

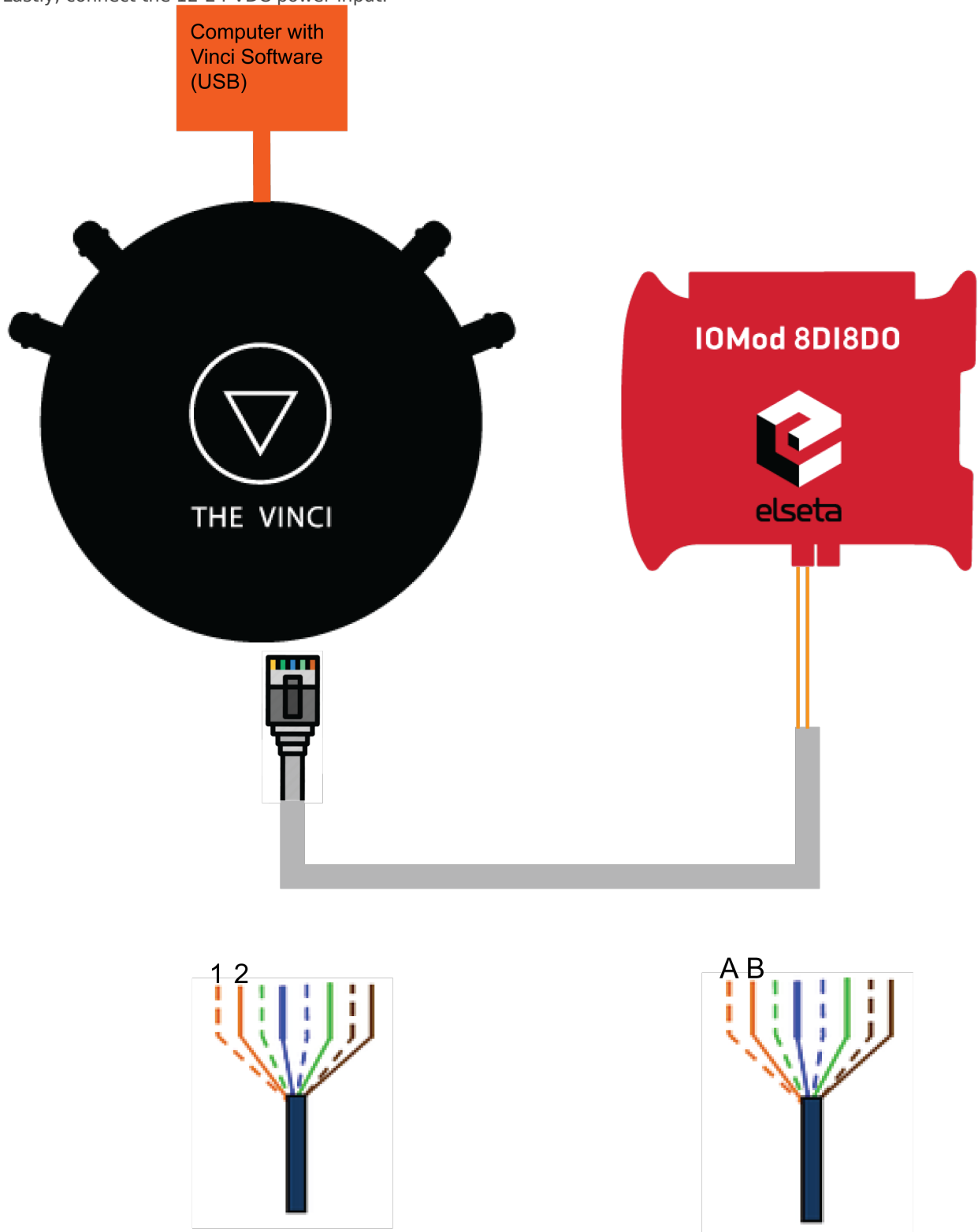
How To

Explaining documents on how to set up.

- [Testing IOMod 8DI8DO IEC-103](#)
- [IEC 104 Slave Simulator for SCADA System](#)
- [IEC-104 Master SCADA Setup](#)
- [IEC 101 Master Simulator Tutorial](#)
- [IEC 101 Slave Simulator Tutorial](#)

Initial Setup

- Connect The Vinci Device to the computer using a micro USB cable.
- Using an ethernet cable connect one end to the Vinci, and the other two wires to IOMod 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.
- Lastly, connect the 12-24 VDC power input.



To test IOMod with default settings, the user connects the device through RS485 to IEC 60870-5-103 master. For example, using “The Vinci Expert” as a serial interface converter and adapter to PC with “The Vinci” software. When opening “The Vinci” software, choose IEC 60870-5-103 – Master mode. Initial settings – 9600 baud rate; 8 data, no parity, 1 stop bit. Press Start, send Time synchronization, General interrogation, and go to the “Statistic” tab:

The screenshot displays the 'THE VINCI PROTOCOL ANALYZER' software interface. The 'Statistic' tab is active, showing a table of protocol events. The 'System' tab on the right contains controls for APDU, General Interrogation, Clock synchronization, and General Command.

Ti	Cause	ASDU	FUN	INFO	INDEX	Value	Status	Time Tag	Name	Count
StartOfGeneralInt...	GeneralInterrogati...	1	0	0	0	1				2
Time Tagged Mes...	GeneralInterrogati...	1	128	1	0	0x(1)	SIN:1	17:14:20:248		2
Time Tagged Mes...	GeneralInterrogati...	1	128	2	0	0x(1)	SIN:1	17:14:22:319		2
Time Tagged Mes...	GeneralInterrogati...	1	128	3	0	0x(1)	SIN:1	17:14:24:392		2
Time Tagged Mes...	GeneralInterrogati...	1	128	4	0	0x(1)	SIN:1	17:14:26:472		2
Time Tagged Mes...	GeneralInterrogati...	1	128	5	0	0x(1)	SIN:1	17:14:28:568		2
Time Tagged Mes...	Command (20)	1	128	6	0	0x(1)	SIN:16	17:29:45:98		6
Time Tagged Mes...	GeneralInterrogati...	1	128	7	0	0x(1)	SIN:1	17:14:32:734		2
Time Tagged Mes...	GeneralInterrogati...	1	128	8	0	0x(1)	SIN:1	17:14:34:811		2
Time Tagged Mes...	GeneralInterrogati...	1	160	1	0	0x(1)	SIN:1	17:14:36:906		4
Time Tagged Mes...	GeneralInterrogati...	1	160	2	0	0x(1)	SIN:1	17:14:38:982		2
Time Tagged Mes...	GeneralInterrogati...	1	160	3	0	0x(1)	SIN:1	17:14:41:55		2
Time Tagged Mes...	GeneralInterrogati...	1	160	4	0	0x(1)	SIN:1	17:14:43:125		2
Time Tagged Mes...	GeneralInterrogati...	1	160	5	0	0x(1)	SIN:1	17:14:45:205		2
Time Tagged Mes...	GeneralInterrogati...	1	160	6	0	0x(1)	SIN:1	17:14:47:277		2
Time Tagged Mes...	GeneralInterrogati...	1	160	7	0	0x(1)	SIN:1	17:14:49:363		2
Time Tagged Mes...	GeneralInterrogati...	1	160	8	0	0x(1)	SIN:1	17:14:51:441		2
GeneralInterrogati...	EndOfGeneralInt...	1	255	0	0	15				2
Identification (5)	StartRestart (5)	1	255	1	0	[2] [IOMOD-88] [1414745157]				1

The 'System' tab on the right includes the following controls:

- APDU:** ASDU: 1
- General interrogation:** Send button, Scan: 1
- Clock synchronization:** Send button, checkboxes for IV, SM, SB, PC time (2021-12-31 12:37:48)
- General Command:** FUN: 128, INF: 5, RI: 0, ON/OFF buttons

Fig. 1. Testing IOMOD device with “THE VINCI” software

As seen in Figure 1, Outputs and inputs are shown with info numbers 1-8, and function types are 128 and 160 respectively.

General Interrogation, Time Synchronization, and General Command options can be found on the right side of the program, in the “System” tab.

Output commands are controlled by the “General command” window on the right side of the program, in the “System” tab, with Output address (Function type) 128, and output number (Info number).

Figure 2 shows the 6th output command sent and the “CMD ACK” response received.

This screenshot is similar to Figure 1, but highlights the 6th output command in the 'Statistic' table. The row for 'Time Tagged Mes...' with FUN: 128, INFO: 6, and INDEX: 0 is highlighted in green.

Ti	Cause	ASDU	FUN	INFO	INDEX	Value	Status	Time Tag	Name	Count
StartOfGeneralInt...	GeneralInterrogati...	1	0	0	0	1				2
Time Tagged Mes...	GeneralInterrogati...	1	128	1	0	0x(1)	SIN:1	17:14:20:248		2
Time Tagged Mes...	GeneralInterrogati...	1	128	2	0	0x(1)	SIN:1	17:14:22:319		2
Time Tagged Mes...	GeneralInterrogati...	1	128	3	0	0x(1)	SIN:1	17:14:24:392		2
Time Tagged Mes...	GeneralInterrogati...	1	128	4	0	0x(1)	SIN:1	17:14:26:472		2
Time Tagged Mes...	GeneralInterrogati...	1	128	5	0	0x(1)	SIN:1	17:14:28:568		2
Time Tagged Mes...	Command (20)	1	128	6	0	0x(2)	SIN:16	17:23:32:800		4
Time Tagged Mes...	GeneralInterrogati...	1	128	7	0	0x(1)	SIN:1	17:14:32:734		2
Time Tagged Mes...	GeneralInterrogati...	1	128	8	0	0x(1)	SIN:1	17:14:34:811		2
Time Tagged Mes...	GeneralInterrogati...	1	160	1	0	0x(1)	SIN:1	17:14:36:906		4
Time Tagged Mes...	GeneralInterrogati...	1	160	2	0	0x(1)	SIN:1	17:14:38:982		2
Time Tagged Mes...	GeneralInterrogati...	1	160	3	0	0x(1)	SIN:1	17:14:41:55		2
Time Tagged Mes...	GeneralInterrogati...	1	160	4	0	0x(1)	SIN:1	17:14:43:125		2
Time Tagged Mes...	GeneralInterrogati...	1	160	5	0	0x(1)	SIN:1	17:14:45:205		2
Time Tagged Mes...	GeneralInterrogati...	1	160	6	0	0x(1)	SIN:1	17:14:47:277		2
Time Tagged Mes...	GeneralInterrogati...	1	160	7	0	0x(1)	SIN:1	17:14:49:363		2
Time Tagged Mes...	GeneralInterrogati...	1	160	8	0	0x(1)	SIN:1	17:14:51:441		2
GeneralInterrogati...	EndOfGeneralInt...	1	255	0	0	15				2
Identification (5)	StartRestart (5)	1	255	1	0	[2] [IOMOD-88] [1414745157]				1

The 'System' tab on the right remains the same as in Figure 1.

Fig. 2 Replies from IOmod device after a command has been sent through "THE VINCI" software

IEC 104 Slave Simulator for SCADA System

Initial Setup

All you need to do to set up is to be connected to a network from which the SCADA is reachable.

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

When you're connected to the network 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 60870-5-104 protocol and select Slave mode.

New

Protocol: IEC 60870-5-104

Mode: Slave (Server)


Start

Fig. 1. Selecting Protocol and Mode.

Go to the settings tab once the software opens. Now it's time to configure your device according to your SCADA settings. The defaults that are here are usually the defaults in most cases, but make sure to double-check. Also make sure to enter the IP and Port of the SCADA system they are located at the top of the window to the right of the green start button.

THE VINCI PROTOCOL ANALYZER

File Tags Options Hardware Help

 Protocol: IEC 60870-5-104 Mode: Slave (Server) START IP: 127.0.0.1 Port: 2404

Extra: Interface info Ping Sockets

Settings Console Statistic

Structure

COT size in bytes: 2

ASDU size in bytes: 2

IOA size in bytes: 3

Parameters

☒ Send End of ini. on start up

☒ Auto ack. U-Frame

☒ Auto ack. control commands

☒ Auto ack. system commands

Timeouts

t0 in seconds: 30

t1 in seconds: 15

t2 in seconds: 10

t3 in seconds: 20

Windows

RWT (w) size: 8

SWT (k) size: 12

Fig. 2. Configuring settings according to SCADA

Data Configuration

To begin adding data to send just go to the tags tab on the right side and press the "Add" button.

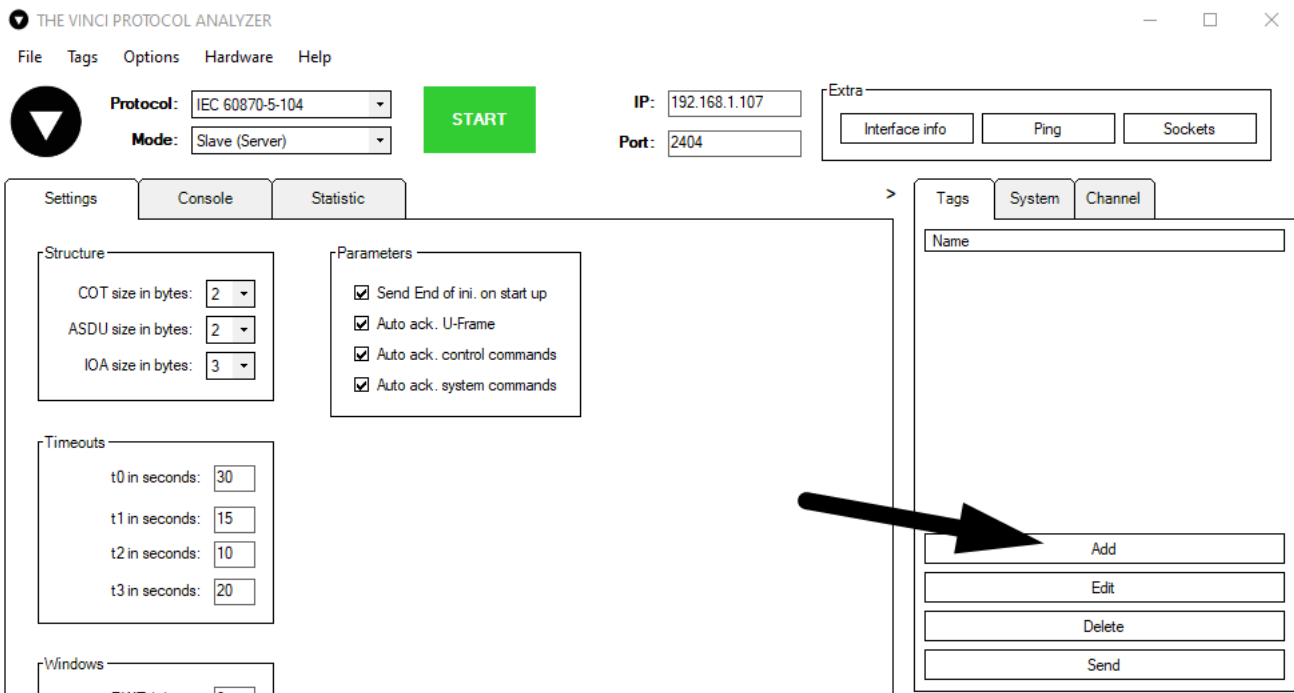


Fig. 3. Add Tag

Now you can configure the data itself. Enter the tag name, select a desired type from the drop down list, type in the ASDU and IOA numbers and then select the value. The value field will change depending on the type selected.

The 'Tag' configuration dialog box is shown. It has a title bar with a play button icon and the text 'Tag'. The fields are: 'Name' (Singe Point No Time Tag), 'Type' (M_SP_NA_1 (1)), 'Asdu' (1), 'IoA' (1), and 'Value' (On). Below these fields is a 'Quality' section with checkboxes for BL, SB, NT, IV, and OV. At the bottom are 'Save' and 'Cancel' buttons.

Fig. 4. Tag Menu

Now you can press the Start button, and The Vinci Software should start establishing communication with the SCADA system. Just like it's depicted in figure 5. You can check the commands that are being sent and recieved in the Console tab.

i If you want to add tags you can also do it even when the communication has been started.

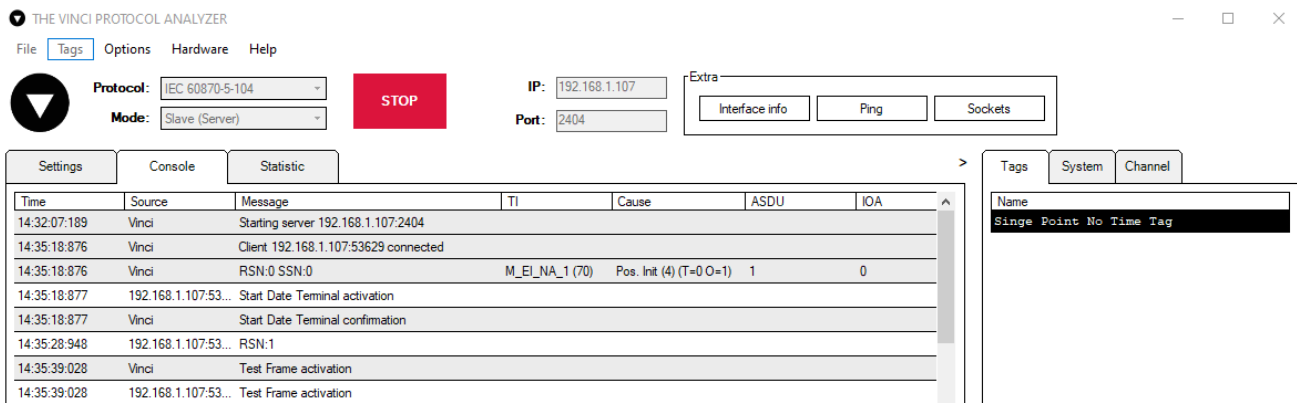


Fig. 5. Connection with SCADA

For simplicity purposes the SCADA used in this example was another instance of The Vinci Software. As you can see after General Interrogation has been sent the slave sends back the value of the tag that was just added. We can see what the value is if we check the statistics window in The Vinci Software. If the value were to be changed the slave would send the updated value automatically to the SCADA system.

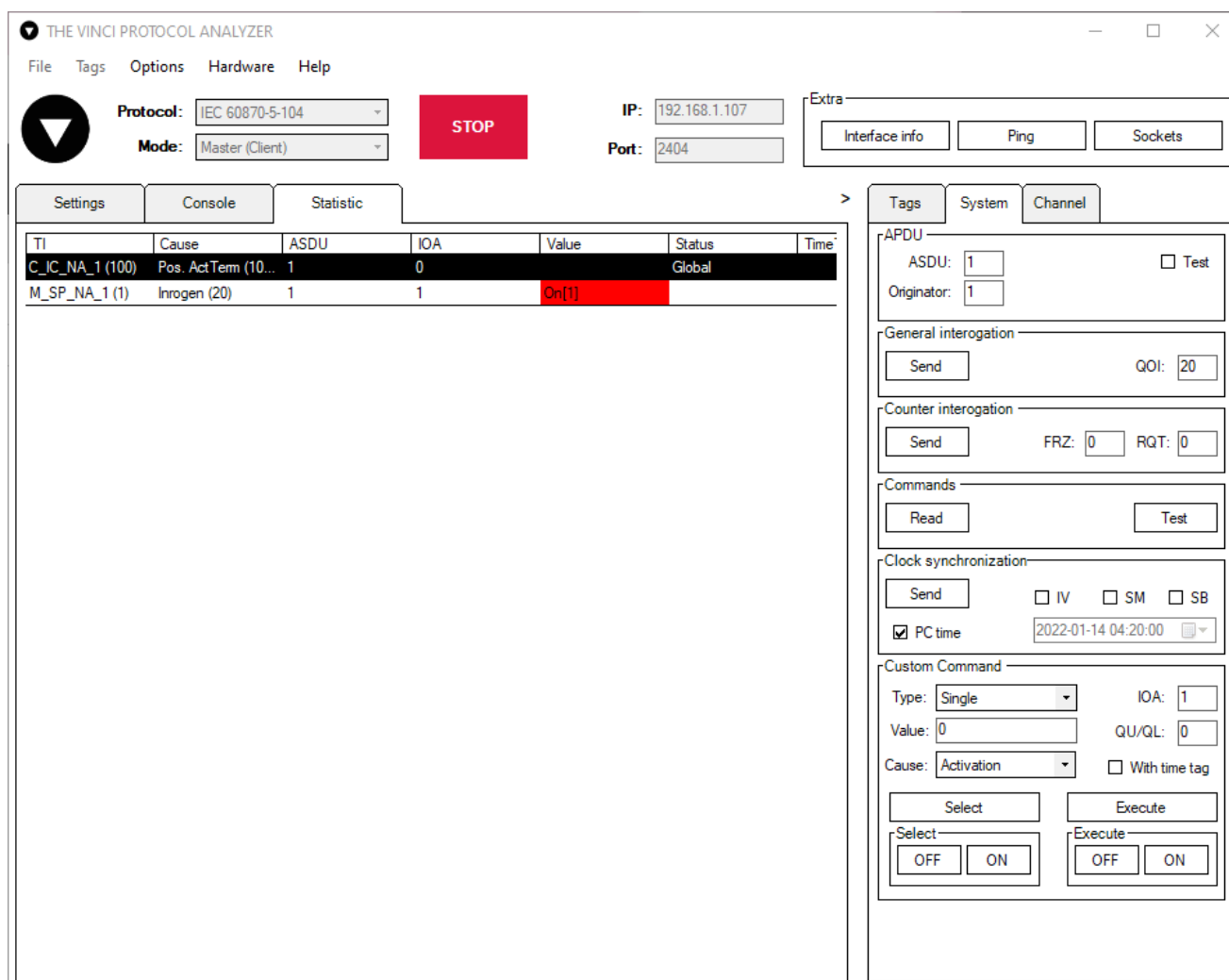


Fig. 6. SCADA Values

All that's left to do is to add the other values you desire in the Tags window and the SCADA should be receiving them after it's done

i If a new tag is added General Interrogation must be called for it to start sending data.

IEC-104 Master SCADA Setup

Initial Setup.

First connect to a network from which the IEC104 Slave device is reachable. When you're connected to the network it's time to open The Vinci Software and start configuring the SCADA parameters. The Vinci Expert will simulate the Master (Client) when the software is started select the IEC 60870-5-104 protocol and select Master mode, after making these selections press the start button.

New

Protocol: IEC 60870-5-104

Mode: Master (Client)

Start

Fig. 1. Selecting Protocol and Mode.

Once the software opens go to the settings tab as depicted in the figure below. Then configure settings in accordance with the Slave device. The defaults that are here are usually good in most cases, but make sure to double-check. After configuring the parameters enter the **IP** and **port** of the SCADA system they are located at the top of the window to the right of the green start button.

THE VINCI PROTOCOL ANALYZER

File Tags Options Hardware License Help

Protocol: IEC 60870-5-104

Mode: Master (Client)

START

IP: 127.0.0.1

Port: 2404

Settings Console Statistic

1

Structure

COT size in bytes: 2

ASDU size in bytes: 2

IOA size in bytes: 3

Parameters

☒ Send Start DT on start up

☒ Auto ack. Test Frame

Timeouts

t0 in seconds: 30

t1 in seconds: 15

t2 in seconds: 10

t3 in seconds: 20

Windows

RWT (w) size: 8

SWT (k) size: 12

2

Fig. 2. Configuring settings according to SCADA

Establishing a connection.

To begin communication with IEC 104 Slave once everything is configured press the green Start button and communication should begin. If it doesn't check if you have entered the correct IP and the Slave is reachable by pinging.

THE VINCI PROTOCOL ANALYZER

File
Tags
Options
Hardware
License
Help

Protocol: IEC 60870-5-104

Mode: Master (Client)

STOP

IP: 192.168.73.210

Port: 2404

Extra

Interface info

Ping

Sockets

Settings

Console

Statistic

Time	Source	Message	TI	Cause	ASDU	IOA	Value	Status
09:02:48:967	Vinci	Connecting to 192.168.73.2...						
09:02:48:974	Vinci	Connected to 192.168.73.21...						
09:02:48:974	Vinci	Start Date Terminal activation						
09:02:48:996	192.168.73.210:2...	Start Date Terminal confirmat...						
09:03:09:001	Vinci	Test Frame activation						
09:03:09:004	192.168.73.210:2...	Test Frame confirmation						

Fig. 3. Connection Established

Command overview.

In the system tab, you can see all the IEC 104 commands that Vinci Software supports. A more detailed command description can be found [here](#). To begin to send commands, first you need to configure your ASDU (CASDU) and Originator at the top of the System tab. (ASDU referred to here is the Common Adress or better known as CASDU). After entering the correct ASDU (CASDU) commands can now be sent. To check if the device is responding with the correct data, a good command to test is General interrogation.

Tags

System

Channel

APDU

ASDU: 1

Originator: 1

Test

General interrogation

Send

QOI: 20

Counter interrogation

Send

FRZ: 0

RQT: 0

Commands

Read

Test

Clock synchronization

Send

IV

SM

SB

PC time

2022-04-05 11:16:19

Custom Command

Type: C_SC_NA_1(45)

IOA: 1

Value: 0

QU/QL: 0

Cause: Activation

Select

Execute

OFF

ON

OFF

ON

SBO

OFF

ON

Fig. 4. Sending Commands

Slave response.

After sending the general interrogation command, the Slave device should respond with all the values that it is currently measuring. The **Statistic** tab will display all the gotten values in an orderly fashion, as depicted in the figure below. In this case, the data is gotten from a 16DI IOMod. As we can see, all the inputs are off.

THE VINCI PROTOCOL ANALYZER

FileTagsOptionsHardwareLicenseHelp

Protocol: IEC 60870-5-104

Mode: Master (Client)

STOP

IP: 192.168.73.210

Port: 2404

Extra

Interface infoPingSockets

SettingsConsoleStatistic

Tl	Cause	ASDU	IOA	Value	Status	TimeTag	Name	Count
C_IC_NA_1 (100)	Pos. ActTerm (10...	1	0		Global			6
M_SP_NA_1 (1)	Inrogen (20)	1	1	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	2	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	3	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	4	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	5	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	6	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	7	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	8	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	9	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	10	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	11	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	12	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	13	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	14	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	15	Off[0]				2
M_SP_NA_1 (1)	Inrogen (20)	1	16	Off[0]				2

Fig. 5. Statistics tab

Sending custom commands.

At the bottom of the system tab, you can configure it to send custom commands. To configure a custom command, follow these steps

1. Select the type of the command.

2. Enter the IOA (Information Object Address).

3. Choose the command cause.

4. Choose what type of command you want to send.

If Select, Execute, or SBO (Select Before Operate) buttons are pressed, a command will be sent with the value entered in the **value** field.

If **ON** or **OFF** buttons are pressed, values will automatically be filled. 0 meaning**OFF** and 1 meaning **ON**

The screenshot shows the 'Custom Command' configuration window. It includes fields for 'Type' (set to C_SC_NA_1(45)), 'Value' (0), 'Cause' (Activation), 'IOA' (1), and 'QU/QL' (0). Below these are sections for 'Select' and 'Execute' commands, each with 'OFF' and 'ON' buttons, and an 'SBO' section with 'OFF' and 'ON' buttons. Red callout boxes with numbers 1 through 4 highlight specific areas: 1 points to the 'Type' dropdown, 2 points to the 'IOA' field, 3 points to the 'Cause' dropdown, and 4 points to the 'Execute' section.

Custom Command	
Type: C_SC_NA_1(45)	IOA: 1
Value: 0	QU/QL: 0
Cause: Activation	
<div>Select</div> <div>Select</div> <div>OFF ON</div>	<div>Execute</div> <div>Execute</div> <div>OFF ON</div>
<div>SBO</div> <div>SBO</div> <div>OFF ON</div>	

Fig. 6. Custom Command Setup

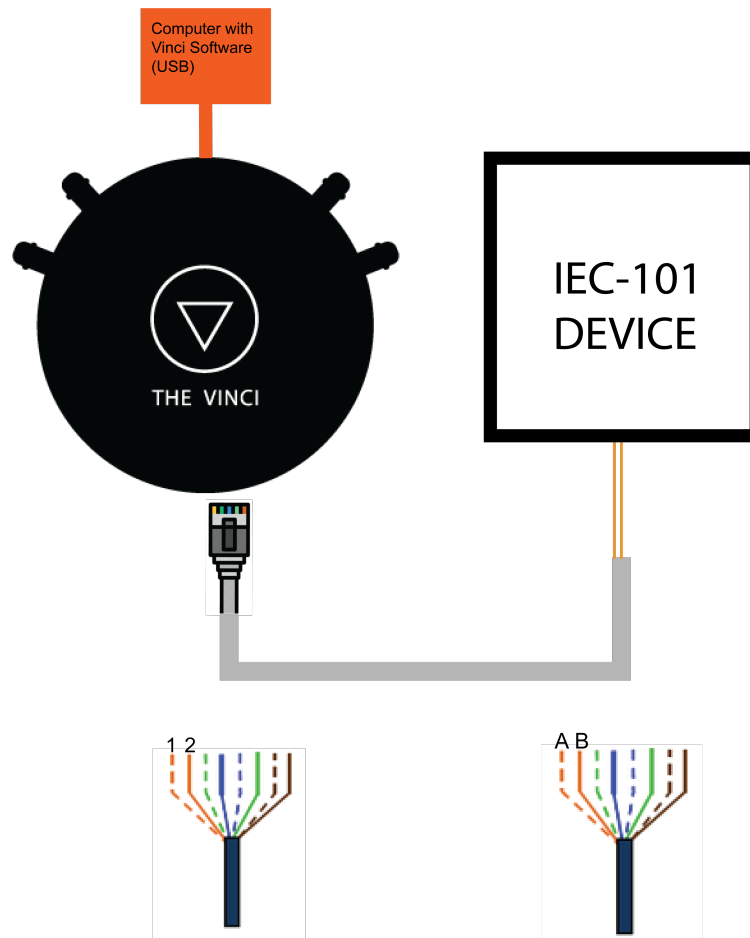
Considering often used functionalities for SCADA, that is about it. Of course, all values in the statistics window can be formatted using tags, although it doesn't make much sense since all data from IEC104 Slave has a type defined in the packet, so Vinci Software automatically formats it for that type. And the channel tab is mainly for testing, because the Vinci software also automatically sends S-Frames and Start DT, Stop DT, and Test frame commands.

IEC 101 Master 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 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.



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

Selecting protocol and mode

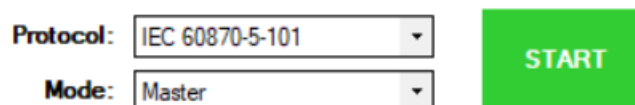


Fig. 1. Selecting protocol and mode

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 Master (Client) when the software is started just select the IEC 60870-5-101 protocol and select Master mode.

Selecting the Serial parameters

Protocol: IEC 60870-5-101
Mode: Master

START

Port: COM8
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

Settings

Console

Statistic

Structure

Link size in bytes: 1

COT size in bytes: 1

ASDU size in bytes: 1

IOA size in bytes: 2

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: Master

STOP

Port: COM3

Bau

Settings

Console

Statistic

Time	Source	Message	TI	Cause
15:20:56:128	Vinci[COM3]	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 commands can be sent. Commands can be found on the right side of the Vinci software in the system tab.

Calling General interrogation

The screenshot shows a software interface with two tabs: 'Tags' and 'System'. The 'System' tab is active. It contains two main sections: 'APDU' and 'General interrogation'. In the 'APDU' section, there are input fields for 'ASDU' (value 1) and 'Originator' (value 1), and a 'Test' checkbox. In the 'General interrogation' section, there is a 'Send' button and a 'QOI' input field (value 20).

Fig. 5. Calling General interrogation

A simple command to start and check if the device is responding and/or configured correctly is General interrogation just press the send button and the command will be sent to the device.

Sending Clock synchronization

The screenshot shows a 'Clock synchronization' dialog box. It features a 'Send' button, three checkboxes labeled 'IV', 'SM', and 'SB', and a checked checkbox labeled 'PC time'. Below these is a date and time field displaying '2022-01-26 10:49:57' with a small calendar icon to its right.

Fig. 6. Sending Clock synchronization

Another command that is usually sent whenever a connection is established is Clock synchronization. You can check the PC time checkbox so it sends the date of your computer and ignores whatever is selected in the date selection text box.

Settings		Console		Statistic					
TI	Cause	ASDU	IOA	Value	Status	TimeTag	Name	Count	
C_IC_NA_1 (100)	Pos. Act (6) (T=0 ...	1	0		Global			1	
M_SP_TB_1 (30)	Inrogen (20)	1	1	Off[0]		2098-1-1 0:0:8.712Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	2	Off[0]		2098-1-1 0:0:9.768Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	3	Off[0]		2098-1-1 0:0:10.822Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	4	Off[0]		2098-1-1 0:0:11.881Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	5	Off[0]		2098-1-1 0:0:12.930Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	6	Off[0]		2098-1-1 0:0:13.990Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	7	Off[0]		2098-1-1 0:0:15.571Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	8	Off[0]		2098-1-1 0:0:16.120Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	9	Off[0]		2098-1-1 0:0:17.171Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	10	Off[0]		2098-1-1 0:0:18.232Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	11	Off[0]		2098-1-1 0:0:19.305Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	12	Off[0]		2098-1-1 0:0:20.364Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	13	Off[0]		2098-1-1 0:0:21.433Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	14	Off[0]		2098-1-1 0:0:22.503Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	15	Off[0]		2098-1-1 0:0:23.565Invalid		1	
M_SP_TB_1 (30)	Inrogen (20)	1	16	Off[0]		2098-1-1 0:0:24.636Invalid		1	

Fig. 7. Statistics window.

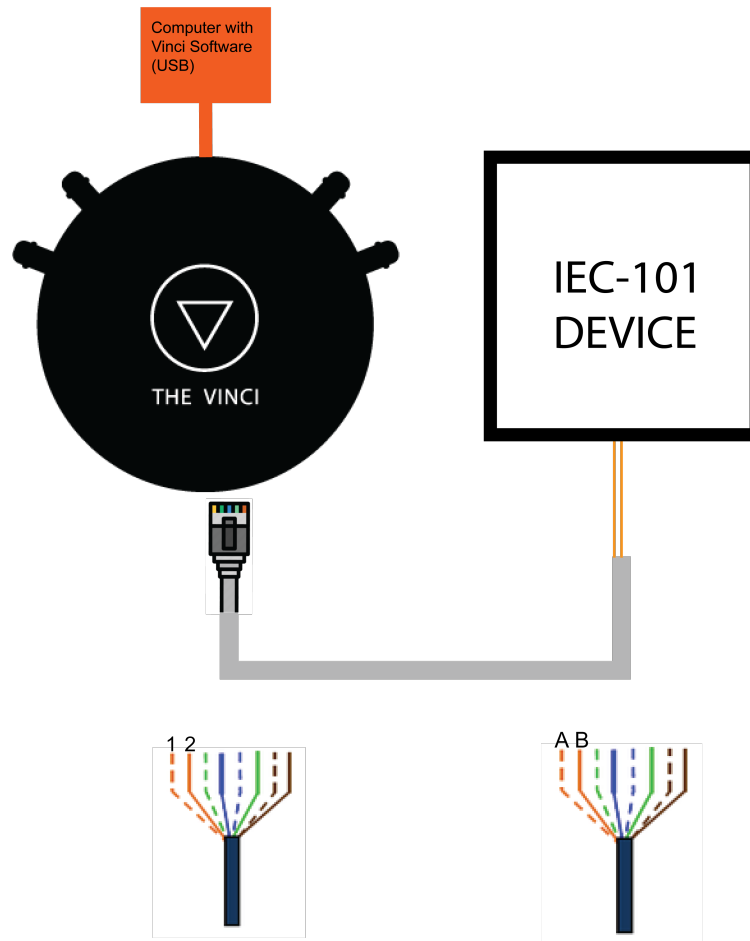
After sending the commands you desire all data that the slave responded with will be displayed in the statistics tab. In this case, the data is from a 16DI IOMod.


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.



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

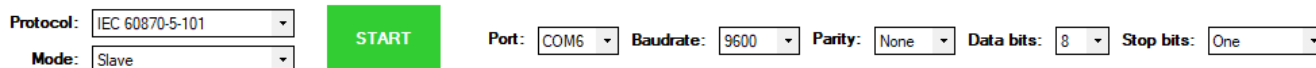
Selecting protocol and mode

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

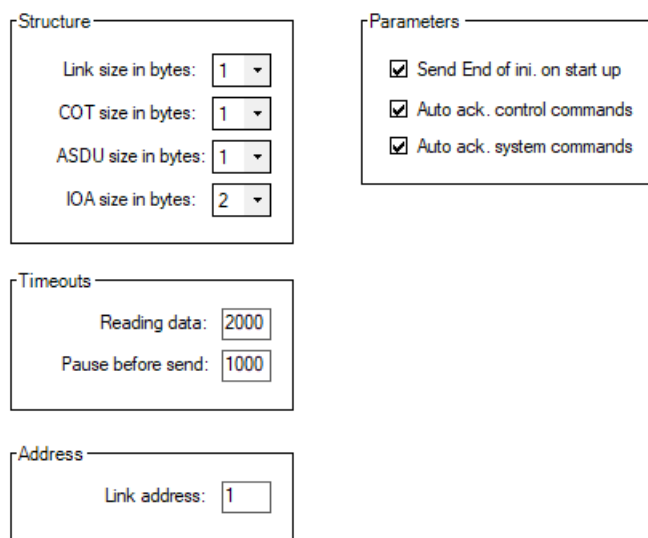
START

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

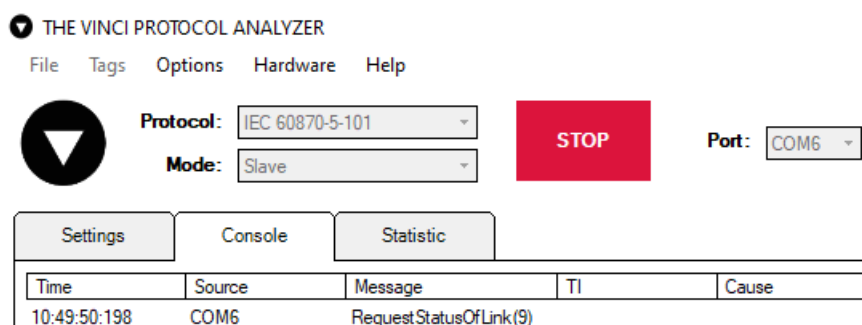
Address

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		<div><div></div></div>					0	real			0	1	1	1	36
RTD2	IOMod4	RTD2			1		<div><div></div></div>					0	real			0	1	1	2	36
RTD3	IOMod4	RTD3			1		<div><div></div></div>					0	real			0	1	1	3	36
RTD4	IOMod4	RTD4			1		<div><div></div></div>					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
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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

IMPORTED SIGNALS						
Device	Signal	Value	Units	State	Attributes	Time
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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.