

Frequency Hopping Scheme

1	ABOUT THIS DOCUMENT	2
1.1	Introduction	2
1.2	Revisions	2
1.3	References	2
1.4	Definitions	2
2	FUNCTIONAL DESCRIPTION	2
2.1	Channel frequencies	2
2.2	Sub-bands	2
2.3	Randomly ordered hop list creation	3
2.4	Dwell time	3
2.5	Random number generator	3

1 *About this document*

1.1 Introduction

This document specifies the frequency hopping scheme, or frequency hopping spread spectrum, used by TagMaster RFID readers. The hopping scheme shall comply with FCC operation standards within the band 2400 to 2483.5 MHz.

Intended audience is the technical personnel at TagMaster and for FCC approval.

1.2 Revisions

<u>Revision</u>	<u>Date</u>	<u>Issued by</u>	<u>Comment</u>
01	2006-05-12	Jonas Romfelt	Reviewed by Johan Franzén

This document follows the TagMaster documentation version numbering standard to identify the document version. This standard use the form P01A, P01B to P01n for draft versions (not for customer issue) then 01 for a released version (reviewed; can be given to the customer). Subsequent issues use 02, 03, 04 etc and are changed via the formal change control process.

1.3 References

- [1] 47 CFR – PART 15, §15.247
- [2] Amendment from September 07, 2004, regarding [1]

1.4 Definitions

FHSS Frequency Hopping Spread Spectrum

2 *Functional description*

Readers are treated as separate systems and shall function properly independently of each other. When FHSS starts, a list of hopping channel frequencies is created independently by each system. The list is created according to the scheme described in this chapter.

2.1 Channel frequencies

FCC allows operation within band 2400 to 2483.5 MHz [1]. TagMaster will use the band 2402 to 2482 MHz with a frequency channel separation of 200 kHz.

2.2 Sub-bands

The available set of frequency channels is divided into 16 sub-bands: A, B, C, D through P. Each sub-band is 5 MHz wide.

2.3 Randomly ordered hop list creation

The channel frequency hop list is automatically created when the reader is started after power-up. The algorithm starts by creating a randomly ordered sub-band list in which each sub-band occurs exactly once. For example:

- Inter sub-band hopping list: K, C, P, F, I, G, E, B, N, H, L, J, O, D, M, A.

The algorithm then creates a random list of frequency channels (each sub-band comprises 25 channels). Each channel occurs exactly once. For example:

- Channel frequency list: 4, 10, 24, 22 ... 17, 6, 13.

The first hop is made to the first sub-band in the randomly ordered sub-band list and to the first channel in the randomly ordered frequency channel list. For instance the frequency corresponding to the 4th channel in sub-band K, according to the example lists above.

The second hop is made to the same frequency channel but to the second sub-band in the randomly ordered inter sub-band list: the 4th channel in sub-band C.

When all sub-bands have been hopped to, the sub-band list pointer is reset and the next frequency channel from the list is used: 10th channel in sub-band K in the example above.

2.4 Dwell time

The dwell time is 300 ms, i.e. hops take place every 300 ms.

2.5 Random number generator

The main purpose for the random number generator is to create the random sub-band lists and the channel frequencies list. That is, select a random number in the interval $\{1...X\}$. Though the probability is low, it is important that each reader generates a new set of random numbers each time it starts to prevent the possibility that 2 or more readers, operating close to each other, are hopping according to the exact same list at the exact same time; thus interfering each other all the time. The random number is created by reading the register of free-running counter