

## Remote Control SIPROTEC 4 via Ethernet-Modems 7XV585x and 7XV5655

### General

In principle the scope of functions of Ethernet-Modems correspond to the already known analog or digital telephone modems. Instead of the analog or digital telephone network, the transmission medium is the well-known Ethernet. For this purpose, the data received at the RS232-interface are packed into a TCP/IP-protocol and unpacked again at the opposite end for output on the RS232-interface. Instead of a telephone number, the connection is established from the calling Ethernet modem (office modem) by selection of an IP address.

This method allows for the simple handling of Ethernet modems by the protection communication program DIGSI 4 if the following application guidelines are strictly adhered to.

The example outlines a small private network with free IP addresses. The operating PC with Windows XP and DIGSI 4.50 in this case has a fixed IP address 192.168.10.100. The office modem has the IP address 192.168.10.161, the substation modems 192.168.10.153 and 192.168.10.154.

**Note:** This application guide only serves as a additional user information and assumes that the user has knowledge of the general application guide for the product and its basic functions as described in the manual.

### Approach:

- • Installing modem driver in Windows
- • Configuring modems with the configuration tool
  - Selecting basic data (IP-address and name) of the office modem
  - Selecting basic data (IP-address and name) of the substation modem
  - Integration of-PC and Ethernet-Modems into the Ethernet
  - Selecting the communication parameters (Baud rate, data format etc.) of the office modem
  - Selecting the communication parameters (Baud rate, data format etc.) of the substation modem
- Inserting telephone directory and modems in the substation manager of DIGSI 4
  - Insert telephone directory with IP addresses
  - Insert office and substation modem with settings
  - Insert modem connection
- Establish the modem connection
  - Start the connection
  - Check the “number” to be dialled (IP address), correct of necessary
  - Check the connection in the report window
  - Establishment of connection to the protection device

## Installation of the modem driver

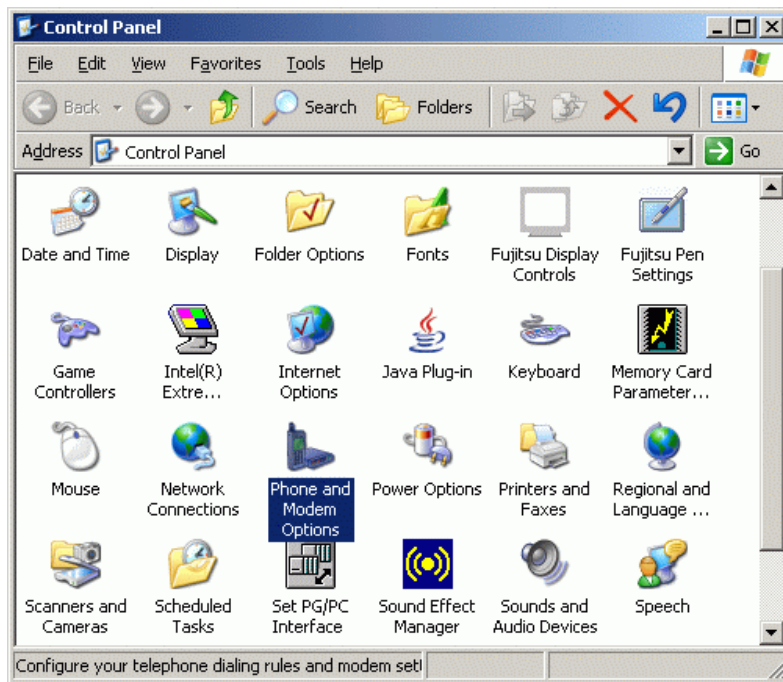
For the operation of an Ethernet modem in a Windows application, it is necessary to install a modem driver in the Control panel of Windows.

The operating systems Windows NT 4 from SP6a, Windows 2000 or Windows XP (Professional) are a pre-requisite for this.

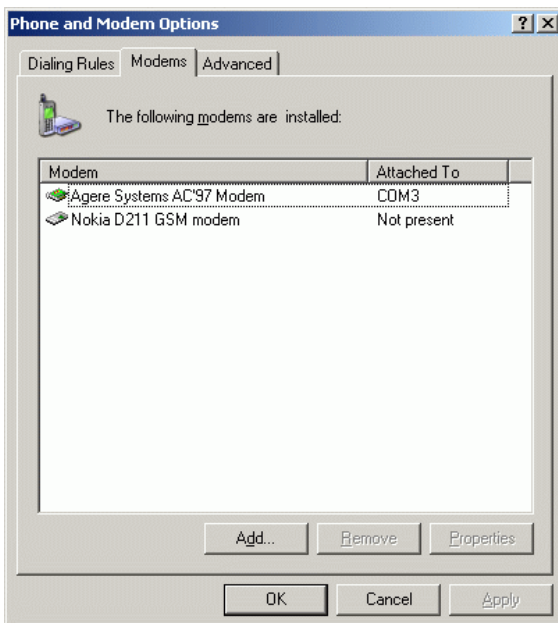
The modem driver **ipetherModem.inf** for the Ethernet-modem may be found on the included **CD „Manuals 7XV5“** under **„Accessories / 7XV585x / Driver“**.

**NOTE! Up-to-date information may be found in the Internet under**

**[www.SIPROTEC.com](http://www.SIPROTEC.com)** under **Accessories / 7XV585x** or **applications / remote-control**



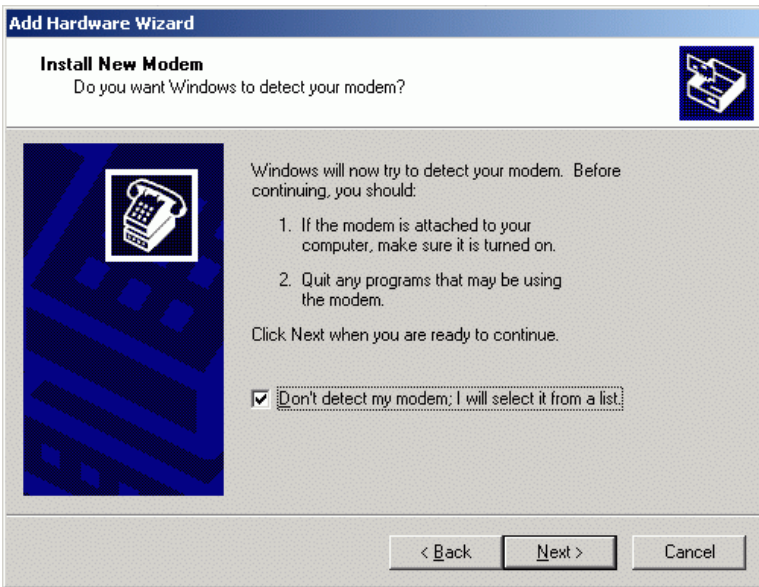
In the Control panel  
**Choose „Telephone- and Modem options“**  
By double-clicking on the icon.



**ADD** installs a new modem driver in Windows.

If a modem driver has not yet been installed, Windows automatically offers an installation window.

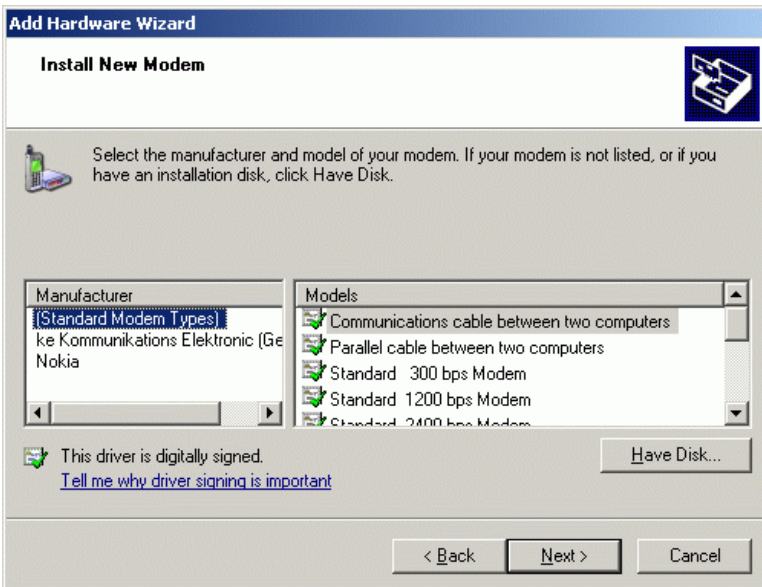
Continue with **OK**.



The modem must be selected manually. For this purpose a check is placed in the field

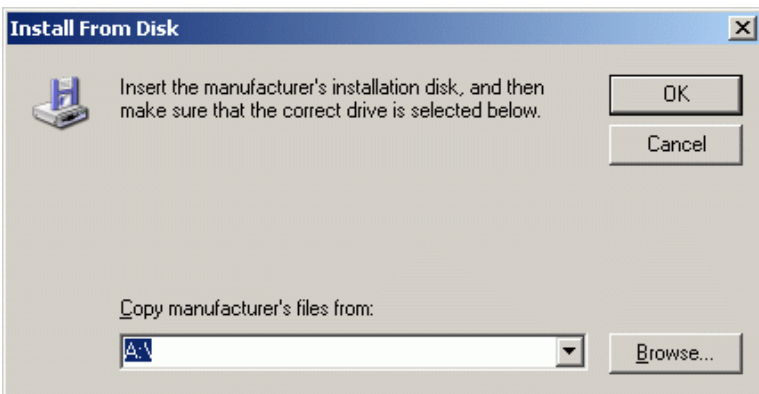
**Select modem  
(no automatic detection)**

**Press Next >.**



Install a new modem from

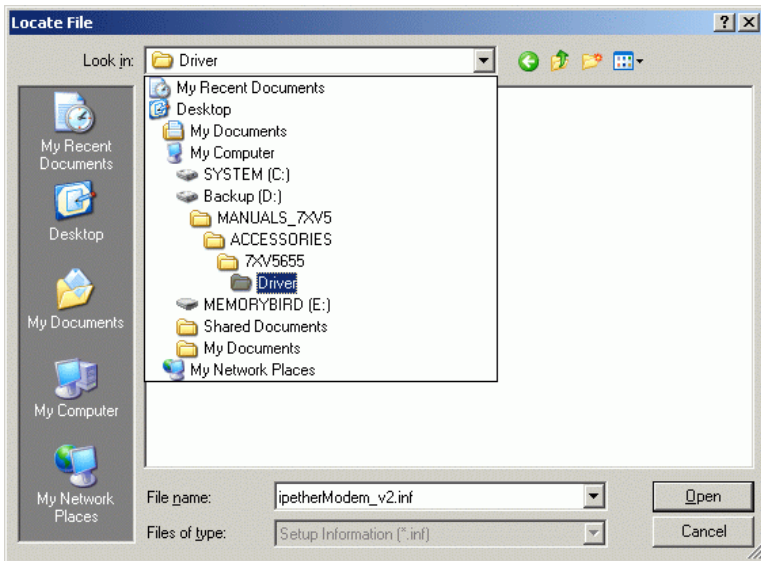
**Have Disk...**



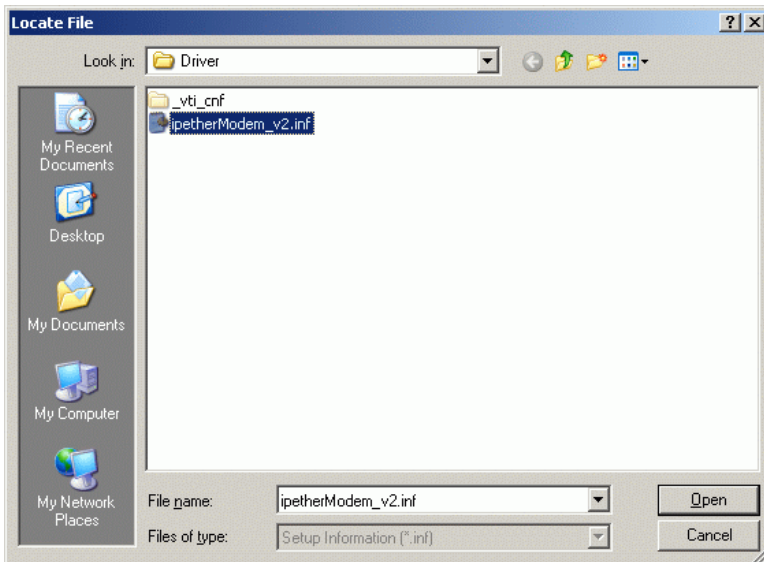
**Select the correct Drive**

And search for the modem driver in the storage medium

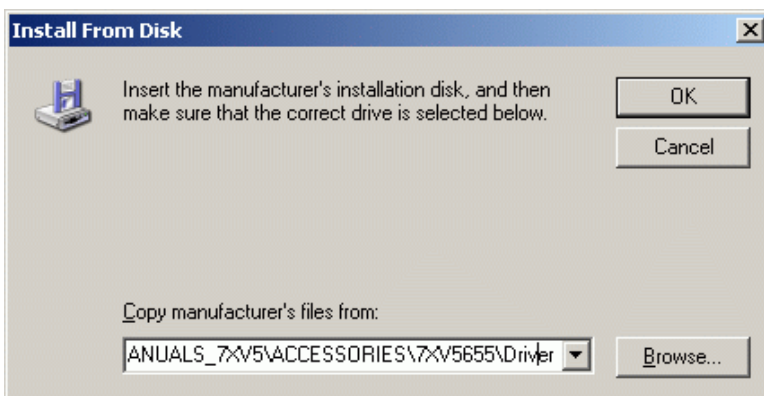
**Browse...**



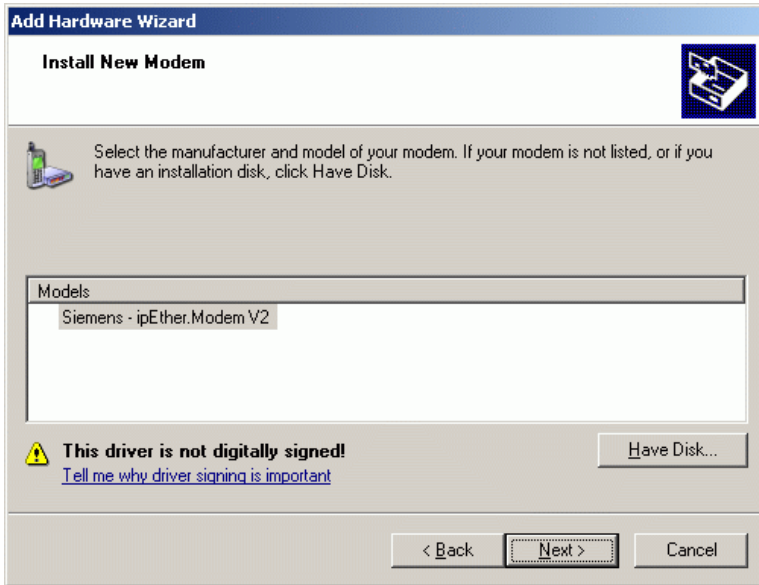
The modem driver is located on the CD  
**Manuals 7XV5**  
path  
**Accessories / 7XV585x / Driver / ...**  
and  
**Open**



Select the driver file  
**ipetherModem.inf** and  
**Open**



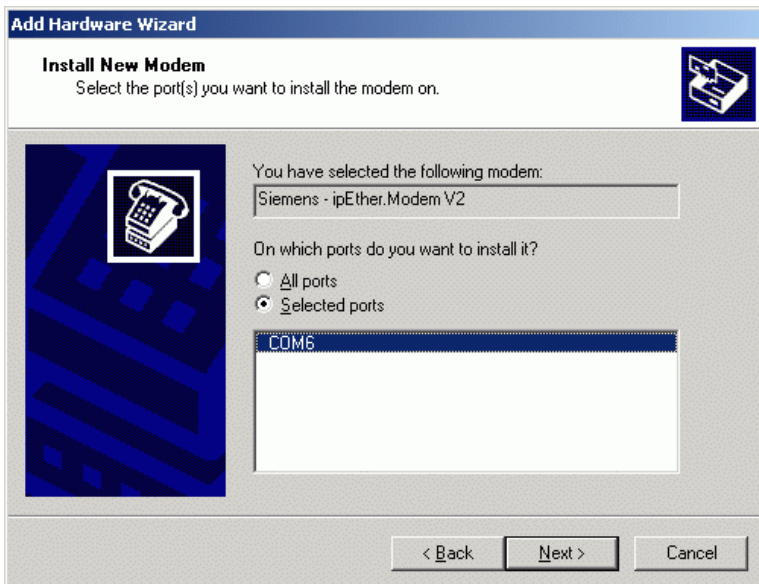
Confirm with  
**OK**



Mark the modem model.  
**Siemens – ipEtherModem**

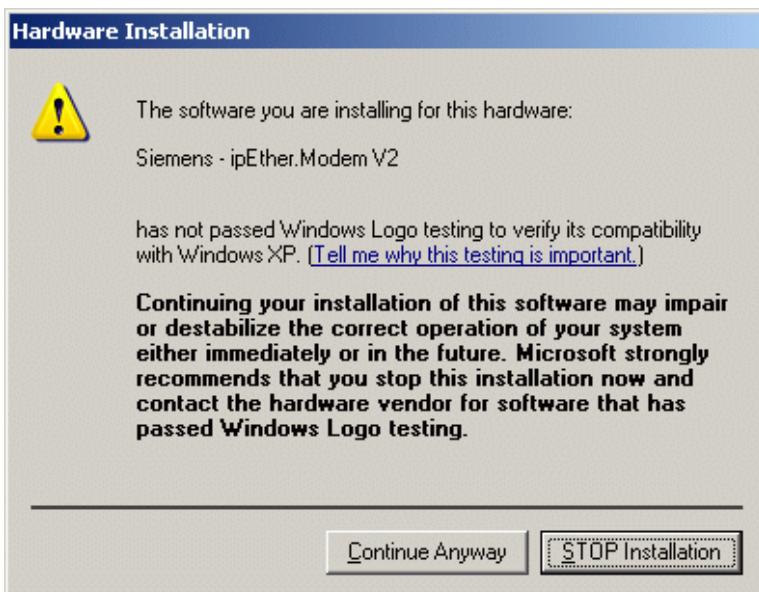
It may be ignored that this driver has no digital signature.

**Next >**



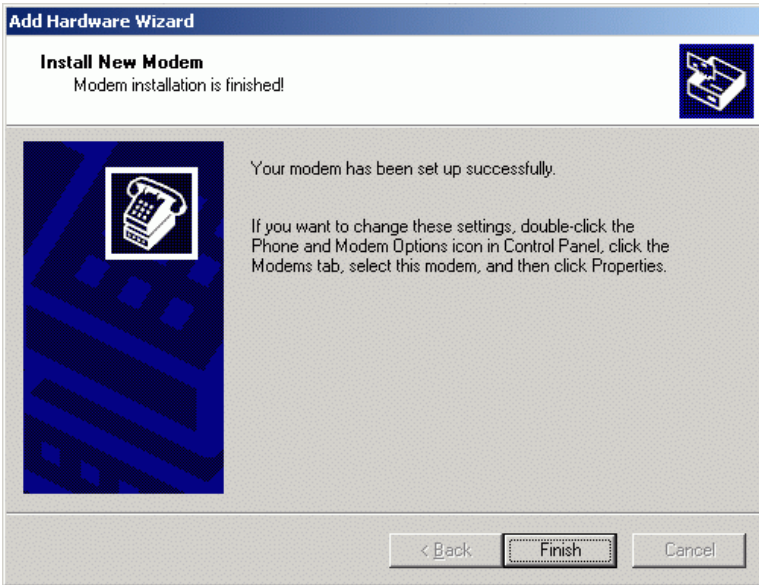
Select the serial connection,  
e.g. COM1  
to which the Ethernet modem will later  
be connected.

**Next >**

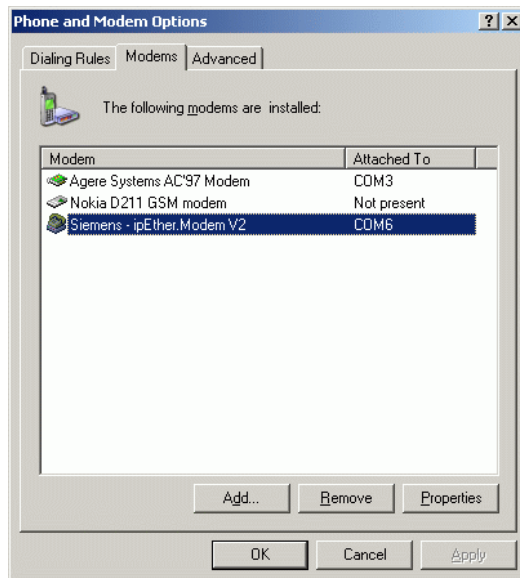


This warning from Windows XP may be ignored. The driver was tested with Windows XP.  
Continue with

**Continue Anyway**

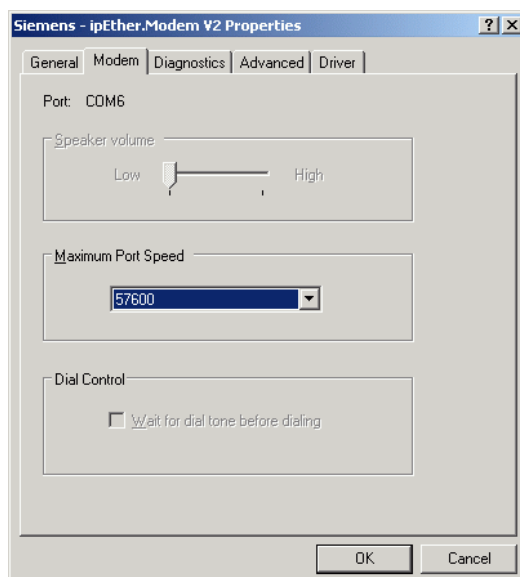


The installation is completed with **Finish**



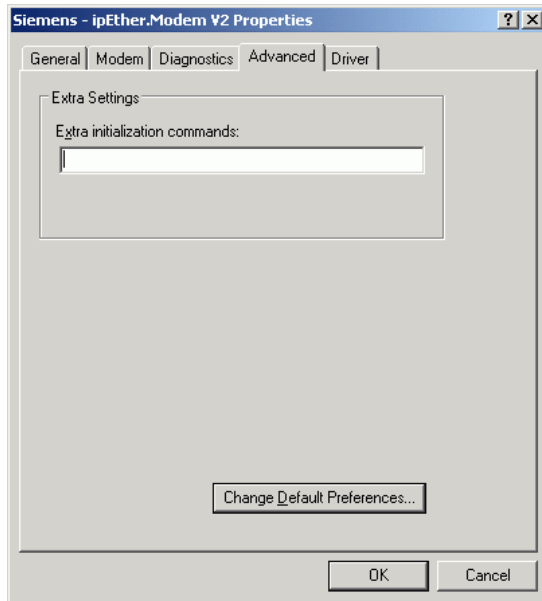
Overview of the modem drivers installed in Windows.

With **Properties** the settings of the marked modems may be checked and changed.



The maximum baud rate to the terminal device may be set here.

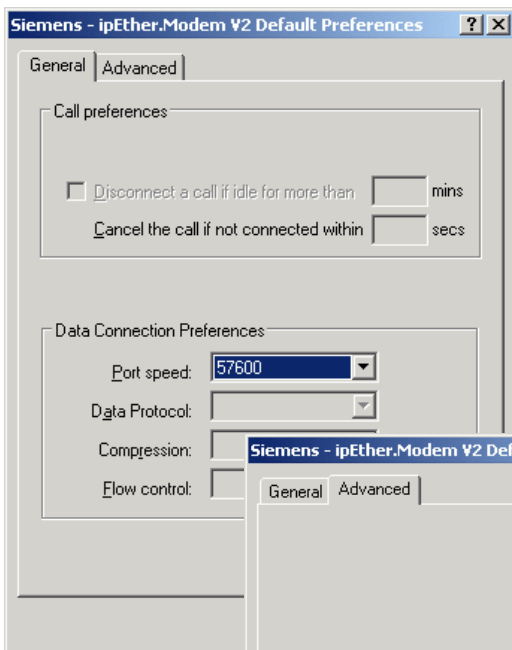
**This baud rate is set to 57600 Bd for all applications and may not be changed.**



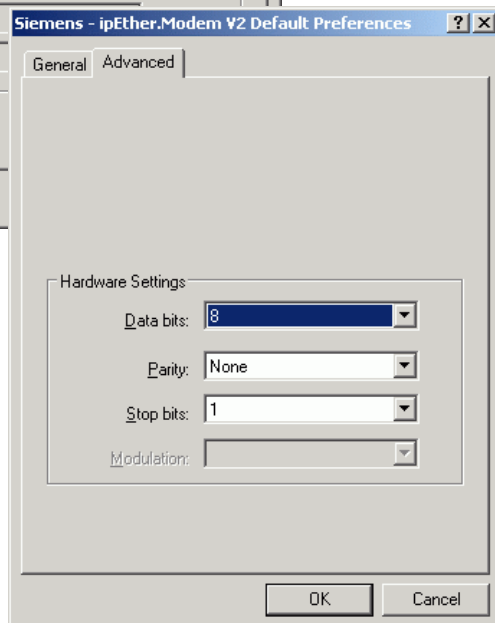
In the area **“Advanced”** no „further initialising commands“ need to be entered.

These additional commands are later entered in DIGSI 4.

No settings need to be made under **“Alter standard settings”**.



For control purposes the standard settings may be opened.



**The setting „57600“ and „(8N1)“ should be used for all applications. Please do not change this!**

Close all Windows with „OK“ and

**Restart the PC.**

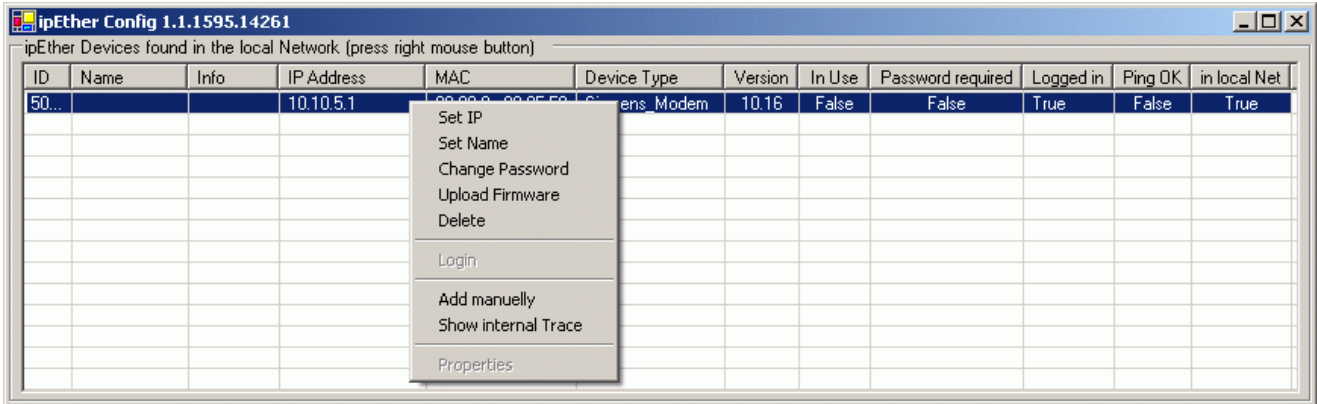
**Note: The settings of the modem driver are accepted by DIGSI 4 and are then used by the office modem during the dial-up process.**



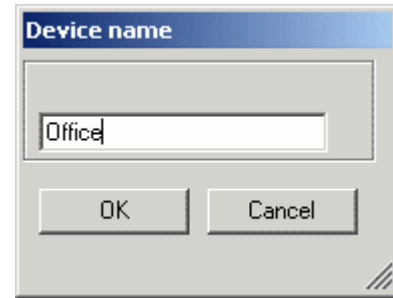
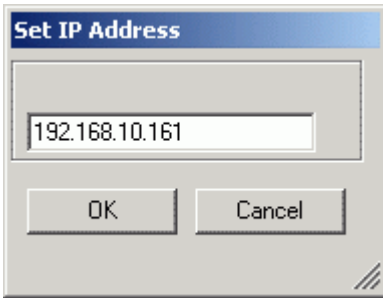


## Allocating an IP-address and name to the Office Modem

In the private network (LAN) or the public network the Ethernet-modem must be allocated with an own, unique IP address.

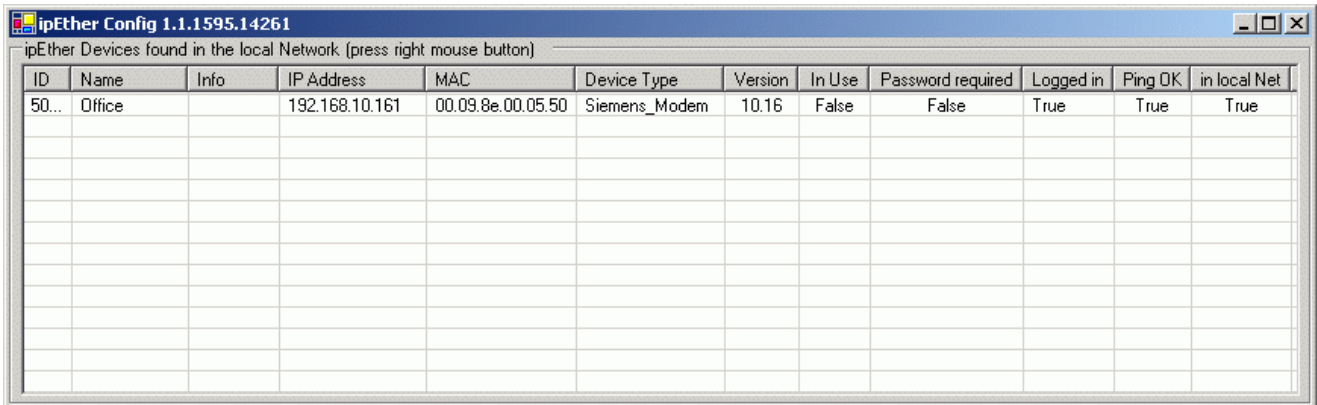


Click on the pre-set IP address (10.10.5.1) with the right mouse button. An option box is opened.



Select **“Set IP”** in the option box, enter the new IP address (here 192.168.10.161) and confirm with **“OK”**.

Select **“Set Name”** in the option box, enter the modem name (here Office) and confirm with **“OK”**.

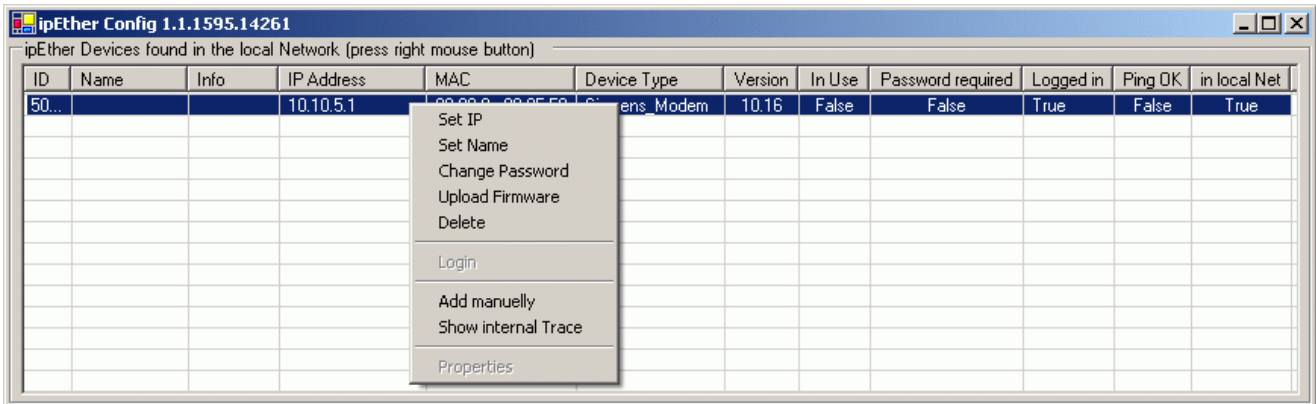


If the settings are confirmed with **“OK”** they are saved in the Ethernet-modem. The information window is up-dated automatically and the Ethernet-modem with its new settings is displayed.

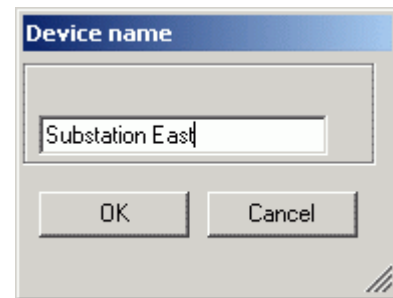
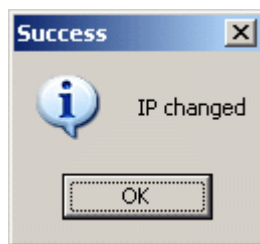
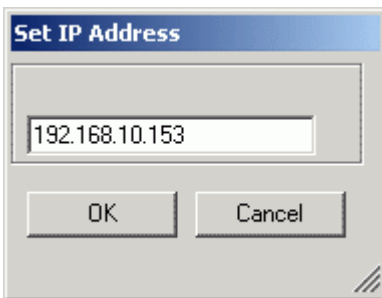
Following a Restart of the configuration tool, the modem with its current settings is located and displayed. In the column **“Ping OK”** and **„in local Net“** the displayed **“True”** confirms that the modem is now located in the same network segment as the operating PC and that it answers to a **“Ping”**. The column **“Logged in”** is **„True“** confirms that other modem parameters may also be set at this point.

## Allocating a name and IP-address to the “Substation modem”

In the private network (LAN) or the public network the Ethernet-modem must be allocated with an own, unique IP address

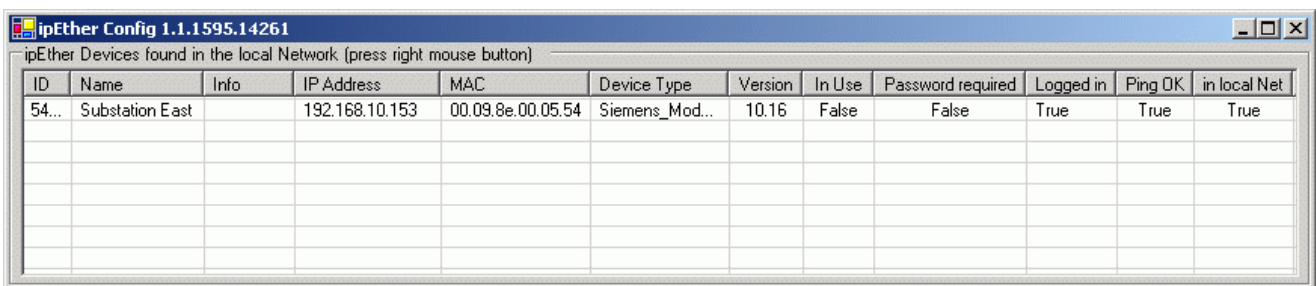


Click on the pre-set IP address (10.10.5.1) with the right mouse button. An option box is opened.



Select “**Set IP**” in the option box, enter the new IP address (here 192.168.10.153) and confirm with “**OK**”.

Select “**Set Name**” in the option box, enter the modem name (e.g. distributor east) and confirm with “**OK**”.

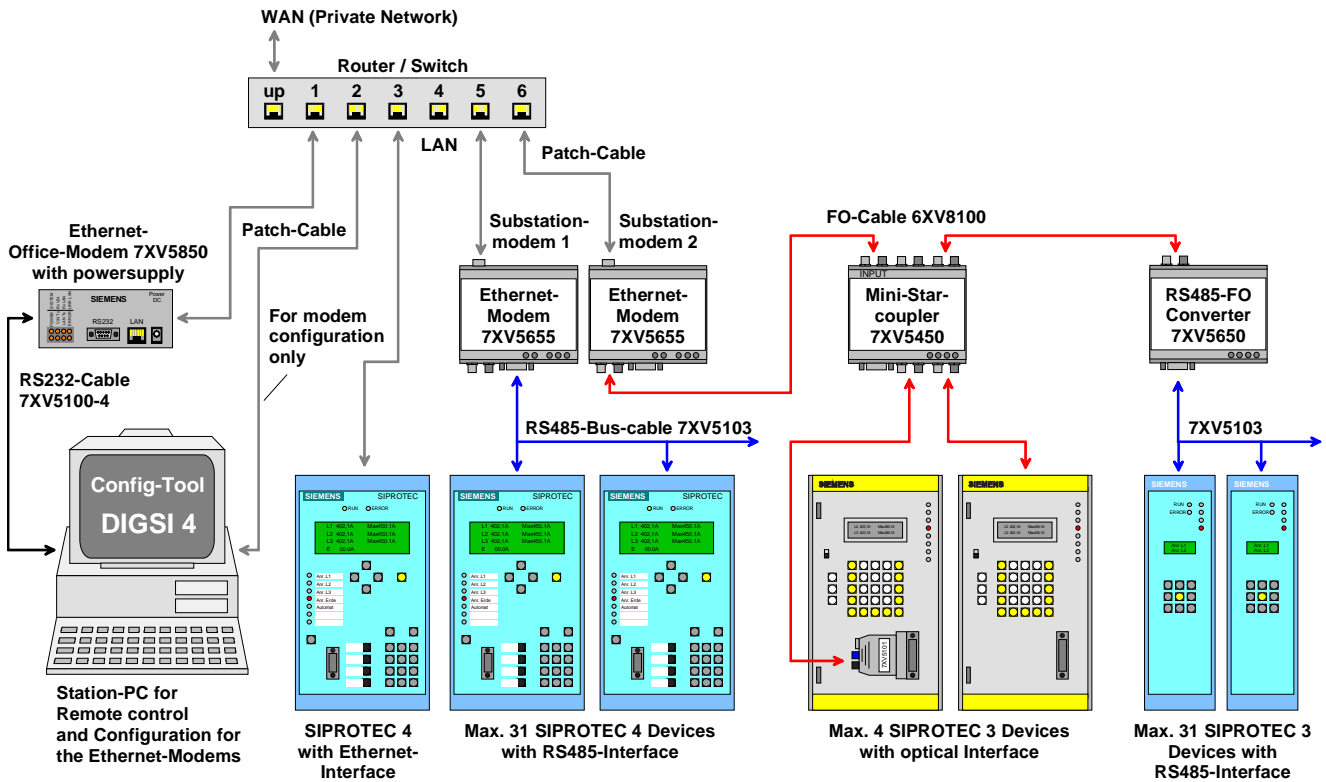


If the settings are confirmed with “OK” they are saved in the Ethernet-modem. The information window is up-dated automatically and the Ethernet-modem with its new settings is displayed.

Following a fresh start of the configuration tool, the modem with its current settings is located and displayed. In the column “Ping OK” and „in local Net“ the displayed “True” confirms that the modem is now located in the same network segment as the operating PC and that it answers to a “Ping”. The column “Logged in” is „True” confirms that other modem parameters may also be set at this point (refer to the following chapters).

## Integrating the modem into a network

After the modems have been allocated with their unique IP-addresses, they may be integrated into the network. The simplest local network may be constructed with a central router, switch or hub, to outputs of which all participants are connected via a patch cable (not crossed) (see Figure).



With this application, the “station PC” may be used to configure all Ethernet-modems applied in the network; and operate all protection devices with DIGSI.

The configuration of the Ethernet-modems is done with the configuration tool on the “station PC” via the Ethernet connection (patch cable) to the router or switch and via the network to the Ethernet-modems.

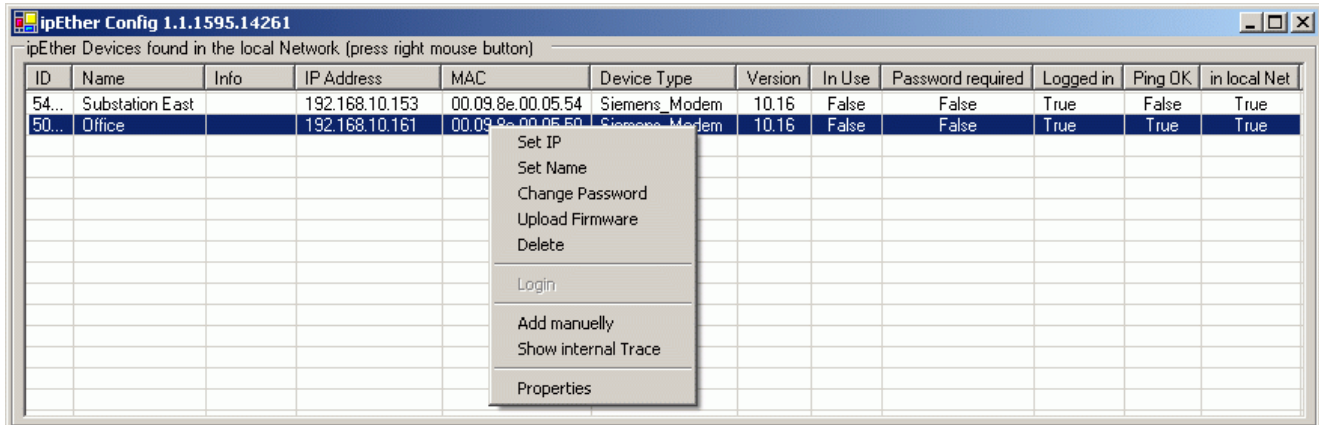
To operate the protection devices, DIGSI 4 REMOTE is used on the “station PC” to establish a modem connection via the RS232-interface to the office modem, via the Ethernet (router or switch) to the substation modem and continuing to the protection devices.

## Setting communication parameters of the office modem

The office modem is only assigned with its basic settings of the RS232 communication parameters. When dial-up to a substation modem takes place with DIGSI 4, other settings (e.g. TC57) are re-set to the factory settings. The settings of the RS232 interface and the password protection remain unchanged.

**Note:** When the RS232-interface settings have been completed, the RS232 interface may from then on only be accessed with these settings.

To access the further settings of the office modem, the option window of the desired modem is opened with the right mouse button; then "Properties" is selected.



Alternatively the setting windows may be accessed by a double-click of the left mouse button on the desired line.

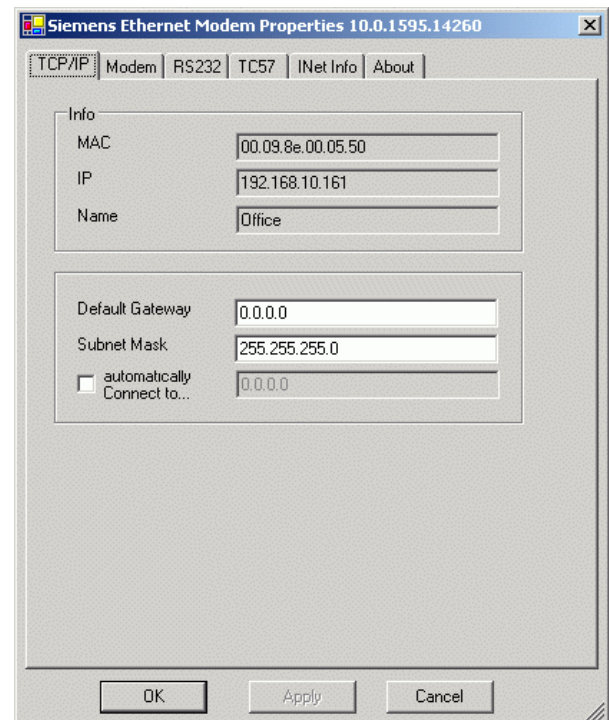
### TCP/IP - settings

In this window, under "Info" the MAC- and IP-address as well as the "Name" of the modem may be checked.

The entry "Default Gateway" is not altered in this example i.e. it remains 0.0.0.0.

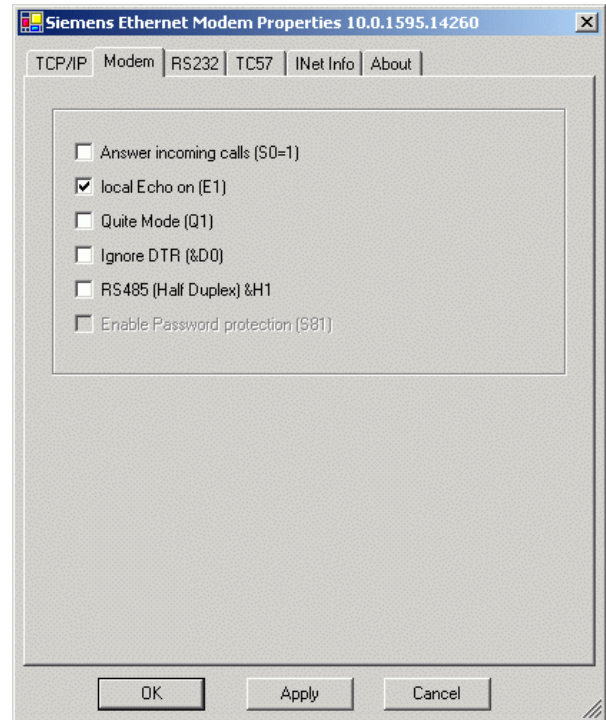
The "Sub-net Mask" is used for the selected IP-address 255.255.255.0.

The field "automatically Connect to..." is only used for leased lines.



## Modem - Settings

In this window only the field "local Echo on (E1)" must (may) be checked.

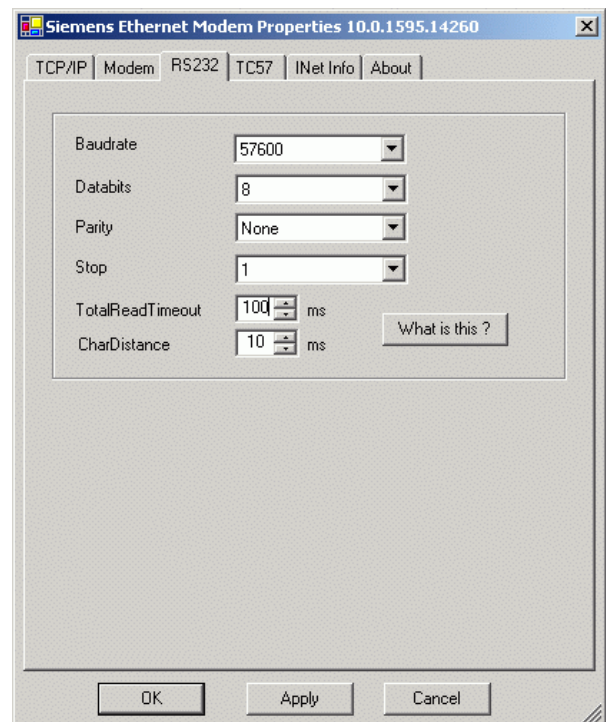


## RS232 - Settings

In the window "RS232" the RS232-interface parameters are set.

The office modem should in general be set to Baudrate 57600 Databits 8 Parity No Stop (Bits) 1

The other basic settings TotalReadTimeout, CharDistance, Should not be changed.



## TC57 - Settings

For communication with DIGSI- or IEC60870-5-1 protocol, the protocol detection TC57 should be activated. This is however unnecessary here, as the settings made here are re-set in the office modem before each dial-up process. The corresponding entry is made in DIGSI 4.

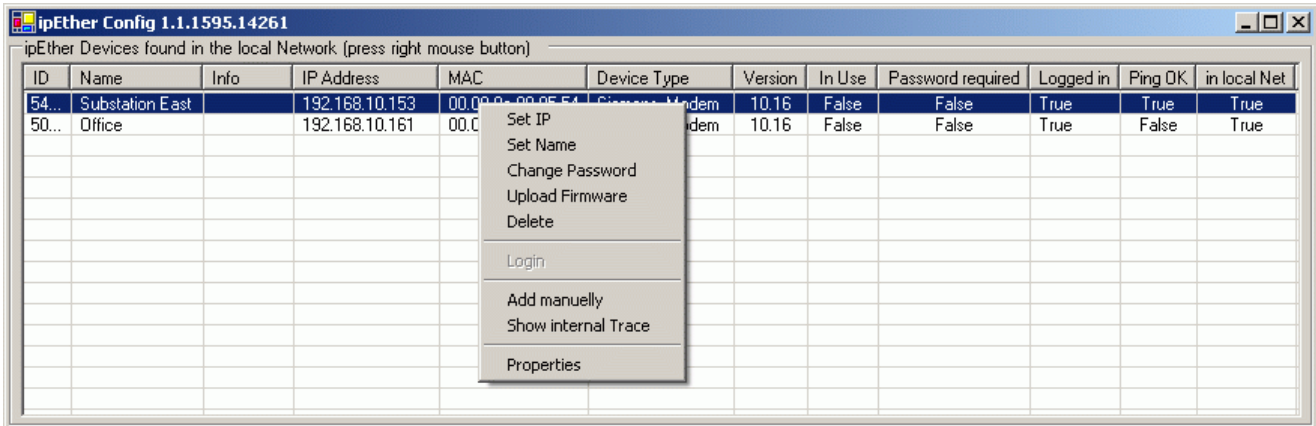
Save all settings with **OK** and close the window.

## Setting the communication parameters of the substation modem

The settings for the substation modem(s) are done once with the configuration tool i.e. the substation modem may no longer be initialised with DIGSI 4.

**Note: In Windows 2000 and Windows XP the initialisation of the substation modem in DIGSI 4 may later lead to problems during the dial-up process.**

To access the further settings of the substation modem “Substation East”, the option window of the corresponding modem is opened and “Properties” selected.



Alternatively, the setting window may be opened with a double-click of the left mousebutton on the desired line.

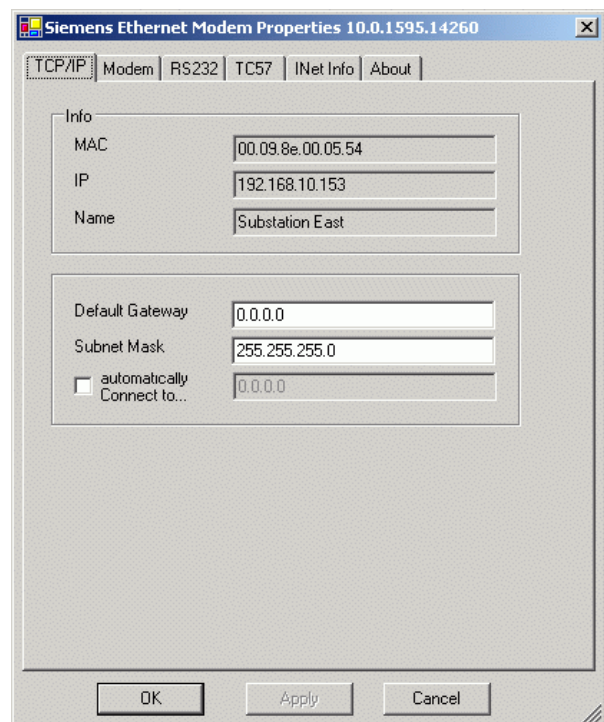
### TCP/IP - settings

In this window, under “Info” the MAC- and IP-address as well as the “Name” of the modem may be checked.

The entry “Default Gateway” is not altered in this example i.e. it remains 0.0.0.0.

The “Sub-net Mask” is used for the selected IP-address 255.255.255.0.

The field “automatically Connect to...” is only used for leased lines.

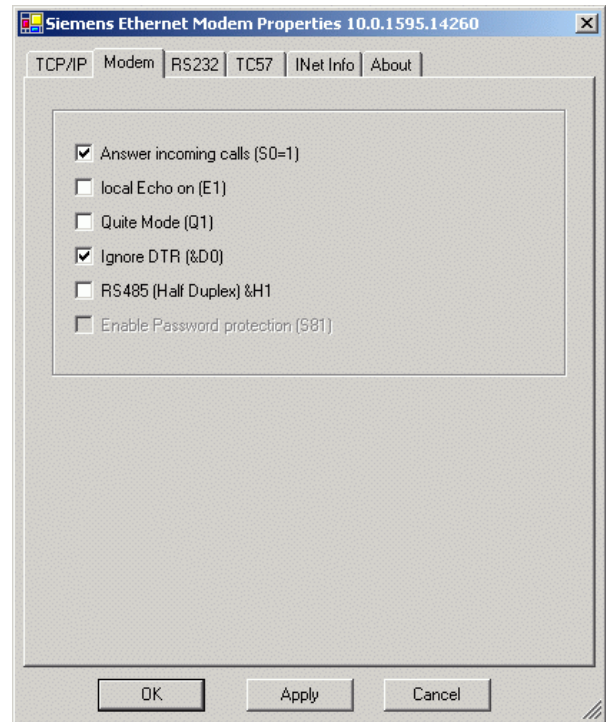


## Modem - Settings

In this window the field "Answer incoming calls (S0=1)" must be checked.  
The modem only answers after the first ring-tone.

The field "Ignore DTR (&D0)" must be checked as the protection devices and various converters do not support the control line (Data Terminal Ready).  
All other fields may not be checked.

"RS485 (Half Duplex) &H1". Mark this checkbox only if devices are connected at the RS485 output.

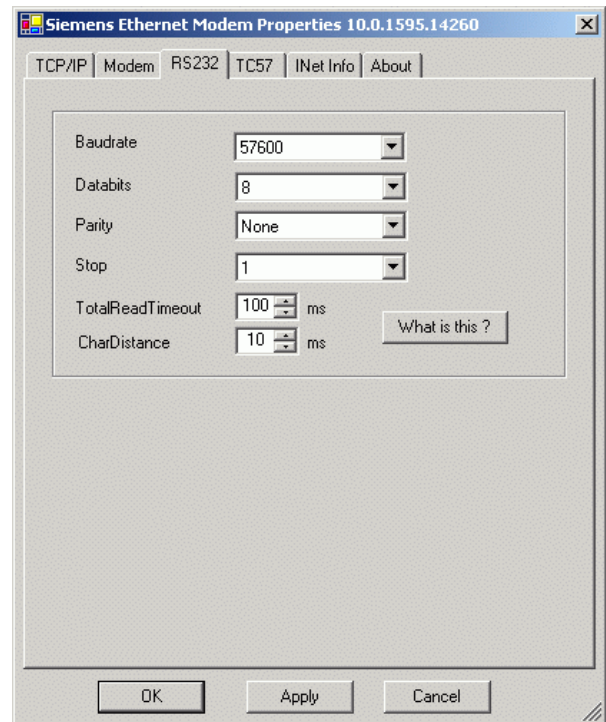


## RS232 - settings

In the window "RS232" the RS232-interface parameters are set.

In this example for SIPROTEC 4 devices they are  
Baudrate 57600  
Databits 8  
Parity No  
Stop (Bits) 1

The other basic settings  
TotalReadTimeout, CharDistance,  
should not be changed.



**Note:** These settings of the substation modem may be set independently of the settings of the office modem. If for example SIPROTEC 3 device are to be operated with 9600 Baud and 8E1, only these settings of the substation modem have to be adapted correspondingly.

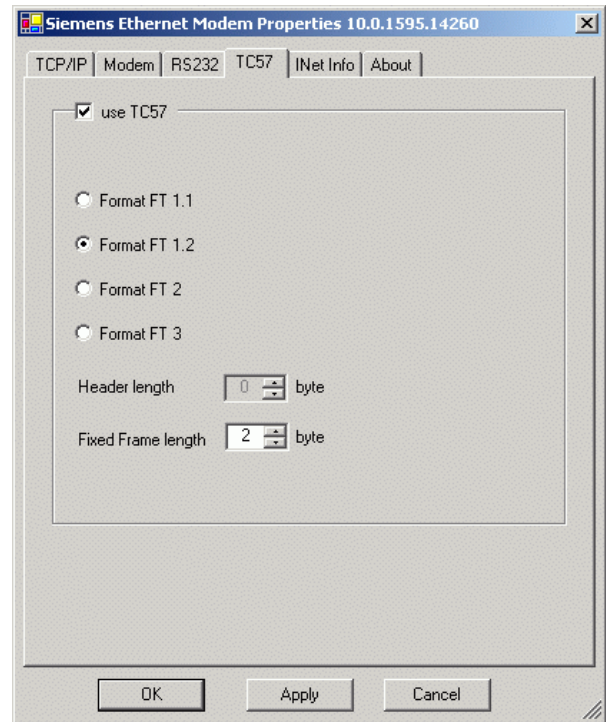
The interface parameters of all protection devices connected to one modem must be the same, the IEC addresses, the service or system interfaces must however be different.

### TC57 - settings

For communication with DIGSI or IEC60870-5-1 protocol, "use TC57" must be checked.

The "Format FT 1.2" is selected (Default).  
In the field "Fixed Frame length" 2 byte is entered.

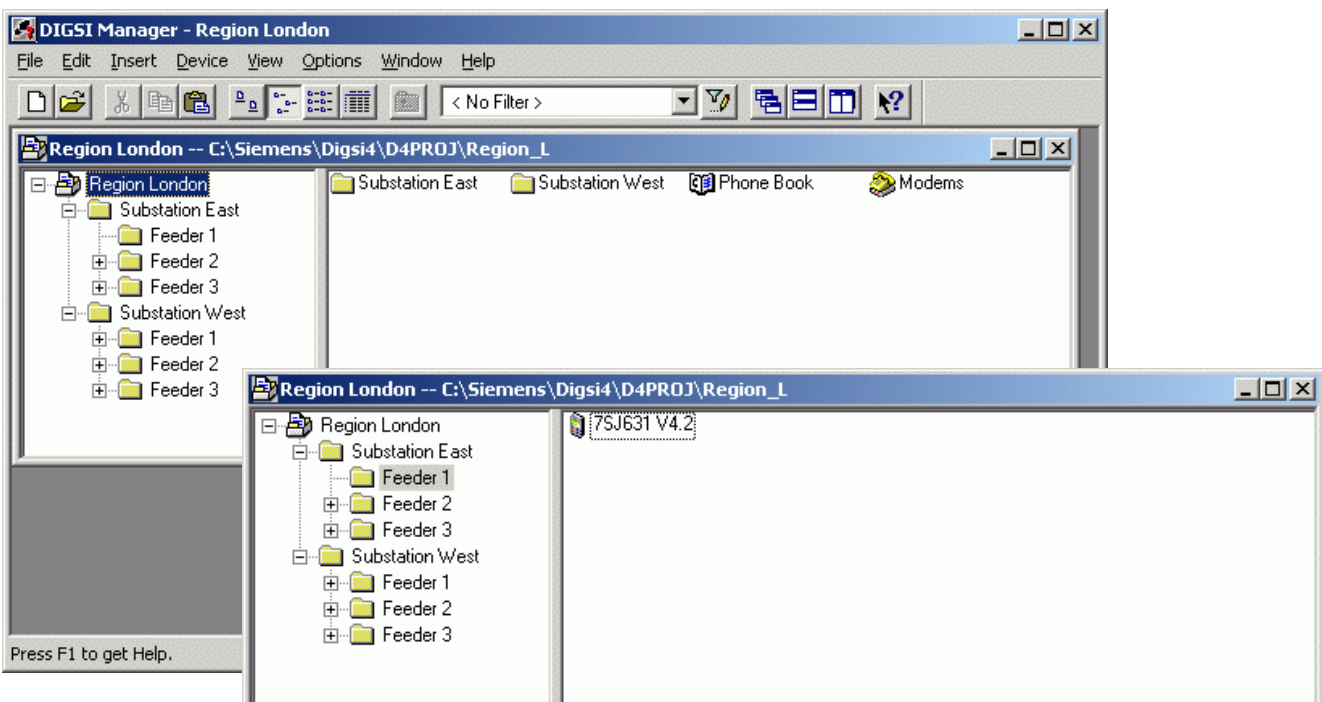
Save all settings with **OK** and close the window.



### Creating a project and substation in DIGSI 4

This description is based on the document „Central operation of SIPROTEC 4 devices“. Here, a substation for the central operation with 57600 Baud and the data format (Frame) 8N1 was constructed and tested.

The project with substation files, feeder bay and protection devices was created and successfully tested.

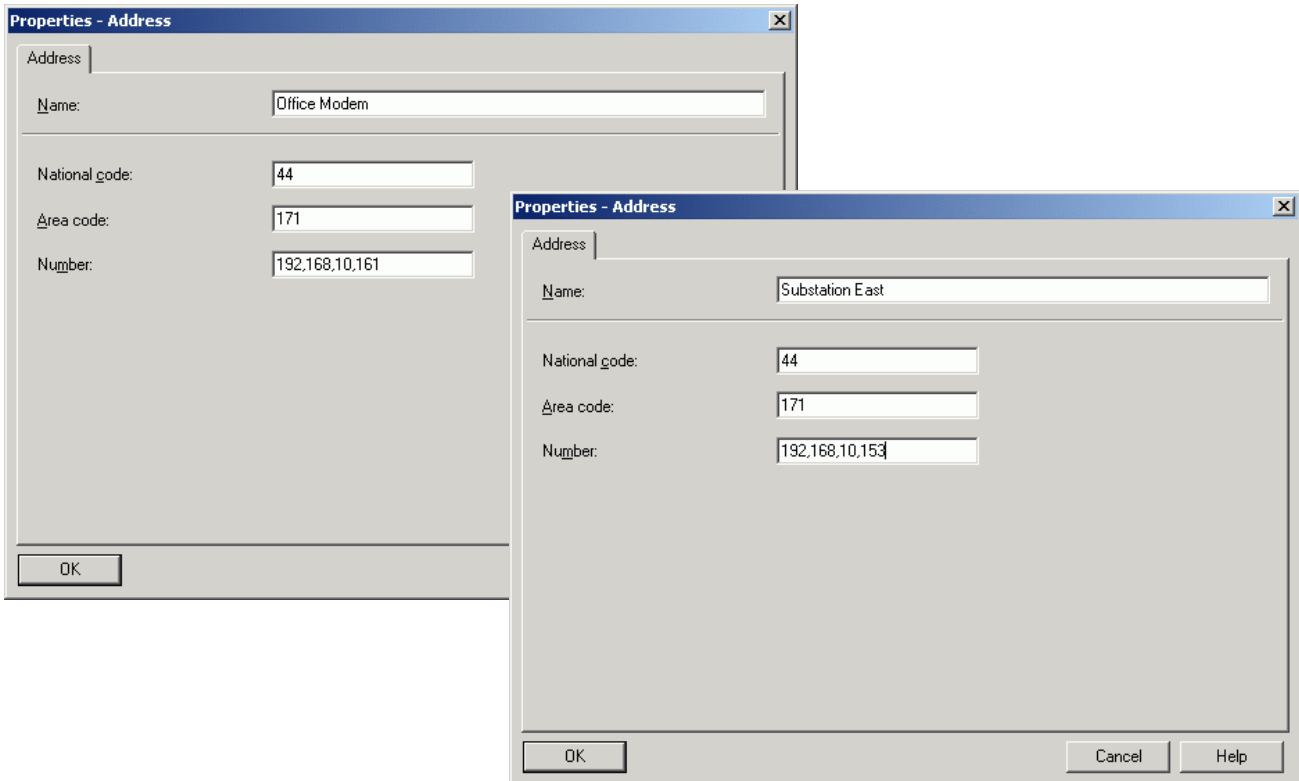




## Creating a telephone directory

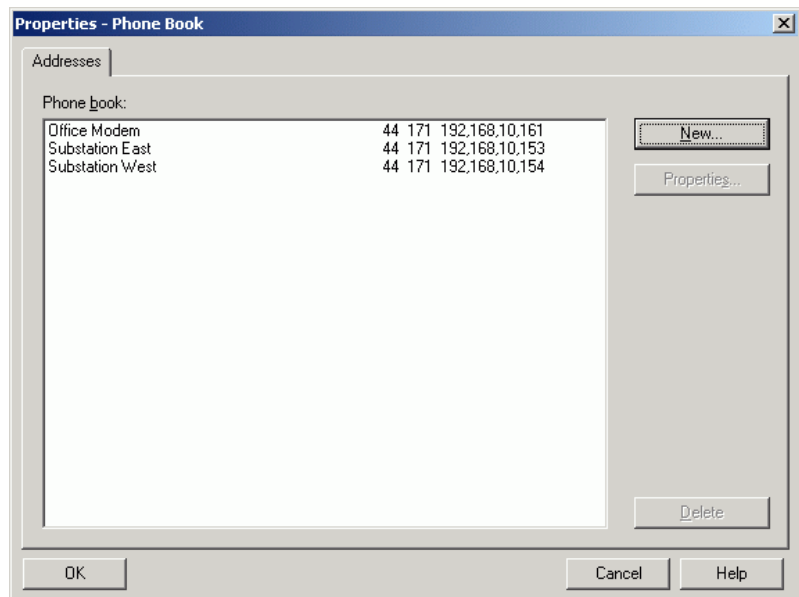
By double-clicking on the icon “Telephone directory “, “New” and “Number” in the project, the “telephone number” of the office modem and all substation modems is saved under “Name” (see pictures below) with a name. An un-used IP-address must centrally be saved in the “Telephone directory” for each Ethernet modem. **Instead of the fullstops, commas are used in the IP-address.**

The same country dialling codes and the city dialling codes (without 0) must be entered as a dummy for all modems. During dial-up these codes are hidden.



If the windows were all closed with “OK”, the settings may be checked in the control window.

When this window is closed with “OK”, all settings are saved in the telephone directory.

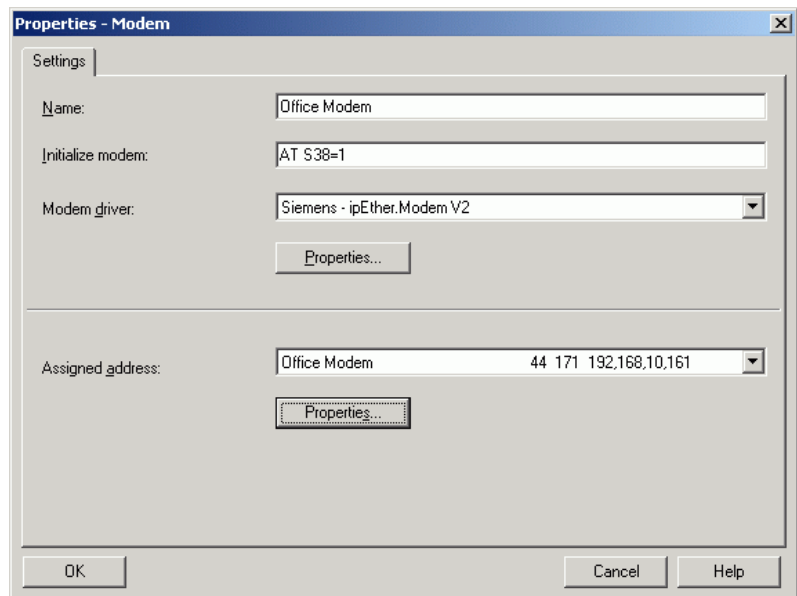


## Creating an office modem in DIGSI 4

When the modem driver for the Ethernet modem together with its settings has been successfully installed, and the telephone directory been filled, the office modem may be created in DIGSI 4.

By double-clicking on the icon "Modems" in the project, the office modem is created with "New" and a name e.g. office modem is assigned under "Name".

In "Modem initialisation" the command **AT S38=1** is entered.



Definition of commands:

- •AT always initiates the command string.
- •S38=1 TC57 switching on protocol detection (DIGSI / IEC60870).  
The other TC57-settings S39 and S40 are basic settings.

**Note:** The office modem is re-initialised during each dial-up. Initially the commands of the Windows driver are sent and thereafter the commands from "Modem initialisation". Lastly the actual dial-up string to the modem is transferred. For more clarity, spaces may be placed between the commands; these are ignored by the modem.

Under "**Modem driver**" the already installed modem driver is selected.

The "**Assigned address**" for the office modem is selected from the telephone directory

### **NOTE for DIGSI older V4.70 only !!!**

***The button "Properties..." may not be used.***

The settings of the office modem were fixed when the driver was installed. If the settings have to be changed, the modem driver must again be installed

## Creating a substation modem in DIGSI 4

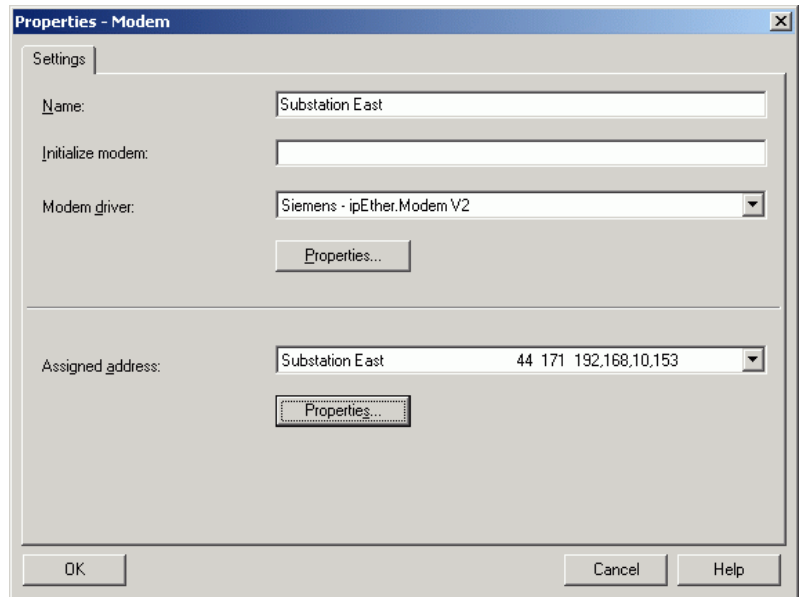
To achieve a modem connection to a substation, a substation modem with modem driver and “assigned address” must be created in DIGSI 4.

By double-clicking on the icon “Modems” in the project, the substation modem is created with “New”, and a name is allocated by entering a name under “Name”, e.g. Substation east.

Under “Modem initialisation” nothing is entered, as the substation modem was already initialised with the configuration tool.

Under **modem driver** the already installed modem driver is selected as was the case with the office modem.

The button **“Properties ...”** of the **modem driver must not be used**, as the dial-up procedure then no longer functions securely.



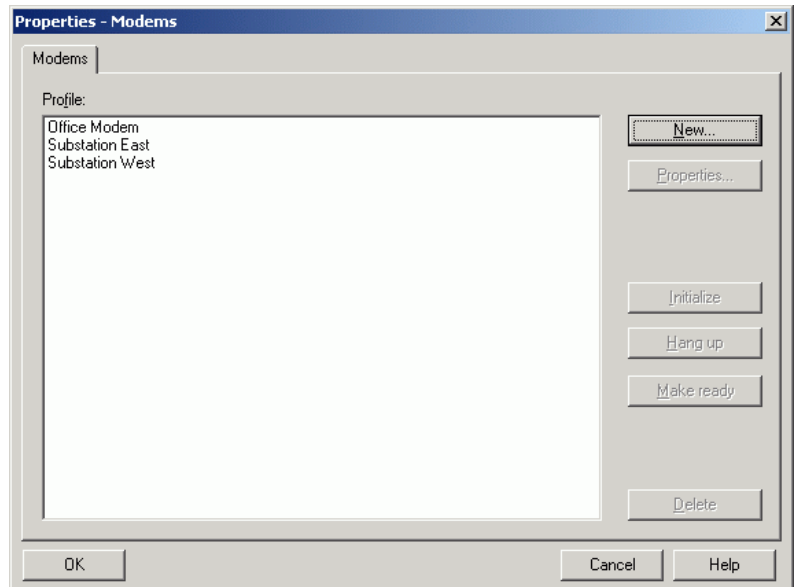
**NOTE !!! The button „Properties...” must not be used.**

The substation modem may only be initialised with the configuration tool.

**Note:** If the “Properties window” was accidentally opened, it must be closed with **Cancel**.

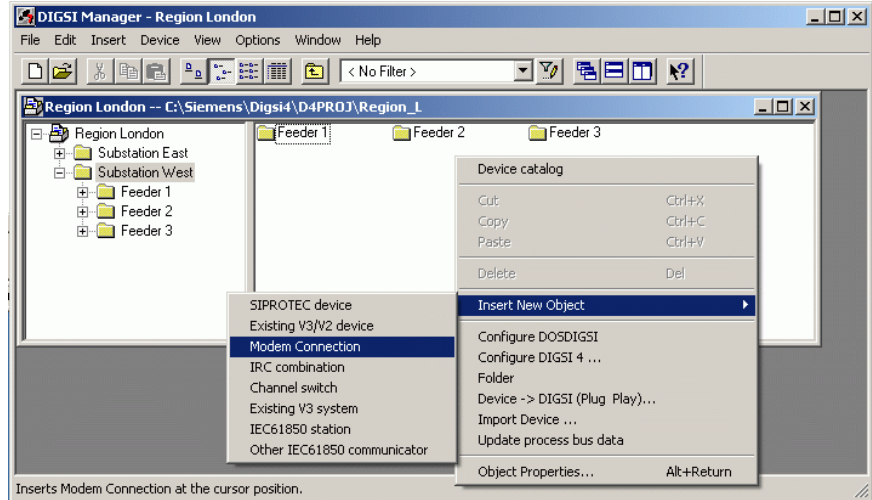
The **“Assigned address:”** is selected from the telephone directory.

When the modems have all been created, they are listed in the overview window.

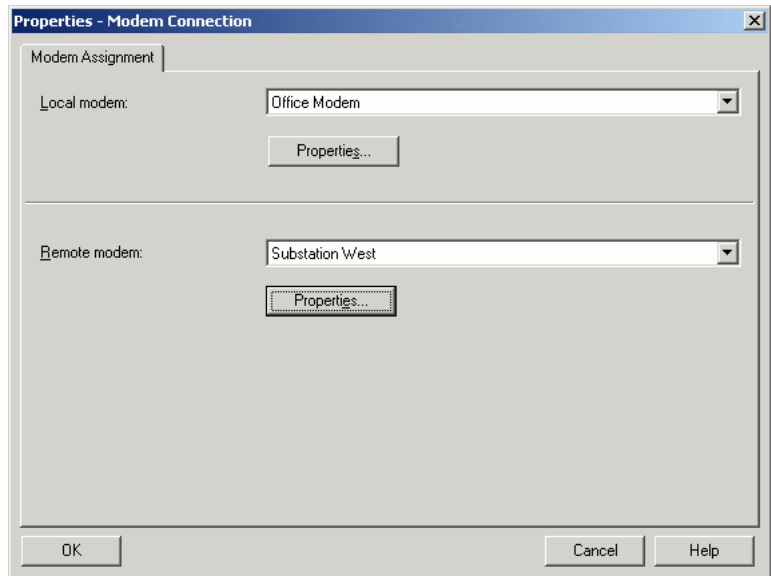


## Setting a modem connection in DIGSI 4

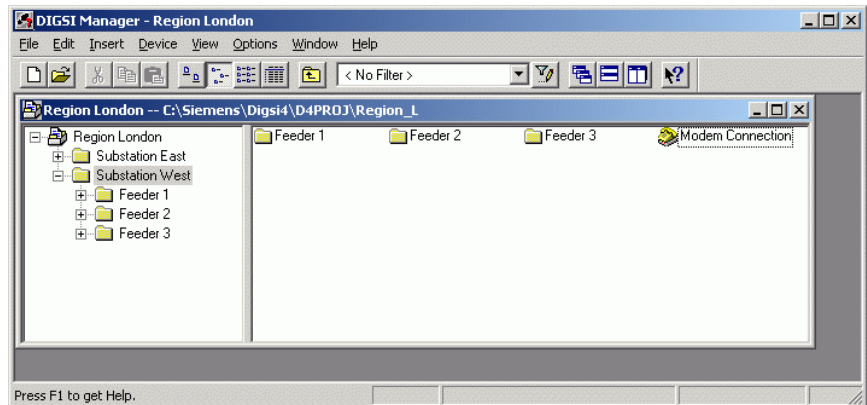
A modem connection must be established for the substation e.g. distributor east. This defines which modems with corresponding settings and assigned IP-addresses (telephone numbers) will be used for the connection arrangement.



When the modem connection for this substation has been created, the modems may be selected under "Properties modem connection".



For this purpose, a "modem connection" must be inserted in the substation file with the right mouse button.



All settings in DIGSI 4 are now complete and the office modem may be connected with the operating PC via the included modem cable.

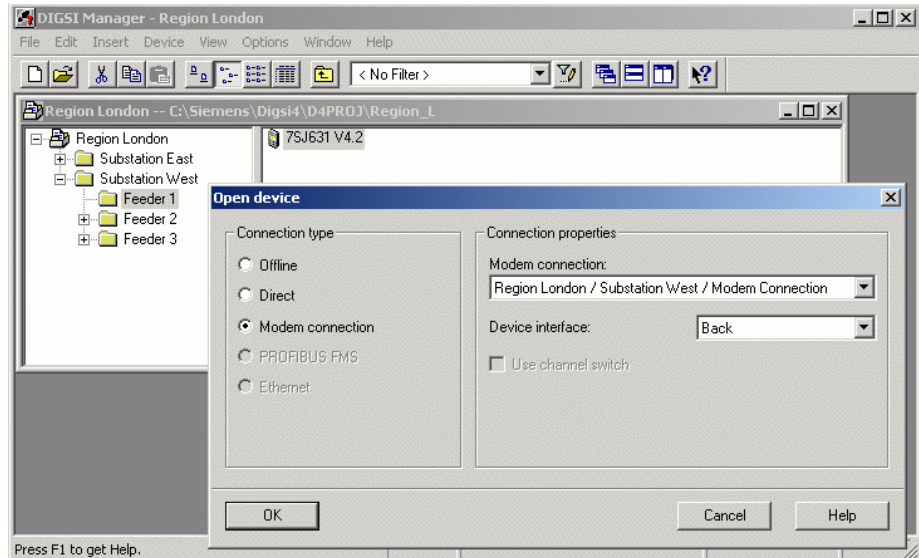
## Establishing a modem connection to a remote modem

The modem connection may be established by double-clicking on “modem connection” and then selecting the device, or directly from the selected protection device.

Under “Connection type”, the item “modem connection” is selected.

The displayed connection is checked in “modem connection”, alternatively the correct one is selected.

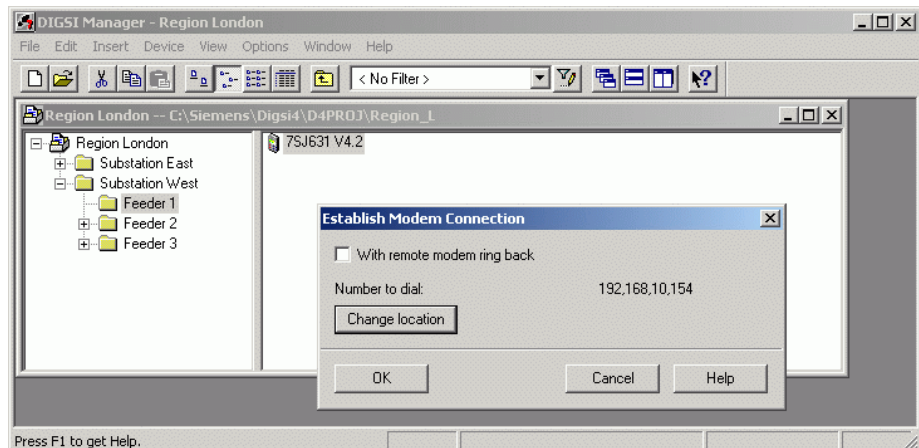
The “rear” service interface is mostly selected as “device interface”, this being the interface via which the protection device is connected to the substation modem.



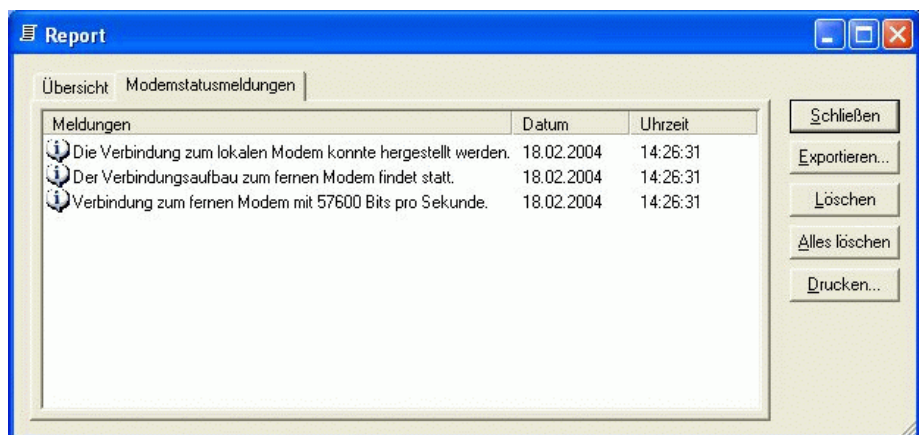
Thereafter the connection is established with “OK”.

In the following window, the “telephone number to be dialled” (here the IP-address) is displayed and may be checked.

Should too many zeroes or a dialling code be displayed, these may be deleted under “change location”. Should this not be of assistance, please check the complete entry of the “telephone number” in the telephone directory (see creating a telephone directory). The dial-up procedure may be checked in the “report window”.



When the modem connection has been established, the connection to the device is automatically established.



Good luck.