

ZXPD-200L Partial Discharge Detector Use Manual



I. Overview

1.1 About this manual

This manual provides how to use the **ZXPD-200L** partial discharge detector in a safe way. Before you use this product for the first time, please read the instruction manual carefully, which will help you to use this product skillfully. The instruction manual details the operation methods of the safety regulations and the flow of using various measurement modes.

1.2 Liability statement

The company guarantees that each product has no quality problems in the host and accessories when it leaves the factory, and that there is no defect in the function of the host. The warranty period of the ZXPD-200L partial discharge detector is one year, and the warranty period starts from the date of shipment. Provide free repair services for products within the warranty period, and guarantee that the repair period does not exceed 90 days. If the user damages the product due to misuse, disassembly, negligence, accident, or abnormal operation during use, the company will not provide any free maintenance service.

When maintenance service is required, please contact the service center of our company nearby. The service center will choose whether to provide door-to-door pickup service according to your area. When the door-to-door pickup is not available, the service center will negotiate with you whether to send the product

to the service center by mail. After the repair is completed, the service center will contact you to negotiate the appropriate way to return the product. If the company determines that the failure is due to misuse, disassembly, accident, abnormal operation, or the product has passed the warranty period, the company will estimate the repair cost and start repairs only after obtaining user authorization. For users who pay for repairs, they will receive invoices for repairs and return shipping costs at the same time they receive the repaired products.

This statement contains all the maintenance contents provided by our company, and our company does not provide maintenance services expressed or implied in other ways. At the same time, the company will not be responsible for any special, indirect, accidental damage and data loss, regardless of whether it will cause economic and civil losses to users. The right to use this manual is limited to users of this company. Without any written permission of the company, it is strictly prohibited to copy, transmit, distribute and store any content in this document in any form.

2. Product Introduction

2.1 Notes

The ZXPD-200L partial discharge detector is used for the detection and evaluation of the insulation status of high-voltage switchgear, ring network cabinets, transformers, GIS, overhead lines, cable terminals, cable branch

boxes and other equipment. There are the following precautions when using this device:

- ☀ Please use indoors with a temperature of $-20\text{ }^{\circ}\text{C} \sim 50\text{ }^{\circ}\text{C}$ and a relative humidity not exceeding 80%;
- ☀ Please stay away from flammable and explosive dangerous goods;
- ☀ Please charge the instrument when it is powered on for the first time, and only turn on when the charging indicator is on;
- ☀ To prevent interference or leakage, please turn off the power switch when charging;
- ☀ If the liquid and corrosive substances come into contact with the instrument, it should be immediately stopped and shut down, and handled by a professional;
- ☀ All connectors are imported connectors, and they should be plugged in and out. Do not rotate, shake the connector, or pull the cable forcefully. The plug connector is moderately strong and should be inserted into place when plugged
- ☀ All mainframes and accessories must not be disassembled. If it is really necessary, it needs to be disassembled by our after-sales service personnel.

2.2 Brief description

The ZXPD-200L partial discharge detector can be widely used in the theater detection of power systems, including the insulation status of high-voltage switchgears, ring network cabinets, voltage / current transformers, transformers (including dry-type transformers), GIS, overhead lines, and cables Detection, to

measure the discharge level of electrical equipment through the following indicators:

Partial discharge intensity detection: By measuring the discharge signal within a power frequency period, the intensity of partial discharge is characterized according to the maximum value (dB) in the discharge pulse sequence.

Partial discharge frequency detection: The device measures the discharge signal within a power frequency period, extracts discharge pulses and characterizes the frequency of partial discharges according to the number of discharge pulses.

2.3 Product features

- ☀ Configure different sensors to realize partial discharge detection of almost all electrical equipment;
- ☀ Provide time domain waveform, PRPD, PRPS and other discharge patterns to realize the analysis of different discharge types;
- ☀ Humanized man-machine interface facilitates data management of different devices, including traceback of historical data change trends, horizontal and vertical data analysis, and realizes 360 ° comprehensive diagnosis of the device under test;
- ☀ Built-in ultrasonic sensors and transient ground voltage (hereinafter referred to as TEV) sensors, which can be connected with special sensors such as transformers, GIS, overhead lines and cables;

☀️ Adopt non-intrusive detection method, no power failure during the test, maybe no high voltage source is applied, which is more convenient to use than traditional pulsed partial discharge detector;

☀️ The test bandwidth range is 30kHz ~ 2.0GHz, suitable for the detection principle of various frequency bands;

2.4 Product Application

ZXPD-200L partial discharge detector is widely used in the following fields:

☀️ Development and distribution enterprises

☀️ Railway system

☀️ Petrochemical power supply system

☀️ Aerospace testing field

☀️ Automatic testing field

2.5 Parameters

TEV measurement		UHF measurement	
Measuring range	0-60 dBmV	detection frequency	300-1500MHz
Resolution	1dB	measurement range	-75dBm-0dBm
Accuracy	±1dB	accuracy	< 1dBmV
Maximum pulse per cycle	1400	Sensor band	300-2000MHz
Measurement frequency band	1~100MHz		
AA measurement		AE measurement	
Measuring range	-6dBμV - 68dBμV	Measuring range	-6dBμV - 68dBμV
Resolution	1dB	Resolution	1dB
Accuracy	±1dB	Accuracy	±1dB
Sensor center frequency	40 kHz	Frequency range	40~200 kHz
HFCT measurement			
Sensor transmission impedance	5mV/mA		
Detection frequency		1~30MHz	
Sensitivity		≤50pC	
hardware			

Shell		ABS	
Display		4.0 inch RGB LCD screen	
Controller		ARM	
Connector	USB interface (also charger input)	wireless wifi	
	3.5mm stereo headphone jack	Wireless synchronization benchmark	
External ultrasonic sensor input			
Earphone		minimum 8 ohm	
SD card		standard 16G	
Built-in battery		3.7V/1Ah lithium battery	
Working time		about 8 hours	
Charger		AC 90-264V or DC 5V	
Operating temperature		-20 ~ 50℃	
Humidity		20-85% relative humidity	
Weight		0.4KG(host)	

2.6 Standard

DL / T 500-2009 Technical conditions for voltage tester

GB / T 4208-2008 Classification of enclosure protection level (IP code)

GB / T 2423.1-2001 Basic environmental test regulations for electrical and electronic products Test A: Low temperature test method

GB / T 2423.2-2001 Basic environmental test regulations for electrical and electronic products Test B: High temperature test method

GB / T 2423.4-1993 Basic environmental test regulations for electrical and electronic products Test: alternating damp heat test method

GB / T 2423.5-1995 Environmental testing for electrical and electronic products Part 2: Test methods Tests and guidelines: Impact test methods

GB / T 2423.10-1995 Environmental testing for electrical and electronic products Part 2: Test methods Tests and guidelines: Vibration (sine) test method

GB / T 17626.2-2006 Electromagnetic compatibility test and measurement technology Electrostatic discharge immunity test (IEC 61000-4-2: 1995)

GB / T 17626.5-2008 Electromagnetic compatibility Test and measurement technology Surge (shock) immunity test (IEC 61000-4-5: 1995)

GB / T 17626.3-2006 Electromagnetic Compatibility Test and Measurement Technology Radio Frequency Electromagnetic Field Radiation Immunity Test (IEC 61000-4-3: 1995)

GB / T 17626.4-2008 Electromagnetic Compatibility Test and Measurement Technology Fast Transient Electrical Pulse Group Immunity Test (IEC 61000-4-4: 1995)

GB / T 17626.7-1998 Electromagnetic compatibility Test and measurement technology Power supply system and connected equipment Harmonic and interharmonic wave measurement and measurement instrument guide

GB / T 19862-2005 Industrial automation instrument insulation resistance, insulation strength technical requirements and test methods

2.7 Product configuration list

The ZXPDP-200L partial discharge detector is composed of the detection host, sensor, PC, software CD and related accessories. Among them, the sensor, PC and software CD are optional parts. Shown as Table 1

	Name	Model	Quantity	Unit	Remarks
1	Detection host	ZXPDP-200L	1	set	standard
2	External contact ultrasonic sensor	GAE-40	1	pcs	optional for partial discharge detection of transformers, GIS, motors, etc
3	UHF sensor	GUHF-2	1	pcs	option for GIS partial discharge detection
4	High frequency transformer	GCT-3	1	pcs	1 option for cable partial discharge detection
5	test leads	-	1	set	standard

6	charger	-	1	pcs	standard
7	USB cable	-	1	pcs	charging and PC data communication
8	Use manual	-	1	copy	
9	Factory inspection report	-	1	copy	
10	Certificate	-	1	copy	
11	Warranty card	-	1	copy	

Table 1

This manual demonstrates that the device language is Chinese, and it can be completely set to English when overseas customers purchase

3. Operating Instructions

3.1 Structure



ZXPD-200L Host

The front end of the ZXPD-200L host has a built-in non-contact ultrasonic sensor and a built-in TEV sensor, which can realize the detection of partial discharge of

high and low voltage switch cabinets without external sensors. For the detection of partial discharge of equipment such as cable terminals and cable branch boxes, it is only necessary to connect the corresponding special sensor through the sensor expansion port at the bottom of the host. The host can automatically switch the measurement mode according to the different sensors. For sensors that can be connected to ZXPD-200L, please refer to the optional part in Table 1 of the product configuration list.

3.2 System power on and off and status display



ZXPD-200L realizes the switch on and off by touch switch, only need to touch on the power label, the status indicator will show the current working status of the host after power on, if the power adapter is connected, and the indicator C Lights up until the battery is fully charged.

The indicator S is used to show the status of data sampling or online status. In normal measurement mode, the S status indicator flashes red, and when the host is online (connected with PC) and the PC is successfully connected, the S status indicator flashes green .

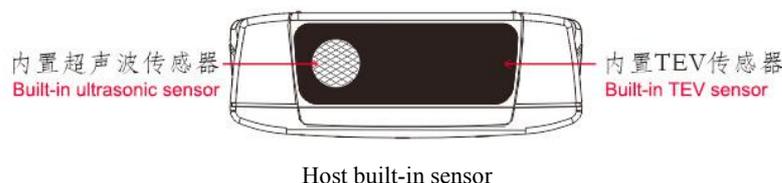


3.3 Test

3.3.1 Test with built-in sensor

There are two principles for the partial discharge detection of the switchgear: the

ultrasonic principle and the transient ground pressure (TEV) principle, and the ultrasonic sensor and TEV sensor built in the ZXPD-200L are used to measure the partial discharge of the high voltage switchgear. The position of the front end, the part needs to be close to (ultrasonic measurement) or close to (TEV measurement) high-voltage switchgear during the test. Note that close to and close to are different, depending on which principle is used to test the switchgear.



Ultrasonic measurement

If you choose the built-in ultrasonic sensor to measure the partial discharge of the switchgear, you do not need to do other operations or settings after turning on, because the ZXPD-200L selects the built-in ultrasonic sensor by default after booting, and the upper left of the screen will show which sensor is currently connected. As shown in the figure below, this state is the ultrasonic measurement mode



Sensor status information

In the ultrasonic measurement mode, the measured data is dBuV, because dBuV is a logarithmic function value based on 1uV. Therefore, the measured

data in the ultrasonic mode can be positive or negative. According to the processing capacity of the ultrasonic amplifier of ZXPD-200L, -6dBuV To the test range of 68dBuV, the larger the negative value, the smaller the ultrasonic signal and the closer to 0uV, not a negative number! The measured data in an interference-free environment is usually between -6dBuV and 0dBuV.

In addition to testing the amplitude of the discharge signal, ZXPD-200L can also detect the number of discharge pulses per cycle, expressed as P / Cycle, the size and amplitude of the pulse number comprehensively reflect the insulation status of the switchgear, and the general pulse number is a high amplitude below 50 The data is a typical discharge phenomenon.

In many cases, the environment of the cabinet under test will be filled with various complex ultrasonic interferences, such as flashing fluorescent lamps, ultrasonic mouse repellents, fans in operation, etc. Therefore, it is necessary to measure the environmental value before testing the cabinet to judge The interference level of the environment, when the ultrasonic environment value is too large (for example, more than about 10dBuV), all sources of interference need to be excluded, otherwise the excessive interference signal will mask the real signal and affect the reading. It is recommended that when the ultrasonic interference is large and cannot be effectively eliminated Use TEV method to measure cabinet value.

Ultrasonic signals use air as a propagation medium and will come out from the gap of the cabinet. Therefore, when measuring the value of the switch cabinet

with ultrasonic waves, the sensor needs to be close to the gap of the cabinet. Ultrasonic signals are audible through digital filtering).

According to the regulations of the State Grid Regulations, refer to Table 2 to determine the insulation status of the switchgear:

Ultrasound reading	Explanation
-6 ~ 0dBuV, No discharge sound	No partial discharge
0 ~ 6dBuV,a short discharge sound	There is a slight discharge of the equipment, you should pay attention to it later
Above 6dBuV, discharge sound	The equipment has obvious discharge, which should be combined with TEV test

Table 2

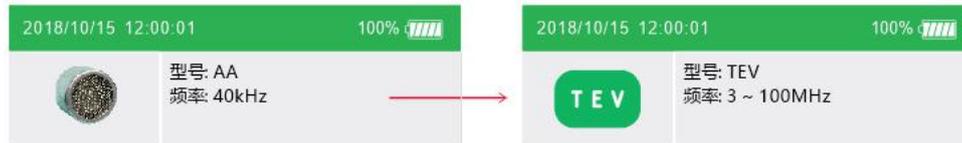
Note: the demarcation point (6dBuV) is slightly different in different regions. In some regions (such as foreign countries and southern networks), 6dBuV is used as the demarcation point. Above 6dBuV is judged as an obvious discharge phenomenon, while users of State Grid generally use 8dBuV as the demarcation point. Whether the final purpose of 6dBuV or 8dBuV is to predict the insulation status of the switchgear, it is recommended to use 6dBuV as the demarcation point, so that the operation status of the switchgear can be more early warning.

TEV measurement

If you need to use the built-in TEV sensor to measure the partial discharge of the switchgear, just click the icon in the sensor type display area to switch to the TEV sensor mode



Built-in sensor to switch active area



Switch from built-in sensor to built-in TEV sensor

Note : clicking this area is only valid for the built-in sensor switching. This function is invalid when external sensors are connected. The system will automatically switch and display the sensor icon according to the connected sensor type, without manual selection.

The TEV probe at the front of the host is a capacitive sensor, and the high-frequency partial discharge signal will propagate on the surface of the metal cabinet. The frequency is generally between 3 and 100MHz. Front) and close to the metal cabinet.

Like the ultrasonic measurement method, the environmental value needs to be measured before the cabinet value is measured. You can measure the environmental value at the metal plate, metal door frame, etc., and then close the TEV sensor on the front of the host to the cabinet body to measure the cabinet value. The difference between the body value and the environmental value is used to judge the operation status of the switchgear.

The TEV measurement mode also needs to refer to the pulse count value P / Cycle, and the pulse number and amplitude comprehensively measure the health of the switchgear.

When the environmental value is large, the source of interference needs to be found. The interference source of TEV is different from ultrasonic waves.

Ultrasonic interference is generally limited to a limited space, while TEV interference affects the entire space through radio frequency, such as welding machines, inverters, walkie-talkies, Compared with ultrasonic interference, wireless broadcasting stations, etc., such interference signals are sometimes difficult to avoid or clear, so it is recommended to use the ultrasonic method to measure when the environment (interference) value is detected to be large.

The TEV test data can be judged according to Table 3, there will be slight discrepancies in different regions, but the difference is not much.

TEV reading	Explanation
High background reading, ie greater than 20dB Note: The background reading refers to the reading when the sensor is not attached to the cabinet.	(a) High levels of noise may mask the discharge in the switchgear; (b) It may be due to external influences, and the external interference source should be eliminated as much as possible before retesting, or use a partial discharge monitor to identify any discharge in the switchgear.
All readings of switchgear and background reference are less than 20dB.	No partial discharge. Recheck once a year.
The reading is 20 ~ 29dB	The device is slightly partially discharged
The reading is 29 ~ 40dB	The equipment has medium-level local discharge, which should be reported to the team or special responsibility to shorten the inspection cycle
The reading is 40 ~ 50dB	There is serious partial discharge of the equipment. It should be reported to the team or special responsibility to shorten the inspection cycle. When there is a motor stop, the source of the partial discharge should be checked.
The reading is 50 ~ 60dB	There is serious partial discharge of the equipment, you should

	report to the team or special responsibility, shorten the inspection cycle, and cut off the power for maintenance as soon as possible
The switchgear reading is 10dB higher than the background level, and the reading is greater than 20dB absolute value, which is 20dB higher than the background	It is likely that there is internal discharge activity in the switchgear. It is recommended to use a partial discharge locator or partial discharge monitor for further inspection

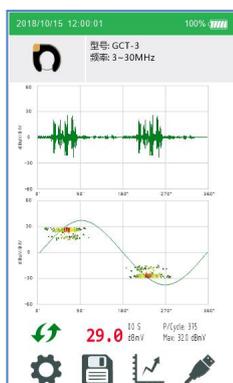
The above description is based on the operation specifications of the switchgear.

The insulation degree of the switchgear can be judged by readings. The operation status of the switchgear can also be analyzed through the map. According to the map, the insulation status of the device can be more comprehensively understood, such as the partial discharge The phase analysis, the number of discharge pulse groups, etc., the spectrum analysis method is suitable for all high-voltage equipment, including switchgear. The following describes the ZXPD-200L's spectrum function in detail.

3.3.3 Atlas mode

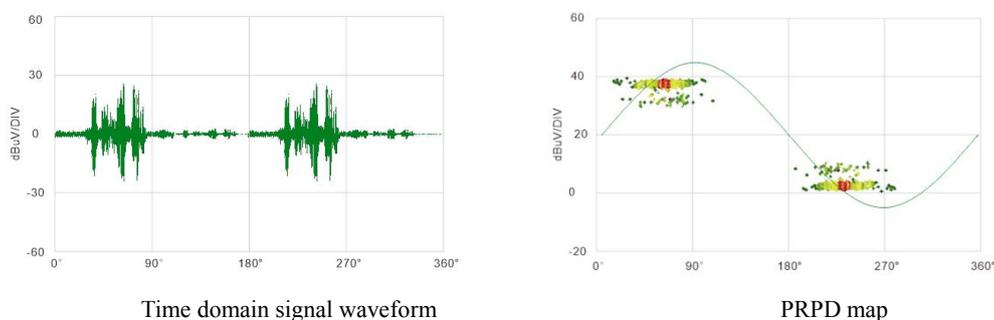
Time domain signal waveform and PRPD pattern

ZXPD-200L can provide time domain signal waveform, PRPD map and PRPS map. ZXPD-200L displays the time domain signal waveform and PRPD phase map by default after booting, as shown in the following figure:



The upper part of this interface is the time-domain signal waveform area, which

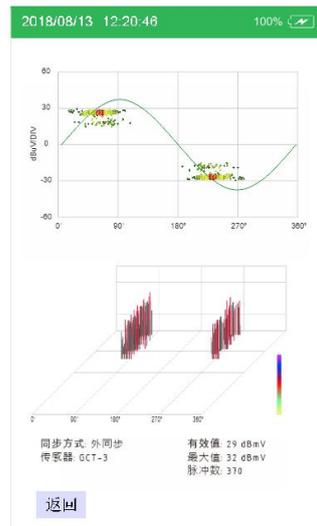
displays the collected signals in real time, and the lower part is the PRPD phase map. With time, the PRPD map will continuously redraw the relationship between the discharge signal and the phase. According to the relationship between the phase and the discharge amplitude, it is analyzed whether the discharge characteristics of the current device have the correlation between 50 Hz and 100 Hz, and the repeatability of the discharge signal in the phase interval.



PRPS map

The PRPS map is a three-dimensional map related to the discharge amplitude, phase and time. It can fully reflect the one-to-one correspondence between the three, and it can more vividly reflect the characteristics of the current device discharge. Combining the PRPD map can be more convenient. Analyze the current discharge type.

Under the default test interface, pressing the icon "" will restart the spectrum data statistics, after the completion of the set number of cycles (can be set in the setting interface) after data sampling, the PRPS spectrum is automatically formed and the PRPD and PRPS spectrum display is automatically popped up interface



PRPD and PRPS atlas

Taking GIS as an example first, a UHF UHF sensor needs to be configured in the field test. The frequency range is 300 ~ 2000MHz. The sensor should be placed in the position of the insulating basin. If you use a contact ultrasonic sensor to test, you can test the whole tank.



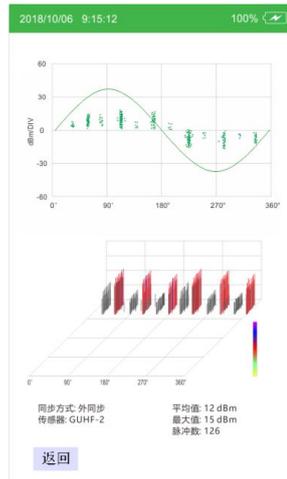
UHF sensor



GIS field partial discharge test

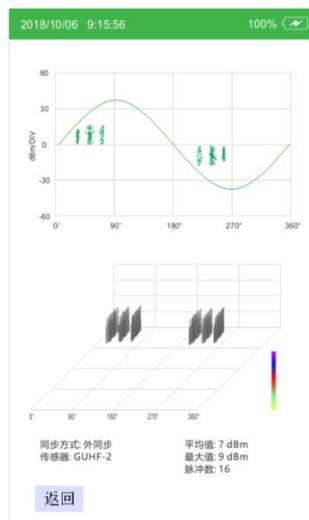
3.3.4 Typical discharge types and discharge patterns

Free metal particle discharge



Free metal particle discharge is a partial discharge between metal particles and metal particles and a partial discharge between metal particles and metal parts. This type of discharge amplitude distribution is relatively wide, the discharge time interval is unstable, its polarity effect is not obvious, and there is a discharge signal distribution throughout the phase of the power frequency cycle.

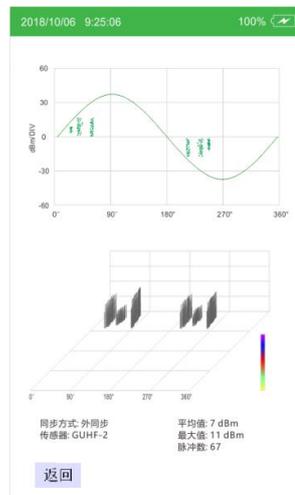
Suspended potential body discharge



The floating potential body discharge is a partial discharge generated by loose metal parts. The amplitude of such discharge pulses is stable, and the adjacent discharge time intervals are basically the same. When the suspended metal body is asymmetric, the positive and negative half-wave detection signals

have different polarities.

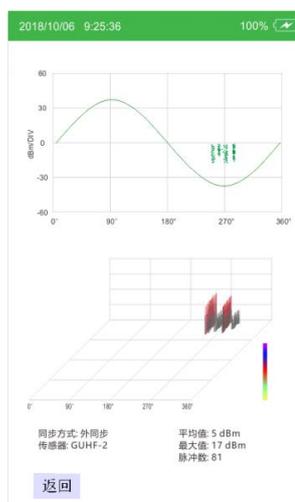
Air gap discharge inside insulation



The air gap discharge inside the insulation is mainly due to internal cracking and gas

Due to defects such as gaps, the number of such discharges is small, and the cycle repeatability is low. The discharge amplitude is also more dispersed, but the discharge phase is more stable and there is no obvious polarity effect.

Metal tip discharge



Metal tip discharge is a metal burr or tip at a high or low potential, SF6

corona discharge due to the concentration of the electric field. This type has many discharge times, small dispersion of discharge amplitude, and uniform time interval. The initial discharge is usually only at the power frequency

The negative half of the phase appears.

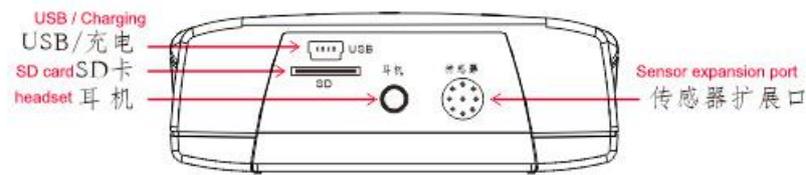
3.3.5 Testing with external sensors

The external sensors that can be connected are as follows:

<p>GAE-40 Transformer ultrasonic sensor</p>		<p>Used for partial discharge detection of transformers, GIS, motors, etc. Frequency: 40 ~ 110kHz</p>
<p>GCT-3 high frequency transformer</p>		<p>Used for cable partial discharge detection Frequency: 1 ~ 30MHz</p>
<p>GUHF-2 UHF sensor</p>		<p>Used for GIS partial discharge detection Frequency: 300-1500MHz</p>

There are many customized sensors that are not listed here. If you have any relevant requirements, please contact our company.

The above sensors are connected through the multi-function sensor expansion port at the bottom of the host. The host will select the sampling channel of the corresponding frequency according to the different sensor IDs. So far, the ZXPD-200L host has integrated four channels of different frequencies through separate sensors. Expansion port connection, truly achieve the purpose of multi-purpose machine.

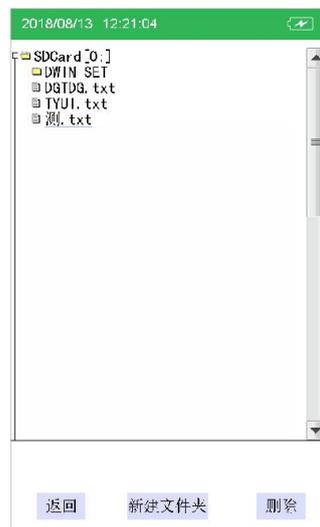


Sensor expansion port

3.4 Data management

During the testing process, if you want to store the current test results (including atlas), you can click the save icon "  " in the main test interface to store the current record, and the system will enter the file editing interface, you can enter Chinese and English files through the numeric keyboard Name, click confirm after input.

If you need to call historical data, you can click the "  " icon in the main test interface, and a file pop-up to call the resource manager will pop up:



File name input dialog



Historical Data Explorer

The historical data is saved in the root directory of the SD card. You can double-click the tree-shaped directory to expand the file name, click the file name in it, and transfer to the historical data and map display interface.

3.5 Settings

The settings of ZXPD-200L are very simple. Click the "⚙️" icon on the main test interface to enter the setting interface. The following describes the settings of each function.



Automatic shutdown: It can be automatically shut down according to the time in this setting to extend the battery life. It can be used normally for 8 hours when the battery is fully charged. Click "⊖" or "⊕" to reduce or extend the shutdown time.

Screen Brightness: This value can be adjusted to change the brightness of the display. Generally, this value can be increased in strong sunlight, and can be reduced in low-light environments. The lower the brightness, the longer the battery life.

Date, time :Touch time to enter editing, the selected edited item will be displayed between "▢" "⊕", indicating that it is currently adjustable.

WIFI: You can use WIFI to transfer data with a computer. Before data transmission, you need to set the WIFI address, and you can set up a connection before data transmission.

Synchronization: establishment of the spectrum requires the use of synchronization signals. You can use internal synchronization and external synchronization. The internal synchronization signal is provided by the internal signal generator, and the external synchronization signal is taken from the internal wireless synchronization receiver. The output of the wireless synchronization receiver is The signal of the power supply system is consistent.

Trigger threshold: The trigger threshold is used to adjust the trigger level of the internal high-speed ADC sampling. In order to make the pulse count value accurate, increasing the value of the trigger threshold can effectively avoid the invalid count of interference signals, but it is recommended not to use this value in a low-noise environment. If it is adjusted too high, select 50 ~ 100mV.

Number of cycles: The number of cycles indicates how many cycles of data are collected for analysis and display when the three-dimensional PRPS map is created. For a 50 Hz power system, one cycle is 20 ms, and the number of cycles is recommended to be set within 50. Too large will increase the data collection time.

After adjusting the above data, click OK to return to the main test interface.

3.6 USB connection

In addition to using WIFI to communicate with computers, ZXPD-200L can also realize data transmission through USB. It is also convenient to use USB communication on computers without WIFI transceivers. Click the USB connection icon "🔌" under the main test interface to establish a connection with the computer. Whether it is using WIFI or USB connection, we need the host computer software provided by our company to achieve data management.

3.7 Charging



Charging is as convenient as a mobile phone. You only need to plug the USB cable that comes with the product into the USB port of the computer to start charging. You can also use an ordinary DC5V power supply (500mA ~ 1000mA). When charging, the battery status at the top of the screen will be updated to the charging status "🔌". When the battery is fully charged, the charging indicator C lights up, indicating that the battery is fully charged and the battery status is updated to "🔋".

Although ZXPD-200L has an over-voltage protection function, it is recommended not to exceed DC 5.5V. Over-voltage charging for a long time may damage ZXPD-200L.