APPLICATION NOTE

Using Atmel ATA5577 in Animal Identification Application according to ISO11784/85

ATAN0086

General

The Atmel® ATA5577 is the successor of the Atmel T5551, Atmel T5557 and Atmel ATA5567 with improved analog front-end circuitry and increased functionality. A basic mode is implemented being backward compatible in most common modes to existing Atmel T5551 (in most common modes), Atmel T5557 and Atmel ATA5567 applications.

To achieve a high flexibility on assembly the chip is offered in various versions differing by package, by the internal chip capacitance and two types of pads: standard pads and mega pads for direct coil mounting.

1. Application

This application note describes the antenna adaptation and programming of the Atmel® ATA5577 to be compliant with ISO standard 11784/85 for animal ID and waste management applications.

Note: For detailed information in terms of functionality and packaging please refer to the Atmel ATA5577 datasheet.

1.1 Example of Animal ID Tag

Figure 1-1. E-unit to be Used for Ear Tags

1.1.1 Tag Parameters

Chip version:

Atmel ATA5577M1330

Capacitor on chip	330pF ±3pF

Antenna Parameters at 134.2kHz:

Inductance	L = 4.26mH ±0.2mH
Resistance	R = 70Ω
Quality factor	Q = 48

Antenna Size:

Diameter external	28mm
Diameter internal	22mm
Thickness	1.5mm

1.2 Tag Programming to Achieve ISO 11784/85 Compliance

The standardization of animal identification via radio frequency (RFID) is described by the ISO standards 11784 and 11785.

ISO11785 specifies how a transponder is activated and how the stored information is transferred to a transceiver, while ISO11784 defines the structure and the information content of the codes stored in the transponder.

1.2.1 Requirements for Compliance with ISO11785

- Atmel LF RFID systems must operate in FDX-B mode, modulating the magnetic field by ASK
- The transceiver carrier frequency and the resonant frequency of the transponder have to be adjusted to typically 134.2kHz ±3kHz.
- The data coding transferred by the transponder must be performed by differential biphase (DBP)
- The data bit rate is specified as RF/32

1.2.2 Telegram Structure as Defined by ISO11784

The graph below shows the 128-bit code structure to be implemented within the 128-bit tag telegram. A header of 11 bits is used to identify the start of the telegram. The identification code is sent in 8 blocks. Each block of 8 bits is trailed by a control bit with a value of logical 1, which is needed to prevent the header from occurring again in the rest of the telegram.

Other than the header, each field of the code structure is transmitted starting with the LSB and ending with the MSB.

The 16-bit CRC detection code is calculated solely over the 64-bit identification code by using the CRC-CCIT algorithm (described in ISO11785 Annex B).

Figure 1-2. Structure of the FDX Identification Telegram

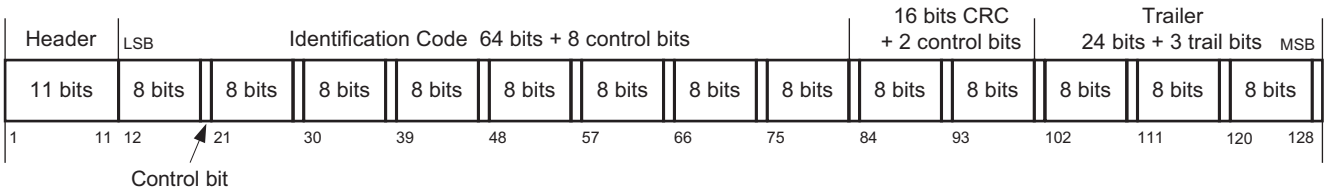


Table 1-1. ISO11784 Code Structure

Information		Bit No.	Description
11-bit header		1 to 11	Identification of telegram start
64-bit identification code + 8 trail bit	38 + 4 bit national code	12 to 53	Unique number within country, controlled by ICAR database
	10 + 2 bit country code	54 to 65	Defined by ISO3166
	1-bit flag	66	Identifies if additional data are appended
	14 + 1 bit reserved	67 to 81	Reserved for future use
	1 + 1 bit flag	82 to 83	Distinguish between animal and non-animal applications
16 bit + 2 bit CRC detection		84 to 100	Computed 16-bit CRC code using CRC-CCIT algorithm
24 bit + 3 bit extension		101 to 128	Data content, if indicated by flag (bit number 66)

Except the header, each field of the code has to be sent LSB first. Accordingly, the related bit steam has to be written into the data blocks below with respect to the bit order. The 16-bit CRC detection code is calculated solely over the 64-bit identification code by using the CRC-CCIT algorithm.

2. Transforming the ISO Telegram Structure to the ATA5577 Memory Map

2.1 Tag Configuration by Block 0

- Data rate RF/32
- Data coding Differential Biphase (DBP)
- Lock bit “1”
- Code length MAXBLK 4

Note: Verify that the data content is correct before setting the Lock bit

Table 2-1. Structure of Block 0 Setting

Block No.	Lock Bit																															
0	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	HEX	1	6				0				3				F				8				0				8				0			
	BIN	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

2.2 Example of ATA5577 Memory Map to Be Compliant with ISO Standard

In the example below, data blocks 1 through 4 are programmed according to the standard with the settings as specified by Figure 2-1.

Figure 2-1. Example of Code Programming

Information		Example of Data Content
11-bit header		00000000001 (binary)
64-bit identification code + 8 trail bits	38 + 4 bit National Code	1
	10 + 2 bit Country Code (according to ISO3166)	999 (decimal) (code for test purposes)
	1 bit data block	0
	14 + 1 bit reserved code	0
	1 +1 bit animal	1
16 bit + 2 bit CRC detection		0010 1110 0100 0100 (binary)
24 bit + 3 bit extension		0

Note: Except the header, each field of the code has to be sent LSB first. Accordingly, the related bit steam has to be written into the data blocks below with respect to the bit order. The 16-bit CRC detection code is calculated solely over the 64-bit identification code by using the CRC-CCIT algorithm.

Figure 2-2. Content of ATA5577 Memory – Example

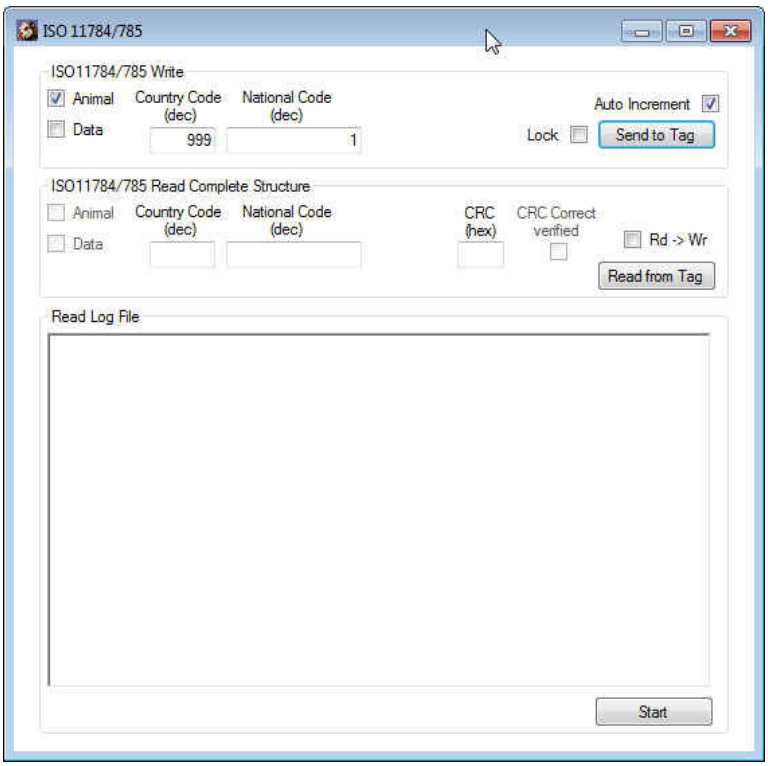
Block No.		Lock Bit																													
1	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	HEX	1	**0**				**0**				**3**				**0**				**1**				**0**				**0**				**8**			
	BIN	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
	Telegr. order		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
2	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	HEX	1	**0**				**4**				**0**				**2**				**0**				**7**				**9**				**F**			
	BIN	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	1	1
	Telegr. order		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
3	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	HEX	1	**8**				**0**				**4**				**0**				**6**				**4**				**5**				**7**			
	BIN	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0	1	0	1	1	1
	Telegr. order		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
4	Order	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	HEX	1	**4**				**8**				**0**				**4**				**0**				**2**				**0**				**1**			
	BIN	1	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
	Telegr. order		97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128

3. Test Sample Programming and Reading via Atmel ATA2270-EK2 RFID Kit

This new generation kit allows programming of sample tags. This can be achieved in stand-alone mode using the on-board buttons, joystick and display or through a PC GUI dedicated to ISO11784/785 applications.

Figure 3-1. ATA2270-EK2: Display Shows Animal Programming Mode, Below Are the Keys

Figure 3-2. Atmel ATA2270-EK2 Graphical User Interface, Example for Atmel ATA5577



Note: This Kits allows to program Animal compatible tags for testing purposes. It is not allowed to put them into the market. For commercial use, tags need an approval in terms of performance and uniqueness of the national ID code number covered by ICAR and national regulation.
This Kit does not lock the tag blocks. It is intended only to create samples.

4. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
9114C-RFID-04/15	• Put document in the latest template

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