Library Stack Antenna L-SA3

User's Guide

Revision 1.0

TAGSYS

January 2005

Publishing Information

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Read This First

Welcome to the TAGSYS RFID System. This User's Guide is designed to help you get up and running quickly using this high-quality Radio Frequency Identification (RFID) system. It describes all you need to know about how to install and use the TAGSYS system and its associated applications.

It provides a step-by-step guide for the following procedures:

- Installation of the Library Stack Antenna L-SA3
- Configuring the product for use within your library system

This guide is designed for all CIT (Certified Integrators by TAGSYS) and for TAGSYS Expert Network customers implementing a low-cost and high-performance RFID solution.

This document does not assume any previous knowledge of Radio Frequency Identification (RFID) technology.

Conventions

Symbol	Meaning
	**CAUTION**: A note that advises users that a specific action could result in the loss of data or damage the hardware. **WARNING**: A note that advises users that a specific action may result in physical harm.
	A note that provides additional information that helps the user perform a task or obtain the best performance from the product.

Abbreviations and Acronyms

AFI	Application Family Identifier
AON	All Or None
API	Application Programming Interface
ASK	Amplitude Shift Keying
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DLL	Dynamic-Link Library
DPU	Digital Processing Unit
DSFID	Data Storage Format Identifier
DSP	Digital Signal Processor
EAS	Electronic Article Surveillance
ETX	End of Text
HPI	Host Port Interface

I/O	Input/Output
IFD	Interface Device
ILS	Integrated Library System
LED	Light Emitting Diode
LSB	Least Significant Bit
MSB	Most Significant Bit
OS	Operating System
PC	Personal Computer
PCB	Printed Circuit Board
RAM	Random Access Memory
RF	Radio Frequency
RFID	Radio Frequency IDentification
RFU	Reserved for Future Use
RPU	Radio Processing Unit
RTC	Real Time Clock
SAM	Security Access Module
STX	Start of Text
TTF	Tag Talks First
TTL	Transistor-Transistor Logic
TTY	TeleTYpe
UID	Unique Identifier

Glossary

Anti-Collision Tag capability making it readable while other tags are present in the RF field.

Antenna An aerial that receives and/or transmits radio frequency signals. Aerials are manufactured in a variety of forms, shapes and sizes.

Baud A unit of measure of data transmission speed representing the number of signal changes per second.

BNC Connector Cylindrical metal connector with a copper core that is located at the tip of a coaxial cable, and is used to connect cables together. It attaches by pushing and twisting the outer cylinder on to two locking pins.

Coupler See Reader.

Data Storage Format Identifier Identifies the structure of the data stored in the smart label.

Digital Signal Processor This part of the Radio Processing Unit (RPU) performs real-time smart label decoding and manages the Medio L200 configuration.

Dynamic-Link Library Executable routines that are stored as separate files with DLL extensions and executed only when needed by the program.

Host Port Interface Interface used to access the DSP memory.

IEC Connector Three-pin connector used on sockets that carry mains electricity to the computer. All PCs use a male IEC connector and mains lead with a female IEC connector.

Interrogation Pulse A signal transmitted by the coupler to activate the smart label's transponder.

Monitoring Port Parallel Port granting access to the HPI. It communicates directly with the Radio Processing Unit

Multi-Read See Anti-Collision

Nibble Half a byte (4 bits)

Packaged Reader A reader in its casing.

Phase Shift Difference of phase between the 13.56 MHz field emitted by two antennas. This feature is dedicated to rotating field applications and three-dimensional volume smart label detection.

Protocol A set of rules governing a particular function, such as the flow of data/information in a communication system (communication between a smart label and a reader or a reader and a PC or host computer).

Radio Frequency Identification System (RFID) An automatic identification and data capture system comprising one or more readers and one or more smart labels in which data transfer is achieved by means of suitable modulated inductive or radiating electromagnetic carriers.

Radio Processing Unit This unit controls the main features of the Medio L200, such as the RF channels, the multiplexer and the smart label decoding.

Reader Electronic system for the communication between smart labels and host computers.

Reader Talks First Chip protocol for exchanges between the reader and the chip, whereby the chip waits for a command from the reader to which it responds.

RS-232 Electronic Industries Association (EIA) standard for serial interfaces between computers and peripherals which defines the function, the electrical characteristics and the timing of signals.

RS-485 Electronic Industries Association (EIA) standard for multipoint, differential data transmission. It allows multiple nodes to communicate bi-directionally over 1 or 2 twisted pairs.

Smart Label Small, flexible tag from the 13.56 MHz TAGSYS product line. A smart label is made of a chip connected to an etched antenna.

Tag See Smart Label.

Tag Talks First Chip protocol for exchanges between the reader and the chip, whereby the tag sends information continuously, without waiting for a specific command from the reader.

Transceiver A combined transmitter and receiver.

Transponder A combined receiver/transmitter that automatically transmits a signal when a 'trigger' is received by it. The trigger is often a pulse, called an interrogation pulse.

If you need assistance

Please contact your nearest TAGSYS sales representative or the TAGSYS welcome desk at:

Telephone: +33 (0) 4 91 27 57 00
Fax: +33 (0) 4 91 27 57 01
E-Mail: info@tagsys.net
Website: http://www.tagsys.net/

Contact for Comments

We welcome your feedback to help us provide high quality documentation.

For technical comments, please contact our welcome desk:

Telephone: +33 (0) 4 91 27 57 00
Fax: +33 (0) 4 91 27 57 01
E-Mail: info@tagsys.net

Please remember to quote the Document Reference Number 11660A0, your job title and your company.

Quality Issues

TAGSYS implements stringent quality controls at all stages of its manufacturing process. However, should you find a defect with this product, please notify your TAGSYS Quality Service representative using the dedicated Product Return Form.

Telephone: +33 (0) 4 91 27 57 36
Fax: +33 (0) 4 91 27 57 02

Table of Contents

1 For Your Safety

1.1 General Use

The Library Stack Antenna L-SA3 is designed to be rugged and reliable and to provide years of trouble-free service. Please observe the following general tips:

- Take care not to scratch the device. Keep the device clean. When working with the device, use only TAGSYS-approved accessories.
- This device is not waterproof and should not be exposed to rain or moisture. Under extreme conditions, water may enter the circuitry. In general, treat the device as you would a pocket calculator or other small electronic instrument.
- Take care not to drop the device or subject it to any strong impact. Do not carry the device in your back pocket: if you sit on it, you may damage it.
- Protect the device from extreme temperatures. For example, do not leave the device on the dashboard of a car or truck on a hot day or on a day when temperatures are below freezing, and keep it away from heaters and other heat sources.
- Do not store or use the device in any location that is extremely dusty, damp, or wet.
- Use a soft, damp cloth to clean the device. If the surface of the device becomes soiled, clean it with a soft cloth moistened with a diluted window-cleaning solution.

1.2 Care and Maintenance

This device is a product of superior design and should be handled with care. The suggestions below will further increase the lifetime of this device.

- Keep the device and all parts and accessories out of the reach of small children.
- Keep the device dry. Precipitation, humidity and liquids contain minerals that will corrode electronic circuits.
- Do not use or store the device in dusty, dirty areas. Its moving parts can be damaged.
- Do not store in hot areas. High temperatures can shorten the life of electronic devices, damage batteries and warp or melt certain plastics.
- Do not store in cold areas. When the device warms up (to its normal temperature), moisture can form inside the device, which may damage electronic circuit boards.
- Do not attempt to open the device. Non-professional handling of the device may damage it.
- Handle the device with care. Shocks may break internal circuit boards.
- Do not clean the device with harsh chemicals, cleaning solvents or strong detergents. Gently wipe the device with a soft cloth slightly dampened in a mild soap-and-water solution.
- Do not paint the device. Paint may clog the device’s moving parts and prevent proper operation.

1.3 Important Safety Information

1.3.1 Operating Environment

Follow all special regulations that are applicable in any area and always switch off the device whenever its use is prohibited, or when it may cause interference or danger.

When connecting the device or any accessory to another device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

As with all RF equipment, users are advised that the equipment should only be used in its normal operating position.

2 Certification

2.1 Occupational Health and Safety Notices

TAGSYS Products have been designed not to exceed the limits given in the European Standard EN 50364 “Limitation of human exposure to electromagnetic fields from devices used in Electronic Article Surveillance (EAS), Radio Frequency Identification (RFID) and similar applications” in conjunction with the European Standard EN 50357 describing how to evaluate the exposure level.

It is the responsibility of the TAGSYS Partner to install the Library Stack Antenna L-SA3 as described in TAGSYS Product Manuals or TAGSYS Documentation and with the appropriate antennas.

Modification of any TAGSYS System is prohibited without the written consent of TAGSYS. Unauthorized modifications may void the conformity of the equipment to safety norm and will void the TAGSYS warranty.

An RF fields survey has been carried out on all the System components, in accordance with AS/NZS 2771.1: Radio Frequency Radiation, Part 1. According to this standard the maximum allowable RF exposure levels (non-occupational) at 3 kHz to 300 GHz are 200 µW/cm2.

2.2 Regulatory Notices

An RFID system typically composed of an RF emission device such as the Library Stack Antenna L-SA3 is subject to national regulations that may differ by country.

One important item to consider is the maximum permissible magnetic field intensity at a distance of 10 meters from the antenna that must not exceed 42 dBµA/m in Europe and 38 dBµA/m in US.

The Library Stack Antenna L-SA3 meets these limits.

It is the responsibility of the TAGSYS Partner to install the Library Stack Antenna L-SA3 as described in this User's Guide or in TAGSYS Documentation.

2.2.1 In Europe (CE and RTTE Directives)

The Library Stack Antenna L-SA3 complies (CE Declaration of Conformity granted) with the European EMC directive.

The Library Stack Antenna L-SA3 complies with the requirements of the Telecommunication Terminal Equipment Act (FTEG) and the RTTE Directive 1995/5/EC.

Any modification of the Library Stack Antenna L-SA3 is prohibited without the written consent of TAGSYS. Unauthorized modifications may void the conformity of the equipment to CE and RTTE Directives and will void the TAGSYS warranty.

If a Library Stack Antenna L-SA3 is further integrated in a different product, it is the responsibility of the manufacturer of this complementary product to obtain the required approvals for this product.

2.2.2 In USA (FCC Directive)

The Library Stack Antenna L-SA3 has been designed to comply with Part 15 of the FCC Rules. Furthermore typical configurations based on a Medio L100 have been successfully tested with Part 15 of the FCC rules (FCC ID Number: QHKLSA2ANT).

Library Stack Antenna L-SA3

WARNING TO USERS IN THE UNITED STATES

FEDERAL COMMUNCIATIONS COMMISSION (FCC) RADIO

INTERFERENCE STATEMENT 47 CFR Section 15.105(b)

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 to that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NO UNAUTHORIZED MODIFICATIONS

47 CFR Section 15.21

CAUTION: This equipment may not be modified, altered, or changed in any way without signed written permission from TAGSYS SA. Unauthorized modification may void the equipment authorization from the FCC and will void the TAGSYS warranty.

ANTENNA REQUIREMENT

47 CFR Section 15.203

CAUTION: This equipment must be professionally installed. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. Non-professional installation or installation of the equipment with an improper antenna may void the equipment authorization from the FCC and will void the TAGSYS warranty.

Operation is subject to the following two conditions: (1) The system devices may not cause harmful interference, and (2) The library system devices must accept any interference received, including interference that may cause undesired operation.

2.2.3 In Canada

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

3 Overview

This antenna is composed of a PCB located on a ferrite support, providing a large area of detection (see Figure 2). This antenna is optimized for use with the TAGSYS L-L100 Library reader for multiple check in/out operations.

This antenna is delivered with a light grey stratified cover or coverless for integration into a dedicated package (OEM product). In this case, a non-metallic material must be used for this packaging.

Due to its specific design, the Library Stack Antenna L-SA3 can be safely used in proximity with other TAGSYS RFID products. It will work also, if properly installed, in metallic-type environments (see Section 4, "Installation" for more details). In this case, performance may be reduced.

The antenna is provided with rubber base pads for installation in a standard desktop configuration.

Although this antenna has been specifically designed for library applications, it can also be used for any application requiring a desktop station which has a good immunity to its environment.

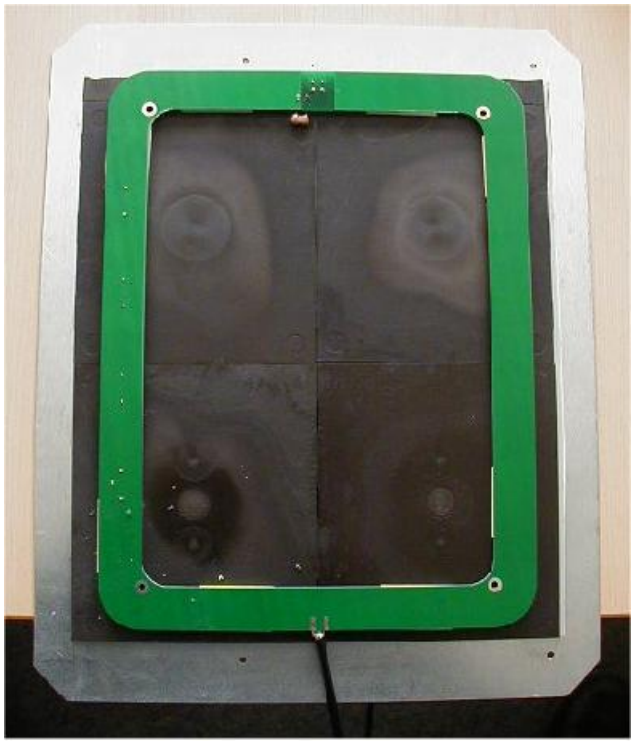
The antenna has been factory calibrated to an impedance of 50 Ω which offers optimal performance when the antenna is installed on the surface of the desk or table.

It may be necessary to retune the antenna once installed if the environment is highly metallic or if the antenna is installed underneath the table or desk. For more information about tuning antennas, refer to Section 6.2, "Antenna Tuning".

Optimal performance is achieved when the smart labels to be read are placed parallel to the antenna surface and centered on the antenna surface.

Figure 1: Library Stack Antenna L-SA3

Figure 2: L-SA3 Antenna without Cover



3.1 Delivery Kit

The items listed in Table 1 are included in the delivery kit.

Table 1: Contents of the Delivery Kit

Quantity	Description
1	L-SA3 Antenna with 1 coaxial cable
1	Mounting Kit including 6 brackets and associated screws and nuts
1	CD-ROM including user documentation, product software and example application

4 Installation

4.1 Standard Installation

The recommended installation for the Library Stack Antenna L-SA3 is the desktop configuration. Its thin shape is ergonomically designed for discreet use at the circulation desk for multiple check in/out operations.

The L-SA3 antenna is designed for indoor use.

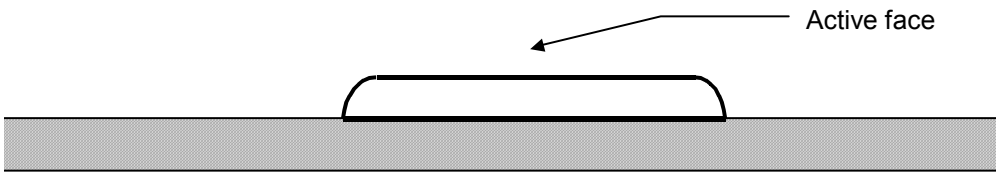
4.2 Desktop Configuration

The antenna is specially designed to operate:

- On wooden, synthetic or metallic desks (or those including metallic parts),
- In close proximity to other antennas.

Place the antenna on the desk and connect the BNC connector to Channel 1 of the L-L100 Library Reader.

Figure 3: Standard Desktop Installation



CAUTION: Always ensure that the reader unit is switched off before connecting or disconnecting the antenna. Also, the antennas MUST be connected to the reader unit before it is switched on.

For optimum performance, always ensure that all metallic or conductive parts are located under the antenna.

Do not shorten or extend the supplied cable as this may affect performance.

Do not place the antenna cable close to other cables, especially power cables.

4.3 Active Area in Desktop Configuration

The unique design of the L-SA3 antenna restricts the active area of the magnetic field radiated by the antenna to the area immediately above the cover.

4.4 Specific Installation using the Mounting Kit

The Library Stack Antenna L-SA3 is provided with a mounting kit for specific installations. This mounting kit can be used to orient the active face of the antenna depending your application.

Metallic or conductive parts must not be present in front of the active face of the antenna.

For best performance, always request an installation compliance agreement from TAGSYS Custom Services regarding your specific installation.

The TAGSYS Antenna Tuning Kit Device may be required to verify the tuning of antennas for a specific installation.

Figure 4: Using the Mounting Kit (Overview)

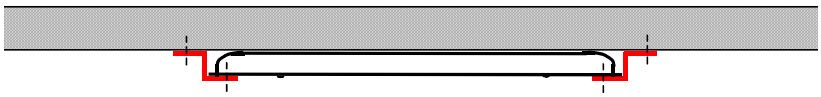
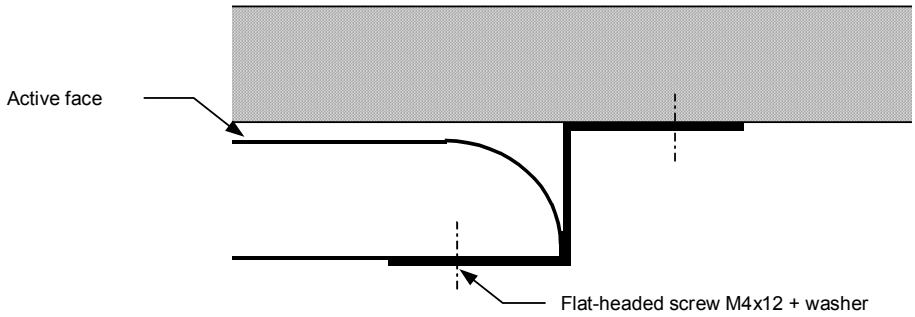


Figure 5: Using the Mounting Kit (Close-up View)



This configuration reduces reading or writing performance (distance). For optimum performance, the antenna must placed above the desk and not underneath.

Always ensure that metallic or conductive parts are located under the antenna.

5 Operation

L-SA3 antennas can be set-up in several different ways. The antenna configuration and the choice of its components depend on the individual library.

The L-SA3 antenna operates best when connected to the TAGSYS L-L100 Reader for library applications. The stations have been designed to carry on multiple items loan and return operations. According to tags types used, performances are shown below with their best practices.

- Each different item must be properly tagged and initialized following TAGSYS Tagging recommendations. Please refer to the **Tagging Guide** and **TAGSYS ISO Library Memory Mapping Software Guide** to do so.
- Stacks of books or VHS must be placed in the middle of the antenna. Stacks must be in compliance with each chips features and antenna configuration.
- Any items less than 10 mm thick (video games, magazines, thin books…) must not be stacked and should be spread out over the antenna.
- CD's, DVD's are processed one at a time.

A stack of books should not be placed on CD's, as CD metallic layer could mask tags placed above.

CAUTION: 1.5 w is the reader optimal power to ensure the performances described below. Be advised that the FCC certification has been granted with this power value.

5.1 Single Item Configuration

Table 2: Minimum Performances

Folio20	**Medio L100 with L-SA3 station**
Reading	220 mm. (8.7 in.)
Writing	180 mm. (7.1 in.)
Folio320	**Medio L100 with L-SA3 station**
Reading	250 mm. (10 in.)
Writing	250 mm. (10 in.)
Folio370	**Medio L100 with L-SA3 station**
Reading	250 mm. (10 in.)
Writing	250 mm. (10 in.)

Performances are given in standard configuration for a single tag operation and measured in the center of the antenna, (Tag attached to a book) using **TAGSYS ISO Library Test Software**.

5.2 Multiple Items Configuration

Table 3: Multiple Items Performances

Labels	Reading/ Writing Range
Folio 20	10 cm / 4 in. (no more than 5 books)
Folio 320	12 cm / 5 in. (no more than 6 books)
Folio 370	12 cm / 5 in. (no more than 6 books)

- Items read/ programmed at a single time
- Performances are obtained through repetitive operations and performed with books only (resulting from different thickness, 10 mm minimum) following best practices recommendations.
- Performances may vary according to operating considerations.
- Performances tests are carried on with **TAGSYS Library ISO SDK**.

Labels coupling effects may arise in this configuration and some labels couldn't be properly detected or programmed. If this happens, we recommend you to slightly mis-aligned books or to spread them over the antenna.

6 Maintenance

6.1 Servicing the Library Stack Antenna L-SA3

CAUTION: The Library Stack Antenna L-SA3 contains no operator serviceable parts and must only be serviced by qualified personnel.

No regular servicing is required, except for keeping the unit clean.

It is recommended that the antenna unit be inspected at least once per year by an approved TAGSYS technical representative.

6.2 Antenna Tuning

The TAGSYS Library Stack Antenna L-SA3 is factory-calibrated. For any questions about antenna tuning, please contact your TAGSYS representative.

7 Technical Data

7.1 Mechanical Characteristics

Description	Value
Housing	Aluminum bars and plastic stratified cover
Dimensions (with Cover)	446 x 366 x 20 mm. (17.56 x 14.41 x 0.78 in.)
Weight	3.8 kg. (8.4 lbs.)
Color	Light grey (RAL 7035)
Protection Class	IP 21
Operating Temperature	0 °C to 55 °C (32 °F to 131 °F)
Storage Temperature	-25 °C to +60 °C (-130 °F to 140 °F)

Figure 6: L-SA3 Antenna Mechanical Diagram (Cover) (in millimeters)

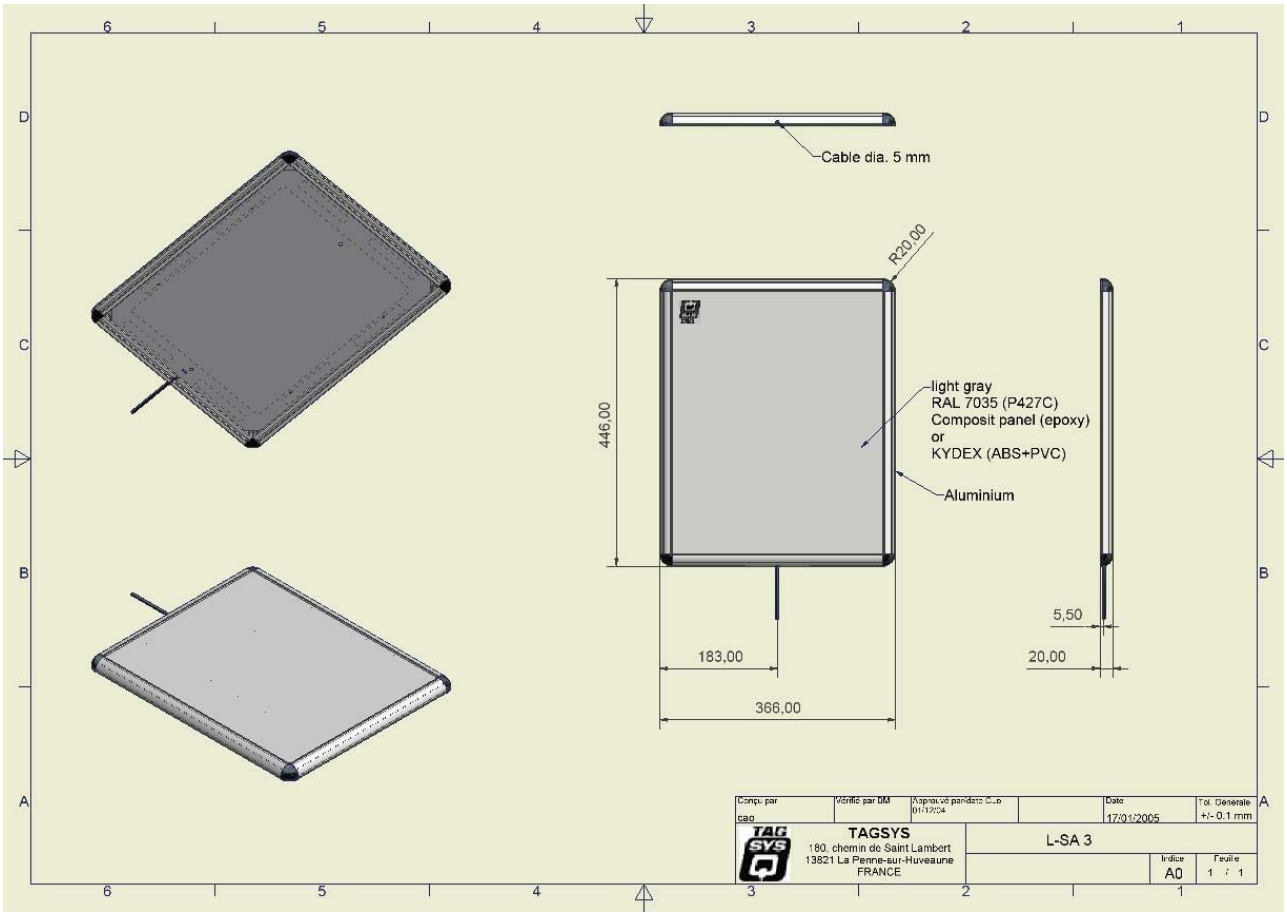
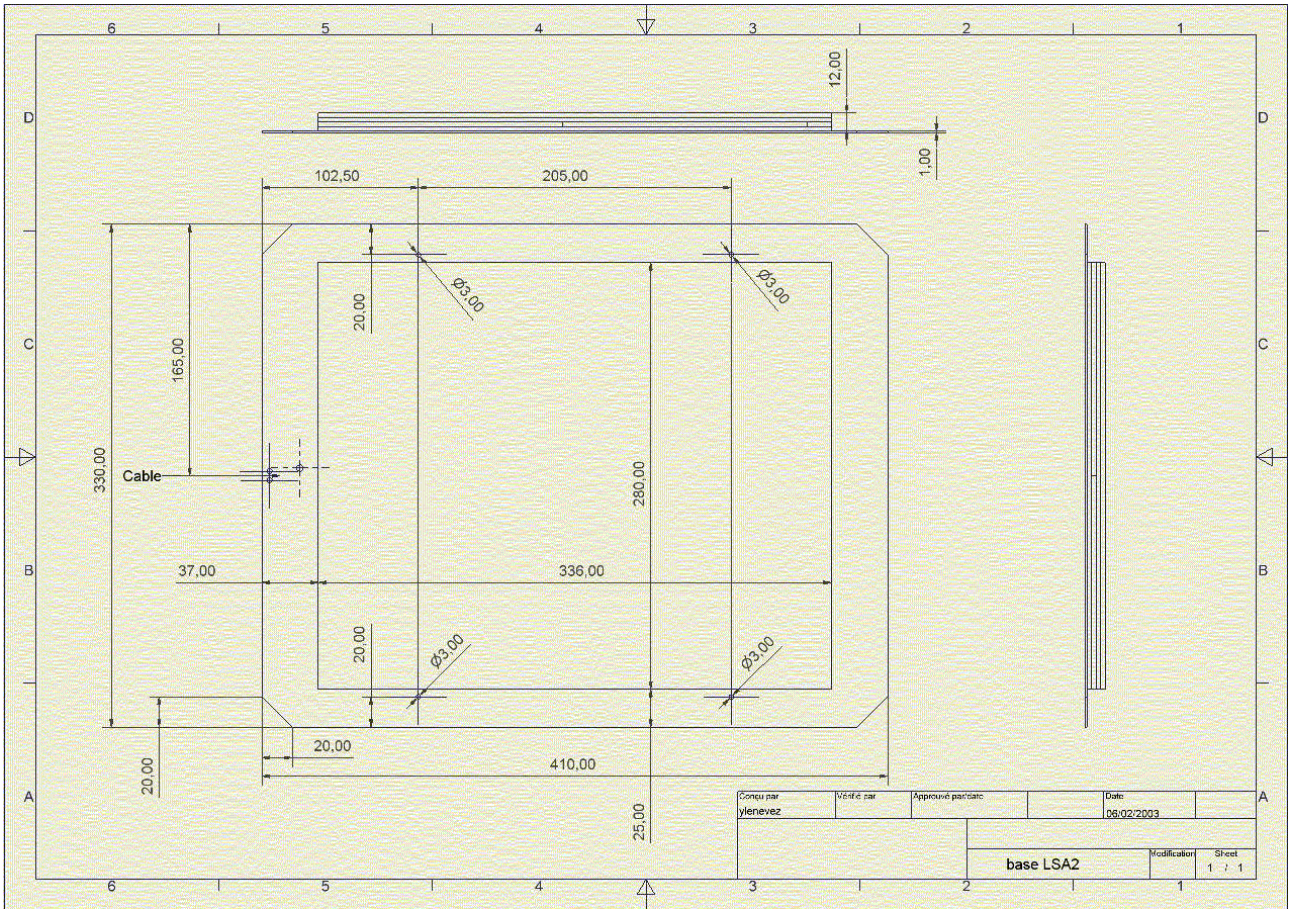


Figure 7: L-SA3 Antenna Mechanical Diagram (Bare Antenna) (in millimeters)



7.2 Electrical Characteristics

Description	Value
Maximum Input Power	1.5 W
Operating Frequency	13.56 MHz
Impedance	50 ± 5 Ω and 0 ± 5 °
Antenna Connection	50-Ω BNC Connector
Antenna Connection cable	50-Ω RG 58 cable (Length: 3 m.)

8 Warranty Conditions

8.1 Warranty

TAGSYS warrants that its Library Stack Antenna L-SA3 (Product) shall comply with the functional specifications set forth herein for a period of one year from the date of delivery to the Buyer.

This warranty is valid for the original Buyer of the Product and is not assignable or transferable to any other party.

TAGSYS cannot be responsible in any way for, and disclaims any liability in connection with the operation or performance of:

- any product in which the Product is incorporated;
- any equipment not supplied by TAGSYS which is attached to or used in connection with the Product; or,
- the Product with any equipment.

This warranty only applies to the Product and excludes all other equipment.

Optimal operation and performance of the Product are obtained by using TAGSYS' readers, by applying TAGSYS installation guidelines and by having your installation reviewed by a TAGSYS' technical consultant.

The TAGSYS warranty does not cover the installation, maintenance or service of the Product and is strictly limited to the replacement of Products considered as defective by TAGSYS and returned according to the return procedure defined below; in such case, TAGSYS will, at TAGSYS' option, either replace every defective Product by one new Product or refund the purchase price paid by Buyer to TAGSYS for the defective Product.

8.1.1 Warranty Exclusions

The following conditions are not covered under the warranty:

- Defects or damages resulting from storage of the Product under conditions that do not comply with TAGSYS specifications or normal usage.
- Defects or damages resulting from use of the Product in abnormal conditions (abnormal conditions being defined as any conditions exceeding the ones stated in the product specifications).
- Defects or damages from misuse, accident or neglect.
- Defects from improper testing, operation, maintenance or installation.
- Defects from alteration, modification except modifications or adjustments specifically described in this Product reference guide, adjustment or repair, or any attempt to do any of the foregoing, by anyone other than TAGSYS.
- Any action on the product that prevents TAGSYS to perform an inspection and test of the Product in case of a warranty claim.
- Tampering with or abuse of the Product.
- Any use or incorporation by the Buyer or a third party of TAGSYS' Product into life saving or life support devices or systems, or any related products; TAGSYS expressly excludes any liability for such use.

8.1.2 General Provisions

This warranty sets forth the full extent of TAGSYS responsibility regarding the Product.

In any event, TAGSYS warranty is strictly limited to (at TAGSYS' sole option) the replacement or refund of the Products purchase price to TAGSYS, of Products considered as defective by TAGSYS.

The remedy provided above is in lieu and to the exclusion of all other remedies, obligations or liabilities on the part of TAGSYS for damages, whether in contract, tort or otherwise, and including but not limited to, damages for any defects in the Products or for any injury, damage, or loss resulting from such defects or from any work done in connection therewith or for consequential loss, whether based upon lost goodwill, lost resale profits, impairment of other goods or arising from claims by third parties or otherwise.

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8.1.3 How to Return Defective Products

The Buyer shall notify TAGSYS of the defects within 15 working days after the defects are discovered.

Defective Products must be returned to TAGSYS after assignment by a TAGSYS Quality Department representative of an RMA (Return Material Authorization) number. No Products shall be returned without their proof of purchase and without the acceptance number relating to the return procedure.

All Products shall be returned with a report from the Buyer stating the complete details of the alleged defect.

Call +33 4 91 27 57 36 for return authorization and shipping address.

If returned Products prove to be non-defective, a charge will be applied to cover TAGSYS' analysis cost and shipping costs.

If the warranty does not apply for returned Products (due to age, or application of a warranty exclusion clause), a quote for replacement will be issued, and no replacement will be granted until a valid purchase order is received. If no purchase order is received within 30 days after the date of TAGSYS quote, TAGSYS will return the products and charge the analysis cost and shipping costs.

All replaced Products shall become the property of TAGSYS.

The Product Return Form is included on the following page. This form should accompany any product you need to return to TAGSYS for analysis in the event of a problem.

Product Return Form

Customer Profile:

Company: .....
Address: .....
.....
.....
City & State:.....
Zip Code:.....
Country:.....

Contact Name: .....
Contact e-mail: .....
Contact Phone: .....
Contact Fax:.....

Order identification:

Product Name:.....
Order Number (OEF):.....

Invoice Number:.....
Return Quantity: .....

Reason for return:

.....
.....
.....
.....
.....

To inform TAGSYS of this return, please email it to

RMA@TAGSYS.net

Address to ship the product with this document attached:

TAGSYS
QUALITY DEPARTMENT
180, chemin de Saint Lambert
13821 La Penne sur Huveaune France
To inform TAGSYS of this return, please also fax it to your Customer Service Representative

+33 4-9127-5701

Return Procedure:

The product returned will go through stringent quality controls.
A final analysis report will be sent to you as soon as possible.
Please contact your Quality Service representative for further details.
+33 4-91-27-5736