

TECHNICAL INFORMATION MANUAL

Revision 5 – 16 April 2021

Easy Controller

Software User Interface for CAEN RFID readers

| CAEN RFID Easy Controller | | | | | - 0 |
|--|----------------------|--------------|-------|--|---|
| File Settings Tools About | | | | | |
| | RFUD | | | De | sign your RFID solution we provide the technology. |
| | | | | STATISTICS | READER INFORMATION |
| 0 | | | | Src 0 Src 1 Src 2 Src 3 | Model: R1280 |
| Start Inventory | | | | Aca/Sec: 0 Efficiency: 0% | Serial: 0001000120400011 |
| TAGS FOUND: 14 | | | | Tags/Sec: 0 Tot. Tags: 0 | FW Rel.: 1.2.0 |
| PC | L. Source | Antenna | COUNT | TimeStamp | |
| 2806810000003918718553 | Source_0 | Ant0 | 3 | 10/28/2020 10:43:43 AM | |
| 4B40000000000000000053 | Source_0 | Ant0 | 33 | 10/28/2020 10:43:37 AM | |
| 5E017004E8DA06300017D51 | Source_0 | Ant0 | 4 | 10/28/2020 10:43:41 AM | |
| 03132333435363738393031 | Source_0 | Ant0 | 14 | 10/28/2020 10:43:41 AM | |
| 00EFE2F94D01E0950213515 00833B2DDD9BD050127EF00 | Source_0 Source_0 | Ant0 Ant0 | 2 | 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM | |
| 00833B2DDD9BD050127EF00 | Source_0 | Ant0 Ant0 | 8 | 10/28/2020 10:43:37 AM 10/28/2020 10:43:38 AM | |
| 800833B2DDD901400000000 | Source 0 | Ant0 | 27 | 10/28/2020 10:43:37 AM | |
| OC1105012A70A46112014200 | Source 0 | Ant0 | 6 | 10/28/2020 10:43:42 AM | |
| 03069900000000000002E98 | Source_0 | Ant0 | 37 | 10/28/2020 10:43:37 AM | |
| | Source_0 | Ant0 | 4 | 10/28/2020 10:43:44 AM | |
| 135240000000000001388 | Source 0 | Ant0 | 22 | 10/28/2020 10:43:37 AM | |
| 01153300000000000002420 | Jource_0 | | | | |
| 01352400000000000001388 01153300000000000002420 00000000000000000000 | Source_0 | Ant0 | 23 | 10/28/2020 10:43:37 AM | |

Scope of Manual

This manual will help you to get started with the Easy Controller, the RFID Software User Interface for CAEN RFID Easy2read family. This Software allows you to control and configure all the CAEN RFID readers in a simple and easy way.

This manual refers to:

• Easy Controller for Windows version ≥ 1.9.0

Change Document Record

| Date | Revision | Changes | Pages |
|--------------|----------|--|--------------|
| 14 May 2012 | 01 | First release. | - |
| | | Added information about CAEN RFID Easy Controller Software Web Page | - |
| | | Modified Fig. 4.1: General Options Window | - |
| | | Modified Continuous mode in the Identification paragraph | - |
| 13 Nov 2013 | 02 | Modified Fig. 4.3: Reader Configuration Window | - |
| 13 1107 2013 | 02 | Added sweep power mode description | - |
| | | Modified Fig. 4.4: Logical Source Configuration Window | - |
| | | Added Multiplexer Management Window paragraph | - |
| | | Added Filtering Tags paragraph | - |
| | | Added Disable list clearing command | - |
| 12 Jan 2015 | 03 | Modified Fig. 3.2: Listview header | - |
| 12 Jan 2012 | | Modified Main Window paragraph | - |
| 14 5 - 2015 | 04 | Added Advanced Settings paragraph | - |
| 14 Sep 2015 | | Modified Read &Write paragraph | - |
| | | Graphic Restyling | All pages |
| | | Modified Installation paragraph | 7 |
| | | Added Hardware Connection chapter | 10 |
| 16 Apr 2021 | 05 | Modified <i>Quick Start</i> chapter | 22 |
| · | | Added information on e-seal mode in the <i>Logging options</i> paragraph | 35 |
| | | Modified Advanced Settings paragraph | 37 |
| | | Modified <i>Kill</i> paragraph | 32 |

Reference Document

[RD1] EPCglobal: EPC Radio-Frequency Identity Protocols Class-1 Generation-2 UHF RFID Protocol for Communications at 860 MHz – 960 MHz, Version 2.0.1 (April, 2015).

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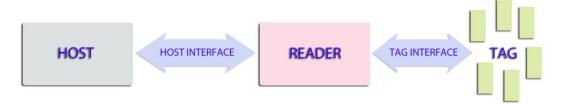


1 INTRODUCTION

Before starting: CAEN RFID reader system overview

Before using this software it is useful to get introduced to the basic concepts of CAEN FID readers.

A CAEN RFID reader can be seen, in a simplified model, as a box with one or more communication interfaces to the host side and one or more communication interfaces to the tag side. The reader receives commands coming from the host (a PC or any other controlling device) and it uses the interface to the tag (typically one or more antennas) to perform operations on tag itself and then it replies back to the host.



Antennas belonging to the same reader can be grouped in logical groups called "logical sources" or simply "sources".

CAEN RFID protocol defines up to 4 logical sources, named from "Source_0" to "Source_3".

A source is composed by the 2 elements specified below:

• Antennas:

CAEN RFID readers can have from 1 to 4 antenna ports according to the model. In case of one antenna reader the only available antenna is linked to "Source_0". In case of four antennas reader, the default configuration consists of a single antenna connected to a single source. Therefore "Source_0" identifies the first antenna... "Source_3" identifies the fourth antenna. Each antenna can be linked to the source in a non-exclusive mode: for example the first antenna can be linked to "Source_0" and "Source_3".

• A set of standard EPC Class1 Gen2 parameters:

Q value, Session, Selected, and Target (for more info please refer to the EPC Class 1 Gen 2 specification document [RD1]).

Remember that all operations on the tags are performed through these logical sources.



Installation

CAEN RFID Easy Controller installation is provided through an auto-installer file called *Setup.exe*: running this, Easy Controller will install on pc.

Before running, be sure that your pc meets the minimum system requirements:

- 1,1 gigahertz (GHz) or faster processor
- 2 gigabyte (GB) RAM
- 30 MB available hard disk space for installation (administration rights required)
- Microsoft .NET 4.5.1 runtime or higher
- Microsoft Windows 7/8/10

To install the software:

- 1. Download the <u>CAEN RFID Easy Controller Software</u> from our web site (support \rightarrow software & firmware section).
- 2. Double click on the Setup.exe file, click on next:





3. Follow the instructions and then click on *Finish*:





If you choose *default value* during setup, the files of the EasyController will be placed under *Program files* in a folder named *CAEN RFID Easy Controller*.

This folder contains:

| Directory/file name | Description | | | |
|---------------------|---|--|--|--|
| Base | This directory contains information on all supported readers and on general options. | | | |
| BaseUtils.dll | This library helps the Easy Controller to parse and save information stored in Base folder. | | | |
| CAENRFIDLibrary.dll | This is the CAEN RFID .NET library used by the Easy Controller to work with reader. | | | |
| | Note: if you want to develop your own .NET application use the appropriate link to our site to download the latest version of the .NET library. | | | |
| Unins000.dat | This file is used by the uninstaller. | | | |
| Unins000.exe | This is the uninstaller: if you want to uninstall the Easy Controller please refer to <i>Uninstalling CAEN RFID Easy Controller</i> paragraph, page 9. | | | |
| Easy Controller src | This folder contains Visual Studio professional projects of the Easy controller with its source code. | | | |

Tab. 1.1: CAEN RFID Easy Controller Directories

Uninstalling CAEN RFID Easy Controller

To uninstall CAEN RFID Easy Controller:

Click on Start \rightarrow All Programs \rightarrow CAEN RFID Easy Controller \rightarrow Uninstall CAEN RFID Easy Controller.



2 HARDWARE CONNECTION

Introduction

A CAEN RFID reader connected to a Windows PC can be controlled using the Easy Controller Software for Windows, as illustrated in this manual.

The connection of the reader to the Windows PC can be done via:

- Bluetooth
- USB
- Ethernet

Depending on the reader's model, one or more of the options described above may be supported (for detail refer to your reader's technical information manual).

For readers that support the activation of different usage profiles, management via the Easy Controller Software takes place **only** with EASY2READ profile active (for detail refer to your reader's technical information manual).

Bluetooth Communication Setup

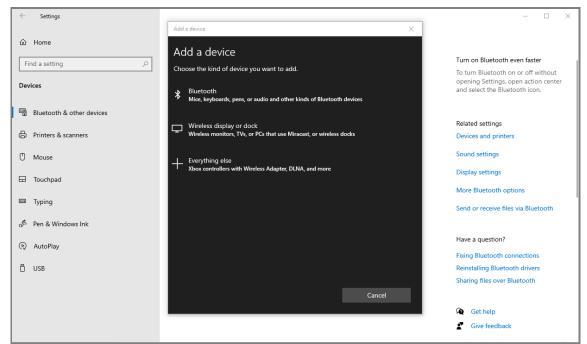
If supported by the reader, follow the steps below to connect your Windows PC to the CAEN RFID reader using the BT connection and the Easy Controller Software. All the images below were generated using the Windows 10 Operating System.

- 1. Follow the instructions given in your reader's technical information manual to select the *Bluetooth communication interface* for the reader.
- 2. In your Windows Pc go to Settings \rightarrow Devices.
- 3. Click on Bluetooth & other devices \rightarrow Add Bluetooth or other device:

| Settings | | | – 🗆 × |
|---------------------------|--------------------------------------|-------------|---|
| යි Home | Bluetooth & other devices | | |
| Find a setting | Add Bluetooth or other device | | Turn on Bluetooth even faster |
| Devices | + Add Bluetooth or other device | | To turn Bluetooth on or off without opening Settings, open action center and select the Bluetooth icon. |
| _ | Bluetooth | | |
| Bluetooth & other devices | On On | | Related settings |
| B Printers & scanners | Now discoverable as "C1621" | | Devices and printers |
| () Mouse | | | Sound settings |
| () Mouse | Mouse, keyboard, & pen | | - |
| 🛱 Touchpad | Microsoft Surface Keyboard | 93% | Display settings |
| I Typing | | | More Bluetooth options |
| iping | Microsoft Surface Mouse Connected | B 3% | Send or receive files via Bluetooth |
| | | | |
| AutoPlay | Other devices | | Have a question? |
| | | | Fixing Bluetooth connections |
| 📋 USB | | | Reinstalling Bluetooth drivers |
| | | | Sharing files over Bluetooth |
| | | | Get help |
| | | | Get neip |
| | | | Give reedback |



4. Click on Bluetooth:



5. Select the CAEN RFID reader (in this example the skID R1280I reader with serial number 20400011):

| \leftarrow Settings | Add a device X | - 🗆 X |
|---------------------------------|---|--|
| Home Find a setting Devices | Add a device Add a device Make sure your device is turned on and discoverable. Select a device below to connect. skiD-20400011 | Turn on Bluetooth even faster To turn Bluetooth on or off without opening Settings, open action center and select the Bluetooth icon. |
| Bluetooth & other devices | | |
| Printers & scanners | | Related settings Devices and printers |
| () Mouse | | Sound settings |
| Touchpad | | Display settings |
| | | More Bluetooth options |
| Typing | | Send or receive files via Bluetooth |
| 🖉 Pen & Windows Ink | | |
| AutoPlay | | Have a question? |
| | | Fixing Bluetooth connections |
| 🖞 USB | | Reinstalling Bluetooth drivers |
| | | Sharing files over Bluetooth |
| | Cancel | |
| | | Get help |
| | | Give feedback |

6. The message on the screen "Your device is ready to go!" informs you that the connection is established.

If supported by the reader, the Bluetooth blue LED of the reader turns on.

| ← Settings | Add a device | × | - 🗆 X |
|---------------------------|-----------------------------|------|---|
| 命 Home | Your device is ready to go! | ~ | Turn on Bluetooth even faster |
| Find a setting Devices | skiD-20400011 Paired | | To turn Bluetooth on or off without opening Settings, open action center and select the Bluetooth icon. |
| Bluetooth & other devices | | | Related settings |
| Printers & scanners | | | Devices and printers |
| 🖰 Mouse | | | Sound settings |
| ☐ Touchpad | | | Display settings |
| Typing | | | More Bluetooth options |
| Pen & Windows Ink | | | Send or receive files via Bluetooth |
| AutoPlay | | | Have a question? |
| V Autoriay | | | Fixing Bluetooth connections |
| USB USB | | | Reinstalling Bluetooth drivers |
| | | Done | Sharing files over Bluetooth |
| | | Done | Get help |
| | | | Give feedback |



Easy Controller via Bluetooth connection

Once the Bluetooth connection is established, a virtual COM port is created on the host PC.

This COM port is used to connect to the reader with the CAEN RFID Easy Controller application.

Follow the steps below to connect the reader using the Easy Controller for Windows via Bluetooth:

- 1. Connect the reader to your PC using the Bluetooth connection as explained in previous paragraph.
- 2. Download from the CAEN RFID web site the latest version of the CAEN RFID <u>Easy Controller for</u> <u>Windows</u> software and install it (see § *Installation* page 7).
- 3. In your Windows Pc go to *Settings* → *Devices*. Click on *Bluetooth* & *other devices* → *More Bluetooth option*:

| Settings | | | - 🗆 X |
|---|---|--------------|--|
| M Home Find a setting Devices | Bluetooth & other devices | | Turn on Bluetooth even faster To turn Bluetooth on or off without opening Settings. open action center and select the Bluetooth icon. |
| Bluetooth & other devices | On | | |
| 日 Printers & scanners | Now discoverable as "C1621" | | Related settings Devices and printers |
| () Mouse | Mouse, keyboard, & pen | | Sound settings |
| Touchpad | Microsoft Surface Keyboard Connected | 9 3% | Display settings More Bluetooth options |
| Typing | Microsoft Surface Mouse | B 83% | Send or receive files via Bluetooth |
| 🖉 Pen & Windows Ink | • connected | | |
| AutoPlay | Other devices | | Have a question? |
| П USB | | | Fixing Bluetooth connections |
| 🖞 USB | | | Reinstalling Bluetooth drivers Sharing files over Bluetooth |
| | | | |
| | | | Get help |
| | | | Give feedback |
| | | | |



4. Look for the COM port in the *Bluetooth Settings* (COM 13 in the example below):

| | Settings | | | | | | - 🗆 | |
|-------|---------------|-----------------------|--|----------------------|------------------------|-------------|--|--|
| ън | lome | | | Bluetoot | h & other devices | | | |
| Find | a setting | | ٩ | | | | Turn on Bluetooth even faster | |
| evice | 25 | | | + Add Blue | etooth or other device | | To turn Bluetooth on or off without opening Settings, open action cente and select the Bluetooth icon. | |
| | 😣 Bluetooth S | ettings | | | × | | | |
| 1 | Options COM P | orts Hardwar | re | | | | Related settings | |
| 1 | | | serial) ports listed bel ort, read the docume | | s "C1621" | | Devices and printers | |
| | with your Blu | etooth device | | | | | | |
| | Port COM13 | Direction Outgoing | Name skiD-20400011 'Blu | an aile Carial Darat | ard, & pen | _ | Display settings | |
| | | Outgoing | SKID-20400011 Blu | etooth senar Port | rface Keyboard | 93% | More Bluetooth options | |
| | 1 | | | | rface Mouse | 8 2% | Send or receive files via Bluetooth | |
| | | | | | | | Have a question? | |
| | | | | | | | Fixing Bluetooth connections | |
| | | | | | | | Reinstalling Bluetooth drivers | |
| | | | Add | Remove | | | Sharing files over Bluetooth | |
| | | | | | | | Get help | |
| | | | OK | Cancel Apply | | | Give feedback | |

5. Launch the CAEN RFID Easy Controller application:

| CAEN RFID Easy Controller | | | | | - | × |
|-------------------------------------|-------------------|--------------|--|--|--|---|
| File Settings Tools About | -1D | | Desi | gn your RFID solution we provide the te | chnology. | |
| Start Inventory TAGS FOUND: 0 | | | TATISTICS Gro 0 Src 1 Src 2 Src 3 Acq/Sec: 0 Efficiency: 0% Gage/Sec: 0 Tot. Tags: 0 | READER INFORMAT | ION Model:None Serial:None FW Rel.:None | |
| EPC | L. Source Antenna | COUNT TimeSt | IMP | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Connected: 🔴 Air Link Protocol: OFF | | | | | | |

6. On the main application window click on $File \rightarrow Connect$; the connection dialog box will appear.



7. Select *RS232* from the *Connection Type* combo box and the right COM port number from the *RS232 Port* combo box (COM13 in this example):

| CAEN RFID Easy Controller | | | - 🗆 X |
|---------------------------------|-----------------|------------------------------|---|
| File Settings Tools About | | | |
| | - 1 0 | | Design your RFID solution we provide the technology. |
| | | G Connection − □ X | READER INFORMATION |
| | | Connection Type 2 Src 3 | 3 Model:None |
| | | RS232 Connection ~ Efficienc | |
| TAGS FOUND: 0 | | RS232 Port | s: 0 FW Rel.:None |
| PC | L. Source Anter | n COM13 ~ | |
| | | Connect | |
| | | Choose a Connection type | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| nnected: Air Link Protocol: OFF | | | |

- 8. Click on *Connect*.
- 9. To verify if the connection with the reader has been established, check the green dot on the bottom left side of the sidebar. Into the *READER INFORMATION* box you can find information on reader model, serial number and firmware release:

| CAEN RFID Easy Controller | | | | | - 🗆 X |
|---|-------------------|-----------|--|-----------------------|---|
| File Settings Tools About | | | | | |
| | כ | | | Design your H we p | RFID solution provide the technology. |
| Start Inventory TAGS FOUND: 0 | | | STATISTICS Src 0 Src 1 Src 2 Src 3 Acq/Sec: 0 Efficienc, Tags/Sec: 0 Tot. Tag | 3 y: 0% | READER INFORMATION Model: R12801 Serial: 0001000120400011 FW Rel.: 1.2.0 |
| EPC | L. Source Antenna | COUNT Tim | eStamp | | |
| Connected: O Air Link Protocol: EPC C1G2 | | | | | .: |



10. Place tags in front of the reader and click on *Start Inventory* to see the tag information displayed on the main window:

| CAEN RFID Easy Controller | | | | | - 0 |
|---|-----------|--------------|-------|--|---|
| File Settings Tools About | | | | | |
| CAEN | RFID | | | Des | sign your RFID solution we provide the technology. |
| | | | | STATISTICS | READER INFORMATION |
| | | | | Src 0 Src 1 Src 2 Src 3 | Model: R1280 |
| Start Inventory | | | | | Serial: 0001000120400011 |
| | | | | Acq/Sec: 0 Efficiency: 0% | |
| TAGS FOUND: 14 | | | | Tags/Sec: 0 Tot. Tags: 0 | FW Rel.: 1.2.0 |
| PC | L. Source | Antenna | COUNT | TimeStamp | |
| 806810000003918718553 | Source 0 | Ant0 | 3 | 10/28/2020 10:43:43 AM | |
| B4000000000000000053 | Source_0 | Ant0 | 33 | 10/28/2020 10:43:37 AM | |
| E017004E8DA06300017D51 | Source_0 | Ant0 | 4 | 10/28/2020 10:43:41 AM | |
| 3132333435363738393031 | Source_0 | Ant0 | 14 | 10/28/2020 10:43:41 AM | |
| 0EFE2F94D01E0950213515 | Source_0 | Ant0 | 2 | 10/28/2020 10:43:43 AM | |
| 0833B2DDD9BD050127EF00 | Source_0 | Ant0 | 22 | 10/28/2020 10:43:37 AM | |
| 0833B2DDD9BD0500D6F609 | Source_0 | Ant0 | 8 | 10/28/2020 10:43:38 AM | |
| 0833B2DDD901400000000 | Source_0 | Ant0 | 27 | 10/28/2020 10:43:37 AM | |
| C1105012A70A46112014200 | Source_0 | Ant0 | 6 | 10/28/2020 10:43:42 AM | |
| 069900000000000002E98 | Source_0 | Ant0 | 37 | 10/28/2020 10:43:37 AM | |
| 35240000000000001388 | Source_0 | Ant0 | 4 | 10/28/2020 10:43:44 AM | |
| 15330000000000002420 | Source_0 | Ant0 | 22 | 10/28/2020 10:43:37 AM | |
| 0000000000000000000030333937 | Source_0 | Ant0 Ant0 | 23 | 10/28/2020 10:43:37 AM 10/28/2020 10:43:44 AM | |
| 000000000000000000000000000000000000000 | Source 0 | | | | |

You can disconnect the reader by clicking on $File \rightarrow Disconnect$.



USB Communication Setup

If supported by the reader, the reader can be connected to a PC using the USB cable and it is detected by the PC as an emulated serial port.

Follow the steps below to connect your Windows PC to the CAEN RFID reader using the USB connection and the Easy Controller Software. All the images below were generated using the Windows 10 Operating System.

- 1. Follow the instructions given in your reader's technical information manual to select the USB communication interface for the reader.
- 2. Connect the CAEN RFID reader to the PC using the USB cable and then power ON the reader.
- 3. The USB interface creates virtual COM port on the host PC that can be used to connect to the reader with the CAEN RFID Easy Controller application.

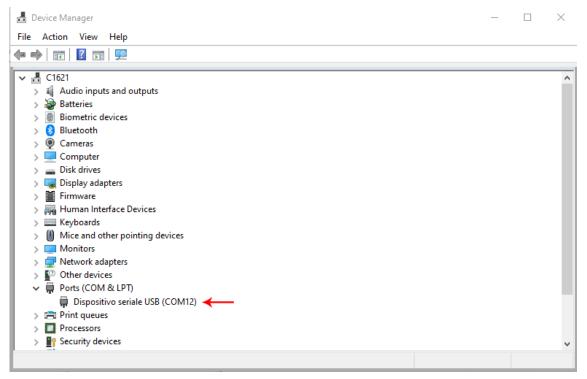
Easy Controller via USB connection

Once the USB connection is established, a virtual COM port is created on the host PC.

This COM port is used to connect to the reader with the CAEN RFID Easy Controller Software.

Follow the steps below to connect the reader using the Easy Controller for Windows via USB:

- 1. Download from the CAEN RFID web site the latest version of the CAEN RFID <u>Easy Controller for</u> <u>Windows</u> software and install it.
- 2. In your Windows Pc go to Settings \rightarrow System. Open the System properties and click on Device Manager.
- 3. Look for the COM port in the Device Manager window (COM 12 in the example below):





4. Launch the CAEN RFID Easy Controller application:

| CAEN RFID Easy Controller | | | | - 0 |
|-------------------------------|------------------|-----------|---|---|
| File Settings Tools About | | | | |
| | ระโม | | Design | your RFID solution we provide the technology. |
| Start Inventory TAGS FOUND: 0 | | | STATISTICS Src 0 Src 1 Src 2 Src 3 Aca/Sec: 0 Efficiency: 0% Tags/Sec: 0 Tot. Tags: 0 | READER INFORMATION Model:None Setial:None FW Rel::None |
| PC | L. Source Antenn | a COUNT 1 | 'imeStamp | |
| | | | | |
| | | | | |
| | | | | |

- 5. On the main application window click on $File \rightarrow Connect$; the connection dialog box will appear.
- 6. Select *RS232* from the *Connection Type* combo box and the right COM port number from the *RS232 Port* combo box (COM12 in this example):

| CAEN RFID Easy Controller File Settings Tools About | RE D | | Design your RFID solution we provide the technology. |
|--|------------------|--------------------------------|---|
| Start Inventory TAGS FOUND: 0 | L. Source Antenn | RS232 Connection V RS232 Port | READER INFORMATION Serial None FW Rel:None FW Rel:None |
| Connected: Air Link Protocol: OFF | | Choose a Connection type | |

7. Click on Connect.

8. To verify if the connection with the reader has been established, check the green dot on the bottom left side of the sidebar. Into the *READER INFORMATION* box you can find information on reader model, serial number and firmware release:

| CAEN RFID Easy Controller | | | | - 0 |
|--|-----------------|---------------|---|---|
| File Settings Tools About | | | | |
| | מ | | Desi | gn your RFID solution we provide the technology. |
| Start Inventory TAGS FOUND: | | | STATISTICS Sirc 0 Sirc 1 Sirc 2 Sirc 3 Acq/Sec: 0 Efficiency: 0% Taga/Sec: 0 Tot. Taga: 0 | READER INFORMATION Model: R12801 Serial: 0001000120400011 FW Rel:: 1.2.0 |
| EPC | L. Source Anter | nna COUNT Tir | meStamp | |
| | | | | |
| Connected: Air Link Protocol: EPC C1G2 | | | | |

9. Place tags in front of the reader and click on *Start Inventory* to see the tag information displayed on the main window:

| CAEN RFID Easy Controller | | | | | - 0 |
|--|--|--|---|--|--|
| File Settings Tools About | | | | | |
| | ₹ IJ | | | De | isign your RFID solution we provide the technology. |
| | | | | STATISTICS | READER INFORMATION |
| | | | | Src 0 Src 1 Src 2 Src 3 | Model: R1280 |
| Start Inventory | | | | | Serial: 0001000120400011 |
| | | | | Acq/Sec: 0 Efficiency: 0% Tags/Sec: 0 Tot. Tags: 0 | EW Rel: 1.2.0 |
| PC . | L. Source | Antenna | COUNT | TimeStamp | |
| | Source 0 | AntO | | 10/28/2020 10:43:43 AM | |
| | | | - | 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM | |
| | Servera 0 | | | | |
| 4B4000000000000000053 | Source_0 | Ant0 | | 10/29/2020 10:42:41 AM | |
| 4B40000000000000000053 ISE017004E8DA06300017D51 | Source_0 | Ant0 | 4 | 10/28/2020 10:43:41 AM | |
| 228068100000003918718553 4484000000000000000053 35E017004E8DA06300017D51 303132333435363738393031 100FEF258401E0950213515 | Source_0 Source_0 | Ant0 Ant0 | 4 14 | 10/28/2020 10:43:41 AM | |
| V484000000000000000053 ISE017004E8DA06300017D51 I03132333435363738393031 I00EFE2F94D01E0950213515 | Source_0 Source_0 Source_0 | Ant0 | 4 14 2 | 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM | |
| A48400000000000000000000000000000000000 | Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 | 4 14 2 22 | 10/28/2020 10:43:41 AM | |
| A4B40000000000000000053 85E017004E8DA06300017D51 | Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 | 4 14 2 22 8 | 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM | |
| 4840000000000000000053 55601700480A06300017051 0007E7594D016095013515 00083822DD096D050127EF00 0008382DD096D050127EF00 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 4 14 2 22 8 27 | 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:38 AM | |
| 48400000000000000000003 56017004680A06300017051 032333435658738393031 006FE2F9400160950213515 0068382DD058050172FE00 008382DD058050172FE00 008382DD0580050172FE00 008382DD0580050172FE00 008382DD0580050172FE00 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 4 14 2 22 8 27 6 | 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:38 AM 10/28/2020 10:43:37 AM | |
| VB4000000000000000053 56017004E0A6500017051 000323343455738393031 0005E2594D0160950123515 0003382DDD98D050127EF00 0003382DDD98D050106F609 0003382DD9914000000000 KC1105012A70A45112014200 305990000000000002E88 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 4 14 2 22 8 27 6 37 | 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM | |
| V48400000000000000000053 SEC17004E0A0630017051 0001232343458738393001 000EF22F94D01E0950213515 0003382DDD98DD050127EF00 0003382DDD99D0500DF609 0003382DDD99D01400000000 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 4 14 2 22 8 27 6 37 4 | 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM | |
| V4840000000000000000053 SEC17004E0A0630017D51 000278234358738393031 000278220D798D051275F0 0003382DD798D050127FF0 0003382DD798D05000F609 0003382DD7901400000000 XC1105012A70A46112014200 130699000000000002288 13524000000000000238 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 4 14 2 22 8 27 6 37 4 22 | 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:44 AM | |

You can disconnect the reader by clicking on $File \rightarrow Disconnect$.



Ethernet Communication Setup

If supported by the reader, the reader can be connected to a Windows PC using an Ethernet cable.

Follow the instructions given in your reader's technical information manual to select the *Ethernet* communication interface for the reader and set the network configuration.

Now you can use the <u>CAEN RFID Easy Software</u> to control the reader.

Easy Controller via Ethernet connection

Follow the steps below to connect the reader using the Easy Controller for Windows via Ethernet:

- 1. Download from the CAEN RFID web site the latest version of the CAEN RFID <u>Easy Controller for</u> <u>Windows software and install it.</u>
- 2. Launch the *Easy Controller* application:

| CAEN RFID Easy Controller | | | | | | - 🗆 X |
|---------------------------|-----------|----------|-------|-------------------|-------------|--|
| File Settings Tools About | | | | | | |
| |) | | | | | RFID solution provide the technology. |
| | | | | STATISTICS | | READER INFORMATION |
| Start Inventory | | | | Src 0 Src 1 Src 2 | Src 3 | Model:None |
| | | | | Acq/Sec: 0 Ef | | Serial:None |
| TAGS FOUND: 0 | | | | Tags/Sec: 0 To | ot. Tags: 0 | FW Rel.:None |
| EPC | L. Source | | | TimeStamp | | |
| LPC | L. Source | Antenna | COUNT | limestamp | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Connected: OFF | | <u> </u> | | | | |

3. On the main screen click on *File* →*Connect*. A Connection windows will open. Select the *Connection Type* (TCP/IP Connection) and type the reader IP address into the *TCP/IP Address* box (in this example 192.168.0.2). Then click on *Connect*:

| CAEN RFID Easy Controller | | | - 🗆 X |
|-------------------------------------|----------------|--------------------------------------|--|
| File Settings Tools About | | | |
| | IRFID | De | rsign your RFID solution we provide the technology. |
| | | Connection – 🗆 X | READER INFORMATION |
| Start Inventory | | Connection Type TCP/IP Connection | Serial:None |
| TAGS FOUND: 0 | | TCP/IP Address | FW Rel.:None |
| EPC | L. Source Ante | | |
| | | Connect | |
| | | Choose a Connection type | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Connected: 🔴 Air Link Protocol: OFF | | | |

4. To verify if the connection with the reader has been established, check the green dot on the bottom left side of the sidebar. Into the *READER INFORMATION* box you can find information on reader model, serial number and firmware release (in this example, Mod. R1290I Hex):

| CAEN RFID Easy Controller | | | | | | - 0 | × |
|--|----------------|-----------|-------------------|--------------------------------|---------------------|---|----|
| File Settings Tools About | | | | Design you | ır RFID solution | | |
| | ן | | | | e provide the te | chnology. | |
| | | | STATISTICS | | - READER INFORMATIO | DN | |
| Start Inventory | | | Src 0 Src 1 Src 2 | | | Model: R1290I | |
| TAGS FOUND: 0 | | | | Efficiency: 0% Tot. Tags: 0 | | Serial: 000100011805000 FW Rel.: 0.2.0 | 12 |
| EPC | L. Source Ante | nna COUNT | TimeStamp | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Connected: O Air Link Protocol: EPC C1G2 | | | | | | | .: |

5. Place a tag on the reader, click on *start inventory* and see the tag information displayed on the main window:

| CAEN RFID Easy Controller | | | | | - 0 | | | | |
|---|--|--|--|--|--|--|--|--|--|
| File Settings Tools About | | | | | | | | | |
| | | | | Design your RFID solution we provide the technology. | | | | | |
| | | | | STATISTICS | READER INFORMATION | | | | |
| Start Inventory | | | | Src 0 Src 1 Src 2 Src 3 Acq/Sec: 0 Efficiency: 0% | Model:R12901 Serial: 0001000118050002 | | | | |
| TAGS FOUND: 14 | | | | Tags/Sec: 0 Tot. Tags: 0 | FW Rel.: 0.2.0 | | | | |
| | | | | TimeStamp | | | | | |
| PC | L. Source | Antenna | COUNT | TimeOramp | | | | | |
| | L. Source Source_0 | Antenna Ant0 | 3 | 10/28/2020 10:43:43 AM | | | | | |
| 806810000003918718553 | | | | | | | | | |
| 8068100000003918718553 B40000000000000000053 | Source_0 | Ant0 | 3 | 10/28/2020 10:43:43 AM | | | | | |
| 8068100000003918718553 840000000000000000053 E017004E8DA06300017D51 | Source_0 Source_0 | Ant0 Ant0 | 3 33 | 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM | | | | | |
| 0068100000003918718553 8400000000000000053 E017004E8DA06300017D51 3132333435363738393031 | Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 | 3 33 4 14 2 | 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:41 AM | | | | | |
| 068100000003918718553 B40000000000000000053 E0170048DA06300017D51 31233345952738393031 0EFE2F94D01E0950213515 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 | 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:43 AM | | | | | |
| 806810000003918718553 B4000000000000000053 B40000000000000053 B17004EB206300017D51 31323343595373833031 06F2E794D01E0950213515 06382DD10960050127Fr00 | Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 8 | 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:41 AM | | | | | |
| 8068100000003918718553 84000000000000000000053 E07004E80A6030017051 313233435453738393031 00EF2F940016506213515 083382DDD980050127EF00 083382DDD998005000000000 083382DD99800500000000000000000000000000000000 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 8 27 | 10/28/2020 10.43.43 AM 10/28/2020 10.43.47 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.43 AM 10/28/2020 10.43.43 AM 10/28/2020 10.43.37 AM 10/28/2020 10.43.37 AM | | | | | |
| 0068100000003918718553 8400000000000000000053 B40000000000000053 B17004E8DA5050017251 31323343563738393031 0EFE2F44001E0950215515 083382DDD980050127FF00 083382DDD980500275F00 083382DD980500275F00 083382DD980500000000 1150512X70A45112014200 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 8 27 6 | 10/28/2020 10.43.43 AM 10/28/2020 10.43.47 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.43 AM 10/28/2020 10.43.37 AM 10/28/2020 10.43.37 AM 10/28/2020 10.43.42 AM | | | | | |
| 806810000000000000000000000000000000000 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 8 27 6 37 | 10/28/2020 10.43.43 AM 10/28.2020 10.43.37 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.43 AM 10/28/2020 10.43.37 AM 10/28/2020 10.43.38 AM 10/28/2020 10.43.37 AM 10/28/2020 10.43.37 AM | | | | | |
| 8058100000003918718553 84000000000000000000003 8517045E80A5000177051 31323343583738393031 06F25F34001E0550213515 063382DDD981D05002F5603 063382DDD981D05002F5603 063382DD991000000000 1105012A770A46112014200 05990000000000002598 35240000000000001388 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 8 27 6 37 4 | 10/28/2020 10:43:43 AM 10/28/2020 10:43:47 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:47 AM 10/28/2020 10:43:47 AM | | | | | |
| 806810000000000000000003 B4000000000000000003 B40000000000 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 8 27 6 37 4 22 | 10/28/2020 10.43.43 AM 10/28/2020 10.43.47 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.41 AM 10/28/2020 10.43.43 AM 10/28/2020 10.43.37 AM 10/28/2020 10.43.42 AM 10/28/2020 10.43.42 AM 10/28/2020 10.43.42 AM | | | | | |
| PC 20206810000003918718553 2020681000000000000000000000000000000000 | Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 Source_0 | Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 Ant0 | 3 33 4 14 2 22 8 27 6 37 4 | 10/28/2020 10:43:43 AM 10/28/2020 10:43:47 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:41 AM 10/28/2020 10:43:43 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:37 AM 10/28/2020 10:43:47 AM 10/28/2020 10:43:47 AM | | | | | |

You can disconnect the reader by clicking on $File \rightarrow Disconnect$.



3 QUICK START

Main window

Once connected to the reader, on the *READER INFORMATION* box you can find information on reader model, serial number and firmware release.

On the menu bar you can find four options:

- File: contains the Connect, Disconnect, Enable Logging and Exit choices
- Settings: contains the Source Selection and Options choices
- Tools: contains the I/O management (GPIO) choice
- About: opens the information dialog showing the Easy Controller Version

| CAEN RFID Easy Controller | | | | | - 🗆 X |
|--|-----------|---------|-------|---------------------------|--|
| File Settings Tools About | | | | | |
| | כ | | | Desig | n your RFID solution we provide the technology. |
| | | | | STATISTICS | READER INFORMATION |
| | | | | Src 0 Src 1 Src 2 Src 3 | Model: R1290IE |
| Start Inventory | | | | Acq/Sec: 0 Efficiency: 0% | Serial: 0674046018420055 |
| TAGS FOUND: 2 | | | | Tags/Sec: 0 Tot. Tags: 0 | FW Rel.: 1.6.0 |
| EPC | L. Source | Antenna | COUNT | TimeStamp | |
| 300EFE2F94D01C02540BE454 | Source_0 | Ant0 | | 23/12/2020 10:33:36 | |
| 300EFE2F94D01C02540BE448 | Source_0 | Ant0 | 5 | 23/12/2020 10:33:36 | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Connected: Air Link Protocol: EPC C1G2 | | | | | .:: |

Fig. 3.1: CAEN RFID Easy Controller Side Bar

The *Start Inventory* button starts and stops the inventory process and shows the information retrieved from the tags in the main window. In the *TAGS FOUND* text box the number of detected tags is shown.

After the inventory has started, on the lower half of the main window you can find a table containing the following parameters:

- EPC: EPC code of the inventoried tag (tag ID)
- L. Source: source of identification
- Antenna: Antenna of the source that has identified the tag
- TID: TID of tag, if available (default is TID reading off)
- RSSI: Received Signal Strength Indicator (as 16 bit signed form)
- COUNT: number of time the tag has been read
- TimeStamp: timestamp associated with the time of first identification of tag



All the above listed parameters can be displayed or not in the table.

Using the context menu you can select the ones you want to be displayed in the table (right click with the mouse on the table and check/uncheck them).

Finally at the bottom of the main window you can find a status bar displaying the connection status (green dot = connected, red dot = not connected) and the anti-collision algorithm (air protocol) in use.

During the inventory cycle you can check the following parameters inside the *Statistic* box:

- Acquisitions per second (Acq/sec): the number of acquisition cycles per second
- Tags per second (tags/sec): the number of tags detected per second
- Efficiency (Efficiency): is the value calculated by a Simple Moving Average algorythm using Acq/sec and tags/sec parameters
- Tot tags (Tags found): maximum number of tags detected for each inventory cycle.

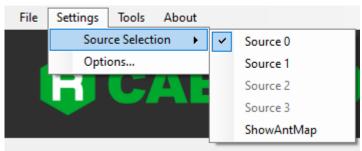
Doing inventory

To start an inventory, click on *Start inventory* button.

By default the reader identifies tags using Source 0 (for further information on sources see § *Before starting: CAEN RFID reader system overview* page 6).

If you want to add sources click on Settings — Source selection and check the desired sources:

CAEN RFID Easy Controller



ShowAntMap option helps the user to get a quick view of the current attached antenna for each source:

| Sourc | e-Antenna Ma | ab X |
|-------|--------------|-------|
| | Source 0 | Ant0 |
| | Source 1 | Ant 1 |
| | Source 2 | H |
| | Source 3 | н |

Remember that if the reader has one antenna, only Source 0 is available.

To stop the inventory click on *Stop Inventory*. If *Enable Logging* has been previously selected, then the inventory results are automatically logged. For logging options, see *Logging options* section.

Once click on the *Start Inventory* button, the statistics are tabbed for source and updated values are shown only after about 30 total acquisitions.

Note: the efficiency and the acquisition speed depend on several factors (antenna type, testing environment and parameters settings) and do not represent a reliable index for an exhaustive evaluation of the reader performance.

To disable the clearing of the tags from the listview of the main window in each "Start Inventory", click right on the listview header and tick the menu item "clear list" (see § *Fig. 3.2: Listview header* page 24).



Filtering Tags

Click right on the listview header and access the "Filtering Options":

| G C | AEN RFID Ea | sy Contro | oller | | | | | | | | | | |
|-------|-------------|-----------|-------|----|-------------|----------|--------------|--------------|-------|------------------------------------|---------|-------------|----------------|
| File | Settings | Tools | About | | | | | | | | | | |
| | B | C | AE | EN | RFU | D | | | | | | | |
| | Start | Invento | ory | | | | | | | STATISTIC: Src 0 Sr Acq/Sec: | c 1 | Src 2 Ef | Src ficient |
| | TAGS FC | OUND: | 2 | | | | | | | Tags/Sec: | 0 | То | ot. Taç |
| EPC | | | | ~ | EPC | I Source | Antenna | RSSI | COUNT | | | | |
| | E2F94D01C0 | | | ~ | Logical So | | Ant0 Ant0 | -525 -485 | _ | 23/12/202 | | | |
| JUUEF | E2F94D01C0 | 2040BE44 | 48 | ~ | = | urce | Antu | -480 | 3 | 23/12/202 | 20 11:4 | 46:40 | |
| | | | | Ľ | | | | | | | | | |
| | | | | _ | TID | | | | | | | | |
| | | | | ~ | 11001 | | | | | | | | |
| | | | | ~ | | | | | | | | | |
| | | | | ~ | TimeStam | р | | | | | | | |
| | | | | | Filtering O | ptions | | | | | | | |
| | | | | ~ | Clear List | | | | | | | | |
| | | | | _ | | | | | | | | | |
| | | | | | | | | | | | | | |

Fig. 3.2: Listview header

| _ | | | |
|--------------------|-----------------------|-----------------------------------|---------------------|
| starting with 🔹 37 | Active? | ● AND ◯ OR | Add New Filter |
| ending with O01A | Active? | ○ AND | Remove Selected |
| not contains | Active? | | |
| | | | |
| | | | ОК |
| | | | Cancel |
| | r ending with v 001A | ending with 		 001A 			 ☑ Active? | ending with 		 001A |

Fig. 3.3: Filtering options window

In the *Filtering Options* window, you can create filters for the inventory operations.

To enable the filtering system, check the "Enable Filtering" on the top.

The filters are concatenated into a unique condition linked by Boolean operators AND and OR.

To create a new filter, click on "Add New Filter" on the right and a new line will appear in the box. Filter parameters:

- Subject of the filter:
 - **EPC**: to filter the EPC bank of a tag

- TID: to filter the TID bank of a tag
- **RSSI**: to filter RSSI values of a tag
- Condition of the filter:
 - starting with (EPC and TID): the bank starts with a specific value
 - ending with (EPC and TID): the bank ends with a specific value
 - contains (EPC and TID): the bank contains a specific value
 - not contains (EPC and TID): the bank doesn't contain a specific value
 - Greater than (RSSI): the RSSI value is greater than a specific value
 - Lesser than (RSSI): the RSSI value is less than a specific value
 - Equal to: the RSSI value is equal to a specific value
- Values:
 - EPC and TID: hexadecimal string representing bytes (eg " 3A5F")
 - RSSI: number of a valid RSSI (eg "-421 " or -42.1 dBm)
- Activate the filter:
 - Checked: active filter
 - Unchecked: passive filter
- Conjunction with the next filter (only for two or more filters):
 - AND: binds the results of the current filter with the next one through the logical AND operator
 - OR: binds the results of the current filter with the next one through the logical OR operator

To remove a filter, select the filter (check "select all" in the top of the box to remove all the filters) and click on "Remove Selected".

To confirm the created filters, click on "OK", otherwise click on "Cancel".

Operating with tags

After the inventory has been stopped, you can make some operations on tags that have been identified. Right click on the desired tag and the following context menu will appear:

| EPC | |
|------------------------------------|--------------|
| FFFF33B2DDD900000 | 00000A9 |
| FFFF33B2DDD900(FFFF33B2DDD900(| ProgramID |
| | Read & Write |
| | |
| | Kill |
| | Сору |
| | |

The available operations on tags are:

- ProgramID
- Read and Write
- Lock
- Kill
- Copy



Copy option copies the EPC string in the Windows clipboard.

ProgramID

ProgramID allows you to modify the EPC code of the selected tag. Usually EPC codes are 12 bytes length (96 bit).

In case the EPC bank has been previously locked you will need to input an access password.

The figure below shows the ProgramID window:

- ID length is the number of bytes of the new ID to program: 12 bytes is the standard length
- ID is an hexadecimal string that represents the new ID
- Password is a hexadecimal string that represents access password; it must be exactly 4 byte long

| ProgramID FFFF338 | 32DDD9000000000A9 | — | | < |
|-------------------|-------------------------------------|----------------|---------|---|
| ID length (bytes) | ID (Hex) FFFF33B2DDD9000000000A9 | Password (Hex) | Program | |
| | | | | : |

Note: EPC Class1 Gen2 defines two types of password: "kill password" and "access password" and both are 4 byte long. If a tag is locked, "access password" is used for all the operations but killing: kill operation must be performed using the "kill password". The two passwords are stored in a reserved bank of tag.

For tags memory map specification, please refer to EPC Class 1 Gen 2 specification document [RD1].

Read &Write

You can quickly read and write information inside the tag using the Read&Write command.

The Read&Write window shows a part of the tag's memory in a mapped area.

An example of the mapped area:

| ry Bank Add | dress (word) | Length (6 | word) P | assword () | Hex) | Read | W | rite |
|---------------|--------------|---------------|---------|----------------|------|------|---|------|
| Address (Hex) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0002 | DADA | 6896 | 0002 | 013C | 6FA3 | 1860 | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

You can set the read/write options:

- Memory Bank: a combobox permits to choose the memory bank (RESERVED, EPC, TID, USER) where to perform the read/write operation
- Address (word): here you can specify the start address (word-oriented integer number) for the read/write operation
- Length (word): (only for the read operation) here you can specify the number of words (an integer number) you want to read starting from *Address*

 \times

• Password (Hex): here you can put the access password (hexadecimal characters)

Read operation

Refer to the precedent paragraph to set the read options (memory bank, address, length, password).

Then click on the *Read* button to perform the read operation.

To stop the reading activity in progress, press on the "Cancel" tab:

Read & Write on Tag DADA68960002013C6FA31860

| Memory EPC | y Bank Addres | s (word) | Length (6 | word) Pa | | Hex) | Cancel | | Write | (()) |
|---------------|---------------|----------|---------------|----------|---|------|--------|---|-------|------|
| [| Address (Hex) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| | 0002 | DADA | 6896 | 0002 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
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In case of successful read:

| Address (Hex) 0 1 2 3 4 5 6 7 0002 DADA 6896 0002 013C 6FA3 1860 7 | ~ 2 | Length (word) | Password (He) | () Read | W | rite |
|--|-----------------|---------------|---------------|------------|---|------|
| 0002 DADA 6896 0002 013C 6FA3 1860 | Address (Hex) 0 | 1 2 | 3 | 4 5 | 6 | 7 |
| | 0002 DADA | 6896 0002 | 013C 6 | FA3 1860 | | |
| | | | | | | |

A red box indicates an unsuccessful read, the causes could be:

- the tag is no more under the antenna field
- inaccessible bank is read-protected by a previous lock operation
- not existing area

Read & Write on Tag DADA68960002013C6FA31860 \times Memory Bank Address (word) Length (word) Password (Hex) EPC Write 6 0 Read ~ 2 Address (Hex) 0 1 2 3 4 5 6 7 DADA 6896 0002 0002

Write operation

Refer to the precedent paragraph to set the write options (memory bank, address, length, password). As an example, consider the following mapped area:

| ny Bank Addre: | ss (word) | Length (2 | word) P | assword (H) | Hex) | Read | W | rite |
|----------------|-----------|---------------|---------|-----------------|------|------|---|------|
| Address (Hex) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0000 | 2345 | 122B | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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You can put the value (a word) you want to write directly in the boxes of the mapped area. The yellow colour indicates the modified boxes:

 \times

Then click on the *Write* button to perform the write operation.

Read & Write on Tag DADA68960002013C6FA31860



To stop the writing activity in progress, press on the "Cancel" tab:

| Read & V | Vrite on Tag DADA6 | 39600020 | 13C6FA3 | 1860 | | | | - | | × |
|----------------|--------------------|----------|----------------|----------|------------|------|---|-----|------|----|
| Memory USER | y Bank Addres | s (word) | Length (v 2 | word) Pa | assword (H | Hex) | | Car | icel | |
| [| Address (Hex) | 0 | 1 | 2 | 3 | 4 🔺 | 5 | 6 | 7 | |
| | 0000 | 2345 | 0024 | | | | | | | |
| | | | | | | | | | | |
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A green box indicates that the writing operation is correctly performed and "Memory written successfully!" appears at the bottom of the screen:

| y Bank Addre | ss (word) | Length (| word) Pa | assword (H | Hex) | Read | W | ite |
|---------------|-----------|----------|----------|------------|------|------|---|-----|
| Address (Hex) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0000 | 2345 | 0024 | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |



Instead, a red box indicates that the *write* operation failed and the *"Fail to write some cells. Press Write to retry or press Read"* appears at the bottom of the screen.

| ory Bank Addre | ess (word) | Length (2 | | Password (0 | (Hex) | Read | W | 'rite |
|----------------|------------|---------------|---|-----------------|-------|------|---|-------|
| Address (Hex) | 0 | 1 | 2 | 3 | 4 🔺 | 5 | 6 | 7 |
| 0000 | 2345 | 0024 | | | | | | |
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Lock

The memory banks of the tag can be write-protected by using the Lock command.

| Lock Tag FFFF33B2 | DD90000 | 8A00000 | | _ | | \times |
|-------------------|---------|----------------------|--------|----------|-----|----------|
| Memory Bank | | Action | Action | | | |
| EPC | ~ | ACCESSIBLE ON SECURE | \sim | A2B3C469 | Loc | k |

The *Lock window* contains the following parameters:

- **Memory Bank**: a combobox permits to choose the memory bank or field (kill password field, access password field, EPC bank, TID bank, USER bank) where to perform the lock operation.
- Action: it contains a list of four lock modes available:
 - ACCESSIBLE: the bank is accessible, no need to provide password to operates on this bank
 - PERMANENT ACCESSIBLE: bank is permanent accessible, and it cannot be locked anymore
 - ACCESSIBLE ON SECURE: bank is accessible only if the password is provided
 - PERMANENT INACCESSIBLE: bank is permanently locked, and cannot be made accessible anymore
- Password (Hex): here you can put the access password (4 bytes in hexadecimal characters)

Lock button: it performs the lock operation. An error message will appear if some parameter is wrong or the selected tag is no more under the antenna field.

Note: the lock command prevents the lock and write operations on EPC, TID and USER memory bank while it prevents read, write and lock operations on the kill password and the access password memory fields contained in the RESERVED memory bank as specified by the following table *Tab. 3.1: Lock – Action-field functionality* page 32.



| pwd-write | permalock | Description |
|--------------------|-----------|--|
| 0 | 0 | Associated memory bank is writeable from either the open or secured states. |
| 0 | 1 | Associated memeory bank is permanently writeable from either the open or secured states and may never be locked. |
| 1 | 0 | Associated memeory bank is writeable from the secured state but not from the open state. |
| 1 | 1 | Associated memory bank is not writeable from any state. |
| pwd- read/write | permalock | Description |
| 0 | 0 | Associated password location is readable and writeable from either the open or secured states. |
| 0 | 1 | Associated password location is permanently readable and writeable from either the open or secured states and may never be locked. |
| 1 | 0 | Associated password location is readable and writeable from the |
| | 0 | secured state but not from the open state. |

Tab. 3.1: Lock – Action-field functionality

The ISO-18000-6C (C1G2) standard specifies that each tag manufacturer should locate the *kill password* in the first four byte of the RESERVED memory bank, while the access password should be in the next four bytes. The standard also specifies that the *kill command* will fail immediately in case the *kill password* is set to 0 (0x00000000).

Kill

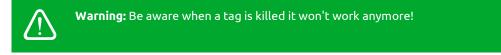
You can kill a tag using the Kill command.

Once selected Kill on the contextual menu the following Kill window will appear:

| Kill FFFF33B2DDD900 | 8A00000000 | | \times |
|----------------------|------------|------|----------|
| Kill Password (Hex): | 3EB8C451 | Kill | |

This window provides a password textbox and a *Kill* button; type the password (4 bytes in hexadecimal format i.e. A013B4F9) in the textbox and press *Kill*.

A dialog window will appear asking for a last confirmation.



Note that according to the ISO-18600C (Gen2) standard, if the kill password is equal to 0 (0x00000000), then the tag cannot be terminated.

Information about the Easy Controller

Information on the CAEN RFID Easy Controller are available clicking on About.

This window shows the current revision of the .NET library used by Easy Controller.



4 EASY CONTROLLER OPTIONS

Options window

On the main menu, clicking on *Settings* —*Options*, will open the Options window. This window has a tree-view on the left site with content in the right side. There are three main sections:

- General
- Reader Configuration
- Logical Source Configuration

These sections will be explained below.

| Log filer Log fi Cog fi Log fi Log fi Log filer Log filer Log filer AN AN TIL RS | NG OPTIONS ame: C:\EasyControll le creation mode verwrite O Apper | - | ile (numbered postfix filename) |
|---|--|---------------|--|
| | | | ile (numbered positiv menume) |
| | C Separate S | arator Tab | Dummy (max 500 chars) "# EasyController Test log " |
| Sav | e general settings on | exit. | Enable e-seal mode |

Fig. 4.1: General Options Window



General section

The *General* section deals with identification and logging options.

Identification

Identification box contains inventory mode and listview options:

- Inventory Mode. There are three inventory modes: Single, Continuous and Buffered
 - Single mode performs a single inventory cycle each time the Start Inventory button is clicked
 - **Continuous** mode performs continuous inventory cycles until Stop Inventory button has been clicked.

By clicking on button you can access the *Continuos Inventory Options* window. Select the *Real Continuous Mode (RCM)* to perform continuous mode, i.e., a continuous inventory via hardware on the source indicated by the RCM Source parameter. If this mode is disabled, the inventory is performed in loop via software by the Easy Controller. *Inventory on button press* can be enabled only in the readers equipped with button and allows you to perform the inventory just by pressing the button (for more info, refer to the technical specifications of your reader).

| O Buffered | ord |
|-----------------------------------|-----|
| Continuos Inventory Options | |
| ContOpt_RCM (Real Continuos Mode) | ÷ |
| Source: Source_0 ~ | nu |
| Inventory on button press | |
| Apply | |
| שור ב | |

Fig. 4.2: Continuos Inventory Options window

- Buffered mode takes the tags from internal buffer if available (when supported by the reader)

Note: when the Buffered mode is activated the *Start Inventory* button change to Download Buffer. If the reader you have connected doesn't have an internal buffer, this mode is disabled. Please refer to your reader documentation.

- ListView Options. In this area you can operate on the following parameters:
 - Converts EPC to ASCII: converts bytes of EPC in ASCII characters.
 - *Either in log?*: the EPCs in the log file will show as ASCII characters too.
 - *Byte Field View*: this groupbox is used to choose the byte field view (useful in case of long codes). The hexadecimal data can be grouping in:

Byte: single byte *Word*: 2 bytes *Dword*: 4 bytes *Font*: opens a dialog to choose the listview font.



Logging options

Logging Options provides a set of preferences for the logging session:

- Log filename: it is the file where all the logging informations will be stored: clicking on the button "..." will open a dialog where you can choose directory and filename.
- Log file creation mode: here you can select between three options:
 - Overwrite: at the end of the inventory session, a log file is created overwriting the existing one.
 - *Append*: at the end of the inventory session, new logged data are appended at the end of the existing file.
 - *New file*: at the end of the inventory session, new logged data will be stored in a new file. The name of the file will be created with an progressive number at the end (i.e. if the name for the log file is DumpTest.txt and it is stored in C drive, the first log file, with absolute path, will be 'C:\DumpTest00.txt').
- Log Info: here you can select the parameters you want to store on the log file:
 - In the first box you can select EPC, SOURCE, ANTENNA, TID, RSSI, COUNT and TIMESTAMP.
 - In the *Separator* box you can choose the separation mode: Tab (Tab separated values) or CSV (comma separated values) useful for most spreadsheet applications.
 - In the *EndLine* box you can choose the endline separator: CR or CR+LF.
 - *Dummy*. Here you can add some extra text information in the file (i.e. a description of a reader test).

In the e-seal mode the inventory operation will show an additional column of the e-seal tag status. This mode **operates only with e-seals:**

| TAGS FOUND: | | | | | |
|---|-----------|---------|-----|---------------------|-----------------------|
| EPC | L. Source | Antenna | COU | TimeStamp | ESeal [Word] + Status |
| 000000000000000000000000000000000000000 | Source_0 | Ant0 | 8 | 10/12/2019 16:00:32 | [8040] SEALED |
| | | | | | |
| | | | | | |
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| | | | | | |

If *Save on Exit* is checked all general settings will be saved on exit and they will be maintained for the next connection.

Reader configuration

CAEN RFID Readers have some basic configuration parameters. By clicking on *Reader Configuration* you can access to the Power settings and Reader Protocol area.

| Options | - 🗆 X |
|---|--|
| General Reader Configuration Logical Source Configuration | Reader Configuration Power Settings Power Input • 0% • 0% • Sweep power from 10 \$% to 100 \$% in 9 \$\$ steps. Radiated Power Parameters Ant0 Ant1 Ant2 Ant. Gain: dB Power: 28,3 |
| | Reader Protocol: Change protocol to: EPC Class 1 Gen 2 OK Cancel |

Fig. 4.3: Reader Configuration Window

Power Settings Area

- *Power Input*. You can increase or decrease the output power of the reader moving the slider from 0% to 100%. Not all values can be accepted by the reader, therefore the reader approximates the chosen value to the nearest valid one when releasing the mouse button from the slider.
- In the *power input* box you can enable the *sweep power* mode. The sweeping power is useful in testing phase to assess the "hit rating" of a session of inventory. Specify the minimum and maximum percentage of power to be applied and the number of steps in which to divide the sweeping. As a result, each inventory cycle is repeated as many times as the steps indicated, starting from the minimum to the maximum percentage of power.
- *Power output* allows you to select the measurement unit (useful in case you want information on Conducted Power (mW dbM) or Radiated Power (mWerp).
- Radiated Power Parameters. In this box you can set two parameters that allow to convert the Conducted Power into Radiated Power (*erp and *eirp units): Antenna Gain (expressed for linear dBi or circular antenna type dBic) and Cable Loss.

Reader Protocol Area

• Change protocol to allows you to change the communication protocol.

Note: in case of fixed power reader, the slider in the "Power Input" box is disabled.

Note: if your reader has an integrated antenna, the *Radiated Power Parameters* are disabled and the values are automatically set with the integrated antenna values.

Advanced Settings

| | n is for advanced users only! | |
|---|--|---|
| Options General Reader Configuration Advanced settings Logical Source Configuration | Advanced settings RF Settings Regulation: ETSI_302208 Channel: 4 Channel: 4 Enable LBT/FHSS Ant0 RF Impedance Matching Match SWR: Matches on connect Ant2 RF Impedance Matching Match SWR: 0 SWR: 0 | Test Link Profile: PR_ASK_M4_TX40RX300 V |
| | | OK Cancel Apply |

- RF Settings:
 - Regulation: it is not possible to modify the regulation, because the RF settings must match the country/region of operating to comply with local laws and regulations. The usage of the reader in different countries/regions from the one in which the device has been sold is not allowed.
 - *Channel*: modify the channel number in case of interferences.
 - Enable LBT/FHSS: by default the LBT (Listen before talk) or, depending on the regulation, the FHSS (frequency hopping) are enabled.

- Test:
 - Link profile: only in case of reading difficulties, you can modify the value of the link profile to
 increase the reading data rate.
- Ant[0-3] RF Impedance Matching:
 - SWR is the result of the impedance matching operation.
 - Matches on connect: enables the reader impedance automatch (if supported by the reader).

Logical source configuration

Logical sources concepts are described in paragraph *Before starting: CAEN RFID reader system overview* page 6.

This section is divided into two parts:

- Source Configuration
- Summary

| General | Logical Source Source Configuration Source Selection: Source 0 ~ Refresh Antenna Status | Attached Antennas Antennas Ant 0 Ant 1 Ant 2 Ant 3 | Properties (C1G2) Q value: 6 + Target | | | | | | |
|---------|--|---|--|----------|--|--|--|--|--|
| | Summary Source 0 - Antennas Ant0 - Ant1 - Properties - Q:6 - Ses:S0 - Tgt:A - Sel:ALL | Source 1 Antennas Ant 1 Properties Ges:S0 Tgt:A Sel:ALL | Source 2 ⊕. Antennas ⊕. Properties | Source 3 | | | | | |
| | | C | OK Cano | el Apply | | | | | |

Fig. 4.4: Logical Source Configuration Window



Source configuration

To configure a logical source follow the steps below:

- Select a source from the Source Selection combobox.
- Check/uncheck the antenna to add/remove it from the selected source.
 - The status of the antenna is indicated by colour:
 - Red: bad-connected or broken antenna
 - Yellow: poor signal from antenna
 - Green: well-connected antenna

Press "Refresh Antenna Status" button in case you need to check the antenna status. On the *Properties* (C1G2) area you can select some EPC parameters (Q value, Session, Selected and Target). For further details on these parameters, please refer to EPC Class 1 Gen 2 specification document [RD1]. Click *OK* or *Apply* to change settings.

Note: Q parameter is useful for the optimization of the inventory efficiency: as a rule of thumb, if you have to read a huge population of tags you need to select a high value for the Q parameter (7 or higher), otherwise you can select a lower value.

Note: if your reader has one antennna connector, only AntO (first Antenna) and Source 0 are available.

Summary

Here you can find the summary of all current sources settings.



5 GPIO MANAGEMENT

GPIO Management Window

Clicking on *Tools*—I/O Management, the GPIO settings window will appear:

| GPIO Management | | | | | | | | | | | | | — | | | | × |
|-----------------------|---------|------------|----|----|----|----|----|---|------------|---|---|----|---|---|------|---|---|
| | GPIO: | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Directions: 0x0002 | In: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ۲ |
| | Out: | \bigcirc | 0 | 0 | 0 | 0 | 0 | 0 | \bigcirc | 0 | 0 | 0 | 0 | 0 | 0 | ۲ | 0 |
| Values: 0x0002 | Status: | | | | | | | | | | | | | | | | |
| Refresh active settin | igs | | | | | | | | | | C |)k | | | Appl | у | |

This window allows you to configure up to 16 GPIO (the number of enabled GPIO depends on the reader model). Direction and value are represented respectively by radiobutton and checkbox (if supported by the reader).

If the direction is set on output value, you can use the checkbox to set the output line value, if the direction is set on input value, the checkbox is disabled and its status reflects the input line value.

You can also find the hexadecimal word values of current settings, useful for programmers.

The *Refresh active settings* button reads and shows the current values, deleting all the non-applied changes made.



Multiplexer Management Window

The Multiplexer Management Window allows you to configure up to 4 multiplexers simultaneously. Multiplexer Management



Fig. 5.1: Multiplexer Management Window

The GPIO to be used to drive the multiplexer are set through the parameters A0 and A1. If you want to disable a multiplexer on an antenna just uncheck all its RFout. Click "OK" to confirm, "Cancel" to cancel the latest changes.