User Manual

TM800 series RFIDS tags

Revision 001 DRAFT

1 Introduction

1.1 Applicable products

This user manual is intended for the TM800 series active RFID tags in the RFIDS™ product family.

Depending on their basic features, they belong to different tag platforms:

- TM801 – an ID tag with limited I/O and memory
- TM802 – an I/O tag with 256 kbit additional memory, several I/Os and real time clock
- TM803 – a sensor tag with 256 kbit additional memory, several I/Os, real time clock and a 3-axes motion sensor

All tags based on these platforms have the same radio circuit:

- TM800 – a tag radio module working in the 2.4 GHz ISM band.

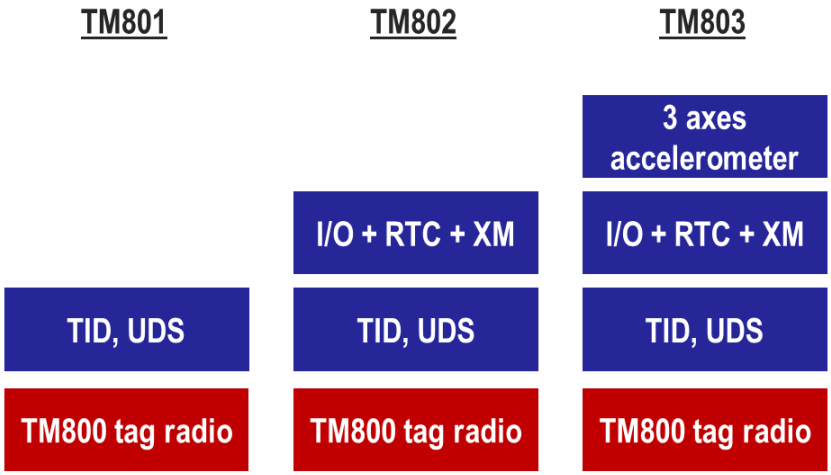

Figure 1 - Tag platforms of the TM800 series
TID = Tag Identifier
UDS = User defined string
I/O = Input/Output interfaces
RTC = Real Time Clock
XM = Expanded Memory

The characteristics of the TM800 tag radio module are described in section 2 of this document.

The tag platforms are the basis for the characteristics of the various Tag products in the RFIDS™ family, but they vary in form-factors, sensors, user-interfaces, battery types and actuators. For instance the TM801-200 Samui is an ID tag in small form-factor with flanges and without any additional sensor, while the TM802-CLZ Edam has calendar function, LED indicator and a buzzer in a card shaped enclosure. Tag specific product information is given in section 3 of this document.

1.2 Introducing RFIDS™

Active RFID technology has the ability to cater for a broad range of needs in the areas of managing assets, environment and people. These may include:

- Ensuring assets are not damaged or stolen
- Knowing location and status of asset

- Ensuring people and assets are where they are expected to be
- Ensuring people are authorised to be where they are
- Ensuring people are safe and secure
- Ensuring environment of people and assets is effective, comfortable and economical

For these reasons, active RFID is not only expected to perform traditional RFID tasks, but can also be utilised as cost-effective wireless sensor networks and provide important functions as contributors to applications in the Internet of Things.

For this reason, TagMaster has named its active RFID technology 'RFIDS™', which stands for 'Radio Frequency Identification & Sensing'.

TagMaster's RFIDS™ product line is an active RFID technology designed to meet a broad scope of requirements. Apart from identification, this may include tracking of movements, status verification, data retrieval, positioning, security alert, sensing, data collection, sensor logging, sensor alerts and actuation of events. Such requirements often demand reliable operation in tough environments at a variety of ranges, typically 3 to 150 metres, and uncontrollable orientations. They may also include requirement tags to perform useful tasks autonomously and independent of a reader.

To meet such broad scope of requirements, while maintaining very good cost-effectiveness and optimal power prudence in all cases, the RFIDS™ is scalable from an ID tag to advanced sensor and actuation tag. In all variants of RFIDS™, the radio module is the same. The design has built-in expandability with sensor and actuation interfaces, additional memory, security, user-interface, and high accuracy calendar functions.

RFIDS™ makes use of TagMaster's Fast RFID Air Protocol (FRAP), which can adjust its payload, i.e. the useful information transmitted from tag to reader and from reader to tag, according to type of tag and/or on a needs basis. For instance, a simple ID tag will indicate to the reader that it is a simple ID tag and only include in its payload what is absolutely needed at that particular point in time. This is important order to minimise duty cycle and thereby improve both anti-collision and battery life. An advanced sensor-tag, on the other hand, might at times require an extended payload to communicate sensor values, alerts, performed actuations and tag status.

In the RFIDS™ system, the FRAP allow all types of RFIDS™ tags to co-exist and be read by the same readers without any confusion. The reader or application does not need to keep long lists of tags for sorting and filtering purposes. Instead, each tag will tell the reader what type of tag it is and what its payload contains.

1.3 Operating principles of RFIDS™

Information from the RFIDS™ tag is sent in ultra-short bursts, whose packets are merely 32 bytes long.

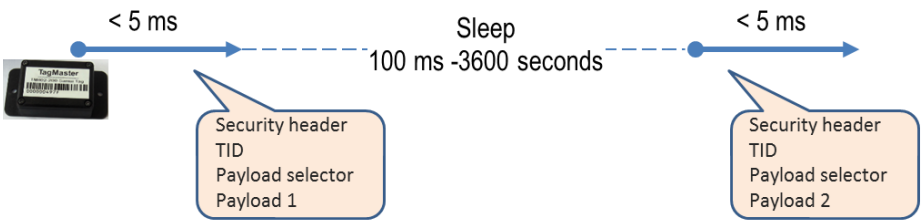

Figure 2 – Information packets sent from tag

Of the 32 bytes, 8 bytes contain security information and a checksum, 5 bytes contain the TID, 1 byte is a payload selector and 18 bytes contain the actual payload.

For tags that do not need to send anything more than their TIDs, the payload is often blank. However, often it will contain the status of the tag, for example the status flag and battery level.

Information packets can be either:

- Time-triggered, i.e. a packet is sent every blink interval.
- Sensor triggered, i.e. a packet is sent when a sensor value or several sensor values are meeting certain criteria.
- Reader triggered, i.e. the tag listens for a reader and only sends a packet when it has found a reader sending a wake-up signal. This is called RTF mode (reader talks first).

In addition, the RFID's tags have a special streaming mode, which is used for reading out large amounts of data from the tag or writing data to the tag. This is used for instance when reading out a sensor log.

2 The TM800 tag radio module

2.1 Introduction

The TM800 tag radio module is used in the TM801, TM802 and TM803 tag platforms.

2.2 FCC Statement for the TM800 tag radio module

The 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.

The FCC ID for the TM800 tag radio module is: **AUKTM800**.

2.3 Technical data

Type	Value	Note
Frequency	2.400 – 2.480 GHz	
Modulation	GFSK	
Data rate	Up to 1 Mbps	
RF output power	Max 1 mW (0 dBm) EIRP	
Power supply	2.3 – 3.6 VDC	
Antenna	0 dBi printed antenna	
Update interval	100 ms to 3600 sec	Settable from reader
Data rate	250 kbps – 1 Mbps	Depends on tag mode
Radio modes	RTF, TTF, TTFA	RTF – Listen to send TTF – Send only TTFA – Send and listen to ACK
Read range	Up to 150 metres	Depends on tag enclosure and reader
TID	40 bits	
Site Code	24 bits	
User defined string	18 byte R/W	TM801 only. TM802 and TM803 have 54 bytes.
EPC memory	128 bit R/W	
Device status flags	8 bits	
Compliance	FCC, CE, RoHS	

2.4 Spectrum

The default channels of the TM800 tag radio module are given by the following spectrum allocation chart. For comparison the radio frequencies of IEEE 802.11b/g (e.g. WLAN), IEEE 802.15.1 (e.g. Bluetooth) and IEEE 802.15.4 (e.g. ZigBee) are also shown.

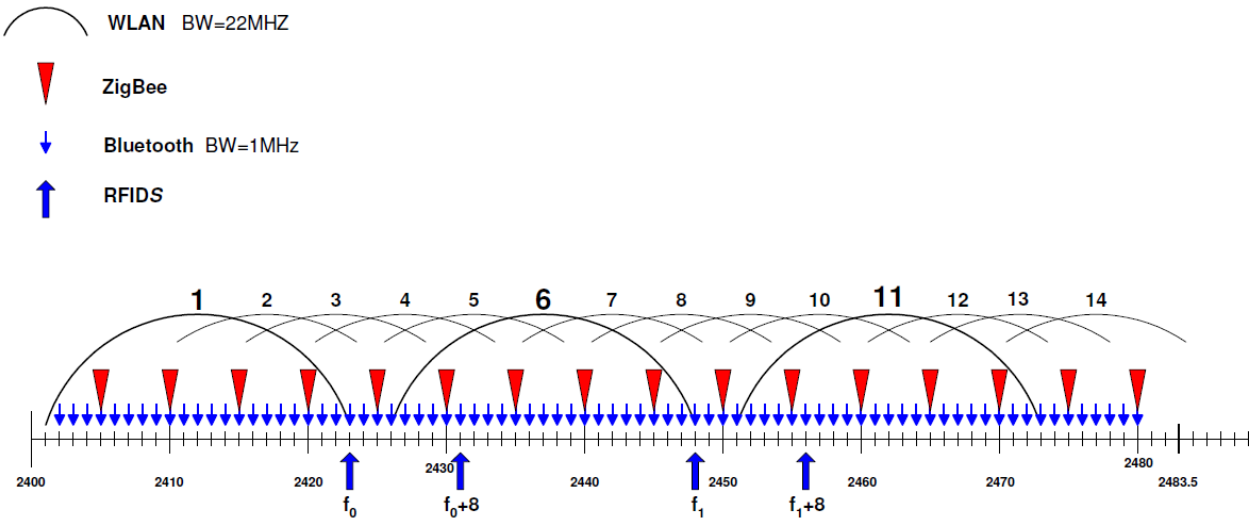

Figure 3 - Spectrum allocation in the 2.4 GHz ISM band

By default, the TM800 radio module makes use of channels 23, 31, 48 and 56 which corresponds to 2.423 GHz, 2.431 GHz, 2.448 GHz and 2.456 GHz respectively.

3 Specific tags

3.1 Supported specific tag types

The following specific tags are supported by this document:

Order number	Product name	Application focus	Note
TM801-200	Samui	Asset identification & tracking	
TM802-CL0	Edam	Personnel tracking with light indicator	
TM802-D000	JAS-Airgas	Custom tag for the gas industry with 3 light indicators	

3.2 TM801-200 Samui

3.2.1 Overview

Type	Value	Note
Part number	TM801-200	
Dimensions	40 × 29 × 13 mm	Excluding flanges
Weight	25 g	
Battery	CR2032 replaceable	
Device status flag	Undefined	Can be set by the user

Figure 4 - TM801-200 Samui

3.2.2 Changing battery

Battery is changed by unscrewing the four small screws on the top of the tag. Inside is a TM800 tag radio module cushioned with cell-foam. Carefully remove the module. On the back of the module is a battery holder with a CR2032 coin battery. It's fixed to the holder with a spring brace. Push the brace away from the battery with a small screwdriver and the battery will pop out.

3.2.3 Use of device status flag

The device status flag has no specified use in the Samui tag.

3.3 TM802-CL0 Edam

3.3.1 Overview

Type	Value	Note
Part number	TM802-CL0	
Dimensions	85 × 40 × 7 mm	Excluding neckband
Weight	25 g	
Battery	CR2032 replaceable	
Device status flag	Used to control light indicator	See FRAP programming manual

Figure 5 - TM802-CL0 Edam

3.3.2 Changing battery

Use a small screwdriver or nail to push the lever to the left of the battery compartment inwards to the

battery. At the same time, use another screwdriver or nail to pull out the drawer. Remove the CR2032 battery and replace it with the positive electrode facing upwards. Push the drawer back until it snaps in place.

3.3.3 Use of device status flag

The device status flag is used to control the light indicator in the Edam tag.

3.4 TM802-D000

3.4.1 Overview

Type	Value	Note
Part number	TM802-D000	
Dimensions	72 × 27 × 40 mm	Tag compartment only. Does not include collar ring which might vary depending on the cylinder
Weight	50 g	
Battery	LTC battery non-replaceable	
Device status flag	Used to control light indicators	See FRAP programming manual and TM802-D000 appendix to FRAP programming manual

Figure 6 - TM802-D000

3.4.2 Changing battery

N/A

3.4.3 Use of device status flag

Used to control light indicators

4 Related Documents

#	Title	Issuer	Revision
1	TagMaster's RFID Application Protocol (FRAP) for TM700 series RFIDS™ readers	TagMaster S/B	Revision 31, 10 Nov 2011

5 Disclaimer

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