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## **DGFL-20**

# **DC GROUND FAULT LOCATOR**

## **User Guide**

## INTRODUCTION

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The DC system ground fault locator, is used for power station and transformer substation DC power system ground fault locating and pinpointing.

It adopts isolate programmable constant flow source to insert small current single to find the faulty point quickly, accurately and safely.

The waveform analysis method real-time calculate and display the resistive current value, the current direction and check the ground current waveform directly.

Device effectively get rid of the system distributed capacitance interference and solve the locating of

- high resistance ground
- low resistance ground
- AC in DC ground
- instant ground
- impulse interference
- loop ground
- single-point, multiple point ground and so on



Signal transmitter



Clamp



Locator

Fig.1 DC ground fault locator

## FUNCTION CHARACTERISTICS

- power on to locate the earth ground fault on-line
- AC into system testing function to avoid the device damage of AC in
- Auto test the DC system voltage and auto adjust output voltage for 220V,110V,48V,24V DC system
- intelligent distinguish the ground state and auto alarm when grounding
- indicate the current direction, test the loop resistance ground fault
- display the current waveform for checking the ground state to avoid the system distributed capacitance affect
- waveform analysis digital signal process technology to real-time calculate and display resistive current, rise testing sensitivity and max. test 200K defective insulation fault
- auto calculate and transmit suitable frequency while testing the DC system
- Signal transmitter supports both AC& DC power supply
- auto low battery level alarm
- auto power off when no operate in 60 minutes and low battery

## TECH. SPECIFICATIONS

- Adopt for DC voltage level 220V、 110V、 48V、 24V。
- Power supply of signal transmitter: DC screen supply(220C,110V)
- Or AC 200V.If use this method, the signal transmitter will cut the DC power supply circuit, and priority of use the AC power supply.
- Locator power: built-in Lithium battery, continue working for 20 hours. Charging for 8~10 hours.
- Clamp power: 2x AA Alkaline dry battery. Continue working for 10~20 hours
- Anti distributed capacitance to ground value: branch  $\leq 22\mu\text{F}$ , system total capacitance to ground  $\leq 150\mu\text{F}$
- Transmit frequency: 2Hz,1Hz,0.5Hz,0.2Hz,0.1Hz
- Transmitting frequency: 2Hz、 1Hz、 0.5Hz、 0.2Hz、 0.1Hz
- Input system signal current effective value  $\leq 5\text{mA}$ , open circuit output voltage peak value  $\leq 35\text{V}$
- Range of the ground resistance of signal transmitter online running (and not include the balance resistance):

\*System voltage +220V, 0-200 K $\Omega$

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\*System voltage + 110V, 0-100KΩ

\*System voltage + 48V, 0-40KΩ

\*System voltage + 24V, 0-20KΩ

- Clamp dynamic range: clamp double root value (clamp the positive and negative bus-bar) range: 0~100A (load) ; clamp single root value: -5A~+5A
- Power consumption: transmitter <2W, locator <0.5W
- Use environment : tem. + -40°C, humidity 10~90% RH, elevation <4500m
- Signal transmitter 195mm×112mm×65mm, 0.8kg

locator 195mm×112mm×45mm, 0.55kg

clamp 180mm×60mm×35mm, 0.21kg

## PHYSICAL CHARACTERISTICS

One system includes:

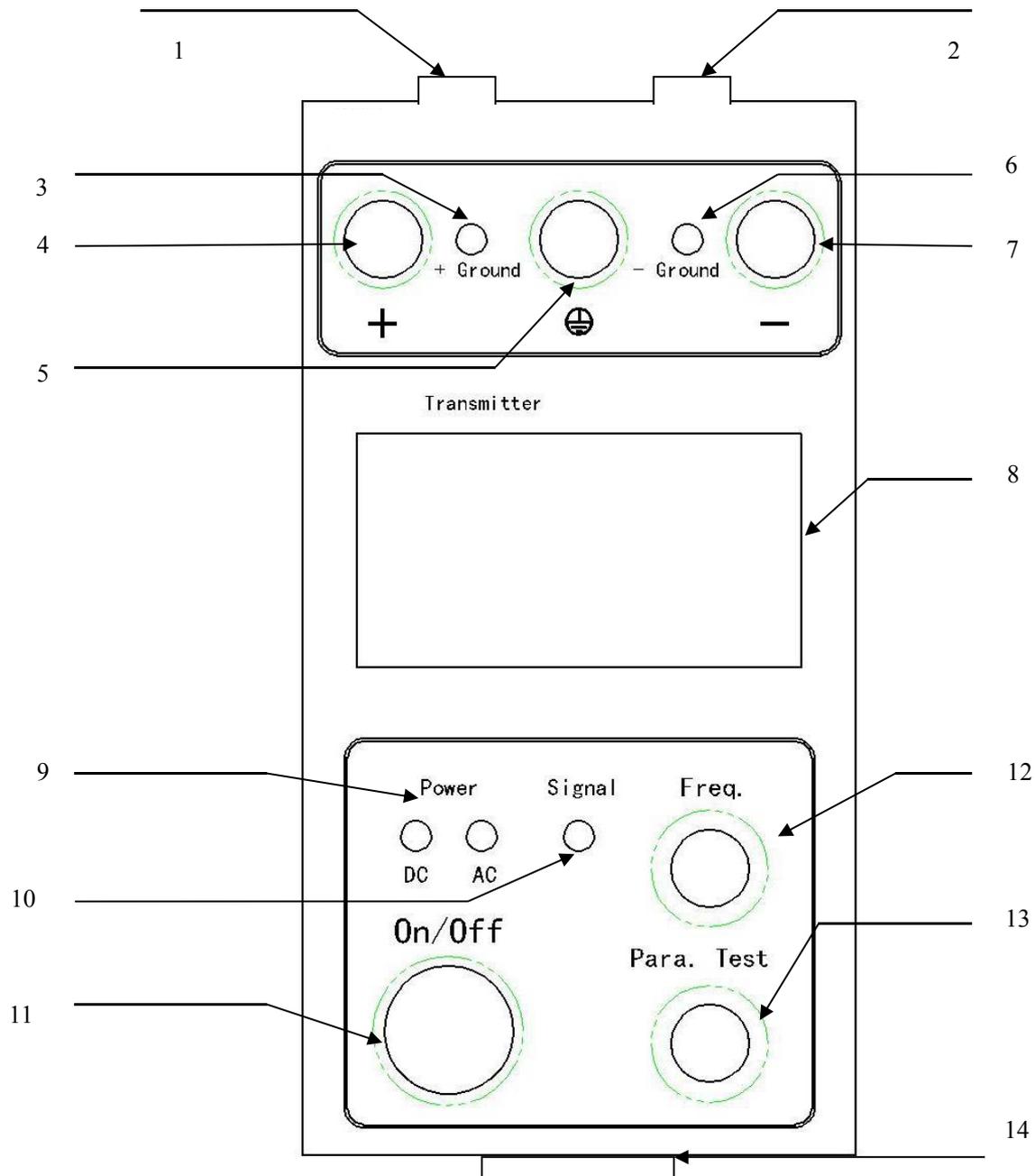
Signal transmitter x 1

Main locating unit x 1

Clamp x 1

**DC system ground fault locating signal transmitter:**

Appearance:



1: positive export insurance: signal positive export insurance

2: negative export insurance: signal negative export insurance

3: bus-bar ground indicator: indicate the positive bus-bar ground status. When + bus-bar ground, the light on

4: DC positive bus-bar port: connect with the DC power supply positive pole

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5: ground port: connect with the grounding connector

6: negative bus-bar indicator: indicate the negative bus-bar ground status.

When - bus-bar ground, the light on

7: DC negative bus-bar port: connect with the DC power supply negative pole

8: LCD screen: display the transmitter work status and DC system parameter

9: power indicator: indicate the power status.

DC: light when DC power supply

AC: light when AC power supply

10: signal indicator: indicator signal output status. When signal output, the indicator flash rate is same as the signal output rate

11: power on/off: on or off the transmitter

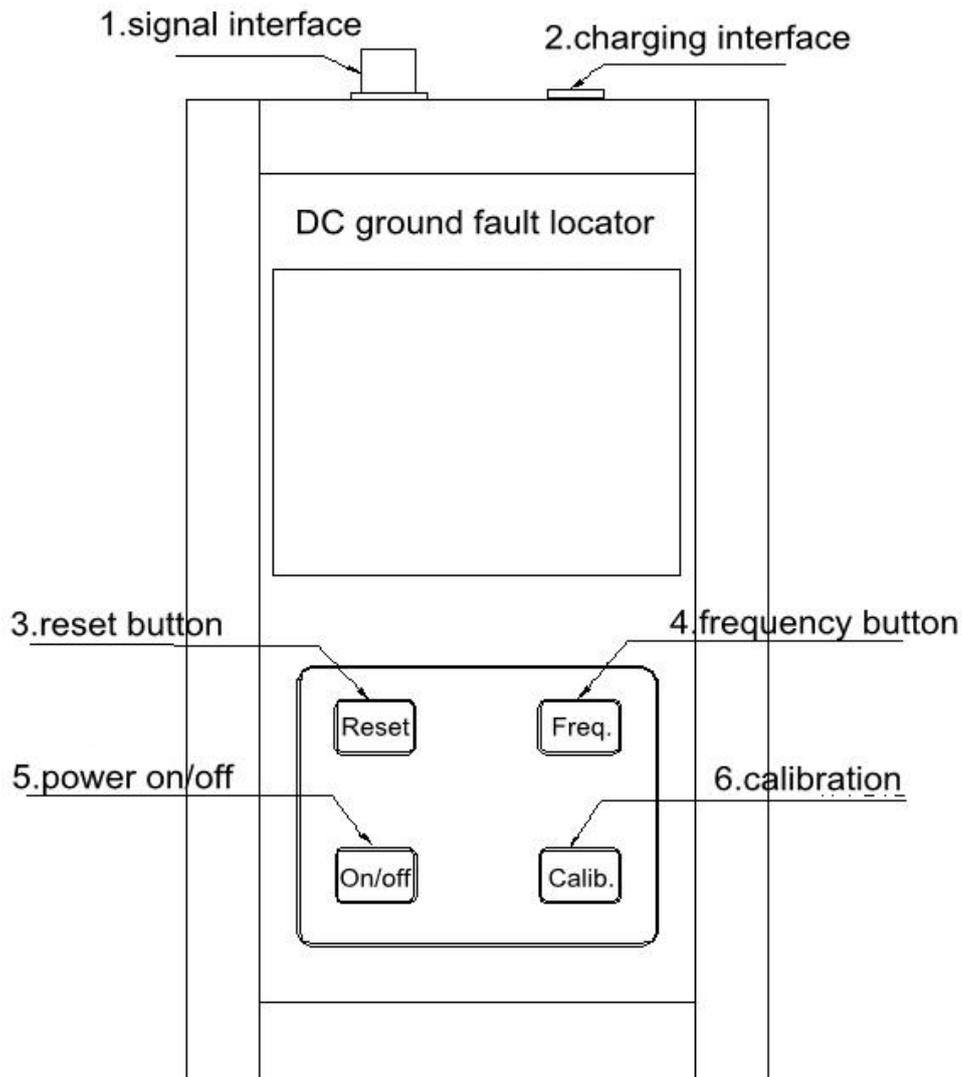
12: frequency adjust knob: adjust the transmitter output signal frequency

13: parameter testing knob: test the DC system parameter

14: AC220V power port: AC power supply of the transmitter with power protection. No need to connect when power from 220V,110V DC system

## DC system ground fault locating main unit

Appearance:



1: signal interface: connect with the clamp

2: charging interface: charging for the built-in battery

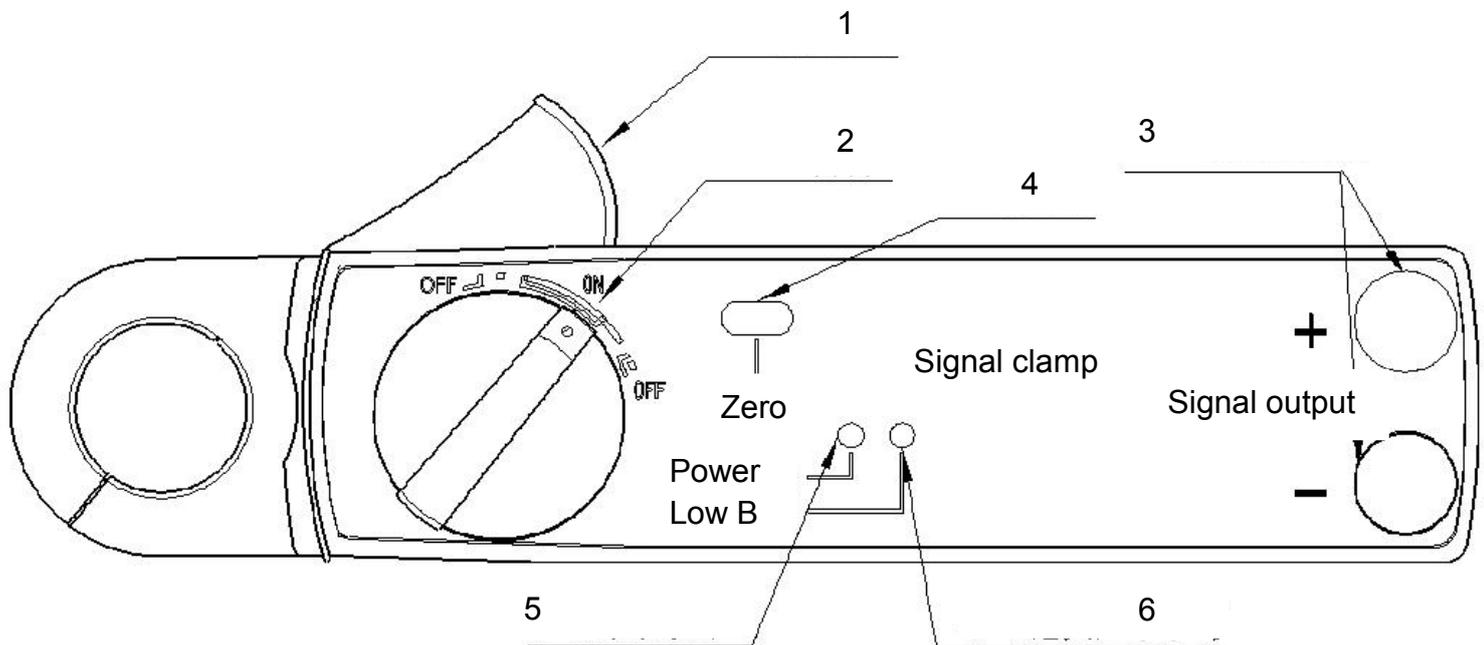
3: device reset to sample and process data

4: set device frequency parameter

5: device power on or off

6:calibration button: record the ground current direction for loop testing reference

**DC system ground fault locating clamp:**



1: clamp hand shank: press to open the clamp

2: power on/off: clamp power on/off

3: signal output interface: clamp voltage output interface

4: zero reset button: clamp output signal electrical level zero setting

5: power indicator: light while work power supply normal

6: low battery indicator: light when low battery level and indicate to change new battery

## APPLICATION METHOD

If DC system has solid ground line selection device, to close it when locate the ground fault. And pull up the insulation alarm relay to avoid test accuracy.

### **DC system ground fault locating signal transmitter :**

#### 1. Wiring:

Power off the transmitter and connect the positive, negative, ground wire with the DC system according position.

Red clip to connect with the power positive (+220V,+110V,+48V,+24V)

Black clip to connect with the power negative (0 V)

Green clip to connect with the system earth wire

#### 2. Power supply:

Use the DC power supply when 220V,110V DC system

Use the 220V AC power supply when 48V,24V DC system or no DC power

#### 3. Use steps:

After wiring the transmitter, power on and the screen will display software information and in 2s, device enter the testing status, display as below:

TESTING  
PLEASE WAITING...

If any AC in DC system, the device will alarm with audio, and display as below:

AC IN  
VOLT: AC 220V

If not, device will finish the DC system parameter testing in 60s, display as below:

Transmitting frequency: 2Hz
Output voltage: 150V
Output current: 10Ma
Ground resistance: 105k

\* the transmitting frequency is the best output frequency that the transmitter calculated according the tested result

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\*when positive bus-bar ground, the positive ground indicator light

\*when negative bus-bar ground, the negative ground indicator light

If need to test the parameter again, press the PARAMETER TEST button and device will test and display parameter.

Press FREQ. button to set the transmitting signal by hand

### **DC system ground fault locating locator :**

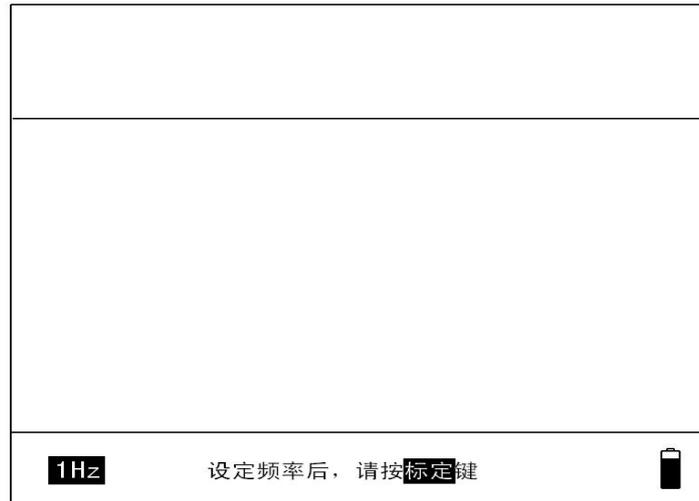
#### 1. Frequency setting and direction calibration

Connect the clamp line with the locator and open the clamp power. Then press the locator power button over 1s to enter the start interface. After 2s, device will display the operation tips as below:

#### Operation tips

- 1.power on the clamp
- 2.clamp the transmitter ground line with the clamp
- 3.Press FREQ. button to set frequency same as transmitter frequency
4. Press CALI. button

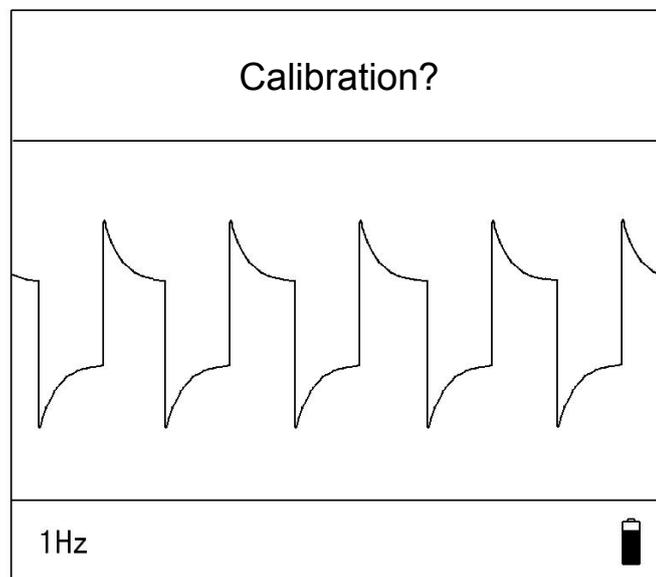
Follow the steps, after clamp on the signal transmitter ground line, press FREQ. button to enter the frequency setting interface as below:



After set frequency press **CALI.** button

After set the frequency, press CALI. button to enter the calibration interface.

\*please notice, after confirm frequency, if need to adjust, restart the device to change

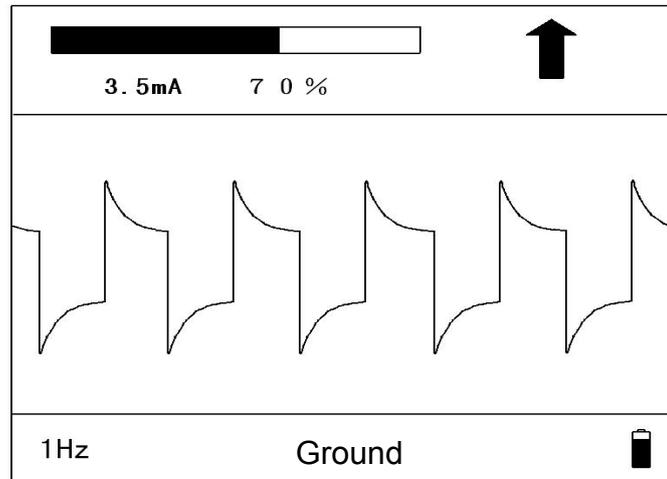


When screen display **Calibration?** Press CALI. button to calibrate after the waveform stabilization.

This process need about 5~20s according different frequency.

After calibration, the locator will record the transmitting signal phase

position and display the current direction arrow. Screen display as below:



The arrow in the pic. is the current direction. Before fault point, the arrow is upward. If loop ground, arrow is downward when behind the fault point.

In the upper part of screen, there will be the current value display and meanwhile show the current waveform. If system has ground, the screen bottom will have Ground indicating and audio alarm.

**\*PLEASE NOTICE DON'T POWER OFF BEFORE FIND THE GROUND FAULT POINT. OTHERWISE NEED TO SET FREQUENCY AGAIN AND CALIBRATION.**

After calibration locator will enter the testing status. Clamp the target branch. Press Zero button on the clamp and then press RESET button on the locator.

The locator will display Reset and re-test to display the testing result.

The longer time to test, to get the more accurate testing result.

Every time to test the branch, need to press the Zero and Reset button.

## 2. Pinpointing

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Locating the ground fault is using the clamp to test the resistive current flow through the grounding fault point. Branch has ground fault will have resistive current. Branch has no ground fault will not exist resistive current. The branch has no ground fault but high ground capacitance will only exist the capacity current but no resistive current

### 1) Pinpointing steps introduction:

#### A. Tree viewer fault locating

- a. Distinguish branch, clamp bundle line, double line or single line. Press RESET button and device re-test. If high ground resistance, device no ground alarm and to distinguish whether branch ground through checking the current waveform. If the ground resistance is near or less than rated value, the locator display ground and will has audio alarming
- b. If ground, to check the branch downward, and then checking smaller branch until find the final connecting lead
- c. If known branch grounding in advance, clamp following the line. If has ground waveform or ground alarming, it means the fault point is in the behind. If clamp until the end terminal still no indicating, the fault point is in the line section between existing ground waveform and no ground waveform.
- d. If clamp until the line end terminal, and find always has ground waveform, it means the fault point in the terminal device

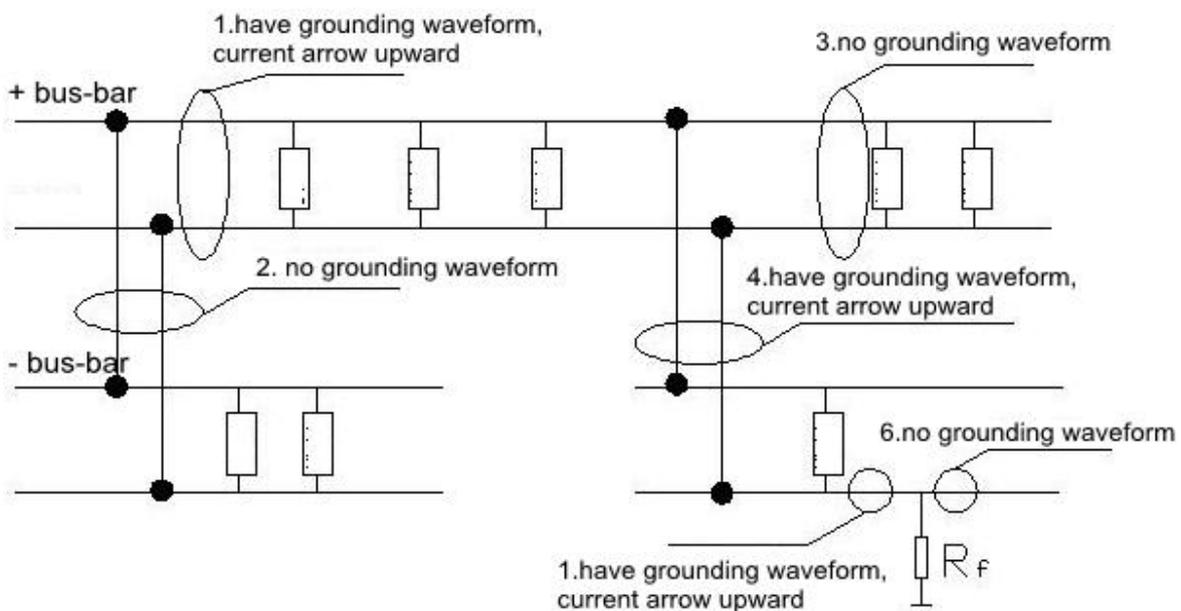
B. If no ground in the branch, it need to check the bus-bar and the insulation monitoring device and the alarming relay device.

C. If still no ground in all above part, check the accumulator

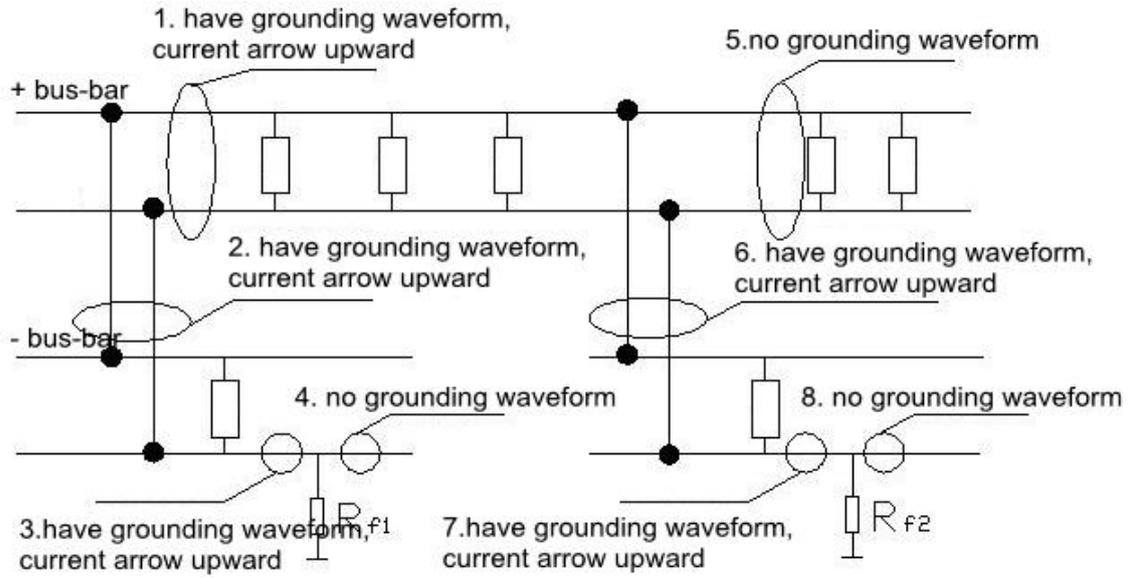
D. If system has loop ground, the position where reverse the current arrow of screen is the ground point.(please notice, the clamp current arrow will keep the direction)

2)Typical fault point pinpointing process:

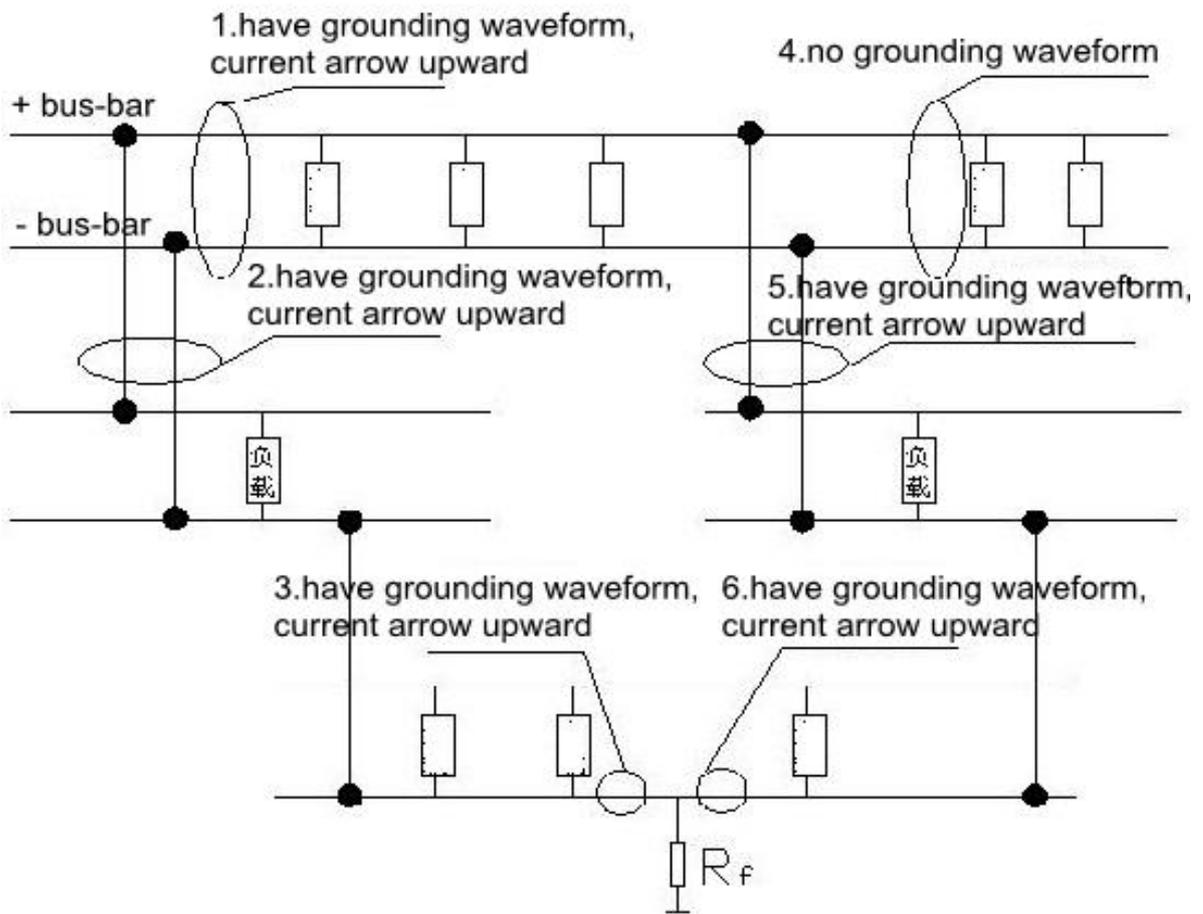
A. Single point grounding pinpointing, as below:



B. Multiple points grounding pinpointing, as below:



C. Loop grounding pinpointing, as below



### 3. Typical waveform

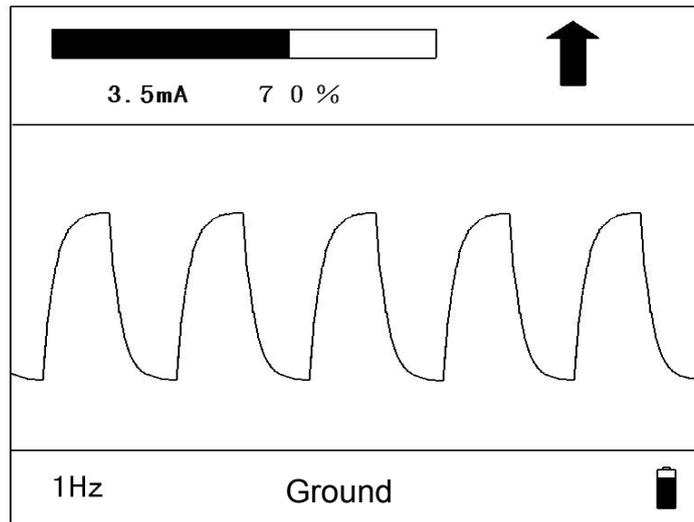
When system has high ground distributed capacitance, the capacity current of branch will also largen. And this will effect the branch resistive current accuracy and make the measureable ground resistance decline. When ground resistance value is high the auto alarming will invalid, and now user can check the waveform to distinguish whether it's capacity ground or resistance ground.

Waveform characteristic as below:

#### A. Ground branch:

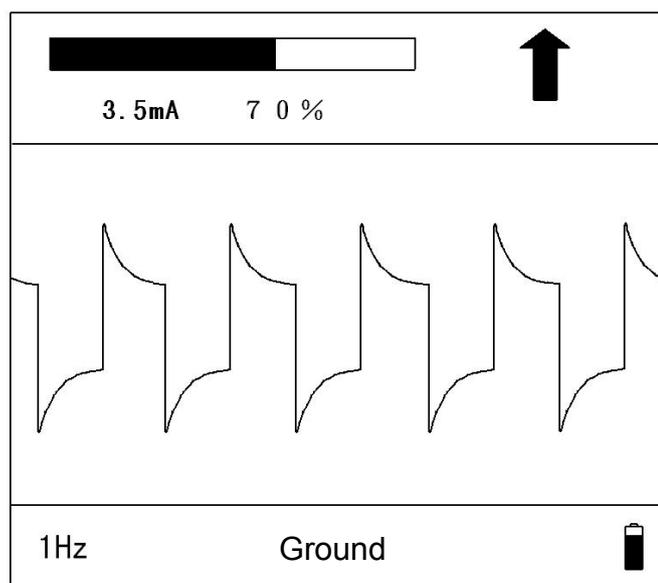
The waveform is similar as rectangle. The higher system ground capacitor the waveform has more slowly change.

The smaller ground resistance, the bigger waveform amplitude. Shape refer below:



B. Big power capacitance and ground branch

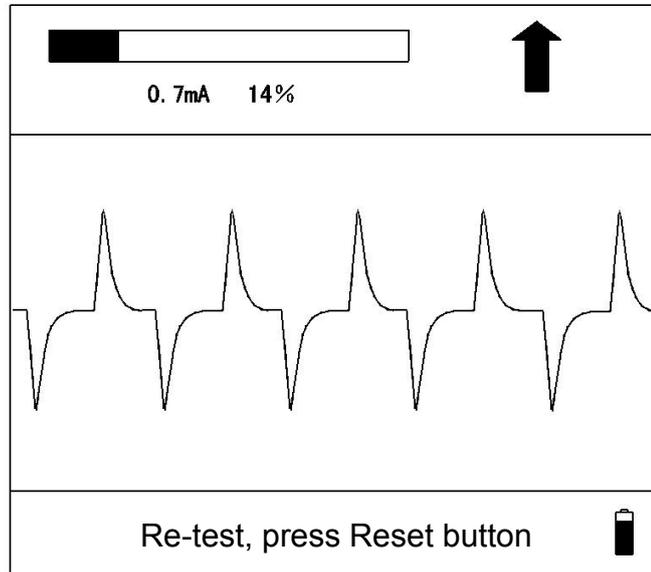
Waveform has sharp variation and there's peak in the front side. The bigger power capacitor the sharper peak. The smaller power resistance the bigger waveform amplitude. Refer below:



C. Big power capacitor no ground branch

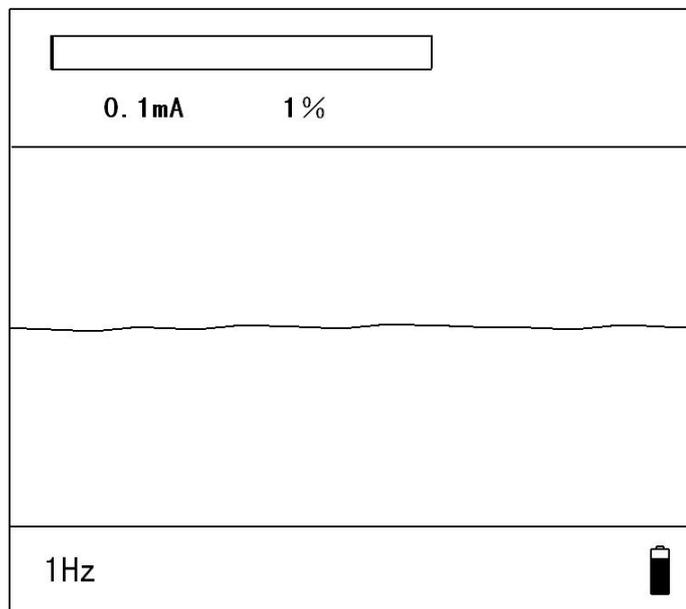
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Waveform front sharp and back edge slowly change. The bigger ground power capacitor the bigger waveform amplitude. Refer below:



D. No ground branch:

Waveform is similar as straight line, refer below



**ATTENTIONS:**

1. Connect the transmitter with the bus-bar or faulty branch. Notice the connect wire polarity: the red line connect with the positive bus-bar, the black line connect with the negative bus-bar, the green line connect with earth
2. If the DC system install stationary ground selection testing device, before testing should close the selection device and pull up the insulation alarming relay to avoid testing accuracy reducing
3. Because the clamp has high sensitivity, please try to keep the clamp static and reduce clamp shake. Or the geomagnetic field may affect the testing result
4. Device auto power off when low battery or no operate in 60m
5. Battery checking and changing

\*When using, pay attention for the clamp and locator battery status

Locator support built-in chargeable lithium battery. Normal charging time is about 8 hours, if emergency, charging 10~15 min, can support 30~50m using.

\*clamp adopts common high capacity Alkaline dry battery.

PLEASE NOTICE CLAMP HAS NO AUTO POWER OFF FUNCTION.

PLEASE NOTICE THE BATTERY POLARITY