BRADY FR22
RFID FIXED READER

USER GUIDE

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1. GETTING STARTED

1.1. GENERAL

The BRADY FR22 is the core device of a new approach for RFID fixed systems with a modular design. It can enable different use cases for different segments depending which modules or accessories are attached to it.

The BRADY FR22 is an IoT Edge Gateway providing USB, Ethernet, WLAN, 4G, GPS, BLE and RFID connectivity.
It also has an embedded computer with Linux OS and connection to HDMI display, what enables installation and operation of 3rd party applications and makes the system much more scalable and manageable than conventional RFID readers.

- Fast and reliable edge computing with support for custom embedded applications
- Wide communication options that enable flexibility in system designing and no need for external connectivity hardware
- New UHF RFID engine based on the very latest technology, BRADY NUR3-1W
- Develop embedded web apps with user interface. Eliminating the need for external PC/tablet
- BRADY extension connector for plug and play accessories like 16 port RF multiplexer
- Connect external devices, sensors, triggers, lights and buzzers
- Full set of API's available for controlling the reader

1.2. ANTENNAS AND ACCESSORIES

The BRADY FR22 needs external RFID antennas to operate. It can work with any standard UHF RFID antenna, but we suggest using BRADY RAIN RFID antennas.

BRADY antenna portfolio includes two exclusive antennas for BRADY FR22:

- BRADY GA30, a general-purpose antenna with high gain and IP rating, that allows the BRADY FR22 to be mounted behind it to create an integrated RFID reader + antenna solution.
- BRADY BFA, a beam-forming antenna for special applications that require reading tags in large areas or detection of movement and direction. This antenna is connected to the BRADY Extension Port in BRADY FR22 instead of SMA ports.

Model and quantity (up to 4 without multiplexer or up to 16 with multiplexer) of antennas depend on the use case.

1.3. PACKAGE CONTENT

BRADY FR22 package contains following items

- BRADY FR22
- WLAN/Bluetooth antenna
- LTE antenna (only in LTE variant)
- Safety and regulations card
- Additional product label with product information *(keep this safe)*

> **NOTE!** Power supply and GPS antenna not included

2. USING THE DEVICE

2.1. FEATURES AND CONNECTORS OVERVIEW

The BRADY FR22 includes external WLAN and WWAN (only the LTE variant) antennas that need to be fastened to the device before it's taken into use.
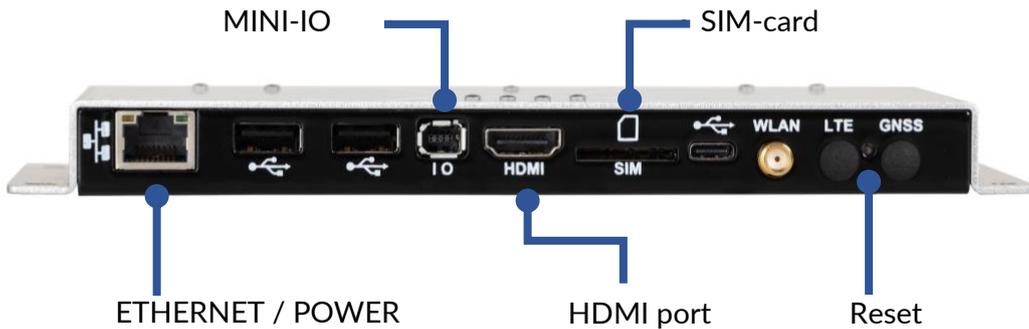
Picture 5 Rear panel of BRADY FR22 (operation)
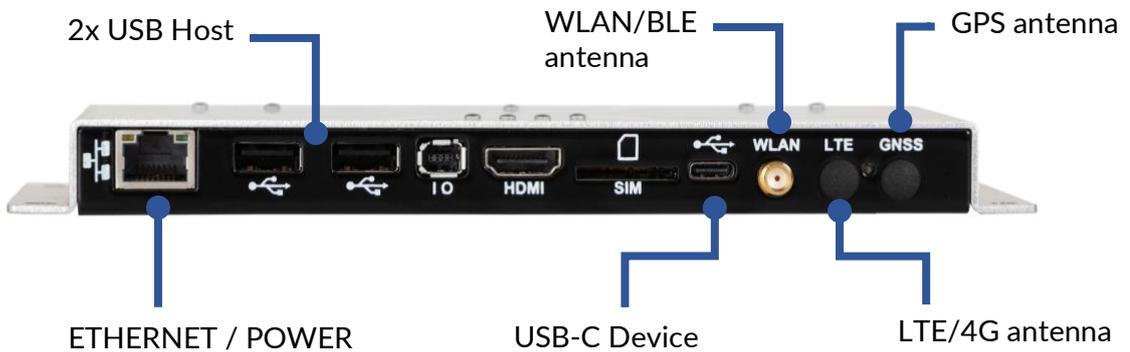
Picture 6 Rear panel of BRADY FR22 (communications)

Picture 7 Front panel of BRADY FR22

2.2. PHYSICAL CONNECTORS

BRADY FR22 includes the following physical connectors:

- Ethernet 10/100Mbps with PoE 802.3at support.
- 2 pcs USB 2.0 host Type A connectors
- USB 2.0 device Type C connector (USB HID profile supported)
- Mini-IO connector (4 pcs of IO's)
- HDMI connector (video only)
- Slot for mini-SIM card (only in LTE variant)
- SMA antenna connector for dual band WLAN and Bluetooth connectivity
- SMA antenna connector for WWAN cellular connectivity (only in LTE variant)
- SMA antenna connector for GNSS (only in LTE variant)
- 4 pcs RP-SMA antenna connectors for connecting external RFID antennas to the reader
- BRADY Extension Port

2.2.1. ETHERNET / POWER

The BRADY FR22 includes standard RJ-45 ethernet connector. The reader supports 10/100Mbps speed class and 802.3at PoE.

There is no DC connector for an external power supply. The BRADY FR22 is powered via Ethernet, regardless of whether Ethernet is the communication interface in use or not.

2.2.2. USB 2.0 HOST WITH TYPE A CONNECTOR

BRADY FR22 includes two USB 2.0 host Type A connectors for connecting peripheral USB devices to the device to expand its functionalities, such as barcode scanners, memory sticks, keyboards, sensors, etc. Maximum current out from the USB 2.0 host Type A connectors is 500mA.

2.2.3. USB 2.0 DEVICE WITH TYPE C CONNECTOR

BRADY FR22 includes one USB 2.0 device Type C connector for connecting it to a host device.

> **NOTE!** Web management interface can't be access using USB connector. Web management interface can be accessed only using ethernet, WLAN and WWAN connections.

2.2.4. GPIO CONNECTOR

The BRADY FR22 includes a standard mini-IO connector that contains the following functionalities:

- I2C bus
- 4 x inputs / outputs (TTL 1.8VDC)
- 3.3VDC supply (output)
- GND level

2.2.5. HDMI

The BRADY FR22 includes a standard HDMI video output, to connect a display.

The supported resolutions are 1280x720 and 640x480.

By default, the HDMI port will not show anything (other than the BRADY logo) at the connected display.

However, after installing the available web browser plugin via the administrator web UI, it will automatically show the web browser in HDMI output. This plugin also includes settings like kiosk mode (locked to full screen) and the default page that the web browser should show out-of-the box.

2.2.6. SLOT FOR MINI SIM CARD (OPTIONAL)

The LTE variant of BRADY FR22 includes a slot for mini-SIM card. Mini SIM card is to be inserted in the slot in a right orientation to be functional. The correct insertion orientation of mini-SIM card can be seen below.
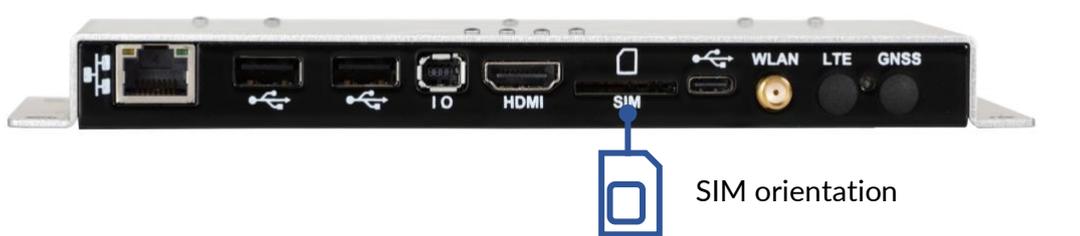
Picture 8 Insertion orientation of mini SIM card

2.2.7. DUAL BAND WLAN AND BLUETOOTH

All the variants of BRADY FR22 include dual band WLAN (supporting 2.4GHz and 5.0GHz frequency bands) and Bluetooth 4.2.

The included external dual band antenna needs to be attached to the device to make WLAN and Bluetooth perform and work as specified.

Supported Bluetooth standars: BT 2.1 + EDR/3.0/4.1 LE/BT4.2

Supported Bluetooth profiles:

- SPP Profile (classic Bluetooth
- HID Profile (classic Bluetooth)
- HID Over GATT Profile (HOGP) (BLE)

2.2.8. WWAN CELLULAR CONNECTIVITY (OPTIONAL)

There is an LTE variant of BRADY FR22 that includes WWAN connectivity supporting 2G, 3G and 4G cellular networks.

Supported bands:

- GSM/EDGE Quad-band 850/900/1800/1900 MHz
- LTE-FDD B1/B3/B5/B7/B8/B20
- LTE-TDD B38/B40/B41
- WCDMA B1/B5/B8

An external WWAN antenna (included in the LTE package) needs to be attached to the device to make WWAN perform and work as specified. WWAN connectivity needs a SIM card to be functional. Please find more information about how the SIM card is inserted to the BRADY FR22 from section 2.2.6.

2.2.9. GNSS (OPTIONAL)

The LTE variant of BRADY FR22 also includes a GNSS receiver, to provide global positioning information using GPS, BeiDou or GLONASS.

An external GNSS antenna (not included in the package) needs to be attached to the device to make the GNSS receiver work.

2.2.10. RFID ANTENNA PORTS

BRADY FR22 includes 4pcs RP-SMA female antenna connectors for connecting external RFID antennas to the device. Impedance of antenna ports is 50Ω and maximum conducted output power is 32dBm (30dBm in FCC region).

The antenna ports can be configured independently via NUR API.

If more than 4 antenna ports are needed, the BRADY FR22 multiplexer can be connected to the Extension Port extending the 4 RF ports to 16 RF ports. See the product code in section 1.3.

2.2.11. EXTENSION PORT

The BRADY FR22 is the first device including the exclusive Extension Port, that enables connection to exclusive accessories, such as RFID multiplexer or advanced antennas.

The extension port enhances the capabilities of the computing units of the BRADY FR22 and can transform the device into a complete system solution for specific use cases and applications.

BRADY EXTENSION PORT

Picture 1 Front panel of BRADY FR22

2.3. MOUNTING

BRADY FR22 can be mounted using the four holes as seen in the picture.

Picture 10 Mounting holes in BRADY FR22

The 1:1 size template below can be printed and used to drill holes before mounting the device in place.
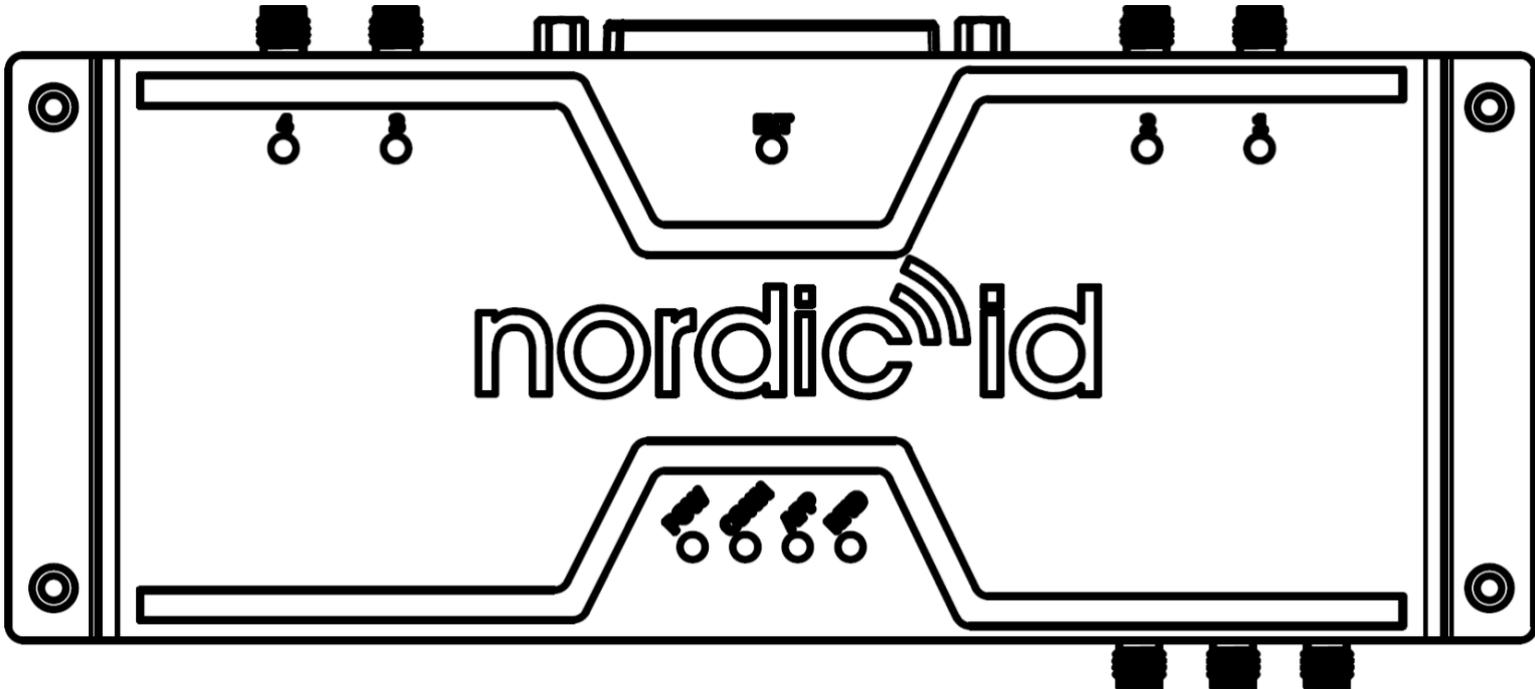
2.4.   POWERING THE READER

BRADY FR22 can be powered via DC ethernet port if the network supports power over Ethernet (PoE) feature or using a PoE+ power supply (sold separately).

Regardless of what powering method is used, the data communication can be handled via USB connection or Bluetooth, or if IP connectivity is required then via WWAN, WLAN or ethernet.

BRADY FR22 powers up automatically when connected to PoE power supply or network.

The rated maximum power consumption for BRADY FR22 reader is:

- 25.5W with maximum RFID transmission level and all the radios (WLAN, Bluetooth and LTE) enabled.

- 18W with maximum RFID transmission level and all the radios disabled (communication via Ethernet or USB).

- 4W in idle state, with RFID and all the radios disabled.

2.5.   LED INDICATORS

The user interface of BRADY FR22 consists of 9 LED indicators:

- 4 LEDs for user indications
    - o   Power LED
    - o   Connection LED
    - o   Application LED
    - o   RFID LED
- 4 LEDs to indicate the antenna ports status,
- 1 LED for the BRADY Extension Port.

The location of the LEDs can be seen in Picture 12.

Picture 12 Location of LEDs

2.5.1. POWER LED

By default, the Power LED indicates if power is supplied to the device.

- 🟢 Green indicates that the device is powered.
- ⚪ No light indicates that the PoE port is not powering the device.
- 🟠 The Power LED turns yellow during the upgrade procedure. DO NOT POWER THE DEVICE OFF DURING THIS PROCESS.

During the boot sequence after powering the device, the Application LED will also flash red and/or green (see 2.5.3).

2.5.2. CONNECTION LED

Connection LED indicates whether the reader has established a network (TCP/IP) connection, i.e. Ethernet, WLAN or LTE connection.

- ⚪ Off: All the communication interfaces are disabled.
- 🟢⚪🟢 Blinking green: Any communication interface is enabled but not connected. For example, Ethernet interface is enabled but the device doesn't have an assigned IP address.
- 🟢 Stable green: At least one communication interface is connected and ready to communicate, i.e., the reader has IP address

2.5.3. APPLICATION LED

The Application LED indicates whether the RFID module is connected to an application (software) or not.

- 🔴 Stable red: RFID module firmware (NUR service) not running.
- 🟢⚪🟢 Slow blinking green: RFID module running, ready to be used.
- 🟢 Stable green: An application is connected to the RFID module.
- 🟢🟢🟢 Fast blinking green: An application is sending commands to the RFID module, it's in use.

When the BRADY FR22 is in "ready" status, the Power, Connection and Application LEDS are all green at the same time (App LED can be blinking green if the host application is not using the RFID module yet).

2.5.4. RFID LED

RFID LED indicates whether the RFID reading is ON or OFF.

- ⚪ Off: The RFID module is not transmitting.
- 🟢🟢🟢 Fast blinking/stable green: The RFID module is transmitting RF commands (read, write, inventory, etc).

2.5.5. ANTENNA LEDS

Antenna LEDs are used to indicate the antenna ports configuration, i.e., whether an RFID antenna port is enabled or not, even if an antenna is not connected or it is not reading.

- ⚪ Off: Antenna port disabled.
- 🟢 Green: Antenna port enabled.

2.5.6. EXTENSION LED

The Extension LED is used to indicate whether the BRADY Extension Port is being used or not.

2.6. RESET BUTTON

The Reset button of BRADY FR22 contains the following functionalities, depending on how long the button is pressed and released:

- Boot into fastboot / bootloader

  - Keep the Reset button pressed while powering up the BRADY FR22.

  - The Power and Connection LEDs will turn on green in this order.

  - Wait until the Connection LED lights on (it will take 5-10 seconds after you pressed the button) and then release the Reset button.

- Factory reset

  - Keep the Reset button pressed while powering up the BRADY FR22.

  - The Power, Connection and Application LEDs will turn on green in this order.

Wait until the Application LED lights on (it will take 10-15 seconds after you pressed the button) and then release the Reset button.

3. RF PROFILES

BRADY NUR3-1W UHF RFID module supports three different kind of RF profiles. The profiles are Robust, Nominal and High speed. It's important to select the correct RF profile based on use case and environment. More detailed description about the RF profiles can be found below:

- **Robust (max sensitivity)**

  - Robust RF profile is intended to be used in challenging environments. It provides the best filtering against the interfering signals coming from nearby reader(s), other signal sources and from reflective environment. This profile uses link frequency of 160 kHz and Miller 8 coding scheme providing read rates up to 100 tags/s. Due to the low data speed and best filtering the Robust RF profile provides the best sensitivity.

- **Nominal**

  - Nominal RF-profile is the default setting of readers containing BRADY NUR3-1W UHF RFID module, such as BRADY FR22. It uses link frequency of 300 kHz and Miller 4 coding providing read rates up to 300 tags/s.

- **High speed**

  - High speed RF profile is intended to be used in use cases where the highest read rates are required. It uses link frequency of 640 kHz and FM0 coding and provides read rates up to 1000 tags/s. Due to the high data speed this profile is quite sensitive to interferences.

NOTE! Read rates will depend on the environment, reader settings, tag population and tag type.

4. THERMAL MANAGEMENT

BRADY FR22 reader includes sophisticated thermal management features that do prevent overheating issues if reader is used in too warm environments. The reader monitors temperatures of onboard computer and UHF RFID module and adjusts operation points based on the temperature information.

Onboard computer starts mitigation scheme (for example clock frequencies of CPUs are dropped) when temperature of the onboard computer reaches 85°C.

Thermal mitigation scheme of the UHF RFID module starts when it reaches 80°C. From that moment on, UHF RFID reading operations are suspended for 100ms and suspend time is increased 20ms by every °C temperature rises. The thermal mitigation scheme is turned off once the temperature drops below 80°C. High temperature warning message (TEMP_HIGH) is sent via NUR API to host. The warning message contains also current temperature information.

5. SOFTWARE

All documentation about software and application development can be found from GitHub.
https://github.com/NordicID/fr22_samples

5.1. BRADY RFID APPLICATIONS FOR BRADY FR22

BRADY provides following Windows tools to test and configure the reader. The tools are available via BRADY Support pages: https://www.nordicid.com/support/devices-downloads/nordic-id-fr22/

5.1.1. BRADY RFID DEMO

The BRADY RFID Demo application is used to perform RFID reading and writing tests. The application provides statistics on the reading performance and logging capabilities for more thorough evaluation. It is available for Microsoft Windows and Android OS.

This application also allows adjusting the RFID parameters on the fly for better understanding how they impact on the reading performance. Note that altered settings cannot be stored permanently into the device. The settings are reverted to defaults upon power cycle. For permanent settings, lease use the BRADY RFID Configurator application
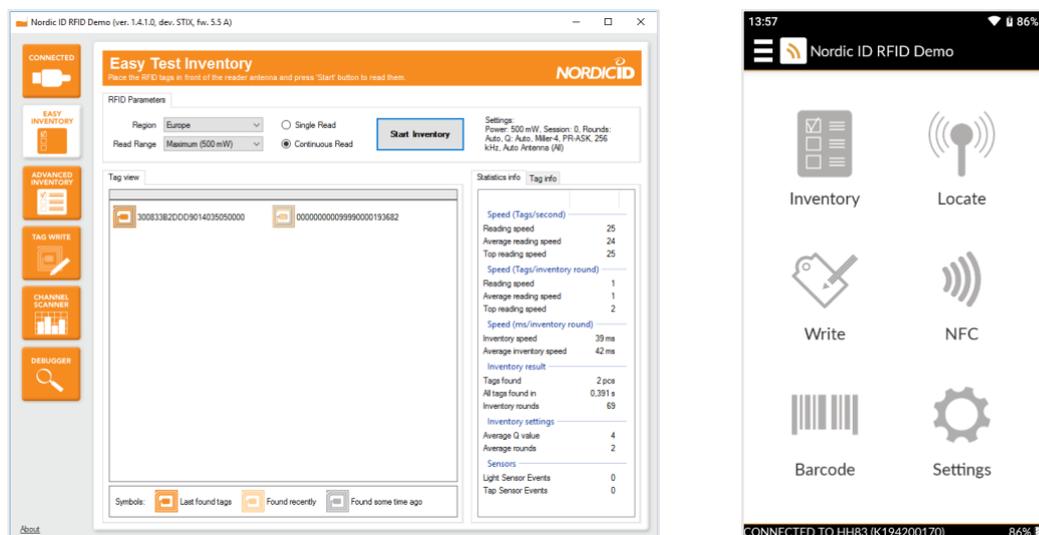
Screenshot 1 BRADY Demo for Microsoft Windows / Screenshot 2 BRADY Demo for Android

5.1.2. BRADY RFID CONFIGURATOR

BRADY RFID Configurator is meant for making non-volatile configuration of the reader's RFID settings. If settings are stored using BRADY RFID Configurator, they will be retained even after the ON-OFF-ON power cycle.

Note that the RFID reading parameters can be assigned to the reader by the host application (installed in BRADY FR22 or running in a host device such as a computer) after successfully connected to the device also.
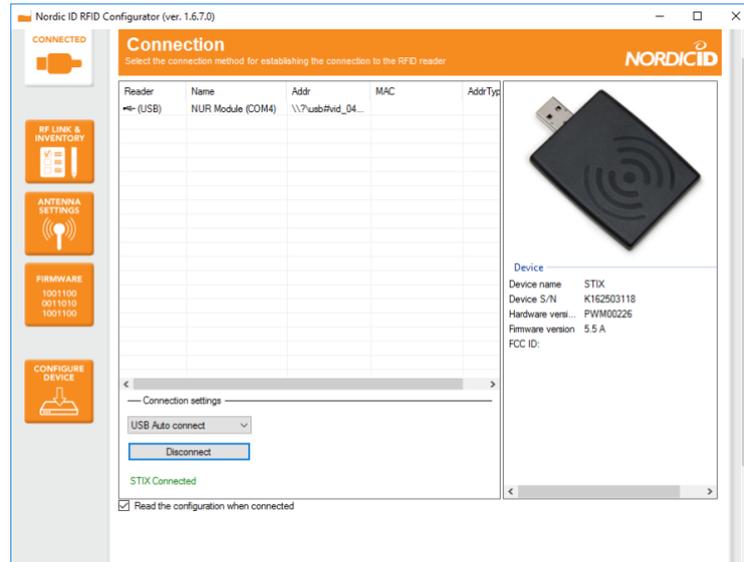
Screenshot 3 BRADY Configurator for Microsoft Windows

5.1.3. BRADY FR APPLICATION SIGNING TOOL

To provide more security to the SW platform, the application zip-files need to be signed with BRADY provided signing tool. The public key generated to the zip-file will be then verified against the list of files when installing the zip-file to the reader. This makes sure that only valid content from the zip-file can be installed.

The tool in question is called BRADY FR Application Signing Tool. The tool can be used to sign pre-built zip-files, as also to create new zip-files from scratch.

5.1.4. BRADY KEYBOARD WEDGE

The BRADY Keyboard Wedge software allows to read tags and feed the tag data into an active input field, emulating a keyboard input.

This is extremely useful when you want to use 3rd party applications that support manual input or barcode scanners. Using BRADY Keyboard Wedge, you can use these same applications with the BRADY RFID readers as the data source.

These 3rd party applications can be for example word processors, spreadsheets, web forms or even an existing ERP.
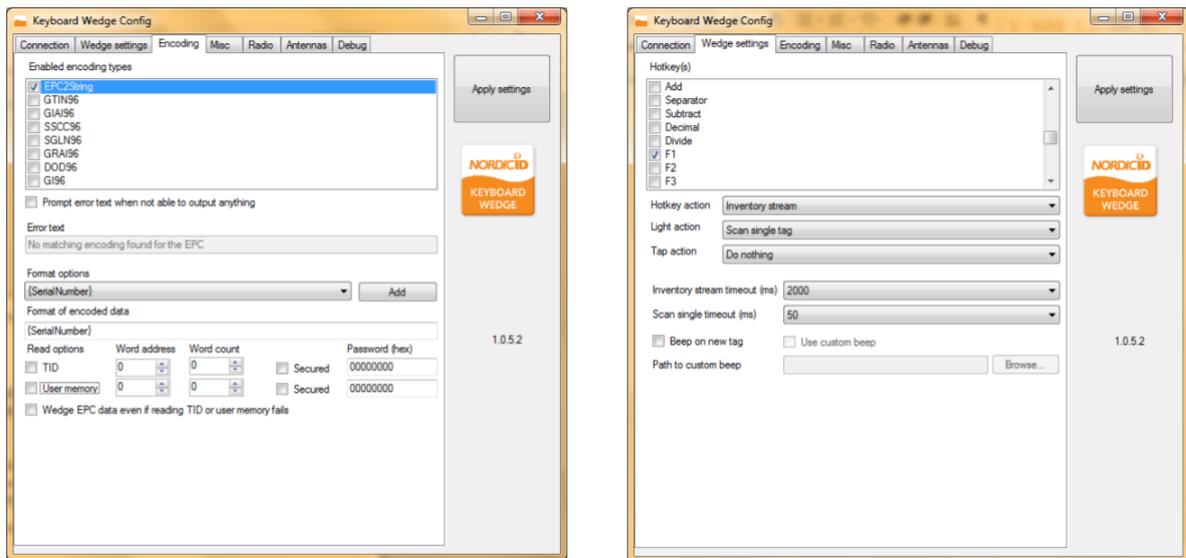
Screenshot 4 BRADY NUR Wedge for Microsoft Windows

6. WEB MANAGEMENT INTERFACE

BRADY FR22 includes a web management interface which can be accessed with a web browser. The web user interface has a responsive design, which makes it fully usable from web browsers in computers, tablets, and smartphones.

The BRADY FR22 web management interface is used for:

- Applications and plugins management.
- System health monitor
- System logs
- Hardware settings
- RFID configuration
- Network configuration
- Firmware update
- Access management
- Application management
- Configure public web user interface (application, admin, web page, display...)
- Factory reset

6.1.   LOG IN

Although the BRADY FR22 can be connected via USB, the built-in administrator web interface can only be accessed via network connections, i.e., Ethernet, WLAN or LTE.

Therefore, it is important to make sure that the network interfaces are configured to be used as expected. By default, all the network interfaces are set to DHCP mode, and the MAC address of each interface is indicated on the printed product label. This will help to find the BRADY FR22 in the DHCP table of the network router or modem.

Picture 2 Type label on the back of BRADY FR22

BRADY Configurator software of RFID demo software can also discover the BRADY devices on the same network and indicate their IP address.

Once the IP address of the BRADY FR22 is known, typing it in the address bar of a web browser will open the log in screen of the web UI. Connection can also be established using device's host name (depending on the network and used host device).

Note that a security alert will pop up on the browser the first time that you connect to the device, as the connection is forced to be secure. This alert will disappear as soon as you install a certificate on your device (see section 6.6).
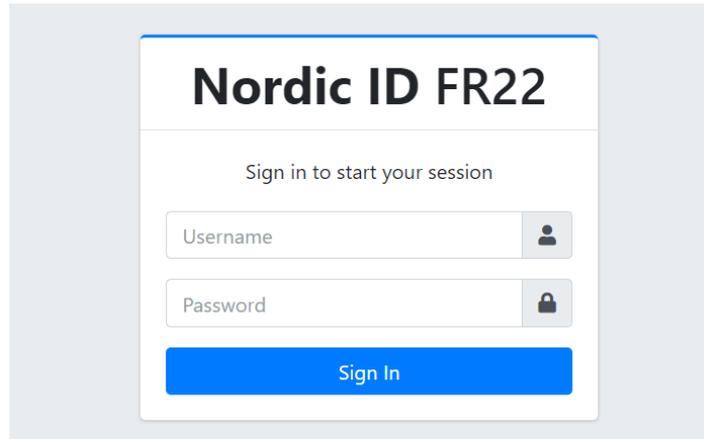
Screenshot 5 Web UI log in form

The default username ("admin") and password are printed on the product label attached to the back side of the device. You will find another identical product label inside the box, so that you can keep this important information visible in case the BRADY FR22 is mounted against a surface that may cover the label.

6.2. MAIN MENU

The BRADY FR22 web UI displays a side navigation menu to access all the different available options to manage the device. The menu pane can also be hidden if wanted.
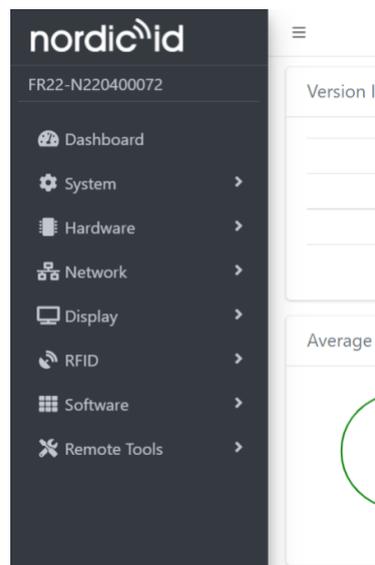
Screenshot 6 Side menu in web UI

There are also four icons always accessible on the top right corner of the screen, to:
- Download debug logs
- Reboot the device
- Toggle full screen mode
- Logout

6.3. DASHBOARD

The default landing page is the dashboard, where you can see the system status and health monitor in real time. Visually, green metrics indicate that the device is behaving as expected. Red metrics would require immediate action on the physical device, environment, or software applications to solve the issues.

This page is shown every time you connect to the device web UI, but you can configure any other page or application to be shown by default instead of the dashboard, as explained in section **Error! Reference source not found.**.
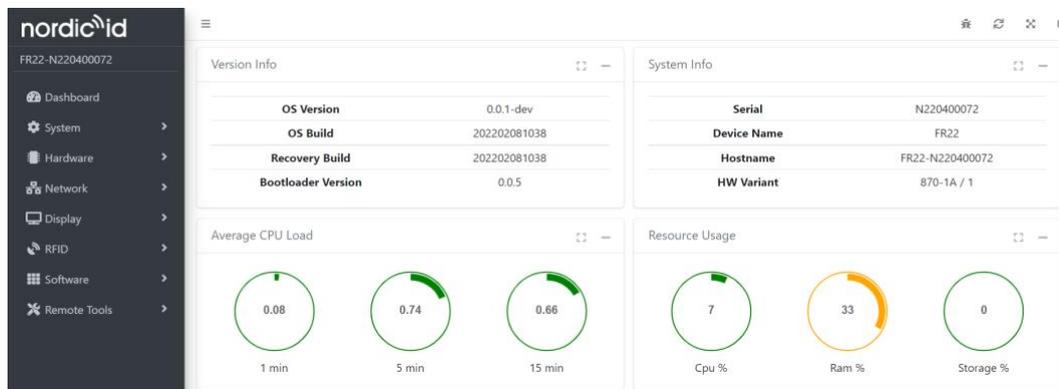
Screenshot 7 Main dashboard in web UI

6.4. SYSTEM MENU

The system menu has six sections, most of them meant for developers.

- API docs
  - Describes the functions of the system APIs to control the reader.

- Date.
  - It shows the current system time and allows adjusting the date and time settings.
  - Date and time can be adjusted manually or automatically using NTP servers.
  - Time zone must be set manually.

- Log.
  - It shows the logged events and allow to download them for debug purposes.
  - Events can be filtered by severity and application/service (started by user, BRADY or system) that created the event.

- Settings (only for Factory Reset)
  - See section 6.4.1.

- Info.
  - Contains more detailed information about the data shown in the dashboard page: hardware versions, software versions and performance metrics.
  - It also shows persistent hardware parameters such as device variant, serial number or MAC addresses.

- Web UI

o   See section 6.4.1.

6.4.1. FACTORY RESET

As the BRADY FR22 includes an operative system where you can install applications and plugins, sometimes you may want to reset the device to the state it was delivered to you to solve unknown issues after changing certain settings or to start from scratch after having installed several apps, mainly if these were applications under development.

For this purpose, there is an option to reset the device back to factory defaults under System > Settings.
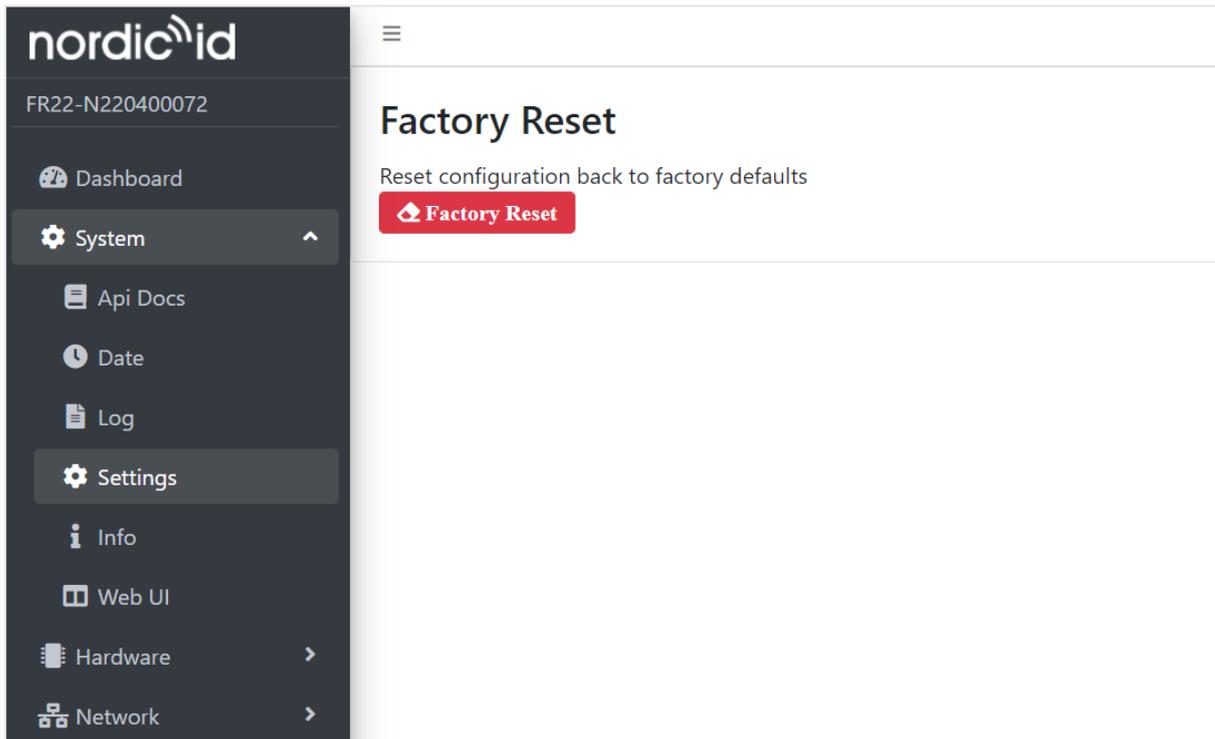
Screenshot 8 Factory reset screen in web UI

6.4.2. WEB USER INTERFACE

The web user interface is the tool to get most of the BRADY FR22. So, managing how it is accessed is a key to keep it secure without impacting the user experience.

This page allows to change the password to access the administrator web UI. The default password is printed in the product label on the device and on its package, and the administrator username is always "admin".

This setting page also allows to set the default landing page (when accessing https://{device_IP}). By default, the landing page of the web UI is the dashboard of the administrator interface, but it can be any installed application, plugin page or a setting page other than the dashboard.

The built-in administrator interface can always be reached at **Error! Hyperlink reference not valid.**, even after changing the default landing page.
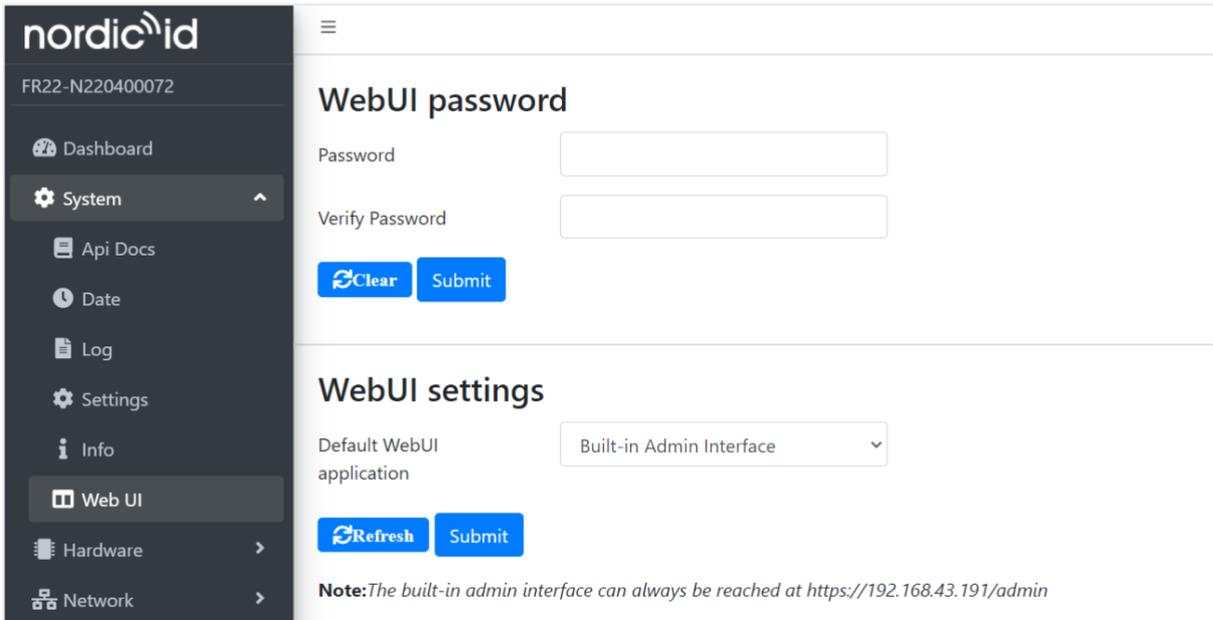
Screenshot 9 Web UI settings screen (1/2)

Note that the administrator web UI will always prompt for username ("admin") and password.

If you want to bypass the authentication step when accessing to the landing page, you can select which applications, plugins or pages will be exposed without authentication.

Be careful when exposing administrator pages without authentication to avoid unwanted changes on your device!
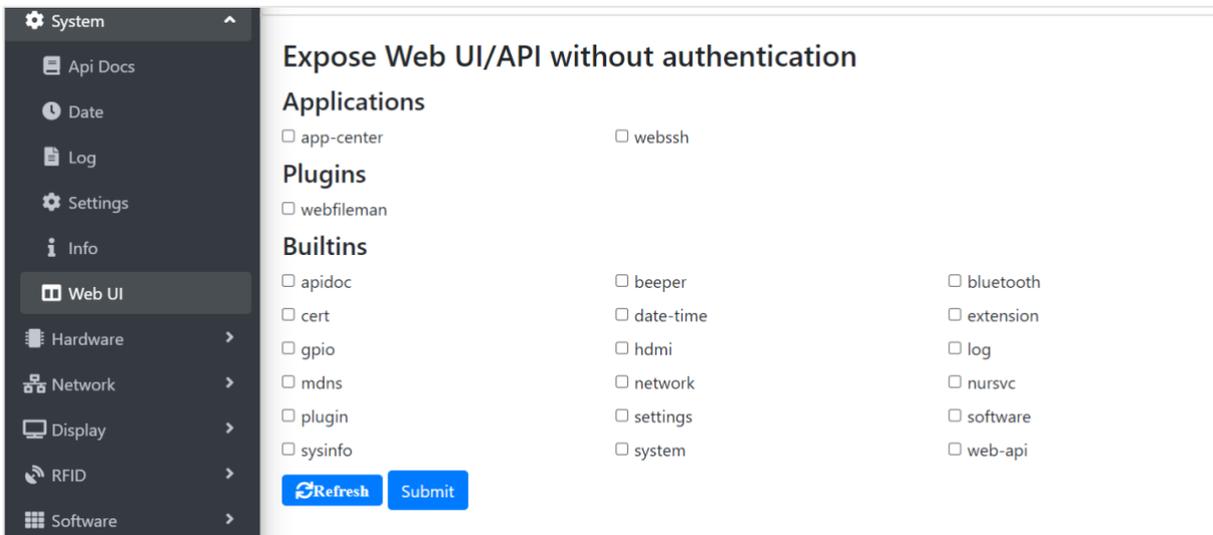
Screenshot 10 Web UI settings screen (2/2)

6.4.3. WEB BROWSER

It's worth mentioning that one of the applications that can be set as the default landing page is a web browser. The web browser can display a local web page or any url on the Internet, e.g., a floor map, statistics and reports, a video, product information, a form, or your own custom web page.

You can also decide whether the user will be able to navigate using the browser interface or whether (in case of enabling kiosk mode) the selected page is displayed, and all the interaction is made via that page, without access to the browser interface.

The Chromium web browser can be installed from the BRADY App Center (see section 6.9.3) and its settings page can be found on the Display section.
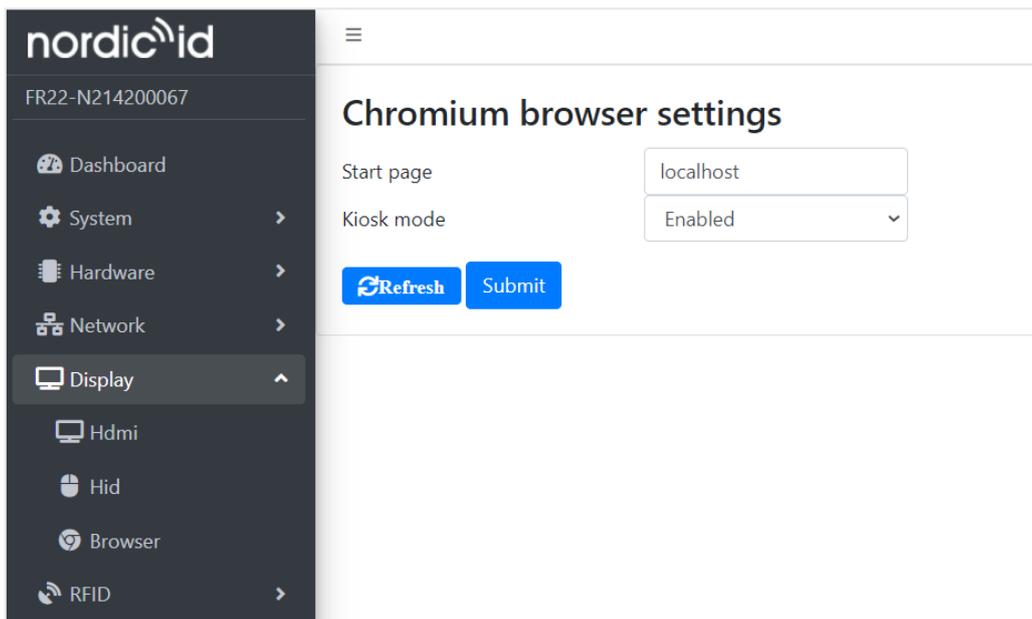
Screenshot 11 Chromium browser settings

6.5. HARDWARE SETTINGS

This section includes all the configuration parameters related to the BRADY FR22 device.

- Beeper.
  - o Internal (and external, if available) beeper can be enabled / disabled.
  - o It's possible to test the beeper with a certain frequency and duration, and also to test all frequencies.
- Bluetooth.
  - o Bluetooth can be enabled/disabled and Bluetooth device name can be set.
  - o This screen also shows the list of detected Bluetooth devices nearby and allows pairing with them.
  - o Supported Bluetooth profiles:
    - ▪ Classic – SPP and HID
    - ▪ BLE – HID

  When pairing is made with a device that exposes a serial port profile service, the BRADY FR22 will automatically bind the port into **/dev/rfcomm***. From there it can be accessed / used by the third-party applications. The lowest free rfcomm number is taken and reserved for the paired device (until pairing is removed).

- Extension Port.
  - o The BRADY FR22 has an exclusive Extension Port, that can be enabled to connect external BRADY modules or accessories such as 16 ports multiplexer or a beamforming antenna.
  - o This page enables managing the connected accessory: update firmware and check the module version and status.

- GPIO.
  - o There are 4 GPIOs in the mini-IO port in BRADY FR22.
  - o The mini-IO port can be enabled and disabled, and also each GPIO can be configured as input or output (with default state high or low)
  - o If a connected external module has GPIOs, they can also be configured in this screen.
  - o This screen also shows the current state of each GPIO and allows changing it.

- USB.
  - o There are 3 USB ports in the BRADY FR22:
    - 2 USB-A host ports that can be enabled or disabled.
    - 1 USB-C port to connect the BRADY FR22 to a host. The available modes are:
      - "NUR serial", to communicate with the device using the BRADY NUR API. Default baud rate 1Mbps
      - "Serial console", to access the console interface for e.g., debug purposes. Default baud rate 115200bps.

6.6. NETWORK SETTINGS

The network settings are a very important section of the BRADY FR22 setup, as it will connected to a network most of the times. Even if it will be connected via USB, the network interfaces must be configured beforehand, as network is the only way to access the administrator web user interface.

There are three network interfaces in the BRADY FR22: LAN (Ethernet), WLAN (Wi-Fi) and LTE (Modem). These can be enabled and disabled in this screen, as well as their network parameters: DHCP mode, IP address, gateway, and DNS.
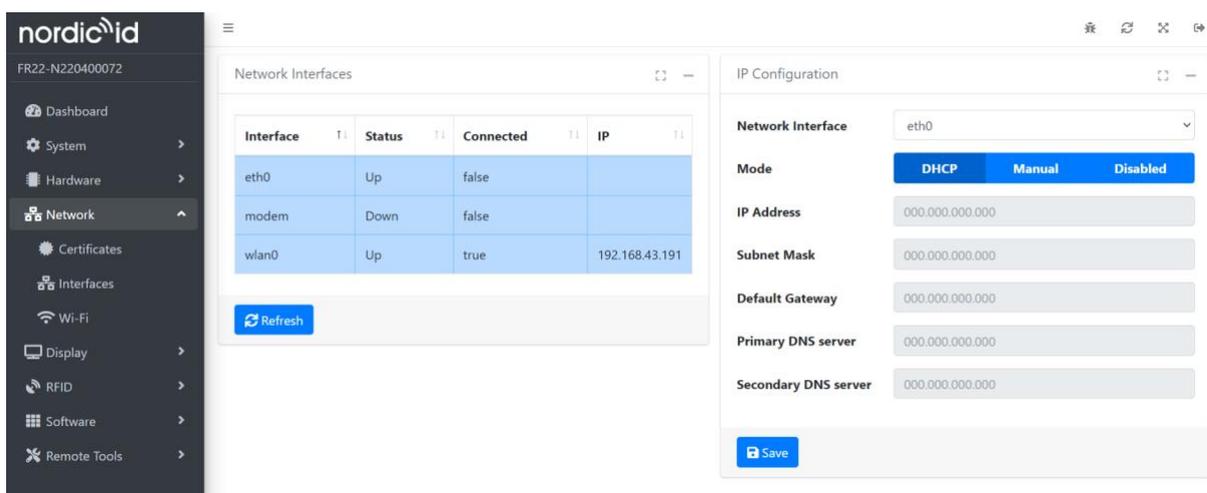
Screenshot 12 Network settings screen

There is a section to scan for WLAN networks and add the network to be used to the list of saved networks entering its SSID and password.

To increase the security of the network connection with the BRADY FR22 and avoid security warnings, you can install your own web server certificates in this section.
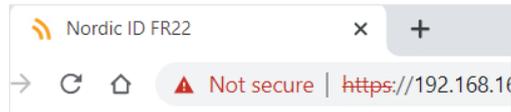
Screenshot 13 Security warning on the web navigation bar

The web server certificates and SSH public keys can also be exported from this screen.

6.7.   DISPLAY

The BRADY FR22 also includes an HDMI connector with video output to connect a display.

Here you can enable/disable the HDMI port and configure the resolution and rotation (if any) of the display.

The supported resolutions are 1280x720 and 640x480.
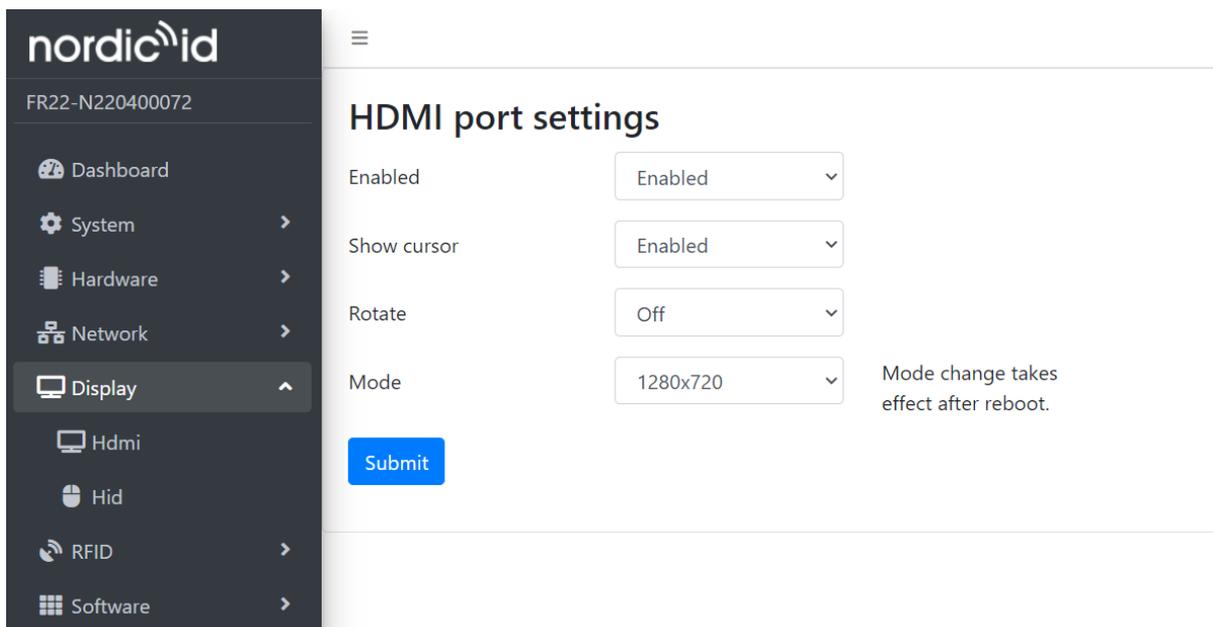
Screenshot 14 HDMI port settings

HID devices such as a keyboard, a mouse or the touch function of a touchscreen can be connected to the BRADY FR22 via USB or Bluetooth.

Here you can configure the touch input settings, the keyboard layout and show or hide the cursor.

6.8. RFID

The RFID section on the web UI allows to change the connection settings to the internal RFID NUR module and all the RFID parameters of the reader:

- Q: auto, 1, 2 ... 15

- Rounds: auto, 1, 2 10

- Session: 0, 1, 2, 3

- Target: A, B, dual

- Tx level: 1dBm / 1mW - 30dBm / 1000mW (30 steps of 1dBm)

- RX Sensitivity: nominal, low, high

- RF Profile: nominal, robust, high speed (see section **Error! Reference source not found.**)

- Power saving mode: off, 100ms, 500ms, 1000ms (see section **Error! Reference source not found.**)

- Active antennas

- Selected antenna: auto or specific antenna

- RSSI filters: min / max for read / write / inventory

- Timeouts for different commands (read, write, kill, lock)

- Channel hopping event: enabled or disabled

- Report Zero Count Inventory: enabled or disabled

-
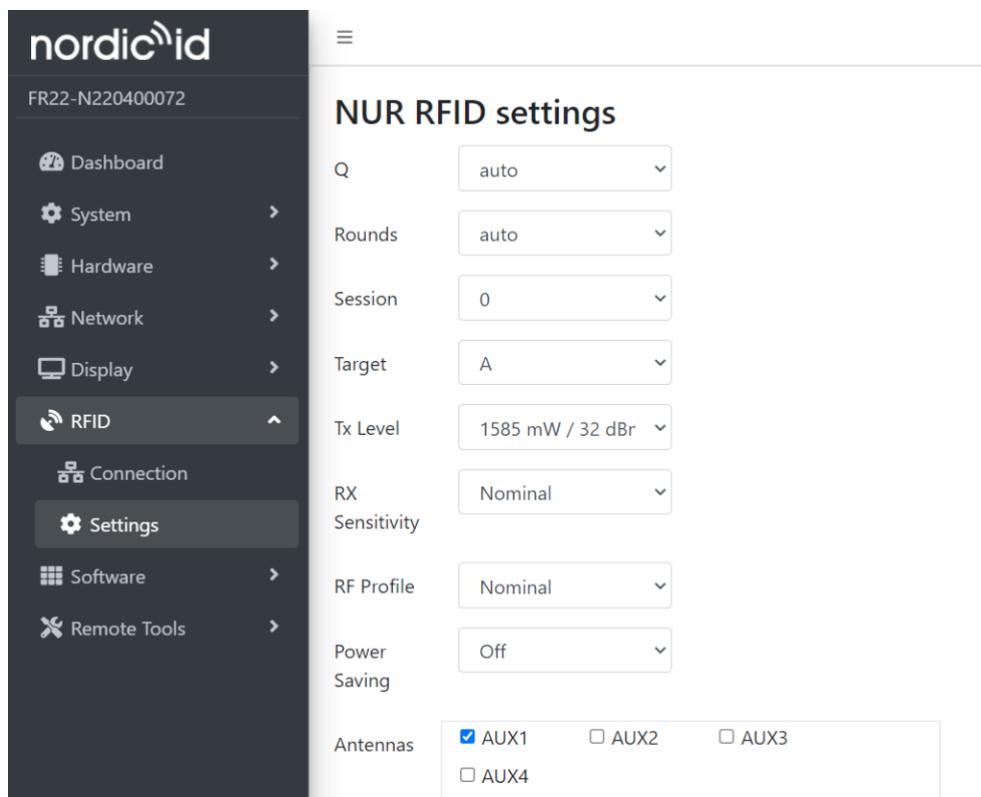
- **Screenshot 15 RFID settings screen**

6.9. SOFTWARE

The software is as important part of the BRADY FR22 as an IoT Edge Gateway, not only as an RFID reader.

In this section you can update the operative system of the device, but also manage applications and plugins.

6.9.1. PLUGINS

A plugin in BRADY FR22 is a service that runs internally on the device to enable certain features.

For example, the RFID functionality is a system plugin (named "nur3") that is installed by default, and it cannot be removed. Other available plugins are a media player (API for playing video files) and C# runtime engine (Mono).

You can manually install other plugins (or other versions of installed plugins) and uninstall the installed plugins using this interface.

Note that as the RFID module is considered as a plugin, the firmware updates are now plugin updates.
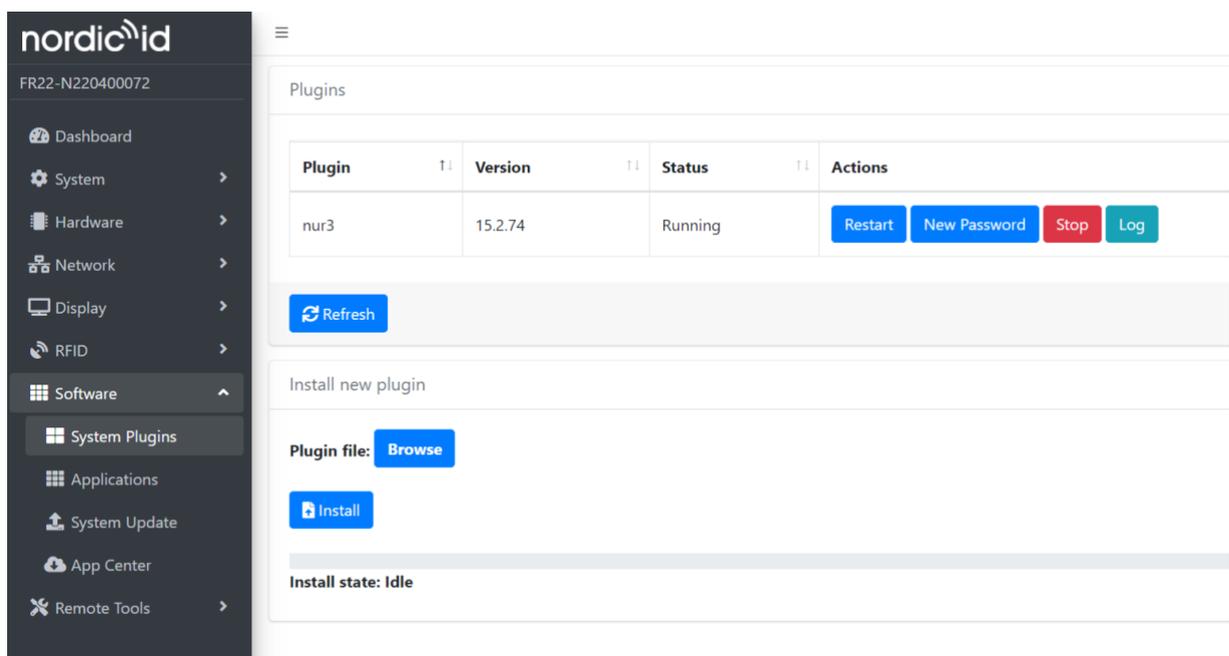
Screenshot 16 System plugins screen

6.9.2. APPS

An application in BRADY FR22 can be any application that you develop for your customers, or applications provided by BRADY to help during your development and implementation process.

Not all the applications have a user interface. For example, an application can just read the data from RFID tags, consolidate it, add additional information such as location or timestamp, and send it to a server in the cloud.

Other applications do have an interface. For example, the web browser (see section 6.4.2), the SSH terminal or the remote desktop app (see section **Error! Reference source not found.**).

If you want to develop your own embedded app in BRADY FR22, you can find the documentation from https://github.com/NordicID/fr22_samples .

6.9.3. BRADY APP CENTER

The BRADY App Center provides a repository of apps and plugins selected by BRADY to help you to get most of the BRADY FR22.

It enables the installation and automatic update of apps and plugins, which is a must have nowadays when deployments include a high number of devices, and you need to update or roll out your app to all the devices at once.

With BRADY App Center, the administrator has full control of the available repositories and can add new ones to extend the number of available apps.

Advanced users can also create their own app repository and upload their own apps, to make them accessible and distribute updates. Also, firmware updates can be included in this repository as plugins, in case that specific versions (and not always the latest one) are required.

Instructions to create a BRADY App Center repository for the BRADY FR22 can be found here https://github.com/NordicID/fr22_samples

Note that although the BRADY App Center includes new versions of installed apps or firmware, these won't be updated automatically, manual update is always required.

If automatic updates or installations are needed, 3rd party MDM/EMM (Mobile Device Management / Enterprise Mobility Management) platforms have to be used.
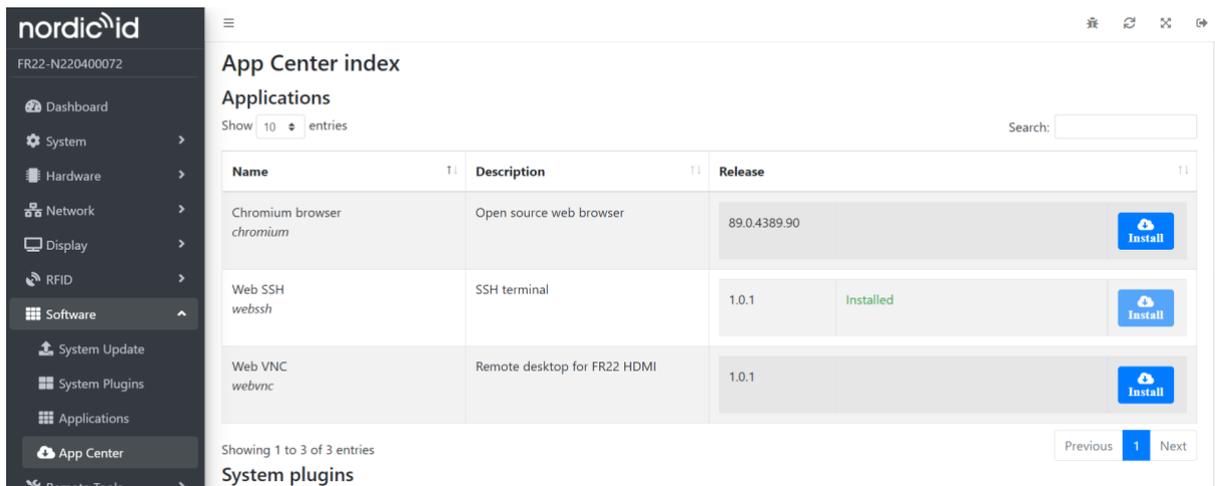
Screenshot 17 BRADY App Center

6.9.4. APPS/PLUGINS CREDENTIALS

For applications or plugins that need credentials to work, you can create an application specific password from the System Plugins or Applications screen.

Go to the application or plugin that needs credentials and click the "New Password" button.

A message will appear indicating the username and the created password (see Screenshot 19).

Screenshot 18 Action buttons for installed apps and plugins
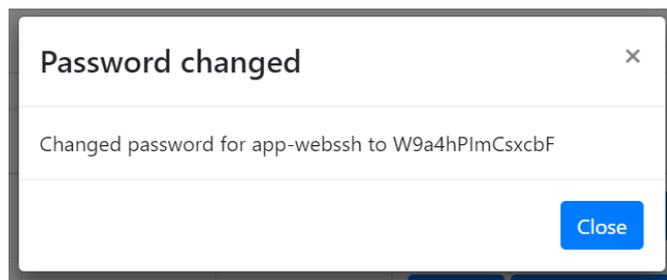
Screenshot 19 Message indicating the username and the new password created for a certain app

The username is the internal app or plugin name (e.g., *app-webssh*) and the password is generated randomly (e.g. *W9a4hPlmCsxbF*).

6.10. REMOTE TOOLS

There are two developer tools available in the BRADY App Center to be downloaded on the BRADY FR22 that make debugging and providing remote assistance much easier.

- SSH, that opens a secure terminal connection with the local machine, to access the command prompt without using an external computer with a telnet software connected to the same network.
  To create a username and password to use the console check the instructions at section 6.9.4.
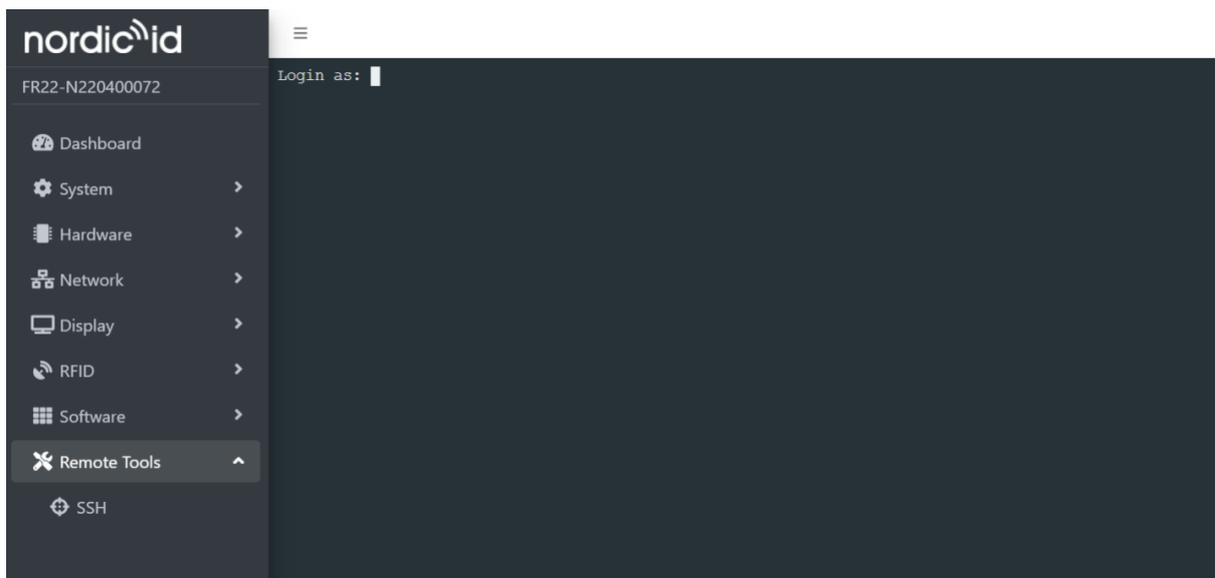
Screenshot 20 Terminal console in web UI

- VNC is a remote desktop application that allows to see the output of the HDMI port. This means that, if a display is connected to the BRADY FR22, you can remotely see exactly what the user is seeing on the display in real time. There is no need to install 3rd party remote access applications such as TeamViewer™ or similar.

7. REGIONAL SETTINGS

BRADY UHF RFID readers support operating frequency range between 860 - 960MHz. Some of the readers cover full operating frequency band and some of them have two sub bands that are

- 868 ETSI lower band (865.6 - 867.6 MHz) and

- 915 FCC band (902 - 928 MHz) and ETSI upper band (915 – 921 MHz).

Regional organizations as ETSI and FCC have set rules and requirements for operating frequencies, output power and other RF parameters for the UHF RFID readers to comply local regional requirements.

BRADY has created a set of regional settings in order to fulfil local regulations. BRADY is required to ensure that compliance of BRADY products will remain after production. Solution for this is that products including UHF RFID functionality are set and locked in production based on customer order e.g. if a product is ordered to Europe, it will be locked to ETSI region. And, if a product is ordered to Australia region, it is locked to Australia region. When a product is locked to individual region, it will comply local regulations of the region.

8. COMPLIANCE STATEMENTS

8.1. CE

Hereby, Nordic ID Oyj a Brady Company, declares that this device is in compliance with the essential requirements and other relevant provisions of:

- RED: 2014/53/EU

- EMC: 2014/30/EU

- LVD: 2014/35/EU

- RoHS: 2011/65/EU

8.2. FCC/IC

The BRADY FR22 device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

WARNING: Changes or modifications not expressively approved by the party responsible for compliance could void the user's authority to operate the equipment.

The BRADY FR22 device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le resent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.   L'exploitation est autorisée aux deux conditions suivantes:

1) L'appareil ne doit pas produire de brouillage;

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

8.3.   RF EXPOSURE

This equipment complies with EU, FCC and IC's RF radiation exposure limits set forth for an uncontrolled environment under the following conditions:

The BRADY FR22 device should be installed and operated such that a minimum separation distance of 20mm is maintained between the antenna and user's/nearby person's body at all times.

BRADY FR22 doit être installé et utilisé de manière à ce qu'une distance de séparation minimale de 20 mm soit maintenue à tout moment entre l'antenne et le corps de l'utilisateur / de la personne proche.

8.4.   HEAT EXPOSURE

Note that after long time in use, the BRADY FR22 chassis might be hot.

Please wait for 30 minutes after switching the unit off before handling parts with your hands.

9. SERVICE AND SUPPORT

For technical enquiries regarding BRADY devices or software development, please contact our Technical Support:

<div align="center">

E-mail: tseurope@bradycorp.com
Telephone: +44 333 333 1111

</div>

As a manufacturer, BRADY stands responsible for providing repair services for its devices during and after the warranty period. Together with partners BRADY serves customers globally. When your BRADY device needs repair, always use BRADY Service or our authorized service partners. We want to make sure that your BRADY product serves you the best possible way, and by using our preferred service partners the quality of the service is trustworthy and the spare parts are original. This way the existing product warranty remains, and you receive a 3-month service warranty for the repaired devices.

BRADY works together with full support and primary support partners. Full support partners can handle both warranty and non-warranty repairs on behalf of BRADY in their own regions. In addition, BRADY has a network of smaller repair centers, primary support partners, who offer the first line of support to their customers locally.

For any enquiries about BRADY repair service please contact:

<div align="center">

E-mail: tseurope@bradycorp.com
Telephone: +44 333 333 1111

</div>

10. WARRANTY

Our products are sold with the understanding that the buyer will test them in actual use and determine for themself the adaptability to their intended uses. Brady warrants to the buyer that its products are free from defects in material and workmanship, but limits its obligation under this warranty to replacement of the product shown to Brady's satisfaction to have been defective at the time Brady sold it. This warranty does not extend to any persons obtaining the product from the buyer.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATIONS OR LIABILITY ON BRADY'S PART. UNDER NO CIRCUMSTANCES WILL BRADY BE LIABLE FOR ANY LOSS, DAMAGE, EXPENSE OR CONSEQUENTIAL DAMAGES OF ANY KIND ARISING IN CONNECTION WITH THE USE, OR INABILITY TO USE, BRADY'S PRODUCTS.

11.   RELATED DOCUMENTS AND CONTENT

Documents mentioned below can be found from BRADY Support pages:

- BRADY FR22 Informational Sheet
- BRADY FR22 Quick Guide
- BRADY Safety and Regulations card
- BRADY GitHub account for developers (https://github.com/NordicID)