USER GUIDE

RD4000 Location System

The RD4000 is the world's first web-enabled cable and pipe location system. This guide provides a quick, step by step reference to some basic applications of the RD4000Rx & MRx receivers & the RD4000T3, T3F & T10 transmitters.

More detailed information on the RD4000 system and its applications can be found in the full RD4000 user manual.

Radiodetection

www.radiodetection.com

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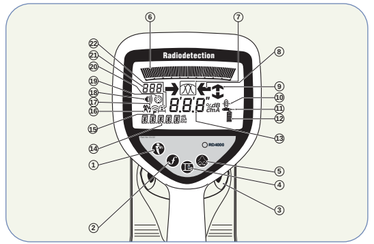
DISPLAY FEATURES

RD4000 RECEIVER



1. **On/Off Key:** Switches the receiver on and off and acts as the menu select key.
2. **Frequency Key:** Press and release to select the required frequency. Holding the key scrolls through the available frequencies, release when the required frequency is displayed.
3. **Gain Paddle:** Increase/decrease signal strength. To reduce pull left paddle towards you, to increase pull right paddle towards you. Strength is indicated on the bar graph, 50% is suitable for most uses. This is also used to scroll through menu options.
4. **Depth/Current Measurement Key:** When pressed displays a line's depth and current for approx. 5secs, then returns to locate mode.
5. **Antenna Select Key:** Press and release to select the required mode (Peak/Null/Single).
6. **Bar-graph:** Displays signal strength.
7. **Antenna Display:** Wide Peak (single horizontal antenna), Narrow Peak (twin horizontal antenna), Null (vertical antenna).
8. **Left/Right Arrows:** Indicates direction of target line (automatic in Null mode).
9. **Current Direction (CD) Arrows:** Indicates current direction in CD mode, and fault direction in FF mode.
10. **Line Selected Indicator:** Displayed when line mode is selected.
11. **Sonde Indication:** Displayed when sonde mode is selected.
12. **Battery Level:** Displays receiver battery level.
13. **Numeric Signal Display:** Indicates signal response and measurement units being used.
14. **Frequency selected indicator:** Displays the selected frequency and measurement units being used.
15. **Electronic Marker System (EMS) mode:** Symbol displayed when EMS mode is selected (RD4000MRx only).
16. **Radio Mode:** Symbol displayed when Radio mode is selected.
17. **Power Mode:** Symbol displayed when Power mode is selected.
18. **Volume Level:** Displays volume level (mute, low, medium, high).
19. **Accessory Indicator:** Symbol displayed when an accessory is fitted.
20. **Fault Find (FF) mode:** Symbol displayed when an A-frame is connected.
21. **Numeric Display:** Displays numeric information.
22. **CD mode indicator:** Arrows are automatically displayed during CD location.

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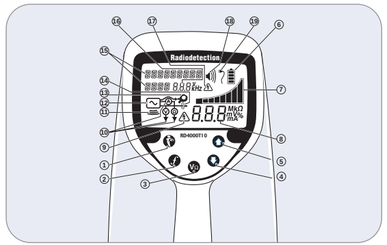
DISPLAY FEATURES

RD4000T10 TRANSMITTER



1. **On/Off Key:** Switches the transmitter on and off and acts as the menu select key.
2. **Frequency Key:** Press and release to select the required. frequency. Holding the key scrolls through the available frequencies, release when the required frequency is displayed.
3. **Measurement Key:** Press to select measurement units: Amps/Volts in normal mode and Volts/Ohms in measurement mode.
4. **Down key:** Press to decrease power output or to scroll down through menu options and parameters.
5. **Up Key:** Press to increase power output, or to scroll up through menu options and parameters. If power output is increased to above 5 Watts, *Hi-Power* will scroll across the screen, this will significantly increase drain on the batteries.
6. **Battery Level:** Displays transmitter battery level.
7. **Bar-graph:** Displays output current or power setting demanded.
8. **Numeric Measurement Display:** Displays numeric measurement information including the units being used.
9. **Live Cable Warning:** Indicates when there is more than 30V on the output terminals.
10. **Measurement Indicator:** Indicates which measurement is being taken.
11. **Induction Mode:** Symbol displayed when induction mode is selected.
12. **Transmitter Indication:** Symbol displayed the entire time the transmitter is switched on.
13. **Clamp Indicator:** Symbol displayed when a Signal Clamp is connected.
14. **Direct Connection Indicator:** Symbol displayed when transmitter is connected to line using direct connection.
15. **Text Display:** Displays operating mode, frequency submode and menus/alarms.
16. **Numeric Frequency Display:** Displays the output frequency and measurement units being used.
17. **Hi-Volts:** Symbol displayed when 50V output max is selected.
18. **Volume Level:** Displays volume level (mute, low, medium, high)
19. **External Power Supply Indicator:** Symbol displayed when external power supply is connected.

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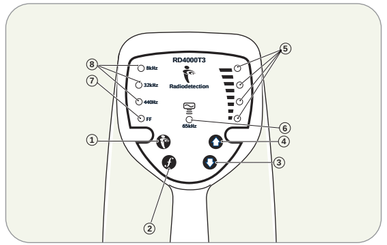
DISPLAY FEATURES

RD4000T3(F) TRANSMITTER



1. **On/Off Key:** Switches the transmitter on and off. The T3(F) will self-test for 2 secs, then switch to induction mode, or direct connection mode if connection leads are present.
2. **Frequency Key:** Press repeatedly to scroll through and select the required frequency. Before doing this ensure that a connection lead is fitted.
3. **Down Key:** Press to reduce power output.
4. **Up Key:** Press to increase power output.
5. **Power Output:** LED's indicate the selected output level.
6. **Induction indicator:** LED indicates when induction mode is selected.
7. **Fault Find Indicator (FF):** LED indicates that FF mode is selected.
8. **Frequency Indicators:** LED's indicate the selected frequency.

MENU SELECTION

The on/off key acts as both an on/off switch and a menu select key for both the RD4000 receivers and the T10 transmitter.

On/off
A momentary press will switch the unit on. Pressing and holding for 3 seconds will switch the unit off

Menu select
While the unit is switched on the on/off switch provides access to the menu system. The list of features will depend on the mode the unit is operating in when the key is pressed.

- Press the on/off key to enter the menu system
- Scroll though the menu options using:

  The receiver gain paddle.
  The transmitter up and down keys.

- Once you have found the menu item you wish to select press the on/off key to confirm the selection.

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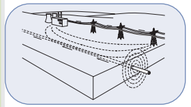
MODES

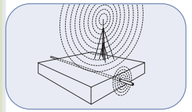
LOCATING

Passive Frequencies

These rely on signals already present on buried metal utilities and do not require the use of a Radiodetection transmitter. There are two types of passive frequency.



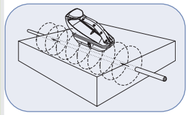
Power: Power cables and some other utilities radiate a signal at 50/60Hz.



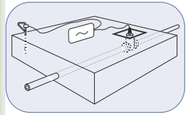
Radio: In addition to power signals, some utilities re-radiate ambient radio signals.

Active Frequencies

These require the use of a Radiodetection transmitter to provide the locate signal, and give very good depth and current readings. These frequencies also travel greater distances and can help to identify individual lines. Remember the transmitter and receiver must be set to the same frequency.
There are three methods of applying an active signal using a Radiodetection transmitter.



Induction
The transmitter is placed over or near the area to be located and switched to the appropriate frequency. A signal will then be induced on to any line(s) below or close to the transmitter. Higher frequencies are normally used in this method as they induce more effectively.



Direct Connection
Electrical connection leads are plugged into the transmitter and attached directly to the line, the circuit is completed by connection to a ground stake (typically at 90° to the line). This method ensures a strong clear signal on an individual line and enables the use of lower frequencies, for example current direction.

Signal Clamp
A Signal Clamp is plugged into the transmitter and clamped around the line to couple the signal to it. A range of Signal Clamps is available to accommodate most conductors.

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FURTHER SYSTEM INFO

Receiver Information Codes

Code	Meaning	Cause/Solution
02.	When switched on the receiver could not restore its previous settings.	It will switch on with default settings and will function normally.
05.	During a depth reading the top antenna signal is greater than the bottom.	This could occur if the receiver is under overhead power cables.
07.	During a depth reading a signal has caused one or both antennas to 'clip'.	Repeat the measurement.
10.	An unsupported accessory has been connected to the receiver.	The receiver may require a software update.
11.	Some 'intelligent' accessories pass an ID code to the receiver when connected. This error indicates that the code has not been passed correctly.	Retry the connection, if un-successful the accessory will need re-programming.
13.	A CD reset has been attempted but there is no valid CD signal.	There is no valid CD signal Try to reset again. If unsuccessful ensure the transmitter connections are the correct way round.

T10 Error Codes

If the system software fails in any way an error code will be displayed. Errors codes are displayed as either **ERR** (error) or **FATAL ERR** (fatal error) followed by a number between 1 and 23. If a fatal error occurs the system will automatically switch off after 10 secs. If an error occurs follow this procedure.

- If **ERR** is displayed switch the T10 off and then on again, if **FATAL ERR** is displayed and the system has automatically switched off, then switch it back on again.
- Once the unit is switched back on, use the web connection feature to download your system configuration. This should be done whether the error code is still displayed or not.
- Switch the T10 off and then on again.
- If the error code is still displayed, or you cannot access the web features then contact Radiodetection for further advice.

Web Connectivity

The RD4000 receivers and the T10 transmitter are web-enabled systems. For information on how to access this feature and the requirements for use, please refer to the full RD4000 user manual.

Safety Information

The rechargeable battery packs can be recharged via a vehicle cigarette lighter. Rechargeable battery packs must not be recharged whilst attached to transmitter or locator units, if the vehicle is being driven.

Transmitter variants can by powered via the vehicle cigarette lighter of a stationary vehicle.

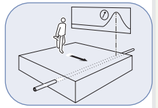
The RD4000 is designed for use by suitably trained personnel, following procedures and instructions described in the full user manual.

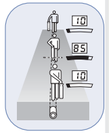
For comprehensive approval, warning and safety information, refer to the full RD4000 user manual.

LOCATING

Peak Mode

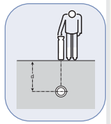
- Select the desired **Frequency** (2).
- Select **Peak** mode (5).
- Select **Line** mode (1).
- Set the Gain (3) so that the bar graph is at approximately **50%**.
- Hold the receiver **vertical** and sweep the area with a steady and deliberate motion. If necessary adjust the gain to keep the bar graph on scale.
- When a signal is detected continue along the search route until it reduces, then move back to where the signal is strongest **(Peak)**.
- Rotate the receiver until the signal is at its strongest. The receiver handle will now be aligned with the target line.
- Move the receiver from side to side using small movements until a clear maximum is observed. The receiver is now directly over the target line.
- Depth and Current measurements can now be made at this point. (See *Depth and Current Measurement*).
- You can follow the line by moving forward while at the same time moving the receiver from side to side, observing the maximum response.





Depth and Current Measurement (CM)

- Pinpoint the line as previously described and rest the receiver on the ground at the **Peak** position.
- Press the **depth/current measurement key** (4). Maintain at least **30 paces** from the transmitter if the signal is applied using the Induction method.
- The reading will be displayed for 5 seconds, after 5 seconds the receiver will revert back to the locate screen and, if an appropriate device is connected, the depth measurement will be logged (See *Data Logging*)



Note: The CM feature measures the actual current on the line regardless of its depth. Therefore the receiver's strongest response may not come from the target line; it may come from a shallow line to which the signal has coupled.

Data Logging

When a depth/current measurement is taken, the readings are displayed for 5 seconds before the receiver reverts back to the locate screen. At this point the measurement information is passed directly to the receiver's RS232 port. If there is an external device, such as a Psion Workabout or GPS device, connected to the port, then the measurement information will be passed to it and stored.

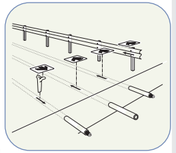
If there is no external device attached to the receivers RS232 port, the measurements will not be logged.

If the depth/current measurement key is pressed a second time, during the 5 seconds that the readings are displayed, the receiver will revert straight back to the locate screen and the reading will NOT be logged.

LOCATING

Current Direction (CD)

In areas where the applied signal has coupled to other conductors, CD mode is used to identify the line to which the transmitter is actually connected. A forward arrow will be displayed for the target line with a reverse arrow displayed for coupled signals.



- Select **CD frequency** on both the T10 transmitter (2) and the receiver (2) and pinpoint the line.
- Select **CD mode** (1) and hold the receiver with your back towards the transmitter.
- Current direction is displayed with the current direction arrows.

Note: You must reset the CD to ensure correct current direction on the target line. With a CD measurement displayed at a known point, press the On/Off key to reset the CD.

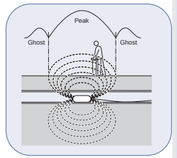
CD – Accessories

CD/CM Clamp,
Plugged into the accessory socket of the receiver enables CD and CM measurements to be made on individual cables.
CD Stethoscope
This can be used in tight spaces to obtain current direction but not current measurement.

Important Note: When using either of these accessories you must reset the CD at a known point, near the transmitter, before making any identification measurements. On both the CD/CM Clamp and the CD Stethoscope there is a label that indicates the direction of the transmitter during CD reset.

Locating a Sonde

A sonde is a small self contained transmitter that, when inserted in a non-metallic drain, sewer, pipe or duct, can be located by the receiver.

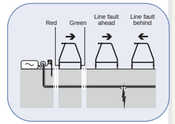


- Select **Sonde** mode (1)
- Select **Peak** mode (5)
- Set the receiver to **Sonde Frequency** (2)
- Hold the receiver vertically with the blade in line with the sonde.
- Move from side to side over the suspected position of the sonde, to obtain a peak response. Ghost peaks will be found on either side of a main peak response.
- With the centre peak pinpointed move the receiver back and forth across the line of the sonde to obtain a second peak.
- Rotate the receiver to obtain a third peak response. The receiver is now directly over the sonde and a depth measurement can be taken.
- Ensure the receiver is set to sonde mode, rest it on the ground and press the **depth/current measurement key** (4). The reading will be displayed for a few seconds.

FAULT FINDING

Fault Find (FF)

The Accessory A-Frame is used with RD4000 receiver and transmitter to locate cable sheath-to-ground faults on power and telco lines. This is done in two stages.



1. Taking a reference reading

- Pinpoint the line and trace its route for a short distance.
- Connect the **A-frame** to the receiver. The A-frame symbol will be displayed and FF mode automatically selected.
- Select **FF mode** on the transmitter and ensure the ground stake is connected.

RD4000T10
- Press **on/off** (1) to select the menu and scroll using the **down arrow** (3) to select FF
- Press **on/off** (1) again to confirm the selection.

RD4000T3F
- Press the **frequency key** (2) until the FF LED is lit.

- Place the A-frame spikes in the ground approx. 2 meters from the ground stake and with the green spike facing it.
- Ensure the receiver is in line with the A-frame and facing the green spike. The FF arrows should point away from the ground stake.
- Make note of the dB reading. During fault find, if the dB reading is approx. equal to the reference there is a single fault. If the dB reading is less than the reference there are multiple faults, in this case the sum of all dB readings should be approx. equal to the reference.

2. Fault Finding

- Place the A-frame spikes in the ground with the **red spike nearest the ground stake.**
- The FF arrows will display the fault direction. The arrows should point away from the ground stake and the bar graph should read zero.
- Follow the cable pushing the A-Frame spikes into the ground at regular intervals and checking for FF arrows. With no fault, the arrows will flicker on and off and the dB readings will be erratic.
- Keep the red spike facing the ground stake and keep the receiver in line with the A-Frame. Near a fault, the arrows will lock on and the dB reading will increase.
- Move in the direction of the arrows. Find the point at which the arrows change direction.
- Rotate through 90° and move back and forth to locate the fault in this direction, the intersection point will be directly over the fault.
- Should the location of the cable becomes uncertain the **antenna select key** (5) can be used to toggle between Null locate mode and FF mode.

VΩ readings (RD4000T10 only)

This function can be used to confirm the presence of a fault.
Note: All earth bonds MUST be removed from the cable.

- Press **on/off** (1) to select the menu and scroll using the **down arrow** (3) to select **Measure**
- Press **on/off** (1) again to confirm the selection
- Press the **measurement key** (3) to select ohms and take a resistance reading. A low resistance (typically less than 2MΩ) indicates a fault.

EMS MARKERS

EMS Markers (RD4000MRx only)

The RD4000MRx receiver enables users to locate the full range of EMS and Omni markers by folding down the special antenna. There are two modes for locating these markers.

Dual mode: Used to locate both the markers and the conductor they are marking.
Single mode: Used to locate the markers only. Mainly for use with plastic and gas pipe markers. This mode is also more sensitive.

Dual mode locating

- Connect the transmitter to the conductor and select locate mode.

RD4000T10
- Press **on/off** (1) to select the menu and scroll using the down arrow (4) to select **Locate**
- Press **on/off** (1) again to confirm the selection
- Press the **frequency key** (2) until the desired frequency is selected

RD4000T3(F)
- Press the **frequency key** (2) until the desired frequency LED is lit.

- Set the receiver to the same frequency as the transmitter using the **frequency key** (2)
- Pull down the EMS antenna. The EMS symbol will be displayed and EMS mode automatically selected.
- Press the **frequency key** (2) to select the type of marker you wish to locate.
- Press the **antenna Select key** (3) to select dual mode.
- Locate the conductor as normal, but also sweep the area either side to ensure all the markers are located. When a marker is located the volume and bar graph reading will increase.

Single mode locating

- Pull down the EMS antenna. The EMS symbol will be displayed and EMS mode automatically selected.
- Press the **frequency key** (2) to select the type of marker you wish to locate.
- Sweep the area to ensure all markers are located. When a marker is located the pitch and bar graph reading will increase.

EMS Marker Types

Application	Colour	RD4000 abbreviation
Power	Red	PWR
Water	Blue	H20
Sanitary	Green	SAN
Telephone	Orange	TEL
Gas	Yellow	GAS
Cable TV	Orange/Black	CTV