

RFID DEMO INSTRUCTIONS


NORDICID

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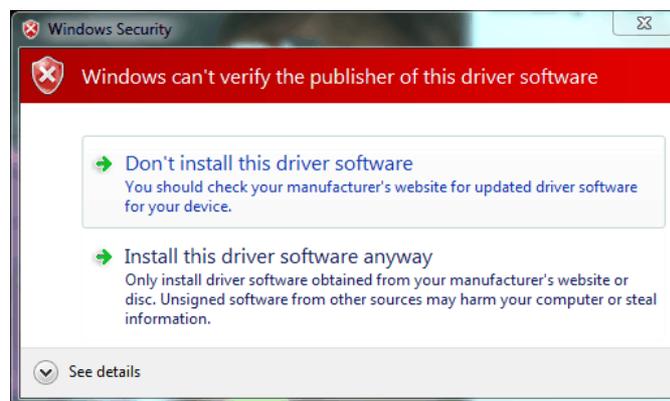


1. INSTALLING NORDIC ID RFID DEMO SOFTWARE

For testing the NUR-05W module or Nordic ID Sampo S1 RFID reader install the latest RFID Demo software. The newest release of the application is available for download in Nordic ID webpages at <http://www.nordicid.com/en/support/login-download-area/login.html> and in extranet pages at <https://support.nordicid.com/extranet>

In case there is a previous version of the RFID Demo software installed on the PC, it must be uninstalled prior to installing the newer one. The uninstallation can be done in Windows Remove programs and features utility.

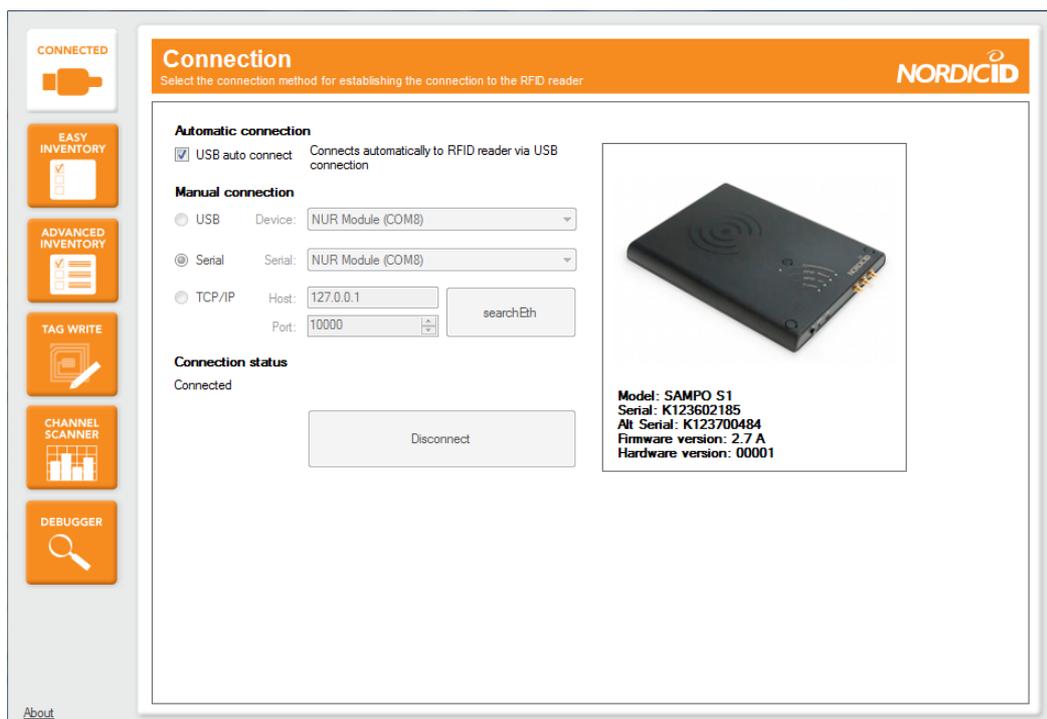
The RFID Demo installer packet will also install the USB driver for the Windows system. For this the user will be prompted during the installation with a pop-up window confirming the driver installation. Select 'install this driver anyway' to proceed with the driver installation.



2. ESTABLISHING THE CONNECTION



After launching the RFID Demo software the first thing to do is to establish the connection between the PC and the reader. Press the 'Connection' button on the side bar and select the connection method. The connection can be established via USB, Serial or TCP/IP connection depending on the model of your the RFID reader.



2.1. AUTOMATIC CONNECTION

USB auto connection: If the RFID reader is connected via the USB connection, 'USB auto connection' can be used for automatic connection. When the connection is successfully established, the picture of the RFID reader together with the model name, serial number and version details are shown in the information box.

2.2. MANUAL CONNECTION

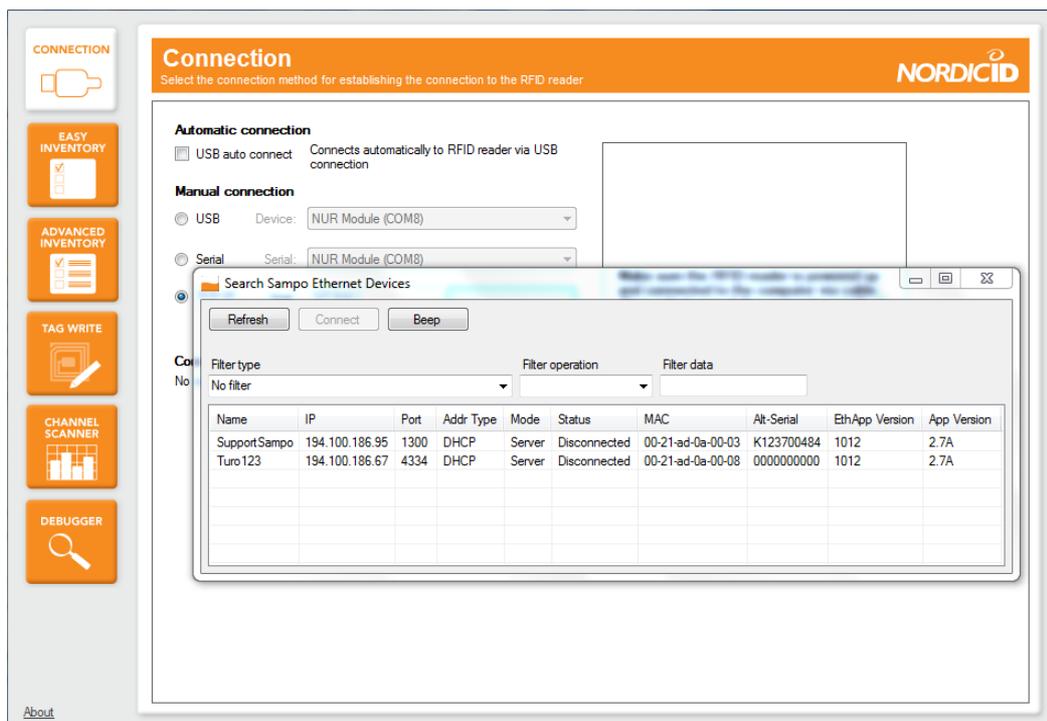
USB: The user can manually select the USB connection. If there are multiple RFID readers connected to the PC, the user can select which one of them to use. After



selecting the RFID reader from the drop down list, press the 'Connect' button to establish the connection.

Serial: Connect the RFID reader with the serial cable and select the device from the drop down list. After this press the 'Connect' button

TCP/IP: In order to connect the RFID reader over a network, select TCP/IP. Then for the 'Host' enter the IP address of the RFID reader and the correct port number. Now press the 'Connect' button to establish the connection. Note that the RFID has to be in client mode in order to be able to connect it. You can also search the reader from the network by clicking 'Search Eth`-button. This will open a dialog Window (picture below).



Select the RFID Reader from the list you want to connect and press the 'Connect' – button.

Note! You can set the Ethernet related settings into the RFID reader with the Nordic ID RFID Configurator software which is available free of charge in the Nordic ID Extranet.

When the connection is successfully established, the picture of the RFID reader together with the model name, serial number and version details are shown in the information box.

2.3. CONNECTION STATUS

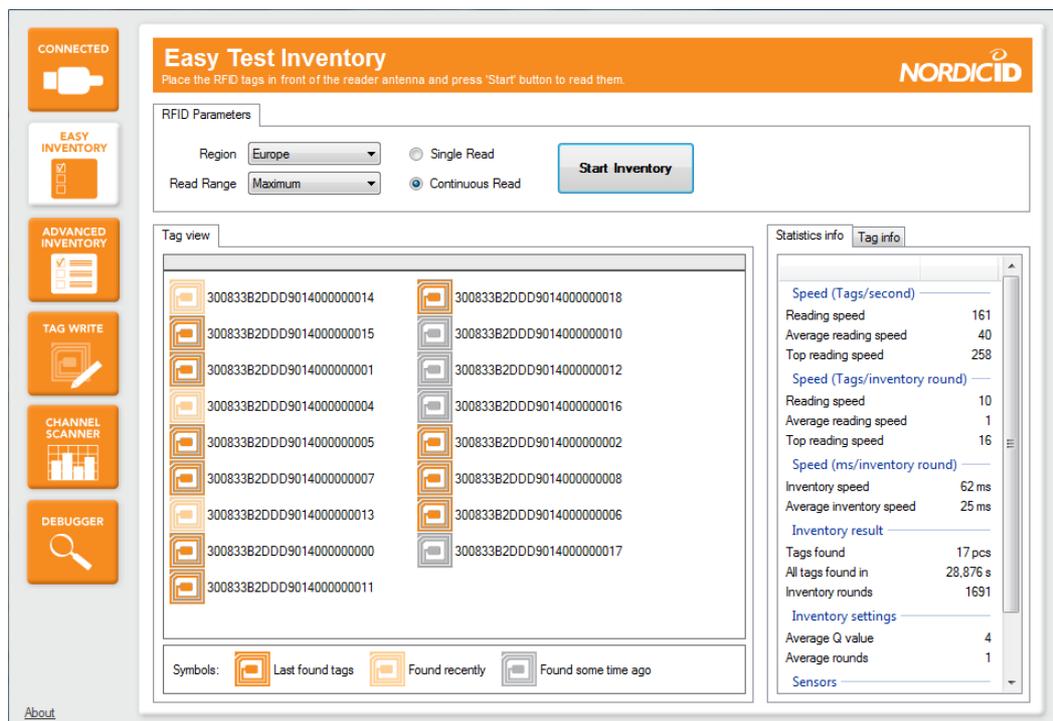
Connection status shows whether the RFID Demo application is connected or disconnected to the reader. When using manual connection and the connection is established the user can disconnect the reader with the disconnect button.



3. EASY TEST INVENTORY



The easy inventory with only few adjustable settings is aimed for making quick reading tests and for users who do not necessarily have deep understanding of all the various UHF RFID settings and how they affect the reading performance. Although the adjustable settings are heavily limited, easy test inventory still gives the user a pretty good idea how the reader performs.



3.1. RFID PARAMETERS

Region: Globally the radio regulations for UHF RFID differ depending on region or country the reader is operated in. These regulations cover the used frequency band, output power, etc. The NUR-05W module in Nordic ID Sampo S1 has multiple preset regulatory environments that the user can select from.

Read range: This setting adjusts the output power of the reader. The output power of the reader affects the maximum reading distance.



Single/Continuous Read: After selecting the reading related settings, start the reading with 'Start Inventory' button. 'Single Read' performs one inventory round whereas 'Continuous Read' performs inventory rounds until the user presses the 'Stop Inventory' button.

3.2. TAG VIEW

The tags that are read successfully are listed as icons together with the EPC code in the tag view window. The color of the icon depends on when the particular tag was read the last time:



Tag was successfully read during last inventory round



Tag was successfully read within last 10 inventory rounds



Tag was successfully read more than 10 inventory rounds ago

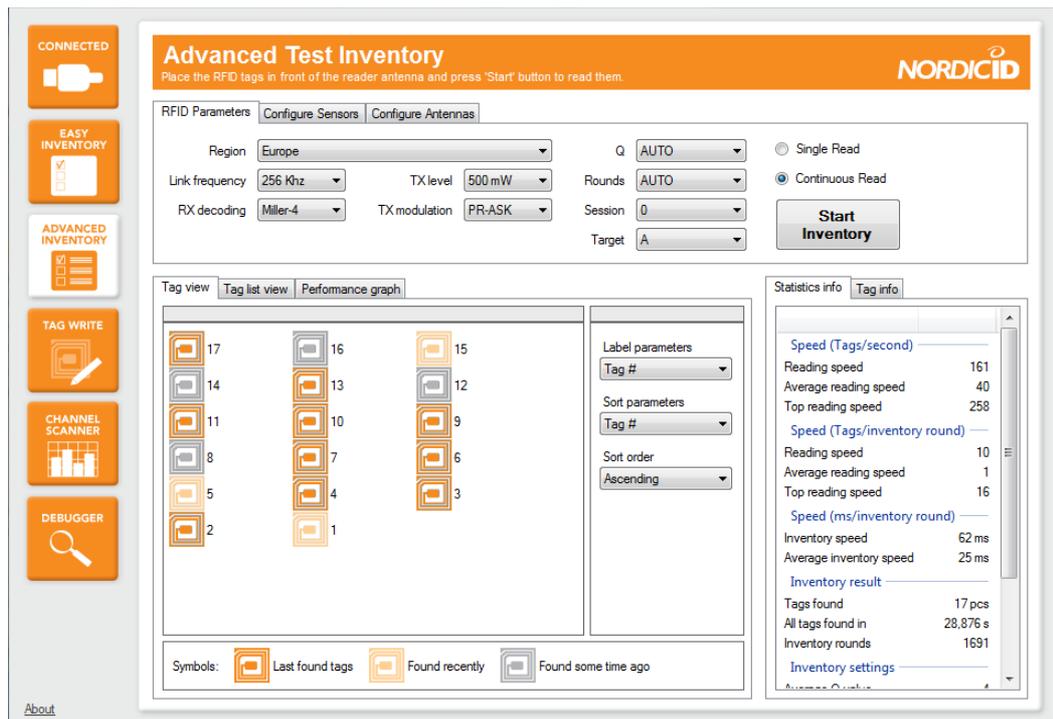
3.3. STATISTICS AND TAG INFO

Statistics info shows general information concerning the reading performance. The information is based on reading the whole tag population in reading range. To get information regarding a particular tag, select the tag from the tag view list by clicking its icon and press Tag info –tab.

4. ADVANCED TEST INVENTORY



Advanced inventory is for testing the RFID reading capabilities in more depth. The user has access to adjust all the settings supported by the RFID reader which are impacting the reading performance.



In addition to RFID settings, Advanced inventory also lets the user to define how the information of the reading process is shown on the screen. Write tag –tab allows also writing in to single tags.

4.1. RFID PARAMETERS

Region: Globally the radio regulations for UHF RFID differ depending on region or country the reader is operated in. These regulations cover the used frequency band, output power, etc. The RFID reader has multiple preset regulatory environments that the user can select from.



Link frequency: The link frequency in tag to reader communication. Higher value enables higher data transmission speeds but is more prone to bit errors. The selectable parameters are 160 kHz, 256 kHz and 320 kHz. Tags that are compliant with ISO18000-6C (EPC C1G2) must support all these parameters.

RX decoding: This setting adjusts how the binary data is encoded in tag to reader communication. Four different line encoding schemes are supported. FM0 provides the highest data rate but is more prone to bit errors. On the other hand Miller-8 is the most robust encoding method and therefore suits well for environments with high level of radio interference but the downside is the lower data rate it offers. This slows down the inventory speed.

TX modulation: It is possible to use ASK (amplitude shift keying) or PR-ASK (phase reversed amplitude shift keying) modulation. Tags that are compliant with ISO18000-6C (EPC C1G2) must support both of these modulations. The PR-ASK has lower transmission data rate and because of that it has narrower output spectrum. That's why it is recommended to be used when operating in DRM mode. By default the modulation is set to PR-ASK.

TX level: This setting adjusts the output power of the RFID reader module. Note that this is not the same as radiated power as this also depends on the gain of the attached antenna. The gain of the Sampo's integrated antenna is 8 dBic (5 dBi). Increasing the output power increases the reading distance.

Q-value: Defines the number of slots in which the tag randomly places the answer. Use higher Q-values when there are multiple tags in the reader's range simultaneously. This reduces the inventory speed but makes reading large quantities of tags faster as there are less data collisions.

The number of slots can be calculated with the following formula: 2^Q . It is recommended that the number of available slots should be double the number of tags in the reading



range. By selecting 'AUTO', the RFID reader automatically adjusts the Q-value which is optimized for the current tag population in the reading range.

Rounds: The rounds setting defines how many query rounds is done inside one inventory round. If data collisions occur during the inventory round, additional rounds are needed in order to read all the tags successfully. After each inventory round the RFID reader will send data to the RFID Demo application. The 'AUTO' setting makes the RFID reader to automatically decide after every query round whether another round is necessary based on the number of data collisions.

Session and Target: There are four session options which can be used for reading tags. Every session has two target states A and B. By default Gen2 tags are in state A if the tag has not been read recently. When tag is read it flips to state B and doesn't reply to readers query. The table below describes the persistence of the tag's state machine when using different session values.

Flag	Persistence: tag power ON	Persistence: tag power OFF
S0	indefinite	none
S1	500ms < t < 5s	500ms < t < 5s
S2	indefinite	t > 2s
S3	indefinite	t > 2s

For example when using session 0 the tag will come back to state A immediately after the tag gets unpowered. Usually the tag loses the power when the reader stops the inventory round or changes the channel. With session 1 the tag will keep its state over 500ms but less than 5s. With session values 2 and 3 the tag will keep its state over 2s when tag power is lost. Time can vary depending what tag IC is used.

By changing the target setting from A target to B target the reader is able to also read tags which have flipped their state into B state. This would happen if tags would have been read recently using session 1, 2 or 3. The RFID reader also supports dual target



mode. In that mode the reader will change the target mode automatically between the inventory rounds.

Single/Continuous Read: Reading is started with 'Start Inventory' button. 'Single Read' performs one inventory round whereas 'Continuous Read' performs inventory rounds until the user presses the 'Stop Inventory' button.

4.2. CONFIGURE SENSORS

Under Configure Sensors –tab you can define the behavior of the onboard tapping and light sensor.

Scan tag: When the sensor is activated, the Nordic ID Sampo reads just one tag in the reading range. If there are multiple tags in the surroundings, the reader will pick up just the first one to answer. For how long the reader tries to scan the tag can be defined with the 'Scan Tag' timeout setting.

Inventory: When the sensor is activated, the Nordic ID Sampo reads multiple tags in the reading range. For how long the reader tries to scan the new tags in the surroundings can be defined with the 'Inventory timeout' setting.

Disabled: The onboard sensor is disabled.

4.3. CONFIGURE ANTENNAS

Some Nordic ID Sampo variants support the use of external antennas. Under Configure antennas –tab you can enable and disable the external and the internal antenna. After you have enabled antennas, you can select which one of them you want to use or let Nordic ID Sampo to automatically switch between them.

Note! In order to avoid damaging the reader, DO NOT enable antennas which are not physically connected to the unit!



4.4. TAG VIEW, TAG LIST VIEW AND PERFORMANCE GRAPH

The tags that are read successfully are listed as icons in the tag view window. The color of the icon depends on when the particular tag was read the last time:



Tag was successfully read during last inventory round



Tag was successfully read within last 10 inventory rounds



Tag was successfully read more than 10 inventory rounds ago

On the right side of the window the user can define what label parameter is used together with the tag icon. The tags can be also sorted according to the parameters.

The alternative way to display the inventory information is by using the tag list view. This view contains in addition to EPC code a tag specific metadata like the PC bits data and the RSSI value.

The performance graph shows inventory performance results in graphical format. This gives the user a better understanding how the reading performance changes during time.

4.5. STATISTICS AND TAG INFO

Statistics info shows general information concerning the reading performance. The information is based on reading the whole tag population in reading range. To get information regarding a particular tag, select the tag from the tag view list by clicking its icon and press Tag info –tab.

5. TAG WRITE



Tag Write is for reading and writing into the memory banks of the RFID tag. The tag's chip memory contains four banks (Reserved, EPC, TID, USER(optional)) which can be accessed and modified individually. Note that some memory banks like the TID bank can be permanently locked by default which prevents altering the content.

Tag Write
Place the RFID tags in front of the reader antenna and press 'Read Tags' button

Tag List

Tag #	PC (Hex)	EPC (Hex)	RSSI	Antenna
1	3000	300833B2DD9014000000014	-69	1
2	3000	300833B2DD9014000000002	-51	1
3	3000	300833B2DD9014000000007	-49	1
4	3000	300833B2DD9014000000008	-67	1
5	3000	300833B2DD9014000000013	-73	1
6	3000	300833B2DD9014000000006	-49	1
7	3000	300833B2DD9014000000000	-53	1
8	3000	300833B2DD9014000000017	-67	1

TX level: 500 mW | RX decoding: Miller-4 | TX modulation: PR-ASK | Link frequency: 256 kHz

Tag Targeting

Password: 00000000 hex Use passwd

Bank: 1 - EPC Use singulation

Address: 32 bits

Mask: 300833B2DD9014000000014 hex

Length: 96 bits

RESERVED memory dump / writer

RESERVED | EPC | TID | USER

```

00000000 00 00 00 00 00 00 00 00 ...
00000008 00 00 07 D5 0C FE ...
    
```

Read Address: 0 bytes | Write Address: 0 bytes

Read Length: 14 bytes | Write Length: 14 bytes

Buttons: Read from RESERVED memory, Write to RESERVED memory

Set Kill Passwd: 00000000 | Set Kill Lock state: 0 - Open

Set Access Passwd: 00000000 | Set Access Lock state: 0 - Open

5.1. ACCESSING AND MODIFYING TAG MEMORY CONTENT

First thing to do is to press the 'Refresh List' -button in the 'Tag List'. This will scan the RFID tags in the surroundings. Now select the tag from the list of which content you want to access or modify.

Selecting a tag will automatically read all the content from the tag which can be seen on the right side of the screen. The content is divided into four sections bank by bank. Select the particular bank in order to access or modify its content.



Password usage: If you want to protect i.e. the EPC bank with a password, you need to first write the password into the access password bank. This can be found under the 'Reserved' -tab.

Type the password in the 'Set Access Passwd' input field and press the 'Set'-button. After this set the access lock state to 'secured'. Now the access password bank cannot be read or modified without out the proper password.

Now go to the 'EPC' -tab and set the EPC memory lock state to 'Secured'. Now the EPC bank cannot be modified without providing a proper password.

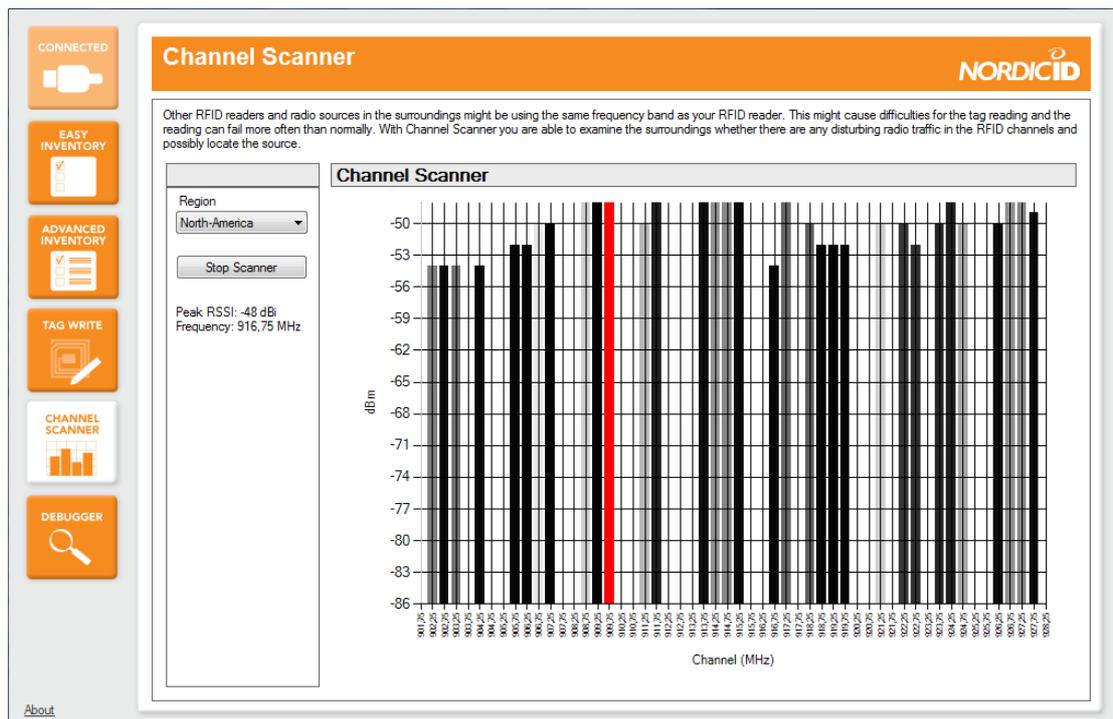
Note! Every time you are changing the locking state of any of the banks, you need to use the valid password; Enter the password in the password field under 'Tag targetin' list and check the 'Use Passwd' -box.



6. CHANNEL SCANNER



Channel Scanner is for listening RFID Channels in the surroundings. Other RFID readers or RF sources might be using the same channels as your reader is and this might decrease the performance of your RFID reader. The Channel Scanner is a good tool for finding these disruptive RF sources.



Note that the power of the detected signal is measured at the antenna input of the RFID reader module. Therefore the value partly depends on the gain of the attached antenna on that particular frequency and might not be accurate.

6.1. REGION

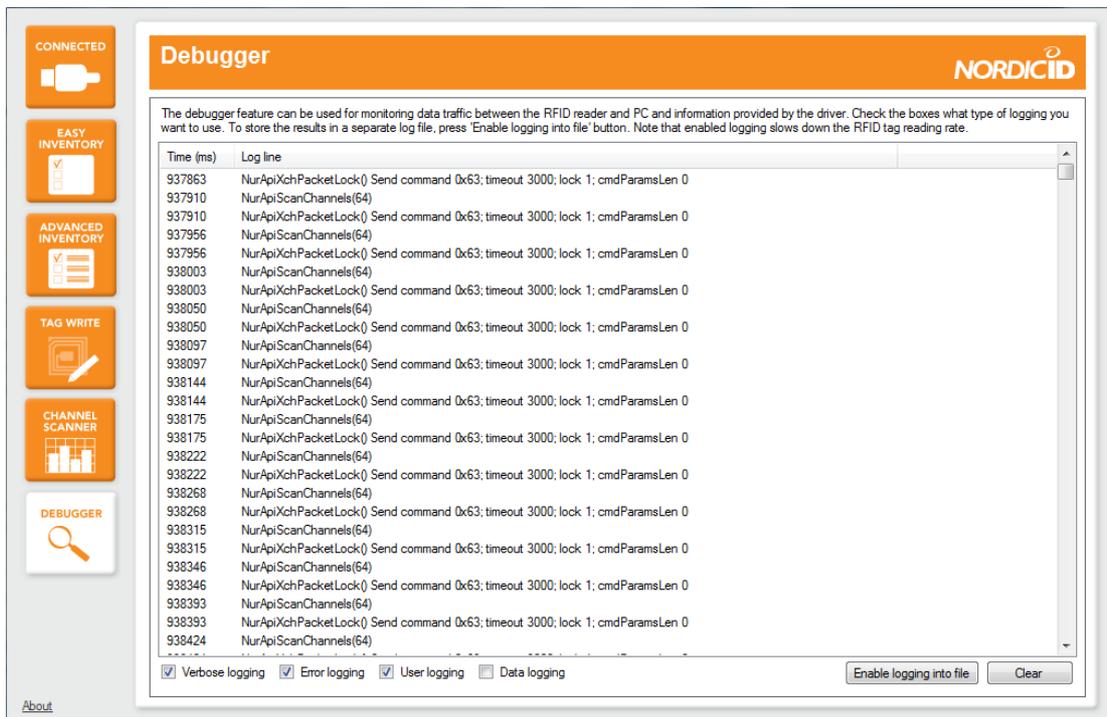
Select the frequency band which to monitor and press 'Start Scanner' button to start the scanning. There are 7 different regions with different frequency bands that can be listened.



7. DEBUGGER



The debugger feature can be used for monitoring data traffic between the RFID reader and PC and information provided by the driver. Check the boxes according to what type of logging you want to use. To store the results in a separate log file, press 'Enable logging into file' button. Note that enabled logging slows down the RFID tag reading rate.



Debugger NORDICID

The debugger feature can be used for monitoring data traffic between the RFID reader and PC and information provided by the driver. Check the boxes what type of logging you want to use. To store the results in a separate log file, press 'Enable logging into file' button. Note that enabled logging slows down the RFID tag reading rate.

Time (ms)	Log line
937863	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
937910	NurApiScanChannels(64)
937910	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
937956	NurApiScanChannels(64)
937956	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938003	NurApiScanChannels(64)
938003	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938050	NurApiScanChannels(64)
938050	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938097	NurApiScanChannels(64)
938097	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938144	NurApiScanChannels(64)
938144	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938175	NurApiScanChannels(64)
938175	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938222	NurApiScanChannels(64)
938222	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938268	NurApiScanChannels(64)
938268	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938315	NurApiScanChannels(64)
938315	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938346	NurApiScanChannels(64)
938346	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938393	NurApiScanChannels(64)
938393	NurApiXchPacketLock() Send command 0x63; timeout 3000; lock 1; cmdParamsLen 0
938424	NurApiScanChannels(64)

Verbose logging
 Error logging
 User logging
 Data logging

About



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