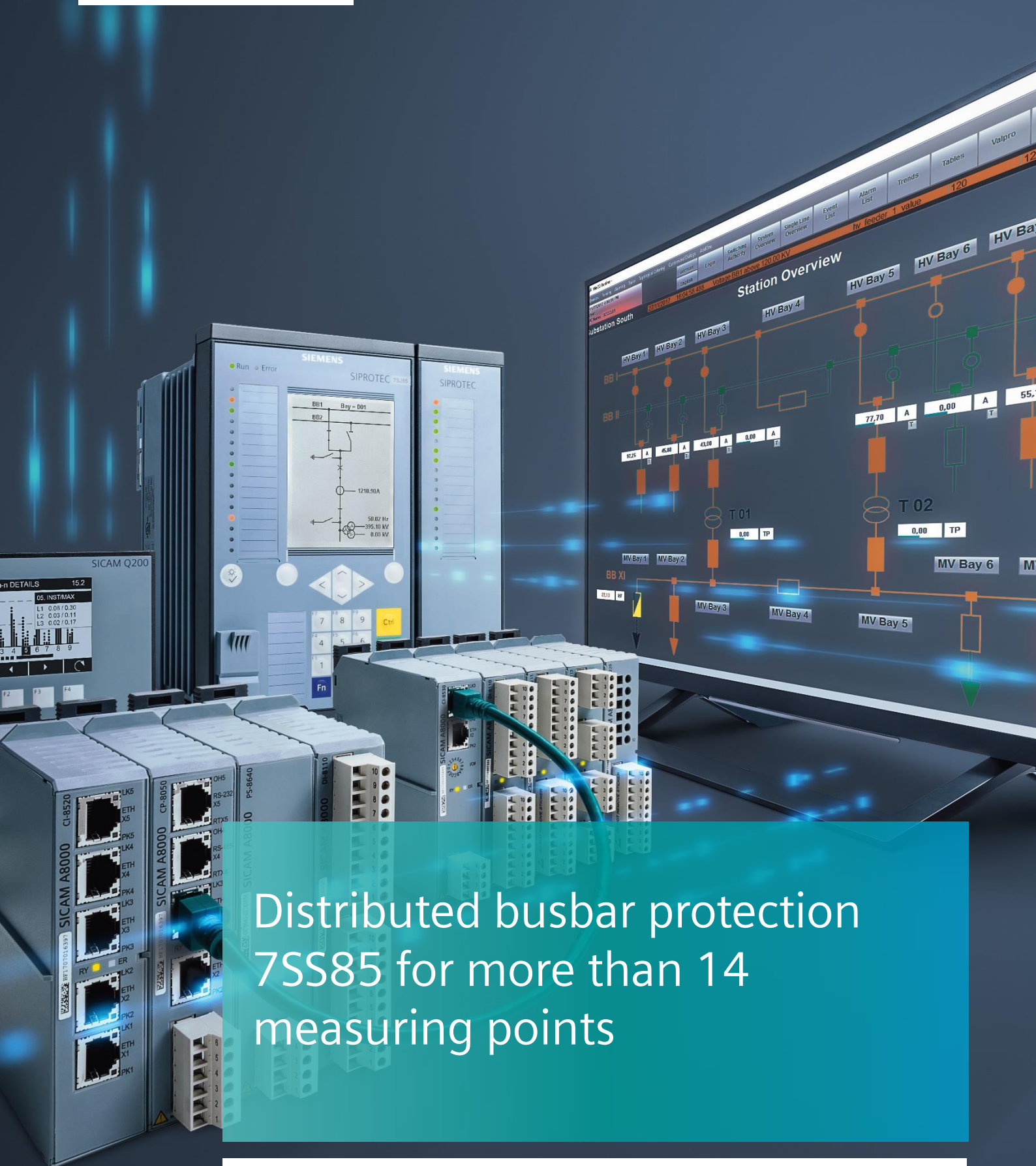


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Distributed busbar protection 7SS85 for more than 14 measuring points

SIPROTEC 5 Application

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APN-074, Edition 1

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1 Distributed busbar protection 7SS85 for more than 14 measuring points

1.1 Introduction

A distributed busbar protection 7SS85 is capable to handle up to 20 measuring points when no sampling-rate configuration higher than "4000Hz, 1 ASDU" is used.

As the ETH-BD-2FO supports a bandwidth of 100 Mbit/s, it is recommended to subscribe a maximum of 14 measuring points with one module. In order to handle up to 20 measuring points, two ETH-BD-2FO modules are required.

This application note describes the network configuration in DIGSI 5 and IEC 61850 System Configurator, when more than 14 measuring points need to be supported. Further on the configuration of VLANs in a RUGGEDCOM Switch, required for this application, is described.

1.2 Topology example

The Figure 1 shows a schematic of a busbar differential protection for 20 measuring points. Please note that for simplifying reasons the communication redundancy and sample values synchronizations are not shown here.

The amount of merging units shall be well-balanced in both ETH-BD-2FO modules.

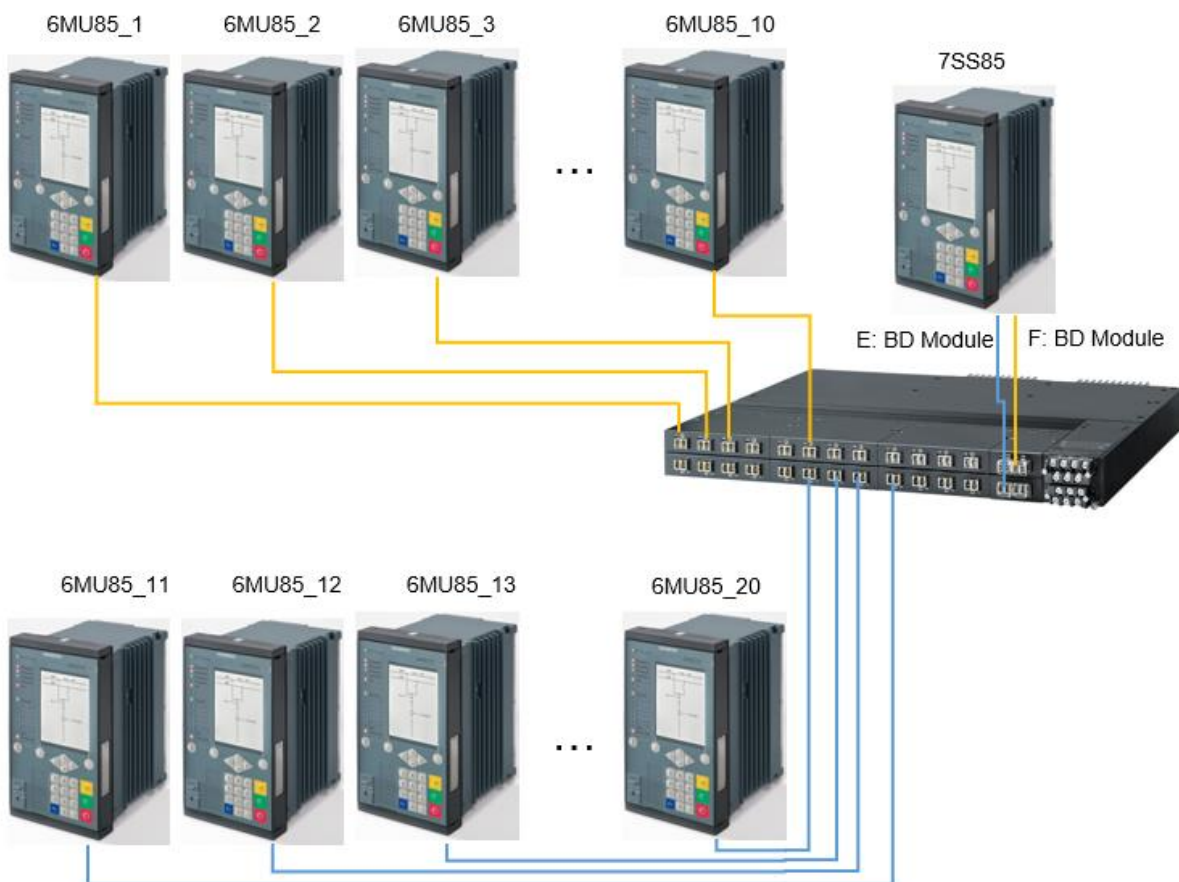


Figure 1: Simplified scheme for a distributed busbar differential protection using two ETH-BD-2FO modules

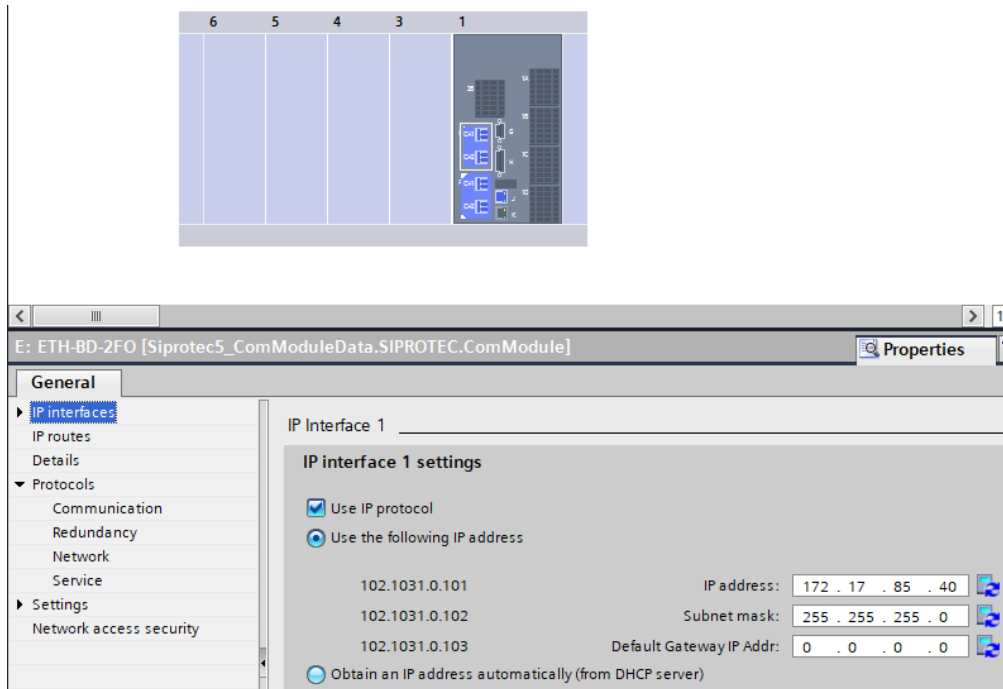
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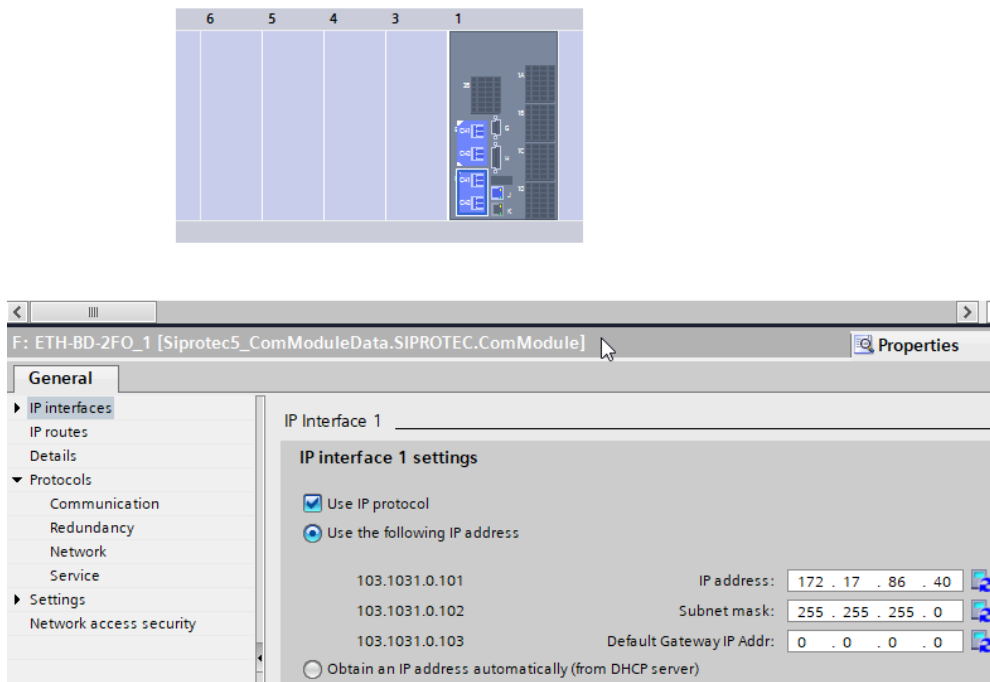
1.3 Configuration in DIGSI 5

After inserting the two ETH-BD-2FO modules in the 7SS85 device, configure one independent subnet for each module. The IP address and subnet masks used here are only examples. They must be adapted to your own network.

Port E: 172.17.85.40

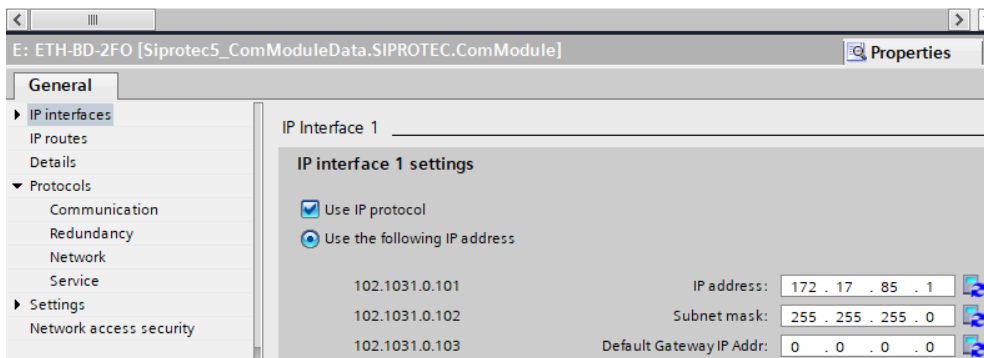
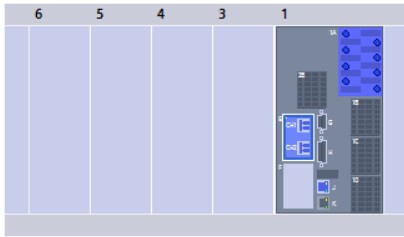


Port F: 172.17.86.40



As mentioned above, it is highly recommended to balance the amount of used devices in the two ETH-DB-2FO modules on port E and F.

The IP configuration of each Bay Unit (merging unit) must be also done according to the subnet it belongs to.



Take the following table as example:

Subnet 1		Subnet 2	
6MU85_01	172.17.85.1	6MU85_11	172.17.86.11
6MU85_02	172.17.85.2	6MU85_12	172.17.86.12
6MU85_03	172.17.85.3	6MU85_13	172.17.86.13
6MU85_04	172.17.85.4	6MU85_14	172.17.86.14
6MU85_05	172.17.85.5	6MU85_15	172.17.86.15
6MU85_06	172.17.85.6	6MU85_16	172.17.86.16
6MU85_07	172.17.85.7	6MU85_17	172.17.86.17
6MU85_08	172.17.85.8	6MU85_18	172.17.86.18
6MU85_09	172.17.85.9	6MU85_19	172.17.86.19
6MU85_10	172.17.85.10	6MU85_20	172.17.86.20

Now, configure the sample values and the GOOSE messages for circuit breaker, disconnector positions, trip signals and breaker failure protection as usual.

Create the IEC 61850 station and assign the merging units and protection device. Export the changes to the IEC 61850 System Configurator.

1.4 Configuration in IEC 61850 System Configurator

In the System Configurator, verify the subnet configuration you did in DIGSI 5:

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Distributed busbar protection 7SS85 for more than 14 measuring points

Subnets		
Name	IED Description	IP address
IEC station 1		
New devices		
Port E		
CU/E	7SS85_40/E	172.17.85.40
MU1/E	6MU85_01	172.17.85.1
MU2/E	6MU85_02	172.17.85.2
MU3/E	6MU85_03	172.17.85.3
MU4/E	6MU85_04	172.17.85.4
MU5/E	6MU85_05	172.17.85.5
MU6/E	6MU85_06	172.17.85.6
MU7/E	6MU85_07	172.17.85.7
MU8/E	6MU85_08	172.17.85.8
MU9/E	6MU85_09	172.17.85.9
MU10/E	6MU85_10	172.17.85.10
Port F		
CU/F	7SS85_40/F	172.17.86.40
MU17/E	6MU85_17	172.17.86.17
MU18/E	6MU85_18	172.17.86.18
MU19/E	6MU85_19	172.17.86.19
MU20/E	6MU85_20	172.17.86.20
MU16/E	6MU85_16	172.17.86.16
MU15/E	6MU85_15	172.17.86.15
MU11/E	6MU85_11	172.17.86.11
MU12/E	6MU85_12	172.17.86.12
MU13/E	6MU85_13	172.17.86.13
MU14/E	6MU85_14	172.17.86.14

Note: The subnets configuration can be also done in SysCon and then imported into DIGSI 5

In the GOOSE and SMV editors connect the signals as described in the manuals *Software IEC 61850 System Configurator V5.90* and *SIPROTEC 5 Process Bus V8.03 and higher*.

1.5 Configuration of VLANs in the RUGGEDCOM switches

The configuration in DIGSI 5 and IEC 61850 System Configurator is based on the use of two independent subnets in order to control the traffic of information arriving at every ETH-BD-2FO module. However, the system is built on a unique physical (redundant) network. Therefore, it is required the use of virtual LANs (VLANs).

In this chapter is shown how the proper VLAN configuration is achieved in the RUGGEDCOM switches. They can be configured using console, telnet or via web browser.

Once the access to the configuration of the switch has been granted, go to the Menu Option **“Virtual LANs”**

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```
Main Menu                                     4 ALARMS!  
  
Administration  
Ethernet Ports  
Ethernet Stats  
Link Aggregation  
Network Redundancy  
Virtual VLANs  
Network Access Control  
Classes of Service  
Multicast Filtering  
MAC Address Tables  
Layer 3 Switching  
Network Discovery  
Diagnostics  
  
<CTRL> Z-Help S-Shell X-Logout
```

Enable the awareness of VLANs in the Menu Option *“Configure Global VLAN Parameters”*

```
Global VLAN Parameters                       4 ALARMS!  
  
VLAN-aware           Yes  
Ingress Filtering    Disabled  
QinQ Outer TPID     0x8100  
  
<CTRL> Z-Help S-Shell
```

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Distributed busbar protection 7SS85 for more than 14 measuring points

Then select the Menu Option **“Configure Port VLAN Parameters”**

```
Virtual LANs 4 ALARMS!  
  
Configure Global VLAN Parameters  
Configure Static VLANs  
Configure Port VLAN Parameters  
View VLAN Summary  
  
CTRL> Z-Help S-Shell X-Logout
```

Here, the physical ports of the switch which connect the devices to subnet 1 and subnet 2 will be defined. All ports connected to devices belonging to the same subnet must get the same VLAN ID. The VLAN ID can be freely configured.

In this example we have selected the VLAN ID “10” for the subnet 1 and the VLAN ID “20” for the subnet 2.

```
Port VLAN Parameters 4 ALARMS!  
  
Port(s) Type PVID PVID Format GVRP  
0/1 Edge 1 Untagged Disabled  
0/2 Edge 1 Untagged Disabled  
0/3 Edge 1 Untagged Disabled  
0/4 Edge 1 Untagged Disabled  
1/1 Edge 10 Untagged Disabled  
1/2 Edge 10 Untagged Disabled  
1/3 Edge 10 Untagged Disabled  
1/4 Edge 10 Untagged Disabled  
2/1 Edge 10 Untagged Disabled  
2/2 Edge 10 Untagged Disabled  
2/3 Edge 10 Untagged Disabled  
2/4 Edge 10 Untagged Disabled  
3/1 Edge 10 Untagged Disabled  
3/2 Edge 10 Untagged Disabled  
3/3 Edge 10 Untagged Disabled  
3/4 Edge 1 Untagged Disabled  
4/1 Edge 20 Untagged Disabled  
4/2 Edge 20 Untagged Disabled  
More below ...  
  
CTRL> Z-Help S-Shell D-Polln U-Pollp
```



```

Port VLAN Parameters 4 ALARMS!
-----
Port(s) Type      PVID  PVID Format  GVRP
-----
2/3     Edge      10     Untagged    Disabled
2/4     Edge      10     Untagged    Disabled
3/1     Edge      10     Untagged    Disabled
3/2     Edge      10     Untagged    Disabled
3/3     Edge      10     Untagged    Disabled
3/4     Edge      1     Untagged    Disabled
4/1     Edge      20     Untagged    Disabled
4/2     Edge      20     Untagged    Disabled
4/3     Edge      20     Untagged    Disabled
4/4     Edge      20     Untagged    Disabled
5/1     Edge      20     Untagged    Disabled
5/2     Edge      20     Untagged    Disabled
5/3     Edge      20     Untagged    Disabled
5/4     Edge      20     Untagged    Disabled
6/1     Edge      20     Untagged    Disabled
6/2     Edge      20     Untagged    Disabled
6/3     Edge      10     Untagged    Disabled
5/4     Edge      1     Untagged    Disabled
More above ...

<CTRL> Z-Help S-Shell D-PoDn U-PoUp
    
```

The VLAN 1 is the default value for ports at RUGGEDCOM switches.

1.6 Conclusions

Due to the bandwidth required to subscribe sampled values for 20 measuring points, it is necessary to use two ETH-BD-2FO modules in the 7SS85. The recommendation is limiting the amount of measuring points to 14 if using only one ETH-BD-2FO module.

When using two modules, the traffic load shall be balanced between them, i.e. subscribing fairly the same amount of measuring points with each module.

Each ETH-BD-2FO of the 7SS85 device and the corresponding bay units (merging units) must belong to the same subnet, which must be different to the subnet used for the other module.

In order to have the two subnets running in the same physical communication network, it is necessary to use VLANs.

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