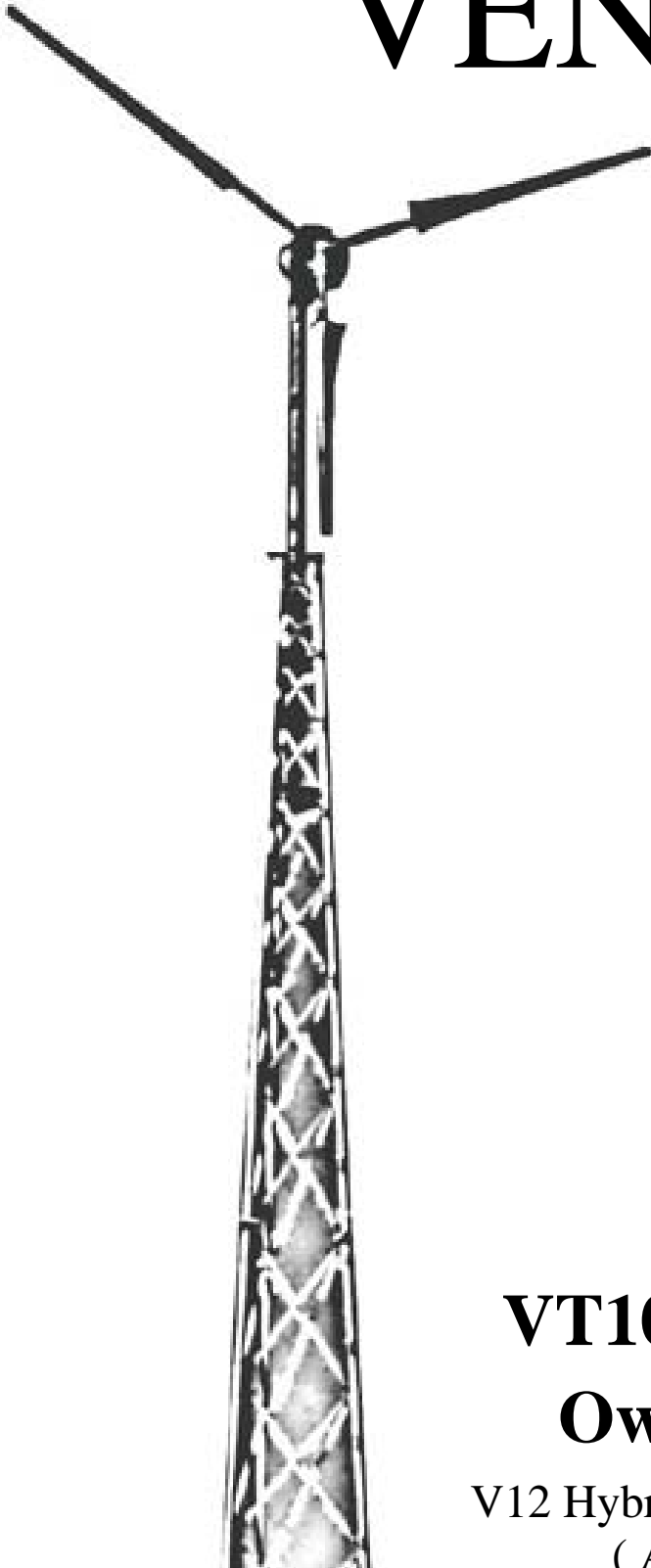


VENTERA



VT10 Wind Turbine Owner's Manual

V12 Hybrid Wind and Solar System
(April, 2010 Edition)

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Equipment Information:

Turbine Serial No.

Inverter Serial No.

Tower Serial No.

LIMITED WARRANTY AND REMEDY

Ventera Energy Corporation warrants that on the date of shipment to the “end user” and for five years thereafter the Ventera Wind Turbine, Tower, and Inverter as described in this owner’s manual will be free of defects in workmanship and material. The term “end user” is defined as anyone seeking to make a warranty claim against Ventera Energy Corp.

In order to make a warranty claim, the end user must have been registered with Ventera Energy, Corp. prior to any warranty claim, and the registration information must include each of the serial numbers of the turbine, tower and inverter. Use the registration form following this warranty to register your System. This warranty may be transferred once from the original end user to a second end user who must also register the system with Ventera.

This warranty does not cover defects due to misuse, abuse, or improper or inadequate installation, storage, service, modification or repair of the Products. This warranty does not cover photovoltaic PV panels which may have been supplied by Ventera Energy, Corp. but manufactured by others.

Note: This warranty does not apply if the Ventera turbine is installed on a tower not approved by Ventera or used with a non-Ventera inverter unless the end user can show reasonable proof at user’s own expense that the non-Ventera supplied components did not contribute to the warranty claim.

If a valid claim is made pursuant to the warranty, as determined solely by Ventera Energy, Corp., in its reasonable judgment, Ventera Energy, Corp., will, at its sole option, repair or exchange the defective parts or components free of charge. Warranty repairs will be made at the Ventera Energy, Corp. factory or another location designated solely by Ventera Energy, Corp. The end user must return the entire wind generator (or, if authorized by Ventera Energy, Corp., specified components) to the factory or other designated location, properly packed and with all freight and any insurance charges prepaid. Ventera Energy, Corp. will return the repaired or exchange components to the end user at Ventera’s expense using transportation of its choice.

THE WARRANTIES STATED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. VENTERA EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. VENTERA IS NOT RESPONSIBLE IN ANY WAY FOR DAMAGE TO A PRODUCT, PROPERTY DAMAGE OR PHYSICAL INJURY RESULTING IN WHOLE OR IN PART FROM (1) IMPROPER OR CARELESS USE, (2) UNAUTHORIZED MODIFICATIONS, OR (3) OTHER CAUSES BEYOND VENTERA’S CONTROL. IN NO EVENT WILL VENTERA BE LIABLE TO BUYER OR ANY OTHER PERSON FOR COST OF PROCUREMENT OF SUBSTITUTE GOODS, LOSS OF PROFITS, OR FOR ANY OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

The foregoing states an end user’s exclusive remedies against Ventera for any defect in the Products or Services or for any failure of the Products or Services to be as warranted, whether end user’s remedy is based on contract, warranty, tort (including negligence), strict liability, indemnity or any other legal theory, and whether arising out of warranties, representations, instructions, installations or defects from any cause.

Some governmental jurisdictions do not allow the exclusion or limitation of end user rights or damages. The end user may have rights in addition to those given in this limited warranty.

FORCE MAJEURE. Ventera shall in no event be liable for delays in delivery of the Products or Services or other failures to perform caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Ventera's control.

REGISTRATION FORM –

End User Location and Contact Information

Complete this form and return to Ventera Energy, Corp. The purpose of this form is to track end user physical location of turbine and contact information for service bulletin, upgrade and other essential information for the user/owner of the turbine. Make a copy for your records.

This form must be on file at Ventera prior to any warranty claims.

Name or Company/Owner _____

Street Address _____

City _____ Province/State _____ Code/Zip _____

Phone _____ E-mail _____ Web _____

Wind Turbine Ser. No. _____ Tower Ser. No. _____

Inverter Ser. No. _____

Purchased From: _____ Order No. & Date _____

Date Rec'd _____

Tower Brand: _____ Tower Type: _____

Owner / Dealer / Contractor installation certification

As the manufacturer-trained installer, or owner, I certify the tower and turbine were properly installed following Ventera's recommended installation practices as out lined in the installation manual.

The turbine startup was conducted following the Commissioning Checklist found in the Installation Manual.

Printed Name and Company

Signature

Congratulations on your purchase of the Ventera V12 Hybrid Wind and Solar System, the world's first integrated utility grid tied wind and solar renewable energy system.

We expect you to receive years of service and enjoyment from your Ventera System, as well as significant energy and money savings. You can take pride in the environmental advantages your system provides!

This manual is meant to introduce you to your V12 Wind and Solar System as well as guide you through its operation and maintenance.



Section 1. Specifications

WIND TURBINE	Model VT10-240
Rated Power to Grid	10kW at 29mph-13m/s
Rated Energy	2,000kWh/month (Class III wind regime)
Cut-in Wind Speed	6mph-2.7m/s
(lowest wind speed for power generation)	
Survival Wind Speed	120mph-54m/s
Weight	500 pounds (230 kilograms)
ROTOR	
Orientation	Downwind
Tip-Speed Ratio	7:1
Diameter	22ft-6.7m
Swept Area:	380ft ² -35m ²
RPM	280 peak, 260-280 governor active range
GENERATOR	
Rating	15 kva at 240 vac at 260 rpm, 3 phase
Type	Rare earth permanent magnet alternator
Poles	32
Construction	Inside rotating magnets, brushless outside stator with cast cooling fins

INVERTER	Model VI12-60S Synchronous Dual-Input	Model VI12-60 Wind-Input
Dual Input	10kw wind, 2kW solar	N/A
Rating	12kw nominal to grid, 12.5kW peak	12kw to grid
Efficiency	94% at full output	90% at full output
Output	240 vac, 60hz, requires dedicated 60amp breaker	
Idle Power Consumption	Less than 12W	
Safety Shutdown	Meets UL and utility requirements for line outage protection	



Section 2. System Components

Turbine.

The frame is an aluminum casting, made from environmentally friendly recycled aluminum. The downwind orientation eliminates the need for a costly and cumbersome tail.

The advanced generator features oversize rare earth super strength magnets rotated by the propeller (direct drive – no gear box) inside an extra large, stationary copper winding assembly. By over sizing these components and choosing the highest grade steel for the winding laminations, Ventera achieves a superior generator efficiency averaging over 90% resulting in more kilowatt hours of electrical energy per month for this size propeller.

There are no electronic components on top of the tower to require inspection or repair or to be prone to damage from lightning or static electricity.

On the tower end of the mainframe is the vertical yaw shaft housing which also includes a redundant connection brush and slip ring assembly allowing the turbine to follow the changing wind direction without twisting the power output cable.



Figure 1. Turbine.



Figure 2. Turbine Exploded View.

Blades.

The fiberglass reinforced injection molded polypropylene propeller blades feature an advanced airfoil design for maximum conversion of wind energy to electricity by the generator. The blades of this propeller have a specific shape, which has been developed from over 30 years experience in wind turbine design, maximizing aerodynamic efficiency to provide the highest output at the lowest noise level at all wind speeds for a propeller of this diameter.

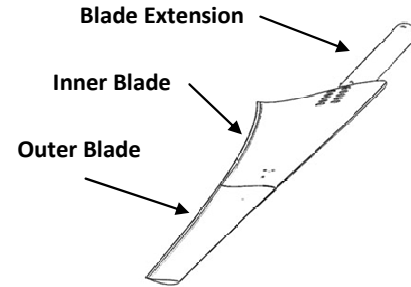


Figure 3. Ventera Blade.

The blades consist of 3 sections, a tubular blade extension from the hub, an inner blade section of fixed pitch and an outer blade section which is variable pitch controlled by the centrifugal force activated rpm governor.

The rpm governor automatically adjusts the pitch of the outer blade section to limit RPM. The outer blade starts governing around 260 RPM and limits the maximum RPM to around 280. This governing feature assures long life and survival in high winds. It also allows the turbine to continue generating 10 kilowatts of power in high winds, when other turbines are shut down!

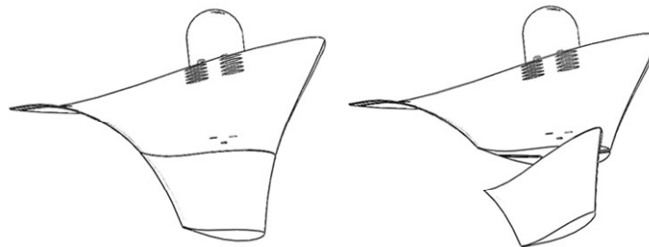


Figure 4. Blade in the closed (left) and governing (right) positions.

Towers.

The Ventera RSSV Tower is a three-legged, self-supporting tower available in 50, 70, 90, 110 and 130 feet tower heights. All Ventera towers are galvanized for longest life.

The tower has hinged feet that allow for easy raising and lowering.

The Mounting Tube extension at the top of the tower extends the tower height and aerodynamically minimizes blade noise.



Figure 5. Ventera RSSV Tower

Inverter.

Ventera offers two inverter options.

1. Synchronous Dual-Input Inverter. The Synchronous Dual-Input Inverter is capable of connecting to the grid 10 kilowatts of 3 phase, variable voltage and frequency electricity from the wind turbine and up to 2 kilowatts of direct current from solar panels.
2. Wind-Input Inverter. The Wind-Input Inverter is capable of connecting to the grid 12 kilowatts of 3 phase, variable voltage and frequency from the wind turbine.

Both inverters feature independent *peak power tracking* hardware and software programs to maximize power delivered to the grid. They both meet all utility and electrical power quality and safety requirements and is certified by to CSA (Canda) and UL1741(USA) standards.

Control Panels.

The Ventera System also includes the Wind Brake, Solar Shutoff, Wind-Solar Grid Disconnect Switch and KWH Meter.

The Wind Brake is a 60 amp, three pole outdoor switch designed to stop blade rotation on the turbine and cutoff power to the inverter by shorting the three electrical wires when in the BRAKE ON position.

The Solar Disconnect is a 60 amp, two pole switch designed to control power delivery from the PV panels (where used) to the synchronous inverter.



Figure 6. Synchronous Dual-Input Inverter.

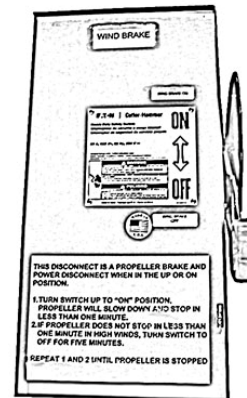


Figure 7. Wind Brake Switch.

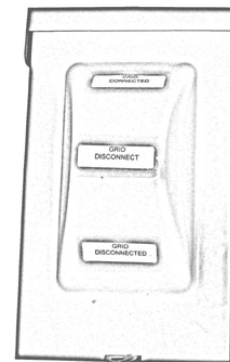


Figure 8. Wind-PV Grid Disconnect Switch.

The Wind-PV Grid Disconnect Switch is a 60 amp, two pole switch designed to stop the flow of electricity to the circuit breaker, and utility grid by disconnecting the inverter. The Box can be locked with a padlock during maintenance by utility personnel.

A customer KWH meter is also included with your turbine so you can monitor the energy production of your Ventura Hybrid System in real time.

Options.

At this time, there are no options available.

Solar Panels.

The Ventura V12 Hybrid Wind and Solar System with the Synchronous Dual-Input Inverter, comes ready to connect up to 2 kilowatts of PV panels to harness solar power as well as your wind resource. When wired to the synchronous inverter, the PV panels help deliver up to an additional 2 kilowatts of power production.

NOTE – PV panels and corresponding mounting hardware are not included with the V12 Hybrid Wind and Solar System and must be purchased separately.

NOTE – The nominal solar panel voltage input to the inverter is 192 volts. Do not exceed the inverter 2000 watt solar input capacity. Common arrays include:

- 16 x 12v nominal voltage panels in series
- 12 x 16v nominal voltage panels in series
- 8 x 24v nominal voltage panels in series
- 4 x 48v nominal voltage panels in series



Section 3. Normal Operations

During normal operation, the turbine's propeller begin spinning in winds exceeding 10 mph. When the turbine is running, power flows to the grid in winds higher than 6 mph (3 m/s).

NOTE: In normal operation, the turbine behaves as follows:

- ✓ Blade tips should track (tip to tower distance) within less than two inches (6cm)
- ✓ The turbine will make an aerodynamic "swishing" noise.
- ✓ One slightly distinguishable blade sound is normal

In winds above 29 mph (13 m/s) the wind turbine will reach its maximum power output of 10 kw and the blade governors will pitch to hold the propeller RPM and generator output approximately constant.

The Turbine can survive in winds up to 120 mph. In winds above governing speed (29 mph), the automatic governor will control the turbine RPM and prevent damage.

NOTE: When the blades are governing, the turbine behaves as follows:

- ✓ The blades will not track perfectly and some wobble will be evident
- ✓ Aerodynamic noise (swishing) will increase
- ✓ The RPM of the rotor will change little with increasing wind speeds.

Once spinning, the turbine will continue to run until the winds drop below approximately 4 mph (2 m/s).

Once stopped, the propeller will not begin to spin again until the winds reach 10 – 12 mph (4 – 4.5 m/s).

When wind and / or solar power is available, the inverter displays the current power output. For a complete list of the inverter features, see the separate inverter manual.



Section 4. Stopping the Wind Turbine

Stopping the turbine propeller will turn off electrical output from the wind turbine to the grid.

NOTE: Wind speed must be below 29 mph (13 m/s) in order to stop the turbine.

Moving the handle of the Wind Brake to the Brake ON position will bring the propeller to a stop in less than one minute.

Once stopped, the turbine will remain in the parked position in winds up to 120 mph (54 m/s) as long as the Wind Brake is in the ON position.



Figure 9. Wind Brake ON Position

WARNING: If the propeller does **NOT** stop within one minute, turn the Wind Brake Switch **OFF**. Leave the switch in the OFF position for at least 5 minutes and ensure the wind speeds are less than 29 mph (13 m/s) before attempting to stop the turbine again. Trying to stop the turbine in high winds will cause the generator wiring to overheat and can cause permanent damage.

NOTE: The Wind Brake is the only designed method of stopping the propeller.



Figure 10. Wind Brake OFF.



Section 5. Starting the Wind Turbine

To start your system, follow the below steps:

1. Turn the circuit breaker in your service panel to the ON position.
2. Turn the Wind-PV Grid Disconnect Switch to the ON position (see Figure 11).
3. The inverter will start automatically after a 5 minute delay. You will hear a click of the contactors closing when it is ready.
4. Turn the Wind Brake to the OFF position (see Figure 10).

Congratulations, your wind turbine is now turned on. The propeller will start to spin once the wind speed reaches 10 – 12 mph (4 – 4.5 m/s) sending quality power to the utility grid .



Section 6. Disconnecting the V12 Wind and Solar System from the Grid

To disconnect the system from the grid, follow the below steps:

1. Stop the wind turbine and shutoff the solar input (as applicable).

NOTE: stopping the wind turbine is described in Section 4.

NOTE: shutting off the solar input is described Section 13.

2. Move the Wind-PV Grid Disconnect Switch to the OFF position.

NOTE: The Stop button on the Inverter is an Emergency Stop, preventing the inverter from sending power to the grid. It is not necessary to use the Stop button in normal operation.

3. Placing the breaker in the service panel to the OFF position is recommended.



Figure 11. Wind-PV Grid Disconnect Switch in the OFF position, shutting off power to the Inverter.

The V12 Wind and Solar System is now disconnected from the grid.

NOTE: You can shutoff power to the grid without stopping the Turbine by skipping step 1 above. With power disconnected to the inverter, the Turbine will operate, unloaded. In the unloaded condition, the blades will reach peak RPM in wind speeds of 17 mph.



Section 7. Loss of Grid Power

In the event you lose grid power, no safety measures are needed with the V12 Wind and Solar System.

Your turbine is protected even with the loss of grid power. Without power from the grid to the Inverter, the VT10 turbine will continue to operate unloaded and the rotor speed will still be governed by the blades. The turbine will not generate power when the inverter is off.

NOTE: In the unloaded condition, the blades will reach peak the peak RPM (260-280) in winds of approximately 17 mph (7.6 m/s).

WARNING: DO NOT work on the inverter unless properly locked out (section 9).

When power is restored to the grid, the inverter will self-start after five minutes and continue normal operation.



Section 8. Special Conditions

This section deals with the operation of the VT10 Wind Turbine during special weather and electrical conditions. Consult the Solar Panel manufacture's manual for information regarding your PV Panels.

Cold Weather & Snow.

The Ventura turbine is designed to operate in cold, snowy climates without issue. No special operating considerations need to be made for cold weather, or snow.

Hail .

The blades are designed to withstand most hail storms, however, large hail can cause impact damage. When these weather conditions are forecast, it is safest to stop the turbine and leave it in the parked position. After the hail storm has passed, conduct a visual inspection of the blades for damage before starting (See the Ground Inspection checklist in section 11).

Ice Storm.

Ice buildup on the blades will cause the rotor to slow down, and even stop. No special attention is required. Once the ice has melted, the turbine will continue normal operation.

Wind Storms.

The VT10 Turbine is designed to survive in winds up to 120 mph / (54 m/s).

However, when severe wind conditions are forecast (as with a hurricane or severe thunderstorm) it is best to fold the hinged tower to the ground. When this is not feasible, stopping the propeller and leaving it in the parked position, is the next best option.

WARNING: DO NOT try to stop the rotor when wind speeds exceed 29 mph (13 m/s) as permanent damage to the generator can occur. See instructions for stopping the turbine in Section 4.

NOTE: the RPM governor protects the turbine in high winds.

Tornados.

When tornados are forecast, it is best to stop the blades and leave the rotor parked. Parking the rotor during tornado conditions best protects the blades from flying debris and turbulent winds.



Section 9. Lockout

Prior to doing any service work or inspections of components, you must ensure the equipment is isolated from all power sources. Locking out the electrical controls prevents accidental charging of the components.

WARNING: the V12 Wind and Solar System can produce high voltages which can cause serious injury or death. DO NOT touch or handle any electrical components or wiring without ensuring all electrical controls are isolated from power sources.

WARNING: The Inverter should only be opened by a licensed electrician
To lockout the V12 Wind and Solar System, follow the below steps:

1. Stop the Turbine, as described in Section 4.
2. Apply a lock to the Wind Brake Switch with the handle in the ON position. This parks the turbine and prevents the generation of electricity.
3. Move the handle of the Solar Disconnect Switch to the OFF Position and apply a lock (where applicable). This prevents the flow of power from the PV Panel Array to the Inverter.



Figure 12. Wind Brake Locked in the ON Position parking the rotor for inspection or maintenance.

NOTE: See the solar manufacturer's manual for information regarding safety and service of your PV Panel Array.

4. Move the handle of the Wind-PV Grid Disconnect Switch to the OFF position (see Figure 11).

5. Apply a lock to the Wind-PV Grid Disconnect Switch. This isolates the V12 Wind and Solar System from grid electricity.
6. Wait 5 minutes for the stored electricity in the Inverter to discharge.



Figure 13. Wind-PV Grid Disconnect Switch in OFF position and locked for maintenance.



Section 10. Required Inspections and Maintenance

Regular preventative inspections are required to ensure your V12 Wind and Solar System operates at peak performance throughout the life of the system. This section highlights the basic preventative inspection requirements.

Inspections should be recorded in the logbook found at the back of this manual.

Ground Inspections

Ground Inspections help to identify any change in normal operation that would indicate an electrical or mechanical problem. Ground Inspections should be conducted at least four times per year.

NOTE: See Section 11 for the Ground Inspection Checklist

Hands-On Inspections

Hands-On Inspections are in-depth preventative inspections and are recommended every three years.

NOTE: See Section 12 for the Hands-On Inspection Checklist

Required Maintenance.

Consult with Ventera Energy before conducting any maintenance, other than described in the Inspection Checklists.

Owner maintenance on the V12 Wind and Solar System without the consent of Ventera will void the Limited Warranty.



Section 11. Ground Inspection Checklist

At least four times a year, conduct a ground inspection using the below checklist. Record the results of the inspection in the inspection log.

___	1.	Observe the operating wind turbine when the wind is below governing speed. Note any abnormal noise or blade operating characteristics. See Section 3 for normal operating characteristics.
___	2.	Observe the tower and turbine mounting structure when the wind is below governing speed. It should show no movement and make no noise.
___	3.	Stop the rotor with the Wind Brake in winds less than governing speed (29mph or 13m/s, and under 10kw output). The rotor should come to a stop in less than one minute without any mechanical noise.
___	4.	With the turbine in the parked position, inspect the blades thru binoculars. Look for chipped or damaged blade surfaces. Ensure the outer blade sits in closed position with respect to the inner blade. See Figure 4.
___	5.	Observe the turbine blades during high winds sufficient to cause them to govern. During governing, note any abnormal noise or blade tracking errors.

Consult the Troubleshooting section of the Manual if you encounter abnormal results.



Section 12. Hands-On Inspection Checklist

Conduct a Hands-On Inspect every three years. Record the results of the inspection in the log at the end of the manual.

The Hands-On Inspection should be conducted with the turbine and tower lowered to the ground, or by a qualified climber from the top of the tower.

WARNING: Before conducting the Hands-On Inspection, shut down and lock out all components of the V12 Wind and Solar System as described in Section 9.

___	1.	Check the tower members and fasteners for looseness or breakage. Look for wrinkled or missing galvanization that would indicate an overstressed member.
___	2.	Inspect the tower feet and anchor bolts for signs of stress. Where grout is required, ensure grout is still in good condition.
___	3.	Rotate the turbine about the yaw shaft. Observe yaw bearings for leakage, looseness or roughness.
___	4.	Try to rotate the rotor hub. It should offer resistance and spin hard and firm (Wind Brake is locked in the ON position).
___	5.	Remove slip ring cover (shroud). Inspect slip rings, brushes and all electrical connections. Tighten all connections and wire nuts.
___	6.	Inspect and replace missing wire ties holding the electrical conduit to the inside of the tower leg.
___	7.	Inspect the wiring connections inside the junction box and Wind Brake Switch. Tighten connections, as required.
___	8.	Ensure the outer blade sits in closed position with the inner blade. (See Figure 4)
___	9.	Check blade surfaces and edges for damage or cracks. Replace blades showing any sign of stress.
___	10.	Clean the leading edge of the blades and lightly sand with 400-500 super-fine grit sand paper, if pitting is observed. Apply a coat of silicone car wax to the entire blade surface and buff.

—	11.	Check the hub casting spokes where blades attach for cracks or stress marks. Check torque of blade mounting hardware.
—	12.	Open the inverter cover and blow / vacuum out dust. Clean the cooling fan blades and screen.
—	13.	<p>Unlock the Wind Brake and move the handle to the OFF position.</p> <p>Turn the rotor hub. It should turn easily. Listen for any sound of debris between the magnets and stator. Check for looseness of hub on shaft (play should be just barely perceptible). Check for any sign of rough or worn bearings.</p> <p>NOTE: this step should only be conducted in winds less than 10 mph (3 m/s)</p>



Section 13. Solar Components.

See the solar manufacturer's manual for information regarding the operation and maintenance of your PV Panels connected to the V12 Wind and Solar System.

Shutting off Power from PV Panels.

Move the handle of the Solar Disconnect Switch to the OFF position to stop the flow of power from the PV Panel Array to the inverter.

Connecting the PV Panels.

See the solar manufacturer's manual for information on operating the PV Panel Array.

Move the handle of the Solar Disconnect Switch to the ON Position to start the flow of power from the PV Panel Array to the inverter

NOTE: See the solar manufacturer's manual for startup information.



Section 14. Troubleshooting

The below matrix provides some potential problems that can occur with the V12 Wind and Solar System. This troubleshooting tool is not meant to be all-inclusive. If you have tried unsuccessfully to fix a problem, or have a question, contact the manufacturer's office.

SYMPTOM	POSSIBLE CAUSE	CORRECTION
Turbine does not orient to wind in winds of 10-12 mph	Tower and turbine not level	Level tower
	Yaw bearing binding	Replace
Blades do not start in 10-12mph	Turbine not oriented to wind direction	See above
	WIND BRAKE switch ON	Turn switch OFF
	Dirt between magnets and stator	Run paper around air gap to remove
	Rotor bearings bad	Contact Factory
Generator and/or tower vibrate	Electrical short	Perform Generator Wiring Test (see installation manual)
	Blades not tracking within 2 inches	Contact factory
	Tip blade not closing to inner blade	Contact factory
Mechanical noise from generator	Blades not pitched uniformly	Contact factory
	Worn bearings	Contact factory
Excessive noise and/or vibration while governing	Loose wiring in generator	Contact factory
	Blade governor sticking on one blade or not deploying uniformly	Contact factory
One blade always pitched	Broken spring or loose spring nut	Contact factory
Blades run fast, output low, buzzing sound	One wire between generator and inverter disconnected (one phase not connected)	Perform Generator Wiring Test (see installation manual)
		Contact factory with results
Blades run fast, no output	Inverter 60amp breaker tripped	Reset
	Wind-PV GRID CONNECT switch is OFF	Turn switch ON
	Inverter problem	See Inverter manual to diagnose
Excessive Over-Volt faults in high winds	Wire size between electrical panel and house is too small	Rewire

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Appendix A. Parts List

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