

Chinook 200 Marine

Assembly and Use Instructions

*The MNChinook 200-12M, MNChinook 200-24M, and MNChinook 200-48M
Micro Wind Turbines that generate clean renewable electricity anywhere the wind blows...*



- Available in 12, 24, and 48 Volt models.
- Innovative design axial flux alternator using neodymium iron boron magnets.
- Powder coated stamped aluminum chassis.
- Maintenance-free, low friction double sealed bearing.
- Extremely quiet injection molded blades with a new airfoil design.
- Long-life yaw pivot slip-rings and wipers.
- Easy installation.
- Simple design for low cost and durability.
- Made in USA.
- Gluten Free.

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MNChinook 200M Instructions

Disclaimer

All specifications are subject to change without prior notice.

- The information given in this user manual is believed to be accurate and reliable.
- *MidNite Solar* assumes no responsibility for omissions or inaccuracies.
- The user of this information and product assumes full responsibility and risk.
- The Chinook 200M Micro-Turbine is a source of electrical power. It must be installed in accordance with all applicable electrical regulations and best practices.
- The Chinook 200M Micro-Turbine has moving parts, and **Sharp Blades** that may cause injury due to poor installation and unsafe handling or operation.
- *MidNite Solar* assumes no responsibility for problems caused by unsafe or unsatisfactory installation or operation.

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Introduction

Please read this manual thoroughly before attempting to assemble, install or operate your *Chinook 200M* small wind turbine. This will assure optimum performance and safety. This manual applies to:

MNCHINOOK-12M, 12V Turbine
MNCHINOOK-24M, 24V Turbine and
MNCHINOOK-48M, 48V Turbine.

A separate manual is supplied with the CDL (Chinook Diversion Load).

The *MNChinook 200M* has been designed to be simple, economic, durable, and yield excellent performance.

Thanks to its unique design; the *Chinook 200M* is not susceptible to corrosion in normal operating conditions. With double sealed bearings and powder coated finish, the Chinook200M is made specifically for **marine installations**,

Applications include:

- Sailboats
- Cathodic protection
- Monitoring sites
- Remote homes / off grid
- Wind-electric water pumping
- Street lighting and road signage
- Farm utilities (electric fencing, irrigation, etc.)
- Telecommunications



MNChinook 200M Instructions

SAFETY

Safety must always be your primary concern during the assembly, installation and operation of your *Chinook 200M* turbine. Always be aware of the risks involved with mechanical and electrical installation work. If in doubt about any issue regarding your turbine, please seek further assistance before proceeding.

Mechanical Safety Hazards

- The main rotor is the most obvious and serious mechanical safety risk. When the turbine is operating at its rated speed, the blades will be very difficult to see due to the rotation speed. Never approach the turbine while it is operating. Always shut down the turbine by activating the stop switch. **Ensure that the turbine is installed in a suitable location where nobody can approach or interfere with the path of the rotor blades.**
- Working with tools of any kind can be dangerous. Your *Chinook 200M* turbine requires some basic mechanical assembly with rudimentary hand tools. If you are in any doubt about how to use these tools correctly, please seek advice from an experienced person.
- Your *Chinook 200M* turbine will inevitably be installed upon a mast, tower or other mount. This may mean working at height. Always ensure that all personnel in the immediate vicinity are aware of any lifting / hoisting operations that will be occurring. Check there are no loose components or tools likely to fall and cause injury during the lifting operation. Where possible, all assembly work should be completed at ground level.
- Ensure that the batteries are disconnected during the installation procedure.
- Twist the turbine output wires together (to create a short circuit) during the mechanical installation process. This will prevent the turbine from 'spinning up' during the installation.
- Never install the turbine upside down or in any orientation other than that depicted on the installation instructions.
- Install your turbine during a calm day.
- When performing routine inspection or maintenance, always stop the turbine by activating a stop switch or by shorting out the turbine output once disconnected from the battery.

Electrical Safety Hazards

- The *Chinook 200M* generates rectified DC voltage. Even at these low voltages there are inherent risks. Caution should always be used when connecting the *Chinook 200M* to the electrical system.
- Ensure that you have followed the wire-sizing chart to ensure that the correct size of wire has been selected. If wire of insufficient size is used, heat will build up in the wires causing a potential fire hazard. A properly sized fuse or circuit breaker must be used in the wires connected to the battery. This will stop the risk of short circuit currents and fire.
- Batteries used in renewable energy systems can deliver a serious amount of current. A short circuit in the battery circuit can lead to hundreds of amps flowing through the battery cables. This will cause a heat buildup and ultimately an electrical fire. Batteries are also susceptible to explode when shorted. Always use insulated electrical tools when working on the battery's electrical connections. Removing rings and jewelry is also a good idea.
- Batteries are very heavy. Do not attempt to move batteries by yourself. Always use manual handling tools and an assistant.
- Always keep lead-acid batteries the correct way up. Do not allow the acidic electrolyte to spill or come into contact with your skin or face. Always follow the manufacturer's safety instructions when handling lead-acid batteries.

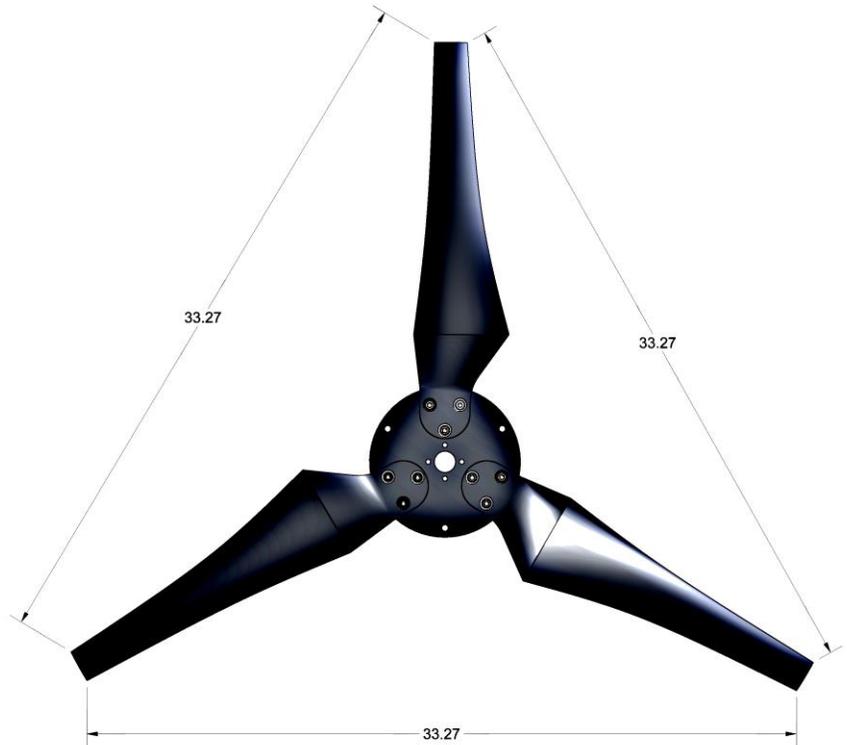
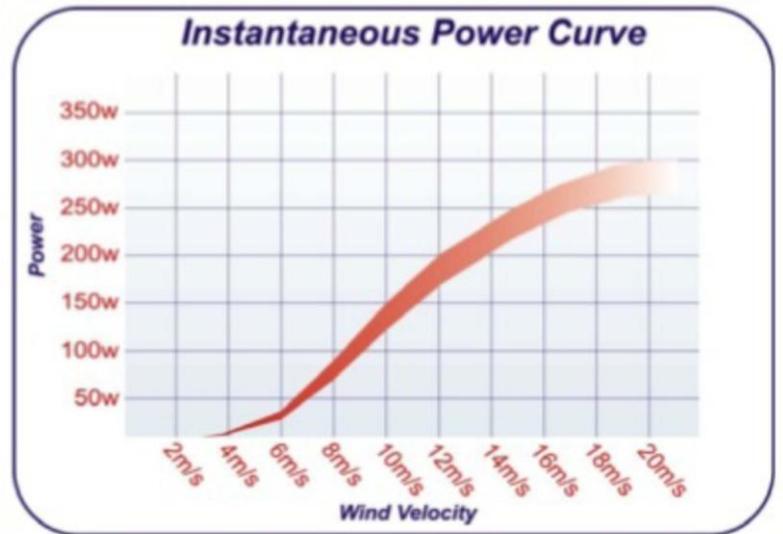
Please use common sense when installing and operating your turbine!



MNChinook 200M Instructions

Specifications:

Turbine Name: **Chinook 200 Marine**
Part Number: MNCHINOOK200M
Nominal Voltage: 12 / 24V / 48V DC
Rotor Blades: Glass Reinforced Nylon
Rotor Diameter: 1 Meter (3.28 Feet)
Rated Wind Velocity: 14m/s (31.30 mph)
Rated Output: 200 Watts
Max Output: 250 Watts
Start-up Wind Velocity: 3.5m/s (7.8 mph)
Total weight: 6.3 Kg (14 lbs)
Tower mount: 1.5" Sch 40 Diameter pipe
Chassis Construction: Aluminum





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Package Contents

Your *Chinook 200M* Turbine will arrive containing the components shown below. If any of the components are missing or damaged, please contact your dealer immediately.



- 3 Blades
- 1 Turbine Chassis (white)
- 1 Controller
- 1 Spinner (Nose Cone)
- 1 Blade mounting plate
- Hardware Kit with Allen wrenches and Manual

MidNite Says:

Take your time,
check your work
and you will enjoy
your turbine for
years to come.

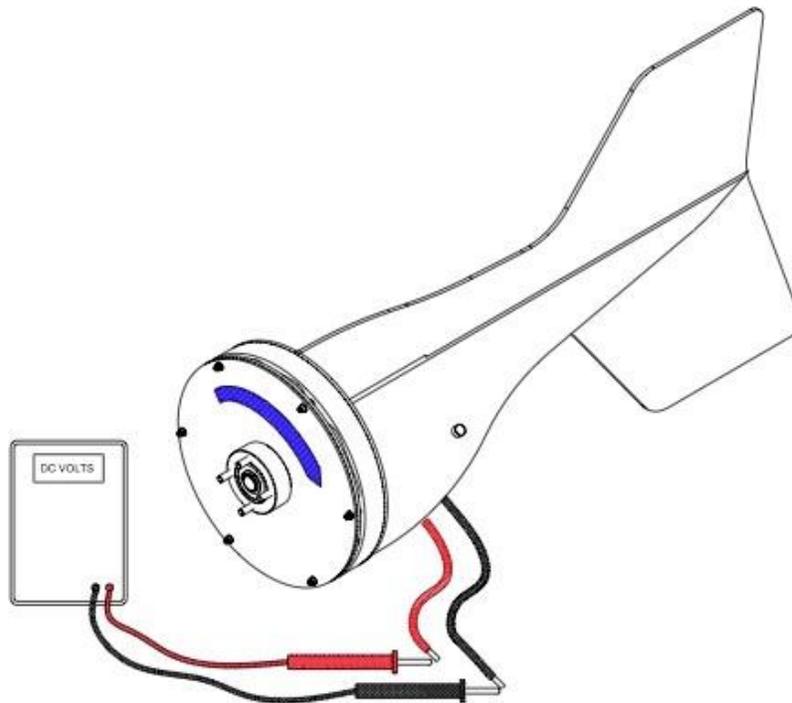




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Mechanical Assembly Procedure

- 1) **Unpacking** - Inspect the contents of the box and ensure that all items are present and free from damage. If any of the components are missing or damaged, please contact your dealer immediately.
- 2) **Check Magnet Rotor & Continuity** - Ensure that the magnet rotor is free turning and does not scrape or rub on the coil disc as it rotates. You may feel a slight resistance from the bearings at this stage. The bearing units used in the magnet rotor assembly are factory lubricated and sealed for life. It will take approximately 100 hours of normal operation for the bearing seals to 'Break-in' and the lubrication to be distributed correctly around the bearing raceways and ball cages. During this period you may notice a reduced performance caused by the additional friction of the bearing seals. In operating temperatures of -10 degrees Centigrade or lower, this 'Break-in' period will be extended by a further 50 hours of normal operation. Connect a digital multi-meter to the positive (red) and negative (black) output leads extending from the yaw pivot. With the multi-meter set to detect DC Volts, a voltage should be displayed when the magnet rotor is spun. This voltage will vary with the speed of rotation. If the magnet rotor rubs, or no voltage is detected when turning the magnet rotor, please contact your dealer immediately.

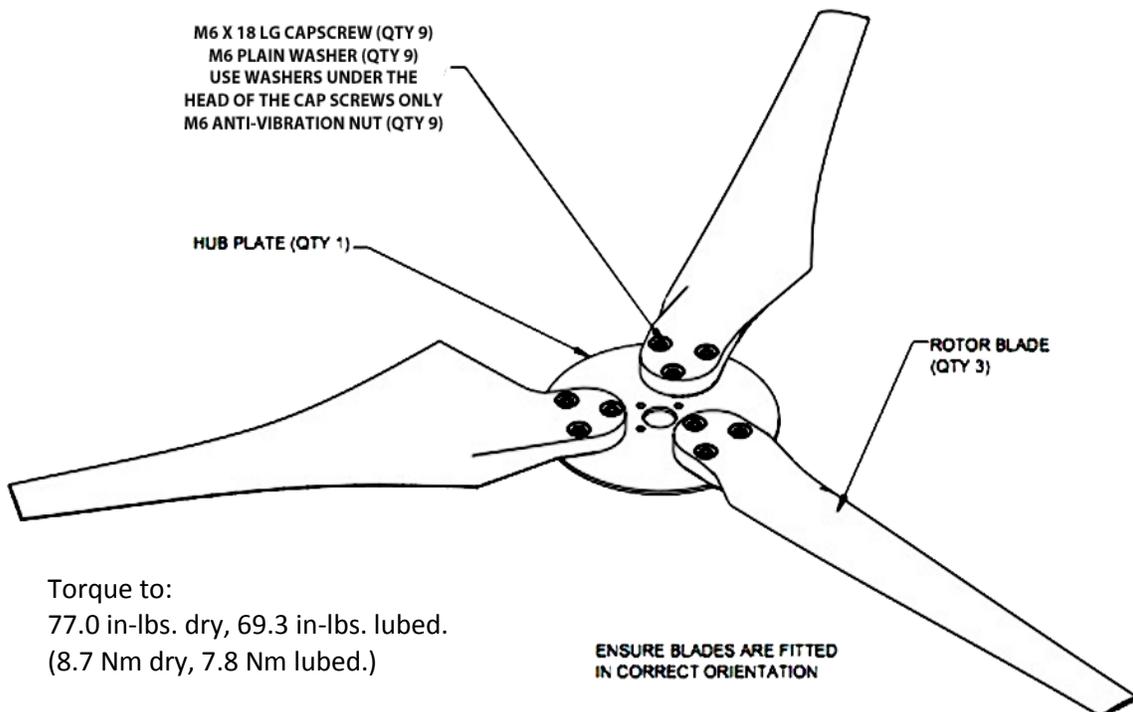




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Warning: The magnet rotor on your *Chinook 200M* turbine is constructed using neodymium iron boron rare earth magnets. These are extremely powerful magnets (scary strong) and can cause injury if not handled with care. Take care when working with tools made of ferrous materials (such as wrenches and screwdrivers) close to the magnetic poles. The magnetic forces between ferrous materials and the magnet rotor will be very strong. This may cause a sudden snapping action that can pinch or trap your fingers or skin.

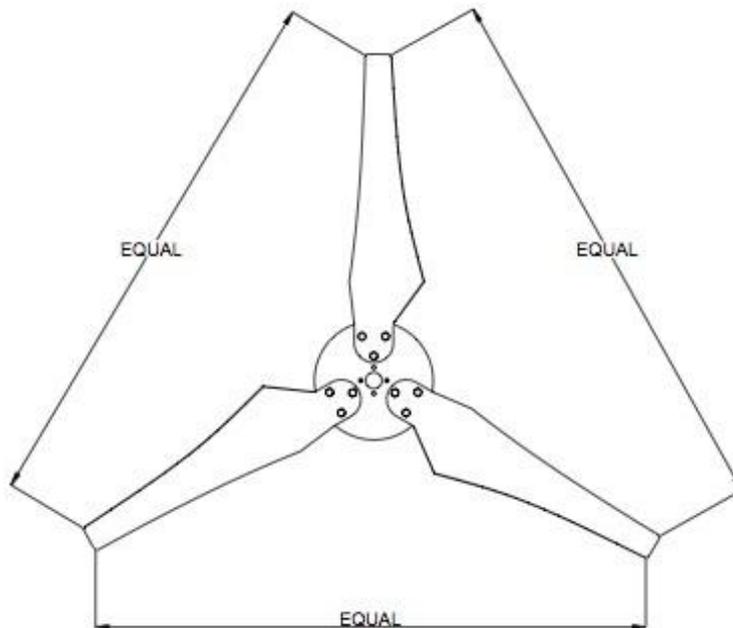
Rotor Blade Assembly: Take the three rotor blades and rotor hub plate. Be careful when handling the blades, they **may have sharp edges**. Use a 10mm socket & hexagon key and three M6 x 18mm long cap-screws to attach each blade to the hub plate. The blades should all be fixed to the hub plate on the same side, with the blades in the same orientation. 3 M6 x 18mm cap-screws, 3 washers and 3 Nylock nuts should be used on each blade. Tighten the Screws until the blades are safely secured. Do not over-tighten the nuts as this may damage the blades and fixings. NOTE: the rotor hub plate has 3-clinch nuts installed for the spinner attachment; the flat side of the clinch nut is the FRONT of the plate.





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Check the Tip Spacing- Lay the assembled rotor blade on a flat surface. Using a tape measure or long steel rule, ensure that the spacing between each tip is equal to within a tolerance of +/-1.5mm. Adjust the blades as required. Output performance may suffer if the blades are not spaced equally.



Fit the Rotor Blade Assembly- The assembled and balanced rotor blades can now be fitted to the *Chinook 200M* chassis. This is done by placing the rotor hub plate against the bearing house on the turbine. In the hardware kit you will find 4 ea M5 X 14mm cap-screws, 4 split lock washers and 4 flat washers. NOTE: you will have 3 ea. M5 X 16mm cap screws that are for use on the Nose cone. Ensure that all 4 screws are securely tightened and that the rotor blades are mounted with the flat side of the blades facing forward.





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Check the blade rotation- Once the blades have been fitted and secured to the chassis, ensure that they rotate freely. Also take this opportunity to check that all of the blade and hub mounting screws are secure. Remember that the blades are SHARP!

Fit the nose cone- The nose cone can now be fitted to the rotor. This is done by aligning the 3 mounting holes of the nose cone with those on the rotor hub plate. Use the 3ea M5 x 14mm hex head screws and 3 flat washers to secure the nose cone in position. Ensure that the nose cone runs concentrically (true) by slowly spinning the rotor by hand. Loosening the screws and adjusting the nose cone position should correct any misalignment or 'wobble'. Make sure you do not over tighten the screws and crack the nose cone (spinner).

Prepare the Turbine Mount- To prepare your tower / mount bracket, you will need to drill a 6.5mm diameter hole into the mast to secure the turbine. This hole should be drilled 18mm from the top of the tower / mount bracket and should be perpendicular to the surface. The hole should penetrate both sides and cross the center line of the tubular section (go straight through).

Install the Transmission Wire- When your tower or mount bracket is ready to have the turbine mounted, the next stage is to run the wire from the top of the mount to where the electrical controller and batteries will be located. Follow the table below to select the correct wire size. This will vary depending on your nominal battery voltage and the distance that the cables will be run. Careful selection of the wire size is required. It will not only affect the safety of the system, but also the overall efficiency. A wire of insufficient size will cause a voltage drop, wasting the power that has been generated. The wire sizes listed below have been selected with efficiency and cost in mind, as it is unlikely that your turbine will be running at full capacity 100% of the time. If in doubt, consult your local electrical supplier. The wire should be installed in accordance with local electrical regulations and guidelines. If in doubt, use a local electrical contractor to complete the wire installation. See "Cable Strain Relief" on **page 12**.

Warning: If a wire of insufficient size is used, heat will build up in the wire causing a potential fire hazard. Wire capacities quoted below are based upon AWG wire sizes.

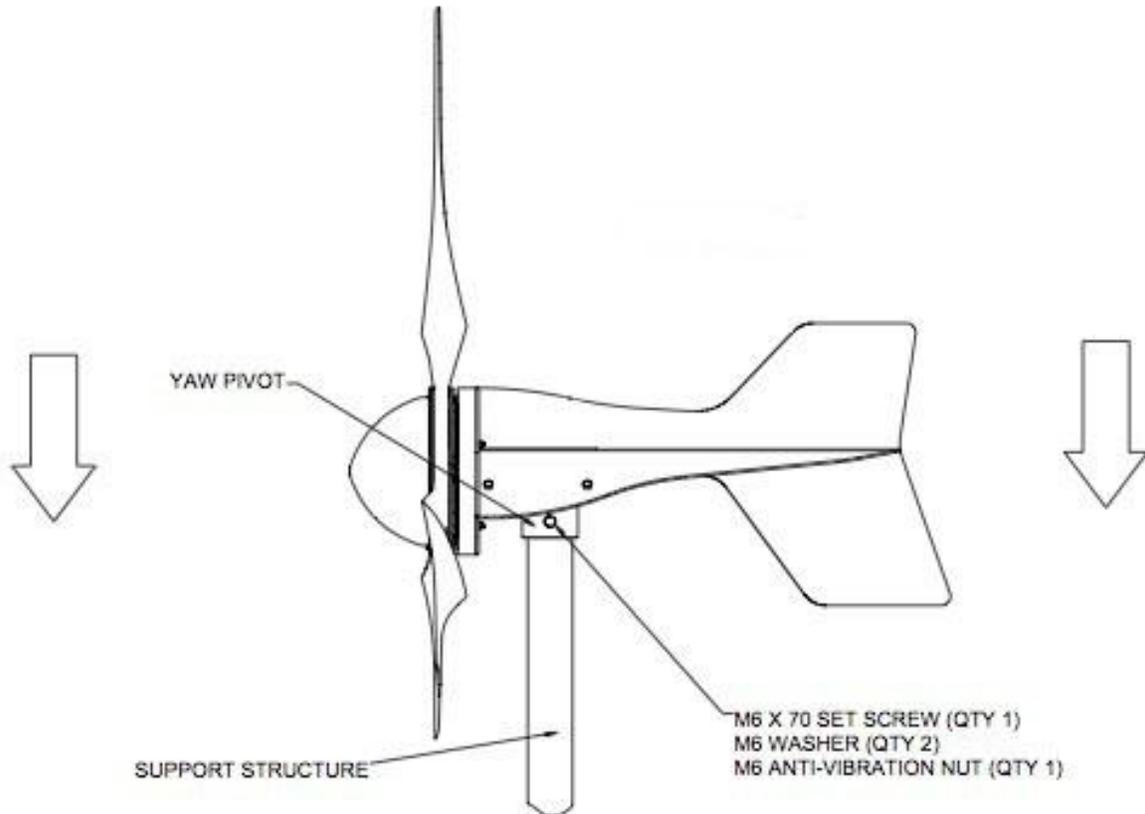
Chinook 200M Output Voltage	Transmission Distance		
	30 Feet	90 Feet	300 Feet
12 Volts	8 AWG	6 AWG	Not Recommended
24 Volts	12 AWG	8 AWG	4 AWG
48 Volts	14 AWG	12 AWG	10 AWG

Mount the Chinook 200M Turbine on to the Support Structure- Ensure that the previously installed power transmission wires are not yet connected to any batteries and are 'shorted' together. This will prevent the turbine from operating during the installation process. Once this has been done, connect the turbine output wires to the transmission wires using a terminal block with a minimum rating of 30 Amps. Move the



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turbine up to the support structure and push the turbine body onto it. Ensure that no wires are snagged. Use the M6 x 70 fully threaded cap screw, along with two washers and a Nylock nut to secure the turbine to the mount using the hole in the yaw pivot. Ensure that all hardware is securely fastened.



Electrical Installation

Please refer to the generic wiring diagram (**page 13**) for a battery charging renewable energy systems, as there may be different ways of wiring small wind turbines, photovoltaic panels, charge controllers and batteries together. This type of system will often expand 'organically', but the following guidelines should be adhered to:

- **Follow the appropriate electrical code** - The electrical wiring of your Chinook 200M turbine and associated electrical systems must be done in accordance with national and local electrical codes and regulations.
- **Do not connect the turbine or batteries during the installation** - Ensure that the turbine is not running or connected to the batteries during the installation or wiring process. Connect the output wires of the turbine together to prevent the rotor from starting up.



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- **Galvanic corrosion of electrical joints** - Try to avoid connections between dissimilar metals. For example, connecting copper and aluminum together will result in galvanic corrosion of the connection. This will increase the electrical resistance of the connection (wasting energy by getting HOT!), and reduce the mechanical integrity of the joint.
- **Protect the cables** - The power transmission wires must be protected from mechanical damage and fatigue. Run the wires through an approved conduit.
- **Cable strain relief** - Prevent mechanical strain on the transmission wires running down from the turbine. Clip the wires. Failure to do this will result in excessive mechanical strain on the wire joints within the slip-ring assembly and may cause a failure. Wire ties or a Kellum type grip (see below) are good ways to prevent mechanical strain on the cables.



- **Negative or Positive Ground System** - The *Chinook 200M* turbine output is isolated. This means that there is no electrical connection between the output wires and the turbine chassis. In a negative ground system, the negative terminal of the battery bank should be bonded to ground. In a positive grounded system, the positive terminal of the battery bank should be bonded to ground. This provides protection against the buildup of static and lightning strikes. The turbine mount should be grounded separately with its own ground rod and an appropriate surge arrestor installed to help prevent damage to the battery charging system during a lightning strike. Ensure that the grounding cables are of the same rating as the positive and negative cables.
- **Wire Selection** - The wire size table shown on **page 10** should be used to select the minimum Sized wire for a given transmission distance. Voltage drop in the wire will be reduced if a larger wire is used.
- **Fuses** - The turbine and charging circuit should be protected with a suitably rated 'slow-blow' DC fuse or DC circuit breaker. Please refer to the table below for the correct rating. The fuse or breaker should be positioned between the turbine and batteries (on the positive wire). If a stop switch is used (recommended) the fuse should be positioned between the switch and the batteries. Important! Fuses and circuit breakers protect the wiring and prevent overheating and fire. Do not use circuit breakers or fuses with a higher current rating than the wire it is protecting!

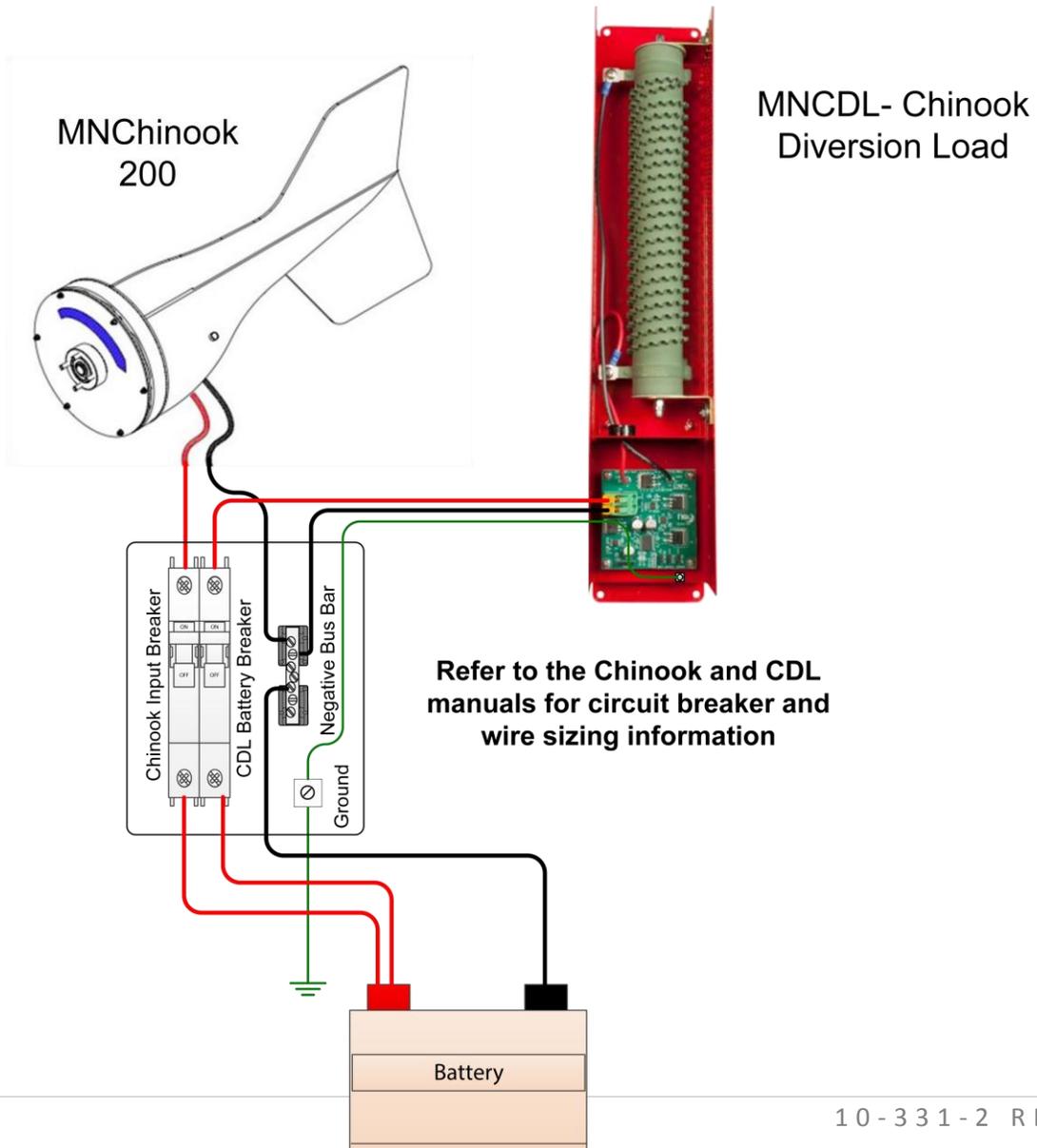
<i>Chinook 200M Nominal Output Voltage</i>	<i>DC Fuse / DC Circuit Breaker Rating</i>
12V	25 Amp
24V	15 Amp
48V	10 Amp

- **Run / Stop Switch** - The optional Midnite MNSTOPSWITCH is a simple brake switch that provides a safe and easy way of stopping the turbine during high winds or for maintenance. As the switch is thrown, the batteries are disconnected and the turbine is 'shorted,' reducing the rotor to a slow rotation.



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- **Charge Controller** - The *Chinook 200M* diversion load charge controller (MNCDL) is used to manage the power output from the turbine to the batteries. A diversion load charge controller operates by increasingly switching output to a dump load once the batteries begin to reach high voltages. The dump load consumes the 'excess' power from the turbine. This means that the turbine's power output is always utilized whether the batteries are fully charged or not. Depending on the size of the dump load, the turbine may slow down or stall during a period when the power is being diverted. Larger capacity battery banks will be able to store more energy and so the dump load will be used less.
- **'Hybrid' Systems** - The *Chinook 200M* turbine can be used in a system with PV panels. We recommend that the PV panels are wired independently with a separate charge controller specifically designed for use with PV panels, and connected in parallel with the battery bank. The *Chinook 200* controller can be used with PV Panels as long as the Maximum rated panel output does not exceed **75 Watts** when using the turbine's CDL controller.





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Turbine Operation

The *Chinook 200M* is based on a simple design for ease of installation and reliable operation. You may notice the following behavior during normal operation:

- **Cut-in** - The turbine will not begin to charge the batteries until the rotor is spinning at approximately 350 RPM. When operating below this speed, the turbine will be 'Un-Loaded' and will be freewheeling. Once the turbine output voltage becomes equal to the nominal battery voltage (at around 350 RPM), the turbine will become 'loaded' and begin to deliver current to the batteries. During the Un-Loaded stages of rotation, the rotor blades rotate very freely. This allows the rotor to build up speed and allows aerodynamic lift to be generated by the blades.
- **Normal Operation** - Once the rotor is spinning at 350 RPM, current will be delivered to the batteries. As the rotor speed increases, so too, will the current and voltage. Excessive wind speed may increase the battery voltage to a high level. Once this happens, the *Chinook 200M* CDL diversion charge controller will recognize that the battery voltage is becoming too high, and begin to divert turbine output.
- **Charge Regulation** - Once the diversion controller (CDL) has engaged, the turbine will no longer be charging the batteries. Instead, the power from the turbine will be delivered to the dump load (The built in resistive heater element) and the turbine rotor may seem to rotate more slowly. The battery voltage will begin to drop to normal levels during the regulation period. Once the battery voltage is back within acceptable limits, the CDL will stop diverting current to the dump load. Refer to the CDL controller user manual for specific operating instructions.
- **Shut Down** - By activating the optional stop switch (if you have installed one), the output from the wires of the turbine are 'shorted' together. This effectively puts a near infinite load on the generator causing the turbine to stall. When the stop switch is activated, the turbine may still rotate slowly during high winds, but the rotor blades will not be able to build up any significant speed. It is **not recommended** that the stop switch be activated while the rotor is spinning at high speed. This sudden braking action will stress the blades and other components. Activate the stop switch during a 'lull' when the rotor is not spinning excessively fast (not following this warning may violate your warranty).
- **High Winds** - Every effort has been taken to ensure that the *Chinook 200M* will withstand the forces exerted by strong winds. However, the raw power in high winds is immense, and the stresses placed upon the turbine are magnified by gusty and turbulent conditions. Where possible, the turbine should be shut down in advance of particularly strong winds (60+ MPH) and storm conditions. This will decrease the wear and tear on the machine and will help to avoid a failure. The rotor blades may rotate slowly during the shutdown period, but the forces exerted will be greatly reduced during strong winds. Protect the turbine from extreme winds as you would protect other items of your property.

Note: Never allow the turbine to run un-loaded with no connection to a battery bank or dump load. Doing so will allow high open circuit voltages to be generated by the turbine. These voltages may be dangerous and will damage the stator coils within the turbine.



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Maintenance

Please follow the preventive maintenance program listed below. This will ensure that the turbine operates reliably and safely with good efficiency.

Always shut down the turbine before attempting to carry out maintenance.

Post-Installation Checks (to be carried out one month after installation):

- Check that the turbine mount pin is secure and has not worked loose. Adjust if required.
- Ensure that the rotor hub is still securely fitted.
- Ensure that the rotor blades rotate freely.
- Monitor the output. Ensure that the turbine and charge controller are functioning correctly.

Annual Maintenance:

- Inspect the tower / support structure.
- Remove the turbine from its installation to a suitable workbench.
- Remove the rotor blade assembly.
- Inspect the edges of the rotor blades for damage such as dents or chips. The blades will become unbalanced if they are damaged. This will cause vibration, noise and poor performance. If many dents have occurred along the edges of the blades, a new set of rotor blades should be installed (Contact MidNite Solar for replacements).
- Inspect the roots of the blades (attachment tabs) for signs of stress cracking or fatigue. A new set of rotor blades should be installed if any cracks or fractures have occurred.
- Remove any build-up dirt and debris from the rotor blades using mild detergent in warm water.
- Check the blade hub for excessive play.
- Check and rebalance the rotor blades as required.
- Check that all electrical connections are sound and free from corrosion.
- Generally ensure that the turbine is in good working condition and is safe for continued use.

After Five years of normal operation:

- We recommend that the rotor bearing and rotor blades should be replaced after five years of continuous operation. This will ensure that the turbine's performance and safety are not compromised.

Other Considerations:

- The equipment used in the charging system (batteries, charge controller, PV panels, etc) should be maintained according to the instructions provided by the equipment manufacturer.
- Where lead acid batteries are used, it is especially important that they are maintained carefully. Failure to do so will result in the batteries being rendered useless within a short period of time.



Replacement Parts

The following components may need to be replaced during the service life of your Chinook 200M turbine:

Rotor Blades (sold only in sets of 3)

Slip Ring Wiper (set of 2)

Slip Ring (sold only with yaw mount assembly)

Stator (48VDC)

Stator (24VDC)

Stator (12VDC)

Bridge Rectifier

Yaw Bearing & Housing

Rotor Bearing & Housing

CDL Turbine Controller (resistor installed for specific voltage at the factory)

Please contact your Dealer or MidNite Solar for replacements.



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MIDNITE SOLAR INC. LIMITED WARRANTY

MidNite Solar Power electronics, sheet metal enclosures and accessories
MidNite Solar Inc. warrants to the original customer that its products shall be free from defects in materials and workmanship. This warranty will be valid for a period of five (5) years for all products except the MNBRAT Charge Controller, MNBIRDHOUSE1 batteries, and MNChinook turbines. These will be two (2) years.
MidNite Solar will not warranty third party inverter components used in MidNite's pre-wired systems. Those components are warranted by the original manufacturer.

At its option, MidNite Solar will repair or replace at no charge any MidNite product that proves to be defective within such warranty period. This warranty shall not apply if the MidNite Solar product has been damaged by unreasonable use, accident, negligence, service or modification by anyone other than MidNite Solar, or by any other causes unrelated to materials and workmanship. The original consumer purchaser must retain original purchase receipt for proof of purchase as a condition precedent to warranty coverage. To receive in-warranty service, the defective product must be received no later than two (2) weeks after the end of the warranty period. The product must be accompanied by proof of purchase and Return Authorization (RA) number issued by MidNite Solar. For an RMA number contact MidNite Solar Inc., 17722 67th Ave NE, Arlington, WA 98223 (360) 403-7207. Purchasers must prepay all delivery costs or shipping charges to return any defective MidNite Solar product under this warranty policy. Except for the warranty that the products are made in accordance with, the specifications therefore supplied or agreed to by customer:

MIDNITE SOLAR MAKES NO WARRANTY EXPRESSED OR IMPLIED, AND ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEEDS THE FOREGOING WARRANTY IS HEREBY DISCLAIMED BY MIDNITE SOLAR AND EXCLUDED FROM ANY AGREEMENT MADE BY ACCEPTANCE OF ANY ORDER PURSUANT TO THIS QUOTATION. MIDNITE SOLAR WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES, LOSS OR EXPENSE ARISING IN CONNECTION WITH THE USE OF OR THE INABILITY TO USE ITS GOODS FOR ANY PURPOSE WHATSOEVER. MIDNITE SOLAR'S MAXIMUM LIABILITY SHALL NOT IN ANY CASE EXCEED THE CONTRACT PRICE FOR THE GOODS CLAIMED TO BE DEFECTIVE OR UNSUITABLE.

Products will be considered accepted by customer unless written notice to the contrary is given to MidNite Solar within ten (10) days of such delivery to customer. MIDNITE SOLAR is not responsible for loss or damage to products owned by customer and located on MIDNITE SOLAR'S premises caused by fire or other casualties beyond MIDNITE SOLAR's control. This warranty is in lieu of all other warranties expressed or implied.

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