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Southwest Windpower

Congratulations on your purchase and welcome to our family!

Dear Whisper™ Owner,

Thank you for your purchase of a Whisper wind turbine. We congratulate you on your choice and are confident you will experience years of dependable service.

Before going any further, please complete and return the enclosed Warranty Registration Card. The conditions of your warranty are dependent upon the proper installation of Whisper. Furthermore, this will assure you of being kept up-to-date with the latest developments from Southwest Windpower. These include new options, performance tips, updated software to maximize output and user notices. It is important to know that we do not sell or distribute your information to any third party. We understand your privacy is important.

Again, welcome to our family and thank you for investing in the future of wind energy with Whisper.

Sincerely,

Southwest Windpower

CE Compliance: The CE marking is a mandatory compliance requirement in EMEA and the UK and although it is self-certification, testing and evidence support testing is preferred from an independent test house. All Southwest Windpower turbine are third party tested and fulfill all the relevant provisions of the following directives: Machinery Directive 2006/42/EC, Low Voltage Directive 2004/95/EC, Electromagnetic Compatibility Directive 2004/108/EC. The report and declaration of conformity are available for inspection on request. The serial number refers to a specific Southwest Windpower product. This product is considered compliant to CE.

Enter the serial and model number below

Serial Number ______________________________
Model Number ______________________________
IMPORTANT SAFETY INSTRUCTIONS

Read these instructions in their entirety before installing or operating.

SAVE THESE INSTRUCTIONS. Enclosed are important instructions that must be followed during installation and maintenance.

Turn Whisper “OFF” and contact Southwest Windpower Technical Service if unusual noise or operation is observed.

Install Whisper on a calm day - no wind at ground level.

Locate your tower well away from occupied buildings and power lines; a minimum of 76 m (250 ft) is recommended.

High voltage systems present a shock hazard and should be wired and maintained by a qualified and licensed electrician.

NEVER place objects on top or near the Whisper Controller enclosure.

These devices must dissipate heat as part of normal operation. FAILURE AND FIRE may result if airflow is blocked.

Recommended Tools, Equipment and Materials for Installation

| Round File | Electrical Tape |
| Ground Rod & Clamp | Electrical Wire and Voltmeter |
| Wrenches (2) 13mm and 17mm or Adjustable Wrenches | Torque Wrench (20N-m or 15ft-lb) and 17mm Socket |
| Electric Drill Motor & 10mm (3/8”) Metal Cutting Drill Bit | Soldering Iron and Solder or Split Bolt Connectors |
| Leather or Strong Fabric Strap (secures casting while handling) | Cable Grip/Strain Relief (support wires inside tower) |
| Metric Hex Wrench Set | Loctite 242 |
| Center Punch Tool (marks for drilling) | Sawhorses |
| Pliers | Small Flashlight |

In this manual

IMPORTANT: Please take note

TIP: Helpful information

WARNING: Risk of injury or death - proceed with extreme caution

MARINE: Information specific to corrosive environments
Whisper 200 Technical Specifications

WHISPER 200

Rated Power 1000 watts at 11.6 m/s (26 mph)
Monthly Energy 200 kWh/mo at 5.4 m/s (12 mph)
Start-Up Wind Speed 3.1 m/s (7 mph)
Rotor Diameter 2.7 m (9 ft)
Voltage 12, 24, 48 VDC*; HV Available at 120v, 230v
Overspeed Protection Patented side-furling
Turbine Controller Whisper controller (Optional with all Units)
Mount 6.35 cm pipe (2.5 in schedule 40)
Body Cast aluminum with corrosion resistant finish
Blades (3) Carbon reinforced fiberglass
Survival Wind Speed 55 m/s (120 mph)
Weight 30 kg (65 lb) box: 39.46 kg (87 lb)
Shipping Dimensions 1295 x 508 x 330 mm (51 x 20 x 13 in)
Warranty 5 year limited warranty

*Power ratings are normalized for sea level.

* The Whisper Controller is factory set for 24-volt operation. If your system is other than 24 volts, the controller MUST be configured to your system voltage. Ensure turbine voltage is consistent with rest of your system voltage.

Note the weight above. Use safe lifting techniques and protective footwear.

Turbine casting pivots open to a 45 ° angle creating a potential pinch point.

Southwest Windpower strongly recommends:
Straping or securing the casting (as shown below) while handling so it cannot pivot open.

Do not remove strap until casting is secure on tower.
EXAMPLE OF AN OFF-GRID HYBRID INSTALLATION

PV array

Batteries provide electricity to home via inverter

PV panels provide electricity to batteries

Inverter

Battery bank

PV Charge Controller

Whisper wind generator

Whisper provides electricity to batteries

Whisper Charge Controller
PRIOR TO INSTALLATION

Siting Tips

PROPER SITING = Better Performance & Increased Longevity
Look at vegetation deformation to determine best area and prevailing wind direction.

EXCESSIVE TURBULENCE = Fatigue Damage & Shorter Turbine Life


ATYPICAL SITING CONSIDERATIONS

Coastal or Lakeside
Trees and taller structures can be down-wind.

Ridge Tops
Wind compresses as it blows over the top of a hill, increasing the wind speed.

Plateau/Mesa
Site the generator far enough from the cliff to avoid turbulent wind.

Turbine should be a minimum of 76m (250 ft) away from and 6m (20 ft) above obstacles.
Tower Selection and Installation

Tower Selection

<table>
<thead>
<tr>
<th>Guyed Towers</th>
<th>Lattice Towers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less-expensive</td>
<td>More-expensive</td>
</tr>
<tr>
<td>Larger Footprint (radius is 1/2 - 3/4 of tower height)</td>
<td>Smaller Footprint</td>
</tr>
</tbody>
</table>

Wind speed increases with height. Higher towers also raise generators above the air turbulence that can exist close to the ground.

- Guyed tower
- Self-supporting lattice tower

Soil and wind conditions vary; towers and tower foundations must be designed for your specific location.

Prevent tower climbing by unauthorized persons or children. Never climb without proper safety equipment.

Always stop the blades before climbing the tower. Both falling from the tower and contact with the spinning blades can be lethal.
**Arrival Kit**

**User's Packet**

**5-Year Warranty & Other Docs**

**Tail Fin Stickers**

**IMPORTANT**: Properly complete the warranty registration card; failure to complete and return the card may affect your warranty.
System Wiring

Batteries may emit explosive and irritating gas while charging. Use protective gloves and safety glasses.

Never make any electrical connection, light a match or make a spark near a recently-charged battery.

Turn off all loads, and look away when making a final battery connection.

TIP: See the Whisper Controller installation section for complete wiring details.

Wire size from wind generator to controller based on voltage configuration and distance (Distance = A + B)

<table>
<thead>
<tr>
<th>Size</th>
<th>12 V</th>
<th>24 V</th>
<th>48 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm²</td>
<td>Distance*</td>
<td>Distance*</td>
<td>Distance*</td>
</tr>
<tr>
<td>4 mm² (12 AWG)</td>
<td>–</td>
<td>–</td>
<td>66 m (216 ft)</td>
</tr>
<tr>
<td>6 mm² (10 AWG)</td>
<td>–</td>
<td>–</td>
<td>106 m (346 ft)</td>
</tr>
<tr>
<td>10 mm² (8 AWG)</td>
<td>–</td>
<td>42 m (138 ft)</td>
<td>168 m (552 ft)</td>
</tr>
<tr>
<td>16 mm² (6 AWG)</td>
<td>–</td>
<td>66 m (218 ft)</td>
<td>266 m (872 ft)</td>
</tr>
<tr>
<td>25 mm² (4 AWG)</td>
<td>26 m (84 ft)</td>
<td>103 m (339 ft)</td>
<td>414 m (1356 ft)</td>
</tr>
<tr>
<td>27 mm² (3 AWG)</td>
<td>42 m (136 ft)</td>
<td>165 m (542 ft)</td>
<td>660 m (2168 ft)</td>
</tr>
<tr>
<td>34 mm² (2 AWG)</td>
<td>52 m (170 ft)</td>
<td>208 m (682 ft)</td>
<td>832 m (2728 ft)</td>
</tr>
<tr>
<td>42 mm² (1 AWG)</td>
<td>66 m (216 ft)</td>
<td>262 m (860 ft)</td>
<td>1048 m (3440 ft)</td>
</tr>
<tr>
<td>54 mm² (0 AWG)</td>
<td>82 m (274 ft)</td>
<td>335 m (1098 ft)</td>
<td>1338 m (4390 ft)</td>
</tr>
<tr>
<td>67 mm² (2/0 AWG)</td>
<td>104 m (342 ft)</td>
<td>416 m (1364 ft)</td>
<td>1662 m (5454 ft)</td>
</tr>
<tr>
<td>85 mm² (3/0 AWG)</td>
<td>132 m (434 ft)</td>
<td>528 m (1730 ft)</td>
<td>2110 m (6924 ft)</td>
</tr>
<tr>
<td>107 mm² (4/0 AWG)</td>
<td>166 m (546 ft)</td>
<td>664 m (2177 ft)</td>
<td>2854 m (8710 ft)</td>
</tr>
</tbody>
</table>

*If using aluminum wire, multiply the distances in the table by 0.65.
Distances are one way from the turbine connection to Whisper Controller terminals.
Simple Tips for Deep Cycle Battery Bank Sizing

In preparation for battery sizing, know:

**ELECTRICAL USAGE** - the amount of energy consumed 1 day in Watt-hours (Wh)

**DAYS OF AUTONOMY** - days of battery back-up required if unable to charge the batteries by any means.

**DEPTH OF DISCHARGE** - limit of energy withdrawal to which you will subject the deep cycle battery bank.
- *Deeper discharge = Shortened battery life.*
  - Recommended: never discharge a deep cycle battery below 50% of its capacity.
  - Off-grid applications, a 25% DoD will extend battery life significantly.

**TEMPERATURE** - Standard for most battery rating is 25 °C (77 °F).
- Cold temperatures = reduced battery capacity
- High temperatures = shortened battery life

**RECOMMENDATION** - Keep the number of parallel strings of batteries to three or fewer. More than three strings of batteries, risks shortening battery life due to uneven charging.
- *Batteries in Series = Voltage is Additive*
- *Batteries in Parallel = Ah is Additive*
  - *Example: 2 12V 100Ah Battery Bank*

<table>
<thead>
<tr>
<th>Series</th>
<th>24V</th>
<th>100 Ah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel</td>
<td>12V</td>
<td>200 Ah</td>
</tr>
</tbody>
</table>

**CALCULATIONS** - calculate battery bank size, use example below:

- A system load of 6,000 Watt-hours per day
- 3 Days of Autonomy (back-up) needed
- Planned Depth of Discharge (DoD): 40%
- Battery bank ambient average low 15.6 °C (60 °F)
- A 48V system

**STEPS:**

1. **Identify total daily use in Watt-hours (Wh)**
   - **EXAMPLE:**
   - 6,000 Wh/day

2. **Identify Days of Autonomy (back-up days); multiply Wh/day by this factor.**
   - **EXAMPLE:**
   - 3 days of Autonomy:
   - 6,000 x 3 = 18,000 Wh

3. **Identify Depth of Discharge (DoD) and convert to a decimal value. Divide result of step 2 by this value.**
   - **EXAMPLE:**
   - 40% DoD:
   - 18,000 / 0.4 = 45,000 Wh

4. **Select the multiplier corresponding to the lowest average temperature your batteries will be exposed to. Multiply result from step 3 by this factor. **Result is minimum Wh capacity of battery bank.
   - **EXAMPLE:**
   - 15.6 °C (60 °F) = 1.11
   - 45,000 x 1.11 = 49,950 Wh

5. **Divide result from Step 4 by system voltage. Result is the minimum Amp-hour (Ah) capacity of your battery bank.**
   - **EXAMPLE:**
   - 49,950 / 48 = 1,040 Ah
Battery Configuration and Location

RECOMMENDED:

- Locate battery in moderately stable room temperature, dry unoccupied building.

- If battery is in an occupied building, an enclosure with vent to outside is required. Follow code.

- Batter enclosure:
  - Allow 5 cm (2 in) on all sides for ventilation.
  - Allow 60 cm (2 ft) vertical clearance for maintenance access.

- To minimize the possibility of EMI (electromagnetic interference), the line from the battery to the Whisper Controller should be less than 10 feet (3 m).

Battery Fuse Installation
(Consult local electrical codes)

- Battery positive
- Nut and bolt
- Fuse included (SWWP recommends using a fuse holder to support wire weight)

Use the diagrams below to determine the series/parallel arrangement for your system voltage. Please note: based on 6V batteries.
Wind Turbine Electrical Tests

Complete these tests before mounting blades to rotor. These tests confirm the wind generator is ready to install on the tower.

Ground Test

Check resistance to ground on any wire. Resistance must exceed 10,000 ohms; on many digital meters this will show a reading of "OL".

Open Circuit Test

When the wires are unconnected the wind generator rotor should spin freely.

Short Circuit Test

When all the wires are shorted together the alternator should turn hard.

Phase to Phase Test

When any two wires are shorted together the alternator should turn lumpy as though there are smooth and bumpy portions of the rotor.
INSTALLATION SECTION

This section of the manual includes pages 15-29. The pages cover:
Setting Wind Turbine Voltage.................................................................15-16
Mounting Wind Turbine On Tower.......................................................17-20
Tail Installation....................................................................................21-22
Blade and Nose Cone Installation.........................................................23-26
Whisper Controller – Mounting...............................................................27
Whisper Controller – Wiring.................................................................27-28
Whisper Controller - Circuit Board Switches and Reset Button.........28-29

⚠️ If it is necessary to print installation instructions, these are the primary pages you will need.
INSTALLATION

Set Wind Turbine Voltage

The Whisper 200 wind turbine and controller must be configured for the correct system voltage - 12, 24, or 48 volts.
• Whisper controllers are shipped from the factory configured for 24 volt operation.
• The correct turbine voltage is set by altering the 12 stator wire and 3 brush wire connections.

- Access wires by removing the “Multi Voltage” cover on the turbine housing.
- The brush wires are interchangeable and not labeled. The brush wires are the larger multi-strand wires; 10AWG.
- The stator wires are numbered and color coded with a wire sleeve. For example stator wire “Red - 3” has a red sleeve with the number “3” printed on it. Wire “Red - “ has a red sleeve with no number. The “-” indicates there is no number.

*Refer to table on next page for specific stator and brush wire connections.

- Cut off the twisted ends of the stator wires and strip off approximately 25 mm (1 inch) of insulation.
- Hold stripped ends of the wires parallel to each other and twist together clockwise direction before installing the wire nut.

- Trim wires and twist on the appropriate color wire nut (indicated in the table). Push hard on the wire nut while twisting clockwise.
- Coat wire nuts and terminal strip connections with dielectric grease to protect wires against corrosion.

*36V configuration has been removed from this manual. Contact Southwest Windpower technical support for 36V configuration.
### Voltage Configuration Wiring Table

Reference the following table to determine the correct brush and stator wire connections for your voltage configuration.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Red Wire Nuts</th>
<th>Yellow Wire Nuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 V</td>
<td>White 1 White 2 White 3 Black 2 Black -</td>
<td>White – White 2 Red 3 Red 1</td>
</tr>
<tr>
<td>24* V</td>
<td>White 1 Red 2 White 3 Red – Black 3</td>
<td>Red 3 Red 1 Black – Black 2</td>
</tr>
<tr>
<td>48* V</td>
<td>White 1 Red – Black 1</td>
<td>Red 1 Black – Black 2</td>
</tr>
</tbody>
</table>

*For high voltage Whisper, use the 24V configuration for a 120V HV Stator, and the 48V configuration for the 240V HV Stator.*
Mount Turbine On Tower

**TIP:** Use medium-strength thread locking compound on all fasteners.

**Tower Insert Kit**
For 64 mm insert (2.5 inch Schedule 40 Pipe – 2.875 O.D. x .20 in Wall)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set Screw (M6 X 20)</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Set Screw M8 X 35</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>M8 SS Nylock Nut</td>
<td>4</td>
</tr>
</tbody>
</table>

Engagement hole

64 mm (2.5 inch) insert

**MARINE:** If you are installing your Whisper in a corrosive environment, use a marined Whisper and apply Tef-Gel to all threaded holes to prevent screws from becoming permanently seized into place.
Tower Preparation

1. Align with top of tower
2. Wrap template around tower until tab arrows line up.
3. Secure template with tape

Recommended:
Begin drilling with small bit & work up to 10MM (3/8”) metal cutting drill bit.

Drill center punch marks

Center punch and mark tower for drilling.

Pipe dimensions

Begin drilling with small bit & work up to 10MM (3/8”) metal cutting drill bit.
Install Tower Insert

1) M6 x 20 set screw secures Tower Insert to yaw shaft

2) Feed tower insert onto yaw shaft

3) Align hole of tower insert and yaw shaft

4) M6 x 20 set screw

5) Slot for Cable Strain Relief
**Mount Turbine to Tower**

1) **Solder or use split bolts to make electrical connections.**

2) **Wrap connections thoroughly with electrical tape to prevent shorts to tower.**

3) **Support wires to avoid weight on slip ring wires and wire connections.**
Tail Installation

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assembled Generator</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Tail Boom</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Tail Fin</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Hex Bolts, M8 x 55</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Nylon Washer, M8 x 31</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>SSTL Washer, M8 x 24</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Nylock Nut, M8</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Hex Bolt, M8 x 25</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Hex Bolt, M8 x 70</td>
<td>1</td>
</tr>
</tbody>
</table>

Tail Installation Kit

- Torque wrench
- 13mm wrench
- 13mm socket
- M8x31 stainless steel washer
- M8x70 Hex Bolt
- M8x25 Hex Bolt
- M8x55 Hex Bolts
- Nylock Nut, M8
- M8x55 nylon washer
- 13mm wrench
Assemble Whisper Tail Fin

1) Attach tail fin.  
Not shown: M8 Nylock Nut

2) Apply Whisper sticker to top and bottom of fin.

3) Complete tailfin assembly.

Mounting Tail Boom

4) Align holes when pushing tailboom into casting.

5) Secure tail boom anchor.

6) Tighten casting to secure tail boom.

7) Secure M8 nylock nuts
Whisper 200 Blade Installation

- Make sure diversion switch is in the “stop” position.
- Flat (non-ground) end of blade extension attaches to rotor.
- Ground edge of blade extension face toward blade.
- Use thread locking compound (Loctite 242 or equivalent) on all bolts.
- Torque all bolts to 24 N·m (18 lb-ft). Do not overtighten.

**IMPORTANT for MARINE units:** The enclosed packet of Tef-Gel should be used in threaded holes to prevent corrosion and screws becoming permanently seized into place.

**IMPORTANT:** Each turbine blade has a paint dot on the “front” of the blade between the blade mounting holes. The blades should be bolted to the ground end of the blade extensions so that the paint dot is VISIBLE after the blades are mounted.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SS Blade Extension</td>
<td>3</td>
<td>6</td>
<td>Blade</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>SS Lock Washer, M10</td>
<td>6</td>
<td>7</td>
<td>SS Nylock Nut M10</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>SS Hex Bolt M10 x 40</td>
<td>6</td>
<td>9</td>
<td>SS Flat Washer M10 x 30 (Thick)</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Nose Cone</td>
<td>1</td>
<td>10</td>
<td>SS Shaved Washer M19 x 30</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>SS Flat Washer M10 x 20 (Thin)</td>
<td>3</td>
<td>11</td>
<td>SS Hex Bolt M10 x 50</td>
<td></td>
</tr>
</tbody>
</table>
BLADE INSTALLATION

6) Whisper 200 Blades

1) Blade Extensions

11) Hex Bolt M10 x 50

3) Hex Bolt M10 x 40

7) M10 Nylock Nut

9) M10 x 30 Flat Washer

Loctite 242

17mm Socket

5) M10 x 20 Flat Washer

10) M10 x 30 Flat Washer - Shaved

Torque Wrench

Adjustable Wrench

Blade Extension

M10 x 40 Bolt

M10 x 20 Flat Washer

Rotor

Nose Cone Attachment Point

Blade Extension to Rotor Attachment Point
Attach blade extension to rotor.

Ensure nose cone to rotor attachment hole lines up before tightening blade extensions.

Attach nosecone to rotor.

Any two tip distances should be equal distances apart to reduce vibration.
Attach blades to blade extensions.

Ensure Paint Dot Faces Out

M10 x 50 Hex Bolt
M10 x 30 Flat Washer - Shaved

Final Assembly

Paint Dot

Torque to 24 N-m (18 ft-lb)
Whisper Controller – Mounting

- When performing preliminary turbine to controller tests, temporarily mounting the controller close to wind turbine allows easy access while testing the turbine and controller functionality.
- Perform turbine to controller tests prior to mounting blades.
- Allow effective heat convection by mounting controller vertically against a wall.
- The dump load side of the controller gets very hot, DO NOT mount near flammable or heat sensitive materials.
- Controller is NOT rated for outside use and must be protected from the elements. Mount inside a protected building.

*Controller can be mounted as shown below, or rotated 90 degrees with dump load on top.

**Whisper Controller – Wiring**

Connecting
Remove the Controller electronic cover and connect the battery, turbine and ground wires as shown in the accompanying schematic.

- Controller **MUST** be connected to the batteries **BEFORE** making the wind turbine connections.
- Correct polarity **MUST** be observed when connecting battery cables.
- Setting dip switch voltages before connecting to battery. See “Printed Circuit Board Switch Settings” section.
- Avoid shorting battery leads together when connecting the battery.
- Connect the battery to the controller. Confirm the microprocessor is energized by moving the diversion switch to the “stop” position; red LED should illuminate.
- If not, momentarily depress the “reset” switch on the controller PCB.
- Return the diversion switch to the battery position and observe the red LED to turn off.
- When connecting the battery do not allow the connection to power the microprocessor on and off quickly. This could cause the microprocessor to lock up.
- If the microprocessor locks up and resetting does not correct the problem, contact Southwest Windpower for instructions.
- After successful startup, cycle red LED by toggling the diversion switch then switch to “Stop”.
- Connect turbine wires to controller (order is not important)

*When the red LED is on, the turbine will not spin as long as at least two of its wires are connected, except in strong winds.*
Optional Anemometer Connection
- Whisper Controller is designed to accommodate a model #40 NRG anemometer (www.nrgsystems.com; Item Number 1900).
- Connect anemometer wires to labeled PCB terminal block.
- Anemometers require specific polarity; observe the labeling on the terminal block connections.
- If applicable, connect a grounding shield to the controller’s grounding terminal.
- Mount anemometer close to turbine without entering the turbine’s swept area (see manufacturer’s installation instructions).

Understanding Voltage Regulation:
"Regulation-On"
- Controller is regulating battery voltage and diverting power to the dump load.
- If the controller measures battery voltage above "regulation-on voltage" for more than 30-40 seconds, it begins diverting power.

"Regulation-Off"
- Controller resumes battery charging.
- If the controller measures battery voltage below "regulation-on voltage" for more than 30-40 seconds, it stops diverting power and begins battery charging.

Dump Load Wiring
- Wire the resistive “dump” load for the correct system voltage.
- Sufficient jumper wires are provided to achieve any system voltage configuration.

Whisper Controller - Printed Circuit Board Switches and Reset Button
- Six switches on the PCB are used to set operating system parameters.
- The default settings are suitable for most systems installations and should only be changed to alter system voltage.

Reset Switch:
- Whisper Controller operation is controlled by a microprocessor.
- The PCB reset switch resets the microprocessor. Depressing the reset switch has the same effect as disconnecting a battery cable.
- To reset momentarily press the reset button. If it is necessary to depress a second time, wait approximately 15 seconds.
- Voltage regulation points set using the optional display setting will be lost if reset switch is depressed or a battery cable is disconnected; controller will revert to potentiometer set points.
Printed Circuit Board Switch Settings

**Switches 1 and 2, System Voltage**
Select the correct system voltage by setting the position of switches 1 and 2 according to the following table.

<table>
<thead>
<tr>
<th>System Voltage</th>
<th>Switch 1</th>
<th>Switch 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Volt</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>24 Volt</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>48 Volt</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

After changing the system voltage depress the reset switch to “read and save” the new voltage setting.

**Switch 3, Time Hysteresis, Default Setting “ON”**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>30-40 second delay for controller to start or stop charging when regulation set point is reached</td>
</tr>
<tr>
<td>OFF</td>
<td>No-delay – charging will stop or start immediately when regulation set point is reached</td>
</tr>
</tbody>
</table>

*It is not necessary to depress the Reset Switch after changing the switch setting. 
*Southwest Windpower STRONGLY recommends Switch 3 remain in ON position

**Switch 4, Voltage Hysteresis, Default Setting “OFF”**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Controller starts or stops charging at the voltage regulation points set through optional display or by the PCB potentiometer</td>
</tr>
<tr>
<td>ON</td>
<td>Voltage regulation-on point (battery stops charging) set using potentiometer increases by:</td>
</tr>
<tr>
<td></td>
<td>- 1.0 volts for 12V systems</td>
</tr>
<tr>
<td></td>
<td>- 2.0 volts for 24V systems</td>
</tr>
<tr>
<td></td>
<td>- 4.0 volts for 48V systems</td>
</tr>
<tr>
<td></td>
<td>Voltage regulation-off point (battery charging resumes) is not affected</td>
</tr>
<tr>
<td></td>
<td>Voltage hysteresis switch does not increase the regulation on and off set points using the optional display</td>
</tr>
</tbody>
</table>

**Switch 5, Potentiometer Enable, Default Setting “OFF”**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Enables reading potentiometer voltage in real time. Resolution limits are:</td>
</tr>
<tr>
<td></td>
<td>- 0.2 volts for 12V systems</td>
</tr>
<tr>
<td></td>
<td>- 0.4 volts for 24V systems</td>
</tr>
<tr>
<td></td>
<td>- 0.8 volts for 48V systems</td>
</tr>
<tr>
<td></td>
<td>Voltage regulation points must be set using potentiometer not optional display</td>
</tr>
<tr>
<td>OFF</td>
<td>Prevents changing the voltage regulation point using the potentiometer</td>
</tr>
</tbody>
</table>

*It is not necessary to Reset after changing the switch 4 & 5 settings.

Before adjusting the Voltage Regulation-On set-point understand that increasing the voltage will not increase the turbine’s output voltage or current. This set-point only adjusts the “shut-down” voltage for battery charging. Overcharging will significantly reduce a battery’s life expectancy.

**Switch 6, Default Setting “OFF”**
There is no function presently associated with this switch. SWWP recommends leaving the switch in the OFF position.
3) Diversion switch
- Diverts power from batteries to dump load to avoid battery overcharging
- Considerations if activated:
  - Will not stop a spinning turbine but will not allow a stopped turbine to start spinning
  - If turbine blades are spinning, it is normal and safe

4) LED Operation
- Red LED = Power diverted to dump load
- Green LED = Turbine is charging battery

OPERATION AND ADJUSTMENTS

Operation of the Whisper Controller
1) Overview
- Controls and converts turbine power. Functions:
  - Rectifies power from wild AC to DC voltage
  - Contains diversion load & controls voltage regulation
  - Monitors voltage, current, energy production and wind speed (if equipped)
- Optional LCD Display:
  - Offers instant access to operational parameters and performance measurements: voltage, current, power, energy, charge, peak power
- Display LEDs function same as controller LED

2) Normal Operation
- Interface mechanisms: LED, diversion switch, voltage regulation adjustment, PCB configuration switches and LCD display (if equipped)
- Interface allows setting regulation voltage, monitoring system

3) Diversion switch
- Diverts power from batteries to dump load to avoid battery overcharging
- Considerations if activated:
  - Will not stop a spinning turbine but will not allow a stopped turbine to start spinning
  - If turbine blades are spinning, it is normal and safe

4) LED Operation
- RED LED = Power diverted to dump load
- GREEN LED = Turbine is charging battery

LED INDICATORS

<table>
<thead>
<tr>
<th>LEDE</th>
<th>LEDB</th>
<th>LEDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>BLINKING</td>
<td>BLINKING</td>
<td>BLINKING</td>
</tr>
</tbody>
</table>

- Battery charging
- Power to diversion load by operator request (via Diversion Switch or remote Display)
5) Setting Regulation Voltage (without Display) *See page 22 - Switch 5
- Turning the potentiometer clockwise (CW) increases the voltage set points. Use following chart for approximate potentiometer set points.

Note: Determine the initial potentiometer position by turning fully counter clockwise (CCW). Count and record the number of turns.

<table>
<thead>
<tr>
<th>Pot Position</th>
<th>Regulation Off Voltage</th>
<th>Regulation On Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully CCW</td>
<td>12.0V 24.0v 36.0v 48.0v</td>
<td>13.0V 26.0v 39.0v 52.0v</td>
</tr>
<tr>
<td>1/4 Turns CCW</td>
<td>13.0V 26.0v 39.0v 52.0v</td>
<td>14.0V 28.0v 42.0v 56.0v</td>
</tr>
<tr>
<td>Factory Preset</td>
<td>13.4V 26.8v 40.2v 53.6v</td>
<td>14.4V 28.8v 43.2v 57.6v</td>
</tr>
<tr>
<td>1/2 Turns CW</td>
<td>14.0V 28.0v 42.0v 56.0v</td>
<td>15.0V 30.0v 45.0v 60.0v</td>
</tr>
<tr>
<td>3/4 Turns CW</td>
<td>14.0V 28.0v 42.0v 56.0v</td>
<td>16.0V 32.0v 48.0v 64.0v</td>
</tr>
<tr>
<td>Fully CW (18 turns)</td>
<td>14.0V 28.0v 42.0v 56.0v</td>
<td>17.0V 34.0v 51.0v 68.0v</td>
</tr>
</tbody>
</table>

6.) Whisper Controller Display (Optional)

- Designed to mount on:
  - Whisper controller base unit (a short CAT5 Ethernet cable is provided) or 4” wall type switch receptacle
  - If mounted on controller, connect CAT5 to jack closest to diversion switch to disable controller LED
- Mounting on Whisper Controller
  - Remove electronics cover
  - Remove sheet metal insert where display will mount
  - Use hardware provided to mount display to electronics cover
  - Hardware: 8-32 x 3/8” black oxide SS screws and 8-32 nuts with captive star washers
- If mounted remotely, the display can be mounted up to 300 m (1,000 ft) from controller; longer CAT5 cable must be purchased by user.

- Verify display function: text should appear on LCD display after display and batteries are connected to controller.
- It may be necessary to adjust LCD contrast:
  - Locate small hole between buttons and LEDs
  - Insert small screwdriver through display cover
  - Turn clockwise to lighten
  - Turn counter-clockwise to darken
- If text is still not visible, disconnect & reconnect cable to display to reset.
### Display Menu Functions

<table>
<thead>
<tr>
<th>Ref #</th>
<th>Page</th>
<th>Display</th>
<th>Menu Select</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main</td>
<td>On or Off</td>
<td>“A”</td>
<td>go to A Ring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.3V 00.0A 000W</td>
<td>“B”</td>
<td>go to B Ring</td>
</tr>
<tr>
<td>2</td>
<td>Energy</td>
<td>kWh 0000 kAh 000.00</td>
<td>“B”</td>
<td>go to reset menu</td>
</tr>
<tr>
<td></td>
<td>Reset Menu</td>
<td>kWh reset kWh? 0000 A: RESET B: CANCEL</td>
<td>“A”</td>
<td>reset power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“B”</td>
<td>return to reset menu</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>History</td>
<td>Mph: 00.0a pow: 00.0p</td>
<td>“B”</td>
<td>go to reset menu</td>
</tr>
<tr>
<td></td>
<td>Reset Menu</td>
<td>Mph reset Page? 00.0a 00.0p</td>
<td>“A”</td>
<td>reset readings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“B”</td>
<td>return to reset menu</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Mode</td>
<td>Mode: A: OFF REM B: SKIP</td>
<td>“B”</td>
<td>batteries diverted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mode: Off</td>
<td>“B”</td>
<td>go to regulation set menu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A: ON REM B: SKIP</td>
<td>“A”</td>
<td>go to regulation set menu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>REGULATION SET:</td>
<td>“A”</td>
<td>change regulation point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A: CHANGE B: SKIP</td>
<td>“B”</td>
<td>return to Main Menu</td>
</tr>
<tr>
<td>5</td>
<td>Regulation Set</td>
<td>Regulation ON voltage:</td>
<td>“B”</td>
<td>go to regulation set menu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15.8V</td>
<td>“A”</td>
<td>increase ON set voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regulation OFF voltage:</td>
<td>“B”</td>
<td>go to regulation set menu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.8V</td>
<td>“A”</td>
<td>increase OFF set voltage</td>
</tr>
</tbody>
</table>

### 1) Main Page
- Displays controller’s measurements: battery charging status, voltage, and current and turbine power and windspeed (if equipped)
- Main display leads to four sub-pages by selecting “A” or “B” functions
  - “A” – Energy and History menu pages
  - “B” – Mode and Regulation menu pages

### 2) Energy Page
- Displays accumulated kWh and kAh since last reset
- Accumulated data can be reset by selecting menu option “B”
- Menu option “A” goes to the History page

### 3) History Page
- Displays average and peak windspeed and turbine power since reset
  - Note: windspeed is only available if anemometer is installed
- Reset accumulation data by selecting menu option “B”
- Menu option “A” goes to the Main Display page

### 4) Mode Page
- Displays current charge mode
  - If “ON” is displayed the battery can be charged; turbine will spin in adequate wind
  - If “OFF” is displayed turbine power produced is diverted to dump load; turbine will not spin in light winds
  - “A” menu button toggles the mode
  - “B” menu button returns to Regulation Set page
- Controller can switch to “OFF” mode in the following conditions
  - “OFF REM” - turbine power is diverted to dump load via request from remote display
  - “OFF_MAN” - turbine power is diverted to dump load when diversion switch is moved to “Stop” position
  - “OFF_REG” - turbine power is diverted to dump load via automatic regulation at present voltage
  - “DIVERSION switch set to “OFF” overrides Remote Display “ON” function

### 5) Regulation Page

**Digitally set “regulation on” and “regulation off” voltages using the Regulation Setpage Menu**
- Select “A: CHANGE” for “Regulation ON” subpage for voltage changes
  - “B” menu button increases voltage to 17V maximum. At 17V, if pressed again, the voltage rolls back to 13V
  - “A” menu button brings up “Regulation OFF” subpage
  - “B” menu button increases voltage to a maximum of one volt lower than “Regulation ON” voltage. At maximum, if pressed again, the voltage rolls back to 12V
  - “A” menu button returns to Regulation Set page
- Select “B: SKIP” to return to Main Display Page
  - *Regulation Off voltage cannot be specified above Regulation On voltage*
MAINTENANCE AND REPAIR

Maintenance – Monthly

1) Test Diversion Control (check electrical wiring)
   - Divert the load by setting the diversion switch to “stop” in a moderate wind (charging but not furling)
   - No unusual difficulty or noise should be experienced in stopping the blade rotor
   - A noise during diversion can indicate a disconnected wire

2) Check Mechanical Condition
   - Watch and listen from the tower base. There should be no mechanical noise, rattle or vibration and the blades and tail must not wobble
   - If you hear mechanical noise, rattle or vibration, or see blade or tail wobble, lower the tower for inspection
   - If you experience any of these conditions, refer to Troubleshooting and Repair

3) Inspect the Tower
   - Follow all inspection and maintenance requirements of the tower manufacturer
   - Tighten all nuts and bolts, especially wire clips
   - Check for cracks and bent/broken parts at the anchors and base
   - Check for broken strands and tighten wires

4) Check the Battery
   - Consult your battery manufacturer maintenance guide
   - Tighten battery connections
   - Remove corrosion and protect terminals

Maintenance - Annual

Lower the tower and give wind generator a complete inspection. Fix or replace any warn or loose parts.

a) Check tightness of all tower and blade nuts and bolts
b) Check all bearings
c) Clean the blades with a mild detergent to remove all dirt and debris. Replace blades if they are cracked or damaged
d) Check the pivot bushing and bore. Lay the turbine down while it is completely unfurled (the normal operating position), and see if you can wobble the lower half. If it wobbles significantly (noticeable play), then the bushing and/or bore is ovalized. Replace the bushing first and retest it. If it still wobbles then the castings need to be replaced.
### Maintenance Log

Observe monthly and annual inspection requirements. Record all maintenance and repair work.

<table>
<thead>
<tr>
<th>Date</th>
<th>Problem/Observation</th>
<th>Action Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Troubleshooting and Repair

#### Table: Symptoms of Mechanical Problems

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Probable Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade rotor is stationary, even in high winds</td>
<td>a) Ice in generator, or on blades</td>
<td>a) Wait for warm weather. Leave running unless vibration is substantial</td>
</tr>
<tr>
<td></td>
<td>b) Debris between rotor and stator</td>
<td>b) Turn blades gently by hand and use thin material to dislodge debris</td>
</tr>
<tr>
<td></td>
<td>c) Loose, broken or rubbing magnet</td>
<td>c) Remove rotor and re-glue magnets – contact factory/ dealer/ distributor</td>
</tr>
<tr>
<td></td>
<td>d) Bad or worn bearing</td>
<td>d) Contact factory or distributor</td>
</tr>
<tr>
<td>Blade rotor will not turn at all except in high wind, scraping or rubbing sound at low rpm, always stops at same blade position</td>
<td>a) Same as above, except more likely to be high magnet or bad bearing.</td>
<td>a) Same as above</td>
</tr>
<tr>
<td>Blade rotor is hard to start, output is lower &amp; there is more blade noise than usual; appears out of balance.</td>
<td>a) Ice on blades</td>
<td>a) Wait for warm weather. Leave running unless vibration is substantial</td>
</tr>
<tr>
<td></td>
<td>b) Dirty blades</td>
<td>b) Clean with mild detergent</td>
</tr>
<tr>
<td></td>
<td>c) Damaged blade(s)</td>
<td>c) Replace damaged blade – contact factory/ dealer/ distributor</td>
</tr>
<tr>
<td></td>
<td>d) Blade(s) on backwards</td>
<td>d) See blade installation</td>
</tr>
<tr>
<td>Blade rotor turns slowly, never spins rapidly</td>
<td>a) Blades on backwards.</td>
<td>a) See blade installation</td>
</tr>
<tr>
<td>Tail, generator and tower vibrate or shake excessively at all or some wind speeds</td>
<td>a) Blade out of balance</td>
<td>a) Replace blade – contact factory/ dealer/ distributor</td>
</tr>
<tr>
<td>SAFETY FIRST - shut down turbine until a physical inspection can be performed.</td>
<td>b) Blade not tracking</td>
<td>b) Contact factory/ dealer/ distributor</td>
</tr>
<tr>
<td></td>
<td>c) Rotor out of balance</td>
<td>c) Contact factory/ dealer/ distributor</td>
</tr>
<tr>
<td></td>
<td>d) Shorted alternator or wiring</td>
<td>d) Perform phase-to-phase testing</td>
</tr>
<tr>
<td>Rattle or clunking from generator</td>
<td>a) Generator loose in tower. Rotor loose on shaft, loose tail, missing rubber bumper, wires slapping inside of mast, governor pivot bolt loose</td>
<td>a) Inspect for damage and repair as required Retighten mounting hardware, use Loctite or equivalent thread-locking compound.</td>
</tr>
<tr>
<td></td>
<td>b) Worn bearings</td>
<td>b) Replace bearings – contact factory/ dealer/ distributor</td>
</tr>
<tr>
<td></td>
<td>c) Shaft broken</td>
<td>c) Replace shaft – contact factory/ dealer/ distributor</td>
</tr>
</tbody>
</table>
Electrical Diagnosis - Determining the Type of Electrical Problem

1. Wind generator will not start (blades turn slowly as if the diversion switch is engaged):
   - In moderate wind, disconnect wind generator wires at controller one at a time.
   - If generator starts, the wire allowing it to start lead to a failed component.

   • Replace failed component
   • Contact factory/dealer/distributor

2. Wind generator still does not start:
   - In moderate wind, disconnect any two wires.
   - If the wind generator starts, the problem is most likely in the controller.
   - Go to table: Symptoms of Whisper Controller Problems

3. Wind generator is running, but may have an electrical problem.

   • Use voltmeter to read the voltage across the leads
   • Go to Voltmeter Test

   OR

   If the generator does not start the problem is in the tower wiring or the wind generator.
   • Go to Table: Symptoms of Electrical Problems.
Voltmeter Test

<table>
<thead>
<tr>
<th>Test</th>
<th>What it tells you</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Voltage increases and decreases slowly relative to wind speed across all combinations of paired wires</td>
<td>• Everything is OK.</td>
</tr>
<tr>
<td>2. No voltage across one set of two wires</td>
<td>• One wire from the wind generator is not carrying power. Check the tower wiring and controller connections to ensure proper wiring. • If the wiring is correct contact authorized factory/ dealer/ distributor for further assistance.</td>
</tr>
<tr>
<td>3. Voltage significantly higher across one set of two wires than the others</td>
<td>• Possibly a shorted diode. Contact factory/ dealer/ distributor.</td>
</tr>
<tr>
<td>4. Voltage significantly lower across one set of two wires than the others</td>
<td>• There is a bad connection at wind turbine voltage connections or faulty stator winding. Contact factory/ dealer/ distributor.</td>
</tr>
</tbody>
</table>

Should these results appear inconclusive in determining the problem proceed directly to Table: Symptoms of Electrical Problems or see Table: Symptoms of Whisper Controller Problems below.

Table: Symptoms of Whisper Controller Problems

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Probable Cause</th>
<th>Correction</th>
</tr>
</thead>
</table>
| Blade rotor turns slowly, even in strong wind | a) Brake switch ON  
    b) Shorted diode  
    c) Dead or disconnected battery  
    d) Short in wiring to turbine | a) Move switch to “OFF”  
    b) Contact factory/ dealer/ distributor  
    c) Ensure battery voltage at controller terminals is at least 10v, 20v, 32v, or 44v depending on turbine model  
    d) See Table of Electrical Problems |
| Doesn’t regulate, red LED off and dump load is cold | a) Battery volts below setting  
    b) Bad circuit board | a) Check battery with voltmeter (see Voltmeter Test). Adjust voltage setting  
    b) Contact factory/ dealer/ distributor |
| Doesn’t regulate, red LED on and dump load is cold | a) Dump load burned out, disconnected or wired incorrectly  
    b) Bad connection from circuit board to power block | a) Contact factory/ dealer/ distributor  
    b) Contact factory/ dealer/ distributor |
| Dumpload always on, red LED on        | a) Wrong battery voltage setting  
    b) Bad circuit board  
    c) Diversion switch set to “Stop” or disconnected | a) Check battery with voltmeter (see Voltmeter Test) Adjust voltage setting  
    b) Contact factory/ dealer/ distributor  
    c) Move diversion switch to “Start”. Check and restore connection, if needed |
### Table: Symptoms of Electrical Problems

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Probable Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade rotor will not turn or turns slowly, even in high wind</td>
<td>a) Diversion switch is ON.</td>
<td>a) Turn Diversion switch to Battery position</td>
</tr>
<tr>
<td></td>
<td>b) Battery is dead (voltage less than 1/2 nominal)</td>
<td>b) Disconnect load and/or battery from generator until it starts; charge battery</td>
</tr>
<tr>
<td></td>
<td>c) Incorrect turbine wiring.</td>
<td>c) Rewire</td>
</tr>
<tr>
<td></td>
<td>d) Short circuit in wiring from generator to controller</td>
<td>d) Check wiring from generator to controller</td>
</tr>
<tr>
<td></td>
<td>e) Failed component in controller</td>
<td>e) See Voltmeter Test</td>
</tr>
<tr>
<td></td>
<td>f) Short circuit in brush card or slip ring assembly</td>
<td>f) Contact factory/dealer/distributor</td>
</tr>
<tr>
<td></td>
<td>g) Short circuit in turbine</td>
<td>g) Contact factory/dealer/distributor</td>
</tr>
<tr>
<td>Blade rotor runs too fast, may whistle; no output, no unusual mechanical noise</td>
<td>a) Two or three wires open between turbine and controller</td>
<td>a) See Voltmeter Test</td>
</tr>
<tr>
<td></td>
<td>b) Controller diodes open or wire is disconnected at diode terminal</td>
<td>b) See Voltmeter Test</td>
</tr>
<tr>
<td></td>
<td>c) Battery voltage over 50%</td>
<td>c) Examine battery specifications and regulation set point. Replace improperly sized battery if necessary</td>
</tr>
<tr>
<td></td>
<td>d) Turbine may be in regulation, but wind is too high for turbine to stop</td>
<td>d) Wait for calmer conditions. Engage diversion switch to determine proper operation</td>
</tr>
<tr>
<td></td>
<td>e) Load or battery disconnected</td>
<td>e) Check all connections</td>
</tr>
<tr>
<td>Blade rotor runs too fast, may whistle, output less than 50% for wind speed, growling, buzzing or vibration felt by hand or mast</td>
<td>a) Disconnect wire between turbine and controller</td>
<td>a) See Voltmeter Test</td>
</tr>
<tr>
<td></td>
<td>b) One open or disconnect diode</td>
<td>b) See Voltmeter Test</td>
</tr>
<tr>
<td></td>
<td>c) One slip ring or brush not making good contact</td>
<td>c) Contact factory/dealer/distributor</td>
</tr>
<tr>
<td>Blade rotor runs too slowly, low output, no unusual mechanical noise</td>
<td>a) Battery voltage low or dead battery</td>
<td>a) Disconnect loads and let battery charge</td>
</tr>
<tr>
<td></td>
<td>b) Incorrect turbine wiring</td>
<td>b) Check turbine wiring connections or rewire</td>
</tr>
<tr>
<td>Green charge light comes on momentarily during wind gusts or only comes on in very high wind conditions</td>
<td>a) The turbine and controller voltage settings may be set to different voltage configurations</td>
<td>a) Verify the turbine output wiring, the diversion load and the controller DIP switch are configured to the same voltage</td>
</tr>
</tbody>
</table>

**Notes:**
- **a)** Green charge light indicates the battery is charging.
- **b)** Low charge light indicates the battery is low on charge.
- **c)** Red charge light indicates the battery is overcharged.

**Caution:**
- Always ensure the turbine is properly grounded before making any electrical connections.

**Important:**
- Always consult the manufacturer’s manual for the Whisper 200 owner’s manual for specific instructions on troubleshooting and maintenance.
Do not attempt repairs on top of the tower. Perform repairs only after tower has been lowered.

Whisper 200 Exploded View

**Mechanical Repairs and Parts Replacement**

- Use exploded view and parts list as guide for replacement parts and troubleshooting.
- *Southwest Windpower strongly recommends internal turbine repairs be performed by an authorized service dealer or Southwest Windpower.*
- Unauthorized repairs leading to turbine damage may void the warranty.

Part descriptions on next page
### Whisper 200 Exploded View Parts List

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Qty.</th>
<th>Part No.</th>
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<tbody>
<tr>
<td>1</td>
<td>Casting-Upper-Machined-100/200-Land</td>
<td>1</td>
<td>3-CMBP-1225-02</td>
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<td>Casting-Upper-Machined-100/200-Marine</td>
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<td>3-CMBP-1225-04</td>
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<tr>
<td>2</td>
<td>Nylock Nut, M8</td>
<td>1</td>
<td>3-HDNT-201-02</td>
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<td>3</td>
<td>Hex Head Cap Screw M8 x25</td>
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<td>3-HDBT-2004-69</td>
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<td>3-CMBP-1199-01</td>
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<td>Stator-200-Marine-LV</td>
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<td>Stator-200-Marine-HV</td>
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<td>5</td>
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<td>Spindle-100/200</td>
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<td>Rotor-200</td>
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<td>Washer M6, SS</td>
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<td>11</td>
<td>Socket Head M6 x 16</td>
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<td>Bushing-Bronze</td>
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<td>16</td>
<td>Pivot Shaft-100/200</td>
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<td>Cover-Brush Card</td>
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<td>Brush-Spring 1&quot;</td>
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<td>Bearing-6206-Sealed</td>
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<td>3-CABR-1004</td>
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</tbody>
</table>
Whisper Wind Turbine Warranty Agreement

Hardware Warranty
Southwest Windpower, Inc., ("Southwest Windpower") will repair or replace free of charge any part or parts of the Southwest Windpower Whisper™ Wind Turbine determined by Southwest Windpower to be defective in materials and/or workmanship under normal authorized use consistent with product instructions for a period of five years from the date the original purchaser ("Customer") receives the Wind Turbine ("Start Date"). This warranty extends only to the original purchaser. The Customer’s sole and exclusive remedy and the entire liability of Southwest Windpower, its suppliers and affiliates under the warranty is, at Southwest Windpower’s option, either (i) to replace the Wind Turbine with new or reconditioned Wind Turbine, (ii) to correct the reported problem, or (iii) to refund the purchase price of the Wind Turbine. Repaired or replaced products are warranted for the remainder of the original warranty period.

Restrictions
Problems with the Wind Turbine Products can be due to improper use, lack of maintenance, non-Southwest Windpower additions or modifications or other problems not due to defects in Southwest Windpower’s workmanship or materials. No warranty will apply if the Wind Turbine (i) has been altered or modified except by Southwest Windpower, (ii) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Southwest Windpower, (iii) has been exposed to winds exceeding 120 mph (54 m/s), (iv) or has been subjected to abnormal physical, thermal or electrical stress, misuse, negligence, or accident. If Southwest Windpower’s repair facility determines that the problem with the Wind Turbine is not due to a defect in Southwest Windpower’s workmanship or materials, then the party requesting warranty service will be responsible for the costs of all necessary repairs and expenses incurred by Southwest Windpower.

Warranty Claims & Return Procedures
In order to be eligible for service under this warranty the Customer MUST return the warranty registration card included with this Warranty Agreement within 60 days of purchasing the Wind Turbine. Additionally, the Customer must submit a service request for Wind Turbine covered by this warranty within the warranty period by contacting Southwest Windpower in writing or via telephone and obtaining a Return Authorization ("RA") number. This RA must be obtained before returning any product under this warranty.

Notification must include a description of the alleged defect, the manner in which the Wind Turbine was used, the serial number, and the original purchase date in addition to the name, address, and telephone number of the party requesting warranty service. Within 3 business days of the date of notification, Southwest Windpower will provide the Customer with a RA number and the location to which the Customer must return the defective Wind Turbine. Any Wind Turbine requiring warranty repair shall be transported at the expense and risk of the party requiring warranty service, including but not limited to proper packaging of the Product. The Customer must return the entire Wind Turbine kit within 30 days after issuance of the RA number. Southwest Windpower will be under no obligation to accept any returned Wind Turbine that does not have a valid RA number. Customer’s failure to return the Wind Turbine within 60 days of its receipt of a RA number may result in cancellation of the RA. All parts that Southwest Windpower replaces shall become Southwest Windpower’s property on the date Southwest Windpower ships the repaired Wind Turbine or part back to the Customer. Southwest Windpower will use all reasonable efforts within five days of receipt of the defective Wind Turbine to repair or replace such Wind Turbine. If a warranty claim is invalid for any reason, the Customer will be charged at Southwest Windpower’s then-current rates for services performed and will be charged for all necessary repairs and expense incurred by Southwest Windpower.

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