ATC-RF-1 User Manual

Doc ID	D00000004
Version	1.0
Date	30 September 2008
Author	Reuven Kishon
Document Name	ATC-RF-1 User Manual

Revision History:

Date	Rev. #	Status	Author	Description of Key Changes
20080930	1	Draft	Reuven Kishon	• Initial version
20081016	2	Draft	Garrett Bartolotta	• Converted to User Manual based on Manufacturer User Manual.
				•
				•
				•
				•
				•

CONTENT

1. MAIN FEATURES

- Tag supported: Mifare 1K, Mifare 4K, Mifare UltraLight
- Auto detecting tag
- Built-in antenna
- RS232 interface, baud rate 9,600 ~ 115,200 bps
- DC4.5V to DC5.5V VDD operating
- Operating distance: Up to 80mm, depending on tag
- Storage temperature: -40 ºC ~ +85 ºC
- Operating temperature: -20 ºC ~ +70 ºC
- Dimension: 85 × 55 × 7 mm
- Two LEDs, green led is auto light when tag in detection range, red led is controlled by host
- The PA1 pin is low level indicating tag in detection range, and high level indicating tag out

2. PINNING INFORMATION

PIN	SYMBOL	TYPE	DESCRIPTION
1	TXD	Output	Serial output port
2	RXD	Input	Serial input port
3	VCC	PWR	Power Supply
4	GND	PWR	Ground
5	GND	PWR	Ground
6	VCC	PWR	Power Supply
7	PA0	Output	
8	PA1	Output	Tag detect signal:low level indicating tag in detection range, high level indicating tag out
9	PA2	Output	
10	PA3	Output	
11	PA4	Output	
12	PA5	Output	
13	PA6	Output	
14	PA7	Output	
15	GND	PWR	Ground

3. BAUD RATE SETTING

R6 & R7 are two 0 ohm resistances assembled on the bottom layer of module, are used for config baud rate as follows sheet

	R6	R7	Baud Rate (bps)
Assembled	NO	NO	9,600
	YES	NO	19,200
	NO	YES	57,600
	YES	YES	115,200

4. COMMUNICATION PROTOCOL

4-1. Communication Setting

The communication protocol is byte oriented. Both sending and receiving bytes are in hexadecimal format. The communication parameters are as follows,

Baud rate: 9,600 ~ 115,200 bps
Data: 8 bits
Stop: 1 bit
Parity: None
Flow control: None

4-2. Communication Format

Host to Reader:

Header	Len	Command	Data	Checksum

Header: Communication header, 1 byte.
                From host to module: 0xBA.
Len: Byte length counting from Command to Checksum inclusively, 1 byte.
Command: Command, 1 byte.
Data: Data, variable length depends on the command type.
Checksum: XOR result from Header to Data inclusively, 1 byte.

Reader to Host:

Header	Len	Command	Status	Data	Checksum

Header: Communication header, 1 byte.
                From module to host: 0xBD.
Len: Byte length counting from Command to Checksum inclusively, 1 byte.
Command: Command, 1 byte.
Status: Command status, 1 byte
Data: Data, variable length depends on the command type.
Checksum: XOR result from Header to Data inclusively, 1 byte.

4-3. Command Overview

Command	Description
0x01	Select Mifare card
0x02	Login to a sector
0x03	Read a data block
0x04	Write a data block
0x05	Read a value block
0x06	Initialize a value block
0x07	Write master key (key A)
0x08	Increment value
0x09	Decrement value
0x0A	Copy value
0x10	Read a data page (UltraLight)
0x11	Write a data page (UltraLight)
0x40	Control PA status
0xFF	Reset

Status Overview

Status	Description
0x00	Operation success
0x01	No tag
0x02	Login success
0x03	Login fail
0x04	Read fail
0x05	Write fail
0x06	Unable to read after write
0x0A	Collision occur
0x0D	Not authenticate
0x0E	Not a value block
0xF0	Checksum error
0xF1	Command code error

4-4. Command List

4-4-1. Select Mifare card

0xBA	Len	0x01	Checksum

Return:

0xBD	Len	0x01	Status	Serial num	Type	Checksum

Status: 0x00: Operation success
        0x01: No tag
        0x0A: Collision occur
        0xF0: Checksum error
Serial num: Serial number of the card detected if the operation is success, 4 bytes for Mifare Standard & Mifare Pro(X), 7 bytes for Mifare UltraLight & Mifare DesFire
Type: 0x01: Mifare Standard 1K card
        0x02: Mifare Pro card
        0x03: Mifare UltraLight card
        0x04: Mifare Standard 4K card
        0x05: Mifare ProX card
        0x06: Mifare DesFire card

4-4-2. Login to a sector

0xBA	Len	0x02	Sector	Type	Key	Checksum

Sector: Sector need to login
Type: Key type (0xAA: authenticate with KeyA, 0xBB: authenticate with KeyB)
Key: Password, 6 bytes
Return:

0xBD	Len	0x02	Status	Checksum

Status: 0x02: Login success
        0x01: No tag
        0x03: Login fail
        0xF0: Checksum error

4-4-3. Read a data block

0xBA	Len	0x03	Block	Checksum

Block: The block number to be read, 1 byte
Return:

0xBD	Len	0x03	Status	Data	Checksum

Status: 0x00: Operation success
        0x01: No tag
        0x04: Read fail
        0x0D: Not authenticate
        0xF0: Checksum error
Data: Block data returned if operation is success, 16 bytes.

4-4-4. Write a data block

| 0xBA | Len | 0x04 | Block | Data | Checksum |

Block: The block number to be written, 1 byte.
Data: The data to write, 16 bytes.

Return:

| 0xBD | Len | 0x04 | Status | Data | Checksum |

Status: 0x00: Operation success
       0x01: No tag
       0x05: Write fail
       0x06: Unable to read after write
       0x0D: Not authenticate
       0xF0: Checksum error
Data: Block data written if operation is success, 16 bytes.

4-4-5. Read a value block

| 0xBA | Len | 0x05 | Block | Checksum |

Block: The block number to be read, 1 byte.

Return:

| 0xBD | Len | 0x05 | Status | Value | Checksum |

Status: 0x00: Operation success
       0x01: No tag
       0x04: Read fail
       0x0D: Not authenticate
       0x0E: Not a value block
       0xF0: Checksum error
Value: Value returned if the operation is success, 4 bytes.

4-4-6. Initialize a value block

| 0xBA | Len | 0x06 | Block | Value | Checksum |

Block: The block number to be initialized, 1 byte.
Value: The value to write, 4 bytes.

Return:

| 0xBD | Len | 0x06 | Status | Value | Checksum |

Status: 0x00: Operation success
       0x01: No tag
       0x05: Write fail
       0x06: Unable to read after write
       0x0D: Not authenticate
       0xF0: Checksum error
Value: Value written if the operation is success, 4 bytes.

4-4-7. Write master key (key A)

0xBA	Len	0x07	Sector	Key	Checksum

Sector: The sector number to be written, 1 byte.
Key: Authentication key, 6 bytes.

Return:

0xBD	Len	0x07	Status	Key	Checksum

Status: 0x00:   Operation success
        0x01:   No tag
        0x05:   Write fail
        0x0D: Not authenticate
        0xF0:   Checksum error
Key: Authentication key written if the operation is success, 6 bytes.

4-4-8. Increment value

0xBA	Len	0x08	Block	Value	Checksum

Block: The block number to be increased, 1 byte.
Value: The value to be increased by, 4 bytes.

Return:

0xBD	Len	0x08	Status	Value	Checksum

Status: 0x00:   Operation success
        0x01:   No tag
        0x05:   Write fail
        0x06:   Unable to read after write
        0x0D: Not authenticate
        0x0E: Not a value block
        0xF0:   Checksum error
Value: The value after increment if the operation is success, 4 bytes

4-4-9. Decrement value

0xBA	Len	0x09	Block	Value	Checksum

Block: The block number to be decreased, 1 byte
Value: The value to be decreased by, 4 bytes

Return:

0xBD	Len	0x09	Status	Value	Checksum

Status: 0x00:   Operation success
        0x01:   No tag
        0x05:   Write fail
        0x06:   Unable to read after write
        0x0D: Not authenticate
        0x0E: Not a value block
        0xF0:   Checksum error
Value: The value after decrement if the operation is success, 4 bytes

4-4-10. Copy value

0xBA	Len	0x0A	Source	Destination	Checksum

Source: The source block copy from, 1 byte
Destination: The destination copy to, 1 byte
The source and destination must in the same sector

Return:

0xBD	Len	0x0A	Status	Value	Checksum

Status: 0x00: Operation success
       0x01: No tag
       0x05: Write fail
       0x06: Unable to read after write
       0x0D: Not authenticate
       0x0E: Not a value block (Source)
       0xF0: Checksum error
Value: The value after copy if the operation is success, 4 bytes

4-4-11. Read a data page (UltraLight)

0xBA	Len	0x10	Page	Checksum

Page: The page number to be read, 1 byte

Return:

0xBD	Len	0x10	Status	Data	Checksum

Status: 0x00: Operation success
       0x01: No tag
       0x04: Read fail
       0xF0: Checksum error
Data: Block data returned if operation is success, 4 bytes.

4-4-12. Write a data Page (UltraLight)

0xBA	Len	0x11	Page	Data	Checksum

Page: The page number to be written, 1 byte.
Data: The data to write, 4 bytes.

Return:

0xBD	Len	0x11	Status	Data	Checksum

Status: 0x00: Operation success
       0x01: No tag
       0x05: Write fail
       0x06: Unable to read after write
       0xF0: Checksum error
Data: page data written if operation is success, 4 bytes.

4-4-13. Control PA status

0xBA	Len	0x40	Mask	Value	Checksum

Mask: PAx which to change, bit to bit
Value: The status level
Return:

0xBD	Len	0x40	Status	Checksum

Status: 0x00: Operation success
        0xF0: Checksum error
Example: If you want PA3 to go low, you can send
                0xBA, 0x04, 0x40, 0x08, 0x00, 0xF6

4-4-14. Reset

0xBA	Len	0xFF	Checksum

No return

5. Hardware and Software

    a.   Janam XP20/30 Terminal
    b.   "RFID Test" Application for Palm OS

6. Unit Test

    a.   Open RFID Test application on Janam Terminal
    b.   Screen will display: "No reader!"
    c.   Attach ATC-RF1-1 unit to Janam Terminal
    d.   If connection is successful, screen will display: "No Card"
    e.   Place RFID card within 4cm of ATC-RF1-1 unit
    f.   If read is successful, screen will display: "Card detected" followed by the card data.

7. INFORMATION TO USER

Add the following to the final product user manual:

INFORMATION TO USER

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.

This equipment has been tested and found to comply with the limits for Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can

be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.