EAGLOTEST

S180D+

CABLE IDENTIFIER







USER MANUAL

CATALOG

Safety Warnings **1**

Introduction **3**

Specification **4**

3.1 Standard and Working Condition 4

3.2 Transmitter 4

3.3 Receiver 6

Structure **11**

Operation **13**

5.1 Basic Operation 13

5.2 Transmitter Operation 16

5.2.1 Self Checking for DE-energized Cable Identifier 17

5.2.2 Wiring Method for DE-Energized Identification 20

5.2.3 Self Checking for Energized Cable Identifier 25

5.2.4 Wiring Method for Energized Cable Identification 27

5.3 Receiver Operation 32

5.3.1 Calibration 33

5.3.2 Energized Cable Identification 36

5.3.3 DE-energized Cable Identification 43

5.3.4 Using Method of the Detector 47

5.3.5 Voltage Measurement 49

5.3.6 Current Measurement 49

Battery Management 51

Packing List 52

SECTION 1

Safety Warnings

Thank you for purchasing S180D+ Multi-Functional Cable Identifier! Before using the models, please carefully read the user manual and strictly follow the instruction. Eaglotest is not responsible for the loss caused by the operator's failure to comply with the operating procedures of this manual or for violation of the safe working procedures of the operator.

- Warning! This equipment must be used by a skillfully trained, certified/licensed, and evaluated person.
- Pay attention to the text and icons on the panel and back panel of the instrument.
- The operator must fully understand the user manual and be proficient in operating the instrument before performing the field test.
- Before using, make sure that the instrument and accessories are in good condition without damage to the insulation or disconnecting wires.
- Pay attention to the measurement range and operating environment stipulated by this instrument.
- It is normal for the coupling clamp to produce sound when transmitting signals.
- It will generate a large magnetic attraction force when the coupling clamp transmits a signal. It is forbidden to open the jaws. The jaws can only be opened after switching off the transmitter.
- It is strictly forbidden to connect the red and black test leads to the live power cable when using the direct connection output mode.
- To ensure personal safety, Cable Puncture Test must be performed on the identified cables before maintenance.
- It is forbidden to use if the rear cover of the instrument and the battery cover is

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not secured properly.

- Make sure that the connecting plug of the test lead is firmly inserted into the terminal.
- Under humid conditions, replace the battery or stop using the device.
- It is prohibited to test in flammable and hazardous locations.
- The test leads must be removed from the conducting wires before they can be pulled out of the instrument, and the output port cannot be touched to avoid electric shock
- Do not use it in a strong electromagnetic environment, so as not to affect the normal operation of the instrument.
- During operation, if the metal is exposed due to the breakage of the casing or test leads, stop using the instrument.
- Do not use the instrument in hazardous atmospheres with high temperatures and humidity. Do not store it under direct sunlight or in condensed fields.
- The device must be maintained regularly to keep it clean. It is not allowed to wipe with corrosive agents and rough objects.
- If the device is not used for a long time, please remove the battery or charge it in time.
- Pay attention to the polarity when replacing the battery. If it can not be replaced, please contact the manufacturer.
- Only authorized personnel can disassemble, repair the instrument, and conduct regular maintenance.
- Stop using the instrument immediately in case of any danger will be caused by continuing to use it. Please securely pack the equipment and send it to an authorized organization for disposal.
- The user must follow the instructions and dangerous warnings to perform a safe operatio

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Introduction

The S180D+ is a **Live Cable Identification** device designed specifically to solve cable identification technology issues. It features live cable identification, DE-Energized cable identification, AC current testing, and AC voltage testing capabilities. It can accurately identify a specific target cable from multiple cables, thereby maximizing the prevention of accidental cutting of live cables and the resulting serious accidents.

Feature:

- DE-Energized Identification
- Energized Cable Identification
- AC current test
- AC voltage test

Energized Cable Identification

Use signal coupling output pulse width frequency signal, transmitting four frequencies: 625 Hz, 1562 Hz, 2500 Hz, and 10000 Hz;Detection is also directional.

DE-Energized Identification

Use direct connection output pulse width frequency signal, transmitting two frequencies: 1562 Hz and 2500 Hz;Detection is also directional.

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Specification

3.1 Standard and Working Condition

Parameter	Standard	Working Condition	Remark
Ambient Temperature	23℃±1℃	-10℃ ~ 40℃	/
Environmental Humidity	40% ~ 60%	< 80%	/
Voltage and Current Frequency	50Hz±1Hz	45Hz ~ 70Hz	Detect voltage and current
Voltage of Receiver	7.4V±0.5V	7.4V±1V	/
Voltage of Transmitter	11.1V±0.5V	11.1V±1.5V	/
External Electric Field, Magnetic Field	Should be avoided		
Position of Cable under test	In the center position of the flexible current clamp		

3.2 Transmitter

Function	Transmitting frequency current signal; Indicating remaining battery voltage and transmission status
Battery	Equipped with 11.1V large-capacity rechargeable lithium battery, when fully charged, it can work about 8 hours

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SECTION 3

Output Method	For the live cables, use clamp coupling method. For dead cables, adopt direct connection.
Transmit Frequency	Frequency of energized cable identifier：625Hz, 1562Hz, 2500Hz or 10000Hz Frequency of DE-energized cable identifier：1562Hz or 2500Hz. Press the Up and Down Arrow to select frequency.
Length of Test Lead	3m red and black test lead, one per color; crocodile clip;
Size of Transmitting Clamp	L250mm×W140mm×H35mm
Inner Diameter of Transmitting Clamp	ϕ105mm
Lead Length of Transmitting Clamp	3m
Size of Earth Probe	L225mm×W100mm×H10mm
Size of Transmitter	320mm×275mm×145mm
Display Mode	Large LCD with backlight, displaying the remaining battery voltage in real time
Size of LCD	L128mm×W75mm；Display Area: 124mm×67mm
Size of Outer Package	L400mm×W245mm×H335mm
Operating Temperature	-10℃～40℃
Storage Condition	-20℃~50℃，≤95％RH, no condensation

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Backlight	White backlight
Operation Temperature	-10℃ ~ 40℃
Storage Condition	-20℃~50℃，≤95％RH, no condensation
Weight	Transmitter: 2.5kg；Transmitting Clamp:1.12kg；Total: 4.44kg（including receiver）
Battery Level	When the battery voltage is lower than 9.65V, it shows low battery voltage icon, reminding to charge the battery; when it is lower than 9.5V, the device will automatically shut down
Charger	12.6V 1A DC
Charging Interface	Round shape，DC
Anti-pressure	Integrated special tool box design, bearing a pressure of about 200kg
Dielectric Strength	AC 3700V/rms
Electromagnetic Properties	IEC61326(EMC)
Safety Regulation	IEC61010-1(CAT Ⅲ 300V、CAT IV 150V、Pollution Level 2)

3.3 Receiver

Function	Live cable identification; dead cable identification; AC voltage, current, frequency measurement

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Battery	7.4V large-capacity rechargeable lithium battery; USB charging interface; when fully charged, it can work for about 6 hours
Receiving Frequency	Press Left and Right Arrow Button to select receiving frequency: 625Hz, 1562Hz, 2500Hz or 10000Hz
Gain Intensity	Press Left and Right Arrow Button to select gain intensity:1dB, 10dB or 20dB
Rated Current	300mA max
Display Mode	3.5-inch TFT LCD screen display, color icon indication
Signal Calibration	Calibrating one to ten cables
	Calibrating the transmit signal: When the current percentage of the receiving signal and the transmitting signal is between 75% and 135% of the calibration value, the cable is successfully recognized.
	Calibrating multiple cables at one time; After being calibrated, the test frequency and gains cannot be changed, otherwise it needs to be re-calibrated.
Direction Recognition	When the transmitting clamp, receiving clamp and loading signal is in the same direction, the direction can be successfully recognized.

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Recognition Result	Green tick icon indicating successful cable identification (√)
Non-target Cable	Red-orange cross icon indicating non-target cable (×)
Size of Receiver	L207mm×W101mm×H45mm
Flexible Clamp	L: about 620mm， Diameter of Lead: 8mm
Inner Diameter of Coil	ϕ200mm, customized
Length of Lead	Flexible Clamp: Appro 3m
Size of Detector	L111mm×W60mm×H27mm Detector is optional.
Length of Lead	Detector： Appro 3m
Voltage Lead	L:1m , red and black lead, one per color
Detection Range	Dead Cable Identification: The coil can detect the pulse signal with loop resistance ranging from 0Ωto 8kΩ. When the resistance reaches 8kΩ, it is necessary to ensure that the battery power of the transmitter is more than 11V. Depending on the grounding resistance and cable resistance, it can identify cables of max length 20 kilometers.

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SECTION 3

	Live Cable Identification: The coil can detect the pulse signal with loop resistance ranging from 0Ωto 200Ω. When the resistance reaches 200Ω, it is necessary to ensure that the battery power of the transmitter is more than 11V. Depending on the grounding resistance and cable resistance, it can identify cables of max length 6 kilometers.
Ranging	AC Voltage： 0.00V ~ 600V(50Hz/60Hz)
	AC Current： 0.00A ~ 5000A(50Hz/60Hz)
	Frequency： 45Hz ~ 70Hz
Accuracy	AC Voltage：±2%±3dgt
	AC Current：±2%±3dgt
	Frequency：±2Hz
Identification Signal	Digital
Detection Rate	Appro one per second
Gain Adjustment	In the test interface, press the Left and Right Arrow Button to adjust the signal magnification, so that the received signal is effective and the gain adjustment is displayed stably.
Backlight Control	In the selection interface after power on, press the Up and Down Arrow Button to adjust the brightness of the LCD backlight

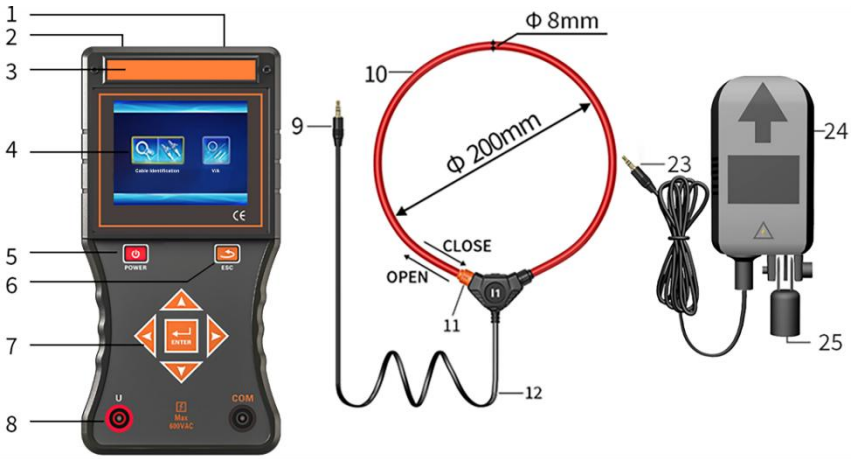
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Automatic Shut-down	After operating for about 1 hour, the device will automatically shut down to reduce battery consumption
Battery Voltage	When the battery voltage is lower than 6.5V, the low battery voltage icon will display, reminding to charge the battery
Charger	8.4V 1A
Charging Interface	USB
Working Temperature and Humidity	-10℃ ~ 40℃； below 80%Rh
Storage Temperature and Humidity	-10℃~50℃， ≤95％RH, no condensation
Weight of Receiver	Flexible Clamp: 172g； Receiver:370g(including battery)
Dielectric Strength	AC2000V/rms
Safety Regulation	IEC61010-1 CAT Ⅲ 600V，IEC61010-031，IEC61326，Pollution Level2

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Structure







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SECTION 4

Receiver:

1.Output Port

2.USB Charging Port(8.4V Charger)

3.Model Number

4.LCD Display

5.POWER ON/OFF

6.ESC KEY

7.ENTER KEY and Arrow Key

8.Voltage Socket

Flexible Clamp:

9.Output Port

10.Flexible Clamp

11.Press Lock

12. Lead

Transmitter:

13.Model Number

14.Direct Connection Port

15.LCD Display

16.Clamp Coupling Socket

17.Function Key

18.DC Charging Port（12.6V Charger）

Transmitting Clamp:

19.Transmitting Clamp

20.Jaw Trigger

21.Lead

22.Clamp Coupling Socket

Detector:

23.Lead, optional

24.Detector, optional

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Operation

5.1 Basic Operation

Transmitter

Press and hold the POWER button to switch on and off. Press the MODE1 key to enter the clamp coupling output mode and MODE2 key to enter the direct connection mode. When power is on, the default mode is clamp coupling. The LCD screen displays the transmission frequency, current battery level, and pulse signal. Press the UP key and the DOWN key to switch the transmitting frequency. Under direct connection, LCD display shows the current battery level and pulse signal. Press the LAMP key to switch the LCD backlight.

Receiver

Press the POWER button to switch it on and off. LCD displays the function menu. If LCD remains black after power is on, the battery may be low, please charge it. It will automatically enter the shutdown state after 1 hour and automatically shut down after 30 seconds without any operation. Press any button to exit the shutdown state, and the device can continue to work.

Function Menu:

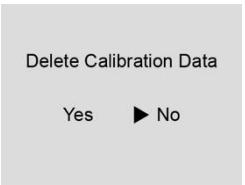
Cable Identification, including clamp coupling and direct connection; Voltage and Current Measurement. Press the Left and Right arrows button to switch and press ENTER key to confirm. Press the ESC key to exit. Press the Up and Down arrows key to adjust the lightness of the LCD.

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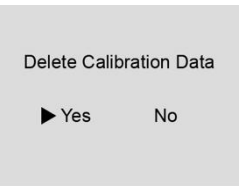
When you choose to enter cable identification for the first time after power is on, the following situations will appear：

1. There is no calibration data saved in the meter, and the meter normally enters the cable identification interface;

2. If there is calibration data saved in the meter, it will enter Delete Interface to show whether to delete all calibration data. Press the Left and Right arrows key to select Yes or No. If Yes, press the ENTER key again to delete data; If No, ENTER key again, it will not delete data. Then the meter automatically switches to the cable identification interface. Or press the ESC key to return to Function Menu.To identify a new cable, all previously saved calibration data must be deleted and the new cable re-calibrated. The interface for deleting the saved calibration data is as follows:



Select "No" to cancel



Select "Yes" to delete

Cable Identification Interface

The upper bar of the screen shows the cable number; the left bar shows the calibration status, frequency and gain; the right bar shows the measured current, calibration current, phase of the target cable and Recognition Results; the lower bar shows the battery level. Press the Up and Down arrows key to select the cable

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number, calibration, frequency and gain.

Select the cable number

Press the Left and Right arrows key to change cable number from L1 to L10.

Select frequency

Press the Left and Right arrows key to switch from 625Hz， 1562Hz, 2500Hz or 10000Hz.

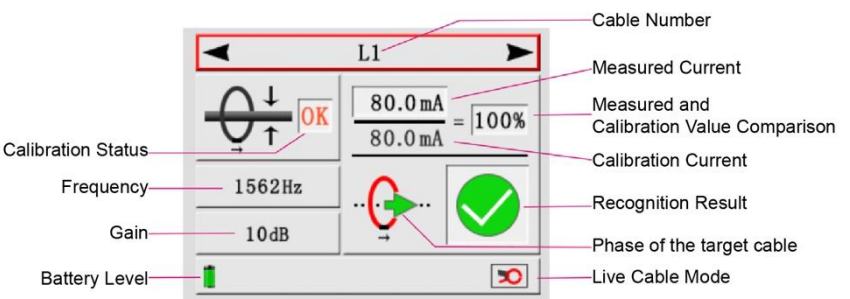
Select gain

Press the the Left and Right arrows key to adjust the intensity from 1dB， to 10dB or 20dB.

Select calibration

Press the ENTER key to calibrate the cables. After the calibration is completed, it is no longer possible to adjust the gain and frequency.

Introduction of Cable Identification Interface：



Voltage and Current Measurement Interface

The screen displays AC voltage, AC current , AC current frequency and battery level.

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Note	As used herein, "Near End Cable" refers to the end of the cable near the transmitter, and "Remote End Cable" refers to the other end of the target cable that needs to be Remote away from the transmitter.
	The flexible current clamp can be replaced by a stethoscope under normal circumstances, and it can adapt to some situations where the flexible current clamp is inconvenient to attach around the cable.

5.2 Transmitter Operation

Warning	This equipment must be used by a skillfully trained, certified/licensed, and evaluated person. The operator must strictly follow the safety rules, otherwise there is a risk of electric shock, resulting in personal injury or equipment damage.
	For dead cable identification, please ensure that the target cables are DE-energized and the conductor cores at both ends have been separated from the system.
	For live cable identification , there is no need to do any operation on the target cable, and the sheath at both ends of the pipeline must be well grounded.
	It is strictly forbidden to forcibly open the transmitting clamp when it transmits signals, so as not to damage the machine. The clamp can be opened and closed only after the transmitter is power off.

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Cable Voltage Detection under Direct Connection

Before dead cable identification, connect the red and black crocodile clips to the cable to be tested. Then switch to the direct connection output mode by operating the transmitter. The transmitter will detect the voltage at both ends of the red and black crocodile clips. If the detected voltage is greater than 50V, the transmitter will not output a pulse signal with an alarm. In this case, the user cannot identify the dead cable. If the detected voltage is less than 50V, the transmitter will output a pulse signal after counting down 5 seconds when the user can conduct dead cable identification.

Note: The transmitter only detects the cable voltage within the first 5 seconds when it switches to the direct connection output mode. Therefore, the user must first use the red and black crocodile clips to connect the cable, and then switch to the direct connection output mode to detect the external cable voltage, so as not to damage the transmitter.

5.2.1 Self Checking for DE-energized Cable Identifier

Dead Cable Identification

The transmitter adopts the direct connection method to load the signal. The voltage of the dead cable is not allowed to exceed 50V. If so, the transmitter will not output signal for dead cable identification so as to avoid damaging the transmitter.

The dead cable identification adopts the direct connection method by connecting the red output port of the transmitter to the metal cable,grouding the black

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output port of the transmitter, and transmitting signal to the metal cable.The Remote end of the metal cable must be grounded, but the Near End of the metal cable can not be grounded.

The direct connection method is suitable for power cables, communication cables, cathodic protection pipeline test points or other access points, and continuous metal structures with long-term characteristics. The direct connection method can get the maximum output current, so the direct connection method should be used as much as possible if conditions permit.

Self Checking method of DE-energized Cable Identifier

1. Please check the status of the transmitter before connecting the red and black leads of the transmitter to the cable.
2. Connect the red crocodile clip and the black crocodile clip test leads to the corresponding socket of the transmitter, short circuit the red crocodile clip and the black crocodile clip to form a loop.
3. Turn on the transmitter, press the MODE2 key to switch to the direct connection output mode with the output frequency of 2500Hz.
4. Turn on the handheld receiver, enter the cable identification mode through the menu with gain setting to 1dB and frequency setting to 2500Hz.
5. Attach the flexible current clamp around the test lead. **The signal from the transmitter flows from the red positive terminal to the arrow direction on the flexible current clamp.**
6. When the current value, between 0.3mA and 1.0mA is displayed in the left bar of LCD, there will be a icon indication as“ ”. Then calibrate it according to the

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calibration operation guideline described in the receiver operation as below.

7. After calibration, the calibration comparison bar of the measured current and the calibration current shows 75% to 135%; the phase of the target cable bar displays a green arrow pointing to the right, and the Recognition Result bar indicates a green tick icon “√”, accompanied by a "beep-beep" prompt sound, which refer to the target cable.

8. Connecting the flexible current clamp in the reverse direction to the direction where the test lead was attached, the phase of the target cable bar will display a red arrow pointing to the left, and the Recognition Result bar will display a red cross icon "X" without a sound, which indicates that it is not a target cable.

9. When the gain is set to 10dB, the detection current value displays between 2.0mA and 3.0mA; when the gain is set to 20dB, the detected current value displays between 4.5mA and 6.0mA.

10. Whether the receiver's current value, current ratio, phase of the target cable and Recognition Results meet the above requirements can determine whether the transmitter is working normally.

11.Transmitter battery power check: Press the power on button, LCD real-time display of battery power, when the battery voltage is lower than about 9.5V, the battery power shortage icon is displayed, prompting the need to charge the battery.

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Dead Cable Identification Self Checking Diagram



5.2.2 Wiring Method for DE-Energized Identification

Conductor-Earth Method

This method is recommended with strong anti-interference ability.

1. Disassemble the ground copper shielding tape at both ends of the cable (if there is difficulty, disassemble the Near End.)

2.Connect the black test lead of the transmitter to the ground or use a grounding pin to ground. When using the grounding pin, try to insert it into fertile or wet soil to reduce the grounding resistance value and ensure that the current amplitude under test is larger and easier to identify.

3. Connect the red test lead of the transmitter to one phase of the core of the cable. If identifying fault cable, the red test lead should be connected to the phase with the highest insulation resistance. It is necessary to do a continuity test first to ensure that the phase is not disconnected. If it is a faulty cable, the fault point is generally burned seriously. Using the high-voltage unit of the cable fault tester to apply a high-voltage pulse to the fault phase in a periodic discharge mode, there will be a loud discharge

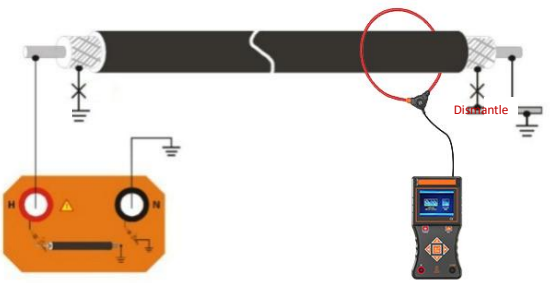
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sound at the fault point, accompanied by discharge sparks. In this case, there is no need to use this instrument to identify.

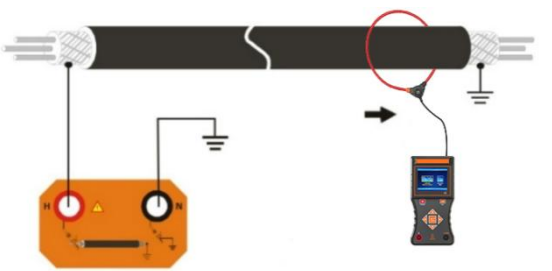
4.Ground the Remote End/ Receiving End of the phase connected to the red test lead. It is recommended to use a grounding pin which can not be in contact with the original ground network. Try to stay away from the original ground network to avoid back flow of earth wire to the cable.

Wiring Diagram

Single-conductor or three-conductor cable, only if there are grounding copper shielding tape at both ends, ensure that wire them according to the following diagram and disconnect the grounding lead of the armored and copper shielding.



If the target cable is not equipped with copper shielding or Armour, please operate according to the below wiring diagram.



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Sheath-Earth Method

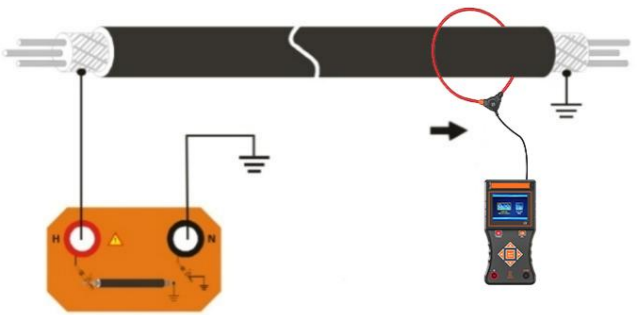
It is not recommended because there are potential problems.

Disconnect the grounding copper shielding tape at the Near End of the cable and the grounding of the neutral wire and ground wire of the low-voltage cable, and keep the grounding copper shielding tape at the Remote End grounded.

Connect the black output port of the transmitter to the black test lead and then connect the black test lead to the ground pin at the Near End. The core lead is suspended in the air.

The red output port of the transmitter is connected to the red test lead sheath.

Wiring Diagram



Potential problem:

If the outer insulating layer of the sheath (armor and copper shielding) is damaged, part of the current will flow from the damaged point to the ground and shunt, causing the current suddenly decrease and affect signal reception.

Conductor- Sheath Method

The wiring is simple, but it is difficult to exclude the interference of adjacent wires.

Do not need to disconnect the grounding copper shielding tape at the both ends of the

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cable. Sheath needs to be grounded.

Connect the red output port of the Near End transmitter to the red test lead and then connect the red test lead to one end of the core wire. Connect the black output port of the transmitter to the black test lead and then connect to the sheath.

3. Short circuit the core wire and sheath at the Remote End.

Wiring Diagram



For single-conductor laying, the signal flows from the transmitter through the core wire, and then returns through the two loops of the sheath and the earth. Although the resistance of the sheath is very small, the total resistance of the earth loop is large due to the grounding resistance at both ends and the soil resistance. There is a mutual inductance in the conductor-sheath loop and sheath-earth loop, it will generate current in the sheath-earth loop through electromagnetic induction, which cause the effective current greatly reduce and signal weak. Considering the effective current contains an induced current, the phase of the induced signal of the target cable and the adjacent pipes is the same, and there may be impossible to exclude the interference of the adjacent line according to the phase of the target cable.

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If there are other cables laid in the same path (same position at both ends), the return current is mainly divided by the sheaths of several cables. As a result, the signals of each cable are not much different, and it is difficult to distinguish only by the magnitude of the received current.

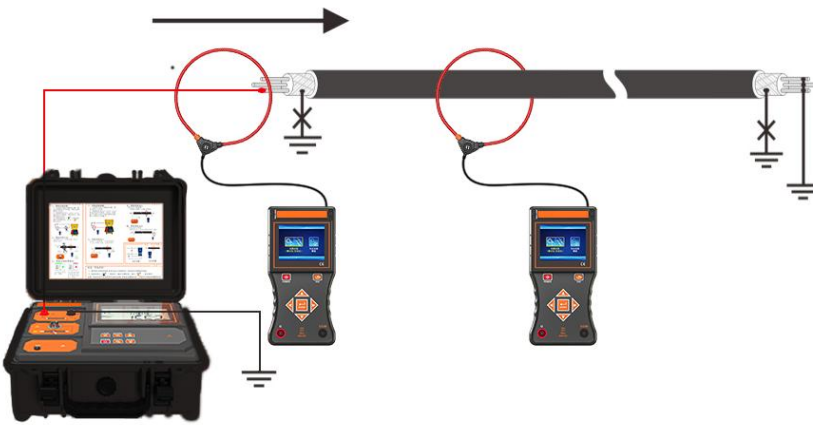
Wiring Detection for DE-Energized Identification

After completing wiring, use the meter to detect the cable wiring and output status.

1. Turn on the handheld receiver, enter the cable identification mode, put the flexible current clamp around the output lead of the red crocodile clip, point the arrow direction of the flexible current clamp from the red line end to the Remote end of the cable, set the gain to above 10db, and then check whether the current exceeds 0.4mA. If it exceeds 0.4mA, it means transmitter output is normal. If it is less than 0.4mA, repeat the steps of self checking of dead cable identifier for the transmitter according to the operation procedure 2.1.1.
2. If the current is above 0.4mA, press the ENTER key to calibrate it. When finished, the meter will beep with tick icon in the Recognition Result bar.
3. Put the flexible current clamp around the Near End cable to check whether the receiver identification status is ticked. If it is ticked, it means that the grounding of the armor and copper shield at both ends has been disconnected, and the Remote End target cable has been grounded. Then conduct cable identification on Remote End cable.

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Note	When calibrating with the direct connection method, make sure the current value of the red test lead and the Near End cable are approximately the same. If not, check whether the Near End and Remote End armored grounds are disconnected.



5.2.3 Self Checking for Energized Cable Identifier

Live cable identification adopts the clamp coupling method, which is suitable for cables, especially power cables that are easy to clamp. It does not need to directly contact the metal core or metal grounding wire of the cable, as long as both ends of the pipes are grounded.

The advantage of the clamp coupling is that it is easy to use without electrically being connected to the pipes to transmit a signal, has no impact on the normal operation of the pipelines, and reduces the induction to other pipes.

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The disadvantage is that the coupling current is smaller than the current under direct connection. Both ends of the pipelines must be well grounded. In some cases, when the coupling current is less than 0.3mA, can not adopt the clamp coupling method.

Self Checking method of Energized Cable Identifier

1. Insert the plug of the red transmitting clamp into the socket of the transmitter and connect both ends of a red crocodile clip to form a loop. Then the red transmitting clamp attaches around the test lead.
2. Press the POWER key to turn on the transmitter, and press the MODE1 key to switch to clamp coupling output mode with a frequency of 2500Hz.
3. Turn on the handheld receiver, enter the cable identification mode through the menu to set the gain to 1dB and the frequency to 2500Hz.
4. Attach the flexible clamp around the test lead. The flexible clamp should be more than 2 meters away from the transmitting clamp to prevent receiving interference.
5. When the current between 80 and 150mA is displayed in the left bar of the LCD screen, there will be an icon indication . Then calibrate according to the calibration operation guideline described in the receiver operation below.
6. After calibration, the calibration comparison bar of the measured current and the calibration current shows 75% to 135%; the phase of the target cable bar displays a green arrow pointing to the right, and the Recognition Result bar indicates a green tick icon “√”, accompanied by a "beep-beep" prompt sound, which refers to the target cable.
7. Connecting the flexible current clamp in the reverse direction to the direction where the test lead was attached, the phase of the target cable bar will display a red

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arrow pointing to the left. The Recognition Result bar will display a red cross icon "X" without a sound, which indicates that it is not a target cable.

8. When the gain is 10dB, the detection current is between 300 and 380mA; when the gain is 20dB, the detected current is between 900 and 950mA.

9. Whether the receiver's current value, current ratio, phase of the target cable and the Recognition Results meet the above requirements can determine whether the transmitter is working normally.

Energized Cable Identification Self Checking Diagram



5.2.4 Wiring Method for Energized Cable Identification

Clamp Coupling Method

Feature: Clear results, strong anti-interference Ability

Wiring Steps for Clamp Coupling

- There is no need to do any operation on the cable under test, attach the transmitting clamp on the cable.
- Both ends of the cable sheath must be well grounded, otherwise the coupling current will decrease with the increase of the grounding resistance.

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- If the sheath at both ends is not grounded or the middle of the sheath is disconnected, it is not advisable to use clamp coupling.
- The direction arrow on the clamp should point to the end of the cable when attaching the transmitting clamp to the cable.
- The receiving clamp and the transmitting clamp should be at least 2 meters away when calibrating it.

Transmitting Frequency

The induced current of the energized cable will interfere with the received signal. Therefore, it is necessary to choose a suitable frequency to achieve the best reception effect.

Generally, do not recommend to use frequency of 625Hz and 10000Hz. They can be used only when meet conditions.

Frequency 2500Hz, the default value, is enough to complete most of the tests, followed by 1562Hz. 625Hz is suitable for long-distance pipe identification with the features of long propagation distance for low-frequency signal but weak anti-interference. Frequency 10000Hz is not able to exclude the interference of the adjacent cable without phase of the target cable.

Note:

1. Keep the frequency of the transmitter consistent with the frequency of the receiver when calibrating it.
2. The cables and pipelines should be well grounded under any frequency. The cable

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can not be identified with total resistance of the ground loop exceeding 200 ohms.

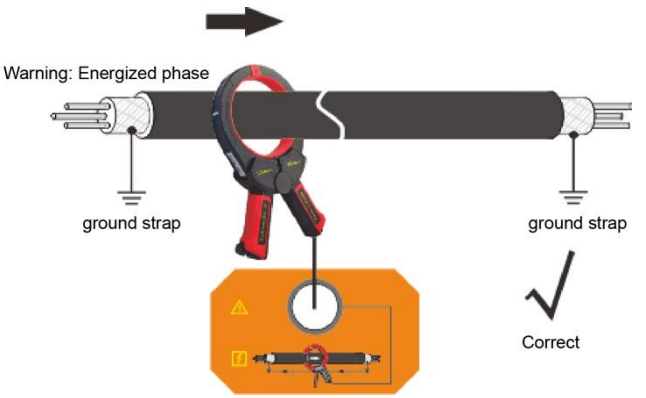
3. The magnitude of the received current can be use to roughly judge the quality of the grounding condition, excluding the situation where the coupling current is less than 0.3mA. The larger the transmitting signal detected by the receiver, the smaller the total resistance of the grounding loop and the better the grounding. The smaller the transmitting signal detected by the receiver, the larger the total resistance of the grounding loop.

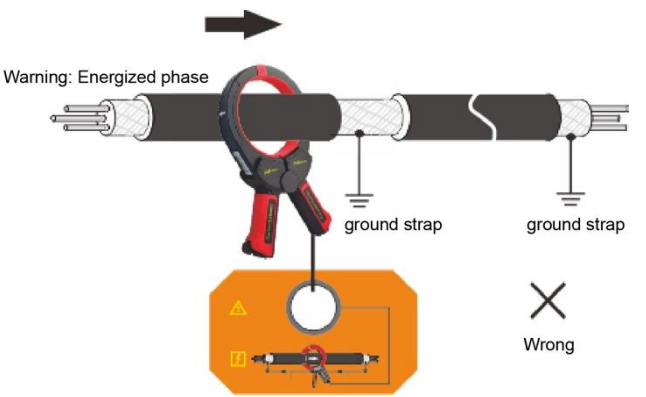
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Wiring Diagram

There should not be a ground strap between the transmitting clamp and receiving clamp.





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This method is applicable to the detection of ordinary three-phase turnkey type cables. Insert the current clamp into the transmitter output port and then attach the current clamp around a cable away from the upper part of ground wire. The current clamp is equivalent to the primary of the transformer, and the cable metal sheath-earth loop is equivalent to the secondary of the transformer. The magnitude of the secondary coupling current is closely related to the loop resistance (mainly the grounding resistance at both ends). The smaller the resistance, the greater the current. If the total resistance of the grounding loop exceeds 200 ohms, it will not be recognized. The current obtained by the coupling cable is small. In order to enhance the detection effect, the receiver gain should adjust to the maximum. When the coupling current is less than 0.3mA, do not recommend to use the clamp coupling.

This method is not suitable for identifying very high voltage single-core live cables. The mains frequency current flowing through the core wire of a single-core cable is strong enough. Without three-phase offset effect, it may cause the magnetic saturation of the current clamp, not receiving signal correctly when attaching the current clamp around a cable.

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5.3 Receiver Operation

Warning	This equipment must be used by a skillfully trained, certified/licensed, and evaluated person. The operator must strictly follow the safety rules, otherwise there may be a risk of electric shock, resulting in personal injury or equipment damage.
	Danger! Voltage measurement cannot be used to measure voltage exceeding 600V, otherwise there will be a risk of electric shock, resulting in personal injury or equipment damage.
	Considering personal and facility safety, before cable identification, except the results given by the instrument, various on-site information, such as cable diameter, current magnitude and direction of each parallel cable should also be analyzed.
	Connect the test lead to the meter and the circuit under test when the receiver tests the AC voltage, which is similar to the operation of multi meter.
	Ensure that the arrow on the flexible current clamp point to the Remote End of the cable/the end of cable core grounding when identifying the cable.
	Ensure the wiring method and calibration operation is correct. Do not change the output frequency and gain of the instrument after calibration, otherwise, it needs to be re-calibrated.
	The flexible clamp should be at least 2 meters away from the transmitting clamp to prevent receiving interference when the

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	energized cable identification is calibrated.
	Switch off the instrument and withdraw the test leads from tested circuit before withdrawing them from the instrument when the test is completed.

5.3.1 Calibration

The receiver can calibrate 10 cables, or calibrate 10 signals on the same cable in advance.

For the same cable, different frequencies and gains can be selected for multiple data calibrations. The operator at the remote end can make a call to the operator at the Near End to change the transmitting frequency of the transmitter to keep it consistent with the calibrated data and then the transmitter identifier the data. In this way, it improves efficiency because the operator does not need to run back and forth for calibration.

The intelligent identification requires the receiver to measure the current intensity and phase at a known position, which is used as a benchmark for comparison. The measurement result at an unknown point can then be compared with the benchmark, so as determine whether it is the correct cable.

Calibration is a process of measuring and recording the detected current and phase of the target cable as the benchmark. It should be performed at a location close to the transmitter where the measurement will not be affected by

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interference.

The transmitting clamp should be at least 2m away from the transmitter and flexible current clamp must be attached to the target cable.

When the arrow direction on the transmitting clamp and the flexible clamp both point to the end of the cable, calibrate it to receive the maximum signal. Do not change the output frequency and receiving magnification of the instrument after each signal is calibrated, otherwise it must be re-calibrated.

In the cable identification interface, select the appropriate frequency and gain with a detected current not less than 0.3mA. When the calibration status bar displays an icon , indicating display is stable, the calibration operation can be performed.

Initial Calibration:

When power is on, if it is not calibrated, the receiver enters the reference setting by default. The recognition result bar displays an icon to confirm whether to calibrate, press the Up and Down arrows key to enter calibration bar and then press the ENTER key to calibrate. When it indicates a“OK”icon in the calibration bar. The recognition result bar displays the recognition result, indicating that the calibration is successful.

Note: After the calibration is finished, the frequency and gain can not be changed by pressing the buttons.

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Re-calibration:

When the receiver has been calibrated, you need to press the **ESC** key to exit the interface and then press the **ENTER** key to enter the interface again. The interface prompts the information of "delete all calibration data or not", press the **Left and Right arrows** key to select Yes, and then press **ENTER** key to delete the previous calibration data and re-calibrate. If there is no need to re-calibrate, select No.

Multi-cable calibration:

After the initial calibration, use spray paint or other methods to mark L1 on the cable, then attach the transmitting clamp and the flexible clamp around the second cable. Press the Up and Down arrows key of the receiver to enter cable number bar, press the Left and Right arrows key to select the second cable, calibrate the second cable according to operation step of initial calibration steps and then use spray paint or other methods to mark L2 on the cable.

If you want to calibrate the third cable or more cables, follow the same steps as above, attaching the transmitting clamp and flexible receiving clamp around the third cable. Operate the receiver to select the third cable number to perform the calibration operation and mark it.

When identifying and calibrating another cable, adopting **multi-cable calibration or re-calibration**.

For the parameter calibration of the same cable, different frequencies and different magnifications can be combined with 10 combined parameters. For example, the

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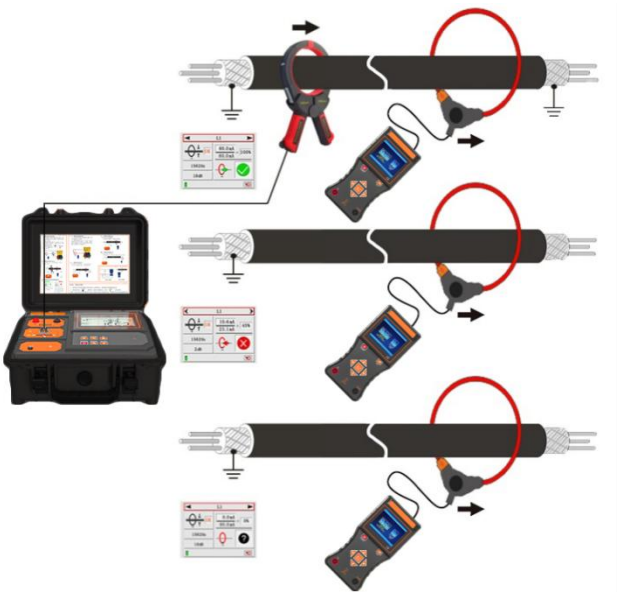
calibrated frequency of L1 is 2500Hz and the gain is 10dB; 2500Hz, and 20dB for L2; 625Hz and 1dB for L3, which indicates that L1, L2, and L3 refer to the same cable.

When some cables may be too long or the impedance of the grounding loop is large, one frequency or gain cannot be identified, and another frequency or gain needs to be changed to identify it.

5.3.2 Energized Cable Identification

Attach the flexible current clamp sized Φ200mm around each cable one by one in the arrow direction as shown in the diagram below.

The clamp coupling method is suitable for the situation where the pipeline is exposed with both ends well grounded, but can not touch its metal part, especially for power cables.



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Note	When identifying cables at the remote end, please perform energized cable identification or DE-energized cable identification. The identification result will be unique. If two cables indicate tick icons, please refer to the description of Common Problem Analysis in the manual to check errors.

Identification Steps

A. Check whether the clamp coupling output of the transmitter is normal

Please check strictly according to the requirements in the manual of the transmitter.

B.Identification at the near end

Energized Cable Identification:

Attach the transmitting clamp at the near end of the cable, with arrow direction pointing to the remote end of a cable. When attaching the flexible clamp, it should be more than 2 meters away from the transmitting clamp to prevent receiving interference. The arrow on the flexible clamp points to the remote end of a cable. Adjust the frequency to make it consistent with the transmitting frequency and the gain to the maximum. When the current to be detected is the maximum value, it will indicate an icon“ ”, try to switch the frequency and gain to achieve the best measurement effect.

Calibrate according to the above calibration steps, after calibration, measured and calibration value comparison displays between 75% and 135%, the phase of the target cable bar indicates a green arrow pointing to the right, and the identification result bar displays a green tick icon accompanied by ticking tone. Based on the above step, set the appropriate frequency and gain.

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Setting maximum gain when adopting coupling clamp, because the coupling current of the pipeline is much smaller than the current of direct connection. The coupling voltage and current of the pipelines also can not be shown.

Target Cable Identification for Energized Cable

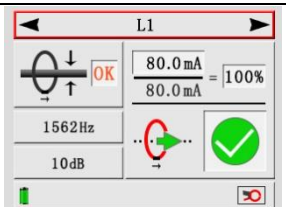
After the completion of calibration, leave the transmitter in place and do not switch off the receiver. After leaving the calibration point, do not change the calibration, the frequency and gain of the receiver. Attach the flexible clamp at the remote end of the cables to identify them.

Ensure that the arrow direction still points towards the end of the cable.

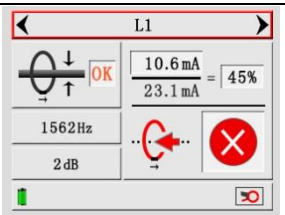
- If it is the target cable, its current value, and phase should be similar to the measurement result at the calibration point. The specific criteria are as follows:
- The detected current value should not be less than 0.3mA;
- The current value is greater than 75% of the calibration value and less than 135%;
- The phase of the cable indicates a green arrow pointing to the right.
- When the frequency is 10000Hz, refer to **3.2.4. Identification Instruction for 10000Hz.**

If matches, the identification result displays a green tick icon accompanied by ticking tone. If it does not meet the above criteria, it may be the adjacent cables with identification result indication a cross icon or black icon?.

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Target cable identified indicated by green Tick √



Non-target Cable indicating a red cross or black "?"

If the signal value becomes smaller and smaller, it may damage the armor of the buried pipeline. In this case, it requires segment identification or 10000Hz identification. Segment identification is shunt the cable into multiple sections, which shortens the identification distance, effectively reduces the impact of signal leakage, and can roughly determine which section of the cable appears damaged Armor.

Multi-cable Identification

1. Calibrate multiple cables at the near end of the cable by using the above multi-cable calibration method, and mark the multiple cables accordingly;

2. Attach the transmitting clamp to the first cable marked with L1, enter the cable number bar of the receiver and then select L1. Follow the above target identification for energized cables to identify and mark the cable that is the same as L1 at the remote end of the cable;

3.Contact the near-end users through the mobile phone to ask them to attach the transmitting clamp around the second calibrated cable marked L2, operate the receiver to select L2, and continue to identify the cable the same as L2 according to the cable identification Steps and mark them accordingly. By analogy, multiple cables can be identified one by one.

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SECTION 5

Analysis of Common Problems in Energized Cable Identification

If two or several cables display a green tick“ √” icon, and a red cross “X “ icon or black “?” icon, observe the measured current values and phase of the cable. If the current value is similar and the phase of the cable is consistent, it may be due to the wrong wiring method of the transmitter. Please kindly check the following errors:

- Perform calibration when the detection current signal is unstable or calibration is incorrect.
- The direction of the current clamp reverses, reversing to the calibrated direction.
- Do not attach the target cable but the adjacent cables when performing identification.
- The frequency of the transmitter and receiver is inconsistent.
- The calibrated gain is inconsistent with the gain identified.
- The detected current is less than 0.3mA.
- The target cable is damaged or disconnected.
- There is dust on the jaws of the clamp. Wipe it, re-calibrate, and identify it.
- After calibration, the receiving frequency and gain of the receiver change without being re-calibrated.
- The number of the cable on the receiver is inconsistent with that of the cable stuck on the transmitter

If it still can not judge, please DE-energize the target cable and use the method of DE-energized cable identification to identify it.

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SECTION 5

Identification Instruction for 10000Hz

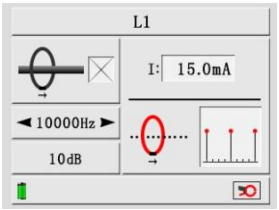
Generally use frequency 10000Hz is in the situation where the frequency signal is insufficient and the co-channel interference is great, resulting in a jump in the current value, and a small current value. In this case, use the frequency 10000Hz for identification.

Note: Manual recognition is needed to identify the frequency 10000Hz , and the recognition result can only be used as reference, not as the final recognition result. When replacing or performing other operations, it is also necessary to use the function of dead cable identification to verify the test results of the cable again when power is off.

1. Set the frequency of the receiver to 10000Hz without calibration;
2. Set the frequency of the transmitter to 10000Hz. The transmitting clamp will intermittently make a sound;
3. Observe the result bar on the lower right of the LCD of the receiver, and manually analyze the identified cables.

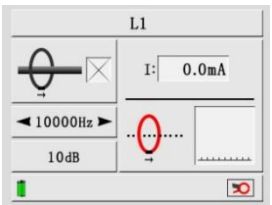
a. Attach around the target cable, the current value intermittently displays in the current bar, on the right side of the screen. 3 equally spaced red dot lines show in the result bar with 4 spaces between each line. It keeps displaying in circulation based on the above rule, which is the most ideal state and can receive the signal normally.

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Signal Normal

b.Attach around the Non-target cable, no current value or red dot lines display in the result bar, on the right of the screen.



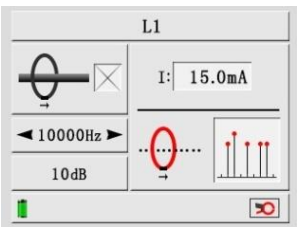
No Signal Detected

c. Attach around a non-target cable or an adjacent cable, when the following situations appear, can not adopt them as judgment criteria.

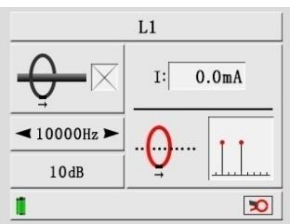
1) The current value on the right side of the screen is unstable with large interference current;

2) The red dotted line in the lower right result bar is more than or less than 3 lines;

3) The interval of each red dotted line is not constant or the results are inconsistent every time.



Signal Abnormal



Signal Abnormal

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5.3.3 DE-energized Cable Identification

Attach the flexible current clamp or detector around each cable in the arrow direction shown in the figure.The following wiring diagram is suitable for on-site identification for dead cable. Ensure the arrows on the flexible clamp or detector point to the remote end of the cables where the cable core is grounded, that is, the direction of the positive input of the pulse code current signal.



Do not measure with the coil interface of the flexible current clamp close to the cable during power identification or power outage identification, as this may cause errors.



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Note:When performing energized cable or dead cable identification, do not put the coil interface of the flexible clamp close to the cable for measurement so as to avoid errors.

Identification Steps

1.Ensure direct output of the transmitter is normal

Please perform self-checking strictly according to the requirements described in the transmitter manual.

2.Identification at the near end

Dead Cable Identification:

Connect the red output terminal of the transmitter to the metal cable and ground the black output terminal of the transmitter.

Inject the transmission signal into the metal cable with its remote end grounded but the near end not grounded.

Attach the flexible clamp around the armored or copper shielded part of the cable, if there is a difficulty, attach around the red connecting lead of the transmitter.

The arrow on the interface of the flexible clamp should point to the remote end of the cable.

Adjust the frequency to make it consistent with the transmitting frequency on the transmitter and the gain to the maximum. When the current to be detected is the maximum value, it will indicate an icon , try to switch the frequency and gain to achieve the best measurement effect.

Calibrate according to the above calibration steps, after calibration, measured and calibration value comparison displays between 75% and 135%, the phase of the target cable bar indicates a green arrow pointing to the right, and the identification result bar displays a green tick icon accompanied by ticking tone.

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Note: Determine the gain based on the above steps. If the transmitter output signal is strong, the gain used by the receiver will be small.

Gain Adjustment

Press the Left and Right Arrow the Left and Right arrows key to increase or decrease the gain, ranging from 1db to 20db. When pressing the Left and Right Arrow Left and Right arrows key, the signal gain of the receiver will change accordingly.

Target Cable Identification for Dead Cable

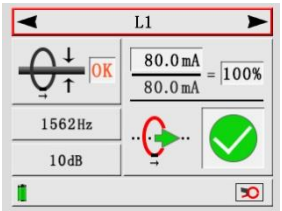
After calibration, leave the transmitter in place and do not switch off the receiver. After leaving the calibration point, do not change the calibration, and the frequency and gain of the receiver. Attach around the flexible clamp at the remote end of the cables to identify them. Ensure that the arrow direction still points towards the end of the cable.

If it is the target cable, its current value and phase should be similar to the measurement result at the calibration point. The specific criteria are as follows:

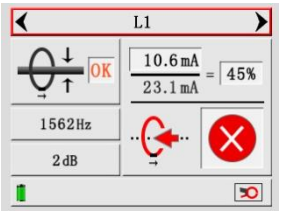
1) The detected current value should not be less than 0.3mA;
2) The current value is greater than 75% of the calibration value and less than 135%;
3) The phase of the cable indicates a green arrow pointing to the right.

If matches, the identification result displays a green tick icon accompanied by ticking tone. If it does not meet the above criteria, it may be the adjacent cables with identification result indication a red cross icon or black icon? without ticking tone.

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Target cable identified indicated by green Tick √



Non-target Cable indicating a red cross or black "?"

Analysis of Common Problems in DE-energized Cable Identification

If two or several cables display a green tick" √"icon, or all cables indicate red a cross "X"icon or black "?"icon, the phase of the observed current is consistent, it may be due to the wrong wiring method of the transmitter. Please kindly check the following errors:

- The arrow on the flexible clamp or the detector does not point to the remote end of the cable;
- The red and black leads on the transmitter do not connect to the corresponding interface.
- The red connecting lead does not connect to the core conductor or sheath, but to the ground.
- Do not attach around the target cable when performing identification, but only a few adjacent lines.
- Improper selection of transmitter wiring method.

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- The target cable is damaged or disconnect.
- Do not select the appropriate gain.

If it still can not judge, please DE-energize the target cable and use the method of DE-energized cable identification.

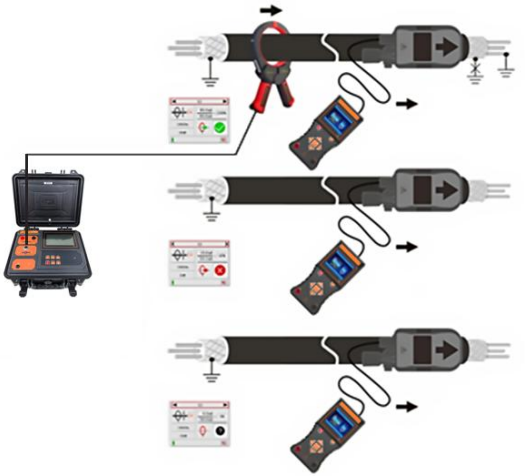
5.3.4 Using Method of the Detector

If using a detector to identify energized or DE-energized cables, the measurement operation method of the receiver is the same as that of flexible current clamp. Insert a detector into the top of the receiver and put its arc-shaped bottom close to the cables with the arrow direction consistent with the flexible clamp.

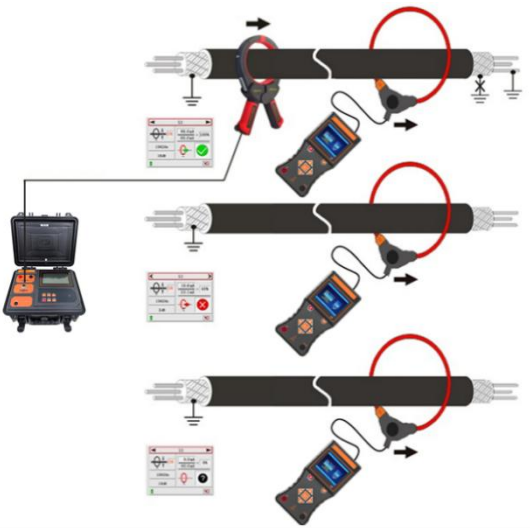
Note: After determining the sensor to be used, ensure using the flexible clamp or the detector, and the corresponding sensor in the whole process of cable identification, including self-checking, calibration, wiring detection, cable identification and other operations, do not change at will in the middle.

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Using a Detector to Perform Energized Cable Identification



Using a Detector to Perform DE-Energized Cable Identification



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5.3.5 Voltage Measurement

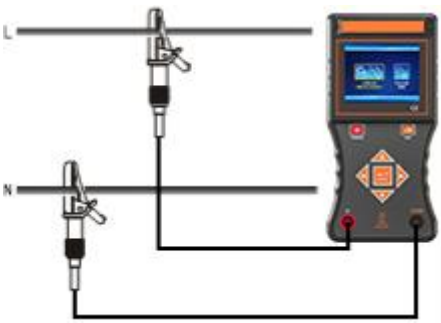
1. Switch on the receiver to enter the voltage and current measurement mode: V/A test.

2. Connect the cable of the red crocodile clip to the corresponding red U port on the receiver, and the cable of the black crocodile clip to the corresponding black COM port.

3. Connect the red lead to the cable core and the black lead to the ground grid. If there is voltage in the cable, LCD will display the AC voltage value; if there is no AC voltage, it will display 0V.

Note: When testing the voltage to the ground, avoid electric shock or causing other equipment to trip due to leakage. If the measured voltage does not exceed 600V, use it similar to multi meter when measuring the voltage.

Wiring Diagram：



5.3.6 Current Measurement

1. Switch on the receiver to enter the voltage and current measurement mode: V/A test.

2、Connect the flexible current clamp to the receiver, and attach the flexible clamp to the cable under test, if there is no AC current, it will display 0.00A, if there is AC current,

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it will display the corresponding current value and current frequency.

Note: When wrapping the coil around the cable under test, avoid electric shock or causing other equipment to trip due to leakage.

If the detected current does not exceed 5000A, use it similar to current clamp meter. When testing current, the cable under test should be close to the center point of the flexible clamp.

Wiring Diagram



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Battery Management

● Charge the battery in time, and charge the battery every 3 months if not using the instrument for a long time.

● Warning! It is forbidden to test without the battery cover, otherwise it will be dangerous.

● When replacing the battery, please pay attention to the polarity of the battery, otherwise the meter may be damaged.

1. When the battery voltage of the receiver is lower than about 6.5V, please charge it in time for about 6 hours.
2. When the battery voltage of the transmitter is lower than about 9.5V, please charge it in time for about 10 hours.
3. If replacing the battery, ensure that power is off and then loosen the screws on the battery cover, open the battery cover, and replace with a new battery. Pay attention to the polarity of the battery, cover the battery cover, and tighten the screws.
4. Press the POWER key to see if it can be turned on normally, if not, please follow step No. 3 to re-operate.
5. If the user can not replace the battery, please contact the manufacturer.

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Packing List

Transmitter	1
Receiver	1
Tool Kit	1
Transmitting Clamp	1
Flexible Clamp	1
Detector	1 optional
Crocodile Clip	One red; One black;
Test Probe	One red; One black;
Crocodile Test Lead	One black
Grounding Pin	2
8.4V 1A Adaptor	One for Receiver
12.6V 1A Adaptor	One for Transmitter
7.4V Lithium Battery	One set equipped with the receiver
11.1V Lithium Battery	One set equipped with the transmitter
Manual, Warranty, and Quality Certificate	1

Note:

- We are not responsible for other damages caused by the use of this product.
- The contents of this user manual do not justify the use of the product for special purpose.
- The Company reserves the right to modify the contents of the user manual. In the case of modification, no further notice will be given.

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