

3KW~20KW

Controller Guide for WTGS

Model : FDC3K-I, FDC5K-I, FDC10K-I, FDC20K-I



CE



Warnings:

- **The guide has been carefully checked by engineers of Yangzhou Shenzhou Wind-driven Generator Co.,Ltd (SWG).**
- **Please excuse from specification alterations without notice.**
- **Color or figuration of pictures might be varied against physical goods.**
- **The controller connection and maintenance should be carried out by professional electricians.**
- **Please do not dismantle the inner structure of wind turbines until get any instructions from us. Any personal actions without our hints to dismantle should be excluded from the rights of warranty.**



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1. Profile



Controller



3KW Dump loader



5KW Dump loader



10KW-20KW Dump loader



The controllers for WTGS within the series ranging from 3KW~20KW are all intellectual controllers, which are adopted microcomputer chip and various sensors (including anemoscope, dogvane, RPM sensor, temperature sensor etc.) to achieve the functions of control, protection and rectification for WTGS. Moreover, controller models FDC3K-I, FDC5K-I, FDC10K-I can be switched mutually through software. A set of dump loader is required to cooperate with the controller operation.

Outstanding merits:

- 1) Off-grid and on-grid version are both engaged into the same hardware. The off-grid and on-grid operational states can be switched through software, which will enable the end users to choose the operational mode of WTGS according to the local environment and to save the repeated expenditure in having two separated controllers (off-grid and on-grid).
- 2) High-sensitive and high-reliable sensitive elements have been employed, which will effectively check wind speed, wind direction, temperature, RPM, voltage and current, as well as effectively make decision and reaction accordingly.
- 3) The RPM check and controller for WTG will prevent the generator rotor from spinning too fast, which might cause the broken to blades.
- 4) Temperature, current check and controller will enable the yawing protection to be started when the generator temperature goes too high. Accordingly, the output will be reduced gradually until be stopped, which will achieve the purpose of protecting the WTG.
- 5) Triple protection modes, namely, yawing, brake and dumpload have been employed in order to make sure the WTG' s normal operation. Much more reliable operation will be contributed by the combination of initiative and passive protections.

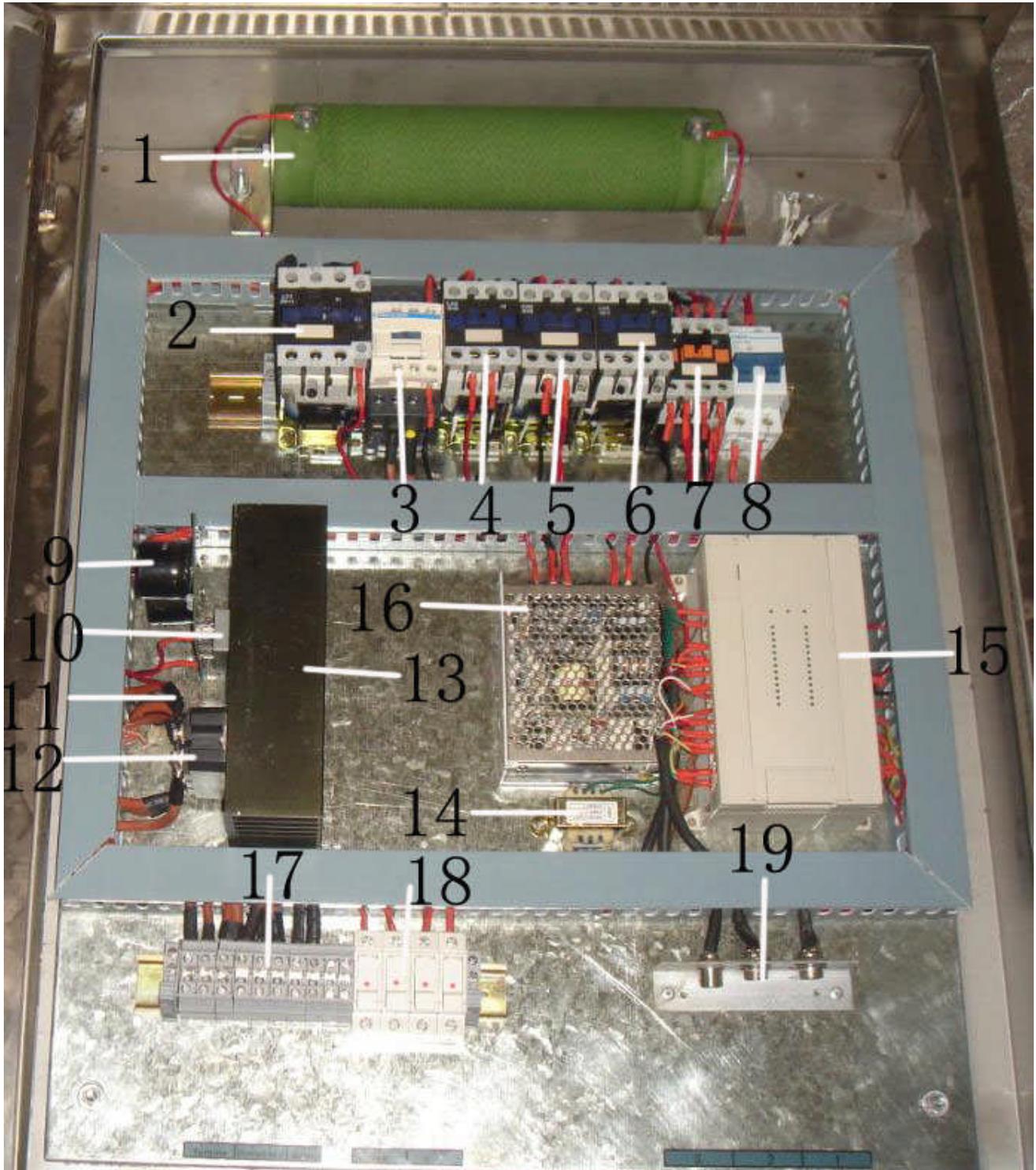


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- 6) The dumpload protection will be achieved by hardware, and will work independently from other protections, which will guarantee that the WTG will continue to operate safely even when the controller is inactive.
 - 7) Cable cast-off function by software and limited spacing function by hardware will prevent the cables from being twisted, which will enhance the reliability of anti-twist function.
 - 8) Wider voltage range with highest voltage reaching 900VDC will avoid any abnormality or damage of controller when under high voltage.

Note: exclusively to model FDC20K-I

- 9) IP65 protection level enable it can be placed outdoors and be operated safely and reliably.

2. Structural diagram & operational principle





Serial No.	Name	Function	Remarks
1	Voltage dropping resistor	To relieve voltage and protect yawing motor (DC motor)	1000W,150Ω
2	DC controller AC contactor	Dump loader control	CJX2 3201Z
3	AC controller AC contactor	Dump loader control	LCID258
4	DC control AC contactor	To control clockwise rotation of generator	CJX2 1801Z
5	DC control AC contactor	To control anticlockwise rotation of generator	CJX2 1801Z
6	DC control AC contactor	Brake	CJX2 1801Z
7	DC control AC contactor	Power supply controller	JZC1-22
8	Air switch	For inspection(push down to dump load and cut off furl)	DZ47-63 C6
10	Capacitance (2pieces)	To filter wave	450V330μF
11	Rectified bridge	To rectify and power the yawing, brake & control modular	KBP C3510
12	Current sensor	To output current	HIC 040G/S
13	Rectified bridge	To convert the three-phase AC output from generator into DC	MDS100~12(100 A,1200V)
14	Heating radiator		
15	Transformer	To check electrical supply available or not	5W(220VAC-6VD C)
16	PLC board	Core circuit of controller	
17	Power supply	To power main circuit	T-40B
18	Connection line	To connect generator, dump loader & batteries & brake (not employed yet)	UK6N(800V57A)
19	Connection line	To connect brake (2 pieces not employed yet)	UK6N(800V57A)
20	Connection line with fuse	To connect yawing motor(DC motor) and electrical supply	250V5A
21	Aviation plug (3 pieces)	To connect with PC, anti-twist & temperature sensor, anemoscope & dogvane	

The controller will be powered by battery bank (off-grid system) or public mains (on-grid system). Under operation, the power generated by wind generator will go through the rectifying bridge to be rectified, and then will pass the circuit board to charge battery bank (off-grid system) or feed up the on-grid inverter (on-grid system). There are automatic or manual modes available. Under automatic mode, when the wind speed reaches or exceeds the startup set wind speed, the wind turbine generator will trace wind direction automatically. Provided that wind direction



changes, the circuit board will control the contactor pickup, together with the clockwise and anticlockwise rotations according to the data sent back by the dogvane and anemoscope in order to make sure the wind generator will face the wind once again.

There are manifold protection decisive conditions in the controller to make sure the wind generator keep facing wind and operating when the voltage, wind speed, current, temperature or electric supply (on-grid system) are under normal operational range. If one or several parameters are not under normal operational range, the controller will adopt the relevant protection steps according to the concrete instances:

- a. Yawing 45°;
- b. Yawing 90°;
- c. Yawing 90° & brake;
- d. Yawing 90°, brake and dump load;

Wind turbine can be guaranteed under safe operation through several determinations by compound condition. Provided that the anemoscope or dogvane is broken, the controller can detect it and it can be showed on the controller screen. Moreover, there is anti-twisted function of cables. Once the cables are revolved around one direction more than two circles, the system will automatically turn in reverse direction two circles in order to make the cables free from being twisted.

When it is set on manual mode, the wind generator cannot trace wind direction automatically. Nor stop working automatically. It is not recommended to choose the manual operational mode until there is something wrong with the system, which requires debugging and maintenance etc.

Please connect the various cables according to the diagram shown on connection line. The



controller will operate under auto-mode without any other setting when the controller is powered.

3. Panel & operational specification



Serial No.	Name	Function	Remarks
1	LCD	To display the operation states of wind speed, voltage & current	
2	Plus key	Not employed yet	
3	Minus key	Not employed yet	
4	Left key	Left yawing	Only be effective under manual mode
5	Upper key	To switch the screen display	
6	Right key	Right yawing	Only be effective under manual mode
7	Bottom key	To switch the manual or automatic	



		operational mode	
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Note: According to the difference in version, the control panel can be installed directly on main controller or be adopted a separated outer controlling box. The controlling box will be connected with communication interface of controller through data line.

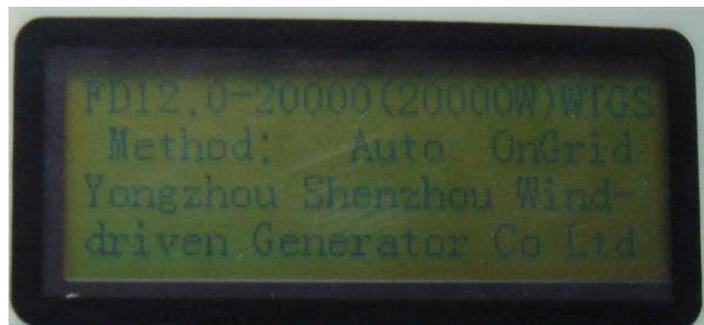


4. Screen display

4.1 First screen on view



Written in Chinese



Written in English

Displayed contents: WTGS model, power, operational mode (manual/auto), on-grid or not and company name.

4.2 Second screen on view



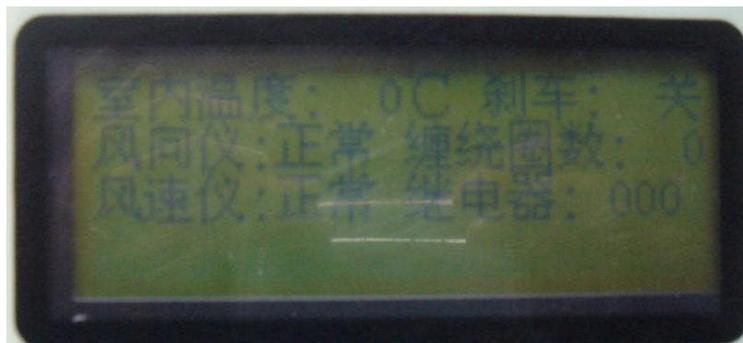
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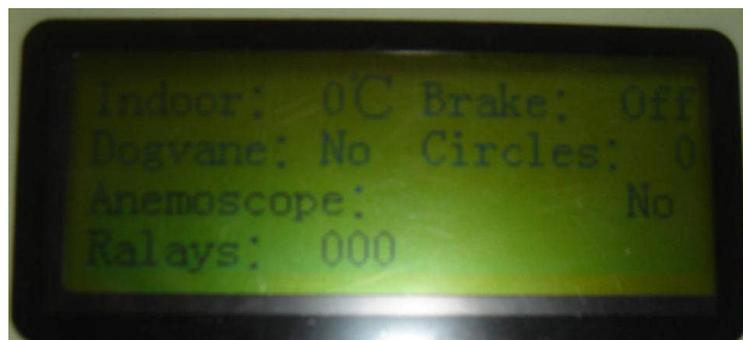
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Displayed contents: output DC voltage, output DC current, generator RPM, generator temperature, wind speed, electric supply available or not, operational mode, and generator angle in the wind.

4.3 Third screen on view



Written in Chinese



Written in English

Displayed contents: temperature indoors, brake state (on/off), dogvane state, cycle of twisting cable, anemoscope state, and relay state.



5. Parameter table

5.1 Different operation states under different conditions where off-grid system operates when in off-grid system or electric supply available.

Factors & operational state			Controller model			
			FDC3K-I	FDC5K-I	FDC10K-I	FDC20K-I
In the wind normally	Voltage (V)	Off-grid	< 280			< 420
		On-grid	≤280			< 420
	Current (A)		≤40	≤40	≤40	≤40
	Wind speed (m/s)		3~13			
	Temperature (°C)		< 85			
Yawing 45°	Voltage (V)	280~290	420~430			
		280~290	420~430			
	Current (A)		> 40	> 40	> 40	> 40
	Wind speed (m/s)		13~18			
	Temperature (°C)		< 85			
Yawing 90°	Voltage (V)	290~295	430~440			
		290~295	430~440			
	Current (A)		> 40	> 40	> 40	> 40
	Wind speed (m/s)		18~20			
	Temperature (°C)		85~90			
Yawing 90° & brake	Voltage (V)	295~300	440~450			
		295~300	440~450			
	Current (A)		> 40	> 40	> 40	> 40
	Wind speed (m/s)		> 20			
	Temperature (°C)		> 90			
Yawing 90°, brake & dump loading	Voltage (V)	> 300	> 450			
		> 300	> 450			
	Current (A)		> 40	> 40	> 40	> 40
	Wind speed (m/s)		> 20			
	Temperature (°C)		> 90			

Note: Under on-grid state, supposed that the public mains fail, the generator will yaw 90° immediately. The other check and protected conditions will be the same as those under public main available state.



5.2 Other parameters

Model	FDC3K-I	FDC5K-I	FDC10K-I	FDC20K-I
Dump loader power (W)	5000	8000	15000	30000
Controller size (mm)	800*600*180			
Dump loader size (mm)	840*600*200			
Controller weight (kg)	27kg			30kg
Dump loader weight (kg)	24kg	28kg	33kg	33kg



6. Connection line

There are no differences between off-grid and on-grid controller in hardware, so the connection lines for off-grid and on-grid controllers are the same as followed:



Please mark the various interfaces as 1~17 from left (the marking is done by the end users in order to describe the users' manual more conveniently and it do not represent that there are such marks on the controller). And then follow the below connection method (no need to tell the difference between positive and negative if there are no special indications)

- 1、 2、 3 : Connect with output cable of WTG;
- 4、 5、 6 : Connect with dump loader;
- 7、 8 : Connect batteries, 7 Connect with positive electrode, 8 Connect with negative electrode (exclusively to off-grid system);
- 9、 10 : not employed yet ;
- 11、 12 : Connect with yawing motor (DC motor) , 11 Connect with positive electrode , 12 Connect with negative electrode ;
- 13、 14 : Connect with public mains (exclusively to on-grid system) ;
- 15 : Connect with communication interface;
- 16 : Anti-twist & temperature interface;



17 : Anemoscope & dogvane interface;

Please refer to the following orders when connecting cables: Anemoscope with dogvane, anti-twisted and temperature cable → brake signal cable → dumper → battery bank and controller (off-grid system) or on-grid inverter (on-grid system) → public mains (on-grid system) → controlling signal cables (yawing motor cable) → generator → connecting inverter to battery bank (off-grid system).

Note 1, Pay attention to match the voltages for controller, on-grid inverter and public mains (110V or 220V) when connecting public mains for on-grid system.

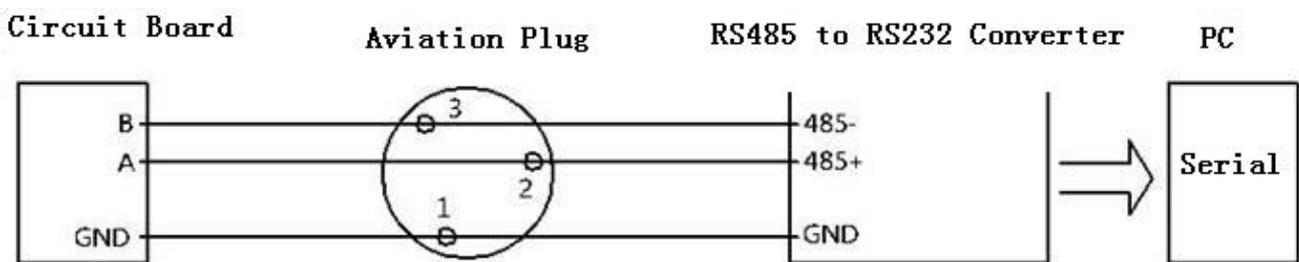
Note 2, The interfaces for anemoscope with dogvane, anti-twisted and temperature are all four-core aviation plug interfaces. In order to avoid any mistake, we mark No. 1 as the interface for anemoscope with dogvane, No. 2 for anti-twisted and temperature. The matched cables are all eight-core double interfaces with marks No.1 and No.2 for the plug also. Connect the ones with the same mark.



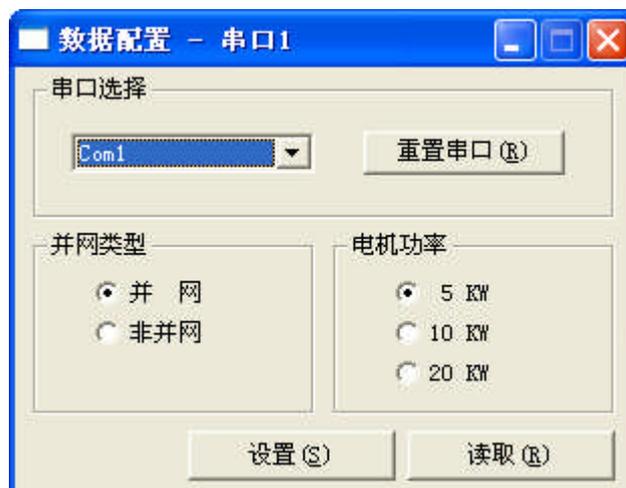
7. Software employment specification

There is RS485 communication interface on the controller. It can be connected with the PC serial and can achieve the communication with PC by transiting line. There are three matched software, namely, data collocation, parameter setup and controller monitor.

The data line is three-core. The line definition and connecting method can be referred to as following:



7.1 Data collocation software



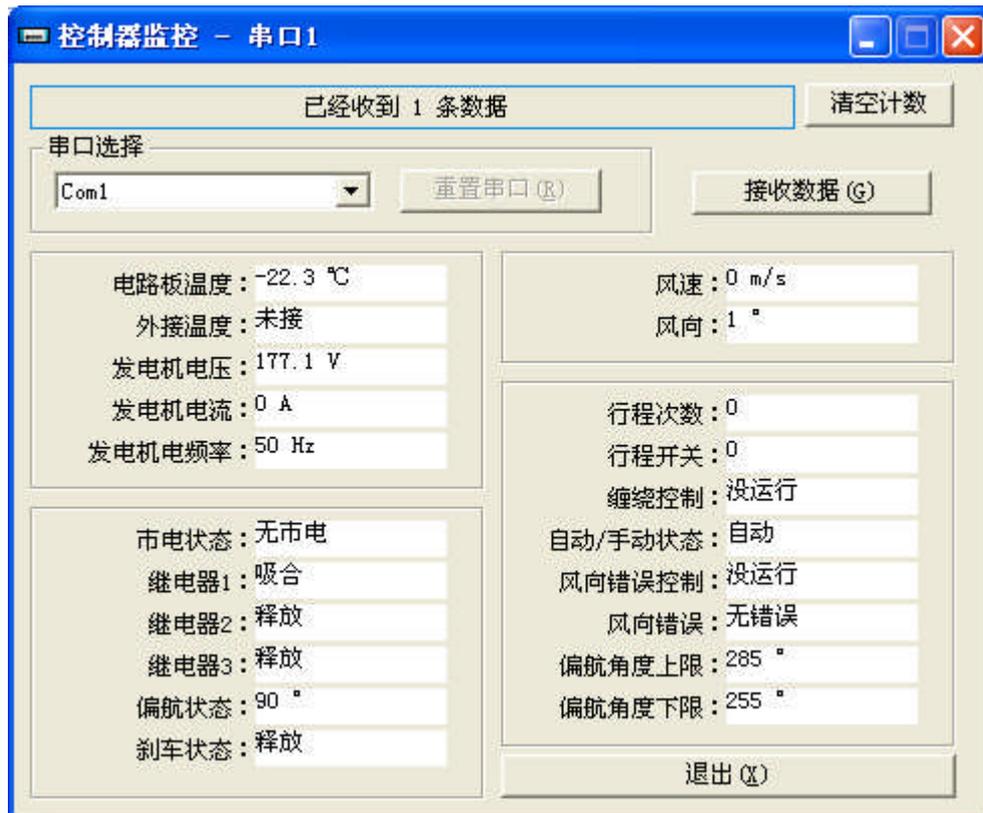
The software is aimed at setting controller model and whether it is on-grid or not. First, please connect the controller with PC by data line, and then operate the software. After choosing the serial (usually as **Com 1**), **on-grid type**, and **Generator Power** together with pressing the button of **Setting**, the information can be written into the controller.

7.2 Parameter setup parameter



The software is aimed at setting the operational parameter for controller. First, please choose the serial. It is usually **Com1**. Press button marking **Read** and the relevant parameters of current controller can be received. Please consult the technicians from SWG first before setting other parameters excluding that the setting for on-grid type can be chosen by end users. **The end users will be excluded from the free maintenance service if there is any generator or controller problem caused by changing the parameters at random by end users without consulting SWG.** Press the button marking **Parameter Input** after succeeding in setting the parameters; the software will input the new parameters into the controller. When the Prompt box marking **Input Data Succeeds** is showed, it means that the input data operation is successful. At this moment, please cut off the power supply for controller and then re-power the controller, the system will be operated under new parameters.

7.3 Controller monitor software



The soft is aimed at monitoring the operational state of controller. First, choose the serial.

The serial is usually **Com1**. Please press the button marking **Received Data**, all the data on the current controller can be received.



8. Malfunction elimination

8.1 Wind turbine generator cannot trace wind direction automatically

- 1) To check whether the setting state on controller panel has been set on auto state; The wind turbine generator will not trace the wind direction automatically when under manual state.
- 2) Provided that the generator cannot trace the wind direction even under automatic mode, the reason can be that the wind speed is too low. Make sure the wind speed will exceed 3m/s and stay 30 seconds above, and then the generator can trace wind direction and change the windward angle;
- 3) Check whether the anemoscope or dogvane is broken. If so, it will be displayed on the controller screen.

8.2 Wind turbine generator yaws towards one direction all the time

The phenomenon is always caused by wrongly connecting the positive and negative electrodes of yawing motor (DC Motor). Please switch the two wires on the controller.