

The SPX logo is located in the top right corner of the image. It consists of the letters 'SPX' in a bold, sans-serif font. The 'S' and 'P' are white, and the 'X' is green. A registered trademark symbol (®) is positioned to the right of the 'X'.

SPX®



RD8000

Training Course

GLOBAL INFRASTRUCTURE X PROCESS EQUIPMENT X DIAGNOSTIC TOOLS



Radiodetection

Welcome to the Radiodetection RD8000 Training Course



Universal precision
cable and pipe locator



User Guide



- RD8000PXL
 - Industry standard high performance cable and pipe locator
- RD8000PDL
 - Radiodetection's most advanced cable and pipe locator



- RD8000 locators contain many features:
 - Model dependant
 - See brochure and user guide



- 1 Watt, 3 Watt & 10 Watt
 - Compliment RD8000
- One platform for all
- Contain many features
 - Model dependant
 - See brochure and user guide



Why do we use Locators and Transmitters ?



- **Safety**

- Reduce cable and pipe strikes
- Could be power cable
- Could be high pressure pipeline

- **Accuracy**

- Reduced time
- Reduced cost



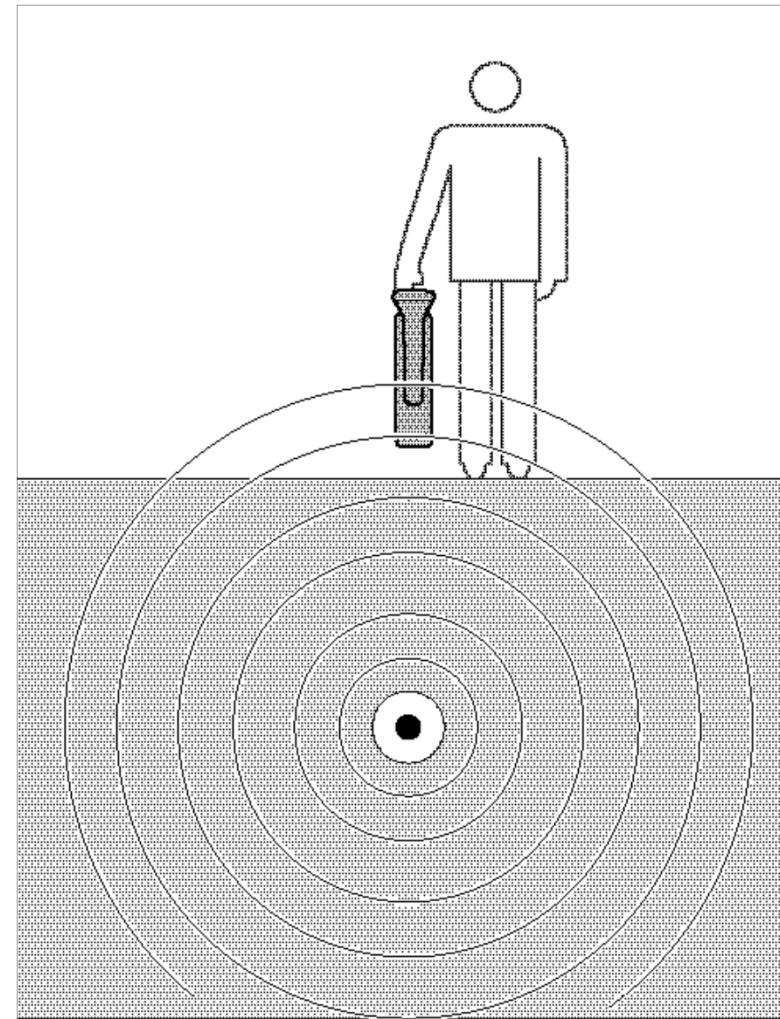
Think safety – at all times

SPX



What are we locating

- Locators do not locate cables or pipes, they locate the magnetic field around the line (**must be a conductor**)
- The magnetic field is created by an **alternating current** (AC) flowing along the line
- This magnetic field forms a cylindrical shape around the line and is known as the 'signal'
- Principle known as electromagnetic induction

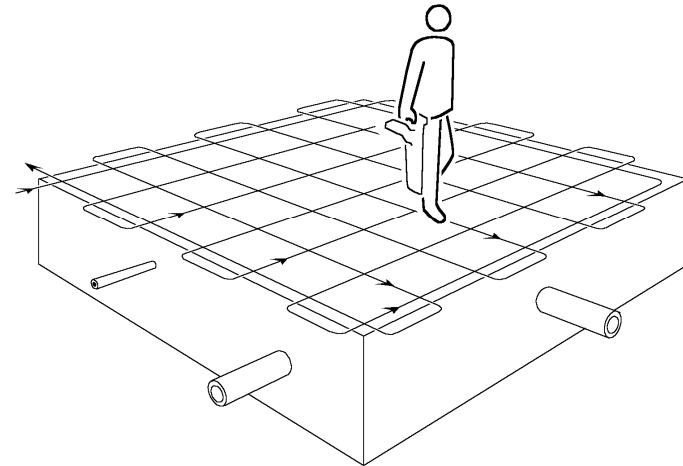


The first step to successful locating is to obtain as much information about the site before the locator is even turned on.

- Obtain utility maps or drawings
- Observe the site
- Look for physical evidence, i.e. covers, telegraph poles, street lamps, trench scars etc

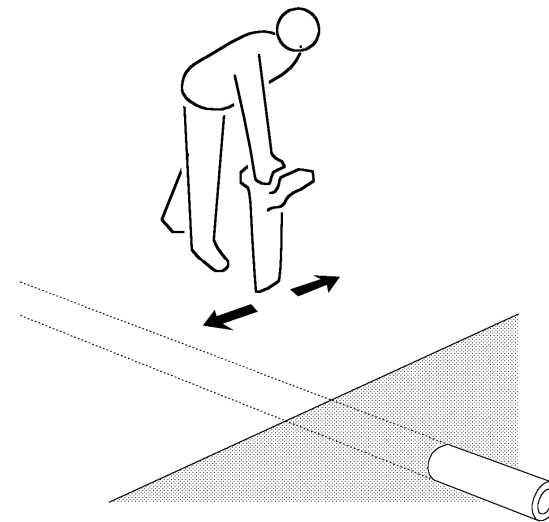
STEP 1

- Set the gain to maximum
- Holding the locator vertical at all times, sweep the area with a steady and deliberate motion
- If necessary adjust the gain to keep the bar graph on scale



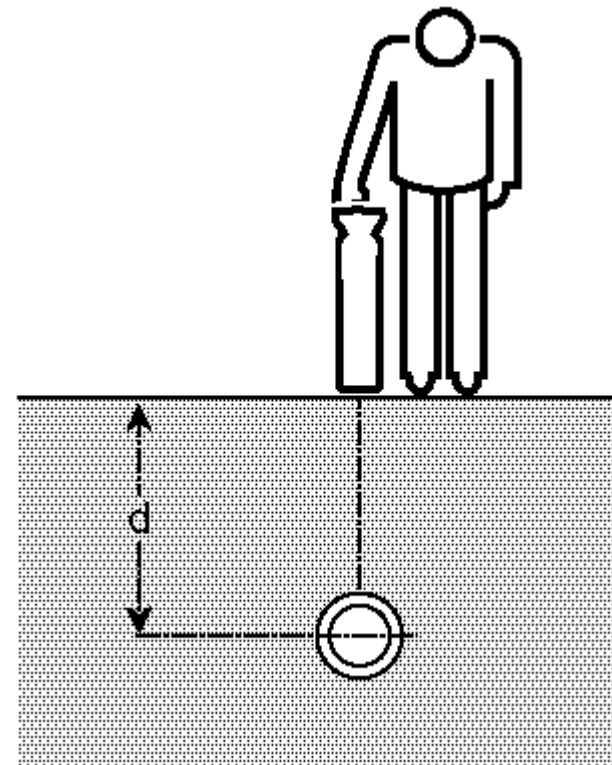
STEP 2

- When a signal is detected continue along the search route until signal reduces, then move back to where the signal is strongest, (Peak).



STEP 3

- Mark position
- Measure depth
- Measure current



Two types of location methods



Passive....

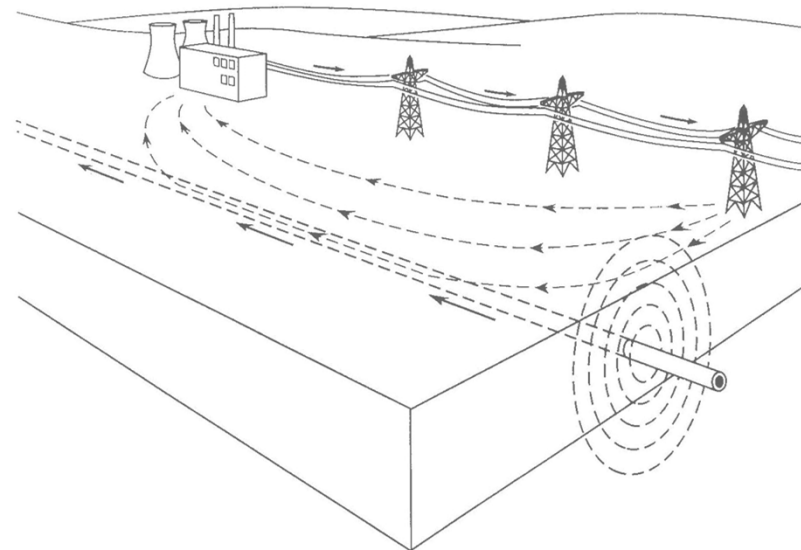
These occur naturally on cables and pipes

- No need for a transmitter
- The main purpose is for avoidance
- Quick
- Relatively easy



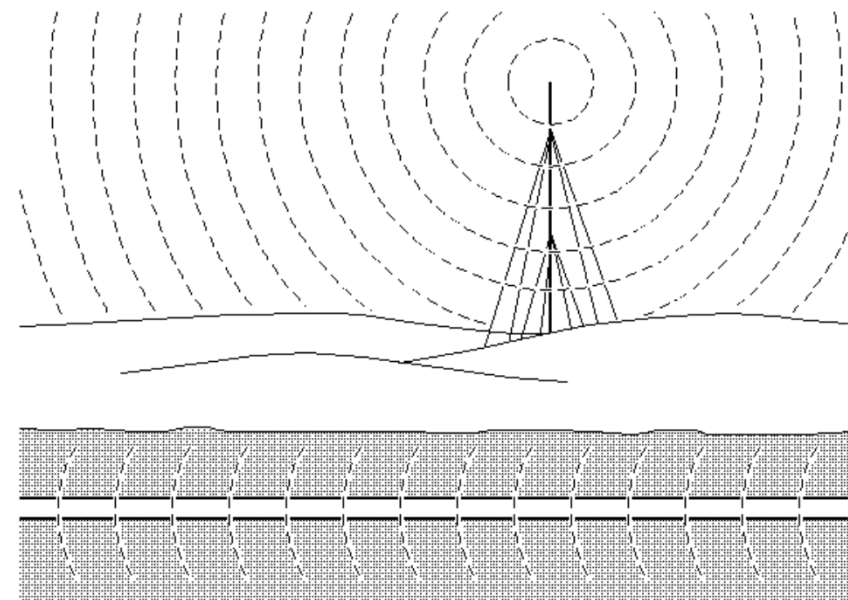
Passive Location (Power)

- 50/60 Hz radiating from loaded power cables
- 50/60 Hz signals induced into ground
- These signals travel along metallic cables or pipes
- Enables most, but not all power cables to be located passively



Passive Location (Radio)

- Very low frequency (long wave) radio waves from distant transmitters
- Ground provides return paths for energy
- Metallic lines form preferred paths



Passive Location - Practical Implications...

- Cannot identify... Same signal may appear on any conductor
- Live line with load switched off... no current flow
 - so no detectable locate signal – **remains a danger**
- 3 phase cables can be difficult to locate...
 - High voltage are better balanced and cancel their fields
 - Radio mode valuable complement to Power mode
- **All passive signals can change without warning**



Active....

A signal produced by a transmitter and actively applied to a cable or pipe.

- Purpose is for tracing and identifying
- Measuring depth
- Measuring current
- Confirmation

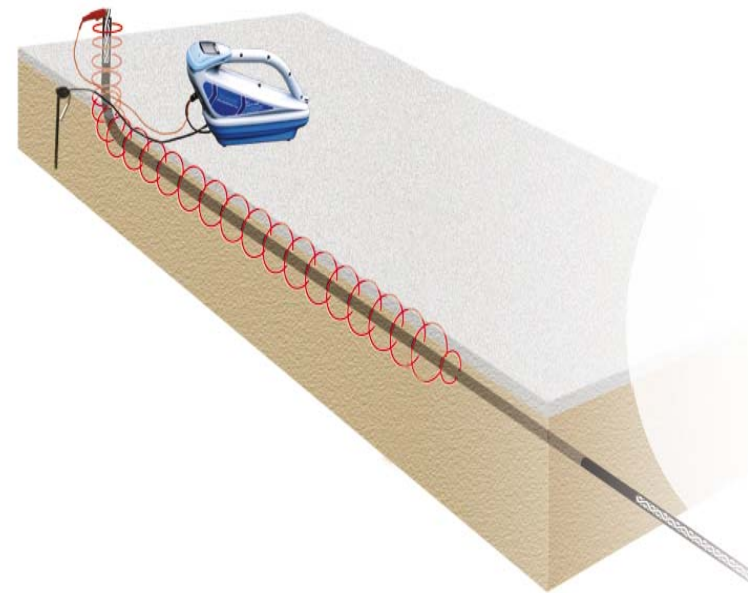


There are three ways to actively apply a signal to a target line....

- Direct Connection
- Induction
- Signal Clamp

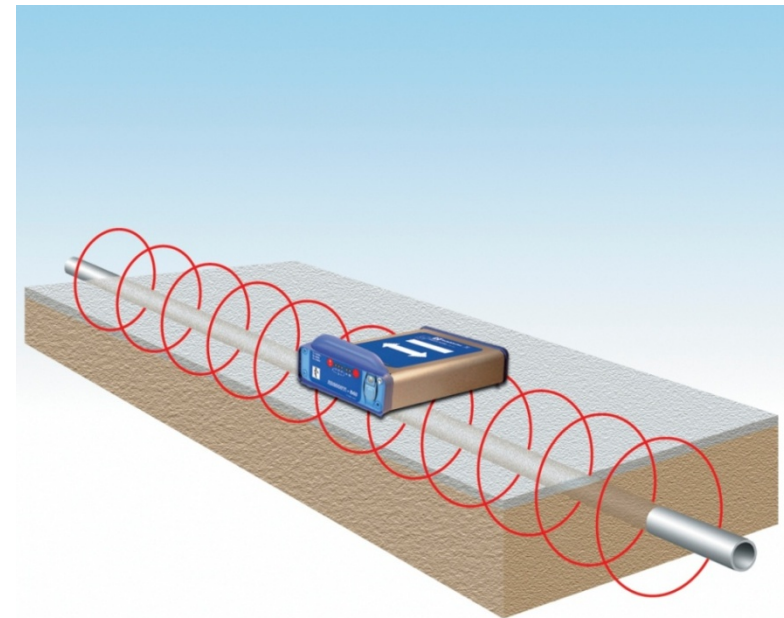
Direct Connection

- Plug connection lead into transmitter
- Ensure good electrical connection and remove paint or rust
- Ground stake should be placed at 90° to the cable and as far away as possible



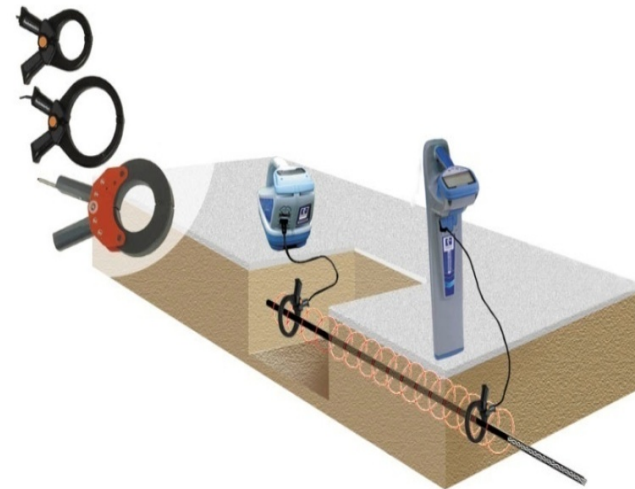
Induction

- Transmitter signal can be applied without connection
- Signal is generally less than that of connection methods
- As high frequency is used, there is a tendency for signal to couple onto adjacent metallic lines



Signal Clamp

- Used when no access for direct connection
- Transmitter does not need to be grounded
- Target line needs to be earthed at both ends
- Typically uses frequencies in region of 8kHz and above (sub 1kHz if using CD clamp)



- **VOL :** Volume level
- **BATT :** Battery type
- **ALERT :** Strike Alert
- **FREQ:** Frequency enable / disable
- **ANT :** Antenna enable / disable
- **POWER :** 50Hz or 60Hz
- **LANG :** Language selection
- **CAL :** Last factory calibration
- **UNITS :** Depth measurement
- **BT :** Bluetooth options
- **LOG :** Logged data
- **CDR :** CD reset

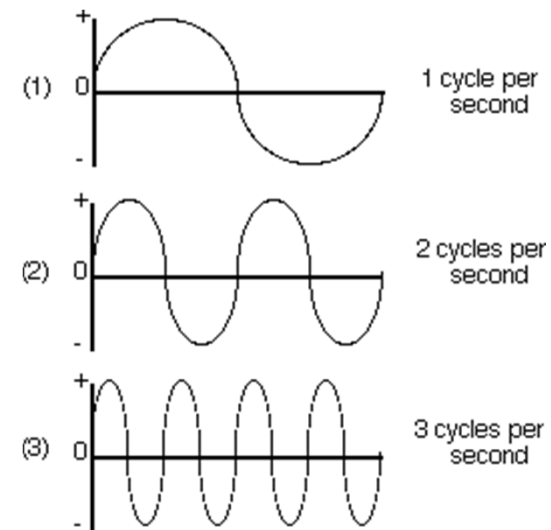


- **VOL:** Volume
- **BT:** Bluetooth
- **MAX V:** Low / High voltage
- **MODEL:** Locator model
- **MAX P:** Maximum power
- **BATT:** Battery type
- **OPT F:** Sidestep Auto
- **LANG:** Language
- **BOOST:** 10W output
- **FREQ:** Enable / disable



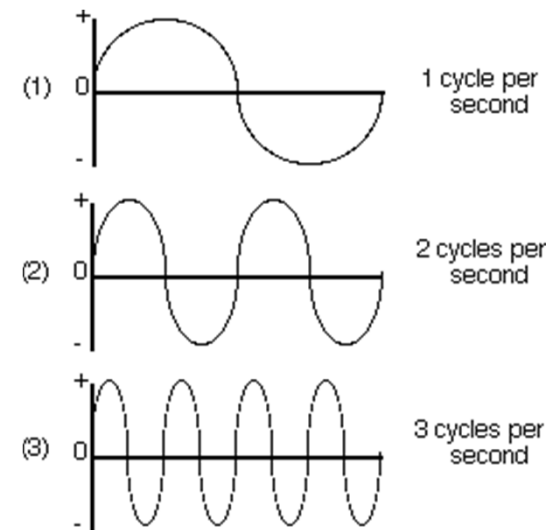
- What are we locating ?
- Passive
- Active
- Ways of applying signal
- Menu navigation

- **RD8000 has many frequencies**
- Using the optimum frequency is very important
- Each application will be different
- Trial and error
 - experience or experiment



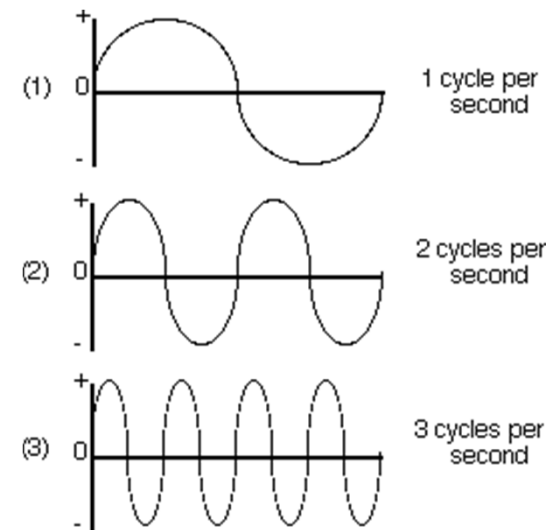
Low frequency (200Hz to 1kHz)

- Direct connection only
- Less likely to bleed off
- Signal carries further
- Unlikely to couple onto other nearby lines
- Will not jump insulated joints
- Difficult to apply to high resistance applications



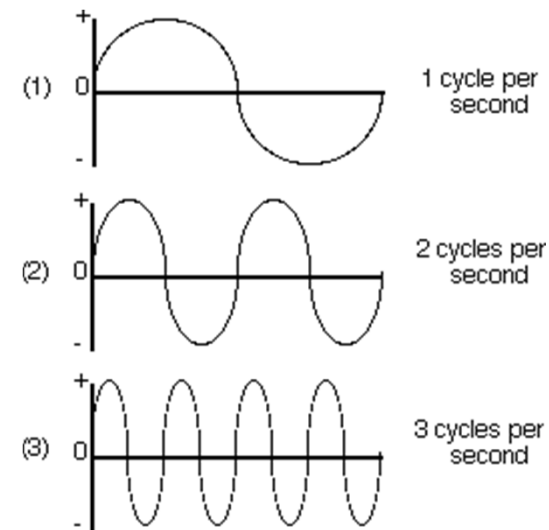
Mid frequency (8kHz to 33kHz)

- Good all round frequency
- More likely to bleed off
- Moderate distance
- Unlikely to couple onto other nearby lines
- Less difficult to apply to high resistance applications
- Cables and pipes
- Direct, clamp and induction



High frequency (65kHz to 200kHz)

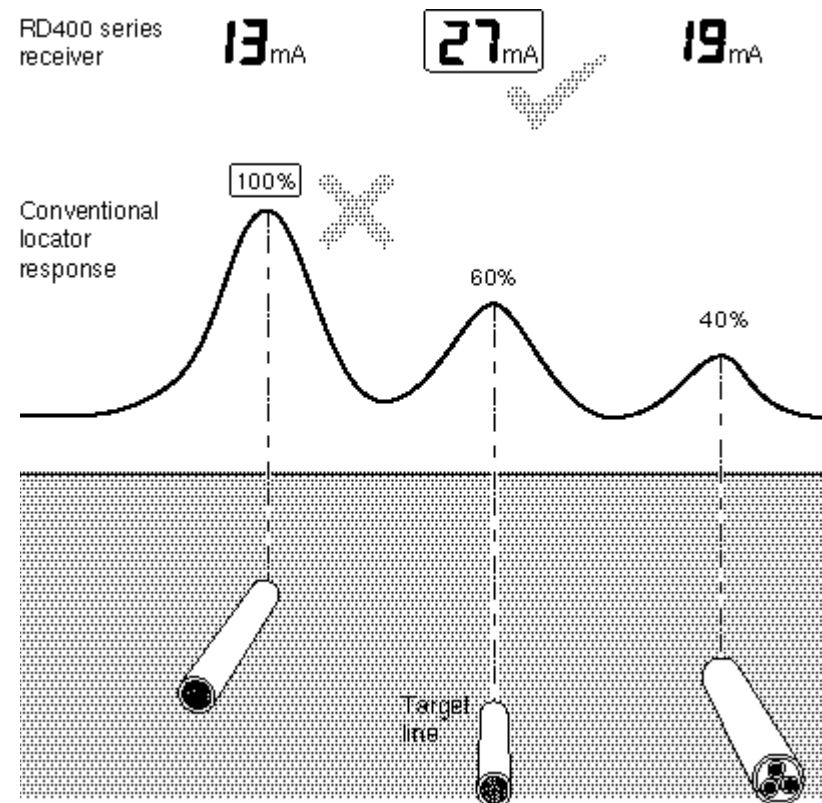
- More likely to bleed off
- Shorter distance
- Will jump insulated joints
- Easy to apply with high resistance applications
- Will couple to adjacent lines
- Good for induction



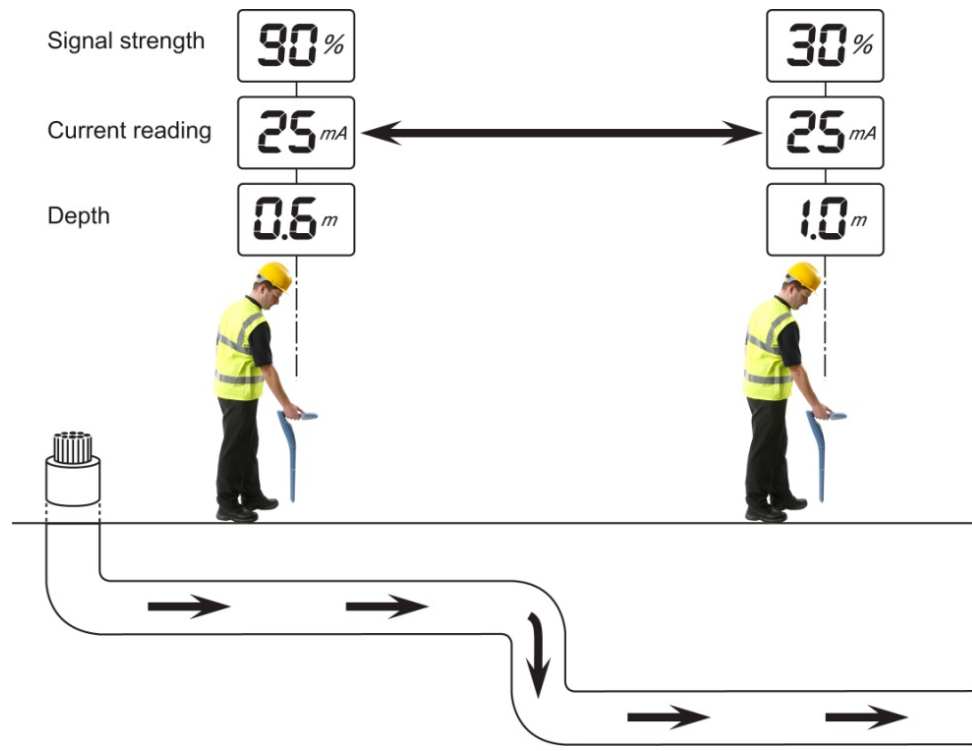
Why do we need CM ?

The diagram shows the conventional locator response for the same signal on three adjacent conductors buried at different depths.

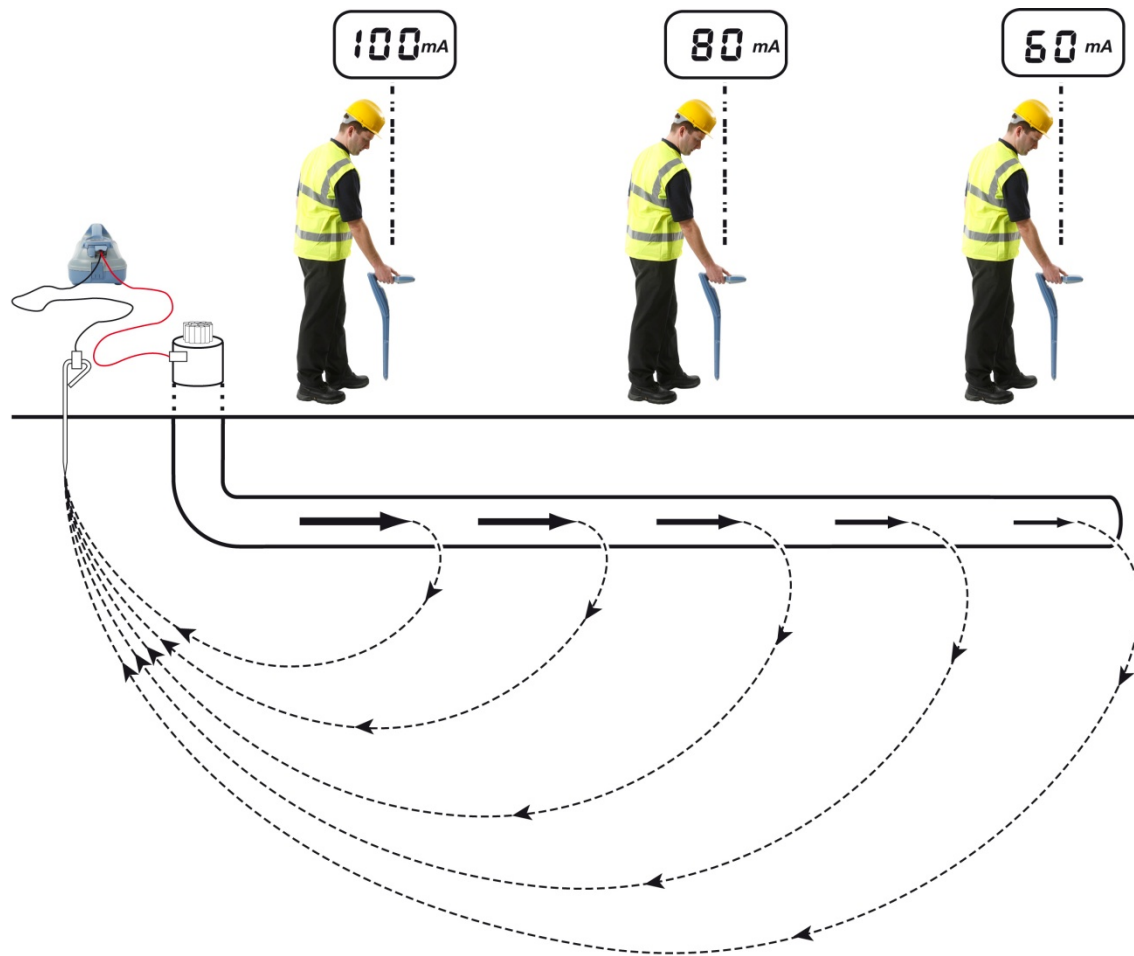
It is only when CM is used that the correct target line can be identified.



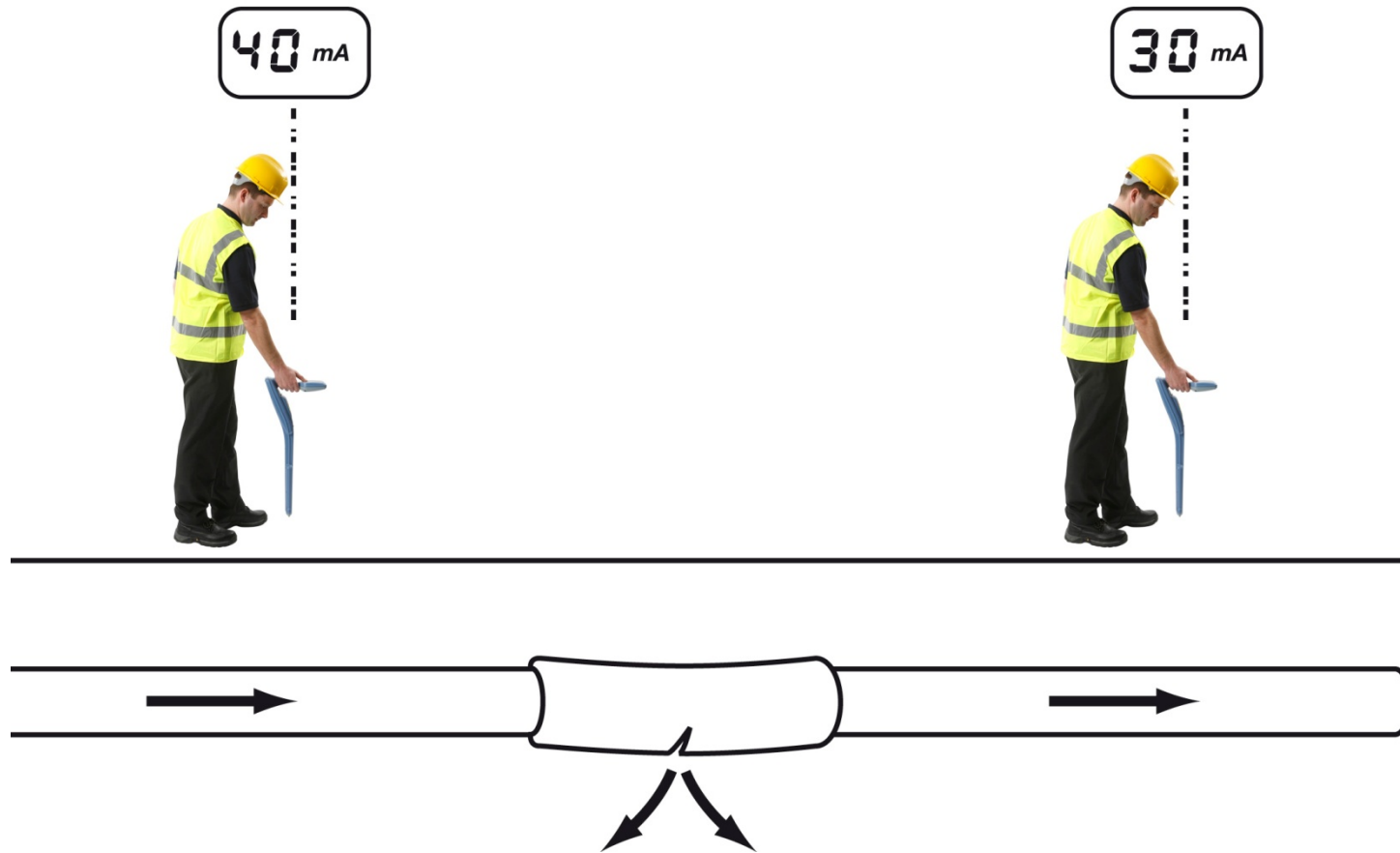
Current Measurement



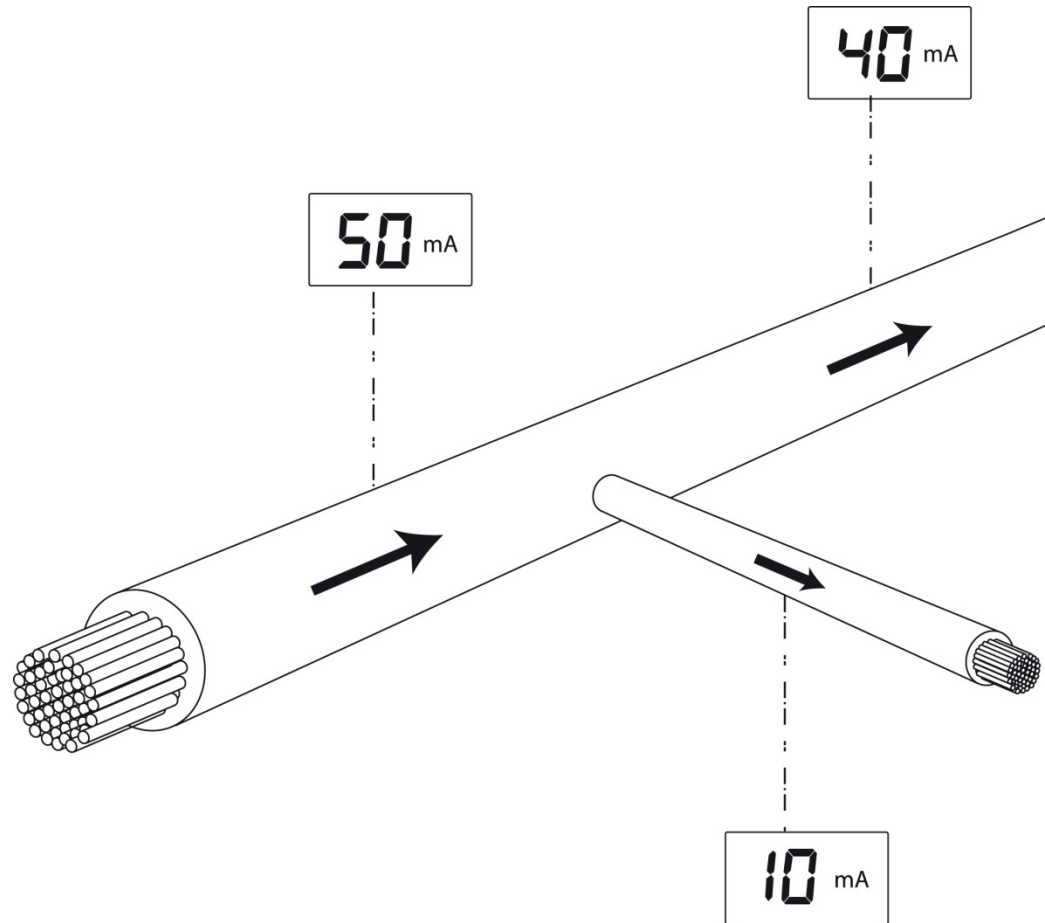
Current losses returning to source

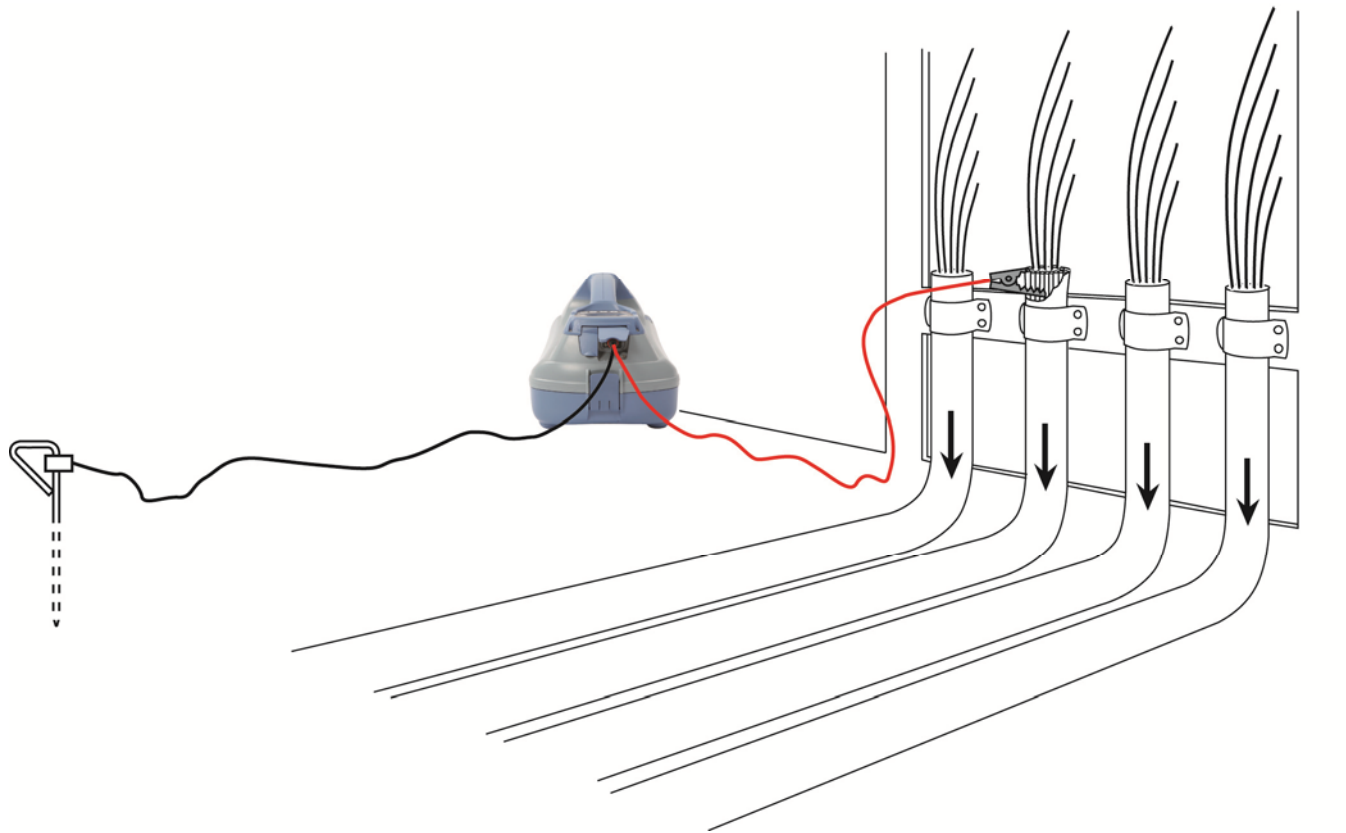


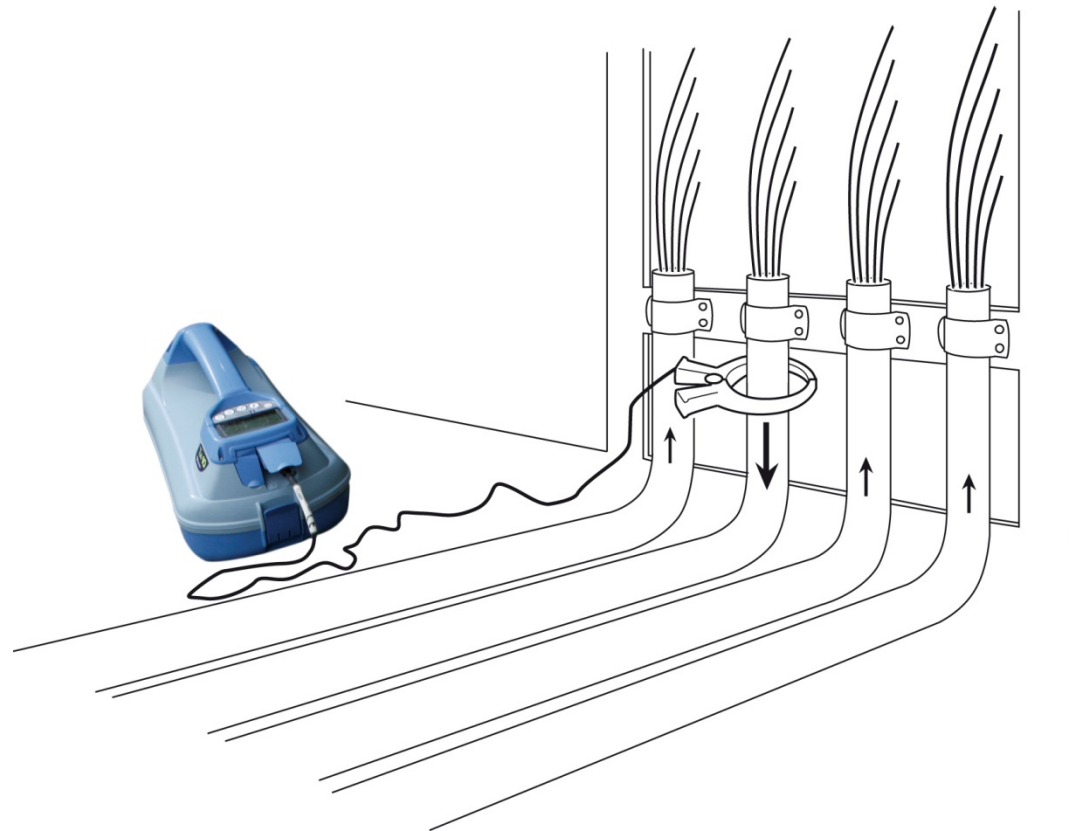
Current loss due to poor insulation



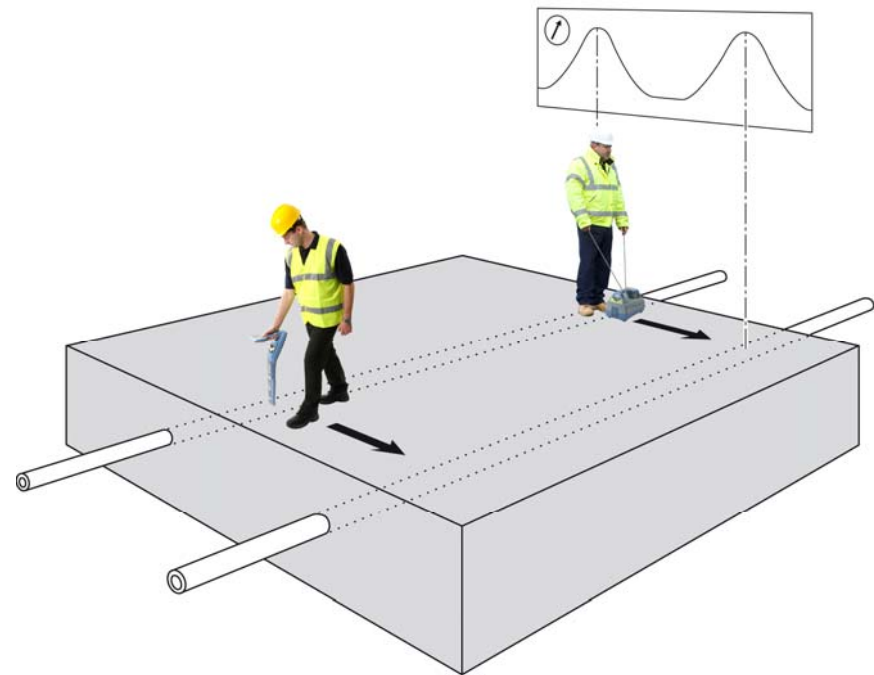
Current loss due to tee connection



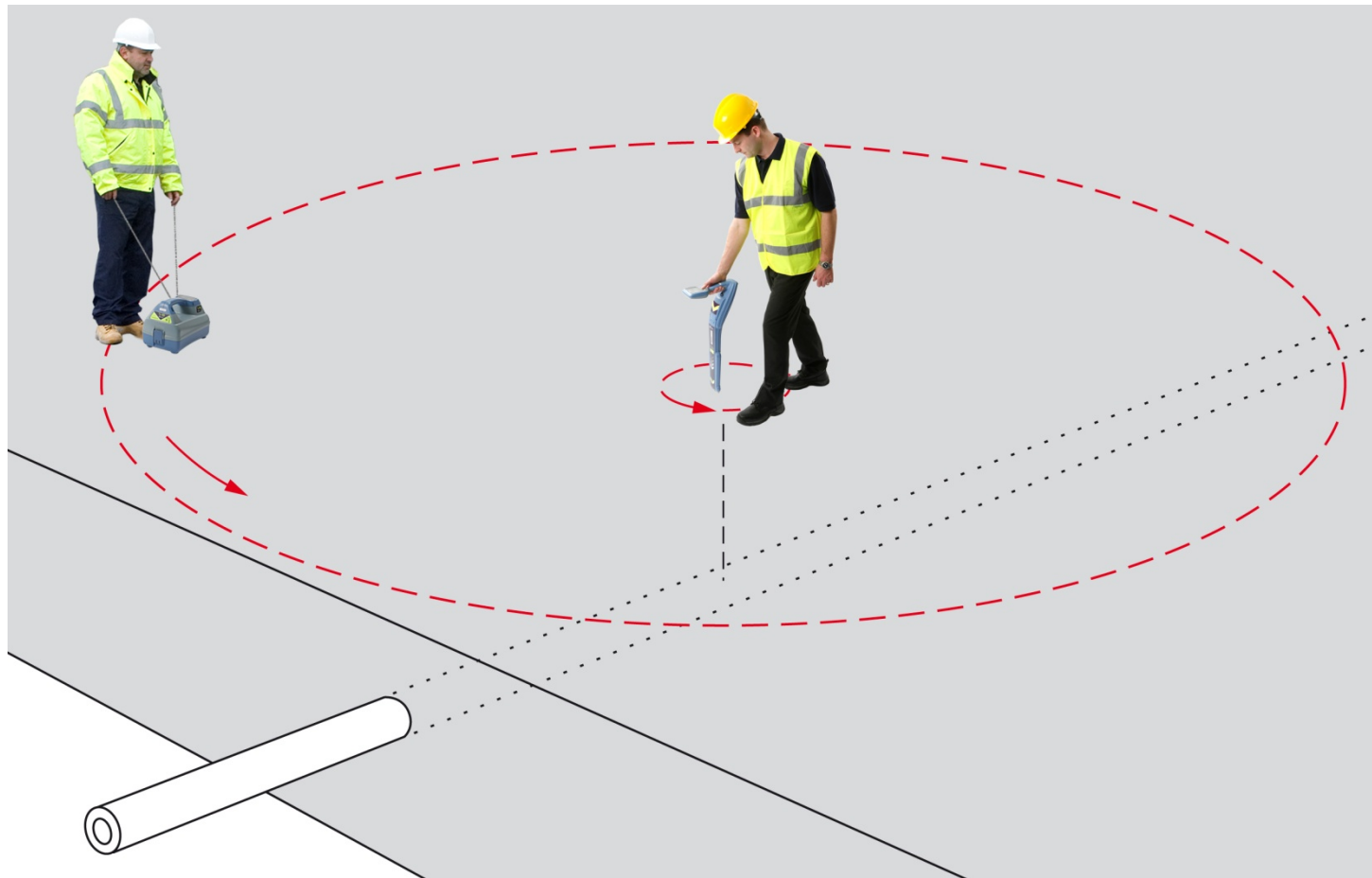


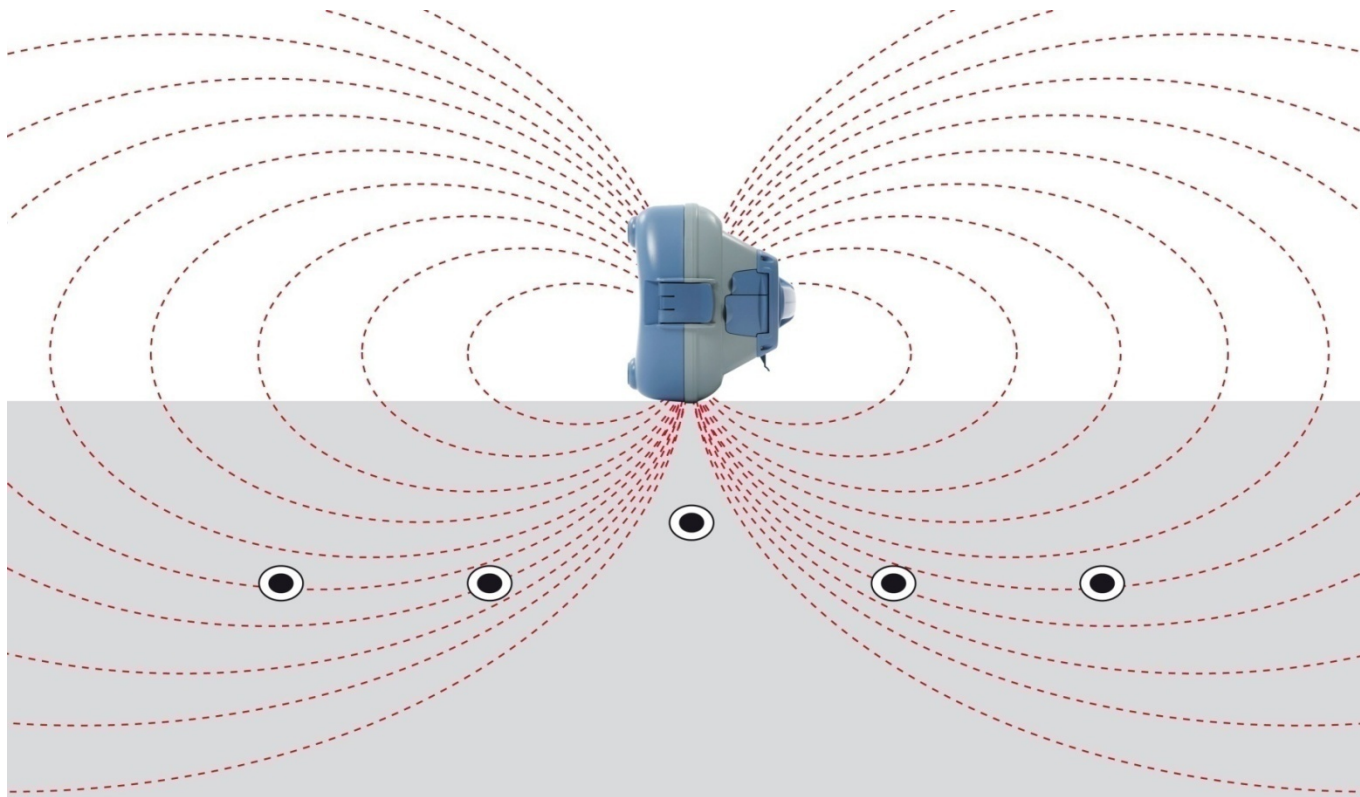


- Another method of finding buried conductors is to use the induction sweep method



Induction Technique - 2 person radial sweep



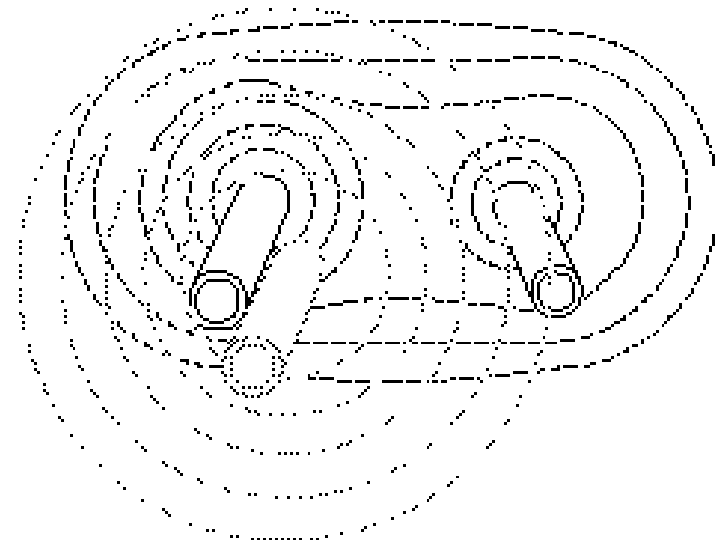


Locators do not find cables or pipes, they find magnetic fields

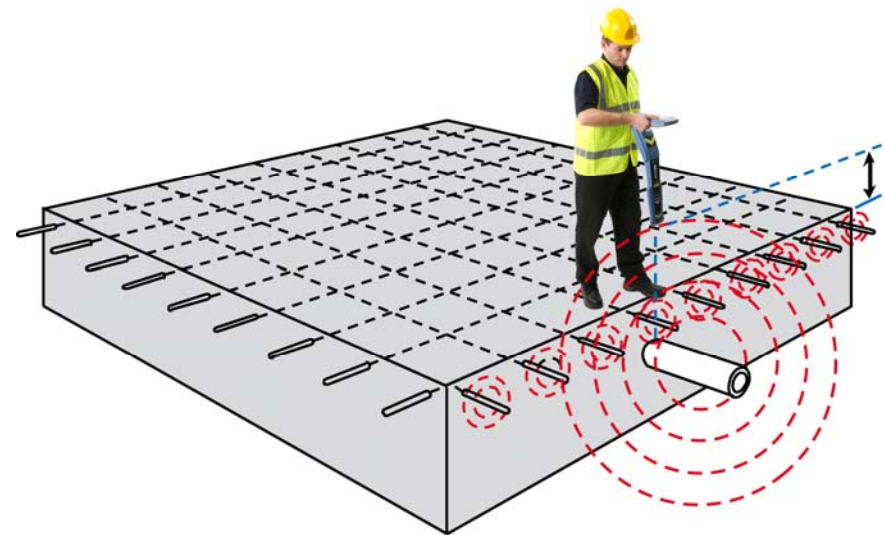
Therefore anything that affects the magnetic field radiating from a buried conductor will cause a problem or result in some form of error

- Commonly the main problem is distortion

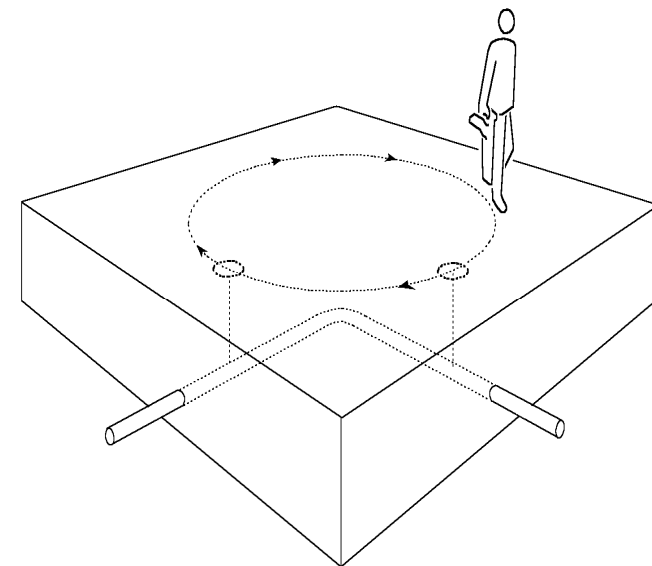
- A distorted field appears to come from a different point.



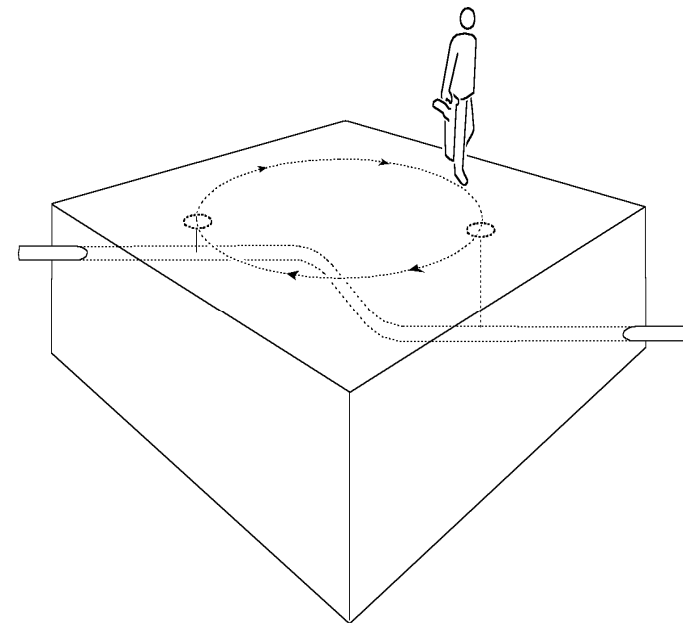
- Reinforcement bars pick up and re-radiate signals
- Raise receiver 0.5m
- Reduce sensitivity
- Reduce transmitter output
- Careful with frequencies



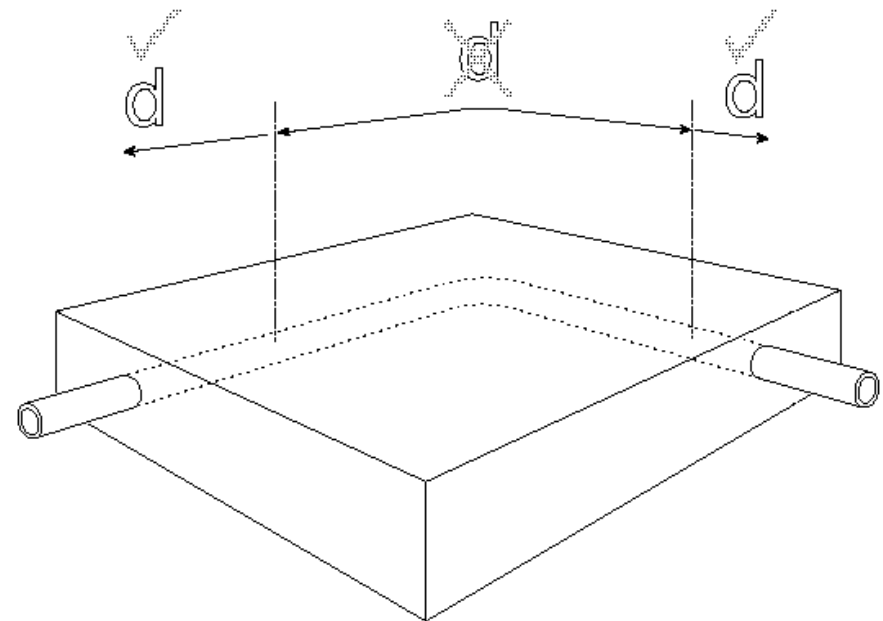
- Changes in direction can be a problem
- If the signal disappears within a short distance, move back to a position where it can be located
- From this position walk in a circle until the signal is found again



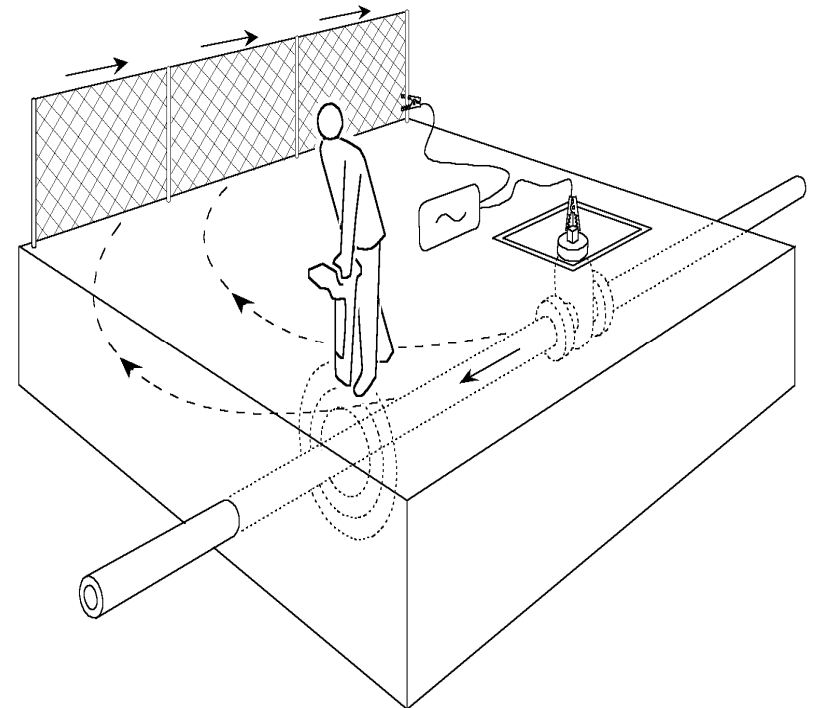
- Changes in target line depth can cause problems.
- Walk in a circle from the last locatable position until the signal is found again.
- If the signal is not found, turn the receiver gain up until it can be.



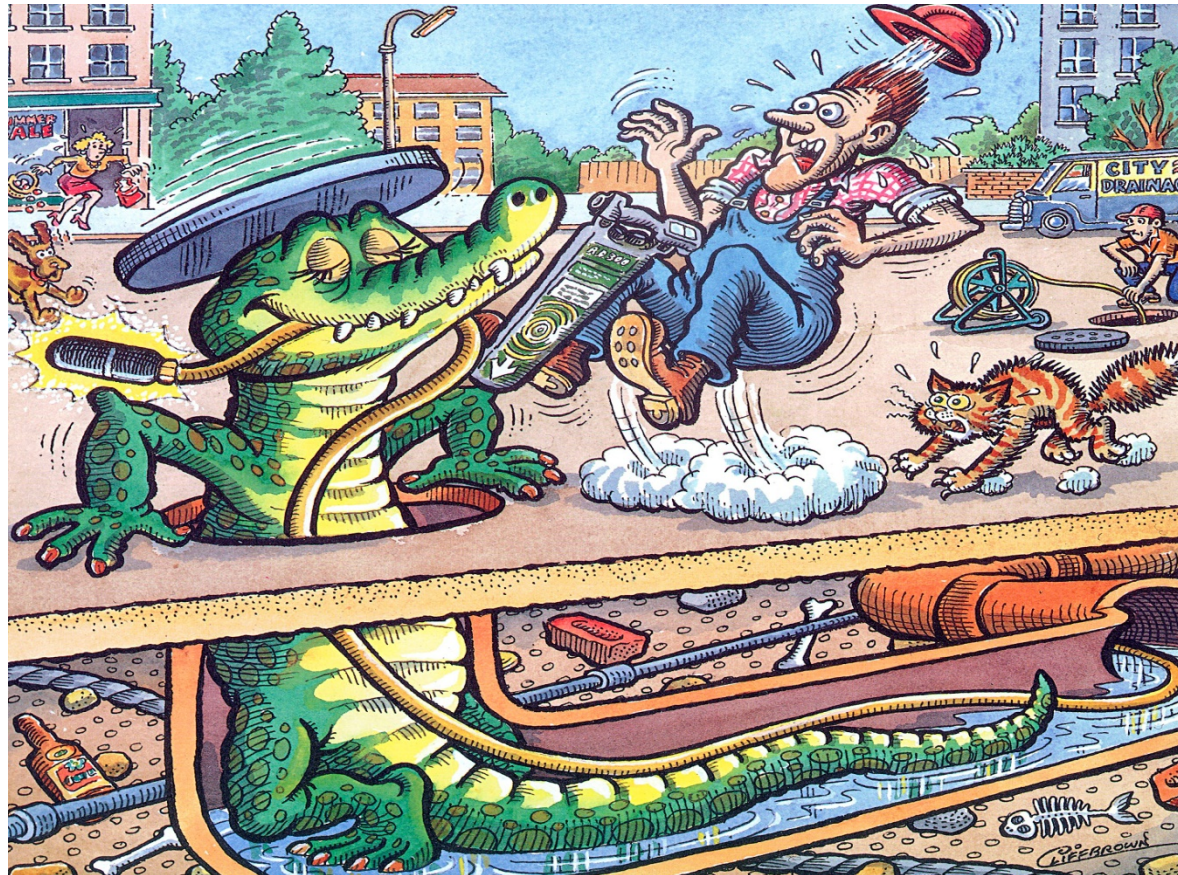
- Do not measure depth near a bend



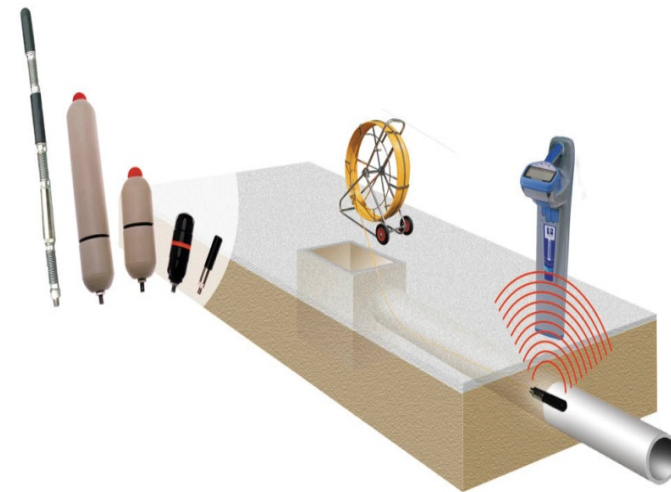
- The fence is a very good earth but...
 - The return signal will flow along the fence, this could be very strong and may interfere with target line



- Antenna selection
- Which frequency ?
- Current measurement
- Locator techniques
- Location problems

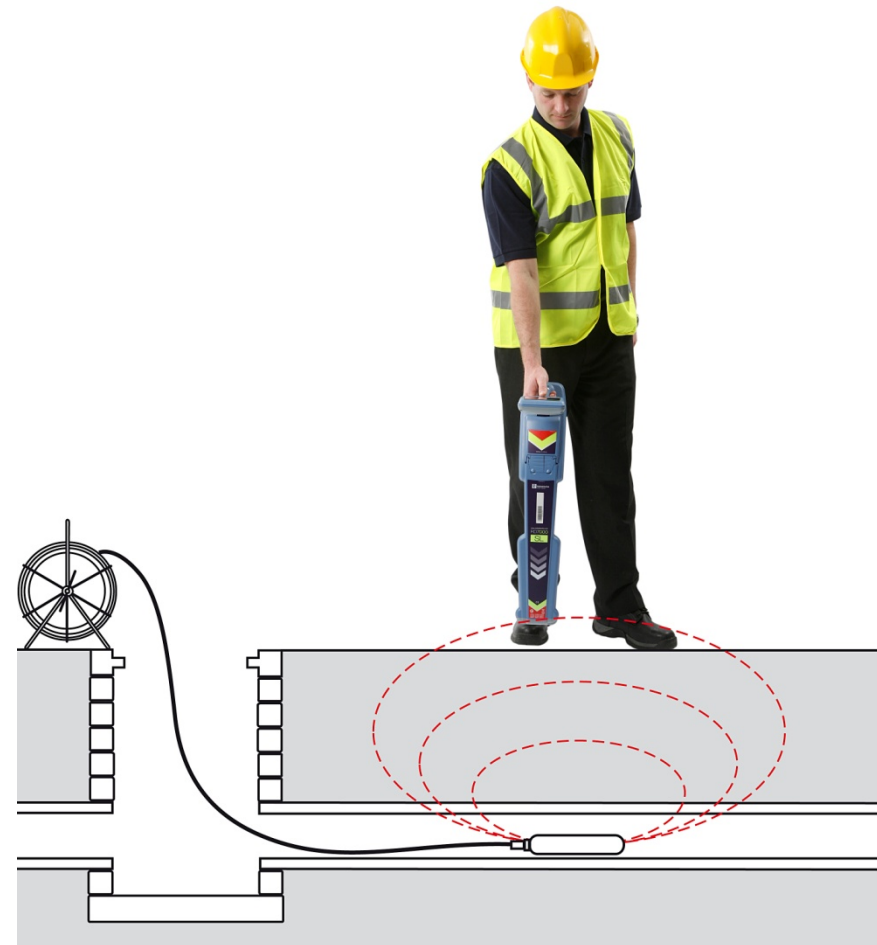


- Plastic or concrete pipes, ducts and drains cannot be located electromagnetically, unless a tracer wire is inserted or laid along pipe
- Sonde - self contained transmitter
- Frequency can be chosen to match locator
- Size dictates detection distance - transmitting power

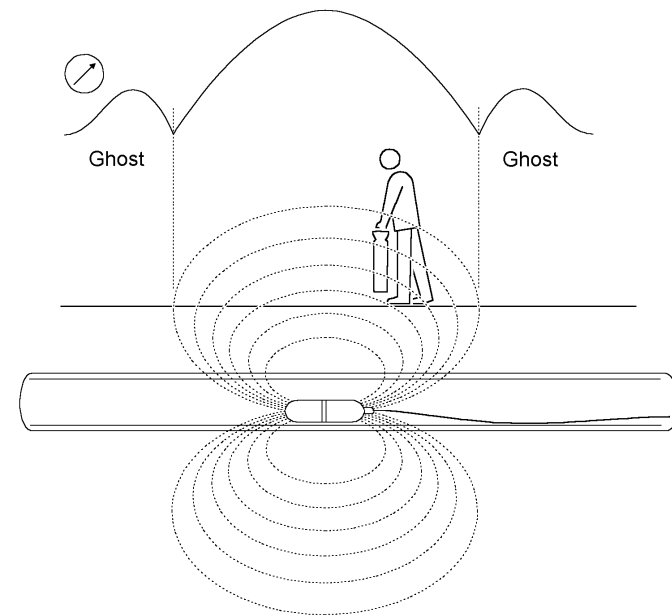




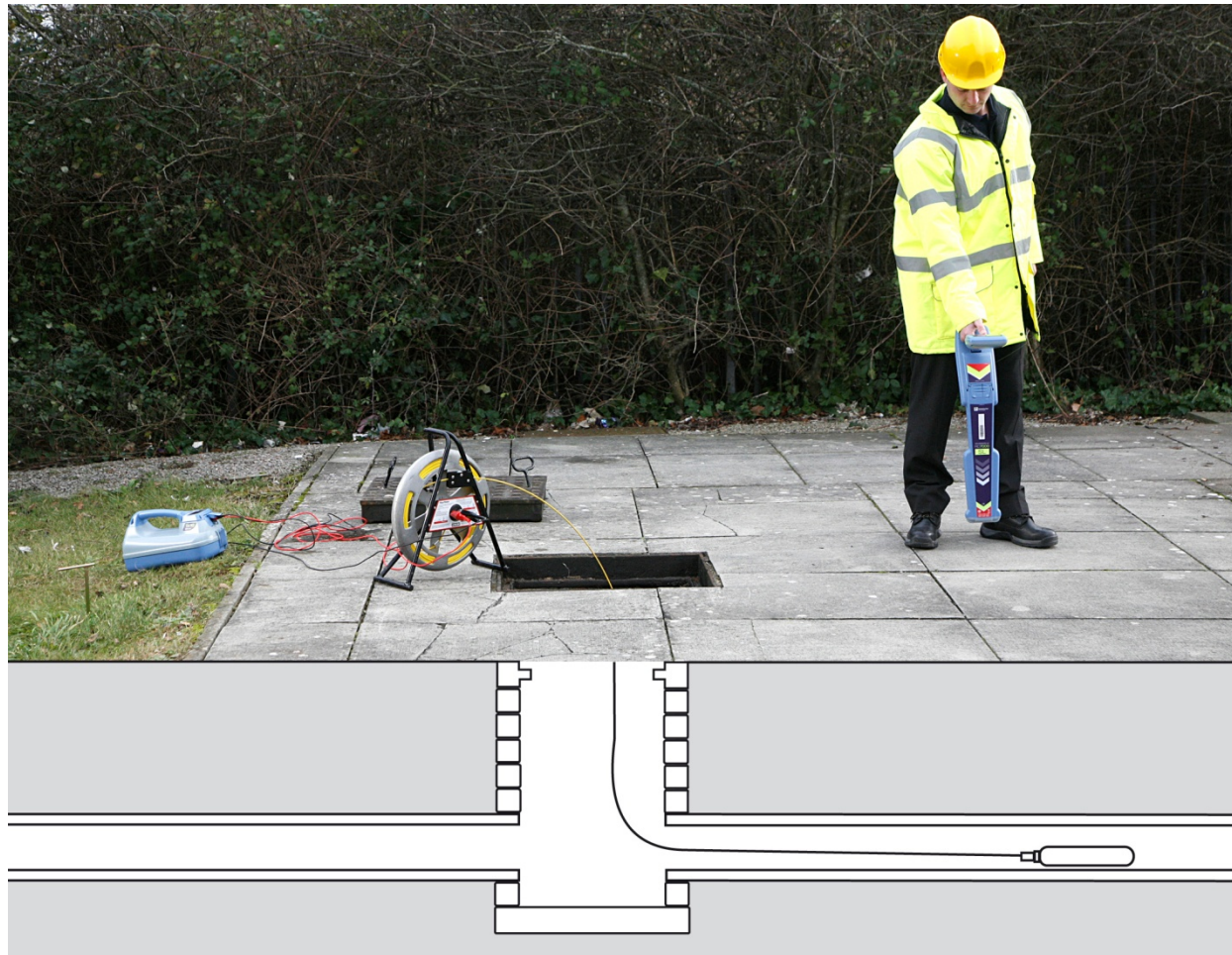
- Sonde on the end of a FlexRod
 - Sonde on the end of a FlexiTrace
- * Notice the orientation of the locator

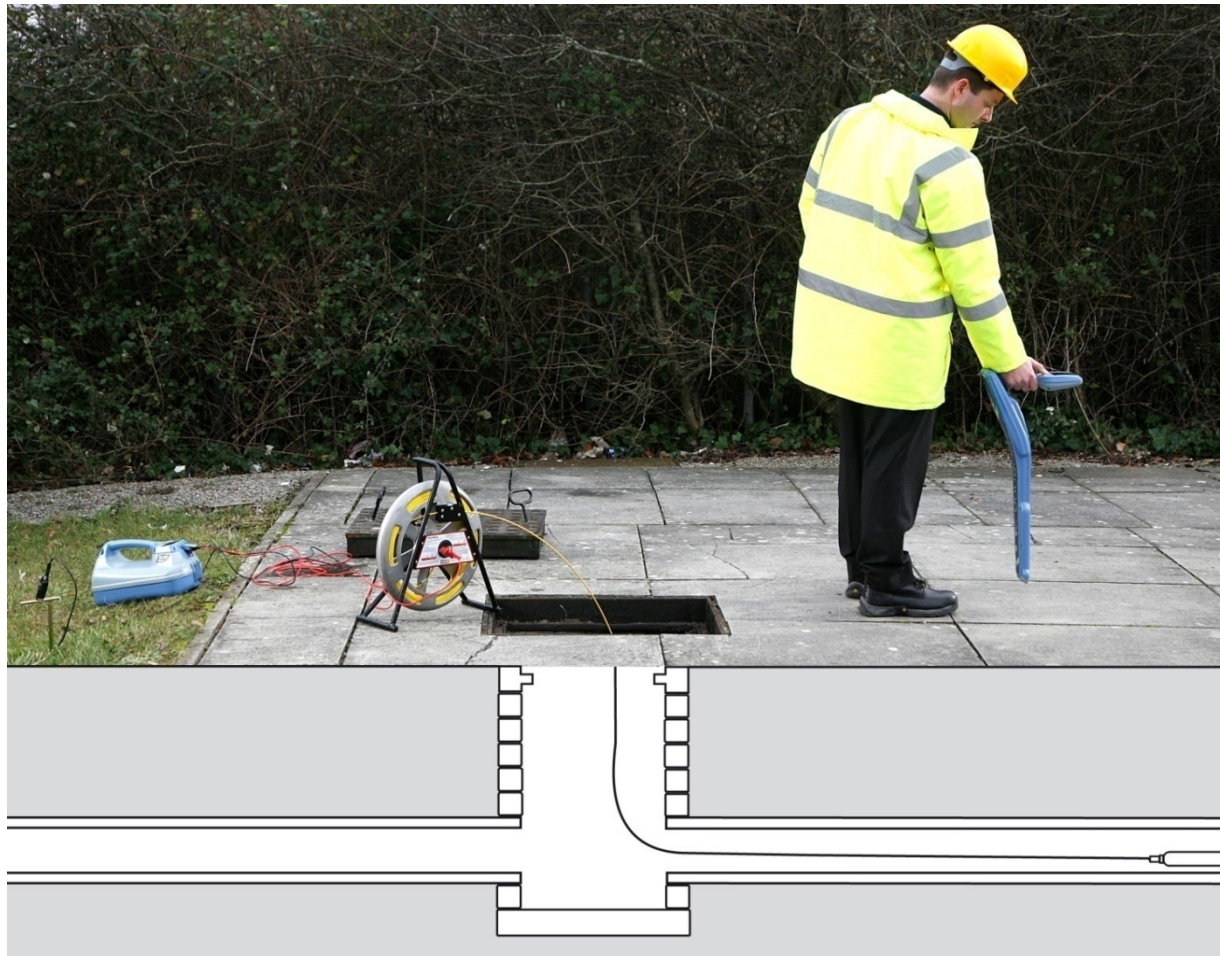


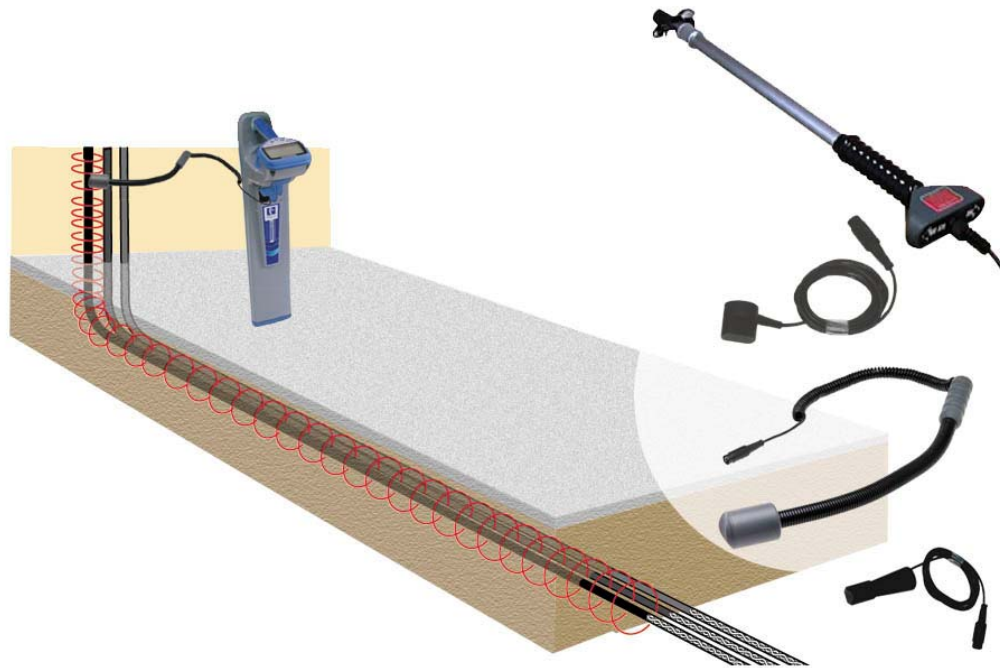
- Sondes produce a different field
- Locator should be in line with sonde
- Locate ghost signal

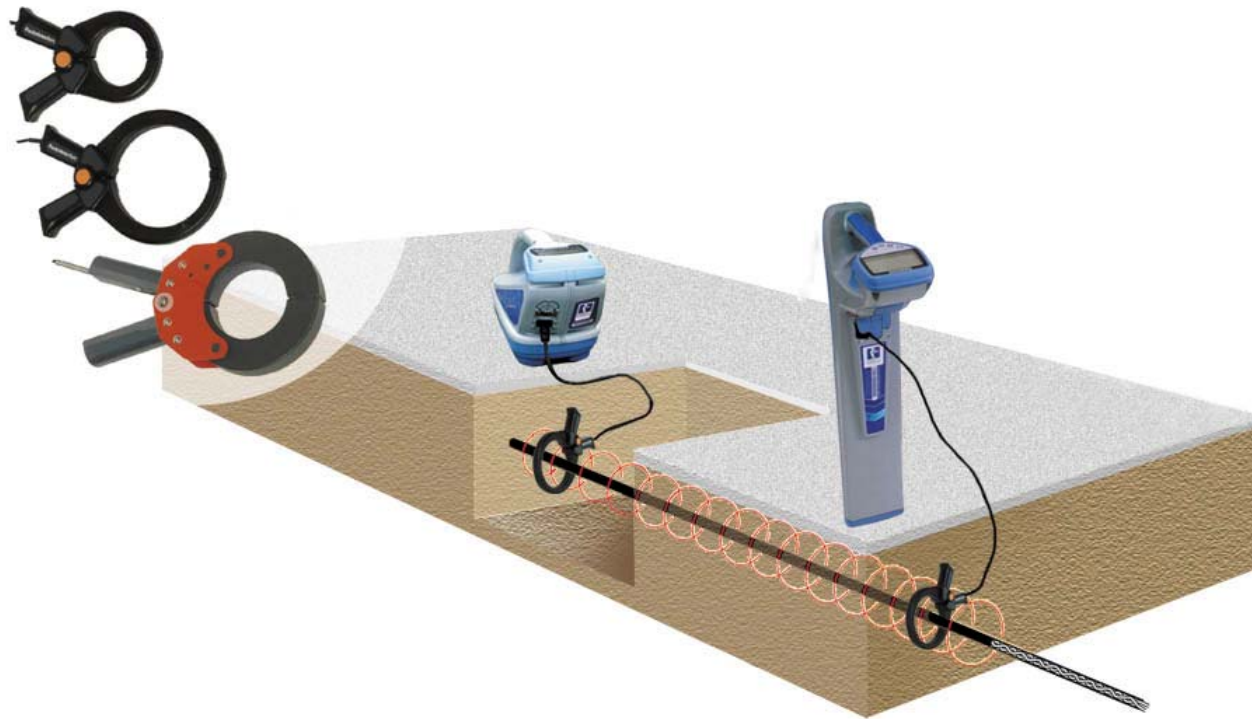




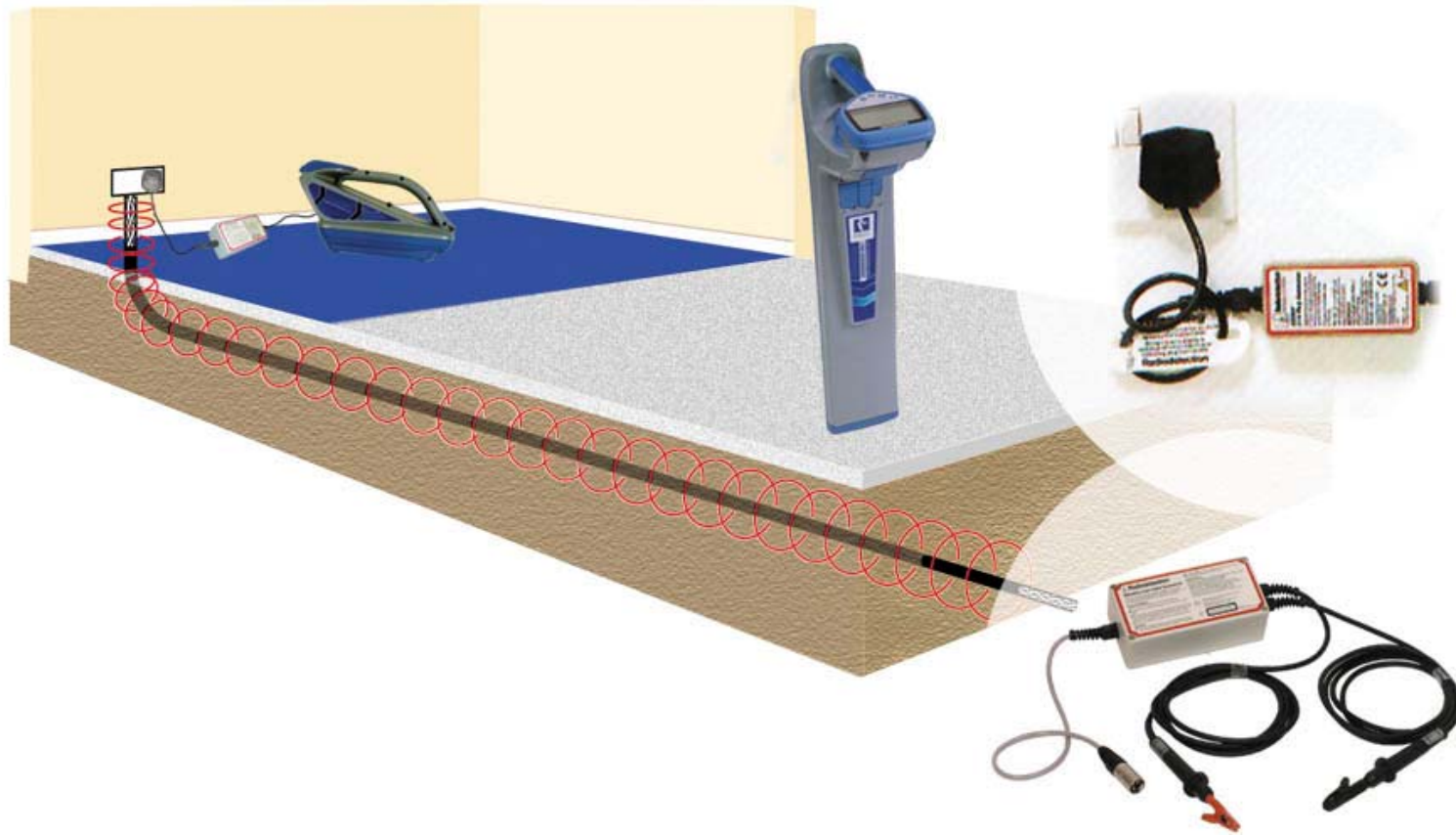






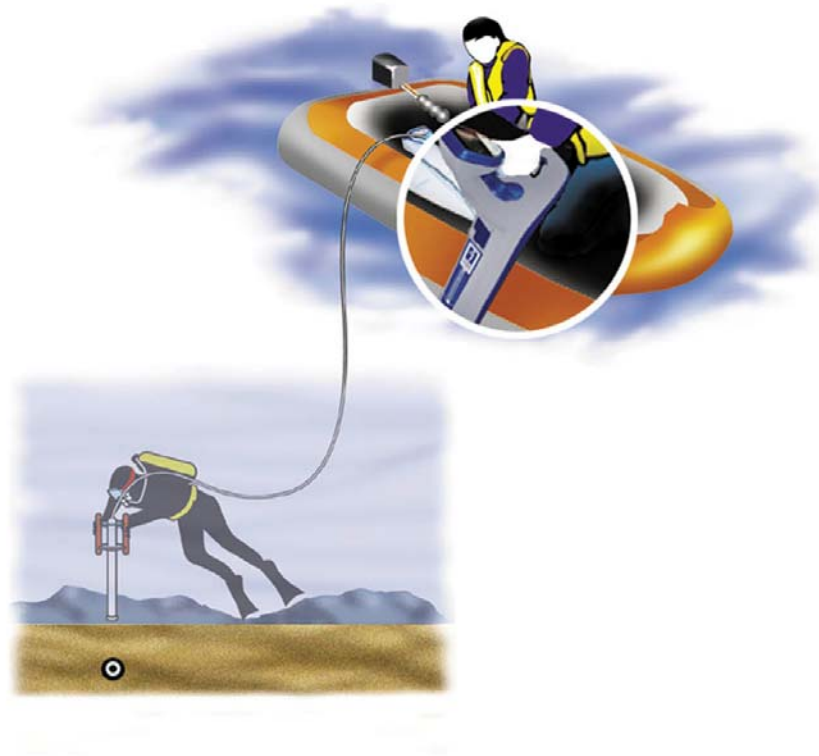


Accessories – Live plug / cable connector



Accessories - rechargeable battery pack





Accessories - rechargeable battery pack



- Compass
- 4 Antenna modes
- Current Direction (CD)
- Fault Find (8KFF & CD)
- Passive Avoidance
- Strike Alert
- Dynamic Overload
- SurveyCERT
- iLOC
- eCAL
- Centros Manager
- 3 year extended warranty
 - **Have you registered ?**



- Provides visual indication of target line
- User can easily follow target line
 - very useful in congested areas
- Alignment required for accurate depth readings
- $\pm 7.5^\circ$ tolerance
- Commonly known as TruDepth

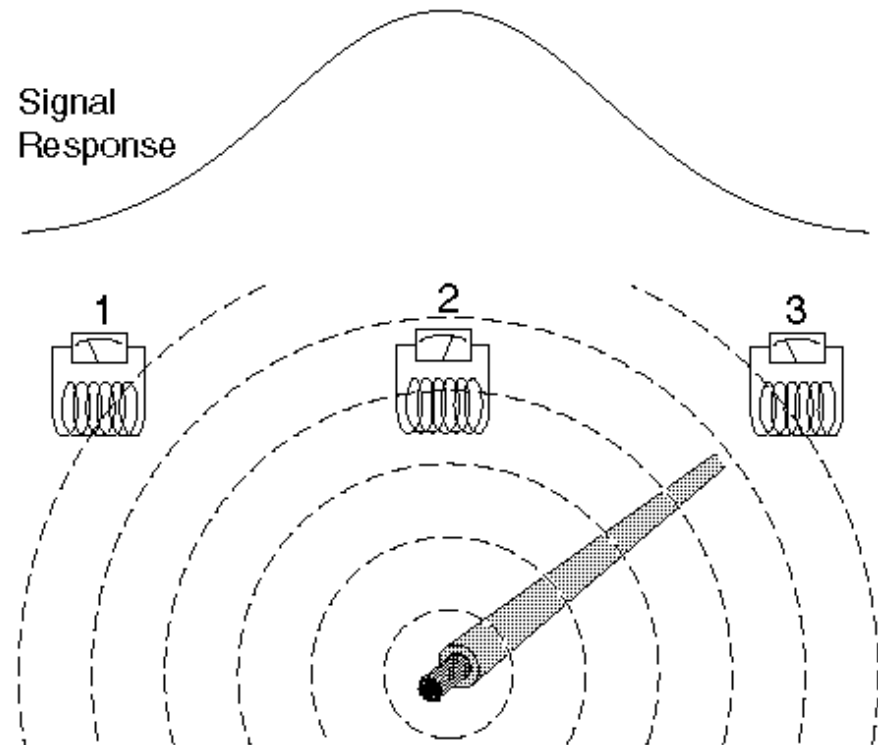


- Peak
- Peak/Null
- Null
- Single



Peak Mode

- Most Accurate
- Ideal in congested areas
- Depth & current readings
- Compass

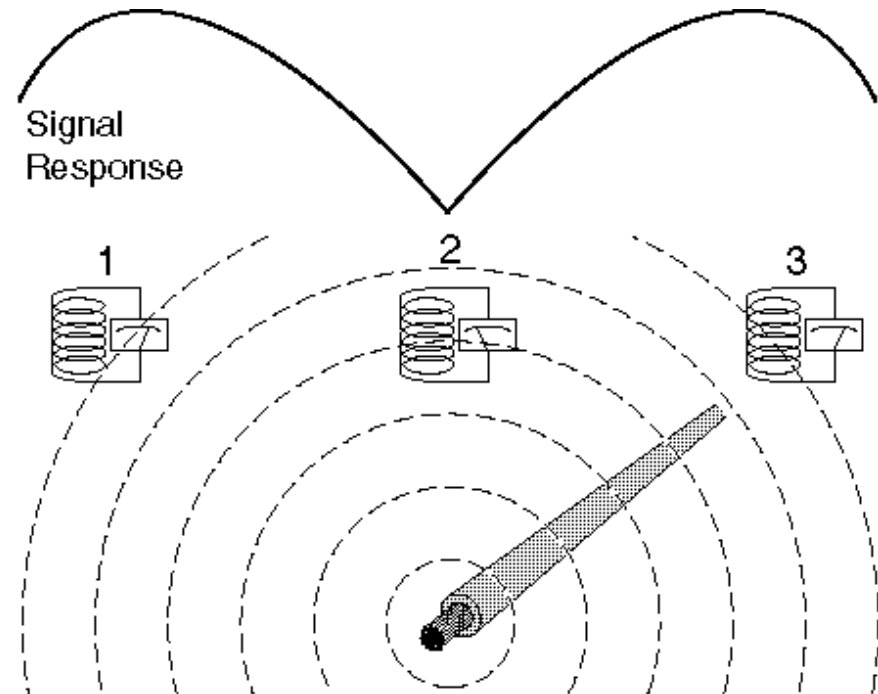


- Simultaneous Peak & Null
- Very popular
- Useful to check for distortion
- Compass
- Depth and Current
- Left & right proportional arrows



Null Mode

- Left Right arrows
- Compass
- Audio tone change
- No depth or current
- Not so good in congested areas



- Used in areas where large signals present
- Automatically detects large signals and reduces gain by 30dB (31)
- Very useful when working near HV cables or sub stations
- In overload condition:
 - Mode flashes
 - No depth or current



- Locates shallow cables and pipes
- Alerts on Power mode only – not active
- Approximately under 30cm
- Audible and visual alert
- User enable or disable



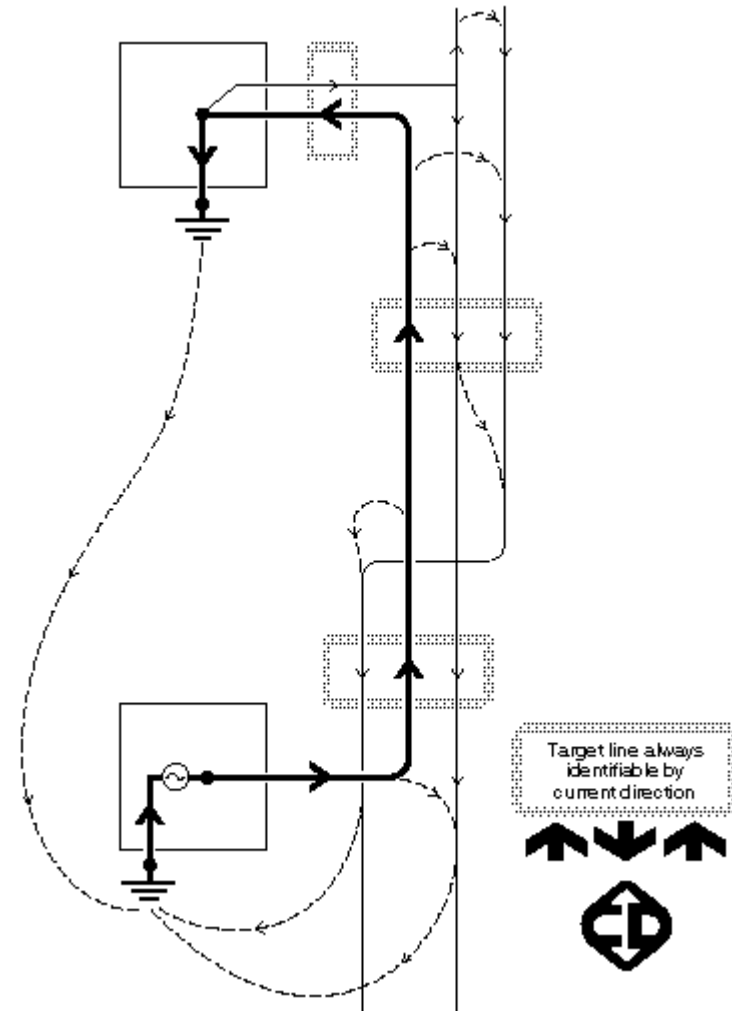
Current Direction Mode (CD)



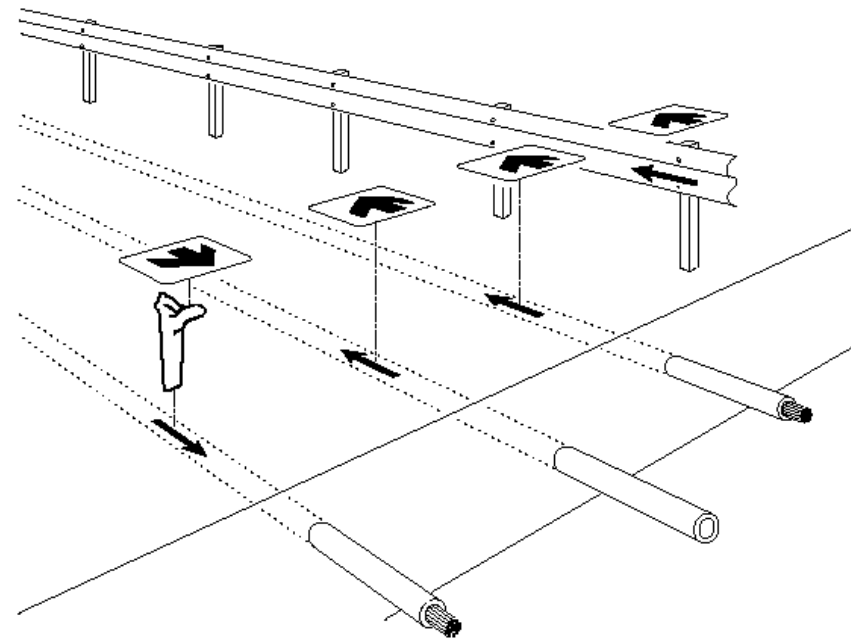
- Compass
- All antenna modes
- Depth and current



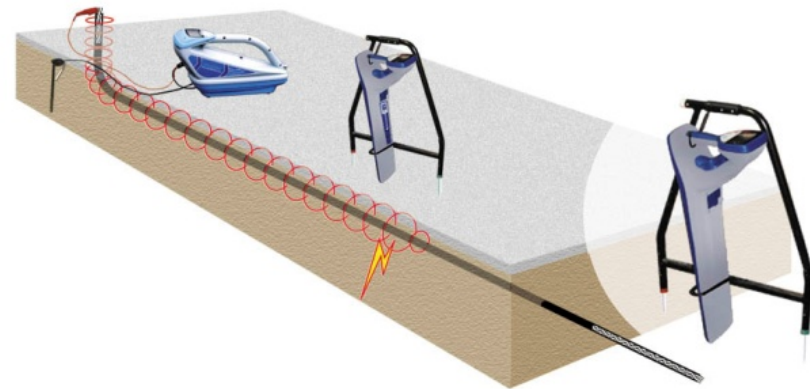
- Current Direction is a technique for increasing the information available at difficult locates.
- How does it work?
 - CD works by comparing the phase relationship of two frequencies that are applied to the line at the same time.

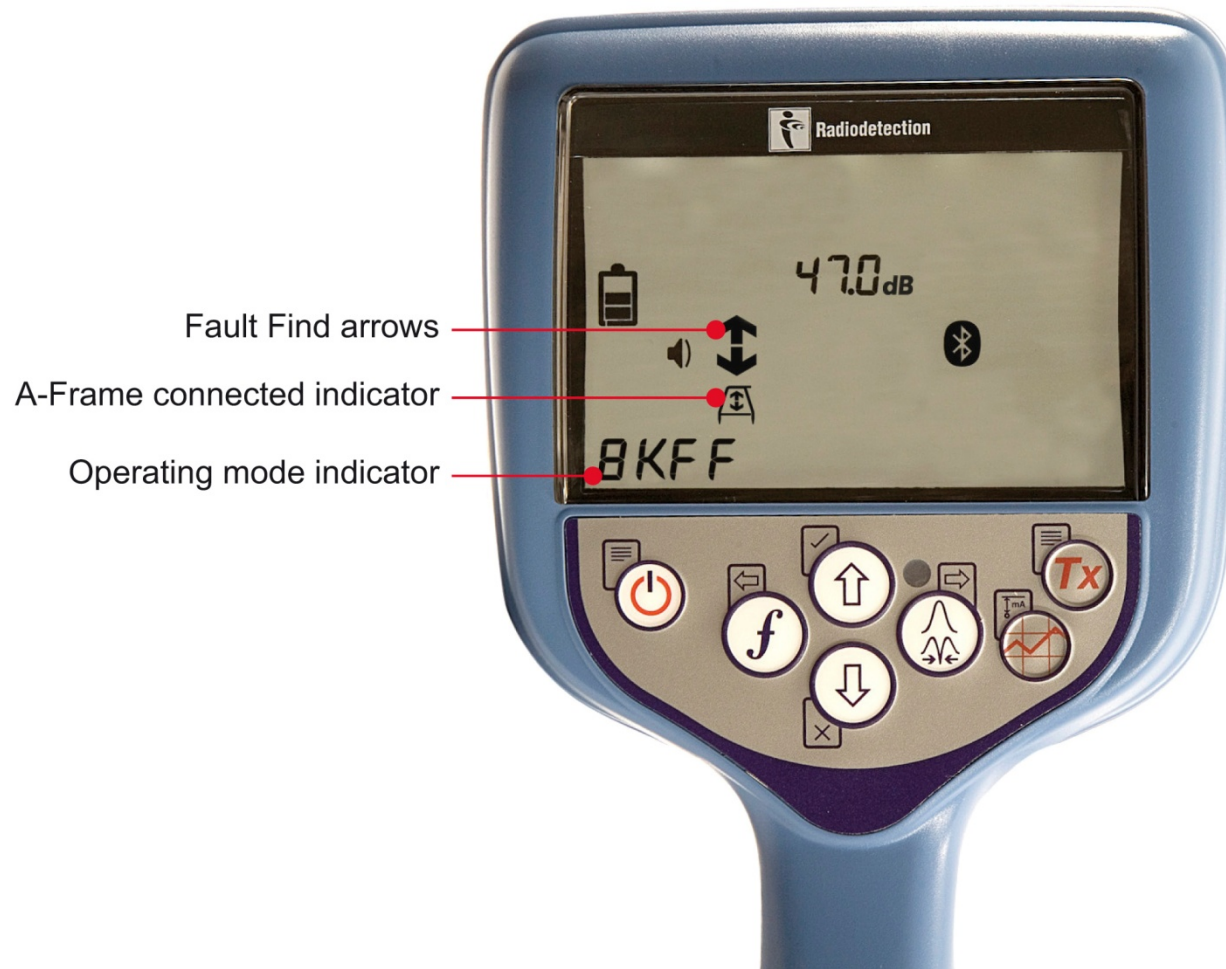


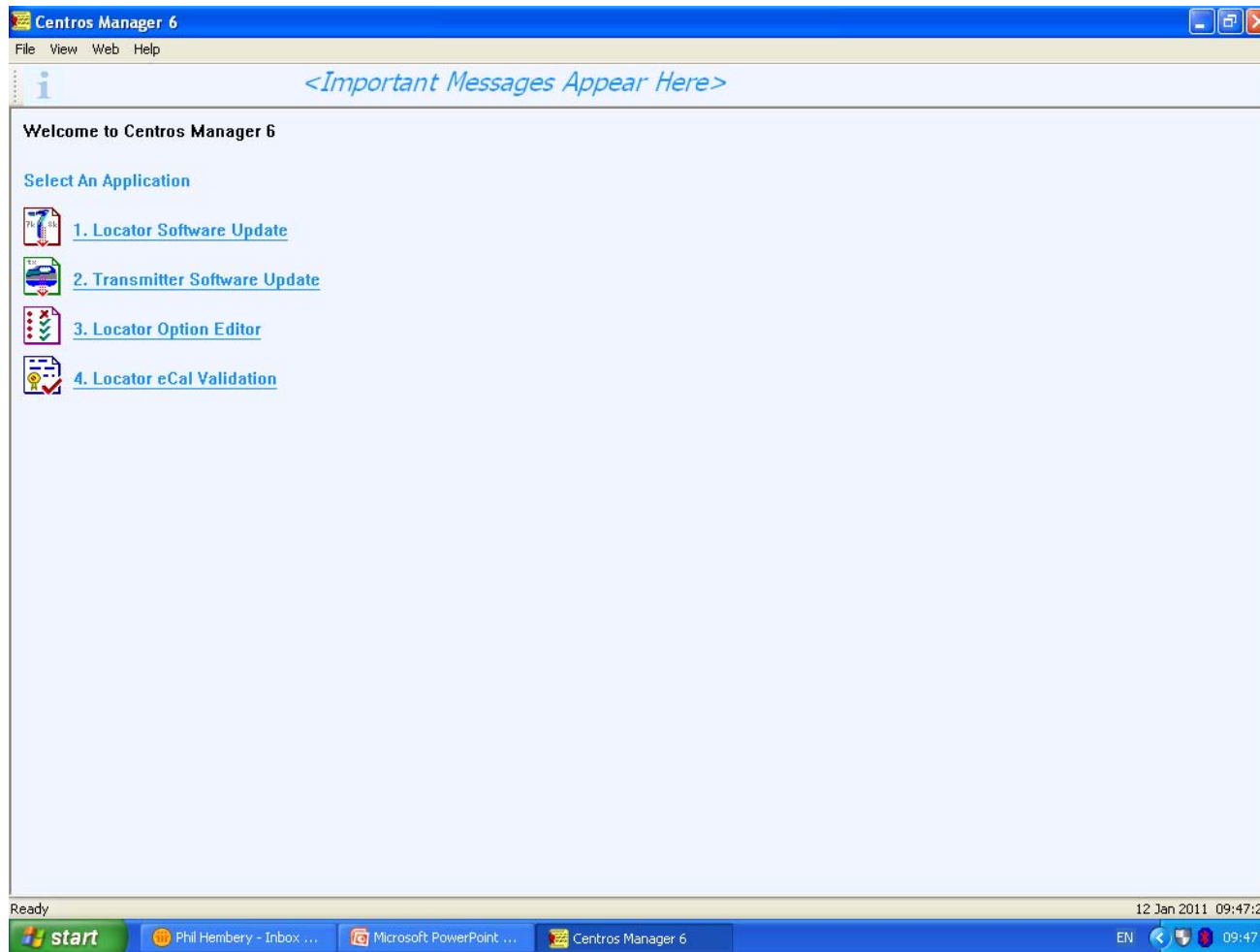
- If this signal couples to another adjacent conductor, will be a change in phase relationship between the two frequencies
- The receiver compares the signal with its reference and decides if it matches.



- Known as 8KFF or CFFF
- Used to locate sheath faults on cables or coating defects on pipes

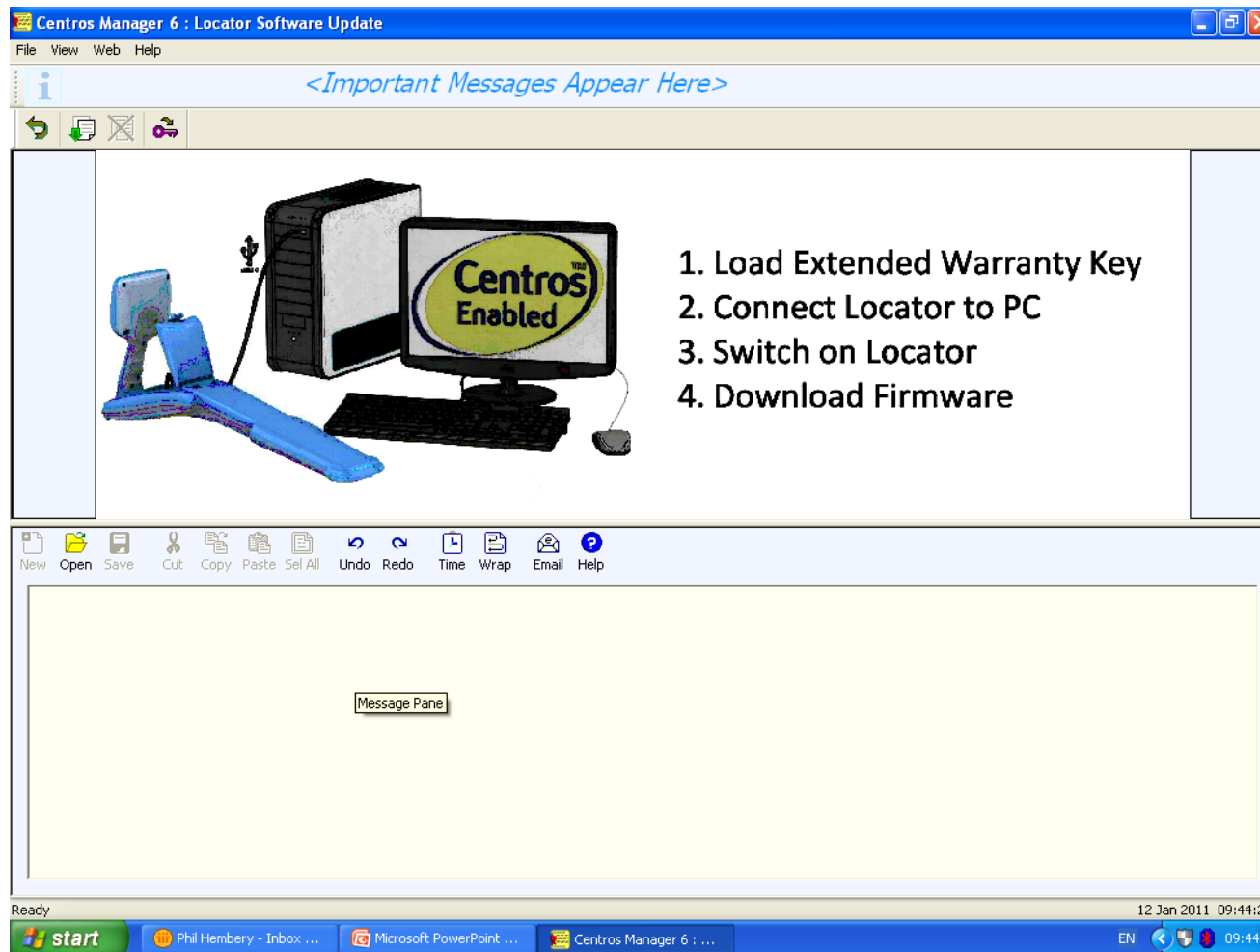




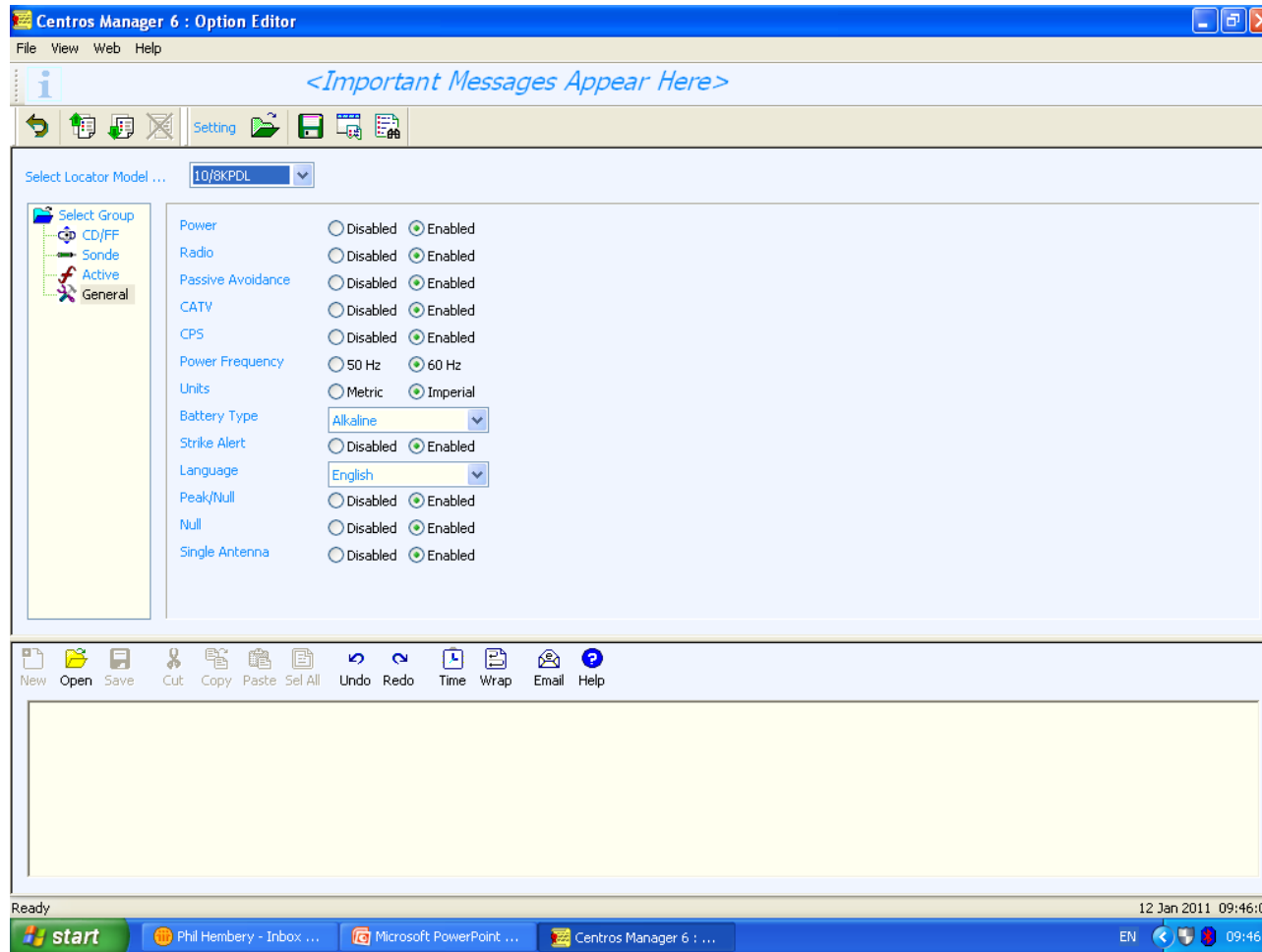


- Provides an operator with the capability to store and review up to 1000 locate records on an RD8000
- Information can be uploaded to a PDA or PC using Bluetooth connection
- Locate information can be sent instantly or at the end of a survey and can be viewed on a PC or PDA using SurveyCERT





Centros Manager – Option Editor



- Validate locator against original factory calibration (0.1%)
- Useful for checking operation of locator (confidence)
- Purchase eCAL key online
- User can carry out eCAL on site
- No need to send back locator – saves time and money



The screenshot shows the 'Centros Manager 6 : eCal Validation' application window. The title bar includes 'File View Web Help' and a status bar at the bottom shows 'Ready' and the date '12 Jan 2011 09:42:00'. The main interface features a left-hand 'Unit Manager' tree view listing various units and their calibration and validation history. The right-hand pane displays a 'Certificate of Validation' for unit 10/8KPDLB-252, issued by Radiodetection (an SPX company). The certificate includes the following details:

- Serial Number: 10/8KPDLB-252
- Model: RD8000
- Test Date: 11 / 01 / 2011
- Result: **PASS**

The certificate also features the Radiodetection logo and the text 'AN SPX COMPANY'. A 'Print Certificate...' button is visible in the top right corner of the certificate area.

Radiodetection
AN SPX COMPANY

Certificate of Validation

Serial Number: 1078KPDLB-252
Model: RD8000

Test Date: 11 / 01 / 2011
dd/mm/yyyy

PASS

This certificate shows the product listed below has passed validation against the original calibration.

Test Results

Frequency	Test/Bit Lo	Test/Bit Hi	M90/Bit Lo	M90/Bit Hi	AccuBT Lo	AccuBT Hi
320.0Hz	0.937	0.938	0.943	0.939	0.997	0.997
640.0Hz	0.937	0.938	0.944	0.939	0.997	0.997
1280.0Hz	0.937	0.938	0.946	0.939	0.997	0.997
2560.0Hz	0.936	0.970	0.935	0.940	0.997	0.997
5120.0Hz	0.937	0.970	0.938	0.934	0.997	0.997
10240.0Hz	0.970	0.970	0.930	0.820	0.997	0.997
20480.0Hz	0.938	0.964	0.931	0.819	0.997	0.997
40960.0Hz	0.968	0.970	0.859	0.571	0.997	0.997
81920.0Hz	0.970	0.999	0.722	0.482	0.997	0.997
163840.0Hz	0.997	0.994	0.447	0.307	0.997	0.997
327680.0Hz	1.000	0.913	0.291	0.188	0.999	0.997

Automation: 28034-37915-09654-09412 09591 14649-16799-01443-43919-54488-44044-03446 11078 04207 42316 04172

Unless otherwise stated above, this item has been tested and its calibration remains valid in accordance with Radiodetection's specification.

Certificate authorized by:

Chris Willerton – Senior Quality Engineer

This certificate was produced using Calyse Manager™ version 8
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RD8000 Training Course

80

- Means of remotely controlling the transmitter via Bluetooth with the RD8000 locator
- Change frequency
- Side Step
- Power Management



Radiodetection Website - www.radiodetection.com

- Technical Support
- xyz of location
- Application notes
- Case studies
- Product support
- Library - User guides / brochures
- News
- Products