IQuip

IQD-NFC-01

IQRF NFC Tool

User's guide

Smarter Wireless. Simply.

Description

IQuip (IQD-NFC-01) is a portable tool for easier, comfortable, and secure including (bonding) end devices equipped with passive NFC (Near Field Communication, contactless) into IQRF wireless networks. Besides other sophisticated approaches, the security is based on AES-128 encryption using OTK (One-Time Key) stored in NFC EEPROM of the Node.

Once the IQuip is activated, prebonding of any IQRF device is executed just by pressing the pushbutton in close proximity with the device. Then bonding can be completed just by launching the Autonetwork.

IQuip enables prebond end devices by any slightly trained person.

Key features

- Ease of use
- Portable
- NFC contactless and IQRF wireless connectivity
- Autonomous, no mobile phone nor Internet connectivity required
- Ultimate security due to OTK and AES-128 encryption

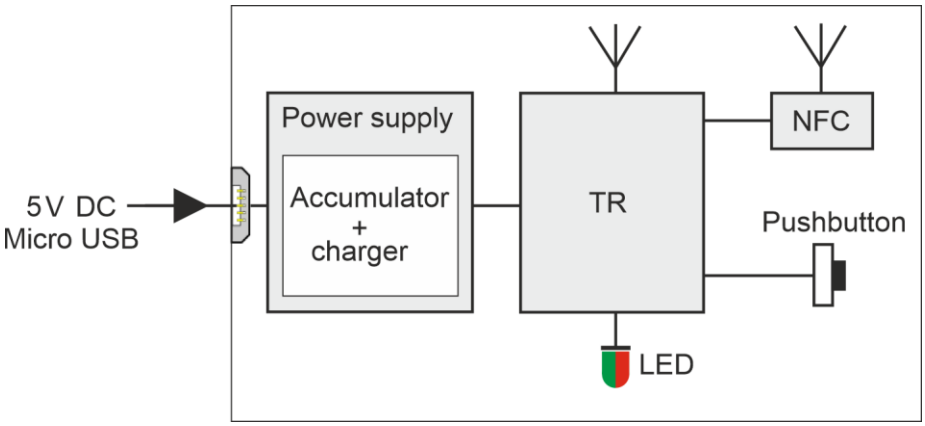
Purpose

- Bonding of any IQRF device equipped with passive NFC
- Fast and secure creation of large networks
- Importing Access Password to end Node device for subsequent service, e.g. by CATS

Applications

- IQRF wireless Mesh (IQMESH) networks
- IQRF interoperable as well as non-interoperable applications
- Internet of Things
- For networks with IQRF OS v4.05D and DPA v4.16 or higher

Simplified block diagram



Technical specifications

***Typical** values (until otherwise specified)*

Power supply	
Accumulator	LIP502030, 3.7 V, 240 mAh, Lithium-Ion Polymer rechargeable, soldered
Charging supply	4.3 V to 6.0 V DC, via USB Micro-B connector
Power consumption	
Standby	28 µA
Operation (after button-press)	
Out of NFC range of the counterpart device	Average current 11.8 mA for about 0.5 s
In NFC range of the counterpart device	Max. current 50 mA, average current 11.8 mA for about 0.5 s
Accumulator charging	Max. current approximately 150 mA, approximately 2 hours
IQRF transceiver	TR-76D
RF band	868 MHz or 916 MHz, fixed
RF range	Up to 150 m (in free space)
Other RF parameters	See TR-76D datasheet
IQRF transceivers supported	TR-7xD series
IQRF OS supported	4.05D or higher
IQRF DPA supported	4.16 or higher
IQRF network types supported	STD as well as STD+LP
NFC mode	NFC reader / writer, active
NFC range	4 cm
Temperature	
Operating	-10 °C to +60 °C
Storage	+10 °C to +25 °C (recommended)
Ingress protection	IP30
Dimensions	90 mm x 45 mm x 12 mm
Weight	36 g

Absolute maximum ratings

Stresses beyond those values may cause permanent damage to the device. Exposure to maximum rating conditions for extended periods may affect the device reliability.

Supply voltage	4.3 V to 6 V DC
Temperature	
Operating	-10 °C to +60 °C
Storage	-10 °C to +60 °C

Hardware

Power supply

IQuip is supplied from the accumulator rechargeable from an external power source connectable via the Micro USB connector. The internal power management circuitry protects the accumulator against deep exhausting as well as overcharging.

The charging takes up approximately up to 2 hours. During charging, there is no battery full indication.

See chapter Standby mode for behavior when the low battery is detected.

IQRF transceiver and antenna

The antenna of the IQRF transceiver is arranged as a PCB meander built on the IQuip board. See chapter *Layout* for antenna location and orientation.

NFC

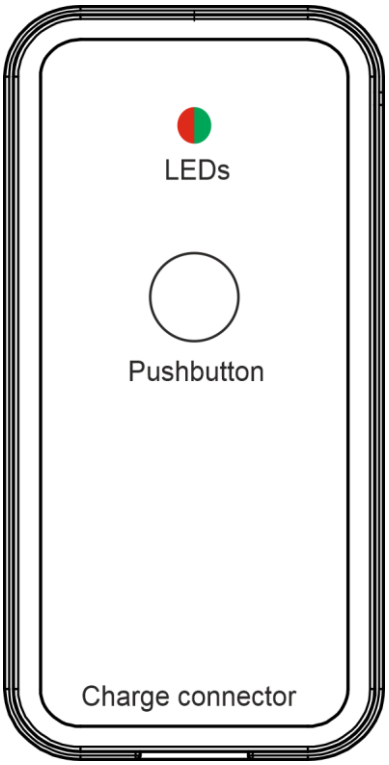
Internal NFC (Near-Field Communication) enables contactless communication with a passive (energy harvesting) NFC counterpart inside an IQRF end Node device when both are located very close (up to a few centimeters) to each other. See *Layout* for the NFC area location.

The end Node device must observe rules regarding NFC design.

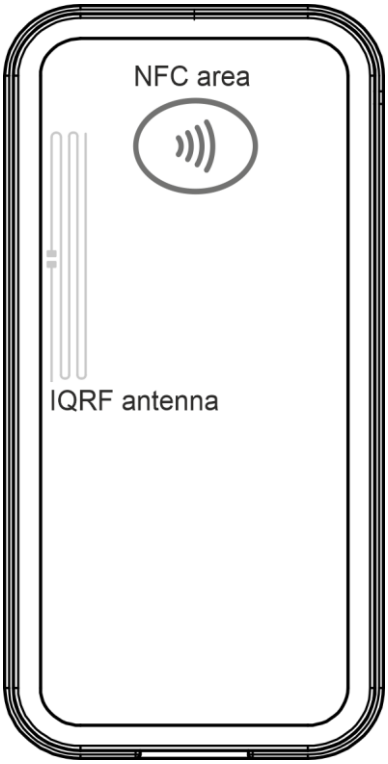
Control and indication parts

To control IQuip and indicate the results, the dual-color (red and green) **LED** and one **pushbutton** is used.

Layout



Top view



Location of internal antennas

Operation

Refer to the *Preconditions* required for the network devices to collaborate with IQuip.

IQuip states

The two states of IQuip are recognized:

Activated

Assigned to the given IQMESH network. Prebonding Nodes is possible in this state.

After wake-up from standby mode, the activated state is indicated by a **single flash** of the **red LED**.

Deactivated

Assigned to no network. No operation (except activating) is possible until IQuip is activated.

After wake-up from standby mode, the deactivated state is indicated by **rapid red LED flashes** for 5 s. In this period, IQuip is **waiting for activation**.

Standby mode

IQuip (either activated or deactivated) stays almost all the time in the power-saving **standby mode** except for the short periods after the button press when it is performing the required task.

A deactivated IQuip must be activated within the 5 s period after the button press otherwise it enters standby mode still deactivated.

Bonding procedure

Bonding of Nodes using IQuip is performed in three steps:

1. IQuip activation
2. Prebonding individual Nodes
3. Finalizing bonding by Autonetwork

Steps 1. and 3. should be performed by a person a bit informed about IQRF technology. Step 2. requires just a brief instruction and can be performed in the terrain by any person.

IQuip activation

An IQuip to be activated **must** always be in the **deactivated** state.

To **activate** IQuip:

- Place IQuip at the **direct RF range** with the network **Coordinator**.
- Press and hold the **pushbutton**. IQuip wakes up and starts to indicate its deactivated state (by rapid red LED flashes).
- While the pushbutton is held, **call** the **bonding command** with the address **240** from the gateway. (Timeout of this command is 10 s.)

If succeeded, IQuip is reset, then it indicates the activated state by a single red LED flash, enters standby mode, and is **ready to prebond Nodes**. If not succeeded, the IQuip enters standby mode deactivated.

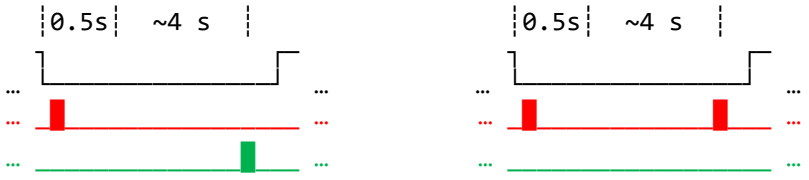
Prebonding a Node

Using IQuip, it is possible to prebond a Node similarly as by Smart Connect but the Coordinator need not know the IBK (Individual Bonding Key) and MID (Module ID) of the given Node.

The Node to be prebonded must be equipped with a Custom DPA Handler supporting prebonding via IQuip and must be in the unbonded state. See chapter Custom DPA Handler. The Node device need not be placed in its final location.

Prebonding a Node is performed as follows:

- Place the IQuip close to the Node device to enable contactless NFC communication.
- Shortly (< 0.5 s) press the pushbutton. A single flash of the red LED appears.
- Continue holding the IQuip close to the Node device. The IQuip attempts to read OTK from the Node and prebond the Node device.
- After about 4 s, the result on the IQuip's side is indicated by another single flash of an LED: success by the green LED or failure by the red LED.



Success Failure

In any case, the IQuip indicates the success **independently on the prebonding result on the Node's side. The actual prebonding result on the Node's side is only indicated by the Node itself.**

If succeeded, the Node is prebonded (with temporary address FE assigned and Access Password and RF channel inherited from the Coordinator) similarly as after the first phase of Autonetwork.

OTK read and prebonding in practice

Bring the IQuip close to the Node, press the pushbutton on the IQuip, check the green LED flash on the IQuip, then put the IQuip aside and watch the Node device whether it started to indicate prebonding.

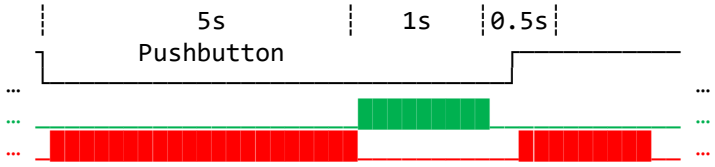
Autonetwork

If all required Nodes are prebonded and placed to their final locations, finalize the bonding by launching the Autonetwork.

Deactivating the IQuip

To deactivate the activated IQuip:

- Press and hold the button. The red LED is on.
- After 5 s the red LED goes off and the green LED goes on.
- Continue holding the button (for 1 s) until the green LED goes off.
- Then release the button immediately (within 0.5 s).
- Deactivating is indicated by a single red LED flash for 1 s.
- The IQuip is automatically reset and starts indicating the deactivated IQuip.



Accumulator check

The accumulator voltage is measured after every wake-up. Low voltage is indicated by the red and green LEDs alternatively flashing 5 times.

If the low battery, nothing but an attempt of activation is allowed.

For advanced users

Preconditions

To make prebonding via IQuip possible, the following preconditions must be met:

IQMESH Coordinator (gateway)

There are no special requirements for the IQMESH Coordinator.

Custom DPA Handler

The IQMESH Coordinator must be equipped with the Custom DPA Handler `Custom-DPA-Handler-OTK-Coordinator.iqrf`.

End Node

Rules regarding HW design

For HW developers of the end Node device only.

HW design rules and recommendations for the construction of an IQRF end Node device utilizing NFC is described in Application note AN016 – NFC in IQRF devices (*Preliminaty information*).

Custom DPA Handler for the Node

For SW developers writing the Custom DPA Handler for the end Node device only.

The Node must be equipped with a Custom DPA Handler supporting prebonding via IQuip. Rules and recommendations for Custom DPA Handler development are described in Application note AN016 – NFC in IQRF devices. It contains the example ready to be run on the IQRF development kit DDC-NFC-01 (*Preliminaty information*).

Product information

Ordering code

IQD-NFC-01	IQuip, IQRF RF band 868 MHz
IQD-NFC-01-916	IQuip, IQRF RF band 916 MHz

Supplied contents

IQD-NFC-01	IQuip. A power adapter for the accumulator charging is not included.

Recommended option

TY-A6A	Power adapter for the accumulator charging
CAB-USBABMICRO	Micro USB cable for the power adapter

Document history

211013	First release

Sales and Service

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Partners and distribution

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Quality management

ISO 9001 : 2016 certified

Complies with EN 62368-1:14+A11:17, EN 55032:15, EN 55024:10+A1:15, ETSI EN 301489-1V2.2.3:19, ETSI EN 301489-3V2.1.1:19.

Complies with ETSI directives EN 301 489-1 V1.9.2:2011, EN 301 489-3 V1.6.1:2013, EN 300 220-1 V3.1.1:2017, EN 300 220-2 V3.2.1:2018 and ERC Recommendation 70-03 (2017) and VO-R/10/05.2014-3.

Complies with directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE).

Trademarks

Legal

Online support: support@iqrf.org

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