SIEMENS

www.siemens.com/protection

SIPROTEC 5 Application Note

SIP5-APN-010:
Jump Start to Smart Engineering

Answers for infrastructure and cities.

SIPROTEC 5 - Application: SIP5-APN-010 Jump Start to Smart Engineering

Content

1 Application Jump Start to Smart Engineering 3
1.1 Summary 3
1.2 The task: protection of a line feeder 3
1.3 Mapping reality in DIGSI 5 4
1.4 Selecting and creating the devices for protection 5
1.5 Which device protects what? 6
1.6 Communication 7
1.7 Setting the protection parameters 8
1.8 Routing the signals 9
1.9 Loading the parameter sets into the protection devices 10
1.10 Reuse made easy 10
1.11 Conclusion 10

1 Application Jump Start to Smart Engineering

1.1 Summary

DIGSI 5 is the powerful engineering tool for system and device engineering. It encompasses configuration, testing, commissioning and operation of SIPROTEC 5 protection devices. It has been tailored to your workflows and supports you with all aspects of their implementation. This description introduces you to the implementation of a typical scenario.

1.2 The task: protection of a line feeder

This article highlights how you can protect a feeder of a double busbar system in few steps using a line protection device (7SL87) as main protection 1 and a distance protection device (7SA87) as main protection 2. This example demonstrates the capabilities of DIGSI 5 and therefore does not go into the details of setting the protection parameters of the two devices.

Let us begin with a single-line diagram. You probably have a similar diagram as that shown in the following picture in a CAD system (at least the single-line part without the devices):

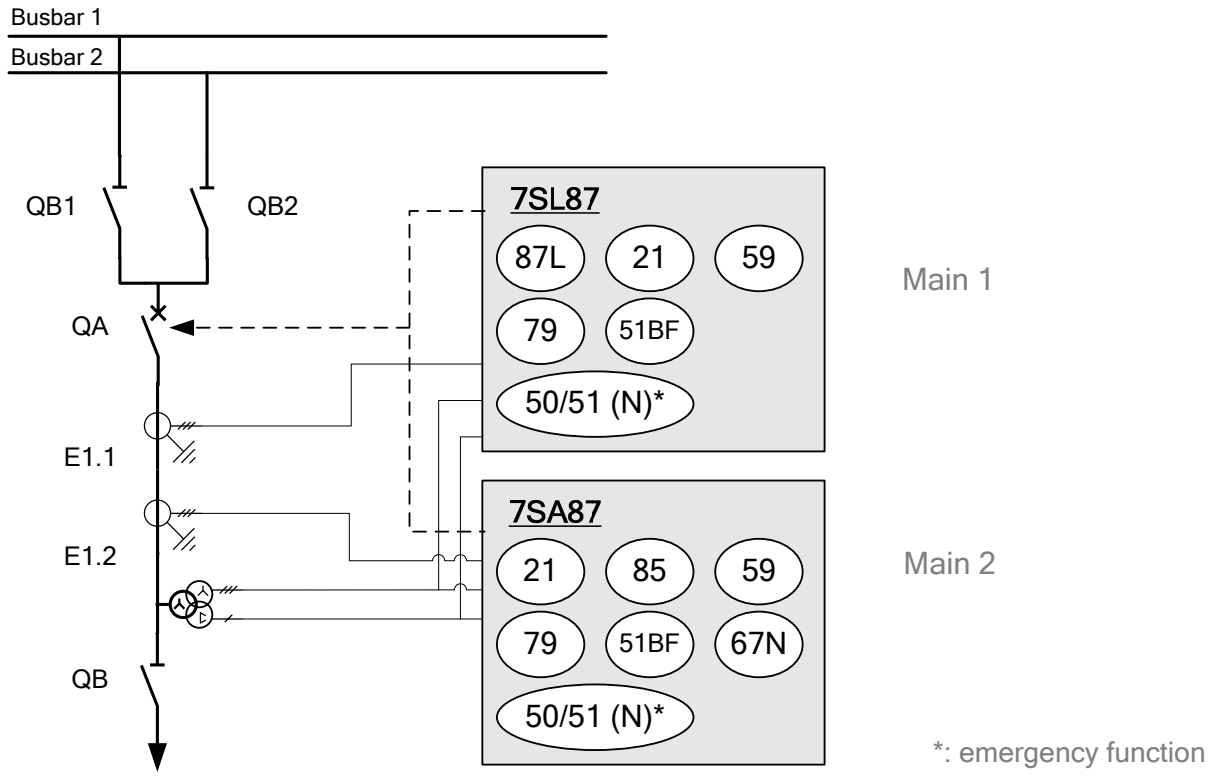

Figure 1: a single-line diagram as displayed for instance in ELCAD

Legend:

87L = line differential protection

21 = distance protection

59 = overvoltage protection

67N = directional ground current protection

79 = automatic reclosing

51BF = circuit-breaker failure protection

50/51 (N) = time-overcurrent protection

When designing the protection system, the modular structure of SIPROTEC 5 is used and several functions (e.g. 21, 59) are activated redundantly in both devices.

1.3 Mapping reality in DIGSI 5

First create a new project in DIGSI 5. The tree on the left side subsequently shows the structure of the project. It reflects the steps required to parameterize protection devices. In our case, we will begin by describing the primary topology of the entire system in the single-line editor. If you do not want to create the diagram manually, select one of the following options:

- Use a primary topology that is already available in ELCAD.
- Import a topology from a SCD/SSD file.
- Use one of the multiple single-line templates from the library for frequent application cases.

In our example, select "Single-Line-Template" and drag the protection template "Doppelsammelschienen-Leitungsabzweig" from the library on the right-hand side and drop it on the drawing area.

If you specify the properties of the primary elements (e.g. current transformer rated current), you save yourself much setting effort later on, as these settings can be synchronized with the connected devices. Other possible primary data include for instance the voltage level, the values of current and voltage transformers or the cable data.

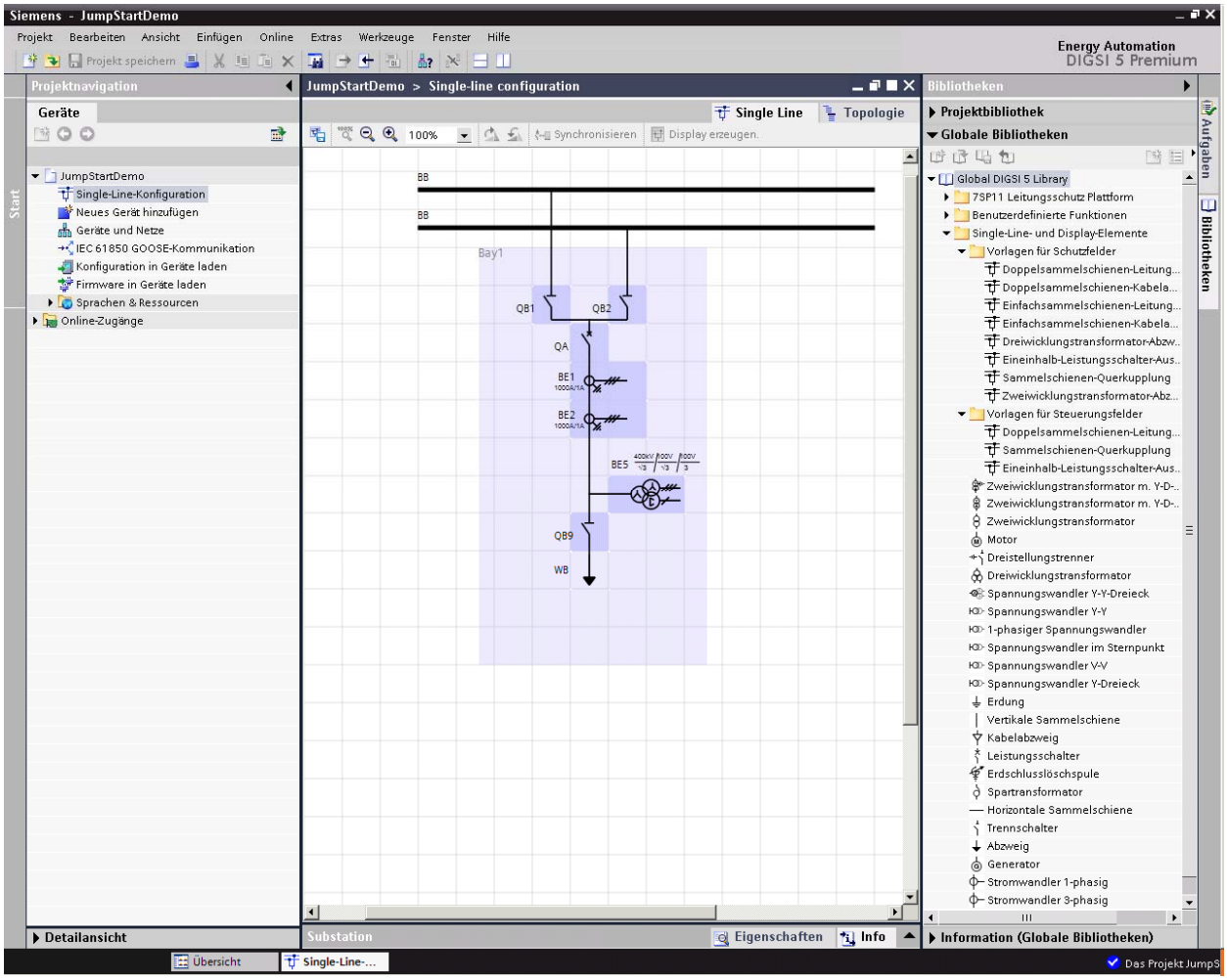

Figure 2: The single-line editor allows you to map your system topology

1.4 Selecting and creating the devices for protection

Select "Add new device" to create a new device of the type 7SL87 with the desired functional scope (4 current inputs, 16 LEDs, small display and one Ethernet communication module). All you need for this purpose is the order number which is indicated in the order configurator for example. There you can also tailor the protection device to your own requirements.

To create the device, you have to select an application template. You thus obtain a device that has the correct functional scope and is nearly ready for use. In our case, we select the application template "Freileitung mit starr geerdetem Sternpunkt" for the 7SL87. If the application template does not fully meet your requirements, you can easily customize it. Add additional functions from the library on the right-hand side by dragging & dropping. This enables you to add individual function blocks to the devices (e.g. stages), functions (detection of power swings, automatic reclosing, circuit-breaker failure protection ...) or entire function groups. The application template we selected contains all functions except for the overvoltage protection which you have to drag from the library into the device for this purpose.

Proceed in the same manner for the 7SA87 and create the device.

1.5 Which device protects what?

In the single-line editor the devices are connected to the primary system. To do so, graphically connect the current inputs and voltage inputs of the protection devices with the current transformers and voltage transformer. You also define in the graphic which circuit breaker is tripped by the protection device. The connections now enable you to transfer the topology settings you have made into the connected protection devices where you can keep them synchronous.

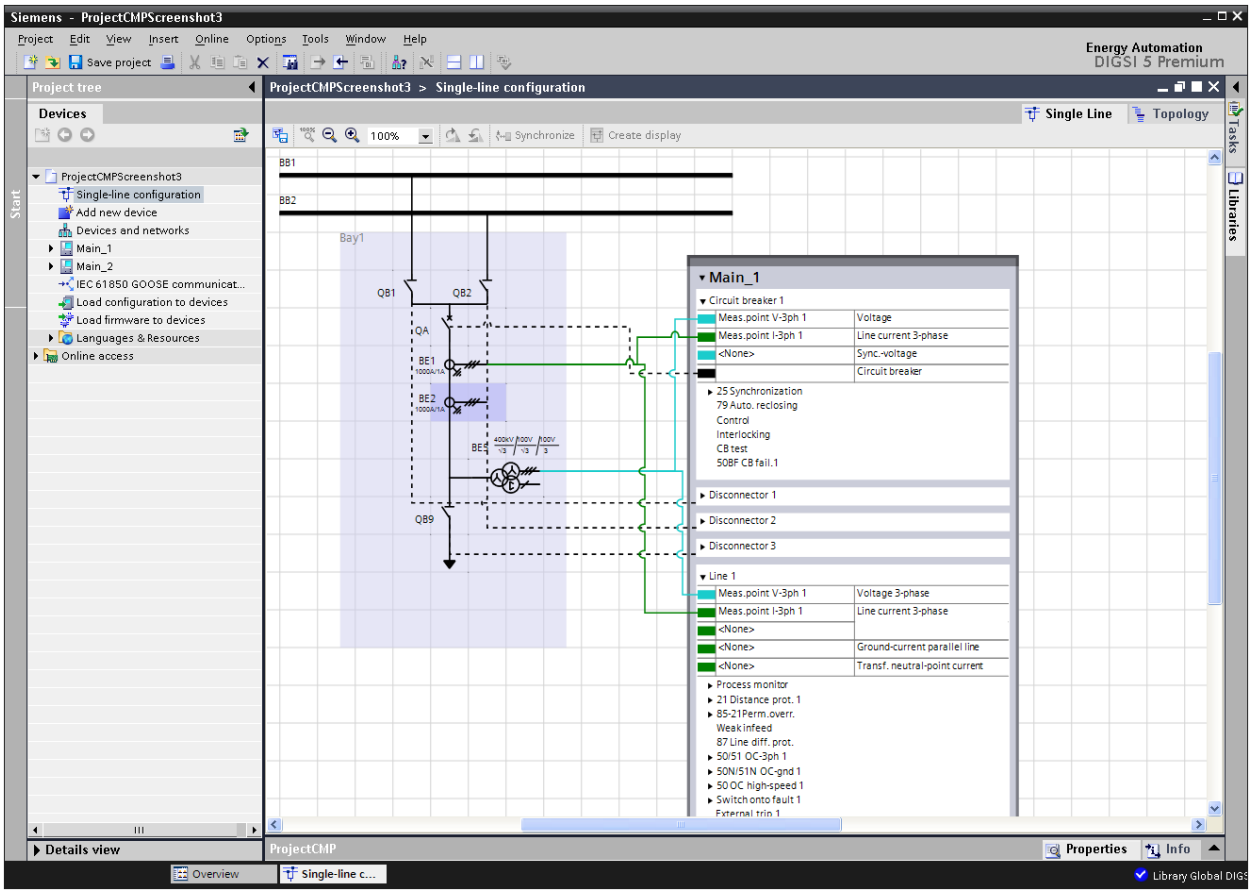

Figure 3: Connections create a relationship between the primary topology and the device

1.6 Communication

The protection devices must also be capable of communicating with a substation automation system or a control center. For this purpose, we already equipped them with a communication module when creating them. In the "Hardware and protocols" editor you can add new communication modules and set their communication parameters.

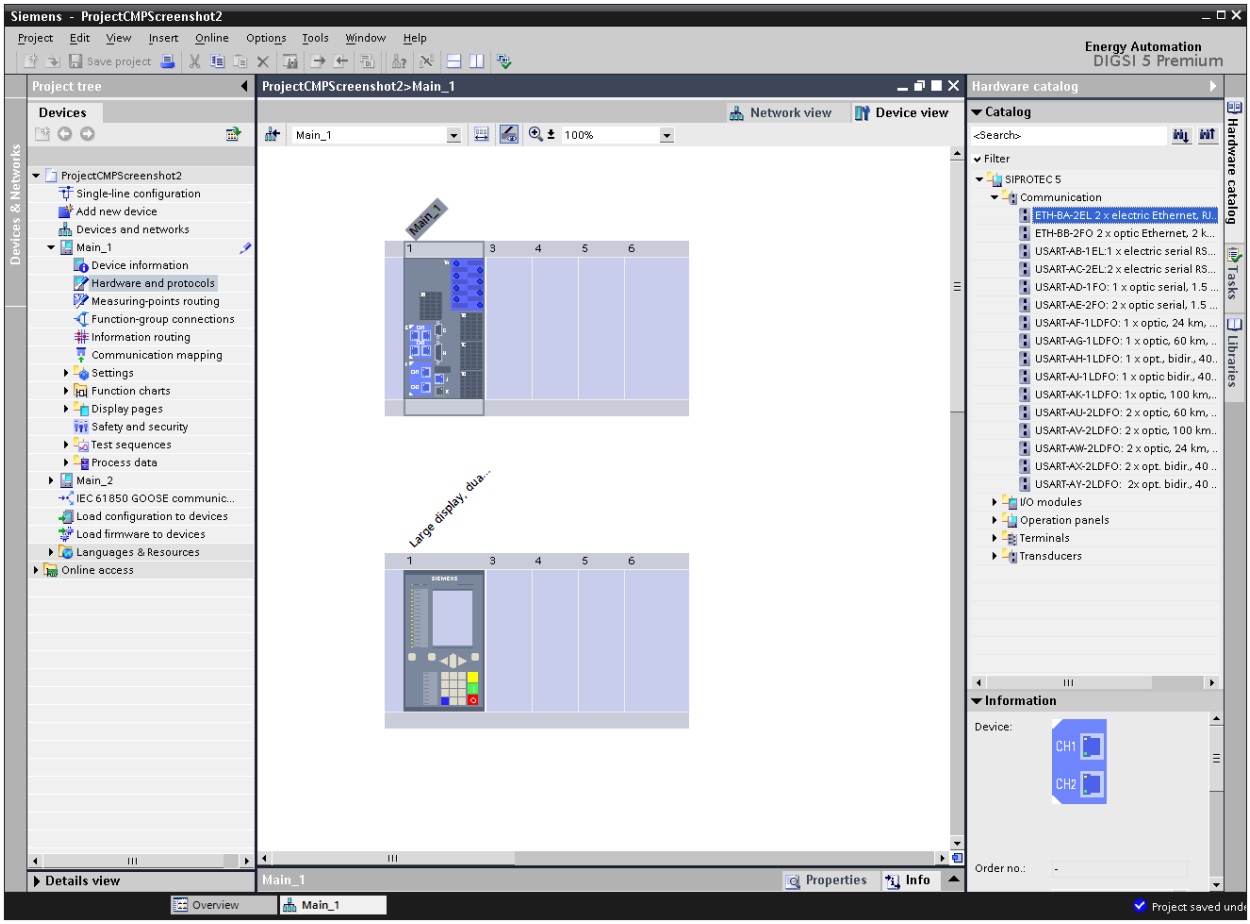

Figure 4: The communication parameters are set in the hardware configuration.

1.7 Setting the protection parameters

DIGSI 5 allows you to enter protection parameters in the parameter editor quickly and in a clearly structured way while checking their consistency. Any inconsistencies are displayed immediately.

The zone settings are particularly important for the distance protection. And since you want the device to perform automatic reclosing, you have to specify them – no other settings are necessary to complete the application. All other settings have already been taken over from the primary topology. The setting values, in our case e.g. the zone settings, are also displayed graphically as zone diagrams so that you can visually verify that you have entered all settings correctly.

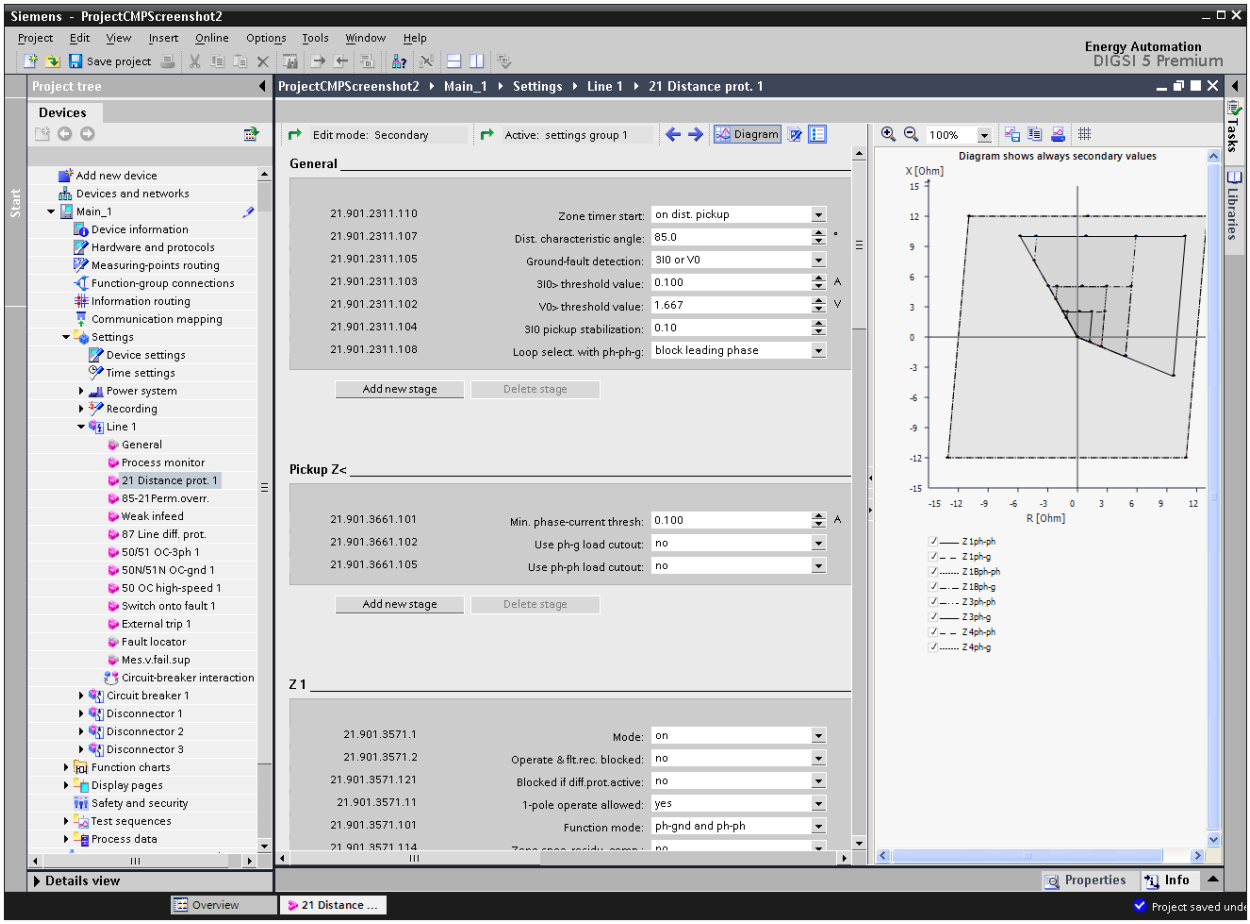

Figure 5: DIGSI 5 allows you to easily enter protection parameters showing them simultaneously in a diagram.

1.8 Routing the signals

In the information routing editor all information items are routed to the corresponding sources and destinations. This includes for instance alarm signals and tripping signals which must be connected to binary outputs to enable them to control the circuit breaker. Furthermore, you need the SEND signals for protection signal transmission (distance protection and ground fault protection). It also makes sense to route the selected pickup indication to LEDs. This gives you a quick overview of the incoming signals.

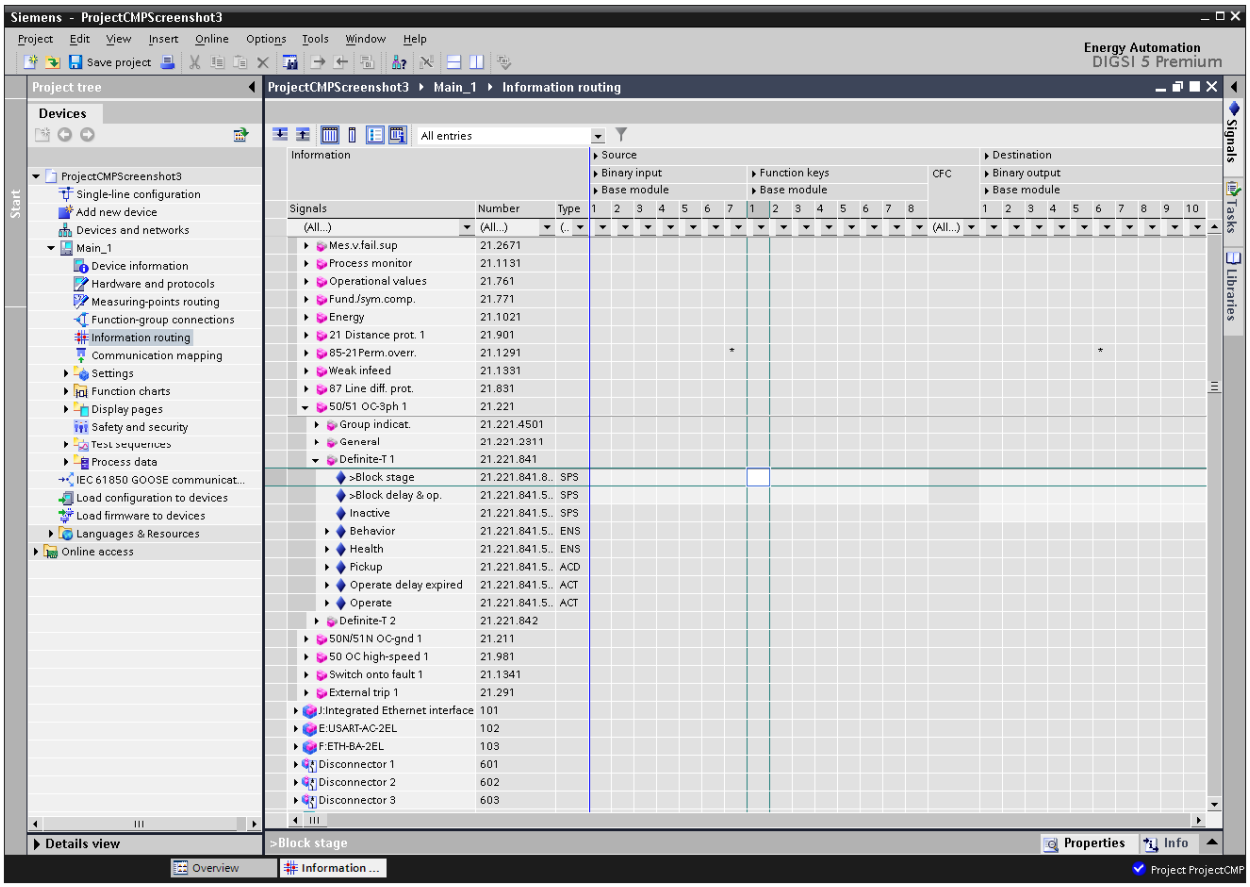

Figure 6: Routing signals to sources and destinations

1.9 Loading the parameter sets into the protection devices

If all settings have been made and all signals been linked, all that remains to be done is load the parameter sets into the protection devices. You can connect the devices to the DIGSI 5 engineering computer via USB or address them via Ethernet. The latter case requires the IP addresses to be assigned to the devices. When loading via Ethernet, you can update all connected devices at once. In our case, both devices are updated and are ready for operation.

1.10 Reuse made easy

If you need additional identical devices with the same functional scope, e.g. to protect additional feeders, just copy a fully configured device and insert the copy into the project. All settings or function expansions already made are thus taken over in a convenient way.

The open interfaces of DIGSI 5 enable you to provide all relevant data to other systems where you can reuse them straight away. For example, it is easy to take over the communication settings, indication lists and even topology information into SICAM PAS.

You can also connect your own system landscape using documented exchange formats like TEAX to optimally import the data into your systems, e.g. to archive device parameterizations, system documentation, generate or control test cases and many more applications.

1.11 Conclusion

DIGSI 5 is fully tailored to your workflow and optimally supports you with all aspects of your work. The consistent reuse option is only one of countless tools that allow you to configure protection devices quickly and efficiently, to test and commission them. But support for DIGSI 5 does not stop here, because the engineering tool is designed to support your workflows in a comprehensive way. Use DIGSI 5 and see for yourself how efficient DIGSI 5 supports you with your other tasks, too, such as testing and commissioning.

Published by and copyright © 2013:

Siemens AG

Infrastructure & Cities Sector

Smart Grid Division

Humboldtstr. 59

90459 Nuremberg, Germany

Siemens AG

Infrastructure & Cities Sector

Smart Grid Division

Energy Automation

Humboldtstr. 59

90459 Nuremberg, Germany

www.siemens.com/protection

Printed on elementary chlorine-free bleached paper.

For more information, please contact
our Customer Support Center.
Tel.: +49 180 524 8437
Fax: +49 180 524 24 71
(Charges depending on provider)
E-mail: support.ic@siemens.com

Application note: SIP5-APN-010