ifm electronic

Software manual

ReaderStart
for DTE8xx / DTE9xx

Version 2.4

UK

706390 / 00 11/2016

ifm electronic ReaderStart V2

Contents

UK

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1 Preliminary note

1.1 Symbols used

► Instructions

> Reaction, result

[…] Designation of keys, buttons or indications

→ Cross-reference

Important note
Non-compliance may result in malfunction or interference.

Information
Supplementary note

2 Safety instructions

Please read the operating instructions prior to set-up of the device. Ensure that the device is suitable for your application without any restrictions.

If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property can occur.

3 Items supplied

On the CD supplied you find this documentation and the following documents and programs:

- Specification of the protocol of the communication between reader and counterpart
- API DLLs for simplified control of the reader with Borland, Visual Studio and easy programming examples
- Set-up program for ifm electronic ReaderStart software
- .Net Framework 4
- C++ 2008 redistributable

4 System requirements

To ensure trouble-free operation with the software on your PC/laptop your PC/laptop should meet the following minimum requirements:

Processor:	X86 compatible
RAM memory:	512 Mbyte RAM
Operating system:	Windows XP (SP3), Vista (SP1), Windows 7 or higher
Free hard disk memory:	32 bits – 850 Mbytes (including Microsoft .Net Framework 4)
	64 bits – 2 Gbytes (including Microsoft .Net Framework 4)

5 Functions and features

In conjunction with the object recognition sensor the ReaderStart program provides the following options:

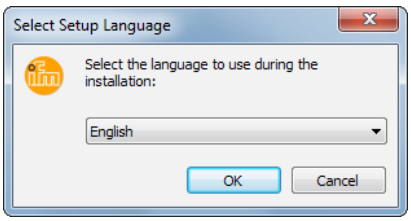
- The sensor uses incident light or backlight to detect the image of an object and compares it with the defined contours of one or several models in a reference image. Depending on the degree of conformity, orientation and tolerances the object is classified as being good or bad.
- Creation, administration and deletion of application-specific applications
- Real-time monitor mode for set-up
- Analysis of the application via the service report

6 Installation

ReaderStart is installed by starting the Setup.exe from the supplied CD ROM. During installation it is checked if the requirements necessary for the installation are met. That means it is checked if all dependencies such as the required Windows Service Packs, the .NET Framework in the respective version and the C++ Redistributables are installed. If this is the case, the demo software and the DLL to control the reader are installed.

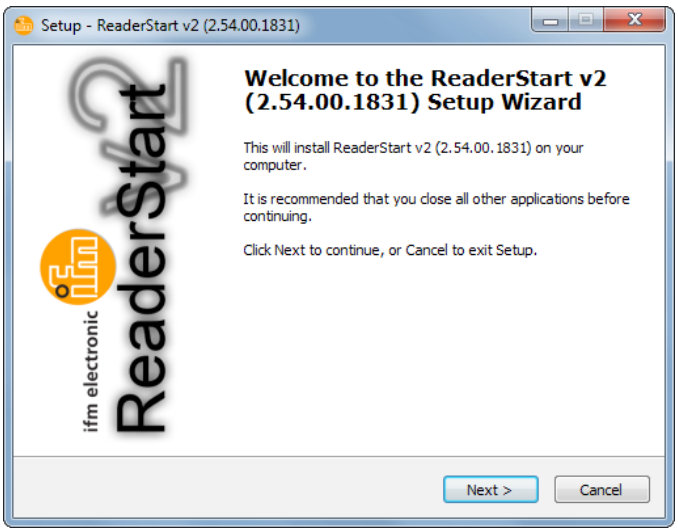
An internet connection may be required to install the dependencies.

When the set-up has been started, you can select the language during installation in the window that opens. Click on the [OK] button to confirm your selection.



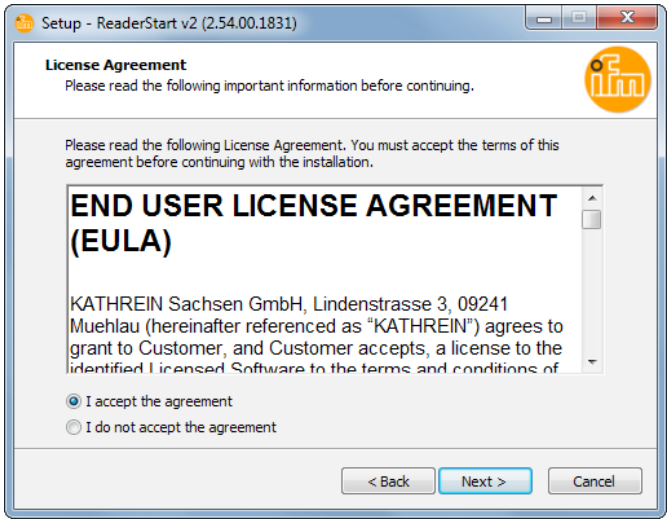
Screenshot: Language selection for the installation

The splash screen now displayed informs you about the exact version of the ReaderStart software. This information can later be accessed in the menu bar via the drop-down menu info.



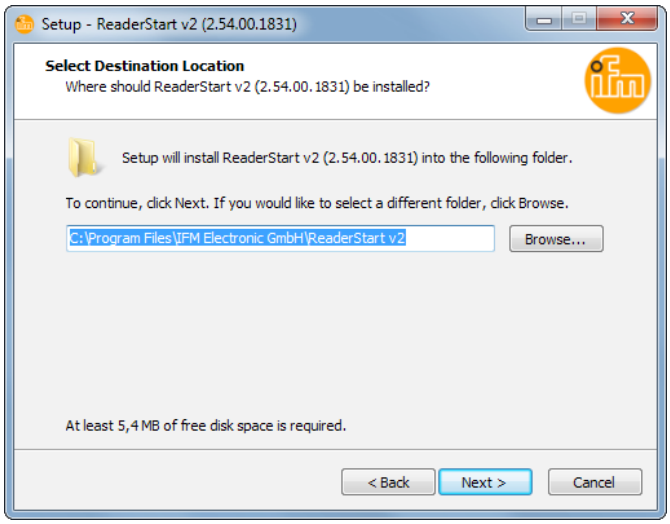
Screenshot: Splash screen with software version

By clicking on the [Next] button you go to the licence agreement. Please read it carefully. Should you not agree with the agreement, you have to reject it. Then the installation is cancelled at this point.



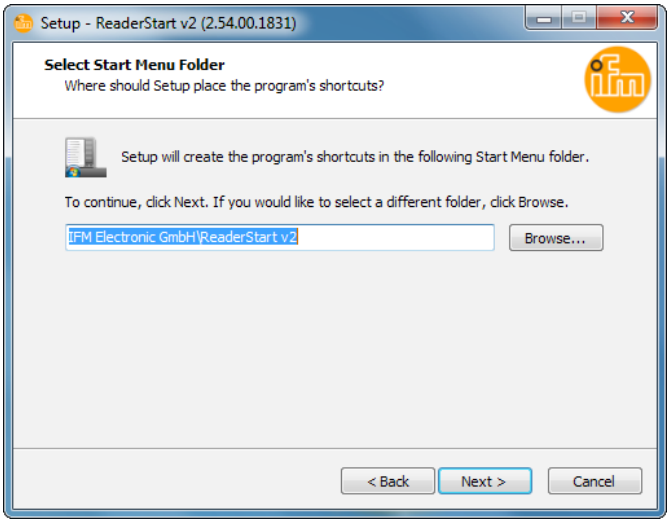
Screenshot: Confirmation of the licence agreement

If you accept the licence agreement, click on the [Next] button to select the destination folder for the software. Select the destination drive.



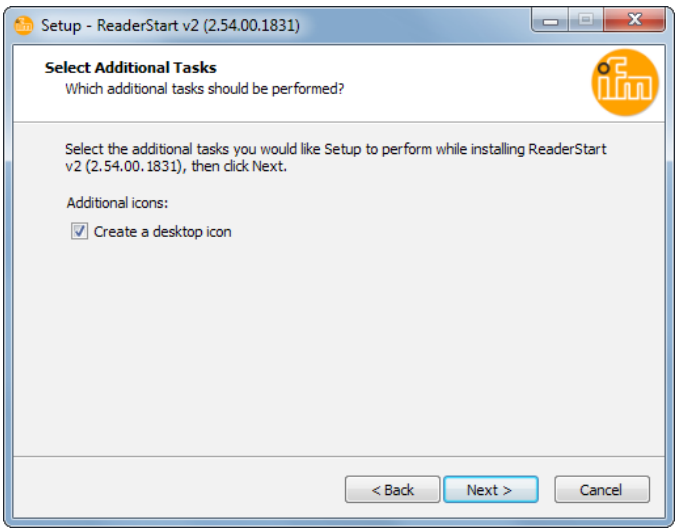
Screenshot: Selection of the installation folder

In the next screen you can adapt the folder in the Windows start menu.



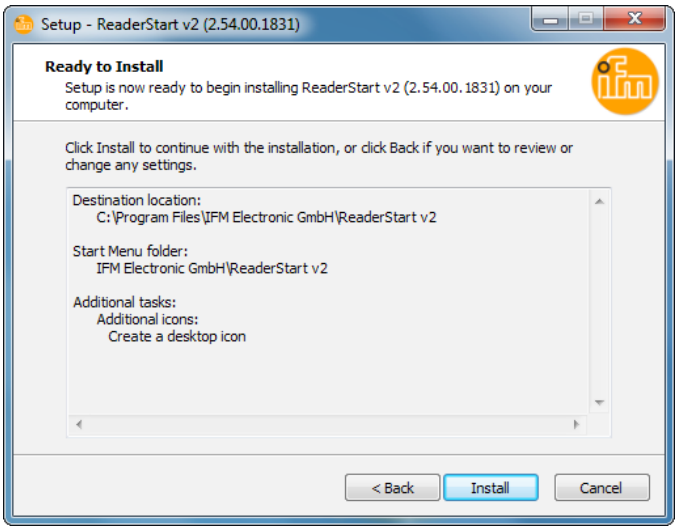
Screenshot: Selection of the folder in the start menu

In the following window you can define if an icon should be created on the desktop. An icon is created on the desktop by default.



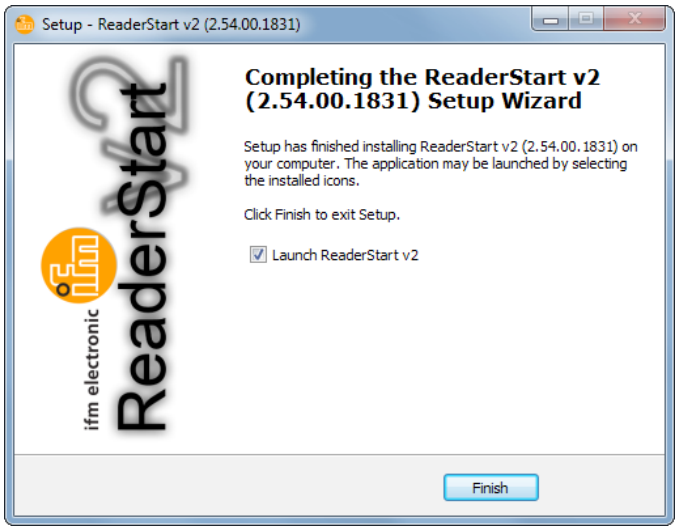
Screenshot: Creation of an icon

Finally a summary of the installation tasks is displayed. Installation is started by clicking on the [Install] button. If a reboot of the PC becomes necessary during the installation process, please perform it.



Screenshot: Summary of the installation tasks

The successful completion of the installation is displayed in the following window. If you do not want to work with the software right away, please remove the tick in the box [Launch ReaderStart v2] since otherwise the program is started when you click on [Finish].



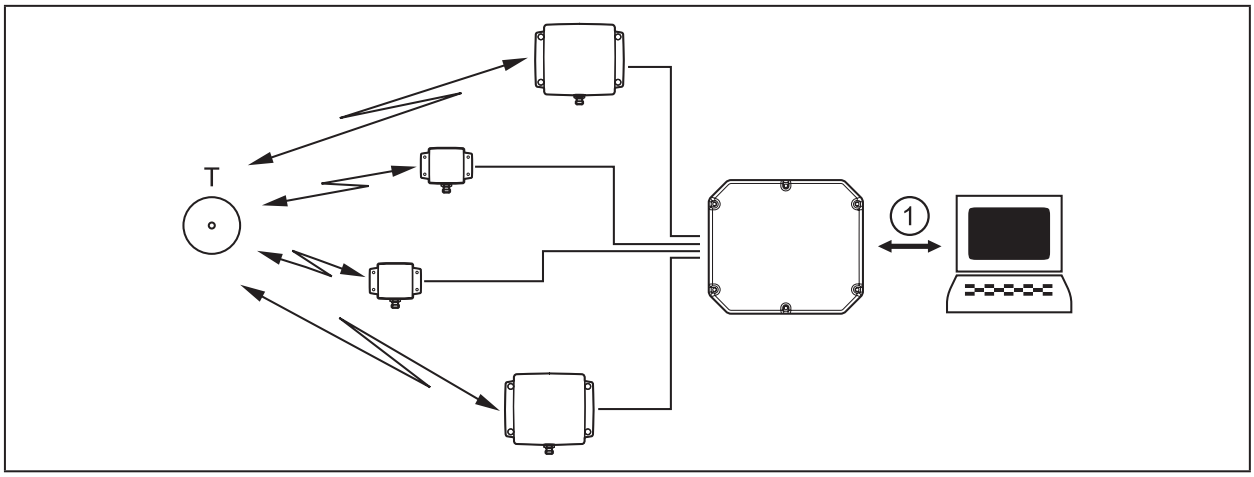
Screenshot: Finish the installation

7 Operation

In the following section the ReaderStart v2 software for the RFID reader from ifm electronic is described. Before the surface, the individual configuration and operation options are described, the function principle of the RFID reader system is delineated.

7.1 General

An RFID system consists of the control processor, the actual reader, the antennas, the antenna connection cables and the tags. The picture below shows the systematic structure of the system:



T: ID tag ; 1: Ethernet interface

Screenshot: RFID system

The tags consist of an antenna and a small chip. They are the actual carriers of the information, the EPC. By means of this number products or product groups can be identified. Alternatively, the EPC can also be overwritten with your own information.

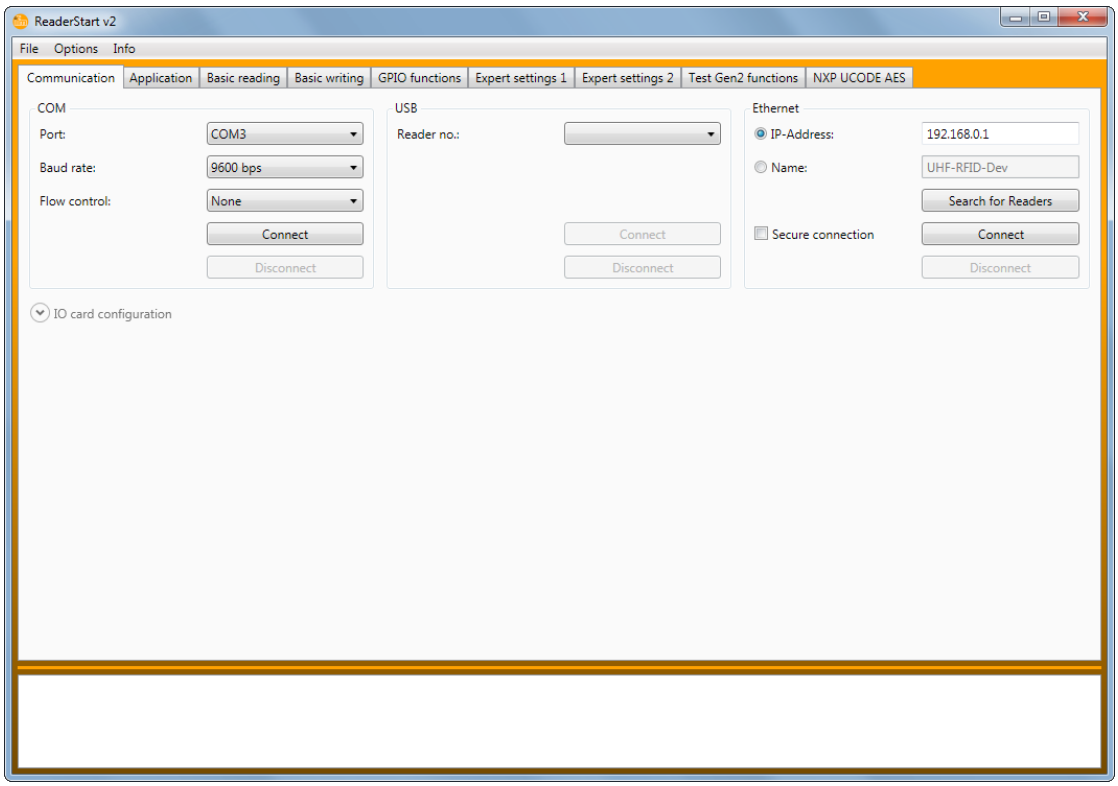
To read information from a tag, the reader sends an HF carrier via the active antenna thus supplying all tags in this HF field with energy. If the information of a tag is now to be read, this tag has to be selected from the population of tags (singularisation). After successful completion of the singularisation, the tag requests a handle. The further communication with the tag is handled via it and the EPC is read. The tag is written to in the same way.

The EPC of the tag is transmitted to the PC by the reader and can there be displayed with more information. This does not only include the time of reading but also the antenna via which the tag was addressed. The tag can always be directly addressed via this EPC as soon as it is within the range of the reader.

The communication from ReaderStart v2 with the reader is effected via the supplied DLL. It maps all device functions relevant for the user on the user interface. Each connection of the program via the different reader interfaces is made via this DLL. The functions that can be used are listed in the "ReaderDll.h" header file.

7.2 ReaderStart user interface

The program is started by the ReaderStart v2.exe. The splash screen is displayed until all required DLLs have been loaded in the background. Then the user interface shown below is displayed. It basically consists of the menu bar, the tabs and the status field.



Screenshot: ReaderStart v2 user interface

- Some tabs are now displayed if the hardware supports this (e.g. AppManager).
- Functions that are not available are greyed out in the program.

The setting and operating elements of the reader are divided into individual function groups with one tab each. The individual pages can be selected via the tabs. The tab order can be adapted by "drag and drop", if required.

All status messages of the reader and the program are protocolled in the status field, if requested. Three message types are defined:

- [Info] indicates the action that is being executed
- [Warning] points out possible problems in the structure and the configuration
- [Error] indicates that a requested action could not be executed

Each message is provided with a timestamp and stored in the status field so that the recent information is always on top.

The status field has a context menu with which warnings, info and errors can be deactivated in the status field. The accumulated messages can be deleted in this menu.

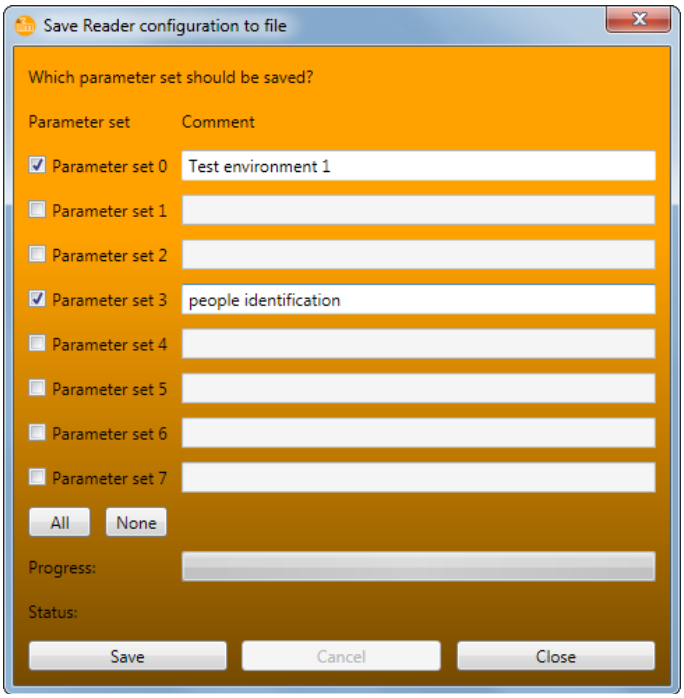
7.3 Menu bar

The program can be adapted to your own wishes via the menu bar. This includes for example language settings, layout, status messages and retrieval of the program information. It consists of File, Options, Info.

7.4 File

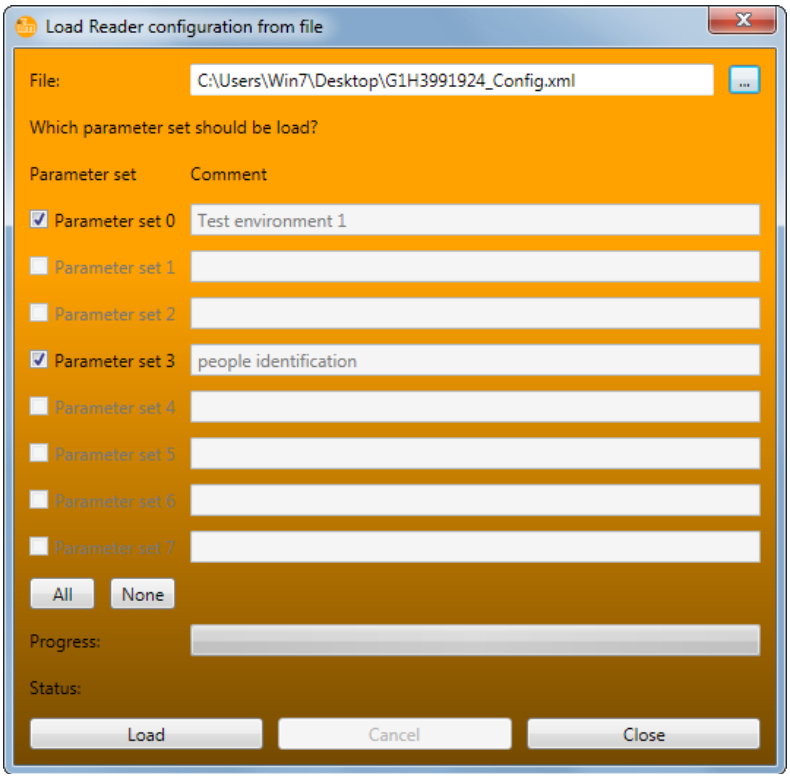
A number of parameters are available for the HF front end for configuration. A complete setting can be saved as parameter set in the file menu item as an XML file and uploaded again.

In the item "Save Reader configuration to file" a dialogue opens displaying all available parameter sets (0 - 7). The selection can be changed by ticking the respective box. It is also possible to briefly describe each parameter set. By saving, another dialogue opens in which a respective memory location and a file name must be selected or entered to successfully save the file. The progress of the saving process is shown in a bar.



Screenshot: Save configuration to a file

Loading of the settings starts with the selection of the parameter file. All available parameter sets are displayed in the dialogue that opens. The parameter sets can be newly assigned to the memory locations. For this purpose the desired parameter on the reader set can be selected in the drop-down menu. By selecting [None] this parameter set is not transferred to the reader. In the default setting there is a 1:1 assignment.

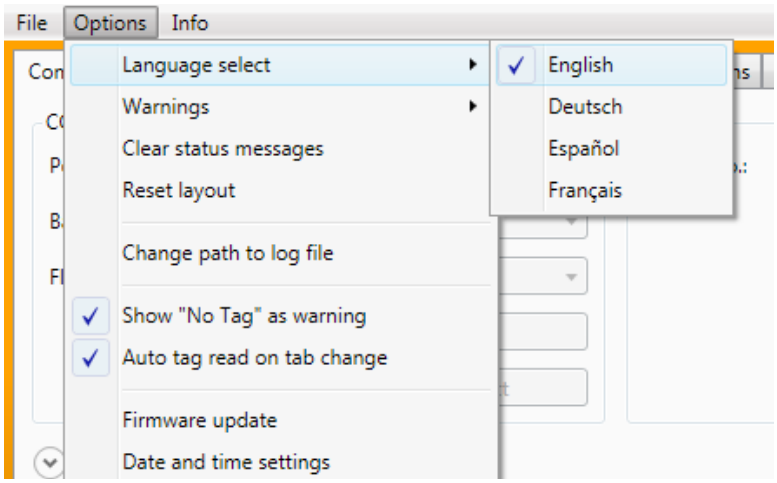


Screenshot: Load configuration from file

7.5 Options

The options are divided into 2 groups. One part allows to change or reset some program features. The second part allows to provide the reader with a new firmware and to change its system time.

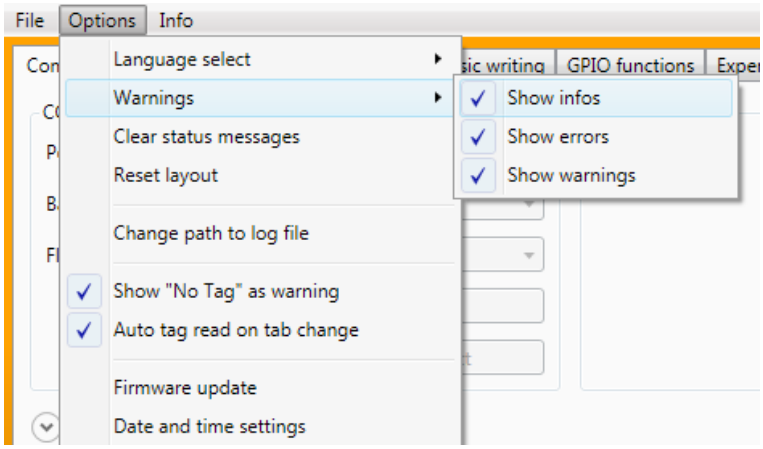
Changing the language, selecting the displayed warnings, resetting the layout and deleting status messages in the status field belong to the first group. The language used in the program is selected by clicking on the requested language in the menu item [Language select]. The currently selected language is shown by a tick; if applicable, the program points out that rebooting is necessary to adopt the change.



Screenshot: Language selection

In the item "Warnings" safety messages about infos, errors and warnings can be can be activated or deactivated.

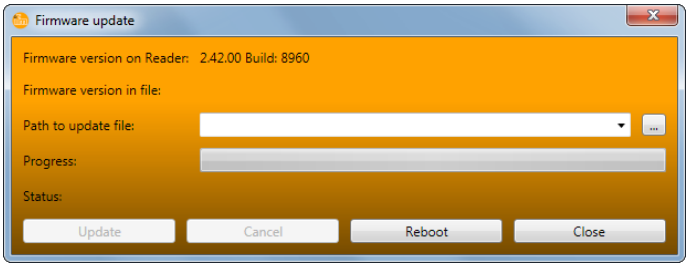
By changing the memory contents of the tags these tags can become useless.



Screenshot: Set the warnings

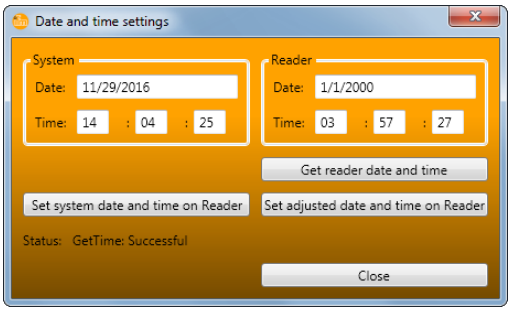
The original program layout can be reset via the menu item [Reset layout] (window size and tab order).

The item [Firmware update] allows to update the reader firmware. The current reader version is displayed in the window that opens. After selection of the firmware file the version is shown in the following line. The button [Update] starts the process. The progress is shown in a bar in the line [Progress]. After successful update the reader must be rebooted either with the button [Reboot] or by disconnecting the operating voltage and connecting it again.



Screenshot: Firmware update

The reader has an integrated clock that can provide the timestamp for a one-day operation. This clock is set via the date and time settings in the menu. When you open this menu item, the current time is automatically read from the reader and compared with the data of the host PC. The time of the host PC can now be transferred to the reader via the button [Set system date and time on Reader]. There is also the possibility to set the reader time manually and to transfer it to the reader. To do so, the requested time must be entered on the reader side and transferred with the button [Set adjusted date and time on Reader]. The status line shows the action that is executed and if the action was successful.



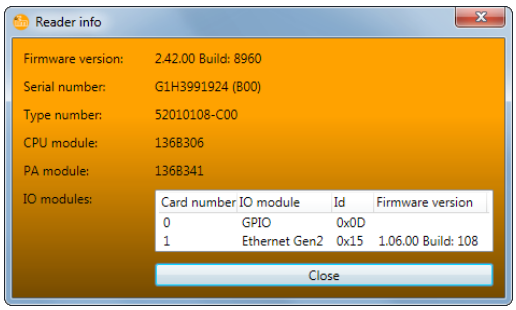
Screenshot: Date and time settings

7.6 Info

This item of the menu bar allows to access information about the ReaderStart software and the reader. The PC software version can be seen in the first line.

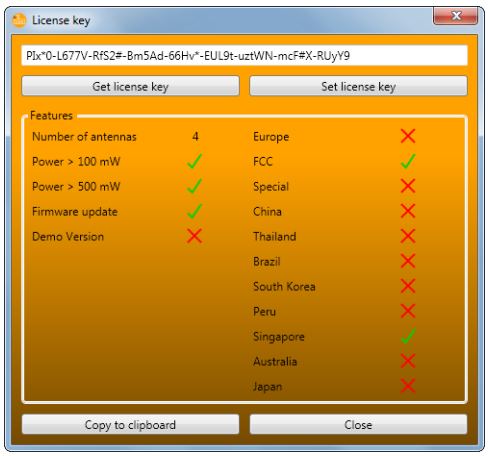
Screenshot: About ReaderStart v2

The second item supplies detailed information about the software and hardware version of the reader. The firmware is indicated including the version number and the build number. The hardware version is divided into CPU module, PA module and the different IO modules. The information about the IO modules is given in the format "location : module type".



Screenshot: Retrieve information about the reader

The third item automatically reads the licence key. The key reflects different factory-set reader parameters. In certain cases it may be necessary to send this key to ifm electronic. The window that opens provides the option to copy the key to the clipboard.



Screenshot: Licence key display

The "Reader error status" item reads the error status of the reader and indicates all existing errors in the status field.

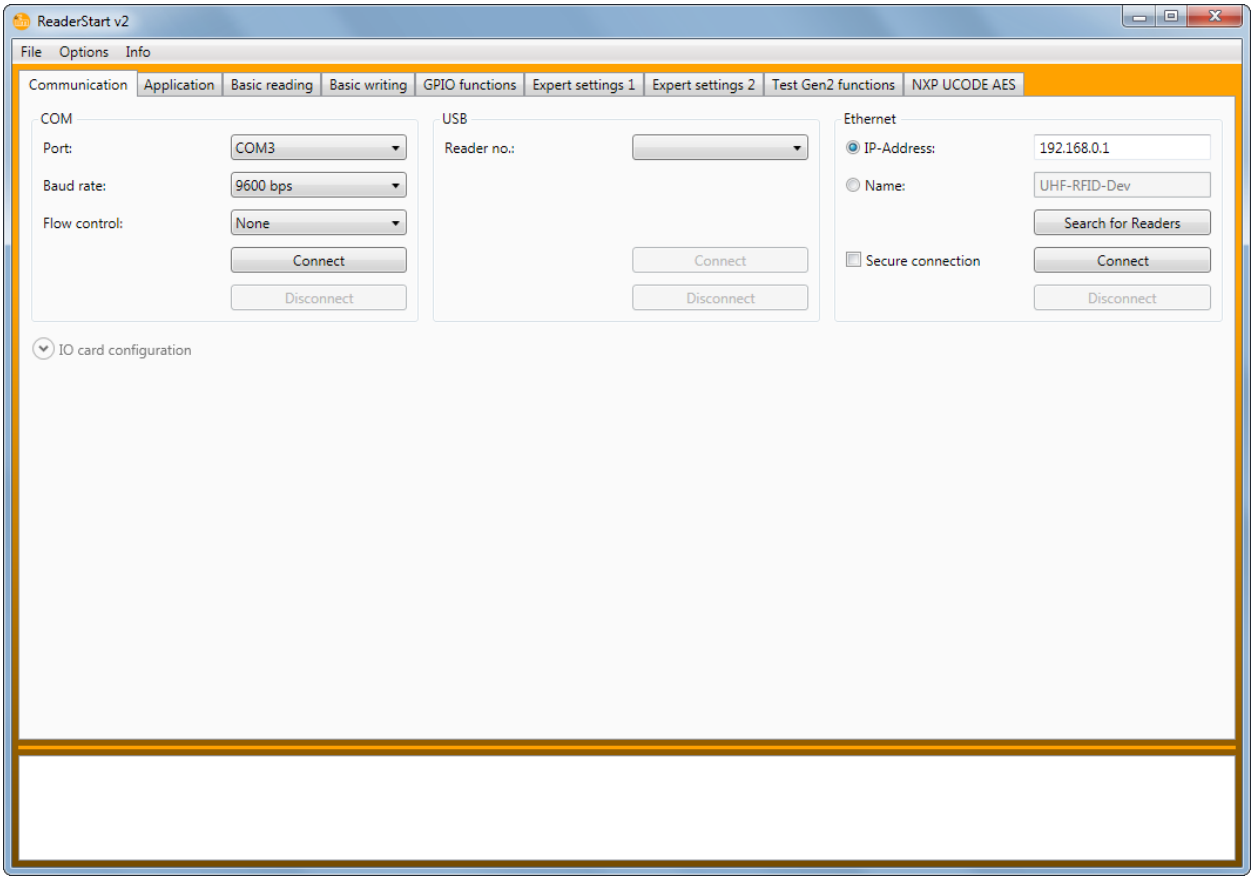
8 Functions

The program is the interface to the most important reader functions. These functionalities are sorted by subject in the individual tabs. In the following sections the contents of the individual tabs is explained.

8.1 Communication

The tab [Communication] groups all functions of connection establishment and interface card configuration.

When the connection has been established, the information about the installed IO-cards is retrieved from the program. The information can be viewed and changed under IO card configuration.



Screenshot: Tab [Communication] with Ethernet IO-card

8.1.1 COM section

The serial interface is used for the communication with the reader via RS232, RS485 or RS422. The RS 485/ RS-422 interface card supports the standard baud rates of the serial interface of a PC. A level converter converting the RS-232-compliant signal of the PC to a differential RS 485 / RS 422 signal is required for the communication.

In this section a serial COM port of the PC can be opened. To do so, the correct serial interface has to be selected in the drop-down menu "Port". Only the ports available in the PC are displayed. It is not verified if this port is already used by another application.

In the menu below only the required baud rate and, if used, the flow control have to be set. By selecting the button [Connect] the ComPort is opened and locked for other applications. Should this port be used by another application, a respective error message is output. If the port is free, the reader can be connected via this port.

With the button [Disconnect] the connection is interrupted and the interface is unlocked again.

8.1.2 USB section

If an RRU4 is connected to the PC via USB, the device is logged in to the system as USB-HID-compliant device. Correct login can only be seen in the program if a number appears in the drop-down menu "Reader no.". This number is unambiguous for each reader. If several readers are connected to the PC, the respective reader can be selected in this menu. By clicking on [Connect] a connection between reader and PC is established.

8.1.3 Ethernet section

The connection via Ethernet can be established by linking the reader to an existing network or by direct connection of the reader to a control processor. A cross-link cable is required for the direct connection of the reader to the PC if the LAN interface of the PC does not support "audi-mdi-x". As an alternative, 2 standard patch cables and a switch can be used.

Network settings

The IP address range of the device and the PC have to be identical.

	IP address range	Factory setting
RFID UHF reader	192.168.0	1
	=	≠
PC	192.168.0	x ("2" in the example)

Verify and set the IP address of the PC

Activate the menu "Internet Protocol Version 4 (TCP/IPv4) Properties".

The Windows menu "Internet Protocol Version 4 (TCP/IPv4) Properties" is accessible for example via: Start → System control → Network connection → Local Area Connection → Properties → Internet Protocol (TCP/IP) → Properties.

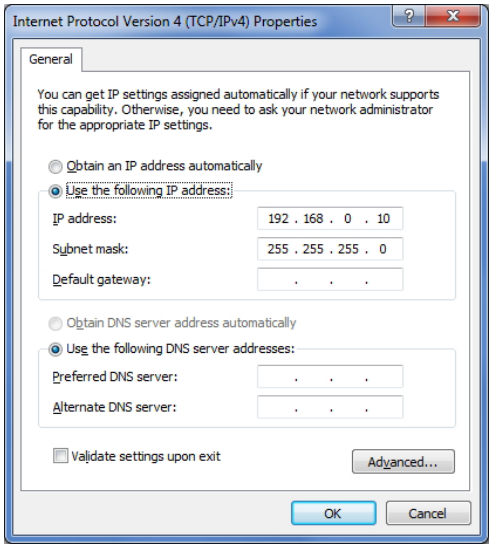
Select the menu item "Use the following IP address".

Verify and set the IP address, if necessary (e.g. 192.168.0.2).

Enter the subnet mask (255.255.255.0).

Leave default gateway blank.

Confirm the settings with [OK].



To link the reader to a company network please contact your administrator who can assign a free IP address and the correct network mask. As an alternative, the reader can also be configured to automatic assignment of an IP address. For this service called DHCP a respective DHCP server must be operated in the network. For further information contact your network administrator.

The control processor and the reader must have an IP address from the same IP area. However, it must not be same address. The network mask must be identical, though.

To establish the connection to the reader the program provides two options. The reader can either be directly addressed by indicating the IP address or a connection can be established via the host name of the reader.

For the connection via host name, a respectively configured DHCP and a DNS server must exist in the network. After power-up the reader logs in to the DHCP server with a corresponding DHCP request. This server assigns an IP address to the reader and logs the network name and the IP address in to the DNS server. If the connection is to be made, the IP address of the reader is determined by a request to the DNS server.

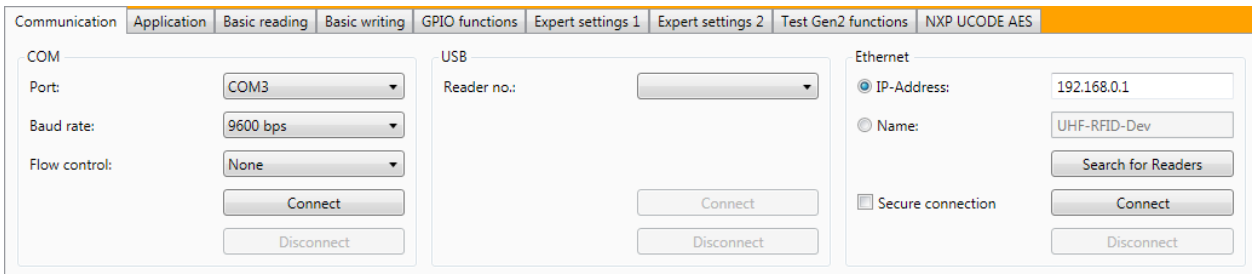
The connection is established if the connection type has been selected in the Ethernet section namely the IP address or the name. The correct IP address or the host name of the reader has to be entered in the corresponding field. The [Connect] button is used to open the data channel to the reader.

If you want to establish a connection via an IP address, the IP address field must be marked and this address must be entered there. The connection is established by clicking on the button [Connect].

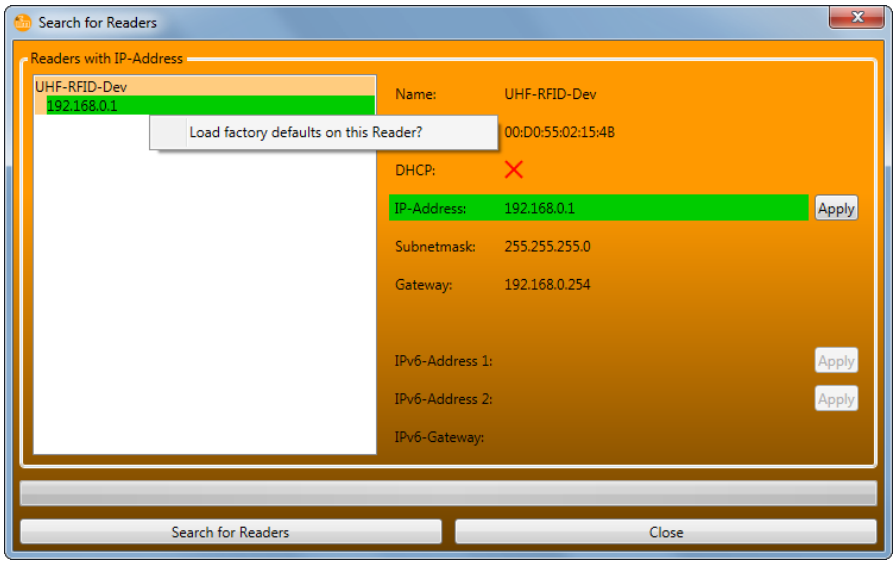
8.1.4 Reset to factory settings

The reader can be reset to the factory settings within 20 seconds after reboot (separation from the current supply) by means of TCP/IP broadcast.

Select the tab [Search for Readers] under the tab"Communication".

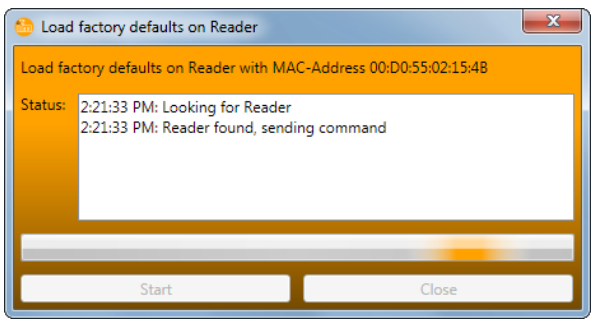


A window with all readers in the network appears. Right-click on the requested reader.



A window with the question "Are you sure to load factory defaults on this Reader?" appears. Select the button [Yes].

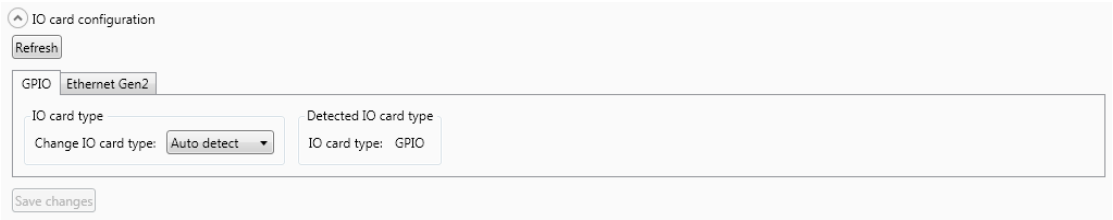
A window with status messages appears.



The reader was reset and can be accessed via the IP address 192.168.0.1.

8.1.5 IO card configuration

The change to the interface settings for communication are made via the IO-card configuration. The available IO cards are displayed as tabs. By clicking on the respective tab the configuration parameters and the detected card type are displayed.



Screenshot: IO card configuration

In the section IO card type there is a drop-down menu in which the card type can be set to [Auto detect], "Card not used" or "GPIO". The automatic detection resets the interface to the default settings. These settings are described in the following chapters for the interfaces. If the card type is set to not used, use of this interface is no longer possible.

All card-specific configuration parameters are displayed if the detected card type has been set. The parameters for the respective card are described in the following chapters. The settings are saved on the reader via the button [Save changes].

The new parameters are only valid after rebooting the reader unless there is a different card-specific definition. If wrong parameters are transferred, access to the reader is no longer possible.

RS232

The serial interface supports the communication according to the EIA232 standard and depending on the configuration level it has five outputs to control LEDs. The configuration parameters are classified into the sections port settings and output.

The communication parameters are classified as below:

- Baud rate - the velocity of the connection; all common serial baud rates up to 230400 bps are supported
- Data bits - the number of the transferred data bits per byte. The card supports 5 - 8 data bits.
- Parity - a bit to secure data transfer

This bit is not transferred if "None" is selected. This bit is transferred with all other settings. The even and odd parity verifies if the number of bits including the parity bit is even or odd. On the basis of this information the receiver can see if the data was correctly transferred. Marking and blanks define if the parity bit is to be transferred with fixed 1 or 0. In this case data transfer will not be secured.

- Stop bits - define if transfer of a byte is terminated with one or two stop bits.
- Flow control - for readers with respective interface it can be defined if the PC and reader are to be synchronised via software (None) or hardware lines (hardware).

Ensure during setting that both participants to the point-to-point connection support the set parameters since otherwise there will be no connection. The RS232 readers whose serial interface is provided via a 4-pole M12 connector do not support hardware flow control.

The RS232 card has five outputs that can be used for controlling LEDs. The configuration parameters for these outputs are in the output section.

Depending on the reader hardware version this functionality may not be available. Please check the data sheet in this respect.

If the LEDs are available (only for ARU), the LED channels can be assigned different functionalities in this section. Depending on the selected function other parameters can be activated.

The following functions are possible:

- Off - the selected LED is deactivated
- On - the selected LED is always on
- 1 Hz frequency - the selected LED flashes at a frequency of 1 Hz
- 2 Hz frequency - the selected LED flashes at a frequency of 2 Hz
- 4 Hz frequency - the selected LED flashes at a frequency of 4 Hz
- 8 Hz frequency - the selected LED flashes at a frequency of 8 Hz
- RF on - the LED is lit switch-off time in milliseconds as soon as the high frequency on antenna First antenna to Last antenna is connected.
- Antenna fault - the LED is lit switch-off time in milliseconds as soon as an antenna error occurs on antenna First antenna to Last antenna.
- Tag found - the LED is lit switch-off time in milliseconds as soon as a tag has been found on antenna First antenna to Last antenna.
- RF on - the LED is lit switch-off time in milliseconds as soon as an operation was successful on a tag on antenna First antenna to Last antenna.
- Protocol access - the LED can be switched on and off directly via the protocol.

Standard configuration	
Baud rate	9600
Data bits	8
Parity	none
Stop bits	1
Flow control	none
LEDs	off

GPIO

The GPIO card permits the reader to interact with its environment. The inputs and outputs can be configured for the respective application in this tab in the input and output sections.

Note the characteristic electric values of the inputs and outputs in the data sheet. Exceeding these characteristic values may destroy the card and the reader.

There are two configuration parameters for each input channel. The option [Invert logical input] negates the electric input signal and uses this status for processing in the reader. If the box is not ticked, the signal is used unchanged. Depending on the used sensor (mechanic or electric) a debouncing time can be defined for each channel in milliseconds.

Different functions can be assigned to the card outputs. Depending on the selected function other parameters can be activated. The following functions are possible:

- [Off] the selected output is deactivated
- [On] the selected output is always on
- [1 Hz frequency] the selected output flashes at a frequency of 1 Hertz
- [2 Hz frequency] the selected output flashes at a frequency of 2 Hertz
- [4 Hz frequency] the selected output flashes at a frequency of 4 Hertz
- [8 Hz frequency] the selected output flashes at a frequency of 8 Hertz
- [RF on] the output is active for "Turn-off time" in milliseconds as soon as the high frequency is connected to the antennas "First antenna" to "Last antenna".
- [Antenna error] the output is active for "Turn-off time" in milliseconds as soon as an antenna field occurs on antennas "First antenna" to "Last antenna".
- [Tag found] the output is active for "Turn-off time" in milliseconds as soon as a tag has been found at the antennas "First antenna" to "Last antenna".
- [Tag operation success] the output is active for "Turn-off time" in milliseconds as soon as an operation was successful on a tag on the antennas "First antenna" to "Last antenna".
- [Protocol access] the output is unlocked and can be controlled with all protocol commands for GPIO.

If the output is not set to protocol access, it cannot be accessed for processing action lists. For more details see "Actionlist" in the chapter "GPIO functions".

When all settings have been made, the changes are assigned to the reader with the button [Save changes]. They are immediately active.

A standard configuration is not intended for this card.

If this card is set to "GPIO" by "Auto detect" or "Card not used", the reader must be rebooted so that the card can be correctly initialised.

RS485

To establish a serial symmetric connection according to the EIA 485 standard, the reader requires an RS485 / 422 card. The tab for the interface configuration has more specific settings in the Port settings section besides the parameters baud rate, parity and stop bits identical to RS232.

LED control is only possible for ARU readers.

The parameters have the following meaning:

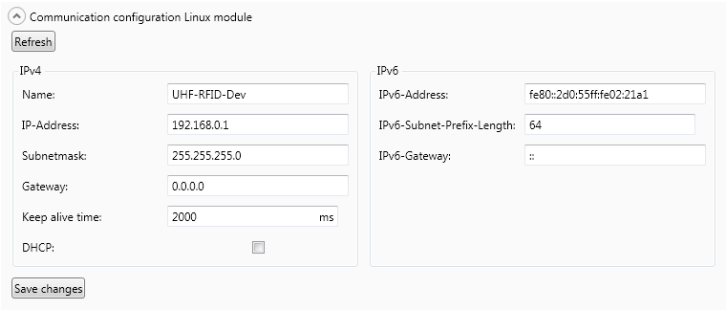
- Pull-Up - When this parameter is set, the differential cables with 120 ohms are pulled up to a fixed reference potential (+5 V and GND). This procedure is recommended if the communication between the participants is critical.
- Load resistance - terminates the differential cables against each other with 120 ohms. This version is required when the reader is the final point of the network.
- RS422 – activates the RS422 mode of the interface card. That means the connection is changed from 2-wire for RS485 to 4-wire (RS422). Therefore a full-duplex connection with differential RX and TX cables is provided.

Ensure during setting that both participants to the point-to-point connection support the set parameters since otherwise there will be no connection.

Standard configuration	
Baud rate	115200
Data bits	8
Parity	none
Stop bits	1
Load resistor	activated
RS422	deactivated

Ethernet

The Ethernet of the reader can be set via the parameters name, IP address, subnet mask, keep alive time and DHCP.



Screenshot: Configuration parameters for Ethernet module

The parameters have the following functions:

- "Name" indicates the host name of the reader which is signalled to the DNS server. The reader can be addressed with this name instead of the IP address.
- "IP-Address" for manual assignment of the address. This parameter can only be used when DHCP is deactivated.
- "Subnet mask" for manual assignment of a network mask. This parameter can only be used when DHCP is deactivated.
- "Keep alive time" - indicates the time intervals at which the reader checks with a data packet if the counterpart is still available. If the connection to the reader is interrupted, the reader closes the connection. If this parameter is deactivated (0 ms), the socket is only terminated via a reboot of the reader.
- "DHCP" activates the automatic assignment of an IP address by the DHCP server. If the network has a configured DNS server, the host name of the reader can also be used.

Without keep-alive time it is possible that the reader does not allow any new connections if existing connections were not duly closed (e.g. by disconnecting the cable). In this case the reader must be rebooted. The use of the keep-alive time is recommended to verify the connection between reader and PC.

With the button [Save changes] the data is saved in the reader. The data is only applied to the current configuration after a reboot.

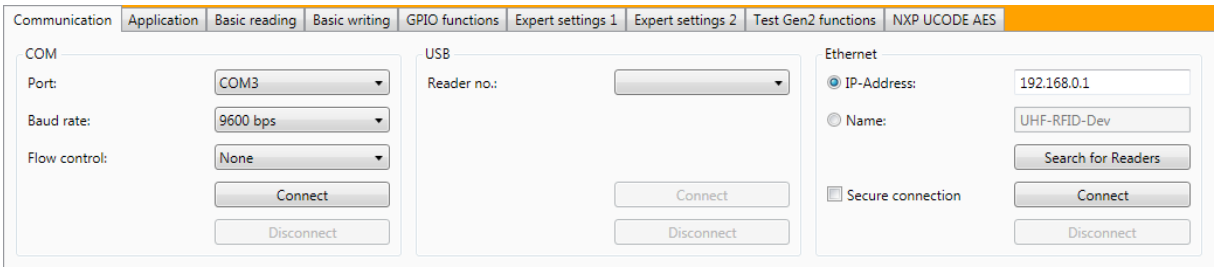
If the interface was incorrectly configured, no connection could be established to the reader. Please note down the set data.

Standard configuration	
Host name	UHF-RFID-Dev
IP address	192.168.0.1
Subnet mask	255.255.255.0
Keep-alive time	2000 ms
DHCP	deactivated

8.1.6 Ethernet password

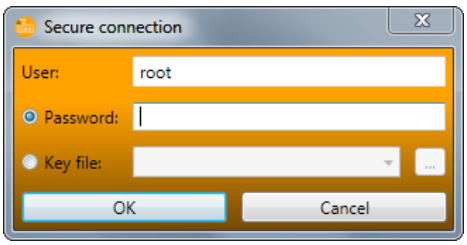
In the following it is described how to change the Ethernet password.

► Select the button [Connect] under "Communication".



The function "Secure connection" is not available at the moment.

► Enter the password "UHF-RFID-Dev".



8.1.7 Configuration password

Password protection is now available for the following commands:

- SetCommunicationStandard
- SetPortPower
- SetCarrierFollowUpTime
- SetPortMultiplexSequenceAndExposureTime
- SetCableLossAndAntennaGain
- SetETSIPortChannelList
- SetETSIPortChannelSwitchingMode
- SetProfile
- SetModulationType
- SetExtendedResultFlag
- SetDefaultParameterSet
- SetActiveParameterSet
- SetParameterByConfigId
- SetIOCardHwConfig
- SetIOCardProtocolConfig
- SetTime
- SetAntennaMapping
- LoadFactoryDefaults
- FirmwareUpdatePrepare
- SetSelSessionAndTarget
- SetInitialQ
- SetMaxAirCommErrors

- SetASyncObservedListParameters

The configuration password can be defined and entered under "Expert settings2" (→ 8.6.2).

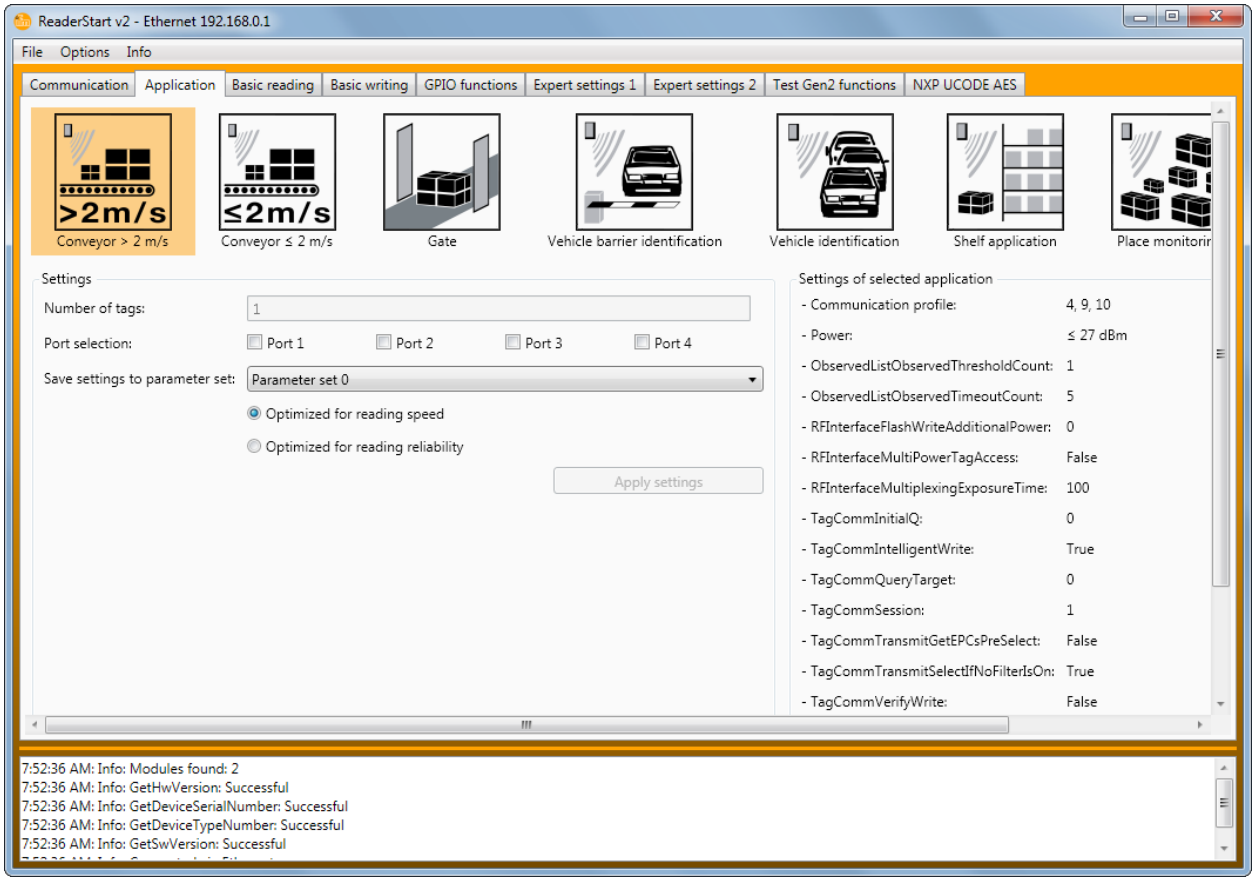
To delete the password, leave the field "New password" blank and select the button "Set config password".

When you have entered the password you have 30 seconds to make changes. With each entry the time is extended by another 30 seconds.

When the time has elapsed after a change, you will receive the message: "Access denied".

8.2 Application

The button [Application] is used for fast and easy configuration of the ifm electronic RFID reader to a selected application. The available applications are visualised in the upper area of the tab by labelled pictograms. In the section "Settings" the expected number of tags, the ports to be used, the parameter set in which the configuration is to be saved and the option "Optimized for reading speed" or "Optimized for reading reliability" can be ticked.



Screenshot: Tab [Application]

By clicking on the button of the requested application this button is highlighted in orange. In addition, the properties and the settings of the selected application are indicated in the respective fields.

In version 2 of the ReaderStart software the following applications can be selected:

- [Conveyor > 2 m/s]
  - Application to detect individual tags in the antenna field on a conveyor belt which is moving faster than 2 m/s.
  - The distance between the tags and the antenna is only a few centimetres.
- [Conveyor ≤ 2 m/s]
  - Application to detect and describe individual tags in the antenna field on a conveyor belt which is moving slower than 2 m/s.
  - The distance between the tags and the antenna is only a few centimetres.
- [Gate]
  - Application to detect several tags in the antenna field which are moving through a gate.
- [Vehicle barrier identification]
  - Application to detect and describe individual tags in the antenna field which are not moving.
  - The distance between the tags and the antenna should be a few metres.
- [Vehicle identification]

- Application to detect and describe individual tags in the antenna field which are moving faster than 14 m/s.
- The distance between the tags and the antenna should be a few metres.

- [Shelf application]
  - Application to detect and describe very many tags in the antenna field which are not moving.
  - The distance between the tags and the antenna should be less than 1 m.
- [Place monitoring]
  - Application to detect and describe several tags in the antenna field which are not moving.
  - The distance between the tags and the antenna should be less than 1 m.
- [People identification]
  - Application to detect several tags in the antenna field which are not moving faster than 3 m/s.
  - The distance between the tags and the antenna should be less than 1 m.

Should not all applications be displayed on the screen, the buttons are activated beside the applications for scrolling.

With the setting "Optimized for reading speed" all tags are reset after detection (inventory) so that they can be read again. It is possible that the time to detect all tags is not sufficient so that some tags are not detected. Thus the frequency of detecting the tag is increased.

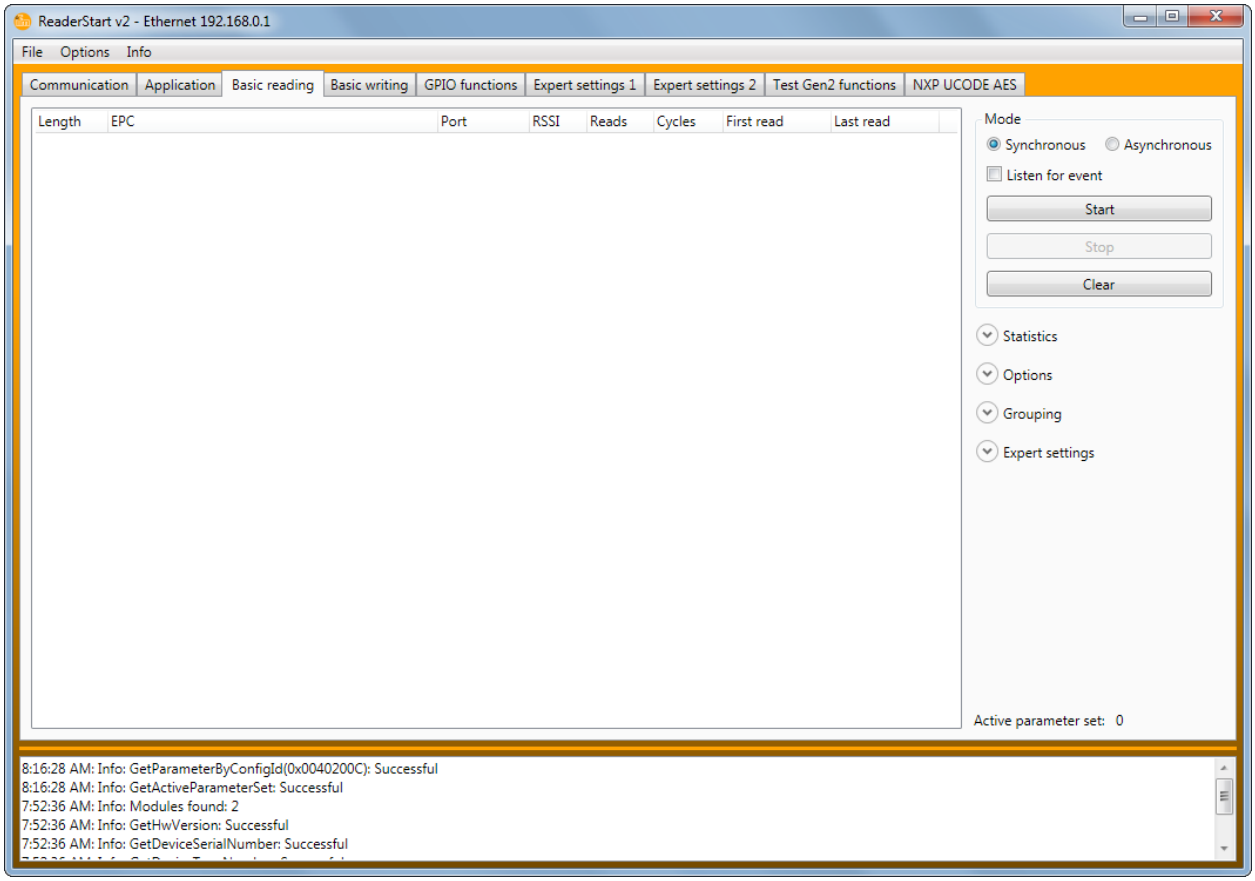
If the setting "Optimized for reading reliability" is selected, tags already read are not reset with each detection (inventory) if they continue to be supplied with energy. This means that only tags that have not yet been registered are detected during reading. Thus the reliability of reading all tags is increased.

By clicking on the button [Apply settings] the settings applied and the settings of the selected application are saved in the selected parameter set. To do so, it is first of all reset to factory settings so that the previous configuration is overwritten. This must be confirmed. The successful completion is signalled by briefly highlighting the button [Apply settings] and by indicating a success message in the status window. Should the process fail, the button is briefly displayed in orange according to the warning or in red in the event of an error and the respective warning or error description is displayed in the status window. Should an indication have been forgotten, the field with the missing information turns red.

Should the settings have been applied successfully, you can now change to the tab [Basic reading] and the reading process can be started.

8.3 Basic reading

The [Basic reading] tab is split into 2 columns. The first column contains a table with information about the tags read; in the second column you find operating elements to control the reading process.



Screenshot: Tab [Basic reading]

Besides the electronic product code [EPC] you find the following information in the table:

- "Length" indicates the length of the EPC in bits; valid lengths 0 - 496 bits
- "EPC" means the EPC of the tag in hexadecimal form
- "Port" means the antenna port via which the tag was read; valid values 1 - 4
- "RSSI" is the display of the signal strength of the tag word without unit; valid values 0 - 255
- "Reads" indicates how often this tag was read successfully
- "Cycles" indicates how often an inventory was started
- "First read" is the timestamp of the first reading of a tag
- "Last read" is the timestamp of the last reading of a tag

For better visualisation the appearance and disappearance of the tag in the field is highlighted in colour. When a tag enters the field, the line with the tag information is shown in green; when it leaves the field again, the line becomes red.

The reading process is controlled in the second tab column. There are 2 different modes.

8.3.1 Synchronous mode

This mode is intended for applications with lower demands on timing. In this mode it is possible to save energy during idle times by switching off the carrier.

The reading process of tags (inventory) is carried out across all configured antennas. When all tags were read in the field on the last antenna, the data is transferred to the PC. The inventory is then automatically triggered again by the PC.

The option "Break after reading" indicates how many milliseconds should be waited between 2 inventories. During this pause the carrier can be deactivated.

To keep the time between the tag inventories as short as possible in the synchronous mode, data transfer between the inventories is not necessary. That means that the reader saves all tags it finds in the field in the internal RAM. When a defined time has elapsed, this result list is transferred to the PC. The time is indicated in milliseconds with the parameter [Bulk reading].

The current reading performance is displayed as "Tags per second".

The reading rate is influenced by parameters such as the selected radio profile with the respective baud rates and application-specific data. For example, how many tags the reader has to expect in the field. The parameters can be optimised in the expert settings 1 and 2. Should you not be sure if the settings you have selected for your application are ideal, please contact the support of ifm electronic.

If the read tags are to be recorded, this can be done by activating the option "Save to file". The data is stored in a csv file in the program directory. The file can be opened or deleted in the context menu for this point.

8.3.2 Asynchronous mode

This mode is intended for applications where maximum performance is important.

The reader executes the reading process of tags (inventory) as soon as possible when the asynchronous mode is started. In the asynchronous mode not every read tag is transferred to the PC after the end of an inventory. Instead only the new tags in the field and the tags leaving the field are transferred. Thus the time necessary for the communication can be minimised.

Reliable reading of a tag's presence within the field and a tag's absence from the field can be defined via parameters. For details about the parameters [ObservedThresholdCnt] and [ObservedTimeoutCnt] we refer you to the annex.

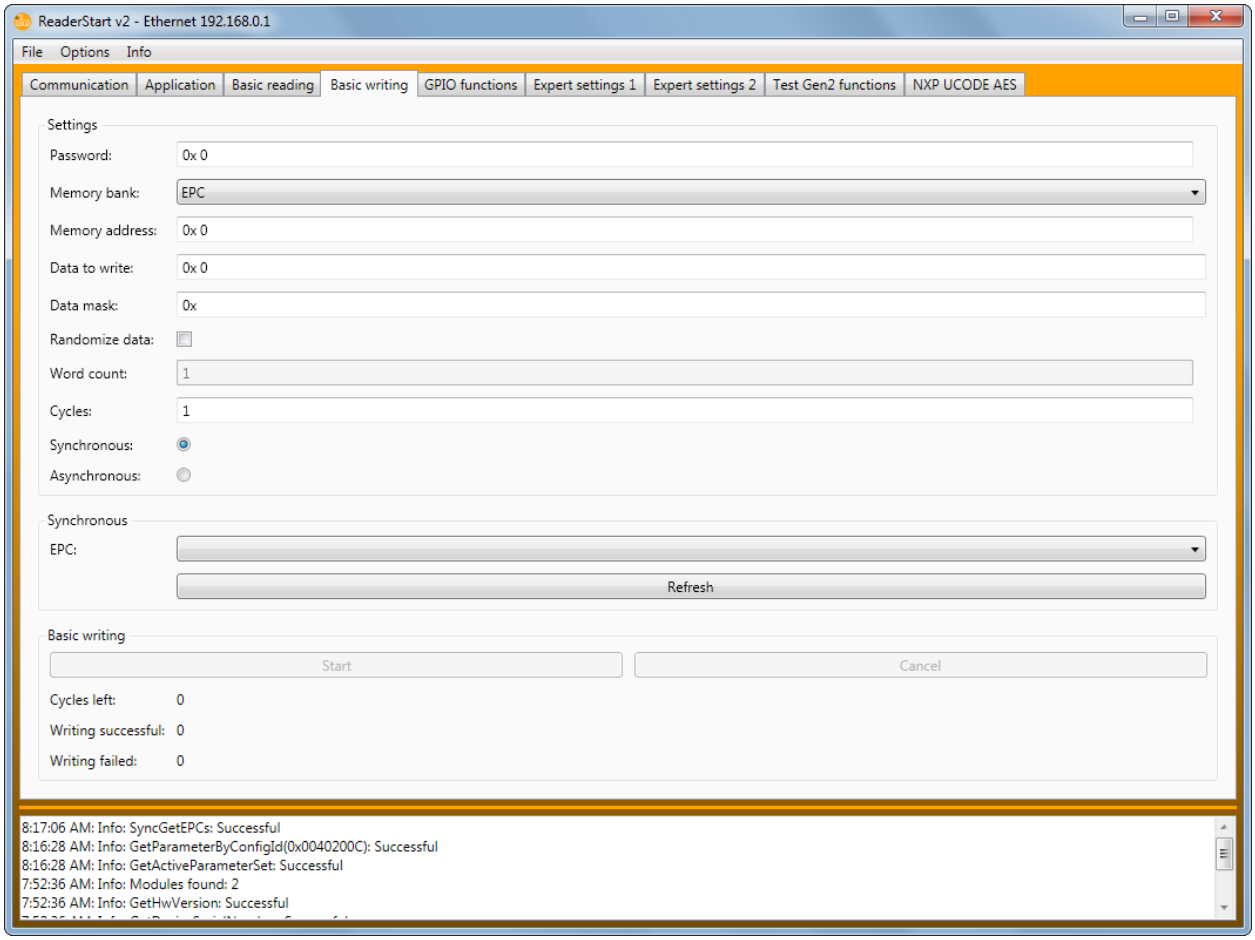
The reading rate is influenced by parameters such as the selected radio profile with the respective baud rates and application-specific data. For example, how many tags the reader has to expect in the field. The parameters can be optimised in the expert settings 1 and 2. Should you not be sure if the settings you have selected for your application are ideal, please contact the support of ifm electronic.

If the read tags are to be recorded, this can be done by activating the option "Save to file". The data is stored in a csv file in the program directory. The file can be opened or deleted in the context menu for this point.

When the mode and the parameters have been selected, the reading process can be started. Both modes are stopped via the button [Stop]. The button [Clear] removes all tag entries form the table.

8.4 Basic writing

The tab [Basic writing] is used for easy writing to tags. In general it is distinguished between synchronous writing (writing on demand) and asynchronous writing (writing on arrival).



Screenshot: Tab [Basic writing]

8.4.1 Synchronous writing

With this type of writing only one EPC can be written to. It is selected in the ComboBox EPC. By clicking on the button [Refresh] all tags in the antenna field are detected again and added to the ComboBox.

When all required information such as password, memory bank and memory address has been entered, the decision has to be made if the data to be written is preset or generated randomly. If self-defined data is to be written, a data mask can be entered as option. If random data is used, the number of it is to be entered in words (16 bits).

A right-click in the field "Data to write" opens a context menu by means of which the selected EPC can be copied to this field.

A left-click in the field "Data mask" allows it be filled with O or F depending on the number of the entered data to be written.

After clicking on [Start], the defined number of write attempts is carried out. The error-free termination of all write attempts is indicated again by the button being lit in green and by a message in the status window. Should necessary information be missing, the button briefly turns red, the field with the missing information is lit in red for a slightly longer time and the respective error is indicated in the status window.

The fields "Writing successful" and "Writing failed" inform about the number of successful or failed write attempts.

8.4.2 Asynchronous writing

With this type of writing each EPC entering the antenna field is written to. When all necessary data has been entered (password, memory bank, memory address, data to write - data mask is optional) and [Start] has been clicked, asynchronous writing will start. Successful and failed write attempts are indicated in the respective fields. When the mouse is briefly hovered over the number of failed write attempts (if errors have occurred), the window with detailed information is displayed.

A left-click in the field "Data mask" allows it be filled with O or F depending on the number of the entered data to be written.

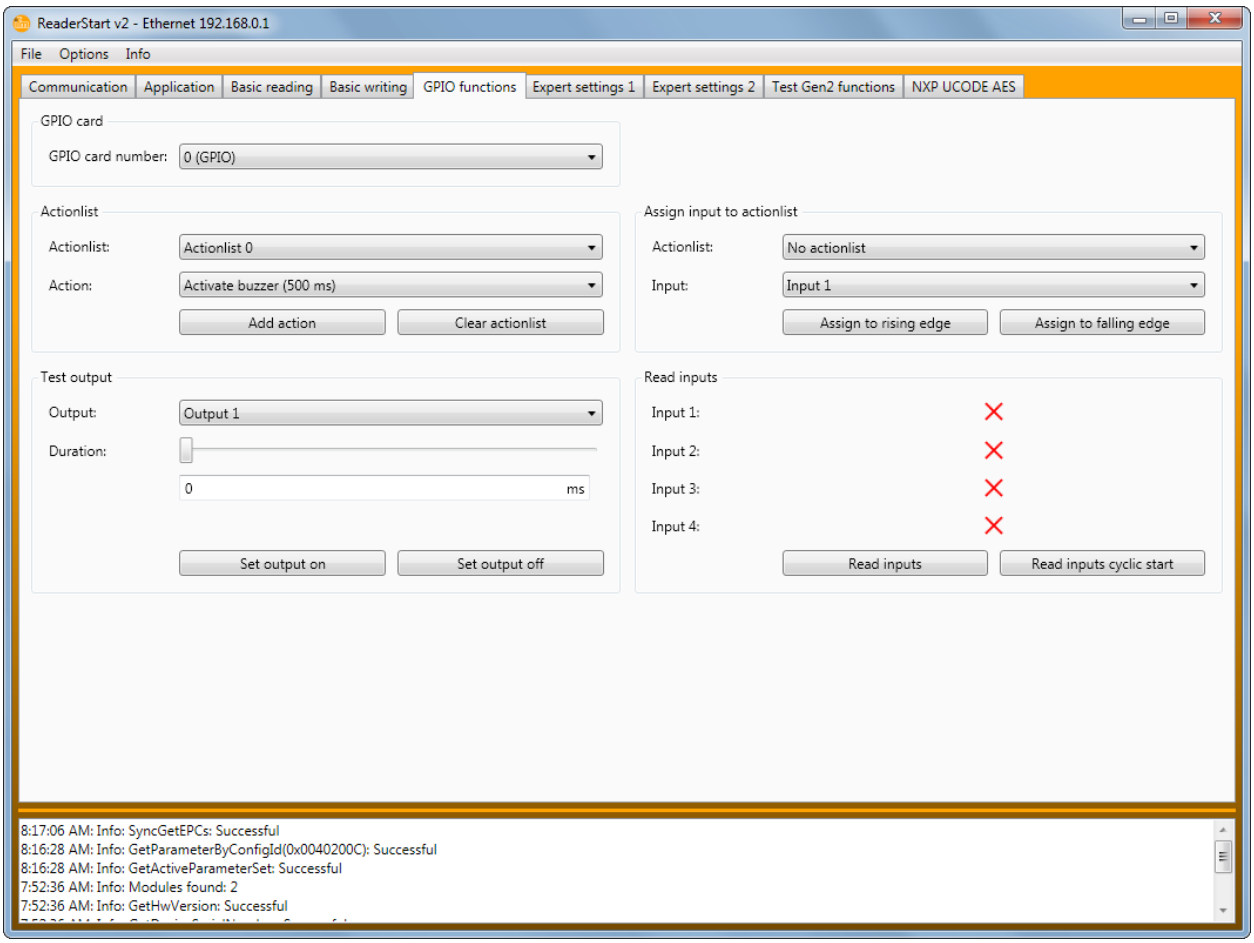
8.5 GPIO functions

Readers with GPIO functionality allow the set-up of small controllers, for example:

- trigger the reader through a light barrier
- trigger an action on the reader outputs by reading certain tags
  (e.g. control the flow of goods by switching an output)

Via the tab [GPIO functions] the program user can manually read or switch the inputs and outputs. For more complex processes it is possible to create action lists that execute a sequence of commands on the reader. These lists can be linked to different inputs.

This configuration sheet is divided into 5 different sections. To make settings on a card the card number has to be selected in the drop-down menu in the section "GPIO card". Only the cards of this type are counted.



Screenshot: Tap [GPIO functions]

The section "Test output" can be used to switch an output manually. To allow this access the respective output of this card has to be switched to protocol access (see IO-card configuration). In the section the output is then selected in the drop-down menu and the time when the output automatically returns to its idle status is indicated with the parameter "Duration". Switching actions can now be performed via the buttons [Set output on] and [Set output off].

The reader inputs can be enquired about in the section "Read inputs". The signal fields indicate if an output is set or not set. The reading process can be triggered via the "Read inputs" button. If this request is to be made automatically, this process can be started with the button [Read inputs cyclic start].

To automate processes command sequences can be stored on the reader as action lists. They are triggered via an edge change on the selected input of the respective GPIO card.

The action lists are composed of individual actions that can be loaded as an XML file in the context menu of the point "Action" in the section "Actionlist". This file can be adapted manually with a text editor. The syntax can be seen in the example. The individual actions can be composed of the described functions (→ 9).

The file is stored in the folder "..\My documents\IFM Electronic GmbH\ReaderStart v2\“ and can be edited with the text editor. To use the newly added actions in the program the file has to be read again in the context menu.

The action list must be selected from the drop-down list. The requested actions are individually selected from the action list and added to the action list in the order in which they are to be performed. The list is emptied with the button [Clear actionlist].

When the action list has been created, it is assigned to an input and an accordingly selected edge with the section [Assign input to actionlist]. If the list is to be assigned to both edges, the assignment has to be made both on the rising and the falling edge.

The assignment can be cancelled by rebooting / resetting the reader or by assigning the point [No actionlist].

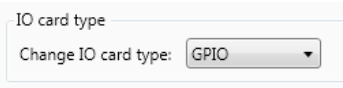
The created action lists are stored in the RAM of the reader. When the reader is rebooted, these lists are deleted again.

For permanent operation of the reader the commands for the digital inputs and outputs must be linked to a user software. This user software can run on an external PC or on the industrial PC of the ETL and ELC reader.

8.5.1 Example for the GPIO function

The basic functions of the GPIO card can be set in the same menu.

First of all the IO card configuration is opened in the tab [Communication] and for the GPIO card "Auto detect" is set to "GPIO":



The settings are global and valid in all configurations.

Invert	If logic high level and physical high lever have to be inverted
Debouncing time	Depending on the used switching element at the input
Output function	Tag found, antenna error etc.

Set up your own action list

ReaderStart creates a directory in the folder "My documents" or the user folder in which the system variables are stored. Contained are for example the antenna list and the action list for the inputs.

The some 150 reader commands with the respective parameter variance do not allow a standardised list. A selection of all possibilities is too extensive. Therefore it is recommended to list only the commands required for the application.

The action list (ActionlistAction.xml) can be edited with an XML editor.

```
<?xml version='1.0' encoding='UTF-8'?>
<ActionlistActions>
    <!--Activate buzzer for 500 ms, CommandID: 0x0045, parameter: 0x01F4-->
    <Action>
        <Description>Activate buzzer (500 ms)</Description>
        <CommandID>0045</CommandID>
        <!--LSB first-->
        <Parameter>F4</Parameter>
        <Parameter>01</Parameter>
    </Action>
    <!--SyncGetEPCs, CommandID: 0x0101-->
    <Action>
        <Description>SyncGetEPCs</Description>
        <CommandID>0101</CommandID>
    </Action>
</ActionlistActions>
```

In this example the commands "Buzzer" and "SyncGetEPCs" were entered. The command IDs can be found in the "Communication protocol" (A).

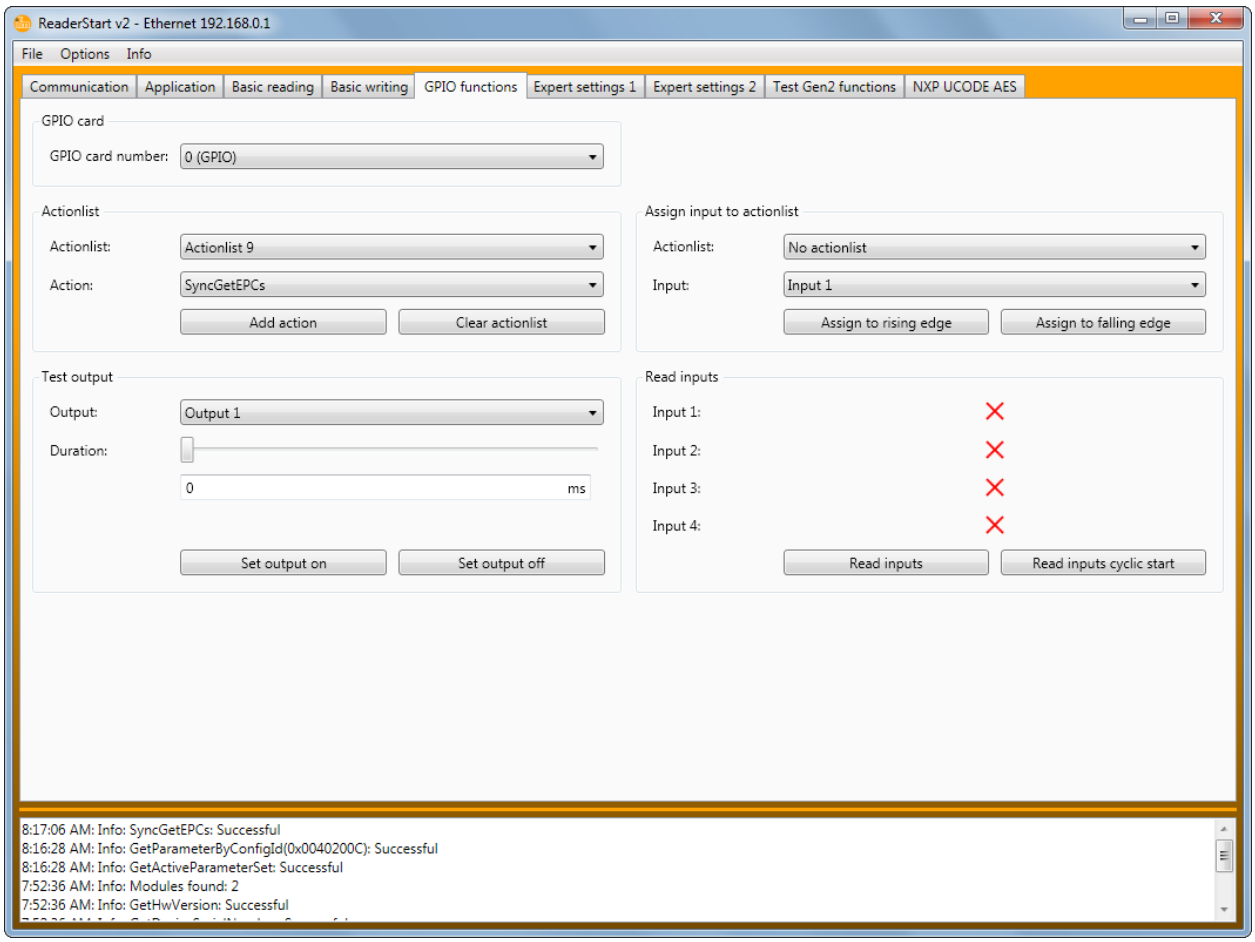
When the action list has been edited, it is saved in the ReaderStart directory under "My documents". When ReaderStart is activated the next time, it becomes active.

Selection of the commands from the action list

The action list commands are now available under the menu field "GPIO functions / Actionlist".

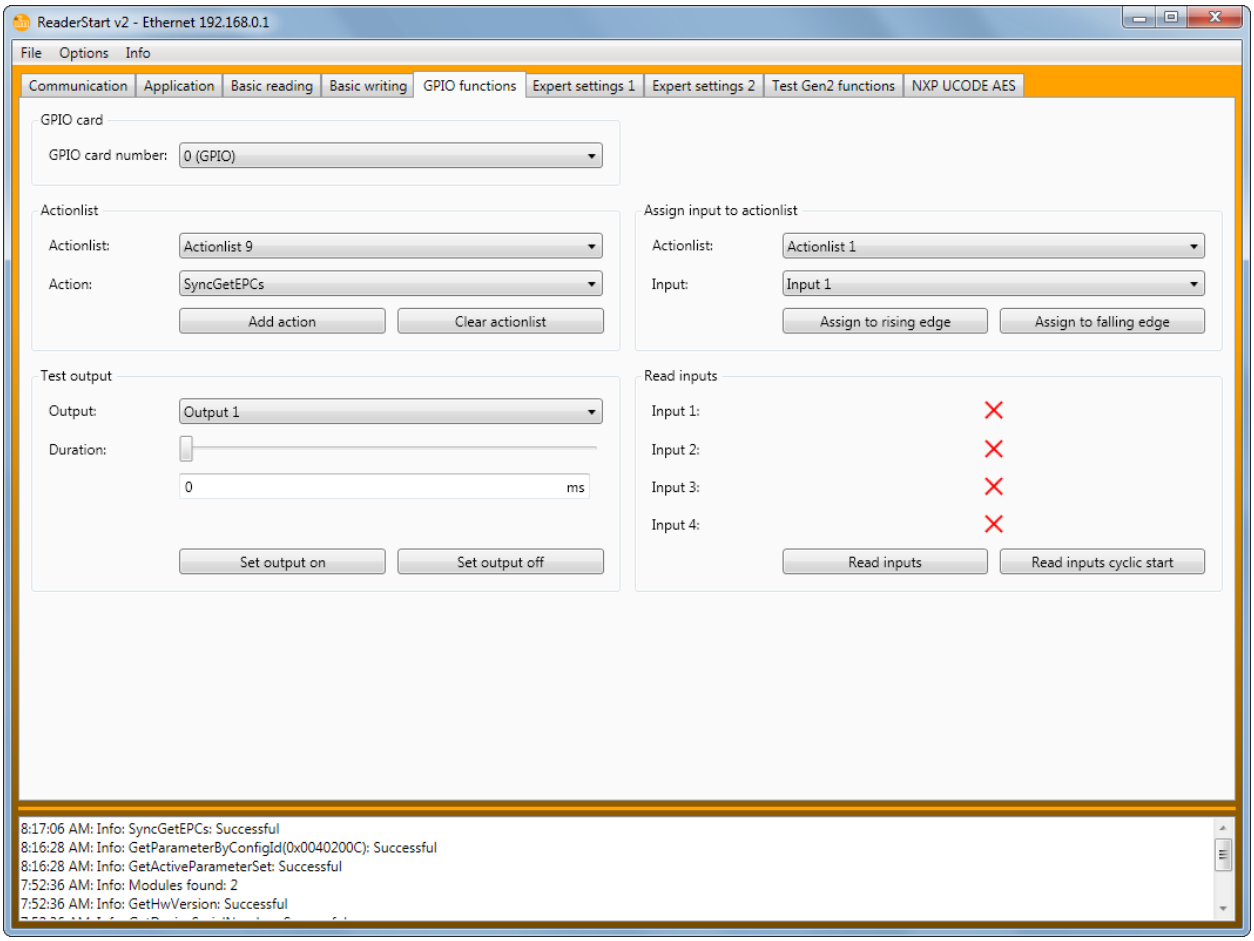
All available commands are listed under "Action".

In the example "SyncGetEPCs"



With "Add action" the commands are written to the selected action list in chronological order. Each added command is acknowledged in the system banner with the message "GPIOAddActionToActionlist(9): Successful". The number in brackets indicates the number of the selected action list ("9" in the message).

Assignment of the action list to the respective inputs



When all commands to be processed are added, the link to the inputs is made in the menu field "Assign input to actionlist".

The action list ("9" in the screenshot) and the input ("1" in the screenshot) are selected. It is also defined if the rising or falling edge is to be reacted to.

The action list is linked to the input via the button "Assign".

This is acknowledged with "GPIOAssignInputToActionlist (1,1,5,9): Successful" in the system banner.

Depending on the setting the values in the bracket (1,1,5,9) may differ.

Each rising edge transmits the command "SyncGetEPCs" to the reader.

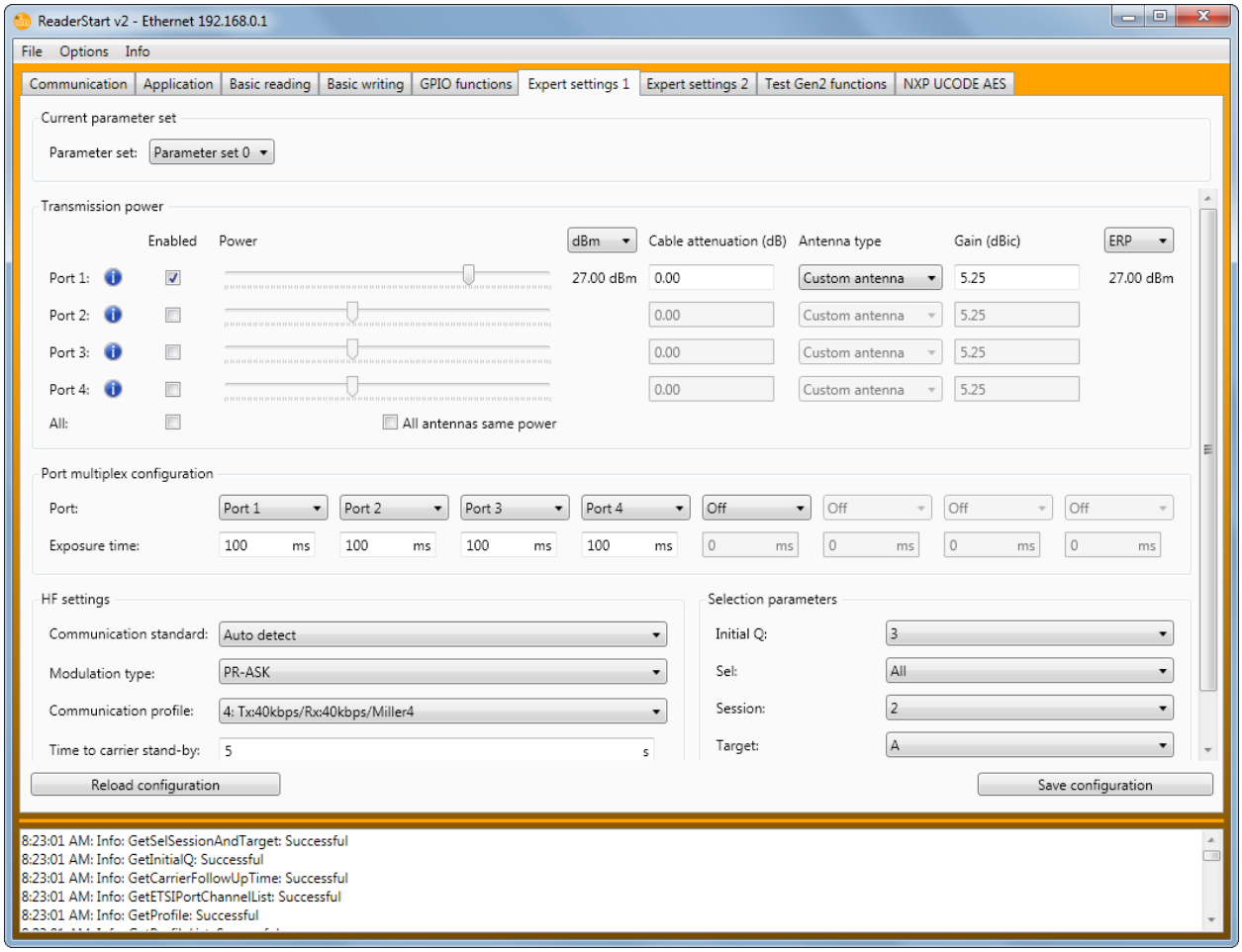
Only basic logical connectives can be made via the action list. Linking the inputs to a defined EPC value is not possible.

8.6 Expert settings

The ReaderStart v2 software is a powerful tool to configure the reader. It ensures that the reader can be adapted to every application. With the expert settings 1 and 2 it is possible to optimise the HF interface and the communication profile from the reader to the tag so that the reader is ideally adapted to the application.

8.6.1 Expert settings 1

8 parameter sets are provided to save the reader configuration. All settings of the transmission power, the port multiplex configuration and the HF settings are stored on these memory locations. More parameters can be changed in [Expert settings 2] (→ 9).



Screenshot: Tab [Expert settings 1]

A default setting can be selected in the section "Current parameter set". A parameter set is selected in the drop-down menu. This parameter now becomes active, is loaded and the sections are refreshed. When all required changes have been made, they can be saved. The settings can be discarded with the button [Reload configuration].

In the section "Transmission power" the transmit path parameters can be entered, such as "Power" and "Antenna type". The valid standards of the respective approval regions have to be complied with for setting the transmission power.

To operate the reader according to the respective country standard the antenna gain and the cable attenuation have to be observed for setting the transmission power. The permissible transmission power must not be exceeded. Non-compliance with this note may lead to non-conforming operation of the reader so that the operating permit of the device expires.

Transmission power

According to ETSE 302208 the radiated transmission is limited to 2 W ERP in Europe. In the FCC validity range max. 1 W connected HF power at an antenna gain of 6 dBi is permitted. The European standard refers to a half-wave dipole, FCC Part 15, however, refers to an isotropic radiator.

The length-dependent cable attenuation and the antenna gain have to be taken into account for the calculation of the transmission power. The example below shows the calculation of the transmission power for Europe and FCC.

For the European scope of application:

$\mathbf{P_{reader} = P_{ERP} + D_{cable} - G_{HW}}$

P_{reader} ... transmission power of the reader in dBm

P_{ERP} ... transmission power referred to a half-wave dipole in dBm

D_{cable} ... cable attenuation in dB

G_{HW} ... antenna gain referred to a half-wave dipole

The cable attenuation corresponds to the length-dependent attenuation of the cable at the respective frequency:

$\mathbf{D_{cable} = l*D_{dB/m}}$

D_{cable} ... cable attenuation in dB

l ... length in m

$D_{dB/m}$ ... attenuation in dB/m at frequency

The antenna gain is indicated in different units, among them dBi and dBic. The units dBi and dBic refer to an isotropic (ball) radiator with dBic referring to a circularly polarised and dBi to a linearly polarised isotropic radiator.

The European scope of application defines that the radiated power must not exceed 2 W ERP. This value refers to the half-wave dipole. There is the following correlation between an isotropc radiator (dBi) and a half-wave dipole.

$\mathbf{G_{HW} = G_{isot} - 2.14\ dB}$

G_{HW} ... gain referred to half-wave dipole

G_{isot} ... gain referred to isotropic radiator in dBi

If the antenna gain refers to the polarisation of a circular isotropic antenna (dBic), the linear gain of the antenna is 3 dB lower. This can increase the transmission power by 3 dB.

$\mathbf{G_{HW} = G_{isot} - 2.14\ dB - 3\ dB}$

G_{HW} ... gain referred to half-wave dipole

G_{isot} ... gain referred to isotropic radiator in dBic

The FCC scope of application defines that the HF power connected to the antenna input must not exceed 1 W. If the antenna gain is greater than 6 dBi, the connected HF cable must be reduced accordingly. That means for the transmission power of the reader:

$\mathbf{P_{reader} = P_{cond} + D_{cable}\ with\ P_{cond} \leq 1\ W\ and\ Giso \leq 6\ dB}$

P_{reader} ... transmission power of the reader in dBm

P_{cond} ... power at the antenna output in dBm

D_{cable} ... cable attenuation

G_{isot} ... antenna gain in dBi

If the antenna gain is indicated in dBic, the transmission power of the reader can be increased by 3 dB.

The transmission power for the European version can be set in steps of 0.25 dB from 20dBm to 33 dBm.

The section has one field each for entering the antenna gain and the attenuation.

The antenna gain must be indicated in dBic.

The transmission power of the RFID reader can be set for each antenna individually or for all antennas at the same time. If the box "All antennas same power" is ticked, the controllers of the remaining antennas are set to the same power when a controller for antennas 1 - 4 is operated. Without this tick the power on the antennas can be set individually for each output.

In the drop-down menu [Antenna type] predefined antennas can be selected. With the selection the antenna gain is set in the program and the transmission power is limited to the maximum value permitted for this antenna. With the selection of the user antenna, gain and power can be freely set.

The XML file can be opened or, if changes have been made to the file, reread via the context menu. During reading the changes become visible in the program.

Port multiplex configuration

In this section you define the order in which the antennas are used for tag reading. If an antenna is not activated, the multiplex list continues with the next entry. For asynchronous operation of the readers the exposure time on the antenna can also be defined (→ 9.3.4)(→ 9.3.5).

HF settings

Depending on the approval the reader transmits in one of the following frequency ranges:

- 865 - 868 MHz for Europe
- 902 - 928 MHz for America
- 916 - 927 MHz for Australia
- 920 - 925 MHz for Singapore

Other frequency ranges can be set.

If the reader is operated outside the permitted frequency range, the operating permit expires. Only operate the reader in the permitted frequency range.

In Europe the number of the channels to be used can be limited. To do so, the box for each channel to be used by the reader has to be ticked in the selection list "Available channels". This avoids use of certain noisy channels right from the start.

With a read command the channels are switched according to the country and the selected communication standard. The device starts searching the channels in ascending order.

In the drop-down menu "Communication standard" the country-specific communication standard can be selected, if necessary and permitted by the reader. Which communication standard is permitted depends on the country in which the reader is operated.

In the drop-down menu "Modulation type" the modulation type can be changed between "Double sideband" and "PR-ASK modulation".

The "Communication profile" is decisive for the speed of the transmission rate and the reading reliability. With this option the setter has a direct influence on the power of the reader and the spectrum of the signal. For easy orientation of the data transmitted and received rates are contained in the profile names.

Depending on the tag used a special transmission rate may be necessary. Please contact ifm electronic.

The parameter "Time to carrier stand-by" indicates how long the carrier of the reader is active after the last action of the air interface. When this time has elapsed, the carrier is switched off.

In the section "Available channels" the available channels can be selected and deselected. The set "Communication standard" indicates which channels are available.

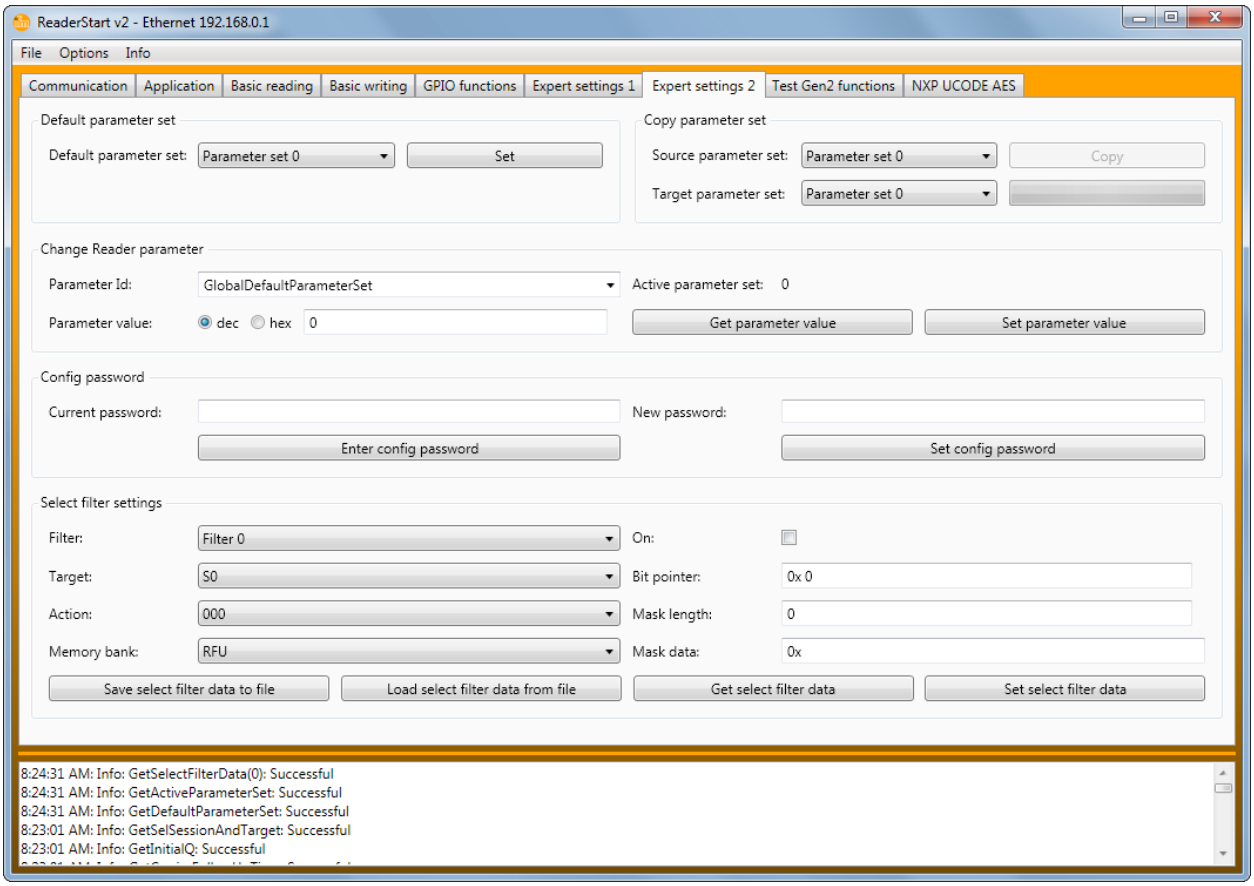
Selection parameters

In this section the user can configure the singularisation of the tags according to the EPC standard. The parameters can be selected in the drop-down menus signifying the following:

- [Initial Q] reflects the number of tags to be expected in the field (→ 9.4.2)
- [Sel] indicates whether or not other parameters are of interest for the inventory of the tag population (→ 9.4.10)
- [Sessions] With this configuration parameter the session with which the reader is to work is predefined (→ 9.4.3)
- [Target] defines which tags of the population are to participate in the inventory (→ 9.4.9)

8.6.2 Expert settings 2

The tab [Expert settings 2] is divided into 5 sections. The default parameters can be changed, a parameter set can be copied to another one, reader parameters can be read via their ID, the configuration password can be set and select filter settings can be configured.



Screenshot: Tab [Expert settings 2]

In the section "Default parameter set" the parameter set to be loaded to the RAM during the start of the reader from EEPROM can be set.

The section "Copy parameter set" is used for copying a parameter set to another one. After successful copying the button [Copy] is briefly lit in green and a respective message is displayed in the status window; otherwise the button [Copy] is lit in red.

In the section "Change Reader parameter" all reader settings can be changed via the respective configuration ID. When the parameter ID has been selected, the respective value of the current parameter set is read by the reader by clicking on [Get parameter value] and displayed in decimal (dec) or hexadecimal (hex) format in the parameter value field. A value already read can be converted by means of the radio buttons [dec] und [hex]. The button [Get parameter value] writes the value indicated in the parameter value field to the selected parameter ID. For both actions (read and set) success and failure are displayed in colour by the lit button and a respective message in the status window.

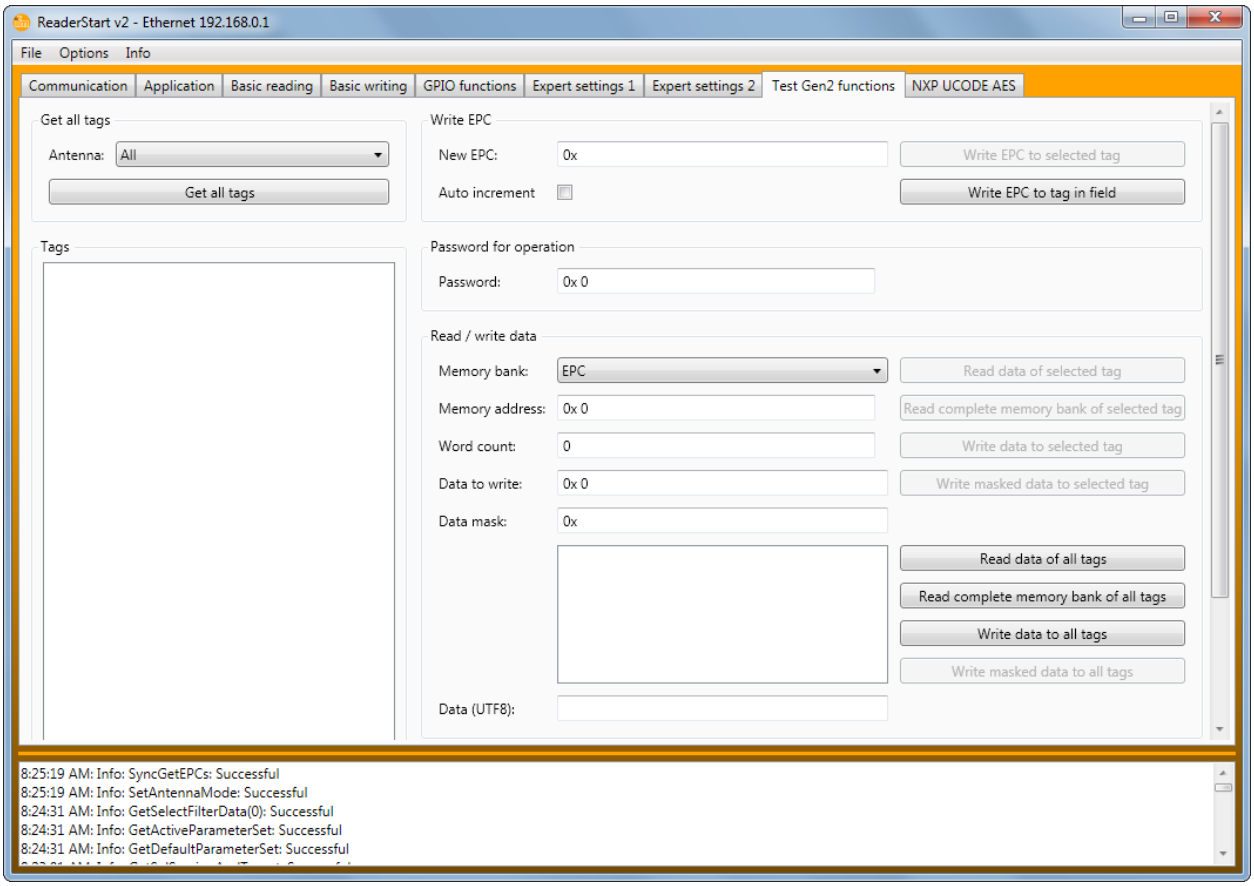
In the section "Config password" a new configuration password can be set or an old one be changed (→ 8.1.7).

In the section "Select filter settings" filters can be set that become effective during a select command. It is possible to filter certain tags or detect only tags with defined data in the respective memory banks. A total of up to 32 filters can be set. Successful reading of the values of the selected filter and successful writing of the filter values is indicated via the respective button lit in green and a text in the status field. Otherwise the respective button is lit in read and the error description is given.

8.7 Test Gen2 functions

The tab [Test Gen2 functions] allows access to individual reader functions. Besides the functionalities to the EPC Gen2 standard such as read individual tags, write tags, set and change passwords it also includes the selection of the antenna for the operation.

The user interface is composed of the sections "Get all tags", "Write EPC", "Password for operation", "Read / write data", "Change password", "Lock", "Kill" and the display window for read EPCs. These functionalities are described in more detail below.



Screenshot: The Test Gen2 functions

8.7.1 Get all tags

To read a tag in this menu the button [Get all tags] has to be activated with correctly configured reader. The reader now tries once to read all tags in the field of the selected antennas. If the number of antennas is limited via the [Antenna] drop-down menu, it is only read via the selected antenna or with "All" via the antennas selected in the tab [Expert settings 1].

The EPCs of successfully read tags are displayed in the field below. For the following operations a tag can be selected from the list by clicking.

Additional information about the manufacturer and the chip type is displayed via the symbol . By left-clicking on this symbol the information can be displayed.

8.7.2 Write EPC

In this section the EPC can be changed at will. For this purpose an EPC has to be entered in hexadecimal format in the field "New EPC".

Note the max. EPC length supported by the tag. If it is exceeded, the tag provides an error.

The EPC can be changed manually or increased by one with each writing process with the "Auto increment" option.

The writing process on the tag can be executed via the button [Write EPC to selected tag]. Several tags may be in the field but one tag has to be selected from the list.

The second option is to write the respective EPC without a selected tag with the button [Write EPC to tag in field]. For this function only one tag must be in the field.

8.7.3 Password for operation

According to the EPC standard the tag has 2 modes, the open and the secured state. In the open state operations can be carried out on the tag if the respective memory areas are not secured by a password greater than 0. When a password has been assigned and if memory areas are set to password protected with the section "Lock", the requested operation is not carried out and the tag signals an access error. Areas that are not locked can be accessed as usual.

If the valid password is entered for access, the tag changes to the secured state and access is also possible to locked areas. Password assignment and the setting how individual areas are to be locked are made in the sections "Change password" and "Lock".

In the first section the password can be set for restricting access to the tag and the password to deactivate the tag. The access password can restrict access to the tag in the open state. Depending on the configuration in the section "Lock", the whole tag or parts of the tag can be assigned limited access rights.

The deactivation password is required to eventually deactivate the tag with a kill command.

After a kill tag command the tag is useless.

To change the password the current password has to be indicated. If no password had been set before, the standard value is 0. The new password is entered in the field of the same name in hexadecimal format. By selecting the button [Set password on selected tag] the old one is replaced with the new one. The deactivation password is set with the field of the same name and the corresponding button.

If the password is to be changed and the respective memory area is already protected by the access password, the access password has also to be entered besides the new password in the field [Current password].

8.7.4 Read / write data

This section provides detailed access to all data ranges of the tag. Access is made via the selection of the memory bank, the address in the memory bank and the number of words with one word corresponding to 16 bits.

If data is to be written, it has to be entered in the field "Data to write". The data mask permits to change only individual bits on the tag. To do so, the mask has to be entered in the field "Data mask". With this mask the reader changes the data read from the task where the mask bits are 1 and writes the result back to the tag. The requested data can be written to a tag in the field or to all tags in the field at option. If all tags in the field are to be written to, all these tags must have the same configuration (lock and password).

The section also provides the option to read data from the selected tag or from all tags in the field. If the tags in the field have different passwords and are configured differently, the data has to be read one by one.

The next chapter deals with the options how to secure the individual memory areas.

8.7.5 Lock

The EPC Gen2 standard provides security mechanisms for the data ranges of the tag. Individual memory areas and functionalities of the tag can be protected with a password against access and / or changes.

In the section "Lock" the mask defining access to the areas can be adapted to the application according to the EPC Gen2 standard. If no changes are to be made for a section, "No change" has to be selected in the respective drop-down menu. The sections are divided as below:

- "Kill password" defines whether or not a deactivation password is required for deactivating the tag.
- "Access password" defines whether or not an access password is required for access to the tag which means that the tag can be worked with in the open state.
- "EPC memory bank" defines whether or not the access password is required for changing the EPC.
- "TID memory bank" This area contains general information about the tag. This area can also be locked against user access by means of the access password.
- "User memory bank" If the tag has a memory area that is intended for user data it can be protected by the access password.

In the drop-down menus of the respective items a distinction is made between access locks preventing writing and reading and writing locks.

If "Accessible with permalock" or "Not accessible with permalock" is selected, this option cannot be changed any more.

By clicking on the button [Lock selected tag] the created mask is transferred to the task selected from the list. Alternatively all tags in the field can be locked on condition that all tags have the same password.

If the Lock section is incorrectly configured, the tag may become useless.

For more information see www.epcglobalinc.org

8.7.6 Kill

With the button [Kill selected tag] a kill command is assigned to this tag with the set password. The button [Kill all tags] executes a kill command on all tags in the field with the indicated password.

To deactivate a tag a deactivation password not equal to 0 has to be assigned.

After a kill tag command the tag is useless.

8.8 AppManager

The App Manager administers applications on the Linux part of the ELC and ETL reader.

The App Manager function is only available for ifm RFID readers with Linux as operating system.

The App Manager function requires the following structure for an application:

```
<Configuration>
    <PlatformIDs>
        <!--SECO-->
        <PlatformID>E2C4D78C-C9FE-4594-8153-82B51312166E </PlatformID>
        <!--KACOM-->
        <PlatformID>59E1F344-C5AE-4662-9A82-D5F265A16271</PlatformID>
    </PlatformIDs>
    <AppID>EC5BD95F-1296-4F94-957F-897219748C9C</AppID>
    <Name>Access Manager</Name>
    <Version>1.00.00.40</Version>
    <Start>startscript.sh</Start>
    <Stop>stopscript.sh</Stop>
    <IsAlive>isalivescript.sh</IsAlive>
        <!-- Optional -->
    <Install>installscript.sh</Install>
    <Uninstall>uninstallscript.sh</Uninstall>
</Configuration>
```

To transfer an application to the reader an FTP server can be started on the reader. Select the menu item "Options/Linux module“ - "Start FTP server“ in ReaderStart. Then the FTP server can be accessed with the Windows Explorer at ftp://192.168.0.1. Please adapt the IP address if the IP address in your system is different.

Alternatively applications can be installed on the Linux system via "Install app". The app structure must be packed in *.tar format.

Then the application can be administered in ReaderStart in the tab [AppManager].

8.9 TagScan

All ifm RFID readers can also detect the tag phase during each reading process. A change to the tag phase is directly proportional to the movement of the tag. As a result the information whether the tag is moving and in which direction is obtained. This enables easy detection of direction without additional sensors such as photoelectric sensors.

In ReaderStart the values phase (shown in blue in the screenshot) and RSSI (shown in red in the screenshot) are illustrated via the time. This makes it easy to judge the criteria for movement assessment.

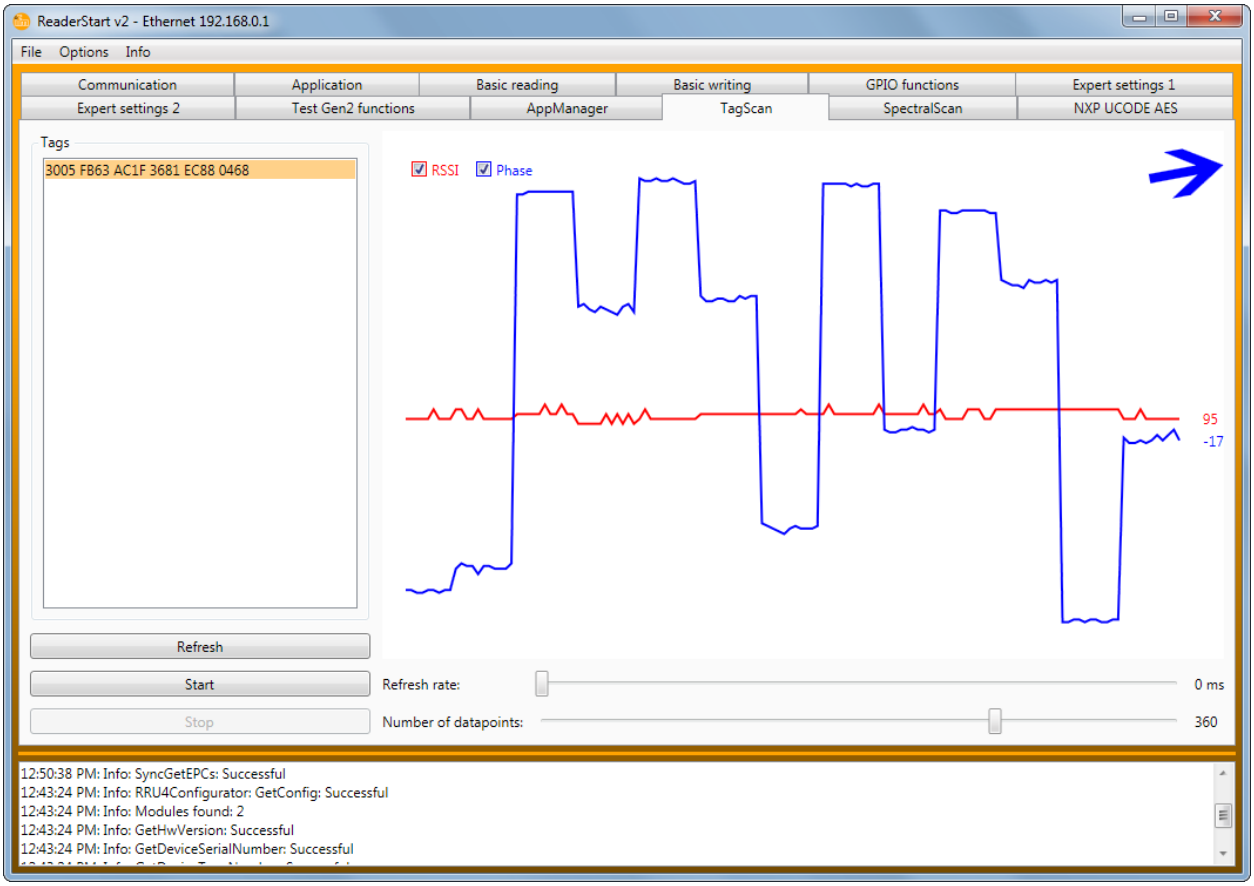
The TagScan function is only available for ifm RFID readers with Linux as operating system.

The ifm RFID readers must change the transmission frequency every 4 seconds. Phase jumps may occur. To eliminate phase jumps only select one transmission frequency under "Expert settings 1".

The values frequency and tag phase are saved in a csv file. Saving must be activated in "Basic reading" -> "Save to file".

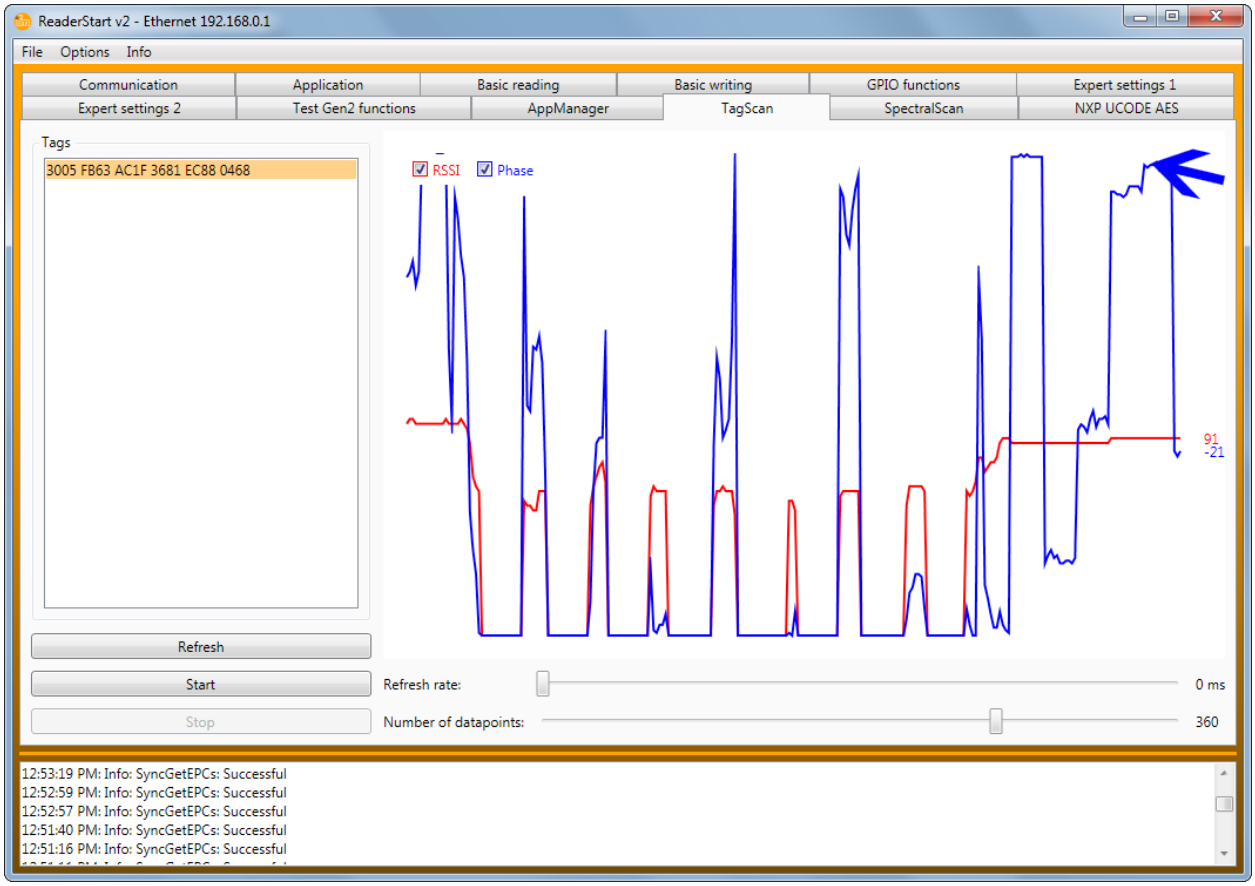
8.9.1 Stationary tag

When the tag has been selected, it can be started via the [Start] button. In the screenshot below the phase jumps during the change of the transmission frequency can be seen. The RSSI value does not change since the tag does not move. The direction of movement is shown via the rotating pointer.



8.9.2 Moving tag

When the tag has been selected, it can be started via the [Start] button. In the screenshot below the tag is moving which is shown by the peaks of the phase. The RSSI value only changes in small steps. The direction of movement is indicated via the rotating pointer.



8.10 SpectralScan

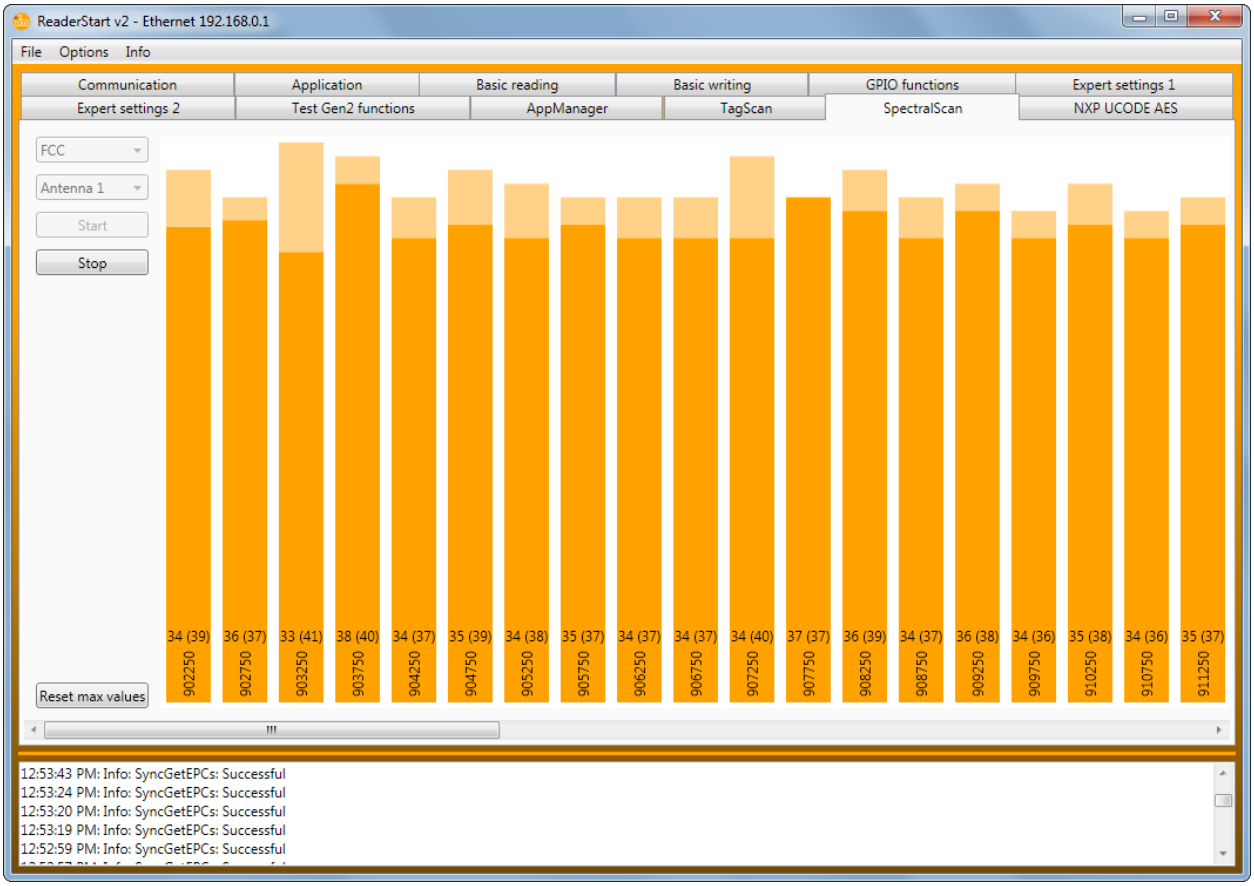
The SpectralScan function permits the indication of jammers in the high-frequency range. The jammers can enter the transmission range of the ifm RFID readers.

The SpectralScan function is only available for ifm RFID readers with Linux as operating system.

With this function noise caused by short-range devices (1st pulsation at 433 MHz) or neighbouring ifm RFID readers with insufficient decoupling are displayed as level.

8.10.1 Example

As an example a neighbouring jammer is shown in the screenshot below.



The mode "Dense Reader" and the free frequency selection permit trouble-free operation in spite of the neighbouring jammer. In the screenshot you can see that the ifm RFID reader uses channel 4. Alternatively channel 7, 10 or 13 would be possible. After 4 seconds the ifm RFID reader changes the channel.

In the example there would be an external error if one of the following criteria is met:

- a jammer permanently uses a frequency,
- the level goes to the maximum with a channel other than 4, 7, 10 or 13.

Since antennas have a reference characteristics, jammers can be found by aligning the antenna. Rotate the antenna until the jammer is signalled with maximum strength. The jammer transmits from that direction.

9 Configuration parameters

This chapter contains parameters and notes for optimum configuration of the ifm RFID reader.

9.1 Introduction

A configuration parameter of the RRU4 reader system consists of a 32-bit identification number (ID) and a data portion of 8 to 32 bits depending on the parameter. Below the data portion is called "parameter value" or "value". By means of the ID different parameters can be read from the reader system or set. Therefore each ID - i.e. each configuration parameter - stands for a certain functionality within the reader system.

9.1.1 Configuration ID

The ID of a configuration parameter is not selected randomly but contains more detailed information about the respective configuration parameter. The ID of a configuration parameter contains the following information:

- the configuration group to which the parameter belongs
- a consecutive number to distinguish parameters within a group
- data type (byte, word etc.) of the value
- number of data bytes of the value
- value of the parameter signed or unsigned
- unity of the value

To simplify handling the configuration parameters are addressed via a plain text name. The plain text name starts with "cfgid" followed by the name of the configuration group. Then follows the function name of the parameter. That means that part that is to clarify the function/use of the configuration parameter. Example:

Configuration parameter "cfgidTagCommIntelligentWrite“

"cfgid“ introducing letter combination

"TagComm“ name of the configuration group

"IntelligentWrite“ function name of the parameter

For more detailed information about the structure of the IDs or the naming of the configuration parameters see the file "konfigids.h" in the source files of the programming environment for the RRU4 reader system.

For programmers: This file contains macros of the programming language "C" by means of which you can address configuration parameters in your programming environment via a plain text name. The plain text name is then translated into the respective configuration ID at the compile time.

9.1.2 Parameter set

The configuration of an RFID reader of the RRU4 reader system is organised in parameter sets. A reader has 8 parameter sets. With one exception ("cfgidGlobalDefaultParamset“) all configuration parameters explained below are represented in each parameter set. When using parameter sets an RFID reader can change from one configuration to another with just one command. The currently selected parameter set is called "active parameter set". Configuration parameters are always read or written on the active parameter set by means of the protocol commands "GetParameterById“ and "SetParameterById“. A changed active parameter set can be saved in the reader EEPROM via "SaveActiveParamset“ and is again available when the reader has been rebooted. The parameter sets are selected with the command "SetActiveParamset".

9.2 "Global" configuration group

9.2.1 DefaultParamset

DefaultParamset	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-7

The parameter "DefaultParamset" is the only one in its configuration group. In contrast to all other parameters this parameter is "independent". That means that this parameter does not exist in every parameter set but only once. The parameter indicates which parameter set is to be loaded and activated when the reader has been started.

9.3 Configuration group "High-frequency interface" (RFInterface)

9.3.1 RFPower1...8

RFPower1...8	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	¼ dBm(erp)
Value range	0; 68-136

The parameter "RFPower1...8" provides the transmission power for the set antenna port. What is meant is the power the antenna is to radiate. It is indicated in dBm(erp). To ensure that the power of the antenna radiated via this parameter is correct, the parameters for attenuation of the antenna cable and the antenna gain have to be correctly set.

Setting a transmission power greater than 0 dBm(erp) is the prerequisite for executing an inventory via this antenna port.

The transmission power is always set in dBm(erp). A transmission power in dBm(eirp) must be converted in dBm(erp):

$$dBm(erp) = dBm(eirp) - 2.14$$

9.3.2 TimeToPowerOff

TimeToPowerOff	
Firmware	as from v1.30.00
Data type	word (16 bits)
Unit	seconds
Value range	0-65535

The parameter "TimeToPowerOff" indicates how long the transmitter carrier should remain switched on after an inventory or a tag operation in general has been completed.

A certain time elapses until the reader can start with the inventory after it has received an inventory command. The reader needs this time for example for LBT (Listen Before Talk) and an antenna test. By means of this parameter it is now possible to shorten this time: When an inventory was completed by the reader and if the next inventory command is given within the time span configured with this parameter, the reader does not need the LBT and the antenna test and can start with the inventory faster.

The time during which the transmission carrier is switched on but there is no imminent tag operation increases the overall energy consumption of the reader.

The LBT (Listen Before Talk) operating mode is only permitted in existing installations.

9.3.3 ModulationType

ModulationType	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0; 1

The parameter "ModulationType" defines the modulation type used by the reader for tag communication. Two modulation types are available:

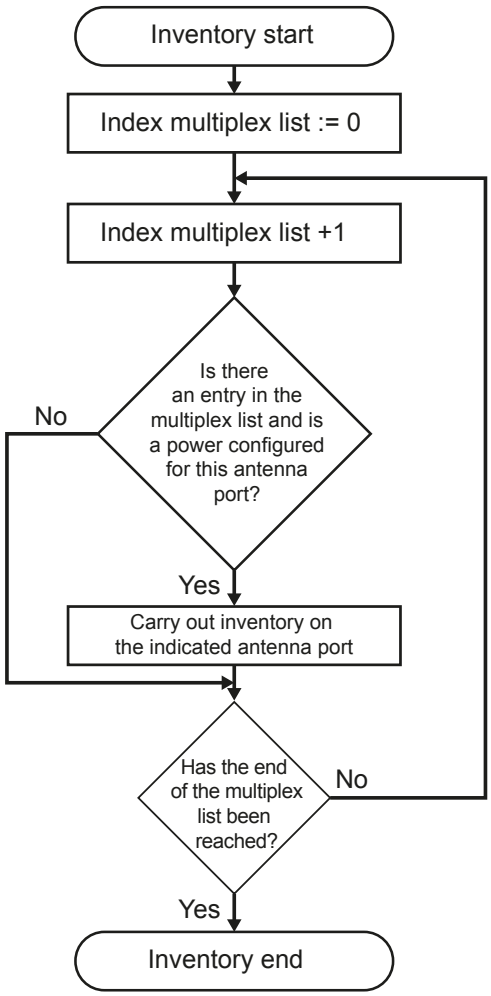
- value 0: Double Side Band (DSB)
- value 1: Phase Reversal Amplitude Shift Keying (PR-ASK)

For readers manufactured for the European Union (ETSI) "Phase Reversal Amplitude Shift Keying" is used irrespective of the setting of parameter value 1.

9.3.4 MultiplexingAntennaport1...8

MultiplexingAntennaport1...8	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0; 1-8

The parameter "MultiplexingAntennaport1...8" is the antenna multiplex list of the reader. In each of the eight list positions an antenna port number (1 to 8) or zero can be entered. The value 0 deactivates the list position and the reader continues to the next list position.



9.3.5 MultiplexingExposureTime1...8

MultiplexingExposureTime1...8	
Firmware	as from v1.30.00
Data type	word (16 bits)
Unit	milliseconds
Value range	0-65535

The parameter "MultiplexingExposureTime1...8" is of interest for the reader commands beginning with "ASync...“. Each parameter stands for a exposure time indicating how long the reader is to stay on the respective position - and thus antenna - in the multiplex list for inventories. In contrast to the synchronous commands the reader does not immediately change to the next entry in the multiplex list after an inventory with asynchronous commands but only when the exposure time indicated for the respective multiplex entry with these parameters has elapsed. An ongoing inventory is not interrupted when the exposure time has elapsed but it is continued until it is completed.

9.3.6 CableLoss1...8

CableLoss1...8	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	¼ dB
Value range	0-255

The parameter "CableLoss1...8" contains the cable attenuation of the antenna cable between reader and antenna for the respective antenna port of the reader. The reader can only set the transmission power correctly if the attenuation values of the antenna cable have been correctly entered.

9.3.7 AntennaGain1...8

AntennaGain1...8	
Firmware	as from v1.30.00
Data type	byte (8 bits); signed
Unit	¼ dBic
Value range	-128 - 127

The parameter "AntennaGain1...8" communicates to the reader the antenna gain of the antennas connected to the reader. The reader calculates the socket power to be applied to the HF output from the set transmission power (antenna radiant power), the antenna gain and the cable attenuation:

$$\text{socket power}_{dBm} = \text{radiant power}_{dBm(erp)} - \text{antenna gain}_{dBic} + \text{cable attenuation}_{dB} + 5.14$$

Use the following formula to convert an antenna gain indicated in dBi to dBic:

$$\text{antenna gain}_{dBic} = \text{antenna gain}_{dBi} + 3$$

Near-field antennas have a negative gain since they are not designed for electromagnetic coupling with the tag but for magnetic coupling.

Configure the near-field antennas by indicating an antenna gain of 5.25 dBic (a parameter value of 21 dec) and not more than the maximum input power of the antenna indicated in the data sheet as antenna radiant power ("RFPower1...8“).

9.3.8 RSSIThreshold1...8

RSSIThreshold1...8	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0; 255

The parameter "RSSIThreshold1...8" defines the response threshold of the RSSI value for each antenna port. If the reader carries out an inventory, the field strength of the reply of the addressed tag is also measured, the RSSI value. Tags with an RSSI value smaller than the set value are not detected by the reader.

9.3.9 MultiPowerTagAccess1...8

MultiPowerTagAccess1...8	
Firmware	as from v1.30.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "MultiPowerTagAccess1...8" can be activated for each antenna port. Then the reader reduces the transmission power by half after an inventory with high transmission power and looks for any "overlooked" tags.

The stronger the transmission signal of the reader hits a tag, the more difficult it is for the tag to modulate the transmission light of the reader via back scatter. The strength of the tag reply decreases with increasing transmission power of the reader. It may occur that the reader can no longer read a tag which is immediately in front of the antenna because of this behaviour although it could detect it with a lower transmission power.

9.3.10 MaxAllowedAntennaOutputPower1...8

MaxAllowedAntennaOutputPower1...8	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	¼ dBm(erp)
Value range	0-255

The parameter "MaxAllowedAntennaOutputPower1...8" limits the radiant power of the antenna at an antenna port to a certain value.

9.3.11 EnableRSSIThresholdAtSpecificCmds

EnableRSSIThresholdAtSpecificCmds	
Firmware	as from v1.46.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The RSSI threshold value set with the parameter "RSSIThreshold1...8“ has an effect on unspecified ("... GetEPCs“, "...Any“) and specified ("...Specific“) tag reader commands. The effect on specific tag reader commands can be activated or deactivated via the parameter "EnableRSSIThresholdAtSpecificCmds".

Application example: The reader cyclically looks for tags in the antenna field with "SyncGetEPCs“. By means of the configuration parameter "RSSIThreshold1...8“ tags below a certain RSSI value are not reported. A tag is now approaching the RSSI threshold and is reported to the higher level by the reader when it has reached the threshold. It triggers a specific command for the reported tag. If

"EnableRSSIThresholdAtSpecificCmds“ is activated, it may now happen that the specific command is rendered ineffective since the RSSI value of the tag trembles around the threshold. In this scenario "EnableRSSIThresholdAtSpecificCmds“ should be deactivated.

9.3.12 FlashWriteAdditionalPower

FlashWriteAdditionalPower	
Firmware	as from v2.00.00
Data type	byte (8 bits)
Unit	¼ dB
Value range	0-48

The parameter "FlashWriteAdditionalPower" has the effect that more transmission power is used for write commands than for read commands.

To write data to a tag a tag needs more energy than for reading data from a tag. That means that a tag has to be closer to the antenna for writing than for reading with the same transmission power. To bridge this distance the transmission power for writing can be increased with this parameter.

9.3.13 FlashReadAdditionalPower

FlashReadAdditionalPower	
Firmware	as from v2.13.00
Data type	byte (8 bits)
Unit	¼ dB
Value range	0-48

The parameter "FlashReadAdditionalPower" has the effect that more transmission power is used for read commands than for write commands.

Different tags need more energy for reading the user memory than for the inventory. That means that a tag with this behaviour must be closer to the antenna for reading the user memory than for the inventory to determine the EPC. To bridge this distance the transmission power for reading can be increased with this parameter.

9.4 Configuration group "Tag communication“ ("TagComm“)

9.4.1 UsePilottone

UsePilottone	
Firmware	as from v1.30.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "UsePilottone" turns the pilot tone on or off. Tags to EPCGlobal Class-1 Gen-2 can transmit a "pilot tone" before the user data. The purpose of the pilot tone is to synchronise the reader with the reply of the tag. Without pilot tone it is more difficult for the reader to synchronise with the tag reply. To ensure reliable tag detection this parameter should always be activated.

9.4.2 InitialQ

InitialQ	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-15

The parameter "InitialQ" tells the reader how many tags are expected in the antenna field. The value Q defines in the inventory process how many tags are probably in the antenna field of the reader and have to be detected. The number x tags is calculated on the basis of the following formula:

$$x = 2^{Q-1}$$

The reader informs the tags about the value Q. Then they randomly select one of x "communication slots" for their reply. To carry out an inventory as fast and efficiently as possible many of the x communication slots should be used by tags, there should, however, be no multi-use of communication slots (collisions). When the reader detects that Q is too big (hardly any communication slots are used) or too small (there are collisions), it is automatically adapted and transmitted to the tags. Since this adaptation takes some time, the reader should be told with the configuration parameter how many tags are probably to be expected in the antenna field. This way the number of communication slots can be set as suitable already at the beginning of the inventory process.

9.4.3 Session

Session	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-3

The parameter "Session" determines which session the reader should work with.

Tags to EPCGlobal Class-1 Gen-2 support four different "sessions“. A tag can remember for each session whether or not it has been detected by the reader via an inventory process (inventoried flag). The inventoried flags of the individual sessions have different persistence time characteristics. The persistence time indicates how long a tag remembers whether or not it was detected by the reader.

Session	Tag has energy	Tag has no energy
0	Unlimited persistence	No persistence
1	Persistence longer than 500 milliseconds and shorter than 5 seconds	Persistence longer than 500 milliseconds and shorter than 5 seconds
2	Unlimited persistence	Persistence longer than 2 seconds
3	Unlimited persistence	Persistence longer than 2 seconds

9.4.4 MaxErrors

MaxErrors	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-255

The parameter "MaxErrors" indicates how often a command is carried out by the reader to the tag if a reply from the tag expected by the reader is missing.

9.4.5 CommunicationProfile

CommunicationProfile	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-255

The "communication profile" between reader and tag is set via the parameter "CommunicationProfile". A communication profile consists of:

- the transmitted baud rate (reader-to-tag communication)
- the received baud rate (tag-to-reader communication)
- the coding of the data from tag to reader

Different transmission rates, received baud rates and coding are available. Since not every combination of these three characteristics is possible, selected combinations are available as communication profile. A list of possible communication profiles can be downloaded from the reader via the command "GetProfileList". Whether or not the reader operates in the dense reader mode depends on the selected communication profile.

This parameter used to be called "DefaultProfile" up to firmware v2.04.00. The configuration ID was not changed.

9.4.6 CommStandard

CommStandard	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-255

The parameter "CommStandard" informs the reader according to which rules the radio communication with the RFID tag is to be carried out. Depending on the country the regulations differ with respect to the transmission power and the transmission channels permitted for communicating with RFID tags.

For further information about the supported country profiles please contact the ifm support.

9.4.7 IntelligentWrite

IntelligentWrite	
Firmware	as from v1.30.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "IntelligentWrite" accelerates the writing process of data. If the parameter is active, the reader reads first of all the data area to be written to from the tag and only rewrites those parts that should change.

Depending on the type it takes a tag 10 to 20 milliseconds to write 16-bit data (one word). If, for example, a 96-bit EPC is to be written, the time a tag needs to save the data is 120 milliseconds at the worst. To read data from a tag only one-fifth up to one tenth of this time is needed. It often happens in practice that data is written to a tag that already exists here. Nevertheless the tag requires the indicated time to complete the write command.

If a memory area on a tag is protected against overwriting via "Lock" and if identical contents is written to the tag with activated "IntelligentWrite", there is no error message from the reader.

By reading the available data, comparing with the data to be written and statement by the reader that no changed data is to be written to the tag, no write command to the tag is triggered. Without write command the reader cannot recognise the "lock" of the memory area.

9.4.8 VerifyWrite

VerifyWrite	
Firmware	as from v1.30.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "VerifyWrite" informs the reader that the data in the tag memory should be verified with the read command after successful writing. Inconsistencies are signalled to the higher level as "Verify Fail".

A tag transmits a result to the reader after a write operation. This result can either be an error code or a success message. The memory cells of a tag cannot be written to as often as you like since they are subject to an ageing process. Depending on the tag 1,000 to 1,00,000 write cycles are possible. In particular at the end of the life of a tag it is possible that a tag transfers a success message after a write operation to the reader but the data is not correctly saved in the tag memory.

In spite of the activated parameter "VerifyWrite" it cannot be guaranteed that data is correctly saved in the tag memory. With older tags it is possible that they forget their memory contents only minutes or hours after the write operation.

9.4.9 QueryTarget

QueryTarget	
Firmware	as from v1.30.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "Query target" defines which tags are to participate in the inventory.

Tags to EPCGlobal Class-1 Gen-2 support four different "sessions“. A tag can remember for each session whether or not it has been detected by the reader via an inventory process (inventoried flag). The status of the inventoried flag can either be "A" or "B". When the tag is detected in inventory, the state of the flag either changes from A to B or from B to A. The state of the flag can also be influenced via "select" commands.

If the parameter "QueryTarget" has the value 0, only those tags participate in inventory whose inventoried flag is set to A. Otherwise only those tags participate in the inventory for which the inventoried flag is set to B. Filter tasks can be solved together with the "select" commands.

See also the "EPCGlobal Class-1 Generation-2 UHF RFID“ ((E)) specification V1.2.0 chapter 6.3.2.2 (pages 43f).

9.4.10 QuerySel

QuerySel	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-3

The parameter "QuerySel" defines the contents of the field "Sel" in the command "Query" Gen2. The tag is informed via this field whether or not the contents of the "Selected-Flags" is relevant for participation in the inventory. Filter tasks can be solved together with the "select" commands.

See also the "EPCGlobal Standard Class-1 Generation-2 UHF RFID“ ((E)) specification V1.2.0 chapter 6.3.2.11.2.1 (page 57).

9.4.11 ForcePowerOffAfterEPCWrite

ForcePowerOffAfterEPCWrite	
Firmware	as from v1.40.00
Data type	byte (8 bits)
Unit	milliseconds
Value range	0-255

The parameter "ForcePowerOffAfterEPCWrite" indicates if and how long after a write operation to the memory bank of the EPC with the purpose of "repowering" the tag the carrier is to be switched off.

During the inventory process a tag transmits its EPC and a checksum to the reader. This checksum is built during "power up" of the tag via the memory area of the EPC. If now the EPC is changed via write command and a new inventory is started without "power up" i.e. without switching off the antenna field, the tag cannot participate in the inventory since the checksum it transmitted does no longer match the transferred EPC.

See also the "EPCGlobal Class-1 Generation-2 UHF RFID“ ((E)) specification V1.2.0 chapter 6.3.2.1.2.1 (page 38).

9.4.12 TransmitGetEPCsPreSelect

TransmitGetEPCsPreSelect	
Firmware	as from v1.41.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "TransmitGetEPCsPreSelect" influences the process of an inventory. The parameter only has an effect on the protocol commands "SyncGetEPCs“, "SyncBulkGetEPCs“, "ASyncGetRawEPCs“ and "ASyncGetEPCs“. All other protocol commands behave as if "TransmitGetEPCsPreSelect" were equal to 0.

If "TransmitGetEPCsPreSelect" is equal to 0, an inventory is carried out as below:

1. The first antenna is selected from the multiplex list.
2. A select is carried out on the selected antenna to reset all tags in the reception range.
3. An inventory is carried out on the selected antenna until no more tags are found.
4. If other antennas are indicated in the multiplex list, the next antenna is selected and it is returned to 2.
5. The protocol command is terminated and the result is transferred to the higher level.

If "TransmitGetEPCsPreSelect" is unequal to 0, an inventory is carried out as below:

6. The first antenna is selected from the multiplex list.
7. A select is carried out on the selected antenna to reset all tags in the reception range.
8. If other antennas are indicated in the multiplex list, the next antenna is selected and it is returned to 2.
9. The first antenna is selected from the multiplex list.
10. An inventory is carried out on the selected antenna until no more tags are found.
11. If other antennas are indicated in the multiplex list, the next antenna is selected and it is returned to 5.
12. The protocol command is terminated and the result is transferred to the higher level.

If several antennas look at a population of tags and it is not of interest with which antenna a tag was detected, the time for complete detection of the tag population can be shortened by activating the parameters. Then tags that were already detected by an antenna are not detected by the antennas following in the multiplex list.

9.4.13 TransmitSelectIfNoFilterIsOn

TransmitSelectIfNoFilterIsOn	
Firmware	as from v1.45.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "TransmitSelectIfNoFilterIsOn" determines whether or not a select is to be sent for global reset of all tags within antenna reception area before the inventory, however only if no select filters are defined.

At the beginning of an inventory the reader resets all tags in the antenna reception area to a defined initial state via defined "select" filters or a "select" command. The following inventory detects all tags that are in this defined initial state.

9.4.14 NumberOfEPCWords

NumberOfEPCWords	
Firmware	as from v2.00.00
Data type	byte (8 bits)
Unit	-
Value range	0-31; 255

The parameter "NumberOfEPCWords" can deactivate the automatic detection of the EPC length. That forces readers to operate with a fixed length.

As from firmware v2.00.00 readers can read tags of an EPC length of 0 to 31 words (0 to 496-bit EPCs).

9.4.15 UseBlockWrite

UseBlockWrite	
Firmware	as from v2.00.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "UseBlockWrite" forces the reader to use the command "BlockWrite" to write data to a tag. Therefore it is possible to write more than 16 bits (one word) to a tag with only one command so that time is saved for writing.

Not all tags support the command "BlockWrite". See also the "EPCGlobal Standard Class-1 Generation-2 UHF RFID“ ((E)) specification V1.2.0 chapter 6.3.2.11.3.7 (page 74).

9.4.16 DisableReceivingNXPReadProtectedTags

DisableReceivingNXPReadProtectedTags	
Firmware	as from v2.01.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "DisableReceivingNXPReadProtectedTags" prevents the reception of read-protected tags.

If a tag from the company NXP was protected with "ReadProtect", it does not transfer its EPC during the inventory any longer and neither a valid checksum. The data content of EPC and checksum is zero. The reader lets tags for which EPC and checksum are zero pass so that these tags can be detected. Since these tags are no longer protected by a valid checksum, it may happen in rare cases that the reader detects such a tag where there is none. To prevent this the reception of "read-protected" tags can be prevented.

9.5 Configuration group "Observed List" ("ObservedList")

9.5.1 GlimpsedTimeoutCnt

GlimpsedTimeoutCnt	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-255

The parameter "GlimpsedTimeoutCnt" indicates the number of inventories after which a tag is deleted from the internal administration list if it was not detected after a generated "Go" message.

The parameter is only valid for asynchronous protocol commands ("ASync..."). With asynchronous commands a list with all tags found in the antenna reception area is created for the duration of the command. If a tag is within the antenna reception area for the length of several inventories, a "Come" message is generated for this tag and transmitted to the higher level. If a tag is no longer detected during several inventories, a "Go" message is generated and transferred.

ifm recommends not to change the parameter "GlimpsedTimeoutCnt". The parameter has no influence on the generation of a "Come" or "Go" message.

9.5.2 ObservedThresholdCnt

ObservedThresholdCnt	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-255

The parameter "ObservedThresholdCnt" indicates after how many inventories during which a tag was detected a "Come“ message is generated and transferred to the higher level.

The parameter is only valid for asynchronous protocol commands ("ASync..."). With asynchronous commands a list with all tags found in the antenna reception area is created for the duration of the command. If a tag is within the antenna reception area for the duration of several inventories, a "Come" message is generated for this tag and transmitted to the higher level. If a tag is no longer detected during several inventories, a "Go" message is generated and transferred.

9.5.3 ObservedTimeoutCnt

ObservedTimeoutCnt	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-255

The parameter "ObservedTimeoutCnt" indicates after how many inventories during which a tag was no longer detected a "Go“ message is generated and transferred to the higher level.

The parameter is only valid for asynchronous protocol commands ("ASync..."). With asynchronous commands a list with all tags found in the antenna reception area is created for the duration of the command. If a tag is within the antenna reception area for the duration of several inventories, a "Come" message is generated for this tag and transmitted to the higher level. If a tag is no longer detected during several inventories, a "Go" message is generated and transferred.

9.6 Configuration group "Host communication“ ("HostComm“)

9.6.1 ExtendedResultFlag

ExtendedResultFlag	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-15

The parameter "ExtendedResultFlag" indicates which additional information about a tag is also to be transferred from tag data to the higher level. Each bit of the lower four bits of the parameter set to "1" initiates the transfer of additional information:

- Bit 0: transfer of the antenna information (on which antenna the tag was detected)
- Bit 1 transfer of the RSSI value (field strength information of the tag reply)
- Bit 2: transfer of the timestamp (at what time the tag was detected)
- Bit 3: transfer of the protocol control word of the tag (PC, [XPC_W1, [XPC_W2]]; see also the specification "EPCGlobal Class-1 Generation-2 UHF RFID“ V1.2.0 chapter 6.3.2.1.2 (page 38).)

9.6.2 AntennaIndependentOperation

AntennaIndependentOperation	
Firmware	as from v1.30.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "AntennaIndependentOperation" permits distinction between an "antenna-dependent“ (parameter deactivated) and an "antenna-independent“ (parameter activated) operation of the reader. This configuration parameter is of relevance for all asynchronous protocol commands ("ASync...") and for the command "SyncBulkGetEPCs". In the case of the mentioned protocol commands the reader has to compare tags detected via inventory with tags from an internal list.

With antenna-dependent operation the antenna information is also taken into account besides the EPC. That means that a tag that is detected by several antennas also created several data records in the reader. Each data record contains the same EPC but a different antenna port number. The antenna information is irrelevant for the antenna-independent operation. A tag that is detected by several antennas creates only one data record in the reader.

9.6.3 ASyncAdditionalRSSIDataDeliveryDelta

ASyncAdditionalRSSIDataDeliveryDelta	
Firmware	as from v2.00.00
Data type	byte (8 bits)
Unit	-
Value range	0-255

The parameter "ASyncAdditionalRSSIDataDeliveryDelta**"** indicates to what degree the RSSI value of a tag has to change so that a "TagData-Changed“ message is generated and transferred to the higher level. At a value of 255 no "TagDataChanged" messages are generated.

With asynchronous commands a "Come" message is generated as soon as a tag enters the reception area of the antenna and is transferred to the higher level. If a tag leaves the antenna field, a "Go" message is generated. In different application scenarios it is of interest how the field strength (RSSI value) of a tag reacts in the time between the "Come" and "Go" message. This allows to draw conclusions concerning the movement of a tag in the antenna field.

The parameter influences the behaviour of all asynchronous protocol commands ("ASynch...) except "ASyncGetRawEPCs“.

The parameter "ExtendedResultFlag" must be configured accordingly so that the RSSI value is an element of the message "TagDataChanged“.

9.6.4 UseMillisecondsAsTimestamp

UseMillisecondsAsTimestamp	
Firmware	as from v2.00.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "UseMillisecondsAsTimestamp" indicates if the timestamp shows the UTC time in seconds since the 01/01/1970 0:00 h or the milliseconds elapsed since the start of the reader.

After an inventory a timestamp with the point of time of detection of the tag can be transferred to the higher level in addition to the tag information (→ 9.6.1). If the parameter is activated, the milliseconds since the start of the reader are transferred as timestamp.

9.7 Configuration group "ETSI"

9.7.1 PortChannelListGlobalValue1...16

PortChannelListGlobalValue1...16	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-15

The parameter "PortChannelListGlobalValue1...16" is used to administer the radio channels permitted for Europe and forms the ETSI channel list. The ETSI channel list comprises max. 16 entries. Each entry can contain an ETSI channel number in the range from 1 to 15. A value of zero is the end of the channel list. All entries of configuration parameters with the higher index are ignored. With the configuration parameter "ChannelSwitchingMode" set accordingly, the reader randomly selects a channel for the communication with the tags from this channel list.

The parameter "PortChannelListGlobalValue1...16" is only relevant if "ETSI_EN302208“ or "ETSI_EN302208_LBT“ was selected as communication standard.

9.7.2 PortChannelListPort1...8Value1...16

PortChannelListPort1...8Value1...16	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-15

The parameter "PortChannelListPort1...8Value1...16" is used to administer the radio channels permitted for Europe and is an individual ETSI channel list for each antenna port. Each ETSI channel comprises max. 16 entries. Each entry can contain an ETSI channel number in the range from 1 to 15. A value of zero is the end of the channel list. All entries of configuration parameters with the higher index are ignored. With the configuration parameter "ChannelSwitchingMode" set accordingly, the reader randomly selects a channel for the communication with the tags from this channel list.

The parameter "PortChannelListPort1...8Value1...16" is only relevant if "ETSI_EN302208“ or "ETSI_EN302208_LBT“ was selected as communication standard.

9.7.3 ChannelSwitchingMode

ChannelSwitchingMode	
Firmware	as from v1.30.00
Data type	byte (8 bits)
Unit	-
Value range	0-1

The parameter "ChannelSwitchingMode" defines if the reader is to operate in "mode 0" or "mode 1" for the channel selection.

ETSI communication standard	Mode 0	Mode 1
ETSI_EN302208	No LBT; use of the global channel list for each port with random selection of the channel	No LBT; use of the channel list associated with the port with random channel selection
ETSI_EN302208_LBT	LBT on the first configured antenna; use of the global channel list in random channel order; no new LBT - and therefore no change of channel - during change of port	LBT for each change of port on this port; use of the channel list associated with the port in random channel order

The LBT (Listen Before Talk) operating mode is only permitted in existing installations.

The parameter "ChannelSwitchingMode" is only relevant if "ETSI_EN302208“ or "ETSI_EN302208_LBT“ was selected as communication standard (only in existing installations).

9.7.4 PowerCheckOverAllAllowedChannels

PowerCheckOverAllAllowedChannels	
Firmware	as from v1.30.00
Data type	bool (8 bits)
Unit	-
Value range	0; 255

The parameter "PowerCheckOverAllAllowedChannels" defines the level setting of the channel plan for the European frequencies according to the valid "4-channel plan" (or the outdated "Listen Before Talk").

The communication standards define different maximum transmission powers per channel. The transmission power is limited to the smallest maximum power of the selected channels.

The parameter "PowerCheckOverAllAllowedChannels" is only relevant if "ETSI_EN302208“ or "ETSI_EN302208_LBT“ was selected as communication standard (only in existing installations).

For EN302208:

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Max. permitted transmission power [W]	0	0	0	2	0	0	2	0	0	2	0	0	2	0	0

Example for EN302208: If the channels 3 and 4 are entered in the channel list, there is a maximum transmission power of 0 watts. The reader signals a "power check error" for the respective channel.

For EN302208_LBT:

Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Max. permitted transmission power [W]	0.1	0.1	0.1	2	2	2	2	2	2	2	2	2	2	0.5	0.5

Example for EN302208_LBT: If channels 3 and 4 are entered in the channel list and if the transmission power is set to 2 watts, the reader only transmits with 0.1 watts since channel 3 of the indicated channels only has a max. power of 0.1 watts.