

# MFDA1A

## Magnetic Field Detector Analyser

Firmware Revision 0.49

### User Guide

**DISCLAIMER:** The product described in this user guide is intended to be used as an indicator only. In the event it does not perform as expected, RHDC Services Ltd may not be held liable.

**WARNING:**

**AUDIO LEVELS:** Users are advised that listening to audio at high levels is a known cause of permanent hearing damage. Users must use the equipment responsibly and avoid excessive sound levels by adjusting the volume appropriately. In the event users suffer hearing damage after using this equipment, RHDC Services Ltd may not be held liable. We also recommend using closed-back headphones to help attenuate background noise and allow lower listening levels.

**BATTERIES:** Use only alkaline AA batteries such as Energizer E91.

## 1 Scope

This document describes how to use the MFDA1A (Magnetic Field Detector Analyser model 1A).



**Figure 1. MFDA1A Magnetic Field Detector Analyser**

In the above image, the complete product is shown comprising...  
1 x MFDA1A-Display, 1 x MFDA1A-Sensor and 1 x 1.5m Mini-DIN cable.

## 2 Important Notes

Please read the following important notes before using this product.

1. The unit must be kept dry. Do not use in the rain or damp.
2. Use Alkaline batteries only such as Energizer E91 or an equivalent.

### 3 Introduction

The MFDA1A is a device for the detection and analysis of permanent magnetic fields. The system comprises separate display and sensor head, connected together via a 1.5m cable. The sensor head uses an 8 x 8 array of 64 sensors to create an image representing the shape and intensity of static magnetic fields. As a magnet is approached, the shape is revealed, thus providing more information compared to a single magnetometer.

The device includes a headphone output such that the presence of magnetic fields can be determined from a variable pitch tone. This allows the operator to perform an initial search for magnetic fields without needing to refer to the display. To increase versatility and to further aid in the initial detection of magnetic fields, the handheld display unit has its own internal magnetometer located near the top front edge, allowing it to be used without the external sensor. Via a simple onscreen menu, the internal or external sensors can be individually selected or combined.

### 4 Controls

The image below shows the controls and connectors of the MFDA1A.

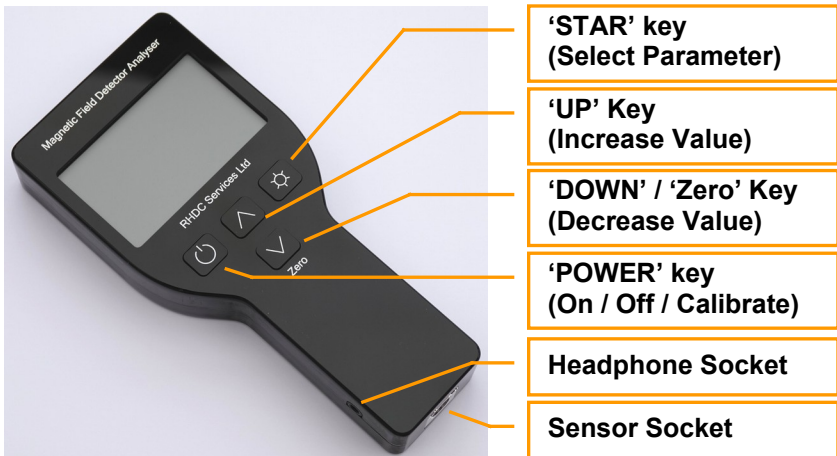


Figure 2. MFDA1A Controls.

## 5 Getting Started

Insert two AA Alkaline batteries then press the power button. The display will become active with one or more sensor outputs shown.

Note. To save power, the instrument switches off after 20 minutes. This setting is fixed on this model.

## 6 Instrument Display

When new batteries are inserted, both internal and external sensors are enabled and the display will resemble the left hand image below.

The right hand image shows the display when just the internal sensor is selected and operating in absolute mode.



**Figure 3. Left = both sensors active, Right = Internal sensor only**

Note. Absolute magnetic field strength in  $\mu\text{T}$  is not shown when the external sensor is active.

## 7 Settings Menu

In the following sections, use the "Star" key to cycle through the instrument settings menu and the "Up" and "Down" keys to make adjustments.

Note. The menu will exit automatically after a few seconds of inactivity.

### 7.1 Sensitivity

This changes the sensitivity of both the internal and external sensor.

### 7.2 Sensor

Selects between displaying the Internal, External or both sensors.

### 7.3 Light

Allows the LCD backlight to be adjusted over 5 power levels or turned off. Turning it off or setting it to "Min" will extend battery life considerably.

### 7.4 Sound

This setting enables or disables the instrument's audio output.

### 7.5 Volume

Sets the audio volume in the range of 0 to 40. **See front cover warnings.**

## 8 Audio System

This instrument outputs headphone-level audio on a 3.5mm jack socket. When enabled, a tone is generated proportional to the magnetic field strength in a similar way to a metal detector.

## 9 Offset Cancellation

In order to search for magnetic fields in the unavoidable presence of the Earth's magnetic field (typically around 50 microteslas), the user can cancel any offset it produces by pressing the DOWN / Zero button (when the menu is not being displayed).

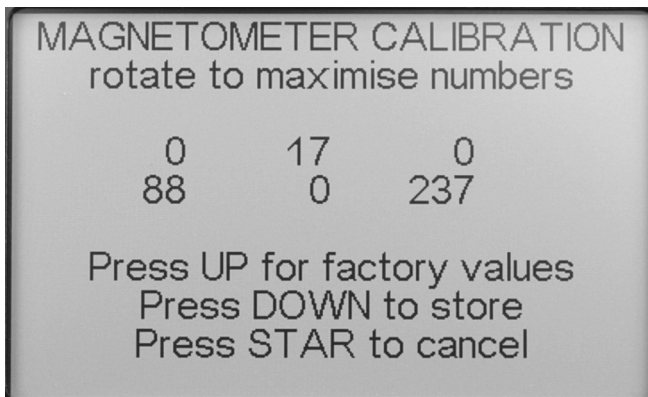
## 10 Absolute Magnetic Field Strength

By setting "Sensor: Internal" and with internal offset cancellation disabled (by pressing the UP button when the menu is not being displayed), the internal display will show absolute magnetic field strength in microteslas.

## 11 Internal Magnetometer Calibration

When the internal sensor is being used in absolute mode, if changing the angle of the handheld unit changes the displayed absolute magnetic field strength by more than 5 microteslas, the internal magnetometer should be re-calibrated using the following procedure.

1. Start with the unit switched off.
2. Move away from any magnets or ferrous metal objects (ideally outside).
3. Stand with the unit pointing toward magnetic North (display facing up).
4. Hold the POWER button for around 5 seconds until the magnetometer calibration screen is shown (see below). The display shows six numbers representing the observed Min/Max for each axis (x, y and z).
5. Complete two or three full 360° rotations in yaw (rotation forward).
6. Tilt the unit 90° onto its side so the display is facing left and repeat.
7. With the unit still on its side, turn it so the display faces you and repeat.
8. The onscreen values will now typically all be between 200 and 500.
9. Once done, press the DOWN button to store the new calibration.



**Figure 4. Internal Magnetometer Calibration Screen (before procedure)**

The above procedure provides the internal magnetometer with a uniform magnetic field rotated around the x, y and z axis. Once the DOWN button has been pressed, the peak values are used to calculate new offsets which are then stored in non-volatile memory and used for subsequent measurements.

For even greater accuracy, complete more rotations in steps 5 to 7 with the unit pointing slightly left and then right of magnetic North. This increases the chance of finding the peak minimum and maximum values.

Note. The original factory calibration values can always be restored by pressing the UP button whenever the calibration screen is shown. If the calibration screen is entered by mistake, pressing the STAR button will exit without making any changes.

## 12 Specifications

Unless Otherwise Stated: Battery = 2 x Energizer E91 AA Alkaline, Backlight (BL) = Low, Temperature = 20°C, Both sensors enabled.

Parameter	Min	Typ	Max	Units
Internal Magnetometer Sensitivity <sup>1</sup>		10		μT
External Sensor Array Sensitivity <sup>1</sup>		100		μT
Absolute Internal Magnetometer Accuracy <sup>2</sup>		2		μT
Measurement Range (Internal)	0.01		2	mT
Measurement Range (External)	0.1		TBA	mT
Battery Life (Internal Sensor Only)	20	TBA		Hours
Battery Life	4	TBA		Hours

Note. Specifications are subject to change without notice.

1. Due to the presence of the Earth's magnetic field, sensitivity is defined as the minimum change in field strength required for reliable detection as opposed to an absolute level.
2. Subject to correct magnetometer calibration.