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 words:

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 Verifier Locator.
Successful use of the Verifier 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.

DAGER 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.

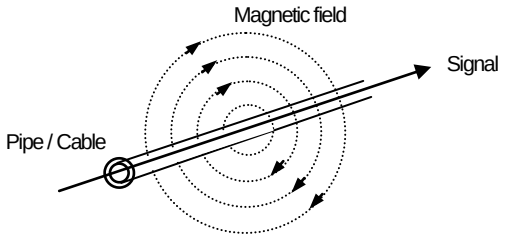
NOTICE : Use only alkaline batteries in the Verifier receiver and transmitter.
Batteries contain acid, which may leak if the batteries are allowed to remain in the equipment when low or completely discharged. This acid can cause Equipment damage.

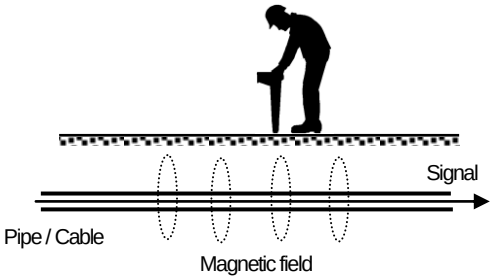
2. Introduction

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 accurate measurement.

- Standard measurement method -

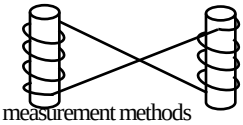
When current flows through a buried cable/pipe, an alternating magnetic field is generated around it.
Location, depth, and current value of the buried pipe can be measured using the Receiver at the surface of the ground.





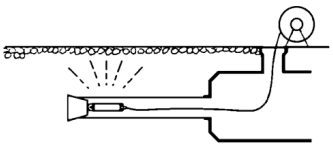
- Feature -

- Adopting differential coil method allows the Receiver to obtain the signal from cable below the Receiver by cutting noise from surrounding area.



*The model figure of the differential coil.

- Two kinds of location measurement methods
  - *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 depth measurement methods
  - *0-5m (16ft) mode : Measurement of deep depth with high precision is possible at indirect method, the end of cable, and jointing points.
  - *0-10m (30ft) 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 four frequencies (512Hz, 9.5kHz, 38kHz, 80kHz) as usage meets various buried pipe.
- A Probe as an option can be used to detect nonmetal pipe.



Probe

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
Accessories		
Connecting cable with a reel	1pc	Used for Direct connection mode 5m/16.5ft.
Ground rod	1pc	Used for Direct connection mode.
Type "D "Alkaline battery	8pcs	LR20/13A For Transmitter
Type "AA" Alkaline battery	8pcs	IEC LR6/NEDA15A For Receiver
Soft carrying case	1pc	
Operating manual	1pc	English version
Data viewer software	1pc	CD, Operating manual

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.
Sewer Probe	1pc	Used for non-metallic pipe. Standard probe for 75mm/ 3" & 100mm/ 4" pipe. Frequency: 38kHz or 512Hz
Mini probe	1pc	For 25mm / 1" fiber optic duct. For tracking non-directional drilling tools. Frequency: 38kHz or 512Hz
RS232C Cable	1pc	
Earphone	1pc	Used in a noisy area.

4. Specification

Transmitter(TX)

Output frequencies	38kHz	:38kHz±0.02% (Standard frequency)
	9.5kHz	:9.5kHz±0.02%
	80kHz	:78.125kHz ±0.02%
	512Hz	:512Hz ±0.02%
	Dual	:9.5kHz /38kHz ±0.02%
Output power	3 watts maximum / 80kHz: 1 watts maximum	
Operating Modes	Direct connection mode, Inductive mode	
	External coil mode (optional)	
Battery type	Eight Alkaline LR20 "D"	
Battery Life	Direct mode : 50 hours (20°C / 68°F)	
	Inductive mode : 20 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 30mA / 512Hz: 0 to 40mA	
	Line Voltage : 0 to 250V	
Output protection	AC 250V (512Hz: Output is cut off automatically)	
Operating Temperature	-20°C to 50°C / -4°F to 122°F	
Dimensions	275 × 314 × 110mm (10.8" × 12.4" × 4.3")	
Weight	3.7kg/ 8.2lbs approx. including eight batteries	

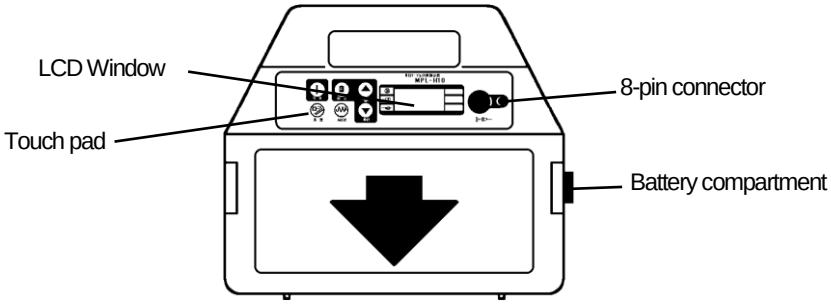
Receiver(RX)

Active Frequencies	38kHz	: 38kHz ±2%
	9.5kHz	: 9.5kHz ±2%
	80kHz	: 78.125kHz ±2%
	512Hz	: 512Hz ±2%
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	Eight Alkaline LR6 "AA"	
Battery Life	20 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 Range	Line : 0 to 5m /16ft. (0-5m / 0-16ft. mode) 0 to 10m /30ft. (0-10m / 0-30ft. mode) Probe : 0 to 10m /30ft.	
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.	
Audio output	Internal Speaker (200 to 5kHz) , Earphone (optional)	
Data logging	Memorized 400 points of the depth / current measurement data.	
Interface	D-sub 9-pin connector (RS-232C)	
Operating Temperature	-20°C to 50°C / -4°F to 122°F	
Dimensions	680 × 140 × 290mm (26.8" × 5.5" × 11.4")	
Weight	2.1kg/ 4.7lbs approx. including eight batteries	

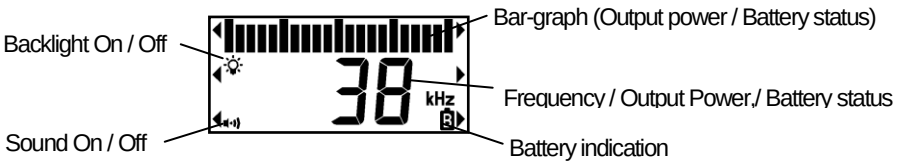
Note: *1 Locators are tested in the model field conditions with no adjacent signals.
Always excavate the line with non-destructive means before digging.
*2 Optional cable is necessary to read the logging data.

5. Description of parts & basic operation

5-1. Transmitter

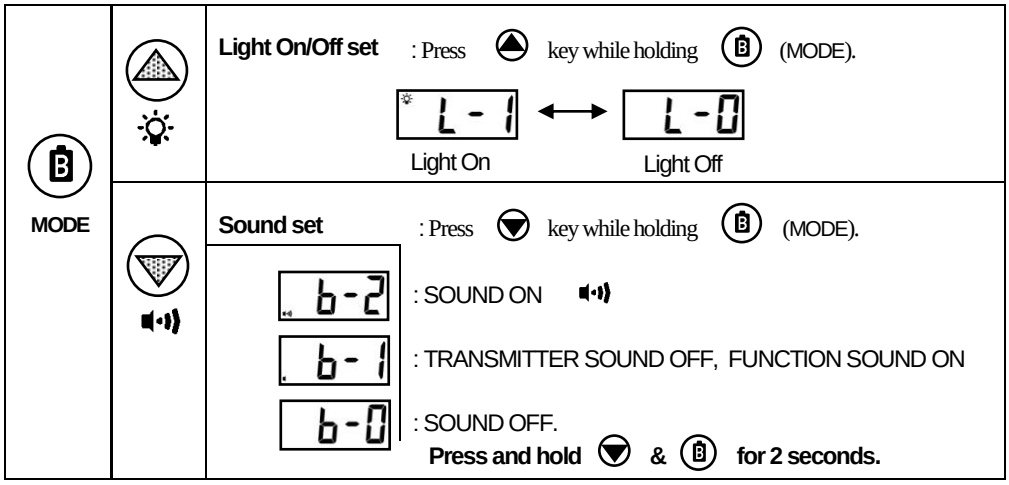


1) LCD window

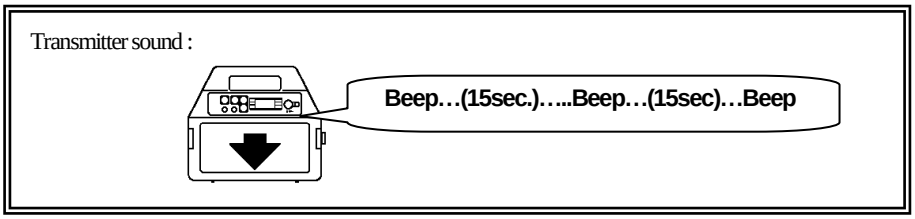


2) Key function

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.**
FREQUENCY	**Selects operating frequency.** 80kHz → 38kHz → 9.5kHz → 9-38kHz *1 → 512Hz *2 *1 9-38kHz : Broadcasts both frequencies simultaneously in direct mode only. *2 512Hz : Direct mode only
MODE	**Battery indication** 75 % *The B symbol appears when battery is low.
	Increase Output power
	Reduce Output power

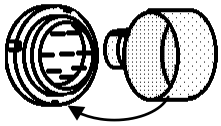


Note : The last setting is memorized after the unit is Turned OFF



3) 8-pin connector

The Direct connection cord or the External coil cord are plugged into the 8-pin connector.

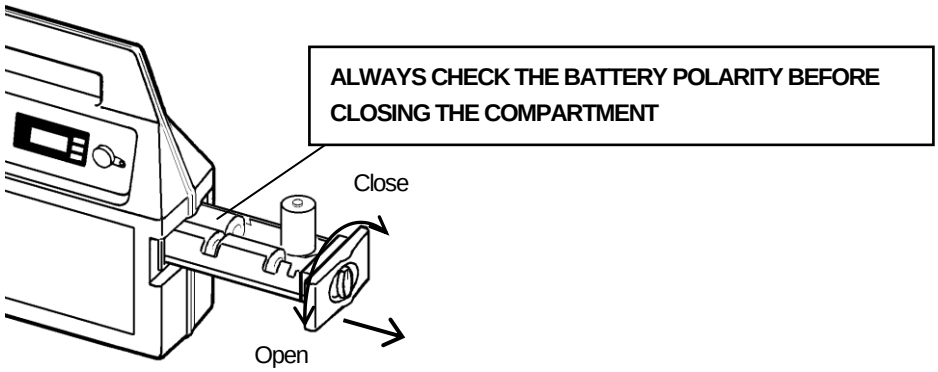


Put the rubber protector on when not in use.

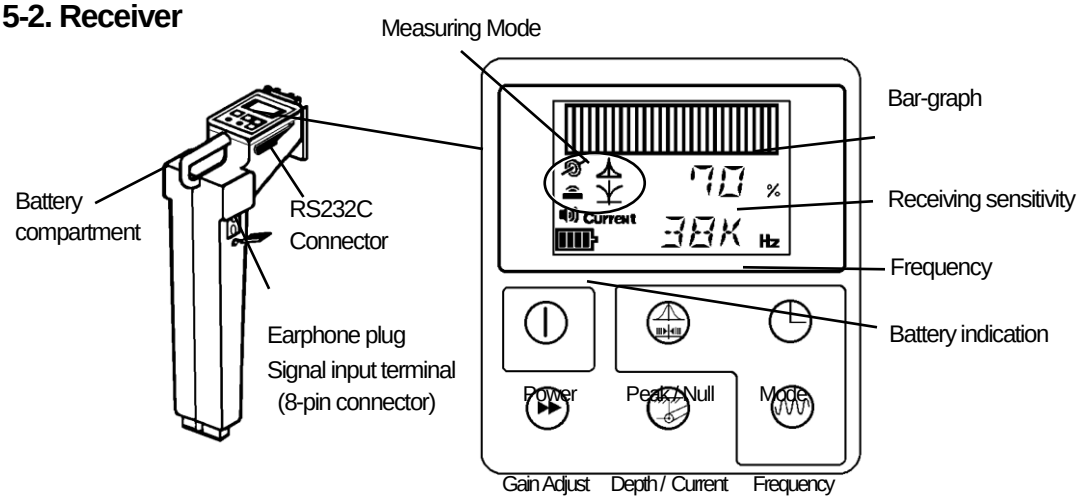
4) Battery compartment

Replace all batteries when there is a low battery condition.

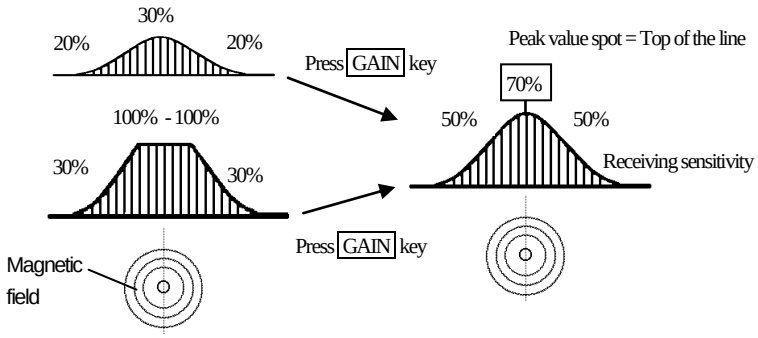
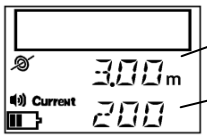
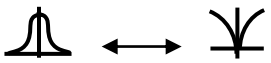
Use 8V alkaline type D (LR20 / 13A) batteries.



5-2. Receiver



1)Key function

Power	**Power ON / OFF** *Power save function: Automatically shuts off after 5 minutes of inactivity.
Gain Adjust	**Adjusts Signal sensitivity for PEAK MODE.**  *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%.*
Depth / Current	**Depth measurement** : Press DEPTH key at the peak value spot.  Depth Current index : Details page 25 *Note: Current index is not displayed if probe is used.*
Peak / Null	**Selects locating mode.**  Peak Mode ↔ Null Mode Peak mode :Maximum sensitivity is the point directly above the object line. Null mode : Minimum sensitivity is the point directly above the object line. The buried object line is indicated with arrow.

Frequency

Selects operating frequency.

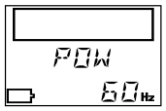
80kHz → 38kHz → 9.5kHz → 512Hz → *50Hz → 60Hz → *100Hz → 120Hz → RAD → 80kHz

*RAD : Radio (passive 9kHz to 33kHz)

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**.

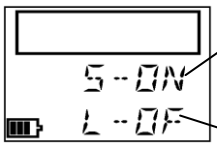
At the same time, 100/120Hz is selected. (50Hz ⇒ 100Hz / 60Hz ⇒ 120Hz)

The setting is memorized with Power off.

Mode

Various settings

1. Selects sound and backlight options. By pressing Mode, move on.



Press **Gain** : Select speaker sound On / Off.

S-ON : SOUND ON

S-OF : SOUND OFF

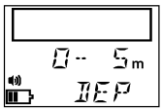
Press **Depth** : Select backlight On / Off.

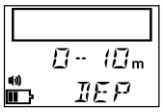
L-ON : LIGHT ON

L-OF : LIGHT OFF

2. Selects Depth function. By pressing Mode, move on.

Press **Depth** : Select depth function 0-5m / 0-10m (0-16ft / 0-30ft.).





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

*0-10m / 30ft : 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.**

3. 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.
Only 38kHz and 512Hz are used for Probe.

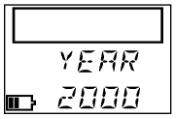
Press **Frequency** : Select detecting function .

PROB ON — Probe detection

PROB OFF — Cable / Pipe detection

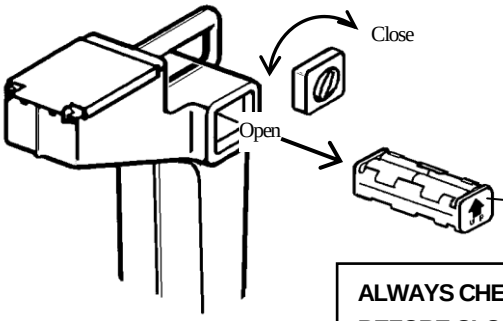
***The last setting is saved.**

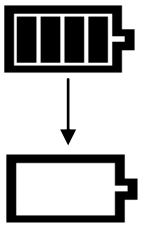
Mode	**Setting the Time and Date** a)Power on while holding **Mode** , wait for clock display appears. The **year** will flash. Press **Gain** to advance the year or **Depth** to decrease the year b) Press **Mode** , the **month** will flash. Press **Gain** to advance the month or **Depth** to decrease the year c)Do same as above to set Day - -> Hour - - > Minute. When measurement starts, setting is completed.



2) Battery compartment

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



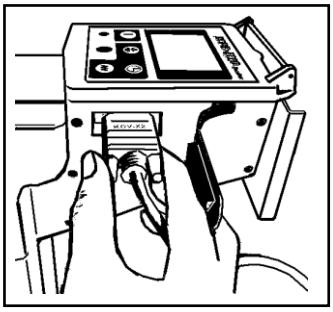


When the batteries tray is stored, check that the ARROW is pointing up.

ALWAYS CHECK THE BATTERY POLARITY BEFORE CLOSING THE COMPARTMENT

3)RS2332C connector

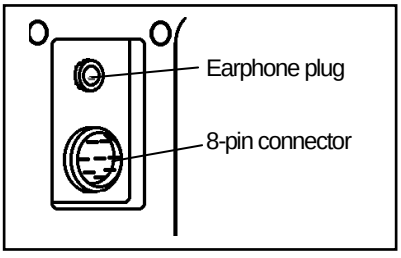
A RS232C connector is provided for serial communications to the personal computer.



*Interface cable is supplied as option.
*Specification of interface cable :
9-pin, D-SUB, straight connection
or same specification RS232C-USB conversion cable
Interface cable is available.

4)Earphone plug

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



5) 8-pin connector

Used with External Coil (9.5kHz or 38kHz) to find wiring systems in a building or overhead telephone cables.
External coils are supplied as options.

6. Warning Message

*Messages during your search procedure :

OVER	**Receiving signal is too high.** a) Indirect mode : Transmitter and Receiver need to separate b) Other cases : Reduce output of the Transmitter.
LOW	**Receiving signal is too small or not present.** 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. 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.

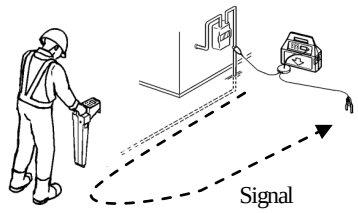
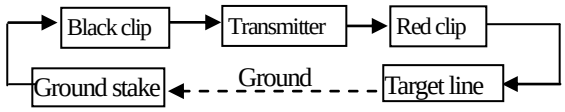
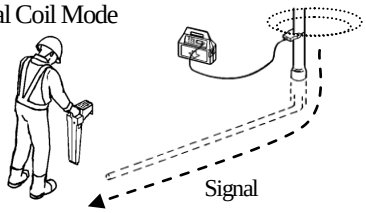
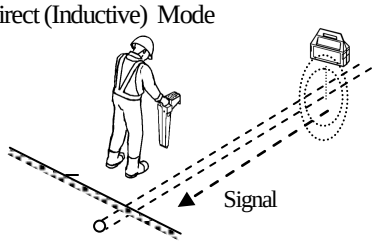
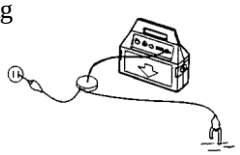
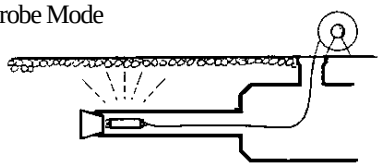
*Messages on location :

PUSH GAIN	**Press GAIN key. ⇒ Normally this is your object line.** **Reduces or increases signal strength.**

*Messages on Depth measurement :

ERR	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.
16. --ft/in. 5. --m	**Indicating that the depth measured is deeper than 5 m / 16 ft.** In Line detection (0-5m / 0-16ft.) mode, locator cannot read below this depth
30. --ft/in. 10. --m	**Indicating that the depth measured is deeper than 10m / 30ft.** In Line detection (0-10m / 0-30t.) or Probe detection mode, locator cannot read below this depth.

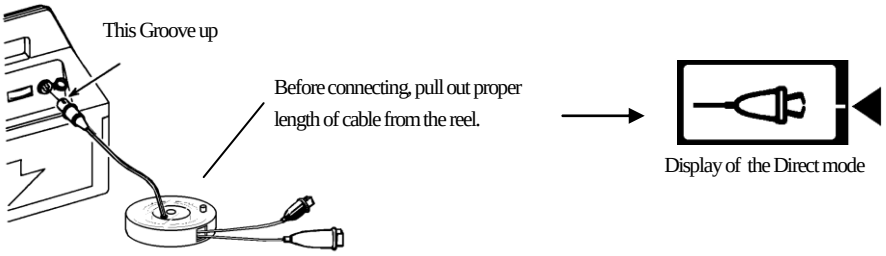
7. Operation of Transmitter (TX)

Mode of Detection	Purpose of usage
Direct Connection Mode 	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.  Effective for detecting the target line in congested areas.
External Coil Mode 	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.
Indirect (Inductive) Mode 	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⇒30 ft / 10 m *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 0-10m (30ft) is applied.*
Building Wiring 	Used with External Coil to find wiring systems in the building. TX's circuit is protected* up to 250V at 50 / 60 Hz. *512Hz output is cut off automatically.
Probe Mode 	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.

7-1. Direct connection mode

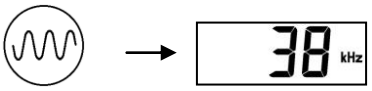
A specific route can be detected in Direct Connection mode. Use two 5m/16.5 ft connecting cable with a reel provided in the carrying case as one of the standard accessories.

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



Frequency setting

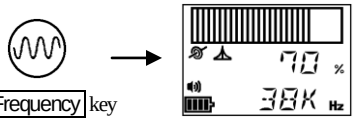
Transmitter



Press FREQUENCY key

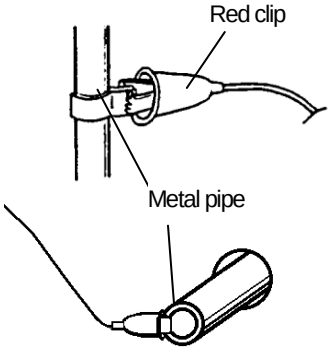
*Set a receiving frequency on the Receiver the same as the transmitter.

Receiver

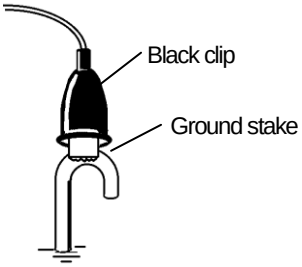


Press Frequency key

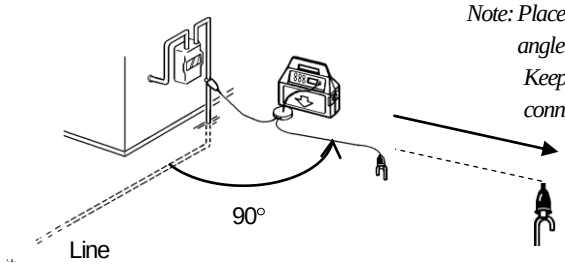
Connect the cable clips to the target line and ground stake.



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



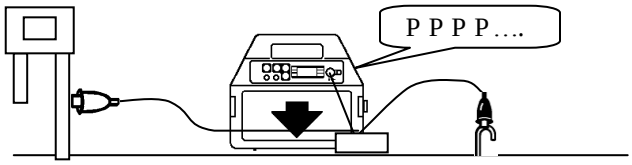
Check the grounded point. Find the best place to ground to have a GOOD SIGNAL LOOP indication.



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 signal loop

When signal loop is acceptable, Beeping sound is emitted.



*Transmitter will beep for 30 seconds.

*Sound stops when you Press the ADJUST key.

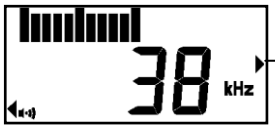
*Sound setting is [b-0].⇒Beeping sound off.

Note: Beeping sound is emitted after output is adjusted when the resistance value of the cable is high.

Adjust output power

Press ADJUST key.

Automatically adjust power



GOOD SIGNAL LOOP

*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

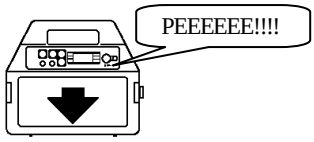
*When the Receiver indicates "OVER", Press ▼ key. ⇒ Reduce output.

*When locating a long-distance line or deeper depth than 3m / 16ft., Press ▲ key. ⇒ Increase output.

Check the voltage when connecting clip to Power line.

- When voltage is greater than 20 volts, voltage is displayed.
- When voltage is greater than 25 volts, Alarm sounds.

Note: 512Hz output is cut off automatically.



AC VOLTAGE

⚠ DANGER

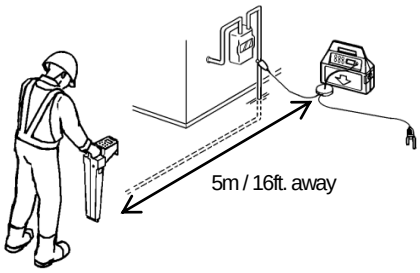
ELECTRIC SHOCK
Death or serious injury will result. 250 Volts maximum across clips. Use protective equipment.

*Alarm stops when you Press the ADJUST key.

*Sound setting is [b-0]. ⇒ Alarm off.

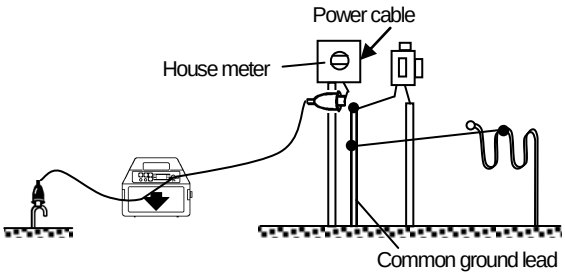
Direct Connection mode

Use the Receiver 5m / 16ft. away from the transmitter and clips.

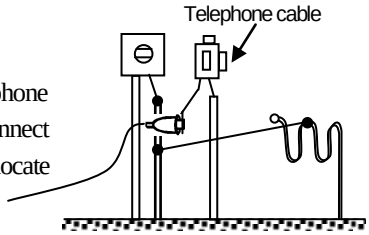


Applications (1)

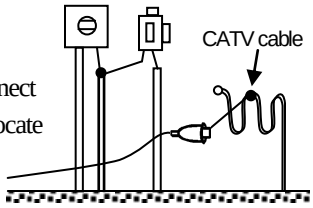
Power cable:
Disconnect common ground lead and connect the Red clip to Power line ground lead. Then locate Power line



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.

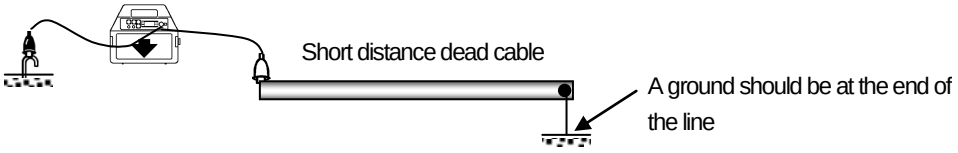


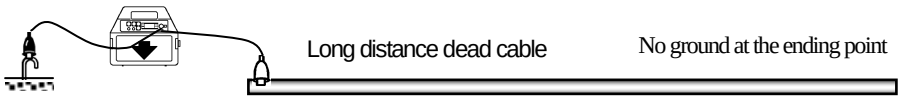
WARNING

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.

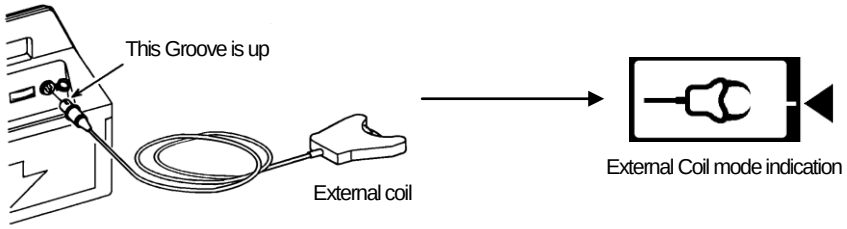




7-2. External coil mode

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.

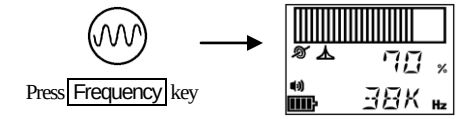


Frequency setting

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

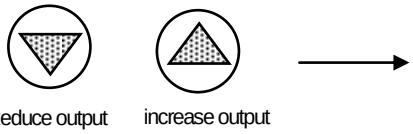
When 38kHz coil is connected

*Set the receiving frequency on the Receiver and Transmitter to the same frequency



Press Frequency key

Adjust output power

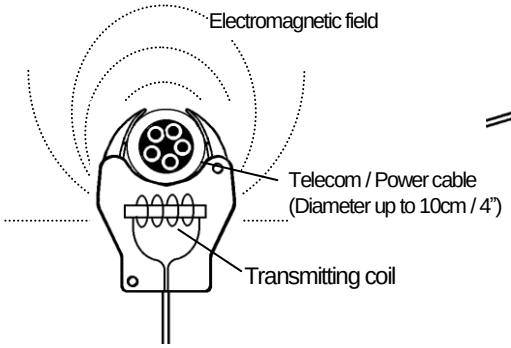


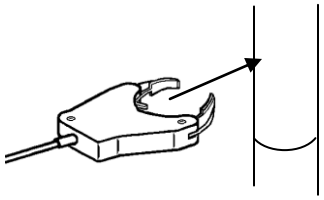
Reduce output power

increase output power

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

Connect the External coil to the target line.

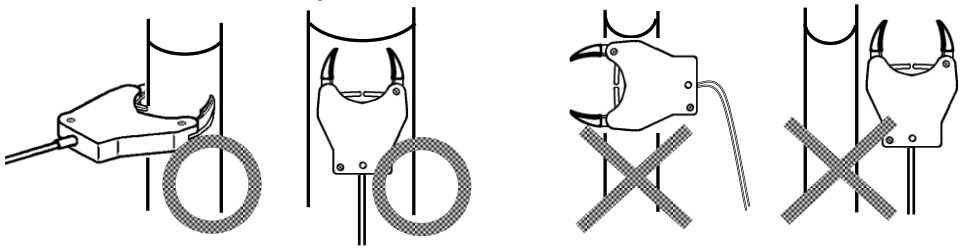




***The jaws do not have to be closed around the cable.**

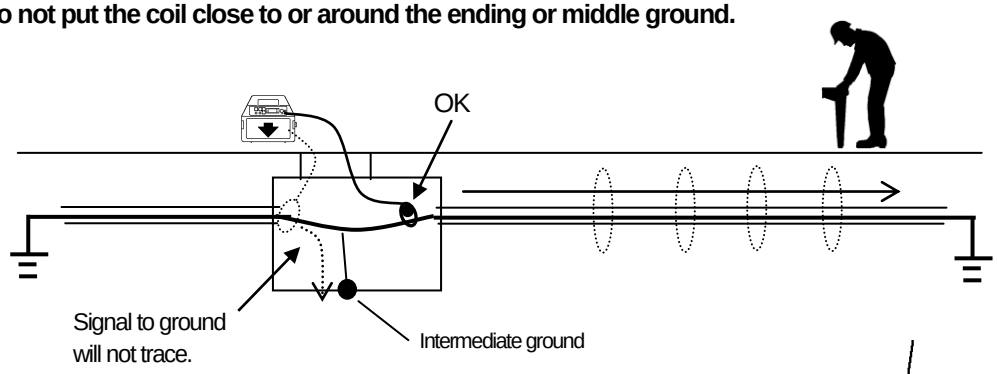
(This coil method is different from the conventional clamp that must have jaws perfectly closed. Different size clamps are not needed. The Verifier coil method uses the indirect / Inductive principle.)

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

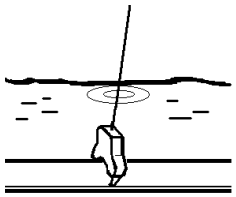


External coil mode

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

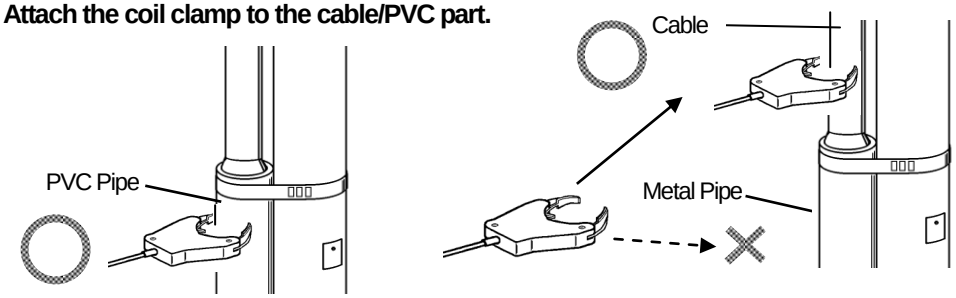


* If the cable is submerged in water, you can use the coil attachment in the water.
The coil attachment is **WATERPROOF**.

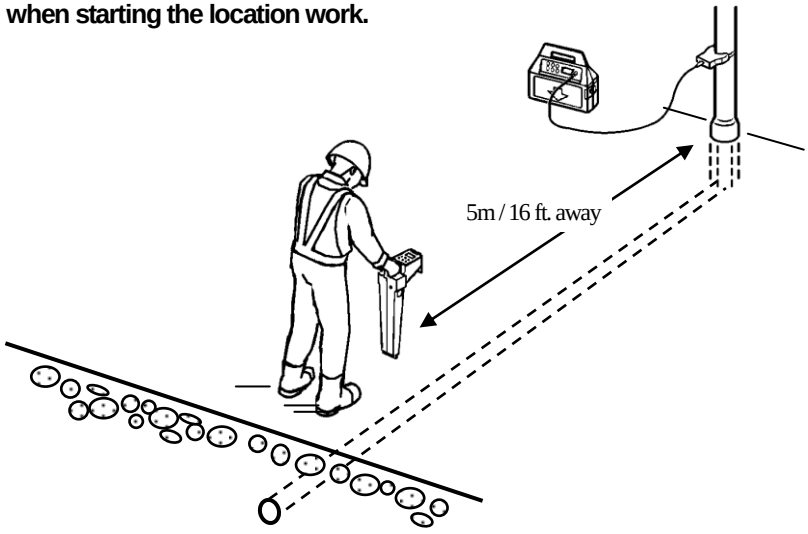


Note : Fresh water has no effect on Locating the cable or detecting depth.
*Brash or salt water **will** disrupt locating.*

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/16 ft away from the coil clamp when starting the location work.

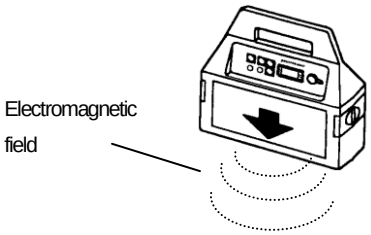


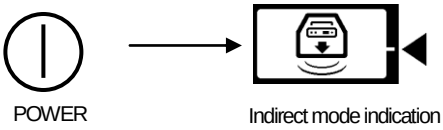
7-3. Indirect (Inductive) mode

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

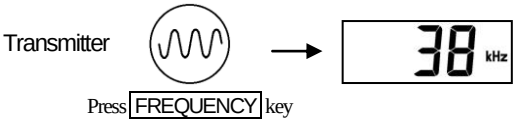
Note: When using the indirect mode, set the depth mode of the receiver to 0-5m (0-16ft.) .

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

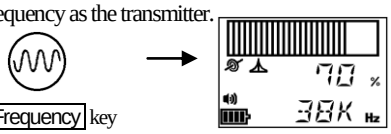




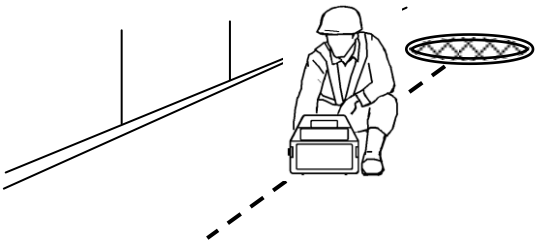
Frequency setting



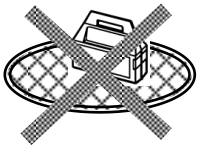
*Set a receiving frequency on the Receiver to the same frequency as the transmitter.



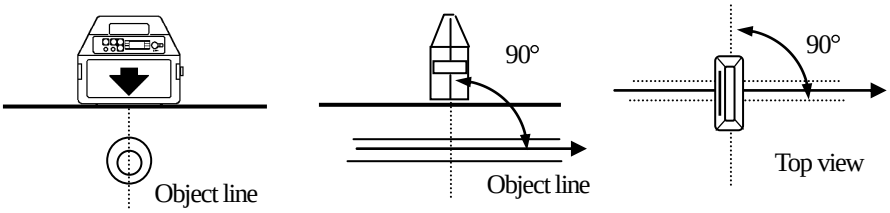
Place the transmitter over or near the area to be located.



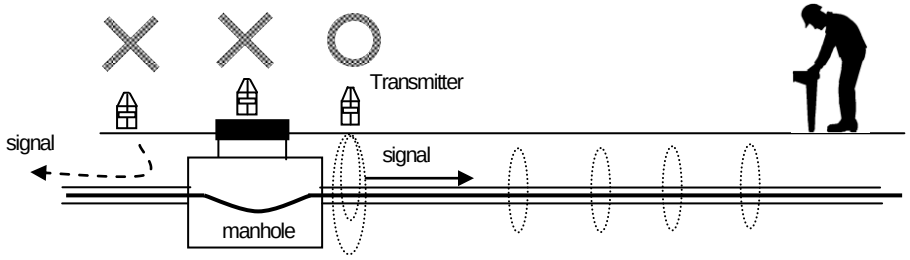
Do not place the Transmitter on a manhole cover or other steel covering.



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

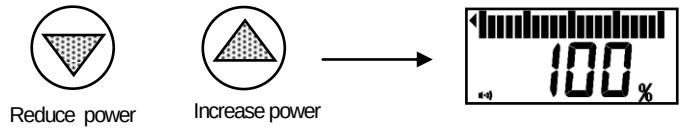


***Place the Transmitter on the side of the manhole you wish to locate.**



Indirect mode

Adjust output power



Reduce power Increase power

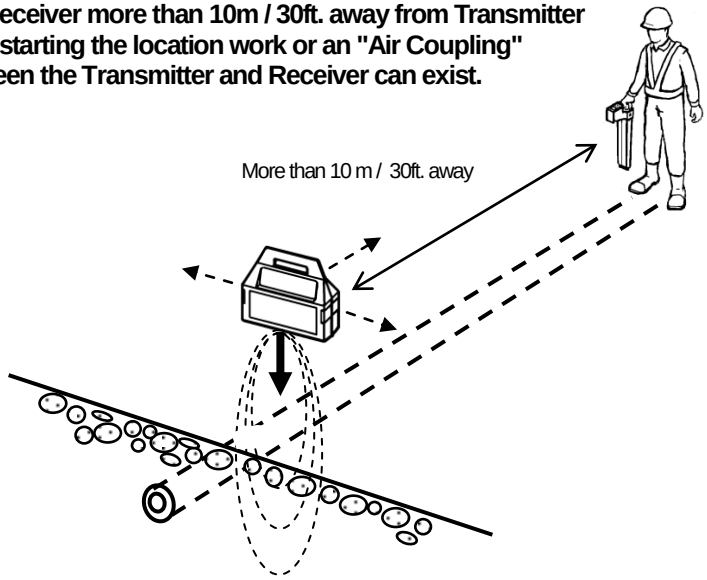
Show the output power level with the bar -graph and the numerical value by pressing the ▼ / ▲ keys.

***Standard of adjustment.**

- When depth is less than 0.6m / 2ft. ⇒ 50% ~ 60%
- When depth is more than 0.6m / 2ft., less than 1.5m / 5ft..⇒ 70 % ~ 80%
- When depth is more than 1.5m / 5ft..⇒ 90 % ~ 100%

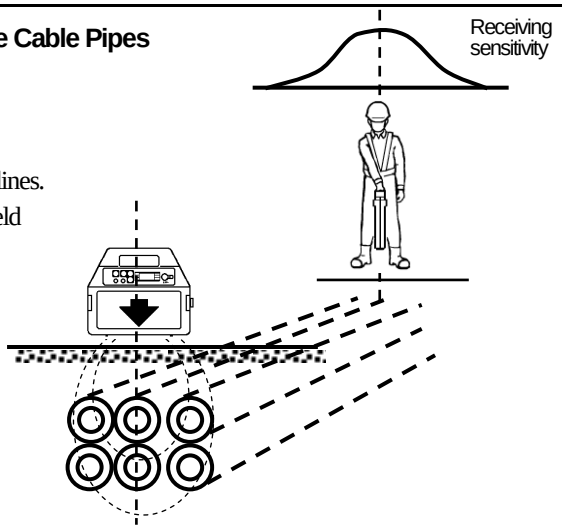
Note: If output is adjusted to 100%, you can usually locate in any place.
But the battery of the transmitter is reduced as output increases.

Note :Use Receiver more than 10m / 30ft. 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.

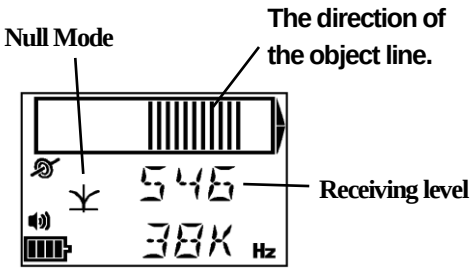


8. Operation of Receiver (RX)

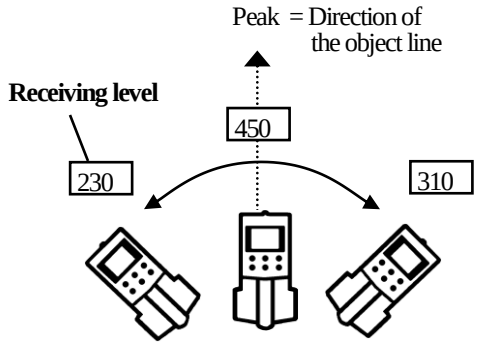
8-1. Null Mode

Starting Null Mode

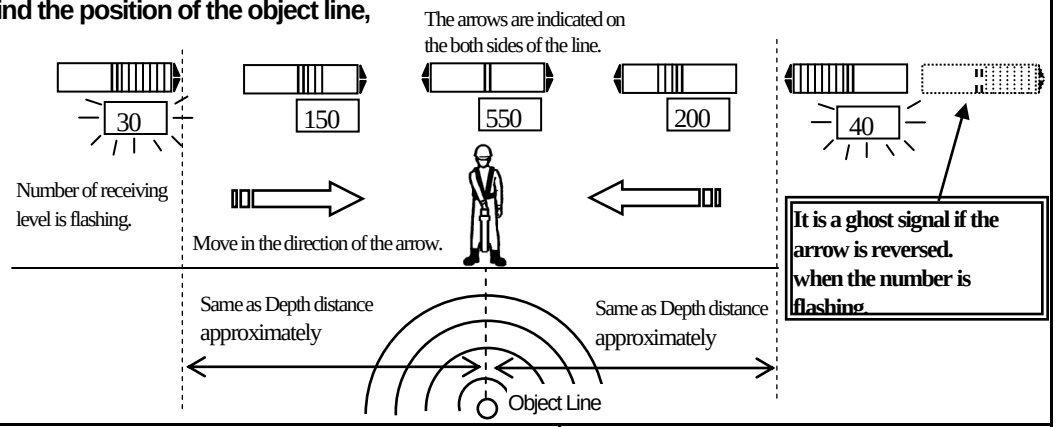
Press **Peak / Null** key. →  Is displayed



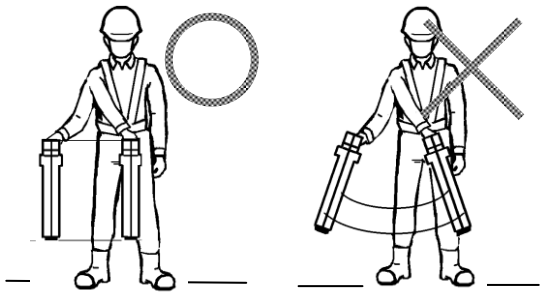
To find the direction of the object line,
rotate the receiver and stop at the position of the maximum receiving level.



To find the position of the object line,



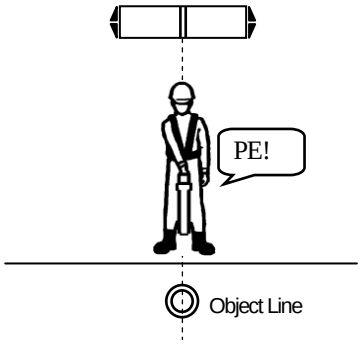
Move the Receiver from side to side to determine the exact position.



Pinpoint the position.

Do not swing like this.

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

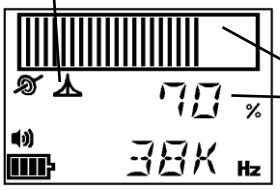


8-2. Peak Mode

Starting Peak Mode

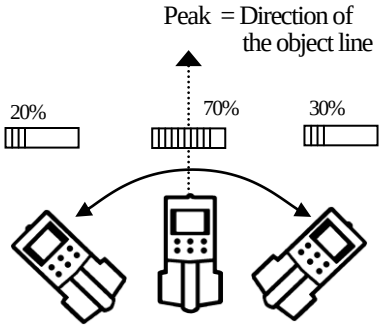
Press **Peak / Null** key. →  **Is displayed**

Peak Mode

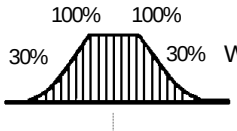


Receiving level

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.



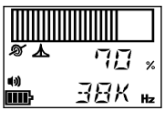
When "PUSH GAIN" appears, press Gain Adjust key until maximum peak value (not 100%) is displayed.

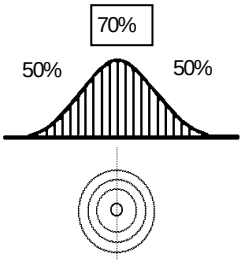


When 100% appears…

When PUSH GAIN appears…

Press Gain Adjust key.



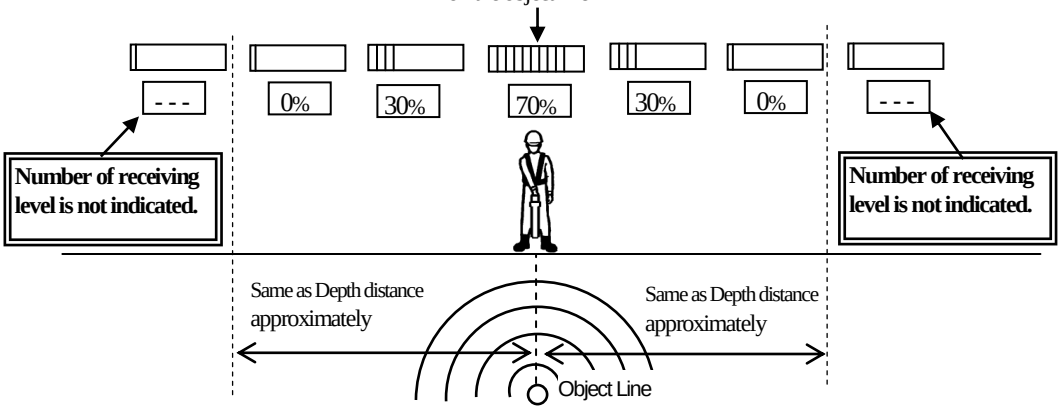


70% appears as an initial receiving level.

Note: 100% is not the maximum peak value.

To find the position of the object line,

Maximum (peak) value, is obtained when the Receiver blade is the top of the object line

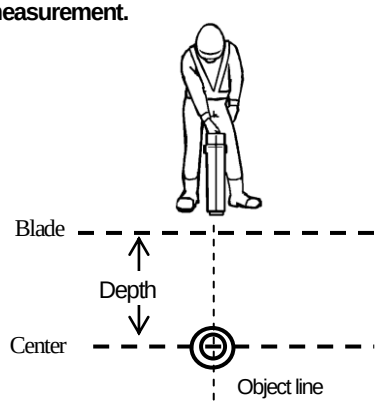


8-3. Depth measurement

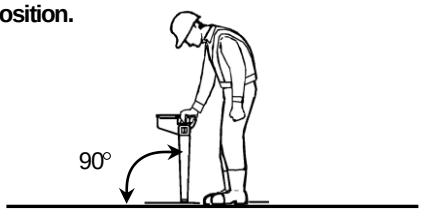
Once the precise location of the object line has been determined, the **Depth** key is pressed to display the distance from the Receiver's blade to the object line. Calculations are indicated on the digital display.

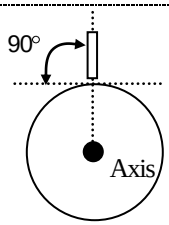
Note: Depth reading is a calculation of received signal strength.

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



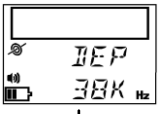
Touch the ground with the Receiver's blade at an upright position.

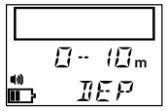




If the ground slopes, keep the Receiver at right angles to the axis of the globe.

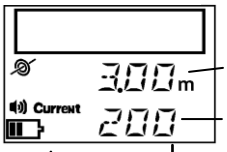
Press **Depth / Current** key.





Indicate depth mode

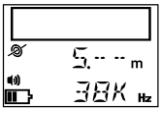
Normal calculation

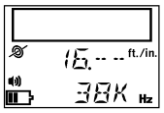


Depth

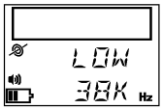
Current index

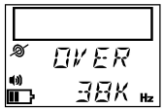
***Warning message**



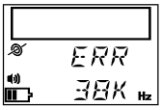


Deeper than 5m / 16ft.



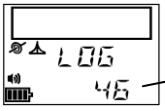


Signal is too small / too high.



Data Logging

Press **Mode** key.



Data number

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

Press **Gain Adjust** key.

Start Tracing

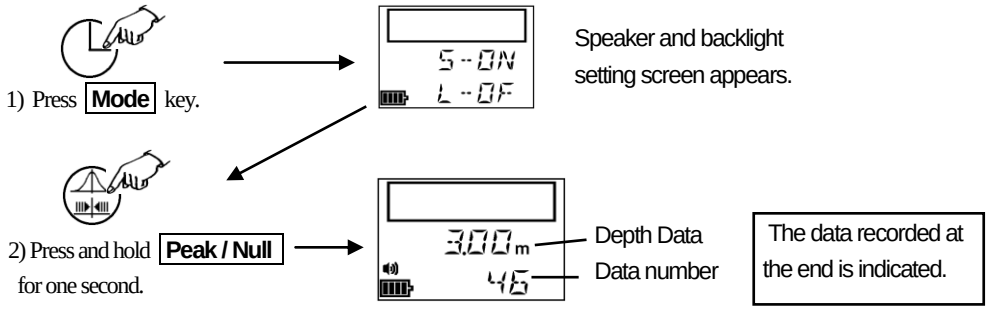
ERR appears….

*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.

Speaker and backlight setting screen appears.

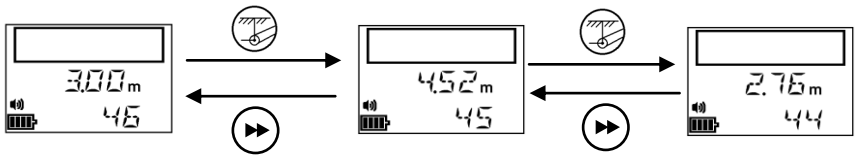
2) Press and hold **Peak / Null** for one second.

Depth Data

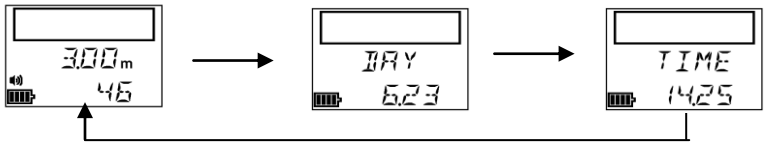
Data number

The data recorded at the end is indicated.

3) Press **Gain Adjust** - Increase data number. Press **Depth / Current** - Decrease data number



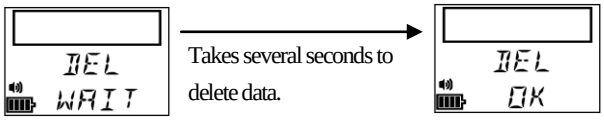
4) Two seconds after data is displayed., it's stored date and hour are displayed automatically in order.



Delete Logging data

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

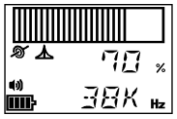
Press and hold **Frequency** key for two seconds..



Takes several seconds to delete data.

Return to locator function

Press **Mode** key.

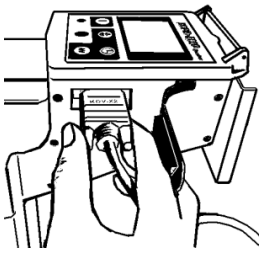


Return to locator function

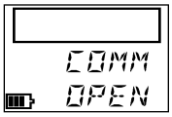
Download data to the PC

Connect the cable to the RS232C connector on the Receiver.

*Cable for PC communication is supplied as option.



Press **Mode** key.



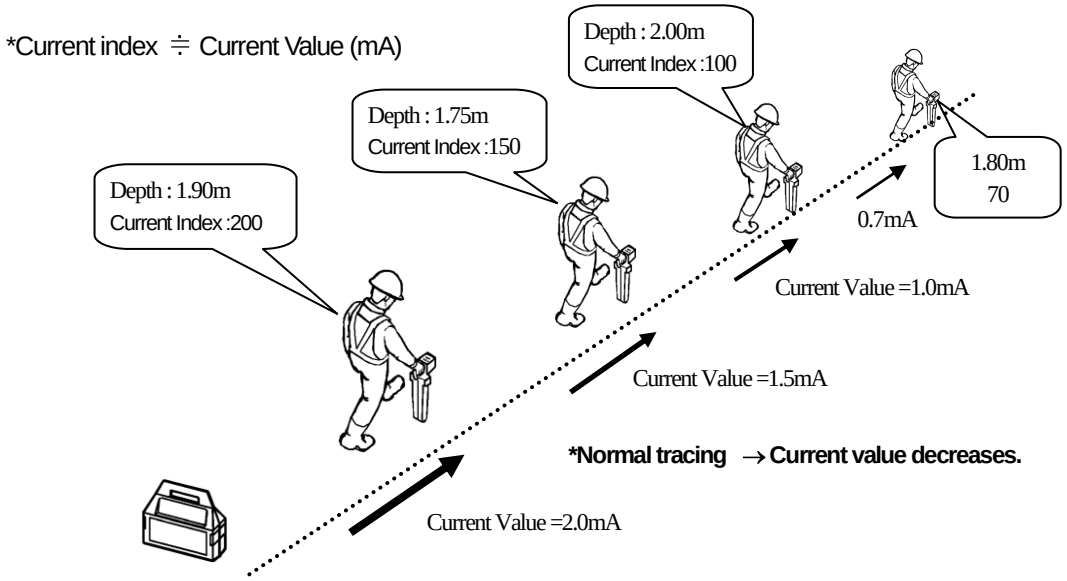
Data communication screen appears.

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

8-5. Current index (Current measurement)

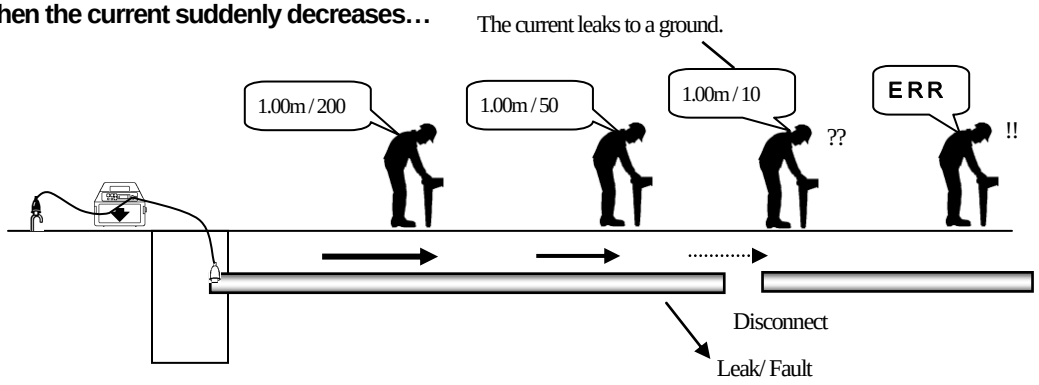
Each time a Depth calculation is taken, a Current Index simultaneously appears on the display.

What's the Current index?



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

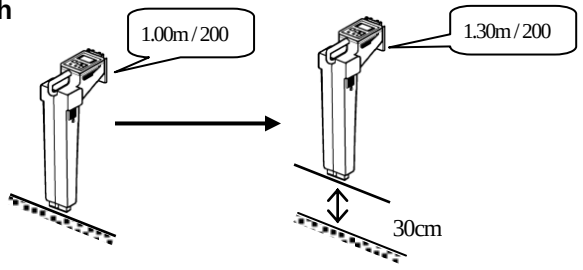
When the current suddenly decreases…



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.

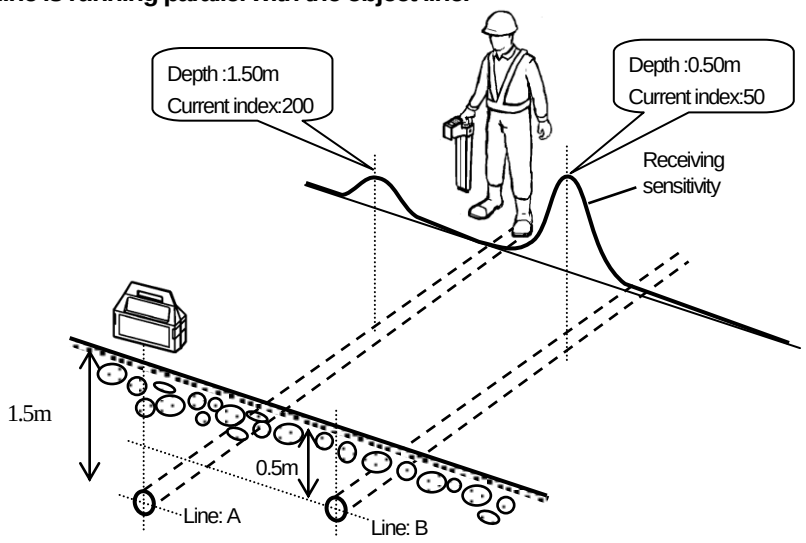
The Current value is not affected by the depth

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.

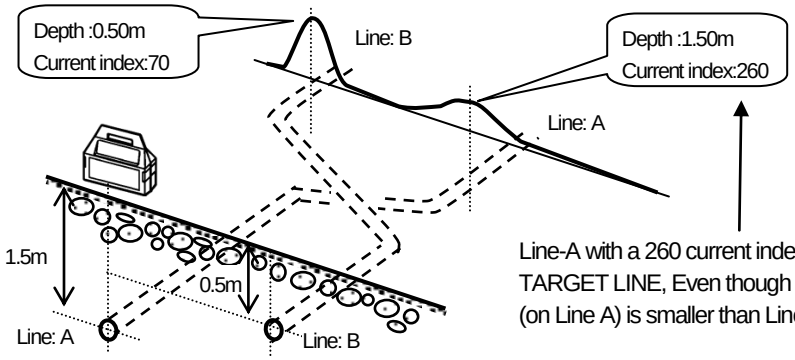
If an adjacent line is running parallel with the object line.



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

⇒Line A with a 200 current index is the trace object.

If two lines are crossing:



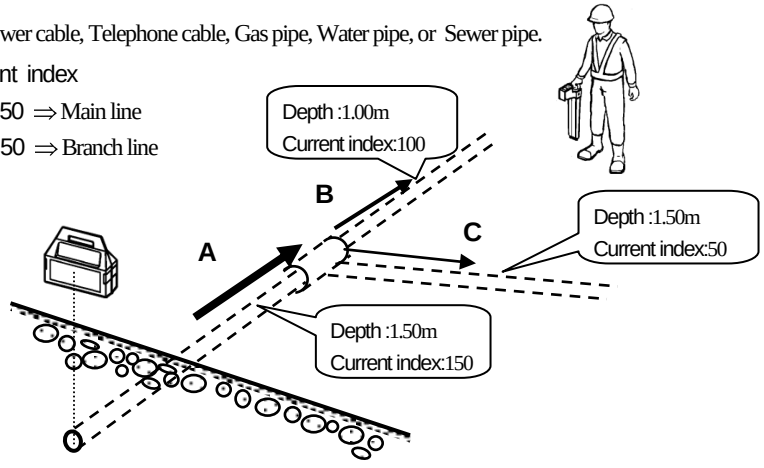
Line-A with a 260 current index is the TARGET LINE, Even though signal (on Line A) is smaller than Line B).

Locating T connection

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

Main line-A with a 200 current index

- Line-B : Index value 150 ⇒ Main line
- Line-C : Index value 50 ⇒ Branch line



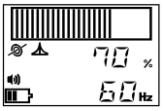
8-6. Passive mode

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

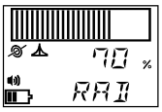
Power mode: Power mode detects 50/60 Hz or 100/120Hz frequency radiated by the live power cable.

Press **Frequency** key.



Select **60Hz** / **120Hz** .
or
50Hz / **100Hz** .

Radio mode: It locates buried utility lines as they reradiate very low frequency,



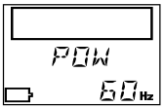
Select **RAD**.

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.

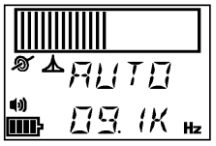
Auto search function of Magnetic field in nature. (Radio wave)

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

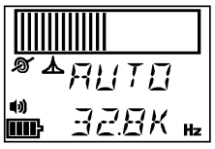
Search all frequencies

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

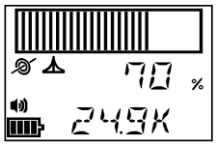
Press **Gain Adjust** key.



Search start



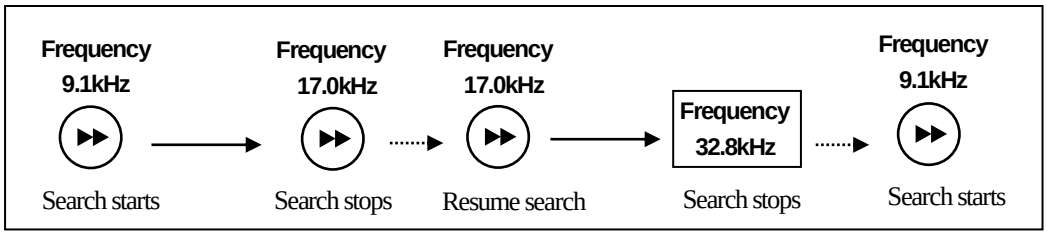
Search end.



Automatically selected the most sensitive frequency

Search frequencies in several bands

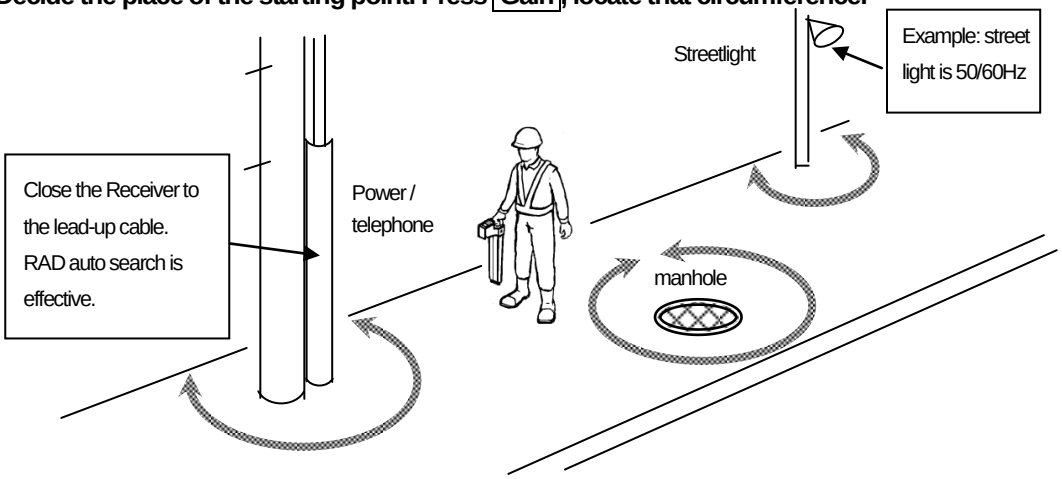
Press **Gain Adjust** during search, Search stops. Resume search, the search starts from the halted frequency.



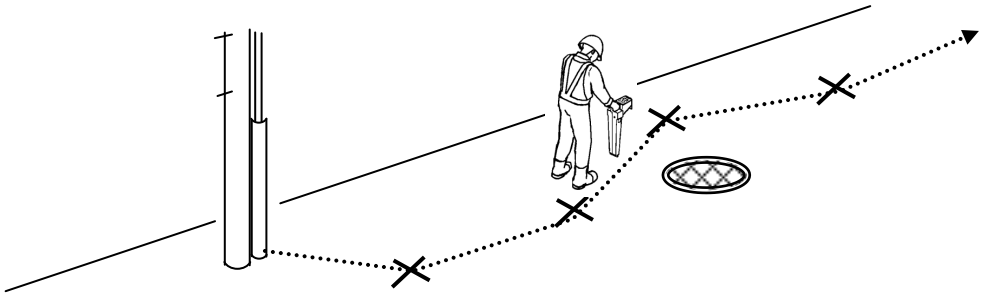
Above mentioned example shows the first search detects the most sensitive frequency from 9.1k to 17kHz. And then search is halted. Then, search resumes. The second search detects the most sensitivity frequency from 17k to 32.8kHz

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

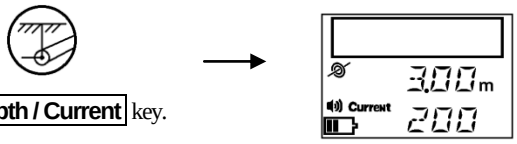
Decide the place of the starting point. Press Gain, locate that circumference.



Trace a line from the starting point



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



Press **Depth / Current** key.

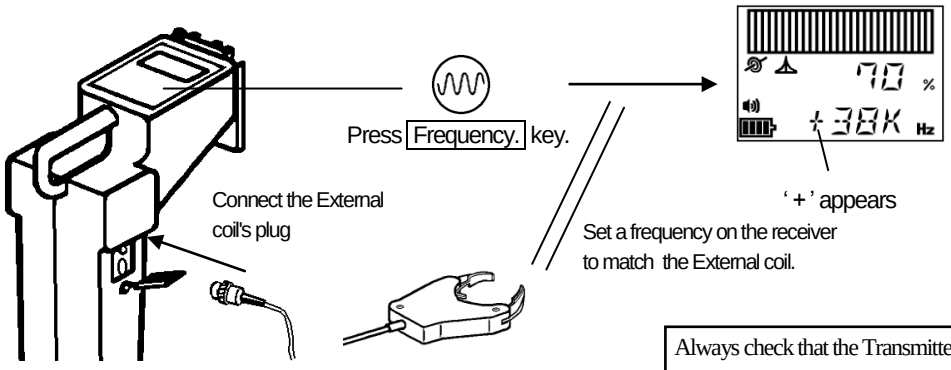
WARNING

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 External coil, supplied as an option, which is connected to the Signal input terminal (8-pin connector) of the Receiver.

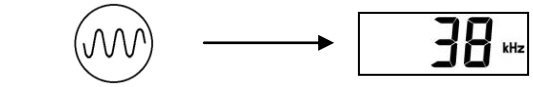
Receiver Connect the External coil's plug to the Signal Input Terminal (8-pin connector) on the Receiver



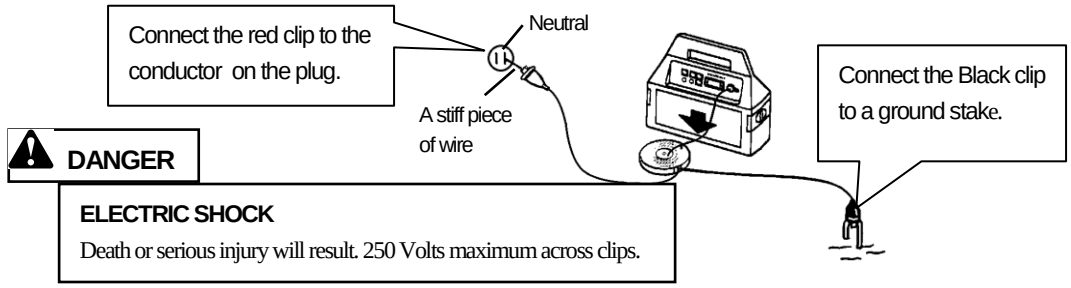
Always check that the Transmitter, the Receiver and the External coil are at the same frequency.

Transmitter

Set the frequency on the RECEIVER and TRANSMITTER to the same Frequency.



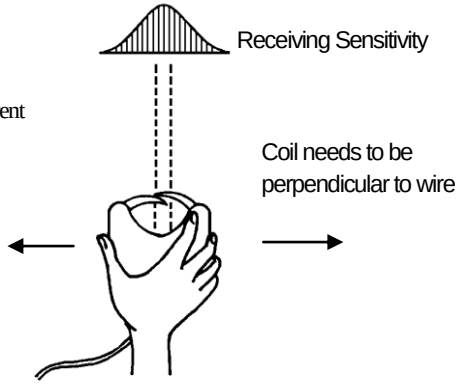
The clips are connected to the transmitter.



Tracing the wire

Hold the External coil near the wall as illustrated.
The coil in the External 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

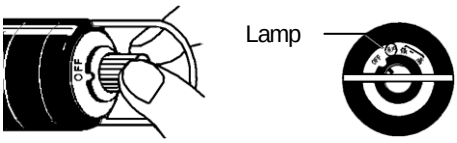
A Probe, supplied as optional equipment, is a small waterproof transmitter emitting a signal that is traced by the Receiver.

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

Note : The metal pipe conceals a signal so that the Receiver cannot detect the signal. Use Direct connection mode.

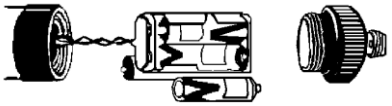
Battery check

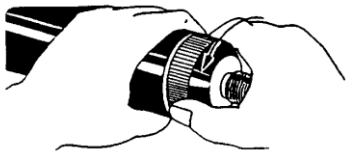
a) Set the rotary select switch to BATT.
b) Check to see if the green lamp is ON.
c) If the lamp is OFF, replace all batteries with new ones.



Replacement of batteries

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.

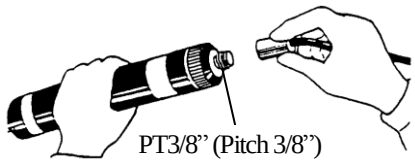




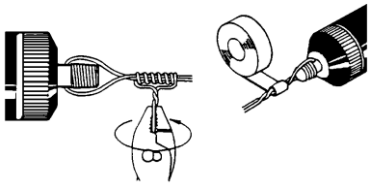
Output setting

a) **OUTPUT LOW:** 0.7 ft to 5.8 ft (0.2 m to 1.8 m) ⇒ less than 4ft / 1 m
b) **OUTPUT HIGH:** 5.9 ft to 16 ft (1.8 m to 5 m)⇒ more than 4 ft / 1 m

Attach the Sewer probe to the rodding tool and insert the probe into the pipe.

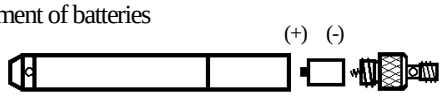


Attach the Sewer probe to the Pulling eye with the pulling wire and pull the probe with the wire.



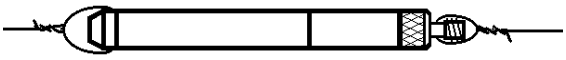
Mini-Probe Small probe for 1" Fiber optic duct or non-directional boring tools

Replacement of batteries

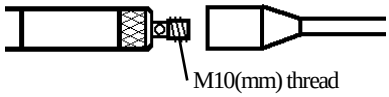


*Mini-probe doesn't have battery check function.
Check the transmission of the probe on the ground before locating.

Attach the Mini-probe to the Pulling eye

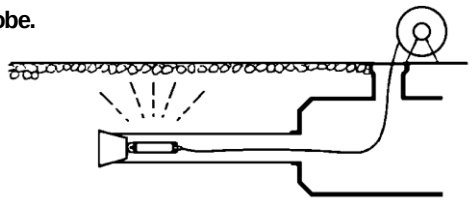


Attach the Mini-probe to the rodding tool



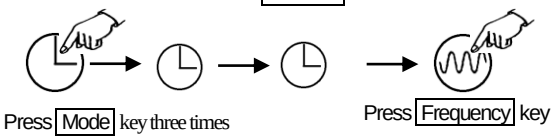
Tracing a non-metallic drain or plastic pipe with the Probe.

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



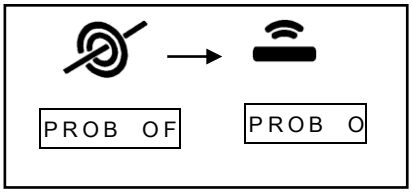
Receiver ⇒ Press **Frequency** key to set **38kHz** **or** **512Hz** .

Set the detection mode to Probe mode.



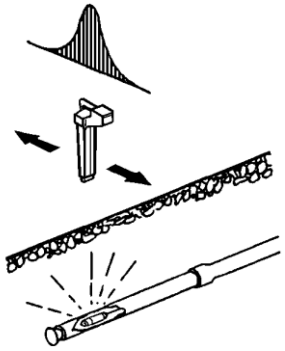
Press Mode key three times

Press Frequency key



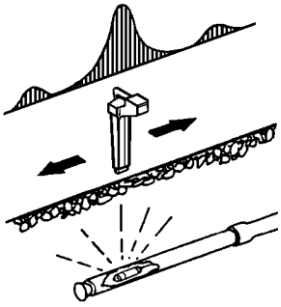
Location measurement

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



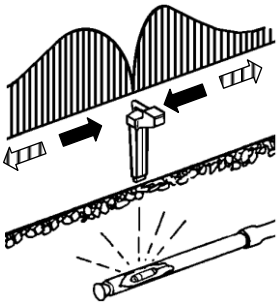
Location measurement

Peak mode.
Three sensitivity peaks appear.
The biggest peak is the point directly above the Probe.

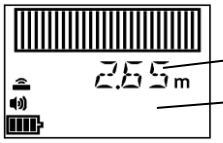


Null mode

- Near the Probe, an arrow indicates the direction of the Probe.
- Above the Probe both arrows flash.
- Away from the Probe, the receiving level flashes and the arrow indicates the direction you need to move.



Depth measurement ⇒ Press **DEPTH** key



Depth
Current index is not displayed.

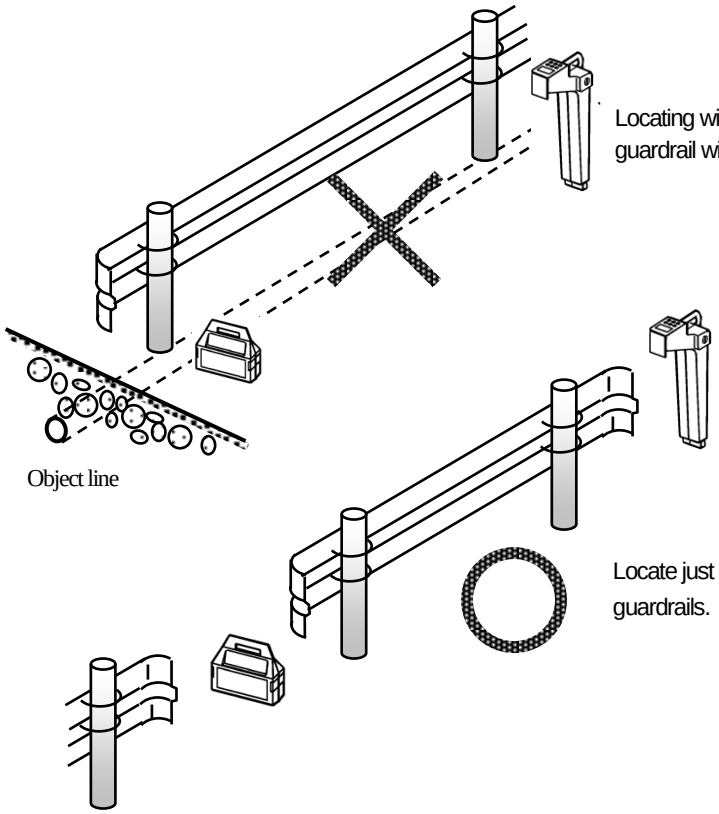
* For the Sewer probe :

OVER ⇒ Change the output to OUTPUT LOW.
LOW ⇒ Change the output to OUTPUT HIGH.

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

9. Precautions and applications (At the locating site)

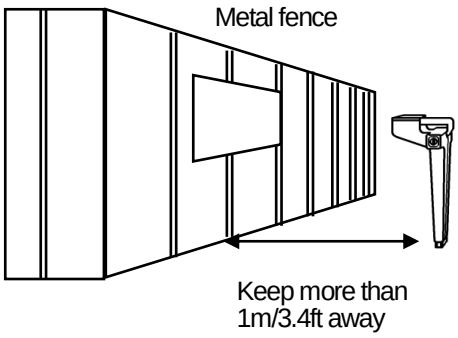
1) Locating Work Near the Guardrail (In Indirect mode)

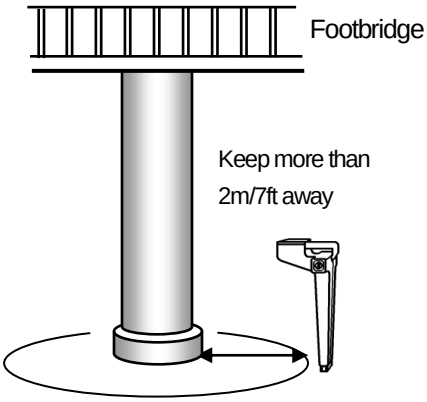


Locating with the Receiver next to the guardrail will give an incorrect reading.

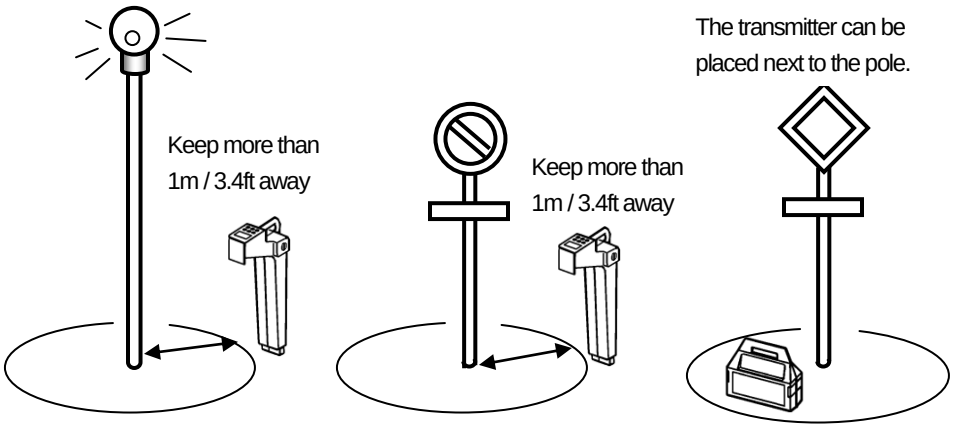
Locate just between the breaks of the guardrails.

2) Metal Fences or Other Metallic Structures

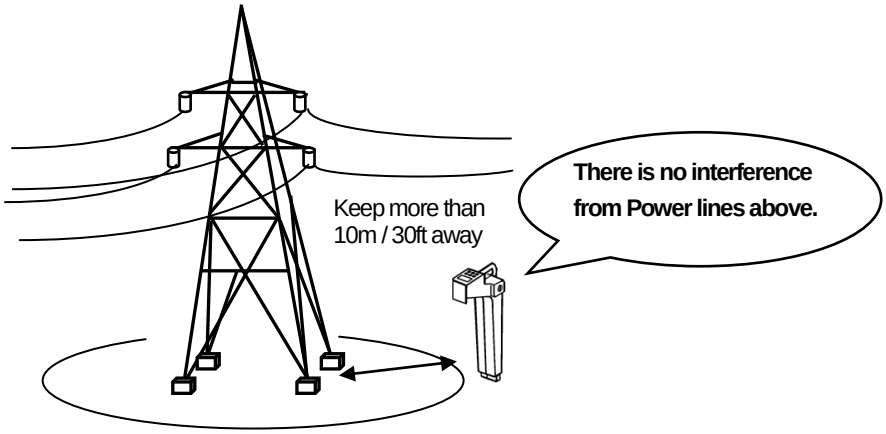




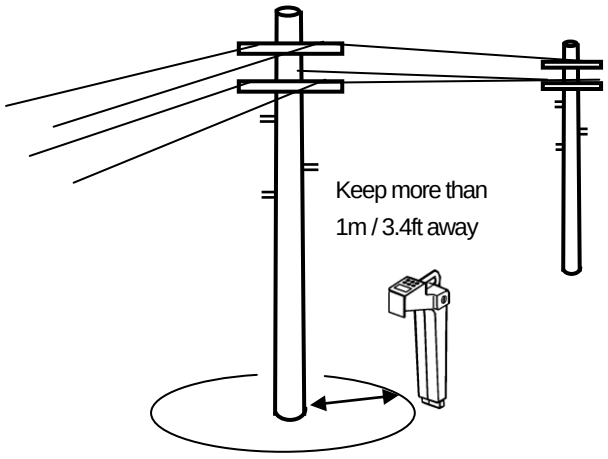
3) Street Light, Traffic-Control Sign



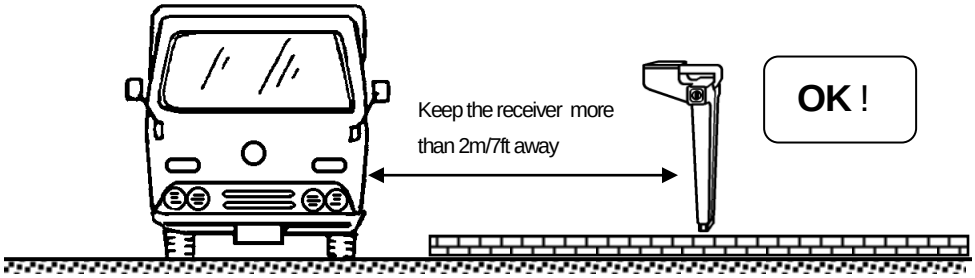
4) Power-Transmission Tower

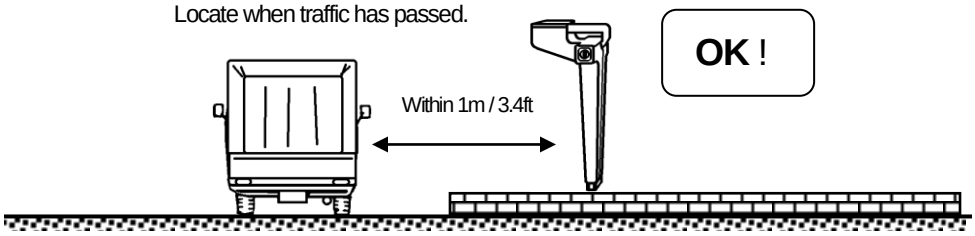


5)Telephone / Electric Power Poles



6) Heavy Traffic Flow





7) Railroads