# CS203X-2 EPC Class 1 Gen 2 RFID Reader User's Manual



Version 2.0

*CSL: The One-Stop-Shop for RFID Solutions*

# 1 Content

# 2    FCC and FCC Statement

FCC regulatory conformance：

 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.

**NOTE:** 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 in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.  If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

 - Reorient or relocate the receiving antenna.

 - Increase the separation between the equipment and receiver.

 -Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

 -Consult the dealer or an experienced radio/TV technician for help

**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.

## RF Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 30 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

**IC regulatory conformance**

This device complies with CAN ICES-3 (B)/NMB-3(B).

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Cet appareil est conforme à la norme CAN ICES-3 (B)/NMB-3 (B).

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## RF Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 30 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux rayonnements de la IC établies pour unenvironnement non contrôé. Cet équipement doit être installé et fonctionner à au moins 30cm de distance d'un radiateur ou de votre corps.

# 3      Introduction on Features

## 3.1      CS203X-2 RFID Fixed Reader

The CS203X-2 RFID fixed reader is a reader designed to work with an any personal computer via the ethernet connection, where the application on the PCs would control the CS203X-2 reader to perform RFID tag reading and GPIO port ON/OFF operation.

Below photo shows the typical connection during operation of CS203X-2 fixed reader
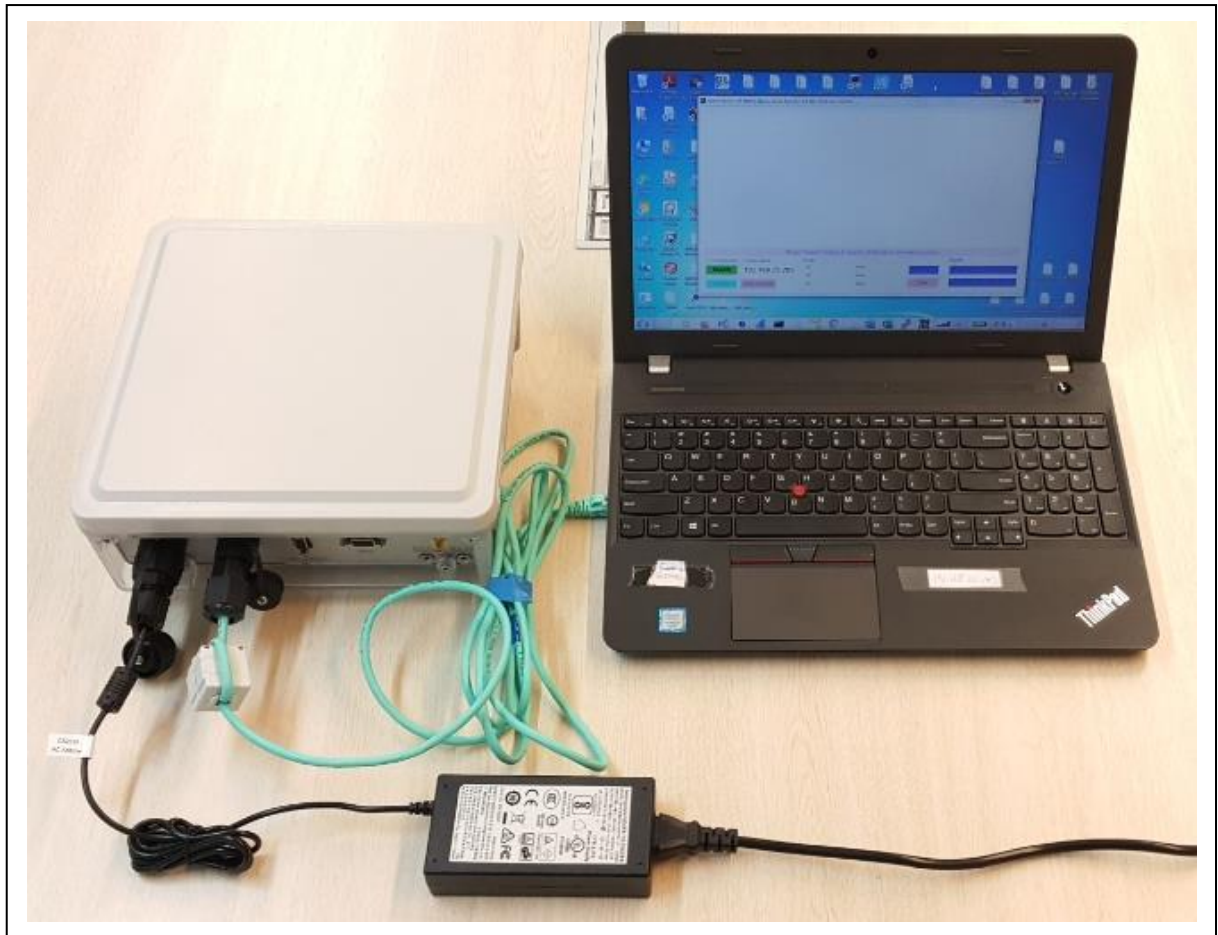


Note: DO NOT use any antenna not including in the shipment package or specify within the product manual. Use only the Power Adaptor Unit included in the package.

# 3.2    Product Package

## 3.2.1    Basic Package Content

The reader package contains:

- A CS203X-2 fixed reader
- Power Adaptor Unit
- Ethernet Cable– 1 piece

# 3.3    Product Specification



**Figure 3-1 CS203X-2 Fixed Reader**

**Features:**

■ ISO 18000-6C and EPCglobal Class 1 Gen 2 UHF RFID protocol compliant including dense reader mode

■ Ultra long read range – peak at more than 18 meters for Monza R6 Dogbone tag

■ Sophisticated data handling for efficient management of large streams of tag data.

■ Highly configurable buffering and tag filtering modes to eliminate the redundant tag data so as to reduce LAN traffic and server loading

■ Robust performance in dense-reader environments

■ Excellent in transmit and receive mode – generates a different combination of unique reader-to-tag command rate, tag-to-reader backscatter rate, modulation format, and backscatter type

■ Configurable parameters offer maximum throughput and optimal performance

■ Supports all Gen 2 commands, including write, lock and kill

**Specifications:**

| | |
|---|---|
| **Physical Characteristics:** | Length: 26.5 cm; Width: 26.5 cm; Height: 12 cm; Weight: 4180 grams |
| **Environment:** | Operating Temp: $-20^0$C to $50^0$C<br>Storage Temp: $-40^0$C to $85^0$C<br>Humidity: 5% to 95% non-condensing |
| **Antenna:** | External antenna has a RP-SMA male connector |
| **RF Power:** | Internal conducted power 30 dBm |
| **EIRP Power:** | 35 dBm (max.) |
| **RFID Frequency Ranges:** | 902 -928 MHz band |
| **Connectivity** | Ethernet , Debug Serial(RS232) |
| **Accessories:** | Ethernet cable<br>GPIO cable |
| **Order Code:** | CS203X-2 |
| **Restrictions on Use:** | Approvals, features and parameters may vary depending on country legislation and may change without notice |

# 4    Introduction on Application

## 4.1    Basic Hardware

The CSL CS203X-2 RFID Reader is an EPCglobal Class 1 Gen 2 handheld reader product.

Below is the front view of the CS203X-2 reader. There are LEDs at side to indicate the operating status

1) Power On
2) RFID Read
3) Active antenna port being selected (default internal)



**Figure 4-1 CS203X-2 Reader Front-side View**
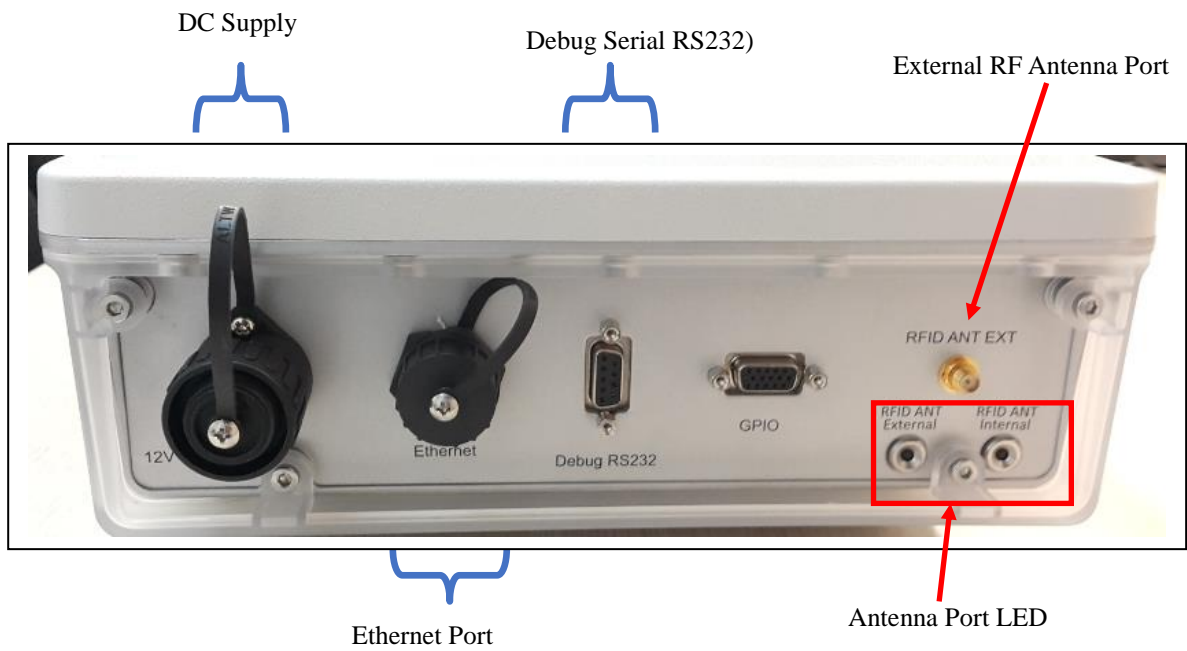
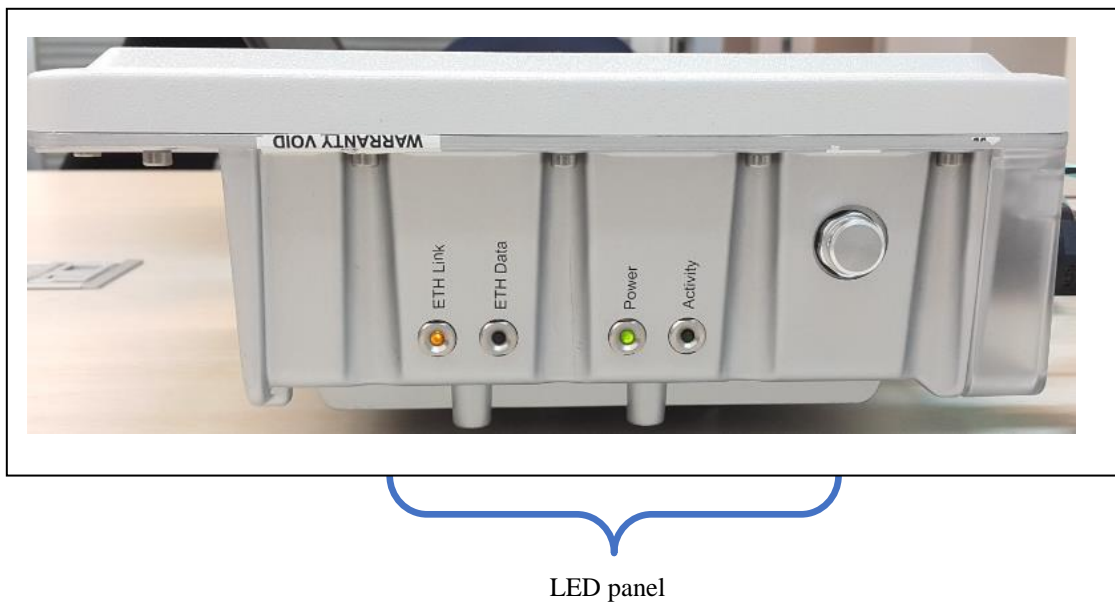Below is the bottom-side views of the CS203X-2 reader.



**Figure 4-2 : CS203X-2 Reader bottom-side View**



**Figure 4-3 : CS203X-2 Reader Left-side View**

**Figure 4-4: CS203X-2 Reader Top-side View**



**Figure 4-5: CS203X-2 Reader Rear-side View**

## 4.2    Power Supply

1) Power Adaptor Unit

CS203X-2 reader can be power up with the power adaptor unit included in the package. This will guarantee that CS203X-2 reader can operating in the optimal condition with its internal built-in patch antenna. Below show the typical connection to use the power adaptor.
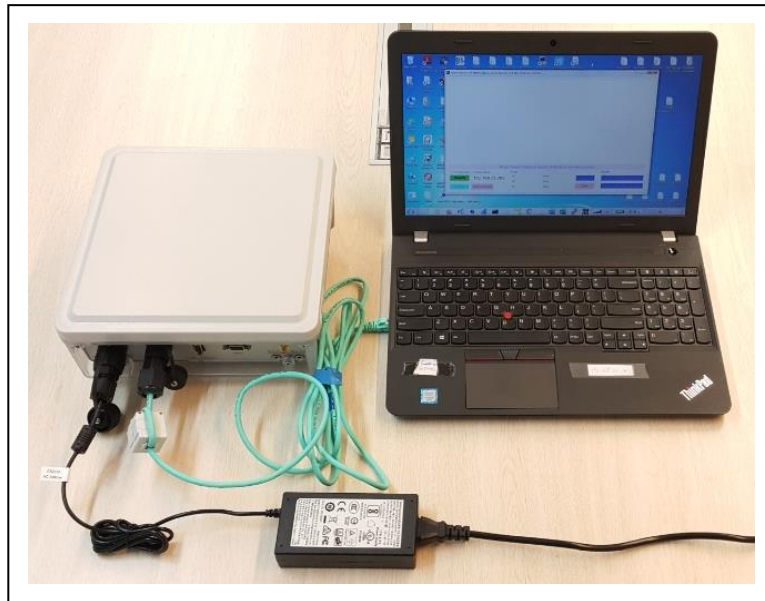


2) PoE+ Switch

CS203X-2 also supports the use of Power over Ethernet (PoE+) switch. Below shows the typical connection of using PoE as the power supply to the CS203X-2 reader.
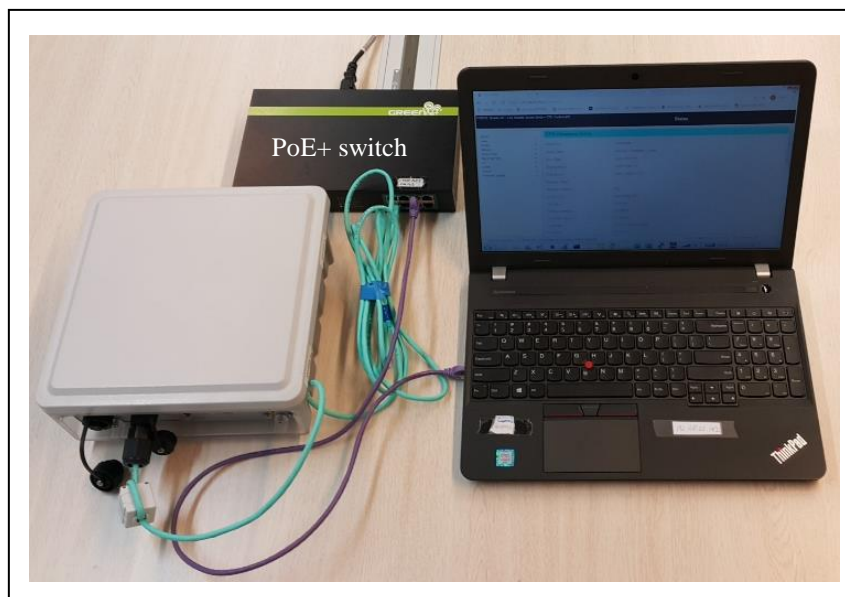
## 4.3   Demo Software on PC

The CS203X-2 can be controlled via the Ethernet.   In this case user need to connect the PC with CS203X-2 with a Ethernet cable directly or via a router.

Below is the screen capture of a Demo application, which is also available for download from Convergence website (www.convergence.com.hk), on PC controlling CS203X-2.   Everything is self-explanatory in the application:
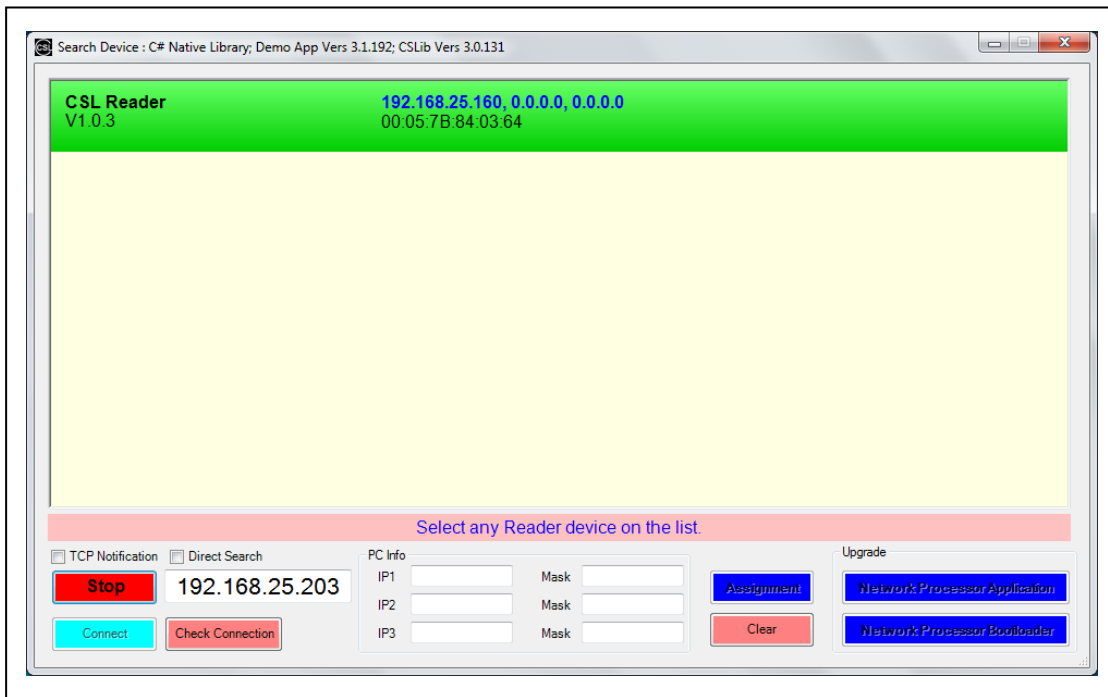


**Figure 4-6 PC Application Screen – controlling CS203X-2 via ethernet**

Below shows the main menu of the PC Demo application. User can perform typical basic tag

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operations via this PC Demo application as mentioned below.

- Inventory
- Tag memory bank read and write
- GPIO On/Off control
- Antenna port settings
- Output power settings
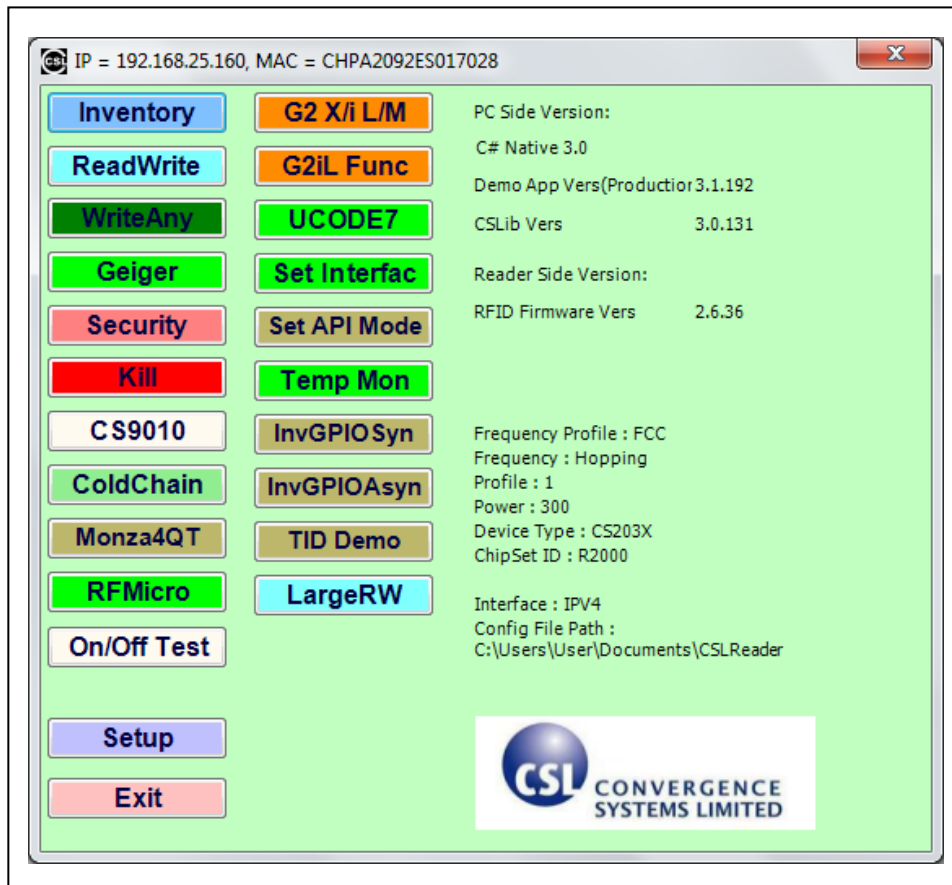


Fig 4-7 Main menu of PC Demo application

For example, if user need to carry out inventory operation, it is necessary to click the "Inventory" icon in Fig 4-7. The corresponding sub-menu has been shown in Fig 4-8 below.

Fig 4-8 Inventory operation using PC Demo application

# 4.4 GPIO Port Signals

Below figure shows the output and input signal for the GPIO signals.
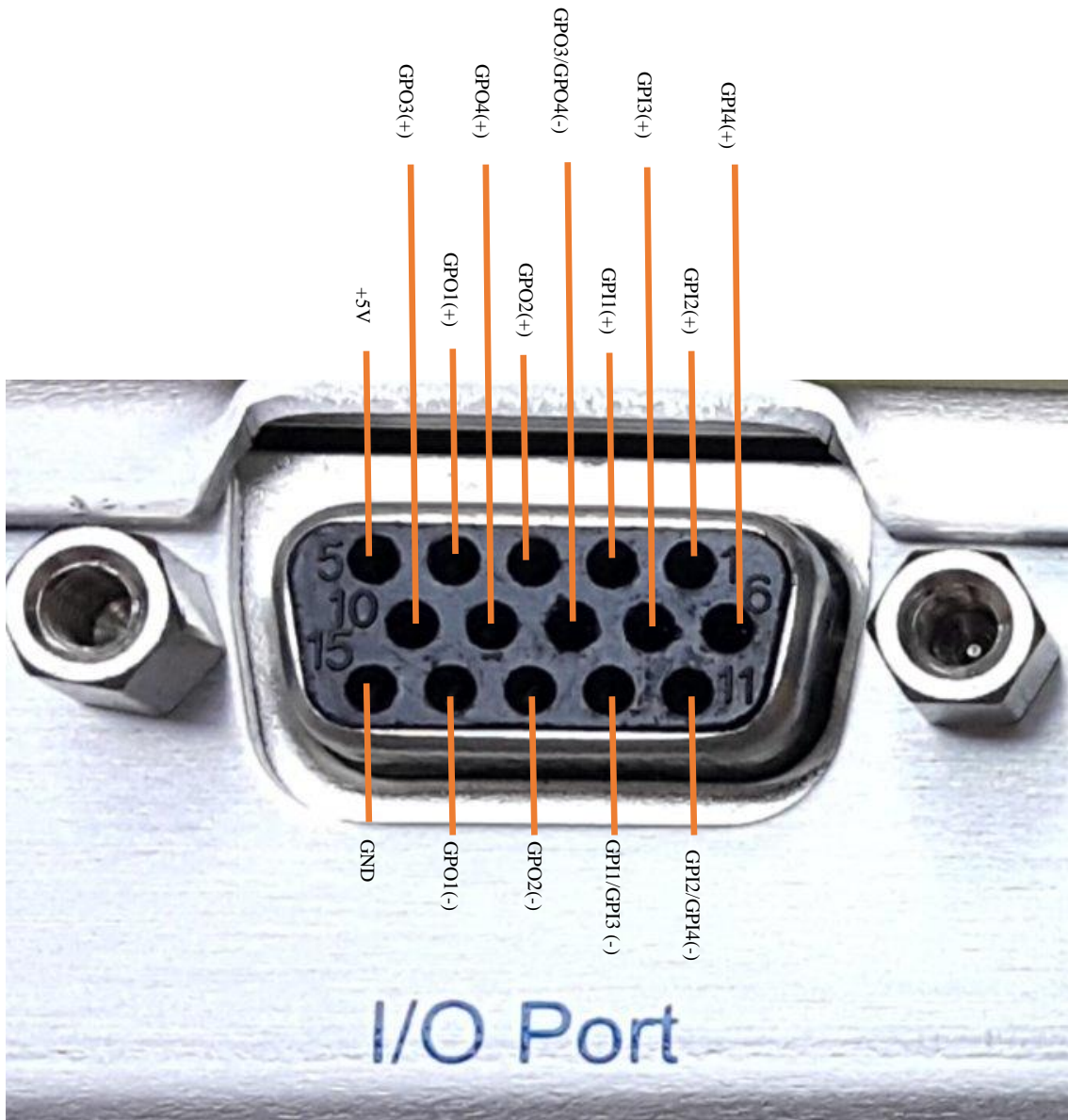
GPI : Input ports

GPO : Output ports



Fig 4-9 GPIO Input and Output signals

# Appendix A.  Frequency Channel Table

**FCC Band Channels**

| Channel number | Frequency (MHz) | Channel number | Frequency (MHz) | Channel number | Frequency (MHz) |
|---|---|---|---|---|---|
| 1 | 902.75 | 18 | 911.25 | 35 | 919.75 |
| 2 | 903.25 | 19 | 911.75 | 36 | 920.25 |
| 3 | 903.75 | 20 | 912.25 | 37 | 920.75 |
| 4 | 904.25 | 21 | 912.75 | 38 | 921.25 |
| 5 | 904.75 | 22 | 913.25 | 39 | 921.75 |
| 6 | 905.25 | 23 | 913.75 | 40 | 922.25 |
| 7 | 905.75 | 24 | 914.25 | 41 | 922.75 |
| 8 | 906.25 | 25 | 914.75 | 42 | 923.25 |
| 9 | 906.75 | 26 | 915.25 | 43 | 923.75 |
| 10 | 907.25 | 27 | 915.75 | 44 | 924.25 |
| 11 | 907.75 | 28 | 916.25 | 45 | 924.75 |
| 12 | 908.25 | 29 | 916.75 | 46 | 925.25 |
| 13 | 908.75 | 30 | 917.25 | 47 | 925.75 |
| 14 | 909.25 | 31 | 917.75 | 48 | 926.25 |
| 15 | 909.75 | 32 | 918.25 | 49 | 926.75 |
| 16 | 910.25 | 33 | 918.75 | 50 | 927.25 |
| 17 | 910.75 | 34 | 919.25 |  |  |

# Appendix B. Link Profiles of CS203X-2 RFID Reader

| Link Profile | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| R-T Modulation | DSB-ASK | PR-ASK | PR-ASK | DSB-ASK |
| Tari (µs) | 25.00 | 25.00 | 25.00 | 6.25 |
| X | 1.00 | 0.50 | 0.50 | 0.50 |
| PW (Pulse Width in usec) | 12.50 | 12.50 | 12.50 | 3.13 |
| RTcal (usec) | 75.00 | 62.50 | 62.50 | 15.63 |
| TRcal (usec) | 200.00 | 85.33 | 71.11 | 20.00 |
| DR (Divide Ratio) | 8 | 64/3 | 64/3 | 8 |
| T-R Modulation | FM0 | Miller-4 | Miller-4 | FM0 |
| TRExt | 1 | 1 | 1 | 1 |
| LF (kbps) | 40 | 250 | 300 | 400 |
| Data Rate (kbps) | 40 | 62.5 | 75 | 400 |

# Appendix C. Antenna ports operation description

**CS203X-2 is a reader where the ports are switched on in time one by one. At any time only 1 port is switched on and the RF power comes out only at that port. The rest of the ports are turned off so that no energy comes out from the other ports.**

| Time Slot | Antenna Port Status | |
|---|---|---|
| | **Port 1** | **Port 2** |
| 1 | On | Off |
| 2 | Off | On |

The Antenna should be set up 0.5 meter apart is shown as below:

0.5 meter

Antenna 1
(Internal)
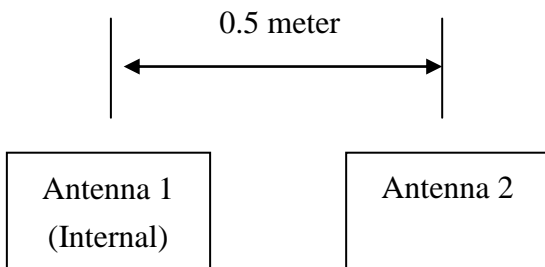
Antenna 2

Energy coming out of 1 antenna (note that CS203X-2 is switched on in time one by one so that at any 1 moment in time ONLY 1 antenna is