

3M Telecommunications

Solutions for Networks

**1420 Series iD
Markers**

**EMS 1420E Marker
Locator**

**2273M/E
Series Locators**

**2273M/E-iD Series
Locators**



Cable Locate

- Trace cable path
- Estimate cable depth
- Not suitable to find special events on cable
- Electro-magnetic principle only works on metallic conductors
- Locate done with cable locator

Cable Locator

- Transmitter:
 - Applies signal to cable (4 frequencies)
 - Additional functions
- Receiver:
 - Detects electro-magnetic field
 - Acoustic / visual indication of cable path and estimated cable depth

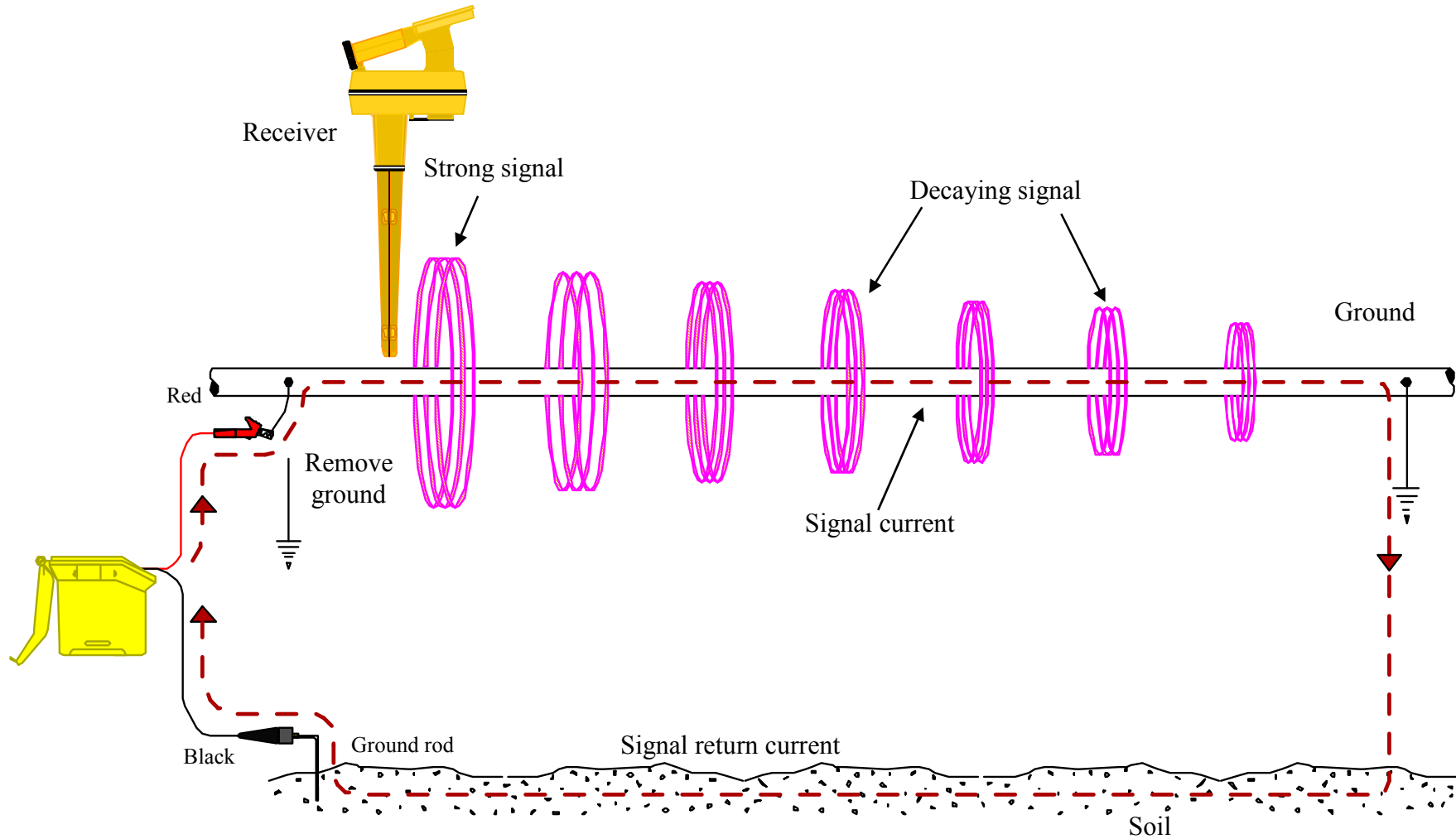
Cable Locator Transmitter keypad



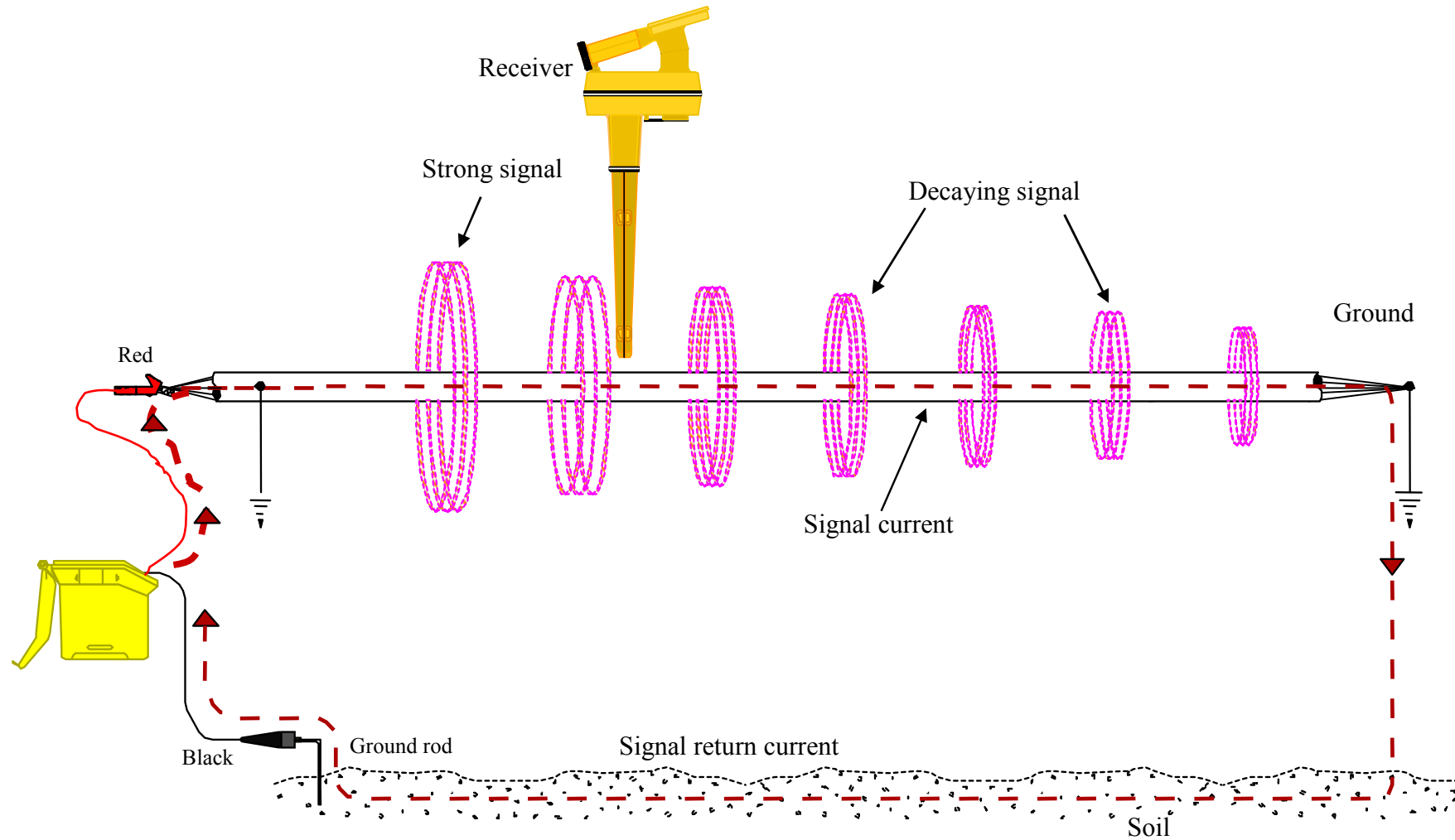
Applying Trace Signal

- Direct connect:
 - Xmtr galvanically connected to cable
- Inductive (Dyna- Coupler)
 - Signal is induced with Coupler
- Inductive (Xmtr antenna)
 - Signal is induced by Xmtr antenna

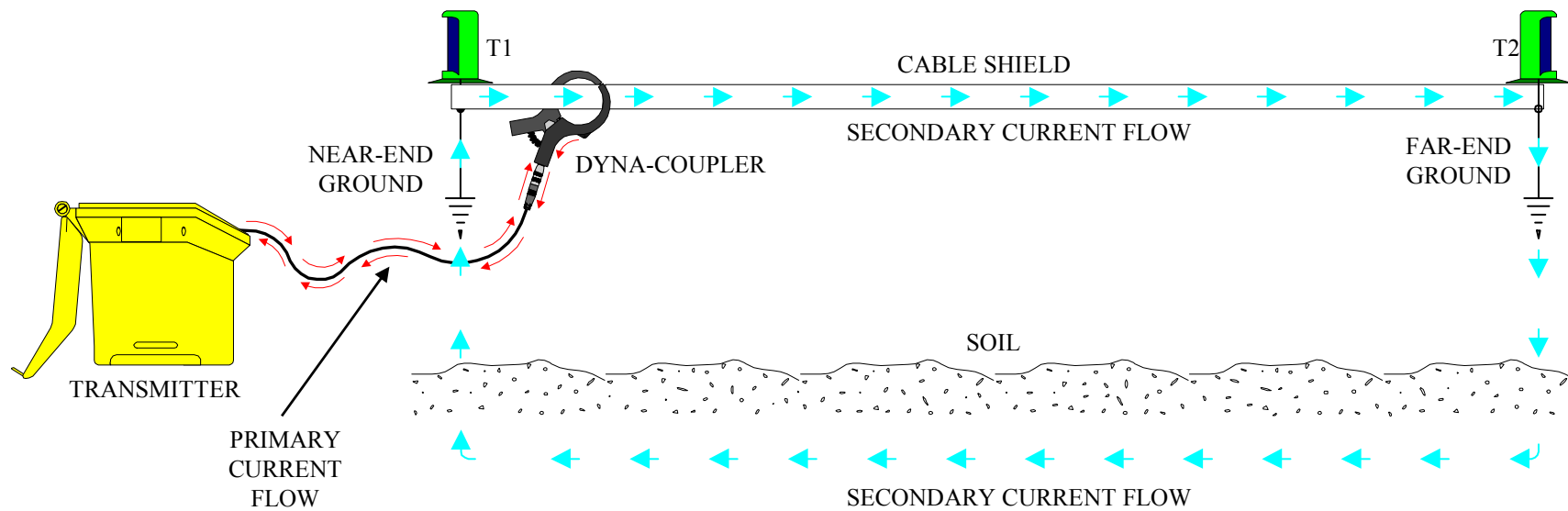
Direct Connect Method



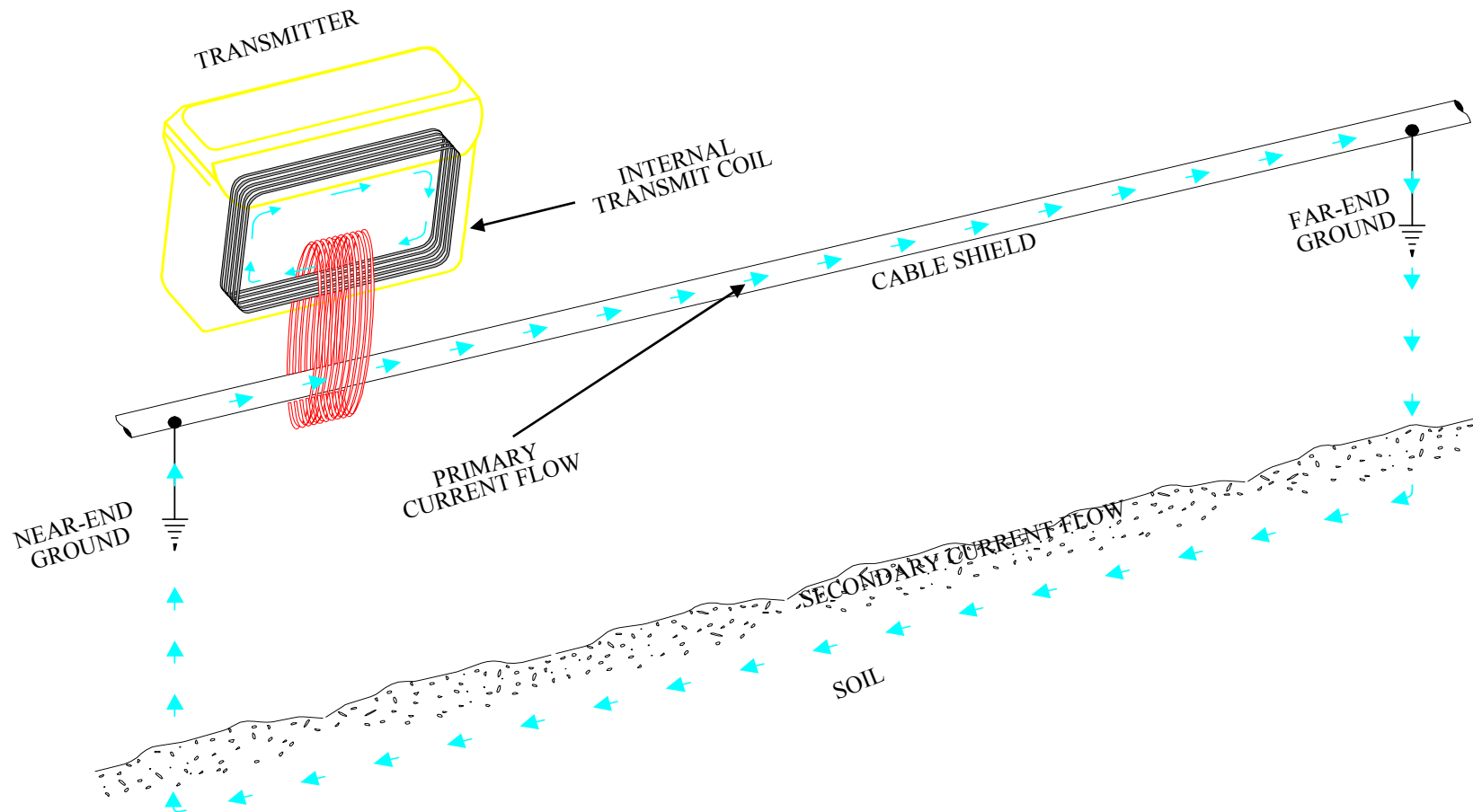
Direct Connect Method



DYNA-COUPLER



INDUCTION METHOD



Frequency Selection

Frequency	Distance	Coupling	Direct Connect	Dyna Coupler	Inductive
577 Hz	High	Low	Yes (max. 15 km)	No	No
8 kHz	High	Low	Yes (max. 10 km)	Maybe	No
33 kHz	Low	High	Yes (max. 3 km)	Yes (max. 1 km)	Yes
133 kHz	Lowest	Extreme	Yes (max. 1 km)	Yes (max. 500m)	Yes

Receiver Top View



Cable Locate

- Active:
 - Transmitter is used to apply signal to the cable (577Hz, 8kHz, 33kHz, 133kHz)
- Passive:
 - Locate with receiver only
 - Mains frequencies (450Hz, 250Hz, 100Hz)
 - Radio frequencies (broadband, ~ 14 –30 kHz)

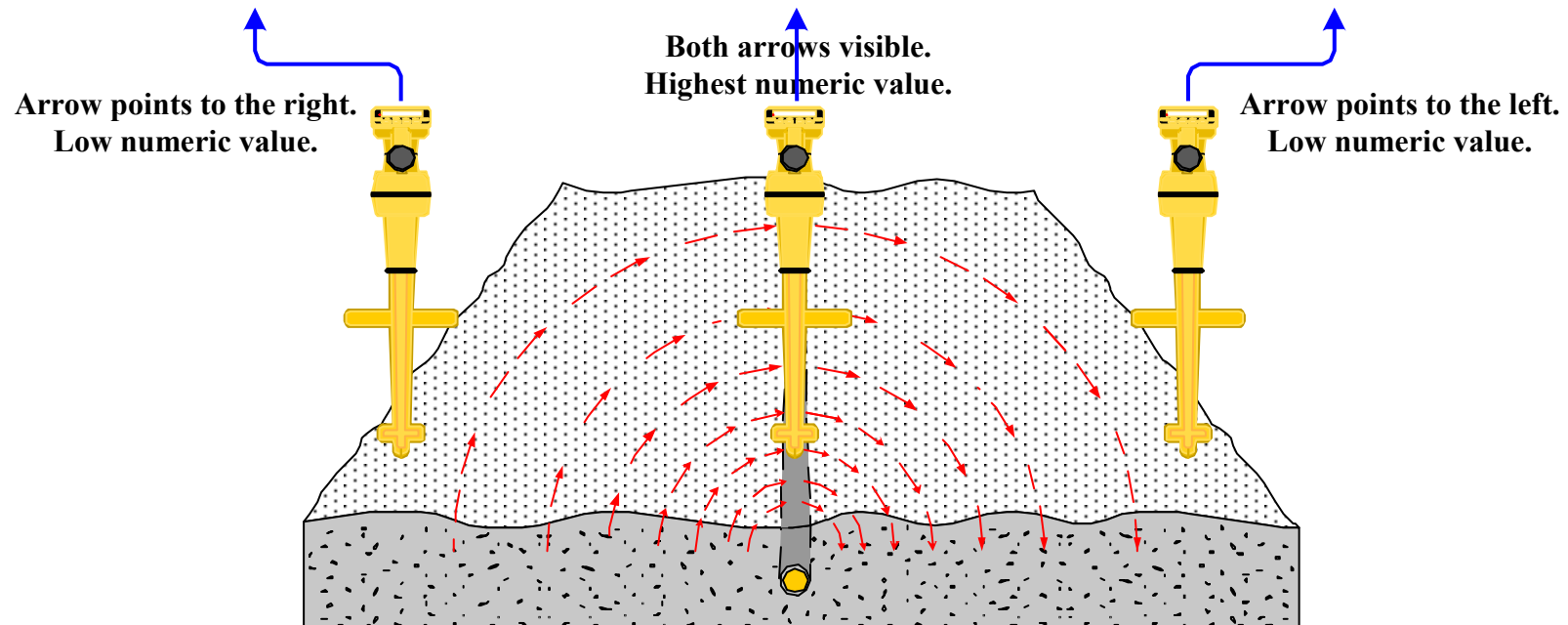
Locate Modes

Maximum (Directional Peak)

Minimum (Directional Null)

Special Maximum (Special Peak)

Directional peak with one cable

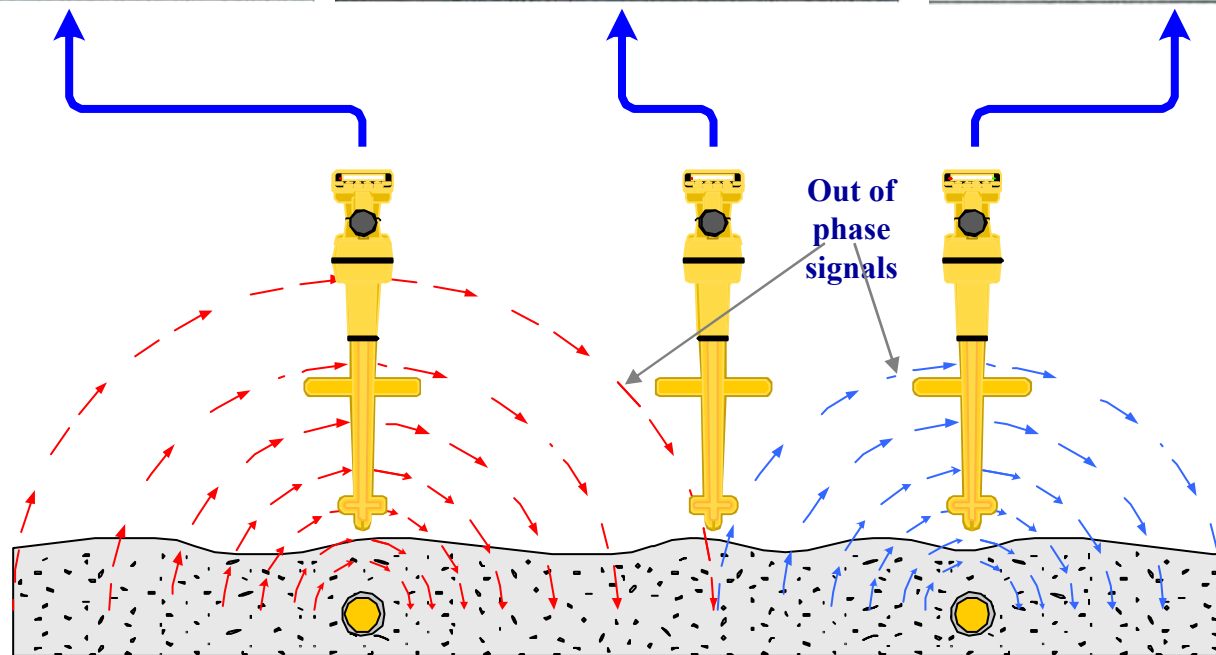


Directional peak with more than one cable

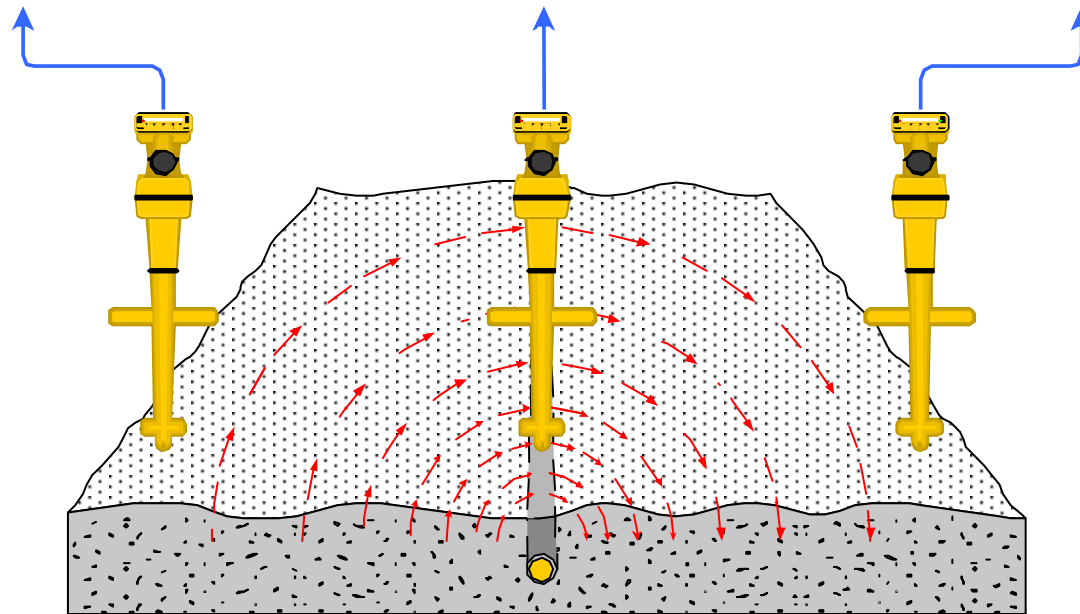


Strong peak

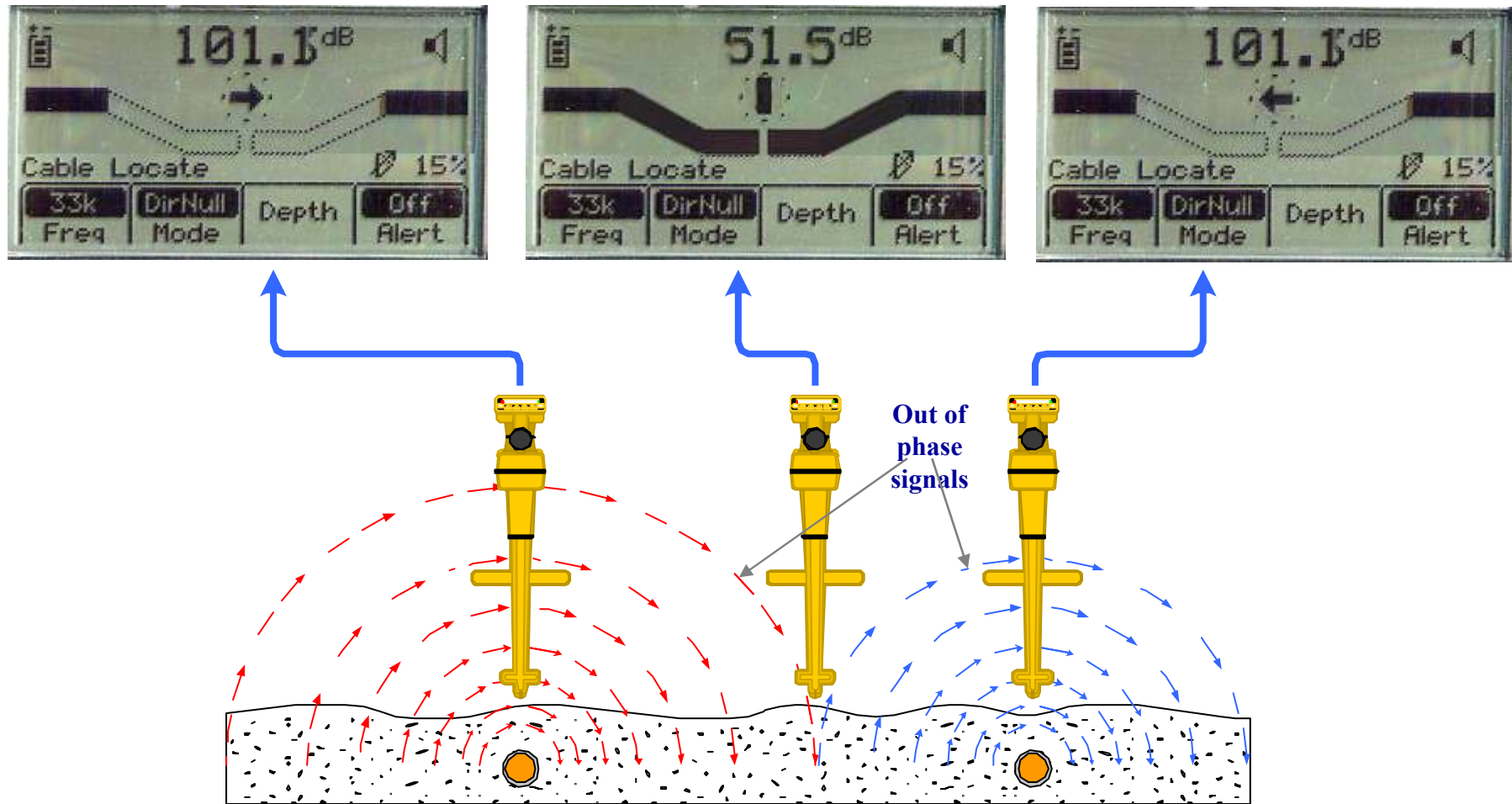
Low peak



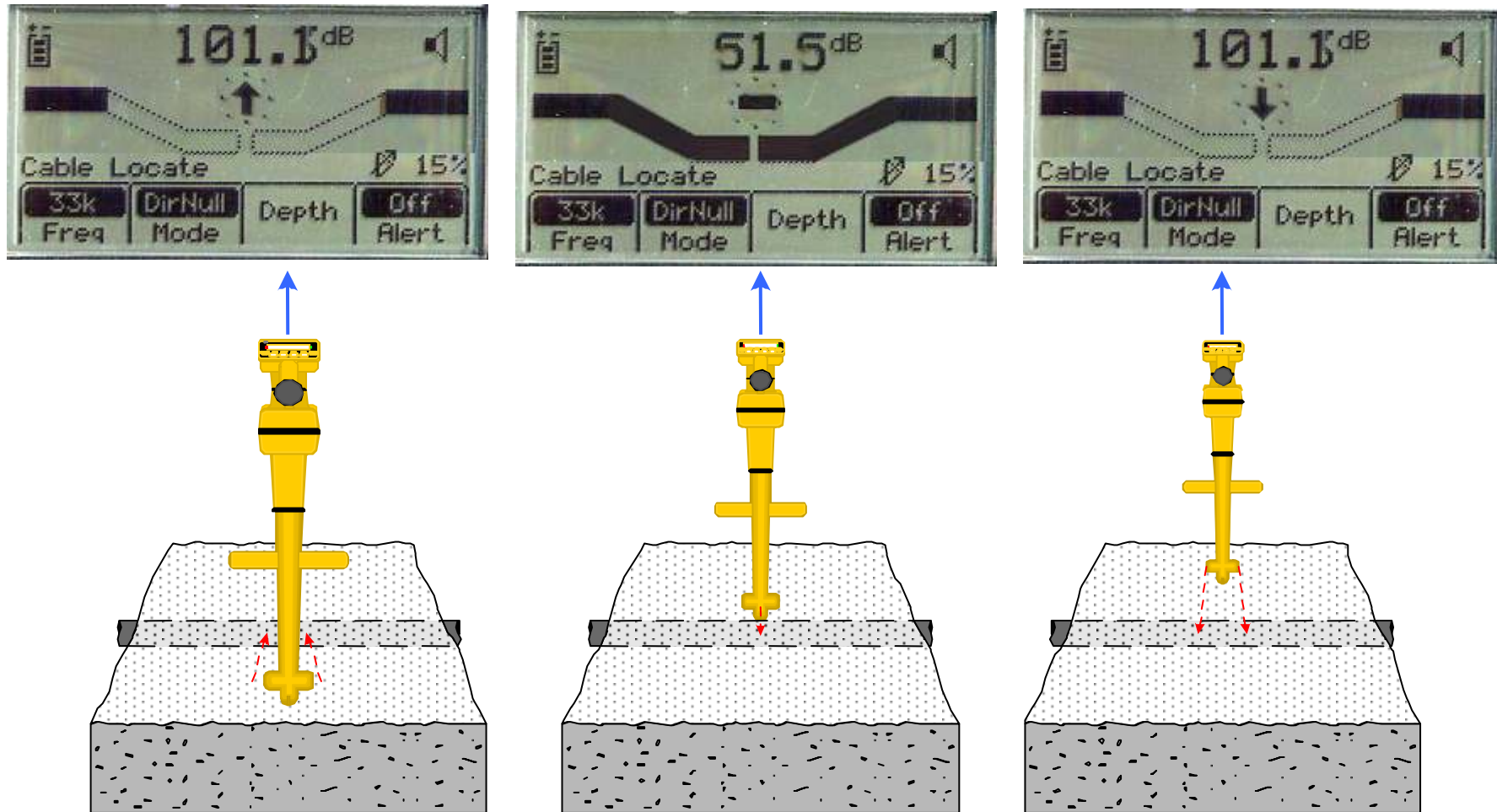
Directional null with one cable



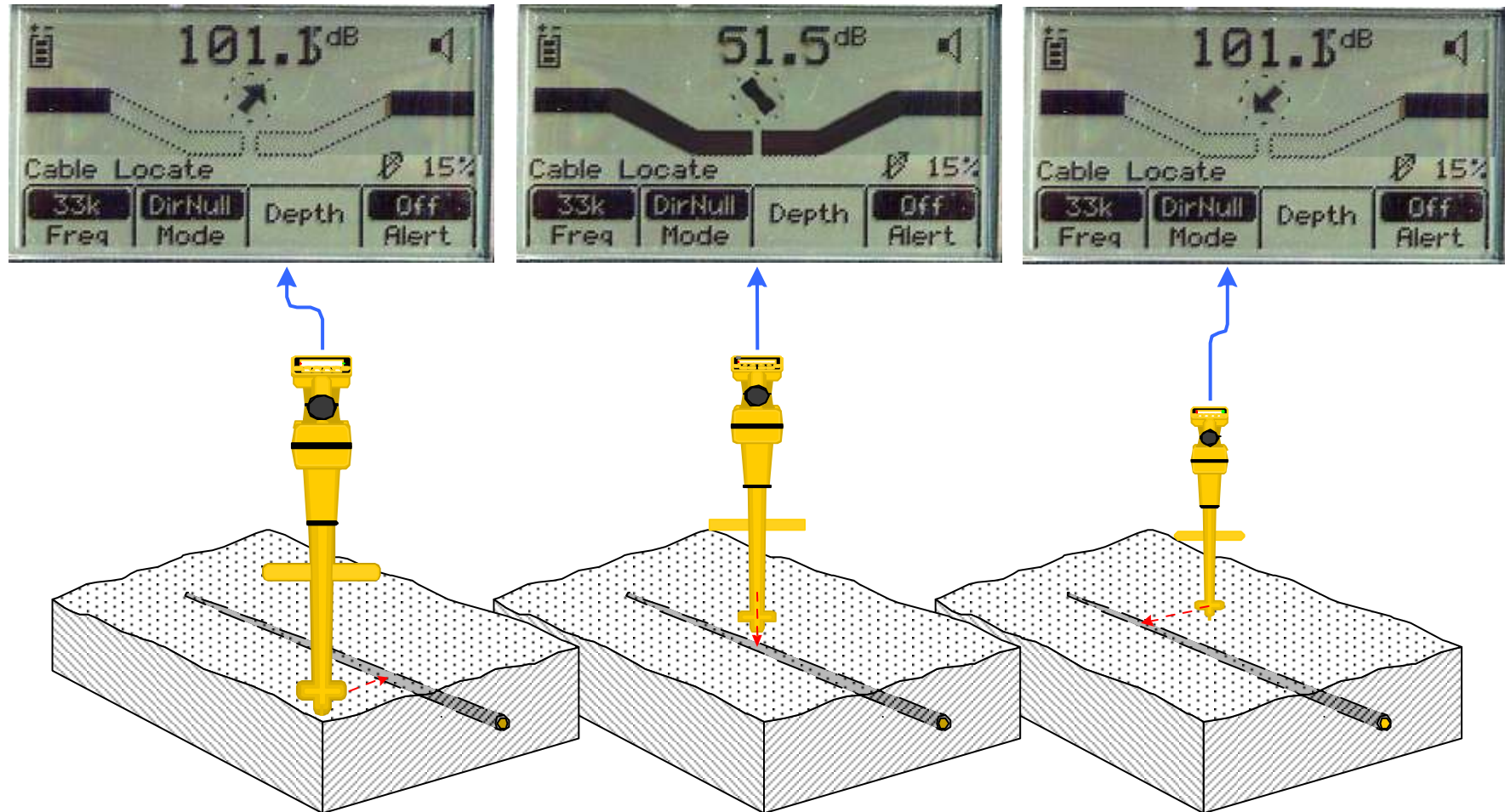
Ghost cable in directional null



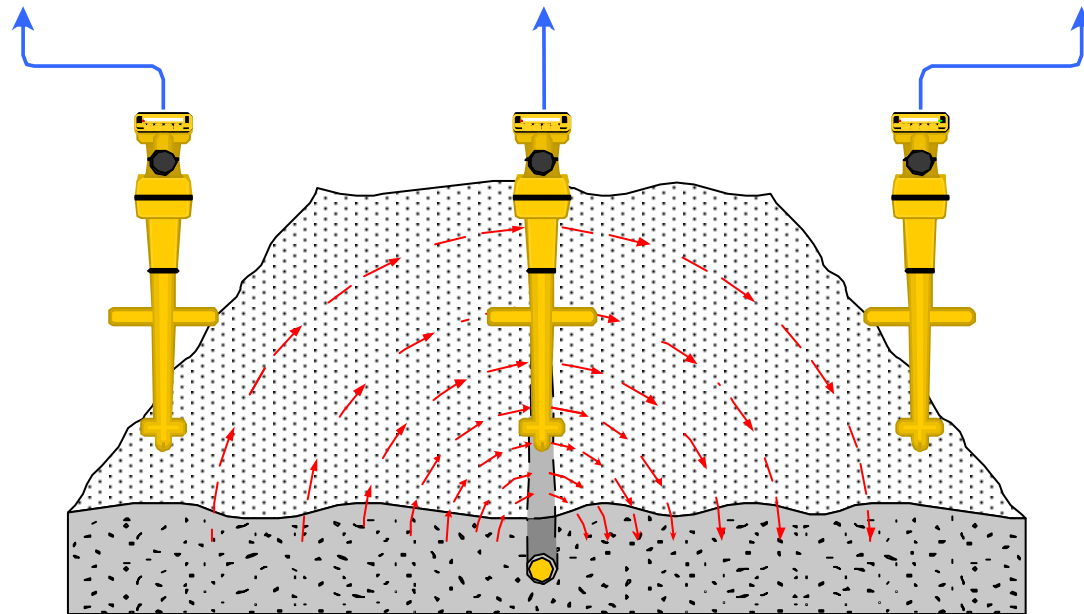
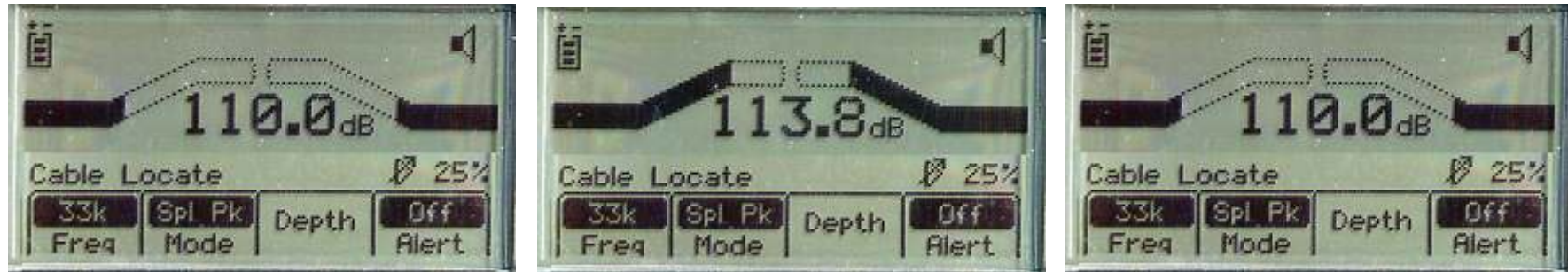
Directional null indication at different cable angles



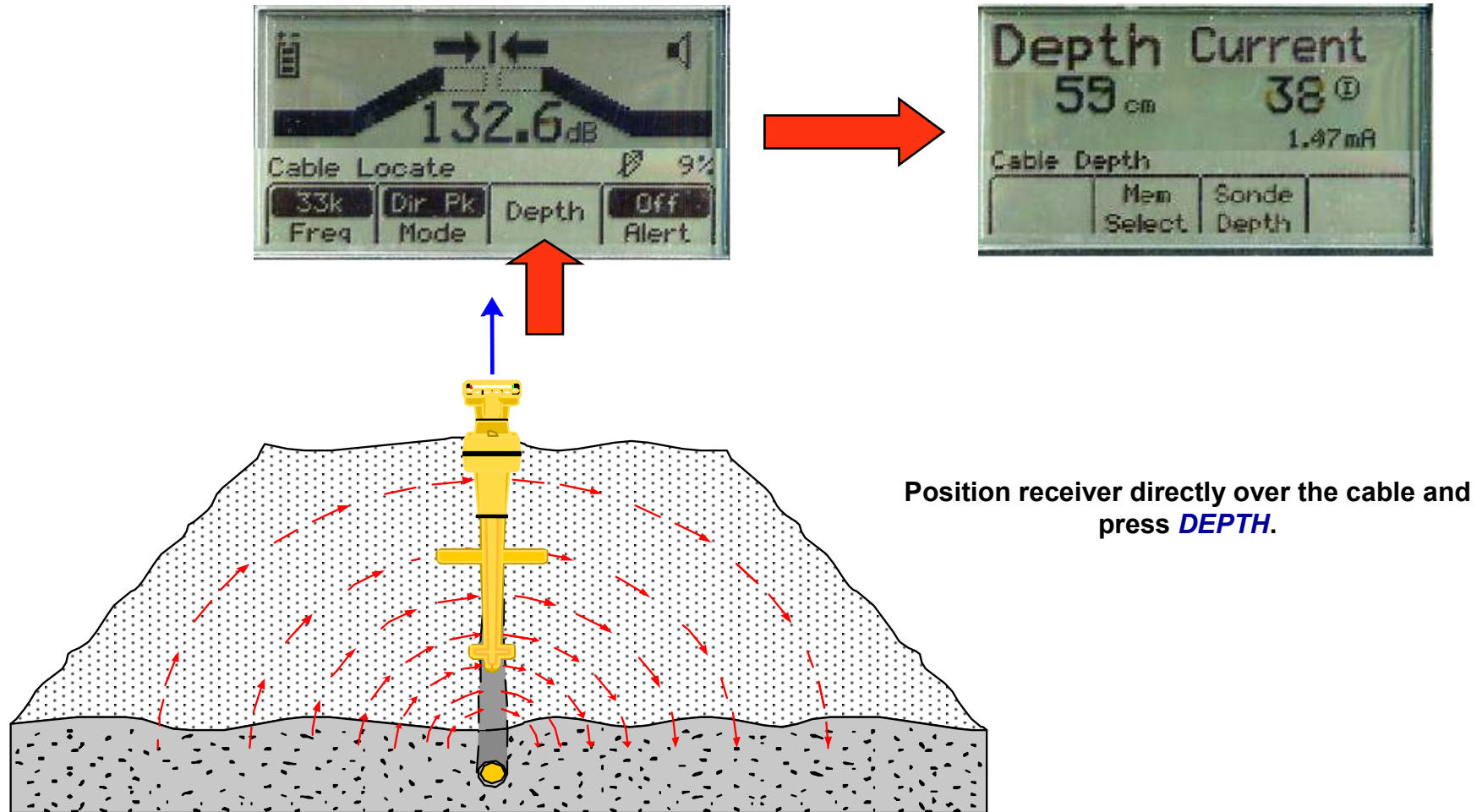
Directional null indication at different cable angles



Special Peak



Depth estimate



Position receiver directly over the cable and press **DEPTH**.

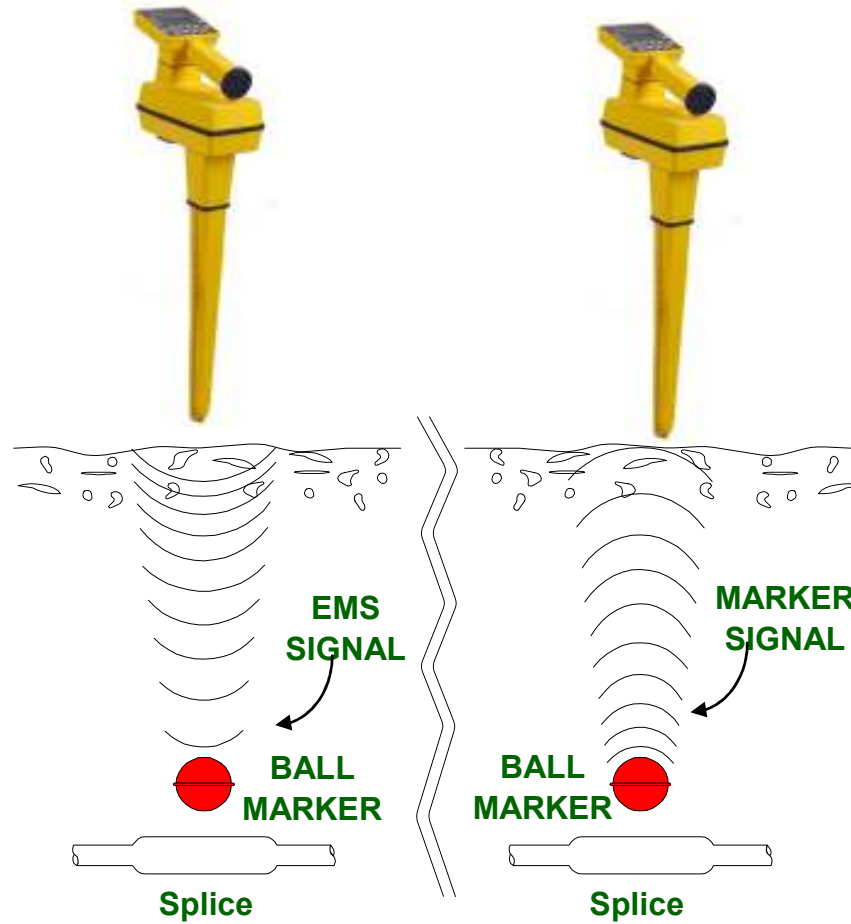
Marker Locate

- Mark special points in the infrastructure
- Pinpoint event
- Used for marking path of non-metallic installations
- No external disturbances
- Locate done with marker locator

Marker Locate

- Marker:
 - Passive electronic resonator
 - Different shapes and frequencies available
- Marker Locator:
 - Combination RCVR / XMTR
 - Audio and visual indication of marker
 - Available in combination with cable locator

Principle



Full Range Marker



Max. depth = 2,4 m

Horizontal orientation

Mini Marker



Max. depth = 1,8 m

Horizontal orientation

Ball Marker



Max. depth = 1,5 m

Orientation does not matter

Near Surface Marker

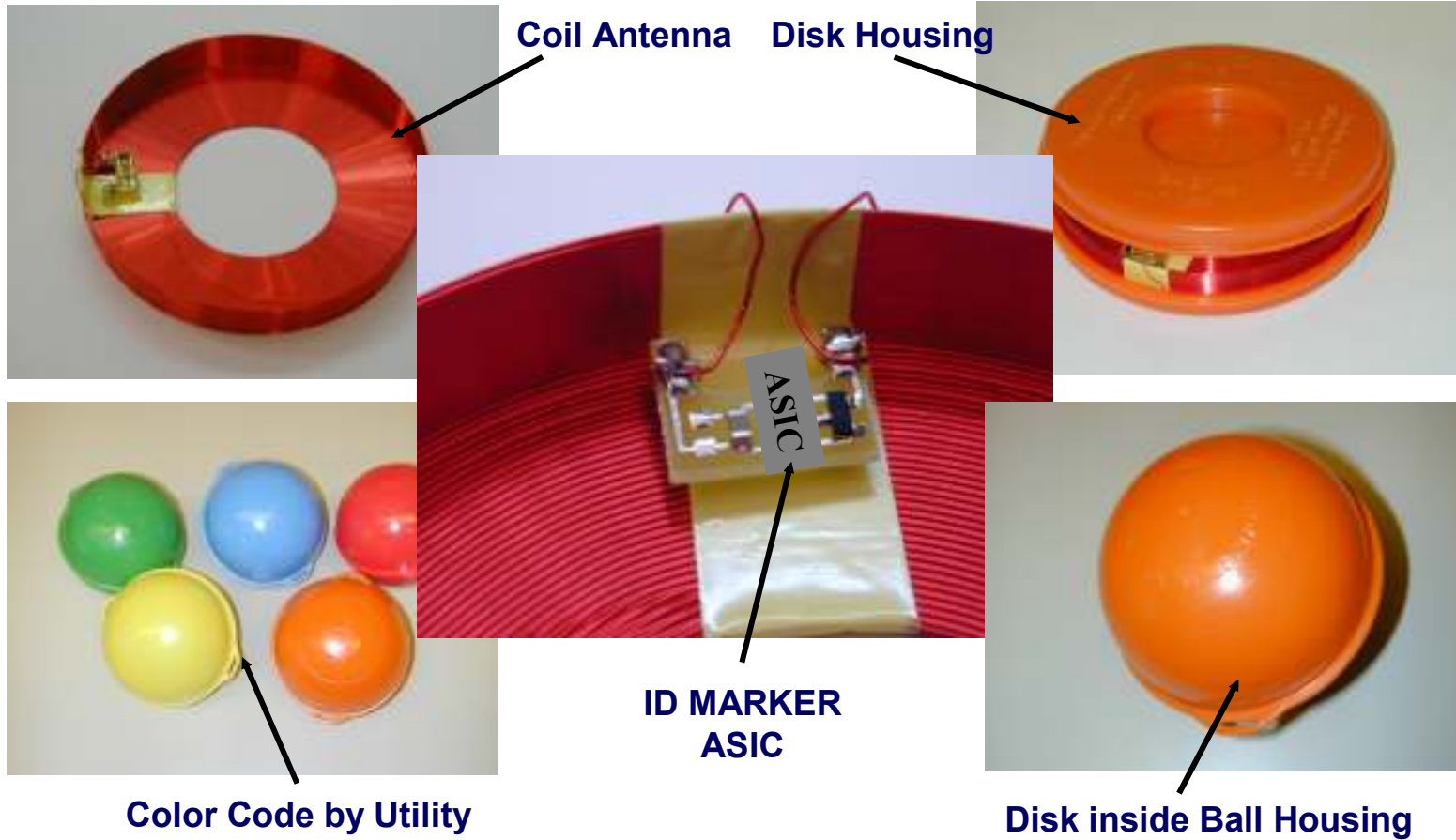


Max. depth = 0,6 m

Vertical orientation



iD Marker Technology



iD Ball Marker



Max. depth = 1,2 m

Read depth = max. 1,2 m

Write distance = 0,1 - 0,3 m

Orientation does not matter

Compatible with passive markers

10- digit serial number

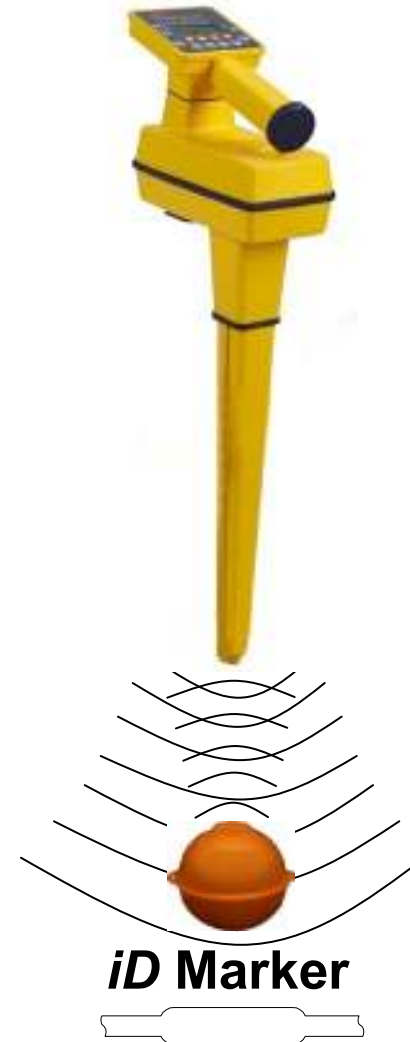
192 Bit user data memory

Data lock function

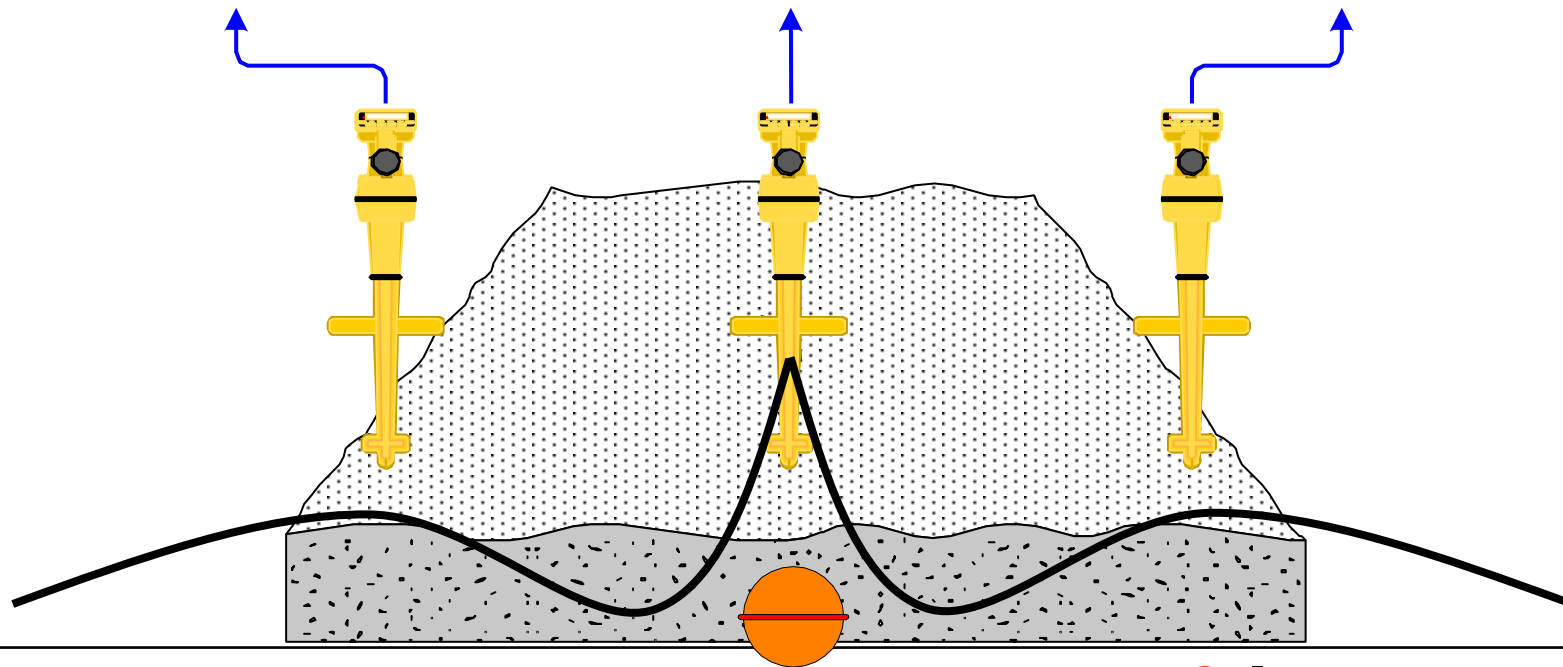


iD Locators

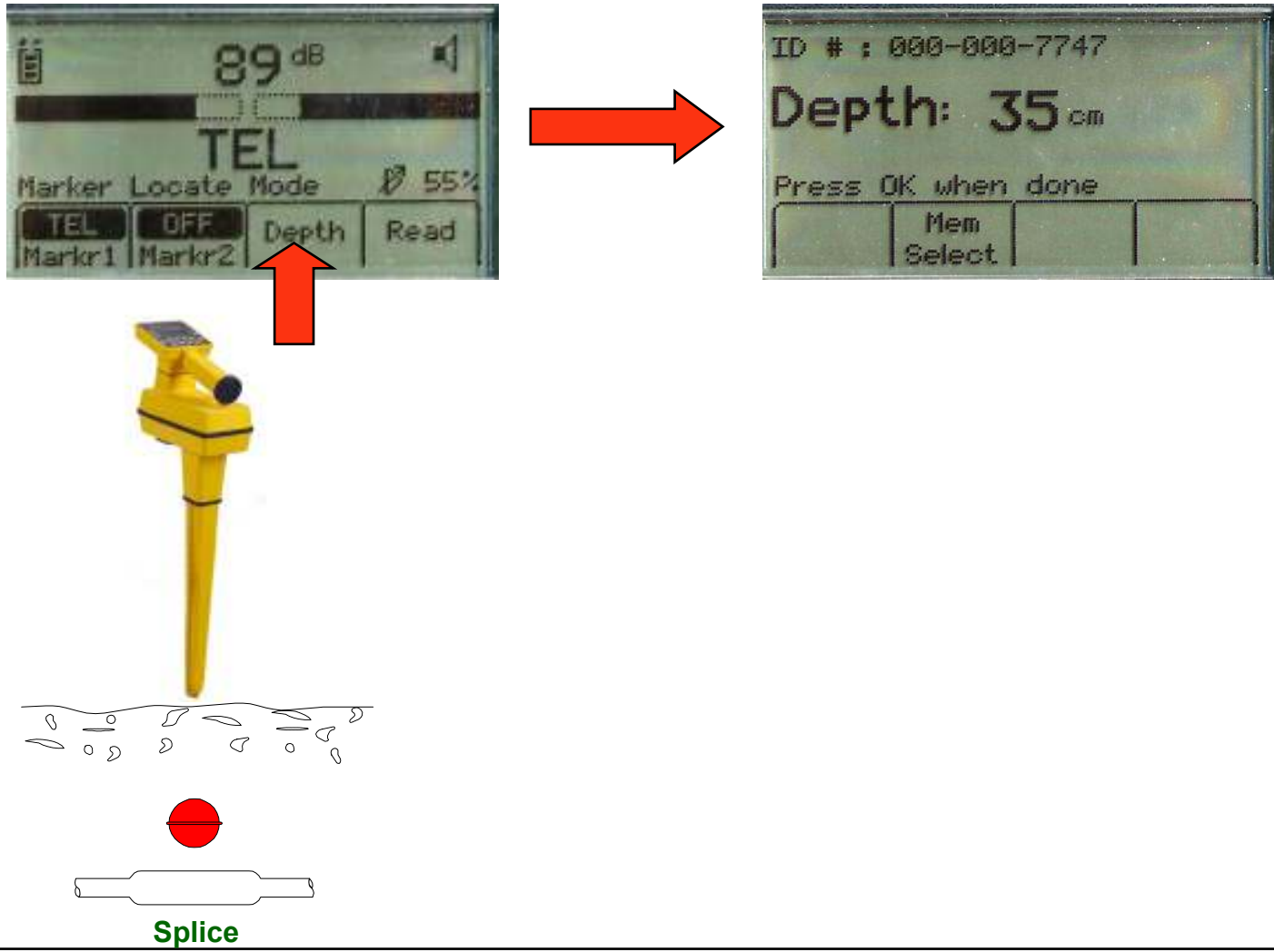
- **Compatible with existing markers**
- **One unit for all frequencies**
- **Scans two marker frequencies simultaneously**
- **Depth estimate on markers**
- **Memory storage with date/time stamp:**
 - Read marker records: 100
 - Written marker records: 100
- **User defined ID templates 32**
- **GPS/GIS support**
- **Estimates marker depth with 5 memory storage registers with date/time stamp**
- ***PC Locator Tools* software for PC based marker programming and glossary management**



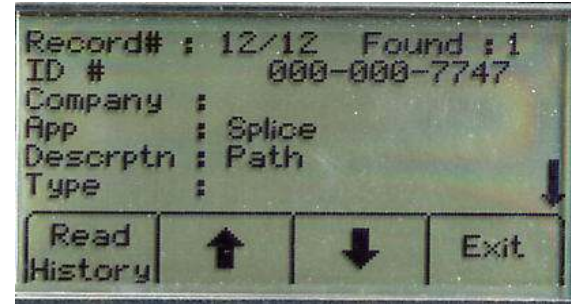
Signal Response



Marker Depth Estimate



iD Marker Read



Splice

PC Locator Tools Software



GPS Interface Compatible Units

Type 1



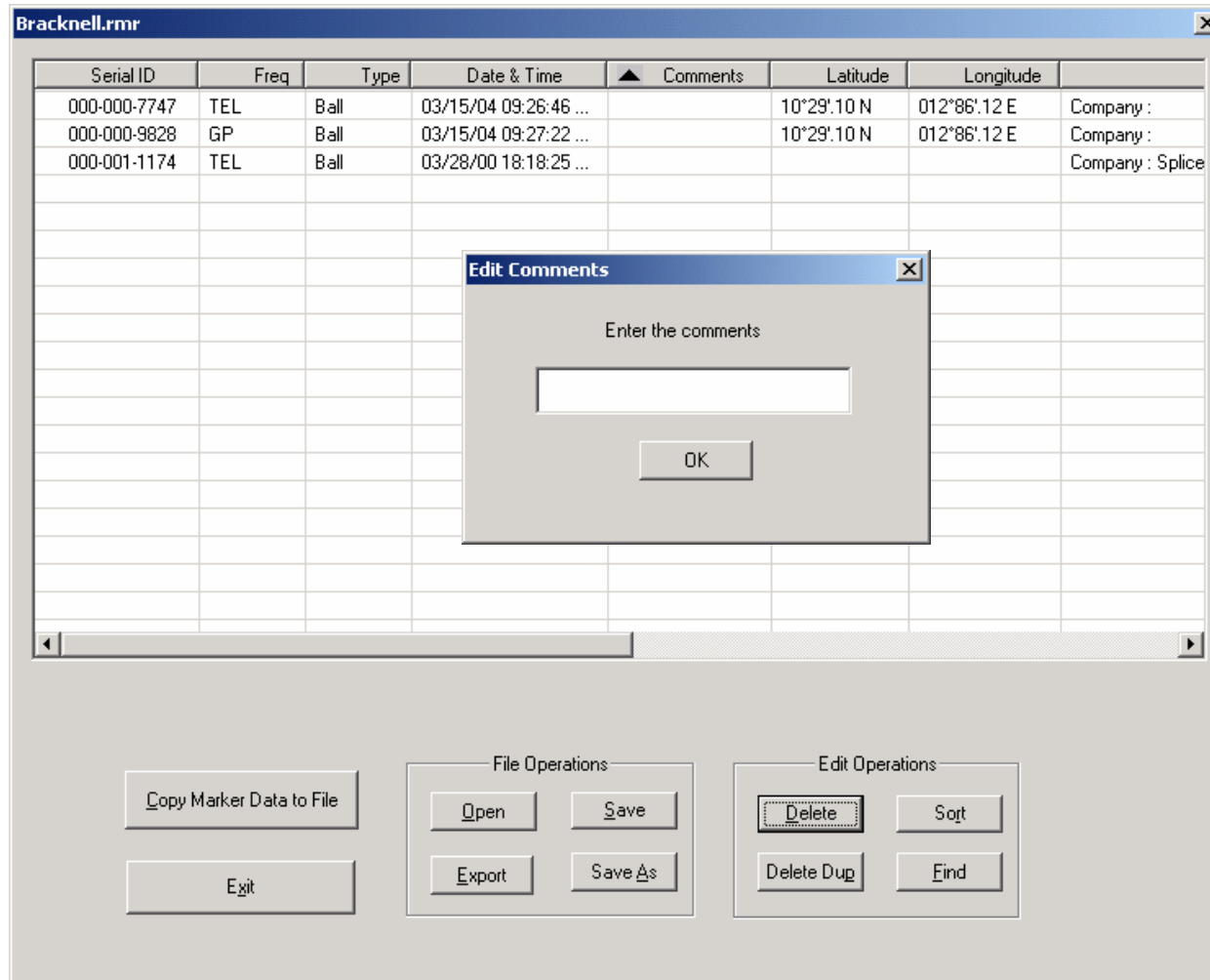
Type 2



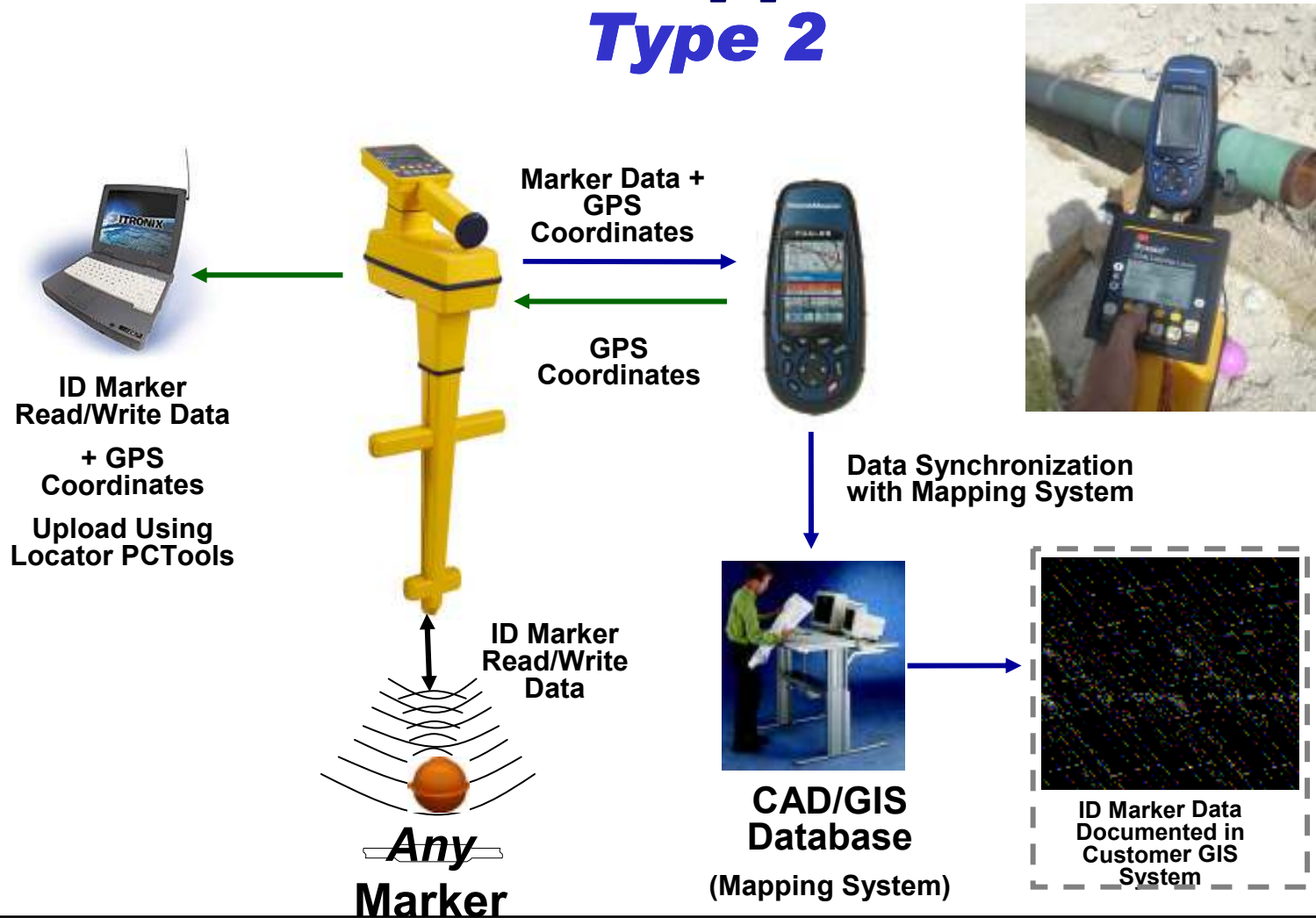
GPS/GIS Application Type 1



PC Locator Tools Software



GPS/GIS Application Type 2



EMS-iD Marking System

Mobile Mapper Upload

The screenshot shows the MobileMapper Office interface. A map displays two markers with IDs 0000016711 and 0000016710. A 'Feature Properties' window is open for the selected marker (0000016710), showing details such as Date/Time, Current Position, and Attributes. An 'Export GIS Data' dialog box is also visible, showing a list of file formats including Shape Files, 3D-Shape Files, MapInfo Files, AutoCAD Files, and CSV Files. Annotations in green circles and arrows point to specific elements: 'Selected ID Marker' points to the 0000016710 marker, 'GPS Data' points to the 0000016711 marker, and 'Marker GIS Data' points to the 'Attributes' section of the Feature Properties window. A large callout box at the bottom right contains the text: 'GIS Data can be Exported to Industry Standard GIS Formats'.

Property	Value
Feature	Marker
Geometry	Point
Observation	
Date/Time	08/02/2004 03:46:25 PM
Duration	00:00:01
Current Position	
Easting (m)	-763113.101
Northing (m)	-656976.246
Altitude (m)	342.196
Num. Sat.	5
PDOP	9.3
Correction	Uncorrected
Attributes	
ID#	0000016710
Label1	1425-XR/iD Gas ID Ball
Company	Gas
Descriptn	Stub
Type	Polyethylene
Size	2 IN
Address	60432
Label2	

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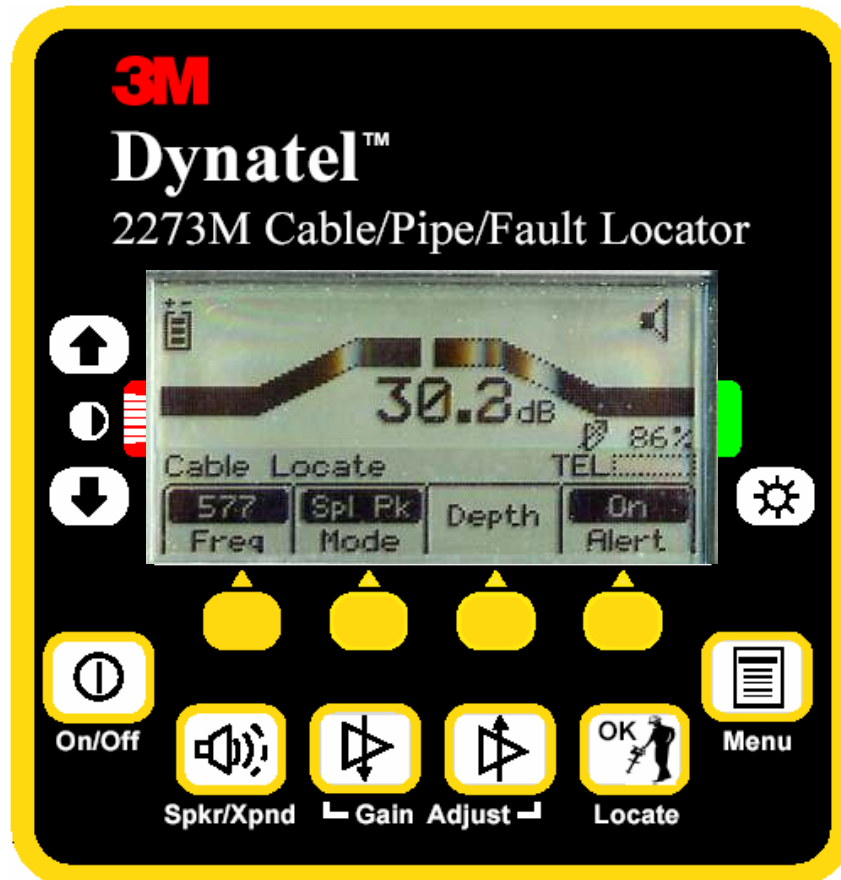
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Combined Cable and Marker Locate

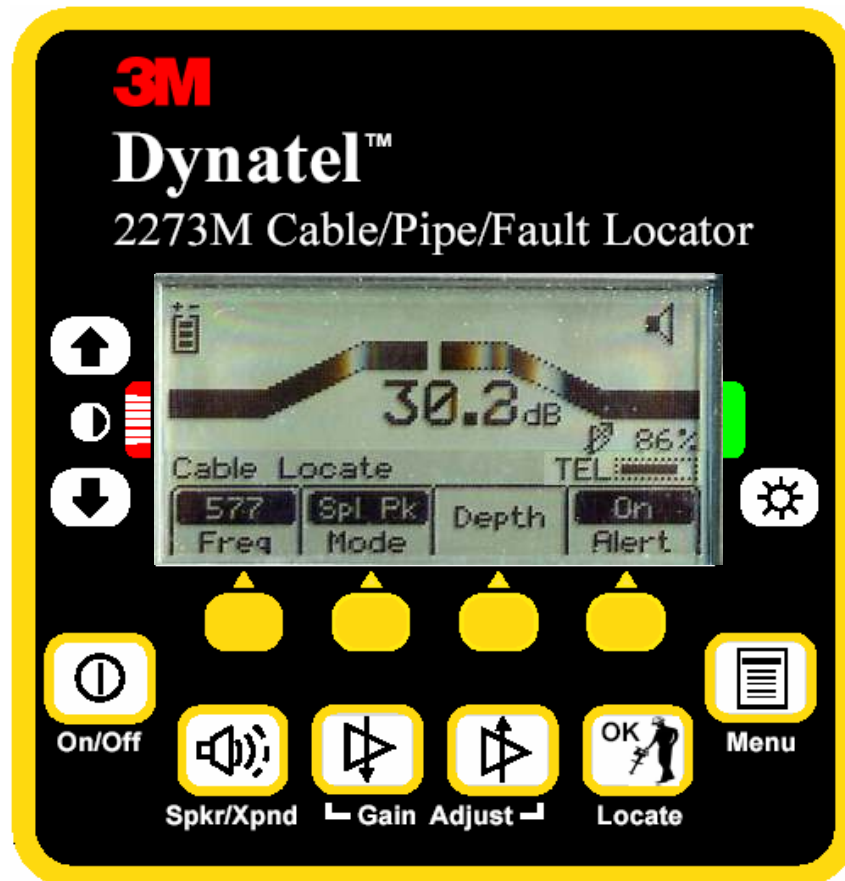


No marker close by:

Bargraph and rel. signal strength apply to cable locate. Speaker audio signals cable locate.

Bargraph besides marker type open.

Combined Cable and Marker Locate



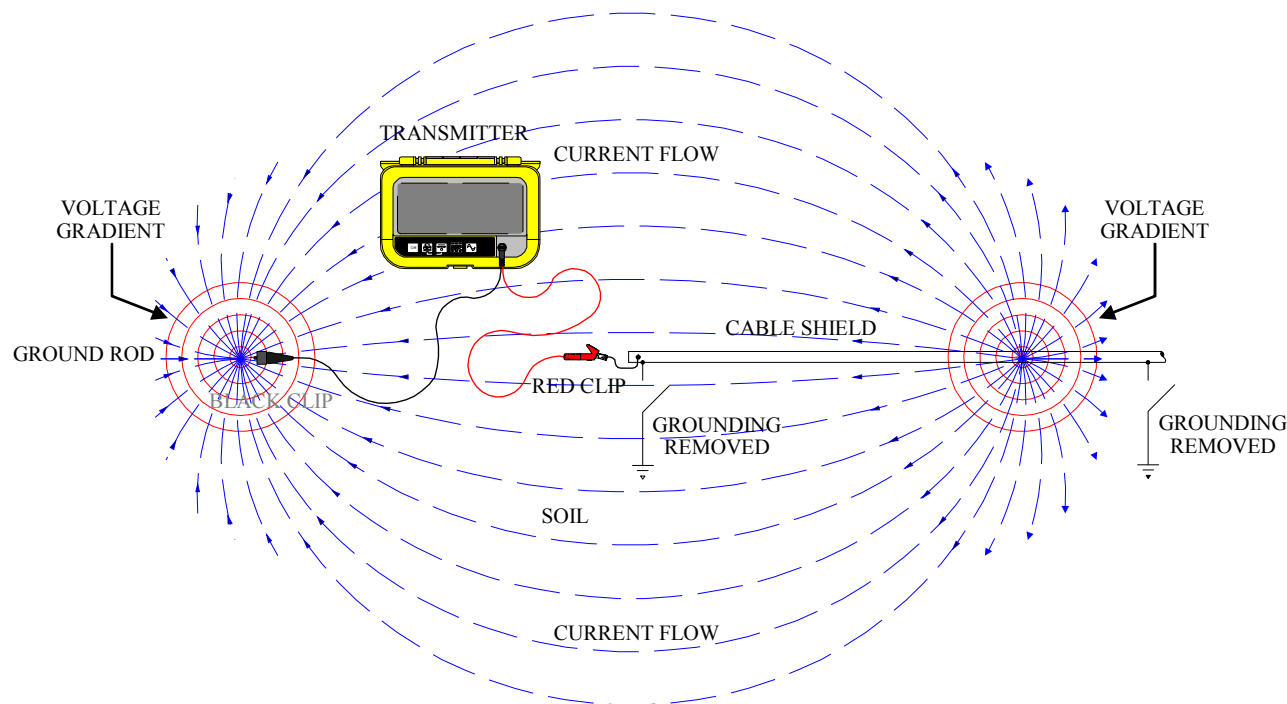
Marker close by:

Bargraph and rel. signal strength apply to cable locate. Speaker audio gets modulated.

Bargraph besides marker type fills up.

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EARTH RETURN (SHEATH) FAULT LOCATE - BASIC CONCEPT



NOTE:

- ❖ In **FAULT-LOCATE**, the Transmitter forces current to flow through the **FAULT/S**. It is important that current flow must be concentrated into the **FAULT/S** only. To do this, all **GROUND or SOIL** connections to the trace cable or conductor must be temporarily disconnected.
- ❖ As the **CURRENT** enters the **SOIL**, it creates a **VOLTAGE GRADIENT (slope)** on the **SOIL's surface** (see illustration on next page).
- ❖ For best results, the **GROUND ROD** should be placed into the **SOIL**, in-line with the cable path.

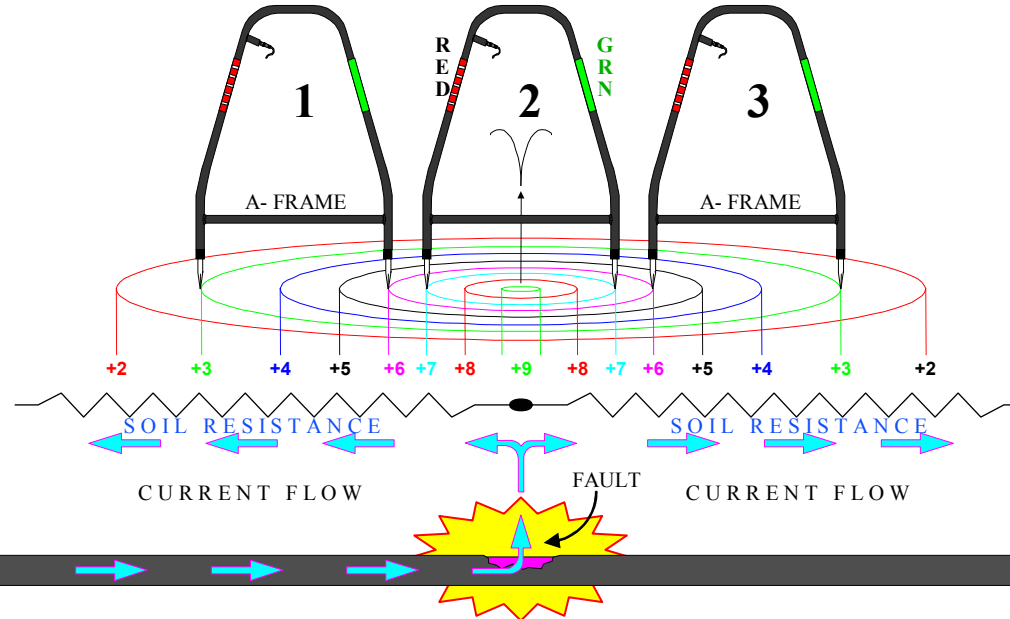
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EARTH FAULT LOCATE - BASIC CONCEPT

Location #1:
 Red Leg = +3V
 Green Leg = +6V
 Bargraph at Green -
 Move forward



Location #2:
 Red Leg = +7V
 Green Leg = +7V
 Bargraph floats - NULL
 Stop - Fault located



Location #3:
 Red Leg = +6V
 Green Leg = +3V
 Bargraph at Red -
 Move back.

NOTE:

- ❖ As the **CURRENT** enters the **SOIL**, a **VOLTAGE GRADIENT** (slope) is created on the soil's surface. The **A-FRAME** is then plugged into the Receiver and it is used to sense voltage potentials along the cable path. The **A-FRAME** has two probe tips, one is marked **RED** and the other is **GREEN**.
- ❖ The goal here is to determine when the **RED** and **GREEN** tips senses a **NULL**, a condition where the voltage potentials at the **RED** and **GREEN** tips are the same or zero.
- ❖ Once **NULL** is achieved, the center of the **A-FRAME** will then represent the location of the **FAULT** (position #2). In real live applications, one will only be able to determine the spot where the graph changes from red to green or vice versa.