal hazards : Not applicable

Environmental exposure controls

General advice : Take appropriate measures to fulfill the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Chapter 6. If necessary, prevent undissolved material from being discharged to waste water. Waste water should be treated in a municipal or industrial waste water treatment plant before discharge to surface water.
Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Liquid at room temperature.

Colour : clear

Odour : Slight hydrocarbon

Odour Threshold : Data not available

pH : Not applicable

pour point : -30 °C / -22 °F
Method: ISO 3016

Initial boiling point and boiling range : > 280 °C / 536 °F
estimated value(s)

Flash point	:	230 °C / 446 °F Method: ISO 2592
Evaporation rate	:	Data not available
Flammability (solid, gas)	:	Data not available
Upper explosion limit / upper flammability limit	:	Typical 10 %(V)
Lower explosion limit / Lower flammability limit	:	Typical 1 %(V)
Vapour pressure	:	< 0.5 Pa (20 °C / 68 °F) estimated value(s)
Relative vapour density	:	> 1 estimated value(s)
Relative density	:	0.856 (15 °C / 59 °F)
Density	:	856 kg/m3 (15.0 °C / 59.0 °F) Method: ISO 12185
Solubility(ies)		
Water solubility	:	negligible
Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	log Pow: > 6 (based on information on similar products)
Auto-ignition temperature	:	> 320 °C / 608 °F
Decomposition temperature	:	Data not available
Viscosity		
Viscosity, dynamic	:	Data not available
Viscosity, kinematic	:	46 mm2/s (40.0 °C / 104.0 °F) Method: ISO 3104 6.9 mm2/s (100 °C / 212 °F) Method: ISO 3104 580 mm2/s (0 °C / 32 °F)

		Method: ISO 3104
Explosive properties	:	Not classified
Oxidizing properties	:	Data not available
Conductivity	:	This material is not expected to be a static accumulator.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph.
Chemical stability	:	Stable.
Possibility of hazardous reactions	:	Reacts with strong oxidising agents.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	No decomposition if stored and applied as directed.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment	:	Information given is based on data on the components and the toxicology of similar products.Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Information on likely routes of exposure
Skin and eye contact are the primary routes of exposure although exposure may occur following accidental ingestion.

Acute toxicity

Product:

Acute oral toxicity	:	LD50 (rat): > 5,000 mg/kg Remarks: Low toxicity: Based on available data, the classification criteria are not met.
Acute inhalation toxicity	:	Remarks: Based on available data, the classification criteria are not met.
Acute dermal toxicity	:	LD50 (Rabbit): > 5,000 mg/kg Remarks: Low toxicity: Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Product:

Remarks: Slightly irritating to skin., Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis., Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation

Product:

Remarks: Slightly irritating to the eye., Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation

Product:

Remarks: Not a skin sensitiser.
Based on available data, the classification criteria are not met.

Germ cell mutagenicity

Product:

: Remarks: Non mutagenic, Based on available data, the classification criteria are not met.

Carcinogenicity

Product:

Remarks: Not a carcinogen., Based on available data, the classification criteria are not met.

Remarks: Product contains mineral oils of types shown to be non-carcinogenic in animal skin-painting studies., Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer (IARC).

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
OSHA	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Reproductive toxicity

Product:

:

Remarks: Not a developmental toxicant., Does not impair fertility., Based on available data, the classification criteria are not met.

STOT - single exposure

Product:
Remarks: Based on available data, the classification criteria are not met.

STOT - repeated exposure

Product:
Remarks: Based on available data, the classification criteria are not met.

Aspiration toxicity

Product:
Not an aspiration hazard.

Further information

Product:
Remarks: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal., ALL used oil should be handled with caution and skin contact avoided as far as possible.

Remarks: High pressure injection of product into the skin may lead to local necrosis if the product is not surgically removed.

Remarks: Slightly irritating to respiratory system.

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment : Ecotoxicological data have not been determined specifically for this product.
Information given is based on a knowledge of the components and the ecotoxicology of similar products.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).(LL/EL/IL50 expressed as the nominal amount of product required to prepare aqueous test extract).

Ecotoxicity

Product:

Toxicity to fish (Acute toxicity) :
Remarks: LL/EL/IL50 > 100 mg/l
Practically non toxic:
Based on available data, the classification criteria are not met.

Toxicity to daphnia and other aquatic invertebrates (Acute toxicity)	:	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to algae (Acute toxicity)	:	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to fish (Chronic toxicity)	:	Remarks: Data not available
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	Remarks: Data not available
Toxicity to microorganisms (Acute toxicity)	:	Remarks: Data not available

Persistence and degradability

Product:

Biodegradability	:	Remarks: Not readily biodegradable. Major constituents are inherently biodegradable, but contains components that may persist in the environment.

Bioaccumulative potential

Product:

Bioaccumulation	:	Remarks: Contains components with the potential to bioaccumulate.

Mobility in soil

Product:

Mobility	:	Remarks: Liquid under most environmental conditions. If it enters soil, it will adsorb to soil particles and will not be mobile. Remarks: Floats on water.

Other adverse effects

Product:

Additional ecological information	:	Does not have ozone depletion potential, photochemical ozone creation potential or global warming potential. Product is a mixture of non-volatile components, which will not be released to air in any significant quantities under normal conditions of use.

Poorly soluble mixture.
Causes physical fouling of aquatic organisms.

Mineral oil does not cause chronic toxicity to aquatic organisms at concentrations less than 1 mg/l.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses

Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment.
Waste, spills or used product is dangerous waste.

Contaminated packaging : Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand. Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Local legislation

Remarks : Disposal should be in accordance with applicable regional, national, and local laws and regulations.

SECTION 14. TRANSPORT INFORMATION

National Regulations

US Department of Transportation Classification (49 CFR Parts 171-180)

Not regulated as a dangerous good

International Regulations

IATA-DGR
Not regulated as a dangerous good

IMDG-Code
Not regulated as a dangerous good

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied. MARPOL Annex 1 rules apply for bulk shipments by sea.

Special precautions for user

Remarks : Special Precautions: Refer to Chapter 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know Act

*: This material does not contain any components with a CERCLA RQ., Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : No SARA Hazards

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Water Act

This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.

US State Regulations

Pennsylvania Right To Know

Zinc dialkyldithiophosphate	4259-15-8

California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

The components of this product are reported in the following inventories:

EINECS : All components listed or polymer exempt.

TSCA : All components listed.

DSL : All components listed.

SECTION 16. OTHER INFORMATION

Further information

NFPA Rating (Health, Fire, Reactivity)	0, 1, 0

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
OSHA Z-1	:	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
ACGIH / TWA	:	8-hour, time-weighted average
OSHA Z-1 / TWA	:	8-hour time weighted average
Abbreviations and Acronyms	:	The standard abbreviations and acronyms used in this document can be looked up in reference literature (e.g. scientific dictionaries) and/or websites. ACGIH = American Conference of Governmental Industrial Hygienists ADR = European Agreement concerning the International Carriage of Dangerous Goods by Road AICS = Australian Inventory of Chemical Substances ASTM = American Society for Testing and Materials BEL = Biological exposure limits BTEX = Benzene, Toluene, Ethylbenzene, Xylenes CAS = Chemical Abstracts Service CEFIC = European Chemical Industry Council CLP = Classification Packaging and Labelling COC = Cleveland Open-Cup DIN = Deutsches Institut fur Normung DMEL = Derived Minimal Effect Level DNEL = Derived No Effect Level DSL = Canada Domestic Substance List EC = European Commission EC50 = Effective Concentration fifty ECETOC = European Center on Ecotoxicology and Toxicology Of Chemicals ECHA = European Chemicals Agency EINECS = The European Inventory of Existing Commercial Chemical Substances EL50 = Effective Loading fifty ENCS = Japanese Existing and New Chemical Substances Inventory EWC = European Waste Code GHS = Globally Harmonised System of Classification and Labelling of Chemicals IARC = International Agency for Research on Cancer IATA = International Air Transport Association IC50 = Inhibitory Concentration fifty IL50 = Inhibitory Level fifty IMDG = International Maritime Dangerous Goods INV = Chinese Chemicals Inventory IP346 = Institute of Petroleum test method N° 346 for the determination of polycyclic aromatics DMSO-extractables KECI = Korea Existing Chemicals Inventory LC50 = Lethal Concentration fifty LD50 = Lethal Dose fifty per cent.

LL/EL/IL = Lethal Loading/Effective Loading/Inhibitory loading
LL50 = Lethal Loading fifty
MARPOL = International Convention for the Prevention of Pollution From Ships
NOEC/NOEL = No Observed Effect Concentration / No Observed Effect Level
OE_HPV = Occupational Exposure - High Production Volume
PBT = Persistent, Bioaccumulative and Toxic
PICCS = Philippine Inventory of Chemicals and Chemical Substances
PNEC = Predicted No Effect Concentration
REACH = Registration Evaluation And Authorisation Of Chemicals
RID = Regulations Relating to International Carriage of Dangerous Goods by Rail
SKIN_DES = Skin Designation
STEL = Short term exposure limit
TRA = Targeted Risk Assessment
TSCA = US Toxic Substances Control Act
TWA = Time-Weighted Average
vPvB = very Persistent and very Bioaccumulative

A vertical bar (|) in the left margin indicates an amendment from the previous version.

Sources of key data used to compile the Safety Data Sheet	:	The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).
Revision Date	:	04/30/2018

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

US / EN

TROJAN BATTERY COMPANY

DATA SHEET

MOTIVE T875-AES

MODEL **T875-AES**
VOLTAGE **8**
CAPACITY **158Ah @ 20Hr**
MATERIAL **Polypropylene**
BATTERY **VRLA AGM / Non-Spillable / Maintenance-Free**
COLOR **Maroon**
WATERING **No Watering Required**

8 VOLT

PHYSICAL SPECIFICATIONS

BCI	MODEL NAME	TERMINAL TYPE	DIMENSIONS [C] INCHES (mm)			WEIGHT [I] LBS. (kg)	HANDLES	INSTALLATION ORIENTATION
			LENGTH	WIDTH	HEIGHT [F]			
GC8	T875-AES	M8/AP/LT	10.30 (262)	7.06 (179)	10.73 (273)	72 (33)	Embedded	Horizontal and Vertical

ELECTRICAL SPECIFICATIONS

VOLTAGE	CRANKING PERFORMANCE		CAPACITY [A] MINUTES		CAPACITY [B] AMP-HOURS (Ah)				ENERGY (kWh)	INTERNAL RESISTANCE (mΩ)	SHORT CIRCUIT CURRENT (amps)
	C.C.A.[D] @0°F	C.A.[E] @32°F	@ 25 Amps	@ 56 Amps	5-Hr	10-Hr	20-Hr	100-Hr	100-Hr		
8	–	–	310	120	131	142	158	169	1.35	3.0	2780

CHARGING INSTRUCTIONS

CHARGER VOLTAGE SETTINGS (AT 77°F/25°C)			
SYSTEM VOLTAGE	**8V**	**24V**	**48V**
Maximum Charge Current (A)	50% of C_{20}		
Absorption Voltage (2.40 V/cell)	9.60	28.80	57.60
Float Voltage (2.25 V/cell)	9.00	27.00	54.00

Do not install or charge batteries in a sealed or non-ventilated compartment. Constant under or overcharging will damage the battery and shorten its life as with any battery.

CHARGING TEMPERATURE COMPENSATION

ADD	SUBTRACT
0.005 volt per cell for every 1°C below 25°C 0.0028 volt per cell for every 1°F below 77°F	0.005 volt per cell for every 1°C above 25°C 0.0028 volt per cell for every 1°F above 77°F

OPERATIONAL DATA

OPERATING TEMPERATURE	SELF DISCHARGE
-40°F to 140°F (-40°C to +60°C). At temperatures below 32°F (0°C) maintain a state of charge greater than 60%.	Less than 3% per month depending on storage temperature conditions

RECYCLE RESPONSIBLY

STATE OF CHARGE MEASURE OF OPEN-CIRCUIT VOLTAGE

PERCENTAGE CHARGE	CELL	8 VOLT
100	2.14	8.56
75	2.09	8.36
50	2.04	8.16
25	1.99	7.96
0	1.94	7.76

SAFETY DATA SHEET

1. Identification

Product identifier **Valve Regulated Lead-Acid Battery – Absorbed Glass Mat (VRLA/AGM)**

Other means of identification

SDS number 20220001USEN

Synonyms VRLA/AGM

Recommended use Industrial/commercial electric storage battery.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer C&D Technologies, Inc.
Industrial del Norte S/N
Reynosa, Tamaulipas, Mexico

Corporate address 200 Precision Road
Horsham, PA 19044, USA

Website www.cdtechno.com

Telephone (562) 236-3000 or (800) 423-6569

Technical contact numbers +1(978) 727-2206 or +1(610) 858-6192

Emergency telephone CHEMTREC (24 hour assistance)
Toll Free (North America): 1-800-424-9300
International: +1-703-527-3887

2. Hazard(s) identification

Physical hazards	Corrosive to metals	Category 1
Health hazards	Skin corrosion/irritation	Category 1A
	Serious eye damage/eye irritation	Category 1
	Carcinogenicity	Category 2
	Reproductive toxicity	Category 1A
	Reproductive toxicity	Effects on or via lactation
	Specific target organ toxicity, repeated exposure	Category 1 (blood, central nervous system, kidneys)
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement

The materials contained in this product may only represent a hazard if the integrity of the cell or battery is compromised. Listed below are the hazards anticipated when the battery is physically, thermally, or electrically abused:

May be corrosive to metals. Causes severe skin burns and eye damage. Suspected of causing cancer. May damage fertility or the unborn child. May cause harm to breast-fed children. Causes damage to organs (blood, central nervous system, kidneys) through prolonged or repeated exposure. Very toxic to aquatic life with long lasting effects. The product is an article and therefore the classification requirements do not apply.

Precautionary statement

Prevention

Keep out of reach of children. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep only in original container. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid contact during pregnancy/while nursing. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.

Response

If exposed or concerned: Get medical advice/attention. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor. If inhaled: Remove person to fresh air and keep comfortable for breathing. Absorb spillage to prevent material damage. Collect spillage.

Storage

Store locked up. Store in corrosive resistant container with a resistant inner liner.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC)

None known.

Supplemental information

Under normal conditions of processing and use, exposure to the chemical constituents in this product is unlikely. Batteries may get hot, explode or ignite and cause serious injury if mishandled, crushed or abused. When exposed to heat, when short circuited, or when exposed to incompatible materials, the battery may rupture and release hazardous substances. These substances can explode and burn. Burning batteries may emit toxic fumes.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Lead	7439-92-1	70.7
Sulfuric acid	7664-93-9	19.4
Tin	7440-31-5	0.35
Calcium	7440-70-2	0.05

Case and Separators

Chemical name	Common name and synonyms	CAS number	%
Polypropylene		9003-07-0	7
Silica		112926-00-8	2.5

Composition comments

The ingredients listed in section 3 are contained in a sealed container. Risk of exposure only occurs if battery is mechanically, thermally or electrically abused.
All concentrations are in percent by weight.

4. First-aid measures

Inhalation

Exposure to contents of an open or damaged battery: Move to fresh air. Oxygen or artificial respiration if needed. Get medical attention immediately.

Skin contact

Exposure to contents of an open or damaged battery: Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact

Exposure to contents of an open or damaged battery: Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.

Ingestion

Exposure to contents of an open or damaged battery: Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed	Under normal conditions of intended use, this product is not expected to be a health risk. Exposure to contents of an open or damaged battery: Narcosis. Behavioral changes. Decrease in motor functions. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Prolonged exposure may cause chronic effects.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed.
General information	IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Suitable extinguishing media	Foam. Special powder against metal fires. Dry sand.
Unsuitable extinguishing media	Leak from a damaged or opened battery: Do not use water unless flooding amounts are available. Do not use carbon dioxide directly on cells.
Specific hazards arising from the chemical	In the event of fire and/or explosion do not breathe fumes. During fire, hazardous combustion products are released that may include: Carbon oxides. Sulfur oxides. Fumes of metal oxides. Hydrogen and oxygen gases are produced in the cells during normal battery operation (hydrogen is flammable and oxygen supports combustion). These gases enter the air through the vent caps. To avoid the chance of fire or explosion, keep sparks and other sources of ignition away from battery.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire fighting equipment/instructions	Fight fire from protected location or safe distance. Keep upwind. Move containers from fire area if you can do so without risk. Avoid discharge into drains, water courses or onto the ground.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	Under normal use, the battery does not exhibit flammable properties. In the event that the battery is abused and disassembly of the battery occurs resulting in exposure of internal components, the exposed solution may be flammable and/or corrosive. Exposure to excessive heat may lead to venting or rupture of the sealed battery, exposing the internal components which may be corrosive and/or flammable. Vented gas would be flammable when in sufficient concentration.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. In the event of damage resulting in a leak or exposed materials, avoid contact with contents of an open or damaged cell or battery. Wear protective clothing as described in Section 8 of this safety data sheet.
Methods and materials for containment and cleaning up	Leak from a damaged or opened battery: Contain spillage with sand or earth. Place in a designated labeled waste container, dispose as hazardous waste. For waste disposal, see Section 13 of the SDS.
Environmental precautions	Avoid allowing material from exposed battery to contaminate soil, sanitary sewers, or waterways.

7. Handling and storage

Precautions for safe handling	Do not allow conductive material to touch the battery terminals. A dangerous short-circuit may occur and cause battery failure and fire. Protect against physical damage. Do not open, disassemble, crush or burn battery. Do not expose battery to extreme heat or fire. Elevated temperatures can result in reduced battery service life. Wash hands thoroughly after handling. Do not release into the environment. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store locked up. Keep out of reach of children. Prevent short circuits. Store in original packaging. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep at room temperature. Avoid contact with water and moisture. Protect from heat and direct sunlight. Inspect periodically for damage or leaks. Store away from incompatible materials (See Section 10).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Components	Type	Value
Lead (CAS 7439-92-1)	TWA	0.05 mg/m3

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Sulfuric acid (CAS 7664-93-9)	PEL	1 mg/m3

US. OSHA Table Z-3 (29 CFR 1910.1000)

Case and Separators	Type	Value	Form
Silica (CAS 112926-00-8)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		0.8 mg/m3	
		20 mppcf	

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Lead (CAS 7439-92-1)	TWA	0.05 mg/m3	
Sulfuric acid (CAS 7664-93-9)	TWA	0.2 mg/m3	Thoracic fraction.

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Lead (CAS 7439-92-1)	TWA	0.05 mg/m3
Sulfuric acid (CAS 7664-93-9)	TWA	1 mg/m3

Case and Separators	Type	Value
Silica (CAS 112926-00-8)	TWA	6 mg/m3

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Lead (CAS 7439-92-1)	200 µg/l	Lead	Blood	*

* - For sampling details, please see the source document.

Exposure guidelines Airborne exposures to hazardous substances are not expected when product is used for its intended purpose.

Appropriate engineering controls Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection Leak from a damaged or opened battery: Use approved safety goggles or face shield.

Skin protection

Hand protection Leak from a damaged or opened battery: Wear chemical-resistant, impervious gloves.
Full contact: Glove material: Nitrile. Use gloves with breakthrough time of 30 minutes. Minimum glove thickness 12 mil.
Incidental contact: Glove material: Nitrile. Use gloves with breakthrough time of 10 minutes. Minimum glove thickness 5 mil.
Other suitable gloves can be recommended by the glove supplier.

Other None under normal conditions. Leak from a damaged or opened battery: Wear suitable coveralls to prevent exposure to the skin.

Respiratory protection None under normal conditions. Leak from a damaged or opened battery: In case of insufficient ventilation, wear suitable respiratory equipment.

Thermal hazards No protection is ordinarily required under normal conditions of use.

General hygiene considerations Do not store food, drink and tobacco near the product. Wash hands after handling. Practice good housekeeping. Observe good industrial hygiene practices.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Battery.
Color	No data available.
Odor	Odorless. If leaking: sharp, penetrating, pungent odor for internal components.
Odor threshold	Not applicable unless individual components exposed.
pH	> 1 - < 2 (Sulfuric acid/battery electrolyte)
Melting point/freezing point	Not applicable unless individual components exposed.
Initial boiling point and boiling range	> 410 - < 473 °F (> 210 - < 245 °C) (Sulfuric acid/battery electrolyte)
Flash point	Not applicable unless individual components exposed.
Evaporation rate	< 1 (n-Butyl acetate=1) (Sulfuric acid/battery electrolyte)
Flammability (solid, gas)	Contains one or more components that will burn if involved in a fire.
Upper/lower flammability or explosive limits	
Explosive limit - lower (%)	Not applicable unless individual components exposed.
Explosive limit - upper (%)	Not applicable unless individual components exposed.
Vapor pressure	10 mmHg (Sulfuric acid/battery electrolyte)
Vapor density	> 1 (Air=1) (Sulfuric acid/battery electrolyte)
Relative density	> 1.215 - < 1.32 (Water=1) (Sulfuric acid/battery electrolyte)
Solubility(ies)	
Solubility (water)	100 % (Sulfuric acid/battery electrolyte)
Partition coefficient (n-octanol/water)	Not applicable unless individual components exposed.
Auto-ignition temperature	Not applicable unless individual components exposed.
Decomposition temperature	Not applicable unless individual components exposed.
Viscosity	Not applicable unless individual components exposed.
Other information	
Density	> 1.215 - < 1.32 g/cm³ (Sulfuric acid/battery electrolyte)
Explosive properties	Not explosive.
Kinematic viscosity	Not applicable unless individual components exposed.
Oxidizing properties	Not oxidizing.
Particle size	Not applicable unless individual components exposed.

10. Stability and reactivity

Reactivity	Exposure to contents of an open or damaged battery: May be corrosive to metals. Reacts with water with release of heat.
Chemical stability	Product is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use. Exposure to contents of an open or damaged battery: Contact with metals may evolve flammable hydrogen gas.
Conditions to avoid	Heat, sparks, flames, elevated temperatures. Protect against direct sunlight. Water, moisture. Shocks and physical damage. Do not open, disassemble, crush or burn battery. Do not allow conductive material to touch the battery terminals. A dangerous short-circuit may occur and cause battery failure and fire.
Incompatible materials	Strong oxidizing agents. Strong reducing agents. Combustibles. Organic material. Metals. Water. Bases. Halides. Halogenated compounds. Potassium nitrate. Permanganates. Peroxides. Bromine azide.
Hazardous decomposition products	Irritating and/or toxic fumes and gases may be emitted upon the products decomposition. Sulfur trioxide. Carbon oxides. Sulfuric acid mist. Sulfur dioxide. Hydrogen sulfide. Arsine gas. Fumes of metal oxides.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Under normal conditions of intended use, this material is not expected to be an inhalation hazard. Exposure to contents of an open or damaged battery: Prolonged or excessive inhalation may cause respiratory tract irritation.

Skin contact	Under normal conditions of intended use, this material does not pose a skin hazard. Exposure to contents of an open or damaged battery: Causes skin burns.
Eye contact	Under normal conditions of intended use, this material does not pose an eye hazard. Exposure to contents of an open or damaged battery: Causes serious eye damage.
Ingestion	Under normal conditions of intended use, this material does not pose a risk to health. Exposure to contents of an open or damaged battery: May have a corrosive effect on the digestive canal.
Symptoms related to the physical, chemical and toxicological characteristics	Under normal conditions of intended use, this product is not expected to be a health risk. Exposure to contents of an open or damaged battery: Narcosis. Behavioral changes. Decrease in motor functions. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Prolonged exposure may cause chronic effects.

Information on toxicological effects

Acute toxicity Not expected to be acutely toxic.

Components	Species	Test Results
Sulfuric acid (CAS 7664-93-9)		
Acute		
Oral		
LD50	Rat	2140 mg/kg

Case and Separators	Species	Test Results
Silica (CAS 112926-00-8)		
Acute		
Dermal		
LD50	Rabbit	> 2000 mg/kg
Inhalation		
LC50	Rat	> 2200 mg/m³, 4 hours
Oral		
LD50	Rat	> 5000 mg/kg

Skin corrosion/irritation	Exposure to contents of an open or damaged battery: Causes skin burns.
Serious eye damage/eye irritation	Exposure to contents of an open or damaged battery: Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	Exposure to contents of an open or damaged battery: Suspected of causing cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Lead (CAS 7439-92-1)	2B Possibly carcinogenic to humans.
Polypropylene (CAS 9003-07-0)	3 Not classifiable as to carcinogenicity to humans.
Silica (CAS 112926-00-8)	3 Not classifiable as to carcinogenicity to humans.

NTP Report on Carcinogens

Lead (CAS 7439-92-1)	Reasonably Anticipated to be a Human Carcinogen.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Reproductive toxicity	Exposure to contents of an open or damaged battery: May damage fertility or the unborn child. May cause harm to breastfed babies.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Exposure to contents of an open or damaged battery: Causes damage to organs (blood, central nervous system, kidneys) through prolonged or repeated exposure.
Aspiration hazard	Not an aspiration hazard.

Chronic effects Exposure to contents of an open or damaged battery: Causes damage to organs through prolonged or repeated exposure. Lead may produce maternal toxicity, toxicity to the fetus, and adverse effects to blood, bone marrow, central/peripheral nervous systems, kidney, liver, and reproductive system. Prolonged exposure may cause chronic effects.

Further information Exposure to hazardous ingredients is not anticipated under normal conditions of use.

12. Ecological information

Ecotoxicity No ecological impacts expected under normal use conditions.
The hazards listed below are only anticipated when the integrity of a battery casing is compromised:
Very toxic to aquatic life with long lasting effects.

Components		Species	Test Results
Lead (CAS 7439-92-1)			
Aquatic			
Acute			
Crustacea	EC50	Ceriodaphnia dubia	0.248 mg/l, 48 hours pH8
Fish	LC50	Pimephales promelas	0.283 mg/l, 96 hours pH8
Sulfuric acid (CAS 7664-93-9)			
Aquatic			
Acute			
Crustacea	EC50	Daphnia magna	29 mg/l, 24 Hours
Fish	LC50	Lepomis macrochirus	> 16 - < 28 mg/l, 96 Hours
Chronic			
Crustacea	NOEC	Invertebrates (Invertebrates)	0.15 mg/l
Fish	NOEC	Brook trout (Salvelinus fontinalis)	0.13 mg/l

Persistence and degradability The product contains inorganic compounds which are not biodegradable.

Bioaccumulative potential The product contains potentially bioaccumulating substances.

Partition coefficient n-octanol / water (log Kow)
Sulfuric acid (CAS 7664-93-9) -2.2

Mobility in soil The product is not mobile in soil. Some components from a leaking battery may be mobile.

Other adverse effects This product contains one or more substances identified as hazardous air pollutants (HAPs) per the US Federal Clean Air Act (see section 15).

13. Disposal considerations

Disposal instructions Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]
D008: Waste Lead
The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

General information

DOT: Not regulated per 49 CFR 173.159a
IATA/ICAO: Not regulated per Special Provision A67
IMDG: Not regulated per Special Provision #238
Label: NONSPILLABLE

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Lead (CAS 7439-92-1)	0.1 % Annual Export Notification required.

CERCLA Hazardous Substance List (40 CFR 302.4)

Lead (CAS 7439-92-1)	Listed.
Sulfuric acid (CAS 7664-93-9)	Listed.

SARA 304 Emergency release notification

Sulfuric acid (aerosol forms only) (CAS 7664-93-9)	1000 LBS

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Lead (CAS 7439-92-1)	Reproductive toxicity Central nervous system Kidney Blood Acute toxicity

Toxic Substances Control Act (TSCA) All components are either listed on the TSCA 8(b) inventory and designated “active” or exempt from listing.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Chemical name	CAS number	Reportable quantity (pounds)	Threshold planning quantity (pounds)	Threshold planning quantity, lower value (pounds)	Threshold planning quantity, upper value (pounds)
Sulfuric acid	7664-93-9	1000	1000		

SARA 311/312 Hazardous chemical Yes

Classified hazard categories

Corrosive to metal
Skin corrosion or irritation
Serious eye damage or eye irritation
Carcinogenicity
Reproductive toxicity
Specific target organ toxicity (single or repeated exposure)

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Lead	7439-92-1	70.7
Sulfuric acid	7664-93-9	19.4

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Lead (CAS 7439-92-1)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Sulfuric acid (CAS 7664-93-9)

Safe Drinking Water Act (SDWA) Contains component(s) regulated under the Safe Drinking Water Act.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Sulfuric acid (CAS 7664-93-9)	6552

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Sulfuric acid (CAS 7664-93-9) 20 %WV

DEA Exempt Chemical Mixtures Code Number

Sulfuric acid (CAS 7664-93-9) 6552

US state regulations

US. Massachusetts RTK - Substance List

Lead (CAS 7439-92-1)
Silica (CAS 112926-00-8)
Sulfuric acid (CAS 7664-93-9)

US. New Jersey Worker and Community Right-to-Know Act

Lead (CAS 7439-92-1)
Silica (CAS 112926-00-8)
Sulfuric acid (CAS 7664-93-9)

US. Pennsylvania Worker and Community Right-to-Know Law

Lead (CAS 7439-92-1)
Sulfuric acid (CAS 7664-93-9)

US. Rhode Island RTK

Lead (CAS 7439-92-1)
Silica (CAS 112926-00-8)
Sulfuric acid (CAS 7664-93-9)

California Proposition 65

WARNING: This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

California Proposition 65 - CRT: Listed date/Carcinogenic substance

Lead (CAS 7439-92-1) Listed: October 1, 1992
Sulfuric acid (CAS 7664-93-9) Listed: March 14, 2003

California Proposition 65 - CRT: Listed date/Developmental toxin

Lead (CAS 7439-92-1) Listed: February 27, 1987

California Proposition 65 - CRT: Listed date/Female reproductive toxin

Lead (CAS 7439-92-1) Listed: February 27, 1987

California Proposition 65 - CRT: Listed date/Male reproductive toxin

Lead (CAS 7439-92-1) Listed: February 27, 1987

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Lead (CAS 7439-92-1)
Sulfuric acid (CAS 7664-93-9)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Industrial Chemicals (AICIS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

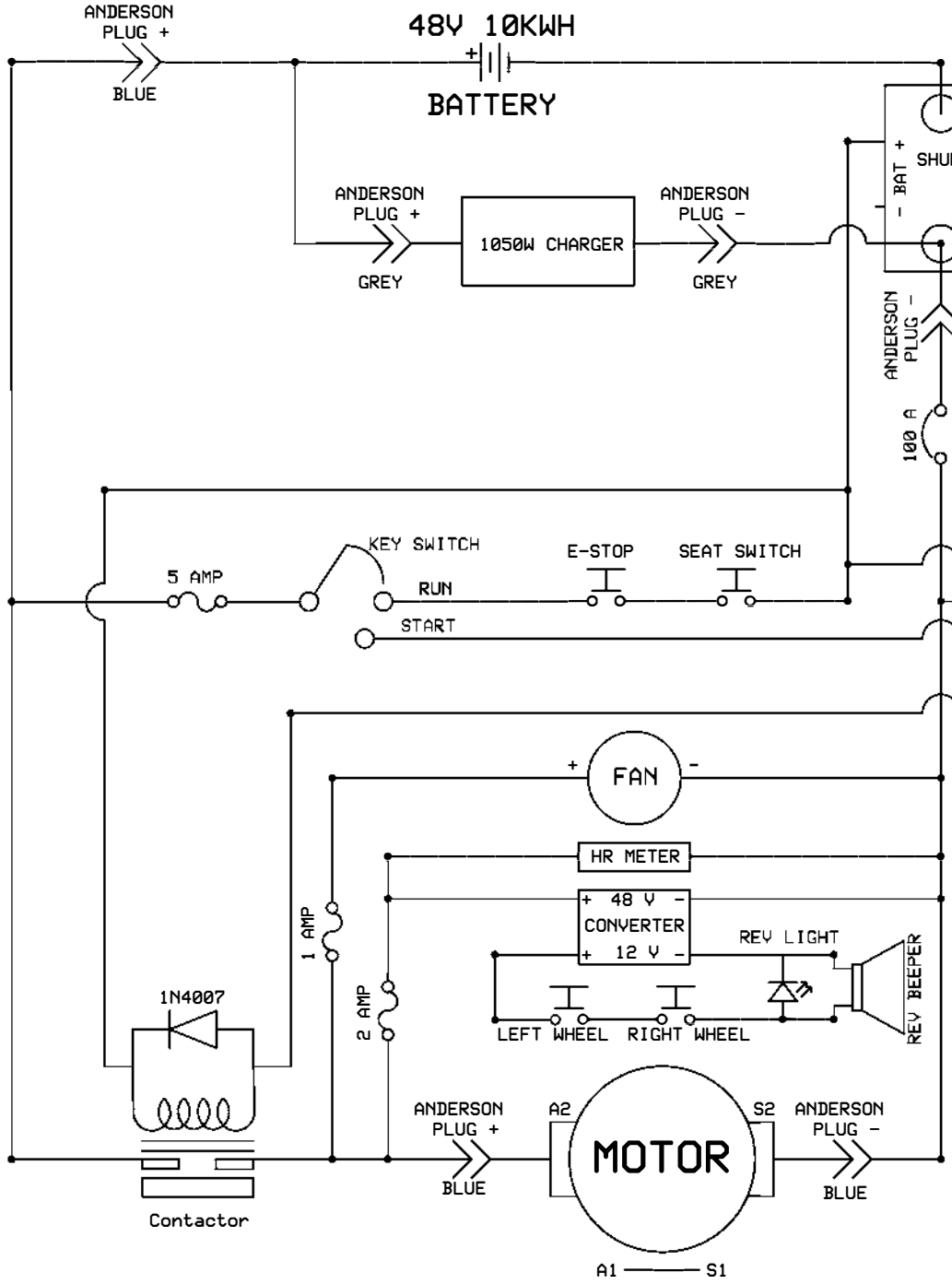
Issue date 31-October-2022

Revision date -

Version # 01

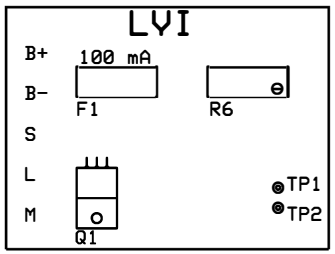
NFPA ratings

Disclaimer C&D Technologies, Inc. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.



LVI Setup Procedure:

- Turn on power to board.
- Connect (-) lead on test meter to the screw on Q1.
- Adjust input voltage to trip point.
- Read voltage between TP1 & Q1.
  Read voltage between TP2 & Q1.
- Adjust R6 so TP2 voltage = TP1 voltage.



ANDERSON INNOVATIONS		
ES2000 SCHEMATIC		
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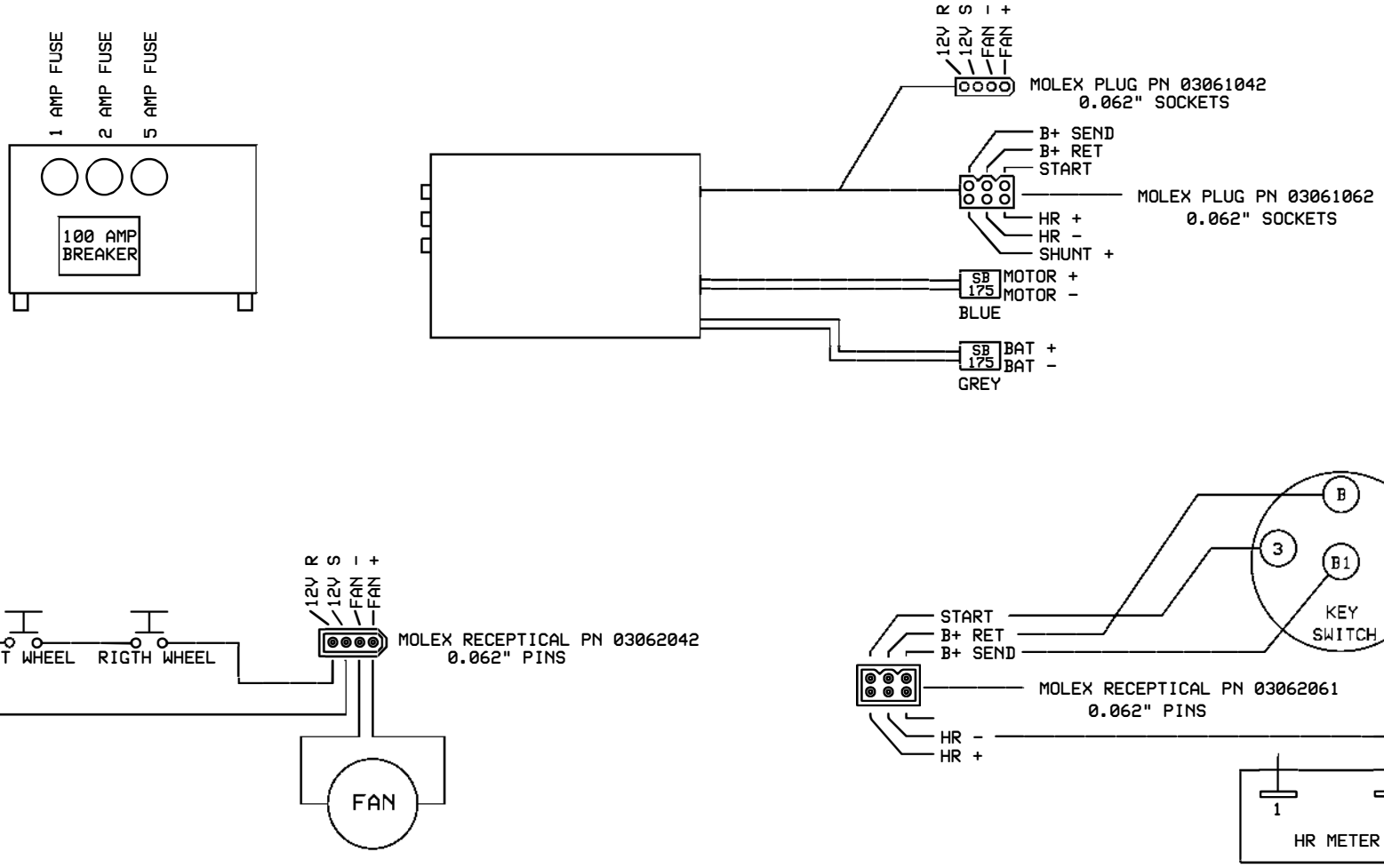

ANDERSON INNOVATIONS		
ES2000 PINOUT DIAGRAM		
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Manufacturer Informaiton

- Address: 5506 Thompson Hill Road, Proctor MN 55810
- Phone Number: 218-249-1314
- Email: info@andinllc.com
- Website: www.andinllc.com
- Patents: US Patent # 10273700, 10619365 - E.U. Patent granted

43068

SUMMIT II® SERIES

1050W, VERSION: V2
SWITCH MODE
INDUSTRIAL BATTERY CHARGER

USER'S MANUAL

Important Safety, Installation, Operation, and Maintenance Instructions

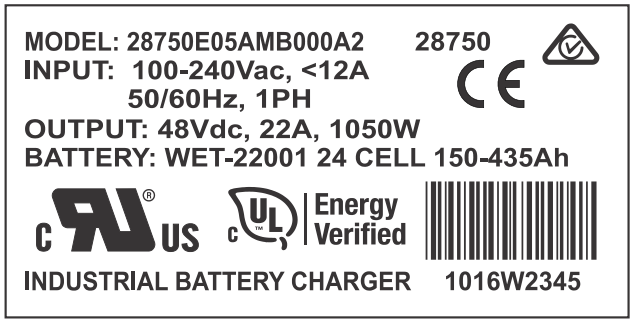
Lester ELECTRICAL

www.LesterElectrical.com

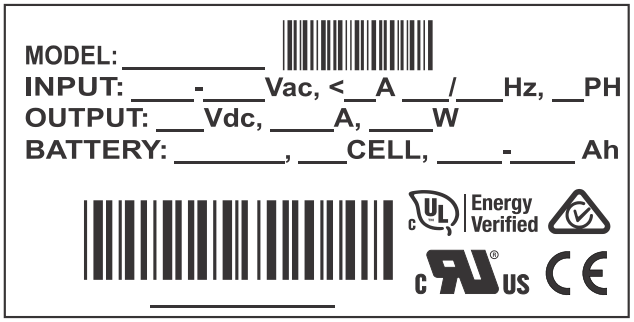
CHARGER RATINGS LABEL

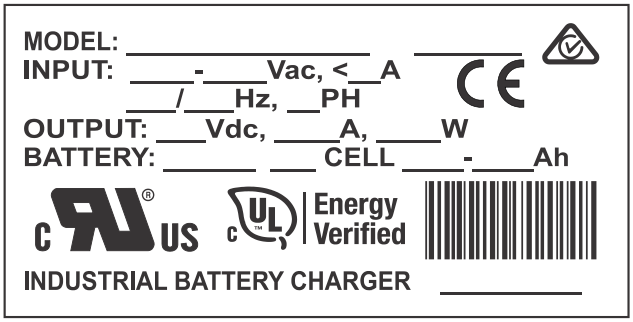
The ratings label is located on the front of the charger and provides the model (MODEL), serial number (located below the barcode at the bottom of the label), AC input ratings (INPUT), and DC output ratings (OUTPUT) of the charger. The BATTERY field indicates the factory-configured active battery profile type. The BATTERY field amp-hour (Ah) rating indicates the full range of battery capacities that are recommended for use with this charger. A different active battery profile may be required to optimize the charging of specific battery capacities within this range. Before (1) using the charger for the first time or (2) using the charger with a battery pack of a different type or capacity, use the ChargerConnect™ app to verify that the proper active battery profile is selected (see Section 8).

One of two styles of ratings label will be attached to your charger. Examples of both styles are shown below.



Please fill in the applicable blank label below with the information from the ratings label on your charger for future reference.





⚠CAUTION: PRIOR TO OPERATING THE CHARGER, VERIFY THAT THE ACTIVE BATTERY PROFILE MATCHES THE BATTERIES IN YOUR EQUIPMENT AND THAT THE SYSTEM SETTINGS MATCH YOUR APPLICATION BY USING A SMART PHONE OR TABLET AND THE CHARGERCONNECT APP AS DESCRIBED IN SECTION 8.

Document any configuration or settings changes that are made by marking the ratings label on your charger or on an additional label or tag attached to the charger.

SAVE THIS MANUAL: Keep it in a location where it is available to anyone who may operate the charger.

TABLE OF CONTENTS

IMPORTANT SAFETY INSTRUCTIONS

1. **SAVE THESE INSTRUCTIONS – This manual contains important safety and operating instructions.**

2. **Before using battery charger, read all instructions and cautionary markings on battery charger, battery, and product using battery.**

LOOK FOR THIS SYMBOL TO POINT OUT SAFETY PRECAUTIONS. IT MEANS: *BE ALERT—YOUR SAFETY IS INVOLVED.* IF YOU DO NOT FOLLOW THESE SAFETY INSTRUCTIONS, INJURY OR PROPERTY DAMAGE CAN OCCUR.

3. **DANGER: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, CAREFULLY READ AND FOLLOW THESE IMPORTANT SAFETY AND OPERATING INSTRUCTIONS BEFORE INSTALLING OR OPERATING THE CHARGER.**

4. **INSTRUCTIONS IMPORTANTES CONCERNANT LA SECURITÉ.**

5. **WARNING: TO REDUCE THE RISK OF FIRE, INSTALL THIS BATTERY CHARGER ON A SURFACE OF NON-COMBUSTIBLE MATERIAL SUCH AS BRICK, CONCRETE, OR METAL.**

6. **DANGER: RISK OF ELECTRIC SHOCK. DISCONNECT CHARGER FROM BATTERY AND AC POWER BEFORE SERVICING. TURNING OFF THE CHARGER DOES NOT REDUCE THIS RISK.**

7. **DANGER: RISK OF ELECTRIC SHOCK. DO NOT TOUCH UNINSULATED PORTION OF AC OR DC CONNECTORS OR UNINSULATED BATTERY TERMINAL.**

8. **DANGER: RISQUE DE CHOCKS ÉLECTRIQUES. NE PAS TOUCHER LES PARTIES NON ISOLÉES DU CONNECTEUR DE SORTI OU LES BORNES NON ISOLÉES DE L'ACCUMULATEUR.**

9. **CAUTION: CHARGE ONLY RECHARGEABLE BATTERIES OF THE SAME TYPE, VOLTAGE, CELL NUMBER, AND AMP-HOUR CAPACITIES AS SHOWN ON THE LABEL. BATTERY TYPES NOT MATCHING LABEL INFORMATION OR NON-RECHARGEABLE BATTERIES MAY BURST CAUSING PERSONAL INJURY AND DAMAGE.**

10. **ATTENTION: UTILISER POUR CHARGER UNIQUEMENT LES ACCUMULATEURS AU PLOMB À ELECTROLYTE LIQUIDE. D'AUTRES TYPES D'ACCUMULATEURS POURRAIENT ÉCLATER ET CAUSER DES.**

11. **DANGER: TO PREVENT ELECTRICAL SHOCK, DO NOT TOUCH EITHER AC OR DC UNINSULATED PARTS. MAKE SURE ALL ELECTRICAL CONNECTORS ARE IN GOOD WORKING CONDITION. DO NOT USE CONNECTORS THAT ARE CRACKED, CORRODED OR DO NOT MAKE ADEQUATE ELECTRICAL CONTACT. USE OF A DAMAGED OR DEFECTIVE CONNECTOR MAY RESULT IN A RISK OF OVERHEATING OR ELECTRIC SHOCK.**

12. **WARNING: HAZARD OF ELECTRIC SHOCK.**

13. **⚠WARNING: LEAD-ACID BATTERIES GENERATE EXPLOSIVE GASES. PLACE BATTERIES AS FAR AWAY FROM THE CHARGER AS THE OUTPUT LEADS WILL PERMIT DURING CHARGING. TO PREVENT ARCING OR BURNING NEAR BATTERIES, DO NOT DISCONNECT DC CHARGING CORD FROM BATTERIES WHEN THE CHARGER IS OPERATING. KEEP SPARKS, FLAME, AND SMOKING MATERIALS AWAY FROM BATTERIES.**

14. **⚠WARNING: ALWAYS SHIELD EYES WHEN WORKING NEAR BATTERIES. DO NOT PUT WRENCHES OR OTHER METAL OBJECTS ACROSS BATTERY TERMINAL OR BATTERY TOP. ARCING OR EXPLOSION OF THE BATTERY CAN RESULT.**

15. **⚠WARNING: BATTERIES PRODUCE HYDROGEN GAS, WHICH CAN EXPLODE IF IGNITED. NEVER SMOKE, USE AN OPEN FLAME, OR CREATE SPARKS NEAR THE BATTERY. VENTILATE THE AREA WHEN THE BATTERY IS CHARGING IN AN ENCLOSED PLACE.**

16. **⚠WARNING: LEAD-ACID BATTERIES CONTAIN SULFURIC ACID, WHICH MAY CAUSE BURNS. DO NOT GET ACID IN EYES, ON SKIN, OR CLOTHING. IF CONTACT WITH THE EYES OCCURS, FLUSH IMMEDIATELY WITH CLEAN WATER FOR 15 MINUTES AND OBTAIN MEDICAL ATTENTION.**

17. **⚠WARNING: ONLY A QUALIFIED SERVICE TECHNICIAN SHOULD PROGRAM OR SERVICE THIS EQUIPMENT.**

18. **⚠CAUTION: DO NOT OPERATE THE CHARGER IF IT HAS RECEIVED A SHARP BLOW, BEEN DROPPED, OR OTHERWISE DAMAGED. HAVE A QUALIFIED SERVICE TECHNICIAN EXAMINE AND REPAIR AS NEEDED.**

19. **⚠WARNING: DO NOT DISASSEMBLE THE CHARGER. HAVE THE CHARGER EXAMINED BY A QUALIFIED SERVICE TECHNICIAN. INCORRECT RE-ASSEMBLY OF THE CHARGER MAY RESULT IN AN EXPLOSION, ELECTRIC SHOCK, OR FIRE.**

20. **⚠CAUTION: MAKE SURE THE BATTERY SYSTEM HAS THE PROPERLY RATED VOLTAGE, AMP-HOURS, AND TYPE ("WET", "AGM", "GEL", "LITHIUM", "LIFEP04", ETC.) FOR THIS CHARGING SYSTEM.**

SAVE THESE INSTRUCTIONS

WICHTIGE SICHERHEITSANWEISUNGEN

1. **BEWAHREN SIE DIESE ANWEISUNGEN AUF. - Dieses Handbuch enthält wichtige Sicherheits- und Betriebsanweisungen.**

2. **Bevor Sie das Ladegerät verwenden, lesen Sie alle Anweisungen und Warnhinweise auf dem Ladegerät, der Batterie und dem Produkt, das die Batterie verwendet.**

ACHTEN SIE AUF DIESES SYMBOL, UM DIE SICHERHEITSVORKEHRUNGEN ZU ERKENNEN. DAS BEDEUTET: *ACHTUNG—DAS BETRIFFT IHRE SICHERHEIT.* WENN SIE DIESE SICHERHEITSHINWEISE NICHT BEFOLGEN, KÖNNEN VERLETZUNGEN ODER SACHSCHÄDEN VERURSACHT WERDEN.

3. **GEFAHR: UM DIE GEFAHR EINES BRANDES ODER EINES ELEKTRISCHEN SCHLAGS ZU REDUZIEREN, LESEN SIE DIESE WICHTIGEN SICHERHEITS- UND BEDIENUNGSANLEITUNGEN SORGFÄLTIG DURCH, BEVOR SIE DAS LADEGERÄT INSTALLIEREN ODER BETREIBEN.**

5. **WARNUNG : UM FEUERGEFAHR ZU VERRINGERN, INSTALLIEREN SIE DIESES BATTERIELADEGERÄT AUF EINER OBERFLÄCHE AUS NICHT BRENNBAREM MATERIAL, WIE ZIEGELN, BETON ODER METALL.**

6. **GEFAHR: STROMSCHLAGGEFAHR. TRENNEN SIE DAS LADEGERÁT VOR DER WARTUNG VON DER BATTERIE UND NETZSTROM. DAS AUSSCHALTEN DES LADEGERÄTS VERRINGERT DIESES RISIKO NICHT.**

7. **GEFAHR: STROMSCHLAGGEFAHR. BERÜHREN SIE NICHT DEN UNINSULIERTEN TEIL VON AC- ODER DC-ANSCHLÜSSEN ODER UNINSULIERTEN BATTERIEANSCHLUSS.**

9. **ACHTUNG: NUR AKKUS DER GLEICHEN ART, SPANNUNG, ZELLENZAHL UND AMPERESTUNDEN-KAPAZITÄT WIE AUF DEM ETIKETT AUFLADEN. BATTERIEARTEN, DIE NICHT DER ETIKETTENINFORMATION ENTSPRECHEN, ODER NICHT-WIEDERAUFLADBARE BATTERIEN KÖNNEN PLATZEN UND KÖRPERVERLETZUNG UND SCHADEN VERURSACHEN.**

11. **GEFAHR: UM EINEN ELEKTRISCHEN SCHLAG ZU VERMEIDEN, BERÜHREN SIE NIEMALS UNINSULIERTE AC-ODER DC-TEILE. VERWENDEN SIE KEINE ANSCHLUSSSTECKER DIE RISSIG ODER KORRIGIERT SIND, ODER DIE SICH NICHT KORREKT ANSTECKEN LASSEN. DIE VERWENDUNG EINES BESCHÄDIGTEN ODER FEHLERHAFTEN STECKVERBINDERS KANN ZU ÜBERHITZUNGS- ODER STROMSCHLAGGEFAHR FÜHREN.**

12. **WARNUNG : STROMSCHLAGGEFAHR.**

13. **⚠WARNUNG : BLEIAKKUS ERZEUGEN EXPLOSIVE GASE. BATTERIEN WÄHREND DES LADEVORGANGS SO WEIT WIE MITTELS DER LEITUNGEN MÖGLICH VOM LADEGERÄT ENTFERNT PLATZIEREN. UM EINE FUNKENBILDUNG ODER EINEN BRAND IN DER NÄHE DER BATTERIEN ZU VERMEIDEN, DAS DC-LADEKABEL NICHT VON DEN BATTERIEN ENTFERNEN, WENN DAS LADEGERÄT IN BETRIEB IST. FUNKEN, FLAMMEN UND RAUCHENDE MATERIALIEN VON DEN BATTERIEN ENTFERNT AUFBEWAHREN.**

14. **⚠WARNUNG : SCHÜTZEN SIE IMMER DIE AUGEN, WENN SIE MIT BATTERIEN ARBEITEN. KEINE SCHLÜSSELANHÄNGER ODER ANDERE METALLGEGENSTÄNDE ÜBER DEN BATTERIEANSCHLUSS ODER DIE BATTERIEPLATTE LEGEN. BOGEN ODER EXPLOSION DER BATTERIE KÖNNEN GESCHEHEN.**

15. **⚠WARNUNG : BATTERIEN ERZEUGEN WASSERSTOFFGAS, DAS EXPLODIEREN KANN, WENN ES ENTZÜNDET WIRD. RAUCHEN SIE NIEMALS, VERWENDEN SIE NIE EINE OFFENE FLAMME ODER ERZEUGEN SIE NIEMALS FUNDEN IN DER NÄHE DER BATTERIE. BELÜFTEN SIE DEN GEGEND, WENN DIE BATTERIE IN EINEM GESCHLOSSENEN ORT AUFGELADEN WIRD.**

16. **⚠WARNUNG : BLEI SÄURE-BATTERIEN ENTHALTEN SCHWEFELSÄURE, WELCHE VERBRENNUNGEN VERURSACHEN KANN. VERMEIDEN SIE KONTAKT MIT DEN AUGEN, DER HAUT ODER DER KLEIDUNG MIT DER SÄURE. FALLS ES KONTAKT MIT DEN AUGEN GEBEN SOLLTE, SPÜLEN SIE DEN AUGEN SOFORT 15 MINUTEN LANG MIT REINEM WASSER UND SUCHEN SIE EINEN ARZT AUF.**

17. **⚠WARNUNG : NUR EIN QUALIFIZIERTER SERVICE-TECHNIKER SOLLTE DIESES GERÄT PROGRAMMIEREN ODER SERVISIEREN.**

18. **⚠ACHTUNG BETREIBEN SIE DAS LADEGERÄT NICHT, WENN ES EINEN SCHWEREN SCHLAG ERHALTEN HAT, FALLEN GELASSEN WURDE ODER ANDERWEITIG BESCHÄDIGT WURDE. BITTEN SIE EINEN QUALIFIZIERTEN WARTUNGSTECHNIKER ES ZU ÜBERPRÜFEN UND ZU REPARIEREN, FALLS ERFORDERLICH.**

19. **⚠WARNUNG : DEMONTIEREN SIE DAS LADEGERÄT NICHT. BITTEN SIE EINEN QUALIFIZIERTEN SERVICE-TECHNIKER DAS LADEGERÄT ZU ÜBERPRÜFEN. FALSCHER WIEDERZUSAMMENBAU DES LADEGERÄTES KANN ZU EXPLOSION, ELEKTROSCHOCK ODER FEUER FÜHREN.**

20. **⚠ACHTUNG VERGEWISSERN SIE SICH, DASS DAS BATTERIESYSTEM FÜR DIESES LADESYSTEM DIE RICHTIG ANGEGEBENE SPANNUNG, AMP-STUNDEN UND TYP ("NASS", "AGM", "GEL", “LITHIUM”, “LIFEP04”, ETC.) HAT.**

ANLEITUNG AUFBEWAHREN.

IMPORTANTES CONSIGNES DE SÉCURITÉ

1. **GARDEZ CES CONSIGNES – Ce manuel contient d' importantes consignes de sécurité et le mode d'emploi.**

2. **Avant l'emploi de ce chargeur de batterie, lisez toutes les consignes et marques d'avertissement sur le chargeur de batterie, la batterie, et le produit utilisant cette batterie.**

CHERCHEZ CE SYMBOLE POUR INDIQUER LES PRÉCAUTIONS DE SECURITÉ. CELA SIGNIFIE: SOYEZ VIGILANT—*VOTRE SÉCURITÉ EN DÉPEND. LE FAIT DE NE PAS* SUIVRE CES CONSIGNES DE SÉCURITÉ PEUT CAUSER DES BLESSURES ET ENDOMMAGER LA PROPRI*ÉTÉ*.

3. **DANGER: POUR RÉDUIRE LE RISQUE D'INCENDIE OU DE DÉCHARGE ÉLECTRIQUE, LISEZ ATTENTIVEMENT ET SUIVEZ CES CONSIGNES DE SÉCURITÉ, ET MODE D'EMPLOI AVANT L'INSTALLATION OU L'USAGE DU CHARGEUR.**

5. **AVERTISSEMENT: POUR RÉDUIRE LE RISQUE D'INCENDIE, INSTALLEZ CE CHARGEUR DE BATTERIE SUR UNE SURFACE EN MATÉRIEL NON-COMBUSTIBLE COMME BRIQUE, BÉTON OU MÉTAL.**

6. **DANGER: RISQUE DE DÉCHARGE ÉLECTRIQUE. DÉBRANCHEZ LE CHARGEUR DE LA BATTERIE ET DU COURANT ALTERNATIF AVANT L'ENTRETIEN. L'ARRÊT DU CHARGEÙR NE RÉDUISANT POINT CE RISQUE.**

7. **DANGER: RISQUE DE DÉCHARGE ÉLECTRIQUE. NE TOUCHEZ PAS LES PARTIES NON-ISOLÉES DES CONNECTEURS AC OU DC, OU LE BORNE NON-ISOLÉ DE LA BATTERIE.**

9. **PRÉCAUTION: RECHARGER UNIQUEMENT LES BATTERIES RECHARGEABLES DU MÊME TYPE, DE LA MÊME TENSION, QUI ONT LE MÊME NUMÉRO DE CELLULES ET LA MÊME CAPACITÉ EN AMPÈRES-HEURES QUE LA VALEUR AFFICHÉE SUR L'ÉTIQUETTE. LES TYPES DE BATTERIES QUI NE CORRESPONDENT PAS AUX DONNÉES SUR L'ÉTIQUETTE OU LES BATTERIES NON-RECHARGEABLES PEUVENT EXPLOSER ET PROVOQUER DES BLESSURES OU DES DOMMAGES.**

11. **DANGER: POUR ÉVITER LES DÉCHARGES ÉLECTRIQUS, NE TOUCHEZ PAS LES PARTIES NON-ISOLÉES, NI AC NI DC. ASSUREZ-VOUS QUE TOUS LES CONNECTEURS ÉLECTRIQUES SONT EN BON ÉTAT DE FONCTIONNEMENT. N'UTILISEZ PAS LES CONNECTEURS QUI SONT CRAQUELÉS, CORRODÉS NI NE FAITES CONTACT ÉLECTRIQUE ADÉQUAT. L'EMPLOI D'UN CONNECTEUR ENDOMMAGÉ OU DÉFECTUEUX PEUT PROVOQUER UN RISQUE DE SURCHAUFFE OU DE DÉCHARGE ÉLECTRIQUE.**

12. **AVERTISSEMENT: DANGER DE DÉCHARGE ÉLECTRIQUE.**

13. **⚠AVERTISSEMENT: LES PILES PLOMB-ACIDE GENERENT DES GAZ EXPLOSIFS. PENDANT LE CHARGEMENT, PLACER LES PILES AUSSI LOIN DU CHARGEUR QUE LES FILS DE SORTIE LE PERMETTENT. POUR EVITER TOUT ARC ELECTRIQUE OU TOUTE BRULURE A PROXIMITE DES PILES, NE PAS DEBRANCHER LE CORDON DE RECHARGE CC DES PILES LORSQUE LE CHARGEUR EST EN FONCTION. GARDER LES ETINCELLES, LES FLAMMES ET LES SUBSTANCES FUMIGENES A DISTANCE DES PILES.**

14. **⚠AVERTISSEMENT:N'OUBLIEZ JAMAIS DE PROTÉGER VOS YEUX LORSQUE VOUS TRAVAILLEZ PRÈS DES BATTERIES. NE POSEZ JAMAIS LES CLÉS OU AUTRES OBJETS MÉTALLIQUES À TRAVERS LES BORNES DE LA BATTERIE OU DESSUS LA BATTERIE. CAR CELA PEUT CAUSER UN ARC ÉLECTRIQUE OU UNE EXPLOSION DE LA BATTERIE.**

15. **⚠AVERTISSEMENT: LES BATTERIES PRODUISENT DE L'HYDROGÈNE, QUI PEUT EXPLOSER SI MISE À FEU. NE FUMEZ JAMAIS, NI N'UTILISEZ UNE FLAMME, NI NE CRÉEZ DES ÉTINCELLES PRÈS DE LA BATTERIE. AÉREZ LA PLACE QUAND LA BATTERIE EST EN TRAIN DE CHARGER DANS UN ENDROIT FERMÉ.**

16. **⚠AVERTISSEMENT: LES BATTERIES PLOMB-ACIDE CONTIENNENT DE L'ACIDE SULFURIQUE, QUI PEUT CAUSER DES BRÛLURES. N'ATTRAPEZ PAS L' ACIDE DANS LES YEUX, NI SUR LA PEAU, NI SUR LES VÊTEMENTS. EN CAS DE CONTACT AVEC LES YEUX, RINCEZ IMMÉDIATEMENT AVEC DE L'EAU PROPRE PENDANT 15 MINUTES PUIS ACCEDER AUXSOINS MÉDICAUX.**

17. **⚠AVERTISSEMENT: SEUL UN TECHNICIEN DE SERVICE QUALIFIÉ POURRAIT PROGRAMMER OU RÉVISER CET ÉQUIPEMENT.**

18. **⚠ATTENTION: NE FAITES PAS MARCHER LE CHARGEUR S'IL A SUBI UN COUP VIOLENT, EST TOMBÉ, OU AUTREMENT ENDOMMAGÉ. FAITES-LE VOIR PAR UN TECHNICIEN DE SERVICE QUALIFIÉ, ET LE FAIRE RÉPARER SI BESOIN EST**

19. **⚠AVERTISSEMENT: NE DÉMONTEZ PAS LE CHARGEUR. FAITES-LE VOIR PAR UN TECHNICIEN DE SERVICE QUALIFIÉ. LE RASSEMBLAGE INCORRECT DU CHARGEUR PEUT RÉSULTER EN EXPLOSION, DÉCHARGE ÉLECTRIQUE, OU INCENDIE.**

20. **⚠ATTENTION: ASSUREZ-VOUS QUE LE SYSTÈME DE BATTERIE A LA CORRECTE TENSION NOMINALE, L'AMP-HEURE, ET LE TYPE ("HUMIDE", "AGM", "GEL", "LITHIUM", "LIFEP04", ETC.) POUR CE SYSTÈME DE BATTERIE.**

GARDEZ CÉ CONSIGNES

1. INTRODUCTION

This switch mode (high frequency) industrial battery charger features advanced charge and termination algorithms designed to optimize both daily battery capacity and overall battery life. The charger is convection cooled with no moving parts, sealed, and designed to provide maximum reliability. The universal AC input enables the charger to be used with a wide range of AC voltages and frequencies, and the charger includes high efficiency and power factor correction. Interface features of the charger include four (4) LEDs and an external port for both Controller Area Network (CAN) communication and a remote panel-mounted LED. The 1050W charger models are also capable of automatic multi-voltage DC charging, which enables automatic DC output voltage detection and adjustment based on the battery pack connected to it.

The charger features Bluetooth® wireless communication, which enables a smart phone or tablet running the ChargerConnect™ app to be used to:

- View the real-time charge cycle status
- Download charge cycle history records from the charger
- Upload charge cycle history records to the Cloud for access anywhere in the world
- Select the active battery profile
- Download new battery profiles from the Cloud
- Upload battery profiles to the charger

The charger was factory-configured with the active battery profile that was requested as part of the original order from Lester Electrical. The charger was also factory-configured for mounting on-board a battery-powered vehicle/machine or for off-board use in a shelf or portable application per the original order from Lester Electrical. Before (1) using the charger for the first time or (2) using the charger with a battery pack of a different type or capacity, use the ChargerConnect app to verify that the proper active battery profile is selected and that the system settings match your application (see Section 8).

⚠CAUTION: PRIOR TO OPERATING THE CHARGER, VERIFY THAT THE ACTIVE BATTERY PROFILE MATCHES THE BATTERIES IN YOUR EQUIPMENT AND THAT THE SYSTEM SETTINGS MATCH YOUR APPLICATION BY USING A SMART PHONE OR TABLET AND THE CHARGERCONNECT APP AS DESCRIBED IN SECTION 8.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

2. RECEIVING AND INSTALLING THE CHARGER

Unpack the charger and examine it for shipping damage. In the event that shipping damage is found, report it as a claim with the freight company.

⚠WARNING: REPLACE WORN, DAMAGED, OR CUT ELECTRICAL CORDS AND PLUGS IMMEDIATELY.

Do not operate the charger with a damaged AC or DC cable or connector. Do not operate the charger if it has received a sharp blow, was dropped, or was otherwise damaged in any way. Contact your dealer.

⚠WARNING: DO NOT INSTALL THE CHARGER ON OR NEAR FLAMMABLE MATERIALS. POSITION THE CHARGER ON A FOUNDATION OF STONE, BRICK, CONCRETE OR GROUNDED METAL.

⚠WARNING: CHARGERS CAN IGNITE FLAMMABLE MATERIALS AND VAPORS. DO NOT USE NEAR FUELS, GRAIN DUST, SOLVENTS, THINNERS, OR OTHER FLAMMABLES.

Proper installation is important to achieve optimum performance and life from the charger and batteries. No minimum distances are specified for mounting clearances, but allow as much free air space around the charger as possible to improve performance. Please refer to the Specifications Section 14 for operating environmental specifications.

The most favorable mounting orientations of the charger are shown in Figure 2-1. For on-board use, the most favorable way to mount the charger is with the charger base bolted to a 0.1 inch (2.5 mm) minimum thick metal plate. This provides both a strong structural mounting and good thermal conductive cooling (examples are shown in Figure 2-1). A poor thermal conductive mounting material such as plastic or wood would be less favorable for cooling.

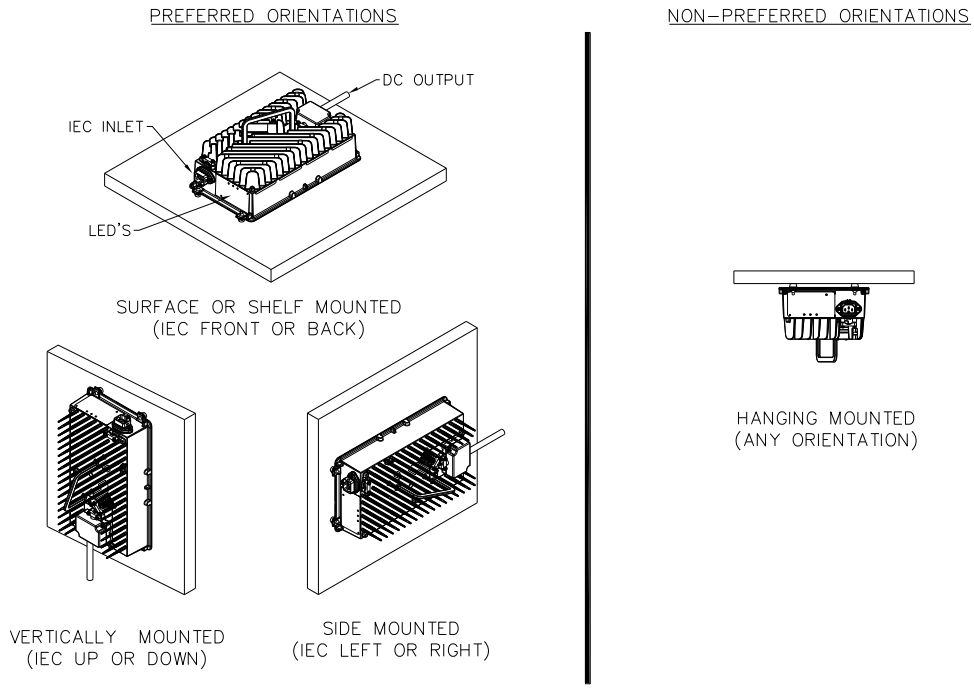


Figure 2-1: Charger Mounting Recommendations

The charger dimensions and mounting hole locations are shown in Figure 2-2. For off-board use, an optional handle is available for ease in carrying. The charger case also has routing and securing locations for the AC and DC cordsets when when they need to be routed to the opposite ends as shown in Figure 2-3.

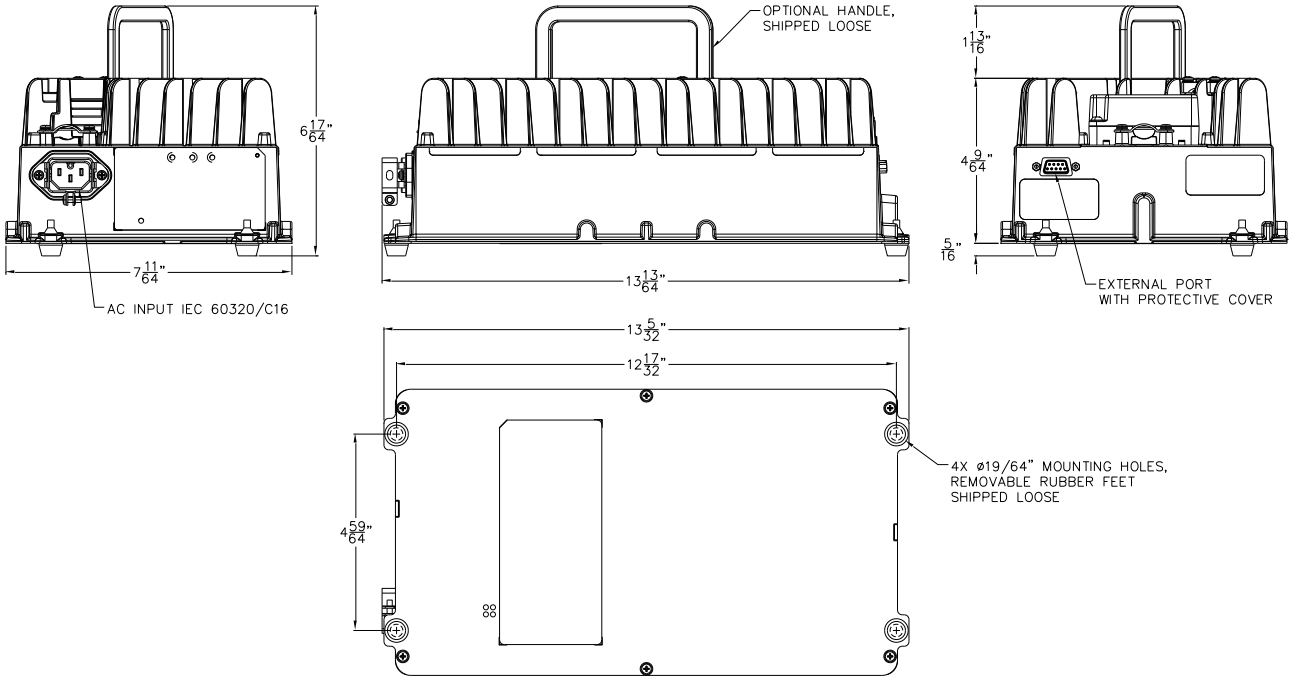


Figure 2-2: Charger Dimensions and Mounting Hole Locations

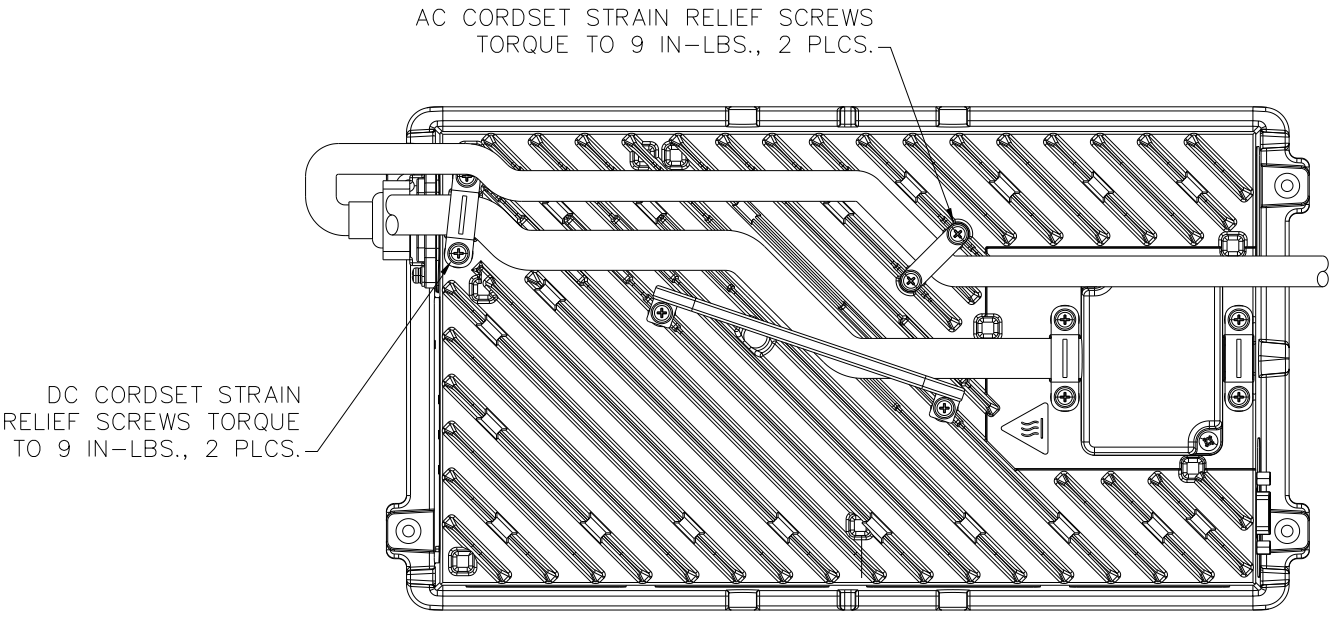


Figure 2-3: AC & DC Cordset Routing

3. BATTERY TYPE

This charger contains multiple battery profiles for different battery types (including wet/flooded, AGM, gel, and lithium) and capacities of batteries. The charger was factory-configured with the active battery profile that was requested as part of the original order from Lester Electrical. Before (1) using the charger for the first time or (2) using the charger with a battery pack of a different type or capacity, use the ChargerConnect app to verify the proper active battery profile is selected. If the proper battery profile is not available on the charger, the ChargerConnect app can be used to download the appropriate battery profile from the Cloud. If the battery type you will be charging is not available via the ChargerConnect app Cloud (for example, a specific lithium-ion brand or chemistry), contact Lester Electrical for more information. See Section 8 for additional details.

If the active battery profile is changed, mark the charger ratings label or add an additional label or tag.

⚠CAUTION: THIS CHARGER IS FOR USE ONLY WITH BATTERY SYSTEMS OF THE SAME TYPE AS THE ACTIVE BATTERY PROFILE. BATTERIES IMPROPERLY MATCHED WITH THE CHARGER MAY BURST CAUSING PERSONAL INJURY AND DAMAGE TO THE BATTERIES OR CHARGER.

Battery manufacturers frequently use the same battery cases for different battery types. Wet/flooded batteries have removable cell caps. Water electrolyzed by discharging and charging the battery is replaced through these openings. Sealed (AGM, gel, and lithium) batteries are generally distinguished by non-removable cell caps. The physical appearance of the battery case is frequently the same as a wet battery, though the cell caps are generally not removable. Refer to the battery manufacturer's information panel on the battery case to determine the type battery you have. If the information panel is missing or not legible, do not use the battery.

If you have questions regarding which battery profile to select for use with your particular battery pack, contact your dealer for assistance.

4. OFF-BOARD (SHELF) VERSUS ON-BOARD (BUILT-IN) CHARGERS

This section describes how the charger operates when the charger type is set to Off-board or On-board. Based on your application, this setting can be changed via the ChargerConnect app under “System Profile” (see Section 8).

The charger was factory-configured with the active battery profile that was requested as part of the original order from Lester Electrical. The charger was also factory-configured for mounting on-board a battery-powered vehicle/machine or for off-board use in a shelf or portable application per the original order from Lester Electrical. Before (1) using the charger for the first time or (2) using the charger with a battery pack of a different type or capacity, use the ChargerConnect app to verify that the proper active battery profile is selected and that the system settings match your application (see Section 8).

4.1 Off-Board Chargers

Off-board chargers are designed to be used in shelf or portable applications. If the AC input plug is connected to AC power, a new charge cycle automatically starts when the DC output is connected to a battery pack of the proper voltage. Disconnecting and reconnecting AC power while the DC output remains connected to a battery pack WILL NOT automatically start a new charge cycle. Disconnecting the DC output from the battery pack IS REQUIRED to automatically start a new charge cycle.

4.2 On-Board Chargers

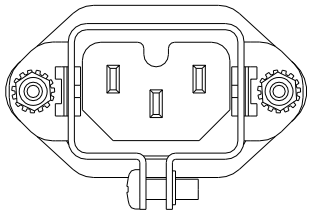
On-board chargers are designed to be mounted on electric vehicles/equipment. If the DC output is connected to a battery pack of the proper voltage, a charge cycle automatically starts when the AC input plug is connected to AC power (unless a safety period of time has not passed since the successful completion of the previous charge cycle). Disconnecting the DC output from the battery pack IS NOT REQUIRED to automatically start a new charge cycle.

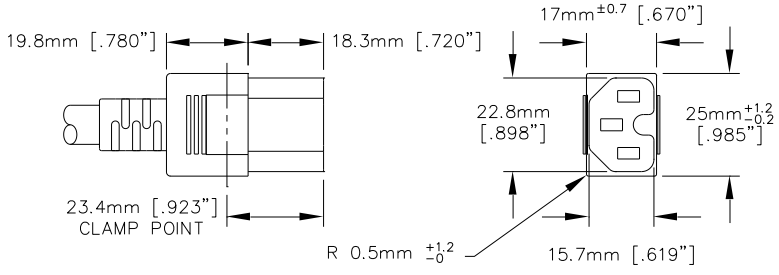
5. AC INPUT

⚠CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK OR FIRE, DISCONNECT AC POWER FROM THE CHARGER BEFORE INSTALLING OR REMOVING UNIT.

The charger has an AC input rating of 100-240 volts, 50-60 hertz, single-phase. The charger has an AC operating range of 85-265 volts, 45-65 hertz. Below 108 volts, the charger may reduce output power.

The charger is equipped with an IEC 60320 C16 inlet for the AC input power as shown. This allows the AC power cordset to be selected with a proper plug compatible with local electrical codes. The AC power cordset wiring must be properly sized for safe operation. For 100-120Vac operation use a minimum wire size of 16 AWG (1.5 mm^2) and for 220-240Vac operation use a minimum wire size of 18 AWG (1.0 mm^2). An AC cord clamp is also included to retain the AC power cordset IEC 60320 C15 connector when the connector has the dimensions as shown below. Loosen the screw on the clamp before inserting the C15 connector. Fully insert the connector into the charger inlet and then tighten the AC cord clamp screw to secure the AC power cordset to the charger.





⚠CAUTION: IF THE IEC 60320 C15 CONNECTOR DIMENSIONS ARE LARGER THAN SHOWN ABOVE, VERIFY CONNECTOR IS PUSHED ALL THE WAY INTO THE CHARGER INLET OR RISK OF FIRE DUE TO LOOSE CONNECTION MAY OCCUR.

The charger must be grounded to reduce the risk of electric shock and is equipped with an IEC 60320 C16 inlet having an equipment-grounding conductor and a grounding socket. The installed AC power cordset must be plugged into an outlet that is properly installed and grounded in accordance with all applicable electrical codes and ordinances.

If this charger includes the UL Listed symbol on its ratings label, it is provided with a cord set for connection to outlets operating at nominal 120 volts (or 240 volts as appropriate). If the input plug does not fit the power outlet, contact Lester Electrical for the proper cord set terminating in an attachment plug of the proper configuration for the power outlet.

⚠DANGER: NEVER ALTER THE AC POWER CORDSET OR PLUG PROVIDED. IF IT WILL NOT FIT AN OUTLET, OBTAIN THE CORRECT CHARGER IEC AC POWER CORDSET FOR THE OUTLET, OR HAVE A PROPER OUTLET INSTALLED BY A QUALIFIED ELECTRICIAN. IMPROPER CONNECTION CAN RESULT IN A RISK OF ELECTRIC SHOCK.

If an extension cord is necessary, it must be a 3-conductor, 12 AWG (2.5 mm^2) minimum for 120Vac input and 14 AWG (2.0 mm^2) minimum for 240Vac input, heavy-duty cord with ground,. It must also be in good electrical condition and as short as possible, 25 ft (7.6 m) maximum. Make sure that the pins on the plug of the extension cord are the same number, size, and shape as the AC power cordset plug on the charger. The use of an improper extension cord could result in a risk of fire or electrical shock.

Locate all cords so that they will not be stepped on, tripped over, or otherwise subjected to damage, stress, or accidentally disconnected.

⚠CAUTION: VERIFY THAT THE AC POWER CORDSET IS FULLY ENGAGED IN THE IEC INLET AND CANNOT BE PULLED LOOSE BEFORE USING THE CHARGER.

⚠DANGER: RISK OF ELECTRIC SHOCK! CONNECT THE AC SUPPLY CORDSET DIRECTLY TO A GROUNDED, 3-WIRE OUTLET. DO NOT TOUCH UNINSULATED PORTION OF DC OUTPUT TERMINALS OR BATTERY TERMINALS. REPLACE DEFECTIVE CORDS, WIRES, OR CONNECTORS IMMEDIATELY.

6. DC OUTPUT

⚠WARNING: LEAD-ACID BATTERIES GENERATE EXPLOSIVE GAS. CHARGE ONLY IN WELL VENTILATED AREAS. TO PREVENT ARCING OR BURNING NEAR BATTERIES, DO NOT DISCONNECT THE DC CHARGING CONNECTOR(S) FROM THE BATTERIES WHEN THE CHARGER IS OPERATING. IF THE CHARGE CYCLE MUST BE INTERRUPTED, UNPLUG THE AC POWER CORD BEFORE DISCONNECTING THE DC OUTPUT CONNECTOR(S) FROM THE BATTERIES. KEEP SPARKS, FLAME, AND SMOKING MATERIALS AWAY FROM BATTERIES. TO REDUCE THE RISK OF FIRE, DO NOT USE THE CHARGER NEAR FLAMMABLE MATERIALS OR VAPORS.

Only charge batteries of the same type, voltage, number of cells, and amp-hour capacities listed on the charger ratings label. Before (1) using the charger for the first time or (2) using the charger with a battery pack of a different type or capacity, use the ChargerConnect app to verify that the proper active battery profile is selected (see Section 8).

6.1 Auto Voltage Mode

The 1050W charger models support automatic multi-voltage DC charging, referred to as Auto Voltage Mode. Auto Voltage Mode provides automatic DC output voltage detection and adjustment so that battery packs of nominal 48V, 36V, and 24V can be charged with a single charger without any configuration changes needing to be made to the charger when switching between battery packs of different nominal voltages.

When connected to a 1050W charger model with the ChargerConnect app (see Section 8), the “System Profile” screen will include an “Auto Profile” selection box, which provides the following three (3) options:

- **OFF:** Single voltage mode – you MUST ensure that the nominal DC voltage of the "Active Battery Profile" for the charger matches the nominal DC voltage of the connected battery pack.
- **PER VOLTAGE PROFILES**: A battery profile can be assigned for 48V, a different battery profile can be assigned for 36V, and yet a different battery profile can be assigned for 24V. The proper battery profile is automatically selected based on the connected battery pack. This mode is primarily used when the charger will be charging 48V, 36V, and 24V nominal battery packs [or any combination of two (2) of these voltages] where the battery packs are of different types and/or capacities so using the "Scalable Profile" mode is not appropriate.
- **SCALABLE PROFILE**: The nominal DC voltage of the "Active Battery Profile" is automatically scaled to 48V, 36V, or 24V based on the connected battery pack.

NOTE: If the charger is currently set to "Per Voltage Profiles" or "Scalable Profile" mode, and you set the "Auto Profile" selection box to "Off", you MUST ensure that the nominal DC voltage of the "Active Battery Profile" for the charger matches the nominal DC voltage of the connected battery pack via the "Battery Profiles" screen in the ChargerConnect app.

When Auto Voltage Mode is active (either "Per Voltage Profiles" or "Scalable Profile") the ChargerConnect app "Dashboard" screen provides the status of the proprietary algorithm that executes at the beginning of the charge cycle by displaying the "Auto Battery Voltage Detection" as a status percentage and the "Detected Battery Pack Voltage".

6.2 DC Output Cordset

The DC output cordset includes a connector, plug, or terminals. The polarity of the charger DC connector/plug/terminals must be the same as the battery connector/receptacle/terminals. The BLACK DC cable must be connected to the battery negative (-), and the WHITE or RED DC cable must be connected to the battery positive (+). The charger will not operate if the polarity is reversed.

⚠WARNING: CHARGER DC CORDSET MUST HAVE A MINIMUM OF 12 AWG WIRE SIZE FOR PROPER HEAT DISSIPATION. TO PREVENT RISK OF FIRE, DO NOT USE SMALLER GAUGE WIRE.

The DC cordset attaches to the external DC terminal block on the charger. Remove the touch proof cover (if pre-installed) to expose the DC terminal block as shown in Figures 6.2-1 and 6.2-2. Based on the DC cordset connector/plug/terminals, use Table 6.2-3 and Figure 6.2-4 to determine the correct Configuration Number, and then attach the DC cordset wires as shown in Figures 6.2-1 or 6.2-2 depending on your charger model number (the model number is located on the ratings label as shown on page 2).

⚠WARNING: DO NOT CONNECT EXTERNAL TEMPERATURE SENSOR OR LOCKOUT WIRES TO THE CHARGERS LISTED IN FIGURE 6.2-2 OR DAMAGE TO THE CHARGER WILL OCCUR.

Torque the screws for the battery connections (Battery Positive and Battery Negative) to 18 in-lbs (2.0 N-m) and the signal connections (external Temp Sense and Lockout or CAN Signals) to 12 in-lbs (1.35 N-m). Place the strain relief over the DC cordset cable/wires on the side of the DC terminal block where the cordset exits. When individual wires are used for on-board applications, place the foam rubber gasket that comes on the cordset under the strain relief, center the wires, and then tighten the strain relief screws and torque them to 9 in-lbs (1 N-m). This prevents the wires from getting pinched on the side of the strain relief when tightened. Replace the terminal block cover, and torque the cover screws to 9 in-lbs (1 N-m).

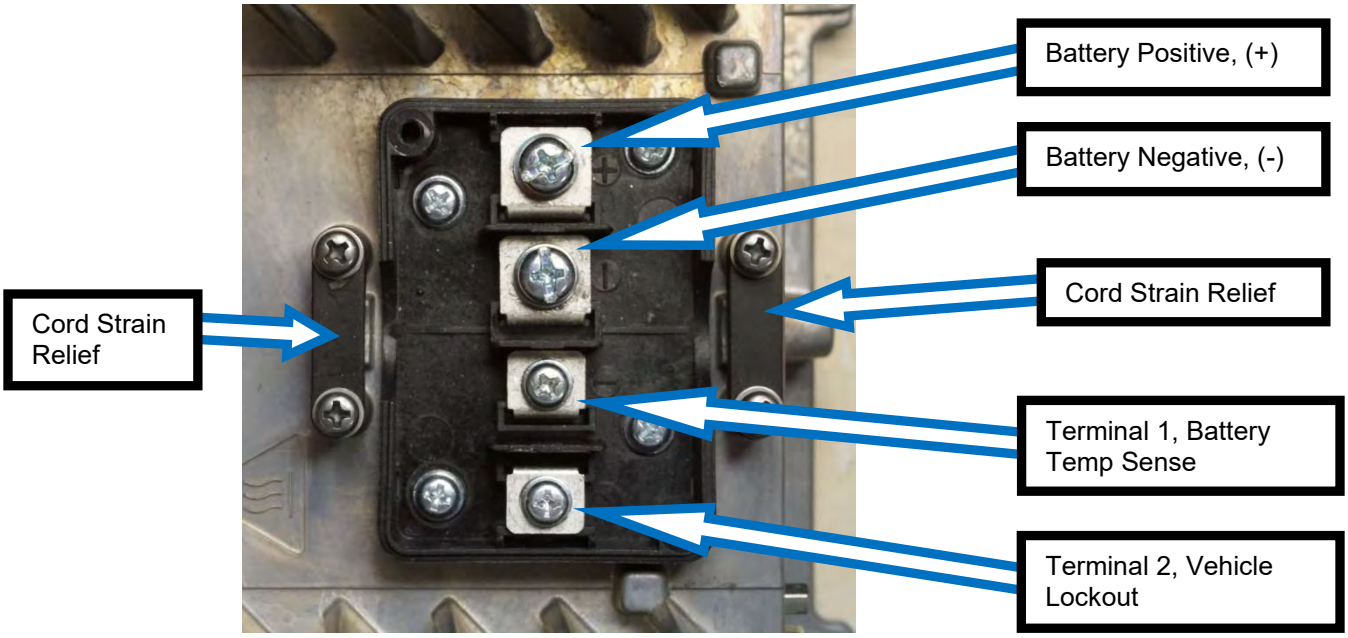


Figure 6.2-1: DC Terminal Block - Models: 28750, 29410 & 30410

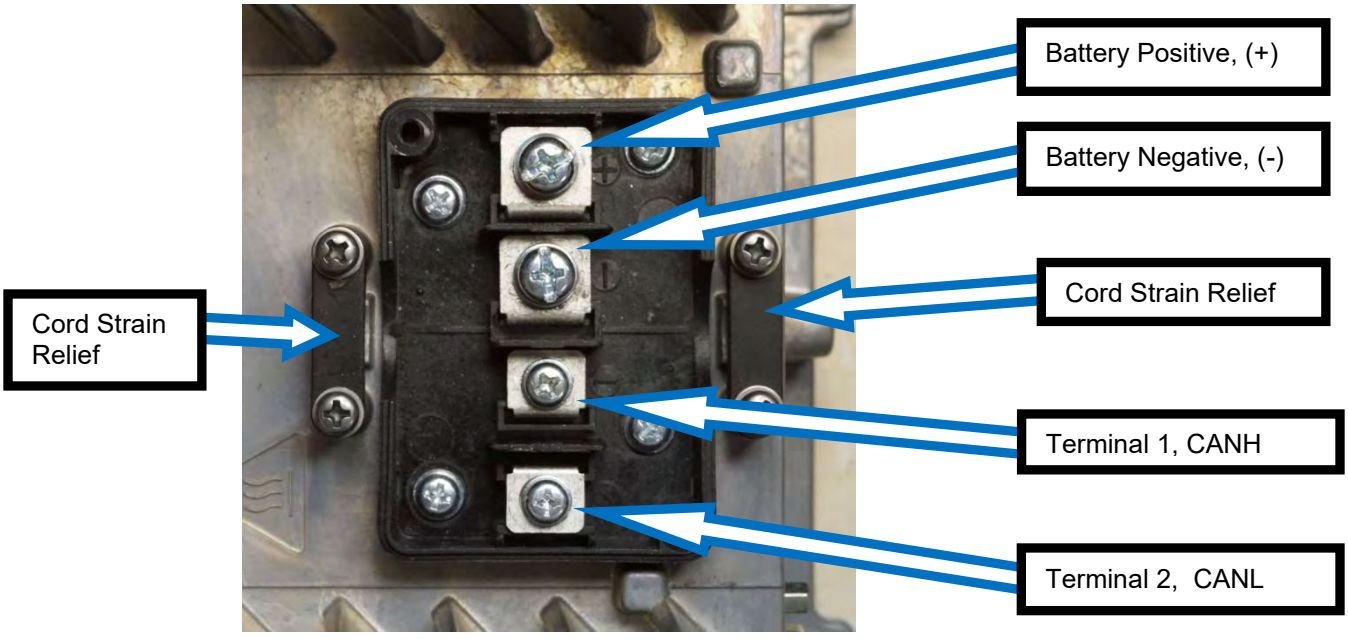


Figure 6.2-2 DC Terminal Block - Models: 28760, 29420 & 30420

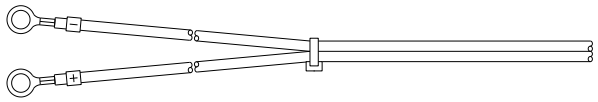
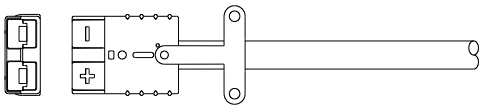
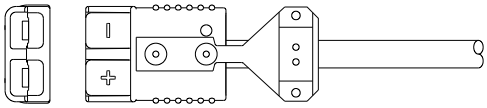
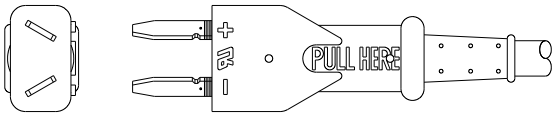
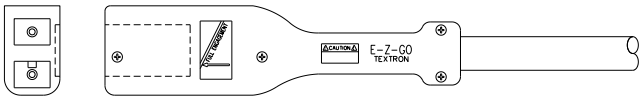
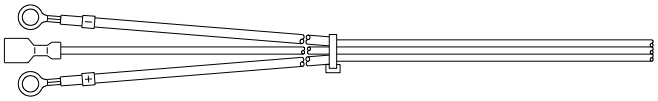
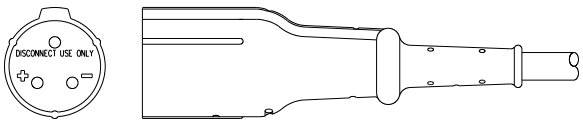
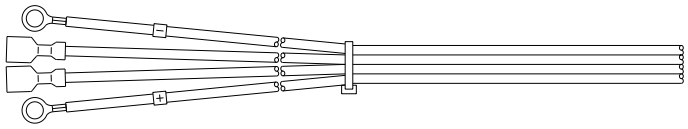
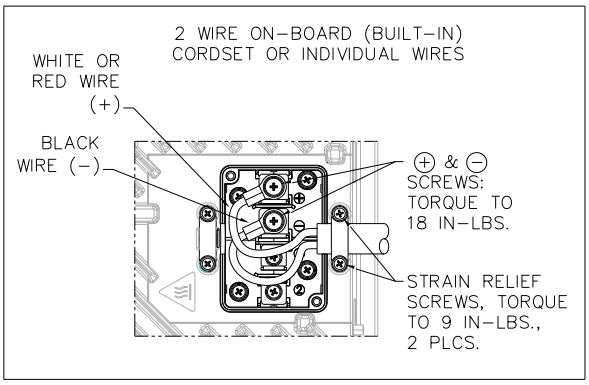
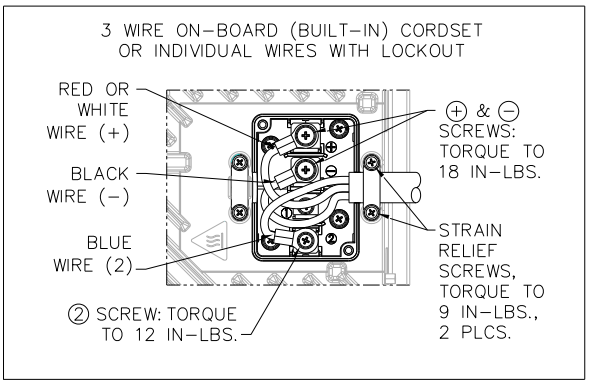
Number of Wires	DC Connector	Vehicle/Battery Connector Image	Configuration # and Figure #
2	Ring Terminals		1 or 4 6.2-1 or 6.2-2
2	Anderson SB50		1 or 4 6.2-1 or 6.2-2
2	Anderson SB175		1 or 4 6.2-1 or 6.2-2
2	2-Blade Gray Molded (Crowsfoot)		1 or 4 6.2-1 or 6.2-2
2	E-Z-GO PowerWise 2-Pin 36V or 48V		1 or 4 6.2-1 or 6.2-2
3	Ring Terminals with QD Lockout		2, 5, or 10 6.2-1
3	Club Car 3-Pin Molded		3 or 6 6.2-1 or 6.2-2
4	Various with CAN Communications	Various/Custom Molded Plug or Individual Wires	7 or 8 6.2-2
5	Ring Terminals with 2 wire Lockouts		9 6.2-2

Table 6.2-3: Common DC Output Connector Configurations

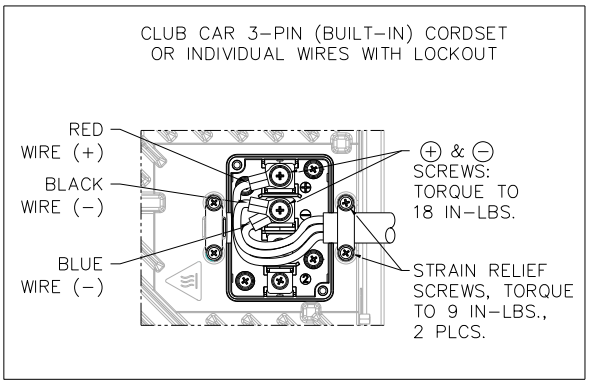
Configuration 1



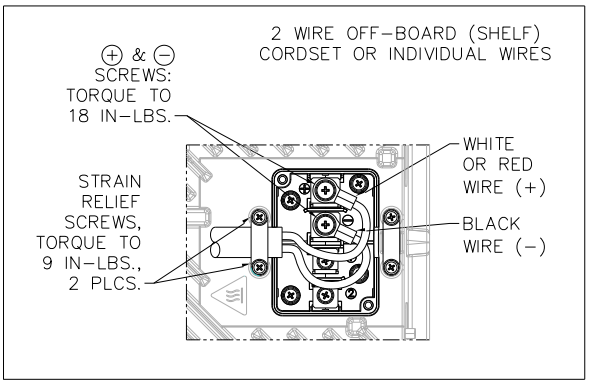
Configuration 2



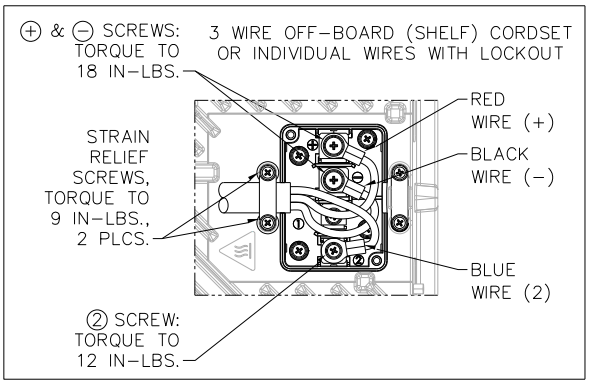
Configuration 3



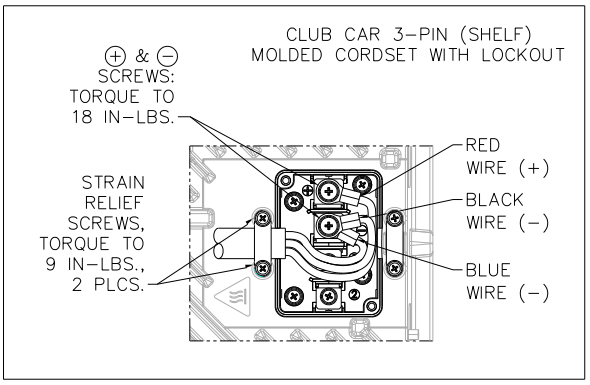
Configuration 4



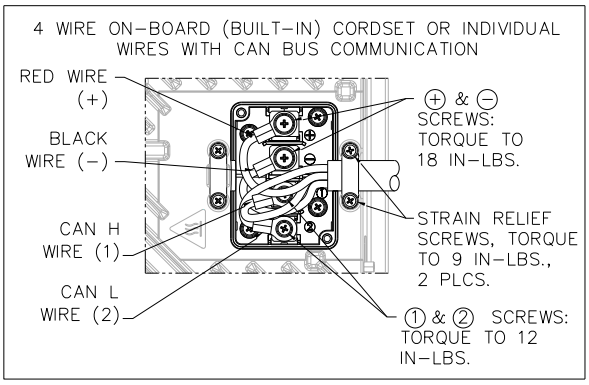
Configuration 5



Configuration 6



Configuration 7



Configuration 8

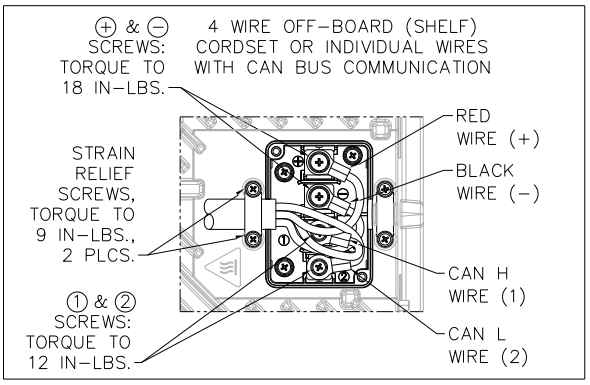
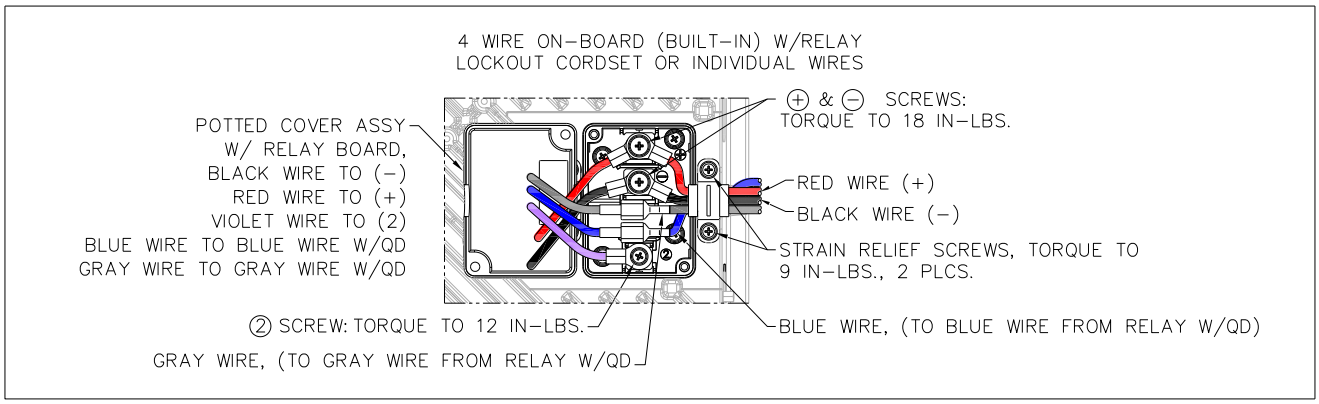


Figure 6.2-4: Common DC Terminal Block Configurations 1-8

Configuration 9



Configuration 10

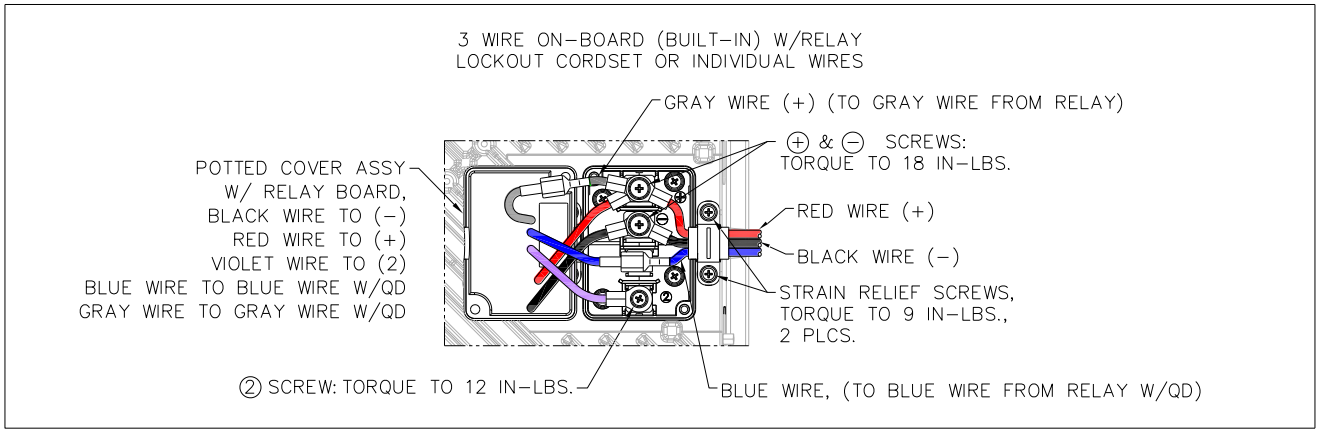


Figure 6.2-4: Common DC Terminal Block Configurations 9-10

7. VEHICLE LOCKOUT CONTROL

Some charger models have a lockout/interlock control signal which can be interfaced with the vehicle/equipment to prevent use/movement of the vehicle while the charger is in use. Depending on your model, the lockout control is available on Terminal 2 of the DC terminal block (see Figure 6.2-1).

⚠WARNING: DO NOT CONNECT LOCKOUT WIRES TO THE CHARGERS LISTED IN FIGURE 6.2-2 OR DAMAGE TO THE CHARGER WILL OCCUR.

The charger's single-wire lockout control is typically interfaced to the vehicle motor speed controller. The lockout signal can be configured to be pulled high to battery positive (+) or low to battery negative (-). The lockout setting is controlled by the "System Profile" and can be changed using the ChargerConnect app (see Section 8). If you are uncertain of how to attach the lockout wiring, please contact your dealer.

If the charger is configured for on-board use, the lockout control will be active while AC power is applied to the charger. If the charger is configured for off-board use, the lockout control will be active while a valid battery is connected to the charger. Based on your application, you can configure the charger as on-board or off-board via the ChargerConnect app under “System Profile” (see Section 8).

8. BLUETOOTH® WIRELESS

The charger features Bluetooth wireless communication, which can be accessed using an Apple® or Android™ smart phone, tablet, or similar device. Download the ChargerConnect app for your device by scanning the QR code on the charger or visiting the App Store® or the Google Play™ store and searching for "ChargerConnect".

The charger communication electronics are DC powered, so the charger must be connected to a valid battery pack in order to communicate with it via Bluetooth. If the charger is connected to a valid battery pack, open the ChargerConnect app and select the charger from the list of available units the app is able to communicate with. The charger serial number is the identifier of the unit, unless the “Charger ID” has been previously changed via the app. While connected, the Red, Yellow, and Green LEDs on the charger will slowly blink at the same time until the Bluetooth communication is disconnected from the charger.

The following is a list of functionality available via the ChargerConnect app:

- “Dashboard” display of charging status
  - Charger ID, Vehicle ID, Battery Profile
  - LED Status, Charge Status, AC Present, Faults
  - Charge Time Remaining, Output Current, Amp-Hours Returned, Battery Voltage, Battery State of Charge (SOC)
  - Auto Battery Voltage Detection Status (if enabled)
  - Detected Battery Pack Voltage (if enabled)
  - Manual Stop/Start of a Charge Cycle
  - Manual Initiation of an Equalize/Balance Cycle
- “Diagnostics” display of real-time data
  - Ammeter for output current
  - Voltmeter for battery voltage
  - Battery State of Charge (SOC), Charge Time Remaining, Charge Cycle Phase, Amp-Hours Returned, Faults, AC Input Voltage, Battery Temperature (if a sensor is present)
- “History” of charge cycle data
  - “Charger Histories” tab
    - Overview:
      - Charger: Total Charge Cycles, Total Amp-Hours
      - Device: Total Charge Cycles, Last Charge Cycle
      - Cloud: Total Charge Cycles, Last Charge Cycle
    - Get 10 Records button
    - Get All Records button
    - Delete All Records button
    - Records section where individual records that have been downloaded from the charger can be selected to view the charge cycle details
  - “Cloud Histories” tab where all records from the “Charger Histories” tab can be uploaded to the Cloud for access via ChargerConnect.com using the charger serial number
- “System Information” (display only)
  - Serial Number, Model Number, Charge Control Firmware Version, Power Control Firmware Version, Hardware Version
  - Vehicle ID, Battery Information
- “System Profile”
  - “Charger Profiles” tab (all items are settable)
    - Charger ID, Vehicle ID, DC Cable Gauge (AWG), DC Cable Length (feet), On Board check box (checked = on-board, unchecked = off-board), Lockout (Disabled, Active Low, or Active High)
    - Auto Voltage Profile (see Section 6.1)
  - “Device Profiles” tab enables System Profiles that reside on the smart phone or tablet (device) to be uploaded to the charger
  - “Cloud Profiles” tab enables System Profiles to be downloaded from the Cloud to the smart phone or tablet (device)
- “Battery Profiles”
  - “Charger Profiles” tab
    - Set the “Active Battery Profile” via the check mark
    - Question mark buttons provide detailed descriptions of the battery profiles
  - “Device Profiles” tab enables Battery Profiles that reside on the smart phone or tablet (device) to be uploaded to the charger
  - “Cloud Profiles” tab enables Battery Profiles to be downloaded from the Cloud to the smart phone or tablet (device)
  - "Battery Profile Selector" tab
    helps you select the proper battery profile for the particular battery (listed by manufacture and model) being used in your application.
- "Help" provides more in-depth information regarding the ChargerConnect app.

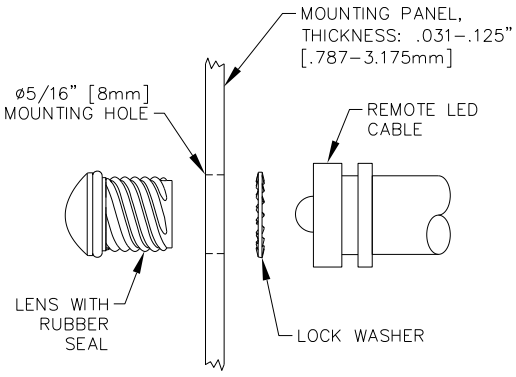
⚠CAUTION: CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC and ICES-003 Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. The Bluetooth wireless module operates at a frequency range of 2402.0 - 2480.0 Mhz and has an output wattage of 0.008.

9. EXTERNAL PORT

The charger has an external port with a DB9 (DE9) connector (sealed internally) located on the DC terminal block end of the unit which can be used for an optional remote LED, CANbus communication cable assembly, or other OEM specific cable assembly. When this port is not used, leave the protective cover over the connector to keep moisture and debris out of the connector. For harsh environments, add dielectric grease to the DB9 port before attaching mating connector.

When mounting the charger on-board a vehicle where the charger LEDs are not visible, an optional remote LED cable assembly can be used. Attach the remote LED cable assembly to the external port on the charger and hand tighten the connector mounting screws. The LED end of the cable assembly is to be rear mounted through a hole on the vehicle or it can be attached to a panel which mounts to the vehicle. Install the remote LED assembly as shown and attach the accompanying decal. Remote LED blink patterns are detailed in Section 12.3.



10. PROPER CARE OF DEEP-CYCLE LEAD-ACID MOTIVE POWER BATTERIES

Motive power battery packs are subjected to severe deep-cycle duty on a daily basis. Although these batteries are designed to withstand such duty, the following precautions must be observed to obtain good performance and maximum cycle life.

⚠CAUTION: ALWAYS WEAR PROTECTIVE EYE SHIELDS AND CLOTHING WHEN WORKING WITH BATTERIES. BATTERIES CONTAIN ACIDS WHICH CAN CAUSE BODILY HARM. DO NOT PUT WRENCHES OR OTHER METAL OBJECTS ACROSS THE BATTERY TERMINAL OR BATTERY TOP. ARCING OR EXPLOSION OF THE BATTERY CAN RESULT.

1. When installing new batteries, be sure the polarity of each battery and the overall battery pack is correct. Otherwise, battery and/or charger damage can result.
2. New batteries should be given a full charge before their first use because it is difficult to know how long the batteries have been stored.
3. New batteries and older batteries that have been in storage are not capable of their rated output until they have been discharged and charged a number of times. Consult the manufacturer of your batteries for more information.
4. DO NOT EXCESSIVELY DISCHARGE THE BATTERIES. Excessive discharge can cause polarity reversal of individual cells resulting in complete failure shortly thereafter.

5. Maintain the proper electrolyte level of wet (flooded) batteries by adding water when necessary. Distilled or deionized water is best for battery life. Never allow the electrolyte level to fall below the top of the battery plates. Electrolyte levels lower during discharge and rise during charge. Therefore, to prevent the overflow of electrolyte when charging, it is mandatory that water be added to cells AFTER they have been fully charged – do not overfill. Old batteries require more frequent additions of water than new batteries.
6. Hard crystalline sulfates form when batteries in storage are not maintained in a charged active state. Internal self-discharge can bring about the start of this condition in as little as three days in warm temperatures. Batteries not maintained and allowed to sit in storage will self-discharge, sulfate and lose capacity. Repeated charging without using the batteries between charges can recover some of the lost power, range, and life, but some permanent loss should be expected.
7. Cold batteries require more time to fully charge. When the temperature falls below 65°F, the batteries should be placed on charge as soon after use as possible.
8. The tops of batteries and battery hold downs must be kept clean and dry at all times to prevent excessive self-discharge and the flow of current between the battery posts and frame. Electrolyte spilled on batteries never dries or evaporates.
9. All connections to batteries must be maintained clean and tight. Due to heating and discharge rates, bolted connections loosen over time. Re-tighten the connections twice yearly to the torques specified by the battery manufacturers.
10. Follow all operating instructions, cautions, and warnings as specified in this manual, on the charger, in the battery manuals, and in the vehicle manuals.

10.1 Personal Safety Precautions

1. Have someone within the range of your voice and close enough to quickly come to your aid when you work near a lead-acid battery.
2. Ensure ample fresh water and soap are nearby in case battery acid contacts your skin, clothing, or eyes.
3. Wear complete eye and clothing protection. Avoid touching your eyes while working near a battery.
4. If battery acid contacts your skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flush your eye with running cold water for at least 10 minutes, and get medical attention immediately.
5. NEVER smoke or allow a spark or flame to be in the vicinity of a battery.
6. Be extra cautious to reduce the risk of dropping a metal tool onto a battery. It could spark or short circuit the battery or other electrical components that could cause an explosion.
7. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short-circuit current that is high enough to cause a severe burn.
8. NEVER charge a frozen battery.

11. CHARGER OPERATION

⚠WARNING: TO REDUCE THE RISK OF AN ELECTRIC SHOCK, CONNECT ONLY TO A SINGLE-PHASE, PROPERLY GROUNDED (3-WIRE) OUTLET. REFER TO GROUNDING INSTRUCTIONS.

⚠CAUTION: MAKE SURE THE BATTERY IS A RECHARGEABLE DEEP-CYCLE BATTERY WITH THE PROPER RATED VOLTAGE FOR THIS CHARGER.

⚠DANGER: TO PREVENT ELECTRICAL SHOCK, DO NOT TOUCH UNINSULATED PARTS OF THE CHARGER DC OUTPUT CONNECTOR, BATTERY CONNECTOR, OR BATTERY TERMINALS. MAKE SURE ALL ELECTRICAL CONNECTORS ARE IN GOOD WORKING CONDITION. DO NOT USE CONNECTORS THAT ARE CRACKED, CORRODED, OR DO NOT MAKE ADEQUATE ELECTRICAL CONTACT. USE OF A DAMAGED OR DEFECTIVE CONNECTOR MAY RESULT IN A RISK OF OVERHEATING OR ELECTRIC SHOCK.

⚠WARNING: CHARGER IS NOT TO BE USED WHILE THE BATTERY POWERED EQUIPMENT IS OPERATING.

ATTENTION: NE PAS UTILISER LE CHARGER PENDANT QUE L'EQUIPMENT EST EN MARCHE.

WARNING: LEAD-ACID BATTERIES GENERATE GASES WHICH CAN BE EXPLOSIVE. TO PREVENT ARCING OR BURNING NEAR BATTERIES, DO NOT DISCONNECT THE CHARGER DC OUTPUT FROM THE BATTERIES WHEN THE CHARGER IS OPERATING. KEEP SPARKS, FLAME, AND SMOKING MATERIALS AWAY FROM BATTERIES.

WARNING: ALWAYS SHIELD EYES WHEN WORKING NEAR BATTERIES. DO NOT PUT WRENCHES OR OTHER METAL OBJECTS ACROSS BATTERY TERMINALS OR THE BATTERY TOP. ARCING OR EXPLOSION OF THE BATTERY CAN RESULT!

WARNING: DO NOT DISCONNECT THE CHARGER DC OUTPUT CONNECTOR FROM THE BATTERY CONNECTOR WHILE A CHARGE CYCLE IS IN PROGRESS. THE RESULTING ARCING AND BURNING OF THE CONNECTORS COULD CAUSE THE BATTERIES TO EXPLODE.

CAUTION: TO AVOID DAMAGE TO THE CHARGER DC CABLE AND CONNECTOR AND BATTERY CONNECTOR, DISCONNECT BY GRASPING THE CHARGER CONNECTOR HANDLE OR BODY AND PULLING IT STRAIGHT OUT OF THE BATTERY CONNECTOR. DO NOT PULL ON THE CHARGER CABLE. DO NOT TWIST, ROCK, OR PULL THE CONNECTOR SIDEWAYS.

The instructions printed on the charger are for daily reference.

11.1 Off-Board Charger Operation

Below are general instructions. However, specific charger configurations may include alternate functionality.

If the charger was configured for off-board use, follow these operating instructions:

1. With the charger DC output connector/plug disconnected from the battery connector/receptacle, connect the charger AC power cord to an appropriate AC outlet (if not already connected) and the blue "AC PRESENT" LED will turn on.
2. Connect the charger DC output connector/plug to the battery connector/receptacle. The charger will start automatically, which is indicated by the yellow "CHARGE STATUS" LED beginning to blink slowly.
3. If the charger must be disconnected from the battery while a charge cycle is in progress, first disconnect the AC power cord from the AC outlet. Do not disconnect the charger DC output connector/plug from the battery while a charge cycle is in progress.
4. The charge cycle 80% point is indicated by the yellow LED beginning to blink quickly.
5. The Finish charge cycle phase is indicated by the solid illumination of the yellow LED. Not all charge profiles include a Finish phase.
6. An extended Balance/Equalize charge cycle phase is indicated by the green "CHARGE COMPLETE" LED beginning to blink quickly. Not all charge profiles include a Balance/Equalize phase.
7. The charger automatically terminates the charge cycle when a battery reaches full charge, which is indicated by [1] the solid illumination of the green LED or [2] the green LED beginning to blink slowly indicating a post-charge phase. The required charge time is affected by numerous factors, including battery amp-hour capacity, depth of discharge, battery temperature, and battery age/usage. (See note below.)
8. Before operating the machine/equipment, disconnect the charger DC output connector/plug from the battery connector/receptacle by firmly grasping both connectors and pulling them straight apart.

Note: Some Lithium-Ion batteries disconnect the charger from the batteries when the batteries reach full charge. In these situations, the "Charge Complete" LED will NOT be illuminated green despite the fact that the charge cycle has completed. Please refer to the State of Charge (SOC) display on the batteries to confirm a full charge.

11.2 On-Board Charger Operation

Below are general instructions. However, specific charger configurations may include alternate functionality.

If the charger was configured for on-board use, follow these operating instructions:

1. Ensure that the vehicle/equipment that the charger is mounted on is turned off.
2. With the charger AC power cord disconnected from the AC outlet, connect the charger DC output connector/plug to the battery connector/receptacle (most likely already connected or hard wired).
3. Connect the charger AC power cord to an appropriate live AC outlet which is indicated by the blue "AC PRESENT" LED turning on. The charger will start automatically as indicated by the yellow "CHARGE STATUS" LED beginning to blink slowly.
4. If the charger must be disconnected from the battery while a charge cycle is in progress, disconnect the AC power cord from the AC outlet. Do not disconnect the charger DC output connector/plug from the battery while a charge cycle is in progress.
5. The charge cycle 80% point is indicated by the yellow LED beginning to blink quickly.
6. The Finish charge cycle phase is indicated by the solid illumination of the yellow LED. Not all charge profiles include a Finish phase.
7. An extended Balance/Equalize charge cycle phase is indicated by the green "CHARGE COMPLETE" LED beginning to blink quickly. Not all charge profiles include a Balance/Equalize phase.
8. The charger automatically terminates the charge cycle when a battery reaches full charge, which is indicated by [1] the solid illumination of the green LED or [2] the green LED beginning to blink slowly indicating a post-charge phase. The required charge time is affected by numerous factors, including battery amp-hour capacity, depth of discharge, battery temperature, and battery age/usage. (See note below.)
9. Before operating the vehicle/equipment, disconnect the charger AC power cord from the outlet.

Note: Some Lithium-Ion batteries disconnect the charger from the batteries when the batteries reach full charge. In these situations, the “Charge Complete” LED will NOT be illuminated green despite the fact that the charge cycle has completed. Please refer to the State of Charge (SOC) display on the batteries to confirm a full charge.

11.3 Storage Mode Operation

1. Storage Mode is designed to keep your battery maintained during storage periods that last a few weeks to several months at a time.
2. Depending on the battery type, the battery profile, and system profile selected, a storage charge can be a continuous float or a periodic charge mode.
3. Do NOT disconnect the charger from the battery or from the AC power until your machine is needed for use. Disconnecting and reconnecting the charger from the batteries or AC power may start a charge cycle, but disconnection disrupts the storage mode so optimum battery maintenance is not achieved.
4. After several months of storage your batteries should be serviced and the charger reset by disconnecting the DC for Off-Board or the AC for On-Board applications (disconnect AC for a minimum of 10 minutes) before continuing another storage season.

12. LED INDICATORS

The charger has four (4) LEDs to indicate charger status and fault information. The general functionality of the LEDs is outlined below and explained in the table below. However, specific charger configurations may include alternate LED functionality.

12.1 Charger LED Status

The functionality of the LEDs is outlined below and in the following table.

- **AC PRESENT (Blue) -** Indicates charger is connected to a live AC inlet.
- **FAULT (Red) -** Indicates when a charger or battery fault has occurred (see section 12.2 for more information).
- **CHARGE STATUS (Yellow) -** Indicates charge cycle status.
- **CHARGE COMPLETE (Green) -** Indicates when a charge cycle completes successfully, when an extended Balance/Equalize charge cycle phase is active, or when a post-charge phase is active. (See note below.)

FAULT (Red) LED	CHARGE STATUS (Yellow) LED	CHARGE COMPLETE (Green) LED	DESCRIPTION
Solid On	Solid On	Solid On	LED check for a few seconds during charger initialization.
Off	Slow Blink	Off	Bulk/Start charge cycle phase (constant power or constant current).
Off	Fast Blink	Off	Absorption/Plateau charge cycle phase (constant voltage). Greater than 80% charged.
Off	Solid On	Off	Finish charge cycle phase (constant current). Not all charge profiles include a Finish phase.
Off	Off	Fast Blink	Balance/Equalize phase. An extended charge cycle is occurring because a trigger condition has been met (cycle count, etc). Not all charge profiles include a Balance/Equalize phase.
Off	Off	Solid On	Charge cycle complete. (See note below.)
Off	Off	Slow Blink	Charge cycle complete. Post Charge phase (constant voltage float, etc). Not all charge profiles include a Post Charge phase.
Slow Blink	Slow Blink	Slow Blink	Charger Bluetooth connected to a smart phone or device, LEDs blink at the same time.

Note: Some Lithium-Ion batteries disconnect the charger from the batteries when the batteries reach full charge. In these situations, the “Charge Complete” LED will NOT be illuminated green despite the fact that the charge cycle has completed. Please refer to the State of Charge (SOC) display on the batteries to confirm a full charge.

12.2 CHARGER LED FAULTS

The charger will indicate when a fault occurs by using different patterns of the Fault (Red), Charge Status (Yellow), and Charge Complete (Green) LEDs as explained in the table below. Using the ChargerConnect App, check the diagnostic tab to get a description of the charger fault.

	FAULT (Red) LED	CHARGE STATUS (Yellow) LED	CHARGE COMPLETE (Green) LED	DESCRIPTION
Charger	Slow Blink	Off	Off	NO AC – AC power was lost during charging. Charge cycle was halted and will restart when AC power returns.
	Slow Blink	Slow Blink	Slow Blink	BLUETOOTH FAULT – Bluetooth communication issue indicated by LEDs blink one at a time in a rotating pattern. Contact Lester Electrical. Unit is still able to charge.
	Slow Blink	Slow Blink	Solid On	PROFILE MISMATCH – Charger has detected a battery profile problem.
	Slow Blink	Fast Blink	Slow Blink	LOW TEMP – Temperature is too low to start a charge cycle (< -25°C). Charging will start when temperature increases.
	Slow Blink	Fast Blink	Fast Blink	LIMIT FAULT – An over/under limit condition was detected causing charge to stop. Charge may restart if issue was temperature related and readings return to normal.
	Slow Blink	Solid On	Slow Blink	INTERNAL HARDWARE FAULT – Contact Lester Electrical.
	Slow Blink	Solid On	Solid On	COMMUNICATION – CAN communication failure has occurred.
	Fast Blink	N/A	N/A	EXTERNAL HARDWARE FAULT – Charger has detected an open or shorted lockout wire or a temperature probe fault. Unit is still able to charge.
Battery	Solid On	Off	Off	PHASE – A fault condition was met during a particular charge cycle phase (start/bulk, plateau/absorption, finish, etc.) or fault sent to charger externally via CAN communication.
	Solid On	Off	Slow Blink	MAX VOLTAGE – Maximum voltage was met.
	Solid On	Off	Solid On	MIN VOLTAGE – Minimum voltage was NOT met after a specified time from the start of the charge cycle.
	Solid On	Slow Blink	Off	MAX AMP-HOURS – Maximum amp-hours for the phase or overall charge cycle was met.
	Solid On	Slow Blink	Slow Blink	MAX TIME – Maximum time for the phase or overall charge cycle was met.
	Solid On	Solid On	Slow Blink	MAX BATTERY TEMPERATURE – External battery temperature sensor increased above limit and stopped charging.
	Solid On	Solid On	Fast Blink	BATTERY FAULT – Pre-set battery criteria above critical limits and charging stopped.

N/A = Not applicable, LED state does not matter

Disconnecting the charger from the battery always clears a fault. If the charger was factory-configured for on-board use, removing AC power from the charger also clears a fault. If a fault cannot be cleared after taking appropriate corrective action, contact your dealer for troubleshooting and/or service.

12.3 Remote LED Status and Faults

When an optional bi-color remote LED cable is attached to the external port, the LED functionality is slightly different from the built-in LEDs and is outlined generally below and in the following table. However, specific charger configurations may include alternate Remote LED functionality.

- **FAULT (Red) -** Indicates when a charger or battery fault has occurred. See ChargerConnect App for fault description.
- **CHARGE STATUS (Amber) -** Indicates charge cycle status.
- **CHARGE COMPLETE (Green) -** Indicates when a charge cycle completes successfully, when an extended Balance/Equalize charge cycle phase is active, or when a post-charge phase is active. (See note below.)

FAULT (Red) LED	CHARGE STATUS (Amber) LED	CHARGE COMPLETE (Green) LED	Description
	Solid On		LED check for a few seconds during charger initialization, Solid On and then Off.
	Slow Blink		Bulk/Start charge cycle phase (constant power or constant current).
	Fast Blink		Absorption/Plateau charge cycle phase (constant voltage). Greater than 80% charged.
	Solid On		Finish charge cycle phase (constant current). Not all charge profiles include a Finish phase.
		Fast Blink	Balance/Equalize phase. An extended charge cycle is occurring because a trigger condition has been met (cycle count, etc). Not all charge profiles include a Balance/Equalize phase.
		Solid On	Charge cycle complete. (See note below.)
		Slow Blink	Charge cycle complete. Post Charge phase (constant voltage float, etc). Not all charge profiles include a Post Charge phase.
Solid On			Charge has recognized a fault condition. See ChargerConnect app for fault description.

Note: Some Lithium-Ion batteries disconnect the charger from the batteries when the batteries reach full charge. In these situations, the “Charge Complete” LED will NOT be illuminated green despite the fact that the charge cycle has completed. Please refer to the State of Charge (SOC) display on the batteries to confirm a full charge.

13. TROUBLESHOOTING

The charger was fully tested and calibrated before leaving the factory. It was delivered ready to charge. If properly installed, the charger should require very little attention. If improper charger operation occurs, it will require repair by a qualified service technician (see section 12.1 for information regarding the Fault LED).

⚠CAUTION: DO NOT OPERATE THE CHARGER IF IT IS DAMAGED OR APPEARS TO BE MALFUNCTIONING. PERSONAL INJURY OR DAMAGE TO THE CHARGER OR BATTERIES MAY RESULT. DO NOT DISASSEMBLE THE CHARGER. CONTACT YOUR DEALER. INCORRECT REASSEMBLY MAY RESULT IN RISK OF ELECTRIC SHOCK OR FIRE.

1. If the charger does not turn on, check for one of the following conditions.
   a. The charger AC power cord is not plugged into a live and/or appropriate AC outlet.
   b. The battery connections are incorrect – battery not connected, reverse polarity, or short circuit.
   c. The battery voltage is too high.
   d. The battery voltage is too low (below 10 volts).

2. If the charger turns off before a battery is fully charged, and a fault condition is not indicated by the Fault LED, this indicates one of the following conditions.
   a. The AC power was interrupted during the charge cycle.
   b. The charger DC output connector was disconnected from the battery during the charge cycle.
   c. The battery has been allowed to sulfate. Charge the battery at least once every three (3) days when the equipment is lightly used. Once sulfation is allowed to take place, it may be partially reduced by returning, temporarily, to daily charging.

3. A decrease in vehicle/equipment range where the battery loses power faster indicates one of the following conditions.
   a. The electrolyte level in a wet lead-acid battery was allowed to drop below the top of the battery plates. If so, add distilled water to just cover the top of the plates immediately upon discovery, and then fill to the proper level with distilled water at the completion of the very next charge cycle.
   b. Use of the vehicle/equipment before the battery has been fully charged and the charger automatically terminates the charge cycle. This shortens battery life and accelerates the onset of reduced daily range.
   c. The normal wear-out pattern for the battery.

4. A charge cycle running longer than anticipated before terminating indicates one of the following conditions.
   a. An overly discharged battery.
   b. The charger output may have been reduced due to low AC input voltage, high ambient temperature, or obstructions to cooling airflow.
   c. The amp-hour capacity of the battery is greater than the charger can fully charge in the anticipated amount of time.

14. SPECIFICATIONS

See the 1050W Summit II datasheet for specifications.

15. SERVICE PART LIST

All models: 48V Model 287X0, 36V Model 294X0, 24-48V Model 304X0

Description	Lester Part Number
Cordset, AC, 16/3, 125V/13A, 78"	39738S
Handle Kit (handle with screws)	42117S
DC Terminal Block Cover Kit (cover with screws)	43151S
DC Terminal Block Cover Assembly with 24V Relay Lockout Board	43508S
DC Terminal Block Cover Assembly with 36-48V Relay Lockout Board	43291S
2 Wire, 2-12AWG, 3ft, DC Cordset with Ring Terminals	41876S
2 Wire, 2-12AWG, 6ft, DC Cordset with Ring Terminals	41877S
2 Wire, 12AWG, 9ft, DC Cordset with SB50 Gray Plug	41881S
2 Wire, 12AWG, 9ft, DC Cordset with SB50 Red Plug	41882S
2 Wire, 12AWG, 9ft, DC Cordset with SB175 Gray Plug	41883S
2 Wire, 12AWG, 9ft, DC Cordset with SB175 Red Plug	41884S
2 Wire, 12AWG, 9ft, DC Cordset with Lester 2-blade Gray Molded Plug	41891S

48V Model 28750, 36V Model 29410, 24-48V Model 30410

Description	Lester Part Number
3 Wire, 2-12AWG, 1-16AWG, 3ft, DC Cordset with Ring Terminals (LO)	41878S
3 Wire, 2-12AWG, 1-16AWG, 6ft, DC Cordset with Ring Terminals (LO)	41879S

48V Model 287X0 and 24-48V Model 304X0

Description	Lester Part Number
3 Wire, 12AWG, 9ft, DC Cordset with 48V CCI Gray Molded Plug	41892S
3 Wire, 12AWG, 12ft, DC Cordset with 48V CCI Gray Molded Plug	41893S
2 Wire, 12AWG, 9ft, DC Cordset with 48V E-Z-GO Powerwise Plug	42457S
2 Wire, 12AWG, 12ft, DC Cordset with 48V E-Z-GO Powerwise Plug	42458S

36V Model 294X0 and 24-48V Model 304X0

Description	Lester Part Number
2 Wire, 12AWG, 9ft, DC Cordset with 36V E-Z-GO Powerwise Plug	41887S
2 Wire, 12AWG, 12ft, DC Cordset with 36V E-Z-GO Powerwise Plug	41888S

LO = Lockout
For model numbers X = 1-9

Represented By:

43068 G