RH4Z2501-KIT

Quick Start Guide

Introduction

This document will guide you step by step to use the RH4Z2501-KIT, its main features and the necessary hardware setup to implement an IO-link network using different approaches.

Target Device

RH4Z2501: IO-Link transceiver with integrated protection

Contents

1. HW Setup

The following hardware tools are necessary in order to fully evaluate the possibilities of the RH4Z2501. The hardware and software ecosystem have been developed to provide you a quick start and an easy understanding of the IO-Link fieldbus functionalities and specificities.

This application note assumes the availability of the following devices/development boards. Please check with your Renesas representatives or the Renesas website on how to obtain these devices/development boards:

HW:

- RH4Z2501-KIT
- SSCCOMMBOARDV4P1C
- **An IO-Link Master Gateway:** Available from a 3rd party company of your choice. We will here use the TMG-USB IO-Link Master V2 SE or the RZ/N1S IO-Link Master Solution.

SW:

- TMG IO-Link Device tool: https://www.tmgte.de/en/products/io-link/io-link-device-tool-standard-edition.html

1.1 RH4Z2501-KIT

1.2 SSCCOMMBOARDV4P1C

This boards acts as an interface between a GUI (or a terminal) and the target to interact with it via commands processed according to the One-Wire-Interface (OWI) standard.

1.3 IO-Link Master

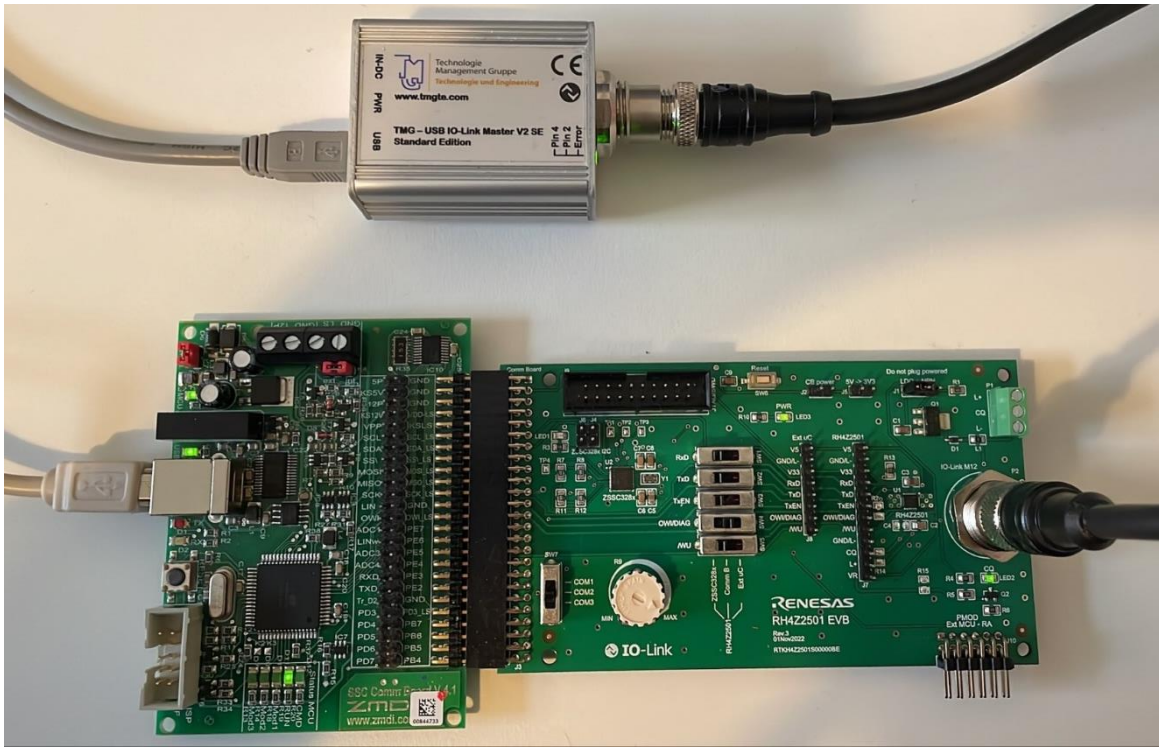
We will here use the TMG-USB IO-Link Master V2 SE or the RZ/N1S IO-Link Master development kit.

Be aware that some RZ/N1S IO-Link Master development kit are available for rent:
https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rz-cortex-a-mpus/io-link-master-development-kit-io-link-master-development-kit

Please check with your Renesas representatives or the Renesas website on how to obtain this devices/development boards.

2. Using the onboard ZSSC3281

2.1 Setup description



Do **NOT** close J2 when using the SSC Communication Board at the same time as powering the board via the IO-Link line!

Here are the jumper settings:

Jumper/Switch	position
J1	LDO (J1_2-3)
J5	open
J2	open
SW1	ZSSC328x position
SW2	ZSSC328x position
SW3	ZSSC328x position
SW4	Comm B position
SW5	ZSSC328x position
SW7	COM3 position

2.2 FW running on the ZSSC3281

At startup, the application running on the ZSSC3281 configures its AFE to read the voltage variation induced by the potentiometer R9, configures the RH4Z2501 via OWI. Then, write/read the processed data via the IO-link device stack provided by TMG.

We (Renesas) do NOT provide the binary file to be flashed to the target for confidentiality reasons. Therefore, no FW updates can/shall be performed to the target.

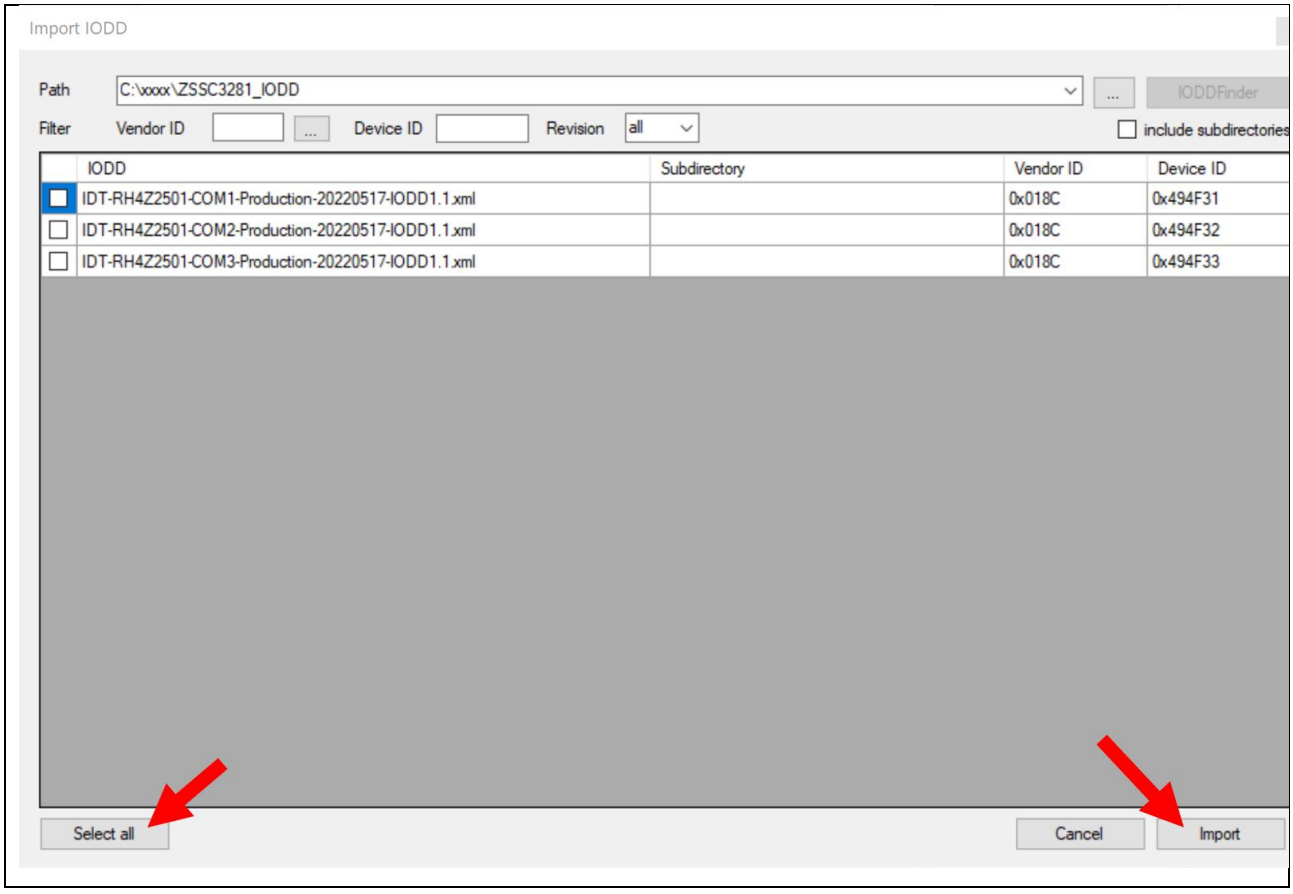
The 2 LEDs (LED2 and LED3) should switch ON when the board is powered from the IO-Link line.

2.3 Data visualization

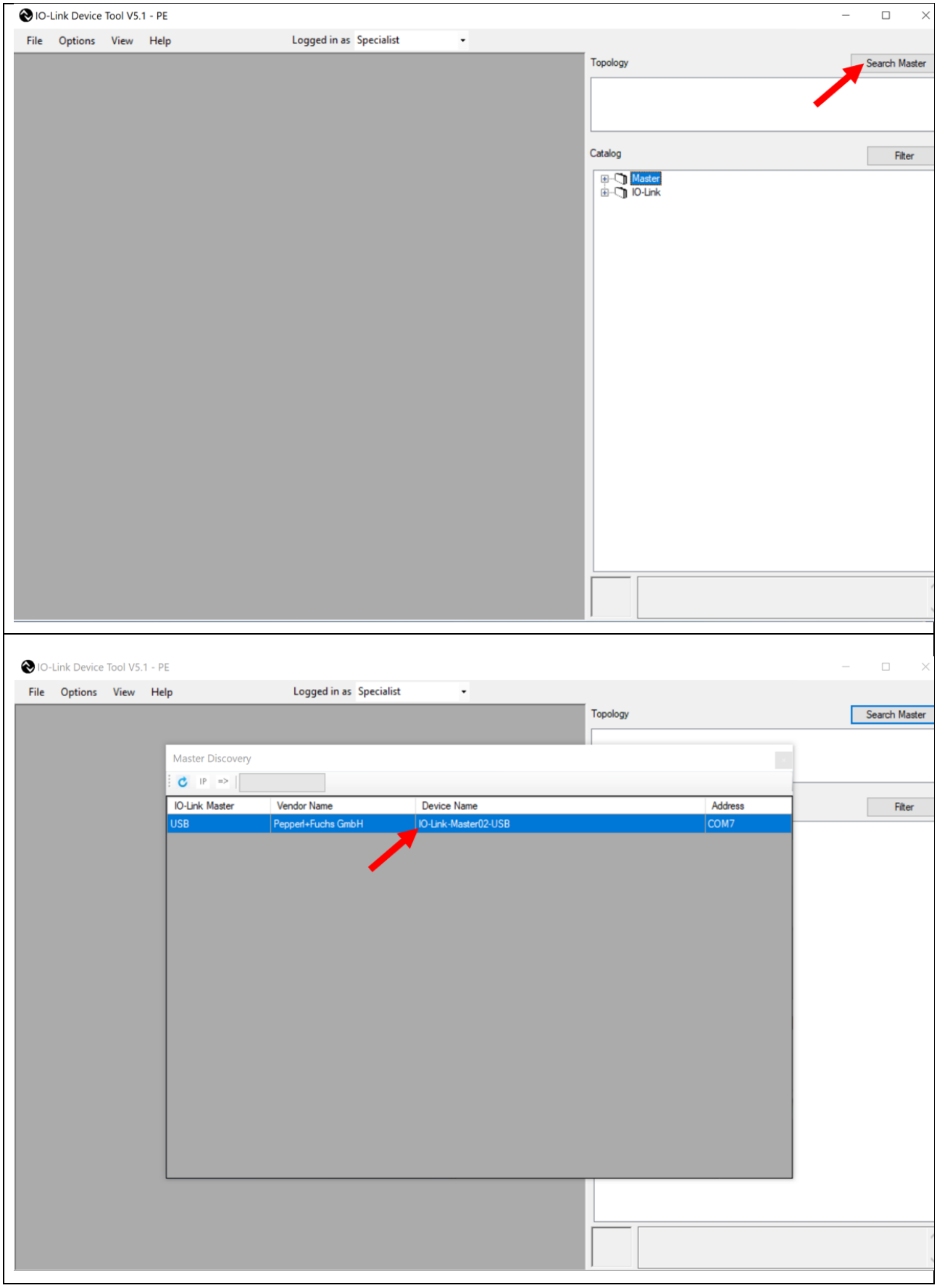
2.3.1 Import IODD file

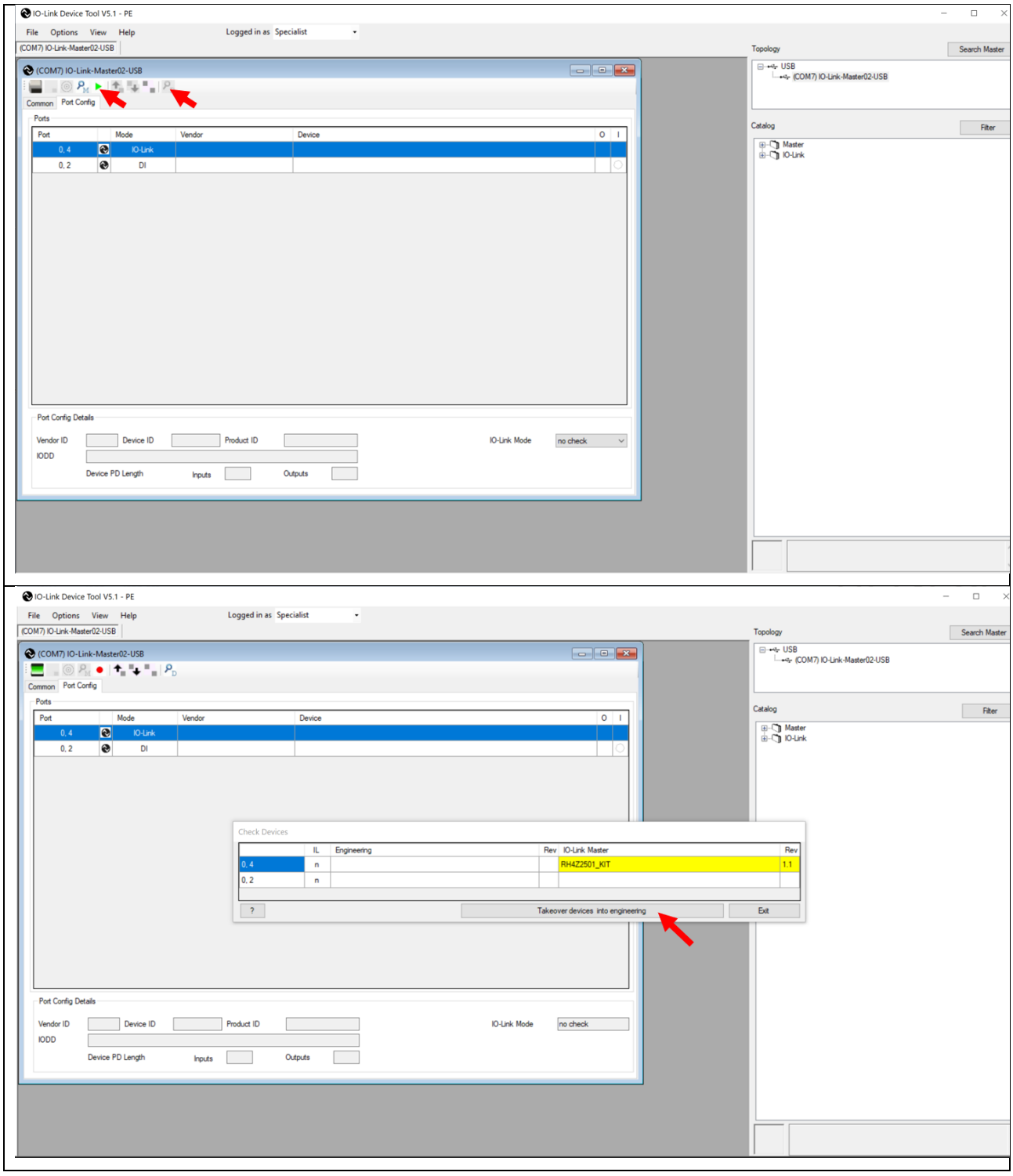
Open “IO-Link Device Tool V5.1.exe” and import the IODD file. In the menu: Option->Import IODD:

Then browse the IODD file location and click on the “import” button:

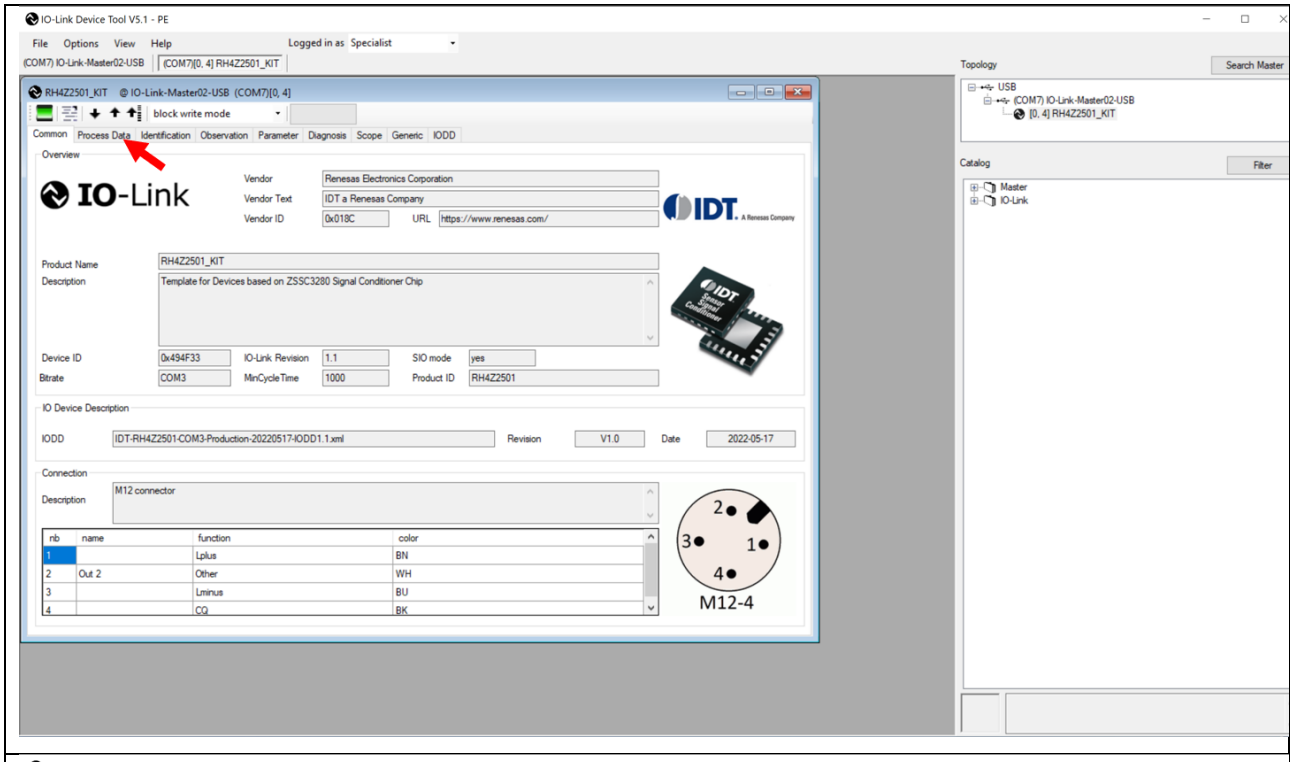


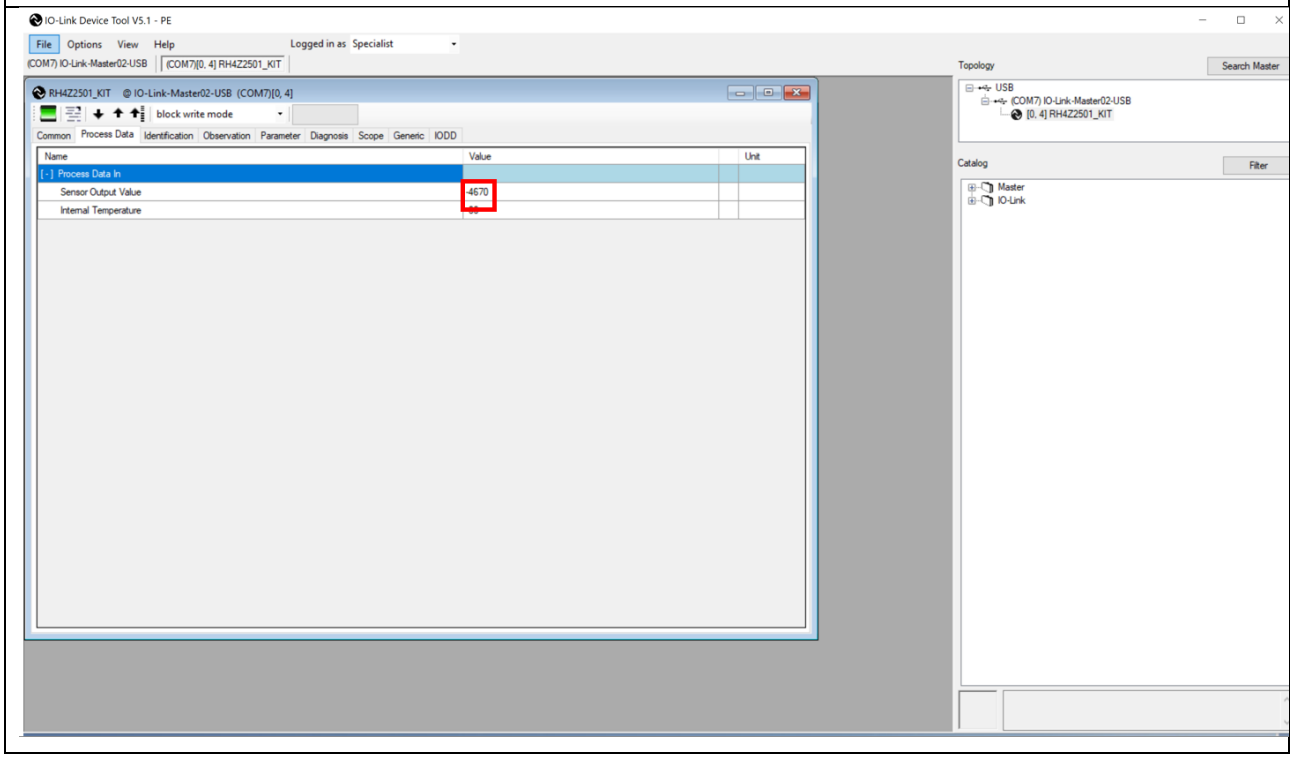
2.3.2 IO-link device detection




IO-Link Device Tool V5.1 - PE
File Options View Help
Logged in as Specialist
(COM7) IO-Link-Master02-USB
Topology
Search Master
USB
(COM7) IO-Link-Master02-USB
Catalog
Filter
Master
IO-Link
Common
Port Config
Ports
Port
Mode
Vendor
Device
O
I
0, 4
IO-Link
0, 2
DI
Port Config Details
Vendor ID
Device ID
Product ID
IO-Link Mode
no check
IODD
Device PD Length
Inputs
Outputs
Check Devices
IL
Engineering
Rev
IO-Link Master
Rev
RH4Z2501_KIT
1.1
n
?
Takeover devices into engineering
Exit

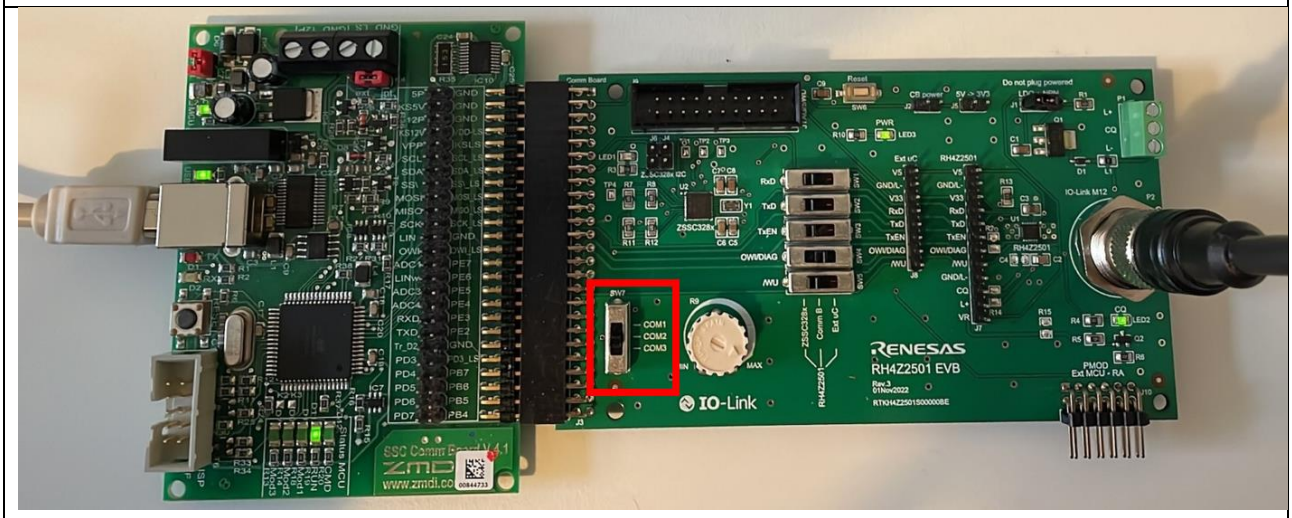
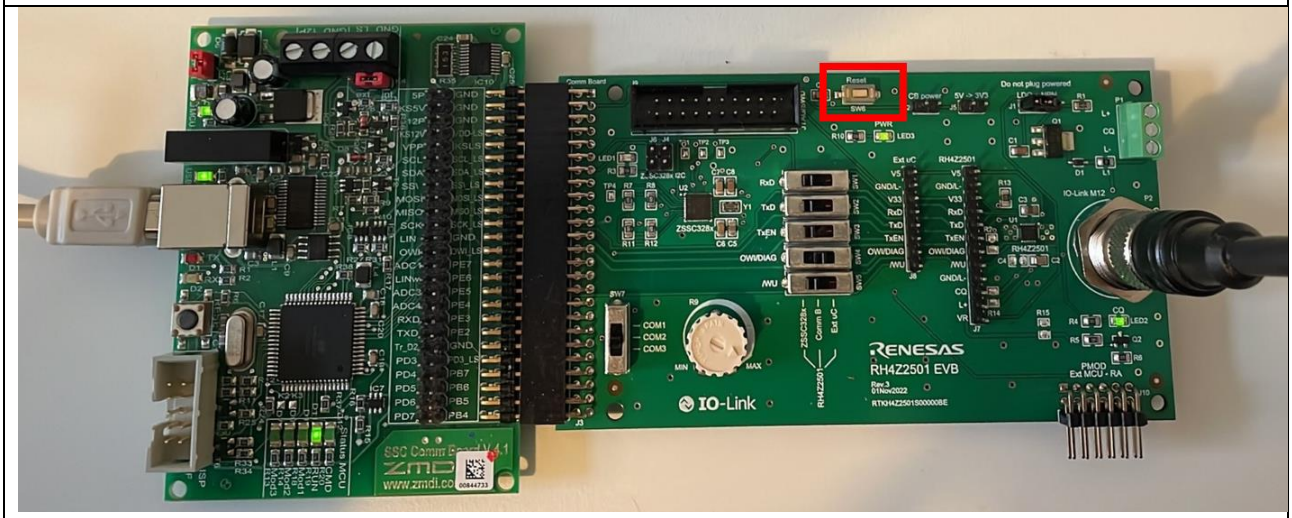
2.3.3 Processed data readings

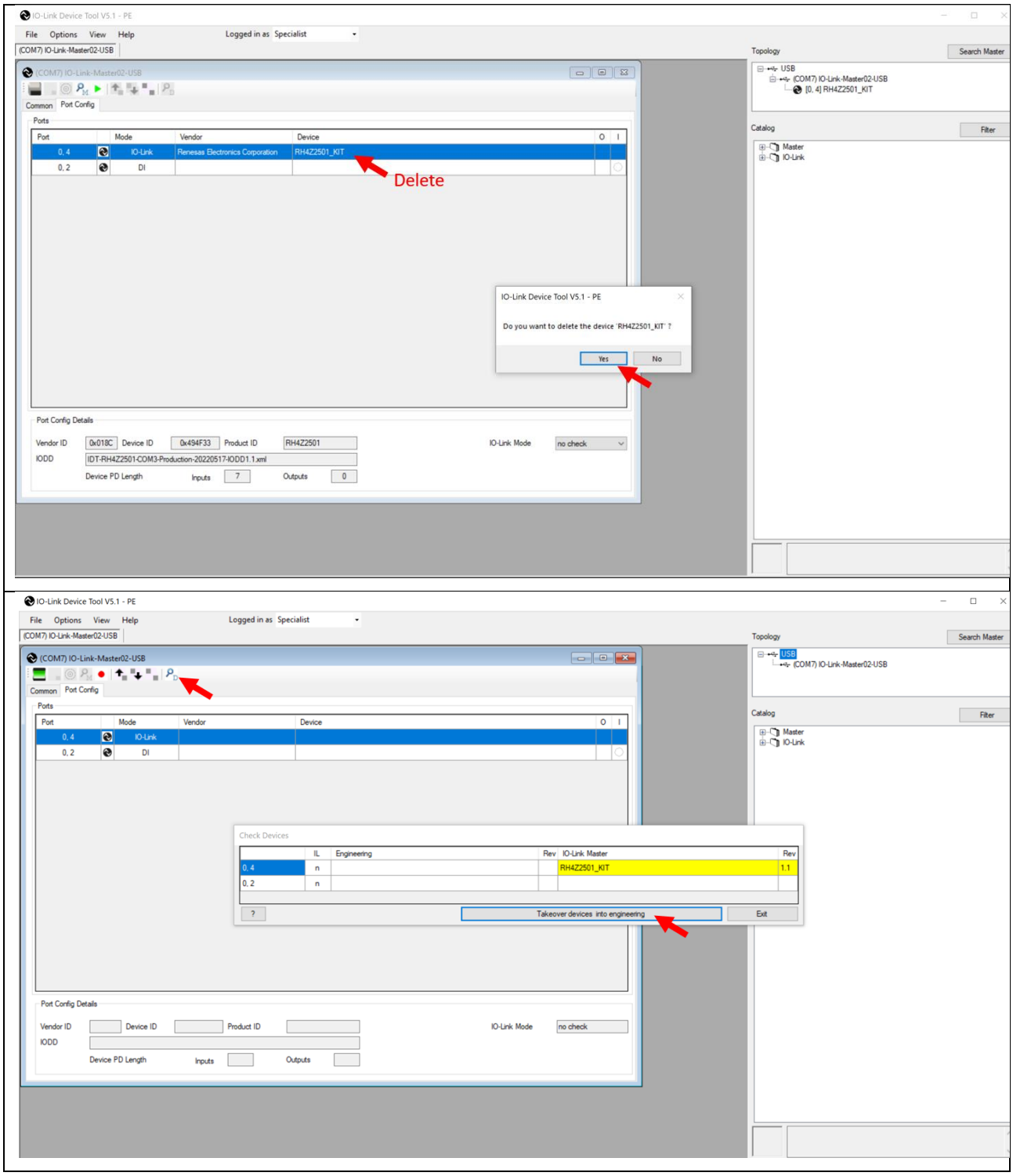


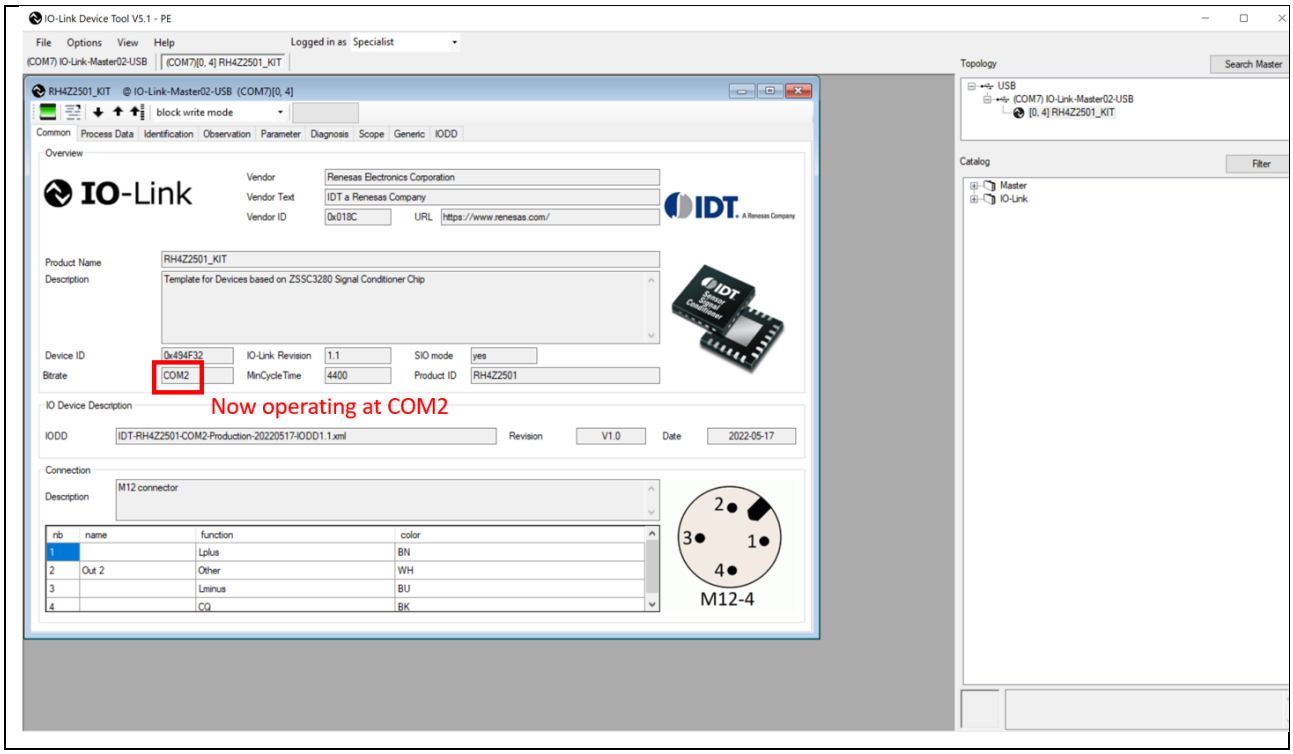


2.3.4 COM selection

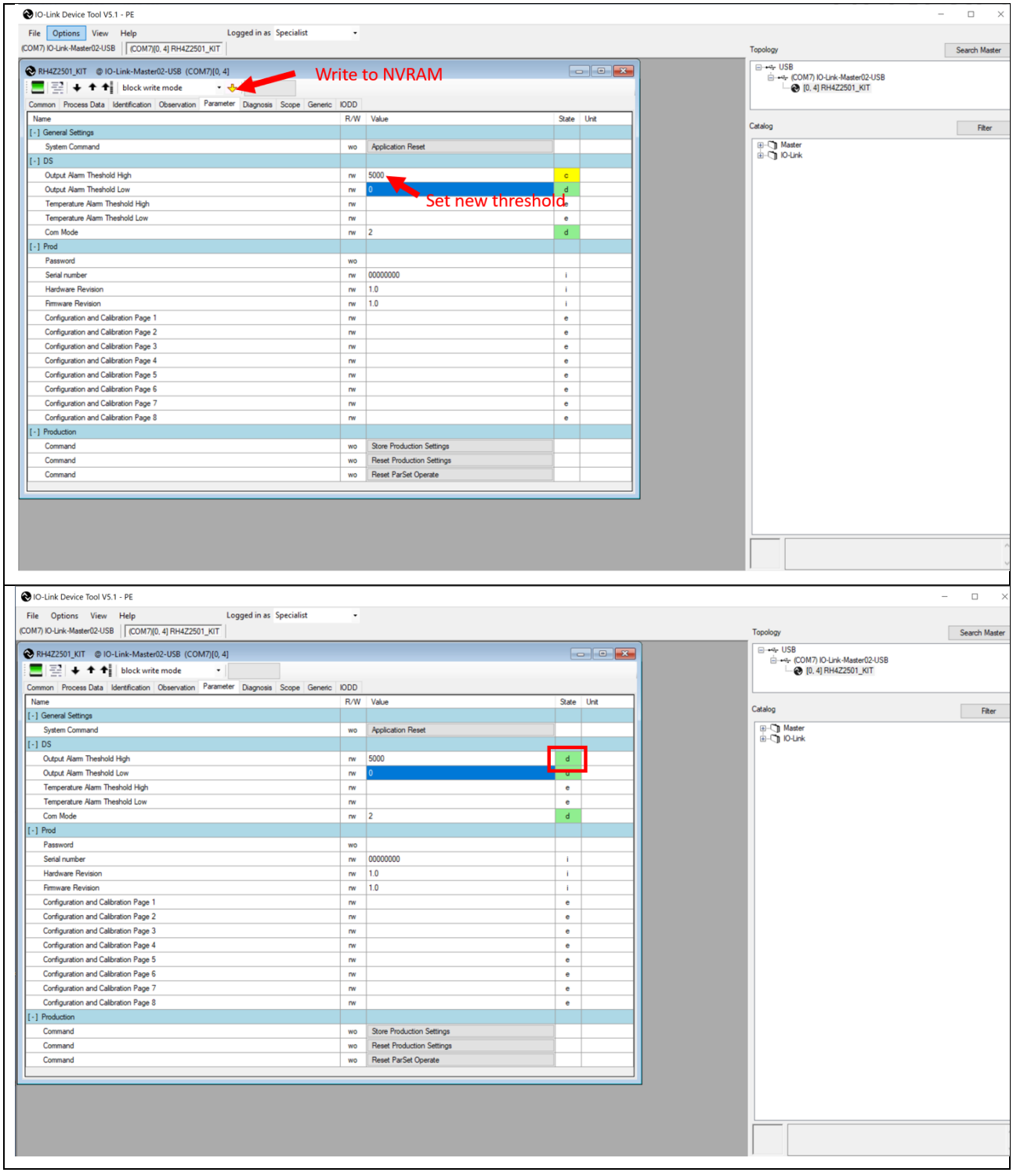
Since we do not provide the FW sources for this demonstrator, here is a method in order to switch from one COM mode to the other.

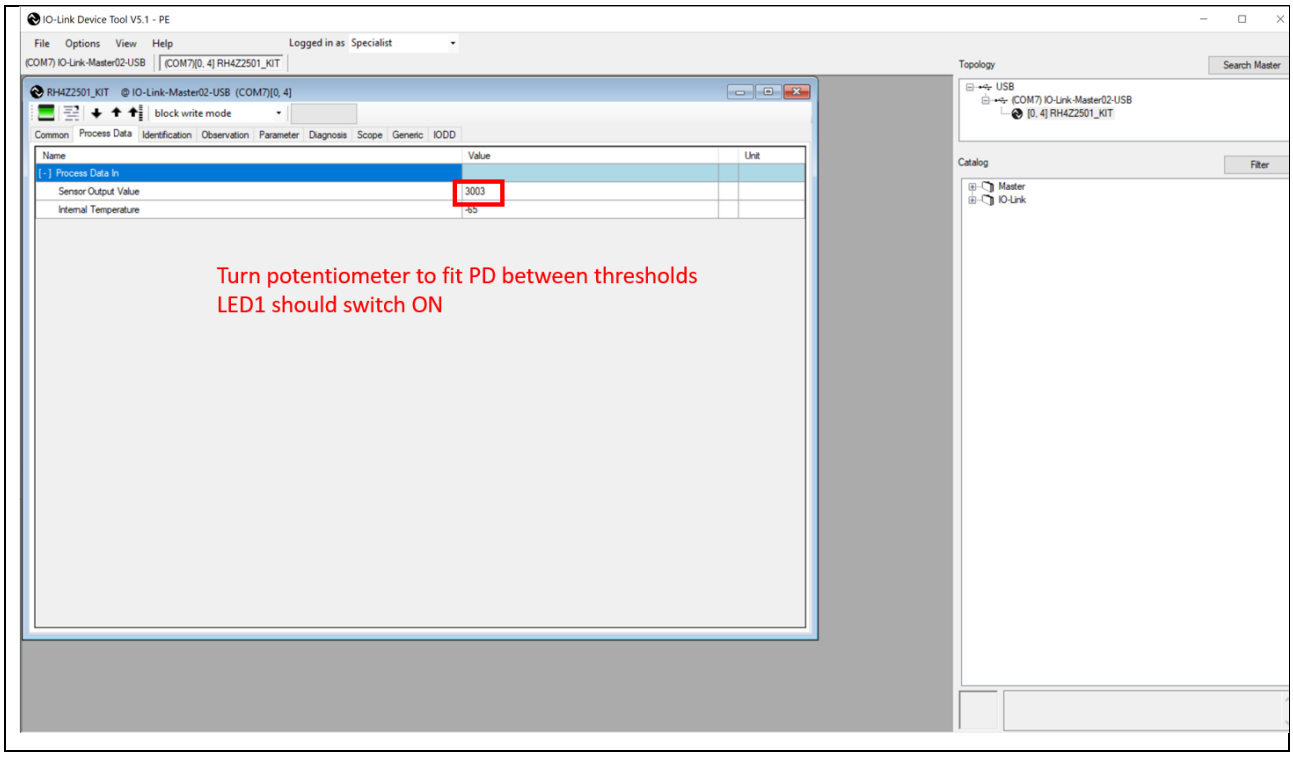
Select desired COM mode with SW7

Press reset switch SW6

Delete old IODD loaded in the tool


IO-Link Device Tool V5.1 - PE
File Options View Help
Logged in as Specialist
(COM7) IO-Link-Master02-USB
Common Port Config
Ports
Port Mode Vendor Device O I
0, 4 IO-Link Renesas Electronics Corporation RH4Z2501_KIT
0, 2 DI
Delete
Topology
Search Master
USB
(COM7) IO-Link-Master02-USB
[0, 4] RH4Z2501_KIT
Catalog
Filter
Master
IO-Link
IO-Link Device Tool V5.1 - PE
Do you want to delete the device 'RH4Z2501_KIT' ?
Yes
No
Port Config Details
Vendor ID 0x018C Device ID 0x494F33 Product ID RH4Z2501
IO-Link Mode no check
IODD IDT-RH4Z2501-COM3-Production-20220517-IODD1.1.xml
Device PD Length Inputs 7 Outputs 0
IO-Link Device Tool V5.1 - PE
File Options View Help
Logged in as Specialist
(COM7) IO-Link-Master02-USB
(COM7) IO-Link-Master02-USB
Common Port Config
Ports
Port Mode Vendor Device O I
0, 4 IO-Link
0, 2 DI
Topology
Search Master
USB
(COM7) IO-Link-Master02-USB
Catalog
Filter
Master
IO-Link
Check Devices
IL Engineering Rev IO-Link Master Rev
0, 4 n RH4Z2501_KIT 1.1
0, 2 n
?
Takeover devices into engineering
Exit
Port Config Details
Vendor ID Device ID Product ID
IO-Link Mode no check
IODD
Device PD Length Inputs Outputs


IO-Link Device Tool V5.1 - PE
File Options View Help
Logged in as Specialist
(COM7) IO-Link-Master02-USB
(COM7)[0, 4] RH4Z2501_KIT
RH4Z2501_KIT @ IO-Link-Master02-USB (COM7)[0, 4]
block write mode
Common Process Data Identification Observation Parameter Diagnosis Scope Generic IODD
Overview
IO-Link
Vendor
Renesas Electronics Corporation
Vendor Text
IDT a Renesas Company
Vendor ID
0x018C
URL
https://www.renesas.com/
Product Name
RH4Z2501_KIT
Description
Template for Devices based on ZSSC3280 Signal Conditioner Chip
Device ID
0x494F32
IO-Link Revision
1.1
SIO mode
yes
Bitrate
COM2
MinCycleTime
4400
Product ID
RH4Z2501
Now operating at COM2
IO Device Description
IODD
IDT-RH4Z2501-COM2-Production-20220517-IODD1.1.xml
Revision
V1.0
Date
2022-05-17
Connection
Description
M12 connector
nb name function color
1 Lplus BN
2 Out 2 Other WH
3 Lminus BU
4 CQ BK
M12-4
Topology
Search Master
USB
(COM7) IO-Link-Master02-USB
[0, 4] RH4Z2501_KIT
Catalog
Filter
Master
IO-Link

2.3.5 Output data threshold activation




IO-Link Device Tool V5.1 - PE
File Options View Help
Logged in as Specialist
(COM7) IO-Link-Master02-USB
(COM7)[0, 4] RH4Z2501_KIT
RH4Z2501_KIT @ IO-Link-Master02-USB (COM7)[0, 4]
block write mode
Common Process Data Identification Observation Parameter Diagnosis Scope Generic IODD
Name
Value
Unit
[-] Process Data In
Sensor Output Value
3003
Internal Temperature
-65
Turn potentiometer to fit PD between thresholds
LED1 should switch ON
Topology
Search Master
USB
(COM7) IO-Link-Master02-USB
[0, 4] RH4Z2501_KIT
Catalog
Filter
Master
IO-Link

Revision History

Rev.	Date	Description Summary
0.1	30/03/2022	Preliminary
	02/06/2022	Adaptation to HW v2
0.2	09/08/2022	Adaptation for fit with new FW running on the ZSSC3281 and new IODD
1.0	30/01/2023	Modification for HW v3

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products

   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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