

## Remote control SIPROTEC 4 with EN100 over ISDN-Modem-Router

Data transmission takes place via an RDT connection of an ISDN modem with an ISDN router and SIPROTEC 4 devices with EN100-interface.

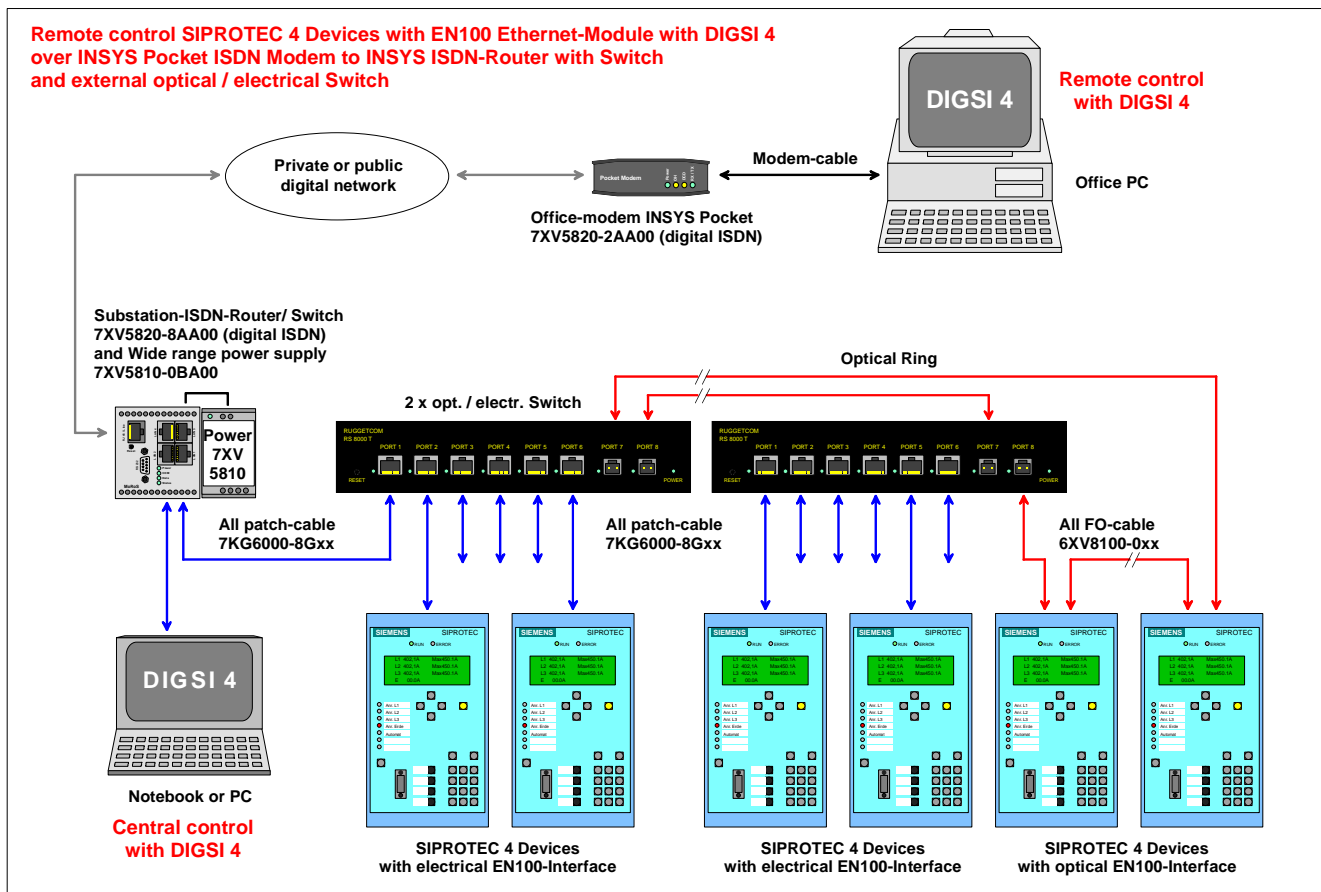
### Operation concept SIPROTEC 4 with Ethernet module EN100

The figure below displays a typical hardware structure for V4-protection devices with Ethernet-interface in the installation. The protection devices with electrical EN100-interface are connected to the switches via patch cables. The devices with optical EN100 module are looped into the optical double ring in the form of a ring together with the switches.

The switches together with the protection devices constitute a local subnet (LAN) with its own address range.

The ISDN modem router which enables the remote connection via an ISDN dial-up line to the control centre, is also connected to the LAN with a patch cable. As a rule, the router is assigned the first IP address, which is then the standard gateway for all users.

The connection is established by the control centre with an RDT connection in Windows XP with an ISDN modem. The DIGSI 4 protection devices can then be operated. To connect various substations, an RDT dial-up connection is required for each substation.



For testing and diagnostic services, or on-site operation of the protection devices, a laptop PC can additionally be connected to the subnet, using a patch cable. Detailed application examples regarding the construction of a local subnet can be found in the EN100 manual under

[www.SIPROTEC.com](http://www.SIPROTEC.com) / Prot. Devices / General Information / Communication.

## ***Introduction***

The possibilities of remote control of SIPROTEC devices are manifold. Help regarding the selection of "Your" remote control concept can be found in the document "Notes" in the Internet under [www.SIPROTEC.com](http://www.SIPROTEC.com) / **Applications / Remote control**

This document describes the procedure for secure remote control of SIPROTEC 4 devices with DIGSI 4 via the modems INSYS Pocket Profi ISDN (table-top device in the office) and INSYS ISDN-router (rail mounted ISDN-Router in the substation) in detail.

The application described here was successfully tested with Windows XP SP2 and DIGSI 4.81 as well as 4.82. The following modems were used during the tests:  
Office modem: INSYS Pocket Profi ISDN (desktop model with plug-in power adapter)  
Substation modem: INSYS ISDN-Router (rail mounted device with external wide range power adapter).

The modem drivers **TA+POX (PPP,V.120,X.25,V.110)** used here for the INSYS Pocket Profi ISDN modem are located on the supplied CD or may be found in the Internet under:

[www.SIPROTEC.com](http://www.SIPROTEC.com) / **Accessories / 7XV5820 / ...**

## ***The safety concept***

The safety concept regarding interference on the entire transmission line, as well as the risk of unauthorised access to the protection devices are taken regard of with correspondingly high priority measures.

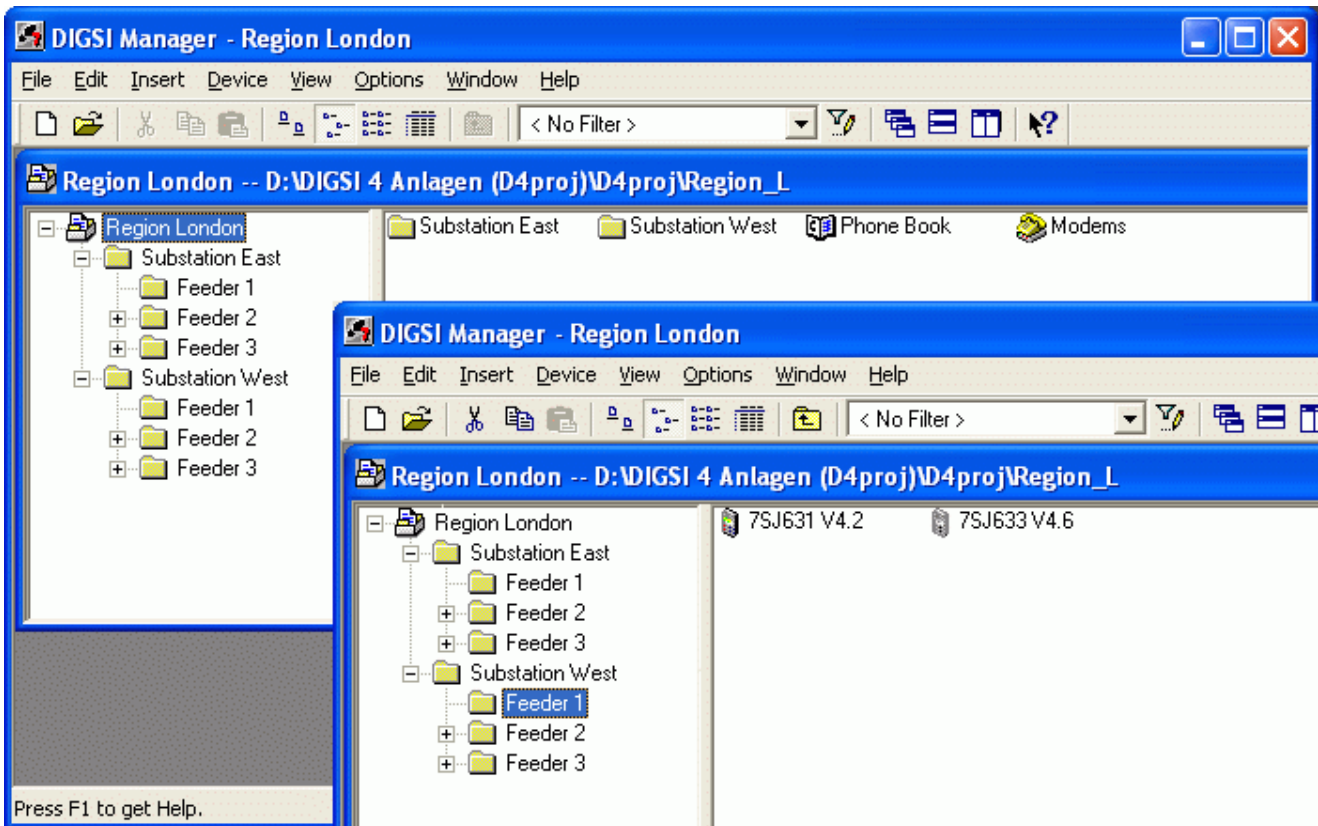
Transmission security is ensured by an efficient error correction procedure along the transmission line. The settings of the modems described here take cognisance of this concept.

The substation with SIPROTEC 4 devices is protected from unauthorised access by an RDT connection with login-name, password and restricted call acceptance from specified telephone numbers.

## ***The most important general rules***

- For remote control under Windows XP Prof. only use DIGSI 4.80 + SP2, DIGSI 4.81 + HF1, DIGSI 4.82 or newer DIGSI-versions.
- Always use the modem drivers referred to in the application manuals. These may be downloaded from the Download-Area under [www.SIPROTEC.com](http://www.SIPROTEC.com).
- Each protection device in the substation must have a distinct IP address.

## Creating a project and substation in DIGSI 4



The new project in DIGSI 4 with substation files, feeder files and protection devices may be de-archived from an archived substation or be newly created.

The procedure is described in the „**SIPROTEC System Manual**“.

Before the necessary settings for remote control are done, the local connection to all protection devices via the central interface (e.g. at the LAN connection of the ISDN router) must be tested (see Figure 1).

Please also note the detailed application examples for the structure of a local subnet in the EN100 manual under:

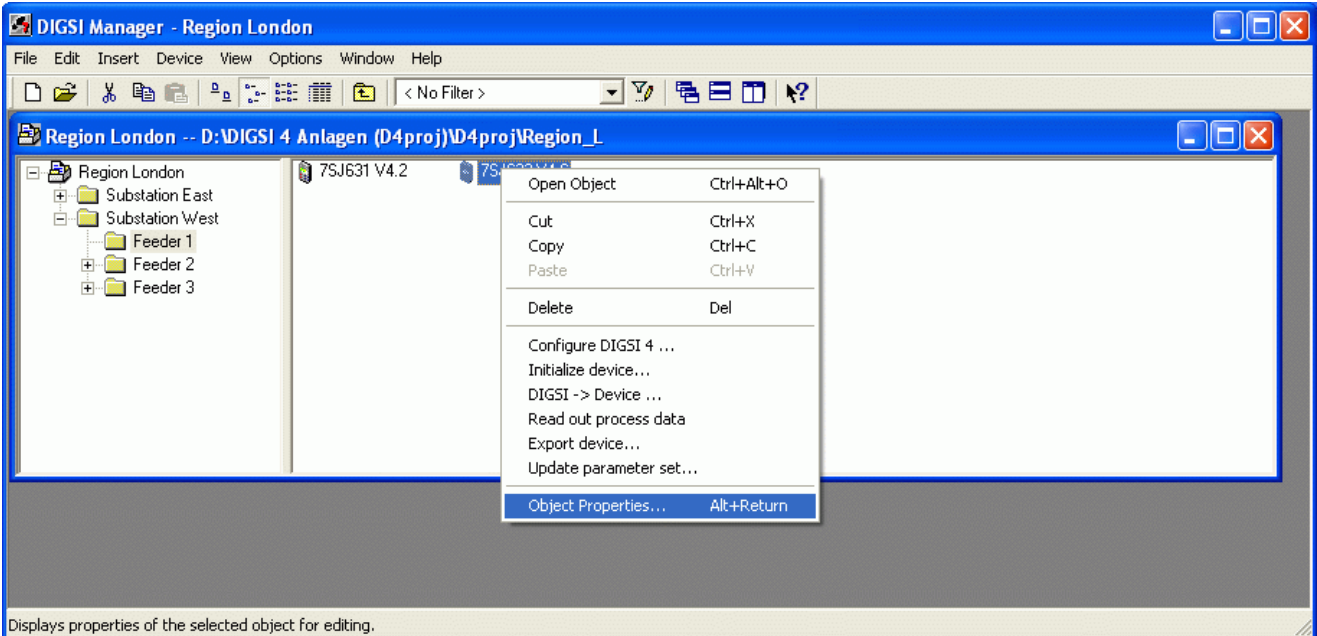
[www.SIPROTEC.com](http://www.SIPROTEC.com) / Prot. Devices / General Information / Communication.

### Note:

- All devices require an **EN100-system interface**
- Each device must have a unique IP-address.

## Setting the protection devices

The Ethernet-system interfaces of the SIPROTEC-protection devices must all be assigned with different IP-addresses. The IP-addresses of the PC's, the routers and other devices in the network may not be



assigned again.

For the purpose of setting the Ethernet-system interface (EN100), a connection via the front interface of the relevant device is created with DIGSI 4. Thereafter, „**Object Properties...**“ is opened with the right mouse button.

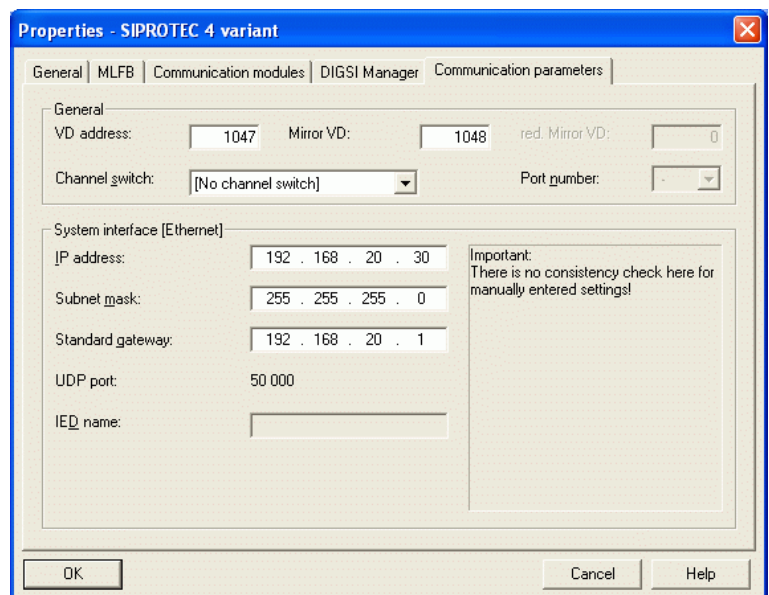
In the window „**Properties**“ the IP addresses of the protection devices can be assigned under „**Communication parameters**“.

The „**IP address**“ must be allocated in the same subnet range as the router. (here 192.168.20.xxx).

The „**Subnet mask**“ 255.255.255.0 allows for the allocation of addresses to 254 devices (incl. PC, Router, etc.).

The IP address of the ISDN router is always used as the „**Standard gateway**“

All other entries should not be changed.



Close the window with „**OK**“ and save the **settings in DIGSI and the protection devices**.

## Installing the modem driver

If the office modem "INSYS Pocket ISDN TA" was already connected prior to the re-start of the computer, the modem is recognised by Windows XP as a PnP modem during the start, and the installation process is started automatically.

The suggested driver **TA+POX X.75 (PnP)** is not needed for this application.

Once the driver has been installed this irritating installation suggestion will not appear in future.

Connect the modem.

Re-start the computer.

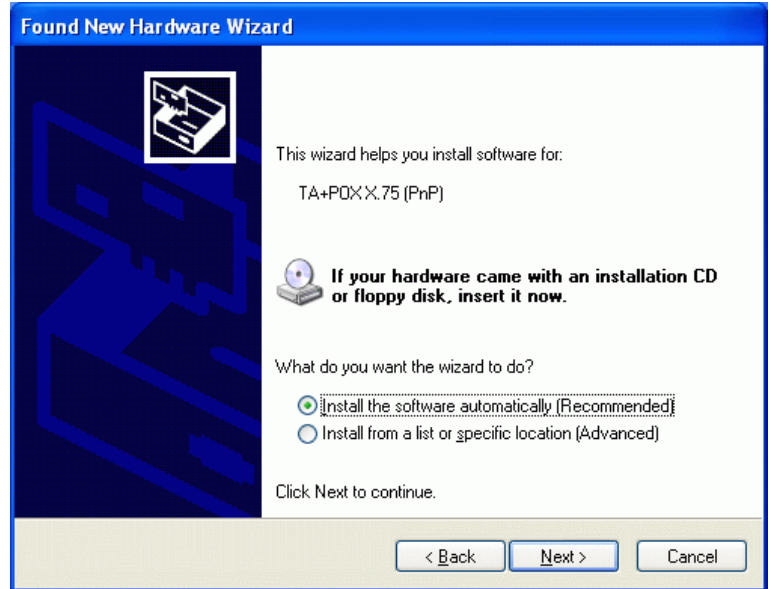
Select the point „Install the software automatically ...“ in „Found New Hardware Wizard“

Select Install.

Insert the driver CD.

Next >

Follow the instructions in Windows and install the driver.

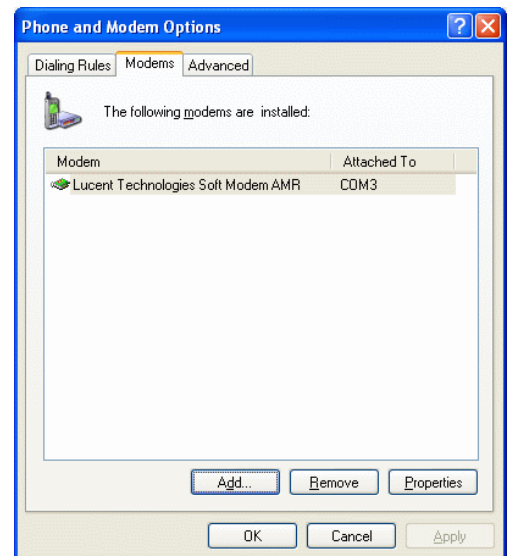


The correct modem driver **TA+POX (PPP,V.120,X.25,V.110)** for this application is included with the modem on a CD, or may be downloaded from the "SIPROTEC-Download-Area". For the purpose of installation the INSYS-driver-CD must be inserted into the CD/DVD-drive of the computer, alternatively the driver must be available from the hard-drive or another storage medium.

The driver, unzipped to C:\Siemens\... is then installed from the SIPROTEC-Download-Area.

In the „Control Panel“ the „Phone and Modem Options“ are opened.

With „Add...“ a new modem driver is installed in Windows.





The modem must be selected manually.

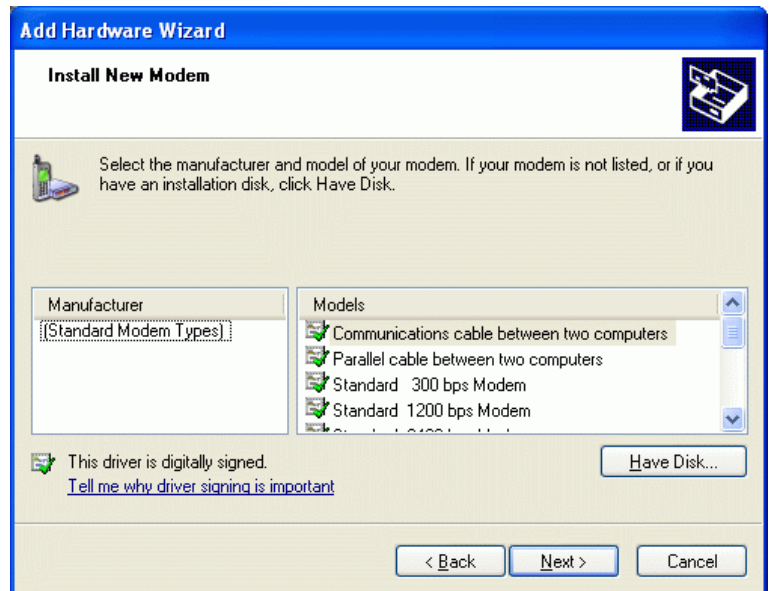
To do this put a check at  
**„Don't detect my modem;  
I will select it from a list.“**

„Next >“



Install the new modem from

„Have Disk...“

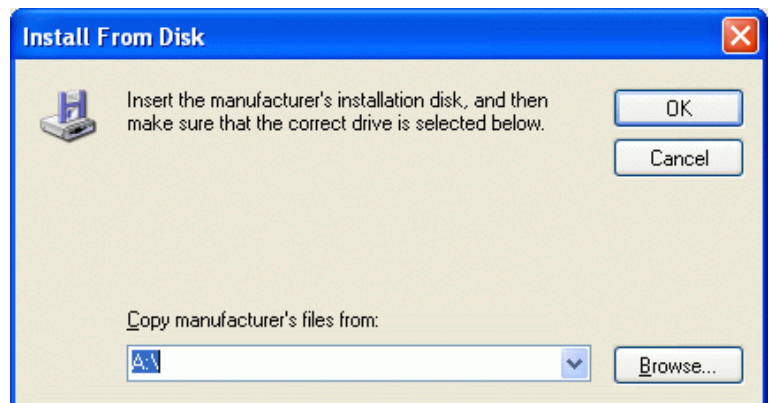


„Next >“

With

„Browse...“

search the relevant drive for the driver  
(e.g. C:\Siemens\INSYS-ISDN ).



The modem driver is located in the following path

e.g.

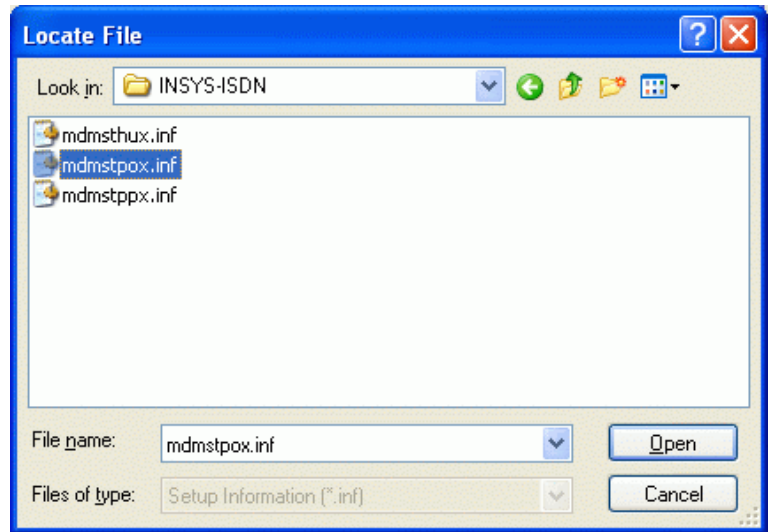
**C:\Siemens\INSYS-ISDN.**

Mark the driver file

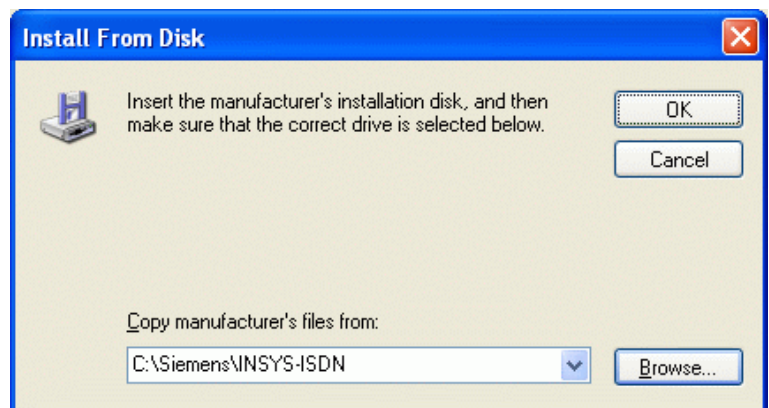
**mdmstpox.inf**

and

„Open“



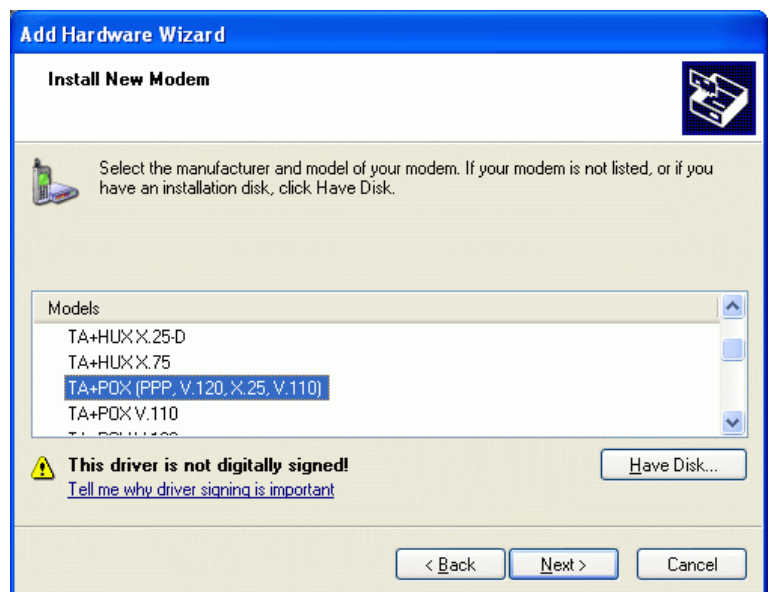
Continue with „OK“



Check the modem driver

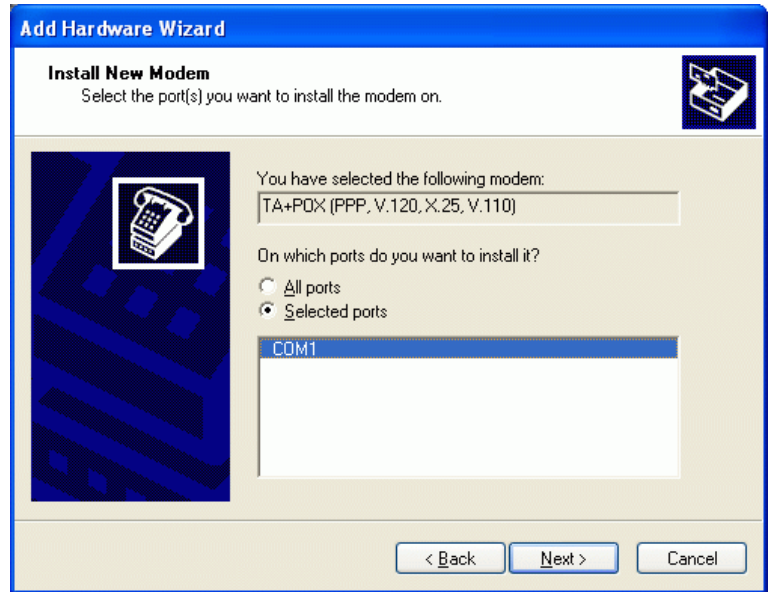
**TA+POX (PPP,V.120,X.25,V.110) and**

„Next >“



Select the serial port e.g.,  
„COM1“  
which will later be connected with the  
modem.

„Next >“

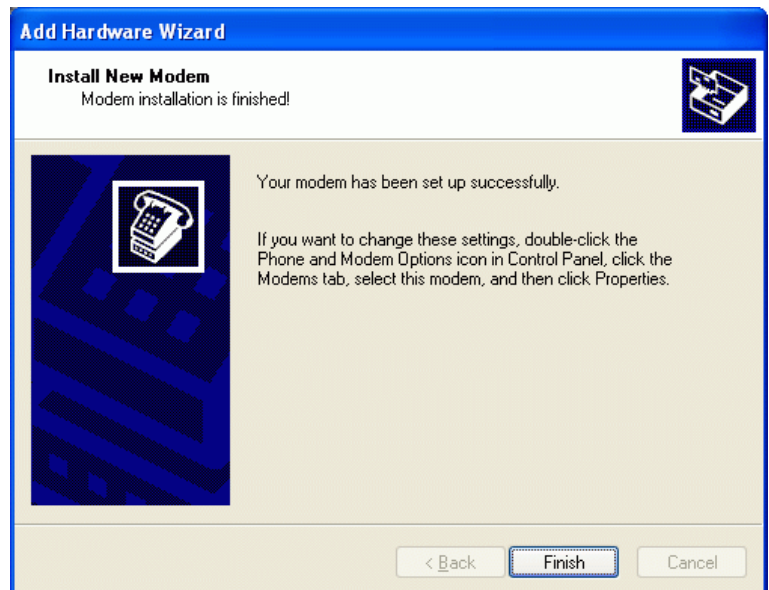


This Windows XP warning may be  
ignored. The driver was tested with  
Windows XP.

Continue with  
„Continue Anyway“



The installation is completed with  
„Finish“



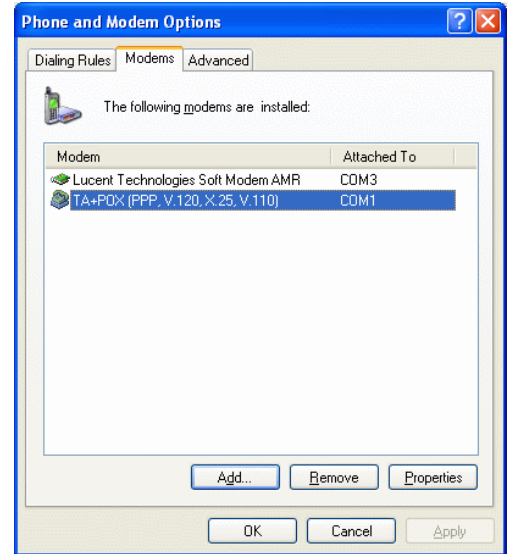


## Setting the modem driver

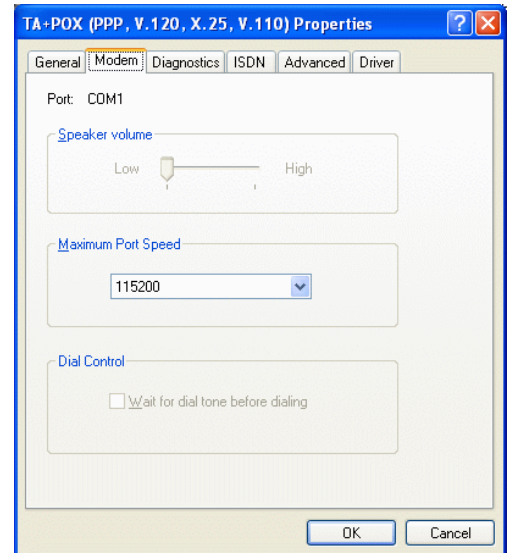
These settings of the system modem driver are used during each dial-up procedure for initialisation of the modem driver and must be done exactly as described.

In the overview of the installed modem drives, the presently installed modem driver is shown.

With „**Properties**“ the settings of the marked modem driver can be controlled and changed.



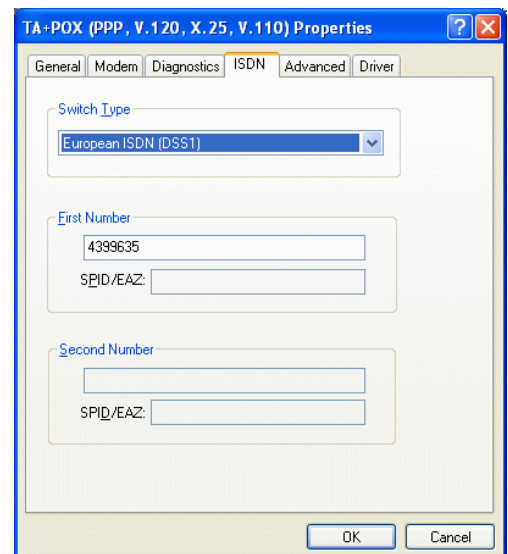
The pre-setting „**Maximum Port Speed**“ of **115200** is not changed.



In the pull-down window „**ISDN**“ the „**European ISDN (DSS1)**“ is selected under „**Switch Type**“.

Under „**First Number**“ the own telephone number is entered. This number is later interrogated by the substation router during “selective call-acceptance”.

Continue to the pull-down menu „**Advanced**“

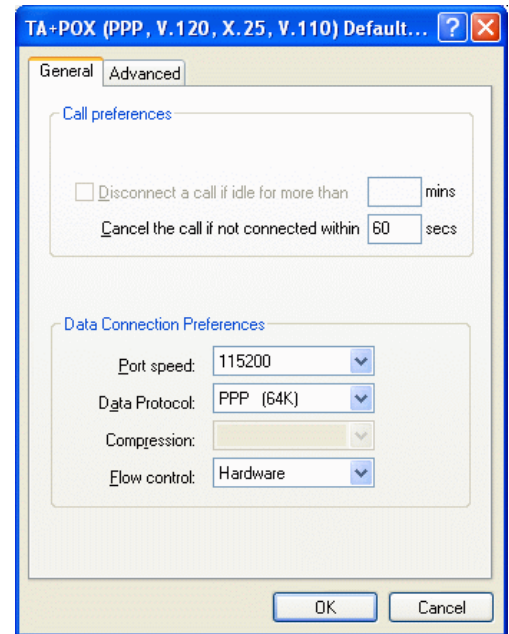


Settings in the pull-down menu „**General**“:

The “**Call preferences**“ do not have to be changed.

Do not change the „**Data Connection Preferences**“

<b>Port speed</b>	<b>115200</b>
<b>Data Protocol</b>	<b>PPP (64K)</b>
<b>Compression</b>	
<b>Flow control</b>	<b>Hardware</b>

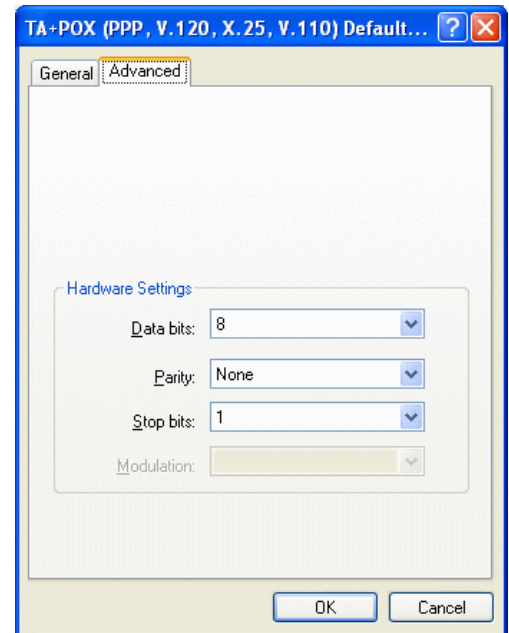


Settings in the window „**Advanced**“:

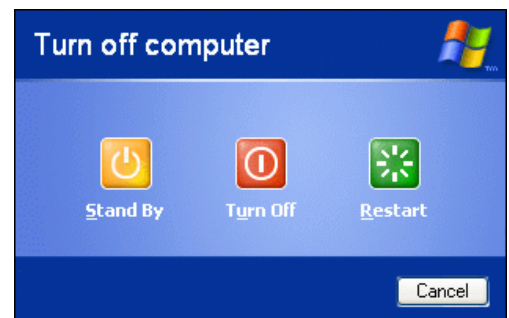
Do not change the „**Hardware Settings**“

<b>Data bits</b>	<b>8</b>
<b>Parity</b>	<b>None</b>
<b>Stop bits</b>	<b>1</b>
<b>Modulation</b>	

Close all windows with „**OK**“.



„**Restart**“  
the PC.



## Setting the Ethernet-interface of the PC

To set the ISDN router via it's LAN interface, a PC/Notebook with Ethernet interface must be connected. Prior to this, the interface must be configured accordingly.

Connect the PC with a patch-cable to the ISDN router and open the window „**Local Area Connection Status**“ .

Then open the next window with the button „**Properties**“.

All elements in the window „**Local Area Connection Properties**“

remain checked.

Under „**General**“ the element „**Internet Protokoll (TCP/IP)**“ is marked and the button „**Properties**“ is selected.

If „**Show icon in notification area when connected**“ is checked, an existing connection is displayed, and the status window may be opened at any time.

Most networks obtain the IP address automatically from the router or server.

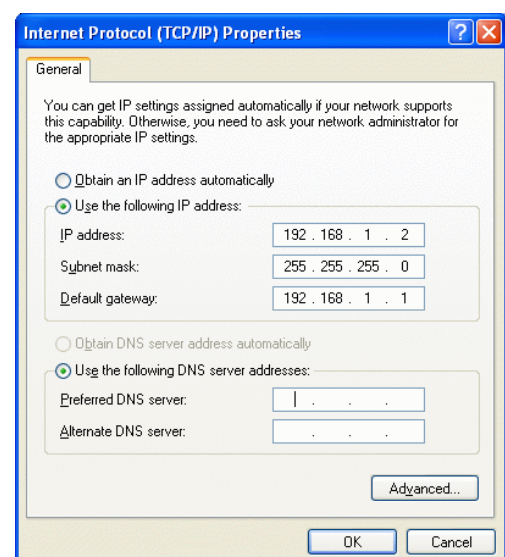
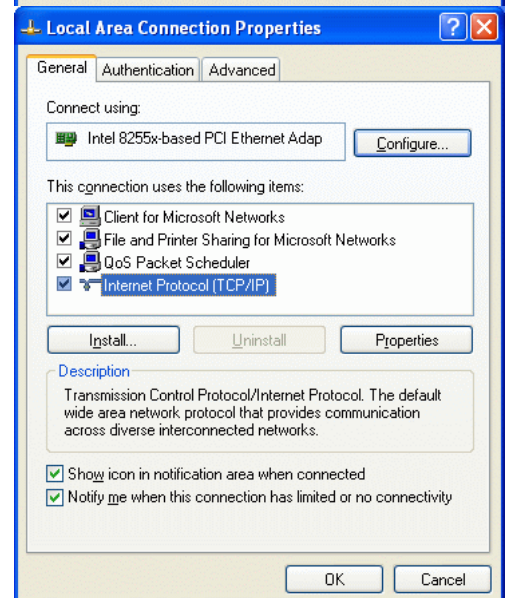
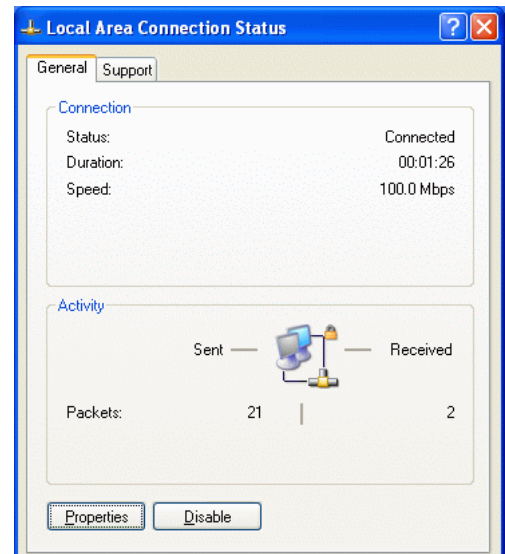
To set the ISDN router, (Default-IP 192.168.1.1) the IP address of the PC must be located in the same network segment.

For this purpose

**IP address:** 192.168.1.2 (IP-PC)  
**Subnet mask:** 255.255.255.0 (Range 1-254)  
**Default gateway:** 192.168.1.1 (IP-Router)

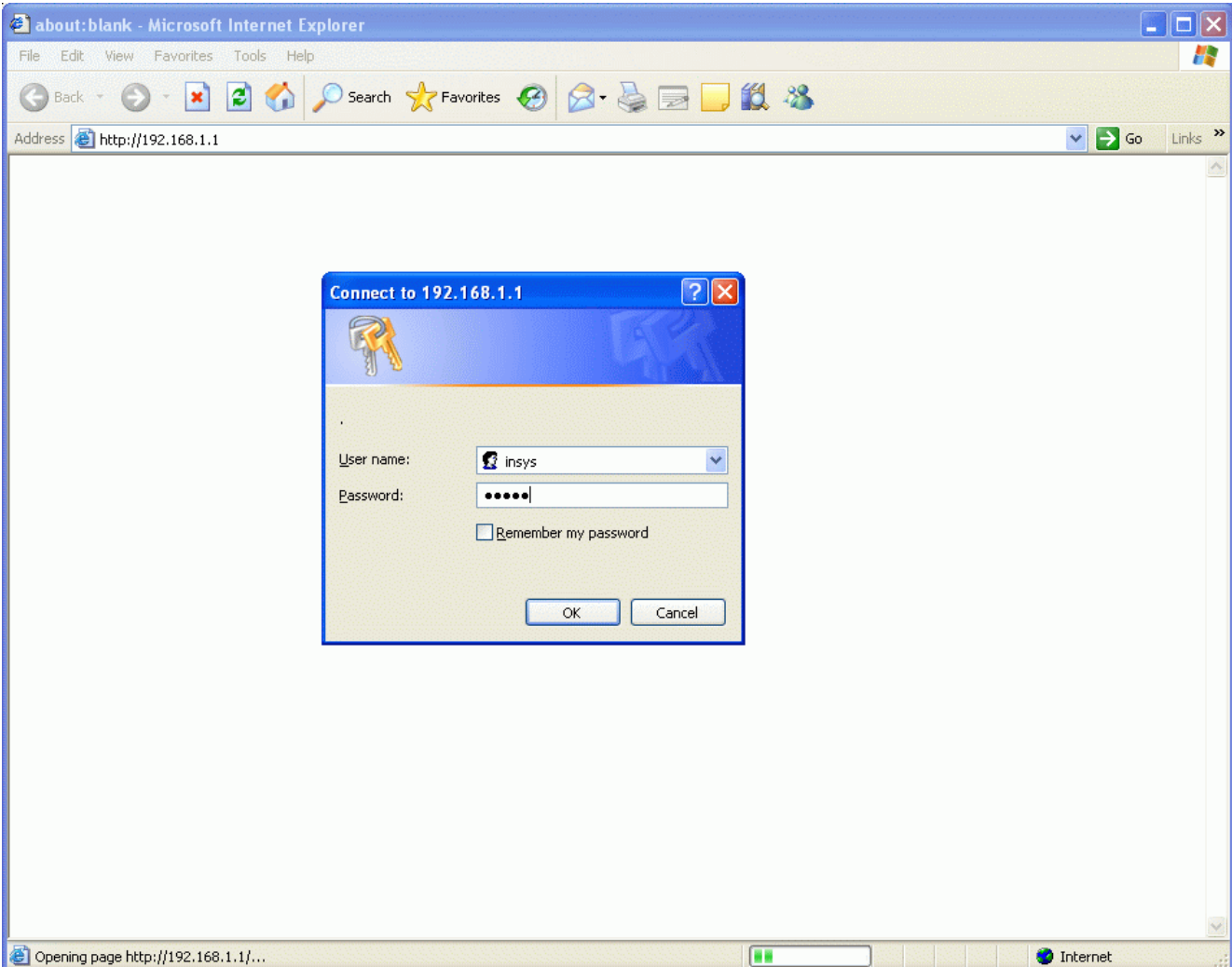
is set under „**Use the following IP address:**“.

Save everything with „**OK**“ and close.



## Setting the ISDN-Router with the Default-IP-address

The ISDN-router is set with an HTML-menu, which is opened by entering the default IP-address 192.168.1.1 in the Internet-Explorer or another Browser.



During the first log-in, the user name „insys“ and the password „moros“ must be entered.

The user name and the password should be changed as described hereunder.

After successful log-in the main menu „Home“ is displayed

Here, the settings can be done in blocks and saved.





## Basic Settings

Under „**Authentication**“ the user name and password for log-in purposes can be altered and saved.

Without valid log-in, no security relevant settings can be changed, which increases protection against unauthorised access.

Save with „**OK**“.

Under „**Ethernet Addresses**“ the IP-address and subnet mask of the ISDN-Routers may be changed, in other words, it can be adapted to the subnet of the substation. (e.g. **192.168.20.1**).

The worldwide unique MAC- address is only displayed and cannot be changed.

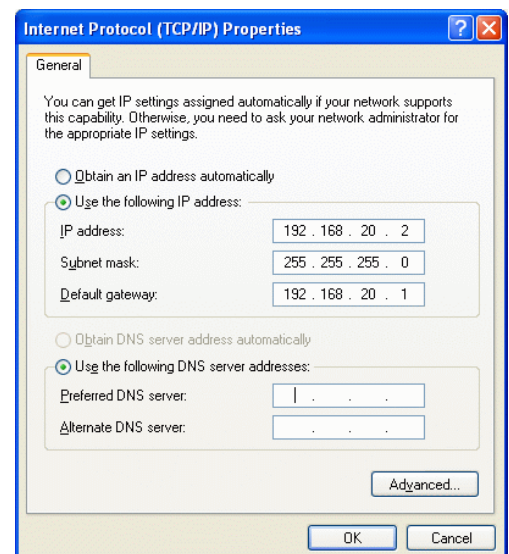
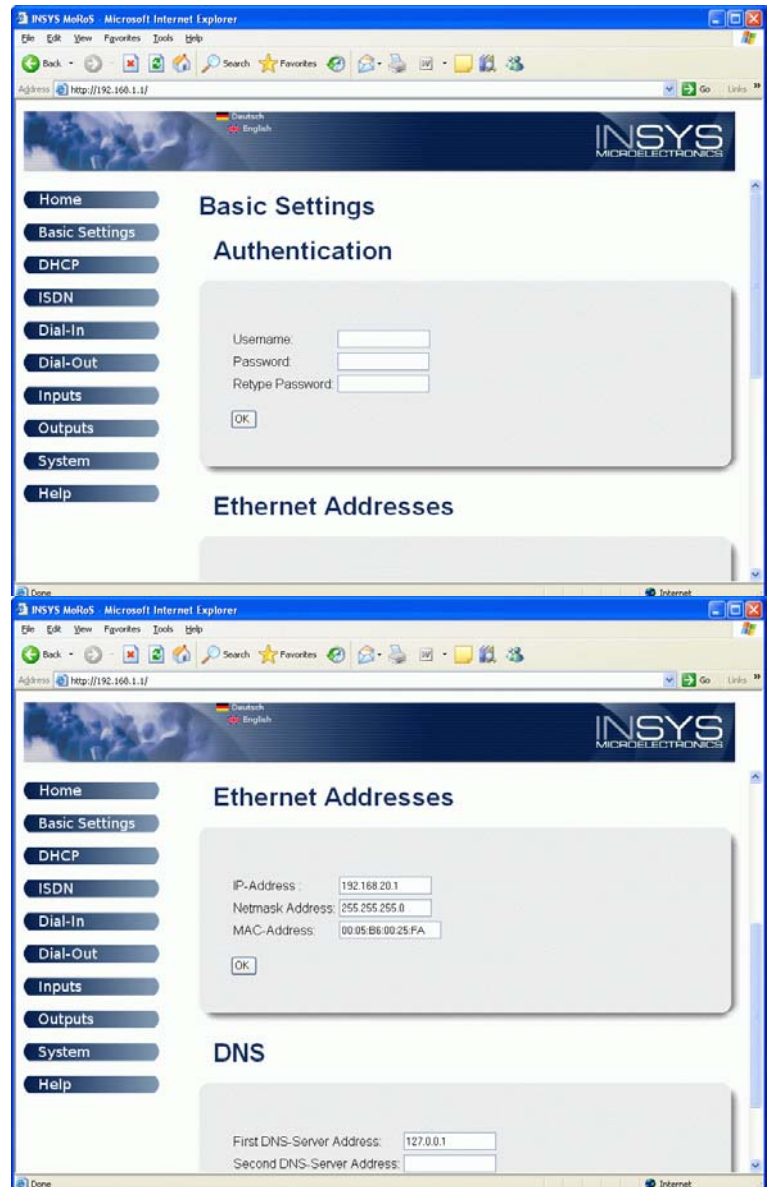
Save with „**OK**“.

Under „**DNS**“ no entries are required.

To further set the ISDN-router, the browser window must be closed and the IP address of the PC must be adapted to the new IP address of the router.

<b>IP address:</b>	192.168.20.2	(IP-PC)
<b>Subnet mask:</b>	255.255.255.0	(range 1-254)
<b>Default gateway:</b>	192.168.20.1	(IP-Router)

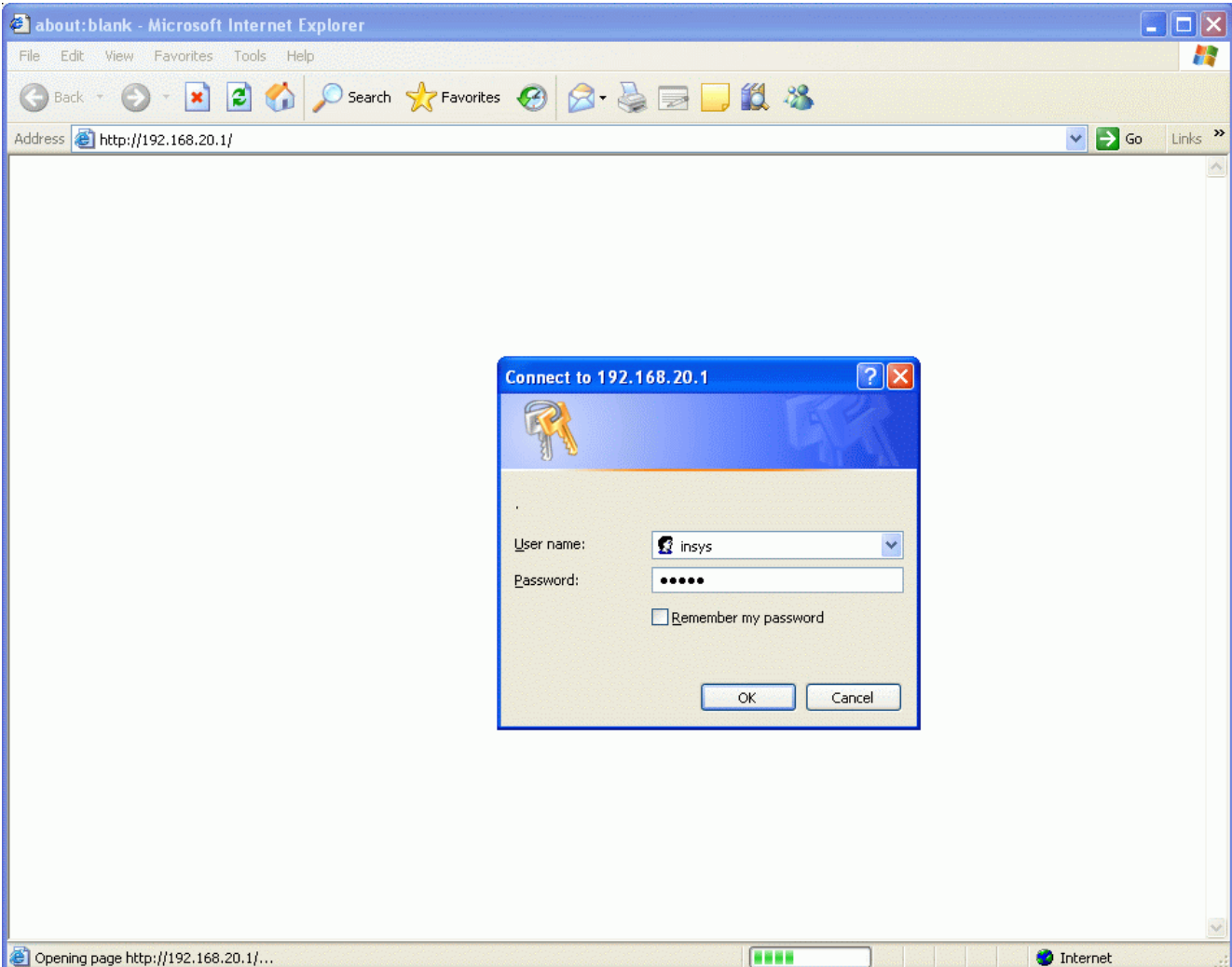
Save with „**OK**“ and close.





## Setting the ISDN-router with user IP-address

The ISDN-router can now again be set in the HTML menu, which is opened after entry of the new user IP address 192.168.20.1, in the Internet-Explorer or other browser.



During log-in new altered user name and the corresponding password must be entered.

After successful log-in the main menu „**Home**“ is reached.  
Further setting options can be selected from the navigation list on the left.

In the window „**Basic Settings**“ the existing settings can again be checked.

In the window „**DHCP**“ both settings must remain on „**Stop**“.



In the window „ISDN“ the own telephone number of the ISDN router connection is entered under „MSN:“ .

Under „Only allow these caller numbers: ...“ 5 telephone numbers can be entered, which receive incoming calls.

This setting ensures high security against unauthorised access to the ISDN-modem-router.

In the window „Dial-In“ all settings pertaining to call pick-up and connection are done.

Initially, the „Activate Dial-In“ must be set to „Yes“.

Under „Idle Time ...“ the time, after which the modem interrupts the connection, when no further data transfer takes place, may be set in seconds. The basic setting of 60 seconds should maybe be increased.

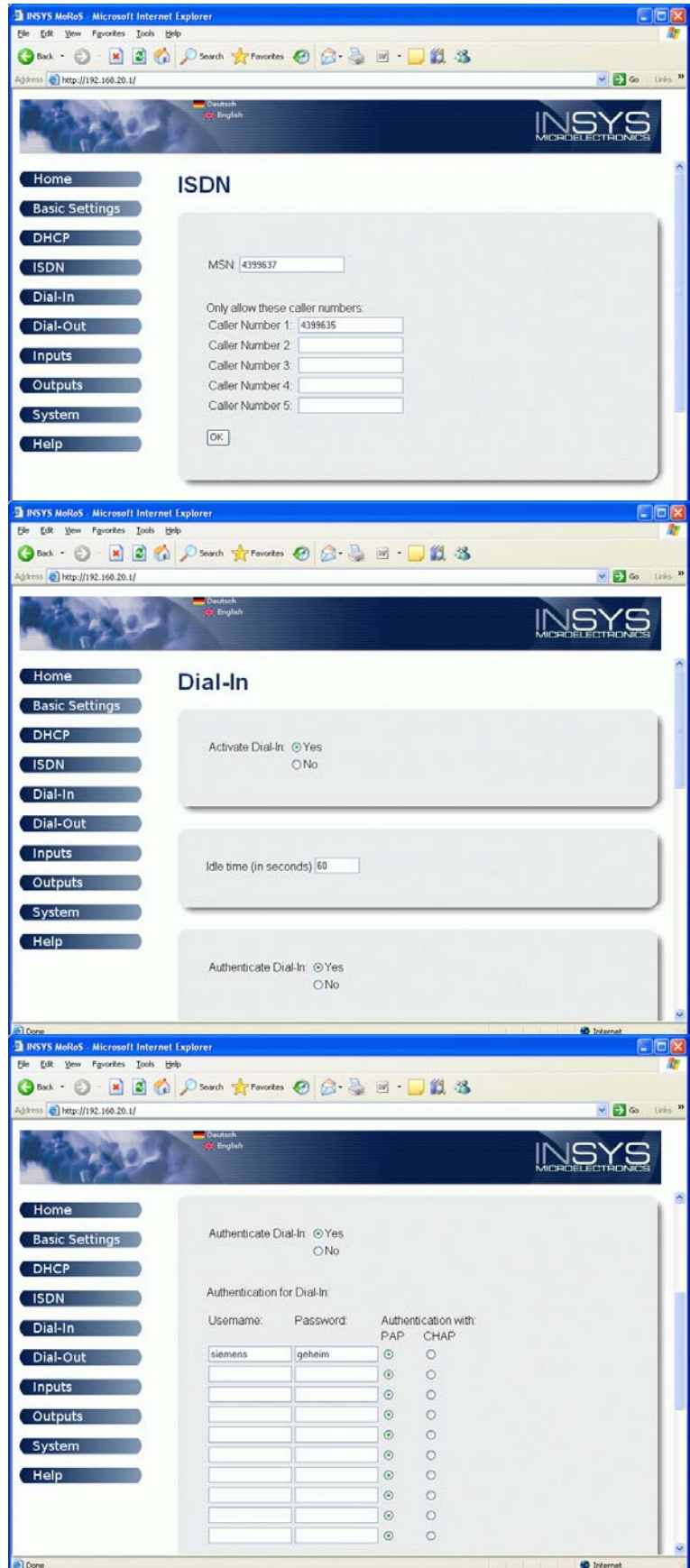
To increase access security, the „Authenticate Dial-In“ should be set to „Yes“.

Under „Authentication for Dial-In“ various rights of access for different users may be assigned, e.g. „Username:“ *siemens* and the „Password:“ *geheim* for the first user.

**NOTE!**

Mind higher and lower case writing!

These access data will later be used for connection of the office modem.



The „**Local IP-Address of PPP-Connection**“ and the „**Remote IP-Address**“ are used for the temporary connection. They can, do however not need to be changed.

A „**Gateway for Dial-In-Connections**“ can, does however not need to be entered

Confirm all settings with „**OK**“.

The windows „**Dial-Out**“, „**Inputs**“ and „**Outputs**“ are not described here, as they do not contain any relevant settings for this application.

In the window „**System**“ the system time can be set under „**Time**“ with „**Set Systemtime to:**“ and under „**Timezone**“ the time zone may be entered.

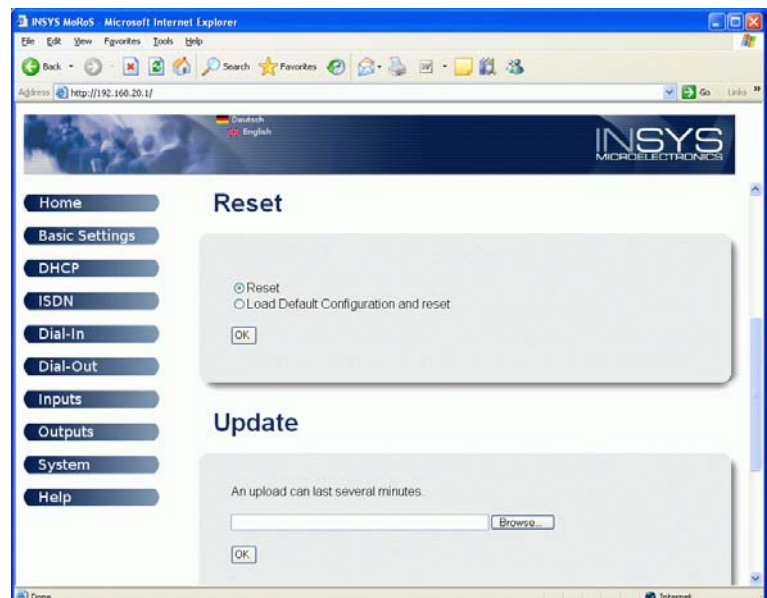
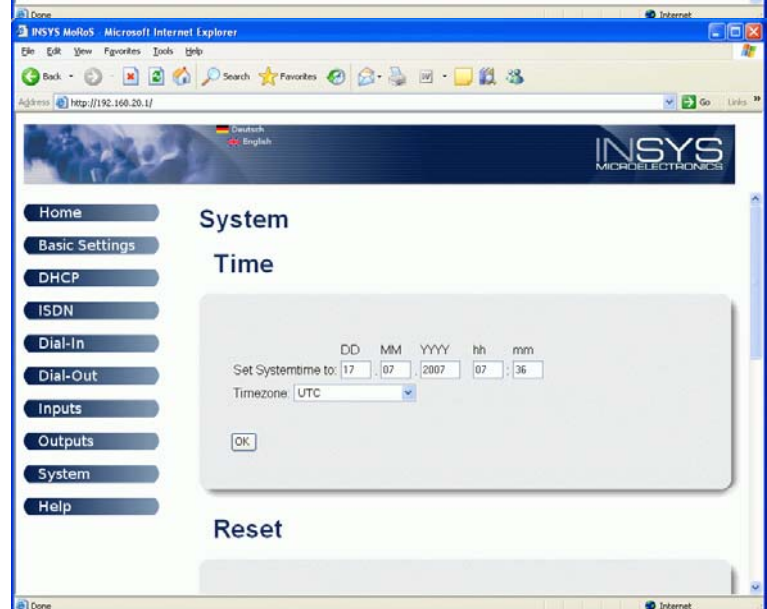
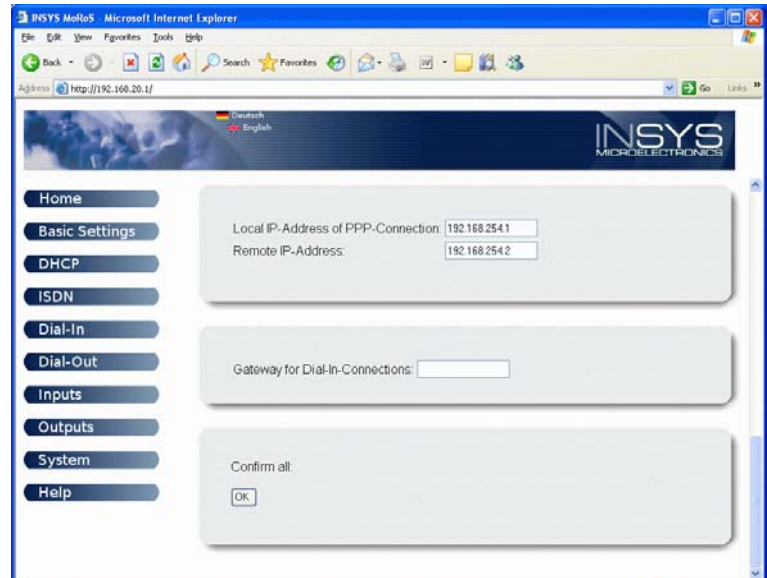
Save the settings with „**OK**“.

In the window „**System**“, no further settings are required under „**Reset**“ and „**Update**“.

Under „**System Data**“ (no longer visible at the bottom in the picture on the right) the current device data is displayed.

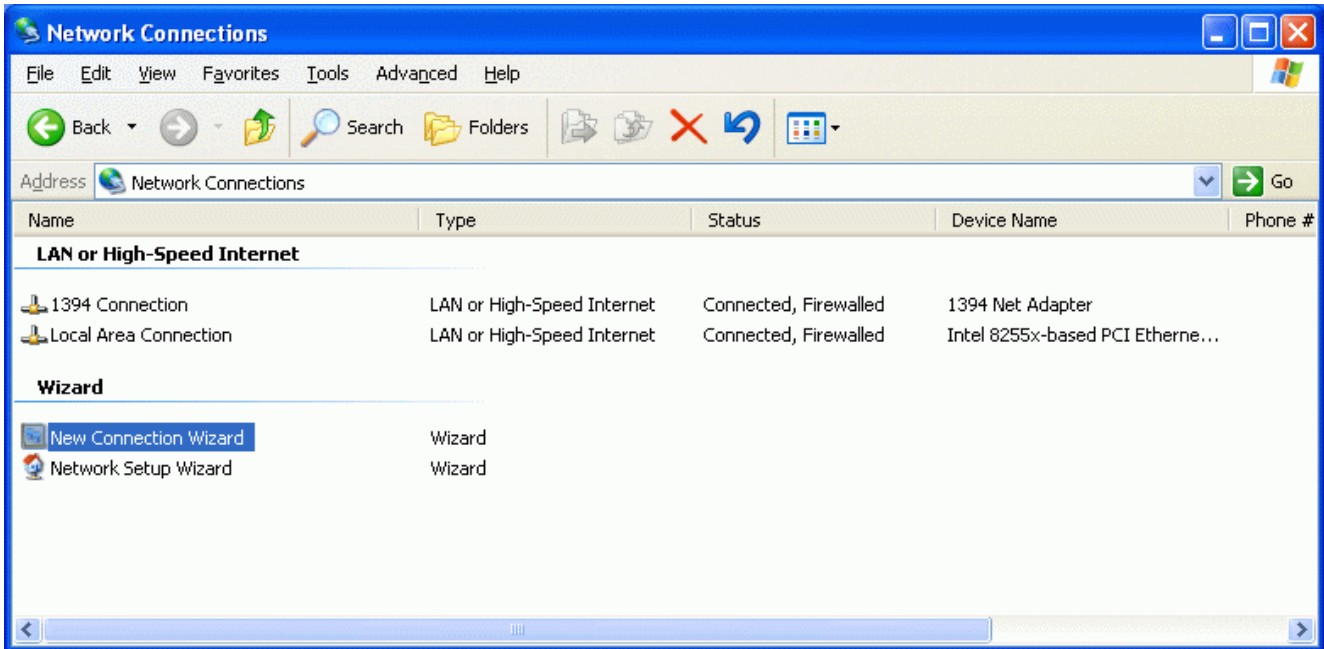
With the button „**Help**“ a new window is opened and general help is offered for every page.

When all settings have been saved with „**OK**“, the ISDN router has been set correctly and the explorer window can be closed.



## Setting up a Dial-up connection

The ISDN-connection between the office modem INSYS Pocket ISDN, and the ISDN-modem router MoRoS in the substation is established via a Dial-up connection. Besides the telephone number, the user name and password are also defined here.



In the Windows „Control Panel“ of the office PC, the file „Network Connencions“ is opened and subsequently the „New Connencion Wizard“ is started.



Continue with „Next >“.



In this window the „**Network Connection Type**“ is defined.

A „**Connect to the network at my workplace**“ is selected.

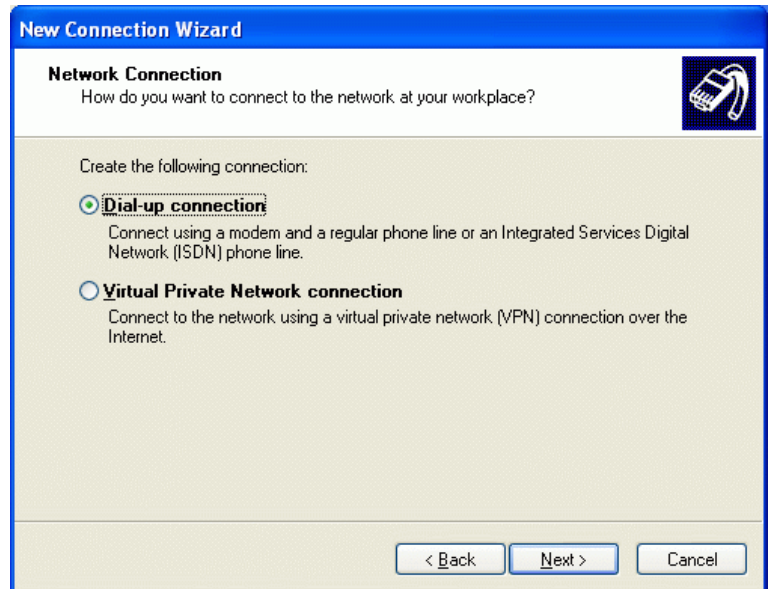
„**Next >**“



In this window the „**Network connection**“ is defined.

A „**Dial-up connection**“ is selected.

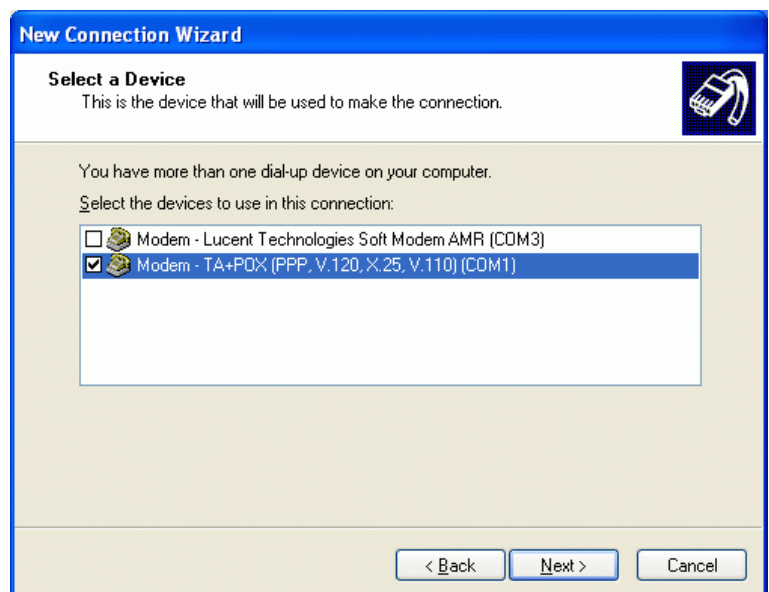
„**Next >**“



The correct device (office modem) is selected with a check.

Here this is the „**Modem – TA+POX (PPP, V.120, X.25, V.110) (COM1)**“.

„**Next >**“





Under „**Company Name**“ an available and distinct Connection name is entered.

As this name is also allocated to the Shortcut on the Desktop, the corresponding Substation name can be entered, e.g. „**Substation West**“.

„**Next >**“

The screenshot shows the 'New Connection Wizard' dialog box. The title bar reads 'New Connection Wizard'. The main heading is 'Connection Name' with the instruction 'Specify a name for this connection to your workplace.' Below this, there is a text box labeled 'Company Name' containing the text 'Substation West'. A note below the text box says: 'For example, you could type the name of your workplace or the name of a server you will connect to.' At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Under „**Phone number**“ the complete telephone number of the substation modem is entered.

Note! All dial-up number and prefixes (e.g. “0”) must be entered.

„**Next >**“

The screenshot shows the 'New Connection Wizard' dialog box. The title bar reads 'New Connection Wizard'. The main heading is 'Phone Number to Dial' with the instruction 'What is the phone number you will use to make this connection?'. Below this, there is a text box labeled 'Phone number:' containing the text '4399637'. A note below the text box says: 'You might need to include a "1" or the area code, or both. If you are not sure you need the extra numbers, dial the phone number on your telephone. If you hear a modem sound, the number dialed is correct.' At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Here a „**Add a shortcut to this connection to my desktop**“ can be checked. This simplifies the selection of a connection to a certain substation later.

The connection is saved with „**Finish**“ and the process is finished.

The screenshot shows the 'New Connection Wizard' dialog box. The title bar reads 'New Connection Wizard'. The main heading is 'Completing the New Connection Wizard'. Below this, there is a text box that says: 'You have successfully completed the steps needed to create the following connection:'. Below this, there is a list item: 'Substation West' with a sub-item: '• Share with all users of this computer'. Below this, there is a text box that says: 'The connection will be saved in the Network Connections folder.' Below this, there is a checked checkbox with the text: 'Add a shortcut to this connection to my desktop'. Below this, there is a text box that says: 'To create the connection and close this wizard, click Finish.' At the bottom right, there are three buttons: '< Back', 'Finish', and 'Cancel'.

## Setting the Dial-up connection

After the set-up of the Dial-up connection has been finalised, the window for the connection is immediately opened. However, before the Dial-up connection can be started, a few settings must be done.

In the window „**Connect Substation West**“ the „**User name:**“ and the „**Password:**“ must be entered to establish a connection. These were previously stored in the ISDN router which is to be called.

**NOTE!** Mind the upper and lower case!

By checking „**Save this user name and password for the following users:**“ the user name and password could be stored for further calls.

**NOTE** Storing this information constitutes a security risk, and is not recommended.

Under „**Dial**“ the telephone number has already been entered. Here the telephone number can again be checked and changed if needed.

Continue with „**Properties**“.

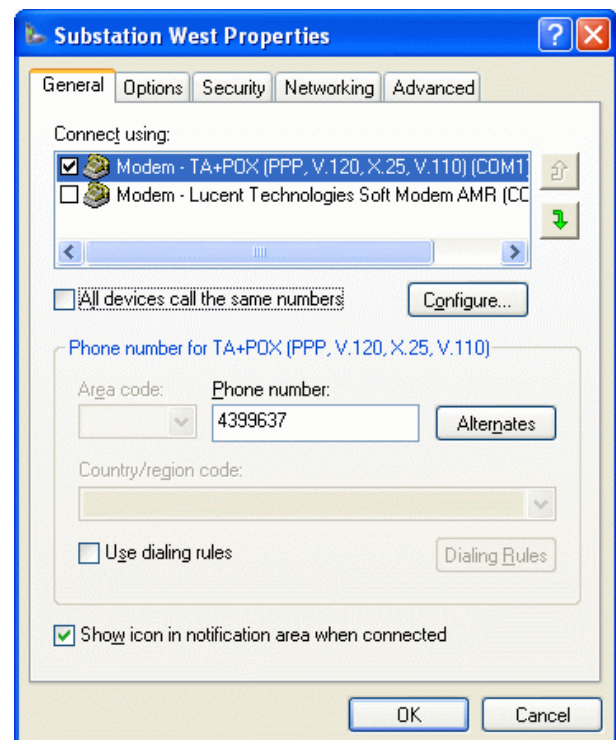


In the window „**Substation West Properties**“ the „**Modem – TA+POX (PPP, V.120, ...)**“ is checked as the only modem.

The check at „**All devices call the same numbers**“ should be removed, as this is not common in practice.

Under „**Phone number for „TA+POX (PPP, ...)**“ the telephone number can again be corrected with setting and use of the dialling rules.

„**Show icon in notification area when connected**“ is useful here.

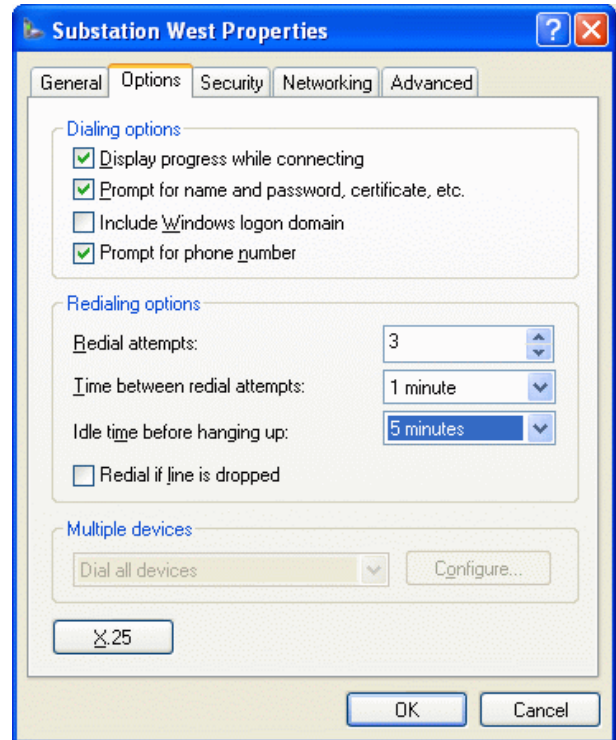


Under „Options“ the pre-settings can be retained.

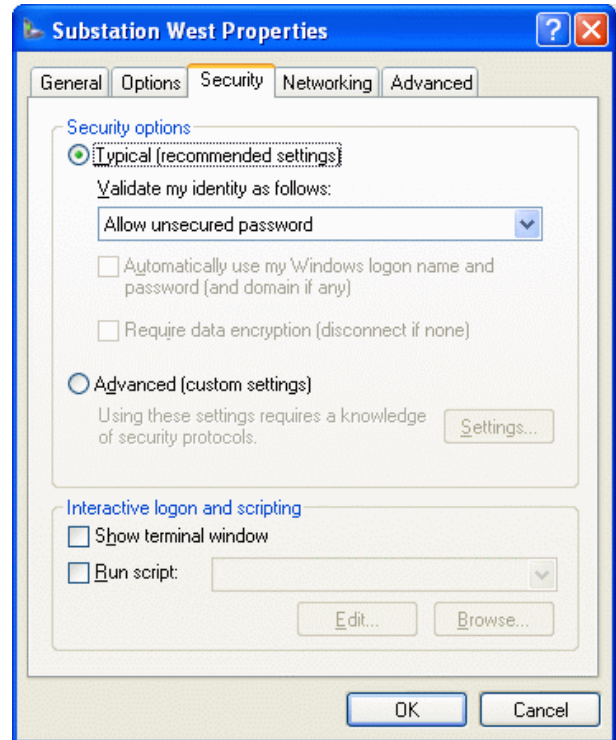
To prevent a connection inadvertently remaining un-terminated, a sensible value (eg. 5-10 minutes) can be entered into the pull-down window „Idle time before hanging up“

Note:

This value should not be too small, as the connection could later be automatically terminated, during a change from one protection device to another.



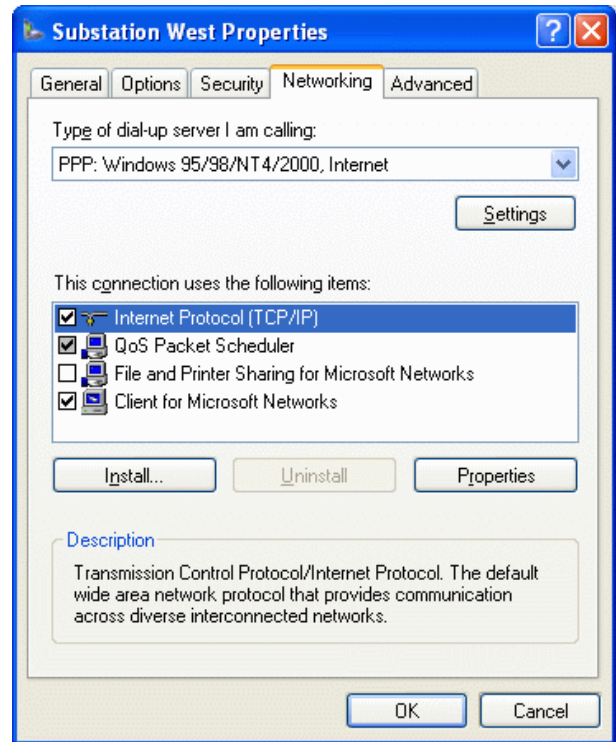
Under „Security“ the security options can be increased. In this application the pre-settings were retained.



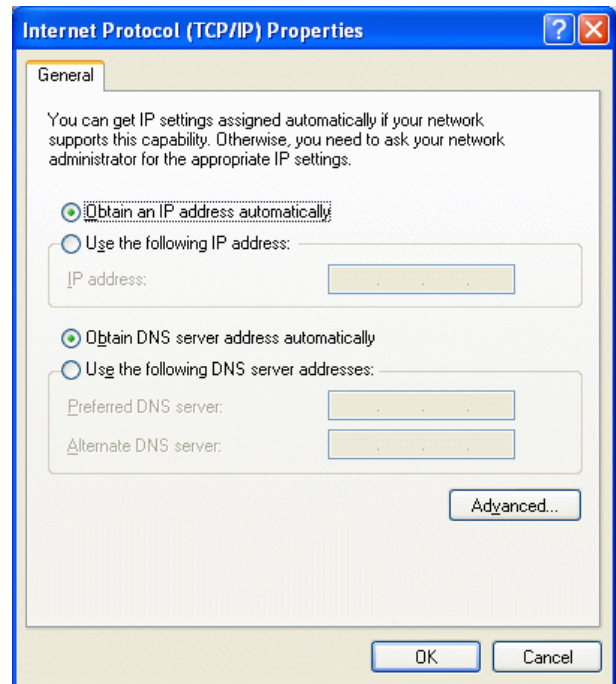
Under „Networking“ the „Type of dial-up server I am calling“ is set to **PPP: Windows 95/98/NT4/2000, Internet**.

The selection under „This connection uses the following items:“ can remain as pre-set (see Figure).

If the element „Internet Protocol (TCP/IP)“ is selected, the following settings must be made under „Properties“ .



Under „Internet Protocol (TCP/IP) Properties“ „Obtain an IP address automatically“ remains selected.

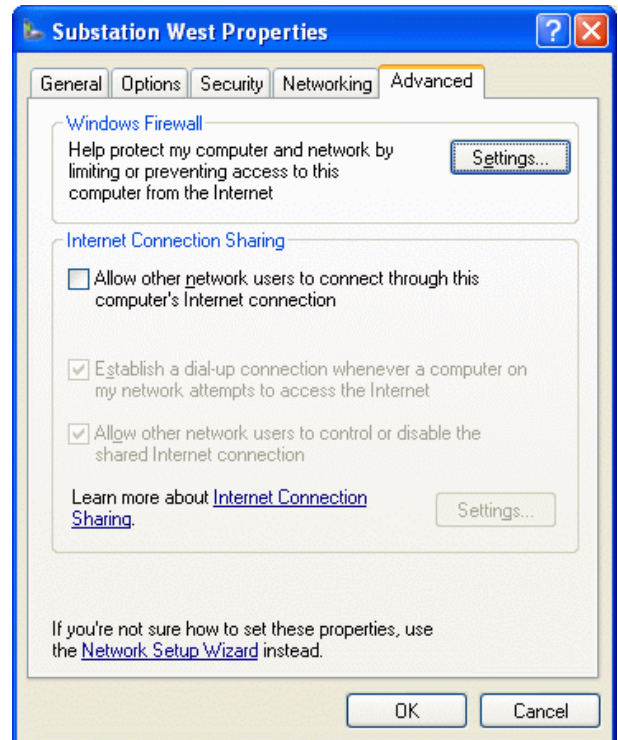




In the window „**Advanced**“ settings regarding security and common use of an Internet connection can be made again.

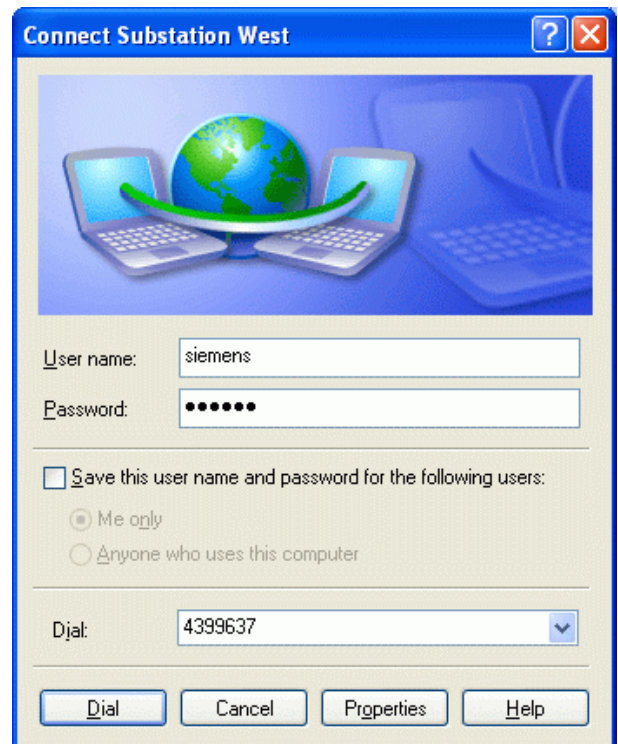
The settings were not changed.

Close all windows with „**OK**“.



Once all setting windows have been closed with „**OK**“ only the connection window remains visible.

As all required settings have now been done and saved, the dial-up of the ISDN router in the substation can be started with the button "**Dial**".



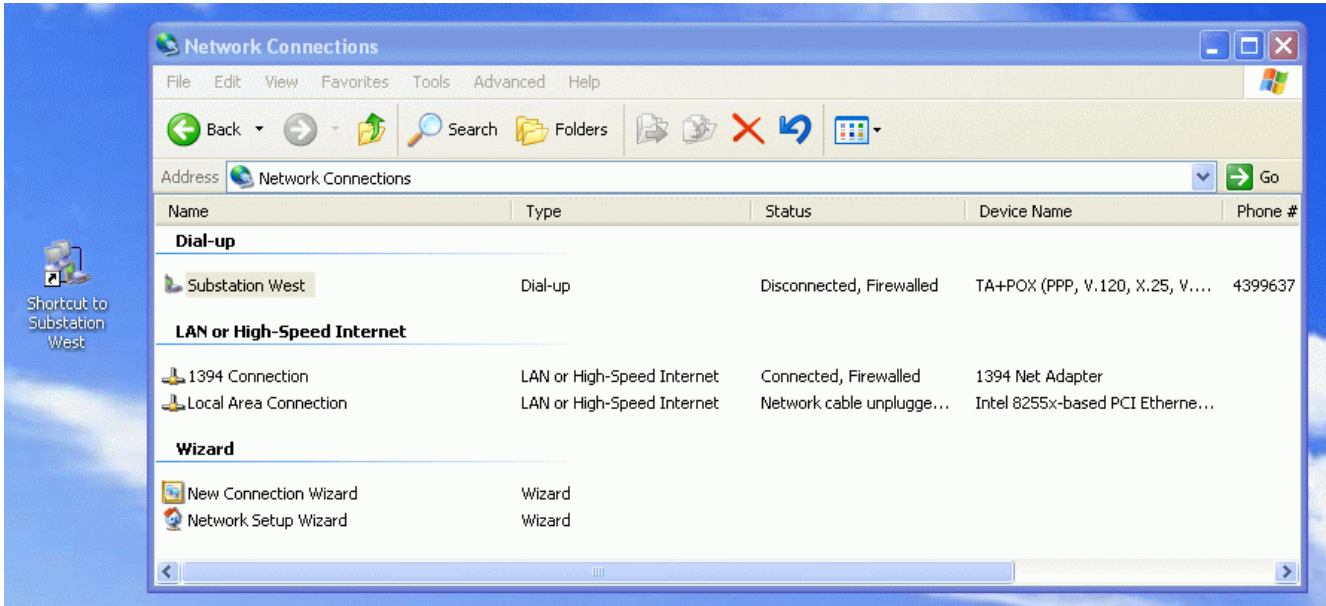


## Establishing a Dial-up connection to the ISDN-router

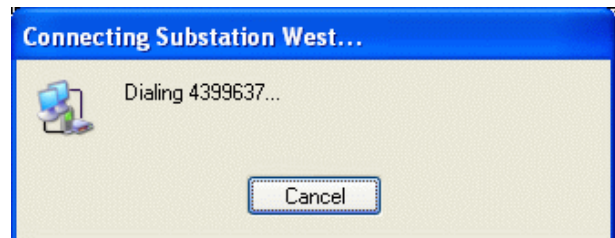
Before remote operation to the protection device can be established, the corresponding Dial-up connection to the ISDN router must be set up.

For a better overview, all

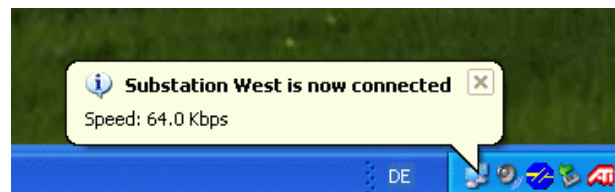
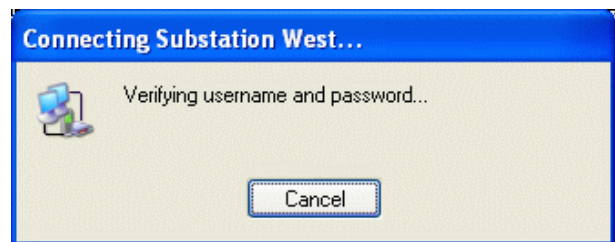
Dial-up connections can be linked to the desktop (see Figure). To do this, they are simply pulled with the mouse from the window „Control Panel“ - „Network Connections“ to the „Desktop“.



The connection is now established with telephone number, user name and password.

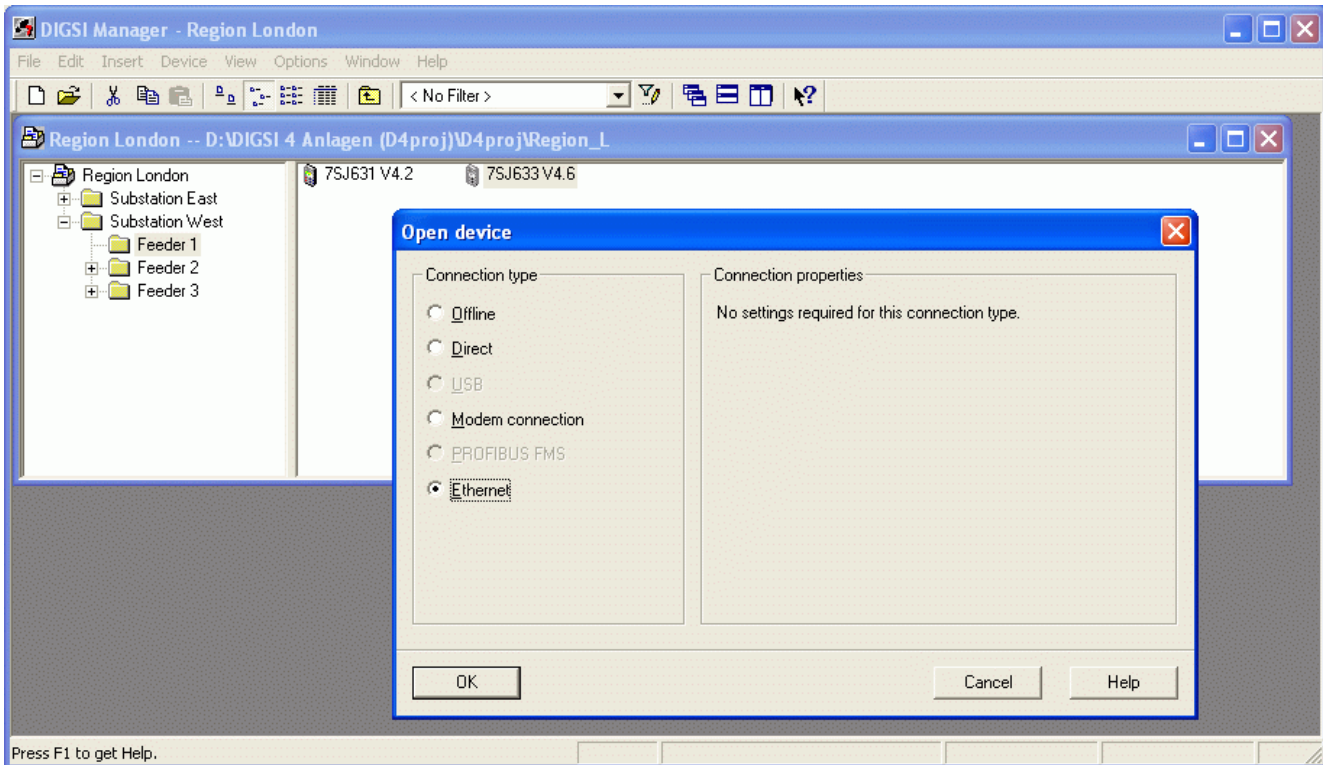


Once the connection stands, an additional icon is displayed in the status line, and a corresponding message issued.



## ***Establishing a connection to the protection device***

After all devices have been set correctly, and the Dial-up connection in the substation is active, a connection to the protection device can be established.



In the window „**Open device**“ „Ethernet“ is selected under „**Connection type**“ and confirmed with „**OK**“.

For the set-up and termination of a connection to the protection device, the following order must be followed:

1. Open the substation with the protection devices that are to be operated in DIGSI 4.
2. Open the Dial-up connection via the corresponding desktop icon.
3. Enter user name and password and dial.
4. Open the first protection device and establish the connection with the connection type „Ethernet“.

**NOTE:** This must be done before the automatic termination by the Dial-up connection or the router. If necessary increase the Idle time settings.

While the protection device is online, the connection is not automatically terminated, as DIGSI 4 constantly transmits data for the purposes of line monitoring.

5. After closing the first protection device, immediately dial up the second protection device.  
**NOTE:** See the note under number 4.

**After closing the last protection device, terminate the Dial-up connection manually!**

**DIGSI 4 does not close this data remote connection!**

Good luck!