NP-6310UPS user manual

2.1.1

2022-11-24

Distribution list:

Name/ Group	Company
EA	NODKA

Reviews/Approvals:

	Name / Function / Company	Signature
Author:	EA	
Reviewed by:		

History:

Version	Date	Anthor	Description
2.0.0	2022-1-16	EA	First release
2.1.0	2022-10-12	EA	Add user testing tools and SDK

Table of Contents:

1. Introduction

This chapter provides necessary information of the product such as the features and manuals before actual use.

1.1 Releated Manuals

The manuals releated to the product are listed below, please read them as necessary along with this document before acutual use.

Name	Purpose	Contents	How to get
User manual	Must read when operating the product.	Descrbes the hardware features and settings	Download from Nodka website.
SDK user manual	Must read when developing the IO functions	Describes the API functions and useage	Download from Nodka website.

1.2 Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources. Undersand the meanings of these symbols to operate the equipment safely.

Symbol	Description
	**WARNING** WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	**DANGER** DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
	**NOTE** NOTE provide the reader with additional information or refer to detailed sources of information.

1.3 Terminology

- DC_IN ： the DC power input of the UPS.
- DC_OUT： the DC power output of the UPS.
- SOC： Status Of Charging.
- PMS： Power Management System.
- UPS: Uninterruptible Power Supply.
- NP-6310： the name of the Nodka UPS box.
- DC_OK： the status of the main supply input.
- Bat.Start： Battery Start, digital input to be used to force the DC output.
- Bat.Mode: Battery Mode, digital output to indicates supercapacitor supply.
- Bat.Ready：Battery Ready, digital output to indicates that the supercapacitor is charged successfully.
- Dev.Psts： Device Power Status, digital output to indicates the power status of the load device.
- SW： Remote switch on/off output.
- SVout： Signal Voltage output, is used to provide DC24V for the IO.
- SGnd： Signal Ground, is used to provide GND for the IO.

1.4 Product Description

Nodka NP-6310 is a standalone UPS module that can protect your PC in case of power outage, the module is composed of four supercapacitors and intelligent power management system, can offer supply power to the back-end system reliably and manage the boot and shutdown automatically by the serial port or IO signals connected to prevent the data loss during the power outage, meanwhile, the module provide properties to be configurable, thanks to the supercapacitors, It can operate in harsh environment from -20 to 65℃ and have extremely high durability lasting over 10 years.

- DC12V/24V voltage input
  - Configurable backup mode and power output
- Safe, efficient and environmentally friendly
  - Up to 10 years service life with high conversion efficiency, environmentally friendly, safe and long backup time characteristics.
- Real Time monitoring
  - The equipment or computer can be monitored in real time by RS232 or USB device, configurable power management strategy, as well as remote switcher by DIO setting
- Wide operating temperature
  - Industrial grade components to make sure operating under -20 to 60 degrees Celsius

Target to be easily test the UPS box, Nodka provides the tool to test its functionality. A brief description on the usage will be introduced in this document.
Meanwhile, the UPS module also supports the Modbus RTU protocol which will be very convenient for the users to develop their own UPS manager application or to do the integeration into their own application. The protocol and Modbus registers will be introduced in this document.

Mode	Power	Mounting mode	Data interface	Notes
NP-6310-A	DC12/24V	Wall-Mounted	Modbus RTU	
NP-6310-A-R	DC12/24V	Din-Rail	Modbus RTU	

2. About Product

This chapter describes product component and their functions, pin assignment of each connector in detail.

2.1 NP-6310

The NP-6310 is an energy storage power device. The input voltage is DC12V±5% or DC24V±5%, and the output voltage is DC12V or DC24V. Please remind that the device may be damaged if the power supply does not meet its specifications.

2.1.1 **Features**

- Industrial supercapacitor energy storage devices and intelligent power management system;
- Real-time monitoring of DC_IN status;
- Multiple I/O interfaces;
- Power input protection of overvoltage and polarity inverse;
- Output short circuit and overcurrent protection;
- Modbus RTU communication protocol;

2.1.2 **Specifications**

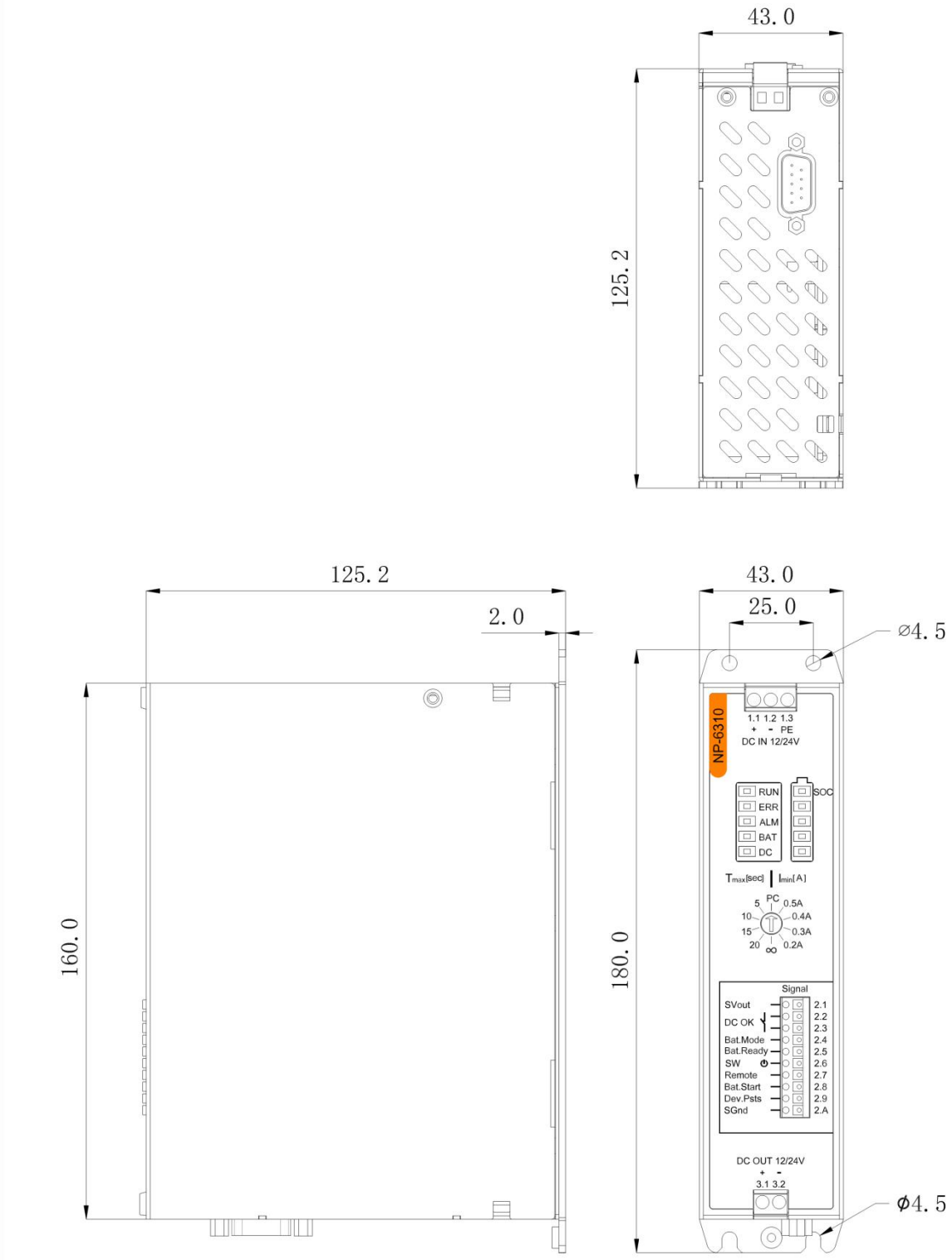
Parameter Type		NP-6310-A
DC_IN	Voltage	DC12V / DC24V
	Current	12A
	Protection	Overvoltage and power anti-reverse connection protection, EFT ±1500V , electrical surge DC2000V
DC_OUT	Voltage	12V / 24V
	Current	9A
	Protection	Overcurrent
Electrical parameters	Power In Idle	3W
	Maximum Power	60W/12V, 120W/24V
	Maximum charging current	3A
Supercapacitor	Capacitance	1080 Ws
	Active life	The charge and discharge times are up to 500,000
IO	IO voltage	DC24V
	Isolation mode	Optocoupler
	Isolation voltage	3.75kV
Signal type	Power	DI/DO dc-dc isolated power VCC, DC24V, 40mA.
	DC OK	Relay Normal Open output
	Bat.Mode	NPN output
	Bat.Ready	NPN output
	SW	NPN output
	Remote	NPN input
	Bat.Start	NPN input
	Dev.Psts	NPN input
Data interface	Interface	DB9
	Mode	RS232 / RS485
	Protocol	Modbus RTU

	Parameters	Can be set via register 40003, default baud rate 115200bps,8-bit data bit,1-bit stop bit, no parity
	Modbus slave address	The address can be set via register 40004, default is 1
Environmental parameters	Working temperature	-20ºC ~ 60ºC
	Storage temperature	-40ºC ~ 80ºC
	Operating humidity	5~95%
Mounting	Mode	Wall-Mounted or Din-Rail
	Dimensions	180.0(mm) × 43.0(mm) × 125.2(mm)
	Weight	850(g)

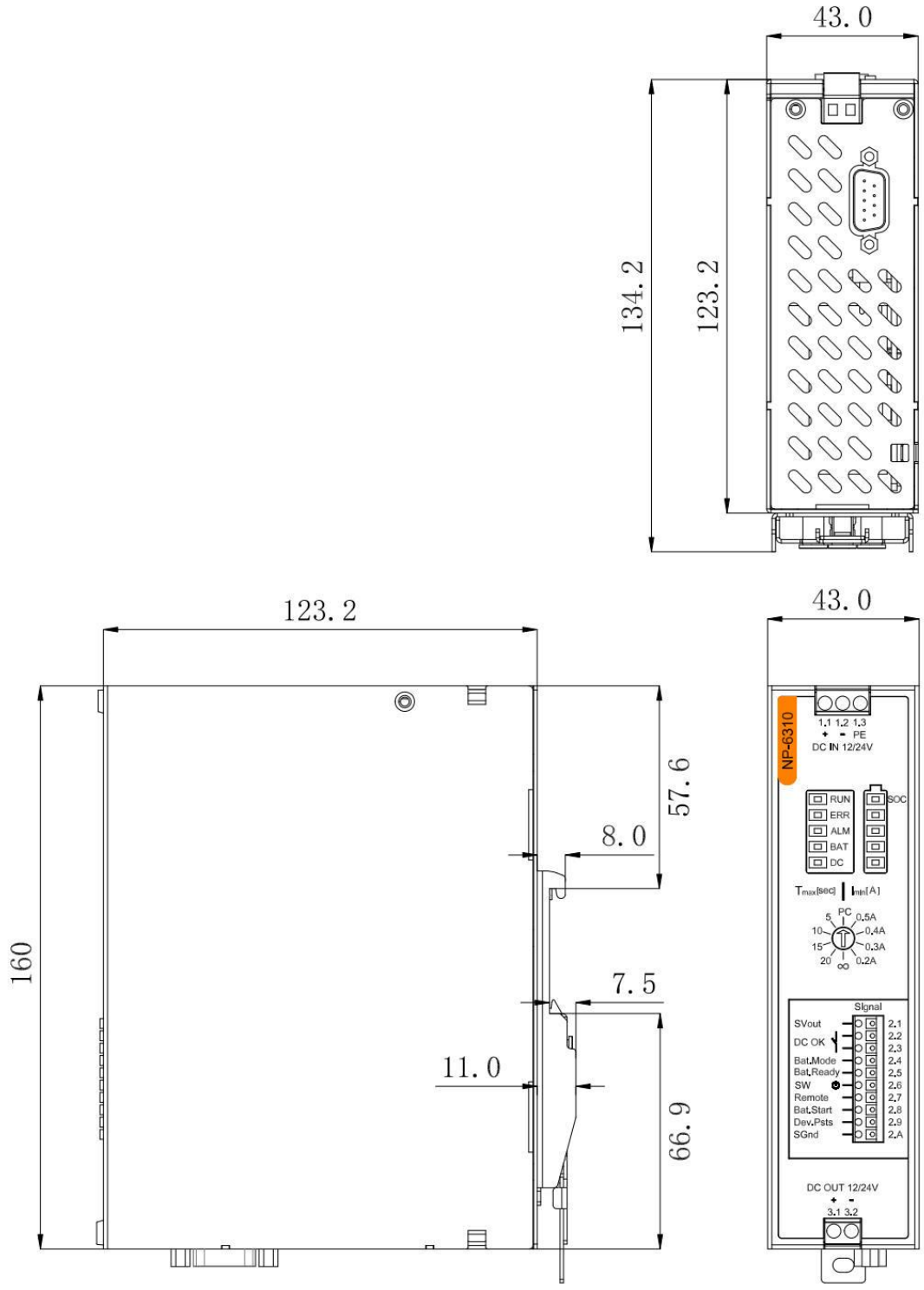
2.1.3 Dimension

Unit: mm

2.1.3.1 Wall-mounted

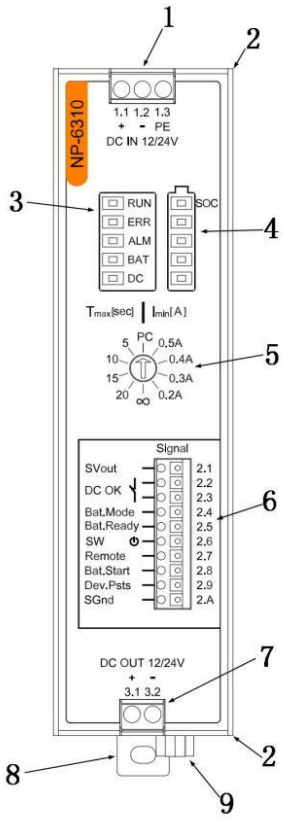


2.1.3.2 Din-Rail



2.1.4 **Device interfaces**

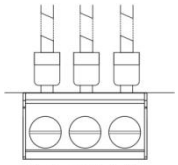
The DC input and output terminal blocks on the front of the UPS feature screw connection technology. The signal level wiring is connected via tool-free Push-in connection technology. The UPS also provides leds showing the working status and battery charging status.



No.	Description	Remarks
1	DC_IN terminal	
3	Working status leds	
4	Status leds of the Charging	
5	Working mode rotary switch	
6	Signal terminal	
7	DC_OUT terminal	
9	Serial communication terminal	

2.1.4.1 DC input terminal blocks

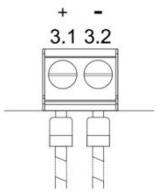
The UPS is primarily supplied by a current-limiting source with a 24VDC or 12VDC voltage. The UPS is connected on the primary side via the DC IN connection terminal blocks.

Port pin	Marking	Description	Example
1.1	+	VCC	 1.1 1.2 1.3 + - PE
1.2	-	GND	
1.3	PE	Protecting Earthing	

1. UPS only supports DC12V ± 5% or DC24V ± 5% power supply. Using power supply that does not meet the specifications will cause equipment damage.
2. To dimension the power supply correctly, you must first determine the total current consumption of the system being supplied. The total current consumption is made up of the maximum load current and the maximum battery charging current.
3. When there are requirements for anti EMC, it is necessary to ensure good grounding, and install a filter before the power input.

2.1.4.2 DC output terminal blocks

The UPS provides two pins of the screw terminal to be used to connect the load device. The output voltage of the DC output is the same as the DC input. In the event of a malfunction of the upstream power supply, the load is supplied with the energy stored in the supercapacitor.

Port pin	Marking	Description	Example
3.1	+	DC_OUT VCC	
3.2	-	DC_OUT GND	

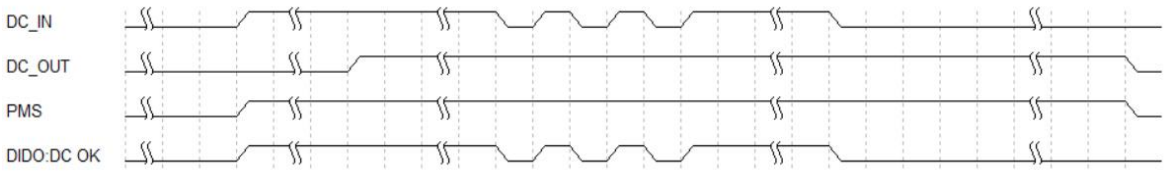
2.1.4.3 Signal terminal blocks

The connection terminal block signals are divided into the following signals for controlling and signaling the operating states of the UPS.

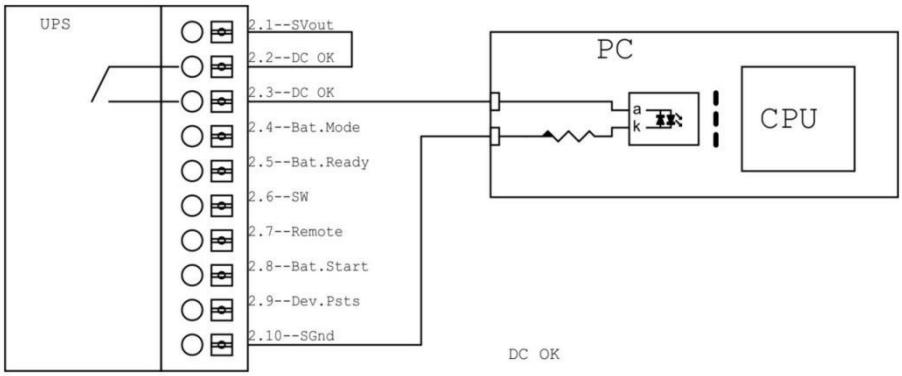
Marking		Description
Port pin	Function	
2.1	SVout	Continuous +24 V signal voltage, e. g. to supply the floating switch contact. The signal voltage is available during mains and battery-powered operation. DC24V,Imax: 40mA.
2.2-2.3	DC OK	Relay normally open output, is is close when DC_IN is connected, otherwise is open.
2.4	Bat.Mode	NPN output, on when the supercapacitor is supplied, otherwise is off.
2.5	Bat.Ready	NPN output, on when the supercapacitor is charged full, else is off.
2.6	SW	NPN output, in the discharge state, when the power level is lower than the power off threshold, it will be switched on once. The turn-on hold time value is set in the 40013 register.
2.7	Remote	NPN input, When DC_IN is disconnected, and remote signal is valid, DC_OUT stops output immediately.
2.8	Bat.Start	NPN input, force the supercapacitor supply output when the DC IN is disconnected.
2.9	Dev.Psts	NPN input, indicates the power on status of the load.
2.A	SGnd	The signal ground SGnd , which is the reference potential for the signal voltage 24V DC. SGnd is also the reference potential for signal outputs and signal inputs.

- DC_OK

The DC_OK signal is the output of the normally open relay. When the DC_IN input is valid, its state is Close, and when DC_IN is disconnected, its state is Open.The reference timing diagram is shown as below. In the figure, the high level state means the DC OK contact is closed with signal output, while the low level state means the DC OK contact is open with no signal output.

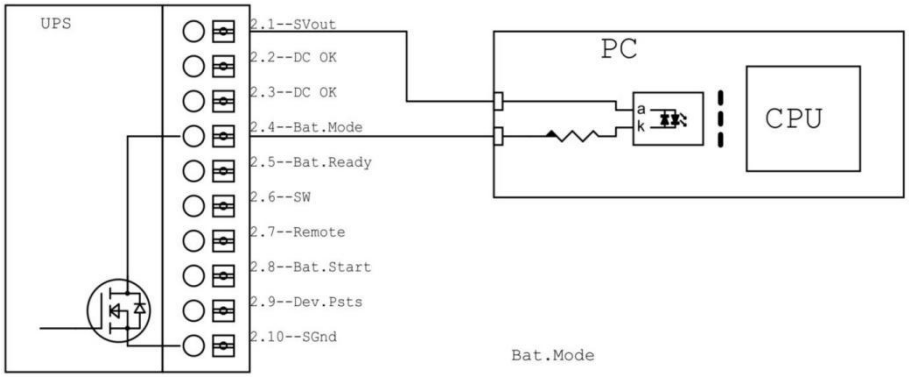


The equivalent circuit is as follows:



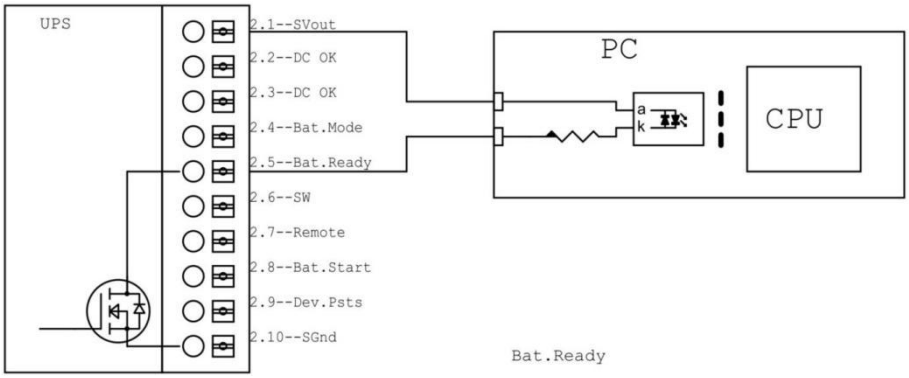
- Bat.Mode

The Bat.Mode signal indicates whether internal supercapacitor power is used. It is an NPN output signal. When Supercapacitor power is used, the Bat.Mode signal is connected to SGnd.
The equivalent circuit is as follows:



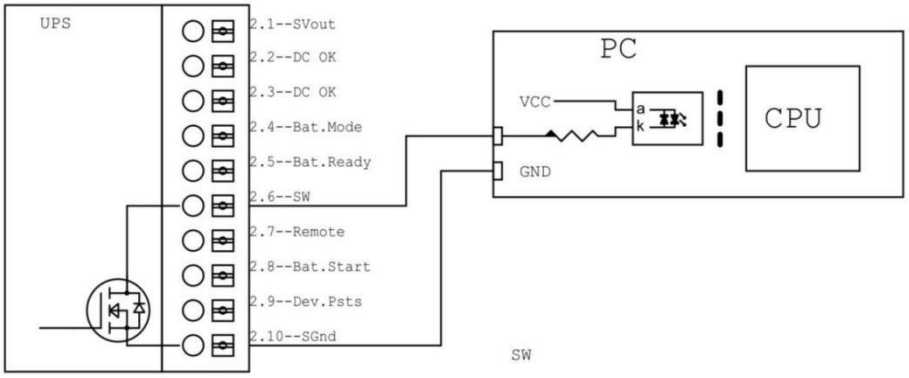
- Bat.Ready

The Bat.Ready signal is an NPN output signal. When the supercapacitor is fully charged, the Bat.Ready signal is output and connected with SGnd.
The equivalent circuit is as follows:

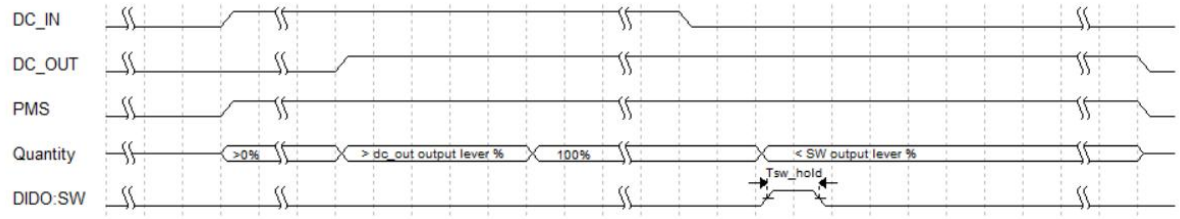


- SW

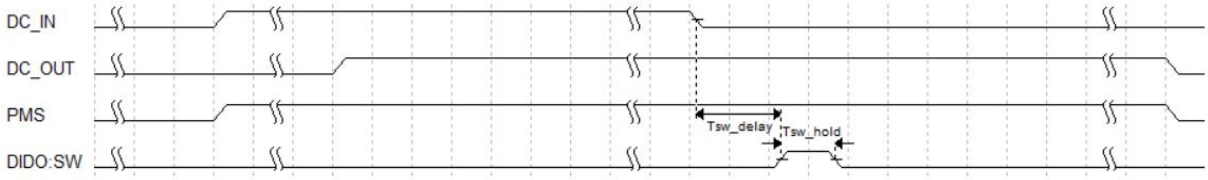
When the powered device has a remote switch interface, the SW signal is used to connect to the remote switch interface of the powered device to simulate the function of pressing power button. This signal is an NPN output signal. When there is a SW signal output, it is connected to SGnd, otherwise it is in the opened state.
The equivalent circuit is as follows:



When the NP-6310 works in the load current monitoring mode, if the load current is lower than the set threshold (set by the rotary switch), the SW will output a pulse signal, whose pulse width time_h can be set by Modbus register 40013.

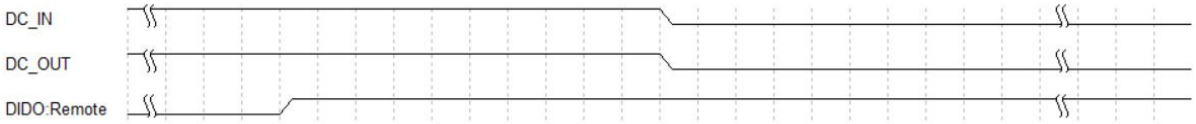


When the NP-6310 works in the mode of time limited mode, if the DC_IN power off, start the timeout timer (timing time time_d can be set through the rotary switch), if the timer times out, SW will output a pulse signal, the pulse width time time_h can be set through the Modbus register 40013.



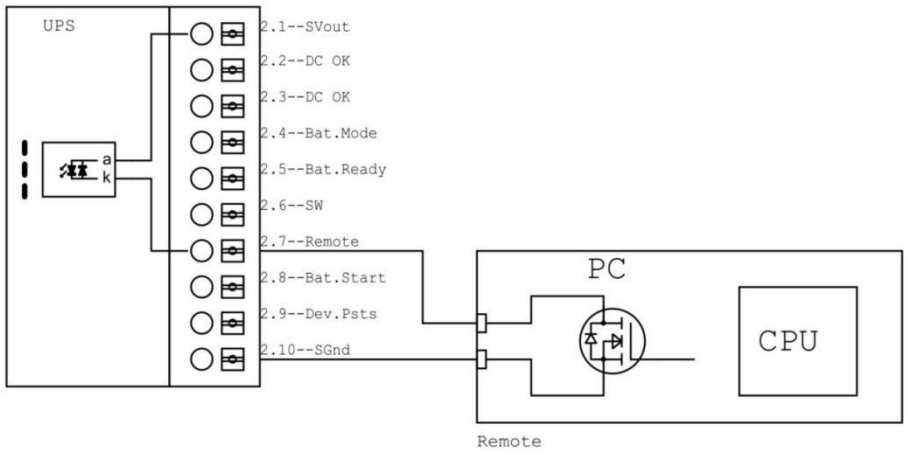
- Remote

The Remote signal is an NPN input circuit used to control the UPS from stopping power output. When the Remote signal is valid and the DC_IN is disconnected, the DC_OUT of the NP-6310 UPS stops output immediately.



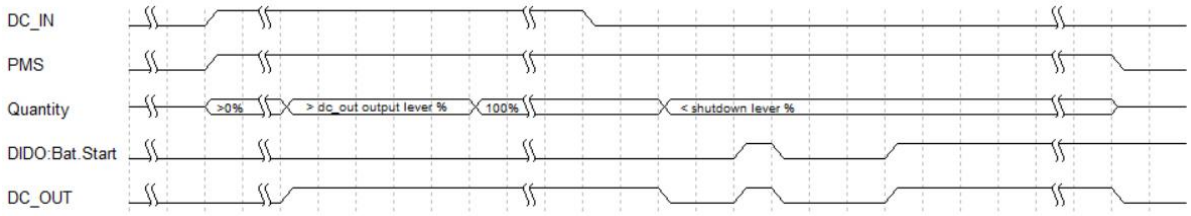
If the NP-6310 UPS is in discharge state, the DC_OUT stops output immediately when the Remote signal is effective.

The equivalent circuit is as follows:

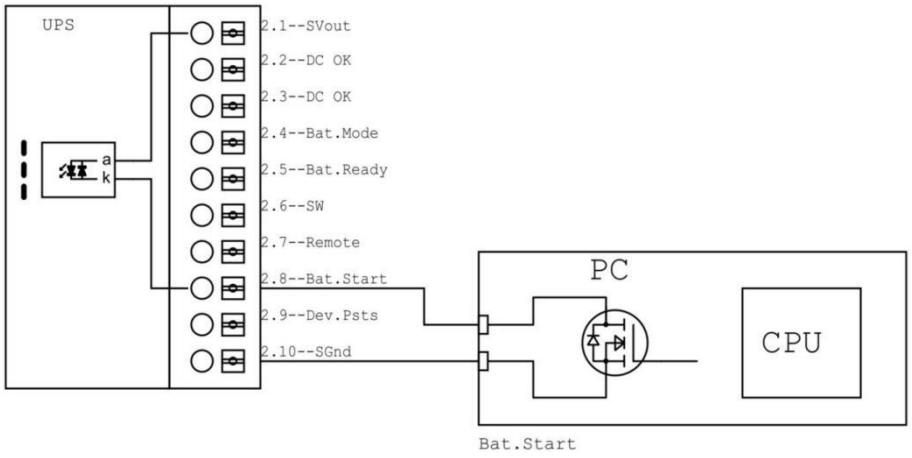


■ Bat.Start

The Bat.Start signal is used to force the internal supercapacitor to power output. When DC_IN is disconnected, if Bat.Start is valid, the internal supercapacitor DC_OUT output is used.

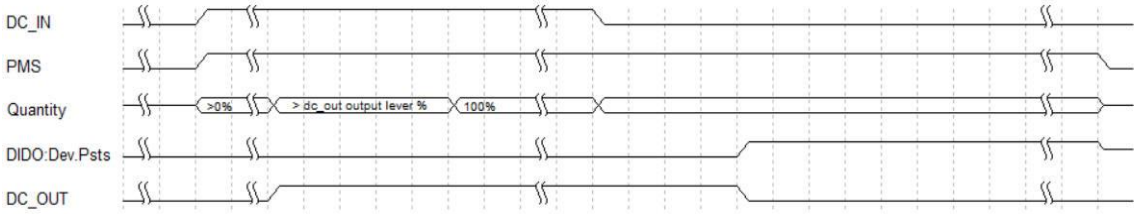


This signal is the NPN input circuit, the input signal internal common anodic processing,The equivalent circuit is as follows:

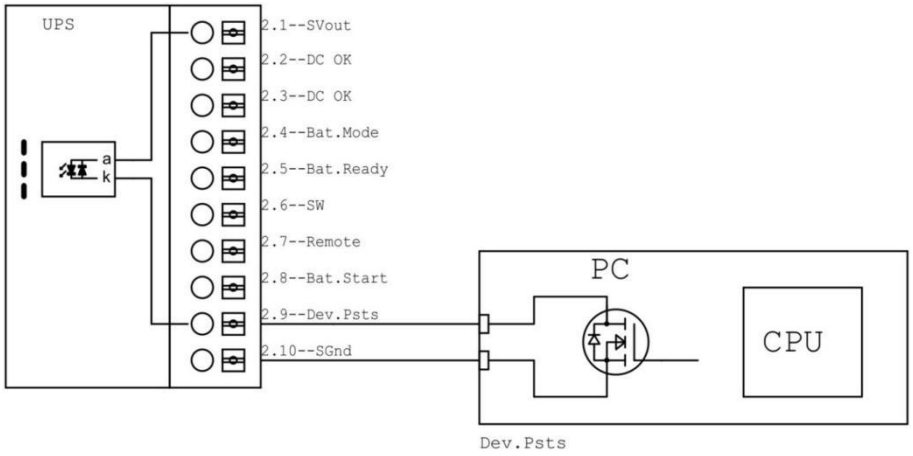


■ Dev.Psts

The Dev.Psts signal is used to receive the power status signal of the load device so that the UPS can determine whether the current powered device is shut down and stop power output. The polarity of its change can be set through the Modbus register 40008.

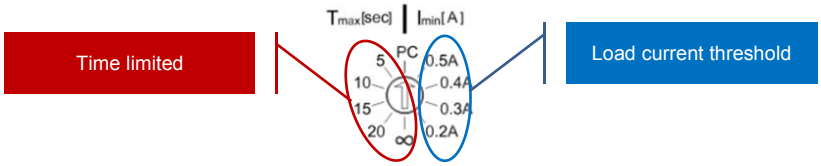


This signal is the NPN input circuit, the input signal internal common anodic processing,The equivalent circuit is as follows:



2.1.4.4 Rotary selector switch

The UPS can also be used without serial communication, the behavior can be set via the 10-stage rotary selector switch T_{max}[Sec.] or I_{min}[mA] on the front of the UPS device. Depending on the application in your system, select between time-limited or load current threshold operation.



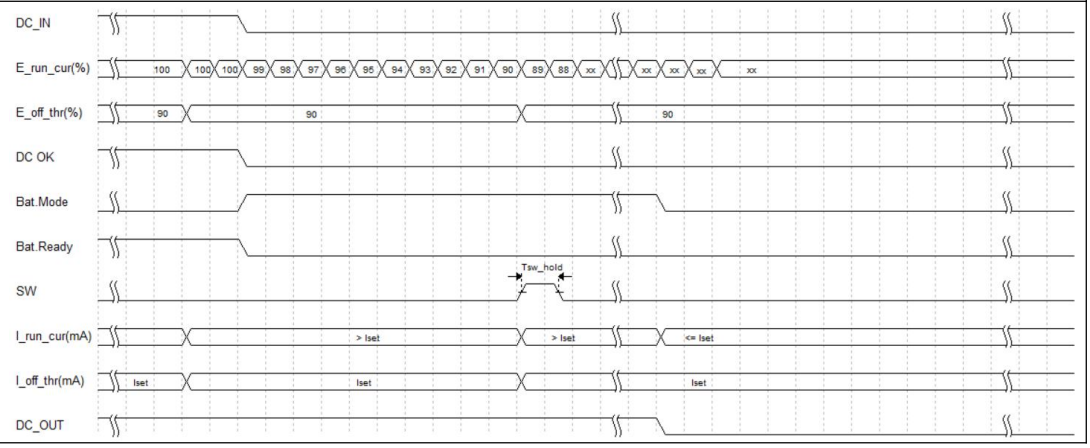
- Current threshold mode is used by the UPS to determine whether the load device is normally shut down.
- Time limited mode is used to set the UPS duration after DC_IN is disconnected. If the time exceeds this value, DC_OUT output is stopped.
- PC mode is used to set the customized logic by changing the registers value.

Type	Marking	Description
Customize	PC	User-defined control mode. The UPS control logic is defined by setting the control mode, shutdown logic, shutdown threshold, SW pulse width and other information in the according Modbus registers.
Current threshold	0.5A	When the DC_IN is disconnected, the Supercapacitors power is lower than the preset shutdown power threshold (95% by default, which can be modified through the register 40015), and the UPS outputs the SW signal. When the load current is less than or equal to 0.5A, the UPS shuts down and stop the DC_OUT output.
	0.4A	When the DC_IN is disconnected, the Supercapacitors power is lower than the preset shutdown power threshold (95% by default, which can be modified through the register 40015), and the UPS outputs the SW signal. When the load current is less than or equal to 0.4A, the UPS shuts down and stop the DC_OUT output.
	0.3A	When the DC_IN is disconnected, the Supercapacitors power is lower than the preset shutdown power threshold (95% by default, which can be modified through the register 40015), and the UPS outputs the SW signal. When the load current is less than or equal to 0.3A, the UPS shuts down and stop the DC_OUT output.
	0.2A	When the DC_IN is disconnected, the Supercapacitors power is lower than the preset shutdown power threshold (95% by default, which can be modified through the register 40015), and the UPS outputs the SW signal. When the load current is less than or equal to 0.2A, the UPS shuts down the DC_OUT output.
Time limited	5	After the DC_IN disconnection time reaches the set value 5S, SW signal will be output, and then DC_OUT output will be delayed to close (the default delay is 5S, which can be modified by register 40006).
	10	After the DC_IN disconnection time reaches the set value 10S, SW signal will be output, and then DC_OUT output will be delayed to close (the default delay is 10S, which can be modified by register 40006).
	15	After the DC_IN disconnection time reaches the set value 15S, SW signal will be output, and then DC_OUT output will be delayed to close (the default delay is 15S, which can be modified by register 40006).
	20	After the DC_IN disconnection time reaches the set value 20S, SW signal will be output, and then DC_OUT output will be delayed to close (the default delay is 20S, which can be modified by register 40006).
	∞	When the DC_IN is disconnected, stop the power output until the supercapacitor power is exhausted.

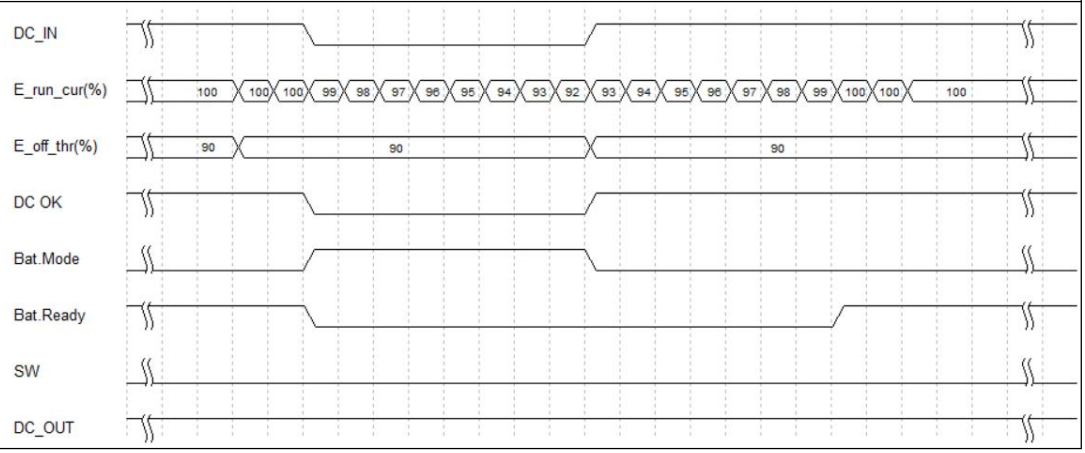
During the shutdown phase of load equipment, when the DC_IN power supply is energized again, different policies can be set via the modbus register 40014:

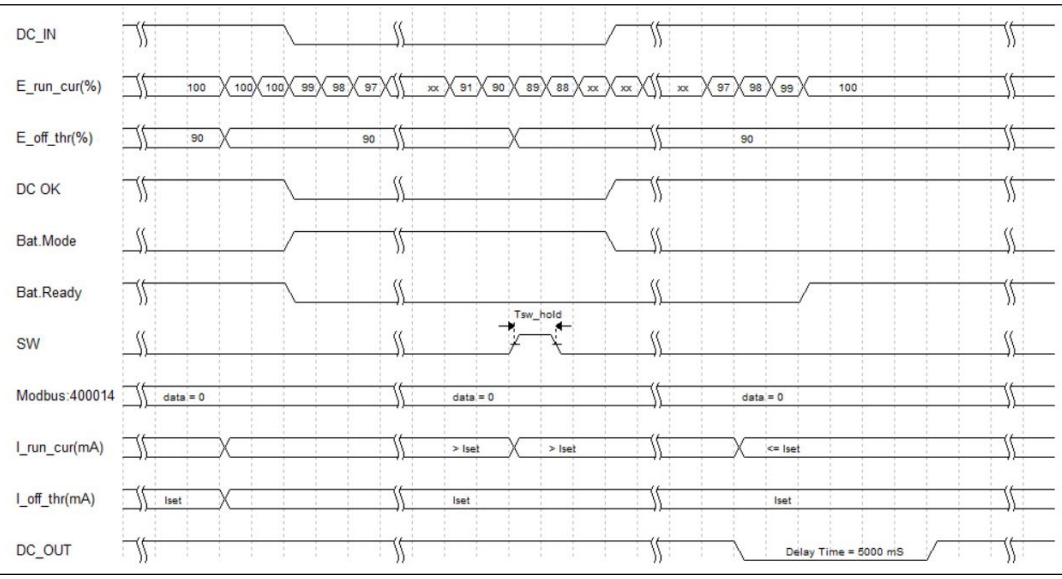
40014 register	Policy
0(default)	After the shutdown stage of the load device is complete, DC_OUT stops the power output, and then delays the power output again by 5 seconds.
1	Indicates that the policy has no operation. During the load shutdown process, DC_IN restores power supply and DC_OUT maintains output state.

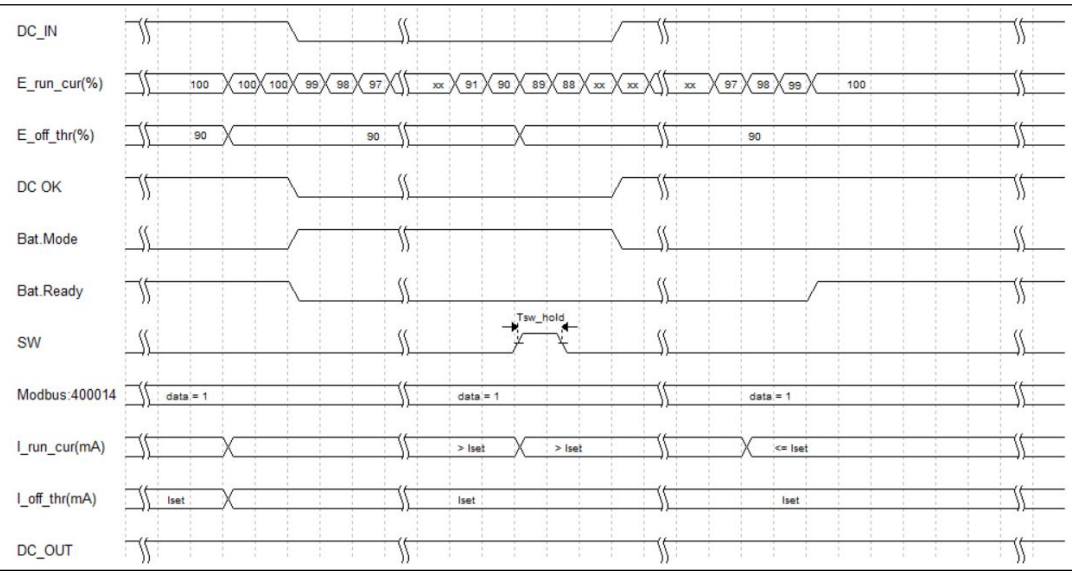
■ Current threshold is enabled

Case 1: After the DC_IN is powered off, the power supply is not restored before the device is shut down	
Coding switch	Current threshold mode
action	After the power off of DC_IN, UPS starts internal super capacitor for external power supply. When the supercapacitor current electricity is lower than the shutdown electricity threshold set in register 40010, the SW pulse signal is output.When the load running current is detected to be lower than the minimum load shutdown current threshold set in the coding switch, the DC_OUT power supply output is stopped. Abbreviation： E_run_cur：supercapacitor current running electricity E_off_thr：shutdown electricity threshold I_run_cur：load running current I_off_thr：load shutdown current threshold
Timing Diagram	

Case 2 : After the DC_IN powered off, power on again before the remaining supercapacitor capacity exceeds the threshold	
Coding switch	Current threshold mode
action	After DC_IN is powered off, UPS enables internal super capacitor to supply external power, and DC_IN recovers power supply before capacitor power is lower than shutdown threshold,UPS switches to supercapacitor charging mode, and keeps DC_OUT power supply, SW signal has no action. Abbreviation： E_run_cur：supercapacitor current running electricity

	E_off_thr：shutdown electricity threshold
Timing Diagram	

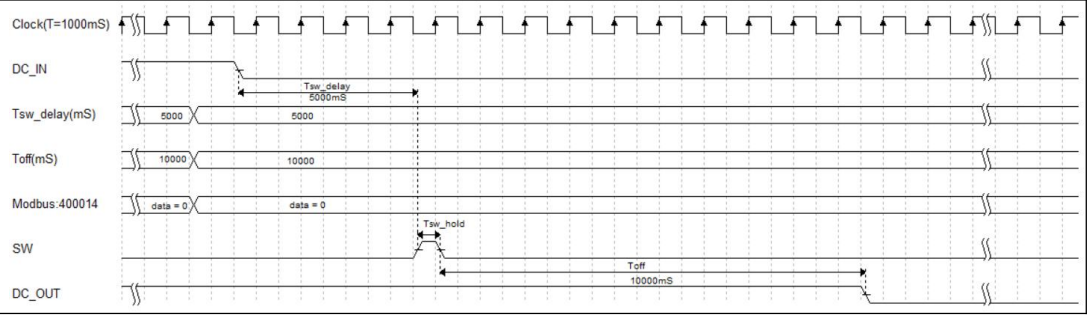
Case 3 ： After the DC_IN powered off, during the load device shutdown phase, the DC IN is powered on again (policy 0).	
Coding switch	Current threshold mode
40014	0
action	After the power off of DC_IN, UPS enables internal super capacitor for external power supply. When the capacitor power is lower than the set threshold, it outputs SW pulse. Before the load device finishes shutting down, DC_IN is powered up again, and the UPS switches to charging mode, but after the load device finishes shutting down, DC_OUT output is stopped, and DC_OUT output is started again after a delay of 5 seconds. Abbreviation： E_run_cur：supercapacitor current running electricity E_off_thr：shutdown electricity threshold I_run_cur：load running current I_off_thr：load shutdown current threshold
Timing Diagram	

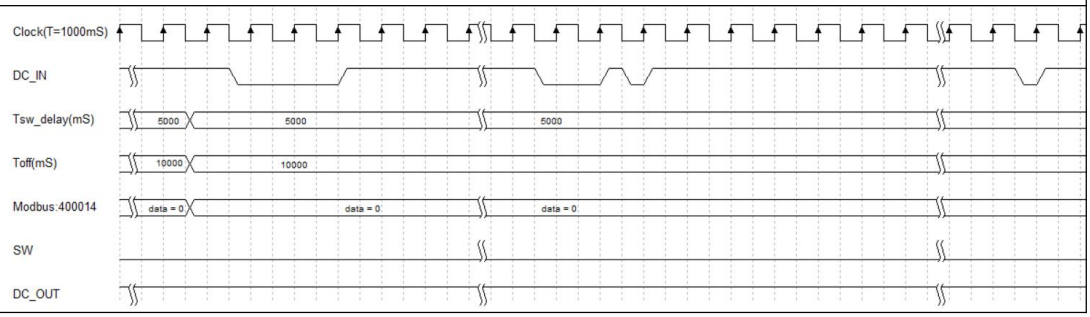
Case 4 ： After the DC_IN powered off, during the load device shutdown phase, the DC IN is powered on again (policy 1).	
Coding switch	Current threshold mode
40014	1
action	After the power off of DC_IN, UPS enables internal super capacitor for external power supply. When the capacitor power is lower than the set threshold, it outputs SW pulse. Before the load device finishes shutting down, DC_IN is powered up again, and the UPS switches to charging mode, DC_OUT output is maintained after the load device completes the shutdown. Abbreviation ： E_run_cur ：supercapacitor current running electricity E_off_thr ：shutdown electricity threshold I_run_cur ：load running current I_off_thr ：load shutdown current threshold
Timing Diagram	

■ Time limited is enabled

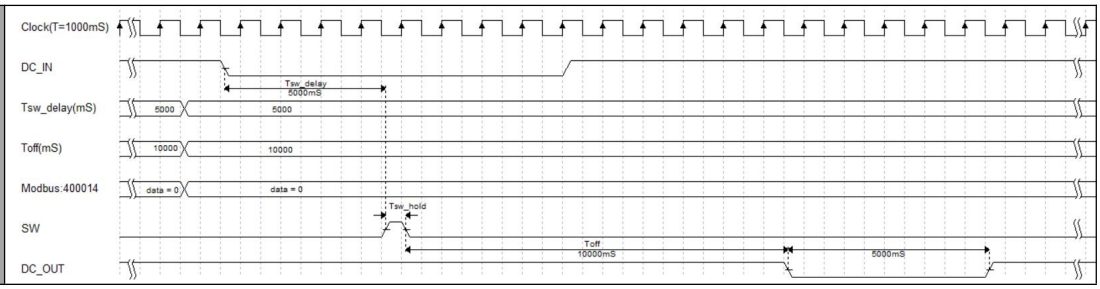
In time limted control mode, the total shutdown time is:
$T = t_{sw\_delay} + t_{sw\_hold} + t_{off}$

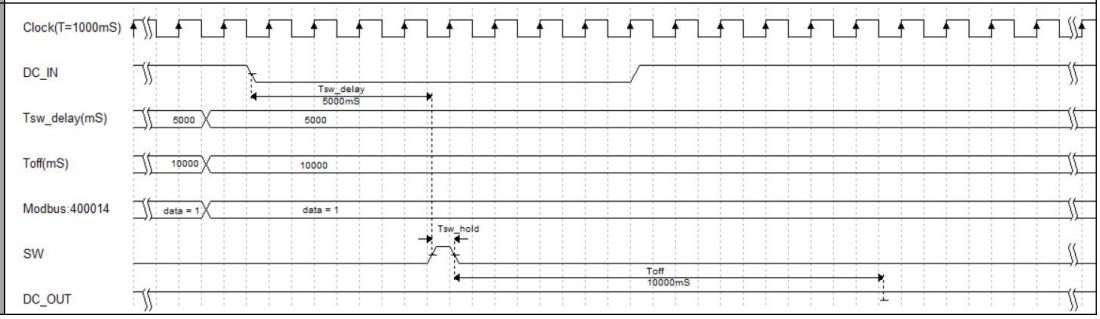
- T is the total shutdown time, that is, the time from DC_IN power down to DC_OUT stopping output, t_{sw_delay} is the time set by coding switch or register, t_{sw_hold} is the SW signal output holding time, t_{off} is the time from DC_IN power down to start output SW signal.
- t_{sw_delay}, when adjusted by the coding switch, the t_{sw_delay} value corresponds to the value indicated by the coding switch; When the PC mode is set to time control mode, the default is 5000mS, which can be modified by modbus 40006 register.
- t_{sw_hold}, default is 500mS and can be changed via Modbus register 40013.
- t_{off}, default is 5000mS and can be changed via Modbus register 40011.

Case 5 : After the DC_IN powered off, the power supply is not restored before the device is shut down	
Coding switch	Time limited mode
action	After the power off of DC_IN, the UPS will start the supercapacitor to supply external power. When the power supply time exceeds the set time, the SW pulse signal will be output, and the DC_OUT power supply will be stopped after a period of time.
Timing Diagram	

Case 6 : After the power off of DC_IN, the UPS starts the supercapacitor to supply external power, and the power supply time does not exceed the set time	
Coding switch	Time limited mode
action	After the power off of DC_IN, the UPS starts the supercapacitor to supply external power, and the power supply time does not exceed the set time, SW signal does not act, DC_OUT will supply power continuously.
Timing Diagram	

Case 7 : After the DC_IN powered off, during the load device shutdown phase, the DC IN is powered on again (policy 0).	
Coding switch	Time mode
40014	0
action	After the DC_IN is powered off, the UPS enables the internal super capacitor to supply external power, and when the power supply time exceeds the time set by the coding switch, the SW pulse is output,before the UPS stops DC_OUT output, DC_IN is powered on again, and the UPS switches to charging mode, but after the timing time for stopping DC_OUT output is reached, the port output 5S outputs DC_OUT again.

Timing Diagram	

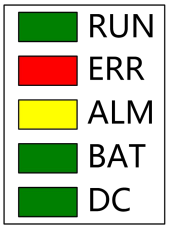
Contextual8：After the DC_IN powered off, during the load device shutdown phase, the DC IN is powered on again (policy 1).	
Coding switch	Time mode
40014	1
action	After the DC_IN is powered off, the UPS enables the internal super capacitor to supply external power, and when the power supply time exceeds the time set by the coding switch, the SW pulse is output,before the UPS stops DC_OUT output, DC_IN is powered on again, and the UPS switches to charging mode, but after the timing time to stop DC_OUT output is reached, DC_OUT keeps output.
Sequential logic	

When the coding switch points to the PC file, the user can customize the supercapacitor life or turn off the device to detect the minimum current through Modbus registers 40005, 40006, 40007.

coding switch	Mode	40005	40006	40007	Function
PC	Time limited	1	t_{sw_delay}	invalid	The same effect as the time mode of the coding switch
	Current threshold	2	Invalid	$I_{min\_threshold}$	The same effect as the current mode of the coding switch

2.1.4.5 UPS working status LED

The front panel of NP-6310 provides five working status leds, which respectively represent the status of RUN, ERR, ALM, BAT and DC.



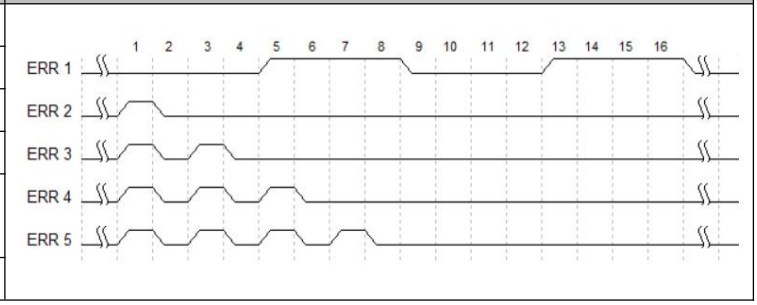
LED	Color	Status	Function
RUN	Green	ON	PMS is normal operation condition
		Flashing	PMS is abnormal operation condition or loading operation parameter after reset
		OFF	UPS Power OFF
ERR	Red	ON	Initialization failed
		Flashing	PMS Error
		OFF	UPS normaloperation or UPS power off status
ALM	Yellow	ON	DC_IN Corresponding DC OK(2.2-2.3) signal ON
		OFF	DC_IN the normal power supply or UPS shutdown state, the corresponding DC OK (2.2-2.3) OFF
BAT	Green	ON	When the super capacitor discharges, the corresponding Bat.mode (2.4) is ON
		OFF	When the super capacitor is not discharged or the UPS is off, the corresponding Bat. Mode (2.4) is off
DC	Green	ON	DC_IN case of normal power supply
		OFF	DC_IN case of abnormal power supply or UPS shutdown

■ RUN

The RUN led is used to indicate the operation status of NP-6310. When the UPS is working normally, it will be on normally, and it will be off or flashing when it is not working normally. The reference timing diagram is shown below. The high-level status in the timing diagram represents that the LED is on, and the low-level status represents that the LED is off.

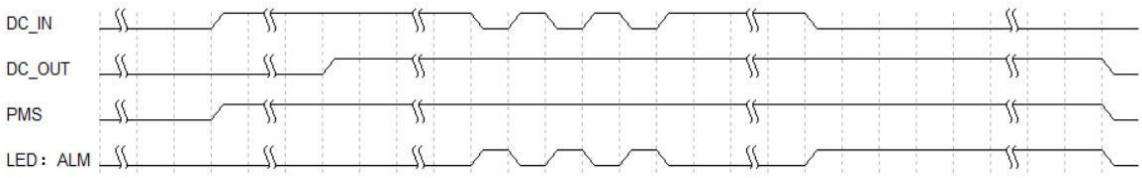
■ ERR

When NP-6310 works normally, the ERR indicator is off. If there is a fault, the ERR indicator will flash.

Error	Error ID	ERR LED flashing timing
Null	0	
Initialization failed	1	
PMS failed	2	
Capacitor lose	3	
DC_IN overvoltage or undervoltage	4	
DC_OUT overcurrent	5	

■ ALM

ALM led represents the state of DC IN, when the UPS DC power supply input is disconnected, this light is always on, and when the power supply is normal, this light is off. The reference timing diagram is shown below. In the timing diagram, the high level status represents that the LED is on, and the low level status represents that the LED is off.



- BAT

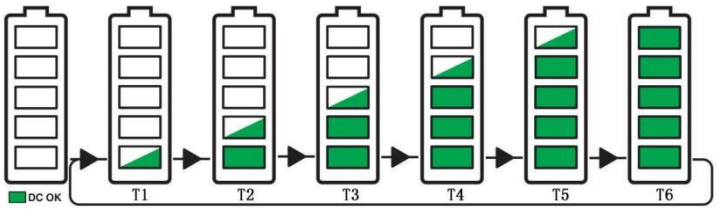
  BAT led indicates whether the UPS uses supercapacitor powered output. It is on when using supercapacitor powered output and off when using DC powered output.

- DC

  The DC led indicates whether the UPS uses DC power supply output. It is on when DC power supply output is used and off when supercapacitor power supply output is used.

2.1.4.6 UPS charging status LED

The front panel SOC area is the charging status LEDs. When the UPS is working, the leds displays according to the corresponding level; When the UPS is turned off, all the leds are off; When the power is turned on but the power management system fails, the leds will flash.
The state of leds during charging is shown in the figure below, T1 to T6 indicates the charging process. The discharge sequence is reverse. The discharge state is from T6 to T1. (The green box indicates that the current led is always on, and the green white box indicates that the current led is flashing)



When the capacitance power level reaches a certain level, the led is always on. When it is about to reach a certain level, the led flashes at 1Hz frequency. For example, when the capacitance power level is 50%, 20% and 40% of the state led are constant on, while 60% of the led are flashing, 80% and 100% of the led are off, and the discharge state is the same.

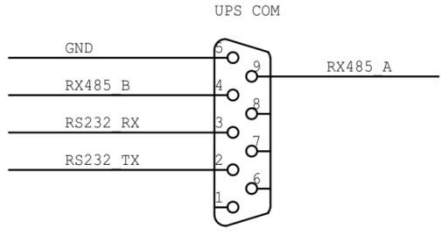
Level	LED	Status	Level	LED	Status	Level	LED	Status
T1 1%~20%	SOC5	OFF	T2 21%~40%	SOC5	OFF	T3 41%~60%	SOC5	OFF
	SOC4	OFF		SOC4	OFF		SOC4	OFF
	SOC3	OFF		SOC3	OFF		SOC3	Flashing
	SOC2	OFF		SOC2	Flashing		SOC2	ON
	SOC1	Flashing		SOC1	ON		SOC1	ON
T4 61%~80%	SOC5	OFF	T5 81%~100%	SOC5	Flashing	T6 = 100%	SOC5	ON
	SOC4	Flashing		SOC4	ON		SOC4	ON
	SOC3	ON		SOC3	ON		SOC3	ON
	SOC2	ON		SOC2	ON		SOC2	ON
	SOC1	ON		SOC1	ON		SOC1	ON

2.1.5 Communicating function

2.1.5.1 serial communication

Load device can use RS232 or RS485 interface, using the standard Modbus RTU protocol to communicate with NP-6310, and can do data saving, system shutdown and other operations when DC input status is changed.

■ Interface definition

Type	DB9 pin	Signal	Signal definition diagram
RS232	Pin_2	TXD	
	Pin_3	RXD	
	Pin_5	GND	
RS485	Pin_9	A	
	Pin_4	B	

Note: When the NP-6310 device is restored to factory Settings, the default communication parameters are baud rate: 115200bps, data bit: 8bit, stop bit: 1bit, parity: none, and device address: 1.

■ Modbus register definition

Function code support : 03(read) / 06(write).

<table>
<tr><th>Address</th><th>Function</th><th>Function description</th><th>R/W</th><th>Note</th></tr>
<tr><td colspan="5">Parameter of device</td></tr>
<tr><td>40000</td><td>Device Type</td><td>Device Type ID</td><td>R</td><td>UPS：0x03</td></tr>
<tr><td>40001</td><td>Hardware version</td><td>Hardware version</td><td>R</td><td>The version number is in the format 0xABCC, where A stands for major version, B for minor version, and CC for release.For example, 0x1001 means that the current version is V1.0.01</td></tr>
<tr><td>40002</td><td>Firmware version</td><td>Firmware version</td><td>R</td><td>The version number is in the format 0xABCC, where A stands for major version, B for minor version, and CC for release.For example, 0x1001 means that the current version is V1.0.01</td></tr>
<tr><td>40003</td><td>Communication parameters</td><td>Communication parameters</td><td>R/W</td><td>Using the 0xPMRB representation, where:
P stands for parity, P=1 means no parity, P=2 means odd parity, and P=3 means even parity
M stands for communication mode, 0: RTU
R stands for reserved value; the default value is 0, which represents 1 stop bit and 8 data bits
B stands for Baudrate serial number, see the Settings as follows:
<table>
<tr><th rowspan="2">Baudrate</th><th colspan="3">value</th></tr>
<tr><th>no parity</th><th>odd parity</th><th>even parity</th></tr>
<tr><td>9600</td><td>0x1001</td><td>0x2001</td><td>0x3001</td></tr>
<tr><td>19200</td><td>0x1002</td><td>0x2002</td><td>0x3002</td></tr>
</table>
</td></tr>
</table>

				38400	0x1003	0x2003	0x3003
				57600	0x1004	0x2004	0x3004
				76800	0x1005	0x2005	0x3005
				115200	0x1006	0x2006	0x3006
				Note: The default value is 0x1006, which means the current baud rate is 115200, 8 data bits, 1 stop bit, and no parity bit			
40004	Communication address	Modbus RTU address	R/W	Data range 1-65535，the default value is 1			
Setting parameter							
40005	Policy basis for stopping DC OUT output	Policy basis for stopping DC OUT output,this register data is only valid when the rotary switch is in "PC" stage	R/W	0x00: represents no policy, DC_OUT according to "PC" mode parameter 0x01: Time limited mode, the effect is the same as the rotary switch is in T stage 0x02: Current threshold mode, the effect is the same as the rotary switch in Ⅰstage The default value： 0x02			
40006	t_{sw_delay} value set in time limited mode	When the register 40005 is set to 0x01, this register represents the corresponding t_{sw_delay} value, similar to the time limited set by the rotary switch.	R/W	Data range 0-65535, Unit: mS The default value : 5000mS			
40007	Current mode Current threshold	When the register 40005 is set to 0x02,this register represents the threshold current of the load to stop the DC output, similar to the current threshold limited set by the rotary switch.	R/W	Data range 0-65535, Unit: mA The default value : 400mA			
40008	Dev.Pst(2.9) Signal effective level type	Dev.Pst(2.9) Signal effective level type	R/W	0: From high level to low level 1: From low level to high level The default value : 0			
40009	SW(2.6) controls the policy type	SW(2.6) controls the policy type	R/W	0: According to the percentage of power left 1: According to the the delay time has been set The default value： 0			
40010	SW(2.6) operation residual electricity value	The percent of power left to active the SW output, which is only valid when 40009 is set to 0	R/W	Data range 0~100%， The default value： 95%			
40011	t_{off} register value set in time mode	The delay time to active the SW output, which is only valid when 40009 is set to 1	R/W	Data range 0~65535, Unit: mS The default value : 5000mS			
40012	SW(2.6) active mode	SW(2.6) Signal effective level type	R/W	0: floating when inactive, turn low when active; 1: connect to GND when inactive, turn high when active			
40013	t_{sw_hold} register value	SW(2.6) active duration	R/W	Data range 0~65535, Unit: mS			

				The default value : 500mS
40014	The policy of shutdown	Set the policy when DC is restore during the shutting down	R/W	0: stop DC out and start DC out after 5s delay; 1: don't care
40015	Power output threshold	Set the power threshold percent to start DC output during charging	R/W	Data range :0%~100%, The default value : 95%
State parameter				
40016	DC_IN voltage	UPS input voltage value	R	Unit: mV
40017	DC_IN current	UPS input current value	R	Unit: mA
40018	DC_OUT voltage	UPS output voltage value	R	Unit: mV
40019	DC_OUT current	UPS output current value	R	Unit: mA
40020	Output power	Instantaneous power	R	Unit: mW
40021	Voltage	Total capacitor voltage	R	Unit: mV
40022	Voltage	Supercapacitor 1 voltage	R	Unit: mV
40023	Voltage	Supercapacitor 2 voltage	R	Unit: mV
40024	Voltage	Supercapacitor 3 voltage	R	Unit: mV
40025	Voltage	Supercapacitor 4 voltage	R	Unit: mV
40026	Power percent	The power percent of the supercapacitor	R	Data range: 0%~100%
40027	Working status	UPS working status	R	1: UPS charging (mains power supply) 2: UPS discharge
40028	DC OK signal status	The status of DC_OK output	R	0: DC OK(2.2/2.3) port has No output 1: DC OK(2.2/2.3) port has output
40029	Bat.Mode signal	The Bat.Mode signal outputs the signal status	R	0: Bat.Mode(2.4) port has No output 1: Bat.Mode(2.4) port has output
40030	Bat.Ready signal	The Bat.Ready signal output state, which represents whether the capacitor is full or not	R	0: Bat.Ready(2.5) port has No output 1: Bat.Ready(2.5) port has output(fully charged)
40031	SW signal	SW signal output status	R	0: SW(2.6) port has No output 1: SW(2.6) port has output,inform load device to shut down
40032	Remote signal	Remote signal input status	R	0: Remote(2.7) port has no signal access or the access signal is 0 1: Remote(2.7) port has a valid signal access
40033	Bat.Start signal	Bat.Start signal input status	R	0: Bat.Start(2.8) port has no signal access or the access signal is 0 1: Bat.Start(2.8)port has a valid signal access
40034	Dev.Psts signal	Dev.Psts signal input status	R	0: Dev.Psts(2.9) port has no signal access or the access signal is 0 1: Dev.Psts(2.9)port has a valid signal access
40035	Temperature	UPS internal temperature	R	Unit: ℃
40036	ErrorCode	The fault code in case of a system failure	R	

2.1.5.2 SDK

Since the standard Modbus RTU protocol, users can easily develop their own Modbus RTU communication protocol to communicate with UPS, Nodka also provides dynamic library (NP-6310SDKx86.dll/NP-6310SDKx64.dll) to the user to develop their own application fastly.

- Function list

function name	function description
UPS_DeviceOpen	Open the device serial port
UPS_DeviceClose	Close the device serial port
UPS_ReadRegisters	Reading single or multiple Holding registers in the UPS
UPS_WriteRegisters	Writing single or multiple Holding registers in the UPS

- Function return value

value	description	note
0	No error	
1	Illegal register address	
2	Illegal argument	
3	Porting layer error	
4	Insufficient resources	
5	I/O error	
6	Protocol stack in illegal state	
7	Retry I/O operation	
8	Timeout error occurred	
10	Illegal function exception	
11	Illegal data address	
12	Illegal data value	
13	Slave device failure	
14	Slave acknowledge	
15	Slave device busy	
16	Memory parity error	

- Function declaration

Data structure

```
typedef struct _COM_InitConfig
{
    unsigned char mode;          /* communication mode, 0: Modbus RTU */
    unsigned char port;          /* serial port number */
    unsigned char slaveAddr;     /* slave address when using modbus rtu protocol */
    unsigned char parity;        /* parity: 0: None, 1: ODD, 2: EVEN */
    unsigned char stopBits;      /* stop bits, default is 1 */
    unsigned char dataLen;       /* data length, default is 8 bits */
    unsigned char fillUp[2];
    unsigned int baudRate;       /* baudrate, maximum is 115200 */
    unsigned int respTimout;     /* slave response timeout, minimum is 500 ms */
    unsigned int retries;        /* number of retries internal used */
}COM_InitConfig, *PCOM_InitConfig;

typedef struct _UPS_HandleTypeDef
{
    void *Instance;              /* modbus protocol handle */
    COM_InitConfig initConfig;   /* serial init data */
    int status;                  /* status */
}UPS_HandleTypeDef, *PUPS_HandleTypeDef;

typedef struct _UPS_DeviceInformation
{
    unsigned short typeId;           /* device type ID, 3: UPS*/
    unsigned short hardwareVersion;  /* hardware version */
    unsigned short firmwareVersion;  /* firmware version */
```

```
    unsigned short driverVersion;        /* driver version */
}UPS_DeviceInformation, *PUPS_DeviceInformation;
```

Function declaration

UPS_DeviceOpen

- Functional description
  Open the serial port and establish communication with the UPS device.
- Functional
  int UPS_DeviceOpen(PUPS_HandleTypeDef pHdl, PUPS_DeviceInformation pInfo)
- Parameter
  - Input
    - pHdl: Serial communication handle pointer
  - Output
    - pInfo ：Device information stores data structure pointers
- Returned value
  It returns 0 on success and the corresponding error code for all other errors.
- Other description
  Before the device can be accessed, this function must first be called to open the device communication port.

UPS_DeviceClose

- Functional description
  Close the serial port and disconnect the communication between UPS devices.
- Functional
  int UPS_DeviceClose(PUPS_HandleTypeDef pHdl)
- Parameter
  - Input
    - pHdl: Serial communication handle pointer
- Returned value
  It returns 0 on success and the corresponding error code for all other errors.
- Other description
  If you do not need to communicate with the device, you need to call this function to close the port and release the resource.

UPS_ReadRegisters

- Functional description
  Read single or multiple Holding registers in the UPS device.
- Functional
  int UPS_ReadRegisters(PUPS_HandleTypeDef pHdl, unsigned short usRegStartAddr, unsigned char ubNRegs, unsigned short arusBufferOut[])
- Parameter
  - Input
    - pHdl: Serial communication handle pointer
    - usRegStartAddr：The start address of the register
    - ubNRegs：The number of registers
  - Output
    - arusBufferOut：Save the read register data
- Returned value
  It returns 0 on success and the corresponding error code for all other errors.
- Other description

UPS_WriteRegisters

- Functional description
  Write single or multiple Holding registers in the UPS device.
- Functional
  int UPS_WriteRegisters(PUPS_HandleTypeDef pHdl, unsigned short usRegStartAddr, unsigned char ubNRegs, const unsigned short arusBufferIn[])
- Parameter
  - Input
    - pHdl: Serial communication handle pointer
    - usRegStartAddr：The start address of the register

- ubNRegs：The number of registers
- arusBufferIn：Register data to be saved

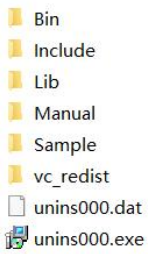
- Returned value
  It returns 0 on success and the corresponding error code for all other errors.
- Other description

2.1.6 Test Tool

In order to set UPS parameters and test conveniently, Nodka provides graphical test tool “NP-6310 utility”.

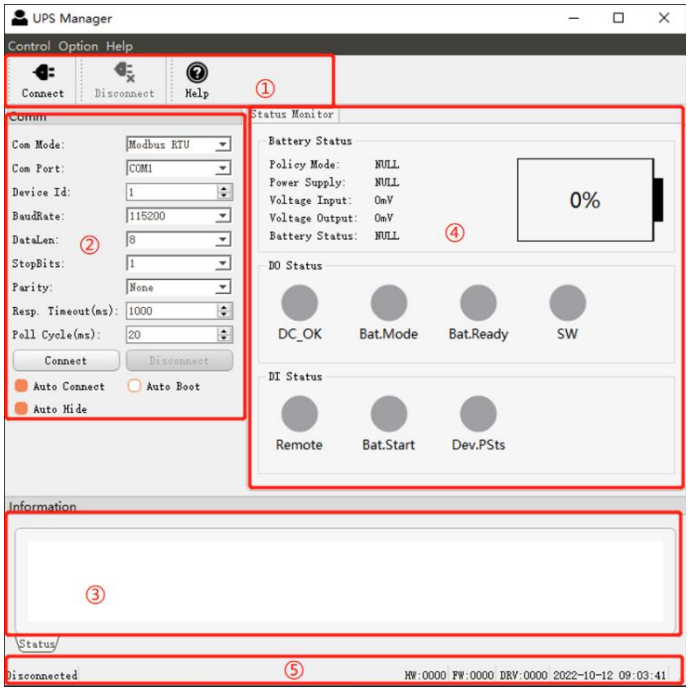
2.1.6.1 Installation

Double-click (NP-6310Utility_Setup.exe) to install the SDK toolkit. The default installation path is: "C:\NODKA\NP-6310". After successful installation, the following directory will appear:

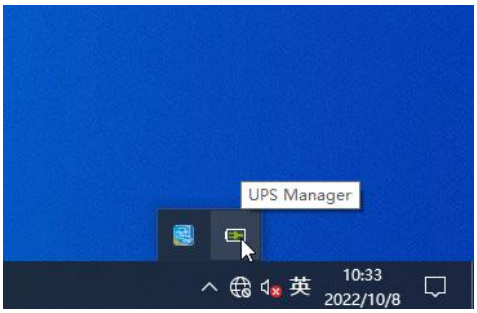


- Bin: Testing tools working folder
- Include: Header file to define the functions
- Lib: Dynamic library
- Manual: User manual
- Sample: Sample projects
- vc_redist: VC++ runtime library

2.1.6.2 Software Introduction



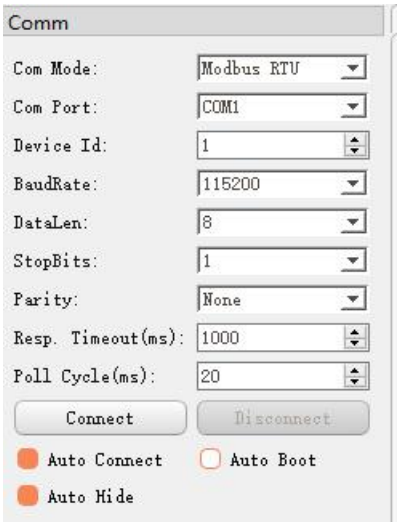
- ① Control area, used to control the connection and disconnection of communication, and the opening and closing of the parameter register interface;
- ②Communication parameter setting area, when Auto Connect is checked, the tool will connect to the device using the setting parameters automatically when the tool is started. When Auto Boot is checked, the tool will be launched automatically when the system is boot. When Auto Hide is checked, the tool will be hidden to the system tray when the tool is launched and connected to the device at the first time.



- ③ Information area, which is used to show the operation information.
- ④ UPS state display area, which can display the DC input power state, voltage, UPS output voltage, super capacitor working state, super capacitor current power, UPS panel DO interface control state, UPS panel DI interface state information;
- ⑤ UPS connection status bar to show the connect status, device hardware version, device firmware version and current date when connecting to the device successfully.

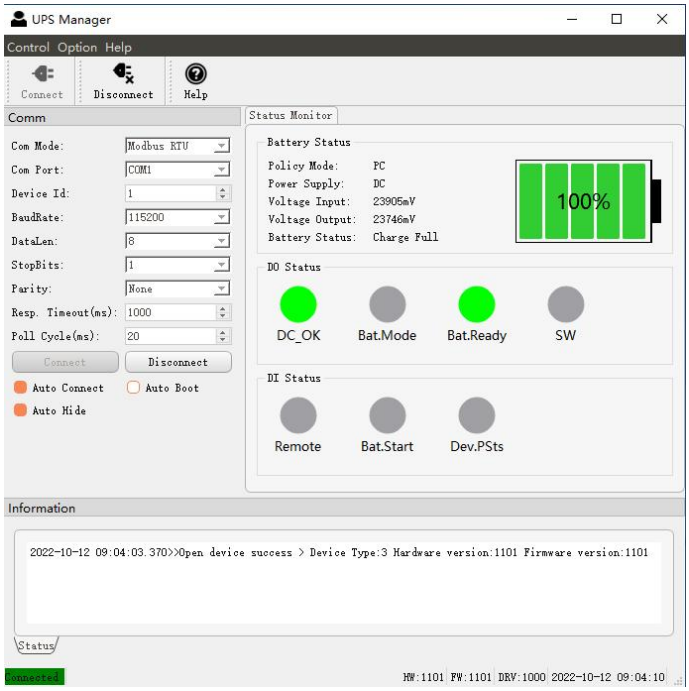
2.1.6.3 How to use

1. Open the tool and set the communication parameters



- ComMode: Default Modbus RTU mode
- Com Port: Set serial port number on the PC to connect to the UPS device.
- Device Id: Modbus Slave ID of the UPS device
- BaudRate: Baud rate of serial communication
- DataLen: Serial communication data length
- StopBits: Stop bit for serial communication
- Parity: Parity bit for serial communication
- Resp.Timeout: The timeout for the Modbus Slave device communication response
- Poll Delay: Time between Modbus polls
- Connect: Connect communication with UPS device
- Disconnect: Disconnect communication with UPS device
- Auto Connect: When the setup tool software is started, it will automatically establish communication with UPS according to the set parameters
- Auto Boot: The tool starts automatically on startup
- Auto Hide: After the tool is started, it is automatically hidden into the system tray when communication with the UPS is first established

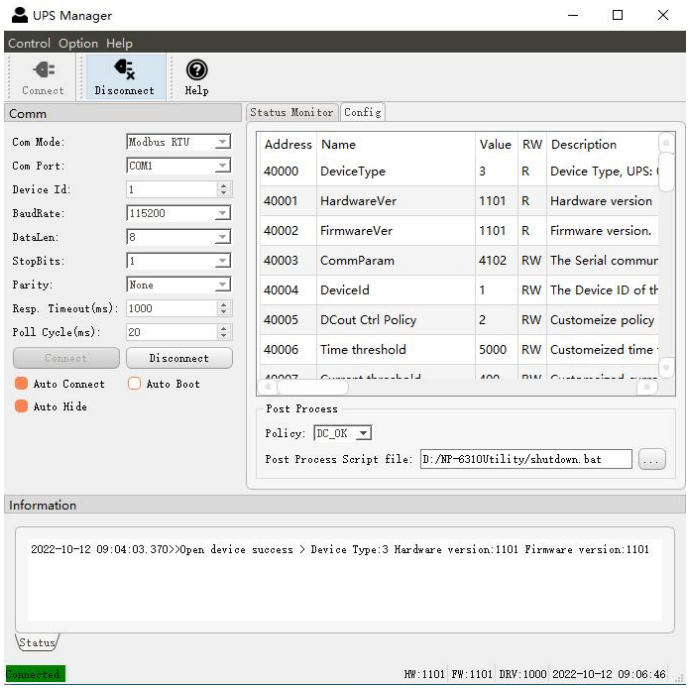
2. Click the Connect button in the communication setting interface or Connect in the toolbar to establish communication with the UPS device. If the communication is successfully established, the hardware version number and firmware version number of the currently connected device will be displayed in the status bar. At the same time, the current power supply status and the electricity status of the supercapacitor will be displayed in the electricity information window.



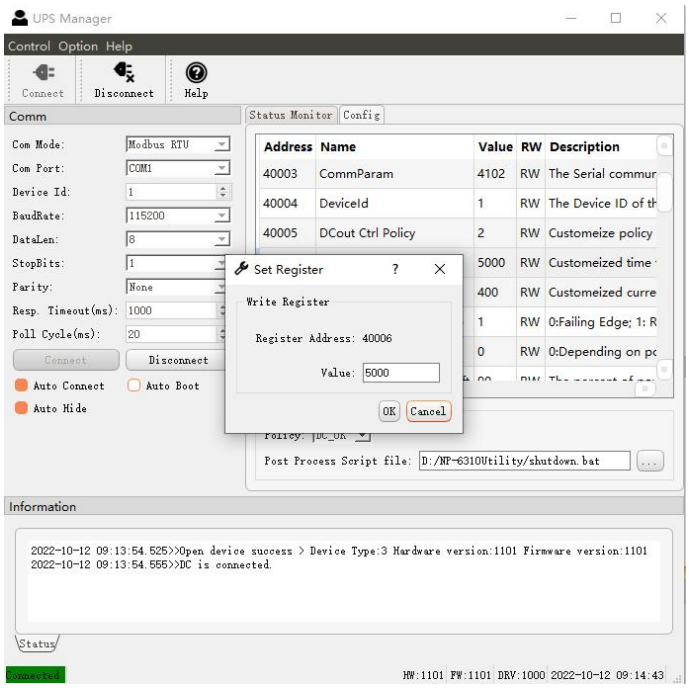
- Policy Mode: Display the coding switch status on the UPS front panel
- Power Supply: Display whether the current DC power supply or UPS discharge
- Voltage Input: Display the voltage value of the current DC IN supply input,Unit: mV

- Voltage Output: Display the voltage value of the current DC OUT supply output,Unit: mV
- Supercapacitor Status: Display the current UPS charging and discharging status
- DO Status：Display the output status of the DO on the front panel of the UPS device
- DI Status： Display the input status of the DI on the front panel of the UPS device

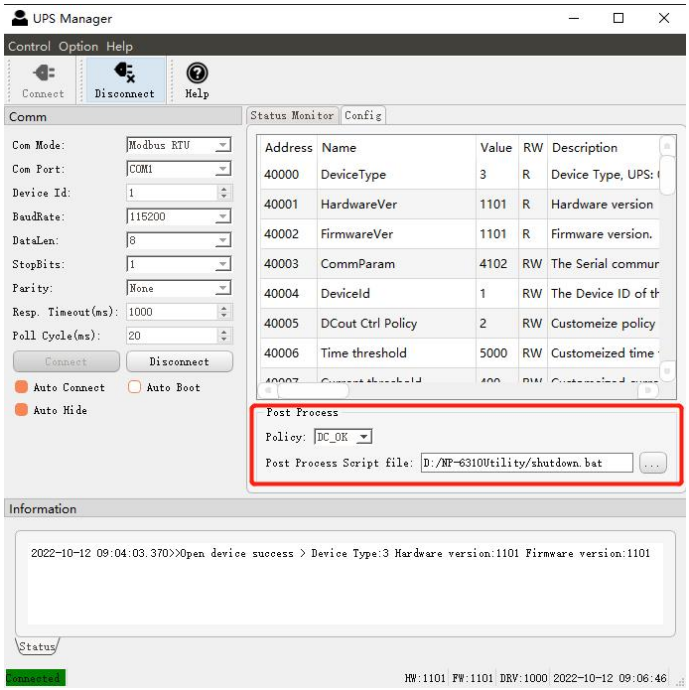
3. When communication is successfully established, the TAB of UPS parameter configuration can be displayed through the menu bar (Option -> Config).
   Note: When the (Config) TAB is opened, the (Status Monitor) TAB will stop refreshing



In the Config TAB, the registers of the UPS device with read operation permission can be refreshed in real time, and the parameters with write operation permission can be configured. When double-clicking the parameter with write operation, the parameter setting dialog box will pop up, and the current parameter can be modified and set.



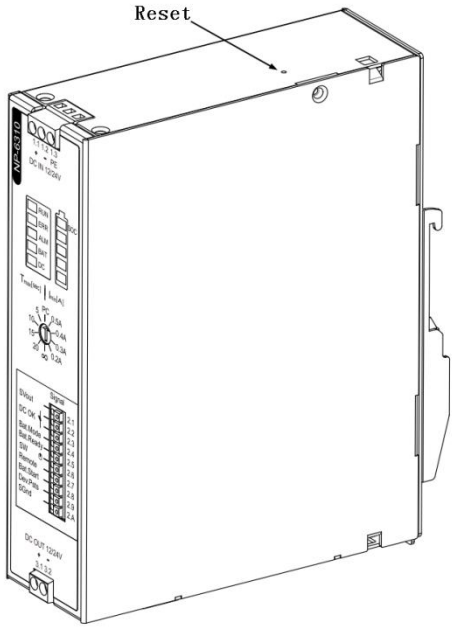
This tool can execute the user-defined batch script file when the DC_OK or SW signal output is monitored in the Status Monitor TAB. The user can define the actions in the batch script file that the PC needs to perform after power failure.



Note that this batch file is executed only when the Status Monitor TAB is selected, and in the Config TAB is only used to configure the parameters of the device. The Config TAB closes automatically when communication is disconnected.

2.1.7 Restore factory setting

If the NP-6310 UPS fails to work properly due to parameter setting errors, you can press the reset button for more than 5 seconds until all the status lights are on. At this time, the UPS enters the factory data recovery phase. In the process of factory data recovery, the RUN status light will flicker until the data recovery is completed.

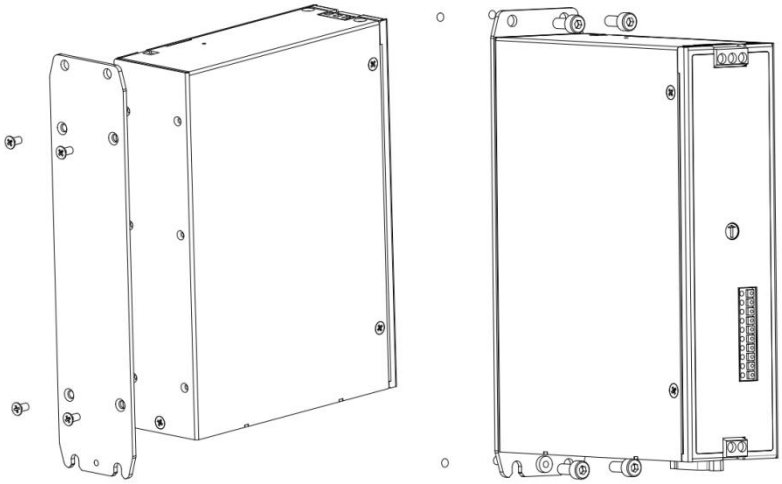


The following table shows the factory default register parameter values:

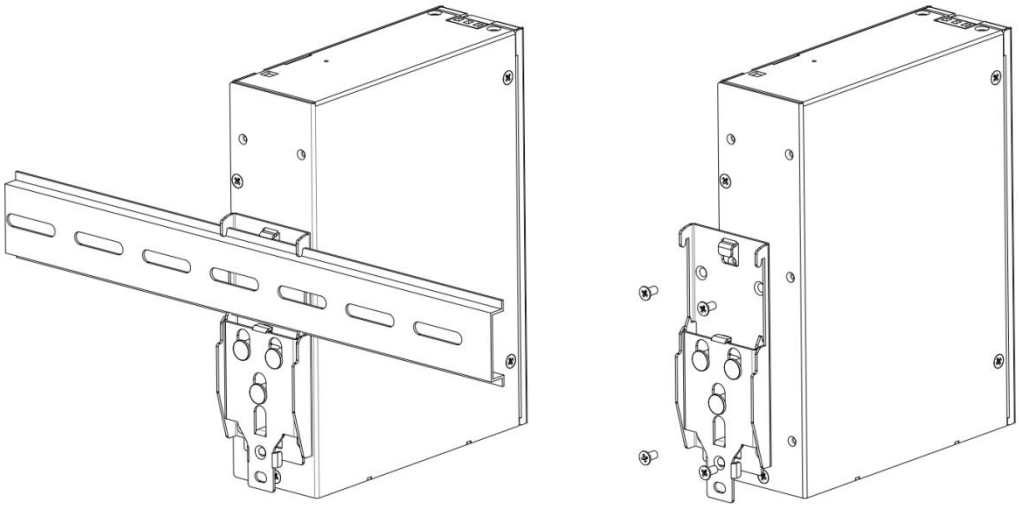
Address	Default	Description
40003	0x1006	Modbus communication baud rate: 115200, data bits: 8, stop bits: 1, check mode: no check
40004	1	Modbus communication address: 1
40005	2	Current control mode
40006	5000	Through the time control mode set by communication, T_{sw_delay} time is 5000mS
40007	400	Current control mode set by communication or coding switch, minimum shutdown current 400mA
40008	1	Dev.Psts effective signal level policy: from high to low state
40009	0	SW control is based on the remaining electricity percentage
40010	90	Current control mode, output SW signal electricity threshold of 90%
40011	5000	Time control mode, t_{off} time 5000mS
40012	0	SW signal output type: OD gate mode
40013	500	The SW signal output hold time t_{sw_hold} hold is 500mS
40014	0	DC_IN recovery policy during UPS shutdown: output DC_OUT again after 5 seconds of complete shutdown
40015	95	DC OUT output electricity threshold of 95%

3. Mounting/remove

3.1 Wall-Mounted



3.2 DIN-Rail



4. Safety and Maintenance

Please follow the precautions described in this chapter, otherwise may cause device damaged.

4.1 Safety Precautions

Please follow the safety precautions described in this section below.

4.1.1 General Safety Precautions

Please ensure that the following safety precautions are followed:

- Follow electrostatic precautions if you open the device;
- When installing, moving or modifying the device, ensure that the power is switched off and the power cable is disconnected;
- It is forbidden to use more than the specified voltage as this may cause a fire or electric shock;
- Electric shock may occur if the device chassis is opened while the device is running;
- Do not drop or insert any debris into the device vents;
- If large quantities of dust, water or liquid enter the device, disconnect the power supply and contact the supplier;
- The following are prohibited:
  - It is forbidden to drop the device on a hard surface;
  - It is forbidden to knock or apply excessive force to the device;
  - It is forbidden to use the device in places where the rated environment exceeds the standard.

4.1.2 ESD Precautions

Failure to take ESD precautions during device installation may result in damage to the device or injury to the user. Electrostatic discharge (ESD) can cause damage to the components of a device. Dry climates are more prone to ESD. Therefore, the following anti-static precautions need to be strictly followed when opening the equipment:

- Wearing anti-static bracelet;
- Personally well grounded: When handling electronic components, grounded conductive substances should be touched frequently;
- Using anti-static mats: Electronic components should be operated on anti-static mats, which can reduce the possibility of ESD damage.
- Touch only the edges of electronic components: operate by holding the edge of electronic components.

4.1.3 Product Disposal

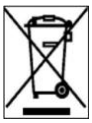
Disposal of used batteries must be in accordance with local environmental regulations.

- Outside the European Union:

If you want to dispose the used electrical and electronic products outside the European Union, please contact your local authority so as to comply with the correct disposal method.

- Within the European Union:

EU-wide legislation, as implemented in each Member State, requires that waste electrical and electronic products carrying the mark (right) must be disposed of separately from normal household waste. This includes monitors and electrical accessories, such as signal cables or power cords. When you need to dispose of your display products, please follow the guidance of your local authority, or ask the shop where you purchased the product. The mark on electrical and electronic products only applies to the current European Union Member States. Please follow the national guidelines for electrical and electronic product disposal.



4.2 Maintenance and Cleaning Precautions

Please follow the guidelines below when maintaining or cleaning the product.

4.2.1 Maintenance and Cleaning

Prior to cleaning any part or component of the product, please read the details below:
Never spray or squirt liquids directly onto any other components.

- The interior does not require cleaning. Keep fluids away from the interior.
- Be careful not to damage the small, removable components inside.
- Turn off before cleaning.
- Never drop any objects or liquids through the openings.
- Be cautious of any possible allergic reactions to solvents or chemicals used when cleaning.
- Avoid eating, drinking and smoking nearby.
- Fans are regularly cleaned of dust.

4.2.2 Cleaning Tools

Some components may only be cleaned using special tool for the safety. In such case, the product will be explicitly mentioned in the cleaning tips.
Below is a list of items to be used for cleaning.

- **Cloth** – Although paper towels or tissues can be used, a soft, clean piece of cloth is recommended.
- **Water or rubbing alcohol** – A cloth moistened with water or rubbing alcohol should be used;
- **Using solvents** – The use of solvents is not recommended as they may damage the plastic parts.
- **Vacuum cleaner** – Using a vacuum specifically designed for computers is one of the best methods of cleaning. Dust and dirt can restrict the airflow and cause circuitry to corrode.
- **Cotton swabs** - Cotton swaps moistened with rubbing alcohol or water are excellent tools for wiping hard to reach areas.
- **Foam swabs** - Whenever possible, it is best to use lint free swabs such as foam swabs for cleaning.

5. Q&A

This section explains and illustrates common problems that users may encounter when using the product.

5.1 Technical Support and Services

For documentation and related drivers, please visit Nodka's website "https://nodka.eu/" or contact your local distributors for support and service.