Remote control SIPROTEC 3 and 4 Devices over analog INSYS–Modems

**Data transmission is done with transparent communication
using 9600 Baud and the data format 8E1.**

Introduction

The possibilities of remote operation of SIPROTEC devices are numerous. Assistance for the selection of "Your" remote operations concept may be found in the document "General Information" in the Internet under:

www.SIPROTEC.com / **Applications / Remote control**.

This document contains a detailed description regarding the secure remote operation of SIPROTEC 3 and 4 devices with DIGSI 4 (from version 4.60 + SP1) via the modem INSYS Pocket 56k (desktop device in the office) and INSYS Modem 56k (rail-mounted system in the substation).

Operational concept

The figure below shows a proven hardware configuration for V3 protection devices in the substation, i.e. an optical star configuration via star-coupler for devices with optical interface, or a RS485 bus configuration for compact devices with RS485 interface. To ensure that data transmission is as safe as possible, the data format 8E1 with parity bit is used. A Notebook PC may be connected temporarily to the mini-star coupler ("A1") for local operation. The modem at the optical input ("A2") is automatically disconnected. For local operation without a mini-star coupler ("A1") the modem must be disconnected from the RS232 FO converter.
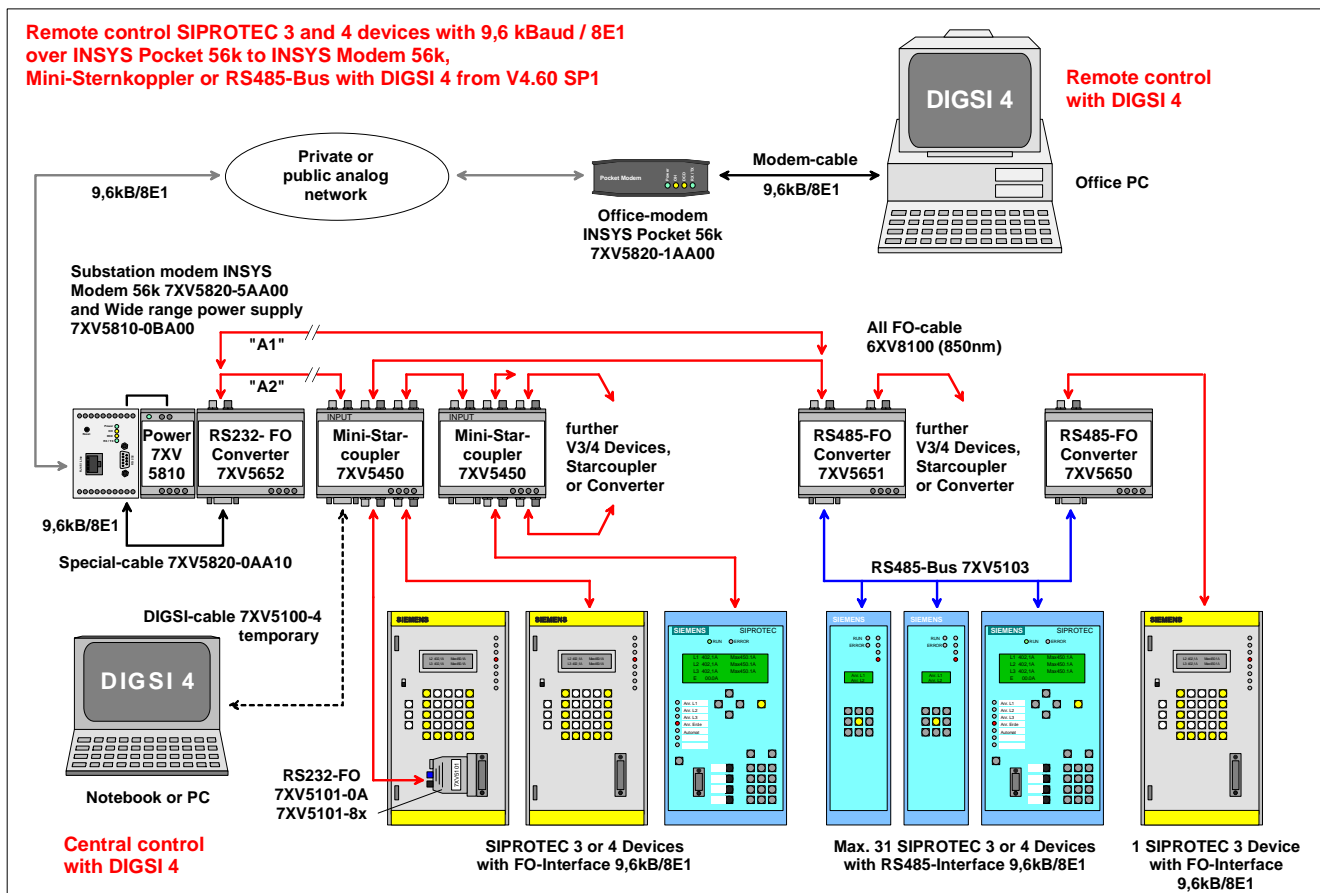

Figure 1: Hardware configuration of a remote operation of SIPROTEC 3 and 4 protection devices

The application described here was successfully tested under Windows XP
using DIGSI 4.80 + SP1. The following modems were used during testing:
Office modem: INSYS Pocket 56k (Desktop device with plug in power supply)
Substation modem   :   INSYS Modem 56k (rail-mounting device with external wide area power supply).

As numerous problems occurred regarding the change of the data format in the office modem in the past, special modem drivers are now available for the remote operation with DIGSI 4.
After the installation of these modem drivers, the office modem can connect to all INSYS-modems with e.g. 57,6 kB / 8N1 or 9,6 kB / 8E1 or 19,2 kB / 8E1 for operation of the protection device.
The modem driver used here, **INSYS Modem 56k - Direct 9600 8E1.inf**   may be found in the Internet under:

www.SIPROTEC.com / Accessories / 7XV5820 / …

The security concept

The security concept regarding interference on the entire transmission line as well as unauthorised access to protection devices has a high priority and regard has been taken of this with various measurements.

Transmission security is ensured by the parity bit (8E1) as well as the transparent transmission. The settings of the modems take regard of this concept.

The system may be protected from unauthorised access by the necessary modem settings with password protection as well as automatic call-back.

The most important general rules

The following rules must be adhered to when operating from remote via a modem:

- For remote operation under Windows XP Prof. only DIGSI 4.60 + SP1,
  DIGSI 4.7x, DIGSI 4.80 + HF2 or newer DIGSI-Versions may be used.

- Only install the exact driver specified for the modem type and operating system in Windows.

- Always use the modem drivers recommended in the application descriptions.
  These may be downloaded from the Download-Area under www.siprotec.com.

- The transmission rate of the telephone line <u>must</u> always be the same or higher than the set baud rate of the substation modem and the protection devices (telegram gaps).

- Baud rate and data format of the office modem <u>must</u> be set exactly the same in the system as well as the DIGSI 4 modem driver.

- ATTENTION: Changes which are entered into the Windows-Registry will only be activated when the PC is <u>re-booted</u>.

- The baud rate and data format of the substation modem as well as of all protection devices must be the same.

- Each protection device in the substation <u>must</u> have a unique address between 1 and 254.

Establishing a project and substation

The new project in DIGSI 4 with substation files, feeder files and protection devices may be imported from an existing DIGSI V3 substation, or be newly established.
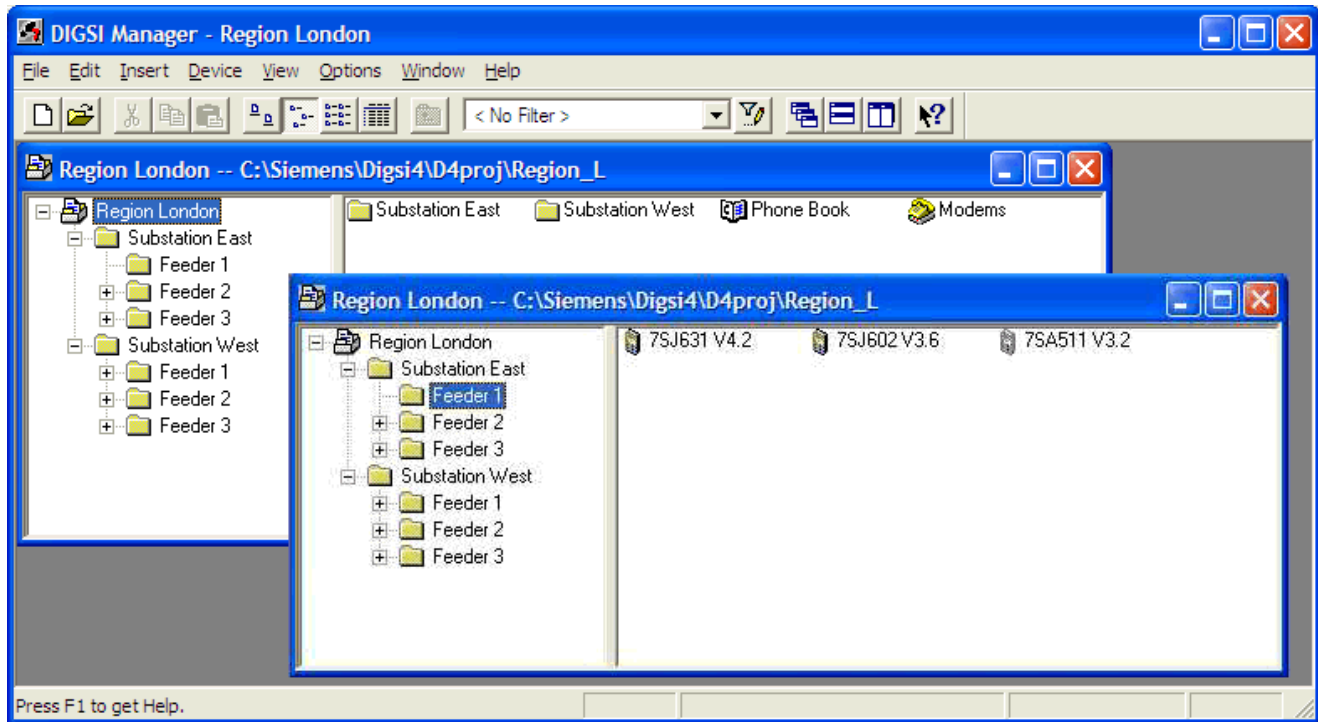The procedure is described in the SIPROTEC system manual.

Figure 2: V3-protection devices in the substation manager of Digsi 4

Before the required settings for the remote operation are done, the local connection to all protection devices should be tested via the central interface (e.g. at the star coupler) (see Figure 1)

Please also take note of the documents "Central Control" in the Internet under

www.SIPROTEC.com */ Applications / Remote control*.

Note:

- The system interfaces of all protection devices must be set to **9600 Baud** with the data format **8E1 (DIGSI/VDEW)**.
- Each device must have a **unique device address** from 1 – 254.

Installing the modem drivers

Before installing and setting of the modems in DIGSI 4, the modem must be installed in Windows.
The original INSYS-modem driver is located on the CD supplied with every modem and must be installed. If this is not done, Windows XP tries to install the driver anew after each new start of the PC.
The driver is not used in this application, and may remain in the pre-settings.
For the remote operation of the V3 devices in this application, a special modem driver is downloaded from the "SIPROTEC Download-Area", unzipped and subsequently installed.
This driver may be found in the Internet under:

www.SIPROTEC.com / Accessories / 7XV5820 / INSYS-Driver.exe

The exe-file automatically unzips itself to C:\Siemens\INSYS-Modem\... and contains all special INSYS-modem drivers for the remote operation of SIPROTEC-devices in DIGSI 4.
To install the required modem driver, please proceed as follows:

In the Windows Control Panel choose
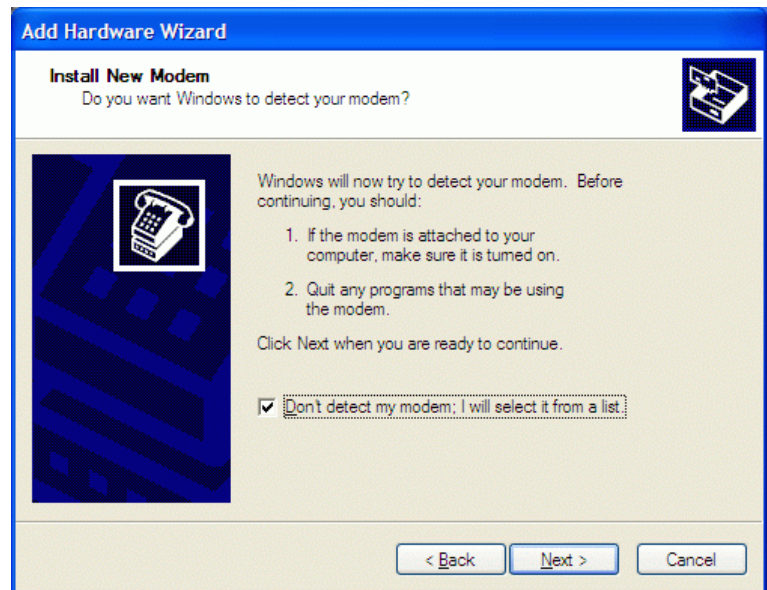**"Phone- and Modem Options"**
by double-click on the icon.
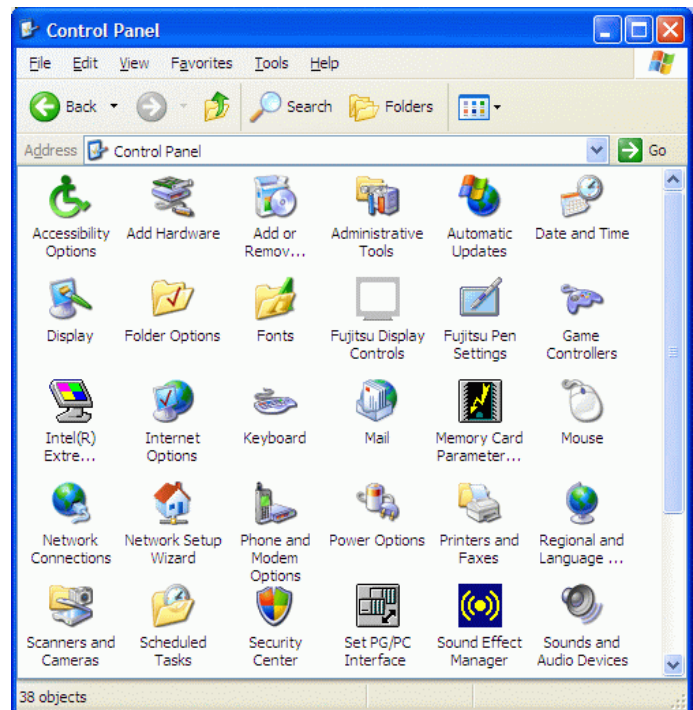
With **"Add"..**" a new modem driver is installed in Windows.

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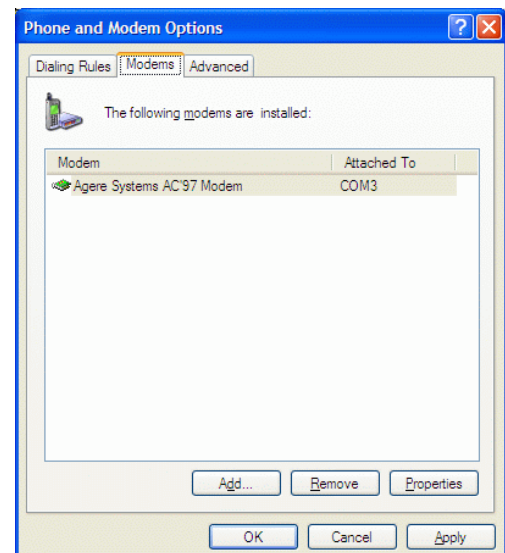
The modem has to be selected manually.

Check
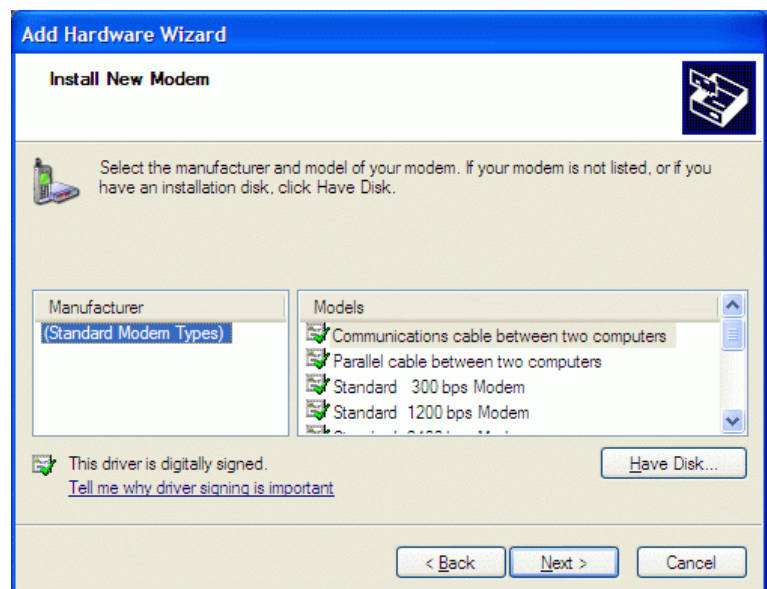**"Select modem"**
(no automatic detection)"
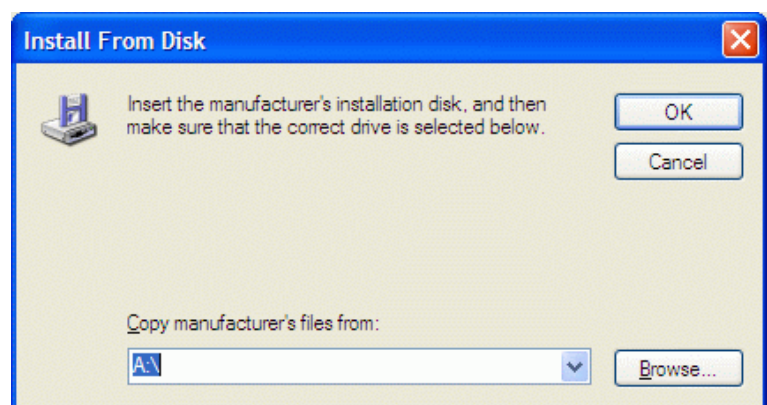
Press "**Next >**".

Install a new modem from

"Disc…"

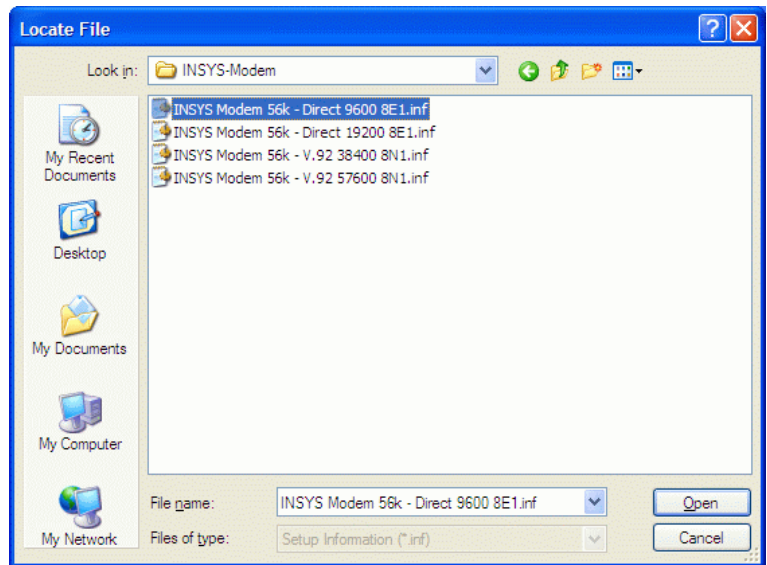Press **"Next >"**.

Select the applicable drive,
e.g.. "C:\"

"Browse…" for the modem driver
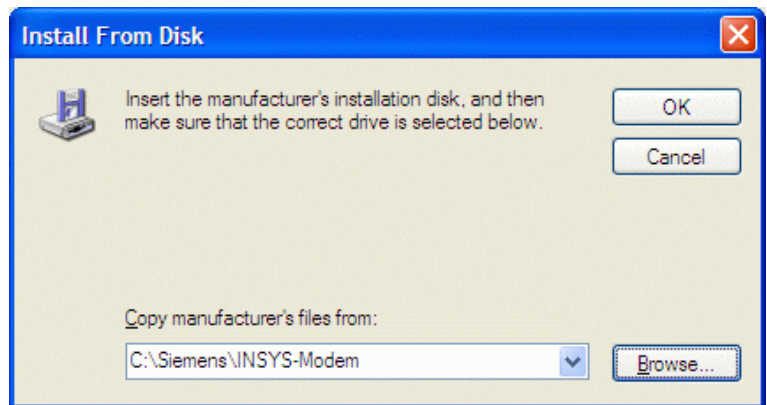on the disc.

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The modem driver is located in
the path, into which it was unzipped, e.g.
„C:\Siemens\INSYS-Modem\...".

Mark the special driver file
**INSYS Modem 56k
                – Direct 9600 8E1.inf**
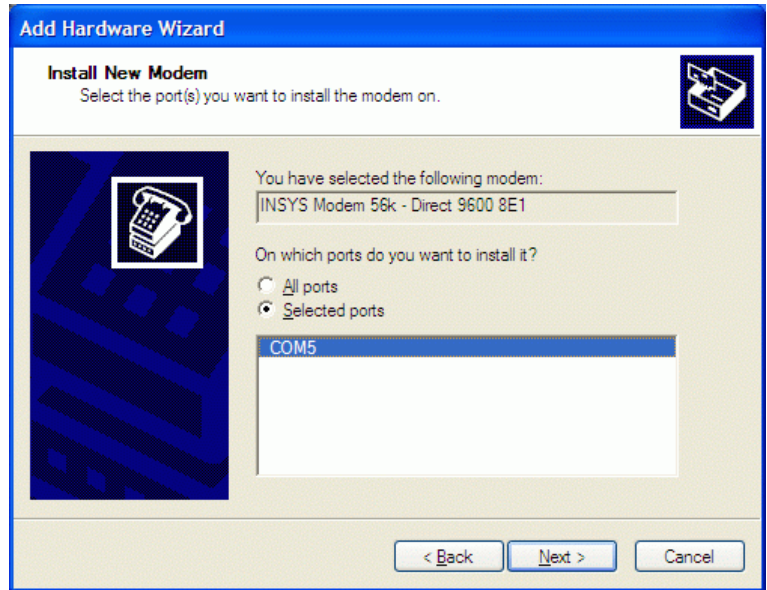and

"Open"

Continue with "**OK**"

Mark the special driver
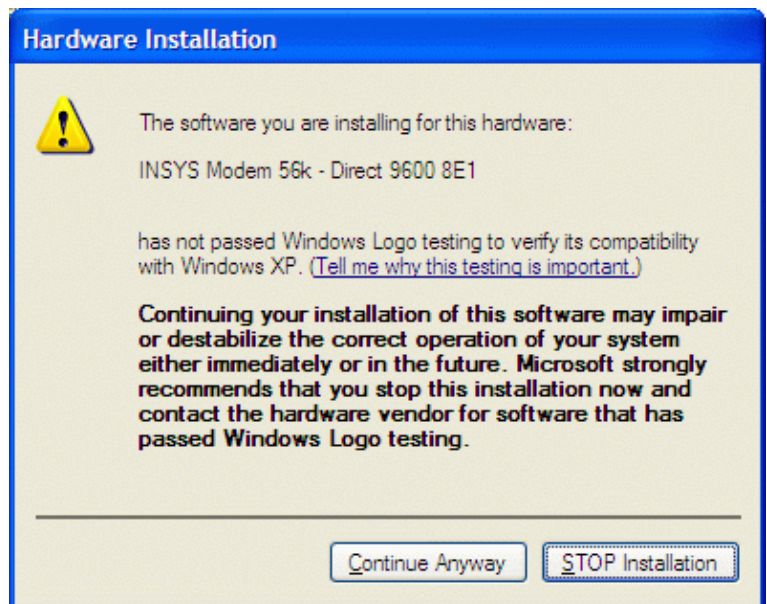**INSYS Modem 56k – Direct 9600 8E1**
and

press "**Next >**".
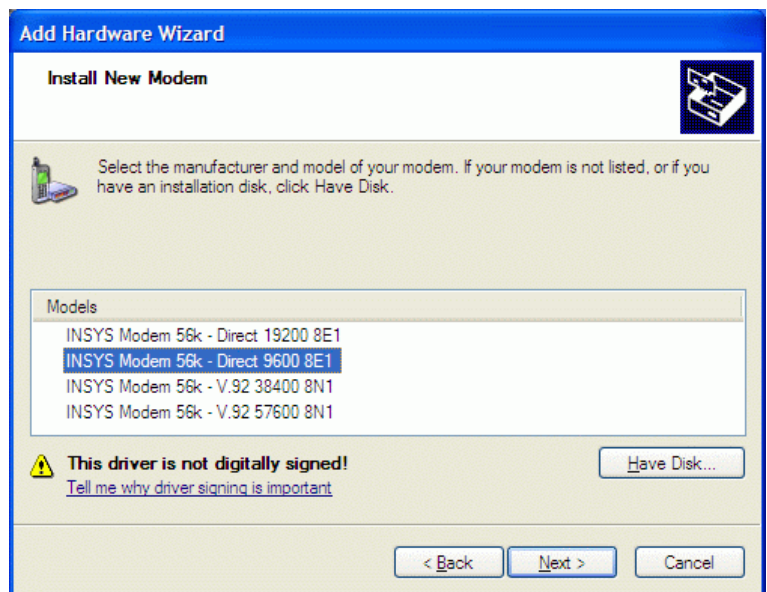
Select the serial port,
e.g. „COM1"
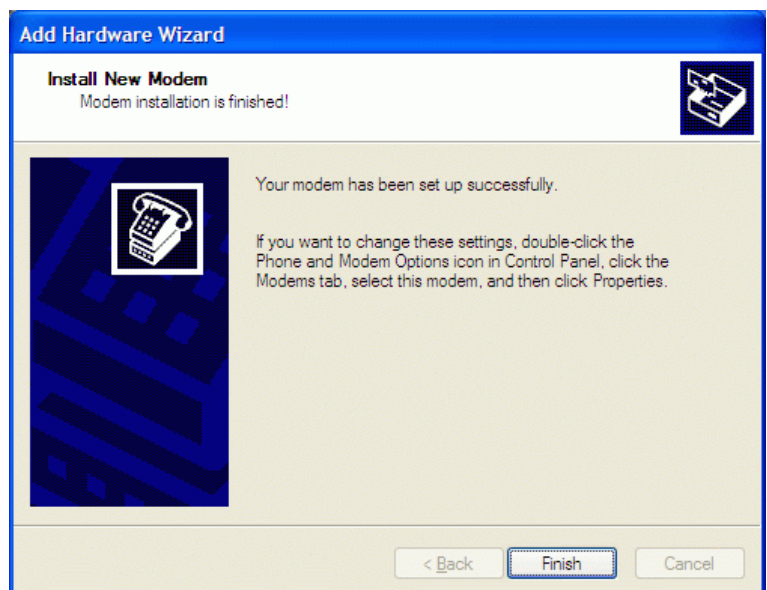to which the modem will later be
connected.

Press "Next >"

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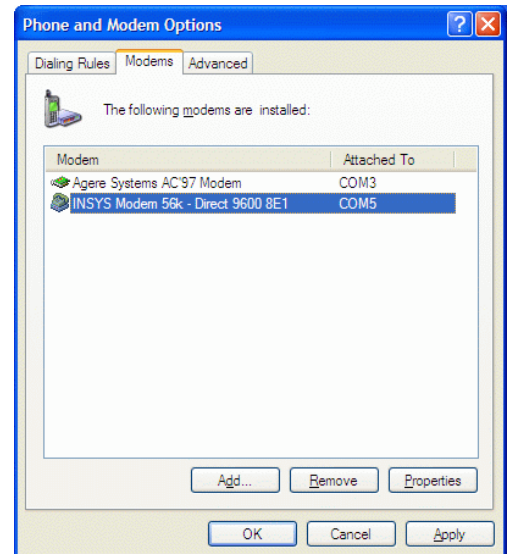Windows XP.

Continue with
"Continue anyway"

Complete the installation with
"Finish"

Setting the modem driver

In the overview of the installed modem drivers, the driver that
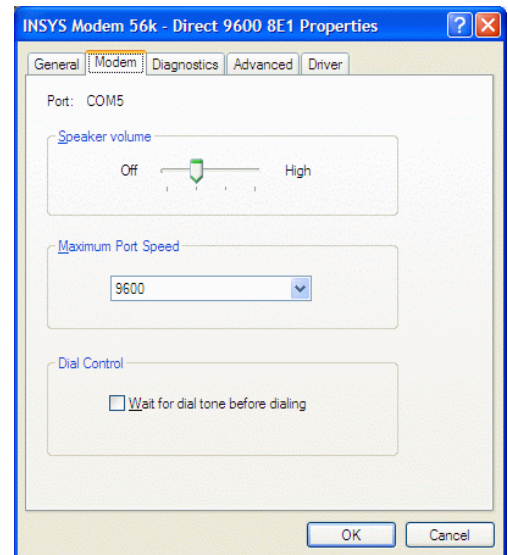has just been installed is visible.

The settings of the selected modems may be checked and
changed with **"Properties"**.

When clicking on the tag **"Modem"** a window appears in
which the "volume" and the "maximum baud rate" to the
terminal device may be changed.
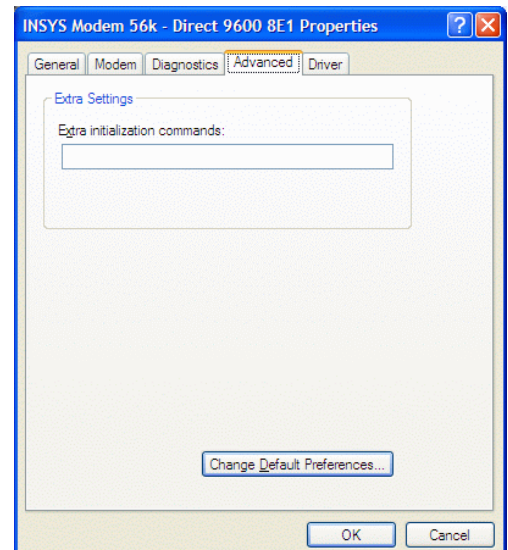
The pre-setting of **9600 Baud** is not changed.

The selection **"Wait for the dial tone before dialling"** is
deactivated.

Under the tag **"Advanced"** no further "initialization
commands"
have to be entered.

Additional commands are later entered in DIGSI 4

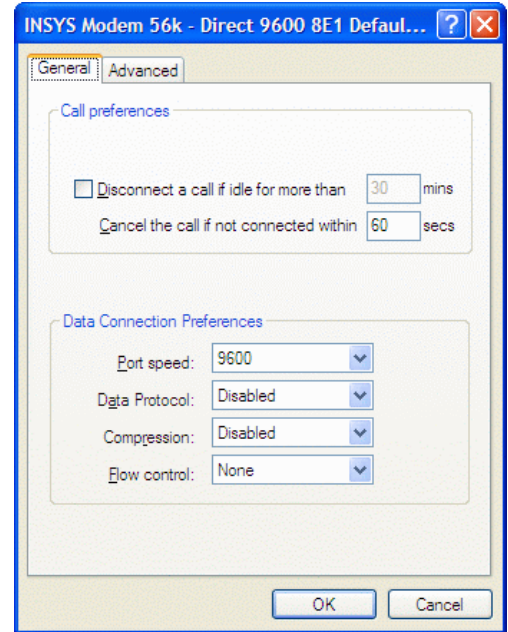No further settings have to be done under **"Change default
preferences ..."**

Settings in the window **"General"**:

The **"Call preferences"** do not have to be changed

Set the **Data connection preferences "**

Port speed   **9600** Baud
Data protocol **disabled**
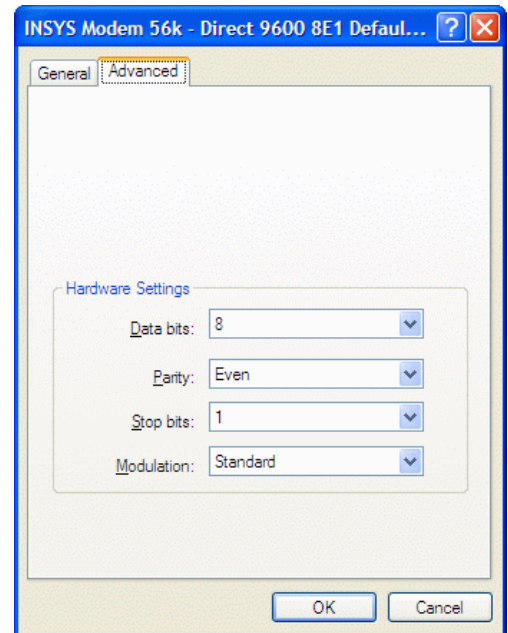Compression **disabled**
Flow control   **none**

Settings in the window **"Advanced"**:

Set the **„Hardware settings"**
Data bits   **8**
Parity   **Even**
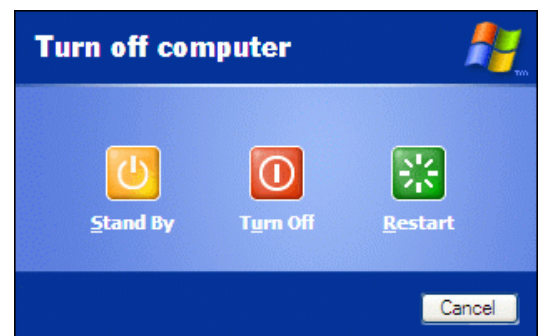Stop bits   **1**
Modulation   **Standard**

Close all windows with "**OK"**.

Attention:

During every dialling process these settings of the system modem drivers are used for initialisation purposes of the office modem and must be done exactly as shown here.

"Re-boot" the PC

Creating a phone book

The phone book is located within the project. An address (telephone number) must be available centrally in this phone book for each modem. After double-clicking on the icon "Phone book", the phone number of the office and station modem can be entered with their names, using the button "New" (refer to the screen shot below).

The country and area codes (without 0) must be entered.
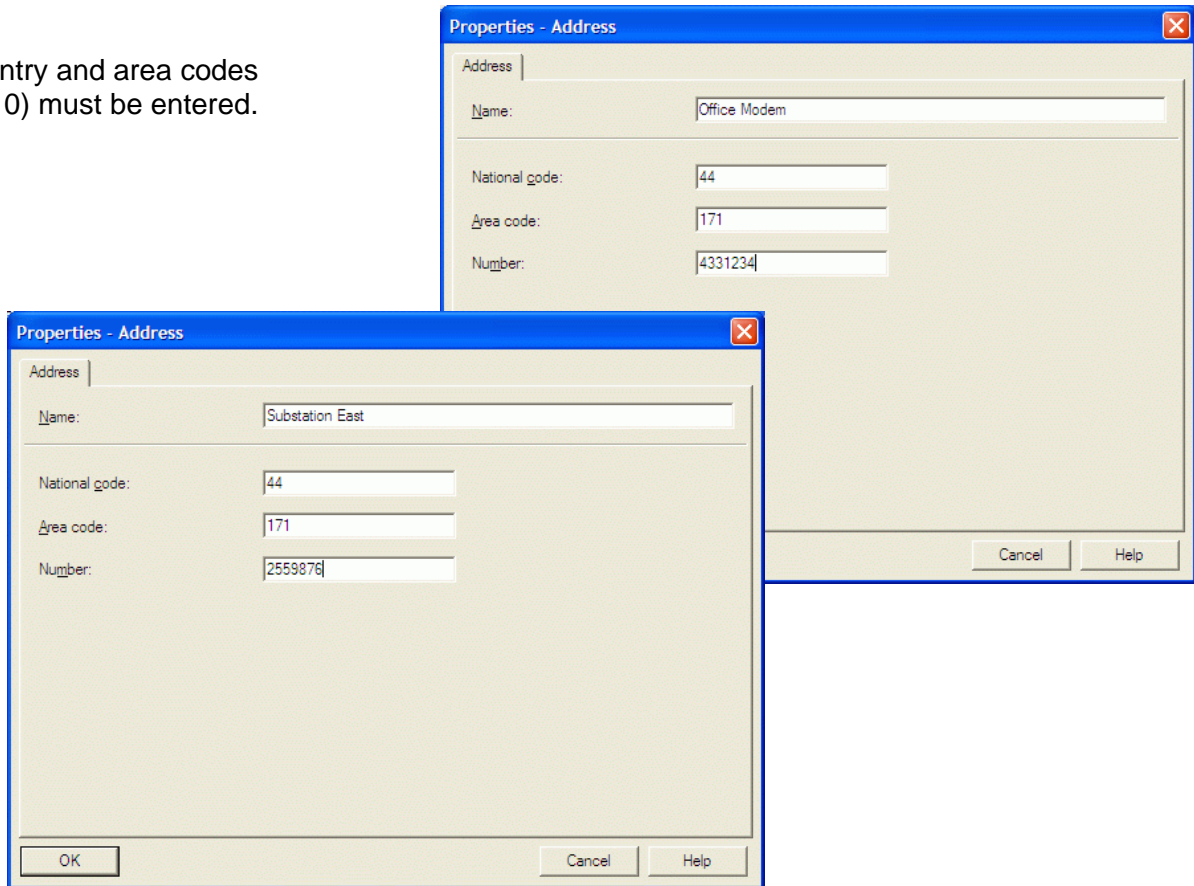
If all the windows were closed with **„OK"**, the settings can be checked in the overview.

After closing this window with **"OK"**, all the settings are saved in the phone book.
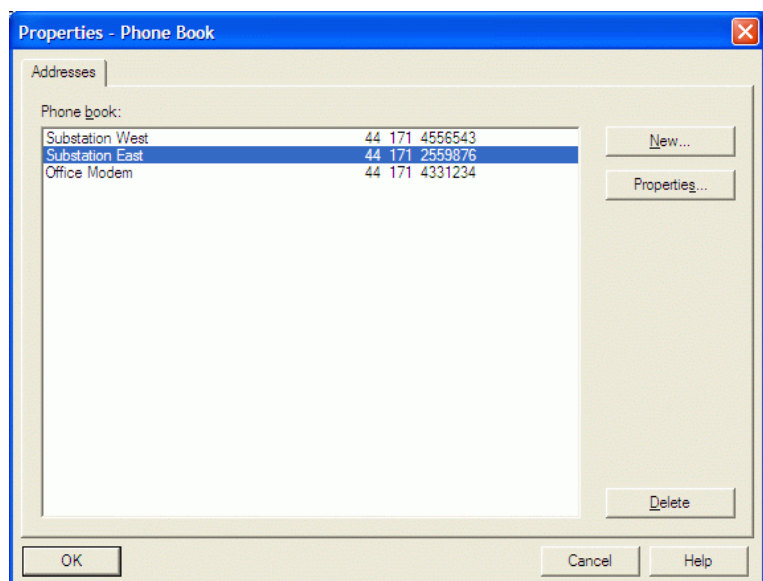
Establishing an office modem in DIGSI 4

When the modem driver for the INSYS-Modem has successfully been installed, and the telephone-book has been filled out, the office modem may with all its settings be established in DIGSI 4. This modem then establishes the connection to all analog INSYS-substation modems with 9600 Bd and the data format 8E1.
For the connection to other substation modems, the required Help Files are available.
By double-clicking on the icon "Modems" in the project, the office modem is established with "New".

The modem is assigned a **"Name"**, e.g. **"Office modem"**.
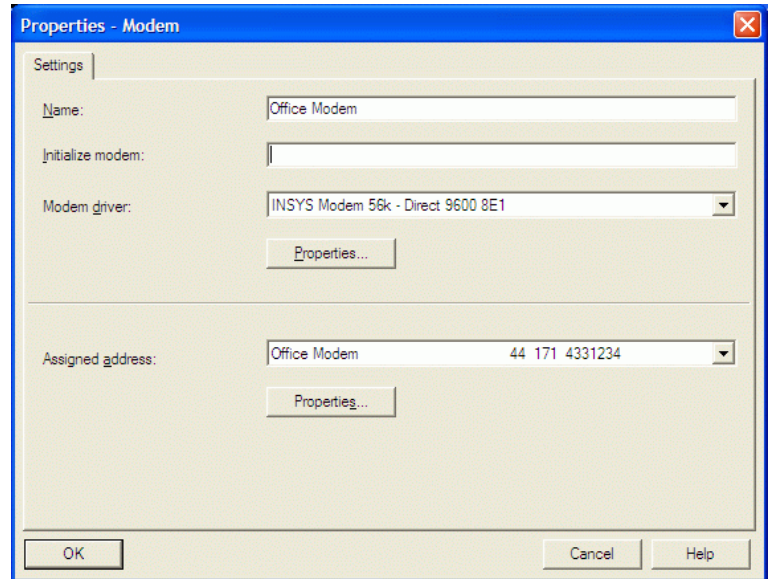Different office modems must have unique names, e.g.
Office 9600 8E1, Office 19200 8E1 etc..

Under **"initialise modem"** the command **ATM0** may be used to switch off the modem speaker. No other commands should be entered here.

Select the **"Modem driver"** already installed
INSYS Modem 56k – Direct 9600 8E1

The **"Assigned address"** is selected from the **"Telephone-book"**.

The following settings under "Properties" correspond to those, which were already selected during installation of the modem driver. They should be checked, and if required, changed here.
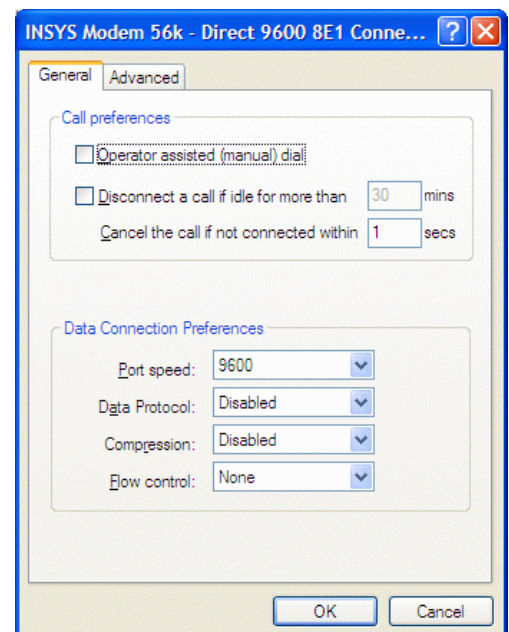
Properties Office modem

Settings in the window **"General"**:

The **"Call preferences"** do not have to be changed

Set the **"data connection settings"**

Port Speed   **9600** Baud
Data protocol   **Disabled**
Compression   **Disabled**
Flow Control   **None**

The settings under the tab **"Advanced"** remain the same.

Under **"Terminal Window"** no checks are made as no password and automatic call-back is required for operation.

Nothing is changed under **"Hardware Settings"**

Data bits	**8**
Parity	**Even**
Stop bits	**1**
Modulation	**Standard**

Close all windows with **"OK"**.

Note: If the settings under "General" and "Advanced" are not correct, these must first be corrected in the modem driver which may be found in the "Control Panel".
After a **re-boot of the PC** the corrected settings should be checked and altered if required.
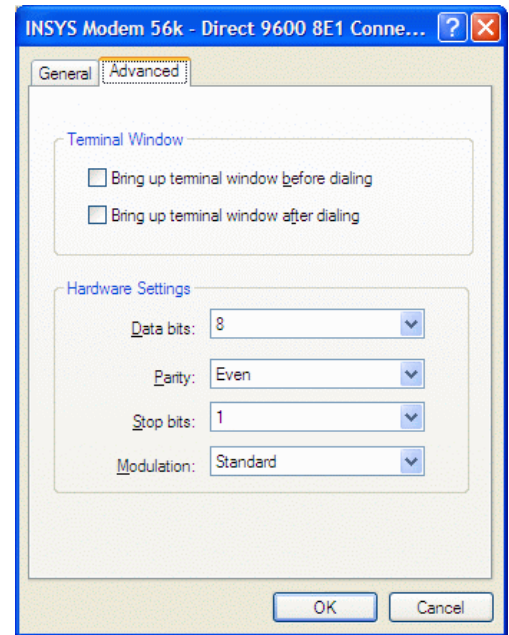
Establishing a substation modem in DIGSI 4

For each substation modem, a "substation modem" has to be established in DIGSI 4, as the telephone number relating to the substation has to be saved together with the modem settings.
By double-clicking on the icon "modems" a substation modem is established with "New".

A "**Name**" is assigned to the modem e.g. **"Substation East"**.

Under **"Initialise modem"** the complete initialisation string **AT &D0 E0 S0=1 &W** is entered. (Spaces between the commands are permissible).
The fixed baud rate of 9600 Bd is set by the modem driver.

Under **"Modem driver"** the same settings are selected for the office modem.

The **"Assigned Address"** is selected from the **"Telephone-book"**.
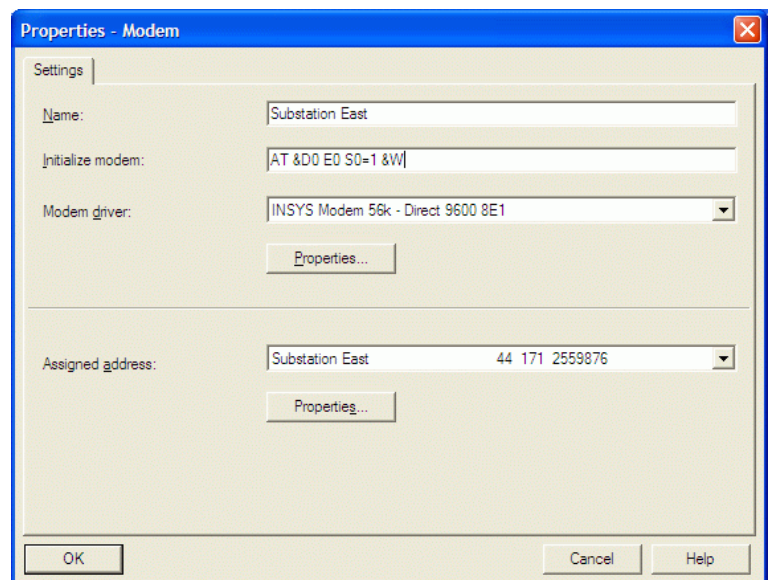
The initialisation commands mean the following

- &D0   the control line DTR is ignored as it is not supported by the protection device
- E0   Echo off
- S0=1   Accept call after the first ring tone (5 are possible)
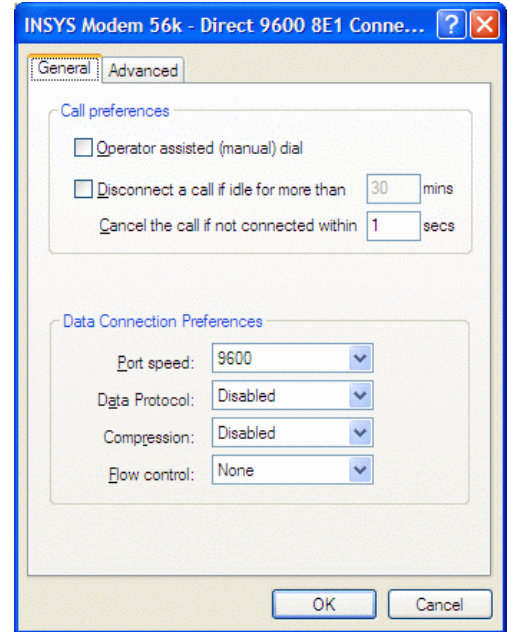- &W   settings are secured in the non-volatile storage

Properties substation modem

Settings under the tab **"General"**

The **"Call preferences"** do not have to be altered

Set the **"Data connection preferences"**

Port speed   **9600** Baud
Data protocol   **disabled**
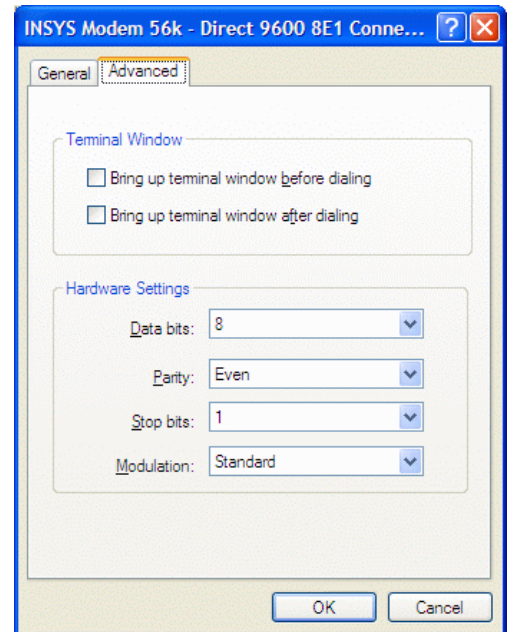Compression   **disabled**
Flow control   **none**

Under the tab **"Advanced"** the settings have to be made or not changed

Data bits   **8**
Parity   **Even**
Stop bits   **1**
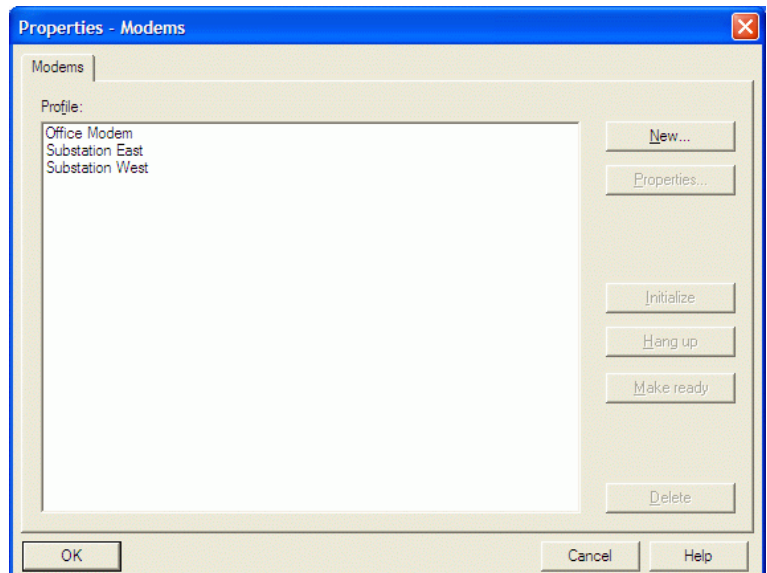Modulation   **Standard**

No check is made under "Open terminal window before/after dialling".

All windows are closed with **"OK"**

When the modems have all been established, they may be marked in the overview and checked or changed if required.

The substation modem can also be initialised here (see next chapter).

Initialising the substation modem

The substation modem has to be connected to the DIGSI PC with a standard modem cable once for initialisation purposes.

Before initialisation, the rail mounted modem should be re-set with the re-set button located on the front side of the device.

When operation takes place with password protection or automatic call-back, entereing the password or call-back number with the Windows program "Hyper Terminal" should be preferred, as the echo is switched off after initialisation with DIGSI 4, and the entries are no longer visible.

In the window **"Properties modems"** the desired modem should be marked and initialised with the button **"Initialise"**
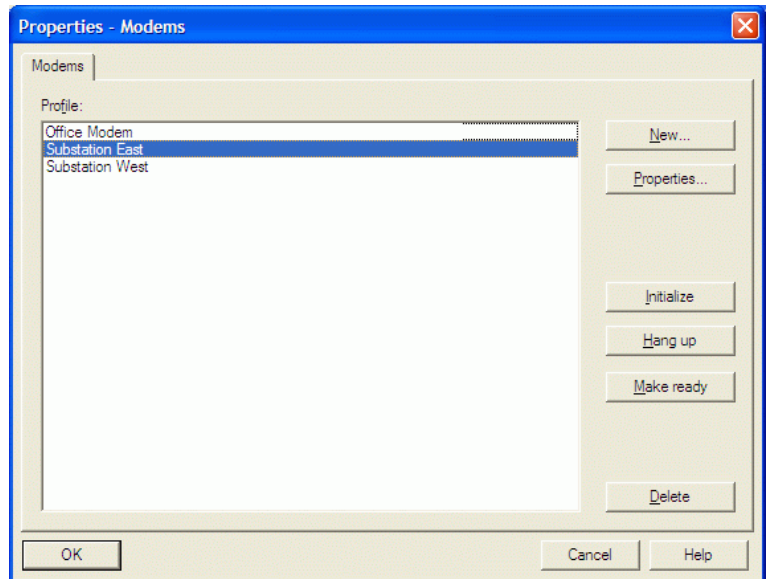
If the initialisation was successful, the settings are permanently stored in the modem and remain there even in the case of a power failure.
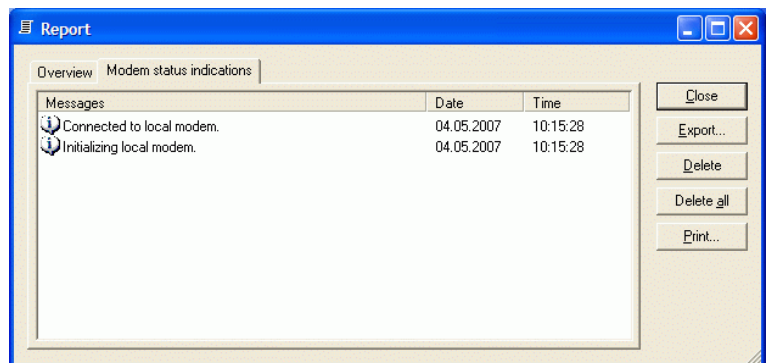

Note: If error messages appear in the "**Report**" window, these may be caused by the modem not being connected properly, or no check-back signals being received from the modem.
Use the modem cable supplied, carry out another re-set and check the modem settings in the system and modem drivers.

To check whether all settings of the modems have been accepted, the windows program "Hyper Terminal" **(Setting COMx, 9600 Baud, 8E1)** may be activated by entering the command "AT&V".
The settings are not displayed because the echo has been switched off.

Attention: Only the setting **9600 Bd, 8E1** may be used. Other settings are automatically detected and registered by the modem which will later lead to a malfunction.

Defining the modem connection in DIGSI 4
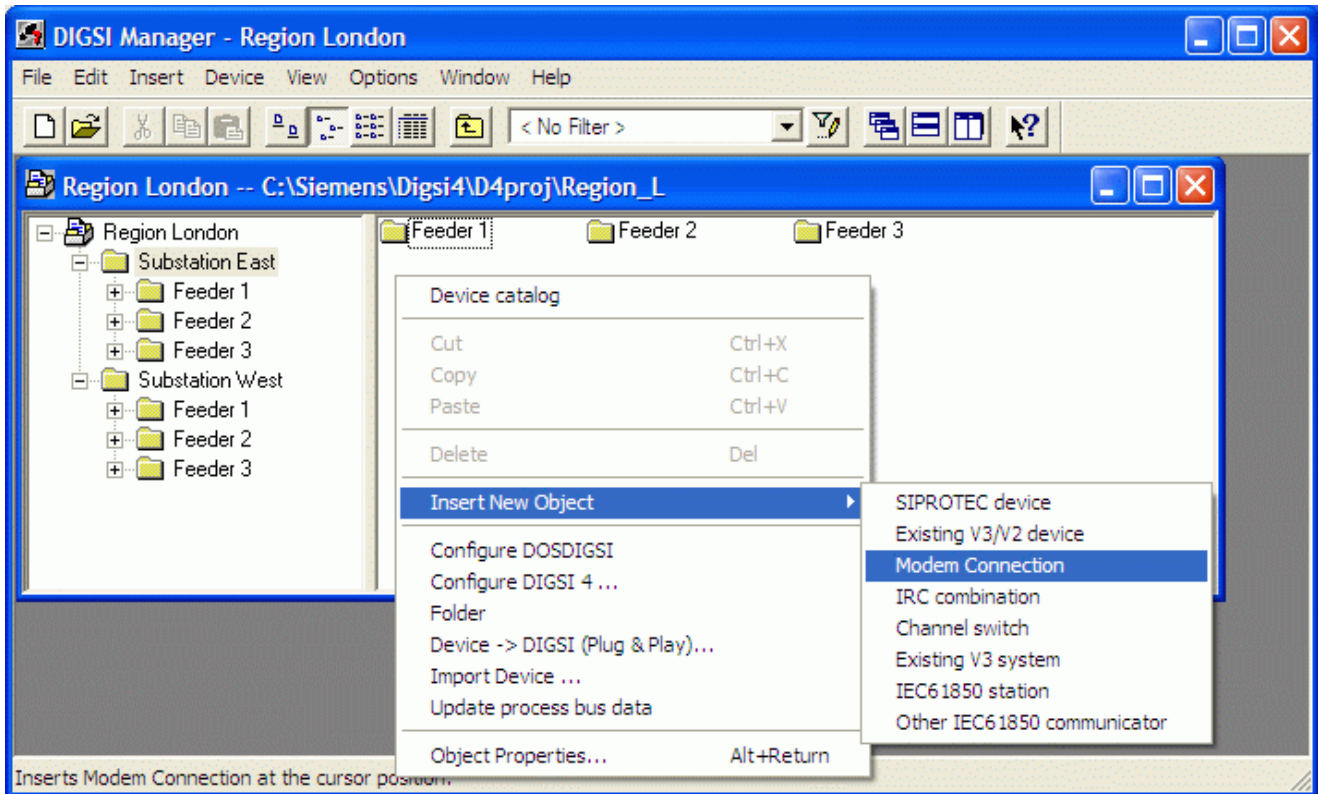
For the substation e.g. **"Substation East"**, a modem connection must be established. This defines which modems with corresponding settings and assigned telephone numbers are used for establishing the connection. To do this, open the dialog box with a click on the right mouse button. With **"Insert new object"**, a "modem connection" can be entered into the feeder file.

In the pull-down window the **"Local modem"** and the **"Remote modem"** may be selected from the list of the modems already created in DIGSI 4.

Save with **„OK"**.
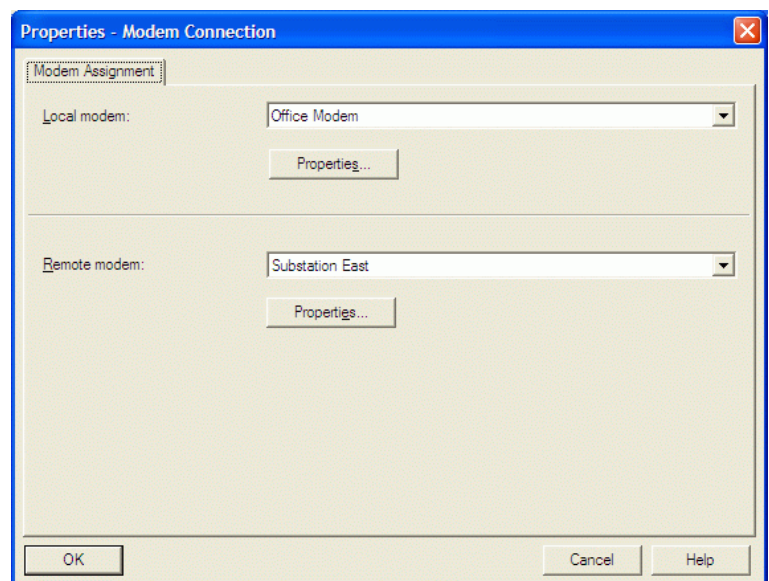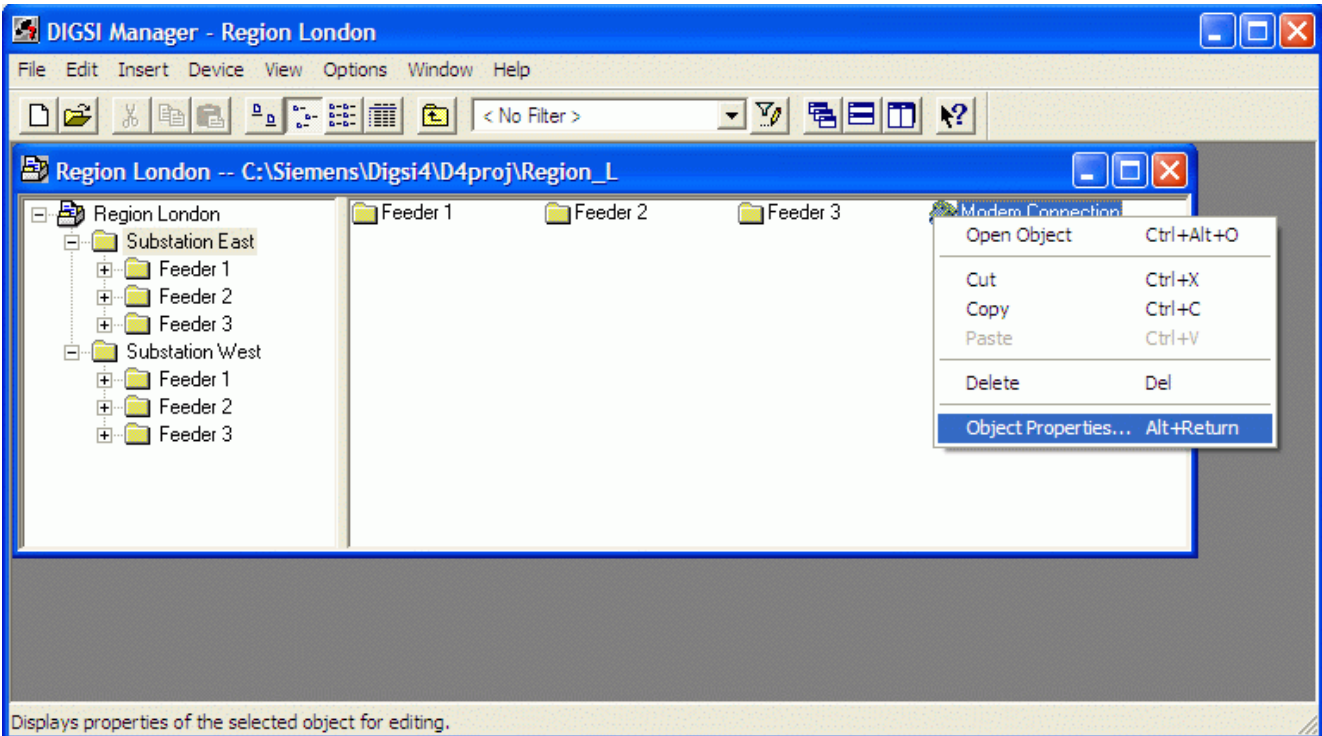
The **"modem connection"** is now displayed in the substation file **"Feeder East"**.
Under (right mouse click) **"Object Properties"** the dialog box is again opened.

Under **"Properties"** the modem settings and assigned **"addresses"** (Telephone numbers) may be checked or changed

Note: If the settings of the modems are changed, the settings of the system modem driver must be changed correspondingly.
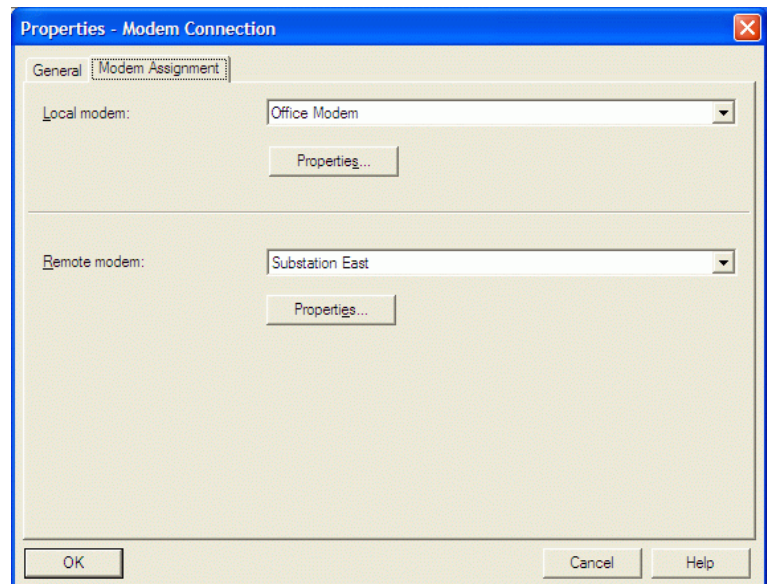

All settings in DIGSI 4 are now complete and the office modem can be connected to the operating PC via a standard modem cable which is usually supplied in the scope of delivery.

The substation modem is connected with the special cable 7XV5820-0AA10 to the RS233.interface of a star coupler 7XV5300, 7XV5450, 7XV5550 or a RS232-FO converter. The cable has a symmetrical construction and may be used in any direction.

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Establishing the modem connection

The modem connection may be established by double clicking on "modem connection" and subsequent selection of the device, or directly from the selected protection device.

The office modem is always initialised during the dial-up procedure, and then the assigned telephone number of the substation modem is dialled.
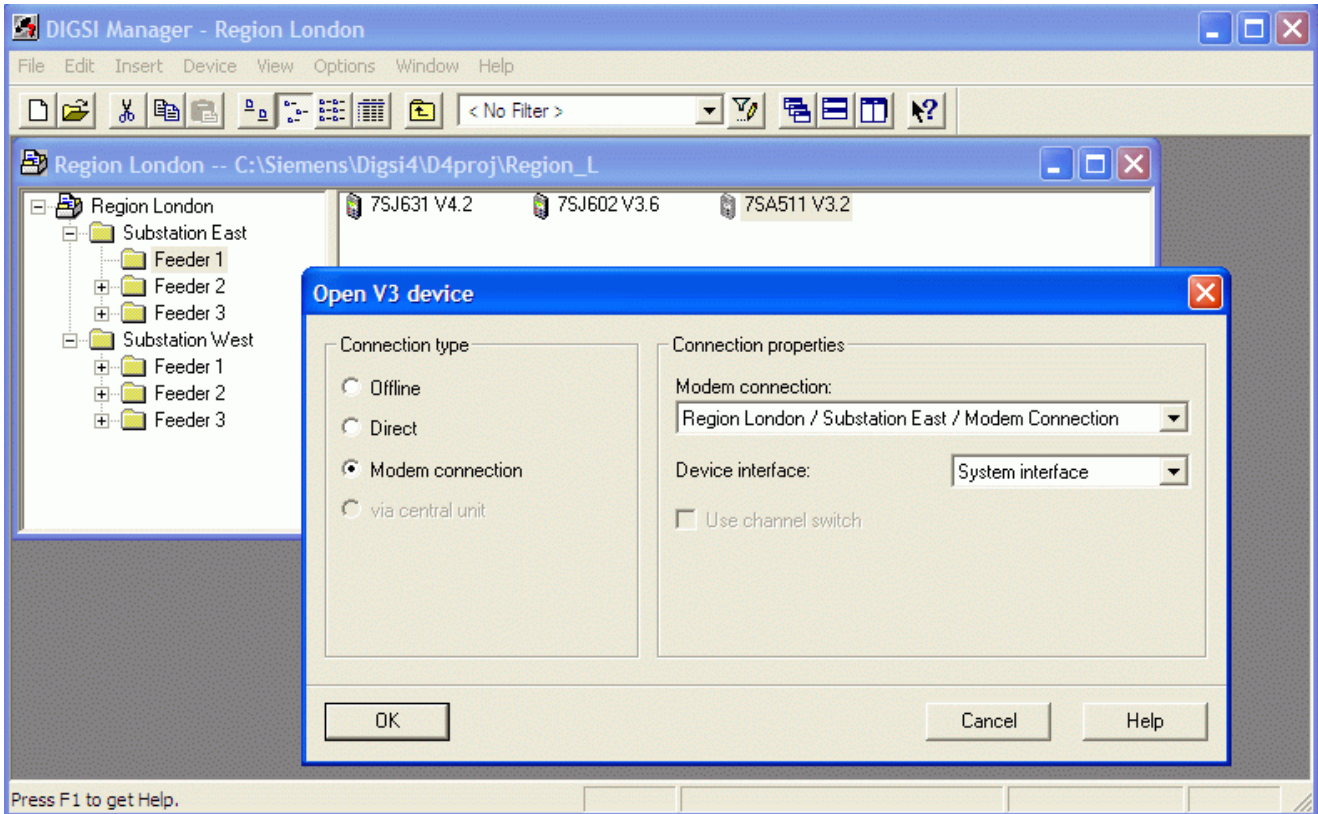
After double clicking on the device, a dialog box is opened.

Under **"Connection type",** "modem connection" is selected.

DIGSI 4 provides the **"modem connection"** of the closest modem connection in the project, i.e. the one that is first in line above the device in the storage path. Under **"Device interface"** the corresponding device interface, in this case the **"System-interface"** is selected.

Confirm with **"OK"**.

In the following window the **"Number to dial"** is displayed and can again be checked.

"With remote modem ring back" is only checked if operation is done with automatic call-back.


The connection set-up is started with **"OK"**.
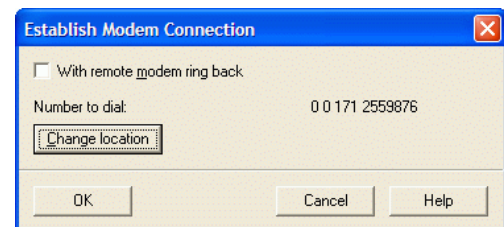
Note: If the telephone number or pre-fix is incorrect, please check the entries in the telephone directory. All numbers must be entered without leading zeroes.

If these are not shown correctly this may be corrected under **"Change location"**.

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Defining the location

In the window **"Dialing Rules"** new locations
may be established or changes may be made to existing
ones.

It is an especially useful feature that more than one
location may be defined, if a notebook is to be operated
at various telephone connections (at home, at the office
or hotel).
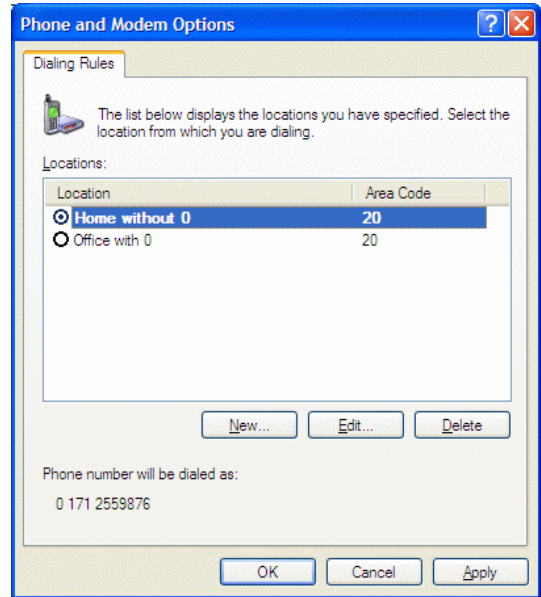
In the window **"Edit location"** the location properties
may be defined.
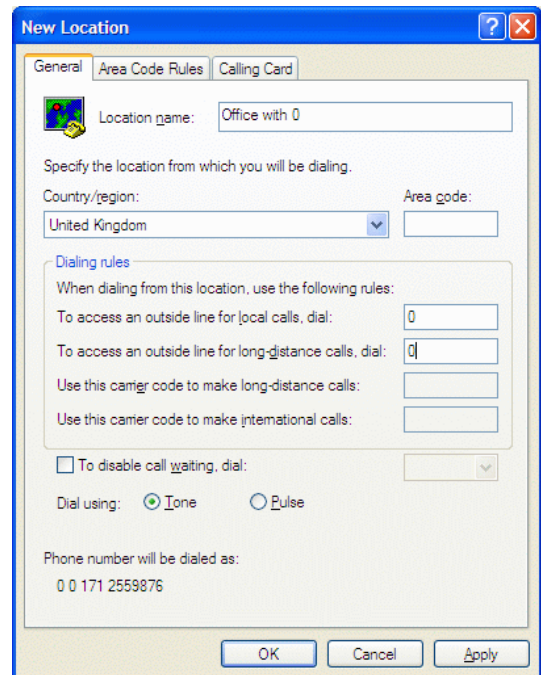
Under **"Phone number will be dialed as":"** the set
telephone number is displayed.

Close with **"OK"** and the dial-up procedure is started.

Report-Window

The dial-up procedure may be
monitored in the **"Report-Window"**.
If the modem connection has been
established (here with 9600 Bits/s at the
PC-interface) the connection to the
protection device is made automatically.

Good luck!