IPICO Spider (3960) reader

User Manual

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Version 1.0 draft

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IPICO
RFID REALISED

IMPORTANT

FCC ID; VHY-IP3960A

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**.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS QUIPMENT.

SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

HISTORY:

Version	Date	Person	Reason
Draft 1.0	22/11/2007	Hubert	Create
Draft 1.1			
Draft 1.2			
Issued version 1.00	Dd/mm/yyyy	Name	Reason
Issued Version 2.00	Dd/mm/yyyy	Name	Issued

GLOSSARY:

DF   Dual Frequency

TX   Transmit antenna

RX   Receive antenna

PSU   Power Supply

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1 INTRODUCTION

This manual is intended to make a description of the Spider reader and to explain the procedure to setup and use the reader. It must be understood that setup environment can influence the performance of the system. This manual will help you to setup the reader to have an optimum tag read performance under most conditions.

2 SUMMARY OF FACILITIES

- Capability to drive 2 TX antennas and 2 RX antennas.

- Ethernet port (RJ45) or USB or WIFI to communicate between a computer and the reader (must be specified when ordering).

- Specific power supply to ensure good filtering in the tag band: 10V->58VDC or 110-220VAC 50-60Hz (must be specified when ordering)

- External input for date/time stamp

- External output for buzzer

- Only one On/Off switch for the whole system

- RS232 connection on the back plane for RX data and TX management

- Leds and buzzer for tag detection.

- DSP(s) for better detection of tags in electromagnetic noisy environment

- Automatic tuning of the system

- Aluminium anodized enclosure

Figure 1: Reader + Power Supply

3 READER

Figure 2: Spider reader

3.1 Front panel

There are 2 different front panels. One corresponding to the USB version or Ethernet version and the other one corresponding to the WIFI version

All the visual indicators are on the front panel. A description of each part of the front panel is done in the followings chapters. The front panel is aluminium anodized.

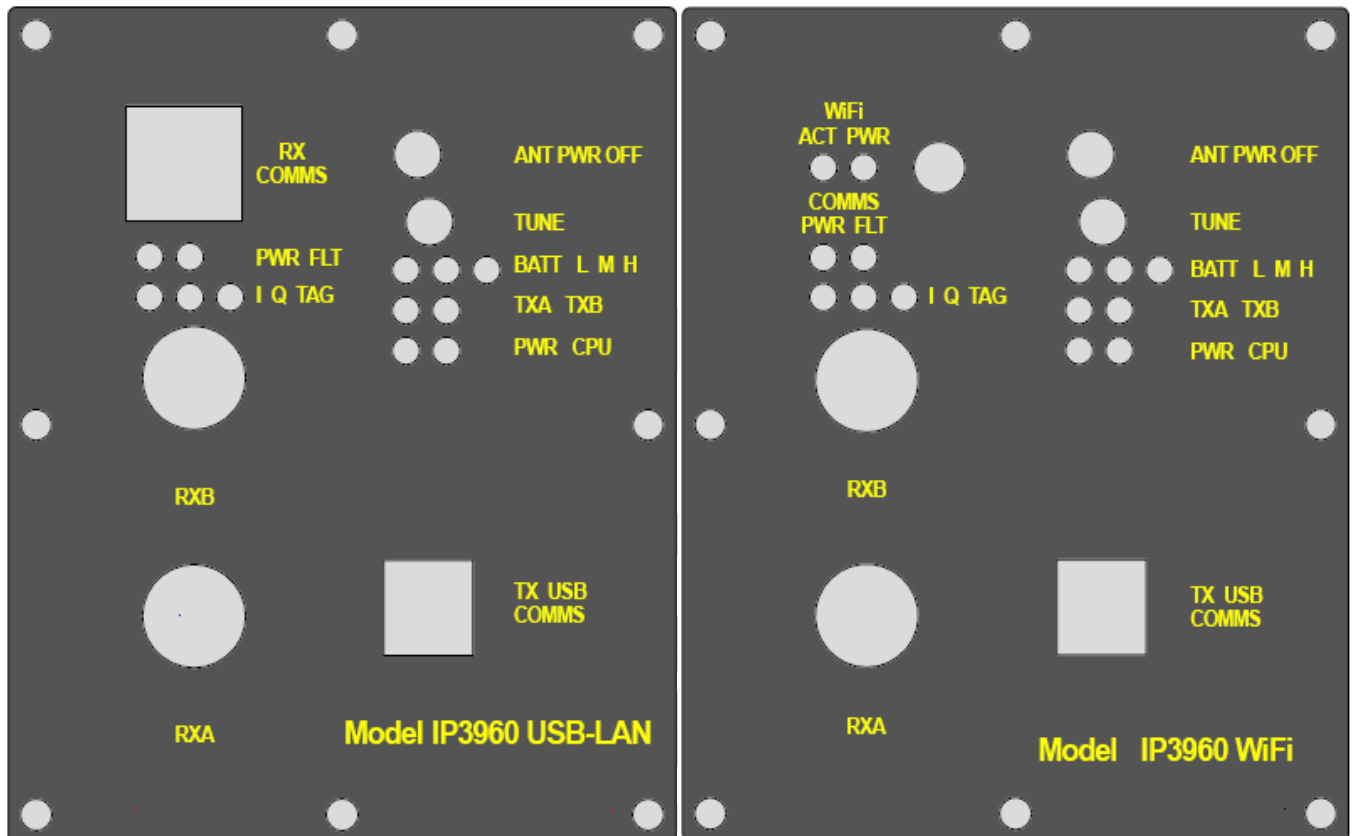The figure below shows the front panel layout for the USB or Ethernet version, and for the WIFI version.

Figure 3: Front panel layout of USB/Ethernet version and WIFI version

3.1.1 Transmitter unit

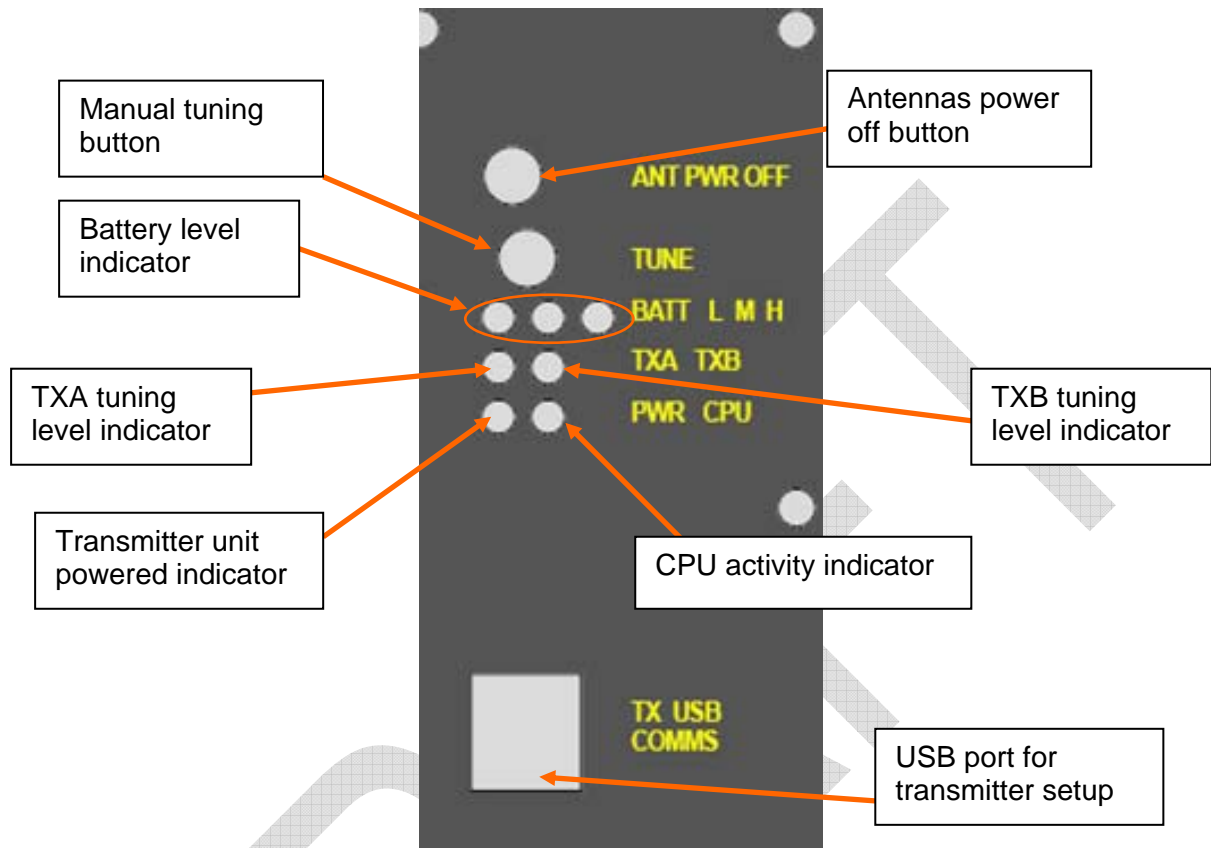This unit manages the TX loops to provide energy to tags.

Figure 4: Transmitter unit

Battery level indicator:

Three indicators show Low (L), Medium (M) and High (H) voltage levels. As the power supply is managed by the Power Supply unit, the light should always show H or M.

Transmitter unit powered indicator:

This indicator should be lit when the reader is switched on to show that the transmitter unit is powered.

Manual tuning button:

This button is used to start a manual tuning of the antennas. When the reader is switched on, the reader will automatically tune the loops. The result of this tuning will be displayed on the TX tuning levels indicators. This manual tuning must not be done when tags are detected. If so, tags can be missed. The aim of the manual tuning is to tune the antennas if something changed in the antennas environment (metallic part…). In most of the cases, the automatic tuning done when the reader is switched on is sufficient.

TXA Tuning Level indicator:

When the indicator is lit, the tuning is correct. When it is flashing and a beep is sounding, something is not correct. Turn the power off, check that your antennas are installed correctly and restart the system.

TXB Tuning Level indicator:

When the indicator is lit, the tuning is correct. When it is flashing and a beep is sounding, something is not correct. Turn the power off, check that your antennas are installed correctly and restart the system.

CPU activity indicator:

This indicator shows that the microprocessor is operating. When operating correctly the CPU indicator will flash at approximately half second intervals.

Antennas power off button:

When you push this button, the TX unit will stop driving the TX antennas, you will hear a repetition of beeps and the tuning level indicator will flash. In that case you will not read tags. If you push the button again, the TX unit will start again to drive the TX antennas, the beeps will stops, and the tuning level indicator will stop flashing.

USB port for transmitter setup:

This USB port must not be used by the user. It is only used by Ipico qualified staff to setup and diagnose the transmitter unit at the manufacturing level.

3.1.2   Receiver unit

It is a dual channel receiver. It collects tag data from the RX loops.

The figure bellows shows the USB or Ethernet version receiver unit on the left. On the right it is the receiver unit of the WIFI version.
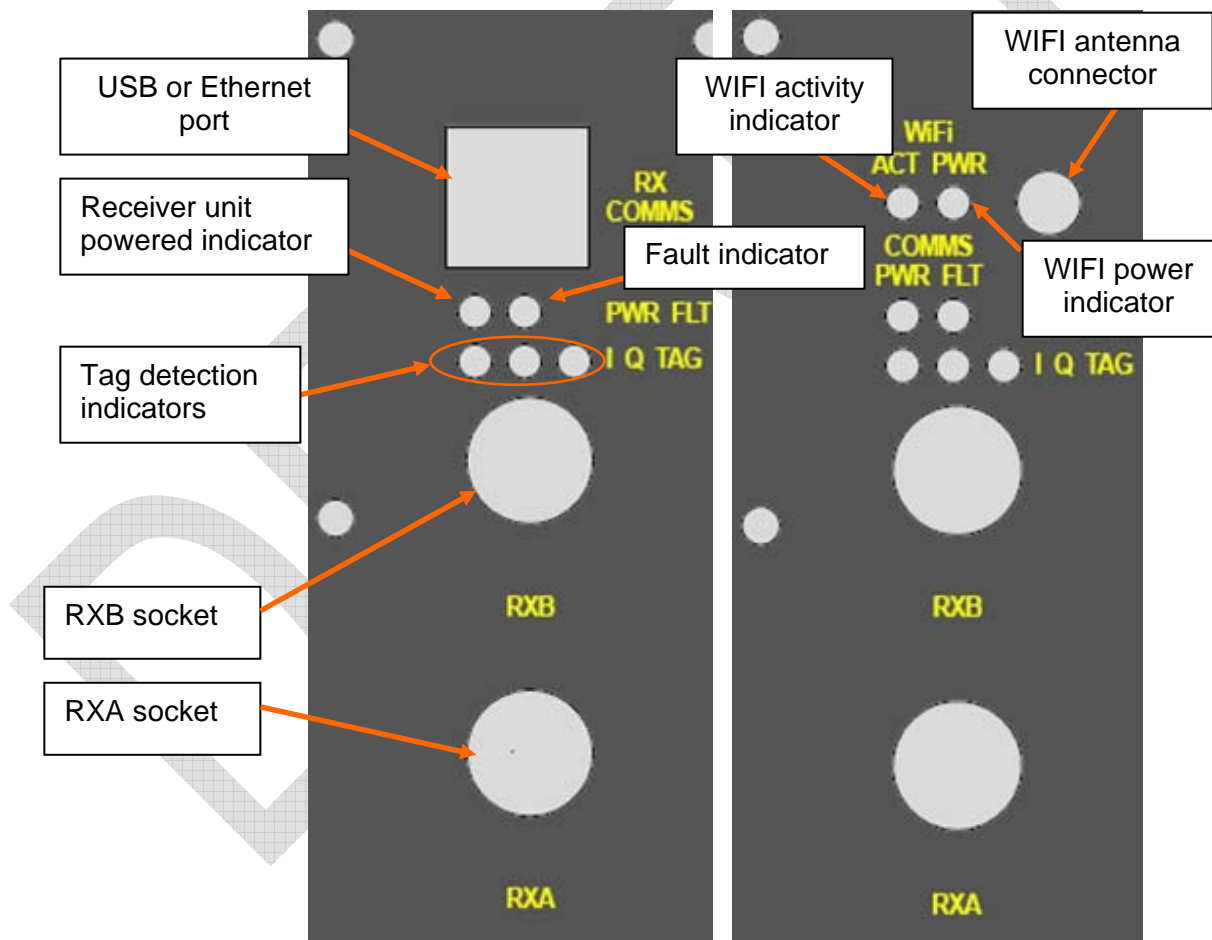

Figure 5:   Receiver unit of USB or Ethernet version, receiver unit of WIFI version

Receiver unit powered indicator:

This indicator should be lit when the reader is switched on to show that the receiver unit is powered.

Tag detection indicators:

The receiver has 3 data activity indicators. These are labelled I, Q and TAG. The I and Q indicator show which section of the receiver RXA or RXB is detecting a tag. I correspond to RXA and B corresponds to RXB. If a tag is detected the indicator is lit or flashes. The TAG indicator shows that the decoder in the receiver is sending data to the Delta unit. A buzzer can also be setup to emit sound when a tag is detected.

Fault indicator:

This indicator will be lit if there is a communication problem in the receiver.

RXA & RXB sockets:

BNC sockets for receiver antennas.

USB or Ethernet port:

On the USB version it will be a USB port sending tags data. On the Ethernet version it will be an RJ45 port sending tags data.

WIFI antenna connector:

It is a SMA connector to connect a standard WIFI antenna.

WIFI power indicator:

This indicator will be lit when the unit is powered.

WIFI activity indicator:

This indicator will flash whenever there is a data activity through the WIFI.

3.2 Back plane

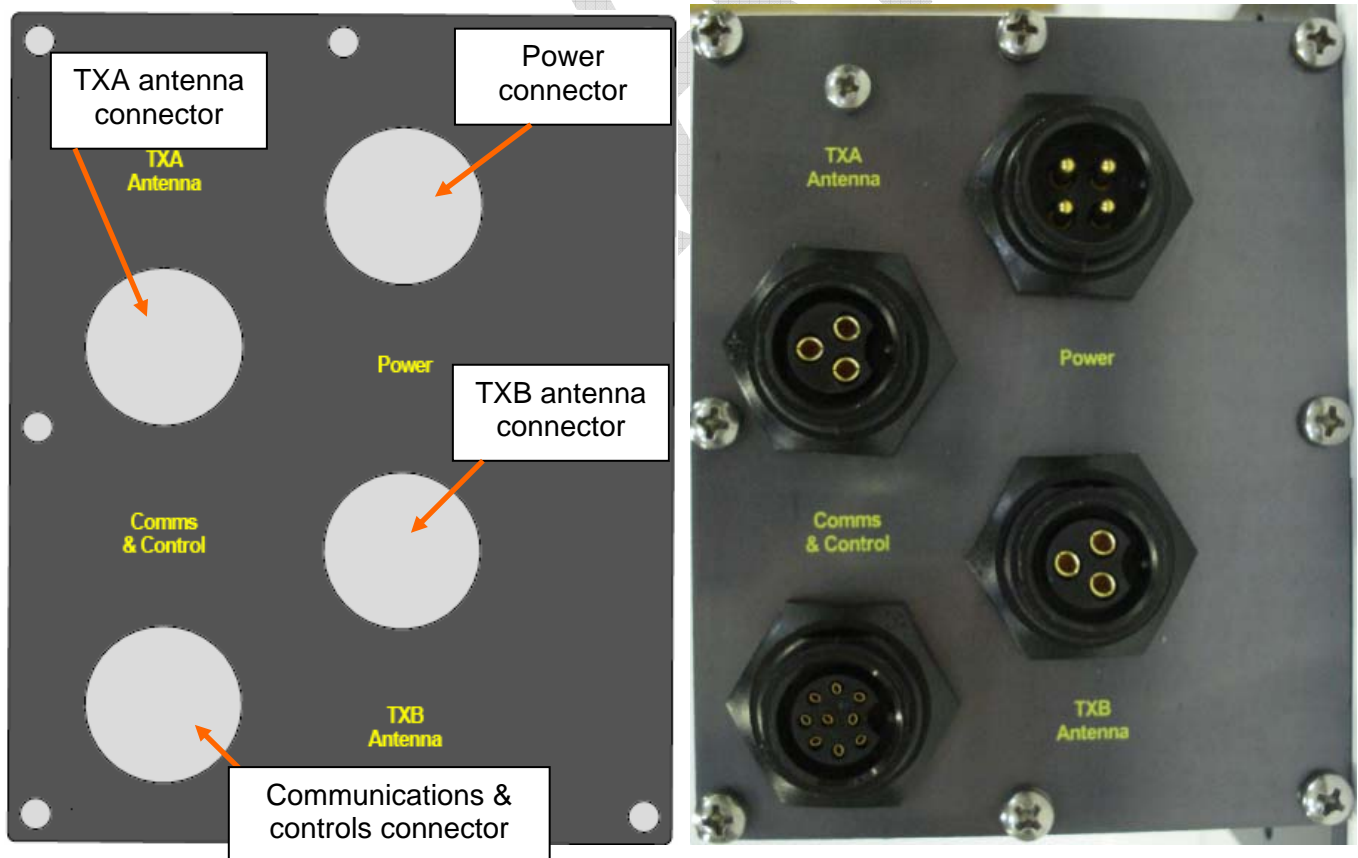The backplane is the same for the different versions of the spider. It is aluminium anodized.

Figure 6: Backplane layout and picture

Power connector:

Connect the cable from the power supply to this connector.
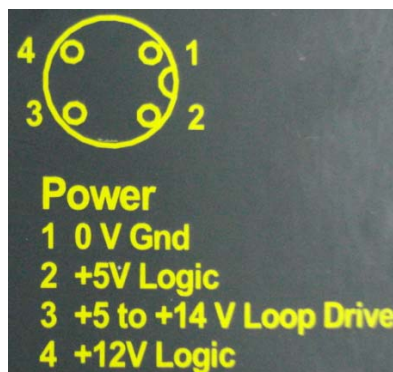
Figure 7: Power connector pins

TXA & TXB antenna connectors:

Connect the TX antennas to these connectors.
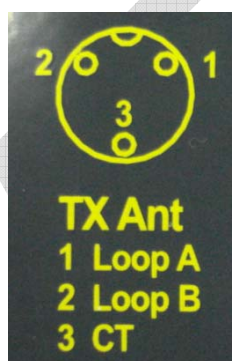
Figure 8: TX connector pins

Communications & controls connector:

Pin 1 is the ground.

Pins 2 & 3 correspond to communication with the RX unit. Pin 3 may be used to get data each time a tag is read.

Pins 4 & 5 correspond to communication with the TX unit. This is usually used for diagnostics by ipico staff.

Pin 6 is a manual tuning input. It is a clear contact input. It has the same effect than the button on the front plate.

Pin 7 is reserved for future use.

Pin 8 is a Date/Time stamp input. It is also a clear input contact. Its action is described in the "Communications with the reader" chapter, in the "Date/time stamp data" section.

Pin 9 is an output to connect an external buzzer. The buzzer must be self oscillating and is connected between pin 9 and pin 1

Figure 9: Communications & controls connector pins

4 POWER SUPPLY

This unit manages the power supply (PSU) of the whole reader. The PSU is specially designed to filter the conducted noise from the mains that can be situated in the tag reply band. This PSU is also designed to radiate as less as possible noise in the tag reply band.

The PSU has mounting holes in the chassis to be fixed on a wall or inside a box.

Figure 10: Mains power supply

4.1 Power input side

The PSU can cope with alternative voltage from 87Vac to 264Vac, 50-60Hz.

Figure 11: Mains input & switch

4.2 Power output side

The PSU provides 3 different voltages:

- +5V @1A
- +12V @1A
- Adjustable voltage for TX drive: +6V, +8V, +10V, +12V or +13.8V (+12V by default) @ 10A

The figure below shows the DC outputs side of the PSU.
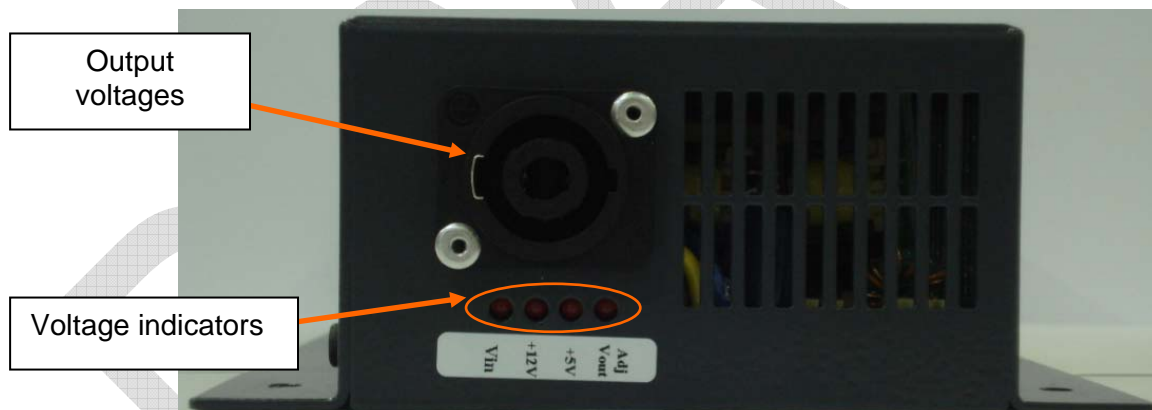
Figure 12: DC voltage outputs

Output voltages connector:

      The connector is a Neutrik NL4FX.

Voltage indicators:

      These indicators correspond to each voltages used in the reader. When the reader is turned on, all should be lit.

Adjustable voltage settings:

The TX drive voltage is adjustable by dipswitches. The picture below shows the location of the dipswitches.
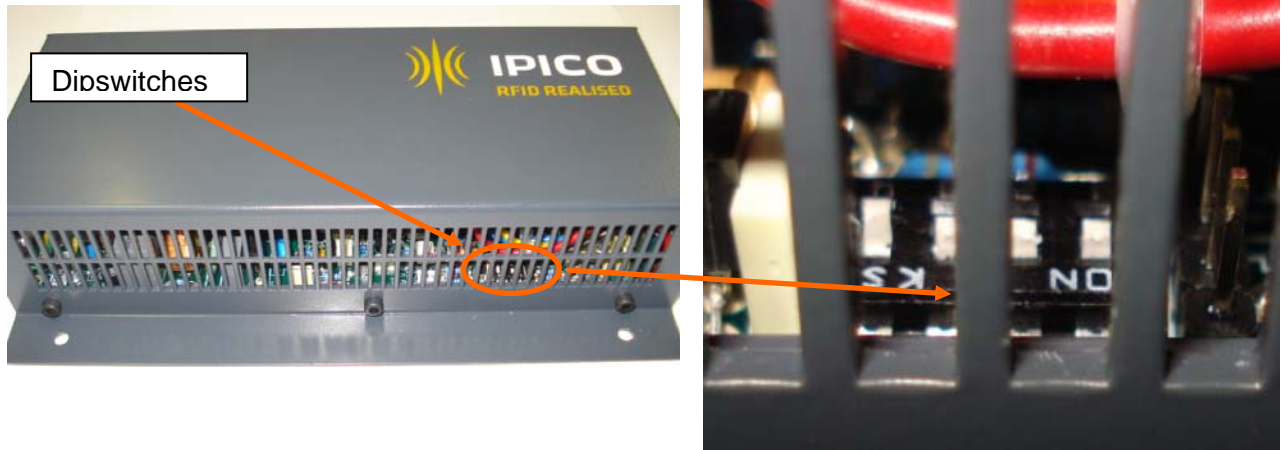
Dipswitches

Figure 13: Adjustable voltage dipswitches location

The figure below shows the different voltage settings of the TX drive voltage.

The usual TX drive voltage is 12V.

Adjustable voltage output: **6V**

Adjustable voltage output: **8V**

Adjustable voltage output: **10V**

Adjustable voltage output: **12V**

Adjustable voltage output: **13.8V**
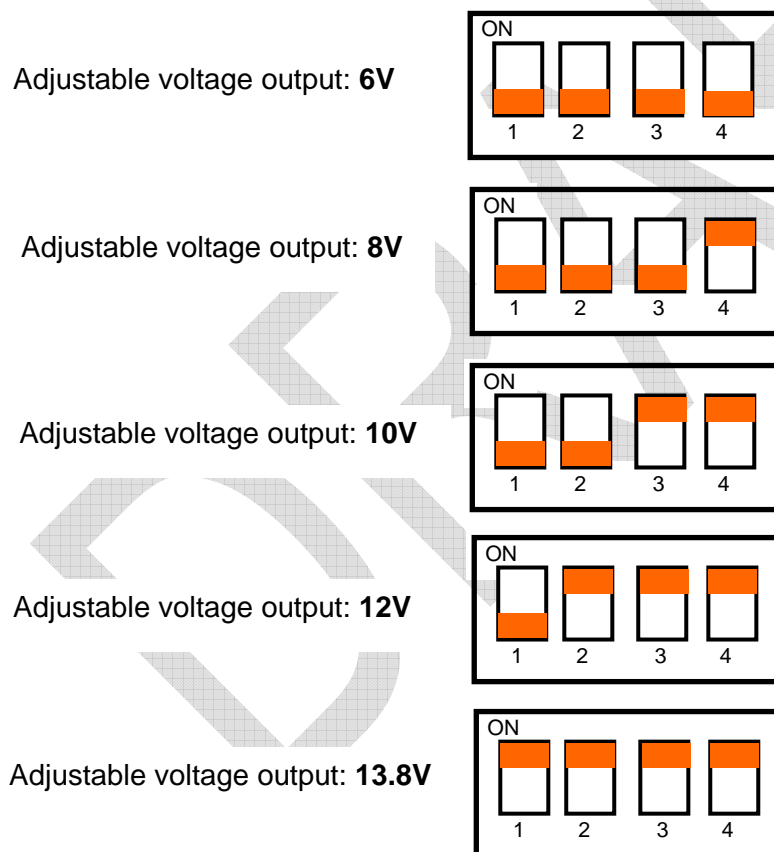
Figure 14: Adjustable voltage settings

Caution As this is a small closed volume unit the only cooling of the internal electronics is by radiation from the case. Accordingly the following rules must be adhered to to ensure that the unit will operate correctly.

100% Duty Cycle Loop Drive Voltage 8 Volts

80% duty cycle Loop Drive Voltage 10 Volts and

50% duty cycle Loop Drive voltage 12 Volts

5   COMMUNICATION WITH THE READER

5.1   Ethernet version

If you want to connect a PC directly to the reader, **use an Ethernet crossover cable**.

The default IP address of the reader is 10.19.1.101

Then connect to the TCP port 10000. Whenever a tag will be read, data will be sent by the reader to the port 10000.

5.2   USB version

The first time you connect the reader to your computer, your computer needs to be connected to internet to be able to download automatically the driver. When Windows® will detect the new device, you have to select the option: "Download automatically the driver from internet".

After the successful installation of the driver, when you connect the reader to your computer, it will create a virtual COM port. To know which COM port number it created, you go to "Windows Control Panel", then "Systems", then "Hardware", then "Peripherals manager". You will see the windows on the figure below:
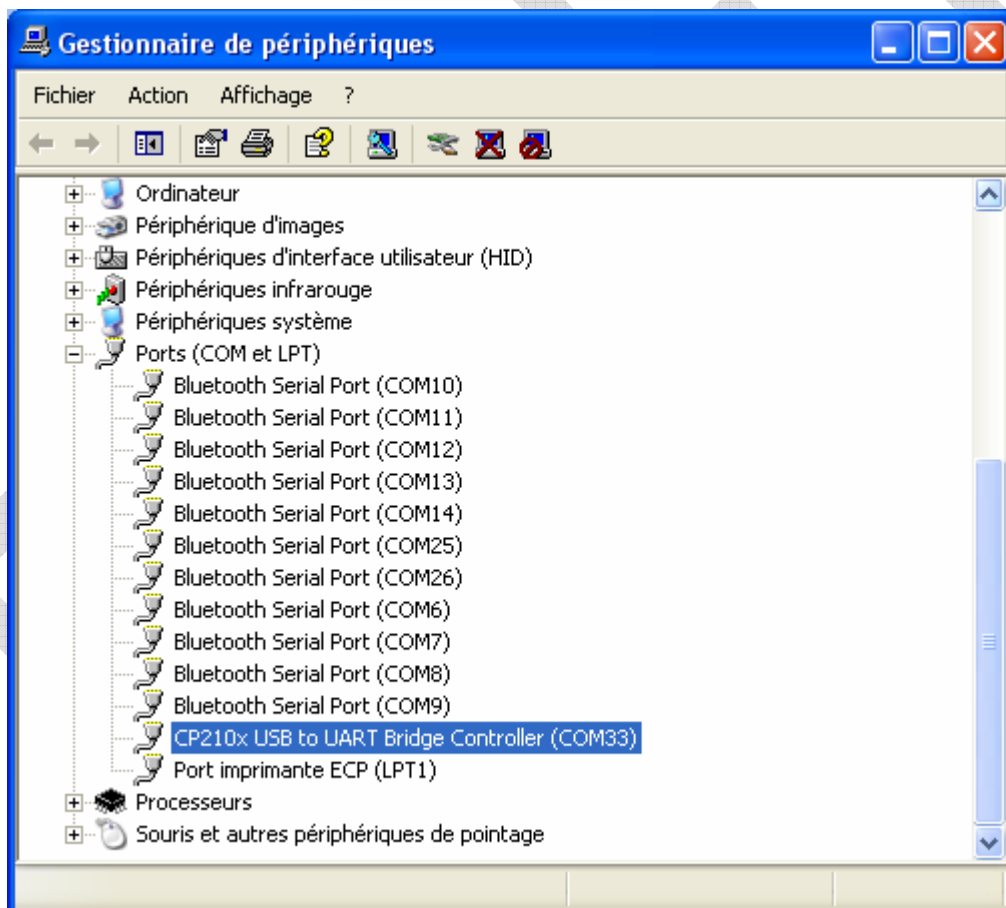
On your application side, the parameters for the connection to the COM port need to be:

Baud rate (Bits per seconds): 9600

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

After you setup correctly the connection, whenever a tag will be read, data will be sent by the reader to the COM port.

5.3   WIFI version

5.4   Change the IP address (Ethernet or WIFI)

If you want to change the IP address, type in your internet browser address bar the current IP address of the reader. A username and password will be asked.

- username: admin
- password: Don't fill anything in the password field

Then a web page will open. You can type the new IP address and click on the "Save" button.

5.5   Reader data protocol

The following lines correspond to 2 tags that have been detected. The first tag detected has the ID 058000ab8684 and the second tag detected has the ID 058000abb494. The first tag has been read 6 times, and the second tag has been read 4 times. There is one line outputted from the reader each time the tag is read.

aa01058000ab868400010706041158086 1bb
aa01058000ab868400010706041158091 7bd
aa01058000ab868400010706041158092 2b9
aa01058000ab868400010706041158094cec
aa01058000ab868400010706041158095 8c2
aa01058000ab868400010706041158096 3be
aa01058000abb49400010706041158131b0c
aa01058000abb494000107060411581320db
aa01058000abb4940001070604115813 2a0c
aa01058000abb49400010706041158135 3e1

The following table explains the different parts of each line:

Byte	Description	Info
0	Header character 1	Frame header, 'a'
1	Header character 2	Frame header, 'a'
2-3	Reader ID	0-255 in ASCII hex
4-15	Tag ID	MS digit first
16-19	I and Q channel counter	Binary counters 0-255 in ASCII hex
20 –33	Date/Time	Date and time with 10ms resolution. 390ms/10 = 39 = "27" (27 = 0x32 + 0x37) and the month 12 is 0x31+ 0x32.
34-35	LRC	Checksum on bytes 2 to 33
36-37	End of packet (CR, LF)	0x0d, 0x0a

Example:

Tag with an ID = 470011223344 is read at 14:05:20.39 on 2006-12-30 the data packet received from the reader would be aa00470011223344090006123014052027xx\r\n where xx is the calculated LRC.

How to know from which antenna the tag was read:

Record ID	Receiver ID	Tag ID	I-Count	Q-Count	Date (YYMMDD)	Time (HHMMSS)	100ths (in Hex)	LRC
aa	00	058000add0fa	01	00	070202	115001	12	aa
aa	00	058000abc5a3	01	00	070202	115001	13	e1
aa	00	058000abd035	01	00	070202	115002	00	17
aa	00	058000abbaa6	01	00	070202	115002	01	41
aa	00	058000add984	00	01	070202	115002	01	5d
aa	00	058000abbe87	00	01	070202	115002	02	86
aa	00	058000abf4aa	01	00	070202	115002	02	19

The receiver ID is always 00 for a spider reader. However if desired this can be changed.

The I and Q counts are used to determine which antenna that tag was seen on.

I-Count: If > 0 the Tag is seen on channel 1 of the receiver (top plug)

Q-Count: If > 0 the Tag is seen on channel 2 of the receiver (bottom plug)

Example: The highlighted tag ID "058000abbe87" was read on the Q-channel. This corresponds to the antenna connected on the bottom plug of the receiver.

On the application software, all the lines that are not starting with "aa" must be ignored. They correspond to maintenance data.

Further details can be obtained from the iPico Reader Serial Protocol document.

5.6 Date/Time stamp data

When you connect an external switch on the Time stamp input on "Comms & control" connector on the back plane, the action on the switch will add the following line on the raw data port and in the data files:

ab000a2c070301041413513bd102d0

red is yymmdd (year month day) – i.e. 070301 (1st of March 2007)

green is dow e.g. 04 is Thursday

blue is hhmmss (hour minute second) i.e.141351 (14h13mins51s)

pink is 100ths in hex i.e. 3b (in hex) = 59ths (in decimal)

6 INSTALLATION OF THE SYSTEM

6.1 Precautions of use!

- Antennas should be placed at least 0.5m from any large metal / conducting objects such as fences, barb wire... to get the best performances.

- The spider reader and antennas should be placed as far as possible from other electromagnetic field generating equipment such as fan motors, audio equipment etc.

- AC power lines including extension cords should be placed at least at a distance of 20cm from antennas leading cables, and as far as possible from the antennas.

- Switch mode power supply must be as far as possible from the reader and antennas.

- The system must always be switched on with the TX antennas connected.

6.2 Installation of the reader

1. Install your antennas
2. Install the spider + power supply (don't connect the mains cable yet)
3. Plug the TX antennas
4. Plug the RX antennas
5. Connect the mains cable to the power supply
6. Switch on the reader
7. 2 seconds after switching on the reader, beeps will be emitted. When they stops, the reader is ready.

6.3 Testing of tag reading distance

A test of reading with a tag should be done on each antenna to check the performances.

After that your system is ready!

7 SPECIFICATIONS

7.1 Reader

- Consumption:
    - o 1 Amp for the +12V voltage
    - o 1Amp for the +5V voltage
    - o TX loop drive 3.5 Amps @ 12 V typical maximum for 2 antennas
    - o Weight: 1.6Kg

- Dimensions: 85mm H x 145mm W x 245mm L.
- Temperature rates: 0°C to 50°C
- IP protection: IP54
- Warranty 1 year

7.2 Power supply

7.2.1 Mains version

- Input: 87Vac->264Vac, 50-60Hz
- Output:
    - o +5V @1A
    - o +12V @1A
    - o Adjustable voltage (by dip-switches) for TX drive: +6V, +8V, +10V, +12V or +13.8V (+12V by default) @ 10A

- Weight: 1Kg
- Dimensions: 57mm H x 140mm W x 240mm L.
- Temperature rates: 0°C to 50°C
- IP protection: IP54
- Warranty 1 year

7.2.2 DC version

- Input: +10Vdc->+58Vdc
- Output:
    - o +5V @1A
    - o +12V @1A
    - o Adjustable voltage (by dip-switches) for TX drive: +6V, +8V, +10V, +12V or +13.8V (+12V by default) @ 10A

- Weight: 1Kg
- Dimensions: 57mm H x 145mm W x 245mm L.
- Temperature rates: 0°C to 50°C
- IP protection: IP54
- Warranty 1 year

APPENDIX A – STANDARD ANTENNAS

The following standard antenna panels are available for use with the Spider reader.

IP 2965 Dual Panel Antenna 600 x 400 mm

IP 2961 Dual Panel Antenna 800 x 600 mm

IP 2962 Dual Panel Antenna 800 x 1200 mm
Incorporates 3D tag read capability

IP 2974 Single Tube Antenna 500 x 100mm diameter
This antenna has a directed field and has been designed to
operate in a constricted under a Fork Hoist truck.

APPENDIX B – OPTIONAL ACCESSORIES

The 2 following tools are really useful for maintenance of the system on site.

Battery assisted tag

It is an active tag that take the necessary energy from an inside battery instead of from the 125 KHz TX field. This tool is used to determine the read range of the system (RX part of reader + antennas).

Ordering number: IP3907

Figure 15: Battery assisted tag

125 KHz Field strength meter

It is a tool that measures the 125 KHz field. It is used to determine the power-up range of the system (TX part of reader + antennas).

Ordering number: IP3908

Figure 16: Field strength meter