RFID Smart Device

(UHF RFID Reader Module include)

U-ways

Ver. 1.0

User Manual

Sept. 2007

KIS900EMM Reader functional description.

Reader includes 1 PCB – Transceiver and Controller UHF.

Transceiver uses homodyne receiver architecture that cover the main bands of operation considered for Korean, US, EU and other global applications. The homodyne topology is classic approach for backscatter radar where received signals are close in frequency to the transmitted carrier.

A homodyne receiver performs a direct conversion of the received RF signals to a zero intermediate frequency (IF) baseband.
This architecture uses demodulator in quadrature along with low pass filtering.

A 26 MHz crystal oscillator is used as the clock signal for the PLD synchronization IC.
13 MHz temperature compensated crystal oscillator serves of the reference in the phase-locked loop (PLL) employed to generate the RF carrier signals. This PLL Frequency Synthesizer operates under control of the Controller UHF.

The PCB Type coaxial connectors make the RF interface. There are two separate antenna ports – each port transmit and receive signal. which are connecting throw Rx SW and Tx SW to input Rx band pass filter and to PA output band pass filter accordingly.

The tag uses Pulse Interval Encoded Data Packets. Generating pulses at variable time intervals performs the data coding. The duration of the interval between two successive pulses carries the data coding information. This is known as Pulse Interval Encoding, (PIE) or GLITCH encoding. Glitch or PIE encoded data signal have dc component.

Transceiver uses Pulse Detector with a DC component threshold tracking. That Pulse Detector make a dynamically adjusting of the threshold level in a detector to detect different pulse polarity, having dc component, as positive as negative pulse packets thereby eliminating false triggering caused by input noise and increasing the restoration quality of the pulse duration and intervals between neighbor pulses.

When Reader is activated and interrogates Tags, there is used pulse mode energizing of Tags with S/W controlled the time of emitting and frequency occupation with almost equal time occupation and emitting pause.
Reader's Communication with UCODE EPC Tag satisfies OID Radio Frequency Identity Protocol Generation 2 Identity Tag, Class 1. Manchester encoded Data to Tags is applied to Modulator and modulates carrier using ASK modulation

The reader's Controller UHF uses an inexpensive microprocessor to control reader operation, power management and data processing. The embedded controller executes firmware routines to energizing tags, collects data from tag including anti-collision, controls and downloads PLL frequency synthesizer In frequency hop modes and other operations.
A 22 MHz crystal resonator is used as the input clock signal for the microprocessor.

Federal Communications Commission (FCC) Interference Statement

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

This device may not cause harmful interference.

This device must accept any interference received, including interference that may cause undesired operations.

Caution : Any changes or modifications in construction of this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notice 1

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Notice 2

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

RF Exposure Statement: The transmitter must not be co-located or operationg in conjunction with any other antenna or transmitter.
The 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 cm between the radiator and your body.

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1. GLOSSARY.

dB	Decibels;
dBi	Antenna gain in dB relative to isotropic antenna;
EIRP	Effective Isotropic Radiated Power;
EPC	Electronic Product Coding;
ERP	Effective Radiated Power;
FH	Frequency Hopping;
RFID	Radio Frequency Identification;
RTF	Reader Talks First (Protocol);
UHF	Upper High Frequency (Band);

2. INTRODUCTION.

The System is designed to read an EPC Class1 Gen2/ISO 18000-6C chips based UHF transponders.
It is equipment for industrial applications especially well suited for large reading distance and multiple Tags with the Random delay Time reply on power Anticollision protocol for EPC Class1 Gen2. System supports OID Radio Frequency Identity Protocol for communications at 860 MHz – 960 MHz Generation 2 Identity Tag (Class 1).

The wide ranges of applications for this equipment includes

- Factory automation
- Electronic toll collection (ETC)
- Railway, car identification and tracking
- Inter modal container identification
- Asset identification and tracking
- Item management for retail, health care, and logistics applications
- Access control
- Animal identification
- Fuel dispensing loyalty programs
- Automobile immobilizing (security)

Typical reading range is between 30 cm to 5 m depending on the type of Reader antenna, used transponder and environment.

3. TECHNICAL SPECIFICATION.

3.1. RFID reader module is used for identifying/reading transponders based on EPC Class1 Gen2 protocol.

3.2. RFID reader module supports multiple tag identification processes using Anticollision protocol.

3.3. RFID reader module supports Tag's user memory writing protocol.

3.4. RFID reader module have two frequency band modifications:

Korean	910 – 914 MHz (18 channels, 200 kHz spacing)
USA ISM Frequency band	902 – 928 MHz (63 channels, 400 kHz spacing);

3.5. Carrier frequency stability		$1X10^{-5}$
3.6. Output power		1 W (Korean Band) 1 W (USA ISM Band)
3.7. Read range (1W)		5 meters (Typically read range depends on Reader environment and the used tag)
3.8. Protocol	:	EPC Class1 Gen2/ISO 18000-6C
3.9. Modulation /Coding		AM/PIE pulse interval encoding
3.10. Interfaces:		TCP/IP (10/100 Mbps Lan)
3.11. DC Power Input Voltages		12 V / 3.5 A
3.12. Operating Temperature range		-20deg to +50 deg C
3.13. Humidity		5 to 95 % non-condensing
3.14. Dimension		Device (212(w) x 180(L) x 48mm(H)) Reader Module (96 (W) x 54 (L) x 10mm (H))
3.15. Weight		Approx. 650g
3.16. Antenna		KIS900SF

Frequency band	860-930 MHz
Gain	<6 dBi
Polarization	Circular
In band VSWR	< 1,2
Dimension (mm)	240 (W) 240 (L) 50mm (H)

4. SUPPLIED GOODS AND ACCESSORIES.

RFID Smart Device U-ways	1
DC 12V 3.5A Adaptor	1
Antenna KIS900SF	1(Optional)
RF Antenna Cable (length 3m)	1
Test S/W & Users Manual CD	1
Lan cable (Cross)	1(Optional)
Tag	Optional

5. PUTTING INTO OPERATION

a) Read please this User manual fully before any installation works.

b) Install and fix RFID Smart Device U-ways (Reader), Antennas and Power Supply, Interface cable on the wall or another device, where you will to place and to use equipment. Distance between RFID Smart Device and Antenna must not be more 3m RF cable length. The Direction of the Antenna front surface must be in direction on the wanted reading area.

There are must be used bolt M4 for Reader mounting. Mounting Bolts placement and dimension depicted on Figure 1.

There are must be made four holes for Antenna mounting, as it depicted on Figure 1.

Notice: The antenna must be installed by the professional installer to comply with the safety, electrical and radiation standards.

The installer should properly configure the output power of transceiver according to related country regulation requirement and per antenna type.

Mounting bolts placement for Device installation.

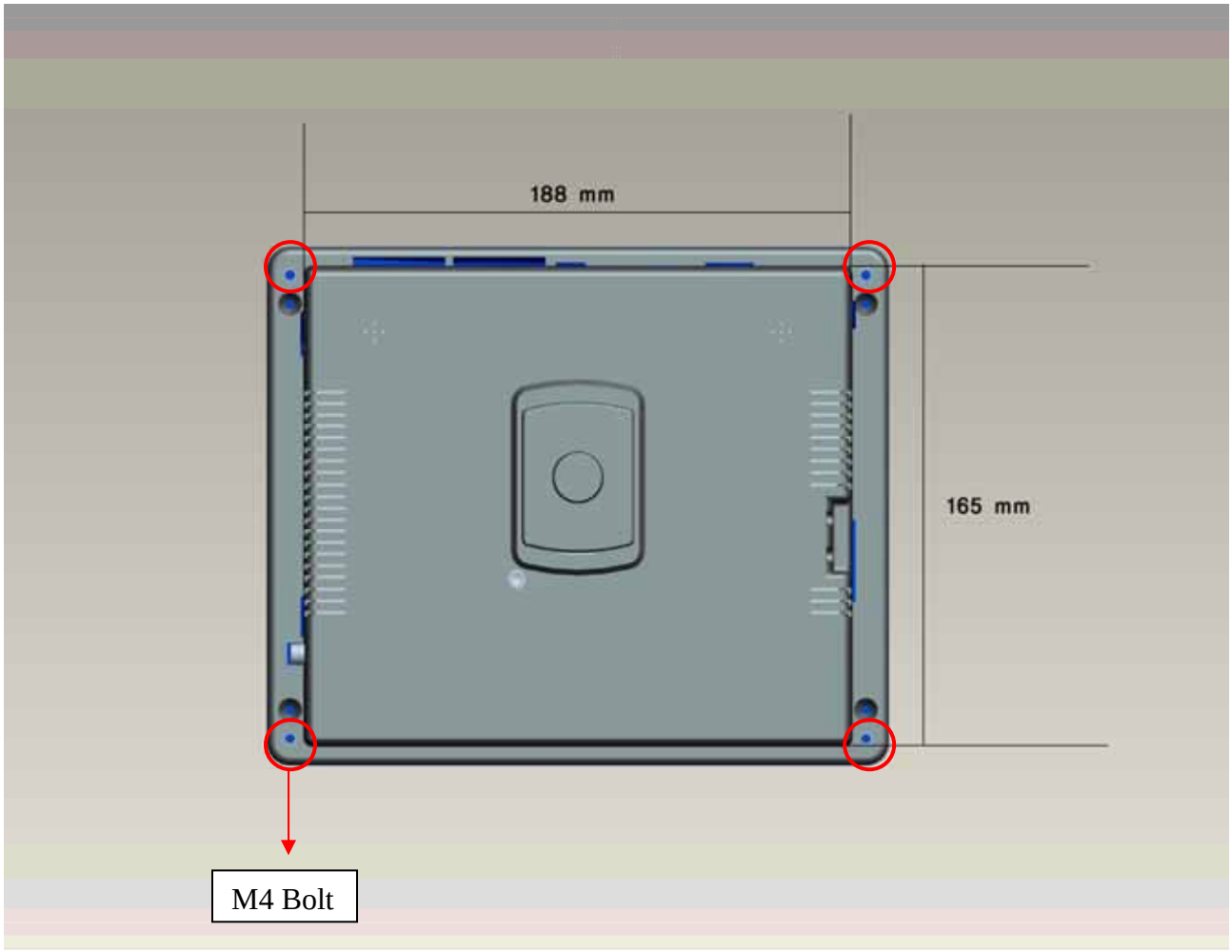

Fig. 1

Fig. 2

c) Make next cable connections:

- RFID Smart Device Uways (Reader) to Antenna using RF cables from the supplied accessories set;
- RFID Smart Device Uways (Reader) to PC according to Fig. 1 in section 6 of this manual;
- RFID Smart Device Uways (Reader) to PC connect Cat.5 UTP Cable.

d) Run appropriate software on PC.

Please assure the interface is set to TCP Port No. (Default Port 7001).

Establish a connection to the U-ways (Reader) and connect power adaptor to power source.

After power on and successful self-test reader send a message, which must to appear on U-ways touch Screen window :

<Reader Started><CR><LF>
<Gen2 mode><CR><LF>
<American Standard 902 ~928MHz><CR><LF>
<Air Link Interface 256Kbit per second><CR><LF>
<Active Antenna: 1><CR><LF>

Default TCP/IP interface : TCP Port 7001

e) Test the U-ways (Reader) with the command described in Command Set Manual.

- R – Reader Start / Stop
- Antenna1 – Set antenna No.1
- Antenna2 – Set antenna No.2
- Antenna All – Set antenna All

f) After the device is successfully tested as described above, you can set the reader configuration as needed.

Last configuration will be stored automatically in RFID Smart Device (reader) and used after power turn off.

6. CABLE CONNECTIONS

Lan(TCP/IP) Connection cable between RFID Smart Device U-ways (Reader) and PC depicted on Fig. 1

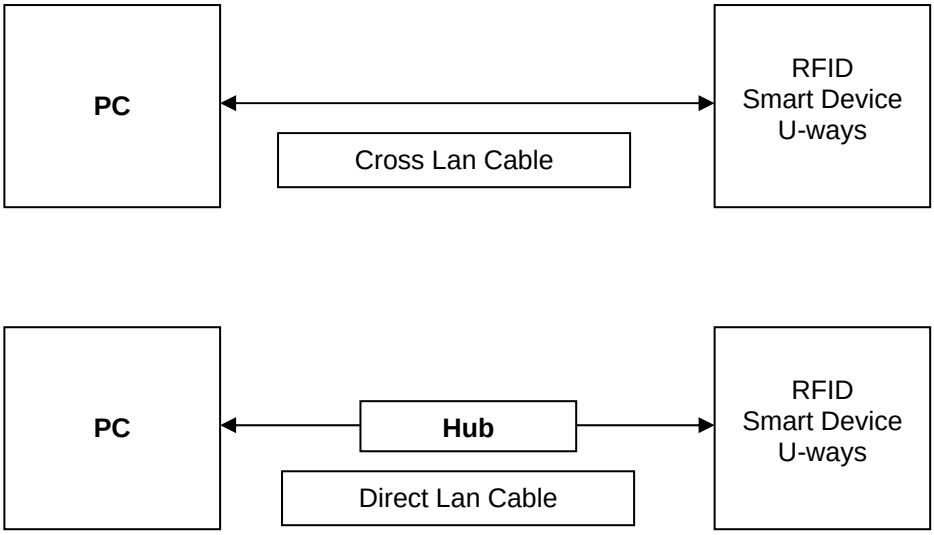

Fig.1

7. TROUBLE SHOOTINGS

Should the RFID Smart Device U-ways (reader) not work as desired, please check the following:

a) Is the configuration of the reader as wanted?

Check with help of the command V[v].

b) Is the configuration not known, are the baud rates of reader and terminal set different?
Restore the basic setting of the parameters values with command D[d].
Now all parameter values are set to the default values, the reader will work in normal condition.

c) Is the antenna defect or not properly connected?

d) The transponder is not in the active antenna field. Bring the transponder closer to the antenna.

e) Antenna mounting is wrong (for example behind a metal structure).
In such a case, it can happen that the radiated power is reflected by unwanted plate in nearby metal structures.

Please change antenna position.

f) Although there is no transponder in the active antenna field.

g) Noise from another radio equipment can also reduce the read range. You should try to remove all source of noise causing devices.

Upper High Frequency fields radiated by other devices interfere with the reader communication: - power supplies, electrical motors, etc.

Please remove such devices or remove the radiated interfering field by proper grounding if trouble takes place.

8. NOTICE

a) The device cannot be sold retail, to the general public or by mail order. It must be sold to dealers or have strict marketing control.

b) Installation of this device should be accomplished only by a qualified RF system Installer

who is :

- Knowledgeable of the use, Installation and configuration procedures and associated RF components.
- Knowledgeable of each system component's equipment User and Installation Guide.
- Knowledgeable of the installation and configuration procedures for the site's. Infrastructure system and wiring.
- Knowledgeable of the installation procedures, safety, and code requirements for the site's antenna, antenna mast, antenna cabling, and installation. highly recommends that the antenna installation be performed by a qualified antenna installation professional.

c) The intended use is generally not for the general public. It is generally for industry/commercial use.

9. WARNINGS AND CAUTIONS

! This Device(Reader) is an active electrical transmission system and radiates in UHF frequency range of approximately 900 MHz. When connecting a defective or a not suited antenna to the device the radiated power can be higher than 4 dB W. The operator is responsible that the device does not endanger people at risk.

! Do not operate the device with open housing, as otherwise there is a danger, that parts with dangerous voltage can be touched.

! Do not disconnect antenna cable when reader is in operating.

! Do not operate the device with antenna cable disconnected. Operating reader with disconnected antenna can damage reader.

! Never operate the device with defective antenna cables. The antenna cables may conduct dangerous voltages. When disconnecting an antenna cable please assure that the device is turned off and the cable was grounded for a short time before touching it. Otherwise stored energy of the antenna may cause harm.

! The device should only be opened by trained personal when switched off.

! **Caution!** Do not bring another antenna very near at the operated antenna (second antenna operated or not). In both cases there is a risk, that the antenna may be destroyed. Such defects are not covered by the warranty.