

Operation Manual

MPL-H100 Ver.1



McLAUGHLIN GX

DIGITAL LOCATOR

TAKACHIHO SANGYO CO., LTD.

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1. SAFETY

Always locate with proper respect and caution. Equipment misuse or carelessness can result in serious injury or damage to property. Always follow safety rules.

HAZARD ALERT INFORMATION

BE AWARE OF SAFETY INFORMATION

This is a safety-alert sign. This is placed in the manual and on your equipment to alert you to the potential for bodily injury or death.



SIGNAL WORDS

The safety-alert icon is used with the following signal word :
DANGER, WARNING, AND CAUTION. When you see these words in the manual or on decals on your equipment, carefully read and follow all instructions. Watch for these words and learn their meanings.

DANGER – Imminent hazards which, if not avoided, will result in death or serious injury.



WARNING – Potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION – Potentially hazardous situation which, if not avoided, may result in minor personal injury or property damage.



OPERATOR PREPARATIONS

Important : Read and understand this manual before using the Locator.
Successful use of the Locator depends on good locating skills and correct understanding of receiver response.

GENERAL SAFETY

 **DANGER** : Do not attempt to connect to Live Power without proper protective Equipment and Training.

 **DANGER ELECTRIC SHOCK** : Death or serious injury will result
NOTICE : Do not apply more than 250 volts across clips. More than 250 volts will damage transmitter.

⚠ DANGER : High Voltage. Cutting high voltage cable can cause DEATH or ELECTROCUTION. Expose lines by a non-destructive means before excavating.

⚠ DANGER : Traffic Hazards can result in death or serious injury. Avoid moving Vehicles. Wear high-visibility clothing.

⚠ WARNING : Buried lines. Always confirm your depth estimate by exposing target line by a non-destructive means.

⚠ WARNING : Jobsite Hazards can cause DEATH or SERIOUS INJURY. Wear proper safety equipment.

NOTICE : Non-metallic lines can be accurately detected only by using a probe. Remember this before searching and attempting any excavation activity.

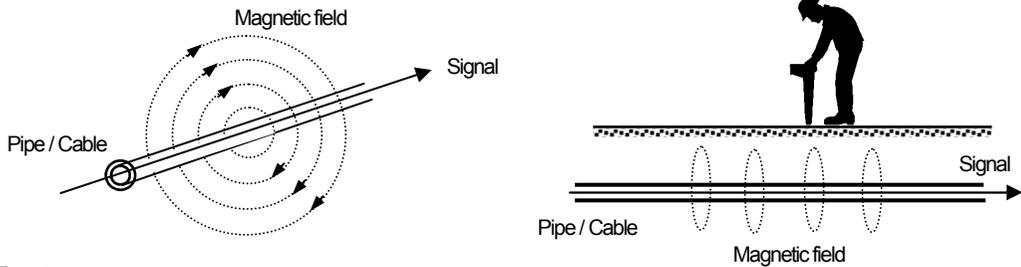
NOTICE : Use only alkaline or rechargeable batteries in the receiver and transmitter. Batteries contain acid, which may leak if the batteries are allowed to remain in The equipment when low or completely discharged. This acid can cause Equipment damage.

2. Introduction

This equipment is the high performance digital measurement equipment to measure the location and the depth of buried cable / metal pipe from the ground. By adopting the most recent microcomputer technology, the digital correction of the measurement data realizes stable and high precious measurement.

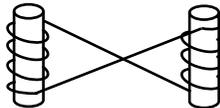
- Principle measurement method -

When current flows through a buried cable/pipe, an alternating magnetic field is generated around it. Location, depth, and current value of the buried pipe can be measured using the Receiver at the surface of the ground.



- Feature -

- Adopting differential coil method makes the Receiver to receive the signal from direct below the Receiver by cutting noise from surrounding area.



*The model figure of the differential coil.
The differential coil connected two coils for each other reverse.

- Two kinds of the location measurement mode
 - *Peak mode: The method to detect maximum sensitivity. High precision. (having error detection protection function)
 - *Null mode: The method to detect minimum sensitivity point being indicated with arrow. (having error detection protection function)

No switch operation needed. Applied to at deep depth with stable location work.
- Two kinds of the depth measurement mode
 - * 0-5m (16ft) mode: Measurement of deep depth with high precision is possible at indirect method, the end of cable, and jointing points.
 - *0-30m(99ft) mode: Stable measurement is possible at deep depth, near guardrail, or fence.

Do not use this mode with inductive mode.
- The Receiver itself can measure commercial frequency (50 / 60Hz, 100 / 120Hz) and Radio (from 9k to 33kHz) without the use of the Transmitter.
- The best-suited frequency is automatically selected at radio (9k - 33kHz) with **search function**.
- The measured data is stored (max. 400 data) with **one-touch operation**.
The data can be transmitted to a PC as standard function.
- Broadcasting of six frequencies (512Hz, 640Hz, 853Hz,9.5kHz, 38kHz, 80kHz) as usage meets various buried pipe.
- A Probe as an option can be used to detect nonmetal pipe.

3. Composition

3-1. Main equipment & standard accessories

Description	Q'ty	Remark
Transmitter Unit	1pc	Used as a signal generator.
Receiver Unit	1pc	Digital locator
<i>Accessories</i>		
Connecting cable	1pc	Used for Direct connection mode
Ground rod	1pc	Used for Direct connection mode.
Type "D" Alkaline battery	10pcs	LR20/13A For Transmitter
Type "AA" Alkaline battery	6pcs	IEC LR6/NEDA15A For Receiver
Carrying case	1pc	
Operating manual	1pc	English version

3-2. Optional equipment

Description	Q'ty	Remark
38kHz External coil	1pc	Used for External coil mode.
9.5kHz External coil	1pc	Used for External coil mode.
80kHz External coil	1pc	Used for External coil mode.
Clamp	1pc	Multi frequency
Sewer Probe	1pc	Used for non-metallic pipe. Standard probe for 75mm/ 3" & 100mm/ 4" pipe. Frequency: 38kHz
Mini probe	1pc	For 25mm / 1" fiber optic duct. For tracking non-directional drilling tools. Frequency: 38kHz / 512Hz / 850Hz
PC interface Cable	1pc	
Earphone	1pc	Used in a noisy area.
Battery charger	1pc	Used for transmitter

4. Specification

Transmitter(TX)

Output frequencies	38kHz :38kHz±0.02% (Standard frequency) 9.5kHz :9.5kHz±0.02% 80kHz :78.125kHz ±0.02% 853Hz :853.33Hz ±0.02% 640Hz :640Hz ±0.02% 512Hz :512Hz ±0.02% Dual : Direct mode 9.5kHz &38kHz ±0.02% : Inductive mode (1) 38kHz & 80kHz ±0.02% : Inductive mode (2) 9.5kHz &80kHz ±0.02%
Output power	7 watts maximum / 80kHz: 1 watts maximum
Operating Modes	Direct connection mode, Inductive mode External coil mode (optional)
Battery type	Ten Alkaline LR20 “D” or NiMH “D”
Battery Life	Direct mode : 50 hours (Output 4mA, 20°C / 68°F) Inductive mode : 20 hours (Output 50%, 20°C / 68°F) Full Power(5W) : 10 hours (20°C / 68°F)
Battery Status	Low battery indication & Press key readout
Visual Indication	LCD : Bar graph & Digital number, includes Backlight
Audio Indication	Internal Speaker : Alarm, Beeping sounds
Measuring function	Output Current : 0 to 400mA Line Voltage : AC 0 to 250V : DC -100V to +100V Resistance : 0 to 10M ohms
Output protection	AC 250V (512Hz/640Hz: Output is cut off automatically)
Operating Temperature	-20°C to 50°C / -4°F to 122°F
Dimensions	400 × 230 × 98mm(15.7” × 9.1” × 3.9”)
Weight	4.2kg/9.3lbs approx. including ten batteries

Receiver(RX)

Active Frequencies	38kHz : 38kHz ±2%
	9.5kHz : 9.5kHz ±2%
	80kHz : 78.125kHz ±2%
	512Hz : 512Hz ±2%
	LF : Low frequency(250Hz to 1000Hz) --- factory configurable
Passive Radio	Radio : 9k to 33kHz
Passive Power	50 / 60Hz : 5th harmonic (50 Hz or 60Hz user selectable)
	100 /120Hz : 3ed harmonic (100 Hz or 120Hz user selectable)
Battery type	Six Alkaline LR6 “AA”
Battery Life	24 hours (20°C / 68°F)
Battery Status	Continuous indication
Power save function	Automatically power off after 5minutes of inactivity
Visual Indication	LCD : Bar graph , Digital number & character, include Backlight
Depth Display Range	Line : 0 to 5m /16ft. (0-5m / 0-16ft. mode)
	0 to 30m /99ft. (0-30m / 0-99ft. mode)
	Probe : 0 to 30m /99ft.
Depth Readout Unit	Meter / ft. & inch
Depth Accuracy*1	2.0m / 6.5ft. : ±2.5%
	3.0m / 10ft. : ±5%
	5.0m / 16.5ft. : ±10%
Current value	Current value flowing on the conductor is displayed for line identity in milli-Amps.
Digital Level	Indicate horizontal level on LCD of the receiver.
Audio output	Internal Speaker (500 to 2kHz) , Earphone (optional)
Data logging	Memorized 400 points of the depth / current measurement data.
Interface	6-pin connector for PC communication / GPS sensor
Operating Temperature	-20°C to 50°C / -4°F to 122°F
Dimensions	660 × 130 × 270mm (26.0” × 5.1” × 10.6”)
Weight	2.1kg / 4.7lbs approx. including six batteries

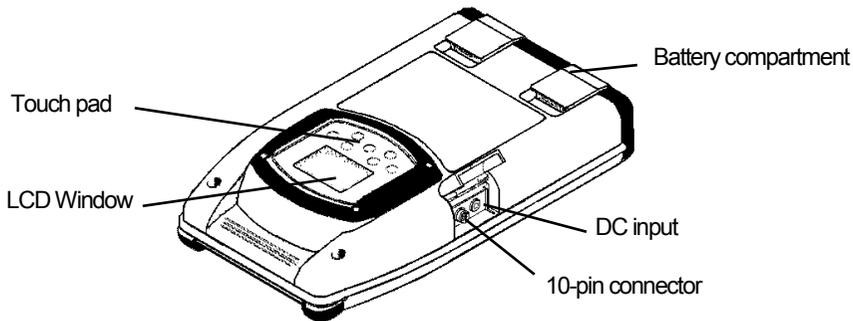
Note: *1 Locators are tested in the model field conditions with no adjacent signals.

Always excavate the line with non-destructive means before digging.

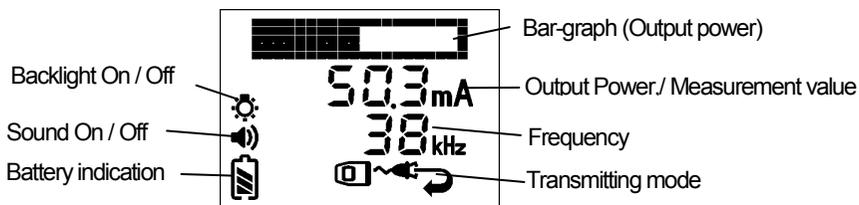
*2 Optional cable is necessary to read the logging data.

5. Description of parts & basic operation

5-1. Transmitter



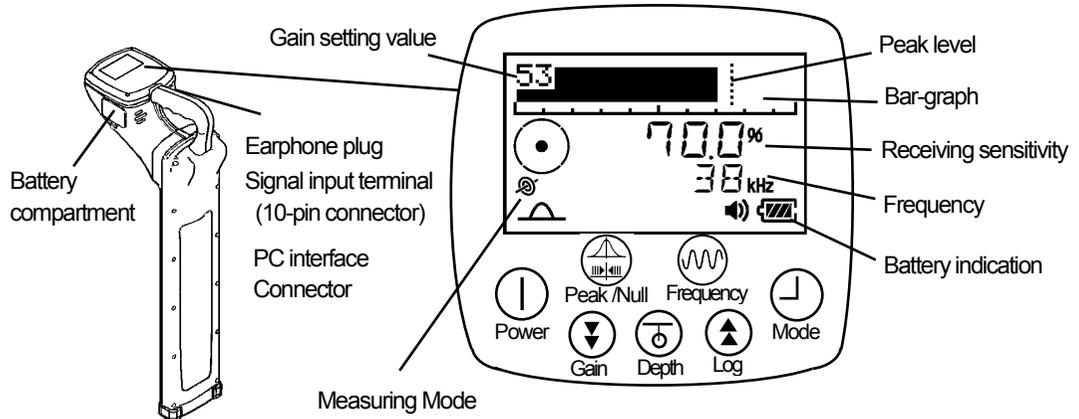
1) LCD window



2) Key function

 Power	Power ON / OFF *Each time Transmitter is turned on the batteries are automatically checked.
 Adjust	Press ADJUST key after hook up to automatically adjust power. * Signal isn't outputted until Adjust is pressed when Direct connection mode.
 Frequency	Selects operating frequency. *1 DUAL : Broadcasts two frequencies simultaneously. *2 512Hz , 640Hz , 850Hz : Direct mode only.
 Measure	Measurement the AC voltage, DC voltage, Resistance or output signal current when Direct connection mode.
	Increase Output power
	Reduce Output power

5-2. Receiver



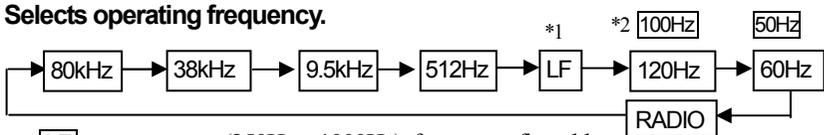
1)Key function

 Power	Power ON / OFF *Power save function: Automatically power off after 5 minutes of inactivity.
 Log  Gain	Adjusts Signal sensitivity for PEAK MODE. * Manual gain control mode (MANU GAIN) Press the Gain  key, sensitivity is decreased. Press the Log  key, sensitivity is increased. * Semi-Automatic gain control mode (AUTO GAIN) When press the Gain key, sensitivity is adjusted automatically to 70%. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <i>Note: 100% is not the maximum peak value. When 100% appears, press Gain key again until a new sharp peak value is obtained, that is not 100%.</i> </div>
 Depth	Depth measurement : Press DEPTH key at the peak value spot. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  <p style="margin: 0;">2.47m — Depth</p> <p style="margin: 0;">103.5mA — Current index : Details page 26</p> <p style="margin: 0;"><i>Note: Current index is not displayed if probe is used.</i></p> </div>
 Peak / Null	Selects locating mode. <div style="display: flex; align-items: center; margin-bottom: 10px;">  ←→  </div> <p>Peak mode :Maximum sensitivity is the point directly above the object line.</p> <p>Null mode : Minimum sensitivity is the point directly above the object line. The buried object line is indicated with arrow.</p>



Frequency

Selects operating frequency.



*1 **LF** : Low frequency (250Hz ~ 1000Hz). factory configurable

***2 Selects Power frequency 50Hz / 60Hz**

Power on while holding **Frequency** key.

POW 50Hz or **POW 60Hz** screen is indicated in 1 seconds.

Press **Frequency**, and select **50Hz** or **60Hz**.

At the same time, 100/120Hz is selected. (50Hz → 100Hz / 60Hz → 120Hz)

The setting is memorized with Power off.





Mode

Various settings

1. Selects backlight options. By pressing **Mode, move on.**

Press **Gain** : Select backlight On / Off. { LIGHT ON  / LIGHT OFF

2. Selects sound options. By pressing **Mode, move on.**

Press **Gain** : Select speaker sound On / Off. { SOUND ON  / SOUND OFF

3. Selects Depth function. By pressing **Mode, move on.**

Press **Gain** : Select depth function 0-5m / 0-30m (0-16ft / 0-99ft).

***0-5m / 16ft** : Applied for Inductive mode.
Detecting near the end of the pipe.
Depth measurement range 0 to 5m(16ft).

***0-30m / 99ft** : Applied for the depth deeper than 5m(16ft), near guardrail or metal fence.
The measurement range of depth 0 to 10m(30ft).

CAUTION

When applying Inductive mode, select **0-5m/16ft** . Depth measurement error gets bigger at near the Transmitter when 0-10m/30ft is applied.

4. Selects Gain control operation. By pressing **Mode, return to measurement.**

Press **Gain** : Select Gain control operation { MANU GAIN (See page 9) / AUTO GAIN

5. Selects PROBE detection. By pressing **Mode, return to measurement.**

When Sewer or Mini Probe is employed for the detection of Non-metallic pipe or Boring device. 38kHz, 512Hz and 850Hz are used for Probe.

Press **Gain** : Select detecting function .



PROBE ON
Probe detection

↔



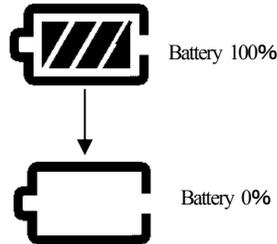
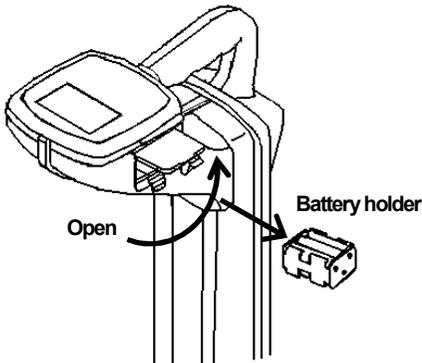
PROBE OFF
Cable / Pipe detection

***The last setting is saved.**

 Mode	<p>Setting the Time and Date</p> <p>a) Power on while holding [Mode], wait for clock display appears. The year will flash. Press [↓Gain] to advance the year or [↑Log] to decrement the year.</p> <p>b) Press [Mode], the month will flash. Press [↓Gain] to advance the month or [↑Log] to decrement the month.</p> <p>c) Do same as above to set Day --> Hour --> Minute. When measurement starts, setting is completed.</p>	
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2) Battery compartment

Replace all batteries when there is a low battery condition.
 Use six 1.5V alkaline type AA (IEC LR6/NEDA15A).



ALWAYS CHECK THE BATTERY POLARITY BEFORE CLOSING THE COMPARTMENT

3) 6-pin connector (PC interface connector)

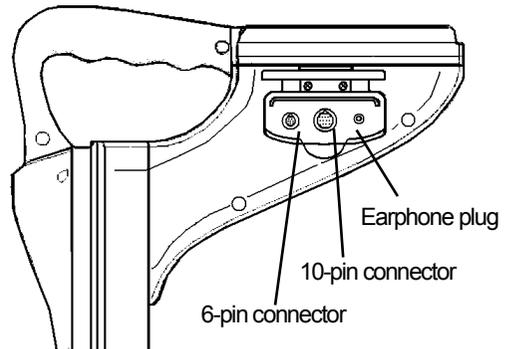
The connector is used to communicate PC and GPS.
 *Interface cable & GPS are supplied as option.

4) Earphone plug

Earphone can be used in a noisy area.
 Supplied as an option.

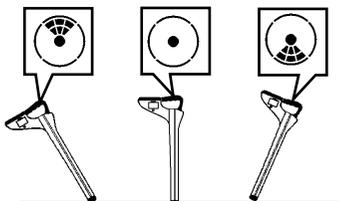
5) 10-pin connector

Used with Sensor Coil to find wiring systems in a building or overhead telephone cables.
 Sensor coil is supplied as options.



6) Digital level

Displayed the inclination of the receiver.



Calibration methodology of digital level

a) Power on while holding **[Depth]** key.
[PUSH GAIN LEVEL] screen is indicated in 1 seconds.

b) Make the receiver vertical posture. (center of left chart)

c) Press **[GAIN]**. Please do not move the receiver until **[OK]** is displayed.

d) Incline the receiver to the front, back, left and right, and confirm the display.
 The setting is memorized with Power off.

6. Warning Message

*Messages during your search procedure :

OVER	<p>Receiving signal is too high.</p> <p>a) Indirect mode : Transmitter and Receiver are too close each other. b) Other cases : Reduce output of the Transmitter.</p>
LOW	<p>Receiving signal is too small or not present.</p> <p>a) In the case of direct, induction or coil - Increase output of the Transmitter. - Check batteries, connecting parts and frequency of the Transmitter. - Check signal loop at the Transmitter.</p> <p>b) In the case of Radio / Power mode - There are no conductors to radiate magnetic fields. There is no pipe or cable - There is a conductor, but the signal is too low to adhere to the line. Use Transmitter to search for the line.</p>

*Messages on location :

PUSH GAIN	<p>Press GAIN key. ⇒ Normally this is your object line. Reduces or increases signal strength.</p>
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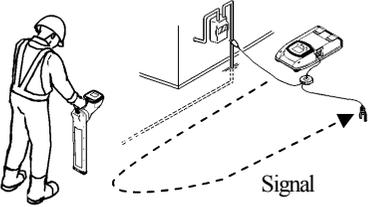
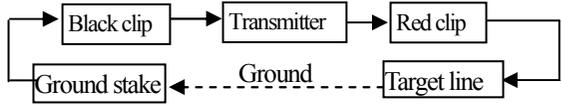
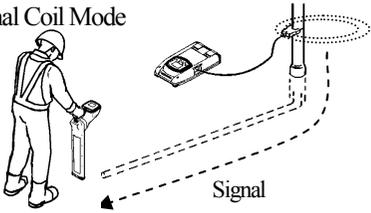
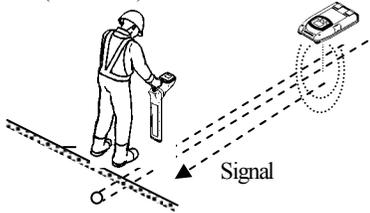
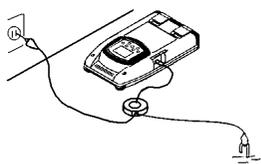
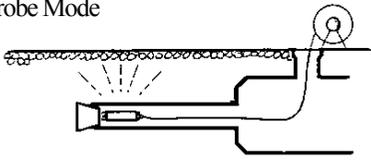
*Messages on Depth measurement :

ERR	<p>a) Received signal level is unusual, or received signal is too small. b) Located point is not right above the object line. c) Metallic fences, metallic structures or cars are interfering with the depth measurement. Find area with less interference. d) The Line is disconnected.</p>
<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">16' -- "</div> <div style="border: 1px solid black; padding: 2px;">5. -- m</div>	<p>Indicating that the depth measured is deeper than 5 m / 16ft.</p>

*Messages on transmitting operation:

HEAT!	<p>Inside temperature exceeded an upper limit. ⇒ Power off and move the transmitter to the cool place.</p>
LIMIT	<p>Power electric current exceeded an upper limit. Inside temperature exceeded an upper limit. ⇒ Leave the transmitter from the neighborhood of the metal. Decrease transmitting output.</p>

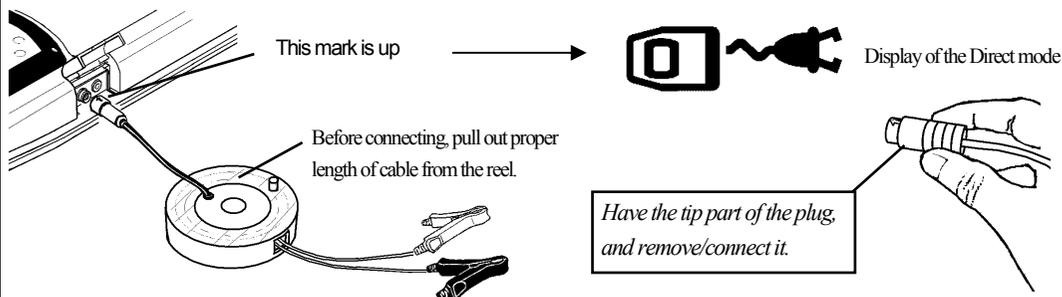
7. Operation of Transmitter (TX)

Mode of Detection	Purpose of usage
<p>Direct Connection Mode</p> 	<p>This is the best way to inject AC current direct to the target line. Signal (AC current) will return to the Transmitter through the ground.</p>  <p>Effective for detecting the target line in congested areas.</p>
<p>External Coil Mode</p> 	<p>Advantage for live power or cable, that is not accessible for Direct connection. The clamp is waterproof and will attach on any size cable. No need for a ground stake. Effective for detecting the target line in congested area. The target line must be grounded.</p>
<p>Indirect (Inductive) Mode</p> 	<p>If there is no direct access to the target line, use this method. The Transmitter can induce its signal to the buried line. Place the Transmitter in an upright position and at right angle to the buried line. Minimum TX to RX distance \Rightarrow 10 m / 30ft.</p> <p><i>Note: When using the indirect mode, set the depth mode of the receiver to 0-5m (0-16ft.) .Depth measurement error gets bigger at near the Transmitter when 0-30m (99ft) is applied.</i></p>
<p>Building Wiring</p> 	<p>Used with External Coil to find wiring systems in the building. TX's circuit is protected* up to 250V at 50 / 60 Hz.</p> <p>*If using the low frequency (512Hz, 850Hz...), output is cut off automatically for protecting the unit.</p>
<p>Probe Mode</p> 	<p>Used for tracing small diameter drains or plastic pipes. Also, pinpoint a drain blockage or collapse. Can trace non-directional boring tools. The Probe is available in two sizes, 20mm/ 0.79" and 50mm/ 2" diameter.</p>

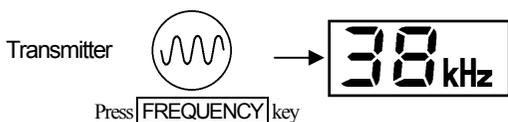
7-1. Direct connection mode

A specific route can be detected in Direct Connection mode. Use two connecting cable with a reel provided in the carrying case as one of the standard accessories.

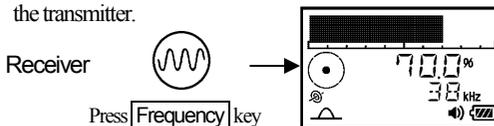
When the clips are connected to the transmitter, Direct Connection mode automatically selected.



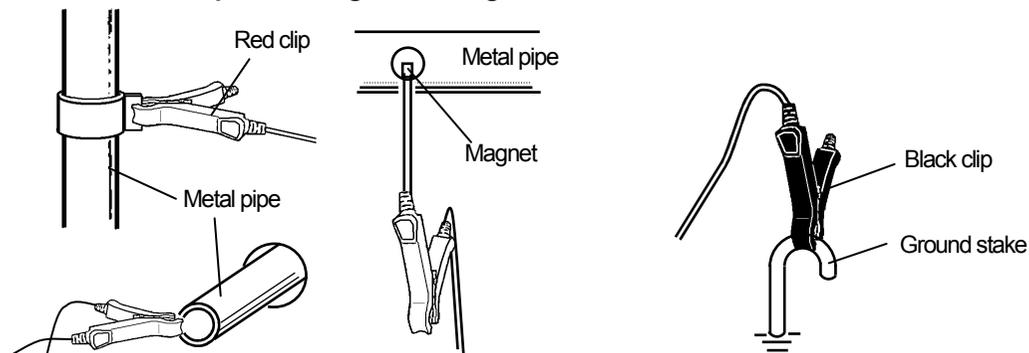
Frequency setting



*Set a receiving frequency on the Receiver the same as the transmitter.

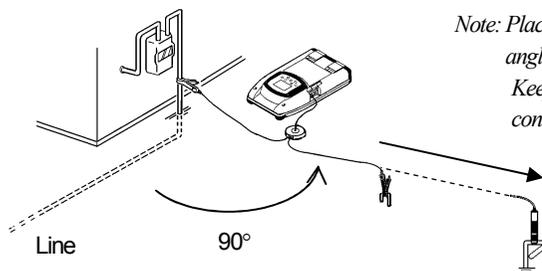


Connect the cable clips to the target line and ground stake.



Note: Clean off if the connected part is rusted or painted to ensure a good electrical connection.

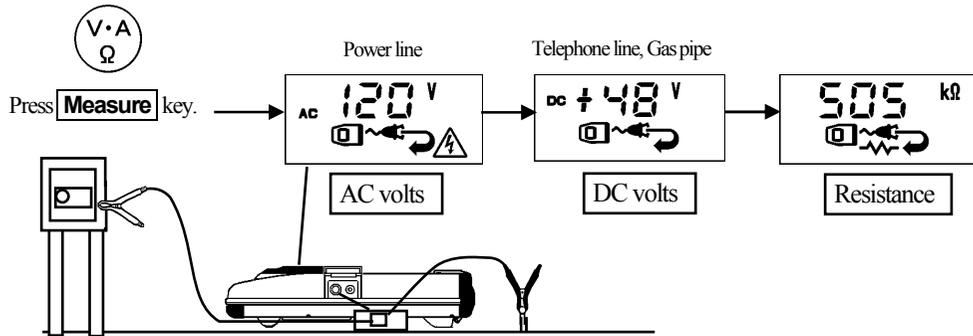
Check the grounded point. Find the best place to ground to have a GOOD SIGNAL LOOP indication.



Note: Place the Earth/Ground as far as possible and at right angle to the object line.

Keep Receiver at least 5m/16ft. away from the signal connection point as illustrated

Check the Voltage and Resistance of the cable/pipe before adjust output power.

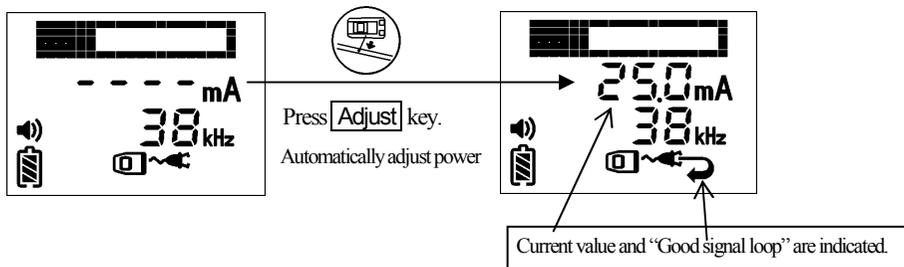


When voltage is greater than 25 volts, Alarm sounds.
 Note: 512Hz / 640Hz output is cut off automatically.

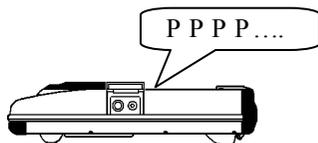


DANGER
 ELECTRIC SHOCK
 Death or serious injury will result. 250 Volts
 maximum across clips. Use protective equipment.

Adjust output power



When signal loop is acceptable, Beeping sound is emitted.



- *Transmitter will beep for 30 seconds.
- *Sound stops when Press **ADJUST** key.
- *Sound setting is [b-0] ⇒ Beeping sound off.

*When "GOOD SIGNAL LOOP" isn't indicated after pressing **ADJUST** ⇒ Clean off the connected part if rusted or painted or move ground stake.

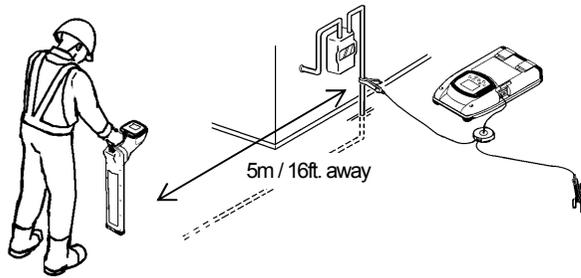
When output is adjusted

- *When the Receiver indicates "OVER", Press **▼** key. ⇒ Reduce output.
- *When locating a long-distance line or deeper depth than 3m, Press **▲** key. ⇒ Increase output.

Note: When frequency is changed, adjust output power again.

Direct Connection mode

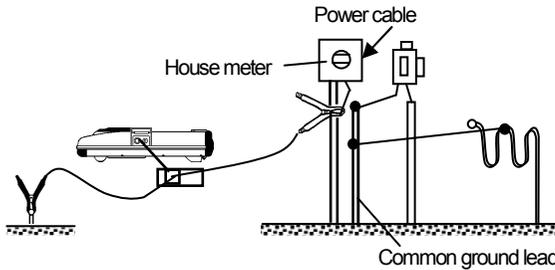
Use the Receiver 5m away from the transmitter and clips.



Applications (1)

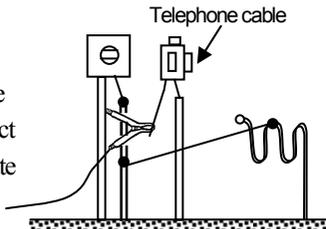
Power cable:

Disconnect common ground lead and connect the Red clip to Power line ground lead. Then locate Power line



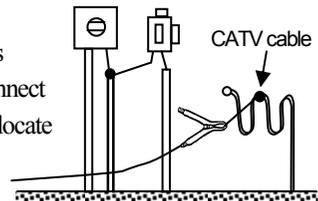
Telephone cable:

Disconnect Telephone Ground lead and connect the Red clip to it to locate Telephone line.



CATV cable:

Disconnect CATV's ground lead and connect the Red clip to it to locate CATV line.

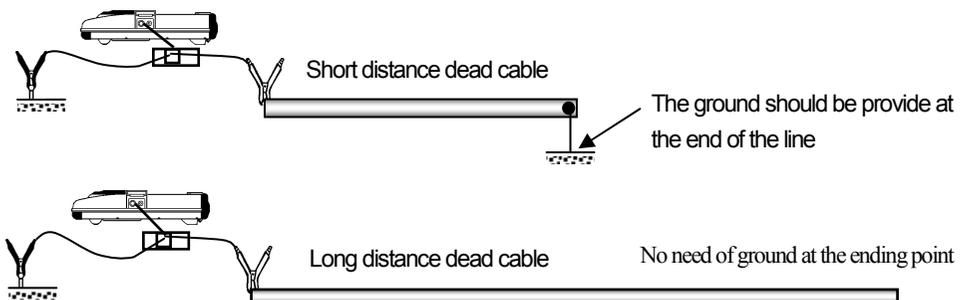


⚠ WARNING

Remember to correctly reconnect common grounds for telephone, CATV and Electric Lines. Check Local codes for proper grounding procedure. IMPROPER GROUNDING MAY CAUSE DAMAGE TO APPLIANCES, FIRE OR EXPLOSIONS.

Applications (2)

If the dead cable is the object, connect the red alligator clip of the connecting cable to either the aluminum-sheath or a bundle of the copper cores directly.

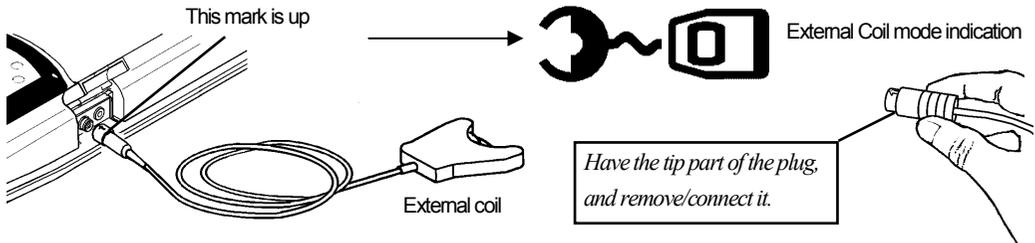


7-2. External coil mode

Use 9.5 kHz, 38 kHz or 80kHz External coil supplied as an option. Use this mode if object is accessible. An induced current, generated by the coil in the External Coil attachment, is applied directly to the exposed part of the cable / pipe to be located.

Applicable to : Live Telecom cable or Live Power cable. Fiber optic cable having an aluminum-sheath.

When the External coil is connected to the transmitter, External coil mode is automatically selected.

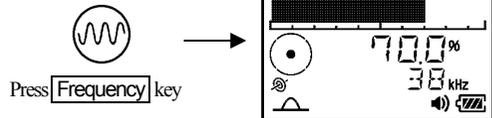


Frequency setting

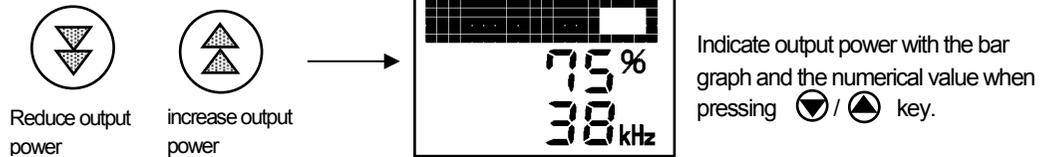
Frequency is selected based on coil used with the External coil automatically.



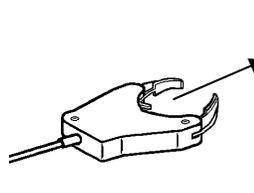
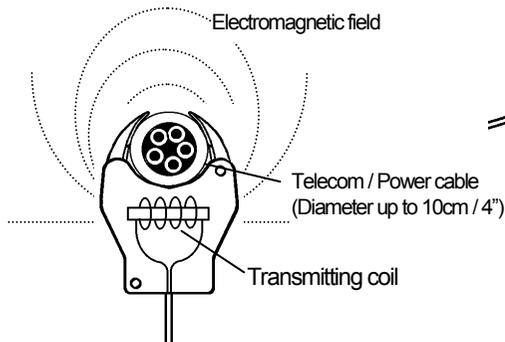
*Set a receiving frequency on the Receiver the same as the transmitter.



Adjust output power



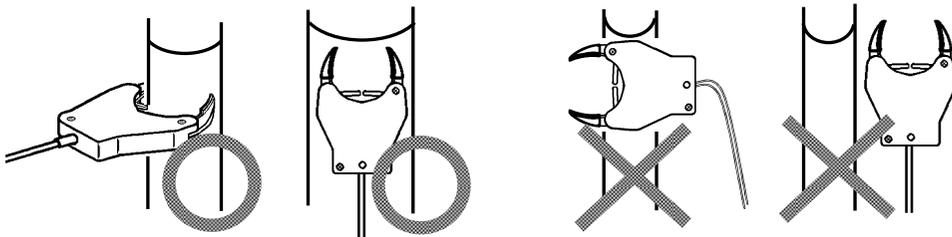
Connect the External coil to the target line.



*The jaws do not have to be closed around the cable.

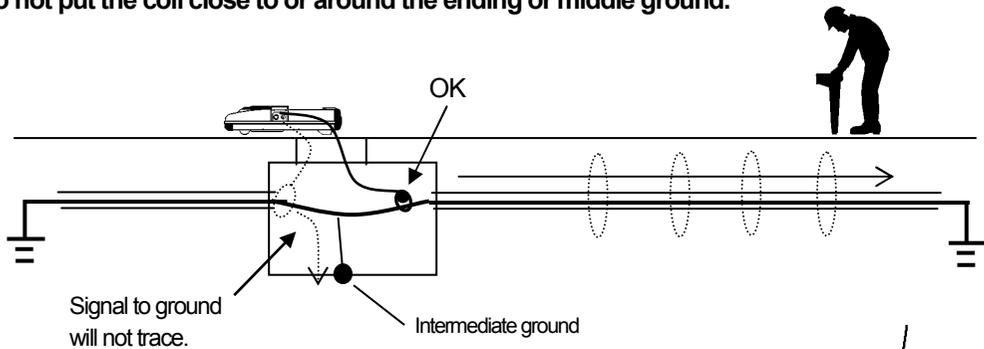
(This coil method is different from the conventional clamp that must have jaws perfectly closed. Different size clamps are not needed. This coil method uses the indirect / Inductive principle.)

Note :Make sure it is attached parallel and in line with the cable as illustrated.



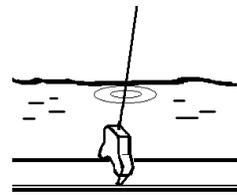
External coil mode

Make sure that the cable is grounded at both ends.
Do not put the coil close to or around the ending or middle ground.

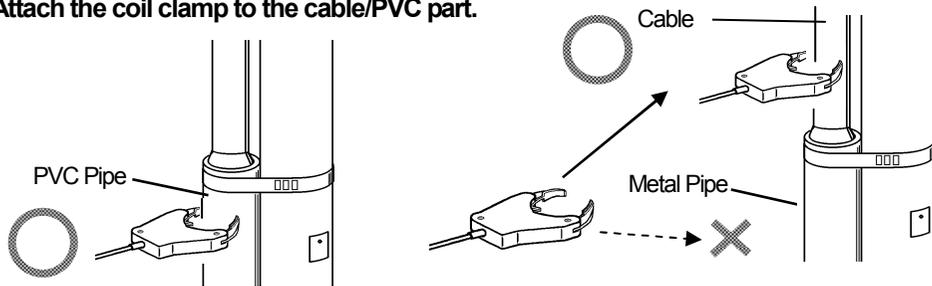


* If the cable is submerged in water, you can use the coil attachment in the water.
The coil attachment is **WATERPROOF**.

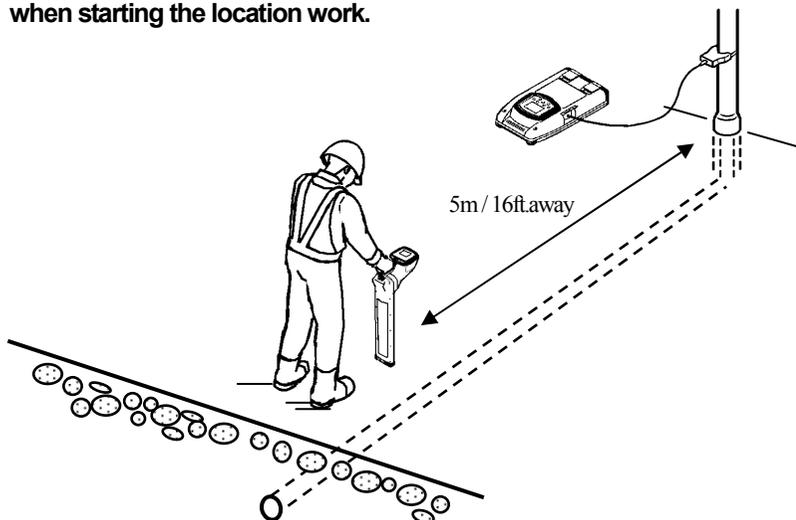
*Note : Fresh water has no effect Locating the cable or detecting depth.
Brash or salt water will effect locating.*



**Note : Do not attach to the metal pipe or metal riser above the ground.
Attach the coil clamp to the cable/PVC part.**



**Note :Use the Receiver more than 5 m / 16ft. away from the coil clamp
when starting the location work.**



7-3. Indirect (Inductive) mode

If there is not direct access to the object line, the Transmitter can apply AC current (signal) to the line directly below the Transmitter.

Note: When using the indirect mode, set the depth mode of the receiver to Standard mode .

When nothing is connected to the transmitter, Indirect mode automatically selected.

Frequency setting

Transmitter

Press **Frequency** key

*Set a receiving frequency on the Receiver the same as the transmitter.

Press **Frequency** key

Place the transmitter over or near the area to be located.

Do not place the Transmitter on a manhole cover or other steel covering.

***Place the Transmitter in an upright position at a 90° angle to the object line as illustrated.**

Object line

Object line

Top view

***Location the area of a manhole, place the Transmitter on the side of the manhole you wish to locate.**

Transmitter

manhole

signal

signal

Indirect mode

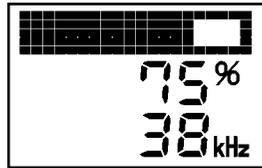
Adjust output power



Reduce power



Increase power



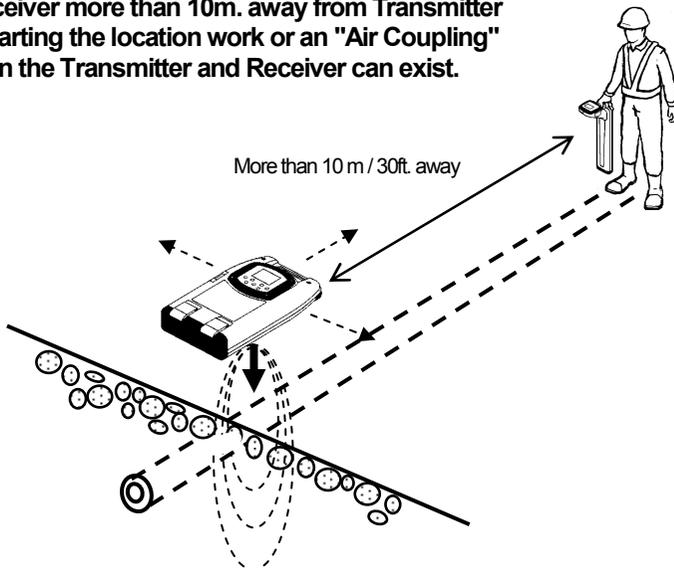
Indicate output power with the bar - graph and the numerical value when pressing  /  key.

*Standard of adjustment.

- When depth is less than 0.6m / 2ft. \Rightarrow 50%
- When depth is more than 0.6m / 2ft., less than 1.5m / 5ft. \Rightarrow 75%
- When depth is more than 1.5m / 5ft. \Rightarrow 100%

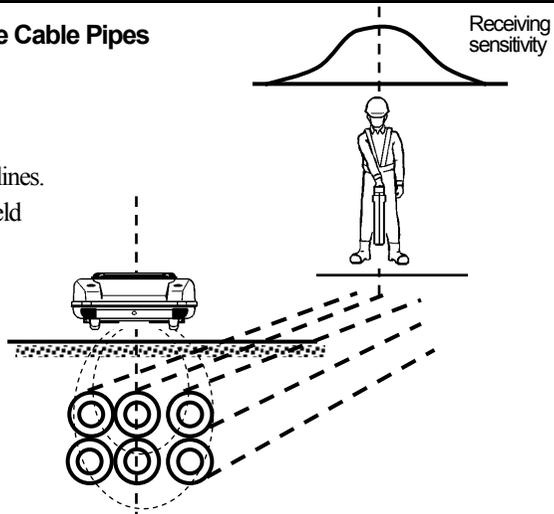
*Note: If output is adjusted to 100%, you can usually locate in any place.
But the battery of the transmitter is reduced as output increases.*

Note :Use Receiver more than 10m. away from Transmitter when starting the location work or an "Air Coupling" between the Transmitter and Receiver can exist.



Note: Detection of the Multiple Telephone Cable Pipes (Metal Ducts) in Indirect mode

Don't assume that the peak point of the signal strength obtained is the center of the multiple lines.
It is the central point of the electromagnetic field applied by the Transmitter.



8. Operation of Receiver (RX)

8-1. Null Mode

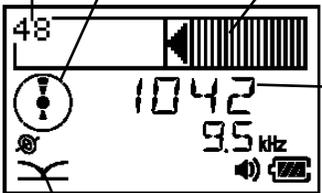
Starting Null Mode

Press **Peak / Null** key. →  is displayed

Gain setting value

Yaw angle

The direction of the object line.

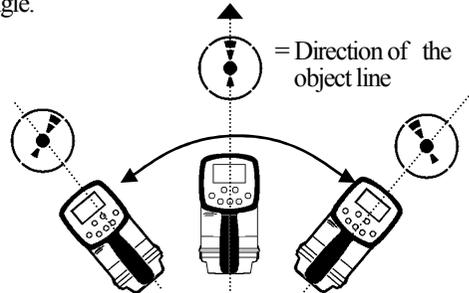


Receiving level

Null mode

To find the direction of the object line,

rotate the receiver and stop at the center position of the Yaw angle.



*ON/OFF of the Yaw Function is chosen by pressing **Gain** key.

*The receiver **don't display the yaw angle** when the low frequency (850Hz~50Hz) is used and when there are a lot of noises. Please search for the direction by the maximum point of the receiving sensitivity.

To find the position of the object line,

The arrows are indicated on the both side.

Number of receiving level is blinked.

Move in the direction of the arrow.

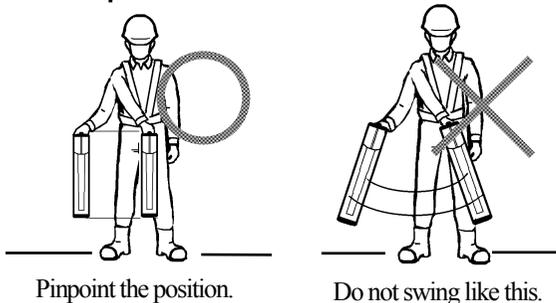
Same as Depth distance approximately

Object Line

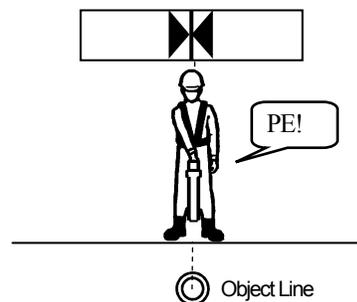
Same as Depth distance approximately

It is ghost signal if the arrow is reversed. when number is blinked

Move the Receiver from side to side to determine the exact position.



When Receiver is passed the top of the line, Beep sound is emitted.

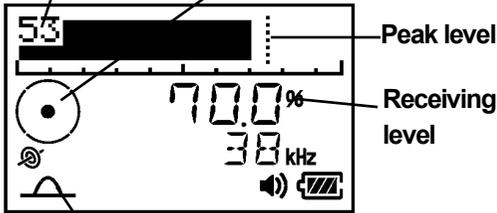


8-2. Peak Mode

Starting Peak Mode

Press **Peak / Null** key. →  is displayed

Gain setting value **Digital level**



Peak level

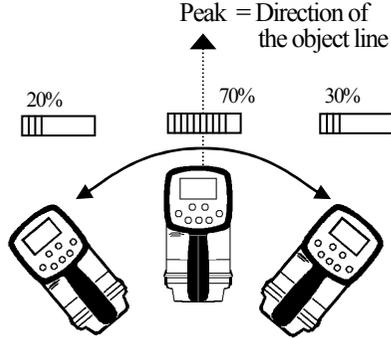
Receiving level

Peak Mode

To find the direction of the object line,

rotate the receiver over the object line and stop at the position of the maximum peak value.

Peak = Direction of the object line



To adjust the sensitivity of the receiving level.

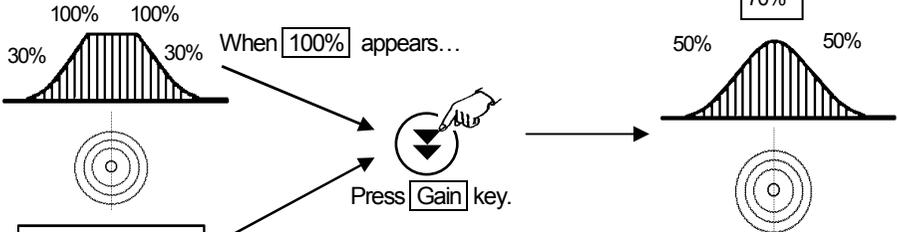
A) Manual gain control mode

Press the **Gain**  key, sensitivity is decreased.

Press the **Log**  key, sensitivity is increased.

B) Semi-automatic gain control mode

Press the **Gain**  key, sensitivity is decreased.



When **100%** appears...

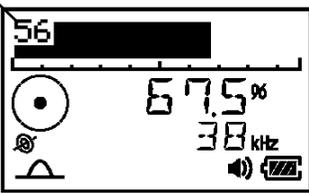
Press **Gain** key.

When **PUSH GAIN** appears...

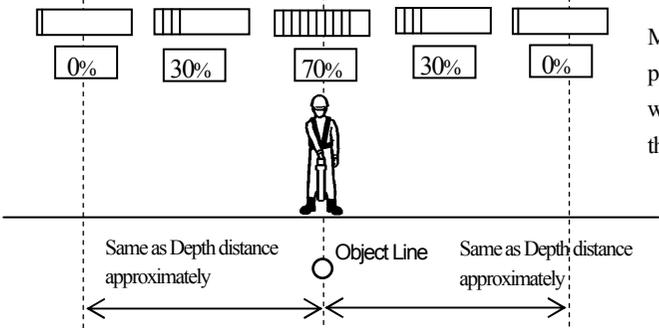
70% appears as an initial receiving level.

Note: 100% is not the maximum peak value.

When adjust the sensitivity, Gain step is indicated. (0~60)



To find the position of the object line,



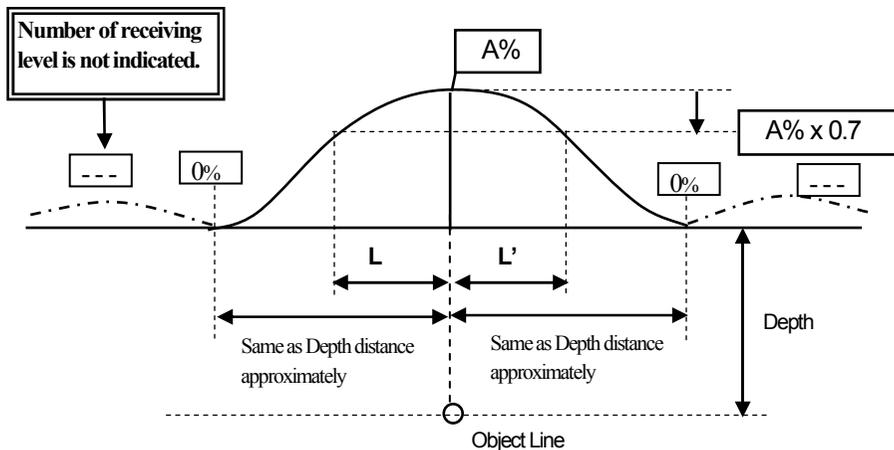
Same as Depth distance approximately

Object Line

Same as Depth distance approximately

Maximum (peak) value, the precise position and direction, are obtained when the Receiver blade is the top of the object line

Characteristic of the “manual gain control” peak mode

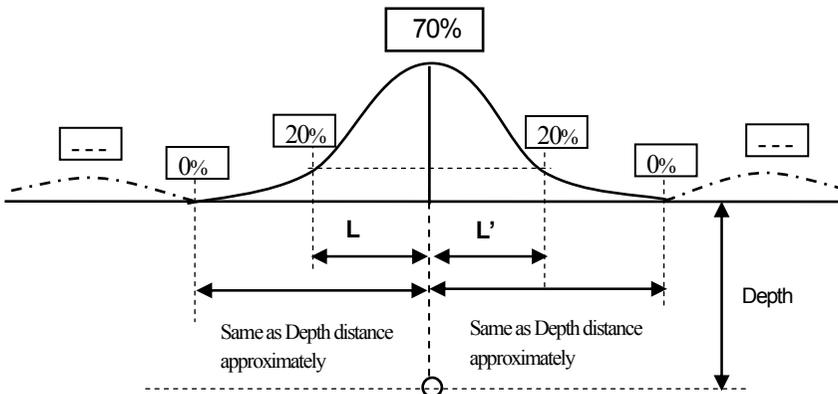


$$L = L' = \text{DEPTH} \div 2 + 0.1\text{m}$$

Example.

71.0%	Move to the side of the object.	49.7%	Ex. Length = 1.1m
Peak value	→	71% x 0.7	Depth = 1.1m x 2 - 0.2m
			= 2.2m - 0.2m = 2m

Characteristic of the “semi-automatic gain control” peak mode



$$L = L' = \text{DEPTH} \div 2 + 0.1\text{m}$$

Example.

70.0%	Move to the side of the object.	20.0%	Ex. Length = 0.6m
Peak value	→		Depth = 0.6m x 2 - 0.2m
			= 1.2m - 0.2m = 1m

8-3. Depth measurement

Once the precise location of the object line has been determined, the **Depth** key is pressed to display the distance from the Receiver's blade to the object line. Calculations are indicated on the digital display.

Note: Depth reading is a calculation of received signal strength.

Hold the Receiver vertically, place the blade on the ground and **do not move it during the depth measurement.**

Blade
↑
Depth
↓
Center
Object line

Touch the ground with the Receiver's blade at an upright position.

90°
90°
Axis

If the ground slopes, keep the Receiver at right angles to the axis of the globe.

Check the vertical condition of the locator by Digital level indicator.

Press **Depth** key.

Normal calculation

3.78m
45.7mA

Depth
Current index

Data Logging

Press **LOG** key.

LOG
NO. 20

Data number

Memorized Depth, Current index, Date, time and frequency.

Press **Gain** key.

Start Tracing

***Warning message**

5m 16ft
38 kHz 38 kHz

Deeper than 5m / 16ft.

LOW OVER
38 kHz 38 kHz

Signal is too small / too high.

ERR
38 kHz

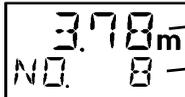
ERR appears....

- *Receiving signal is not strong enough.
 - Possibly this is the wrong line.
 - Move the Receiver again from side to side to find the exact position.
- *Gas pipe ⇒ if not well jointed
 - injected signal does not travel well
 - receiving signal is too small

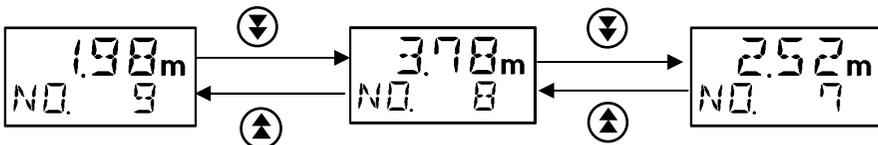
8-4. Logging Data

Indicate the Logging data

1) Press **Mode** key.  →  Backlight setting screen appears.

2) Press and hold **LOG** for one second.  →  Depth Data
Data number The data recorded at the end is indicated.

3) Press  - Increase data number. Press  - Decrease data number

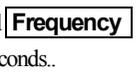
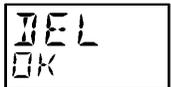


4) Two seconds after data is displayed., its stored date and hour is displayed automatically in order.

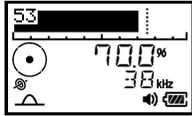


Delete Logging data

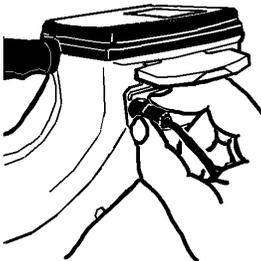
 **CAUTION : If delete operation is done, all data is gone.**

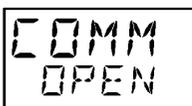
Press and hold **Frequency** key for two seconds.  →  Takes several seconds to delete data. → 

Return to locator function

 Press **Mode** key. →  Return to locator function

Download data to the PC



Press **Mode** key. →   Connecting mark

Data communication screen appears.

Refer Data viewer soft manual about operation of data communication with a PC.

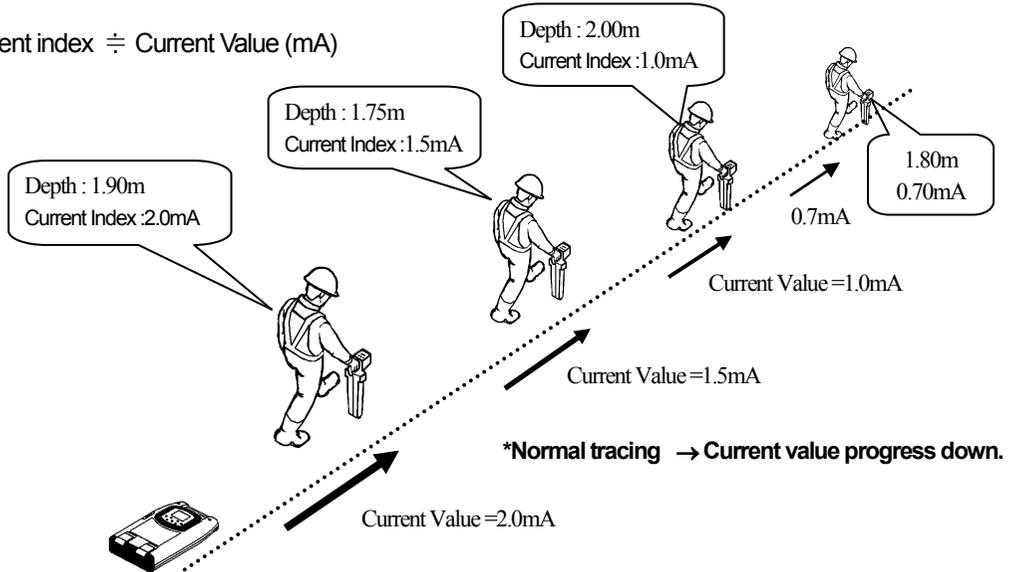
*Connect the PC interface cable to the 6-pin connector.
* PC interface cable is option.

8-5. Current index (Current measurement)

Each time a Depth calculation is taken, a Current Index simultaneously appears on the display.

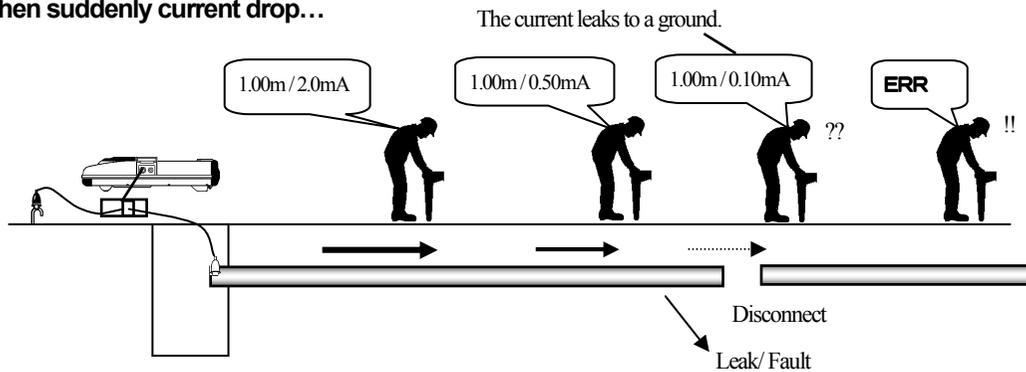
What's the Current index?

*Current index \div Current Value (mA)



*The Current gradually reduces as the distance from the Transmitter increases.

When suddenly current drop...

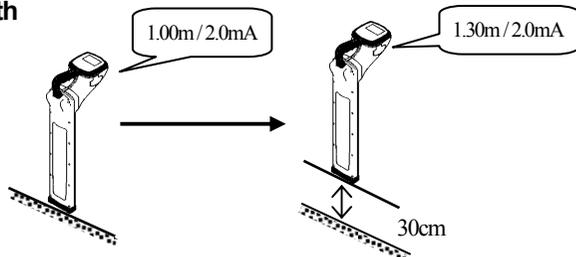


ERR : The line is disconnected.

Or, the current does not travel after the joint of the gas line / water line due to the non-conductivity.

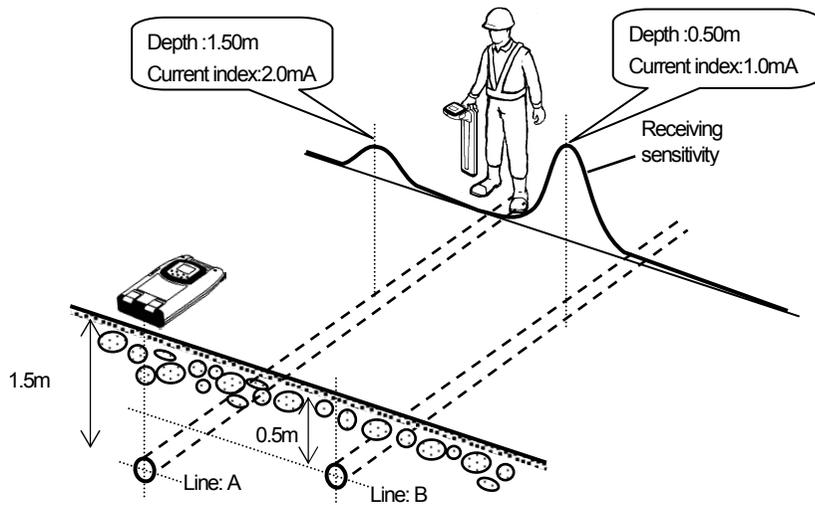
The Current value is not affected by the depth

The current value is not affected by the depth, but it is affected by the detection methods, the frequencies and power level.



The Current index helps to confirm the line's identity.

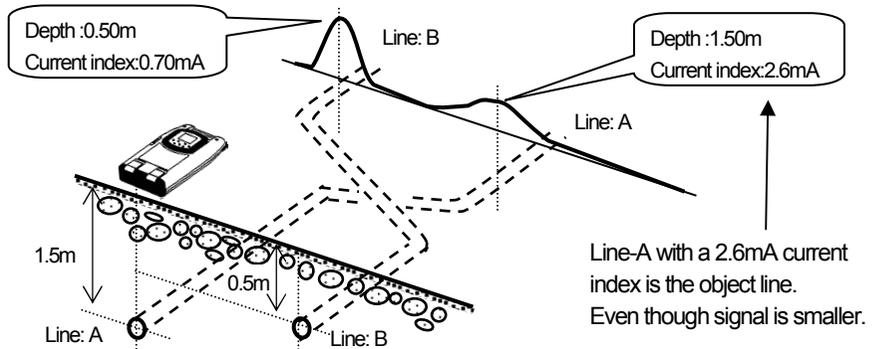
If an adjacent line is running parallel with the object line.



The line with the highest current index is the object line into which the signal is being broadcast.

⇒Line A with a 2.0mA current index is the trace object.

If two lines are crossing:



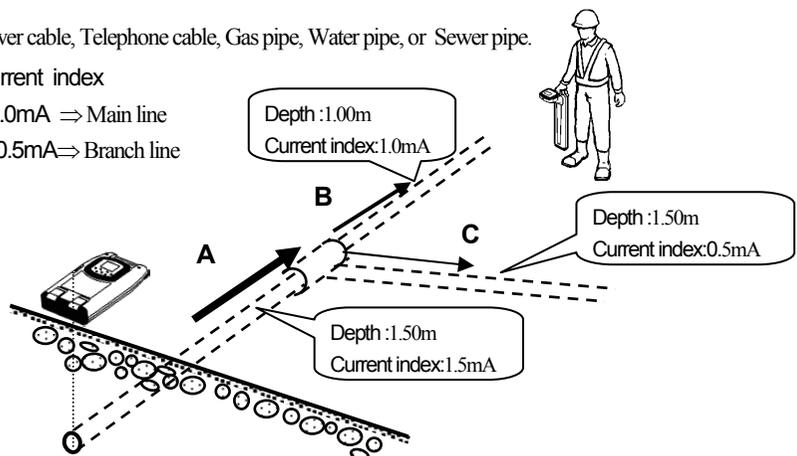
Locating T connection

⇒ Splicing/jointing points of Power cable, Telephone cable, Gas pipe, Water pipe, or Sewer pipe.

Main line-A with a 1.5mA current index

↳ Line-B : Index value 1.0mA ⇒ Main line

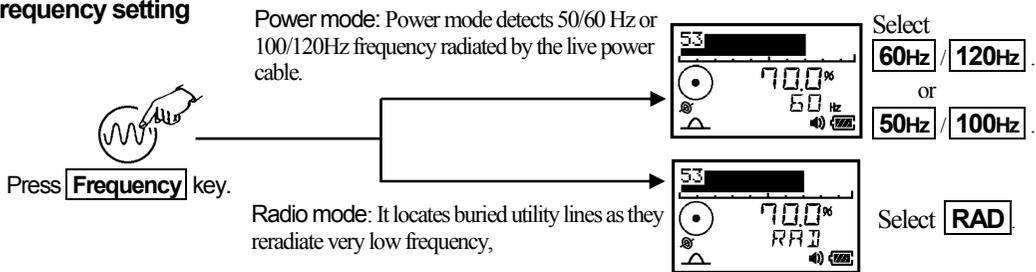
↳ Line-C : Index value 0.5mA ⇒ Branch line



8-6. Passive mode

The Power and Radio passive modes of the Receiver are used to search an area for unknown power cables and other utility lines, without the use of the Transmitter.

Frequency setting



How to choose 50/ 60Hz

Power on while holding **Frequency** key. **POW 50Hz** or **POW 60Hz** screen is indicated in 1 seconds.

Press **Frequency**, and select **50Hz** or **60Hz**.

At the same time, 100/120Hz is selected. (50Hz ⇒ 100Hz / 60Hz ⇒ 120Hz)

The setting is memorized with Power off.

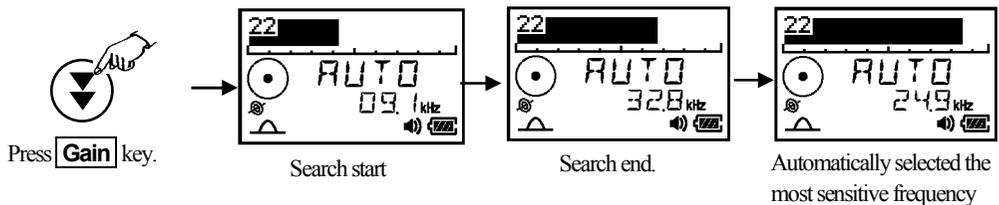


Auto search function of Magnetic field in nature (Radio wave)

When applying Radio wave (RAD) detection, the most sensitive frequency is selected with auto search function.

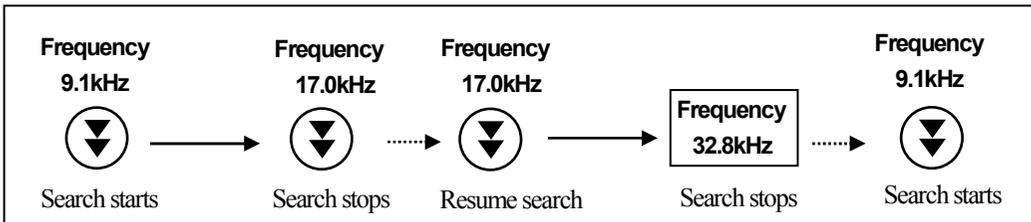
Search all frequencies

Set frequency to **RAD**. Press and hold **Gain** for one second. And then, search starts.



Search frequencies in several bands

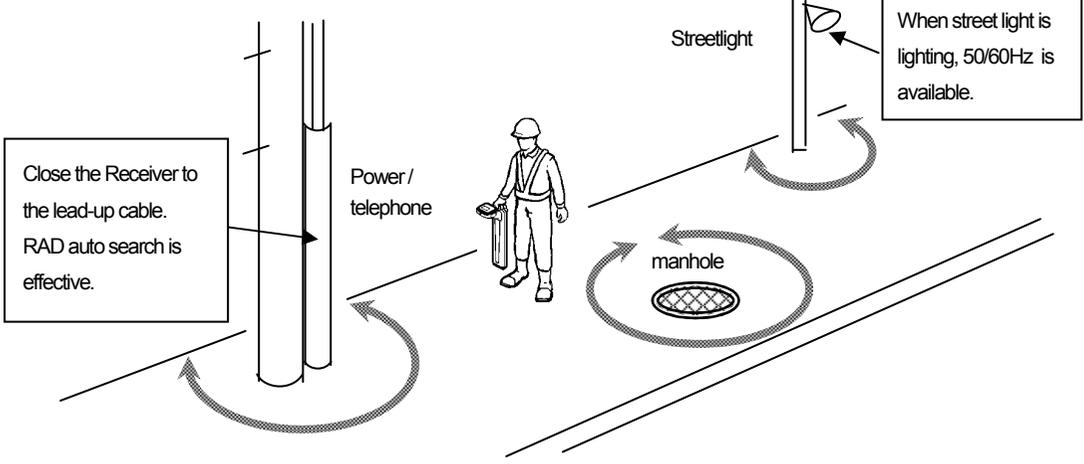
Press **Gain** during search, Search stops. Resume search, the search starts from the halted frequency.



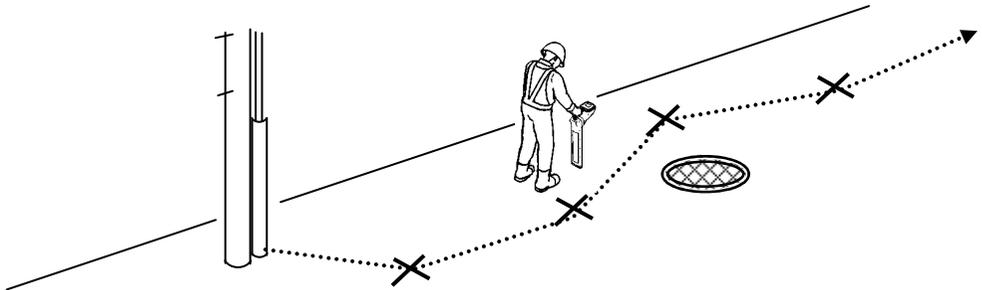
Above mentioned example shows the first search detects the most sensitive frequency from 9.1k to 17kHz. And then search is halted. Then, search resumes. The second search detects the most sensitivity frequency from 17k to 32.8kHz

Applying this function, several different kind of cables can be detected in several stages.

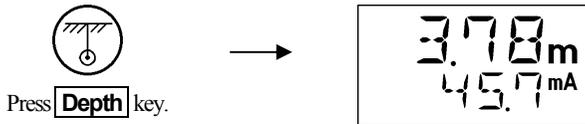
Decide the place of the starting point. Press **Gain**, locate that circumference.



Trace a line from the starting point to have sensitivity.



Depth measurement Press **Depth** key after pinpointing the location.



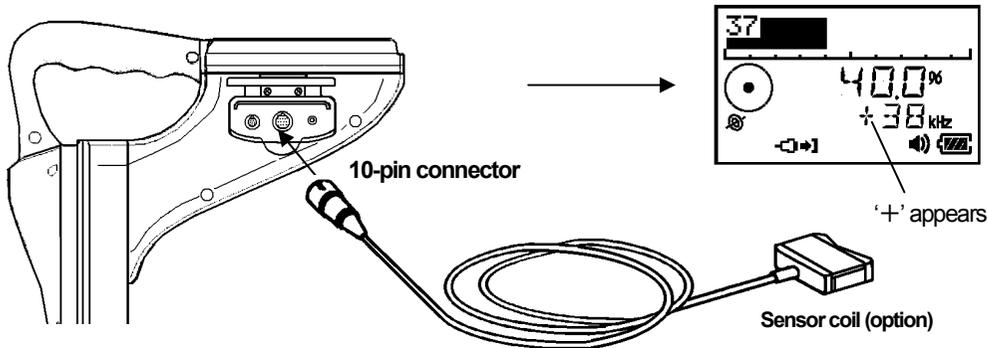
WARNING

Accuracy of the depth measurement using the passive modes is unreliable. Always expose the utility lines by carefully hand digging before excavation.

8-7. Building wiring

It is possible to detect the wiring in a building by broadcasting the Transmitter signal into the wiring. For searching, use the Sensor coil, supplied as an option, which is connected to the Signal input terminal (10-pin connector) of the Receiver.

Receiver Connect the Sensor coil's plug to the Signal Input Terminal (10-pin connector) on the Receiver

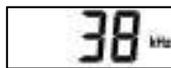


Transmitter

Set the frequency same as the Receiver.



Press **FREQUENCY** key.



Always check that the Transmitter, the Receiver is at the same frequency.

The clips are connected to the transmitter.

Connect the red clip to the conductor on the plug.

A stiff piece of wire

Neutral



Connect the Black clip to a ground stake.

⚠ DANGER

ELECTRIC SHOCK

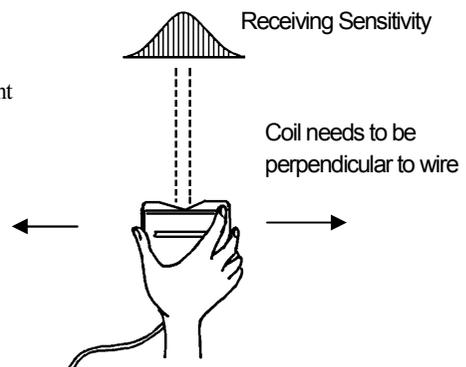
Death or serious injury will result. 250 Volts maximum across clips.

Tracing the wire

Hold the Sensor coil near the wall as illustrated.

The coil in the sensor coil attachment picks up the signal and the current strength (=receiving sensitivity level) is displayed on the LCD.

Note: The depth is not displayed.

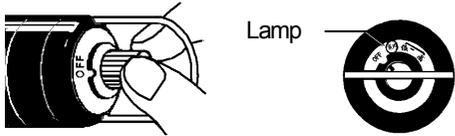
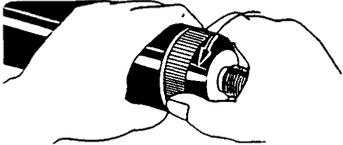
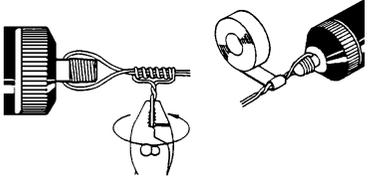
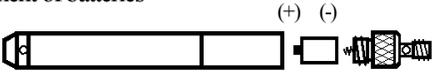


8-8. Probe for non-metallic pipe

A Probe, supplied as optional equipment, is a small waterproof transmitter emitting a signal that is traced by the Receiver.

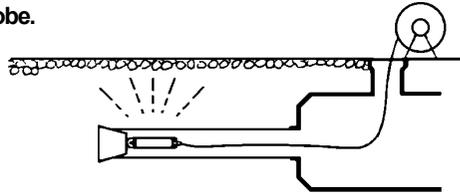
The Probe can only be used in the non-metallic pipe.

Note : Using the Low Frequency probe (512Hz, 850Hz) for the measurement of the cast iron pipe.

<p>Battery check</p> <p>a) Set the rotary select switch to BATT. b) Check if the green lamp is ON. c) If the lamp is OFF, replace all batteries with new ones.</p>		
<p>Replacement of batteries</p> <p>a) Unscrew the top cover and open the battery compartment. b) Four 1.5V AA (LR-6, NEDA15A) batteries are placed in series. c) The proper polarities for the batteries are shown on the battery holder.</p>		
<p>Output setting</p> <p>a) OUTPUT LOW Depth range: shallower than 1m / 3.3 ft. b) OUTPUT HIGH Depth range: deeper than 1m / 3.3ft.</p>		
<p>Attach the Sewer probe to the rodding tool and insert the probe into the pipe.</p>  <p>Screw pitch 3/8"</p>	<p>Attach the Sewer probe to the Pulling eye with the pulling wire and pull the probe with the wire.</p> 	
<p>Mini-Probe Small probe for 1" Fiber optic duct or non-directional boring tools</p>		
<p>Replacement of batteries</p> 		<p>*Mini-probe doesn't have battery check function. Check the transmission of the probe on the ground before locating.</p>
<p>Attach the Mini-probe to the Pulling eye</p> 		<p>Attach the Mini-probe to the rodding tool</p>  <p>Screw pitch 10mm</p>

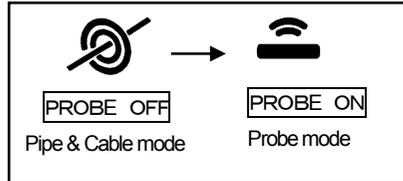
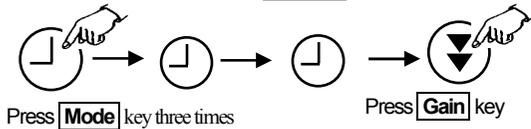
Tracing a non-metallic drain or plastic pipe with the Probe.

Ex. Feed the Probe into the PVC pipe and locate the blockage or collapse



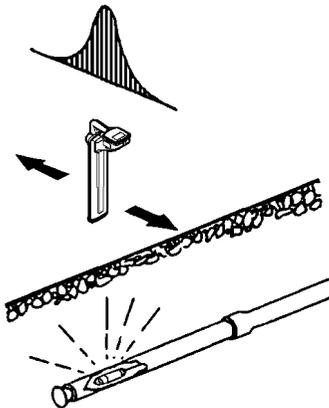
Receiver ⇒ Press **FREQUENCY** key to set the same frequency of the probe.

Set the detection mode to Probe mode.



Location measurement (horizontal direction of the line)

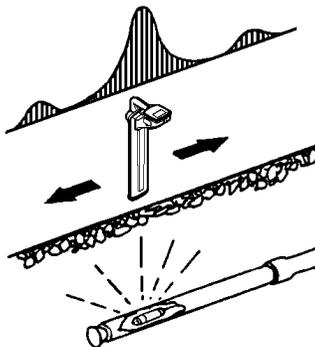
Apply **Peak mode**. Horizontal direction can not be detected with Null mode. Use the Receiver right angle to the object line like the drawing



Location measurement (Same direction in the line)

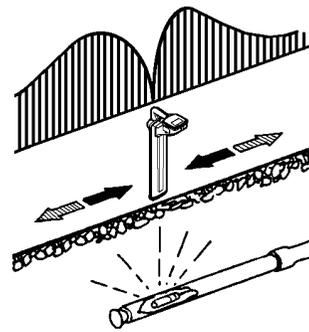
Peak mode.

Three sensitivity peaks appears. The biggest peak is the point direct above the Probe.

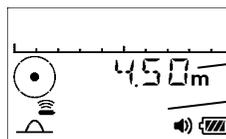


Null mode

Near the direct above the Probe, arrow indicates the direct above the Probe. Away from the direct above the Probe, the receiving level flashes and the arrow indicates opposite direction.



Depth measurement ⇒ Press **DEPTH** key



Depth

Current index is not displayed.

* For the Sewer probe :

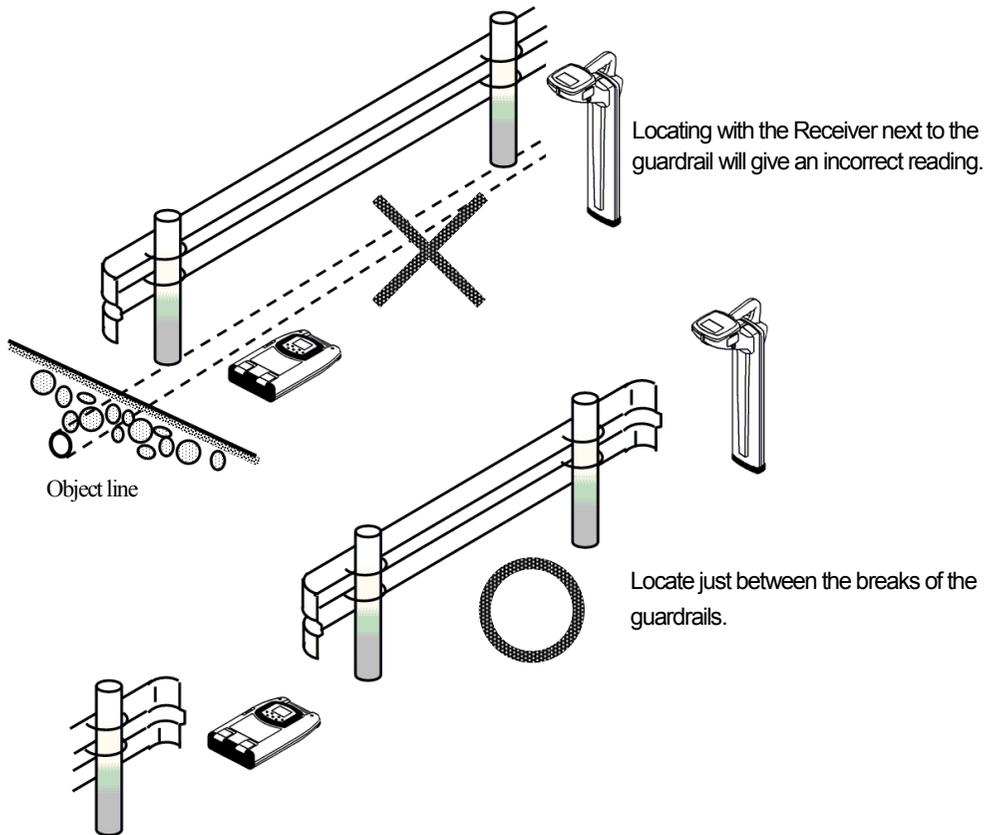
OVER ⇒ Change the output to OUTPUT LOW.

LOW ⇒ Change the output to OUTPUT HIGH.

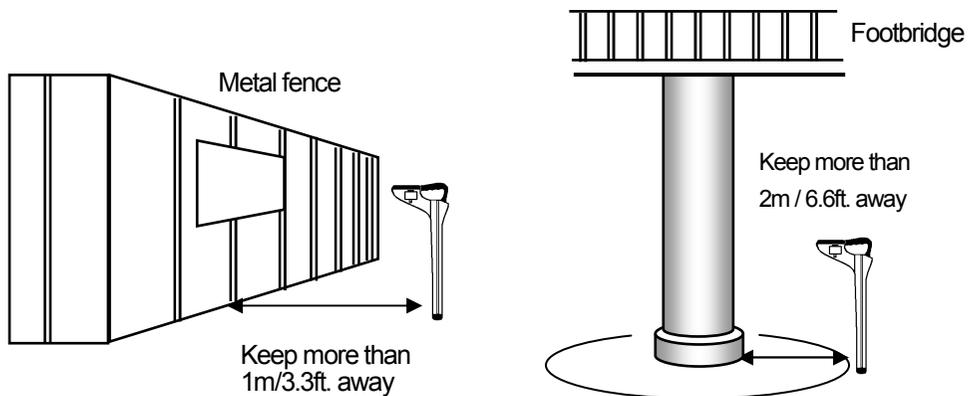
* If tracking a boring tool, Probe should be housed in a metal housing with slots milled in housing to allow signal to escape. Location is done as above.

9. Precautions and applications (At the locating site)

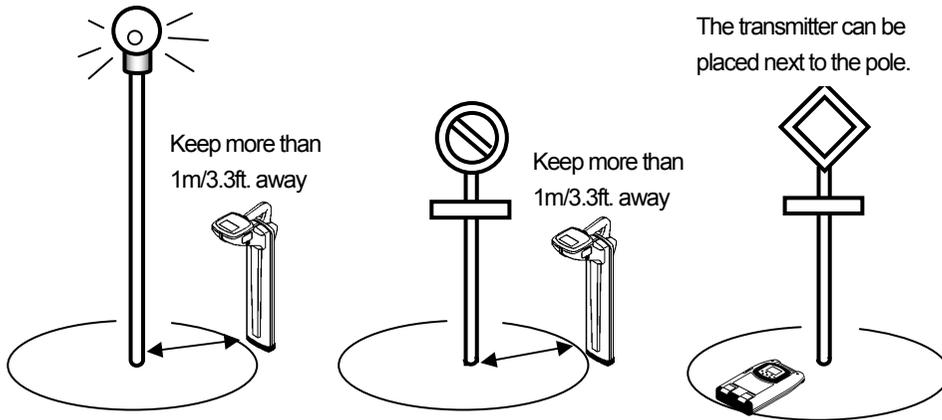
1) Locating Work Near the Guardrail (In Indirect mode)



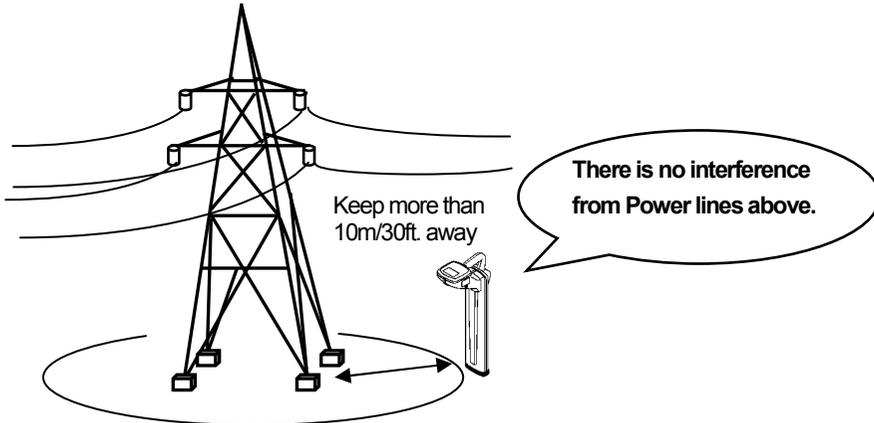
2) Metal Fences or Other Metallic Structures



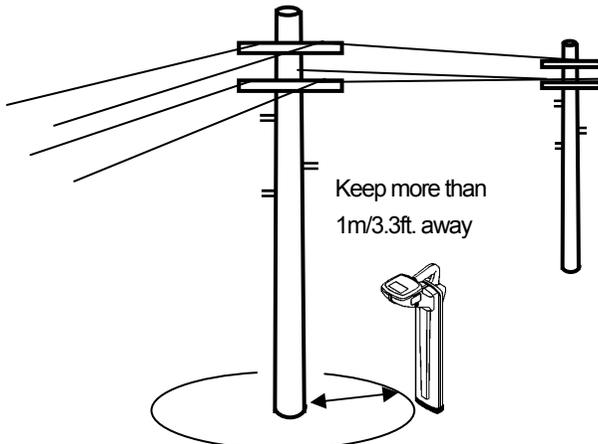
3) Street Light, Traffic-Control Sign



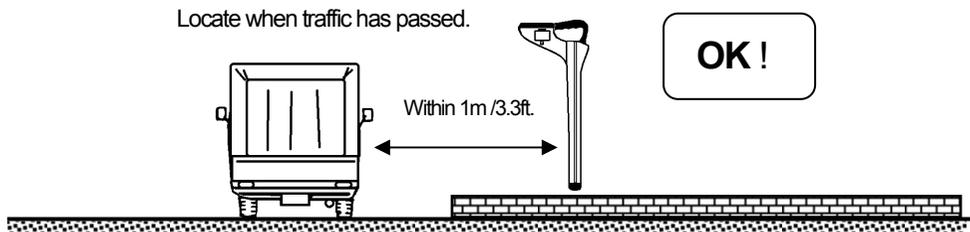
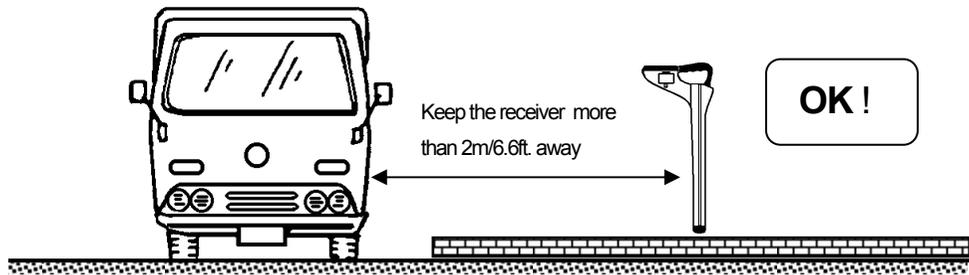
4) Power-Transmission Tower



5) Telephone / Electric Power Poles



6) Heavy Traffic Flow



7) Railroads

