Urban Green Energy - Electrical Supplement

Version 1.05

CONTENTS

INTRODUCTION

In addition to the owner's manual for Urban Green Energy (UGE) wind turbines and the installation manual(s) produced by electronics manufacturers, this electronics supplement is a vital guide to the proper installation of a UGE wind turbine. Please read this supplement carefully and do not hesitate to reach out to the Urban Green Energy support team at **techsupport@urbangreenenergy.com** or **+1 (917) 720-5685** if you have any questions.

DISCLAIMER

This guide should be used in conjunction with the appropriate product installation manuals from the electronics providers. The electronics should only be installed by a certified electrician.

SAFETY INSTRUCTIONS

Please pay close attention to the following symbols as they appear throughout the manual.

CAUTION SYMBOL

Please pay close attention to these instructions.

ELECTRICAL DANGER SYMBOL

This step involves risk of exposure to high voltage, please use appropriate precautions.

DO NOT FREE SPIN!!

Our vertical axis wind turbines rely on their external electronic components for proper speed control. If the wind turbine is allowed to spin when the electronics are not completely and properly installed, the turbine may “free-spin”, which can lead to extremely dangerous operation and possible turbine damage. Therefore, please ensure that the turbine does not spin freely by always having it connected to the electronic components. DAMAGE OCCURING AS A RESULT OF ALLOWING YOUR WIND TURBINE TO FREE SPIN WILL VOID YOUR WARRANTY.

A turbine with no load on it may overspin even in very low wind conditions. Keep in mind that if you use an unauthorized controller or program a low MPPT table there may not be sufficient resistance on the turbine, allowing it to overspin and voiding your warranty. Always check with a UGE engineer before making such changes.

For grid tie systems, not using an inverter, or using an inverter that is not connected to the grid, will also allow the turbine to operate dangerously. Allowing the turbine to operate in such a way will also void your warranty. Please make sure that unless the turbine is fully operational, it is completely stopped either through electrical or mechanical means.

ELECTRICAL ASSEMBLIES

Turbine installations can broadly be divided into grid-tie and battery back-up (off-grid) systems. Each of these uses different electrical components, is wired differently, and will behave differently under various conditions.

GRID-TIE

In a grid-tie system no batteries are necessary and excess electricity is instead sent to the grid. A typical grid-tie system will include a rectifier, a diversion load, and an inverter. The grid-tie option is available for the eddyGT and the UGE-4K turbine models. Please follow the instruction on the following pages for proper connection of a grid-tie electrical system.

BATTERY BACK-UP

Systems which use batteries typically do not export energy directly to the grid and instead use batteries to store excess power produced. In addition to the components necessary for the grid-tie system, an off-grid system will also include batteries, while the inverter is not an essential requirement.

WIRING DIAGRAMS

Detailed wiring diagrams are available on our website and in the UGE turbine installation manuals. Please ensure they are followed closely to ensure all safety precautions are in place.

UGE-SUPPLIED PRODUCTS

The following pages describe the products which can be directly purchased from UGE and appear on our complete price sheet.

GRID-TIE ELECTRONICS

WIND INTERFACE BOX

The rectifier in a UGE grid-tie system is also known as the wind interface box. The purpose of this box is to rectify the current produced by the turbines into DC voltage and to engage the diversion load when the wind turbine is spinning in excess of its rated velocity. The wind interface box includes three 20 amp fuses which should be checked for continuity as part of the full project commissioning process.

Installation note: For performance and warranty purposes, the Wind Interface Box must be installed with the cooling fins on the left side and the terminals on the bottom.

DIVERSION LOAD

The diversion load is the component used to slow down the turbine when the turbine begins to exceed its rated speed, which corresponds to wind speeds of roughly of 12 m/s [27mph]. If the diversion load was not connected, the turbine would continue spinning up and reach unsafe rotation speeds.

The diversion load is also used to keep the turbine spinning at a safe RPM in the event that the grid fails, a condition called "islanding." If utility grid does go down, the inverter will separate the wind turbine system from the grid and the wind interface box will divert 100% of the energy generated by the wind turbine to the diversion load.

The diversion load is essentially one large resistor which, when necessary, absorbs the kinetic energy of the turbine by converting it into heat.

It is therefore important to keep in mind that the diversion load may heat up in strong wind conditions, and place it in a location where its heat will not directly affect any of the other electronic components (at least 12" above and to the side of the other components). If the diversion load is being installed against flammable construction, i.e. a wood frame house, a thermal barrier shall be placed between the back of the diversion load and the wall on which it is mounted. Products that qualify as an appropriate thermal barrier include sheet rock that has been tested per the applicable ASTM Standard to allow limit temperature rise to less than 250˚F over 15 minutes of fire exposure.

During the installation commissioning process, the resistance of the diversion load should be verified to ensure that it matches the specifications listed in the following page. Using an inappropriately-wired diversion load could lead to dangerous operation of the wind turbine.

INVERTERS

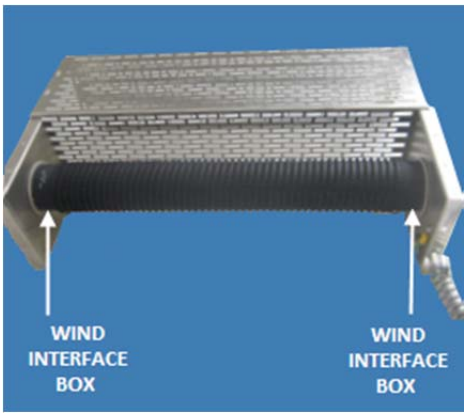
The inverters in a grid-tie system serve two main functions: To determine the amount of energy pulled from the turbine and to coordinate the turbine's electricity production with that of the grid. The turbine determines how much power to take from the turbine by noting the RPM (through the DC voltage) of the turbine, and determining what would be an adequate amount of power to export to the grid. This information is manually programmed into what is called an MPPT Table, which you may read about in the following section.

UGE supplies inverters which are compatible with most grid systems in the world, although it is important when ordering to ensure the inverter will match your local grid. Additionally, the inverters are able to connect to three-phase systems by connecting to two of the three-phase leads (which often function at common voltages) to the ports of the inverter. The inverters also meet the electrical code requirements for most locations, including UL1741 certification and anti-islanding protection. Anti-islanding protection is a requirement in many places, which specifies that the inverter may not send energy into the grid when there is a black-out. This is done for the safety of utility personnel repairing the grid. As a result of this code required safety measure, customers with grid-tie systems will not be able to use the electricity from their wind turbine during a black-out.

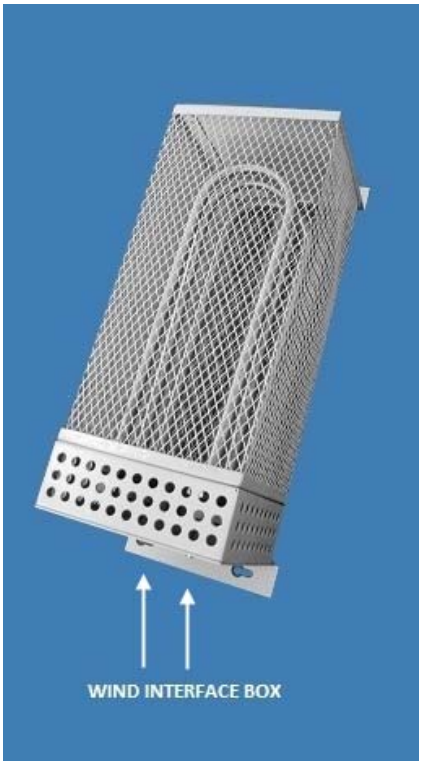
See the inverter manufacturer's installation manual for additional information including clearances, installation procedure, and safety instructions.

GRID-TIE IMAGES AND SPECIFICATIONS

PVI 7200 Wind Interface Box	
Manufacturer	Power One®
Output Voltage	0 - 600 VDC
Output Rated Power	7200 W
Safety Ratings	Over-charge protection, short-circuit protection, automatic diversion load function
Environment Ratings	Indoor/Outdoor-type, NEMA 4X enclosure, wall mountable
Dimensions	290 X 265 X 95 mm [11.42 X 10.24 X 3.75 in]
Developers Homepage	www.power-one.com/



UGE Grid-Tie Eddy GT Diversion Load – US	
Environment Rating	Indoor-type, NEMA 1 enclosure, wall mountable
Dimensions	550 X 160 X 155 mm [21.75 X 6.25 X 6.13 in]
Resistance	30 Ω



UGE Grid-Tie Eddy GT Diversion Load – International Sites	
Environment Rating	Indoor-type, NEMA 1 Enclosure, Wall mountable
Dimensions	412 X 172 X 150 mm [16.2 X 6.77 X 5.9 in]
Weight	3 kg [6.6 lb]
Resistance	250 Ω

UGE Grid-Tie UGE-4K Diversion Load – US Sites	
UGE-4K Diversion Load	
Environment Rating	Indoor-type, NEMA 1 enclosure, wall mountable
Dimensions	550 X 615 X 155 mm [21.75 X 24.25 X 6.13 in]
Resistance	35 Ω

UGE Grid-Tie 4K Diversion Load – International Sites	
Environment Rating	Indoor-type, NEMA 1 enclosure, wall mountable
Dimensions	600 X 400 X 225 mm [23.6 X 15.75 X 8.86 in]
Weight	12 kg [26.45 lb]
Resistance	60 Ω

eddyGT & UGE-4K Grid-Tie Inverter	
Manufacturer	Power-One
Input Voltage	50VDC - 580VDC
Output Voltage	To Match Local Grid
Rated Output Power	3000W or 4200W
Frequency	To Match Local Grid
Safety Ratings	Over-temperature protection, Over-current protection, Corrosion protection
Environment Ratings	Indoor/Outdoor-type, NEMA 4 Enclosure, Wall mountable
Dimensions	547 x 352 x 208 mm [21.5 X 12.75 X 8.25 in]
Weight	17 kg - [37.5 lbs]
Certification	UL1741/IEEE1547
Developers Homepage	www.power-one.com/

BATTERY BACK-UP

CONTROLLERS

The controller for an off-grid system takes the energy produced by the wind generator and converts it into stable DC voltage to charge a battery bank of the appropriate voltage. The standard voltages used are 24V for the eddy and eddyGT and 48V for the UGE-4K. Like the inverter in a grid-tie system, the controller determines how much power to pull from the turbine by monitoring the RPM of the turbine, although the MPPT is determined automatically and dynamically. Additionally, UGE also offers controllers that have the option of taking in both wind and solar power. In doing so, your customers will save costs as they will not require separate electronics for their renewable energy systems. For each size turbine, the UGE controllers have different capacities for solar, so please check with your UGE representative to ensure that the controller will be appropriate for the solar panels you or your customers have in mind.

DIVERSION LOAD

For off-grid systems, the diversion load is included with the controller. Like in a grid-tie configuration, the diversion load is a resistor which in high-wind conditions will slow down the turbine by converting its energy into heat.

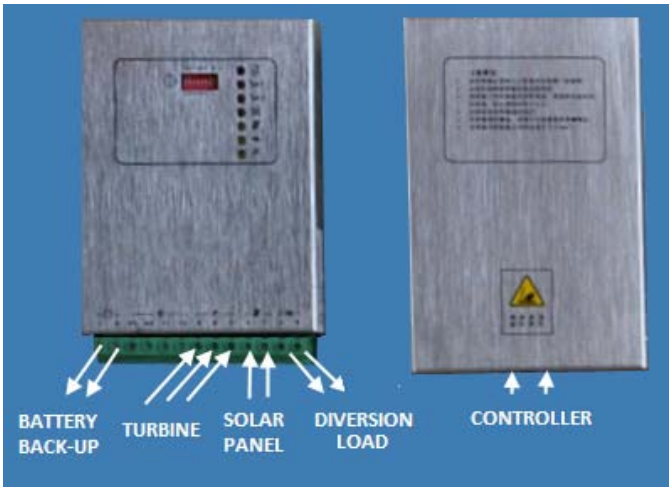
It is therefore important to keep in mind that the diversion load may heat up in strong wind conditions, and place it in a location where its heat will not directly affect any of the other electronic components (at least 12” above and to the side of the other components). If the diversion load is being installed against flammable construction, i.e. a wood frame house, a thermal barrier shall be placed between the back of the diversion load and the wall on which it is mounted. Products that qualify as an appropriate thermal barrier include sheet rock that has been tested per the applicable ASTM Standard to allow limit temperature rise to less than 250˚F over 15 minutes of fire exposure.

INVERTER/CHARGERS

An optional component to an off-grid system, an inverter or a charger may be required for the application of a customer. An inverter will convert the energy in the battery into standard grid AC voltage which can be utilized to power standard electrical components. An inverter can be sized appropriately for the appliances that the customer wishes to run off of the batteries.
A charger is used to ensure that the batteries are never uncharged if the wind is insufficient for a given period of time. The charger uses electricity from the grid, when necessary, to maintain the batteries’ charge.

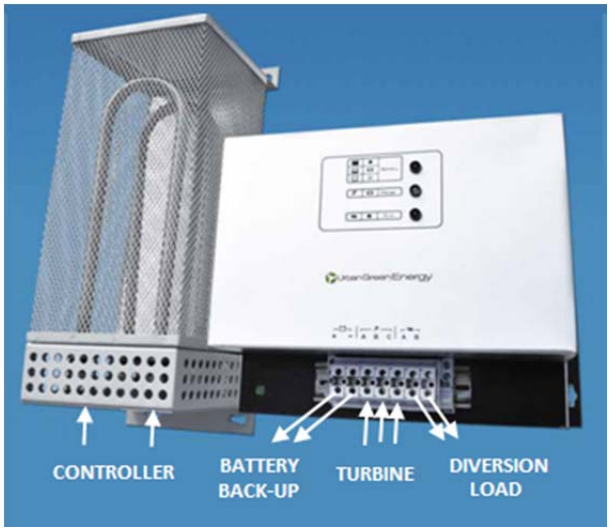
Urban Green Energy offers electronics which bring together the inverter and charger into a single useful device.
Additionally, Urban Green Energy also offers Xantrex inverters, which allow users to have a battery back-up system that can also connect with the grid and be used for net metering.

IMAGES / SPECIFICATIONS



UGE EDDY Off-Grid Controller	
Manufacturer	Urban Green Energy
Recommended battery	Valve Regulated Lead-Acid Battery
Solar Panel Current/Voltage/Power	10 A/24 VDC/150 W
Output Voltage	24 VDC
Output Rated Power	600 W
Safety Ratings	Over-charge protection, short-circuit protection, pole-confusion protection, automatic diversion load function
Environment Ratings	Indoor-type, Powder-Coated Enclosure, Wall mountable Controller (Diversion Load incl.)
Dimensions	220 X 180 X 80 mm [8.66 X 7.09 X 3.15 in]
Features	Solar panel extendable

UGE EDDY Off-Grid Diversion Load	
Environment Rating	Indoor-type, NEMA 1 Enclosure, Wall mountable
Dimensions	140 X 200 X 90 mm [5.5 X 7.8 X 3.5 in]



UGE 1K OG Charge Controller	
Manufacturer	Urban Green Energy
Recommended battery	Low maintenance sealed lead acid battery
Output Voltage	24 VDC
Output Rated Power	1000 W
Safety Ratings	Over-charge protection, short-circuit protection, pole-confusion protection, automatic diversion load function
Environment Ratings	Indoor-type, powder-coated enclosure, wall mountable
Dimensions	240 X 182 X 150 mm [9.45 X 7.17 X 5.91 in]
Weight	3.2 kg [7 lb]

UGE 1K OG Diversion Load	
Environment Rating	Indoor-type, NEMA 1 Enclosure, Wall mountable
Dimensions	412 X 172 X 150 mm [16.2 X 6.77 X 5.9 in]
Weight	3 kg [6.6 lb]

UGE 4K OG Charge Controller	
Manufacturer	Power General
Recommended battery	Low maintenance, valve regulated, sealed lead-acid battery
Output Voltage	48 VDC Nominal
Safety Ratings	Over-charge protection, short-circuit protection, automatic diversion load function
Environment Ratings	Indoor-type, IP43 Rating, Wall mountable.
Dimensions	400 X 325 X 130 mm [15.75 X 12.80 X 5.12 in]
Weight	15 kg [33 lb]

UGE 4K OG Diversion Load	
Environment Rating	Indoor-only, IP43 Rating, wall mountable
Dimensions	900 X 600 X 185 mm [35.4 X 23.6 X 7.3 in]
Weight	38 kg [83.8 lb]

eddy & eddyGT Inverter/Charger	
Manufacturer	Magnum Energy, Inc.
Input Voltage	18VDC - 32VDC
Output Voltage	120VAC +/-5%
Continuous Output Power at 25˚C	1500W
Continuous Charging Power at 25˚C	70ADC
Wave Form	Modified Sine Wave
Safety Ratings	Overcurrent protection Over-temperature protection Corrosion protection
Environment Ratings	Indoor-type, Wall mountable
Dimensions	420 x 210 x 120 mm [16.6 x 8.4 x 4.7 in]
Weight	10 kg - [22 lbs]
Developers Homepage	www.magnumenergy.com/

OFF-THE-SHELF PRODUCTS

As shown in the wiring diagrams, the electrical assembly for each turbine requires electrical devices, such as switches, batteries, etc., that are not specific to wind turbines. It is often convenient and economic for our installers to purchase these components at a local hardware or electrical supply store.

REQUIRED SWITCHES

There are several switches which must be included in your system for additional safety precautions. Please see the schematic drawings on the UGE website or in the turbine installation manual for the specific locations where these switches should go. The safety brake and AC disconnect switch #1 are standard 3-pole non-fused disconnect switches and can be combined into a single dual-throw switch if desired. The AC disconnect switch #2 is a standard 2-pole disconnect switch. Depending on local regulations, switch #2 can either be fused or non-fused. All switches and fuses should be UL certified.

The safety brake should be the first component after the turbine and may be used to stop the turbine for maintenance or during an emergency situation. In a few words, the emergency brake shorts the terminals, effectively creating a large magnetic resistance on the turbine's rotations. As a result, the turbine will completely stop spinning in low winds, and maintain a safe low RPM even in extreme wind conditions. Due to the strong braking force this component enacts on the turbine, this brake would ideally not be used while the turbine is spinning rapidly, unless it is an emergency situation.

The AC disconnect switch #1 should be located between the turbine and the electronics. Flipping this switch to the off position will allow your electrician to work on the electronic components while being certain that there is no current flowing through the system.

It is important to note that if the AC disconnect switch #1 is disengaged and the safety brake is not engaged, the wind turbine will be effectively free spinning - a very dangerous condition. Allowing the turbine to free spin will void the warranty. Whenever the AC disconnect switch #1 is to be disengaged, make sure the safety brake is engaged and the turbine is stopped.

The second disconnect switch is often located between the inverter and the grid. This disconnect switch allows for installers to stop sending energy to the grid if it is ever necessary. By breaking the connection between the inverter and the grid it also allows installers to manipulate the inverter and its wires without risking electrical shock.

BATTERIES

Batteries will be necessary for off-grid systems. While the exact type and capacity of the batteries chosen will depend on the specific application and desires of the end-user, batteries must match the controller output voltage and are recommended to be lead-acid, valve regulated type batteries. UGE recommends a minimum battery capacity of 200Ah for the eddy & eddyGT, and a minimum of 400Ah for the UGE-4K.

FUSES

Battery back-up systems should also use a fuse as an additional precaution to protect the often-expensive batteries. The size of the fuse and its position should follow the information in the controller and/or inverter manuals. Fuses should be in an enclosure or have covered terminals depending on the requirements of the local electrical code. Fuses must be UL certified.

WIRES

It is important to size your wires appropriately in order to ensure that efficiency of the system is not affected and operation remains safe. The appropriate wire to use will depend on the current flowing through the wire and whether the electricity flowing through is DC or AC. Therefore, the wires used at different stages will vary and will also depend on whether a grid-tie or an off-grid turbine is used.

Suggested wire sizes are shown on the wiring diagrams available on the UGE website and in the turbine installation manuals. Wire sizes should be verified by a certified electrician.

CONDUIT

Electrical conduit should be used in the installation to protect the wires as they travel between the generator, electronic components and the grid.

Conduit between the generator and electronics shall be a maximum of 120mm [5”] in diameter and be located no less than 600mm [24”] below grade to prevent damage during construction and when the site is occupied. The exact size of the conduit should be determined by the project electrician based on the local electrical code and the size of the wires in the conduit. Conduit shall be placed so that one end terminates 6” above the top of the center of the foundation (in the middle of the tower anchor bolt cage). This will ensure that the project electrician can reach the top of the conduit through the lower hand hole of the tower after it has been installed. See the sample foundation drawings located on the “Distributor Login” section of the Urban Green Energy website for additional information.

Conduit layout will vary from project to project depending on the number of turbines at the site and distances from turbines to electronics. A certified electrician should verify the conduit diameter and type matches all local electrical codes and requirements.

PROGRAMMING THE INVERTER

INTRODUCTION – MPPT TABLES

A Maximum Power Point Tracking (MPPT) table plays a crucial role in any wind turbine grid-tie system. It is manually programmed into the inverter and, while UGE supplies standard MPPT tables for its turbines, they may need to be modified to be compatible with wind patterns in the exact location.

The function of the MPPT table is to determine how much power to pull from the wind turbine generator at a given wind speed. An example may help explain the process: When a turbine is free spinning, meaning its cables are not connected to the controller or any other electrical load, it is not producing any power, and all its potential energy is manifested as kinetic energy in the turbine. If, for example, 100 W are now requested from the turbine, the turbine will slow down as magnetic resistance from the generator pulls the energy. As more power is pulled from the turbine, it continues to slow down until more power is being pulled from the system than the wind can put into it and the turbine ultimately stops. For optimal performance, the electrical system will pull exactly enough energy from the turbine to keep it rotating at a constant RPM at any given wind speed. This optimal amount of power the turbine produces at a given wind speed is called the Maximum Power Point, and these points at different wind speeds make up the data in the MPPT Table. The following sections go over the process involved in programming an inverter.

This section is divided as follows:

Powering the Inverter with the Grid – In order to be programmed, the inverter needs to be on. The inverter relies on wind power to switch on typically, however, which is not great when an inverter must be programmed on a non-windy day. This section describes how to power the inverter directly from the grid.

Connecting your Computer to the Inverter – This can be surprisingly challenging due to the numerous drivers that must be installed. We offer step-by-step instructions to guide you through this portion. Please note that the necessary software is not compatible with 64-bit computers.

Programming the Inverter – Once you have done the two portions above, it is merely following the steps below to program the inverter successfully.

TURNING ON THE POWER-ONE INVERTER USING THE GRID

When our wind turbines are installed on a non-windy day, it is normal for the electronics to stay off, as they will only turn on when the wind turbine crosses a threshold 50 Vdc. Fortunately, there is a way to turn on the electronics using power from the grid, which will allow you to program them even during a windy day.

First, a quick overview of what we will do. Starting with the electrical components wired per the wiring diagrams on the UGE website and in the installation manual, we are going to take the voltage from the grid and input it into the wind interface box, in effect having the grid and its AC voltage simulate the AC output of a rotating turbine. This will allow the controller to perform its rectifying task and power the inverter, turning it on and allowing us to program it.

Three additional notes of caution:

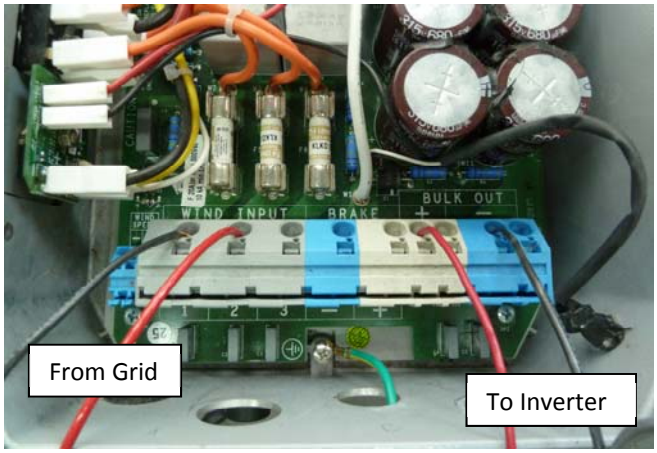
1. Verify that the disconnect switch between the grid and the inverter has been disconnected before wiring the electronics to prevent electric shock to the installer and/or programmer. The electrical components should only be installed by a certified electrician.

2. Since the turbine is being unplugged from the electronics in this step, please make sure you are preventing it from free-spinning, as the electronics are its only brake. To do so, simply turn on the safety brake or short-circuit the wires from the generator. Keep in mind that even a few gusts on a non-windy day may cause a turbine to free spin if it does not have an adequate mechanical or electrical break applied. Allowing the turbine to free spin may cause damage to the turbine will void the warranty.
3. Since we will be feeding the grid into the controller, it is important that the grid is disconnected from the inverter – otherwise we will be short circuiting the grid and may easily damage the inverter, placing it out of warranty. Therefore, disconnect the grid output from the inverter.

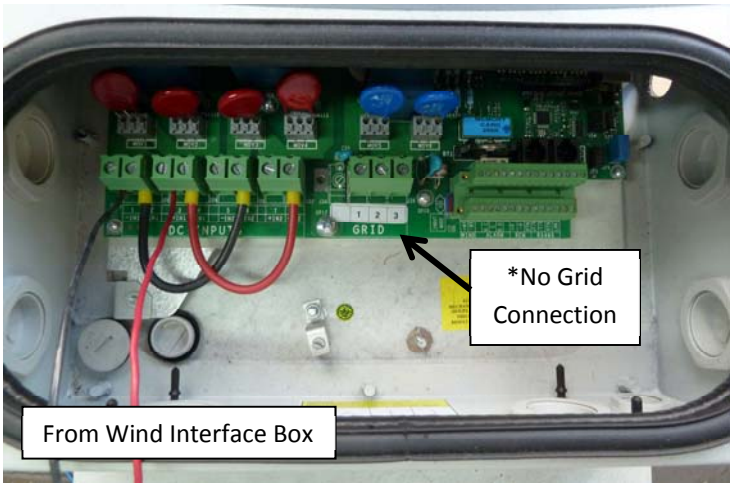
Please verify that you or your installer is complying with the above notes of caution before proceeding.

These are the steps to follow:

1. Turn on the safety brake to prevent the turbine from free-spinning.
2. Unplug the grid from the "Grid" outputs on the inverter*.
3. Unplug the wind turbine wires from the wind interface box.
4. Take the "hot" and the "neutral" wires from the grid (no need to use the ground), without them being live, and plug them into the wind input terminals of the wind interface box, as shown in the picture below.
5. Turn on the switch– the inverter is switched on.

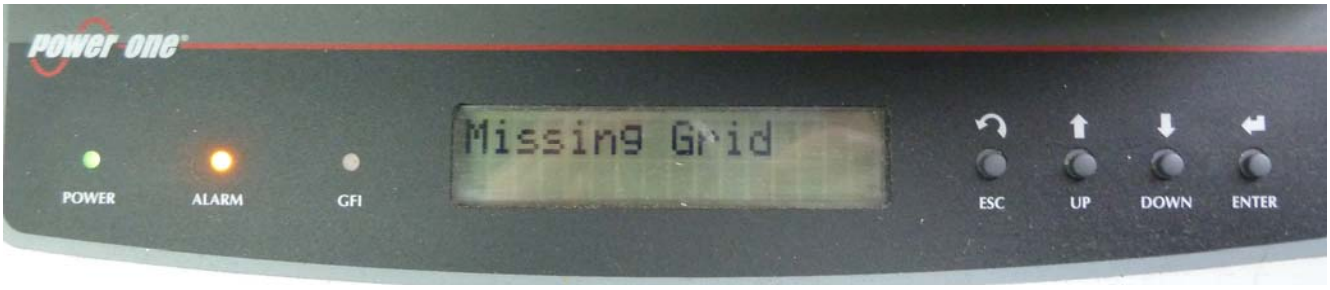


Wind Interface Box



Inverter

The inverter will display an error, claiming it does not sense the grid. This is to be expected as we disconnected the grid in step 2.



When you are done with the programming portion below, disconnect the grid from the turbine's electrical system and rewire the components to match the wiring diagrams on the UGE website and in the installation manual. Switch the disconnect switch between the inverter and the grid to the closed position and release the safety break.

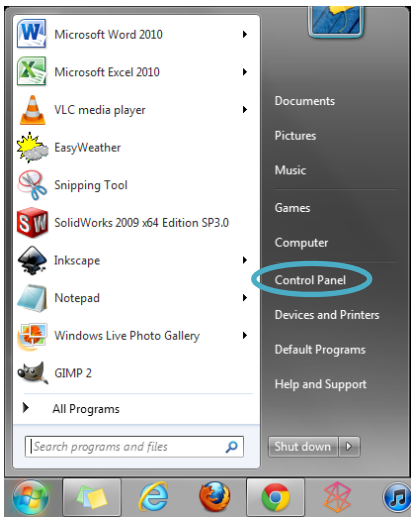
CONNECTING YOUR COMPUTER TO THE INVERTER

Important note: Power One's driver is designed to work with 32-bit PC computers running Windows XP. If a more recent 32-bit Windows edition is installed (eg. Windows 7 – 32bit), the driver can be installed and run in 'Compatibility mode' for Windows XP Service Pack 2. For 64-bit Windows operating systems a third party driver will need to be installed instead of the PVI String Inverter USB driver provided by Power One.

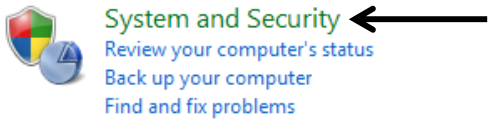
Let's get started. First verify the Windows operating system for the computer that will be connecting to the inverter is a 32 or 64 bit system.

<u>For Windows Vista and 7</u>

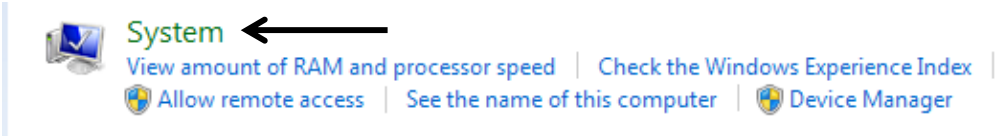
1. Open the windows menu and select *Control Panel*.



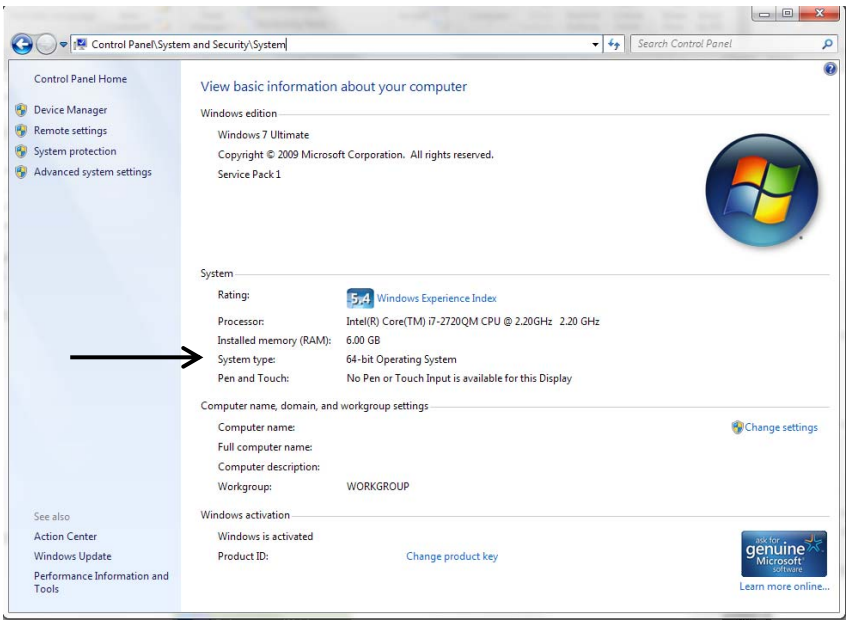
2. Once in *Control Panel*, Select *System and Security*



3. In *System and Security*, Select *System*

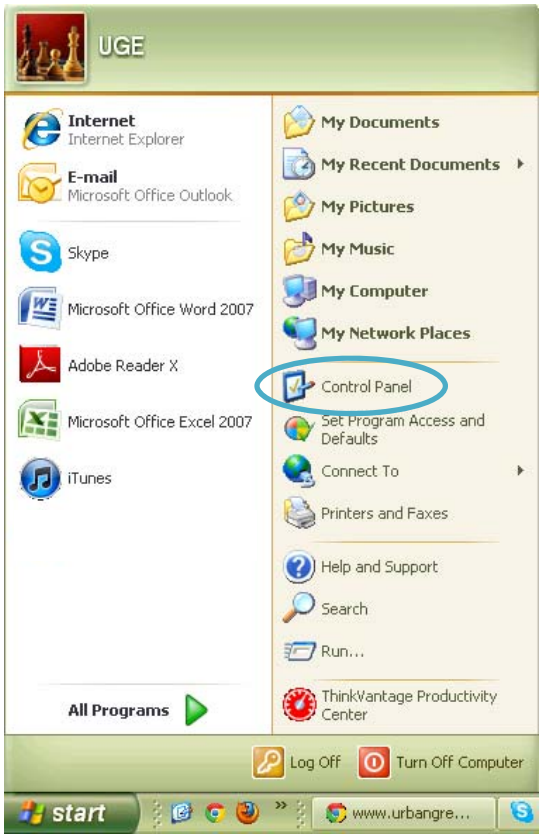


4. Here details the information of the computer and next to System type will be the information for whether the computer is a 32-bit or 64-bit system



For Windows XP

1. Open the start button and Select *Control Panel*.



2. Once in *Control Panel*, Select *Performance and Maintenance.*

3. Now in *Performance and Maintenance* near the lower right select *System*

4. For 64-bit Windows XP, next to the operating system name will be the text **x64** or **64-bit**. For 32-bit systems there will just be the name of the operating system or the text **x86** next to the operating system name.

Aurora Installer Guide: For all Windows Operating Systems

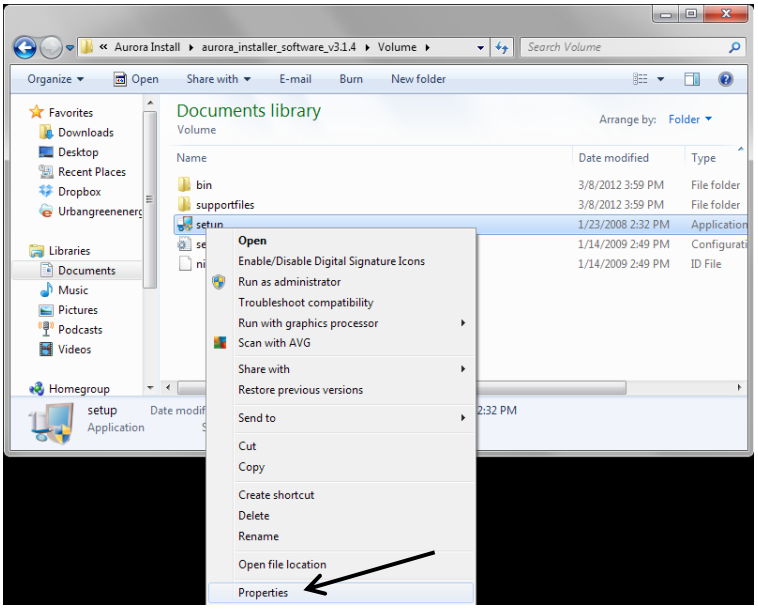
Before connecting the computer to the inverter, type in the following website in your browser to download the necessary software in order to install Aurora Installer: **http://www.power-one.com/renewable-energy/series/aurora-installer-software**

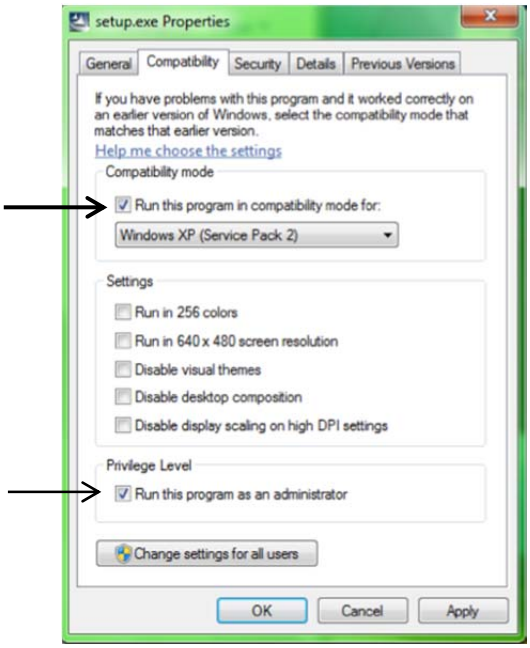
Aurora Installer Software V3.1.4 - The Aurora Installer – The actual software that your computer will use to connect to the inverter.

– Once your computer has downloaded the software, unzip/extract the files into a folder and find setup.exe in the volume folder.

Aurora_installer_software_v3.1.4 -> Volume -> setup.exe

Before you run the setup, please note that this file may need to be run in Compatibility Mode since it was designed for Windows XP 32bit Service Pack 2. Therefore, if you are running more recent versions of Windows, you will have to right-click on setup.exe and select 'Properties'. In the 'Properties' window you can select the 'Compatibility' tab and choose to run in "Windows XP Service Pack 2" as well as the bottom checkbox to "Run as Administrator". Now you can proceed to run the setup.exe. Follow the on-screen instructions to complete the installation.





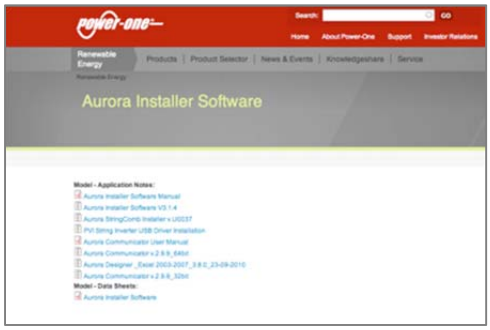
Now for installing the drivers that allow the computer to communicate with the inverter will depend on the Windows Operating System. Please follow the instructions based upon whether the computer is a 32-bit or 64-bit system.

Driver Installation Guide: 32-bit Windows operating system

Now to download the drivers for a Window 32-bit system, type in the following website in your browser to download the necessary software: **http://www.power-one.com/renewable-energy/series/aurora-installer-software**

Once at the website, download the following .zip files:

1. PVI String Inverter USB Driver Installation
2. Aurora StringComb Installer v.U0037 - These drivers tell your computer how to communicate with the inverter.



PVI String Installer – Now to install the drivers unzip/extract the PVI String Inverter zipfile into a folder, and find setup.exe. Before you run the program, please note that this file is for Windows XP Service Pack 2 on a 32bit system. Therefore, if you are running more recent versions of 32-bit Windows, you will have to right-click on setup.exe and select 'Properties'. In the 'Properties' window you can select the 'Compatibility' tab and choose to run in "Windows XP Service Pack 2" as well as the bottom checkbox to "Run as Administrator".

After running setup.exe, you may see several screens at this stage depending on what version of Windows and security settings you have. If asked, please allow the installation to continue and accept the necessary license agreements until you reach I final screen that says the VCP installer is now installed and you click 'Finish'.

StringComb Installer – Repeat the above procedure with the StringComb Installer. Make sure you unzip/extract it and run it as an administrator in compatibility mode if you are not running Windows XP. Once you reach the final screen, click 'Finish'.

Connecting the Computer to the Inverter – Now that both drivers are installed, we can connect the computer to the inverter to finalize the driver installation process. You will require a USB type A-to-B cable (shown on the right) to connect both components together. On the inverter, the connection is made on the right side in the 'USB' slot. Unscrew the cap and connect the USB B side of the cable (see picture on the next page).

Type A-to-B USB Connector

Do NOT insert the USB cable into the "Prog. DC/DC" or "Prog Inverter" ports.

After connecting the computer to the inverter, wait a few seconds. Due to the drivers you just installed, Windows should automatically detect that an inverter has been connected and will ask you what to do (on a window that shows "New Hardware Found", or similar). Among the options listed, choose to install the software automatically. We will now see a few windows as we did before, asking for approval to continue – approve all requests until you see the final screen, confirming that software for the 'TUSB3410 Device' has been installed.

Windows will again detect new hardware. Allow Windows to install the software automatically, accept the permission screens, and then you will land on the final page confirming that software for 'USB – Serial Port' has been installed.

Congratulations, we are done with installing all the drivers!

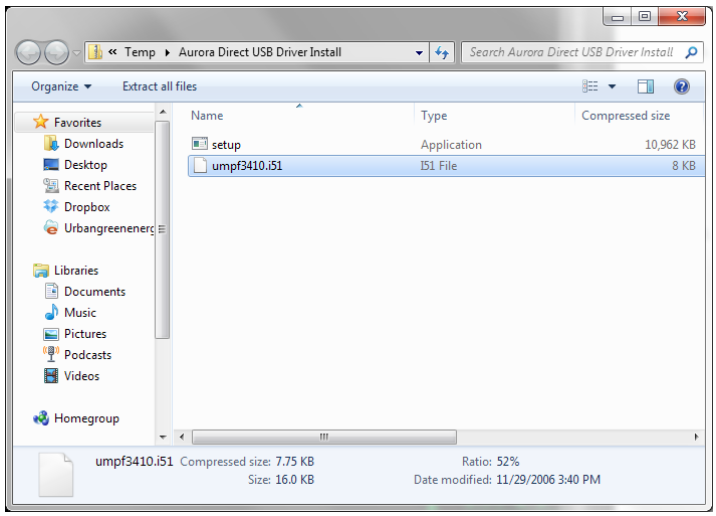
At this stage, experience has shown that it is beneficial to unplug the inverter and restart the computer. Once the computer has been restarted, let's proceed with programing the inverter.

For 64-bit Windows Operating Systems

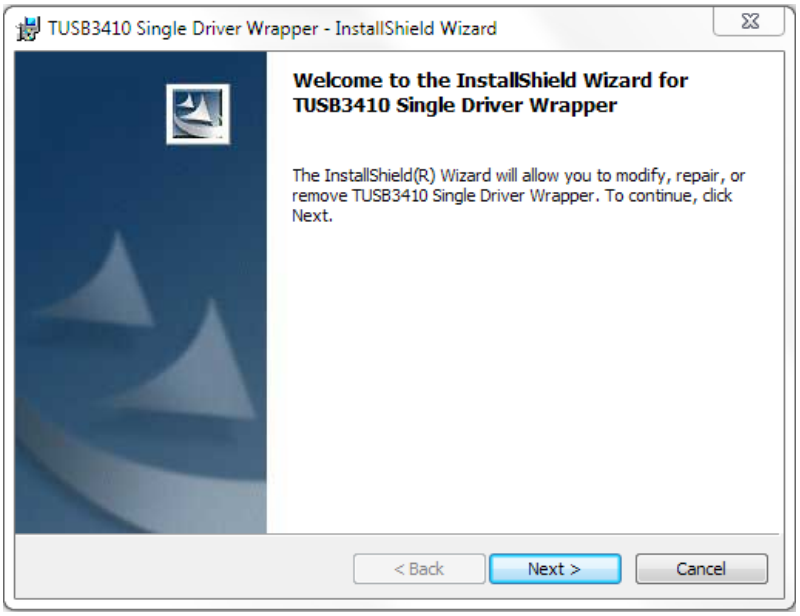
To install on a 64-bit system the driver installation is more complicated so please follow the directions closely.

Note: The setup is a two-step process. The first setup.exe in the downloaded file extracts the files into the folder *C:\Program Files (x86)\Texas Instruments Inc.* The second setup.exe will install the actual TUSB3410 driver which allows the computer to communicate with the inverter. Here are the detailed instructions:

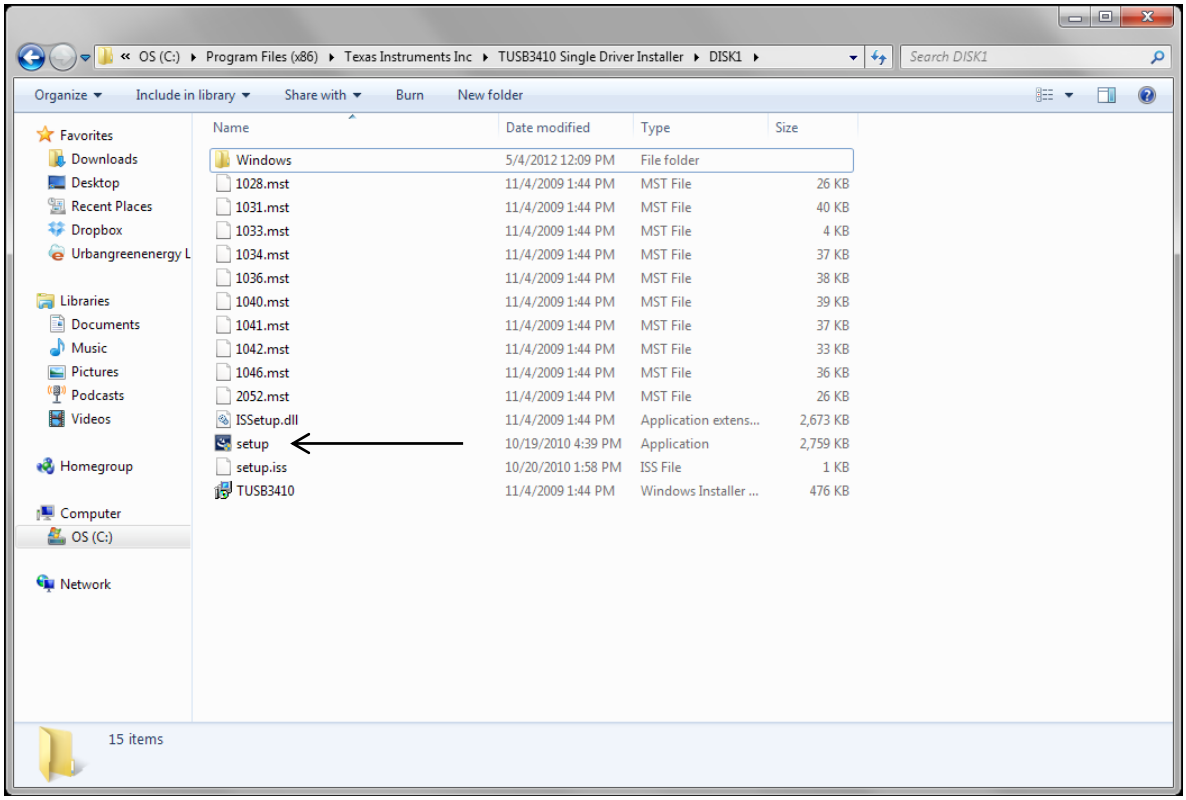
1. First, go to the 3rd Party Components tab in the UGE Partner Portal and Download the Aurora Direct USB Driver Install zip file.
2. Once downloaded, extract the folder and there should be two files within the folder: Setup and umpf3410.i51



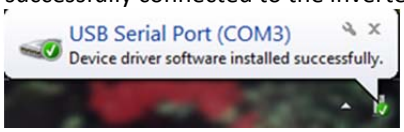
3. Keep this window open and run setup.exe
4. This will activate the TUSB3410 Single Driver Wrapper Installer. Follow the instructions to install the driver and allow the program to install through the various security measures the computer may have.



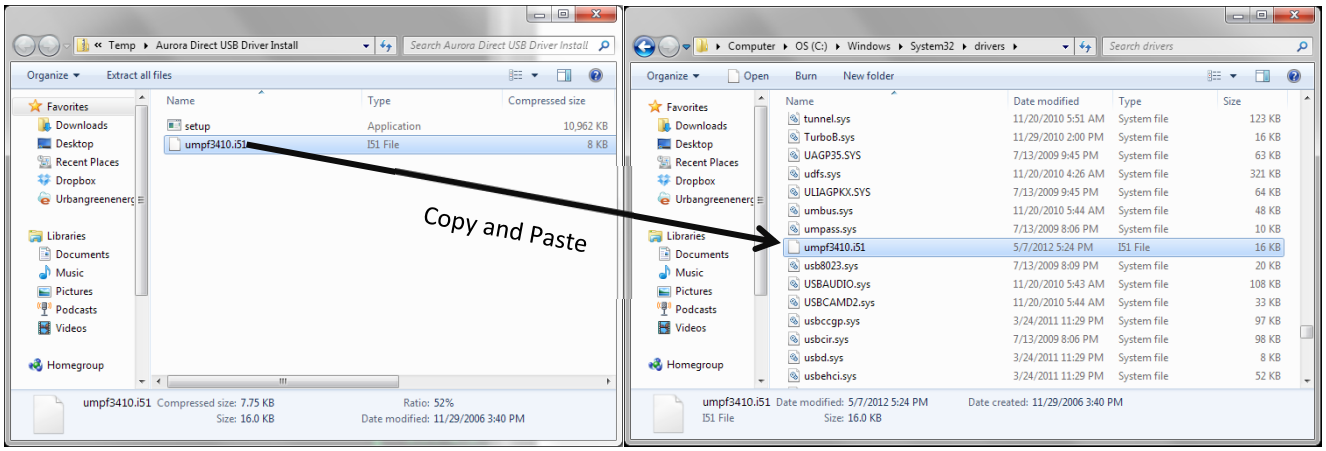
5. Once the Driver Wrapper has finished installing, go to *Computer -> (C:) -> Program Files (x86) -> Texas Instruments Inc -> TUSB3410 Single Driver Installer -> DISK1* . The following files should be visible.



6. Now click on the setup.exe file within the DISK1 folder to install the TUSB3410 VCP driver. Follow the instructions to install the driver and allow the program to install through the various security measures the computer may have.
7. After completing the installation wizard, plug the USB cable into the computer with the inverter powered on. See the "Connecting the Computer to the Inverter" section above for more information on this step. Once the computer has been successfully connected to the inverter, wait for the computer to recognize the USB port.



8. Now power down the inverter by unplugging the cord from the wall outlet and open the window that just had the files: Setup and umpf3410.i51. Then open the folder *Computer -> (C:) -> Windows -> System32 -> drivers* and copy and paste the file umpf3410.i51 into this folder.



9. Now power the inverter back on and launch Aurora Installer.
10. Select USB in the COM Port box and select okay
11. If you cannot see the serial number, you may need to power down the inverter one more time and turn it back on. Then reconnect the computer to the inverter and launch Aurora Installer again

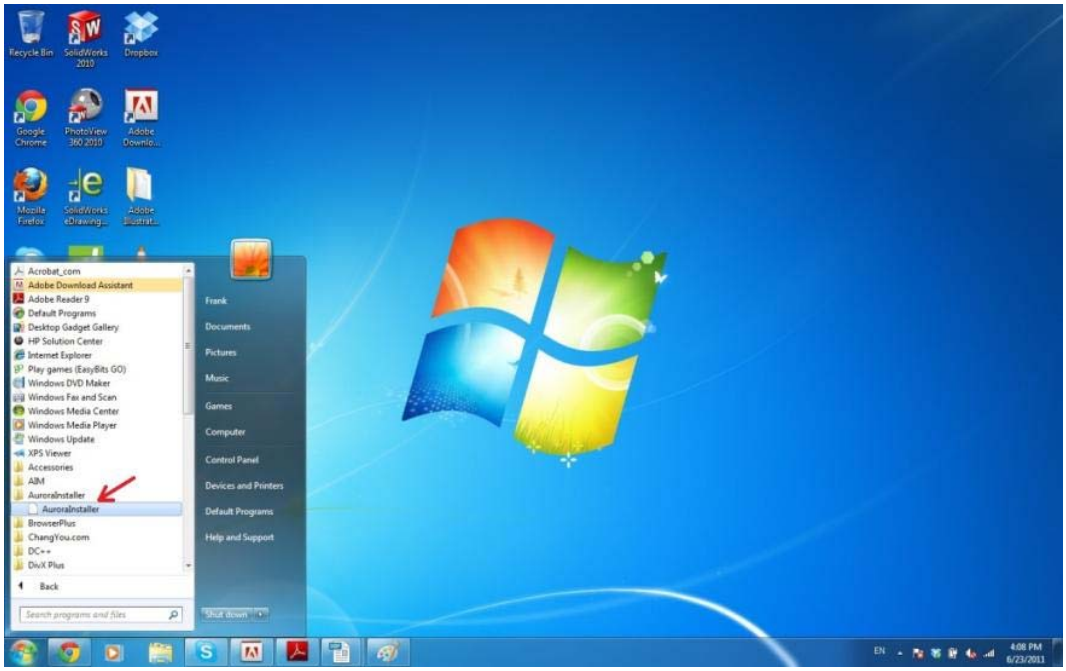
Note: It is normal on a 64-bit Windows Operating System for the Aurora Installer once launched to say that the USB driver is not installed or not installed correctly. Just in ignore this message and continue, the driver is installed correctly if you followed the above procedure.

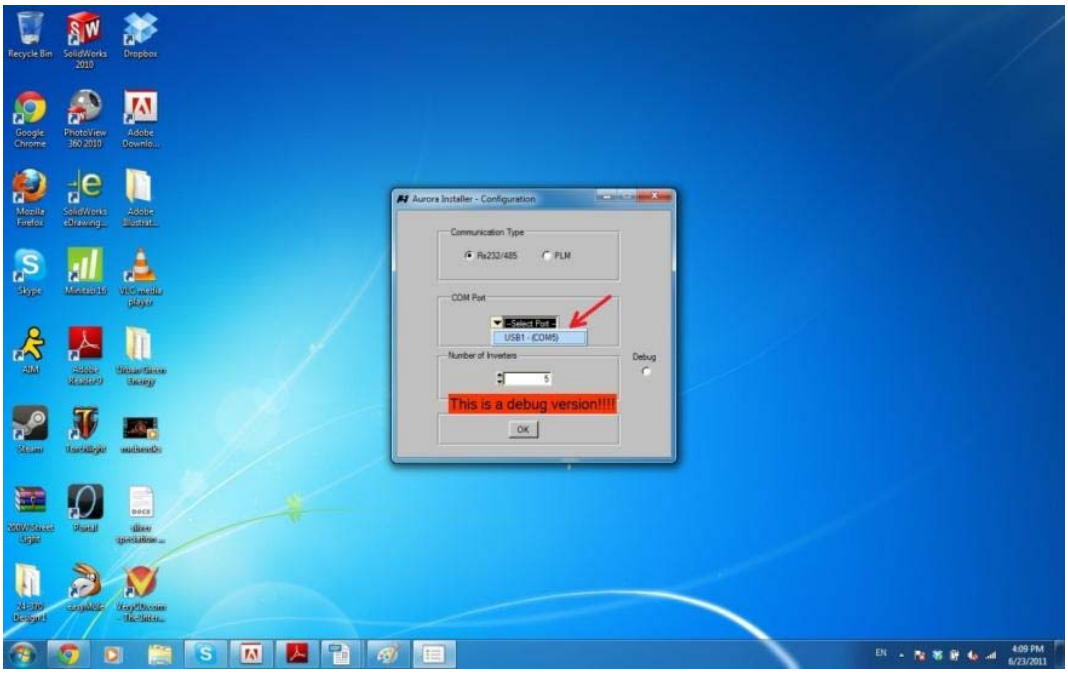
Congratulations on installing the driver, now continue on to programming the inverter!

PROGRAMMING THE INVERTER

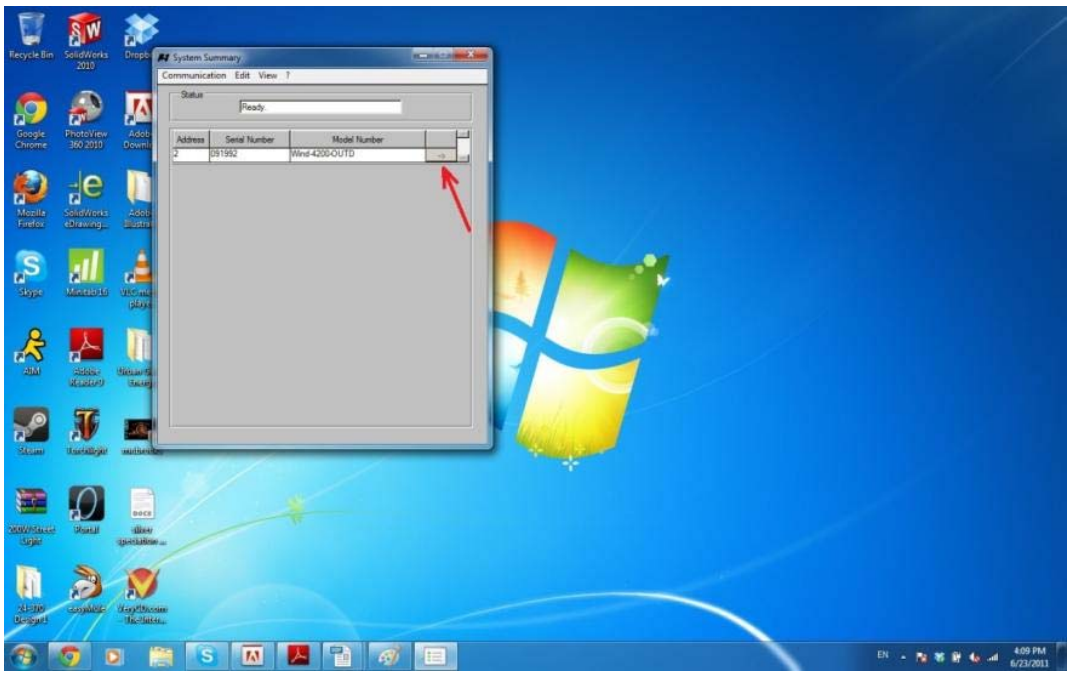
Congratulations on completing the above. We now have to input the MPPT table into the inverter.

1. Open the Aurora Installer software if you have not done so yet, and under COM Port, choose the proper port for the inverter (there will likely only be a single choice) and click OK.

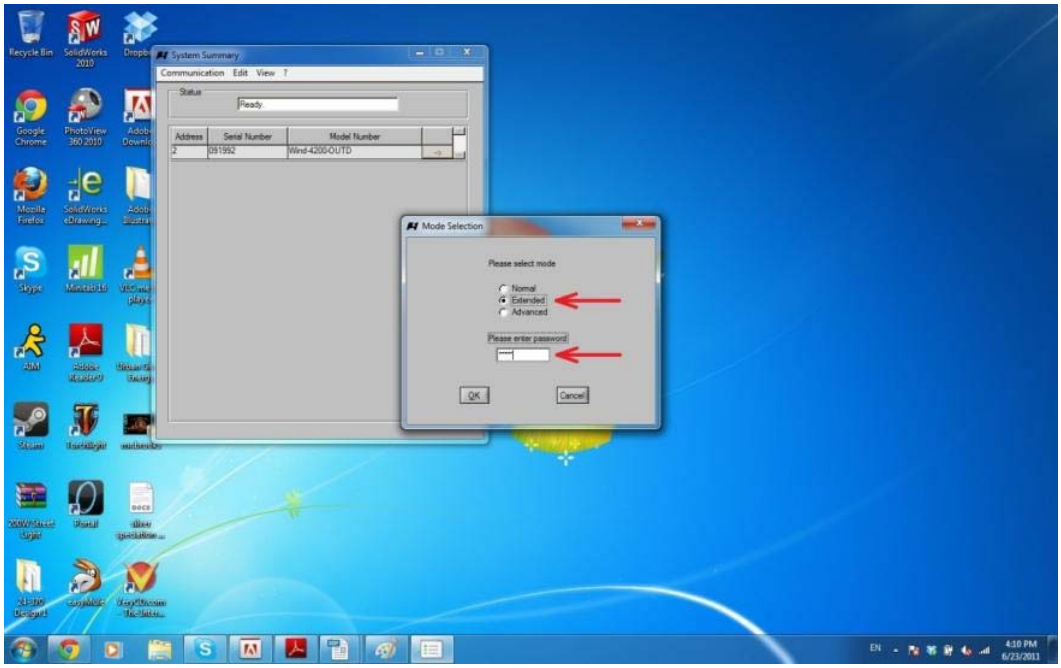




2. In this first screen, you can find the serial number and the model number of your inverter. Let's click on that little arrow on the right of this information, which will pop-up a menu.

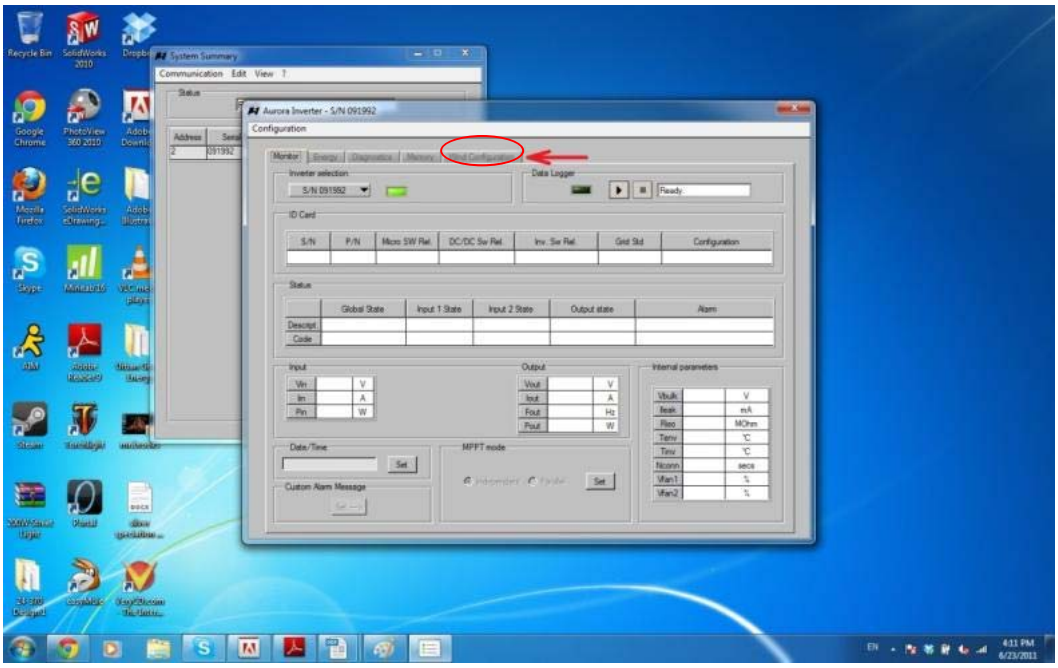


3. From the modes available select 'Extended' and type in the password **05591**

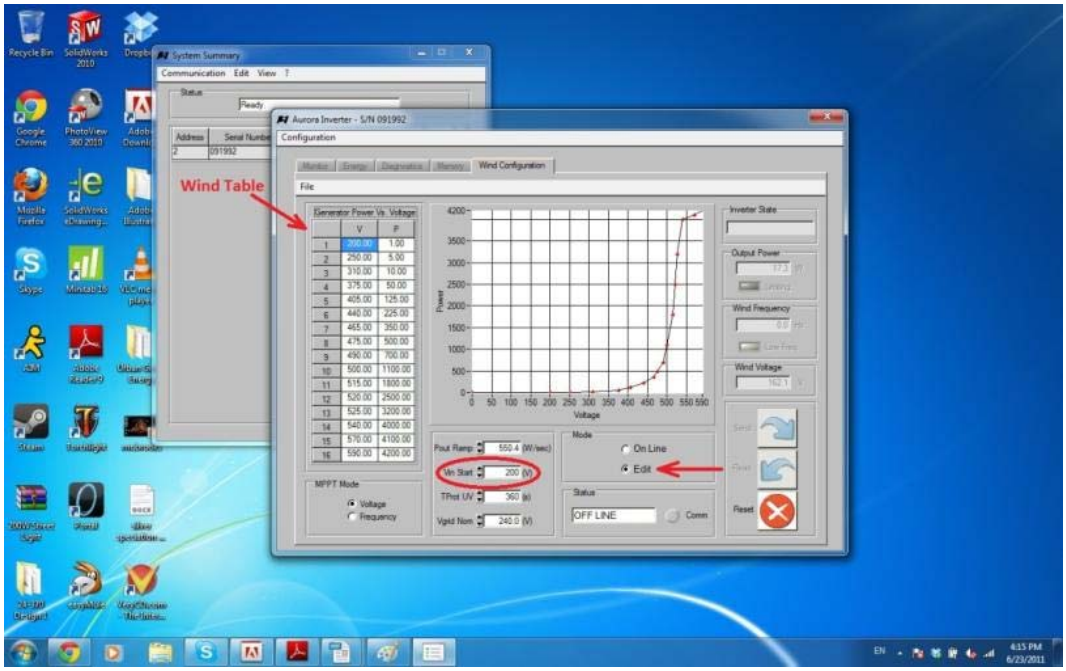


4. You have now accessed the information available within the Power-One unit, including monitoring of current production of energy and energy production over time. Please take a moment to familiarize yourself with the tabs available.

5. One of these tabs is "Wind Configuration". Select that tab.



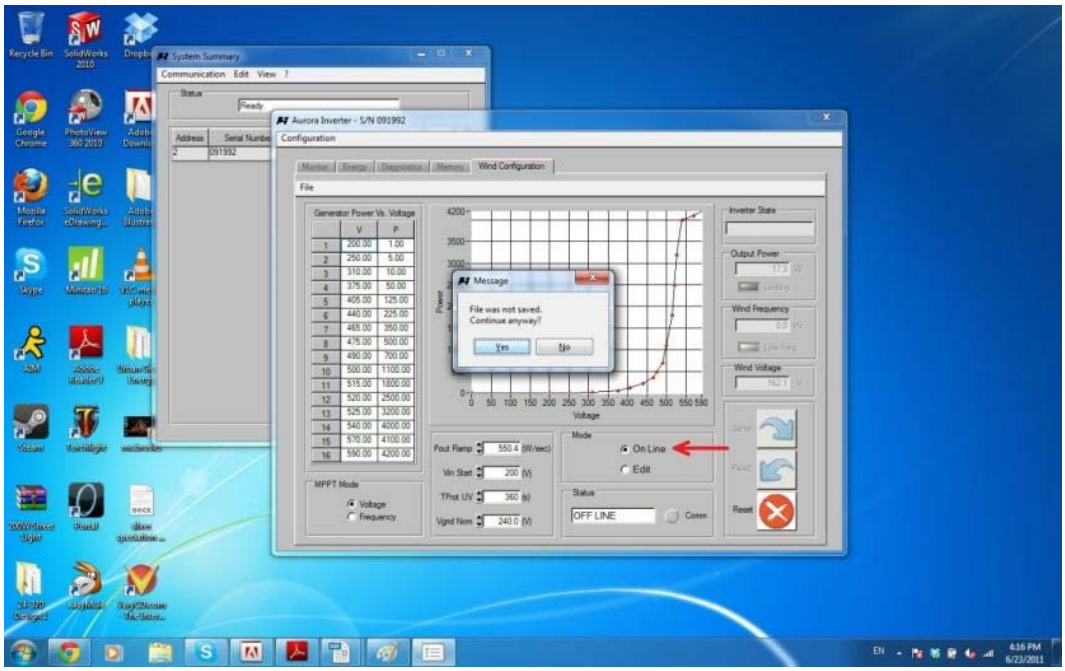
6. We now see a default MPPT table that came with the inverter, along with its complimentary graph and other options. In order to edit this table, you will have to change the mode to 'Edit' (the options are just below the graph).



7. Once in 'Edit' mode, you can alter the MPPT table at will and put in the proper table UGE has provided for your turbine. We recommend clicking the reset button (on the right of the screen) before continuing to reset the entire table to zeros. From here, entering the appropriate MPPT table should be fairly easy. To enter values in the table, double-click the cells and input the appropriate numbers. As you enter the corresponding voltage and power values, the graph to the right will update and the MPPT curve will appear.

8. Please make sure you adjust the "Vin" value as described in the MPPT document for your model turbine.

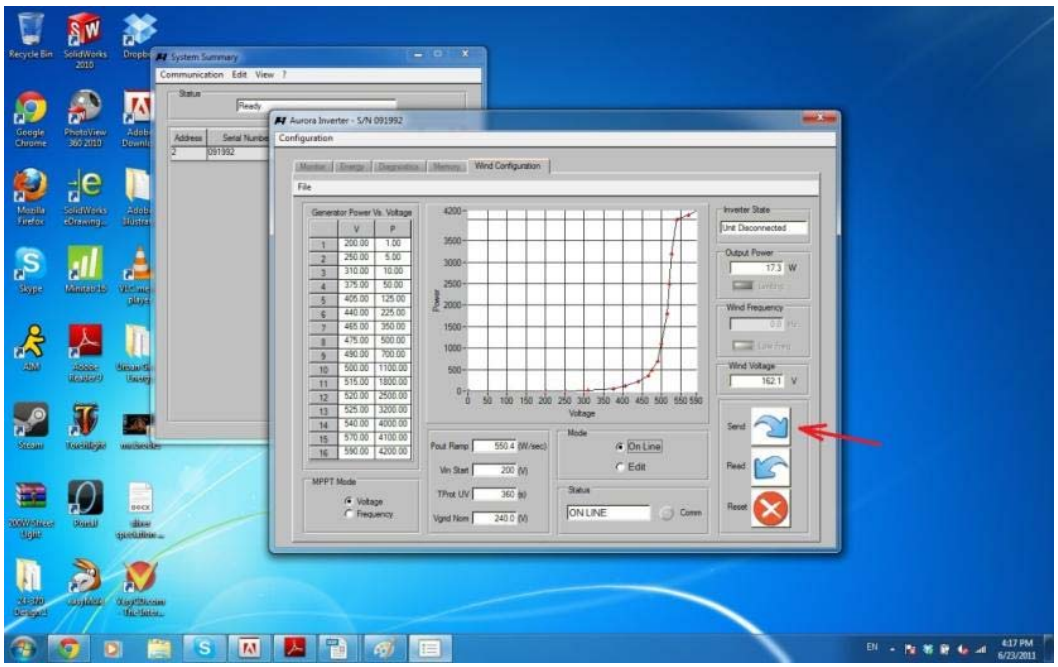
9. Adjust the Tprot UV value to '600' seconds.



10. Now that we have finished entering all the values, let's change the mode back to 'Online' and select 'Yes' when prompted 'File was not saved, Continue anyway?'

11. In order to send the data over to the inverter we click the "Send" arrow, available at the right-hand side.

12. To confirm the inverter has logged the MPPT table properly, press the "Read" arrow to retrieve the information on the inverter and verify that the table read from the inverter matches the one you entered.



You can now close the program and unplug the inverter. Congratulations on successfully completing the programming of the inverter!

If you were powering the inverter via the grid during this process, please be sure to now disconnect the grid from the turbine's electrical system and rewire the components to match the wiring diagrams on the UGE website and in the installation manual. Put the disconnect switch between the inverter and the grid to the closed position and release the safety break. Your turbine is now operational!

OTHER INSTALLATION CONSIDERATIONS

FREE SPIN

Our line of wind turbines rely on the electrical system for braking, avoiding the need for complex and maintenance-intensive mechanical braking systems inside the wind turbine. Free spinning is a situation in which a spinning turbine is not connected to the electronic components and is allowed to spin freely without the restraint of an electrical load. Even in a mild breeze this can easily lead to blade failure, bearing failure, or material wear and will void your warranty. Please ensure that there is always a resistive force on the turbine: this can take the force of the electrical load on the electrical components, engaging the safety break, or mechanically tying down the turbine during installation or maintenance.

CONNECTING TO THE GENERATOR

The wires coming from the generator should be connected to longer wires, of the appropriate gauge for your installation, to travel down the tower and to the electronics. For standard concrete foundations, the wires can then be led through conduit in the foundation. There are hand holes both at the top and bottom of UGE towers to aide with this process.

CABLE SUPPORT

To comply with NEC section 400.10, wires connecting the generator to the electronics should be fed through cable grips (see figure on right) which then should then be hung from a hook just below the generator. Towers supplied by UGE are constructed with a J hook opposite the upper hand hole for this purpose. These supports will prevent tension forces from being applied directly to the wires leaving the generator.

PLACING THE ELECTRONICS OUTDOORS

The ability to place the electrical components of the wind turbine system are determined by the NEMA rating of the enclosure of that components. The wind interface box and inverter are in NEMA 4 enclosures and therefore suitable for both indoor and outdoor applications. The controllers themselves are rated for indoor use only, but can be placed in an enclosure with a NEMA rating of 3R or greater for outdoor use. The diversion loads are rated for indoor use only. Batteries can be placed in enclosures with ratings of 3R or greater for outdoor use. Switches can be purchased in either indoor or outdoor enclosures.

GROUNDING

Grounding is a precaution that is taken in most electrical systems to prevent electrocution. The concept is that by grounding a component of the system (for example, the inverter) if the insulation between the inverter and its casing fails, someone touching the inverter will not get electrocuted as the current is being diverted towards the path of least resistance - the ground.

It is therefore important to ensure that all components of the system are properly grounded. Our turbines include an additional ground wire for this purpose, while our standard towers have a convenient hole in their base plate for attaching a grounding wire. Likewise, all electrical components have a dedicated point where grounding wires can be attached. The location of the grounding point for the controller, wind interface box, and inverter can be found in their respective manuals (see the Reference section below). The grounding line should then be led to the ground line for the building or to a common earth ground. The turbine and tower can be connected, if desired, to a separate grounding point.

PV PANELS

It is possible to combine solar energy with wind energy and minimize the additional costs of equipment, primarily for systems that use batteries. Our eddy off-grid controllers, for example, include an input for up to 150W of solar power, which will allow you to maintain a single controller, battery, bank, and inverter for both renewable energy systems. For the other off-grid turbines, a separate controller should be used for wind and solar but they can be wired through to a single battery bank and inverter.

LIGHTNING PROTECTION

If you are in an area prone to lightning strikes, it is an understandable concern that lightning may strike the turbine within its lifetime. UGE strives to make sure that every step is taken to impede lightning from striking and, if it does strike, to ensure that the home or adjacent building is unaffected, and that every precaution is taken to prevent damage turbine and electronic components.

In order to prevent, or discourage, lightning from striking the turbine in a high-probability location a common solution is to install a lightning rod next the turbine and at a point higher than it. The characteristics of the lightning rod allow it to accumulate charge at its tip, which will attract lightning strikes to it rather than to the turbine.

In the event that lightening does strike the turbine, precautions have been taken to ensure that little damage to the turbine or adjacent property occurs. Above all, it is important to understand that the high current in the lightning strike should not get “pulled” through the generator wires into the electronics and the home. The outer casing of the turbine is purposefully insulated from the inner components of the generator which create the turbine’s electricity to prevent this from occurring. While this insulation does have limits, since the turbine and tower are grounded the lightning current follows the path of least resisting through the grounding wires into the earth - avoiding the electronic components.

For high-power lightning strikes it is possible that, as with anything, structural damage or melting may occur to the outer metallic components of the turbine or tower. In this case, we recommend stopping the turbine and running a thorough inspection to verify if repairs are required.

COMMISSIONING CHECKLIST

Please follow the checklists below closely for your system to ensure that the installation has been completed properly.

GRID-TIE

*****WITH THE SYSTEM PROPERLY WIRED PER THE SUPPLIED WIRING DIAGRAM, ENGAGE THE SAFETY BRAKE AND OPEN THE AC DISCONNECT SWITCHES #1 AND #2 BEFORE RUNNING THE FOLLOWING TESTS*****

Safety Brake Switch
- Confirm the resistance between each phase is 0Ω

AC Disconnect Switch #1
- Confirm a switch is present between the turbine and PVI-7200
- Confirm the switch rating meets or exceeds the recommended values as shown in the supplied wiring diagram

Wind Interface Box
- Confirm model
  - PVI-7200
- Confirm continuity across all three fuses inside the PVI-7200

Diversion Load
- Confirm the resistance of the diversion load is appropriate for the specific turbine:
  - 30 – 250 Ω for eddyGT
  - 30 – 65 Ω for UGE-4K
- Confirm model
  - PVI-3000 or PVI-3600 for eddyGT
  - PVI-4200 for UGE-4K
- Using the Aurora Installer software, confirm the correct MPPT is programmed to the inverter AND that the “Vin Start” input is set appropriately.
- Confirm on the LCD screen that the nominal grid voltage is correct, and that the inverter to grid connection is wired per the inverter manual.

AC Disconnect #2
- Confirm a switch is present between the PVI-4200 inverter and the main panel
- Confirm the switch rating meets or exceeds the recommended value

Grounding
- Confirm the resistance between all grounding conductors is 0Ω

*****WITH THE SYSTEM PROPERLY WIRED PER THE SUPPLIED WIRING DIAGRAM, CLOSE THE AC DISCONNECTS #1 AND #2 AND DISENGAGE THE SAFETY BRAKE*****

Safety Brake Switch & AC Disconnect #1
- Confirm a voltage exists between each phase with turbine spinning at the input terminals (If there is no wind present, the turbine can be manually spun by hand to confirm voltage presence)

PVI-7200 Wind Interface Box
- Measure the voltage at the turbine input terminals. This value will vary based on turbine RPM. (If there is no wind present, the turbine can be manually spun by hand to confirm voltage presence)

PVI-4200 Inverter
- Confirm the inverter turns on at 50VDC, shows no errors and successfully connects to the grid

OFF-GRID

*****WITH THE SYSTEM PROPERLY WIRED PER THE SUPPLIED WIRING DIAGRAM, ENGAGE THE SAFETY BRAKE AND OPEN ALL AC DISCONNECT SWITCHES BEFORE RUNNING THE FOLLOWING TESTS*****

Safety Brake Switch
- Confirm the resistance between each phase is 0Ω

AC Disconnect Switch #1
- Confirm a switch is present between the turbine and off-grid controller
- Confirm the switch rating meets or exceeds the recommended value

Controller
- Confirm model
  - UGE-600-OGC for eddy
  - UGE-1K-OGC for eddyGT
  - Power General WCHG-483000 for UGE-4K

Diversion Load
- Confirm diversion load is present and connected to controller.

Batteries
- Confirm battery voltage matches system voltage
  - 24V for eddy & eddyGT
  - 48V for UGE-4K

Inverter (if applicable)
- Confirm model according to local requirements and system voltage

AC Disconnect #2 (if applicable)
- Confirm a switch is present between the inverter and the electric panel
- Confirm the switch rating meets or exceeds the recommended value

AC Disconnect #3 (if applicable)
- Confirm a switch is present between the inverter and the main panel
- Confirm the switch rating meets or exceeds the recommended value

Grounding
- Confirm the resistance between all grounding conductors is 0Ω

*****WITH THE SYSTEM PROPERLY WIRED PER THE SUPPLIED WIRING DIAGRAM, CLOSE THE AC DISCONNECTS SWITCHES AND DISENGAGE THE SAFETY BRAKE*****

Safety Brake Switch & AC Disconnect #1
- Confirm a voltage exists between each phase with turbine spinning at the input terminals (If there is no wind present, the turbine can be manually spun by hand to confirm voltage presence)

Controller
- Measure the voltage at the turbine input terminals and verify that the turbine light is flashing, indicating charging. (If there is no wind present, the turbine can be manually spun by hand to confirm voltage presence)

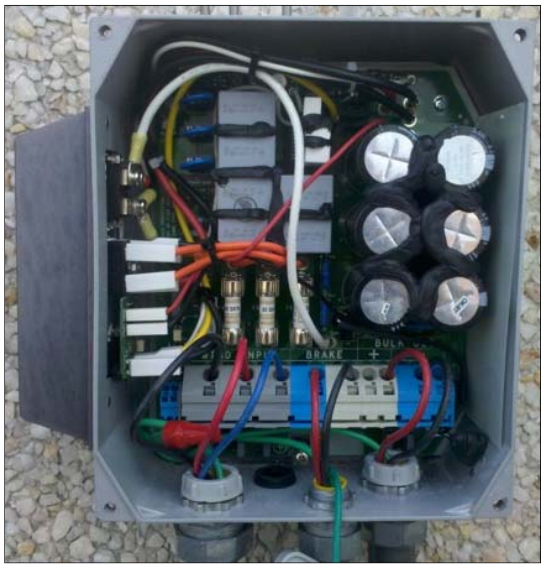
Inverter (if applicable)
- Confirm that the inverter is creating the appropriate voltage and frequency desired and powering the appropriate devices.

WARRANTY INFORMATION

In order to verify the accuracy and completeness of the installation Urban Green Energy requests in its warranty agreement that the installer or owner forward to UGE's technical staff pictures of the properly wired electrical components. A copy of the warranty agreement can be found in the turbine installation manual and examples of the required photo can be seen below:

GRID-TIE

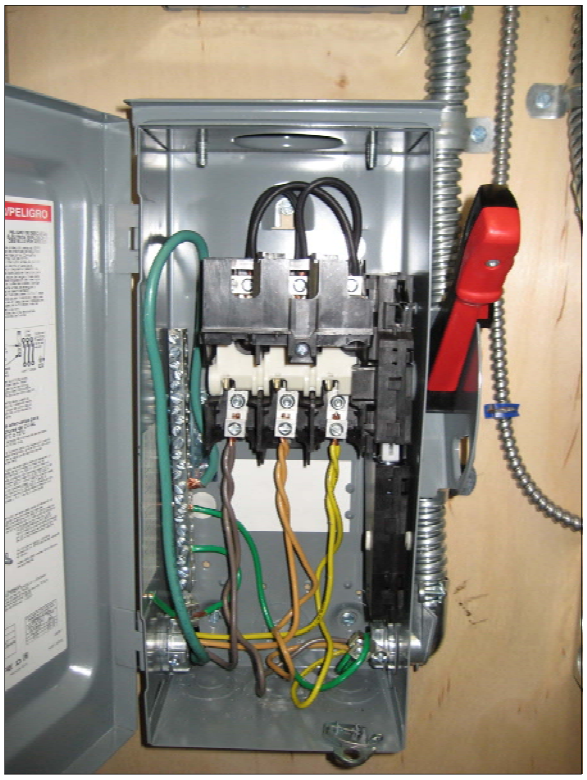
Wind Interface Box: Please provide a photo of the wind interface, with its cover off, showing the wires coming in from the wind turbine and out to the diversion load and inverter. Make sure the box has its cooling fins on its left side and the terminals on the bottom.



Diversion Load: Please provide a photo of the diversion load showing the connection of the wires to the wind interface box

Inverter: Please provide a photo of the inverter, with its cover off, showing the wires coming in from the wind interface box and out to the grid.

Safety Break and Switches: Please provide a photo of all switches with the cover off showing wires into and out of the switch enclosure

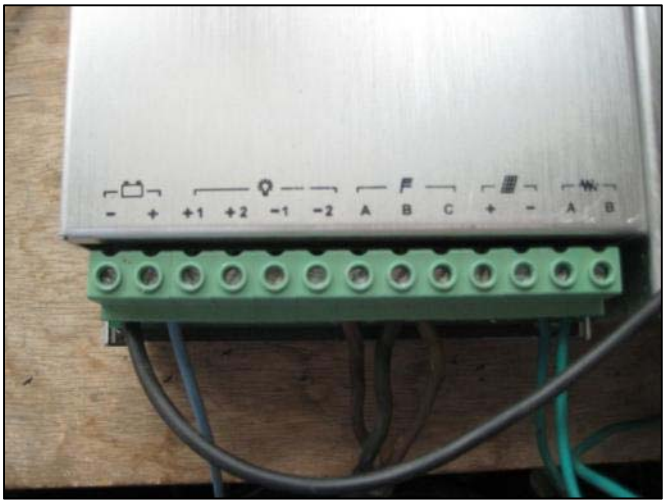


AC Disconnect Switch #1: Please provide a photo showing the AC disconnect switch between the generator and the wind interface box in the 'on' position with a lock through the handle ensuring that it cannot be accidentally turned off (this ensures that the turbine cannot free spin).

Overall Electrical Assembly: Please provide a photo showing all of the electrical components including the conduit between them.

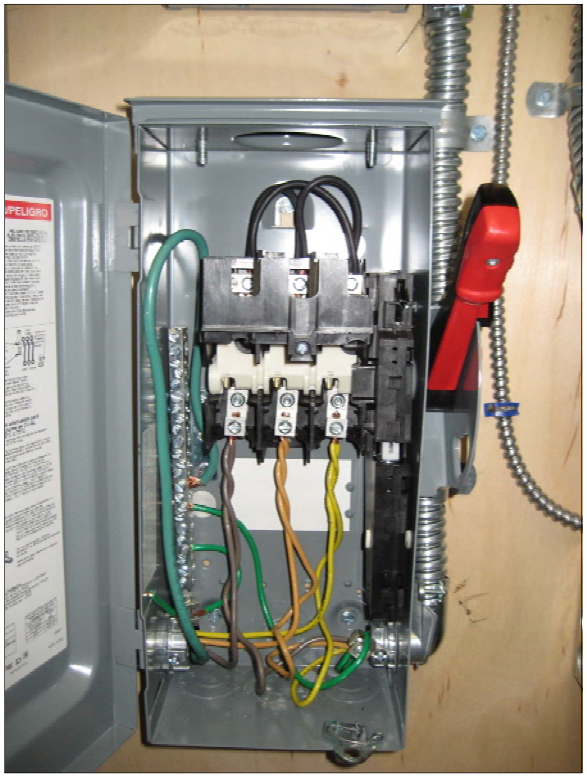
OFF-GRID

Controller: Please provide a photo of the controller showing the wires coming in from the wind turbine and out to the diversion load and battery bank:



Diversion Load: Please provide a photo of the diversion load showing the connection of the wires to the controller

Safety Break and Switches: Please provide a photo of all switches with the cover off showing wires into and out of the switch enclosure.



AC Disconnect Switch #1: Please provide a photo showing the AC disconnect switch between the generator and the controller in the ON position with a lock through the handle ensuring that it cannot be accidentally turned off (this ensures that the turbine cannot free spin).

Overall Electrical Assembly: Please provide a photo showing all of the electrical components.

REFERENCES

1. PVI 7200 Eddy GT/4K Grid-Tie Wind Interface Box
   http://www.power-one.com/sites/power-one.com/files/pvi7200windinte12.pdf

2. PVI 3000 Eddy GT Grid-Tie Inverter
   http://www.power-one.com/sites/power-one.com/files/pvi303642outdus.pdf

3. PVI 4200 4K Grid-Tie Inverter
   http://www.power-one.com/sites/power-one.com/files/pvi303642outdus.pdf

4. MM1524AE Eddy/Eddy GT Off-Grid Inverter
   http://www.magnumenergy.com/Literature/Manuals/Inverters/64-0035%20Rev%20A%20(MM-AE%20Series).pdf

5. MS4448PAE 4K Off-Grid Inverter
   http://www.magnumenergy.com/Literature/Manuals/Inverters/64-0032%20Rev%20A%20(MS-PAE%20Series).pdf