Small Wind Turbine Controller

With Dump Load

Contents

Important Safety Instructions

Read this manual before installation, operation, maintenance or inspection of the controller. Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.

Indicates a potentially hazardous situation, if not heeded could result in serious injury or death.

Indicates a potentially hazardous situation, if not heeded could result in moderate injury or damage to controller.

INTRODUCTION and SAFETY NOTE

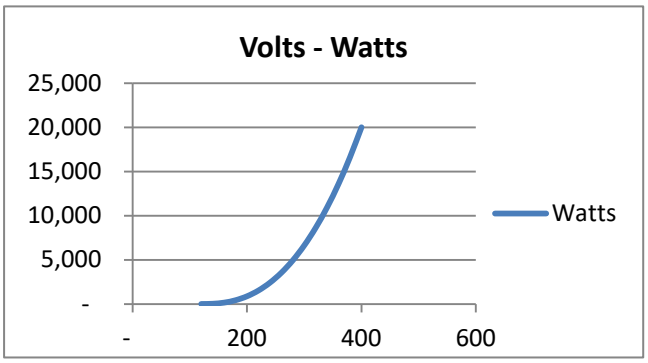
This controller provides rectification, smoothing capacitors, dump load control, power curve control and various functions for ABB inverters and also for Solis inverters when used with hydro.

The controller also provides datalogging to a micro-SD card. There is an option to add an anemometer to include wind speed as part of the datalogging.

The controller also has a USB port which can be used for adjusting settings and monitoring via a laptop.

In using the controller you need to understand some functions and adjust settings on the inverter.

Control of the power converted by inverter
Wind and most hydro turbines need power extracted at different rates, depending on the RPM or turbine voltage. This is known as a power curve, or power table, and usually the ratio is non-linear as per the example graph on the right. In the past, wind inverters provided the ability to enter a power curve.



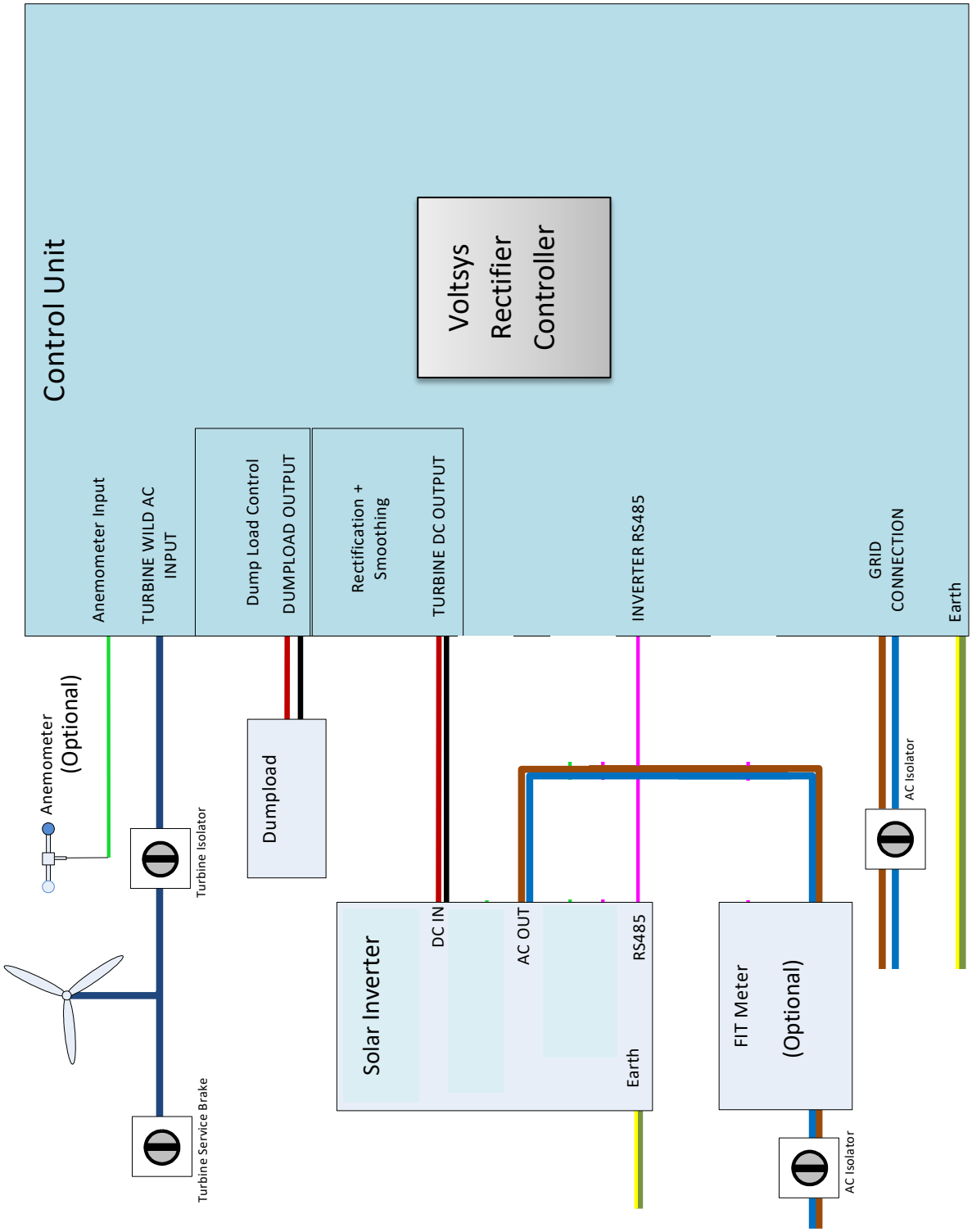
The Voltsys Wind Turbine Controller provides power curve control for ABB solar inverters, including the Trio and Uno DM range of inverters and also for Solis inverters when used with hydro.

This means that solar inverters can now be used as wind inverters, and controlled in a manner which makes them suitable for use with a wind or hydro turbine. The load on the generator is increased based on a generator speed or DC voltage and that power is then exported to the grid by the inverter.

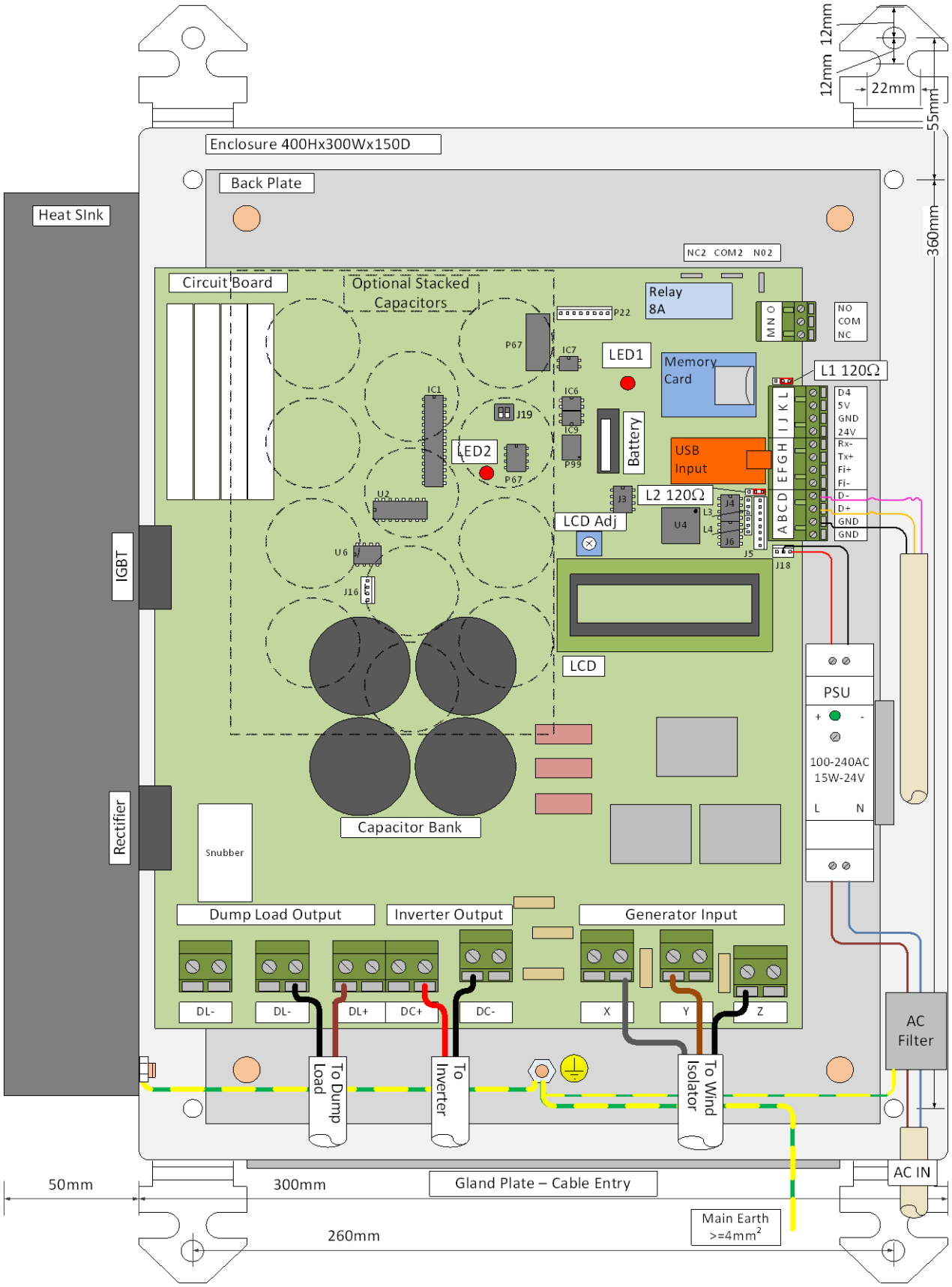
The inverter manufacturers may not offer complete technical support when using the inverter for purposes other than solar, it can be helpful if any support queries and questions are directed to our office first if problems are encountered. The inverter manuals contain extensive information and should be used when needed, however they are written for use with Solar panels and information on using other sources of DC power will not be covered. Care should be taken when following information intended for use with solar panels and the DC input to the solar inverter (e.g use of DC switches should typically not be used with wind system). The information in this manual will be needed for the settings that are compatible with wind and how this controller works.

SAFETY NOTE - Dump load control of turbines
While a dump load can be used to provide additional loading for a wind turbine to manage overspeed, there is no guarantee that this will prevent turbine overspeed in high winds. Dump load systems can fail for a variety of reasons, and it is up to the turbine manufacturer to ensure that their turbine is safe under all conditions, irrespective of any of the functions of this controller.

System Overview Diagram



Controller Layout



Controller layout may differ slightly from drawing.

Installation

When installing controller allow adequate space around sides of the controller for heatsink cooling, at least 300mm recommended.

Controller should not be placed in area where somebody is likely to accidently come into contact with the heatsink

The controller should be installed in a location without excessive oscillation or electromagnetic noise

Ambient Temperature should be -10C ~ 40C

The unit should only be opened and handled by electricians or electronics engineers. Dangerous grid, generator and DC voltage are present inside this unit. The unit should be stickered with "Dual Supply" warning stickers on commissioning the system. When opening and working on controller always stop generator and take necessary precautions to ensure that the controller is safe to work on.

Before opening take measures to stop the generator and ensure generator can't restart by applying external manual brake and/or isolator. Disconnect Controller AC power supply from the grid. Ensure inverter disconnected from grid and powered off. Allow 5 minutes for capacitors to discharge.

The controller contains capacitors that can store high voltage. This charge is typically discharged through the inverter when the generator is stopped. Before working on or servicing the controller, measure DC voltage across DC+ & DC- to check voltage is low.

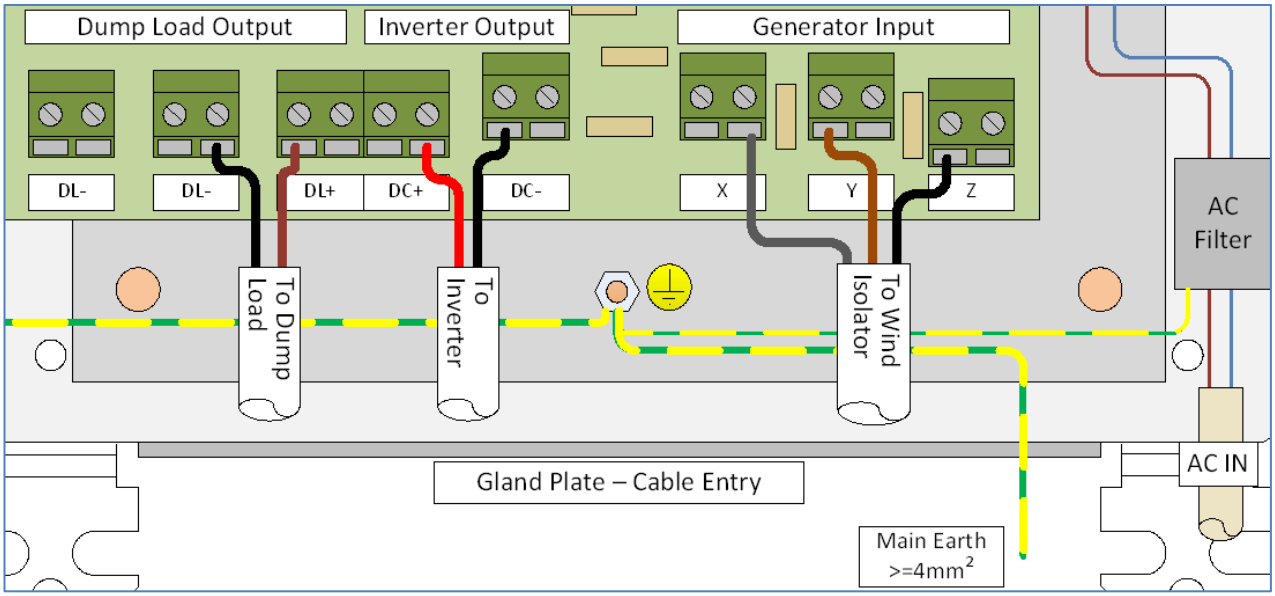
Don't operate the controller if there is any evidence of damage or if it's not functioning as expected.

MC4 Connectors on inverter. Connections to solar inverters are made with solar MC4 connectors. These are rated 20A and it is generally best to parallel connect these to reduce current. To prevent arcing and a potential fire hazard, the cable **must** be stranded wire crimped using the correct crimping tool which we can supply. The U section of the crimp is inserted into the crimping tool as shown. The wire is crimped only on this U section.

There are male and female plastic holders, and male and female crimped connectors. The male crimp connector goes into the female holder and vice-versa. Crimp the wire then push wire and crimp into the connector until it clicks firmly into place. Then screw down the plastic cap and seal to make a water-tight connection.

When using this controller, isolators should not be used on the DC connection to solar inverters. Connecting the DC while the generator is running can damage the inverter due to the high inrush current. Where a DC isolator is built into the inverter a clear warning label should be placed near the isolator.

Power Connections



Dump Load Output.

CAUTION!

Failure to wire the dump load properly could lead to a high voltage damaging the controller and inverter

The controller is designed to work with one or two dump loads in parallel. Please check that the resistance of the dump load(s) ensures that the maximum current is less than the rated current at maximum voltage. The default rated current is 20A, though other models may have an increased rating. R(min) = V(max)/20. Depending on controller version, the negative connections may both be on DL1-, or one each on connections marked DL1- and DL2-

DL+	Positive Output to Dump Load Resistors (Max 6AWG/16mm^2 per terminal)
DL1-/DL2-	Negative Output to Dump Load Resistor(s)

Inverter Output

DC+	Positive DC Voltage Output to Inverter (Max 6AWG/16mm^2 per terminal – please make parallel connections if current is above 40A)
DC-	Negative DC Voltage Output to Inverter

Turbine / Generator Input

For 3-Phase generator, this should be connected to X, Y & Z.

X	Generator Phase 1	(Max 6AWG/16mm^2 per terminal.)
Y	Generator Phase 2	
Z	Generator Phase 3	

Please use parallel connections for current over 40A

Grid Supply to Controller

AC supply input for controller, controller will typically be rated for 230V AC/50Hz or 115V AC/60Hz, this will be indicated on the controller. Maximum Power Consumption 15W. The controller will be prewired with an AC cable.

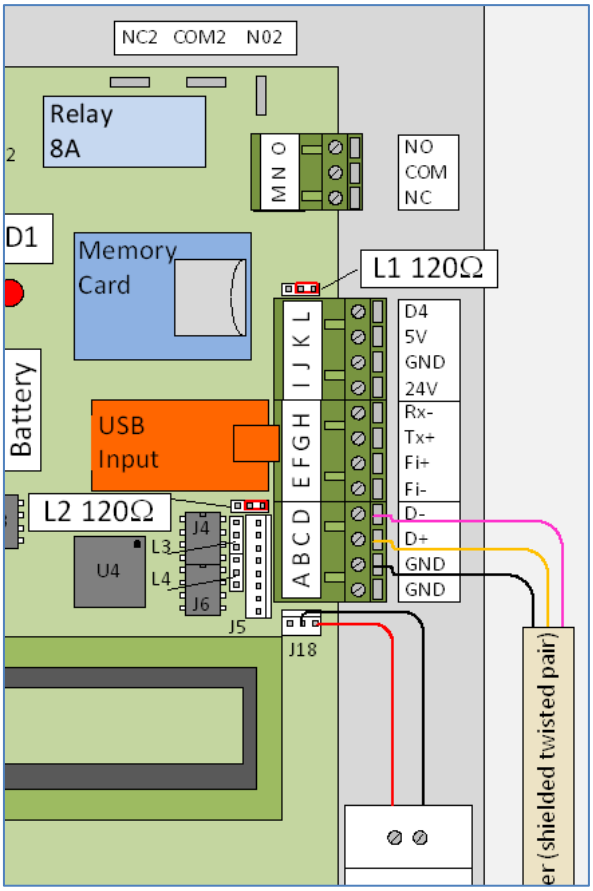
L	Grid Supply Live
N	Grid Supply Neutral

WARNING!

Earth: Controller requires Protective Earth Connection. The Earth should be connected to the Earth point on the base plate of the controller. The Earth conductor should be sized for the rating of the system.

Signal Connections

Many of these connections are optional and depend on whether the functionality is required.



RS485 for Inverter

A GND/0V

B Connect to Inverter RS485 RTN *(Required when using ABB Solar inverters)*

C RS485 D+ to inverter RS485 T/R+ (See inverter manual. For Trio use **PMU +T/R** or for Trios with the PMU expansion board use **S +T/R**).

D RS485 D- to inverter RS485 T/R-
(Jumper L2 to the right applies 120 Ω terminating resistor)

Frequency Input (Eg. Anemometer)

E Fi– Pulse Anemometer RTN

F Fi+ Pulse Anemometer Signal (Includes 1kΩ/Max 50mA)

Controller Modbus (Separate Document Available)

G Tx+ Optional RS485 monitoring

H Rx- Optional RS485 monitoring
(Jumper L1 to right applies 120 Ohm terminating resistor)

Other Connections

I 24V – 20mA

J GND/0V

K 5V – 20mA

L Run Switch Contact, open circuit to Stop, connect to GND to Run (Software Enable/Bypass). This contact will lock the dump load on and open the relay. However the dump load may not be enough to stop all types of generator. Grid power is needed for the dump load to be switched at a low DC voltage or in PWM mode.

Multipurpose Relay

M/NC Normally closed relay connection (Finder 40.52… Rating 8A/250VAC or 30VDC)

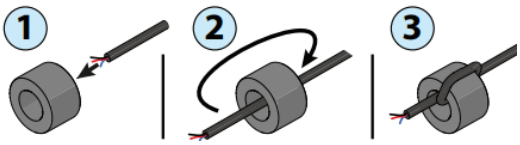
N/COM Common relay connection

O/NO Normally open relay connection

RS485 Comms to Inverter

RS485 connection is required to control the level of power converted by the inverter

Note: Uno DM will require a comms kit add on
Trio 5.8/7.5/8.5 will require a PMU expansion board fitted.



The wiring of the RS485 line should be wrapped around the EMI ferrite, where it is supplied with the inverter coms kit or expansion board. This should be fitted where the cable exits, inside the inverter. No excess cable should be used inside the inverter and the wiring should not be grouped with AC wiring. Shielded cable is recommended. See inverter or com kit instructions for more details

Before connecting the inverter to the grid it is important to configure the inverter and to check that the controller is communicating with the inverter. Please read through the steps on configuring the inverter. Ensure the inverter level is at 0% before connecting the inverter to the grid (Setting this level is not possible with the standard wifi setup, in this case please ensure the controller is communication with the inverter before connecting the grid, see p.20)

Voltsys Control PCB Layout

See Layout on Page 6

Internal Clock

With backup power from CR2032 coin cell. Time is set using the Voltsys programmer.

MicroSD(uSD) card logging

This is located at the top on the printed circuit board.

The MicroSD memory card should be formatted as FAT32 and should only be fitted or removed when the controller is completely powered down. Log files are stored on the memory card in CSV text files. Requires class 4 memory card. See separate manual for details of headers on CSV files.

A new file is created every night at midnight.

USB Port for Computer

This is used to connect a computer to the processor for changing settings and uploading new firmware. The USB port is located on the right side above the signal connections. The system is supplied with a USB mini cable.

Trimmer

Used to adjust the LCD contrast.

Jumper Switch J19

Adjust dump load switching level (*Both Switches OFF uses software programmable levels, which is the recommended way to adjust, Default On-530V/Off-430V)

J19 Switch1	J19 Switch2	DL On	DL Off
Off	Off	530V *	430V *
On	On	480V	380V
Off	On	430V	330V
On	Off	380V	300V

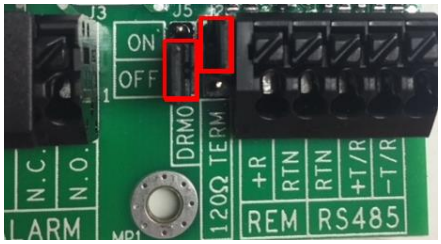
Note this does not adjust the PWM dump load settings but adjusts the self-powered hysteresis switching (used if the controller loses power during a grid failure)

Inverter Terminating Resistor

To the left of the RS485 connections is a jumper L2 for a RS485 termination resistor.

120R Resistor is OFF when the jumper is in the left position.

120R Resistor is ON when jumper is in the right position. Resistor ON (as shown in photo) may help reduce noise on the cable and is recommended.



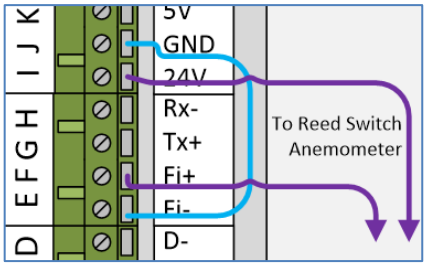
The inverter should have its jumper set to match the controller.

Example Uno DM inverter shows DRM0 set OFF and 120 Ohm set ON

Example Anemometer Wiring

Anemometer requires connection to power supply (external or as shown here, connection to internal power supply from board)

Shielded cable should be used with shield connected to earth or GND at the controller side. Input resistance 1kΩ (5mA at 5V or 24mA at 24V)



Troubleshooting

LCD Display

In running mode with no errors, LCD will display from left to right, DC voltage, generator RPM, Wind speed in m/s

At Start up or due to fault

"Braking" is displayed. This indicates the dump load is set on and the controller is either starting or requires a reset after a fault. See resetting instructions below.

When "Running" and after the inverter connects to the grid, the alarm relay on the inverter should close (if it has been set to production in the inverter menu). At this stage the controller should start controlling the inverter power output as per the power curve.

Fault Conditions

If the controller experiences a fault with the generator being out of range the following errors may be displayed:

- "**Over-Volt Err**" is displayed when the DC voltage has exceeded the Over-Voltage limit set with the software.
- "**Over-Freq Err**" is displayed when the generator has exceeded the Over-Freq limit set with the software.
- **"Over-Curr Err"** is displayed if over current limits set in software have been exceeded
- "**Inverter Err"** is displayed if inverter error has been reported by an inverter connected on RS485 bus
- **"Remote Lock"** is displayed if internal software lock set. Reset can only be done with software.
- **"Run Switch Off"** is displayed if the run switch contact is open or the connected switch in the off position.
- **"PSU Low"** is displayed if power supply voltage has fallen below warning level. Check AC supply to controller.
- **"Controller Err"** is displayed if on board handshake between internal microprocessors is not detected, this may appear when programming the controller, when AC power is lost or when there's a problem with controller. If error doesn't clear check PSU supply to controller connections.

Resetting errors on the controller

To clear errors and reset the controller, please power off the controller by switching the grid supply. If USB cable is connected the Voltsys programmer can be used to reset errors.

Software

Changing Parameter Settings

In some cases we will have set up the controller to match the generator specified. However, the settings can subsequently be modified using the supplied Voltsys Programmer application.

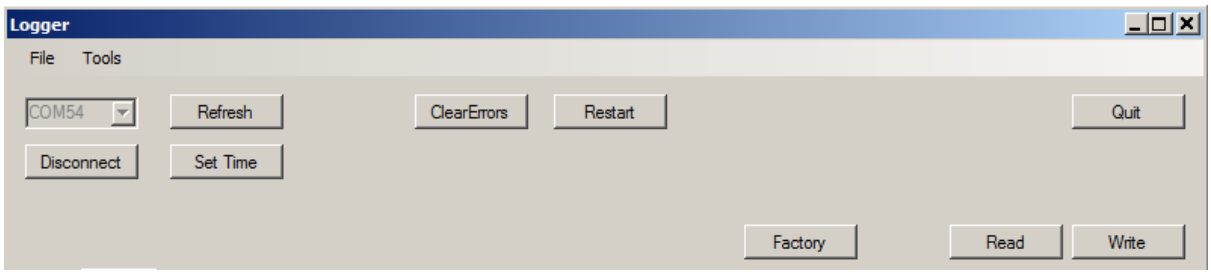
Voltsys Programmer

In order to use the programmer software, you need to connect the pc running the software to the controller. You can download the software and drivers from our website at https://www.voltsys.com/voltsys-20a-wind-hydro-controller/. If you have not already done this, please do so and refer to page 12 to install the drivers on your computer first.

To connect to the controller -

- Power off controller
- Connect USB cable from controller to computer (for details see Installation Instructions near end of document)
- Wait for the driver to install
- Run programmer file

The top third of the application window allows you to communicate with the controller. Below that there are four tabs with further options. The application defaults to the “Monitor” tab.



To connect to the controller, you will need to know which com port number your pc has assigned to the controller (usually found in the computer’s device manager)

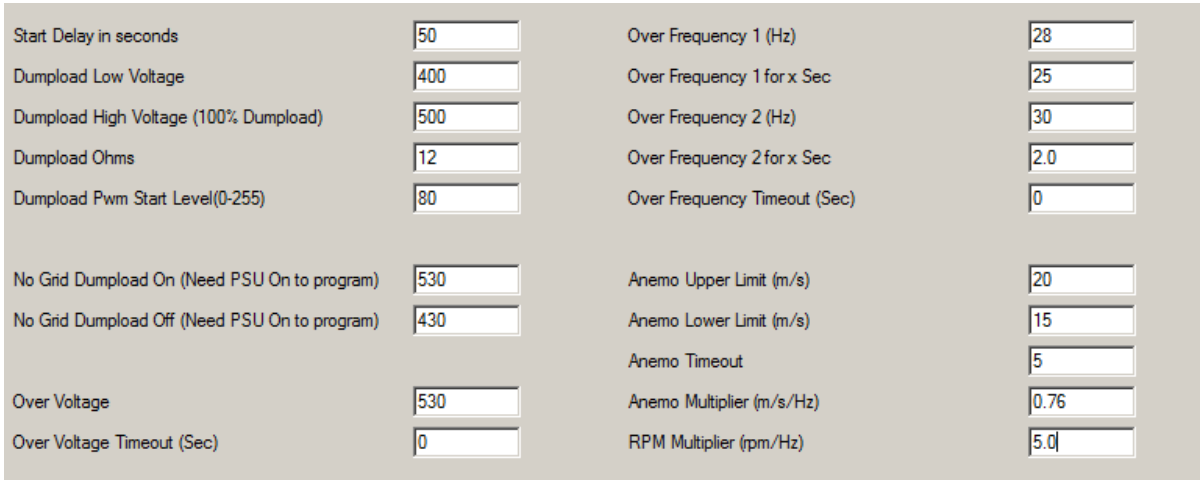
Select your com port from the drop down option and click “Connect”

To set the controller Time and Date from the computer clock, click the “Set Time” button

To read the current control panel settings click the “Read” button and wait for settings to be read

To write changes to the control panel settings click the “Write” button and wait for the control panel to restart.

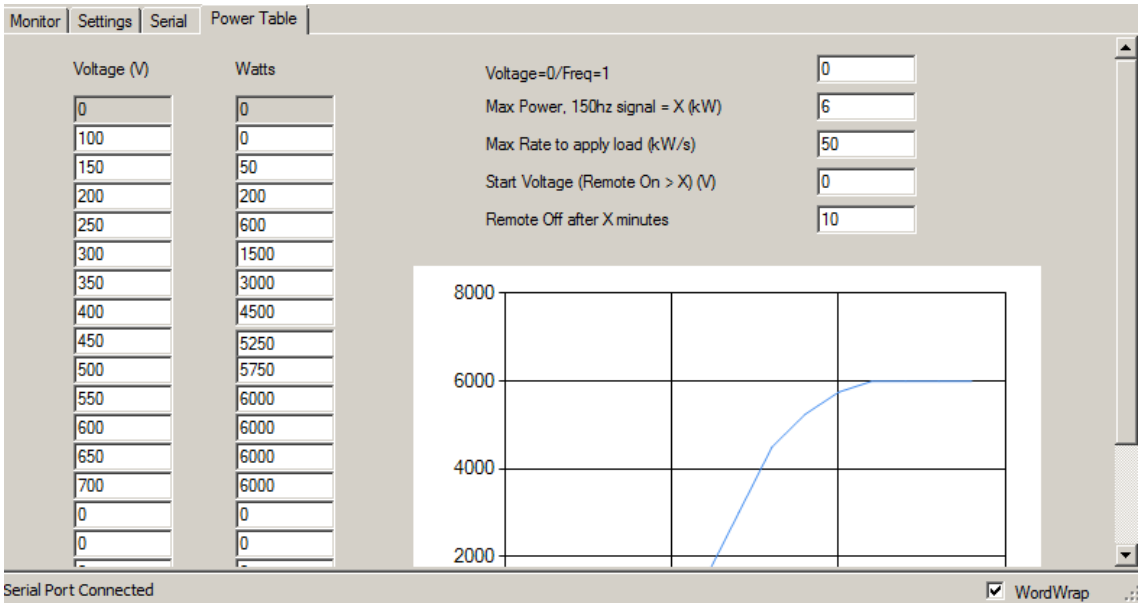
Settings Menu



Start delay	Time delay in seconds before the controller turns off dump load during startup
Dump Load Low Voltage	DC Voltage at which the dump load will start at 0% PWM
Dump load High Voltage	DC Voltage at which the dump load will be on at 100% PWM. This must be at least 40V above Dump Load Low Voltage above
Dump load Ohms	Dumpload Resistance in Ohms (used to calculate current)
Dump load Start Level	Lower PWM level. Used to set initial PWM level the dumpload turns on at. Use a Level from 0-255 for 0% to 100%. eg.127=50%
No Grid Dump load on	In the event of grid loss and the controller losing its auxiliary power, the dump load will be switched in hysteresis mode, switching on at this voltage. This must be higher than the standard dump load high voltage as this setting also functions when grid is present. (NOTE:Requires AC power to adjust, USB power will show low value)
No Grid Dumpload off	Corresponding voltage to switch dump load off. This should not be set lower than 350V. Should be 80-100V lower than On volts.
Over voltage	If controller measures a DC generator voltage above this, controller will lock on the dump load until controller is reset or the error times out (see below).
Over Voltage Timeout	The time in seconds for an over voltage error to automatically clear. Set to zero for no time out (permanent shut down)
Over Frequency	If controller measures a generator frequency above this for x seconds (**Over Freq for x Sec)**, controller will lock on the dump load until controller is reset. Eg 27hz for 25seconds
Over Frequency For x Sec	See Above.
Over Frequency 2	As Over Freq, but provides a second set of limits, usually a higher frequency for a shorter period
Over Frequency 2 for x Sec	Period for over-frequency 2 setting
Over Frequency Timeout	The time in seconds for an over frequency error to automatically clear. Set to zero for no time out (permanent shut down)
Anemometer Upper Limit	Windspeed limit in m/s for wind speed error
Anemometer Lower Limit	Windspeed limit in m/s for restart.
Anemometer Timeout	Time in seconds that anemometer wind speed must remain below **Anemo Lower Limit**, to clear the above error
Anemometer Multiplier	Anemometer transfer function, slope. Convert frequency from anemometer into wind speed reading. E.g. 0.40 m/s/Hz
RPM Multiplier	Amount to multiply frequency by to get RPM. This is calculated as = 60/N where *N* = number of pole pairs, or 120/n where n is the number of poles

Power Curve Settings

You will need to enter a power curve into the controller which will then manage the power conversion by the solar inverter.



Voltage/Freq	Enter 0 if using voltage power curve and 1 if using frequency. Press the “Write” button & then “Read” button to refresh table header
Max Power	Max inverter power. For 20kw Trio should be 22. For 27.5kw Trio should be 30, For UNO DM inverter check the table on the next page.
Max rate to apply load	Ramp rate at which load can be increased. The value to use will depend on generator characteristics.
Start voltage	In this controller this setting should not be adjusted. Please leave at 0
Remote off after X minutes	In this controller this setting should not be adjusted. Please leave at 0

Dump load Voltage Settings

The controller uses measured DC voltage and the dump load resister to control the speed of the turbine. When turbine is in a running state the controller will allow the DC voltage to rise to the Dump Load Low level. If the voltage rises above this level the dump load will be applied at increasing %age PWM reaching 100% PWM at Dump Load High level.

If the Dump load fails to control turbine speed and voltage keeps rising above the Dump Load On Voltage and reaches the Over Voltage Level, this will trigger a permanent dump load connection. The turbine will restart after a pre-set delay.

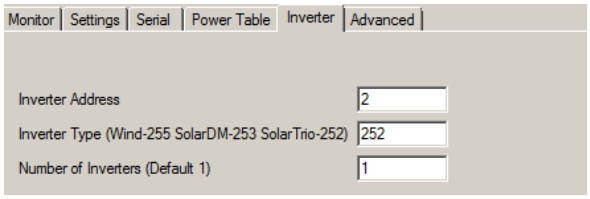
If the voltage ever reaches the “No Grid Dump load on” level, the dump load will be switched on fully, until the voltage falls to “No Grid Dump load off” level

Inverter Settings

Please set the inverter settings to match the type of inverter(s) being used. For Solar inverters to work with the controller power curve it is critical to wire to the correct RS485 terminal on the inverter and set the RS485 protocols correctly.

Inverter Address	The RS485 Address or Port that the controller connects to. For Multiple inverters, input the lowest address. (eg. 2 if inverters set to 2,3,4,5) For multiple inverters addresses should be sequential and not exceed 9.
Inverter Type	This sets the inverter protocol. For monitoring a single ABB wind inverters use 255, for Uno DM inverters use 253 (Modbus RTU), for Trio inverters use 252 (Modbus RTU). Note for Trio 50/60 use 253, however in this case advanced settings may need to be changed. For Solis use 254
Number of Inverter	If using multiple solar inverters enter the number of inverters here.

Examples for inverter type and Max Power



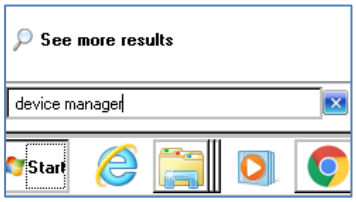
INVERTER	Max Power	Inverter Type	RS485 Port
Uno DM4	4	253	Coms kit RS485 (Inverter address 1 prefered)
Uno Trio 5.8	5.8	249	Slave RS485 PMU Expansion Board
Trio 20kW	22	252	PMU RS485
Trio 27.6kW	30	252	PMU RS485
Solis 10kW	10	254	Built in wifi stick port (may require special RS485 cable)

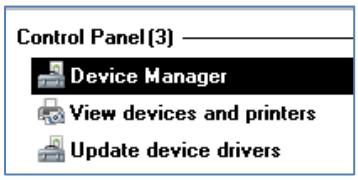
Driver Installation

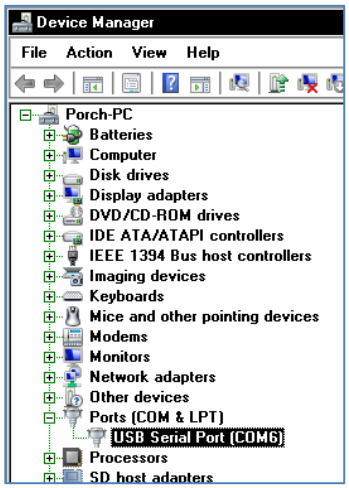
Drivers can be downloaded at

https://www.voltsys.com/wp-content/uploads/2018/09/CDM21228_Setup.zip

1. Plug in USB cable
2. Click on “Start Button”, type “device manager” in search box
3. From the search results,
   open Device Manager
4. In Device Manager
   Click to expand “Ports”
   And note the USB Serial Port com port number







5. Run the Inverter Software
   (Windows 10 may display a “Unknown publisher” warning, click “More info” and “Run anyway”. If the Software is blocked by Windows Store, open computer “Settings”, click on “Apps”, “Apps & Features”, under “Installing Apps”, select either “Warn me before installing apps outside the store” or “install apps from anywhere” and retry)

DM Com Kit/PMU Expansion Board

You will need to fit a DM Com kit into UNO-DM inverters or a PMU Expansion Board in the case of the Trio 5.8/7.5/8.5. This kit is an optional extra and is required for the Voltsys controller to communicate with the inverter. The coms comes as standard on larger Trio and Solis inverters. For Solis inverters, see “Step by step instructions”p24

Inverter Settings

You will need to change some settings on the inverter in order for the Voltsys controller to over-ride MPPT tracking normally used by solar inverters. These settings can vary slightly depending on the type of inverter. Please check the inverter manual for additional details on navigating the front panel menu and for more details on the inverter settings.

Inverter Menus (Where Inverter has LCD screen)

1. Navigate to the main menu (press ESC if needed) and press up and down to find “Settings” and then press “Enter”. (On the Uno DM inverter there are both system settings and inverter settings)
2. The default password is “0000”, press “Enter” to move to next character
3. Once in the “Settings” menu, press up and down to navigate options, options should include “Set RS485 Coms”, “Address”, “VStart”, etc.

RS485 Coms, Address or Port

This is used to set the address and protocol for the inverter. It is important that this matches the setting in the controller. For Uno DM single phase inverters Address 1 is preferred, larger inverter start with address 2.

RS485

The RS485 setting on the inverter should be set to “**ModBus RTU ABB**” or “**Aurora Modbus**”. Baud rate should be left at 19200. Parity should be left at “none”. On inverters with more than one RS485 port, please connect to a port that supports Modbus RTU.

Input Mode

The input mode should be set to **Parallel**. Please follow the connection information given in the inverter manual regarding paralleling the DC inputs and do not exceed the input rating of the DC connectors. ***Please ensure you have a proper crimping tool to crimp MC4 connections. Otherwise they may arc and present a fire hazard.***

MPPT & Inverter Level

The MPPT scan should be disabled by selecting “Multi-max scan” (“E/D MPPT Scan” on Uno DM Inverter) and choosing **Disable**. The Inverter level should be set to 0% before the inverter is connected to the grid.

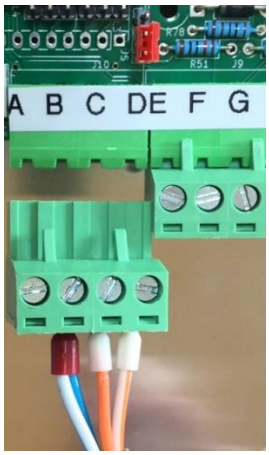
VStart/UV Prot. Time

Start up voltage can be set according to the characteristics of the turbine generator. Once the set voltage is reached the inverter should begin its procedure for connecting to the grid. For most turbines, you set this voltage to the lowest level at which you want the inverter to start up. Once the inverter has started, it will generally continue working until the voltage falls below 70% of VStart. **UV Prot. Time** can be adjusted to change the number of seconds the inverter stays grid connected after voltage falls below 70% of VinStart

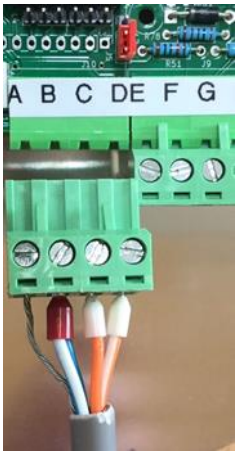
For example, on a Trio 20kw inverter, the default setting for VStart is 430V. You can set it as low as 250V. If you set it to 250V, it will connect to the grid at 250V and then work as low as 175V DC.

Step by step instructions for Uno Single Phase Inverters

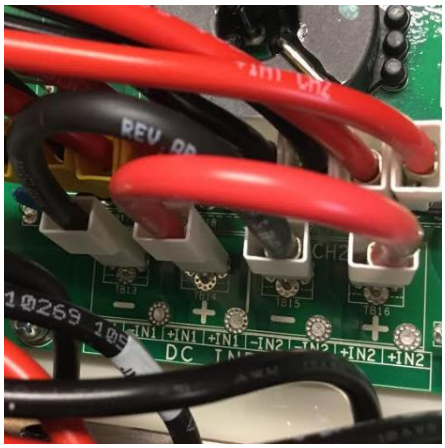
Example RS485 Connection to the RS485 on the Uno DM Inverter



Turbine Controller (unshielded or shielded)

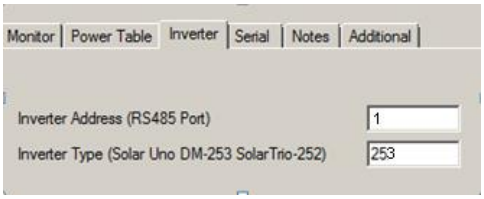


Uno DM Com Kit



Install Jumpers to Parallel the DC inputs

Ensure programmer setting matches inverter setting shown below:
Address 1 is prefered with the Uno DM Single phase inverter



Setting up Uno DM Inverter using Wifi

Recommended

Please check the inverter Coms Kit is fitted inside the inverter (see the guide supplied with the coms kit) and check the DC inputs are paralleled using the supplied links (See Above)

Take a photo or make a note of the WiFi product key (PK) sticker

To power on, the Inverter will need at least 110VDC connected to the DC input. It is recommended that the inverter AC is disconnected during setup. The DC supply should be increased gradually or of limited current, a high inrush current could damage the inverter.

For more detailed instructions see the Commissioning Section of the full product manual, can be found at www.fimer.com

Powered On

A short time after the inverter is powered on (3min) a WiFi access point should be visible to a smartphone or laptop. The access point name will be in the format “ABB XX-XX-XX-XX-XX-XX-XX”

Connect to this access point using the 16 digit product key (PK), include dashes, from the side of the inverter

Web browser

Once connected to the Inverter WiFi access point open a web browser on the laptop or smartphone

While connected to the Inverter WiFi internet on the device may stop working (please ignore security or loss of internet warnings and stay connect to the inverter access point.

In the web browser address bar, type in the inverter IP address, this will be 192.168.117.1 and press enter. If this is the first time connecting to the inverter, a setup wizard should appear. Alternatively if the inverter was previously configured, a login screen will appear, select the “forgot password” option and login with the product key (PK). If the inverter was previously configured skip the steps below and continue at “Checking Inverter Data is being read”.

Step 1
Create an Admin user account and password. The password should be at least 8 characters. The username and password are case sensitive. Create a standard user account; this does not need a password

Step 2
Connect the inverter to a local WiFi network. This is optional but will give the inverter a local IP address so it can be accessed by any device on the local network. This is also required for updating firmware. Once connected to the WiFi network, **take a note of the new IP address, e.g. 192.168.0.xxx**

Step 3
Set the Time and Date

Step 4
Set the required grid standard (note this cannot be changed to a different grid standard after 24 hours has passed).

Set the input channel configuration to Parallel

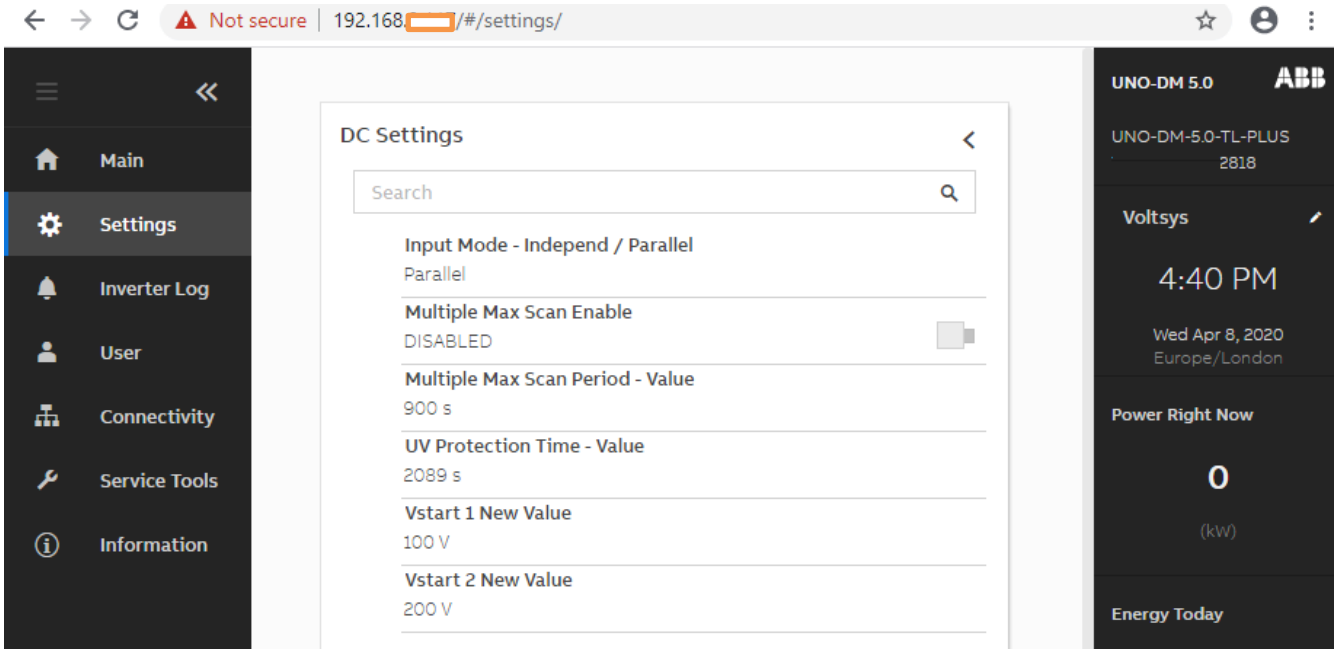
After completing Step 4 the inverter will reboot. When this happens the WiFi connection on the phone or laptop might change. Please reconnect to the inverter WiFi or change to the local network and new IP Address

Typical setting to modify

Input Mode: Set to Parallel Multiple Max Scan: Set to Disable

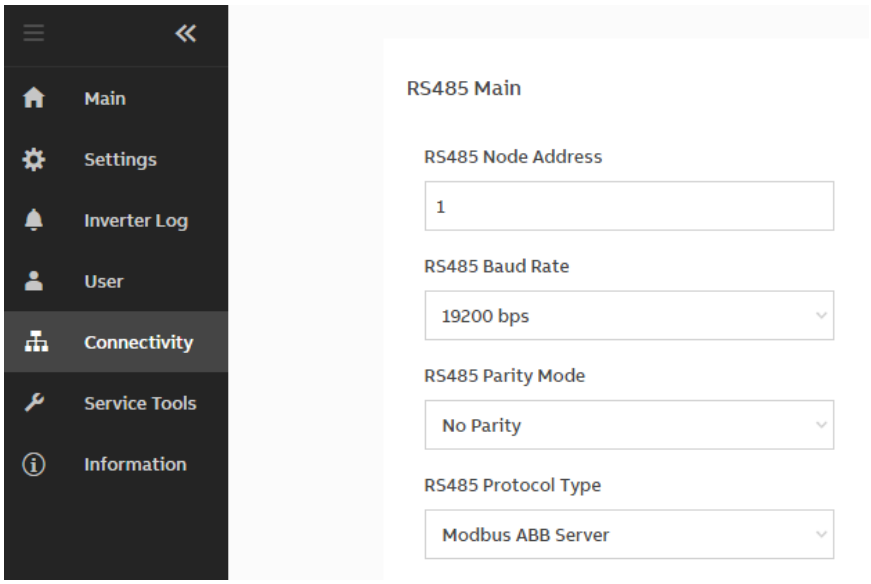
UV Protection Time: Keeps the inverter grid connected for a time after the voltage falls, set to 600s for 10mins

VStart 1: Set to 100V or suitable value for starting generation (if



Check the RS485 Main settings. Set the address to match the controller address (if changing the address from 1 temporarily set the protocol to Protocol Aurora Server while changing address and then to Modbus ABB Server)

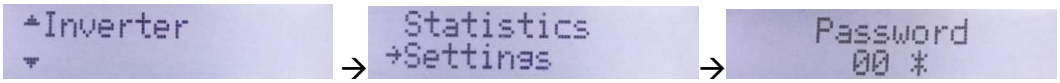
Set RS485 the protocol to Modbus ABB Server (Only set to Aurora Server if using Aurora Manager Software)



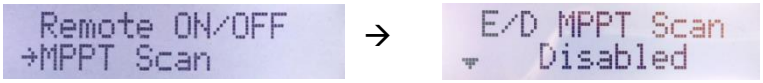
Caution: Please check on a laptop that the controller is able to read inverter data before connecting the grid

Setting up Uno DM Inverter using Screen (Screen only available on older Uno DM models)

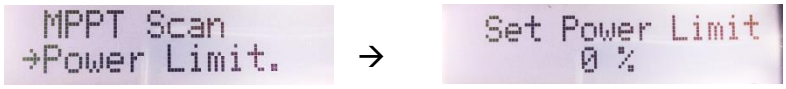
Inverter Settings:



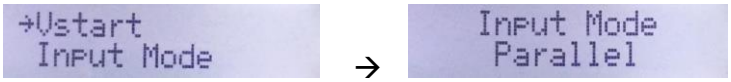
MPPT disable:



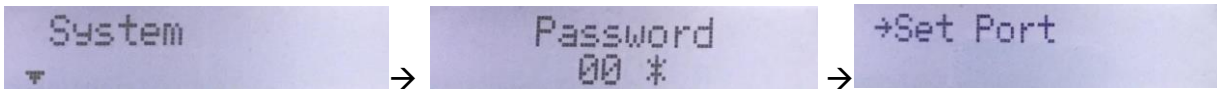
Set Power Limit to zero:



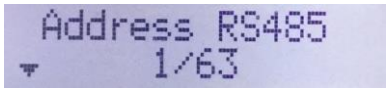
Vin Start & Input mode:



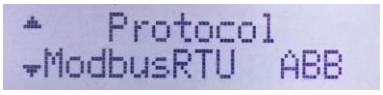
Set RS485 Slave Address (Com port) & Protocol:



→ Set Address



→ Change Protocol (from Aurora Slave to ModbusRTU)



Checking Inverter Data is being read

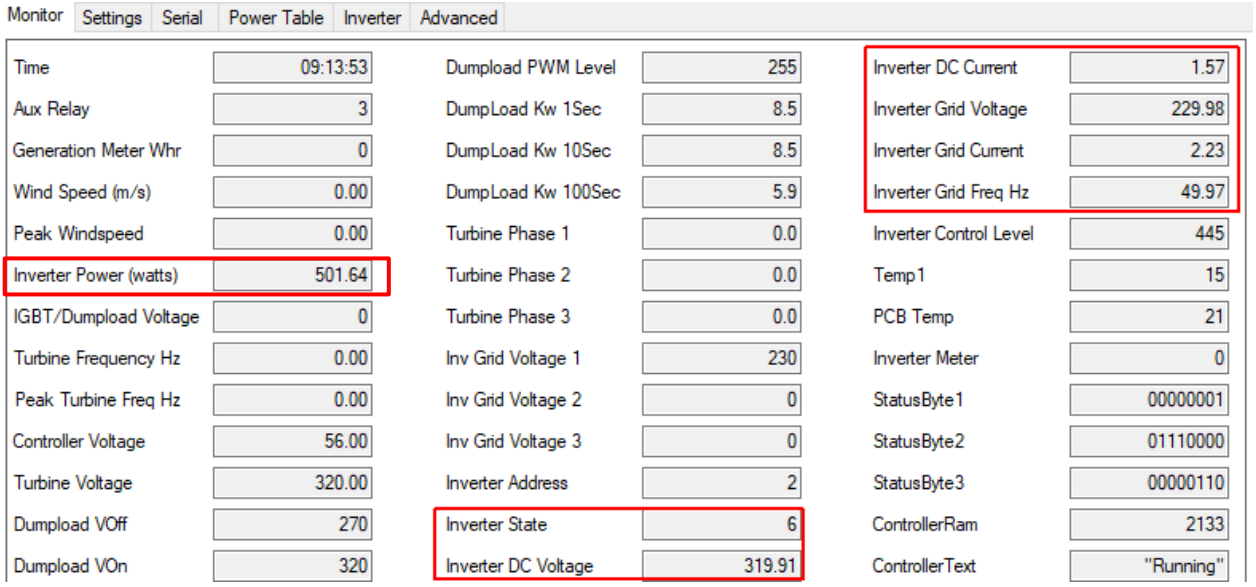
Using the programming software monitor tab, it is possible to check if data is being received from the inverter.

The “Inverter Voltage” will show the Inverter DC input voltage when the inverter is powered on

If grid is present “AC Voltage” reading will be shown

When the inverter successfully connects to the grid, the “Inverter State” will change to 6 (ABB Fimer Inverters)

If data is not being received, please check the RS485 wiring is correct and wired to the RS485 port that supports Aurora Modbus or ModBus RTU ABB. Also check that the correct inverter setting has been used in the programming software. 120 Ohm terminating resistor should typically be in the ON position when connecting to a single inverter. Also on the inverter COM kit the resistor should be set ON.



Step by step instructions for Trio Inverters

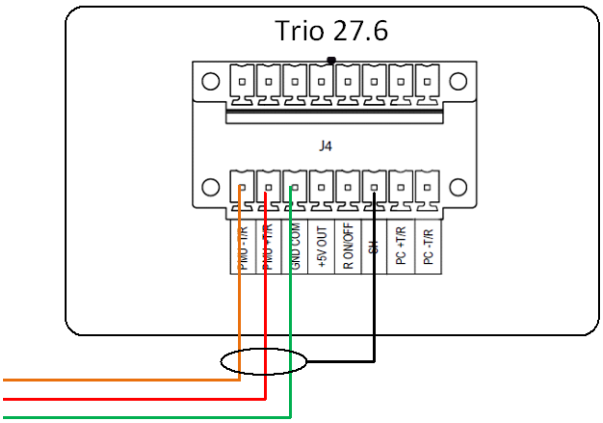
Example RS485 Connection to the RS485 PMU on the TRIO-20, 27.6

Green: GND

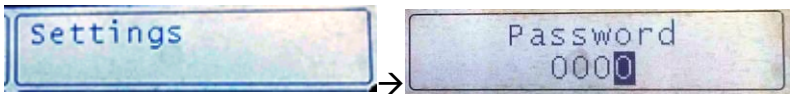
Red: D+/+TR

Orange: D-/-TR

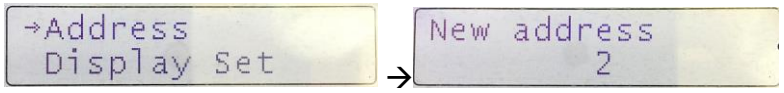
Black: Shielding



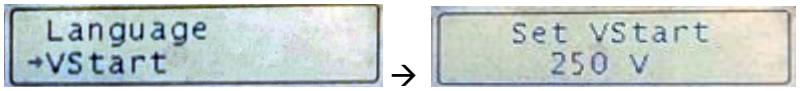
Inverter Settings:



Set/Check Address:



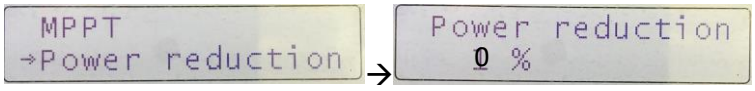
Vin Start:



UV Prot.Time:

MPPT disable:

Set Default Power Reduction to 0%:

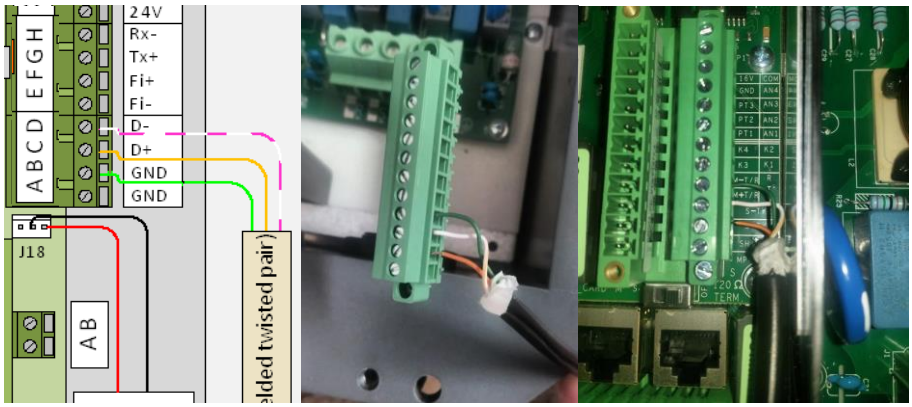


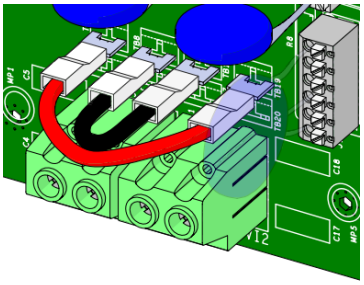
Set RS485 Protocol:

Ensure setup file (or programmer) matches inverter setting:

```
Inv,TR
COM,2
```

Example RS485 Connection to the RS485 slave on the TRIO-5.8, 7.5, 8.5-TL-OUTD

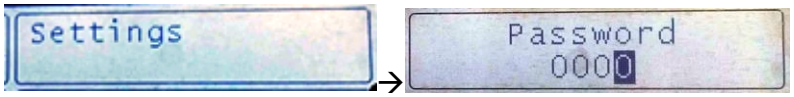




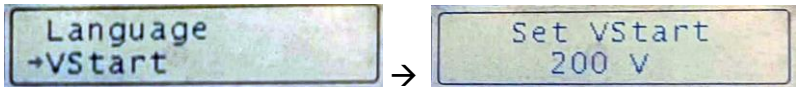
On the Trio 7.5 & 8.5, install links
Set the Input Mode to PARALLEL

Turbine Controller Screw Connector Trio 5.6kW PMU Expansion card RS485 Slave

Inverter Settings:



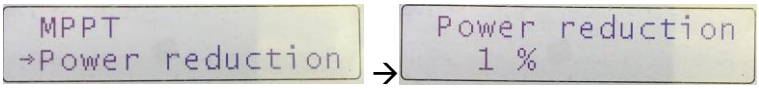
Vin Start:



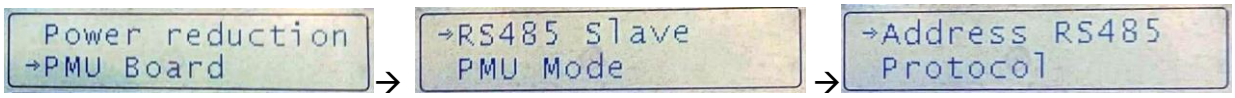
UV Prot.Time:

MPPT disable:

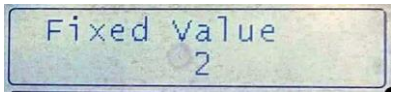
Set Default Power Reduction (1%-4%):



Set RS485 Slave Address (Com port) & Protocol:

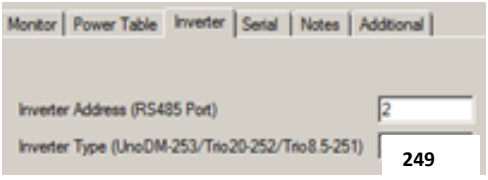


→ Check Address



→ Set Protocol

Ensure setup file (or programmer) matches inverter setting:

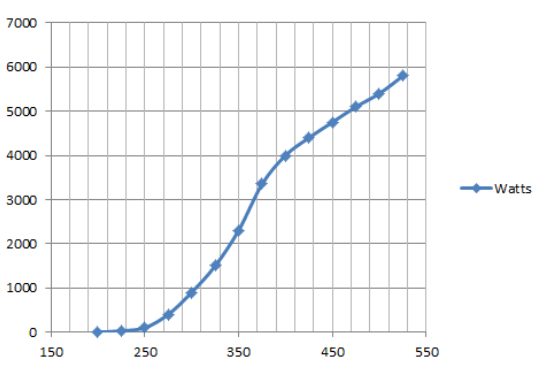


Notes on TRIO-5.8, 7.5, 8.5-TL-OUTD power curve

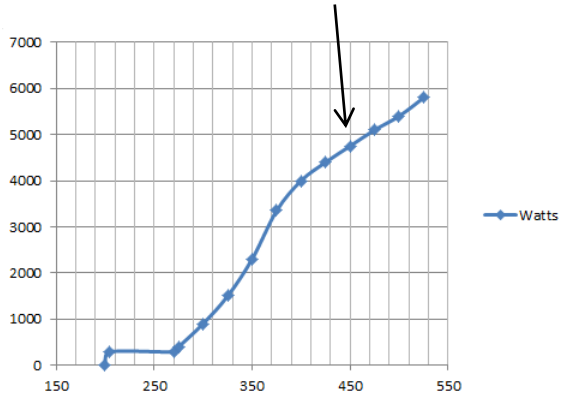
The Trio 5.8-8.5kW has a workable range of 5%-100% of its max power.

Programmed Curve

V	Watts
0	0
200	0
225	30
250	100
275	400
300	900
325	1500
350	2300
375	3350
400	4000
425	4400
450	4750
475	5100
500	5400
525	5800

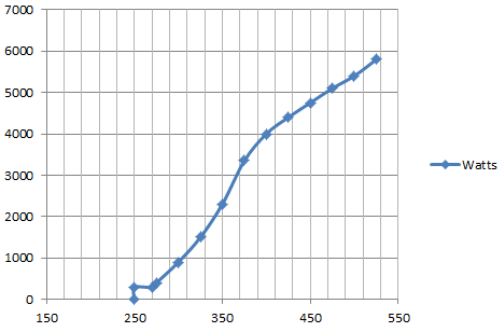


P.out With VinStart=250V



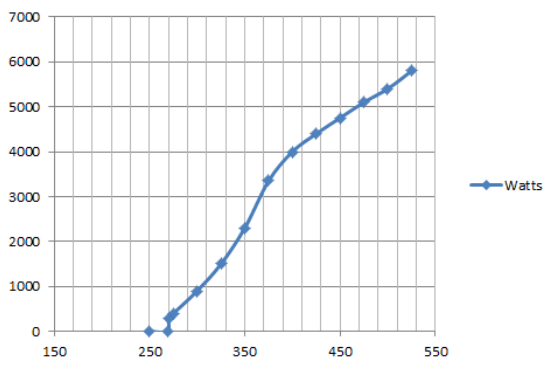
Or With VinStart=360V (0-5% output at 70%of 360V)

P.out

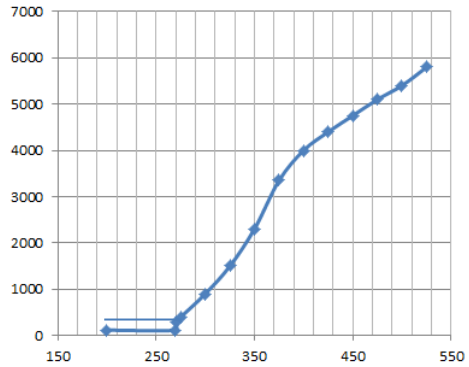


Programmed Curve

V	Watts
0	0
250	0
269	0
270	290
275	400
300	900
325	1500
350	2300
375	3350
400	4000
425	4400
450	4750
475	5100
500	5400
525	5800



With Vin Start =250V & Power Limit Set to 2% on Screen



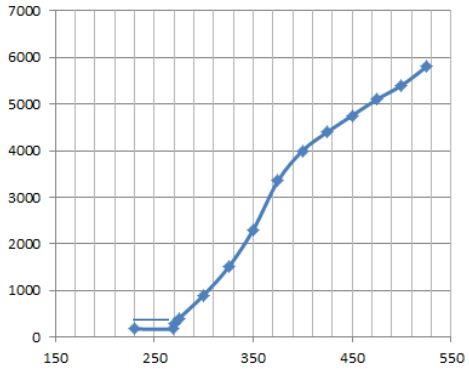
Initially Power out will be 5% at 200-270V

After 1min below 270V Power out will be 2% at 200-270V,

Switching back to 5% at 270V

With VinStart = 330V & Power Limit Set to 3% on Screen

After 1min below 270V P.out will switch from 5% to 3%



Step by step instructions for Solis Inverters

RS485 Comms to Inverter for Solis / Ginlong inverters

RS485 connection is required to control the level of power converted by the inverter

D+ Connect to the inverter RS485 positive **+A** (Inverter Pin 3) Yellow
(Part No. for connector : EC04681-2023-BF)
D- Connect to the inverter RS485 negative **–B** (Inverter Pin 4) Blue
Gnd Connect to the inverter RS485 **GND** (Inverter Pin 2).

Data Logging Stick GPRS Interface

Inverter Settings

You will need to change some setting on the inverter in order for the Voltsys controller to over-ride MPPT tracking normally used by solar inverters. These settings can vary slightly depending on the type of inverter. Please check the inverter manual for additional details on navigating the front panel menu and for more details on the inverter settings.

Inverter Menus

The are four options in the Solis main menu. You may need to press ESC to get to the main menu. The menu items are “Information, Settings, Advanced Info and Advanced Settings”

Set Address

This is found in the settings menu. This is used to set the address for the inverter. It is important that this matches the setting in the controller. For the examples in the setup file above, the inverter address would be set to 2.

Power Control

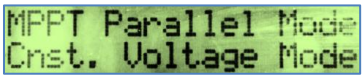
This is found in the Advanced settings. Use the advanced password “0010” to open the advanced settings

Move down to “Power Control”

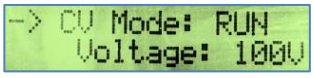
Set “Out_P With Restore” to zero, so the inverter will output zero power by default or if there is a problem

Special Settings

The input mode should be set to **Parallel** with the inputs paralleled at the controller. Please follow any connection information given in the inverter manual regarding paralleling the DC inputs and do not exceed the input rating of the DC connectors. ***Please ensure you have a proper crimping tool to crimp MC4 connections. Otherwise they may arc and present a fire hazard.***



Navigate to the special settings menu
Navigate to “MPPT Parallel Mode” and set it to RUN to enable parallel operation



Navigate to “Cnst. Voltage Mode” and set CV Mode to RUN and lower the voltage to the lowest setting.