

IP-X DF Proximity RW/TTO Reader

(USB or RS422 for Registration and Process control)

IP-X DF Proximity RO Reader

(26-bit Wiegand™ for Access Control)

IP66 Housings optional

User Manual



Version 1.05

26 February 2008

Doc. Number: IP7160

FCC ID: VHY - IP3490A

IMPORTANT

Please read instructions before operating this device. This device may cause interference to other electronic equipment that is sensitive to magnetic radiation.

Only use an approved linear power supply.

Only an authorised technician may open and work on this unit.

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

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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

This is a low power RF device. Avoid any extended human exposure directly in front of the reader, up to a distance of 2 cm, when unit is switched on.

In most aircraft and hospitals the use of RF devices are prohibited. Please consult the local authorities and safety official when operating this device.

Only qualified personnel may open the unit.

APPROVALS

FCC Part 15: **Subpart C, Class B**

EN 300-220-1, 300-220-3, ETS 300-683 and EN 6100-3-2& 3 (CE) : **Pending**

IEC 60950 (CE): **Pending**

UL 60950/CAN/CSA22.2 No. 60950 : **Pending**

FCC ID: **VHY-IP3490A**

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 15.21)

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.

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HISTORY

Version	Date	Person	Reason
1.00	2008-01-01	MVD	Created. Release for internal use.
1.01	2008-01-07	MVD	Correct table 2. 34 bit to 26 Bit Wiegand, Add Buzzer to Fig 2
1.02	2008-01-07	MVD	Add order codes and release for review
1.03	2008-01-27	MVD	Add basic SW interface specification
1.04	2008-02-06	MVD	Update naming conventions
1.05	2008-02-26	MVD	Add Industrial IP66 Housing detail

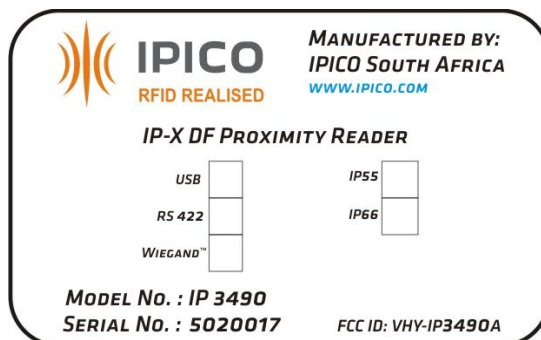
GLOSSARY

BT	Bluetooth™
CW	Continuous Wave
dB	Decibels
DF	Dual Frequency
HMI	Human Machine Interface
PC	Personal computer
RFID	Radio Frequency Identification
RFU	Radio Frequency Unit
R/O	Read-Only. This is the mode in which the reader gets the UID from the tag and happens in the presence of non-modulating readers.
RS422	Differential transceiver interface for RS232
R/W	Read / Write. This functionality can only happen in the presence of modulating readers.
RX	Receive
SW	Software
TX	Transmit
TTO mode	Mode in which tag can present USER DATA in the presence of a non-modulating Read-Only reader.
USB	Universal Serial Bus
Wiegand™	Electrical and Data interface specifically for security industry

1. Know your reader.

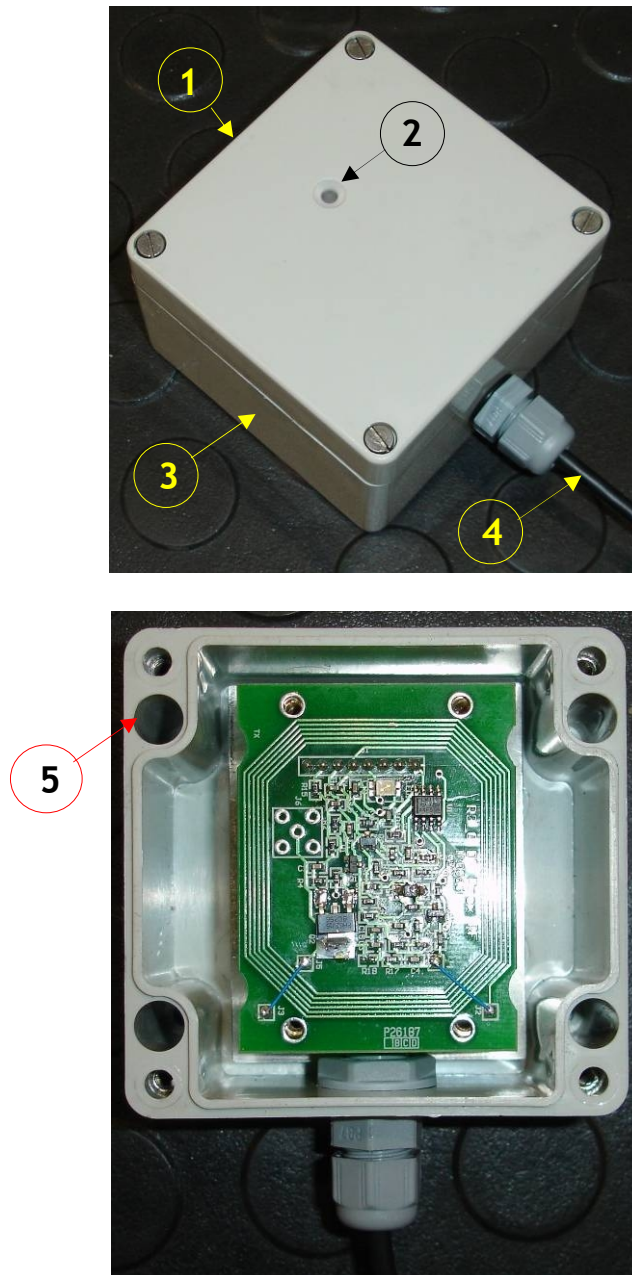


- 1. ABS Reader housing with integrated antenna
- 2. **Status indicator (may not be available on all preliminary housings)**
- 3. FCC and Product data label



- 4. Power/Communication link
(Communications are USB, RS422 or Wiegand™ (26-bit))

Figure 1 Reader overview



1. Reader in grey, glass reinforced polyester housing with integrated antenna
2. Status indicator
3. FCC and Product data label
4. Power/Communication link
(Communications are USB, RS422 or Wiegand™ (26-bit))
5. 4x Mounting holes

Figure 2 Industrial IP66 Reader overview

2. Functional overview

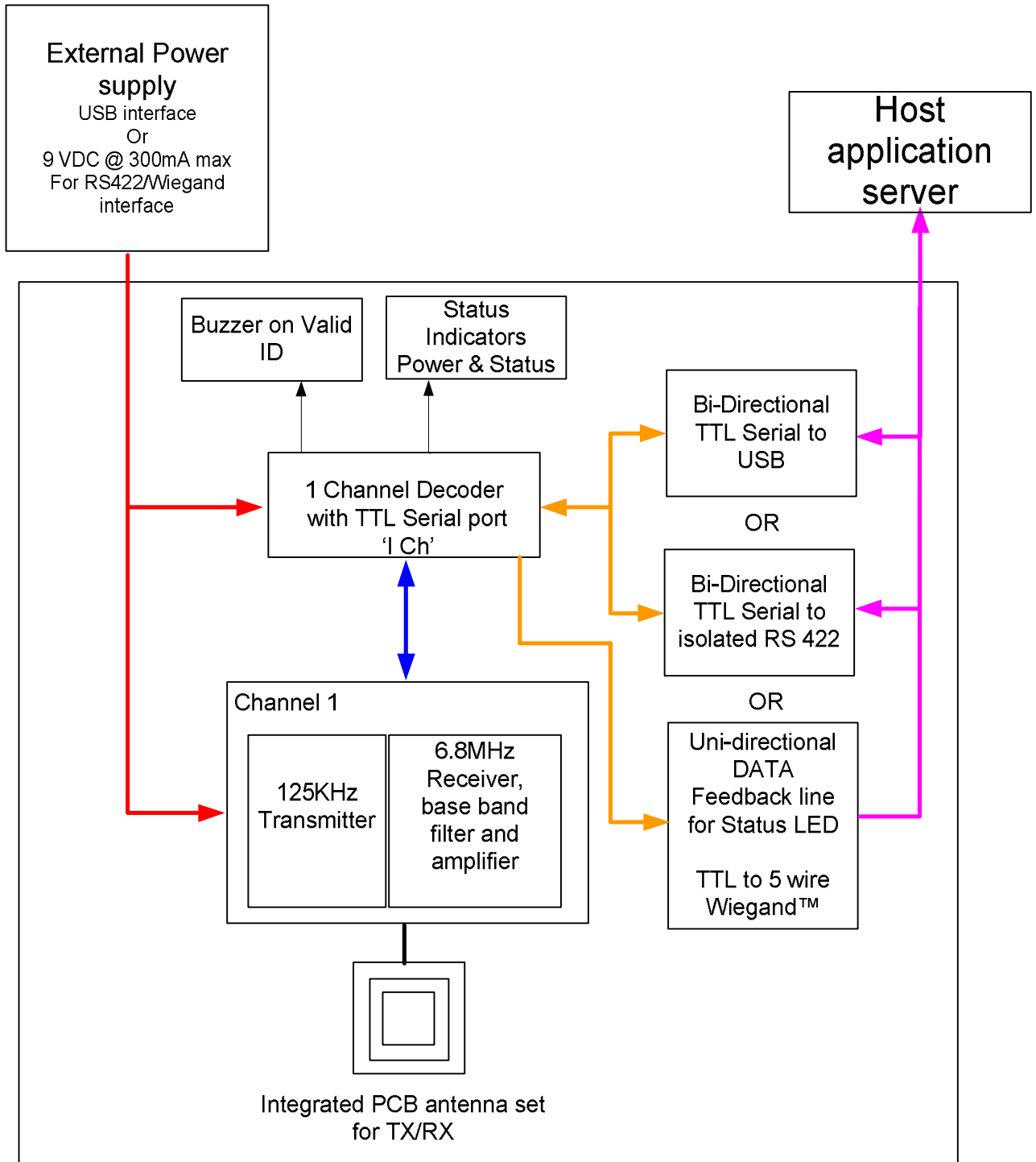


Figure 3 Functional overview of Proximity reader

3. Quick start (Reader connected to PC via USB – Full R/W capability)

1. Connect the reader to the host via the USB cable, and switch the reader ON.
2. Windows will detect a new device. Install the "CP210x USB Composite Device". This driver can be downloaded from the manufacturer at Silicon Laboratories. Windows will detect readers above serial number 5020016 as IPICO Proximity readers.
3. Data format: Refer to IPICO's serial protocol document.

4. Quick start (Reader connected to Host via RS 422 - Full R/W capability)

1. Connect the reader to the host via the RS 422 cable, and switch the reader ON. The Host can be a PC or any other field device like a PLC. If the host does not support RS422 interface, the user can use any commercial RS422/RS232 converter to connect reader to the host.
2. Once connected the user can use HyperTerminal, Showtags or any other client application that can communicate to the reader.
3. Data format: Refer to IPICO's serial protocol document.

5. Quick start (Reader connected to Host via Wiegand™ - R/O capability)

1. Connect the reader to the host via the Wiegand cable, and switch the reader ON. Reader will operate in Read Only mode.
2. The Wiegand settings will be hard coded during manufacturing as follows:
 - a. 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).
 - b. Tpw = 50us, Tpi = 1.8ms and a code retransmit rate of 100ms.
 - c. D0 and D1 are open-collector outputs. User need to supply external pull-up resistors to VCC at the host device.
 - d. LED input can be driven by +5V signal from the host device.

3. 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 E E
          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.

6. Operations overview

The reader transmits CW carriers, which causes the tags in the RF beam to power up and start backscattering their ID codes back to the reader. The RF unit receives the modulated backscatter and decodes the tag ID's. A time stamp is typically added by the reader for each tag read event (Wiegand mode is 26-Bit ID only). The data from the reader is transmitted immediately communication port to the host. No buffering takes place on the reader. When using the USB or RS 422 interface, additional data fields can be added. If more ID's are received from the same tag before its packet had been transmitted, a hit counter is increased. These hit counts are included in the transmitted packet as "I" counts. The length of the tag ID data packet that is sent to the host can be altered. The USB and RS422 readers can be used to WRITE USER DATA into EM4522 tags and also setup these tags to operate in TTO mode. (TTO is a special operational mode of the tag in which the tag will send its USER DATA pages in the presence of a RO or Non-modulating reader)

Refer to the instruction set in the serial protocol document or Showtags document – www.ipico.com.

7. Application notes

- a. Read distances depends on the relationships between Tag size and Antenna characteristics.
- b. Electrical noise sources in close proximity to the reader may influence read performance. The magnetic field produced by the unit may also cause slight interference with other sensitive electronic equipment.
- c. The USB interface allows the reader to be powered from the host as well as for bi-directional communication between the host and the reader. An alternative isolated RS422 interface is also available for integration into industrial point-to-point control applications. The reader is typically used as a desktop registration reader, validation reader, printer programming head or production line programming head, depending on how it integrates into the host application.

8. Troubleshooting

Visual indicator guide

- GREEN Random flashing indicates valid tag ID's are decoded.
- GREEN 1HZ flashing indicates Heartbeat (Shows Decoder is running).
- RED Steady indicates Power ON.

NOTE : in Wiegand mode the Greed LED will be under Host control

Symptom	Possible causes
Red LED Off	Reader switched OFF
	Power source faulty
	Reader faulty
Cannot read a tag although Host communicates with the reader.	Transmitter not switched ON.
	Faulty Tag or incorrect Tag baud rate selection.
	Tag not orientated correctly.
	Faulty Reader front end
	High levels of ambient RF noise operating in the same frequency spectrum as reader.

Table 1 Troubleshooting guide

9. Maintenance

This is a low maintenance device. The user must make sure that the reader is kept clean and dry where possible. Do not use solvents to clean this unit. This unit will encase in a waterproof enclosure. Do not use any switch mode power supplies unless approved by IPICO.

10. Technical specification

Power supply requirement	USB type = 5V from PC @ 300mA RS422 and Wiegand type = 9VDC @ 300mA (less than 5mV ripple)
Transmitter power	-10dBuA/m with 50% duty cycle (10ms ON/OFF) (Antenna power will always be set to be less or equal to the max allowed according to ETSI or FCC, typically 64.8dBuA/m at 10m)
Operating frequency	CH1 TX = 125 KHz CH1 RX = 6.8 MHz
Antenna type	Integrated PCB type (50x44mm, 12windings) (Electrical/Physical configuration to comply with ETSI and FCC)
Read range	Depends on the tag type. Typical read ranges with a laminated ISO credit card = 40mm Can be mounted on metal.
Communication	Reader/Host: USB – bidirectional – Full R/W RS422 – bi-directional – Full R/W 26-bit Wiegand™ - uni-directional – R/O, LED feedback signal from host possible Reader/Tag: iP-X Read Only, Read/Write enabled. EM4322, EM4522
Data storage	No buffer storage on reader. Configuration data storage only.
Electrical interface	USB/Power – via USB type A connector on 600mm fly lead Isolated RS 422/Power = 3pair cable (600mm fly lead) Wiegand/Power = 5 Wire standard (600mm fly lead)
Environmental	Operating temperature range: -10 to +60 Deg C Storage temperature range: -20 to +85 Deg C Humidity: 5 to 95 % non-condensing IP rating: IP54 and IP66 available in proto type housing (production housing will be IP66)
Physical	Approx dimension: 93(L) x 67(W) x 28(D) mm Desktop or wall mount (bracket excluded) Weight: Approx. <50g unpacked
Accessories	Security Enhanced Decoder (application specific-not for general use)

Table 2 Technical Specifications

11. Support

Ordering information

Product Name	Product Code	Description
DF Proximity Reader USB, RWTTO	IP3490 - A	IP-X DFRDR-PROX-USB-RWTTO
DF Proximity Reader RS422, RWTTO	B	IP-X DFRDR-PROX-RS422-RWTTO
DF Proximity Reader Wiegand 26 Bit, RO	C	IP-X DFRDR-PROX-WIEGAND 26Bit-RO
DF Proximity Reader USB, RWTTO (IP66 housing)	D	IP-X DFRDR-PROX-INDUST-USB-RWTTO
DF Proximity Reader RS422, RWTTO (IP66 housing)	E	IP-X DFRDR-PROX-INDUST-WIEGAND 26Bit-RO
DF Proximity Reader Wiegand 26 Bit, RO (IP66 housing)	F	IP-X DFRDR-PROX-INDUST-RS422-RWTTO

Please consult your local dealer for more information regarding the accessories and system design

12. Technical Assistance

Support support@ipico.co.za
IPICO online <http://www.ipico.com>



13. Appendix A: Mechanical layout of preliminary housing

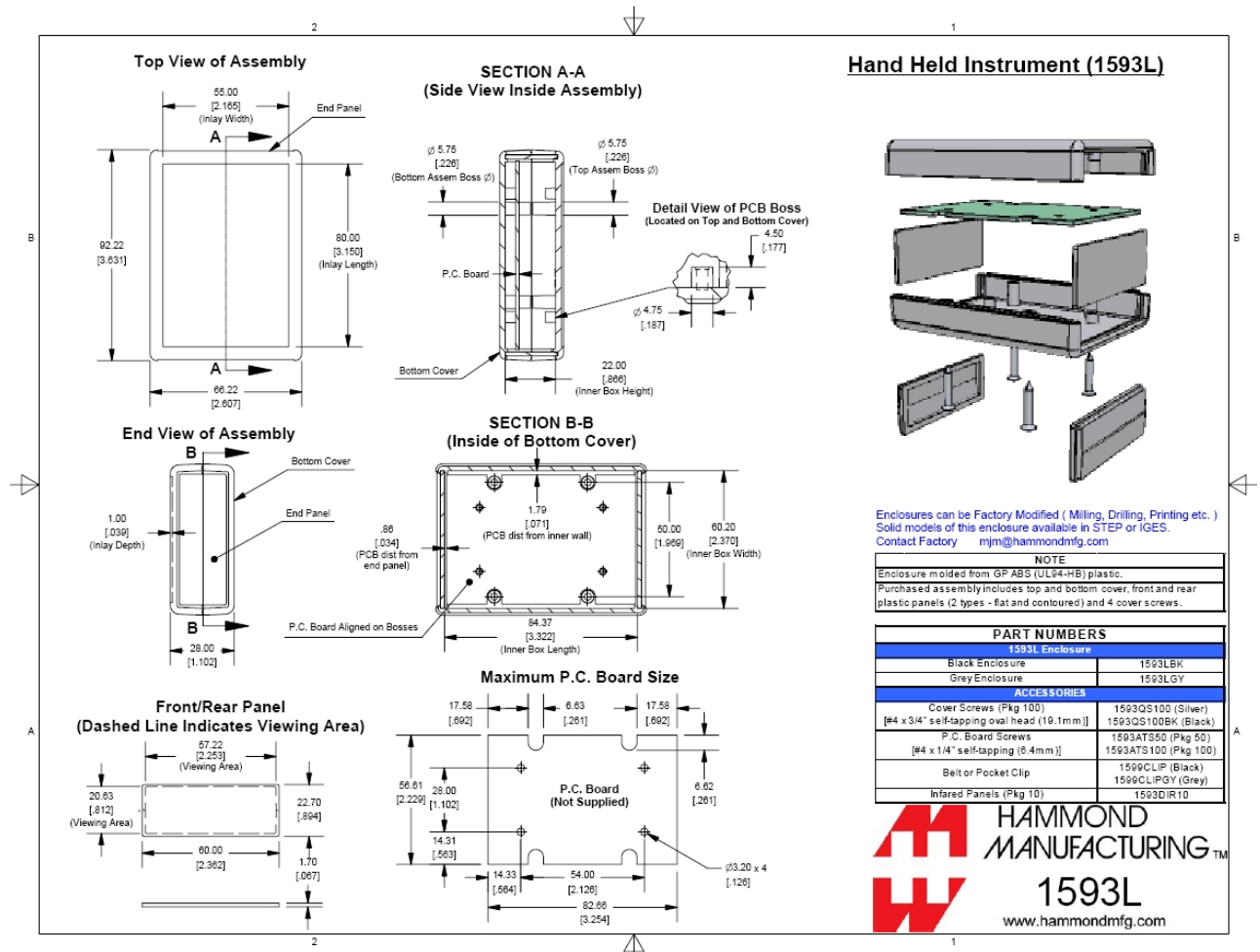
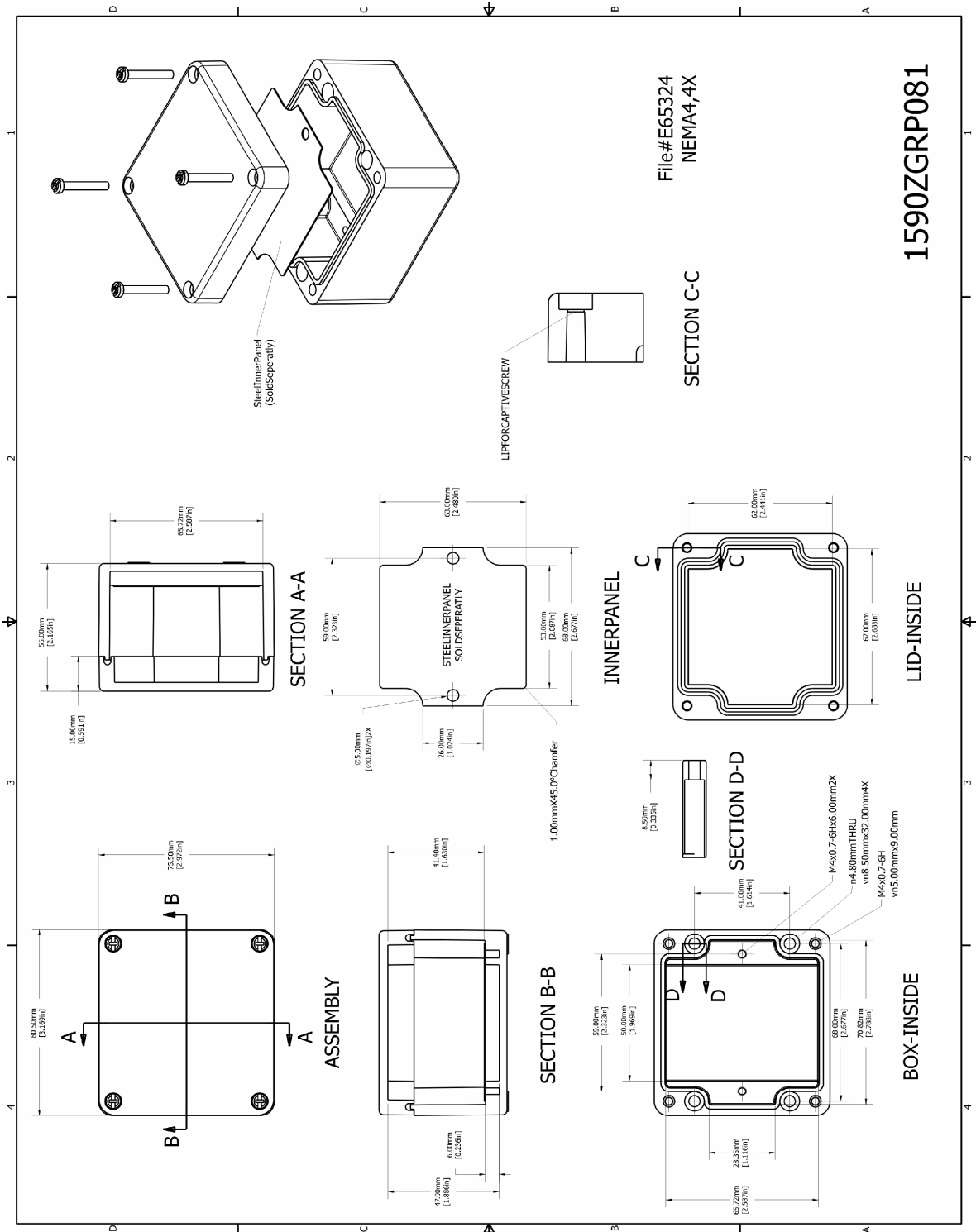
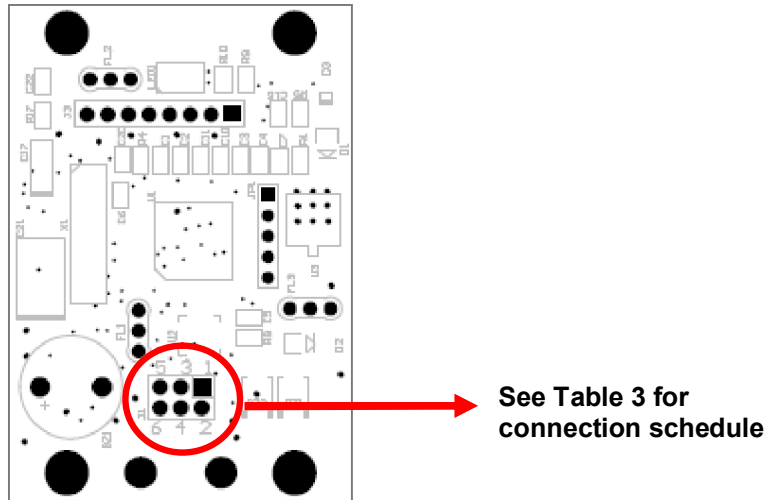


Figure 4 Mechanical layout of Preliminary enclosure

14. Appendix B: Mechanical layout of IP66 Housing



15. Appendix C: Wiring Schedule for reader



PCB Pin Designation	Power/Communication Interface		
	USB	RS 422	Wiegand™
1	Terminated on USB type A connector	+V (White)	+V (Red)
2		GND (Black)	GND (Black)
3		RX- (Red)	D1 (White)
4		RX+ (Blue)	D0 (Green)
5		TX- (Yellow)	LED (Brown)
6		TX+(Green)	NC

Table 3 Wiring Schedule

NOTE:

1. All readers are supplied with an approximately 600mm fly lead that needs to be terminated to a host system.
2. Wiegand interface
 - a. D0 and D1 on Wiegand interface are open-collector outputs. Two external pull-up resistors between D0 and 12V and D1 and 12V (typical 10Kohm) need to be connected to host controller's input side.
 - b. LED input can be driven by 5V, 12V levels

16. Appendix D: Read/Write SW interface overview

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

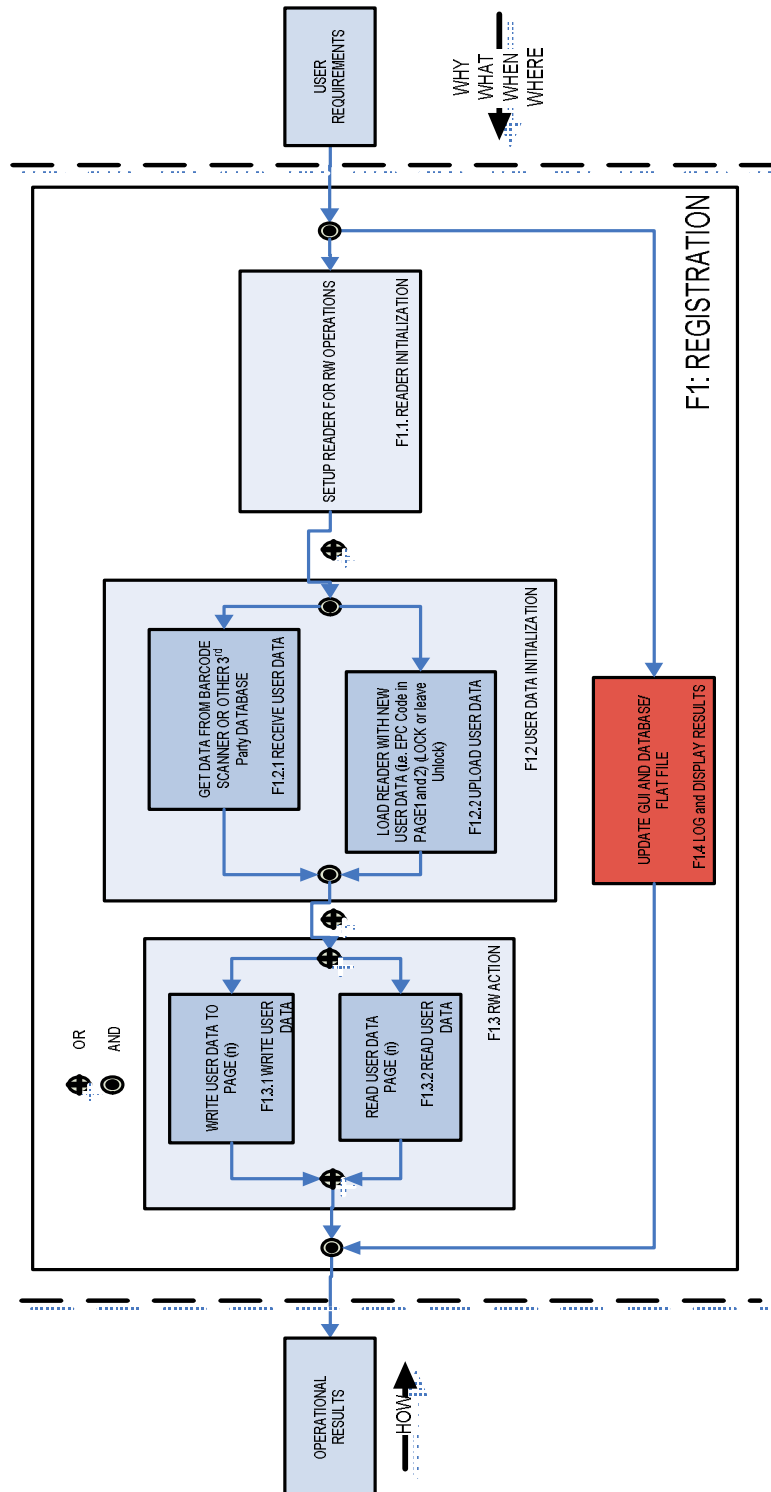


Figure 5. FFBD of RW functionality

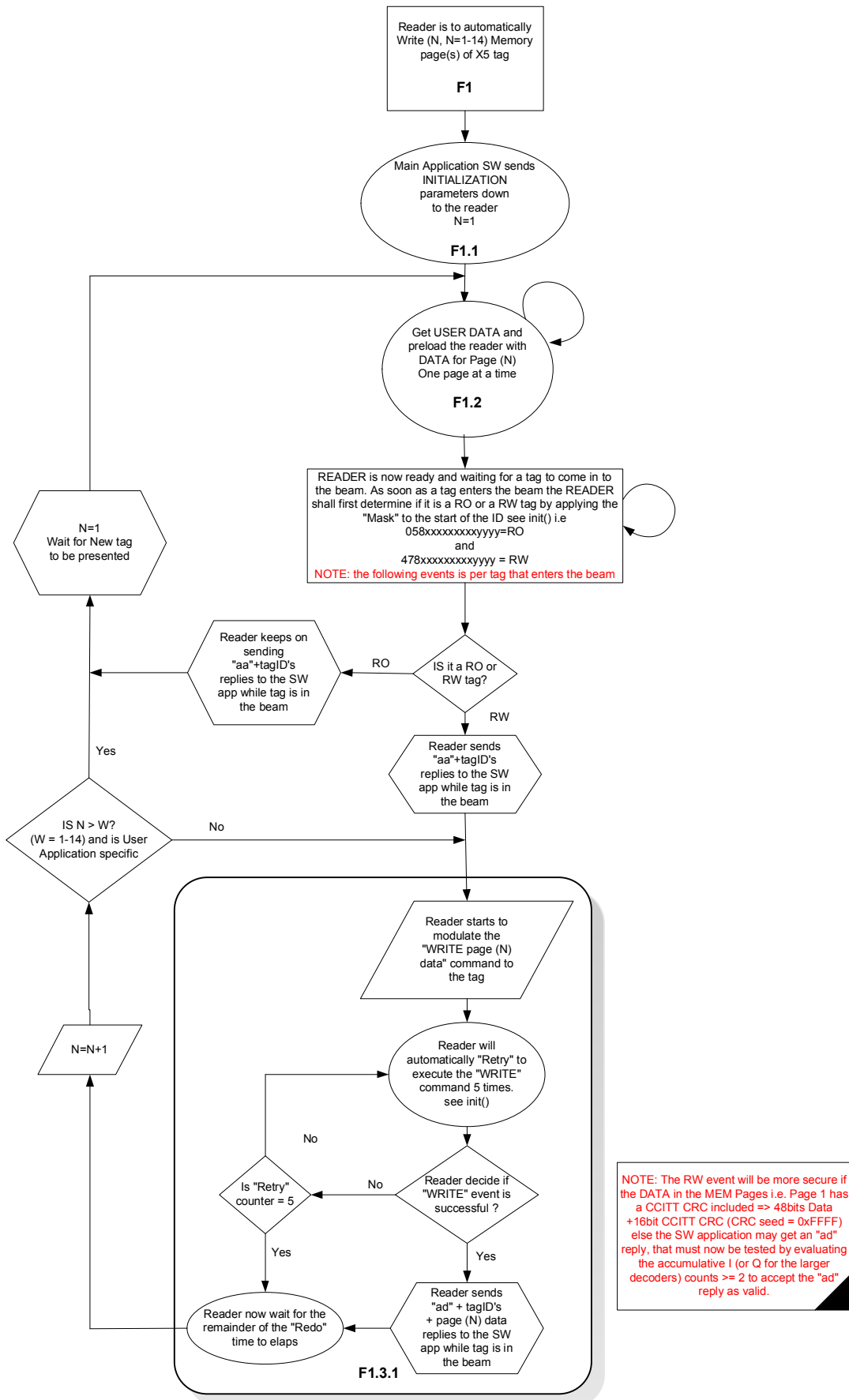


Figure 6. WRITE DATA - Transition Mode diagram (single page at a time)

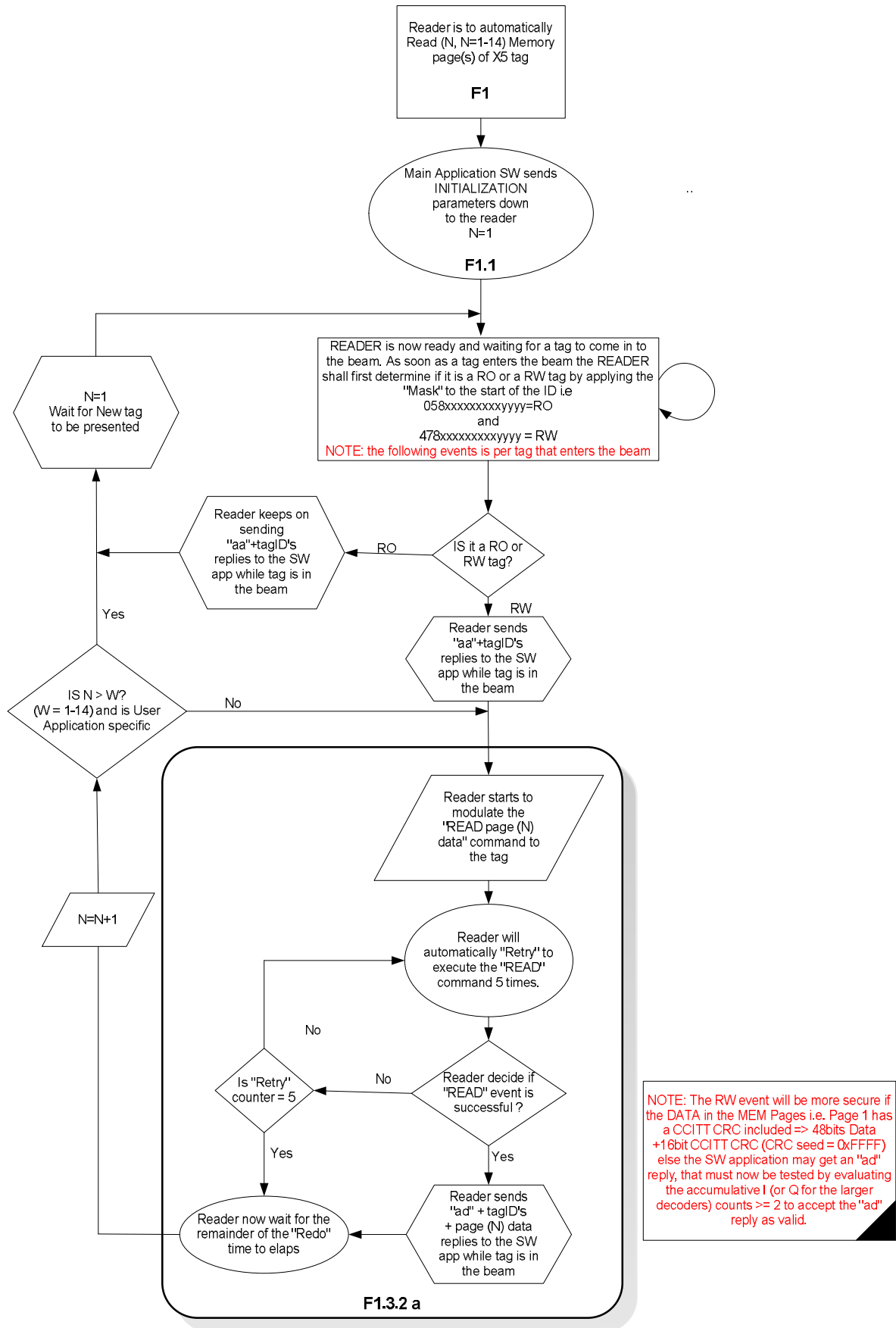


Figure 7. READ DATA - Transition Mode diagram (single page at a time)

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, l count, All 8 UID bytes and LRC	ab00091143ff6161aa000d0a00d3\r\n	ab00001122
1.1.2	Set Message Mode i.e. Normal	ab00030900ff07b\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 3rd 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 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