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# POLISMART

Radiation Detection on your iPhone

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## QUICK START OPERATION GUIDE

Radiation Detector  
PM1904 POLISMART® II



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Radiation Detector  
**PM1904 POLISMART® II**  
Made for iPhone® 4S, iPhone® 4



Professional technologies for public radiation protection

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## READ THIS FIRST

Thank you for purchasing this Polimaster® product. Before operating the unit, please read this manual thoroughly and retain it for future reference.

Radiation Detector PM1904 POLISMART® II is designed to continuously monitor and measure ionizing radiation from gamma emitting radiation sources and provide a visual alarm whenever the preset thresholds are exceeded. Users do not need to be experts in health physics to operate this instrument; however, understanding of basic principles of ionizing radiation is desirable for proper operation.

“Made for iPod®”, “Made for iPhone®”, and “Made for iPad®” mean that an electronic accessory has been designed to be connected specifically to iPod®, iPhone®, or iPad®, respectively, and has been certified by the developer to meet Apple® performance standards. Apple® is not responsible for the operation of this device or its compliance with safety and regulatory standards. Please note that the use of this accessory with iPod®, iPhone® or iPad® may affect wireless performance.

## PRECAUTIONS

- Keep your PM1904 charged at all times for proper exposure measurement.
- Charge the instrument for at least 4 hours before the initial use.
- Please observe all local regulations and safety procedures when working with sources of ionizing radiation.

## WARNING

The Manufacturer is not responsible for any damage or costs caused by improper understanding of the device operation(s) or reading(s). The User bears all the risks in interpreting the device output and/or making decisions based on the device operation(s) or reading(s). Please consult local laws, regulations and standards before making decisions based on the device reading(s).

## GENERAL DESCRIPTION

Radiation Detector PM1904 POLISMART® II belongs to Polimaster® new family of highly sensitive, small and efficient gamma detection devices. When ON, the device continuously measures the ambient Dose Equivalent Rate (**DER**) and the ambient Dose Equivalent (**DE**) of gamma radiation and compares those measurements to the preset thresholds. In case thresholds are exceeded **PM1904** alerts the user with flashing light signals indicating that radiation source is nearby or critical dose has been accumulated.

The operation history is stored in the instrument's non-volatile memory and may be downloaded to an iPhone® through its connector. **PM1904** can also exchange data with the iPhone® in real-time, thus transferring actual **DER** and **DE** readings to the iPhone®.

The instrument may be used both indoors and outdoors by various users who need to track environmental gamma radiation and personal exposure.

## Delivery Kit

- PM1904;
- Cable USB – micro USB;
- Quick start operation guide
- Warranty certificate
- Package

## Specifications

<b>Detector type</b>	Geiger-Müller tube
<b>DER Measurement range</b> Limits of permissible main relative DER measurement error	0.01 $\mu\text{Sv/h}$ – 13 $\text{mSv/h}$ $\pm 20\%$ in the range 1.0 $\mu\text{Sv/h}$ – 10 $\text{mSv/h}$
<b>DE Measurement range</b> Limits of permissible main relative DE measurement error	1 $\mu\text{Sv}$ – 10 $\text{Sv}$ $\pm 20\%$
<b>Energy range</b> Energy response relative to 0.662 MeV ( $^{137}\text{Cs}$ ), no more than	(0.06 – 1.33) MeV $\pm 30\%$
<b>Alarm type</b>	LED
<b>Power</b>	Rechargeable battery



<b>Charge time</b>	Up to 4 hours over micro USB
<b>Battery lifetime</b> at average background < 0.3 $\mu$ Sv/h	2200 hours
<b>iPhone® communication</b>	Dock connector
<b>Data collection</b>	500 data points
<b>Environmental:</b> temperature range humidity	0 to +50 °C up to 95 % at +30 °C
<b>Ingress protection</b>	IP30
<b>Drop Test</b>	0.7 m onto concrete surface
<b>Dimensions</b>	59 x 45 x 15 mm
<b>Weight</b>	30 g

*NOTE - For more detailed information please contact the Manufacturer or visit <http://www.polimaster.com/>*

## Instrument Design and Control

The instrument requires no control buttons and operates fully autonomously when the battery is charged. It automatically records all measurements in non-volatile memory at preset intervals. There is one LED display that can indicate the following:

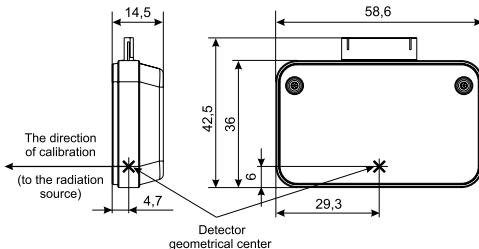
- **Green light flashing** every second – **PM1904** is connected to a PC or charger USB port, battery is charging;
- **Green light indicates the full charged battery;**
- **Green light flashing** every 10 seconds – the instrument is operating normally and background radiation is below the preset thresholds;
- **Red light** – indicates that **DER** or **DE** thresholds have been exceeded. A single red flash every second means the **DER** threshold has been exceeded; a double red flash every second means the **DE** threshold has been exceeded;
- **Orange light flashing** every 5 seconds – partial battery discharge. Please connect PM1904 to a USB port to charge the battery.

# OPERATION

The normal operation mode of PM1904 is always ON. This provides continuous monitoring and correct measuring of the Dose Equivalent of gamma radiation and provides accurate readings and measuring of background radiation. When the instrument is charged and operates normally, the green LED light flashes every 10 seconds.

If the light does not flash green, but instead flashes orange, the battery is partially discharged. If there is no light indication on the LED the battery is critically discharged. Please charge the battery of PM1904 following the procedure described below. NOTE!

*Before the first use, please allow the battery to be fully charged in a USB port for at least 4 hours.*



PM1904 detector geometrical center

## Charging PM1904

To charge **PM1904** please connect it to any USB port of a personal computer or use a wall charger with a USB slot. When the battery is charged, the Green light is always on.

A full charging cycle requires 4 hours. This will provide 2200 hours of the instrument operation under normal background conditions. The Manufacturer recommends charging **PM1904** for 4 hours every month, to ensure reliable operation of the instrument for at least 1000 hours and to extend lifetime of the battery.

### **NOTE!**

*If the battery is partially discharged an orange LED light flashes every 5 seconds.*

### **IMPORTANT!**

*After partial battery discharge indication appearing the instrument keeps working for 16 hours. Using PM1904 in the environment with radiation background higher than 0.1 mSv/h it is recommended to charge fully PM1904 before operation.*

## Normal Operation Mode and Alarms

After PM1904 is charged and disconnected from the power source it is ready for autonomous operation. The green light flashes every 10 seconds and the instrument continuously measures DER and DE of gamma radiation and compares it to the preset thresholds.

If the thresholds are exceeded, PM1904 alerts the User with a red LED indicator. If the DER threshold is exceeded the instrument flashes the red LED light every second. If the DE threshold is exceeded, the red LED light flashes twice every second.

Manufacturer's preset values are the following:

- DER Threshold 1: 1.0  $\mu\text{Sv/h}$
- DER Threshold 2: 10  $\mu\text{Sv/h}$
- DE Threshold 1: 10 mSv
- DE Threshold 2: 10 Sv

When the DER threshold is exceeded that usually means there is a source of radiation nearby and the general course of action is to leave the area (the radiation rate drops significantly as the distance from the radiation source increases). The red DER alarm will stop

after background radiation drops below the preset threshold.

When the DE threshold is exceeded it doesn't necessarily mean that there is a radiation source nearby. Moreover, the red DE alarm will not stop even if the current background radiation level returns to its normal state. This usually means that the User has been in the increased radiation background field for too long and the risk of damaging effects to personal health is elevated. Please consult health specialists in such circumstances or in case of any uncertainty.

The red DE alarm can be reset only by connecting PM1904 to an iPhone® and using the User Software.

### ***IMPORTANT!***

*To set up suitable values for thresholds and/or to get instructions for dealing with any given value of DER/DE the user should consult authorized licensed specialists. The User assumes full responsibility for compliance with applicable laws, regulations, and standards in connection with the use of the device. Additionally, the User bears all the risks in interpreting the device output and/or making decisions based on the device operation(s) or reading(s).*

To set new thresholds, and/or reset current DE value to zero, connect PM1904 to an iPhone® and use the User Software.

## Recording Data to Internal Memory

When operating normally, PM1904 records current DER and DE values to the internal memory. The interval of recording can be set within the values from 1 to 1000 minutes using the supplied User Software. The Manufacturer's preset value is 1 hour.

All data recorded into the instrument's memory are time stamped with the internal instrument clock. When the instrument is connected to the User Software over the connector for the first time, it will prompt to synchronize the internal PM1904 clock with the iPhone®. It is recommended to synchronize time with the iPhone® every time data is downloaded from PM1904 into the iPhone®. Otherwise the timestamps of the DE and DER readings might not be correct.

### **IMPORTANT!**

*After complete battery discharge (no LED indication) the internal instrument time as well as data recording stops. Thus after recharging the instrument it is recommended to synchronize time with an iPhone® in order to have proper timestamps of the DER and DE readings in the instrument non-volatile memory.*

## COMMUNICATION WITH iPhone®

PM1904 POLISMART® II communicates with an iPhone® by using iOS App available on the App Store.

It allows setting up User's thresholds and data recording intervals, synchronizing the internal instrument time, downloading event data stored in the instrument memory to the database and working with the instrument over the iPhone® in real-time data exchange mode.

## TROUBLESHOOTING

Most of the problems that have been analyzed can be traced to low battery power, so troubleshooting in the field is limited to charging the battery regularly. This is especially important if you are planning to stay in an environment with elevated radiation background.



# SOFTWARE USER MANUAL

## Working with the detector

For working with the PM1904 you should download free POLISMART® program from App Store.

### **iTunes, via USB:**

Connect the iPhone® to your computer. Launch iTunes.

Go to “iTunes Store”.

Search for the program by typing in the search box: “polismart”.

Select the POLISMART® program from the directory. Select the **FREE** button (or select the price).

Enter your account information: name and password.

The selected file will be downloaded to your computer.

You can see the “Programs” tab for downloaded programs.

Click the “iPhone” tab.

In the top menu select “Programs” tab and make sure the “Sync.” box is checked.

Click “Apply” to synchronize programs with the iPhone®.

Application is being installed.

### **Via Wi-Fi from App Store:**

Open App Store on the iPhone®.

Search for the program by typing in the search box: “polismart”.

Select the POLISMART® program from the directory. Select the **FREE** button (or select the price).


Select **INSTALL** or **BUY NOW** options.

Enter your account information: name and password.

Application is being installed.

### **Connect the detector to the iPhone® connector.**

Connect the detector to the iPhone® connector.

Select the button with the yellow-black radiation sign  and “Polismart” inscription.

The startup screen will appear. The iPhone® will define the detector.




## Dashboard screen.

The DER value appears after the detector initialization is complete. The statistical error of average measured value will be displayed in the middle of the screen to the right from the DER value.

The DER values can be read when the statistical uncertainty is 20 % and less.




The **Dose Rate** and **Dose** buttons are used to switch the detector between the gamma-radiation DER measurement mode (indication units are  $\mu\text{Sv/h}$ ,  $\text{mSv/h}$ ,  $\text{Sv/h}$  or  $\mu\text{R/h}$ ,  $\text{mR/h}$ ,  $\text{R/h}$ ), and the DE measurement mode (indication units are  $\mu\text{Sv}$ ,  $\text{mSv}$ ,  $\text{Sv}$  or  $\mu\text{R}$ ,  $\text{mR}$ ,  $\text{R}$ ), the DE accumulation time is displayed in days, hours and minutes.

While in the DER measurement mode press the **Reset** button to reset accumulated DER statistical data and to restart a new accumulation. Press the button  (in the upper right corner) to open the settings window where the User can change DER thresholds, DER measuring units, enable or disable the sound alarm or restore the settings by default. The default DER threshold settings are:

DER Threshold 1:  $1.0 \mu\text{Sv/h}$ ;

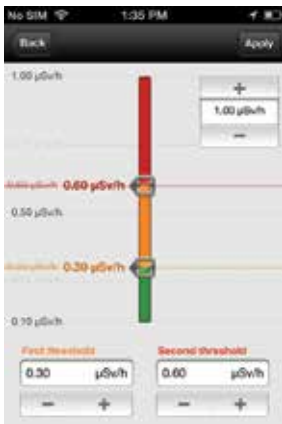
DER Threshold 2:  $10 \mu\text{Sv/h}$ .

While in the DE measurement mode press the **Reset** button to reset the accumulated dose and DE accumulation time values. Press The button  (in the upper right corner) to open the settings window where the User can change DE thresholds, DE measuring units, enable or disable the sound alarm or restore the settings by default. The default DE threshold settings are:


DE Threshold 1:  $10 \text{mSv}$ ;

DE Threshold 2:  $10 \text{Sv}$ .

The **Waypoint** button allows the User to save the current DER and DE value into the iPhone® memory in accordance with the actual GPS-position. Press Add to save the value.





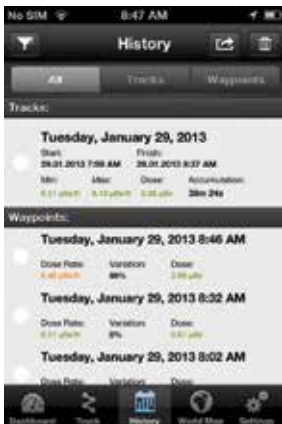


Press the **Track** button  to switch the device to the tracking mode. Press the **Record** button to save the route in accordance with the current track settings.





Press the **History** button to open the history window displaying events/values stored in the instrument memory. Saved events can be sorted by time, alarm or name\*. The User can send saved data by e-mail, to the Facebook® or to the Twitter® by pressing the **Send** button . Press the **Delete** button  to clear the screen and the instrument memory. Software will suggest the User to save the data.



*\*Reading of big amount of data stored in the instrument can take a considerable time. You should wait until the end of the process of reading, which is illustrated by circular processing bar.*



Press the **World Map** button to enter the World Map mode. This mode allows viewing the map with the waypoints stored in the iPhone® memory. Current user location is marked on the map as a blue point. Touch this point to see a pop-up message on current user location. To zoom the map in/out: double press or slide the fingers on the iPhone® screen.





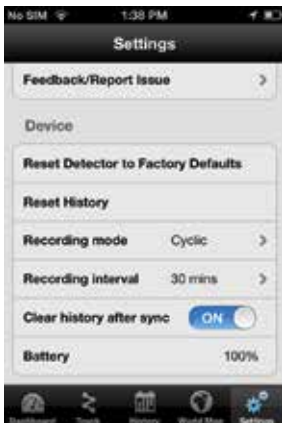


Press the **Settings** button to open the settings window. This mode allows the User to choose settings of the device:

**Units** – Imperial (yard, mile) or Metric (meter, kilometer);

**Readings** – Sv (Sievert) or R (Roentgen);

**Start Screen** – Dashboard (by default);



**Sound OFF by Shake** – switching off the sound alarm when the instrument is being shaken;

**Auto Save Waypoints** – track auto save On/Off;

**Auto Save Period in sec** – set an interval for waypoints automatic record into history. Interval setting discreteness is 1 second. Recommended time interval – 60 seconds or larger;

**Terms and Conditions** – a license agreement on using the software together with the instrument;

**Version** – installed software version;

**Device** – instrument type and its serial number;

**Feedback/Report Issue** – sent a report to the manufacturer support department;

**Restore to Defaults** – set default instrument parameters.



Thank you for choosing

**POLISMART® II**  
Designed by POLIMASTER

For technical support please contact us via WEB.

The contact form is available on our website

<http://www.polimaster.com/support>

[www.polimaster.com](http://www.polimaster.com)

[www.polimaster.eu](http://www.polimaster.eu)

[www.polimaster.us](http://www.polimaster.us)

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