USER MANUAL
FOR THE
WAVETREND TAGS

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AMENDMENT HISTORY

Issue	Date	Amendment Details	Amended By
0.00	18 February 2002	Draft and Final	C.L. Neuhoff
1.10	26 March 2002	Orientation of L-TG800 corrected at movement	C.L. Neuhoff
1.20	9 September 2002	Tag Age at 15 seconds interval	C.L. Neuhoff

Table 1: Amendment History

APPROVALS

Number	Name	Designation	Date	Signature
1.	A. Evangelidis	Technical Director		
2.	C.L. Neuhoff	Systems Engineer		

Table 2: Approvals

REFERENCED DOCUMENTS

Number	Title	Document Number	Rev	Source
1.				
2.				
3.				
4.				
5.				

Table 3: Referenced Documents

ABBREVIATIONS

Abbreviation	Meaning
BCC	Block Check Character (Checksum)
CR	Carriage Return
EOM	End of Message
I/O	Input/Input
ID	Identity
LF	Line Feed
LSB	Least Significant Bit/Byte
m	Meter
mm	Millimeter
MSB	Most Significant Bit/Byte
NC	No Connection
PC	Personal Computer
PCB	Printed Circuit Board
Pwr	Power
RF	Radio Frequency
RFID	Radio Frequency Identification
Rx	Receive
SOM	Start of Message
TBA	To be Announced
Tx	Transmit
UPS	Uninterruptible Power Supply
VHB	Very High Bond

Table 4: Abbreviations

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1 SCOPE

1.1 IDENTIFICATION

Wavetrend Active Tags can be used in various applications such as access control, personnel monitoring, asset monitoring, vehicle monitoring and building management applications. Wavetrend Tags are suitably packaged to meet the various requirements for different applications.

L-TG100   L-TG501   L-TG800

1.2 PRODUCT OVERVIEW

Wavetrend tags are Active Radio Frequency Identification tags (i.e. self-powered). Tags can be configured to transmit its unique identification with a predefined time-interval, and can report events such as tampering and movement. Each tag in the Wavetrend Tag range has unique properties that enable the user to tag a wide range of appliances and objects.

- L-TG100 → Tag plastic, wooden and rubber objects.

- L-TG501 → Tag people.

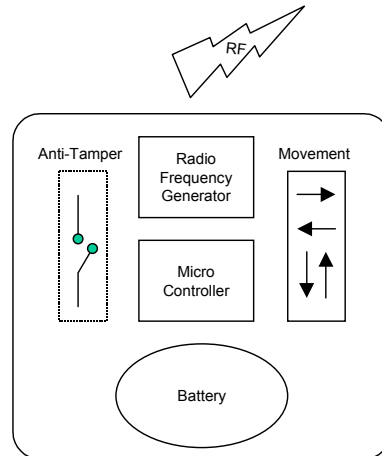- L-TG800 → Tag metal objects, computers and notebooks.

Wavetrend tags operate at a frequency of 433.92MHz.

DOCUMENT NO	PRODUCT NO	REAL TIME RESOURCE CONTROL™	DATE	PAGE
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2   TECHNICAL INFORMATION

All tags consist of the same functional blocks. This functionality is illustrated in the figure below.

- Battery: Lithium Battery provides life-span of up to 6 years

- Micro-Controller: Handles communications and sensors.

- Radio Frequency Generator: Modulates digital data for transmission over free air.

- Anti-Tamper: Magnetic sensor used for tamper detection and to configure the tag with unique properties.

- Movement Sensor: Detect and report movement (Only MS options)

- RF: Modulated Radio signal transports data over free air

2.1   TAG SPECIFICATIONS

PARAMETER	L-TG100, L-TG501, L-TG800
Environmental	
Operational Temperature	-10°C to +60°C
Storage Temperature	-20°C to +70°C
Humidity	5% to 90% (non condensing)
Physical	Ultrasonically sealed unit IP65
Size	64 x 30 x 9mm (L-TG100) 86 x 54 x 6mm (L-TG501) 85 x 70 x 9mm (L-TG800)
Weight	<15grams, (L-TG100 excluding antenna) <15grams (L-TG501) <20grams (L-TG800)
Colour	Grey (Clariant 04-600 2%)
Material	PVC
RF Specifications	
Tx Frequency	433.92MHz
Power Output	38uW, -14dBm, 93dBuV
Modulation	ASK
Bandwidth	<1MHz
Stability	SAW Controlled
Power	Internal Lithium Battery

2.2 TAG DATA AND CONFIGURATION

Each tag can be configured with a unique configuration. This configuration consists of the following parameters.

PARAMETER	RANGE	NOTE
Identification Number	0 → 4294967295 (4 Bytes)	Per customer requirement
Site Code	0 → 16777215 (3 Bytes)	Assignment by Wavetrend
Transmission interval	15 and 30 Seconds	Per customer requirement

Data that gets transmitted from the tag to a tag reader consists of the data as indicated below.

PARAMETER	RANGE	NOTE
Identification Number *	0 → 4294967295 (4 Bytes)	Per customer requirement
Site Code	0 → 16777215 (3 Bytes)	Assignment by Wavetrend
Transmission interval **	15 and 30 Seconds	Per customer requirement
Movement Alarm Counter ***	0 → 255 (1 Byte)	Counts the number of movements
Anti-Tamper Alarm Counter	0 → 127 and Magnet sensor status (Reed Switch) (1 Byte)	Counts the number state changes of the anti-tamper circuit
Alarm information	0 → 1	Either move or anti-tamper alarm condition
Tag Age	0 → 4294967295 (4 Bytes)	Number of transmissions from tag, starts at 0
Transmission interval	15 and 30 Seconds	Transmission interval in seconds

*   Note that Identification Number of the tags used in Wiegand applications can only be between 1 and 65535.

**   Tags can also operate when no time interval is configured (Sleep Mode). In this mode tags will only transmit when it is activated with a magnet via the magnetic sensor. See par 2.5 ANTI-TAMPER.
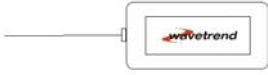
*** Only MS option tag.

For more detailed information on the above, refer to Wavetrend Reader Documentation for further information

Life span can be determined by interrogating the Age Counter Value that gets transmitted from the tag. The table below gives typical maximum values. The tag increments the Age Counter value each time that the tag transmits it data. The Age Counter starts at zero. The table below gives the maximum Age Counter value at the theoretical maximum life span of a tag.

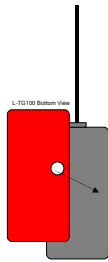| TRANSMISSION INTERVAL	MAXIMUM AGE COUNTER VALUE
15 Seconds (0.066Hz)	12614400 (6 Years)
30 Seconds (0.033Hz)	6307200 (6 Years)

2.3   MOVEMENT SENSING

Tags can be rotated through 360° degrees to achieve various sensitivity levels of movement sensing. Note that the tag is rotated in the vertical plane (i.e. a wall mount).

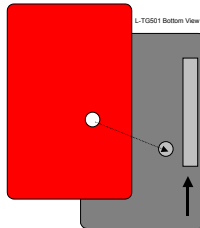| Sensitivity	L-TG100-MS	L-TG501-MS	L-TG800-MS
Most Sensitive			
Least Sensitive			

Once the movement sensor has been activated, the Movement Alarm Counter will be incremented and the tag will transmit four consecutive transmissions with a 0.4-second interval. Thereafter the tag movement sensor will be de-activated for 1 seconds. The tag will then return to its normal state again. (i.e. sensor activated)
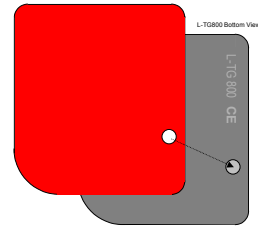
2.4 TAG MOUNTING METHODS

Very High Bondage (VHB) Tape can be used to affix Wavetrend Tags to various objects and appliances. The pictures below describe the method in which the tape is affixed to the tags. Note that the magnet for anti-tamper applications should be positioned as indicated. (Bottom view of tags)

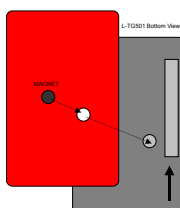L-TG100   L-TG501   L-TG800

2.4.1 TAG ACCESSORIES

Code	Description	Note
L-TA100	L-TG501 Card Holder for personnel tagging	Plastic holder and clip
L-TA200	Double sided VHB fixing tape for L-TG501	VHB Tape cut to size (10 per pack)
L-TA300	Anti-tamper kit for L-TG501	VHB Tape cut to size and magnet (10 per pack)
L-TA400	Double sided VHB fixing tape for L-TG100	VHB Tape cut to size (10 per pack)
L-TA500	Anti-tamper kit for L-TG100	VHB Tape cut to size and magnet (10 per pack)
L-TA600	Double sided VHB fixing tape for L-TG800	VHB Tape cut to size (10 per pack)
L-TA700	Anti-tamper kit for L-TG800	VHB Tape cut to size and magnet (10 per pack)

2.5 ANTI-TAMPER

All tags have a magnetic sensor that can be used to detect the tampering of tags that have been affixed using VHB tape. The figure below illustrates how the magnet is placed in the VHB tape. For certain applications it is suggested that the magnet is affixed to the object with glue prior to mounting the tag.

3   TROUBLE SHOOTING

PROBLEM	DIAGNOSTIC	REMEDY
Tag is not transmitting	Tag is in sleep mode	Tag must be activated
	Life-span of tag expired	Tag must be replaced with a new tag
	L-TG100, L-TG501 on metallic surface	L-TG501 and L-TG100 do not work on metallic surfaces
Movement sensor not working	Movement sensor not fitted	Not a **MS** option tag
Tamper not working	Magnet not present	See paragraph 2.5 ANTI-TAMPER
Mounting and Affixing	No VHB tape	See paragraph 2.4 TAG MOUNTING METHODS

4 NOTES

4.1 CERTIFICATION

All the tags in this document conforms to the following certification specifications

FCC

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.

CE

The following standards applied in accordance with Article 5 of the directive, 1999/5/EC:

EN 300 220-1 V1.2.1 (1997-11)

ETS 300 683 (1997-03).

Summary of tests:

Effective radiated power   25MHz-4GHz

Range of modulation bandwidth for wideband equipment

Frequency stability under low voltage conditions

EN55022   Radiated emissions 30MHz – 1GHz

EN61000-4-3   Radiated immunity 80MHz – 1GHz, excl 433.92MHz$\pm$20MHz

EN61000-4-2   Electrostatic discharge