

# PCM PLUS<sup>+</sup>

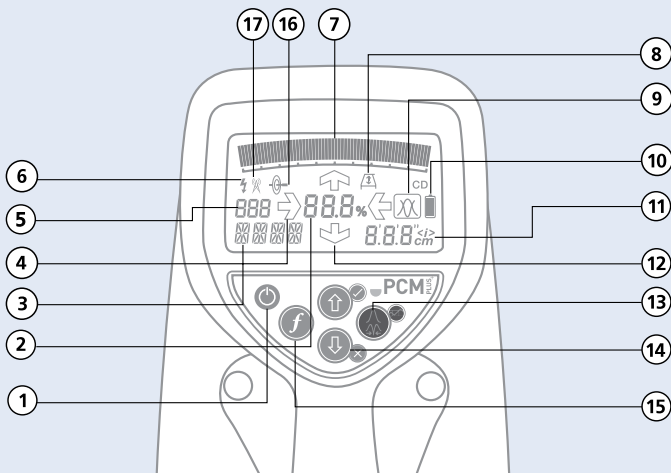


## Pipeline Current Mapper

User Guide





**Radiodetection**  
AN SPX COMPANY



## Display Features & Key Functions

- 1** On / Off Key. Momentary press to access menu options and to set user settings. Holding down the Function key on power up will display PCM+ software version and last calibration date.
- 2** Numeric Signal Display: Provides a numeric representation of the signal response in a percentage.
- 3** Frequency / Mode Indicator: Displays the selected frequency or operating mode.
- 4** Left / Right Arrows: Indicates direction of target line; available in Null mode only.
- 5** Numeric Display: Displays the current gain value. Also Log file index.
- 6** Power Mode: Indicates when Power mode selected.
- 7** Bar Graph: Displays signal strength.
- 8** Fault Find 8KFF or ACVG using the Radiodetection A-frame.
- 9** Antenna Display: Narrow Peak (twin horizontal antenna), Null (vertical antenna).
- 10** Battery Level: Displays battery level. No locate is possible at minimum (zero bars).
- 11** Depth or Current Display: Displays depth or current as applicable.
- 12** Current Direction / Fault Find Arrows: Indicates the direction along the pipe / utility to the measured fault. In ELCD or LFCD mode they identify outgoing current (4 / 8Hz) from the PCM transmitter.
- 13** Antenna Select Key. Press and release selects Peak or Null mode. Sustained key press initiates a 4Hz current measurement.
- 14** Gain Controls / Accept or Reject 4Hz current measurement. Sustained hold of gain-up or gain-down in steps of 1dB increment / decrement.

**15** Function Key: Press and release to select the required frequency / operating mode. Sustained press toggles between depth measurement and locate current.

**16** Line  or accessory  .

**17** Bluetooth: Indicates when Bluetooth is switched on.

## PCM+ Menu

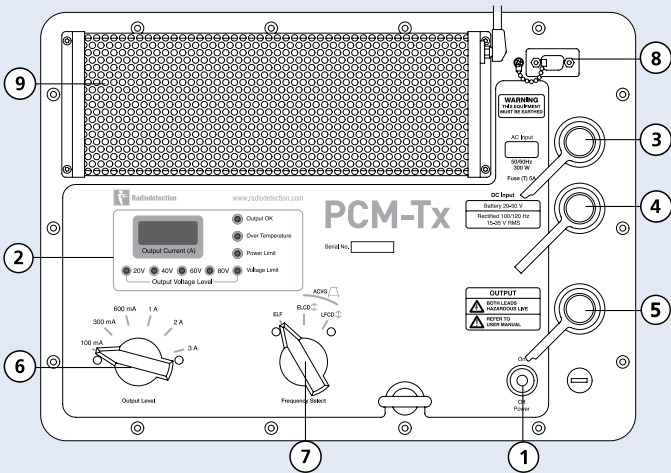
When the receiver is switched on, momentarily press the On / Off key to enter the menu. When the menu (illustrated below) appears, use the Up and Down keys to scroll through available features. To select required feature, momentarily press the On / Off key and then use the Up and Down keys to scroll through the available options within that feature. Momentarily press the On / Off key to select the option.

**Note: The PCM+ is set to locate power frequencies at 50Hz. If your country uses 60Hz, the PCM+ receiver will need to be set for 60Hz operation (see below). If the PCM+ receiver is set to the incorrect power frequency, the user will have difficulty locating in Power, CPS, ELF and LF modes as these locate frequencies are all dependant upon the correct Power frequency.**

## Features List

- 1** Volume: 4 levels. VOL 0 mutes the speaker and VOL 3 sets the volume to its loudest setting.
- 2** BLUT. Bluetooth option menu. Select Off to switch Bluetooth radio off. Select Auto to switch Bluetooth on; note in Auto mode the Receiver will connect to a paired device. Select Pair to pair the receiver to a compatible Bluetooth device such as PC or PDA.
- 3** SEND: Sends logged data over a Bluetooth™ connection. Stored data logs can be sent via Bluetooth to a PC or PDA running Radiodetection's SurveyCERT.
- 4** DEL?: Erases all stored data logs.
- 5** BATT: Select either Alkaline or NiMH batteries.
- 6** PWR?: Selects the power mode frequency to either 50Hz or 60Hz.
- 7** UNIT: Select either Metric or Imperial measurements.
- 8** SIGL.: Select either NORM or LOW. NORM is sufficient for most applications. Select LOW if working in poor conditions or areas where there is interference.
- 9** TIME: Automatic power down, can be set to 5 minutes, 10 minutes, 20 minutes or set to OFF.
- 10** VIEW: Used to review and overwrite stored log results. Once in view mode the user may use the Up/Down arrows to scroll through stored results. To overwrite a particular stored result press the Antenna Select key, the PCM+ will revert back to normal operating mode. When a measurement is taken and stored the selected stored result will be overwritten.
- 11** ACCE: The PCM+ supports the Submersible Double Depth Antenna and Stethoscopes. Select DDA, STH or NONE.

# PCM+ TX Transmitter



The PCM+ transmitter is housed in a rugged waterproof case. To open the transmitter, unsnap the clips located either side of the handle. In certain situations, the air pressure within the case may need to be equalised by unscrewing the small knob located by the handle.

The case must remain open during operation; this allows the transmitter to remain at optimal temperature.

Before closing the case disconnect all cables and keep them away from the heat sink and the support strut.

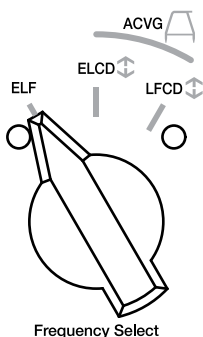
## Transmitter Features

- 1 On / Off switch.
- 2 LCD and LED indicators. Indicates the current output in amps and provides critical feedback on the TX's operation.
- 3 AC Input socket.
- 4 DC Input socket.
- 5 Output lead socket.
- 6 Output Level Selector: Select the output level in amps.
- 7 Frequency Selector: Selects the frequency.
- 8 Serial Port: For service personnel only.
- 9 Heat Sink: Vents heat from the transmitter during operation.

## Frequency Select

The LCD displays the selected 4Hz output current in amps.

The three-position rotary switch selects the applied mapping frequencies as follows:



## ELF Transmission lines

ELF maximum range:

- 35% 4Hz
- 65% ELF (128Hz or 98Hz)

## ELFCD Transmission And Distribution Lines

ELF current direction (ELFCD), medium range:

- 35% 4Hz
- 30% 8Hz (current direction)
- 35% ELF (128Hz or 98Hz)

## LFCD Distribution Lines

LF current direction (LFCD), alternative frequency.

- 35% 4Hz
- 30% 8Hz (current direction)
- 35% LF (640Hz or 512Hz)

The 4Hz mapping frequency is always present.

The operator has a choice of selecting the locate frequency and current direction indication if required for identification in congested areas or for fault finding.

## Output Current Selector

This rotary switch allows users to select six different 4Hz current settings. These are 100mA, 300mA, 600mA, 1A, 2A, 3A.

When the PCM Transmitter is operating, the selected current will remain at a constant level, unless the input power supply limit is reached.

## Warning Lights and Output Indication

Output voltage is indicated by the yellow output voltage level LEDs.

If no LED is lit the voltage is below 20V.

The 20V LED indicates that the voltage applied is between 20 – 40V.

The 40V LED indicates that the voltage applied is between 40 – 60V.

The 60V LED indicates that the voltage applied is between 60 – 80V.

The 80V LED indicates the voltage is between 80 – 100V.

## Voltage Limit

The Voltage Limit LED indicates that the transmitter has reached its 100V output voltage limit. When this happens the resistance of the pipe or ground connection is too high. Check all connections to correct this problem.

### WARNING

**Pipelines with well-conditioned coating will likely generate a voltage warning as the current is increased.**

If the 60V / 80V / 100V lights are illuminated, do not use excessive voltage or current, as this may result in high current density through small holidays and coating defects. This may cause minor corrosion if the transmitter is left switched on for very long periods.

## LCD

The 3 digit LCD displays the 4Hz signal current in amps that is being delivered onto the pipe.

## Over Temperature

If the transmitter temperature exceeds its recommended limits it will automatically shut down. Wait until the transmitter has cooled before you recommence operation.

## Power Limit

This LED indicates that the external power supply is incapable of supplying the demanded power to support transmission at the selected current. The transmitter has reached its own power limit. Switch to a lower current setting until the GREEN Output OK LED illuminates. Allow a few seconds to settle between selections.

## PCM transmitter signal connection

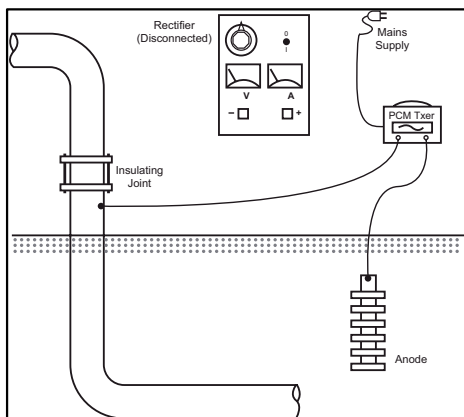
### WARNING

**Appropriate safety procedures must be followed before removing pipeline CP connection from the rectifier. Before handling connection leads switch both the rectifier and PCM+ transmitter OFF.**

### Connection to a rectifier

A rectifier station is an ideal place to connect the output of the PCM+ transmitter as it provides connections to both pipe and an anode bed for a suitable ground. The rectifier can also be used to power the PCM+ transmitter using either the mains supply or the rectifier output.

- 1 Disconnect both pipe and anode cables from the rectifier.
- 2 Ensure the transmitter is turned off.
- 3 Connect the White signal output lead to the pipe cable.
- 4 Connect the Green signal output lead to the anode cable.



## When connection to a rectifier is not possible

Connection of the PCM+ transmitter can be made to a suitable test point or directly to the pipeline itself. Connect the White output cable to the connection that is connected directly to the pipeline and connect the Green output lead to either a sacrificial anode or use a suitable earth stake.

If using a sacrificial anode make sure that it is not directly connected to the pipeline. When using an earth stake position the stake 45 M / 150 feet away from the pipe. To achieve a suitable earth it may be necessary to use more than one earth stake linked together.

When connecting to an electrical isolation joint you may connect the White lead to one side of the joint and the Green output lead to the opposite side of the pipe section as this can often provide a suitable ground connection.

## Locating Cables or Pipes with the PCM+ receiver

The PCM+ receiver can locate cables and pipes using different methods and frequency types.

### Passive Frequencies

Passive frequencies are detectable without the use of a transmitter. Use passive frequencies when you want to locate a conductor when using a transmitter is not practical. The PCM+ receiver can detect the following passive frequencies:

- 50 or 60Hz from power cables
- 100 / 120Hz CPS signals

### Active Frequencies

Active frequencies require the use of a Radiodetection transmitter to apply a locatable signal to a pipe or cable.

The PCM+ can locate using all PCM+ transmitter frequencies and also 8kHz from a suitable Radiodetection transmitter.

## Location Procedure

Set the PCM+ receiver to locate the applicable frequency, whether it is an active frequency from the PCM+ transmitter or one of the passive frequencies.

Sweep the site holding the PCM+ receiver upright at your side. Continue the sweep beyond the perimeter of the site. The presence of a buried conducting pipe or cable will be indicated by a tone emitted from the loudspeaker and a spike on the bar graph.

Keep the receiver blade vertical and move slowly backwards and forwards over the conductor. Reduce the gain sensitivity for a narrower response; this will allow you to pinpoint the conductor. When directly over the conductor and with the sensitivity level set for a narrow response, rotate the receiver on its axis until the signal minimum is found. The blade is now parallel with the conductor.

## Depth measurement and locate current

Upon locating a pipe or cable, the PCM+ will automatically display depth or current. The PCM+ will not display both depth and locate current at the same time. Hold down the Function key to toggle between depth and locate current. Depth and locate current is not available in Power, 8KFF and ACVG modes.

**Note: Depth and locate current will not be displayed where environmental conditions are poor (e.g. weak signal or interference).**

The depth measurement is to the center of the pipe/conductor.

The depth accuracy is  $\pm 5\%$  or better under standard earth conditions and with undistorted fields. If you intend to excavate a located pipe, it is imperative that due care is taken appropriate to the danger of personal injury and damage to infrastructure. It is recommended that depth measurement is repeated throughout an excavation.

## Taking 4Hz PCM current measurements

With the PCM+ transmitter connected to the pipeline and set to the appropriate output, select the corresponding frequency on the PCM+ receiver.

### Procedure

- 1 Locate the pipeline using the PCM+ receiver. When taking a 4Hz measurement the white arrow on the base of the PCM+ receiver should be pointing away from the PCM transmitter. Having pinpointed the pipeline sit the PCM+ receiver on the ground keeping it upright and very still.
- 2 Press and hold the Antenna Select key for approximately 5 seconds and upon release the signal bargraph will scroll across the display and a measurement cycle will now begin.

**Note: the reading on the display is a 'live' reading. A fluctuating reading may indicate interference and it may be better to move along the pipeline and take another measurement.**



- 3 To store the reading press the Up arrow key or reject the reading by pressing the Down arrow key. The PCM+ receiver can store up to 1000 readings and the log number of the stored reading will be shown on the PCM+ display.

**Note: If a reading is saved it will automatically be saved inside the PCM+ receiver and if the Bluetooth is switched on, the PCM+ receiver will automatically attempt to send the reading via Bluetooth to a paired device. If the PCM+ has not been paired, a FAIL message will be displayed. If it is intended to only save the reading internally within the PCM+ receiver you need to switch off Bluetooth. See page 3 for details of Bluetooth settings.**

## Review Mode

Saved readings within the PCM+ can be viewed or over written. To view a saved result, go into the menu and select VIEW. The last saved result will be displayed. To view other readings use the Up / Down key to step through.

To over write a saved result, select the result and press the Antenna key. Once a new measurement is taken press the Up key to over write the selected reading.

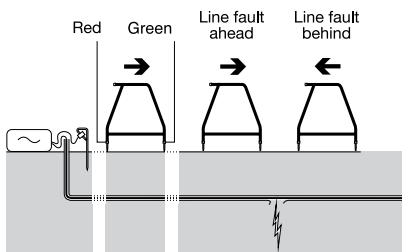
## Fault Finding using Radiodetection's A-Frame

The PCM+ system features an A-Frame. Once a PCM survey has been carried out any potential faults on the pipeline can be pinpointed using the A-frame.

### Procedure

- 1 Connect the transmitter to the pipeline and ground using the procedure described previously.
- 2 Fault find can be carried out with the PCM transmitter set to either ELCD or LFCD mode or using a Radiodetection transmitter with 8KFF.
- 3 Connect the A-frame to the PCM+ receiver via the accessory socket.
- 4 Switch on the PCM+ receiver.
- 5 Select ACVG mode or 8KFF if using an alternative Radiodetection transmitter with 8KFF using the Function Key. Fault find mode is indicated by the A-frame symbol on the PCM+ receiver display.
- 6 Place the A-frame spikes in the ground with the red spike nearest the ground stake.
- 7 The FF arrows will display the fault direction. The arrows should point away from the ground stake and the bar graph should read zero.
- 8 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.

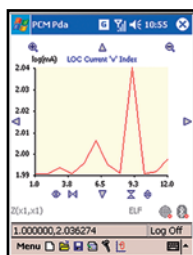
- 9 Keep the red spike facing the ground stake and keep the receiver in line with the A-Frame. Near a fault, the arrows will lock on and the dB reading will increase.
- 10 Move in the direction of the arrows. Find the point at which the arrows change direction.
- 11 Rotate through 90° and move back and forth to locate the fault in this direction, the intersection point will be directly over the fault.
- 12 Should the location of the cable become uncertain the Function key can be used to change between locate mode and FF mode.



## PCM+ results

Stored results can be uploaded via Bluetooth using Radiodetection's SurveyCERT application.

SurveyCERT is an application that receives and charts data from the PCM+. The PCM+ can send data logs via its integrated Bluetooth module to a PDA for realtime analysis or to a PC for analysis back at the office. If your PDA features a GPS receiver, the PDA SurveyCERT application will automatically integrate longitude and latitude coordinates into the PCM+ data.



For more information on SurveyCERT go to [www.radiodetection.com/pcm+](http://www.radiodetection.com/pcm+)

**Note: A PCM+ operation manual with a more comprehensive guide to using Radiodetection's PCM+ is available for download via the Radiodetection website. Go to [www.radiodetection.com/pcm+](http://www.radiodetection.com/pcm+)**

## Troubleshooting

When reporting any problem to your Radiodetection Dealer or Supplier it is important to quote the unit serial number and the purchase date.

This instrument, or family of instruments, will not be permanently damaged by reasonable electrostatic discharge and has been tested in accordance with IEC 801-2. However, in extreme cases temporary malfunction may occur. If this happens, switch off, wait and switch on again. If the instrument still malfunctions, disconnect the batteries for a few seconds.

## Safety Notices

Radiodetection products should be operated by qualified personnel only.

### WARNING

**This equipment is NOT approved for use in areas where hazardous gases may be present.**

Reduce volume before using headphones.

Batteries should be disposed of in accordance with your company's occupational health and safety procedures, and/or any relevant laws or guidelines in your country.

## Service and Maintenance

The PCM+ and the TX are designed so that they do not require regular calibration. However, as with all safety equipment, it is recommended that they are serviced at least once a year either at Radiodetection or an approved repair center.

Radiodetection products, including this user guide, are under continuous development and are subject to change without notice.

Go to **[www.radiodetection.com](http://www.radiodetection.com)** or contact your local Radiodetection representative for the latest information regarding the PCM+ or any Radiodetection product.

## Training

Radiodetection provides training services for most Radiodetection products. Our qualified instructors will train equipment operators or other personnel at your preferred location or at Radiodetection headquarters.

For more information go to **[www.radiodetection.com](http://www.radiodetection.com)** or contact your local Radiodetection representative.

## More information

For case studies or more information on the applications of the PCM+ product range, please visit **[www.radiodetection.com](http://www.radiodetection.com)**.

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