



CSL CS203ETHER-2LHCP/2RHCP EPC Class 1 Gen 2 RFID INTEGRATED Reader

User's Manual

Version 1.0

CSL: The One-Stop-Shop for RFID Solutions

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2 FCC Statement

FCC NOTICE: To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination is expressly forbidden. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

3 Introduction

3.1 Product Package

3.1.1 Basic Package Content

The reader package contains:

- Integrated reader
- waterproof LAN Cable for converting to regular RJ45 Ethernet connector
- GPIO cable
- 12V switching power supply
- Extended mounting stud and nuts
- Plastic caps for connectors and cables

3.1.2 Product Specifications



Fig 1-1 CS203ETHER-2 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 7 meters for Banjo tag
- Ultra high read rate – peak at 300 tags per second
- Choices of right hand circular polarization antenna version and left hand circular polarization antenna version for different application scenarios
- 400 kbps tag-to-reader data rate profile
- 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: 30 cm; Width: 30 cm; Height: 7.5 cm; Weight: 2 Kg
Environment:	Operating Temp: 0 ⁰ C to 50 ⁰ C Storage Temp: -40 ⁰ C to 85 ⁰ C Humidity: 5% to 95% non-condensing Enclosure: IP-65
Antenna:	Choice of: Left Hand Circular Polarized Antenna (LHCP) Right Hand Circular Polarized Antenna (RHCP)
Power:	12 Volt supplied via an AC/DC adaptor or IEEE 802.3af compliant Power Over Ethernet enabled power source
RFID Frequency Ranges:	902-928 MHz band
Interfaces	LAN TCP/IP (Configurable to use fixed IP address or DHCP)
Maximum Tag Read Rate:	150 tag/sec.
Maximum Speed of Tag:	660 ft/min
Accessories:	<ul style="list-style-type: none"> • SFTP waterproof LAN Cable for converting to regular RJ45 Ethernet connector • GPIO cable • 12V switching power supply • Extended mounting stud and nuts • Plastic caps for connectors and cables
Accessories (Optional)	POE Adaptor
Order Code:	CS203ETHER-2LHCP CS203ETHER-2RHCP
Restrictions on Use:	Approvals, features and parameters may vary depending on country legislation and may change without notice

4 Hardware Installation

4.1 Hardware Content of Shipment Package

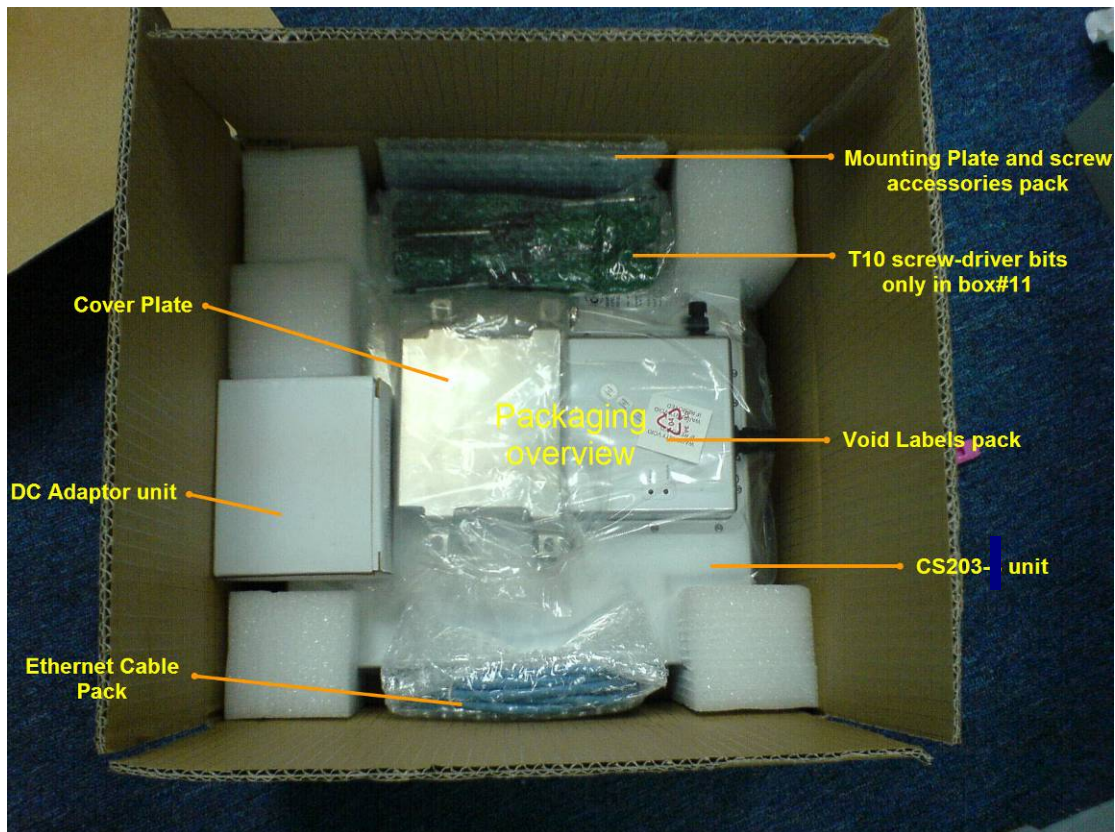


Figure 4.1 Packing Content

4.1.1 CS203 Reader

The CSL CS203ETHER-2 integrated RFID Reader is an EPCglobal Class 1 Gen 2 integrated reader product.



Figure 4-2 CS203ETHER Reader Side View



Figure 4-3 CS203ETHER Reader Side View

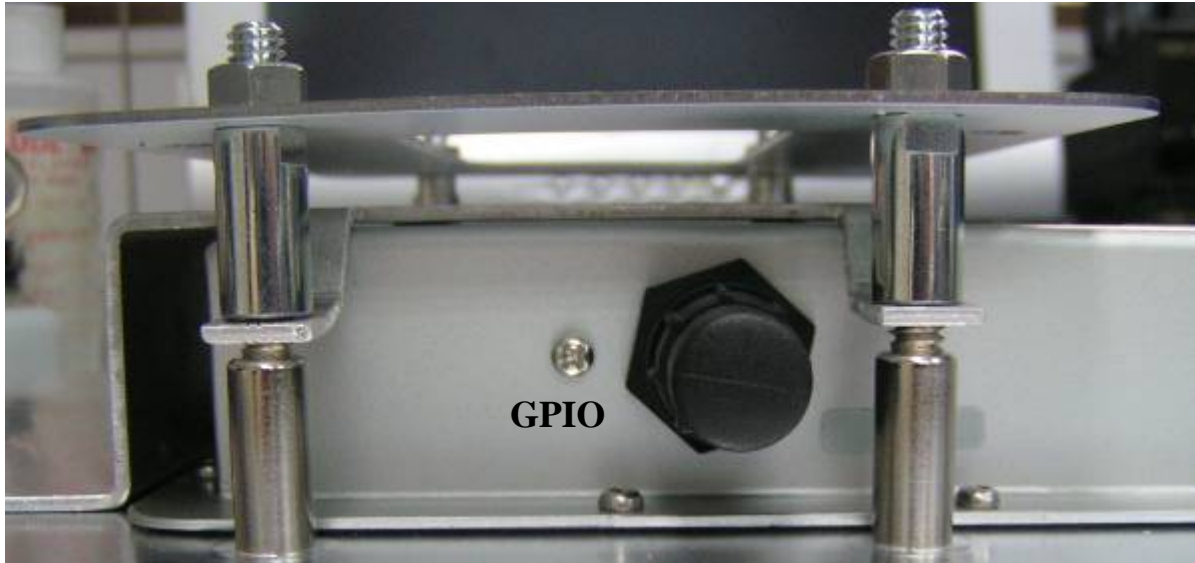


Figure 4-4 CS203ETHER Reader Side View

4.2 Mounting

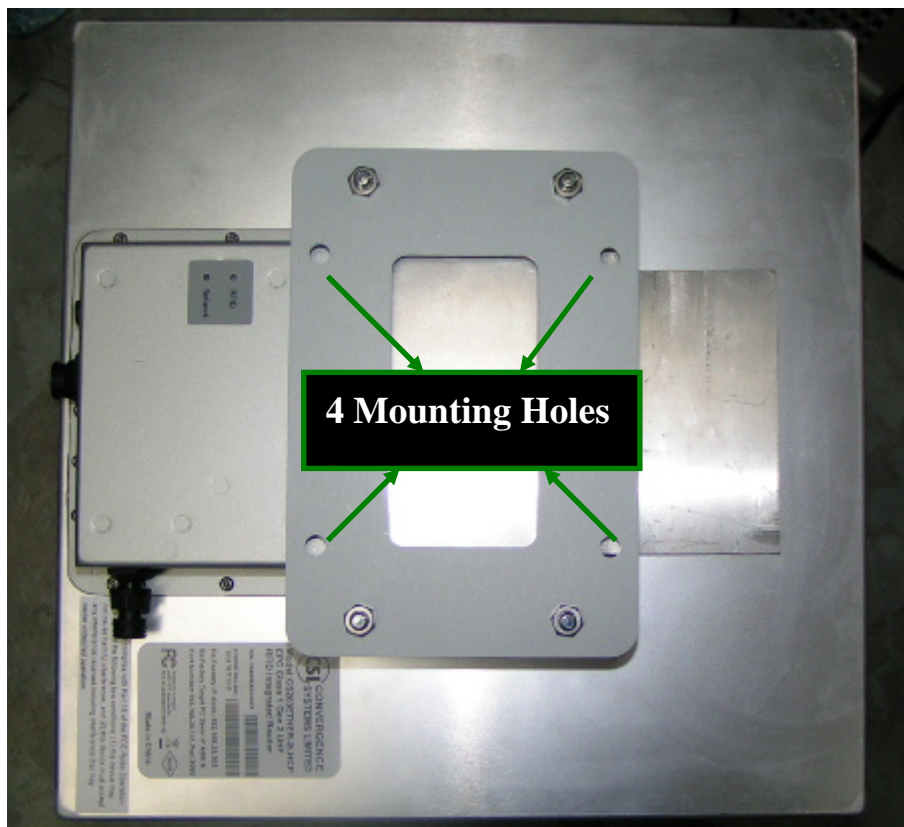


Figure 4-5 CS203ETHER Mounting

4.3 Operating Setup

CS203ETHER-2 has two power up modes: POE mode and 12V power supply mode.



Figure 2-5 POE adaptor Setup

The reader is connected to POE adaptor's output port via the cable provided in the package. The input port of POE adaptor is connected to a host computer.

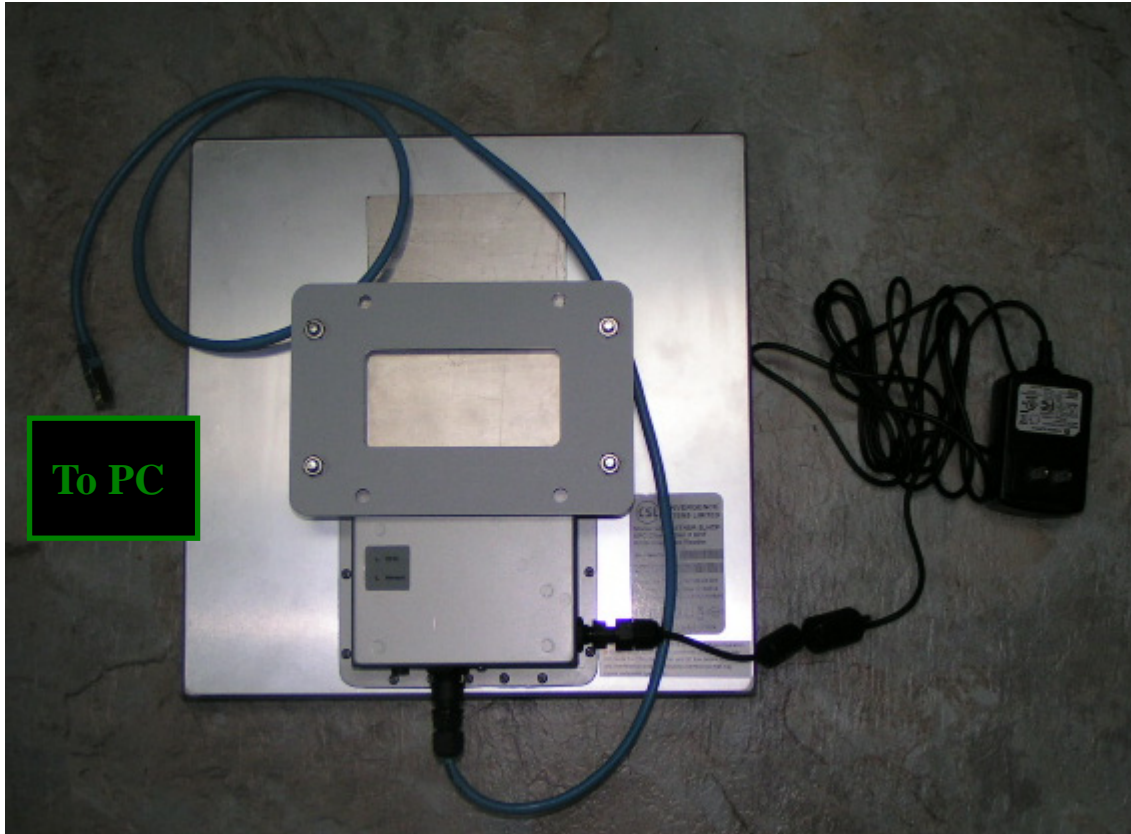


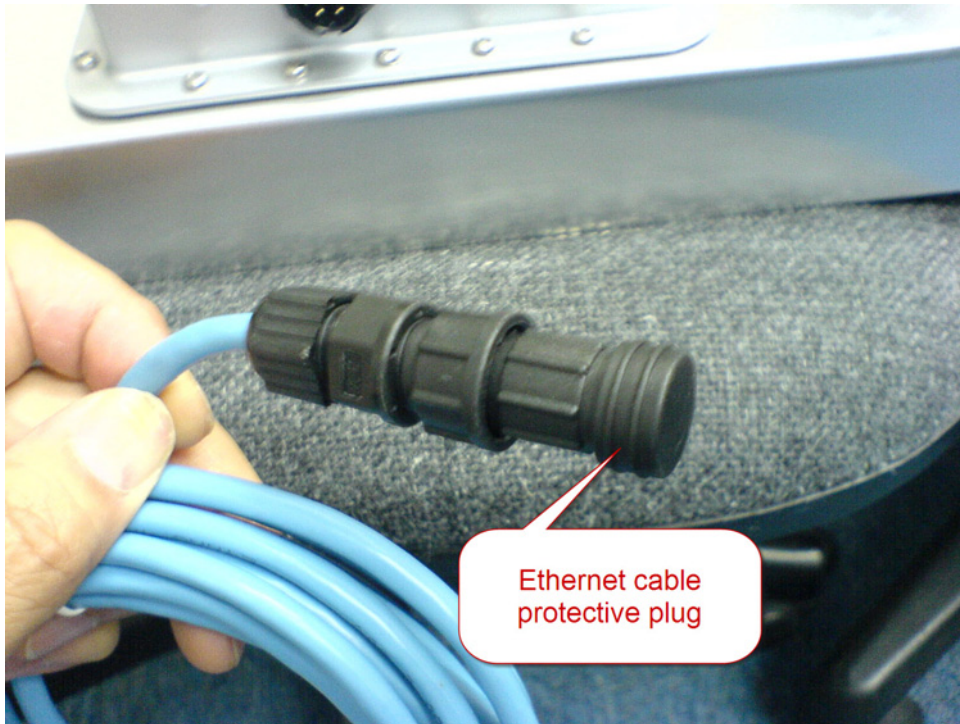
Figure 2-6 12V power supply Setup

The reader is directly connected to a host computer via the cable provided in the package.

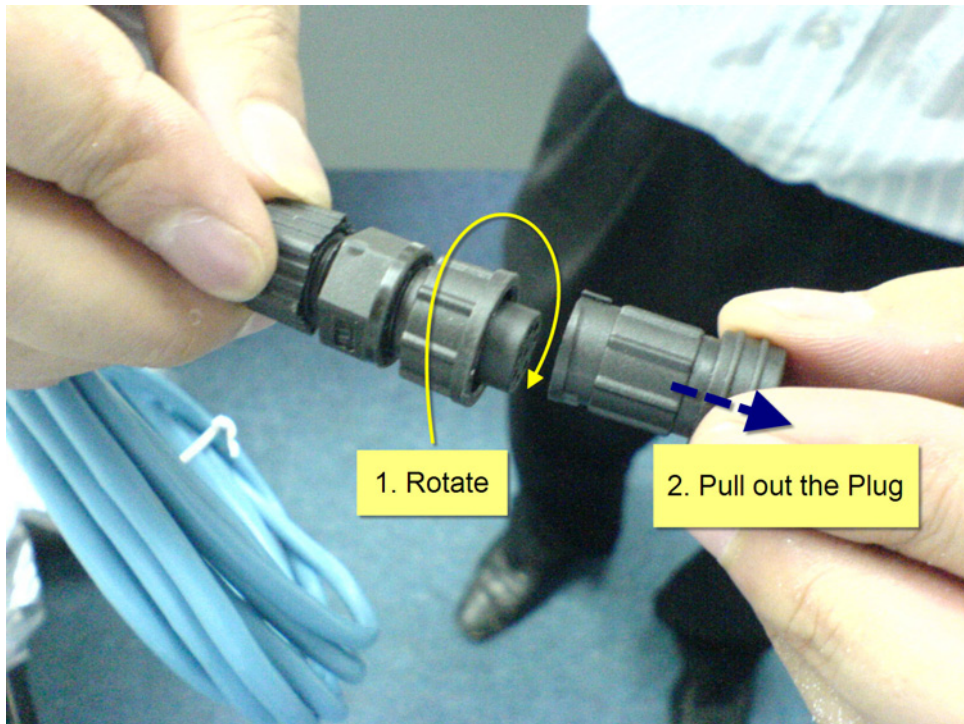
4.4 Cable Connection for CS203

4.4.1 Ethernet Cable Connection for CS203

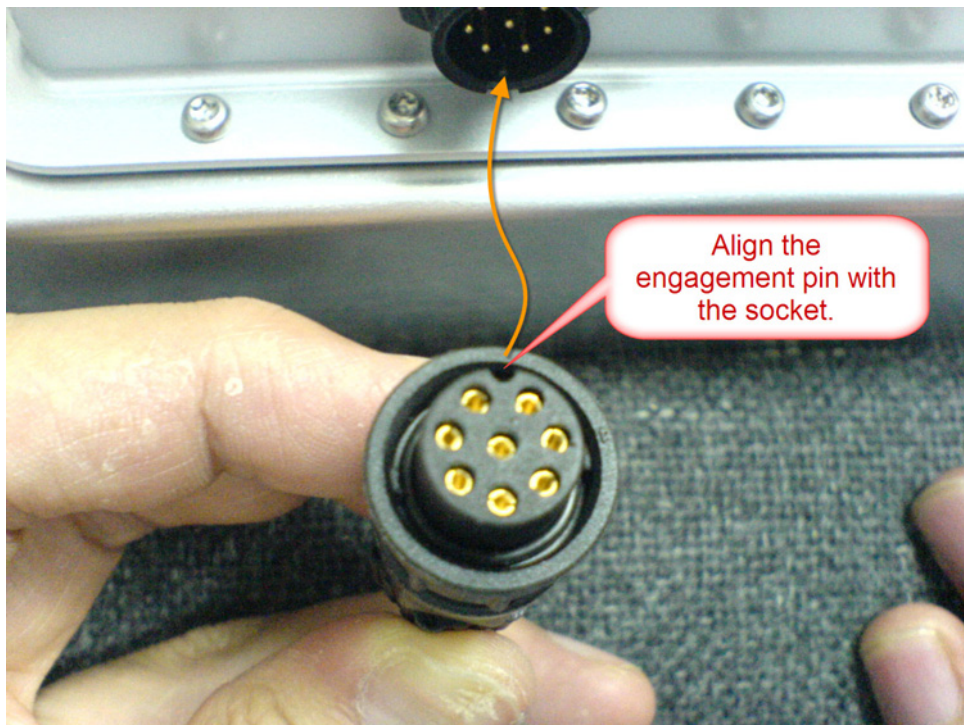
For Ethernet cable, remove the protective plug first followed with the below procedure.



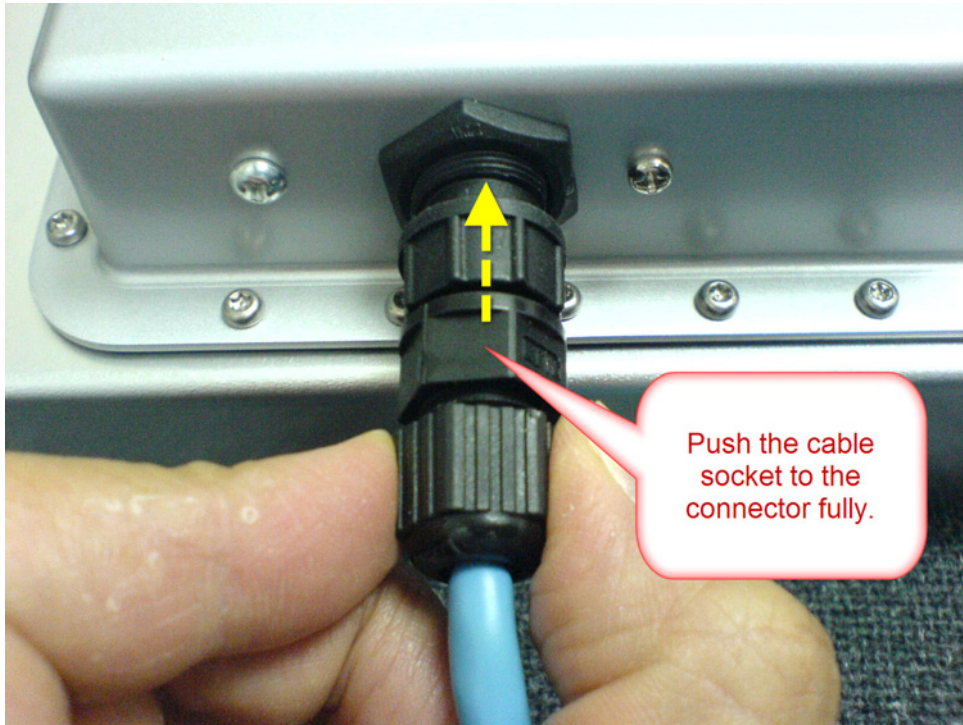
Rotate the security cap and then pull out the protective cover.



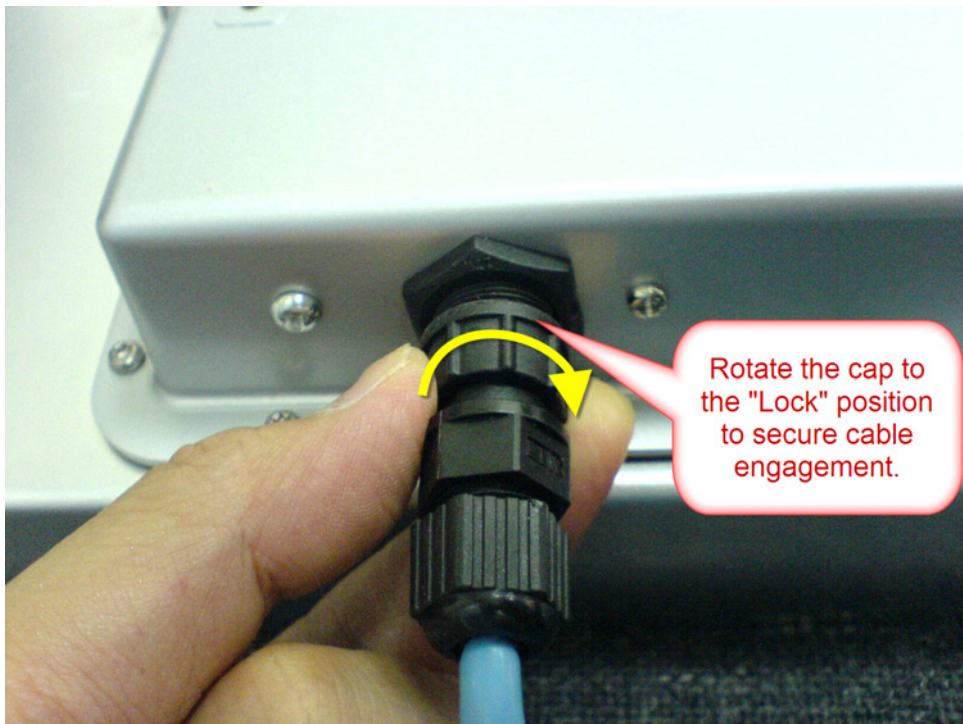
Align the engagement pin with the rib on the Ethernet cable socket on the CS203.



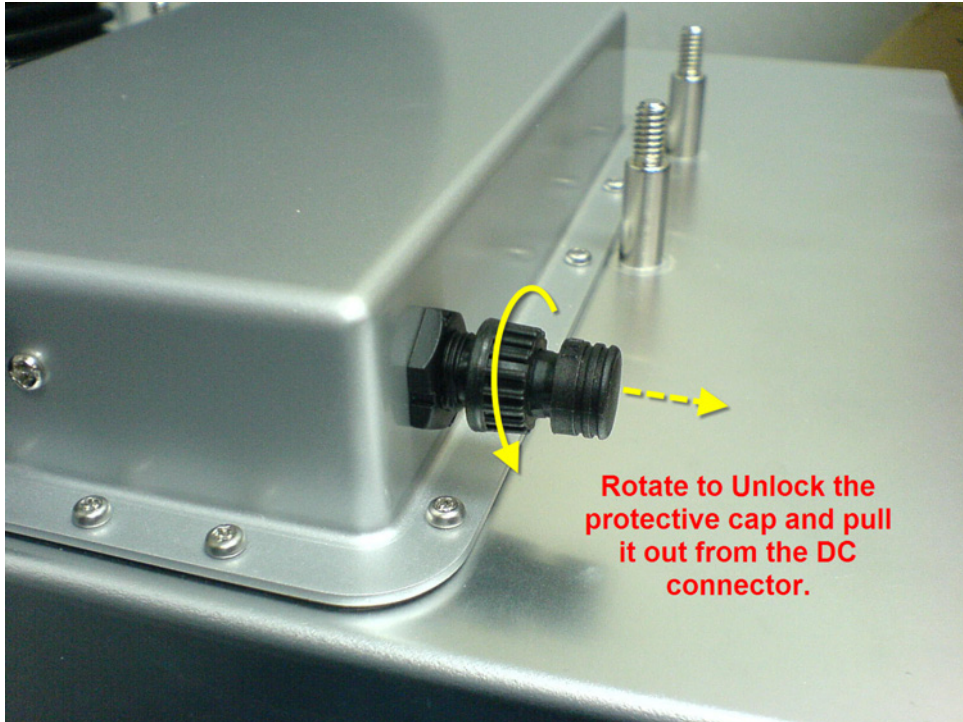
Engage the pins on the connector and push fully the cable head to the socket.



Secure the Ethernet cable engagement by rotating the cap to the “LOCK” position on the cable gland. **Finish.**



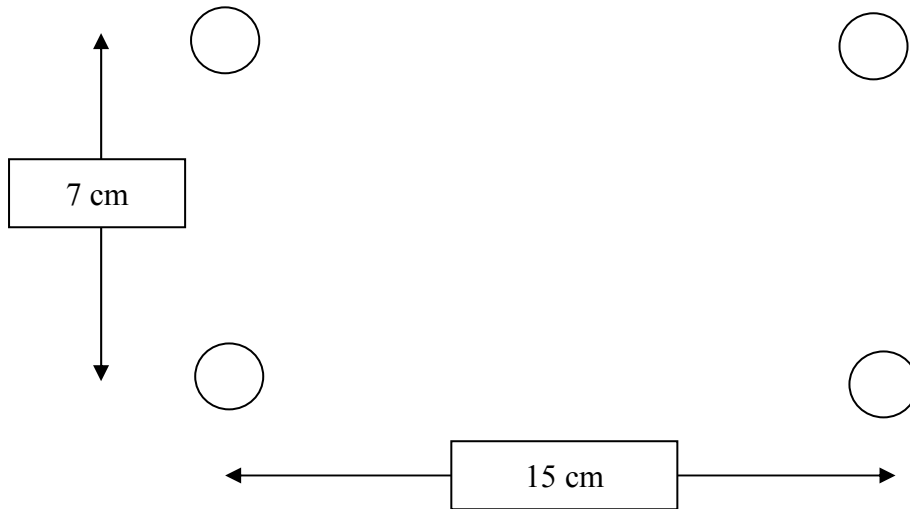
For DC connector, remove the protective cap. Connect the DC adaptor cable to the socket in the same manner as the Ethernet connector. **Finish.**



4.5 Reader Mechanical Mounting

The four rear mounting holes are spaced in the following manner for mechanical mounting:

$\frac{1}{4}$ x 0.625 inch studs with 20 threads/inch



5 Software Installation

5.1 Software Content of Shipment Package

The shipment CDROM contains a zip file that includes 6 folders.

- | | |
|---------------------------|---|
| 1. CS203 GPIO | Demo how to change GPIO and IP settings |
| 2. CS203 Start Stop Debug | This shows how to start and stop CS203 many times |
| 3. CSLibrary | CSL Library is placed here |
| 4. DEMO | Demo Application setup folder |
| 5. Document | All documents are placed in this directory |
| 6. Demo App Source Code | CS203 Demo Application Source Code |

5.2 PC Side Prerequisites

The PC needs to be installed with Dot Net Framework 3.5.

5.3 PC Side Libraries and API Document

On the PC side, there are 4 dll libraries:

1. RFID_XP.dll
2. rfid.dll
3. rfidtx.dll
4. cpl.dll

5.4 Default Ex-Factory IP Settings

CS203 is shipped out with the following default ex-factory IP settings:

Reader IP address:

IP = 192.168.25.203

Target PC Server IP address and Subnet Mask:

IP = 192.168.25.141

Subnet Mask = 255.255.255.0

For the first connection to it, one can use a PC or a laptop, set it to the IP address of 192.168.25.141 with subnet mask 255.255.255.0, then run the CS203GPIO application that comes with the CS203 package. On that application, one can then change CS203's own IP as well as its targeted PC server IP address. This is described in the next section.

5.5 Changing IP Addresses

After initial unpacking and connecting to the CS203 reader using the default ex-factory device and PC server IP address, the system integrator will need to change the IP address of the CS203 reader, as well as the PC server it connects to, to the actual IP address at the site.

There are 2 ways to change the IP. Either using the "Netfinder" program or the "CS203 GPIO Program". The "Netfinder" Program is run by setting the CS203 into bootloader mode. The "CS203 GPIO" program is run with the CS203 in normal operation mode.

5.5.1 "Netfinder" Program Method

5.5.1.1 Hardware Setup

The only external hardware connections required by the CS203 are power and a connection to a network.

1. Connect the CS203 to a network with Ethernet cable.
2. Push the reset button and hold it.
3. Power up the CS203.
4. Wait for 5 seconds and release the reset button.

5.5.1.2 Software Setup

After the hardware setup, open the Netfinder utility ("CS203 Netfinder.exe"). The utility provides the following functions:

5. Search for available CS203 board in the network.
6. Change the CS203 IP and port.
7. Change the server IP and port.
8. Change the TCP timeout value.
9. Update the CS203 Bootloader.

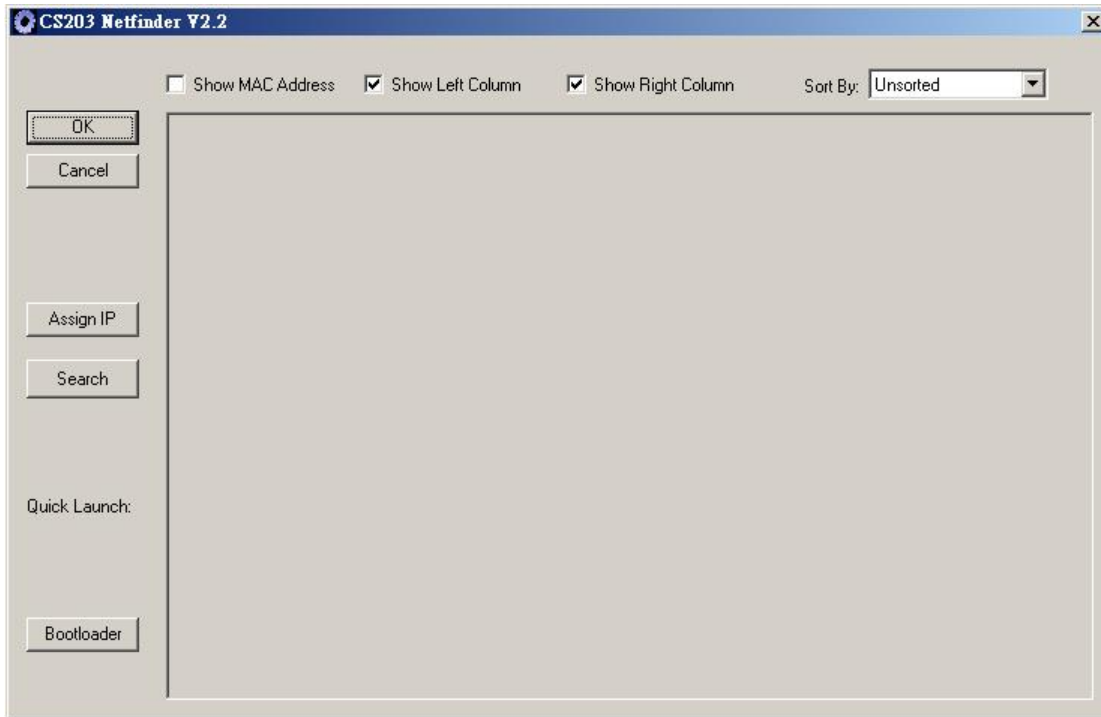


Fig. 1. CS203 Netfinder Utility

5.5.1.3 Search CS203 Board

10. Press the “Search” button.

11. Available CS203 board will be listed as shown in Fig. 2.

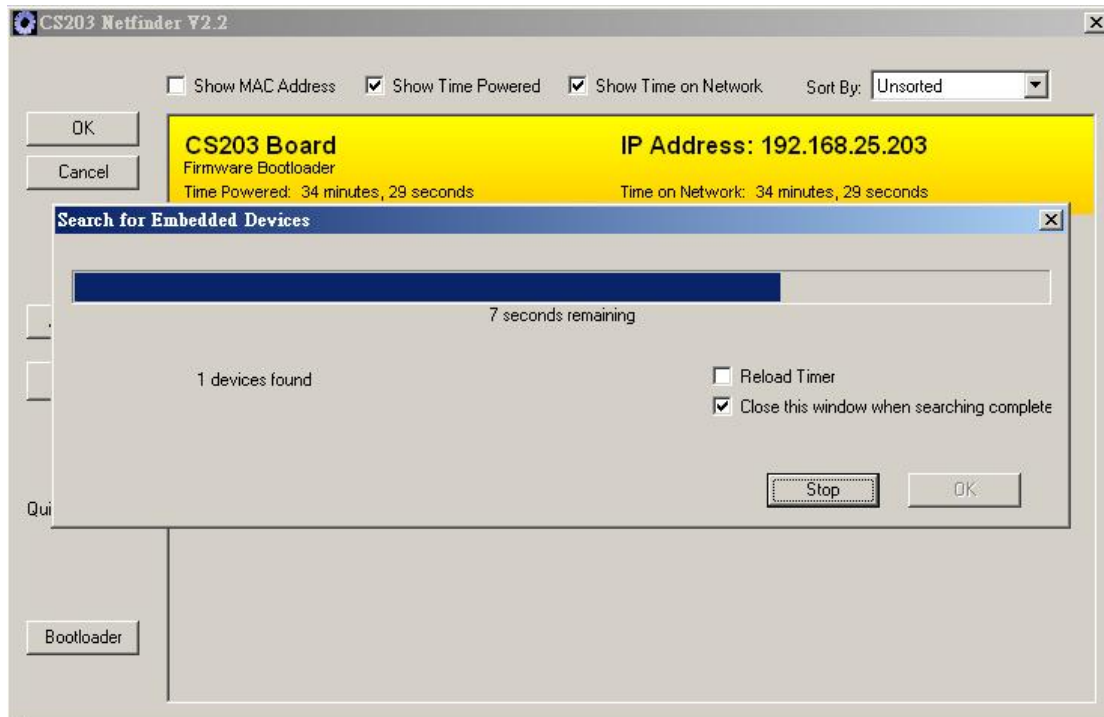


Fig. 2. Searching CS203 Board

5.5.1.4 Assign CS203 IP, Server IP and TCP Timeout

1. Select the found CS203 board. The selected one will be highlighted by a black border.
2. Press the "Assign IP" button.
3. Change the IP, TCP timeout setting and press "OK".
4. Wait until "Success – Device Programmed" has displayed as shown in Fig. 4

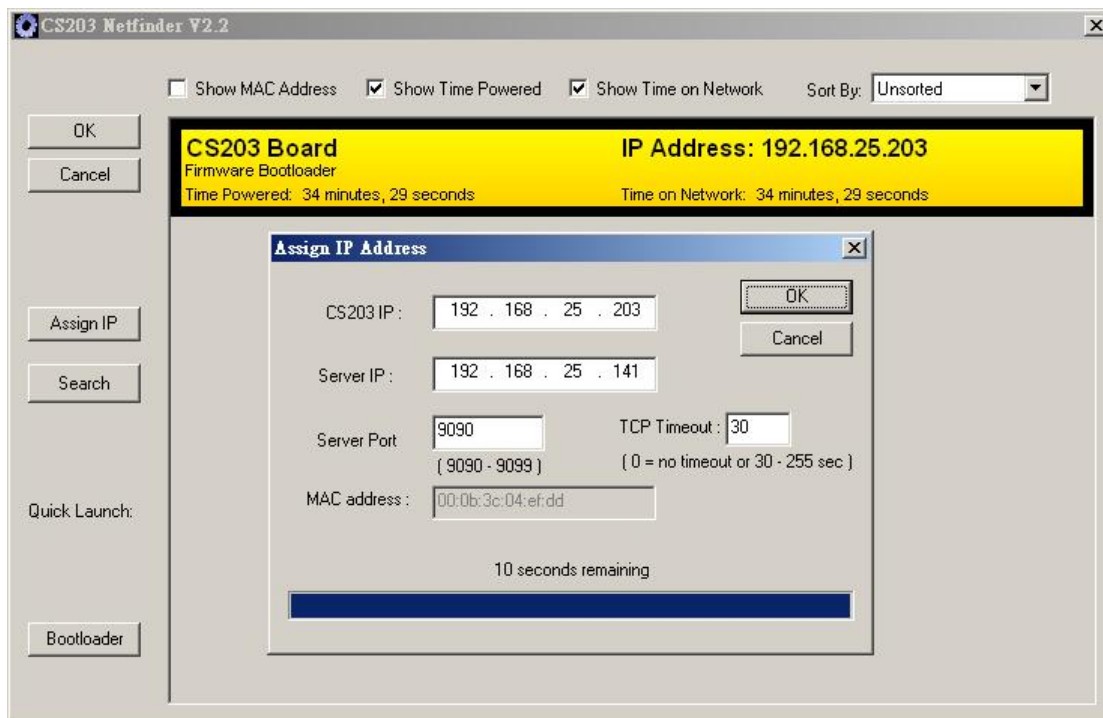


Fig. 3. Assign IP(1)

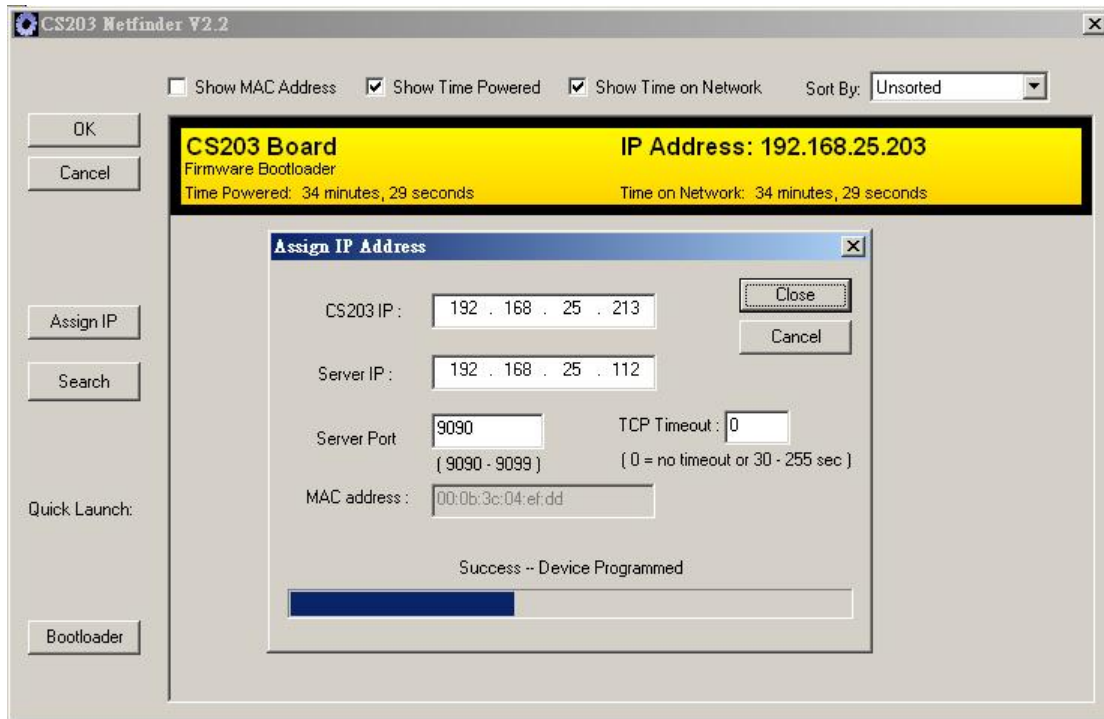
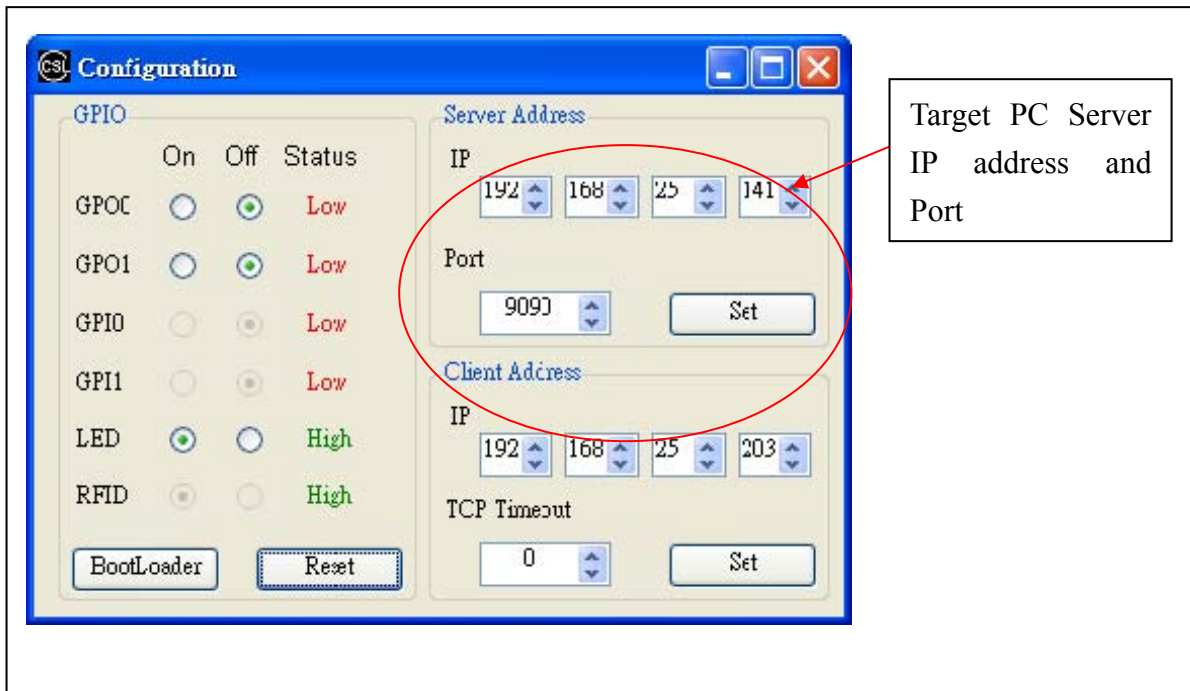
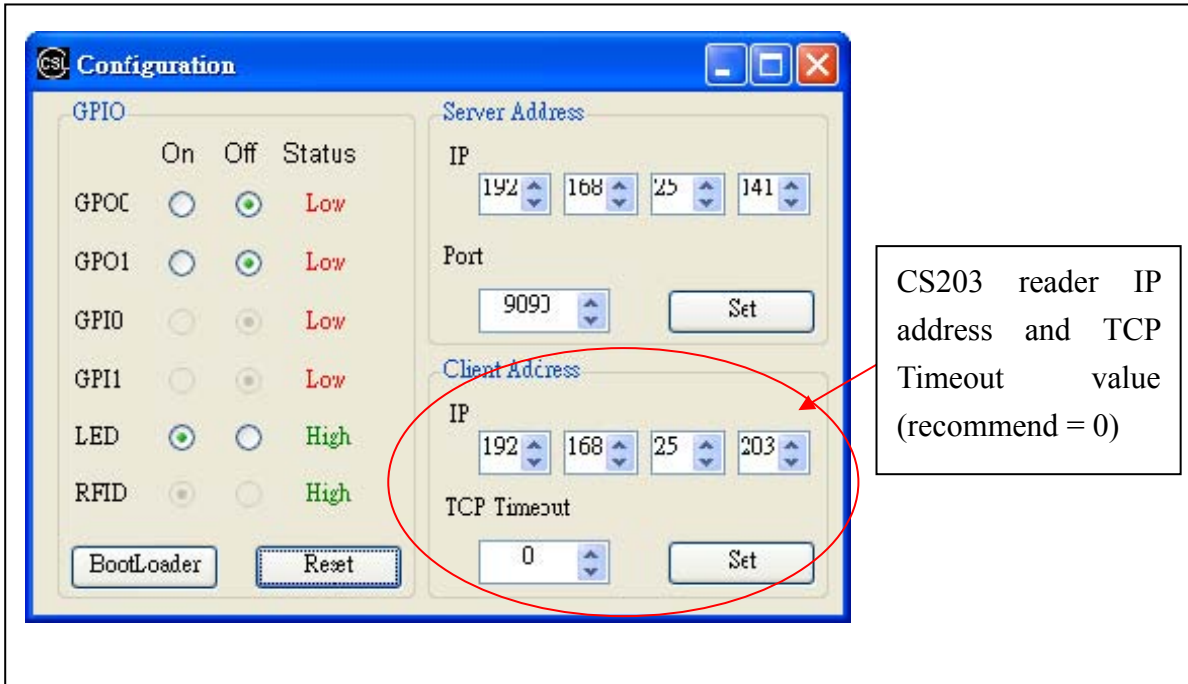


Fig. 4. Assign IP(2)

5.5.2 "CS203 GPIO" Program Method

This can be done easily by API or simply by running the CS203 GPIO program.





5.6 Status Verification

The status of the reader, the PC software, and the network link in between should be constantly monitored. The following are the methods:

1. PC server side IP configuration: run command prompt and then run "ipconfig"
2. CS203 reader side IP configuration confirmation: run command prompt and then run "ping 192.168.25.203" (or any other IP address that you have already modified the CS203 reader into).
3. Socket status: run command prompt and then run "netstat -na"
4. Reader read tag capability: put a reference tag (tag with an ID that you know a priori) on the CS203 front face corner. Reference tag is actually an excellent idea to check the health of a reader. The backend system should monitor the presence of this ID. If this ID is seen, then the reader is still alive and well.

5.7 Exception Situations

The following are standard exception situations:

1. CS203 reader is turned off and on for
 1. Very short time: due to power spikes
 2. A few minutes or more, due to site maintenance or other regular site electrical operations

2. PC side software is turned off and on for
 1. Very short time, due to manual software application reset
 2. A few minutes or more, due to site PC OS maintenance or other regular site PC server hardware maintenance

5.8 Finding a "Lost" CS203

Sometimes, the operator may have changed the IP address of CS203 and then forgot what it is. In that case the user can use the "Netfinder" to search for the CS203.

2. Hardware Setup

The only external hardware connections required by the CS203 are power and a connection to the network.

1. Connect the CS203 to a network with Ethernet cable. Please note that the weatherproof cable that comes with the CS203 shipment package is a "Straight" cable. So connecting it to a network switch or router is OK. For connecting it directly to a PC, it depends on whether the PC's network card can auto-switch to handle straight cable. If not, then an Ethernet to Ethernet adaptor is needed.
2. Press the reset button and hold it.
3. Power up the CS203.
4. Wait for 5 seconds and then release the reset button.
5. The CS203 Network Board will then enter the "Boot Loader Mode"

3. Software Setup

After the hardware setup, open the Netfinder utility ("CS203 Netfinder.exe"). The utility provides the following functions:

1. Search for available CS203 board in the network.
2. Change the CS203 IP address and port number.
3. Change the targeted server IP address and port number.
4. Change the TCP timeout value. (best set to zero)
5. Update the CS203 Boot Loader to newer version.



Fig. 5. CS203 Netfinder Utility

4. Search CS203 Board

1. Press the “Search” button.
2. Available CS203 board will be listed as shown in Fig. 2.

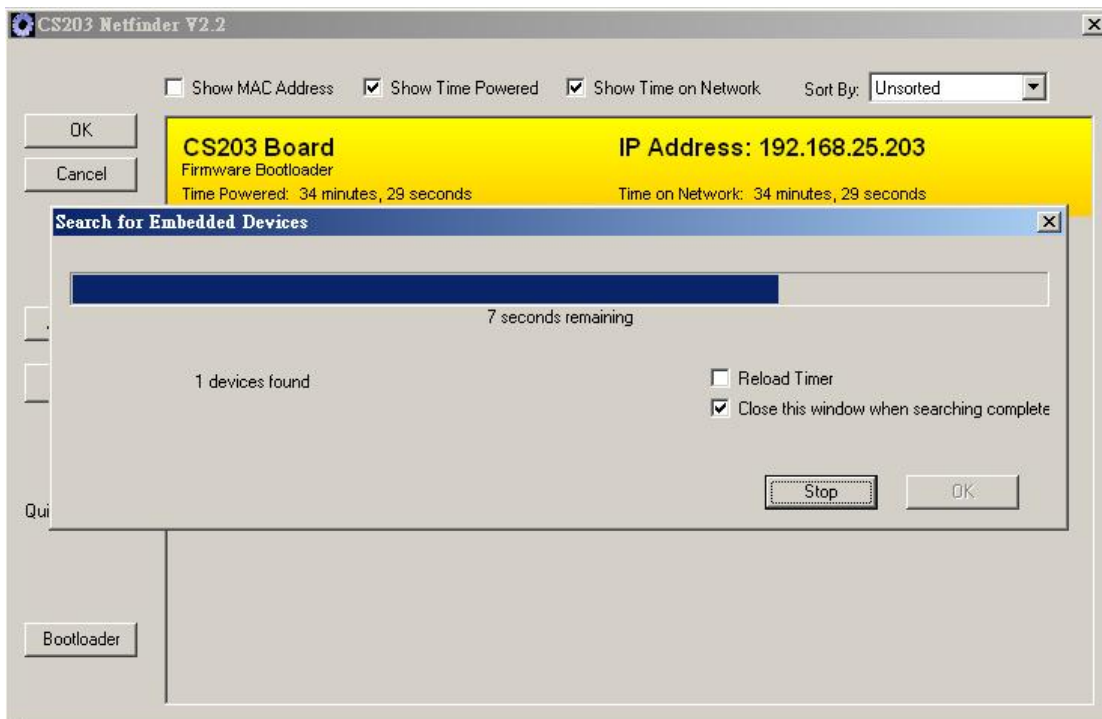


Fig. 6. Searching CS203 Board

5. Assign CS203 IP, Server IP and TCP timeout

1. Select the found CS203 board. The selected one will be highlighted by a black border.
2. Press the "Assign IP" button.
3. Change the IP, TCP timeout setting and press "OK".
4. Wait until "Success – Device Programmed" has displayed as shown in Fig. 4

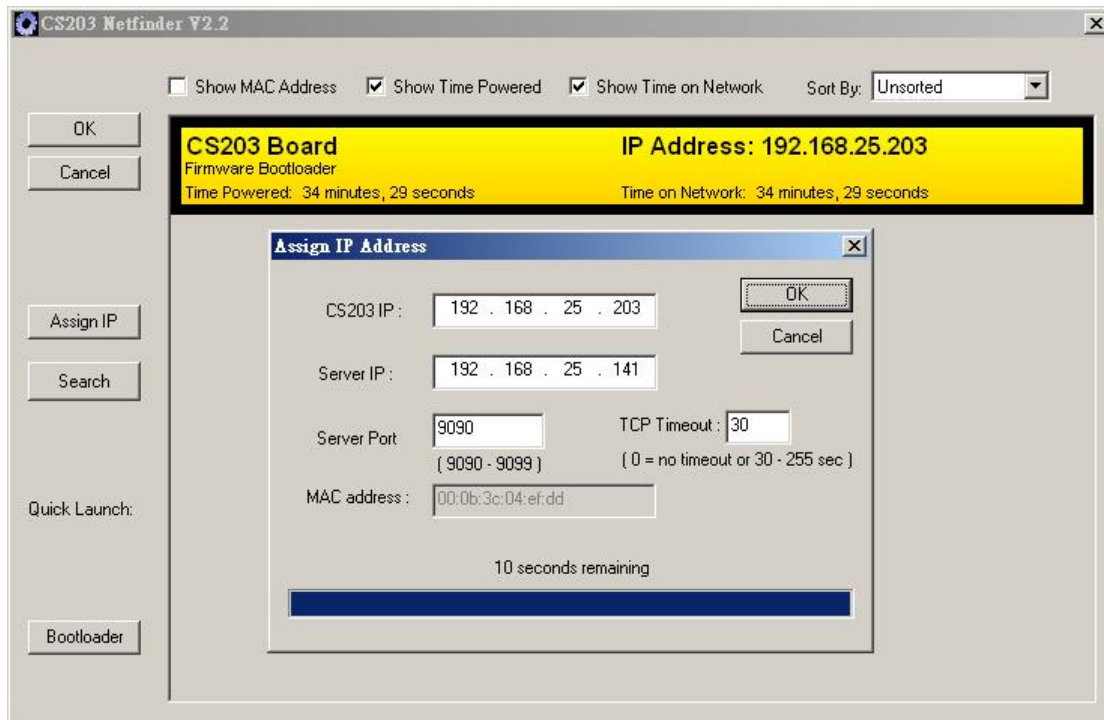


Fig. 7. Assign IP(1)

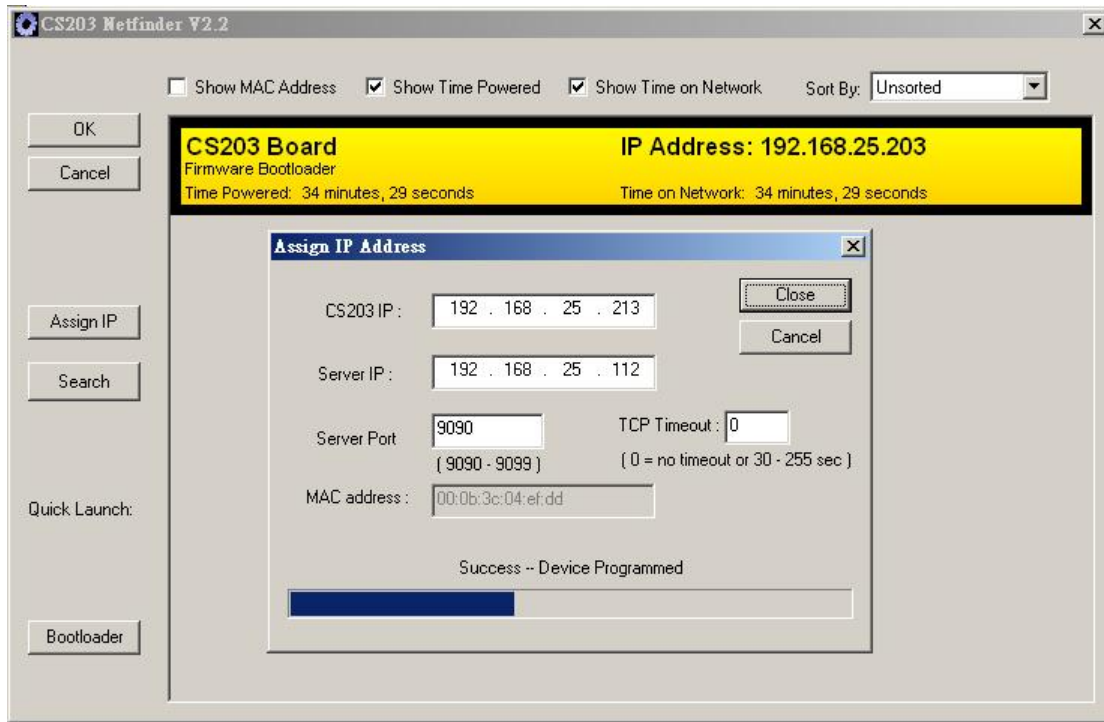


Fig. 8. Assign IP(2)

6 Demo Applications

6.1 Introduction

This document will describe the details about the CS203 demo application program (CS203_Callback-API_DemoApp) that is based on the Callback-Based API set. Software developers can refer to this demo program for programming CS203 based on this new set of API.

6.2 Program Structure

The shipment package consists of the following directories:

CS203 GPIO	Demonstrate the GPIO and IP setting function of the reader
CS203 Start Stop Debug	Demonstrate start stop reader function
CS203 CALLBACK API DEMO	Demonstrate basic operation of the reader. E.g., inventory, read and write etc...
CSL Library	All necessarily dll library files will put to this folder
Document	User Documents: API Library manual, User Manual, etc.

6.3 Build Project Requirements

To build demo application successfully, you need to install Microsoft Visual Studio 2005 (with Visual C# component and SP1 patch) or above. For more detailed information, please go to Microsoft webpage (<http://msdn.microsoft.com/en-us/vstudio/default.aspx>).

Visual Studio 2005 SP1 -

<http://www.microsoft.com/downloads/details.aspx?familyid=bb4a75ab-e2d4-4c96-b39d-37baf6b5b1dc&displaylang=en>

To run CS203 application, the PC must have Dot Net Framework 3.5 or above. This can be downloaded from Microsoft.

6.4 CS203 CALLBACK API Demo Program Operations

A. Main Menu

In main menu of the CS203 CALLBACK API DEMO program, the configuration information of the reader is shown and you can select the various functions.

Menu Item	Configuration / Function
Inventory tags	Inventory
Read and write	ReadWrite
Geiger Search	Geiger
Tag Securities	Security
Channel Setup	Setup
Exit program	Exit

Configuration Item	Value
Demo App Vers	1.0.1
RFID Lib Vers	1.3.2
Firmware Vers	1.3.60
CSLib Vers	1.0.2
8051 App	2.7.0
Frequency Profile	FCC
Frequency	Hopping
Profile	2
Power	300

B. Inventory

This page demonstrates the tag inventory functions for reading tags continuously with the RSSI value and read count.

Click the “Start” button to start reading tags.

The screenshot shows the 'Inventory' application window with a table of tag data and control buttons. Annotations point to specific features:

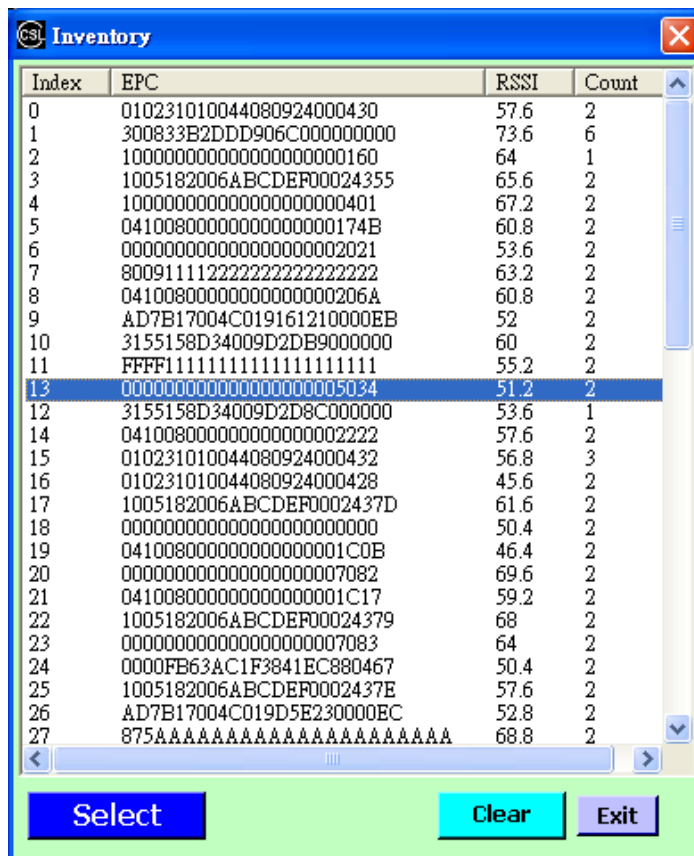
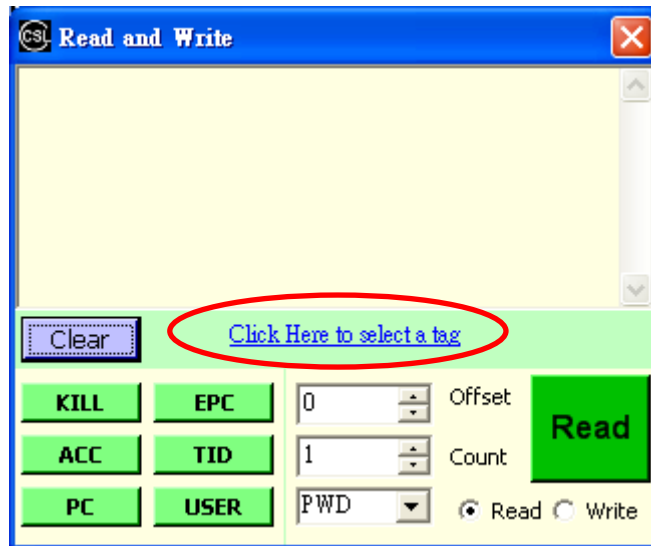
- Back to main**: Points to the window's close button (X) in the top right corner.
- Click to sort Tags by Index**: Points to the 'Index' column header.
- Click to sort Tags by total Count**: Points to the 'Count' column header.
- Click to sort Tags by EPC**: Points to the 'EPC' column header.
- Click to sort Tags by RSSI**: Points to the 'RSSI' column header.
- Start continuous inventory**: Points to the 'Start' button at the bottom left.
- Back to main**: Points to the 'Exit' button at the bottom right.
- Clear all tags in data list**: Points to the 'Clear' button at the bottom center.

Index	EPC	RSSI	Count
0	000000000000000000002023	64	2
1	000000000000000000000000	50.4	2
2	0000FF63AC1F3841EC880467	51.2	3
3	300833B2DD906C000000000	60.8	6
4	556990111111111111111111	58.4	2
5	1005182006ABCDEF0002437E	57.6	2
6	311500000000000000000404	73.6	3
7	DA1122222222222222222222	48.8	2
9	AD7B17004C017F5E210000E9	61.6	3
8	000000000000000000000402	68	3
10	875AAAAAAAAAAAAAAAAAAAAA	67.2	3
11	1005182006ABCDEF0002437D	60	2
12	0410080000000000000001C0B	46.4	2
13	AD7B17004C019161210000EB	52.8	3
14	0410080000000000000001C17	59.2	3
15	010231010044080924000428	48	2
16	1005182006ABCDEF00024379	72	3
17	1234FFFF1234FFFF1234FFFF	52	2
18	0000000000000000000005035	48.8	2
19	0410080000000000000001C0D	48.8	2
20	AD8A2000452DE1951D00003C	46.4	2
21	100000000000000000000401	68	2
22	333333333333333333333333	62.4	3
23	0000000000000000000007084	59.2	2
24	300833B2DD9048035050000	68	5
25	222222222222222222222222	48.8	3
26	010231010044080924000432	58.4	2
27	1005182006ABCDEF00024355	65.6	2

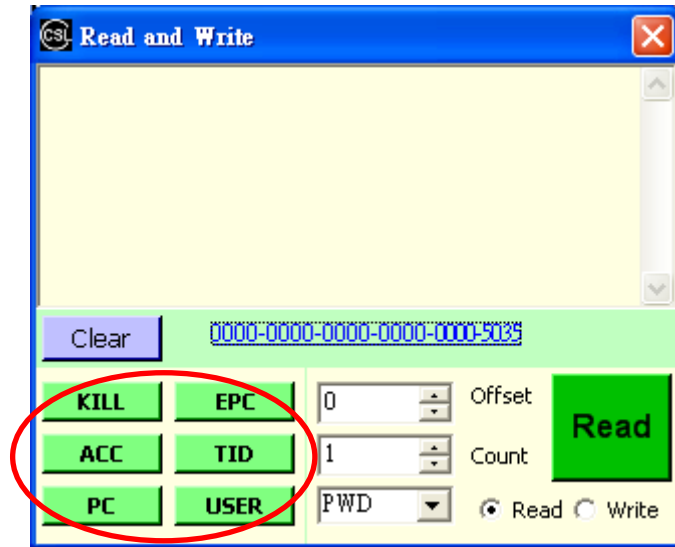
C. Read/Write

This page demonstrates the function of reading and writing different memory banks of a selected tag.

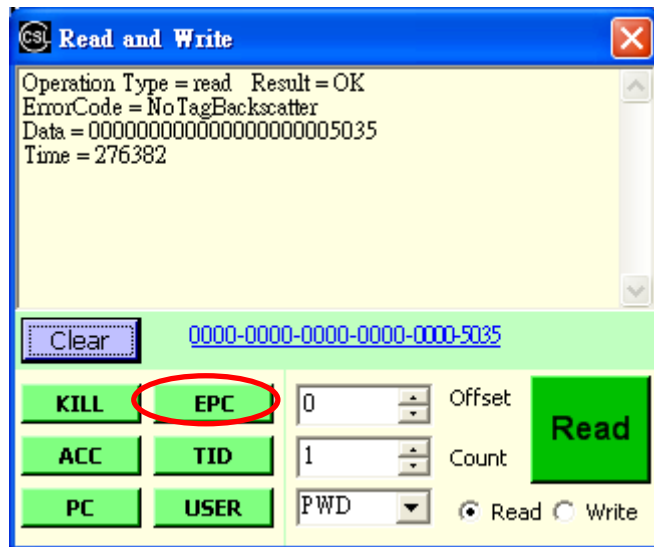
Click on the “Click Here to select a tag” to scan for and select the tag you want to access.



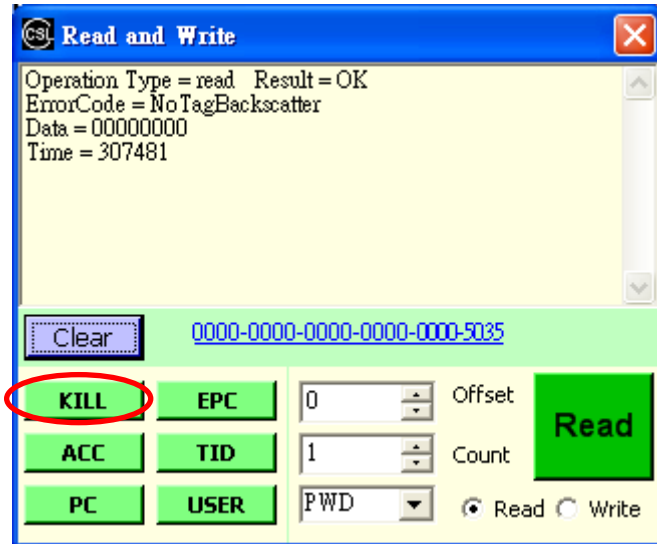
After the tag is selected, you can click on the left hand side buttons to read the corresponding data on the tag.



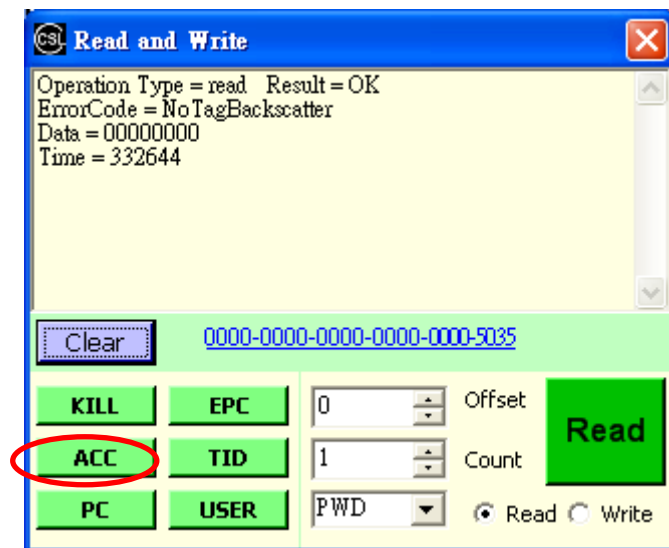
Read EPC: click on the “EPC” button to read the EPC ID



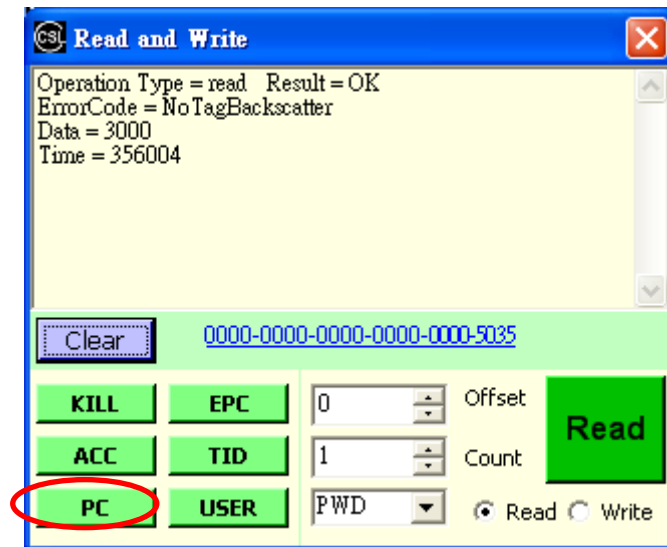
Read Kill Password: click on the “Kill” button to read the kill password



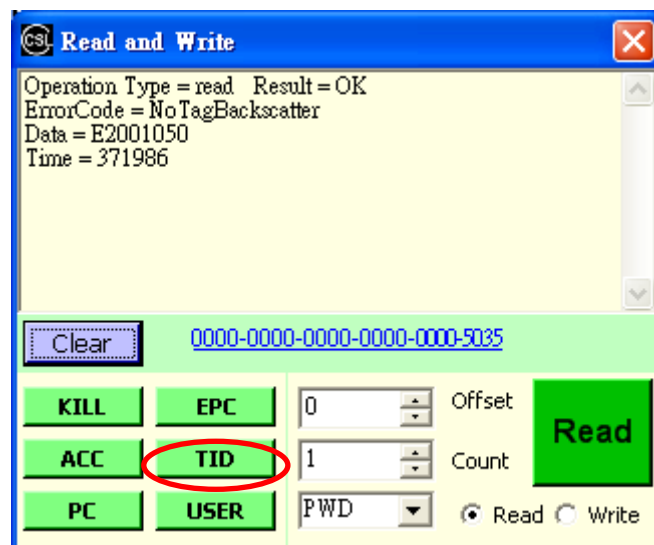
Read Access Password: click on the “ACC” button to read the access password.



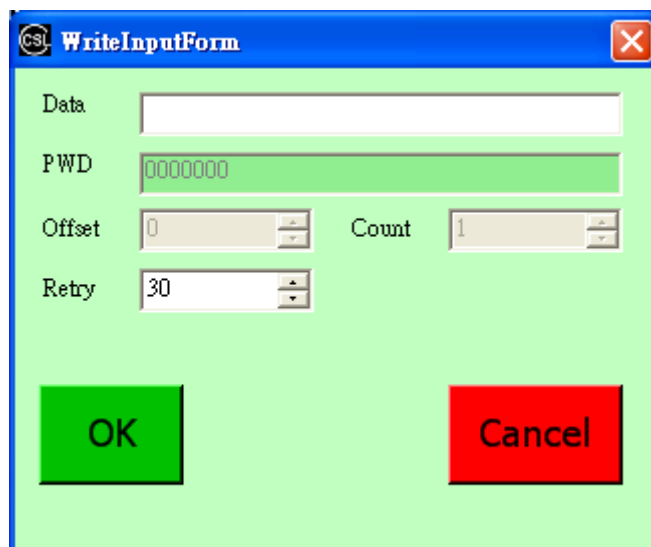
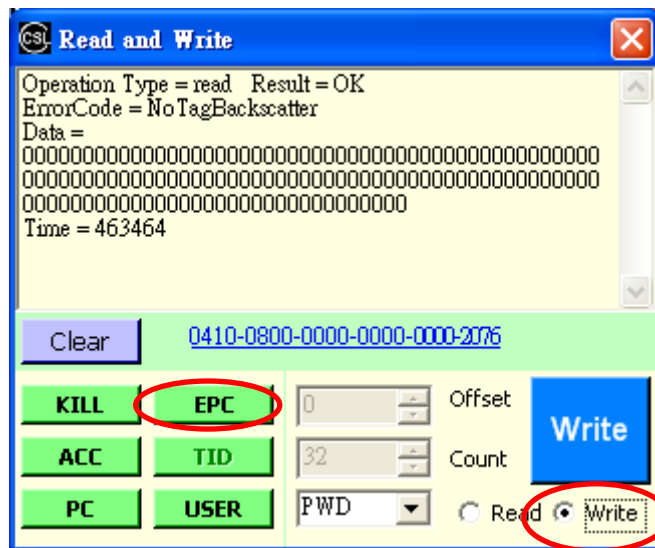
Read Protocol Control (PC): click on the “PC” button to read the PC value.



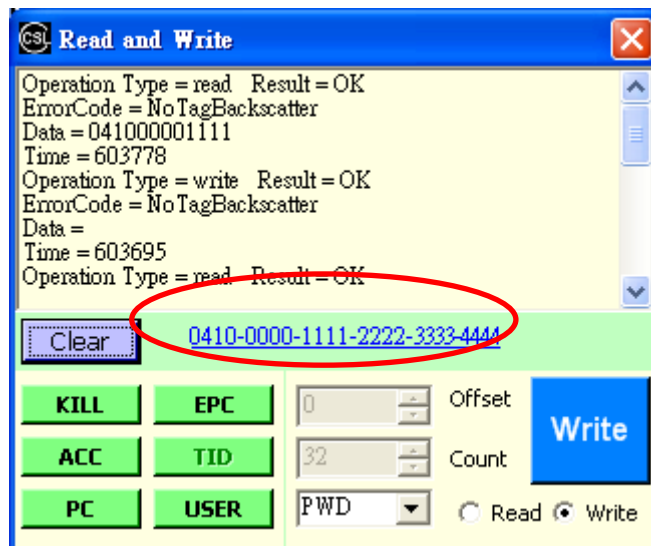
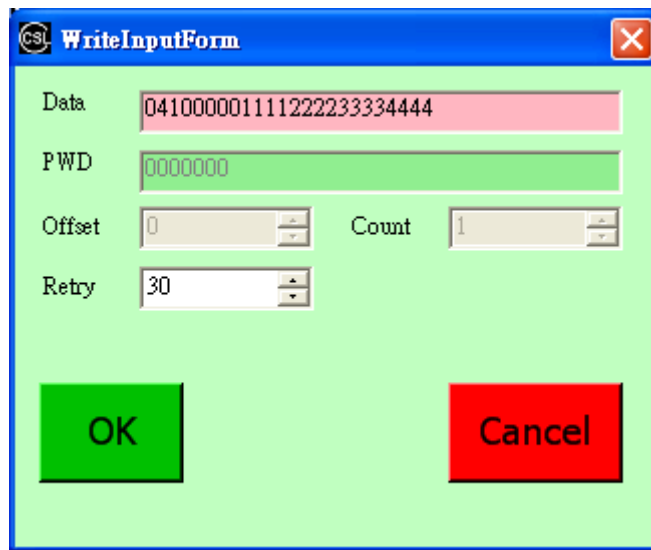
Read TID Value: click on the “TID” button to read the TID value.



Write EPC: select “Write” and click on “EPC” button to enter the write EPC page

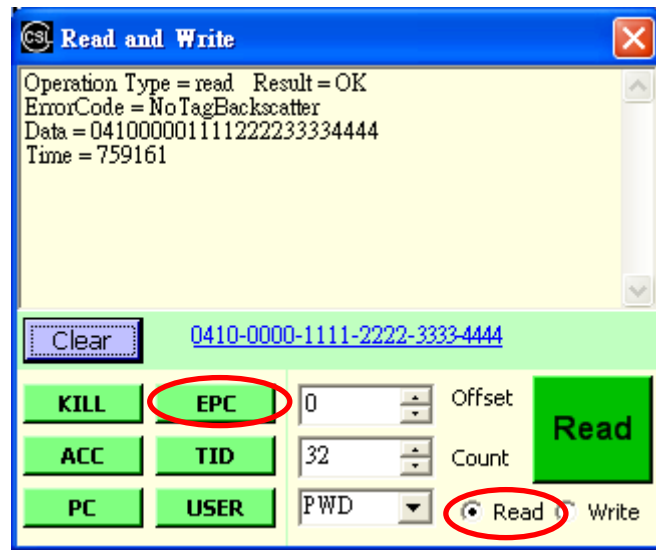


Input the new EPC ID in the “Data” field and then click “OK” button

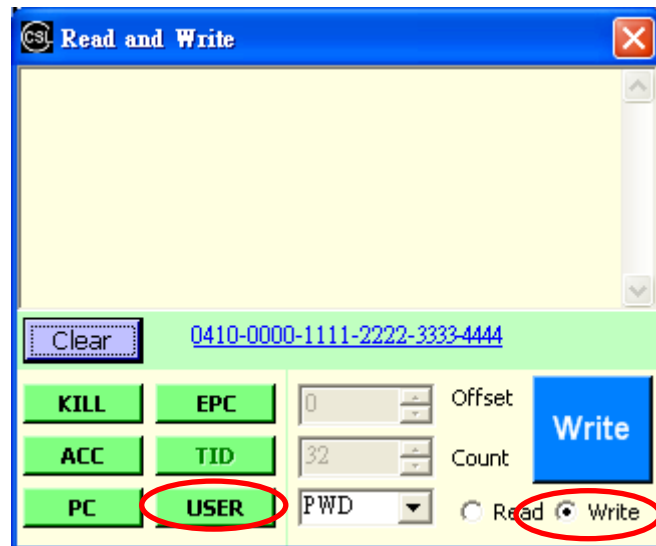


If write success, not error will show on the screen.

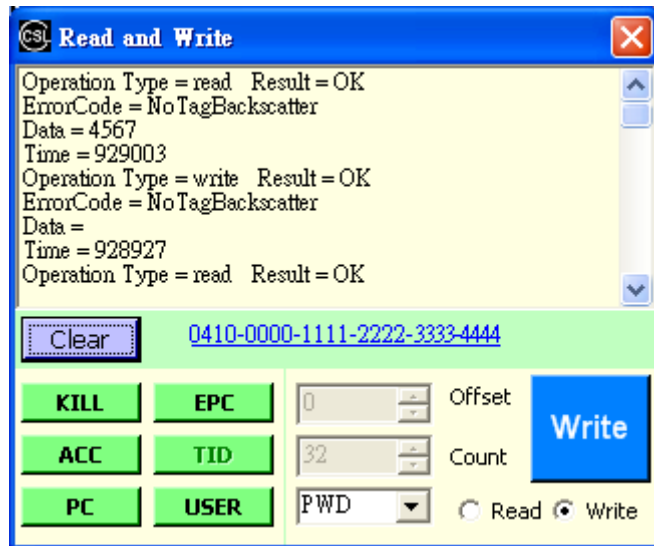
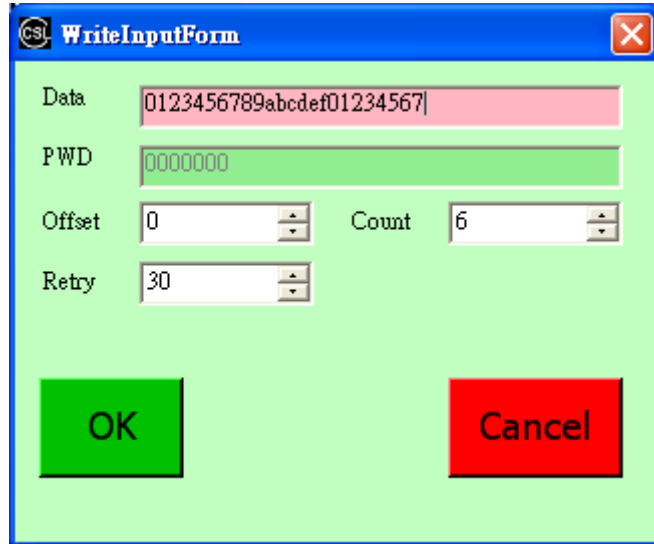
After the EPC is written, you could verify by reading the EPC ID again



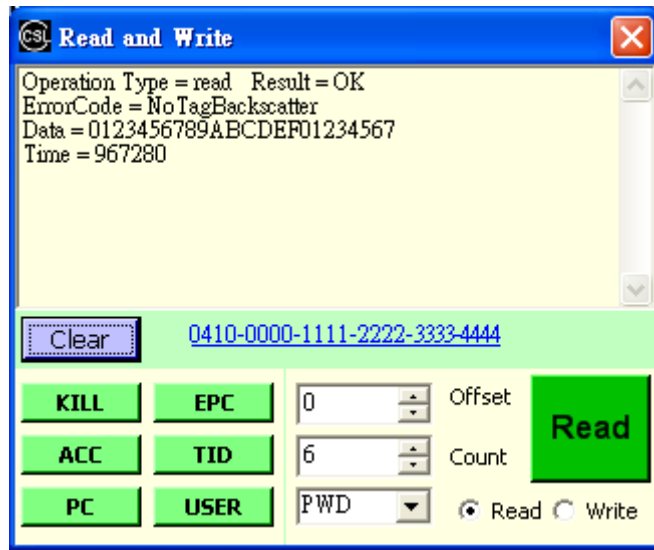
Write User Memory: select “Write” and click on “USER” button to enter the write user memory page.



Select the offset word and length of words you want to write, then input the data into “Data” field and click “OK” button to write the tag.

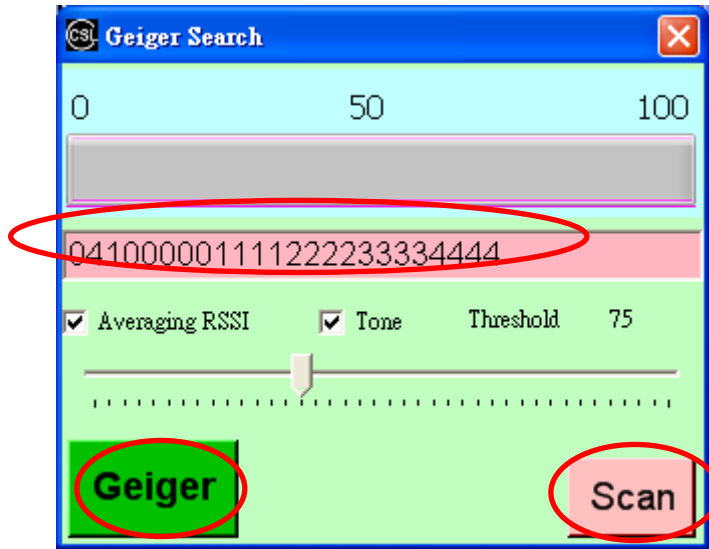


After writing the user memory, you can verify by reading the user memory again.



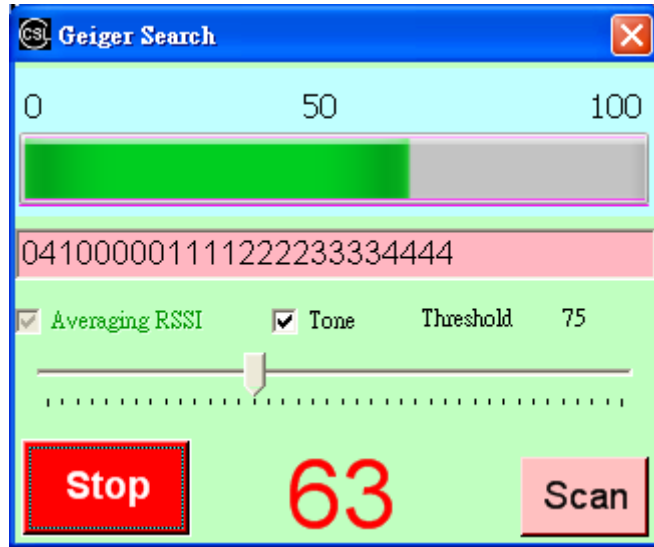
D. Geiger Counter Search

This page demonstrates the Geiger counter tag search mode. Input the EPC ID of the tag or scan a tag you want to search and then click the “Geiger” button.



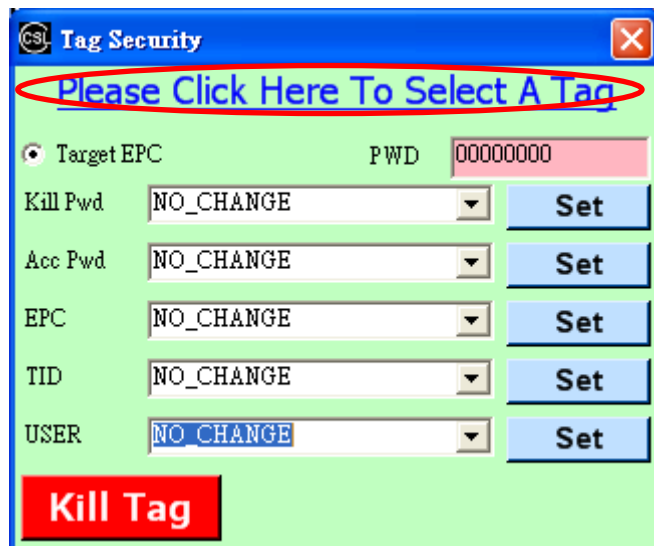
Index	EPC	RSSI	Count
19	00000000000000000000402	64.8	3
10	041000001111222233334444	64.8	3
12	041008000000000000002069	59.2	3
9	04100800000000000000206A	61.6	4
17	04100800000000000000206F	58.4	3
6	041008000000000000002072	46.4	3
13	041008000000000000002073	61.6	3
15	041008000000000000002074	56	3
5	041008000000000000002222	65.6	3
20	10000000000000000000D6	71.2	3
7	12340000FFFFFFFFFFFFFF	49.6	3
4	222222222222222222222222	53.6	3
8	31150000000000000000404	71.2	3
21	433333333333333333333333	54.4	3
18	444444440D444444444444	61.6	3
3	777777777777777777777777	46.4	3
16	875AAAAAAAAAAAAAAAAAAAA	69.6	3
1	888888888888888888888888	60	3
0	999999999999999999999999	64	3
14	F00100000000000000000000	53.6	3
2	FFF080000000000000002079	67.2	3
11	FFFFFFFFFFFF222222333333	59.2	3

When the tag is seen, it shows the RSSI value.



E. Tag Security

This page demonstrates the tag security operations (lock, unlock and kill)



Inventory

Index	EPC	RSSI	Count
19	000000000000000000000402	64.8	3
10	041000001111222233334444	64.8	3
12	041008000000000000002069	59.2	3
9	04100800000000000000206A	61.6	4
17	04100800000000000000206F	58.4	3
6	041008000000000000002072	46.4	3
13	041008000000000000002073	61.6	3
15	041008000000000000002074	56	3
5	041008000000000000002222	65.6	3
20	10000000000000000000D6	71.2	3
7	12340000FFFFFFFFFFFFFF	49.6	3
4	222222222222222222222222	53.6	3
8	31150000000000000000404	71.2	3
21	433333333333333333333333	54.4	3
18	4444444400D4444444444444	61.6	3
3	777777777777777777777777	46.4	3
16	875AAAAAAAAAAAAAAAAAAAAA	69.6	3
1	888888888888888888888888	60	3
0	99999999999999999999AAAA	64	3
14	FD0100000000000000000000	53.6	3
2	FFFF80000000000000002079	67.2	3
11	FFFFFFFFFFFF222222333333	59.2	3

Select Clear Exit

Tag Security

041000001111222233334444

Target EPC PWD: 00000000

Kill Pwd: NO_CHANGE [Set]

Acc Pwd: NO_CHANGE [Set]

EPC: NO_CHANGE [Set]

TID: NO_CHANGE [Set]

USER: NO_CHANGE [Set]

Kill Tag

Enter the access password in “PWD” and click “Set” button to set the security setting.

Tag Security

041000001111222233334444

Target EPC PWD 12345678

Kill Pwd SECURED_ACCESSIBLE Set

Acc Pwd NO_CHANGE Set

EPC SECURED_WRITEABLE Set

TID NO_CHANGE Set

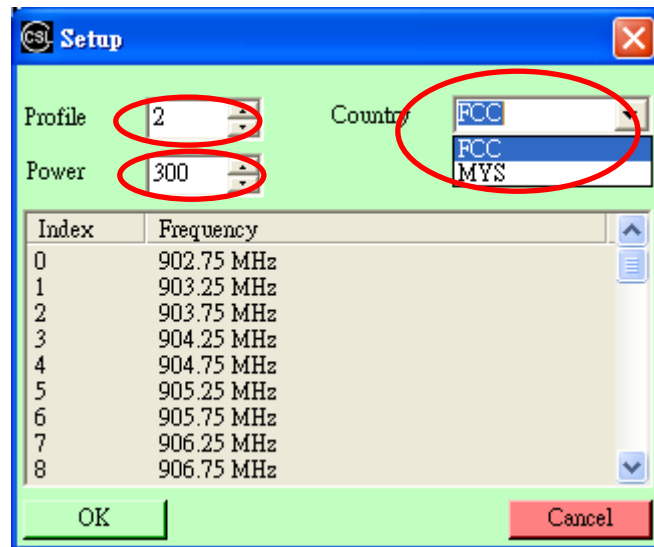
USER NO_CHANGE Set

Kill Tag

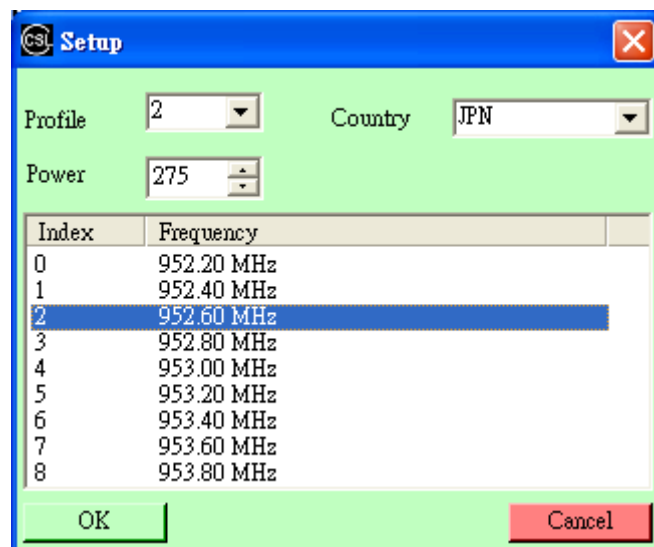
F. Setup

The “Setup” page allows the user to configure the country setting and link profile.

For FCC, you can only set link profile, power and country but not the fixed frequency channel.



For JPN, you can set fixed frequency channel. Note that Channel 952.20 MHz and Channel 953.80 MHz are not allowed with CS203.



7 Middleware Connectivity

The CS203 is connected to many middleware, and the list of compatibility will continuously grow. Currently there are 2 middleware already connected:

1. Sybase iAnywhere
2. Microsoft Biztalk

8 Software Upgrade

8.1 Upgrade of PC Side Libraries

On the PC side, there are 4 dll libraries required:

5. RFID_XP.dll
6. rfid.dll
7. rfidtx.dll
8. cpl.dll

The main dll library that user application has to call is the RFID_XP.dll. This is a C# library under Dot Net Compact Framework. The other 3 dlls are called by RFID_XP.dll

For upgrading, just copy the latest versions of these 4 dll libraries to the appropriate Visual Studio directory and then recompile and create new installer (.msi file). The end customer can then take this new installer and then install into their PC.

8.2 Upgrade of Reader Firmwares

8.2.1 Upgrade of Network Processor Firmware

The network processor firmware is further divided into 2 pieces:

1. Boot Loader
2. Application

The Boot Loader cannot be upgraded in the field by user.

The Application code is upgraded using Netfinder. The reader is first put into Boot Loader Mode, so that the Netfinder can search for it. Once found, the boot loader code can be downloaded.

8.2.1.1 Network Processor Application Upgrade

8.2.1.1.1 Hardware Setup

The only external hardware connections required by the CS203 are power and a connection to a network.

1. Connect the CS203 to a network with Ethernet cable.
2. Push the reset button and hold it.
3. Power up the CS203.
4. Wait for 5 seconds and release the reset button.

8.2.1.1.2 Software Setup

After the hardware setup, open the Netfinder utility ("CS203 Netfinder.exe"). The utility provides the following functions:

1. Search for available CS203 board in the network.

2. Change the CS203 IP and port.
3. Change the server IP and port.
4. Change the TCP timeout value.
5. Update the CS203 Bootloader.

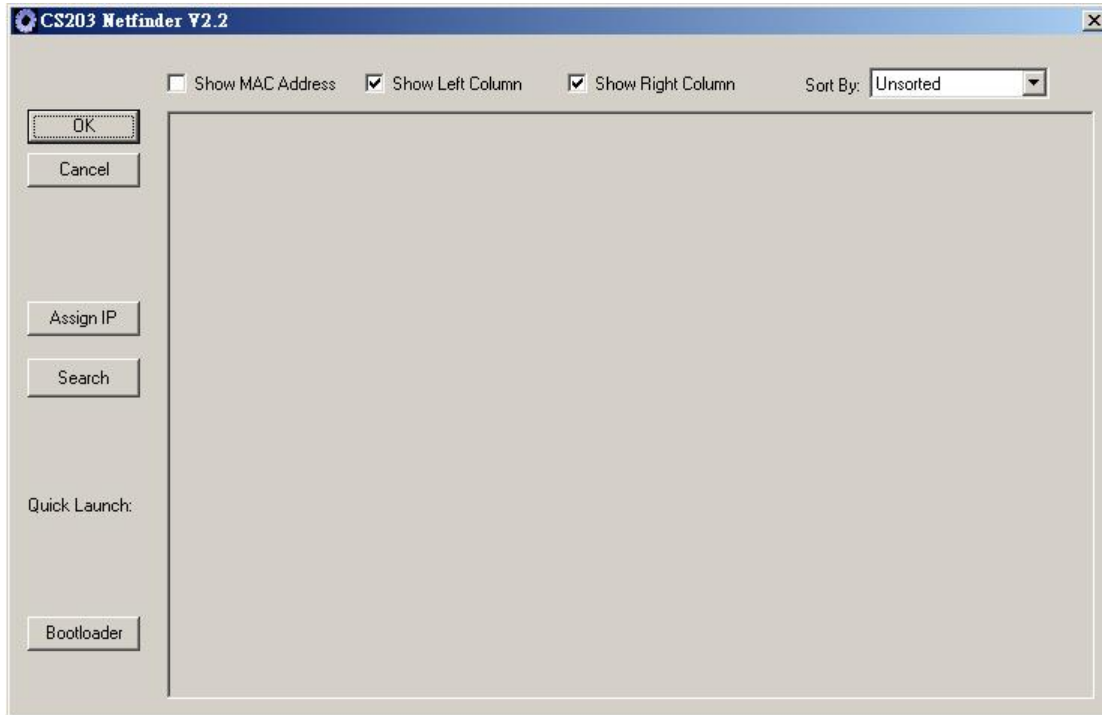


Fig. 9. CS203 Netfinder Utility

8.2.1.1.3 Search CS203 Board

1. Press the "Search" button.
2. Available CS203 board will be listed as shown in Fig. 2.

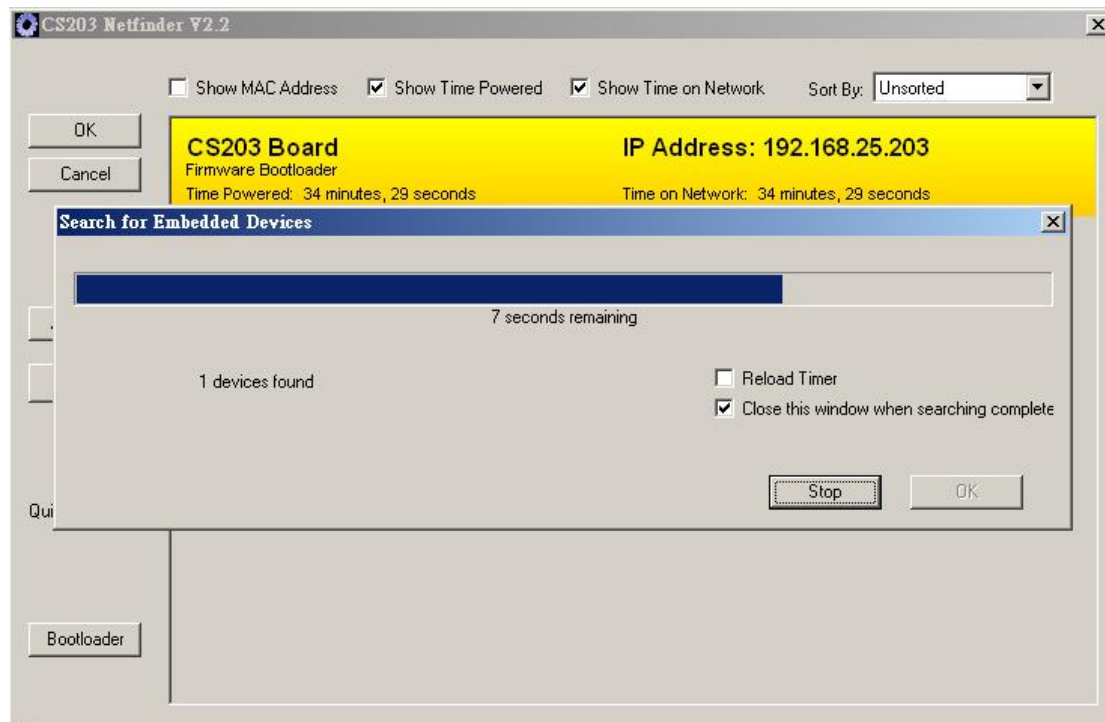


Fig. 10. Searching CS203 Board

8.2.1.1.4 Image Update

1. Select the found CS203 board. The selected one will be highlighted by a black border.
2. Press the “Bootloader” button.
3. Change the IP, TCP timeout setting and press “OK”.
4. Select a *.img file to update (Fig. 5).
5. Wait about 6-15 Seconds.
6. If success, “Transfer successful:” will be displayed as shown in Fig. 6. **Remark: If “Transfer successful:” doesn’t appear after 20 seconds, please re-open the Netfinder utility and repeat the image update process from step 1 again.**
7. Turn off and turn on the power of CS203 to run the new image software.

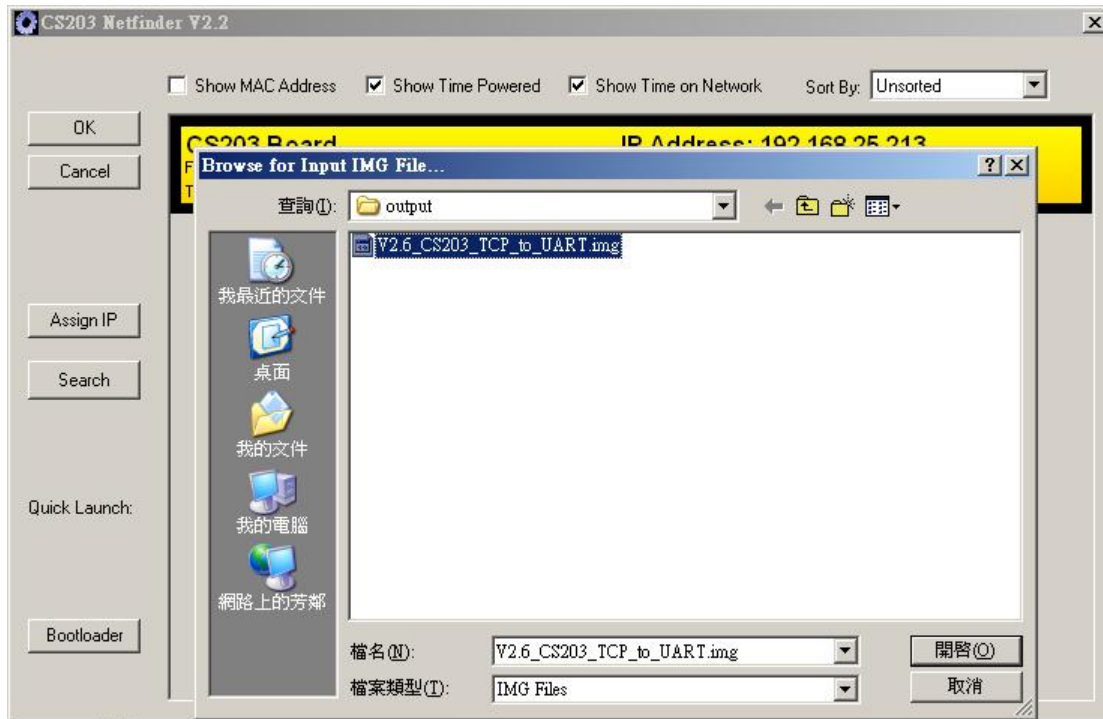


Fig. 11. Select image file to update

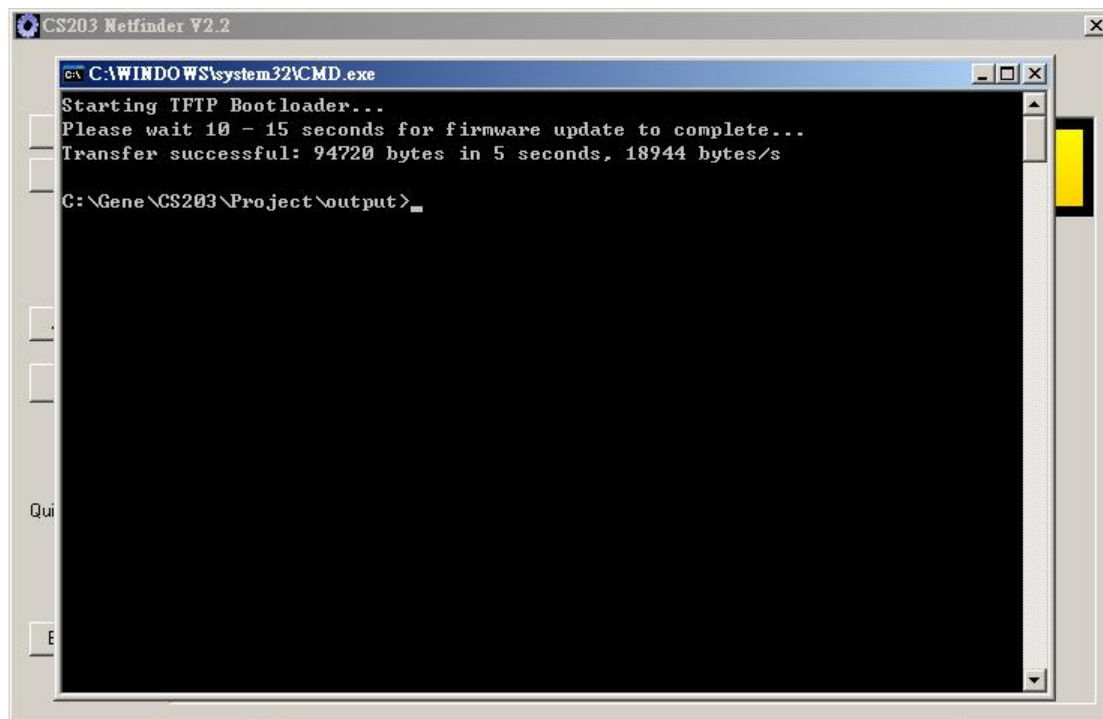


Fig. 12. Image update successful.

8.2.2 Upgrade of RFID Board Firmware

The RFID board firmware cannot be upgraded in the field by user.

9 Regulatory Information

9.1 Federal Communications Commission (FCC) Compliance

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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter. This product must be installed by a professional technician/installer.

Appendix A. RFID Basics

Passive tag RFID technology involves the reader, the antenna and the tag.

The reader sends out energy in the relevant frequency band to the antenna via RF cables, and the antenna radiates the energy out. This energy impinges on an RFID tag.

The RFID tag consists of an antenna coupled to an RFID IC. This IC converts the AC voltage it receives at the antenna port to DC voltage that in turn is used to empower the digital circuit inside.

The digital circuit then turns on and off some components connected to the antenna port, thereby changing its scattering behavior, in a pre-designed clock rate.

This changing of antenna port parameters then causes a “modulation” of the back-scattered RF energy.

This modulated back-scattered energy is detected by the reader and the modulation is captured and analyzed.

Appendix B. Operation Profiles

Region 2: FCC

Profile	0	1	2	3	4	5
R-T Modulation	DSB-ASK	DSB-ASK	PR-ASK	PR-ASK	DSB-ASK	PR-ASK
Tari (μ s)	25.00	12.50	25.00	25.00	6.25	25.00
R-T speed (kbps)	40	80	40	40	160	40
PIE	2:1	2:1	1.5:1	1.5:1	1.5:1	1.5:1
Pulse Width (uS)	12.50	6.25	12.50	12.50	3.13	12.50
T-R LF (kbps)	40	160	250	300	400	250
T-R Modulation	FM0	Miller-2	Miller-4	Miller-4	FM0	Miller-2
Divide Ratio	8	8	64/3	64/3	8	64/3
T-R Data Rate (kbps)	40	80	62.5	75	400	125

Appendix C. RF channels

Region 2: FCC

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 D. FAQ

1. How can I connect to CS203 wirelessly?

Easy. Just purchase any off-the-shelf Ethernet to Wi Fi bridge or Ethernet to GSM/GPRS bridge or 3G bridge, then you can convert the CS203 to a wireless reader.

2. others

Appendix E. Common Mistakes

1. The weatherproof Ethernet cable that comes with the product package is a "STRAIGHT" cable. If user wants to connect directly to a PC, then it may or may not work depending on whether the network card on the PC can handle a straight cable. Newer PCs have Ethernet card capable of "Auto-Detect" and "Auto-Switch". Older PCs are not capable of that. So for older PC one has to use a network switch or router to go in between. First connect the CS203 via the weatherproof cable to the network switch, then use another straight cable to connect from the network switch to the PC. Another option is an Ethernet to Ethernet bridge. This is a small adaptor with Ethernet socket on both ends. This will cross switch the cable.
2. The CS203 comes ex-factory with a standard IP address and also a "target PC server IP address". When the user first open the unit from the box, the user must use a laptop with that particular "target PC server IP address" for them to connect. Once connected, then the user can change the IP address on the CS203 and also change the "target PC server IP address". Once that is done, the CS203 can be deployed in the actual site.

Appendix D. Technical Support

System integrators setting up the CSL CS203 Integrated Reader may encounter some problems. To quickly solve that, they are welcome to send the symptoms and configuration files back to techsupport@convergence.com.hk for support. Please send the following:

- 1) CS203 Factory Serial Number - best to take a photo of the label at the back of the reader and send the photo to CSL technical support team
- 2) Final firmware versions of reader
- 3) Final library version on PC side
- 4) Brief description of problems
- 5) Screen capture of problems or error messages on PC with time
- 6) Screen capture of command window doing "netstat -na" command
- 7) Screen capture of command window doing "ipconfig" command
- 8) Screen capture of Windows Task Manager "Processes" window
- 9) Screen capture of Windows Task Manager "Applications" window
- 10) Screen capture of Windows Task Manager "Performance" window
- 11) Photos of the overall site (if that can be released)

Send the above sets of data to techsupport@convergence.com.hk