Huazheng®

# Cable Fault Location Unit

# USER MANUAL

**Huazheng Electric Manufacturing (Baoding) Co., Ltd**

# Attention

**Product characteristics of the introduction may involve equipment with high functionality, the actual characteristics of the purchase configuration shall prevail!**

**Welcome you to choose the company's instruments and equipment, it is recommended that a person to keep, a person to use, half a year not used please charge maintenance once, such as equipment work abnormally shall not open the main chassis at will.**

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# Section I Power Cable Fault Pre-Locator Function Introduction

## I. Product Introduction

The HZ-A30 fully intelligent multi-pulse cable fault tester is a high-performance device that integrates a complete set of cable fault testing functions, closely following the development direction of the international power industry and catering to the rapid development of the domestic power industry. It has been independently developed based on the characteristics of the cable fault testing industry, and is highly stable. It systematically integrates wireless communication technology, photoelectric knob mouse technology, and expandable Bluetooth technology, greatly improving the functionality and value of the instrument, as well as convenient on-site operation and on-site service.

The entire system meets the general technical conditions for specialized testing instruments for power equipment in the People's Republic of China's electric power industry standard DL/T849.1-2019~DL/T849.3-2019. The system consists of a flash tester, a multi-pulse generator, a pinpoint locator, and a cable path locator (optional). It is used to test various faults in power cables and to locate cable paths and cable burial depths. The functions cover the precise testing of faults in power cables, railway, airport signal control cables and street light cables.

## II. Product Features

◆ It uses a 12.1-inch large screen, a knob mouse, a high-brightness LCD display, and adapt to outdoor-ready for use in the field. It is powered by lithium batteries and is convenient for on-site testing. The engineering plastic case is shockproof and moisture-proof, and has strong stability.

◆The flash tester has a WIFI module and SIM interface that can realize wireless remote transmission of measurement data and technical support for mobile terminals. It adopts integrated communication technology, stable signal acquisition, and the main unit can automatically select eight sampling frequencies ranging from 3.125MHz to 400MHz, with adaptive pulse width, which can meet the testing requirements of cables of different

lengths.

◆ The software can automatically identify and search for the inflection points of three test waveforms: low-voltage pulse method, impulse current method, and multiple pulse method. The inflection points of the waveform fault are automatically locked, and the fault distance is automatically read and displayed.

◆The waveform is displayed in three areas on the same screen, and ten measured waveforms are randomly displayed on the same screen for selection. At the same time, it can realize automatic and manual processing of waveform card verification in two modes, and has the function of storing, playing back and analyzing test waveform data.

◆ The unique multi-pulse generator design can generate ten low-voltage short-circuit pulse waveforms in one discharge, automatically optimizing the standard waveform and greatly reducing the interference of large oscillations.

◆The pinpointing instrument uses dual-selection technology with noise filtering, which can directly and digitally display the change in the distance between the test point and the fault point, and simultaneously detect the direction of the cable path.

◆The precise positioning instrument can support mobile phone apps, connecting the mobile phone and headset via Bluetooth to enable two people to quickly locate points simultaneously with one probe.

◆The professional cable quick test app supports remote assistance for users to analyze waveforms, case sharing, teaching and training, and simulated exams anytime, anywhere.

# III. Technical Parameters

It can test all kinds of main insulation faults of power cables with different voltage levels, different cross-sections, different media and various materials, including: open circuit, short circuit, low resistance, high resistance leakage, high resistance flashover fault.

Display mode: 12.1-inch industrial-grade LCD screen (Linux operating system).

Storage space: 32G electronic disk.

Languages: Chinese, English, Russian, switchable

Test methods: low-voltage pulse method, high-voltage flash method, and multiple pulse

method.

Operation: touch screen and rotary knob (touch screen function is optional)

Pulse width/pulse amplitude (100ns~10μs, 120V)

Gain adjustment (-20…+40dB)

Output impedance matching (120 ohms)

The flash tester has a WIFI module and a SIM interface for remote transmission of test data

Test distance: 5m-100km.

Minimum test distance (blind zone): 5 meters.

Accurate positioning error: ±0.2m.

Test error: system error less than ±1%.

Multiple pulse generator: impulse voltage ≤ 40kV.

Resolution: v/(2f)m. (v: propagation speed m/μs; f: sampling frequency MHz)

Sampling frequency: 400MHz, 200MHz, 100MHz, 50MHz, 25MHz, 12.5MHz, 6.25MHz, 3.125MHz.

Power supply and power consumption: AC220V±10%, no more than 15W; DC12V (7AH) no more than 20W.

Standby time: can be used continuously for about 6 hours.

Weight of main unit: 5kg.

Dimensions: 390mm×280mm×160mm.

Temperature: -20℃～＋40℃; Relative humidity: ≤80%.

# IV. System Composition And Operating Principle Of The Instrument

Cable fault test system ten pulse method of the composition of the block diagram shown in the following figure

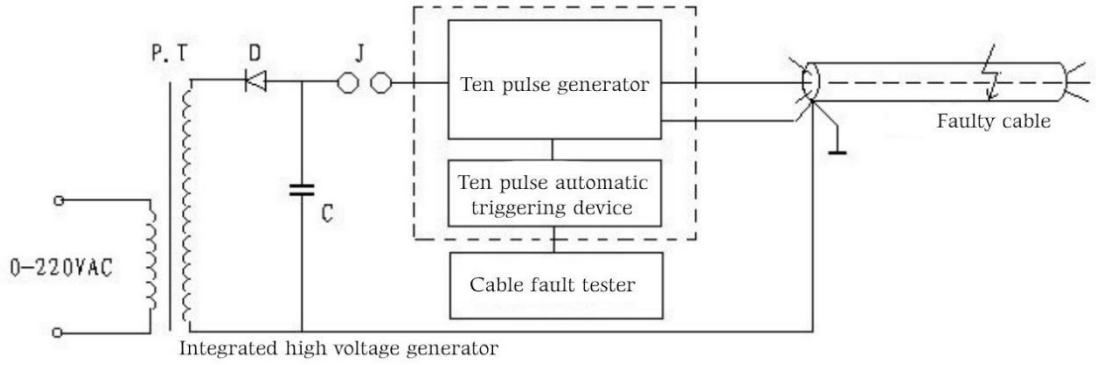



**Figure 1 Cable fault test system composition block diagram**

As a cable fault test system using the ten times pulse method, this set of instruments include "integrated high-voltage generator" that can produce a single impact high voltage, "ten times pulse generator", "ten times pulse automatic trigger device This instrument includes the cable fault tester which can produce single impact high voltage, "integrated high voltage generator", "ten times pulse generator", "ten times pulse automatic triggering device", and test waveform analysis software.

# V. Tester Panel

(A) HZ-A30 Power Cable Fault Pre-locator panel schematic diagram shown below, please note that according to the test requirements to select the corresponding output port and switch.

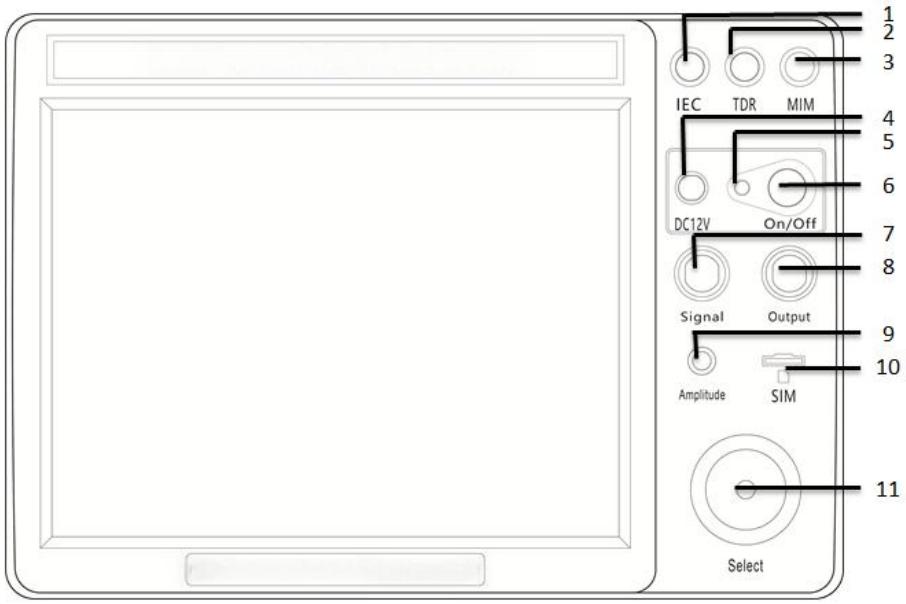



**Figure 2 cable fault tester panel schematic diagram**

1. **Flash indicator:** red diode, the working state in the high-voltage flash sampling state, the red light.

2. **Low-voltage pulse indicator:** green diode, green light after power on, the working state in the pulse method of testing state.

3. **Multiple pulse indicator:** red diode, red light when the working condition is in multiple pulse sampling state.

4. **Charging socket: C**harging line using this socket to charge the device.

5. **Power Indicator:** Pressing the on/off key, the power indicator light is on, which is used to indicate the power status.

6. **Power switch:** Press to turn on the power, release the lock to turn off the power.

**7. Communication:** Used for signaling between the cart and the handcart.

**8. Output socket:** the instrument uses four-hole navigation socket, for testing cable fault signal output and input.

**9. Output amplitude:** used to adjust the input and output pulse amplitude size. Use should be adjusted according to the screen display waveform. When adjusted too small, the pulse reflection is very small, and even can not be sampled, **such as Figure 3 (left)**. If the adjustment is too large, the reflected pulse will have no intersection with the baseline or even the baseline will become a diagonal line, **as in Figure 3 (right)**. In general, before sampling, input amplitude knob rotated about 1/3, and then according to the size of the sampled waveform and then adjusted to re-sample.

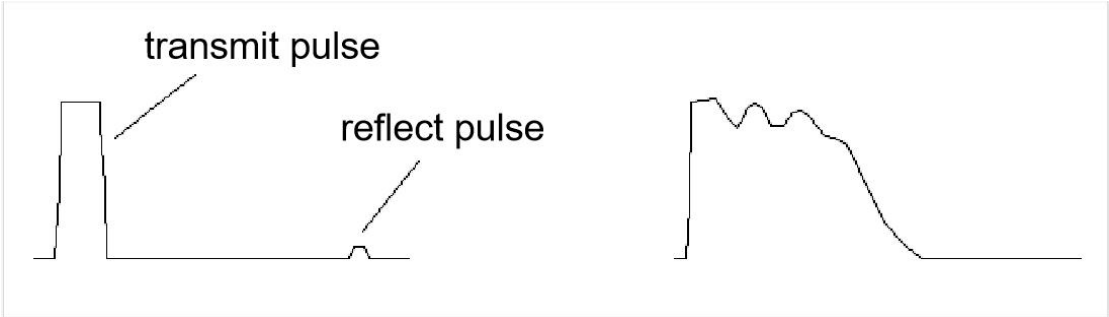



**Figure 3 amplitude adjustment chart**

**10, wireless communication: SIM interface can realize the measurement data remote transmission**

**11, photoelectric rotation: by rotating the completion of the operation of the entire system, press this key, said to confirm.**

(ii) Multiple pulse generator panel, as shown in the following figure

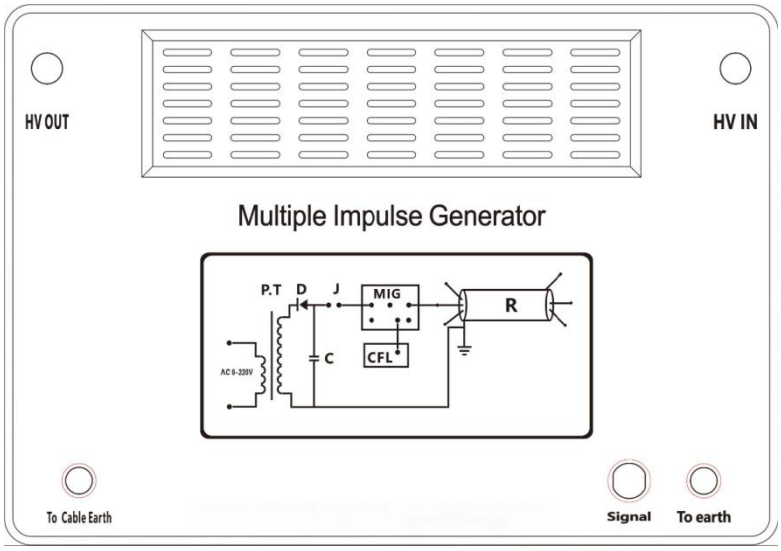



**Fig. 4 Schematic diagram of multiple pulse generator panel**

The role of the "multiple pulse generator" is to "integrated high-voltage generator" generated by the instantaneous impact of high-voltage pulses guided to the fault phase of the fault cable to ensure that the fault point can be fully penetrated, and can prolong the fault to penetrate the arc after the duration of the arc. At the same time, generate a trigger pulse to start "multiple pulse automatic trigger device" and cable fault tester, is one of the key equipment of this set of equipment.

"High-voltage in" input high-voltage, "high-voltage out" is the choice of multiple pulse method of testing high-voltage out, "signal acquisition" and cable tester host connection.

# Section II Cable Testing System Software

## I. Flash Tester Mainframe

1. After pressing the main switch, press and hold the start button until the screen lights up and the buzzer sounds, and then let go to realize the power-on function.
2. To turn off the machine, press and hold the power button until the backlight turns off and then turn off the power switch. It is not recommended to turn off the machine during use or to turn it on and off frequently.
3. If the flash tester shows a low battery, please plug in the dedicated lithium battery charger for the main unit to continue working.

## II. Test System Control Interface

The system automatically enters the test interface after power on, the test interface is as follows

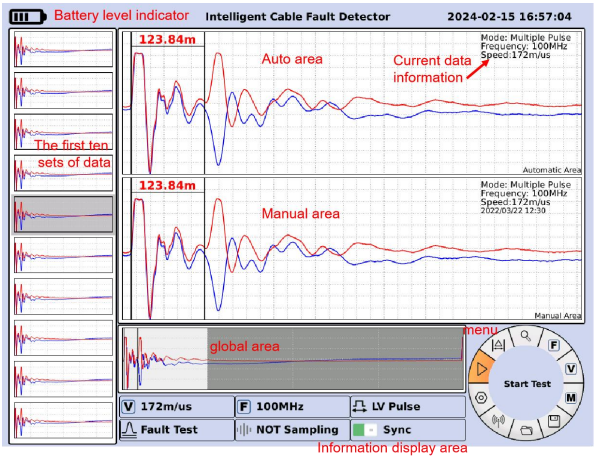



**Figure 5 Software test interface**

**(I) Waveform display area**

The waveform display area is mainly divided into automatic area, manual area, global area and the first ten waveform display area.

The automatic area displays the latest data waveforms collected each time, and the current fault distance is displayed in the waveform area if it is a low-voltage pulse or multiple-pulse test mode.

Manual zone and global zone display the same waveform.

Manual zone displays any set of data waveforms selected by the user, and can be used to fault jamming through the knob.

The global area displays the whole waveform of any group of data selected by the user, and the waveforms in the non-shaded part of the global area correspond to the waveforms in the manual area, which can be compressed or extended by selecting the Adjust View function through the knob.

The left side of the interface is the display area of the first ten groups of waveforms. As the sampling continues, the ten waveform display areas will be updated from bottom to top, i.e., for the newly collected data waveforms are displayed in the bottom area, and the first data waveform is overwritten. When the user clicks on a particular set of waveforms, the background of that waveform display area becomes brighter.

Clicking on the small arrows on the right side of the manual area and the automatic area can expand the manual area and the automatic area respectively, which provides users with a good visual effect for waveform jamming and view adjustment.

**(ii) Other Displays**

The upper left corner of the interface displays the current remaining battery power of the instrument, and when the battery is undervoltage, it will display the insufficient power, which is convenient for users to charge the instrument in time.

The upper right corner of the interface displays the current time, if the time is inaccurate after powering on the instrument, the user can open the "other settings"

through the knob to set the time by themselves.

**(III) Test Information Display**

The lower side of the interface is the test information display area, mainly including the current wave speed, cursor position (the distance of the manual jamming fault), the current test method (the default is the low-voltage pulse test method), the X-axis distance (the actual distance corresponding to the full wavelength of the manual zone (and also the actual distance corresponding to the non-shadowed portion of the global zone of the wave)), and the 50 ohms (output impedance).

**(iv) Rotary menu**

The lower right corner of the interface is the menu selection area. The clockwise direction is as follows: Start Sampling, Card Line Adjustment, View Area Adjustment, Fault Measurement Setting, Speed Measurement Setting, Historical Data Viewing, Save Data File, Open Data File, Print Report, and Other Settings.

By default, "Start Sampling" is selected when the system is powered on. Users can select the specific function through the knob, and the text description of the corresponding function is displayed in red font on the left side of the rotary menu. The default acquisition mode is "Single", user can set it to "Continuous", the text description is displayed on the left side of the rotary menu.

Please refer to the operation manual of the instrument for the specific description of each function.

# III. Operation Steps

**(A) Startup**

After pressing the power switch, press and hold the start button until the screen lights up and the buzzer sounds, then release it to realize the power-on function.

**(B) Fault detection**

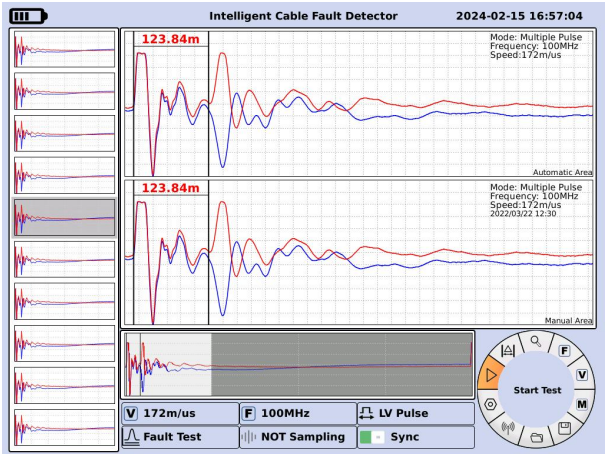



**Figure 6 Fault Detection Setting Level 1 Menu**

As shown in Fig. 1, rotate the knob to make the focus switch to , the center display "Fault Detection Setting". Press the knob to enter the fault detection setting interface, as shown in Figure 7. Rotate the knob to switch the focus between test mode, fault cable length L range selection, media selection, delay factor, OK and cancel. Select test mode: rotate the knob so that the focus is placed on a certain test mode (low-voltage pulse or high-voltage flash or multiple pulses), and press the knob button, you can select the test mode.

Select sampling frequency: rotate the knob so that the focus is placed on a certain length range (there are six length ranges, from top to bottom corresponding to the sampling rate of 400MHz, 200MHz, 100MHz, 50MHz, 25MHz, 12.5MHz, 6.25MHz, 3.125MHz), and press the knob button to select the sampling frequency.

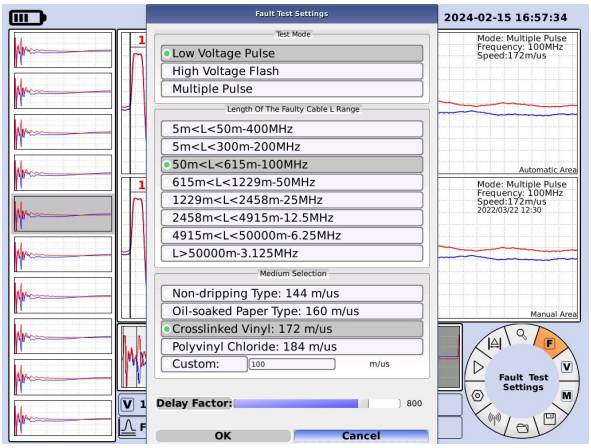



**Fig. 7 Fault Detection Setting Interface**

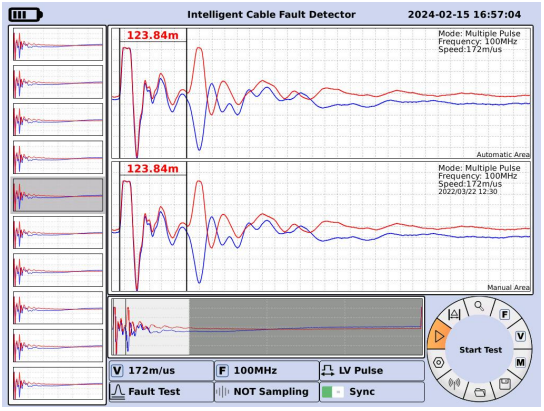



**Fig. 8 First Level Menu after Successful Parameter Setting**

Select wave speed: rotate the knob so that the focus is placed on a media option, and press the knob button to select the media, when you need to use self-selected media, select the "self-selected media" label, press the knob button, the use of pop-up numeric keypad to enter the wave speed. When the above way to select the test mode, sampling frequency, test speed, rotate the knob to switch the focus to the "OK" button and press the knob button, you can set the parameters successfully. At this time, the

first level of the menu interface shown in Figure 8, the focus should be on . Sampling mode selection has a single and continuous two ways, by rotating the knob to realize a single or continuous sampling options, press the knob button to start sampling.

**(C) measuring speed**

As shown in Figure 9, rotating the knob makes the focus switch to  , press the knob to enter the speed test interface, as shown in Figure 10. Press the knob to switch the focus between cable length, fault cable length L range selection, confirmation and cancel.

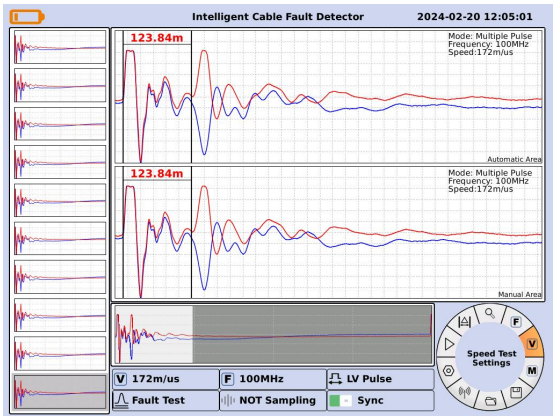



**Figure 9 Speed Test Setting Level 1 Menu**

Setting cable length: rotate the knob to set the focus on "cable length", press the knob button, use the pop-up numeric keyboard to input wave speed.

Select sampling frequency: rotate the knob so that the focus is placed on a certain cable length range (a total of six length ranges), the system automatically sets the appropriate sampling frequency.

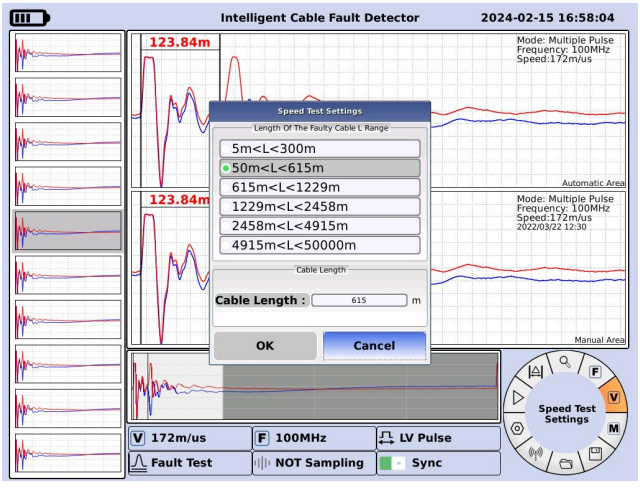



**Figure 10 Speed Test Setting Interface**

After selecting the cable length and sampling frequency in the above way, rotate the knob to switch the focus to the "OK" button and press the knob to set the parameters successfully.

Setting is complete, rotate the knob to Figure 8 shows that the data acquisition.

**(D) ranging card position**

As shown in Figure 11. Rotate the knob to make the focus switch to , press the knob button, then use the focus selection left and right rotary knob to adjust the left card position line, and use the focus selection left and right rotary knob to adjust the right card position line. When adjusting the card position line, the step size changes from small to large with the number of rotations. When the position to be snapped is exceeded, the knob should be rotated from right to left, and the step size changes from small to large with the number of rotations.

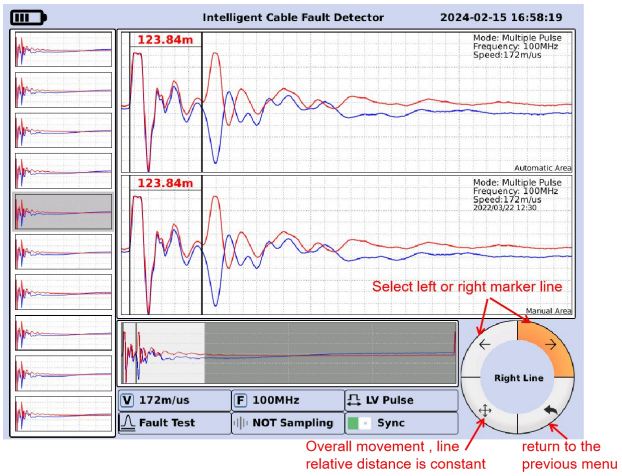



**Figure 11 Snap Line Adjustment Secondary Menu**

**The main interface display area shows the current actual jamming distance (fault distance) as shown in Figure 12:**

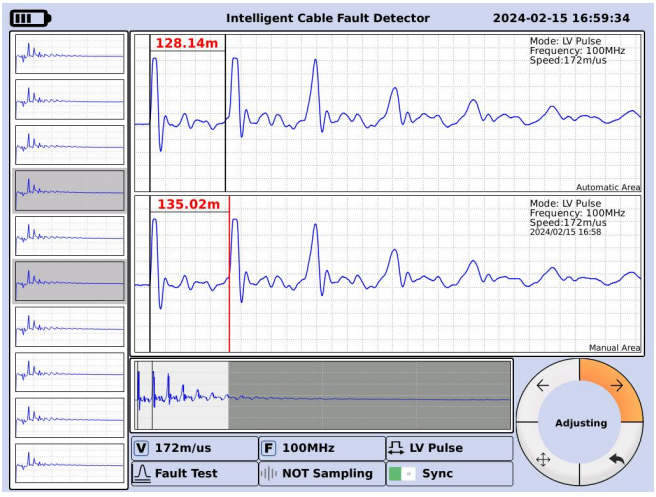



**Figure 12 Fault distance display interface**

**(E) View adjustment**

As shown in Figure 13, rotate the knob to make the focus switch to , press the knob button to enter the view adjustment interface, rotate the knob to make the

waveform compression or extension, as shown in Figure 14.

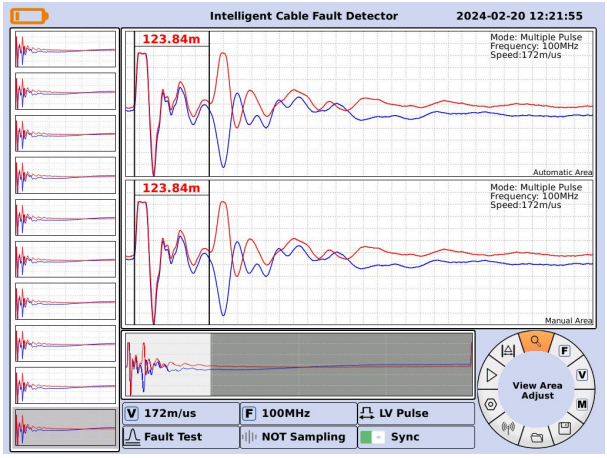



**Figure 13 View Adjustment Level 1 Menu**

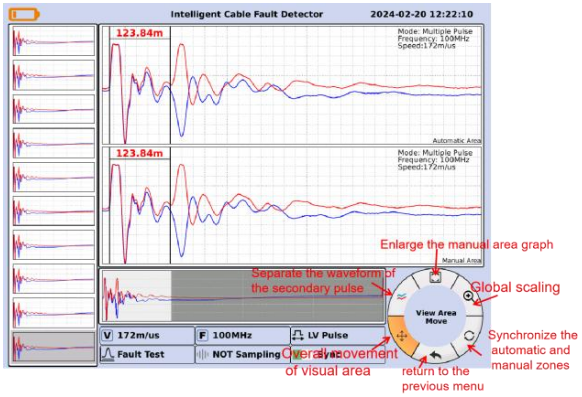



**Figure 14 View Adjustment Interface**

**(F) Open historical data**

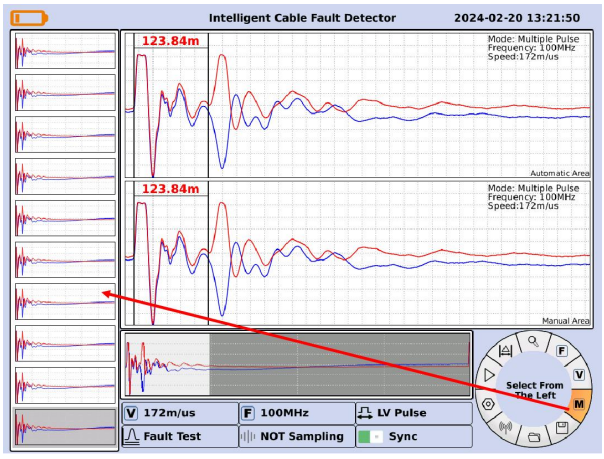



**Figure 15 Historical data selection interface**

As shown in Figure 15. Rotate the knob to make the focus on a certain historical data, and press the knob button to select the historical data, and then use the knob button to switch the focus to the "OK" button, press the knob button to display the waveform of this data in the manual area.

**(G) Save data**

According to the operation method of "Open Historical Data", select a certain group of data (for example: select the 8th group of data), and then, as shown in Figure 16, rotate the knob to make the focus switch to , and press the knob button to save the group of data.

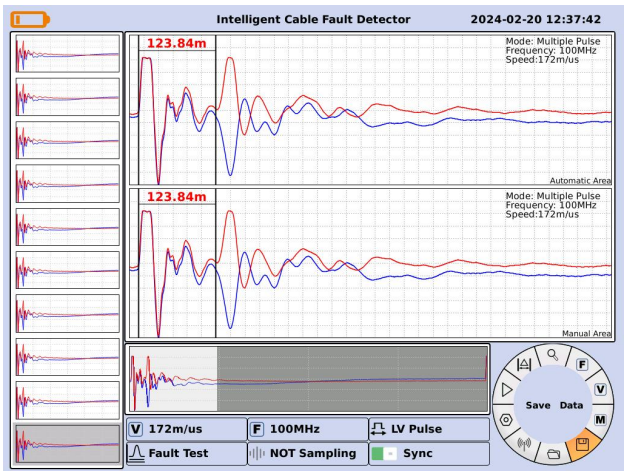



**Figure 16 Save data file a menu**

**(H) Open the data**

As shown in Figure 16, rotate the knob to switch the focus to , press the knob to enter the open data interface. As shown in Figure 17, rotate the knob to switch the focus and press the knob to open the data and exit the interface.

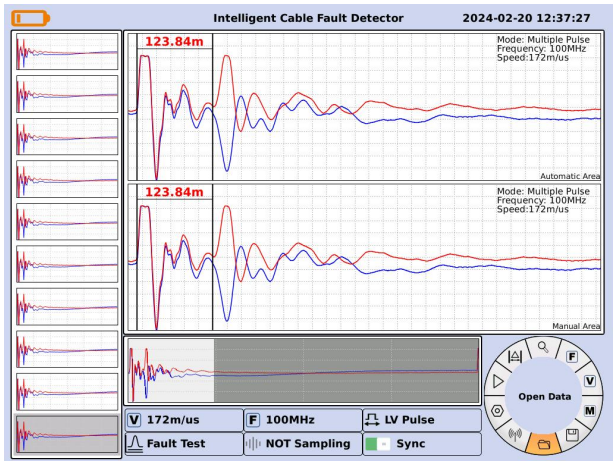



**Figure 17 Open data file first level menu**

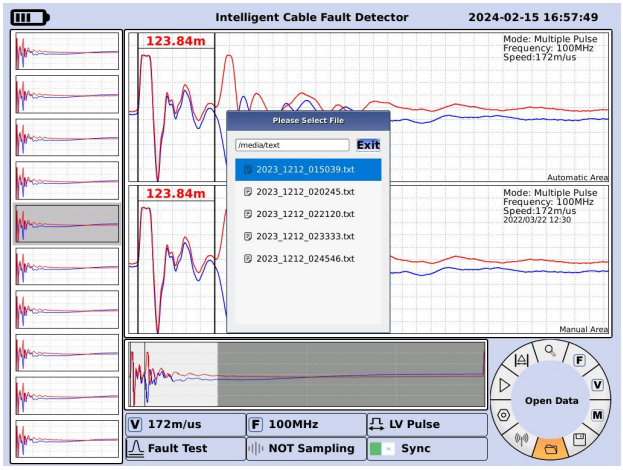



**Figure 18 Open data interface**

## (I) Other Settings

As shown in Figure 19, rotate the knob to switch the focus to , press the knob button to enter the other settings interface, as shown in Figure 20, press the knob button to switch the focus to the backlight, and adjust the size by rotating the knob.

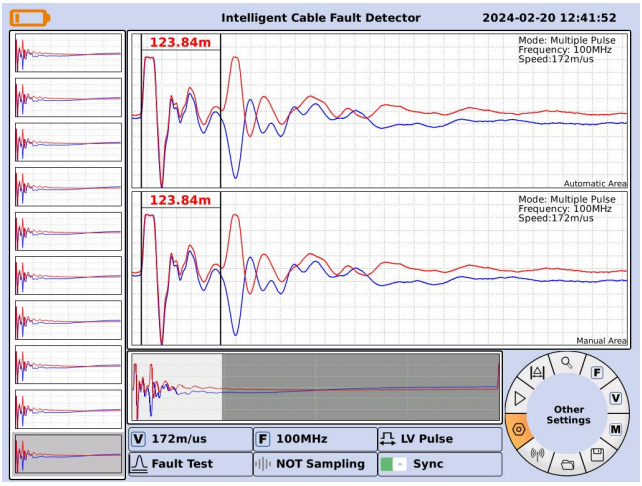



**Figure 19 Other Settings First Level Menu**

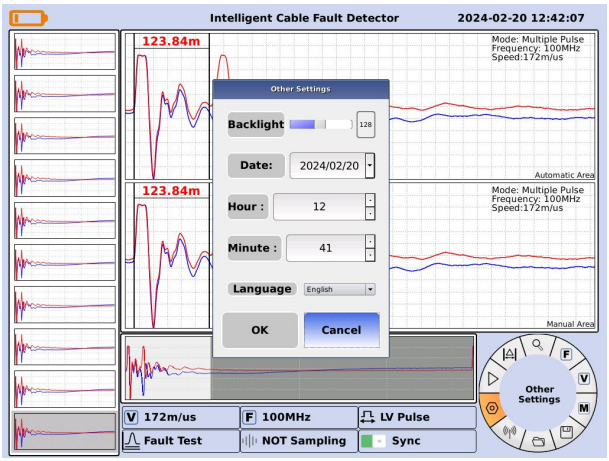



**Figure 20 Other Settings Interface**

Date adjustment: the cursor selects "date", press the knob button, you can switch between "year", "month" and "day". Switch, select the position to be adjusted, press the rotary button and then select through the knob.

Time Adjustment: Cursor selects "hour", "minute" and then press the rotary button to adjust the size through the knob.

Language Adjustment: Cursor selects the language, you can switch between English, Chinese, Russian and Turkish. As in Figure 21:

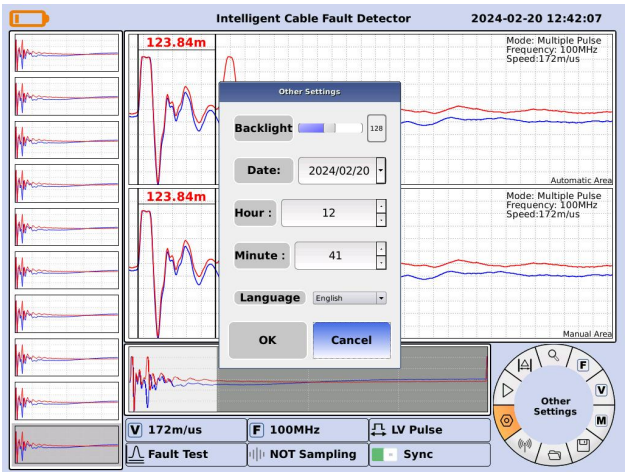



**Figure 21: Language Adjustment Interface**

After all the settings are completed, focus on the "OK" button, press the knob button to complete the settings.

(J) Power off

Press and hold the power button until the screen backlight turns off. Release the button to power off the device, and then turn off the power switch.

# Section III Testing Of Cable Faults Procedure

In order to solve cable faults smoothly and quickly, please follow the following steps to test power cable faults:

**First, analyze the nature of the cable fault to understand the type of faulty cable;**

**Second, use the low-voltage pulse method of the cable meter host to test the length of the cable, calibrate the cable wave transmission speed;**

**Third, select the appropriate test method, the cable meter host cable fault rough test;**

| Fault nature | Insulation resistance | Breakdown of the fault |
|---|---|---|
| Open circuit | ∞ | ● Breakdown under DC high voltage pulse |
| Low resistance | Less than 10$Z_O$ | ● Breakdown by high voltage pulse if insulation resistance is not too low. |

| | | |
|---|---|---|
| High resistance | Greater than 10Zo | ● High-voltage pulse breakdown and use of multiple pulse generators. |
| Flashover | ∞ | ● DC or high-voltage pulse breakdown and use multiple pulse generator. |

Note: Zo in the table for the cable's characteristic impedance value, power cable impedance is generally between 10-40Ω.

**Fourth, with a path meter to detect the direction of the buried cable;**

**Fifth, with a fixed-point instrument to pinpoint the fault point;**

# Section IV Cable Fault Testing Methods

## I. Cable Fault Test Principle

The host of this instrument adopts the principle of time domain reflection (TDR), launch a series of electrical pulses on the cable under test, and receive the reflected pulses in the cable due to impedance changes, and then according to the propagation speed of the electric wave in the cable and the time represented by the characteristic inflection points of the two reflected waves, the distance from the fault point to the test end can be measured as:

$$S=VT/2$$

Where: S represents the distance from the fault point to the test end

V represents the propagation speed of the wave in the cable

T represents the time required for the wave to propagate back and forth in the cable.

In this way, in the case of V is known and T has been measured, you can calculate the fault point from the test end of the distance S. All this requires only a little human intervention, can be automatically completed by the computer, test faults quickly and accurately.

## II. Low-Voltage Pulse Method

Low-voltage pulse is used to test the speed of wave propagation in the cable, the full length of the cable, low-resistance faults (fault-phase resistance value of less than 1K) and open-circuit faults and short-circuit faults, the host computer can complete the task, without the need for multiple pulse generator. At the same time to the next step in the application of multiple pulse method to test the cable high resistance faults provide a basis.

**(I) The basic principle of pulse testing**

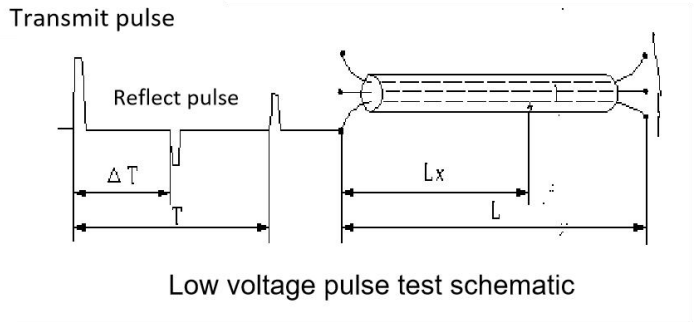



**Figure 23 Principle diagram of low-voltage pulse testing**

Measurement of cable faults, the cable can be regarded as a uniformly distributed transmission line, according to the transmission line theory, the pulse voltage added to one end of the cable, the pulse according to a certain speed (determined by the dielectric constant of the cable medium and the permeability coefficient) along the line to the far end of the transmission, when the pulse encounters faults (or uneven impedance) will produce a reflection, and the flash meter to record the transmission time between the sending pulse and the reflection of the pulse T, it is Can be known transmission speed V to calculate the distance from the fault point S, S = V - T / 2, as shown in the figure above: the full length of the measurement can be utilized to terminate the reflected pulse: L = V - T / 2

The same known full length can be measured transmission speed: V = 2S/T

Test, in the cable fault phase plus low-voltage pulse, the pulse along the cable propagation until the impedance mismatch places, such as intermediate joints, T-connectors, short-circuit points, breaks and termination, etc., in these points will cause the reflection of the wave, the reflection of the pulse back to the test end of the cable is received by the tester. The tester can display this change process in real time.

According to the test waveform of the cable, we can determine the nature of the fault, when the emitted pulse and the reflected pulse are in phase, it means that it is a break fault or an open circuit at the termination head. When the transmitting pulse and the reflected pulse are in opposite phase, it is a short-circuit grounding or low-resistance fault.

Where the cable fault insulation resistance drops to the cable's characteristic impedance, or even the cable resistance is zero fault are called low-resistance faults or short-circuit faults (Note: This concept is defined from the perspective of the use of low-voltage pulse reflection method, taking into account the impact of different impedances on the polarity of the reflected pulse changes).

Where the cable insulation resistance is infinite or although the same value of insulation resistance with a normal cable, but the voltage can not be fed to the user end of the fault are called open-circuit (circuit-breaking) fault.

The fault phase (or phase under test) and ground of the cable are connected to the input

line of the test system (the other end of the input line is connected to the test system's aviation socket).

**(ii) Measurement of faults**

As shown in Figure 24, rotate the knob so that the focus switches to , the left side of the display "test fault settings". Press the knob to enter the fault detection setting interface, as shown in Figure 25. Rotate the knob to switch the focus between test mode, fault cable length L range selection, media selection, delay factor, OK, cancel.

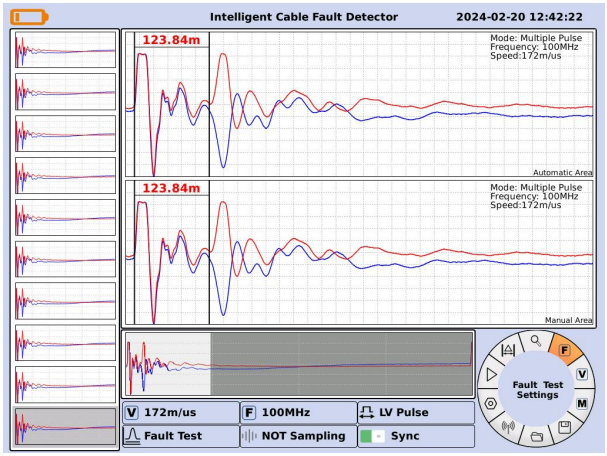



**Figure 24 Fault detection and setting first level menu**

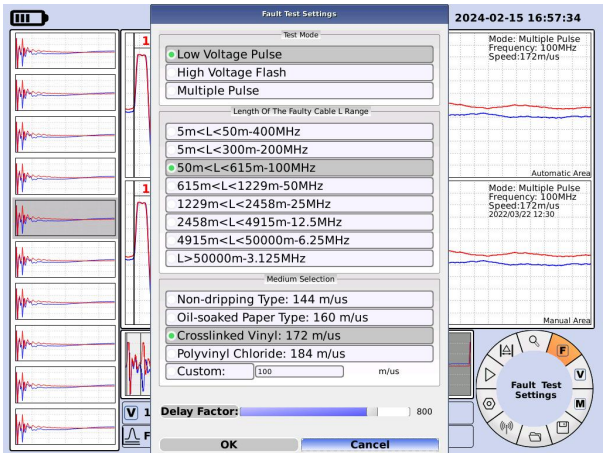



**Figure 25 Fault detection and setting interface**

Select test mode: rotate the knob to make the focus on a certain test mode (low-voltage pulse or high-voltage flash or secondary pulse), and press the knob button, you can select the test mode.

Sampling Frequency: rotate the knob so that the focus is placed on a certain length range (there are six length ranges, and the corresponding sampling rates from top to bottom are 400MHz, 200MHz, 100MHz, 50MHz, 25MHz, 12.5MHz, 6.25MHz, and 3.125MHz, respectively), and press the knob to select the sampling frequency.

Select wave speed: rotate the knob so that the focus is placed on a media option, and press the knob to select the media, when you need to use self-selected media, select the

"self-selected media" label, press the knob and use the pop-up numeric keypad to enter the wave speed.

When the above way to select the test mode, sampling frequency, test speed, rotate the knob to switch the focus to the "OK" button and press the knob button, you can set the parameters successfully. At this time, the first level of the menu interface shown in Figure 26, the focus should be on  . Sampling mode selection has single and continuous two ways, by rotating the knob can realize single or continuous sampling switch, press the knob button to start sampling.

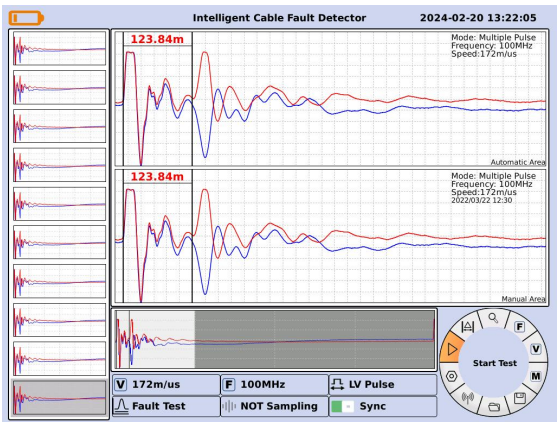



**Figure 26a First-level menu after successful parameter setting**

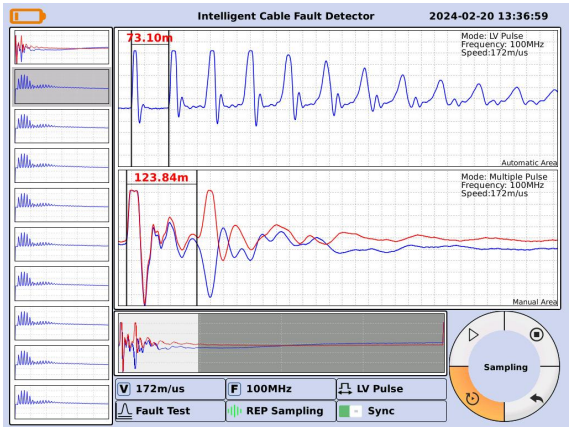



**Figure 26b Open-circuit (full-length) fault waveform measured by low-voltage pulse method**

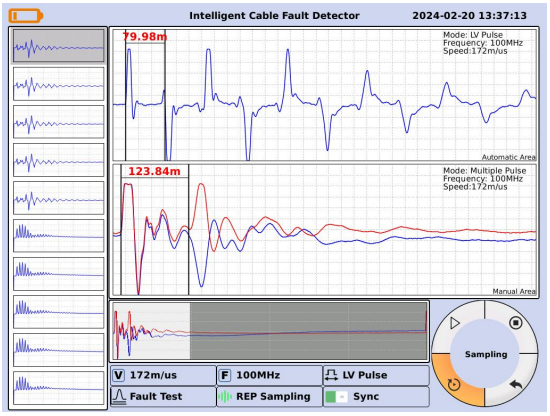



**Figure 26c Short-circuit (low resistance) fault waveform measured by low-voltage pulse method**

**(iii) Speed Measurement**

As shown in Figure 27, rotate the knob to make the focus switch to V , press the knob button to enter the speed test interface, as shown in Figure 28. Pressing the knob button, the focus switches between cable length, fault cable length L range selection, confirmation and cancel.

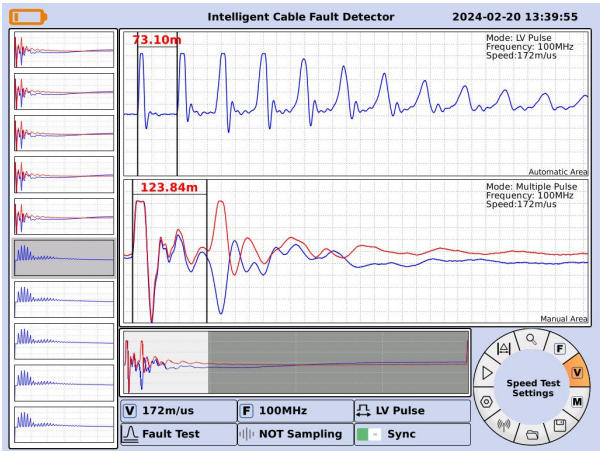



**Figure 27 Speed Test Setting Level 1 Menu**

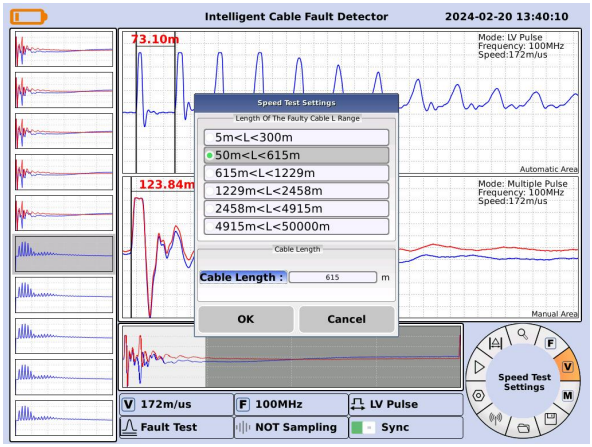



**Figure 28 Speed Test Setting Interface**

Setting cable length: rotate the knob to set the focus on "cable length", press the knob and use the pop-up numeric keyboard to input cable length.

Select sampling frequency: rotate the knob so that the focus is placed on a cable length range (a total of six length ranges, selected after the system automatically sets the appropriate sampling frequency)

After selecting the cable length and sampling frequency in the above way, rotate the knob to switch the focus to the "OK" button and press the knob to set the parameters successfully.

Setting is complete, rotate the knob to Figure 26a shown in the data acquisition.

Measurement of faults in the working state menu select "low-voltage pulse", and then select the appropriate cable length range corresponding to the sampling frequency, and then according to the test distance to select the cable to be tested by the corresponding pulse speed, and then press the "Sampling" button, the top of the screen will display the open-circuit waveforms (Figure 26b) or short-circuit waveform (Figure 26c), HZ-A30 fully intelligent multi-pulse cable fault tester has an automatic card function, the screen automatically waveform area waveforms will be automatically card position, or from the left side of the multi-pulse waveforms to select one, in the "Manual Waveforms" that is, the fault waveforms are displayed, the vernier card position, the test results The test result will be displayed immediately as in Figure 29.

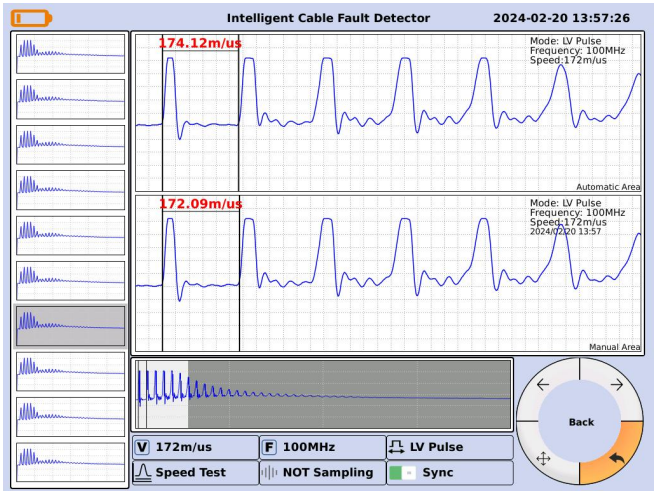



**Figure 29 Interface after the completion of speed test**

# III. Multiple Pulse Method To Test The Cable High Resistance Faults

If the resistance value of the power cable fault is greater than the characteristic impedance value of the cable, we are regarded as high-resistance faults (**high-resistance leakage faults and high-resistance flashover faults)** can be tested using multiple pulse method. Preparation before the test: in the field, first of all, the

HZ-G35A high-frequency high-voltage power supply or test transformer, operating box, pulse capacitor, multiple pulse generator, cable fault tester, cable fault phase, system grounding wire, cable grounding wire, according to Figure 30 shown in the connection.




**Figure 30 multiple pulse method of field fault test wiring diagram**

Start the instrument power supply, open the multiple pulse cable test software, select the multiple pulse test method, according to the relevant parameters to complete the setup interface, ready to start testing.

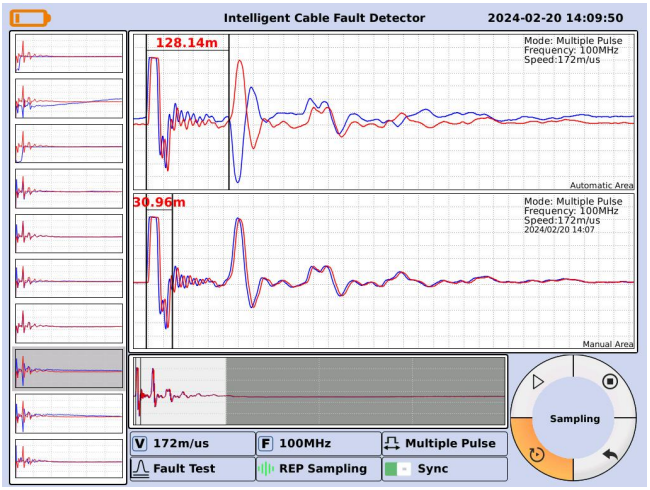



**Figure 31 Fault point is not impacted by high-voltage breakdown or "delay factor" adjusted too large waveforms**

Rotate the mouse to choose to start the test, you can immediately start the test transformer to start flash discharge. Impact high-voltage adjusted to about 20kV, the test. If the impact of high-voltage measured after a number of pulse waveforms by the selected broadening of the waveform shown in **Figure 31** waveforms, that is, the upper and lower two waveforms are exactly the same. Waveforms blue, red completely overlap, and the polarity of the two echo pulse and the polarity of the transmitter pulse is consistent, the cursor positioning display is the full length of the cable, indicating that the point of failure is not impact high-voltage breakdown or "delay factor" adjusted to too large. Must re-press

the "sampling" key (after the instrument into the automatic sampling state, do not have to press the "sampling" key), and increase the impact voltage. While raising the impact voltage, sampling and screen monitoring. At the same time, adjust the size of the "delay factor" until you see the screen above the waveform of the automatic waveform area waveforms appear with the opposite polarity of the transmitter pulse return pulse until. **As** shown in **Figure 34**. At this point the test waveform displayed on the screen should be the final sampling results, you can also select a number of pulse groups in the "manual waveform area" artificial analysis. If the selected waveform group is not satisfied, you can click on the left side of the screen multiple pulse waveforms of another waveform, to analyze the card position and automatic waveforms in the area of the fault distance comparison, close to or the same as the pre-positioning end.

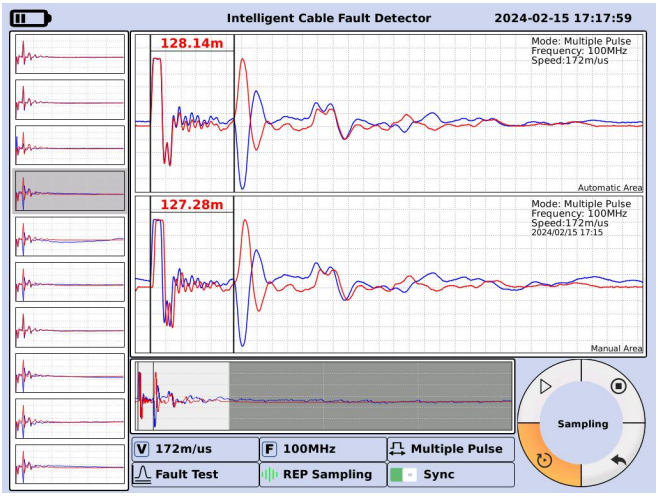



**Fig. 34 Test waveform of multiple pulse method**

**Move the cursor to read the fault distance:** this software is fully automatic setup, divided into upper and lower two areas, the upper area will automatically select an optimal waveform from the ten waveforms on the left side and automatically snap to the position; automatically display the fault distance. The lower area is the manual analysis area, as shown in Figure 11. Rotate the knob to switch the focus to , press the knob button, focus selection, rotate the knob left and right to adjust the left jam line; focus selection, rotate the knob left and right to adjust the right jam line. When the jam line is adjusted, the step size changes from small to large with the number of rotating circles, when the position to be jammed is crossed, the knob should be rotated from right to left, and the step size changes from small to large with the number of rotating circles.

After completing the above operation, the information display column can show the distance from the test end to the fault point.

After the test is completed, if the operator believes that the test results have the value of retention, you can choose to save the data, the test results of the preservation of the

operation can be referred to in the operation of the steps (VII) in the data preservation of the relevant content of the narrative.

# IV. Flash Current Test Method

Power cable high-resistance faults (high-resistance faults: the fault point of the DC resistance is greater than the cable's characteristic impedance fault for high-resistance faults) accounted for almost all the fault rate of more than 90%. Although the multiple pulse method easily solves most of the high-resistance faults, the multiple pulse method is not able to help due to the problem of voltage drop caused by the multiple pulse generator and the situation of the discharge point of the exceptionally high resistance fault. Most of the high-resistance faults (high-resistance leakage faults and high-resistance flashover faults) can be tested by the flash method, but the waveforms are complicated, which makes the user not good at grasping the waveforms of the high-resistance faults, and the error of rough measurement is often large.

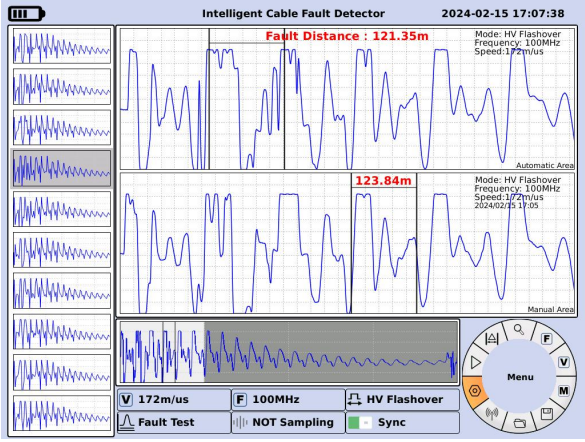


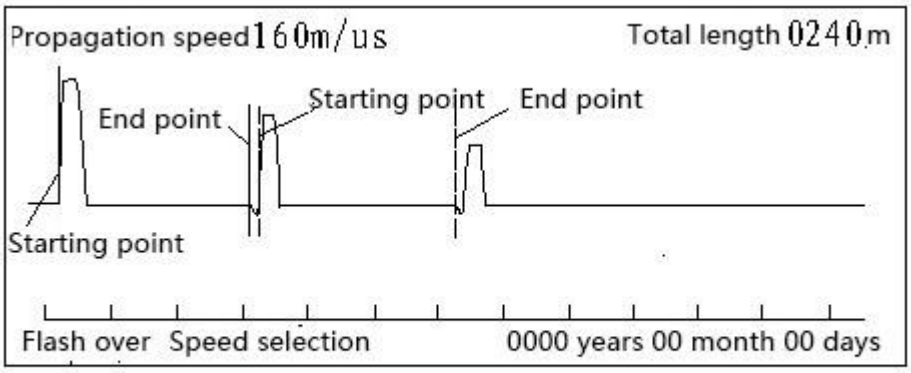

**Figure 35 Flash test waveform**

The current sampling method is generally used to test the faults in the flash mode. Because current sampling wiring is simple, high security, waveforms are easy to recognize, so it is recommended to use current sampling. According to Figure 35 wiring is completed, according to the third section of the operation step instructions, the input amplitude knob rotated to about 1/3 (Note: please fine-tune), and then rotate the mouse to start the test and press, the instrument enters the waiting sampling state.

Adjust the high-voltage positioning power supply, so that the fault point discharge, flash tester to record the fault waveform. According to the fault waveform amplitude size can be re-adjusted input amplitude, repeat sampling, until the relative standard waveform. The flash test waveform is shown in Figure 33.

**Note: If the high-voltage positioning power supply is not integrated, discharged through the ball gap, the distance between the ball gap 1mm approximately represents 3kV, please adjust the output voltage according to the high-voltage power supply appropriately.**

**Waveform characteristics**: the transmitting pulse is positive, and the reflecting pulse is also positive but with negative backlash at the leading edge. Due to the nature of the fault and other reasons, the size of the negative backlash is different, but much smaller than the amplitude of the positive pulse.




Flash current sampling test waveform

**Fig. 34 Waveform of current sampling test of impulse flash method**

Cursor positioning, adjust the left marker to flash waveform rising edge as the starting point, and then adjust the right marker to the next cycle of the falling edge of the front of the rising edge as the end point, the screen in the middle of the information display area shows the distance that is pre-positioned for the fault distance.

**If there is no negative pulse, the end of the cursor will be set at the intersection of the rising edge of the reflected pulse and the baseline, the screen in the middle of the display distance** minus 15% or so that is the pre-positioning distance of the fault point.

**The use of high-frequency high-voltage power supply as shown in Figure 35 Field physical wiring diagram shown below**

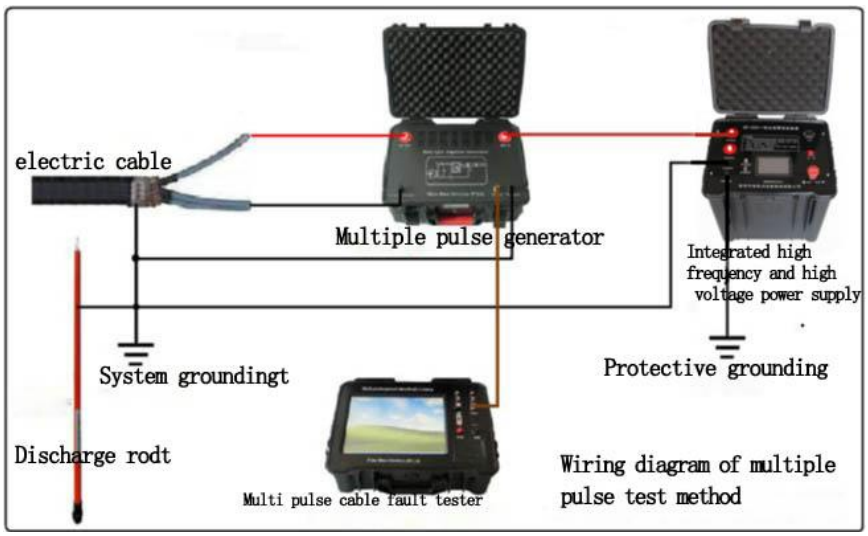



**Figure 35 punch flash method of field fault test wiring diagram**

# Section V HZ-A30 Power Cable Fault Pre-locator accessories introduction

## I. Current Sampler

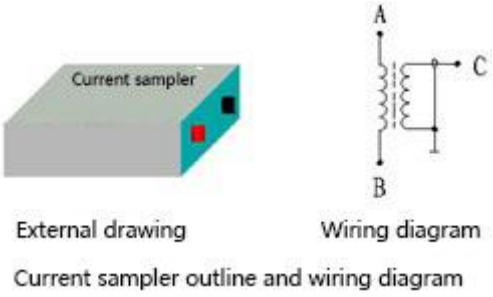



**Figure 36 current sampler shape wiring diagram**

High-voltage flashover test, the current sampler red and black terminals and test line red and black clamp corresponding connection, and the current sampler placed parallel to the capacitor ground line 3-5cm. If the signal is strong, it can be moved farther away, and the signal is weak, it can be moved closer. To capture a better waveform as a standard.

## II. Connecting Cable

The instrument is equipped with two connecting cables for flashover test and low-voltage pulse test. As shown in the figure below.

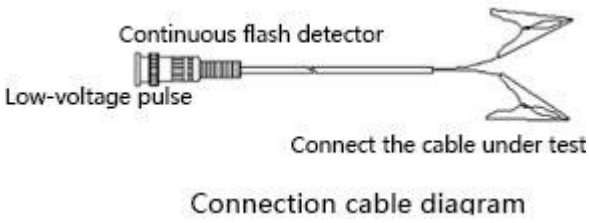



**Figure 37 connecting cable schematic**

## III. Accurate Pointing Physical Wiring Diagram

Precise pointing is a key step in testing cable faults, after rough testing. Remove the host and A30 multiple pulse generator, according to the following physical wiring diagram, the cable continuously add impact high voltage so that the fault point of continuous discharge, the frequency is probably placed on the 3 ~ 4 seconds / times. Take the acoustic and magnetic digital synchronization point instrument to the rough measurement distance of 10 meters before and after listening carefully to the fault point of the discharge sound, listen to the sound of the largest point under the

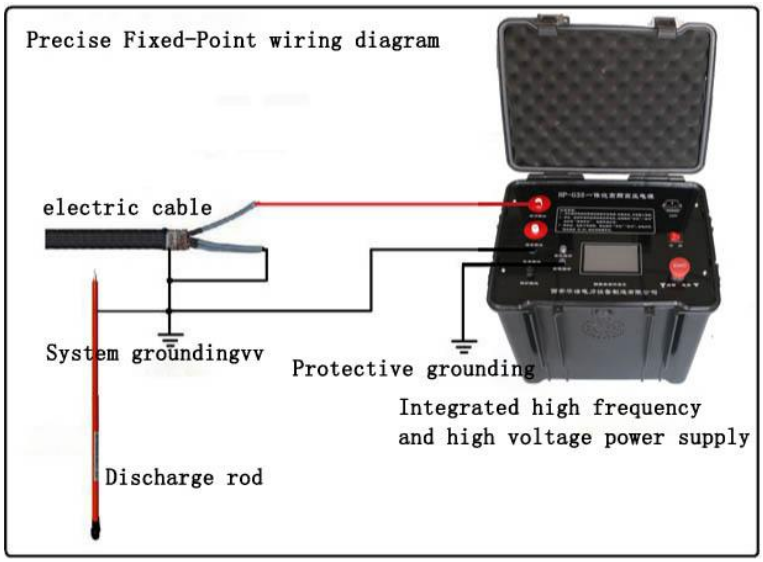



**Figure 38 with an integrated high-frequency high-voltage power supply accurate fixed-point wiring diagram**

# Chapter VI Path Instrument Introduction

## Summary

The path instrument is composed of a transmitter and routing receiver.This instrument is a special instrument for the cable fault positioning test.Its main function is to detect the cable path.

The instrument uses a microcomputer central processor and a special integrated circuit.It is characterized by high reception sensitivity, small static drift, strong anti-interference ability, stable work and high accuracy.The instrument is more solid and durable, thus reducing the repair rate of the instrument.The routing receiver is powered by large capacity rechargeable lithium battery, which has the advantage of longer waiting time.

## I. Basic Composition And Main Uses

The instrument consists of the following two parts:

- Transmitter: send a test signal to the tested cable (as shown in Figure 1).
- Routing receiver: receives the signal through the sensor near the buried wire (buried cable) and identifies the cable path direction (as shown in Figure 2).



Figure 1 Transmitter



Figure 2nd way receiver

# II. Technical Indicators

**1. Detection distance: 5km**

**2. Detection depth: 3m**

3. **Routing error,: 5cm**

4. Basic parameters of the transmitter: Output frequency: transmission frequency of 9.6kHz, and output power: 5W

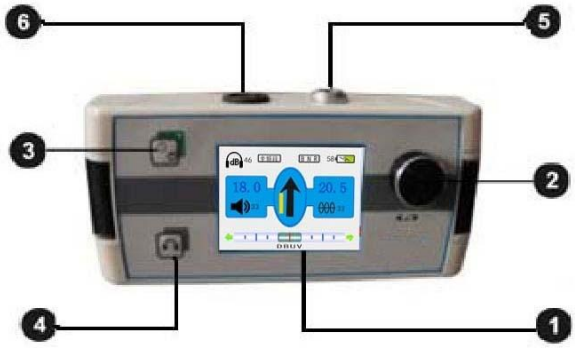
**5. Basic parameters of the routing receiver:**

- ◆ Input frequency: 9.6kHz
- ◆ probe routing error: ± 2cm
- ◆ detection buried depth error: ± 5cm.
- ◆ 9V rechargeable lithium battery works for 8 hours.
- ◆ LCD display: bright real color screen, 320 x 240 pixels, suitable for outdoor use.

# III. The Routing Receiver Introduction

### 3.1. Connection and control of the receiver host

The following figure shows the connection method and control keys of the path instrument and receiver host:



- ❶: LCD; ❷: one key adjustment key; ❸: start receiver host (red LED light after 3 seconds) / shutdown (after 3 seconds); ❹: mute on / off; ❺: connect socket, sensor; ❻: connect socket and headset.

### 3.2. Connect the sensor to the handle

3.2.1 The following figure shows how to connect the adjustable handle to the sensor:



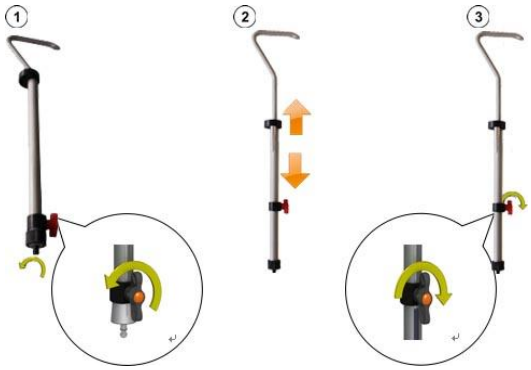

3.2.2 Connect the sensor and headset to the receiver host

Connect the headset to the black socket of the receiver host❻.Note the alignment of the white markings on the plug and socket.The plug is plug and play, do not rotate!




### 3.3. Adjust the height of the handle

The following figure shows how to adjust the handle height:




# IV. Operation Instructions

### 4.1 Preparation before detection

①The detects the battery power

Routing receiver: After startup, the battery power is displayed. If it is less than 25%, please charge the battery before using it for more than 50%.

② at both ends of the suspended cable

In general, the end of the tested cable is disconnected from the ground, just the beginning of the cable and the distribution cabinet are disconnected (the zero line grounding must be untied).

**4.2. Use method of the transmitter**

Note: When the transmitter is working, do not touch the output terminal in hand to prevent electric shock.Do not connect the transmitter to a live cable, and do not directly short-circuit the output.

① Turn off the transmitter before connecting to the transmitter.

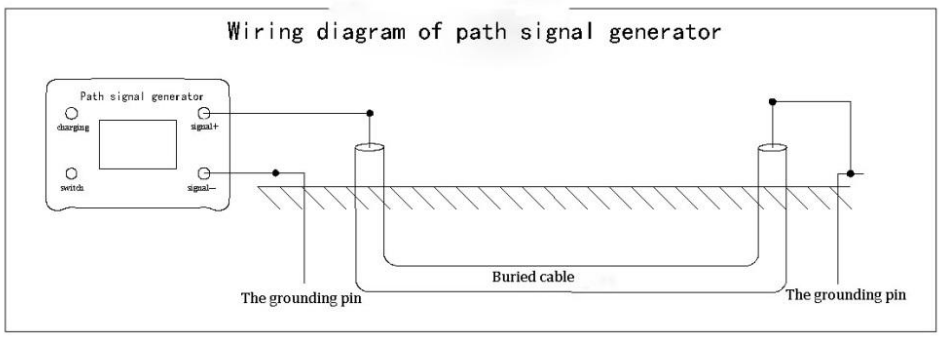
② inserts the red and black output lines into the corresponding output jack on the transmitter.

③ red output line clip, clip in the cable good phase, and then the cable good phase terminal ground.If the cable armor is complete and the outer sheath is not damaged, you can also open the test end armor and clamp the red clip on the armor for testing.

④ black output line clip clip test end systematically.

⑤ connects the 24V power adapter, turn on the transmitter power switch, the display shows the operating voltage, transmission frequency.The transmitter started working.

⑥ shall short circuit the output red and black clips.




**Transmitter connection diagram**

**4.3. Function and usage method of the routing receiver**

4.3.1 Role of the routing receiver

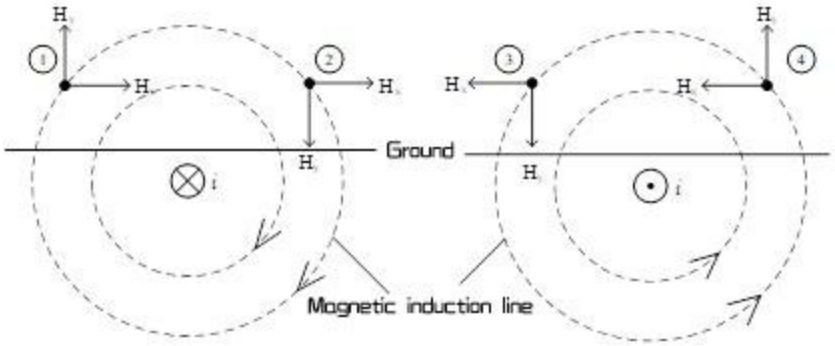
Signal produced by the transmitter and through direct connection to the signal to the

underground detected cable, underground cable will produce induction current, induction current will spread along the cable to the distance, in the process of current transmission, electromagnetic radiation through the underground cable to the ground, so that when the receiver on the ground, will receive the cable above the electromagnetic signal, through the signal strength change to determine the location and direction of the underground cable.

4.3.2 Role of the routing receiver

The principle of detecting the routing and buried depth of low-voltage cable is the magnetic sensor line direction recognition method and the triangles method.

① magnetic sensor wire direction identification method: the routing receiver has two coils vertical to each other, respectively vertical to the low-voltage cable.As shown in the following figure, when the equipment is on the left side of the cable, the device in the cable crosses the two coils in opposite directions, and when the device in the cable crosses the two coils in the same direction.




Principle of magnetic inductive line direction recognition method

② triangle method: the first step: first, the magnetic sensor wire direction recognition method to find out the low-voltage cable route, Select a little point A on the path of the low-voltage cable route before; Step 2: Place the device on the left side of the cable and make the handle run parallel to the cable, Ensure that the angle between the arrow above the equipment and the vertical direction is positive 45° (namely, the arrow points to the top right), The lower end of the probe is attached to the ground and moves the handle parallel LV cable horizontally to the left, When the received signal shows the first minimum value, Minimum signal signal, Note down the point as " B; Step 3: Place the equipment on the right side of the cable and make the handle parallel to the cable, Ensure that the angle

between the arrow above the equipment and the vertical direction is negative 45° (i. e., the arrow points to the upper left), The lower end of the probe is attached to the ground and moves the handle parallel LV cable to the right horizontally, When the received signal shows the first minimum value, Minimum signal signal, Note down the point as " C; The straight line distance of the AB (AC) point on the ground is the buried depth AD of the low-voltage cable.The general error is around ± 5CM.

Note: The accuracy of detecting the buried depth of low-voltage cables will be affected by soil conditions, adjacent cables and cable metal materials.When detecting the buried depth, the bend of the low-voltage cable should be avoided, and the transmitter is 10 meters away, so as not to set the depth or increase the error.

4.3.3 Introduction of routing receiver host and usage method

①Opening of the receiver host

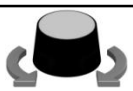
After pressing the on machine key of the receiver host, the host can be turned on or off.Three seconds later, the receiver host is ready for use, when the measurement interface is displayed.

② battery power BIT

When you start up, look at the upper right corner of the monitor and check the remaining power of the lithium ion rechargeable battery.If you find that the percentage of battery is less than 25%, charge first and start 50%.

③ One-button rotary knob for the path meter

Receiver host is mainly based on one key suitable for single key adjustment.See the following figure for using the one-key adjustment button:

| gesture | The function of the measurement interface |
|---|---|
|  | Adjust gain |

④ Adjustment settings of the measurement interface

Please press the boot button on the host panel of the path to start on.You need to enter the menu interface by pressing the single key from the measurement interface, and

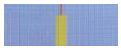
select the path detection to switch to the path detection measurement interface, as shown in the figure below:







4.3.4 Use method

| step | movement |
|---|---|
| 1 | Place the path finder ground sensor where the cable starts. |
| 2 | Always observe the indicated direction, magnetic field strength value and magnetic field strength indication bar of the arrows on the display screen.The arrow points to the right (i. e. ), indicating that the cable is on the right side of the sensor and should continue to the right of the cable. During the movement, the closer to the centerline of the screen, and the greater the sound signal in the headset.The arrow points to the left (i. e. ), indicating that the cable is on the left side of the sensor and should continue to the left. During the move, the closer the arrow is to the centerline of the screen, and the greater the sound signal in the headset.The yellow line (i. e. ) at the axis position indicates that the cable is directly below the sensor and should move forward. |

| | |
|---|---|
| 3 | When the cable is detected directly below the sensor: when the value of magnetic field strength is always shown 99.9, the single key should be rotated counterclockwise to reduce the gain; when the value of magnetic field strength is less than 90, the single key should be rotated clockwise to increase the gain, so that the user can roughly judge the distance from the cable. |

# V. Matters Needing Attention

5.1 Detection around it

Using the magnetic inductive line direction recognition method to detect.When the probe reaches the surround of the cable, if the routing receiver appears the left arrow and the right arrow swing back and forth, this is normal, because the magnetic field at the surround crosses, so you should tentatively skip the surround, find the exit of the surround, and then continue the measurement.

5.2 Equipment maintenance

This instrument is used for outdoor work and shall be kept clean and dry.When not in use, the instrument should be put in the packaging box, and stored in a low temperature, dry place.The battery power of the routing receiver shall be detected before each operation.This instrument is limited to the trained and experienced professional electrical staff.Anyone else, please stay away from this instrument.

# VI. Standard Configuration

- One receiver host, including a shoulder strap;
- One slave sensor;
- One height adjustable handle, height range of 450 750 mm;
- A headset, sound level sound quality;
- One signal line, connect the receiver host to the sensor, 1.20 m long;
- Lithium battery charger, input: AC100-240V/0.5A, output: DC8.4V/1A;
- A single Chinese instruction manual.

# Chapter VII Introduction Of Fixed-Point Instrument

## I. Overview



HZ-B Cable Fault Acousto-Magnetic Accurate locater is a portable, ultra-quiet and visualized impulse discharge receiver precise locating instrument. It is specially used in conjunction with a high-voltage impulse generator. It adopts advanced background intelligent noise reduction and sound tracking new technologies, can achieve continuous optimization, perfect sound effects, record the characteristic sound of impact discharge and compare the signal picked up on site.

When the front-end continuous impulse discharge, the impulse discharge sound of the fault point within the rough measurement distance is transmitted on the ground above the cable, and is recorded by the ground probe on the ground. The distance between the detection point and the true fault point of the cable can be obtained by the volume of the impact discharge noise.

## II. Technical Characteristics

◆Ultra-quiet noise reduction processing, excellent discharge sound quality, quieter background, monitor headphones are used to quickly and reliably locate the fault point.

◆Using ultra-quiet technology and BNR intelligent background noise reduction technology, the volume of impact discharge can be adjusted.

◆ A special free-falling ground-penetrating sensor is designed, and equipped with sensor joints for soft pavement, hardened pavement and lawn.

◆ The reliable imported connectors are used to ensure the purity of the sound. The humanized design of the height-adjustable probe handle is very suitable.

## III. Technical Parameters

◆ Sensor dynamic range: sound channel>104dB.

◆ Impact discharge sound amplification factor >90dB, and the upper limit of the impact discharge volume is 84dB(A).

◆ LCD display: high-brightness true color screen, 320 x 240 pixels, suitable for outdoor use.

◆ Power supply: Alkaline replaceable battery/Lithium-ion rechargeable battery, convenient for field use.

3.1. Standard configuration:

• One receiver host, model HZ-B, including shoulder strap;

• One sensor (ground penetrating microphone);

• One height-adjustable handle with a height range of 450-750 mm;

• One earphone, sound quality;

• One signal line, which connects the receiver host to the sensor, 1.20m long;

• One hard ground probe, 18 mm long;

• One grass probe, 75 mm long;

• 6 AA alkaline batteries, model IEC R6;

• One manual.

3.2. Connection and control of the receiver host

The following figure shows the connection method and control buttons of the HZ-B receiver host:



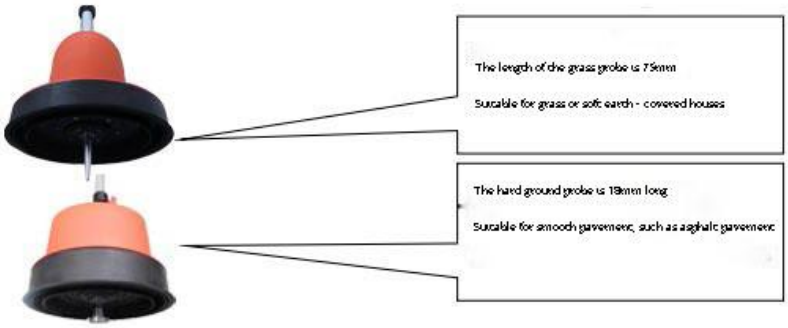

1. LCD display 2. One-key adjustment button 3. Receiver switch on(the red LED indicator flashes after press for 10 seconds)/off (after press for 3 seconds) 4. Mute on/off 5. Connect socket and sensor 6. Connect the socket and earphone.

# IV. HZ-B Site Installation And Operation

Turn on HZ-B and prepare the sensor.

4.1. Connect the sensor to a suitable probe

The HZ-B sensor can be connected to two different probes. The standard configuration includes one 18mm long hard ground probe and one 75mm long grass probe. The above probes can be screwed on with threads to suit various ground covering conditions.



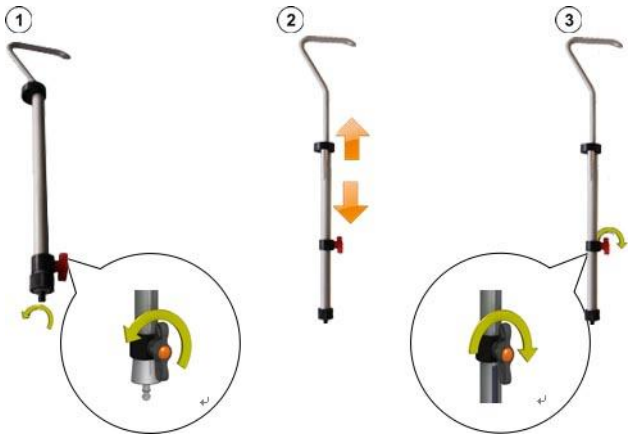

4.2. Connect the sensor to the handle

The figure below shows how to connect the adjustable handle with the sensor:




4.3. Adjust the height of the handle

The following figure shows how to adjust the height of the handle:




4.4. Connect the sensor and headset to the receiver host

Connect the headset to the black socket of the receiver. Please pay attention to align the white marks on the plug and socket. The plug is plug and play, please do not rotate.




4.5 Introduction to HZ-B receiver host

1. Turn on the receiver host

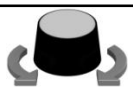
Pressing the on/off button to start/shutdown the receiver. The receiver host will be ready for use after several seconds and the measurement interface will be displayed.

2 Battery self-checking

Be sure the battery power is over 50% before using.

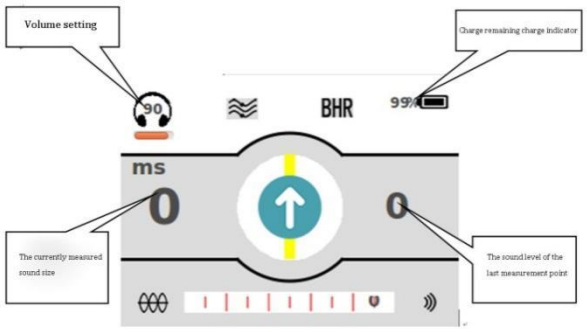
3. One-key knob

Please refer to the figure below for the use of one-key adjustment keys:

| | Function |
|---|---|
|  | volume adjustment |

4. Display of measurement interface

When you are close to the fault point in the process of precise locating, HZ-B displays relevant information that may be useful through the measurement interface.




# V. Operating Procedure

Please connect the high-voltage integrated impulse generator (high-voltage unit) to the faulty cable, and start to apply an appropriate impulse voltage to cause a flashover breakdown discharge at the fault point Appropriate impulse voltage refers to the model

suitable for the cable under test, and the highest allowable impulse voltage will not cause damage to the cable under test. For more details on using the high-voltage impulse generator (high-voltage unit), please read the HZ-G35A integrated high-voltage power supply operation manual.

5.1 Precise locating operation procedures

When you are approaching the point of failure, please follow the sequence of procedures below:

Step 1: Place the ground penetrating microphone of HZ-B at the initial position.

Step 2: If HZ-B cannot pick up any sound signal at this measuring point, please follow the route of the cable under test. When the HZ-B has received the first useful shock discharge sound signal, the left side of the LCD of the HZ-B host will automatically display the sound level at the measuring point.

If HZ-B cannot pick up the impulse discharge sound signal through the ground penetrating microphone or earphone in a long time, you should try to accurately locate the point from the starting point in the opposite direction.

Step 3: Continue along the path of the cable under test, moving one step at a time, and adjust the position of the center axis of the cable under test if necessary. At each measuring point, please stop for several impulse discharge signals.

When you approach the cable fault point, you will hear a stronger knocking sound, and the sound level of the current measurement point displayed by HZ-B will increase suddenly.

Step 4: Rotate the HZ-B ground penetrating microphone 180° and approach the fault point again with a smaller step.

Step 5: Please continue to reduce the step distance, find the point where the fault sound is loudest, and locate the fault point as accurately as possible. Make a precise mark on the ground.

5.2 Switch off HZ-B

Press on/off button for a long time to switch off.

Note: This instrument can only be operated by trained and experienced professional electricians. Keep anyone else away from this instrument.

**Warnings**

**Welcome to use our HZ-G35A integrated high frequency high voltage power supply. This product is a one-piece automated highly integrated high voltage equipment, do not operate this instrument before reading the instruction manual in detail to avoid danger.**

**Before energizing, please be sure to check whether all wiring is correct and good. The pulse output wire should be suspended and kept at a safe distance from the surrounding area. The system ground and the protective ground must be independently and reliably grounded, and check whether the grounding resistance value is in accordance with the standard. Whether the emergency stop/start button is in the emergency stop state (pressed state). In addition, whether the discharge rod is connected to the spare.**

**Before removing the high-voltage connecting line after the test, please turn off the power supply and use the discharge rod to discharge the cable fully for not less than 5 seconds, and then remove the high-voltage line, power supply line, etc. in turn, and finally remove the protective earthing wire.**

**We will continue to improve its perfection, this manual may have individual discrepancies with the instrument, please forgive me! If you have valuable comments, please feel free to contact us.**

# HZ-G35A Integrated High-Frequency High-Voltage Power Supply Instruction Manual

## I. Overview

HZ-G35A integrated high-frequency high-voltage power supply is my company combined with their own long-term experience in cable fault test research and the current market demand, the latest development of innovative generation of pure integrated high-voltage power supply products, stable performance, leading technology, portable and safe. Equipment to meet the "People's Republic of China electric power industry standards - General Technical Conditions for High Voltage Test Equipment". This product adopts the principle of switching power supply, the maximum output of 32 kV DC negative

high voltage, integrated design, stable performance, built-in capacitance, drop type impact ignition, designed with emergency stop and automatic discharge function, safe and reliable. Matching any one of the company's cable fault tester can be convenient to use multiple pulse method or current flash method for cable fault rough measurement or pre-location, matching cable fault locator can quickly pinpoint the fault point, is an indispensable part of the cable fault test system.

# II. Performance Characteristics

1、Pure integrated design with built-in capacitors and simple wiring;

2、Touch screen human-computer interaction, simple operation, instrument status display is simple and intuitive;

3、With voltage regulation, automatic voltage stabilization and automatic protection;

4、The output high voltage has the function of single pulse and continuous pulse, which can be used with the fault tester to measure the distance and the fixing instrument to find the fault point respectively;

5、Software controlled drop shock ignition discharge with adaptive discharge and pulse period;

6、With emergency stop button, automatic discharge function, emergency stop or shutdown automatic voltage reduction and discharge, safe and reliable;

7、Continuous working time of not less than 6 hours to meet the maximum working time of cable fault testing;

8、Engineering trolley chassis design, compact, small size, light weight, easy to carry.

# III. Technical Parameters

This product is mainly used for 35kV and the following power cable fault impact discharge with cable meter fault waveform sampling and fixed-point instrument fault point accurate fixed point when used.

1、 Output method: Pulse output

2、 Output voltage: DC negative voltage ≤32kV

3、 Working current: ≤10A

4、 Working mode: single pulse, continuous pulse

5、 Built-in capacitance: 3uF/32kV

6、 Discharge energy: ≤1536J

7、 Pulse period: 4s～8s adaptive

8、Automatic discharge: automatic discharge at shutdown

9、Working power supply: industrial frequency 220V ± 10%

10、Display screen: 800 × 480 resolution touch LCD screen

11、Working Temperature: -10℃～40℃

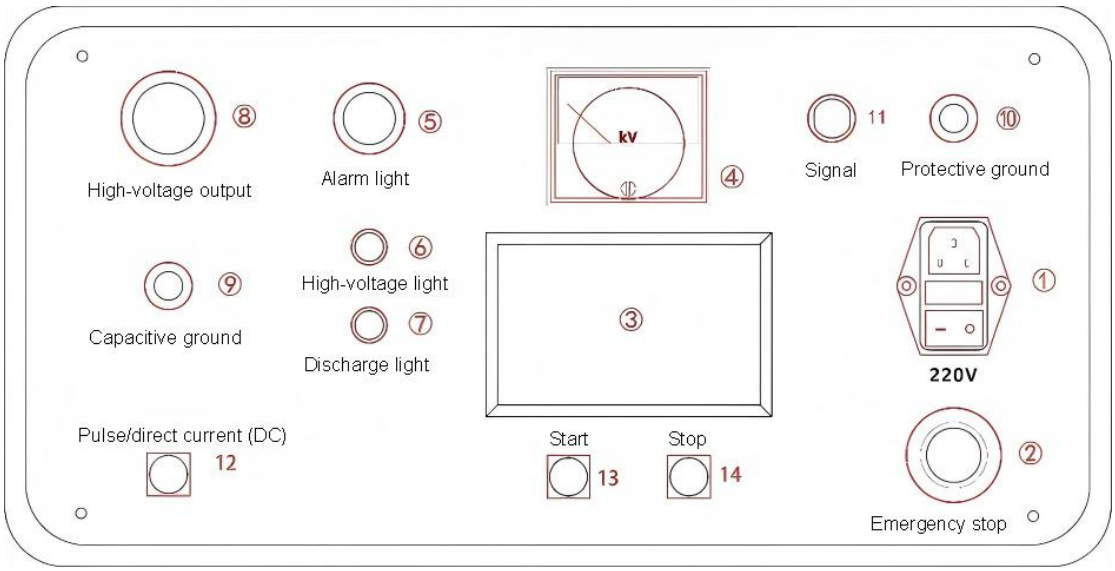
12、Working humidity: ≤80%

13、Altitude: ≤1000 meters

14、Dimension: 550(L)*300(W)*435(H) mm

15、Weight: ≤28kg

# IV. Operation Panel




1、Three-in-one power switch: industrial frequency 220V/50Hz standard three-core socket; with 10A insurance; boat-type switch, open the switch light, the display is bright, control instrument power on and off;

2、Start/emergency stop knob: Pressing it indicates emergency stop; clockwise rotation and automatic pop-up indicates start; in any case, this key can be pressed to make it stop working and automatically release high pressure;

3, display screen: 800 × 480 resolution touch LCD screen, can be set voltage, single pulse, continuous pulse and other operations, display the instrument's discharge time,

working time;

4, voltmeter: display the output voltage value, you can pointer down to determine whether the failure point breakdown discharge.

5, alarm lamp: set sound and light integrated alarm device. The main function is to prompt the automatic discharge state of high-frequency high-voltage power supply.

When the power switch is turned on, the alarm device starts to alarm prompt. After setting the voltage, then rotate the start/emergency stop key (rotate clockwise and pop up automatically to indicate the start), then press the start key, the discharge mechanism action pulls off the alarm will be automatically lifted, in which case the instrument automatically carries out the boosting and discharging work in accordance with the set voltage.

When the test is completed and the emergency stop button is pressed, the alarm light will flash and alarm, and when the power is turned off, the alarm light will turn off automatically.

6, high pressure indicator: when clicking on the "boost operation" interface "start" button, the instrument will automatically boost the pressure, the indicator light;

7, discharge indicator: emergency stop or shutdown after power failure, automatic discharge instructions, with the instrument internal high voltage gradually discharge, this light also gradually from bright to dark;

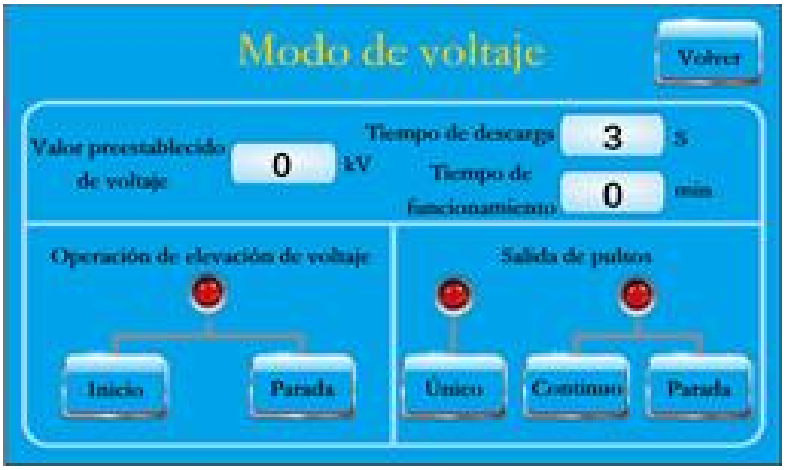
8, pulse output: output single high-voltage pulse or continuous high-voltage pulse, for multiple pulse method test, flash current method test, fault location and other wiring;

9、System ground: It is the working ground of high voltage, and it is required to be connected to the reliable grounding pole (system ground). Usually phase - armor (ground) fault, should be connected to this grounding pole to the outer armor of the cable; phase - phase fault, the grounding pole to one of the fault phase, and then reliably connected to the system ground.

10, protective ground: for the safety protection of the chassis set up grounding, should use a special grounding wire must be individually connected to a reliable grounding pole.

**(If the site grounding conditions allow as far as possible away from the cable grounding, separate grounding, grounding resistance of less than 6 ohms)**.

# V. Touch Screen




1、Voltage setting: Click on "Voltage preset value" to set the voltage. The setting range is 6-32 kV;

2、Boost control: After setting the preset voltage, in the "Boost operation" interface;

① Click the "Start" button, the machine will automatically boost the voltage, the boost indicator turns green; (before starting, the emergency stop/start switch must be rotated clockwise and automatically popped up, at this time, the emergency stop/start switch is in the start state, before boosting the voltage)

② When you click the "Stop" button, the machine will stop boosting and the boost indicator will turn red.

3、Pulse Output: After the boost is set on the screen, the "Pulse Output" screen will be displayed;

① Click the "Single" button, the instrument will output a single pulse and stop automatically;

② Click the "Continuous" button, the instrument works in the continuous high voltage pulse mode, and the continuous pulse indicator turns green;

③ Click the "Stop" button, the instrument stops continuous high-voltage pulse output, and the continuous pulse indicator turns red.

4、Discharge time: Discharge time is automatically displayed according to the set voltage.

5、Working time: real-time display of the instrument's continuous pulse working time.

# VI. Instructions For Use

After all the wires of the device are connected, please self-test the device first.

The self-test process is as follows:

After power on, the alarm lamp starts to work, under the voltage mode, set the voltage 6 kV, rotate the start/emergency stop button, and then select start under the boost operation interface, at this time, the alarm lamp goes out. When the voltmeter pointer starts to rise, select Continuous under the Pulse Output menu, and after 4S, you will hear the sound of action inside, and at the same time, the voltmeter pointer will fall back. After a few discharge cycles, then press the start/emergency stop button, there is action sound inside the device, at the same time, the discharge indicator light on the panel is always on, when the discharge indicator light is off, the device automatic discharge has been completed.

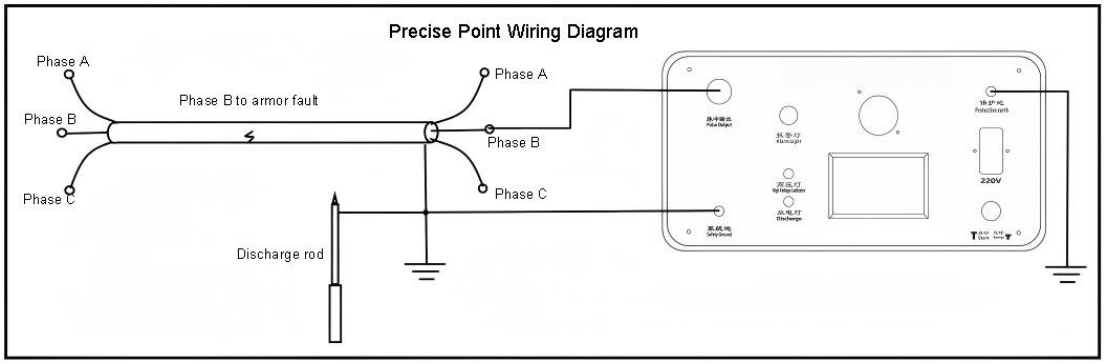
After completing these operations, it can be proved that all functions of the equipment are normal and the test operation can be carried out.

After the self-test is completed, there is no need to stop, you can directly set the desired voltage (it is generally recommended to step up the voltage sequentially from low to high), and operate according to the normal process.

**A. Pulse output mode**

This mode is used for multiple pulse method test, current impulse flash method test, fault location and other work, can output a single high-voltage pulse or continuous high-voltage pulse, continuous pulse period of 4s ~ 8s.

This section describes the operation process in detail in the way of fault fixing, and other references are made to the corresponding wiring schematic diagrams.



**1. The whole machine wiring steps:**

a. Pulse output wiring: red high-voltage cable plug in the panel "pulse output" jack, clip end of the fault cable core.

b. Capacitor grounding wiring: the black test cable plug end is inserted in the panel "capacitor grounding" jack, and the black clip end is connected to the system ground at the test site.

c. Protective grounding wire: a dedicated 4-meter ground wire, one end of the clamp clamp panel "protective grounding" terminal, the other end of the clamp to connect the site grounding brazier. The location of the grounding brazier must be away from the "system ground".

(Special note: In the distribution room, if it is not possible to insert a grounding braze, "capacitor ground" is connected to the system ground, and "protective ground" is connected to the yellow and green ground rows on the enclosure wall of the distribution room. (Confirm on site that the system ground and the yellow and green ground rows are independently grounded). The site confirms that the system ground and the yellow and green ground rows are independent of each other.

d. Wiring of the remaining cable cores: In addition to the high-voltage line applied to the faulty phase core, the remaining cable cores and armor are short-circuited to the system ground.

e. Discharge rod wiring: Discharge rod with 3 meters of single-ended clamp line, clamp to the system ground.

**2. Check**:

Check in turn whether the switch is in the "off" state, whether the emergency stop button is pressed, whether the wiring is correct. If the check is normal, turn on the working power 220V.

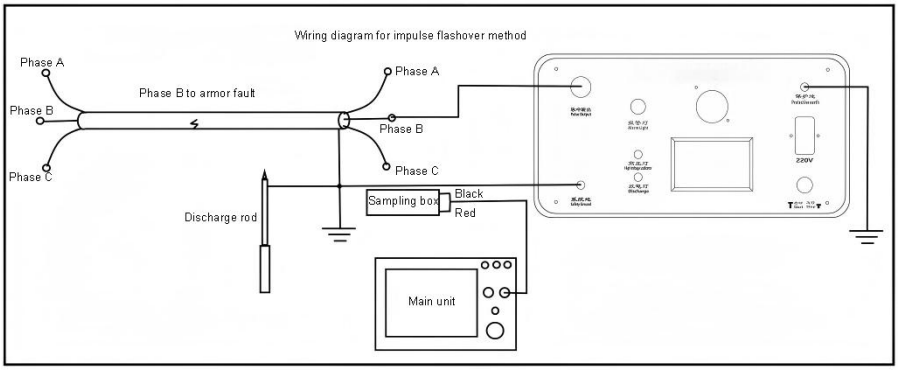
**3、 Operation**:

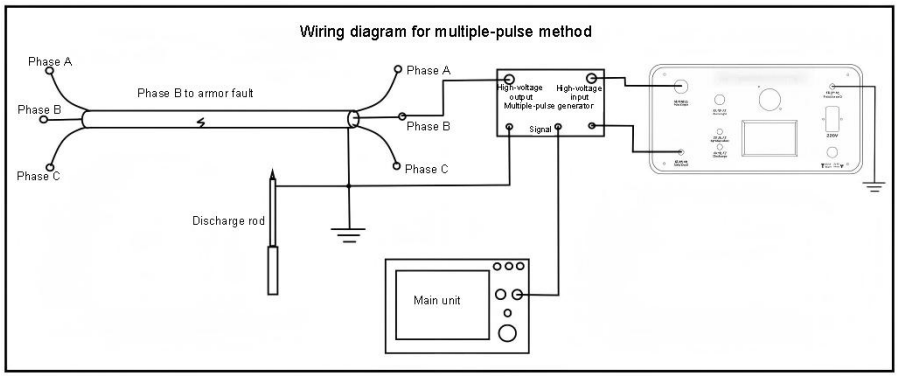
Open the switch, touch the screen light, discharge time display 3s, clockwise rotation of the "emergency stop" button to start, and then click on the screen "voltage preset value", set the voltage, and then in the "Boost operation Click the "Boost" button in the "Boost Operation" interface, when the expected voltage is reached, click the "Single"

button in the "Pulse Output" interface, and then the instrument will make a sound and the voltage will be increased. When the desired voltage is reached, click the "Single" button in the "Pulse Output" interface, and then the internal sound of the instrument will be emitted, and the voltmeter voltage will swing from high to low to high. If this change occurs, it means that the fault point has been discharged, you can directly click on the "continuous" button, indicating continuous output of high-voltage pulse; if there is no such change, it means that the voltage is low, you can continue to raise the voltage, and then operate and observe again until the fault point is discharged.

**4、Downtime**:

After the fault point is determined, click "Stop" button in "Pulse Output" interface, click "Stop" button in "Boost Operation" interface, and then press "Emergency Stop" button, after about 5 seconds, the panel "Discharge Indicator" light turns from bright to dark, and the voltage meter shows that the voltage returns to about 0kV. "button, and then press the "emergency stop" button, about 5 seconds later, the panel "discharge indicator" light from bright to dark, the voltmeter shows that the voltage is back to 0kV or so, turn off the switch, with a discharge rod to discharge the residual power of the cable under test. Wait for about 5 seconds, remove the equipment power line, high voltage output line, cable grounding line, and finally remove the protective grounding line and discharge rod.






# VII. Precautions

1, This instrument is an integrated high-frequency high-voltage power supply, is a cable fault test of the impact of high-voltage special equipment.

2, This instrument is a one-piece automated highly integrated high-voltage equipment, such as in the case of special cable faults [such as dead ground (multimeter test resistance value close to zero), special high-resistance faults (resistance value greater than 200 megohms)], because of the built-in system integration, is not suitable for the use of the device test, please choose to use other high-voltage source (test transformer) test or contact with the manufacturer.

3、When the machine stops discharging automatically, wait for about 5 seconds, the discharge indicator will turn from bright to dark. In case of sudden power failure and other abnormal conditions, the host will also automatically start the backup power discharge, it is recommended to use the discharge rod again at the cable end to release the capacitor residual power.

4, This instrument has a high pressure, encounter abnormalities, please contact me quickly, the user may not be disassembled and repaired without authorization, so as not to cause further damage to the instrument, and even threaten the user's personal safety. Failure or damage caused by the user's private repair and disassembly will not be warranted.

**5. If the voltage meter pointer shows a certain voltage setting during use, and the meter head does not fall back after several discharge cycles, and no sparking sound can be heard inside the device, please press the emergency stop button and turn off the power. Wait a while and restart the test. If there is no sound of**

**movement inside the device after restarting several times, please contact the manufacturer.**

**Important Tip:**

**Please follow the instructions for use!**

**This product is a high-voltage device. Some fault phenomena may cause discharge or open flame. Please note that it is strictly forbidden to use it in a high-gas or high-concentration flammable gas environment. In the event of such a situation, please contact the manufacturer to take other measures to test. The manufacturer is not responsible for any safety accidents that occur as a result!**

# Packing List

| Functional Unit | No. | Instrument Name | Qty |
|---|---|---|---|
| cable fault Test unit | 1 | Cable Fault Tester Charger DC12V 3A | 1 |
| | 2 | 4-core aviation plug clip cable | 1 |
| | 3 | Current sampling box | 1 |
| | 4 | Discharge rod | 1 |
| | 5 | Discharge rod transparent grounding wire | 1 |
| cable fault Fixed-point unit | 1 | Positioning instrument host computer(Lithium battery powered) | 1 |
| | 2 | Positioning instrument lower unit | 1 |
| | 3 | Positioning instrument connection cable | 1 |
| | 4 | earphone | 1 |
| | 5 | Handle | 1 |
| | 6 | Ground needle(Special for positioning on soft ground) | 1 |
| | 7 | Positioning device charger | 1 |
| Cable path Detection Unit | 1 | Cable path signal generator | 1 |
| | 2 | power adapter | 1 |
| | 3 | Path signal output test line(One red and one black) | 2 |
| Integrated | 1 | Integrated high-frequency high-voltage power supply | 1 |

| | | | |
|---|---|---|---|
| high-frequency high-voltage power supply | 2 | Cable Coil | 1 |
| | 3 | Combined test lines | 1 |
| | 4 | Red high-voltage line(Two-prong plug) | 1 |
| | 5 | Black grounding wire(One end is a plug, the other end is a clip) | 2 |
| | 6 | Protective ground - grounding wire(5 meters long, with clamps at both ends) | 1 |
| | 7 | power cord | 1 |
| | 8 | jumper wire(0.8m, clamps at both ends) | 3 |
| | 9 | signal line | 1 |
| | 10 | Ground Rod(One protective ground wire and one spare cable ground wire) | 2 |