PONOVO POWER CO., LTD	
2F, 4Cell, Tower C, In.Do Mansion No.48A Zhichun Road, Haidian District Beijing, China (Post Code 100098)	
Office	TEL. +86 (10) 82755151 ext. 8887 FAX +86 (10) 82755257
E-Mail	Info@ponovo.com.cn
Website	www.ponovo.com.cn

PW636i

HARDWARE INSTRUCTION MANUAL

VERSION: **PW636i-AE-2.03**
DATE : **21/09/2011**

This manual represents the technical status for the moment of publishing. The product information, description and specifications mentioned in the manual do not have any contact binding force and PONOVO POWER CO., LTD remains the right to make modifications to the technical specifications and configurations without prior notice. PONOVO POWER does not take responsibility to the possible error/mistakes in this manual.

Contents

1. Preface

This manual gives detailed introduction to ***PW636i*** so that user can have the reasonable, effective and safe operation of this test kit.

This manual mainly consists of the following parts:

Equipment and functions:
This part describes the main hardware parts and their functions.

Panel description
This part describes the interfaces on the panels and their applications

Technical specifications
This part describes the technical specifications

Optional accessories
This part describes the optional accessories which will be used for dedicated applications

At the test site user should also refer to other safety and test regulations required by his management authorities.

This test equipment must be operated by professional test people and careful reading of this manual is required before operating this test equipment.

The complete test system consists of ***PW636i*** test equipment (used for generating analog test signals), ***PowerTest*** test software, Computer which has installed ***PowerTest*** software, Test Leads/cables, etc. This manual gives only the description to the hardware part. Please refer to ***PowerTest*** software user manual or ***PowerTest*** online help for details of the software.

2. Safety precaution

1. In case the power outlet for powering up the ***PW636i*** dose not have protective ground customer must connect the ground socket of ***PW636i*** to the protective ground at the test site
2. Please turn off the output before connecting/disconnecting the test object
3. The voltage output of over 36V is considered as dangerous and care must be taken
4. It's not allowed to feed external voltage into the voltage/current output sockets
5. It's not allowed to feed external current into the current/voltage output sockets
6. Disconnect the external circuit from the relay to avoid any influence to the test
7. Do not block the ventilation outlets
8. Avoid the equipment to be wet by rain
9. Do not switch-on and operate the equipment in the place having explosive gas or water vapor
10. The 500V dangerous voltage can be in the equipment and please don't remove the cover by yourself
11. Please contact the manufacture for any maintenance
12. The guarantee will become invalid if ***PW636i*** is opened by the customer

3. Designed applications

PW636i can be used by power plants, substations, and relay manufactures, etc, for the following test applications.

1. Test protective relays
2. Test transducers
3. Test energy meters

With optional ***AR-7D*** or ***AR-10*** analog recording unit the ***PW636i*** can even be used for analog waveform analysis.

Product features

1. Output sources
   - 6×32A current sources in two groups
   - 4×300V voltage sources
2. Binary inputs
   - 8 binary inputs for potential free or potential contacts
3. Counter inputs
   - 4 high speed counter inputs
4. DC measuring inputs
   - 2 DC measuring inputs for testing transducers
5. Binary outputs
   - 8 binary inputs in two groups, 4 of dry contact type and 4 of semiconductor type
6. Low level outputs
   - 12 low level outputs used for driving external amplifiers or testing Rogowski principle based relay
7. External amplifiers interface
8. GPS interface
   - Can receive GPS pulse signal from optional PGPS02
9. Synchronized control interface
   - Used for synchronizing several ***PW636i*** for specialized test purpose
10. Current booster interface (optional)
    - Used for increasing the compliance voltage of current output for testing high burden relays
11. AR-7D/AR-10 analog recording unit (***optional***)

4. Operation preparation

Preparation

Be sure that the following preparation/system components are ready before operating the test equipment:

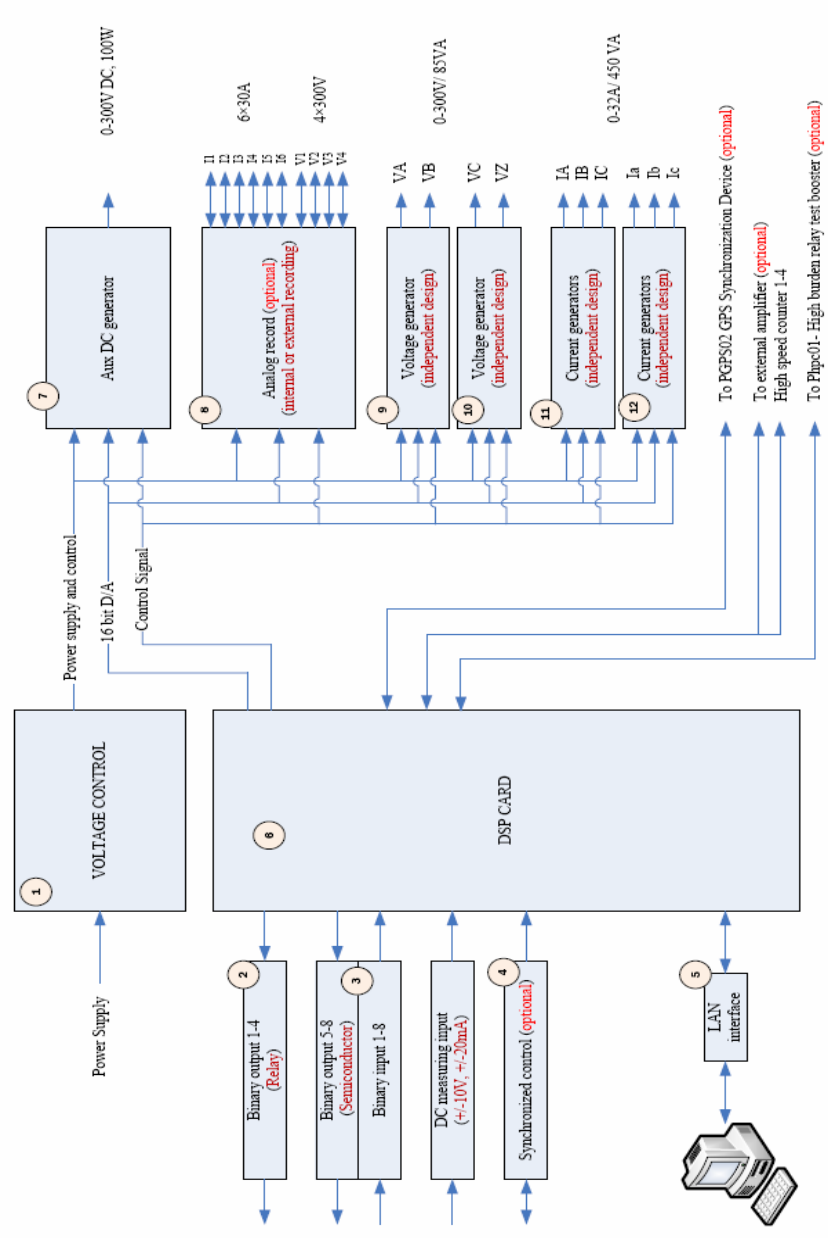
- ***PW636i*** test equipment
- Main supply cable (delivered)
- LAN control cable (delivered)
- PC with ***PowerTest*** software properly installed
- Test leads connected to the test object

Connecting PC

1. Connect the LAN cable between PC and ***PW636i***
2. Connect the power cables for PC and ***PW636i***
3. Connect ***PW636i*** ground socket to the protective ground
4. Power on the PC and ***PW636i***
5. Run ***PowerTest*** software

5. General description

Block diagram



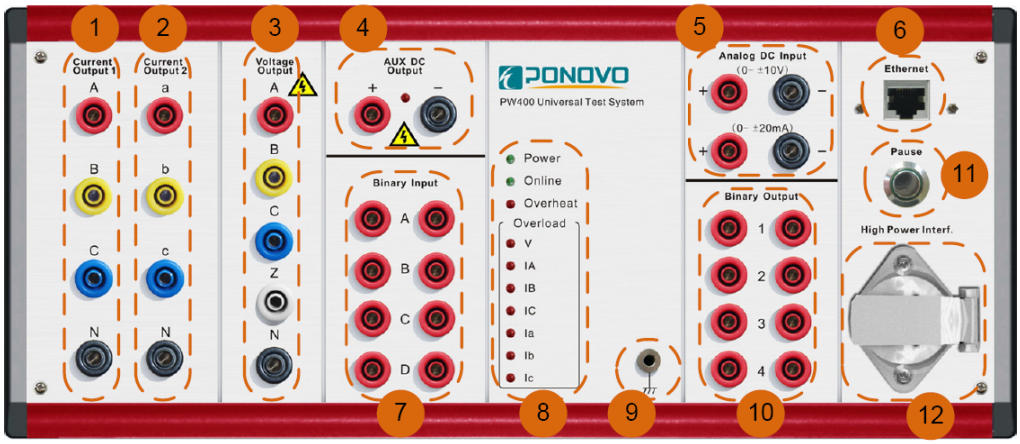
DSP card

High performance DSP (digital signal processor) is used on the DSP card to ensure the accurate and fast signal generation.

To get the satisfied accuracy and resolution the 32 bit D/A data converting technology is applied.

Front panel

1. **Current output group 1**
2. **Current output group 2**
3. **Voltage output**
4. **Auxiliary DC**
5. **DC measuring input**
6. **RJ45 Ethernet PC control port**
7. **Binary input group 1**
8. **LED indication**
9. **Earth socket**
10. **Binary output group 1**
11. **Pause button**
12. **Current booster interface**



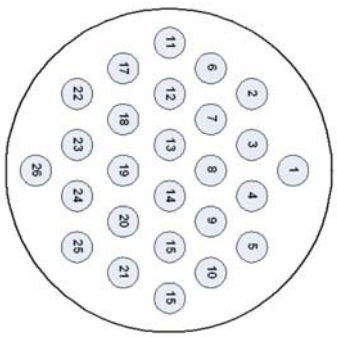
Ethernet port

The Ethernet port is used to connect to external PC via Ethernet control cable.

Please refer to "**Getting ready for connecting to PC**" for details

Current booster interface

This interface is used to connect to the external current booster (optional) for testing high burden relays.



Please refer to "**Current booster user manual**" for details

Pin	Signal
1	Current IA
2	Current IN
3	Current IB
4	Current IN
5	Current IC
6	Current IN
7	Current Ia
8	Current In
9	Current Ib
10	Current In
11	Current Ic
12	Current In
13	Voltage VA (not used)
14	Voltage VB (not used)
15	Voltage VC (not used)
16	Voltage VZ (not used)
17	Voltage VN (not used)
18	Not used
19	Not used
20	+12V（100mA）
21	+12V GND
22	Range switcher 1
23	Range switcher 2
24	Range switcher 3
25	Range switcher 4
26	Range switcher (GND)

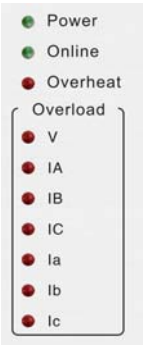
Pause button

The **Pause** button on the front panel is designed to cut the current/voltage outputs either for test purpose or under emergency case.

	'*Manual*' control mode	**'*Auto*' control mode**
Push '***Pause***' button	cut the current/voltage	cut the current/voltage, PC software will continue to run
Release '***Pause***' button	current/voltage output will be recovered from the point where we push the ***Pause*** button	current/voltage output will be recovered from the software execution point at the moment we release the ***Pause*** button

LED Indication

The LED indication on the front panel gives information about the hardware working conditions

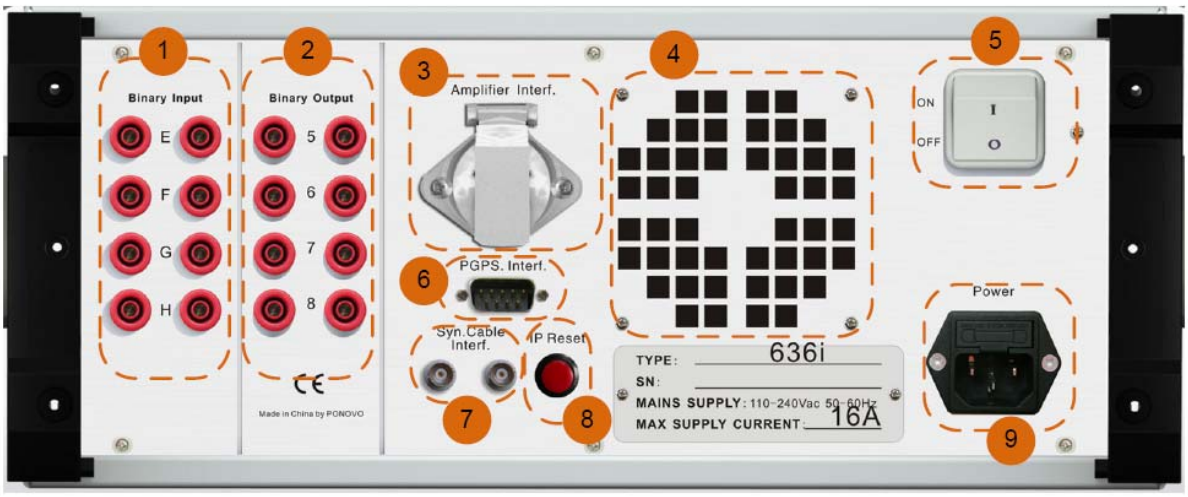


In normal working condition the status of LEDs will have the following indication in 'Power on' and 'Testing process' conditions

		Power on condition	**All current/voltage channels are having outputs**
Power lamp		Lighted	Lighted
Online lamp		**Not lighted**	**Lighted and flashing**
PAUSE lamp		Not lighted（push to light）	Not lighted（push to light）
Overheat lamp		Not lighted	Not lighted
Overload lamp	V	Not lighted	Not lighted
	IA	Not lighted	Not lighted
	IB	Not lighted	Not lighted
	IC	Not lighted	Not lighted
	Ia	Not lighted	Not lighted
	Ib	Not lighted	Not lighted
	Ic	Not lighted	Not lighted

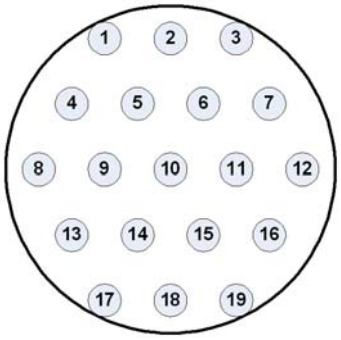
Rear panel

1. **Binary input group 2**
2. **Binary output group 2**
3. **External amplifier and low level output interface**
4. **Ventilation**
5. **Power switcher**
6. **GPS interface**
7. **Multi-kits synchronization interface**
8. **IP reset**
9. **Connector for mains supply**



External amplifier and low lever output interface

This interface is used to connect to external amplifier (optional) to increase the output channel and output power.

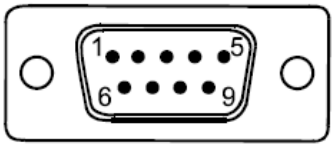


Pin	Signal
1	Low level output 1
2	Low level output 2
3	Low level output 3
4	Low level output 4
5	Low level output 5
6	Low level output 6
7	Low level output 7
8	Low level output 8
9	Low level output 9
10	Low level output 10
11	Low level output 11
12	Low level output 12
13	Low level output GND
14	Control signal
15	High speed counter 1
16	High speed counter 2
17	High speed counter 3
18	High speed counter 4
19	High speed counter GND

The 12 low level outputs are to be used for testing relays with Rogowski or voltage dividers input. For more information about the external amplifier please refer to "**External amplifier user manual**"

GPS interface

This interface is used to connect to our optional PGPS02 GPS-based synchronization device.

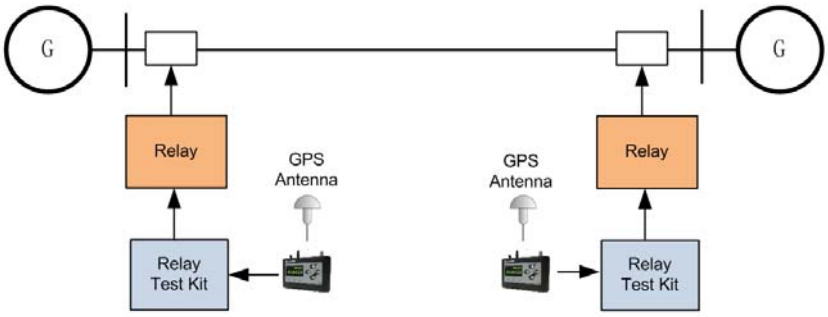


DB9 Chassis contact, male

Signal	Contact pin
Power	1
Ready	2
PPS	3
GND	5
GND	9

Note: **PPS** means **P**ulse **P**er **S**econd

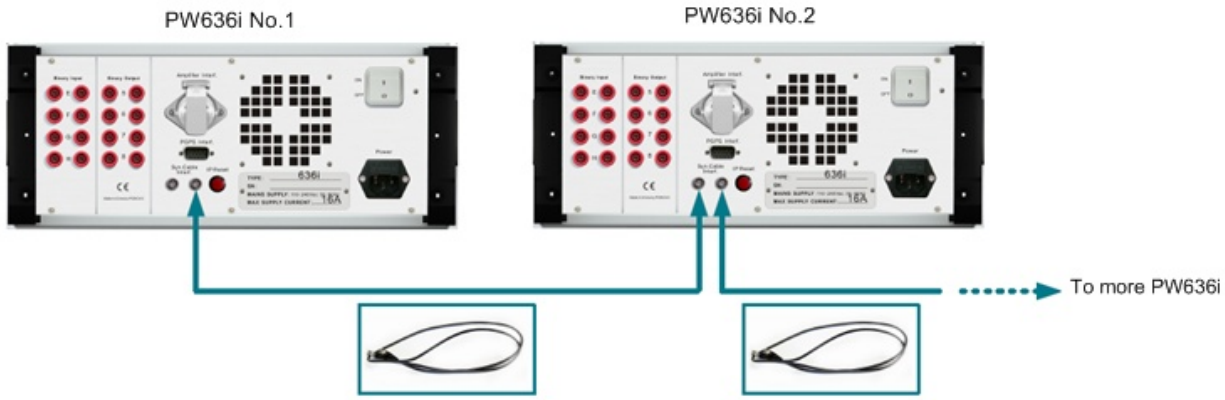
One popular application of GPS-synchronized control is for end-to-end test for line protection relay



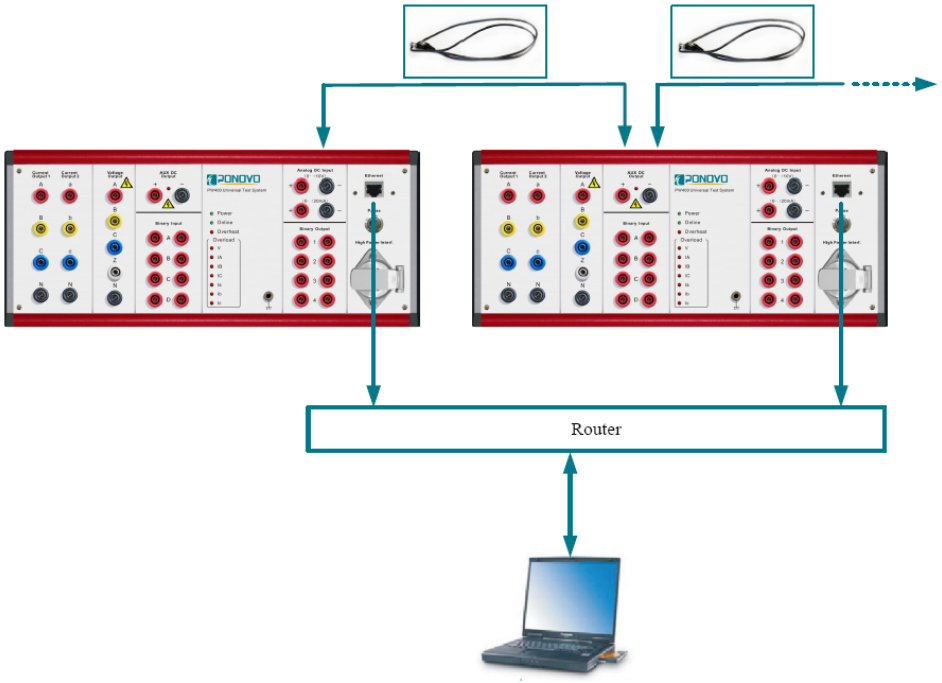
Please refer to '**PGPS02 user manual**' for details

Multi-kits synchronization interface

This interface is used to connect more relay test kits for synchronized control.



In synchronized control mode only one PC is required to control all relay test kits. Point-by point synchronization is used to ensure the synchronization accuracy.



IP reset

This reset button is used to restore the IP address of ***PW636i*** to the default factory setting.

- Press this button
- Switching on the power for ***PW636i***

After this operation the IP address will be restored to the following settings.

IP address: **191.168.1.133**
Subnet mask: **255.255.255.0**

Note: The IP after reset is only valid for the current operation. If users need to fix the default IP, please set it in “IP set” of *PowerTest*.

6. Hardware configuration

Current generators

PW636i has 6 current generators in two groups. They can be configured as either 3 currents mode or 6 current mode.
Test modules which requires 3 current mode configuration

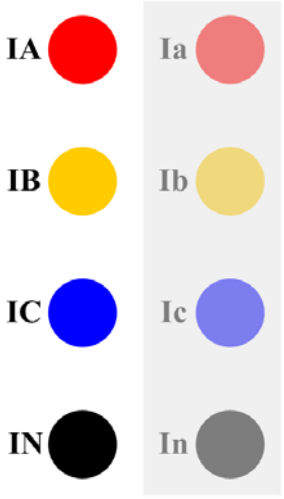
General	QuickTest
	● QuickTest (4V, 3I)
	● QuickTest (VL-L, 3V0)
	● QuickTest (Sequence)
	● QuickTest (Power)
	● QuickTest (Vf, If)
	● QuickTest (Z, I const)
	● QuickTest (Z, V const)
	● QuickTest (Z, Zs const)
	Ramp
	Distance
	Time inversed current
	Under Frequency Relay
	Under Voltage Relay
	State Sequence
	● State sequence (4V, 3I)
	Auto Reclosing
	Harmonic
	Transient Playback (4V, 3I)
	U,I,T Relay (AC)
	U,I,T Relay (DC)
	SOFT Check
	Fuse Failure
Advanced	Transducer
	Power Swing
	CB operation
	Energy Meter
	R/X characteristic check
	Synchronizer
Line	All modules

Test modules which requires 6 current mode configuration

General	QuickTest
	● QuickTest (4V,6I)
	Differential
	State sequence
	● State sequence (4V, 6I)
Advanced	Diff configuration
	Advanced differential
Transformer	All modules

Current output configuration in 3 current mode

In three 3 current mode the 3 current generators (IA, IB and IC) in first group will be used.



In 3 current mode the output range and power for IA, IB and IC will be doubled as shown bellow.

Range

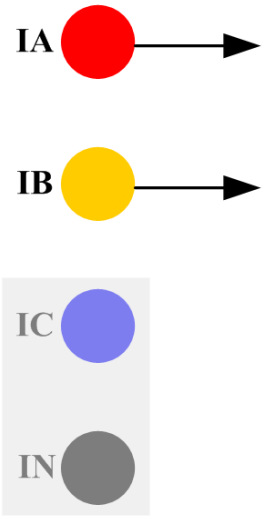
3-phase ac (L-N)	3 × 0 … 64 A

	1-phase ac (3L-N)	1 × 0 … 180 A
	1-phase dc (3L-N)	1 × 0 … 90 A
Power		
	3-phase ac (L-N)	3 × 800 VA at 64A
	1-phase ac (3L-N)	1 × 1200 VA at 180A
	1-phase dc (3L-N)	1 × 1400 W at 90A

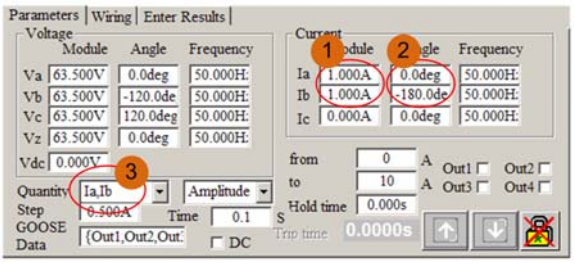
Current in series connection in 3 current mode

In 3 current mode the two current generators can be connected in series to increase the compliance voltage.

Example: IA and IB are connected in series



Example: Settings in QuickTest (4V, 3I) for IA and IB in series connection



1. Set Ia and Ib with the same amplitude
2. Set Ia and Ib angel as 180 deg
3. Set Ia, Ib as the quantity to change

Voltage generators

PW636i has 4 voltage generators.

Connect two voltage generators in series

We can connect two voltage generators in series to get higher voltage output range.

Example: VA and vvB are connected in series

Note: The maximum voltage output will become 600Vac in this case

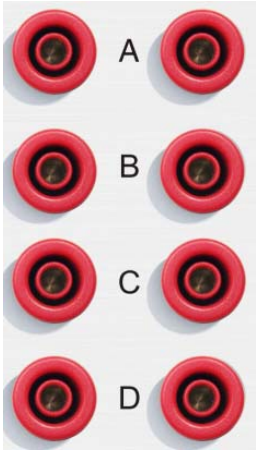
---

7. Binary inputs and outputs

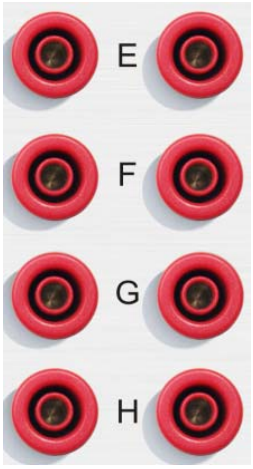
General description

PW636i has 12 binary inputs in two groups. There are 8 in the panels and other 4 connecting from the kit.

The first group of 4 binary inputs (A, B, C, D) are on the front panel.



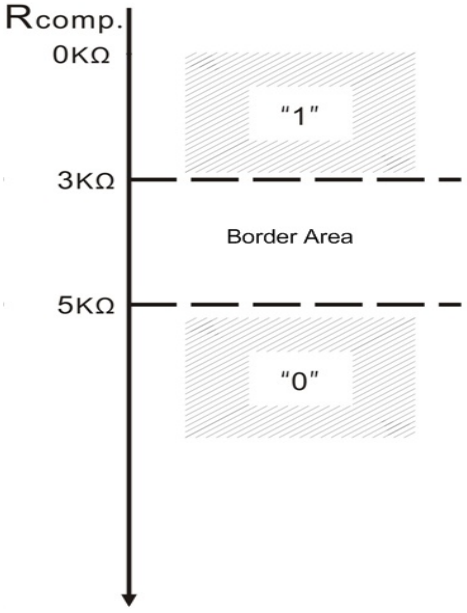
The second group of 4 binary inputs (E, F, G, H) are on the rear panel.



Binary Input

The device has 8 binary inputs. Electricity is isolated in A-H. Space contact or active contact (15V-250V) can be set by software. The threshold impedance for space contact is shown below. The threshold impedance for active contact can be set by software in 10V-250V.

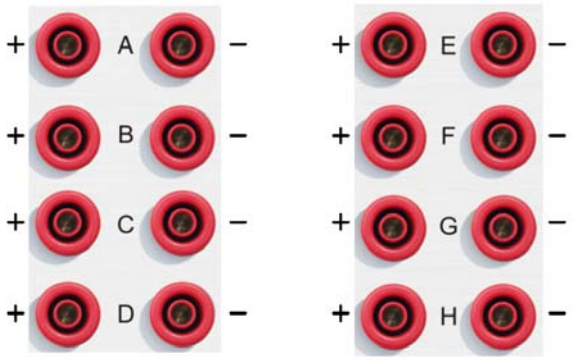
Threshold impedance for space contact



When connecting active contact, the polarity should be correct, red to positive, black to negative, otherwise, false tripping will occur. The polarity for A-H shows below figure.

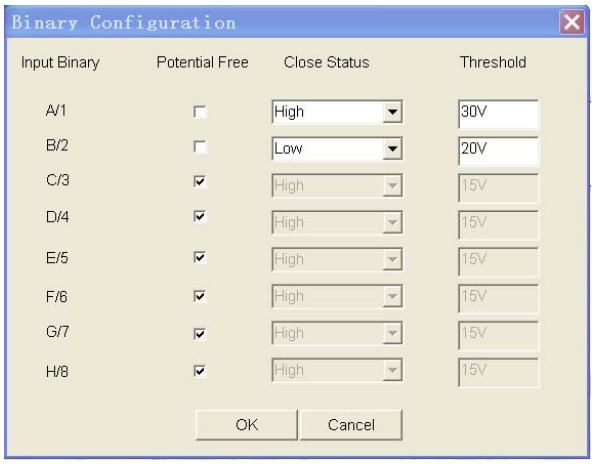
Polarity of binary inputs

The polarity reference of the binary inputs are shown bellow



Binary configuration

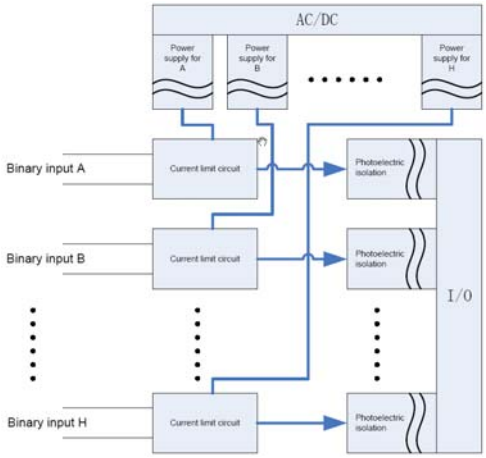
The software interface for binary configuration (A-H) shows below.



Notes： Any end of binary input is prohibited from connecting with ground.

Isolation of the Binary Inputs

All 8 binary inputs are gavanically isolated from each other.



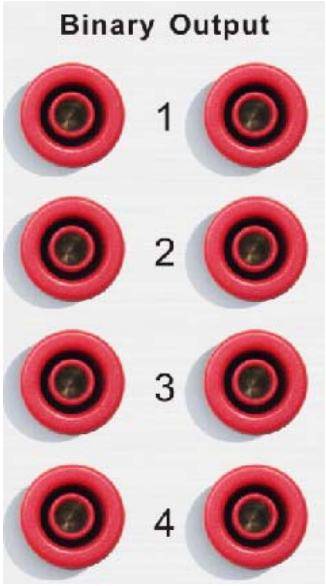
Threshold for the Binary Inputs

The threshold of 8 binary inputs can be independently set from the range of 0-250 Vdc.

Binary outputs

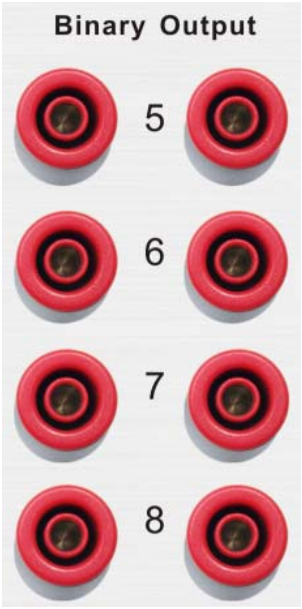
PW636i has 8 binary outputs in two groups

The binary outputs 1-4 are placed on the front panel.



These 4 binary outputs are potential free relay contact output.

At the rear side of the kit there are another 4 binary outputs 5-8.



These 4 binary outputs are high speed semiconductor type.

8. Getting ready for PC controlled operation

General description

The ***PW636i*** is to be controlled by the external PC via the Ethernet control cable.

PowerTest test software must be properly installed on the PC to control ***PW636i***. The installation description of ***PowerTest*** test system can be found in ***PowerTest*** user manual.

To connect the computer to ***PW636i*** a 10M/100M Ethernet Network Interface Card (NIC) must be installed in the PC. The computer without network card could use a UBS NIC. The drive program of NIC also should be installed.

The computer with mounted NIC should be able to log on Internet properly.

Set IP address

The IP address of ***PW636i*** is internally fixed as 192.168.1.133 when dispatched from the factory.

Steps for setting IP address in PC

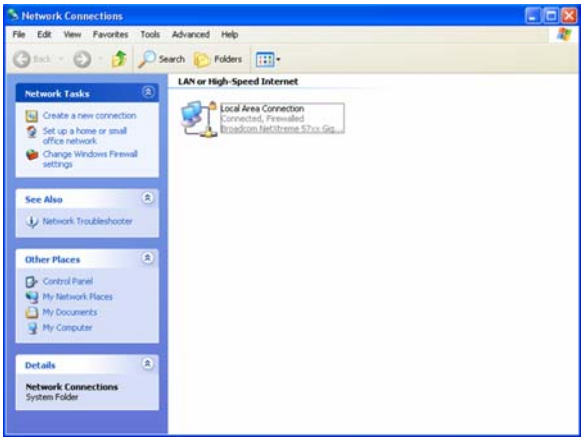
After the ***PowerTest*** is installed we need to set the IP address for the computer.

The IP address must be set as ***192.168.1.****

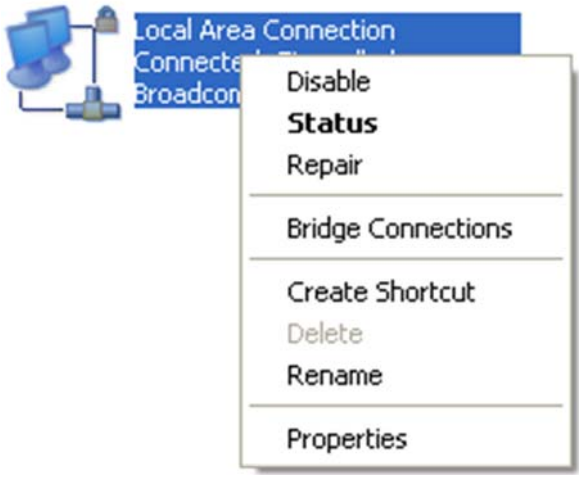
The first three section can not be changed and the last section can be the number among ***2~254 (except 133)***.

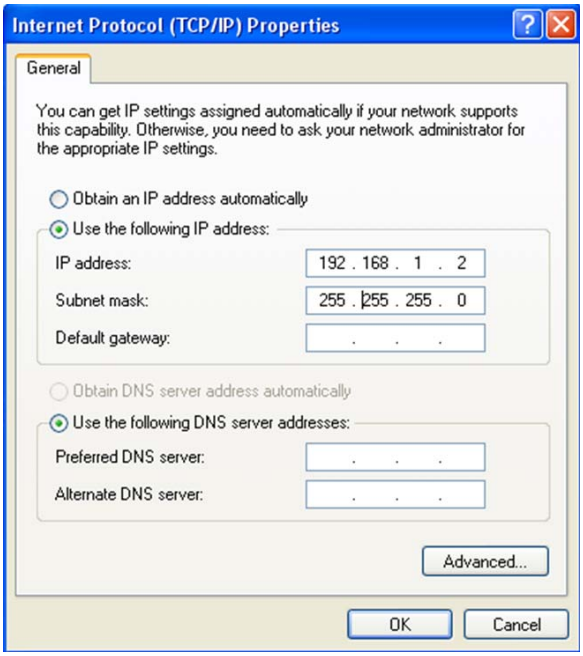
Steps for setting IP address for computer.

Step 1: Left click 'Start/Control panel/Network connection' (or right click the icon of "Network Neighbour" and left click the 'Properties' of drop menu) on the desktop of win2000 or winXP

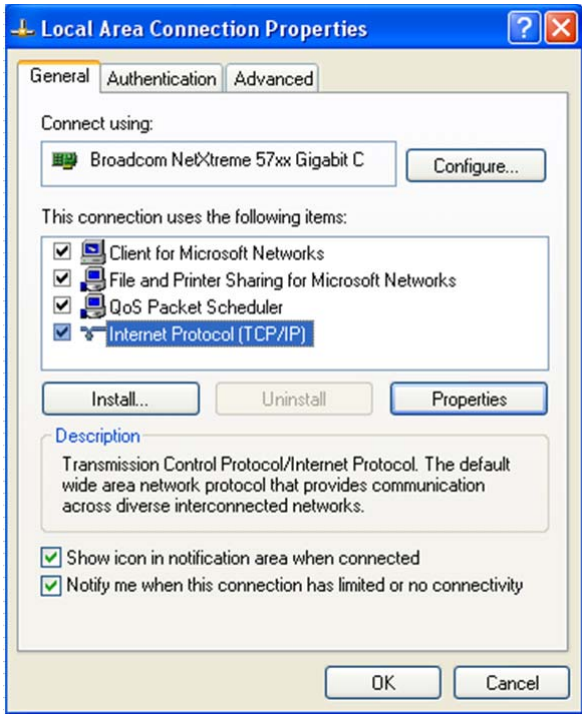


Step 2: Right click 'Local connection' icon





Step 3: Left click the 'Properties'



Step 4: Click the 'Properties' button

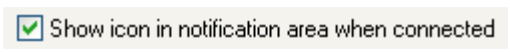
Note: the last section of IP address can be any number between ***2-254 (except 133)***

Step 5: Make the settings

- Select 'Use the following IP address
- Set 'IP address' as ***192.168.1.2***
- Set 'Subnet mask' as ***255.255.255.0***
- Press 'OK' button to confirm the setting

Step 6: Make the settings

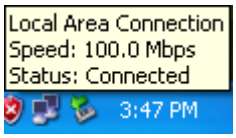
In 'Local connection' window make the following selection



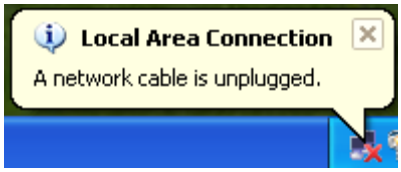
Then click the 'OK' button to complete the IP setting.

Step 7: Check if IP is set properly

If IP address is properly set we will see on the right bottom corner the following display



If we see the following display on the right bottom corner then we need to make the check as mentioned bellow



- Check if control cable is connected
- Check if ***PW636i*** is powered up
- Check if IP address is set properly

9. PW636i-Related Products and Accessories

This chapter describes the optional equipments and accessories for the *PW636i* test set. Please visit the PONOVO Web site **www.ponovo.com.cn** for up-to-date information.

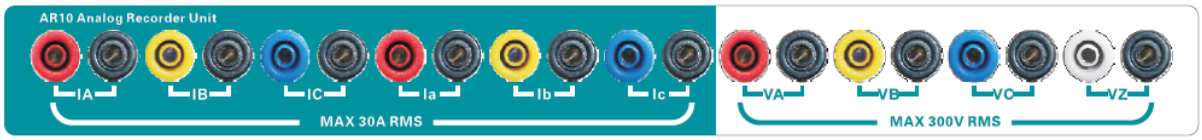
Optional accessories

Item	Part No.
AR-10 analog recording unit	SAR0101
AR-7 analog recording unit	SAR0201
PGPS02 GPS based synchronization device	SAG0101
IRIG-B based synchronization device	SAG0102
PSS01 circuit breaker simulator	SAB0101
Phpc01 current booster	SAH0101
PACB108 scanning head	SAS0101
Low level output and counter input cable	SAW0014
Synchronization control cable	SAW0015
Fiber optic cable/MTRJ-ST	SAW0016
Fiber optic cable/MRTJ-MRTJ	SAW0017

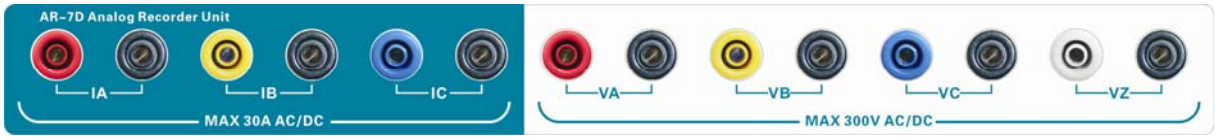
Standard accessories

Item	Part No.
Color coded current cables	SAW0201/0203
Color coded voltage cables	SAW0202
Signal cables	SAW0204/0205
Flexible terminal adapter	SAW0206
Flexible jumpers	SAW0207
Crocodile clips	SAW0208
U clamps 1#	SAW0209
U clamps 2#	SAW0210
Pin clamps	SAW0211
Power cord	SAW0009
Earthing lead	SAW0018
PC control cable (LAN)	SAW0012
Transportation case	SAC0105

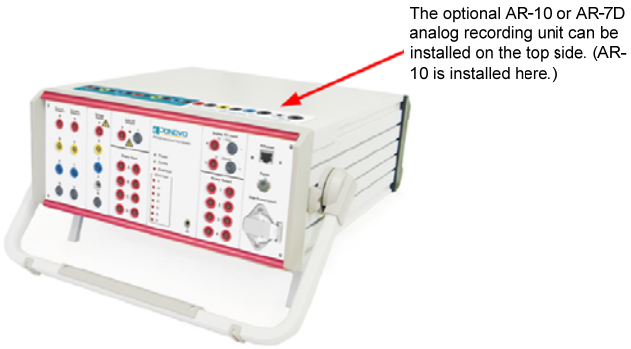
9.1 Analog Recording Unit (AR-10/AR-7D)



SAR0101 AR-10



SAR0201 AR-7D



The optional ***AR-10 or AR-7D*** analogue signal recording unit can be installed on the top cover of the test equipment.

This facility can be used to monitor the current/voltage outputs and binary input/output status during the relay test process enabling the fast trouble shooting of wiring and test circuitry. We can also use this provision to analyze the external signals, such as phase angle, power, harmonic, etc.

Main specifications of *AR-10/AR-7D*

Item	AR-10	AR-7D
No. of analog recording channel	10	7
Voltage input range	0-300Vac	0-300Vac/dc
Current input range	0-30Aac	0-30Aac/dc

9.2 PGPS02-GPS-based Synchronization Device

It provides GPS synchronization signal in PPS (pulse per second) or PPM (pulse per minute) for synchronized test. Trigger time can be set locally.

SAG0101 PGPS02

You can synchronize two or more PONOVO test sets by connecting a PGPS synchronization unit to each of the test sets' inputs.

For detailed information about the PGPS, please refer to the ***PGPS User Manual,*** the product catalog, or the PONOVO Web site www.ponovo.com.cn

Table 8-2

Pulse signal level	TTL or RS-232
Timing error between two RT GPS	TYP.<100ns MAX.<500ns
Pulse width	100ms
Weight	640g
Dimension W x H x D	95x45x160mm

9.3 PIRIG-B Based Synchronization Device

It converts external IRIG-B signal into trigger pulse to synchronize several of our relay test equipment for synchronized test application.

SAG0102 PIRIG-B

Via the PIRIG-B interface box users can connect devices to the PW636I test set that either transmit or receive the IRIG-B time reference signal (DC level shift protocol B00x). That way, two or more PONOVO test sets are synchronized.

For detailed information about the PIRIG-B, please refer to the ***PIRIG-B User Manual***

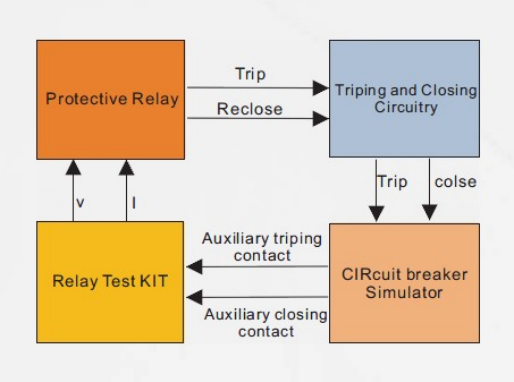
9.4 PSS01 Circuit Breaker Simulator

It can simulate circuit breaker behaviors in three pole or 1 pole tripping of 6-500KV voltage grade, being available for power system, etc.

It provides 12 circuit breaker auxiliary contacts for complex test applications.

SAB0101 PSS01

This is one of the application examples:



9.5 Phpc01 Current Booster

Phpc01 current booster is designed to supply high compliance voltage even at small current range, suitable for testing high burden electromagnetic current relays.

SAH0101

Table 9-5

Setting range	0-10A
Accuracy	0.15% rd. +0.05% rg. typ., 0.4% rd. +0.1% rg. guar.
Ranges	10A/8A/6A/4A/2A
Frequency	40-65Hz

9.6 PACB108 Scanning Head

The passive optical scanning head PACB108 detects the status of an LED, that is either an optical pulse output from an energy meter or the binary status of a protective relay or other similar optical source.

SAS0101 PACB108

Output pulse: 5V or 24V
Sampling distance: 10-30 mm
Maximum sampling pulse: 100 pulses/second

9.7 Low Level Output and Counter Input Cable

SAW0014

This cable is used to connect amplifiers with PONOVO kit.

9.8 Synchronization Control Cable

Synchronization control cable is used to connect more relay test kits for synchronized control.

SAW0015 Synchronization control cable

9.9 Fiber Optic Cable

SAW0016/SAW0017 Fiber Optic Cable

2xorange-MTRJ-ST 2xorange-MTRJ-MTRJ

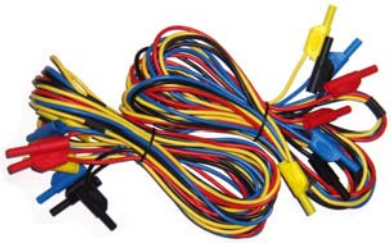
When PW636i is connected with a fiber switcher, fiber optic cables are required.

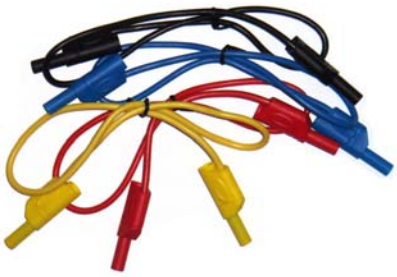
9.10 Standard Accessories

9.10.1 Soft Bag for Test Leads

The PW636i Wiring Accessory Package contains the following articles:

1. Colour coded current cables



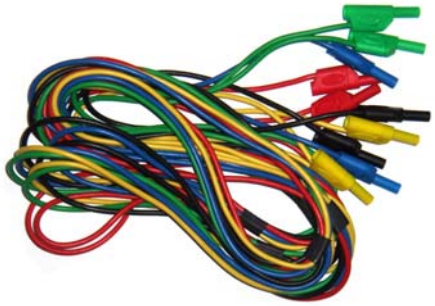


SAW0201/ 0203 colour coded current cable

Amount: 2xred, 2xblack, 2xyellow, 2xblue 1xred, 1xblack, 1xyellow, 1xblue

The current cables to connect the PW636i output to other safety sockets of, generally the current parts, voltage and signal tripping.

2. Color coded voltage cables



SAW0202 Colour coded voltage cable

Amount: Amount: 1x red, 1x yellow, 1x green, 1x blue, 1x black

The voltage cables to connect the PW636i output to other safety sockets of, generally the voltage parts, current and signal tripping.

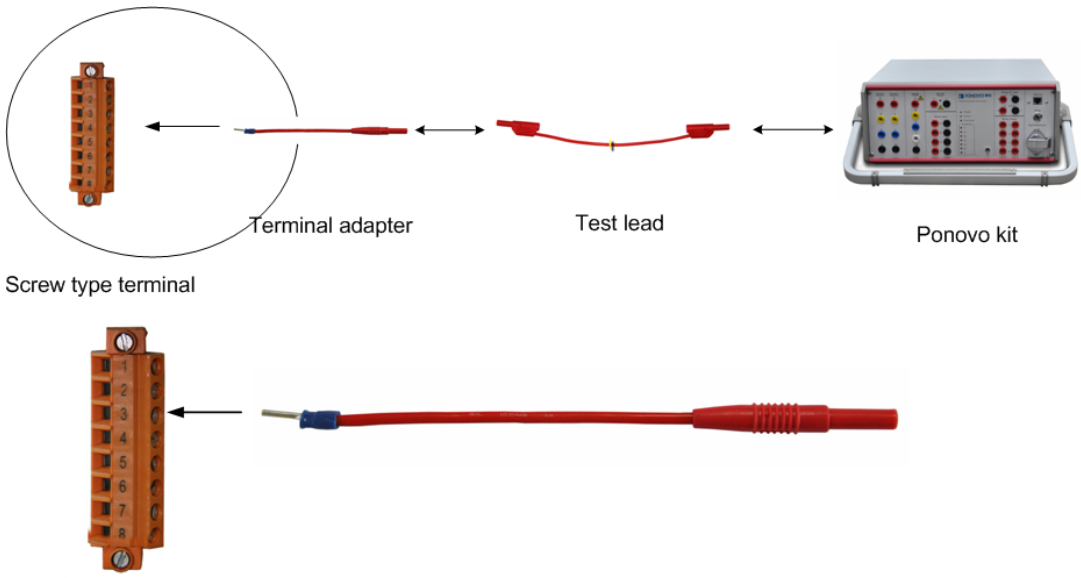
3. Signal Cable

SAW0204/0205 Signal cables

Amount: 2xred, 2x black 2xred, 2xblack

It connects the PW636i with other different sockets, generally with signal tripping and current/voltage testing.

4. Flexible Terminal Adapter



SAW0206 Flexible terminal adapter

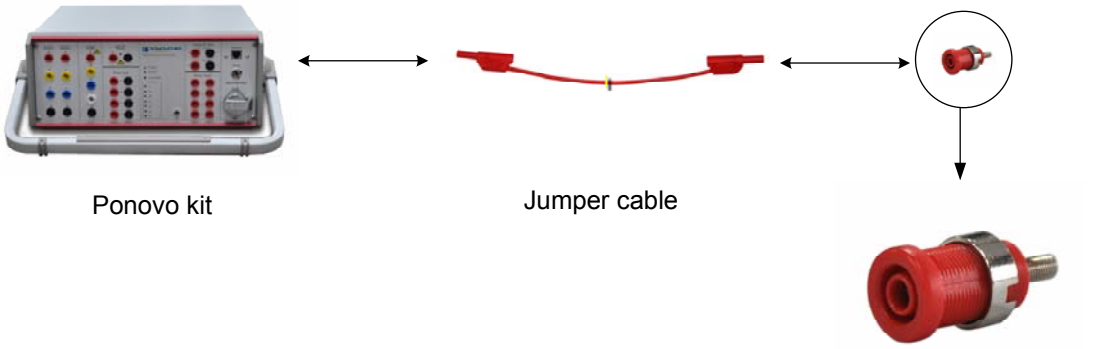
Amount: 10xred, 10xblack

Flexible terminal adapter connect to screw-clip terminals.

Notes: One end of the adapters have no insulator, users should make sure there is no output during connecting the adapters. Users insert the non-safety into the terminals and screw it firmly, then connect the test lead with the other end.

---

5. Jumper Cable

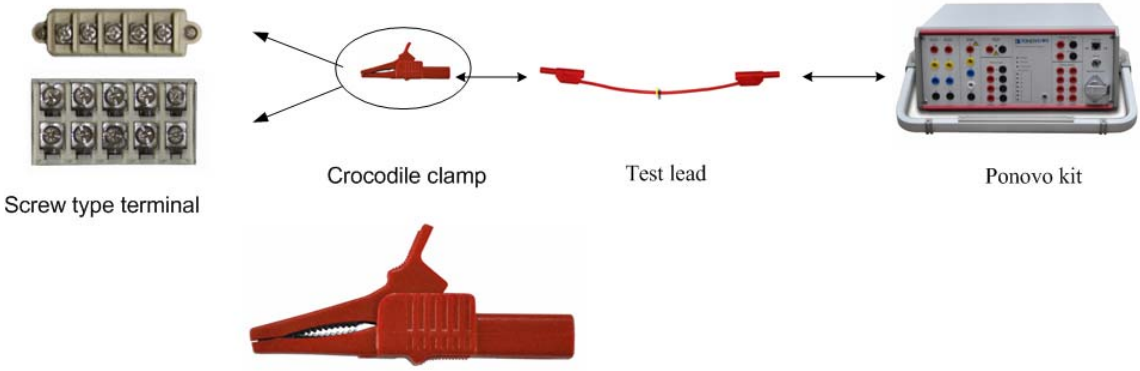


SAW0207 Flexible jumpers

Amount: 4xblack

Flexible jumper connects current outputs in parallel.

6. Crocodile Clips



SAW0208 Crocodile clips

Amount: 2xred, 2xblack, 2xyellow, 2xblue

Crocodile clips for secondary side to connect to pins or screw types.

7. U Clamps

SAW0209 U clamps 1#
Amount: 10xred, 10xblack

SAW0210 U clamps 2#
5xred, 5xblack

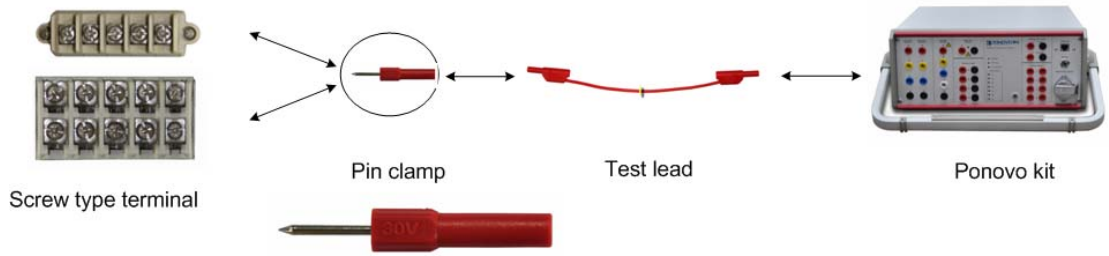
Screw type terminal

U clamps for screws to connect regular test leads to screw-clamp terminals relays.

Notes: One end of the adapters have no insulator, users should make sure there is no output during connecting the adapters. Users insert the non-safety into the terminals and screw it firmly, then connect the test lead with the other end.

---

8. Pin clamps



SAW0211 Pin clamps

Amount: 4xred, 4xblack

Pin clamps for screws to connect regular test leads to screw-clamp terminals relays.

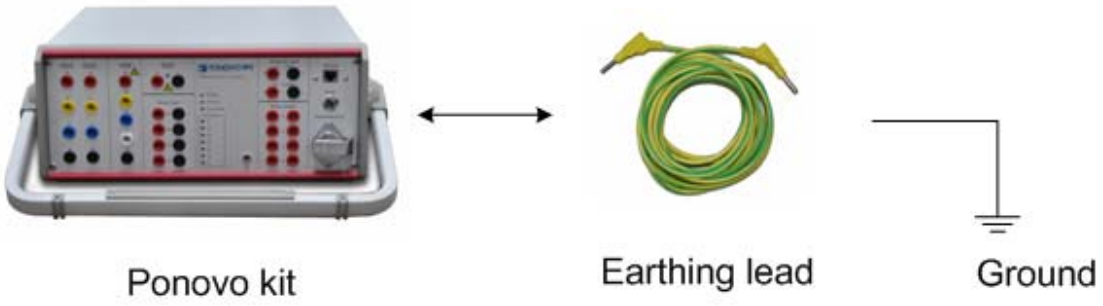
9. Power Cord

SAW0009 Power code

Amount: 1 piece

Power cord connects the PW636i with power supply socket. PONOVO will provide relevant plug socket according to different countries. For the plug socket information, please check the ***Chapter11. Appendix.***

10. Earthing Lead



SAW0018 Earthing lead

Specification: 2.5mm²×4m
Amount: 1 piece

Earthing lead connects the PW636i with ground to ensure kit safety.

Notes: In order to avoid static induction, users should connect the PW636i with ground reliably before testing.

---

11. PC control cable (LAN)

SAW0012 PC control cable (LAN)

Amount: 1 piece
The LAN cable connects the PW636I with PC for communications.

9.10.2 Transportation Case

The large-size case with wheels is designed for heavy transport stress with folding hand it is made of fireproof materials and smooth rolling rubber tires.

SAC0105 Transportation case

Dimension: 465x250x525mm (WxHxD)
Weight: 10Kg.

10. Specifications

Voltage Generators

Setting range

4-phase ac (L-N)	4 × 0-300V
1-phase ac (L-LL)	1 × 0-600V
dc (L-N)	4 × 0-±300V

Power

4-phase ac (L-N)	4 × 85VA at 300V 3× 120VA at 300V
1-phase ac (L-L)	1 × 170VA at 600V
dc (L-N)	4 × 100W at ±300V

General

Accuracy	< 0.08% rd + 0.02% rg guar. < 0.02% rd + 0.01% rg typ.
Resolution	10mV for 300Vac
Distortion	< 0.05% typ. (0.1% guar.)

Current Generators

Setting range

6-phase ac (L-N)	6 × 0-32A
3-phase ac (2L-N)	3 × 0-64A
1-phase ac (6L-N)	1 × 0-180A
dc (6L-N)	1× 0-±180A

Power

6-phase ac (L-N)	6 × 450VA typ. at 32A 6 × 400VA guar. at 32A
3-phase ac (2L-N)	3 × 800VA typ.at 64A 3 × 700VA guar.at 64A
1-phase ac (6L-N)	1 × 1200VA typ.at 180A 1 × 1000VA guar.at 180A
1-phase dc (6L-N)	1 × 1400W typ.at 90A 1 × 1000W guar.at 90A
dc (3L-N)	1× 1400W at ±90A

General

Accuracy	< 0.15% rd + 0.05% rg guar. < 0.05% rd + 0.02% rg typ.
Resolution	1.0mA
Distortion	< 0.05% typ. (0.1% guar.)

Generator, general

Frequency range	
Sine signal	DC 1-1000Hz
Transient signal	DC-10.0kHz
Frequency accuracy	±1ppm
Frequency resolution	0.001Hz
Phase angle range	-360° -+360°
Phase angel accuracy	0.05° typ (0.1° guar) at 50/60Hz
Phase angle resolution	0.001°

Auxiliary DC supply

Voltage range	0-300V
Power	88W at 110V, 176W at 220V, 120 W at 300V
Accuracy	<0.1% rg typ. (0.5% rg. guar.)

Binary Input & Output

Binary input group 1

Number	8
Input characteristic	0-400V_{dc} threshold or potential free
Sample rate	20kHz
Time resolution	50μs
Max. measuring time	infinite
Debounce/Deglitch time	0-25ms
Counting function	<3kHz at pulse width >150us
Galvanic isolation	8 galvanically isolation

Binary input group 2

Number	4
Input characteristic	0-±5V dc or dry contact
Sample rate	100kHz
Time resolution	10μs
Max. measuring time	infinite
Debounce/Deglitch time	0-25ms
Max counting frequency	100kHz
Pulse width	< 3us
Threshold voltage	2V
Voltage hysteresis	0.8V
Max input voltage	±5V
Connection	19pin combination socket (rear side)

Binary output, semiconductor

Number	4 (rear side)
Type	semiconductor
Break capacity ac	Vmax:300V / Imax: 0.5A /Pmax:150W
Update rate	100us
Imax	0.5A

Binary output, relay

Number	4 (front side)
Type	Potential free relay contact, controlled via software
Break capacity ac	Vmax:300Vac / Imax:8A /Pmax:2000VA)
Break capacity dc	Vmax:300V / Imax:8A /Pmax:150W

DC voltage measuring inputs

Measuring range	0-±10V
Accuracy	<0.02% rg. typ; <0.05% rg, guar
Input impedance	100kΩ

DC current measuring inputs

Measuring range	0-±20mA
Accuracy	<0.02% rg. typ.;<0.05% rg, guar
Input impedance	50Ω

AC measurement & monitoring (*optional*)

Voltage measurement

Channel number	4
Measuring range	0-300V (error < 0.5% rg. typ.)
Phase	0-360° (error < 0.5°)

Current measurement

Channel number	6
Measuring range	0-30A (error < 0.5% rg. typ.)
Phase	0-360° (error < 0.5°)

Power measurement

Active/reactive power	error < 1% rg. typ.

Monitoring

Channel number	10
Mode	monitoring the output voltage/current waveform during the test process

Low level outputs

Setting range	12 x 0-10Vpk
Max. output current	1mA
Accuracy	0.025% typ (0.07% guar) at 1-10Vpk
Resolution	250uV
Distortion	0.05% typ (0.1% guar)
Connection	19 pin combination socket (rear side)

Power supply

Nominal input voltage	110-240V_{ac}
Permissible input voltage	90-260V_{ac}
Nominal frequency	50/60Hz
Permissible frequency	45-65Hz

Environmental condition

Operating temperature	0-+50°C
Storage temperature	-25-+70°C
Relative humidity	5-95%, non-condensing
EMC (Emission)	IEC-61000-3-2/3
EMC (immunity)	IEC-61000-4-2/3/4/5/6/11
Safety	IEC 61010-1

Others

PC-Connection	Ethernet, 10M/100Mbps
Amplifier interface	Circular connector
Current booster interface	Circular connector
Synchronization interface	Coaxial cable connector
GPS control interface	RS232
Ground socket (earth)	4 mm banana socket
Weight	20 kg
Dimensions	360 × 157 × 367 mm

AR-10/AR-7D Analog recording unit (*optional*)

	AR-10	AR-7D
Channel number	10	7
Voltage input range	0-300V	0-300Vac, 0-300Vdc
Current input range	0-30Aac	0-30Aac, 0-30Adc
Amplitude accuracy	< 0.5%	
Bandwidth	DC-1.0kHz	
Sampling frequency	3.5kHz	
Voltage input impedance	300kΩ	
Transient input buffer	15s for all 10 inputs channels simultaneously at 3.0kHz	
Transient trigger	threshold voltage or current, manual	
Measurement function	I (AC), V (AC), phase, frequency, power, energy, harmonics, transient recording, event recording	
Input overload indication	Yes	
Input protection	Yes	
Galvanic isolation	Independent isolation for all 10 inputs	

IEC61850 compliant relay testing (*optional*)

IEC61850 GOOSE

Simulation	Mapping of binary outputs to data attributes in published GOOSE message
Subscription	Mapping of data attributes from subscribed GOOSE messages to binary inputs
Performance	Type 1A; Class P2/3 (IEC61850-5)
VLAN support	selectable priority VLAN-ID

11. Appendix

In order to assure PONOVO sockets are used smoothly in foreign countries, PONOVO provides the plug sockets to our customers in different countries.

The followings are the sockets used in different countries.

1. Plug Type B

Type B adapter is mainly used in America, Canada and Taiwan etc.

2. Plug Type I Adapter

The UK type plug is mainly used in United Kingdom, India, Pakistan, Thailand, Malaysia, Singapore, New Zealand and Hong Kong etc.

3. Plug Type L Adapter

Type L Adapter is mainly used in South Africa and British Standard 15A.

4. Plug Type N Adapter

This adapter is mainly used in Italy.

5. Type G Adapter

Type G Adapter is mainly used in German, Finland, France, Norway, Sweden, Poland, South Korean, Austria, Spain, Hungary, Czech, Ukraine, Turkey, Brazil and Russia etc.