

IEC 61850 interface configuration for VAMP 50/51/52/257/259

1. Overview

This document applies to VAMP 50/257/259 devices, which have a so called “native” 61850 interface, this is available starting from software version 10.1.

IEC 61850 protocol is available with the optional inbuilt Ethernet port. IEC 61850 protocol can be used to read / write static data from the relay or to receive events and to receive / send GOOSE messages to other relays.

IEC 61850 server interface is capable to do the following:

- Configurable data model: selection of logical nodes corresponding to active application functions
- Configurable pre-defined data sets
- Supported dynamic data sets created by clients
- Supported reporting function with buffered and unbuffered Report Control Blocks
- Supported control model: direct with normal security
- Supported horizontal communication with GOOSE: configurable GOOSE publisher data sets, configurable filters for GOOSE subscriber inputs, GOOSE inputs available in the application logic and output matrix

The inbuilt Ethernet is available as communication option 2 (see figure 1-1) in VAMP 257/259. IEC 61850

protocol can be used, if the last letter of the device ordering code for VAMP257/259 is M (e.g. VAMP 257 3C7 AAM). For VAMP50 the 6'th letter in the ordering code is K (e.g. VAMP50 – 3 AAAACA).

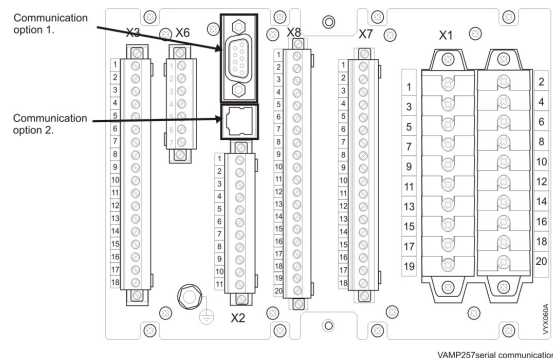

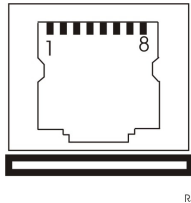


Figure 1-1 VAMP 257 equipped with the optional Inbuilt Ethernet interface (Comm. option 2).

Pin assignment of the optional Inbuilt Ethernet interface

Type	Ethernet 
Communication ports	TCP port
Signal levels	Ethernet
Connector	RJ-45 connector 
Pin usage	1=Transmit+ 2=Transmit – 3=Receive+ 4=Reserved 5=Reserved 6=Receive- 7=Reserved 8=Reserved

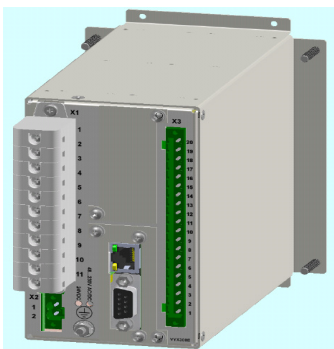


Figure 1-2 VAMP 50 equipped with the communication option, which includes Ethernet port.

2. Configuration

The configuration of the 61850 is done with VAMPSET. VAMPSET may be connected to the relay either via serial interface to the front panel connector or via the Ethernet network. Correct version of the VAMPSET is 2.2.1 or later. Also the ICD file can be generated with VAMPSET.

2.1 Setting the main parameters TCP PORT, IP address and NetMask

The configuration is started by selecting the IEC-61850 protocol as the "ETHERNET PORT protocol" and setting the IP Address and the NetMask of the device (see figure 2.1-2).

Please notice that IP address and netmask must be properly set in reference to client system in order to get the communication to work properly. In customer network please consultant with IT responsible to obtain proper addresses allowed to be used.

Also notify that the device doesn't support DNS while PC can obtain different addresses each time connected to a network. Such trouble might occur especially if

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Two useful commands for trouble shooting can be found under dos prompt. The command **ipconfig** show the current address and netmask of your PC.

The command **ping** can verify if LAN connection work. A successful ping response indicates that physical connection between client and server. Furthermore it proves that TCP/IP address and netmask setting is accepted. Illegal address might disturb network communication so if available, customer IT support should always be consulted if the device is connected to existing network.

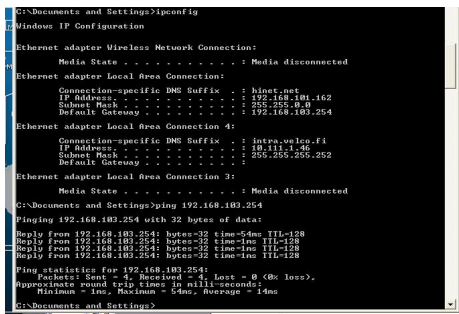


Figure 2.1-1 Example of ipconfig and ping command.

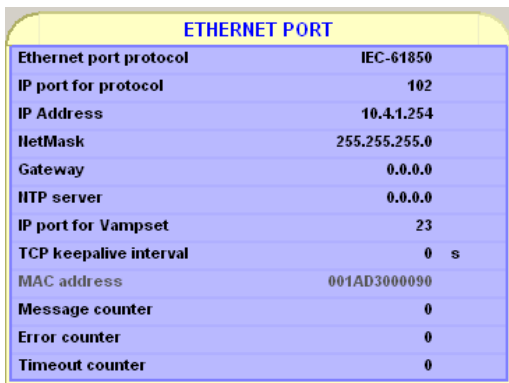


Figure 2.1-2 Setting for the Ethernet port protocol, IP Address and NetMask (seen the "PROTOCOL CONFIGURATION" menu).

The "IEC 61850 main config" –menu first part contains some 61850 parameters, which normally do not have to be changed (see figure 2.1-2).

The IED Name parameter is unique identifier and must be set differently for each device connected to the same network.

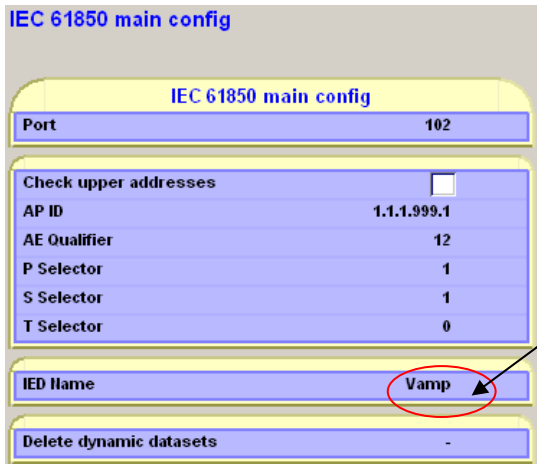


Figure 2.1-3 The "IEC 61850 main config" menu.

2.2 Selecting the Logical Nodes and Datasets for event reporting

The Logical Nodes (LN) to be visible via the IEC 61850 interface are selected in "IEC 61850 data map (1)"... "IEC 61850 data map (8)" (see figures 2.2-1 and figure 2.2-2).

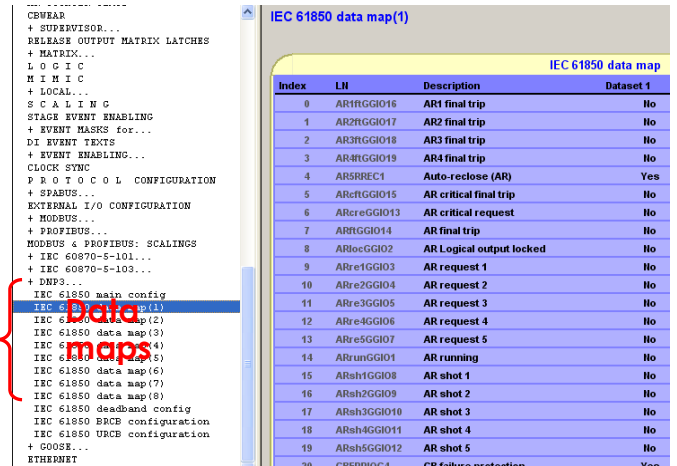


Figure 2.2-1 IEC 61850 configuration menus in VAMPSET.

The data maps contain the 61850 names for the functions of the device, maps are edited as follows:

- Set "In use" field of the needed functions to "Yes"
- Select which Dataset is used for sending reports from the function: set "Dataset x" to "Yes"
- Edit the "Description" field of the selected function if needed

Note: If there is no special reason to use many datasets, use only Dataset 1.

VAMPSET IEC 61850 data map configuration view

Index	LN	Description	Dataset 1	Dataset 2	Dataset 3	In use
90	DI9GGIO53	Digital input 9	No	No	Yes	No
91	DOC1PTOC12	IDir>	Yes	No	No	No
92	DOC2PTOC13	IDir>>	Yes	No	No	No
93	DOC3PTOC14	IDir>>>	Yes	No	No	No
94	DOC4PTOC15	IDir>>>>	Yes	No	No	No
95	EF1PTOC4	Io>	Yes	No	No	No
96	EF2PTOC5	Io>>	Yes	No	No	No
97	EF3PTOC6	Io>>>	Yes	No	No	No
98	EF4PTOC7	Io>>>>	Yes	No	No	No

Predefined IEC 61850 names for the functions (pointing to LN column)
 Editable text for the functions (pointing to Description column)
 Select, which functions are in use (pointing to In use column)
 Select, which data set(s) are used to send events from the function (pointing to Dataset 1-3 columns)

Figure 2.2-2 Description of the contents of the “IEC 61850 data map (x)”.

Datasets are assigned to Report Control Blocks in the “IEC 61850 BRCB configuration” and “IEC 61850 URCB configuration” menus. A VAMP device has 3 predefined data sets DS1...DS3, these can be assigned to one or more of the 3 buffered report control blocks BRCB 1...BRCB 3 and to one or more of the 3 un-buffered report control blocks URCB 1...URCB 3.

Some clients may create their own so called dynamic data sets and assign these to report control blocks. Both persistent and non-persistent dynamic data sets are supported.

Note: The clients (e.g. the RTU) reserve one or more RCBs to get events. The relay sends events to those clients who have done reservations.

Note: The maximum number of simultaneous client connections is 3.

IEC 61850 BRCB configuration

BRCB 1	
Dataset	DS1
Name of selected Dataset	LLI0.DS1
Integrity Period	0
Buffer Timer	0
Triggering Options	
- Data Change	<input checked="" type="checkbox"/>
- Quality Change	<input checked="" type="checkbox"/>
- Data Update	<input checked="" type="checkbox"/>
- Integrity	<input checked="" type="checkbox"/>
- General Interrogation	<input checked="" type="checkbox"/>
Optional Fields	
- Sequence Number	<input checked="" type="checkbox"/>
- Report Time Stamp	<input checked="" type="checkbox"/>
- Reason For Inclusion	<input checked="" type="checkbox"/>
- Dataset Name	<input checked="" type="checkbox"/>
- Data Reference	<input checked="" type="checkbox"/>
- Buffer Overflow	<input checked="" type="checkbox"/>
- Entry ID	<input checked="" type="checkbox"/>
- Configuration Revision	<input checked="" type="checkbox"/>
- Segmentation	<input checked="" type="checkbox"/>

Figure 2.2-3 Report Control Block configuration.

2.3. Configuration of the GOOSE communication

The working principle of the GOOSE communication is described in figure 2.3.1.

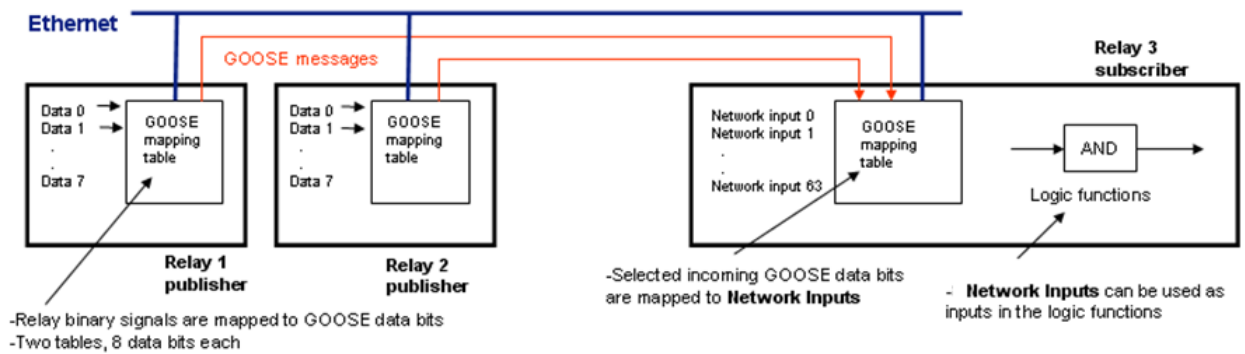


Figure 2.3-1 Operation principle of the GOOSE communication.

One-bit binary signals can be sent/received as GOOSE data. One device can send max. two GOOSE data packets containing 8 bits of data, thus max. number of data points from one device is 16 bits. Goose control block 1 (GCB1) and Goose control block 2 (GCB2) are used to control the sending of these two 8-bit GOOSE data packets.

GOOSE data is multi-casted to the Ethernet network. The multicast MAC Address, Application ID and Configuration Revision are the main parameters when routing the information from one relay to the other.

Note: The MAC Address used in GOOSE communication is totally independent from the MAC Addresses of the devices in the Ethernet network!

One device can receive max. 64 bits of GOOSE data. These can be utilized in the device internal logic and output matrix - these are named as GOOSE NI1...GOOSE NI64.

The main parameters of the GOOSE communication are available via "GOOSE configuration" menu (see figure 2.3-2).

The relay bit values to be sent are selected in GOOSE mapping tables "GOOSE GCB1: DATA POINTS" and "GOOSE GCB2: DATA POINTS" (see figure 2.3-3).

The bit values to be received as GOOSE data are defined in "GOOSE Subscriber: DATA POINTS" (see figure 2.3-4).

Main configurations to enable sending of the first outgoing 8-bit GOOSE data packet.

Configuration Revision number, which may be used to block usage of wrong data in the GOOSE data receiver.

MAC Address for GOOSE data, allowed range 01-0C-CD-01-00-00 ... 01-0C-CD-01-01-FF

Application ID
This is a number which identifies the GOOSE data packet and is used in the receiver to receive correct data package

Main configurations to enable sending of the second outgoing 8-bit GOOSE data packet.

Main configurations to enable reception of GOOSE data from other devices.

Figure 2.3-2 The main parameters of GOOSE configuration.

DSG1 data configuration				DSG2 data configuration			
Index	IEC-61850 Variable	Signal	Status	Index	IEC-61850 Variable	Signal	Status
0	DI01GGIO45.Ind.stVal(ST)	DI1	Not in use	0	DI05GGIO49.Ind.stVal(ST)	DI5	Not in use
1	DI02GGIO46.Ind.stVal(ST)	DI2	Not in use	1	DI06GGIO50.Ind.stVal(ST)	DI6	Not in use
2	DI03GGIO47.Ind.stVal(ST)	DI3	Not in use	2	DI07GGIO51.Ind.stVal(ST)	DI7	Not in use
3	DI04GGIO48.Ind.stVal(ST)	DI4	Not in use	3	DI08GGIO52.Ind.stVal(ST)	DI8	Not in use
4	None	None	Not in use	4	None	None	Not in use
5	None	None	Not in use	5	None	None	Not in use
6	None	None	Not in use	6	None	None	Not in use
7	None	None	Not in use	7	None	None	Not in use

Figure 2.3-3 Examples of selected data bits to be sent in the two 8-bit GOOSE data blocks.

Subscriber data configuration						
Network input	Application ID	Configuration Revision	Data index	Value	In use	
0	1	1	0	0	Yes	
1	3	1	0	0	Yes	
2	4	1	0	0	Yes	

Figure 2.3-4 An example of data point definition to receive GOOSE data.

2.4 Creating ICD file with VAMPSET

IED Capability Description (.ICD) file defines complete capability of an IED. This file needs to be supplied by each manufacturer to make the complete system configuration. The file contains a single IED section, an optional communication section and an optional substation part which denotes the physical entities corresponding to the IED.

In order to create the IEC61850 description file connect the device

with vampset and select "COMMUNICATION" ; "Get ICD File" Please select "Yes" if configuration requires indexed report control blocks, else select "NO". After that you can select directory to save the .icd file to. The need for indexed or non-indexed report control blocks depends on the client system. Consult the client system manufacturer about this. In case this is not known, the best way is to create both and test.

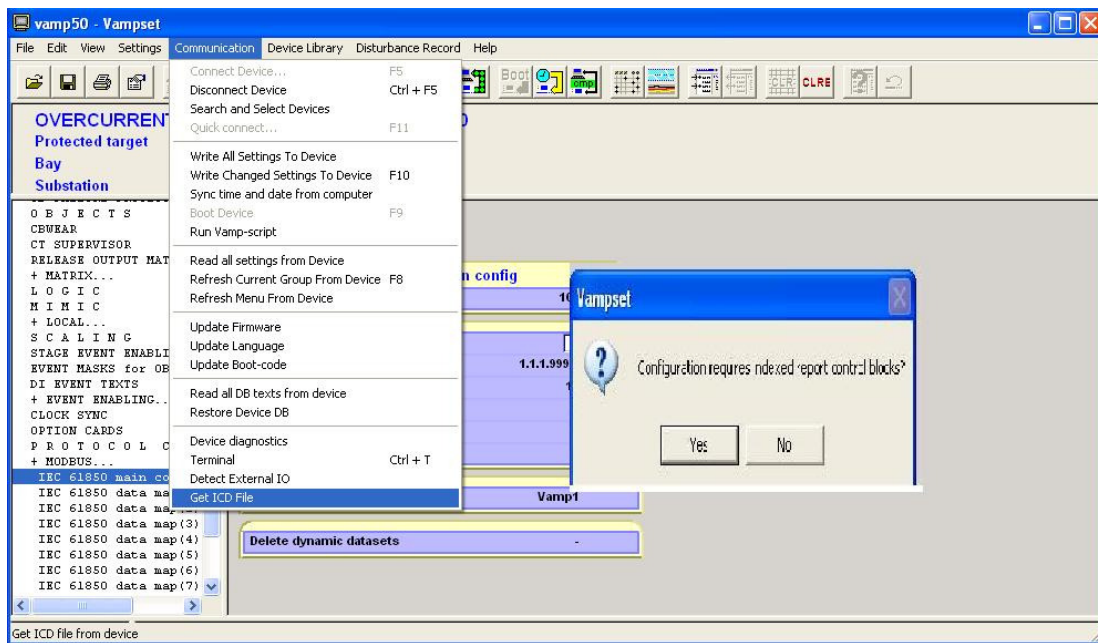


Figure 2.4-1 Create ICD file with VAMPSET program

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