# ATOMICX PROTON PRECESSION MAGNETOMETER

# **ATOMICX PPM USER MANUAL**

# WELCOME

# TO THE NEXT GENERATION OF

# **PROTON PRECESSION MAGNETOMETERS**

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# INTRODUCTION

Dear Valued User,

Welcome to the future of magnetometry!

Thank you for choosing the AtomicX Proton Magnetometer (PPM) -

a revolutionary advancement in precision magnetic field measurement. Designed with cutting-edge technology, the AtomicX PPM redefines the standards of efficiency, accuracy, and ease of use in geophysical surveys, archaeological exploration, and beyond.

With its zero-tuning technology, instant real-time data visualization, and innovative toroidal sensor, this device offers an unparalleled experience in magnetic field detection. Whether you're mapping subsurface anomalies, detecting buried structures, or conducting scientific research, the AtomicX PPM ensures you achieve the most precise results with minimal effort.

This user manual has been carefully crafted to guide you through the seamless operation of your new magnetometer. Inside, you'll find detailed instructions on setup, usage, troubleshooting, and maximizing the full potential of its powerful software.

We are excited to be part of your journey in exploration and discovery. Should you need any assistance, our support team is always ready to help.

Welcome to the next generation of proton magnetometers.

Sincerely,

The AtomicX Team

# HARDWARE OVERVIEW

### **Package Contents**

AtomicX PPM is securely packaged in a rugged IP67-rated carrying case, designed to protect against shock, dust, and water ingress. Inside the case of the Basic Package, you will find the following components:

- 1. AtomicX PPM Main Unit
- 2. AtomicX Toroid Sensor
- 3. External AtomicX Battery (4000mAh)
- 4. AtomicX Battery Charger
- 5. 10.1 inch Tablet with AtomicX Software
- 6. USB-C Tablet Charger
- 7. Tablet Protection Case
- 8. Tablet Flip Cover with Carrying Strap
- 9. Protective Bag with Belt Loop for AtomicX PPM Main Unit
- 10. Protective Bag with Belt Loop for AtomicX Battery
- 11. Belt



The Pro Package also includes the following extra items:

- 1. Coordinate Recording with High Accuracy GPS
- 2. External GPS Antenna
- 3. Mounting Tripod
- 4. Carbon Fiber Mounting Rod
- 5. Mounting Vest for AtomicX Toroid Sensor

For more information on these accessories and the additional functionality of the AtomicX PPM Pro, please refer to the accompanying documents.

### **Device Overview**

The main unit is the core of the AtomicX Proton Magnetometer, containing all essential electronics that power the device. Engineered for durability and efficiency, it features a compact yet robust design suitable for field operations in various environments.



To ensure ease of use and streamlined connectivity, all ports and connectors are conveniently positioned on the bottom of the unit.



The power button is the only physical control on the device, ensuring a simple and intuitive operation. It recognizes single clicks only—press once to turn the device on or off.

Upon powering on, a single beep confirms that the device is initialized and ready to connect to the tablet.



Holding the power button down or multiple presses should be avoided as they will not trigger any additional functions.

### **Key Operating Considerations**

- To conserve power and protect the battery, the device will automatically shut down after 10 minutes of inactivity, even when connected to the tablet.
- Avoid obstructing the Bluetooth antenna, as this may degrade connection quality and affect communication with the tablet.
- Always ensure that all connectors are securely fastened before use to prevent connectivity issues.
- While the main unit is water-resistant, it is not fully waterproof. Prolonged exposure to water or harsh weather conditions should be avoided. For additional protection, use the included waterproof protective bag.
- The main unit is equipped with protective circuitry to safeguard against sensor malfunctions and other faults. However, it contains no userserviceable parts—do not attempt to disassemble or modify it.
- The device operates using an ultra-high precision quartz crystal oscillator, which is crucial for its accuracy. To maintain optimal performance, avoid dropping or exposing the main unit to mechanical shocks, as this could damage the oscillator and affect functionality.

# **Toroidal Sensor**

The AtomicX Proton Magnetometer is equipped with a state-of-the-art toroidal sensor, designed to deliver unmatched accuracy and convenience in the field.

Unlike conventional sensors, **it requires no alignment with the Earth's magnetic poles**, allowing for effortless operation in any orientation. Its high resistance to electromagnetic interference ensures reliable readings, even in environments near power lines or other electronic disturbances. With exceptional sensitivity, it can detect even the smallest variations in the magnetic field, making it an invaluable tool for precision surveying.

Built for versatility, the sensor is lightweight (just over 1kg), tripod-compatible, and fully waterproof, tested at depths of up to 30 meters (with some extra protective accessories), making it ideal for both land and underwater applications.



### **Using the AtomicX Proton Magnetometer Sensor**

To operate the AtomicX Proton Magnetometer (PPM), securely connect the sensor cable to the designated sensor port on the main unit. **The connector features a small white alignment dot to ensure proper orientation—align it carefully before insertion to prevent damage.** 

### **Sensor Construction & Safety**

The toroidal proton sensor is built with a fully sealed, rugged construction, containing isopropyl alcohol as part of its internal design. It is engineered to withstand harsh environmental conditions and requires no user maintenance. In the unlikely event that the sensor is damaged and its internal components become exposed, immediately disconnect it and discontinue use. Under no circumstances should the sensor be operated in this state. Please contact the AtomicX support team for assistance.

### **Operational Considerations**

The omnidirectional toroidal sensor is designed to function without alignment constraints and has no dead zones. However, for optimal signal strength, the sensor's axis should be aligned parallel to the external magnetic field. This consideration is especially relevant near the equator or in regions where the Earth's magnetic field has a significant angular deviation from the sensor's axis.

### **Environmental Factors & Best Practices**

- Avoid proximity to metallic objects, as strong magnetic field gradients can significantly degrade the nuclear precession signal.
- Even non-magnetic conductive materials can interfere with measurements due to eddy currents induced during operation. Ensure the sensor is kept at a distance from such objects for the most accurate readings.
- Minimize movement during measurements—for best results, avoid rotating or shifting the sensor while data is being recorded.

### Waterproofing

 The sensor is fully waterproof and has been tested for immersion in water up to 30 meters. It can be used in both terrestrial and underwater applications without compromising performance. However some additional protective accessories are suggested for use at great depths.

# **Power & Charging**

The AtomicX Proton Magnetometer is powered by an external lithium-ion polymer battery. To operate the device, securely connect the provided cable to the battery port, **ensuring proper alignment using the small white dot on the connector**. Aligning the connector correctly before insertion is crucial to prevent damage.



### **Battery Specifications & Performance**

The magnetometer operates on a 4-cell, 14.8V, 4000mAh lithium-ion polymer battery.

- To ensure optimal performance, always use a fully charged battery before starting a survey.
- Always handle the battery with care and avoid exposing it to extreme environmental conditions to prolong its lifespan and ensure stable performance.

### Low Battery Considerations:

**Operating the device with less than 10% battery may lead to inconsistent readings**, as a stable and powerful current is required to stimulate the sensor fluid and accurately detect magnetic fields.

When the battery level drops below 2%, the device will initiate an automatic shutdown to prevent deep discharge, accompanied by three consecutive beeps as a warning signal.

### **Charging Procedure**

**1. Connect the charger to a main power source** — once powered, the charger's LED indicator will begin blinking green, signaling readiness for battery connection.

**2. Plug the charger into the battery** — the big LED indicator will turn solid red, indicating active charging.



**3. Monitor charging progress** — the process takes approximately three hours.

Once complete, the big LED indicator will turn solid green, confirming that charging is finished.



- Before powering on the device, always disconnect the charger to prevent potential electrical issues.
- Never attempt to charge the battery at temperatures below 0°C, as this can cause permanent damage to the battery cells.

# **USING ATOMICX PPM**

### **Software Overview**

### **Home Screen**

The Home Screen of the AtomicX Proton Magnetometer application serves as the central hub for device management, data visualization, and configuration. It is divided into four key sections, each designed to provide efficient access to critical functions.

		* CONNECT   MAPS   ŵ ₼
	RECENT CHARTS	RECENT MAPS
	Geological Scan - South	Ferrous Object Detection - Site B
АТОМІСХ	Geological Scan - North	Test Site 2
PROTON PRECESSION		Test Site 1
MAGNETOMETER		
Status		
Selected Sensitivity 0.1 nT		
Selected Polling Time 3 sec	ALL CHARTS	ALL MAPS
NEW MAP	NEW GRAPH BACKUP MANUAL	ô SETTINGS
•	•	

The Home Screen includes the following:

### 1. Navigation/Status Bar (Top Section)



The persistent navigation bar allows users to:

- Connect to the Main Unit from any page in the app.
- Monitor the Main Unit battery percentage.
- Access the maps and charts management system to organize and review previous scans.
- **Open the settings menu** for configuration and adjustments.
- Navigate back to the home page quickly.

This ensures users can **stay informed** and **maintain control** of the device at all times, without needing to leave their current workflow.

### 2. Device Status Panel (Left Section)



This panel displays critical information about the **paired device**, including:

- **Paired Device Serial Number** Users should verify that the serial number shown matches the label on the back of the device to ensure they are connected to the correct unit.
- **Connection Status** Indicates whether the device is connected or not connected to the application.
- Selected Sensitivity Displays the current sensitivity setting in nanoteslas (nT).
- **Polling Time** Shows the selected measurement interval in seconds.

This panel helps users **quickly verify** that the device is properly configured before conducting surveys.

### 3. Recent Maps & Charts Panel (Center-Right Section)

RECENT CHARTS	RECENT MAPS
Geological Scan - South	Ferrous Object Detection - Site B
Geological Scan - North	Test Site 2
	Test Site 1
ALL CHARTS	ALL MAPS

This section provides **quick access** to the **10 most recently created maps and charts**, allowing users to view previously recorded scans without navigating through multiple menus.

For a full list of stored maps and charts, users can select "All Charts" or "All Maps" to access the complete archive.

### 4. Toolbar (Bottom Section)



The toolbar contains **shortcut buttons** for essential functions, ensuring users can quickly access key features:

- New Map Create a new magnetic field map.
- New Graph Generate a new time-series graph of measurements.
- Backup Securely back up or recover stored data.
- Manual Open the user manual for guidance.
- Settings Access and configure advanced options.

This intuitive layout enables users to **navigate the app efficiently**, manage their projects, and ensure seamless operation of the AtomicX Proton Magnetometer.

### **AtomicX Settings**

The settings can be accessed via the persistent navigation bar located in the top-right corner of the screen or via the toolbar on the Home Screen. This menu allows users to customize device parameters, adjust measurement settings, and manage connection preferences.

	ଞ୍ଚି DEVICE	لَ) About	
4	Device Settings		
	Sensitivity: 0.1 nT		e B
	•		
	Coil Polling Time 3: sec		
6		•	
Paired Devic	Beep sound after each measurement		
Status	Special beep sound for 'NO SIGNAL' measurement		
Selected Po	Disable 'NO SIGNAL' warning		
	Show extra measurement details		
	Auto Measurement Time: 1 second Applies to the AUTO system for chart recordings		
	4		

### Below is a table outlining the available settings and their functions:

Setting	Description
Auto-Connect on	When enabled, the app will automatically attempt to
App Startup	reconnect to the last paired device upon startup.
Language	Allows the user to select the interface language. Options include <b>English</b> , <b>German</b> , <b>Greek</b> , and <b>Turkish</b> .

Select New Device	Opens a menu to scan for and connect to a different AtomicX Main Unit.
Check for Firmware Update	Initiates a check for the latest firmware updates for the AtomicX Main Unit, ensuring optimal performance and feature enhancements.
Sensitivity	Adjusts the magnetometer's detection sensitivity, measured in nanoteslas (nT). Higher sensitivity improves detection accuracy but may increase false positives, especially when using the magnetometer for metal detection. <b>Recommended Setting: 0.1 nT.</b>
Coil Polling Time	Defines the duration (in seconds) that the Main Unit supplies current to the sensor. A shorter polling time increases data frequency but <b>significantly reduces</b> <b>measurement quality</b> . To achieve the advertised accuracy, it is recommended to use a <b>minimum of 3</b> <b>seconds</b> of polling time.
Beep Sound After Each Measurement	Enables or disables an <b>audible beep</b> after each measurement cycle, providing auditory feedback during data collection.
Special Beep Sound for 'NO SIGNAL' Measurement	When enabled, the device will emit a <b>distinct two-</b> <b>beep sound</b> if it is unable to accurately detect the magnetic field during a measurement.
Disable 'NO SIGNAL' Warning	Suppresses the <b>'NO SIGNAL' warning</b> displayed in the app, preventing interruptions during data collection.
Show Extra Measurement Details	Displays <b>additional measurement details</b> during data collection and when later viewing <b>maps and graphs</b> , useful for advanced users analyzing raw measurement data.

Auto Measurement	Configures the automatic measurement duration
Time	for chart recordings.
<b>.</b>	
Restore Factory	Resets all settings to their original <b>factory defaults</b> ,
Settings	useful for troubleshooting or reconfiguring the device.

### **AtomicX Maps & Charts Managment System**

The AtomicX Proton Magnetometer software features an intuitive Maps & Charts Management System, designed for seamless data organization and accessibility. This screen can be accessed via the persistent navigation bar or through the All Charts and All Maps buttons on the home screen.

	~∕ CHARTS	888 MAPS	
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	Ferrous Objects Test - Site A		e B
	Ferrous Object Detection - Site B		🤫 💷 🍵
	Test Site 2		🔫 💷 💼
	Test Site 1		
	ADD N	EW MAP	
	4	) .	

The management system is divided into two primary categories:

- Charts Time-series measurements recorded over a period.
- Maps Geospatial magnetic field measurements for visualization in 2D and 3D.

Every time a new chart or map is created, it is automatically added to the respective list, making this the central hub for all recorded measurements.

### **Chart Management**

Each chart entry includes two quick-action buttons:

- 1. **Rename** Allows renaming the chart for better organization.
- 2. **Delete** Permanently removes the chart from the system.



Simply tapping on a chart opens the **Main Chart Screen**, where users can **view recorded measurements** and **even continue adding new data**.

### **Map Management**

Each map entry includes three quick-action buttons:

- 1. Add Data Reopen a previously closed map to add more measurements.
- 2. **Rename** Modify the name for better organization.
- 3. **Delete** Remove the map permanently.



Tapping on the name of a completed map enters **Viewing Mode**, allowing users to **analyze survey data** in **2D or 3D** and use **filtering tools** for enhanced visualization.

# **Data Display Modes**

The AtomicX Proton Magnetometer software offers multiple data visualization modes to help users analyze and interpret measurement results effectively. These include:

- Time Graph Mode (1D) A time-series plot of magnetic flux values.
- 2D Map Mode A top-down visualization of collected survey data.
- **3D Surface Mode** A three-dimensional representation of magnetic field variations.



### Time Graph Mode (1D)

The Time Graph Mode provides a 1D representation of recorded magnetic flux values plotted against time. This mode allows users to track variations in the magnetic field and analyze data trends efficiently.

### Navigating the Graph

- The graph supports **drag and zoom gestures**, allowing users to pan across the data and zoom in for detailed analysis.
- A **reset button** is available in the **top-right corner** to instantly revert the view to its default scale.
- Next to the reset button, an **integrated graph settings menu** allows customization of the graph display.

### **Graph Settings Options**

- Vertical Lines Show or hide the dotted vertical grid lines for easier alignment of data points.
- Horizontal Lines Show or hide dotted horizontal grid lines for better readability.
- Show Points Enable or disable circular markers at each data point.
- Smooth Lines Apply curve interpolation between data points for a smoother representation of trends.
- **Export Graph** Opens the **export menu** to save the graph in various formats. (*More details on exporting can be found in the relevant manual section.*)

### **Measurement Details & Controls**

On the **right side** of the screen, a **control column** includes:

- A card displaying measurement details, either for the latest recorded point or a previously selected point if the user taps on an earlier measurement.
- The 'AUTO' and 'MANUAL' **controls**, explained in detail in their respective manual sections.

### 2D Map Mode/3D Surface Mode

Once a **map has been finalized**, it can be opened in the unified 2D Map Mode/3D Surface Mode screen. Both modes display the **same underlying data**, but each provides a unique visualization approach to enhance data analysis.

- In 2D Mode, the data is represented as a **top-down map**, where colors indicate variations in the magnetic field.
- In 3D Surface Mode, the magnetic field values at each point are used to generate height displacements, creating a three-dimensional representation of the data. Surface colors are calculated using bicubic interpolation between data points.





### **Navigation & Interaction**

### **2D Mode Controls**

- **Drag and zoom** the view using **drag and pinch gestures** for precise navigation.
- **Tap on any point** to highlight it, updating the **information card** with its details.
- Edit or delete points directly from the information card when expanded.

### **3D Mode Controls**

- Rotate the view using one-finger gestures.
- Zoom in or out with two-finger pinch gestures.
- Move the entire view by holding two fingers and dragging.

### **User Interface Features**

- Mode Toggle & Reset Button
  - Easily switch between **2D Map Mode** and **3D Surface Mode** using the **toggle button** in the **top-right corner**.
  - A reset button next to it restores the default view instantly.



- Information Card (2D Mode only)
  - Located in the top-left corner, the point information card displays data for the currently selected point.
  - Click the Magnetic Flux section of the card to minimize it, maximizing the viewport for better visualization.
  - In 2D mode, selecting a point highlights it and updates the information card.
  - When expanded, the card provides options to edit or delete the selected data point.



- Map Navigation Widget
  - Positioned at the top center of the screen, this widget displays the title of the open map.
  - **Use the arrows** to quickly switch between recorded maps without leaving the view.



### **Customization & Data Filters**

Similar to **Time Graph Mode**, both **2D and 3D modes** feature an **integrated settings menu**. This menu allows users to:

• **Customize the map or surface display**, adjusting visual parameters to your preferences.



• Apply special filters to enhance data interpretation, making it easier to analyze magnetic field variations.



### **Colorscale Filter**

The Color Scale Filter allows you to exclude a specific range of values from the data, ensuring that **contours are calculated only for the values you choose to include**.

This is particularly useful when you need to focus on certain areas or remove less relevant data to make the map clearer. By adjusting the slider, you can define which values remain visible and how they are represented in color, making it easier to highlight key patterns and differences in the visualization.



### **Discrete Levels Filter**

The Discrete Levels Filter allows you to **control the visibility of specific areas on the map** <u>without changing how contours are calculated</u>. Unlike the Color Scale Filter, which removes certain values from the data, this filter simply disables the colors for selected regions while keeping all contour lines intact.



This makes it a powerful tool for emphasizing patterns, highlighting important areas, or reducing visual clutter to make the map easier to read. The filter also includes an Invert option, which flips the selection—allowing you to hide the chosen areas or everything except the selected values, depending on what you need to focus on.

### **Sensitivity Filter**

The Sensitivity Filter helps you control how much small variations in data affect the final visualization. This filter smooths things out by setting a threshold—if a value is close to the average, it gets adjusted to match, reducing unnecessary noise. A higher sensitivity level keeps more details, while a lower one creates a cleaner, more simplified map.



# **Connecting The Main Unit to The Tablet**

Every AtomicX Proton Magnetometer (PPM) comes with a specialized tablet specifically modified for the device. This tablet does not contain any magnets, ensuring that no external magnetic interference affects your measurements. Additionally, the Main Unit is pre-paired with this tablet, allowing for a seamless connection process.

### **Step-by-Step Connection Process**

- 1. Power On the Main Unit
  - Ensure that the **battery is properly connected** to the Main Unit.
  - Press the power button—the LED ring should illuminate red, and you should hear a single beep, indicating that the device is powered on.



### 2. Launch the AtomicX App

Open the AtomicX Proton Magnetometer application on the tablet.

If the Auto-Connect feature is enabled, the app will
automatically attempt to connect to the Main Unit upon startup.

### 3. Manually Connecting (If Auto-Connect is Disabled)

 If Auto-Connect is turned off, simply press the Connect button in the Navigation Bar, and the app will attempt to establish a connection with the paired Main Unit.



 The connection status can be monitored via the persistent Navigation/Status Bar at the top of the screen. If the Connect button is visible, the device is not connected. If the serial number of the Main Unit appears along with a green indicator light and the battery percentage, the Main Unit is successfully connected.

In case of an unexpected disconnection, the app will automatically attempt to reconnect to the Main Unit.

### How To Create Charts

Creating charts in the AtomicX Proton Magnetometer software is a straightforward process. After initiating a new chart via either:

- The toolbar on the Home Screen, or
- The Charts & Maps Management System,

the app will automatically open the empty chart for data collection.

This screen follows the same structure described in the Data Display Modes section of the manual.

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		•		•				

Adding Measurements to a Chart

Data can be manually or automatically recorded using the two buttons located at the bottom-right corner of the screen:

### 1. Manual Measurement Mode (MANUAL Button)

• Pressing the MANUAL button adds a single reading to the chart.

- When pressed, the button **turns green**, signaling the **Main Unit** to start polling the sensor for a **magnetic field measurement**.
- Important: If you are holding the sensor, remain still until the button turns white again.
- A single beep confirms a valid measurement, and the recorded magnetic flux value is plotted on the chart.
- If the measurement **is not valid**, the device will emit **two beeps**, and a **NO SIGNAL** message will appear (if enabled in settings).
  - The **warning message** allows you to either **keep** the reading or **delete it** if it is considered inaccurate.
- Users can **continue pressing the MANUAL button** to manually add additional measurements as needed.



### 2. Automatic Measurement Mode (AUTO Button)

• Pressing the AUTO button activates the automatic measurement mechanism, which takes new measurements at fixed intervals.

- The **interval duration** is determined by the **Auto Measurement Time** setting in **Device Settings**.
- While active, a **progress bar** appears above the AUTO button, indicating the **remaining time** before the next automatic measurement.
- To **stop** automatic measurements, press the **AUTO** button again—it will turn **white**, signaling that the function is disabled.

# How To Create Maps

Creating maps in the AtomicX Proton Magnetometer software is a straightforward and efficient process. A new map can be initiated through:

- The toolbar on the Home Screen, or
- The Charts & Maps Management System.

Once a new map is created, the app will automatically open the special map recording screen, designed specifically for structured field data collection.

### **Recording Mode Overview**

During recording mode, **certain advanced features such as 3D view mode and filtering options are not accessible**. However, display settings remain fully adjustable via the menu in the upper-right corner, allowing users to customize the visualization according to their preferences. All controls are conveniently located in the bottom-right corner of the screen, making it easy to operate the app with one hand while handling the tablet in the field.



### Step-by-Step Data Collection

### 1. Taking a Measurement (READING Button)

Press the READING button while standing still to capture a data point.

While the Main Unit is measuring the magnetic field, the READING button will turn green.

# **Do not move until the button turns gray again and you hear a beep** (if sound feedback is enabled in settings).

The measurement details will appear in the information card in the upper-left corner.

After a successful measurement, the system automatically moves to the next point on the X-axis.



### 2. Continuing Along the X-Axis

Press the READING button again to record another point along the same row (X-axis).

### 3. Advancing to the Next Row (PROFILE Button)

To move to a new line (Y-axis), press the PROFILE button.

This will reset your position to the starting point but at the next row.

(Refer to the diagram in the manual for a visual guide on structured data collection.)



### 4. Deleting the Last Recorded Point

If a mistake is made, press the BACK button to remove the last recorded point.

### 5. Skipping a Point

If there is an obstacle in your way, press the SKIP button to bypass that location and move forward.



### 6. Saving & Finalizing the Map

The app automatically saves progress every time a new row is created.

To finalize the map and unlock advanced viewing options, press the Save button (disk icon) and then select "END RECORDING".



### **Tips for Accurate Mapping**

Step Consistently: Maintain uniform step sizes to create a structured grid. Imagine moving across a precise coordinate system for the most accurate mapping results.

• Unlimited Mapping Area: The AtomicX software supports maps of virtually unlimited size, allowing for detailed, large-scale magnetic field surveys.

The following is a useful visual representation of how you should move to capture data in this mode:



# **Exporting Maps and Charts & Managing Backups**

Exporting your maps and charts is an extremely simple process with the AtomicX Proton Magnetometer software. Whether you need to analyze raw measurement data in third-party software or save a visual snapshot of your results, the built-in export function allows for seamless data management.

### How to Export Data

- 1. Open the desired map or chart in the application.
- 2. Access the integrated options menu, which varies depending on whether you are in a map or a chart view.
- 3. **Press the Export button** a window will appear displaying the available export formats.



### **Export Format Options**

- **CSV (Comma-Separated Values)** Compatible with spreadsheets and data analysis tools.
- JSON (JavaScript Object Notation) Ideal for structured data processing and integration with various software applications.
- **Surfer Format** Specifically designed for use with the Surfer app from Golden Software.
- **PNG (Portable Network Graphics)** Saves the current view of the map or chart as an image file, perfect for reports and presentations.



All exported files are **automatically saved** to the **local storage** of the tablet, specifically in the **Documents directory**. From there, you can easily transfer or share your data as needed.

# **Updating the AtomicX PPM Main Unit Firmware**

Keeping your AtomicX Proton Magnetometer (PPM) Main Unit updated ensures optimal performance and that you have all the latest features and bug fixes.

The firmware update process is straightforward and can be completed in just a few steps.

### Step-by-Step Firmware Update Procedure

### 1. Ensure the Main Unit is Connected

• First, connect the Main Unit to the tablet as described in the connection guide. Also connect the Sensor to the Main Unit.

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ß		DEVICE	ABOUT		
	App Settings				
	Auto-connect of	n app startup		$\checkmark$	
			English		
	Language	Firmware Update			
		A new update is available! Ve	ersion: 2.0.1 - Installed Firmware: 1.5.0		
				0	
Paired Devic	Devices		UPDATE CANCEL		
	Paired Device: A	AtomicX-1002			
		SELECT NEW	CHECK FOR FW UPDAT	Έ	
	Device Settings				
	Sensitivity: 0.1 r	١T			
		4	•		

• Navigate to Settings and tap on Check for Firmware Update.

### 2. Check for Available Updates

- If a **firmware update** is available, the app will display:
  - The new firmware version
  - The currently installed firmware version
- Press **UPDATE** to begin the process.

### 3. Firmware Installation Process

- The update process will take a few minutes.
- Follow the **important precautions** below to ensure a smooth update.

ATOMICX	) AtomicX-1002   88% 🔛   MAPS   🛞 🟠				
	RECENT CHARTS	RECENT MAPS			
	Geological Scan - South	Ferrous Objects Test - Site A			
ATOMICX	Geological Scan - North	Ferrous Object Detection - Site B			
PROTON PRECESSION	Eirmware Undate	Test Site 2			
		Test Site 1			
Status Connected					
Selected Sensitivity 0.1 nT					
Selected Polling Time 3 sec	ALL CHARTS	ALL MAPS			
NEW MAP	NEW GRAPH BACKUP MANUAL	段 SETTINGS			
•	•				

### **Important Precautions**

To prevent any issues during the update, please follow these **critical** guidelines:

- Keep the Main Unit close to the tablet and do not move it during the firmware update.
- Ensure battery levels are above 80% on both the Main Unit and the tablet before starting.
- Secure all connections the battery cable and the sensor must be firmly attached to the Main Unit.
- Do not close or put the tablet to sleep while the update is in progress.

### What Happens After the Update?

• If the update completes successfully, the Main Unit will automatically restart, and you will hear a single beep.

	AtomicX-100	)2   79% 💶   MAPS   🚱 🚮	
АТОМІСХ	RECENT CHARTS	RECENT MAPS	
	Geological Scan - South	Ferrous Objects Test - Site A	
	Geological Scan - North	Ferrous Object Detection - Site B	
PROTON PRECESSION Firmware Update			
The updat	e was successful. The device will restart aut	omatically.	
Paired Device A		ок	
Status OConnected			
Selected Sensitivity 0.1 nT			
Selected Polling Time 3 sec	ALL CHARTS	ALL MAPS	
NEW MAP NEW GRAPH BACKUP MANUAL SETTINGS			
4	•		

• The device should **reconnect to the tablet automatically**, and a **success message** will appear on the screen.

### **Troubleshooting Firmware Updates**

✤ If the update fails (e.g., due to tablet disconnection), simply restart the process and try again.

### **Dual Firmware Recovery Technology**

- The AtomicX PPM is designed with a dual-partition firmware recovery system, making it virtually impossible to brick the device.
- If an update fails, the device will **automatically recover** using a clean firmware partition.
- Simply attempt the update again.

 $\underline{\mathbb{A}}$  If the update fails twice in a row, please contact AtomicX support for assistance.

# **TECHNICAL SPECIFICATIONS**

### General

Туре	Proton Precession (EFNMR) Magnetometer	
Operating Range	20000 – 100000 nT	
Sensor Sensitivity	0.1 nT	
Maximum Field Gradient	1200 nT/m	
Absolute Accuracy	±0.5 nT	
Resolution	0.01 nT	
Sensor Polarization	1 – 5 seconds (User-configurable)	
Measurement Cycle	1 – 120 seconds (User-configurable)	

### Hardware

Switching	Solid-state
Coil Tuning	Not required (Global Tuning-Free Technology)
Connectivity	Bluetooth LE 5.0
Battery Life	8 hours of continuous measurements 55 hours standby
Battery Type	External Li-Poly 14.8V, 4000mAh
Dimensions	Toroidal Sensor: 10.6cm x 10.2cm (D x H) Console: 10.6cm x 5.2cm x 15cm (W x H x D)
Weight	Toroidal Sensor: 1.20 Kg Console: 0.80 Kg

### Software

OS Compatibility	Android 12.0 or newer
Visualization	Time graph Contour Grid plot (2D) Surface plot (3D)
Maps, Charts	Unlimited
Measurement Points Per Map	Unlimited
Storage	Internal database (128GB)
Interface Languages	English, Greek
Additional Features	Automatic signal detection SNR measurement Extensive Signal Information Easy Backup and Database Recovery Tools Map data export to CSV, JSON, Surfer DAT Graph data export to CSV, JSON PNG screenshots Software update checking Over-the-air firmware updates

# TROUBLESHOOTING

### Device Shuts Down Immediately After Powering On & Emits Three Beeps

**Cause:** The battery level has dropped below 1%, triggering an automatic safety shutdown.

**Solution:** Turn off the device and recharge the battery before attempting to power it on again.

### No Beep Sound When Powering On

Check if the power switch LED lights up.

If the LED is on, but there is no sound, contact customer support.

If the LED is off, the battery is fully discharged. Replace the battery and attempt to power on the device.

If the device powers on successfully, the issue is resolved.

If the issue persists, contact customer support.

### **Continuous Tone When Powering On**

Cause: This indicates excessive input voltage or a short circuit.

**Solution:** Disconnect all inputs and restart the device.

If the issue is resolved, resume normal operation.

If the tone continues, a critical fault has occurred. Contact customer support.

### Sensor Connected, but App Displays a Disconnection Error

Check for loose sensor connections and reconnect if necessary.

If the app recognizes the sensor, the issue is resolved.

If the issue persists, the sensor may be faulty. Replace the sensor or contact customer support.

### **Tablet Cannot Connect to the Device**

Before troubleshooting, verify the following:

1. The device is powered on and has emitted one beep.

2. Bluetooth and Location Services are enabled in the tablet settings.

If the issue persists:

1. Restart the app and attempt to reconnect.

2. If unsuccessful, reboot the tablet and try again.

If the connection still fails, contact customer support.

### **Device Suddenly Disconnected from Tablet During Use**

Ensure that the tablet is within the normal operating range of the magnetometer.

If the device beeps and the app automatically reconnects, the system has successfully recovered from an unexpected crash, and normal operation may continue.

If the device does not reconnect, reboot both the tablet and the magnetometer before attempting to reconnect.

### **Battery Overheating While Charging**

**Warning:** If the battery becomes excessively hot, immediately disconnect it from the charger and discontinue use. Follow local disposal regulations for safe disposal.

### Charger Overheating While Charging

Check for loose connections and secure all cables.

If the charger cools down and functions normally, continue use.

If the charger remains hot, replace the charger and charging cable.

If the issue persists after replacing the charger, replace the battery.

### Charging Does Not Complete After 5 Hours, and LEDs on Charger Keep Blinking

Check for loose connections and ensure the charger is properly connected.

If the issue persists, the battery may have one or more failed cells. Replace the battery.

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