

SIEMENS



SIPROTEC 5 Application Note

Secure transmission of trip signal with GOOSE

SIP5-APN-032, Edition 1

SIPROTEC 5 – Application Note

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1 Secure transmission of trip signal with GOOSE

1.1 Introduction

In some substation configuration the trip signal to the circuit breaker has to be transferred over several hundreds of meters.

SIPROTEC 5 and IEC 61850 GOOSE (Generic Object Oriented Station Event) offers the possibility for a fast and secure trip signal transmission over long distances. Voltage drop along the line, undesired induction and higher risk of earth faults of the DC power supply can be avoided.

The application describes the fast and secure transmission of the trip signal with IEC 61850 GOOSE and the related DIGSI 5 settings.

1.2 General

The SIPROTEC 5 architecture is designed to represent all primary components as image with function groups in the DIGSI configuration (see fig 1).

The use of application templates (pre-tested standard configurations) in DIGSI 5 leads to fast and clearly engineering.

SIPROTEC 5 devices are equipped with high-performance communication interfaces. With IEC 61850 GOOSE messages time-critical signals can be transferred. Receivers of GOOSE messages can constantly monitor the reception of indications and measure values for a break of the connection; state of missing indications is automatically updated at the receiver, in order to attain a safe state. Therewith a continuous, high-performance supervision of GOOSE communication can be realized.

Through the flexible extendable communication modules a dedicated SUB net, separately from the station bus, for time-critical signals should be configured.

An uninterruptible ring redundancy can be achieved through activating the redundancy protocols HSR (High availability seamless redundancy) and PRP (Parallel Redundancy protocol) on the electrical and optical Ethernet modules.

1.3 Example

In case of transformer failure it is mandatory to trip circuit breaker on both sides. The related trip command is initiated from 7UT85 function group FG Transformator Diff. Instead with own trip contacts the trip command will be transferred with GOOSE to the related 7SJ85 device.

By using the IEC 61850 system configurator the trip command of 7UT8 Function Group Circuit Breaker Q Remote D03_F87_1/Q0_Fern/XCBR1/TripOpnCmd will be connected with logical node (LN) of 7SJ85 FG UI 3p Function Ext. Trip J05_F51_1/VI3p1_ExternalTrip/EXT_PSCH1.

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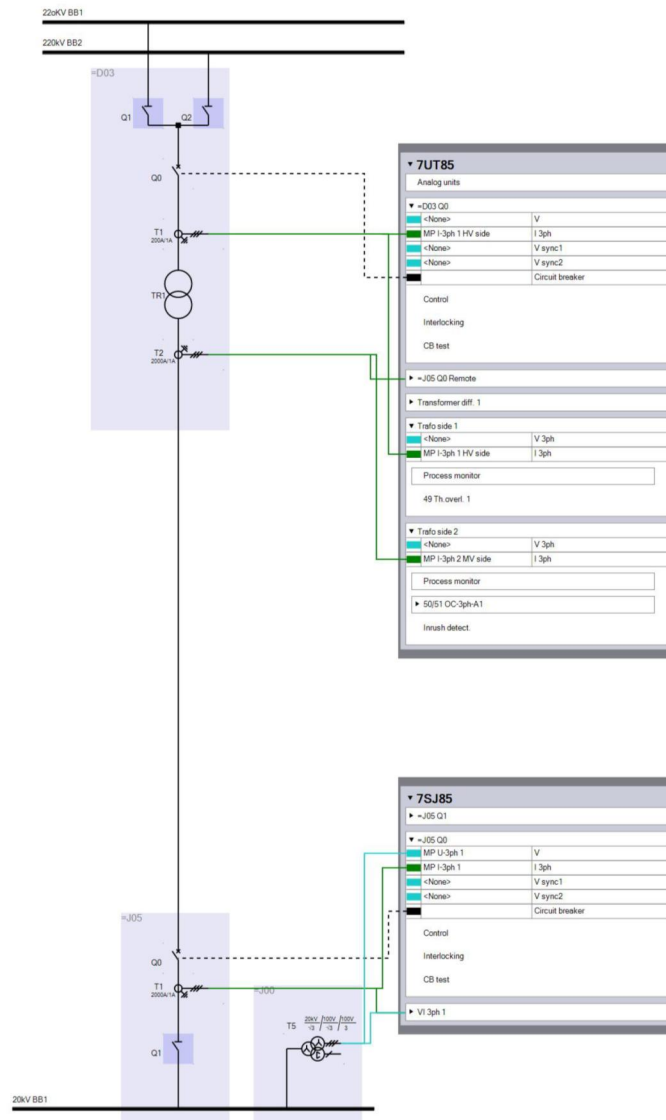


Figure 1: DIGSI 5 Single Line Diagram with the connection of the function groups to the primary components.

The function "External Trip" secures the controlled termination of the binary input signal External trip in the device structure, see chapter 1.5.

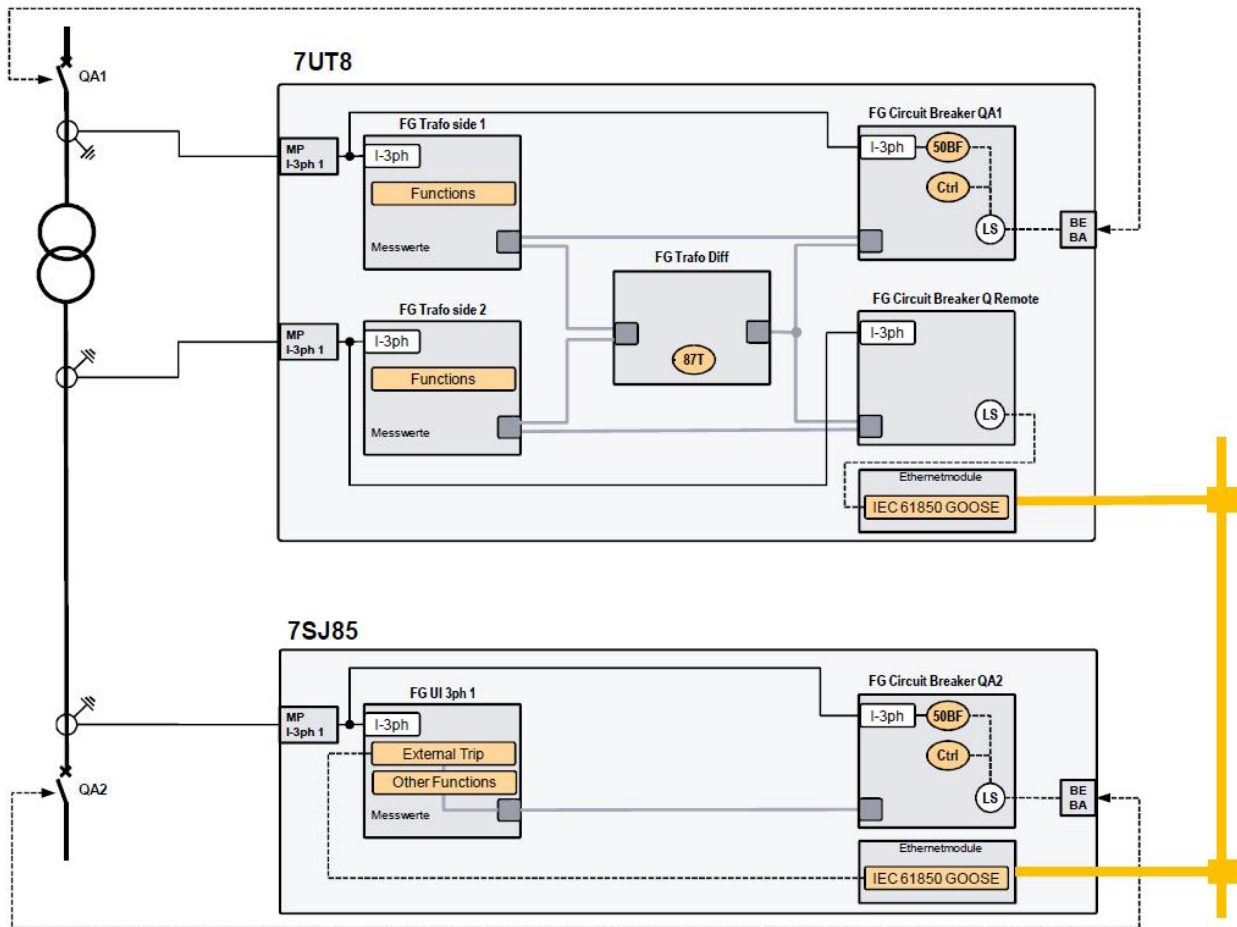


Figure 2: Schematic view with related function groups

1.4 Realization

1.4.1 Adaption of the IEC 61850 structure in DIGSI 5

For better traceability of the GOOSE connection it is recommended to change the name of the logical device (LD) in the IEC 61859 structure of 7UT85 from CB2 (2nd circuit breaker) into QO_Remote.

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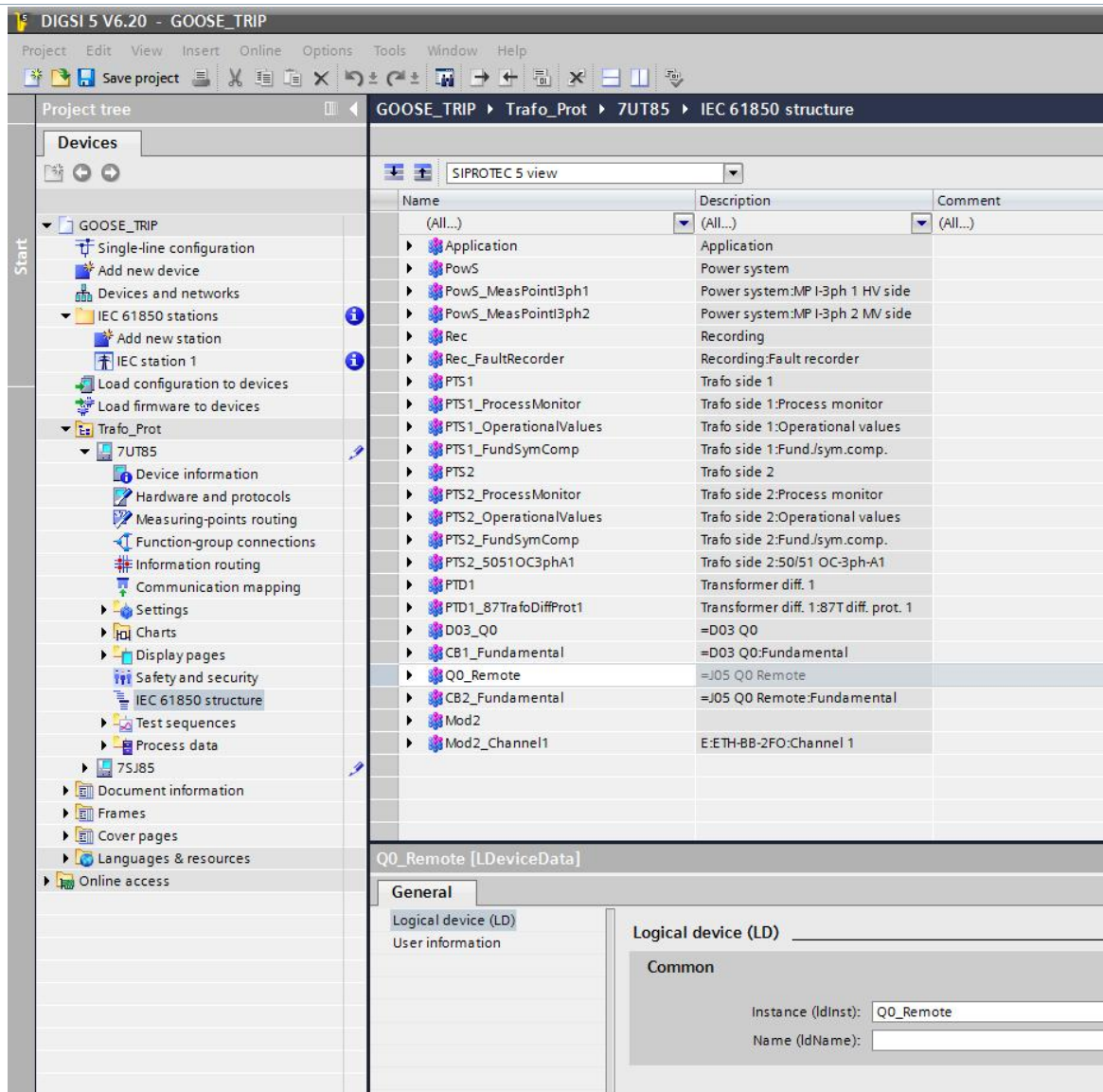


Figure 3: IEC 61850 Structure in SIPROTEC 5 view

1.4.2 Create GOOSE Connection in the IEC 61850 system configurator

Source:

Source	CDC	Description
GOOSE_trip		
GOOSE application		
D03_F87_1/D03_Q0/LLN0/DataSet (2/60)		
D03_F87_1/D03_Q0/XCBR1/TripOpnCmd	SPS	=D03 Q0/=D03 Q0/Trip/open cmd.
D03_F87_1/D03_Q0/XCBR1/TripOpnCmd/Status value	SPC	=D03 Q0/=D03 Q0/Trip/open cmd./Status value

Target:

Destination	Description
*	
*	
*	
J05_F51_1/VI3p1_ExternalTrip1/EXT_PSCH1	VI3p1_Ext 1/Stage 1

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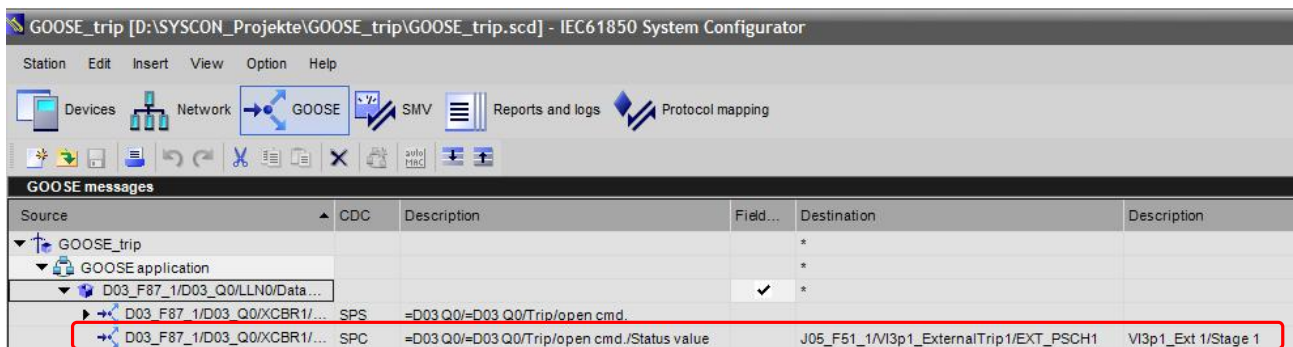


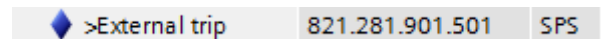
Figure 4: IEC 61850 System configurator

1.4.3 Information routing and CFC

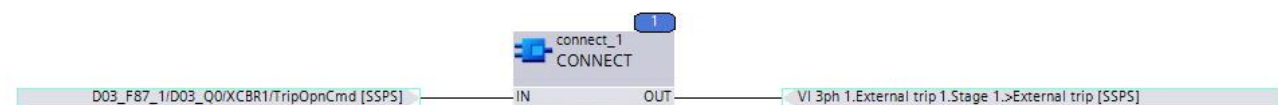
The GOOSE signal



Has to be connected with the following signal, see information matrix, Figure 5.



The chart CONNECT is required for this (fast-event triggered task).



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The screenshot displays the DIGSI 5 V6.20 - GOOSE_TRIP software interface. The left pane shows the Project tree with the following structure:

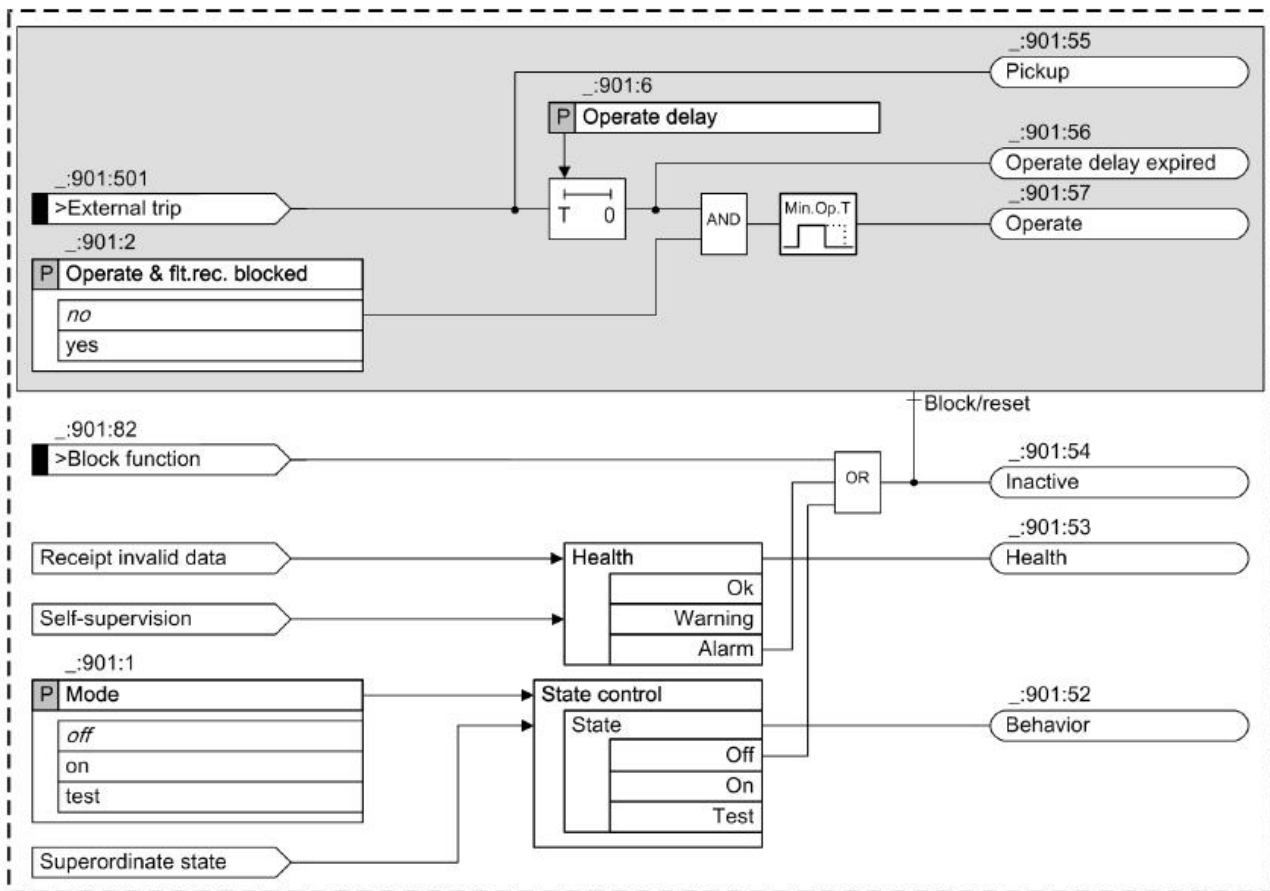
- GOOSE_TRIP
 - Single-line configuration
 - Add new device
 - Devices and networks
 - IEC 61850 stations
 - Add new station
 - IEC station 1
 - Load configuration to devices
 - Load firmware to devices
 - Trafo_Prot
 - 7UT85
 - 7SJ85
 - Device information
 - Hardware and protocols
 - Measuring-points routing
 - Function-group connections
 - Information routing
 - Communication mapping
 - Settings
 - Charts
 - Display pages
 - Safety and security
 - IEC 61850 structure
 - Test sequences
 - Process data
 - Document information
 - Frames
 - Cover pages
 - Languages & resources
 - Online access

The right pane shows the GOOSE_TRIP > Trafo_Prot > 7SJ85 > Information routing configuration. The table below represents the data shown in the right pane:

Information	Source	Binary input	Base module			
Signals	Number	Type	1.1	1.2	1.3	1.4
(All)	(All)
OC group ind.	821.10681					
Process monitor	821.1131					
Operational values	821.761					
Fund./sym.comp.	821.771					
50/51 OC-3ph-B1	821.1941					
50N/51N OC-gnd-B1	821.1731					
67 Dir.OC-3ph-B1	821.1971					
67N Dir.OC-gnd-B1	821.1741					
Switch onto fault 1	821.1341					
Energy	821.1021					
External trip 1	821.281					
Stage 1	821.281.901					
>Block function	821.281.901.82	SPS				
>External trip	821.281.901.501	SPS				
Inactive	821.281.901.54	SPS				
Behavior	821.281.901.52	ENS				
Health	821.281.901.53	ENS				
Pickup	821.281.901.55	ACD				
Operate delay exp..	821.281.901.56	ACT				
Operate	821.281.901.57	ACT				
TripOpnCmnd		SPS				
50/51 OC-3ph-B2	821.1942					
User-def. FN 1	821.0					
=J05 Q1	603					
=J05 Q0	201		*	*		
E:ETH-BA-2EL	102					
Main menu						

Figure 5 DIGSI 5 Information routing

1.5 Logic diagram for the External Trip-Initiation Stage



[lotrip3p-070611-01.tif, 1, en_US]

Figure 6-230 Logic Diagram for the External Trip-Initiation Stage

Further information is described in the different device manuals of SIPROTEC 5.

1.6 Conclusion

By consequent use of existing functions and function groups it is possible to retain with system architecture of SIPROTEC 5. That secures a high quality of the functionality.

The powerful communication interfaces of SIPROTEC 5 - IED's and IEC 61850 GOOSE offer the opportunity of fast and high quality transmission of time critical information over longer distances. Voltage drop along the line, undesired induction and higher risk of earth faults of the DC power supply can be avoided. Thus voltage drop along the line, undesired induction and higher risk of earth faults of the DC power supply can be avoided.

Additionally, it is possible to achieve uninterruptible ring-redundancy by activating HSR/PRP functionality.

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