

IPICO STK Elite reader

User Manual

Compiled by Hubert PEYRE

Version 1.7 draft

July 19, 2007



IPICO

RFID REALISED

IMPORTANT

FCC ID; VHY-IP3911A

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 EQUIPMENT.

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

HISTORY:

Version	Date	Person	Reason
Draft 1.0	15/09/2006	Hubert	Create
Draft 1.1	27/10/2006	Hubert	Edit and enhance
Draft 1.2	22/11/2006	Hubert	Edit and enhance with comments from Aus, add mats configuration
Draft 1.3	05/04/2007	Hubert	Modified mats configuration, add communication with the reader section, modified specifications section, modified installation of the system section
Draft 1.4	11/04/2007	Hubert	Removed colour coding on RX face plate, add inch and foot dimensions, modifications on comments from Chuck and Larry, new front plate, space between rows of timing line and backup
Draft 1.5	18/04/2007	Hubert	Modified mat configuration, add 6m mat line, add top panel info, add info on summary of facilities
Draft 1.6	10/07/2007	Hubert	Add external +12V pin polarity on the power supply front plate. Add external loud buzzer picture Add reader data protocol, add command port section Change on Webmin NTP, Version, removed Dimi start/stop function, FirstSeen/LastSeen, XML Add battery management appendix Add optional accessories appendix
Draft 1.7	19/07/2007	Hubert	Add FCC info Modifications on comments from Werner, add port layout summary, modify Webmin explanations
Draft 1.8	12/12/2007	Roger	FCC Warning Notices changed
Issued Version 2.00	Dd/mm/yyyy	Name	Issued

GLOSSARY:

STK	Sport Time Keeping
TX	Transmit antenna
RX	Receiver antenna
Delta	Embedded computer in the reader

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1 INTRODUCTION

This manual is intended to make a description of the STK Elite 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 4 reading mats (2mx1m each), equivalent to an 8 meters timing line for one reader, or 4 meters with a second 4 meter line for backup. With 2 readers a 16 meters timing line is possible.
- Data can be stored on an internal flash drive (with battery backup)
- Ethernet port (RJ45) to communicate between a computer and the reader (Optional WIFI or RS485).
- Internal power supply by battery for mobile application
- External power supply: 12VDC or 110-220VAC 50-60Hz (must be specified when ordering)
- External connectors for supplementary power supply battery
- External connector for fast charge 3h (can only be used with an Ipico charger)
- External inputs for date/time stamp (can be used with an acoustic coupler for start gun)
- Battery management card: beeps on low voltage or incorrect input polarity, voltage indicator
- Only one On/Off switch for the whole system
- Input (RS485) for the storage of data from a single STK Lite reader
- Leds and buzzer for tag detection.
- External loud buzzer as option
- DSP(s) for better detection of tags in electromagnetic noisy environment
- Automatic tuning of the system
- Aluminium skin/plywood Road Case
- Venting on bottom and top of reader for hot climates (like Australia and Africa).

3 READER



Figure 1: STK Elite reader

3.1 Front panel

All the cable connections on the reader are done on the front panel. All the visual indicators are also on the front panel. Figure 1 shows the front panel layout. A description of each part of the front panel is done in the followings chapters.

The face plate of each unit is powder coated Zinc annealed Steel.

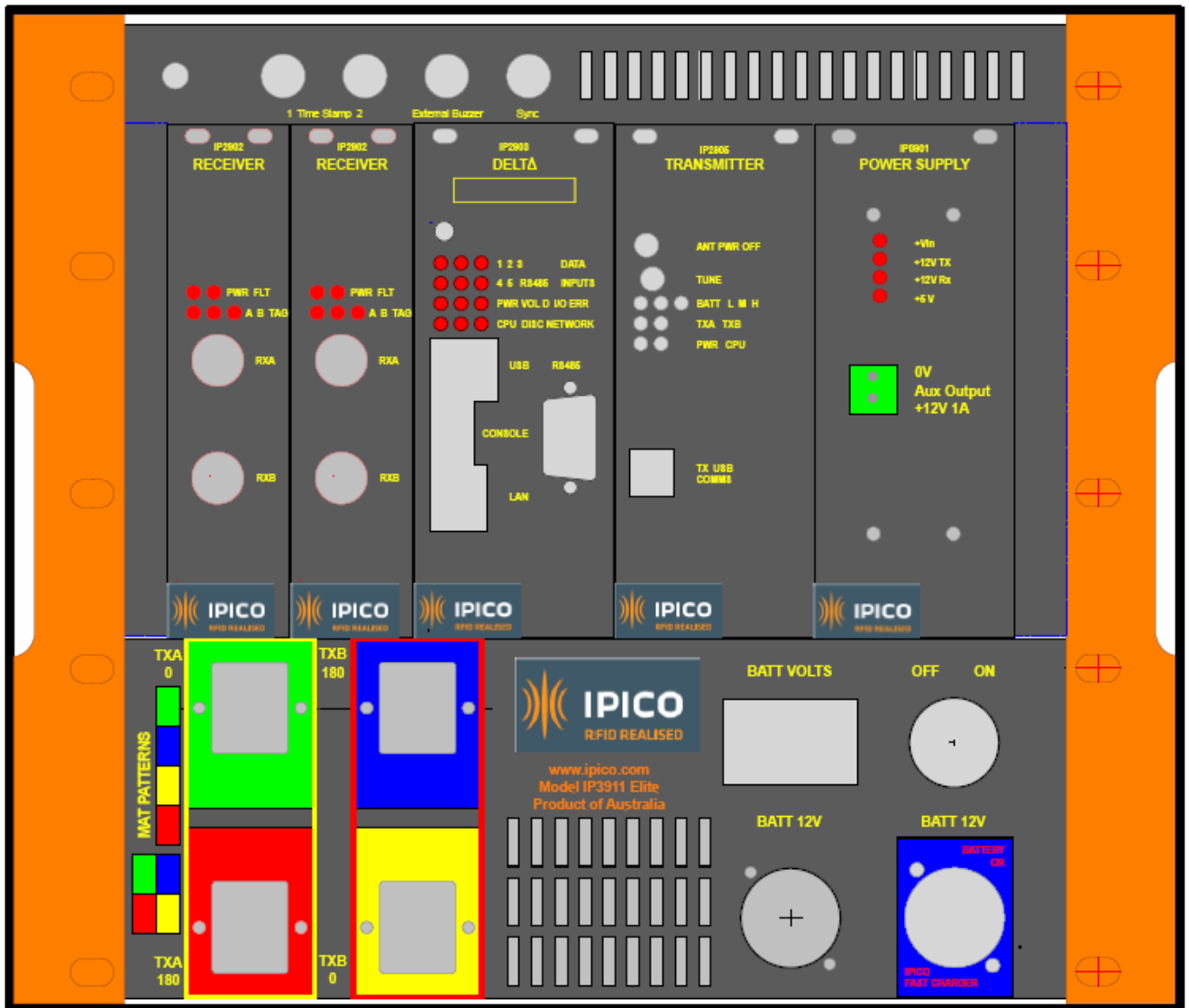


Figure 2: STK Elite reader Front panel

3.1.1 Transmitter unit

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

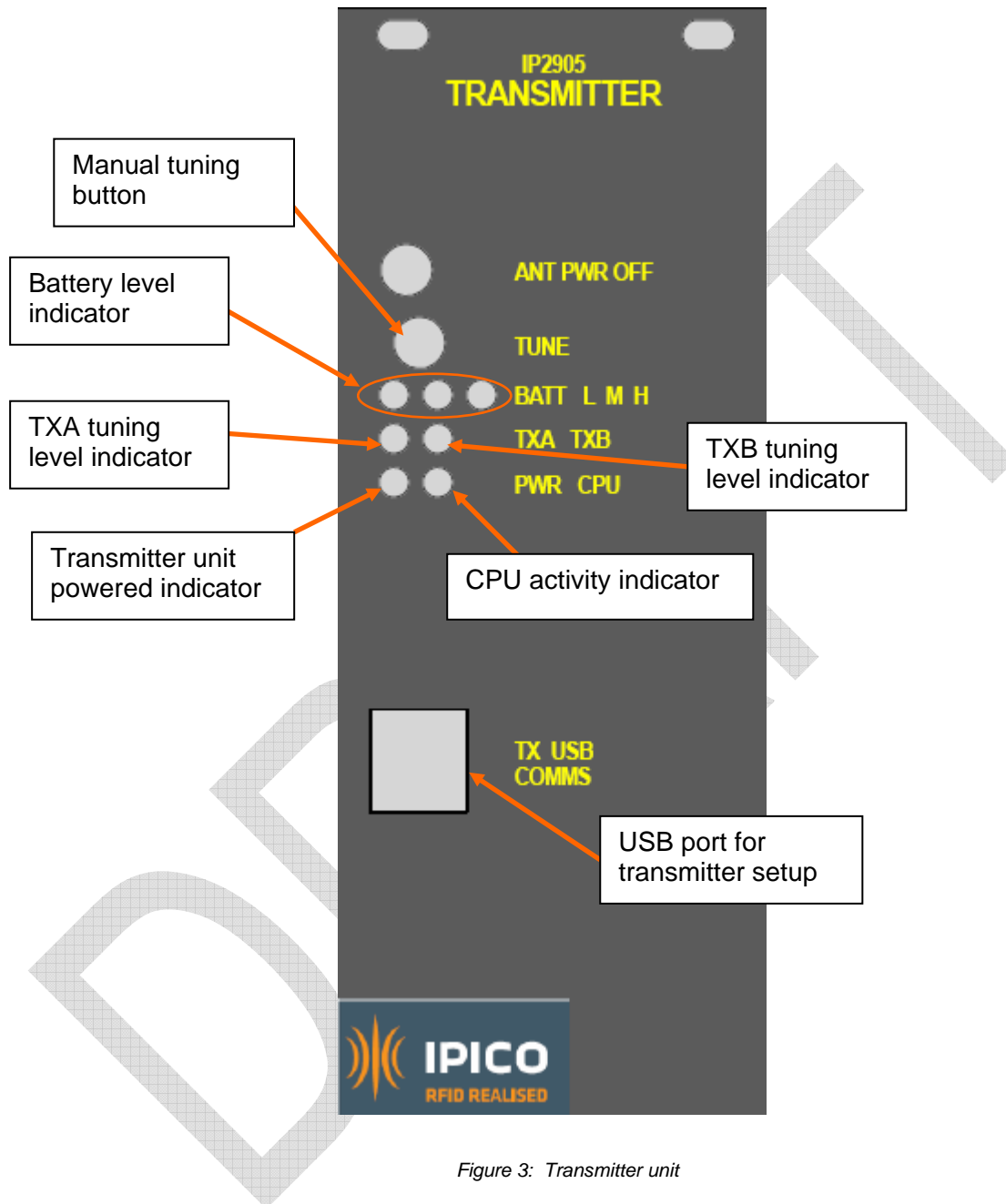


Figure 3: Transmitter unit

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 mats antennas. After the reader and mats are installed and 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 may be done during an event when there is no traffic on the mats, if it seems like the mats have detuned slightly due to temperature changes. In most of the cases, the automatic tuning done when the reader is switched on is sufficient.

TXA Tuning Level indicator:

TXA drives 2 mats (with red and green plugs). 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 mats are installed correctly and restart the system.

TXB Tuning Level indicator:

TXB drives 2 mats (with blue and yellow plugs). 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 mats 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.

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

There are 2 Dual channels receiver units per STK Elite. They collect tag data from the RX loops in the mats.

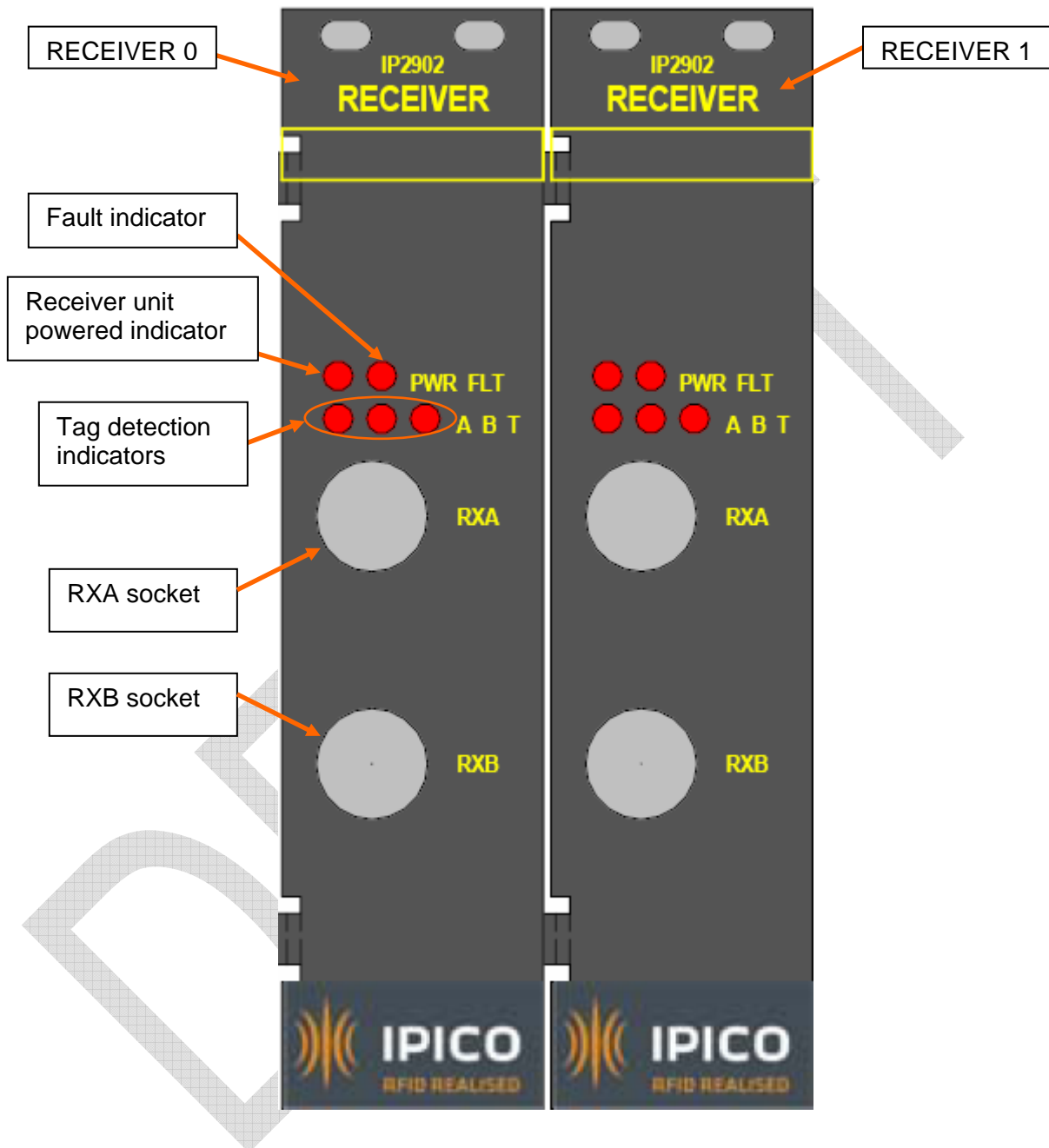


Figure 4: Receiver unit

Receiver unit powered indicator:

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

Fault indicator:

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

Tag detection indicators:

The receiver has 3 data activity indicators. These are labelled A, B and T. The A and B indicator show which section of the receiver RXA or RXB is detecting a tag. If a tag is detected the indicator is lit or flashes. The T 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.

RXA socket:

BNC sockets for receivers. It doesn't matter which mat is plugged on which receiver.

RXB socket:

BNC sockets for receivers. It doesn't matter which mat is plugged on which receiver.

DRAFT

3.1.3 Delta unit

The Delta unit gets data from the receiver units and stores them on a flash drive. The streaming data is also available during the race from the Ethernet port, and after the race the complete data file can be copied from the Delta to the computer by the Ethernet port.

After switching off the reader, the Delta will still run for a couple of minutes to be sure that the computer inside shutdown properly.

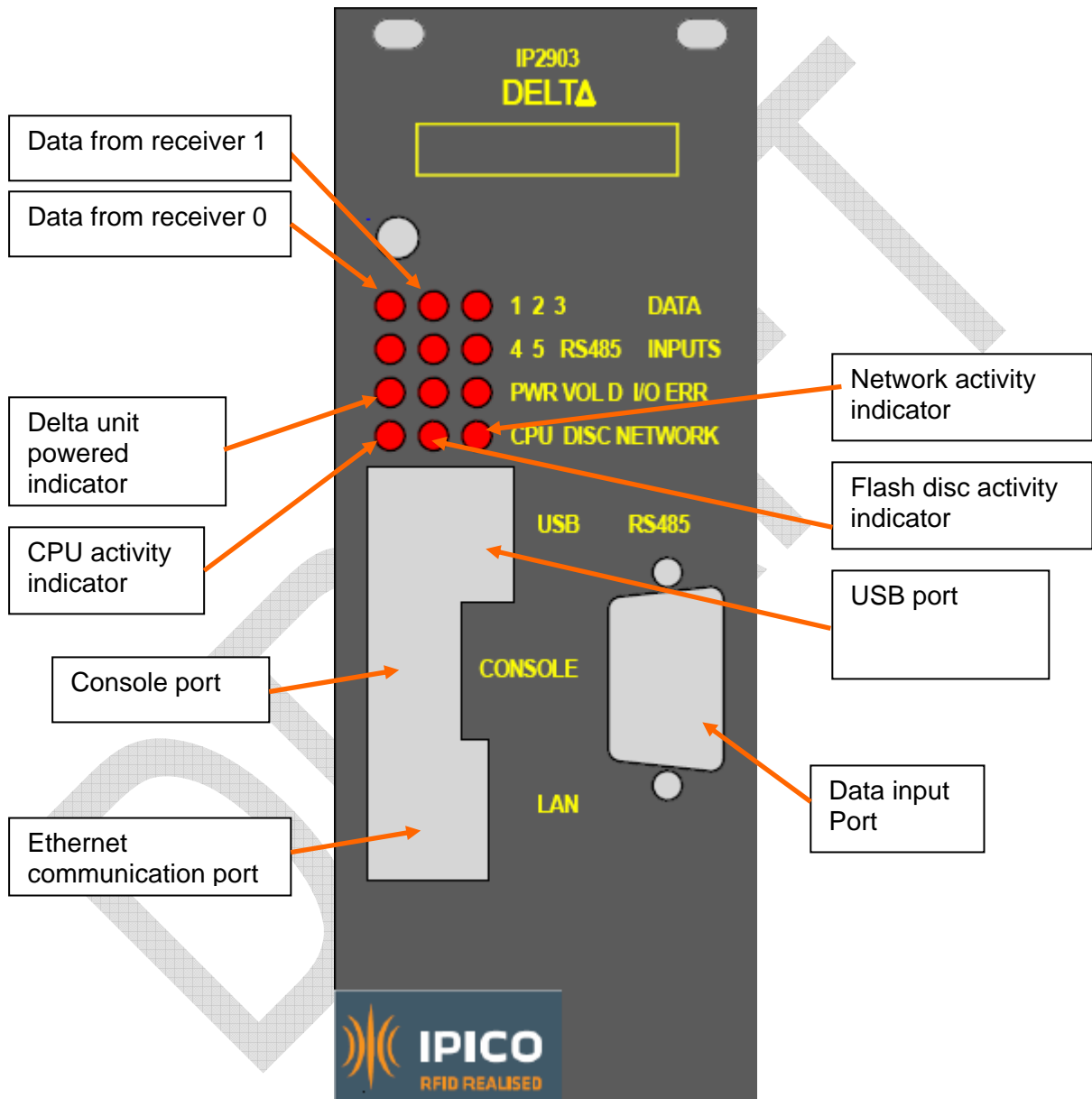


Figure 5: Delta unit

Data from receiver 0:

This indicator shows when data is received from the receiver 0 unit to the Delta unit.

Data from receiver 1:

This indicator shows when data is received from the receiver 1 unit to the Delta unit.

CPU activity indicator:

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

Delta unit powered indicator:

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

Network activity indicator:

This indicator shows data exchanges between the network and the reader.

Flash disc activity indicator:

This indicator flashes when data are stored on the flash disc.

Ethernet communication port:

This communication port permits to plug a computer or a network to get data from the reader and to setup the reader.

Data input port:

This port is used to store data from a STK Lite reader by the RS485 line.

Console port:

This console port must not be used by the user. It is only used by Ipico qualified staff.

USB port:

This USB port must not be used by the user. It is not used for the moment and is there for future development (for memory key...).

3.1.4 Power supply unit

This unit manages the power supply of the whole reader.

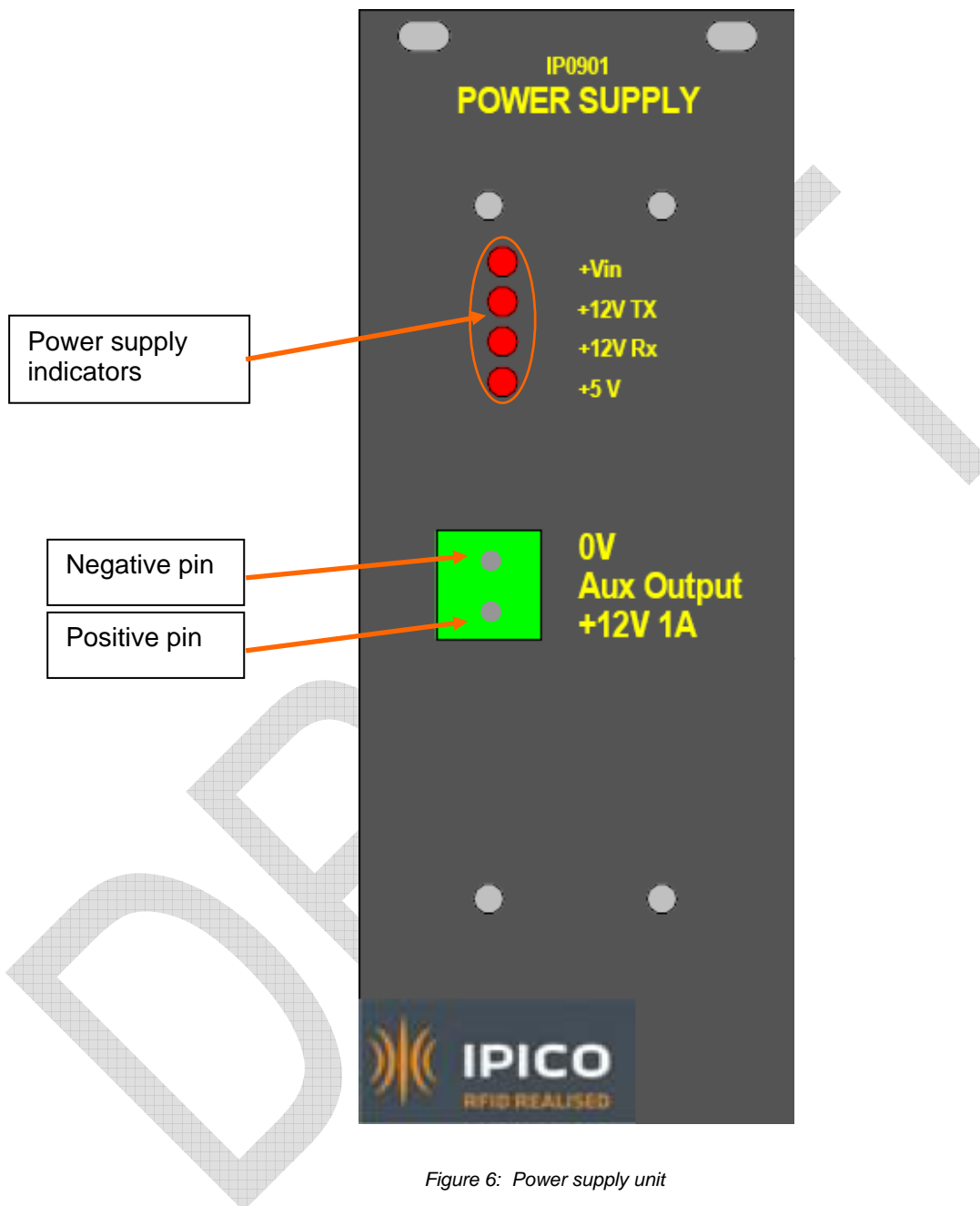


Figure 6: Power supply unit

Battery specifications/buzzer:

The battery will give approx 2.5 hours of run time. When the battery reaches a preset discharge voltage (approx 11.5v) the reader will sound an alarm alerting the operator that a second battery is needed. This will happen only for Long events over 2.5 hours. The operator has approximately 15 minutes to add a second battery before the reader shutdown to save damage to its internal battery.

If external batteries are plugged in with incorrect polarity, beeps will be emitted by the reader and the external battery will not connect.

Power supply indicators:

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

Auxiliary output:

There is a two pins power supply output (+12V 1A) that can be used to power a WIFI converter or a GPRS module for example. The lower pin is +12V and the upper pin is 0V.

3.1.5 Top panel unit

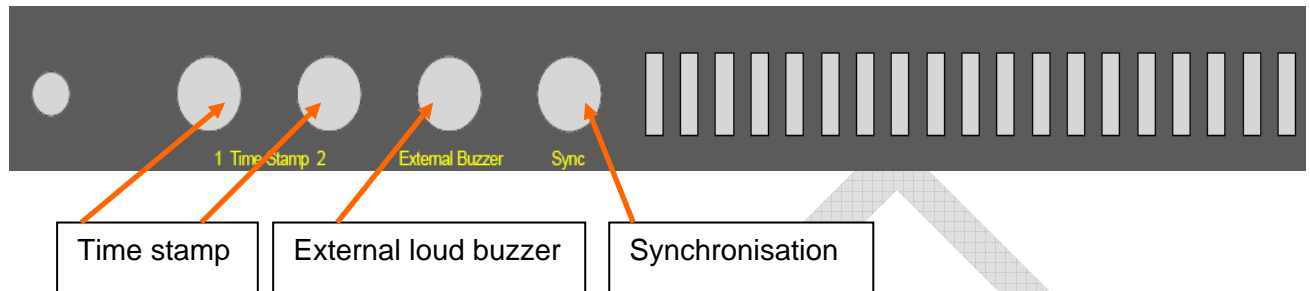


Figure 7: Top panel unit

Time stamp 1 and 2:

They are 2 time stamps input connectors. They are in parallel. They use clean input contacts to connect external switches such as acoustic coupler for start gun, or external switch. The action related to these inputs is to add a message on the data flow of the reader. It adds a time and a date stamp.

External loud buzzer:

Allow a 12Vdc loud buzzer to be connected in order to allow the athletes to hear when they are detected. It is an option that can be provided by Ipico.



Synchronisation:

Reserved for future use.

3.1.6 Bottom panel unit

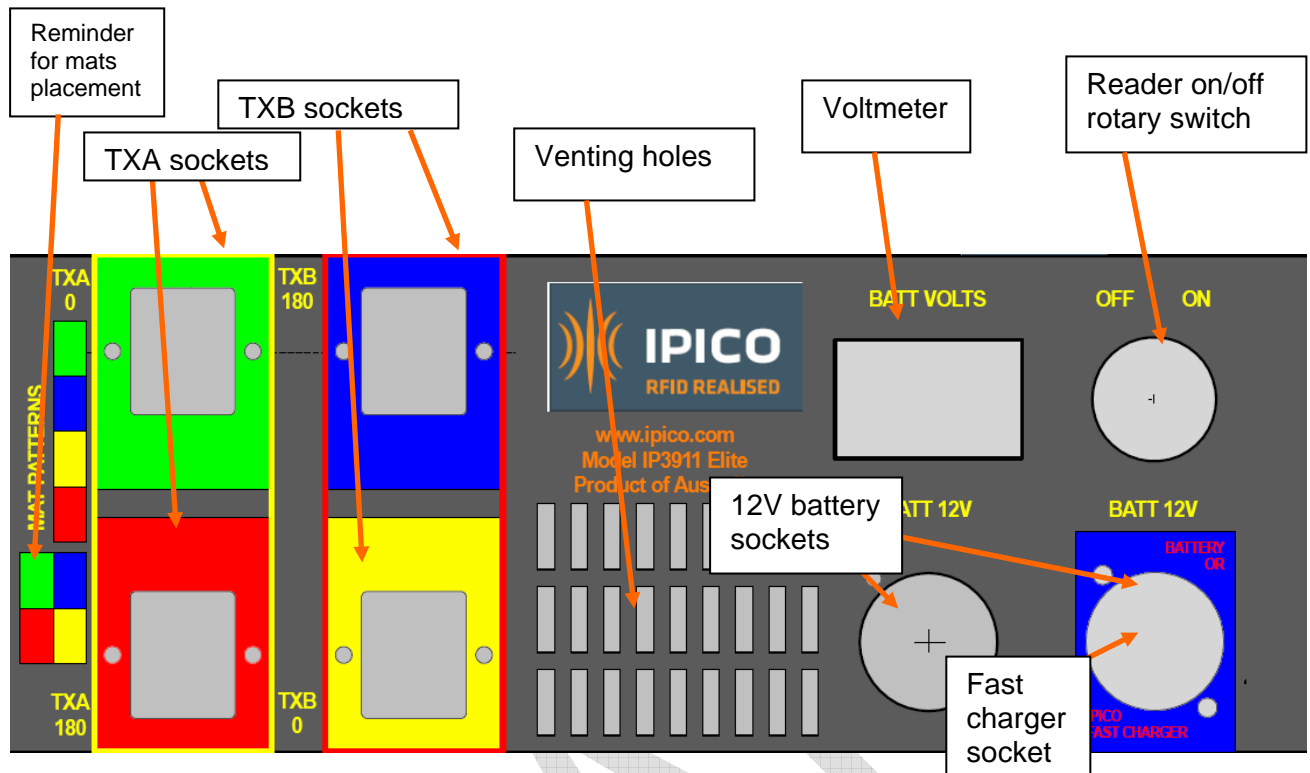


Figure 8: Bottom panel unit

Reader on/off switch:

This is a rotary switch that switches on all different units in the reader.

Voltmeter:

It displays the battery voltage.

12V battery sockets:

There are 2 external battery input sockets. This allows adding an external 12V battery that can be hot swapped without loss of data capture, or used to plug a charger.

External batteries can be either any 12V battery (automotive etc) or an optional battery pack which can stack under the reader and be secured with the integral latches.

Fast charger socket:

Allow a fast ipico charger to be connected to the reader. No other charger must be connected to this socket.

Venting holes:

These holes provide a better circulation of air inside the reader to cool it when it is used in high temperature countries.

TXA/TXB sockets:

These sockets correspond to the TX loops of the mats and are colour coded with the mats. The mats configuration is colour coded and is screened on the lower panel plate.

All live TX pins are enclosed in the socket for operator safety. Very robust TX plugs and sockets. Very easy to fit even in the dark. Cannot be plugged incorrectly. Securing clips on each.

3.2 Metallic box

The reader is packaged in a Rugged Road Aluminium Case.

Dimensions: 285mm H x 325mm W x 370mm L (11.2in H x 12.8in W x 14.6in L).

All fixings are in aluminium or stainless steel to minimise corrosion over time.



Figure 9: Road case box1



Figure 10: Road case box2

4 MATS

4.1 Mats description



Figure 11: Mats in the bags



Figure 12: Mat's bag open

The mats are 2.4m (7.9ft) long and 1.2m (3.9ft) wide. See picture below



Figure 13: Mat

For a set of 4 mats with an Elite reader, 2 mats have a 10m (32.8ft) tail long and 2 mats have a 5m (16.4ft) tail long.

4.2 Mats configurations

The placement of the mats is colour coded. The colours on the following drawings correspond to the colour that is painted on the plug of the mat cables and also on the reader mat's sockets. **The timing line and the backup line should be spaced by 1m (3.3ft).**

4.2.1 16m (53ft) timing line: 2 rows of 8 mats

4 Elite readers are needed.

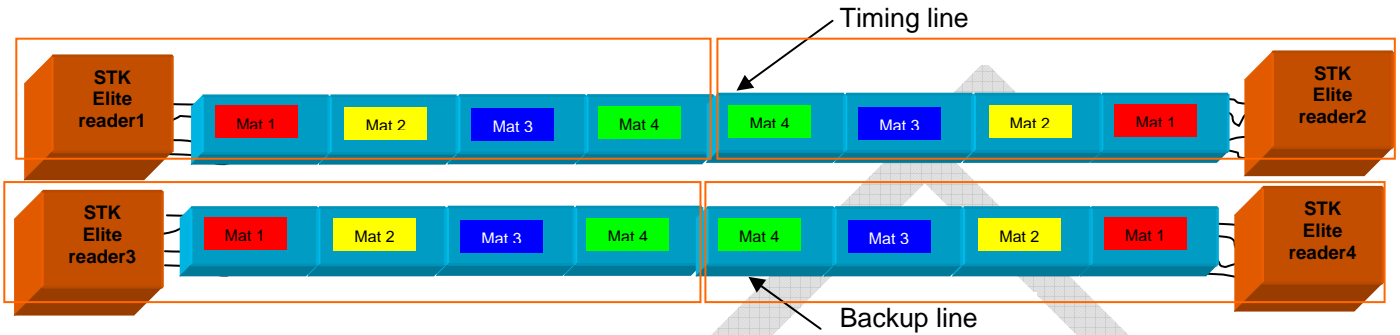


Figure 14: 16m timing line

4.2.2 12m (40ft) timing line: 2 rows of 6 mats

3 Elite readers are needed.

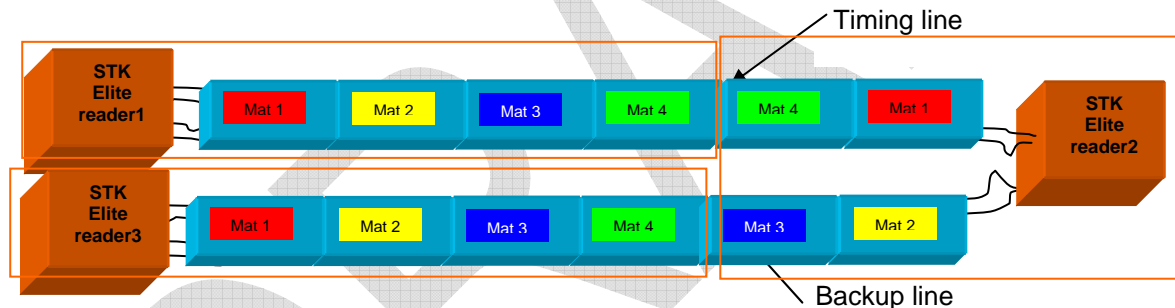


Figure 15: 12m timing line

4.2.3 8m (26ft) timing line: 2 rows of 4 mats

2 Elite readers are needed.

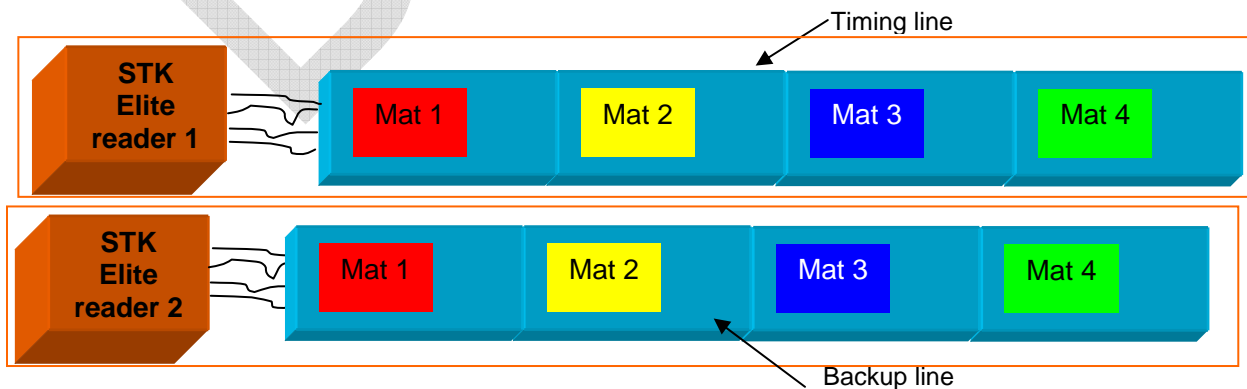


Figure 16: 8m timing line

4.2.4 6m (20ft) timing line: 2 rows of 3 mats

2 Elite readers are needed.

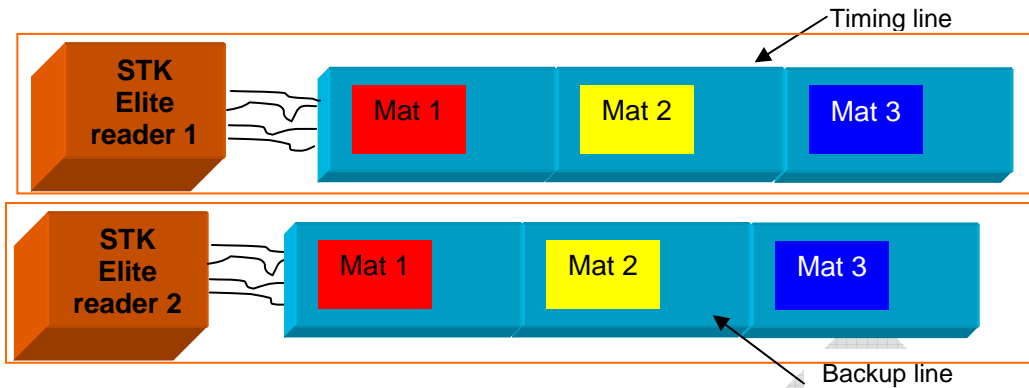


Figure 17: 6m timing line

4.2.5 4m (13ft) timing line: 2 rows of 2 mats

Only 1 Elite reader is needed.

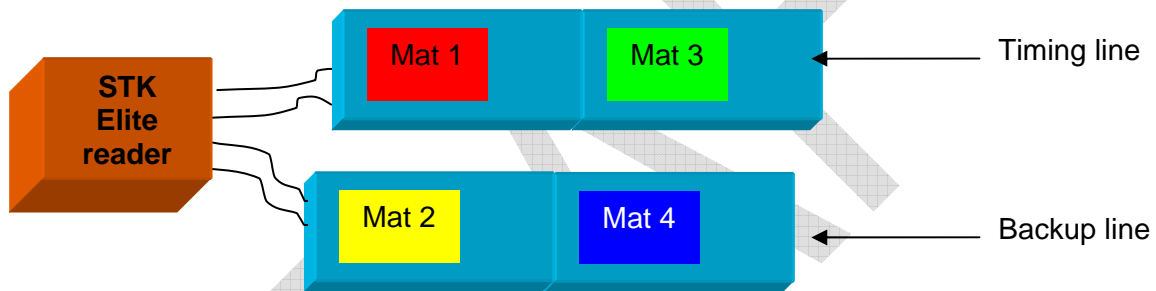


Figure 18: 4m timing line

4.2.6 2m (6.5ft) timing line: 4 rows of 1 mats

Only 1 Elite reader is needed.

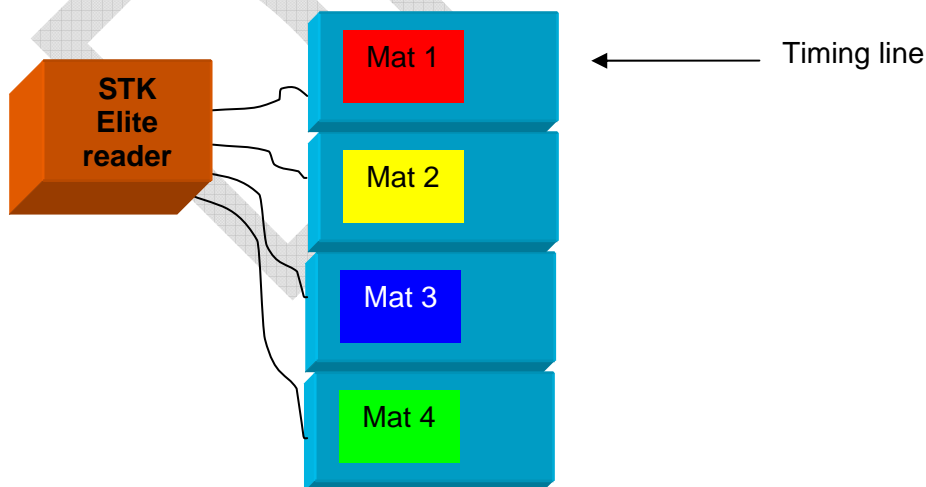


Figure 19: 2m timing line

4.2.7 Precautions of use!

4.2.7.1 Tail placement

The tail of the mat's cables should be placed correctly under the mats. The tail should run under the other mats right in the middle. If it is not correctly done, the reader setup will not be in its optimal configuration and tags can be missed.

The correct placement is showed in *Figure 19*.

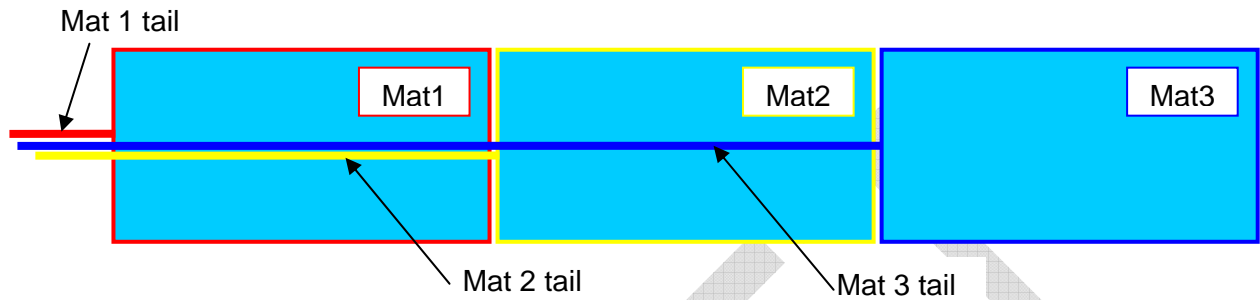


Figure 20: Mat's tail placement

4.2.7.2 Mat overlap

The mats should always overlap for about 30cm (1ft). The 2 following pictures show the overlap. The shift in wideness is just for the picture to see the overlap, the mats should be aligned.



Figure 21: Mat overlap 1

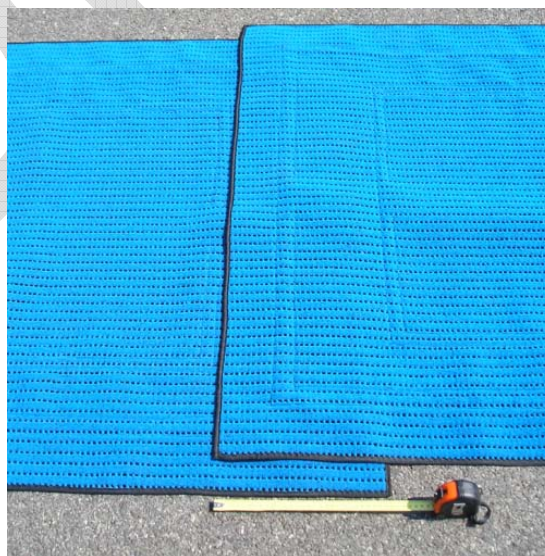


Figure 22: Mat overlap 2

5 TAGS

5.1 Shoe tag

It is a Half-Credit card size that must be attached to the shoe. It is robust and light.



Figure 23: Shoe tag

5.2 Ankle tag

Product in development, it is not available yet.



Figure 24: Ankle tag

5.3 Mountain bike tag

It is an A5 format plate that can be fitted under the plate number of the bike.



Figure 25: Mountain bike tag

6 COMMUNICATION WITH THE READER

The communication is done over the Ethernet port of the reader. If you want to connect a PC directly to the reader, **use an Ethernet crossover cable**.

6.1 Configuring the reader with Webmin

6.1.1 Connection

Open an internet browser and type in the address bar:

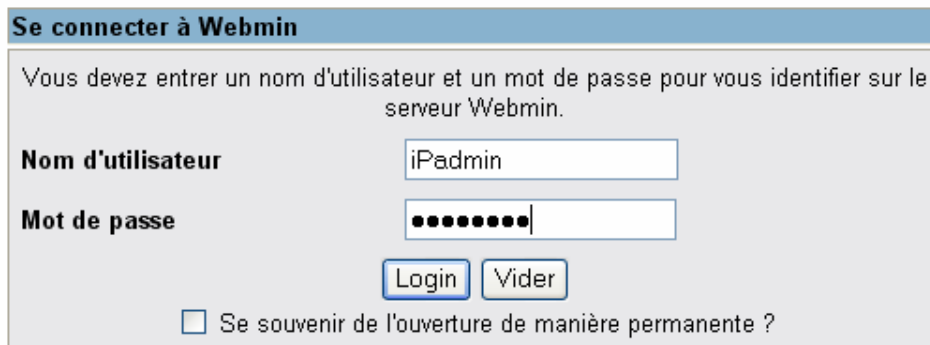
<http://10.19.1.101:10042> (if you have already changed the IP address, then put the right IP address)

Then the page represented on the picture below will open. Note that the language of text displayed will be the one of your internet browser.

You have to enter:

- username: iPadmin
- password: Fox1Bat

Username and password are case sensitive.



It takes about 20s to see the main page. The displaying of the different pages on the screen should be a bit slow.

6.1.2 Main page



6.1.3 Advanced setup

The power out grace period is used to set how long the DELTA should run of its own NiMH batteries from the point where the main power supply of the STK is depleted. This is to safeguard against blackouts and battery changes and ensure a graceful shutdown of the Delta.

LastSeen timeout is used to set the timeout in which a tag should not be seen before a LastSeen event would occur. This is related to data on port 10200 and 10201.

STK
Webmin Home
Se déconnecter

Aide..
Advanced Setup

Set Power-out Grace Period (seconds)

Set LastSeen Timeout (seconds)

[← Retourner à index](#)

6.1.4 Basic setup

EventName / TimingPoint Configuration

This value is the hostname of the STK-DELTA and is used to uniquely identify STKs from one another.

Routing Configuration

The "Default Router" is the gateway to the Internet. Usually this value is the IP as you receive it from the DHCP server, but ending with a ".1". Thus, if your IP address is "192.168.1.182", then the gateway is most probably "192.168.1.1". If this is not the case then contact your network administrator to obtain this address.

STK
Webmin Home
Se déconnecter

Aide..
Basic Setup

EventName / TimingPoint Configuration

Hostname Must not contain space character

IP Address & Netmask Configuration

IP Address

Netmask

Routing Configuration

Default Router

Changes will be applied after next reboot
 Apply Changes NOW

[← Retourner à index](#)

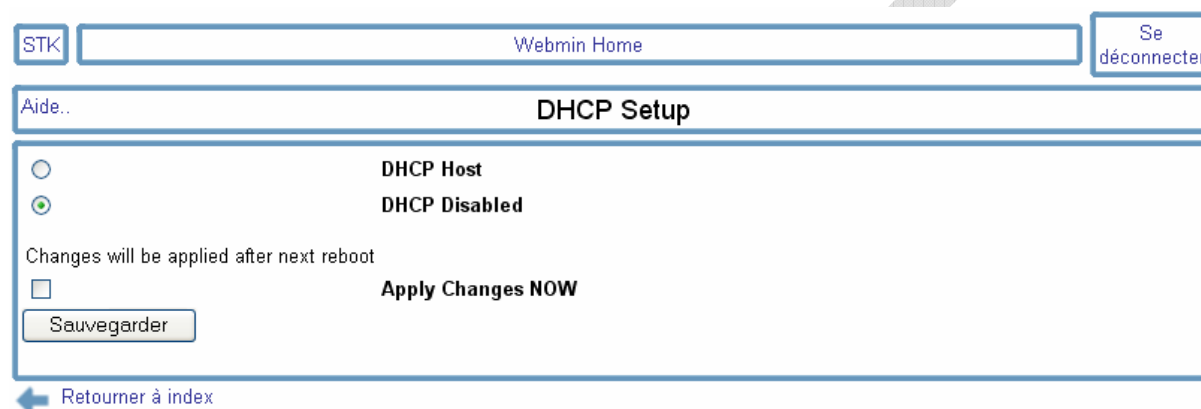
IP Address & Netmask Configuration

"IP Address" is the parameter that specifies the local IP address on the STK-DELTA. For you and other STKs to see each other on a network they all have to be on the same subnet. Thus, if your IP address is "192.168.1.182" then all the other STKs must also have an IP address starting with "192.168.1.*", where the "*" is replaced with a unique number for each device on the network.

Apply Changes Now

If you select this option the changes will be implemented immediately. This will require your connection to the STK-DELTA to be reset. Some browsers might re-establish this connection but it might be necessary to manually re-connect with the Browser Refresh option.

6.1.5 DHCP setup



DHCP HOST

When a STK-DELTA is a DHCP Host it means that the STK-DELTA will lease an IP address to any host on the same subnet requesting an IP via DHCP. When you want to prepare your STK-DELTA to access it via Ethernet while you will not be on a network somewhere, you have one of 2 choices:

1) Change the IP of your Notebook/PC to a static IP on the same subnet than the IP configured on the STK-DELTA. In this case the DHCP option of the STK-DELTA should be "DHCP Disabled"

OR

2) Enable the DHCP option of the STK-DELTA to "DHCP Host". In this case you will not need to change the IP on you Notebook/PC and if you have DHCP enabled on your Notebook/PC, you will be able to access the STK-DELTA on the configured IP of the STK-DELTA.

NOTE 1: Only ONE DHCP server should be active on a network. Do not leave your STK-DELTA in DHCP-HOST mode while on your office/home network since it will interfere with your current DHCP HOST.

NOTE 2: The STK-DELTA will lease IP addresses in the range that is 10 IPs away on either side of the local IP. This if your IP is 192.168.1.100, the leased DHCP IPs will be in the range 192.168.1.[1..90] and 192.168.1.[110..250]. Thus, if you have other statically defined addresses on the same subnet, then select them within the 20 IP range around the local IP to avoid clashes.

DHCP Disabled

In this option the STK-DELTA will not lease any IP addresses to requesting hosts and will still be available on the configured IP address.

Apply Changes Now

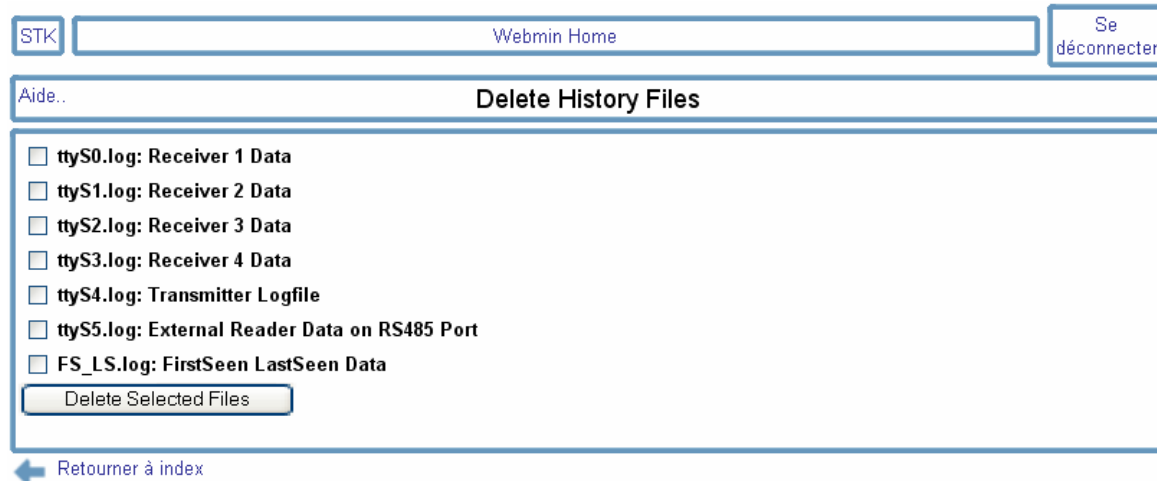
If you select this option the option you selected will be enforced immediately. This will necessarily entails that your connection to the STK-DELTA will be reset. Some browsers might re-establish this connection but it might be necessary to manually re-connect.

6.1.6 Delete STK history files

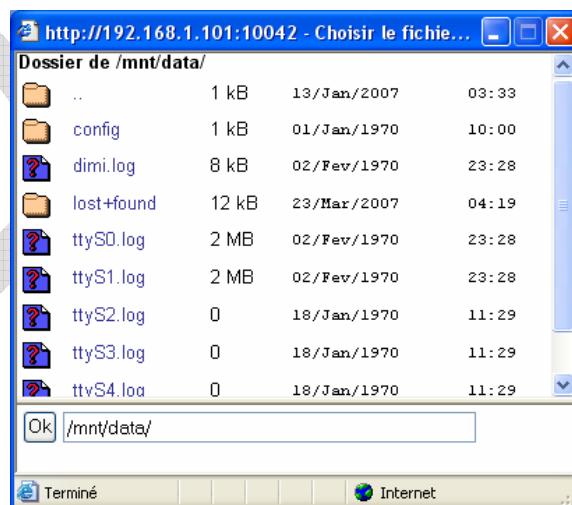
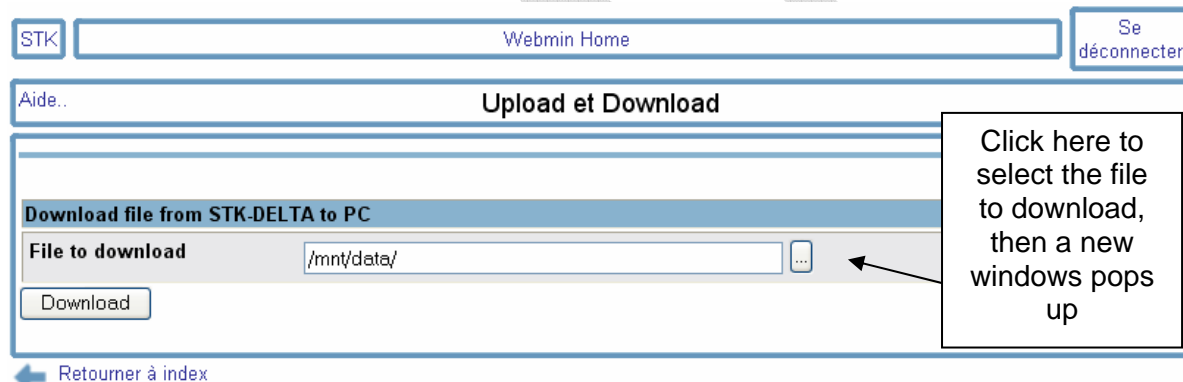
Be cautious, after deleting the files, the data are irremediably lost.

Tick the boxes that correspond to the files you want to delete and click on the Delete button.

You only need to delete Receiver 1 data, Receiver 2 data and FS_LS.log that correspond to the 3 files where the tag data from the mats are stored. The other files are reserved for future use.



6.1.7 Download Files



Select the file by clicking on it, and click on “OK” button. The windows will close and you will see the “Download files windows” and you just have to click on “Download” button.

You have to do this for each file.

The 2 files you have to download are ttyS0.log that corresponds to receiver 1, and ttyS1.log that corresponds to receiver 2, or you can just download FS_LS.log that corresponds to filtered data (this is the best to do).

6.1.8 Time synchronization

You will see 5 radio buttons, and only one can be ticked.

This is a Slave...

This means that this Delta will automatically attempt to source its internal time from another computer or Delta

This is a Master Timeserver...

This means that the Delta will act as a Master Time Server thus providing the facility for other Deltas to synchronize their time with it.

STK
Webmin Home
Se déconnecter

Aide..
Time Synchronization Setup

This is a Master Timeserver

Own time is configured manually

Synchronize own time to Internet Timeservers

This is a Slave

Synchronize time to Internet Timeservers

Synchronize time to a Delta Master Timeserver

Delta Master / NTP Server - IP Address

Disable Automatic Time Synchronization

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This is a Slave: Synchronize time to Internet Timeservers

When this option is selected the Delta will access Internet and automatically correct its time using the NTP protocol. The Delta must have Internet access when this option is selected

This is a Slave : Synchronize time to a Delta Master Timeserver

When this option is selected, an IP Address should be filled into the space provided. This Delta will on fixed intervals of 5 minutes synchronize its own time with the time of the Delta specified in the edit box. The Deltas must be on the same network for this option to work.

This is a Master Timeserver: Own time is configured manually

This option is for cases where, for example, the user would like to have all the Delta's time in synchronization, but with a custom time, such as the time of the Official Timekeepers' watch. Selecting this option will allow other Deltas that are configured with the option *This is a Slave -> Synchronize time to a Delta Master Timeserver* along with this Deltas IP Address to automatically synchronize their time according to the time as per this Delta. Typically the time on this Delta will be set using the Command-Port running on this Delta.

NOTE: Always allow at least 10minutes for all the Deltas to synchronize their times as this is a slow correction protocol.

This is a Master Timeserver: Synchronize own time to Internet Timeservers

When this option is selected the Delta will access Internet and automatically correct its time using the NTP protocol. This time is also synchronized to the RX cards on a fixed interval. The Delta must have Internet access when this option is selected. Selecting this option will allow other Deltas that are configured with the option *This is a Slave -> Synchronize time to a Delta Master Timeserver* along with this Deltas IP Address to automatically synchronize their time according to the time as per this Delta. The other Deltas do not need also to have Internet access.

Disable Automatic Time Synchronization

This will disable all automatic time synchronizations.

6.1.9 System time

The date/time can be checked here.

STK
Webmin Home
Se déconnecter

Aide..
System Time

System Time

Day	Date	Month	Year	Hour
Mardi	3 <input type="button" value="v"/>	Février <input type="button" value="v"/>	1970 <input type="button" value="v"/>	00 <input type="button" value="v"/> : 36 <input type="button" value="v"/> : 04 <input type="button" value="v"/>

[← Retourner à index](#)

6.1.10 Time Zone Setup

The current timezone will be the option displayed in the dropdown box.

To change the timezone, select the appropriate location and click the update button. The change will take effect immediately.

STK
Webmin Home
Se déconnecter

Aide..
Time Zone Setup

Time Zone

Current Time : Tue Feb 3 00:37:28 EST 1970

Europe/Paris

Note: This change will show in the Webmin "System Time" tab upon next reboot. The changes is active on all outgoing data.

[← Retourner à index](#)

6.1.11 Upgrade

This function is used to upgrade the software inside the Delta by downloading a file.

Fill in the upgrade URL given by Ipico and click on Upgrade. The upgrade procedure should take several minutes. Be patient, and check on the Delta when the reader reboots. After the reboot completed, the reader is ready.

STK
Webmin Home
Se déconnecter

Aide..
Upgrade

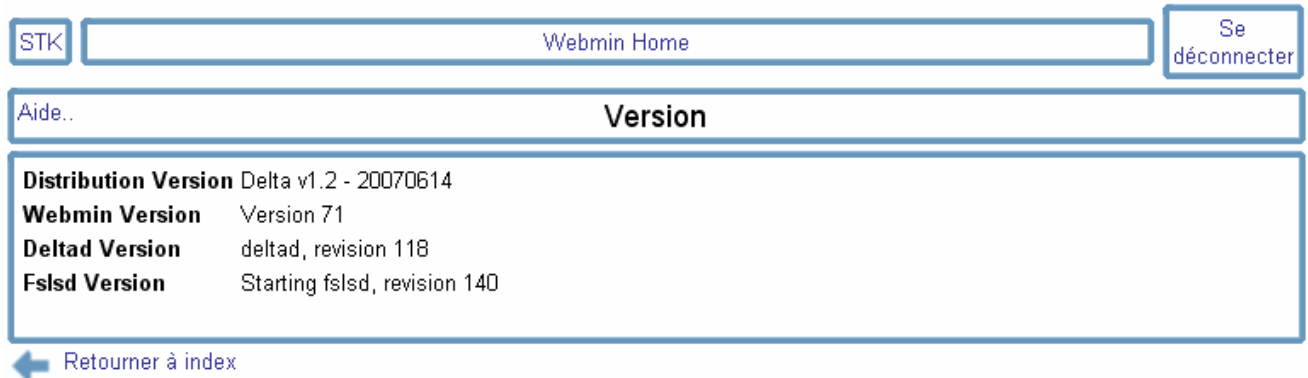
Leave this field empty if you manually uploaded the update.tar.gz file

Upgrade URL:

[← Retourner à index](#)

6.1.12 Version

Display the current versions of the core modules on the DELTA.



STK Webmin Home Se déconnecter

Aide.. **Version**

Distribution Version Delta v1.2 - 20070614
Webmin Version Version 71
Deltad Version deltad, revision 118
Fslsd Version Starting fslsd, revision 140

← Retourner à index

6.2 Configuring the reader with the command port

Connect to the reader on the TCP port 9999. When you are connected, press Enter and you will see the menu represented on the following figure.

```

Welcome to the Delta Command Port
USAGE:
function: set date
  command: "setdate.yyyymmddHH:MM:SS\n"
  reply: "date.Thu Mar 22 15:19:00 EST 2007\r\n"

function: get date
  command: "getdate\n"
  reply: "date.Thu Mar 22 15:19:00 EST 2007\r\n"

function: insert marker
  command: "insert_marker.<Marker-String>\n"
  reply: "marker_inserted\r\n"

function: clear history files
  command: "clear_history\n"
  reply: "history_cleared\r\n"

function: ipx set-date
  command: "ab000701yyyymmdd00hhmmss00\n"
  reply: "ab000000121\r\n"

function: ipx get-date
  command: "ab000000222\n"
  reply: "ab0000902yyyymmdd00hhmmss001100\r\n"

```

Figure 26: Command port menu

There are six functions available:

- Set date: setup of date and time in a standard format
- Get date: get the date and time of the reader
- Insert marker: insert a marker string in the history files. The string that will be inserted is the string between < and >.
- Clear history files: Be really cautious with this function. After you used this function, all the recorded tag data will be lost.

- `lpx set-date`: setup of date and time in the `lpx` format
- `lpx get-date`: get the date and time of the reader in the `lpx` format

Each function is described on the menu. Command corresponds to what you have to type, and reply corresponds to the reply you will get after sending the command.

For example the following function will set the date and time with 4th of June 2007, 11h25m32s

```
setdate.07060411:25:32
```

The following line corresponds to the reply:

```
date.Mon Jun 4 11:25:32 TFT 2007
```

6.3 Get the tags data

6.3.1 *In real time*

6.3.1.1 Raw data

Connect to the reader on the TCP port 10000, and then you will see tags data as runners pass over the mats. You will also see some data that are not tags information. **Ignore all the info that are not starting with "aa"**.

The reader allows multiple connections to this port. So you can send the data to different computers.

6.3.1.2 Filtered data

Connect to the reader on the TCP port 10200, and then you will see filtered tags data as runners pass over the mats. This data will be the FirstSeen and LastSeen of each tag only. You will also see some data that are not tags information. **Ignore all the info that are not starting with "aa"**.

The reader allows multiple connections to this port. So you can send the data to different computers.

You can also get the filtered data in a XML format if you connect on the TCP port 10201.

6.3.2 *After the race*

You can download the 3 files corresponding to tags data (see section 6.1.7 Download files).

6.3.3 *Reader data protocol*

6.3.3.1 Raw data

The following lines correspond to 2 runners who passed over the mats. The first runner has the ID 058000ab8684 and the second runner has the ID 058000abb494. The first runner has been read 6 times, and the second runner has been read 4 times. There is one line outputted from the reader each time the tag is read.

```
aa01058000ab8684000107060411580861bb  
aa01058000ab8684000107060411580917bd  
aa01058000ab8684000107060411580922b9  
aa01058000ab868400010706041158094cec  
aa01058000ab8684000107060411580958c2  
aa01058000ab8684000107060411580963be  
aa01058000abb49400010706041158131b0c  
aa01058000abb494000107060411581320db  
aa01058000abb49400010706041158132a0c  
aa01058000abb494000107060411581353e1
```


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 mat 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	01	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
aa	00	058000abaec	01	00	070202	115002	1a	9c
aa	01	058000abd108	01	00	070202	115002	1b	a7
aa	00	058000abbe25	00	01	070202	115001	0f	1c

The receiver ID will tell you from which receiver the tag was read

Receiver ID 00 corresponds to receiver 0 (left one) and ttyS0 file.

Receiver ID 01 corresponds to receiver 1 (right one) and ttyS1 file.

The I and Q counts are used to determine which mat(s) 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 "058000add984" was read on receiver 1 and on the Q-channel. This corresponds to the mat connected on the bottom plug of the right 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.

6.3.3.2 FirstSeen/LastSeen data

This is really practical to use FirstSeen/LastSeen as you only get 2 records per tag instead of several.

FirstSeen corresponds to the first read of the tag and LastSeen corresponds to the last read of the tag. Usually, at a start we use the LastSeen and at the finish, we use the FirstSeen.

The data pattern is almost the same than for the raw data except that at the end of the packet "FS" is added when it is a First Seen, and "LS" is added when it is a LastSeen:

```
aa01058000ab8684000107070612582326bdFS
```

```
aa01058000ab8684000107070612584959cbLS
```

When you get the FirstSeen/LastSeen data on the XML format, it has the following pattern:

```
<DataRecord>
  <ReaderID>01</ReaderID>
  <TagID>0580000cbd8c</TagID>
  <ICount>01</ICount>
  <QCount>01</QCount>
  <Date>070710</Date>
  <Time>112449</Time>
  <Milliseconds>21</Milliseconds>
  <RecordType>FS</RecordType>
```

```
</DataRecord>
```

```
<DataRecord>
  <ReaderID>01</ReaderID>
  <TagID>0580000cbd8c</TagID>
  <ICount>01</ICount>
  <QCount>01</QCount>
  <Date>070710</Date>
  <Time>112451</Time>
  <Milliseconds>0f</Milliseconds>
  <RecordType>LS</RecordType>
```

```
</DataRecord>
```

6.3.3.3 Date/Time stamp data

When you connect an external switch on the Time stamp input on the top panel unit, 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)

6.4 Port layout summary

Port	Name	Description
9999	Command port	This port is used to set the date/time and does some basic history file management via the TCP/IP protocol in order to automate the processes.
10000	Raw port	Raw data output
10042	Webmin port	This port is used to setup the reader via HTML pages
10200	FS_LS port	Only transmits FirstSeen (& LastSenn) data
10201	XML port	Transmits FS_LS data in XML format

7 INSTALLATION OF THE SYSTEM

7.1 Precautions of use!

- Timing mats should be placed at least 0.5m (2ft) from any large metal / conducting objects such as fences, barb wire etc.
- The STK Elite reader and mats should be placed at a distance of at least 10m from other electromagnetic field generating equipment such as fan motors, audio equipment etc.
- Try to avoid as much as possible to put the mats on reinforced concrete, because it decreases the performances of the reading.
- No AC power lines including extension cords should be placed at a distance of less than 1m from the reader unit and timing mats.
- Ensure that mats are lain out in there full length and breadth and not rolled up or folded when being used, to use the system in the optimum configuration.
- The system must always be switched on with the 4 mats connected.
- During the race, the external conditions (temperature, humidity or new metallic object close the mats) can change and might decrease the performances of the system. In that case, to come back again to optimum performances, you should press for 2 seconds on the "Manual tuning button" (see chapter 3.1.1 Transmitter unit) to tune again the antennas. When you do that, be sure that there are no runners passing on the mats in order to not miss tags.

7.2 Installation of mats

1. The mat configuration (colour coded) should be followed as indicated in section 4.2 Mats configurations.
2. Always start with the most distant mat from the reader and put it at the desired place on the floor.



3. Then install the second mat in overlapping it with the first mat (see section 4.2.6.2 Mat overlap)



4. Then install mat 3 and 4 as described on the following pictures. Be cautious with the mat's tail placement (see section 4.2.6.1 Tail placement)



7.3 Installation of the reader

5. Position the reader where the mat's plugs are reachable
6. Plug the TX antennas in respecting the colour matching
7. Plug the RX antennas in respecting the colour matching
8. Switch on the reader
9. 2 seconds after switching on the reader, a beep will be emitted
10. 1min 45seconds after switching on the reader, 4 beeps will be emitted indicating that the reader is ready to operate

7.4 Testing of tag reading distance

A test of reading with a tag should be done on each mat to be sure that there is not too much electromagnetic perturbations that will limit the reading distance.

11. The tag should be presented over each mat and you should check that the tag is read by the reader with a good reading distance (more than 40cm (1.3ft) in height).
12. Now your system is ready!

8 SPECIFICATIONS

- Reader consumption: 6Amps
- External power supply: 12Vdc, 6Amps
- Battery:
 - Characteristics: 12V, 17Ah, 6Kg
 - Time life: 4 years
 - Autonomy: 2.5h when fully charged
 - Charge time: 9h with 12Vdc/ 6Amps charger. 3h with Ipico fast charge charger.
- Weight: 18Kg
- Dimensions: 285mm H x 325mm W x 370mm L (112in H x 128in W x 146in L).
- Temperature rates (mats and reader): 0°C to 50°C
- IP protection:
 - Reader open: IP21
 - Reader closed: IP54
 - Mats: IP68
- Warranty 1 year

APPENDIX A – 12V BATTERY MANAGEMENT

Precaution of use

- Fully charge the battery before the first use
- Fully charge the battery before the race
- The battery should be fully charged every 2 months in case it is not used. Otherwise the battery can be irremediably damaged.

Usual charge cycle

- The charge cycle with the blue fast charger is approximately 3h
- The charge cycle with the mains power supply / charger is approximately 9h

DRAFT

APPENDIX B – OPTIONAL ACCESSORIES

External loud buzzer

It is a 12Vdc loud buzzer to be connected on the top panel of the reader in order to allow the athletes to hear when they are detected.



Figure 27: External loud buzzer

Fast charger

It can charge the inside battery of the charger in 3h from the mains (100V-240V 50-60Hz). Be aware that the reader must not run while the charger is charging the reader.



Figure 28: Fast charger

Mains power supply / charger

Product in development. It will be available soon.