



# RFID ANTENNA

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RML-HFANT500/500-B

RML-HFANT500/300-B

User Manual



**Revision History**

Revision	Description	Revised by	Approved by	Date
1.1	Antenna revision B			Dec. 2008

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## 1. Warning and Safety Instructions



### READ BEFORE STARTING UP THE ANTENNA!

- The antenna must be placed inside insulation packaging when being applied to any application.
- Unauthorized changes and the use of additional devices that have not been sold or recommended by the manufacturer may cause fire, electric shocks, or injuries. Such measures will lead to exclusion of any liability by the manufacturer.
- Repair can only be made by the manufacturer.
- Installation, operation, and maintenance must be conducted by qualified personnel.
- Before connecting the antenna, the power supply must be disconnected.
- When working on the devices the valid safety regulations must be observed.
- The components may carry voltages of up to 1000V.
- The intended use of this product is generally not for the general public. It is generally for industry/commercial use. This device will be used in non-residential environments.

**Caution:** changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## 2. Antenna Features

### 2.1 General

The RML-HFANT500/500-B and RML-HFANT500/300-B are single loop antennas with pre-set matching circuit. It has been optimized as a transmitting and receiving antenna for RFID transceiver with working frequency of 13.56MHz and output impedance of 50ohm. The maximum power input to this antenna is 4W.

At the time of installation, the antenna must be tuned for a defined range using on board jumpers. The antenna tuning must be conducted by qualified personnel.

The antennas are suitable for both object and personal identification. The preferred direction of a transponder is parallel to the antenna. The best position to obtain a maximum range is above the center of the antenna.

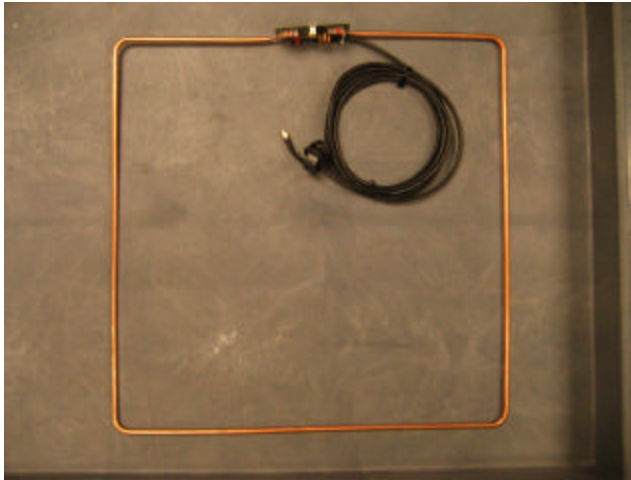


Fig 1: RML-HFANT500/500-B Antenna

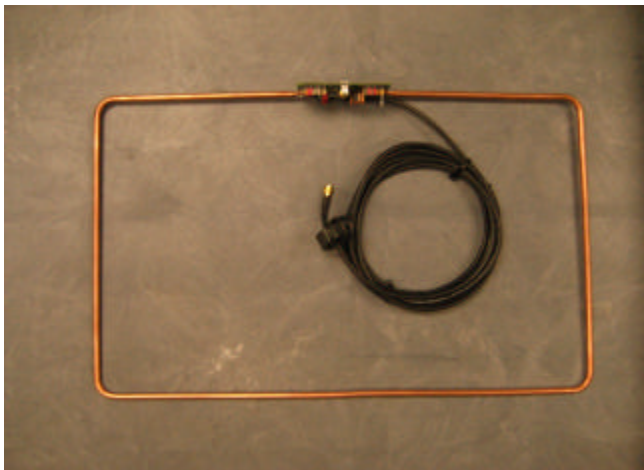
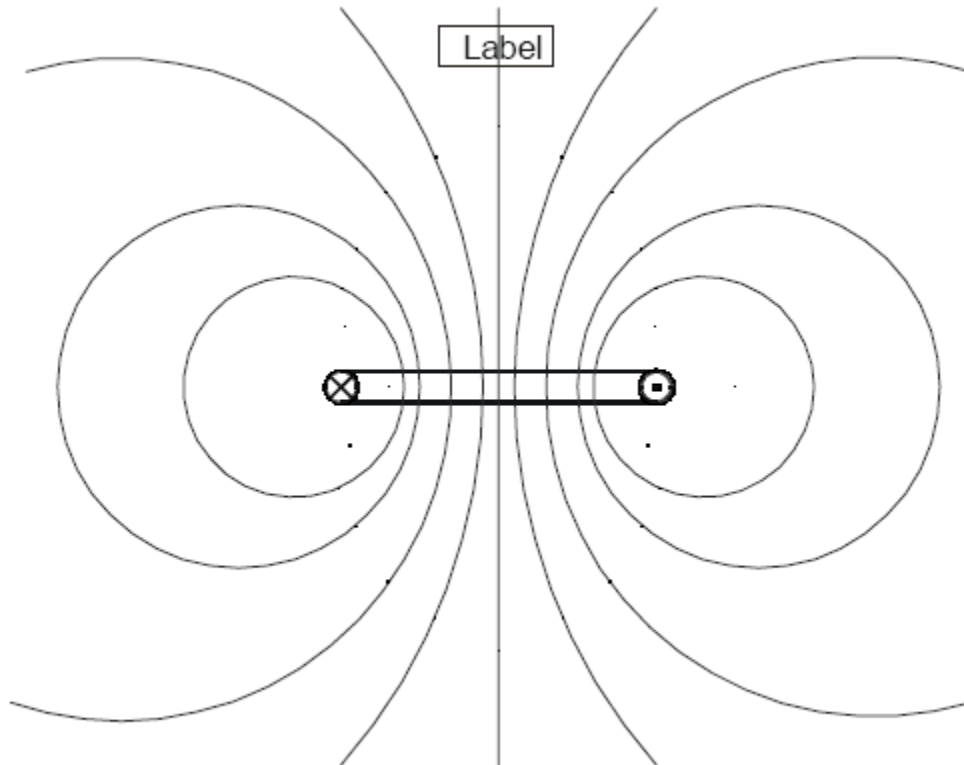


Fig 2: RML-HFANT500/300-B antenna

## 2.2 Shape of Antenna's Magnetic Flux Lines

The working range of an antenna depends very much on the position and alignment of the tag. A single loop antenna has the highest range in the center of the antenna if the tag is aligned parallel to the antenna.



**Fig 3: Magnetic Field Distribution of a Single Loop Antenna**

## **3. Installation Instructions**

### **3.1 Mounting**

The loop antennas have been designed for installation inside an enclosure or container made of non-conductive materials (for example: plastic or wood). Unless packaged inside waterproofed containers, it can only be used indoors.

To fix the antenna inside an enclosure, make sure that only plastic cable ties or non-conductive tapes are allowed to use. Note that exposed metal bolts or conductive tapes might cause electric shock and degrade the antenna performance.

Keep a minimum distance of 10cm between the antenna and any metal parts. Even a distance of 50cm to metal parts will still lead to a reduction in the reading range.

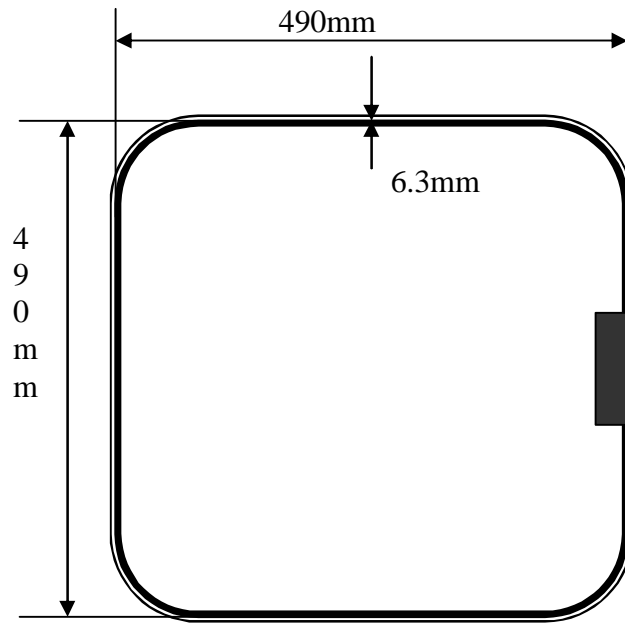


Fig 4 Installation dimensions – RML-HFANT500/500-B antenna

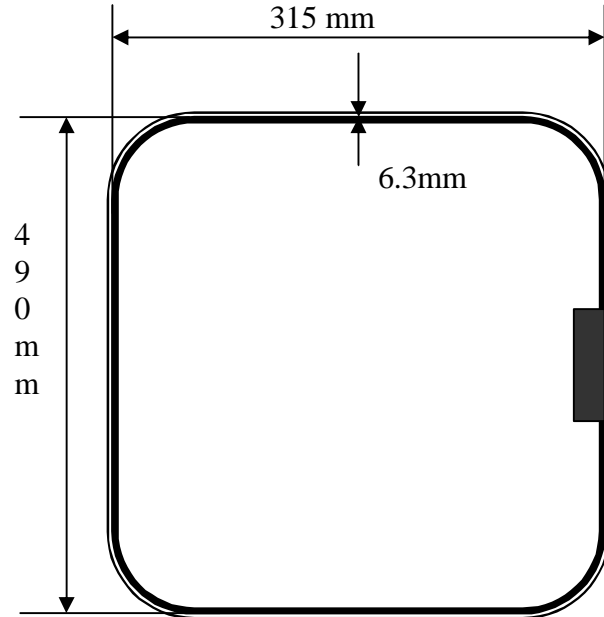


Fig 4 Installation dimensions – RML-HFANT500/300-B antenna



### 3.2 Connectivity

The antenna should be connected to the reader using a coax cable.

A toroid should be used with the antenna cable with 4 turns. The distance between the toroid and the end of the SMA connected should be less than 10cm.

The Antenna cable should be routed away from electrical wires and the antenna conductors as much as possible.



Fig 4: Toroid integration to the coax cable

### 3.3 Tuning

The antenna is tuned on a wood table at the time of production. However, it may need re-tuning on site by qualified personnel specially if it is installed in proximity of metal or other magnetically conductive materials.

When installed in different ambient conditions, the antenna may be re-tuned for the best performance or a limited range. The tuning can be conducted with the help of jumpers and trimming capacitors on the tuning circuit board.

For tuning purpose a SWR meter or other appropriate device in order to match the impedance to 13.56MHz is required. Refer to the user manual of the SWR meter for operations.

Fig 5 shows the top view of the tuning circuit board. Follow the procedure below to tune the antenna if needed.

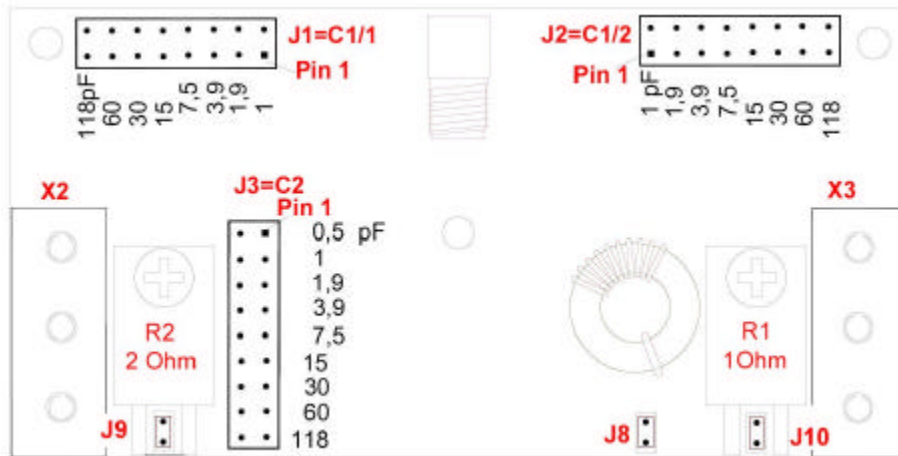


Fig 5: Tuning circuit board

#### Antenna tuning procedure:

Connect tuner board (with antenna attached) to impedance analyzer.

At C1/1 and C1/2 enable the same capacitance of 15pF or 30pF.

Change capacitance C2 to the value closest to  $R=50 \Omega$  using the jumper strip J3

Change capacitances C1,1 and C1,2 to the value closest to  $X=0 \Omega$  and  $\theta = 0^\circ \pm 3^\circ$  on J3

Use capacitance C2 (on J3) to recalibrate to the value closest to  $R=50 \Omega$  and  $Z = 50 \Omega$ .

If necessary repeat steps above if necessary.



#### Warning

VOLTAGE AS HIGH AS 1000V MAY BE PRESENT ON THE ANTENNA WIRE OR ON TUNING BOARD. THEREFORE MAKE SURE THAT THE READER IS SWITCHED OFF OR DISCONNECTED FROM THE ANTENNA WHEN TUNING IS PERFORMED.

## 4.0 Specifications

	<b>RML-HFANT500/500-B Antenna</b>	<b>RML-HFANT500/300-B Antenna</b>
<b>General</b>		
Type	Inductive Loop	Inductive Loop
<b>Mechanical</b>		
Conductor	¼'' Copper Tube	¼'' Copper Tube
Dimension	490mm x 490 mm	490 mm x 3150 mm
Color	Brown	Brown
<b>Electrical</b>		
Maximum TX power	8W	8 W
Admissible TX Power	1.5 W	1.5 W
Operating frequency	13.56 MHz	13.56MHz
Working range	55 cm Maximum	55 cm Maximum
Antenna connection	1 SMA Male (50O)	1 SMA Male (50 O)
Cable Length	3.6 m	3.6m
Frequency Range:	13.56MHz ± 7KHz	13.56MHz ± 7KHz
Gain (dBi):	-30dBi maximum	-30dBi maximum
<b>Ambiance Conditions</b>		
Temperature range		
-Operation	-25°C to +55°C	-25°C to +55°C
-Storage	-25°C to +60°C	-25°C to +60°C
<b>Applicable Standards</b>	IC RS-210 , FCC Part 15	IC RS-210 , FCC Part 15