SM-R400
USER'S MANUAL

V2.4.16

April 2012

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■ Revision history

Version	Revision Date	Revision page	Revision Description
V2.4.16	1012-04-16		Draft

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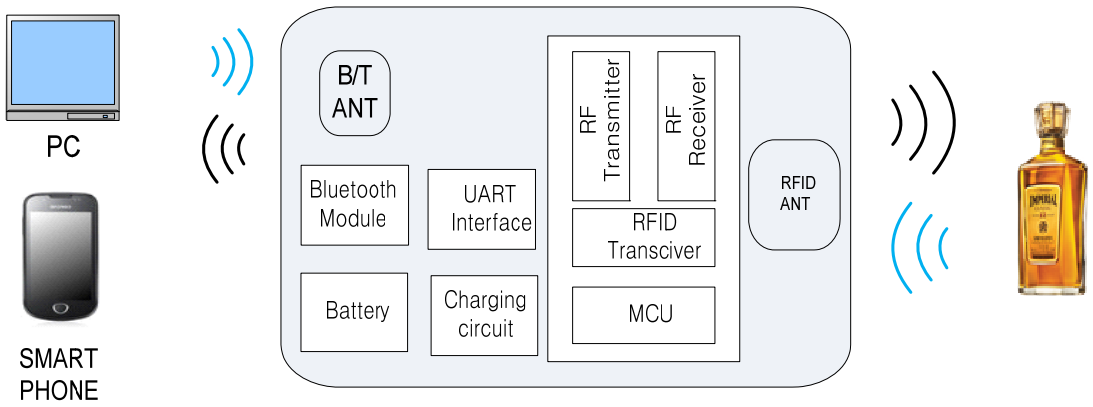
1. Introduction & System composition diagram

● Introduction

- This product, as a Bluetooth embedded UHF RFID Reader, is designed for short distance application using the Bluetooth, USB Interface with PC and SMART PHONE, and it provides customers with Compact size, low cost, high performance functions.
  It supports protocols of ISO18000-6C(EPC C1G2), and it is embedded class2 Bluetooth module.

- Target Application
  Whiskey genuine discriminator
  Portable RFID Printers / Tag Encoders
  Portable RFID Readers
  Medical Monitoring

● System composition diagram



i) Connect to PC : Use as fixed

ii) Connect to Smart Phone (Bluetooth pairing)
: Used as portable (Hand-held type)

*RFID Functional Description

The transmitter supports both in-phase quadrature (IQ) vector modulation and polar modulation. The direct IQ up-conversion is intended for phase reversal amplitude shift keying (PR-ASK). The polar modulation is intended for double sideband amplitude shift keying (DSB-ASK). In both cases, the signals are generated in the digital domain and converted to analog signals by sigma-delta digital-to-analog converters (DACs) followed by reconstruction filters. The integrated power amplifier can be operated in three different modes:

• Class F with high output power and without internal amplitude modulation (AM)

The integrated power amplifier acts as a driver for an external power amplifier. The external power amplifier performs the amplitude modulation, but it does require an external modulator. This is likely to be done with DSB and not PR-ASK.

• Class F with drain modulation using an external modulator

• Class A required for PR-ASK An optional linear external power amplifier can be used to increase the output power to the maximum allowed level.

The receiver is in principle a homodyne to ensure that as much as possible of the transmitter leakage falls on DC. The receiver down-conversion mixer uses an internal local oscillator (LO). The receiver uses a single on-chip, low noise amplifier (LNA) to maintain a desirable signal to noise ratio.

After down conversion, the DC signal is removed internal which reduces off chip component requirements and lowers implementation costs. The analog intermediate frequency (IF) filter provides coarse channel selectivity. It has programmable bandwidth to accommodate the large range of required data rates. The coarsely filtered I and Q signals are analog-to-digital converted. Automatic intermediate frequency gain stepping in the filter reduces the required dynamic range of the analog-to-digital converter (ADC). Sharp and well-controlled digital filtering supplements the coarse analog filtering. Digital logic also performs the demodulation.

The reader chip logic derives the clocks for the digital blocks from a 24 MHz reference frequency signal originating from an external temperature-compensated crystal oscillator (TCXO). The sigma-delta DACs run directly off the 24 MHz signal. The sigma-delta ADCs run off a 48 MHz clock generated by an integrated frequency doubler.

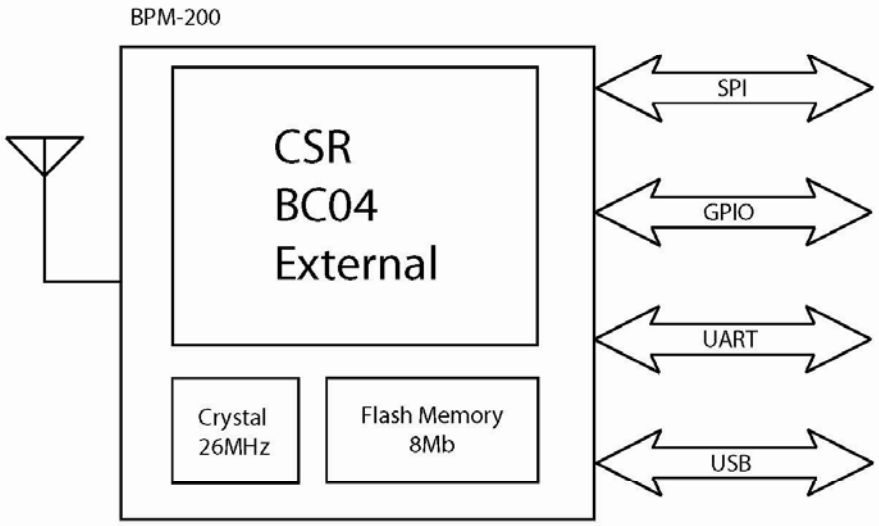
The Indy R500 includes a fully integrated voltage-controlled oscillator (VCO). The loop filter is external so that the synthesizer meets the stringent phase noise requirements and allows flexibility. The reader chip logic derives the time reference required by the phase locked loop and the digital blocks from the 24-MHz reference frequency.

The Indy R500 reader chip supports two interfaces—one low speed parallel interface with a data rate of up to 20 Mbps and one serial interface with data rates of 150 Mbps to (downstream), and up to 450 Mpbs from (upstream) the Indy R500 reader chip. The serial interface is used on the Impinj reference design and firmware. The interfaces are multiplexed on the same pins, and the interface is determined during power-up. Both interfaces operate at 3.3 V. The Indy R500 executes one low level instruction at a time from those written into a first in, first out buffer. All information is transferred via the register bank, and state machines control the reader chip.

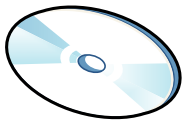
1. General

1.1 Overview

This specification covers Bluetooth module (class 2) which complies with Bluetooth specification version 2.1 + EDR and integrates RF & Baseband controller in small package.
This module has deployed CSR's BC04 External chipset.
All detailed specification includig pinouts and electrical specification may be changed without notice.



2. Composition parts

RFID Reader	
USB Cable	
Reader Software & User Document CD-ROM	

3. Reader Description

S/W & STATUS LED

- POWER S/W : Power on/off Switch
- Battery charging LED : When the battery is being charged, the Red Led is turned on
  When the battery is charging done, the Green Led is turned on
- Low-battery LED : The Red LED will twinkle when the battery is low
- POWER LED : The Green LED is turned on when the POWER S/W is on
- READ LED : The Green LED will twinkle when the reader is receiving data from a tag
- Bluetooth LED : The Blue LED will turn on when the Bluetooth is connecting the host
- RESET S/W : RESET switch

ANT PART & USB


ANT


USB : It is used Battery charging
and USB interface with PC

4. Reader Specification

● UHF RFID Reader Performance

Description	Value
MODEL	SM-R400
Architecture	UHF RFID Reader Module
Protocol	EPC Gen2(ISO 18000-6C),
Frequency	902.75MHz to 927.25MHz(USA)
Max. Tx Power	27dBm±1dBm (0.5W)
Power control	5dBm to 27dBm(1dB step)
Hopping Channels	50
Channel Spacing	500KHz
Channel Dwell time	< 0.4 seconds
Modulation Method	PR-ASK
Supply voltage	Li-ion Battery
Max Current (max power)	< 850mA
Operating Temperature	-10℃ to +50℃
LED Indicators	Charging(Low-battery), Data(Power), BT
Signaling	Bluetooth, Baud rate(115200bps)

● Interface

USB connector	MICRO USB

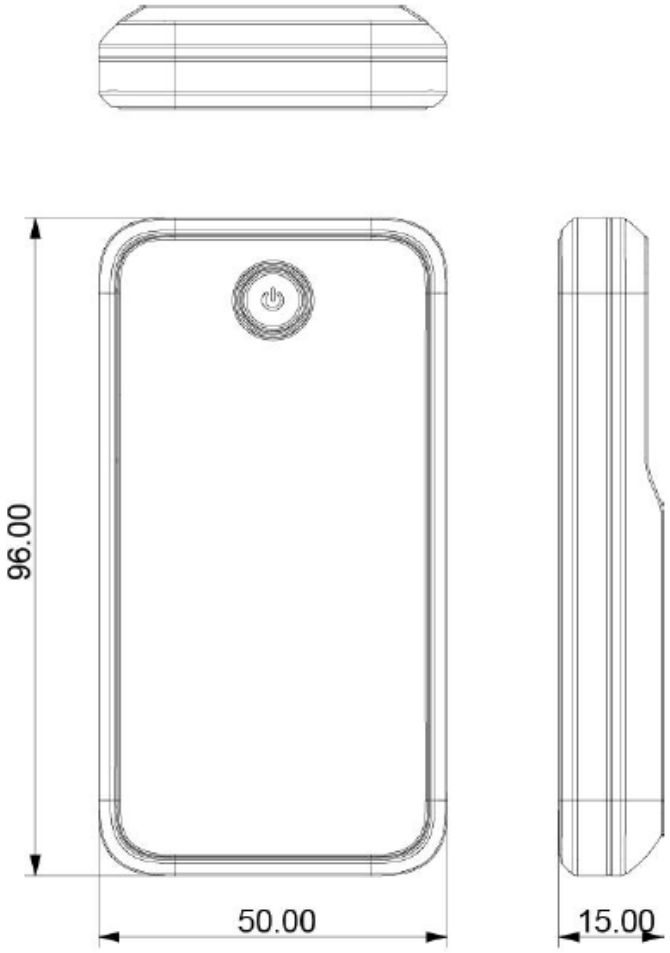
● Physical Dimension

SIZE	96mm × 50mm × 15mm
Weight	90 g

● Bluetooth Setting Parameter

Parameter	Value
Local Device Name	"Blue Angel"
Bluetooth Service Name	"Serial Port Profile"
Bluetooth Device Address	"123456000000 ~ 123456ffffff"(HEX)
PIN Code	"0000"(ASCII)
UART Baud Rate	115200bps
UART Parity	None
UART Stop Bit	1
UART Flow Control	None
Class of Device(COD)	SPP
Security Mode	Secure Simple Pairing(Bluetooth 2.1+EDR)
Operating Mode	Transparent Mode
Page Scan Mode	Connectable
Inquiry Scan Mode	Discoverable or Non-discoverable

- **Mechanical Dimension**



5. How to Run SM-R400 Sample Program

1. Windows XP/7

1.1 File name :

Reader@Express V3.2.24.zip

1.2 Simple use :

0. **Add bluetooth device (Reader), and confirm relevant communication port in device manager.**

1. Decompress the file. Execute reader@express.exe.
2. **Designate communication port → Select from combo box located at top upper left side.**
3. **Click [OPEN] button** → It is right below the combo box located at upper left side
4. If it is normally connected

   "RFID_OPEN() = 0 OK" is displayed in list box.
5. **If you click [INVENTORY MULTIPLE] button then it starts to read tag (Inventory).**

   If tag is recognized,

   Tag ID is displayed in list box → the latest one will be displayed at the most top.

   Total number of readers is displayed → It is displayed at just upper left side of list box in small size.

   Number of tags is displayed → It is displayed at just upper right side of list box in large size.
6. **If you click [StopOperation] button then it stops to read tag (Inventory).**

1.3 Notes :

Use it by setting POWER value as below 27 in upper combo box.

2. Android

2.1 File name :

AndroidSample.zip

2.2 Simple use :

It is SDK sample program for developers therefore it is not registered in the market.
You can directly install it in PC in following method.

1. Prepare Android phone and relevant data communication cable.
2. Download USB driver of relevant phone from Android phone manufacturer's homepage and install it in your PC.
3. Connect the phone to PC using data communication cable.

   At this time, relevant drivers can be additionally installed through internet.
4. Execute command prompt (cmd.exe), and move to decompressed folder.
5. If you input as follows and execute it then it will be installed.

   adb install -r ReaderApiBlueDemo.apk

You can connect with bluetooth reader in following method.

1. **If you select [Search] in [Option menu],**
   then the window to select bluetooth device appears.
   Already paired devices are appeared on upper part.
   Because you must search new device therefore click [Scan for devices]
   Select the device name "Blue Angel" among searched devices at the lower part.
2. Only when you connect first time,
   Pairing process is progressed – PIN number is "0000".
   In most cases, it is connected normally after pairing.
3. Sometimes, it is not connected after pairing,
   [Option menu]→[Search]→Select "Blue angel" in paired devices.

If you click [Inventory] button then it starts to read tag (Inventory).
If tag is recognized
Tag ID is displayed in list box → you can find the latest one on first top.
If you click [StopOperation] button then it stops to read tag (Inventory).

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FCC Information to User

This equipment has been tested and found to comply with the limits for a 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, uses 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 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.

Caution

Modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Compliance Information : 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

IMPORTANT NOTE:
FCC RF Radiation Exposure Statement:
This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.