PH1607 Smart Solar Charger w/ LED light driver controller

Description

The PH1607 is the worldwide first solution that integrated the solar charger & LED driver in the same controller.
In the day time, the Solar charger enable the MPPT(Maximum Power Point Tracking) technology to guarantee the best energy harvest. In the night time, the same power stage, playing as the LED driver, reversely boost the battery energy to drive LED with dimming control. Also the proprietary NEVER DARK Technology will calculate the battery residual energy vs. the preset LED current with lighting time & thus may reduce the LED current to make sure the battery never over discharged however the LED can still light . In system of view, the PH1607 can accept the PV open-circuit voltage up to 40V & the power is up to 300W. There are 2 outputs, one is battery voltage, the other is LED driver. The maximum voltage for LED driver is 40V & the maximum LED power is 100W. The PH1607 has the Bluetooth wireless communication option, which can be used to diagnose the PH1607 by hand phone.

Feature :

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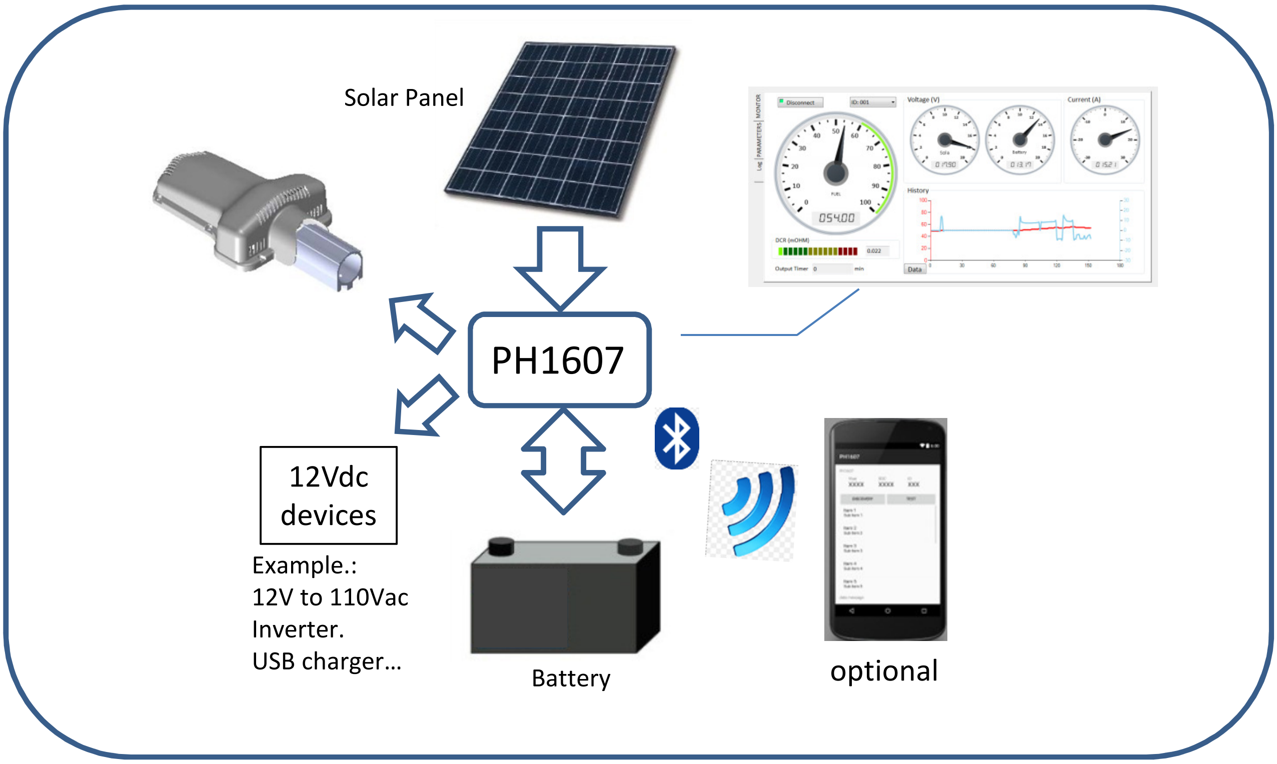
A. SOC, State Of Charge for Lead-Acid battery & Li-On battery .
B. Programmable output timer
C. Programmable output current profile.
F. Avoid over charge/discharge scheme
G. Charge / discharge current limited
I. Wireless communication(Optional).
J. Android APP available

Applications:

1. Portable solar devices
2. Solar street light system

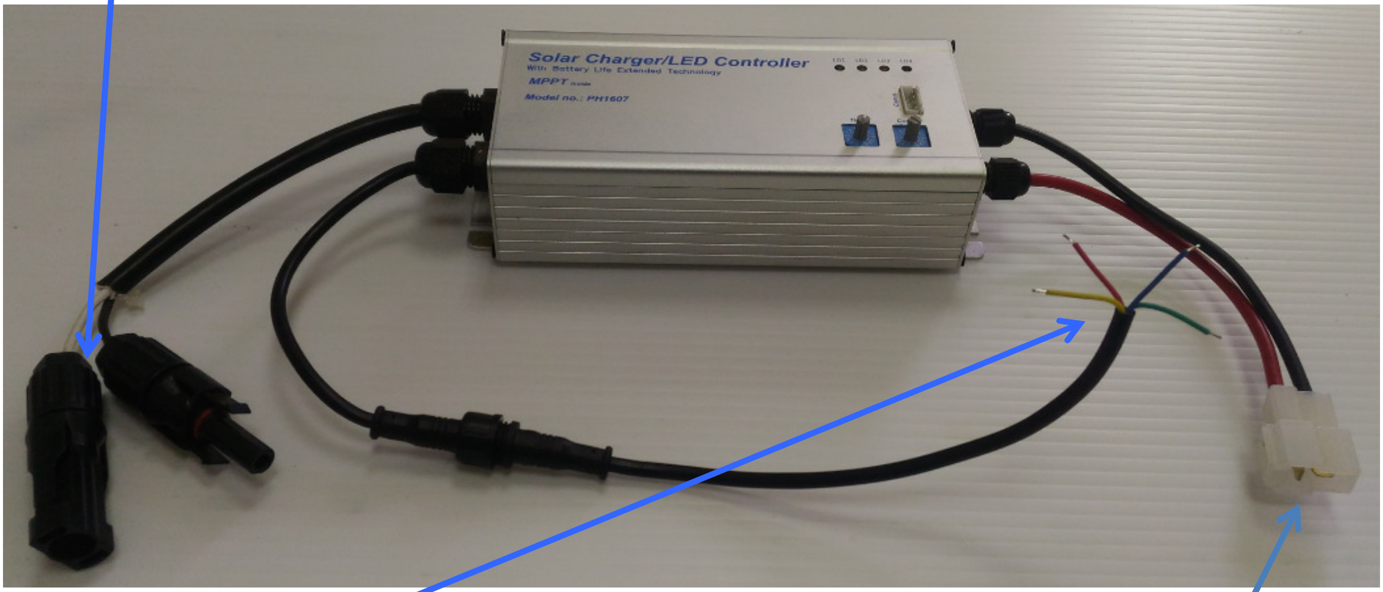


Electrical Specification

items	unit	Specification	Remark
Solar Charger			
Charge voltage	V	15-40	
Charge current	A	20	
maximum charge voltage	V	13.8V	Programmable
Maximum PV Power	W	300W	
MPPT		Yes	
Output			
Maximum Output Power	A	100W	
Maximum Output voltage	V	40	
Time control		by tool or rotor switcher	
Battery management System			
Battery type		Lead Acid	Seal, Gel, Li-On
Maximum battery size		150AH	
SOC(state of Charge) accuracy	%	10	
Protection			
Over voltage protection		yes	
Over current protection		yes	
short protection		yes	
Control portion			
Communication port		Bluetooth	
System			
Maximum input voltage	V	40	
Standby current	mA	<20	w/o bluetooth
Environment			
IP		65	
Operation temperature	C	-20~85	
storage temperature	C	-40-125	
altitude	M	0-3000	
humidity	%	0-100	
Compliance			
Standard EMC		TBD	
Mechnical			
W*D*H(mm)		160*60*40	

Connections

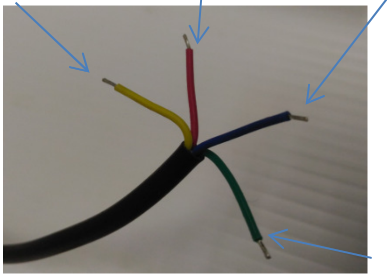
1. Solar input(MP4 connector)


Solar Charger/LED Controller
With Battery Life Extended Technology
MPPT
Model no.: PH1607

2. Output

3. Battery connector

Yellow(LED+) Red(Battery+), Blue(Battery-)



Green(LED-)

Front Panel

LEDs

LD1 : battery status

Quick blinking : full

light : Normal

Slow blinking : Battery low

LD2 : Charge/Discharge

Light : Charge

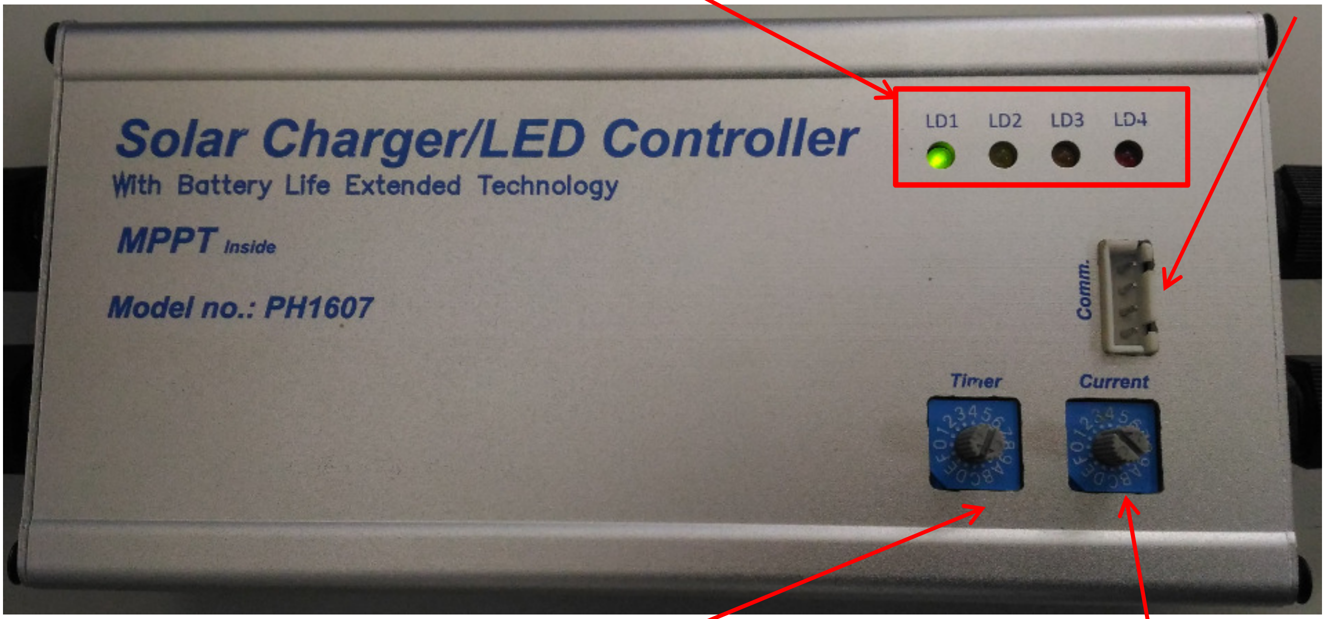
Blinking : Discharge

LD3 : Fault

Light : Short circuit…..

LD4 : Output

RS485/
Bluetooth


Solar Charger/LED Controller
With Battery Life Extended Technology
MPPT Inside
Model no.: PH1607
LD1
LD2
LD3
LD4
Comm.
Timer
Current

Time/Function setting

Current setting
0.5A/step

Digit	function
0	Off
1	1Hr.
2	2Hrs.
3	3Hrs.
4	4Hrs.
5	5Hrs.
6	6Hrs.
7	7Hrs.
8	8Hrs.
9	9Hrs.
A	10Hrs.
B	11Hrs.
C	12Hrs.
D	Toggle note1
E	Tool note2
F	Fully ON

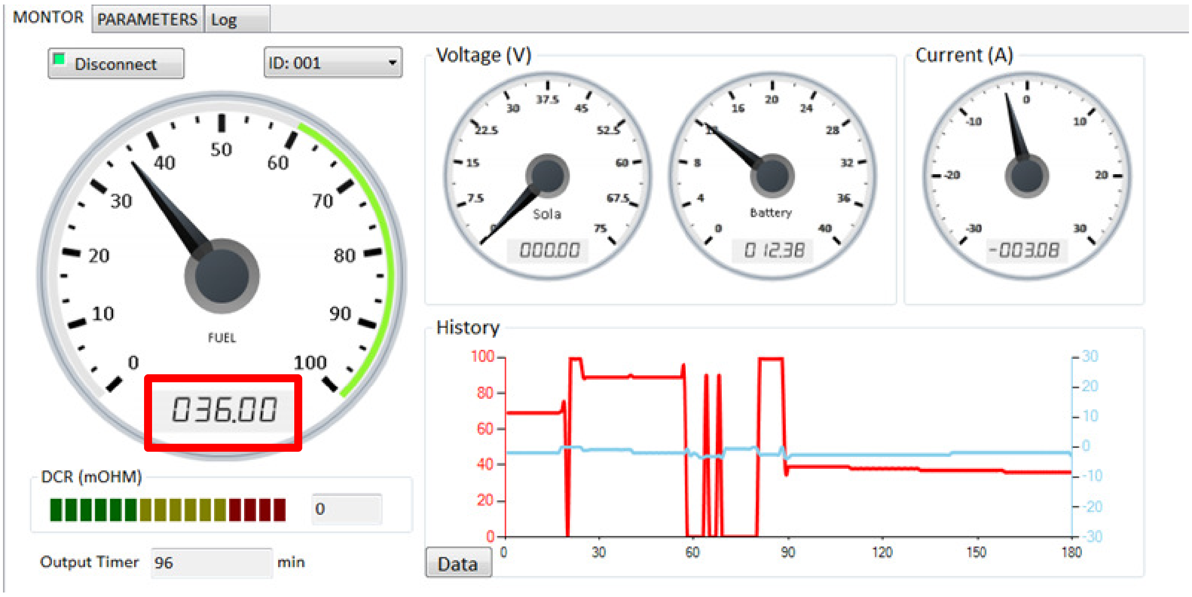
Note 1. function for diagnose by hand phone see page 10

Note 2. set the timer with minutes by monitoring tool.

Features

1. SOC

The PH1607 record the SOC(State of Charge) of battery to manage the output not over-discharge the energy of battery that charged in the day time from solar.

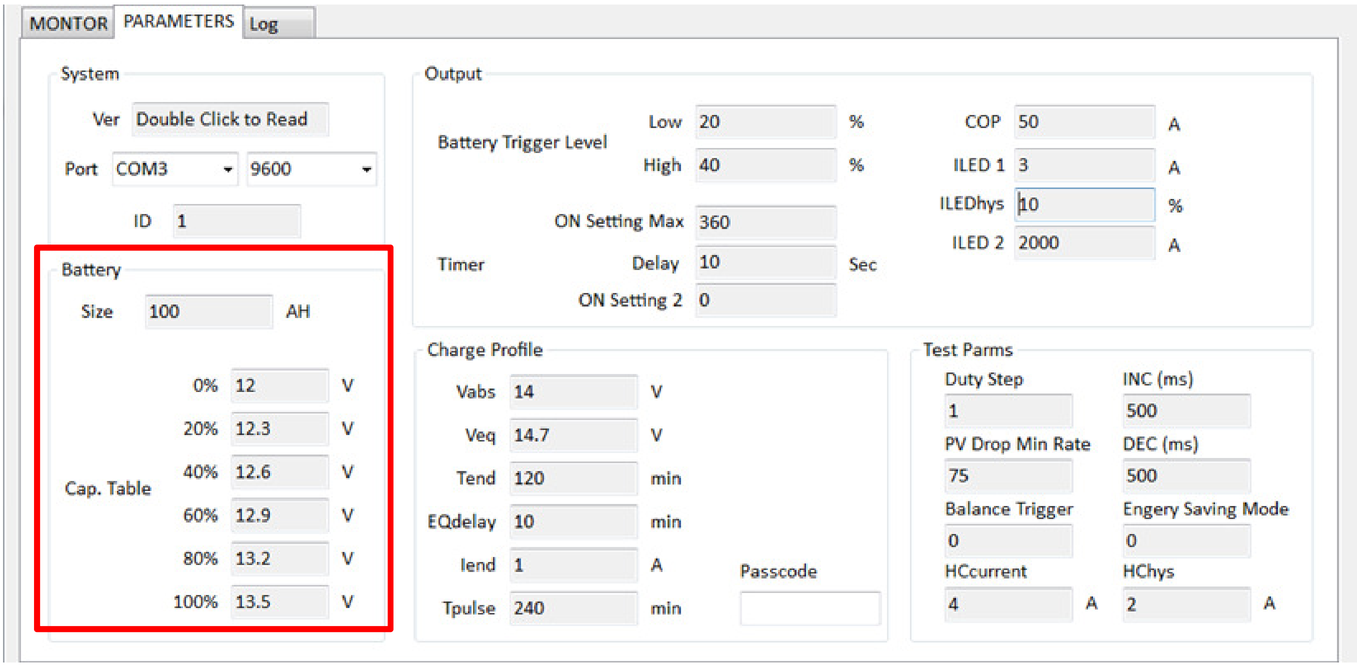

MONTOR
PARAMETERS
Log
Disconnect
Voltage (V)
Current (A)
FUEL
036.00
Sola
000.00
Battery
012.38
-003.08
History
Data
0
30
60
90
120
150
180
100
80
60
40
20
0
30
20
10
0
-10
-20
-30

ID: 001

DCR (mOHM) 0

Output Timer 96 min

To accurate the SOC, users have to enter the cap. Table & battery size(AH) according to the datasheet of the battery at the very beginning when the battery installed. Once the table setup, the PH1607 has the mechanism to calcualte the SOC according the energy charged from solar & energy discharged by output.


MONTOR
PARAMETERS
Log

System

Ver Double Click to Read

Port COM3 9600

ID 1

Battery

Size 100 AH

Cap. Table

0%	12	V
20%	12.3	V
40%	12.6	V
60%	12.9	V
80%	13.2	V
100%	13.5	V

Output

Battery Trigger Level Low 20 %

Battery Trigger Level High 40 %

Timer ON Setting Max 360

Timer Delay 10 Sec

Timer ON Setting 2 0

COP 50 A

ILED 1 3 A

ILEDhys 10 %

ILED 2 2000 A

Charge Profile

Vabs	14	V
Veq	14.7	V
Tend	120	min
EQdelay	10	min
Iend	1	A
Tpulse	240	min

Passcode

Test Parms

Duty Step 1

INC (ms) 500

PV Drop Min Rate 75

DEC (ms) 500

Balance Trigger 0

Engery Saving Mode 0

HCcurrent 4 A

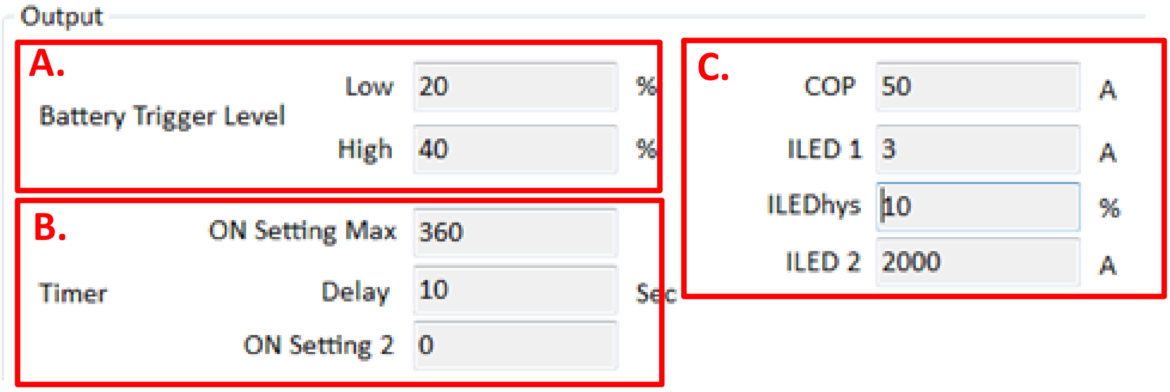
HChys 2 A

2. Output

The output of the PH1607 can be set as follows:

A. Battery trigger level:

The low level set the minimum level that the battery can be discharged by output. Once the battery SOC lower than this point, the output is cut out. The high level sets the threshold SOC that the output can be enabled again after the battery is re-charged from solar. This mechanism protect the lead-acid battery from sulfide due to battery stay at low energy level in a long period. For Li-ion battery, the high & low level can be set the same.



Battery Trigger Level
Low 20 %
High 40 %

Timer
ON Setting Max 360
Delay 10 Sec
ON Setting 2 0

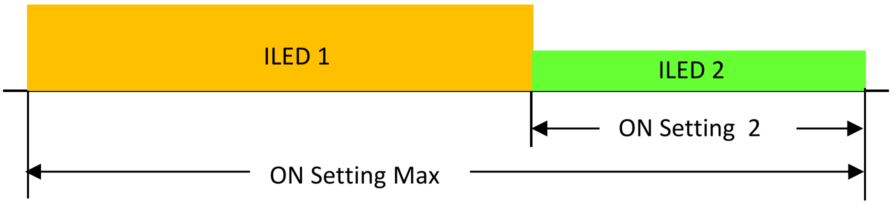
COP 50 A
ILED 1 3 A
ILEDhys 10 %
ILED 2 2000 A

B. Timer:

The “ON Setting Max” set the period(the unit is minute) the output enabled after sunset, which is defined as PV voltage lower than 4V. It can be also set by the rotor switcher on the PH1607. One step stand for 1 hours & can be synchronized to this monitor screen.

The “Delay” set the time period between the PV lower than certain level (defined as sunset) & the output enabled. This protect the noise from triggering the LED on.

The “ON setting 2” functions for 2 step brightness control as follows. This function is enabled when Timer roator switch set as E(tool, see page 4).



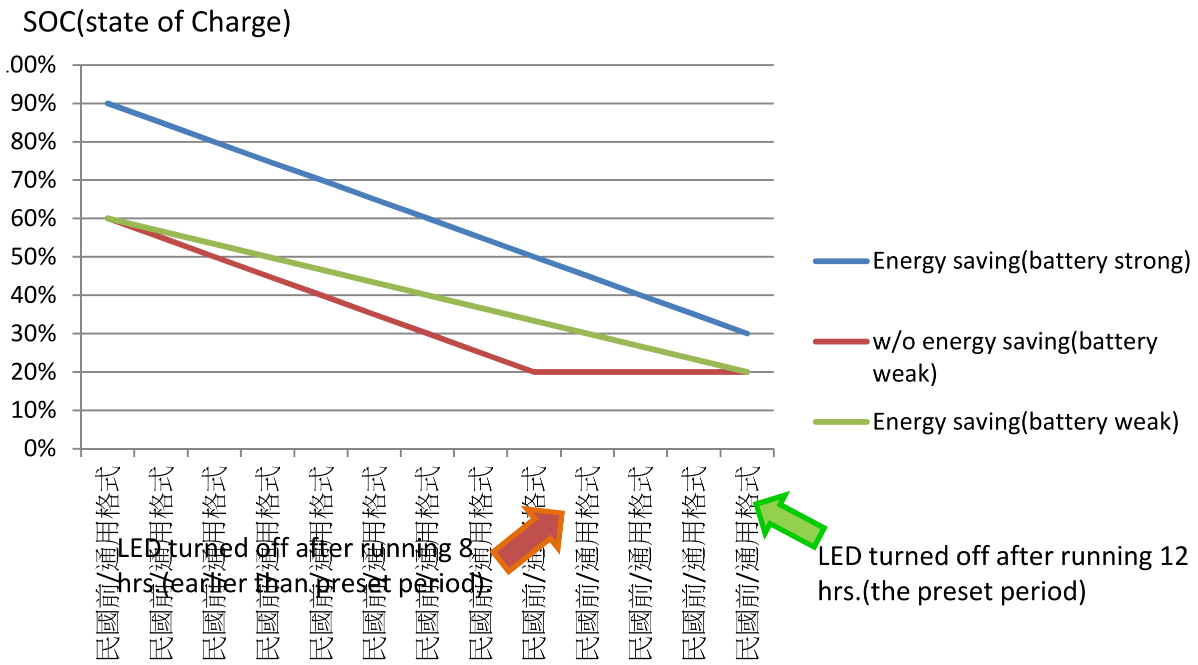
C. Current setup:

The “ILED1” set the current of output & also function as the LED dimming control. This information is synchronized with the current rotor switcher on the panel.

The “ILEDhys” is the parameter to set the LED brightness stable.

The “ILED2” set the current for 2 step brightness function.

Never-Dark Technology



LED turned off after running 8 hrs.(earlier than preset period)

LED turned off after running 12 hrs.(the preset period)

	1hr.	2hr.	3hr.	4hr.	5hr.	6hr.	7hr.	8hr.	9hr.	10hr.	11hr.	12hr.	13hr.	14hr.
Io(Energy saving@battery strong)	5	5	5	5	5	5	5	5	5	5	5	5	0	0
Io(w/o energy saving)	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Io(Energy saving@battery weak)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3	3.3	3.33	3.33	3.33	0	0

The PH1607 cut the output according to the preset battery's SOC(State Of Charge) rather than the battery voltage, which is the more reliable mechanism to save battery life. However, the user may feel uncomfortable if the LED just run certain period in the night time due to the battery energy weak. The Never-Dark technology enabled the energy saving mode of the PH1607 ensure the LED running whole preset period in the night time. Inside the PH1607, the computer calculates the residual battery energy vs. the preset running hours & then dim the LED brightness to reduce the current consumption & thus assure the LED can work whole period of the preset period. The minimum current of the LED output is 0.5A to guarantee the brightness of LED for safe issue.

Please check the above plot. If the minimum battery SOC is 20% , the LED turned on @SOC=60% & the preset running hours is 12 hours, without energy saving mode (the red curve) , the LED will be off after 8 hours. However, using the energy saving mode(the green curve) make the LED running the whole period of the preset 12 hours. The trade-off is the LED dimmed.

Typical application

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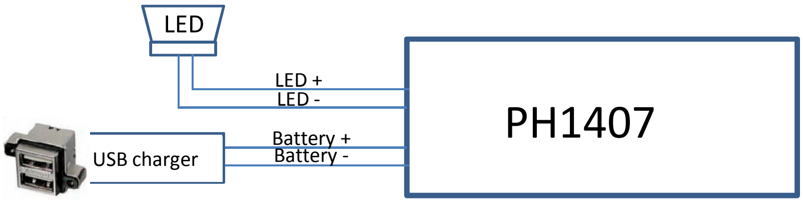
1. Solar street Lamp

Features :

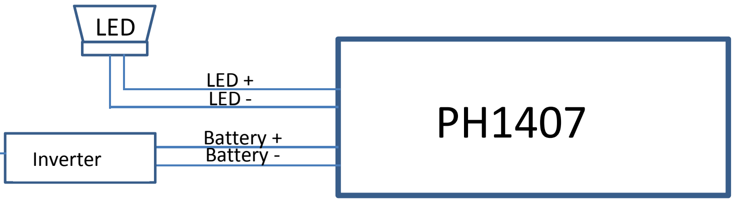
1. Output controlled by battery energy(not voltage) ensure the battery life.
2. Simple meter for battery fuel gauge display
3. Remote monitoring by Bluetooth or RS485.
4. Output current & timer can be simply set by rotor switcher on panel.
5. Never Dark Technology
6. Hand phone diagnose tool.

2. Solar street Lamp with USB charger

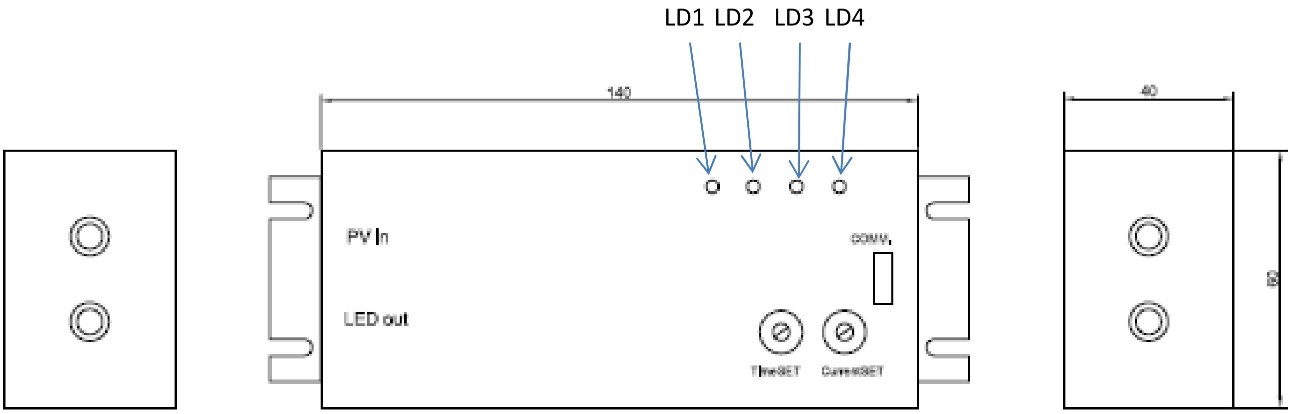

LED
LED +
LED -
Battery +
Battery -
USB charger
PH1407

3. Solar street Lamp with 110/220Vas

Christmas lamps

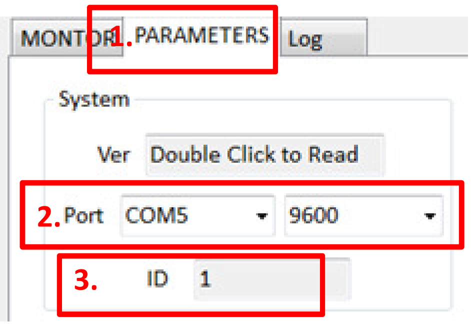

LED
LED +
LED -
Battery +
Battery -
Inverter
PH1407

Mechanical dimision


LD1
LD2
LD3
LD4
140
40
60
PV In
LED out
COMM.
TimeSET
CurrentSET

Enable the monitoring tool(RS485)

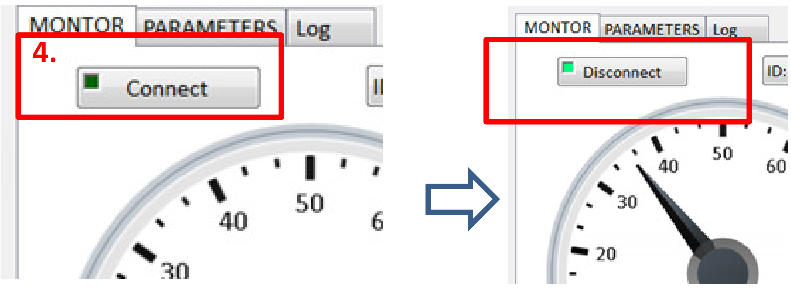
1. Open the parameter page.
2. Enter the COMx , Baud rate
3. Enter the ID of the PH1407(factory default is 1)


MONTOR
1. PARAMETERS
Log
System
Ver
Double Click to Read
2.
3.

Port COM5 9600

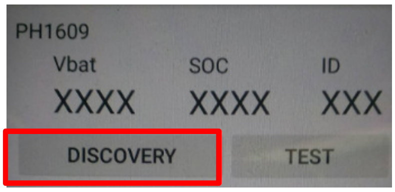
ID 1

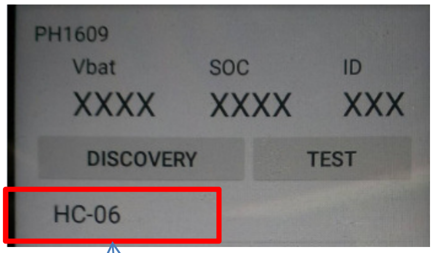
4. Back to the "Montor" page & click connect bottom, one the icon turn green & show "Disconnect", the connection success


MONTOR
PARAMETERS
Log
4.
Connect
40
50
6
30
MONTOR
PARAMETERS
Log
Disconnect
ID:
50
60
40
30
20

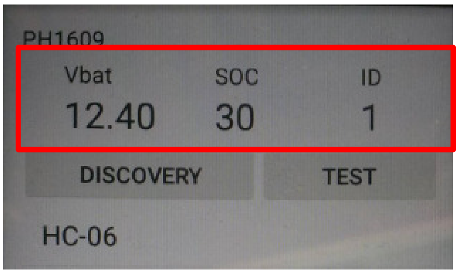
Enable Wireless APP(Android)

1. Pair the Bluetooth module, HC06 by code 1234.
2. Open the APP. Click the "DISCOVERY" bottom.


PH1609
Vbat
SOC
ID
XXXX
XXXX
XXX
DISCOVERY
TEST


PH1609
Vbat
SOC
ID
XXXX
XXXX
XXX
DISCOVERY
TEST
HC-06

3. Find HC06, & then
double click the "HC06"


PH1609
DISCOVERY
TEST
HC-06

Vbat 12.40 SOC 30 ID 1

4 . Successfully connect