RD8000
Training Course

GLOBAL INFRASTRUCTURE  X  PROCESS EQUIPMENT  X  DIAGNOSTIC TOOLS
Welcome to the Radiodetection RD8000 Training Course
RD8000 – Precision locators

- **RD8000PXL**
  - Industry standard high performance cable and pipe locator

- **RD8000PDL**
  - Radiodetection’s most advanced cable and pipe locator
RD8000 Locators

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

- 1 Watt, 3 Watt & 10 Watt
  - Compliment RD8000

- One platform for all

- Contain many features
  - Model dependant
  - See brochure and user guide

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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
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
Basic Locating

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
Basic Location

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

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Naturally occurring signals

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
Naturally occurring signals

Passive Location (Radio)

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

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
Two types of location methods

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
Actively applying the transmitter signal

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

- Direct Connection
- Induction
- Signal Clamp
Actively applying the Transmitter signal

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
Actively applying the transmitter signal

**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
Actively applying the transmitter signal

**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)
RD8000 Locator Menu – Model specific

- **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
RD8000 Transmitter Menu – Model specific

- **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
Questions?

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

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

(1) 0
1 cycle per second

(2) 0
2 cycles per second

(3) 0
3 cycles per second
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
Frequency selection

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
Frequency selection

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

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Current losses returning to source
Current loss due to poor insulation
Current loss due to tee connection

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Connection methods
Connection methods
Another method of finding buried conductors is to use the induction sweep method.
Induction Technique - 2 person radial sweep
Induction Technique
Location Problems

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.
Location Problems

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

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

- 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
Locator Problems

- 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
Locator Problems

- 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
Questions?

- Antenna selection
- Which frequency?
- Current measurement
- Locator techniques
- Location problems
Tracing Non-Metallic Pipes

- Plastic or concrete pipes, ducts and drains cannot be located electromatically, 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
Accessories - FlexRod

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Sonde locating

- Sonde on the end of a FlexRod

- Sonde on the end of a FlexiTrace

* Notice the orientation of the locator
Sonde Locating

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

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Using a FlexiTrace

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Accessories - Stethoscopes

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Accessories – Live plug / cable connector
Accessories - rechargeable battery pack

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Accessories - rechargeable battery pack
Locator Features

- 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?
Compass

- Provides visual indication of target line
- User can easily follow target line
  - very useful in congested areas
- Alignment required for accurate depth readings
- ± 7.5° tolerance
- Commonly known as TruDepth
Antenna Modes

- Peak
- Peak/Null
- Null
- Single
Peak Mode

- Most Accurate
- Ideal in congested areas
- Depth & current readings
- Compass
Peak/Null Mode

- 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
Dynamic Overload Protection (DOP)

- 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
Strike Alert

- 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

- 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.
Current Direction

- 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.
Fault Find (FF & CD)

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

Fault Find arrows
A-Frame connected indicator
Operating mode indicator

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Welcome to Centros Manager 6

Select An Application

1. Locator Software Update
2. Transmitter Software Update
3. Locator Option Editor
4. Locator eCal Validation

*Important Messages Appear Here*
SurveyCert™

- 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 – Software download

1. Load Extended Warranty Key
2. Connect Locator to PC
3. Switch on Locator
4. Download Firmware

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Centros Manager – Option Editor

<Important Messages Appear Here>

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- 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
Centros Manager – eCAL Validation

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Certificate of Validation

Serial Number: 108KPD1DB-222
Model: RD8000

Test Date: 11/01/2011
ddmmyyyy

PASS

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

Test Results

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Desired Test Value</th>
<th>Result in mm</th>
<th>Specified Range</th>
</tr>
</thead>
<tbody>
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Unless otherwise stated above, the item has been tested and its calibration remains valid in accordance with Radiodetection’s specification.

Certificate authorized by:

Chris Williamson – Senior Quality Engineer

Radiodetection - An SPX Company
- Means of remotely controlling the transmitter via Bluetooth with the RD8000 locator
- Change frequency
- Side Step
- Power Management
Further Information

Radiodetection Website - www.radiodetection.com

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