



## F1-T Underground pipeline amperemeter detector

### Instructions



Haian Discory Detecting Instrument CO.,Ltd



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## Foreword

Thank you for using F1-T underground pipeline amperemeter detector. It is great honor to service for you. In order to make sure that you can use this instrument as soon as possible, the instrument is equipped with manual.

This manual is an important part of instrument. It can provide you a safety guideline. Please read this manual carefully before use our instrument. And after read please keep this manual in a good way.

HaiAn Discory Detecting instrument CO.,Ltd reserves the right to improvement and innovation of the instrument without prior notice. If any problem during using, customer can connect us by following ways.

- 1、Service tel: 400-012-6866;
- 2、E-mail: postmaster@dscr.com.cn ;
- 3、Our web side: <http://www.dscr.com.cn>。

Thank you!

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## 一、Instrument Introduction

### (一) Features (a) of the instrument

- 1, flat design, keyboard, a multi-purpose keys.
- 2, no additional wiring, press the measure key to automatically measure the transmit power, the transmission voltage, emission current, grounding resistance and other parameters.
- 3, for detecting the signal strength of the whole process, carried out by the internal circuit normalized so that the leak size coating and insulation resistance value of each test section comparable.
- 4, the voltage controlled oscillator frequency technology, the signal intensity of the reaction tube bit and missed the point more clearly.
- 5, audio, showing the value, analog bar cursor, displays the signal strength and more intuitive.
- 6, easy to operate, simple to use, easy to understand.
- 7, small size, light weight, easy to carry, more suitable for field testing.
- 8, when the lack of voltage the instrument automatically shut down, automatically cut off when the internal power supply, energy-saving effect is remarkable.

### (二) the instrument functions and buttons Introduction

- 1, a transmitter: a transmitter for transmitting electromagnetic signals of a specific frequency to underground pipes, to establish a single line - underground pipeline detection field of the earth loop. Its function is schematically shown in Figure 1.

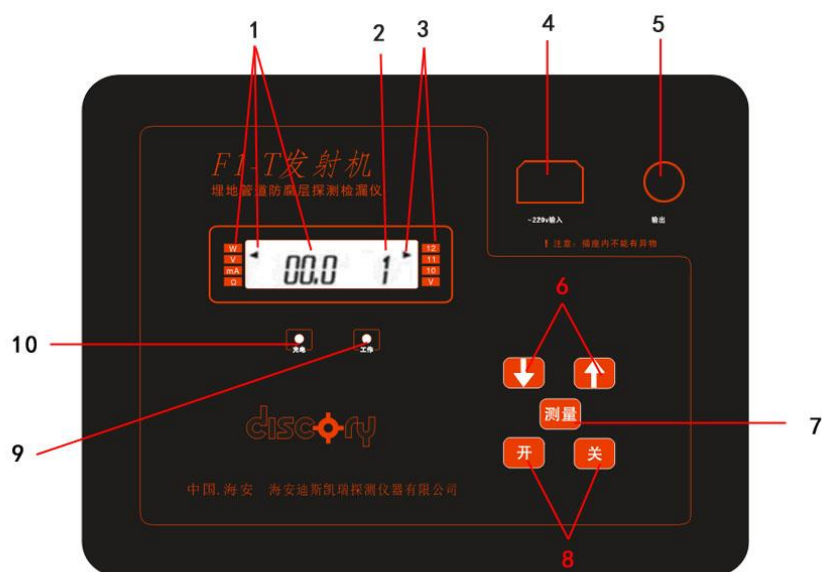


Figure 1 a schematic view of the transmitter panel

- (1) emission W, V, mA,  $\Omega$  in a certain measure, the LCD screen displays measurements with a value corresponding to the location of the cursor;
- (2) display stalls, press  $\uparrow$   $\downarrow$  keys to adjust the position in the 1-9 range adjustment profile;
- (3) battery voltage display, the cursor to the right side corresponds to the number, the cursor on the corresponding 12V, the charge level is sufficient;
- (4) work lights, work lights, work lights off when not;
- (5) charging indicator, charging indicator light red, light is green when fully charged.
- (6)  $\uparrow$   $\downarrow$  key: Used to increase or decrease the transmitter power;
- (7) Measurement key: used to measure the transmitted power W, emission voltage V, the emission current mA, grounding resistance  $\Omega$ ;
- (8) ON OFF button: To turn the transmitter power;
- (9) -220V Input: power input;
- (10) OUT: signal output.

2, the instrument probe: probe instrument and probes are used together to detect the location of the pipeline, to the depth. Its function is schematically shown in Figure 2.

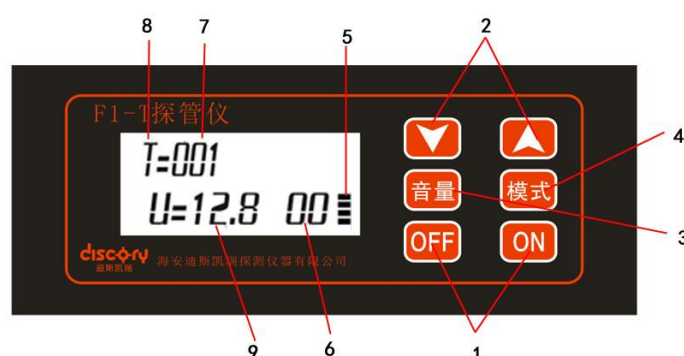


Figure 2 a schematic view of the probe instrument panel

- (1) OFF ON key: after plugging the probe plug, for opening or closing the probe instrument power supply;
- (2)  $\uparrow$   $\downarrow$  key: Used to increase or decrease the receiver sensitivity of the probe instrument, within the 0-50 range adjustment;
- (3) Volume Jian: is used to adjust the size of the probe instrument receiver volume;
- (4) Mode key: For mutual conversion between T and QT represents the sensitivity of amplification and normalized in order to detect more distant and complex environment;
- (5) Analog bar cursor, consistent with the value, volume, change in signal intensity;

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- (6) show sensitivity values between 0-50 adjustment;
  - (7) the signal strength indication, between 0-1000 change;
  - (8) mode to display the values of T or QT;
  - (9) Built-in battery voltage display position.
- 3, leak: leak detector and wire used together to detect coating damage point and point size fractionation damage. Its function is schematically shown in Figure 3.

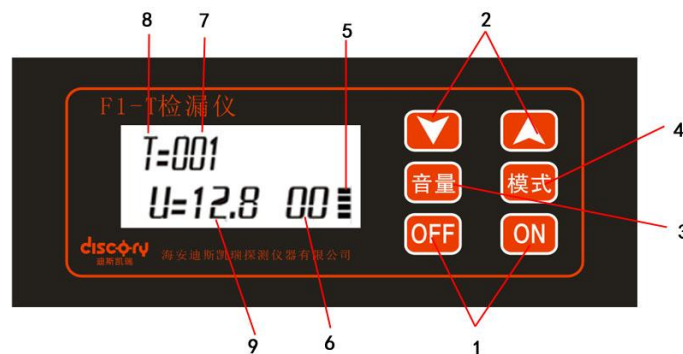


Figure 3 a schematic view of the detector panel

- (1) OFF ON key: Plug cord leak after leak detector is used to turn on or off the receiver power supply;
  - (2) ↑ ↓ key: Used to increase or decrease the leak detector receiver sensitivity, adjust within the range of 0-50;
  - (3) Volume Jian: is used to adjust the size of the leak detector receiver volume;
  - (4) Mode key: For mutual conversion between T and QT represents the sensitivity of amplification and normalized in order to compare the size and grade point damage;
  - (5) Analog bar cursor, consistent with the value, volume, change in signal intensity;
  - (6) show sensitivity values between 0-50 adjustment;
  - (7) the signal strength value, the change between 0-1000;
  - (8) mode to display the values of T or QT;
  - (9) Built-in battery voltage display position.
- (三) technical specifications of the instrument
- (一) Transmitter Technical Specifications:

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1. Transmitting power: 0-25W automatic adjustment
  2. Transmission frequency:  $1\text{K} \pm 0.1\text{HZ}$
  3. Impedance matching:  $5-500\Omega$ , automatic matching
  4. Transmission Distance: 0.03-8km, can be progressively moved to 8km outside
  5. Power supply: 14.8V military lithium batteries
  6. Operating temperature:  $-20\text{ }^{\circ}\text{C} \sim +60\text{ }^{\circ}\text{C}$
  7. Control system: DSP + vector control, system upgrade support
  8. Adjustment system: digital keyboard control
  9. Weight: 3kg (including battery)
  10. Dimensions (mm):  $276 \times 227 \times 98$

(二) detector technical indicators:

1. Sensitivity: -85db
2. To position deviation:  $\leq 5\text{cm}$
3. Detection depth:  $\leq 8\text{m}$
4. Power supply: 9.6V Ni-MH battery
5. Working temperature:  $-20\text{ }^{\circ}\text{C} \sim +60\text{ }^{\circ}\text{C}$
6. Display: Digital Display
7. Weight: 0.9kg
8. Dimensions (mm):  $165 \times 110 \times 68$

(三) the leak detector technical indicators:

1. Sensitivity: -85db
2. Leak detection accuracy:  $\geq 0.25\text{mm}^2$
3. Power supply: 9.6V Ni-MH battery
4. Working temperature:  $-20\text{ }^{\circ}\text{C} \sim +60\text{ }^{\circ}\text{C}$
5. Display: Digital Display
6. Weight: 0.9kg
7. Dimensions (mm):  $165 \times 110 \times 68$



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## 二, The method of operation of the instrument

### (一) the use of the transmitter

#### 1, the transmitter connection

(1) the output cable into the transmitter "OUT" socket, press the "ON" key to boot.

(2) the red alligator clip connected to the output line of the magnet and the magnet attached to the pipe. The other end of the line and then the red pistol output connector and ground line black pistol plugs to connect the ground wire and the other end of the black alligator clip to the ground rod, with the pipeline to open 90 degrees, into the ground.

#### 2. Select the location of the transmitter launch wiring

Try to avoid multi-drop center, such as metering stations, joint station, gathering stations where network extending in all directions, not only signal attenuation fast, and when the target line when buried deep in the ground receiver receives the signal is weak increase the difficulty of detecting pipeline should be possible to select a single line at the transmitter signal is applied, so that the signal transmission is unidirectional or bidirectional transmission, the current concentration, probe leak effects are better.

#### 3, the transmitter grounding

The transmitter can have three ground wiring:

(1) Ground unilateral: only the target line while grounding the grounding connection point is a pipe and the pipe perpendicular to the strike direction 10-20M at the ground rod into the ground, dry place need watering moist. See Figure 4.

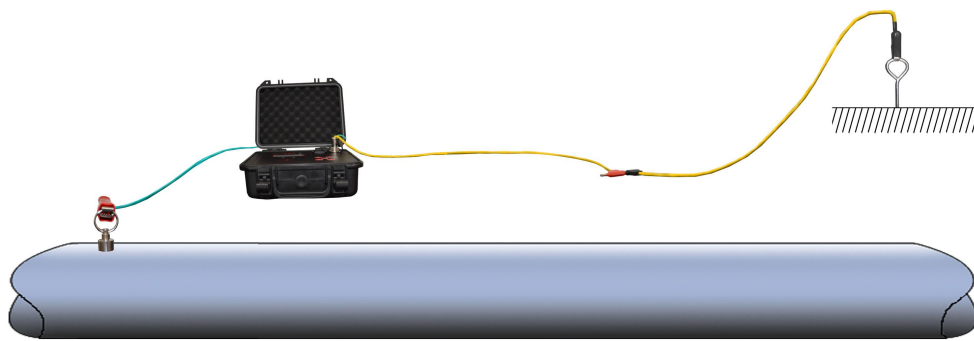
(2) Bilateral Ground: the ground wire transmitter leads to two, namely access to the pipeline on both sides of the earth, this method symmetrical magnetic field distribution, probe, sounding very accurate, but to check the grounding effects are the same on both sides the method is based on measuring key when viewed grounding resistance side, the other side of the grounding wire disconnected. Observing other end of the resistor is the same on both sides of the grounding resistors are equal, the effect was the same. When the grounding resistance range, by playing deep or

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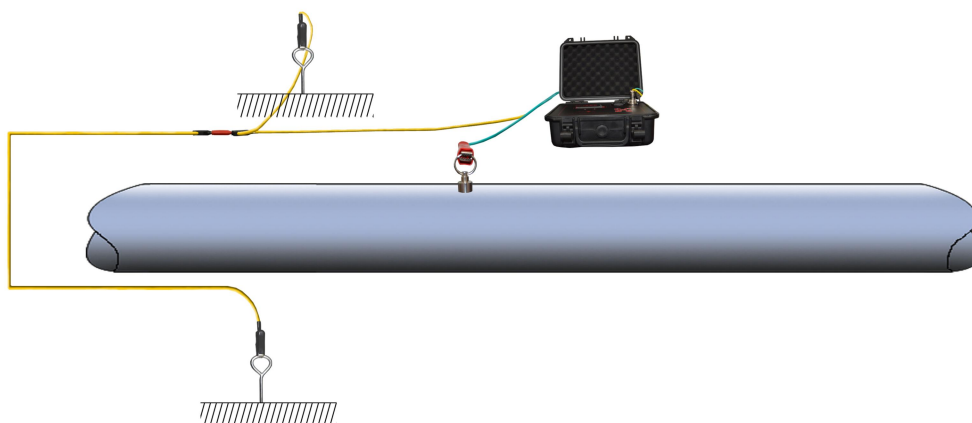
shallow ground rod pull, but also through water ways to make both sides equal grounding effect. (See FIG. 5)

(3) long-range ground loop method: This method is the transmission line connected to one end of the pipe to the ground line extended to the other end of the pipe. When working on the pipe to form a loop. This method only in solving particularly complex pipe network when using the probe. Loop method to pipeline and ground wiring as a transmission circuit from wire and pipe must be more than 10 times the depth of the pipeline, otherwise they will be too close to detect the effect of pipeline bits. Remote loop method wiring, piping on the strongest signal. (See FIG. 6)

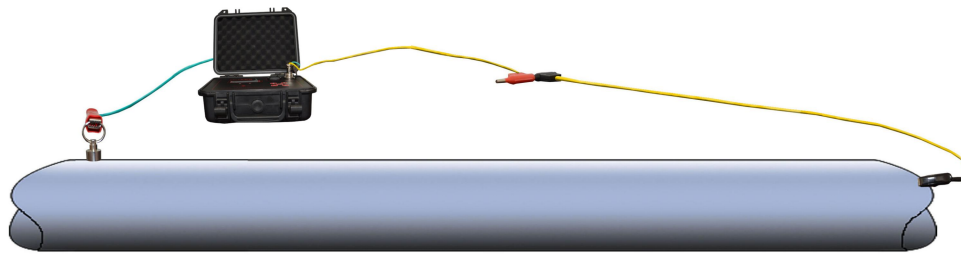
Further, when the pipe ends are reserved manifold not well grounded, not when the probe signal may be added at the end of a ground line, called ground loop method wiring away. (FIG. 7)



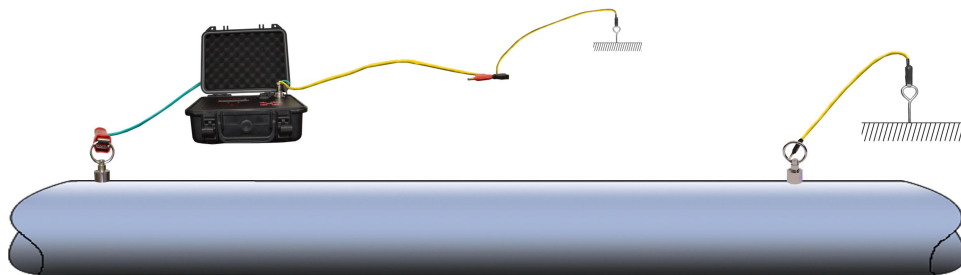
4 a schematic diagram of unilateral Ground



5 a schematic diagram of bilateral Ground



6 schematic ground loop method



7 Ground Loop schematic diagram far

Precautions:

(1) can not hit the ground unpreserved water pipeline or other metal top of the line, or the ground beneath the pipeline may have misjudged a strong signal to the target line.

(2) If there is a pond in the vicinity of the vertical line from the detection site, ditches, grounding wire of the building, lightning rod grounding, poles or other conductive cable means, using them is a very convenient choice.

(3) Check the ground loop resistance, loop resistance should be between a few ohms to one hundred ohms, when the loop resistance is too large, then the signal can not get over the target line, it can be used for watering the earth, increasing the number of ground-level playing deep grounding rods and other measures to reduce resistance.

For as the Gobi desert, frozen soil, the soil is too dry environment, can prepare one or several 1-2m irons, deep plunge into the ground as far as possible, pour brine, so that the ground effect is more ideal.

4, the ground distance and direction

The location and distance from access point will affect the emission from

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the probe, in particular a large number of damaged pipeline corrosion, too close, current flows from the emission point and the nearest ground constitute a loop, not the distance transmission. Ground and pipes, too close, current flows from the ground and from the launch point near constitute a loop, not the distance transmission. Ground farther and pipes, better detection.

#### 5, select the transmitter power

The initial stage, the transmitter power of 5-10W to meet the test requirements, with the extension of the test distance, and gradually increase the transmission power, so you can save power, but also to meet the needs of time remote measurement of electricity supply.

#### (二) the use of the probe instrument

##### 1, pipeline location detection and gain adjustment

Probe will probe plug into the socket probe instrument receiver, turn the receiver on, adjust the gain by the  $\uparrow \downarrow$  keys to adjust the sensitivity level, so that the meter showed some static signal, if in the vicinity of the transmitter signal is too strong, and the gains to the minimum when the signal is still strong on the need to reduce transmitter power.

When selecting a peak detection method, the probe parallel to the earth, to the transmitter connection point as the center, 10-20M is the radius of the circular probe, when the receiver receives from small to large, from large to small and then when the signal indication 1000 reaches T =, adjust the gain in this endless exploration continue to do, a small receiver - big - small changes in the signal, the maximum point is the location of the pipeline.

When choosing a zero value detection method, the probe is perpendicular to the ground plane, adjust the gain, the transmitter connection point 10-20m around the circular probe, has received signals big - small - big changes, small point is the location of the pipeline.

##### 2, the pipeline to detect

Trend line detection There are several ways:

(1) two first-line method: stuck after the pipeline location, connect the transmitter signal line connection point and anchor point is the trend

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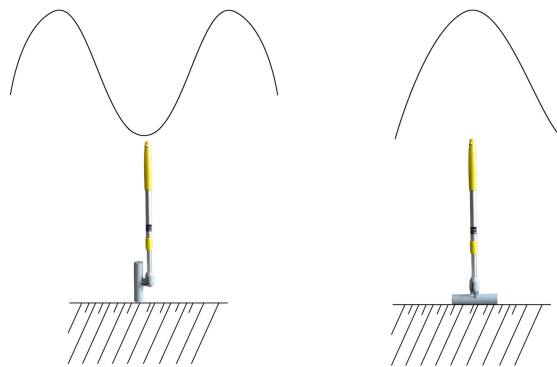
line.

(2) Steering probe method: After the pipe stuck position detection personnel as the center position, the angle of the probe to the probe uniformly parallel, then this point do annular plane probe, probe to the sound value of the minimum angle is shown pipeline route.

(3) step sweep method: This method uses the minimum detection method, each probe to a minimum point, further forward, stand on it, and then stuck a minimum point, then move further, and stood on it, so cycle times, the last one is the smallest point of connection to the pipeline, therefore, also known as multi-point connection method. This method of pipe bend and bend pipe laying area stretching more applicable.

After the pipeline location stuck performed conventional exploration pipeline, it can be used two ways: Zero peak value method and method. The selection method in detecting zero value, while the probe forward, while for the S-shaped swing probe to see whether the value shown on both sides symmetrically. Asymmetric detect small staff moved to the side showing the value of sound, in order to maintain always directly above the target line. Zero value detection method is shown in Figure 8.

The selection of the peak detection method, the probe and the probe is perpendicular and parallel to the ground line to the ground plane with a  $90^\circ$ , this time in the signal line directly above the strongest received. Peak detection method is shown in Figure 9



8 zero value detection method schematic

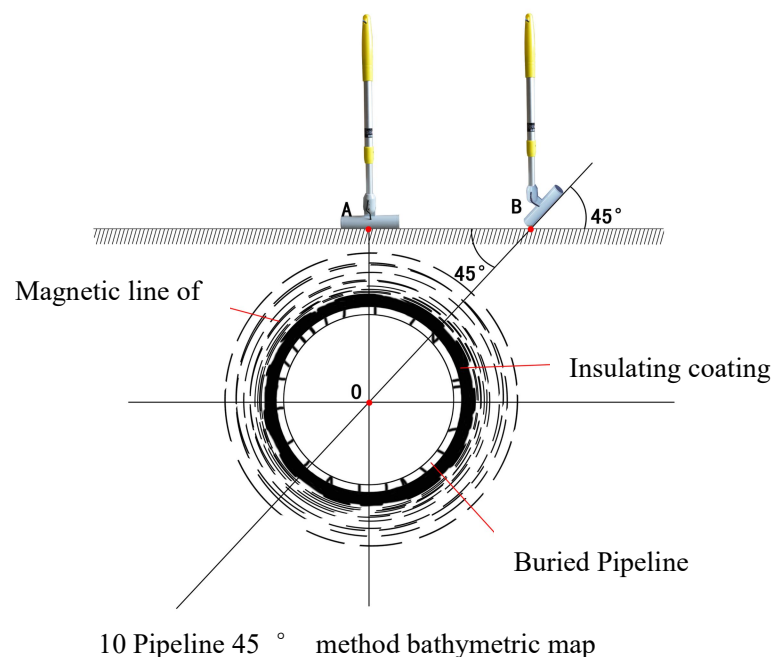
9 analysis probe schematic

When detecting the peak method, the receiver sensitivity gain adjustment values should be displayed at  $T = 300-800$  around, easy to observe the

situation along the pipeline at the time of the anomaly detection. Phenomena will react by changing the values out: weak pipeline coating intact slow; poor pipe coating decay fast, frequent need to increase the gain to compensate for attenuation value; bifurcation sudden decay; turn signal disappears need to go back five steps, as ring probe; before and after the breakage was also damaged due to different sizes and have different apparent change in size; valve on the pipe clamp, weld also have varying degrees of change.

### 3, the depth probing pipeline

Pipeline depth detection method using  $45^\circ$  method. When using  $45^\circ$  sounding method, the first tube position to explore in the future to make a mark directly above A, then the probe to the orientation angle of  $45^\circ$ , with the pipeline to move the vertical plane, when moved to the minimum value of the signal, and then to make a mark B, shown in Figure 10, Figure known, the central pipe is O, such as an isosceles triangle  $\triangle ABO$ , so  $AB = AO$ , is buried deep in the pipeline.



Probe sounding when selecting a single line intermediate straight section, the ground is not usually the height of injustice to be corrected, the probe into the pipe at  $45^\circ$  on both sides of the vertical direction as sounding pipes, ranging from pipe on both sides of the minimum point

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position and distance described intermediate positioning point margin of error, with both sides of the distance divided by the sum 2 averaged depth. Transmitter near the pipeline, three, four at the corner, and the other line and position the lap and cross the line parallel to the general should not exist as a sounding choice locations.

4, the detection signal factors

4.1 pipe: pipe good conductivity and transmission distance.

4.2 diameter: smaller diameter transmission distance, large diameter pipeline transmission distance close.

4.3 depth: shallow buried pipeline, strong signal, buried deep, the signal is weak.

4.4 Distance: Pipeline testing long distance, large power attenuation, pipeline testing short distance, the signal is strong.

4.5 connector: insulating flange joints if the signal does not pass in the past, the impact of the pipeline probe.

4.6 conduit: conduit or pipe periphery has steel shield the magnetic field, the signal becomes weaker.

4.7 Coating: coating quality is good transmission distance, a large number of damaged coating, an alternating current signal leakage to earth, attenuation speed.

4.8 near line: If the target line and cross lap or equalizing line is connected, it will signal the shunt.

4.9 geoelectric conditions: Dry desert slow decay, the detection distance; pipeline located in river marshes decay quickly detect from the past.

4.10 Transmitting power: low power transmitter, transmission distance close, far away and vice versa.

4.11 receiver gain: Gain increased exploration far away, otherwise close.

4.12 Circuit Status: Loop good strong signal circuit difference signal is weak, so the short branch office or an insulating material wrapped manifold end signal is weak, should be intact end coating transmit signals form a loop from one end of the earth coating damage.

4.13 pipe: branch too will divert part of the current, generally after the branch, the gain should be increased in order to continue exploration,

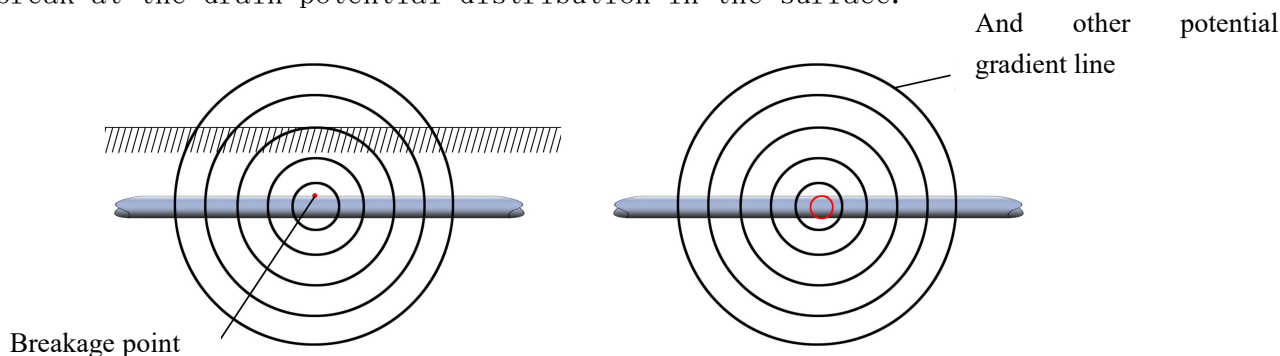
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but not in front of this judgment is the pipeline terminal.

(三) the use of the leak detector

1, electrical leakage radiation distribution point

After the local line is added under an alternating current signal, if present in the pipe coating damage, the signal current will leak into the earth in the coating breakage, and other potential distribution in the ground is broken as the center point a three-dimensional spherical distribution (Fig. 11), with ground probe can explore this phenomenon. When the signal reaches the surface, places point just above the center breakage planar circular distribution (Fig. 12), the potential distribution was equidistant around other potential, if two inspectors stood equidistant from the center position, the receiver machine shows a value of zero, zero return is called equidistance method. This is a point break at the drain potential distribution in the surface.



11 underground breakage point potential gradient elevation map

12 Surface and other potential gradient plane distribution

2, precise positioning and verification of leak

The leak detector cord into the jack and press the power on key leak, the display window shows the battery voltage. Two inspectors body and electrically connected to the line leak, keep a distance of about 5m, adjust the gain by  $\uparrow$   $\downarrow$  key to the leak detector receiver digital meter has some static signal, you can start the test. Actually locate the leak by transverse stations, stations determine longitudinal circular field coating damage potential leaks in the center of the projection surface of the tube position unanimous points. When field operations, both lateral detection, but also longitudinal testing.

There are several ways to pinpoint and validate:



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(1) Mobile Reference method: This method is a longitudinal leak detection. When using longitudinal leak in front of inspectors who probe instrument probe, followed by detection of persons who leak leak, people currently face when you walked near the leak point, the leak detector receiver indication from small to big and move on, showing the value and from large to small, people come back this time, showing the value of the same reaction can be initially determined value of the maximum point is shown breakage point.

(2) equidistant zero return method: authenticate using the zeroing method, the method is based on the leakage point at the center position when the two inspectors and leak location equidistant from the leak detector shows zero, indicating the exact leak location . This is the point of having a broken feature. If the two inspectors from the leakage point equidistant from the center, showing the value does not return to zero, indicating that while there is a small leak or damaged points in a row of varying sizes.

(3) fixed potential comparative validation: When using this verification method, a person who does not move in the receiver at the line side of 4-5M in situ, the potential of the human body sensing this person is fixed, while the other along the pipe directly above the line to move in parallel, showing the value has steeled again descending change, the biggest point is damaged coating point, the leak point. When moved to the maximum point on both sides, down the numerical asymmetry center while adjusting to the needs of large value until both sides of the step voltage drop value equal.

(4) parallel to the conduit mobile verification method: This method in the verification, two inspectors of a signal at the maximum position, the other inspectors in about 5M distance apart as the direction parallel to the pipeline at the same time equidistant mobile, if the original signal is unchanged, that is, interfering signals. This method is mainly used to exclude pipeline to cross the target duct coupled with a lap or do produce false signals.

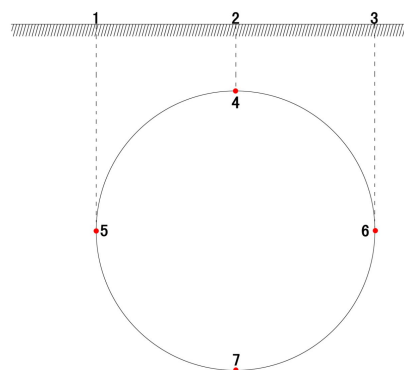
3, compare the size of the leak

Leak size is based on the size and potential leakage points to determine the scope of the following ways:

(1) digital direct reading method: This method is detected, to maintain a certain static signals within 300mV not be judged as breakage point, which is due to changes in soil moisture, pipeline coating is too thin, buried pipeline depth change detection departing staff tube position and other factors, as is generally believed 300–600mV corrosion minute defects, 600–900mV moderate damage to the coating, 900mV above a large excavation damage should be repaired.

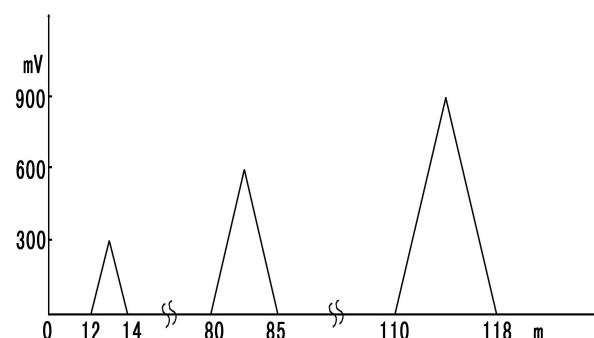
(2) radiation from the method: This method is based on the leak point radiation from the diameter divided: Usually a small leak of radiation from the diameter of about 2M, large leakage of radiation from the diameter of 5m or more, moderate leakage radiation from the diameter located between the size of the leak.

Graphics (3) statistics: In terms of the potential leakage of radiation from the two factors are plotted above the leak appears a triangle, triangle size closely reflect the size of the leak, as shown in Fig.



14 break points in the schematic diagram tubular body position

- 1- break point in the left pipe 5, the surface potential maximum is located at 1;
- 2- break point in the top of the tube 4, the surface potential maximum is located at position 2 and the tube is consistent;
- 3- breakage point in the right pipe 6, the surface potential maximum is located at 3;
- 4- break point at the bottom of the pipe 7, the surface potential of 1 and 3 are equal.



15 breakage point size graph

Secondary measure larger leak: When the King leak at  $T = 1000$  or more over-range display, "1" can be secondary or multiple measurements in a

superimposed value of leakage actual measured values is to fix a leak when the center point later, when a person went to the vicinity of the drain detecting point, showing the value has reached  $T = 1000$ , another personnel move from the position in the radial center of the leak, and other potential gradient to reach the ring, showing the value back to zero continue to move towards the center, showing the value and becomes larger, the two or indication of the measured times the sum is the actual value of the signal leakage points.

Leak Note: When leakage detection and location by the stepping point to point positioning method method, there may be three steps equipotential stepped leak detection, when the switch point positioning, feet close together, the leakage current will leak point induction into the human body through the soil. Equipotential three-step diagram shown in Figure 16.

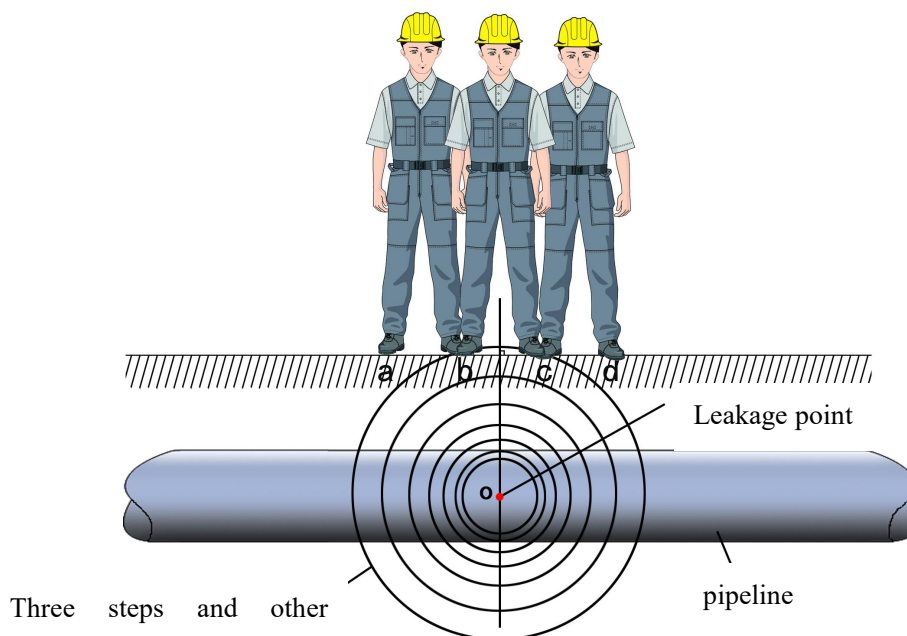


Figure 16 a schematic three-step equipotential

Leak point is 0:00, the body in a, b bits leakage signal from the forefoot b induction into the body; the body in the b, c position, the leakage signal from the b and c induction into the body; the body c, d bits, c leakage signal from the sensor to the body, since b, c and the drain point 0 is on the potential gradient coil, solid three-step potential. When pinpointing, feet close together, was stood at attention, the potential

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detected only at a certain point on the body below.

#### 4. Verify that the leak of the excavation

After a leak must pinpoint repeated verification before excavation, when the excavation to the point of breakage, the pipe must be dug over 1m length, dangling 20cm, in order to find the location of the leak, if you do not see above the pipeline leak, there may be at the bottom of the pipe, it is possible due to the leak is too small, the naked eye can not see, they need to be expanded pit, the original bell-shaped pit dug widened into a square hole, the pipe has been dug in the suspended state, the ground is detected less leakage current, if there is ground current measured, indicating that the excavation point positioning point and inconsistent on both sides of the potential of the excavation will not equal, will continue to dig the potential of the high side, you can dig into the leak. Initial detection stage, because some inspectors lack of theoretical knowledge and practical experience, may cause misjudgment, miscalculation of the main reasons are the following outputs:

① Cross bare tube above the target line, and can not verify the transverse dike or the like in alley narrow roadway, causing miscarriage of justice.  
② billboards, grounding wire, cable and other good conductor pole buried in the vicinity of the pipeline, the soil becomes conductive metal signal transduction signal.

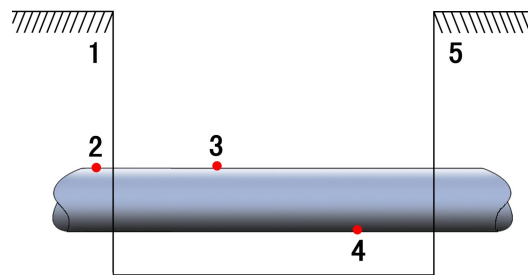
The presence of a metal block, or in the earth's magnetic field caused by the uneven distribution of the Mo misjudgment

③ pipeline near the soil.  
④ presence Hekan, climbing, trenches, pits, when taking signal detected by the two different positions, a signal not comparable.  
⑤ sacrificial anode material embedded non-compliance from the pipes too close, the anode material leakage current.

Excavation verify damage point shown in Figure 17. Fig. 1, 5 is the surface soil, when broken at two points, has not been dug up, the potential of the surface 1 than the surface 5 side of high potential, you need to continue digging the pipe 2 an edge, you can dig breakage points. In the top of the pipe breakage point 3, can be seen directly with the naked eye, at the bottom of the tube breakage point 4, in the lower part of the

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pipeline to use the lens in order to see the albedo, the need is too small to see with a magnifying glass.



17 pipeline coating damage at the excavation verification experiment Figure

#### 5. Improve aid effectiveness leak

Body capacitance method leak in the pipeline buried deep, arid surface, underground and high temperature oil and water pipelines, drying the soil around the pipe, a common result of the multiple roles of high resistivity layer is formed, the impact detection signal pickup. In case of such cases can take the following measures to improve the detection effect:

- (1) Ground probe method: metal crutches known method, each holding by two inspectors detected a thick iron bar, walking into the soil, it will increase the intensity of the received signal.
- (2) with a damp cloth: In a complex pipe network area cement asphalt pavement, people also can not reach the area with a damp cloth or wet sponge in contact with the cement surface, instead of body capacitance of the received signal.
- (3) iron shoes in law: testing personnel to detect wear shoes with nails at the end, plus the combined effect of the human body sensors will improve leak detection effect.
- (4) Optional when the law: extra-dry areas can also be selected after the rain detecting change reception. Pipeline construction welding end of the tube placed in the trench, this time using a small soft fine soil, backfill manually early, filled to the top after the pipe depth, water wet, grab the pipeline detected at this time, can improve the detection effect, but also greatly reduce breakage repair earthwork excavation.

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(5) increase the transmission power, effective means to improve reception sensitivity is also an effect of improving leak detection, which is at the bottom of the pipe to detect small leaks in particular.

#### 6. Factors influencing the effect of leak

(1) transmitter power: power leakage point the signal is strong, weak and vice versa.

(2) the gain of the receiver: That sensitivity, high gain signal is strong, weak and vice versa.

(3) detection by two distance: that is the position of the two inspectors, within the above range of radiation leak, detected two are getting closer, the smaller the signal.

(4) the accuracy of the probe: the closer to the top of the pipeline leak detection signal more accurately, on the contrary, the signal becomes small deviation from the pipeline.

(5) adjacent to the pipeline: the pipeline adjacent parallel or cross, the carrier and the carrier direction or not, the current size, will produce different effects.

(6) on the pipeline and surrounding soil surface dielectric constant: wet surface, good conductivity, strong signal, high-temperature drying of soil around the pipeline, a common effect of high resistivity layer and dried the ground, it will affect the detection of the leak.

(7) from the leak and the emission point: from a transmitter near the signal is strong, weak and vice versa, thus extending the distance must be increased with test transmitter power.

(8) Receiver signal: body capacitance method, a metal crutch, Iron shoe law, induction signal is weak, direct conduction signal strength.

(9) of buried pipeline depth: shallow buried strong signal, otherwise weaker.

#### 7. Several detection problem complex cases

(1) a small problem big bag leak leak point: Big and small leak leak closely spaced, small leakage signal is large leakage signal coverage, it must be a large leak dig, dig to vacant, again small leak probe out of the large and small leak be dug up, processed and then backfilling earthwork.

(2) a plurality of parallel and overlapping network detection, leak

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detection. First, should the transmitter signal is applied to the overlapping points away from the root of a pipeline, so prominent target line signal; secondly, the detected leak detection and pipe location combined with the target pipe will leak location unanimous points as excavation point; again, leak detection method using the longitudinal method, if overlapping and parallel pipes in close proximity can be considered as a whole pipeline leak detection.

(3) leak point longitudinal and transverse verify Shique not detect the leak, and vice versa lateral tainted point detection, leak detection portrait had disappeared. The cause of the phenomenon, there are three:

① leak exists around the carrier pipe, two inspectors potential changes in relative position has changed.

② soil dielectric constant leak or inconsistency exists around the geomagnetic field.

③ two testers in one sole special insulation, together with dry soil, the formation of a high resistance layer. Can not form a current loop.

The latter two phenomena may be ground probe body capacitance method to the law, that two inspectors in the detection into the soil with a ground rod or thick wire, the original phenomenon will disappear.

(4) city gas pipeline branch into the residential building was a tubular stand, it is difficult to enter each household probe, after the regulator person households, usually by unpreserved bare metal pipe or plastic pipe access gas stove, water heater, etc. combustion facilities, home appliances also need some ground, some residents convenience and save time, household appliances will be connected to the grounding line gas pipeline. For example: water heater shell is metallic, gas pipes and water pipes are metal hose protection, gas pipes and water pipes on the water heater through the metal housing of the implementation of the metal electrical connection.

In the riser at the bottom of the building, the location of the probe with the gas pipeline angle of  $90^\circ$ , near the pipeline and, if significant signal becomes large, you can determine the upper building of the pipeline and other pipelines have formed a grounded electrical or metallic electrically connection, in addition to the connection point of the

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pipeline cathodic protection cable, sacrificial anode protection anode bed at unpreserved pipeline valve connections, condensate tank, etc. where there may also be leakage current, these problems will affect the cathodic protection effects should also be dealt with isolated.

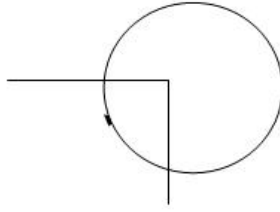
(5) at the end of the pipe branch, since the transmitted signal and diversion pipeline has become vacant, the transmitted signal can not form a loop with the earth, etc., so that the signal is weak or does not receive receiver signal, such cases may be the transmitter move the end of the courtyard pipe network, re-wiring, the target line signal is very strong.

(6) single-well derrick transmitter around blind, double-flow water pipe on the oil pipeline QianYi detection probe to have two or more than two pipes, signal strength and depth should be combined to determine the target line. Maximum detection method, for example, in the dry sand, the magnetic field strength attenuation probe each increase 1m, the first table shows the value equivalent to a reduction of about 400mV potential gradient. There is not much change in the spread of airborne and dry the sand. While also walking forward in detecting the rotation angle of the probe, probe to prevent somewhere probe happened with the pipeline running parallel, not receiving a signal. When these areas probe, transmitter power and receiver sensitivity can not just change the value shown otherwise not comparable.

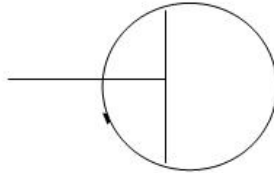
(7) to detect pipeline bend: when using conventional methods to detect forward, no signal is received, the five steps to go back to the circular probe, you can find the corner line. Step method may also be swept away as shown in Figure 18.

(8) branch line or three, four point detection: In the place of the detection signal will be significantly attenuated the probe instrument receiver gain improved return 5m walk endlessly probing, you can find a branch line or tee four-way place. Figure 19, Figure 20.

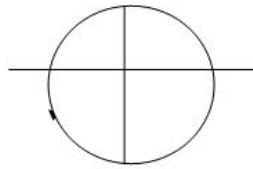




180 corner probe schematic



19 tee at the probe schematic



20 at the four-way probe schematic

(9) becomes deep pipeline detection: using the maximum method upon detection. If there is obvious indication sudden decay phenomenon, where the probe is rotated  $90^\circ$  with a line parallel to the orientation, and then in the pipeline for about a parallel move, if the signal is a large - small - big change here is the line change deep.

(10) yard pipe network probe: low-power transmitter, coupled with the reduction of the target line, the other line low gain signal reception, the received signal probe as close to the ground, the rotation angle of the probe, the probe height increase, with the minimum detection method, then the maximum validation, in order to rule out false.

(11) buried too shallow or exposed surface of the pipe, the pipe collide directly with the human body on display a large leak detector signal is not judged to be the leak, the leak is determined such cases must be combined with the depth of buried pipes. If the entire pipeline is so can be used in the soil after the rain is not completely dry, the inspectors leave the top of the pipe 1m move in parallel testing, this distance is

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considered to 1m depth of buried pipes.

(12) blind spot solution: detecting pipeline process, special lots blind transmitter, pipeline particularly complex area, the end of the transmitted signal, ground network, casing, etc., are likely to tell the target line. The method can be used to solve this problem as follows:

- ① avoid the law: some distance away, to continue the investigation forward, when there is no signal in front of the circle exploration;
- ② press method: it increases the transmission power, suppressing other interfering signals;
- ③ shift method: refers to the end of the transmitted signal, the equivalent electromagnetic field generated by the current in the tube can not radiate to the surface, we need to move the transmitter terminal on the pipeline end manifolds.

(13) to identify interference and solutions:

- ① peak method and the zero value method positioning inconsistent error exceeds 20cm, may be due to the presence of two parallel pipes, the pipes fixed position near the side of the peak. Compromise is to allow zero value 2/3, 1/3 of the peak so that pipes can be dug;
- ②- no peak one side edge of the case, after the close bend pipe, transmitter emission point and the ground are in the pipeline. Back to the transmitter signal circuit only ground location from the pipeline one side;
- ③ pipeline position detection signal is not obvious, it may cause: measuring point too close to the transmitter, it is a blind spot detection; strong electric field near the earth's magnetic field; in the pipeline terminal measures the signal transmitter; parked motor vehicles, etc., can get out a certain time and place probed.

(14) Prepare a spare wire, the problem can be solved as follows: the extension of the transmission line, moving to a remote transmitter can detect blind spot; the ground wire connected to the other side and extend the pipe to form a loop in the tube, so that the detection signal the strongest, complex problem solving exploration pipe network; the end of the pipe is grounded, so that the end of the earth form a loop, the original end of the pipe can not be probed probe; concrete floor can not solve the

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problem of the ground; extend the ground that the detection distance farther; in line escrow do simulation test, obtain line current detection data, avoiding excavation trouble.

(15) affixed to the pipeline: cities, roads, gardens, houses some of the original installation in the pipeline surface to prevent pedestrian walk kicked stumble. Coupled with the surface layer of cement, so that the top of the tube with the ground in the same plane, the pipeline when measuring depth probe to  $45^\circ$  moves toward the pipeline, no longer experience mute point can be placed on a bench top of the pipe to the surface height stool normal depth of buried pipes. Original features will return to normal when the probe sounding.

(16) via pipeline river, ditch, lake, pond, marsh when segment, leak detection method to make the following changes: a wire is available, there is an end buckle wiring nose, and the other end of the body capacitance leak detection cable is electrically connected to the fish folder the line at the top of the water along the pipe drag when the lugs reach the top of the leak, leak signal through soil and water conduction to reach the leak detector receiver, such effects are leak is ideal.

#### (四) detecting the basic principles and methods

1. Probe principle: after the transmitter current is applied to the pipe around the pipe to form a magnetic field by receiving signals to determine the location of the pipeline, and to depth.
2. Leak detection principle: the transmitter to the pipeline by applying specific electromagnetic signals, in the underground pipeline coating breakage and earth current loop is formed, will produce radiation leak signal to the ground, and is the strongest signal at the top of the radiation damage point, according to this principle, you can find coating damage point.
3. Leak Detection Methods: body capacitance method, which uses the body to do the leak detector sensing element along the pipeline inspectors to detect. When we arrived near the leak, the instrument has a reaction, when went to leak directly above the loudest sound, display the maximum value, thereby accurately find the point of breakage.

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### 三, the instrument Caution

1. Instruments in use should note the following:

(1) line sounding right or not, largely depends on the accuracy of the positioning plane. Near the branch pipeline and other pipeline lateral, the magnetic field is superimposed, the measured data where each line is the result of superposition, relative to a single line, the magnetic field distortion occurred, so the measure should be selected in the depths intermediate line segment a single line, the length of the straight section should be greater than 5 times the depth of the pipeline.

(2) test and line pipe casing should have better contact with the laying of new lines should be compacted soil after a period of time in the casing, with full access to the pipeline after leak detection, otherwise ineffective.

(3) instrument should be used when lateral leak method, that is at the top of the pipe member probe walking, walking inspectors left the pipeline so that the pipeline leak detection line perpendicular direction, and the value of the leak detector display the maximum sound, the location of the probe member is leak location.

(4) Leak detection of two lines must have a good contact with the human body. The human body can not collide with the shield layer, the core wire and shield can not collide, otherwise it will cause the leak detector malfunction.

(5) The transmitter is preferably ground line do not cross on top of the other lines or the other line, in this case, the transmitted signal will be coupled to other pipelines, may cause mistracking.

(6) probe instrument receiver at work, sometimes in the absence of detection of the pipeline to have a pipeline of illusion, the illusion generally have the following characteristics can be distinguished exclude:

① false premises does not match the measured signal strength and the actual position of the line;

② peak method and the zero value method measured line positions do not coincide;

③ change the transmitter transmits a signal injection point or grounding

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wire grounding point, the illusion will disappear.

(7) pipeline depth measurement is the center, the depth of the line at the top of subtracted radius line. Pipeline plane positioning and sounding dumb broad point of large diameter are to be amended to take dumb center position of the positioning and sounding pipes.

(8) within a certain area around the transmitter is blind, within range of the receiver will receive both a transmitter and a signal from the line, if you want to detect within this range may be extended emission lines, the transmitter will move a little far away.

(9) If the peak value and zero nominal position coincides may be considered to be accurate positioning, if the tag does not coincide with the positioning is not accurate, the error flag is displayed close to the peak position in line with the real side of the pipeline.

## 2. Charging Precautions

(1) Before using the instrument, transmitter, probe tester, leak detector must be fully charged again. When instrument unused for long periods, should be placed in a cool dry place, once a month enough electricity for all of the battery pack to prevent the loss of electricity damage.

(2) transmitter charging cord into the first transmitter output "Output" jack and the 220V power cord into the transmitter "220V Input" jack charged. Charging indicator light red, fully charged light green.

(3) instrument probe, the charge leak detector: 9.6V charger will probe instrument is inserted, the leak detector jack. When the charger red light, green light after fully charged. Probe tester, battery voltage automatically prompted a symbol Lb off below 8.5V when using the leak detector, which automatically shut down.



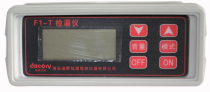










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#### 四, this manual Terminology explained

- 1, coating damage point: Yiming coating leak, leak coating iron point, point corrosion coating, coating pinholes.
- 2, location: at the point of the ground line projection, the connection of a plurality of dots called to the pipeline route.
- 3, the peak method: Yiming maximum method, the sound signal is shown on the maximum value of the target line.
- 4, zero-value method: Minimum Yiming Law, dumb-point method, the valley value method, the target line signal indication the smallest sound.
- 5, blind: within a certain range around the transmitter, transmitter field more than once within the target line in the area of secondary field. Size range by the transmission power, transmitter placement, ground positioning.
- 6, the target line: the transmitter is connected to the signal line need to probe to find the line.
- 7, coupling: inductive signal applied to the target line to a nearby pipeline or other metal facilities.
- 8, signal: the detected magnetic field lines in alternating current, or potential difference between the leak two points.
- 9, the probe: a built magnet coil device, its displacement and rotation angle can be positioned to the underground pipeline, fixed depth, the rate of decline observed signal, and can assess the merits of coating damage point size.
- 10, the receiver: receiving the transmitter signal to the load on the pipeline and the leak detector probe instrument.
- 11, the leak detector: also known as detector.
- 12, gain: Yiming sensitivity.
- 13, the coating: refers to the pipeline coatings.

## Packing list

Packing Date:      y      m      d

No.	Name	Item No.	Quantity	Picture
1	transmitter		1	
2	Probe instrument		1	
3	Leak		1	
4	Probe		1	
5	Line Leak		1	
6	Output lines		1	
7	Ground wire		1	
8	Ground rod		2	
9	Small rasp		1	
10	magnet		1	
11	220V power cable		1	
12	9.6V charger		2	
13	Fuse 2A		2	
14	random document		1	Manual certificate

The supervisor:

Packing:

Check:

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## Certificate of inspection

Hai Yi (word) No. 325th

Manufacturer: Haian Discory Detecting Instrument CO., Ltd

Product name: underground pipeline amperemeter detector

Specifications:

Factory no. :

Test conclusion:

Executive director :

Test :

Verification :

date:        y        m        d

validity period: one year



## warranty card

Product name	Underground pipeline amperemeter detector	Purchase date	date      y      m      d
model		No.	
Quantity		Customer name	
tel		tel	
add		Zip No.	

### Repair records

Repair times	1	2	3
trouble			
situation			
Repair date			
Repair personnel			

### warranty card:

- 一、 the warranty period: 1 year
- 二、 the warranty conditions: customer used instrument normally, and In the warranty period
- 三、 Paid repair: (1) no warranty card or invoice
  - (2) remove Voluntarily
  - (3) improperly secured,
  - (4) Man-made damage、 Natural disasters or improper operation of irresistible  
cause
  - (5) over the warranty period
- 四、 Users should keep a good this card, this card shall not be altered。
- 五、 With the card and certificate of inspection to repair
- 六、 after-sales service telephone: 400-012-6866.
- 七、 Address:#159 TanGangLu HaiAn JiangSu China

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## service

### dear customer:

thank you for using our product, Quality is our lifeblood of a brand, develop on credit, good service is our purpose.

### Our commitment

- 1、 our production process strictly implement the ISO9002 international quality standard system
- 2、 24hours service
- 3、 provide training
- 4、 one year warranty, life-long maintenance
- 5、 provide technical support and spare parts replacement
- 6、 pay attention to the feedback and suggestions
- 7、 The on-line service, online interpretation

### After-sale service

- 1、 24hours hot-line (400-012-6866)

We guarantee 4 hours to solve the problem, after we received your phone call

if solving problem on site is necessary. We guarantee 24 hours on the main city, and 48-72 hours on others

if hardware failure, we guarantee solving problem after 2days

- 2、 E-mail service (postmaster@dscr.com.cn)

reply not over 12 hours

- 3、 web side (www.dscr.com.cn)

Introduction and connection

- 4、 fax (0513-88931551)

reply not over 4 hours

- 5、 Emergency service

we will arrive at the customer scene in the shortest time

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