



Ion-Hound

Handheld Ion Chamber
Survey Instrument

User Manual

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Important Information

Copyright Statement

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Unpacking and inspection

Begin by inspecting the shipping carton for any signs of damage. Although there are no detailed unpacking instructions, handle the instrument carefully to prevent damage, particularly to the delicate Mylar® foil beneath the beta shield. Once unpacked, thoroughly examine the instrument for any visible damage, such as dents, scratches, or broken components.

Technical Support

For support with applications or answers to technical queries, please either e-mail info@southernscientific.co.uk or call for support on +44 (0) 1273 497600

Warning

Unauthorised user modifications or use beyond the published specifications may lead to electrical shock hazards or improper operation. Southern Scientific will not be liable for any injuries sustained as a result of unauthorised equipment modifications.

Manufacturing Location

The Ion-Hound is manufactured by Southern Scientific at the address listed on the back page.

Explanation of Icons



Risk of Electric Shock



Caution



Note



Inspection



Warning, Prohibition



Maintenance Action

1. Introduction

This User Manual provides essential information for the safe and effective use of the Southern Scientific Ion-Hound.

The Ion-Hound is a compact, portable, handheld ionisation chamber that provides highly sensitive directional dose equivalent ($H'(0.07)$) rate and ambient dose equivalent ($H^*(10)$) rate measurements from mixed radiation fields (beta, gamma, and X-ray radiation). It utilises an approx. 430 cm³ open-air chamber, is lightweight, easy to use, and manufactured in the UK.

The device provides dose rate measurements across six manually selectable ranges, with an effective range of 0.5 μ Sv/h to 500 mSv/h. It features real-time data streaming via the USB-C port, while a built-in, full-colour backlit LCD screen displays measurements and the instrument's status. Ergonomically designed with a robust housing and a handle for single-handed operation, the Ion-Hound boasts a familiar, industry-standard design, incorporating additional connectivity and ease-of-use features.

The Ion-Hound is an excellent like-for-like replacement for existing ionisation chamber instruments and is suitable for a range of application areas, including:

- Nuclear
- Defence
- Medical and Health Physics
- Research

Target Audience

This User Manual is intended for professional users, and maintenance personnel. Professional users are expected to have a good understanding of similar ionisation chamber instruments and their functionality, whereas maintenance personnel are expected to be familiar with working on and repairing similar instruments of the same type.

Compliance and Standards

The Ion-Hound complies with the following regulations and standards:

- EN IEC 61326-1:2021
- BS EN 60529:1992+A2:2013
- BS EN 60846-1:2014 (Partial Compliance)

See the Declaration of Conformity for full details.

Intended Use

The Ion-Hound Ion-Chamber Survey Instrument is a hand-held, battery-operated dose-rate measurement device designed to measure beta, X-ray, and gamma radiation. It uses a slidable beta shield to measure both directional and ambient dose equivalent rate.

2. Important Safety Information



General Safety Guidance



- Read and understand this manual before operating the device.
- Only trained and authorised personnel should use the device.
- Only trained and competent calibration professionals should calibrate the device.
- Do not modify or tamper with the device in any way other than instructed how in this manual, as doing so may affect its accuracy and safety.
- Always follow local radiation safety regulations and guidelines.
- Use the detector only for its intended use (see the intended use section above; see also the device specification for device limits).
- Ensure the instrument is used within the specified environmental conditions.



Electrical Safety Guidance



- The device utilises a permanently on ~60 Vdc chamber bias voltage. To avoid potential electric shock, the device should not be opened by untrained professionals.
- Use only manufacturer-approved batteries.
- Keep the device away from strong electromagnetic fields that could interfere with readings.



Handling and Maintenance Safety



- Inspect the device before each use for any visible damage or defects.
- Always allow a warm-up time when switched on of at least 2 minutes 30 seconds before taking any measurements.
- If the instrument malfunctions or provides inconsistent readings, discontinue use and contact the manufacturer.
- This instrument must be calibrated on an annual basis (the device includes a built-in service reminder).
- Store the instrument in a dry place when not in use.
- Please observe all local rules for disposal of this device.

3. Device Specification

Detector Details	
Type	Open Air Ionisation Chamber
Volume	430 cm ³
Mass per unit area	Window: 7.0 mg/cm ² Beta Shield: 680 mg/cm ²
Collecting Potential	60 V

General	
Dose Rate Ranges	0 - 5 µSv/h 0 - 50 µSv/h 0 - 500 µSv/h 0 - 5 mSv/hv 0 - 50 mSv/h 0 - 500 mSv/h
Effective Range	0.5 µSv/h - 500 mSv/h
Measurement Qualities	$\dot{H}'(10)$ and $\dot{H}'(0.07)$
Statistical Fluctuations	1 µSv/h – 10.3% 15 µSv/h – 2.1% 150 µSv/h – 1.3% 1 mSv/h – 0.4% 20 mSv/h – 0.4% (Measured using ¹³⁷ Cs)
Warm-Up Time	<2 minutes 30 seconds
Response Time	0 - 5 mSv/h – 5.4 seconds 0 - 50 mSv/h – 4.9 seconds 0 - 500 mSv/h – 0.6 seconds (Measured using ¹³⁷ Cs)

Energy Range	
Photons	H'(0.07) 10 keV - 250 keV H'(10) 59 keV - 1.33 MeV
Beta Radiation	H'(0.07) 200 keV - 2.0 MeV

Energy Dependence		
Photons (H'(10)	Energy (keV) ~59 (²⁴¹ Am) 662 (¹³⁷ Cs) 1332 (⁶⁰ Co)	Relative Response 0.84 0.99 0.98
Photons H'(0.07)	Energy (keV) 16 33 ~59 (²⁴¹ Am) 65 83 118 248	Relative Response 1.25 0.88 0.99 0.94 0.91 0.87 0.93
Beta Radiation	Nuclide ⁹⁰ Sr/ ⁹⁰ Y ⁸⁵ Kr ¹⁴⁷ Pm	Relative Response 1.07 0.60 0.94

Environmental Conditions	
Operating	-10 °C to +40 °C
Storage Temperature Range	-25 °C to +50 °C (without batteries)
Relative Humidity Temperature Range	Max. 85% (tested at 35 °C)

Power Supply	
Batteries	6 x 1.5 V C Cells (LR14)
Battery Life	Approx. 40 hrs

Mechanical	
Dimensions	200 (W) x 126 (D) x 216 (H) mm
Weight	1.4 kg (3.1 lbs) (without batteries)
Display	320 x 480 3.5" LCD display
Complies with	BS EN 60846-1:2014 (Partial Compliance) EN IEC 61326-1:2021 CE Marked

4. Components

The basic equipment of the Ion-Hound includes:

- Device packaging.
- Ion-Hound Main Unit.
- 2x Replacement Mylar® Covers.
- 6x Batteries (LR14, C cells).
- USB Stick (Including a copy of the User Manual and Ion-Hound Application Software).
- 2 m USB-A to USB-C Cable.

The following equipment are optional accessories and replacement parts:

- Protective Hardshell Peli Case with Custom Foam Cutouts.
- Replacement Batteries.
- Bias Batteries (21 x CR1225).
- Replacement Mylar® Cover.

5. Control Elements

The Ion-Hound device has four control elements as listed below:

- 1. Main Switch.
- 2. Zero Switch.
- 3. Left and Right Screen Buttons.
- 4. Beta Shield.



5.1 Main Switch

The Main Switch is used to turn the device on/off and allows the user to select from the following device functions:

1. Battery.
2. Zero.
3. Dose Rate Ranges (5 $\mu\text{Sv/h}$ to 500 mSv/h).

Battery

Choosing the battery function displays two battery gauges on the screen, as shown in Figure 1.

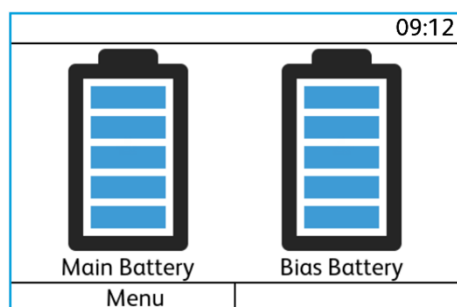


Figure 1. Battery Screen.

The two gauges represent the two internal batteries. The main battery powers the device and is comprised of six LR14 (C Cell) batteries. The nominal battery voltage for the main voltage is between 5.5 VDC to 9.0 VDC. The second gauge represents the bias battery, which provides the bias voltage needed by the ionisation chamber and is comprised of ten CR1225 batteries. The nominal voltage of the bias battery (combined) is 28.0 Vdc to 32 Vdc.

Zero Switch

Choosing the zero function displays the zero screen, as shown in Figure 2.

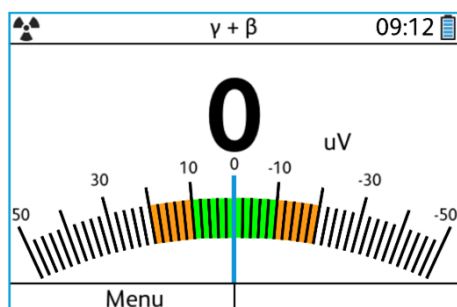


Figure 2. Zero Screen.

Ion-Hound

The zero screen allows the user, in combination with the Zero switch, to correct any internal error in the measurement circuit. By turning the zero switch either clockwise or anticlockwise the error can be reduced to zero. It is recommended that whenever the device is used the error zero switch be used to reduce the measurement error.



Failure to properly zero the instrument may result in incorrect readings. The zero switch should not be adjusted once set during measurements.

Dose-Rate Ranges

Choosing any of the dose rate ranges displays the relevant dose rate screen, as shown in Figure 3, for the lowest rate range (5 $\mu\text{Sv/h}$).

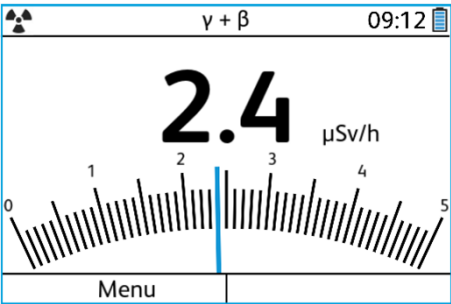


Figure 3. Dose Rate Screen for the 5 $\mu\text{Sv/h}$ range.

The dose-rate screen displays the current measurement of the device in both numerical and familiar bar graph format.

5.2 Zero Switch

See the above section on the Zero function accessible via the main switch. The zero switch allows the user to correct any internal error in the measurement circuit.

5.3. Left and Right Screen Button

The left and right screen buttons allow the user to interact with the Ion-Hounds digital interface. The screen shows the button action above the button position in the two rectangles at the bottom of the screen. For example, on any of the dose-rate range screens, the left button opens the Main Menu, see Figure 3 above.



The Beta Shield should only be actuated using the finger taps built into the Beta Shield. Failure to properly actuate the Beta Shield risks damaging the Mylar[®] window and can lead to erroneous results.

6. Getting Started Guide

1. Remove the Ion-Hound from the packaging and inspect the unit for any damage. Pay special attention to the fragile Mylar® window, which should be intact with no abrasions or holes. If the device is damaged, do not continue and contact the manufacturer.
2. Ensure the beta shield slide is in the up position covering the chamber. Remove the four screws using a PZ1 Screwdriver retaining the battery cover and remove the battery cage. Insert the six LR14 batteries into the battery cage, ensuring they are placed in the correct orientation. Reconnect the battery cage to the battery connector and reinsert the battery cage into the Ion-Hound main body, ensuring it is inserted in the proper orientation.
3. Use the main switch to switch the Ion-Hound to the battery screen; if the batteries used in step (2) are new, the main battery gauge should be full, indicating full battery power, as well as the bias battery.
4. Wait two and a half minutes for the device to warm up.
5. Use the main switch to switch the Ion-Hound to the zero screen, and use the zero switch to adjust the internal electrical offset to zero.
6. Use the user interface buttons to adjust the device screen brightness for optimal readability.
7. Ensure no errors are displayed. If no error messages are displayed the device is ready to take measurements.
8. Use the main switch to switch the Ion-Hound to the dose rate range of choice. Starting with the lowest dose rate range and working up the ranges ensures you're always in the most optimal measurement range.

7. User Interface

7.1 Menu Structure

The menu structure can be accessed from any default screen (Battery, Zero and Dose-Rate Screens) by pressing the left screen button. This displays the Main Menu screen, as shown in Figure 4.

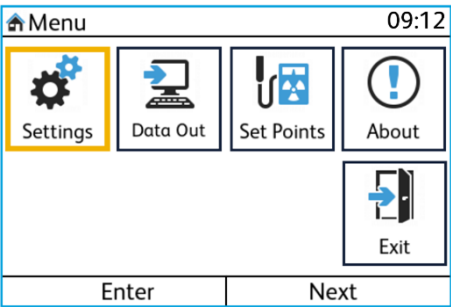


Figure 4. Main Menu Screen.

From the main menu screen, the following menu structure is accessible:

- 7.1. Menu Structure
 - 7.1.1 Settings Screen
 - 7.1.2 Brightness Screen
 - 7.1.3 Time Screen
 - 7.1.4 Date Screen
- 7.2 Data Out Screen
- 7.3 Set Points Screen
- 7.4 About Screen
- 7.5 Exit

The menu structure options are further discussed below.

7.1.1 Settings Screen

From the settings page, the following settings are available: Brightness, Time and Date. As shown in Figure 5. Note the screen button actions change function depending on the current screen displayed.

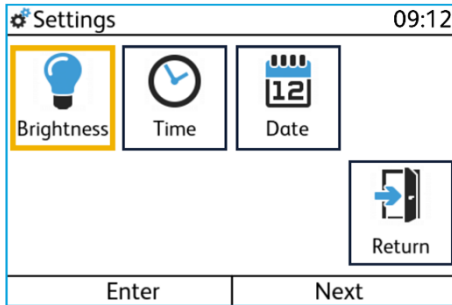


Figure 5. Settings Screen.

7.1.2 Brightness Screen

The brightness screen is shown in Figure 6. This screen allows the user to be able to modify the screen brightness in increments of 20% from 20% to 100%.

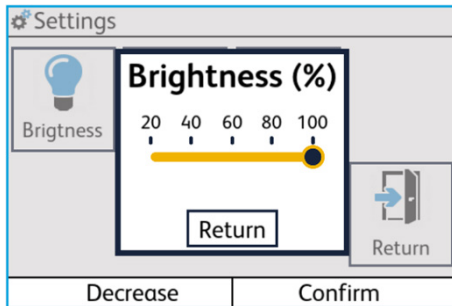


Figure 6. Brightness Screen.

7.1.3 Time Screen

The time screen is shown in Figure 7. This screen allows the user to be able to modify the time saved on the device. Please note the device does not have any internal day light saving correction and will need to be changed during the year.

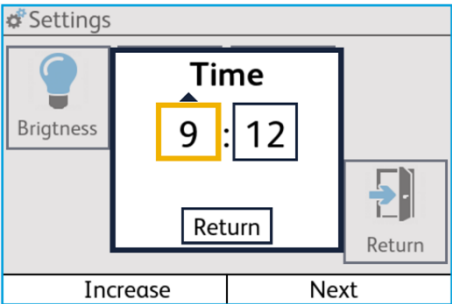


Figure 7. Time Screen.

7.1.4 Date Screen

The date screen is shown in Figure 8. This screen allows the user to be able to modify the date saved on the device.

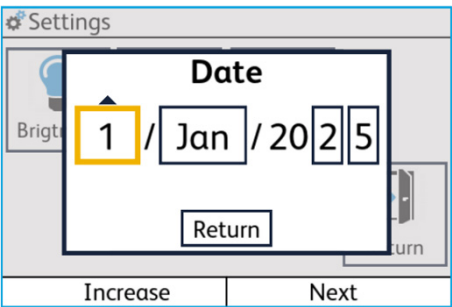


Figure 8. Date Screen.

7.2 Data Out Screen

The data out screen allows the user to turn on or off the serial communication via the device's USB-C port. The device comes as default with this setting turned off. Activating this setting allows the device to be connected to a PC to externally adjust the data set points and receive data remotely. As shown in Figure 9.

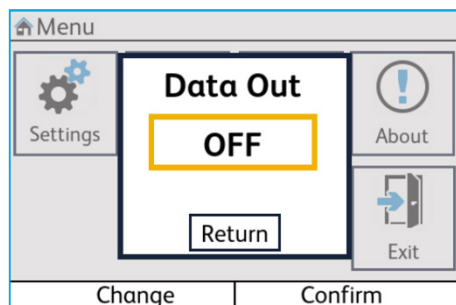


Figure 9. Data Out Screen.

7.3 Set Points Screen

The screen is shown in Figure 10. The Set Points screen displays the two calibration factors for the device. First, the dose calibration factors are shown, and beneath them is the current calibration. Both calibration set points are set by the manufacturer. The current factors correct the analogue-to-digital current read-back error and should never be modified by the user. The dose factors adjust the current-to-dose-rate conversion and may need to be changed by the calibration facility or customer. Please note: It is not possible to alter the calibration set points on the device; to change them, the Ion-Hound Application Software must be used; this is intended to prevent any accidental alteration of important settings.

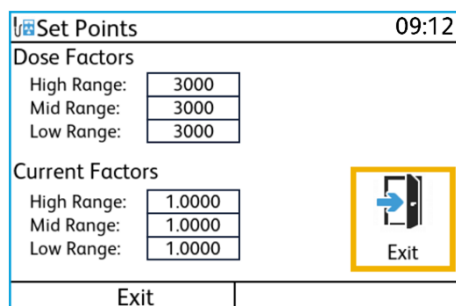


Figure 10. Set Points Screen.

7.4 About Screen

The About screen, shown in Figures 11 and 12, displays information related to the specific Ion-Hound, including the Firmware Version, Serial Number, Manufacture Date, Last Calibration Date, Calibration Due Date in date format DD/MM/YYYY, and the manufacturer's contact information.

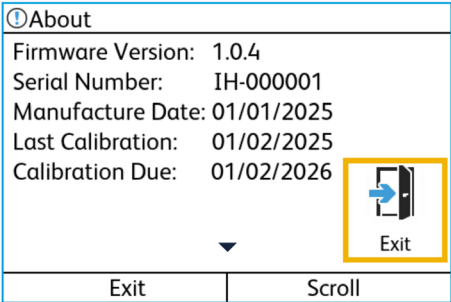


Figure 11. About Screen.

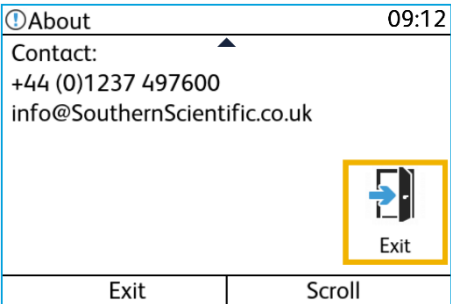


Figure 12. About Screen Continued.

7.5 Exit

The Exit button allows the user to return to the main function screen determined by the main switch position, i.e. the Battery, Zero or Dose Rate Range screens.

8. Taking a Measurement

1. Ensure all the steps in the 'Getting Started Guide' have been completed.
2. Choose which dose equivalent rate quantity is desired and slide the Beta Shield into the correct position accordingly:

Dose Equivalent Quantity	Beta Shield Position
$\dot{H}^*(10)$	The Beta Shield should be in the closed position and covering the Mylar® opening. The display indicates 'γ' at the top of the screen, signifying that the device is measuring only gamma radiation.
$\dot{H}^*(0.07)$	The Beta Shield should be in the open position and not covering the Mylar® opening. The display indicates 'γ + β' at the top of the screen, signifying that the device is measuring both gamma and beta radiation.

3. Use the Main Switch to set the device to the lowest dose rate range (5 μSv/h) and wait for the reading to return to zero (The reading may not return to zero in a high background environment).
4. Expose the Ion-Hound to the radiation field of interest, by pointing the Ion-Hound towards the radiation source.



To ensure an accurate measurement, maintain a sufficient distance between the source and the Ion-Hound. Note that the entire volume of the Ionisation Chamber should be encompassed by the radiation field to provide an accurate measurement. For example, measuring a point source on contact with the Ion-Hound will not result in an accurate response.

5. When the reading is above the dose-rate range of the Ion-Hound the display will instruct the user to change range. Upon changing range allow the reading to settle.
6. If desired, the Ion-Hound can be connected to a PC running the Ion-Hound Application software. Only used the supplied USB cable to connect the Ion-Hound to the PC. The data out setting must be set to 'On' for the visualiser software to receive data.

9. Using the Ion-Hound Application Software

On your Ion-Hound

1. Ensure all the steps in the 'Getting Started Guide' have been completed.
2. Navigate to the 'Data Stream' settings using the keypad buttons.
3. Ensure the 'Data Stream' setting is set to 'On'.
4. Plug in the provided USB-C to USB-A USB cable into the Ion-Hound.

On your PC

1. Install the Ion-Hound Application Software using the provided USB stick, note the minimum PC requirements below.
Minimum PC Requirements:
 - Intel/AMD CPU.
 - Windows 10 or 11 (64-bit).
 - Approximately 1 GB of free disk space.
 - 4 GB RAM.
2. Connect the USB-C to USB-A USB cable to an available USB-A port on your PC.
3. The software will recognise the Ion-Hound is connected and add COM Port to the 'Select Connection' drop down. Select the COM Port associated with the Ion-Hound. When connected, the software will state the serial number of the connected device.
4. The software can now receive data from the Ion-Hound device.

Software Functionality

The Ion-Hound Application software can be used to record data from the Ion-Hound and save it to a PC for further analysis. The file is saved as a CSV file, which can be opened using Microsoft Excel or equivalent data processing programs.

The software allows the user to pause the incoming data stream, clear the graph and save the recorded data; further information on each function is provided below.

Pause Readings

The pause reading function allows the user to stop and start receiving data from the Ion-Hound.

Clear Chart

The clear chart function allows the user to clear the saved data from the chart; this also clears the data from memory. The save function must be used prior to the clear function if the user intends to save the recorded data.

Save to CSV

The save to CSV function opens a new window allowing the user to save the recorded data to a '.csv' file. The maximum recording length is 10 minutes. The window allows the user to select the save location and a new file name. The default location is the user's Documents folder.



10. Storage, Handling, Cleaning and Transport Instructions

10.1 Storage

- Store the detector in a cool, dry place, ideally between -25 °C to 50 °C avoiding areas with humidity above 85% RH.
- When not in use, keep the instrument in its protective storage case to protect against dust, moisture, and accidental impacts.
- If the device will be stored for more than three months, remove the main batteries and store them separately.

10.2 Handling

- Always grip the device by its handle to prevent accidental damage to the delicate Mylar® foil.
- Avoid rough handling, excessive force, or impact, as this can harm the instrument.

10.3 Cleaning

- Should the instrument require cleaning, the instrument must first be powered down.
- Use an appropriate cleaning agent, such as alcohol-based wipes or a damp cloth with a gentle cleaning solution, to clean the exterior surfaces.
- Efforts have been made to reduce the number of small contamination traps; however, areas like screw heads do pose a potential hard to clean contamination trap, in these areas the manufacturer recommends using DeconGel to aid decontamination efforts.
- Avoid using concentrated solvents (e.g., Acetone or Methanol), as they may damage the device casing.
- Gently wipe the surface, ensuring no excess liquid enters any openings or connectors.
- The device must not be immersed in any liquid as this will cause damage to the device.

10.4 Transport

- When transporting, always secure the instrument in its original packaging to protect the device against shocks and vibrations.
- It is recommended to transport the Ion-Hound with the beta shield in the closed position.
- In case of transport delays, it is recommended to remove the batteries during shipping.

11. Service Information

11.1 Annual Calibration

It is recommended that the Ion-Hound be calibrated on an annual basis.

The internal Calibration Due alert is set for 12 months from the date of calibration. The Ion-Hound should only be calibrated by trained personnel; returning the device to the manufacturer for calibration is recommended.

11.2 User Serviceable Parts

The Ion-Hound has minimal serviceable parts; the Mylar® cover and both the Main and Bias Batteries are the only parts recommended for the user to service.

Mylar® Cover

The Mylar® covers are easily damaged and hence they have been designed for easy serviceability. Please follow these instructions when replacing the Mylar® cover.

1. Ensure the device is powered off by turning the Main Switch to the 'Off' position.
2. Slide the Beta Shield into the open position.
3. Remove the four M2.5 PZ1 screws securing the Mylar® cover in place using a PZ1 screwdriver.
4. The Mylar® cover is now free to be removed from the Ion-Hound.
5. Insert the new Mylar® cover, ensuring the plastic frame is in the correct orientation facing up.
6. Replace the four M2.5 PZ1 screws securing the Mylar Cover in place using a PZ1 screwdriver.
7. Slide the Beta Shield into the closed position. Note: It is recommended to keep the Ion-Hound with the Beta Shield in the closed position when not in use to avoid accidental damage to the delicate Mylar® film.



To view various maintenance videos for the Ion-Hound, scan the code.

Main Battery

The Main Battery is easily replaced. Please follow these instructions when replacing the Main Battery.

1. Ensure the device is powered off by turning the Main Switch to the 'Off' position.
2. Place the Ion-Hound on its slide and ensure the Beta shield is in the closed position.
3. Unscrew the four PZ1 screws retaining the battery cover and remove the battery cover.
4. Remove the battery cage from the Ion-Hound and carefully unclip the battery connector.
5. Remove the six 'C' cell batteries and replace them with new batteries. The manufacturer recommends Procell Intense Power C LR14 Batteries for the best performance. It is strongly recommended not to replace some of the batteries; all batteries should be replaced at the same time.

6. Reclip the battery cage to the battery connector.
Please Note: that the connector only fits on one polarity.
7. Reinsert the battery cage into the Ion-Hound.
Please Note: The battery cage must be inserted in the correct orientation. Insert the battery cage so that the connector lines up with the hole in the top of the battery compartment.
8. Place the battery cover into the slot over the battery cage.
Please note: The battery cage must be placed in the correct orientation with the beta shield stopper at the bottom of the case.
9. Reinsert the four PZ1 screws that secure the battery cover in place.
10. Check the device powers on correctly by switching the main switch to the 'Battery' position, the main battery should read completely full.

Bias Battery

The Bias Battery can be easily replaced. Please follow these instructions when replacing the Bias Battery.

1. Ensure the device is powered off by turning the Main Switch to the 'Off' position.
2. Place the Ion-Hound on its slide and ensure the Beta shield is in the closed position.
3. Unscrew the four PZ1 screws securing the two halves of the case together.
4. Gently pull the two halves of the case apart.
Please Note: There is a fragile cable connecting the two halves of the case. Be careful when separating the two halves of the case so as not to damage the cable or associated connectors.
5. Locate the Bias battery cage in the bottom right-hand corner of the circuit board attached to the top half of the case.
6. Gently unclip the top portion of the battery cage away from the bottom part and remove the twenty coin cell (CR1225) batteries.
7. Replace the batteries with twenty new CR1225 coin cell batteries.
Please note: The polarity of the battery is marked both on the batteries themselves and the battery holder, ensure the batteries are inserted in the correct polarity.
8. Replace the battery cage by clipping it over the top of the batteries.
9. Reinstall the cable connecting the two halves of the case.
10. Gently close the two halves of the case together.
11. Re-screw the four PZ1 screws securing the two halves of the case together.



To view various maintenance videos for the Ion-Hound, scan the code.

12. Alerts / Error Messages

Calibration Due Alert

The Calibration Due alert will display on the screen when the Calibration Due Date is surpassed. The Ion-Hound should not be used for measurements when it is out of calibration. Pressing 'OK' clears the alert. Please see the Service Information section for details on required maintenance. The Calibration Due Alert is shown in Figure 13.

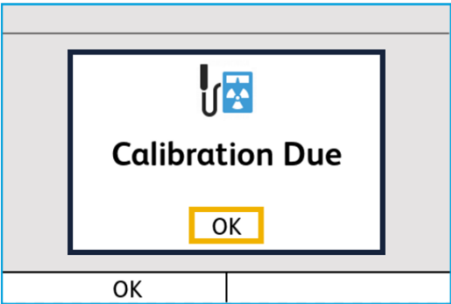


Figure 13. Calibration Due Alert.

Low Battery Alerts

The Low Battery alert displays on the screen when the Main Battery or Bias Battery is too low and could prevent nominal performance. The Ion-Hound should not be used for measurements when either the Main Battery or Bias Battery are low. Pressing 'Back' clears the alert. Please see the service information section for details on required maintenance, such as changing the batteries. The two Low Battery Alerts are shown in Figures 14 and 15.

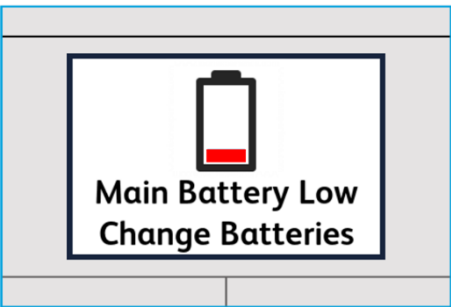


Figure 14. Low Main Battery Alert.

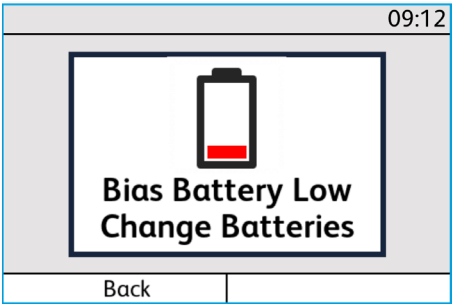


Figure 15. Low Bias Battery Alert.

Shield Error Alert

The Shield Error alert displays on the top of the screen when the Beta Shield is not detected in the closed or open position. The Beta Shield should be moved to sit in either the closed or open position to prevent inaccurate measurements. The Shield Error Alert is demonstrated in Figure 16.

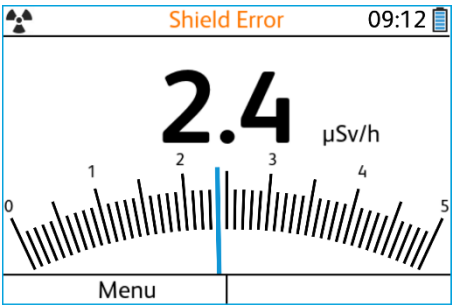


Figure 16. Shield Error.

Change Up and Change Down Alert

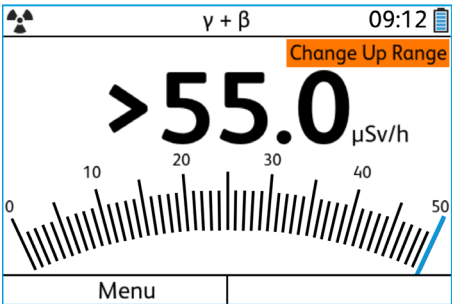


Figure 17. Change Up Range Screen.

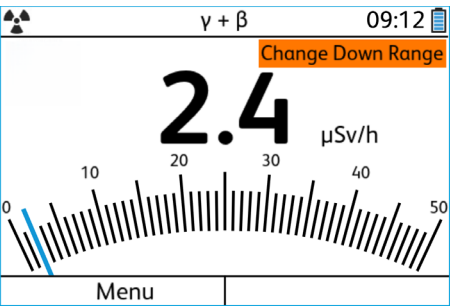


Figure 18. Change Down Range Screen.

13. Troubleshooting

Symptom	Possible Solution
The device does not power on	Verify that batteries are correctly inserted. Check battery contacts for corrosion. Replace batteries if necessary. Contact the manufacturer if the problem continues.
Inaccurate or fluctuating readings	Confirm that the device calibration is up to date, and send the device for calibration if required. Ensure the mylar foil is not damaged. Contact the manufacturer if the problem continues.
The display is blank or unresponsive	Ensure the device is turned on. Verify that batteries are correctly inserted. Check battery contacts for corrosion. Replace batteries if necessary. Contact the manufacturer if the problem continues.
Error messages or system errors	Refer to the error codes listed in the above section. Follow the recommended troubleshooting steps for the specific error. Contact the manufacturer if the problem continues.

Service History Record

Serial Number:

Chamber Serial Number:

[illegible]

Europe & Worldwide

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