
Dear Client,

Thank you for purchasing our JFD-2000A Partial Discharge Detector System. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.



Our aim is to improve and perfect the company's products continually, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix.

Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.



The input/output terminals and the test column may bring voltage, when you plug/draw the test wire or power outlet, they will cause electric spark. PLEASE CAUTION RISK OF ELECTRICAL SHOCK!

Company Address:

- ◆ T4, No. 1, High-tech 2 Road, East Lake High-tech Development Zone, Wuhan
- ◆ Sales Hotline: 86-27- 87457960
- ◆ After Service Hotline: 86-27- 87459656
- ◆ Fax: 86-27- 87803129
- ◆ E-mail: whhuation@163.com
- ◆ Website: www.whhuation.com

◆ **SERIOUS COMMITMENT**

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ **SAFETY REQUIREMENTS**

Please read the following safety precautions carefully to avoid body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specification of this produce.

Connect and Disconnect Correctly

When the test wire is connected to the live terminal, please do not connect or disconnect the test wire.

Grounding

The product is grounded through the power wire; besides, the ground pole of the shell must be grounded. To prevent electric shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with the input/output port.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Circuit and Charged Metal

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Failures

If you encounter operating failure, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry.

– Security Terms

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

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1. Model: JFD-2000A

2. Brief introduction

Be suitable to measure and monitor the partial discharge of transformer of any voltage grade, generator, arrester, tube, GIS, capacitor, cable, switch, and other electrical-equipment which work in high-voltage.

3. Structure

- 3.1 Screen: 15' true-color TFT LCD screen, Industrial high brightness;
Resolution: 1024×768; 4 bits LCD displays voltage.
- 3.2 Hardware interface: USB, Power Interface, 2-channel input signal terminal;
to ground terminal; input outer trigger signal; RJ45; RS232;
- 3.3 Figure size: length × width × height (540×460×320) mm
- 3.4 Weight: 18kg.

4. Main specification

- 4.1 Measuring channel: 2 Independent channels
- 4.2 The capacitor range of test sample: 6pF~250μF
- 4.3 Test precision: 0.1pC
- 4.4 Sample precision: 12bit; Sample Rate: 20M/S
- 4.5 Display Mode
 - (1) Display Mode: Ellipse —— Sine —— Line
 - (2) Tigger mode: Inner trigger mode and outer trigger mode; Inner trigger mode is triggered by power, 50Hz; Outer trigger mode is to synchronize the power frequency, can be any value between 50 ~ 400 Hz.
 - (3) The voltage range of outer trigger signal: 10~200V, Input power <1VA
 - (4) Distinguish the signal phase: Ellipse displays signal with the method of polar, Sine displays as the sine wave, it's start is the zero position of phase of test power, it's length is a circle of the test power, the system exactly displays the circle, phase of the test power in the outer trigger mode.
- 4.6 Time Base: you can select the phase dynamically, amplify the time base dynamically
- 4.7 Filter frequency band
 - (1)) On low frequency 3dB, fL: 10, 20, 40kHz optional

-
- (2)) On high frequency 3dB, f_H : 80, 200, 300 kHz optional
(3)) f_L and f_H can be freely combined to form any filter band

4.8 Amplifier

(1) Gain adjust: gross adjustment and fine adjustment, 5 grade in gross adjustment, Gain difference between grades is 20 ± 1 dB, fine adjusting range >20 dB

(2) The Asymmetry of positive, negative polar response of amp: <1 dB

4.9 Partial discharge measurement

it can measure in the continuous and amplified mode, the deviation: $\pm 5\%$.
(measured in full scale)

4.10 Data store and display。 It can print and generate standard test report

4.11 Work temperature: $-10 \sim 45^\circ\text{C}$, Relative humidity: $\leq 95\%$

4.12 AC220V; Frequency 50Hz; 300W

5. Product Features

- 4 partial discharge measurement channels sample, process, display independently;
- Inner, Outer trigger mode for options. Have zero mark indicator and can distinguish phase;
- Display mode: Ellipse, Line, Sine;
- Single partial discharge pulse wave analysis, to analyze it's character;
- Support to store test wave and data, playback and analyze the stored test record;
- Gain: Adjust each channel independently, it doesn't interfere other channels, and doesn't change the measurement result of other channels;
- Support capture some special or random wave and to have specific analysis;
- Anti-noise, can get rid of the interfere noise which fixed in phase;
- Anti-noise with filter, can filter out the random noise which is not synchronized with power;
- Bandpass filter adopts analog and digital filter methods, the band can be freely combined to restrain any interferes;
- Freely select within 360° with single window mode, double window mode;
- Display test voltage while measuring the partial discharge;
- Support measure, time and wave analysis with the partial discharge record;
- Display partial discharge figure in 2D, 3D.

-
- Freely store, print partial discharge picture, data, and automatically generate test report;

6. A brief introduction of partial discharge Atlas

6.1.3 Different ways of connecting the measuring piece with the input unit(Fig.3).

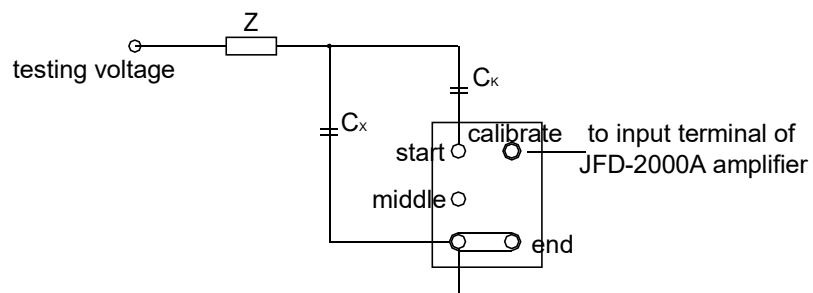


Fig 3a. Parallel connection

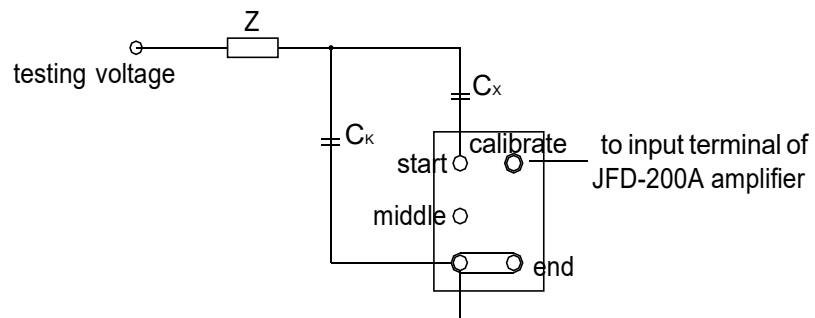


Fig.3b. serial connection

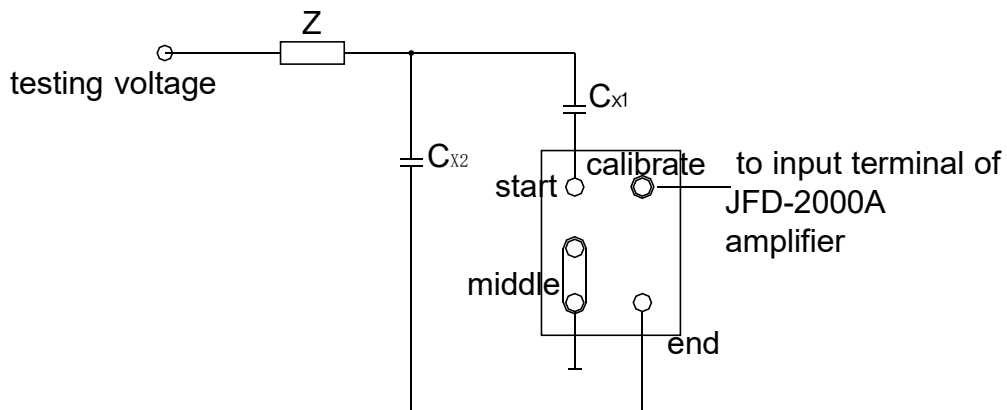


Fig.3c. Balance connection

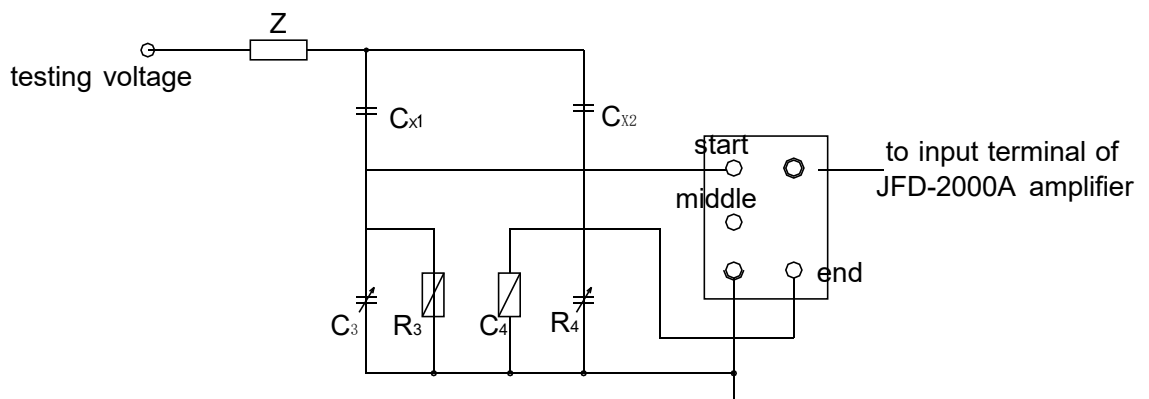


Fig.3d. Bridge connection

In these figures:

Cx--measuring pieces; Ck--coupling capacitor; Z--damping impedance;
R3, C3, R4, C4- the balance impedance in bridge connection.

6.1.4 Connect the resistance divider or capacitive divider to testing voltage, then connect the output with "to high voltage resistance" outlet (31) on back panel by the cable.

6.1.5 The partial discharge measuring circuit. (Fig.4)

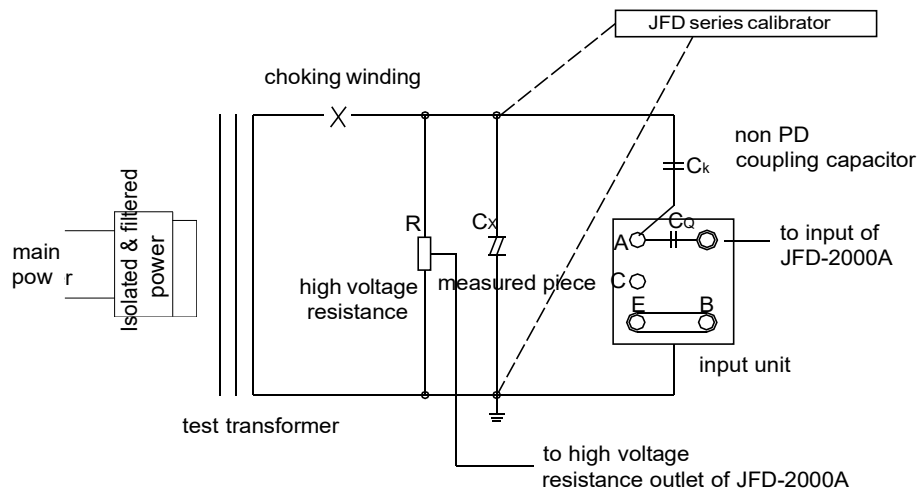


Fig.4, Standard connecting circuit of partial discharge measuring (parallel connection).

A—primary beginning of input unit;
C—central tap of input unit;

B—primary end of input unit;
E—ground of input unit

7. Operation

➤ Boot interface

1. Basic function

After the software is started, you will see the following interface.

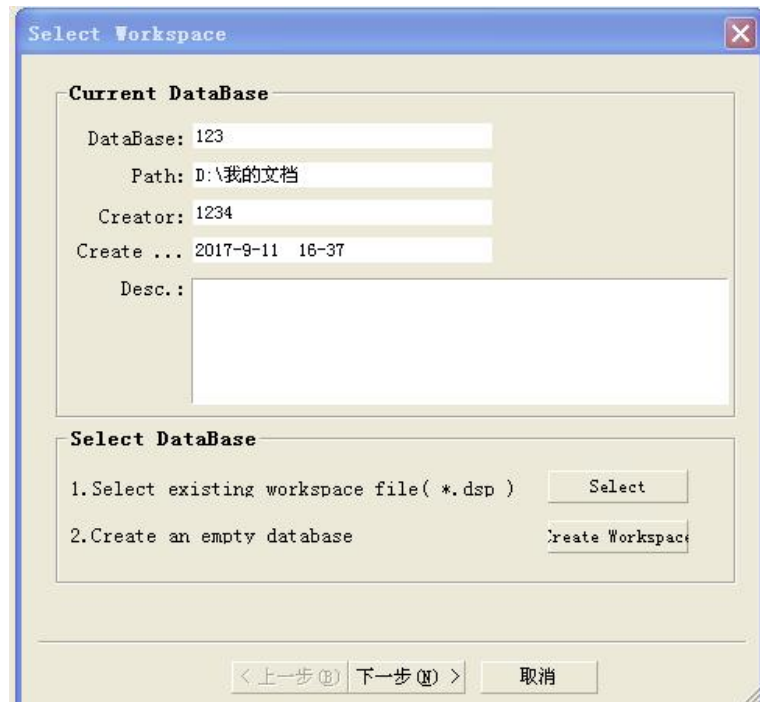


You can choose: creating tasks, data analysis, soft keyboard, and help.

1.1 Creating tasks

When using the digital database management system, users only need to open the directory, and select the appropriate database project files. This method provides convenience for video storage, analysis of more users and test records management of the product.

Click the Creating Task button to open the creating test task and create the dialog box for the current workspace, as the following picture:



The software will automatically open the database which you selected last time.

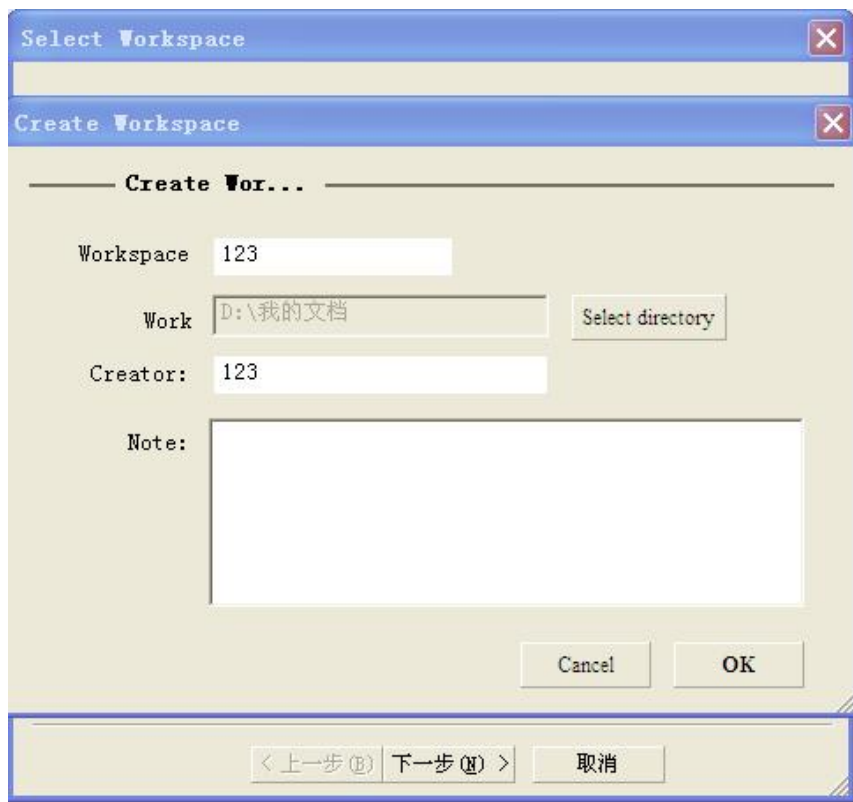
If you want to select a new database, you can click [Select existing workspace] button, and the following dialog box will be appeared:



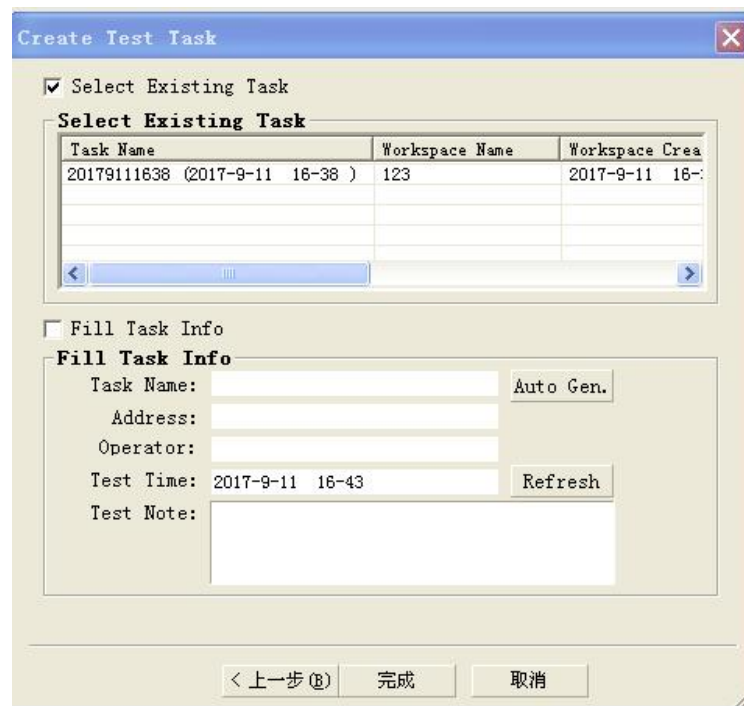
Attention: the name of the selected database must be the one with .Dsp suffix. A database includes the following parts: (1) engineering database files

with .Dsp suffix; (2) database files; (3) Data directory of the test task

Click the [create new workspace] button and the following dialog box appears:



Fill in the name of the corresponding project, and select the directory where the database works, and then click the completion button. After that, click the [next] button to enter the test task interface.



You can either select an existing test task or create a new task. Click the interface to select the existing task button, select a test task from the existing task list and double-click or click the completion button, the system will enter the measurement interface.

You can also choose to create a new task button, and then click the completion button, the system will create a new test task, and enter the measurement interface.

1.2 Data Analysis

1.3 Soft Keyboard

Click the keyboard button, you can open the software's auxiliary keyboard, as the following picture:



1.4 Help

Click the help button and you can open the help document.

➤ Analysis Part

1. Introduction of the Software function

Open the PD measurement interface as follows:

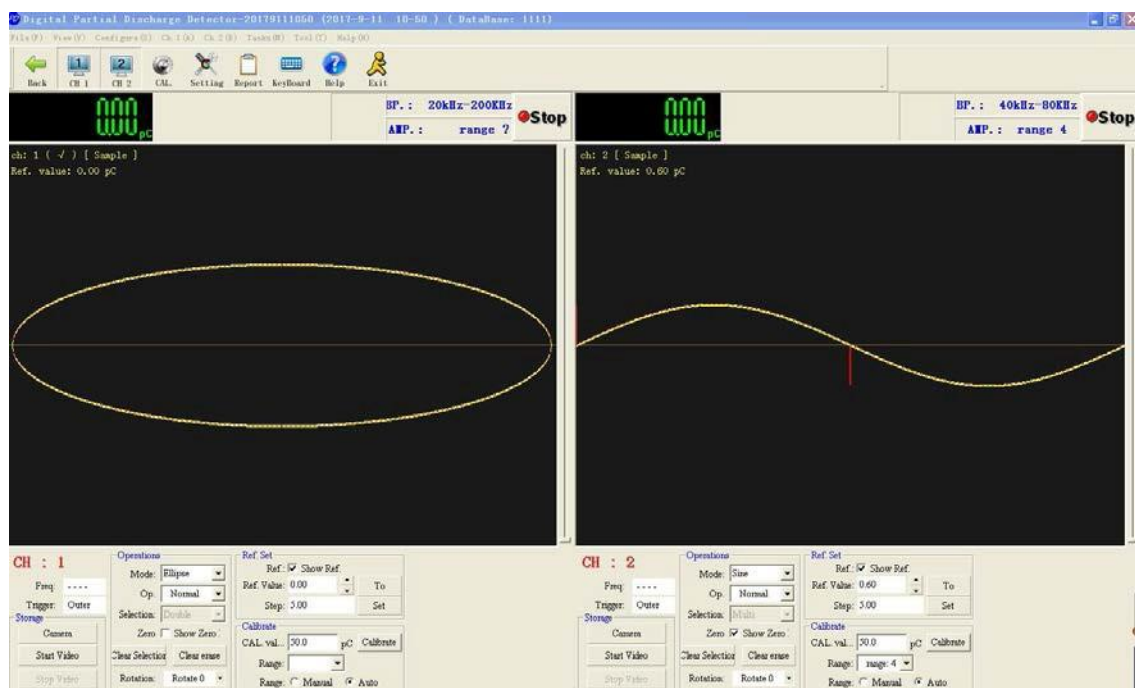


Figure 1 the PD Test interface

The interface includes three parts: (1) discharge status panel; (2) waveform display form; (3) channel control panel.

1.1 discharge status panel

The panel includes: discharge display window, test voltage display window, [run] control button, [coarse] label, [bandwidth] tab, [limit] status button. [Limit] button only will be activated for users to click after the discharge exceeds the set limit threshold.

1.2 waveform display form

The window will display real-time partial discharge waveform. If using the calibration function, [calibration value] to describe the character will also be displayed.

1.3 channel control panel

The panel display modules include: [display mode], [mode of operation], [window selection], [display properties], [clear window selection], [clear blanking], [rotation angle], [calibration settings], [storage management].

[Display mode]: There are three ways to show: elliptic model, sine model, linear model. The real-time current time base frequency will be displayed in the system parameter panel.

[Mode of operation]: There are four modes, namely conventional mode, window selection mode, amplification mode, blanking mode.

[Window selection]: This option is valid only in the windowed mode, and in other modes it is not clickable. You can select a single window, double window, or multiple windows.

[Display properties]: It indicates whether the zero mark on the display. The zero mark represents the display time of 0 degrees; 180 degrees under the zero mark represents the position of time.

[Clear window selection]: If the [Clear window selection] was selected in the current window, the operation will remove it. The window selection operation of the current channel is canceled.

[Clear blanking]: If the [Clear blanking] was selected in the current window, the operation will remove it. The previous blanking settings will be canceled

[Rotation angle]: For rotating the display part of the signal, the signal and the zero mark will rotate clockwise together, as shown in Figure 2.

[Calibration settings]: To set the calibration value, and move the calibration line.

[Storage management]: To grab the video and the current window of the discharge graphics. The graphics is stored in the form of JPG in the current task directory.

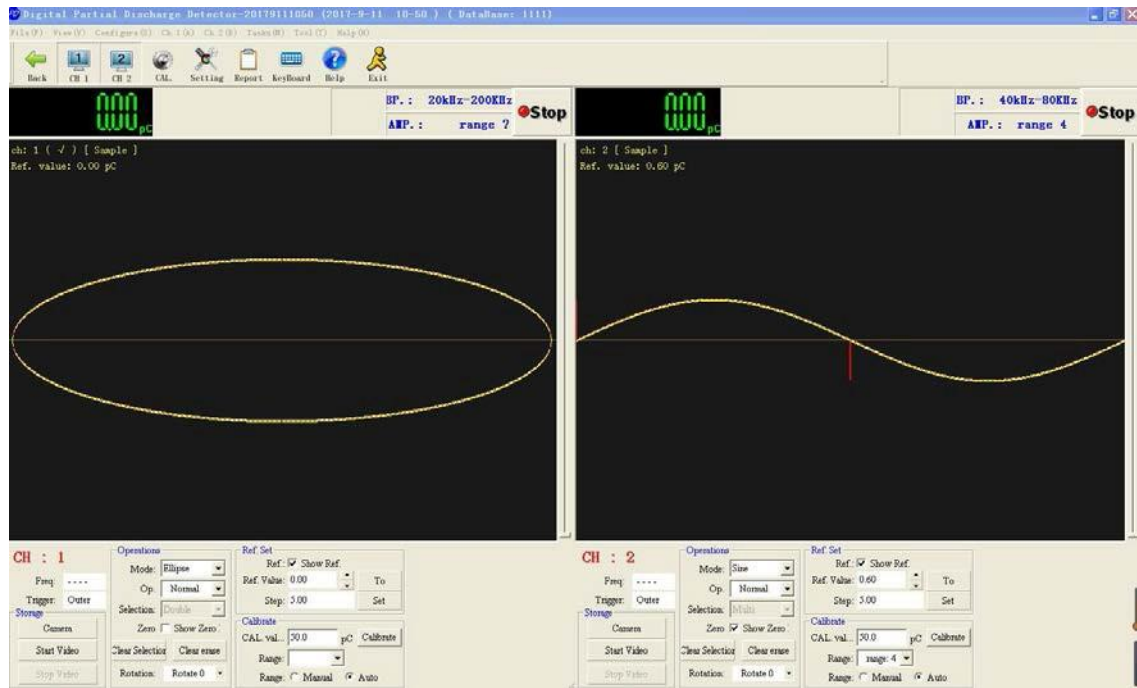


Figure 2

2. Adjustment

When carry on the PD Test measurement, connect the external test circuit and the hardware module correctly,



Figure 3 Adjustment panel

The system corrects the correction value automatically. The operation is as following:

2.1 The calibration pulse generator is connected at both ends of the PD test circuit.

2.2 Select the test channel which needs correction. The display window of the selected channel will display the symbol "V" (Note: the correction channel must be the current acquisition correction pulse generator channel).

2.3 Start the selected channel. In the upper panel of the channel display, click the stop button, and if the device is connected properly, the button will

become the run button. The icon on the left will become green, indicating that the channel is in the acquisition state; if the button displays the contents of [wait], indicating that the system is finding the digital substation hardware devices. If the device cannot be collected, you must find the problem, or the next step cannot be carried out.

2.4 Select the correction button from the toolbar and fill in the value in the correction value input box of the correction panel according to the input amount of the external correction pulse generator.

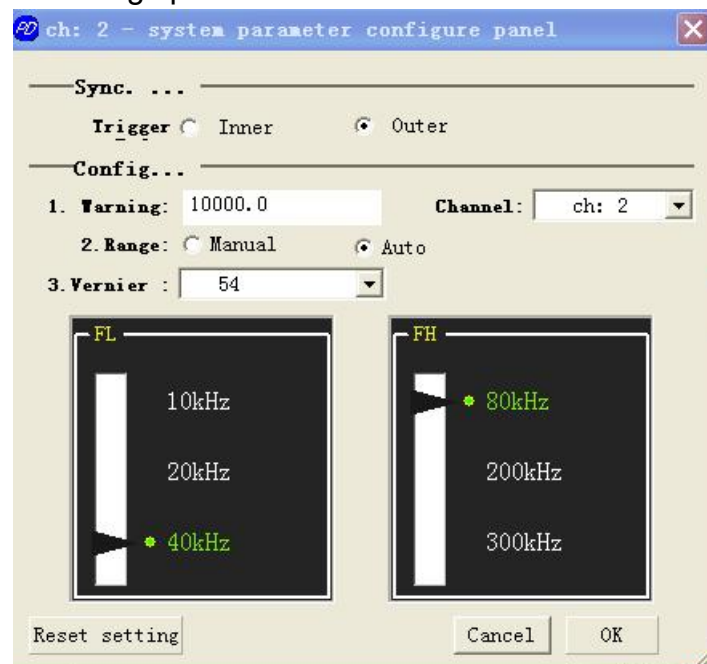
2.5 Press the [auto correction] button to correct automatically. After 3~4 seconds, the correction will be ended. If the communication fails, or the correction timeout occurs, you can click the [auto correction] button again to complete the calibration.

2.6 When calibration is done, be sure to disconnect the calibration pulse generator.

In the correction process, it should be noted that: It needs to take a series of measures to remove interference; at least the signal should be greater than the interference significantly, otherwise it will affect the results of system correction. Select the appropriate filter to filter out the obvious interference signal. Low frequency is 20kHz, high frequency is 200kHz by default. You can also use software windowing, blanking method to get stable, reliable calibration pulse generator signal.

3. Setting system parameter

In the PD test, you sometimes need to set the scope of the filter, the display effect and so on. Click the [parameter settings] button on the toolbar to open the system parameter settings panel as shown below:



3.1 System trigger mode

The system provides two trigger options: internal trigger and external trigger. Selecting here will be valid for each channel of the system. Internal trigger: the trigger frequency is the power frequency of the instrument, usually 50Hz. External trigger: The user access to a frequency of power, to control the system display cycle frequency.

3.2 Threshold of limitation

The amount of discharge displayed by the system is the peak of all discharge values in the whole trigger period. Set a limit of pC. When the discharge peak is bigger than the limit threshold, the limited lights will be flickered on the window of the corresponding channel. When the discharge peak is lower than the limit threshold after 3~5 seconds, the limited lights will stop flickering.

3.3 Range switching

In the PD test, due to the change in the discharge, the current magnification cannot meet the requirements of the measurement, or the signal becomes smaller. It needs to amplify to observe the signal in detail. **Note:** The peak value of the discharge is not directly related to its height. It is different in different ranges; so the amplitude change caused by the range conversion is normal.

Selecting the [auto switch] button, it will make the current choice of the channel into the automatic switch. If the current value is higher than the maximum value of the switching range, the system will automatically be down one step; if the minimum value is lower than the current switch range, then the system will automatically be up one step. If the "manual switch" button is selected, the system will measure all the values in the current range regardless of the amount of pC input.

3.4 Fine location

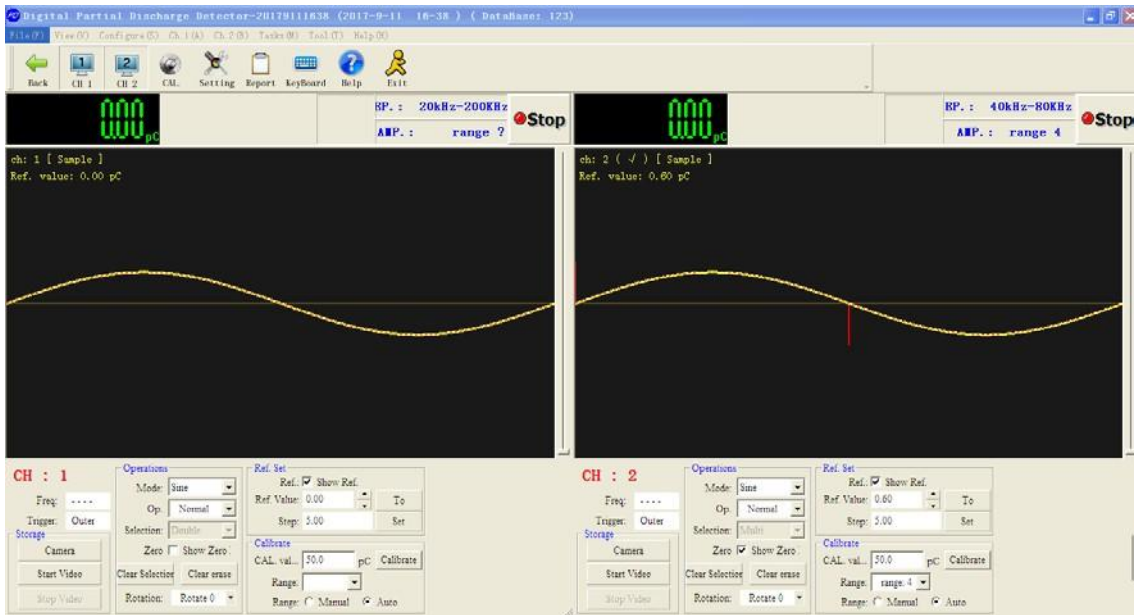
Fine tuning refers to the current position within the system to enlarge the number. When the automatic correction is completed, the fine location will be updated. The system will automatically adjust the tuning up to the appropriate location, so we do not recommend the user to set the first position here. If the user fails to set the fine position, the fine interface will automatically switch to the last fine position.

3.5 Filter

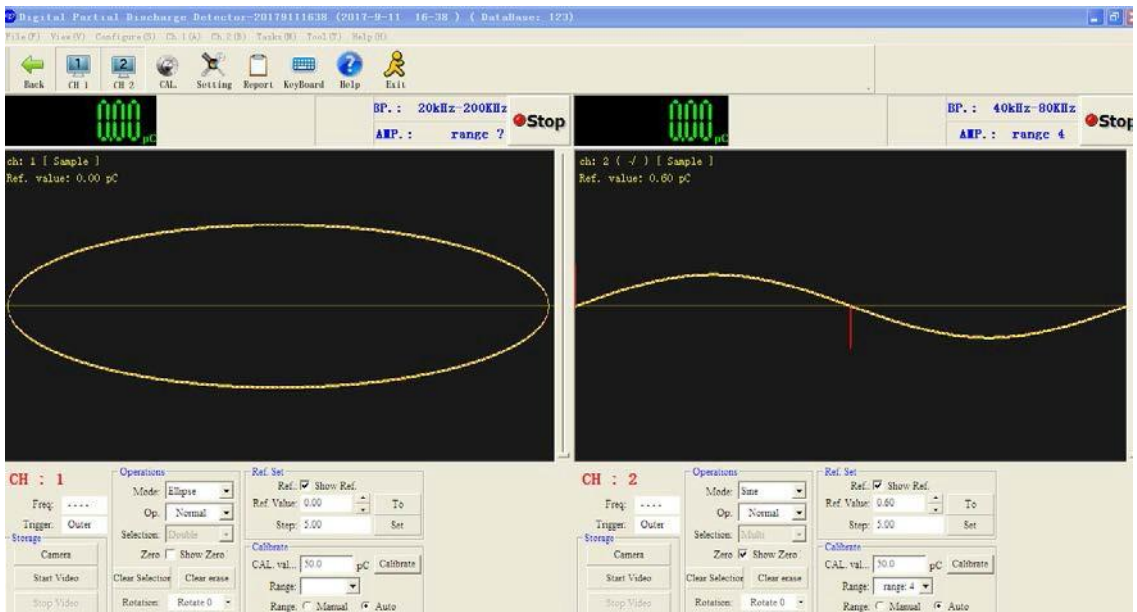
Filtering is mainly used for anti-jamming. Before correcting, we can select the filtering bandwidth to filter the current noise to get a relatively clean discharge signal.

4. System display mode

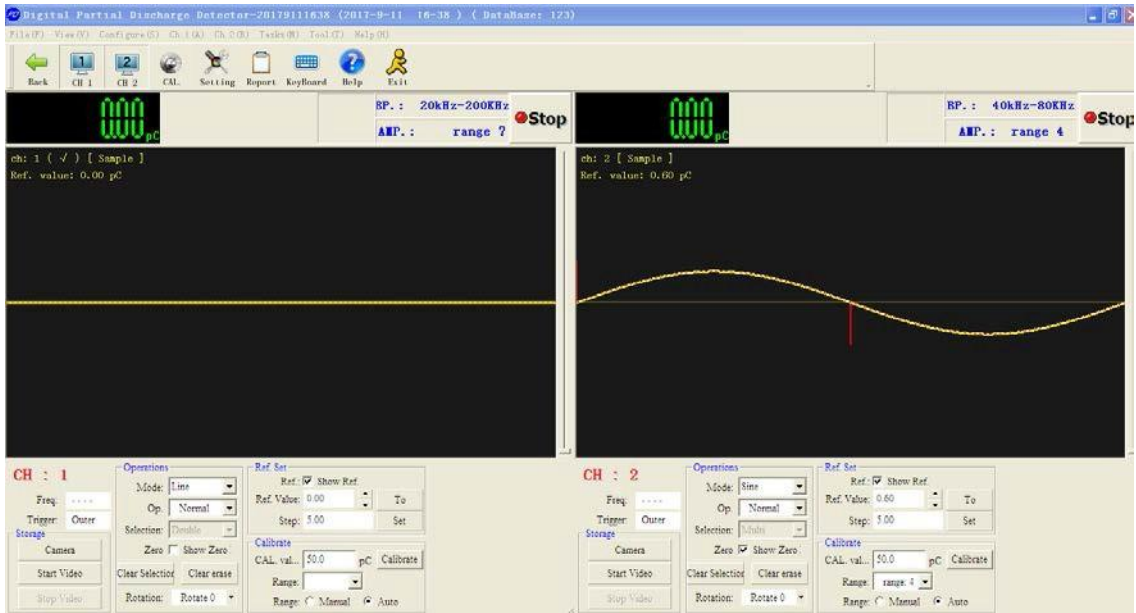
Three modes: sine mode, ellipse mode, line mode.



Sine mode



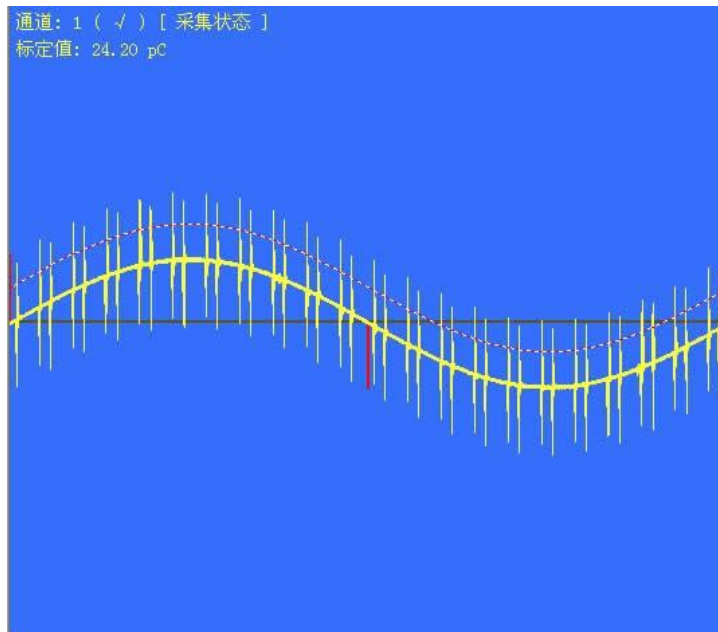
Ellipse mode



Line mode

5. Calibration function

The digital discharge window on the panel shows a discharge waveform. It shows the discharge peak in the period of the current discharge trigger above the panel. If you want to see the detailed discharge value, you can use the calibration function to achieve.



The calibration function is located in the right control panel.



Specific operations are as follows:

5.1 Before using the calibration function, select the current channel first. The current channel which is selected in the display window will be with a "√" symbol.

5.2 Select [show] button, calibration value: 27.5pC will be showed at the top of the window to specify the current calibration value. The calibration value is the same as the value shown in the calibration option of the right panel. If the calibration value is too large or too small, it will not be visible beyond the display range of the measurement window, but it is displayed.

5.3 Set the calibration value: users can enter the value directly from the right panel. Then click [calibration] button, the channel display window calibration line will be displayed in the current position of the calibration value.

5.4 Modify the calibration value: Fine calibration value can adjust the display window position calibration, and the calibration value will be changed. The change step of the calibration value is set according to the [step size] button.

5.4.1 Using the mouse wheel to move the display window calibration position.

5.4.2 Using the arrow button on the right side of the [calibration value] button in the right panel to change the calibration value.

5.4.3 Using the upper and lower keys on the keyboard to change the calibration position.

Note: When the calibration value shows negative value, it indicates the negative direction of the discharge value.

6. Test report

If you need to print the test report in the PD Test, you can click the toolbar to open the edit window of the test report, as the following picture:

The report will be kept as a Word document.

6.1 Screenshot refreshing function

Users can click [refreshing picture] button to refresh the screenshot of any channel.

6.2 Storage

Users can put some parameters in the form of a file on the hard disk. When fill in the test report, users can choose the previous parameters through the [import parameters] button.

Click the [generate WORD report] button to create the WORD report:

Partial Discharge Test Report

Test No.:

test department:

Test man:		Test Date:	2017-9-11
department:			
review:		manager:	

test object:

product name:	product type:
product no.:	

test enviroment conditions:

test place:		temp. :	℃
humidity:	%RH		

test enviroment conditions:

pd measure device:	CAL. pulse generator:
--------------------	-----------------------

ch 1 test record:

试验电压:	0.00 kV	pd value(pC):	0.00
CAL. pC:	50.00	range:	range -26851
lowpass FL:	20kHz	highpass FH:	200kHz
synchro-type:	Outer	synchro-freq:	----

ch 2 test record:

试验电压:	0.00 kV	pd value(pC):	0.00
CAL. pC:	50.00	range:	range 4
lowpass FL:	40kHz	highpass FH:	80kHz
synchro-type:	Outer	synchro-freq:	----

➤ Analysis of database

1. Test database inquiry

Click the query button on the toolbar to open the database query interface.

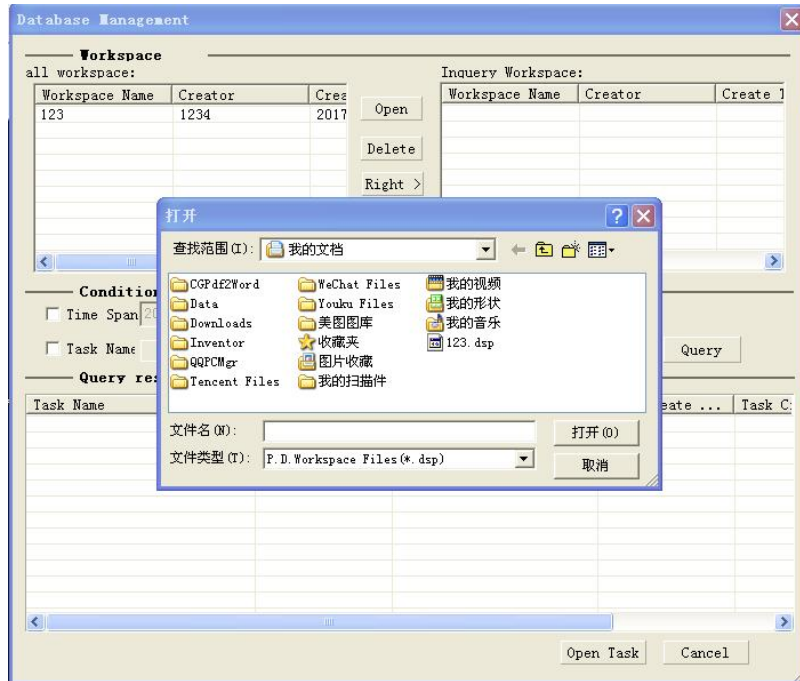


Figure 6 the database query interface

Steps:

1.1 Add database to the database query module.

Select [add] button, it will open dialog box of the DSP database. Then select the correct database files to the left of the database file list, as shown in Figure 6.

1.2 Add the database file which needs to be queried from the database that has already been added.

The conditions of the query database file can be selected: (1) the time of creation; (2) the name of the task; (3) the task executor

1.3 Fill in the database query conditions, and then click the [query], the current selected database files will be queried one by one, the resulting database records will be displayed in the list below.

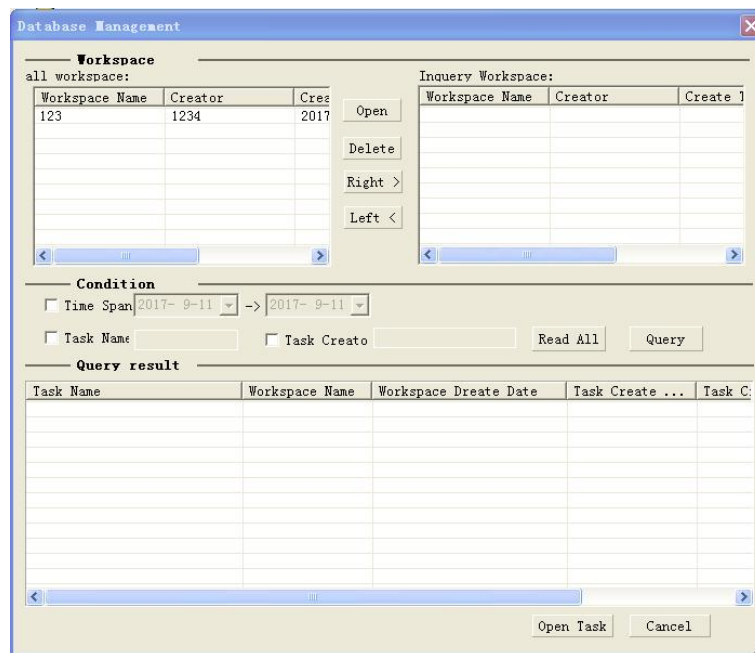


Figure 7 Query results

1.4 Select a test task record from the query's list; then double-click to open the dialog box for the test task to record details.

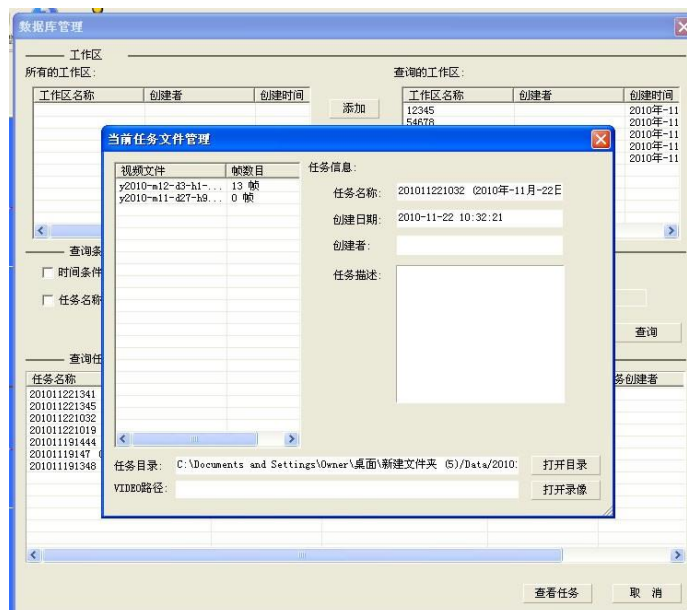


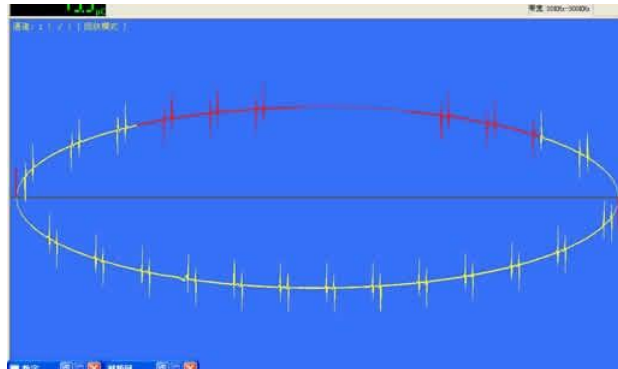
Figure 8 Page of record

The list on the left is a list of stored video files, double click, and the following information will be displayed in the current path of the selected video files. Click on the right of the [Open Video] button, it will be placed in the video playback screen.

2. Analysis of two dimensional, three dimensional

Digital PD test system provides the functions of test record database management and analysis

Open the video analysis, as the following picture, and take the detailed method of operation test.



Blanking part cannot be included in the discharge value; the window can be included in the selected part of the discharge value. Open the video analysis panel and you can see there is a corresponding change in each video analysis due to a series of operations in the video playback.

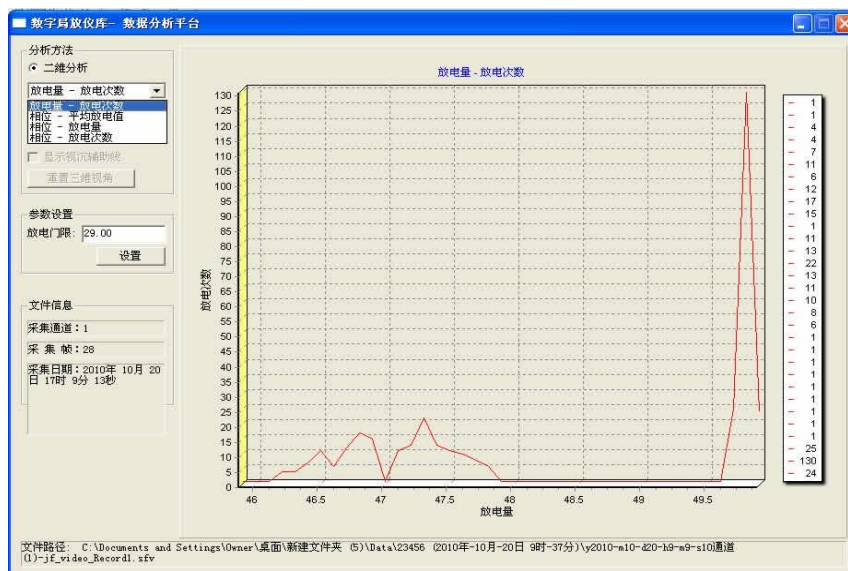


Figure 9 Discharge capacity- Discharge times

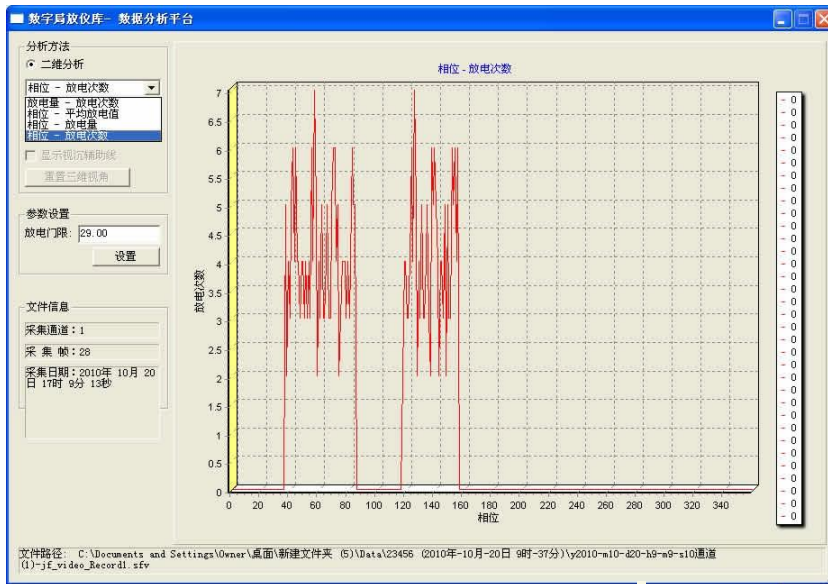


Figure 10 Average discharge capacity- phases

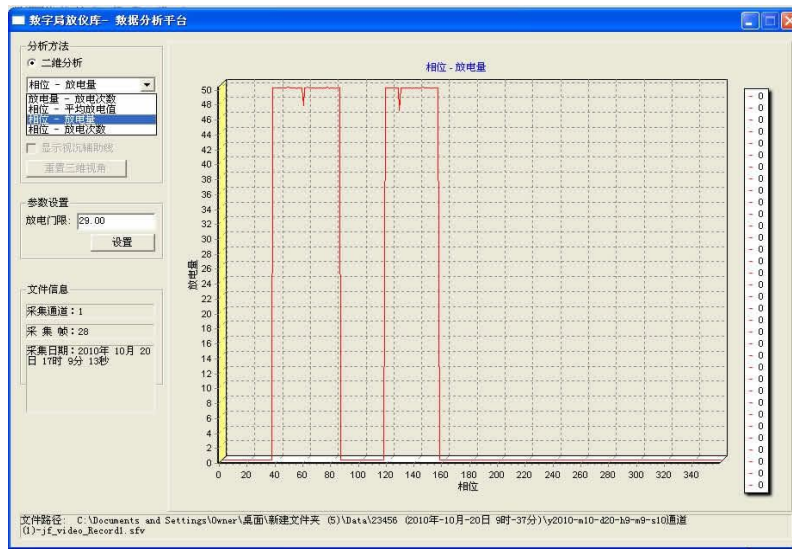


Figure 11 Phase discharge

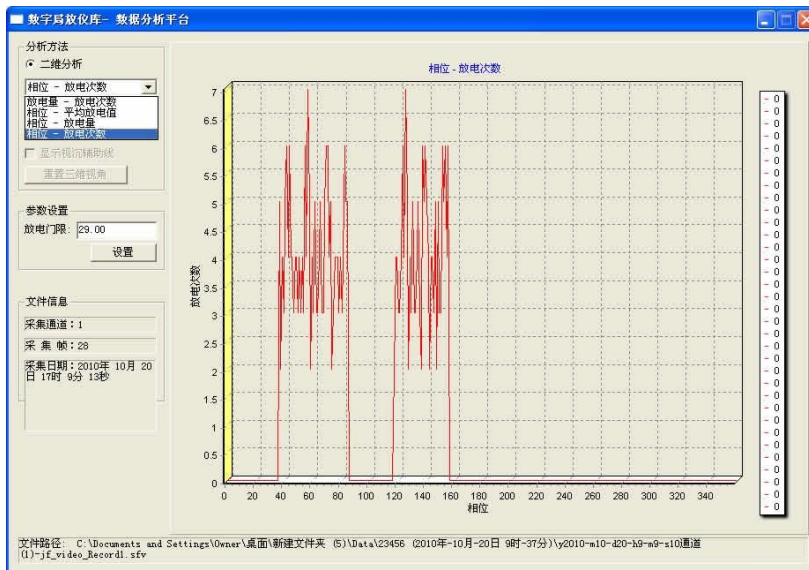


Figure 12 Phase- Discharge times

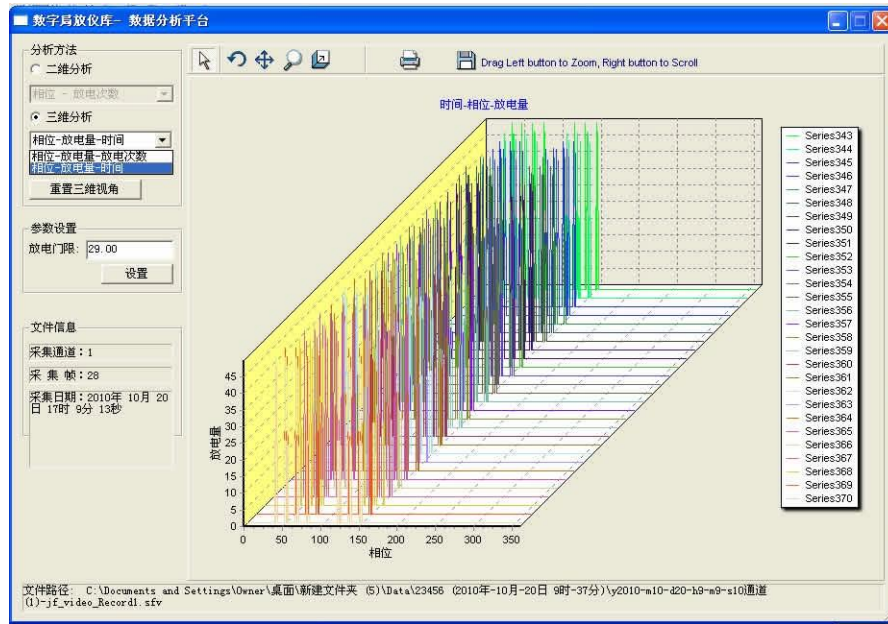


Figure 13 Time-Phase-Discharge capacities

3. Video playback

Click the [video playback] button; the video playback interface will be shown as following:



Functions that can be used: [next frame], [last frame], [fast forward], [rewind], [stop], [pause].

3.1 Fast forward、rewind

Move forward or backward into 10 frames from the currently displayed frame.

3.2 Single step

[Next frame], [last frame]: convert the video playback from the playback state to the suspended state.

3.3 A B Partial Play

A B Partial Play: Select a video of the two frames, and then control the continuous playback between the two frames. Click [>] button and it will trigger the current play into AB playback mode.

3.4 Video analysis

If you want to analyze the video of the two dimensions or the three dimensions, you can click [two-dimensional, three-dimensional analysis] button

to open the analysis panel.

EXTERNAL CALIBRATOR TYPE JFD-2000A

1. Brief introduction

JFD-2000A is a partial discharge calibrator. Supplied by battery, small size, and light weight, easy to carry and synchronize.

This calibrator can output calibrating pulse of 1.2 kHz to the produce with different output range. It is suitable for every experiment circuit recommended by IEC-270.

2. Technical specification

- 2.1 Calibration pulse range: 5pC, 10pC, 20pC, 50pC
- 2.2 Polarity: plus and minus alternate
- 2.3 Frequency Adjust: 1.2 kHz
- 2.4 Frequency change range: $>\pm 100\text{Hz}$
- 2.5 Pulse rising edge: $<60\text{nS}$
- 2.6 Pulse falling edge: $>100\mu\text{S}$
- 2.7 Input capacitance: 10pF
- 2.8 Calibrating charge deviation: $E_q = (E_u^2 + E_c^2)^{1/2} \leq \pm 10\%$
- 2.9 Dimension: $160 \times 125 \times 50\text{mm}^3$
- 2.10 Weight: 0.5kg
- 2.11 Battery: 6F 22
- 2.12 Battery voltage: 9V

3. Operation

After unloading, check model, size on the nameplate.

3.1 Open the back panel, and then install the battery.

3.2 Connect the testing wires to the red and black terminals. The red wire should be short and connect with the high voltage side of the product, connect the black wire to the low voltage side.

3.3 According to the different products, set the "Pulse Ranges" switch to different position of 5pC, 10pC, 20pC, 50pC.

3.4 Set "Frequency Adjust", the frequency of calibrating pulse can be adjusted near 1.2 kHz (adjust the calibrating pulse synchronously).

3.5 The voltmeter on front panel indicates the voltage of the battery. If the reading of the voltmeter is under 7V, please change a new battery to keep normal work of the calibrator.

3.6 To avoid the calibrator being damaged by high voltage. After the calibration, the calibrator should be disconnected with the product.

INPUT UNIT

1.Introduction

Input unit is an important component that extracts partial discharge signal from the test circuit. It is also named input impedance. The input unit series including No.1 to No.12 and 7R, which is compliant with the IEC270 suggested test circuits (balance circuit, series circuit, parallel circuit).This input unit adopts high frequency transformer 2 resonance input circuit. Its primary circuit is LCR circuit; its primary side inductance is within the partial discharge detector amplifier band width and is resonance of the equivalent capacitance of the test circuit.

2.Primary Technical Specification

No.	Tuning capacitance range	Sensitivity (pC) (Un-balance circuit)	RMS Of max. current	
			(Un-balance Circuit)	(Balance circuit)
1	0 ~ 25 ~ 100pF	0.02	30mA	0.25A
2	25 ~ 100 ~ 400pF	0.04	50mA	0.5A
3	100 ~ 400 ~ 1500pF	0.06	120mA	1A
4	400 ~ 1500 ~ 6000pF	0.1	0.25A	2A
5	1500 ~ 6000 ~ 25000pF	0.2	0.5A	4A
6	0.006 ~ 0.025 ~ 0.1μF	0.3	1A	8A
7	0.025 ~ 0.1 ~ 0.4μF	0.5	2A	15A
8	0.1 ~ 0.4 ~ 1.5μF	1	4A	30A
9	0.4 ~ 1.5 ~ 6.0μF	1.5	8A	60A
10	1.5 ~ 6.0 ~ 25μF	2.5	15A	120A
11	6.0 ~ 25 ~ 60μF	5	25A	200A
12	25 ~ 60 ~ 250μF	10	50A	300A
7R	Resistor	0.5	2A	15A

3.Input Impedence Selection

Selecting a proper input unit can acquire better sensitivity. The principle choosing the input unit is that its resonance frequency F_0 with LCR is within the amplifier bank width. The operating method is: the equivalent capacitance of the test circuit which is connects in series with the primary side of the input unit. It must be at about central point of the resonance range described on the nameplate of the input unit. This input unit the best input unit for this test circuit. The middle capacitance value is the square root value of the multiply value of capacitance at 2 terminal. Selecting this input unit will get best sensitivity.

