

UHF Single Antenna RFID Reader

IP 3222

User Manual



Version 1.08
11 January 2011

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.

IPICO, IP-X, 'IP-X Inside', 'IP-X Outside' and 'TOTAL RFID' are trademarks of IPICO Inc.

For further information contact +27 12 349-7620

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 Part15, Subpart B.

b. EN 302 208-2 V1.2.1 (2008-01)

Safety: IEC 60950-1:2001

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
2.1 Proposed wiring scheme	9
3. Communication interfaces (per order)	11
3.1 $\pm 50V$ isolated RS232 and 26/34 bit Wiegand™	11
3.2 Isolated RS422	13
3.3 Ethernet	13
4. Status Indicator	14
5. Operations overview	14
6. Reader overview.....	15
7. Quick Start	15
1.1 Show tags.....	15
8. Application notes.....	16
9. Troubleshoot	18
10. Maintenance	18
11. Technical specification Note: Specifications are subject to change without notice for the purpose of product improvement.....	19
12. Support	20
12. Technical Assistance	20
13. Appendix A: IP-X Tag Types.....	21
14. Appendix B: Reader interface schematics	22
15. Appendix C: Read/Write SW interface overview.....	23

FIGURES

Figure 1. Supplied goods and accessories (version 1)	7
Figure 2. Supplied goods and accessories (Current version 2)	8
Figure 3. Connector layout and termination options (mating face view).....	10
Figure 4. RS 232 and Wiegand interface	11
Figure 5. RS422 Typical Application Circuit.....	13
Figure 6. Reader status indicator	14
Figure 7. UHF Integrated Reader Overview	15
Figure 8. Reader Antenna polarization	16
Figure 9. Typical Reader Installation: Side read scenario	17
Figure 10. FFBD of RW functionality.....	23
Figure 11. WRITE DATA - Transition Mode diagram (single page at a time).....	24
Figure 12. READ DATA - Transition Mode diagram (single page at a time)	25

TABLES

Table 2. Souriau connector sets.....	10
Table 3 Frequency selection guide	17
Table 4 Troubleshoot guide	18
Table 5 Technical Specifications	19

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
1.06	2009-09-10	MVD	Add CE certification details
1.07	2010-07-19	MVD	Update Ethernet interface and wiring proposal
1.08	2011-01-11	MVD	Update Ethernet Reset procedure
1.09	2012-11-03	MVD	Minor update on cable specification on pg. 9

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 MIL STD 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.

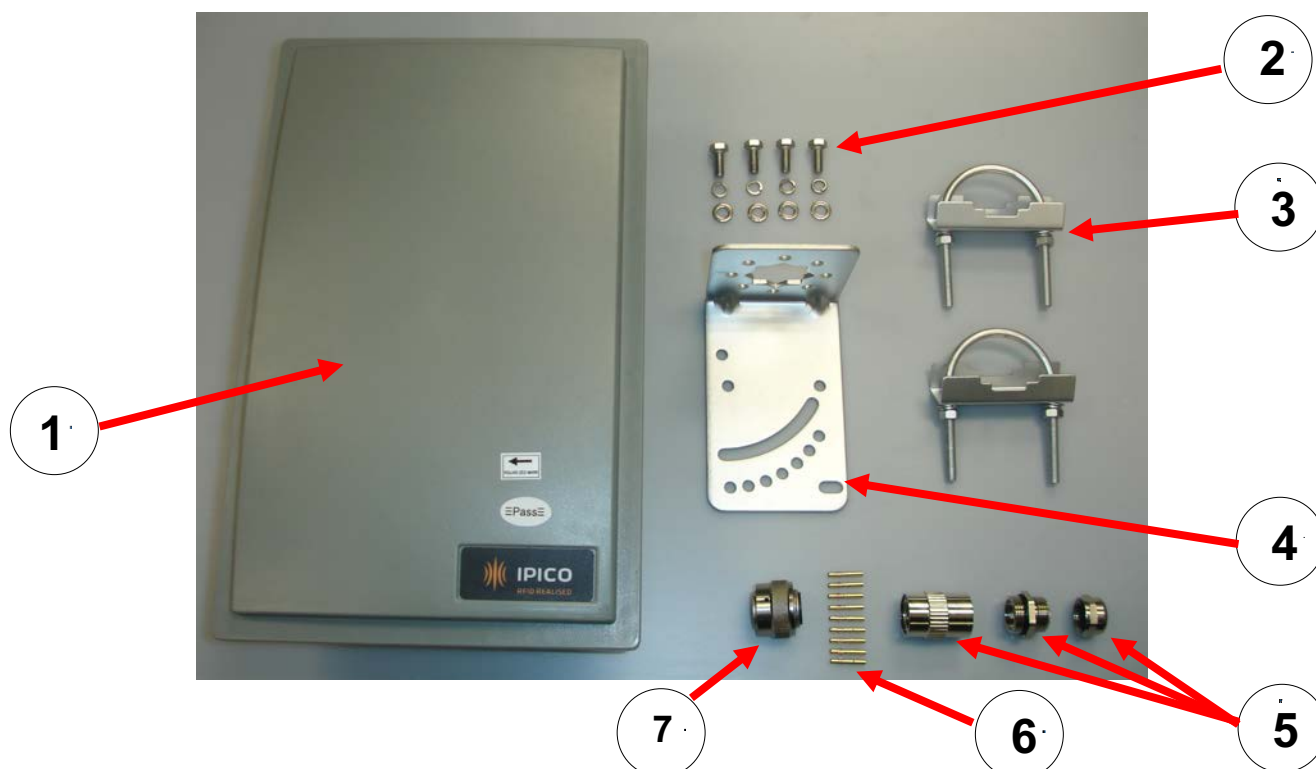


Figure 2. Supplied goods and accessories (Current version 2)

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

2.1 Proposed wiring scheme

Refer to Figure 3. The proposed cables to use are a **4 pair 0.75mm² Multi-stranded Mylar cable** or **INDUSTRIAL ETHERNET (CAT 5 or 6)** cable for **data** and **power** - typical **BELDEN** reference **BLDN7924A-BK**. The following constraints will apply when using a single cable for both the data and power:

- a. **Scenario 1a.** In case the ON/OFF switch input will be used, (SW+, SW-) the cable limitation is 6m for both cable types.
For the Industrial Ethernet the blue pair can be used for the switch input whilst the brown pair can be used for the power supply feed.
- b. **Scenario 2.** In case the ON/OFF switch input will not be used, the switch wires can be parallel joined with the PSU wires. In this way the cable length limitation is 15m.
For the Industrial Ethernet the blue pair can be joined for the PSU GND connection and the brown pair can be joined for the PSU +12V connection.

NOTE: For longer cable runs the PSU voltage may need to be adjusted so that the current consumption is approx **1.35 Amp for 2W ERP**.

CAUTION: The reader chassis is connected to the GND pin internally. During reticulation make sure no ground loops are formed between the reader and the host. When reader is mounted outside please ensure additional power and data line surge/lightning protection.

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	Mylar 6m	Ethernet 6m	Mylar 15m	Ethernet 15m
A	Black	Brown	Black+Cyan	Blue+Blue/White
B	Brown	Brown/White	Brown+Pink	Brown+Brown/White
C	Red	Nc	Red	Nc
D	Orange	Green/White	Orange	Green/White
E	Yellow	Green	Yellow	Green
F	Green	Orange/White	Green	Orange/White
G	Blue	Orange	Blue	Orange
H	Violet	Nc	Violet	Nc
J	Grey	Nc	Grey	Nc
K	White	Nc	White	Nc
L	Cyan	Blue	Nc	Nc
M	Pink	Blue/White	Nc	Nc



	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			n/c	RX+	RX-	TX+	TX-	***S _{GND}	n/c	n/c		
Ethernet*			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)	1. Cable plug for socket contacts – UT061412SH (IP68)
2. Extra O-seals for wall mounting (UT00) receptacle connectors – UT014REARSEAL	2. Connector socket contacts(solder/crimp) – RC16M23K
3. Sealing for wall mounting receptacle (UTFD1-B) – UTFD14B	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 $\pm 50V$ isolated RS232 and 26/34 bit Wiegand™

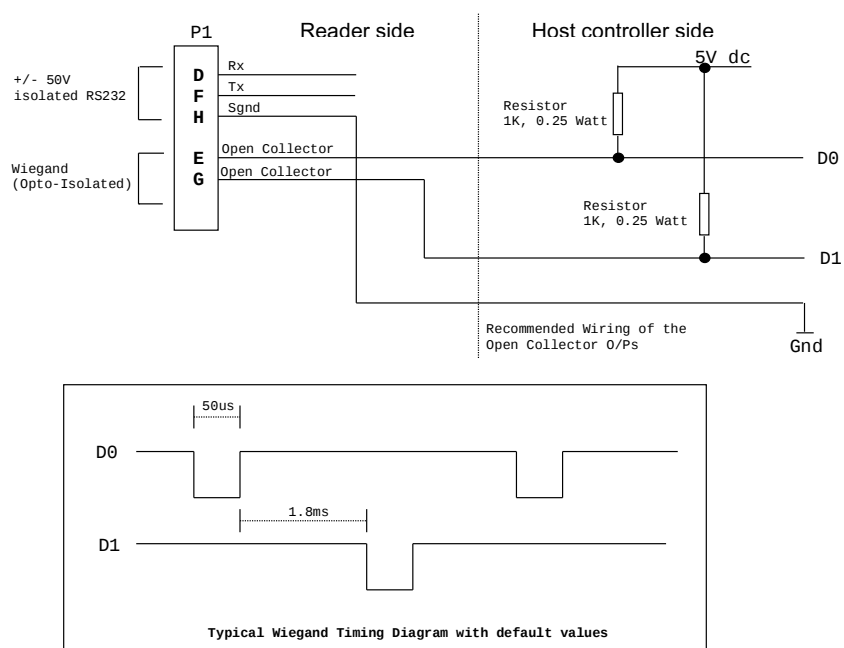


Figure 4. RS 232 and Wiegand interface

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).
- $T_{pw} = 50\mu s$, $T_{pi} = 1.8ms$ 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 2

3.2 Isolated RS422

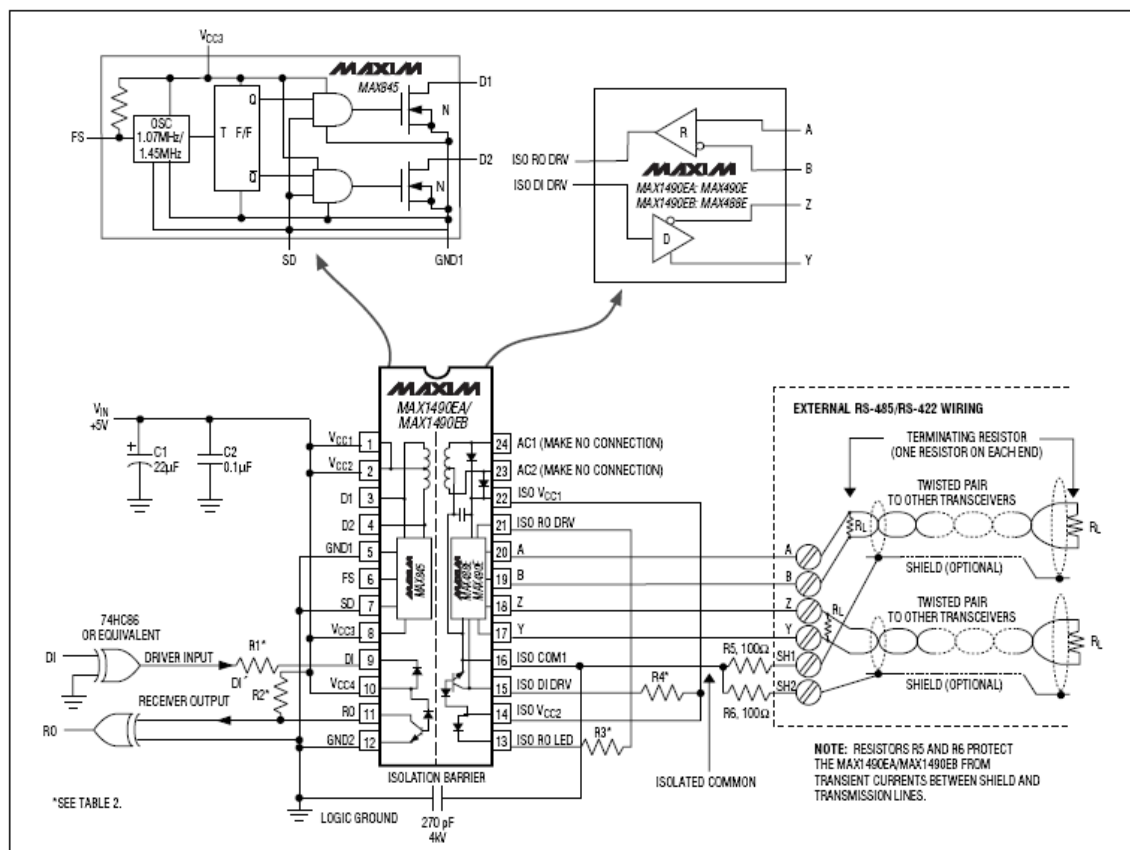


Figure 5. RS422 Typical Application Circuit

3.3 Ethernet

The reader is fitted with a Lantronix WiPort – NR module. The default IP address is 192.168.1.31 port 10001. In case the Ethernet IP is lost or unknown and cannot be allocated with the Lantronix network tool, the reader can be reset to the IPICO default address. RESET: Power OFF. Remove the screw below, press the micro switch inside and Hold it in until 10sec after Power –ON.



Remove plug



Push and Hold reset until
10sec after Power ON

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

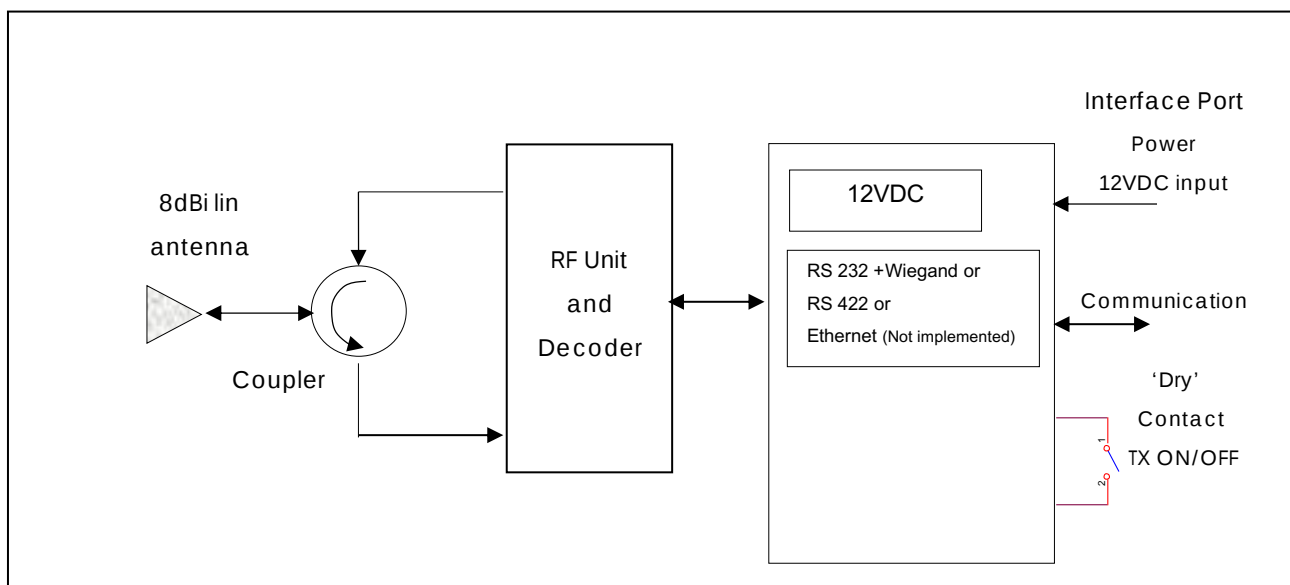


Figure 7. UHF Integrated Reader Overview

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.

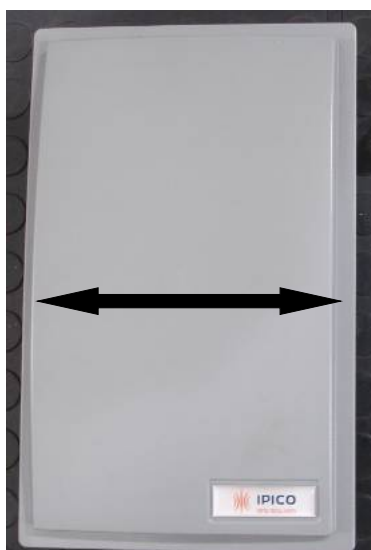


Figure 8. Reader Antenna polarization



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	Input: 12Vdc @ 2A max; The max current depends on the RF Output Power setting. Ripple less than 100mV at the reader (or as low as possible). Devices are reverse voltage protected. Provision must be made for additional surge protection and regulated power (if necessary). Power supply not included.
Transmitter power	USA unlicensed: 2 W ERP European unlicensed: 2W ERP in Hopping band, 500 mW ERP in fixed band South Africa: 2 W ERP
Operating frequency	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) European unlicensed: Hopping 865-868 MHz band; Fixed frequency 869.4 MHz South Africa: Fixed frequency at 921 MHz typically Freq settings can be changed via software from reader SN AV000076 onwards.
Antenna type	Internal 8 dBi, linear polarisation (Horizontal) (If antenna housing is vertical upright then polarisations is horizontal left to right)
Read range	Normal dipole in free space. Typical read ranges depends on reader placement and tags used. (IPICO industrial tags will typically have 2x range) 0.5 W ERP: 1 – 2m, 1 W ERP: 2 – 3m, 2 W ERP: 3 – 5m
Write Range	Normal dipole in free space. Typical read ranges depends on reader placement and tags used. (IPICO industrial tags will typically have 2x range) 0.5 W ERP: 0.3 – 0.6m, 1 W ERP: 0.6 – 0.9m, 2 W ERP: 0.9 – 3m
Communication	Binary or ASCII RS232 with programmable baud rate and flow control Options: Isolated RS232 and 26/34 bit Wiegand or Isolated RS422 or Ethernet (Ethernet in Q3 2009)
Protocol	IP-X™ and ISO 18000-6 "TOTAL". Compatible with EM4122, EM4123, EM4232, EM4432, EM4444 and EM4445
Data storage	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) 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.
Electrical interface	12 way multi-core twisted pair cable for power & data communications Typical: 0.8mm (20 AWG) multi-core screen cable with an outdoor specification
Environmental	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. Humidity: 5 to 95% non-condensing, IP rating: IP 6 UV protection: Yes
Physical	Dimension: 320 (W) x 200 (L) x 100 (H) mm Weight: Approx. 4 kg Packed for shipping.
Mounting	Adjustable single pole mounting brackets for pole ≤ 50 mm diameter (typically Vertically)
Approvals	EMC a. Class B of EN55022 : 2006 and FCC Part15, Subpart B. b. EN 302 208-2 V1.2.1 (2008-01) Safety: IEC 60950-1:2001

Table 4 Technical Specifications

12. Support

Ordering information

Description	Model number / (IPICO order code)
UHF Single Antenna reader <i>Specify 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 12 349 7620
fax: +27 12 349 1118
info.sa@IPICO.com

13. Appendix A: IP-X Tag Types

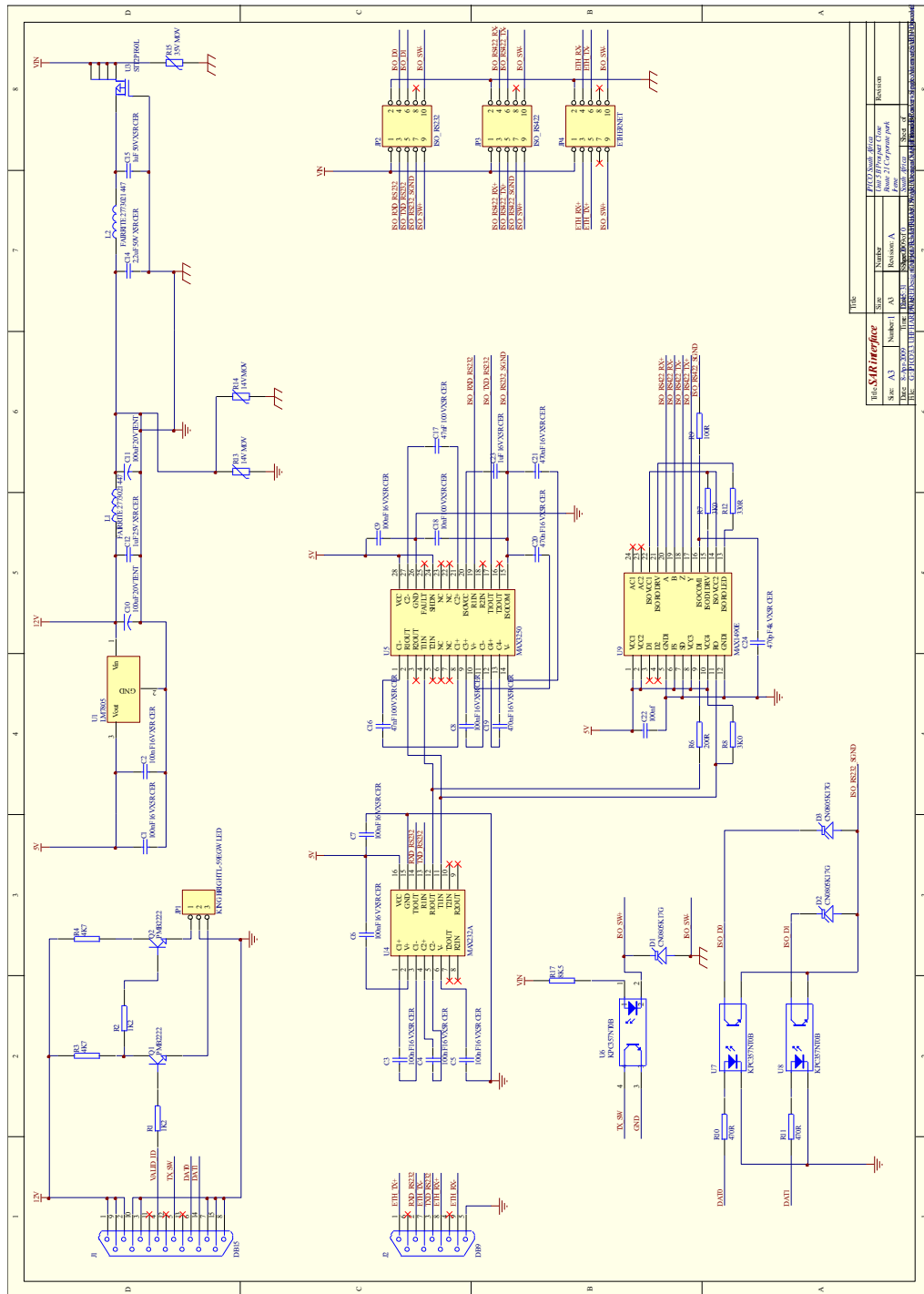
The following tag types and configurations are compatible with this reader:

Proposed Tag Types.

Type	IP Code	Capability
UHF Tag Industrial Vehicle 869MHz RWTTO	IP3459	Read/Write and TTO
UHF Tag Industrial Vehicle 915MHz RWTTO	IP3409	Read/Write and TTO
UHF Tag, ENP 160x10 label, 869, RWTTO	IP3214	Read/Write and TTO
UHF Tag, ENP 160x10 label, 915, RWTTO	IP3233	Read/Write and TTO
UHF Tag, Windshield label, 915, RWTTO	IP3535	Read/Write and TTO
UHF Tag, Windshield label, 915, RWTTO	IP3577	Read/Write and TTO
UHF Tag, Industrial On-Metal, 869/915MHz, RWTTO	IP3423	Read/Write and TTO
UHF Tag, ENP C label, RWTTO	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.

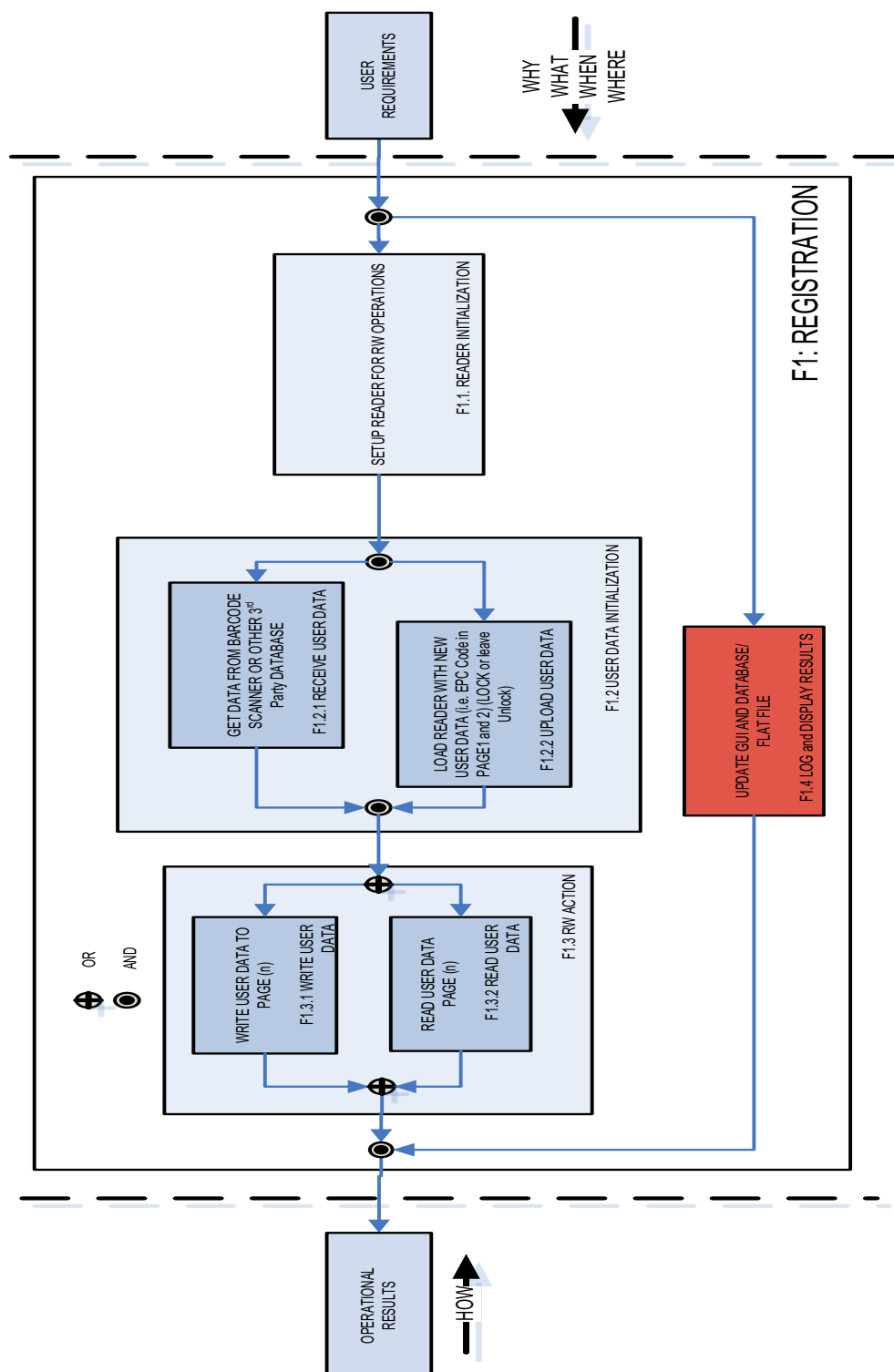


Figure 10. FFBD of RW functionality

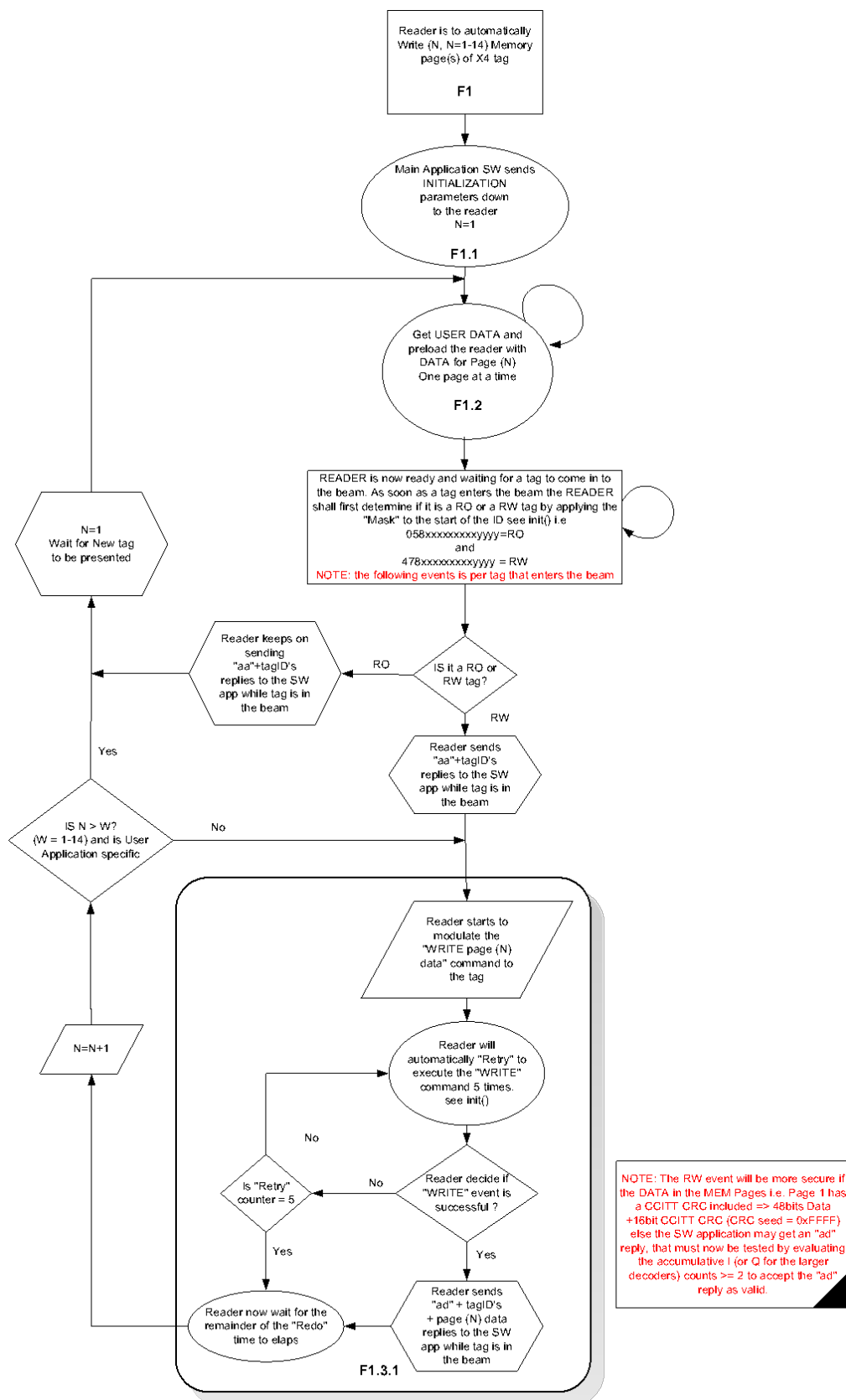


Figure 11. WRITE DATA - Transition Mode diagram (single page at a time)

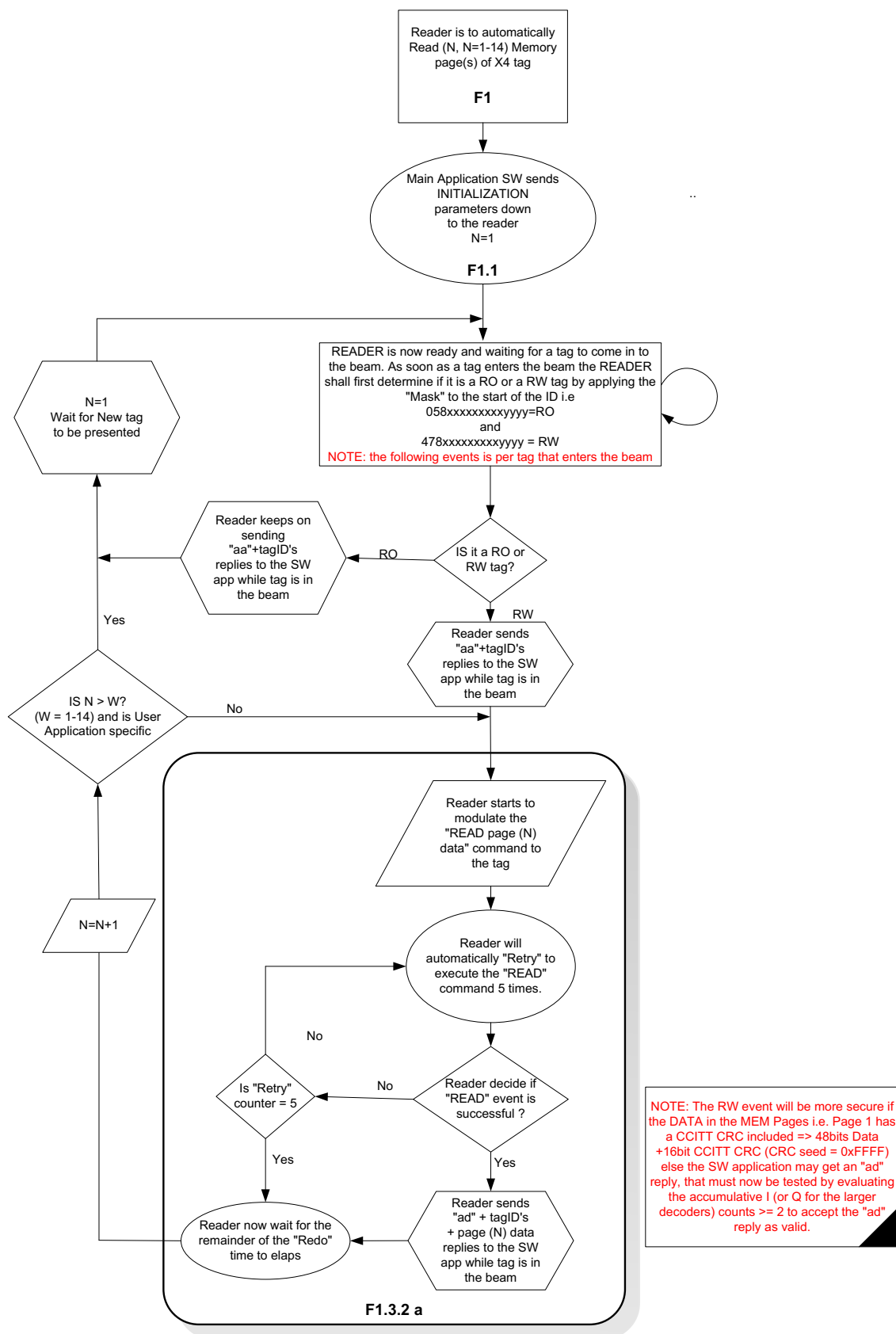


Figure 12. READ DATA - Transition Mode diagram (single page at a time)

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	ab0008224ff00000000000009c\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 - Page 1 = 495049434f000000 With CRC16 seeded with FFFFh - Page 1 = 495049434f003231 With CRC CCITT seeded with FFFFh - 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

ad004699000010df4a608101495049434f0000004c