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## Hardware Reference

### iONE-BT Wireless Debugger



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iONE-BT is iSYSTEM Cortex-M debug and test tool connecting to the target microcontroller through the standard Cortex-M debug interfaces. It's used in conjunction with winIDEA IDE, which supports all iSYSTEM debug and test tools.

Its primary objection is wireless operation, which is also the reason why Cortex parallel trace is not supported. Trace support would require a high bandwidth communication channel to the PC. iONE-BT is very compact in size (44 mm x 25 mm x 13 mm), which makes possible building it into almost any target application (e.g. cordless drill machine, cordless lawn mower, cordless vacuum cleaner, etc.), which can then be debugged and tested without any wires (range up to 10m without physical obstacles like walls, metal housing,...). iONE-BT communicates to the PC, where winIDEA is running, through a wireless link. iBRIDGE-BT (USB stick form) which inserts into the PC USB port, acts as a wireless link to the iONE-BT.

As an alternative, iONE-BT can be also directly connected to the PC via the USB connection.

Minimum setup is sold as a bundle under the ordering code IW-IONE-BT-CORTEX-M and consists of:

- iONE-BT
- iBRIDGE-BT
- winIDEA license

Three different power supply modules are available for use cases where target cannot provide sufficient power supply for iONE-BT operation.

Wireless debugger can be built from the following parts:

- ***iONE-BT***

<b>Ordering code</b>	<b>IW-IONE-BT101</b>
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iONE-BT is a basic part of the wireless debugger setup. It's a small piece of hardware which connects through the debug interface to the Cortex-M target microcontroller and it communicates to the PC either over the wireless communication or over the USB.



Package content:

- iONE-BT101 with 10-pin 1.27 mm Cortex Debug pinout
- 15 cm Cortex debug cable with 20-pin 1.27 mm Cortex Debug + Trace connector
- 15 cm Cortex debug cable with 10-pin 1.27 mm Cortex Debug connector
- Micro USB cable

- **iBRIDGE-BT**

Ordering code	IW-BRIDGE-BT1
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When iONE-BT is not connected to the PC via the USB cable, iBRIDGE-BT acts as a wireless link between iONE-BT and the PC. iBRIDGE-BT is the USB 2.0 compliant device and connects to the PC USB port.



*iBRIDGE-BT device*

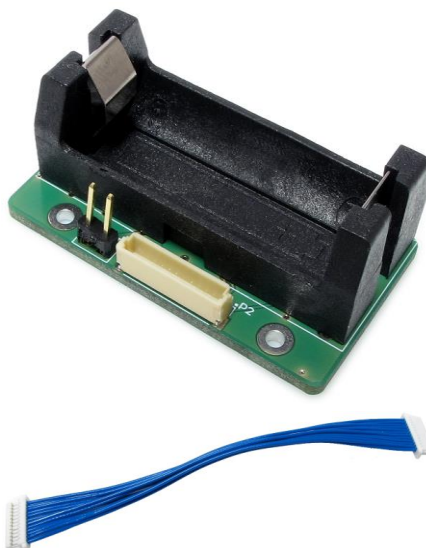
- **iONE-BT CR123 Power Supply**

Ordering code	IW-PS-3V-CR123
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When target application cannot provide sufficient power for iONE-BT operation, one of the three backup power supply modules can be used to supply the required power for iONE-BT.

This module is based on the CR123 Lithium battery. It should be used when battery replacement is possible. It provides a little bit shorter iONE-BT autonomy comparing to the IW-PS-3V-AA module but on the other hand it's smaller in size and may fit into the target application housing where IW-PS-3V-CR123 would not.

The battery is not shipped with the module since a special handling is required for all air shipments of lithium batteries. The CR123 battery is widely used and shouldn't be difficult to get.



Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{IN}$	Input Voltage		3.15		3.6	V
$V_{OUT}$	Output Voltage	$I_{OUT} = 50 \text{ mA}$		3.0		V
$I_{OUT}$	Output Current				150	mA
$t_{BKP}^1$	Backup Time	$I_{OUT} = 50 \text{ mA}$			1400	Min

Note 1: The maximum backup time depends on selected batteries.

- ***iONE-BT 2xAA Power Supply***

<b>Ordering code</b>	<b>IW-PS-3V-AA</b>
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When target application cannot provide sufficient power for iONE-BT, one of the three backup power supply modules must be used in conjunction with iONE-BT.

This module is based on two standard AA type batteries. It should be used when battery replacement is possible and size isn't a concern. It is shipped without batteries due to the potential risk of leaking. Use alkaline type AA batteries for best performance.



<b>Symbol</b>	<b>Parameter</b>	<b>Conditions</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>
$V_{IN}$	Input Voltage		3.15		3.6	V
$V_{OUT}$	Output Voltage	$I_{OUT} = 50 \text{ mA}$		3.0		V
$I_{OUT}$	Output Current				150	mA
$t_{BKP}^1$	Backup Time	$I_{OUT} = 50 \text{ mA}$			2400	min

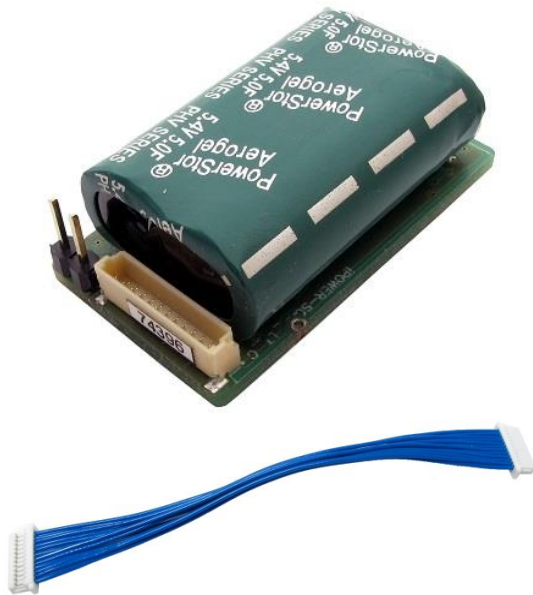
Note 1: The maximum backup time depends on selected batteries.

- ***iONE-BT SuperCAP***

<b>Ordering code</b>	<b>IW-PS-3V-SCAP</b>
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When target application cannot provide sufficient power for iONE-BT, one of the three backup power supply modules must be used in conjunction with iONE-BT.

This is a rechargeable module based on a 5 farads supercapacitor, which is charged from the target application. It should be used when battery replacement in the target application is not possible.



Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{IN}$	Input Voltage		3.15		3.6	V
$V_{OUT}$	Output Voltage	$I_{OUT} = 50 \text{ mA}$		3.0		V
$I_{OUT}$	Output Current				150	mA
$t_{BKP}^1$	Backup Time	$I_{OUT} = 50 \text{ mA}$ $V_{SCAP} = 5.3 \text{ V}$			240	s

Note 1: The maximum backup time depends on selected Mode.

On power on of the system, the rechargeable module first enters a so called Precharge mode in which iONE-BT is not active and all current taken from the target application is used for charging the rechargeable module. iONE-BT cannot be used at this stage until the Precharge mode completes. It completes when it reaches certain charge level, which is user configurable. See 'Precharge supercap first' setting explanation in the Advanced IONE-BT Configuration section later on in the document. In the same dialog, user can also configure either 'Low' or 'High' charge mode. Depending on the setting, different charge current is used. Higher charging current yields shorter charging time.

Once the Precharge mode completes, it enters a so called Charge mode and iONE-BT is ready for use.

Below tables shows current consumption of the rechargeable module in the Charge and the Precharge mode for 'Low' and 'High' charge mode.

Symbol	Parameter	Mode	Conditions	Value	Typ.	Unit
$V_{IN}$	Input Voltage	Charge	$V_{IN} = 3.3 \text{ V}$	Low	10	mA
$V_{IN}$	Input Voltage	Charge	$V_{IN} = 3.3 \text{ V}$	High	40	mA
$V_{IN}$	Input Voltage	Precharge	$V_{IN} = 3.3 \text{ V}$	Low	40	mA
$V_{IN}$	Input Voltage	Precharge	$V_{IN} = 3.3 \text{ V}$	High	80	mA

## Powering the wireless debugger

iONE-BT can be powered from different power sources:

- iONE-BT powered from the USB

When iONE-BT connects to the PC over the USB cable, it is powered from the PC USB port. Jumper on iONE-BT must be placed in position 1-2.

- iONE-BT powered from the target

iONE-BT is powered directly from the target when connected to the PC over the wireless communication. Jumper on iONE-BT must be placed in position 1-2.

- iONE-BT powered from the target with backup power supply

Primarily iONE-BT is powered from the target. Connect one of the three available backup power supply modules to iONE-BT when the target temporarily cannot provide. Jumper on iONE-BT must be placed in position 2-3 and jumper on the backup power supply module must be placed too.



*iONE-BT powered from the target with backup power supply*

- iONE-BT powered from backup power supply

iONE-BT is powered only from the backup power supply if the target cannot provide extra 50mA for iONE-BT, the backup power supply module must be used. Remove jumpers on iONE-BT and the backup power supply module.



*iONE-BT powered from the backup power supply*

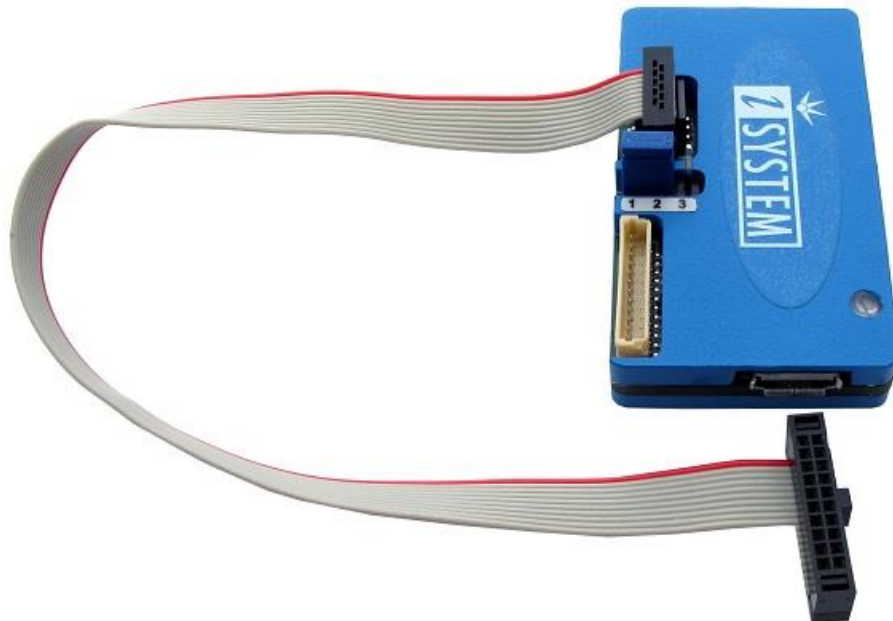
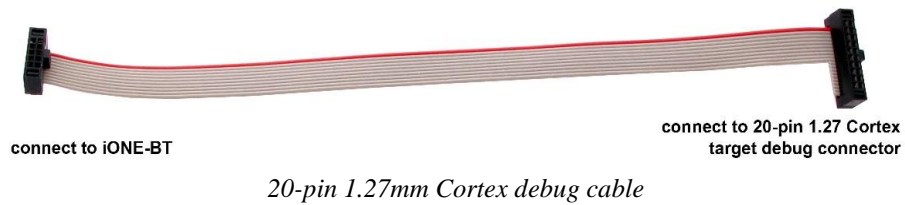
## Debug I/O Levels

iONE-BT drives debug interface signals at 3.3 V while debug inputs are 5V tolerant.

## Target Debug Connectors

Two target debug connectors are supported:

- 15 cm Cortex debug cable with 20-pin 1.27 mm Cortex Debug + Trace pinout (no parallel trace recording)



*iONE-BT ready for connecting to the target via the 20-pin 1.27 mm Cortex Debug + Trace connector*



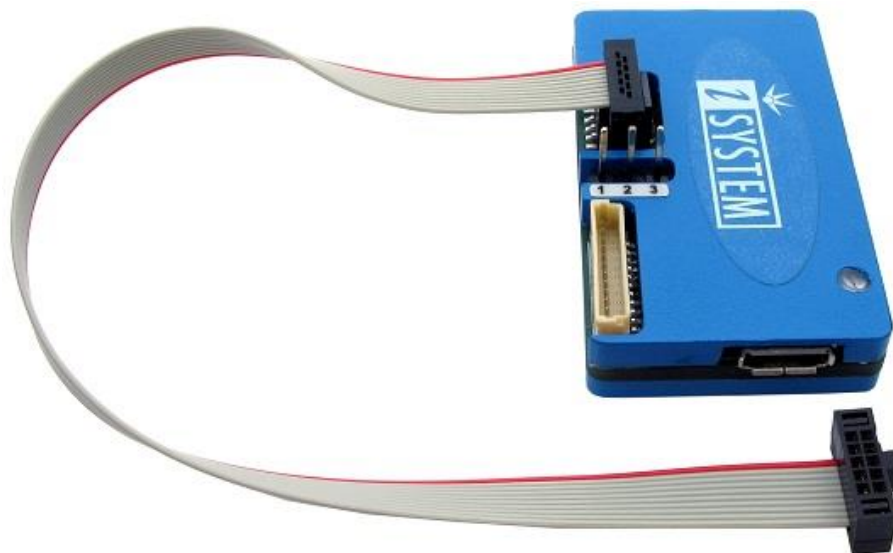
Signal direction	Signal	Pin	Pin	Signal	Signal direction
I	V <sub>Tref</sub>	1	2	SWDIO/TMS	I/O
	GND	3	4	SWCLK/TCK	O
	GND	5	6	SWO/TDO	I
	GND	7	8	EXTB/TDI	O
	GND	9	10	RESET	I/O
I	NC	11	12	NC	I
I	NC	13	14	NC	I
I	NC	15	16	NC	I
I	NC	17	18	NC	I
I	NC	19	20	NC	I

*20-pin 1.27mm Cortex Debug + Trace pinout*

- 15 cm Cortex debug cable with 10-pin 1.27mm Cortex Debug



*10-pin 1.27mm Cortex debug cable*



*iONE-BT ready for connecting to the target via the 10-pin 2.54 mm Cortex Debug connector*



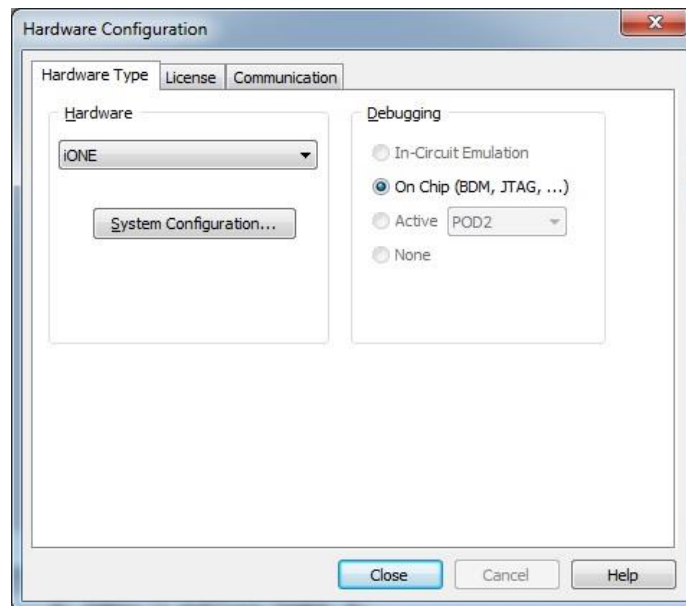
Signal direction	Signal	Pin	Pin	Signal	Signal direction
I	V <sub>Tref</sub>	1	2	SWDIO/TMS	I/O
	GND	3	4	SWCLK/TCK	O
	GND	5	6	SWO/TDO	I
	GND	7	8	EXTB/TDI	O
	GND	9	10	RESET	I/O

*10-pin 1.27mm Cortex Debug pinout*

## **Communication**

iONE-BT supports two types of communication: Bluetooth (wireless) and USB 1.1/2.0.

Specify the communication port through which iONE-BT unit connects to the PC in the “**Hardware**”>”**Hardware Type**” and select iONE.

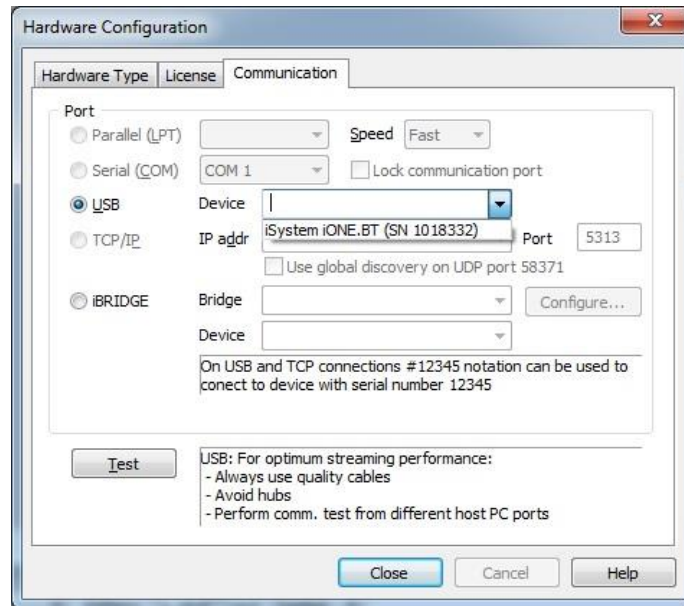


*Select iONE Hardware Type*

Under “**Communication**” pane, select type of communication.

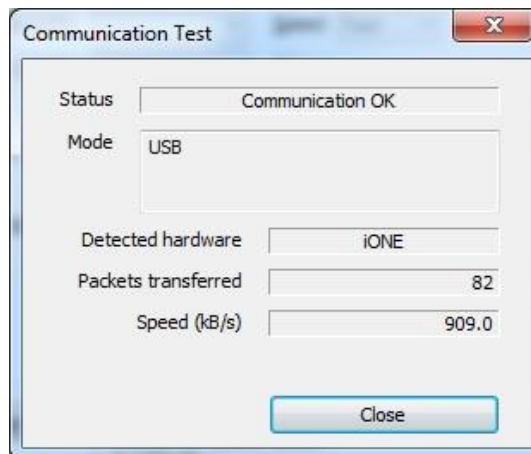
## USB

When the debugger is connected via the USB port, select it in the drop down menu. When the debugger is connected to the PC USB port for the first time, Windows OS will detect a new device and prompt you for the driver for it. Drivers are installed with winIDEA full setup.



*Select Emulator from drop down menu*

Use the “**Test**” button to test the communication settings.



*Communication Test via the USB*

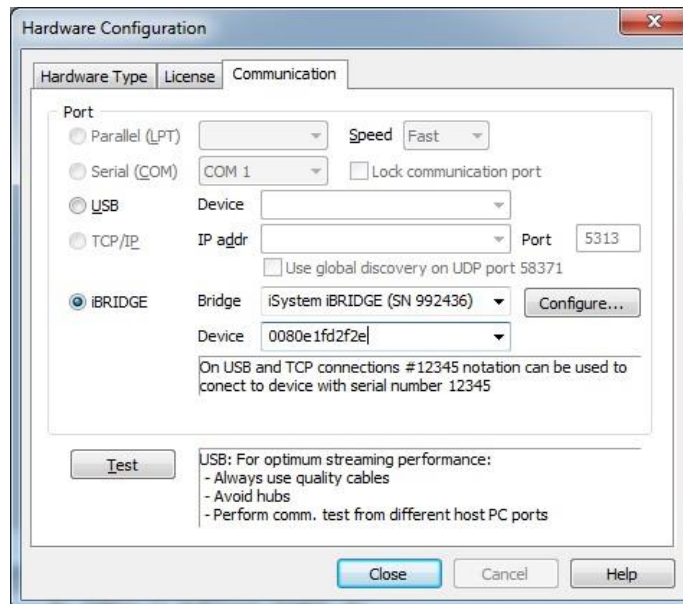
## Wireless

**Note:** When wireless type of communication is selected, Firmware update is disabled.

Connection via a wireless link is established via the iBRIDGE-BT which is connected to the PC. Select the iBRIDGE communication port. From the drop down menu select the connected iBRIDGE-BT device. Under the 'Device', type in Bluetooth serial number (BTSN) which can be found on the bottom side of iONE-BT.

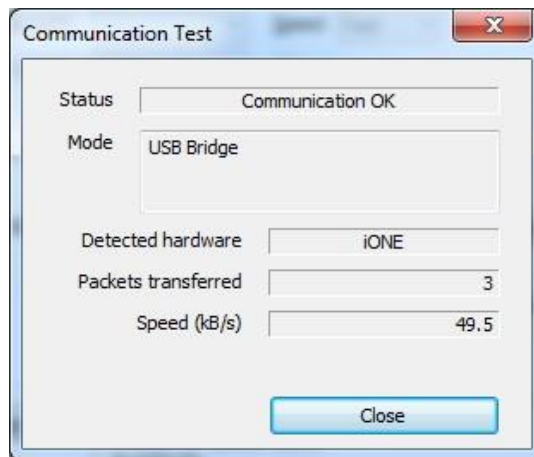


*Bluetooth serial number (BTSN)*



*Settings for wireless communication*

Use the “**Test**” button to test the communication settings.



*Communication Test via wireless link*

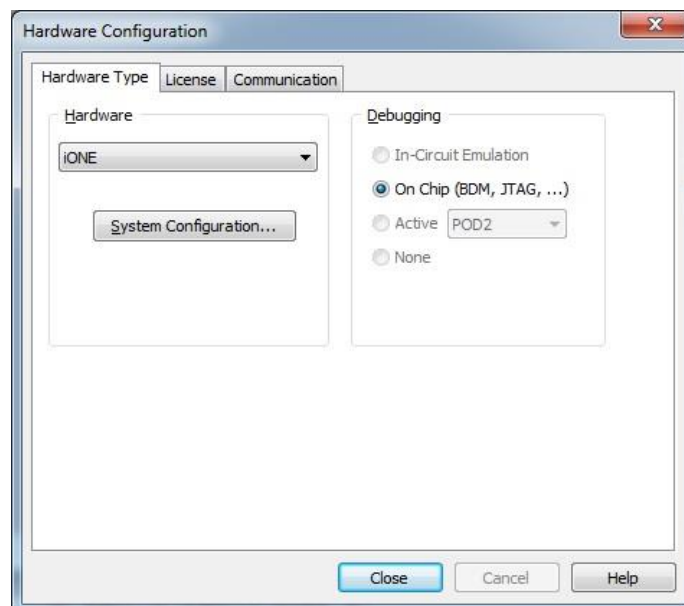
## Bluetooth Serial Number

Bluetooth serial number can be also obtained from the debugger. Connect iONE-BT to the PC via the USB. Click “**Hardware**” > “**Hardware Type**” and select iONE.

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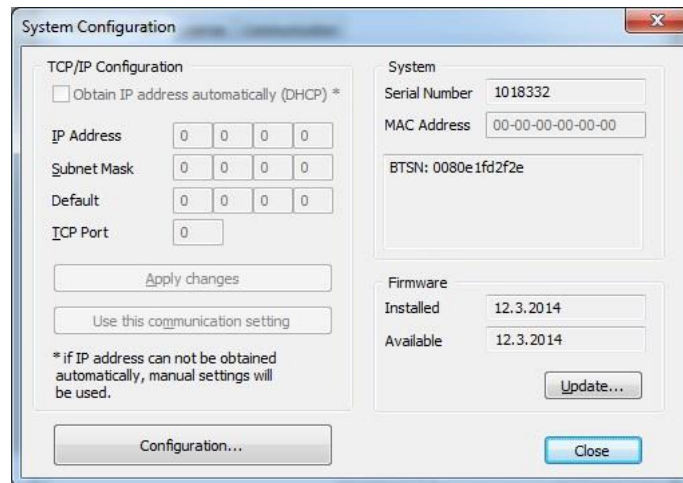
**Note:** USB port must be selected.

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*Select iONE Hardware Type*

Use the “**System Configuration...**” button. In System Configuration window Bluetooth serial number (BTSN) can be found on the right side.

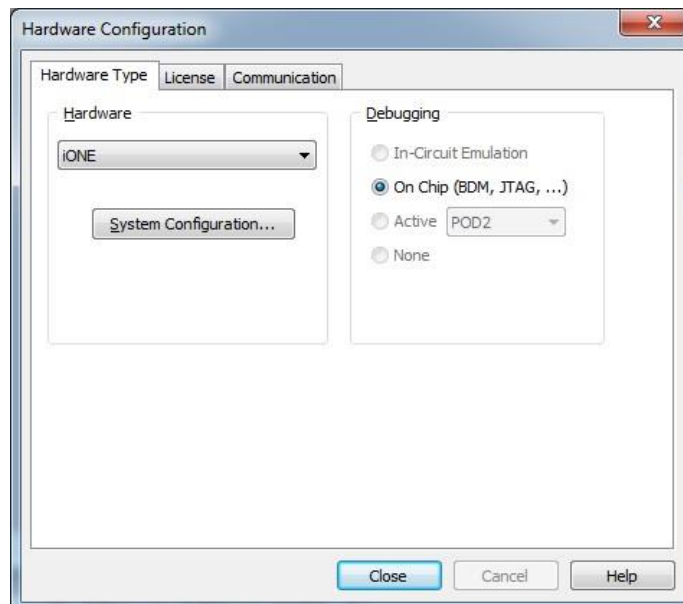


*System Configuration window*

## **Advanced iONE-BT Configuration**

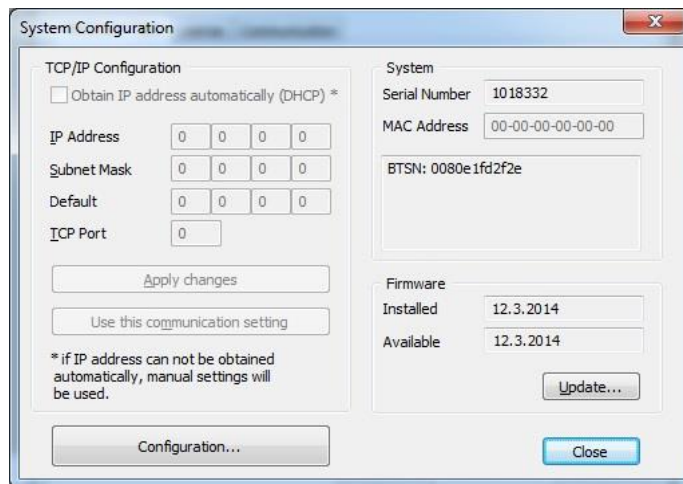
Advanced iONE-BT configuration allows user optimizing the debugger’s power consumption and customizing the IW-PS-3V-SCAP backup power supply module operation.

Click “**Hardware**” > “**Hardware Type**” and select iONE.



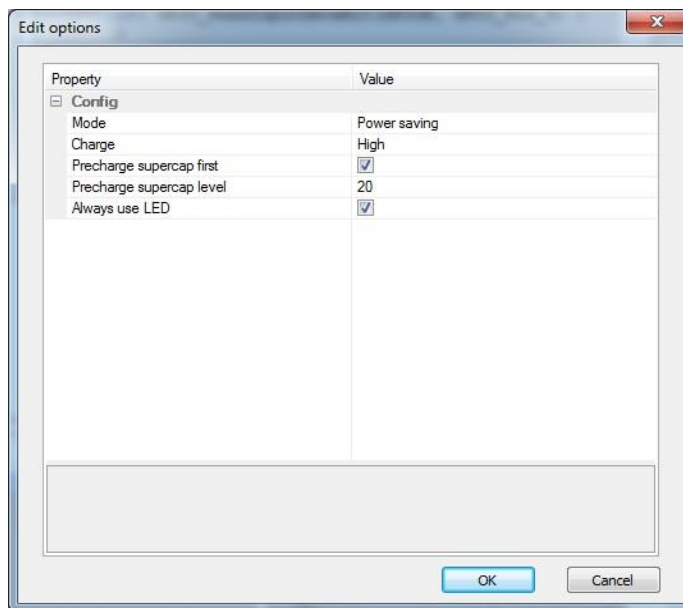
*Select iONE Hardware Type*

Use the “System Configuration...” button.



*System Configuration window*

In System Configuration window use “Configuration...” button.



*Edit options*

- Mode: When iONE-BT uses wireless communication it can operate in three different modes, each optimized for different parameters: Power saving, Balanced and Performance
  - Performance: run at maximum speed.
  - Balanced: run at reduced speed.
  - Power saving: run at reduced speed and without optional debug engine (WD reset, DAQ).

Mode	Current Consumption <sup>1</sup>
Performance	100 mA
Balanced	55 mA
Power saving	50 mA

Note 1: RMS current measured during communication test.

- Always use LED: LED is used independently of the selected Mode.

The following options apply only when the IW-PS-3V-SCAP backup power supply module is used as a power source.

- Charge: select charging current during operation and pre-charge.
- Precharge supercap first: Pre-charge super-cap immediately after power up.
- Precharge supercap level: super-cap will be pre-charged to selected level. Level means amount of stored energy.

## Backup Supply Status

In case of the IW-PS-3V-SCAP backup power supply module, a power supply status can be monitored via the Measurement plugin, which opens under “**Plugins**” > “**Measurement**”. The amount of available backup energy is specified in percentage. Once the capacity goes below 10%, the value doesn’t change anymore and it is advised to start recharging or exchanging the module.

Item	Value	Description
Run Duration	0.00 s	Duration of running
Vref	3.23 V	Measured reference voltage
Backup Supply	29 %	Backup supply voltage.

*Measurement plugin*

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