

## Central operation of SIPROTEC 4 with DIGSI 4

19,2 kBaud / 8N1

### Introduction

Hereafter follows a guide for setting up a substation data management structure for a number of bays and/or devices. This data management is required for the central and/or remote control. For this purpose, the DIGSI 4 manager on a particular PC must be used to set up the SIPROTEC 4 protection devices. During this process, a unique VD address is assigned to each device by DIGSI 4. If a different PC (e.g. note-book) is to be used to operate these devices, the original substation data with valid VD addresses must be copied onto the note-book.

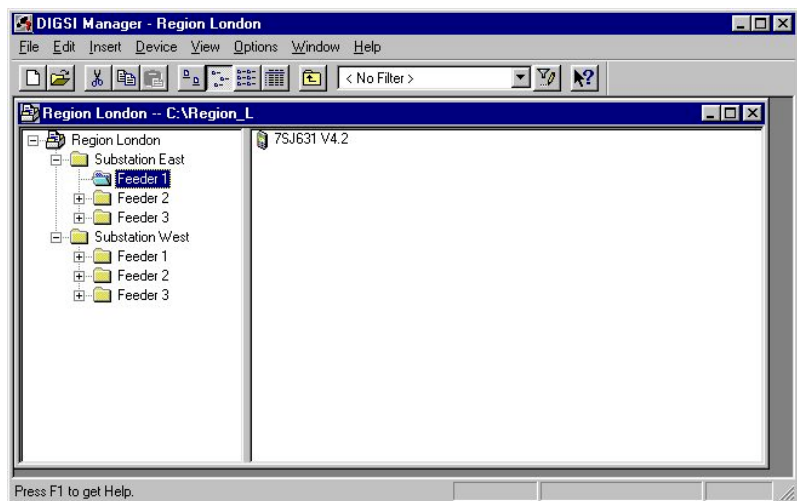
Operation of devices via the front interface is always possible with Plug & Play.

### Creating a project and substation

Initially a project must be created, a folder for the substation must then be added in the project. Subsequently an empty folder, as a master bay, must be created in the substation. All these folders must be provided with clearly recognisable names.

### Creating the master bay /master devices

After creating the first master bay with master devices in the DIGSI manager, the common settings such as power system data, configuration, masking of input/output and the serial port data can be applied.



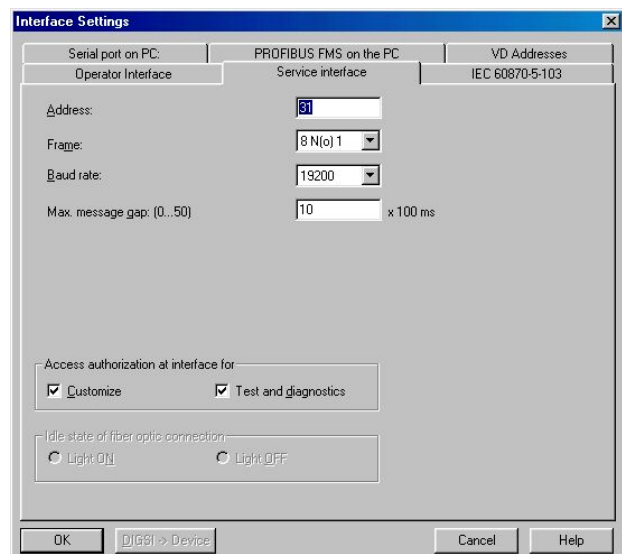
### Setting the Service Interface

The service interface located at the rear of the device is used for central/remote control of SIPROTEC 4 devices with DIGSI 4. This may be a RS232-, RS485- or FO-interface. These interfaces merely differ in their electrical properties. All versions operate with the same DIGSI 4 protocol, i.e. the setting page containing the parameters of the service interface is approximately the same for all SIPROTEC 4 devices.

The settings for this interface is done with the DIGSI 4 program. In the initial page, click on "Settings". Subsequently double click in the right hand window on "Serial Ports", and apply your specific parameters in the subsequent dialog boxes.

### Baud-rate and Frame

In this example, the communication is done with a Baud-rate of **19200 Baud** and the standard data frame **8N1**, i.e. all devices from the controlling PC through to the individual protection relays are set accordingly. If different settings are required, e.g. 57600 Baud 8E1, then the settings must be uniformly changed in all devices.



## **Address of the Service Interface**

Within the substation data management structure, each service interface of a SIPROTEC 4 device must be allocated with a unique address. A total of 254 addresses are available per substation. The service interface address applied to the device must be the same as the address of the corresponding device in the DIGSI 4 substation data management structure.

**Note:** When creating new devices, address 1 is always allocated. When devices are copied, the address is not changed. There is no automatic check of multiple use of the same address.

## **Message-gaps**

The message gap setting is only required if the device communicates via modems. The „Maximum Message-gap“ of the device should be set to 1,0 s (refer also to sending a “ping”).

The set gap is the maximum permissible duration of a gap during the transmission of a message (telegram). In the case of direct connection to personal computers, the maximum message gap can be set to 0 s. Message gaps are introduced by data compression, error correction and variation of Baud rate in conjunction with modems. In case of good transmission quality between modems a setting of 1,0s is recommended.

**Note:** The baud rates of the device interfaces should be the same or smaller than the rate on the remote communication link, to prevent gaps after each byte.

## **Sending a „Ping“**

If the parameter “maximum message gap” in the SIPROTEC 4 devices up to version 4.1x is set with a value greater than 0s, the device will send a “ping”, i.e. a message „ATE0Q1“, at the baud rate set inside the protection device, every 11-16 seconds (timing generated randomly). From version 4.2x onwards, this “ping” is only sent for maximum message gaps of 2.1 s and greater, which allows a maximum message gap setting of 2.0s without “ping”. Before sending a “ping” the protection device checks, by “listening” on the bus, whether data traffic is present in the system, and only transmits a “ping” in the system when no data traffic is present.

The message „ATE0Q1“ synchronises the connected modem to the baud rate set in the protection device, and disables the echo-function in the modem.

**Note:** Some modems cancel the connection immediately if a “ping” is received during establishment of the connection. In the ke-modems for example, this is prevented with the parameter „ATS20=0“. As problems in conjunction with the “ping” can also be encountered with other modem types, the gap tolerance of the devices should be set such that no “ping” is transmitted.

## **Copying of Master and/or Master device**

Once the settings in the master devices have been done, the entire master bay or each master device individually, is copied in the substation folder as often as required, by using the functions “copy and paste” or “drag and drop”. During copying all the settings (also the interface address) of the master device are maintained. DIGSI 4 however allocates a new VD address for each new device.

## **VD-Address**

With DIGSI 4 the VD address can be viewed under the **Object Properties** (DIGSI manager; edit; object properties; FMS/IEC setting). It can however not be changed.

## **Initialising devices**

Before initialising the devices, the interface addresses of the duplicated devices must be changed. Subsequently each device in turn is initialised with a DIGSI cable 7XV5100-4 connected to the front interface. During initialisation all settings, as well as the VD address, are transferred..

## Reading out Device settings

Via the keypad and display of the device, the most important interface parameters can be viewed and changed.

SERVICE PORT	02 / 04
Phys. Addr.	31
Baudrate	19200 Baud
Parity	8N1
Gaps	1.0s

## Testing Central Control

Commissioning should be co-ordinated and done in small steps. In distributed topologies, it is recommended to commission individual branches (e.g. cascaded star coupler or several RS485 buses) in turn.

If all devices are properly connected, these can be sequentially operated with DIGSI 4 via the rear interface. For this purpose select “**Open Object**” in the DIGSI 4 manager (“Edit”; “Open Object”) (refer to screen shot on the right). In this example, the connection with the protection device is established via the COM 1 interface of the operating PC to the rear service interface of the selected SIPROTEC 4 device. Thereby the communication parameters of the service interface, set with DIGSI 4, are automatically used.



## Fault diagnosis

Experience has shown that if fault free operation of the device is not possible, this is often only due to small errors that have crept in and that prevent correct operation. Therefore use a systematic approach in the fault diagnosis.

### Method

- Check the settings with DIGSI 4.
- Check device settings via the front display.
- Check the communication components.
- Check all connections of the communication equipment.
- Test communication with the first protection device (all other devices are disconnected).
- Sequentially connect and test the other devices/branches.

### Settings DIGSI 4 / Protection Devices

- Was the project generated on a single PC i.e. no duplication of VD addresses?
- Do the service interfaces in DIGSI 4 all have unique IEC addresses?
- Do the baud rate and data frame of all service interfaces in DIGSI 4 have the same setting?
- Were all the protection devices initialised with these settings?
- Are the jumper settings on all service interfaces (RS232/RS485) in the protection devices correct?

### Communication components

- Are the settings of the used converters correct e.g. data frame, Idle state of FO connection etc.
- Have the prescribed electrical communication cables with correct pin allocation been used?
- Have plastic FO connectors longer than 3.5 m been used?
- Do the implemented FO cables match the wave length 820nm viz. 1300nm of the converter?
- Are the FSMA-plugs of the FO cables fitted properly and not over tightened?
- Have all the FO connectors been crossed over (transmitter to receiver and vice versa)?

Have fun!