Breaker Data Adapter (BDA) Breaker Data Adapter *Plus* (BDA *Plus*)

Short description of the BDA/BDA *Plus*

System Requirements
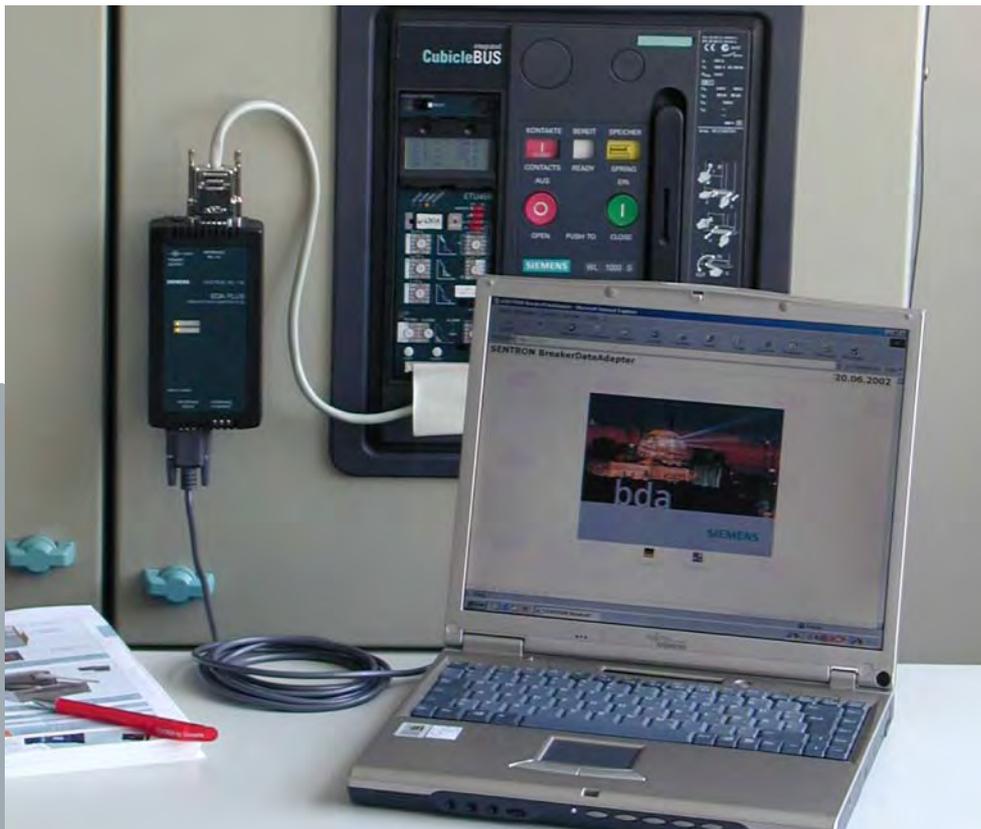
Connect the BDA/BDA Plus to the SENTRON circuit breakers

Communication via the serial interface

Communication via the Ethernet interface

Operating Instructions

Troubleshooting

6

The Breaker Data Adapter (BDA) and BDA *Plus*
Brief Description and System Requirements

The breaker data adapter (BDA) is the first circuit-breaker parameterisation device to feature an integrated webserver to parameterise, operate, monitor, and diagnose the SENTRON WL and SENTRON VL circuit-breakers. The BDA *Plus* also features an Ethernet interface for connection to the Ethernet, intranet, or Internet.

Description

The BDA can be used to read and change the parameters of the SENTRON WL and SENTRON VL circuit-breakers, display measured values, as well as visualise, analyse, and store diagnostic data.

It comprises a microcomputer on which an embedded Linux operating system featuring a web server application runs. The HTML pages and the Java program codes are stored in the internal flash and can be displayed on a browser. The browser itself displays the HTML pages, while the more complex functions are implemented using Java applets. A Java Virtual Machine (VM) is required to run the Java applets. This is available free of charge for a wide range of browsers and operating systems.

All the pages that can be displayed are stored on the BDA in German and English; the language is selected when the data is called up in the browser for the first time. A new language can be selected during operation when "SENTRON WL/VL" at the top of the hierarchy is selected.

The cable supplied is used to connect the BDA to the SENTRON circuit-breaker. With the SENTRON WL, the BDA can either be connected directly to the trip unit or to the last **Cubicle**BUS module. With the SENTRON VL, it is connected directly to the trip unit. The indicator with the browser application (e.g. notebook) is connected to the BDA using a null modem cable.

The breaker data adapter *Plus* features an additional Ethernet interface, which means that the BDA *Plus* can also be addressed via the intranet or Internet. The communication options available via the intranet or Internet are restricted only by the network administration.

All write actions (changing parameters or switching actions) are password protected.

When connected temporarily, the BDA can be used to read and change parameters, perform diagnoses, or display measured values. For this reason, a magnet is supplied with the BDA so that it can be attached to doors and other elements containing iron. The DIN rail installation kit supplied can be used to connect the BDA permanently. Depending on the application, the BDA *Plus* is normally used for a permanent connection. In this way, it can be accessed via the Ethernet, intranet, or Internet.

If the SENTRON WL is to be switched on or off via the BDA, the PROFIBUS-DP COM15 module must also be installed. This contains the connections for activating the opening and closing solenoids and the motorised drive.

The PROFIBUS-DP communication function does not have to be started here.

Benefits of the BDA:

- No special software has to be installed; the display software is supplied with the circuit-breaker data directly from the BDA. The appropriate help pages are also stored directly in the BDA, which means they are always available when they are needed.
- The comprehensive use of Java technology ensures the systems can operate regardless of the operating system. This means that the BDA can be used with all Windows versions, Linux, and all other operating systems provided by the corresponding Java Virtual Machine.
- Smaller hand-held devices with PocketPC as the operating system can also be used as can PCs or notebooks, provided they fulfill the system requirements.
- The way the data is structured and formatted for display in the BDA and Switch ES Power is largely identical, so the pages have the same look and feel.
- The memory formats for storing and documenting the circuit-breaker parameters that have been set are identical to those in Switch ES Power. Files generated in Switch ES Power can also be transmitted to the circuit-breaker and vice versa using the BDA. This saves time and effort in documenting data and makes it easier to replace circuit-breakers, for example.

BDA in Offline Mode (or BDA Plus)

In offline mode, the BDA or BDA *Plus* is only connected to a notebook (represents all input/output devices). All the required parameters can be set in this operating mode and saved for later use (download to the circuit-breakers). The memory format is identical to that of the PROFIBUS-DP software Switch ES Power. No power is supplied via the notebook COM interface, which means that an additional power supply unit (24 V DC) must be connected to the BDA.


Graphic 6-1 *In offline mode, the BDA must be supplied externally with 24 V DC. Parameters can be set, stored, and printed out.*

BDA as a Hand-Held Controller (or BDA *Plus*)

As a hand-held controller, the BDA is operated by connecting it temporarily to the appropriate SENTRON VL/WL trip unit interface.

All SENTRON circuit-breakers in a system can be parameterised one after the other using just one BDA, and the parameter data saved to a notebook for further processing. In addition, all the diagnostic data of the circuit-breaker can be read via the BDA. The parameter data can also be exchanged with the PROFIBUS-DP parameterisation software Switch ES Power.

An additional 24 V DC power supply is required if the circuit-breaker is not yet supplied with power (e.g. by means of a current on the main circuit; with SENTRON WL by an external 24 V DC on the c; with SENTRON VL, an additional 24 V DC power supply usually has to be connected).
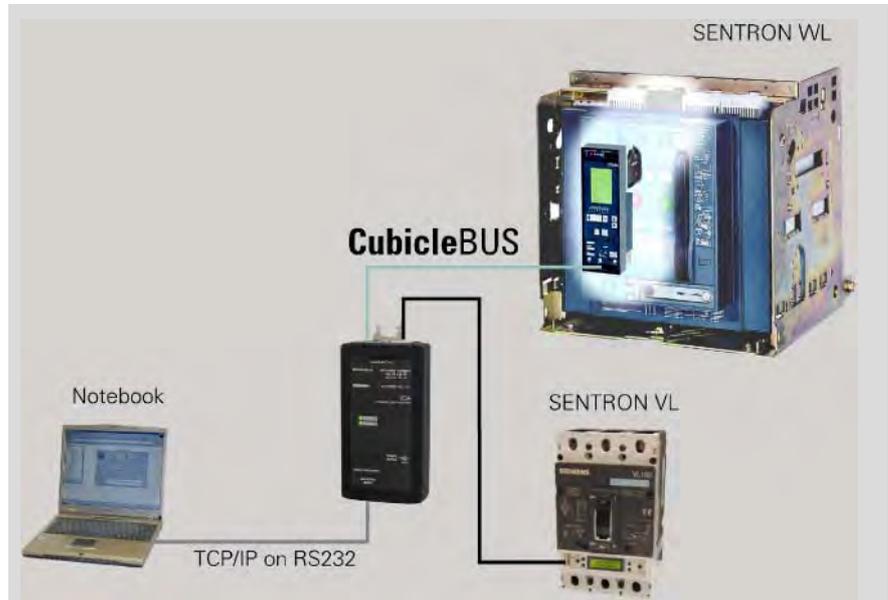

Graphic 6-2 *In temporary mode, the BDA is normally attached using magnets.*

BDA Plus as an Ethernet Interface

In addition to the above-mentioned functions, the BDA *Plus* enables data to be accessed via the Ethernet. In this case, the circuit-breaker data is not transmitted as net data, but displayed on HTML pages in an application-specific format. The BDA/BDA *Plus* cannot be used to integrate the circuit-breakers in higher level visualisation systems, such as WinCC. If it is to be possible to display several SENTRON VL/WL circuit-breakers round-the-clock online using the communication system in a switchgear unit without the PROFIBUS-DP, one BDA *Plus* is required for each circuit-breaker. In this case, the circuit-breaker is selected by entering the BDA-specific IP address in the browser. Password protection in the BDA and BDA *Plus* prevents unauthorised access.

By making the appropriate settings on the firewall, the SENTRON VL/WL circuit-breakers can also be accessed via the intranet and Internet.
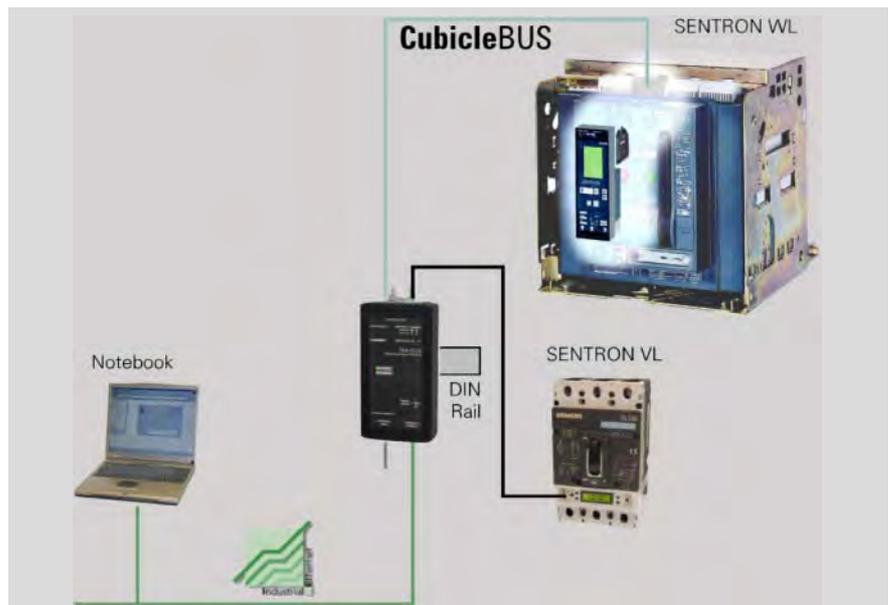
Graphic 6-3	*Depending on the network settings (routing tables and firewall entries), the circuit-breaker can be diagnosed by all PCs with an Internet connection.*

System Requirements

Certain prerequisites have to be fulfilled before the BDA or BDA *Plus* can be operated. One of the two standard browsers (Internet Explorer as of V5.5 or Netscape Navigator as of V6.2) must be installed on the output device (e.g. notebook). Compatibility with other browsers cannot currently be guaranteed.

To ensure independence between the operating systems and browsers, all the pages have been written in HTML code and Java applets. A Java Virtual Machine is required to display the pages.

What is Java?

Java is a platform-neutral object-oriented programming language originally developed by Sun Microsystems. Java is implemented in all IT areas of the commercial, industrial, and administrative sectors, and is available free of charge for many operating systems and platforms - from cell phones to real-time mainframe systems.

Unlike most compiler languages, Java applets are not directly translated into a set of commands that can be understood by a "real processor". Instead, they are first converted to the "Java byte code". Although this byte code is highly machine-oriented, a "Java Virtual Machine" (VM), which emulates a standardised processor for all Java applets, is required on the target computer.

Since Java normally compiles data twice (once with the developer and once with the user), this principle is known as the Just-In-Time (JIT) compiler. Despite the advantages already mentioned, however, Java applets take longer to start, since the machine code is generated during initialisation.

The same Java applet, however, can run on all supported systems without modifications.

The Java Virtual Machine V2 V1.4.0_01 is required to display the BDA pages. When these pages are called up for the first time, the BDA checks whether Java VM2 is available on the browser. If not, the system automatically displays a window informing the user of this and automatically links the user to the appropriate Sun Microsystems page. An Internet connection must be established to ensure the automatic installation procedure functions properly. If this is not the case, the Virtual Machine required for the Microsoft Windows operating systems can be downloaded from the following address:

http://java.sun.com/products/archive/j2se/1.4.0_01/index.html

Once installed, the option Java 2VM V1.4.0_01 must be activated in the browser (if it is not already).

To avoid conflicts with other Java versions, you are recommended to de-install older Java versions and delete the cache in the browser.

The target system with the browser also requires one or both of the following communication interfaces:

• A serial interface with RS232 design, such as that usually integrated on standard PCs (e.g. COM1) for point-to-point (PPP) communication with the BDA.

• A LAN interface for communicating with the BDA *Plus* via the Ethernet

Connectable circuit-breakers

The BDA can be connected to all SENTRON WL circuit-breakers with **Cubicle**BUS . These are all the circuit-breakers with the following trip units: ETU45B, ETU55B, and ETU76B. It can be connected either directly to the trip unit or to the last external **Cubicle**BUS module. Circuit-breakers can also communicate with the BDA if they have been retrofitted with the communication function.

With SENTRON VL circuit-breakers, the BDA can only communicate with trip units with the ETU LCD (ETU40M, ETU40, or ETU42). The connection is established via the front interface.

Getting started with the BDA *Plus*

If the BDA *Plus* is installed the first time, the settings for the IP address and the standard gateway as well as the subnet mask must be set using the serial communication via RS232. After this the BDA *Plus* must boot again to load the ethernet driver with the specified parameters.

The Breaker Data Adapter (BDA) and BDA *Plus*
Connection to SENTRON Circuit-Breakers

To operate the BDA, it must be connected to the target system (e.g. a PC) on one side and a SENTRON circuit-breaker on the other. Different scenarios are possible here depending on the application.

SENTRON WL

With SENTRON WL, two basic methods are available for connecting the BDA.

Temporary

If the BDA is to be used as a local parameterisation tool and several circuit-breakers are to be set in succession, the local front interface of the trip unit can be used.

The cable required is supplied with the BDA. An additional 24 V DC power supply unit is also required if the circuit-breaker is not yet supplied with power via the **Cubicle**BUS. For this purpose, a voltage connection is located on the top of the BDA next to the interface to the SENTRON circuit-breaker.

In temporary mode (as a replacement for the hand-held controller), the BDA can be quickly secured to all switchgear cubicle using magnets fitted on the back.

Permanent

The trip unit interface through the front connection is not suitable if a BDA or BDA Plus is to be permanently connected to a SENTRON WL circuit-breaker. The connection on the last **Cubicle**BUS module, such as the COM15 module, or one of the other modules, is much more suitable. In this case, a cable is supplied with the BDA that can be connected directly to the RJ45 plug-in contact of the **Cubicle**BUS module. In most cases, a BDA Plus is used for permanent installation. The DIN rail installation kit supplied ensures that the device is permanently secured.

The principle regarding the power supply is the same as for temporary operation: if the **Cubicle**BUS is supplied with power, the BDA will also operate without an extra power supply unit. Otherwise, the BDA must also be connected to a 24 V DC power supply unit.

SENTRON VL

If the BDA is connected to the front interface of the ETU LCD, it must always be operated with a 24 V DC power supply, since it is not supplied by the circuit-breaker.

24 V DC power supply   Connection to the circuit-breaker

Top

Bottom

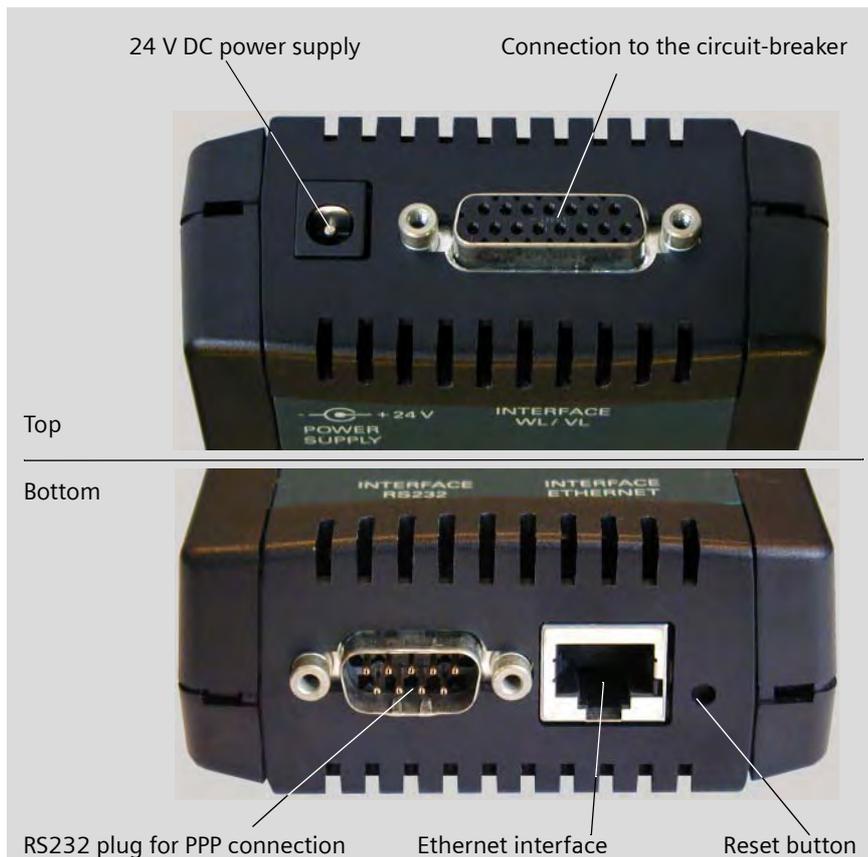RS232 plug for PPP connection   Ethernet interface   Reset button

Fig. 6-1 *The physical BDA interfaces. The connection to the circuit-breaker and optional power supply are on the top, while the RS232 interface (or the Ethernet interface in the case of BDA Plus) and the reset button are on the bottom.*

Operation

As a microcomputer, the BDA is booted in the same way as a PC. This takes approximately 40 seconds and is started automatically when the power supply is switched on. During this time, the content is loaded from the Flash memory to the main memory, an internal self test is carried out, the operating system (embedded Linux) is booted, and the web server application started.

The reset button on the underside enables the BDA to be restarted manually at any time.

The LEDs indicate the operating status during the boot-up process. The upper DEVICE LED is first red/green, while the lower **Cubicle**BUS LED is red only. After about 10 seconds, this also changes to red/green. During the load process, the Ethernet connection is checked for a connected network. Only then is the appropriate driver loaded. Since the BDA *Plus* is to be operated with an Ethernet connection, a physical connection to the Ethernet must already exist during the boot-up process.

Fig. 6-2 *For operation over a short period of time, the BDA can be connected to the local interface of the trip unit. In this configuration, only the RS232 connection to the PC is generally used.*

Meaning of the LEDs on the BDA

LED	Display	Meaning
DEVICE	red	BDA out of order
	green	BDA in operation
	red/green	BDA booting up
CubicleBUS	red	BDA in online mode and connection to circuit-breaker interrupted
	green	Connection exists to **Cubicle**BUS or SENTRON VL
	red/green	BDA booting up
	off	BDA in offline mode, even if circuit-breaker is connected.

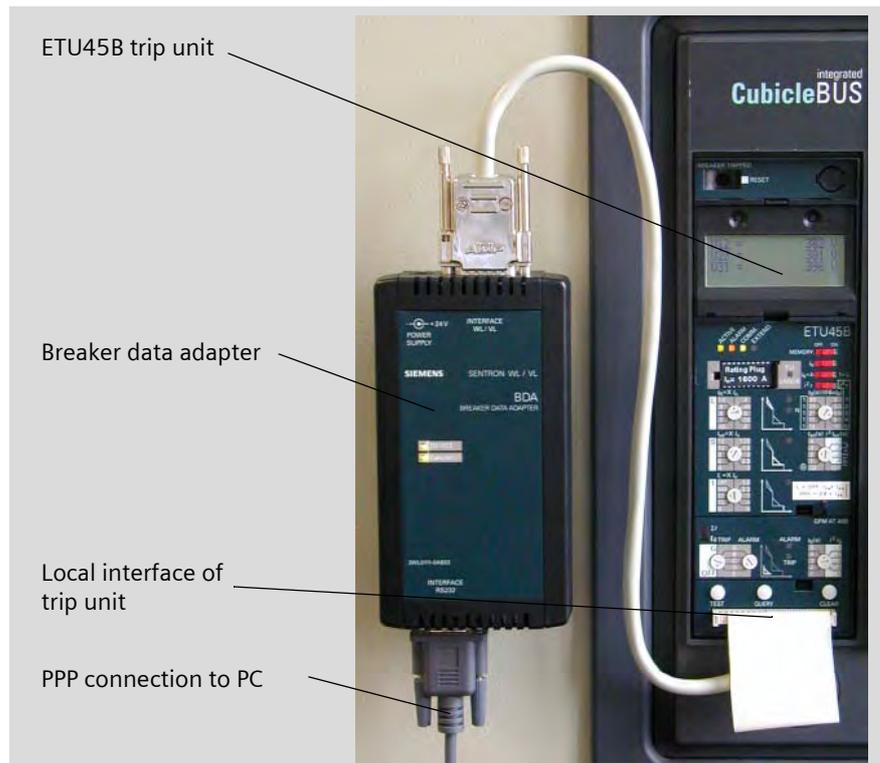**Table 6-1** *The LEDs on the BDA indicate the current operating status.*

Fig. 6-3 *In a permanent installation, the BDA should be connected to the last external* **Cubicle**BUS *module. It can be secured using either a magnet or a DIN rail, as shown above.*

When the boot-up process is complete, the DEVICE LED switches to green, while the **Cubicle**BUS LED switches to green or is extinguished, depending on the connection.

If the BDA is not supplied via the **Cubicle**BUS of the SENTRON WL, it must be activated via an external 24 V DC power supply. The power supply unit used to run serial communication of the 3WN6 with Win3WN6, if the 3WN6 is not supplied externally, can be used for this purpose. The order number is: 3WX3647-6JA02.

Other 24 V DC power supply units that supply the required power can also be used.

BDA – SENTRON VL connecting cable

24 V DC power supply

ETU LCD

PPP connection to PC

Connection to COM10

Connection to Ethernet
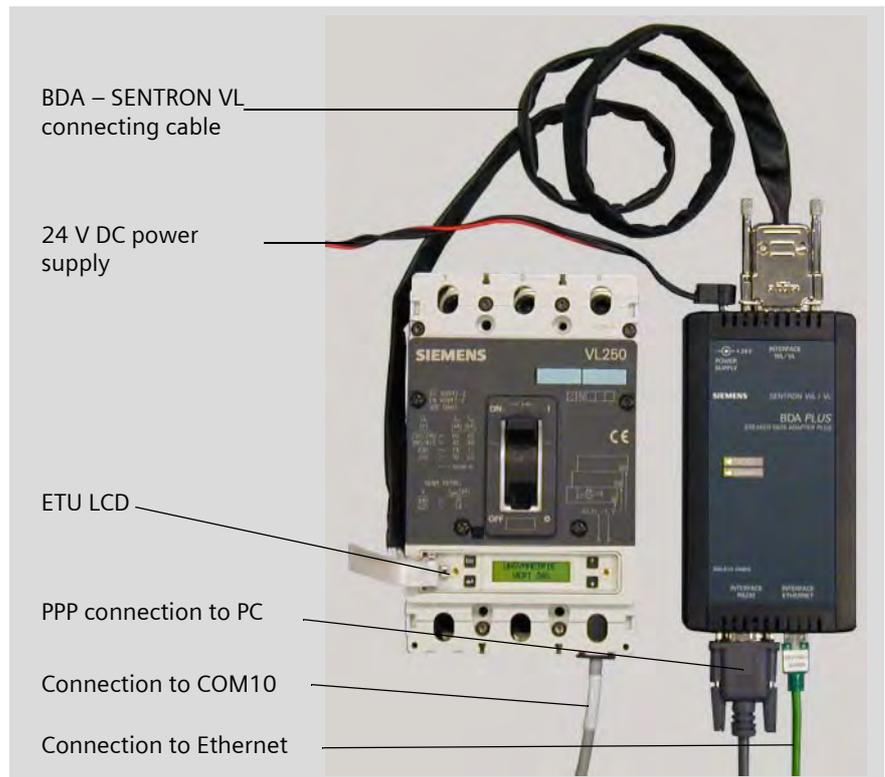
Fig. 6-4 *If the BDA is operated with the SENTRON VL, a 24 V DC power supply is essential. With the BDA Plus, the Ethernet interface can also be used.*

Technical data for the BDA and BDA *Plus*	
Max./min. operating voltage (V)	19.2/28.8
Current input from the **Cubicle**BUS or power supply unit min./typ./max. (mA)	100 mA/300 mA
Power loss min./typ./max. (W)	3/5/7
Dimensions W/H/D (mm)	82/153/38
Weight (kg)	0.38
Temperature range (°C)	0 to 55°C

Table 6-2 *This table provides accurate technical data for the BDA and BDA Plus*

The Breaker Data Adapter (BDA) and BDA *Plus*
Connection to the BDA via the Serial Communication System

To operate the BDA, it must be connected to the target system (e.g. a PC) on one side and a SENTRON circuit-breaker on the other. A range of options is available, depending on the application and operating system.

To ensure that serial communication is possible between the target system and the BDA, you have to carry out the following steps:

- Connect the BDA to the circuit-breaker and supply with power.
- Connect the BDA to the COM interface of the target system (e.g. PC) using a fully assigned null modem cable. Caution: With a null modem cable, pins 2 and 3, 4 and 6, and 7 and 8 must be assigned and reversed with respect to each other.

  The COM port used must not be being used by a different application (e.g. synchronisation program).

- Installing a standard modem.
  Once the physical connection has been established using a null modem cable, a standard modem must be installed **once** on each PC. The procedure for installing the modem varies slightly depending on the operating system. The screenshots on the following pages provide a step-by-step guide to the procedure. The standard modem to be selected - 28800 bps - is not related to the actual transmission rate. The examples illustrate the connection to the COM1 interface; other interfaces must be set accordingly. The installation process always begins in the Control Panel of the operating system. The default settings in the "Properties" windows of the modem do not usually have to be changed. They are only shown as a reference if any problems arise. The screenshots on the following pages for Windows98 are identical for Windows95, WindowsNT, and

WindowsME. WindowsXP screens are virtually the same as those in Windows2000.

- Installing a data communications connection.
  Once a standard modem has been installed, a communications link must be established **once** via this modem. To do so, a data communications connection must be set up via "Workstation > Data Communications Network". Once the appropriate modem has been selected, the maximum rate has to be selected again. The name of the connection is user defined, while the user name must be "ppp" and the address signal "555". A preselection code and password must not be entered. All of these settings are shown on the following pages. Windows98 screenshots are used to represent the operating systems Windows95, Windows98; WindowsNT, and WindowsME. Only the screenshots from WindowsXP are used for Windows2000 and WindowsXP.
- Establishing the connection.
  A communications link is established by activating the installed data communications connection. Once the user name and password have been checked (a password must not be entered), the window for establishing the connection disappears from the Windows systray. The systray is the area on the bottom right next to the system clock in the toolbar. A small icon with two computers appears here. Double-clicking this opens a window displaying the properties of this connection.

A test ping can also be used to check that the connection has been established correctly. Once you have opened the entry screen (Start > Execute) and entered "ping 2.2.2.1", a DOS box appears that displays either "Reply from 2.2.2.1 after..." (connection OK) or "Reply timed out" (connection not available).

- Start the browser (Internet Explorer or Netscape Navigator)
- Entering the target IP address 2.2.2.1. You have to enter 2.2.2.1 in the address line. The usual "http://" does not have to be entered. When you press ENTER, the pages will be loaded from the BDA.
  Note: You may have to include the address 2.2.2.1 in the list of addresses that do not use a proxy server. The use of a proxy server is optional and depends on the network.

A desktop link can be created if the BDA connection is used frequently. To create an Internet Explorer link with the local IP address of the BDA on the desktop, you have to drag the Internet Explorer icon in the address line to the left of the address to the desktop. Alternatively, the BDA start icon can be used. To do so, press the left mouse button to save it on the hard disk as a bitmap and specify it as an icon in the properties window of the link saved on the desktop.

Fig.
6-6
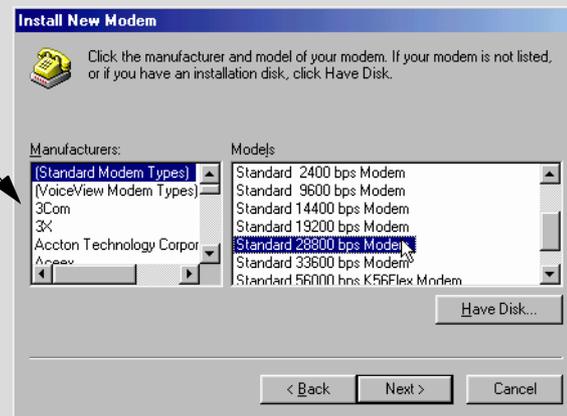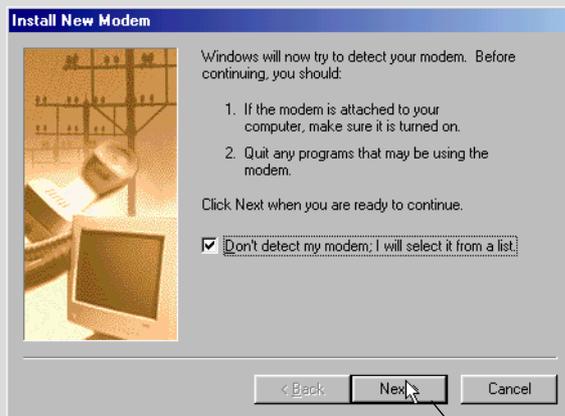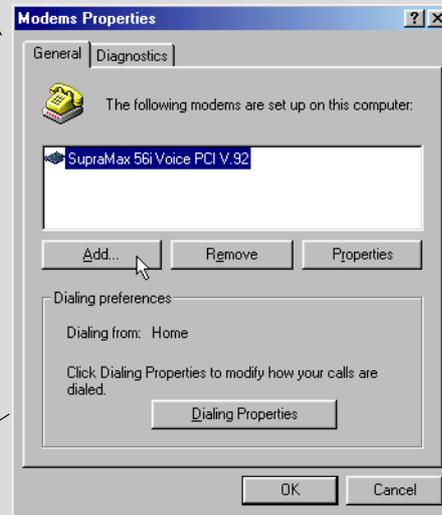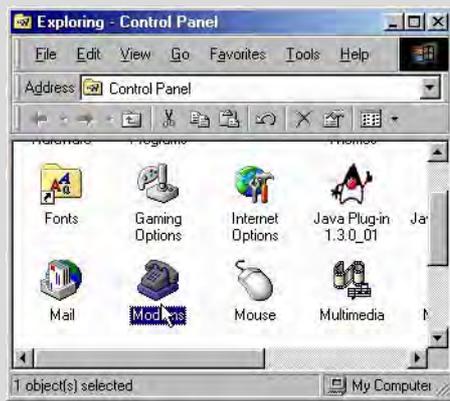
Installing a standard modem with Windows98, part 2 (identical to Windows95, WindowsNT, and WindowsME):
Once you have installed the standard modem, you have to set it to the maximum rate of 115200; the default settings in the other windows are retained.
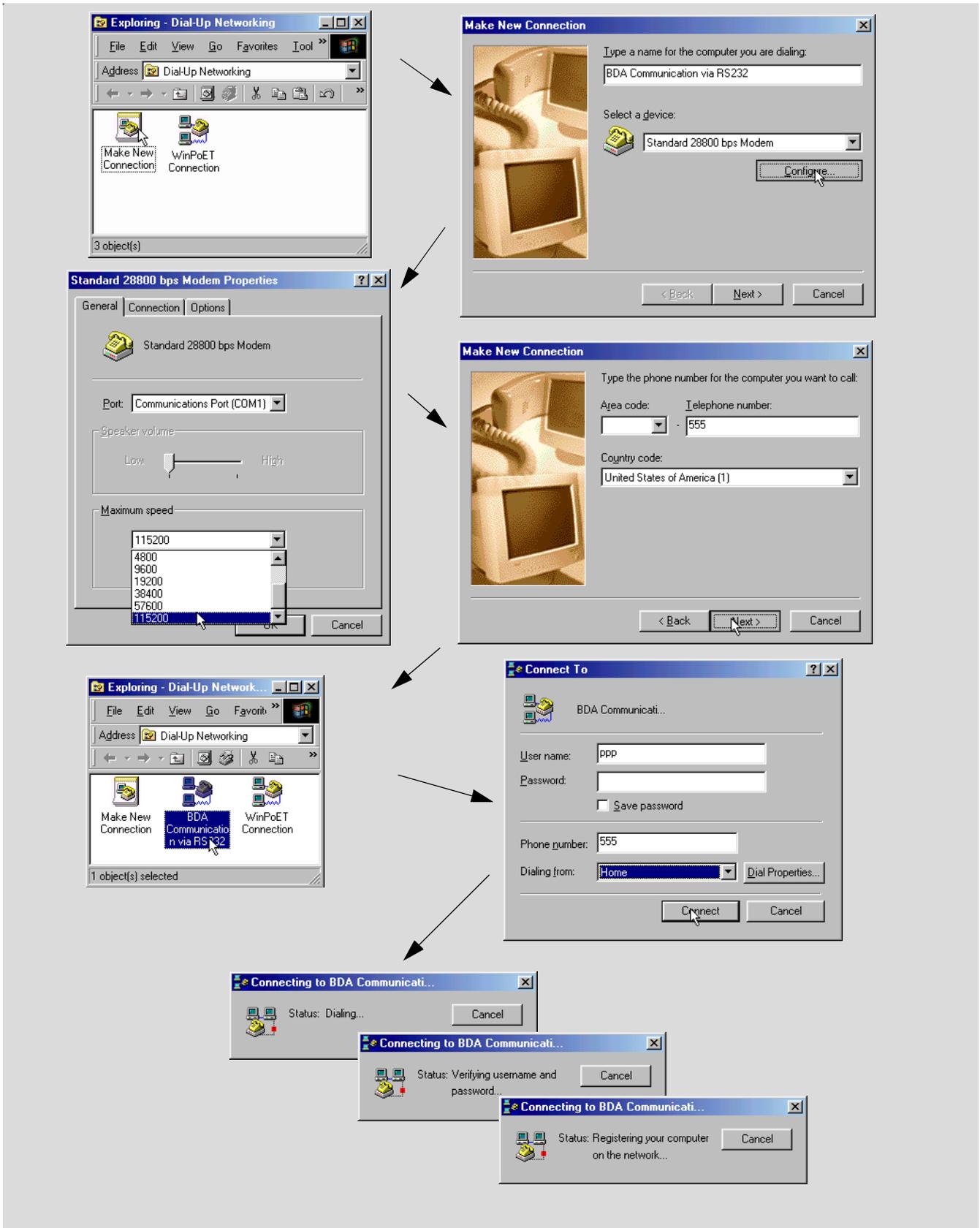
Fig. 6-7

Installing a data communications connection to the BDA with Windows98, part 1 (identical to Windows95 and WindowsME): You now have to establish a data communications connection to the BDA. To do so, double-click "Establish new connection" in the Control Panel and then maintain the windows as shown.

Installing a data comm. connection to the BDA with Windows98, part 2 (identical to Windows95 and WindowsME):
Once communication has been established, the connection window disappears from the Windows systray. To display the BDA pages, enter address 2.2.2.1 in the browser. To call up the connection window, double-click the relevant icon in the systray.

Installing a standard modem with Windows2000, part 1 (identical to WindowsXP):
To install a standard modem in WindowsXP, double-click the "Telephone and modem options" icon in the Control Panel.
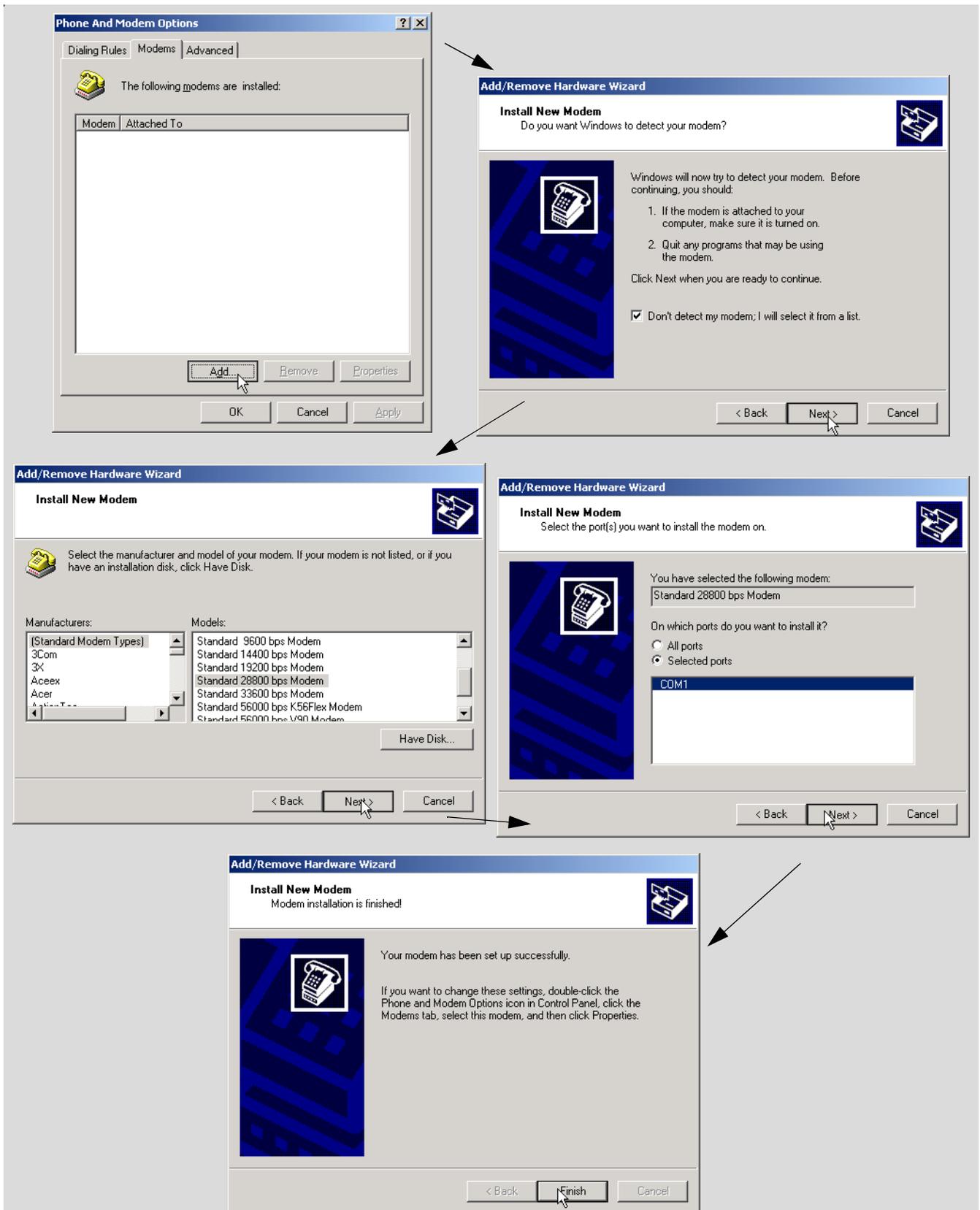
Fig. 6-10
Installing a standard modem with Windows2000, part 2 (identical to WindowsXP):
Select the standard modem (28800) and assign it to a free COM interface.
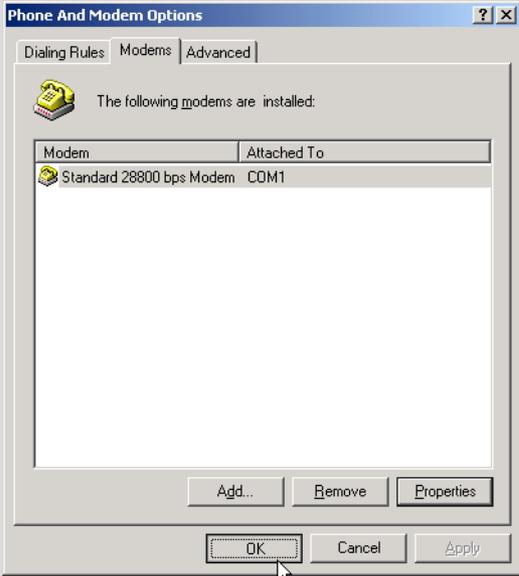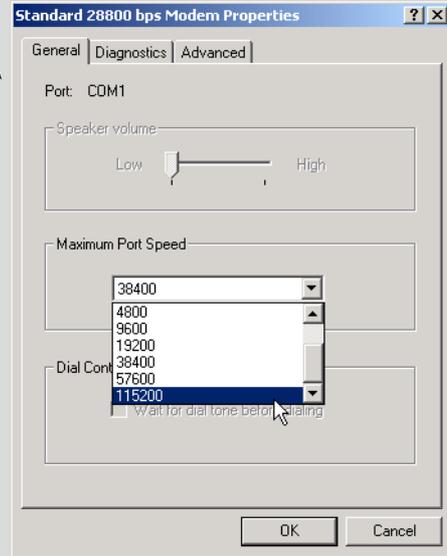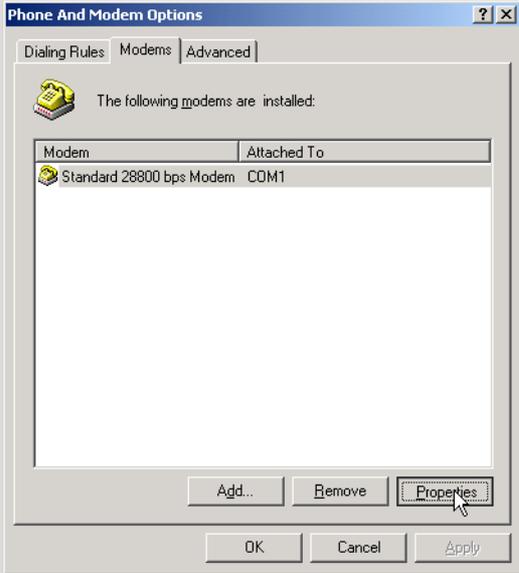
Fig. 6-11

Installing a standard modem with Windows2000, part 3 (identical to WindowsXP):
After installation, you have to set the maximum rate to 115200. This completes the installation procedure.

Fig. 6-12

Setting up a data communications connection to the BDA with WindowsXP, part 1:
Go from the Control Panel to "Network environments" and click "Establish new connection", as shown above.
Then follow the instructions provided by the Installation Wizard.

New Connection Wizard

Network Connection
How do you want to connect to the network at your workplace?

Create the following connection:

- **Dial-up connection**
  Connect using a modem and a regular phone line or an Integrated Services Digital Network (ISDN) phone line.
- **Virtual Private Network connection**
  Connect to the network using a virtual private network (VPN) connection over the Internet.

< Back Next > Cancel

New Connection Wizard

Connection Name
Specify a name for this connection to your workplace.

Type a name for this connection in the following box.
Company Name

`BDA communication via RS232`

For example, you could type the name of your workplace or the name of a server you will connect to.

< Back Next > Cancel

New Connection Wizard

Phone Number to Dial
What is the phone number you will use to make this connection?

Type the phone number below.
Phone number:

`555`

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.

< Back Next > Cancel

New Connection Wizard

Completing the New Connection Wizard

You have successfully completed the steps needed to create the following connection:

BDA connection via RS232
• Share with all users of this computer

The connection will be saved in the Network Connections folder.

☐ Add a shortcut to this connection to my desktop

To create the connection and close this wizard, click Finish.

< Back Finish Cancel

Connect BDA Communication using RS232

User name: ppp
Password:

☐ Save this user name and password for the following users:
  ○ Me only
  ○ Anyone who uses this computer

Dial: 555

Dial Cancel Properties Help

BDA Communication using RS232 Properties

General | Options | Security | Networking

Connect using:
☑ Modem - Standard 28800 bps Modem (COM1)
☐ Modem - Lucent Technologies Soft Modem AMR (CC

☐ All devices call the same numbers   Configure...

Phone number for Standard 28800 bps Modem
Area code: Phone number:
              555   Alternates
Country/region code:

☐ Use dialing rules   Dialing Rules

☑ Show icon in notification area when connected

OK Cancel

Fig. 6-13
Setting up a data communications connection to the BDA with WindowsXP, part 2:
Continue following the instructions and maintain the windows as shown above.

Fig. 6-14

Setting up a data communications connection to the BDA with WindowsXP, part 3:
Once the data communications connection has been successfully set up, WindowsXP establishes a connection with the BDA when you click "Dial".
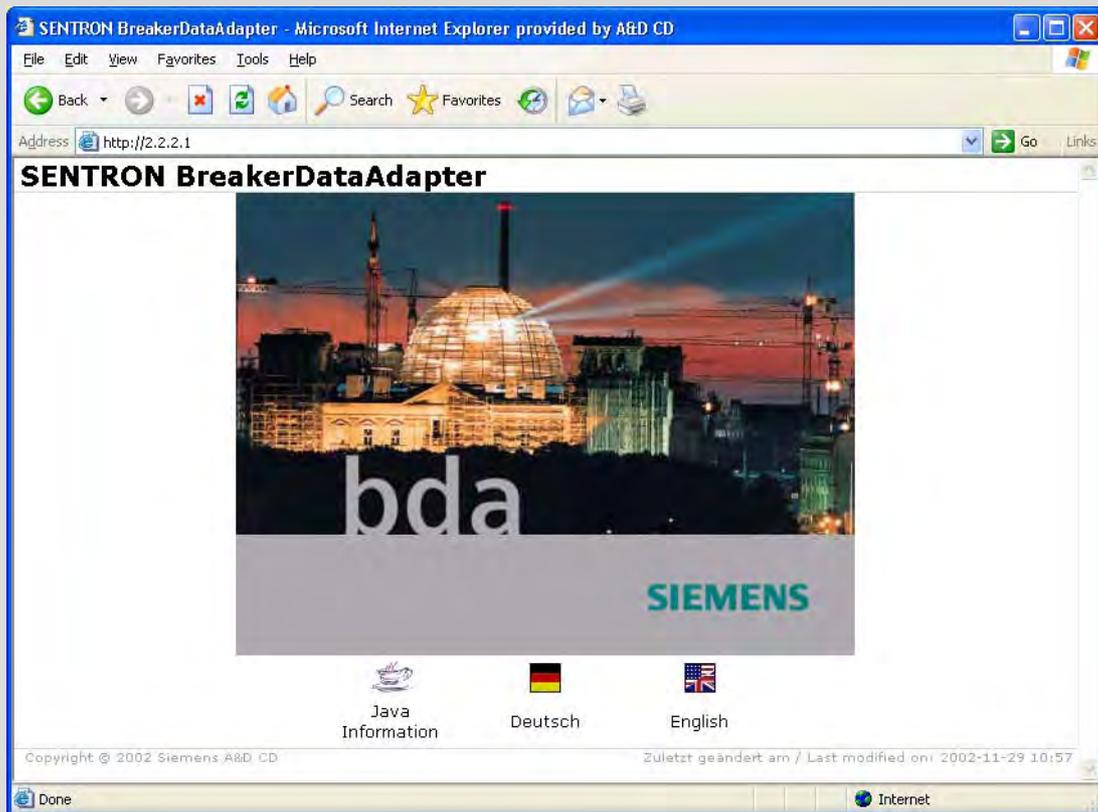
Setting up a data communications connection to the BDA with WindowsXP, part 4:
Once the connection has been established, start the browser and enter the address 2.2.2.1. To display the connection properties
so that you can check them, double-click the appropriate icon in the systray.

Fig. 6-16

Setting up a data communications connection to the BDA with Windows2000, part 1 (similar to WindowsNT):
A modem is installed for Windows2000 in the same way as for WindowsXP. You then have to set up the data communications connection to the BDA. To do so, proceed as shown in the screenshots.

Network Connection Wizard

Phone Number to Dial
You must specify the phone number of the computer or network you want to connect to.

Type the phone number of the computer or network you are connecting to. If you want your computer to determine automatically how to dial from different locations, check Use dialing rules.

Area code:

Phone number:
555

Country/region code:

☐ Use dialing rules

< Back | Next > | Cancel

Network Connection Wizard

Connection Availability
You may make the new connection available to all users, or just yourself.

You may make this connection available to all users, or keep it only for your own use. A connection stored in your profile will not be available unless you are logged on.

Create this connection:
⦿ For all users
◯ Only for myself

< Back | Next > | Cancel

Network Connection Wizard

Completing the Network Connection Wizard

Type the name you want to use for this connection:

BDA connection via RS232

To create this connection and save it in the Network and Dial-up Connections folder, click Finish.

To edit this connection in the Network and Dial-up Connections folder, select it, click File, and then click Properties.

☐ Add a shortcut to my desktop

< Back | Finish | Cancel

Connect BDA connection via RS232

User name: ppp

Password:

☐ Save password

Dial: 555

Dial | Cancel | Properties | Help

BDA connection via RS232

General | Options | Security | Networking

Connect using:
Modem - Standard 28800 bps Modem (COM1)

Configure...

Phone number

Area code:

Phone number:
555 | Alternates

Country/region code:

☐ Use dialing rules | Rules

☑ Show icon in taskbar when connected

OK | Cancel

Modem Configuration

Standard 28800 bps Modem (COM1)

Maximum speed (bps): 38400

Modem protocol

1200
2400
4800
9600
19200
38400
57600
115200

Hardware features
☑ Enable hardware flow cor
☐ Enable modem error cont
☐ Enable modem compression

Initialization
☐ Show terminal window
☐ Run script:

Edit... | Browse...

☐ Enable modem speaker

OK | Cancel

Fig. 6-17 *Setting up a data communications connection to the BDA with Windows2000, part 2 (similar to WindowsNT):*
The procedure for setting up the data communications connection for WindowsNT is largely the same as the example shown above for Windows2000.
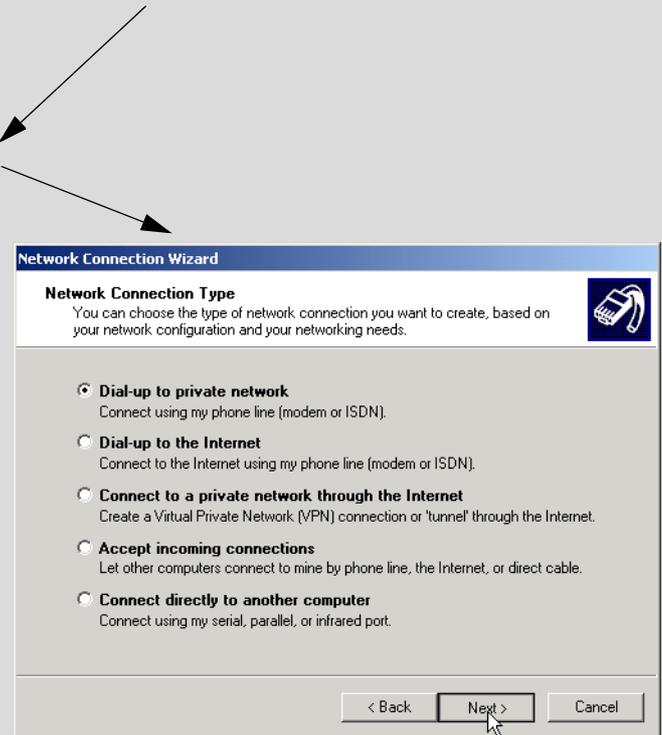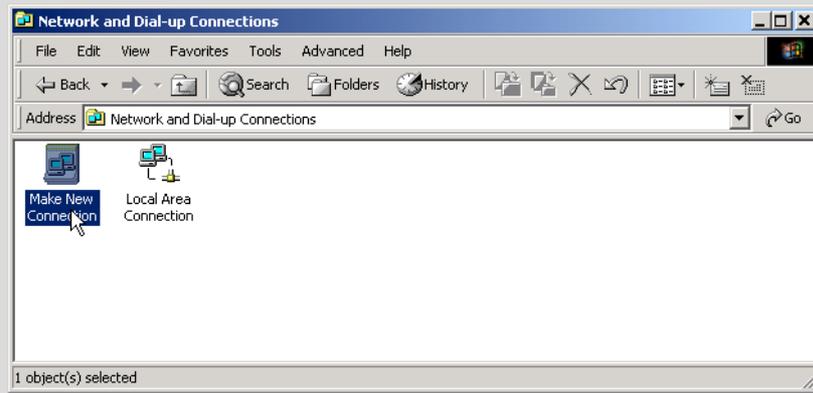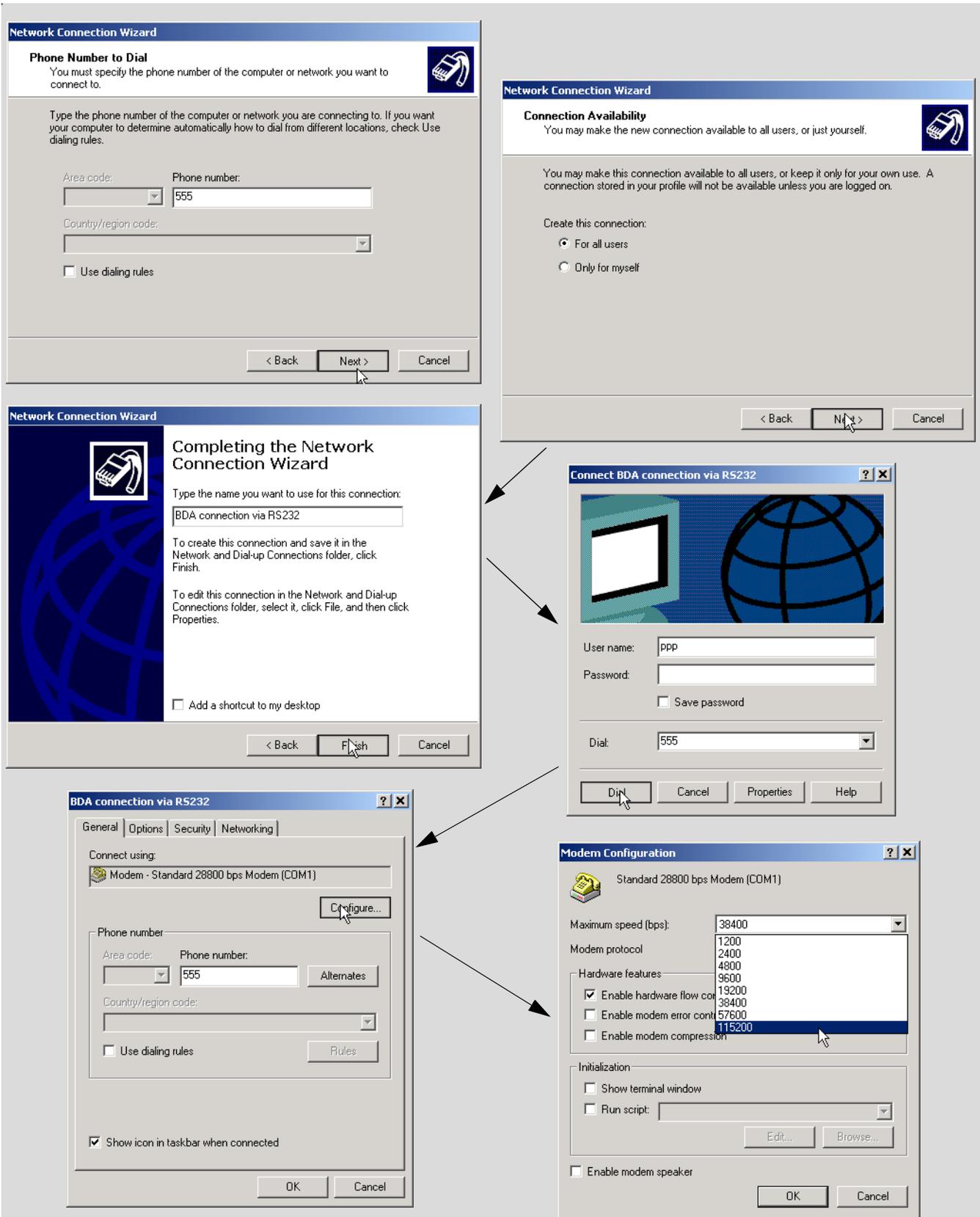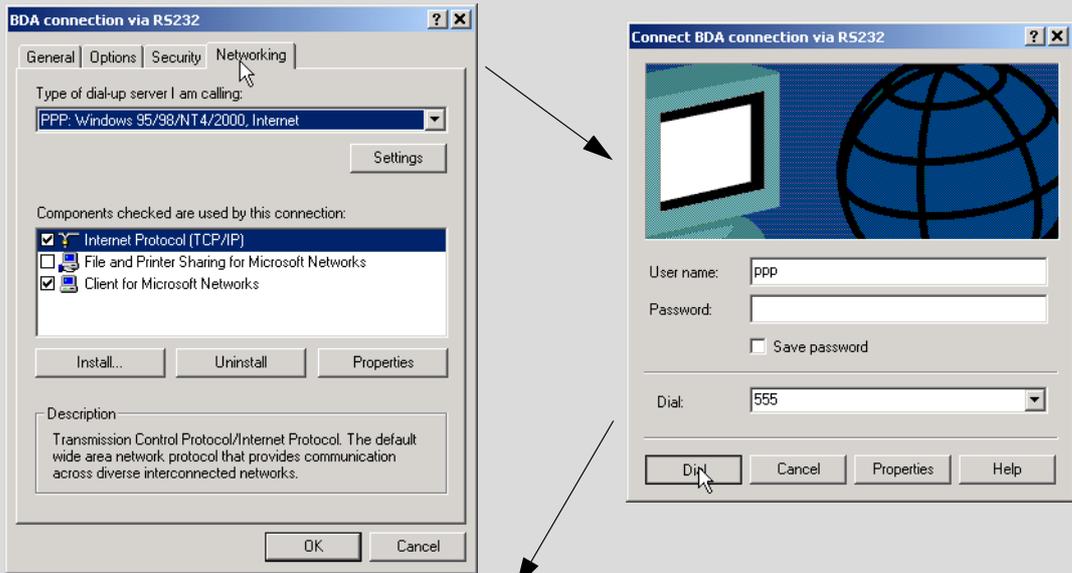
Fig. 6-18

Setting up a data communications connection to the BDA with Windows2000, part 3 (similar to WindowsNT):
Once the installation is complete and the connection has been established via the null modem cable, start the browser by entering the address 2.2.2.1. The PC temporarily adopts the address 2.2.2.2.

The Breaker Data Adapter (BDA) and BDA *Plus*
Connection to the BDA *Plus* via the Ethernet Interface

In addition to communication via the serial RS232 channel, the BDA *Plus* features an Ethernet interface. If the BDA Plus is to be addressed via this interface, it must be integrated in the local Ethernet (LAN). This chapter explains a number of key terms and settings.

Ethernet

Unlike the PROFIBUS-DP, Ethernet does not function according to a master-slave principle. All the stations have equal priority on the bus, which means that any station can be the sender and/or receiver.

A sender can only send on the bus if no other station is sending at that point. This is made possible due to the fact that the stations are always "listening in" to find out whether any messages are being sent to them or any senders are currently active. If a sender has started sending, it checks that the message it has sent is not corrupt. If the message is not corrupt, the send operation continues. If the sender detects that its data is corrupt, it must abort the send operation because a different sender has already started sending data.

After a random time has elapsed, the sender restarts the send operation.

This is known as CSMA/CD and, as a "random" access procedure, does not guarantee a response within a certain time frame. This largely depends on the bus load, which means that real-time applications cannot yet be implemented with Ethernet.

Definition of Key Terms

An intranet system comprises several Ethernet lines connected to each other via gateways within a company. The structure of an intranet system can be just as heterogeneous as that of the Internet: it can be restricted to one location or distributed worldwide.

Ethernet/intranet lines are connected to each other using repeaters, bridges/switches, routers, and gateways. These modules work at different levels in the ISO/OSI 7-layer model.

The repeater (or star coupler) only regenerates and strengthens the electrical signal; it does not interpret bits. The bridge (or switch) physically separates the networks and performs fault and load disconnection. Filtering and guidance mechanisms are usually implemented. The router decouples the networks at the logical level (protocol level) by means of the specified addresses. Using routing tables it knows which messages are to be sent to which address. It continues to work, however, on a protocol-dependent basis. The gateway also enables the router to convert services.

This means that it can act as a security mechanism, such as a firewall, while functioning as a proxy.

A proxy is a program in a gateway that acts as both the server and client. It processes requests, translates them if necessary, and forwards them to the addressees. Proxies are also used to control access (firewall) and forward
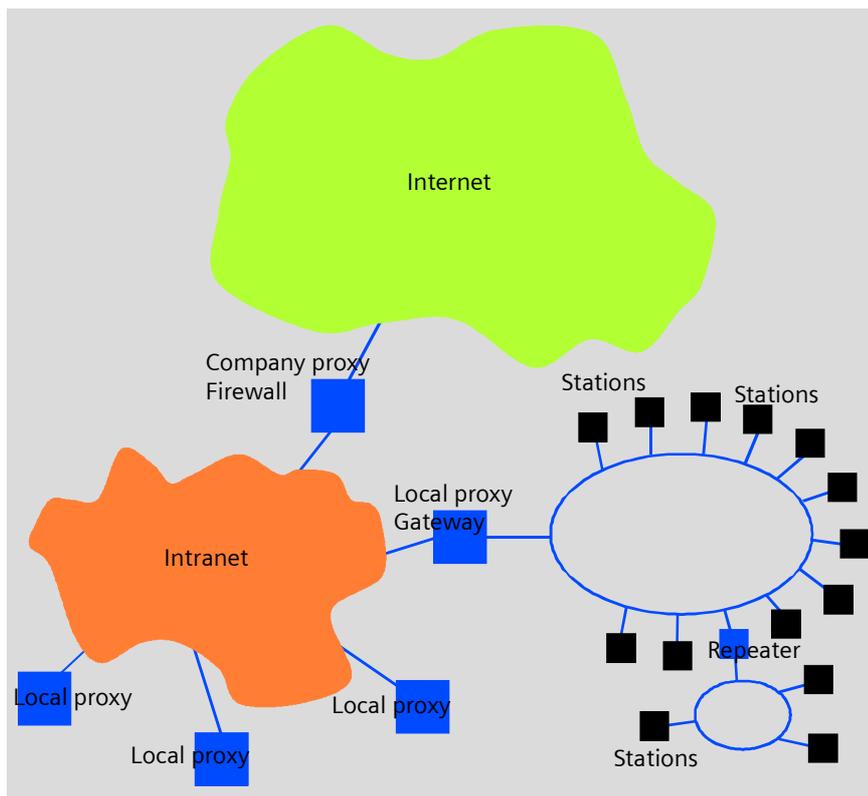
Graphic 6-4 *This diagram illustrates the structure of an Ethernet, how an intranet is integrated, and how this is connected to the Internet.*

requests for protocols that are not supported. Intranet users in particular are familiar with the Internet/intranet page caching function offered by proxies.

The intranet is connected to the Internet via a company proxy, which can also act as a firewall. If a PC (user) wants to access an area of the intranet from the Internet, the firewall must be informed of which addresses can be accessed from outside.

IP Addresses

The partner must have a unique address so that it can be addressed in the extensive intranet/Internet system. The IP address format is used for this purpose, which, as of Version 4, comprises four figures from 0 to 255, separated by a decimal point. Example: 146.254.245.62

The address is 32 bits long. Three classes have been created to enable the addresses to be structured on a world-wide basis and to ensure that the same address does not exist twice. The IP address comprises a small header, which describes the class, a network number, and a host number. The address of a subnetwork (intranet, for example) is encoded in the network number. The host number is basically the unique address of a station in a network of class X and subnetwork Y.

The first byte of class A IP addresses contains a number from 0 to 127: e.g. 98.x.x.x. This class can support up to 128 subnetworks, each with around 16 million connections. Since class A networks are very limited in number, these addresses are only available for large global companies and organisations. A Network Information Center (NIC) is responsible for assigning the classes and network numbers.

Class B networks (these begin with 128.x.x.x to 191.x.x.x) support up to 16,384 subnetworks, each with up to 65,535 stations. The majority of large companies and providers have a class B address.

With around 2.1 million subnetworks, each with up to 256 stations, class C addresses are often used by smaller providers and companies with no more than 256 connections in their corporate network. The IP addresses start from 192.x.x.x to 223.x.x.x

Subnet Mask

The subnet mask provides information on the size of the subnetwork (intranet) and its address band. In this way, each station knows whether the IP address to be addressed is located in the same subnetwork or whether it has to be addressed via a gateway.

Example:

IP address 1st BDA:	206.150.100.89
IP address 2nd BDA:	206.150.102.32
IP address gateway:	206.150.100.1
IP address browser:	206.150.100.50
Subnet mask:	255.255.255.0

Subnet mask 255.255.255.0 means that all addresses whose first three bytes are the same as the station address are located on the line of that station. These can be addressed directly (in the example above, from the browser of the first BDA). A comparison of the address of the second BDA with the subnet mask shows that this address is not on the same line as the station. This means that the gateway must be addressed, via which the request is then forwarded to the second BDA. The subnet mask must be obtained from the network administrator (usually 255.255.255.0).

BDA IP Address

The BDA must be assigned its own unique IP address that has not been used before so that it can run on the Ethernet. This address must be in the same band as the other addresses on this line. You may have to contact the network administrator here.

Gateway IP Address

If an address that is not located in the subnetwork is addressed in the browser, the request is forwarded to the gateway. The gateway knows the location to which the request has to be forwarded on account of the configuration. The IP address of the gateway must be obtained from the network administrator.

If 0.0.0.0 is set as the gateway IP address, no access to a gateway has been configured.

Operation

Once the addresses have been set, it should be possible to call up the BDA *Plus* via the Ethernet. This can be checked using a test ping. To do so, enter "ping x.x.x.x" in Start > Execute (x.x.x.x is the placeholder for the IP address of the BDA to be addressed). The DOS box that then appears tells you either that a reply from the "pinged" IP address is received, or that the request has been timed out. In this case, no connection has yet been established from the BDA *Plus* to the target system.

Note: You may have to include the IP address of the BDA *Plus* in the list of addresses that do not use a proxy server. The use of a proxy server is optional and depends on the network.

Once a connection has been established, start the browser and enter the IP address of the BDA *Plus* in the address line.

The Breaker Data Adapter (BDA) and BDA *Plus*
Operating Instructions and Troubleshooting

The BDA supports state-of-the-art communications technology. It can be implemented regardless of the operating system and browser used, and its structured tree and the pages it displays are harmonised with the Switch ES Power tool. The instructions provided here aim to show you how to make particular settings. A troubleshooting table is included at the end to help you solve any problems.

Languages and Help

The BDA interface is in German and English. The language is selected every time the browser is started. If you want to switch the language during operation, choose the option "SENTRON WL/VL" at the top of the tree. The language selection window then appears on the right-hand side of the screen.

In addition to the HTML pages and Java applets, the BDA stores the accompanying help pages in different languages. The help pages can be called up where they are available via the question mark icon in the top right-hand corner of the screen. They are available whenever the BDA is activated.
The help pages are available in German and English.

Offline/Online Mode

The BDA (and BDA Plus) can be run in two different operating modes.

Online mode

Online mode is activated automatically when the BDA is connected to a circuit-breaker. In this mode, the current operating and diagnostic data, as well as the parameters are displayed and loaded directly to the circuit-breaker after they have been changed. Online mode is indicated by a green **Cubicle**BUS LED.

If the connection to the circuit-breaker is interrupted, the BDA switches to offline mode. This also occurs if a file has been opened under "Parameter transfer" or received from the circuit-breaker.

Offline mode

If the BDA is supplied with 24 V DC and is not connected to a circuit-breaker, the BDA starts in offline mode, indicated by the fact that the **Cubicle**BUS LED is not illuminated. Offline mode is used to configure the BDA even if it is not connected to a circuit-breaker, and save this file for later use. Files created by Switch ES Power can also be opened and edited.
To switch from offline to online mode, you first have to connect a circuit-breaker. You then press either the "Online" or "Send parameters" button in "Parameter transfer".

Displaying Data

SENTRON VL and SENTRON WL use "property bytes", which provide information on the required value, such as whether it is available, or readable and/or writable. The display then changes depending on the property byte.

If a value is not available, for example, because the circuit-breaker does not have any neutral conductor protection (N-conductor protection parameter), it is displayed as an empty white field with no outline.

If a value is available, the system differentiates between whether it is only readable or also writable. Read only data is displayed in black on a gray background in a black, outlined field. If the value is also writable, the background is white.

Values that are available but not currently valid are displayed in red. This could be the case, for example, if the number of measured values available for calculating the long-term mean values of the current is insufficient because the circuit-breaker has only just been switched on.

Parameter: read and writable	PROFIBUS Address (1...125) 11
Measured value: read only	Current L1 439 A
Parameter: read only	N-protection I_N 315 A
Parameter not available	N-protection I_N A
Measured value not valid	Demand L1 0 A

Fig. 6-19 *The way data is displayed on the BDA pages depends on the property byte. This tells you which data is read only, which data can be written, and which data is not available.*

Password Protection

All write actions that would result in a change to the status or a parameter in the circuit-breaker are password protected. This ensures that parameters cannot be changed and switching is impossible without this password.

Note: The electronic relays of the COM15 module are required to switch the SENTRON WL on and off via the BDA.

The default password is

"**sentron**"

This can be changed by choosing "Extras > Password" in the BDA tree (strongly recommended). You have to enter the new password twice. When you click OK, the BDA asks you for the old password.

If you have forgotten it, it can be reset by means of a master password. To do so, contact Technical Assistance at SIEMENS AG, A&D CD.

Tel.: +49 9131 743833

E-mail:
nst.technical-assistance@siemens.com

Operation Example

This example aims to describe the functionality of the BDA. You want to set the PROFIBUS-DP address of the COM15 module for a SENTRON WL. To do so, open the Communication node by choosing "Device Parameters > Circuit-Breaker". Then click the input/output field next to the PROFIBUS address and edit it in accordance with the new address. Once you have changed this parameter and exited the field, the outline turns blue to indicate parameters that have not yet been transferred to the circuit-breaker.

You can then change other parameters. If you want to transfer the modified parameters to the circuit-breaker, click OK on this page.

If the parameter transfer process is the first write action in this session, the system prompts you to enter the password. Once you have entered the password successfully, the data is transmitted to the circuit-breaker.

If you want to reset the modified parameters, click the "Undo" button.

If you exit the parameters page without clicking OK, the changes are ignored.

Printing

Since Java applets are used, the normal print function in your browser on the parameter pages will not provide a satisfactory printout.

If you want to print the parameters for documentation purposes, open the pages to be printed from the tree in the BDA. All the parameter pages are displayed again under "Extras > Print", and you can print them individually as required using the print menu in your browser.

Comparing Parameters

The parameter comparison function is used to check whether the parameters set in Switch ES Power or the BDA match those in the device. The following parameters are checked:

• Protection parameters A and B
• Extended protection function parameters
• Threshold value settings
• Measurement function settings
• Communication parameters
• Settings for the configurable output module

The parameter comparison function can be used, for example, to ensure that the set parameters are transferred without any errors once they have been downloaded to the device.

Due to the complex nature of SENTRON circuit-breakers, it is impossible to judge accurately whether the parameters and settings loaded to the device have actually been transferred. This is because, for example:

• BDA just forwards parameter changes. Whether a parameter is correct can only be verified in the memory location (e.g. in the trip unit). If this changes the value because one has exceeded the maximum value, for example, the modified value is reported back to the BDA. This discrepancy would be detected when a subsequent parameter comparison is performed.
• In the BDA interface, not all eventualities regarding the dependencies between minimum/maximum values and other parameters are checked. This means that a parameter could be entered that cannot be copied in the protection device in its current form.
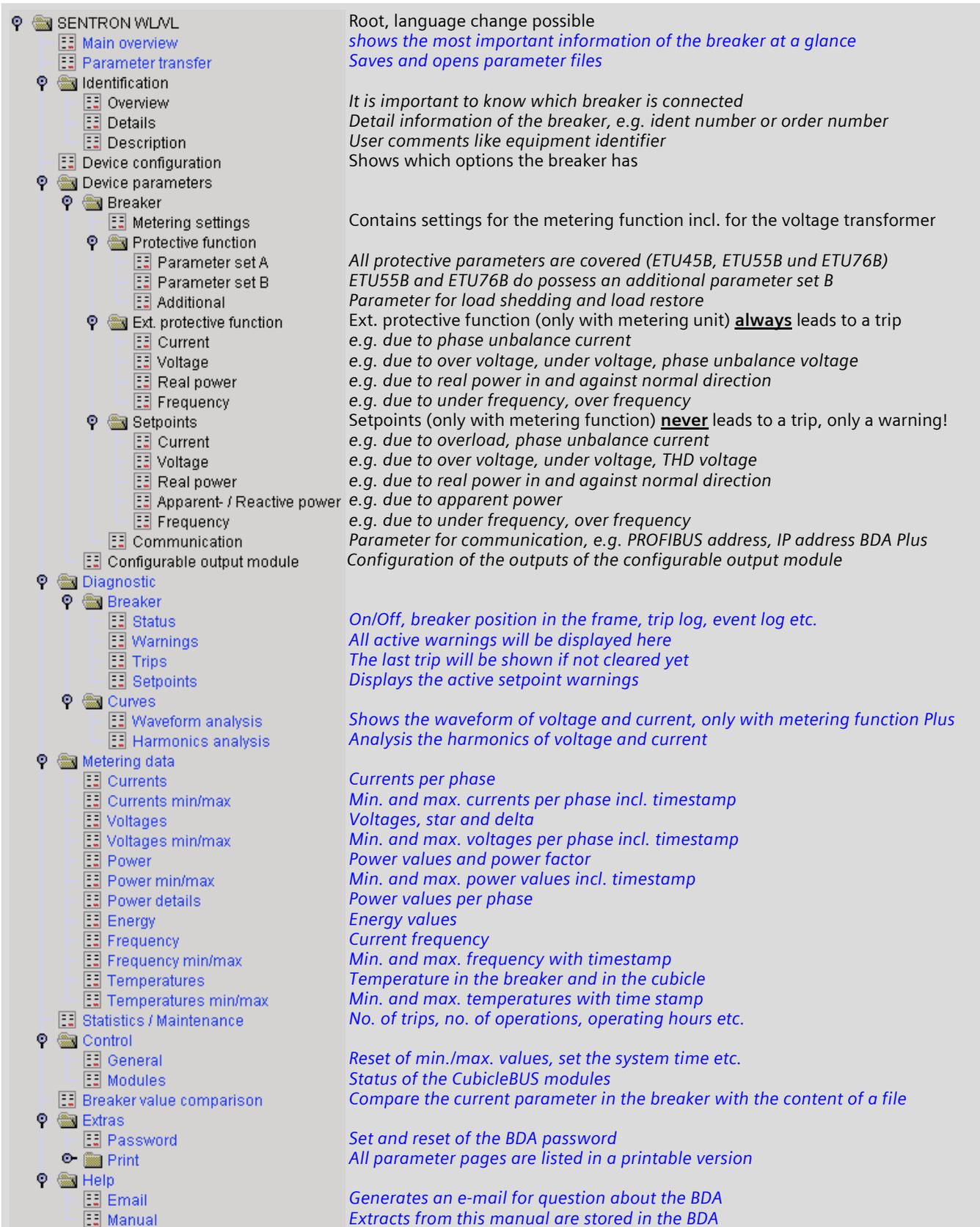
Tree item	Description
SENTRON WL/VL	Root, language change possible
Main overview	*shows the most important information of the breaker at a glance*
Parameter transfer	*Saves and opens parameter files*
Identification	
Overview	*It is important to know which breaker is connected*
Details	*Detail information of the breaker, e.g. ident number or order number*
Description	*User comments like equipment identifier*
Device configuration	Shows which options the breaker has
Device parameters	
Breaker	
Metering settings	Contains settings for the metering function incl. for the voltage transformer
Protective function	
Parameter set A	*All protective parameters are covered (ETU45B, ETU55B und ETU76B)*
Parameter set B	*ETU55B and ETU76B do possess an additional parameter set B*
Additional	*Parameter for load shedding and load restore*
Ext. protective function	Ext. protective function (only with metering unit) **always** leads to a trip
Current	*e.g. due to phase unbalance current*
Voltage	*e.g. due to over voltage, under voltage, phase unbalance voltage*
Real power	*e.g. due to real power in and against normal direction*
Frequency	*e.g. due to under frequency, over frequency*
Setpoints	Setpoints (only with metering function) **never** leads to a trip, only a warning!
Current	*e.g. due to overload, phase unbalance current*
Voltage	*e.g. due to over voltage, under voltage, THD voltage*
Real power	*e.g. due to real power in and against normal direction*
Apparent- / Reactive power	*e.g. due to apparent power*
Frequency	*e.g. due to under frequency, over frequency*
Communication	Parameter for communication, e.g. PROFIBUS address, IP address BDA Plus
Configurable output module	Configuration of the outputs of the configurable output module
Diagnostic	
Breaker	
Status	*On/Off, breaker position in the frame, trip log, event log etc.*
Warnings	*All active warnings will be displayed here*
Trips	*The last trip will be shown if not cleared yet*
Setpoints	*Displays the active setpoint warnings*
Curves	
Waveform analysis	*Shows the waveform of voltage and current, only with metering function Plus*
Harmonics analysis	*Analysis the harmonics of voltage and current*
Metering data	
Currents	*Currents per phase*
Currents min/max	*Min. and max. currents per phase incl. timestamp*
Voltages	*Voltages, star and delta*
Voltages min/max	*Min. and max. voltages per phase incl. timestamp*
Power	*Power values and power factor*
Power min/max	*Min. and max. power values incl. timestamp*
Power details	*Power values per phase*
Energy	*Energy values*
Frequency	*Current frequency*
Frequency min/max	*Min. and max. frequency with timestamp*
Temperatures	*Temperature in the breaker and in the cubicle*
Temperatures min/max	*Min. and max. temperatures with time stamp*
Statistics / Maintenance	*No. of trips, no. of operations, operating hours etc.*
Control	
General	*Reset of min./max. values, set the system time etc.*
Modules	*Status of the CubicleBUS modules*
Breaker value comparison	*Compare the current parameter in the breaker with the content of a file*
Extras	
Password	*Set and reset of the BDA password*
Print	*All parameter pages are listed in a printable version*
Help	
Email	*Generates an e-mail for question about the BDA*
Manual	*Extracts from this manual are stored in the BDA*

Fig. 6-20 *The tree of the BDA was extracted in this picture so all items can be seen at a glance. The part with the black text is identical to the tree content of Switch ES Power. The "blue" part contains the Online masks of Switch ES Power which are accessable via the menu "Target system" of Switch ES Power. This is not possible within the BDA, therefor the online masks are placed in the tree.*

Troubleshooting List	
Fault description	**Solution**
An error message appears (e.g. Modem not initialised, etc.) a PPP connection is established with the BDA.	Ensure that you are using a fully-assigned null modem cable. With a null modem cable, pins 2 and 3, 4 and 6, and 7 and 8 must be assigned and reversed with respect to each other.
	Before starting the BDA, disconnect the null modem cable from the BDA and reboot the BDA (DEVICE LED is green). Then reconnect the cable.
	The COM port that you are using on the target system must not be being used by a different application (free it up, if necessary).
	Check the modem and data communications connection settings. You must choose "555". Only the user name "ppp" works.
	In the Control Panel, you also have to set the baud rate for the COM interface that you are using to 115200.
Nothing happens after you select the language on the first page.	Ensure that the option "Use Java v1.4.0 <applet>" is active in the browser.
	Delete the cache memory of the browser.
	Open the Java plug-in operator panel in the Control Panel. Check that the plug-in is active and Version 1.4.0 is selected under "Extended". On the "Browser" tab page, the browser that you are using must be active, and the Java VM cache can be deleted to be on the safe side. Then restart the system.
	If the problem persists, remove any older versions of Java you may have.
You cannot establish a connection to the BDA Plus via the Ethernet.	Check the settings for the gateway, the subnet mask, and the proxy.
	Enter the address of the BDA to be addressed in the proxy so that it is not routed via the proxy. This then only works if the BDA is located in the network specified by the subnet mask.
	Ping the BDA address to check whether TCP/IP communication is established to the BDA. If the ping does not work, check the network configuration again with your network administrator. If the BDA replies to a ping but not to a request to call up the browser, reset the BDA.
	The BDA must have already been booted with a connected Ethernet cable so that the Ethernet interface is activated. To solve the problem, connect the active Ethernet cable and boot up the BDA.
The system displays a message about security settings and the BDA pages stop loading.	The security level of the browser is set to "secure" and stops Java applets from running, for example. For this reason, you have to reduce the security level to a level where the security message no longer appears and the BDA pages are displayed.

Table 6-3 *This troubleshooting list helps you solve any problems you may encounter communicating with the BDA. If you have any other problems, Technical Assistance of SIEMENS AG, A&D CD (+49 9131 743833) will be happy to help.*