



ARI Hybrid Solar-Wind Generator

450 Watt and 750 Watt Small Wind Turbine Series!

Owner's Manual

Wind Turbine Serial Number _____



Reliable, Affordable and Durable

ARI Solar-Wind Generators combine the newest wind turbine technology and market research from years of feedback of owners of small wind turbines. Our goal is to produce reliable, affordable, and durable solar-wind generators that will last for years with maintenance free operation.

Wind generators, like other sources of electrical power, must be installed following the owner's manual and the guidelines established by state and local regulations. It is very important for you to read the entire manual thoroughly prior to installation. Also, please consult a local electrical contractor or the local planning and zoning office for your area of regulation details.

Table of Contents

Introduction.....	4
1. Safety Precautions.....	8
2. Parts in the Package.....	10
3. Features of the Wind Turbine.....	12
4. Specifications of the Wind Turbine.....	14
5. Installation Procedures.....	16
6. Configuration.....	20
7. Choosing Site.....	22
8. Tower.....	23
9. Troubleshooting.....	24
10. Maintenance.....	25
11. Warranty Policy.....	25
12. Contact Us.....	27

Introduction

ARI hybrid solar-wind generator system optimizes the use of natural energy resources combined with cutting-edge technology.

The Optimal Stand-Alone Power System

Many remote towns or sparsely populated areas are not serviced by the main power grid. Power must be generated locally using engine generators powered by conventional fuels, such as diesel. However, the transportation and storage of diesel fuel can be expensive and the supply is not always reliable. Therefore, diesel generators are best used on a short-term basis or for emergency purposes. Solar and wind resources are good alternatives to provide more consistent year-round energy power. Solar and wind are also the most available renewable energy resources on earth, and many remote areas have sufficient supply of both.

The sun is the source of all energy on earth. Wind is a form of solar energy and is caused by the uneven heating of the earth's surface by the sun. For example, the poles receive less energy from the sun than does the equator, and dry land heats up and cools down more quickly than does the seas. On much of the earth, wind speeds are low in the summer, when the sun shines brightest and longest. The wind is stronger in winter, when less sunlight is available to produce electricity from solar cell technology. Wind speeds may also be lower during the morning and mid day when sunlight is strong, but increase in the evening when electricity from solar cell technology is less available. Because the peaks for wind flow and sunlight often occur at different times of the day and year, wind energy and solar energy can complement each other. A hybrid solar-wind power system can balance out the ever-fluctuating solar and wind resources and is more likely to produce power when you need it.

The Best Combination of Technology

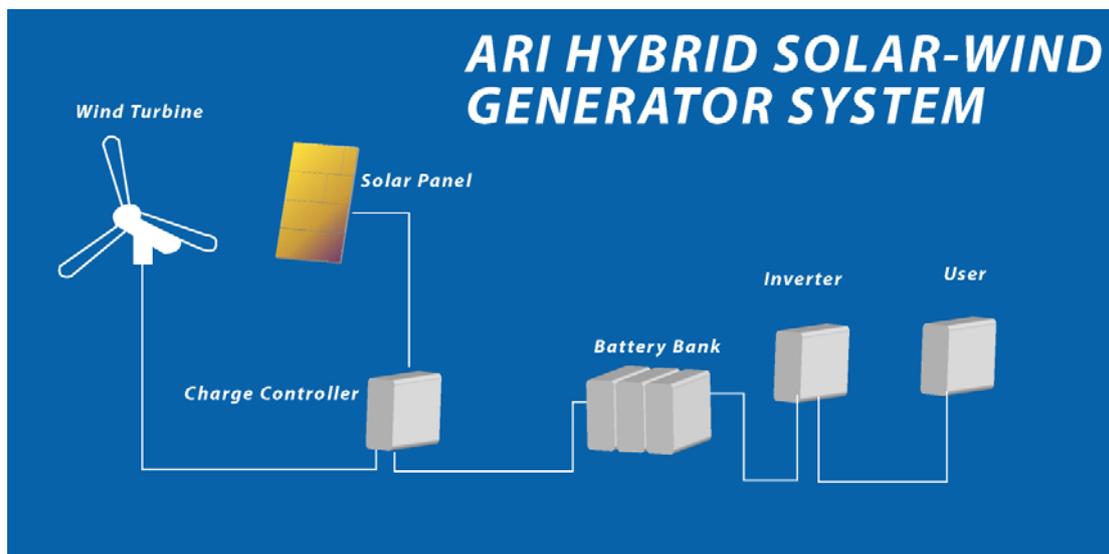
ARI hybrid solar-wind generators produce power from both solar and wind energy sources. Hybrid solar-wind regulators, which are also known as hybrid solar-wind charge controllers, regulate the charging current of solar panels and wind turbines, before it is stored in battery banks. Inverters are then used to convert direct current (DC) electricity stored in the battery banks to alternating

current (AC). The advantages of solar systems are their reliability and low operating costs, but they are relatively expensive to manufacture.

Wind power generators use a wind turbine to convert wind energy into electricity. Similar to solar power systems, charge controllers are used to regulate the charging current before it is first stored in battery banks, and inverters are then used to convert DC back into AC. The advantages of wind power systems are their low manufacturing and operating costs, but their reliability is sometimes lower due to the fluctuation of air flow.

Non-combined solar systems or wind systems can be affected by variations in the weather and the season, resulting in inconsistent power generation. The fluctuations could lead to batteries being under-charged for a long period of time, causing the lifecycle of the batteries to be shortened.

Since solar power and wind power can complement each other as energy sources, a hybrid solar/wind power system will optimize the use of these two natural energy resources for needed power supply. Manufacturing costs of hybrid systems can be reduced because the same battery bank and inverter can be used for both the solar and the wind generators.



Advanced Over-Speed Protection System

As the technology of small wind generators has advanced in past decades, so has the industry. However, the reliability of small wind generators continues to plague the industry. Due to cost considerations, manufacturers tend to use mechanical controllers, which are based on simple principles of

aerodynamics, for wind power control, in lieu of the more technologically advanced and more expensive hydraulic pressure controller. While it could pass wind turbine tests, a mechanical controller, which has movable parts, does not work well in the field due to the complexity and rapidity of change in wind speed and wind direction. The movable mechanical parts invariably wear out in extreme weather conditions, resulting in a break down of the system.

Since fewer movable parts give less chance for a breakdown, high-quality wind generators today typically have only three movable parts:

- a. Main body of wind turbine
- b. Rotor blades
- c. Over-speed protection system

The first two movable parts are indispensable because they compose the core of the wind turbine. In order to increase reliability, we must turn our attention to the over-speed protection system.

All wind turbines are designed with some kind of over-speed protection system. In case of strong wind, it is necessary to waste part of the excess energy of the wind in order to avoid damaging the wind turbine. There are two different ways to design an over-speed protection system on modern wind turbines.

- a. A pitch-controlled wind turbine that turns blades out of the wind when the wind output becomes too high and turns them back into the wind when the wind speed drops.
- b. A stall-controlled wind turbine that has blades bolted onto the hub at a fixed angle. When the wind speed becomes too high, it creates turbulence on the side of the blades that is not facing the wind. In other words, a stall, the same way an aircraft wing stalls. This stall reduces or stops the lifting force of the rotor blade from moving it forward.

However, both approaches have technical problems. Wind flow is a complex phenomenon. Not only is turbulence a constant occurrence, but the change of wind speed and direction is instantaneous and frequent. No mechanical apparatus can react swiftly enough to match the instant change in wind flow. As a result, the heavy wear and tear often causes the breakdown of the wind turbine.

ARI Renewable Energy Company has developed a brand new electromagnetic brake for ARI wind turbines. The new technology incorporates an entirely new magnetoelectricity regulator that functions as a

brake, similar to modern electrical and hybrid cars.

This brand-new regulating protection idea has discarded the mechanical regulation structure and has fundamentally solved the reliable operational problem associated with the hybrid solar-wind generator. This advanced over-speed protection system has the following advantages:

- a. It has discarded the mechanical regulator of the wind turbine, and therefore it only retains two moving parts. This greatly enhances the structural stability and reliability of the ARI wind turbine.
- b. The design of the main body of the wind turbine now has more artistic and diverse choices when the mechanical regulating structure is eliminated.
- c. The advanced over-speed protection system also gives different levels of charge control, according to the variable wind speeds, which greatly increases the performance of the ARI wind turbines.



I. Safety Precautions

The ARI Solar-Wind generator is designed under strict safety regulations. However, any electrical and/or mechanical equipment during installation or operation can cause potential inherent dangers, if the proper safety precautions are not taken. Please read the following ARI solar-wind power generator safety precautions thoroughly before installing your solar-wind generator.

1.1 Installation Safety

- 1.1.1 Rotating blades can move fast enough that the tip of a blade is almost invisible, which can cause serious injury or damage to anything it contacts. **DO NOT INSTALL THE TURBINE WHERE ANYONE CAN COME IN CONTACT WITH THE BLADES. DO NOT INSTALL THE BLADES UNTIL THE TURBINE IS MOUNTED ON THE TOWER.**
- 1.1.2 Undersized wire or a bad connection can cause over-current electrical dangers and overheating in wiring systems that could cause fire or other personal dangers. **STRICTLY FOLLOW THE INSTRUCTIONS ON THE WIRE-SIZING CHART IN THIS MANUAL . FUSE ALL CONNECTIONS AND CHOOSE THE CORRECT SIZE OF FUSE OR CIRCUIT BREAKER ACCORDING TO THE GUIDELINES OF THIS MANUAL.**
- 1.1.3 It is very important to disconnect all turbine wiring from batteries and turn the charge controller switch off before installation. Please, carefully follow the step-by-step installation procedures. Connecting the wires to the battery prior to the installation of the turbine can cause the rotor to spin up during installation and result in personal injury. **DO NOT ATTACH THE WIRES TO THE BATTERIES UNTIL THE LAST STEP OF THE INSTALLATION PROCESS.**
- 1.1.4 During tower set up, under no circumstance should anyone stand near the construction site. It is important for you to consult with a local specialized tower installation technician, and you will need someone available to help during the installation process. The turbine installation should take place at ground level prior to mounting the turbine to the tower. **DO NOT ALLOW ANY PERSON UNASSOCIATED WITH THE INSTALLATION TO STAND NEAR THE CONSTRUCTION SITE DURING THE INSTALLATION PROCESS.**

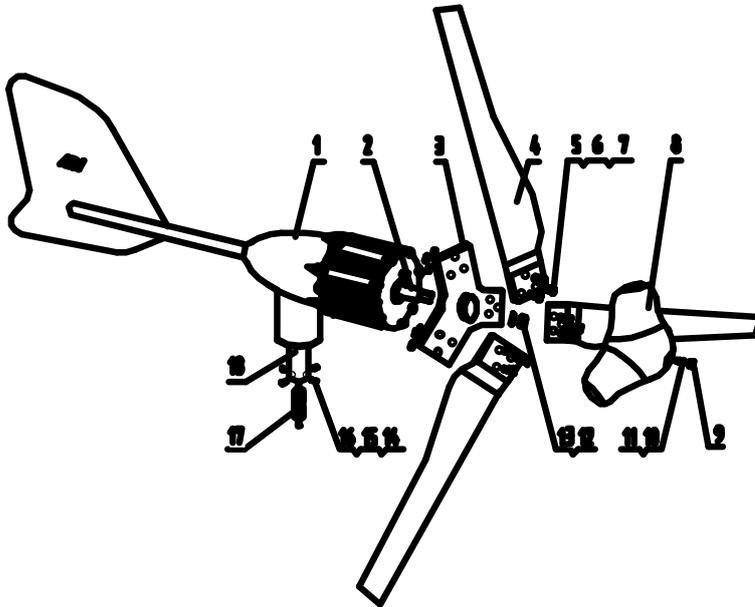
1.2 Operation Safety

- 1.2.1 Fasten all tower welding, bolts, and nuts and tighten all connections before operation.
- 1.2.2 Before regular maintenance or battery replacement, shut down the turbine by setting the charge controller switch to the “STOP” position. Do not disconnect the battery wires when the controller is set to “ON” position.
- 1.2.3 Caution: The moving rotor blades can be broken, if a solid object comes in contact with them. After setting the controller switch to the “STOP” position, you should wait until the blades stop rotating before any maintenance or inspection of the blades.
- 1.2.4 The ARI wind turbine is designed to shut down automatically when a strong wind blows through the site. However, before extreme weather approaches your area, including but not limited to hurricanes, tornados, and extreme winds (140 MPH+; 63 m/s), you should lower the tower to protect from any potential accidents. Before lowering the tower, you must set the controller switch to the “STOP” position, disconnect the wires to the battery bank, and make sure the blades stop rotating.



2. Parts in the Package

Please unpack and check the packing list to ensure every part is included in the packing box.



No.	Part Name	Quantity
1	Alternator Main Body	1
2	Rotor Shaft	1
3	Hub	1
4	Rotor Blades	3
5	M8*30 Screw	9
6	Φ8 Flat Washer	9
7	M8 Anti-Loosening Nut	9
8	Nose Cone	1
9	Nose Cone Cover	1
10	M6*45 Screw	1
11	Φ 6 Flat Washer	1
12	M16*1.5 Nut	1
13	Φ16 Spring Pad	1
14	M8*15 Screw	4
15	Φ8 Flat Washer	4
16	M8*15 Nut	4
17	Cable Connector	1
18	Yaw Shaft	1

3. Features

3.1 Alternator

The ARI wind alternator is made with high quality, high strength permanent magnetic materials. It is lightweight and compact with high power generating capacity. Our wind alternator experts have used unique electromagnetic technology that results in very little starting resistance, thus effectively guaranteeing the easy startup of the ARI wind turbine even with gentle breezes. And the ARI alternator is designed to provide efficient AC power with its built-in electronic control system. The power capacity and startup performance have made this alternator one of the best in the world.

3.2 Turbine

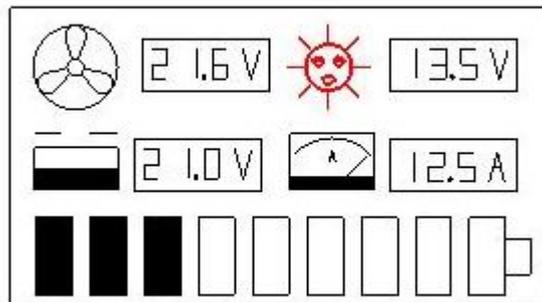
The ARI turbine's main body is made of high-quality die cast aluminum alloy and stainless steel components from a precision casting process. Thus it is lightweight, yet extremely strong and highly reliable. Because of the precision casting process, the ARI wind turbine has a perfect shape. Moreover, the die cast aluminum alloy works as a cooling system for the turbine, by transferring heat into the wind passing through the turbine. Furthermore, the ARI wind turbine is easy to install and maintenance-free. Its sculptured artistry as it adds beauty to the skyline, while providing clean energy for you in sunny or windy weather.

3.3 Blades

ARI wind turbine blades are made of fiberglass reinforced composite, shaped through a high-precision casting process. The fiberglass blades are an extremely strong material that also has the advantage of stability and quiet operation. Fiberglass can endure severe weather and environments, such as storms and exposure to salt water and heat. Fiberglass itself is heat resistant and corrosion resistant. The material is extensively used in the ship industry in boat frames, in Olympic sports for pool materials, in the construction industry as support pillars for mansions, and as high-quality blades for wind turbines. Due to its high strength, heat and corrosion resistance, fiberglass is the best choice for propeller materials for the hybrid solar wind generator system. ARI rotor blades are meticulously designed by experts in aerodynamics to require very low wind speeds for startup and electricity generation and a very high wind energy utilizing ratio. Because of the aerodynamic quality of the blades, propeller racing can be avoided in all circumstances.

3.4 Charge Controller

The surface of the ARI solar-wind charge controller is made through a precision casting process with high quality and die cast oxidized-processed aluminum alloy plate. On the outside of the controller is a digital monitor that visually displays the process of charging and discharging the battery. Separate lights on the monitor indicate charging of the battery bank by the solar panels and by the wind turbine. When solar power is charging the battery banks, the solar LED lights up, and when the wind power is charging the battery banks, the wind charging LED lights up.



The ARI charge controller is designed with built-in over-speed protection to give the ARI wind turbine maximum safety and reliability. Moreover, the charge controller has a built-in circuit breaker to avoid accidental short circuits of the battery bank. Furthermore, the ARI charge controller is also designed with a voltage regulator that monitors and regulates the battery voltage. When the battery voltage rises above the set point, the CPU automatically shuts off the turbine and stops the rotor blades from rotating. As a result, the wind turbine stops generating power, protecting the system. When the CPU senses a voltage drop, the wind turbine resumes rotating and begins normal charging of the battery.



4. Specifications

4.1 Technical Data of the Wind Turbine

Model	ARI-450		ARI-750	
Start up wind speed	5 mph 2.3 m/s		5 mph 2.3 m/s	
Rated wind speed	26mph 11.8 m/s		26 mph 12 m/s	
Incision wind speed	6.5 mph 3 m/s		6.5 mph 3 m/s	
Survival wind speed	140 mph 63 m/s		140 mph 63 m/s	
Rated voltage (VDC)	12	24	24	48
Rated power (W)	450		750	
Max. power (W)	520		880	
Blade diameter	4.6 feet 1.4 meters		5.9 feet 1.8 meters	
Number of blades	3			
Material of blades	Fiberglass reinforced composite			
Alternator	Permanent magnet brushless			
Charge controller	Hybrid solar-wind controller, charging LED display			
Over-speed protection	Aerodynamic effects of the blades and electromagnetic brake			
Over-current protection	Electromagnetic brake			

4.2 Output Power Curves of the Wind Turbine

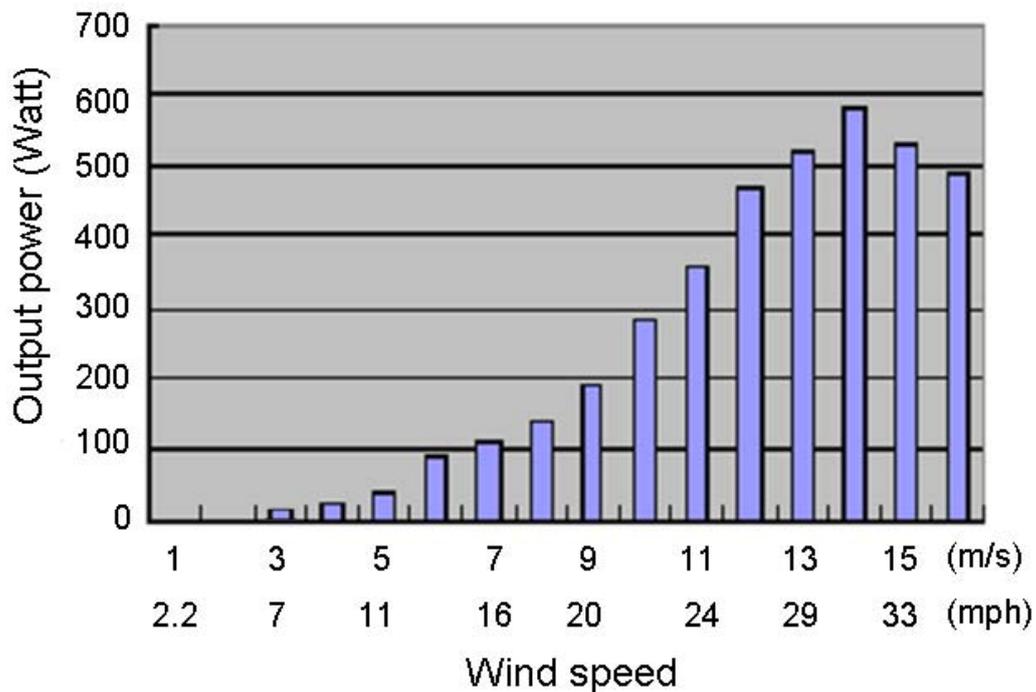
At ARI, we consider the following criteria for wind speed measurement:

- a. The speed of wind varies from moment to moment, so it is not reliable to rate electricity output based on the wind speed of a particular moment.

- b. The average wind speed varies little from year to year for a given area. This allows us to calculate annual electricity output with reasonable accuracy.
- c. Based on the formula $E=0.2D^2V^3$, energy varies with the third power of the wind speed. During the year, wind speed varies between 3m/s and 8m/s. Electricity output should be measured based on the low end of the wind speed instead of the peak speed.
- d. Wind generators often have to work in extreme weather conditions such as in sandstorms, rainstorms, turbulent wind climates, and in high salt alkaloid environments. To ensure reliability, the turbine must undergo rigorous testing. Systems that are less costly are usually under-tested and are therefore less reliable.

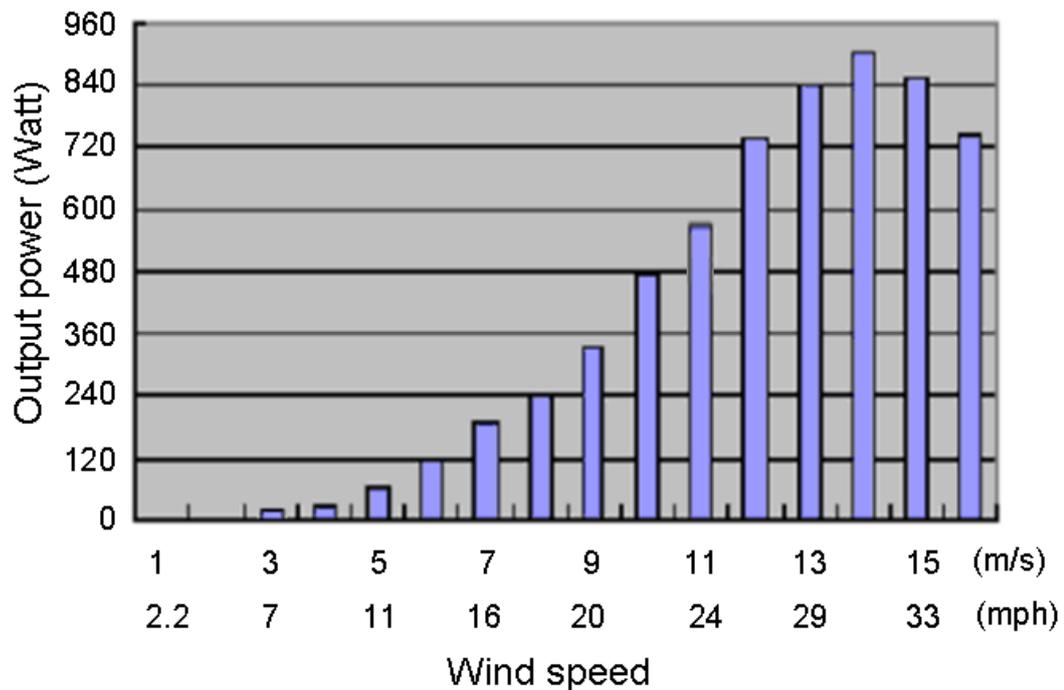
4.2.1 ARI-450

Table 1 ARI-450 Output Power Curve



4.2.2 ARI-750

Table 2 ARI-750 Output Power Curve



5. Installation Procedures

5.1 Preparation for the Installation

- 5.1.1 Choose a site for the installation of the ARI Solar Wind Power Generator system according to the recommendations of this manual.
- 5.1.2 Purchase a tower kit, tower pipe, an inverter, battery banks, and cable wires according to the recommendation of this manual. Have the tower on site and prepare all the necessary wires, inverter, and battery banks on site for the installation of the ARI hybrid solar wind generator system.
- 5.1.3 If you choose to install solar panels at the same time as installing the wind turbine, have your solar panels ready at the site for installation.
- 5.1.4 Choose calm weather and have someone available to help.
- 5.1.5 If necessary, find a local eligible solar-wind installer or a certified wind energy electric technician to help with the installation process.

5.2 Step-by-Step Instructions

1. Unpack the packing box. Check the packing list to make sure every part is included in the packing box.
2. Choose a tower pipe that is at least 8 meters or 26 feet high for the wind turbine. Have your tower kit ready on the site. Refer to the ARI Tower Kit User's Manual to install your tower on the ground. Note: Please wait to erect the tower.
3. Choose the appropriate size of 3-wire copper cable according to table 1 below or larger diameter (smaller number on A.W.G standard). Run the cable from the tower base through the tower pipe to the top of the tower. From the tower base, gently stretch out the cable to the charge controller.

Model	450		750	
Voltage	12V	24V	24V	48V
50M	16#	18#	16#	19#
100M	15#	17#	15#	18#
≥	13#	16#	13#	16#

NOTE: Table 1 shows the distance from the wind turbine to the charger controller.

4. Strip the insulation back from each set of the 3-wire cable out of the tower base. Connect the three wires separately to W1, W2, and W3 on the charge controller.

Note: it does not matter which wire connects to which number. The three leads from the ARI Turbine are AC and may be hooked up in any order.

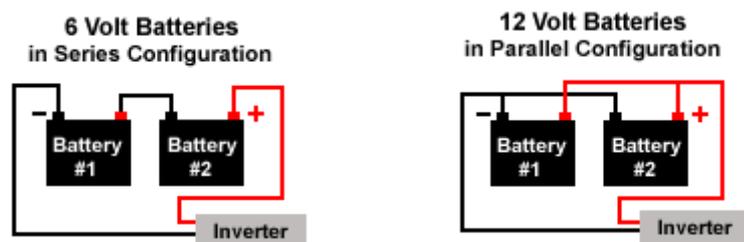
Note: Connecting screws for the ARI controller are easily accessed by removing the silver nameplate located on the front of the controller. Please pay close attention to the polarity when inserting battery connection output leads and PV panel input leads. Make sure each of the three wires is locked firmly on its position.

5. Set up the battery bank. Depending on the voltages of the batteries

you have chosen, have your batteries connected either in series connections or parallel connections. Please choose Solar-Wind compatible batteries. We recommend the rechargeable deep cycle sealed lead-acid (SLA) gel batteries for the ARI Solar-Wind generator system. Note: The deep cycle Marine battery is not recommended. Battery banks should be installed according to the installation guidelines, and this part of the manual involves the simple steps of the installation of battery banks. Only use batteries of the same type and same voltage.

When connecting your battery banks, determine the negative terminal (anode) and positive terminal (cathode) of batteries or battery bank.

- A. Series connection: Connect each set of battery banks in series (daisy chained) with its neighboring battery to achieve voltage increase. For example, connecting two 6-volt batteries in series will achieve 12 volts i.e. connecting positive terminal of one battery to negative terminal of next battery creates new battery bank with higher combined voltage of previous batteries or battery banks, but with same duration of previous battery or bank.
- B. Parallel connection: Connecting multiple sets of batteries in parallel will maintain the same voltage in new battery bank, but will multiply power duration capacity. Parallel connection is often used to increase the duration of available power from the system and the quantity of stored power. In parallel connection, two of the same batteries will generate twice the amp/hours of a single battery; three batteries will generate three times the amp/hours, and so on. This will lengthen the time before your batteries will need to be recharged, resulting in a longer run time for your appliances.

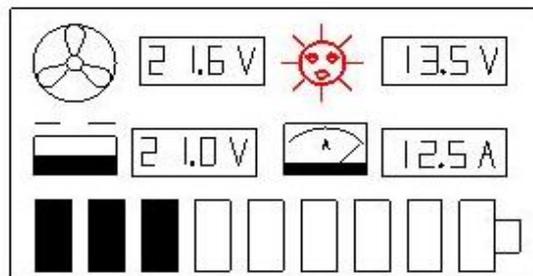


Caution: Do not reverse the connections of your batteries. Make sure that the connections between batteries are firm and secure.

- 6. Connect the battery bank to the charge controller.

NOTE:

- 1) The size of the 3-wire cable that connects the charge controller to the battery bank needs to follow or exceed the recommendation of section 6.2.1. (Refer to table 2.) Improper wiring size can cause the cable to overheat.
- 2) Make sure the ends of all wires are connected correctly, with the positive end to the positive and the negative end to the negative. Otherwise, the generator system may work improperly or some parts of the system could burn out.
- 3) To test the connection between the charge controller and the battery bank, turn on the charge controller. Two digital numbers for voltage and amps will display. Turn off the charge controller again.



NOTE: IT IS IMPORTANT TO TURN OFF THE CHARGE CONTROLLER BEFORE PROCEEDING TO THE NEXT STEP!

7. Connect the top of the yaw shaft to the main body shaft and firmly lock the yaw shaft (torque the screw to 4.1~6.8w.m. Do not over-torque). Pass the 3-wire cable out of the alternator main body through the pole of the yaw shaft.

NOTE: Make sure the yaw shaft does not cut or scratch the cable.

8. Strip the insulation back from each set of the 3-wire cable out of the top of the tower pipe. Do the same to the 3-wire cable stretched out of the yaw shaft, using the cable connector (the pins with male and female) to connect the 3-wire cable out of the alternator and the 3-wire cable from the top of the tower pipe. Then connect the male and the female pins together.
9. Take out the three blades. On each of the blades you shall see three screw holes about 8mm in diameter. If the surface of the screw hole has a block, it is the front, facing the wind. If the surface

of the screw hole is smooth, it is the back of the blade. Place this back side of the blade on the hub and lock it with M8*30 screws and Φ 8 flat washers. Firmly tighten the screws. The blades will move counterclockwise if they are installed correctly.

10. Place the nose cone to the center of the rotor blades, close it with the nose cone cover and then lock it with M6*45 screws and Φ 6 flat washers.
11. Mount the hub onto the rotor shaft, align the screw holes, place the nut at the end of each screw, and tighten the screw. Make sure the hub is firmly attached to the rotor shaft.
12. To test if the hub is correctly mounted to the rotor shaft, turn the charge controller to "ON". Manually move the hub. If the LED display on the charge controller shows battery voltage as 1~3V, then you have correctly connected the hub and all the wiring. NOTE: At this point, please turn the switch of the charge controller to the "OFF" position.

NOTE: IT IS IMPORTANT TO TURN THE SWITCH OF THE CHARGE CONTROLLER TO THE "OFF" POSITION BEFORE YOU PROCEED TO THE NEXT STEP!

13. Mount the wind turbine on the top of the tower by inserting the yaw shaft into the tower pipe (the end with four holes) and lock the wind turbine with four of the M8*15 3/8" screws provided with your wind turbine parts.
14. Erect the tower. Firmly secure the tower with all supports. For tower installation, please refer to your Tower Kit User's Manual.

NOTE: In the process of erecting the tower, please keep the switch of the charge controller to the "OFF" position.

15. Connect the solar panel to the charge controller. Please refer to the following table for the choice of your solar panel.

Wind Turbine	ARI-450	ARI-750
Solar Panel	300W	400W
Battery Bank	2*120Ah-150Ah	4*100Ah-120Ah

The total solar power output Amp, when the solar panels are

connected in parallel, shall not exceed the maximum allowed capacity of the charge controller (refer to the section 6.2.3).

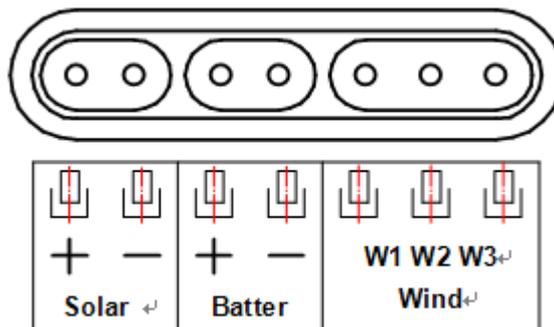
NOTE: If you plan to install more solar panels to increase the power output of your solar-wind system, please contact us. We can design a charge controller that specifically meets the technical requirement of your solar-wind generator system.

Before making the connection, use a dark cloth to cover the solar panel.

WARNING: If you do not cover the solar panel with a dark cloth, under strong sunlight the solar panel could generate enough voltage to cause injury to the installers.

Make sure to attach the positive wire from the solar panel to the positive connecting point on the charge controller and the negative wire to the negative connecting point. (Refer to the diagram below.)

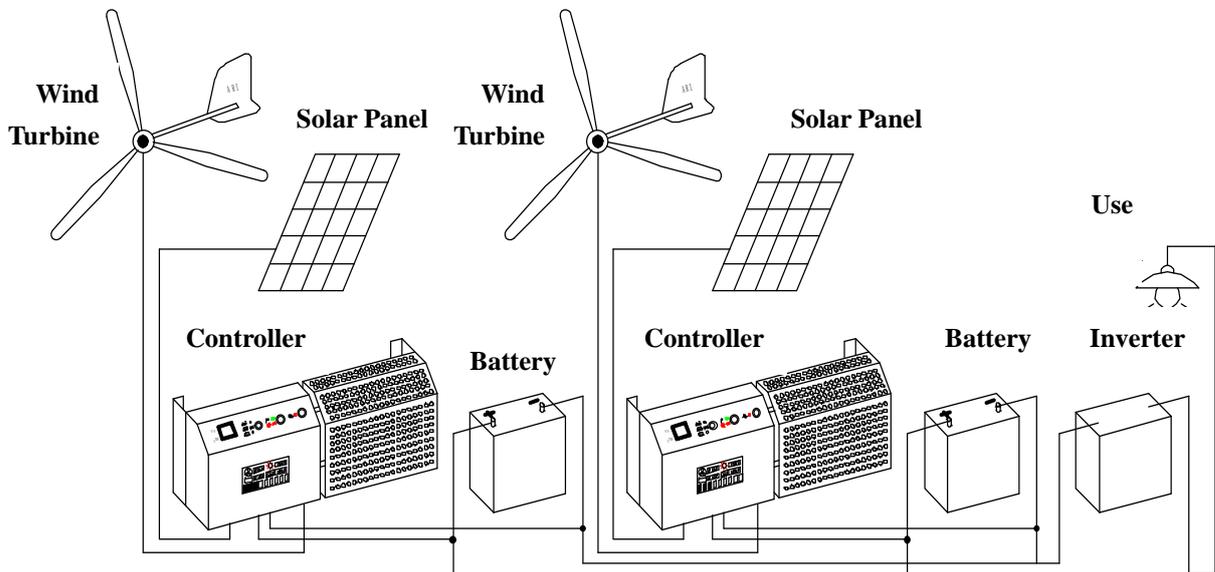
NOTE: Incorrect connection can cause the wires and parts to burn out.



16. Test the charge controller. ARI Renewable Energy Co. has designed the charge controller with an LED display. The three indicating lights separately represent solar, wind, and battery. When the solar panel generates charging voltage, a solar indicating light will light up. When the wind turbine generates charging voltage, the wind indicating light will light up, and when the battery is charging, the battery indicating light will light up. Turn the switch of the charge controller to the "ON" position. The LED display will turn on, if every step of the installation is done correctly.
17. Congratulations! You have now completed the installation process.

6. Configuration

6.1 Basic Circuit of the ARI Hybrid Solar-Wind Generator System



6.2 System Configuration of ARI Hybrid Solar-Wind Generator

6.2.1 Battery Bank

For the ARI-450 wind turbine, two 120AH/12V or two 150AH/12V batteries are recommended, and for the ARI-750 wind turbine, we recommend four 100AH/12V or 120AH/12V batteries. The positive terminal (cathode) of the battery must be well grounded. Too small diameter of 3-wire cable can substantially cause electric power loss. For the minimum requirement of diameters of the cable, please refer to Table 2 below (A.W.G. standard):

Distance		450			750		
voltage		12V	24V	48V	12V	24V	48V
50M	A.W.G. (#)	9	12	15	7	9	14
	Diameter (mm ²)	3.0	2.5	1.5	4.0	3.0	2.5
100M	A.W.G. (#)	8	11	14	6	8	13
	Diameter (mm ²)	4.0	2.5	2.5	6.0	4.0	2.5
≤ 100m	A.W.G. (#)	7	10	13	5	7	12
≥ 200m	Diameter (mm ²)	4.0	2.5	2.5	6.0	4.0	2.5

6.2.2 Inverter

An inverter converts the DC power to supply AC power. When power is first generated by solar PV and wind turbine, it is stored in the batteries as DC power. It is normally necessary to change it to supply AC power supply with the use of an inverter. We recommend an inverter 110V 60HZ (or 220V 50HZ). Inverted watts should equal to 1.3 x watts of your solar-wind generator power output. For example, if your wind turbine is ARI-750 without solar PV panel, then you should choose 1000W inverter, i.e., 1000W 24VDC or 48VDC/110VAC 60Hz or 220VAC 50Hz. We recommend a pure sine wave inverter or modified sine wave inverter for the ARI solar-wind generator system.

6.2.3 Charge Controller

The Charge Controller has a supplementary function. The solar PV panel and the wind turbine can simultaneously charge the battery bank. The ARI charge controller is designed with overcharging protection. It will stop charging when the battery bank is fully charged. After the storage battery charge is complete, the wind turbine automatically moves to bypass load and the red indicating light will turn on. When CPU senses the bypass load, CPU automatically dumps the excessive power. The following are the specifications of ARI charge controller:

Model	Maximum Charging Amp (A)	Maximum Charging volts (V)
ARI-450/12V	35	15.5
ARI-450/24V	18	30.5
ARI-750/24V	30	30.5
ARI-750/48V	15	60

NOTE: When used, the charge controller must be connected to the battery banks. Otherwise, burn out will occur.

7. Choosing a Site for the Wind Turbine

Site selection is very important for both effective performance and safe operation of your wind turbine. Because wind power is a cube function of the wind speed, a 10% increase in wind speed will result in approximately a 37% increase in the wind power available from the wind and a similar increase in turbine performance. For example, wind energy at a wind speed of 5 m/s is twice as much as wind energy at a wind speed of 4 m/s. And it is always true that as the tower gets higher off the ground, the wind speed gets stronger. As a rule of thumb, therefore, your wind turbine will perform better on a higher tower.

In order to ensure the normal operation of your wind turbine, please refer to the following rules:

1. The wind turbine will generate greater energy power at a higher wind speed as the tower gets taller.
2. The wind turbine will be severely damaged and its operational lifespan can be affected, if it is installed at a site where there is unstable air flow or severe turbulence. Furthermore, turbulence can substantially reduce the capacity of the wind turbine to generate power. Therefore, a site with severe turbulence should not be chosen, but rather avoided at all costs.
3. The recommended tower height is at least 26 feet above ground.

Trees and various objects can block air flow. The following data

is provided for your reference:

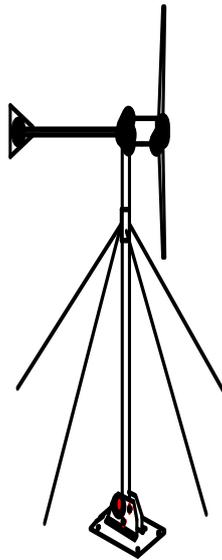
- (1) The tower should be at least 20 feet higher than the highest obstacle.
- (2) The tower should be twice as high as surrounding obstructions (trees, buildings, etc.) if they must be located close together.
- (3) If there are houses or trees in the surrounding area, a good rule of thumb is to choose a tower site that is at least 15 feet away from any obstructions around it. Note: A shorter distance requires less wire as well as reduces the amount of power “lost” in the wires and voltage drop through the wire.

8. Tower

Towers are made with different materials. They come in all shapes, sizes and costs in the market. The most common wind turbine towers are guyed and freestanding towers. NOTE: Radio towers should not be used for wind turbines.

ARI Renewable Energy Co. has specifically designed a tower kit for ARI-450 and ARI-750 wind turbines. The ARI tower kit is easy to install and economical. It comes with all the necessary parts and bolts to erect your tower (except tower pipe). You will need to purchase a fence pipe or tubing from your local store. Please refer to the ARI Tower Kit User’s Manual, where you will find demonstrative graphics and step-by-step instructions. Read your manual thoroughly before you begin to assemble your tower kit.

Evaluate your site to determine the appropriate tower height and available acres to install a tower. Consider the quantity of wind turbines you will install and the cost of the tower. Choose one that fits your budget and the availability of space on your property.



9. Troubleshooting

Problem	Possible Cause	Solution
Blades do not spin or move slowly	<ol style="list-style-type: none"> 1) The blades are not locked tightly to the hub. 2) The blades are reversed and installed upside down. 3) The height of the tower is less than 8m, and surrounding trees and buildings have blocked the flow of wind. 4) Short-circuit of the wiring from the alternator has caused electromagnetic brake, which leads the blades to slow down. 	<p>Follow these steps:</p> <ol style="list-style-type: none"> 1) Tighten the screws and make sure the blades are locked tightly to the hub. 2) Make sure the blades are installed correctly and are not reversed or upside down. 3) Increase the height of the tower; make sure the top of the tower is above the surrounding trees and buildings. 4) Contact our company for possible wiring short circuits.

<p>Turbine is not charging or the battery voltage is too low.</p>	<ol style="list-style-type: none"> 1) Solar panel, wind turbine, or battery bank incorrectly connected to the charge controller. 2) Before erecting the tower, you connected the alternator to the charge controller but did not turn the switch of the charge controller to the "OFF" position to prevent the wind turbine working, which caused an accidental short-circuit of the charge controller. 3) You accidentally scratched the cable wires during installation, which caused a short circuit or shuts. 4) A bad battery or an improper battery size was used. One bad battery can cause high voltage and prevent the turbine from charging. 	<ol style="list-style-type: none"> 1) Check the connections from the charge controller to the battery bank, solar panel, and wind turbine, and make sure all the wirings are correctly connected according to this manual, with positive to positive and negative to negative. 2) If a short circuit has caused the turbine from charging, please contact us. 3) Ask a certified electrical technician to examine the problem. 4) Make sure you have followed the recommendation of this manual in choosing proper batteries for your wind turbine and the positive terminal (cathode) of the battery is well connected. <p>Note: please choose deep cycle SLA gel batteries.</p>
---	--	---

10. Maintenance

The ARI wind turbine is highly reliable and does not need regular maintenance. However, the overall system of wind turbine – tower – power transmission cables must be inspected and maintained regularly to ensure the system's normal operation.

- (1) Check the tower cables for loosening and fasten any loosened wiring in a timely manner. Carry out this inspection multiple times in the initial three months after tower erection. It is also necessary to check wiring after high winds.
- (2) Check to see if various connecting points of the wires are well-connected or are corroded.
- (3) Regularly check and maintain the battery bank as per the maintenance requirements of the batteries.
- (4) It is recommended that you lay down the tower in the case of

approaching extremely rough weather (such as typhoons or hurricanes) to avoid accidents.



11. Warranty Policy and Procedures

11.1 What is Covered and Warranty Terms:

- (1) Dead on Arrival (DOA): Within the first thirty (30) days from the shipment date, any DOA unit will be replaced with a new wind turbine.
- (2) Defective Parts: Within the first three (3) years from the shipment date, any defective part will be replaced at no charge.

11.2 What is NOT Covered

- (1) Damage due to lightning and extreme weather (including but not limited to hurricanes and tornados).
- (2) Damage due to extreme winds (110 MPH+; 60 m/s).
- (3) Damage due to improper installation (including but not limited to improperly choosing a site, poor tower design and inverted hanging).

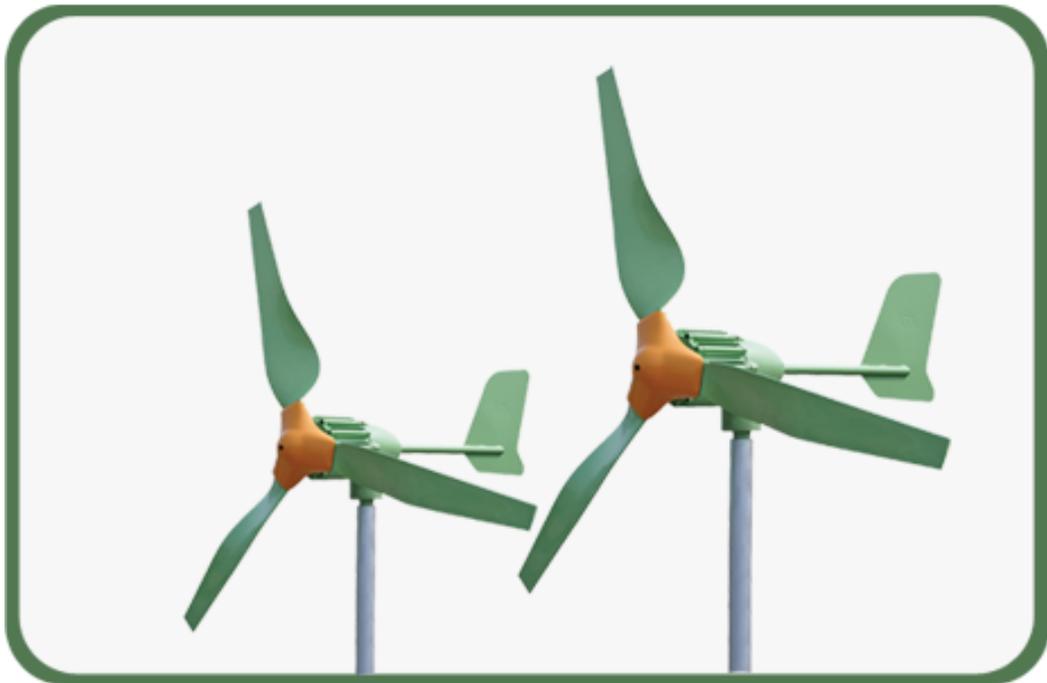
- (4) Damage due to modification of the wind turbine or replacing parts with non-ARI parts NOT provided by ARI Renewable Energy Company.
- (5) Damage due to improperly wiring to batteries.
- (6) Damage to blades due to flying debris.
- (7) Damage due to neglecting to follow the maintenance recommended in this manual or compromising the safety of the machine.
- (8) Any consumable materials (including but not limited to indicating lamp, gasket, fuse, and electronic brush).

11.3 Procedures

- (1) Write the serial number on the front of this manual and keep your receipt or invoice with this manual. You will need them in the case of filing a claim.
- (2) In the event of a wind turbine failure or if there are defective parts, please contact ARI Renewable Energy Company or your dealer to obtain a Return Material Authorization (RMA) number. All returned unit must have a valid ARI RMA number. Please do not return any unit until you receive a RMA number. ARI Renewable Energy Company reserves the right to refuse shipments that do not have an authorized RMA number. Refused shipments will be returned to the shipper via collect freight.
- (3) For a Dead on Arrival (DOA) unit, you must provide the serial number for the wind turbine and a copy of the receipt or the invoice to the claim department. DOA unit must be returned within ten (10) days from receipt of RMA issuance and a prepaid shipping label. A new ARI wind turbine will be shipped from a designated manufacturing facility of ARI Renewable Energy Company within two (2) business days of receipt of DOA unit.
- (4) For defective parts, the customer must provide the serial number of the wind turbine, a copy of the receipt or the invoice of purchase, and a detailed description (photos, if necessary) of the defective parts to the claim department. An ARI wind turbine technician or a designated manufacturing facility of ARI Renewable Energy Company is the only source capable of determining a defective part. Upon receipt of the information, ARI Renewable Energy Company will either issue an RMA number or refuse the claim once the cause of the defective parts is determined.
- (5) Defective parts must be returned within ten (10) days from receipt of RMA issuance for replacement. New parts will be shipped within two (2) business days of the receipt of the defective parts.
- (6) Upon determine the cause of the defective parts, the claim department

of ARI Renewable Energy Company may allow a customer to return the whole wind turbine for repair. In this case, the customer must return the wind turbine within ten (10) days from receipt of RMA issuance if the repair is granted.

- (7) The customer will be responsible for shipping the parts for replacement or turbine for repair. ARI Renewable Energy Company will ship the repaired turbine back to the customer using the lowest shipping cost available. If faster shipping is requested, the customer is responsible for paying the difference.



12. Contact Us

ARI Renewable Energy Company
9043 Brewer Creek Pl
Manassas, VA 20109
USA

Email: info@arisolarwind.com
Website: www.arisolarwind.com



Thanks for your Purchase!