

Southwest Windpower, Inc.
Renewable Energy Made Simple

Owners Manual
Installation, Operation and Maintenance



WHISPER WIND GENERATORS
MODEL Whisper 200
Tailored for Grundfos
SQFlex Water Pumping Systems

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WIND GENERATOR SERIAL NUMBER _____

WELCOME TO YOUR RENEWABLE ENERGY SYSTEM!

BEFORE YOU BEGIN:

Read this entire manual. Following the instructions and recommendations in this manual will help assure safe and enjoyable use of your new renewable energy system.

SAFETY INFORMATION: These systems present mechanical and electrical hazards that can be life threatening. The tower could fall and cause injury or death and property destruction. A component of the wind generator could come loose causing injury or death and property destruction. During installation, ensure that the turbine wires are shorted to each other (twisted together) to prevent the turbine from spinning up in unexpected gusts. Contact with the high speed propeller can result in severe injury or death. High voltage from the wind generator or the breaker box can cause injury or electrocution. A burn injury can result from an electrical short.

These conditions are addressed in the following safety messages:

STOP! DANGER! It is your responsibility to obtain all required permits and engineering certifications for your tower and tower location. Soil and wind conditions vary and towers and tower foundations must be designed for your specific location. Tower must not be able to fall on occupied buildings, neighbor's property or power lines. Tower climbing is dangerous and should be attempted only by experienced personnel using proper safety equipment. A fold-over tower can eliminate climbing. Locate your mounting mast (tower) well away from occupied buildings and power lines; a minimum of 100m (300 ft) is recommended.

STOP! DANGER! If the generator appears or sounds loose in the tower or is making an unusual sound, the condition must be corrected immediately. A loose generator or component will soon damage itself further and may fall from the tower or lose parts that could be lethal. Never stand in line with an operating propeller.

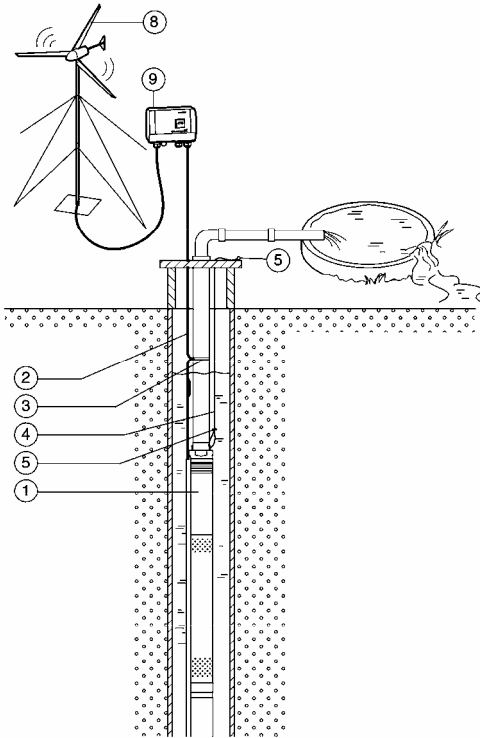
STOP! DANGER! Provide climbing protection against all unauthorized persons or children. Never allow an untrained person or someone without the proper safety equipment to climb the tower. Always stop the propeller before climbing the tower. Both falling from the tower and contact with the operating propeller can be lethal.

STOP! DANGER! High voltage systems represent a dangerous shock hazard and could be lethal. All high voltage systems should be wired and maintained by a qualified and licensed electrician.

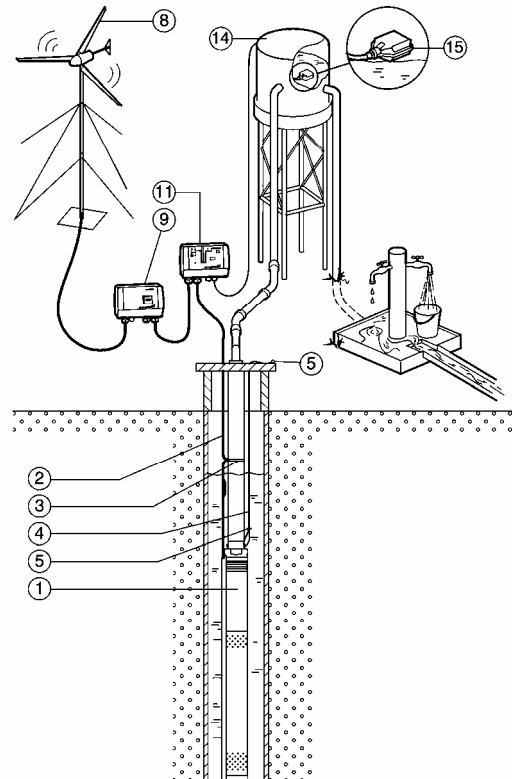
DESCRIPTION OF SYSTEMS

The illustrations below depicts typical installations. **Whisper Wind Generators include the turbine system and water pumping system only.** For more information regarding specifications, please contact your distributor or installer. Note that the illustrations below are for information purposes only. See the appropriate section to properly wire your own wind system.

Wind System Only



Wind System with Level Switch

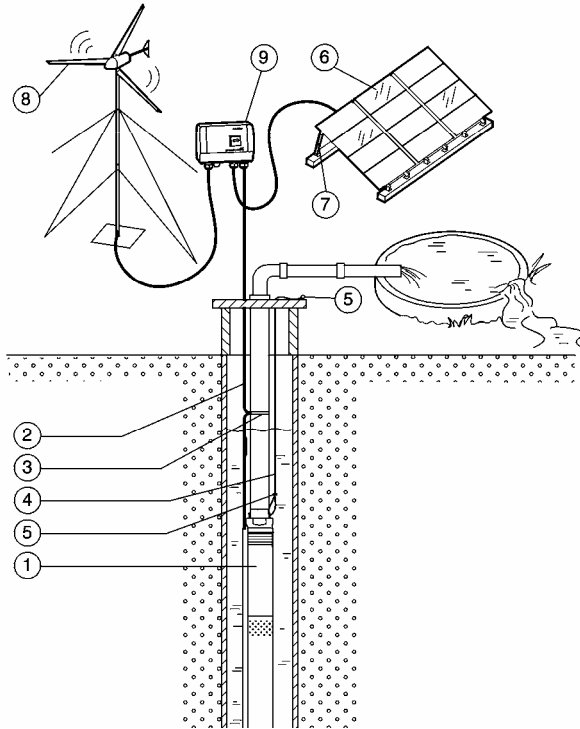


Item Number	Description
1	SQF Pump
2	Cable
3	Cable Clips
4	Straining Wire
5	Wire Clamps
8	Wind Turbine
9	IO 102 Breaker Box
11	CU 200 Control Unit
14	Water Reservoir
15	Level Switch

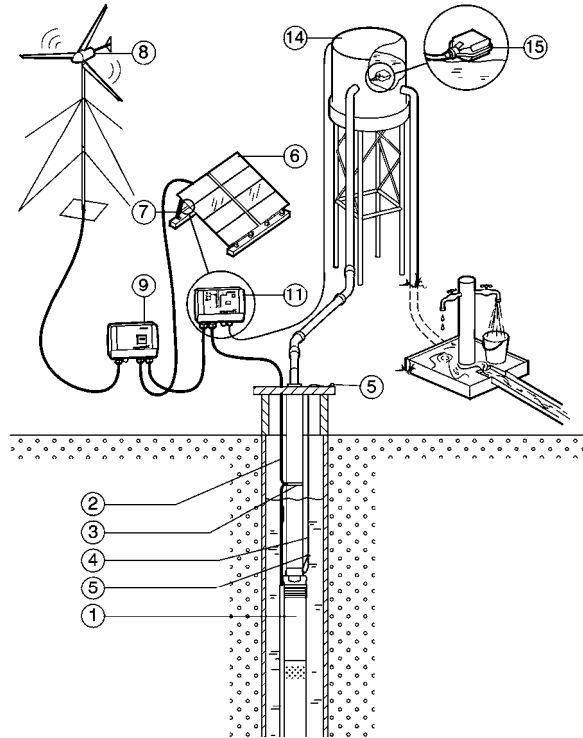
FURTHER DESCRIPTION OF SYSTEMS

During windless periods, solar panels may supplement your usage of renewable energy. Solar PV (photovoltaic) panels make electricity directly from the sunlight

Wind/Solar Combi System

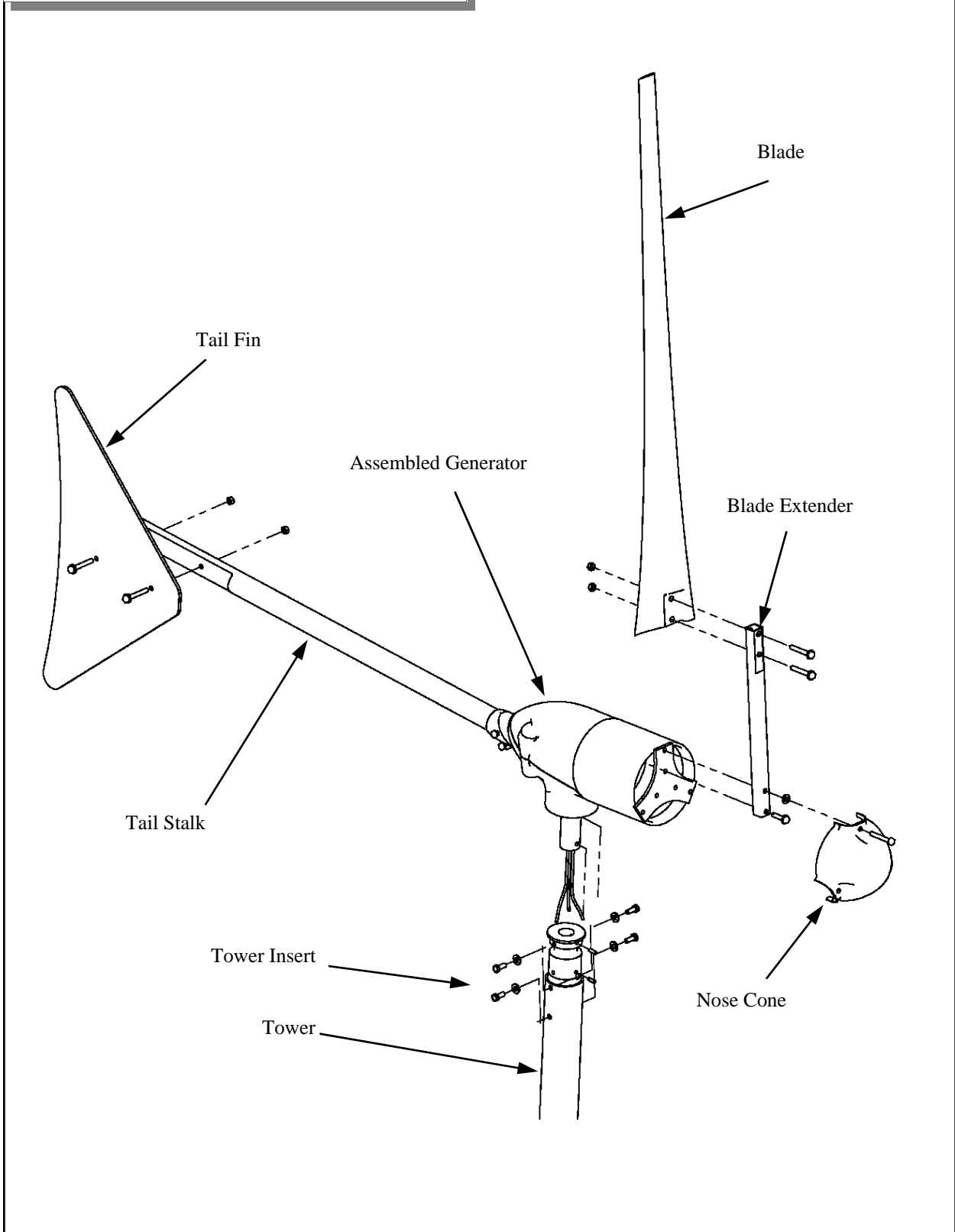


Wind/Solar Combi System with Level Switch and CU 200 Control Unit



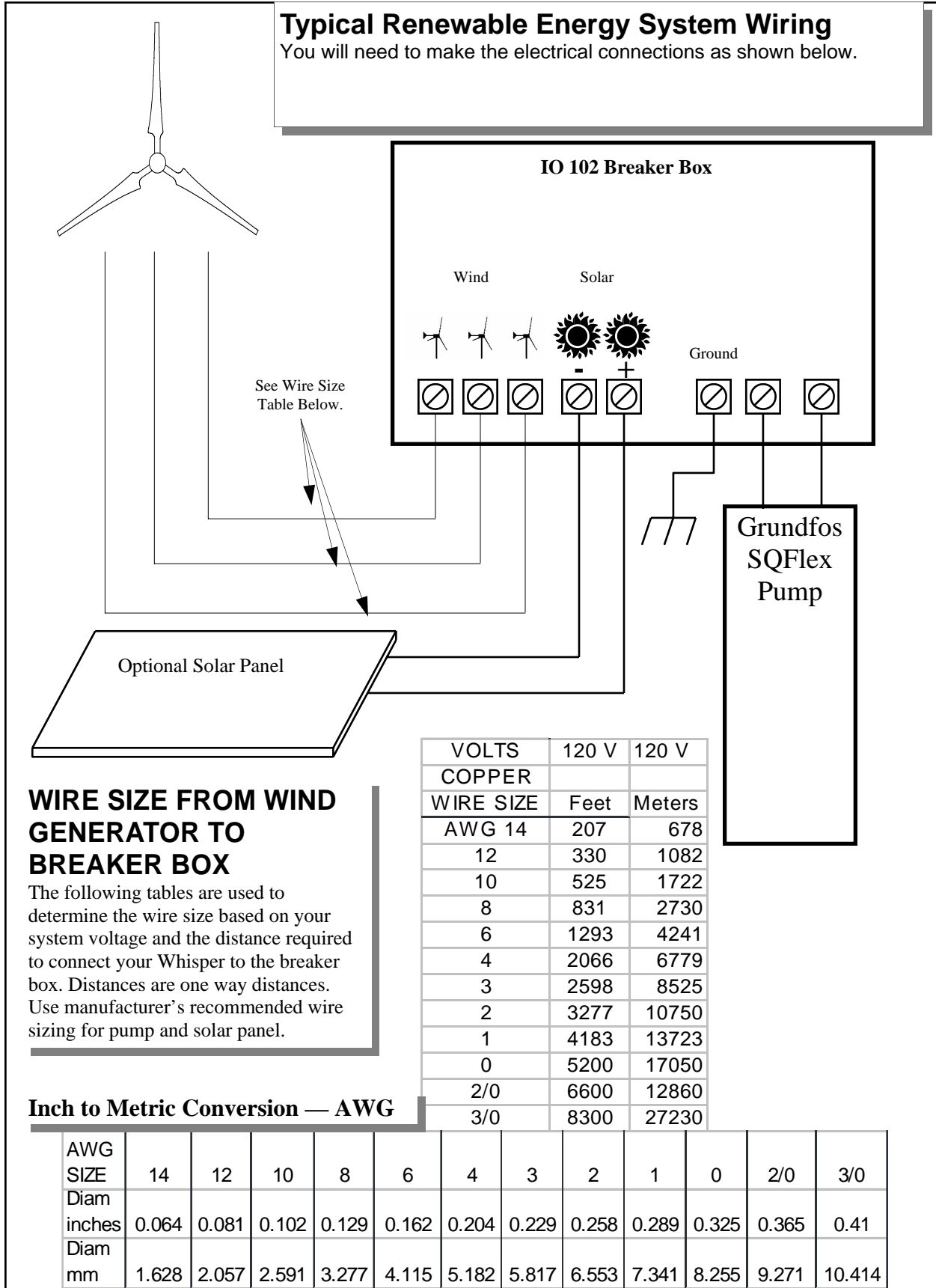
Item Number	Description
1	SQF Pump
2	Cable
3	Cable Clips
4	Straining Wire
5	Wire Clamps
6	Solar Panels
7	Support Structure
8	Wind Turbine
9	IO 102 Breaker Box
11	CU 200 Control Unit
14	Water Reservoir
15	Level Switch

Overview of Wind Generator Whisper 200 Shown



Typical Renewable Energy System Wiring

You will need to make the electrical connections as shown below.



See Wire Size Table Below.

WIRE SIZE FROM WIND GENERATOR TO BREAKER BOX

The following tables are used to determine the wire size based on your system voltage and the distance required to connect your Whisper to the breaker box. Distances are one way distances. Use manufacturer's recommended wire sizing for pump and solar panel.

VOLTS	120 V	120 V
COPPER		
WIRE SIZE	Feet	Meters
AWG 14	207	678
12	330	1082
10	525	1722
8	831	2730
6	1293	4241
4	2066	6779
3	2598	8525
2	3277	10750
1	4183	13723
0	5200	17050
2/0	6600	12860
3/0	8300	27230

Inch to Metric Conversion — AWG

AWG SIZE	14	12	10	8	6	4	3	2	1	0	2/0	3/0
Diam inches	0.064	0.081	0.102	0.129	0.162	0.204	0.229	0.258	0.289	0.325	0.365	0.41
Diam mm	1.628	2.057	2.591	3.277	4.115	5.182	5.817	6.553	7.341	8.255	9.271	10.414

1. INSTALLATION

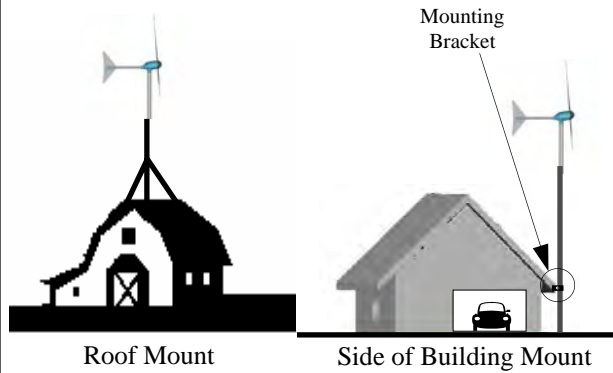
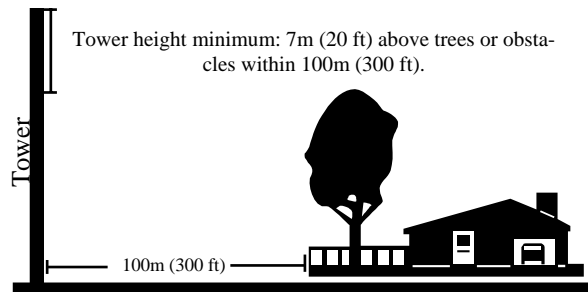
DO THE FOLLOWING STEPS IN ORDER AND CIRCLE WHEN COMPLETE

1. TOWER LOCATION/TYPE AND HEIGHT. INSTALL TOWER

(Install tower following manufacturer's instructions.)

Tower height minimum is 7 meters (20 feet) above trees or obstacles within 100m (300ft). The lateral thrust rating at top must match wind generator model. The highest point on your property is generally best, but wind generator distance to the pumping system determines the correct wire size (Refer to wire size table on the previous page). A fold over design permits easy installation and maintenance on the ground and eliminates the need for climbing.

Whisper Models are suitable for roof or side-of-building mounting on **unoccupied** buildings such as garage or barn. Some vibration transmission will be noticeable from mounts to structure. Foundations must be designed and approved for local wind/soil conditions.



2. WIND GENERATOR ELECTRICAL TESTS

Complete these tests before mounting blades to rotor.

These tests confirm that the wind generator was not damaged in shipment and is ready to install on the tower.

OPEN CIRCUIT TEST



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

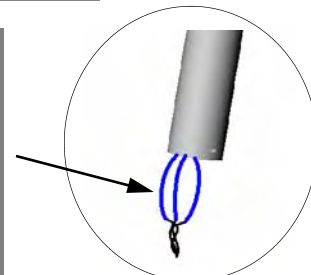
GROUND TEST



Check resistance to ground on any wire. Resistance must exceed 10,000 ohms.

SHORT CIRCUIT TEST

When the wires are shorted together the generator rotor should turn hard and smooth.



3. CONNECT WIRES AND MOUNT WIND GENERATOR TO TOWER
Whisper 200 - Tower Mount

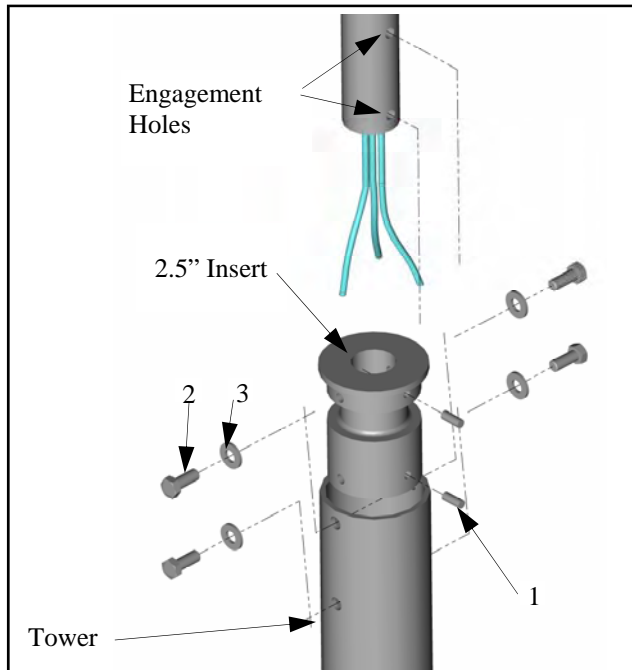
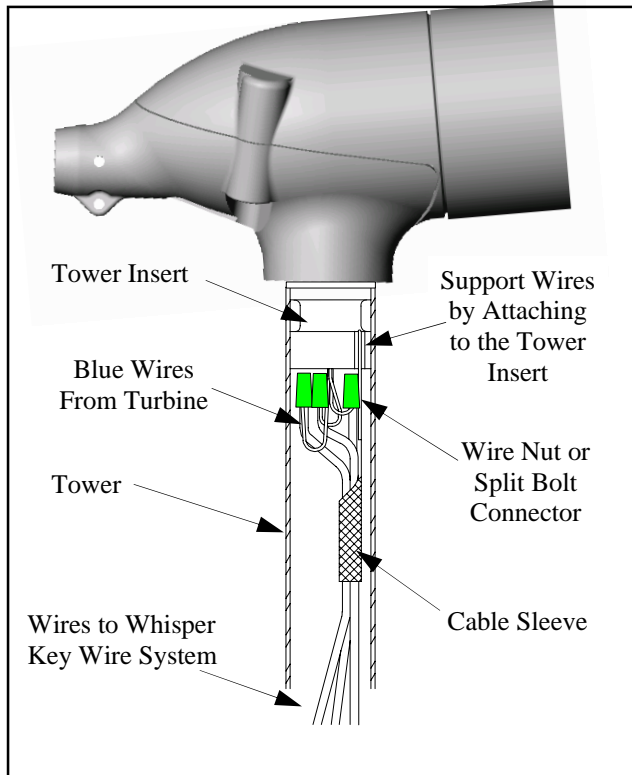
Mounting Instructions

Check fit of insert by fitting it inside the tower. A maximum of 1.5 mm (1/16 in) play is allowed. You must be able to pull pipe or tube tight against insert with mounting bolts.

Install insert on yaw shaft with slot facing down. Slot used for tower wire support. Use medium-strength thread locking compound on all fasteners. M6 X 10 Allen head set-screws must engage both holes in yaw shaft

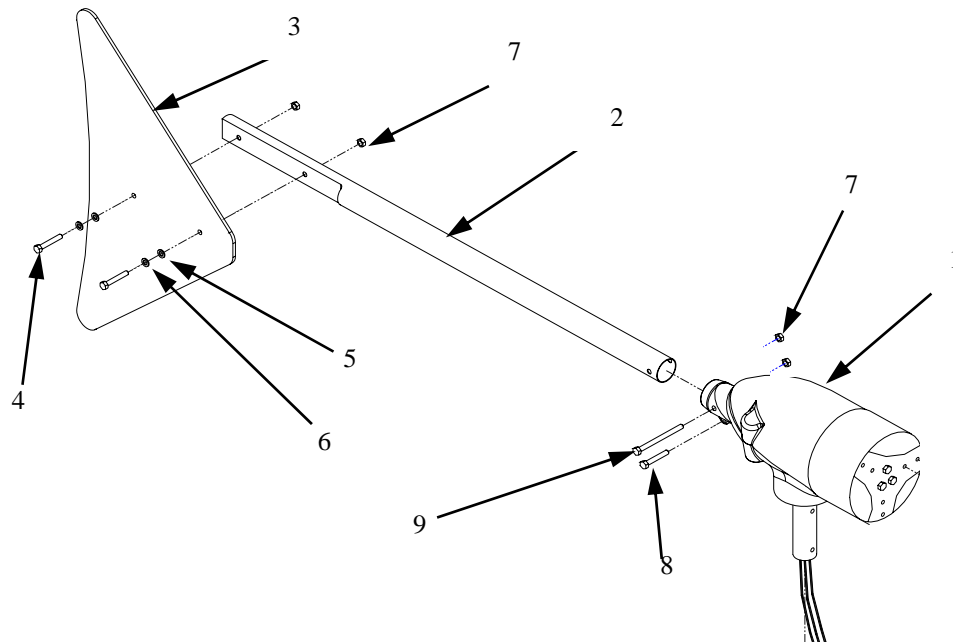
Use plastic wire nuts or split bolts to make electrical connections. Any wind generator wire can go to any tower wire. Wrap split bolts thoroughly with electrical tape to prevent shorts to tower. Support wires to avoid weight on slip ring wires.

Slide generator without propeller into tower and install mounting hardware as shown. For a more complete description of the tower installation, refer to the Whisper tower manual.



Item	Description	2.5" QTY
1	Set Screw (M6 X 10)	2
2	Bolt M8X20	4
3	Lock Washer M8	4

4. INSTALL TAIL



Whisper 200 Tail Assembly

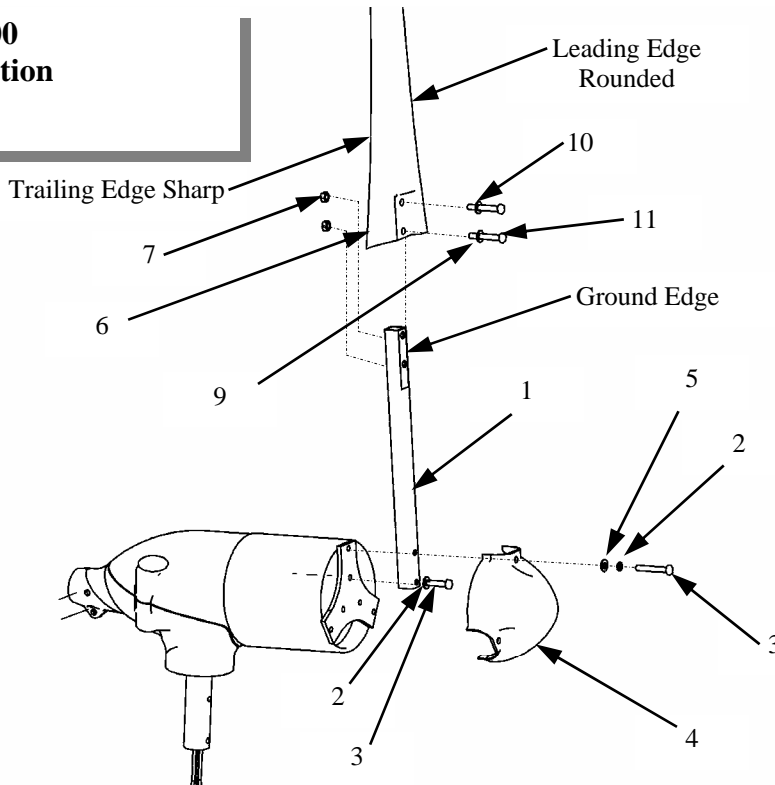
Item Number	Description	Quantity
1	Assembled Generator	1
2	Tail Stalk	1
3	Tail Fin	1
4	Hex Bolts, M8 x 55	2
5	Nylon Washer, M8 x 31	2
6	SSTL Washer, M8 x 30	2
7	Nylock Nut, M8	4
8	Hex Bolt, M8 x 25	1
9	Hex Bolt, M8 x 70	1

5. INSTALL BLADE AND NOSE CONE. IO 102 ON/OFF SWITCH IN POSITION “OFF”

Installation instructions for Whisper 200

1. Bolt down Blade Extension (#1) to rotor using only the one bolt (#3) and lock washer (#2) nearest center of rotor. Insure remaining Extension bolt-hole lines up with rotor by loosely inserting bolt in outer hole and tighten inner bolt securely. Repeat for each Blade Extension.
2. Line up bolts (#3) through Nose Cone (#4) using Flat Washers (#5), and lock washers (#2). Tighten.
3. Install blade (#6), rounded edge advancing clock-wise, on Extension (#1) using cut washer (#10) on outside mounting bolt. Using bolts (#11), Washers (#9 and #10), and Nuts (#7) Tighten all bolts to 18 Ft-lbs torque. Repeat for remaining Blades. Note: Tapered ground end of extensions faces towards blades.

**WHISPER 200
Blade Installation**



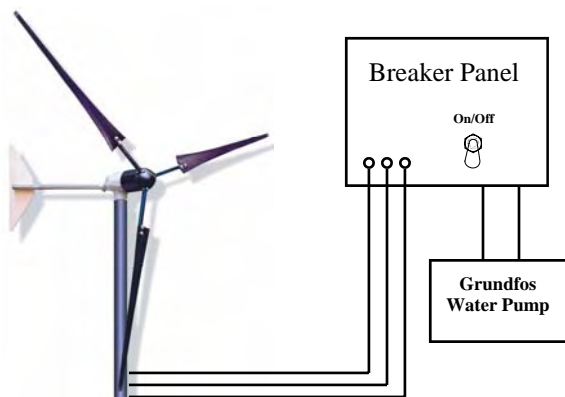
Item	Description	Quantity
1	SS Blade Extension	3
2	SS Lock Washer, M10	6
3	SS Hex Bolt M10 x 40	6
4	Nose Cone	1
5	SS Flat Washer M10 x 20 (Thin)	3
6	Blade	3
7	SS Nylock Nut M10	6
9	SS Flat Washer M10 x 30 (Thick)	3
10	SS Shaved Flat Washer M10 x 30	3
11	SS Hex Bolt, M10 x 50	6

MAINTENANCE - MONTHLY, Whisper 200 Turbine

1. TEST BRAKE

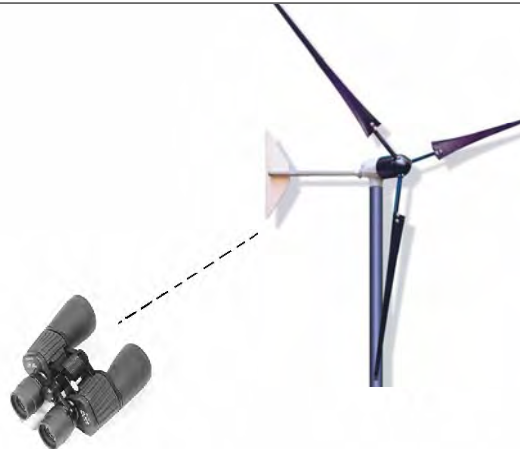
(This checks electrical wiring.)

STOP THE WIND GENERATOR IN A MODERATE WIND (CHARGING BUT NOT FURLING) No unusual difficulty or noise should be experienced in stopping the propeller. A noise during braking can indicate a disconnected wire.



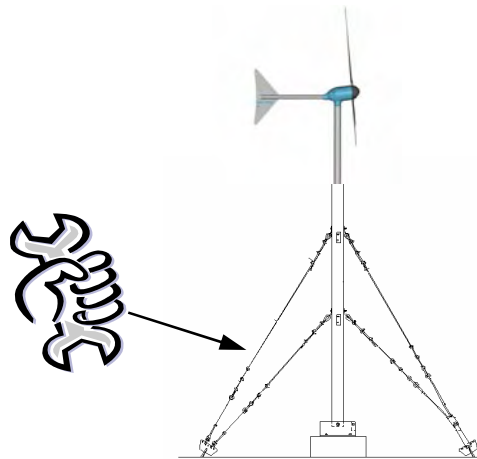
2. CHECK MECHANICAL CONDITION

WATCH AND LISTEN FROM THE TOWER BASE. Use binoculars. There should be no mechanical noise, rattle or vibration. The propeller and tail must not wobble. Lower or climb the tower for inspection, if indicated. There should be no buzzing either heard or felt with your hand on the tower mast. Go to Electrical Problems, if indicated.



3. INSPECT THE TOWER

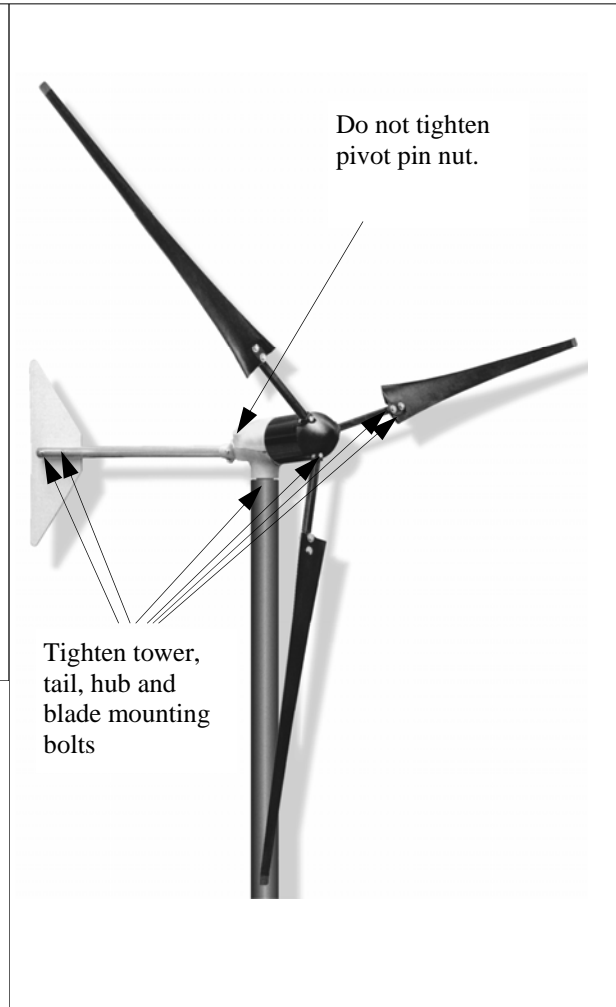
Follow all inspection and maintenance requirements of the tower manufacturer. Tighten all nuts and bolts, especially wire clips. Check for cracks and bent or broken parts at the anchors and base structure. Check for broken strands and tighten guys.



MAINTENANCE - ANNUAL Whisper 200 Turbine

LOWER TOWER AND GIVE WIND GENERATOR A COMPLETE MECHANICAL CHECK. FIX OR REPLACE ANY WORN OR LOOSE PARTS.

- a) Check tightness of all tower, hub, tail mounting nuts and bolts and propeller mounting bolts.
- b) Check all bearings. Just perceptible play is acceptable.
- c) Clean the propeller with mild scrubbing agent to remove all dirt and debris. Replace blades if they are cracked or damaged.



TROUBLESHOOTING AND REPAIR

WIND GENERATOR SYSTEM

First, one must determine if the problem is mechanical or electrical. Refer to the two illustrations below and then proceed to the appropriate section.



Propeller does not turn = Mechanical Problem

Proceed directly to **Table: Symptoms of Mechanical**

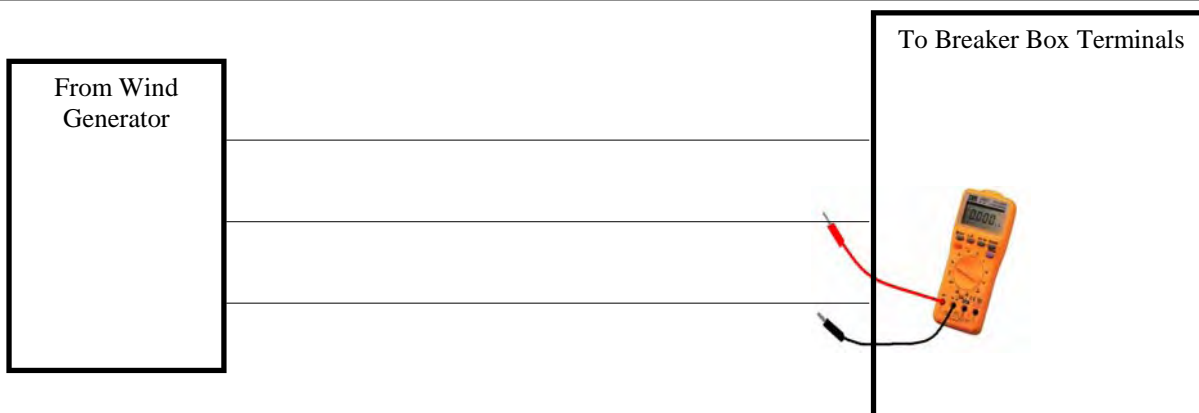
Propeller turns slowly = Electrical Problem

Proceed to next page to diagnose the type of electrical problem the turbine is experiencing.

DETERMINING THE TYPE OF ELECTRICAL PROBLEM

Electrical problems can be in the generator or the breaker box. Determine which as follows:

1. Wind generator will not start (blades turn slowly as if the IO 102 on/off switch is off): On a day of moderate wind, disconnect the three wires from the wind generator one at a time at the breaker box. If the wind generator starts, the wire that allowed it to start leads to a bad diode in the breaker box. Call the factory or the distributor to replace the breaker box.
2. Wind generator still does not start. On a day of moderate wind, disconnect any two wires. If the wind generator starts, the problem is in the breaker box or in the pump. Call the factory or the distributor to replace the breaker box or the pump. If the wind generator still does not start the problem is in the tower wiring or the wind generator. Go to Table, **Symptoms of Electrical Problems**.
3. Wind generator is running, but may have an electrical problem. Using a voltmeter, read the voltage across the leads and see the list below as a guide to possible problems.



Voltmeter Test

1. Voltage increase and decreases slowly with wind speed equally across all wires = Everything ok.
2. No voltage across two wires = One wire from wind generator not carrying power. Check in order: Check the tower wiring to insure it is properly wired. Check slip rings and brushes, stator connections and stator windings for obvious damage. Report damage to authorized distributor or factory.
3. Voltage significantly high across two wires than the others = Contact the distributor or the factory, possibly a bad diode.
4. Voltage produced after IO 102 on/off switch OFF = Possibly a faulty brake switch or a wire shorted to the other two or an internal fault has occurred in the breaker box.
5. Voltage significantly lower across two wires than the others = Bad connection at wind turbine voltage connections or faulty stator winding. Report this failure to your distributor or the factory.
6. Should these results appear inconclusive in determining the problem proceed directly to **Table: Symptoms of Electrical Problems**.

Table: Symptoms of Mechanical Problems

Symptom	Possible Cause	Correction
1. Propeller is stationary, even in high winds	<ul style="list-style-type: none"> a. Ice in generator, or uneven ice on propeller b. Debris between rotor and stator c. Loose magnet d. Bad bearing, worn bearing 	<ul style="list-style-type: none"> a. Wait for warm weather b. Turn propeller gently by hand and blow or use piece of paper to dislodge debris c. Contact distributor d. Contact distributor
2. Propeller will not turn at all except in high wind, scraping or rubbing sound at low rpm, always stops at same propeller position	<ul style="list-style-type: none"> a. Bad bearing, worn bearing b. Swelled wire keepers due to high moisture 	<ul style="list-style-type: none"> a. Contact distributor. b. Contact distributor.
3. Propeller is harder starting, output is lower & there is more propeller noise than usual. Seems out of balance.	<ul style="list-style-type: none"> a. Ice on blade b. Dirty blade c. Split, warped or damaged blade d. One or more blades on backwards 	<ul style="list-style-type: none"> a. Wait for warm weather. Prop will eventually shed ice, leave running unless there is substantial vibration b. Clean with soap or bug cleaner c. Contact factory or distributor to replace broken or damaged blade d. See blade installation
4. Propeller turns a little, never starts	<ul style="list-style-type: none"> a. Blades on backwards. (See blade installation) 	<ul style="list-style-type: none"> a. Turn blades over. Leading edge advances clockwise from upwind view.
5. Tail, generator and tower vibrate or shake at all or some wind speeds	<ul style="list-style-type: none"> a. Blade out of balance b. Blade not tracking 	<ul style="list-style-type: none"> a. Contact distributor b. Contact distributor
6. Rattle or clunking from generator	<ul style="list-style-type: none"> a. Generator loose in tower b. Loose rotor (magnet can) on shaft loose tail, missing rubber bumper, wires slapping inside of mast, governor pivot bolt loose c. Worn bearings d. Shaft broken 	<ul style="list-style-type: none"> a. Retighten mounting hardware, use Loctite or equivalent thread-locking compound b. Repair as required c. Contact distributor d. Contact distributor

Troubleshooting and Repair

Table: Symptoms of Electrical Problems**Symptom—Generator will not start (blades spin slowly as if IO 102 switch is set to OFF)**

Check	Observation	Possible Cause
1. Check to see if the IO 102 on/off switch is ON (in the normal run position)	When the on/off switch is ON , the turbine should begin spinning. If not proceed to step 2.	
2. On a day of <u>moderate wind</u> , disconnect the pump.	The generator starts to turn.	<p>The pump may have a problem or the motor cable can have a short circuit or the generator is producing too little energy.</p> <p>Connect the pump again.</p> <p>If the pump still does not start:</p> <ul style="list-style-type: none"> -check the voltage to the pump -check the cable and connections -check the pump <p>Consult the Grundfos Service Instructions.</p> <p>Note: The wind speed must be moderate to insure that the wind energy is powerful enough to start to pump.</p>
3. If the generator still does not turn in moderate winds.		<p>Disconnect the three wires from the generator one at a time at the breaker box. If the generator starts, the rectifier in the breaker box is defective.</p> <p>Call the installer or distributor to replace the breaker box.</p>

NOTE: ALWAYS BE AWARE OF THE DANGER OF HIGH VOLTAGE. DO NOT DIRECTLY TOUCH THE WIRES.

Table: Symptoms of Electrical Problems

Symptom—Generator spins up and pump does not operate

Check	Observation	Possible Cause
1. Set IO 102 on/off switch to OFF (in stopped position).	The generator slows down and turns slowly or stops. If the generator does not slow down, proceed to step 2.	No connection to the pump. Check to see that the pump is connected Check the motor cable for disconnections.
2. If the generator does not slow down	Turbine blades running fast and not slowing when IO 102 on/off switch in OFF position.	One or more of the three wires may be disconnected. Check the wires. Note: Be aware of high voltage. <u>Danger exists if the wires are touch or short against each other.</u>

If all steps have been followed to this point and the pump or generator does not function as described. Either the pump or generator may be defective. Please contact the installer or distributor to replace the defective units.

MECHANICAL REPAIRS AND PARTS REPLACEMENT

(Refer to exploded view)



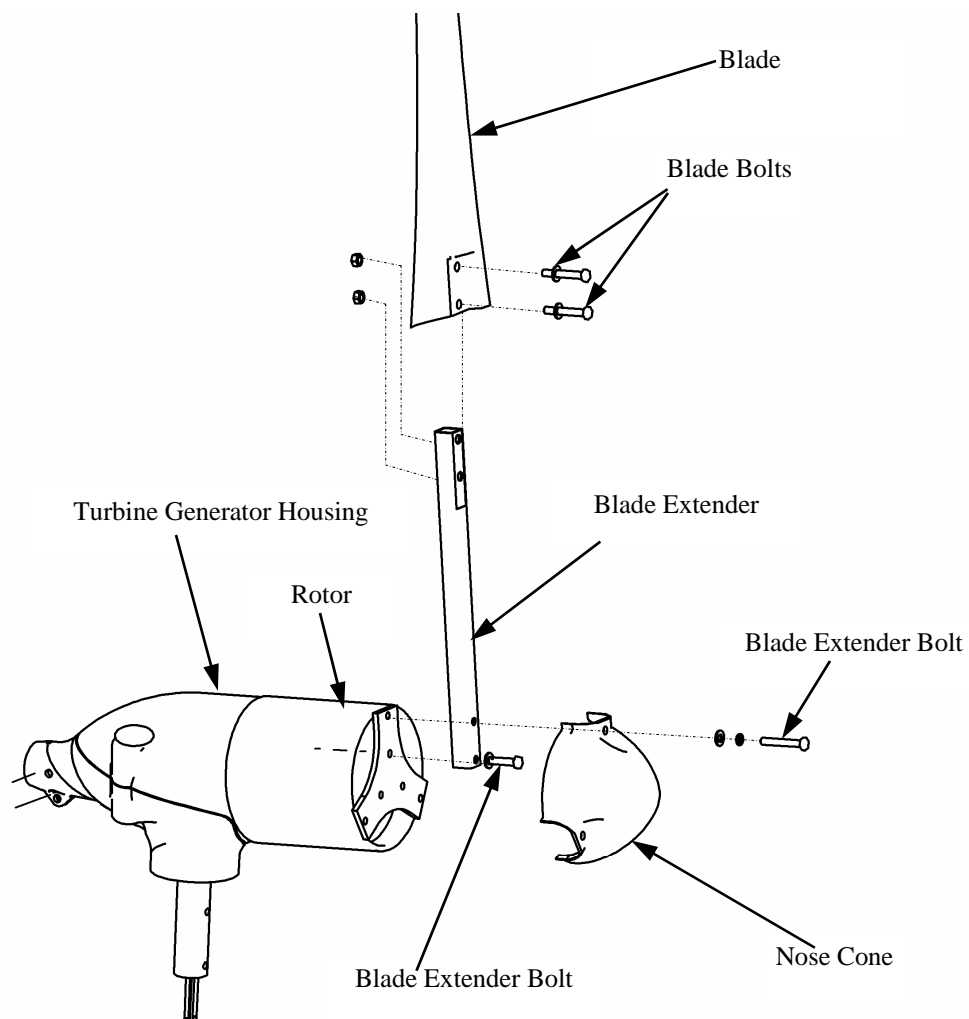
Do not attempt these repairs on top of the tower. Perform repairs only after tower has been lowered.

BLADE UNMOUNTING

Remove blade, see Installation step #8. Remove rotor bolts and blade mounting plate. See exploded view

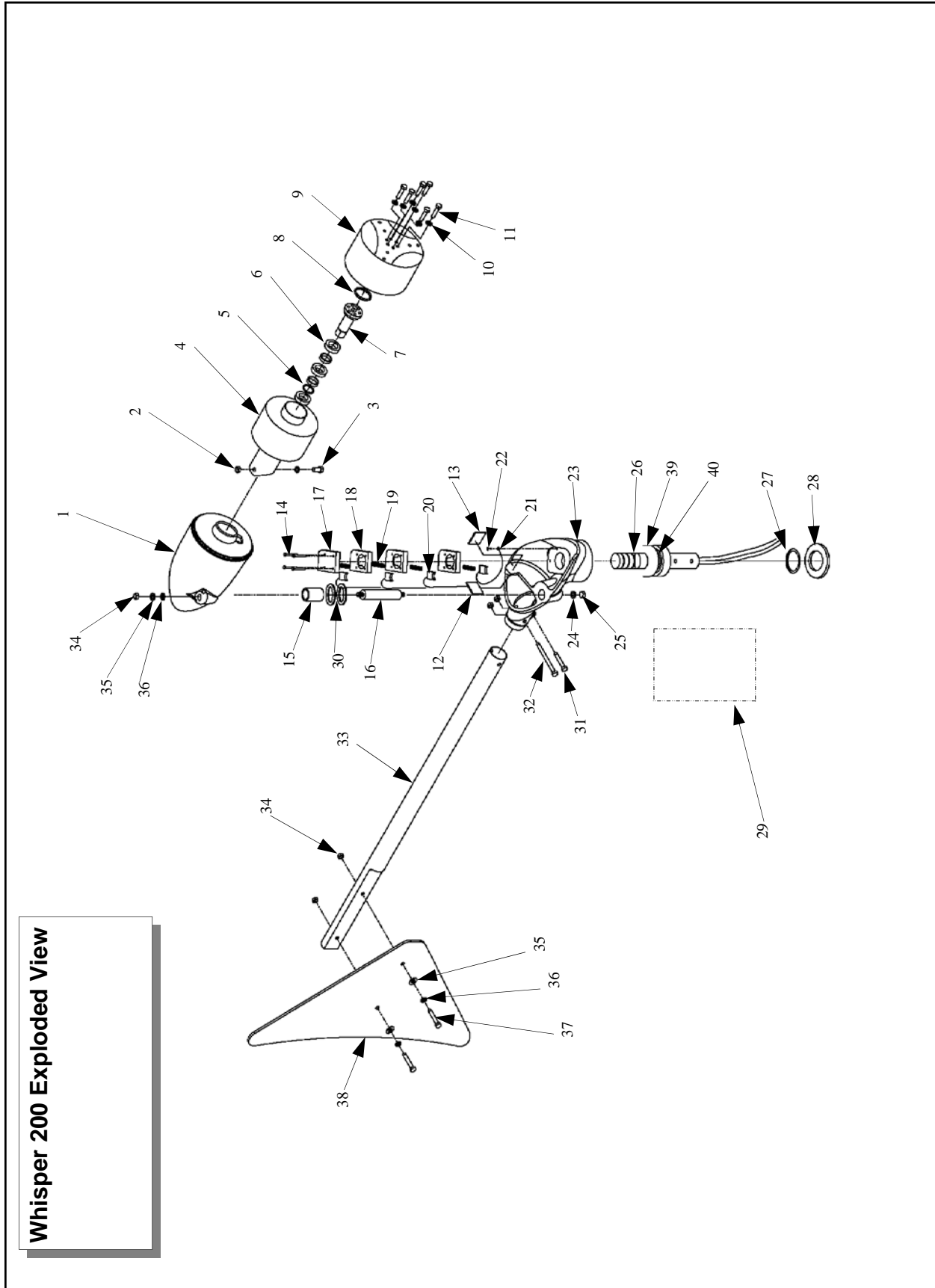
Reassemble in reverse order.

Typical Blade Assembly Whisper 200



Exploded View Parts List-Whisper 200

Item No.	Description	Quantity	Southwest Windpower Part # - H80
1	Casting Top	1	IAA07
2	Nylock Nut, M8	1	IAR17
3	Hex Head Cap Screw M8 x20	1	IAR07
4	Stator	1	IAR019
5	Snap Ring (20 mm)	2	IAR18
6	Bearing	3	IAJ01
7	Spindle	1	IAP06
8	Snap Ring (47 mm)	1	IAR22
9	Rotor	3	IAE20
10	Washer M6, SS	3	IAR05
11	Socket Head M6 x 16	3	IAR06
12	Stop Head, Rubber Pad	1	IAL03
13	Stop Head, Rubber Pad	1	IAL04
14	Pan Head Screw, M5 x 60	4	IAR02
15	Bronze Bushing	1	IAJ04A
16	Pivot Shaft	1	IAG06
17	Brush Cover	1	IAF09
18	Brush Holder	3	IAF06
19	Spring	4	IAF03
20	Brush with wire	3	IAF02
21	Brush, wire with terminal	1	IAF02, IAF01
22	Ground Screw M6 x 10	1	IAR03
23	Casting Bottom	1	IAB07
24	Washer, M8 x 16	1	IAR48
25	Nylock Nut, M8	1	IAR17
26	Yaw Shaft	1	IAD03
27	Snap Ring (62mm),	1	IAR21
28	Seal	1	IAR22
29	Light Assembly (Not Available)	1	IAK06
30	Bronze Thrust Washer	1	IAJ12
31	Hex Bolt, M8 x 25 SS	1	IAR09
32	Hex Bolt, M8 x 70 SS	1	IAR13
33	Tail Stock	1	IAQ07
34	Nylock Nut, M8	3	IAR17
35	Nylon Washer, M8 x 31	3	IAR16
36	SS Washer, M8 x 24	3	IAR15
37	Hex Bolts M8 x 55 SS	2	IAR12
38	Tail Fin	1	IAS04
39	Yaw Bearing	2	IAJ02
40	Yaw Shaft Snap Ring	1	IAR19



Whisper 200 Exploded View

