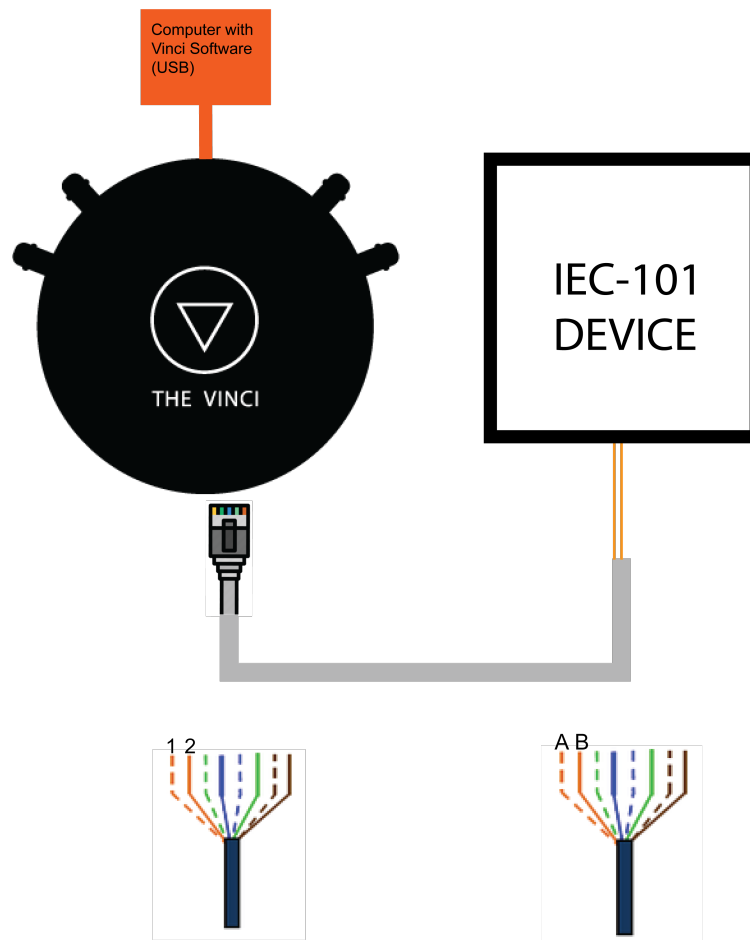


IEC 101 Slave Simulator Tutorial

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.

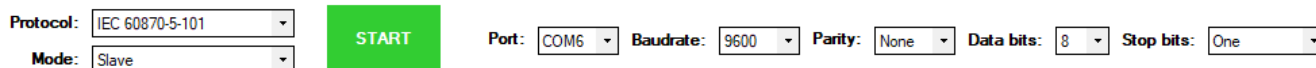
Selecting protocol and mode

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



Protocol: IEC 60870-5-101 Mode: Slave

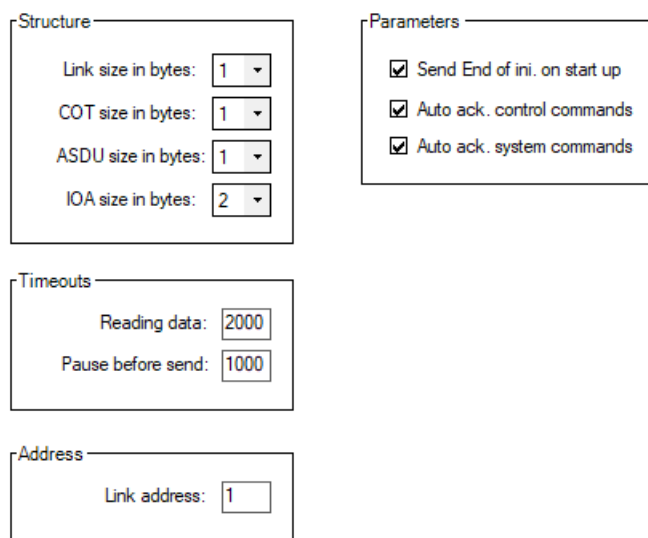
START

Port: COM6 Baudrate: 9600 Parity: None Data bits: 8 Stop bits: 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



Structure

Link size in bytes: 1

COT size in bytes: 1

ASDU size in bytes: 1

IOA size in bytes: 2

Parameters

☒ Send End of ini. on start up

☒ Auto ack. control commands

☒ Auto ack. system commands

Timeouts

Reading data: 2000

Pause before send: 1000

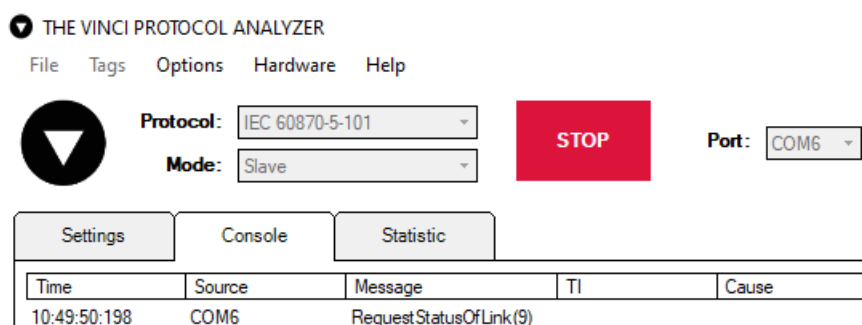
Address

Link address: 1

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 VINCI PROTOCOL ANALYZER

File Tags Options Hardware Help

Protocol: IEC 60870-5-101 Mode: Slave

STOP

Port: COM6

Settings Console Statistic

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).

TagsSystem

Name

RTD1

RTD2

RTD3

RTD4

Add

Edit

Delete

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:

RTD3

Type:

M_ME_TF_1 (36)

Asdu:

1

IoA:

3

Value:

15

Quality:

☐ BL
☐ SB
☐ NT
☐ IV
☐ OV

Time:

☐ PC

2023-05-02 02:16:26

Lookup values:

☐ Use

Save

Cancel

Fig. 7. Tag creation window.

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

PROTOCOL HUB

STATUS


SYSTEM

SERVICES

NETWORK

USERS

LOGOUT (ROOT)



WCC LITE

CONFIGURATION

IMPORTED SIGNALS

EVENT LOG

PROTOCOL CONNECTIONS

SCRIPT-RUNNER

IMPORTED SIGNALS

Device	Signal	Value	Units	State	Attributes	Time
<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
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:

IEC 60870-5-101

Mode:

Slave

STOP

Port:

COM6

Baudrate:

9600

Parity:

Even

Data bits:

8

Stop bits:

One

Settings

Console

Statistic

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.

Tags

System

APDU

ASDU: 1

Originator: 1

☒ Test

☒ P/N

End of Initialization

Send

☐ LPC

COI: 0

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

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

PROTOCOL HUB

STATUS

SYSTEM

SERVICES

NETWORK

USERS

LOGOUT (ROOT)

WCC LITE

CONFIGURATION

IMPORTED SIGNALS

EVENT LOG

PROTOCOL CONNECTIONS

SCRIPT-RUNNER

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