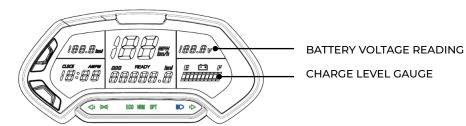
BATTERY STUFF

Make sure to check out all the nuts and bolts about the ONYX Standard RCR Battery (pg. 44) in the User Manual. onyxmotorbikes.com/pages/user-manual

HOW TO READ THE BATTERY GAUGE OR VOLTMETER

It is easy to see how much battery power (charge voltage) you have at any given time by looking at your LCD Speedometer dashboard display. Read below for more information about these display readings.

LCD Dashboard Display



23Ah Battery Level

| 100% | 84V |
|------|-----|
| 80% | 79V |
| 60% | 75V |
| 40% | 72V |
| 20% | 69V |
| 0% | 60V |

Battery Voltage Reading

The LCD Display shows the current real-time battery "juice" (voltage reading) in the upper right corner of the screen when the bike is turned on. This is your key battery indicator! The battery's instantaneous voltage reading changes while riding based on the battery's power demand, power output available (at rest), and power input from regenerative braking.

In order to protect the battery, the voltage will **cut off your battery at than 60 volts**.

NOTE: The Onyx RCR draws 0.6 volts while it is turned on, thus add 0.6 volts to the displayed voltage for the actual voltage.

Charge Level Gauge

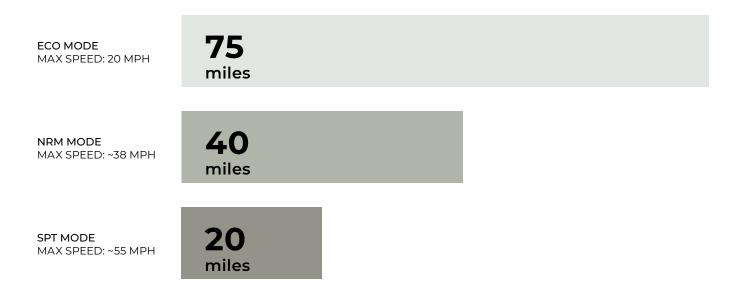
The LCD Display shows a 10-tick (roughly 10% increments) visual representation of the battery charge level in the lower right corner of the screen when the bike is turned on. Use this as an indicator to know generally how much charge you have left.

At lower states of charge, the Battery Management System (BMS) of will limit power output to prevent damage to the battery. When the battery is close to being fully depleted, the last bar will begin to flash, warning the user to charge the battery as soon as possible. If you've been riding, let the battery cool down for 20 minutes before charging.

BATTERY RANGE

The battery gives the bikes an expected range of between 20-75 miles on a single charge for the ONYX RCR Model (15-40 miles for the CTY Model) depending on the mode you use, the amount of pedaling you do, the terrain, and your size/weight. All of these things affect your overall range. For example, only using the throttle consumes the most battery power, but you can help increase your range by pedaling and using the regenerative rear brakes to conserve battery power.

As a basic reference, take a look at the graphic below to get an idea about how far you can go on a single charge with the (standard) 72 Volt / 23Ah battery in the RCR Model:



NOTE: The throttle-only estimates above are based on a 170 pound rider riding a standard RCR model on flat paved roads with nominal stops and starts with no pedaling assistance.

BATTERY CHARGING TIME

When properly maintained, the 5 Amp battery charger that ONYX provides will quickly and efficiently charge your lithium ion battery in the best manner possible to maintain the life and performance of the battery. A simple equation is used to quickly calculate how long a given battery charger will charge a particular battery from fully discharged to fully charged. Here is the basic equation:



For example, with the standard 23Ah RCR battery charging on the 5A charger, the total charge time is 4.6 hours. However, while the equation gives a good general idea of how long it can take, actual battery charging times may vary depending on various factors related to your battery including the battery's age, battery's SoC, battery's internal temperature, ambient temperature, etc.

Below is a table that provides a basic idea of typical charge times that can be expected to fully charge a battery from fully discharged to full:

| ONYX MOTORBIKES LITHIUM ION BATTERY | ONYX BATTERY CHARGER | FULL CHARGE VOLTAGE | ESTIMATE TIME FOR A FULL CHARGE |
|--|------------------------|------------------------|------------------------------------|
| | STANDARD 5 Amp Charger | 84.0 V | 4 to 5 Hours |
| RCR 72V / 23Ah Battery | RAPID 10 Amp Charger * | 84.0 V | 2 to 3 Hours |
| | | | |
| RCR 72V /41Ah Battery | STANDARD 5 Amp Charger | 84.0 V | 10 Hours |
| | RAPID 10 Amp Charger * | 84.0 V | 5 to 6 Hours |

^{*} Optional accessory sold separately. Do not use any other battery charger without approval from ONYX Motorbikes. Contact ONYX Motorbikes for availability and more information.

BEST PRACTICES FOR BATTERY CHARGING

It is really easy to charge your ONYX Motorbike battery. The battery pack in your ONYX Motorbike is removable, which allows to you remove and take the battery with you to charge or store the battery to prevent theft. However, **you can charge the battery with it installed in the bike** (and let's face it, it is much more convenient to run an extension cord out to the shed).

If charging the battery IN the bike, you can leave the battery switch (RCR only) in the ON position, but make sure that your e-bike is system is turned completely off before beginning charging using the kill switch button on the right side controls in the OFF position and/or by disconnecting the battery.

The battery is a flammable lithium-ion battery and should not be stored or charged near a heat source or open flame. For more safety precautions, reference the OPERATION INSTRUCTIONS - BATTERY OPERATION, CHARGING, STORAGE section of the user manual on our website: onyxmotorbikes.com/pages/user-manual

Follow these instructions for battery charging with the standard 5Amp charger:

- Making sure that the charge cord connector will reach the battery, place the charger on an open (uncovered), flat, cool, dry and secure surface so that it will not be disturbed or heated while charging the battery.
- 2. Leave your battery ON to charge. If your battery has an accessible on/off switch (RCR model only), you may turn it to the OFF position but it is not necessary. If it does not have an ON/ OFF switch, such as for the 48V/16Ah ONYX CTY battery, or you cannot easily access the ON/OFF switch, no worries, is still safe to charge it as-is!
- 3. Plug the charger input plug into a suitable power outlet (before plugging the charger into the battery). The indicator light on the charger should be green with nothing connected to it. The charger works on 110/220 V 50/60 Hz standard home AC power outlets.

- 4. Connect the charger XLR-style battery charge cable to the battery's XLR-style charge cable. After the battery is connected, the charger light will change from GREEN to RED to indicate that it is charging.
- 5. Charging status is indicated by the LED light on the charger:
 - RED Battery is charging,
 GREEN Battery is fully charged.

 If the indicator light is not lit at all, it is possible that the charger's replaceable fuse may be blown and needs to be changed. Do NOT open the charger case. Replacement fuses are included in the charger box. Fuses are easily replace-
- **6.** When the battery is fully charged (**GREEN**), unplug the charger from the power outlet first.

able without removing the charger case/cover!

MAINTAINING THE BATTERY AND CHARGER

Battery chargers generally require little to no maintenance. However, below are some basic tips for maintaining your battery charger for optimal function and life.

- Do not just toss your battery charger around or store it haphazardly. It deserves respect!
- Keep water and other liquids away from the battery charger at all times.
- Keep the cooling fan uncovered and clear so that the charger is able to properly keep itself cool.
- Periodically wipe the case of the battery charger with a soft cloth to remove dirt/debris.
- Store the battery charger indoors in a safe and secure place where it will be protected from falls and external damage.
- Always keep a spare battery charger fuse handy in case it the fuse blows. The battery charger comes with an extra fuse.

BATTERY SAG

Become familiar with the amount of battery sag full throttle causes in eco mode, normal mode, and sports mode. Sag is described as the amount of electricity drawn depending on how much throttle is given. On a colder day it is not uncommon at full throttle for the voltage sag to be 7 volts and on warmer days for it to be between 4 volts to 5 volts.

- Each mode limits the amount of sag.
- Eco mode will help prevent cut offs by reducing the sag amount.
- The amount of throttle given directly controls the amount of sag.

BATTERY CUT OFF

When the amount of battery sag falls below 59.4 volts, the Onyx RCR will turn off. Cut off occurs because the battery management system is programmed to protect the batteries from damage from low voltage.

One way to turn the Onyx RCR back on after it has cut off due to dropping below 59.4 volts is to roll the bike while slightly applying the left brake, which will engage the regenerative braking.

LOW BATTERY LEVELS

The Onyx RCR battery does not discharge in a straight constant line, it is more like a curve where the top of the charge above 85% (80.4 volts) and the charge below 15% (68.8 volts) deplete faster. The entire 84 volts are available but spread out and discharged at a different rate towards the top of the charge and bottom of the charge.

If an Onyx RCR battery is well balanced then it will cut out at 60 volts. If the battery is unbalanced, it can cut out at 67 volts or below, depending on the degree in different voltages between the individual cells.

BATTERY DISCHARGE CURVE

The Onyx RCR battery management system is programmed from 4.20 volts (84.0 volts) to 3.00 volts (60 volts). The benefits of this voltage range are a better battery cycle life by not discharging lower than 3.00 volts and it's safer to not charge above 4.20 volts. With a Grin Tech Cycle Satiator charger, the battery can be charged to 4.22 volts (84.4 volts) but it's not worth the extra time to charge and the small amount of gain. Nominal voltage is where most of the battery's capacity is stored, between 3.6 volts (72 volts) and 3.695 volts (73.9 volts).

| | LOW VOLTAGE DISCHARGE CURVE |
|-----------|-----------------------------|
| 6% Charge | 65.8 Volts |
| 4% Charge | 64.4 Volts |
| 2% Charge | 62.0 Volts |
| 0% Charge | 60.0 Volts |

BATTERY BALANCING

It is really easy to charge your ONYX Motorbike battery. The battery pack in your ONYX Motorbike is removable, which allows to you remove and take the battery with you to charge or store the battery to prevent theft. However, **you can charge the battery with it installed in the bike** (and let's face it, it is much more convenient to run an extension cord out to the shed).

If charging the battery IN the bike, you can leave the battery switch (RCR only) in the ON position, but make sure that your e-bike is system is turned completely off before beginning charging using the kill switch button on the right side controls in the OFF position and/or by disconnecting the battery.

The battery is a flammable lithium-ion battery and should not be stored or charged near a heat source or open flame. For more safety precautions, reference the OPERATION INSTRUCTIONS - BATTERY OPERATION, CHARGING, STORAGE section of the user manual on our website: onyxmotorbikes.com/pages/user-manual



- + Riding faster consumes more battery.
- + Become familiar with how many miles away your destination is going to be.
- + Not balancing the individual battery cells makes for a not so great battery.
- + Keep your battery charge levels above 20 percent which is 69.9 volts on the display voltmeter.
- + How well the battery is taken care of directly impacts the Onyx RCR's performance, battery sag, and top speed.

WHAT ELSE CAN I LEARN ABOUT CHARGING MY BATTERY?

A great thing about lithium-ion batteries compared to other, older batteries (i.e. lead-acid, nickelmetal hydride (NiMH), etc.) is that lithium-ion batteries have little to no "memory effect." This means that you can charge your battery after each ride, regardless of its charge level, with little effect on its long term health. Each battery has a built-in smart Battery Management System (BMS) that monitors and maintains the health of the cells, and our optimized battery chargers automatically monitor and turn off when the battery is fully charged.

Below are some additional battery charging tips, advisories, and notes that can be handy to keep in mind...

- COOL DOWN After riding your ONYX, do not charge the battery yet, let it cool down for an hour or more if possible. It is best to provide your battery a cooling period of about 1 hour AFTER a ride
- before starting to charge it, and then let the battery rest for about 1 hour after charging it before going on a ride.
- Allow an ample amount of time to fully charge your battery.
- Never leave your battery on the charger after it is done charging. Even though the battery charger does have a cut off this is good practice to keep your battery safe.
- Only use a battery charger provided or approved by ONYX. Using an aftermarket high current rapid-charge or quick-charge battery chargers can damage your battery and will void your warranty.
- Avoid constant exposure to extreme temperatures for a long battery life.
- Always charge your battery before use if it has been sitting unused for a few days.
- Avoid frequently fully discharging your battery (dead all the way down to cell protection cutoff) in order to prolong the life of the cells.
- Keep the bike power OFF while charging the battery in the bike. You can turn the bike on briefly to check the battery charging progress but do not leave the power on.
- Do not charge or use a damaged battery.
- The charger works on 110/220 V 50/60 Hz standard home AC power outlets.
- Do NOT open the charger case for any reason! Fuses are replaceable without removing the charger case/cover!
- Do not cover the charger while charging. The charger should be used in a dry location (preferably inside at room temperature (~50-77 degrees Fahrenheit) with good ventilation away from direct sunlight and debris.
- DO NOT try to charge your battery when it is frozen (below 32 degrees Fahrenheit). This can lead to permanent damage. Let your battery rest indoors and warm up to about 50 degrees Fahrenheit before beginning charging.
- Lithium ion batteries charge differently from traditional technology lead acid batteries. Using smart chargers that ONYX provides, they charge quickly up to 80%, and then they taper off until the final few volts trickle in. This is normal and safest for your battery. However, this also means that the last 20% will seem like it is going to take forever to finish... Be patient!

- It is advised to use the 5 Amp battery charger provided by ONYX. However, occasionally you maycharge your battery using our quicker 10 Amp charger. Keep in mind that it is not ideal to rapid charge for your battery EVERY time. Patience can extend the life of your battery...
- After charging the battery, let the battery rest for an hour or two if possible so that the battery
 can cool down and to let the cell charges can even out. This is known as cell balancing. When new,
 battery cell balancing can take a couple or more 100% charge cycles to completely balance out for
 consistent and even charges every time.
- Charge the battery in a safe well-ventilated place, and don't leave the charger unattended. Unplug the charger when done as soon as possible.
- It may not always be practical, but charging the battery to 80% and discharging it to 20% are actually best for a long life. It's of course more than OK to charge it to 100%. Try not to let the battery sit at 100% on the charger longer than necessary.
- Keep in mind that the 100% RCR battery maximum charge voltage is 84.0 Volts +/- 2% on the 72V battery for the RCR. Yours may charge fully to a little more or a little less. This normal, so don't worry if it is not exactly 84.0V. The chargers that ONYX provides are smart, but they are not calibrated power supplies where the output is digitally monitored and adjusted. So you can patiently to charge the battery to 84.0V (for the RCR), but DO NOT expect it to perfectly fill each and all cells and show 84.0V once unplugged. The high-quality cells are matched, but each and all of the cells in the pack are not perfect can have some variance. So the BMS manages it to make sure it is optimized based on the cells and their condition in the pack. Also note that the bike draws a certain amount of voltage when it is on. For example, a standard RCR will normally draw approximately 0.6 volts when it is turned on. Therefore, it is normal for the display show 83.8 V when fully charged.
- There will be times when YOU JUST HAVE TO RIDE ASAP and want to recharge your battery as fast as possible. Again, it is recommended the ONYX-provided charger for best results, however, if you just can't wait and you decide to forego your warranty, you can charge the 72V battery with an 84V charger that has an output higher than 5A so that the battery will charge faster. However, the higher amperage charging rate crams more into the cells quicker, which will heat up the cells and make the battery warmer. Doing this occasionally is not a big deal. But charging the battery solely with a higher amperage charger risks of shortening the life of the battery. Remember, the cooler the battery, the better... So it is nice to give the battery a break and just charge it normally with the standard charger from time to time...

BATTERY LIFE

This depends on several factors, including the age of the battery, the frequency of your discharge/recharge cycles, temperatures, and general storage techniques. Your ONYX batteries will typically give most riders an average of 5 years of awesome riding adventures or approximately 800 full discharge/charge cycles (where a full charge cycle is from completely empty to completely full)! Here are some general riding style considerations that will give you a good idea of what to expect regarding the long-term health and life of your battery:

fore each use may see around 5-6 years of life

from their battery.

| DAILY RIDERS AND REGULAR SPEED RACERS | CASUAL OR WEEKEND WARRIOR RIDERS |
|---|--|
| A rider who rides out the full charge every time. This could be hammering the throttle the whole | A casual rider who rides maybe once every few days or only on weekends for a couple of hours |
| time to fully drain and recharge every day, sev- | at a time and charges the battery only just be- |

time to fully drain and recharge every day, seven days a week. This style rider may see about 3-4 years of life from their battery.

BATTERY TEMPERATURES AND STORAGE

Using and storing your battery in extreme heat and extreme cold are not ideal for your lithium ion battery. Below are some lists of notable considerations with respect to the Lithium Ion battery pack that is used in your ONYX Motorbike.

COLD TEMPERATURES

Here are some points that are good to know about your battery's performance in low temperatures:

- If possible, make sure that the battery is kept above 50° F and below 105° F to avoid performance issues. If it is colder than 50° F outside, bring the battery inside with you. If that is not a reasonable option, it would be good to cover it with a blanket. Cold storage will result in more voltage sag, which is felt as a lack of power until the battery and motor heat up from riding.
- Never leave the battery fully discharged in the freezing weather for a long time. Always keep a minimum 30-50% state of charge.
- Never charge the battery if the battery pack itself is below 40° F.
- Never try to rapidly heat up a frozen battery (like putting in an oven or near a fire place). Let the battery come up to proper temperature slowly and naturally.
- When you ride in the cold, you could lose range, sometimes as much as 20% or more. Cold (above -4° F) doesn't necessarily lessen the battery capacity. You should generally get the same Ah out of your pack, if you baby the cold battery.
- Cold riding your battery could result in early voltage cutoff. Cold raises the internal resistance (IR) of your battery. That means that the increased IR may cause more "sag" more under load, thus producing less power (Watts). This will not cause permanent long term damage unless the battery is repeatedly used hard in extreme cold conditions.
- While Ah remains about the same the Watt-hour (Wh) will drop because Wh are a result of the amp-hours X voltage. So when the voltage "sag" drops low due to the internal resistance, the overall Wh drops too...
- As you use a cold battery, the cells and motor warm up and will gain power. It is advisable to use enough power to allow the cells get hot. Without enough power, you will have massive sag and early cutoffs. So use power, but be aware of where your riding falls on the spectrum of babying and thrashing your bike. Be reasonable. Think about what it takes you to get your body going on a really cold morning!

HOT TEMPERATURES

Here are some points that are good to know about your battery's performance in high temperatures:

- Lithium-ion batteries perform well at elevated temperatures, but prolonged exposure to heat reduces longevity. Capacity loss at elevated temperature is in direct relationship with the battery's state-of-charge. So, a fully charged battery pack in very hot weather is bad in the long run. It won't catch fire, but don't expect as much cycle life out of it long term!
- Don't charge the battery if it is above 113° F (45° C).
- If possible, don't charge the battery right after riding since cells can be well above 113° F (45° C).
- If possible, don't charge the battery in direct sunlight if the ambient temperature is over 85° F (29°C). Charge in a cool place away from direct sunlight.

LONG TERM BATTERY STORAGE

For seasonal riders, winterization or an anticipated break in riding, here are some ways to help best preserve your battery:

- Don't store the pack fully charged. Store your pack at around a 40-50% charge level as indicated on the battery gauge.
- Store your battery in a cool, dry place. It is best to store the battery at room temperature (approximately 72° F).
- If storing the battery IN the bike, make sure that you unplug your battery from the controller by disconnecting the large red battery connector.
- Do not leave the battery and charger connected together and plugged to the wall outlet to keep the battery charged. It is best to store it with a charge of around 40-50% of capacity as indicated on the battery gauge.
- If you let the battery go too low for too long, the battery could potentially suffer permanent damage, and that is not covered under your warranty.
- ONYX does not currently (as of August 2020) offer battery upgrades, but you may purchase an extra battery (great for extending your range on long trips!) or a replacement battery.
- Failure to follow proper charging and storage procedures may result in a non-functional battery, and replacement will not be covered under warranty. Always ensure battery is charged before use. Before each ride, inspect the battery to ensure there is no damage to battery and that it is securely locked to the frame. Charge and store bike and battery in a cool, dry location, between 50°F 77°F (10°C 25°C). Failure to properly charge, store, or use your battery may void the warranty and may cause a hazardous situation.

ADDITIONAL BATTERY TIPS AND USAGE (TL/DR)

All of ONYX's ebike batteries are lithium-ion batteries. Lithium ion batteries are great and in many respects better than old-school lead acid, but they do have some quirks that should be noted in order to ensure good, safe, and reliable operation. Make sure that you read the 'BATTERY CARE / MAINTENANCE / SAFETY TIPS" section in your RCR User Manual. The following advice will help maximize the performance and life of your battery.

- Keep in mind that charging and general performance results will vary on your ONYX Motorbike depending on the SoC (state of charge), the # of charge cycles on your pack, the ambient temperature, the (internal) temperature of your battery, the motor, and your riding style.
- Do not immerse or submerge the battery in water or any other liquids, and prevent it from getting wet.
- Do not drop the battery.
- Do not use or charge the battery under high temperatures.
- Do not place or allow the battery to be near a fire or a heating device.
- Do not disassemble the battery.
- Do not touch/short circuit the positive (red) and negative (black) terminals of the battery connector.
- Store the battery inside in a cool, dry environment.
- Always unplug the battery when cleaning or working on the bike, especially when any covers are removed!
- When storing your battery, make sure to always store the battery unplugged from the charger, disconnected from your bike, and if applicable in the OFF position. When storing the battery long term, keep the battery at around a 50% charged level. Check the battery monthly and charge the battery back to approximately 50% partial charge state.
- Do NOT touch the "+" and "-" terminal contacts on or in the battery connectors when the battery is removed from the bike.
- Avoid damaging the exposed connector pins and sockets, and keep them clear of debris. If they get dirty, carefully clean them using compressed air or a soft bristle nylon brush if available.