

UHF Single Antenna RFID Reader
IP 3222
User Manual



Version 1.05
12 June 2009

IMPORTANT



The lightning flash with arrowhead, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to people.

CAUTION

RISK OF ELECTRICAL SHOCK
DO NOT OPEN

**Please read instructions before operating this device.
Warranty is void if you open or tamper with this device.
Explosive atmospheres**

User shall switch off this unit and obey all safety requirements in these areas. This unit may only be operated if the area is declared safe by a safety official. Hazardous areas typically include fuelling areas, below decks on boats, fuel or chemical transfer/storage points, blasting locations and areas where air contains chemicals or particles, such as grain, dust or metal powders.

NOTICE

All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without written permission from IPICO Inc.
IPICO Inc. shall not be liable for any errors or for incidental or consequential damages in connection with the furnishing, performance or use of this document, hardware and/or software.
All information in this document including the design and specification are subject to change without notice for the purpose of product improvement.
For further information contact +27 12 345-9520.

SAFETY

- Avoid any extended human RF exposure directly in front of the UHF Reader, up to a distance of 30 cm, when unit is switched on.
- Only authorised personnel may open/modify the unit. Warranty and certification is void if opened/modified by unauthorised person.

APPROVALS

EMC: a. Class B of EN55022 : 2006 and FCC Part 15, Subpart B.
b. EN 302 208-2 V1.2.1 (2008-01) certification pending

Safety: IEC 60950-1:2001

Environmental: IP65 pending

FCC ID: VHY3222, 902.8-927.2 MHz band

FCC DECLARATION (USA)

FCC Section 15.19

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

Information to User (FCC section 15.105)

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 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 installation 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 you will be required to correct the interference at your own expense.

Information to User (FCC section 15.21)

The user is cautioned that any changes or modifications not expressly approved by IPICO or authorized representative could void the user's authority to operate the equipment.

Warning: Exposure To Radio Frequency (RF) Radiation

- The radiated output of this device is below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized.
- The end user must avoid any extended human RF exposure directly in front of the UHF Reader, up to a distance of 30 cm, when unit is switched on.
- When servicing the equipment and selecting a location for the antennas, it is important to note that a minimum distance of 30 cm is required between personnel and the IPICO antennas to comply with the radio frequency exposure limit.
- The antenna used for this transmitter must be installed to provide a separation distance of at least 30 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- The following safety precautions should be observed:
 - Do not touch or move the antenna while the unit is transmitting or receiving.
 - Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
 - Do not operate the radio or attempt to transmit data unless the antenna is connected; this behaviour may cause damage to the radio.

Table of Contents

| | |
|---|----|
| Figures..... | 5 |
| Tables | 5 |
| History | 5 |
| Glossary | 6 |
| 1. Supplied goods and accessories..... | 7 |
| 2. Cable Connections..... | 9 |
| 3. Communication interfaces (per order) | 10 |
| 3.1 \pm 50V isolated RS232 and 26/34 bit Wiegand™ | 10 |
| 3.2 Isolated RS422 | 12 |
| 3.3 Ethernet | 12 |
| 4. Status Indicator..... | 13 |
| 5. Operations overview | 13 |
| 6. Reader overview | 14 |
| 7. Quick Start..... | 14 |
| 1.1 Show tags | 14 |
| 8. Application notes | 15 |
| 9. Troubleshoot | 17 |
| 10. Maintenance..... | 17 |
| 11. Technical specification (preliminary) | 18 |
| 12. Support..... | 19 |
| 12. Technical Assistance..... | 19 |
| 13. Appendix A: IP-X Tag Types..... | 20 |
| 14. Appendix B: Reader interface schematics | 21 |
| 15. Appendix C: Read/Write SW interface overview..... | 22 |

FIGURES

| | |
|--|----|
| Figure 1. Supplied goods and accessories (version 1)..... | 7 |
| Figure 2. Supplied goods and accessories (version 2)..... | 8 |
| Figure 3. Connector layout and termination options (mating face view) | 9 |
| Figure 4. RS 232 and Wiegand interface | 10 |
| Figure 5. RS422 Typical Application Circuit..... | 12 |
| Figure 6. Reader status indicator..... | 13 |
| Figure 7. UHF Integrated Reader Overview..... | 14 |
| Figure 8. Reader Antenna polarization..... | 15 |
| Figure 9. Reader Installation: Side read scenario..... | 16 |
| Figure 10. FFBD of RW functionality | 22 |
| Figure 11. WRITE DATA - Transition Mode diagram (single page at a time)..... | 23 |
| Figure 12. READ DATA - Transition Mode diagram (single page at a time) | 24 |

TABLES

| | |
|--|----|
| Table 1. Souriau connector sets | 10 |
| Table 2 Frequency selection guide..... | 16 |
| Table 3 Troubleshoot guide..... | 17 |
| Table 4 Technical Specifications | 18 |

HISTORY

| Version | Date | Person | Reason |
|---------|------------|---------|--|
| 0.01 | 2008-01-24 | GJO | Create and issued for review |
| 0.02 | 2008-08-15 | GJO | Updates to reflect reader modifications |
| 1.00 | 2008-10-10 | MVD/GJO | Update with new 12 Way connector info. |
| 1.01 | 2009-03-10 | MVD | Update electrical interface and RF radiation notice |
| 1.02 | 2009-04-04 | MVD | Add RW instructions |
| 1.03 | 2009-06-04 | MVD | Correct Figure 3. Pin B = 12VDC |
| 1.04 | 2009-06-08 | MVD | Update document with latest connector information. All Figure numbers updated. |
| 1.05 | 2009-06-12 | MVD | Update and issue for official release |
| | | | |
| | | | |

GLOSSARY

| | |
|---------|---|
| dB | Decibels |
| dBd | Antenna gain in dB relative to dipole antenna |
| dBi | Antenna gain in dB relative to isotropic antenna |
| dBil | Antenna gain in dB relative to linearly polarized isotropic antenna |
| EIRP | Effective Isotropic Radiated Power (measured in dBi or dBil) |
| ERP | Effective Radiated Power (referred to a dipole) (measured in dBd) |
| EVI | Electronic Vehicle Identification |
| I and Q | Quadrature RF signals (90 deg out of phase) |
| RFID | Radio Frequency Identification |
| RFU | Radio Frequency Unit |
| CW | Continuous Wave |

1. Supplied goods and accessories.



Figure 1. Supplied goods and accessories (version 1)

Upon opening the reader package please make sure that you have the following (shown in figure 1) items:

- 1 1 X IPICO Reader
- 2 1 X Multi-angled bracket
- 3 2 X Clamps
- 4 2 X U-bolts with nuts
- 5 Connector pins/plugs and insertion/extraction tool
- 6 12W MilStd Cable connector and cable clamp

Note: This MIL STD connector were only used for the following readers with ser. Numbers:

100956, 100957, 100958, 100959, 100980, 100981, 101015, 101025, 101026 and AV000001 through to AV000025.

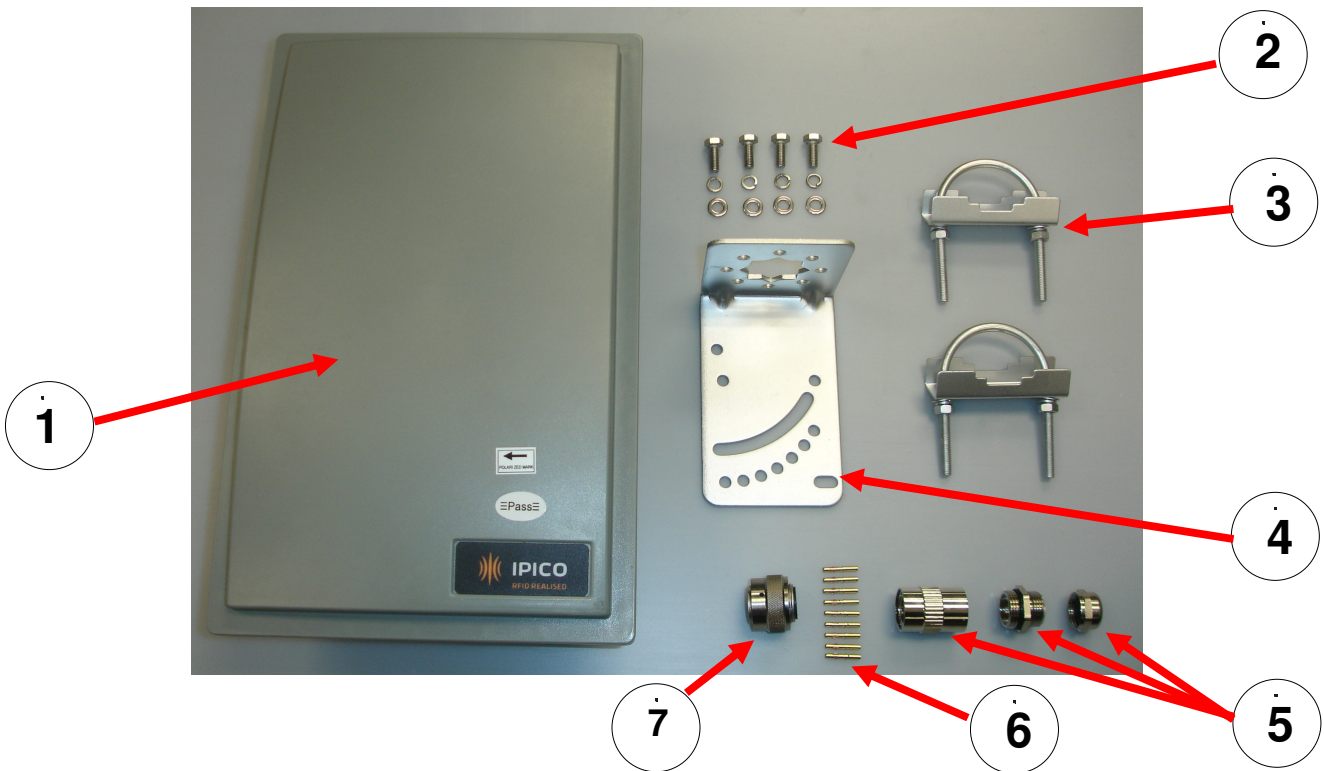


Figure 2. Supplied goods and accessories (version 2)

Version 2 readers are fitted with a lower cost but high quality industrial connector from Souriau – refer to Table 1 for detail :

1. 1 x IPICO Reader
2. 4 x Bracket/Reader mounting screws
3. 2 x U-bolts with nuts
4. 1 x Multi-angled 'L' bracket
5. 1 x Short cable clamp with strain relief nut assembly
6. 9 x Connector socket contacts
7. 1x 12W Cable connector plug for socket contacts (only 9 connections are used)

Note: This connector are used for readers with Ser. Numbers starting at: AV000031 onwards.















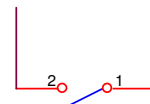
2. Cable Connections

The connector system is based on the Souriau **UT061412SH** series. The cable clamp and pins are provided and should be connected as below:

| PIN-OUT | Cable Colour |
|---------|--------------|
| A | Black |
| B | Brown |
| C | Red |
| D | Orange |
| E | Yellow |
| F | Green |
| G | Blue |
| H | Violet |
| J | Grey |
| K | White |
| L | Cyan |
| M | Pink |



| | A | B | C | D | E | F | G | H | J | K | L | M |
|---|---|---|---|---|---|---|---|--|---|---|---|---|
| Proposed colour scheme |  |  |  |  |  |  |  |  |  |  |  |  |
| Power | GND | 12VDC | n/c | | | | | | n/c | n/c | | |
| Communications options (per order) | | | | | | | | | | | | |
| RS232 and Wiegand or | | | n/c | RX | D ₀ | TX | D ₁ | ***S _{GND} | n/c | n/c | | |
| RS422 or Ethernet* | | | n/c | RX+ | RX- | TX+ | TX- | ***S _{GND} | n/c | n/c | | |
| | | | n/c | *RX+ | *RX- | *TX+ | *TX- | n/c | n/c | n/c | | |
| Control | | | | | | | | | | | | |
| TX ON/OFF | | | n/c | | | | | | n/c | n/c | **SW- | **SW+ |



* Not available at present (Q3 2009)

** Dry contact input to switch RF transmitter **ON** when closed. Reader firmware must be configured / checked by User, to accept this input as 'TX ON/OFF' switch.

*** Isolated Signal ground for RS422 and RS232 interface

n/c = not connected

Figure 3. Connector layout and termination options (mating face view)

| Reader side | Cable side |
|---|--|
| 1. Wall mounting receptacle for pin contacts – UT001412PH6 (IP68) 2. Extra O-seals for wall mounting (UT00) receptacle connectors – UT014REARSEAL 3. Sealing for wall mounting receptacle (UTFD1-B) – UTFD14B | 1. Cable plug for socket contacts – UT061412SH (IP68) 2. Connector socket contacts(solder/crimp) – RC16M23K 3. Short cable clamp with strain relief nut for water protected applications (IP68) – UT014JCS |

Table 1. Souriau connector sets

3. Communication interfaces (per order)

3.1 ±50V isolated RS232 and 26/34 bit Wiegand™

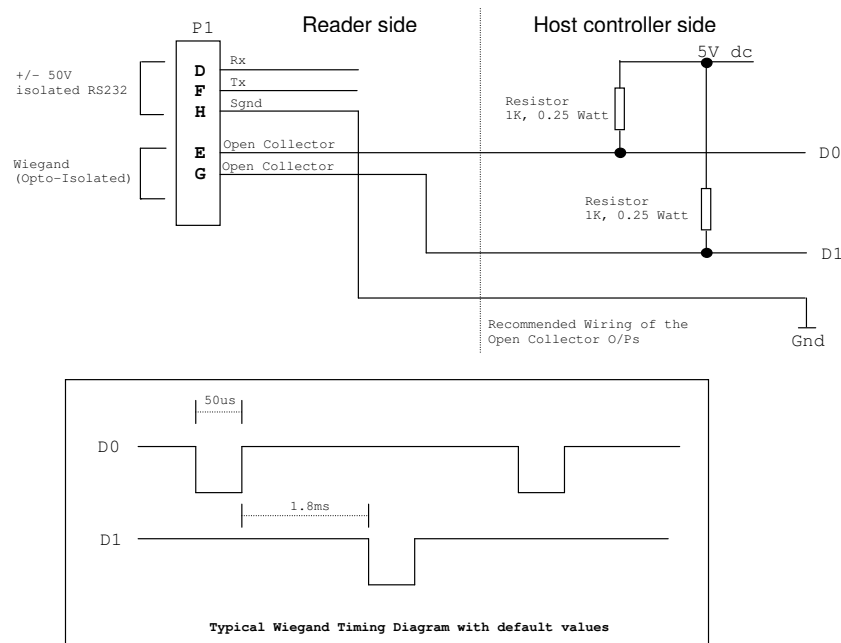


Figure 4. RS 232 and Wiegand interface

The Wiegand settings can be changed under software control using the isolated RS232 interface. Default settings is:

- 26-Bit code. For a 24 bit ID, bits 16 to 39 of the IPICO Tag ID are used (least significant 24 bits excluding the CRC + 2 parity bits).
- Tpw = 50µs, Tpi = 1.8ms and a code retransmit rate of 100ms.
- D0 and D1 are open-collector outputs. User need to supply external pull-up resistors to VCC at the host device.

Data format

The 26 bits of transmission from the reader to the panel consists of two parity bits and 24 code bits. The bits are transmitted in the order described. The first bit transmitted is the first parity bit, P1, it is even parity calculated over the first 12 code bits. The last bit transmitted is the second parity bit, P2, it is odd parity calculated over the last 12 code bits:

CODE FORMAT

```

          1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
P1 C C C C C C C C C C C C C C C C C C C C C C P2
  
```

PARITY FORMAT

```

          1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
P1 E E E E E E E E E E E E
          O O O O O O O O O O O O O P2
  
```

- P1: First, or even parity bit.
- C: Code bits.
- P2: Second, or odd parity bit.
- E: Bits for calculation of even parity.
- O: Bits for calculation of odd parity.

NOTE: Data format within the 24 code bits which include the partitioning of the bit, the designation of the Most Significant Bit (MSB) or the Least Significant Bit (LSB) shall be subject to definition by the panel and reader manufacturers and may remain proprietary.

3.2 Isolated RS422

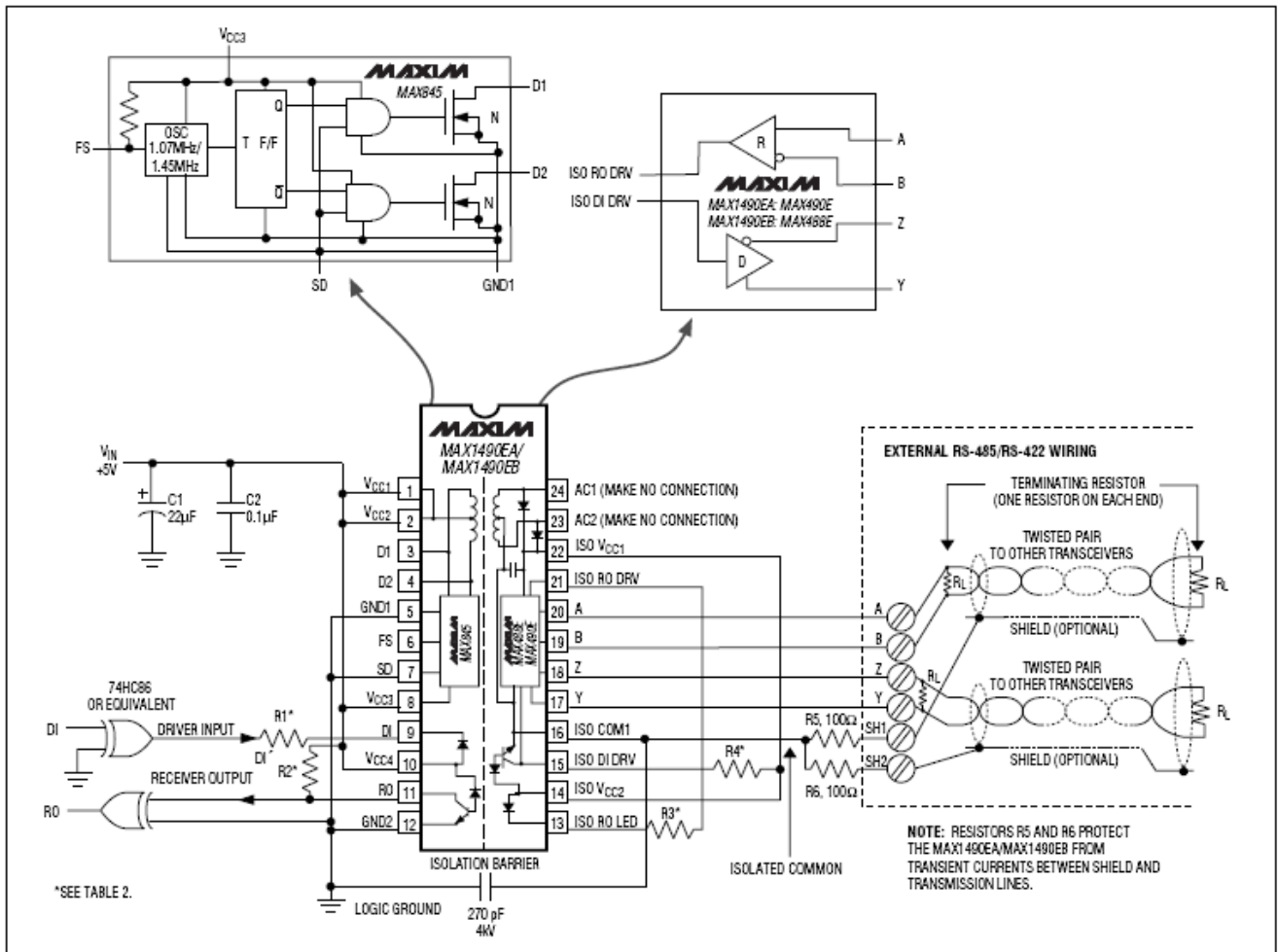


Figure 5. RS422 Typical Application Circuit

3.3 Ethernet

Not implemented yet (Q3 2009)

4. Status Indicator



**Status
Indicator**

Figure 6. Reader status indicator

The status indicator alternates red and green when power is applied and will have intermitted green flashes that indicate communications or tag activity.

5. Operations overview

The IPICO reader is designed as a read/write (RW) reader. The reader modulates READ commands to the tags in order to interrogate the tag. Depending on the application new DATA can be updated on the tag using a modulated WRITE command. Read commands will typically be 5ms in duration with a response from the tag in 300us for 64bits. A WRITE command will typically be longer and will average around 35ms.

During a read event, the reader will energise a tag(s) (can be a few milliseconds i.e 7ms), followed by modulating a READ command in order to 'get' DATA from the tag. The reader decode the incoming signal and place a time/date stamp on it, whilst buffering the data temporarily until such time it can be send, on the communication port, to the host. If multiple DATA pages are received from the same tag before the packet is send to the host, a hit counter is increased. This hit count is included in the communication packet to the host. The RF unit does a full quadrature down conversion, and both in-phase and quadrature phase signal (I and Q) are decoded.

Readers can also read Read/Only (RO) and TTO enabled tags. In TTO mode the tag can present the DATA pages automatically together with the ID.

6. Reader overview

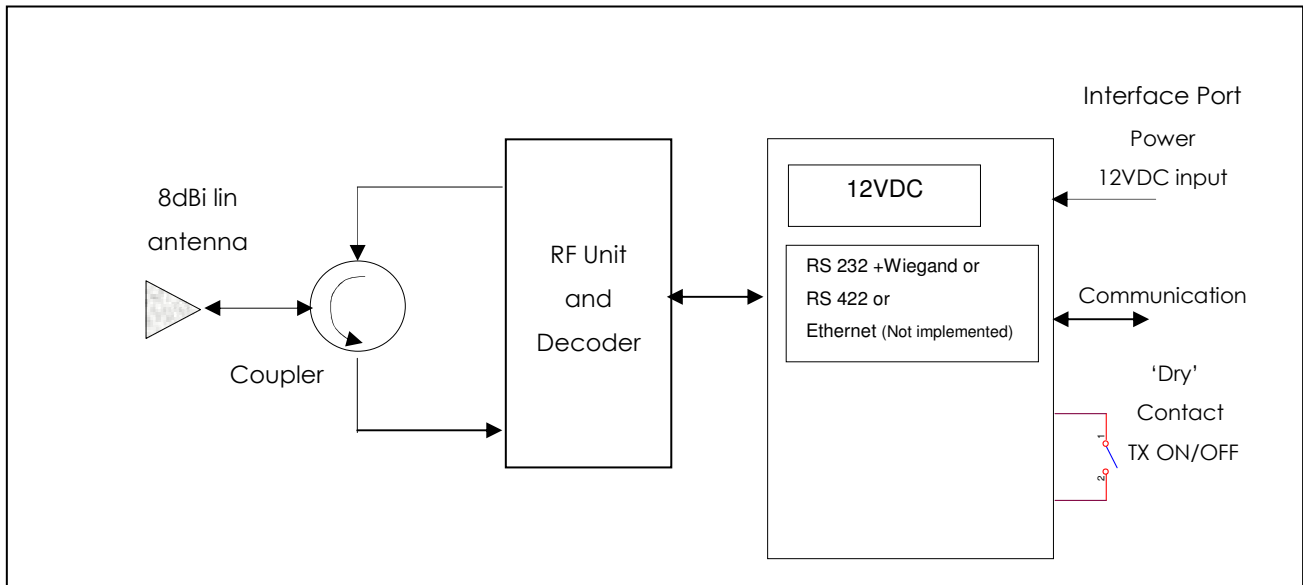


Figure 7. UHF Integrated Reader Overview

7. Quick Start

1.1 Show tags

Note: The following set-up is for demonstration purpose only. Installation and applications will be site dependant.

1. Install ShowTags on the controlling PC running on Windows™ 95,98 NT,XP or 2000. It consists of a single .EXE file, which can be downloaded from <http://www.IPICO.com> to any directory on the controlling PC and run from that directory. From time to time updates are available on the Web at <http://www.IPICO.com>
2. Start ShowTags. Check the serial port settings. The readers' serial port factory setting is 9600bps, no flow control, no parity, but it will remember the last setting used. The default setting for ShowTags is the same, but the setting can be changed and saved.
3. Mount the reader on an overhead structure facing downwards (height depending on reader range and tagged object size) or vertically on a pole to such height that the horizontal centreline of the reader is inline with the tags on the objects.
4. Terminate a cable to the selected interface and power termination block on the reader
5. Apply power to the RF unit. Refer to the technical specification regarding the Input voltage requirements for the reader.
6. Present tags into the reader beam.
7. Use ShowTags as a debugging tool to view the tag reading results and to evaluate the different reader commands.
8. The User's application software can now be implemented.

8. Application notes

1. Some of the IPICO tag antenna formats are dipoles. Like dipoles, they have nulls end-on.
2. Tags should always be orientated in a plane orthogonal to the direction to the reader.
3. Reading speed depends on the tag version used. Please consult IPICO's support team or your local dealer regarding these specifications.
4. Up to 30 tags can be read per second. This depends however on the total number of tags present in the reader beam at the same time. The reading speed will reduce when more than 30 tags are present simultaneously.
5. This reader is compatible with all IPICO UHF tags. See appendix A for available tag types/modes.
6. At 2 W ERP (USA unlicensed) the read range is about 4+ m and at 500 mW, ERP (Europe) the read range is about 2 m depending on the environment and the tags used.
7. Readers operating in small confined spaces can "jam" themselves due to unwanted reflections. Two readers operating simultaneously in close proximity from each other may also influence each other. Please consult IPICO's support team or your local dealer regarding possible multiplexing/screening strategies.
8. The standard dipole tags must be mounted at least 18 mm away from a metallic or conductive surface, fluids and human bodies. Refer to IPICO's range of packaged tags in order to plan an application.
9. Reflections from nearby conducting surfaces and multi-path propagation in particular can lead to nulls in the reader field.
10. Please take note that the reader is fitted with a linear polarised antenna and must be mounted correctly, namely vertically.

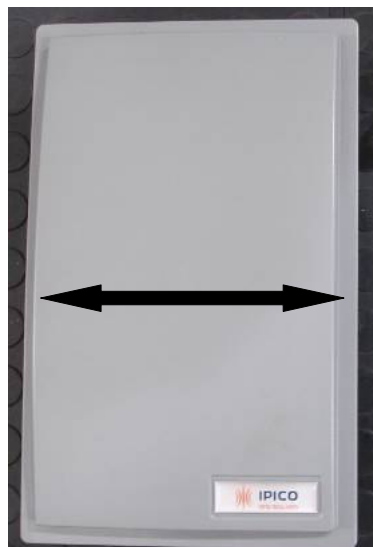


Figure 8. Reader Antenna polarization



Figure 9. Typical Reader Installation: Side read scenario

Note:

Typical angle is also a function of height above ground and is site dependant. Surrounding structures may cause unwanted reflections or extended read capabilities. The installer needs to test and re-adjust for best performance.

Note:

$R_{freq n}$ = Reader frequency allocations (these are country and site dependable)

Frequencies can be remotely set via software from reader SN AV000076 onwards. Speak to your consultant for more information.

| | Fixed Frequency | Frequency Hopping |
|--|--|---|
| Free flow: tags moving fast >1m/s | $ R_{freq 1} - R_{freq 2} \geq 1MHz$ | $ R_{(Freq hop seq 1)} - R_{(Freq hop seq 2)} \geq 1MHz$ |
| Non Free flow: tags moving slower (<1m/s) | $R_{freq 1} = R_{freq 2}$ Or $ R_{freq 1} - R_{freq 2} \geq 1MHz$ | $ R_{(Freq hop seq 1)} - R_{(Freq hop seq 2)} \geq 1MHz$ |

Table 2 Frequency selection guide

9. Troubleshoot

Visual indicator guide

- Slow GREEN Flash of Status LED at 1/6Hz indicates Internal processor working.
- Fast GREEN Flash of Status LED at 1/2Hz indicates communication activity between reader and controller/PC.
- Random GREEN Flash of Status LED indicates that a valid Tag ID is decoded.
- RED Status LED indicates that the unit has power.

| Symptom | Possible causes |
|---|---|
| RED Status LED Off | Power cord not connected or faulty |
| | Power source faulty |
| | Indicator board faulty |
| | Reader faulty |
| Slow GREEN flash with no communication possible between PC and reader | Communication Cable not connected or faulty wiring. |
| | Application software not running |
| | Baud rate incorrect |
| Cannot read a Tag although PC communicates with reader (fast heartbeat) | Transmitter not switched ON (Refer to reader protocol document). |
| | Faulty Tag |
| | Tag not orientated correctly. (Refer to par 8) |
| | Faulty Reader front end |
| Random GREEN fast Flash with no Tag in the beam | High levels of ambient RF noise operating in the same frequency spectrum as reader. |
| | Faulty Reader |

Table 3 Troubleshoot guide

10. Maintenance

This is a low maintenance device. The user must make sure that the reader dome is kept clean and dry where possible. Any build-up of foreign substances, water or snow will degrade the performance of the unit.

11. Technical specification Note: Specifications are subject to change without notice for the purpose of product improvement.

| | |
|---------------------------------|---|
| Power supply requirement | <p>Input: 12Vdc @ 2A max; The max current depends on the RF Output Power setting.</p> <p>Ripple less than 100mV at the reader (or as low as possible). Devices are reverse voltage protected.</p> <p>Provision must be made for additional surge protection and regulated power (if necessary).</p> <p>Power supply not included.</p> |
| Transmitter power | <p>USA unlicensed: 2 W ERP</p> <p>European unlicensed: 2W ERP in Hopping band, 500 mW ERP in fixed band</p> <p>South Africa: 2 W ERP</p> |
| Operating frequency | <p>USA unlicensed: Frequency hopping in the 902-928 MHz ISM band (min of 64Ch hop over 6.4MHz band within the 902-928 MHz band)</p> <p>European unlicensed: Hopping 865-868 MHz band; Fixed frequency 869.4 MHz</p> <p>South Africa: Fixed frequency at 921 MHz typically</p> <p>Freq settings can be changed via software from reader SN AV000076 onwards.</p> |
| Antenna type | Internal 8 dBi, linear polarisation (Horizontal) (If antenna housing is vertical upright then polarisations is horizontal left to right) |
| Read range | <p>Normal dipole in free space. Typical read ranges depends on reader placement and tags used. (IPICO industrial tags will typically have 2x range)</p> <p>0.5 W ERP: 1 – 2m, 1 W ERP: 2 – 3m, 2 W ERP: 3 – 5m</p> |
| Write Range | <p>Normal dipole in free space. Typical read ranges depends on reader placement and tags used. (IPICO industrial tags will typically have 2x range)</p> <p>0.5 W ERP: 0.3 – 0.6m, 1 W ERP: 0.6 – 0.9m, 2 W ERP: 0.9 – 3m</p> |
| Communication | <p>Binary or ASCII RS232 with programmable baud rate and flow control</p> <p>Options:</p> <p>Isolated RS232 and 26/34 bit Wiegand or</p> <p>Isolated RS422 or Ethernet (Ethernet in Q3 2009)</p> |
| Protocol | IP-X™ and ISO 18000-6 "TOTAL". Compatible with EM4122, EM4123, EM4232, EM4432, EM4444 and EM4445 |
| Data storage | <p>This data is transmitted as a free running stream and needs to be captured externally by a PC, or other device. Data logging will be available in Q3 2009 (FW upgrade)</p> <p>Serial protocol manual available. Reader can be configured to send only the first instance of each tag ID it receives, with a settable time-out.</p> |
| Electrical interface | <p>12 way multi-core twisted pair cable for power & data communications</p> <p>Typical: 0.8mm (20 AWG) multi-core screen cable with an outdoor specification</p> |
| Environmental | <p>Operating temperature range: -20 to +55 °C, Storage temperature range: -30 to +85 °C. For extreme temp additional heating/cooling maybe required. Please consult IPICO account manager.</p> <p>Humidity: 5 to 95% non-condensing, IP rating: IP 65, UV protection: Yes</p> |
| Physical | <p>Dimension: 320 (W) x 200 (L) x 100 (H) mm</p> <p>Weight: Approx. 4 kg Packed for shipping.</p> |
| Mounting | Adjustable single pole mounting brackets for pole ≤ 50 mm diameter (typically Vertically) |
| Approvals | <p>EMC a. Class B of EN55022 : 2006 and FCC Part15, Subpart B.</p> <p> b. EN 302 208-2 V1.2.1 (2008-01) certification pending</p> <p>Safety: IEC 60950-1:2001</p> <p>Environmental: IP65 pending (when terminated with the correct cable connector housing)</p> |

Table 4 Technical Specifications

12. Support

Ordering information

| Description | Model number / (IPICO order code) |
|---|-----------------------------------|
| UHF Single Antenna reader <i>Specify</i> <i>RF Power, Frequency and communication interface (default RF power: 2W ERP)</i> | IP 3222 |
| Cable plug for socket contacts | UT061412SH (IP68) / (0-206000) |
| Connector socket contacts(solder/crimp) | RC16M23K / (0-213000) |
| Short cable clamp with strain relief nut for water protected applications (IP68) | UT014JCS / (0-206001) |

NOTE: Please consult your local dealer for more information regarding the accessories, system design, frequency, RF power settings and communication interfaces.

12. Technical Assistance

IPICO online <http://www.IPICO.com>

Group

IPICO INC
 Ontario, Canada
 tel: +1 905 631 6310
 fax: +1 905 631 6614
 info.can@IPICO.com
 www.IPICO.com

North Asia
 Shanghai, China
 tel: +86 21 5080 0345
 fax: +86 21 5027 8271
 info.cn@IPICO.com

Operations

South Africa
 Pretoria
 tel: +27 12 345 9520
 fax: +27 12 345 5834
 info.sa@IPICO.com

Europe
 Vienna, Austria
 tel: +43 (676) 30 68 924
 info.europe@IPICO.com

USA
 Georgia, USA
 tel: +1 770 552 9654
 fax: +1 404 601 9679
 info.usa@IPICO.com

Australasia
 Clontarf, Queensland
 tel: +61 7 3889 5799
 fax: +61 7 3889 5980
 info.aus@IPICO.com

13. Appendix A: IP-X Tag Types

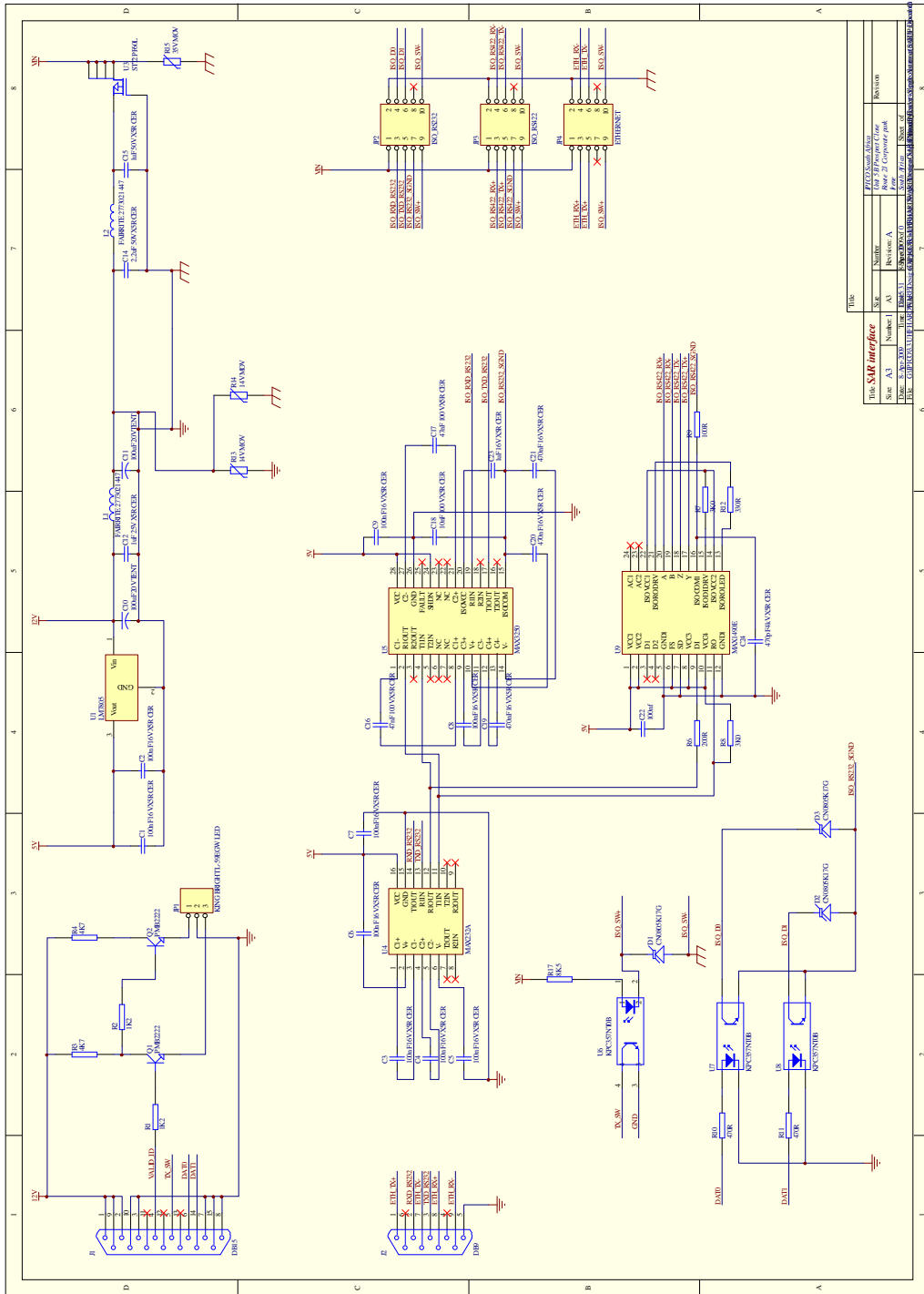
The following tag types and configurations are compatible with this reader:

Proposed Tag Types.

| Type | IP Code | Capability |
|--|---------|--------------------|
| UHF Tag Industrial Vehicle 869MHz RWTO | IP3459 | Read/Write and TTO |
| UHF Tag Industrial Vehicle 915MHz RWTO | IP3409 | Read/Write and TTO |
| UHF Tag, ENP 160x10 label, 869, RWTO | IP3214 | Read/Write and TTO |
| UHF Tag, ENP 160x10 label, 915, RWTO | IP3233 | Read/Write and TTO |
| UHF Tag, Windshield label, 915, RWTO | IP3535 | Read/Write and TTO |
| UHF Tag, Windshield label, 915, RWTO | IP3577 | Read/Write and TTO |
| UHF Tag, Industrial On-Metal, 869/915MHz, RWTO | IP3423 | Read/Write and TTO |
| UHF Tag, ENP C label, RWTO | IP3472 | Read/Write and TTO |
| UHF tag, CR80 PVC laminated | IP3557 | Read/Write and TTO |

NOTE: Tag types can be added/removed without notification. Please consult with your account manager for details.

14. Appendix B: Reader interface schematics



15. Appendix C: Read/Write SW interface overview

Reader will typically connect to one host i.e. PLC or PC.

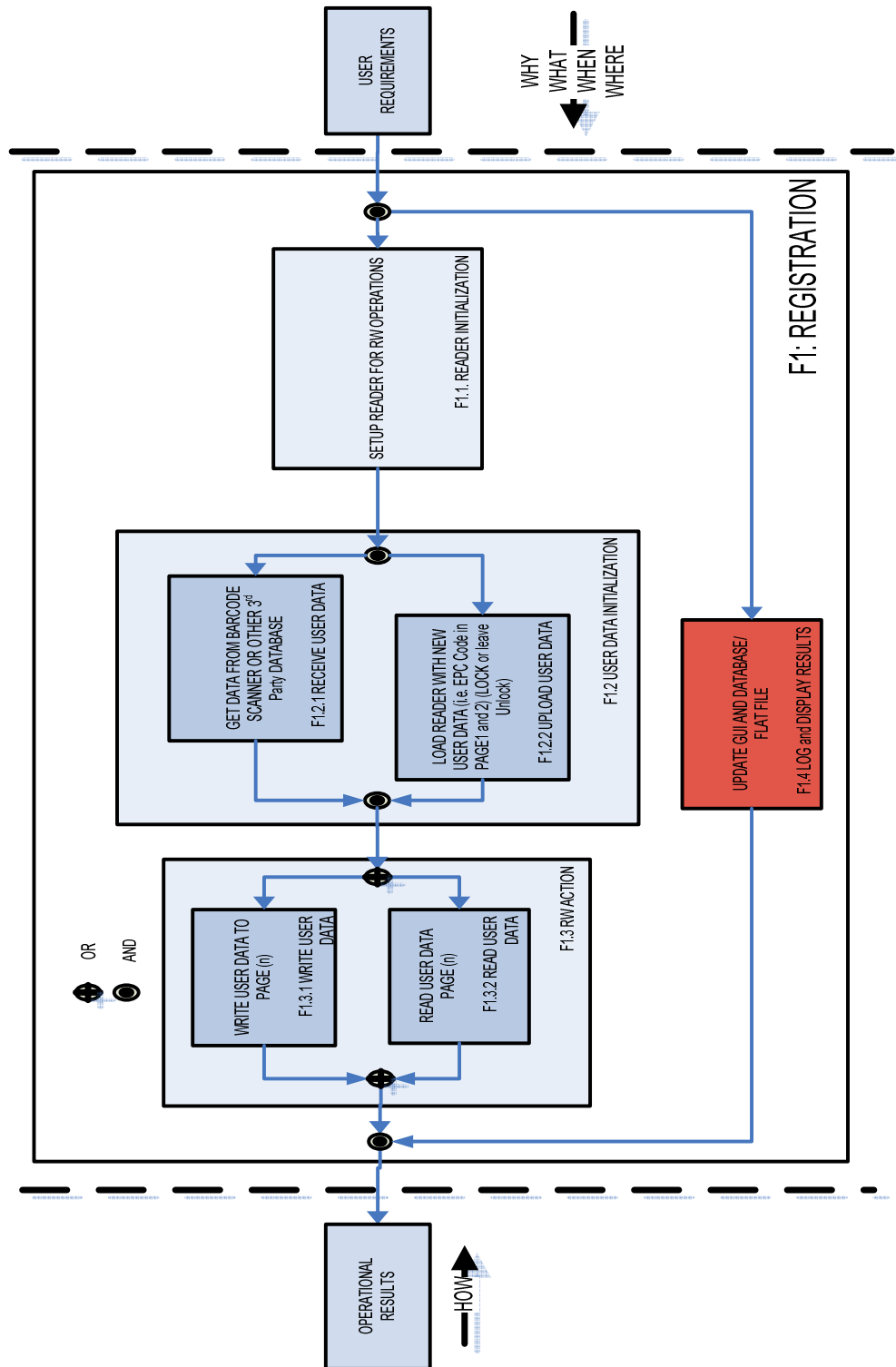


Figure 10. FFBD of RW functionality

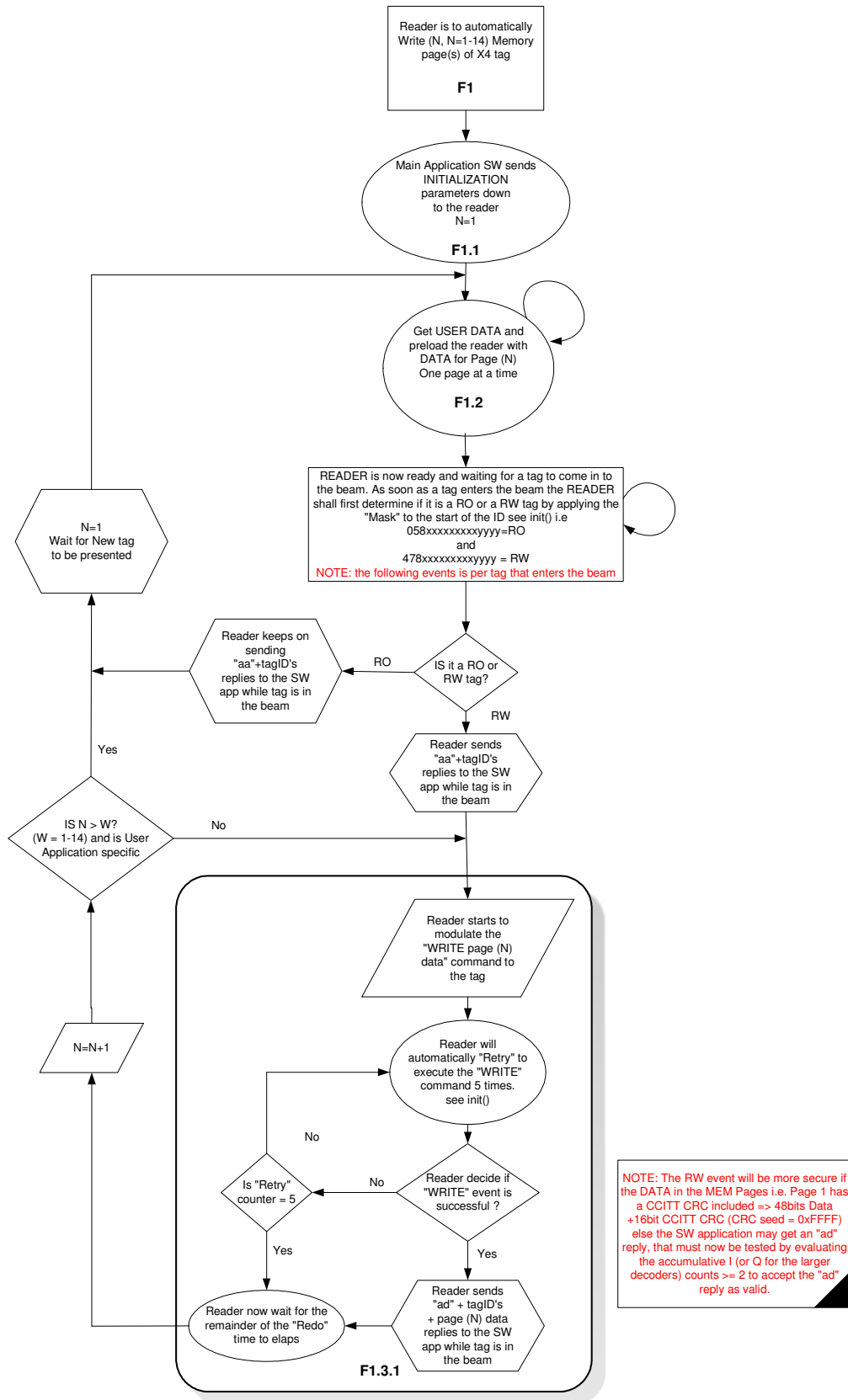


Figure 11. WRITE DATA - Transition Mode diagram (single page at a time)

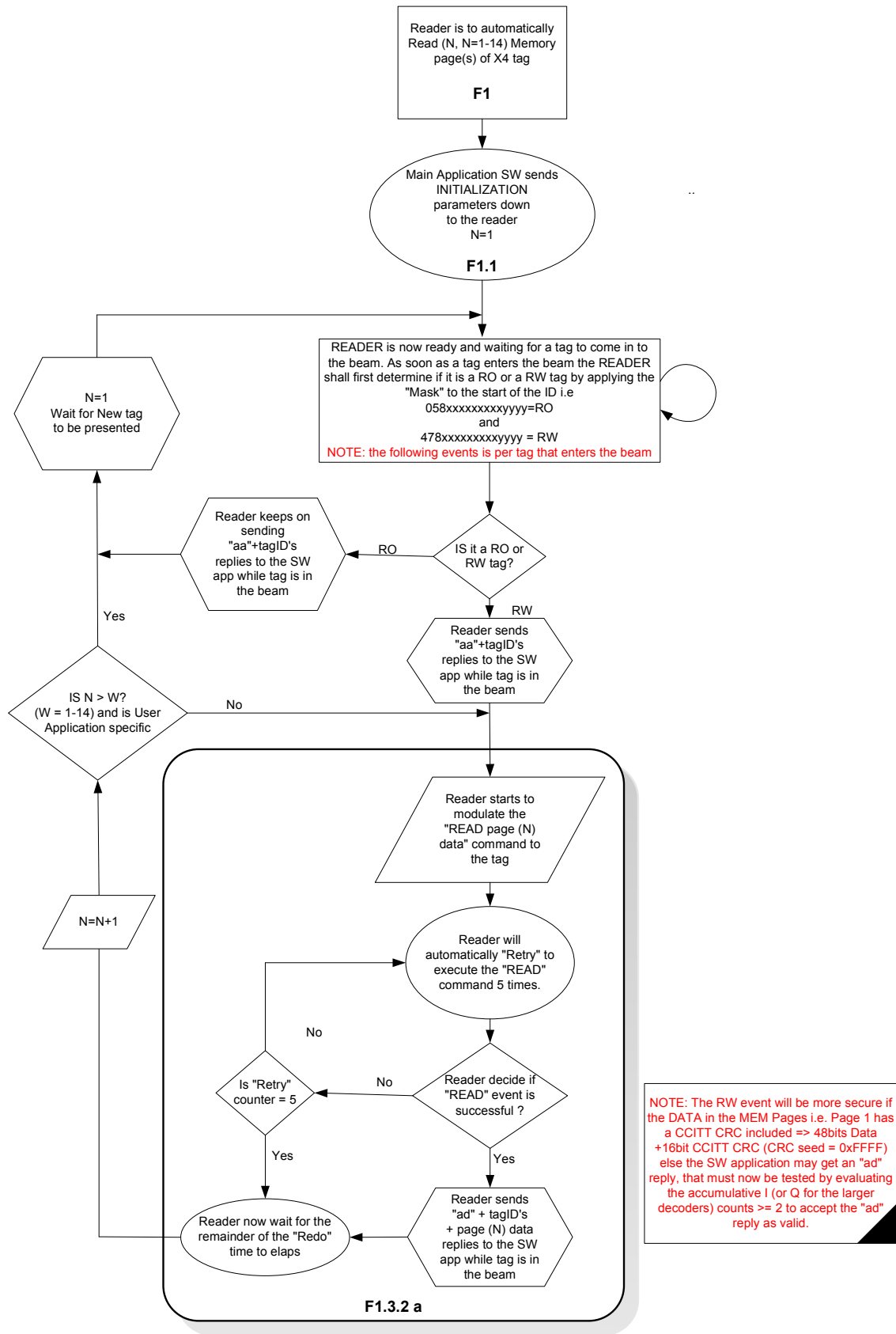


Figure 12. READ DATA - Transition Mode diagram (single page at a time)

F1.1 Reader initialization

| Step | Description | String From Host to Reader | Return String |
|-------|---|----------------------------------|---------------|
| 1.1.1 | Set Message Format in a semi reduced format i.e. Rd ID, I count, All 8 UID bytes and LRC | ab00091143ff6161aa000d0a00d3\r\n | ab00001122 |
| 1.1.2 | Set Message Mode i.e. Normal | ab00030900ff07bf\r\n | ab00000929 |
| 1.1.3 | Stop any RW actions | ab00002325\r\n | ab00002325 |
| 1.1.4 | Resume all tags | ab000125e0bd\r\n | ab00002527 |
| 1.1.5 | Set RW transmit rate for DF reader at 4kbps | ab000117cdf0\r\n | ab00001728 |
| 1.1.6 | Set timeouts Data=220, Redo=1, Retry=5, Rd Retry =3 | ab00062400dc016d050316\r\n | ab00002426 |
| 1.1.7 | Set Tag Baud Rate 128kbps (HH option using Showtags) | ab0001120286\r\n | ab00001223 |
| 1.1.8 | Set Match Mask | ab0008224ff0000000000009c\r\n | ab00002224 |
| | | | |
| | | | |

F1.2 Preload Reader with USER DATA

| Step | Description | String From Host to Reader | Return String |
|-------|--|--------------------------------|---------------|
| 1.2.1 | Get USER DATA from Database or 3 rd party device i.e Barcode scanner. Now send USER DATA to reader. USER DATA to be configured with or without CRC and must be 8 bytes per Page i.e. " IPICO " written Hex format Without CRC <ul style="list-style-type: none"> Page 1 = 495049434f000000 With CRC16 seeded with FFFFh <ul style="list-style-type: none"> Page 1 = 495049434f003231 With CRC CCITT seeded with FFFFh <ul style="list-style-type: none"> Page 1 = 495049434f00FD34 NOTE: Only ONE Page can be loaded at a time and WRITE to the tag. | ab000821495049434f0000008b\r\n | ab00002123 |

F1.3.1 WRITE DATA Command and Automatic VERIFY (Data is known) Action

| Step | Description | String From Host to Reader | Return String |
|---|---|----------------------------|--|
| 1.3.1.1 | Issue WRITE Command i.e. Page 1, Target = Addressed | ab0003200011624f\r\n | ab00002022 |
| <i>Reader will now perform the WRITE function according to the preloaded Retry count value and Redo timer value</i> | | | |
| 1.3.1.2 | Upon Successful WRITE an "ad" string with the UID and DATA page info will return to the host. | | ad004699000010deca65f109495049434f000000b5 |

Decoding of the return string is as follows

| Header | Reader ID | UID including CRC | Page 1 Page 2 = 02 etc x= 0 hex to f hex incrementing for each WRITE command issued until x=f hex. Then x=0 again. | Sequence number | USER DATA in Page 1 | LRC for complete string |
|--------|-----------|-------------------|--|-----------------|---------------------|-------------------------|
| ad | 00 | 4699000010deca65 | x1 | 09 | 495049434f000000 | b5 |

For more information refer to Table 10 in the IPICO Reader Serial Protocol 100 20071120.pdf

F1.3.2.a READ DATA Command Action (single page)

| Step | Description | String From Host to Reader | Return String |
|--|--|----------------------------|--|
| 1.3.2.a.1 | Issue READ Command i.e. Start Page = 1, number of pages =1, Target = Addressed (Byte 5 = incrementing Seq number 51h (00h-ffh) for each attempt) | ab00032051218258\r\n | ab00002022 |
| <i>Reader will now perform the READ function according to the preloaded Retry count value and Redo timer value</i> | | | |
| 1.3.2.a.2 | Upon Successful READ an "ad" string with the UID and DATA page info will return to the host. | | ad004699000010df4a60810a495049434f0000007c Data page as per function in 1.2.1 |

Decoding of the return string is as follows

| Header | Reader ID | UID including CRC | Page 1 = 01 Page 2 = 02 etc x= 0 hex to f hex incrementing for each READ command issued until x=f hex. Then x=0 again. | | USER DATA in Page 1 | LRC for complete string |
|--------|-----------|-------------------|--|----|---------------------|-------------------------|
| ad | 00 | 4699000010df4a60 | x1 | 01 | 495049434f000000 | b5 |

ad004699000010df4a60810a495049434f0000004c