4016 Series

Operation manual

S/N:900401602 REV:I

PRODIGIT
INSTRUMENT PROFESSIONAL

Material Contents Declaration

(材料含量宣称)

(Part Name) 零件名称	Hazardous Substance (有毒有害物质或元素)					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬 (Cr6+)	多溴联苯(PBB)	多溴二苯醚 (PBDE)
PCBA (印刷电路装配件)	X	○	X	○	○	○
Electrical part not on PCBA's 未在PCBA上的电子零件	X	○	X	○	○	○
Metal parts **金属零件**	○	○	○	X	○	○
Plastic parts 塑料零件	○	○	○	○	X	X
Wiring 电线	X	○	○	○	○	○
Package **封装**	X	○	○	○	○	○

对销售之日的所售产品,本表显示, PRODIGIT 供应链的电子信息产品可能包含这些物质。注意:在所售产品中可能会也可能不会含有所有所列的部件。This table shows where these substances may be found in the supply chain of Prodigit electronic information products, as of the date of sale of the enclosed product. Note that some of the component types listed above may or may not be a part of the enclosed product. ○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006 标准规定的限量要求以下。○：Indicates that the concentration of the hazardous substance in all homogeneous materials in the parts is below the relevant threshold of the SJ/T 113632006 standard. ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006 标准规定的限量要求。×： Indicates that the concentration of the hazardous substance of at least one of all homogeneous materials in the parts is above the relevant threshold of the SJ/T 11363-2006 standard.

Note(注释):

1.Prodigit has not fully transitioned to lead-free solder assembly at this moment；However, most of the components used are RoHS compliant.
(此刻，Prodigit 并非完全过渡到无铅焊料组装；但是大部份的元器件一至于RoHS的规定。)

2. The product is labeled with an environment-friendly usage period in years.

The marked period is assumed under the operating environment specified in the product specifications.
(产品标注了环境友好的使用期限制(年)。所标注的环境使用期限假定是在此产品定义的使用环境之下。)

Example of a marking for a 10 year period:
(例如此标制环境使用期限为10年)

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. PRODIGIT assumes no liability for the *customer's failure to comply with these requirements.*

GENERAL

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

ENVIRONMENTAL CONDITIONS

This instrument is intended for indoor use in an installation category I, pollution degree 2 environments. It is designed to operate at a maximum relative humidity of 80% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage and the correct fuse is installed.

GROUND THE INSTRUMENT

This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the ac power supply mains through a three conductor power cable, with the third wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired
Fuses or short circuited fuse holder. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

DO NOT SERVICE OR ADJUST ALONE.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT EXCEED INPUT RATINGS.

This instrument may be equipped with a line filter to reduce electromagnetic interference and must be connected to a properly grounded receptacle to minimize electric shock hazard. Operation at line voltages or frequencies in excess of those stated on the data plate may cause leakage currents in excess of 5.0 mA peak.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a PRODIGIT ELECTRONICS Sales and Service Office for service and repair to ensure that safety features
are maintained.

Instruments which appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

EC DECLARATION OF CONFORMITY

We **Prodigit Electronics Co., Ltd.** declares under our own responsibility that the product

Digital Power Analyzer

(Model No.: 4016**)** satisfies all the technical relations application to the product within the scope of council:

Directive: 2014/30/EU; 2014/35/EU; 2015/863/EU; 2012/19/EU

The above product is in conformity with the following standards or other normative documents

Harmonized Standard：

EN 61010-1: 2010+A1:2019

EN IEC 61010-2-030:2021+A11:2021

EN 61326-1:2013

EN 61326-2-1:2013

Reference Basic Standards：

Emission:

EN 55011: 2016+A1: 2020 Class A

EN 55032: 2015+A1:2020

EN 61000-3-2: 2014

EN 61000-3-3: 2013

Immunity:

EN 61000-4-2: 2009

EN 61000-4-3: 2006+A2:2010

EN 61000-4-4: 2012

EN 61000-4-5: 2014+A1:2017

EN 61000-4-6: 2014

EN 61000-4-8: 2010

EN 61000-4-11: 2020

Company Name : Prodigit Electronics Co., Ltd.

Company Address : 8F, No.88, Baojhong Rd., Sindian District, New Taipei City,Taiwan.

Person is responsible for marking this declaration:

PRODIGIT INSTRUMENT PROFESSIONAL

Manufacturer/Importer
Signature:

Date: **2022/10/20** Name:

Dean Wang

Dean Wang
R&D Assistant Manager

UK Declaration of Conformity

We Prodigit Electronics Co., Ltd. declares under our own responsibility that the product

Digital Power Analyzer

(Model No.: 4016) Satisfies all the technical relations application to the product within the scope of council:

Directive: Electromagnetic Compatibility Regulations 2016; Electrical Equipment (Safety) Regulations 2016; the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The above product is in conformity with the following standards or other normative documents

Harmonized Standard：

BS EN 61010-1:2010+A1:2019 ;BS EN IEC 61010-2-030:2021+A11:2021

BS EN 61326-1: 2013 ; BS EN 61326-2-1: 2013

Reference Basic Standards：

Emission:		**Immunity:**
BS EN 55011: 2016+A1: 2020	Class A	BS EN 61000-4-2: 2009
BS EN 55032: 2015+A1:2020		BS EN 61000-4-3: 2006+A2:2010
BS EN 61000-3-2: 2014		BS EN 61000-4-4: 2012
BS EN 61000-3-3: 2013		BS EN 61000-4-5: 2014+A1:2017
		BS EN 61000-4-6: 2014
		BS EN 61000-4-8: 2010
		BS EN 61000-4-11: 2020

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Person is responsible for marking this declaration:

PRODIGIT INSTRUMENT PROFESSIONAL

Manufacturer/Importer

Signature: Dean Wang

Date: **2022/10/20** Name: Dean Wang R&D Assistant Manager

SAFETY SYMBOLS

Direct current (DC)

Alternating current (AC)

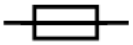
Both direct and alternating

Three-phase alternating current

Protective earth (ground)

On (Supply)

Off (Supply)



Fuse

Caution ! Refer to this manual before using the meter.

Caution, risk of electric shock

CAT IV – Is for measurements performed at the source of the low-voltage installation.

CAT III – Is for measurements performed in the building installation.

CAT II – Is for measurements performed on circuits directly connected to the low-voltage installation.

CAT I – Is for measurements performed on circuits not directly connected to Mains.

4016 series Digital Power Analyzer operation manual
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Tables

Chapter 1 Introduction

1-1. General description

5 digit V/A/W Meter，display the Voltage（Vrms, Vpeak, Vmax., Vmin）、Current（ Irms, Ipeak, Imax, Imin.）,Watt, Voltampere（ VA）, Frequency Crest Factor、 Power Factor,Total Harmonic Distortion of Voltage（ VTHD）, Voltage Harmonic(VH）、Total Harmonic Distortion of Current（ ITHD）, Current Harmonic（ IH）

1-2. Features

The main features of the 4016 series of digital Power Analyzer are highlighted below.

1.2.1. Less than 0.001W standby power measurements meet IEC62301 Energy Star 0.03W standby power.
1.2.2. Harmonic analysis to the 50thorder
1.2.3. 6 voltage range and 18 current range
1.2.4. Up to 800Vpeak/200Apeak input
1.2.5. Color graphical display
1.2.6. Data log with Vrms, Arms, Watt, PF,VTHD and ITHD
1.2.7. The built-in Power switch can be Controlled the ON/OFF degree angle (0~359°) according to of the Voltage source phase angle
1.2.8. RS-232, GPIB, USB, Ethernet Interface(Option)
1.2.9. 9942 Measuring fixture box(Option)
1.2.10. Supports the Inrush Current of the power supply at startup and the Surge Current test When the load is suddenly plugged in (Hot Plug-in).

1-3. Standard Accessories

a 4016 Series operation manual.....1PCs
b Power Cord.....1PCs

1-4. Option

1.4.1. GPIB interface
1.4.2. RS232 interface
1.4.3. GPIB interface
1.4.4. USB interface + USB & LAN DRIVER CD
1.4.5. LAN interface+ USB & LAN DRIVER CD
1.4.6. 9942 Measuring fixture box
1.4.7. GPIB cable 1 M
1.4.8. GPIB cable 2 M
1.4.9. USB TYPE A TO TYPE B cable 1.8 M.

1-5. Specifications 1

AC INPUT	LINE	100Vac~230Vac ± 10%
	FREQUENCY	50/60 Hz ±3Hz
	PROTECT FUSE	0.5A/250V (5*20mm)
	MAX.POWER CONSUMPTION	50VA

Model	Voltage	Current	Dimension(HxWxD)	WEIGHT
4016	500V	20A 30A(Option)	99.4 mm x 213 mm x 304 mm	

Table 1- 1 4016 Series Specifications

1-6. Specifications 2

4016 Specification			
Item			**Specification**
ACV & DCV Vrms, Vpk+/Vpk-, Vmax/Vmin, V Harmonic		Range	20Vpeak/0.001V 40Vpeak/0.001V 80Vpeak/0.01V 200Vpeak/0.01V 400Vpeak/0.01V 800Vpeak/0.1V
		Max. Input	**800Vpeak/500Vrms**
		Accuracy	±0.1% of (Reading + Range)
			±0.5% of (Reading + Range, For Peak)
ACA & DCV Arms, Apk+/Apk-, Amax/Amin, A Harmonic	Shunt 0.05A (10Ω)	Range	0.002Apeak/0.1uA 0.004Apeak/0.1uA 0.008Apeak/0.001mA 0.02Apeak/0.001mA 0.04Apeak/0.001mA 0.08Apeak/0.01mA
		Max. Input	**0.08Apeak/0.05Arms**
	Shunt 0.5A (1Ω)	Range	0.2Apeak/0.01mA 0.4Apeak/0.01mA 0.8Apeak/0.1mA
		Max. Input	**0.8Apeak/0.5Arms**
	Shunt 5A (0.04Ω)	Range	2Apeak/0.1mA 4Apeak/0.1mA 8Apeak/0.001A
		Max. Input	**8Apeak/5Arms**
	Shunt 20A (0.005 Ω)	Range	10Apeak/0.001A 20Apeak/0.001A 40Apeak/0.001A 50Apeak/0.001A 100Apeak/0.01A 200Apeak/0.01A
	Shunt 30A (0.00275 Ω)		
		Max. Input	**200Apeak per 25ms/20Arms continuous**
			200Apeak per 25ms/30Arms continuous
	Accuracy		±0.1% of (Reading + Range)
			±0.5% of (Reading + Range,For Peak)
VCF & ICF		Range	0.0000~9.9999
		Accuracy	±0.5% of (Reading + Range)
AC Power & DC Power Watt, VA, VAR		Range	Vrange*Arange
		Accuracy	±0.2% of (Reading + Range)
PF		Range	±0.001~1.000/0.001
		Accuracy	1% of (Reading + Range, Corresponds to V and A)
Frequency		Range	dc, 20~1000/0.1Hz
		Accuracy	± 0.1 Hz
V/A Harmonic		Number	1~50 th/ Same as ACV, ACA meter
		Accuracy	±0.5% of (Reading + Range)
V/A THD		Range	0%~255%/0.001%
		Accuracy	±0.5% of (Reading + Range)

Inrush V/A	Voltage	Range	Same as ACV & DCV
		Max. Input	
		Accuracy	±2% of (Reading + Range)
	Current Shunt 20A (0.005 Ω)	Range	Same as ACA & DCA
	Current Shunt 30A (0.00275 Ω)	**Max. Input**	
	Accuracy		±2% of (Reading + Range)
	Measurement Wide		100mS
AC ON/OFF Programmable output switch	ON		0~359°/1°
	OFF		0~359°/1°
	Accuracy		Max. +/- 1° @50/60Hz
Standby Power	Accumulated Time		$0_D0_H0_M0_S$~$9999_D23_H59_M59_S$
	WHr		0.000000~999.999999 WHr / 1.000~9999.999 KWHr
	Counter		$0_H0_M0_S$~$99_H59_M59_S$
	Accuracy		±0.2% of (Reading + Range)
Data Log	Item		Vrms、Arms、Watt、PF、V_{THD}、I_{THD}
	Updata Rate		0.2、0.5、1、2、5、10 Second
ON/OFF Cycling	ON time		$0_M0.200_S$ ~ 10_M0_S
	OFF Time		$0_M0.200_S$ ~ 10_M0_S
	Repeat Cycle		0~9999
Low Pass Filter(V & A)			50KHz
Interface(Option)			RS-232, GPIB, USB, Ethernet
Operating Theory	Rms Voltage (Vrms)		$\sqrt{\frac{1}{T}\int_0^T A_t^2 dt}$
	Rms Current (Arms)		
	+ or - Peak Value (+/-Vpk, +/-Apk)		Max[Value$_{(t)}$] or Min[Value$_{(t)}$]
	Max.or Min Value (Vmax/Vmin, Amax/Amin, Wmax/Wmin)		Max[Value] or Min[Value]
	Crest Factor (VCF, ICF)		Peak Value/Rms Value
	Active Power (Watt)		$\frac{1}{T}\int_0^T V_t \times A_t dt$
	Apparent Power (VA)		
	Reactive Power (VAR)		$\sqrt{VA^2 - W^2}$
	Power Factor (P.F.)		$\frac{Watt}{Vrms \times Arms}$
	Harmonic		$\sqrt{Hr^2 + Hq^2}$
	Tatal Harmonic Distortion (%)		$\sqrt{H_2^2 + H_3^2 + \ldots H_{50}^2} \div H_1$
Rms Sampling Rate			4096 sample/Cycle @ 50/60 Hz
Inrush Sampling			<2.5us
V/A ADC			Dual 16-Bit, 500KSPS ADC with DSP
Power Input			110/220V 50/60Hz
Consumption			38VA
Protection(fuse)	Shunt 0.05A (10Ω)		3.6x11mm 250Vac 0.2A Fast
	Shunt 0.5A (1Ω)		3.6x11mm 250Vac 1A Lag
	Switch		6*30mm 250V/25A 30 Option(no Fuse)
Display			3.5" TFT LCD, 320 x RGB x 240
Dimensions	Height		99.4 mm with feet
	Width		213 mm
	Depth		304 mm
Weight			3.5 Kg
Storage temperature			-20 ºC to +60 ºC (-4 °F to 140 °F)
Operating temperature			0 ºC to 40 ºC (32 °F to 104 °F)
Maximum operating altitude			2000 M (6562 ft)
Maximum relative humidity			80% for temperatures up to 31 °C (88 °F) decreasing linearly to 50 % relative humidity at 40 °C (104 °F)

Table 1-1A 4016 Series Specification

Chapter 2 Installation

2-1 Inspection

The 4016 Series AC/DC Digital Power Analyzer was carefully inspected before shipment. If instrument damage has occurred during transport, please inform Prodigit's sales and service office or representative.

You're 4016 Series AC/DC Digital Power Analyzer was shipped with a power cord for the type of Terminal blocks used at your location. If the appropriated cord was not included, please contact your nearest Prodigit sales office to obtain the correct cord. Refer to "check line voltage "to check the line voltage is 100V~230Vac.

2-2 Check line voltage

The 4016 Series AC/DC Digital Power Analyzer can operation with 100 Vac ~230Vac input as indicated on the label on the rear panel.

Make sure that the factory check mark corresponds to your nominal line voltage. Skip this procedure if the label is corrected marked.

2.2.1. With the 4016 Series AC/DC Digital Power Analyzer power OFF, disconnect the Power cord.

2.2.2. Refer the drawing on the rear panel of 4016 Series high power Digital Power Analyzer in Fig 2-1.

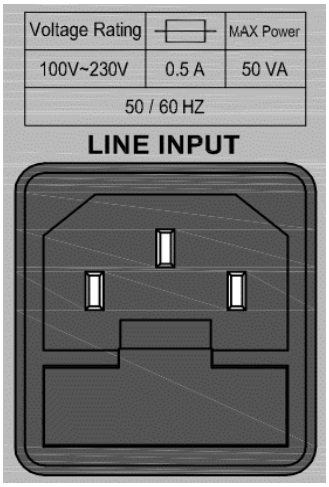


Fig 2-1 4016 Series AC Input Connection

2-3 Fuse Exchange

This product has the power fuse, and exchanges it according to the following procedure.

CAUTION

Never fail to turn off the power of this product, and disconnect the plug of the AC Power cable.

WARNING

To avoid the fire or electronic shock, the Fuse that will be used in the product should have the safety standard in the area of the region you use. Any use of improper Fuse or shorting the Fuse holder would be extremely dangerous and would be strictly prohibited.

- Before exchanging the Fuse, if there are abnormal odor or abnormal noise,
- Please stop using immediately and ask for the repair.

2.3.1. Check the rating of the line fuse and replace it with the correct fuse if necessary.
100V~230V use T0.5A/250V (5*20mm).

2.3.2. The AC line fuse is located below the AC line receptacle see Fig 2-2. Use a small Screwdriver to extract the fuse holder, to change a new one. Change an appropriate Specifications fuse which indicated in Table 1-1.

2.3.3. Reinstall fuse holder and connect the power cord.

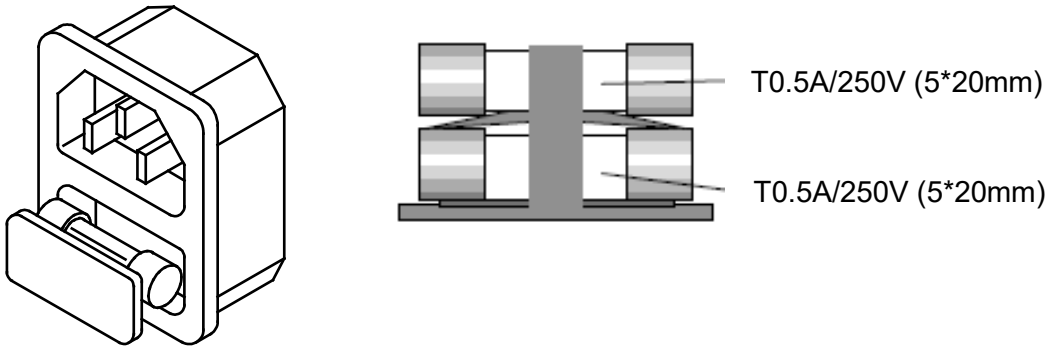


Fig 2-2 4016Series fuse holder

2-4 Grounding requirements

SHOCK HAZARD

1. It is requested to use the 3Pin plug connector only for 4016 Series mainframe to out of danger when electric leakage. And the complete and proper grounded is necessary.

2. The 4016 Series high power AC/DC Digital Power Analyzer is equipped with three conductor cable which plugs in an appropriate receptacle to ground the instrument's cover.

2-5 Environmental requirements

- Indoor use.
- Measurement Category I.
- Pollution Degree 2.
- Relative Humidity 80% Max.
- Ambient Temperature 0 to +40°C
- Altitude up to 2000m.
- The equipment is not for measurements performed for CAT II, III and IV.
- Transient Overvoltage on the mains supply can be 2500V.

2-6 Repair

If the instrument is damaged, please attach a tag to the instrument to identify the owner and indicated the require service or repairing. And inform the Prodigit sales and service office or representative.

Fuses (F1, F2, Fuse 25A), overcurrent protection diodes (D1~4, D31~32) and switching components (14016402) are consumables and are not covered by the warranty.

2-7 Cleaning

Use a soft or slightly damp cloth to clean this product.

BEFORE you clean the unit, switch the mains power off and disconnect the input lead.

- Please do NOT use any organic solvent capable of changing the nature of the plastic such as benzene or acetone.
- Please ensure that no liquid is allowed to penetrate this product.

2-8 Power Up

The following procedure should be followed before applying mains power:

2.8.1. Turn off (O) the POWER switch
2.8.2. Check that the power cord is corrected.
2.8.3. Check that nothing is connected to the DC INPUT on the rear panels.
2.8.4. Turn on POWER switch.

2-9 Connection to the load Input Terminal on the Rear Panel

Connection procedure of the load input terminal on the rear panel

2.9.1. Turn off POWER switch.
2.9.2. Check that the output of the equipment under test is off.
2.9.3. Check the polarity of the connection and connect the load wire to the output Terminal of the equipment under test.

2-10 RS232 interface option

Fig 2-3 shows the RS232 interface (Female) on the rear panel connects 4016 Series Digital Power Analyzer to RS232 port of computer in one by one configuration .The RS232 BAUD-RATE can be set in the front panel

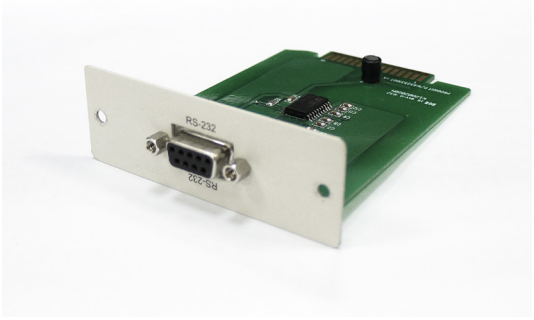


Fig 2-3 4016 Series RS232 interface

2-11 GPIB interface option

2.11.1 The maximum number of devices including the controller is no more than 15.
2.11.2 The maximum length of all cable is no more than 2 meters times the number Of devices connected together, up to 20 meters maximum.

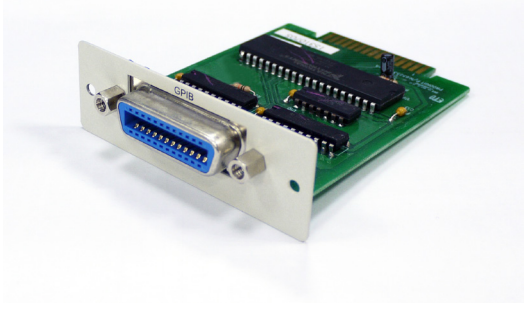


Fig 2-4 4016 Series GPIB interface

2-12 USB interface option

Fig 2-5 shows the USB interface in the rear panel of 4016 Series Digital Power Analyzer . Please Refer Appendix 1.

The USB card chip PL2303TA only supports operating systems before Win10(Including).

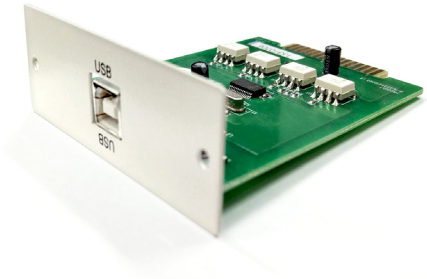


Fig 2-5 4016 Series USB interface

2-13 LAN interface option

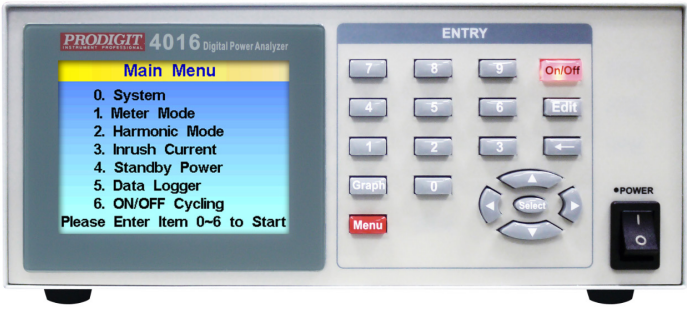
Fig 2-6 shows the LAN connector in the rear panel of 4016 series mainframe. Please Refer Appendix 2.

Fig 2-6 4016 Series LAN interface

Chapter 3 Operation

This chapter describes the front panel function and operation of each 4016 Series Digital Power Analyzer, The communication Interface programming is described in Chapter 4.

3-1. 4016 Series dimension description



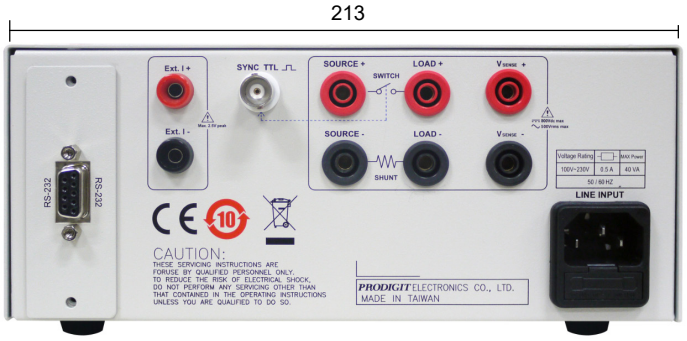


Fig 3-1 4016 Digital Power Analyzer dimension

3-2. 4016 I/O interface function

The 4016 Series Digital Power Analyzer I/O interface includes Vsense, Load, Source, SYNC TTL, and EXT.

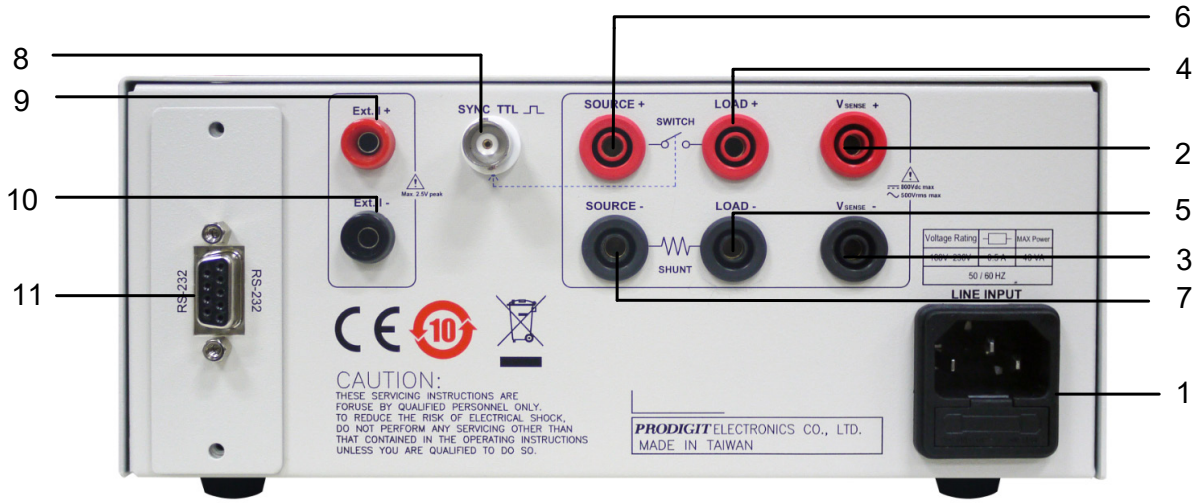


Fig 3-2 4016 Series I/O interface Connection

1. Power Input 100~230V 50/60Hz
2. Voltage measurement contact positive terminal
3. Voltage measurement contact negative terminal
4. Positive end of the EUT
5. Negative end of the contact of the EUT
6. Measuring the positive input of the power supply
7. Measuring the negative input of the power supply
8. Internal Switch Synchronization Signal
9. External current signal input positive terminal
10. External current signal input negative terminal
11. Interface card (optional RS232 GPIB USB)

3-3. Operating instructions:

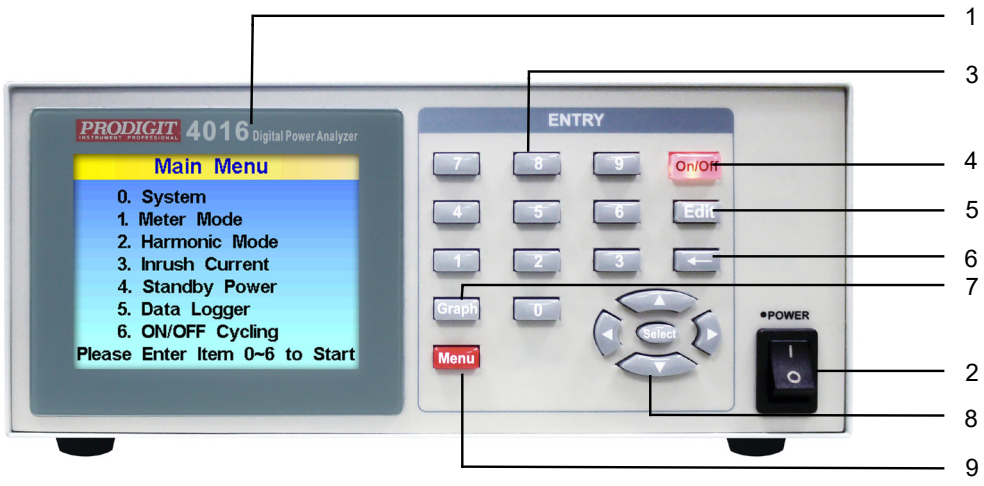


Fig 3-3 4016 Display panel

- Model number (1)
  Refers to model number, of 4016 Series Digital Power Analyzer.

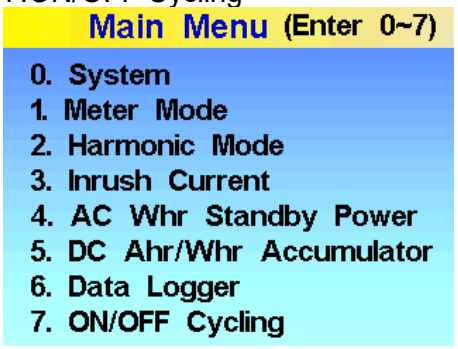
- 4016 Power switch (2)
- Number keys (3)
- On/Off Key (4), Turn output on or off.

※ The output switch has an angle control function. In the AC mode, VSource and VSense need to input power supply to operate normally.

- Edit Key (5), Enter or leave the edit page
- ← Key (6), clear data
- Graph Key (7), Switch data and graphics pages.
- The arrow keys and Select keys (8) switch the screen and select functions.
- Menu Key (9), Return to the Menu menu

3.3.1. In the 4016 series, there are 0~7 kinds of available numeric keys to choose from. The Program is as follows:

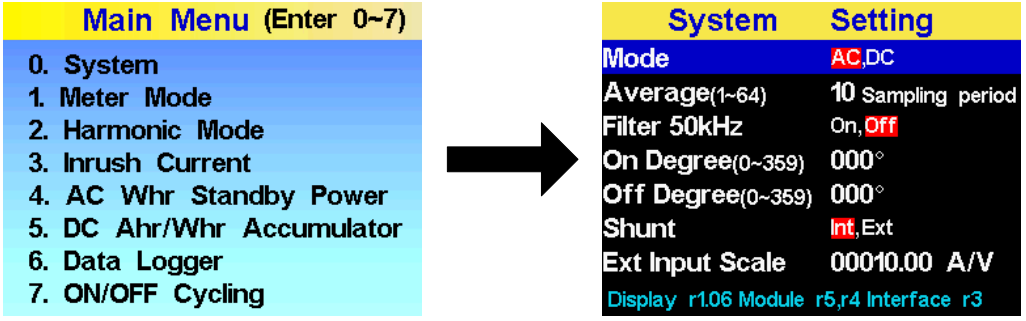
- 0.System
- 1.Meter Mode
- 2.Harmonic Mode
- 3.Inrush Current
- 4.AC Whr Standby Power
- 5.DC Ahr/Whr Accumulator
- 6.Data Log
- 7.ON/OFF Cycling



3.3.2. Basic system function settings

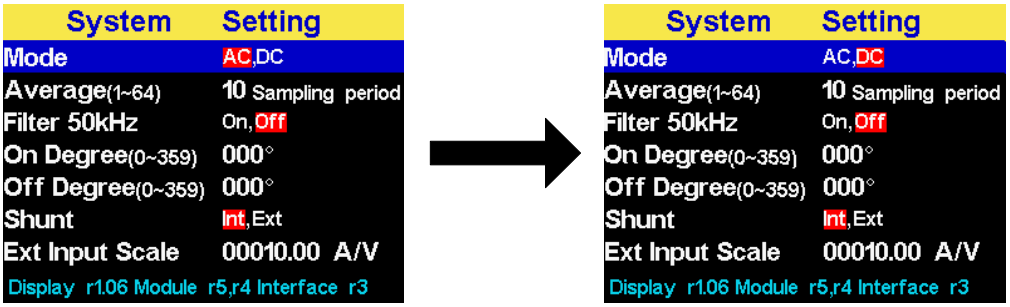
- System function setting

➢ To set the main menu page, press the number key 0 to enter the system settings As follows:

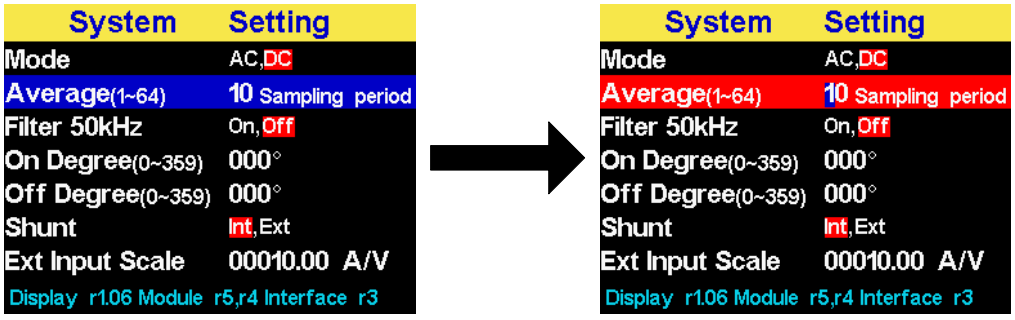


- Measurement mode setting

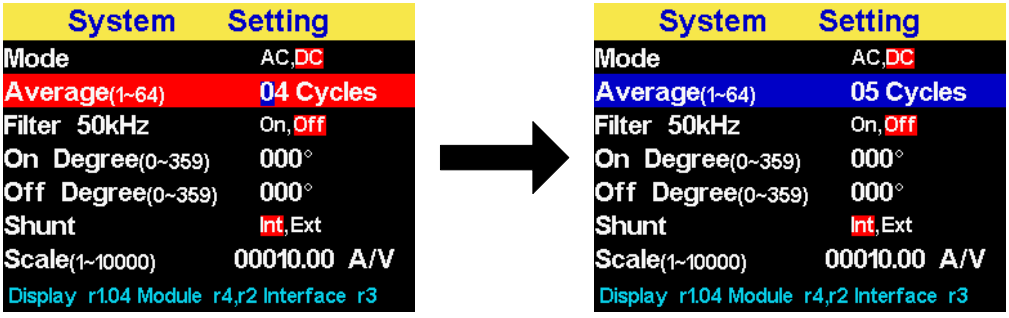
➢ Press the up or down key to Mode, Press the left or right key switches between AC Mode and DC mode.



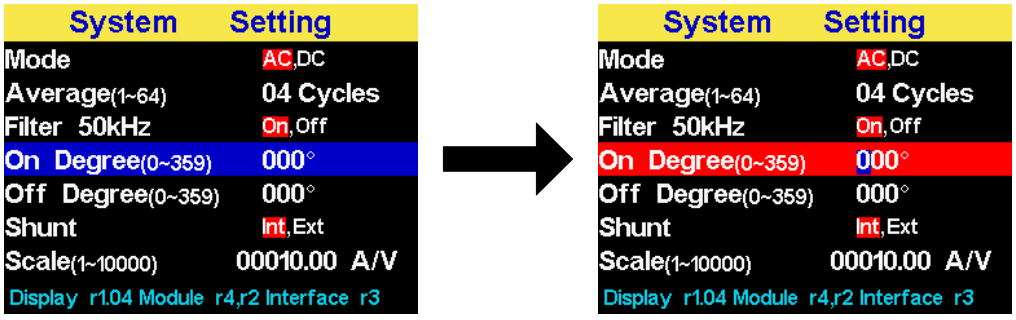
- Sampling cycle average setting
  - Press the up or down keys to Average, press the select key to enter the edit.



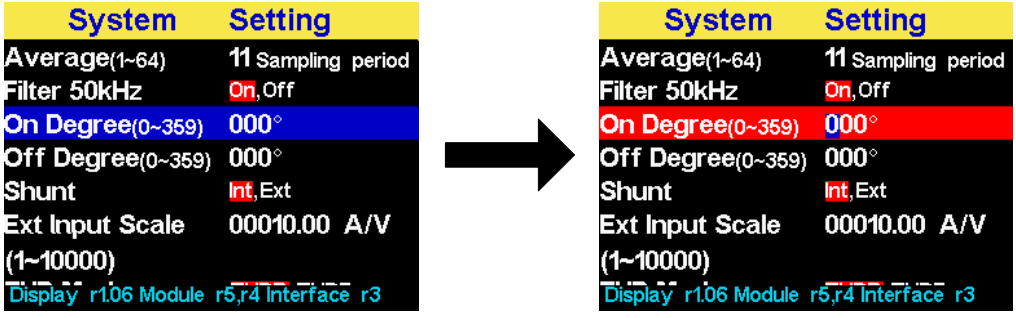
  - Press the up, down, left, right keys to editing data, range from 1 to 64 Cycles; press the select key to store the data.



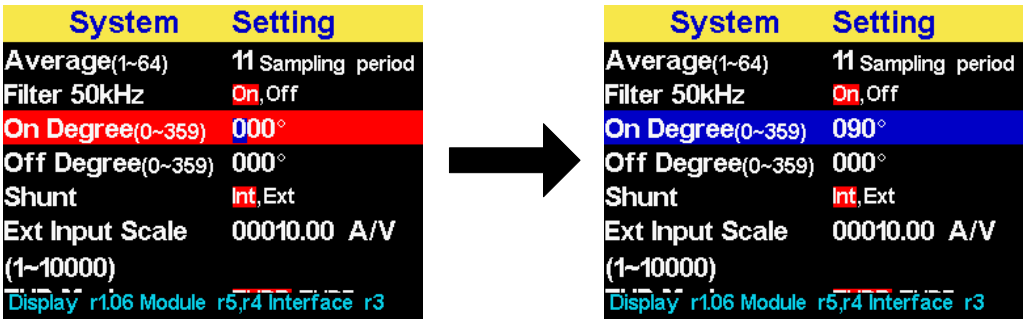
- Filter 50 kHz setting
  - Press the up or down keys to filter 50KHZ, press the left and right key to select to on or off.



- Switch opening angle setting
  - Press the up or down keys to On Degree, press the select key to enter the edit.

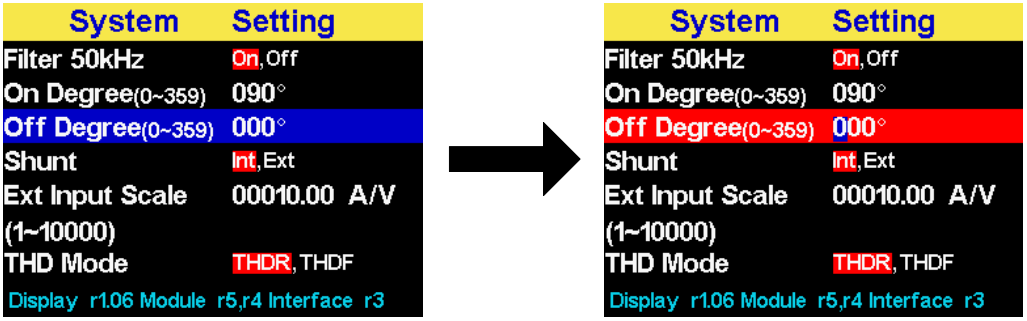


➢ Press the up, down, left, right keys to edit, press the select key to save the data.

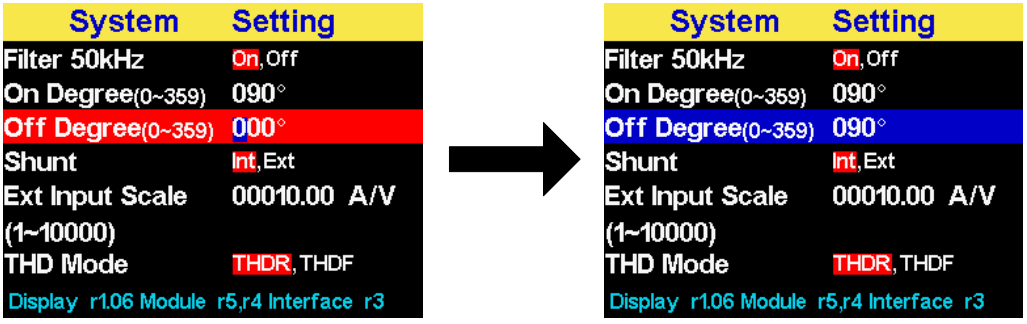


- Switch off angle setting

➢ Press the up or down keys to Off Degree, press the select key to enter the edit.

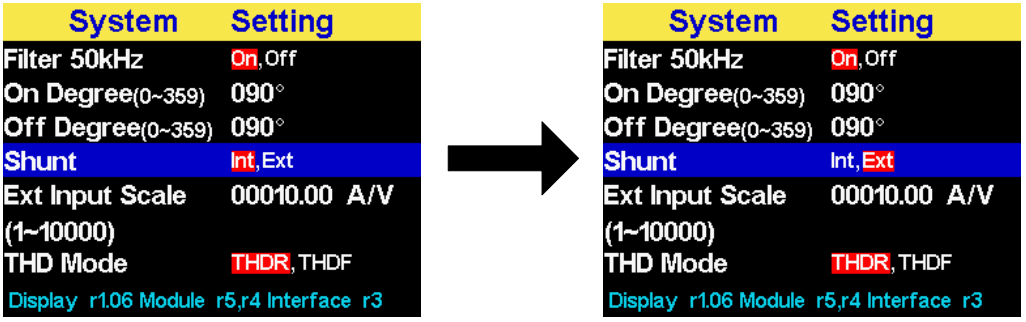


➢ Press the up, down, left, right keys to edit, press the select key to save the data.



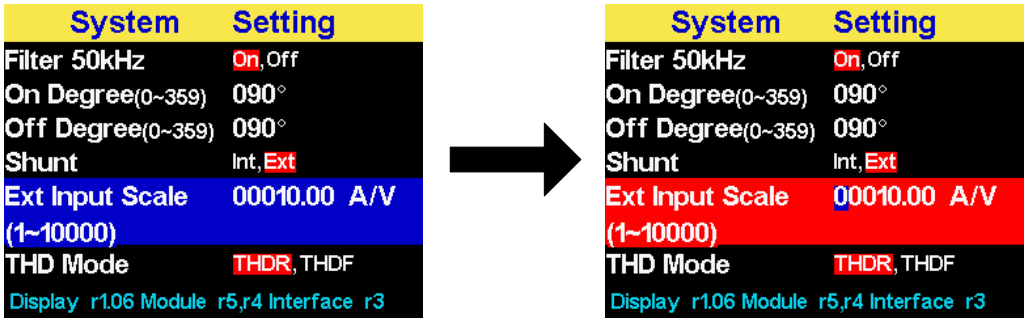
- Electric current measurement switching

➢ Press the up or down keys to Shunt, press the left and right keys to set INT or Ext.

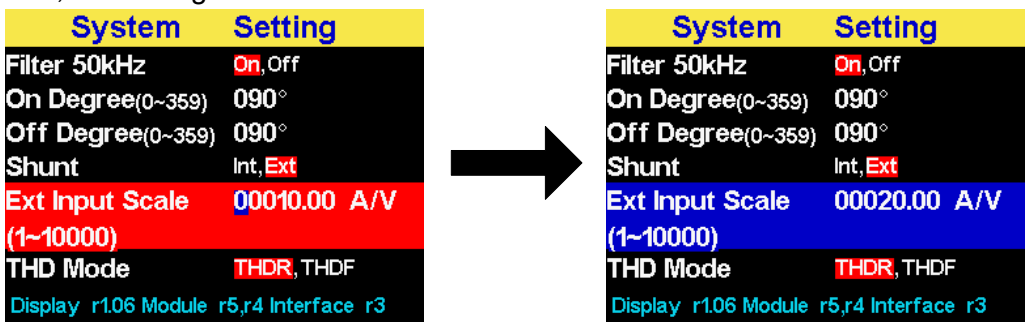


- External Input Scale rate adjustment

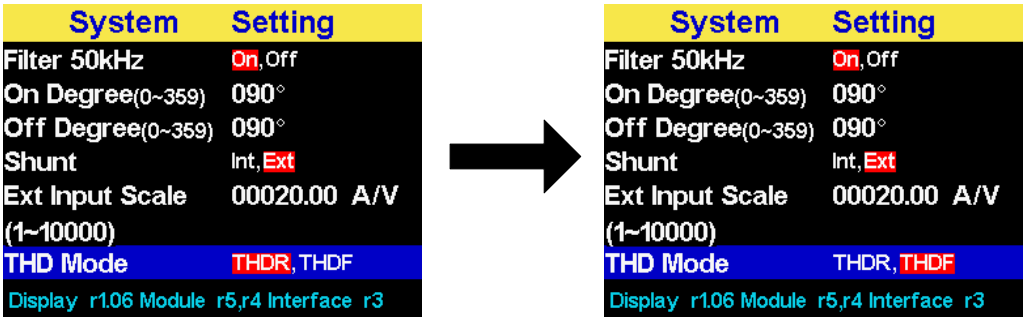
➢ Press the up or down keys to Ext Input scale, press the select key to enter the edit.



➢ Press the up, down, left, right keys to edit the data, press the select key to save the data, scale range from 1 to 10000.



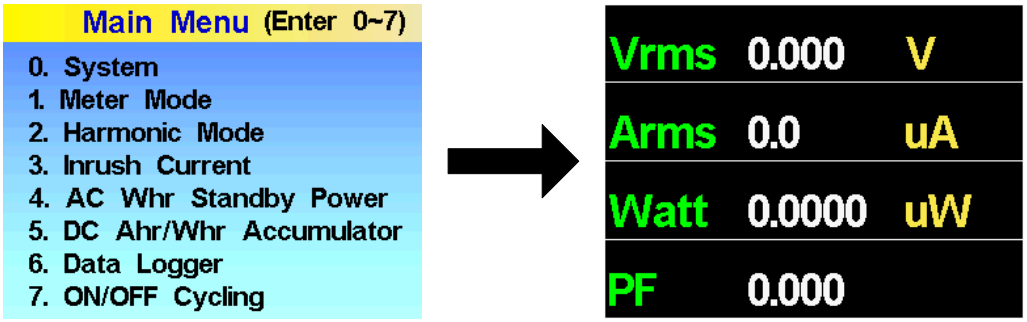
➢ Press the up or down keys to THD Mode,press the left or right keys to set THDR/THDF



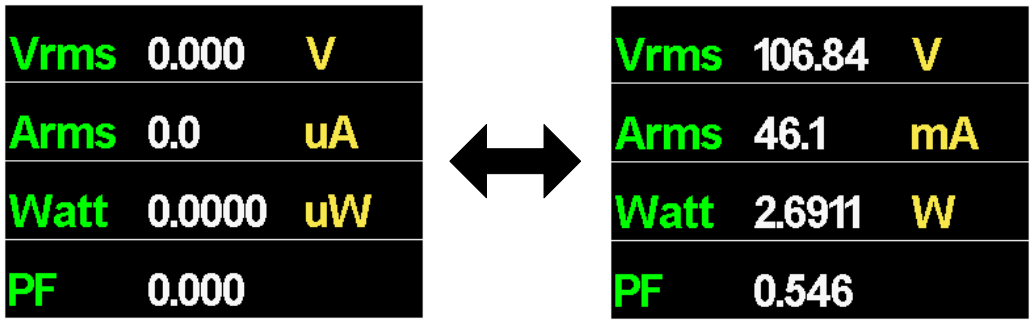
3.3.3. General measurement mode

- General measurement mode

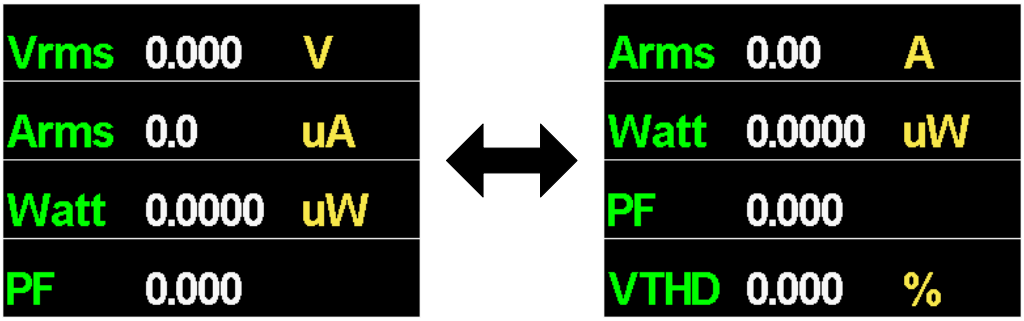
➢ Press the number key 1 to enter Meter:



➢ Press the On/Off key to turn the output on or off.



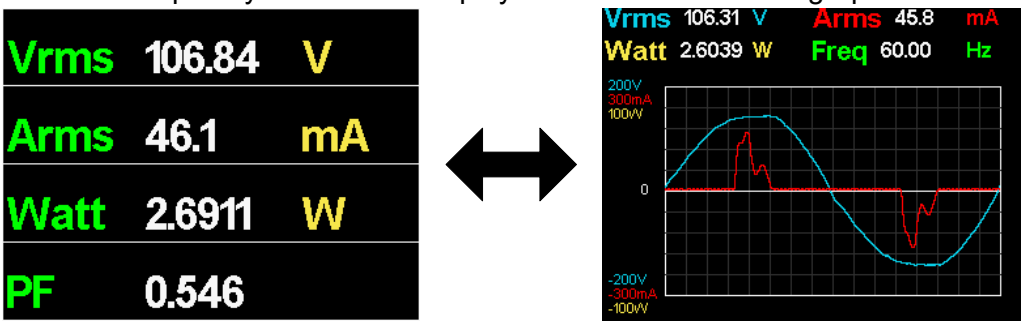
➢ Press the up or down key to switch the display item.



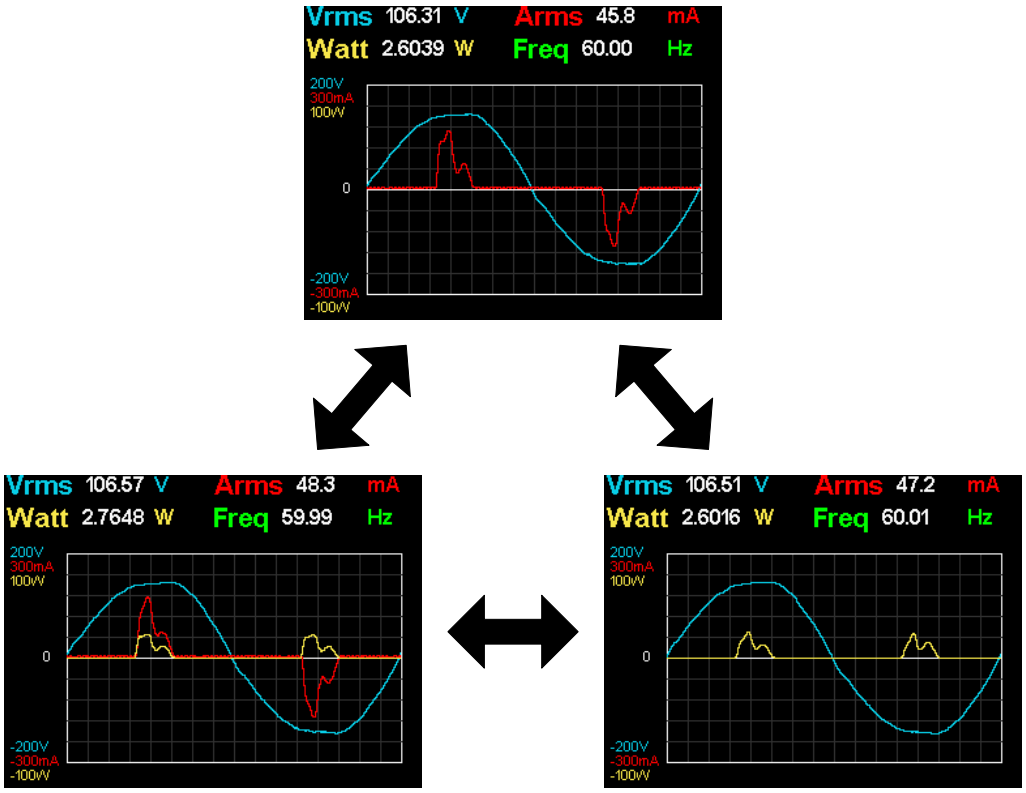
※ The display order is: Vrms→Arms→Watt→PF→VTHD→ITHD→VA→Freq→Vpk+→Vpk-→Vmax→Vmin→Apk+→Apk-→Amax→Amin→Wmax→Wmin→VAR→VCF→ICF。

- Switch display measurement data and waveform

➢ Press the Graph key to switch to display measurement data or graphics.

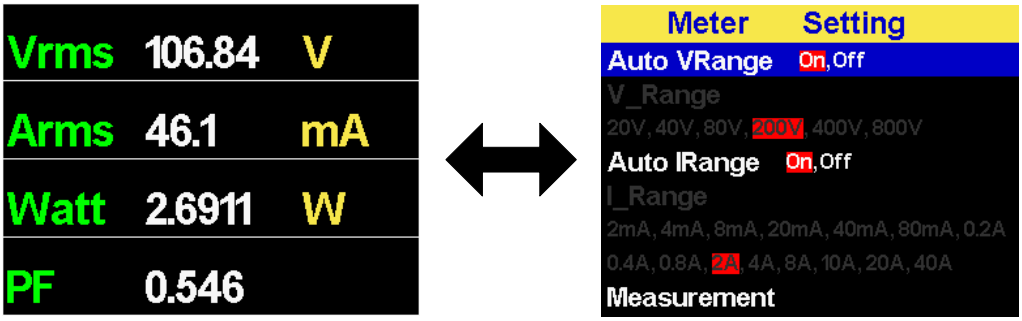


※ In graphics mode, press the left or right key to switch between Volt & Amp, Volt & Watt, Volt & Amp & Watt.

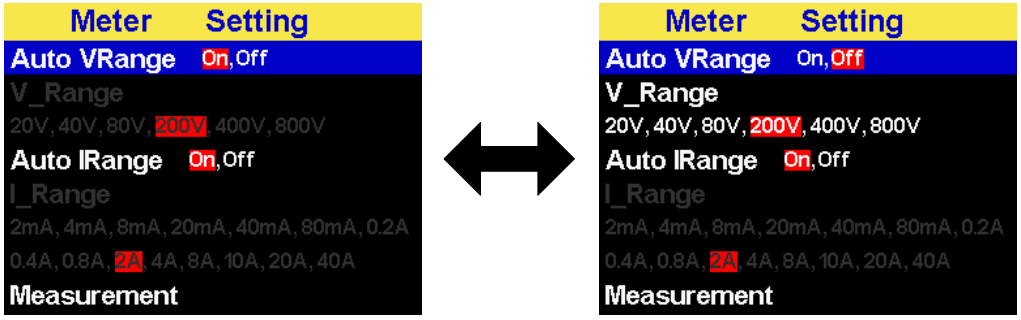


- Meter Mode Setting

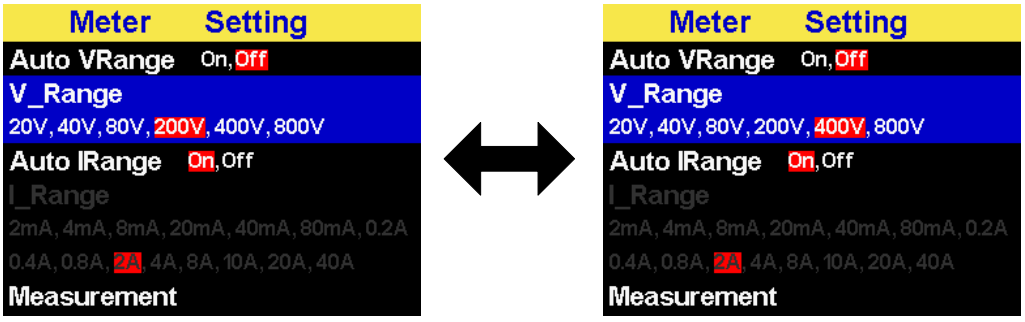
➢ Press the Edit key to enter the Meter Mode Setting page.



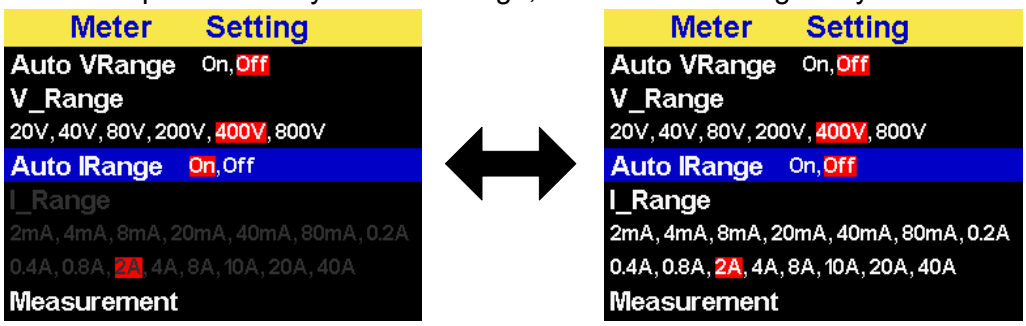
➢ Press the up or down key to Auto VRange, Press the left or right key to set On or Off.



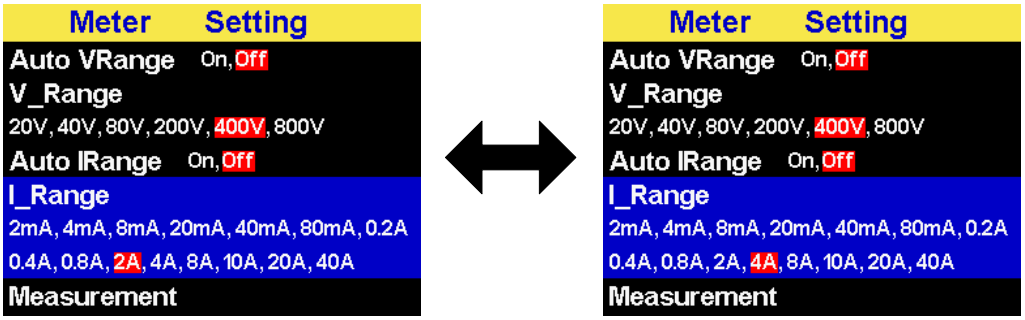
➢ Press the up or down key to V_Range, Press the left or right key to set Voltage Range.



➢ Press the up or down key to Auto IRange, Press the left or right key to set On or Off.

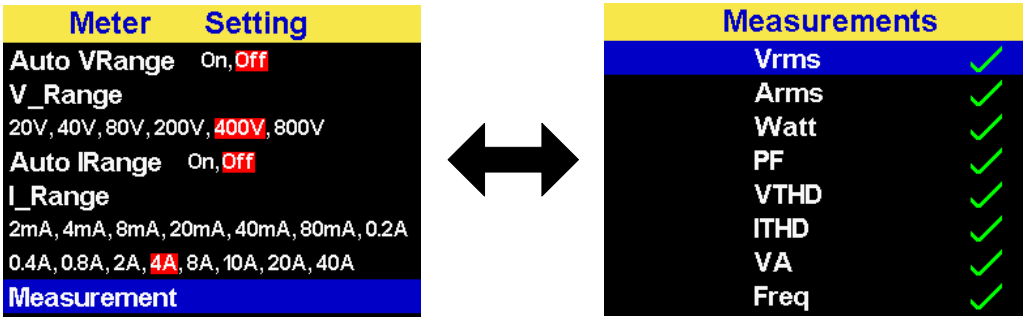


➢ Press the up or down key to I_Range, Press the left or right key to set Current Range.

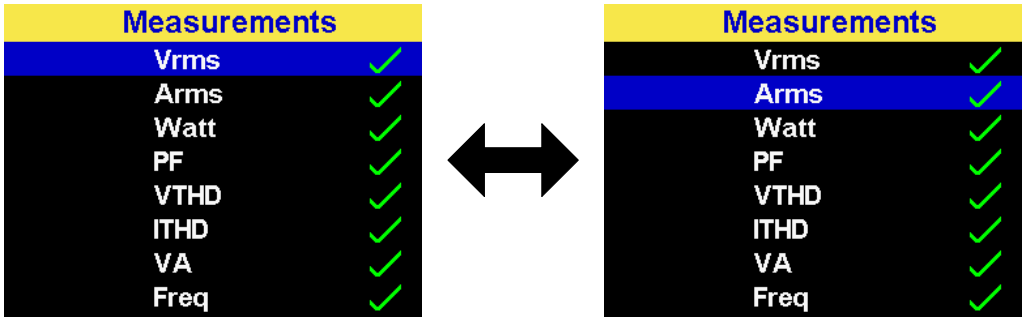


- Edit display measurement

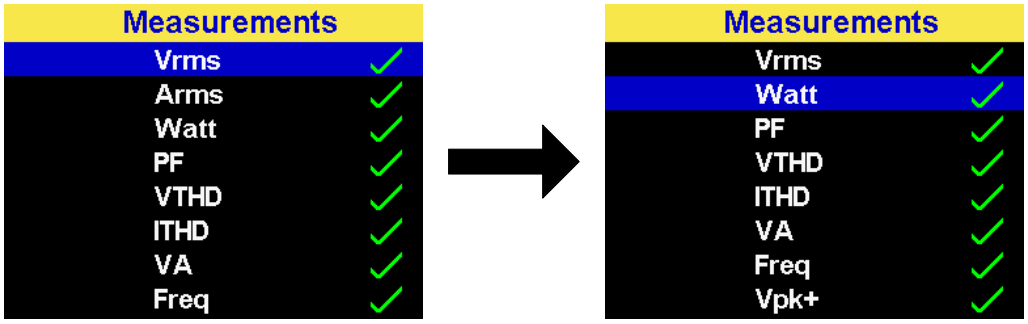
➢ Press the up or down keys to Measurement, press the select key enter the edit display measurement page.



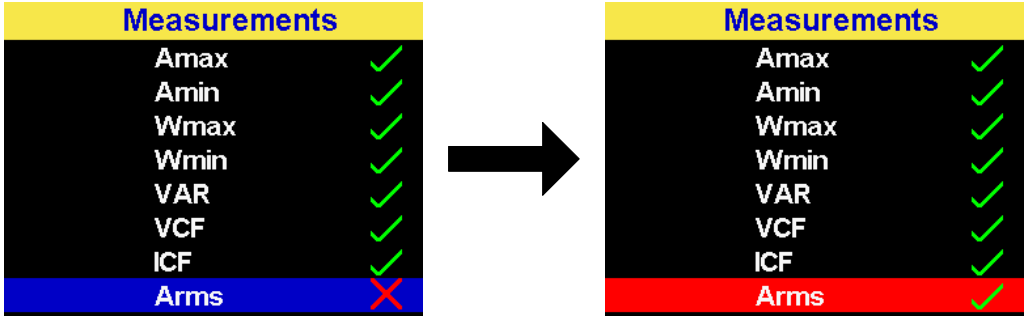
- Press the up or down key to move the display item you want to modify.



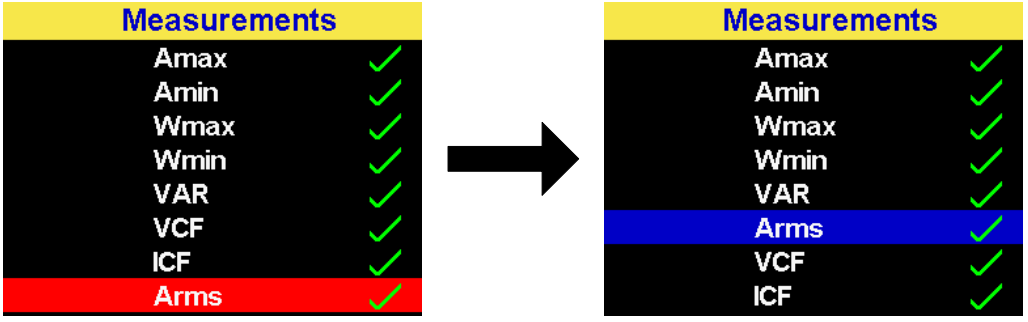
- Select the open display item; press the select key to close the display item (the closed item will automatically move to the end of the page).



- Select the closed display item, press the select key to open the display item and lock the indicator (the selected item is red when locked).



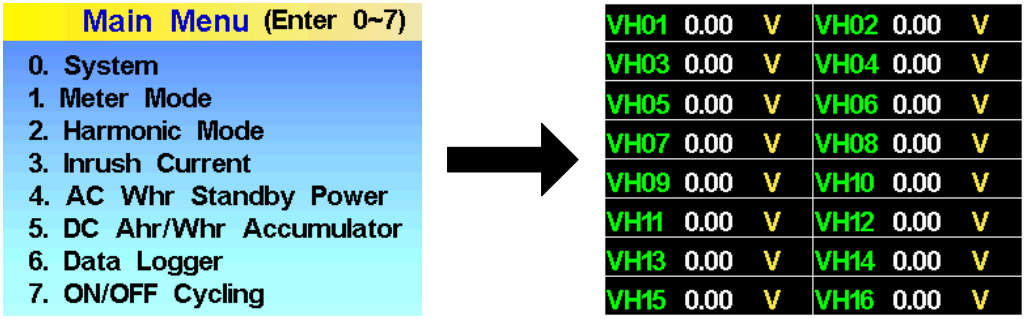
- When locking the indicator, press the Up or down key to move to the position you want to place, and press the Select key to confirm the placement position.



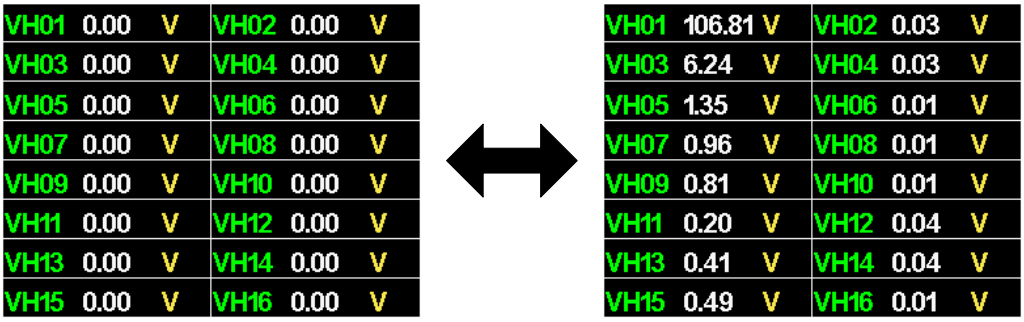
3.3.4. Harmonic measurement mode

- Harmonic measurement mode

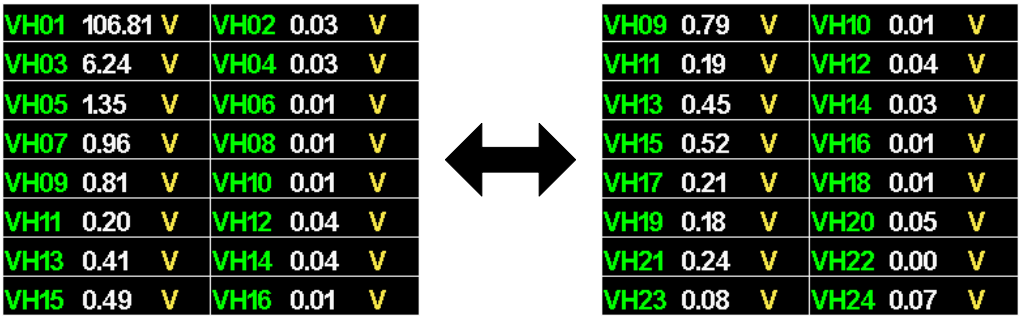
➢ Press the number key 2 under the Menu page mode to enter the harmonic measurement mode.



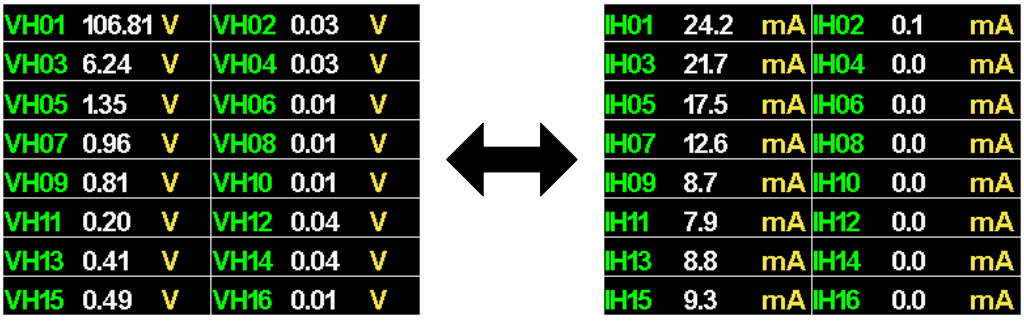
➢ Press the On/Off key to turn the output on or off.



➢ Press the up or down key to switch display the harmonic level page.

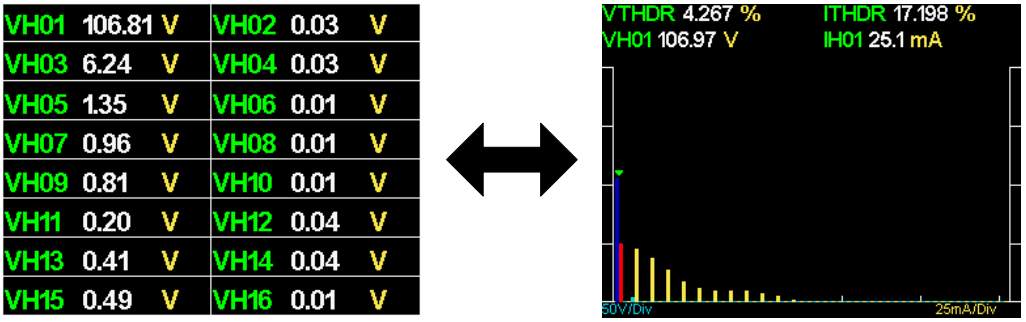


➢ Press the left or right key to change the display voltage or current harmonic page.

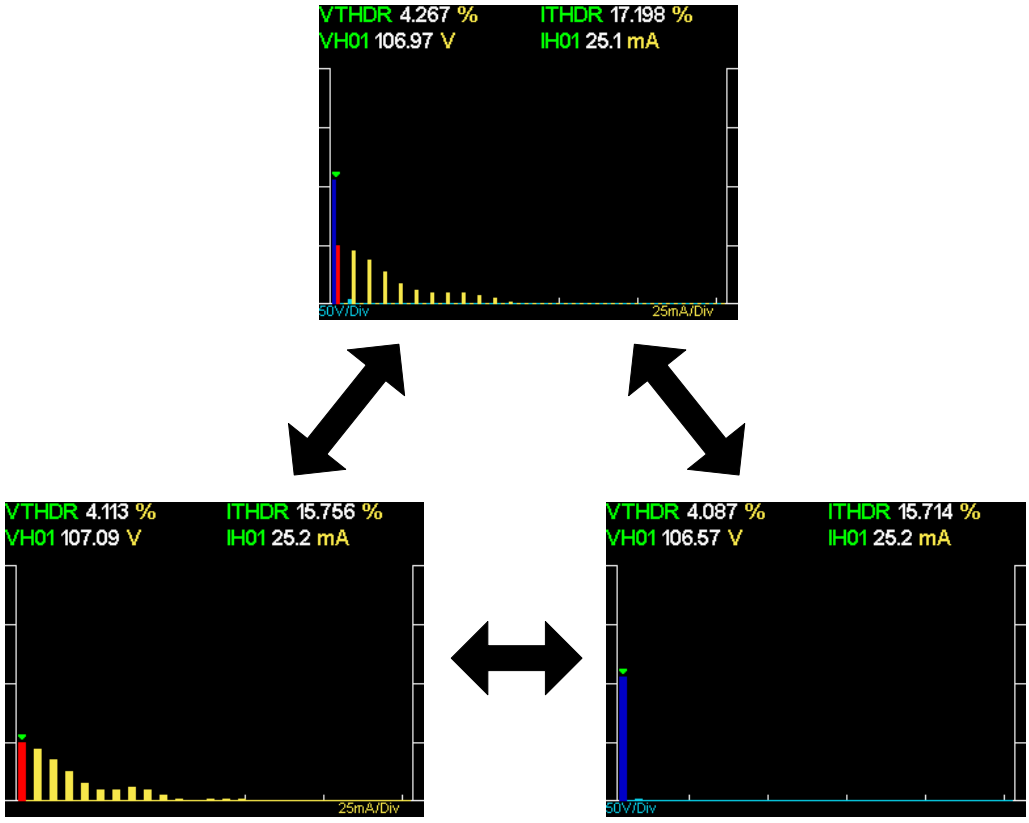


- Harmonic graphic display

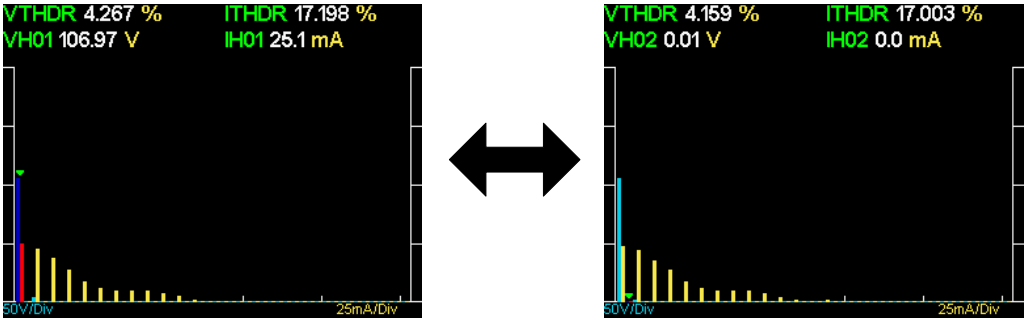
➢ Press the Graph key to switch data or graphic display



➢ When the harmonic graphic is displayed, press the up or down key to switch between the V&A, V, and A harmonic patterns.

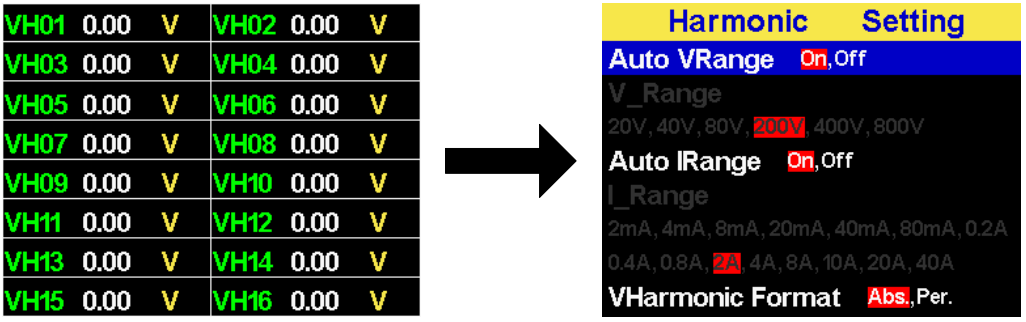


➢ When the harmonic graphic is displayed, press the left or right key to switch to display the harmonic level value.

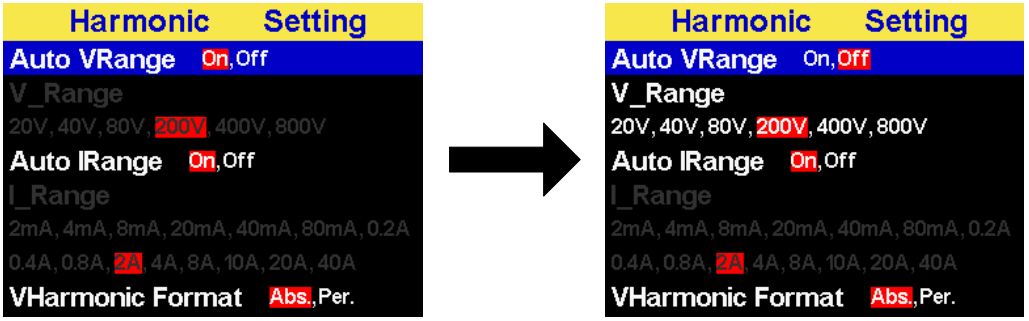


- Harmonic measurement mode setting

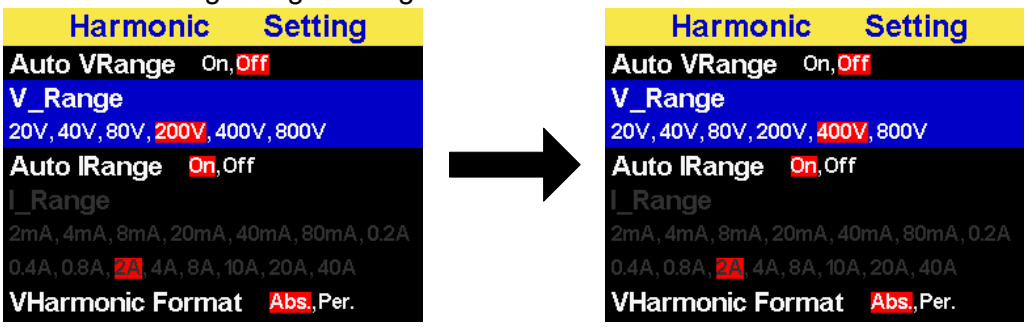
➢ Press the Edit key to enter the harmonic measurement settings.



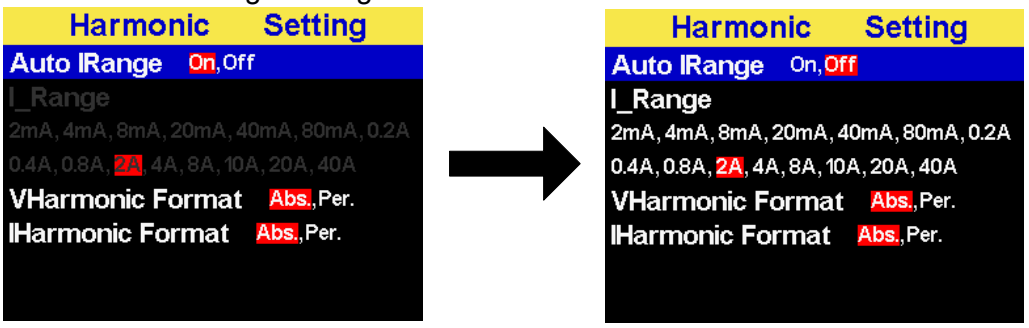
➢ Press the up or down key to “Auto VRange”, press the “Left or Right” key to switch the auto voltage range setting on and off.



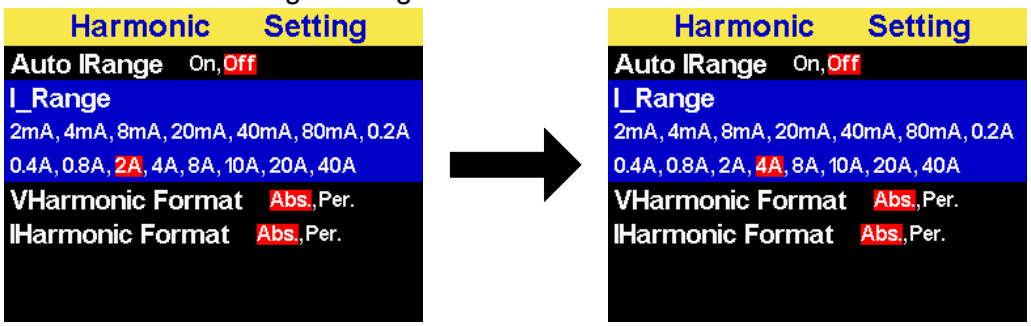
➢ Press the up or down key to “V Range”, press the “Left or Right” key to switch to the manual voltage range setting.



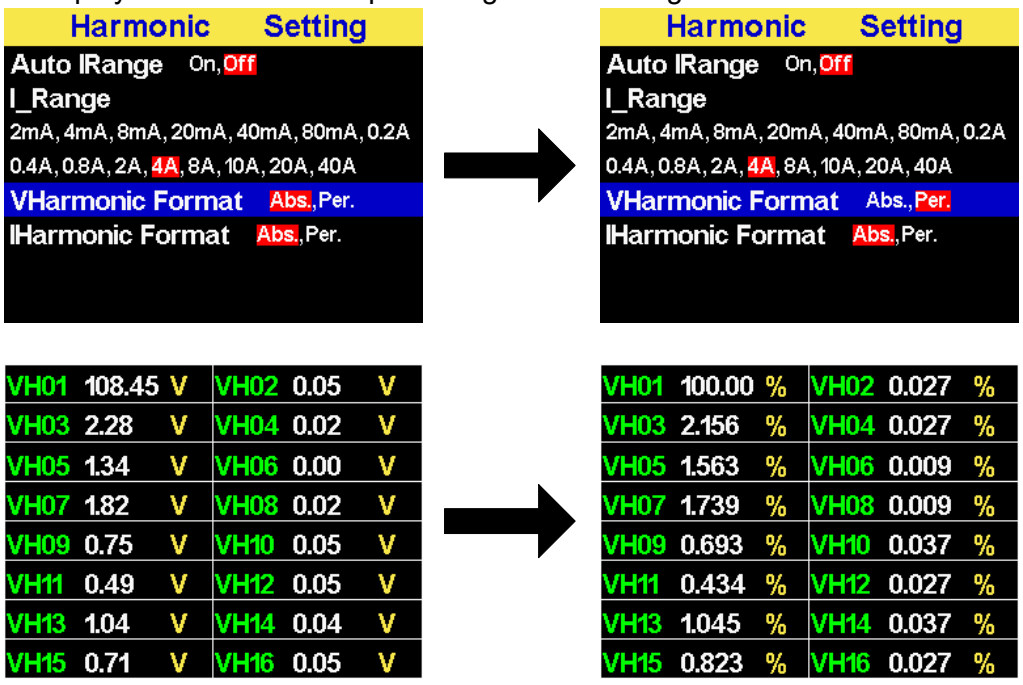
➢ Press the up or down key to “Auto IRange”, press the “Left or Right” key to switch the auto current range setting on and off.



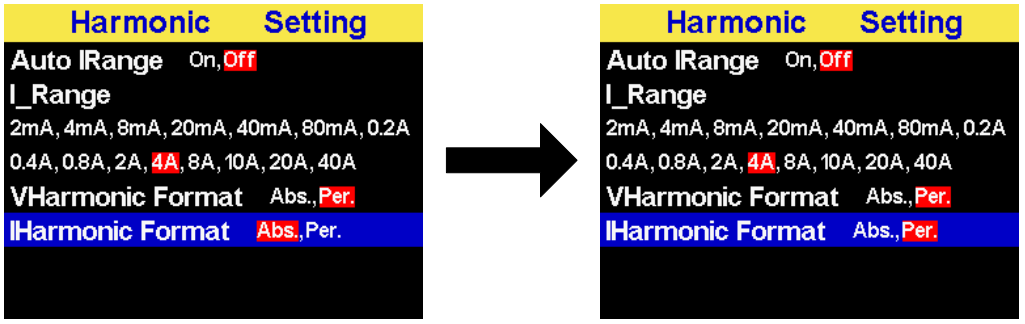
- Press the up or down key to “I Range”, press the “Left or Right” key to switch to the manual current range setting.

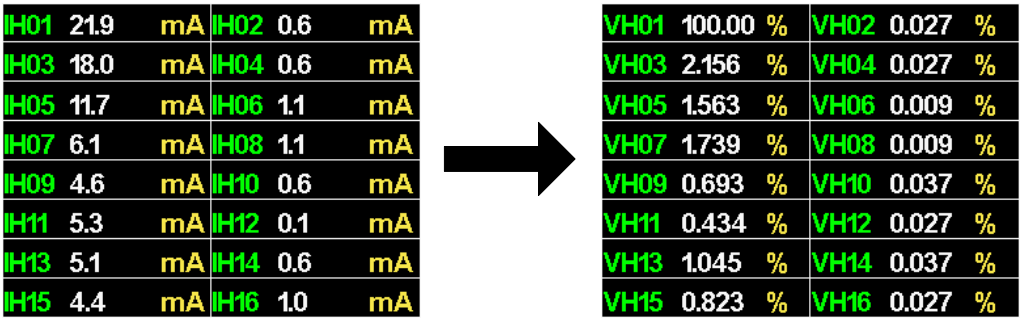


- Press the up or down key to “VHarmonic Format”, press the “Left or Right” key to display absolute value or percentage of the voltage harmonic.



➢ Press the up or down key to “IHarmonic Format”, press the “Left or Right” key to display absolute value or percentage of the current harmonic.



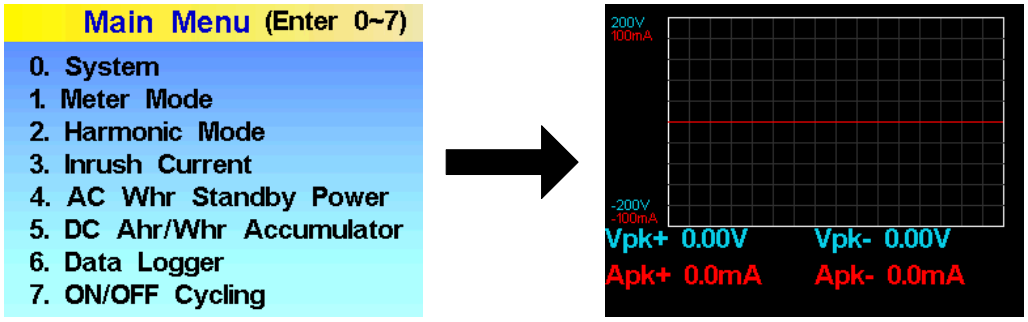


➢

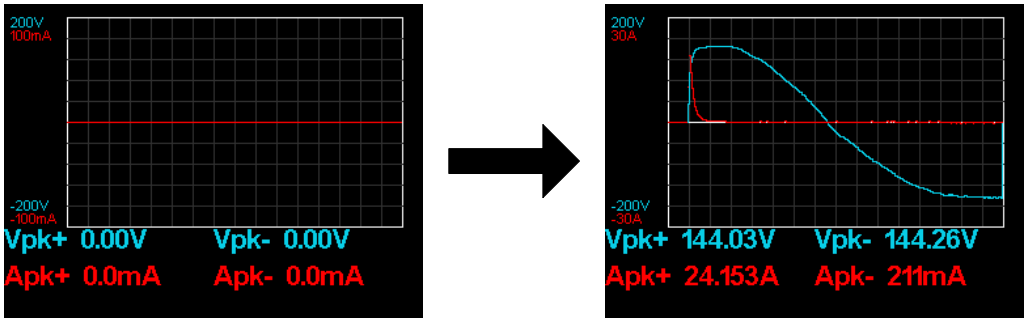
3.3.5. Inrush voltage and current measurement

- Inrush voltage measurement mode

➢ Press the number key 3 under the Menu page mode to enter the inrush voltage and current measurement mode.

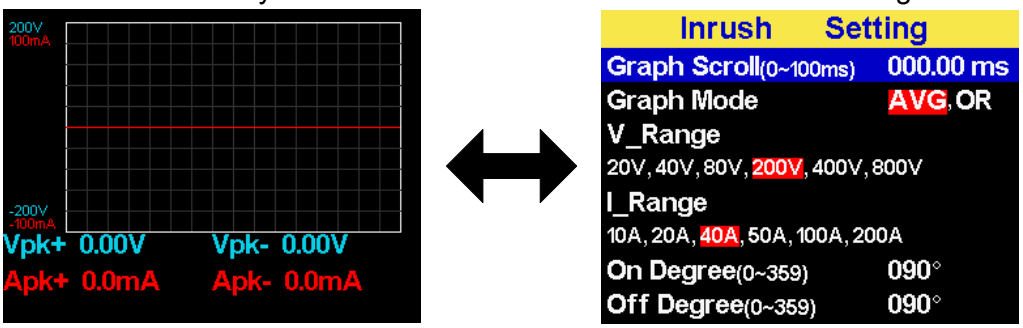


➢ Press the On/Off key to turn on the output and measure the inrush values and graphs.

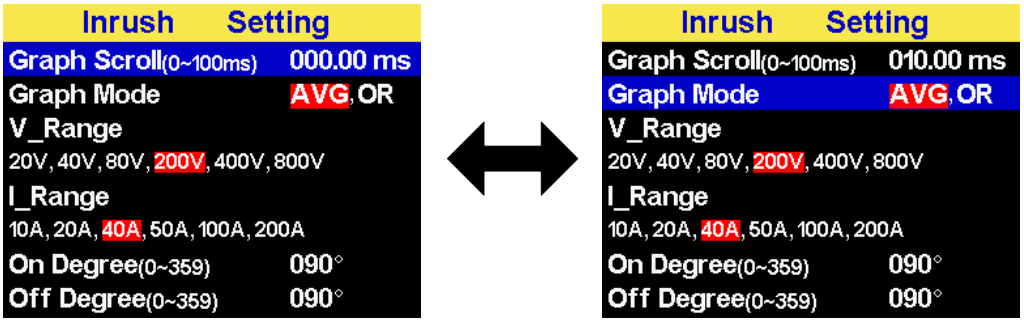


- Inrush voltage measurement mode setting page

➢ Press the Edit key to enter or leave the inrush measurement settings.

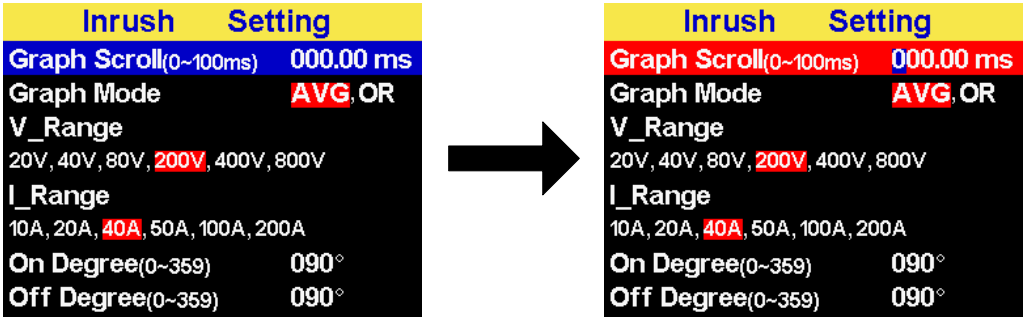


➢ Press the up or down key to move the modified option.

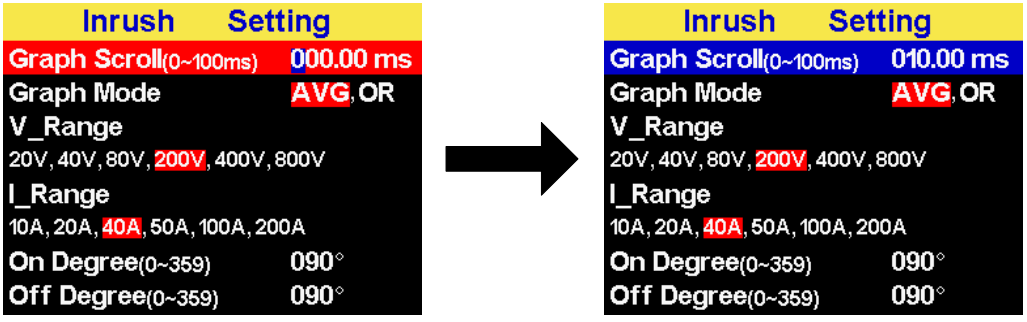


- Graphic shift setting

➢ Press the up or down key to Graph Scroll, press the select key to enter the edit graphic shift setting, Graph scroll range form 0~100ms.

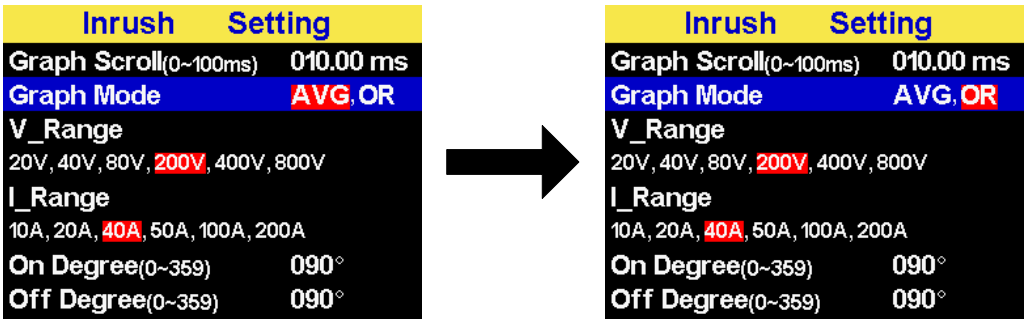


➢ Press the up or down key to edit the value, press the select key to store the value.



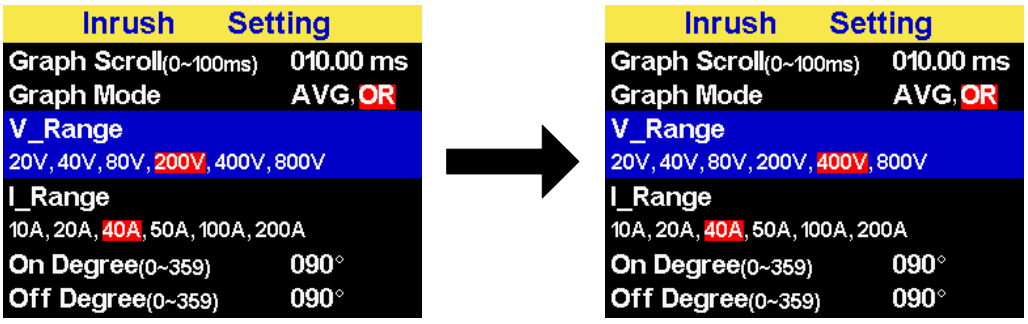
- Graph display mode setting

➢ Press the up or down key to Graph Mode,press the left or right key to switch the set mode



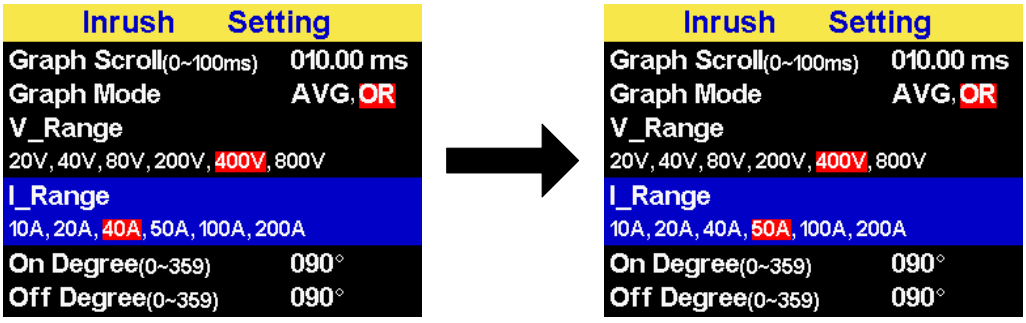
- Voltage measurement gear setting

➢ Press the up or down key to V_Range, press the left or right key to switch the set voltage position.



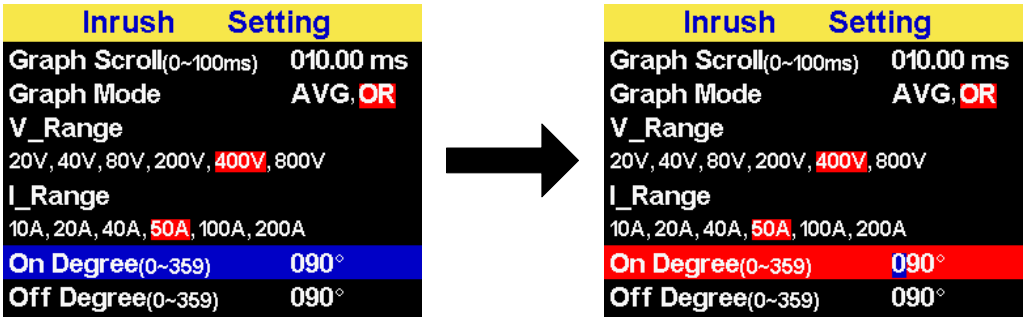
- Current measurement gear setting

➢ Press the up or down key to I_Range, press the left or right key to switch the set current position.

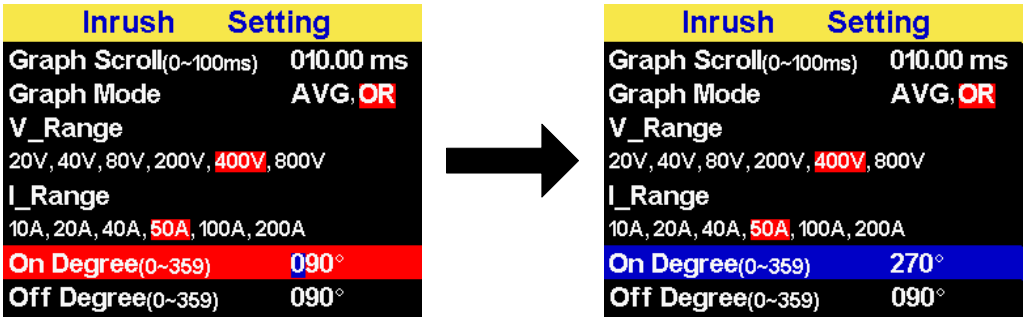


- Output opening angle setting

➢ Press the up or down key to On Degree, press the select key to enter the opening angle setting.

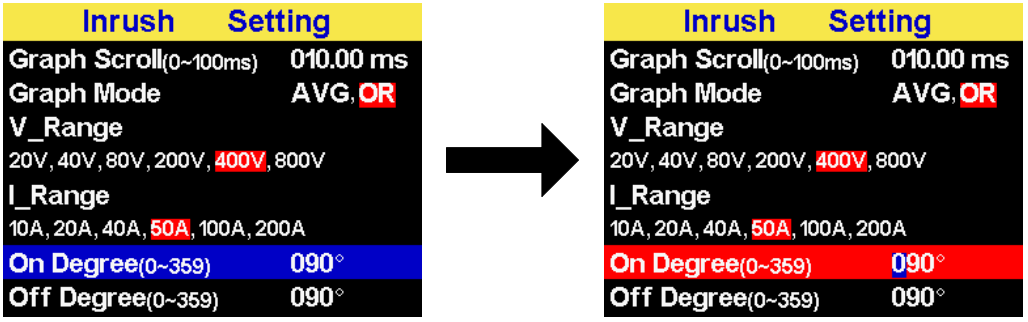


➢ Press the up or down key to edit the opening angle, Press the select key to save the setting angle.

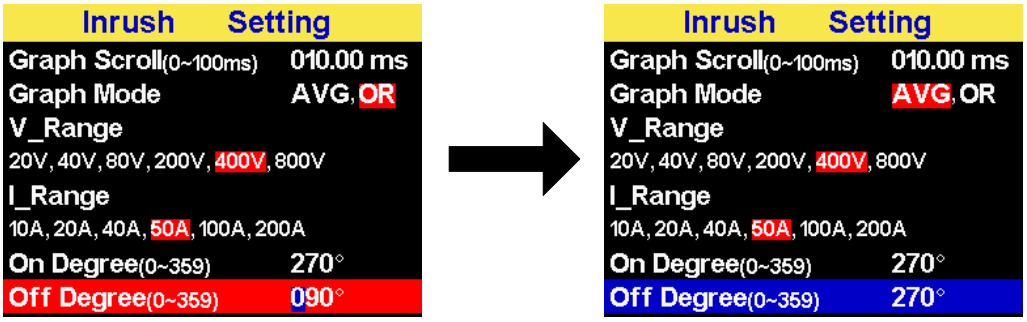


- Output close angle setting

➢ Press the up or down key to OFF Degree, press the select key to enter the closing angle setting.



➢ Press the up or down key to edit the closing angle, press the select key to save the setting angle.



3.3.6. AC standby power measurement

- AC standby power measurement mode

➢ AC Standby power wiring diagram

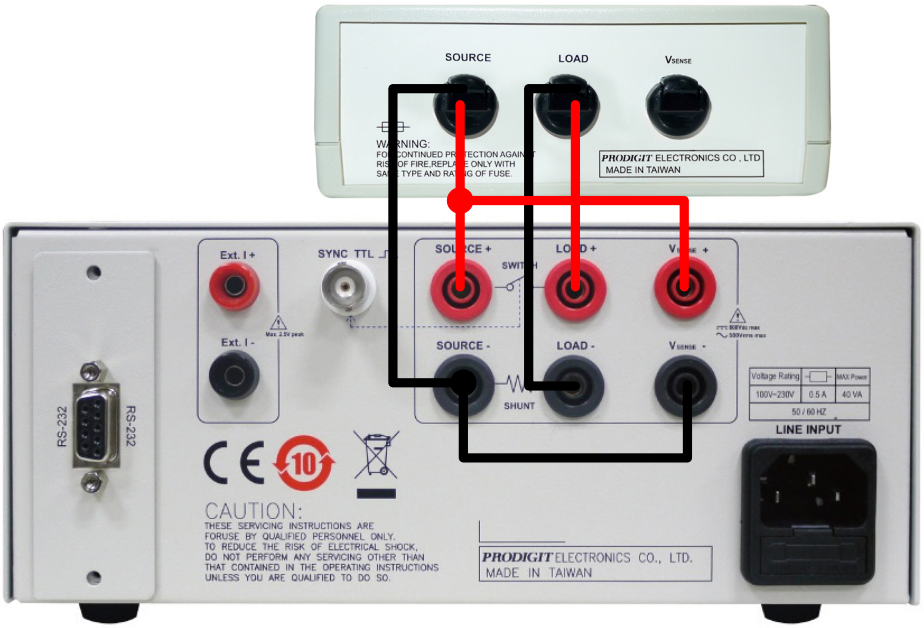
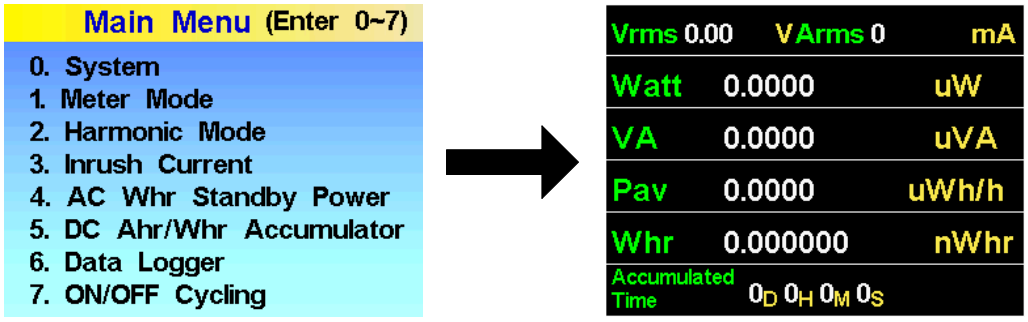
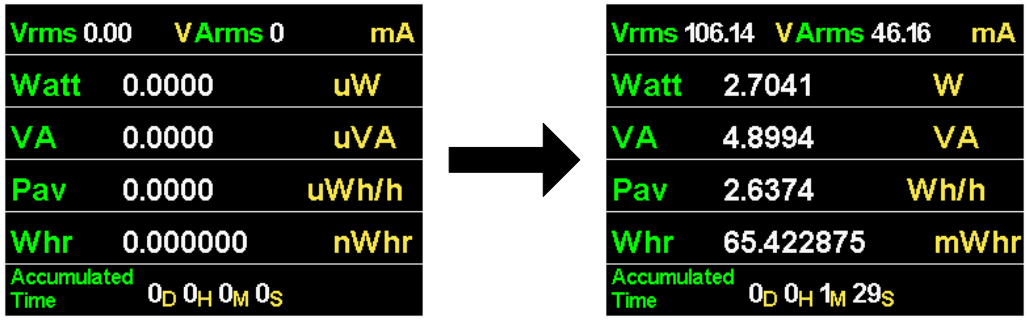


Fig 3-4 AC Standby power wiring diagram

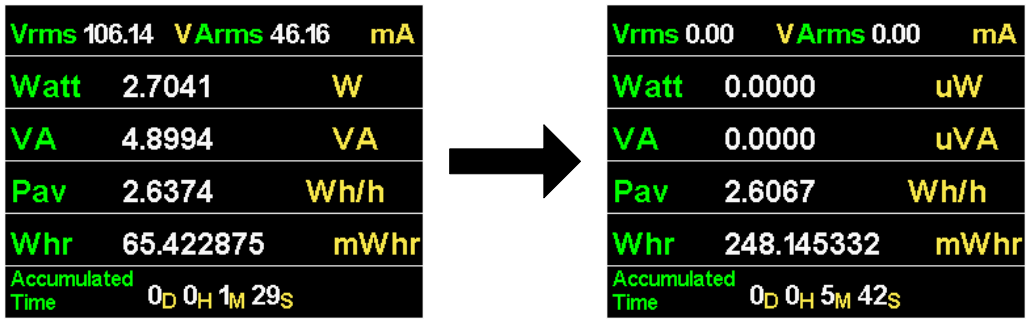
➢ Press the number key 4 under the Menu page to enter the AC standby power measurement mode.



➢ When the output is off, press the On/Off key to start accumulating power consumption.

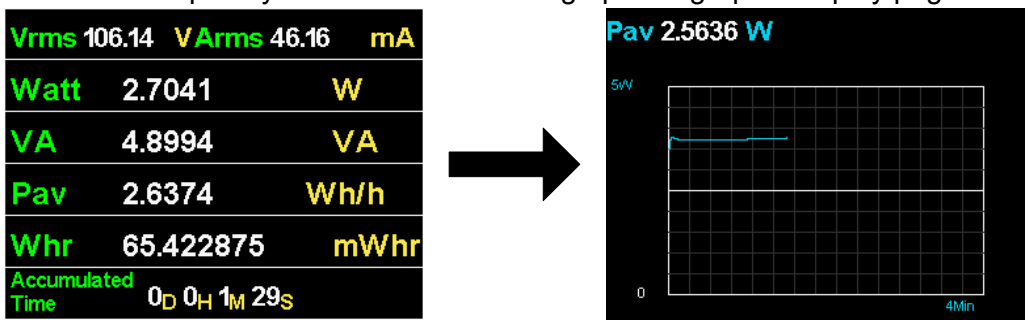


➢ When the output is turned on, press the On/Off key to stop the accumulated power consumption.



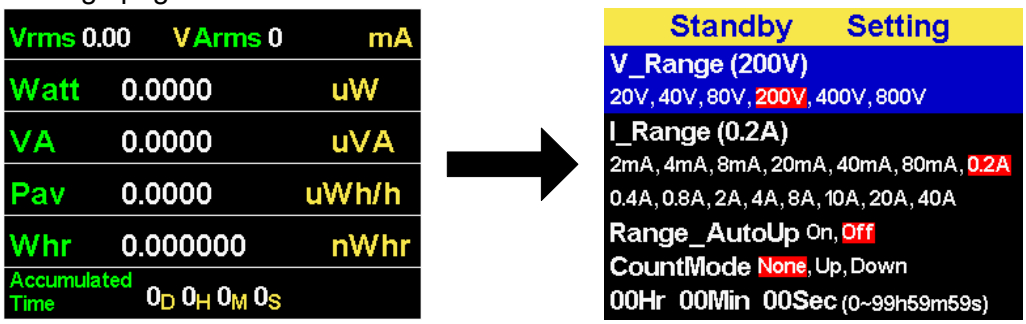
- AC average standby power graph

➢ Press the Graph key to switch to the average power graphic display page.

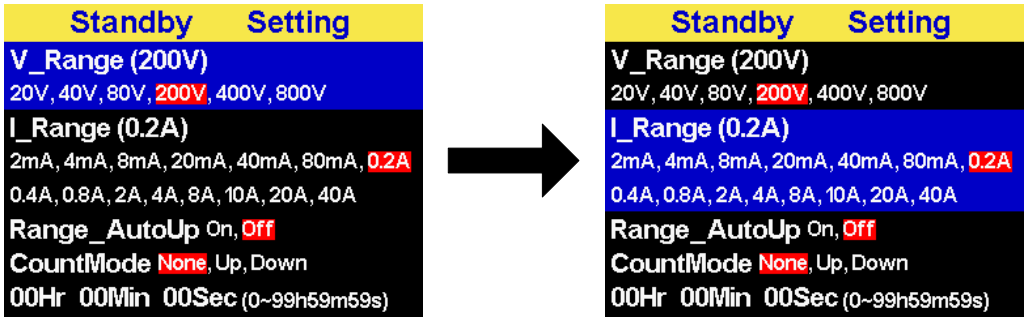


- AC standby power setting page

➢ On the AC Standby Power page, press the Edit key to enter the AC Standby Power Settings page.

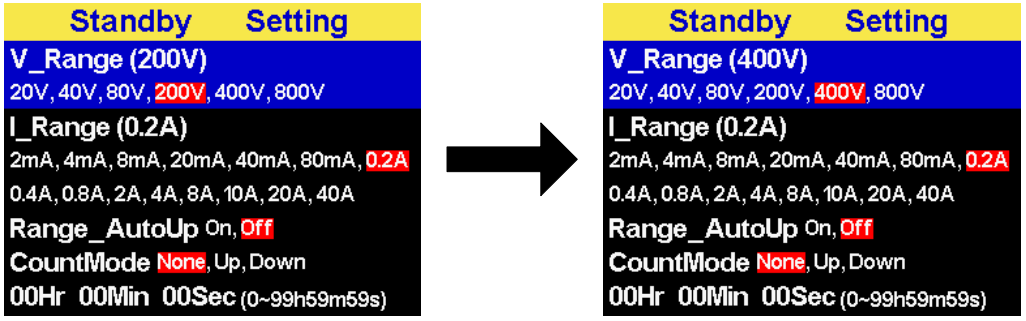


➢ Press the up or down key to move to the option you want to modify.



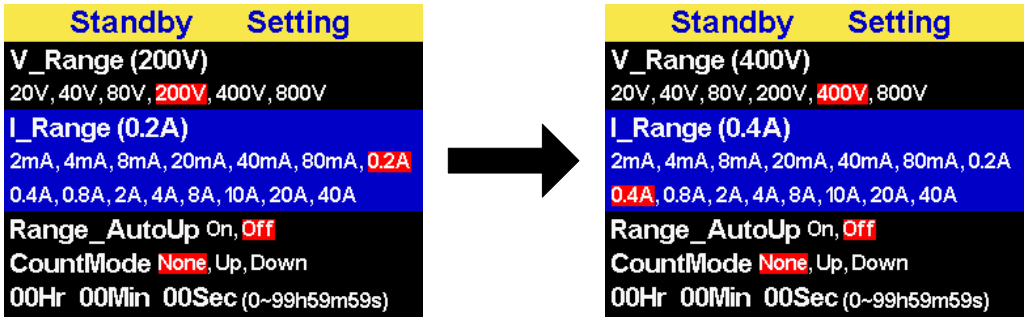
- Voltage gear setting

➢ Press the up or down key to V_Range , press the left or right key to switch the set voltage position.



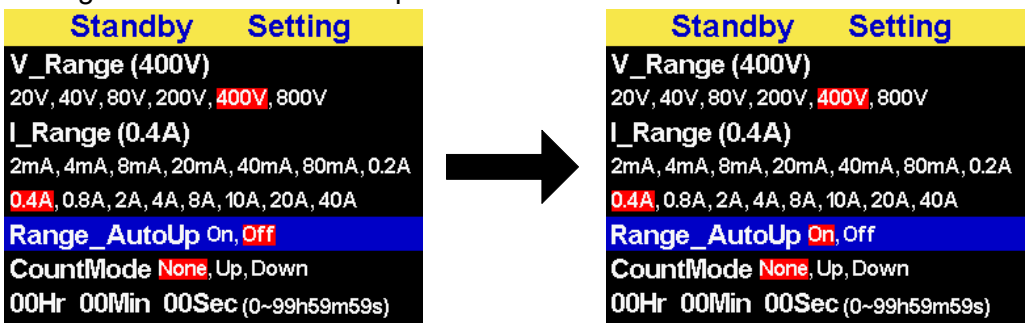
- Current gear setting

➢ Press the up or down key to I_Range, press the left or right key to switch the set current position.



- Automatic upshift setting

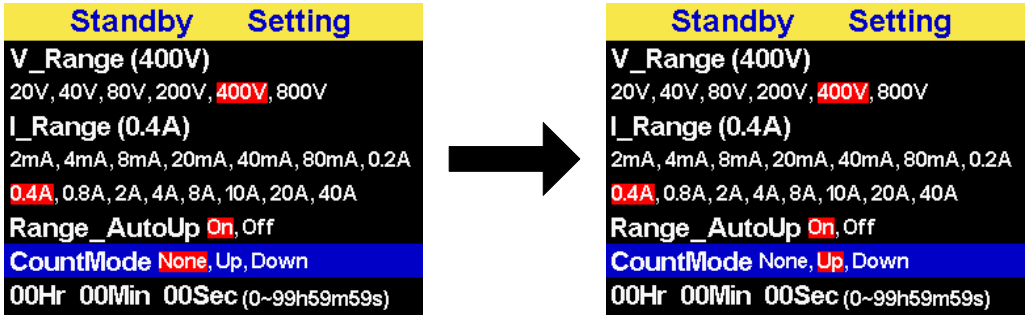
➢ Press the up or down key to Range_AutoUp, press the left or right key to change the setting to turn the automatic upshift function on or off.



※ When this function is turned on, it will automatically rise to the next gear when the voltage or current exceeds the set gear position.

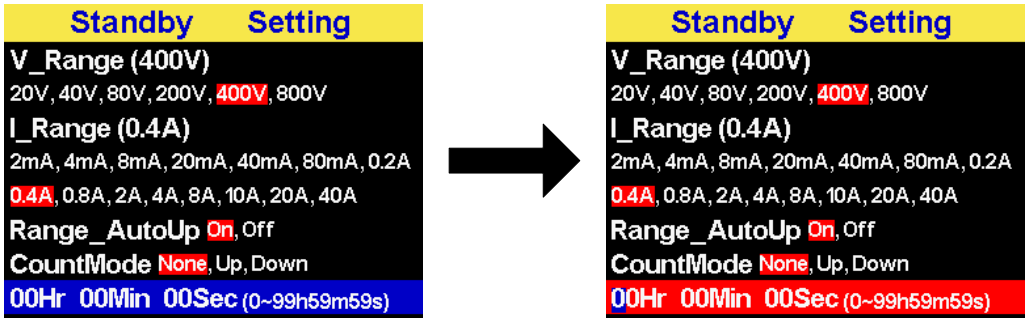
- Counting function

➢ Press the up or down key to Count Mode, press the left or right to switch the setting count.

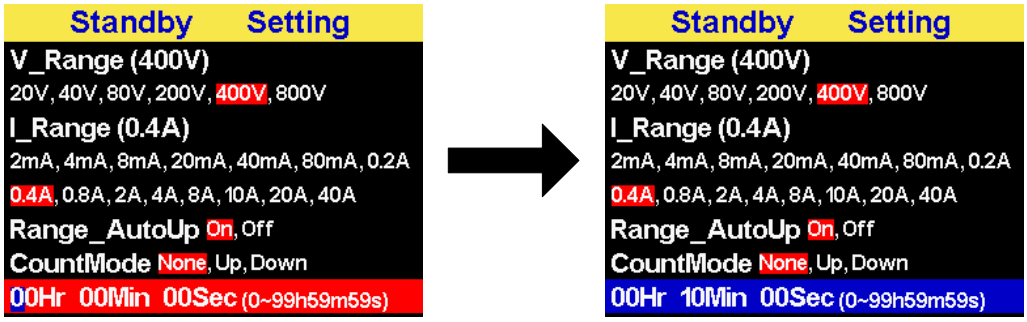


※ None=Off count, Up=Time positive, Down=Time countdown.

➢ Press the up or down key to xxHr xxMin xxSec, press the select key to enter the counting time setting.



➢ Press the up, down, left, right key to edit the value, press the select key to save the set value.



3.3.7. DC power cumulative measurement

- DC power accumulation measurement mode

➢ DC power accumulation wiring diagram

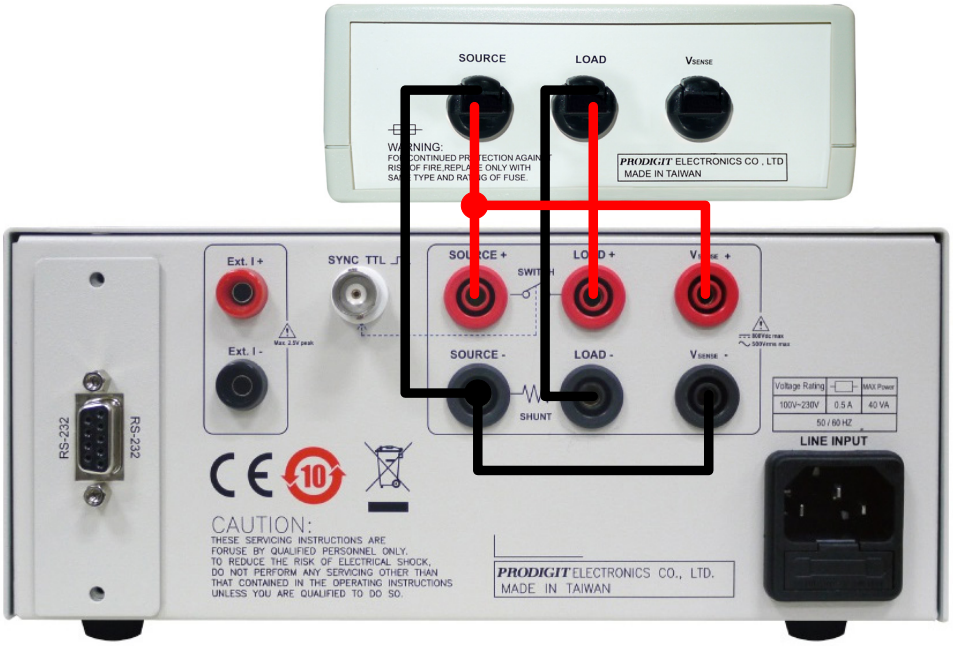
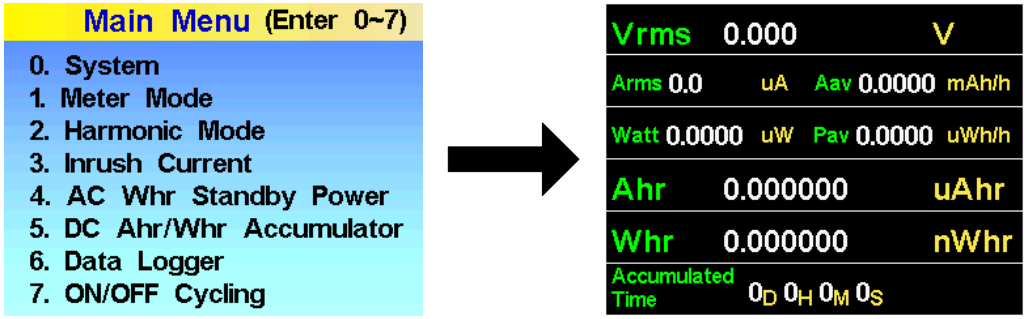
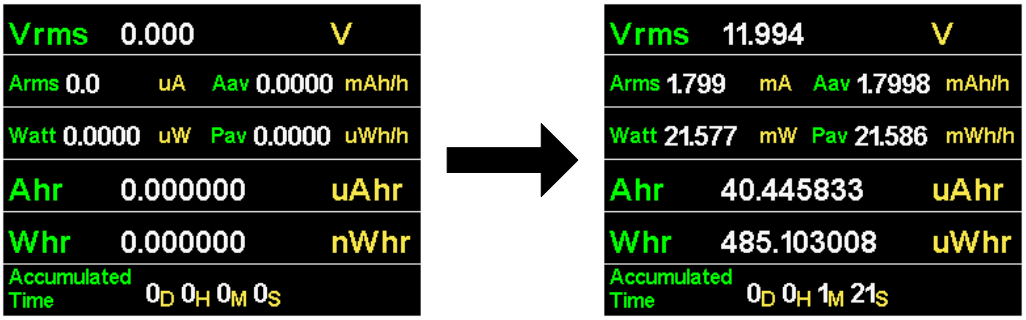


Fig 3-5 DC power accumulation wiring diagram

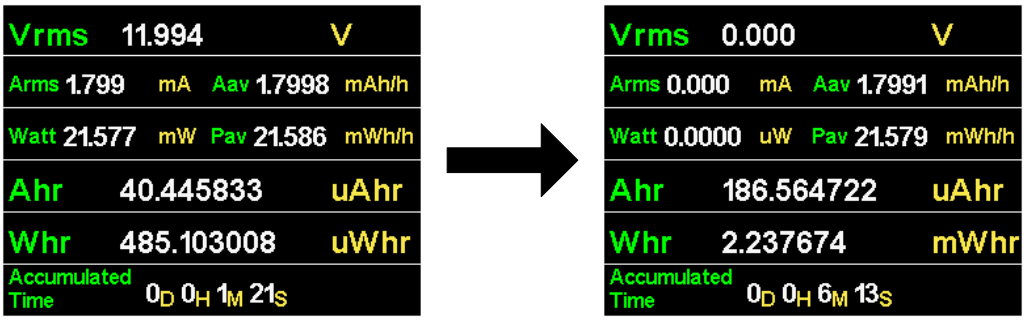
➢ Press the number key 5 under the Menu page to enter the DC power cumulative measurement mode.



➢ When the output is off, press the On/Off key to start accumulating power Consumption.

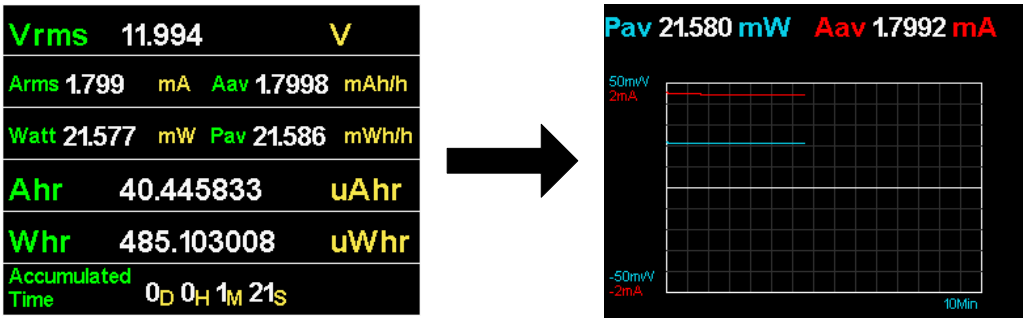


➢ When the output is turned on, press the On/Off key to stop the accumulated power consumption.



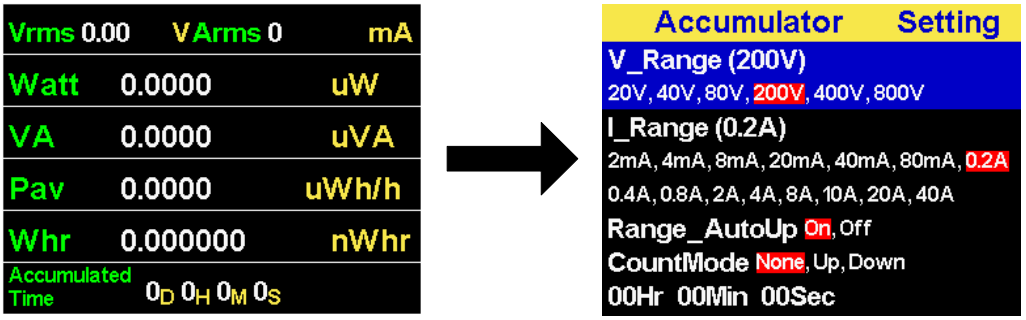
- DC average current, power graph

➢ Press the Graph key to switch to the average current, power graphic display page.

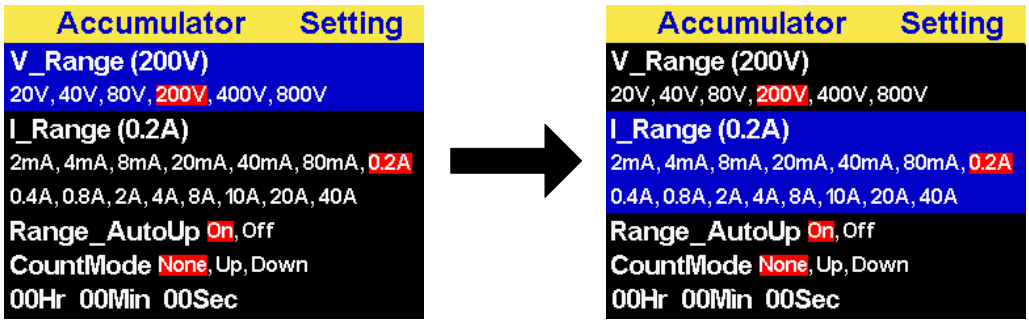


- DC current, power accumulation setting page

➢ On the DC power accumulation page, press the Edit key to enter the AC standby power setting page.

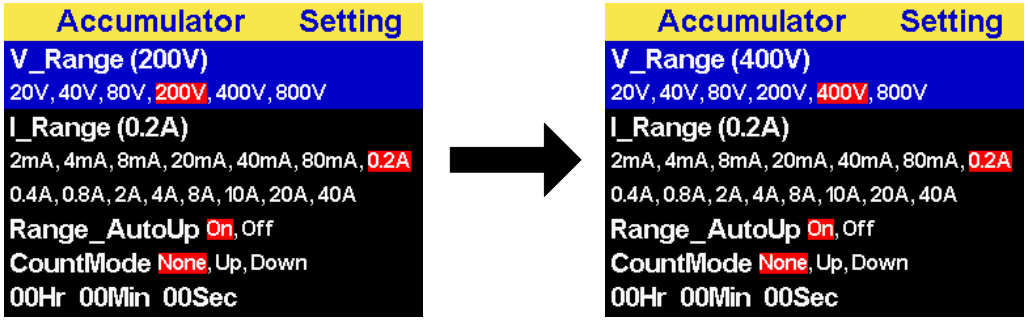


➢ Press the up or down key to move to the option you want to modify.



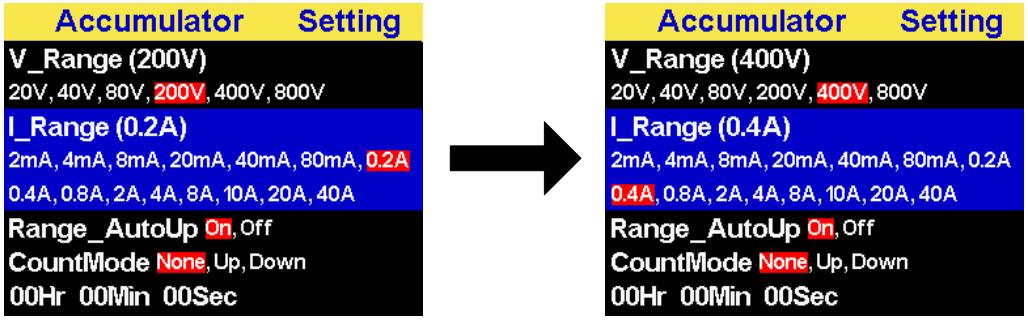
- Voltage gear setting

➢ Press the up or down key to V_Range, press the left or right key to switch the set voltage position.



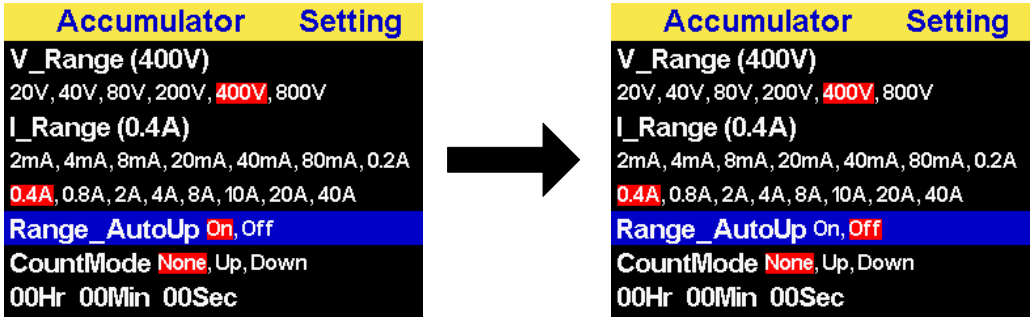
- Current gear setting

➢ Press the up or down key to I_Range, press the left or right key to switch the set current position.



- Automatic upshift setting

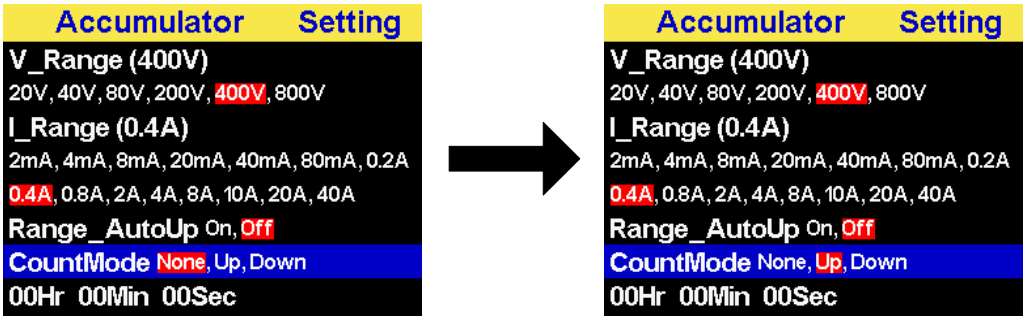
➢ Press the up or down key to Range_AutoUp, press the left or right key to switch the setting to turn the automatic upshift function on or off.



※ When this function is turned on, it will automatically rise to the next gear when the voltage or current exceeds the set gear position.

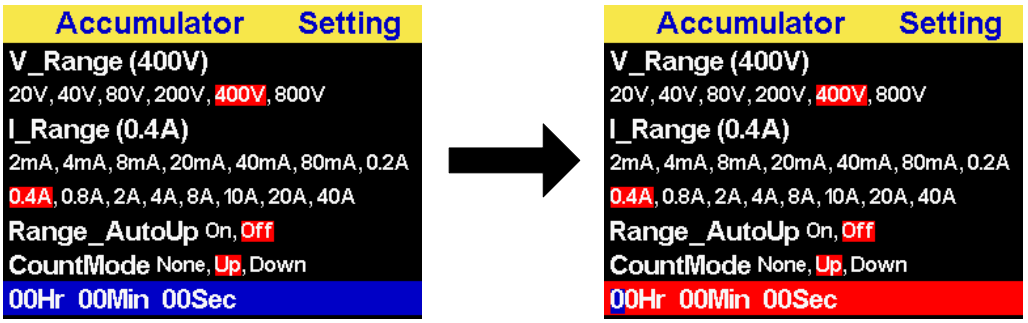
- Counting function

➢ Press the up or down key to Count Mode, press the left or right key to switch the setting count setting.

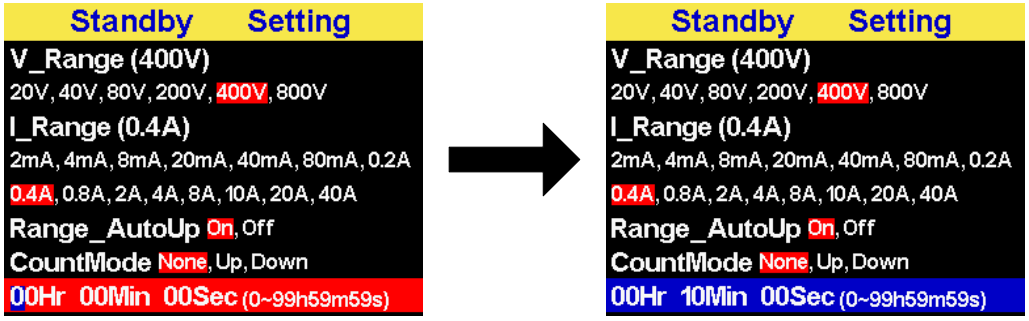


※ None=Off count, Up=Time positive, Down=Time countdown.

➢ Press the up, down key to xxHr xxMin xxSec, press the select key to enter the counting time setting.



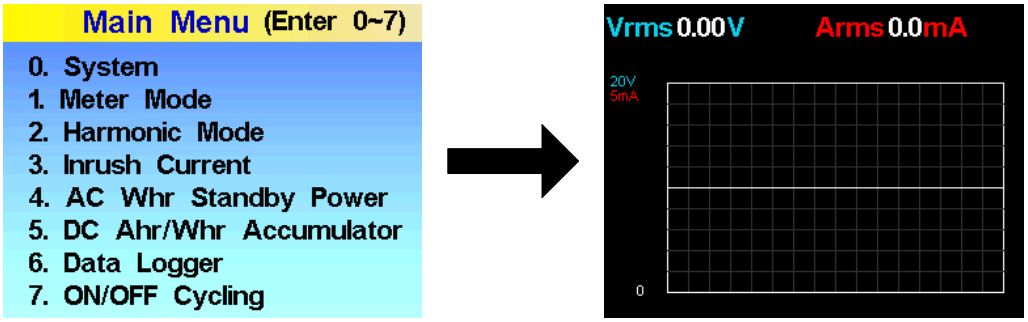
➢ Press the up, down, left, right key to edit the value, press the select key to save the set value.



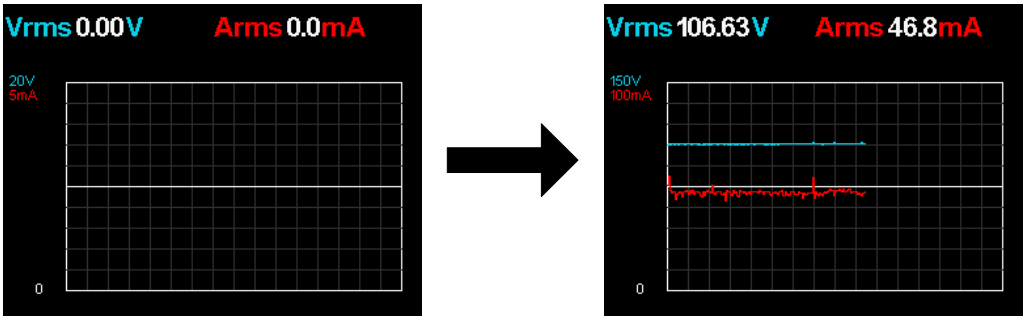
3.3.8. Measurement data recorder mode

- Measurement data record mode

➢ Press the number key 6 under the Menu page to enter the measurement data recorder mode.

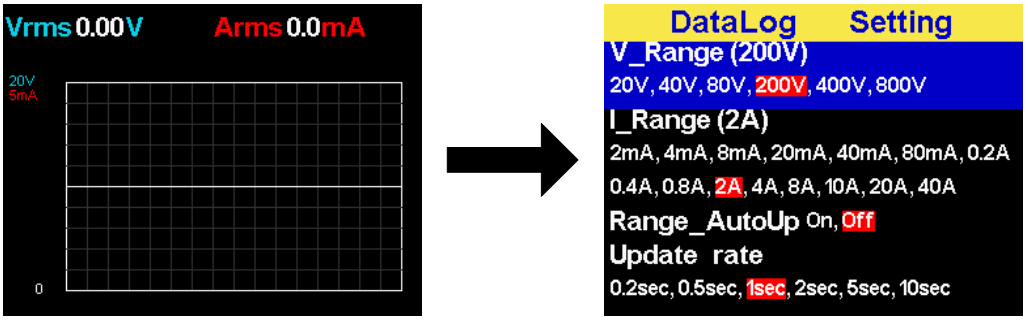


➢ Press the On/Off key to start or end the data measurement record.



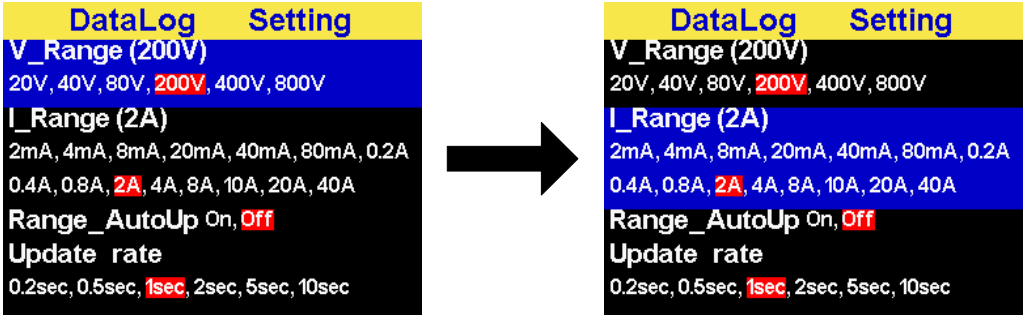
- Measurement data record setting

➢ Press the Edit key to enter the measurement data record setting.



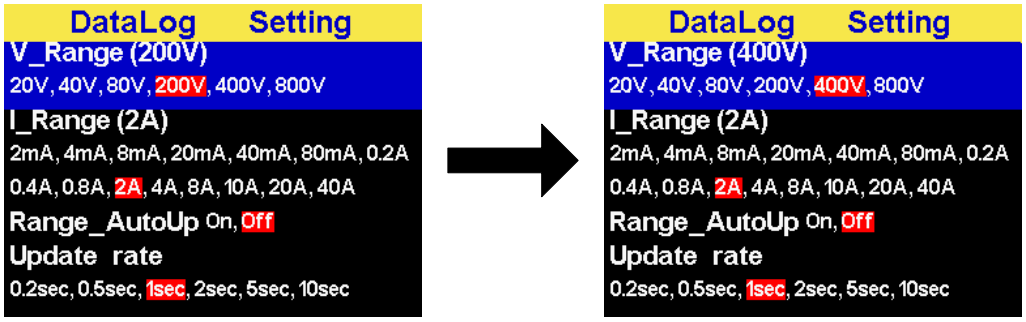
- Measurement data record setting

➢ Press the up or down key to switch to the item you want to modify.



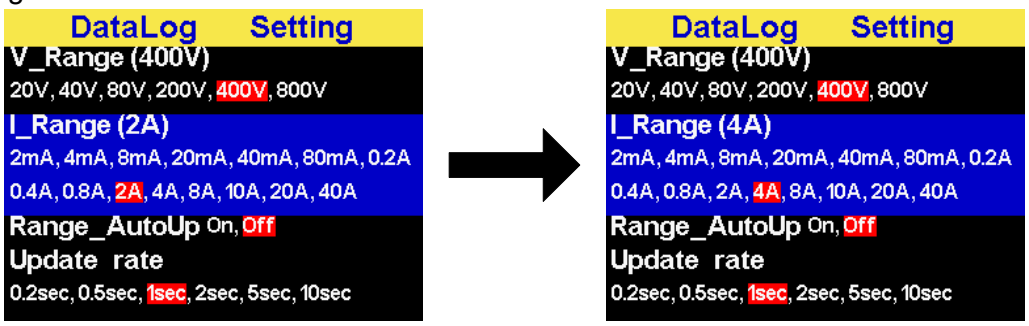
- Voltage gear setting

➢ Press the up or down key to switch to V_Range, press the left or right key to switch the voltage position.



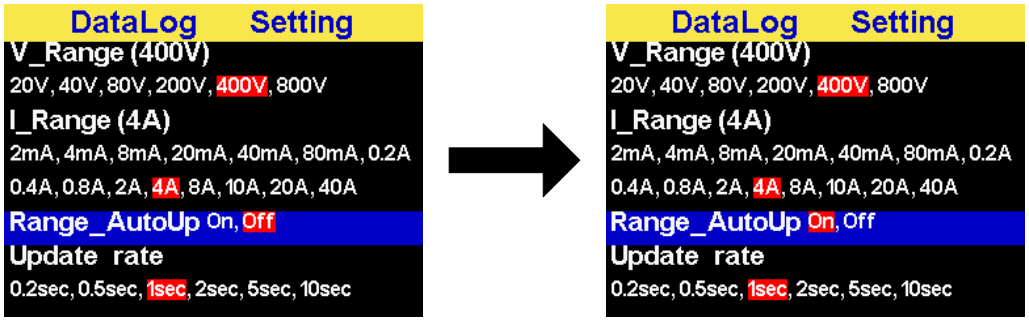
- Current gear setting

➢ Press the up or down key to I_Range, press the left or right key to switch the current gear.



- Automatic upshift setting

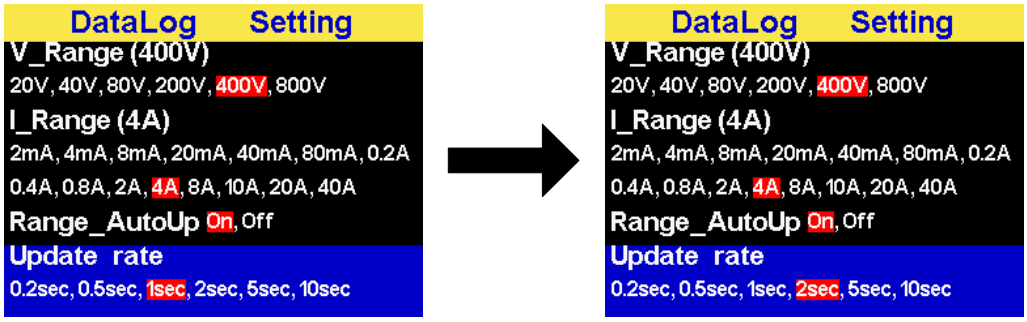
➢ Press the up or down key to Range_AutoUp, press the left or right key to turn the function on or off.



※ When this function is turned on, it will automatically rise to the next gear when the voltage or current exceeds the set gear position.

- Data record update time setting

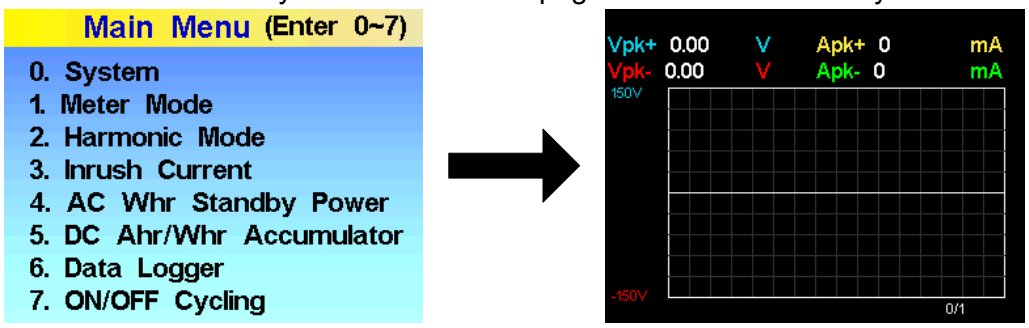
➢ Press the up or down key to Updata rate, press the left or right key to switch the setting update time.



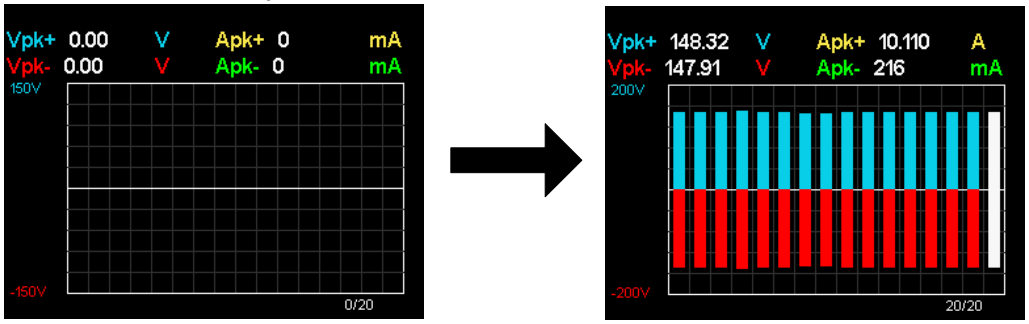
3.3.9. Switch cycle test

- Switch cycle test mode

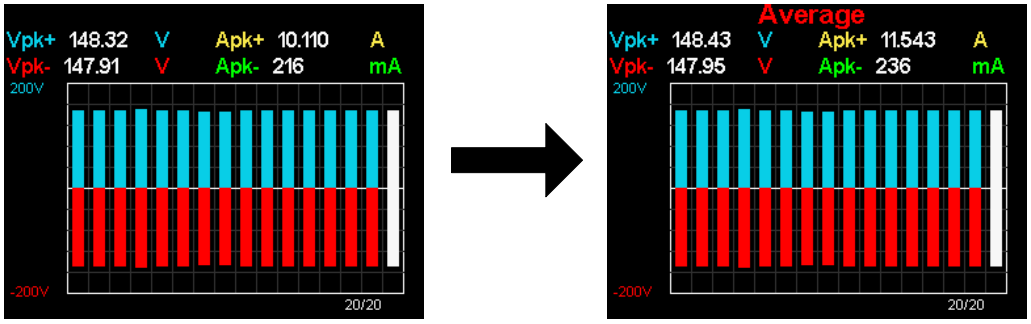
➢ Press the number key 7 under the Menu page to enter the switch cycle test.



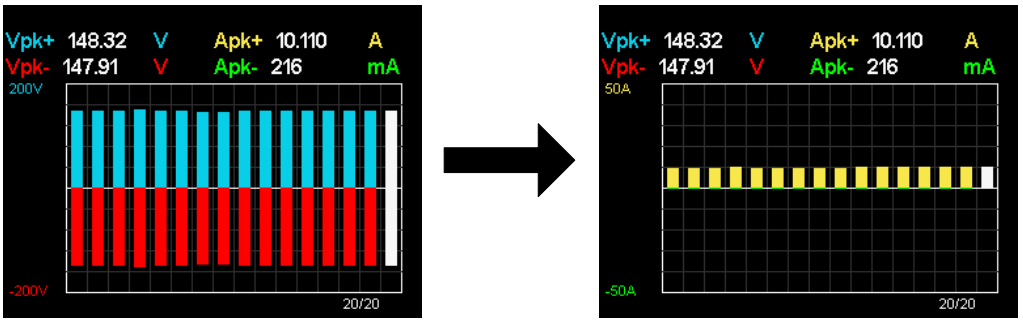
➢ Press the On/Off key to start the test.



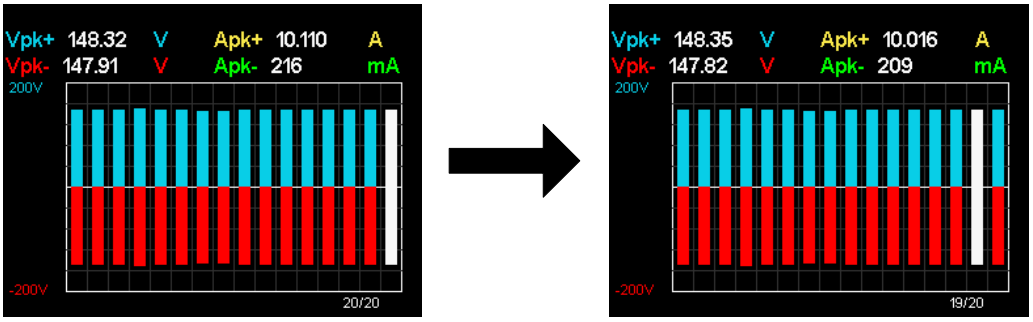
➢ Press the up or down key to change between displaying the immediate value or the Average value.



➢ Press the select key to switch the voltage or current measurement graphics.

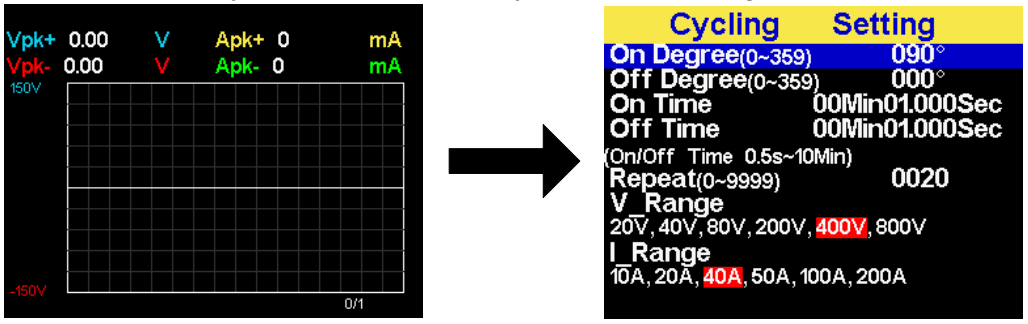


➢ Press the left or right key to switch to display the Nth test value (the data retains the last 256 tests).

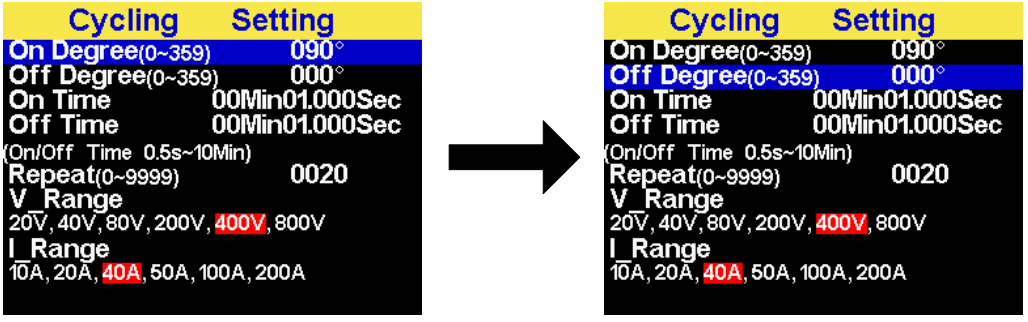


- Switch cycle test setting

➢ Press the Edit key to enter the switch cycle test setup page.

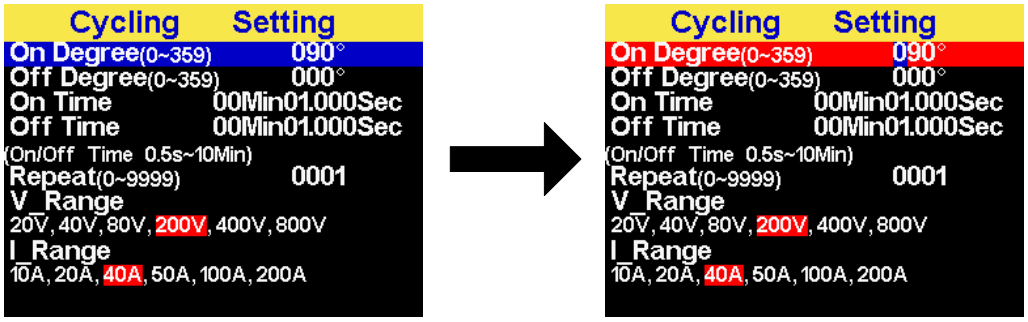


➢ Press the up or down key to switch to the option you want to set.

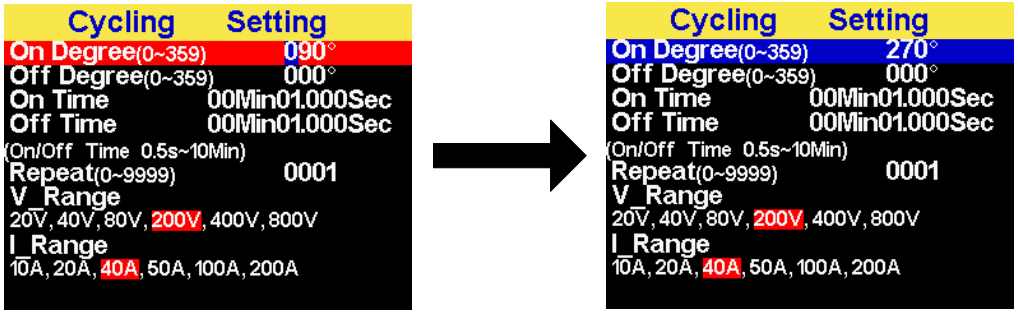


- Switch opening angle setting

➢ Press the up or down key to On Degree, press the select key to enter the setting switch opening angle.

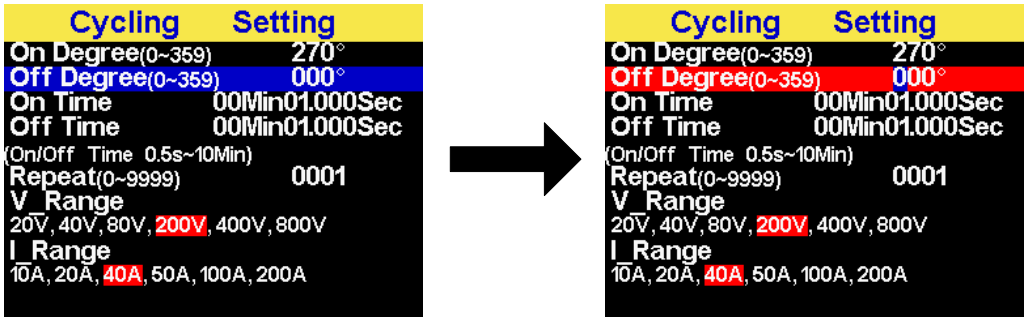


➢ Press the up, down, left, right keys to modify the value, press the select key to save the set value.

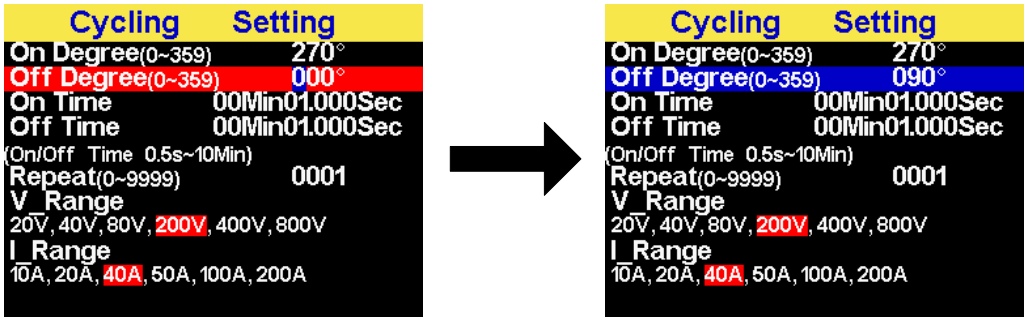


- Switch off angle setting

➢ Press the up or down key to Off Degree, press the select key to enter the setting switch closing angle.

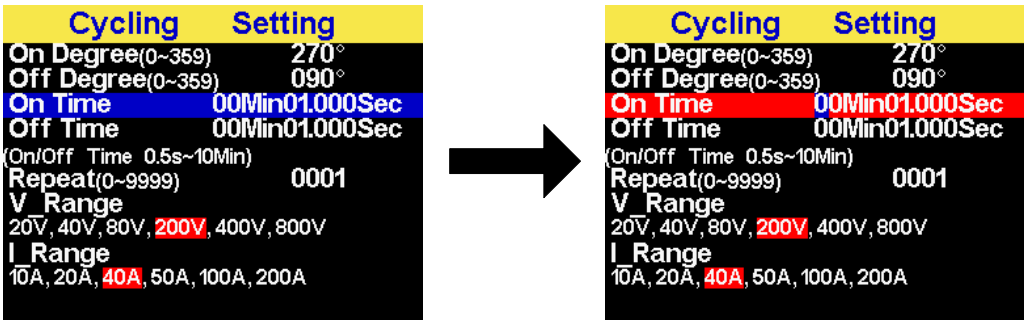


➢ Press the up, down, left, right keys to modify the value, press the select key to save the set value.

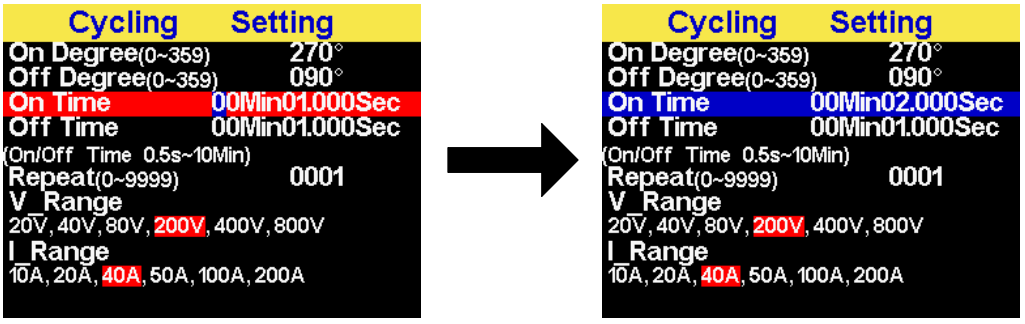


- Switch on hold time setting

➢ Press the up or down key to On Time, press the select key to enter the setting switch to turn on the hold time.

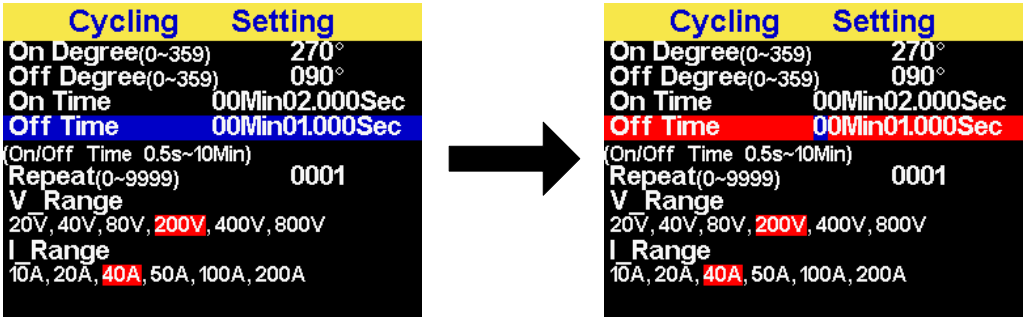


➢ Press the up, down, left, right keys to modify the value, press the select key to save the set value.

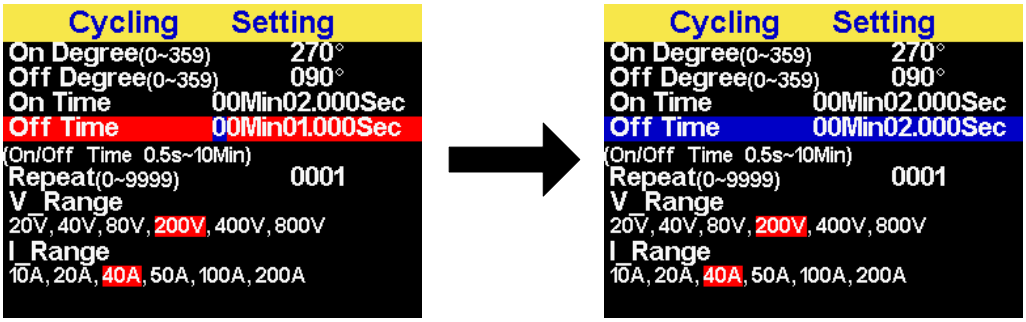


- Switch off hold time setting

➢ Press the up or down key to Off Time, press the select key to enter the setting switch to turn off the hold time.

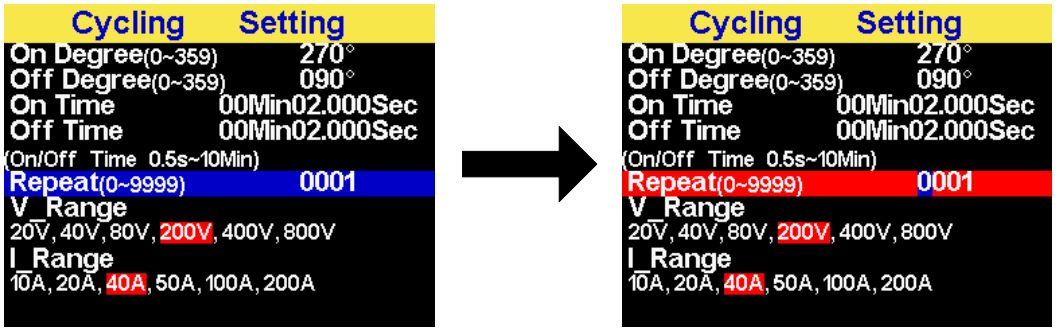


➢ Press the up, down, left, right keys to modify the value, press the select key to save the set value.

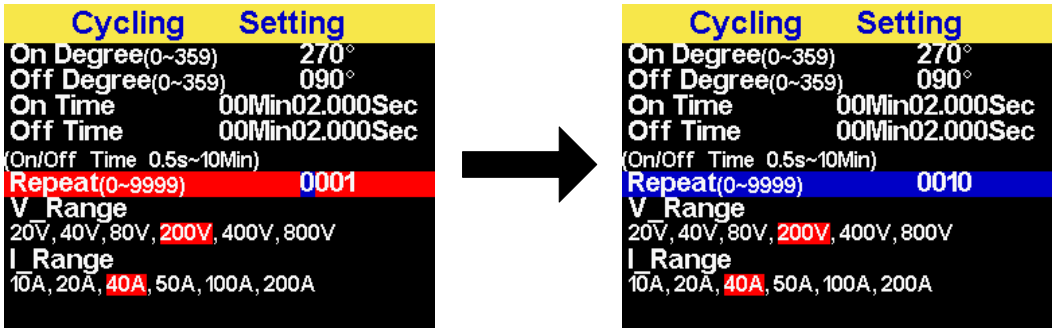


- Switch test cycle setting

➢ Press the up or down key to Repeat, press the select to enter the set switch test cycle.

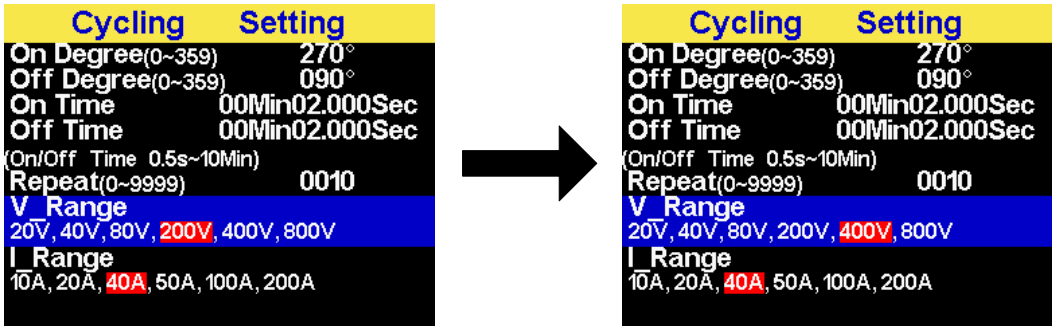


➢ Press the up, down, left, right keys to modify the value, press the select key to save the set value.



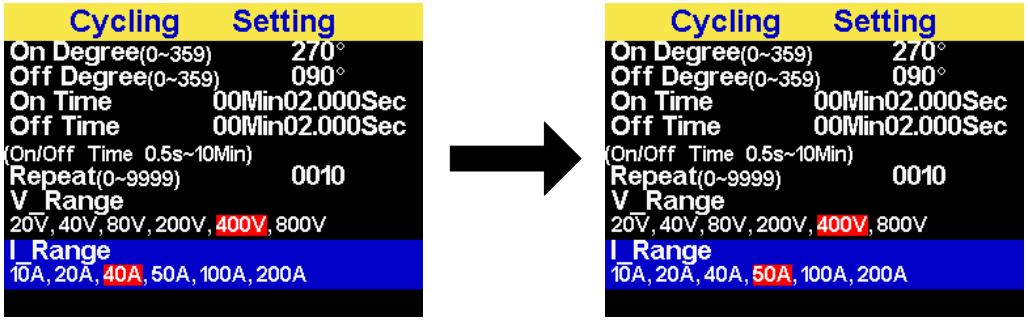
- Voltage gear setting

➢ Press the up or down key to V_Range, press the left or right key to switch the setting position.



- Current gear setting

➢ Press the up or down key to I_Range, press the left or right key to switch the setting position.



3-4. External current measurement wiring diagram

3.4.1. Series resistance partial pressure measurement current

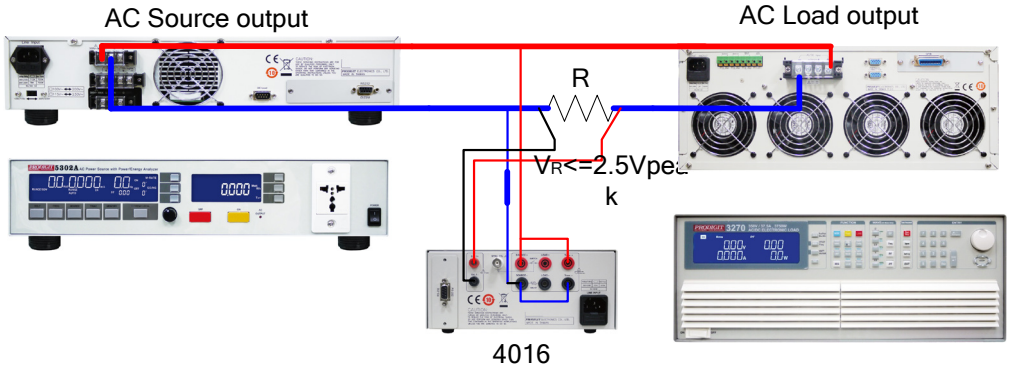


Fig 3-6 Series resistance partial pressure wiring diagram

3.4.2. CT measurement current wiring diagram

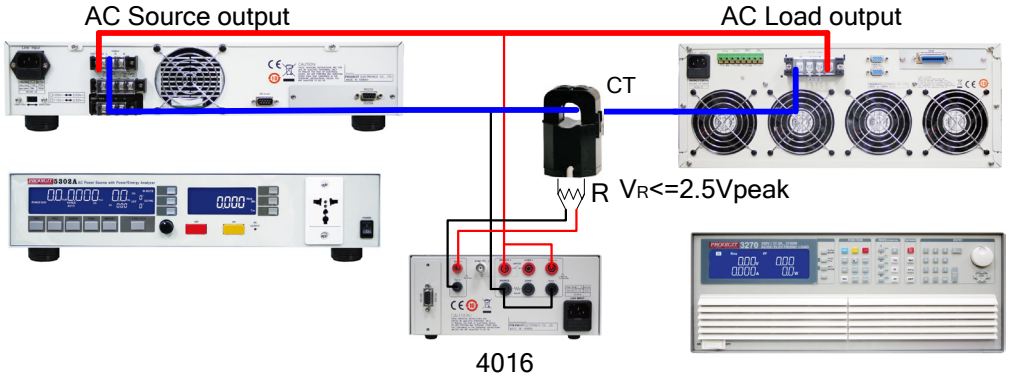


Fig 3-7 CT measurement current wiring diagram

3.5.1. Three-phase measurement wiring connection diagram

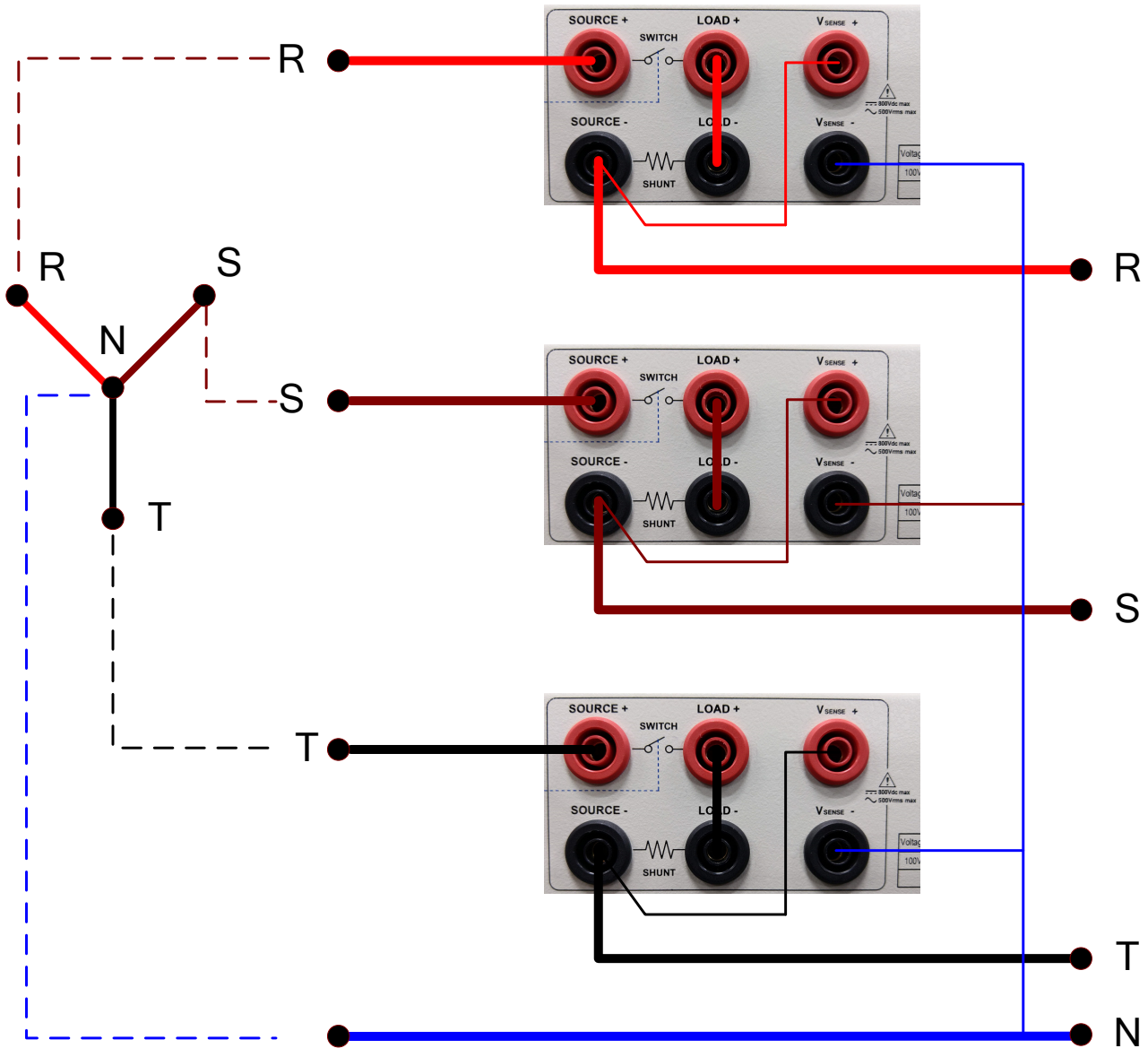


Fig 3-8 4016 three-phase four-wire Y connection 3 sets of electricity meter wiring diagram

3.5.2. Three-phase three-wire△ connection three groups of meter connection

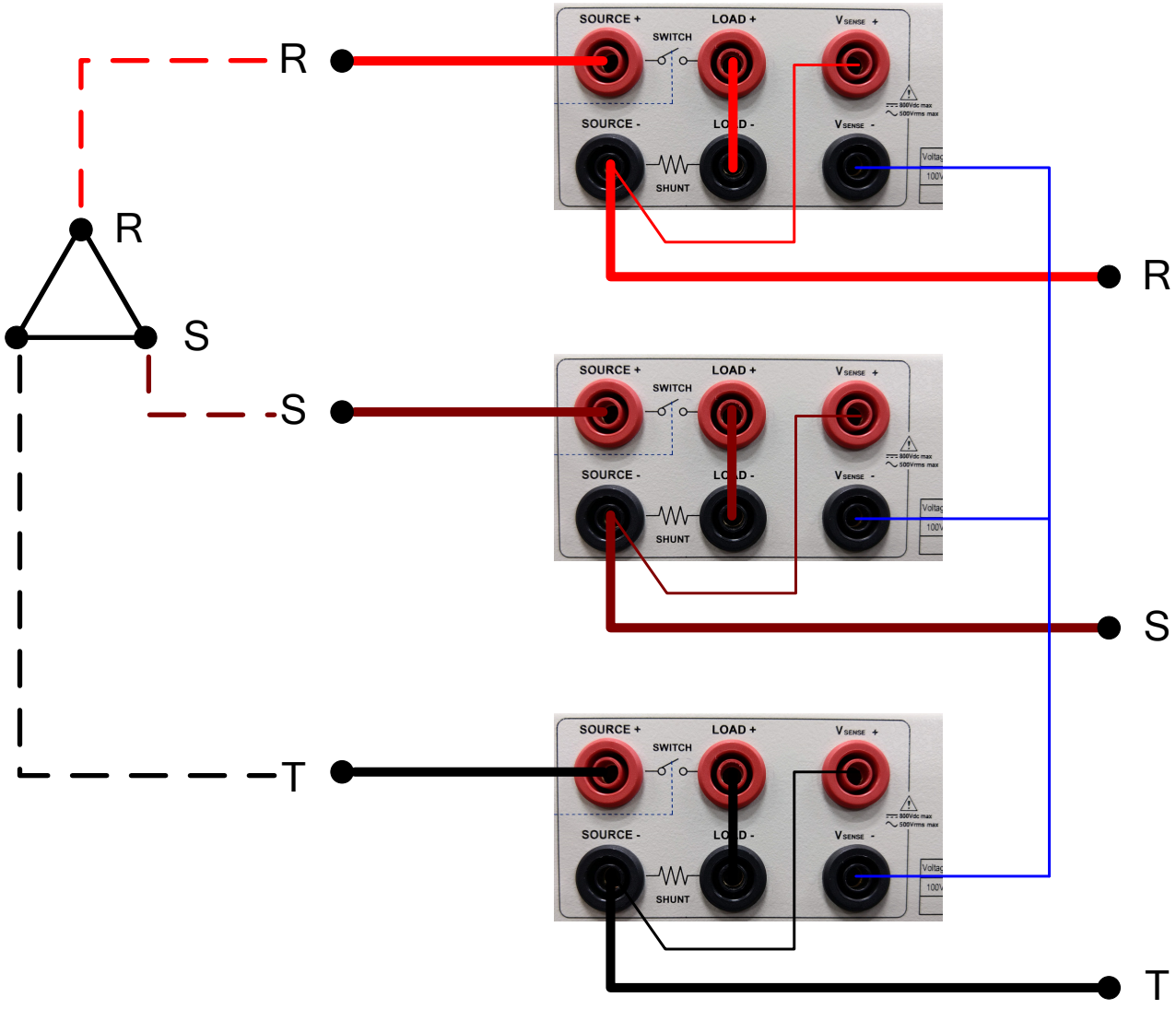


Fig 3-9 4016 three-phase three-wire △ connected to three sets of electricity meter wiring diagram

3.5.3. Three-phase three-wire △ connection Two groups of meter connection

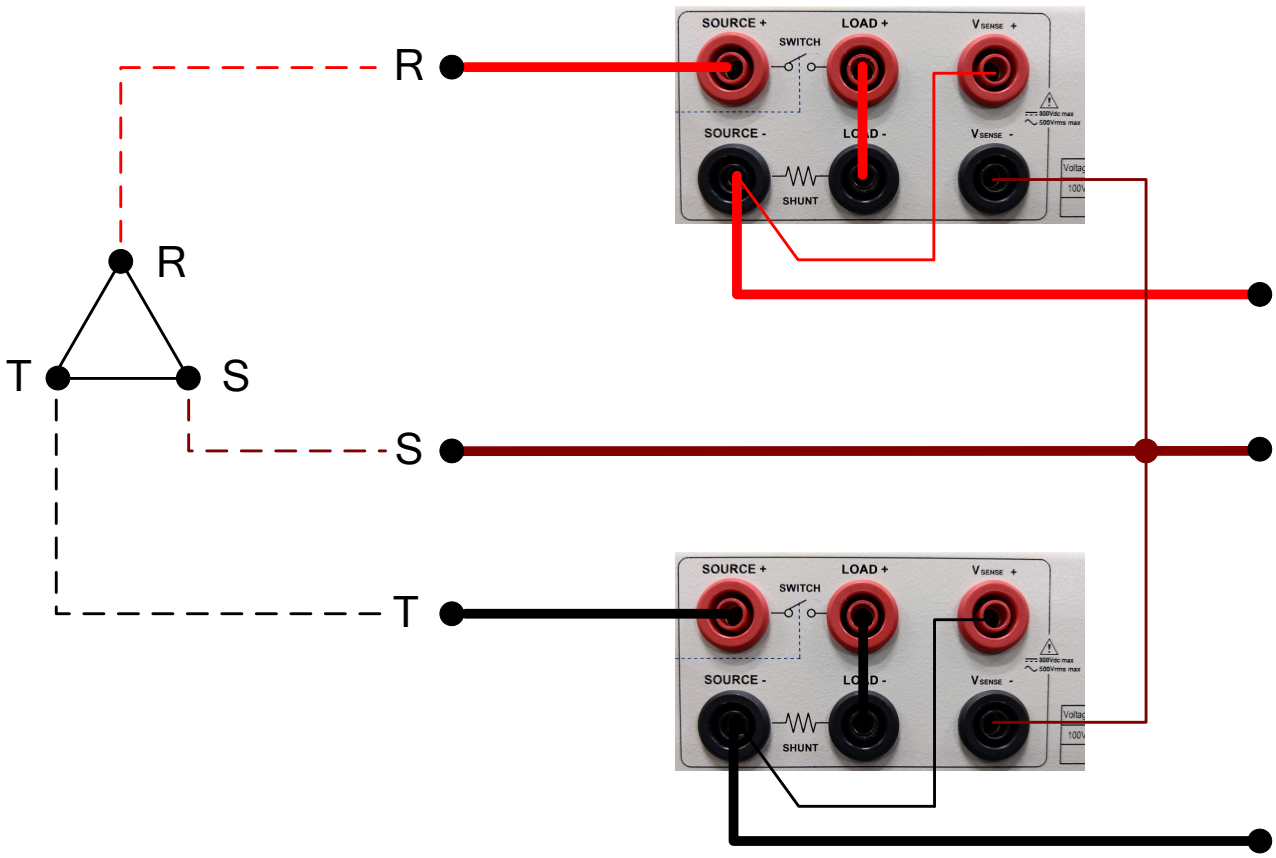


Fig 3-10 4016 three-phase three-wire △ connected to two sets of meter diagram

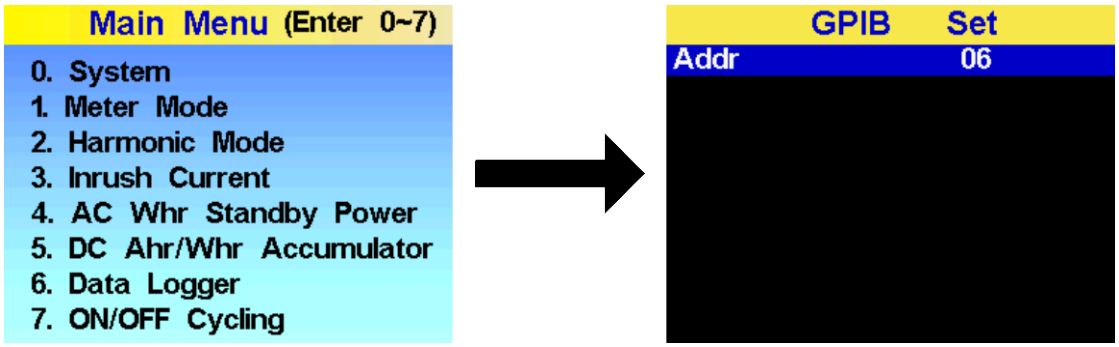
Chapter 4 Communication Interface programming operation

4-1. Introduction

The rear panel Communication Interface programming of 4016 Series is designed to connect PC or NOTEBOOK PC with Communication Interface programming; you can use an application such as high-level syntax C and VB to form an automatic control system.

NOTE: When use USB interface controls the 4016 Series, the 4016 Series will convert the USB interface to RS232 interface.

4-2. GPIB address modification instructions



4.2.1. Press the EDIT key under the Menu page to enter the Edit GPIB Settings page.

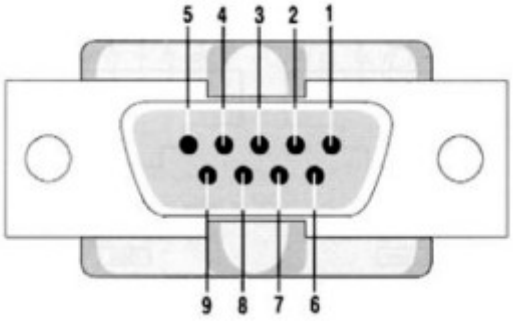
- Press the Select key to enter the edit.
- Number keys or up and down keys to set the value.
- Press the Select key to finish editing.
- Press the Menu key to leave the GPIB screen.
- After modifying the GPIB address and returning to the MENU page, you need to power off the 4016 and reboot to update the GPIB address.

4-3. RS232 protocol

The following RS232 commands are same as GPIB commands. The RS232 protocol in 4016 Series mainframe is listing below:

Baud-rate : 115200bps
Parity : None
Data bit : 8 bits
Stop bit : 1 bit
Handshaking : Hardware (RTS/CTS).

The RS232 Interface connector of 4016 Series rear panel, RS232 is shown in Fig4-1.



PIN	Abbreviation	Description
Pin1	CD	Carrier Detect
Pin2	RXD	Receive
Pin3	TXD	Transmit
Pin4	DTR	Data Terminal Ready
Pin5	GND	Ground
Pin6	DSR	Data Set Ready
Pin7	RTS	Request To Send
Pin8	CTS	Clear To Send
Pin9	RI	Ring Indicator

Fig 4-1 RS232 INTERFACE CONNECTION OF REAR PANEL

4-4. 4016 Series Communication Interface programming command list

COMMAND	RETURN	Remark
MEAS:VRMS?{;|NL}	###.###V	
MEAS:VPEAK?{;|NL}	###.###V,###.###V	
MEAS:VMAXMIN?{;|NL}	###.###V,###.###V	
MEAS:IRMS?{;|NL}	###.####(uA|mA|A)	
MEAS:IPEAK?{;|NL}	###.####(uA|mA|A)，###.####(uA|mA|A)	
MEAS:IMAXMIN?{;|NL}	###.####(uA|mA|A)，###.####(uA|mA|A)	
MEAS:WATT?{;|NL}	###.####(uW|mW|W|kW)	
MEAS:WMAXMIN?{;|NL}	###.####(uW|mW|W|kW)，###.####(uW|mW|W|kW)	
MEAS:VA?{;|NL}	###.####(uVA|mVA|VA|kVA)	
MEAS:VAR?{;|NL}	###.####(uVAr|mVAr|VAr|kVAr)	
MEAS:PF?{;|NL}	#.###	
MEAS:VCF?{;|NL}	#.####	
MEAS:ICF?{;|NL}	#.####	
MEAS:FREQ?{;|NL}	####.##Hz	
MEAS:VH?{;|NL}	###.###V，……	
MEAS:IH?{;|NL}	###.###(uA|mA|A)，……	
MEAS:VTHDR?{;|NL}	###.###%	
MEAS:VTHDF?{;|NL}	###.###%	
MEAS:ITHDR?{;|NL}	###.###%	
MEAS:ITHDF?{;|NL}	###.###%	
MEAS:KWH?{;|NL}	####.###(uWhr|mWh|Whr|kWhr)	
MEAS:AVGWATT?{;|NL}	###.###(uW|mW|W|kW)	
MEAS:ELT?{;|NL}	####D##H##S	
MEAS:INRUSHV?{;|NL}	###.### V	
MEAS:INRUSHI?{;|NL}	###.###(mA|A)	
MEAS:GROUP?{;|NL}	###.###(V)，###.###(V)，###.###(V)，###.###(V)，###.###(V)，###.###(uA|mA|A)，###.####(uA|mA|A)，###.####(uA|mA|A)，###.####(uA|mA|A)，###.####(uA|mA|A)，###.####(uW|mW|W|kW)，###.####(uW|mW|W|kW)，###.####(uW|mW|W|kW)，###.####(uVA|mVA|VA|kVA)，###.####(uVAr|mVAr|VAr|kVAr)	Vrms，Vpk+，Vpk-，Vmax，Vmin，Irms，Ipk+，Ipk-，Imax，Imin，Watt，Wmax，Wmin，VA，VAR，PF，VCF，ICF，Hz
MEAS:GRAPH?{;|NL}	(3bytes x 4096) VGarph+(3bytes x 4096) IGraph+ (5bytes x 4096) Wgraph+0x0D 0x0A	Hex
MEAS:VGRAPH?(;|NL)	(3bytes x 4096) + 0x0D 0x0A	Hex
MEAS:IGRAPH?(;|NL)	(3bytes x 4096) + 0x0D 0x0A	Hex
MEAS:WGRAPH?(;|NL)	(5bytes x 4096) + 0x0D 0x0A	Hex
MEAS:AH?(;|NL)	####.######(uAh| mAh|Ah|kAh)	

MEAS:PAV?(;丨NL)	###.###(uW丨mW丨W丨kW)	
MEAS:AAV?	###.####(uA丨mA丨A)	

COMMAND	RETURN	備註
OUT?{;丨NL}	ON丨OFF	0=OFF,1=ON
MODE?{;丨NL}	AC丨DC	
METER?{;丨NL}	0~7	0=Menu，1=Meter，2=Harmonic，3=Inrush，4=AC Standby，5=DC Accumuloator 6=DataLog，7=On/Off Cycling
VRANG?{;丨NL}	1~6	1=20V，2=40V，3=80V，4=200V，5=400V，6=800V
IRANG?{;丨NL}	1~18	1=2mA，2=4mA，3=8mA，4=20mA，5=40mA，6=80mA，7=0.2A，8=0.4A，9=0.8A，10=2A， 11=4A，12=8A，13=10A，14=20A，15=40A，16=50A，17=100A，18=200A
SHUNT?{;丨NL}	INT丨EXT	
FILTER?{;丨NL}	ON丨OFF	
ONDEG?{;丨NL}	0~359	
OFFDEG?{;丨NL}	0~359	
GraphT?{;丨NL}	0~100ms	
VERsion?{;丨NL}	r#.##,r#,r#,r#	Display rev. , Module1 rev. , Module rev.
*IDN?{;丨NL}	PRODIGIT:4016	
ONTIME?{;丨NL}	###.### (sec)	
OFFTIME?{;丨NL}	###.### (sec)	
REPEAT?{;丨NL}	####	
SCALE?{;丨NL}	1~10000	
AUTOUP?{;丨NL}	ON丨OFF	
THD?{;丨NL}	0丨1	0=THDR ,1=THDF
GRAPH?{;丨NL}	0丨1	0=AVG,1=OR
MODE:VHAR?{;丨NL}	ABS丨PER	ABS=Absolute value,PER=Percentage
MODE:IHAR{;丨NL}	ABS丨PER	ABS=Absolute value,PER=Percentage

COMMAND	Remark
OUT {SP}{0 | 1 | ON | OFF} {; | NL}	Set Output
MODE{SP}{0 | 1 | AC | DC}{; | NL}	Set AC/DC Mode
METER{SP}{0~7}{; | NL}	Set Meter Mode
VRANG{SP}{0~6}{; | NL}	Set VRange
IRANG{SP}{0~18}{; | NL}	Set IRange
SHUNT{SP}{0 | 1 | INT | EXT}{; | NL}	Set Shunt INT/EXT
FILTER{SP}{0 | 1}{; | NL}	Set FILTER
ONDEG{SP}{0 ~ 359}{; | NL}	Set On Degree
OFFDEG{SP}{0 ~ 359}{; | NL}	Set Off Degree
GRAPHT{SP}{0~100.00}{; | NL}	Set_Inrush Graph T
REMote{; | NL}	Set Remote
LOCAL{; | NL}	Set Local
CLEAR{; | NL}	Clear MaxMin Data
ONTIME{SP}{0.200~600.000}{; | NL}	Set Output OnTime
OFFTIME{SP}{0.200~600.000}{; | NL}	Set Ourput OffTime
REPEAT{SP}{1~9999}{; | NL}	Set Outpit Repeat
SCALE {1~10000} {; | NL}	Set ext input scale
LOCK (0 | 1) {; | NL}	Set data lock
AUTOUP{SP}{0 | 1 | ON | OFF}{; | NL}	Set Range Auto Up
THD{SP}{0 ‖ 1} { ; | NL}	Set THD Mode
GRAPH {SP} { ; | NL}	Set Inrush Graph Mode
MODE:VHAR{SP} {0 | 1 | ABS | PER}{ ; | NL}	Set V Harmonic Mode
MODE:IHAR{SP}{0 | 1 | ABS | PER}{ ; | NL}	Set I Harmonic Mode

Table 4-1 Communication Interface programming setting command summary

4-5. The description of abbreviation

SP：Space, the ASCII code is 20 Hexadecimal.
；：Semicolon, Program line terminator, the ASCII code is OA Hexadecimal.
NL：New line, Program line terminator, the ASCII code is OA Hexadecimal.
NR2：Digits with decimal point. It can be accepted in the range and format of ###.#####.
For Example：
30.12345, 5.0

The description of GPIB programming command syntax.

4-6. Communication Interface programming command description

4.6.1. PRESET Set and Read the Default of Load

VRMS?
Syntax: MEAS: VRMS? {; | NL}
Description：Read Voltage rms.

VPEAK?
Syntax: MEAS: VPEAK? {; | NL}
Description：Read Voltage VPEAK.

VMAX/MIN?
Syntax: MEAS: VMAXMIN? {; | NL}
Description：Read the measured voltage maximum and minimum

IRMS?
Syntax: MEAS: IRMS? {; | NL}
Description：Read the measured current RMS value.

IPEAK?
Syntax: MEAS: IPEAK? {; | NL}
Description：Read the measured current PEAK value.

IMAX/MIN?
Syntax: MEAS: IMAXMIN? {; | NL}
Description：Read the measured current maximum and minimum

WATT?
Syntax: MEAS: WATT? {; | NL}
Description：Read measured effective power

WMAXMIN?
Syntax: MEAS: WMAXMIN? {; | NL}
Description： Read the measured maximum and minimum effective power

VA?
Syntax: MEAS: VA? {; | NL}
Description：Read power.

VAR?
Syntax: MEAS: VAR? {; | NL}
Description：Read measurement invalid power.

PF?
Syntax: MEAS: PF? {; | NL}
Description：Reading measurement power factor.

VCF ?
Syntax: MEAS: VCF? {; | NL}
Description：Read measurement voltage peak factor.

ICF?
Syntax: MEAS: ICF? {; | NL}
Description：Read measurement current peak factor.

FREQ?
Syntax: MEAS: FREQ? {; | NL}
Description：Read measurement frequency.

VH?
Syntax: MEAS: VH? {; | NL}
Description：Reading the measured voltage 50th harmonic.

IH?
Syntax: MEAS: IH? {; | NL}
Description：Reading the measured current 50th harmonic.

VTHDR?
Syntax: MEAS: VTHDR? {; | NL}
Description：Read measurement voltage total harmonic distortion rate.

VTHDF?
Syntax: MEAS: VTHDF? {; | NL}
Description：Read measurement voltage total harmonic distortion rate.

ITHDR?
Syntax: MEAS: ITHDR? {; | NL}
Description：Read measurement current total harmonic distortion rate.

ITHDF?
Syntax: MEAS: ITHDF? {; | NL}
Description：Read measurement current total harmonic distortion rate.

KWH?
Syntax: MEAS: KWH? {; | NL}
Description：Read accumulated watt hour value.

AVGWATT?
Syntax: MEAS: AVGWATT? {; | NL}
Description：Reading watt average.

ELT?
Syntax: MEAS: ELT? {; | NL}
Description：Read elapsed time.

INRUSHV?
Syntax: MEAS: INRUSHV? {; | NL}
Description: Read and measure the Inrush voltage value.

INRUSHI?
Syntax: MEAS: INRUSHI? {; | NL}
Description: Read and measure the Inrush current value.

GROUP?
Syntax: MEAS: GROUP? {; | NL}
Description: Read measured values (Vrms, Vpk+, Vpk-, Vmax, Vmin, Irms, Ipk+, Ipk-, Imax, Imin, Watt, Wmax, Wmin, VA, VAR, PF, VCF, ICF, Hz).

GRAPH? (For RS232 or USB Interface only)
Syntax: MEAS: GRAPH? {; | NL}
Description: 3bytes x4096(Volt Graph)+3bytes x4096(Current Graph)+5bytes x 4096(Watt Graph)+0x0D 0x0A

Graphic data format: the 1st highest bit is positive and negative flag, 0=positive value 1=negative value, the value contains decimal place, the decimal place is determined according to the current gear position (please refer to 1.6 Specifications), the watt decimal place is composed of voltage and current gear Decide
Volt Graph (VRange=400V):0x00 0x2A 0xF8=110.00V
Current Graph(IRange=10A):0x80 0x1F 0x40= -8.000A
Watt Graph(400V 10A):0x80 0x05 0x3E 0xC6 0x00=-880.00000W
※Before reading , you need to send command 〝LOCK ON〞 to lock the data update. At this time, the measurement data will not be updated. After reading, you need to send command 〝LOCK OFF〞 to unlock the data.
The starting point of the graphic data is random, not starting from 0 degrees

V GRAPH? (For RS232 or USB Interface only)
Syntax: MEAS: VGRAPH?{; | NL}
Description: 3bytes x4096(Volt Graph)+0x0D 0x0A

The 1st highest bit is positive and negative flag, 0=positive value 1=negative value, the value contains decimal place, and the decimal place is determined according to the current gear position (please refer to 1.6 Specifications)
Volt Graph (VRange=400V):0x00 0x2A 0xF8=110.00V
※Before reading , you need to send command 〝LOCK ON〞 to lock the data update.

At this time, the measurement data will not be updated. After reading , you need to send command 〝LOCK OFF〞 to unlock the data.
The starting point of the graphic data is random, not starting from 0 degrees

I GRAPH? (For RS232 or USB Interface only)
Syntax: MEAS: IGRAPH?{; | NL}
Description: 3bytes x4096(Current Graph) +0x0D 0x0A

The 1st highest bit is positive and negative flag, 0=positive value 1=negative value, the value contains decimal place, and the decimal place is determined according to the current gear position (please refer to 1.6 Specifications)
Current Graph(IRange=10A):0x80 0x1F 0x40= -8.000A
※Before reading , you need to send command 〝LOCK ON〞 to lock the data update.
At this time, the measurement data will not be updated. After reading , you need to send command 〝LOCK OFF〞 to unlock the data.
The starting point of the graphic data is random, not starting from 0 degrees

W GRAPH? (For RS232 or USB Interface only)
Syntax:MEAS:WGRAPH?{; | NL}
Description: 5bytes x4096(Watt Graph)+0x0D 0x0A

The watt decimal place is composed of voltage and current gear Decide
Watt Graph(400V 10A):0x80 0x05 0x3E 0xC6 0x00=-880.00000W
※Before reading , you need to send command 〝LOCK ON〞 to lock the data update.
At this time, the measurement data will not be updated. After reading , you need to send command 〝LOCK OFF〞 to unlock the data.
The starting point of the graphic data is random, not starting from 0 degrees

AH?
Syntax: MEAS: AH? {; | NL}
Description: Read Cumulative amp hour

PAV?
Syntax: MEAS: PAV? {; | NL}
Description: Read Average Watt

AAV?
Syntax: MEAS: AAV? {; | NL}
Description: Read Average Amp

4.6.2. Read set value

OUT?
Syntax: OUT? {; | NL}
Description: output status?
Return: ON, OFF

MODE?
Syntax: MODE? {; | NL}
Description: setting AC and DC mode?
Return: AC, DC

METER?
Syntax: METER? {; | NL}
Description: usage model?
Return:0=Menu,1=Meter,2=Harmonic,3=Inrush,4=AC Standby,5= DC Accumulator
6=DataLog,7=On/Off Cycling

VRANG?
Syntax: VRANG? {; | NL}
Description: Voltage range?
Return: 1=20V, 2=40V, 3=80V, 4=200V, 5=400V, 6=800V

IRANG?
Syntax: IRANG? {; | NL}
Description: Current range?
Return:
1=2mA,2=4mA,3=8mA,4=20mA,5=40mA,6=80mA,7=0.2A,8=0.4A,9=0.8A,10=2A,11=4A,
12=8A,13=10A,14=20A,15=40A,16=50A,17=100A,18=200A

SHUNT?
Syntax: SHUNT? {; | NL}
Description: if you are using internal or external current measurements?
Return: INT=internal, EXT=external

FILTER?
Syntax: FILTER? {; | NL}
Description: filter settings?
Return: ON, OFF

ONDEG?
Syntax: ONDEG? {; | NL}
Description: Set the opening angle?
Return: Supports the opening angle control, the full range of 0-359 degree.

OFFDEG?
Syntax: OFFDEG? {; | NL}
Description: Set the closing angle?
Return: Supports the closing angle control, the full range of 0-359 degree.

GRAPHT?
Syntax: GRAPHT? {; | NL}
Description: INRUSH current waveform time setting?
Return: 0~100ms

VERsion?
Syntax: VERsion? {; | NL}
Description: Firmware version?
Return: r#. ##,r#,r#

***IDN?**
Syntax: *IDN? {; | NL}
Description: Model name?
Return: PRODIGIT: 4016

ONTIME?
Syntax: ONTIME?{; | NL}
Description: Ask the switch to turn on the hold time setting?
Return: ###. ### (Sec)

OFFTIME?
Syntax: OFFTIME?{; | NL}
Description: Ask the switch to the off hold time setting?
Return: ###. ### (Sec)

REPEAT?
Syntax: REPEAT?{; | NL}
Description: Ask the switch to repeat the test number setting?
Return: ####

SCALE?
Syntax: SCALE?{; | NL}
Description: Ask the Ext input scale number setting?
Return: #####.##

AUTOUP?
Syntax: AUTOUP?{; | NL}
Description: Ask about the automatic upshift function setting?
Return: ####

THD?
Syntax: THD?{; | NL}
Description: Ask about the THD mode setting?
Return: {0 | 1} 0=THDR,1=THDF

GRAPH?
Syntax: GRAPH?{; | NL}
Description: Ask about the Inrush graph mode setting?
Return: {0 | 1} 0=AVG,1=OR

MODE:**VHAR**?
Syntax: MODE:VHAR?{; | NL}
Description: Ask about the voltage harmonic display mode setting?
Return: ABS | PER (ABS= Absolute value，PER=percentage)

MODE:**IHAR**?
Syntax: ：MODE:IHAR?{; | NL}
Description: Ask about the current harmonic display mode setting?
Return: ABS | PER (ABS= Absolute value，PER=percentage)

4.6.3. Control Setting Command

OUT
Syntax: OUT {SP}{0|1} {; | NL}
Description: Set switch on or off
Return: 0: OFF, 1: ON

MODE
Syntax: MODE {SP} {0|1|AC|DC} {; | NL}
Description: Set AC and DC measurement mode
Return: 0: AC, 1: DC

METER
Syntax: METER {SP} {0~7} {; | NL}
Description: Set the analyzer function mode:
Return: 0=Menu, 1=Meter, 2=Harmonic,3=Inrush,4=AC Standby,5=DC Accumulator
6=DataLog, 7=On/Off Cycling

VRANG
Syntax: VRANG {SP} {0~6} {; | NL}
Description: Set the Voltage position
Return: 0=Automatic shifting, 1=20V, 2=40V, 3=80V, 4=200V, 5=400V, 6=800V

IRANG
Syntax: IRANG {SP} {0~18} {; | NL}
Description: Set the Current position
Return:
0=Automatic ,shifting,1=2mA,2=4mA,3=8mA,4=20mA,5=40mA,6=80mA,7=0.2A,8=0.4A,
9=0.8A,10=2A,11=4A,12=8A,13=10A,14=20A,15=40A,16=50A,17=100A,18=200A

SHUNT
Syntax: SHUNT {SP} {0|1|INT|EXT} {; | NL}
Description: Set the internal or external CT measurement current
Return: 0 or INT=Internal SHUNT, 1 or EXT=External CT

FILTER
Syntax: FILTER {SP} {0|1|} {; | NL}
Description: Set filter switch
Return: 0=off, 1=on

ONDEG
Syntax: ONDEG{SP} {0~359} {; | NL}
Description: Set switch opening angle
Return: Setting range 0~359 degree

OFFDEG
Syntax: OFFDEG {SP} {0~359} {; | NL}
Description: Set switch off angle
Return: Setting range 0~359 degree

GRAPHT
Syntax: GRAPHT {SP} {0~100} {; | NL}
Description: Set the Inrush current measurement mode waveform displacement time
Return: Setting range 0~100.00ms.

REMote
Syntax: REMote {; | NL}
Description: Set to remote control lock button

LOCAL
Syntax: LOCAL {; | NL}
Description: Set to stand-alone mode

CLEAR
Syntax: CLEAR {; | NL}
Description: Clear voltage, current, watt maximum and minimum

ONTIME
Syntax: ONTIME {SP} {0.200~600.000} {; | NL}
Description: Set switch on hold time (Cycling Mode)

OFFTIME
Syntax: OFFTIME {SP} {0.200~600.000} {; | NL}
Description: Set switch off hold time (Cycling Mode)

REPEAT
Syntax: REPEAT {SP} {1~9999} {; | NL}
Description: Set the number of switch cycle tests (Cycling Mode)

SCALE
Syntax: SCALE {SP} {1~10000.00} {; | NL}
Description: Set Ext input scale

LOCK
Syntax: LOCK {SP} {ON | OFF | 0 | 1} {; | NL}
Description: Set to lock data

AUTOUP
Syntax: AUTOUP {SP}{0 | 1 | ON | OFF} {; | NL}
Description: Set automatic upshift function, 0 or OFF= closed, 1 or ON= open
(Standby Mode & Accumulator & Data Logger Mode)

THD
Syntax: THD {SP} {0 | 1} {; | NL}
Description: Set THD mode,0=THDR,1=THDF

GRAPH
Syntax: GRAPH {SP} {0 | 1} {; | NL}
Description: Set Inrush Graph mode,0=AVG,1=OR

MODE:**VHAR**
Syntax: MODE:VHAR{SP}{0 | 1 | ABS | PER}{; | NL}
Description: Set voltage harmonic value display mode,
0 | ABS=Absolute value，1 | PER=percentage

MODE:IHAR
Syntax: MODE:IHAR{SP}{0 | 1 | ABS | PER}{; | NL}
Description: Set current harmonic value display mode,
0 | ABS=Absolute value，1 | PER=percentage

4-7. Communication Interface programming Command syntax description

{ } ：The contents of the { } symbol must be used as a part or data of the GPIB command, it cannot be omitted.

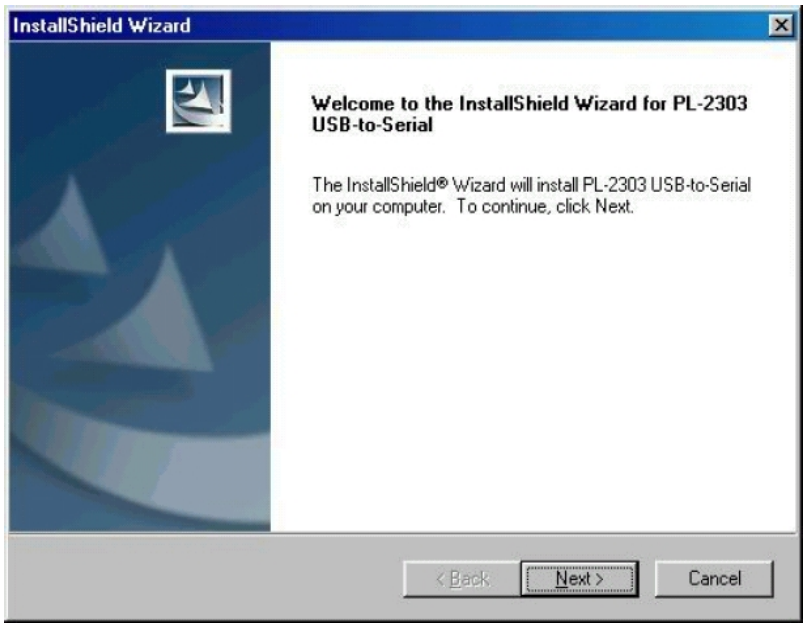
[ ] ：The contents of the [ ] symbol indicts the command can be used or not. It depends on the testing application.

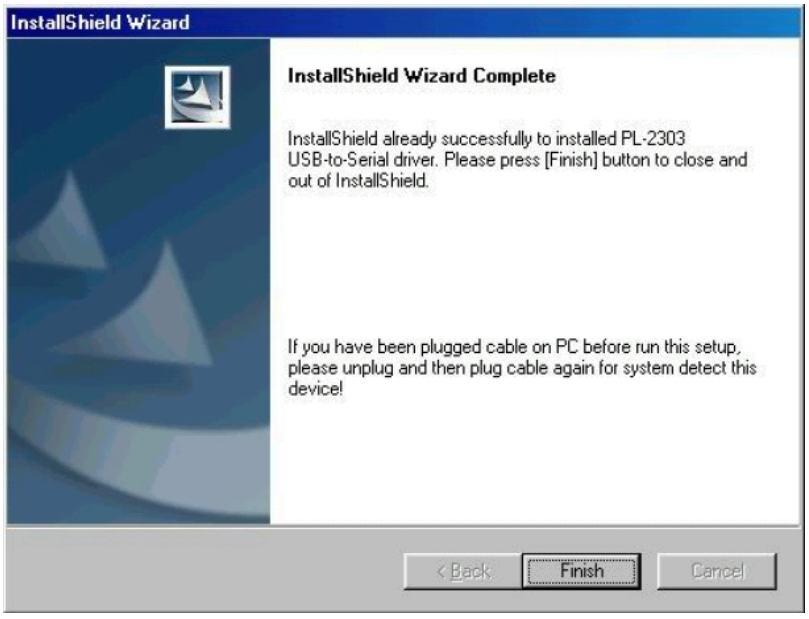
LF
LF WITH EOI
CR，LF
CR，LF WITH EOI

Table 4-2 GPIB COMMAND TERMINATOR

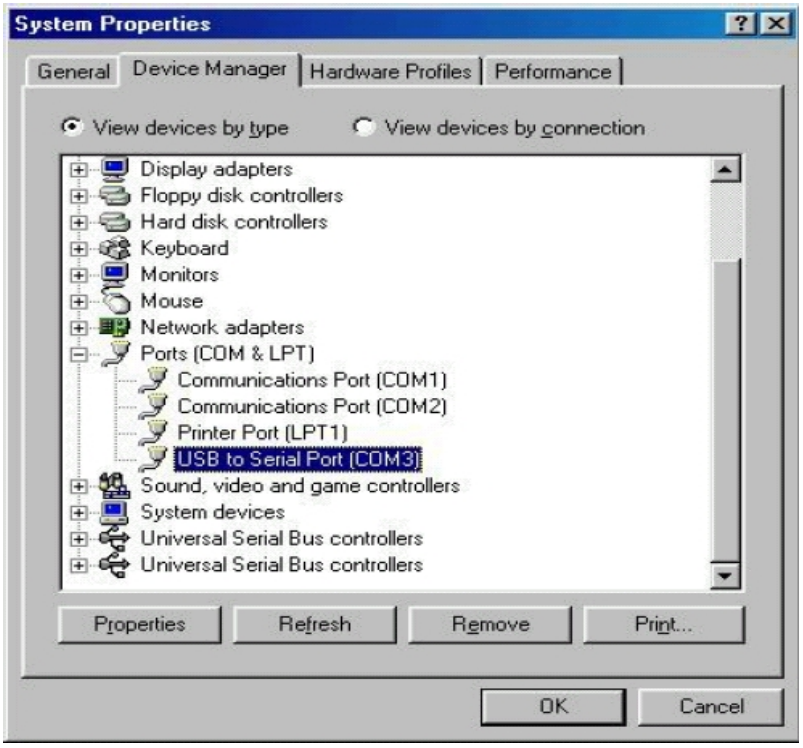
Appendix 1 4016 series USB Instruction

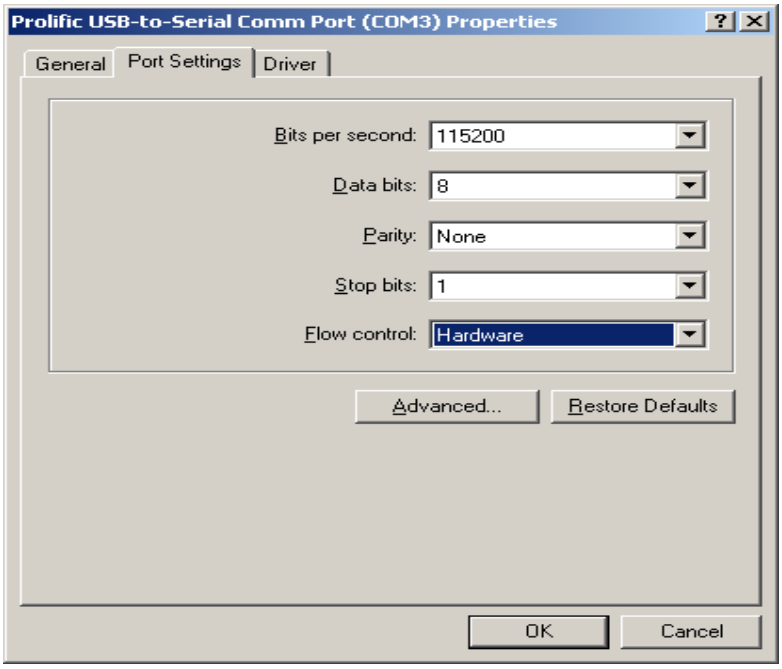
1. Install the USB DRIVER select USB\SETUP\PL-2303 Driver Installer.exe





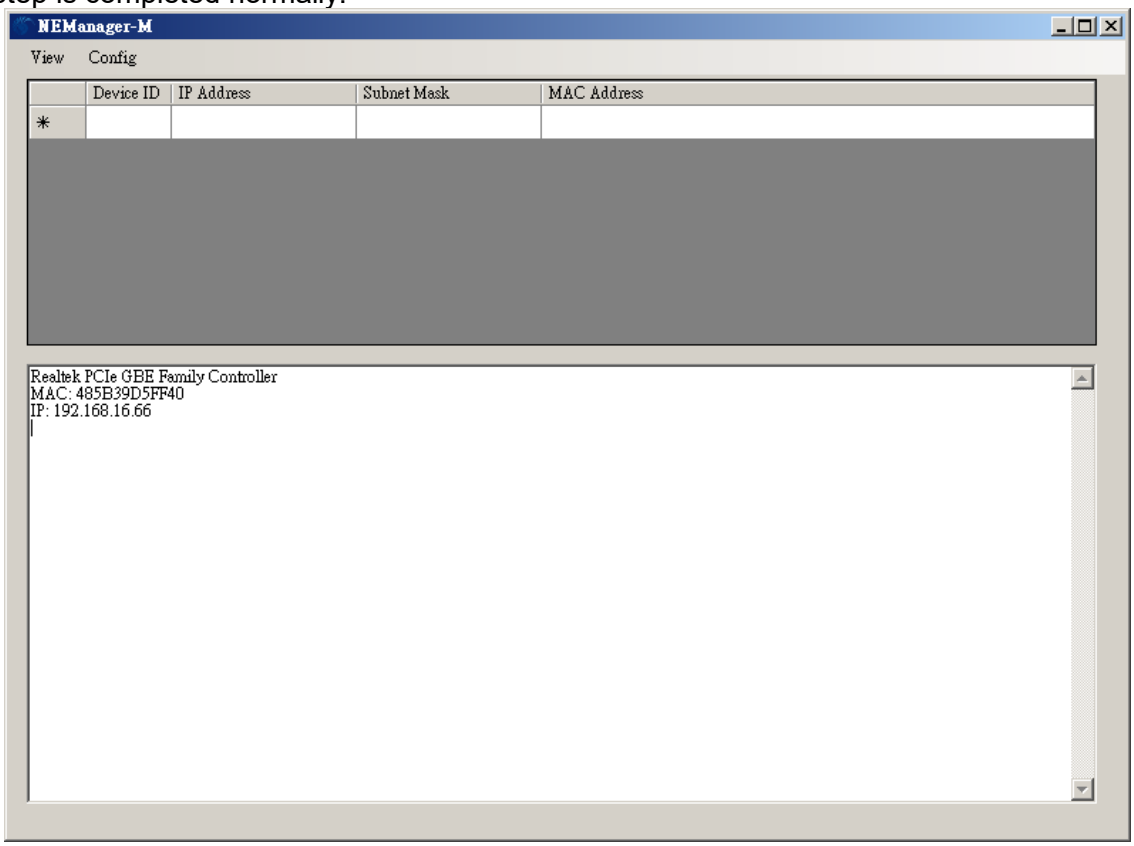
2. After the installation, connect the 4016 series and PC with USB. Then select the item USB to Serial Port (COM3), set the BAUD-RATE and Flow control to 115200bps and Hardware to control 4016 series with COM3.



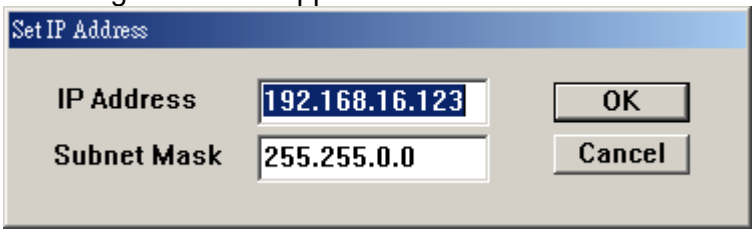


Appendix 2 4016 series LAN Instruction

1. Connect the 4016 to the power supply, connect to the lan cable, and connect the other end of the network route to the HUB hub.
2. Please execute IPScanner.EXE in the LAN directory on the CD. Windows security alert will appear first. Please select the public network and press [Access].
   The following screen appears: If no device appears, press F5 to re-detect, or check if the first step is completed normally.

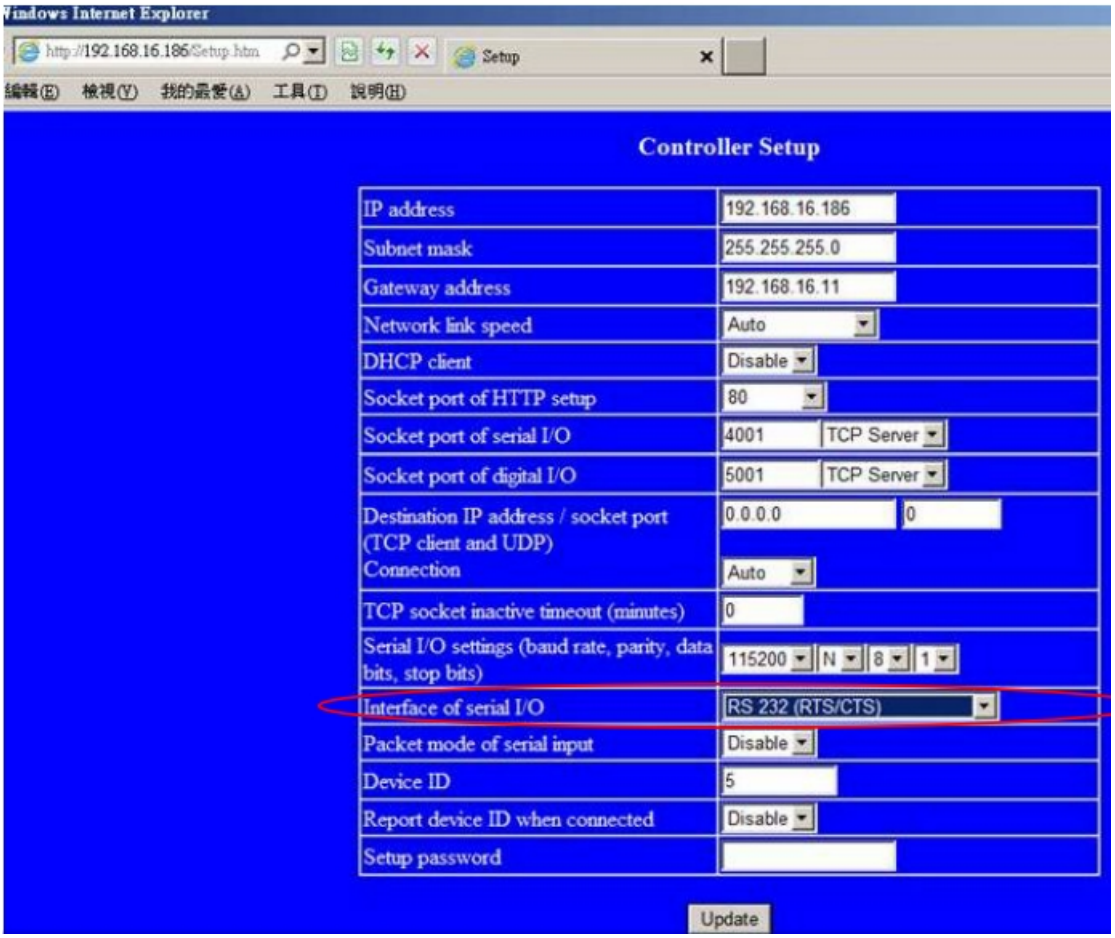


3. The currently detected device will be displayed on the screen. Please press the IP Address under Config. The following screen will appear:



4. Please set an available network IP Address and Subnet Mask. (You can ask the network administrator to get the correct available network settings)

5. Please press Device Setting, the following screen will appear.



6. Please enter the relevant settings :
   i. IP Address :
   ii. Subnet Mask :
   iii. Gateway Address :
   iv. Network link speed : (AUTO)
   v. DHCP client : Dynamic IP setting, the default value is Disable, unless the DHCP Server can change the setting to Enable
   vi. Socket port of HTTP setup : The default is 80, no need to set
   vii. Socket port of serial I/O : Please set to 4001
   viii. Socket port of digital I/O : Please set to 5001
   ix. Destination IP address / socket port (TCP client and UDP) Connection : no need to set
   x. Serial I/O settings (baud rate, parity, data, bits, stop bits) :
   Please set to 115200, N, 8, 1
   xi. Interface of serial I/O : Please set to RS-232
   xii. Packet mode of serial input : The default value is Disable, no need to set
   xiii. Device ID : Default value 5, no need to set
   xiv. Setup password :
   xv. Access password :