

Section A

**RD400PXL
Precision Locator
technical information**



The RD400PXL is a Precision Locator comprising a receiver and a transmitter for pinpointing buried utility lines in congested and complex situations in the highway or on an industrial site.

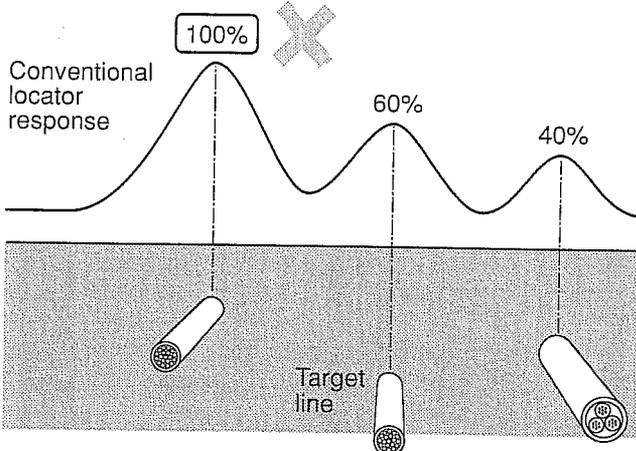
The receiver has a microprocessor driven display that provides more information about buried lines than has previously been available. The locator is designed for use by utility and telecom technicians needing to obtain as much information as possible about their buried plant. It is also suitable for users who like the convenience of automatic gain adjustment with a manual override and who prefer having a digital liquid crystal rather than a moving needle display.

Information for the user

The digital microprocessor controlled receiver has a simple and clear liquid crystal display. The display gives digital and meter indication of response when a signal is detected. The display also indicates the gain in dB required to obtain the response.

The display indicates responses, modes, battery state and depth measurement in either metres/centimetres or feet/inches and mA current value.

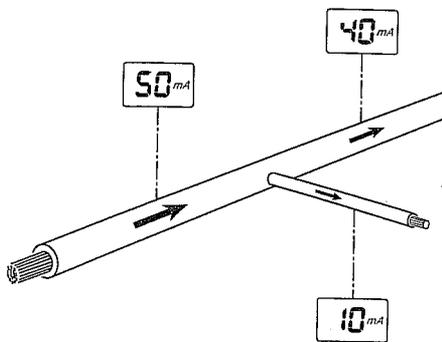
RD400PXL
CM response 13 mA 27 mA 19 mA



CM Current Measurement

The receiver indicates the amount of current on the target line in mA. The user can therefore distinguish a deep target line from a shallow line to which the signal may have coupled and which may give a stronger response. This important feature can also be used to monitor current on the line or to register current loss along the length of a line. The identity of a line in a congested area can be verified using Current Measurement. The line with the strongest current is the target line to which the transmitter signal has been applied.

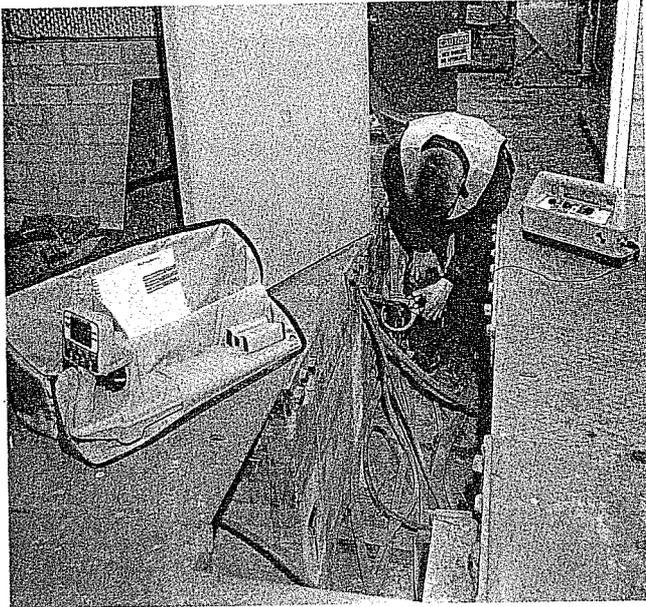
The Current Measurement feature can be used to monitor insulation or coating condition on a buried cable or pipe. Monitoring surveys carried out at regular intervals and at convenient points along a line can establish if there is any deterioration of the line's protection.



Current Measurement over a tee indicates the current along the main line and the branch.

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Controls

Modes and functions are selected with a convenient keypad.

Touch gain for adjusting receiver sensitivity combines the convenience and simplicity of auto gain with manual override.

Precision pinpoint

The three internal sensing aerials are arranged to provide both a peak and a null response to make a positive and precise pinpoint of a target line. If the position of a peak response is confirmed with a null response it indicates that the plan position is precise and that it is a suitable position for making an accurate depth measurement.

Transmitter signal

The signal transmitters each have two signal frequencies. If required both signals can be applied to a target line at the same time allowing the user to choose the most suitable frequency by trial and error.

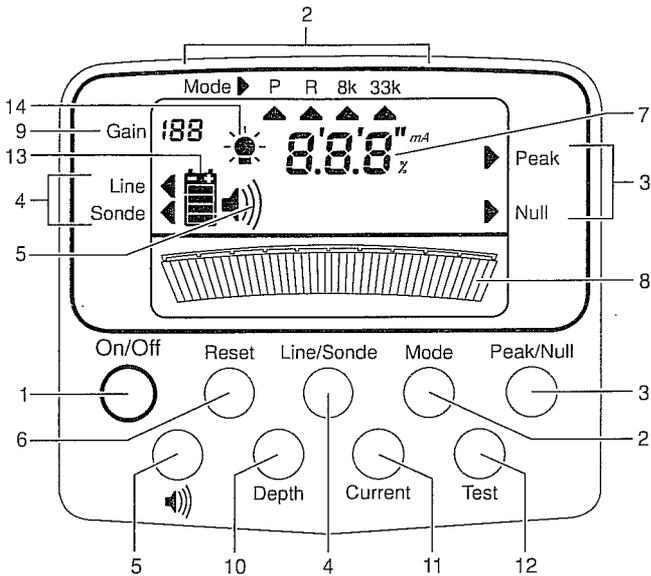
The transmitter signal can be connected directly to a target line or applied to a target with a wide choice of accessories. The signal can also be induced to lines through 2m/6ft of soil. The transmitter signal can be controlled and reduced to a very low level to permit the receiver to be used close to the transmitter.

Accessories

Accessories to increase the usefulness or widen the scope of the RD400PXL precision locator are described in Section B. Section C details a range of transmitting sondes and accessories for inserting in all types of non metallic drains, ducts or pipes so that they can be traced with the RD400PXL receiver.



RD400PXL Precision Locator features



Receiver functions and display

1 Press On/Off key to activate the receiver which remains energized for five minutes. Loudspeaker pulses then waits for 30 seconds before automatically switching off. Pressing any key (apart from On/Off) or adjusting Touch Gain (16) keeps the receiver on for a further five minutes.

Press On/Off key to reactivate receiver after switch off.

Press On/Off key whilst receiver is activated to turn it off.

Receiver checks microprocessor and display circuitry at each switch on.

Mode, function and gain setting remain unchanged for future use after switch off.

2 Press Mode key to select either P Power or R Radio passive modes or the active mode corresponding to the transmitter frequency. Each key depression moves through the choice of modes indicated at the top of the display.

3 Press Peak/Null key to select either horizontal aerials for a peak response or vertical aerial for a null response. Peak is more accurate than Null and should be used for all locating.

Use null to verify a peak pinpoint or for speedy tracing (22).

Accessories do not work when the receiver is in null and this is indicated by error #1 in display (9).

4 Press Line/Sonde key to select either Line for all line locating work or Sonde when locating the transmitting sonde for tracing non metallic ducts and drains.

5 Press  key to increase or decrease speaker loudness.

6 Press Reset key to cancel previously selected function.

7 Digital display indicates the receiver response to a signal. It also provides information arising from other functions. If a non-permissible function combination is selected, eg. Depth/Null - display indicates 3 lines and ignores the request.

8 Meter indicates response to a signal. Adjust Touch gain (16) if meter goes off scale.

9 Indicates receiver gain in dB. Also indicates error code number when 'Err' is indicated on digital display (7).

10 Press Depth key to measure distance to an active signal on a target line. Digital display (7) indicates 'dEP' for a few moments followed by the measurement in either metres/centimetres or feet/inches.

Error #11 (9) indicates that receiver is being moved while registering depth measurement.

Error #21 (9) indicates that the target line is deeper than the 4.5m/15ft max pushbutton measurement.

Error #9 (9) indicates that the signal is too small or too large to measure depth. Check transmitter settings.

Error #12 (9) indicates that there is too much interference from external power sources to measure depth.

11 Press Current key to measure mA value of active signal on target line. Digital display (7) indicates 'cur' for a few moments followed by the reading.

Error #9 (9) indicates that the signal is too small or too large to measure current. Check transmitter settings.

Error #13 (9) indicates that there is too much interference from external power sources to measure current.

Error #20 (9) indicates that the current to be measured is out of receiver range.

12 Press Test key to initiate check of receiver microprocessor and display circuitry, aerials and speaker. Display segments appear momentarily. Digital display (7) indicates 'tSt' followed by 'PAS' (Pass) or 'FAL' (Fail).

Error #2 or #3 (9) indicates there is too much interference from external power sources. Move to a quieter site.

13 Continuous indication of battery state. Display pulses and 'LO bAt' appears in display (7) for 30 seconds before automatically switching off, indicating that 12 x AA (LR6) alkaline batteries require replacement.

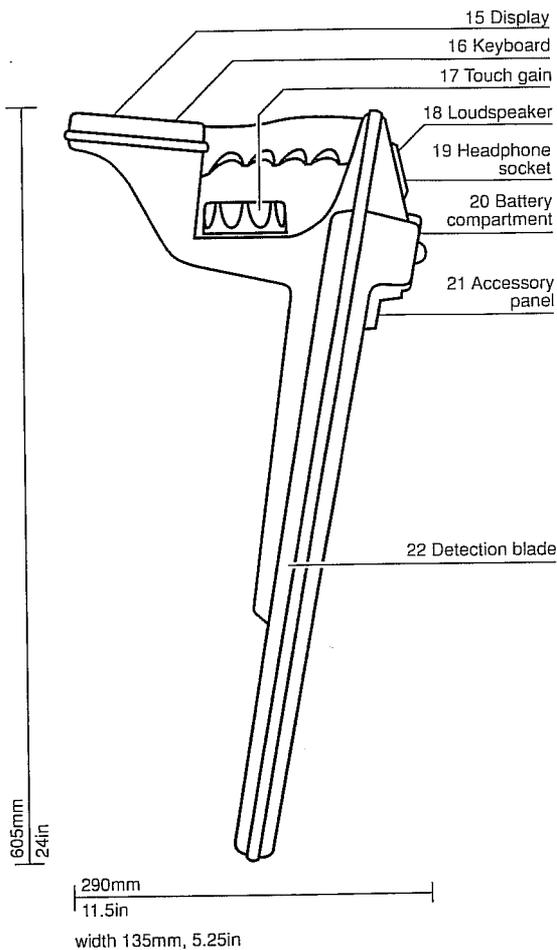
14 Optional display backlight

During switch on check, lamp icon appears momentarily to indicate backlight is fitted.

Press and hold Reset key then momentarily press  key to switch on backlight. Light bulb icon is indicated on display for duration of use. Backlight is automatically off at switch on, regardless if it was previously on when receiver was last used.

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RD400PXL Precision Locator features



15 Display
Liquid crystal display indicates responses, modes and functions.

16 Control keypad
for choosing modes and functions.

17 Touch Gain

A clockwise touch increases gain. Counter clockwise touch decreases gain. If the meter (8) is off scale a touch will automatically adjust gain to a band for convenient locating. If response is already indicated on meter, a touch will trigger a small incremental increase or reduction. Gain (9) on the display indicates relative decibel gain level.

18 Loudspeaker

The speaker is not activated at low signal levels. The speaker tone is complementary to the meter and identifies the signal. The eye sees the response to the signal and the ear identifies it.

The vane can be rotated to reduce tone volume.

19 Headphone socket

The speaker vane can be rotated to give access to the socket. Headphones should have a resistance of <math><100\Omega</math>.

20 Batteries

Unscrewing the fastener at the top of the cover opens the battery compartment. There are two battery holders each with 6 off AA (LR6) alkaline batteries. Always replace all the batteries when there is a low battery condition.

Check that battery polarity is correct before closing the compartment.

Rechargeable packs are available as an option.

21 Accessory panel

Panel is fitted with two sockets. Socket for fitting accessories. Second socket is an RS 232 communications port for fitting a data logger.

22 Detection blade

The search aerials are fitted inside along the blade. Pressing Peak key (3), the aerials give a peak response with the blade vertical, at right angles to the target line and directly over it.

Pressing Null key, the receiver gives a null response directly over the line regardless of the receiver orientation.

Peak response gives a more accurate locate and should be used for all locating work. Null should be used to verify a peak pinpoint or for speedy line tracing when accuracy is not important.

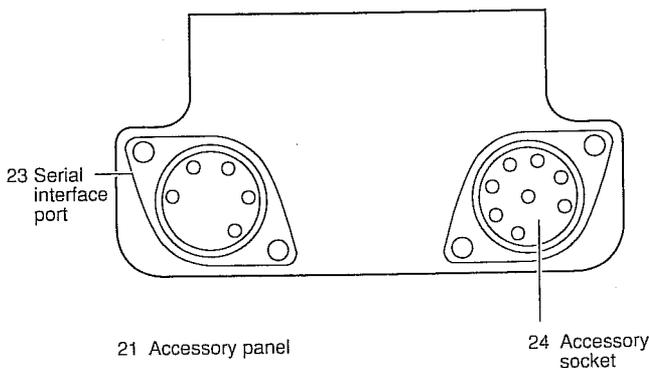
23 Serial interface port

24 Accessory socket

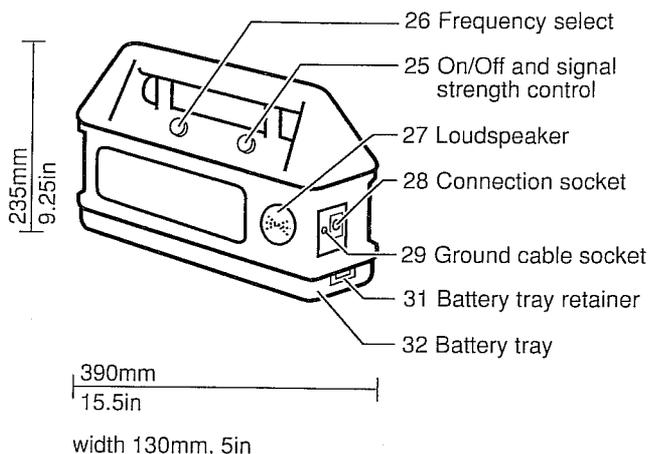
The accessory socket fitted to the panel is for plugging in optional antennas such as the double depth, clamp or stethoscope antennas.

Optional accessories

Optional receiver accessories are described in Section B.



RD400PXL Precision Locator features



RD400SDTx standard power transmitter

25 On/Off and signal strength control

The rotary control combines on/off and signal strength control.

Conserve batteries and always switch to Off when the transmitter is not in use.

The rotary control adjusts signal strength from 2% to 100%. Start locating with the level control set to *Normal*. This will give adequate signal level for most applications. Only use *High* level when more signal is needed - for long distance tracing or deep lines. A sudden increase in speaker tone indicates the transmitter is overloaded. Turn control back until tone drops. Generally, keep the control set as low as possible - this will prolong battery life and avoid unnecessary signal coupling.

26 Frequency select switch

Selects either an 8kHz or 33kHz signal or dual frequency mode. Dual frequency application may only be made if the signal is connected or clamped to the target line and not induced. Available signal strength is halved when both frequencies are applied.

27 Loudspeaker

Continuous tone from the loudspeaker indicates that the batteries are live.

A drop in tone indicates when a direct connection signal has been applied successfully to a target line.

The vane can be rotated to mute the loudspeaker tone.

28 Connection socket

The connection cable or options such as the signal clamp are plugged into the connection socket.

Fitting the connection cable or an option such as the signal clamp disables the induction mode.

29 Ground socket

The green ground cable plugs into the green socket to provide a return path for the signal whenever the transmitter is directly connected to a target line.

The ground socket is not used with the signal clamp or in the induction mode.

30 Induction

The induction aerial is partly housed in the transmitter handle. Once the transmitter has been switched on it radiates an induction signal until an accessory is plugged into the connection socket which disables the induction mode.

31 Battery tray retainers

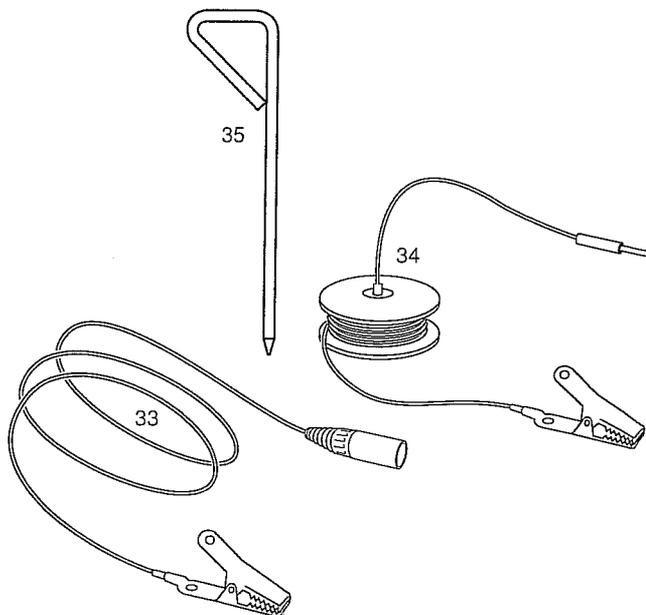
Insert thumbs into each retainer and push down, then pull out to release the battery tray from the transmitter.

32 Battery tray

The battery tray of the standard power transmitter is fitted with 10 x AA (LR6) alkaline batteries housed in two reducer tubes. 10 x D (LR20) cell batteries will give a longer transmitter battery life and can be fitted in the place of AA cells and reducer tubes.

Low battery state is indicated by interruption in the signal to the receiver and in the loudspeaker tone every 5 seconds. Transmitter shuts down and loudspeaker gives short pulse every 5 seconds when battery becomes inadequate.

A battery tray fitted with rechargeable D cells can be supplied as an option for the transmitter.



33 Direct connection cable

Connects the transmitter signal with the clip directly to a target line.

34 Ground cable

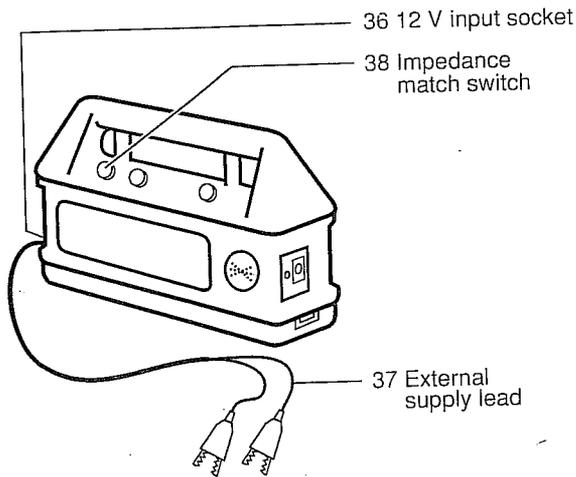
10m/yard ground cable on a spool with a clip for attaching to a ground point or stake.

35 Ground stake

Stake for making a ground connection to provide a return path for the signal.



RD400PXL Precision Locator features



RD400HPTx high power transmitter

Warning: High voltage output - up to 50V. Do not touch energized conductors.

The High Power RD400HPTx transmitter produces 10 times more power than the RD400SDTx standard power transmitter and is available as an option in place of the RD400SDTx transmitter. It is useful for applications such as long distance tracing and locating extra-deep lines or energizing a local cable network.

The RD400HPTx is fitted with 10 x D (LR20) battery cells as standard.

Transmitter controls are the same as the RD400SDTx with the following additions.

36 Power socket - 12V input only

An external power supply, often from a motor vehicle, is very useful when a high power signal is applied for long periods. The socket comes with a plug and lead which can be wired to any external 12V supply. The supply by-passes the battery pack to energise the transmitter directly.

37 12V external supply cable

38 Impedance match switch

This facility enables the transmitter to make the most efficient use of the available power.

Always start by using the low setting. If more signal is needed, try the higher setting. Monitor the speaker tone to check that the higher setting gives more signal, i.e. more tone change. If it does not, return to the lower setting.

RD400PXL

technical specification

Receiver RD400PXL

Detection system

Radiodetection patented twin horizontal aerial system for directionality and interference rejection. Peak response when blade is vertically above conductor and at 90° to it.

Special dual-winding design for symmetrical response.

Vertical coil array for null response and rapid convenient tracing.

Input socket for receiver accessories. Coil systems are disabled automatically when an accessory is connected.

Output

LCD	2 section; simulated analogue meter and digital/numerical data with status flags.
Mode	Status flag shows selected operating frequency.
Peak/Null	Status flag shows which coil option is selected.
Sonde/Line	Status flag shows which depth calculation will be used.
Gain	3 digit number shows relative gain setting in db.
Battery gauge	Shows battery status in 4 steps.
Loudspeaker icon	Shows speaker loudness setting.
Lamp icon	Shows to warn that backlight is on.*
Digital display	3 large numerals to display signal strength, depth and other numerical data.
Analogue section	41 bar scale indicates signal strength to accuracy of $\pm 1.5\%$.

Loudspeaker

Threshold inhibits speaker sound when signal is less than 20% of meter full scale in Peak mode and 5% in Null mode. Output sound derived directly from detected signal - alien signals can be audibly identified.

3.5mm mono jack for headphones.

Waterproof speaker. Socket for optional headphones.

Controls

Gain control

3 position switch, spring biased to central position. Gain is increased or decreased by holding the control clockwise or counter-clockwise.

One touch system: When signal strength meter is off-scale showing that gain setting is too high or too low, a single touch of the gain control automatically sets gain to a usable level.

Sensitivity

Performance conforms to the relevant requirements of NJUG 8.

9 key control panel

On/Off	Press to switch on or off. Auto-off system ensures that instrument is not left on inadvertently. It will not switch-off while being used. Microprocessor and display circuitry checked at each switch on.
Reset	Enables user to 'escape' from a function.
Sonde/Line	Enables correct depth calculation to be selected. Sonde is only available in active modes.
Mode	For selecting required operating frequency. Sequentially cycles through the available options.
Peak/Null	Enables selection of either: - Twin horizontal coil 'Peak' reading. - Vertical coil 'Null' reading.
Speaker	Allows speaker loudness to be changed. 3 levels of loudness or silent can be selected.
Depth	A single press automatically calculates and displays depth. Available in active frequency modes and Peak only.
Current	Available as for depth. Calculates and displays actual line signal strength in mA. Not available in Sonde mode.

Test

Self test mode checks microprocessor and display circuitry, aerials and speaker.

Functions

Depth

Accuracy: $\pm 5\text{cm}/2''$ and 5%.
Range: to 3m/10'0" (line)
to 7.5m/25'0" (sonde)

Backlight*

Switched on by holding Reset and Loudspeaker keys. Automatically re-set to off when instrument is switched off.

Current measurement

Accurate to $\pm 10\%$.

Illegal functions

When a non-permissible combination is selected, eg. Depth/Null - display indicates 3 lines and ignores the request.

Dynamic range

100db.

Batteries

12 x 1.5V alkaline (IEC LR6). 30 hours intermittent use at 20°C. Unit is protected against inadvertent polarity reversal.

Optional rechargeable batteries and chargers (110V or 240V) can be supplied (See section B).

Weights

2.3kg with batteries (5lb).

Modes

Power
Radio
8kHz
33kHz

Accuracy

Plan location, 5% of depth. (Transmitter signal on a single, straight conductor).

Twin parallel conductors carrying equal signals can be found with accuracy better than 10% of depth when the separation is greater than 1.5 times their depth.

Vertical guide

Omni-directional bubble level enables vertical positioning to within 1/2 degree of arc.

* Optional feature.

Transmitter RD400SDTx

Signal

Continuous sine wave, changes to pulse to warn low battery condition.

Frequency

Dual 8192Hz or 32768Hz.

Controls

Signal strength: Off, low, normal and high output level switch rotary control. Frequency: Switch for 8kHz, 33kHz, both simultaneously.

Modes

'Induction' 'connector' automatically selected when cable or accessory is plugged in.

Loudspeaker

Sounds to warn that the unit is energized. Variable pitch to indicate quality of signal connection. Mechanical 20dB attenuator.

Connection mode

Open circuit voltage V	20
Short circuit current mA	60
Max power mW	300
Optimum load ohms	300

Will deliver at least 2mA into any load impedance not exceeding 10,000 Ohms.

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technical specification

Loudspeaker continuity indication

Variable frequency tone. Output current of 0.1mA causes noticeable change.

Induction mode: Reactive power (accuracy $\pm 15\%$)
8kHz 27 VAR, 33kHz 9 VAR.

Output protection

Output circuitry is protected against inadvertent connection to conductors at up to 250V at 50/60Hz.

Batteries

10 x 1.5V AA Alkaline (IEC LR6). Typical drain: 50mA. Life: 25 hours intermittent use at 20°C, 68°F. 10 x D (LR20) cells. 120 hours use.

Battery test: Continuously checks battery under actual load conditions.

Battery warning: Pulsed speaker tone and output signal (in any mode) indicates low battery.

Unit is protected against polarity reversal.

Optional rechargeable batteries and chargers (110V or 240V) can be supplied.

Standard equipment

200cm/80" lead with clip for line connection. 10m/33ft lead on spool with clip for ground connection. Ground stake. Carry bag.

Weight

Net 2.8Kg (6lb) with batteries. 3.8Kg (8.4lb) with D cell batteries.

Optional transmitter RD400HPTx

Specification as RD400SDTx except:

Level switch

Changes output impedance matching to optimise signal efficiency.

Batteries

10 x D (LR20) cells only. AA batteries should not be used in RD400HPTx. Life: 40 hours normal use.

External supply

12V socket - min. 10V, max. 18V. Maximum current drawn 1A.

Signal output

Adaptive circuitry monitors output voltage and current and adjusts levels automatically to give maximum output current that is consistent with safety and interference regulations. Speaker tone rises indicating output is being limited.

Output levels	Level 1	Level 2
Open circuit voltage	30V	50V
S/C current	150mA	90mA
Optimum load	150Ω	450Ω
Power	3W	3W

Induction mode: Reactive power (accuracy $\pm 15\%$)
8kHz - 72 VAR, 33kHz - 24 VAR.

Weight

3.8kg (8.4lb) with batteries.

RD400PXL construction

Housings

Housings are manufactured in mid grey from a high impact thermoplastic alloy for good mechanical strength. All access points are sealed against water ingress and control shafts have a double-lip rubber seal. Plastic cone loudspeakers are fitted to maintain weatherproof integrity to IP 54 and NEMA IV. Vibration tested to BS2011.

Circuitry

Integral wiring harness links controls to the main circuit boards via proprietary plugs and sockets. All control sub-assemblies can be replaced using only a cross head screwdriver and fine nose pliers.

Temperature range

-20°+50°C * -4°F+122°F.

User information

An illustrated User Information Manual is supplied.

RD400PXL order codes

Complete RD400PXL sets: receiver, transmitter, standard accessories, User Information Manual and carry bag.

RD400PXL with standard power Tx	10/RD400PXLSDK*
RD400PXL with high power Tx	10/RD400PXLHPK*
Receiver display backlight - optional	10/RD4DISLT

Refer to Section B for information and order codes for optional locator accessories.

Refer to Section C for information and order codes for transmitting sondes to enable the receivers to trace non metallic ducts and drains.

Each part of the RD400PXL kit is available separately:

RD400PXL receiver	10/RD400PXL*
RD400SDTx transmitter	10/RD400SDTX
RD400HPTx transmitter	10/RD400HPTX
RD400 carry bag	10/RD400BAG
RD400 rigid carry case	10/RD400CASE

*Add FT to order code if receiver depth calibration is required in feet.

*Add RC to order code if rigid carry case is required in place of carry bag.

Radiodetection make every effort to ensure that information about locating equipment and its use is correct but do not accept responsibility for damage or problems caused through use of the equipment; priority must always be given to following national and local safety requirements. We are continually developing our products and the design of Radiodetection equipment is subject to change without notice. Printed in UK 90/RD4PXL/ENG/4 4.93

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