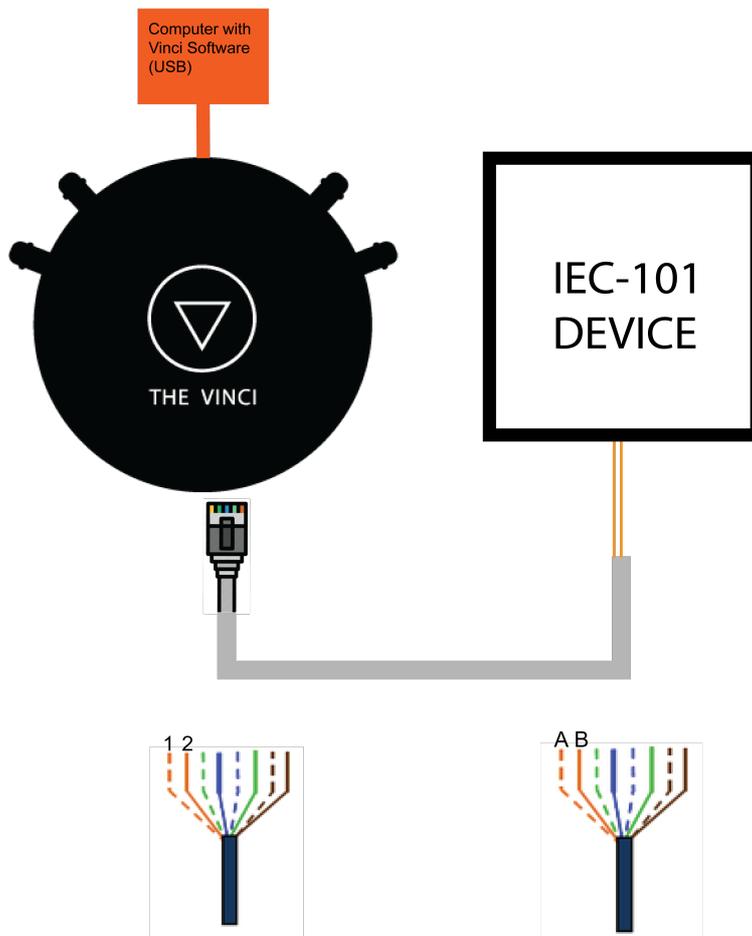


# IEC 101 Slave Simulator Tutorial

## Initial Setup

The first thing to do when setting up is to connect the IOMod to the computer using The Vinci Expert to convert from RS485 to USB. You need to connect it like in the diagram depicted below.

- Connect The Vinci Device to the computer using a micro USB cable.
- Using an ethernet cable or connect one end to the Vinci, and the other two wires to IEC101 Device A and B pins.
  - If the wire is connected using RJ-45 the A wire will be the orange striped wire and the B wire will be the single color orange wire.



**i** Standard settings in the Vinci software are for an RJ-45 cable, but it is configurable using the [Hardware](#) tab.

## Selecting protocol and mode

Protocol:	<input type="text" value="IEC 60870-5-101"/>	<input type="button" value="START"/>
Mode:	<input type="text" value="Slave"/>	

**Fig. 1. Selecting protocol and mode**

After the ethernet cable has been connected it's time to open The Vinci Software and start configuring the simulated device parameters. Since The Vinci Expert will simulate the Slave (Server) when the software is started just select the IEC 60870-5-101 protocol and select Slave mode.

# Selecting the Serial parameters

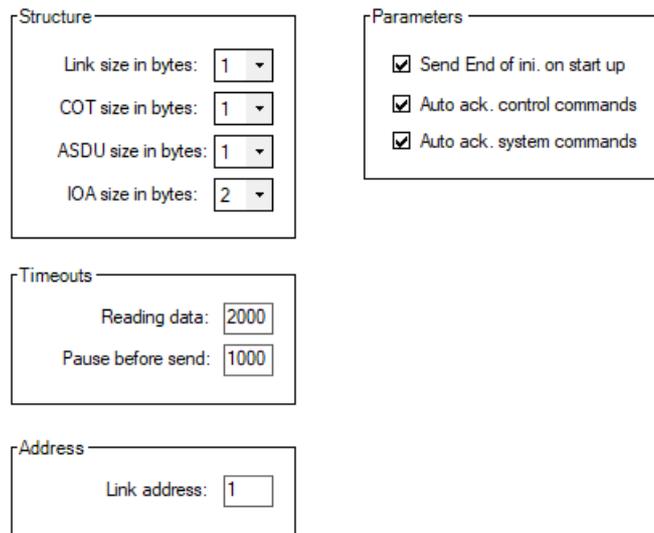


The screenshot shows a configuration interface for serial communication. It includes a 'Protocol' dropdown set to 'IEC 60870-5-101', a 'Mode' dropdown set to 'Slave', a green 'START' button, a 'Port' dropdown set to 'COM6', a 'Baudrate' dropdown set to '9600', a 'Parity' dropdown set to 'None', a 'Data bits' dropdown set to '8', and a 'Stop bits' dropdown set to 'One'.

**Fig. 2. Selecting the Serial parameters**

The next step is to choose the correct serial port for your device and then set up serial communication parameters like baudrate, parity, databits, and stopbits in accordance with your device.

# Selecting the protocol parameters

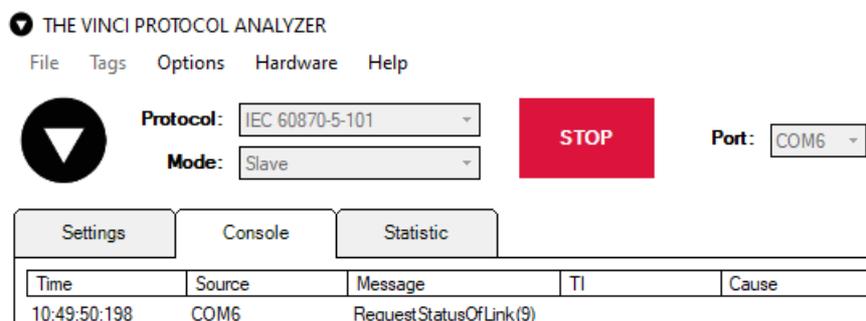


The screenshot shows a configuration interface for protocol parameters. It is divided into three sections: 'Structure', 'Timeouts', and 'Address'.  
- 'Structure' section: 'Link size in bytes' (1), 'COT size in bytes' (1), 'ASDU size in bytes' (1), and 'IOA size in bytes' (2).  
- 'Timeouts' section: 'Reading data' (2000) and 'Pause before send' (1000).  
- 'Address' section: 'Link address' (1).  
The 'Parameters' section on the right has three checked options: 'Send End of ini. on start up', 'Auto ack. control commands', and 'Auto ack. system commands'.

**Fig. 3. Selecting the protocol parameters**

Go to the settings tab when you have serial communication parameters configured. Now it's time to configure your device according to your Device settings. The defaults that are here are usually the defaults in most cases, but make sure to double-check.

# Establishing a connection with the device



The screenshot shows the 'THE VINCI PROTOCOL ANALYZER' software interface. At the top, there are menu items: File, Tags, Options, Hardware, Help. Below the menu is a navigation icon (a black circle with a white triangle pointing down). The configuration area shows 'Protocol' set to 'IEC 60870-5-101', 'Mode' set to 'Slave', a red 'STOP' button, and 'Port' set to 'COM6'. Below this are three tabs: 'Settings', 'Console', and 'Statistic'. The 'Console' tab is active, displaying a table with the following data:

Time	Source	Message	TI	Cause
10:49:50:198	COM6	RequestStatusOfLink(9)		

**Fig. 4. Establishing a connection with the device.**

Pressing the green "START" button should establish serial communication with the device. After the device responds with link status tags can be sent. Tags can be found on the right side of the Vinci software in the system tab.

# Simulating an IOMod

This example will show how to simulate an IOMod using Vinci Protocol Analyzer. In the example below 4RTD IOMod is simulated.

Firstly, to simulate an IOMod tags should be created by clicking "Add" button. Tags are simulating signals that would be otherwise sent by a real IOMod (4RTD in this case).

The screenshot shows a software interface with two tabs: 'Tags' and 'System'. The 'Tags' tab is active, displaying a list of tag names: RTD1, RTD2, RTD3, and RTD4. Below the list, there are four buttons: 'Add', 'Edit', 'Delete', and 'Send'.

**Fig. 5. Tags section.**

In order to create a tag some values from Excel configuration will be required.

signal_name	device_alias	signal_alias	source_device_alias	source_signal_alias	enable	units	add	multiply	math_expression	min_value	max_value	absolute_threshold	threshold_units	suppression_time_ms	suppression_values	log	gi	common_address	info_address	data_type
RTD1	IOMod4	RTD1			1						0	real			0	1	1	1	36	
RTD2	IOMod4	RTD2			1						0	real			0	1	1	2	36	
RTD3	IOMod4	RTD3			1						0	real			0	1	1	3	36	
RTD4	IOMod4	RTD4			1						0	real			0	1	1	4	36	

**Fig. 6. Signals sheet of 4RTD IOMod.**

In the picture below a tag creation window is shown. It opens after clicking "Add" button. To create a tag the Name has to be specified. After that the Type has to be specified. The type can be found in "data\_type" column of Excel configuration. After that "loa" has to be specified. Its value for each tag can be found in "info\_address" column. Lastly, a random value can be specified in "Value" box. Finally the tag can be saved by clicking "Save" button.

Tag

Name:

Type:

Asdu:  Ioa:  Value:

Quality:

BL  SB  NT  IV  OV

Time:

PC

Lookup values:

Use

**Fig. 7. Tag creation window.**

The created tags can be seen in WCC Lite Imported Signals section in browser.

Device	Signal	Value	Units	State	Attributes	Time
IOMod 4RTD	RTD1	10			asdu=1,cot=20,ioa=1,org=0,type=float	2023-05-02 16:59:58.20
IOMod 4RTD	RTD2	17			asdu=1,cot=20,ioa=2,org=0,type=float	2023-05-02 17:07:21.72
IOMod 4RTD	RTD3	15			asdu=1,cot=20,ioa=3,org=0,type=float	2023-05-02 17:16:26.86
IOMod 4RTD	RTD4	12			asdu=1,cot=20,ioa=4,org=0,type=float	2023-05-02 17:16:49.42

**Fig. 8. Imported Signals tab in browser.**

They can also be seen in Statistics section of Vinci application.

THE VINCI PROTOCOL ANALYZER

File Tags Options Hardware Help

Protocol:  Mode:   Port:  Baudrate:  Parity:  Data bits:  Stop bits:

TI	Cause	ASDU	IOA	Value	Status	TimeTag	Name	Count
C_IC_NA_1 (100)	Pos. ActTerm (10...	1	0		Global			150
M_ME_TF_1 (36)	Inrogen (20)	1	1	10		2023-5-2 13:59:5...	RTD1	48
M_ME_TF_1 (36)	Inrogen (20)	1	2	17		2023-5-2 14:7:21:...	RTD2	29
M_ME_TF_1 (36)	Inrogen (20)	1	3	15		2023-5-2 14:16:2...	RTD3	21
M_ME_TF_1 (36)	Inrogen (20)	1	4	12		2023-5-2 14:16:4...	RTD4	21

**Fig. 9. Previously created tags in Statistics section of Vinci.**

The state of the signals can be changed in System section of Vinci application by ticking Test or/and P/N options.

**Fig. 10. Selecting Test and P/N options.**

The change of signal states will be seen in WCC Lite Imported Signals section in browser.

Device	Signal	Value	Units	State	Attributes	Time
IOMod 4RTD	RTD1	10		cotn,test	asdu=1,cot=20,ioa=1,org=0,type=float	2023-05-02 16:59:58.20
IOMod 4RTD	RTD2	17		cotn,test	asdu=1,cot=20,ioa=2,org=0,type=float	2023-05-02 17:07:21.72
IOMod 4RTD	RTD3	15		cotn,test	asdu=1,cot=20,ioa=3,org=0,type=float	2023-05-02 17:16:26.86
IOMod 4RTD	RTD4	12		cotn,test	asdu=1,cot=20,ioa=4,org=0,type=float	2023-05-02 17:16:49.42

**Fig. 11. Changed State of signals after selecting Test and P/N options.**