
PowerCable IQRF 901x Manual

This manual assumes basic familiarity with the IQRF technology. It is not intended as an IQRF tutorial. It provides an overview of the device's functions.

PowerCable IQRF 901x behaves as a standard **IQRF Interoperable** device. The product supports **SmartConnect**. It is subject to all guides and procedures issued by the IQRF Alliance. For useful documents, see:

- [IQRF Alliance Tech Guide](#)
- <https://www.iqrfalliance.org/iqrf-interoperability/>
<https://www.iqrfalliance.org/techDocs/>
 - [IQRF-StandardSensor-V014](#)
(https://www.iqrfalliance.org/techdoc_files/IQRF-StandardSensor_V014.pdf)
 - [IQRF-StandardBinaryOutput-V004](#)
https://www.iqrfalliance.org/techdoc_files/IQRF-StandardBinaryOutput_V004.pdf
- [IQRF Quick Start Guide](#)
(<http://www.iqrf.org/weben/downloads.php?id=235>)

IQRF Glossary

- **901x**

The NETIO products company supplies the PowerCable IQRF in several versions with different types of electrical sockets and plugs. The type is specified by the last character at the place of the “x” in 901x. 901**E** = sockets for France, Czechia, Slovakia and Poland, 901**F** = German (“schuko”) sockets used in most of Europe.
- **Node**

In an IQRF network, a Node is a device that performs its function (e.g. measures electrical current – PowerCable IQRF 901E) and, at the same time, acts as a hub for other Nodes. A Node connects to a Coordinator (Gateway), either directly, or through other Nodes.
- **Coordinator**

In the IQRF network, a Coordinator is a device (such as an IQRF Gateway) that controls network traffic and gathers data from individual Nodes. Connection of Nodes to the network is initiated at the Gateway. Nodes can be connected to the Coordinator either directly or through other Nodes.

Specifications

Power	901E, 901F: 230V~; 50Hz; 16A
Switched output	901E, 901F: 230V~; 50Hz; 16[8]A; max. 3600W
Internal consumption	Max. 1W
Output relay	Micro-disconnection (μ) (resistive load) 1E5 switching cycles, max. 1.5kV pulse voltage Switch heat and fire resistance class 1
Interface	IQRF DPA 4.00 and higher
Environment	IP30, protection rating = class 1 Operating temperature -10 .. 65°C (under load: 6A = max. 63°C, 10A = max. 50°C, 16A = max. 30°C) Device rated for pollution degree 2. Designed for continuous operation in altitudes up to 2000m. No additional cooling required.
Caution	The device is not designed to power appliances with a high inrush current. Do not connect several devices in series. The device is safe only when completely disconnected from the electrical network. The cable plug serves as the disconnection means and must be easily accessible. The electrical socket must be earthed and protected with a circuit breaker rated at 16A or less.

The manufacturer assumes no responsibility for any technical or printing errors and reserves the right to modify the product or this document without prior notice. Such changes are announced at the manufacturer's website, <http://netio-products.com>.

The manufacturer disclaims all warranties of any kind with respect to the contents of this document, as well as all implied warranties of merchantability or fitness for a particular purpose. In particular, the manufacturer disclaims all responsibility for any damages caused by incorrect use of the product, failure to comply with instructions and recommendations in the user manual, and/or unprofessional actions of third parties not authorized by the manufacturer to perform warranty service.

March 2019

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Installation

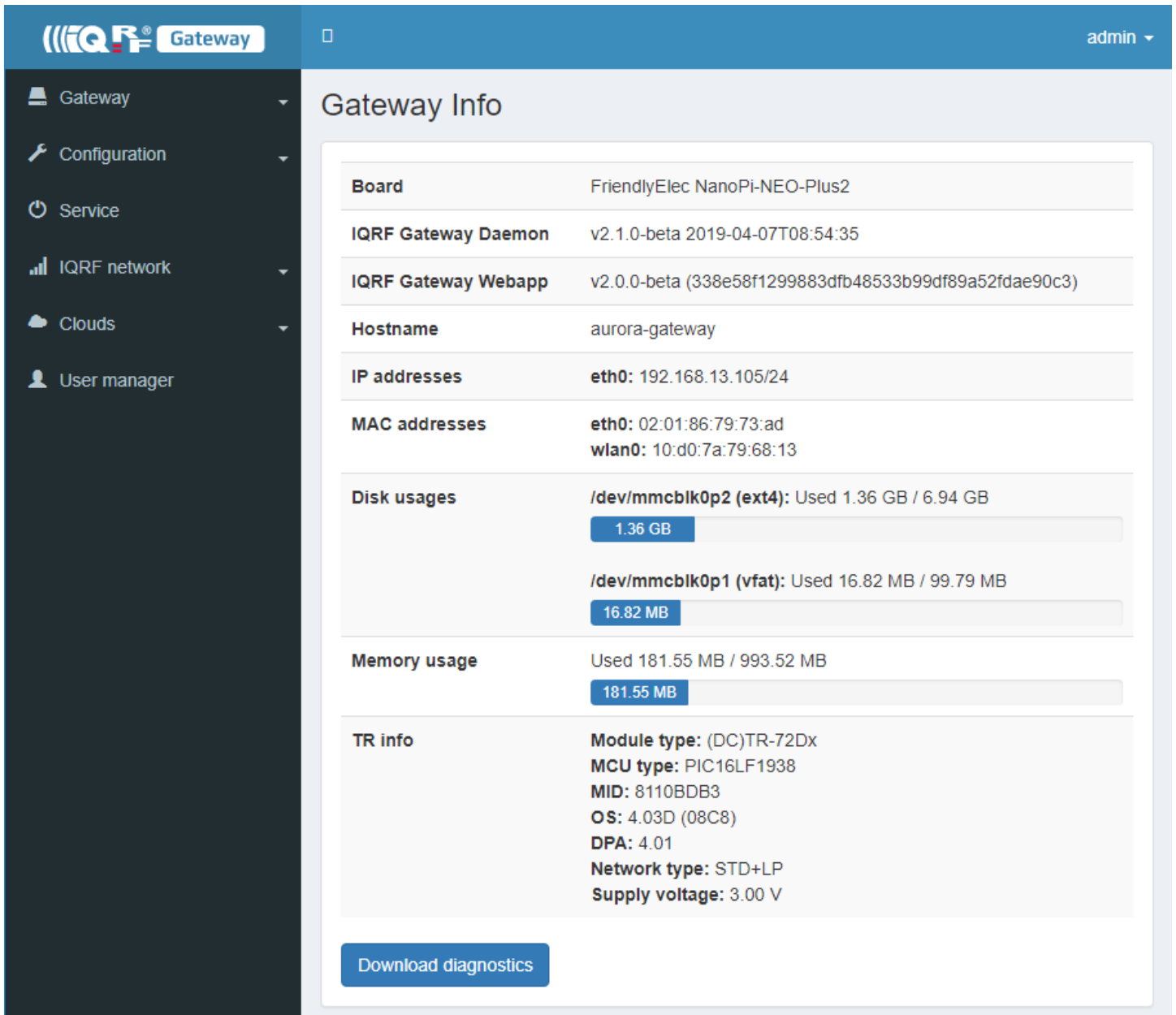
IQRF network and IQRF Gateway

An IQRF network is managed by an IQRF Coordinator. An IQRF Interoperable Gateway is created by connecting the IQRF Coordinator to a computer and installing the IQRF Daemon. The IQRF Interoperable Gateway in turn provides a **JSON API interface** that is used for all communication and configuration of the IQRF network over a LAN.

For available IQRF Interoperable Gateways, see:

<https://iqr.shop/product/gateways/>

After setting up the IQRF Gateway according to its manufacturer's instructions, the following web applications can be used to set up the IQRF network and verify the basic functionality.



The screenshot displays the 'Gateway Info' page of the IQRF Gateway web interface. The interface has a dark blue header with the 'IQRF Gateway' logo and a user profile 'admin'. A dark sidebar on the left contains navigation links: Gateway, Configuration, Service, IQRF network, Clouds, and User manager. The main content area shows the following information:

Board	FriendlyElec NanoPI-NEO-Plus2
IQRF Gateway Daemon	v2.1.0-beta 2019-04-07T08:54:35
IQRF Gateway Webapp	v2.0.0-beta (338e58f1299883dfb48533b99df89a52fdae90c3)
Hostname	aurora-gateway
IP addresses	eth0: 192.168.13.105/24
MAC addresses	eth0: 02:01:86:79:73:ad wlan0: 10:d0:7a:79:68:13
Disk usages	/dev/mmcblk0p2 (ext4): Used 1.36 GB / 6.94 GB 1.36 GB /dev/mmcblk0p1 (vfat): Used 16.82 MB / 99.79 MB 16.82 MB
Memory usage	Used 181.55 MB / 993.52 MB 181.55 MB
TR info	Module type: (DC)TR-72Dx MCU type: PIC16LF1938 MID: 8110BDB3 OS: 4.03D (08C8) DPA: 4.01 Network type: STD+LP Supply voltage: 3.00 V

At the bottom of the page, there is a blue button labeled 'Download diagnostics'.

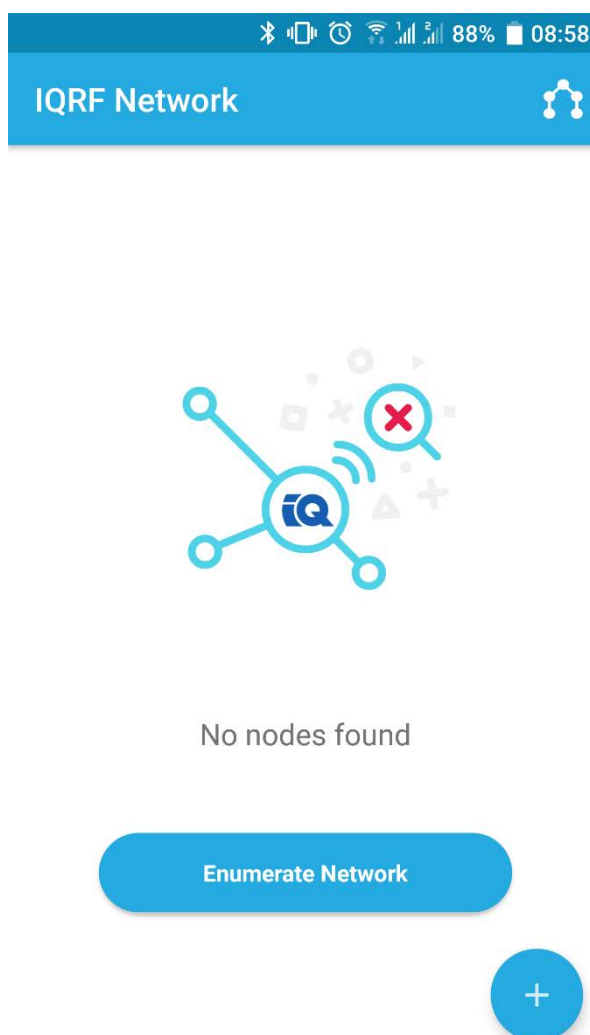
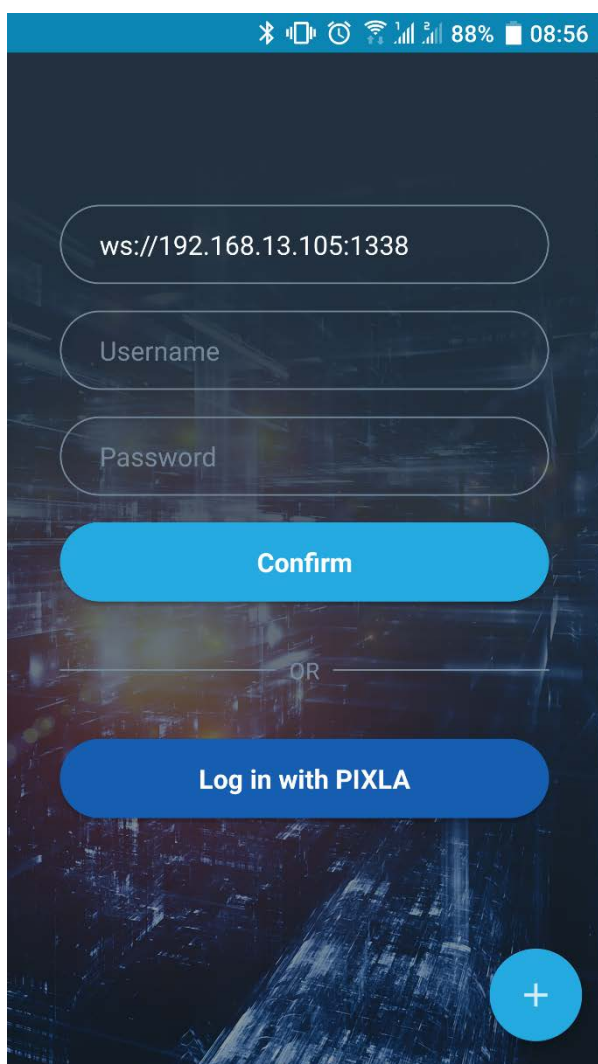
IQRF Network Manager

IQRF Network Manager is an Android mobile app for managing the IQRF network.

It is available free of charge in the Google Play store:

<https://play.google.com/store/apps/details?id=org.igrfalliance.demo>

1. When the app is started, it needs the details to connect to the IQRF Interoperable Gateway.
The Gateway must be accessible in the LAN. Websocket is used for the connection.
2. When the connection is successfully established, the current network status is loaded. At the beginning, the network is empty (“No nodes found”).



Connecting to the IQRF network (Bonding)

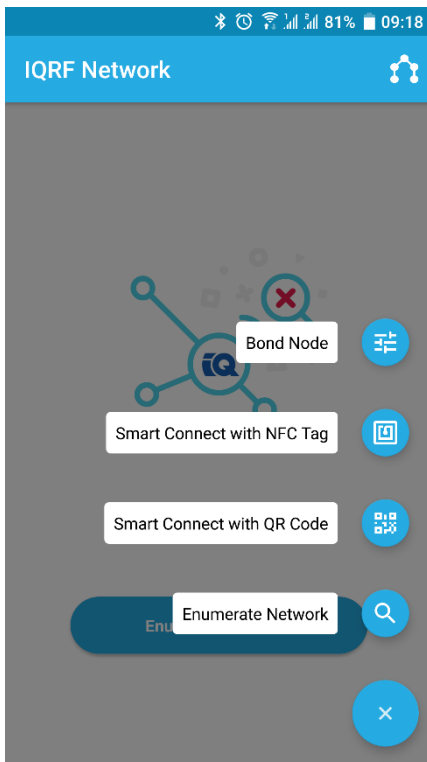
Bonding must be started at the device to which the PowerCable IQRF should connect. Most often, this is the IQRF Gateway. When testing, it could be the IQRF Coordinator controlled with the IQRF IDE.

A device can be bonded in three ways:

- SmartConnect – using the IQRF Smart Connect code (QR code) shown on the device.
- Local Bonding – using some physical interaction with the device (a button on the PowerCable IQRF).
- AutoNetwork – automatically connects all available devices with the same network key.

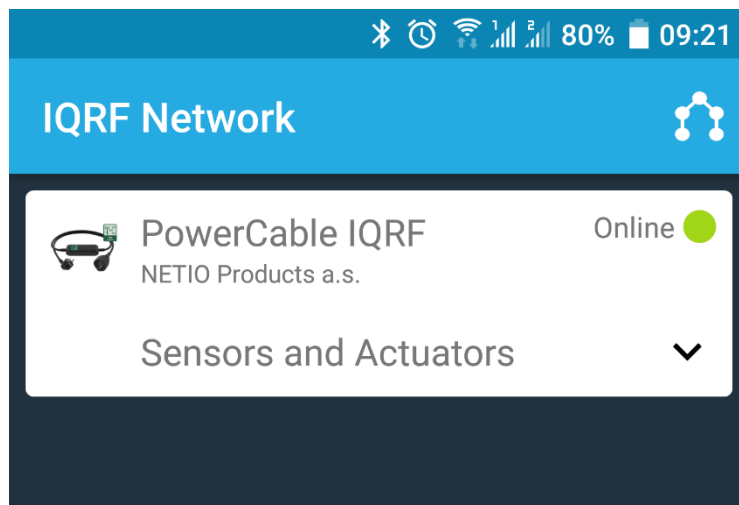
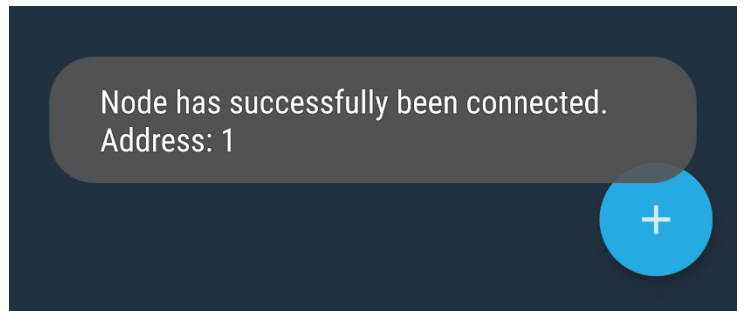
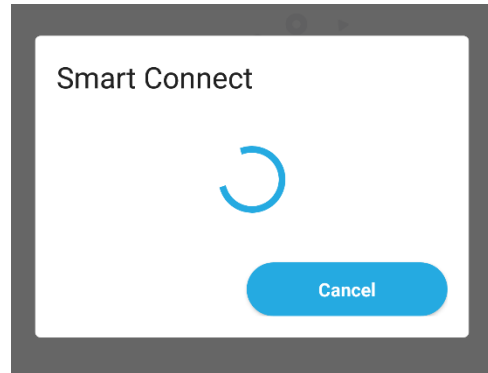
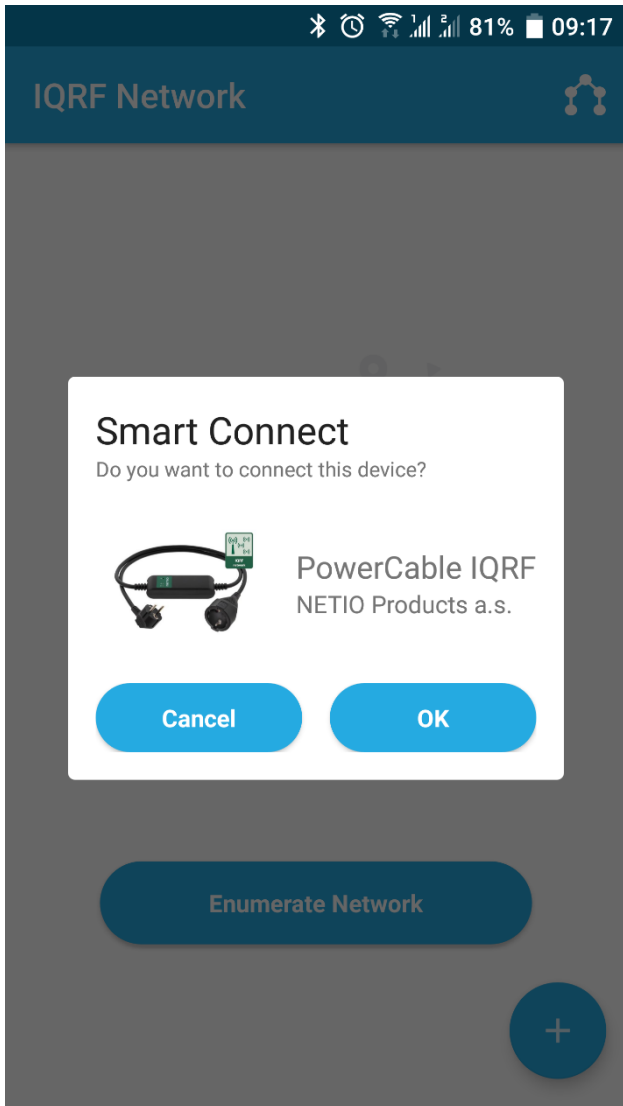
Example: Connecting with the mobile app – SmartConnect

- Connect the app to the IQRF Interoperable Gateway.
- Click the blue circle with a plus symbol in the bottom right-hand corner to add a device into the network using any of the available methods. To add a device using the SmartConnect method, select “Smart Connect with QR Code”.
- Point the phone’s camera so that the QR code is in focus and within the indicated area.



The code is scanned and device details are displayed. After confirming, the Smart Connect procedure starts. The app informs about the progress and the result.

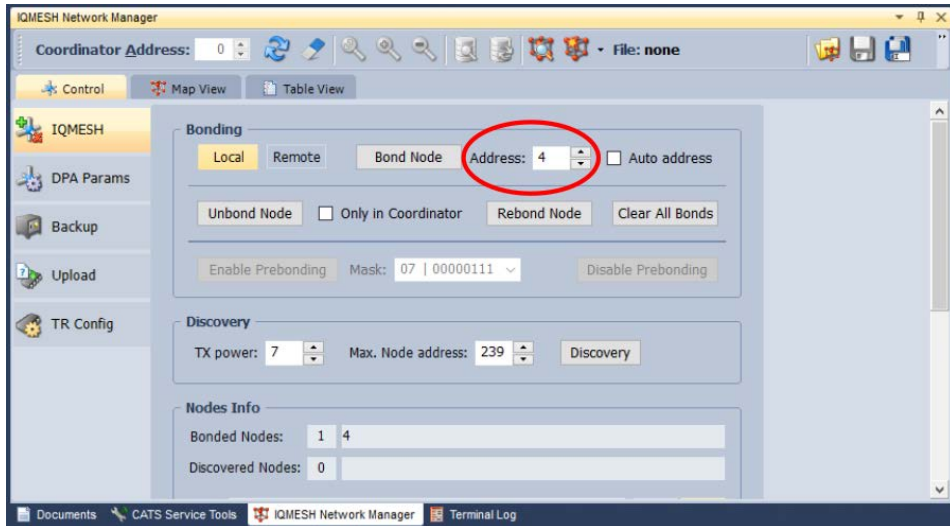
The message about a successful connection also shows the address assigned to the device.



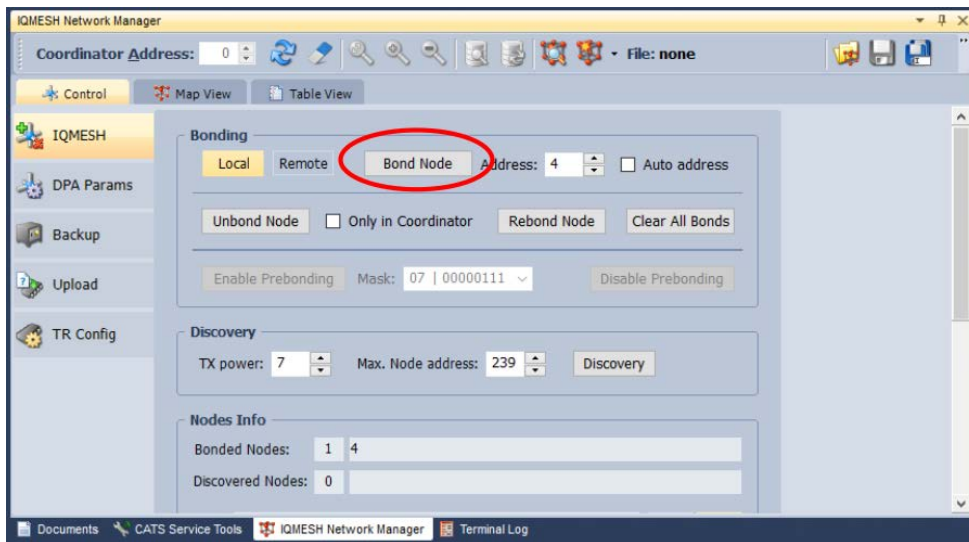
All interoperable devices connected to the network are then listed in the home panel.

Example: Connecting with the IQRF IDE – Local Bonding

1. Connect the module or the USB Gateway that acts as the Coordinator to the IQRF IDE.
2. In the IQRF IDE, open these windows: Packet Inspector, Terminal, IQMESH Network Manager

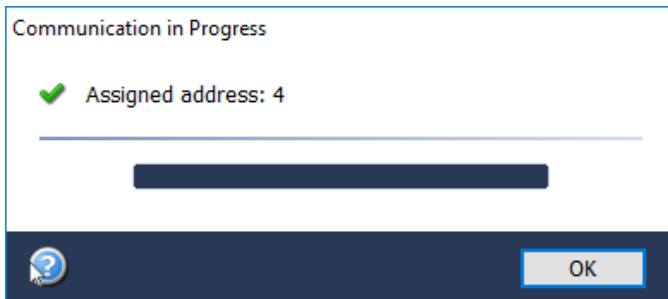
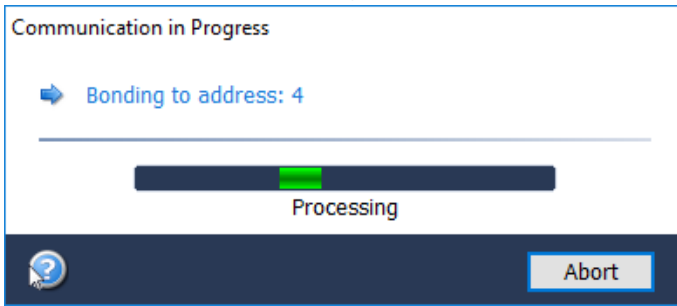


3. In the IQMESH Network Manager, go to the Control tab, and enter address 4 in the IQMESH menu.



4. Click **Bond Node**

5. While the search is in progress, press the button on the PowerCable IQRF



6. After a successful bonding, a message about the bonding result appears and the yellow LED lights up on the PowerCable IQRF.

Unbonding from the IQRF network

The device can be unbonded in two ways:

1. **By the Coordinator** – use the “Unbond Node” function with the selected PowerCable address, and confirm the unbonding at the remote device, too.
2. **By the PowerCable IQRF** – unplug the PowerCable IQRF. Press and hold the bonding button (Reset icon) and plug the device back in. Hold the button pressed until the green LED (Output icon) lights up, then release immediately. Successful unbonding is indicated by flashing yellow LED (WiFi icon) = Unbonded status.

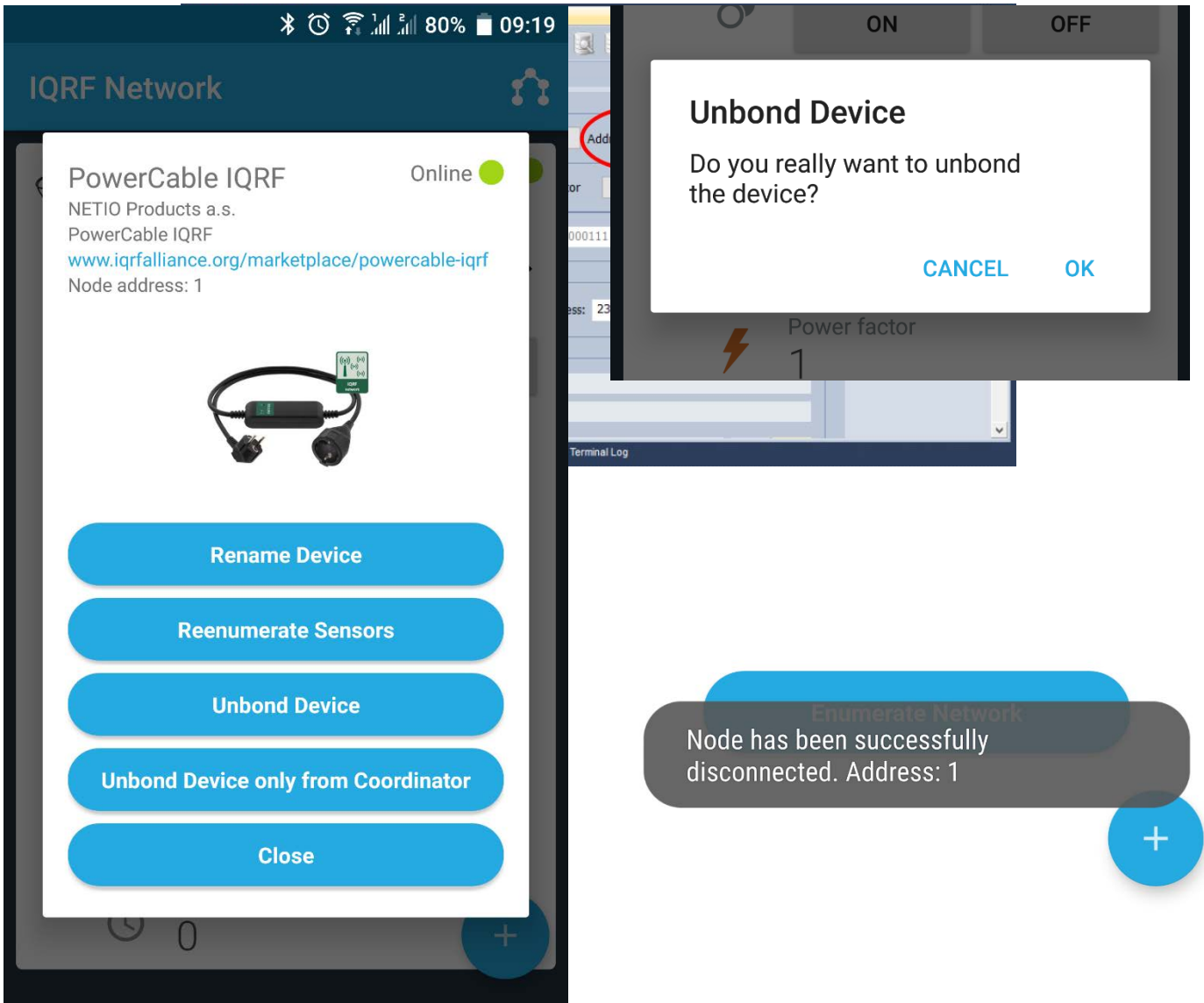
Example: Unbonding from the IQRF network in the mobile app

After clicking a particular device in the list, details can be shown or additional actions selected from a menu.

The “Unbond Device” item removes a device from the network **by the coordinator**

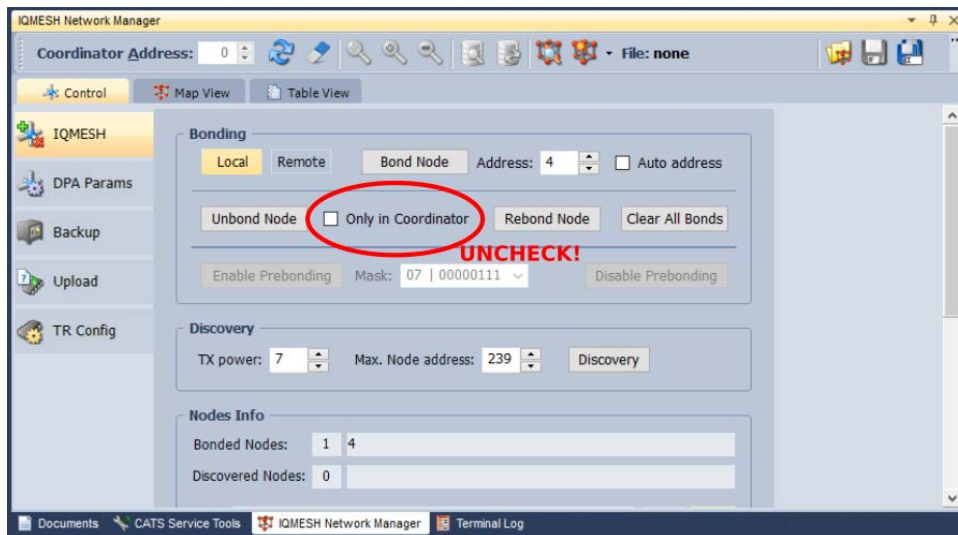
If the device is unbonded **by the PowerCable IQRF**, it will show up as Offline. Such a device can be removed with the “Unbond Device only from Coordinator” function.

Example: Unbonding from the IQRF network in the IQRF IDE

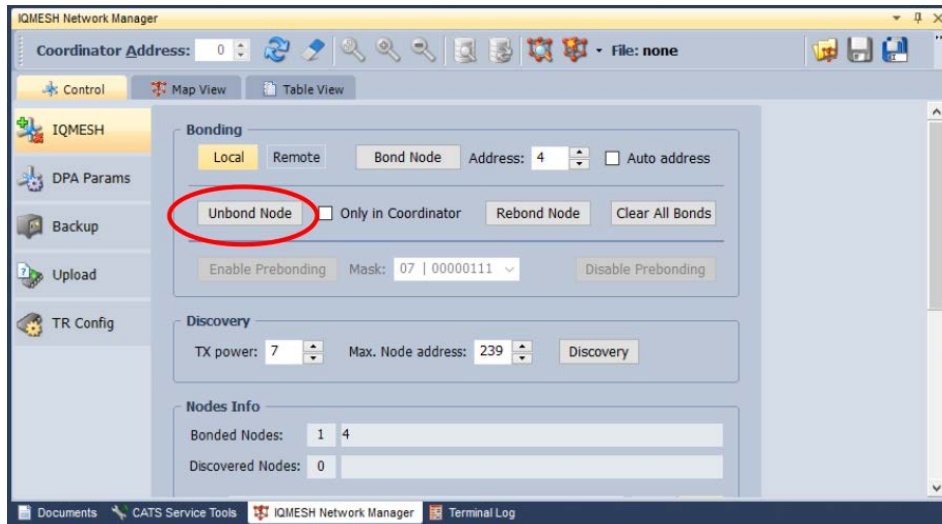


1. In the IQMESH Network Manager, go to the Control tab, and enter the address of the PowerCable IQRF to unbond in the IQMESH menu. For example **address 4**. Leave the PowerCable IQRF turned on and connected to the 230V grid!

2. Check "Only In coordinator".



3. Click Unbond Node and confirm.



Controlling the output

DPA Standard Binary Output

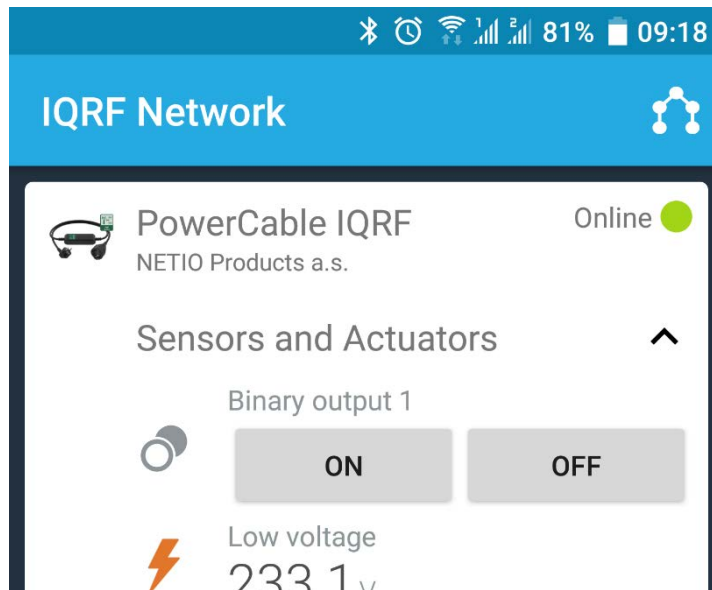
The output of the PowerCable IQRF can be controlled and monitored using the “Standard Binary Output” function of the DPA protocol. Commands and states conform to this standard.

Documentation according to DPA Interoperable: [IQRF-StandardBinaryOutput-V004](https://www.iqrfalliance.org/techdoc_files/IQRF-StandardBinaryOutput-V004)

https://www.iqrfalliance.org/techdoc_files/IQRF-StandardBinaryOutput_V004.pdf

Output address: 0x01

Example: Switching the PowerCable output on in the mobile app



Example: Switching the PowerCable output on in the IQRf IDE

In the IQRf IDE, open these windows: Packet Inspector, Terminal, Terminal Log.

Message header (HEX):

NADR: 0x0004

PNUM: 0x4B

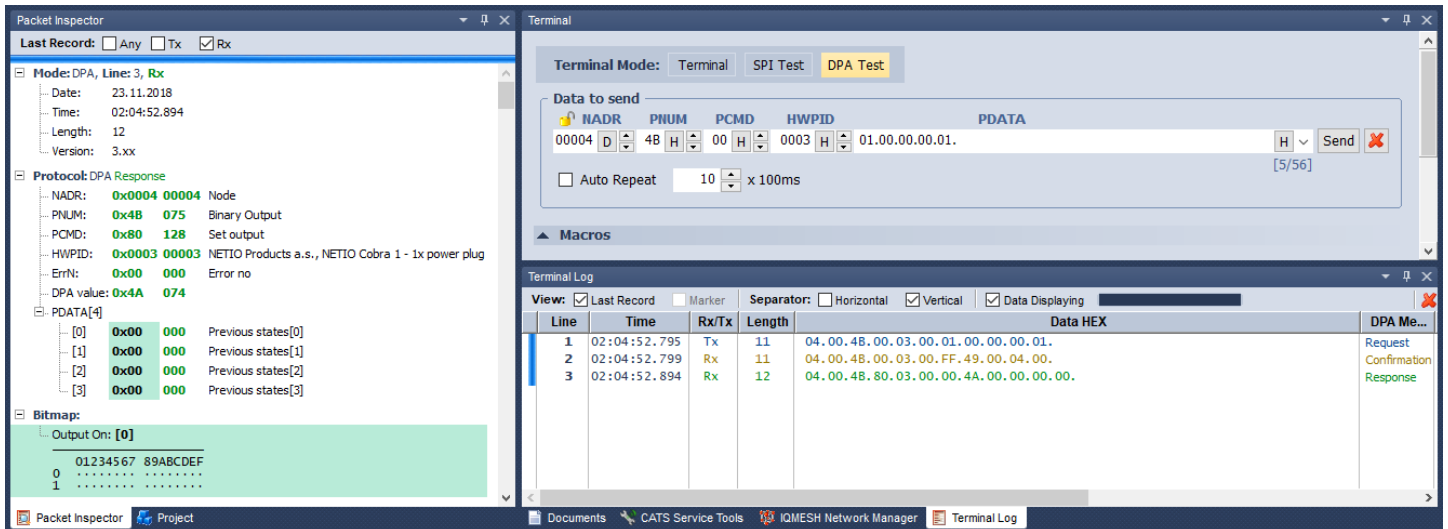
PCMD: 0x00

HWPID: 0x0003

Message data (HEX):

PDATA: 01.00.00.00.01

Response PDATA if the command is correctly received: 04.00.4B.80.03.00.00.4A.00.00.00.00.
 (Previous output state: off)



Example: Switching the PowerCable output off in the IQRF IDE

In the IQRF IDE, open these windows: Packet Inspector, Terminal, Terminal Log.

Message header (HEX):

NADR: 0x0004

PNUM: 0x4B

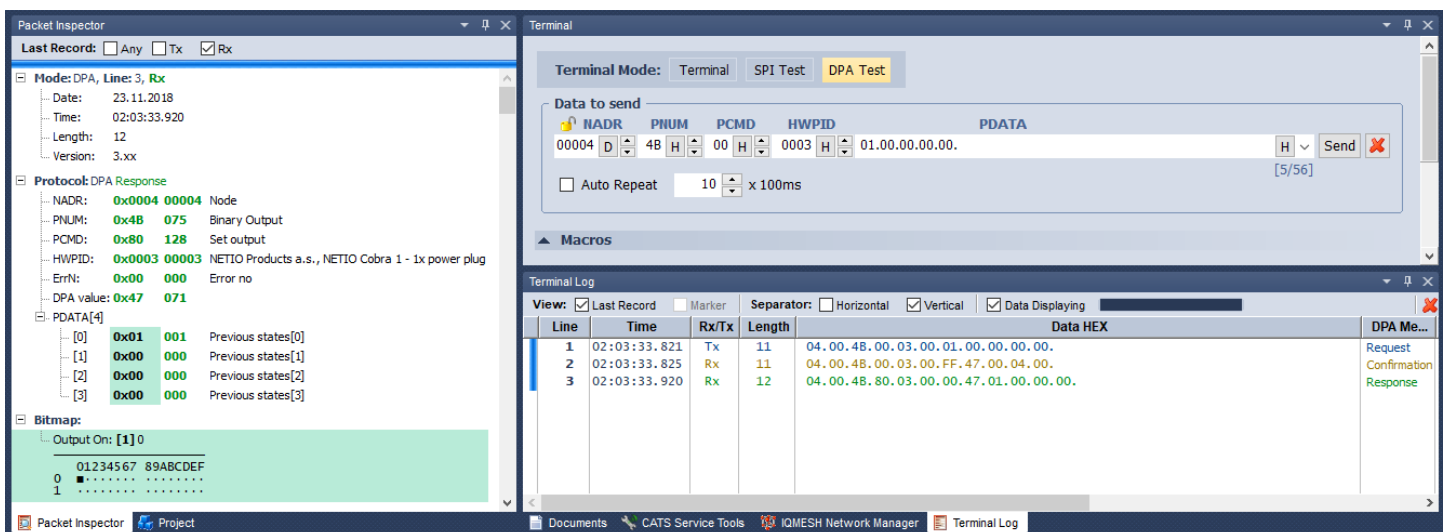
PCMD: 0x00

HWPID: 0x0003

Message data (HEX):

PDATA: 01.00.00.00.00

Response PDATA if the command is correctly received: 04.00.4B.80.03.00.00.47.01.00.00.00.
 (Previous output state: on)



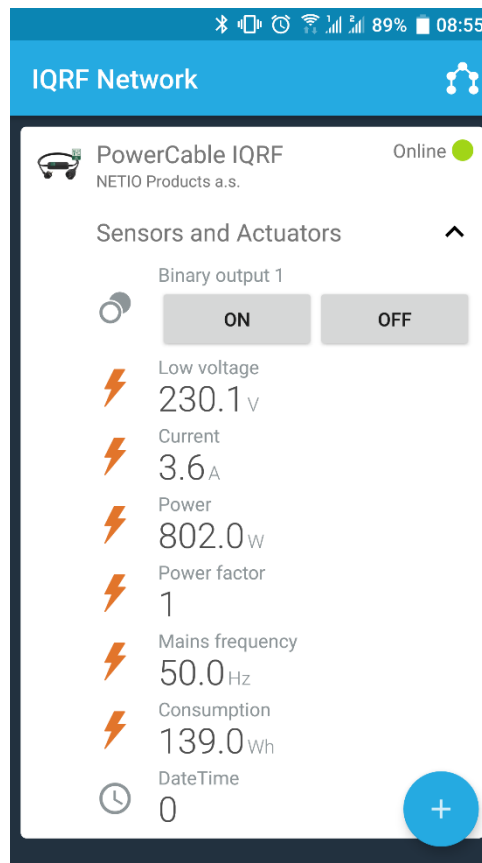
Reading the measurements

DPA Standard Sensor

PowerCable IQRf measurements can be controlled and read using the “Standard Sensor” function of the DPA protocol. Commands and values conform to this standard.

Documentation according to DPA Interoperable: [IQRf-StandardSensor-V014](https://www.iqrfalliance.org/techdoc_files/IQRf-StandardSensor_V014.pdf)
(https://www.iqrfalliance.org/techdoc_files/IQRf-StandardSensor_V014.pdf)

Example: Reading all PowerCable IQRf sensors in the mobile app



Addresses of individual sensors in PowerCable IQRf 901x

Voltage (Sensor 0)

Sensor Type: [0x06] Low Voltage
PDATA:

Current (Sensor 1)

Sensor Type: [0x07] Current
PDATA:

Power (Sensor 2)

Sensor Type: [0x08] Power
PDATA:

Power factor (Sensor 3)

Sensor Type: [0x82] Power Factor
PDATA:

Frequency (Sensor 4)

Sensor Type: [0x09] Mains Frequency
PDATA:

Consumption (Sensor 5)

Sensor Type: [0xA1] Consumption
PDATA:

Date and time when the consumption measurement started (Sensor 6)

Sensor Type: [0xA2] Datetime
PDATA:

Note: The consumption cannot be reset. In this regard, the PowerCable IQRF behaves as a regular power meter. The date and time refer to the factory reset.

Example: Reading all PowerCable IQRF sensors in IQRF IDE

In the IQRF IDE, open these windows: Packet Inspector, Terminal, Terminal Log.

Message header (HEX):

NADR: 0x0004

PNUM: 0x5E

PCMD: 0x01

HWPID: 0x0003

Message data (HEX):

PDATA: 7F.00.00.00

Response PDATA if the command is correctly received (example):

04.00.5E.81.03.00.00.44.06.BD.0E.07.E6.14.08.AC.13.82.C6.09.64.C3.A1.23.00.00.00.A2.9D.07.C0.5B.

The screenshot displays the IQRF IDE interface with three main windows:

- Packet Inspector:** Shows a list of 24 data points (PDATA[24]) for various sensors. The list includes:
 - [0] 0x06 006 Data[0] Sensor[0] Low voltage
 - [1] 0xB0 189 Data[1]
 - [2] 0x0E 014 Data[2] Sensor[0] 235.8125 V
 - [3] 0x07 007 Data[3] Sensor[1] Current
 - [4] 0xE6 230 Data[4]
 - [5] 0x14 020 Data[5] Sensor[1] 5.350 A
 - [6] 0x08 008 Data[6] Sensor[2] Power
 - [7] 0xAC 172 Data[7]
 - [8] 0x13 019 Data[8] Sensor[2] 1259.00 W
 - [9] 0x82 130 Data[9] Sensor[3] Power factor
 - [10] 0xC6 198 Data[10] Sensor[3] 0.99
 - [11] 0x09 009 Data[11]
 - [12] 0x64 100 Data[12] Sensor[4] Mains frequency
 - [13] 0xC3 195 Data[13] Sensor[4] 50.020 Hz
 - [14] 0xA1 161 Data[14] Sensor[5] Consumption
 - [15] 0x23 035 Data[15]
 - [16] 0x00 000 Data[16]
 - [17] 0x00 000 Data[17]
 - [18] 0x00 000 Data[18] Sensor[5] 35 Wh
 - [19] 0xA2 162 Data[19] Sensor[6] Datetime
 - [20] 0x9D 157 Data[20]
 - [21] 0x07 007 Data[21]
 - [22] 0xC0 192 Data[22]
 - [23] 0x5B 091 Data[23] Sensor[6] 1.5393115E9
- Terminal:** Shows the 'Data to send' section with fields for NADR (00004), PNUM (5E), PCMD (01), HWPID (0003), and PDATA (7F.00.00.00). A 'Send' button is visible.
- Terminal Log:** Displays a table of communication events:

Line	Time	Rx/Tx	Length	Data HEX	DPA Me...
1	01:48:45.310	Tx	10	04.00.5E.01.03.00.7F.00.00.00.	Request
2	01:48:45.314	Rx	11	04.00.5E.01.03.00.FF.43.00.04.00.	Confirmation
3	01:48:45.414	Rx	32	04.00.5E.81.03.00.00.44.06.BD.0E.07.E6.14.08.AC.13.82.C6.09.64.C3.A1.23.00.00.00.A2.9D.07.C0.5B.	Response

Example: Reading the electrical current from PowerCable IQRF in the IQRF IDE

In the IQRF IDE, open these windows: Packet Inspector, Terminal, Terminal Log.

Message header (HEX):

NADR: 0x0004

PNUM: 0x5E

PCMD: 0x01

HWPID: 0x0003

Message data (HEX):

PDATA: 02.00.00.00

Response PDATA if the command is correctly received (example):

04.00.5E.81.03.00.00.44.07.DB.14.

The screenshot displays the IQRF IDE interface with three main windows:

- Packet Inspector:** Shows a received message (Rx) with details: Date: 23.11.2018, Time: 01:53:50.401, Length: 11, Version: 3.xx. The protocol is identified as DPA Response. Fields include NADR: 0x0004 00004, PNUM: 0x5E 094, PCMD: 0x81 129, HWPID: 0x0003 00003, ErrN: 0x00 000, and DPA value: 0x44 068. The PDATA array contains three elements: [0] 0x07 007 (Sensor[1] Current), [1] 0xDB 219 (Data[1]), and [2] 0x14 020 (Data[2]).
- Terminal:** Shows the 'Terminal Mode' set to 'DPA Test'. The 'Data to send' field contains the command: 00004 D 5E H 01 H 0003 H 02.00.00.00. The 'Auto Repeat' is set to 10 x 100ms.
- Terminal Log:** A table showing the communication sequence:

Line	Time	Rx/Tx	Length	Data HEX	DPA Me...
1	01:53:50.299	Tx	10	04.00.5E.01.03.00.02.00.00.00.	
2	01:53:50.303	Rx	11	04.00.5E.01.03.00.FF.44.00.04.00.	Request Confirmation
3	01:53:50.401	Rx	11	04.00.5E.81.03.00.00.44.07.DB.14.	Response

Configuring the default power-on state

The Power Cable IQRF supports user-configurable power-on output state. The following options are available:

- **OFF** – when the power is restored, the output is always off and can only be switched on with a command over the IQRF network
- **ON** – when the power is restored, the output is always switched on (within 2 seconds after powering up the device), and can be only switched off with a command over the IQRF network
- **LAST** – when power is disconnected or interrupted, PowerCable IQRF remembers the output state and restores it within 2 seconds after the power is restored

These states are set over a special service channel using the following commands:

Setting the power-on state to OFF (address 0x0004)

Message header (HEX):

NADR: 0x0004

PNUM: 0x5E

PCMD: 0x40

HWPID: 0x0003

1st message data (HEX):

PDATA: 55.AA.00.0A.01.00.2D

Response PDATA if the command is correctly received: 55 AA 00 05 00 27

2nd message data (HEX):

PDATA: 55.AA.00.09.01.00.2C

Response PDATA if the command is correctly received: 55 AA 00 05 00 27

The screenshot displays two windows from a network analysis tool. The 'Packet Inspector' window on the left shows a captured packet for Mode: DPA, Line: 6, Rx. The packet details include Date: 23.11.2018, Time: 01:37:08.944, Length: 14, and Version: 3.xx. The protocol is identified as DPA Response. The message header fields are: NADR: 0x0004 00004, PNUM: 0x5E 094, PCMD: 0xC0 192, and HWPID: 0x0003 00003. The PDATA field is shown as an array of six bytes: [0] 0x55 085, [1] 0xAA 170, [2] 0x00 000, [3] 0x05 005, [4] 0x00 000, and [5] 0x27 039. The 'Terminal' window on the right shows the 'Terminal Mode' set to 'DPA Test'. The 'Data to send' section contains the following fields: NADR (00004), PNUM (5E), PCMD (40), HWPID (0003), and PDATA (55.AA.00.09.01.00.2C). The 'Terminal Log' window below shows a table of captured data:

Line	Time	Rx/Tx	Length	Data HEX	DPA Me...	Error
1	01:36:59.833	Tx	13	04.00.5E.40.03.00.55.AA.00.0A.01.00.2D.		0x
2	01:36:59.837	Rx	11	04.00.5E.40.03.00.FF.45.00.04.00.	Request	0x
3	01:36:59.933	Rx	14	04.00.5E.C0.03.00.00.47.55.AA.00.05.00.27.	Response	0x
4	01:37:08.845	Tx	13	04.00.5E.40.03.00.55.AA.00.09.01.00.2C.	Request	0x
5	01:37:08.849	Rx	11	04.00.5E.40.03.00.FF.46.00.04.00.	Confirmation	0x
6	01:37:08.944	Rx	14	04.00.5E.C0.03.00.00.45.55.AA.00.05.00.27.	Response	0x

Setting the power-on state to ON (address 0x0004)

Message header (HEX):

NADR: 0x0004

PNUM: 0x5E

PCMD: 0x40

HWPID: 0x0003

1st message data (HEX):

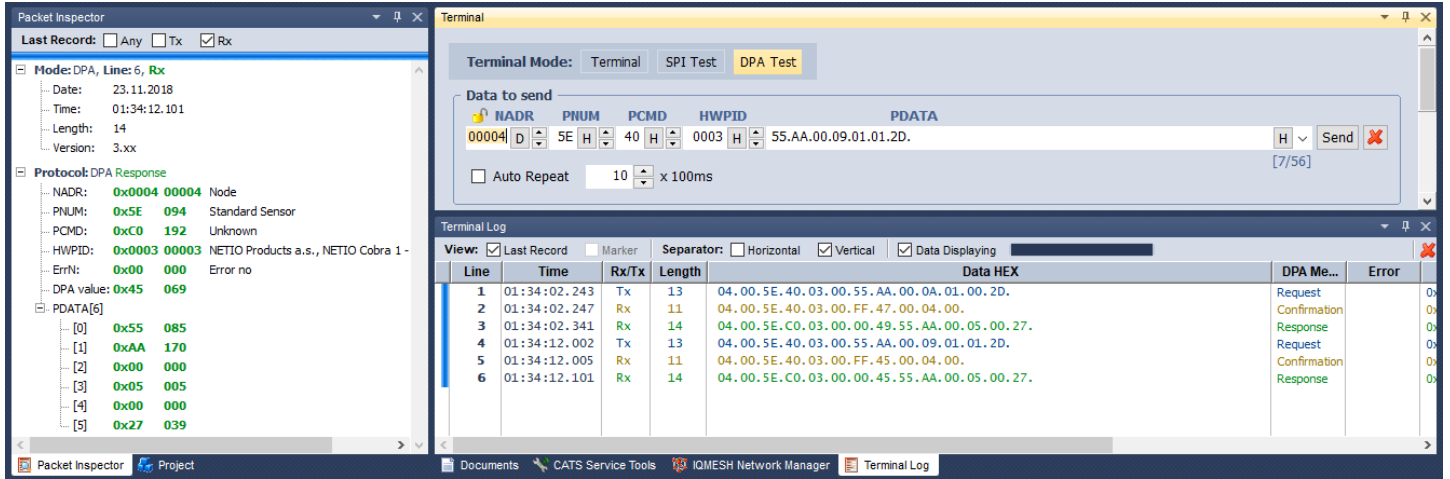
PDATA: 55.AA.00.0A.01.00.2D

Response PDATA if the command is correctly received: 55 AA 00 05 00 27

2nd message data (HEX):

PDATA: 55.AA.00.09.01.01.2D

Response PDATA if the command is correctly received: 55 AA 00 05 00 27



Setting the power-on state to LAST (address 0x0004)

Message header (HEX):

NADR: 0x0004

PNUM: 0x5E

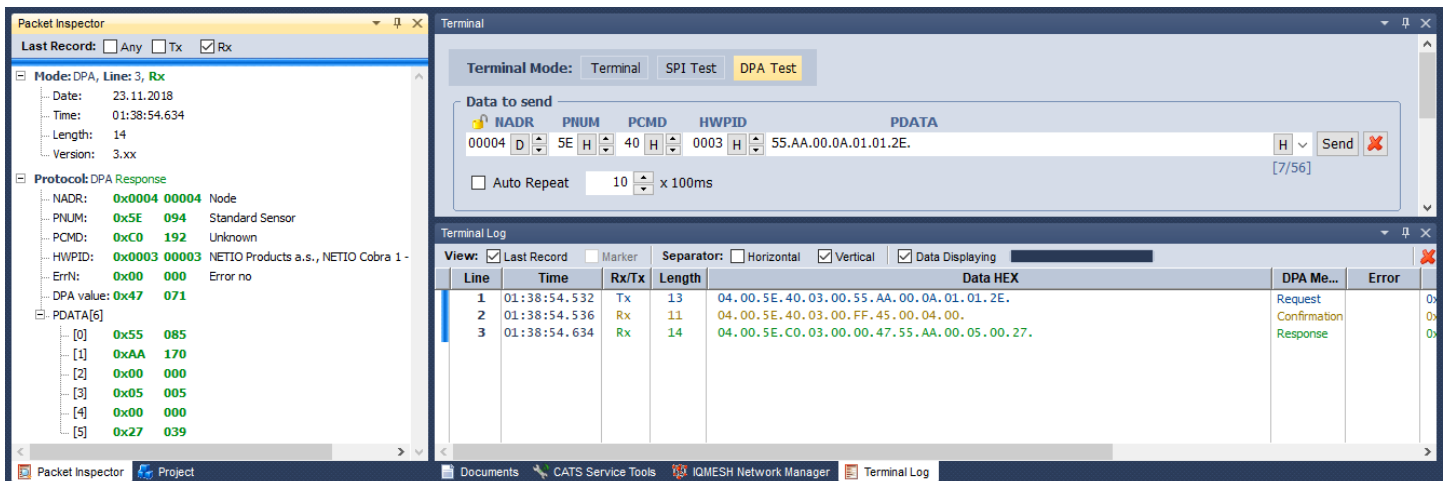
PCMD: 0x40

HWPID: 0x0003

Message data (HEX):

PDATA: 55.AA.00.0A.01.01.2E

Response PDATA if the command is correctly received: 55 AA 00 05 00 27



EU DECLARATION OF CONFORMITY

Manufacturer: NETIO products a.s

Address: U Pily 3/103
143 00 Praha 4, Czech Republic

Product / type: 901x - where "x" stands for the socket/plug type

code:

E FR

F DE



This EU Declaration of Conformity is issued under the sole responsibility of the manufacturer.

Object of this Declaration: "NETIO PowerCable IQRF 901x extension cord controlled and monitored over the IQRF network".

The above-mentioned object of this Declaration complies with applicable harmonizing legislation of the European Union:

- 2014/53/EU (CZ no. 426/2016) including addendums

References to applicable harmonized standards or other technical specifications, with which conformity is hereby declared

- Article 3(1)(a) Protection of health and safety
- Article 3(1)(b) Electromagnetic compatibility
- Article 3(2) Effective and efficient use of radio spectrum

Additional information:

- Test protocol No.: EZÚ 700026-01/06 dated 31st January 2018
- Test protocol No.: EZÚ 700026-01/09 dated 31st January 2018

RoHS:

We hereby declare that the above-mentioned product(s) comply with essential requirements of the Government Regulation No. 481/2012 Sb. (Directive 2011/65/EU) on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The following standards were used in the conformity assessment: EN 50581:2012

Czech Republic, Praha, 18th March 2019

Jan Řehák, Chair of the Board

A handwritten signature in black ink, appearing to be 'J. Řehák', is located in the lower right area of the page, below the name of the signatory.