



GemWave™ Smarto L122 EAS System

User Guide

Version 3.0

FCC Compliance Statement

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 the receiver
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technical for help

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Welcome

Welcome to GemWave™ Smart Asset Tracking!

Thank you for the confidence you have shown TAGSYS by choosing the GemWave™ product range.

GemWave™ products can help you implement high-quality Radio Frequency Identification (RFID) systems for the most demanding applications. They can also be adapted easily to existing systems.

Assumptions

This User Guide is designed for all TAGSYS partners and for TAGSYS Expert Network customers implementing a low-cost and high-performance RFID solution.

This document does not assume any knowledge of Radio Frequency (RF) Identification technology. If you would like more information on this technology, a good reference source is:

"RFID Handbook, Radio Frequency Identification Fundamentals" by Klaus Finkenzeller, published by John Wiley & Sons UK 1999.
ISBN 0-471-98851-0.

This User Guide assumes the equipment is installed, set up, tuned, and operating correctly.

About this manual

This document describes the **Smarto L122 Electronic Article Surveillance (EAS)** system. This system scans items passing between two or more pedestals to determine if they have been correctly processed or checked out.

The manual contains:

- ✎ a brief description of the **Smarto L122** and explanation of how it works
- ✎ a description of the operations carried out using the unit
- ✎ a troubleshooting table
- ✎ reference information such as technical specifications
- ✎ a glossary and list of abbreviations and acronyms

This document uses the following conventions:

Symbol	Meaning
✎	One of a list of items.
➤	One of a list of actions.
	A warning about safety or hazards, or about actions that could lead to equipment failures or breakdown.
	A note or additional information to which your attention is drawn.

Getting help

If you require assistance with your **Palmo P121** system, please contact your customer support representative, or TAGSYS.

Quality assurance

TAGSYS implements stringent quality controls in all stages of manufacture. If you find a defect with this product, please notify your customer service representative.

Warranty

TAGSYS partners and customers are not authorised to modify the **Smarto L122**. Any modification invalidates the warranty.



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

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Introducing the Smarto L122 EAS system

1.1 Introduction

The GemWave™ **Smarto L122 EAS** system (see *Figure 1*) reads information from microchips embedded in smart labels.

Smart labels are small tags, which may be injected into plastic for protection from hostile environments. They have numerous applications such as managing the borrowing and return of books or tracking laundry articles. As well as providing identification, smart labels can also prevent theft by triggering an alarm if the labelled item is not checked out or processed correctly.

Theft prevention has traditionally been performed by single bit magnetic and electromagnetic tags used only for theft prevention, but the smart labels used in the **Smarto L122 EAS** system have the EAS capability built into the smart label, along with identification and other information.

1.2 Anti-theft system overview

The anti-theft system is called an Electronic Article Surveillance (EAS) system and comprises:

- ✂ at least one pair of vertical **Aero L122 EAS** pedestals forming a 'gate' (called an EAS gate) at the building or room entry/exit point
- ✂ a **Medio L122** EAS electronics unit for each pedestal, to drive the system

Each item to be checked is labelled with a 'smart label' (see below) that includes identifying information about the item. Part of the information on the label is the theft status, encoded on a 'theft bit', which is either ON or OFF. When the item is being processed, for example, by being checked out of the library, the theft status is changed to OFF.

The labelled articles (such as library books) are passed or carried through the gate. Pedestrian traffic is only allowed between the pedestals. As the item passes between the pedestals the status of the theft bit is detected. If it is ON, a panel of lights at the top of the pedestal flashes, and a buzzer may sound.

Smart labels

A smart label consists of a silicon microchip (C220 type) connected to an antenna etched on to the label substrate. When the label passes through the electromagnetic field produced by the antennas inside the EAS pedestal, the label begins to send information about the theft status. This information can be detected even when the label is invisible to the pedestal, or if it is covered in grime or dirt or in a challenging environment.

The smart labels used in this system are of the passive type, which means they do not have an internal power source and derive their power from the EAS pedestal antennas. Their operational lifetime is virtually unlimited.

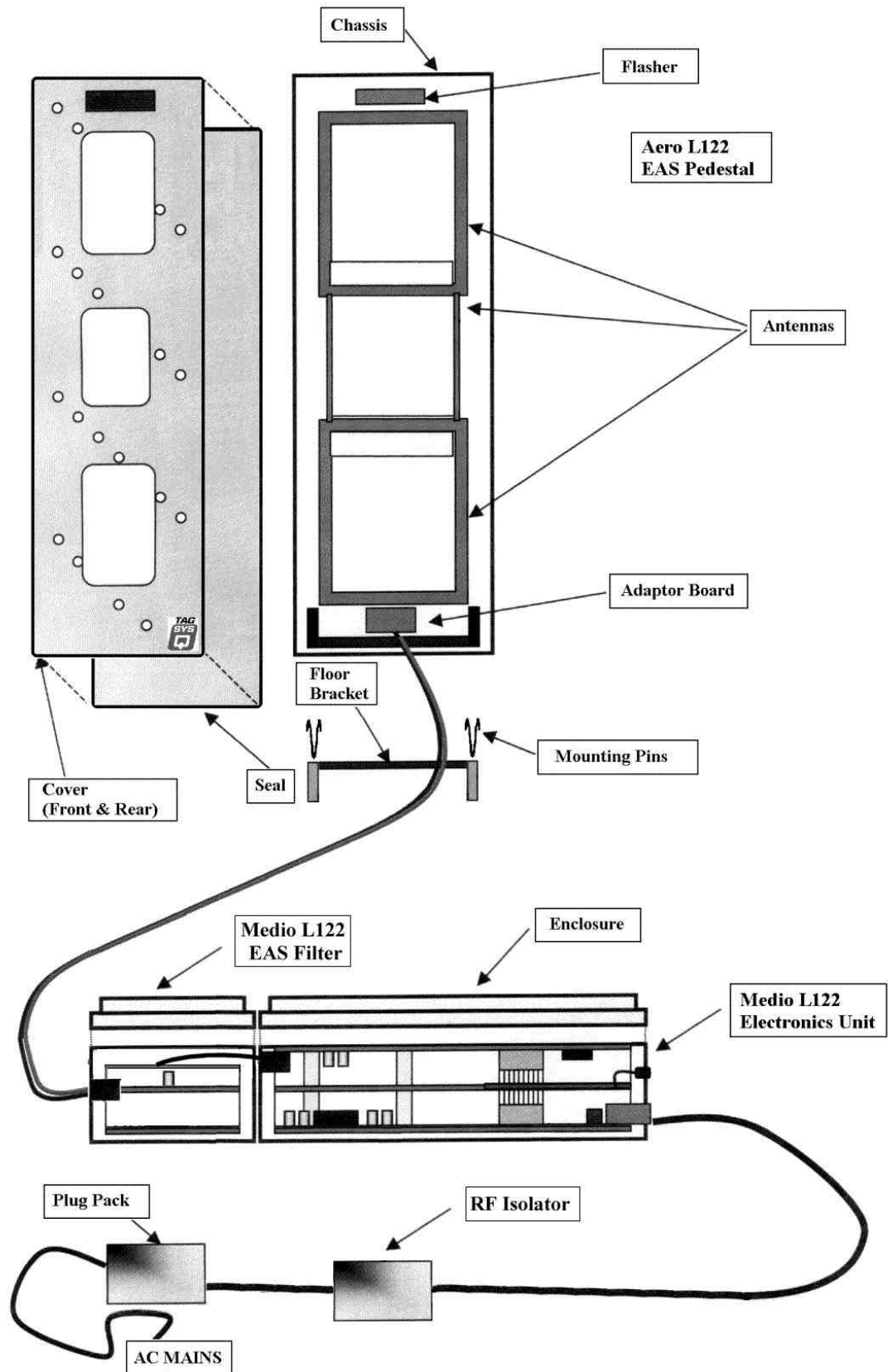
The GemWave C220 microchip is available on a number of styles and sizes of smart labels. The performance of each of these types varies, and some may not provide performance suitable for EAS systems.

Theft bit

The smart label may have up to 128 bits of information programmed into it. One of these 'bits' of information is the theft bit. This bit must be in one of two states: ON (enabled or set) or OFF (disabled or cleared).

When the theft bit in a smart label is ON, the label transmits a short burst of reply (the 'EAS burst') when in the electromagnetic field of the EAS gate antennas. This short burst is detected by the antennas and the alarm is raised. If the theft bit is off, the EAS burst is disabled and no alarm results.

Figure 1: System overview



1.3 Smarto L122 EAS system overview

The **Smarto L122** system (see *Figure 1*) consists of:

- ✎ *pedestals*—normally two or more between which items pass for theft detection, and which raise an alarm if an item has not been correctly processed
- ✎ *smart label*—attached to the item(s) to be checked for theft status, and includes a transponder programmed with information to identify the object to which it is attached, and a tiny antenna etched onto the label substrate
- ✎ *Medio L122 electronics unit*—applies radio waves to a pedestal to interrogate smart labels near the pedestal

1.4 Smarto L122 components

The **Smarto L122** components are located in the **Aero L122** pedestal and the **Medio L122** electronics unit.

Pedestal components

Each pedestal acts independently of any others, though it must be synchronised with all other pedestals in the building, and with the phases of the mains power supply, to function correctly. The maximum number of pedestals in close proximity to each other is eight.



Note: If the pedestals are not correctly tuned and synchronised, they may interfere with each other and produce anomalous results.

The set of pedestals at an entrance or exit is termed an EAS gate, and may comprise up to four pedestals. A pair of pedestals is shown below.

Figure 2: Pedestals

The following components form the pedestal:

- ✂ *chassis* — a supporting frame fixed to the floor
 - ✂ *flasher unit* — produces a visual alarm at the top of the pedestal (a buzzer is also provided)
 - ✂ *antennas* — three antennas, which detect theft bit information from the smart labels
 - ✂ *adaptor board* — connection point for cables to the electronics unit, the antennas, and the flasher unit
- PIR (passive infrared) sensors are also mounted on this board for detecting the presence of people near the pedestals.
- ✂ *mountings* — fix the chassis to the floor, and strong enough to ensure the pedestal will not collapse even if an average sized person falls against it
 - ✂ *cover and seal* — plastic cover in two halves with a flasher and a rubber seal between the halves

Electronics unit components

Each pedestal is cabled to a **Medio L122 EAS** electronics unit that reads information from the smart labels passing between the pedestals.

The electronics unit has two small indicator lights. The green light should be on when the electronics unit has power. The red light should be on whenever the flasher unit on the pedestal is flashing to indicate a smart label with theft bit ON has been detected.



WARNING: The electronics unit contains no operator serviceable parts and must only be serviced by qualified personnel.

Figure 3: Electronics unit (front and rear)



Connections to:

plug pack

optional outputs

pedestal adaptor board



Note: The electronics unit is not fused and does not contain any fans, batteries or insulated interconnecting wiring.

1.5 Cabling and plug pack

The pedestals are supplied with all internal wiring and cabling connected. The cable from the electronics unit to the adaptor board provides received (Rx) and transmitted (Tx) signals to and from the pedestal, and power for the flasher unit.

The mains power supply to the electronics unit is a separate wall plug style linear mains pack that converts the local mains power to 12 V AC, 1 Amp power at 50 Hz or 60 Hz. A separate plug pack should be provided for each pedestal.

The plug pack must be purchased locally to suit the voltage and frequency ratings of the national supply. It must meet the national regulations for the country in which it is installed. Full specifications are included in *Section 4.1*

SMARTO L122 FCC EQUIPMENT STATEMENT

WARNING TO USERS IN THE UNITED STATES

FEDERAL COMMUNICATIONS 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 UNAUTHORISED 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 Australia Pty Ltd. Unauthorised modification may void the equipment authorisation 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 authorisation from the FCC and will void the TAGSYS warranty.

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Operation



Note: This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

2.1 Factors affecting operation

Other electronic equipment within two to five metres of EAS pedestals (such as borrowing stations) can interfere with the performance of the system in the following ways:

- ✎ smart label couplers emit an electromagnetic field that can interfere with the sensitivity of nearby pedestal antennas
- ✎ the smart label's response to the nearby coupler can be picked up on the EAS pedestals if it contains EAS information

A minimum of five metres¹ is recommended between an EAS pedestal and any other reader system or antenna such as that on a return chute. Where borrowing stations and other Library RFID modules are used, and where smart labels are being programmed, we recommend a minimum of ten metres. In this case a fully shielded antenna is also necessary. Refer to *Chapter 3* for further information on interference.

¹ Subject to site variables. Distance may be less under some conditions. Metal frames on furniture and fixture items may interfere with the EAS system if they are too close. This is because energy from the antenna can couple into the metallic frame and be transmitted to smart labels and antennas several metres away. Consult your TAGSYS partner for advice on installing and positioning the pedestals.

2.2 Starting the system

If possible, each pedestal plug pack should be connected to a single board with a single mains switch to ensure all pedestals are powered simultaneously.

There is no on/off switch. As long as the system is correctly cabled and all connections are good, the system operates when power is applied.

2.3 Normal operation

No operating procedures are required. The system continues to operate as long as it is plugged in.

2.4 Shutting down

Do not shut the system down unless absolutely necessary.



WARNING: We recommend all pedestals in the building remain on at all times.

2.5 Adjusting the buzzer volume

The buzzer volume may be adjusted with the potentiometer on the top of the pedestal, above the flasher unit.

To gain access to the trim pot, separate the covers from the pedestal chassis and remove the pedestal seal from the top of the pedestal cover sufficiently to access the trim pot. To adjust the volume, turn the trimpot — clockwise to increase buzzer volume, or anti-clockwise to decrease the volume.

Troubleshooting

3.1 Troubleshooting table

Fault	Possible causes	Remedies
No power.	Cabling fault. Plug pack fault.	Check cabling and connections. Replace any suspected faulty cables. Replace plug pack.
Alarms missed (smart labels with theft bit ON not triggering alarms).	Tuning fault.	Call your TAGSYS customer service representative.
No detection of smart labels.	One or more of the inputs or outputs not functioning correctly. No RF output pulse power from the multiplexer to the antenna.	Call your TAGSYS customer service representative. Call your TAGSYS customer service representative.
False alarms (smart labels with theft bit OFF trigger alarms).	Nearby devices are interfering with the pedestals. (Refer also to <i>Section 3.2.</i>) Tuning fault.	Switch off all or some of the suspicious nearby devices and check if the EAS detection performance changes. (If not, call your TAGSYS customer service representative.) Call your TAGSYS customer service representative.

3.2 Sources of interference

The following devices may cause interference with EAS systems when in close proximity (within approximately ten metres) of pedestals:

- ✂ smart label couplers and programming devices
- ✂ computers
- ✂ radios tuned to the SW region
- ✂ high power music systems with D-class amplifiers
- ✂ some industrial vacuum cleaners
- ✂ high frequency fluorescent lights (if very close to pedestals)
- ✂ neon lights such as advertising signs
- ✂ equipment using switch mode power supplies
- ✂ data or power cables within 400 mm
- ✂ illuminated exit signs generating 80–100 kHz noise
- ✂ digital phone lines (wideband noise)



Note: Contact customer support for advice on installation or any interference problems experienced.

Technical data

4.1 Technical specifications

Feature	Details
Microchip compatibility	GemWave C220
Operating conditions	0°C to 55°C
Storage temperature	-20°C to 70°C
Weight	Electronics: 1.1 kg Pedestal: 17 kg
Conformity	FCC Part 15, CE; C-Tick, UL, IEC 60950 (Applications pending at time of printing.)
Power supply	12V AC 1 Amp 50/60 Hz

4.2 Spare parts

Please contact TAGSYS for any spare parts you require.

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Glossary

The following terms apply to RFID technology. Not all of these terms appear in this document.

Term	Description
Antenna	An aerial that receives and/or transmits radio frequency signals. Aerials are manufactured in a variety of forms, shapes and sizes.
Baud	A transmission speed rate representing the number of signalling events per unit time.
Bit	A single character in a binary processing system.
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.
Byte	A group of eight bits used to represent characters in a binary processing system.
Coupler	An electronic device enabling communication between smart labels and host computers.
GemWave™	TAGSYS' range of products operating at the 13.56 MHz frequency.
Hexadecimal	A system based on the number 16, in which numbers are made up of the digits 0 to 9 and letters A to F. Often used in computer systems instead of long strings of binary digits.
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.
Microchip	An integrated circuit in which all components are on a single piece of semi-conductor material.
Reader	This term is interchangeable with coupler.
RFID	An automatic identification and data capture system comprising one or more couplers and one or more smart labels, in which data transfer is achieved by means of suitable modulated inductive or radiating electromagnetic carriers.

Term	Description
Smart label	Small, flexible tag belonging to TAGSYS' 13.56 MHz GemWave™ product line. It consists of a chip connected to an antenna etched on a substrate (such as plastic film).
Tag	This term is often used interchangeably with smart label.
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.

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Acronyms and abbreviations

The following abbreviations and acronyms apply to RFID technology. Not all of these terms appear in this document.

Abbreviation	Meaning
AC	Alternating Current
CEC	Canadian Electrical Code
CRC	Cyclic Redundancy Check
EAS	Electronic Article Surveillance
ETX	End of Text
GRT	General Response Time
NEC	National Electrical Code
NYI	Not Yet Implemented
PC	Personal Computer
PIR	Passive Infrared
RAM	Random Access Memory
RF	Radio Frequency
RFID	Radio Frequency Identification system
STX	Start of Text
TEP	Transmit Enable Pulse

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