GOOSER
IEC 61850 Test System

- Reliable testing of IEC 61850 relays using any conventional relay test set
- Separate Ethernet ports for the substation LAN and the controlling PC forming a Safe Substation Bus Access Point
- Seamless interaction between SCL GOOSE and GOOSE “sniffing”
- GOOSE MERGE – SCL GOOSE vs captured GOOSE SCD file validation at FAT and consistency check
- Stand alone functionality – Download a configuration and run

Description

The GOOSER™ is the world’s first IEC 61850-8-1 GOOSE test equipment, dedicated to test the GOOSE horizontal communication in substation protection/control applications.

The GOOSER can convert a GOOSE message received on its rear Ethernet port into binary output and it can convert a binary input into a GOOSE message and publish it at its rear Ethernet port. The conversion time is typically 0.6 ms.

The GOOSER is equipped with 10 binary inputs and 10 binary outputs. Using these it can convert simultaneously up to 20 GOOSE messages.

Binary inputs of the GOOSER can react on DC-voltage presence (voltage sense or “wet” contact mode) or can independently detect an applied closed/open contact (contact sense or “dry” contact mode).

For high speed operation the binary outputs of the GOOSER are solid state, fully protected against incorrect connections and short circuits. These have a strong breaking capacity to drive inductive loads like auxiliary relays.

The GOOSER has two physically isolated Ethernet ports: front and rear. The GOOSE messages are transferred by the firmware from the rear port to the front port, where the messages can be visualized using the provided PC-GOOSER software or with any third party network analyzer. This functionality allows the GOOSER to be a secure and safe substation access point permanently installed in the substation.

With the 6.4” color touch screen on the front panel the GOOSER can be used without the need for a PC. The GOOSER configuration files are read from a memory stick inserted in the USB port on the front panel.

The software PC-GOOSER provides mapping of the binary inputs and outputs of the GOOSER to the desired GOOSE messages. The GOOSE messages are read from available SCL (Substation Configuration Language) files or may be automatically detected by scanning the substation network in search of available published GOOSE messages. This process is known as GOOSE “sniffing”.

The PC-GOOSER also provides advanced network troubleshooting tasks such as comparing the GOOSE messages available on the network with the GOOSE messages described on the SCL files with GOOSE MERGE functionality; this is also a powerful tool for validating the horizontal communication description (GOOSE) in the supplied SCD file at Factory Acceptance Tests (FAT) in IEC 61850 substations (consistency check).
Features and benefits

1. **BINARY INPUTS**
The GOOSER is equipped with 10 binary inputs. The binary inputs can sense both potential free contact ("dry" contact) or DC voltage ("wet" contact). An LED indicator positioned close to each binary input shows in real time the status of the binary input (ON – Input energized, OFF – Input not energized).

2. **BINARY OUTPUTS**
The GOOSER is equipped with 10 normally open binary outputs. The binary outputs have a strong make and break current capability sufficient to drive many external electromechanical relays e.g. auxiliary relays. The outputs are also self-protected against incorrect connection such as reverse polarity or a short circuit. An LED indicator positioned close to each binary output shows in real time its status. (ON – Closed, OFF – Open).

3. **USB MEMORY**
The USB port is designed for connecting a memory stick only. It is used to freely upload a GOOSER configuration file that has been generated off-line by the PC-GOOSER software. Then the GOOSER can be run from its local interface according to the mapping described in the selected configuration file without using a PC.

4. **LCD screen**
6.4" color touch screen.

5. **PC COM port (front Ethernet port)**
This port can be connected to the PC. The PC-GOOSER software can be used to control the GOOSER through the front port. The private traffic between the PC-GOOSER application and the GOOSER is present on this link only. The GOOSER will forward the detected GOOSE messages on the rear port to the front port, hence any network analyzer can be connected to the GOOSER front port to analyze the GOOSE traffic without connecting any PC directly to the substation bus. Thus the GOOSER can be used as a Secure Substation Access Point.

6. **IEC 61850 port (rear Ethernet port)**
The rear Ethernet port is the port that should be connected to the IEC 61850 substation bus (Ethernet switch or relay Ethernet port). The GOOSER reads and sends the GOOSE messages from/to the substation bus through this port.

19” Rack mounting version
GOOSER is available also as a 19” rack mounting version (see ordering information) for fixed installation where the GOOSER is intended to be used as a permanent secure substation network access point.
Application

Testing IEC 61850 equipped protection relays with a conventional relay test set.

Using the GOOSER, any conventional relay test-set can be used for testing IEC 61850 equipped protection relays or IEDs (Intelligent Electronic Devices).

The GOOSER is connected to the IEC 61850 substation bus (or directly to the Ethernet port of the relay) and is configured to map, for example, the trip GOOSE message from the tested relay to a chosen binary output. The GOOSER binary output is then connected to the relay test set binary input. The trip test timer of the test set will be stopped by the binary input energized by the GOOSER binary output. The conversion time of the GOOSER, typically 0.6 ms, introduces a negligible time delay in the reported relay trip time.

For testing IEC 61850 relay applications where the protection relay needs an external signal to allow or trigger some protection functions (e.g. external direct inter-trip command, external auto-reclose start, or breaker failure signal) it is necessary to send a GOOSE message to the relay, as the protection IED expects the external command as a GOOSE message rather than a relay binary input activation.

The GOOSER, connected to the IEC 61850 substation bus is configured to map a GOOSER binary input activation to a defined GOOSE message that is sent (published) by the rear Ethernet port of the GOOSER.

The GOOSER binary input is then connected to the relay test-set binary output. The test-set activates the binary output when the test starts. Because of the minimal conversion time from binary input activation to published GOOSE message the GOOSER does not introduce any significant time delay to the test.

In a practical situation both applications of the GOOSER (publishing of a GOOSE message and subscription of a GOOSE message), are often used simultaneously.
Testing the substation interlocking system

When testing substation interlocking/control applications it is often necessary to rapidly visualize the status of several GOOSE messages at the same time. It will also be necessary to interface the interlocking signals (GOOSE messages) with a model, often electromechanical, of the system that is to be controlled. (i.e. The circuit breaker, the disconnector or the entire bay).

The GOOSER binary outputs are powerful enough to drive external auxiliary relays to represent the primary equipment that is to be controlled. The binary outputs have a breaking capacity of 250 mA DC on inductive load with 40 ms time constant at 110 V DC.

For example, it is possible to receive two GOOSE messages: GOOSE_CLOSE and GOOSE_OPEN (that are sent from a control IED) to activate two different binary outputs of the GOOSER. With the two binary outputs one bi-stable relay is operated (open and close coils) simulating the circuit breaker operations. The auxiliary contacts of the bi-stable relay are then connected to binary inputs of the GOOSER that will send back to the controller IED the GOOSE message containing the breaker position (GOOSE_CBPOS).

GOOSER can map double indication (double point) to the binary inputs/outputs, this type of data set content being very common in control/interlocking applications.

The LED indication of the binary outputs from the GOOSER shows immediately the actual status of the GOOSE messages available on the substation network (10 + 10 LEDs).
PC-GOOSER – Easy mapping and powerful GOOSE message troubleshooting

The GOOSER can be controlled (mapping of the GOOSE messages to physical inputs and/or outputs) using the supplied PC-GOOSER software.

The list of the GOOSE messages to be mapped can be obtained by importing an SCL file or by scanning the network and searching for available GOOSE messages on the GOOSER front Ethernet port.

The unit can map the selected GOOSE messages to the chosen binary inputs or outputs of the GOOSER. The mapping instruction is sent directly to the test equipment or it can be saved as a file on a USB memory stick that can be read by the GOOSER.

The PC-GOOSER software provides mapping of binary information of the GOOSE data set (single point and double point) to GOOSER inputs and outputs.

Other data set information like real numbers, integer, time etc., not relevant to the inputs and outputs of the GOOSER can also be received and published by the GOOSER. This allows the handling of GOOSE messages containing a complex data set where only part of the data is of interest.

GOOSE monitoring with online indication of status change.

The PC GOOSER is easy to use and provide useful up-front monitoring information from the “sniffed” GOOSE messages. If the dataset of a captured GOOSE message changes any value, the GOOSE message shown on the Captured messages list will change its color prompting the user that the GOOSE message has changed its value in the dataset. This is useful when you want to make a quick search for a particular GOOSE message available on the network where a large amount of GOOSE messages are published. For instance a GOOSE message carrying the circuit breaker position will change its color and therefore is easy to identify when the circuit breaker is operated.

The protection relay test engineer will easily identify the GOOSE messages sent by an IED in the substation by injecting a fault into the IED and using the PC GOOSER to check only the GOOSE messages that have changed their status among several hundred that did not.

In the adjacent figure you can see that the GOOSE message 01-0C-CD-01-00-03 has changed some values in its dataset (indicated by the yellow color). By exploring the GOOSE message one can see which part of the dataset that has changed value, here indicated by the red color. It can also be seen that the dataset of the GOOSE messages 01-0C-CD-01-00-10 and 01-0C-CD-01-01-AA has not changed as they are not colored in yellow.

Advanced GOOSE Filter capabilities are also enabled using the PC GOOSER, while “sniffing” the network, in order to allow you to monitor the GOOSE messages of interest only.
GOOSE MERGE

The PC-GOOSE application also contains a GOOSE MERGE feature. The list of “sniffed” GOOSE messages can be merged with the list of the SCL file GOOSE messages. If the “sniffed” GOOSE message is recognized to be the same as the GOOSE message within the SCL file, the merge will succeed and one single GOOSE message will be shown in the resulting GOOSE message list and the merge indicated with an “M” symbol. If the merge does not succeed, the PC-GOOSE will show the two GOOSE messages (“sniffed one” and “SCL one”) one below each others in the resulting list, indicating that there are some differences. This information can be used to help identify problems within a IEC61850 network.

A successful GOOSE merge between a “network GOOSE” (green) and an “SCL GOOSE” (black). MERGE functionality is used to perform GOOSE consistency check.
### Specifications GOOSER

The specifications are valid for nominal voltage supply and at an ambient temperature of +25°C (77°F). Specifications are subject to change without notice.

#### Environment

- **Application field**: The instrument is intended for use in high-voltage substations and industrial environments.
- **Measurement category**: CAT I, transient voltage 1500 V
- **Temperature, operating**: 0°C to +50°C (32°F to +122°F)
- **Temperature storage & transp.**: -20°C to +70°C (-4°F to +158°F)
- **Vibration**: IEC 60068-2-6
- **Shock (non-operating)**: IEC 60068-2-27
- **Humidity**: 5% – 95% RH, non-condensing
- **Altitude (operational)**: <3000 m
- **Altitude (non-operational)**: 0°C to +50°C (32°F to +122°F)
- **Pollution degree**: 2
- **Humidity**: 5% – 95% RH, non-condensing
- **Altitude (non-operational)**: 0°C to +50°C (32°F to +122°F)
- **Pollution degree**: 2

#### CE-marking

- **EMC**: 2004/108/EC
- **LVD**: 2006/95/EC

#### General

- **Mains voltage**: 100 – 230 V AC, 50-60 Hz
- **Current consumption**: 1 A (max)
- **Fuses, F1 / F2**: F 2A
- **Dimensions**:
  - **Portable version**: 446 x 290 x 180 mm
  - **(17.6" x 11.4" x 7.1")
  - **19" rack mounting version**: 19"
- **Weight**: 8.5 kg (18.7 lbs) 18.8 kg (41.4 lbs)
- **with accessories and transport case**: 6" LCD touchscreen
- **User feedback**: Small LED
- **Galvanic isolation**: Groupwise 3+3+2+2
- **Contact sense**: Small LED
- **Output voltage**: 19 VDC
- **Short-circuit current**: 15 mA

#### BINARY INPUTS, 1...10

- **Number**: 10
- **Voltage sense**: 250 V DC
- **Max voltage**: 446 x 290 x 180 mm
- **Protection**: Self-protected against wrong connection
- **Transition level**: Approx. 15 V DC
- **User feedback**: Small LED
- **Galvanic isolation**: Groupwise 3+3+2+2
- **Contact sense**: Small LED
- **Output voltage**: 19 VDC
- **Short-circuit current**: 15 mA

#### BINARY OUTPUTS, 1...10

- **Number**: 10
- **Protection**: Self-protected against wrong connection. Built-in current limiter
- **Type**: Normally open solid state contact
- **Rated current range**: 0 – 250 mA DC
- **Rated voltage range**: 48 – 220 V DC
- **Breaking capacity DC at L/R <= 40 ms**: 110 V DC 0.25 A
- **Galvanic isolation**: 10 separate outputs
- **Withstand voltage**: 250 V DC
- **User feedback**: Small LED

#### Communication ports

- **IEC 61850**: Ethernet RJ-45 100 Mbps
- **PC COM**: Ethernet RJ-45 100 Mbps
- **USB MEMORY**: USB 2.0 type A

#### Mappable GOOSE messages to inputs/outputs

- **Boolean (single point indication)**: Explicit and one level structured data set

#### GOOSE messages

- **Conversion time GOOSE – Electric signal**: 0.6 ms typical
- **Conversion time GOOSE – Electric signal**: 0.5 ms typical

#### Publishable GOOSE messages

- **Type**: Boolean, 2-bit String

#### SCL file importing

- **From IEC 61850 Edition 1**: cid, scd, icd, xml
- **From IEC 61850 Edition 2**: sed, iid

### Ordering information

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Registered to ISO 9001 and 14001

Subject to change without notice.

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