# User Manual for
# the Link-It Active Tag

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# APPROVALS

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Table 1: Approvals

# AMENDMENT HISTORY

| Issue | Date | Amendment Details | Amended By |
|---|---|---|---|
| 0.00 | 23 April 1999 | Draft | C.L. Neuhoff |
| 1.00 | 22 August 00 | FCC Approval | H. Shrank |
| | | | |
| | | | |

Table 2: Amendment History

# REFERENCED DOCUMENTS

| Number | Title | Date | Rev | Source |
|---|---|---|---|---|
| 1. | Info Sheet L-TG100 (Tag Information) | | | AIT |
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Table 3: Referenced Documents

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# 1 SCOPE

## 1.1 IDENTIFICATION

The Link-It Active Tag (Sometimes referred to as the tag) is manufactured in two different types of packages to suite various applications. These applications include asset management, asset protection, stock monitoring, fleet management, and access control for people. The system can be used in a very wide range of environments, including workplaces, medical facilities, educational establishments, warehouses, receiving and despatch areas, parking lots and for many security applications, depending on the interfaces required.

## 1.2 PRODUCT OVERVIEW

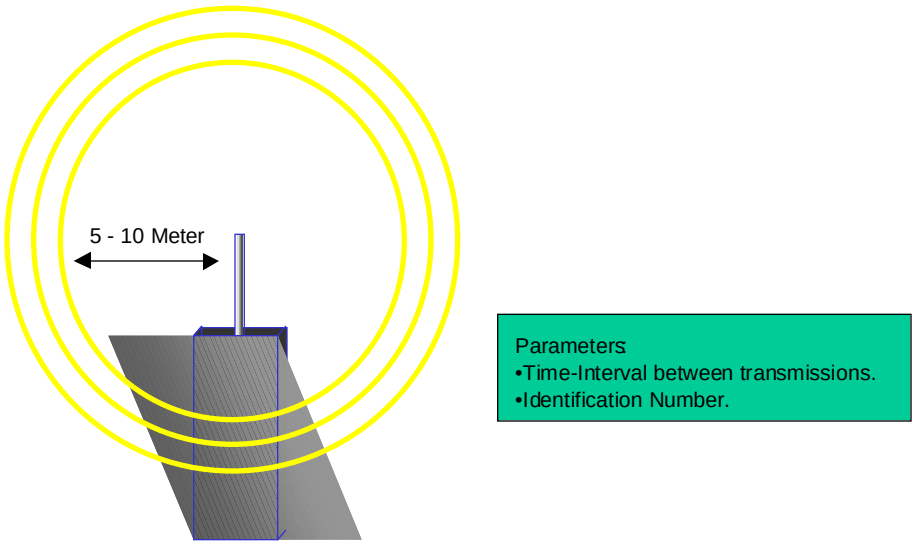


Figure 1: Tag Block Diagram

The tag perform the following functions:

- Transmit ID at pre-set time-intervals.
- Accepts new parameters when being reprogrammed with a tag programmer.
- Depending on the environment in which the tags are being used, and the type of tag, it can transmit up to a range of 10 meters.

## 1.3 DOCUMENT OVERVIEW

This document is intended for use by users and system vendors of the Link-It Tagging System. Operational details of the tag are described.

- Chapter 2 describes the performance parameters of the tag. Operational, functional and physical characteristics of the tag are explained.
- Chapter 3 describes the interface details of the tag. Software interfaces are explained.

- Chapter 4 describes the principal of operation of the tag. Aspects such as communication between components of the system as well as operational concepts are explained.
- Chapter 5 contains information regarding the installation procedures for the various tags. This information will particularly useful for system integrators and solution providers.

# 2 PERFORMANCE PARAMETERS

## 2.1 OPERATIONAL DESCRIPTION

### 2.1.1 Tagging System

The main function of the system is to monitor and control equipment, assets and people in an area or building in terms of position. This is done by active tags that each transmits a unique ID within a pre-set time interval. Multifunction readers, appropriately situated in the area where position monitoring has to be conducted, interpret signals transmitted by the tags. All tags interpreted by a specific reader are in fairly close proximity to the reader; enabling the position of the tags to be established quite accurately.

The system can also monitor movement of equipment. This function is implemented by using tags designed to sense movement.

### 2.1.2 Tags

#### *2.1.2.1 Basic Tag*

The basic tag can be configured to send its unique ID at a pre-set time-interval. This tag is usually used on equipment where the position should be monitored. A Tag Programmer is used to externally configure the tag. The tag is capable of transmitting its ID up to a distance of 5m. It must be however be emphasised that the transmission range may vary from environment to environment.

#### *2.1.2.2 Tag with movement sensor*

The tag with movement sensor senses movement. It transmits its unique ID at pre-set intervals, but will go into alarm mode automatically when it senses disturbance. This type of tag is generally used on assets that should not be moved, or subjected to vibration, in normal circumstances. The tag is capable of transmitting its ID up to a distance of 5m. It must be however be emphasised that the transmission range may vary from environment to environment.

#### *2.1.2.3 Slimline Tag*

The slimline tag can be configured to send its unique ID at a pre-set time-interval. This tag is usually used on equipment and people where the position should be monitored. A Tag Programmer is used to externally configure the tag. The tag is capable of transmitting its ID up to a distance of 10m. It must be however be emphasised that the transmission range may vary from environment to environment.

## 2.2 FUNCTIONAL CHARACTERISTICS

### 2.2.1 Tagging System

The system is capable of determining the relative position of tags. Tags can be attached to assets or people.

### 2.2.2 Tags

#### *2.2.2.1 Normal Tag*

The normal tag can be attached to assets, equipment, and people. The tag is used to perform the following functions in the system.

- Transmit its unique pre-programmed ID at a pre-programmed time interval.

#### *2.2.2.2 Tag with movement sensor*

The tag with movement sensor can be attached to assets, equipment, and people. It is used to perform the following functions in the system.

- Transmit its unique pre-programmed ID at a certain pre-programmed time interval.
- Transmit its unique pre-programmed ID each time that the tag senses movement.

#### *2.2.2.3 Slimline Tag*

The slimline tag can be attached to assets, equipment, and people. The tag is used to perform the following functions in the system.

- Transmit its unique pre-programmed ID at a pre-programmed time interval.

## 2.3 PHYSICAL CHARACTERISTICS

### 2.3.1 Normal Tag and Tag with movement sensor

Both these tags have the same physical characteristics. The physical characteristics of tags are described in the table below.

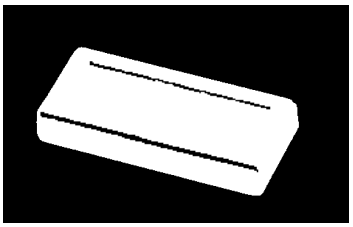

Figure 2: Active Tag

| Parameter | Specification |
|---|---|
| Size | 61mm x 30mm x 9mm |
| Weight | < 25gms |
| Type of material | PVC (ultrasonically sealed) IP 65 rating |

Table 4: Physical Characteristics of Normal and Movement Tags

Tag colours are described below:

- Normal tags are Light Grey
- Tags with movement sensors are Dark Grey.

### 2.3.2 Slimline Tag

Slimline tags are flat and are normally used in personnel tagging and laptop tagging applications. The physical characteristics of slimline tag are described in the table below.

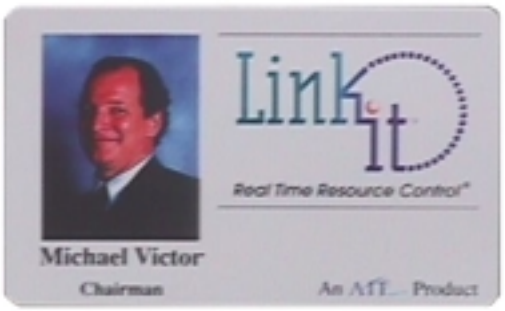


Figure 3: Active Tag

| Parameter | Specification |
|---|---|
| Size | 86mm x 54mm x 5mm |
| Weight | < 30gms |
| Type of material | PVC (ultrasonically sealed) IP 65 rating |

Table 5: Physical Characteristics of Slimline Tags

Tag colours are described below:

- Enclosures are manufactured in light and dark grey.
- Custom labels can be printed onto the slimline tag.

# 3 INTERFACE DESCRIPTION

## 3.1 BASIC TAG OR TAG WITH MOVEMENT SENSOR

Tags basically have two data interfaces that are explained in the paragraphs below.

### 3.1.1 RF Interface

Tags are designed to operate in the more commonly known free-bands (403MHz, 868MHz). The typical power output is less than 100uW.

### 3.1.2 Programming Interface

Each Tag has to be programmed with specific variables. These variables include time-interval of its transmissions and the tags unique ID. A Tag Programmer is used for this purpose.

# 4 TECHNICAL DESCRIPTION

## 4.1 PRINCIPAL OF OPERATION

The principal of operation of the Link-It Tagging System s described in this section. A basic knowledge of the system is essential before commencing with any installations or implementation. A basic system block diagram is illustrated in Figure 4. Tags A → N attached to assets, equipment and people are recognised and interpreted by a network of Readers and Repeaters. In larger areas Repeaters are used in conjunction with Readers to increase the area of operation. In smaller areas one reader will normally be sufficient to read all tags in that area. Information regarding the relative tag positions is sent via cables from readers to a PC.

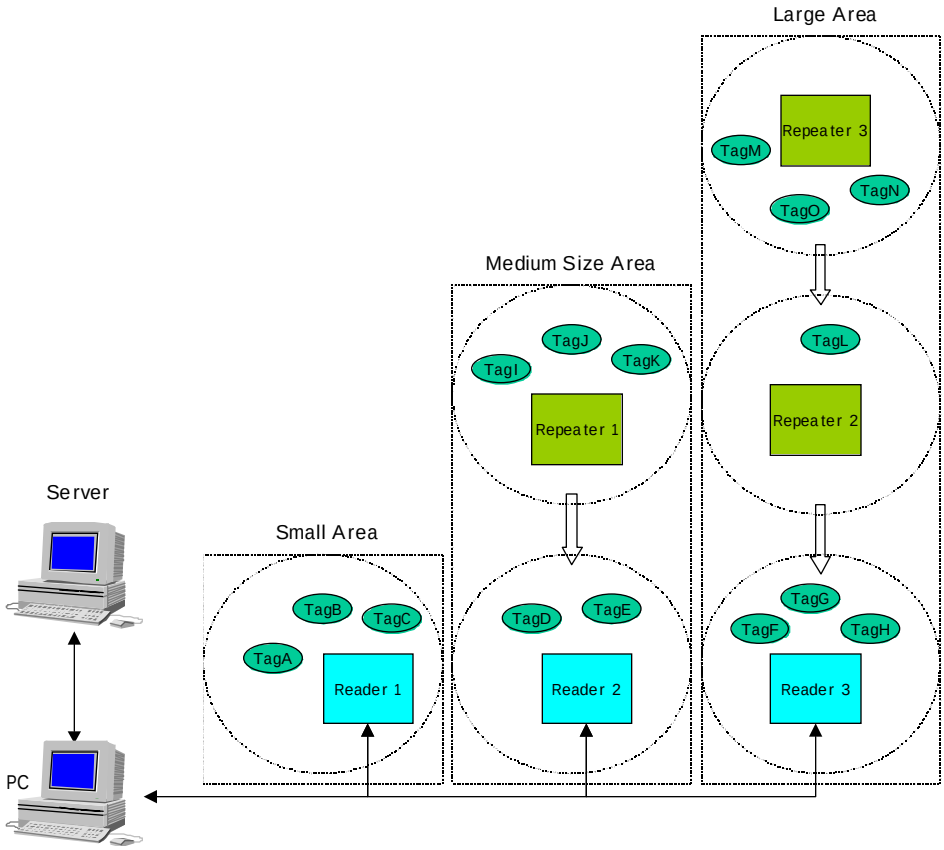


Figure 4: Basic System Block Diagram

### 4.1.1 TAG TO READER/REPEATER COMMUNICATION

Tag to Reader/Repeater communication is done via a RF channel. The interface is described in paragraph 3.1.1. Tags transmit their pre-programmed ID's at a certain time-interval. These ID's are received and interpreted by the Reader/Repeater. Readers/repeaters can be configured filter data received from tags. This means that only certain tags may be interpreted by the reader/repeater.

Figure 5 illustrates a configuration of two repeaters (Repeater1 and Repeater2), one reader (Reader1) and 12 tags (TagA → TagL). Repeater2 can be configured to receive data only from tags except for TagE, TagF, TagG and TagH. All other tags that fall within Repeater2 receive zone will be discarded. However, this type of

configuration is not recommended, but would rather be used in applications where two different systems are situated in close proximity of each other as illustrated in Figure 6.

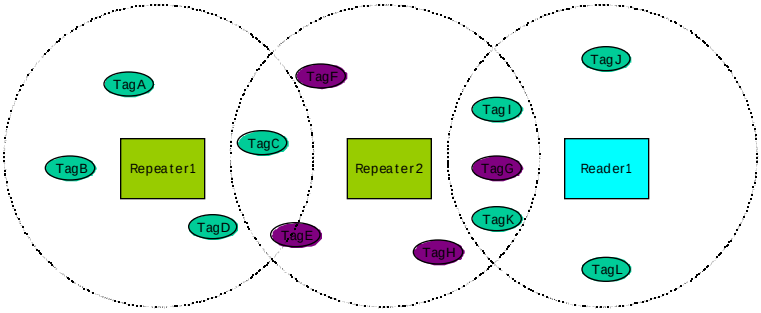


Figure 5: Tag to Reader/Repeater Communication

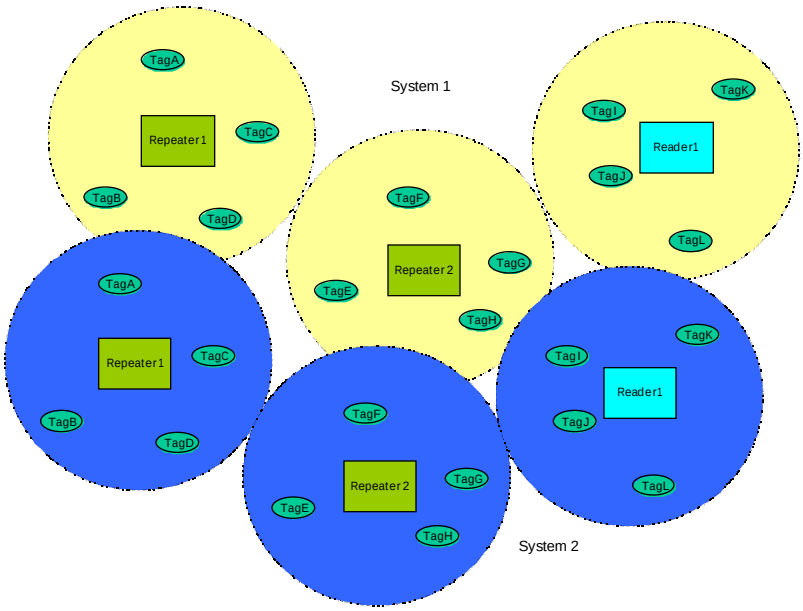


Figure 6: Tag to Reader/Repeater Communication of 2 Different Systems

# 5 CONFIGURING TAGS IN THE LINK-IT SYSTEM

## 5.1 PROGRAMMING OF THE TAGS

Custom Tag Programming software is supplied to each user and vendor of the Link-It Tagging System.

The Tag Programming Software runs on any IBM compatible PC using a Windows 95 operating system. The program is installed by running “setup.exe” on Disk 1 of the installation disks. A snapshot of the programming software is illustrated in Figure 7.

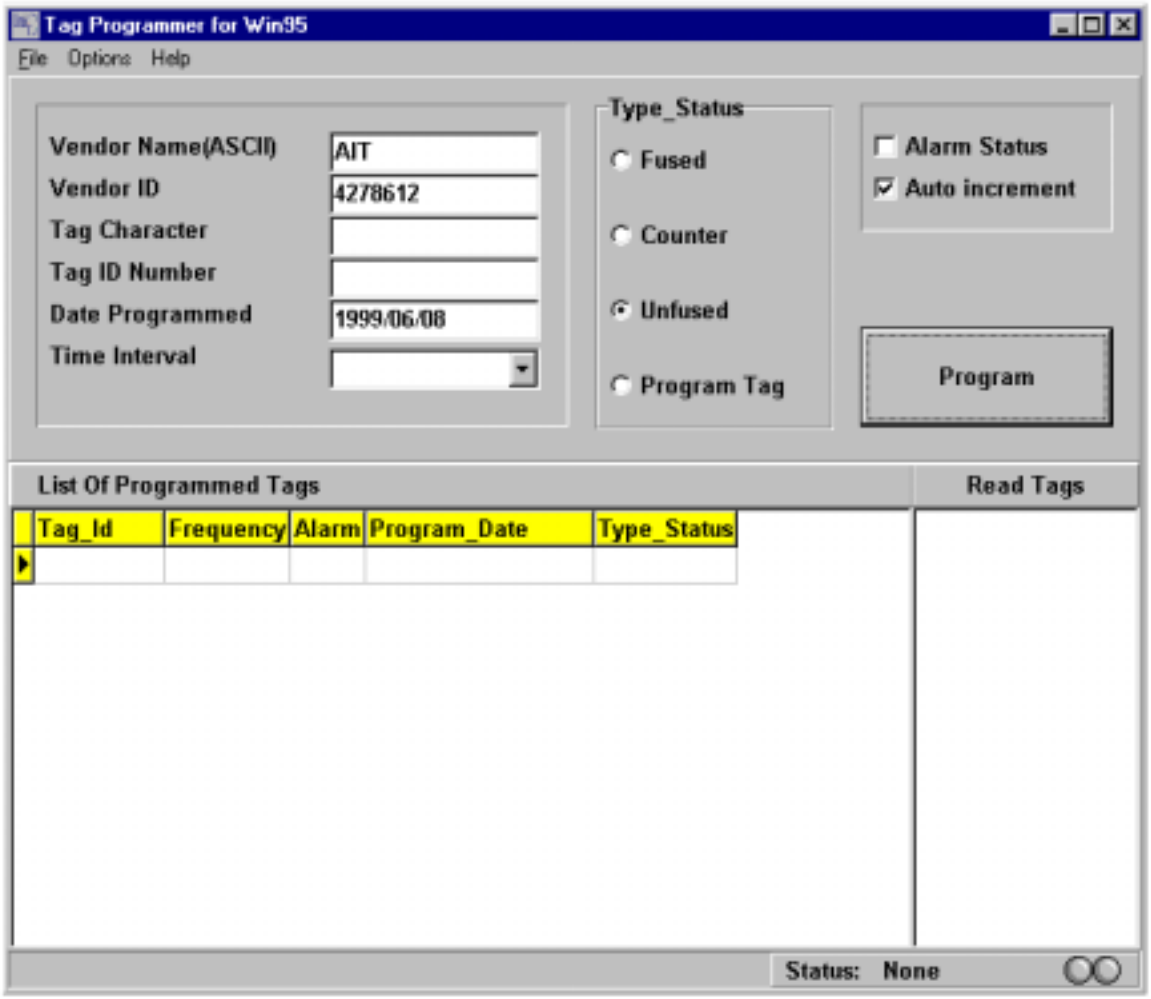


Figure 7: Tag Programming Software

Please insure that a Tag Programmer is connected to communications port 2 of the PC before attempting to program tags.

The program functions are explained in the paragraph below:

- **Vendor Name (ASCII)** : 3 Byte Vendor ID displayed in ASCII format. Note that the ID must always be 3 bytes in length. The Vendor Name will be pre-programmed by

AIT, and will not be configurable for the user.

- **Vendor ID** : 3 Byte Vendor ID displayed in decimal format. The Vendor ID is programmed into the Tag. This is a fixed value pre-programmed by AIT
- **Tag Character** : Tag ID displayed in ASCII format. Note that the Tag ID must always be 4 bytes in length.
- **Tag ID** : Tag ID displayed in decimal format. This is the ID that is programmed into the Tag. This is a user configurable option. The range of values available is 0000000000 → 4294967295 and must always be 10 digits in length.
- **Date Programmed** : Current Date. The date is not programmed into the tag but is inserted into the database for further reference in configuration management.
- **Programming Sequence** :
- Coloured Indicator : Indicator to indicate current status and step in programming sequence.
- Text Box : Indicates all tag IDs interpreted by the programmer after the last programming sequence
- **Type Status Frame** :
- Fused : If the tag is programmed with this option, no future programming of the tag will be allowed
- Counter : Reset the Counter Byte to 0
- Unfused : Default option. Tag can be re-programmed in future
- Program Tag : Program the tag as a Program Tag
- **Auto-increment Frame** :
- Checked : Sets the Tag Programming Software to auto-increment the ID to be programmed to the next tag.
- Not Checked : Opposite of above
- **Alarm Status Frame** :
- Checked : Sets the Alarm option of the tag.
- Not Checked : Do not set the alarm status of the tag
- **Time Interval** : Time Interval between Tag transmissions
- 3 : 3 Second time interval between transmissions.
- 2 : 2 Second time interval between transmissions.
- 1 : 1 Second time interval between transmissions.
- 0.5 : 0.5 Second time interval between transmissions.
- 0.3 : 0.33 Second time interval between transmissions.
- 0.16 : 0.16 Second time interval between transmissions.
- **List of programmed tags** : Displays a list of all tags that has been programmed. The user uses the table for verification purposes.
- Tag ID Column : ID of the tag
- Frequency Column : Time Interval of the Tag

- Alarm Column : Display alarm status of the tag
- Program Date Column : Display the date on which the tag has been programmed.
- Type Status Column : Displays the tag type.
- **Read Tags** : Displays a list of all the tags currently being read by the programmer.

The following paragraph describes the typical programming sequence for a tag.

- Install the Programming software by running “setup.exe” on disk 1.
- Connect the Programmer to communications port 2 of the PC.
- Run the Programming Software.
- Enter the 10 digit unique ID for the tag in the “Tag ID Number” box.
- Select all other options.
- Ensure that the tag is correctly placed on the programmer.
- Press the Program button.
- Follow Instructions on the screen.
- Repeat for next tag. (No need to enter next ID if the “Auto Increment” option is checked)

## 5.2 INSTALLATION OF THE TAGS

### 5.2.1 Normal Tags

This type of tag is used in a variety of tagging applications. Depending on the application, tags are attached to equipment with glue, epoxy, velcro or double sided tape.

### 5.2.2 Tag with movement sensor

The movement tag is used in applications where slight movement of equipment needs to be monitored. . Depending on the application, tags are attached to equipment with glue, epoxy, velcro or double sided tape.

### 5.2.3 Slimline Tag

The slimline tag is normally used in personnel tagging application as well as laptop tagging applications. A slimline tag bracket can be used to attach the slimline tag to personnel, the tag can however be kept in a persons pocket or carried by hand. The slimline tag is attached to laptops by means of double-sided tape, velcro, or glue.

# 6 NOTES

## 6.1 APPROVALS

**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.**

## 6.2 ABBREVIATIONS

| Abbreviation | Meaning |
|---|---|
| CR | Carriage Return |
| EOM | End of Message |
| I/O | Input/Input |
| ID | Identity |
| LF | Line Feed |
| LSB | Least Significant Bit |
| UPS | Uninterruptible Power Supply |
| M | Meter |
| Mm | Millimeter |
| MSB | Most Significant Bit |
| NC | No Connection |
| PC | Personal Computer |
| Pwr | Power |
| RF | Radio Frequency |
| Rx | Receive |
| SOM | Start of Message |
| Tx | Transmit |
| RFID | Radio Frequency Identification |
| | |
| | |

Table 6: Abbreviation