Preface

This document provides general user instructions regarding the connection and use of TapNLink modules to a target application board.

Users of TapNLink standard wireless modules should start development of their implementation and apps using a TapNLink Primer evaluation kit. The Primers support access to the full range of configuration and app generation tools described in this document. The configurations created using a Primer can then be transferred to TapNLink standard wireless modules.

For specifics about TapNLink standard module wireless implementations, refer to the product datasheets. You'll find them online: http://docs.iotize.com/Datasheets/

Electrical connections

This section describes the electrical interface for following TapNLink modules: TnL-FIR103, TnL-FIW103 & TnL-FIT203.

Connectors

The TapNLink modules have 3 connectors:

P1 extension connector, composed of two rows (P1A and P1B) of contacts.

J1 connects the TAP to the target board's debug connector (ARM-SWD standard).

J3 connects the TAP to the target board (it is a subset of J1). We recommend you move CLK (SWDCLK) away from DATA (SWDIO). Do not use a ribbon cable with these two signals adjacent. This pdf shows a wiring that has been tested with a 150cm cable.

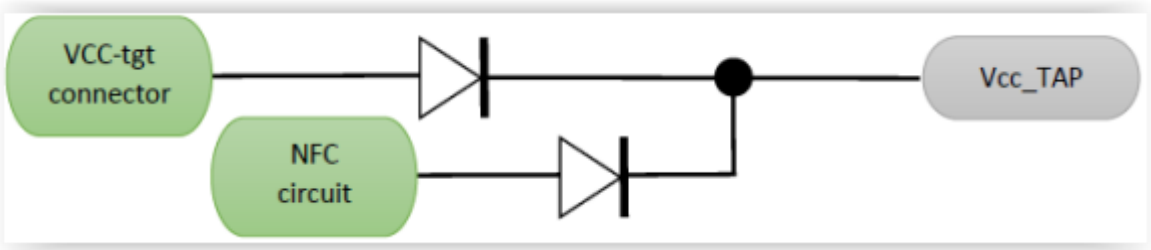
Cable

The cable between the Tap and the application board must be less than 1 meter (the shorter, the better). You must guard against electromagnetic interference, and you may have to use a shielded cable.

Electrical characteristics

The TAP signals are connected to the main microcontroller via a 22 ohm resistance:

The power source is lowered by a diode (NSR20F30) (typically 250 mV drop) to allow NFC to provide the power supply.



Note: Full Energy harvesting is only available for the NFC-only module (ref TnL-FIT203).

The applicable voltage levels are those of the main MCU (STM32L432K).

Symbol	Parameter	Min	Typ	Max	Unit
Vtarget[1]	Voltage supplied by target	2	3	3.5	V
VIL	I/O signals input low level	-		0.25xVcc[2]	V
VIH	I/O signals input high level	0.75xVcc[2]			V
VOH	Output high level voltage for I/O signals	0.8xVcc		-	V
VOL	Output low level voltage for I/O signals	-		0.35xVcc	
ICC	Current supplied by target	10mA	15mA	18mA	mA

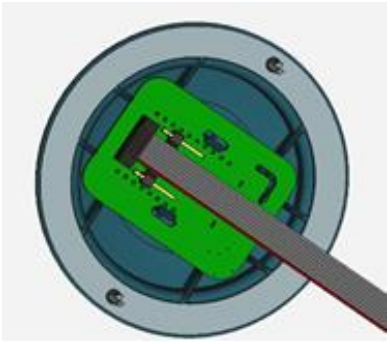
Notes:

1. *Vtarget is the voltage supplied by the application board (the target) at the J1/J3 connector.*
2. *VCC is the TAP voltage (typically Vcc = Vtarget – 250mV).*

Mechanical connections

This section describes how to physically connect the TapNLink to the target.

The TapNLink can either be used by itself, or be clipped into an IoTize Cup (see image) and used in proximity to the target.



Connection constraints

- Antennas (NFC, BLE or WiFi): Avoid having metal screens (Faraday cages) between the smartphone and the Tap. Avoid proximity with any metal which may disturb the electromagnetic field.

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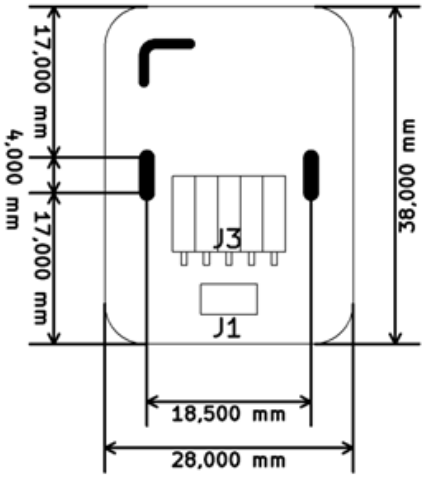
- The smartphone NFC antenna must be placed close to, and parallel and centered with, the TAP NFC antenna. Smartphones/tablets vary greatly in size and in the position of their NFC antenna. Generally, smartphone NFC communication is optimal at a distance of 10 mm, and can be problematic at 30 mm.
- The TapNLink electronics must be protected from electrostatic discharge, and corrosive environments.
- The connection cables should be kept away from electromagnetic disturbance (motors,...).

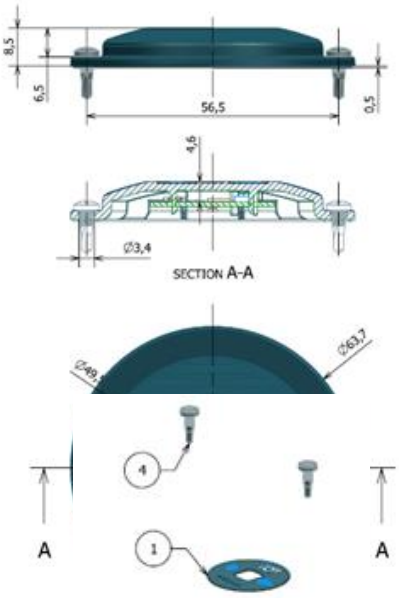


The TapNLink PCB does not have screw holes. When used without a Cup box, it must be fixed either by:

- gluing
- snaps applied to the outer perimeter or to the central slots (in the same way as the Cup box),
- elastic tape inserted in the two central slots,
- metal screws (M1.6) in the central slots, with insulating washers between the screw head and the PCB to avoid contact with the extension connector.

IoTize Cup box *(Option)*

It is recommended to put the TapNLink inside an IoTize Cup box which resolves the connection constraints. The minimum order quantity is 50 boxes.



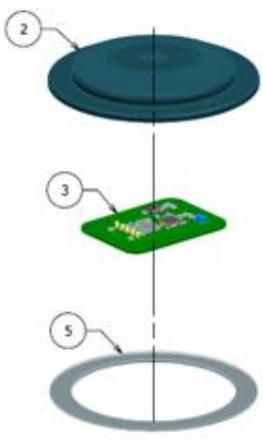
The Cup box can be supplied with optional items or a customized color:

- A flat or double-sided adhesive gasket to waterproof the support's joint,
- A Bluetooth logo decoration which could be glued to the outside of the case.
- The Cup box color can be customized if more than 2000 boxes are ordered. Simply request a quotation from IoTize.

The customer could manufacture a specific label (dimensions are given below).

If required, the customer must provide 3mm diameter screws best suited to their support.

Placement of the Tap in the Cup



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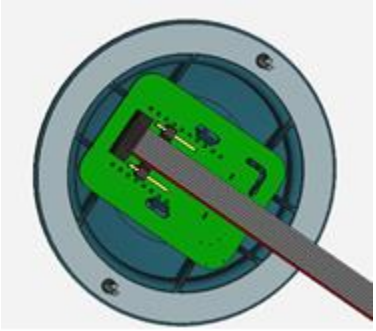
The tap should be correctly positioned over the tap connectors and snapped into the CUP.

Caution: The guide marker must be correctly positioned for the ceramic antenna.



The exploded view shows the Tap and Cup fitting:

1. Customized label (optional) which may indicate connection modes (BLE, WiFi,...). The center of the label corresponds to the center of the NFC antenna.
2. Cup case, in ABS.
3. Tap, see previous section for details.
4. Fixing screws (not supplied) to be chosen according to the support wall.
5. Optional gasket (double-sided adhesive or silicone gasket).

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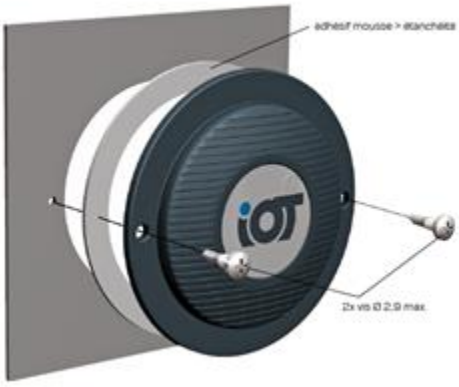
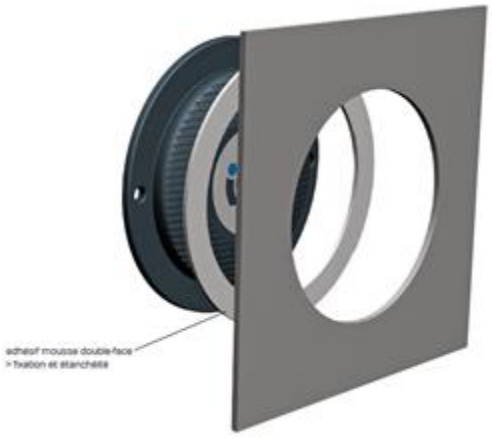
Placement of CUP on support wall

The CUP can be mounted on the inside or outside of the support wall.

Outside or inside mounting:





An inside mounting requires a 50mm diameter hole in the support wall which will be visible so must have a neat finish. It is attached with either screws or a double-sided adhesive seal. If fastening screws are used:

1. Mark the center of the CUP on the support wall.
2. Drill the screw holes (3.2mm diameter) on a diameter of 56.5mm from the center of the CUP, on the same horizontal as the center.
3. Drill the main hole (50mm diameter) using a bit saw.

An outside mounting requires a smaller hole in the support wall (for the passage of the cable and its connector), and requires holes for two fixing screws, made in the same way as for an inside mounting. The size and shape of this hole depends on which connector is used, J3 or J1.

- J3 simplified connector (1x5 points) 2.54mm step (e.g. Molex 0705430004). Recommended for wide range of connections, very low cost of connectors, better robustness.

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- J1 complete connector (2x5 points) 1.27mm step (for a flex cable with 0.635mm step). Recommended when the target application has the same type of connector, and to use the JTDI/JTDO signals that are absent from the main connector.

The connection can be vertical or horizontal depending on:

- congestion constraints (horizontal is more compact),
- waterproofing requirements,
- locking system requirements on the connectors.
- Waterproofing or sealing

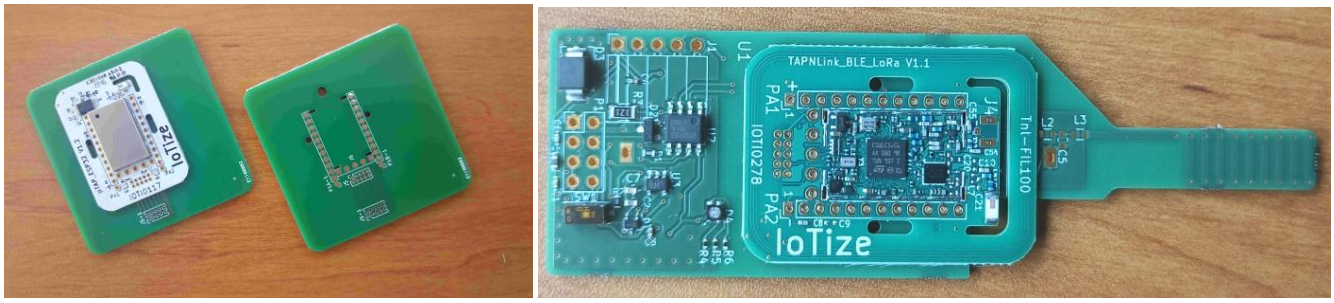
If the Cup is used as a receptacle for an elastomeric resin (silicone elastomer system specially designed for electronic potting application), a vertical connection is preferable to allow easy connection/disconnection of the TAP without the resin needing to be modified.

Waterproofing or sealing

If the Cup is used as a receptacle for an elastomeric resin (silicone elastomer system specially designed for electronic potting application), a vertical connection is preferable to allow easy connection/disconnection of the TAP without the resin needing to be modified.

Direct soldering of TapNLink modules on PCB

TapNLink modules can be soldered automatically onto a PCB:



This technique is cost effective but precautions are required:

- the NFC antenna must be kept far away from metallic areas,
- milling must be done to make room for the 4 pins of the shield (for WiFi and BLE modules), so that the TapNLink is flush with the PCB,
- traces should be routed between Tap and the PCB (the PCB conformal coating is not an insulator),
- vias can safely be made just outside the P1A.1-12 and P1B.1-12 pins, so traces can be routed safely to the outside layer (near the black lines).
- paste must be applied to approx 80% of the SMD pads, so that excess paste goes directly into the Taps pin holes, and not onto the PCB.

Do not hesitate to contact IoTize to receive detailed information about this technique.

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I/O pins

These are made use of by Java so are described in the Java documentation.

Factory reset

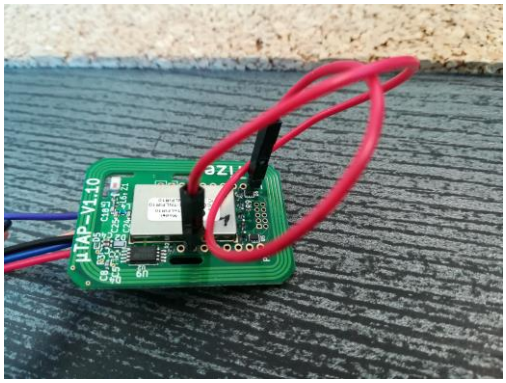
If you lose the administrator password, you can no longer change your Tap's configuration.

In this case, you must erase the current configuration and recover the factory configuration using the hardware factory reset procedure, presented here.

This feature can be disabled in IoTize Studio from menu IoTized Application\Tap\Configuration Access control\By hardware signal but it is strongly advised to keep the default value 'Yes' (otherwise reconfiguration won't be possible).

Hardware factory reset

The PA7 pad on the PCB of your Tap must be linked to ground during power-on to perform a factory reset:



1. Power off the module.
2. Connect the HW_FR signal (P1A.7) to the ground (P1B.1) and keep them connected.
3. Power on the module.
4. Wait for 10 seconds.
5. Power off the module.
6. Disconnect the HW_FR.
7. Power on the module again: the default configuration is reloaded.

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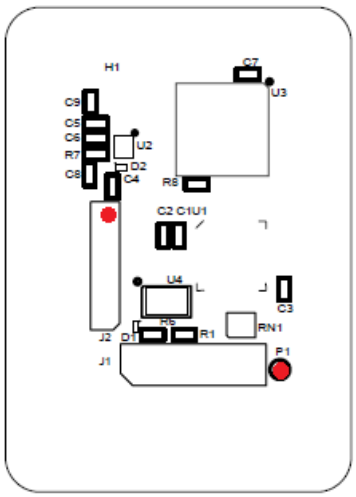
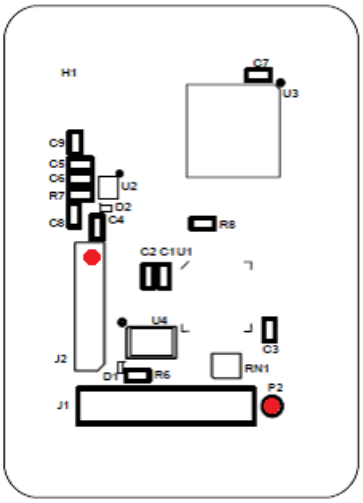
SWD 10-point connector modules	SWD 5-point connector modules
Connect pad P1 to GND (pin 7 connector J2)	Connect pad P2 to GND (pin 7 connector J2)
	

Studio factory reset

If you can connect to the Tap, you can do a factory reset from IoTize Studio: Configuration -> Clear (Factory Reset).

After factory reset

The factory reset values are:

WiFi password: ABCD1234

WiFi network: TAP_

IP number: 192.168.4.1

Service name/Port: 2000

Network mode: Access Point

SSID: TAP

Studio | Configuration version: 0.0.0. This must be 0.0.1 or higher.

A factory reset removes the Sensor demo.

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If you want to use your current project to reconfigure the Tap, check these options before you Test Connection, Configure, then Test | Reboot Tap.

- Studio: Connection to Tap -> Socket host name/IP = 192.168.4.1
- Reconnect to the Taps WiFi network.
- App AAR to access the Sensor demo: com.iotize.app.sensordemo (the default app is Tap manager com.iotize.android.communicationapp).

Configuration

You define the way TapNLink communicates with the target system in IoTize Studio, as described in Part II of the appropriate Getting started.

App Generation

We recommend you generate your mobile apps using IoTize Studios Generate App button (which uses IoTize BuildServer).

- Buildserver can build the project and generate an APK version (debug mode) of the generated project (Android app).
- Buildserver can generate a complete project that you can download
    - to complete it manually, or
    - to modify it to build an IPA for iOS using Xcode).

You could also use our command line interface tool, from IoTize Studio or a command interpreter, to generate local IoTize apps, but we do not recommend this solution. You must install all the required tools on your computer: IoTize App Generator CLI, NodeJS, SDK, Android Studio/Xcode, Chrome.

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Product Support Resources

The latest complete information documentation are provided online at the Iotize Documentation Center:

- Software Downloads: http://docs.iotize.com/Downloads/
- TapNlink Datasheets: http://docs.iotize.com/Datasheets/
- TapNLink User Manual: http://docs.iotize.com/UserManuals/TapNLink/
- TapNLink Primer Getting Started: http://docs.iotize.com/GettingStarted/

For direct assistance from Iotize software and hardware engineering teams, please contact your reseller or email us at support@iotize.com

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Confidentiality

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