



# OR8400 User Manual

(V0.3)

**Model Name:** OR8400

**Description:** UHF RFID Reader Module

<i>Edition#</i>	<i>Reason for revision</i>	<i>Issue date</i>
V0.1	First release	2014/06/18
V0.2	Modify return loss	2014/07/03
V0.3	Modified for FCC	

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# 1 Introduction

OR8400 is a superior, high sensitivity and high performance 4 ports RFID reader module with built-in Impinj Indy R2000 RFID reader chip.

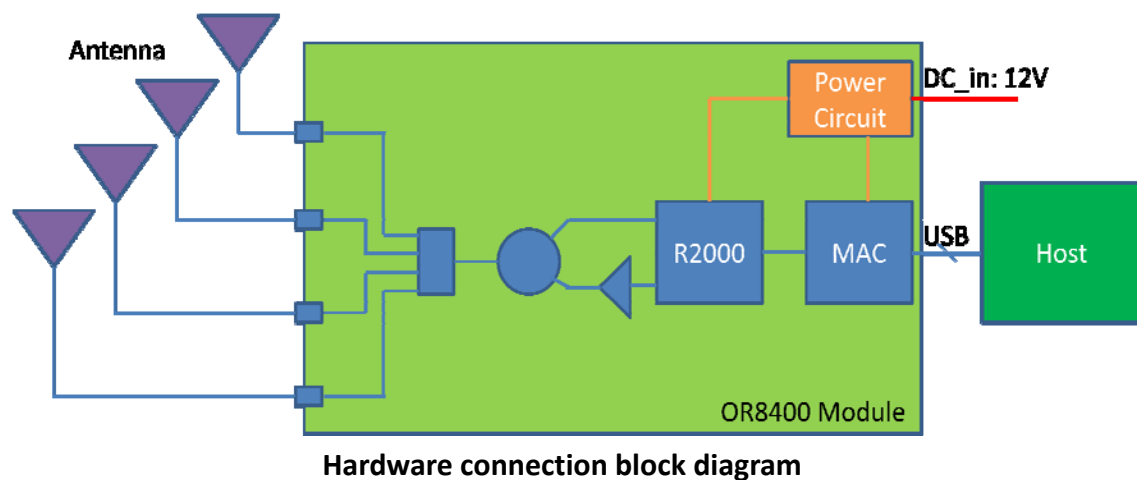
OR8400 supports EPC class1 Gen2/ ISO 18000-C. The maximum RF output power is 30.0dBm. The typical sensitivity is -84dBm at 30dBm output power.

OR8400 supports auto sensitivity improving technology. It can improve more than 10dB sensitivity.

In summary, the R2000 RFID chip was chosen because it provided the very best basic performance. The RF section was optimized by using a circulator. Thus, the combination of the R2000 chip and circulator based RF section with auto sensitivity improving technology provides the very best performance possible. Therefore, OR8400 is superior to all other R2000 base designs.

## 2 Hardware Block Diagram

OR8400 can be controlled via USB interface. OR8400 can connect 4 antennas via R/P TNC connectors. The hardware connection block diagram as below.



### 3 Specification

OR8400 Specification	
Air Interface Protocol	EPCglobal UHF Class 1 Gen 2 / ISO 18000-6C
Transmit Power	+10.0 to +30.0 dBm
Max. Receive Sensitivity [1]	-82dBm
Typical Receive Sensitivity [1]	-84dBm at 30dBm -86dBm at 27dBm
Min. Return Loss	10dB
Antenna ports	4 reverse polarity TNC mono-static ports
Dense Reader Mode	Support Dense Reader Mode(DRM), Built-in DRM Filter
Performance optimization	Support Auto improving sensitivity technology
Frequency	US: 902 ~ 928MHz
Interface	USB1.1 (USB 2.0 Full Speed)
USB Driver	Support Windows XP / 7 / Linux 32bit
DC Power	12V +/- 5%
Power Consumption	12W at 30.0dBm
Operating Case Temperature[2]	-20 °C to +70 °C
Humidity	5% to 95%, non-condensing
Dimensions	140 x 90 mm (not include TNC connector)
RoHS	Compliant to European Union directive 2002/95/EC

Note:

[1] Sensitivity value is measured by Voyantic Readformance at TNC connectors.

[2] The OR8400 module may be considered as a single electronic component. It is designed so that all the internal components have safe margins to their thermal limits when the heat spreading plate (bottom) does not exceed 70°C. The heat spreading plate temperature must not exceed 70 degrees C. Heat sinking will be required for high duty cycle applications.

## **Federal Communication Commission Interference Statement**

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 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.

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

### **Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

**This device is intended only for OEM integrators under the following conditions:**

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID: NKR-OR8400”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

**Manual Information To the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

## 4 Hardware interfaces

### 4.1 Antenna Connections

OR8400 supports four mono-static bidirectional RF antennas through four reverse polarity TNC connectors. The maximum RF power can be delivered to a 50 ohm load from each port is +30.0 dBm.

#### 4.1.1 Antenna Requirements

The sensitivity of most of RFID reader is affected by antenna return loss. OR8400 supports auto sensitivity improving technology. The technology can reduce the effect to keep good sensitivity. The minimum antenna return loss is 10dB.

#### 4.1.2 Antenna Detection

To minimize the chance of damage due to antenna disconnection, the OR8400 supports antenna detection. Detection can be done automatically and manually. Antenna detection helps protect the module from possible damage due to return losses less than 6 dB.

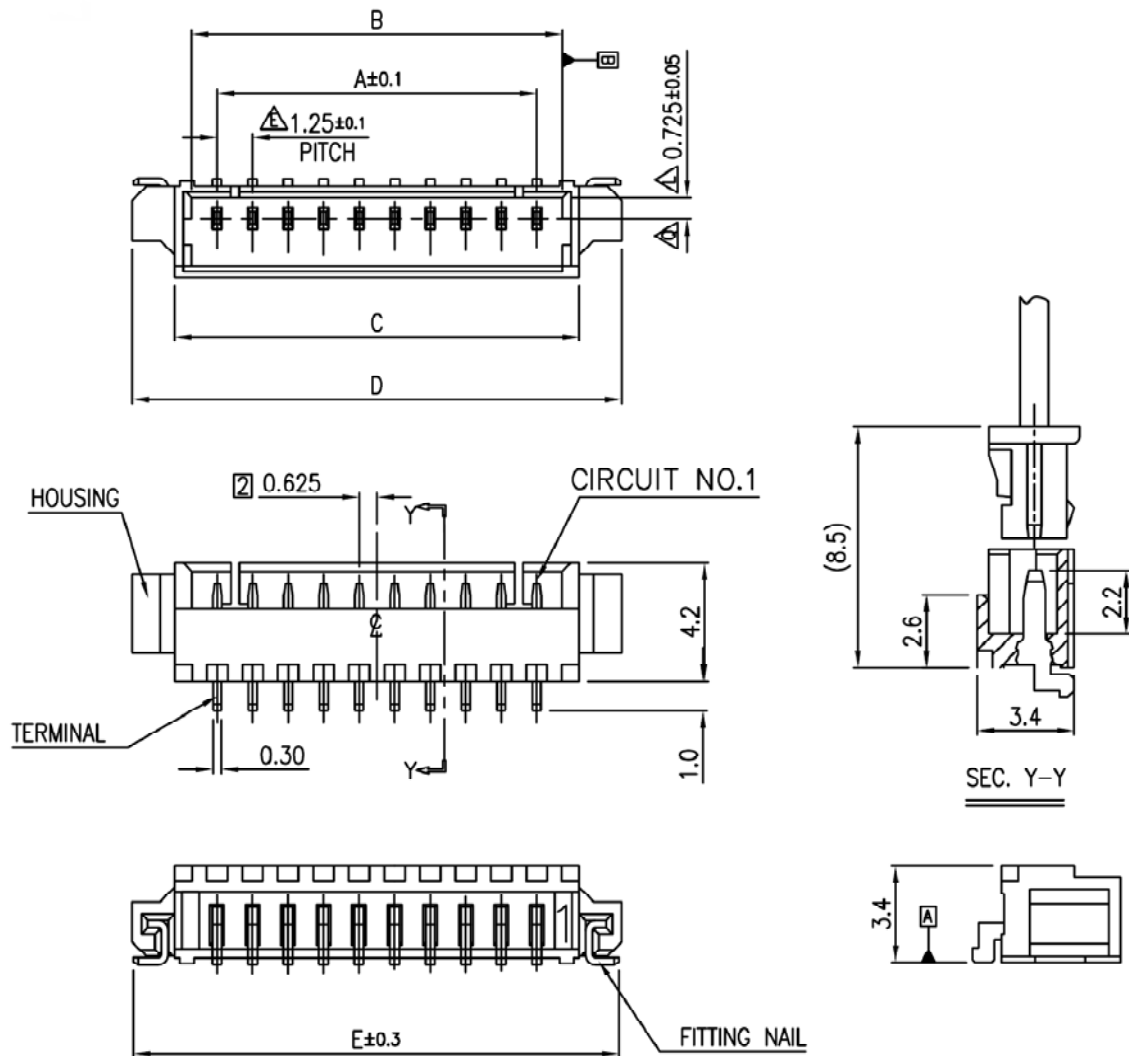
### 4.2 Digital/Power Connector Definition

The digital connector provides power, serial communications signals, LED signal and reset signals to the OR8400 module. These signals are provided through a connector that is compatible with part number: *Molex 53261-1571* - 1.25mm pin centers, 1 amp per pin rating which mates with Molex housing *p/n 51021-1500* with crimps *p/n 63811-0300*.

**Digital Connector Signal Definition**

Pin Number	Pin Define	Signal Direction	Notes
1	GND	Power Ground	Must connect both pins to ground
2	GND	Power Ground	
3	+12VDC	Power Input	Must connect both pins to DC +12V

4	+12VDC	Power Input	
5	ANT0	Output	Antenna status bit0
6	ANT1	Output	Antenna status bit1
7	LED_CRCError	Output	Common Anode (330 ohm on board)
8	LED_Link	Output	Common Anode (330 ohm on board)
9	UART_RX	Input	3.3V TTL Level
10	UART_TX	Output	3.3V TTL Level
11	USB_DM	Bi-directional	USB DATA (D-) Signal
12	USB_DP	Bi-directional	USB DATA (D+) Signal
13	USB_5V_Sense	Input	USB 5V detection
14	N/A		
15	Reset_N	Input	Low Reset (Module internal pull high)



Connector drawing



### 4.2.1 Antenna status signals

The signals show antenna status currently. They also can be decoded for LED usage.

**Antenna status table**

<b>Antenna</b>	<b>ANT1</b>	<b>ANT0</b>
<b>Antenna1</b>	<b>0</b>	<b>0</b>
<b>Antenna2</b>	<b>0</b>	<b>1</b>
<b>Antenna3</b>	<b>1</b>	<b>0</b>
<b>Antenna4</b>	<b>1</b>	<b>1</b>

### 4.2.2 LED signal

During an inventory command execution, two LEDs (LED\_CRCError and LED\_Link) are used to indicate the tag read status. LED\_Link is turned on each time a valid EPC is received. LED\_Link turns off when a tag is not read (for any reason). Each time a CRC error in the EPC is detected, LED\_CRCError turns on. If no error is detected, LED\_CRCError turns off.

## 5 Mechanical Dimension

