

IBM ISDN PC Card

User's Guide

19K5716

Note: Before using this information and the product it supports, read the information under Appendix A, “Package contents” on page 219, Appendix E, “Help and service information” on page 241, and Appendix F, “Product warranties and notices” on page 245.

IBM ISDN PC Card

User's Guide



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Note: Before using this information and the product it supports, read the information under Appendix A, “Package contents” on page 219, Appendix E, “Help and service information” on page 241, and Appendix F, “Product warranties and notices” on page 245.

Third Edition (November 2002)

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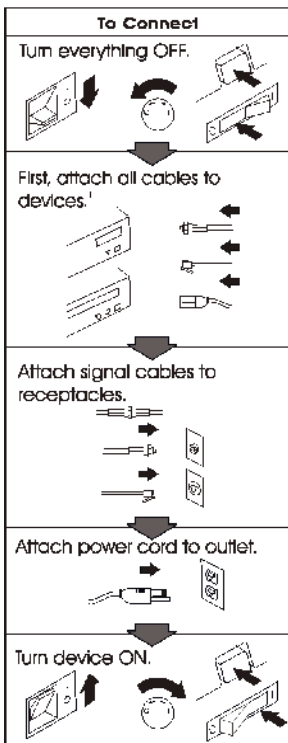
Safety

This ISDN PC Card is designed only for use in Personal Computers that have installation instructions describing user installation of PC Cards in PCMCIA slots.

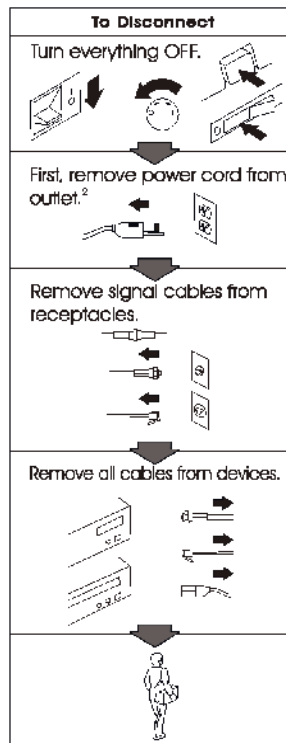


DANGER!

Electrical current from power and ISDN communication cables is hazardous. To avoid shock hazards, connect and disconnect cables as shown below when installing, moving, or opening the covers of this product or attached devices. The power cord must be used with a properly grounded outlet.



¹ In the U.K., by law, the telephone cable must be connected after the power cord.



² In the U.K., by law, the power cord must be disconnected after the telephone line cable.



DANGER!

To avoid shock hazards, do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.

To avoid shock hazards:

- The power cord must be connected to a properly wired and grounded receptacle.
- Any equipment to which this product is to be attached must also be connected to properly wired receptacles.

This is a high-performance ISDN adapter. Prolonged high-speed data transfers will result in the ISDN adapter becoming noticeably warm. If you need to remove the ISDN adapter immediately after prolonged operation and you are uncomfortable with handling the ISDN adapter while it is warm, eject the ISDN adapter from the PCMCIA slot and let it cool for about 15 seconds before handling it.

Declaration of CE Conformity

The manufacturer
Address

AVM Gmb H
Alt-Moabit 95
D-10559 Berlin

herewith declares that the product

Type
Product

ISDN-Controller
IBM International ISDN PC Card

complies with the following directives:

- 1991/5/EC Radio equipment and telecommunications terminal equipment
- 89/336/EEC EMC Directive: Electromagnetic Compatibility
- 73/23/EEC Low Voltage Directive: Electrical equipment designed for use within certain voltage limits

The following norms were consulted to assess conformity:

- CTR 3/1994.11.1.8
- EN 55022/9.98 Class B
EN 55024/9.98
- EN 60950/1992+A1+A2+A3+A4+A11
EN 41003/1993



The CE symbol confirms that this product conforms with the above mentioned norms and regulations.

Berlin, 16.03.2000

A handwritten signature in blue ink, appearing to read 'P. Foxel', is written over a light blue horizontal line.

Peter Foxel, Technical Director

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1. Welcome to the IBM International ISDN PC Card

Welcome to the IBM International ISDN PC Card. Thank you for choosing this product.

The IBM International ISDN PC Card is a passive adapter in PCMCIA (credit-card size) format. It was designed for ISDN basic-rate interfaces, and can be used with one B channel at a rate of 64 kbit/s or, for multilink connections with two B channels simultaneously (multilink connections) at 128 kbit/s.



The IBM International ISDN PC Card is fully CAPI 2.0-compliant.

The adapter can be installed and operated in Microsoft® Windows® 95, Windows 98, Windows NT 4.0 Workstation, Windows 2000 Professional, Windows Millennium Edition (Me), and Windows XP Home and Professional Edition.

For more information on how to install and use the adapter, please see the corresponding sections in this manual. For further assistance, please refer to the telephone numbers included in Appendix E, “Help and service information” on page 241. If you need additional assistance, please contact your nearest IBM dealer or, if possible, consult one of the following Internet sites:

IBM Personal Computing Support Web Site Language	URL
English	http://www.ibm.com/pc/support
German	http://www.ibm.com/pc/support/de
French	http://www.ibm.com/pc/support/fr
Italian	http://www.ibm.com/pc/support/it
Spanish	http://www.ibm.com/pc/support/es

Note: If the national language version of the IBM Personal Computing Web Site is not available or not working, you can use the English language version at <http://www.pc.ibm.com/pc/support>.

2. How the IBM International ISDN PC Card installation software CD is organized

The IBM International ISDN PC Card installation software CD contains the following directories:

\AUTORUN	Autorun menu for all Windows operating systems
\EXTRAS	Additional Windows software
\Fritz!	Contains the AVM Fritz! Software version 3.0 in English, German, French, Italian, and Spanish.
\GUIDE	Contains the current release of the User's Guide for the IBM International ISDN PC Card
\Marketing	Contains additional software marketing material from AVM in English (EN) and German (DE) that will enhance the usability of your IBM International ISDN PC Card. For more details please review the PDF files in the \MARKETING directory or visit the German AVM or English AVM home page
\WIN2000	CAPI 2.0 compliant device drivers for the IBM International ISDN PC Card for Microsoft Windows 2000 Professional
\WIN95	CAPI 2.0 compliant device drivers for the IBM International ISDN PC Card for Microsoft Windows 95
\WIN98	CAPI 2.0 compliant device drivers for the IBM International ISDN PC Card for Microsoft Windows 98
\WINME	CAPI 2.0 compliant device drivers for the IBM International ISDN PC Card for Microsoft Windows Millennium Edition
\WINNT	CAPI 2.0 compliant device drivers for the IBM International ISDN PC Card for Microsoft Windows NT 4.0 Workstation
\WINXP	CAPI 2.0 compliant device drivers for the IBM International ISDN PC Card for Microsoft Windows XP Home Edition and Professional

For driver and software updates, visit one of the following international IBM support web pages:

IBM Personal Computing Support Web Site	URL
English	http://www.ibm.com/pc/support
German	http://www.ibm.com/pc/support/de
French	http://www.ibm.com/pc/support/fr
Italian	http://www.ibm.com/pc/support/it
Spanish	http://www.ibm.com/pc/support/es

If you encounter any problems with the above links, follow these steps:

- Connect to <http://www.pc.ibm.com/support>
- Select your language.
- Double-click the **Options** link underneath the **Browse** menu.
- In the **Category** list, select **Communication Adapters**.
- From the **Option** list, select **09N3606 International ISDN PC Card**.

3. Before you install the IBM International ISDN PC Card

Before installing your IBM International ISDN PC Card, make sure your operating system is up to date. Refer to the following Web sites if possible:

The Windows 95 update page:

<http://www.microsoft.com/windows95/downloads>

The Microsoft Dial-Up Networking 1.3 update download page for Windows 95:

http://www.microsoft.com/windows95/downloads/contents/wurecommended/_wunetworking/dun13win95/license.asp

The Windows 98 update page:

<http://www.microsoft.com/windows2000/downloads>

The Windows Me home page:

<http://www.microsoft.com/windowsme>

The Microsoft download home page:

<http://www.microsoft.com/downloads>

For further assistance regarding the installation of specific patches or updates for any Microsoft Windows operating system, contact Microsoft or your computer manufacturer's help desk.

Be sure to have the user's manual or installation guide for your computer available for quick reference.

Also keep the original Windows 95, Windows 98, Windows Me, Windows NT, or Windows 2000 CD at hand when installing the device drivers software.

If you do not have a CD for your operating system, check to see if the required .CAB files for Windows 95, Windows 98, or Windows Me Setup are installed on the hard disk of your computer.

If you are using Windows NT 4.0, Windows 2000, or Windows XP, check to see if your hard disk drive contains the I386 directory and its sub-directories from the original CDs.

If this is not the case, or if you require assistance to find the Setup files in question, contact the manufacturer of your computer or your IT department specialist.

4. Installing the device drivers in Windows 95

The device drivers for the IBM International ISDN PC Card are installed in two steps:

1. Install the CAPI 2.0-compliant device drivers
2. Install the NDIS WAN CAPI device drivers

The following section explains in detail the prerequisites for the device driver installation, and how to perform the installation on your specific version of Windows 95.

Determining the Windows 95 version in use

Before you begin installing the IBM International ISDN PC Card in Windows 95, check which version of Windows 95 you are using. For this purpose, Microsoft has released the following instructions for determining the Windows 95 version on its technical support Web site:

1. In the Control Panel, double-click the **System** icon.
2. Click the **General** tab.
3. Locate the version number under the **System** heading and compare it with the following table:

Release	Version	File Date
Windows 95 retail, OEM	400.95	11/07/95
Windows 95 retail SP1	4.00.950A	11/07/95
OEM Service Release 1	4.00.950A	11/07/95
OEM Service Release 2	4.00.1111 (4.00.950B)	24/08/96
OEM Service Release 2.1	4.03.1212-1214 (4.00.950B)	24/08/96-27/08/97
OEM Service Release 2.5	4.03.1214 (4.00.950C)	24/08/96-18/11/97

A comprehensive, up-to-date article on this subject can be found on the Web at the following site:

<http://search.support.microsoft.com>

Search for the article **Q158238**.

If you are running the initial release of Windows 95 (Windows 95 retail or OEM) you must first upgrade it to Windows 95 SP1 by downloading the corresponding Service Pack for your Windows 95 version. The Service Pack 1 can be found at:

<http://microsoft.com/windows/software/localize/localize.html>

If the above URL is outdated, please contact your local Microsoft support desk for further assistance.

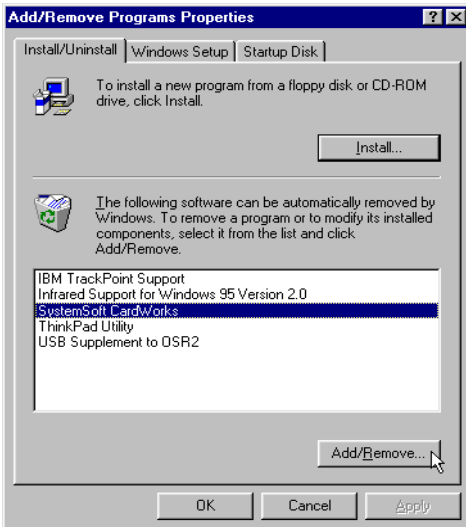
Removing any PCMCIA support software

Some notebook computer manufacturers install PCMCIA support software such as Systemsoft's CardWizard as part of the Windows 95 package. IBM includes this program with its Thinkpad notebook computer series. This section briefly describes how to remove CardWizard from the system. This software must be removed to ensure correct operation of the IBM International ISDN PC Card.

1. Click **Settings** -> **Control Panel** in the Windows Start menu.
2. Double-click the **Add/Remove Programs** icon in the Control Panel.



3. In the **Add/Remove Programs Properties** window, select **SystemSoft CardWorks** in the list of installed programs.
4. Click the **Add/Remove** button to remove CardWizard.

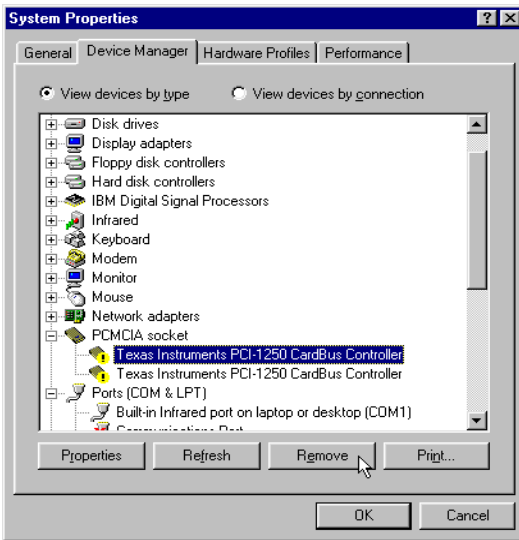


5. Confirm that you want this software to be completely removed.

6. When the removal has been completed, click the **OK** button and then confirm that you want to restart the computer.
7. After Windows has restarted, open the Control Panel again by clicking **Start -> Settings -> Control Panel**.
8. Double-click the **System** icon and select the **Device Manager** tab. Both PCMCIA sockets are now highlighted with a yellow exclamation mark in the list of devices.

Select each socket in turn and click **Remove** to remove it from the Device Manager.

Even if the PCMCIA sockets are not highlighted with the exclamation mark, you must remove them, and follow the instructions in this chapter.



Attention: Make sure that you have removed both sockets.

Note: Some Windows 95 versions might show only one PCMCIA socket instead of two.

When you have removed the PCMCIA sockets, restart your computer.

When Windows 95 restarts, the operating system reinstalls the device drivers for the PCMCIA sockets. After system start-up has been completed, return to the **System** applet in the Control Panel and check in the Device Manager to make sure that the PCMCIA sockets are now installed properly. If so, close the Device Manager by clicking the **OK** button.

The next step is to install PCMCIA support in Windows 95. Proceed as follows:

1. Double-click the **PC Card (PCMCIA)** icon in the Control Panel. Windows 95 now asks you for some information and offers default settings. Please read the next windows carefully and answer the questions accordingly.



2. Windows 95 prompts you to shut down your notebook computer. Confirm this action by clicking **Yes**. When your notebook computer has been restarted, it is ready to use PCMCIA adapters.

Upgrading dial-up networking for Windows 95

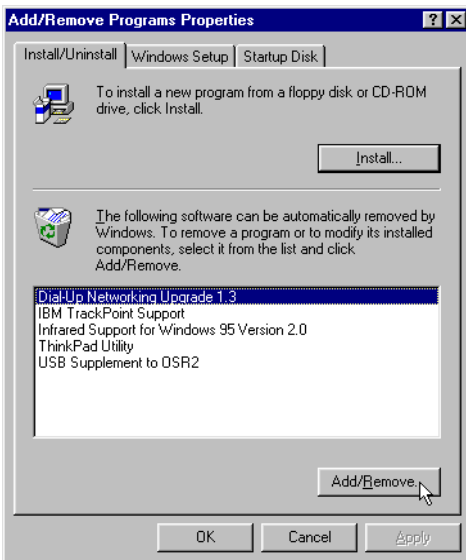
For proper operation of the IBM International ISDN PC Card, your computer must have at least Windows 95 with Service Pack 1 (Windows 95 version 4.00.950A) installed.

First, check to see if Dial-Up Networking or any ISDN accelerator kit is installed:

1. Click **Start -> Settings -> Control Panel** and then double-click **Add/Remove Programs**.
2. In the first window, entitled **Install/Uninstall**, check to see if a newer version of the Microsoft Dial-Up Networking update is installed.

If an entry called **Dial-Up Networking Upgrade 1.2** or **Dial-Up Networking 1.3** is listed:

1. Highlight this entry in the list, then click **Add/Remove** to uninstall the older Dial-Up Networking upgrade.



- Restart your system and install the Microsoft Dial-Up Networking 1.4 Upgrade from the \EXTRAS\Win95\DUN\MSDUN14 directory on the CD, selecting the msdun14.exe program.

Note: The Microsoft Dial-Up Networking 1.4 upgrade is only available in English. You can choose to leave the Dial-Up Networking 1.3 Update installed or install it alternatively from the \EXTRAS\Win95\DUN\MSDUN13 directory by selecting the corresponding update for your language version of Windows 95. But for optimal performance, install the Dial-Up Networking 1.4 upgrade.

- Run the MSDUN13.EXE file or the file corresponding to the Dial-Up Networking 1.4 upgrade and follow the instructions on the screen.

Note: If you choose to install the Windows 95 Dial-Up Networking 1.3 upgrade and it is not available in your language, you can

- install the English Dial-Up Networking update or
- download the country specific version of it from http://www.microsoft.com/windows95/downloads/contents/wurecommended/s_wunetworking/dun13win95/license.asp and install it on your Windows 95 computer.

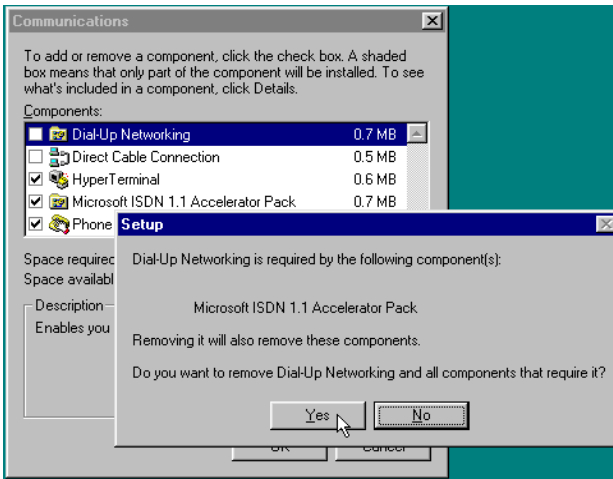
The Windows 95 Dial-Up Networking 1.4 Update is available at http://www.microsoft.com/windows95/downloads/contents/WURecommended/S_WUNetworking/dun14win95/Default.asp.

For information on how to install the English version of the Microsoft Dial-Up Networking 1.4 upgrade for Windows 95, see Appendix D, "Troubleshooting and frequently asked questions" on page 231 .

If there are no entries under **Install/Uninstall** referring to a Dial-Up Networking update:

- Click the **Windows Setup** tab.
- In the next dialog, double-click the **Communications** icon and then deactivate the checkbox to the left of **Dial-Up Networking**.
- Click **OK** to confirm the operation.

If the Microsoft ISDN 1.1 Accelerator Pack is installed on your computer, a window will open reporting that you are about to remove it. Click **Yes** to confirm.



4. Restart your system and perform the Microsoft Dial-Up Networking 1.4 upgrade from the \EXTRAS\win95\DUN\MSDUN14 directory on the CD, selecting the `msdun14.exe` program.

Note: The Microsoft Dial-Up Networking 1.4 upgrade is only available in English. You can choose to leave the Dial-Up Networking 1.3 Update installed or install it alternatively from the \EXTRAS\Win95\DUN\MSDUN13 directory by selecting the corresponding update for your language version of Windows 95. But for optimal performance, install the Dial-Up Networking 1.4 upgrade.

5. Execute the `msdun14.exe` file or the file corresponding to the Dial-Up Networking 1.3 upgrade and follow the instructions on the screen.

Note: If you choose to install the Windows 95 Dial-Up Networking 1.3 upgrade and it is not available in your language, you can

- install the English Dial-Up Networking update or
- download the country specific version of it from http://www.microsoft.com/windows95/downloads/contents/wurecommended/s_wunetworking/dun13win95/license.asp and install it on your Windows 95 computer.

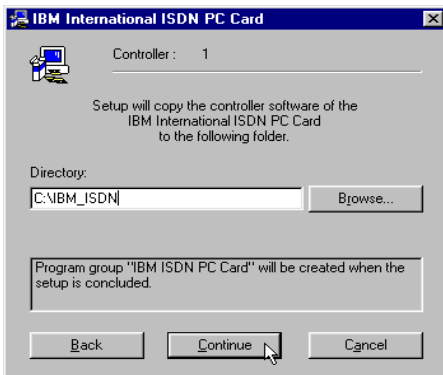
The Windows 95 Dial-Up Networking 1.4 Update is available at http://www.microsoft.com/windows95/downloads/contents/wurecommended/s_wunetworking/dun14win95/default.asp.

For information on how to install the English version of the Microsoft Dial-Up Networking 1.4 upgrade for Windows 95, see Appendix D, “Troubleshooting and frequently asked questions” on page 231.

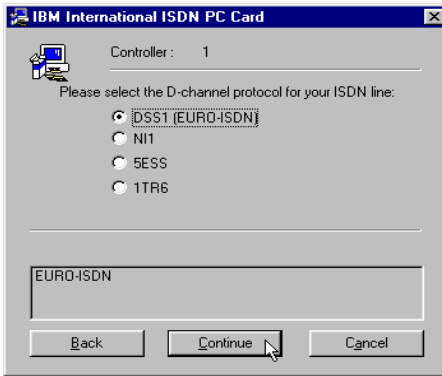
Installing the IBM International ISDN PC Card in Windows 95 service release 1

When you have prepared Windows 95 by following the instructions above, you are ready to install the IBM International ISDN PC Card.

1. Turn off the computer, choose a PCMCIA slot and insert the IBM International ISDN PC Card into the slot without the ISDN cable attached.
2. Turn the computer back on. The New Hardware Found window opens and reports that it has detected an ISDN PC Card.
3. Make sure that the option **Driver from disk provided by hardware manufacturer** is selected, then click **OK**.
4. The Install From Disk window opens. Click **Browse** and select the letter of the CD-ROM drive containing the **IBM International ISDN PC Card Driver CD** in the Open window. Select the **Win95**, then the **DRV** directory and confirm your selection by clicking **OK**.
5. In the Install From Disk window, click **OK** once more to confirm that you want to install the device drivers.
6. Click **OK** in the Select Device window. Installation of the device drivers begins.
7. The next window lets you select the installation language. Confirm the default language **English** by clicking **OK** or selecting your language from the list, then clicking **Continue**.
8. In the next window, specify the installation directory for the device drivers. By default this path is **C:\IBM_ISDN**. Click **Continue** to confirm this path, or enter a different path in the **Directory** field.



9. In the next window, select the appropriate D-channel protocol for your ISDN line. For newer ISDN lines in Europe select **DSS1**, the **Euro-ISDN D** protocol. **NI-1** and **5ESS** are D-channel protocols used in the United States of America. **ITR6** is the older national D-channel protocol for Germany.



Although some older ISDN lines in Germany still use the D-channel protocol 1TR6, DSS1 is generally preferable. The 1TR6 protocol is no longer very common and might be excluded from future device driver releases for this adapter.

10. Once you have selected the appropriate D-channel protocol, click the **Continue** button.
11. The last window informs you of the resources used by the IBM International ISDN PC Card. Click **Continue** to complete the installation, then connect the ISDN cable.

Your IBM International ISDN PC Card is now ready to use with any CAPI 2.0-compliant application software.

Installing the IBM International ISDN PC Card in Windows 95 service release 2.x

After you have prepared Windows 95 by following the instructions above, you are ready to install the IBM International ISDN PC Card.

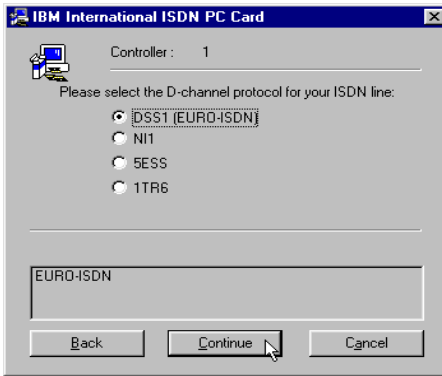
1. Turn off the computer, select a PCMCIA slot and insert the IBM International ISDN PC Card into this slot without the ISDN cable attached.
2. Turn the computer back on. The New Hardware Found Wizard detects the newly inserted IBM International ISDN PC Card as **ISDN PC Card**.
3. Now insert the CD labeled **IBM International ISDN PC Card Drivers** into your computer CD-ROM drive.
4. The Update Device Driver Wizard prompts you to install the device drivers. Click **Next**.
5. When the Wizard has finished searching for the device drivers, click **Other Locations**, and then click **Browse**.
6. In the Browse for Folder window, select the letter of the CD-ROM drive containing the **IBM International ISDN PC Card Driver CD**. Select the

Win95 directory, then the **DRV** directory and confirm your selection by clicking **OK**.

7. In the **Select Other Location** window, click **OK**.
8. Next, click the **Finish** button in the **Update Device Driver** window.
9. The following message now displays:
Please insert the disk labeled 'IBM International ISDN PC Card Installation Windows 95'
. Click **OK**.
10. Click **OK** to close this window. In the **Copying Files...** window, click the **Browse** button, and in the **Open** window, select the **WIN95** directory and then the **DRV** directory on the CD. Click **OK** twice.
11. The next window enables you to select the installation language. Confirm the default language **English** by clicking **OK** or selecting your language from the list, then clicking **Continue**.
12. In the next window you can specify the installation directory for the device drivers. The default path is **C:\IBM_ISDN**. Click **Continue** to confirm this path, or enter a different path in the **Directory** field.



13. In the next window, select the appropriate D-channel protocol for your ISDN line. For newer ISDN lines in Europe, select **DSS1**, the **Euro-ISDN** protocol. The **NI-1** and **5ESS** are D-channel protocols used in the United States of America. **ITR6** is the older national D-channel protocol for Germany.



Although some older ISDN lines in Germany still use the D-channel protocol 1TR6, DSS1 is generally preferable. The 1TR6 protocol is no longer very common and might be removed from future device driver releases for this adapter.

14. After you have selected the appropriate D-channel protocol, click the **Continue** button.
15. The final window informs you of the resources used by the IBM International ISDN PC Card. Click **Continue** to complete the installation, then connect the ISDN cable.

Your IBM International ISDN PC Card is now ready to use with any CAPI 2.0-compliant software.

NDIS WAN CAPI driver installation in Windows 95

If you have not yet installed the CAPI 2.0-compliant device drivers, please return to the corresponding chapters and install them first.

During installation you might be asked to specify the location of the NDIS WAN CAPI device drivers a second time. In this case, simply enter the path to the device driver source files again.

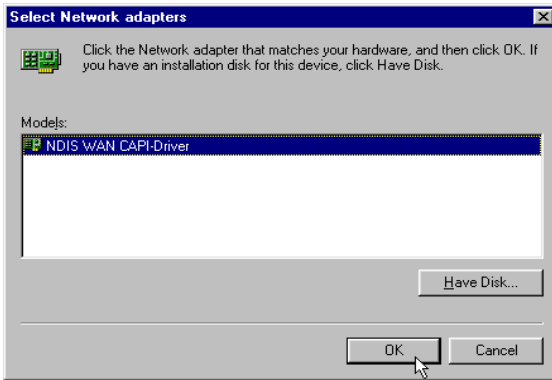
1. Insert the CD labeled **IBM International ISDN PC Card Installation Software** into your computer CD-ROM drive.
2. Click **Start -> Settings -> Control Panel** to open the Control Panel. Double-click the **Network** icon.



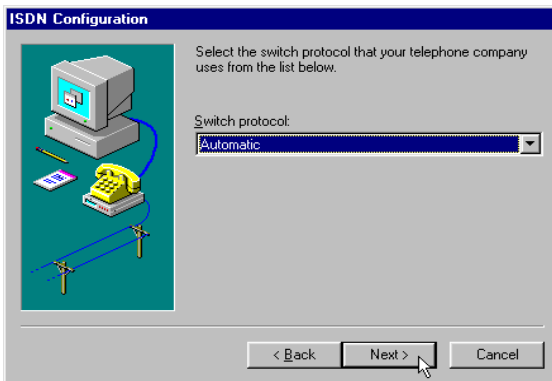
Network

3. In the Network Configuration window, click **Add**.
4. In the Select Network Component Type window, click **Adapter**, then **Add**.

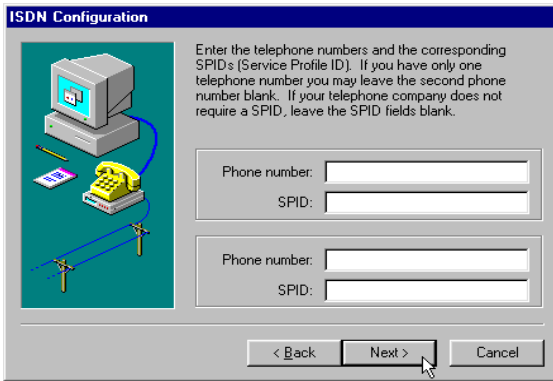
5. In the Select Network Adapters window, click **Have Disk**.
6. In the Install From Disk window, click **Browse**. Select the CD-ROM drive in the Drives list in the Open window, then browse to the path WIN95\NDIS. Click **OK**.
7. Click **OK** to close the Install From Disk, Select Network adapters, and Network windows.



8. Windows 95 now starts the ISDN configuration. Click the **Next** button. Leave the **Switch protocol** selection at **Automatic** and click **Next** again.



9. The next window prompts you to enter two phone numbers and the corresponding SPIDs. The SPID entries are applicable only in the United States of America and Canada. However, even if you are in the United States of America or Canada, SPID entries are not mandatory. Leave these fields blank and click the **Next** button.



10. In the last window, click **Finish**.

11. Restart your computer when prompted to do so.

The NDIS WAN CAPI Device Drivers are now installed. You will also find the guide for the NDIS WAN CAPI Device Drivers as a Windows Help file on your Windows 95 desktop. This guide is available only in English.



5. Installing the device drivers in Windows 98

The device drivers for the IBM International ISDN PC Card are installed in two steps:

1. Install the CAPI 2.0-compliant device drivers
2. Install the NDIS WAN CAPI device drivers

Installing the Dial-Up Networking 1.4 Update for Windows 98

Microsoft has released the Dial-Up Networking 1.4 Update for Windows 98 in two versions:

- Windows 98 First Edition (initial release)
- Windows 98 Second Edition

You can find these updates on the CD in the following directories:

- \EXTRAS\Win98\DUN14\FE for Windows 98 First Edition
- \EXTRAS\Win98\DUN14\SE for Windows 98 Second Edition

The Microsoft Windows 98 Dial-Up Networking 1.4 update can be downloaded from

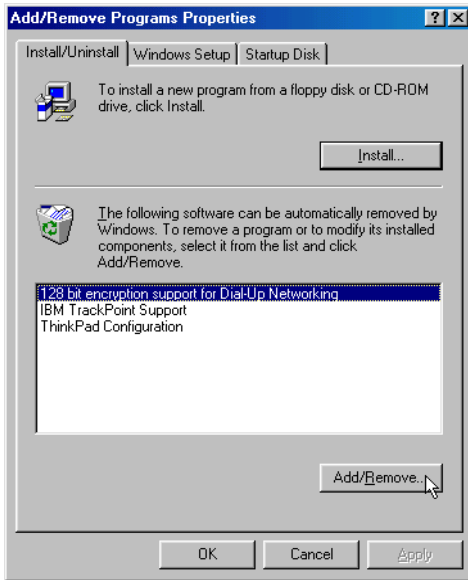
http://www.microsoft.com/windows98/downloads/contents/WURecommended/S_WUNetworking/dun14/Default.asp.

Prior to the release of the Dial-Up Networking 1.4 update, Microsoft released other fixes and updates for Windows 98 Dial-Up Networking. These were:

- 40-bit encryption update for Windows 98 First Edition
- Virtual Private Networking update for Windows 98 First Edition
- 128-bit encryption update for Windows 98 Second Edition

The updates for Windows 98 First Edition cannot be uninstalled.

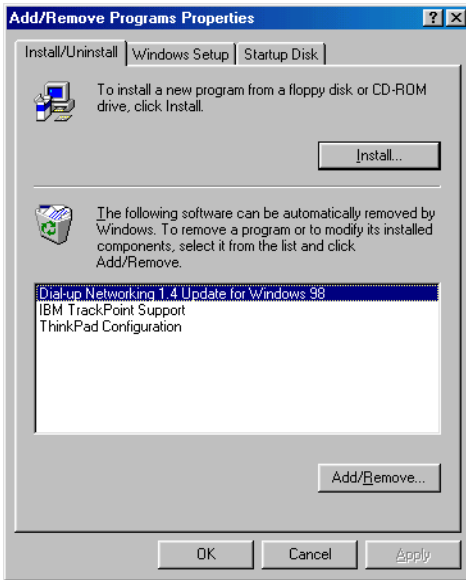
For Windows 98 Second Edition, click **Start -> Settings -> Control Panel** and double-click the **Add/Remove Programs** icon. Click the **Install/Uninstall** tab in the **Add/Remove Properties** and look for the 128-bit encryption update. If it is listed, highlight it and click the **Add/Remove...** button to uninstall it. Reboot your system.



To install the Microsoft Dial-Up Networking 1.4 update to your Windows 98 computer, change to the relevant directory on the CD and launch the program for your Windows 98 language version.

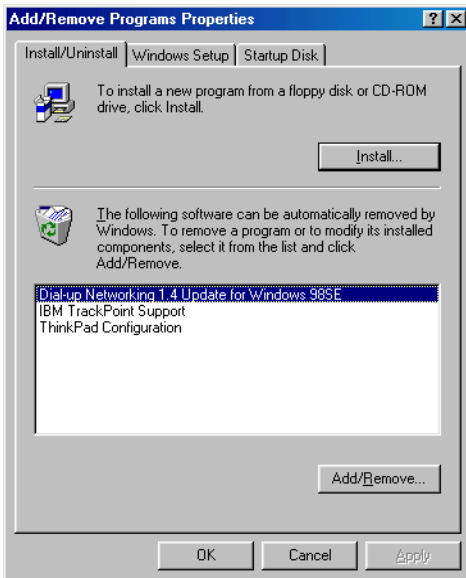
For example, for Windows 98 First Edition, you would launch

dun14-98en.exe



For Windows 98 Second Edition, you would launch

dun14-SEen.exe



For more information on the available language versions of the Microsoft Dial-Up Networking 1.4 update, please read the `_info.txt` file in the relevant directory.

For information on how to install the English version of the Microsoft Dial-Up Networking 1.4 update onto a non-English Windows 98 version, consult Appendix D, “Troubleshooting and frequently asked questions” on page 231

Installing the IBM International ISDN PC Card in Windows 98

The installation for the IBM International ISDN PC Card is the same for both Windows 98 First Edition and Second Edition.

To install the IBM International ISDN PC Card in Windows 98, proceed as follows:

1. Turn off the computer, choose a PCMCIA slot and insert the IBM International ISDN PC Card into the cable attached.
2. Turn the computer back on. The New Hardware Found window opens on screen and reports that it has detected an **ISDN-CARD**.
3. Now insert the CD labeled **IBM International ISDN PC Card Installation Software** into the CD-ROM drive of your computer CD-ROM drive.
4. The Add New Hardware Wizard soon informs you that the system is searching for a device driver for the adapter. Click Next.
5. Accept the default option **Search for the best driver for your device** by simply clicking Next.
6. In the next window, you can indicate where Windows must search for device drivers. By default, the option **Floppy disk drives** is checked. Activate the option **Specify a location**, then click **Browse**. Select the letter of the CD-ROM drive containing the **IBM International ISDN PC Card Drivers** CD, then click the **WIN98** directory, then the **DRV** directory, and confirm your selection by clicking **OK**.
7. Now click the **Next** button to start the device driver installation.

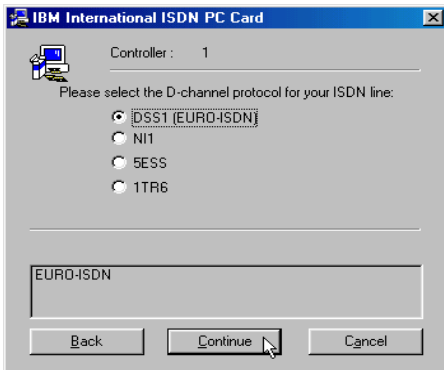


The window that opens informs you that the computer is ready to install the file FPCMSET.INF file for the ISDN PC Card. Click **Next**.

8. When the Add New Hardware Wizard reports that it has finished copying the required software for the IBM International ISDN PC Card, click **Finish**.
9. The next window informs you that the device driver software in English is ready to install. Select your language from the given list and click **Continue**.
10. The IBM International ISDN PC Card Setup program sign-on window opens. Click **Continue**.
11. The following window enables you to select the target directory. The default path is C:\IBM_ISDN, but you can enter any other directory desired in the window. After completing your entries, click **Continue**.



12. In the next window, select the appropriate D-channel protocol for your ISDN line. For newer ISDN lines in Europe, select DSS1, the Euro-ISDN D-channel protocol. NI-1 and 5ESS are D-channel protocols used in the United States of America. 1TR6 is the older national D-channel protocol for Germany.



Although some older ISDN lines in Germany still use the D-channel protocol ITR6, DSS1 is generally preferable. The ITR6 protocol is no longer very common and might be removed from future device driver releases for this adapter.

13. After you have selected the appropriate D-channel protocol, click **Continue**.
14. The final window informs you which resources are used by the IBM International ISDN PC Card. Click **Continue** to complete the installation, then connect the ISDN cable.

Your IBM International ISDN PC Card is now ready to use with any CAPI 2.0-compliant software.

NDIS WAN CAPI driver installation in Windows 98

If you have not yet installed the CAPI 2.0-compliant device drivers, please return to the corresponding chapters and install them first.

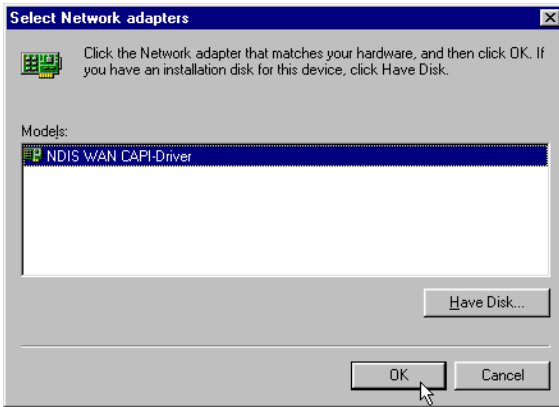
Note: During installation you may be asked to specify the location of the NDIS WAN CAPI drivers a second time. In this case, simply enter the path to the driver source files again.

To install the NDIS WAN CAPI Driver in Windows 98, do the following:

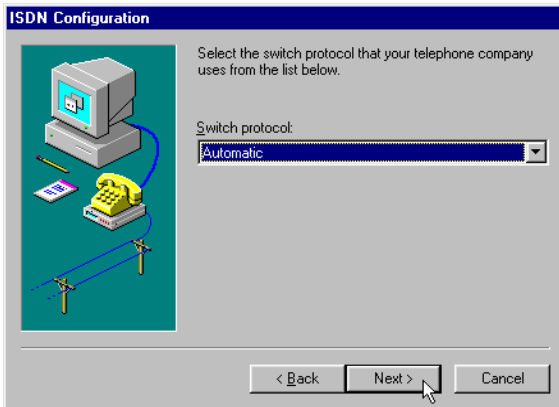
1. Insert the CD labeled "IBM International ISDN PC Card Installation Software" into your computer's CD-ROM drive.
2. Click **Start -> Settings -> Control Panel** to open the Control Panel. Double-click the **Network** icon.



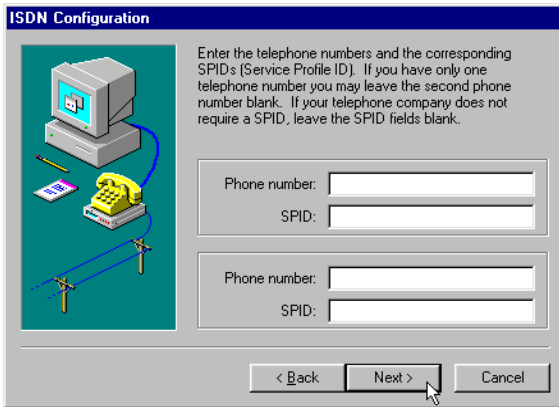
3. In the Network Configuration window, click **Add**.
4. In the Select Network Component Type window, click **Adapter**, then **Add**.
5. In the Select Network Adapters window, click **Have Disk**.
6. In the Install From Disk window, click **Browse**. Select the CD-ROM drive in the **Drives** list in the Open window, then browse to the path **WIN98 \ NDIS**. Click **OK**.
7. Click **OK** to close the Install From Disk, Select Network adapters, and Network dialogs.



- Windows 98 now starts the ISDN Configuration. Click Next button. Leave the Switch protocol selection on Automatic and click Next again.



- The next dialog prompts you for two phone numbers and the corresponding SPIDs. The SPID entries are applicable only in the USA and Canada. However, even if you are in the USA or Canada, SPID entries are not mandatory. Leave these fields blank and click Next.



10. In the last dialog, click **Finish**.

11. Restart your computer when prompted to do so.

The NDIS WAN CAPI Drivers are now installed. You will also find the guide for the NDIS WAN CAPI Drivers as a Windows Help file on your Windows 98 desktop. This guide is only available in English.



6. Installing the device drivers in Windows Me

The device drivers for the IBM International ISDN PC Card are installed in two steps:

1. Install the CAPI 2.0-compliant device drivers
2. Install the NDIS WAN CAPI device drivers

Installing the IBM International ISDN PC Card in Windows Me

To install the IBM International ISDN PC Card in Windows Me, proceed as follows:

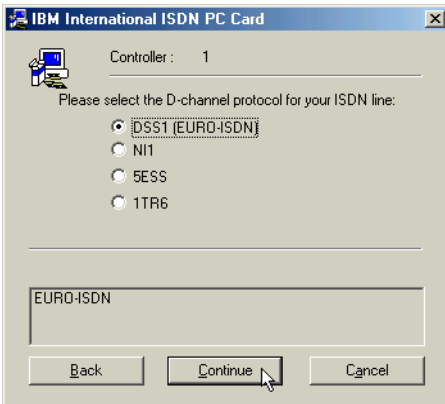
1. Turn off the computer, choose a PCMCIA slot and insert the IBM International ISDN PC Card into this slot without the ISDN cable attached.
2. Turn the computer back on. The New Hardware Wizard opens and reports that it has detected an ISDN-CARD.
3. Now insert the CD labeled **IBM International ISDN PC Card Installation Software** into your computer CD-ROM drive.
4. Since Windows Me cannot find the proper device driver for the adapter automatically, select the option **Specify the location of the driver (Advanced)** in the Add New Hardware window. Then click **Next**.
5. In the next window, click to remove the check mark next to the option **Removable Media (Floppy, CD-ROM,...)**, then click **Browse**. In the Browse for Folder window, select the CD-ROM drive and double-click the directory **WINME** and then the **DRV** directory. Click **Next** to confirm your selection.



6. Now click the **Next** button to start the device driver installation. Windows Me copies a number of files to the hard disk. In the last **Add New Hardware Wizard** window, click **Finish**.
7. The next window informs you that the **New Hardware Wizard** is ready to install the device drivers in English. Select your language from the given list and click **Continue**.
8. The **IBM International ISDN PC Card Setup** program sign-on window opens. Click **Continue**.
9. The following window enables you to select the installation directory. The default installation directory is **C:\IBM_ISDN**, but you can enter any other directory desired in the window. After your entries are complete, click **Continue**.



10. In the next window, select the appropriate D-channel protocol for your ISDN line. For newer ISDN lines in Europe, select **DSS1**, the Euro-ISDN protocol. **NI-1** and **5ESS** are D-channel protocols used in the United States of America. **1TR6** is the older national D-channel protocol for Germany.



Although some older ISDN lines in Germany still use the D-channel protocol ITR6, DSS1 is generally preferable. The ITR6 protocol is no longer very common and might be excluded from future device driver releases for this adapter.

11. After you have selected the appropriate D-channel protocol, click **Continue**.
12. The final window informs you which resources are used by the IBM International ISDN PC Card. Click **Continue** to complete the installation, then connect the ISDN cable.

Your IBM International ISDN PC Card is now ready to use with any CAPI 2.0-compliant software.

NDIS WAN CAPI driver installation in Windows Me

If you have not yet installed the CAPI 2.0-compliant device drivers, please return to the corresponding chapters and install them first.

To install the NDIS WAN CAPI Device Drivers in Windows Me, proceed as follows:

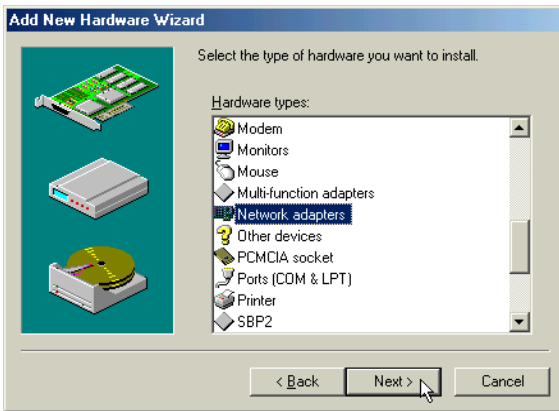
1. Click **Start -> Settings -> Control Panel**, then double-click the **Add New Hardware** icon.



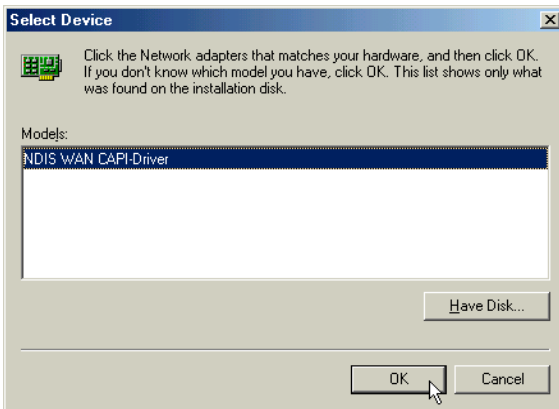
2. In the Add New Hardware window, click **Next** twice. In the next window you are asked if you want Windows to search for new hardware. Select the option **No, I want to select the hardware from a list**, then click **Next**.



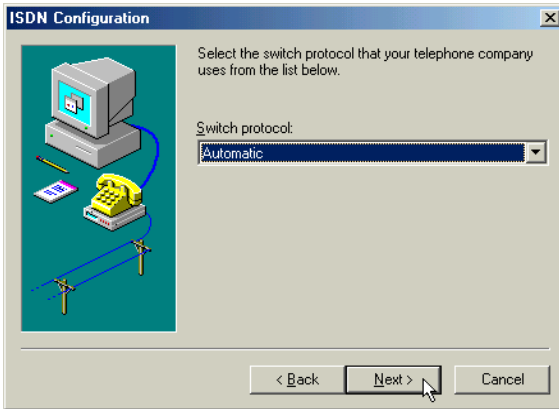
3. In the Hardware types window, select **Network adapters** and click **Next**.



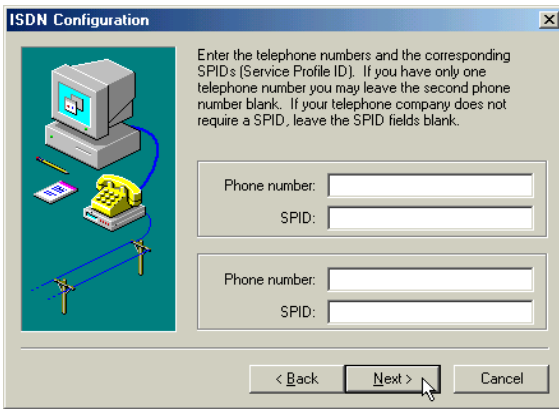
4. In the Select Device window, click **Have Disk**, then in the Install From Disk window, click **Browse**. Browse to the path `WINME\NDIS`. Click **OK**. In the next window, click **OK** again to install the NDIS WAN CAPI Device Driver.



5. In the Add New Hardware window, click **Finish**. Windows Me now starts the ISDN Configuration. Click **Next**. Leave the **Switch protocol** selection at **Automatic** and click **Next** again.



- The next window prompts you to enter two phone numbers and the corresponding SPIDs. The SPID entries are applicable only in the United States of America and Canada. However, even if you are in the USA or Canada, SPID entries are not mandatory. Leave these fields blank and click Next.



- In the last window, click **Finish**.
- Restart your computer when prompted to do so.

The NDIS WAN CAPI Device Drivers are now installed. You will also find the guide for the NDIS WAN CAPI Device Drivers as a Windows Help file on the desktop of your Windows Me computer. This guide is available only in English.



7. Installing the device drivers in Windows NT 4.0

Throughout this chapter it is assumed that you are logged on to the Windows NT 4.0 system as a local Administrator. If you are not logged on as a local Administrator, you might not be able to perform all the steps outlined in this chapter.

The IBM International ISDN PC Card works under Windows NT 4.0 with CardWizard 5.10 or higher installed.

The device drivers for the IBM International ISDN PC Card are installed in two steps:

1. Install the CAPI 2.0-compliant device drivers
2. Install the NDIS WAN CAPI device drivers

The following section provides detailed prerequisites for the device driver installation.

Before you begin

Before you begin installing the IBM International ISDN PC Card in Windows NT, you must have Service Pack 3 or higher installed. To check which Service Pack version is installed on your Windows NT 4.0 operating system, proceed as follows:

1. Click through the menus **Start-> Programs -> Command Prompt**. In the command prompt window, type **WINVER** and press **Return**. A window opens as illustrated below. In the illustration, the About Windows NT window shows that Service Pack 3 is installed.



2. Click **OK** to close this window, then type **EXIT** and press **Return** to close the command prompt window.

Checking the PCMCIA support software for Windows NT 4.0

Some notebook computer manufacturers install PCMCIA support software, such as SystemSoft's CardWizard as part of the Windows NT 4.0 package. IBM includes this program with its ThinkPad notebook computer series. This section briefly describes how to find out what version of CardWizard is installed, and how to remove it from the system if necessary.

Note: The IBM International ISDN PC Card works without SystemSoft's CardWizard installed, or with CardWizard 5.10 or higher.

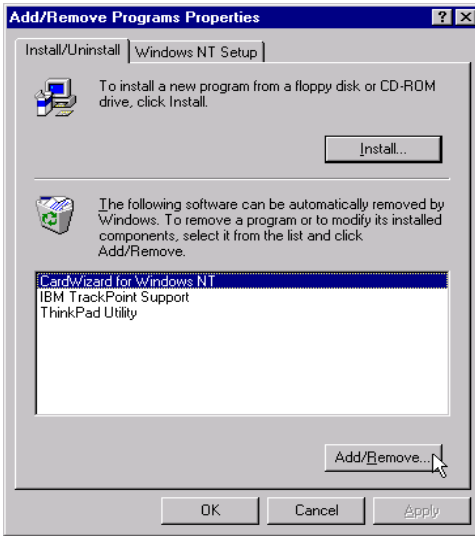
1. Start SystemSoft's CardWizard by clicking **Start -> Programs -> CardWizard** for Windows NT.
2. Once SystemSoft's CardWizard for Windows NT has started, click **Help -> About CardWizard**. This opens a window indicating the version in use. If the version number is lower than 5.10, use the following steps to remove it.

Note: You can download a trial version of CardWizard 5.20 from IBM's PCD support Web page for the IBM International ISDN PC Card or use the trial software supplied on the IBM International ISDN PC Card Installation Software CD in the \EXTRAS\CW52NT directory. For additional information, please refer to "Installing CardWizard 5.20 for Windows NT 4.0 trial version" on page 157.

3. In order to complete a successful removal of SystemSoft's Card Wizard, you must shut down the computer and remove any PCMCIA card plugged into any PCMCIA slot in your computer. To remove the current installation of SystemSoft's Card Wizard, open the Control Panel by clicking **Setting -> Control Panel** in the Start menu, then double-click the **Add/Remove Programs** icon.



4. The first panel of the Add/Remove Programs Properties window contains an entry for **CardWizard for Windows NT**. Select this entry and then click the **Add/Remove...** button.



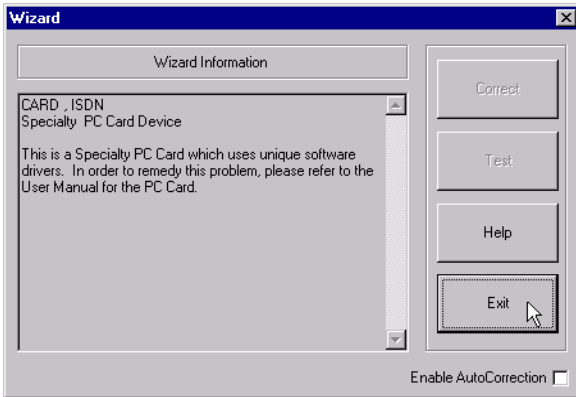
5. In the Confirm File Deletion window, confirm that you want to remove CardWizard for Windows NT by clicking the Yes button. In the next window, confirm that you want to remove all files.
6. After the removal of CardWizard has been completed, you are prompted to restart your system. Click No, since restarting your system at this point might cause problems. Instead, run the current Service Pack installation for your Windows NT 4.0 computer.

After the Service Pack has been installed again, your computer will restart. After the system has restarted, you can install a newer version of SystemSoft's CardWizard for Windows NT or install the device drivers for the IBM International ISDN PC Card.

Installing the IBM International ISDN PC Card in Windows NT 4.0

To install the IBM International ISDN PC Card in Windows NT 4.0, proceed as follows:

1. Turn off the computer, select a PCMCIA slot and insert the IBM International ISDN PC Card into this slot without the ISDN cable attached.
2. Turn your computer back on and insert the CD labeled **IBM International ISDN PC Card Drivers** into your computer CD-ROM drive.
3. If you have SystemSoft's CardWizard 5.10 or higher installed on your notebook computer, the following message might display. Click Exit to close this window and continue the installation as described below.



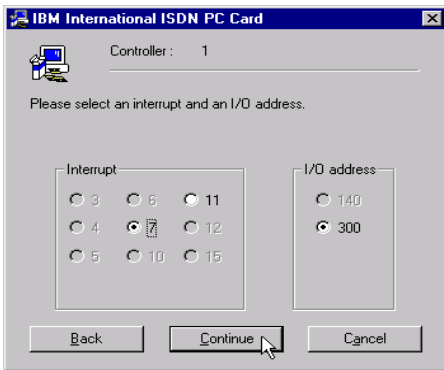
4. Double-click the **My Computer** icon on the Windows NT desktop, then right-click the CD-ROM icon and select in the menu the item **Open**. Double-click to open the **WINNT** folder and then the **DRV** folder. This folder contains an icon called **Setup**. Double-click this icon to start the installation.



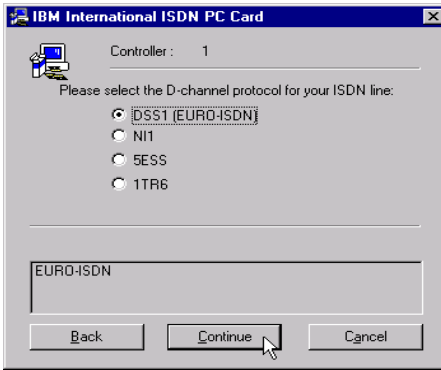
5. The first window enables you to select the installation language. If the highlighted language selected is not the one desired, select the language you prefer and click **Continue**.
6. The next window welcomes you to the installation procedure for the IBM International ISDN PC Card. Click **View Readme now** to read the latest information on the product, or **Continue** to proceed with installation of the CAPI 2.0 device drivers for the IBM International ISDN PC Card.
7. The next window enables you to specify the installation directory for the IBM International ISDN PC Card. The default installation directory is **C:\IBM_ISDN**. Click **Continue** to confirm this directory, or enter any other drive and path name as the installation directory for the device drivers.



- The next panel shows you what resources are available on your computer and how many adapters you have installed. Since Windows NT 4.0 is not a plug-and-play operating system, assigning free resources can be complicated.



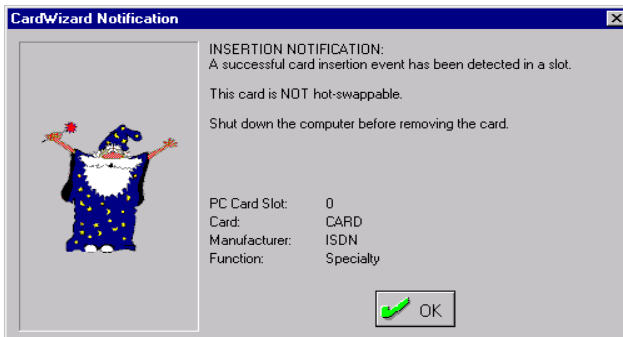
- In the next window, select the appropriate D-channel protocol for your ISDN line. For newer ISDN lines in Europe, select DSS1, the Euro-ISDN D-channel protocol. NI-1 and 5ESS are D-channel protocols used in the United States of America. ITR6 is the older national D-channel protocol for Germany.



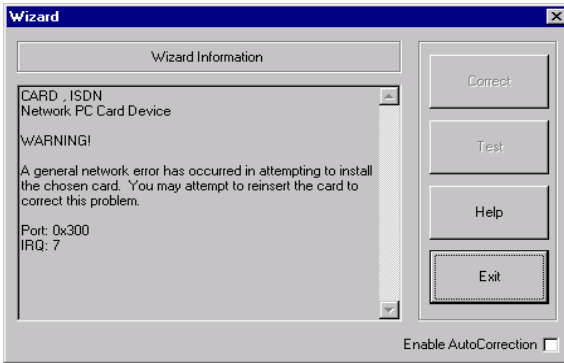
Although some older ISDN lines in Germany still use the D-channel protocol 1TR6, DSS1 is generally preferable. The 1TR6 protocol is no longer very common and might be removed from future device driver releases.

10. After you have selected appropriate D-channel protocol, click **Continue** .
11. The last window displays the selected adapter settings. Click **Continue** to complete the installation.
12. After the installation has been completed, confirm that you want to restart the computer, then connect the ISDN cable.

If you have SystemSoft's CardWizard for Windows NT 5.10 or higher installed, the software notifies you of the card insertion after the computer has restarted.



With version 5.10 and some early version 5.20 releases of SystemSoft's CardWizard, the following warning message displays.



In this case, click **Exit** and select the entry for the adapter marked with a red X. Select the menu command **Actions / Stop**. Remove the adapter from the PCMCIA slot. Open the `\EXTRAS\CW52NT\RegUpd` directory on the IBM International ISDN Pc Card Installation Software CD and select the `IBMISDN.REG` file.



Double-click the file and confirm that you want to update the Windows NT Registry by clicking **OK** when prompted. Now reinsert the adapter. CardWizard should display a message letting you know the ISDN PC card is successfully inserted.

The evaluation version of SystemSoft's CardWizard 5.20 provided on the IBM International ISDN PC Card support Web page does not exhibit this problem.

Your IBM International ISDN PC Card is now ready to use with any CAPI 2.0-compliant application software.

Checking and installing Remote Access Service

To install the NDIS WAN CAPI device drivers, you must have Remote Access Service installed. To check whether Remote Access Service (RAS) is installed on your notebook computer, proceed as follows:

1. Double-click the **My Computer** icon on the Windows NT 4.0 desktop, then double-click **Dial-Up Networking**.



2. If the phone book displays, then RAS is properly installed on your computer and you can continue with the section **Installing the NDIS WAN CAPI**

Drivers. If the phone book does not display, perform the following steps to install RAS on your computer.

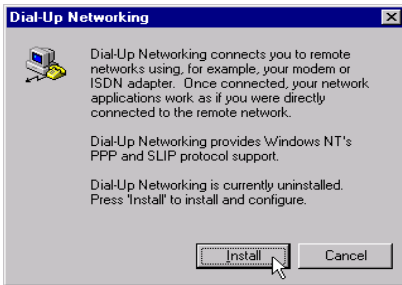


Installing remote access

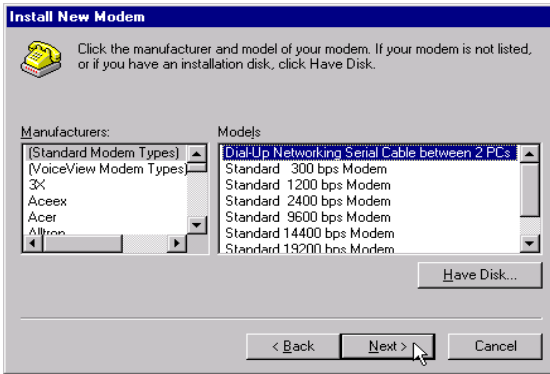
Before you install Remote Access Service, check the documentation for your notebook computer to see whether your system has an integrated analog modem. If so, install the modem device driver according to the instructions in the documentation, or contact the notebook computer manufacturer's technical support.

Also make sure that you have at least one physical COM port available in your Windows NT 4.0 system. Double-click the **Ports** applet in the Control Panel to obtain this information.

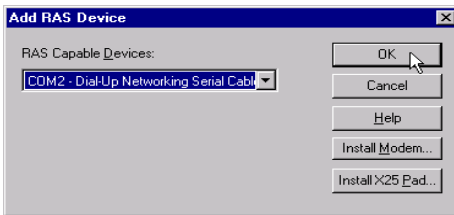
1. Double-click the **My Computer** icon on the Windows NT 4.0 desktop, then double-click **Dial-Up Networking**. If a window opens informing you that Dial-Up Networking is not installed on your computer, then click **Install**.



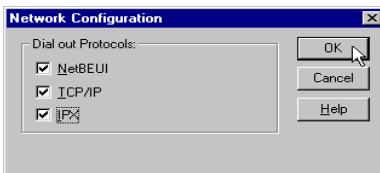
2. The **Files Needed** window prompts you for the source directory of your Windows NT 4.0 Setup files. Type the correct path in the **Copy files from** field, then click **OK**. Windows NT installs the necessary files.
3. After these files have been installed, the RAS setup searches for a RAS-capable device. Click **OK** to start the modem installer.
4. When the modem installer has started, check the option **Don't detect my modem; I will select it from a list**, and click **Next**. If you have an integrated analog modem, then follow the installation instructions provided by your computer manufacturer. Otherwise, select **(Standard Modem Types)** in the list of manufacturers, then **Dial-Up Networking Serial Cable between 2 PCs**, and click **Next**.



5. In the next window you must select a COM port to be assigned to the modem. Select a port and click **Next**. You are then asked to type your location information: the country you are in, the area code, and other details. Fill in the text fields and click **Next**. In the last window, click **Finish**.
6. The Dial-Up Networking installation now displays the Add RAS Device window. In the example illustrated below, the RAS device is the **Dial-Up Networking Serial Cable between 2 PCs** on COM 2. Click **OK**.



7. The selected device is now displayed in the Setup window. Click **Continue**. Remote Access Setup informs you that no networking protocols have been installed. Click **OK**. In the Network Configuration window, select the network protocols you want to use. The TCP/IP protocol is usually sufficient. Click **OK**.



8. Now click **Continue** again. When you are prompted to restart your computer, click **Do Not Restart**. Instead, reinstall the current Service Pack before restarting. This will help you to avoid problems afterwards.

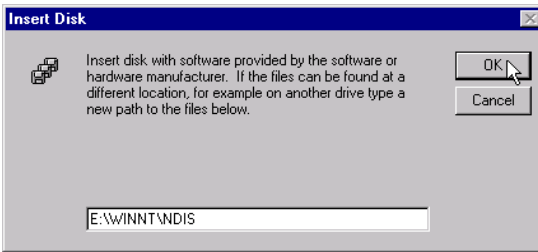
After restarting, your system is ready for the NDIS WAN device driver installation.

Installing the NDIS WAN CAPI drivers

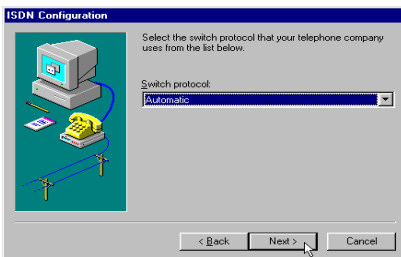
1. Click **Start -> Settings -> Control Panel** and double-click the **Network** icon.



2. Click the **Adapters** tab, then the **Add** button. In the **Select Network Adapter** window, click **Have Disk**. In the **Insert Disk** window, type the complete path to the NDIS device driver location. The NDIS WAN CAPI Drivers are located on the CD in the directory `\WINNT\NDIS`. If your CD-ROM drive has the letter E, for example, enter the path `E:\WINNT\NDIS`. Then click **OK**.

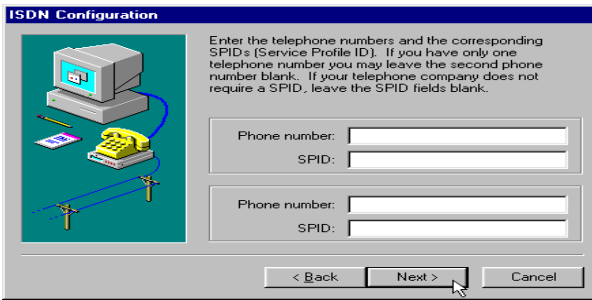


3. Click **OK** again in the **Select OEM Option** window. In the **NDIS WAN CAPI Driver Properties** window you can enter the desired **MSNs (Multiple Subscriber Numbers)** of your ISDN line for each **B-channel**. You might also leave these fields blank for now and click **OK**. You can add an **MSN** setting later.



4. After the **NDIS WAN CAPI Device Driver** installation has completed and you have clicked **OK**, **Setup** starts the **Remote Access Setup** utility. Click **Add** and install the **ISDN1 - CAPIWAN** device by clicking **OK**. Repeat this step again to install the **ISDN2 - CAPIWAN** device.

5. If you have installed the Dial-Up Networking Serial Cable between two computers, you can now remove it from RAS by selecting it in the list and clicking **Remove**.



6. Now click **Continue** to complete the installation. Click **Close** in the Network Control Panel applet window. Restart your computer when prompted to do so.



The installation of the NDIS WAN CAPI Device Drivers has now been successfully completed. On the Windows NT 4.0 Desktop you will find a Help file for the NDIS WAN CAPI Device Drivers. This file is available in English only.



8. Installing the device drivers in Windows 2000

The IBM International ISDN PC Card is fully compatible with Windows 2000 and is listed on the Windows 2000 HCL.



Note: Windows 2000 is the direct successor to Windows NT 4.0 and behaves similarly to its predecessor. However, Windows 2000 is a plug-and-play operating system.

Throughout this chapter it is assumed that you are logged on to a Windows 2000 system as a local Administrator. If you are not logged on as a local Administrator, you might not be able to perform all the steps outlined in this chapter.

Note that the device drivers provided on the CD no longer support the German ISDN D-channel protocol ITR6.

The device drivers for the IBM International ISDN PC Card are installed in one step.

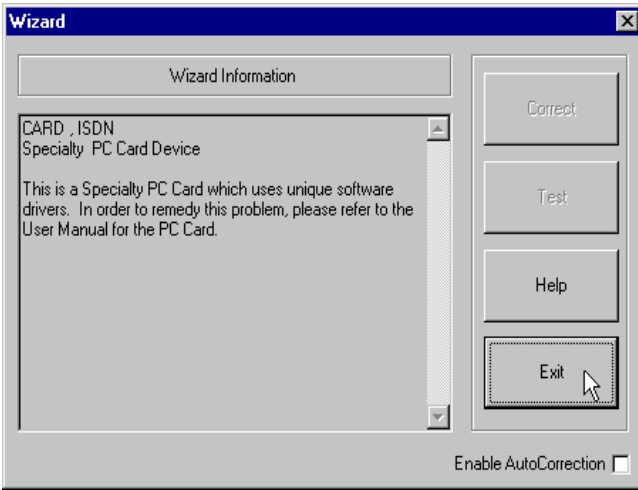
No separate installation is required for the NDIS WAN CAPI Device Driver because it is installed automatically with the CAPI 2.0-compliant device driver.

Installing the device drivers in Windows 2000

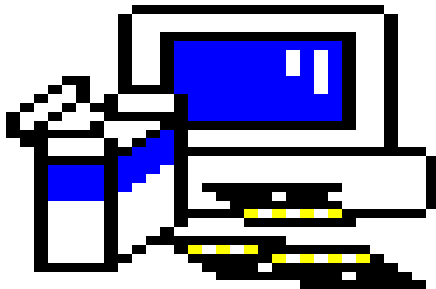
To install the device drivers in Windows 2000, proceed as follows:

1. Turn off the computer, choose a PCMCIA slot and insert the IBM International ISDN PC Card into this slot without the ISDN cable attached.
2. Turn the computer back on. The Found New Hardware window opens and reports that an ISDN CARD was detected.
3. Now insert the CD labeled **IBM International ISDN PC Card Drivers** into your computer CD-ROM drive.
4. The Found New Hardware Wizard now opens. Click the **Next** button to start the device driver installation. The following window informs you that the

Wizard will complete the installation for this device. Make sure that the option **Search for a suitable driver for my device** is activated, then click **Next**.



5. The next window helps you to locate the device drivers for the new adapter. By default Windows 2000 searches the hard disk drive and CD-ROM drives. This might result in Windows 2000 finding the wrong device driver file on the CD. To avoid this situation, deactivate the options **Floppy disk drives** and **CD-ROM drives**, and activate the option **Specify a location**. Click the **Next** button.



Setup

6. Windows 2000 displays a smaller window for the the device driver source. Click the **Browse** button, then double-click the **WIN2000** and afterwards the **DRV** folder on the CD. Select the file **fpcm** and click **Open**.

7. This returns you to the previous window, which now displays the correct source drive and directory. Click **OK**.
8. The Found New Hardware Wizard informs you that appropriate device drivers have been found. Click the **Next** button. Windows 2000 begins the device driver installation.
9. When the ISDN - IBM International ISDN PC Card Setup window opens with the subtitle **ISDN Switch Type or D-channel Protocol**, select the appropriate protocol for your ISDN line. For newer ISDN lines in Europe, select **European ISDN (DSS1)**, the Euro-ISDN D-channel protocol. NI-1 and 5ESS are D-channel protocols used in the United States of America.



10. After you have selected the appropriate D-channel protocol, click the **Next** button. If you selected Euro-ISDN, you can now enter MSNs (Multiple Subscriber Numbers). These numbers are used to identify individual ISDN terminal devices such as telephones and computers. when more than one device is connected to your ISDN line. (Due to an abbreviation error in Windows 2000, the term "Multiple Subscriber Numbers" might have been changed to "Multisubscriber Numbers". Please make your entries in the relevant fields despite this incorrect designation.)
11. The Found New Hardware Wizard informs you when the installation has been completed. Then click **Finish** to conclude the installation.
12. After the installation completes, connect the ISDN cable.

9. Installing the device drivers in Windows XP

Windows XP is the direct successor to Windows 2000 and behaves similarly to its predecessor.

Throughout this chapter it is assumed that you are logged on to a Windows XP Home Edition or Professional system as a local Administrator. If you are not logged on as a local Administrator, you might not be able to perform all the steps outlined in this chapter.

Note that the device drivers provided on the CD no longer support the German ISDN D-channel protocol ITR6.

The device drivers for the IBM International ISDN PC Card are installed in one step: install the CAPI 2.0-compliant device drivers.

No separate installation is required for the NDIS WAN CAPI Device Driver: it is installed automatically with the CAPI 2.0-compliant device driver.

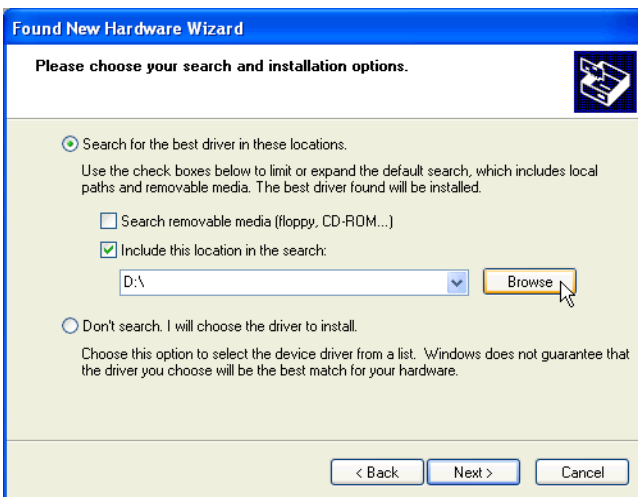
Installing the device drivers in Windows XP

To install the device drivers in Windows XP Home Edition and Professional, proceed as follows:

1. Turn off the computer, select a PCMCIA slot and insert the IBM International ISDN PC Card into this slot without the ISDN cable attached.
2. Turn the computer back on. The Found New Hardware window opens and reports that an ISDN CARD was detected.
3. Now insert the CD labeled **IBM International ISDN PC Card Installation Software** into your computer CD-ROM drive. Then select the option **Install from a list or specific location (Advanced)** and click **Next**.

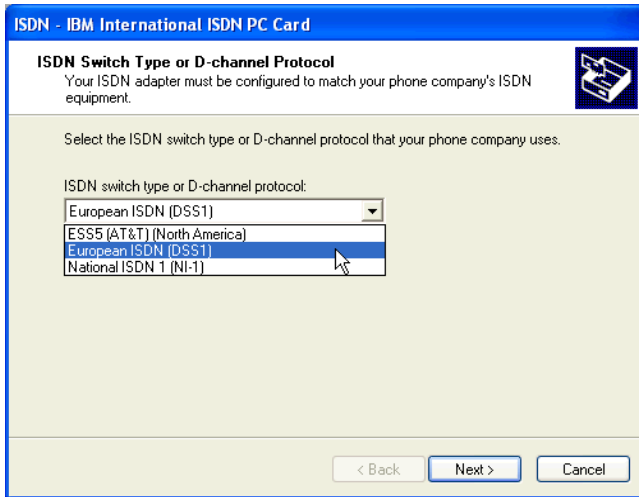


4. In the next window, select the option **Search for the best driver in these locations** and make sure that only the checkbox **Include this location in the search** is selected. Then click **Browse**.



5. In the **Browse For Folder** window, select the **CD-ROM** drive and then double-click the **WINXP** and then the **DRV** directory on the CD-ROM, which contains the Windows XP device drivers. Now click **OK** to close the **Browse For Folder** window, then click **Next**.
6. Windows XP now copies all the necessary device driver files. After Windows XP has finished copying the files, the **D-channel switch protocol selection** window opens. Select the appropriate protocol for your ISDN line. For newer ISDN lines in Europe, select **European ISDN (DSS1)**, the **Euro-ISDN D-**

channel protocol. NI-1 and 5ESS are D-channel protocols used in the United States of America.



7. After you have selected the appropriate D-channel protocol, click the **Next** button. If you selected Euro-ISDN, the MSN (Multiple Subscriber Number) configuration window opens. (Due to an abbreviation error in Windows XP, the term **Multiple Subscriber Numbers** might have been changed to **Multisubscriber Numbers**. Please make your entries in the relevant fields despite this incorrect designation.)

If you selected one of the North American D-channel switching protocols (5ESS or NI-1), the SPID configuration window opens. Type the numbers for your line and click on **Next**.

8. The Found New Hardware Wizard informs you when the installation has been completed. Then click **Finish** to conclude installation.
9. Once the installation completes, connect the ISDN cable.

Your IBM International ISDN PC Card is now ready to use with any CAPI 2.0-compliant application software.

10. Configuration and diagnostics of the IBM International ISDN PC Card

Note: No diagnostics tool is available for Windows 2000 and Windows XP.

This chapter briefly describes how to change the D-channel protocol (also called the switch type), how to change MSNs, and how to diagnose problems with the adapter.

When you travel to another country outside Europe, it might be necessary to change the adapter D-channel protocol, also known as the switch type. The IBM International ISDN PC Card supports the following D-channel protocols:

- Euro-ISDN (DSS1)
- NI-1
- 5ESS

Euro-ISDN is used all over Europe, Australia and New Zealand. NI-1 and 5ESS are North American switch types.

Note: In the United States of America, Canada, Australia, or New Zealand, the IBM International ISDN PC Card cannot be connected directly to the ISDN line. To use this adapter in these countries, an NT1 adapter is required to convert the U interface provided in these countries to the S/T interface used in Europe.

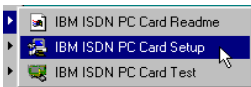
Make sure that you purchase an NT1 adapter with the capability to convert the U interface to a S/T interface.

Changing the switch type in Windows 95, Windows 98, Windows Me, and Windows NT 4.0

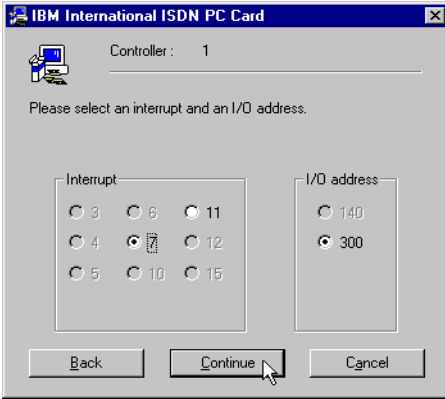
To change the switch type in Windows 95, Windows 98, Windows Me, and Windows NT 4.0, do the following:

Note: If you are using Windows NT 4.0, the following section assumes that you are logged on to a Windows NT 4.0 system as Administrator. If you are not logged on as Administrator, you might not be able to perform all the steps outlined in this chapter.

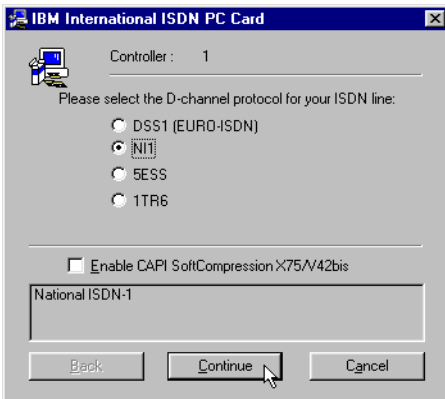
1. Click **Start -> Programs -> IBM ISDN PC Card** and then **IBM ISDN PC Card Setup** to start the configuration tool.



If you are using Windows NT 4.0, the first window enables you to change the system resources used by the adapter (interrupt and I/O address). Change the resources or simply click **Continue**. The next window enables you to select the switch type.

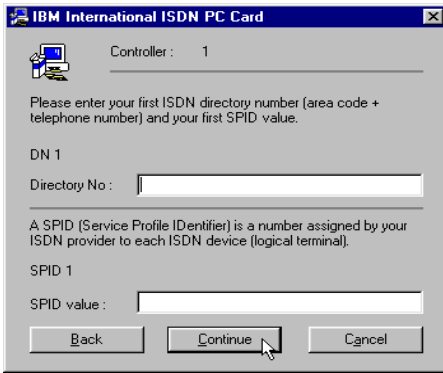


2. Select the desired switch type and then click **Continue**. The next window informs you about the new adapter configuration.



3. Click **Continue** again. To activate the selected switch type you must restart your computer.

Note: If you activated either of the North American switch types NI-1 and 5ESS, two windows open prompting you to enter two directory numbers (DN) and the corresponding service profile identifiers (SPID). This information must be obtained from your ISDN service provider (telephone company).

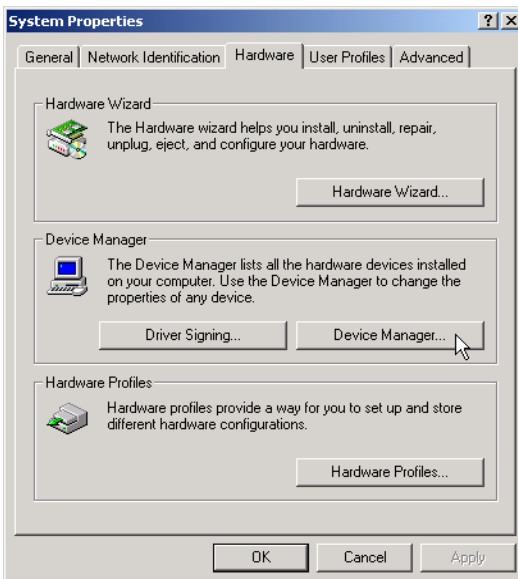


Changing the switch type in Windows 2000

Note: The following section assumes that you are logged on to a Windows 2000 system as Administrator. If you are not logged on as Administrator, you might not be able to perform all the steps outlined in this chapter.

To change the switch type in Windows 2000, do the following:

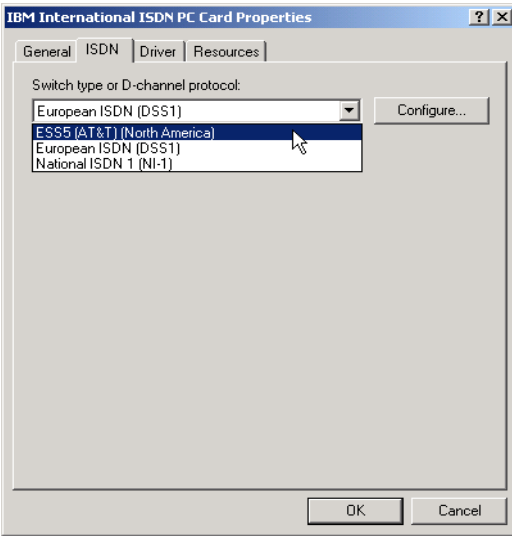
1. Click **Start** -> **Settings** -> **Control Panel** to open the Control Panel. Double-click the **System** icon.
2. Click the **Hardware** tab, then the **Device Manager** button.



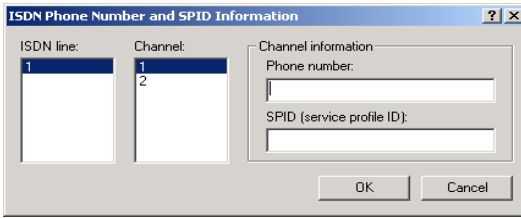
3. Click the plus sign to expand the **Network adapters** node, then right-click **IBM International ISDN PC Card**.
4. In the context menu, click the **Properties** command.



5. In the **IBM International ISDN PC Card Properties**, click the **ISDN** tab, then select the desired switch type.



Note: If you activated either of the North American switch types NI-1 and 5ESS, you must configure the directory numbers and SPIDs separately. Do this by clicking **Configure** in the IBM International ISDN PC Card Properties window (see the illustration above). The following window opens in which you can select the ISDN line and where you enter both the directory number (in the **Phone number** field) and the SPID. When you have done so, click **OK** to save the settings. The directory numbers and SPIDs for your ISDN line must be obtained from your ISDN service provider (telephone company).



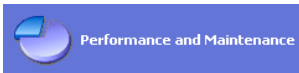
6. Click **OK** and restart the computer.

Changing the switch type in Windows XP

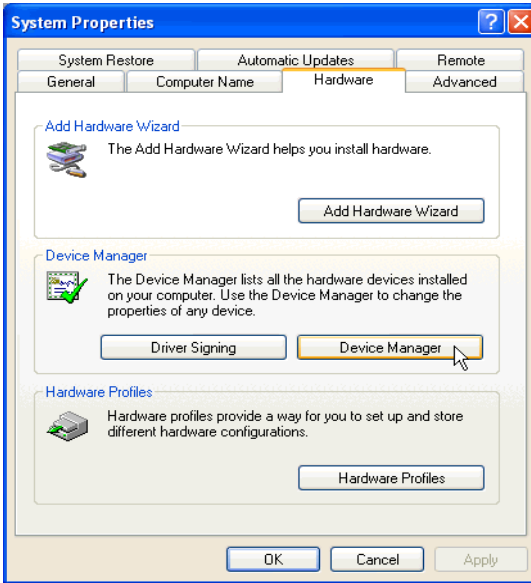
Throughout this chapter it is assumed that you are logged on to a Windows XP Home Edition or Professional system as a local Administrator. If you are not logged on as a local Administrator, you may not be able to perform all the steps outlined in this chapter.

To change the switch type in Windows XP Home Edition and Professional, do the following:

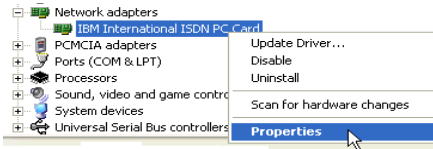
1. Click **Start -> Control Panel** to open the Control Panel.
2. Double-click the icon labeled **Performance and Maintenance**



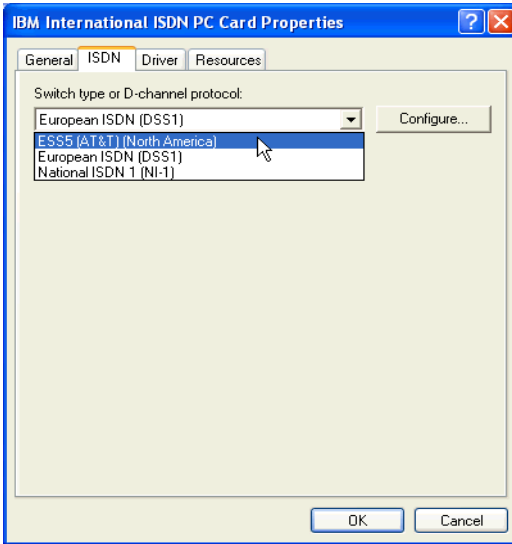
In the window that opens, double-click the **System** icon to open the System Properties. Click the **Hardware** tab, then the **Device Manager** button.



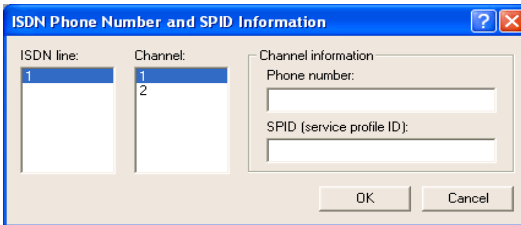
3. Click the plus sign to expand the **Network adapters** node, then right-click **IBM International ISDN PC Card**.
4. In the context menu, click the **Properties** command.



5. In the **IBM International ISDN PC Card Properties**, click the **ISDN** tab, then select the desired switch type.



Note: If you activated either of the North American switch types NI-1 and 5ESS, you must configure the directory numbers and SPIDs separately. Do this by clicking **Configure** in the IBM International ISDN PC Card Properties window (see the illustration above). The following window opens in which you can select the ISDN line and where you type both the directory number (in the **Phone number** field) and the SPID. When you have done so, click **OK** to save the settings. The directory numbers and SPIDs for your ISDN line must be obtained from your ISDN service provider (telephone company).



6. Click **OK** and then restart the computer.

Configuring multiple subscriber numbers (MSNs)

Note: The following section describes how to add or change the configuration of Multiple Subscriber Numbers in the NDIS WAN CAPI device driver. Although MSNs can be configured in the device driver, you should enter MSN settings only in applications that require them. You must have the NDIS CAPI WAN device drivers installed in order to perform the

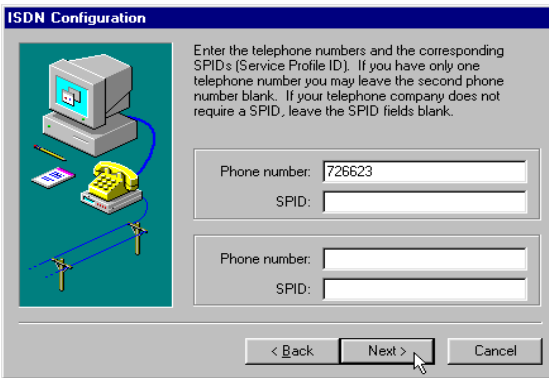
following steps. Note that MSNs are a feature of the Euro-ISDN (DSS1) switch protocol only!

Configuring MSNs in Windows 95, Windows 98, and Windows Me

To configure MSNs in Windows 95, Windows 98, and Windows Me, do the following:

Note: If you are using Windows 95, it is assumed that you have installed the Microsoft Dial-Up Networking 1.3 or 1.4 update on your computer. If not, please refer to 4, “Installing the device drivers in Windows 95” on page 7.

1. Click **Start -> Programs -> Accessories -> Communications** and start the ISDN Configuration Wizard .
2. In the first ISDN Configuration Wizard window, click **Next**. In the next section, leave the **Switch protocol** set to **Automatic** by clicking **Next** again. In the next window, enter an MSN in either or both of the **Phone number** fields. When you have done so, click **Next**.



3. In the last window, click **Finish**. This completes the MSN configuration.

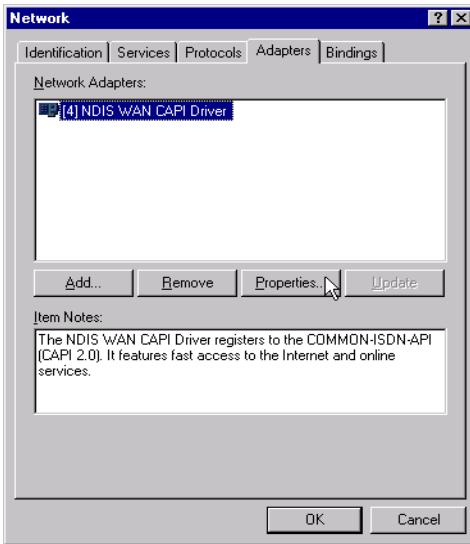
Note: Since the Windows operating systems are a United States software product, the ISDN Configuration Wizard is also tailored to the United States market. When entering an MSN in the Wizard, you can ignore the SPID fields, which are used only in North America. If you encounter any problems with your application software after entering an MSN, remove the MSN settings in the same way as described above, then enter MSN settings in any application software that requires them!

Windows NT

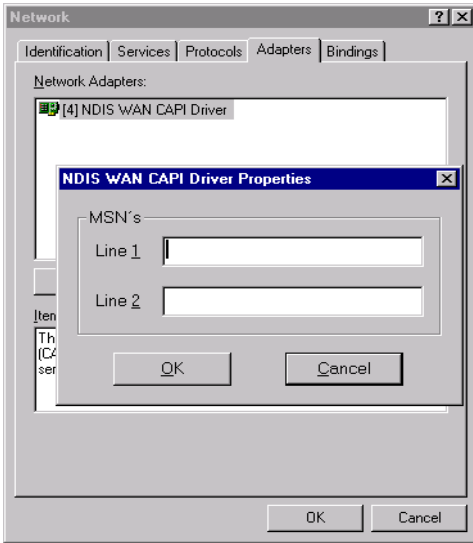
Note: Throughout this chapter it is assumed that you are logged on to a Windows NT 4.0 system as Administrator. If you are not logged on as Administrator, you might not be able to perform all the steps outlined in this chapter.

The following section describes how to add or change the configuration of Multiple Subscriber Numbers in the NDIS WAN CAPI device driver. Although MSNs can be configured in the device driver, you should enter MSN settings only in applications that require them. You must have the NDIS CAPI WAN device drivers installed in order to perform the following steps. Note that MSNs are a feature of the Euro-ISDN (DSS1) switch protocol only!

1. Click **Start -> Settings -> Control Panel**. Double-click the **Network** icon.
2. In the Network Settings window, click the **Adapters** tab, select the **NDIS WAN CAPI Driver**, and then click **Properties**.



3. In the Properties window, type the MSNs for each line and click **OK**, then **Close**.



4. When prompted to restart your computer, click Yes.

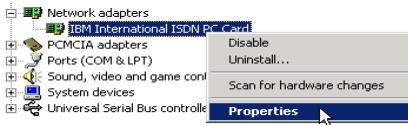
Note: If you encounter any problems with your application software after entering an MSN, remove the MSN settings in the same way as described above, then enter MSN settings in any application software that requires them!

Windows 2000

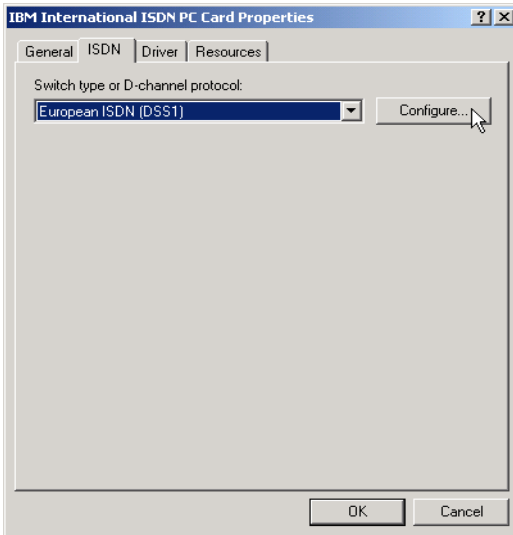
Note: Throughout this chapter it is assumed that you are logged on to a Windows 2000 system as Administrator. If you are not logged on as Administrator, you might not be able to perform all the steps outlined in this chapter.

The following section describes how to add or change the configuration of Multiple Subscriber Numbers in the NDIS WAN CAPI device driver. Although MSNs can be configured in the device driver, you should enter MSN settings only in the applications that require them. You must have the NDIS CAPI WAN device drivers installed in order to perform the following steps. Note that MSNs are a feature of the Euro-ISDN (DSS1) switch protocol only!

1. Click Start -> Settings -> Control Panel. Double-click the System icon. Click the Hardware tab, then the Device Manager button. Click the plus sign to expand the Network adapters node, then right-click the IBM International ISDN PC Card. In the context menu, select the Properties command.



2. In the IBM International ISDN PC Card Properties box, click the ISDN tab, and then the **Configure** button.



3. In the window that opens, enter an MSN in the field above the **Add** button. Click the **Add** button. You can enter more than two MSNs in this window. You should not add more than eight MSNs, however, since the number of MSNs is limited in Euro ISDN.



4. When you have finished, click **OK**.

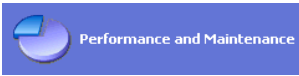
Note: If you encounter any problems with your application software after entering an MSN, remove the MSN settings by selecting each MSN individually in the **Multisubscriber number** list and clicking **Remove**. Then enter MSN settings in any application software that requires them!

Windows XP

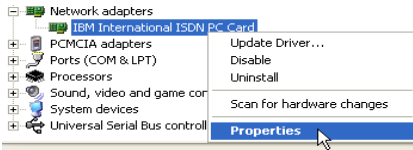
The following section describes how to add or change the configuration of Multiple Subscriber Numbers in the NDIS WAN CAPI driver. Although MSNs can be configured in the driver, it is strongly recommended that you enter MSN settings only in the applications that require them. You must have the NDIS CAPI WAN drivers installed in order to perform the following steps. Note that MSNs are a feature of the Euro ISDN (DSS1) switch protocol only.

Throughout this chapter it is assumed that you are logged on to a Windows XP Home Edition or Professional system as a local Administrator. If you are not logged on as a local Administrator, you might not be able to perform all the steps outlined in this chapter.

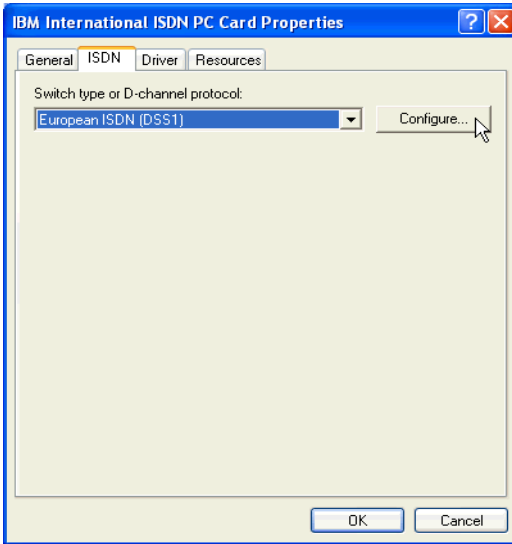
1. Click **Start -> Control Panel**. Double-click the **Performance and Maintenance** icon.



Double-click the **System** icon. In the System Properties, click the **Hardware** tab, then the **Device Manager** button. In the list of devices, scroll down to **Network adapters** and click the plus sign beside it to expand the node. Right-click **IBM International ISDN PC Card**. In the context menu, select the **Properties** command.



2. In the IBM International ISDN PC Card Properties, click the **ISDN** tab, then the **Configure...** button.



3. In the window that opens, type an MSN in the field above the Add button. Click the Add button. You can type more than two MSNs in this window. You should not add more than eight MSNs, however, since the number of MSNs is limited in Euro ISDN.



4. When you have finished, click OK.

If you encounter any problems with your application software after entering an MSN, remove the MSN settings by selecting each MSN individually in the **Multisubscriber number** list and clicking **Remove**. Then enter MSN settings in any application software that requires them!

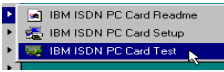
Running the diagnostics in Windows 95, Windows 98, Windows Me, and Windows NT

Note: If you are using Windows NT 4.0, the following section assumes that you are logged on to a Windows NT 4.0 system as Administrator. If you are not logged on as Administrator, you might not be able to perform all the steps outlined in this chapter.

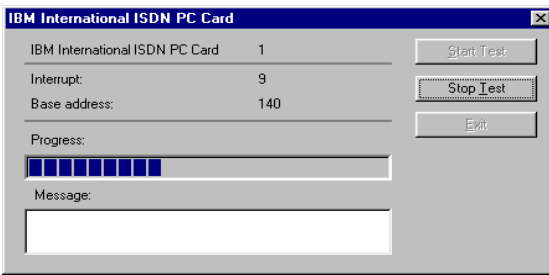
Note: There is no diagnostics tool available for Windows 2000 Professional or Windows XP!

To run the diagnostics in Windows 95, Windows 98, Windows NT, or Windows Me, perform the following steps:

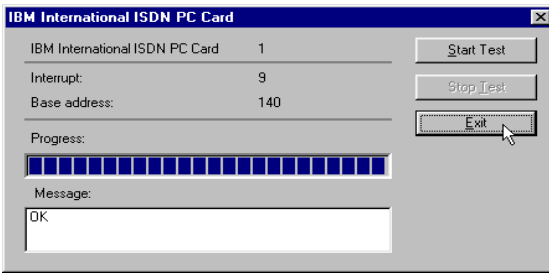
1. Click **Start** -> **Programs** -> **ISDN PC Card**, then click **ISDN PC Card Test**. If you are using Windows 95, Windows 98, or Windows Me, a message informs you that CAPI will no longer be available after testing until you restart your computer. This is not the case in Windows NT 4.0, since services can automatically be restarted without restarting the system.



2. Click **Yes** perform the diagnostic tests.



3. The diagnostics program then reports that the tests were completed. Click **OK** again.
4. Click **Exit** to close the diagnostics program.



Windows 95, Windows 98, and Windows Me users must complete the following steps in order to restart the IBM International ISDN PC Card's CAPI 2.0 device driver.

5. A message informs you that CAPI is no longer available. Click **OK**.
6. To reactivate CAPI, confirm that you want to restart your computer by clicking **Yes**.

11. Implementations of the IBM International ISDN PC Card

This chapter contains instructions for using the IBM International ISDN PC Card with certain software products.

This chapter only outlines briefly how to use certain software products together with the IBM International ISDN PC Card. It cannot cover all possible situations. If you encounter problems of any kind, you should also consult the software product's manual.

You may notice that some of the screen shots in this chapter do not exactly match the windows displayed on your screen. This may be due to minor differences between Windows 95 and Windows 98, for example. The screen shots included here are only intended to illustrate the basic principles of the setup procedures.

This chapter is provided for your convenience only. It provides some examples of how to use the IBM International ISDN PC Card with certain software. IBM will not provide any assistance for this chapter, nor will IBM accept any responsibility for damages or losses of any kind related to the use of this chapter.

If not otherwise stated, the examples cover all versions of the Windows operating system: Windows 95, Windows 98, Windows Me, Windows NT 4.0 Workstation, Windows 2000, and Windows XP.

Installing cFos

To use the IBM International ISDN PC Card with application software that is not CAPI 2.0-compliant, IBM recommends that you download, purchase and use cFos. For further assistance with cFos, please see one of the following web pages:

URL	Page Content
http://www.cfos.com	cFos main entry page
http://www.cfos.com/index2.html	cFos home page in German
http://www.cfos.com/index2_e.html	cFos home page in English

Introduction: What is cFos?

If you have successfully installed the CAPI 2.0-compliant drivers for the IBM International ISDN PC Card, your system is now equipped with the CAPI 2.0 interface. This means you can use CAPI 2.0-compliant ISDN communications software directly, such as AVM's FRITZ!, Symantec's WinFax PRO 9.0, PC

Anywhere 9.x, and many others. A list of CAPI 2.0-compliant software products can be found in the World Wide Web at

<http://www.capi.org/cgi/sinfo.pl>

However, many programs are not CAPI 2.0-compliant, including AOL 5.0, the CompuServe 4.0 dialer and other applications. By installing cFos you can equip your computer with a set of drivers that simulate analog modems, but communicate over the digital ISDN line. In other words, cFos installs a set of virtual modems which allow you to use practically any software designed to communicate with a modem.

In principle, cFos inserts an additional layer between the application you use and the CAPI 2.0 interface. It interprets the modem communication program's AT commands and converts them into CAPI 2.0-compliant API calls, thus allowing software which was not designed for ISDN communication to use your ISDN line.

Note: Using cFos does not guarantee that your non-CAPI compliant software will work with the IBM International ISDN PC Card. If this is the case, please consult the User's Guide for your software or your software support.

The CAPI 2.0 interface is not restricted to Europe – it works all over the world.

Prerequisites for the cFos installation and additional tips

Before you can install cFos, the device drivers for the IBM International ISDN PC Card must be installed in your system. Please read the corresponding chapters in this User's Guide to install the device drivers for the IBM International ISDN PC Card.

Tips

1. The following installation sections contain instructions for installing cFos. In the cFos Setup program, you may find that almost all COM ports have been selected by default. When configuring these settings, observe the following:
 - Avoid selecting COM1 and COM2 if possible. Selecting these ports may cause conflicts. The safest method is to select only COM ports above COM4, unless your application program only supports COM1 to COM4. If this is the case, try to use either COM4 (recommended) or COM3 (if you have no alternative).
 - Activating all COM ports will consume a considerable amount of system memory. Try to use cFos with only as many COM ports as you actually need. No more than two or three COM ports are recommended.
 - Using cFos with all the available COM ports results in a very large status window.
 - If you use both an analog modem and the IBM International ISDN PC Card, and you have selected all COM ports in the cFos Setup—that is, COM1 to COM9 are all configured for use by cFos—then your analog modem may be assigned the next free COM port available, such as COM10. It is strongly recommended that you install the analog modem

first and assign it a free COM port between COM1 and COM4. Then install the IBM International ISDN PC Card, followed by cFos.

- You may be able to assign two different cFos modem emulations the same COM port—assigning both “cFos ISDN, FAX via CAPI” and “cFos ISDN, Internet, Sync PPP over HDLC” to COM5 for example—and then use the two virtual modems in alternation.

This practice is not recommended, however, since it may cause problems in cFos. If possible, avoid configurations with shared COM ports!

2. When using SystemSoft's CardWizard under Windows 95, the CardWizard software may not be able to detect the IBM International ISDN PC Card properly. Removing and reinserting the ISDN PC Card allows CardWizard to detect it. However, this may result in cFos becoming unavailable. For this reason it is therefore strongly recommended that you remove SystemSoft's CardWizard from your system before installing the IBM International ISDN PC Card.
3. During the installation you may enter an MSN, although this is not required. However, if your ISDN line is a PBX extension, cFos may be unable to dial. In this case, reconfigure cFos to use an MSN. This problem is due to a limitation of some currently available ISDN PBX systems.
4. In all versions of Windows, the cFos installer also automatically installs the modem emulations “cFos ISDN, Internet, Sync PPP over HDLC” and the “cFos ISDN, Internet, add. Sync PPP over HDLC” by default. Select at least two COM ports during the cFos installation.
5. You may find that some software applications install a set of drivers called the CAPI Port Driver. The CAPI Port Driver is similar to cFos, but offers fewer functions and features. This is not a problem: cFos and the CAPI Port Driver can coexist on a Windows computer.

Installing cFos in Windows 95, Windows 98, and Windows Me

IBM recommends to download, buy, and use the latest cFos version or use the one provided on the CD for the IBM International ISDN PC Card for use with non-CAPI 2.0 compliant software. For further assistance with cFos, see one of the following Web sites:

URL	Page Content
http://www.cfos.com	cFos main entry page
http://www.cfos.com/index2.html	cFos home page in German
http://www.cfos.com/index2_e.html	cFos home page in English

Notes:

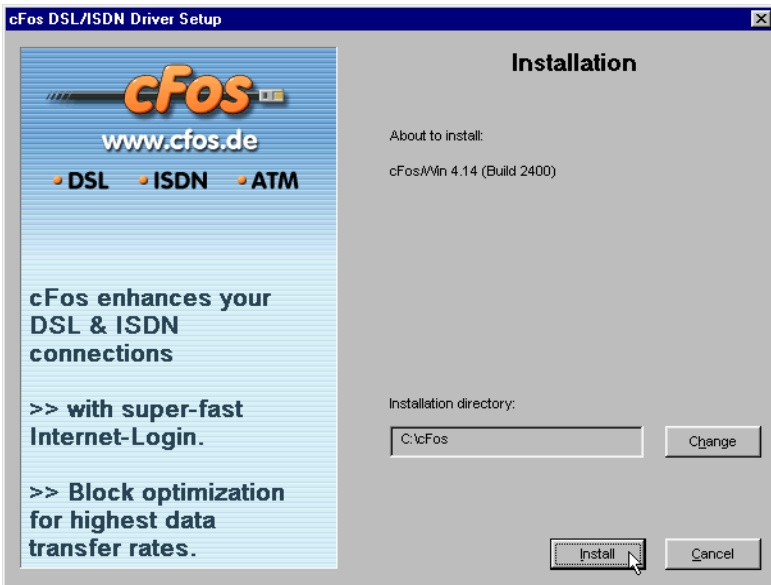
1. Before installing the cFos drivers please read “Prerequisites for the cFos installation and additional tips” on page 68 .
2. If you plan to only use CompuServe 2000 on your system you may not need to install cFos at all. For further information please see “Using CompuServe” on page 104.

To install cFos on Windows 98, Windows 95, and Windows Me, do the following:

1. On the CD you will find version 4.14 of cFos in the directory \EXTRAS\cFos\Win9X. Alternatively you can download the latest package from <http://www.cfos.com>. Double click on the cfos-win9x-me-v414.exe icon in order to launch the cFos setup program.



2. If you install cFos completely new the first dialog box will inform you that it is about to install cFos. Click **Install**. Click **Change** if you want to have cFos installed in a directory other than C:\cFos.



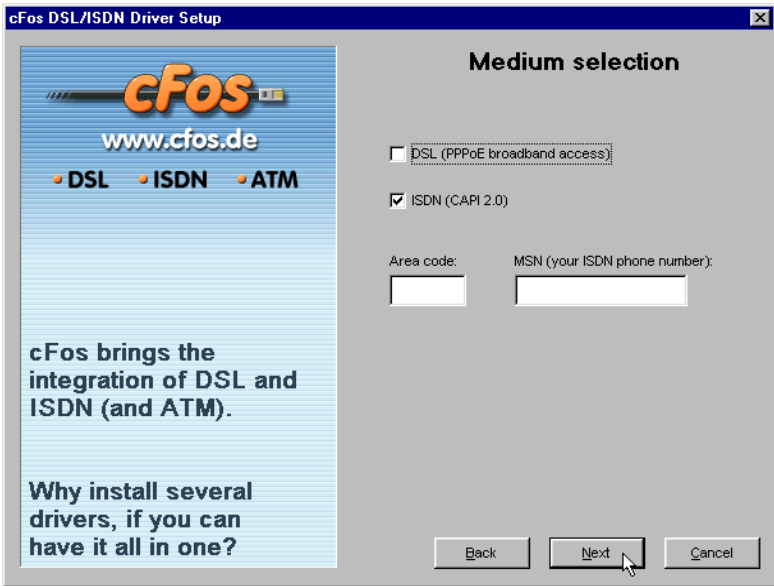
Note: The license agreement is presented in both German and English.

3. Read now the program license information which is presented in both German and English. If you agree to the terms and conditions of usage tick the box to the left of I agree and click Next.

- Next you can select the communication media. By default, the items **DSL (PPPoE broadband access)** and **ISDN (CAPI 2.0)** are selected. The DSL feature works anywhere in the world, provided that you are using a PPPoE-controlled DSL modem. If you do not have an ADSL/ISDN connection, then this feature is not applicable, and you must untick the box to the left of **DSL (PPPoE broadband access)**. For further assistance with this additional feature, please contact the cFos support team.

If you are using the IBM International ISDN PC Card with the Euro-ISDN D-channel protocol, you can also enter an MSN, if desired. However, you can leave the relevant fields blank.

Note: For optimal performance, leave the MSN field blank and set the MSN to use in your application software, if possible.



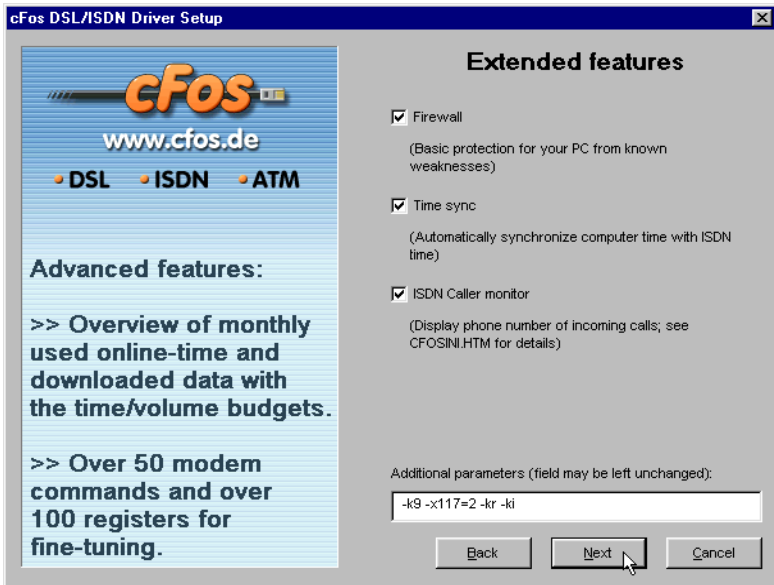
- The next dialog allows you to select available COM ports for use with cFos. Select the ports you want to use.
- The extended features dialog box allows you to install a basic firewall, time synchronisation with the ISDN network, and an ISDN caller monitor. Untick any feature that you do not want to have installed on the system.

The following parameters should be used during the installation of cFos:

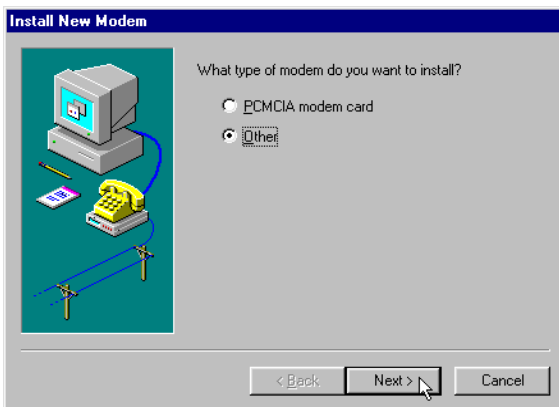
- ki
- kr

The above information was obtained from the cFos support team.

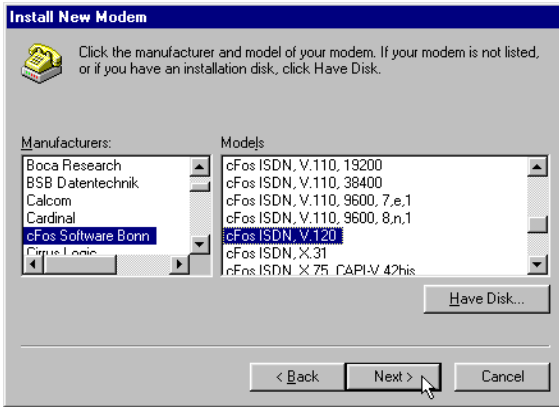
Click Next to continue with the installation of cFos.



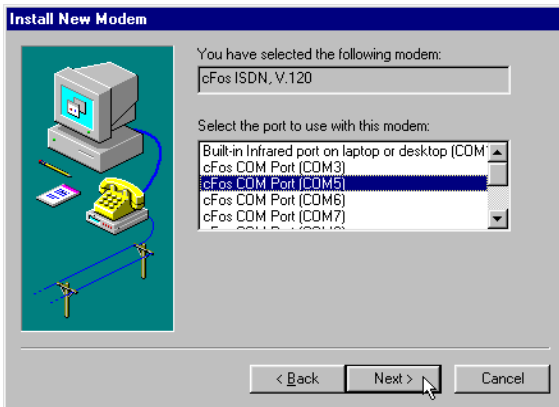
7. The installer is now ready to proceed with the installation. Click **Install**. In the next window you can choose if you want to set up an internet connection with cFos and if you want to block your ISDN card from dialling certain phone numbers. Make your selection and click on **OK**.
8. If you want to add another analog over ISDN modem for the IBM International ISDN PC Card click through **Start -> Settings -> Control Panel** and double-click on the **Modems** icon. Once the Modems Properties window is open click **Add**. In the next window, select that you do not want to install a PCMCIA modem.



9. In the Install New Modem dialog box select **Don't detect my modem; I will select it from a list** and click **Next**. In the Manufacturers window, select **cFos Software Bonn** and the modem emulation you wish to use.



10. In the next window select the cFos COM port you wish to use.



Note: Some software packages require a COM port between 1 and 4. Be careful when selecting the emulated COM port!

Now click **Next**. If you have not provided Windows with any dialing information, you may now get the Location Information window in which you enter all relevant dialing details. Complete them accordingly and then click **Finish** once you are back in the Install New Modem window. In the modem properties window, click **Close** if you have chosen all modem emulations you want to use. If you have not, repeat the relevant sections of steps 8 through 10 again and click **Close** when you are done.

You are now ready to use cFos together with the IBM International ISDN PC Card.

Installing cFos in Windows NT 4.

Throughout this section it is assumed that you are logged on to the Windows NT 4.0 Workstation system as Administrator. If you are not logged on as Administrator, you may not be able to perform all the steps outlined in this chapter.

To use the IBM International ISDN PC Card with application software that is not CAPI 2.0-compliant, IBM recommends that you download, purchase and use cFos. For further assistance with cFos, see one of the following Web sites:

URL	Page Content
http://www.cfos.com	cFos main entry page
http://www.cfos.com/index2.html	cFos home page in German
http://www.cfos.com/index2_e.html	cFos home page in English

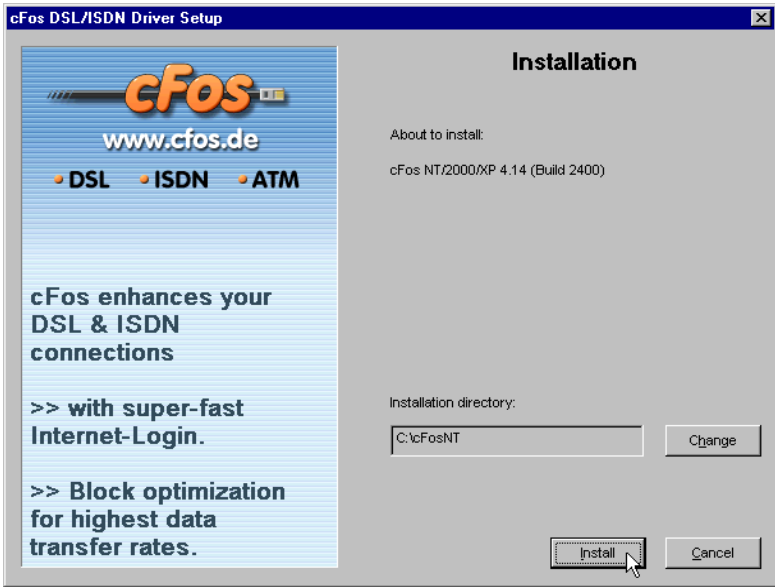
Note: Before installing the cFos drivers, please read “Prerequisites for the cFos installation and additional tips” on page 68 .

To install cFos in Windows NT 4.0, do the following:

1. On the CD you will find version 4.14 of cFos in the directory \EXTRAS\cFos\NT4W2K. Alternatively you can download the latest package from <http://www.cfos.com>. Double-click on the cfos-nt-2000-xp-v414.exe icon in order to launch the cFos setup program.



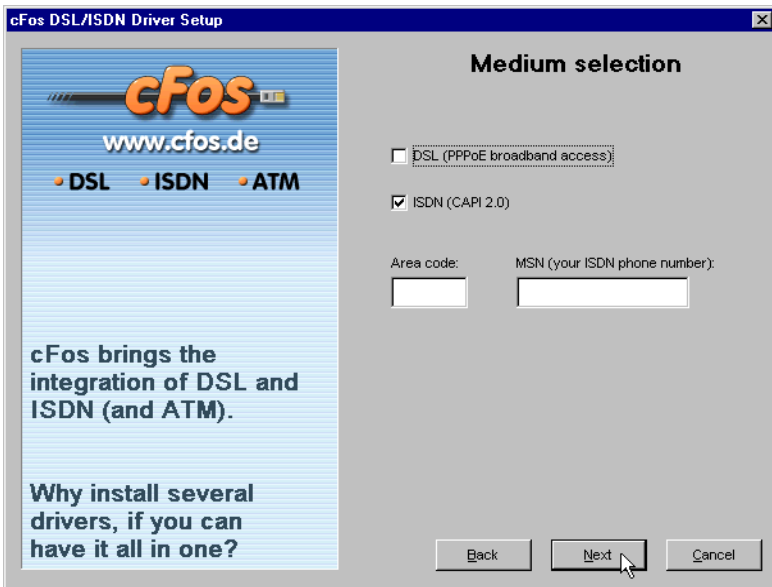
2. If you install cFos completely new the first dialog box will inform you that it is about to install cFos. Click on the **Install** button. Click on the **Change** button if you want to have cFos installed in a directory other than C:\cFosNT.



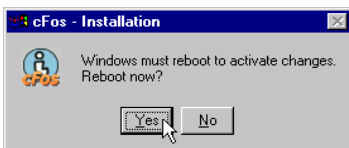
3. Read now the program license information which is presented in both German and English. If you agree to the terms and conditions of usage tick the box left to **I agree** and click then on the **Next** button.
4. Next you can select the communication media. By default, the items "DSL (PPPoE broadband access)" and "ISDN (CAPI 2.0)" are selected. The DSL feature works anywhere in the world, provided that you are using a PPPoE-controlled DSL modem. If you do not have an ADSL/ISDN connection, then this feature is not applicable, and you must untick the box left to "DSL (PPPoE broadband access)". For further assistance with this additional feature, please contact the cFos support team.

If you are using the IBM International ISDN PC Card with the Euro-ISDN D-channel protocol you can also enter an MSN, if desired. However you can leave the relevant fields blank.

Note: For optimal performance, leave the MSN field blank and set the MSN to use in your application software, if possible.

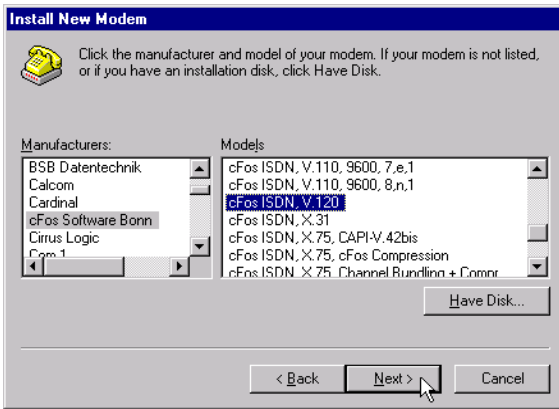


5. The next dialog allows you to select available COM ports for use with cFos. Select the ports you want to use and then click on the "Next" button.
6. The extended features dialog box allows you to install a basic firewall, time synchronisation with the ISDN network, and an ISDN caller monitor. Untick any feature that you do not want to have installed on the system. Click on the Next button in order to continue with the installation of cFos.
7. The installer is now ready to proceed with the installation. Click on **Install**. In the next window you can choose if you want to set up an internet connection with cFos and if you want to block your ISDN card from dialling certain phone numbers. Make your selection and click on **OK**. Once the installation is complete you will be asked to reboot your computer. Click on **OK** in order to restart your system.



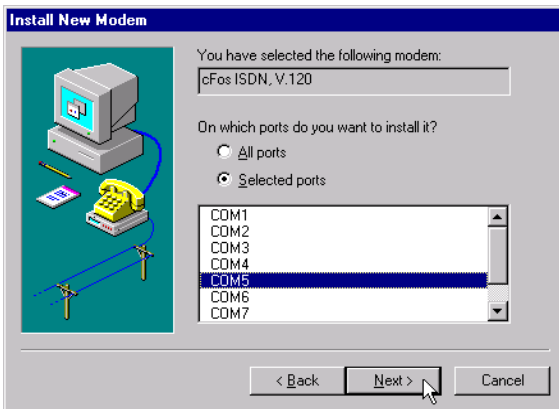
8. After the reboot click through **Start -> Settings -> Control Panel** if you want to add another analog over ISDN modem for the IBM International ISDN PC Card. Double-click on the **Modems** icon to open the Modem Properties window. Click **Add...** to install the cFos emulated modems. In the next window, tick the box to the left of **Don't detect my modem; I will select it**

from a list and click Next button. In the Manufacturers window, select cFos Software Bonn and the modem emulation you wish to use.

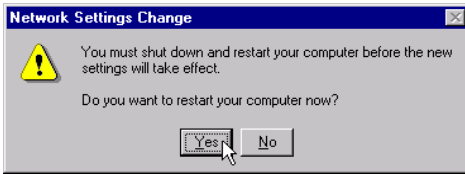


- In the next window, select the COM port you wish to use and click Next and then click Finish.

Note: Some software packages require a COM port between 1 and 4. Be careful when selecting the COM port. Selecting a wrong COM port may cause sever problems.



- Back in the modem properties window click Close if you have chosen all modem emulations you want to use. Otherwise, repeat the relevant sections of steps 8 and 9 again and click Close when you are done.
- Now the Dial-up Networking needs to be reconfigured. Click on Yes in order to launch the Remote Access Setup. Click Add... button. In the Add RAS Device window, click on OK. Repeat the add procedure until there are no devices that can be added. Click Continue in the Remote Access Setup and confirm that you want to reboot your computer by clicking Yes.



When your computer has restarted you are ready to use cFos together with the IBM International ISDN PC Card.

Installing cFos in Windows 2000

Throughout this section it is assumed that you are logged on to the Windows 2000 Professional system as Administrator. If you are not logged on as Administrator, you may not be able to perform all the steps outlined in this chapter.

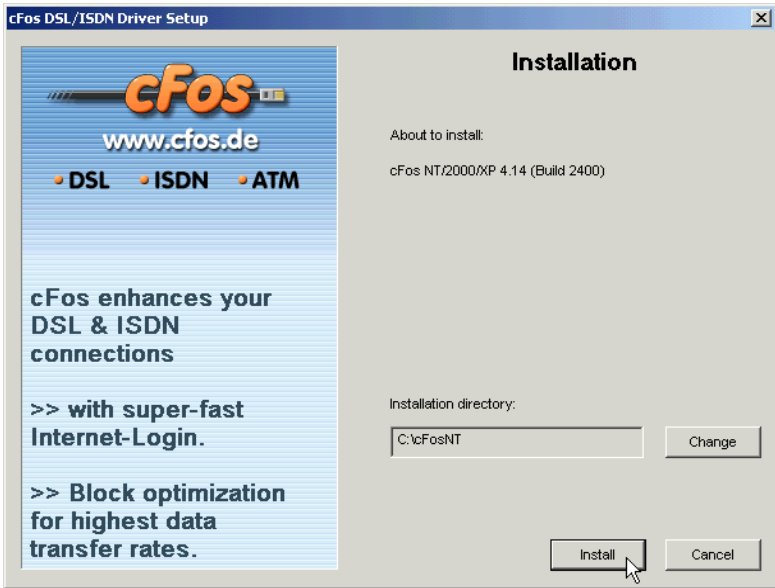
To use the IBM International ISDN PC Card with application software that is not CAPI 2.0-compliant, IBM recommends that you download, purchase and use cFos. For further assistance with cFos, see one of the following Web sites:

URL	Page Content
http://www.cfos.com	cFos main entry page
http://www.cfos.com/index2.html	cFos home page in German
http://www.cfos.com/index2_e.htm	cFos home page in English

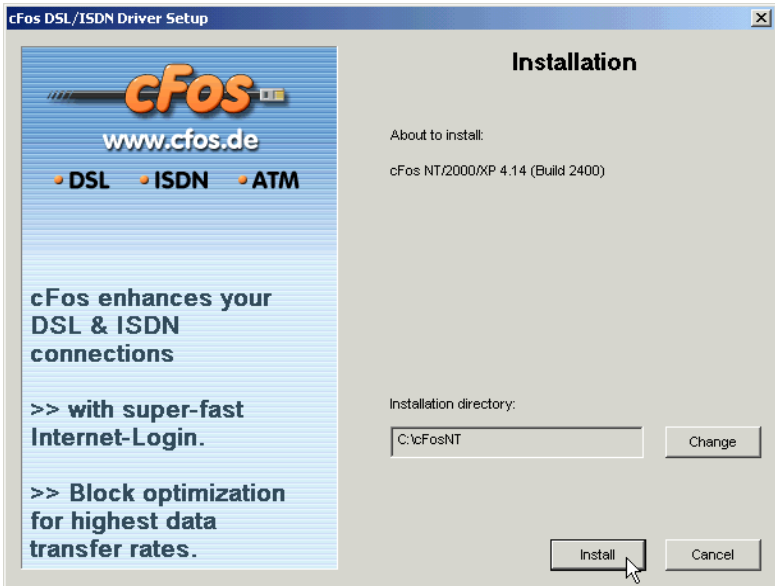
Note: Before installing the cFos drivers, please read “Prerequisites for the cFos installation and additional tips” on page 68 .

To install cFos in Windows 2000, do the following:

1. On the CD you will find version 4.14 of cFos in the directory \EXTRAS\cFos\NT4W2K. Alternatively you can download the latest package from <http://www.cfos.com>. Double-click on the cfos-nt-2000-xp-v414.exe icon in order to launch the cFos setup program.



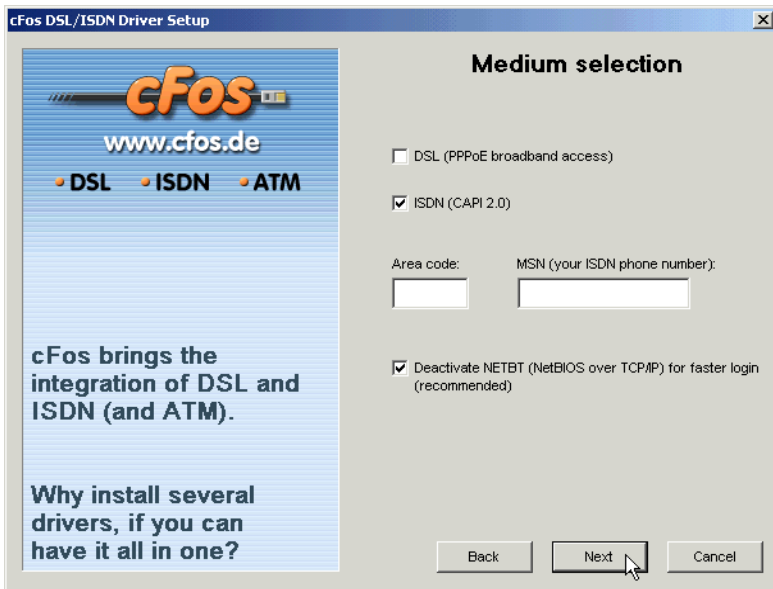
2. If you install cFos completely new the first dialog box will inform you that it is about to install cFos. Click **Install**. Click **Change** if you want to have cFos installed in a directory other than C:\cFosNT.



3. Read now the program license information which is presented in both German and English. If you agree to the terms and conditions of usage, tick the box to the left of I agree and click then on the Next button.
4. Next you can select the communication media. By default, the items "DSL (PPPoE broadband access)" and "ISDN (CAPI 2.0)" are selected. The DSL feature works anywhere in the world, provided that you are using a PPPoE-controlled DSL modem. If you do not have an ADSL/ISDN connection, then this feature is not applicable, and you must untick the box left to "DSL (PPPoE broadband access)". For further assistance with this additional feature, please contact the cFos support team.

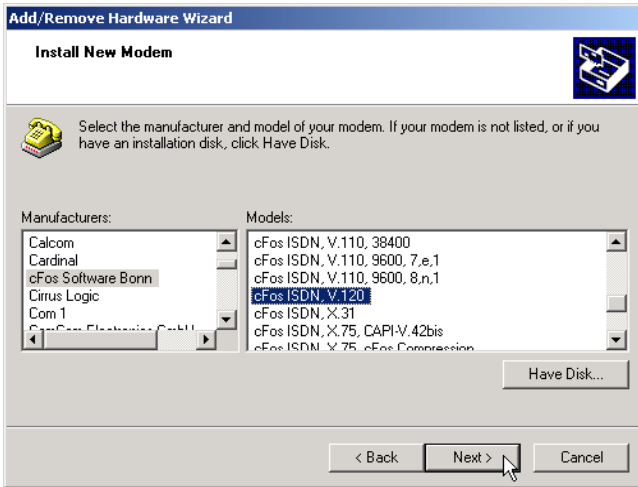
If you are using the IBM International ISDN PC Card with the Euro-ISDN D-channel protocol you can also enter an MSN, if desired. However you can leave the relevant fields blank.

Note: For optimal performance, leave the MSN field blank and set the MSN to use in your application software, if possible.

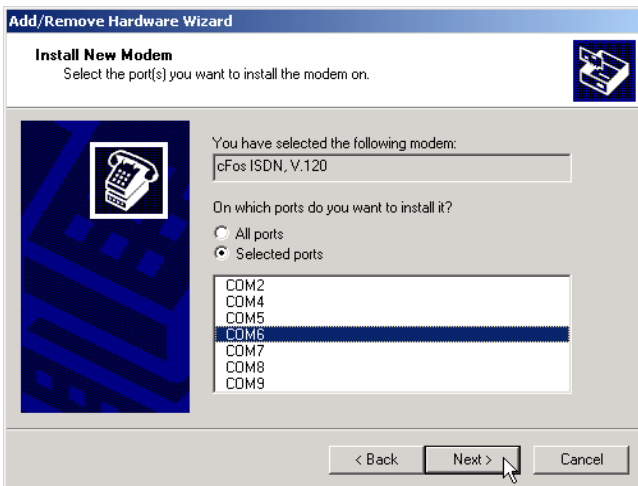


5. The next dialog allows you to select available COM ports for use with cFos. Select the ports you want to use and then click Next.
6. The extended features dialog box allows you to install a basic firewall, time synchronisation with the ISDN network, and an ISDN caller monitor. Untick any feature that you do not want to have installed on the system. Click Next to continue with the installation of cFos.
7. The installer is now ready to proceed with the installation. Click on Install. In the next window you can choose if you want to set up an internet connection with cFos and if you want to block your ISDN card from dialing certain phone numbers. Make your selection and click OK.

8. If you want to add another analog over ISDN modem for the IBM International ISDN PC Card click through **Start -> Settings -> Control Panel** and double-click the **Modems** icon. Once the Modems Properties window is open, click **Add**. In the next window, tick the box left to **Don't detect my modem; I will select it from a list"** and click **Next**. In the Manufacturers window, select **cFos Software Bonn** and the modem emulation you wish to use.



9. In the next window select the COM port you wish to use and click **Next**.
- Note:** Some software packages require a COM port between 1 and 4. Be careful when selecting the COM port. Selecting a wrong COM port may cause sever problems.



10. Windows 2000 will now issue a warning that the driver has not been digitally signed by Microsoft. In the Digital Signature Not Found window click **Yes** to confirm that you want to install the driver selected.

Note: IBM is not responsible for the software since it is supplied by a third party company, although we strongly recommend to use this software.

Furthermore cFos Software Bonn is updating its software very often and they have decided that having a digital signature for cFos would be an advantage, unfortunately the process of signing the drivers is too expensive and too time consuming (due to the frequency of updates).

Complete the driver installation by clicking **Finish**.

11. Back in the Phone And Modem Options window, click **Close** if you have chosen all modem emulations you want to use. Otherwise, repeat the relevant sections of steps 8 through 10 again and click **Close** when you are done.

When your computer has restarted you are ready to use cFos together with the IBM International ISDN PC Card.

Installing cFos in Windows XP

Throughout this chapter it is assumed that you are logged on to a Windows XP Home Edition or Professional system as a local Administrator. If you are not logged on as a local Administrator, you may not be able to perform all the steps outlined in this chapter.

To use the IBM International ISDN PC Card with application software that is not CAPI 2.0-compliant, IBM recommends that you download, purchase and use cFos. For further assistance with cFos, see one of the following Web sites:

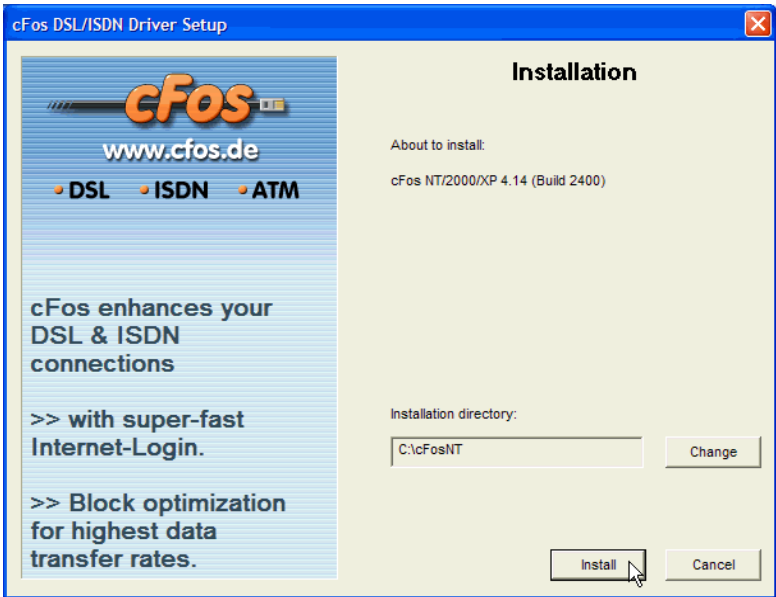
URL	Page Content
http://www.cfos.com	cFos main entry page
http://www.cfos.com/index2.html	cFos home page in German
http://www.cfos.com/index2_e.html	cFos home page in English

Note: Before installing the cFos drivers, please read “Prerequisites for the cFos installation and additional tips” on page 68 .

To install cFos in Windows XP, do the following:

1. On the CD you will find version 4.14 of cFos in the directory \EXTRAS\cFos\NT4W2K. Alternatively you can download the latest package from <http://www.cfos.com>. Double-click on the cfos-nt-2000-xp-v414.exe icon in order to launch the cFos setup program.

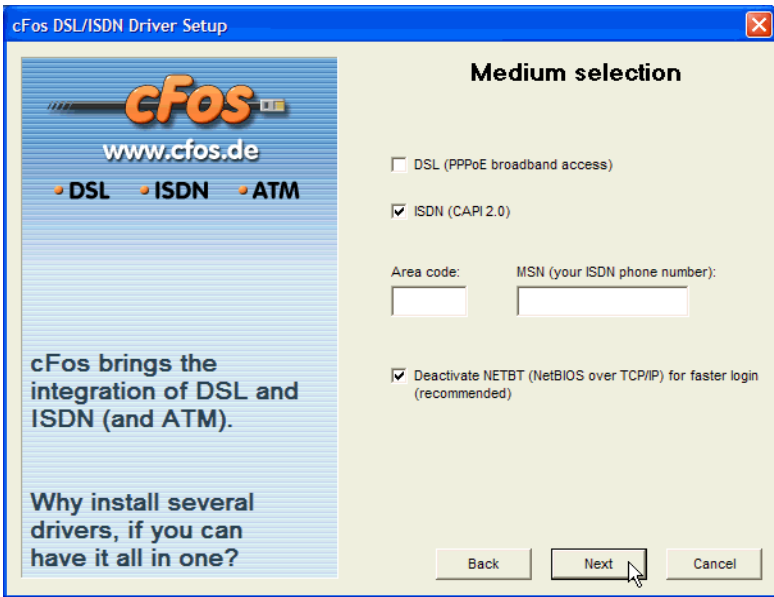
2. If you install cFos completely new the first dialog box will inform you that it is about to install cFos. Click **Install**. Click **Change** if you want to have cFos installed in a directory other than C:\cFosNT.



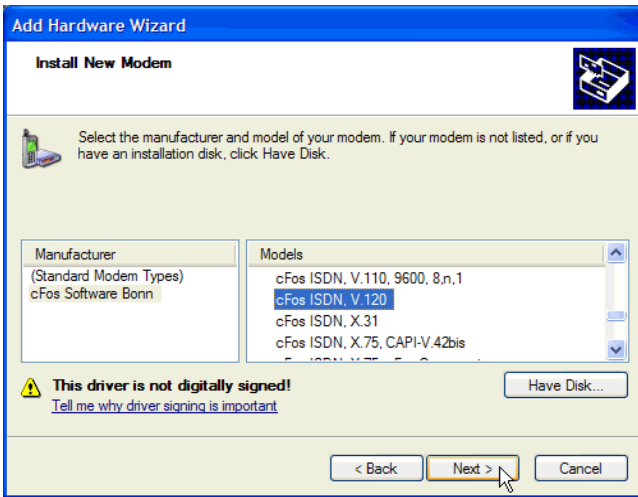
3. Read now the program license information which is presented in both German and English. If you agree to the terms and conditions of usage, tick the box to the left of **I agree** and click **Next**.
4. Next you can select the communication media. By default, the items "DSL (PPPoE broadband access)" and "ISDN (CAPI 2.0)" are selected. The DSL feature works anywhere in the world, provided that you are using a PPPoE-controlled DSL modem. If you do not have an ADSL/ISDN connection, then this feature is not applicable, and you must untick the box to the left of **DSL (PPPoE broadband access)**. For further assistance with this additional feature, please contact the cFos support team.

If you are using the IBM International ISDN PC Card with the Euro-ISDN D-channel protocol you can also enter an MSN, if desired. However you can leave the relevant fields blank.

Note: For optimal performance, leave the MSN field blank and set the MSN to use in your application software, if possible.

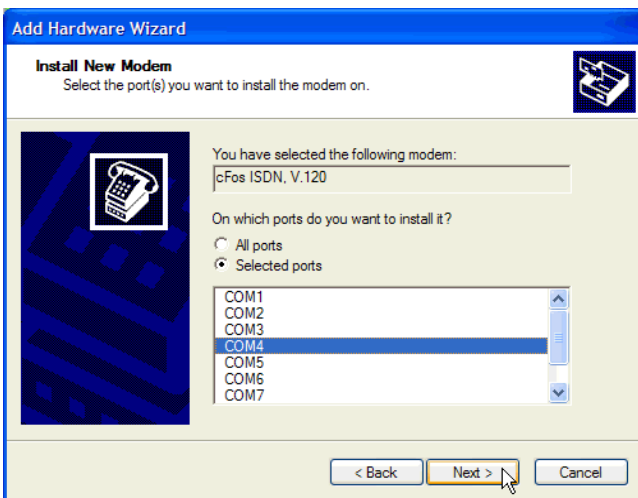


5. The next dialog allows you to select available COM ports for use with cFos. Select the ports you want to use and then click Next.
6. The extended features dialog box allows you to install a basic firewall, time synchronisation with the ISDN network, and an ISDN caller monitor. Untick any feature that you do not want to have installed on the system. Click Next to continue with the installation of cFos.
7. The installer is now ready to proceed with the installation. Click on **Install**. In the next window you can chose if you want to set up an internet connection with cFos and if you want to block your ISDN card from dialing certain phone numbers. Make your selection and click **OK**.
8. If you want to add another analog over ISDN modem for the IBM International ISDN PC Card click through **Start -> Settings -> Control Panel** and double-click the **Modems** icon. Once the Modems Properties window is open, click **Add**. In the next window, tick the box to the left of **Don't detect my modem; I will select it from a list** and click **Next**. In the Manufacturers window, select **cFos Software Bonn** and the modem emulation you wish to use.



9. In the next window, select the COM port you wish to use and click Next.

Note: Some software packages require a COM port between 1 and 4. Be careful when selecting the COM port. Selecting a wrong COM port may cause sever problems.



10. Windows XP will now issue a warning that the driver has not been digitally signed by Microsoft. In the Digital Signature Not Found window, click Yes to confirm that you want to install the driver selected.

Note: IBM is not responsible for the software since it is supplied by a third party company, although we strongly recommend to use this software.

Furthermore cFos Software Bonn is updating its software very often and they have decided that having a digital signature for cFos would be an advantage, unfortunately the process of signing the drivers is too expensive and too time consuming (due to the frequency of updates).

Complete the driver installation by clicking **Finish**.

11. Back in the Phone And Modem Option window, click **Close** if you have chosen all modem emulations you want to use. Otherwise, repeat the relevant sections of steps 8 through 10 again and click then on **Close** when you are done.

When your computer has restarted you are ready to use cFos together with the IBM International ISDN PC Card.

Setting up Internet access

This chapter explains briefly how to use one ISDN B channel for Internet access at 64 kbit/s or both B channels at 128 kbit/s.

Note: Bear in mind that the IBM International ISDN PC Card is a basic-rate ISDN adapter, and permits the use of up to two ISDN B channels.

Internet access in Windows 95 and Windows 98

Note: In order to use Dial-Up Networking for connections to the Internet, you may need to install cFos. Please see "Installing cFos" on page 67.

Creating a connection using one B channel

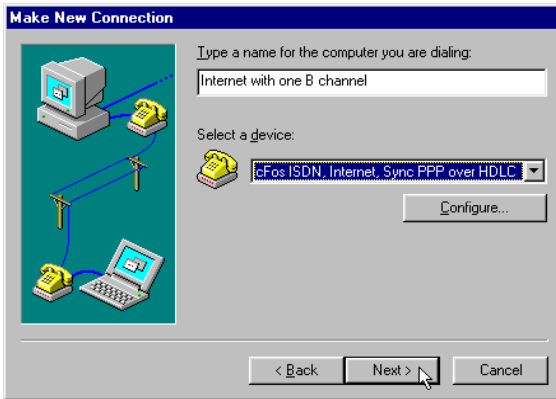
To create an Internet connection using one B channel, do the following:

1. Double-click the **My Computer** icon on the Windows 95/98 desktop. Double-click the **Dial-Up Networking** icon. In the sign-on window, click **Next**.



2. In the **Make New Connection** window, enter the type and name of the computer to be dialed in the **Name** field. This is the name that will be used for the connection in Dial-Up Networking. Select any of the following devices to use for the connection to the Internet:
 - cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - NDIS WAN Line 1
 - NDIS WAN Line 2

Click **Next** to continue.



Note: Since the NDIS WAN CAPI drivers are installed, you have the option of using “NDIS WAN Line 1” or the “NDIS WAN Line 2” for the Internet connection. However the choice depends on the Internet access software you want to use.

3. In the next window, enter the area code and phone number to dial. If necessary, change the country code. Click Next again. Finally, click **Finish**.

Now you can enter a user name and a password and dial up the connection to the server.

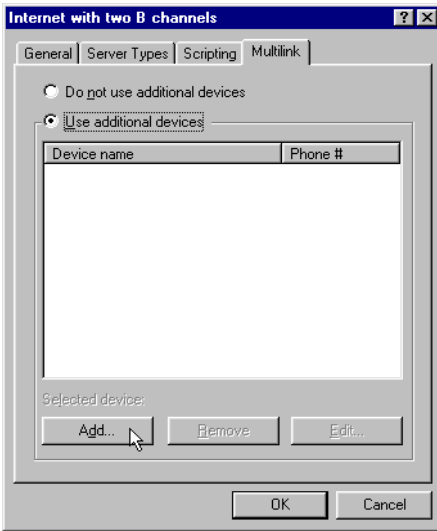
Creating a connection using both B channels

This technique is also referred to as "multilinking". Proceed as follows:

1. Create a new Dial-Up Networking connection as described in “Creating a connection using one B channel” on page 86 .
2. In the Dial-Up Networking window, click the new entry with the right mouse button.
3. Click the **Properties** command in the pop-up menu.

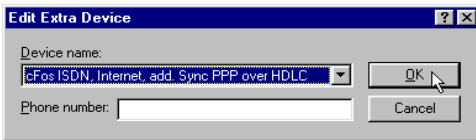


4. Click the **Multilink** tab. Select **Use additional devices**, and then click **Add**.



5. In the Edit Extra Device window, select one of the following devices in the drop-down list:
- cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - NDIS WAN Line 1
 - NDIS WAN Line 2

Click OK to complete this operation.



To save your settings, click OK again.

Note: Any of the four devices can be combined in a multilink connection!

Whether you use cFos or the NDIS WAN CAPI drivers in Dial-Up Networking depends on the Internet access software you want to use.

Note: You can add only one additional device to the dial-up connection. Adding more than one device in the Multilink page may cause the connection to fail.

You cannot form a multilink connection using the same device twice. Doing so will not increase transfer speed, and it may cause the connection to fail.

6. To save your settings, click OK again.

Note: In Europe you do not need to specify an additional phone number for the second B channel. If you leave this field blank, the number originally specified for the Dial-Up Networking connection will be dialed.

Internet access in Windows Me

Note: In order to use Dial-Up Networking for connections to the Internet, you may need to install cFos. Please see “Installing cFos” on page 67 .

Creating a connection using one B channel

To create a connection in Windows Me using one B channel, do the following:

1. Click the **Start -> Settings -> Dial-Up Networking** to open the Network and Dial-up Connection window. Double-click the **Make New Connection** icon.



2. In the Connection Wizard's first window, click **Next**. If you have not yet entered any country-specific telephony information, the Location Information window opens, in which you can enter the pertinent dialing information.
3. In the Make New Connection window, enter the type and name of the computer to be dialed in the Name field. This is the name that will be used for the connection in Dial-Up Networking. Select any of the following devices to use for the connection to the Internet:
 - cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - NDIS WAN Line 1
 - NDIS WAN Line 2

Click **Next** to continue.



Note: Whether you use cFos or the NDIS WAN lines in Dial-up Networking depends on the Internet access software you want to use.

4. In the next window, enter the phone number to dial for Internet access and then click **Next**. In the last window, click **Finish**. Your Dial-Up Networking window now contains an icon representing your dial-up connection to the Internet.

When you have finished the setup procedure, you are ready to connect to your Internet Service Provider.

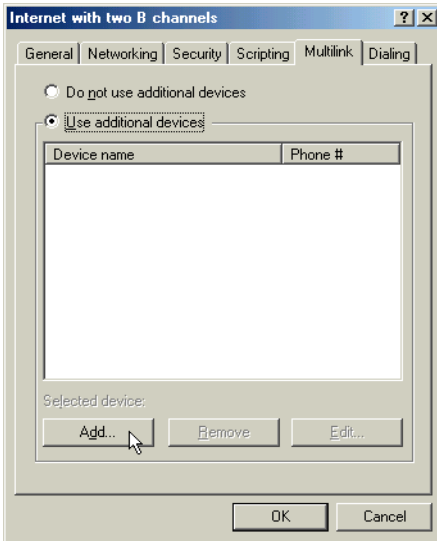
Creating a connection using both B channels

To create a connection in Windows Me using both B channels, do the following:

1. Create an Internet connection as described in “Creating a connection using one B channel” on page 86. In the Dial-Up Networking window, right-click the connection icon you want to use for a multilink connection, and select **Properties** in the context menu.

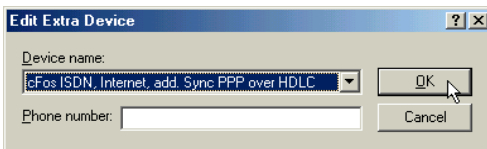


2. In the Properties window, select the **Multilink** tab. Select the **Use additional devices** option, then click **Add**.



3. In the Edit Extra Device window, select one of the following devices in the drop-down list:
- cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - NDIS WAN Line 1
 - NDIS WAN Line 2

Click OK to continue.



Notes:

- a. Any of the four devices can be combined in a multilink connection. Whether you use cFos or the NDIS WAN CAPI drivers in Dial-Up Networking depends on the Internet access software you want to use.
- b. You can add only one additional device to the dial-up connection. Adding more than one device on the Multilink page may cause the connection to fail.

- c. You cannot form a multilink connection using the same device twice. Doing so will not increase the transfer speed, and may cause the connection to fail.
4. To save your settings, click OK again.

You are now ready to connect to your Internet Service Provider over two ISDN B channels simultaneously.

Internet access in Windows NT 4.0

The following section assumes that you are logged on to a Windows NT 4.0 Workstation system as Administrator. If you are not logged on as Administrator, you may not be able to perform all the steps outlined in this chapter.

In order to use Dial-Up Networking for connections to the Internet, you may need to install cFos. Please see "Installing cFos" on page 67 .

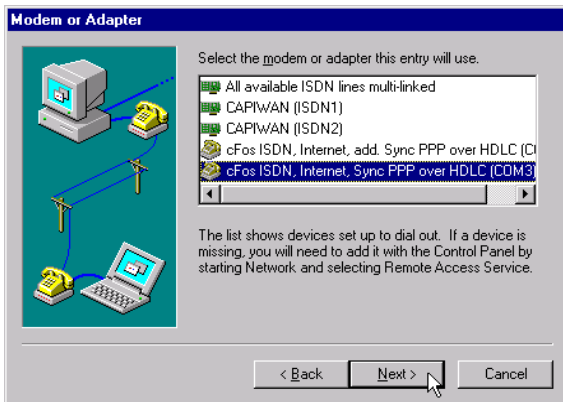
Creating a connection using one B channel

To create a connection in Windows NT 4.0 using one B channel, do the following:

1. Double-click the **My Computer** icon on the Windows NT 4.0 Workstation desktop.



2. Double-click the **Dial-Up Networking** icon. The New Phonebook Entry Wizard opens and prompts you to specify a name for the new phonebook entry. Enter a name for your Internet connection.
3. In the Server window, select the option **I am calling the Internet**.
4. In the Modem or Adapter window, select one of the following entries:
 - cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - NDIS WAN Line 1
 - NDIS WAN Line 2



Note: Since the NDIS WAN CAPI drivers are installed, you have the option of using “CAPIWAN (ISDN1)” or “CAPIWAN (ISDN2)” for the Internet connection. However, the choice depends on the Internet access software you want to use.

5. In the next window, enter the phone number to dial your access provider.
6. Finally, click **Finish**.

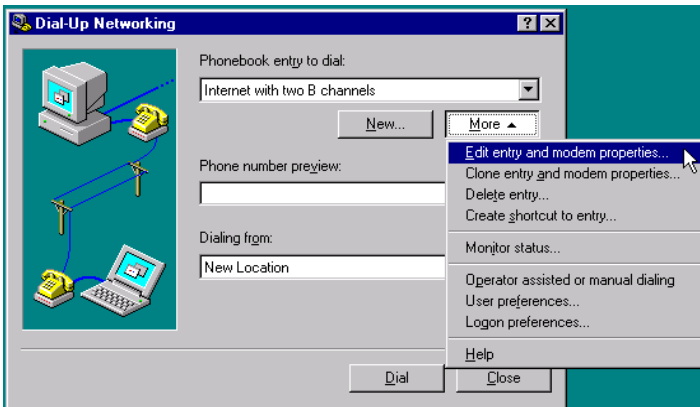
Creating a connection using both B channels

This technique is also referred to as “multilinking”. To create a connection in Windows NT 4.0 using both bB channels, do the following:

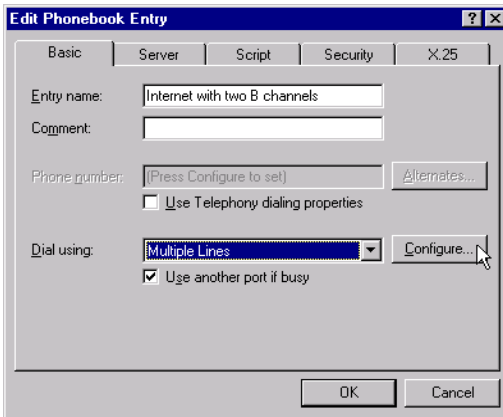
1. Create a new Dial-Up Networking connection as described in “Creating a connection using one B channel” on page 86.

If the option **Multilink all ISDN lines** appears during the setup, do not activate it. This option may result in malfunctions due to an improper configuration.

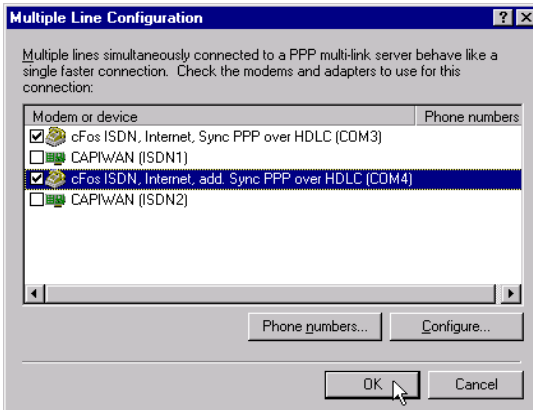
2. Once the new connection has been completed, click **More** and select **Edit entry and modem properties** in the drop-down menu.



3. On the Basic page of the Edit Phonebook Entry window, click the arrow button to open the Dial using drop-down list.
4. Select Multiple Lines, then click Configure.

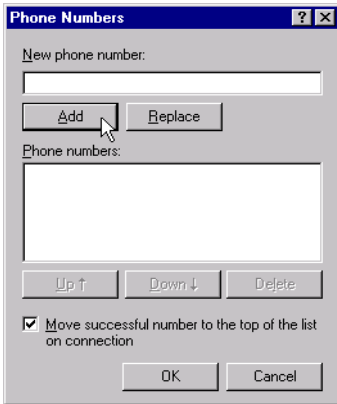


5. In the list of available devices, select the entry cFos ISDN, Internet, additional PPP Modem, then click Phone numbers.



Notes:

- a. Any of the four devices can be combined in a multilink connection.
 - cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - NDIS WAN Line 1
 - NDIS WAN Line 2
 - b. You can add only one additional device to the dial-up connection. Adding more than one device on the Multilink page may cause the connection to fail.
 - c. You cannot form a multilink connection using the same device twice. Doing so will not increase the transfer speed, and may cause the connection to fail.
6. In the Phone Numbers window, enter the phone number to be dialed on the second B channel, then click Add. When the correct number appears in the list, click OK.



7. Now click **OK** twice to close the remaining configuration windows.

You are ready to dial up a multilink connection to your Internet account using two ISDN B channels.

Internet access in Windows 2000

The following section assumes that you are logged on to a Windows 2000 Professional system as Administrator. If you are not logged on as Administrator, you may not be able to perform all the steps outlined in this chapter.

In order to use Dial-Up Networking for connections to the Internet, you may need to install cFos. Please see “Installing cFos” on page 67.

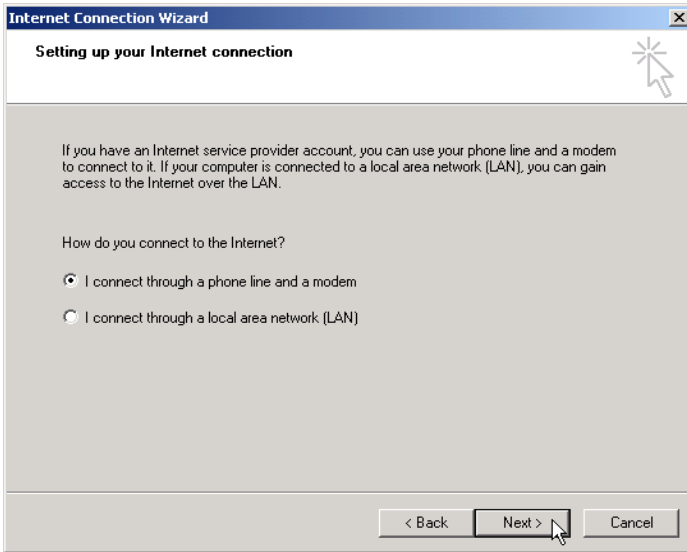
Creating a connection using one B channel

To create a connection in Windows 2000 using one B channel, do the following:

1. Click **Start -> Settings -> Dial-Up Networking** to open the Network and Dial-up Connections window. Double-click the **Make New Connection** icon.



2. In the Connection Wizard's first window, click the **Next** button. Select the option **Dial-up to the Internet**, then click **Next**. In the Welcome to the Internet Connection Wizard window, select the option **I want to set up my Internet connection manually, or I want to connect through a local area network (LAN)**, then click **Next**. In the following window, select **I connect through a phone line and a modem**, and click **Next**.



3. In the Choose Modem window, select any of the following devices to use for the connection to the Internet:

- cFos ISDN, Internet, Sync PPP over HDLC
- cFos ISDN, Internet, add. Sync PPP over HDLC
- IBM NDIS WAN CAPI Driver

Note: Whether you use cFos or the NDIS WAN CAPI drivers in Dial-Up Networking depends on the Internet access software you want to use. Note too, that there are two entries called "IBM NDIS WAN CAPI Driver". Each of these entries represents one B channel.

4. The next windows allow you to configure your Internet access. Perform the following steps:
 -
 - Enter the complete telephone number including country information
 - Enter the User name and Password
 - Enter a Connection name
 - Configure an Internet mail account
5. In the last window, click **Finish** to complete Internet access configuration.

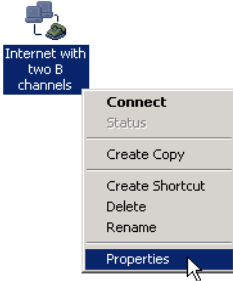
Once you have finished the configuration, you are ready to connect to your Internet Service Provider.

Creating a connection using both B channels

To create a connection in Windows 2000 using both B channels, do the following:

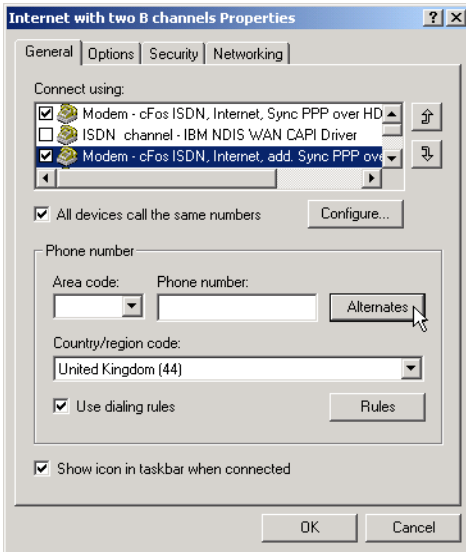
1. Create an Internet connection as described in “Creating a connection using one B channel” on page 96 . Do not connect to your Internet Service Provider upon completion, however. Instead, close the Dial-up Connection window, and close Internet Explorer if it has been started.

In the Dial-up Networking window, right-click the entry you want to use to create a multilink connection. In the context menu, select **Properties**.

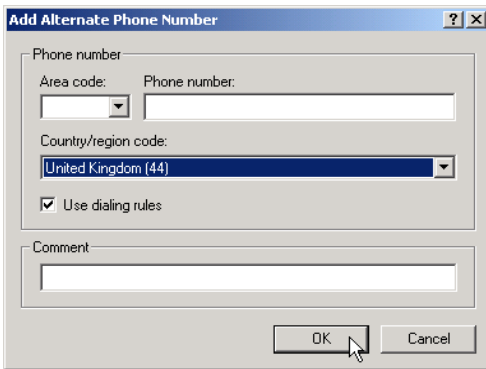


2. On the **General** page in the properties window for the selected connection, select the additional device you wish to use for the multilink Internet connection from the list labeled **Connect using**. You can combine the following devices to create a multilink connection:
 - cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - IBM NDIS WAN CAPI Driver

Note: You can add only one additional device to the dial-up connection. Adding more than one additional device may cause the connection to fail. Click the **Settings** button to the right of the connection.
3. Select the option **All devices call the same numbers** below the **Connect using** list. To make sure that the phone number to dial has been stored, click the **Alternates** button in the Phone number section.



4. If the field in the Alternate Phone Numbers window is empty, click the Add button. In the Add Alternate Phone Number window, select the option Use dialing rules, then enter the area code and phone number in the fields above it. Select the destination country if necessary. Then click OK to close each of the configuration windows.



You are now ready to connect to your Internet Service Provider over two ISDN B channels simultaneously.

Internet access in Windows XP

In order to use Dial-Up Networking for connections to the Internet, you may need to install cFos. Please see “Installing cFos” on page 67.

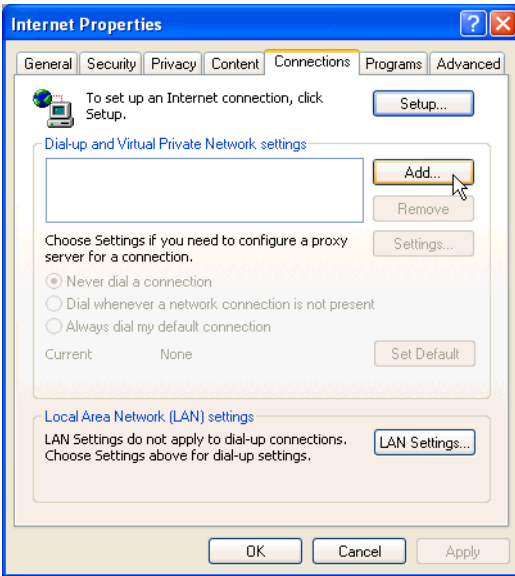
Creating a connection using one B channel

To create a connection in Windows XP using one B channel, do the following:

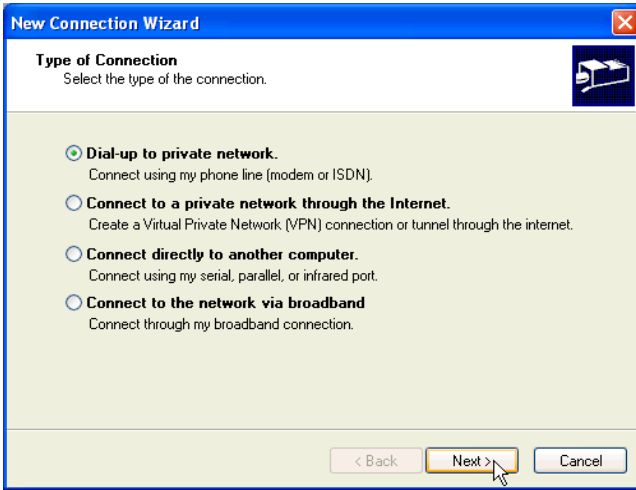
1. Click **Start -> Control Panel**. Double-click the **Network and Internet Connections** icon.



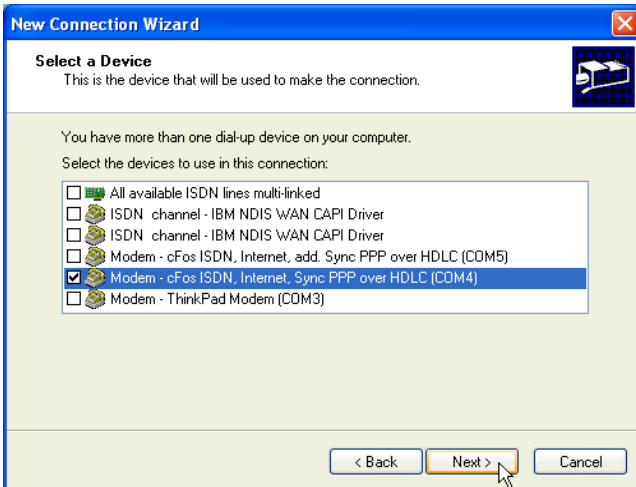
Click the menu command **Set up or change your Internet connection**. In the Internet Properties window, click **Add** to launch the New Connection Wizard.



2. In the Connection Wizard's first window, click **Dial-up to private network**, then **Next**.



3. In the Select a Device window, first make sure that the option **All available ISDN lines multi-linked** is NOT activated. If necessary, deactivate the options for all devices that you do not want to use for dialing out. Then select any of the following devices to use for the connection to the Internet:
- cFos ISDN, Internet, Sync PPP over HDLC
 - cFos ISDN, Internet, add. Sync PPP over HDLC
 - IBM NDIS WAN CAPI Driver



Note: Whether you use cFos or the NDIS WAN CAPI drivers in Dial-Up Networking depends on the Internet access software you want to use.

Note too that there are two entries called “IBM NDIS WAN CAPI Driver”. Each of these entries represents one B channel.

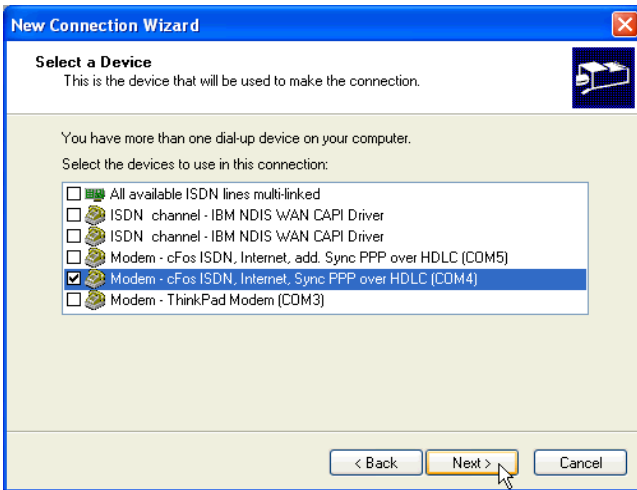
4. The next windows allow you to configure your Internet access. Perform the following steps:
 - Enter the complete telephone number
 - Enter a connection name
 - Enter the User name and Password
5. When you have finished these operations, click **OK** in the Internet Properties window to complete your Internet access setup.



Once you have finished the configuration, you are ready to connect to your Internet Service Provider. Click **Start -> Connect To**, then select the connection you have created.

Creating a connection using both B channels

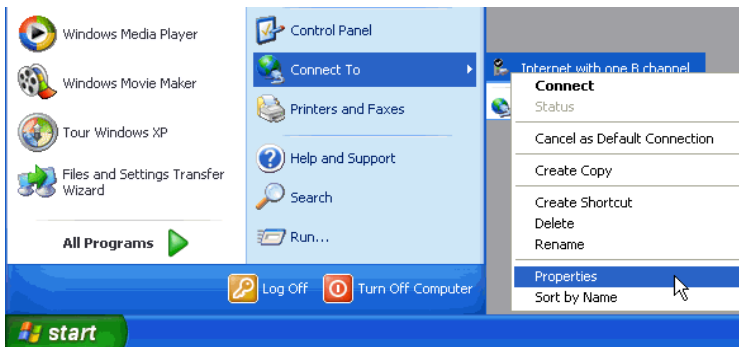
There are two ways to create a connection for multilink Internet access. The first is to create a new dial-up connection as described above in “Creating a connection using one B channel” on page 100 , but to select two devices to use for the connection rather than one as in Step 3.



Note: Note that you only can use two ISDN devices for a multilink connection. Configuring more than two devices may cause the connection to fail.

The second method is to modify an existing dial-up connection as follows:

1. Click **Start -> Connect To** and select the connection you want to modify. Right-click it and select **Properties** in the context menu.



2. On the **General** page in the properties window for the selected connection, select the additional device you wish to use for the multilink Internet connection from the list labeled **Connect using**. You can combine the following devices to create a multilink connection:

- cFos ISDN, Internet, Sync PPP over HDLC
- cFos ISDN, Internet, add. Sync PPP over HDLC
- IBM NDIS WAN CAPI Driver



You can rename the modified connection if desired. You are now ready to connect to your Internet Service Provider over two ISDN B channels simultaneously.

Using CompuServe

In order to be able to use CompuServe with your IBM International ISDN PC Card, you must have cFos installed, unless you only plan to use CompuServe 2000 on your system. In this case, you may not need to install cFos at all. Please ask your local CompuServe help desk what communication protocol is used for dial-in. In Europe the X.75 protocol is widely used.

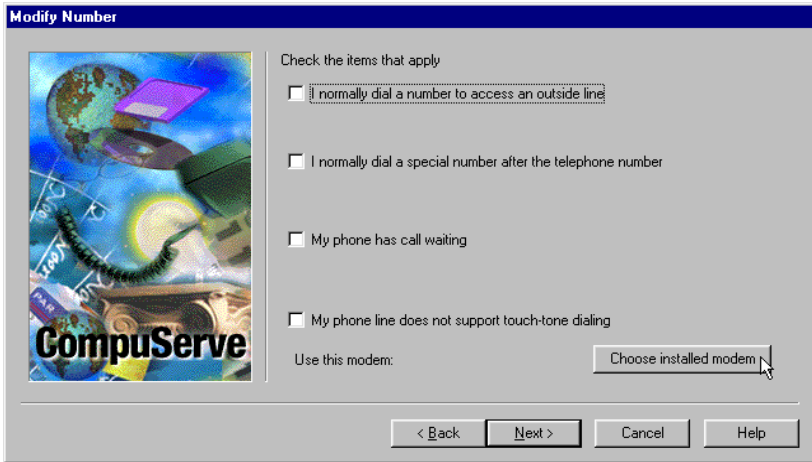
IBM has tested the CompuServe 3.0 and higher access software under Windows 95, 98 and ME, and CompuServe 4.0.x and higher access software under Windows NT 4.0 and Windows 2000 Professional.

CompuServe 3.0 and non-CAPI 2.0-compliant CompuServe dialers in Windows 9x, Me

Note: The screen shots in this section may vary somewhat from the user interface you see on your screen.

Before you can use CompuServe 3.0 or any non-CAPI 2.0-compliant CompuServe access software, you must configure cFos for use with it by installing either the “cFos ISDN, X.75, Defaults, Mailbox Settings” or the “cFos ISDN, CompuServe” modem emulation on any available COM port.

When you perform a fresh installation of the CompuServe 3.0 or a non-CAPI 2.0-compliant CompuServe access software, you may be offered the option of entering or modifying the telephone number and modem properties.



Click the **Choose installed modem** button and select one of the following modem entries:

- cFos ISDN, CompuServe
- cFos ISDN, X.75, Defaults, Mailbox Settings



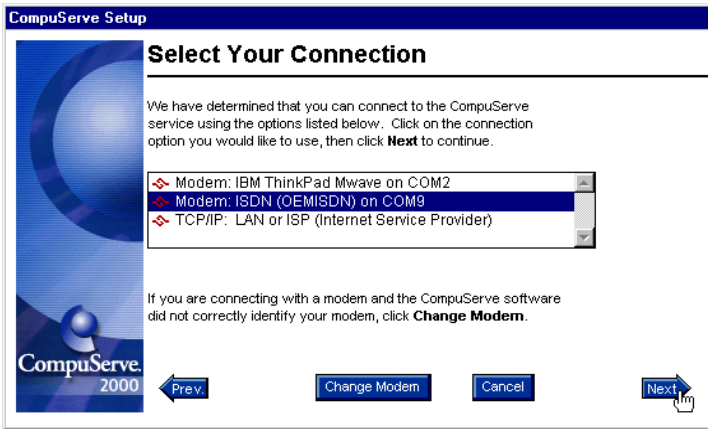
Note: You can also select the entry **cFos ISDN, Analog Modem Support**. Note, however, that this entry emulates an analog modem connection with a maximum speed of 14,400 bit/s (V.32bis). Only the two modem emulations named above allow you to connect to CompuServe at 64 kbit/s.

If you encounter any problems in selecting the modem, please contact your local CompuServe help desk for further assistance.

CAPI 2.0-compliant CompuServe 2000 in Windows 9x, Me without cFos installed

In some countries, such as Germany and the UK, CompuServe ships its access software as “CompuServe 2000”. Unlike earlier versions, this software is designed to handle CAPI 2.0-compliant ISDN hardware. When you install CompuServe 2000, it automatically installs an OEM version of cFos which is then used only by CompuServe 2000.

When the CompuServe 2000 access software searches for a modem, it detects the IBM International ISDN PC Card as illustrated below.



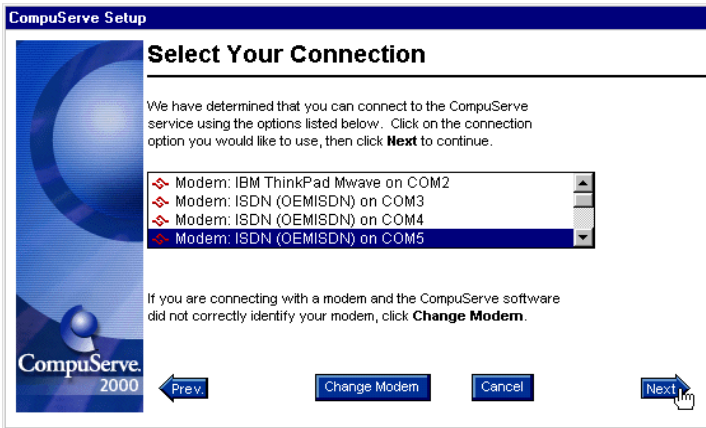
Click Next to set up CompuServe 2000 with the selected modem emulation, and follow all further instructions displayed on your screen.

CAPI 2.0-compliant CompuServe 2000 in Windows 9x, Me with cFos installed

In some countries such as Germany and the UK, CompuServe ships its access software as “CompuServe 2000”. Unlike earlier versions, this software is designed to handle CAPI 2.0-compliant ISDN hardware.

To use CompuServe in Windows 9x or Windows Me with cFos installed, do the following:

1. After you have installed the CompuServe 2000 software, check the cFos configuration. To do so, click **Start -> Programs -> cFos ISDN & DSL Driver -> Configure cFos**. In the cFos Configuration program, click **Configure MSN and parameters**. If the parameter **-kv** appears in the additional parameters field, remove it. Then click **OK**. Select **Save changes**, click **OK** and then confirm that you want to restart your computer by clicking **Yes**.
2. After the system has restarted, verify that you have installed either the **cFos ISDN, CompuServe** or the **cFos ISDN, X.75, Defaults, Mailbox Settings** modem emulation. Make a note of the COM ports on which these modem emulations are installed.
3. Now you can start CompuServe 2000 and let it search for modems. The software detects your IBM International ISDN PC Card as illustrated below. Select the modem entry that corresponds to your cFos modem emulation.



Click Next and follow all further instructions displayed on your screen to set up CompuServe 2000 with the selected modem.

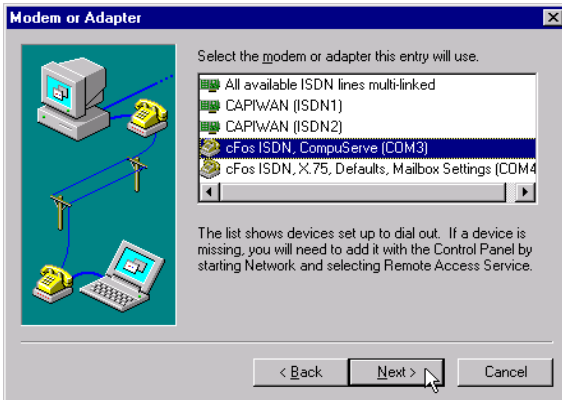
CompuServe 4.02 and higher in Windows NT 4.0

The following installation instructions are based on the CompuServe 4.0.2 installation Help file for Windows NT 4.0. If you experience problems of any kind during this procedure, please contact your local CompuServe help desk for further assistance.

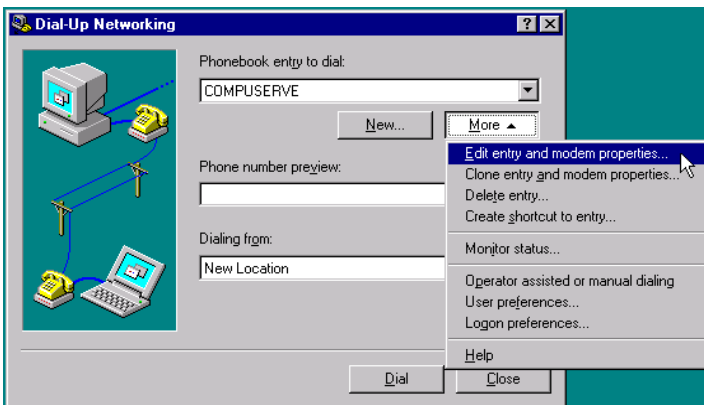
During this procedure, retain the default settings for all options except where otherwise instructed.

You must install and configure the CompuServe access software before carrying out the steps below.

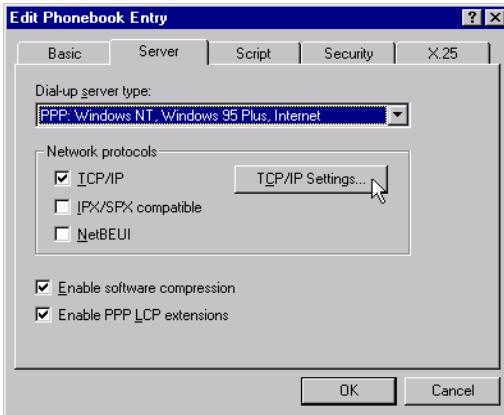
1. Double-click the **My Computer** icon on the Windows NT desktop, then double-click the **Dial-Up Networking** icon.
2. In the window that tells you the phonebook is empty, click **OK**.
3. In the New Phonebook Entry Wizard window, enter **COMPUSERVE** as the name and click **Next**.
4. In the Server window, select the options **I am calling the Internet** and **Send my password as plain text if that's the only way to connect**. Click **Next**. Now select the modem you want use. This may be one of the following:
 - cFos ISDN, CompuServe
 - cFos ISDN, X.75, Defaults, Mailbox Settings



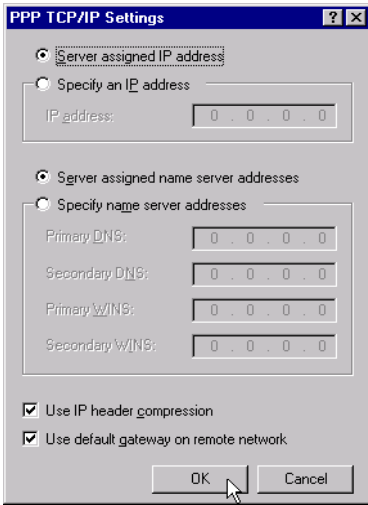
5. Click **Next**.
6. In the **Phone Number** window, enter the local phone number that you dial to connect to CompuServe. If you want to define any alternate numbers, click **Alternate** and enter those numbers in the appropriate fields.
7. Click **Next**.
8. In the **New Phonebook Entry Wizard** window, click **Finish**.
Note: If this is the first time you have created a Dial-Up Networking entry, a few more windows are displayed. Simply click **Next** in each window.
9. In the **Dial-Up Networking** window, click **More**.
10. You can review or modify basic properties of the connection on the **Basic** page in the **Edit Phonebook Entry** window.
11. To place a shortcut on your desktop, click **Create shortcut to entry** in this menu.



12. To add alternate phone numbers to dial, click the **Alternates** button on the Basic window page, then enter the phone numbers.
13. To modify the modem settings, click the **Configure** button on the Basic page, then edit the modem properties as necessary.
14. Click the **Server** tab in the Edit Phonebook Entry window and make sure that **TCP/IP** is the only network protocol selected. (If any other option in the Network protocols group is checked, click it to remove the check mark.)
Note: The option **Enable software compression** may also be selected. Note that in rare cases this option can cause connection problems, however.

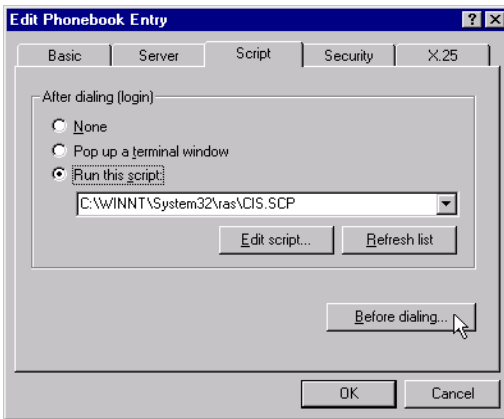


15. On the Server page, click the **TCP/IP Settings** button.
16. In the PPP TCP/IP Settings window, select the option **Server assigned IP address**.
17. Select the option **Server assigned name server addresses**.
18. Leave zeroes in the WINS server entries, activate both of the options at the bottom of the window, and click **OK**.



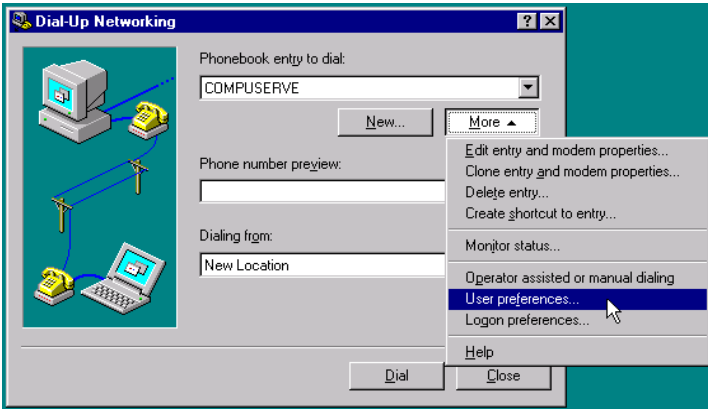
19. Click the **Script** tab in the Edit Phonebook Entry window, and select CIS.SCP in the drop-down list.

Note: You may also edit the script to speed up the logon process. Change the statement `/go:pppconnect^m` in the script to `/noint/go:pppconnect^m`.

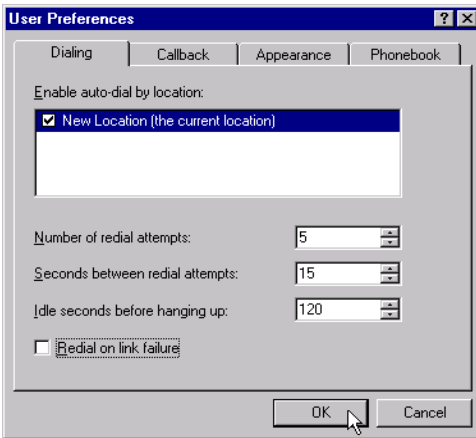


20. Click **Before dialing**, make sure that the **None** option is activated, then click **OK**.
21. In the Edit Phonebook Entry window, click the **Security** tab, then select the option **Accept any authentication including clear text**. Depending on your security settings, you may also have the option of preventing your password from being saved, so that you can enter it again if necessary (see Step 34).
22. Click the **X.25** tab and make sure that all the settings are blank, then click **OK**.

23. In the Dial-Up Networking window, click **More** again and select **User Preferences** in the menu that opens.



24. On the Dialing page in the User Preferences window, set the number of redial attempts, and activate the **Redial on link failure** option if you want Dial-Up Networking to redial if the connection is lost.
25. Set the **Idle seconds before hanging up** option so that Dial-Up Networking automatically disconnects if the line is idle for a certain period.
26. In the **Enable auto-dial by location** list, make sure the checkbox for your current location is activated.

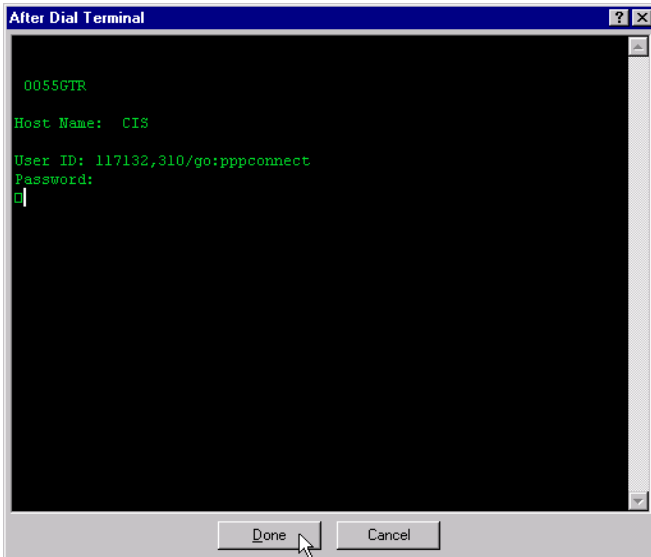


27. Click the **Callback** tab, then select the option **No, skip callback**.
28. Click the **Appearance** tab and make sure that all of the options are activated.
29. Click the **Phonebook** tab and select the option **The System Phonebook**.
30. Click **OK**.

31. In the Dial-up Networking window, select **Dial**.
32. In the window **Connect to CompuServe**, enter your CompuServe member ID number in the User name field and your password in the Password field.



33. If you want to save your password on your computer, activate the **Save password** option. (This option may not be available if your security settings prohibit saving passwords.) If you need to change your password later, you must also click **Unsave password** on the Security page in the phonebook entry properties (see Step 22).
34. Click **OK** to dial up the connection. Do not make any changes in the After Dial Terminal window, but observe the logon process. Your password is incorrect if you see the following after the password prompt:
??LOGINE - Invalid entry - try again
.
.
35. Once the logon has succeeded, click **Done** to close the terminal window and activate the connection to CompuServe.



After you have successfully logged on, the Dial-up Networking icon appears in the system tray on the task bar. Click this icon to hang up the connection, or select **Open Dial-up Monitor** to get information about your connection, including the DCE connection speed (bps) and your IP address (**Details** button).

CompuServe 4.02 and higher in Windows 2000

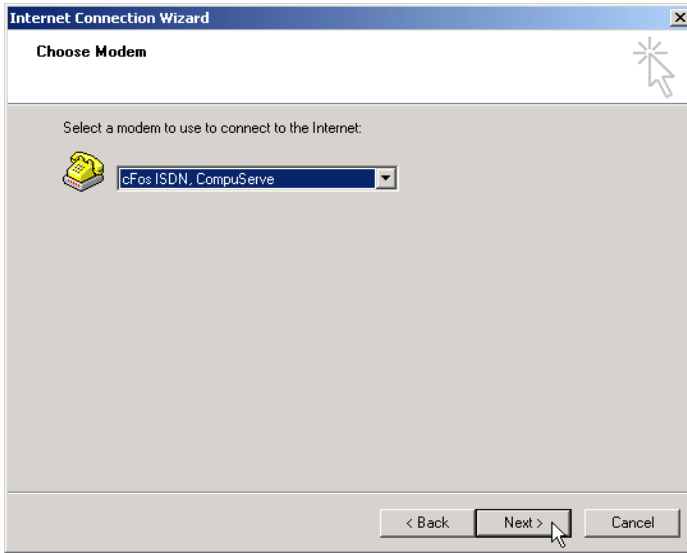
The following installation instructions are based on the CompuServe 4.0.2 installation Help file for Windows NT 4.0 and modified for use in Windows 2000 Professional. If you experience problems of any kind with these instructions, please contact your local CompuServe help desk for further assistance.

Unless otherwise noted, all settings or selections should be left at their default values.

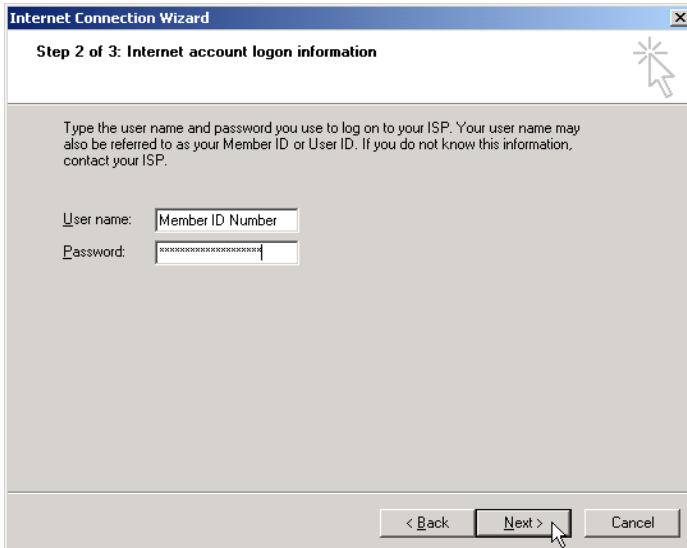
To use CompuServe 4.02 or higher in Windows 2000, do the following:

1. Click **Start -> Settings->/ Network and Dial-Up Connections**. Double-click **Make New Connection** to start the Network Connection Wizard.
2. In the first window, click **Next**. In the following window, select the option **Dial-up to the Internet**, then click **Next**. Now select **I want to set up my Internet connection manually, or I want to connect through a local area network (LAN)** and click **Next**. In the next window, choose the option **I connect through a phone line and a modem**, then click **Next**.
3. In the Choose Modem window, select one of the following modem entries:
 - cFos ISDN, CompuServe
 - cFos ISDN, X.75, Defaults, Mailbox Settings

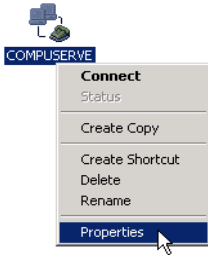
Then click Next.



4. In the Internet account logon information windows that follow, do the following:
- Enter the phone number to dial for CompuServe access and click Next.
 - Enter your CompuServe User ID and password and click Next.
 - Enter **COMPUSERVE** as the connection name and click Next.

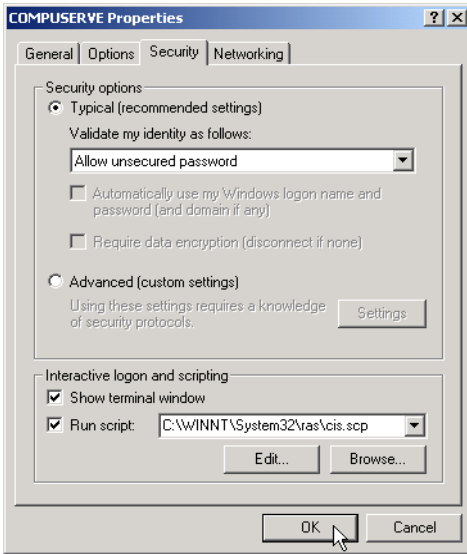


- In the Set Up Your Internet Mail Account window, select **No** then click **Next**. Deactivate the option **To connect to the Internet immediately, select this box and then click Finish**. Now click the **Finish** button to complete the dial-up configuration.
- In the Network and Dial-Up Connections window, select the new **COMPUSERVE** icon, right-click it, and select **Properties** in the context menu.

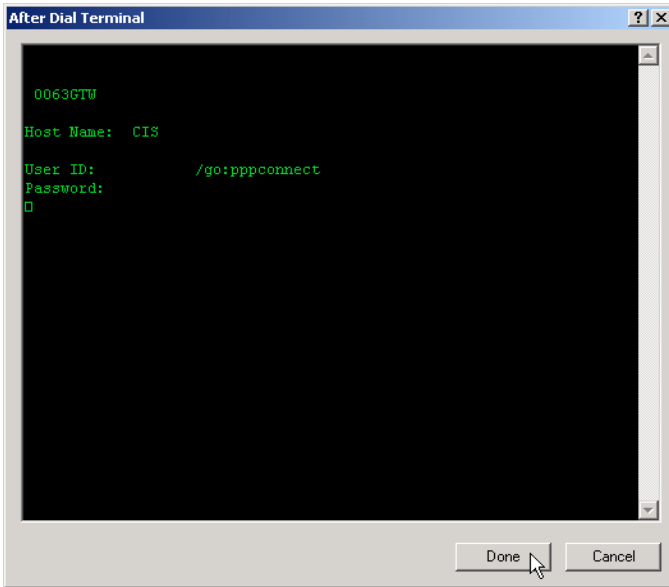


- In the COMPUSERVE Properties window, click the **Options** tab. In the Dialing options group, select the options **Display progress while connecting** and **Prompt for name and password, certificate, etc.** In the Redial attempts group, set the desired number of attempts, the delay between redial attempts, and the delay before an idle connection should be hung up. If desired, you may enable the option **Redial if line is dropped**. Click the **X.25** button and make sure the settings are blank, then click **OK**.
- Click the **Security** tab. Select the option **Typical (recommended settings)** and make sure that the option **Validate my identity as follows:** is set to **Allow unsecured password**. In the Interactive logon and scripting group, select the options **Show terminal window** and **Run script**, and select the script **cis.scp** in the list.

Note: You may also edit the script to speed up the logon process. Change the statement `/go:pppconnect^m` in the script to `/noint/go:pppconnect^m`



9. Now click the **Networking** tab. In the list labeled **Type of dial-up server I am calling**, choose the entry **PPP: Windows 95/98/NT4/2000/Internet**. In the option group **Components checked are used by this connection**, make sure that only **Internet Protocol (TCP/IP)** is selected. Then click **OK**.
10. Double-click the **COMPUSET** icon in the dial-up window to test your settings. If the dial-in succeeds, the terminal window will appear as illustrated below:



Click **Done** to complete the connection procedure.

After you have successfully logged on, the Dial-up Networking icon appears in the system tray on the task bar. Click this icon to hang up the connection, or select **Open Dial-up Monitor** to get information about your connection, including the DCE connection speed (bps) and your IP address (**Details** button).

Using AOL

In order to be able to use AOL with your IBM International ISDN PC Card, you must have cFos installed, unless you plan to use only the CAPI 2.0-compliant AOL 5.0 or higher access software on your system. In this case you may not need to install cFos.

This section is based on Windows 9x. At the time of writing, there was no AOL access software available for Windows NT 4.0 or Windows 2000, so that AOL use could not be tested.

Please ask your local AOL help desk what communication protocol is used for dial-in. In Europe the X.75 protocol is widely used.

IBM has tested the AOL 4.0 and higher access software.

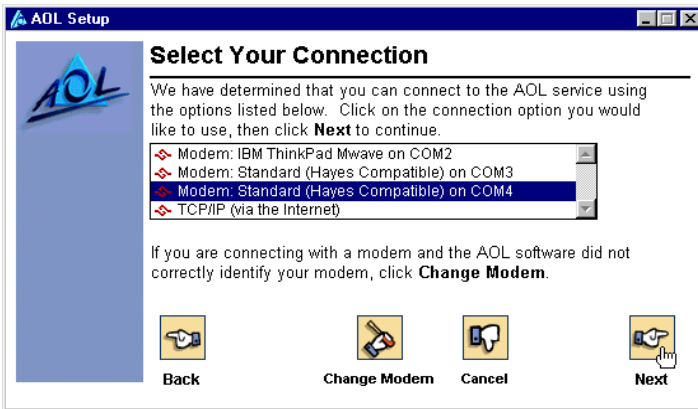
AOL 4.0 and other non-CAPI 2.0-compliant AOL access software

AOL 4.0 or a non-CAPI 2.0-compliant AOL access software version may only detect modems assigned to COM ports 1 to 4. It is strongly recommended that you configure cFos to use COM4.

Note: The screen shots in this section may vary somewhat from the user interface you see on your screen.

Before you can use AOL 4.0 or any non-CAPI 2.0-compliant AOL access software, you must configure cFos for use with it by installing either the “cFos ISDN, X.75, Defaults, Mailbox Settings” or the “cFos ISDN, CompuServe” modem emulation on either COM3 or COM4.

When you perform a fresh installation of the AOL 4.0 access software or a non-CAPI 2.0-compliant AOL dialer software, or when you reconfigure the already installed AOL dialer, select the option to **Begin automatic setup**. The AOL software then searches for an installed modem. When the search is completed, AOL announces it has found a modem as illustrated below.



Click the **Next** button to use AOL with the selected modem.

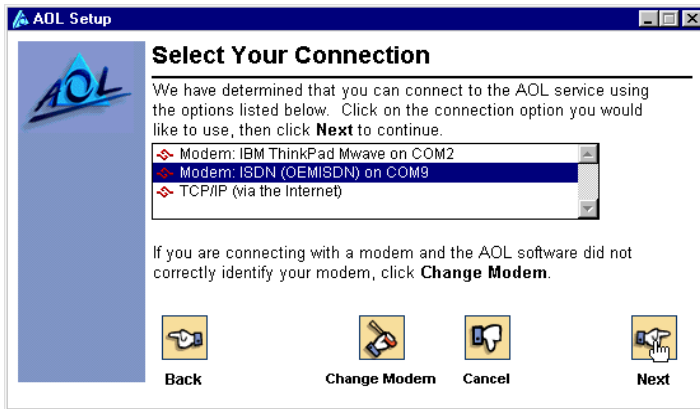
Note:

Please contact your local AOL help desk if AOL does not detect your modem correctly.

CAPI 2.0-compliant AOL 5.0 and higher without cFos installed

In some countries, such as Germany and the UK, AOL ships its AOL 5.0 access software in a version designed for CAPI 2.0. When you install AOL 5.0, it automatically installs an OEM version of cFos which is then used only by AOL 5.0.

When the AOL 5.0 access software searches for a modem, it detects the IBM International ISDN PC Card as illustrated below.

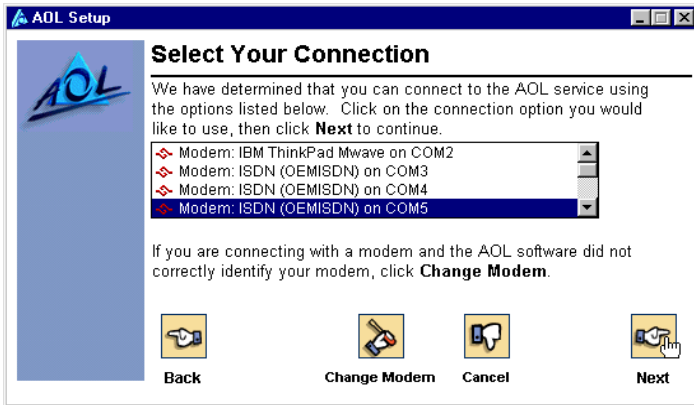


Click **Next** to set up AOL 5.0 with the selected modem emulation, and follow all further instructions displayed on your screen.

CAPI 2.0-compliant AOL 5.0 and higher with cFos installed

To use CAPI 2.0-compliant AOL 5.0 or higher with cFos installed, do the following:

1. After you have installed the CAPI 2.0-compliant AOL 5.0 or higher software, check the cFos configuration. To do so, click **Start -> Programs -> cFos ISDN & DSL Driver -> Configure cFos**. In the cFos configuration program, select **Configure MSN and parameters**. If the parameter `-kv` appears in the additional parameters field, remove it. Then click **OK**. Select **Save changes**, click **OK** and then confirm that you want to restart your computer by clicking **Yes**.
2. After the system has restarted, verify that you have installed either the “cFos ISDN, CompuServe” or the “cFos ISDN, X.75, Defaults, Mailbox Settings” modem emulation. Make a note of the COM ports on which these modem emulations are installed.
3. Now you can start AOL 5.0 or higher and let it search for a modem. The software detects your IBM International ISDN PC Card as illustrated below. Select the modem entry that corresponds to your cFos modem emulation.



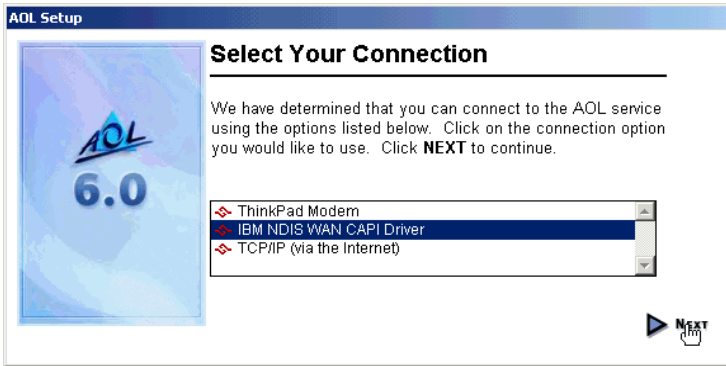
4. Click **Next** and follow all further instructions displayed on your screen to set up AOL 5.0 or higher with the selected modem.

CAPI 2.0-compliant AOL 6.0 and higher for Windows 9x and Windows Me

Obtain the correct version of AOL 6.0 for your operating system. AOL maintains separate versions for Windows 9x and Windows Millennium Edition. The installation instructions for AOL 6.0 in these operating systems are exactly the same as those outlined in “CAPI 2.0-compliant AOL 5.0 and Higher without cFos Installed” on page 118 .

CAPI 2.0-compliant AOL 6.0 and higher for Windows 2000

Obtain the AOL 6.0 software for Windows 2000. Note that AOL does not support Windows NT 4.0. AOL 6.0 for Windows 2000 does not require that you install cFos for Windows NT / 2000. When AOL 6.0 for Windows 2000 searches for communication devices, it detects the IBM International ISDN PC Card and displays it as “IBM NDIS WAN CAPI DRIVER”, alongside any analog modems found.



AOL 6.0 for Windows 2000 uses the NDIS WAN Miniport driver to connect over ISDN.

If you encounter problems of any kind, please contact your local AOL help desk and tell the support personnel that you are using a fully CAPI 2.0-compliant ISDN device to connect to AOL.

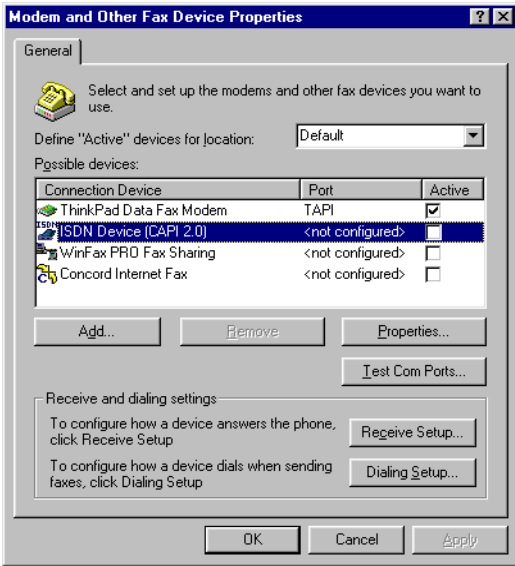
Using Symantec's WinFax PRO

This section briefly describes the use of the IBM International ISDN PC Card with WinFax PRO 9.0 and higher. Please refer to the WinFax PRO User's guide or get in touch with your local Symantec help desk for further assistance.

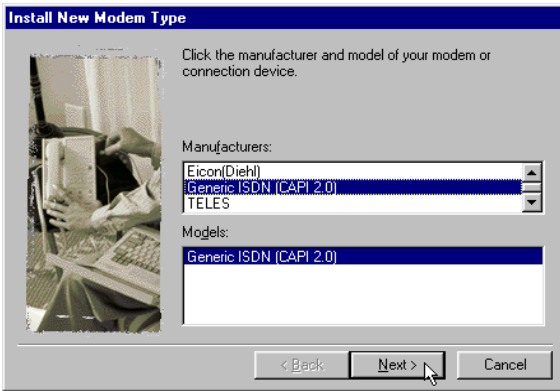
WinFax PRO 9.x

To use WinFax PRO 9.x, do the following:

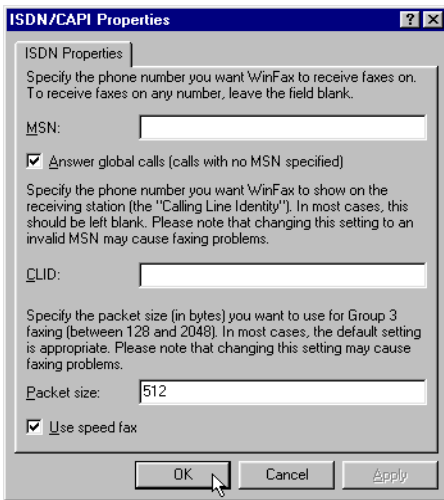
1. Start WinFax PRO 9.x. Select the menu command **Tools -> Setup -> Guided Setup**. In the Guided Setup window, select **Modem/Other Device Setup**. In the **Possible devices** list, select **ISDN Device (CAPI 2.0)**. Click the **Properties** button.



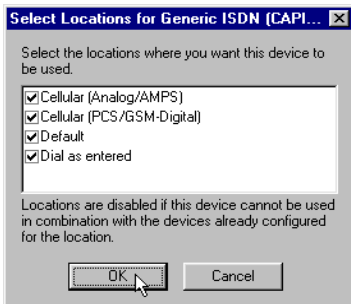
- If a message appears informing you that the ISDN has not been configured, click Yes to configure it. In the Install New Modem Type window, scroll down to **Generic ISDN (CAPI 2.0)** in the **Manufacturers** list, then select the corresponding entry in the **Models** list. Click **Next**.



- In the ISDN/CAPI Properties window, enter an MSN (Multiple Subscriber Number) and a CLID (Calling Line Identification). In the "Packet size" field, enter 512.



4. If you did not enter an MSN in the previous step, WinFax PRO displays a warning that you must enter an MSN in order to receive faxes. At this point you must enter an MSN.
5. When you have done so, click **Finish** in the last window. Now the **Select Locations for Generic ISDN (CAPI 2.0)** window opens. Usually all the options in this window are enabled. Leave these settings as they are and click **OK**.

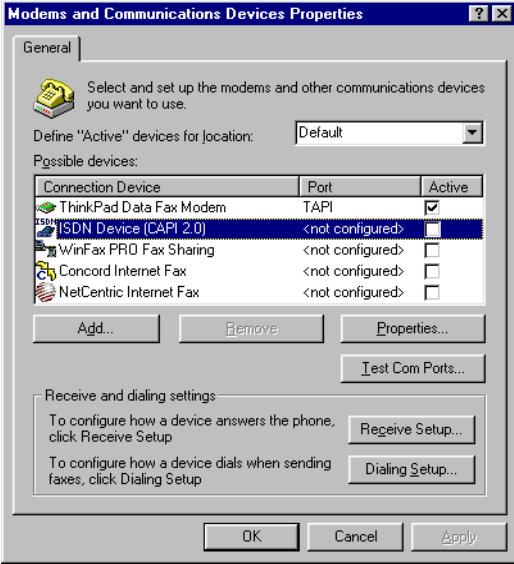


6. If you have not yet configured your country information for modem dialing, a message appears asking whether you want to configure how this device dials when sending faxes. Click **Yes**.
7. On the **Locatio**n page in the **Dialing Properties** window, select the country you are in and add your area code and phone number. Then click **OK**.
8. In the **Modem and Other Fax Device Properties** window, click **OK**. This completes the configuration of WinFax PRO 9.x.

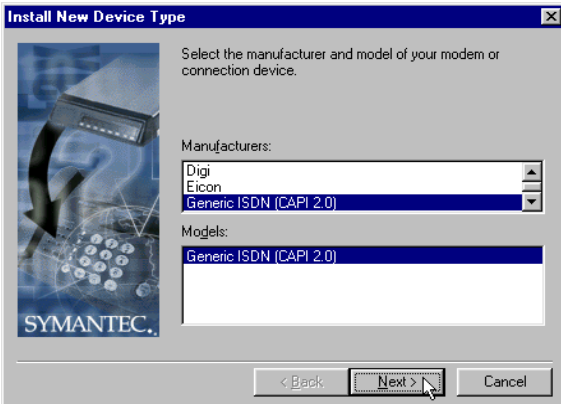
WinFax PRO 10.0

To use WinFax PRO 10.0, do the following:

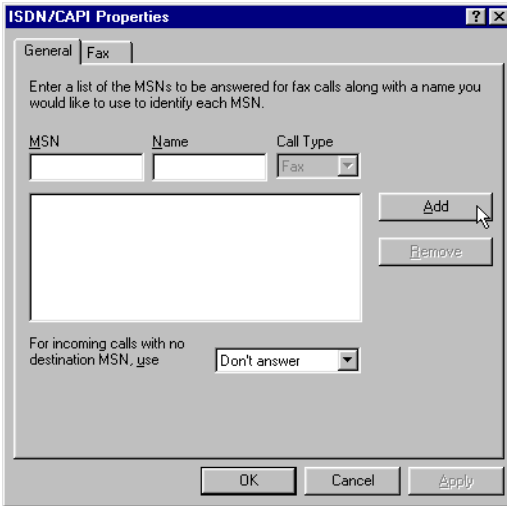
1. Start WinFax PRO 10.x. Select the menu command Tools -> Program Setup. In the WinFax PRO Program Setup window, select **Modems and Communications Devices**. In the Possible devices list, select **ISDN Device (CAPI 2.0)** and click the **Properties** button.



2. If a message appears informing you that the ISDN device has not been configured, click **Yes** to configure it. In the **Install New Device Type** window, scroll down to **Generic ISDN (CAPI 2.0)** in the **Manufacturers** list, then select the corresponding entry in the **Models** list. Click **Next**.



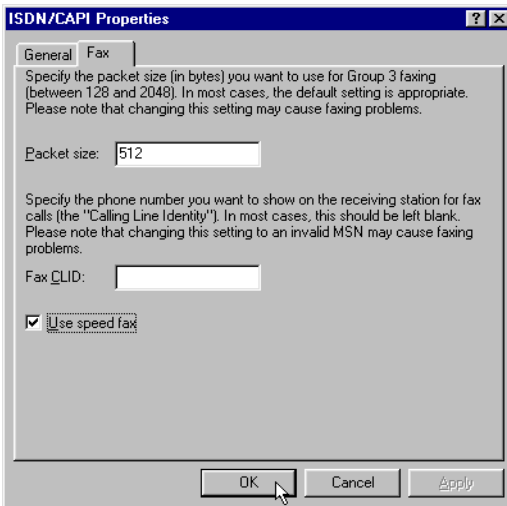
3. If a warning appears informing you that the CAPI driver has not been verified by Symantec, simply acknowledge it by clicking **OK**. In the ISDN/CAPI Properties window, you can now enter MSNs and assign them names. Click **Add** after entering each MSN and its name to make them available in WinFax PRO 10.0. When you have finished adding MSNs, click the Fax tab.



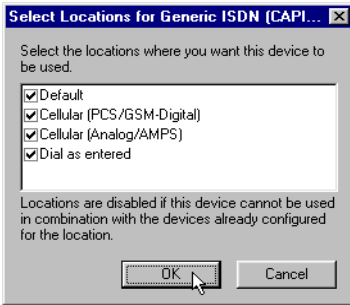
4. Now type

512

in the Packet size field, and enter one of your ISDN line's MSNs as a fax CLID (Calling Line Identification). Click **OK** to complete the configuration process.



5. In the Install New Device Type window, click **Finish**. Now the Select Locations for Generic ISDN (CAPI 2.0) window opens. Usually all the options in this window are enabled. Leave these settings as they are and click **OK**.



6. If you have not yet configured your country information for modem dialing, a message appears asking whether you want to configure how this device dials when sending faxes. Click **Yes**.
7. On the Location page in the Dialing Properties window, select the country you are in and add your area code and phone number. Then click **OK**.
8. In the Modem and Communications Devices Properties window, click **OK**. In the WinFax PRO Program Setup window, click **OK** again. This completes the configuration of WinFax PRO 10.0.

Using IBM DIALs client

This section explains the basic use of the IBM DIALs Client in Windows 95 and Windows 98. The client software should work with the following IBM products:

- 8235 DIALs Server
- 2210 Nways Multiprotocol Router and Multiprotocol Routing Services (MRS)
- 2212 Access Utility (AIS)
- 2216 Nways Multiaccess Connector

Support for the use of the IBM DIALs client is available at the following web site:

<http://www.networking.ibm.com/support>

This section only describes the use of the Dial-In client.

The latest DIALs Client can be obtained from the download section of the 2210 support page located at

<http://www.networking.ibm.com/support/code.nsf/2210dial?OpenView>. This client works with the 8235, 2210, 2212, and 2216.

The IBM DIALs client is included on the IBM International ISDN PC Card Software CD in the directories \EXTRAS\Win95\Dials and \EXTRAS\Win98\Dials.

To use the IBM DIALS client, do the following:

1. After installing the IBM DIALS client on your notebook computer, double-click the **My Computer** icon.

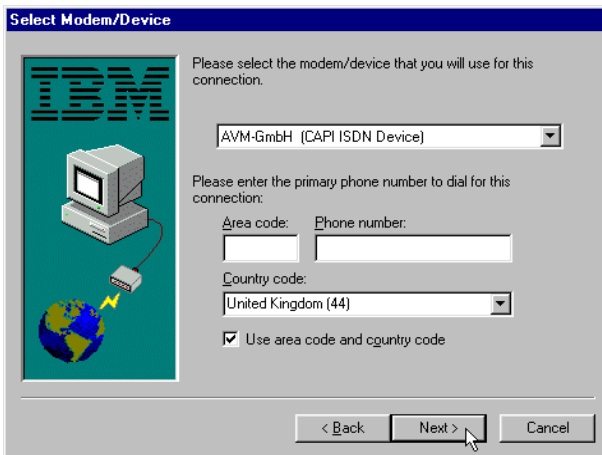


The **Dial-In Networking** icon which now appears represents the DIALS client. Double-click this icon.

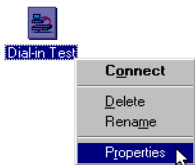
2. In the Dial-In Networking window, double-click the **Make New Connection** icon.



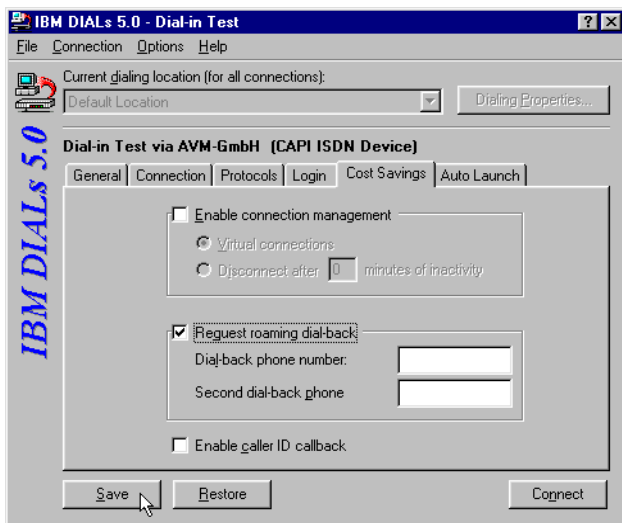
3. The New Connection Wizard starts. Enter a name for the connection in the New connection name field. In the Select Modem/Device window, select **AVM-GmbH (CAPI ISDN Device)** in the drop-down list. Enter any phone number and select the country code if necessary. Click **Next**. In the last window, click **Finish**.



4. To require the router to call back, select the connection in the Dial-In Networking window, right-click it, and select **Properties** in the context menu as shown in the example below.



5. In the Properties window, click the **Cost Savings** tab. Fill in the appropriate fields, then click **Save**. You may now dial up the connection immediately, or simply close the window.



Using ISDNWatch

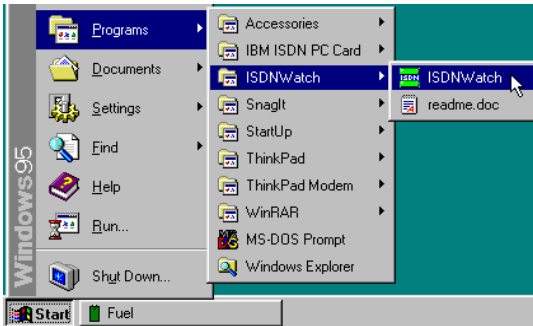
ISDNWatch is a small utility for Windows 9x, Millennium Edition, NT 4.0, 2000, and XP for use with any CAPI 2.0-compliant ISDN adapter. It displays the status of the B channels and related information.

In order to install and use ISDNWatch, you must have a CAPI 2.0-compliant ISDN adapter installed.

To use ISDNWatch, do the following:

1. Open the folder \EXTRAS\ISDNW on the device driver CD. Double-click the **Setup** file to start the installation.
2. Select the installation language and click **OK**. In the next window you may choose the installation directory. The default path is **C:\Program Files\ISDNWatch**. To select a different installation directory, click **Browse**; otherwise, click **Next** to install ISDN Watch in the default path.

- When the installation has been completed, click **Finish**. A shortcut to the ISDNWatch utility is installed by default in the Start menu under **Programs / ISDNWatch**. To start the program, click the ISDNWatch shortcut.



- After starting ISDNWatch, dial up a connection. An icon in the system tray on the task bar indicates that one or both of the B channels are in use. Each B channel in use is represented by a green bar. If both B channels are active, then the ISDNWatch icon displays two green bars.



- To configure the ISDNWatch settings, right-click the ISDNWatch icon in the system tray on the task bar.



CAPI Port Drivers

The drivers you installed for the IBM International ISDN PC Card are compliant with the CAPI 2.0 standard interface. This means that the ISDN PC Card can be used directly by application programs that conform to CAPI 2.0, such as the FRITZ! Software package included with the ISDN PC Card, Symantec's WinFax PRO 9.0, PC Anywhere 9.x, and many others. A list of CAPI 2.0-compliant software can be found in the Internet at <http://www.capi.org/cgi/sinfo.pl>.

However, many communication programs are not CAPI 2.0-compliant, including AOL 5.0, the CompuServe 4.0 dialer and many other applications. The CAPI Port Drivers are included in this package so that such programs can nonetheless be used over ISDN. The CAPI Port Drivers provide analog modem emulation over the CAPI interface, so that programs which do not conform to CAPI can use the ISDN adapter as if it were a conventional modem. In this way you can use practically any data communication software over ISDN.

In principle, the CAPI Port inserts an intermediary layer between the application you use and the CAPI 2.0 interface. It interprets the modem communication program's AT commands and converts them into CAPI 2.0-compliant API calls, thus allowing software which was not designed for ISDN communication to use your ISDN line.

Note: The CAPI 2.0 interface is not restricted to Europe - it works all over the world!

Prerequisites for the CAPI Port installation

Before the CAPI Port drivers can be installed, the device drivers for the IBM International ISDN PC Card must be installed on your system.

If you already have CAPI Port drivers installed on your system, reinstallation may not be possible without removing the older driver versions. See "Removing the CAPI Port Drivers" on page 152 for details.

Installing the CAPI Port Drivers in Windows 95

For optimal performance, install the Microsoft Dial-Up Networking Update 1.3 or 1.4 in your Windows 95 system before installing the CAPI Port Drivers. See "NDIS WAN CAPI driver installation in Windows 95" on page 16.

Note: Once the CAPI Port Driver is installed, you cannot change its settings! If you need to change the available modem emulations, you must remove and reinstall the CAPI Port Driver.

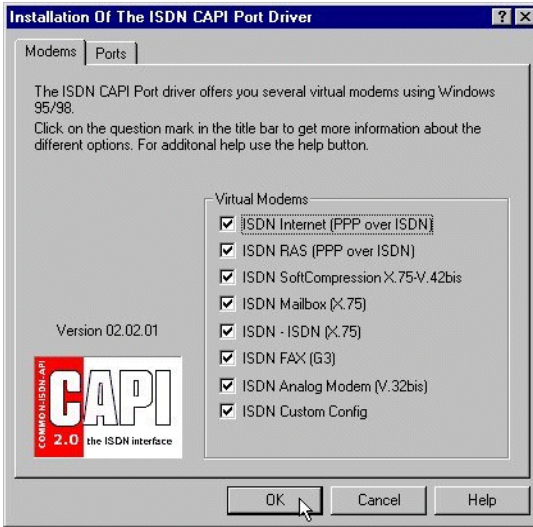
DE	Deutsch
EN	English
FR	Français
IT	Italiano
SP	Español

To install the CAPI Port drivers in Windows 95, do the following:

1. Insert the CD labeled "IBM International ISDN PC Card Drivers" into your computer's CD-ROM drive.
2. Double-click the **My Computer** icon on the desktop, then double-click the icon for your CD-ROM drive.
3. Continue double-clicking to open the folders "Extras", "PORT", "W95", and then "EN".
4. The "EN" folder contains a setup program. Double-click it to start the CAPI Port Driver installation.



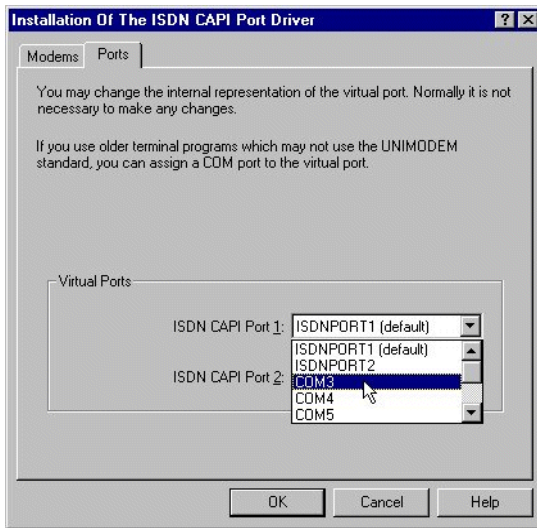
5. If you do not plan to install any other modem emulation software for CAPI 2.0, such as cFos, or if your other software does not need to access any COM ports, then you can leave all the options selected as illustrated below. In most cases you can simply click OK to confirm that you want to install the drivers.



6. Some software packages designed for use with an analog modem may require that the CAPI Port Drivers be mapped to a COM port. Older software in particular often requires a serial port in the range from COM1 to COM4.

Note: Please consult the user's guide for your notebook to find out which COM ports are used and which are available, and how to make COM ports available if necessary.

To configure the CAPI Port drivers on a specific port, click the **Ports** tab in the Installation Of The ISDN CAPI Port Drivers window.

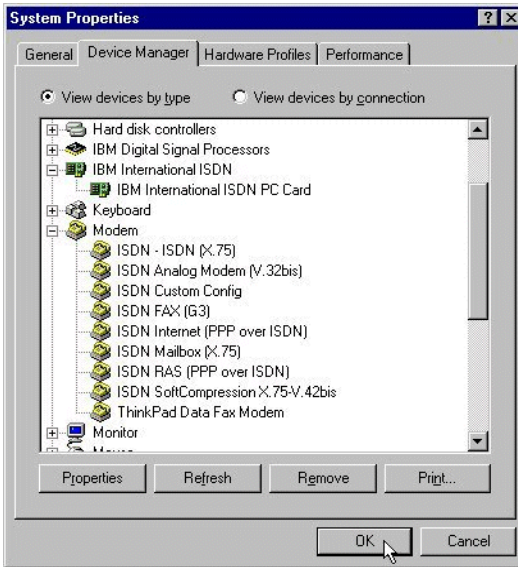


In the Virtual Port field, select one of the available COM ports in the drop-down list. In the example illustrated above, COM3 will be mapped to ISDN CAPI Port 1.

When you have selected the desired COM port in the Virtual Port field, click **OK** to complete the CAPI Port Driver installation.

Note: Selecting a COM port rather than the ISDNPORT does not affect the use of the emulated modems at all. The COM port selection is provided for those programs which require access to a COM port. These applications are few in number. The best way to find this out whether your application requires a COM port is to try it with the default CAPI Port settings first, then change them if necessary by repeating the CAPI Port Driver installation.

7. Once the installation is complete, you are prompted to restart your computer. After the system has restarted, you will find the CAPI Port Drivers installed as modems in the Windows 95 Device Manager.



Each modem name that starts with “ISDN” is an emulated modem for the CAPI Port Drivers for the CAPI 2.0 interface.

Your IBM International ISDN PC Card is now ready to use with communication software that is not CAPI-2.0 compliant. You will also find a Windows Help file for the CAPI Port Drivers on your Windows 95 desktop.



Installing the CAPI Port Drivers in Windows 98

Note: Once the CAPI Port Driver is installed, you cannot change its settings! If you need to change the available modem emulations, you must remove and reinstall the CAPI Port Driver.

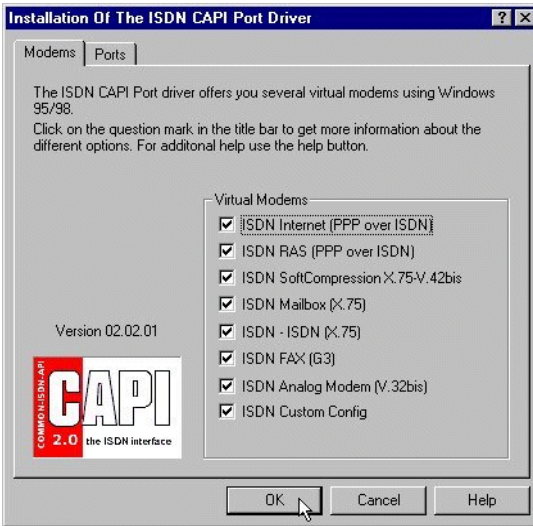
DE	Deutsch
EN	English
FR	Français
IT	Italiano
SP	Español

To install the CAPI Port drivers in Windows 98, do the following:

1. Insert the CD labeled “IBM International ISDN PC Card Drivers” into your computer’s CD-ROM drive.
2. Double-click the **My Computer** icon on the desktop, then double-click the icon for your CD-ROM drive.
3. Continue double-clicking to open the folders "Extras", "PORT", “WIN98”, and then “EN”.
4. The “EN” folder contains a setup program. Double-click it to start the CAPI Port Driver installation.



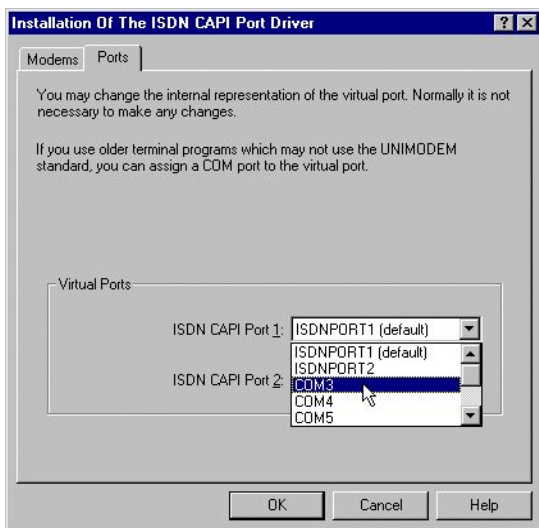
5. If you do not plan to install any other modem emulation software for CAPI 2.0, such as cFos, or if your other software does not need to access any COM ports, then you can leave all the options selected as illustrated below. In most cases you can simply click **OK** to confirm that you want to install the drivers.



6. Some software packages designed for use with an analog modem may require that the CAPI Port Drivers be mapped to a COM port. Older software in particular often requires a serial port in the range from COM1 to COM4.

Note: Please consult the user’s guide for your notebook to find out which COM ports are used and which are available, and how to make COM ports available if necessary.

To map the CAPI Port Driver to a specific port, click the **Ports** tab in the Installation Of The ISDN CAPI Port Drivers window.

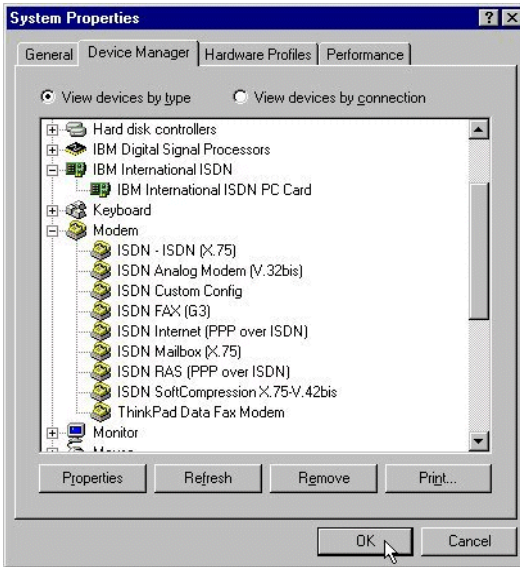


In the Virtual Port field, select one of the available COM ports in the drop-down list. In the example illustrated above, COM3 will be mapped to ISDN CAPI Port 1.

When you have selected the desired COM port in the Virtual Port field, click **OK** to complete the CAPI Port Driver installation.

Note: Selecting a COM port rather than the ISDNPORT does not affect the use of the emulated modems at all. The COM port selection is provided for those programs which require access to a COM port. These applications are few in number. The best way to find this out whether your application requires a COM port is to try it with the default CAPI Port settings first, then change them if necessary by repeating the CAPI Port Driver installation.

7. Once the installation is complete, you are prompted to restart your computer. After the system has restarted, you will find the CAPI Port Drivers installed as modems in the Windows 98 Device Manager.



Each modem name that starts with “ISDN” is an emulated modem for the CAPI Port Drivers for the CAPI 2.0 interface.

Your IBM International ISDN PC Card is now ready to use with communication software that is not CAPI-2.0 compliant. You will also find a Windows Help file for the CAPI Port Drivers on your Windows 98 desktop.



Installing the CAPI Port Drivers in Windows Me

Note: Once the CAPI Port Driver is installed, you cannot change its settings! If you need to change the available modem emulations, you must remove and reinstall the CAPI Port Driver.

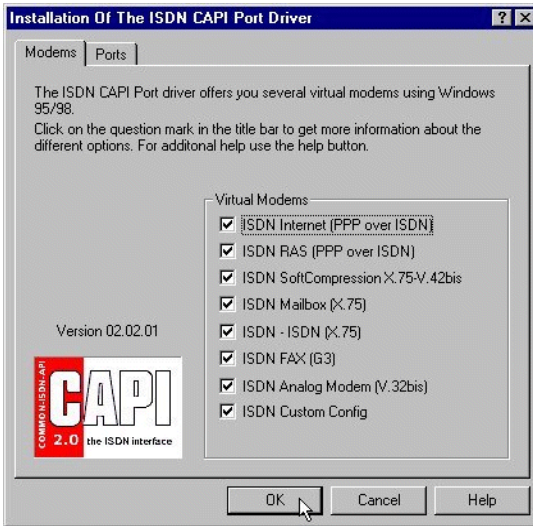
DE	Deutsch
EN	English
FR	Français
IT	Italiano
SP	Español

To install the CAPI Port drivers in Windows Me, do the following:

1. Insert the CD labeled “IBM International ISDN PC Card Drivers” into your computer’s CD-ROM drive.
2. Double-click the **My Computer** icon on the desktop, then double-click the icon for your CD-ROM drive.
3. Continue double-clicking to open the folders “Extras”, “PORT”, “WINME”, and then “EN”.
4. The “EN” folder contains a setup program. Double-click it to start the CAPI Port Driver installation.



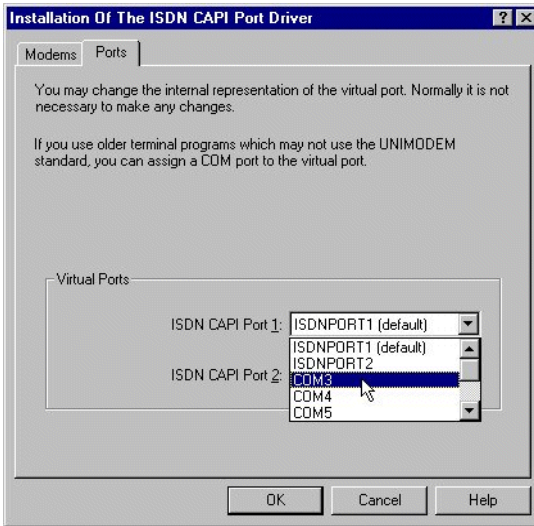
5. If you do not plan to install any other modem emulation software for CAPI 2.0, such as cFos, or if your other software does not need to access any COM ports, then you can leave all the options selected as illustrated below. In most cases you can simply click **OK** to confirm that you want to install the drivers.



6. Some software packages designed for use with an analog modem may require that the CAPI Port Drivers be mapped to a COM port. Older software in particular often requires a serial port in the range from COM1 to COM4.

Note: Please consult the user’s guide for your notebook to find out which COM ports are used and which are available, and how to make COM ports available if necessary.

To map the CAPI Port Driver to a specific port, click the **Ports** tab in the Installation Of The ISDN CAPI Port Drivers window.

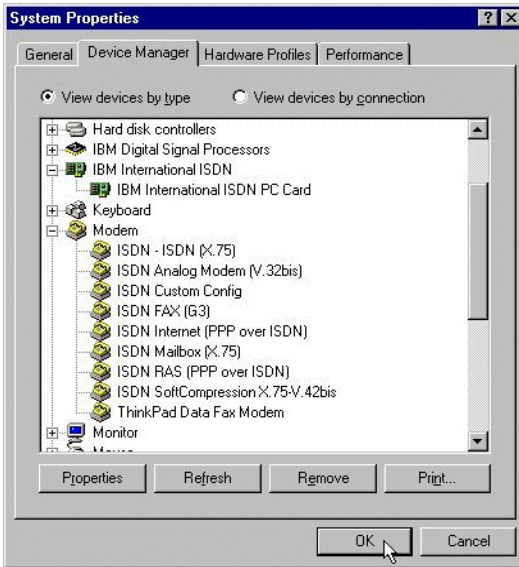


In the Virtual Port field, select one of the available COM ports in the drop-down list. In the example illustrated above, COM3 will be mapped to ISDN CAPI Port 1.

When you have selected the desired COM port in the Virtual Port field, click **OK** to complete the CAPI Port Driver installation.

Note: Selecting a COM port rather than the ISDNPORT does not affect the use of the emulated modems at all. The COM port selection is provided for those programs which require access to a COM port. These applications are few in number. The best way to find this out whether your application requires a COM port is to try it with the default CAPI Port settings first, then change them if necessary by repeating the CAPI Port Driver installation.

7. Once the installation is complete, you are prompted to restart your computer. After the system has restarted, you will find the CAPI Port Drivers installed as modems in the Windows Me Device Manager.



Each modem name that starts with “ISDN” is an emulated modem for the CAPI Port Drivers for the CAPI 2.0 interface.

Your IBM International ISDN PC Card is now ready to use with communication software that is not CAPI-2.0 compliant. You will also find a Windows Help file for the CAPI Port Drivers on your Windows Me desktop.



Installing the CAPI Port Drivers in Windows NT 4.0

Throughout this section, it is assumed that you are logged in to Windows NT 4.0 as a Administrator. If you are not, you may not be able to perform all the steps outlined in this section.

Note: Once the CAPI Port Driver is installed, you cannot change its settings! If you need to change the available modem emulations, you must remove and reinstall the CAPI Port Driver.

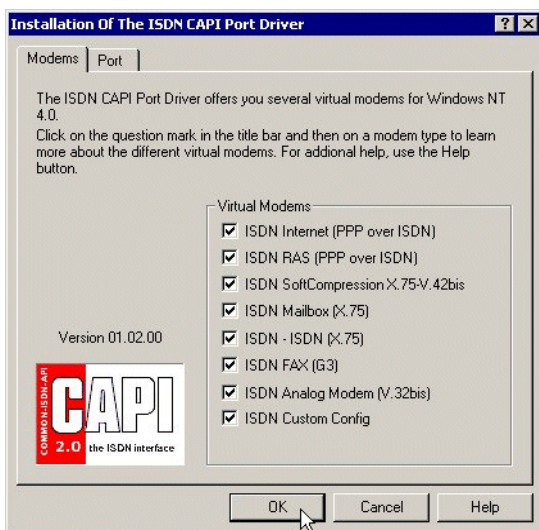
DE	Deutsch
EN	English
FR	Français
IT	Italiano

To install the CAPI Port drivers in Windows NT 4.0, do the following:

1. Insert the CD labeled “IBM International ISDN PC Card Drivers” into your computer’s CD-ROM drive.
2. Double-click the **My Computer** icon on the desktop, then double-click the icon for your CD-ROM drive.
3. Continue double-clicking to open the folders “Extras”, “PORT”, “WINNT”, and then “EN”.
4. The “EN” folder contains a setup program. Double-click it to start the CAPI Port Driver installation.

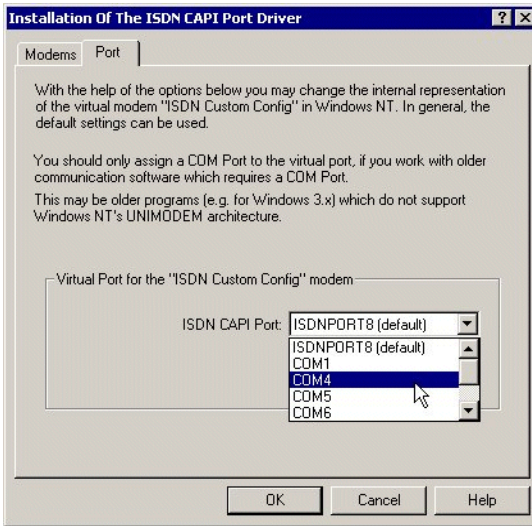


5. If you do not plan to install any other modem emulation software for CAPI 2.0, such as cFos, or if your other software does not need to access any COM ports, then you can leave all the options selected as illustrated below. In most cases you can simply click **OK** to confirm that you want to install the drivers.



6. Some software packages designed for use with an analog modem may require that the CAPI Port Drivers be mapped to a COM port. Older software in particular often requires a serial port in the range from COM1 to COM4.

To map the CAPI Port Driver to a specific port, click the **Ports** tab in the Installation Of The ISDN CAPI Port Drivers window.



In the Virtual Port field, select one of the available COM ports in the drop-down list. In the example illustrated above, COM3 will be mapped to ISDN CAPI Port 1.

When you have selected the desired COM port in the Virtual Port field, click **OK** to complete the CAPI Port Driver installation.

Note: Be aware that during the installation of the CAPI Port Drivers the selected COM port will always be assigned to the "ISDN Custom Config" modem emulation.

If you need any other COM port assignments you must install cFos for Windows NT 4.0. You can download this software from <http://www.cfos.com> or install the one delivered on the IBM International ISDN PC Card Software Installation CD.

The selection of a COM port instead of the ISDNPORT does not influence the usage of the emulated modems at all. The COM port selection is provided for those software packages that demand access to a COM port. The number of applications that demand COM port access is low. To find out if an application demands COM port access, test the software with the standard CAPI Port settings and, if needed, change the settings by reinstalling the CAPI Port device drivers.

7. Once the installation is complete, you are prompted to restart your computer. After the system has restarted, you will find the CAPI Port Drivers installed as modems in the Windows NT 4.0 Device Manager.

Each modem name that starts with "ISDN" is an emulated modem for the CAPI Port Drivers for the CAPI 2.0 interface.

Your IBM International ISDN PC Card is now ready to use with communication software that is not CAPI-2.0 compliant. You will also find a Windows Help file for the CAPI Port Drivers on your Windows NT 4.0 desktop.

Activating the CAPI Port Drivers in Windows NT 4.0

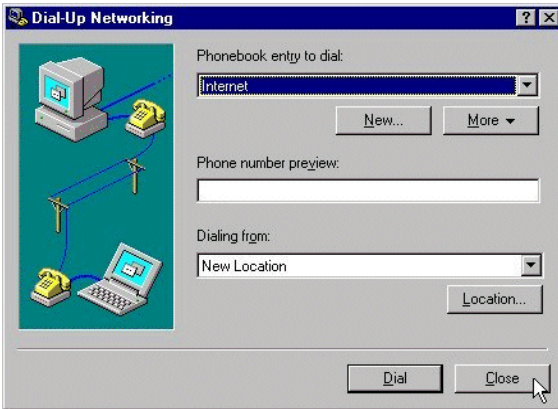
To activate the CAPI Port Drivers in Windows NT 4.0 Workstation, first check whether the Windows NT 4.0 Workstation Remote Access Service has been installed onto your computer.

To activate the CAPI Port drivers in Windows NT 4.0, do the following:

1. Double-click the **My Computer** icon on the desktop, then the **Dial-Up Networking** icon.



2. A message may then appear informing you that the phonebook is empty. Click **OK**. If the New Phonebook Entry Wizard opens, or a dialog like the one illustrated below, then Dial-Up Networking is properly installed on your Windows NT 4.0 Workstation computer. In this case, close the **My Computer** window and continue from “Adding CAPI Ports to an existing RAS installation” on page 144. Otherwise, read “CAPI Port Drivers” on page 129.



3. Now click the **Add** button to install the next RAS-capable device. In the dialog that appears, click **OK** again. Repeat this procedure until you have added all the RAS-capable devices available. Finally, click **Continue**.
4. In the dialogs that follow you will complete the RAS configuration. Follow the instructions displayed.

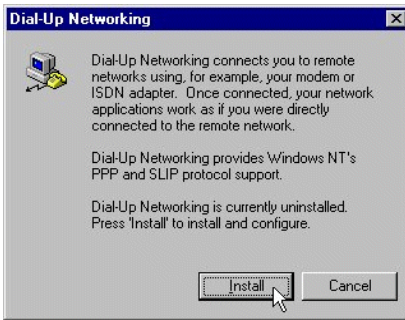
After Dial-Up Networking installation has been completed, do not reboot your computer when prompted to do so. Instead, click **Do Not Restart** and then reapply the latest Service Pack that was installed on your computer.

After the Service Pack has been reapplied, your IBM International ISDN PC Card is ready to use with communication software that is not CAPI-2.0 compliant. You will also find a Windows Help file for the CAPI Port Drivers on your Windows NT 4.0 Workstation desktop.

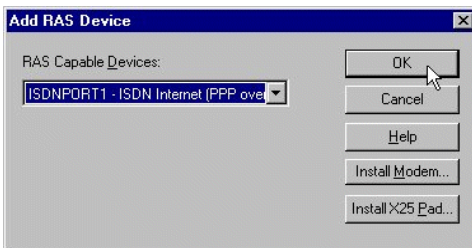
Installing RAS and adding the CAPI Ports to RAS

To install RAS and add the CAPI Ports, do the following:

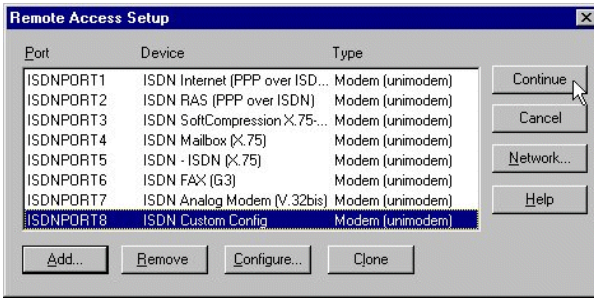
1. If you receive the following window that tells you that Dial-Up Networking is uninstalled on your system then click **Install** to add it to your system. Follow any on screen instructions you get. Ensure that as a minimum you install the TCP/IP protocol.



2. At the end of the installation process the Remote Access Setup will be invoked which displays a RAS capable device. Click the **OK** button.



3. Now click on the **Add...** button to install the next RAS capable device. In the following window click **OK**. Repeat this procedure until you do not have any RAS capable device to add. Finally **Continue**.



- In the next windows you will have to complete the configuration of RAS. Follow the on screen instructions to do this.
- Once the installation of Dial-Up Networking is complete do not reboot your computer when prompted to do. Instead click **Do Not Restart** and reapply the service pack that is installed on your laptop computer.



After the service pack has been reapplied You are ready to use non-CAPI 2.0 compliant communication software with the IBM International ISDN PC Card as well. You will also find the guide for the CAPI Port Drivers as a Windows help file on the desktop of your Windows NT 4.0 Workstation computer.



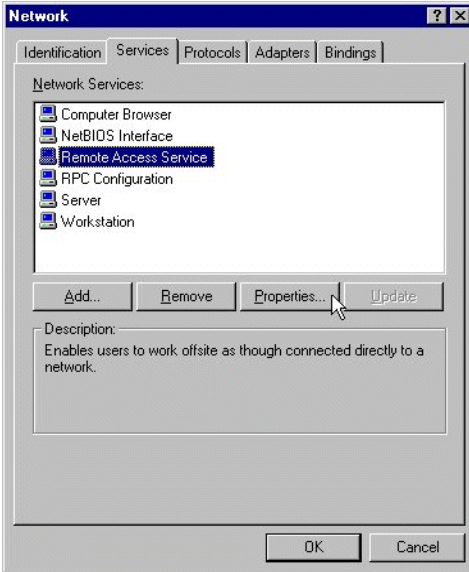
Adding CAPI Ports to an existing RAS installation

To add a CAPI Port to an existing RAS installation, do the following:

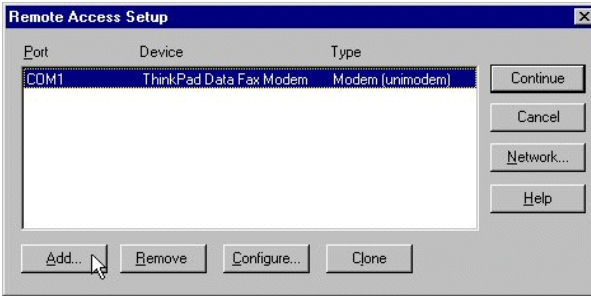
- Click through **Start -> Settings -> Control Panel** to open the Control Panel, then double-click the **Network** icon.



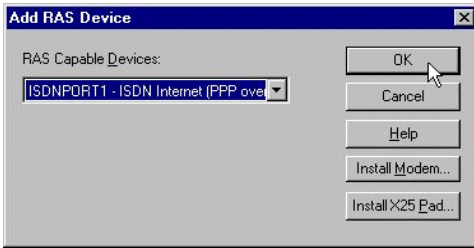
2. In the Network settings, click on the Services tab. Select **Remote Access Service** in the list of installed services, then click **Properties**.



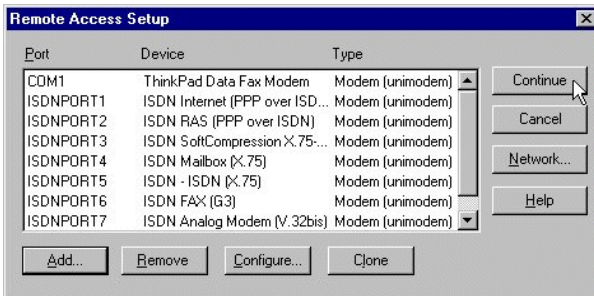
3. In the Remote Access Setup window, click **Add** to add additional RAS-capable devices.



4. In the Add RAS Device window, click **OK**. Repeat steps 3 and 4 until all of the available RAS-capable devices have been added.



- Click **Continue** to complete the installation. Click **Close** in the Network Control Panel applet. Windows NT 4.0 then updates the configuration. Reboot your computer when prompted to do so.



You are now ready to use non-CAPI 2.0 compliant communication software with the IBM International ISDN PC Card as well. You will also find the guide for the CAPI Port Drivers as a Windows Help file on the desktop of your Windows NT 4.0 Workstation computer.



Installing the CAPI Port Drivers in Windows 2000

Throughout this section it is assumed that you are logged on to the Windows 2000 system as Administrator. If you are not logged on as Administrator, you may not be able to perform all the steps outlined in this section.

Note: Once the CAPI Port Driver is installed, you cannot change its settings! If you need to change the available modem emulations, you must remove and reinstall the CAPI Port Driver.

The directory structure for the CAPI Port Drivers on the web is as follows:

DE	Deutsch
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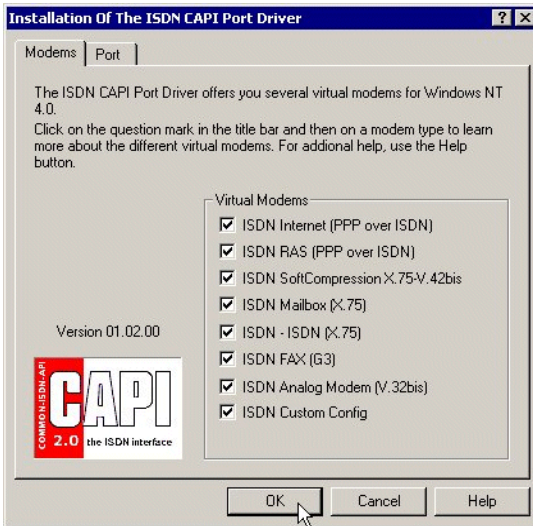
EN	English
FR	Français
IT	Italiano
SP	Español

To install the CAPI Port drivers in Windows 2000, do the following:

1. Insert the CD labeled "IBM International ISDN PC Card Drivers" into your computer's CD-ROM drive.
2. Double-click the **My Computer** icon on the desktop, then double-click the icon for your CD-ROM drive. Continue double-clicking to open the folders "Extras", "PORTS", "WIN2000", and then "EN". The "EN" folder contains a setup program. Double-click it to start the CAPI Port device driver installation



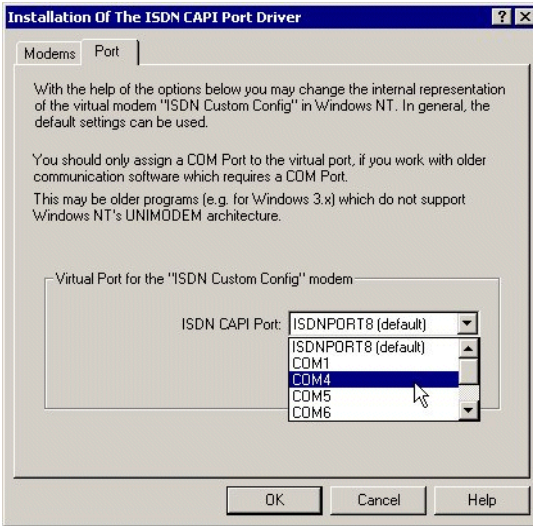
3. If you do not plan to install other modem emulator software for CAPI 2.0 drivers such as cFos or your software does not need to access any COM port, leave all selections as they are displayed below. Just click "OK" to confirm the installation of the drivers.



4. However some software packages that are tailored for use with an analog modem may require that the CAPI Port Drivers are installed to a physical COM port. Especially older software demands access any serial port in the range of COM1 to COM4.

Note: Please consult your User's guide for your laptop computer in order to find out which COM ports are used, which ones are available, and how to make COM ports available if this becomes necessary.

In order to configure the CAPI Port drivers click on the Port tab of the Installation Of The ISDN CAPI Port Driver window.



In the Virtual Port section you can select any of the ISDN CAPI Ports and choose from the drop down list any of the available COM ports. In the above example you will be selecting COM4 for the ISDN CAPI Port.

If you have made the correct selection of the COM port under the Virtual Port tab you now can click OK to complete the installation of the CAPI Port Drivers.

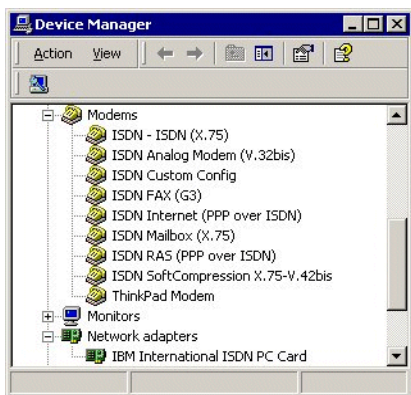
Note: Be aware that during the installation of the CAPI Port Drivers the selected COM port will always be assigned to the "ISDN Custom Config" modem emulation.

If you need any other COM port assignments you must install cFos for Windows 2000 Professional. You can download this software from <http://www.cfos.com> or install the one delivered on the IBM International ISDN PC Card Software Installation CD.

The selection of a COM port instead of the ISDNPORT does not influence the usage of the emulated modems at all. The COM port selection is provided for those software packages which demand access to a COM port. The number of applications doing this is very low. The best way to find this out is by testing the software with the standard CAPI Port settings and then changing them if needed by reinstalling the CAPI Port drivers.

5. Once the installation is complete you will be asked to restart your computer.

After the system restart you will find in the Windows 2000 Professional Device Manager the CAPI Port Drivers installed as modems.



Every modem name that starts with "ISDN" is an emulated modem for the CAPI 2.0 interface provided by the CAPI Port Drivers.

Your IBM International ISDN PC Card is now ready to use with communication software that is not CAPI-2.0 compliant. You will also find a Windows Help file for the CAPI Port Drivers on your Windows 2000 desktop.



Installing the CAPI Port Drivers in Windows XP

Throughout this section it is assumed that you are logged on to the Windows XP system as Administrator. If you are not logged on as Administrator, you may not be able to perform all the steps outlined in this section.

Note: Once the CAPI Port Driver is installed, you cannot change its settings! If you need to change the available modem emulations, you must remove and reinstall the CAPI Port Driver.

The directory structure for the CAPI Port Drivers on the web is as follows:

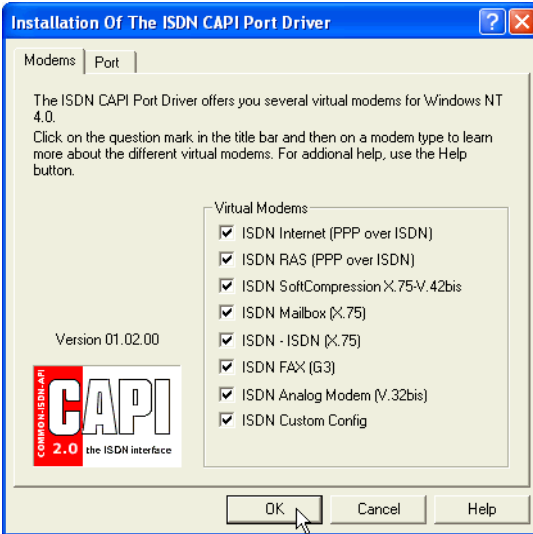
DE	Deutsch
EN	English
FR	Français
IT	Italiano
SP	Español

To install the CAPI Port drivers in Windows XP, do the following:

1. Insert the CD labeled “IBM International ISDN PC Card Drivers” into your computer’s CD-ROM drive.
2. Click Start -> My Computer and double-click the icon for your CD-ROM drive. Continue double-clicking to open the folders "Extras", "PORT" "WINXP", and then "EN". The "EN" folder contains a setup program. Double-click it to start the CAPI Port device driver installation.



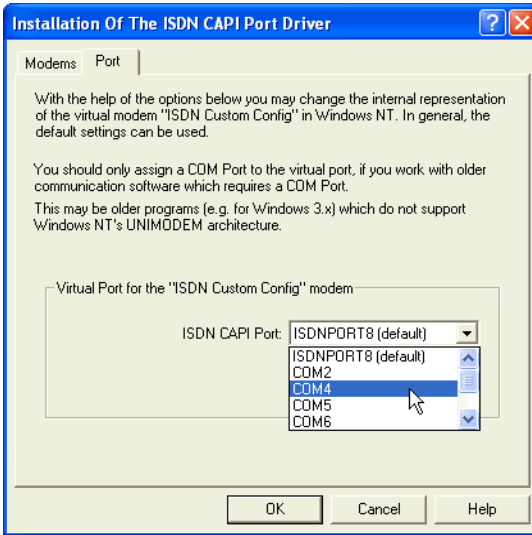
3. If you do not plan to install other modem emulator software for CAPI 2.0 drivers such as cFos or your software does not need to access any COM port, leave all selections as they are displayed below. Just click OK to confirm the installation of the drivers.



4. However some software packages that are tailored for use with an analog modem may require that the CAPI Port Drivers are installed to a physical COM port. Especially older software demands access any serial port in the range of COM1 to COM4.

Note: Please consult your User's guide for your laptop computer in order to find out which COM ports are used, which ones are available, and how to make COM ports available if this shall become necessary.

In order to configure the CAPI Port drivers click on the **Port** tab of the Installation Of The ISDN CAPI Port Driver window.



In the Virtual Port section you can select any of the ISDN CAPI Ports and choose from the drop down list any of the available COM ports. In the above example you will be selecting COM4 for the ISDN CAPI Port.

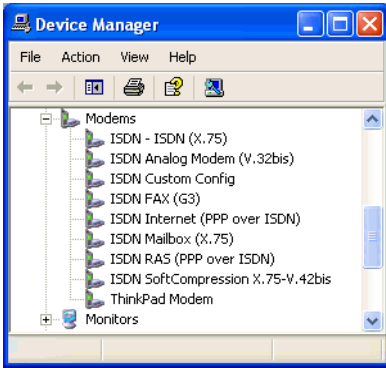
If you have made the correct selection of the COM port under the Virtual Port tab, click OK to complete the installation of the CAPI Port Drivers.

Note: Be aware that during the installation of the CAPI Port Drivers the selected COM port will always be assigned to the "ISDN Custom Config" modem emulation.

If you need any other COM port assignments you must install cFos for Windows XP. You can download this software from <http://www.cfos.com> or install the one delivered on the IBM International ISDN PC Card Installation Software CD.

The selection of a COM port instead of the ISDNPORT does not influence the usage of the emulated modems at all. The COM port selection is provided for those software packages which demand access to a COM port. The number of applications doing this is very low. The best way to find this out is by testing the software with the standard CAPI Port settings and then changing them if needed by reinstalling the CAPI Port drivers.

5. Once the installation is complete you will be asked to restart your computer. After the system restart you will find in the Windows XP Device Manager the CAPI Port Drivers installed as modems.



Every modem name that starts with "ISDN" is an emulated modem for the CAPI 2.0 interface provided by the CAPI Port Drivers.

Your IBM International ISDN PC Card is now ready to use with communication software that is not CAPI-2.0 compliant. You will also find a Windows Help file for the CAPI Port Drivers on your Windows XP desktop.



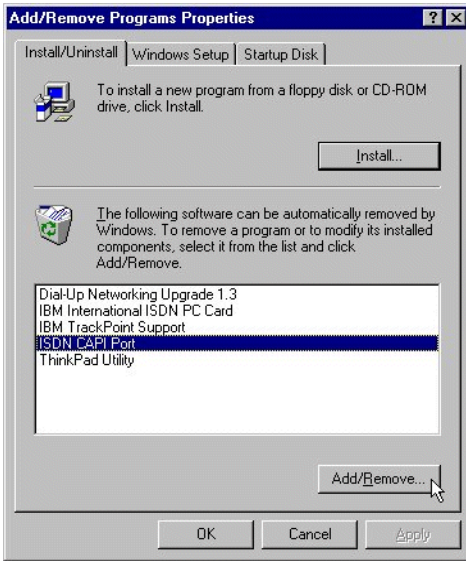
Removing the CAPI Port Drivers

To remove the CAPI PORT Drivers from Windows 95, Windows 98, and Windows Me:

1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect its cable from the ISDN line.
2. Click **Start -> Settings -> Control Panel** to open the Control Panel.
3. Double-click the **Add/Remove Programs** icon.



Select **ISDN CAPI Port** in the list of installed programs, then click **Add/Remove**. When the CAPI Port Drivers have been removed, confirm that you want to restart the computer.



Once the computer has restarted the removal of the CAPI Port Drivers is complete.

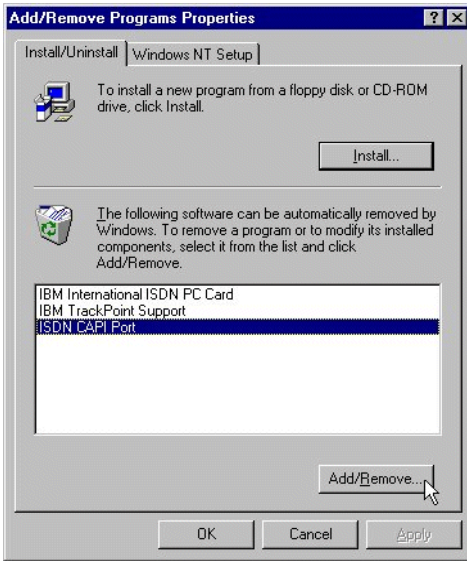
To remove the CAPI Port drivers from Windows NT 4.0:

Throughout this section it is assumed that you are logged on to the Windows NT 4.0 Workstation system as Administrator. If you are not logged on as Administrator, you may not be able to perform all the steps outlined in this section.

1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect its cable from the ISDN line.
2. Click Start -> Settings -> Control Panel to open the Control Panel.
3. Double-click the Add/Remove Programs icon.



Select **ISDN CAPI Port** in the list of installed programs, then click **Add/Remove**. When the CAPI Port Drivers have been removed, confirm that you want to restart the computer.



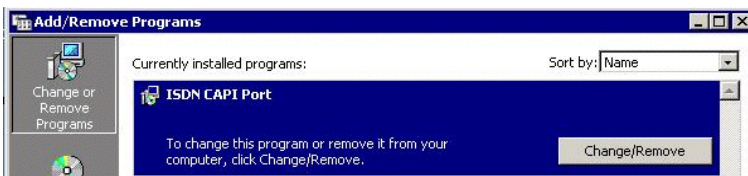
Once the computer has restarted the removal of the CAPI Port Drivers is complete.

To remove the CAPI Port drivers from Windows 2000:

1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect its cable from the ISDN line.
2. Click **Start -> Settings -> Control Panel** to open the Control Panel.
3. Double-click the **Add/Remove Programs** icon.

Make sure that **Change or Remove Programs** is selected in the column to the left.

4. Select **ISDN CAPI Port** in the list of currently installed programs.



Click the **Change/Remove** button. When the software has been removed, restart your computer.

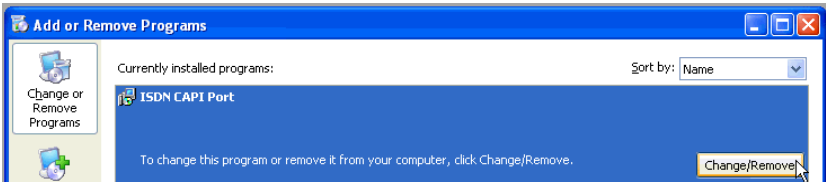
Once the computer has restarted the removal of the CAPI Port Drivers is complete.

To remove the CAPI Port drivers from Windows XP:

1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect its cable from the ISDN line.
2. Click **Start -> Control Panel** to open the Control Panel.
3. Double-click the **Add or Remove Programs** icon.



4. Make sure that **Change or Remove Programs** is selected in the column at left. Select **ISDN CAPI Port** in the list of currently installed programs.



Click the **Change/Remove** button. When the software has been removed, restart your computer.

Once the computer has restarted, the removal of the CAPI Port Drivers is complete.

CAPI Port troubleshooting and frequently asked questions

General

Which of the CAPI Port Driver's modem emulations should I use to connect to the Internet?

To set up Internet access using the CAPI Port Driver, see the section on Internet access using cFos in the User's Guide for the IBM International ISDN PC Card. When you are prompted to select a device for the Internet connection, you may select the following CAPI Port driver modem emulations:

- ISDN Internet (PPP over ISDN)
- ISDN RAS (PPP over ISDN)

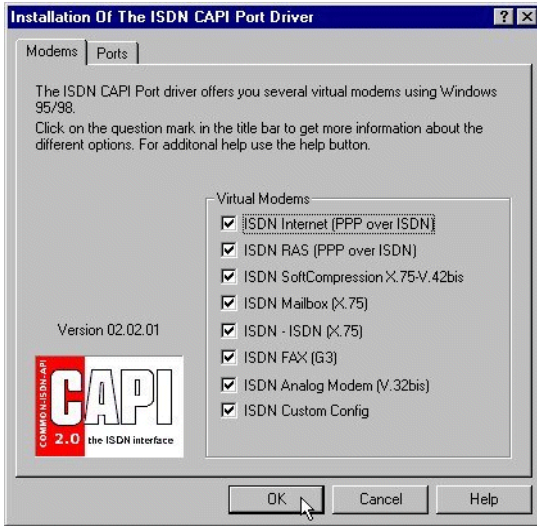
Can I use both cFos and the CAPI Port Driver?

cFos and the CAPI Port Drivers provide similar capabilities. You may use both together, or you may replace one with the other.

Windows 95

I have installed the CAPI Port Drivers in Windows 95. During the software setup, however, I was not prompted to choose the modem emulation I want. The modem is installed and works. How can I make the dialog appear?

Some versions of Windows 95 do not display the modem emulation selection dialog during the CAPI Port Driver installation:



The cause of the problem is an older version of the MFCxx.DLL files. To solve this problem, first remove the CAPI Port Drivers, then install the Year 2000 fix for Windows 95. This fix can be found on the Microsoft Windows 95 download page at <http://www.microsoft.com/windows95/downloads/>. On this page, scroll down to "Featured Updates" and then select **Windows 95 Year 2000 Update**. When you install this fix, the following dialog may appear:

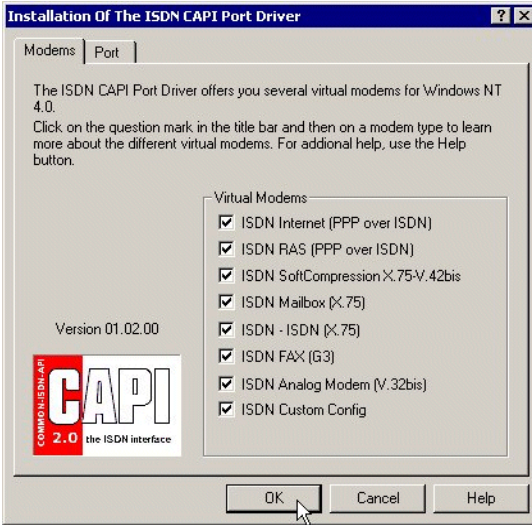


In this case, click **Cancel** to skip the installation of the Internet Explorer 4.01 Service Pack 2, then click **OK** in the following dialog to complete the installation of the Year 2000 fix. The Internet Explorer Service Pack installation is not required. Finally, reinstall the CAPI Port Drivers for Windows 95.

Windows NT 4.0

I have installed the CAPI Port Drivers in Windows NT 4.0 Workstation with Service Pack 3. During the software set-up, however, I was not prompted to choose the modem emulation I want. The modem is installed and works. How can I make the dialog appear?

Windows NT 4.0 with Service Pack 3 installed does not display the modem emulation selection dialog during the CAPI Port Driver installation:



This combination of Windows NT 4.0 Workstation and Service Pack 3 contains older versions of the MFCxx.DLL files. To solve this problem, first remove the CAPI Port Drivers, then install Service Pack 4 or later, and finally reinstall the CAPI Port Drivers .

Installing CardWizard 5.20 for Windows NT 4.0 trial version

Before installing any version of SystemSoft's CardWizard software, make sure that no adapter is currently inserted in any PC Card (PCMCIA)slot, and verify that you have removed any older versions of CardWizard. For more information on how to remove CardWizard from your Windows NT 4.0 Workstation system please see "Checking the PCMCIA support software for Windows NT 4.0" on page 34 .

You can find a trial version of CardWizard 5.20.06 on the Software CD for the IBM International ISDN PC Card in the \EXTRAS\CW52NT directory in these languages:

Directory	Language
DE	German (Deutsch)

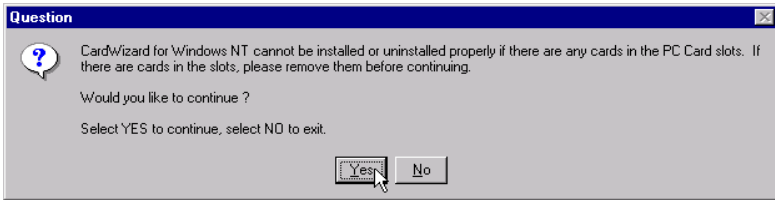
Directory	Language
EN	English
FR	French (Français)
IT	Italian (Italiano)
SP	Spanish (Español)

For details on ordering or upgrading SystemSoft's CardWizard Software, please visit the following web site:

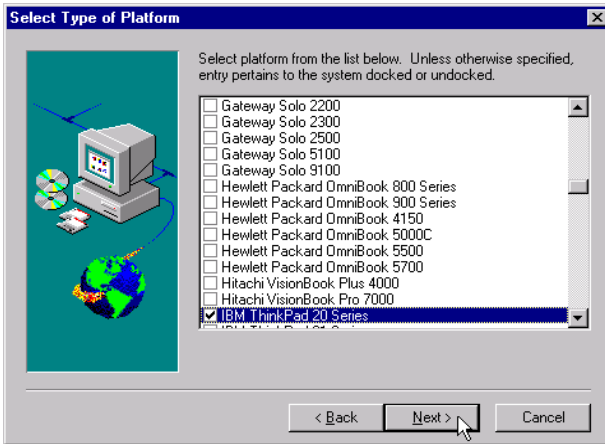
<http://www.systemsoft.com>.

To install CardWizard 5.20 for Windows NT 4.0 trial version, do the following:

1. Download the evaluation version from the IBM International ISDN PC Card web page and read the accompanying Readme file. Start the setup program as instructed in the Readme file.
2. In the first two windows, click the **Next** button. In the Software License Agreement window, read the End-User License agreement. If you agree to the license conditions, click **Yes**.
3. The **Question** message reminds you that you must remove all PC Cards from all of your computer's PCMCIA slots. If you have done so, click **Yes** to continue the installation.



4. In the next window, you must select the type of notebook computer you are using. Select the appropriate model in the list, then click **Next**.



- In the next window you can select a Power Management Utility:
 - SystemSoft PowerProfiler/PPSE
 - IBM Power Management System
 - None

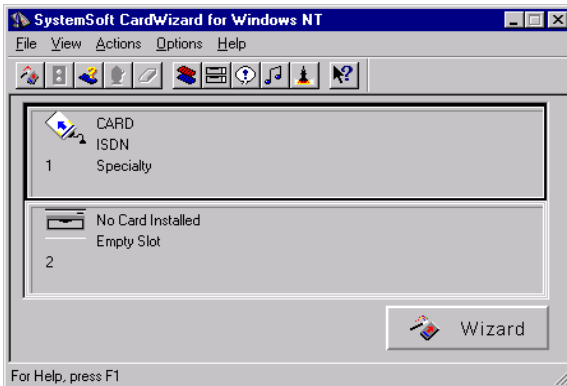
For IBM notebook computers, select the **IBM Power Management System**. For any other notebook computer you may select either the **SystemSoft PowerProfiler** or **None**. If you are not sure what to choose, please contact either the manufacturer of your notebook computer or SystemSoft for further assistance.

On Toshiba notebook computers you can also select the Toshiba Power management during the CardWizard installation. If you have further questions about this feature, please refer to the SystemSoft web site.

- In the next window you can choose the installation directory for the software. If you want to accept the default path, **C:\Program Files\SystemSoft\CardWizard**, click **Next**. Otherwise, click **Browse** and open the desired installation directory.
- After the setup has been completed, click **Yes** to read the CardWizard Readme file.
- After you have completed the installation and read the Readme file, confirm that you want to restart your computer by selecting the option **Yes, I want to restart my computer now**, then clicking **Finish**. You must restart the system in order for the changes to take effect.
- If you are using the trial version of SystemSoft's CardWizard 5.20, the following window opens after the system restart.



10. After you have completed the installation of the IBM International ISDN PC Card, the adapter will be listed in the CardWizard Window as a specialty card.



12. Using NDIS

This section contains instructions for using NDIS.

Using NDIS in Windows 95, Windows 98, and Windows Me

The NDIS WAN CAPI device driver

The NDIS WAN CAPI Device Driver for Windows 95 provides the capability for dial-up networking (RAS) over ISDN. The NDIS WAN CAPI device driver is based upon the standardized CAPI 2.0 application interface, and can be used with all CAPI 2.0-compliant ISDN adapters.

To install the device driver into MS Windows 95, you need the Microsoft ISDN Accelerator Pack v1.1 or its successor, Microsoft Dial-Up Networking 1.3 Upgrade.

Do not install these programs at the same time!

Both programs extend the functionality of Windows 9x and Windows Me Dial-Up Networking and form the basis for installation of the NDIS WAN CAPI Device Driver for Windows 9x and Windows Me. The table below shows the location of this software on the CD-ROM for each operating system.

Operating System	Directory
Windows 95	Win95\NDIS
Windows 98	WIN98\NDIS
Windows Me	WinME\NDIS

Both products contain a WAN architecture for Windows 95, identical to that of Windows NT, with features beyond simple modem support. This software enables Windows 95 to support media such as X.25, Frame Relay and ISDN.

Please note that this architecture allows you to set up only ISDN connections based on the Point-to-Point-Protocol (PPP) over ISDN and HDLC using Dial-Up Networking, unlike the ISDN CAPI Port Device Driver, which provides a UNIMODEM/VCOMM device driver. HyperTerminal, CompuServe client software and similar packages cannot be used with the ISDN Accelerator Pack. For these packages, please use the ISDN CAPI Port Device Driver or cFos.

NDIS is an abbreviation for Network Device Interface Specification and defines a standard for binding network adapters (hardware) to network protocols (software). NDIS WAN is a Microsoft extension of this standard for Wide-Area

Networking (WAN). The NDIS WAN CAPI device driver thus allows the ISDN adapter to be used as a WAN adapter, addressed through the Common ISDN API (CAPI) 2.0 applications interface.

Installing the ISDN adapter

Install the ISDN adapter as instructed in the manual. Always use the latest CAPI 2.0 device driver.

Installing Windows 95 dial-up networking 1.3

If Dial-Up Networking has not yet been installed, install it now:

1. Click **Start -> Settings -> Control Panel -> Add-> Remove Programs -> Windows Setup tab -> Communications -> Details -> Dial-Up Networking -> OK** .
2. You are prompted to confirm that you want to install Microsoft Dial-Up Networking. Click **Yes**.
3. Accept the terms of the license agreement by clicking **Yes**.
4. If the TCP/IP protocol is not yet installed on your computer, start the installation by clicking **Yes**.
5. After having restarted your computer, Windows updates several files. During this process, you must insert the Windows 95 CD-ROM when prompted. To complete the installation of Microsoft Dial-Up Networking 1.3, restart your computer.

Installing the Microsoft ISDN accelerator pack v1.1

Copy the file a temporary directory on your hard disk drive, then start the installation by double-clicking the `msisd11.exe` file. After you have accepted the Microsoft license agreement, the ISDN Accelerator Pack v1.1 is installed. At the end of the installation procedure, the following message displays:

If you are installing an ISDN adapter, you should now refer to the setup directions provided by the manufacturer.

Acknowledge this message, then restart Windows to complete the installation of the Microsoft ISDN Accelerator Pack v1.1. After successful installation, the program group ISDN Programs opens in the Accessories folder.

Installing the NDIS WAN CAPI device driver for Windows 95

You can now install the NDIS WAN CAPI Device Driver for Windows 95 using the following instructions:

1. Open the Windows 95 Control Panel and click the **Network** icon.
2. Select **Add -> Adapter -> Add**. In the next window, click the **Have disk** button. In the **Install from Disk** window, enter the path to the directory containing the NDIS WAN CAPI Device Driver files. Confirm this by clicking **OK**.

3. A device driver with the name “NDIS WAN CAPI Device Driver” is displayed. Confirm this by clicking **OK**.
4. The required files are then copied to your hard disk drive. Afterward, the network configuration window should display at least the following components:
 - The required files are then copied to your hard disk drive. Afterward, the network configuration window displays at least the following components:
 - Network Adapter: Dial-Up Adapter
 - Protocol: NDISWAN / NDIS WAN CAPI Device Driver
5. Now add any network protocols you require, such as TCP/IP, IPX/SPX or NetBIOS (you will need TCP/IP for the test connection described below). Check the bindings of the protocol to the dial-up adapter. Remove any unnecessary protocol bindings. Such changes can also be carried out later.
6. To continue the installation, confirm the settings in the network configuration window by clicking **OK**. The ISDN Accelerator Pack's ISDN Configuration Wizard starts automatically to assist you with the further configuration of the device driver. Click **Next**.
7. In the next window, select the setting **Switch Protocol: Automatic**, since the D channel protocol was already selected during the installation of the ISDN adapter device driver software, and does not need to be entered again here. Click **Next**.
8. The next window enables you to assign Multiple Subscriber Numbers (MSNs) for both Modem Entries of the NDIS WAN CAPI Device Driver, if required, in the Phone Number field. Confirm your entries by clicking **Next**.

You must assign MSNs if the ISDN adapter is to be used in RAS Server mode, and other CAPI applications which answer data calls (with the service indicator DATA64K) are present on your computer. This is necessary to direct incoming calls to the correct application. The Multiple Subscriber Number entered is used for both incoming and outgoing calls: you cannot configure separate incoming and outgoing MSNs. If you need a separate MSN for outgoing calls, use the ISDN CAPI Port Device Driver or cFos. Subsequent changes to the MSN setting will only become active after Windows is restarted.
9. When the ISDN Configuration Wizard has finished, you are prompted to insert the Windows 95 CD-ROM. If a version conflict is reported for the file NDIS.VXD (Windows NDIS 3.1 Wrapper) when copying files from the CD-ROM, then answer **Yes** to the question “Do you want to keep this file?” The file NDIS.VXD that was copied on to your computer by the ISDN Accelerator Pack v1.1 setup is more recent than the version on the Windows 95 CD-ROM.
10. The installation is then complete. After restarting the computer, the ISDN Accelerator Pack v1.1 is ready to use in conjunction with the NDIS WAN CAPI Device Driver for Windows 95.

Connections to Internet Service Providers (ISPs)

There are no binding standards for ISDN dial-up access to ISPs. PPP and SLIP protocol variants, fixed and dynamically assigned IP addresses, static or dynamic name server addresses and a variety of authentication procedures are all possible.

For TCP/IP connections with the NDIS WAN device driver, you must use 32-bit client software (such as Web browsers and FTP clients), and not 16-bit software for Windows 3.x. Otherwise, no IP connection can be established with Windows 95's 32-bit TCP/IP protocol stack.

ISDN B channel protocols and PPP variants

Many Internet providers use HDLC or the X.75 protocol on the ISDN B channel. Two protocol variants are used for PPP connections: "PPP over ISDN", based on RFC 1618 and also known as synchronous PPP; and "modem-style PPP", based on RFC 1162 and also called asynchronous PPP.

Your Internet Service Provider (ISP) can tell you which protocol combinations and authentication procedures you need for ISDN access.

Incorrect protocol settings result in immediate termination of the connection or failure to establish a connection at all, with the Dial-Up Networking error message

The computer you are dialing in to is not answering.

These settings are fixed in the Microsoft NDIS specification, and cannot be modified by the user. If you require other protocols or PPP variants, use the ISDN CAPI Port Device Driver or cFos.

Connecting computers using remote access service (RAS)

This section provides information on connecting your Windows 95 computer with another computer (Windows 95 or Windows NT) for the purpose of accessing remote files. For assistance with RAS configuration, please refer to the Windows 95 manual or on-line Help.

In this section, "Server" refers to the computer waiting to answer an incoming call, while "Client" refers to the computer that dials up the ISDN connection. The RAS configuration procedures for Windows 95 and Windows NT are different. Windows NT 3.51/4.0 enables you to operate RAS in server mode using the appropriate NDIS WAN CAPI Device Driver for Windows NT.

Remote access service (RAS) in Windows 95

To use RAS, you need the following components:

- An ISDN adapter with current CAPI 2.0-compliant device driver software
- The NDIS WAN CAPI Device Driver for Windows 95
- Dial-Up Networking (with the Dial-Up Server module for the server computer)
- A network protocol (such as NetBEUI) with suitable client software, bound to the dial-up adapter

Make sure that all of these components are installed, and determine the correct configuration options for the client software. Windows 95 only enables one Dial-Up Networking connection to be active at a time. In the following configuration example, the NetBEUI protocol from Microsoft is used to map a folder on the remote server hard disk drive to a network drive on the client computer, enabling the client to access the remote folder over ISDN as if it were a local hard disk drive.

RAS configuration example

(Local Site: Windows 95 computer; Remote Site: Windows 95 computer; both equipped with ISDN adapters)

Preparations (client and server):

To prepare your client and server, do the following:

1. Install the Dial-Up Server (on the server only)

For a Windows 95 computer to operate as a RAS server, the file **RNASERV.DLL** must be present in the **\WINDOWS\SYSTEM** directory. This file is usually installed with the MS ISDN Accelerator Pack 1.1, but can also be installed from the Windows 95 Plus Pack. If this DLL is present, then the command "Dial-Up Server" opens in the Connections menu of the Dial-Up Networking window.

2. Install the NetBEUI protocol by doing the following:

Click **Control Panel -> Network -> Add... -> Protocol -> Add... -> Manufacturer: "Microsoft" -> NetBEUI.**

3. Check the protocol binding by doing the following:

Click **Control Panel -> Network -> Dial-Up Adapter -> Properties -> "Bindings" tab -> NetBEUI" must be active**

4. Install the client by doing the following:

Click **Control Panel -> Network -> Add... -> Client -> Add... -> Manufacturer: "Microsoft" -> Client for Microsoft Networks**

5. Install File and Print Sharing (on the server only) by doing the following:

Click **Control Panel -> Network -> Add... -> Service -> Add... -> Manufacturer: select "Microsoft"-> File and print sharing for Microsoft Networks**

Configuring the Windows 95 server

Configure the Windows 95 server by doing the following:

1. Define the computer name by doing the following:

Click **Control Panel -> Network -> Identification. Computer name.** Type a name for the computer.

Example: SERVER

2. Activate file and print sharing by doing the following:

Click Control Panel -> Network File and Print Sharing... -> "I want to be able to give others access to my files"

3. Share a directory by doing the following:

Start the Explorer. Select the directory to be shared, such as C:\TEST. Right-click the directory to open the context menu. Select **Sharing -> Shared as:** and type a share name, such as

TEST

.

Type

FULL

in the Access Type field. and click OK.

4. Activate the server by doing the following:

My Computer -> Dial-Up Networking -> Connections -> Dial-Up Server. Select NDIS WAN Line 1 or Line 2 and activate **Allow call access.**

Configuring the Windows 95 client

Configure the Windows 95 client by doing the following:

1. Create a new Dial-Up Networking connection.

Click **My Computer -> Dial-Up Networking -> Make new connection -> Enter connection name** . Select modem NDIS WAN Line 1 or Line 2. Click **Continue**. Type the phone number (including outside dialing prefix for a PBX extension line if necessary). Click **Finish**.

2. Configure the Dial-Up Networking connection.

Select the newly created Dial-Up Networking connection. Right-click and select **Properties**. Deactivate the option "Use country codes and area codes". Click **Server Type** and set **Type of Dial-Up Server** to **PPP: Windows 95, Windows NT 3.5, Internet**. Optionally, you can activate **Log on to network** and **Enable software compression** options. Select **NetBEUI** as the allowed network protocol. Click **OK**.

3. Activate the Dial-Up Networking connection.

Double-click on the newly created connection in the Dial-Up Networking window and verify the phone number.

4. Map a drive to the shared folder on the remote computer.
5. Start Explorer. Click **Tools -> Map Network Drive**. Select an available drive letter. Enter the path in UNC format as follows:

\\<Computer name>\<Shared folder name>

. Click **OK**.

Important: You must use the exact notation for the remote computer's shared folder!

For example: \\SERVER\TEST

Remote access service (RAS) in Windows NT

To use RAS with Windows NT, you must first install the NDIS WAN CAPI Device Driver for ISDN/CAPI 2.0 in Windows NT. This device driver works with both Windows NT 3.51 and Windows NT 4.0. Installation of the device driver is fully described in the accompanying documentation. You can set up connections to a Windows 95 computer as the RAS server. The Windows 95 server might use the modem NDIS WAN Line 1 or Line 2 in its Dial-Up Server configuration. Please make certain of the following:

- the same network protocols are installed on both computers and configured for RAS connections
- the necessary rights have been granted (RAS dial-in access, access rights for resources, etc.)

For further information, please see the documentation that comes with Windows NT.

If you are using third-party products as RAS servers, determine the required configuration for the PPP protocols being used (synchronous or asynchronous), and for the ISDN B-channel protocols.

Multilink PPP connections

The capabilities of Windows 95 Dial-Up Networking are considerably extended by installing the MS ISDN Accelerator Pack. This extension allows you to set up Multilink PPP connections, in which both ISDN B-channels are bundled in a single network connection to one destination. This doubles the available bandwidth. Before you set up a multilink PPP connection, please note the following:

- Capabilities of Windows 95 Dial-Up Networking are considerably extended by installing the MS ISDN Accelerator Pack. This extension enables you to set up Multilink PPP connections, in which both ISDN B channels are bundled in a single network connection to one destination. This doubles the available bandwidth. Before you set up a multilink PPP connection, please note the following:
- The remote site, that is, your ISP, must also support multilink connections.
- RAS connections (see Section 4) can also use multilink PPP. This is done by configuring the second modem, NDIS WAN Line 2, to answer incoming calls on the RAS server.

To set up a multilink PPP connection, proceed as follows:

1. Create a new connection in the Dial-Up Networking window.
2. With the right mouse button, click the connection and select **Properties**.
3. Click **Settings** in the **Set additional devices** field.
4. Activate the option **Use additional devices**, then click **Add**.
5. In the **Device Name** list, select the modem entry not yet used, for example, NDIS WAN Line 2. In the **Phone number** field, enter the same number you entered when creating the connection in Step 1 above.

6. Click **OK** to close the window.

Now when you activate this dial-up connection, the computer will automatically attempt to connect to the destination ISDN number using both ISDN B channels. If only one ISDN B channel can be used –if your ISP does not support multilink PPP for example– no message will appear to indicate the fact. You can see how many B channels have actually been connected, however, by double-clicking the **Dial-Up Networking** icon in the Windows 95 task bar. Click **Details** to manually connect and disconnect the second B channel as desired. This technique allows you to double the connection bandwidth as needed for such tasks as downloading large files from the Internet, and to reduce it again afterwards to avoid excessive charges.

Legal notice

The AVM NDIS WAN CAPI Device Driver is commercial software owned by AVM Computersysteme Vertriebs GmbH Berlin.

The AVM NDIS WAN CAPI Device Driver and accompanying documentation may not be offered, used, altered, or marketed, nor may any of its identifying characteristics be altered, as part of offerings by third parties, such as hardware and software manufacturers, without written permission from AVM Computersysteme Vertriebs GmbH. Bundling with hardware and software not manufactured by AVM is expressly prohibited. Reverse engineering of the AVM NDIS WAN Device Driver, in whole or in part, is not permitted.

Possible faults and remedies

- **Fault condition:** RAS (Dial-Up) Error “Connection has gone down”:
Possible cause: This common error message can have many causes, such as a busy remote terminal, faulty cabling, an incorrect D channel protocol, no CAPI available (ISDN adapter device driver not loaded), B channel already in use, etc.
Solution: Check the following:
Examine whether another CAPI application has access to the ISDN adapter and the ISDN line. If not, refer to the trouble-shooting section in the ISDN adapter manual.
- **Fault condition:** CAPI applications that answer incoming data calls (with the service indicator DATA64K) are not functioning alongside the NDIS WAN CAPI Device Driver in RAS server mode.
Possible cause: Both the CAPI data application and RAS with the NDIS WAN CAPI device driver are trying to answer the same calls.
Solution: Assign a different Multiple Subscriber Number (MSN) to each application so that incoming calls can be differentiated.
- **Fault condition:** Unable to establish PPP connection
Possible cause: The Windows 95 ISDN Accelerator Pack v1.1 uses the Point-to-Point Protocol (PPP) over ISDN as specified in RFC 1618. This protocol is also referred to as synchronous PPP, and is a standard in ISDN internetworking.

Solution: The remote site, i.e. your Internet Service Provider must also support this standard.

- Fault condition: Multilink PPP connections are not possible.

Possible cause: Your Internet Service Provider (ISP) does not support multilink PPP connections, or you have not configured the RAS server with a second modem entry for incoming calls.

Solution: Use the same device driver at both ends of the connection, i.e. either the ISDN CAPI Port device driver or the NDIS WAN device driver. Avoid mixed operation of the two device drivers.

- Fault condition: The modem entries “NDIS WAN Line 1” and “Line 2” are not displayed in Dial-Up Networking, or a message appears upon starting Dial-Up Networking prompting you to install a modem.

Possible cause: You have not followed the installation sequence exactly (see Section 13.1.2).

Solution: Remove all components already installed (Dial-Up Networking, NDIS WAN CAPI device driver) and begin the installation again with Dial-Up Networking (see Section 13.1.2.2).

Using NDIS in Windows NT

The NDIS WAN CAPI Device Driver for Windows NT enables the use of Remote Access Services (RAS) over ISDN. NDIS is an abbreviation for Network Device Interface Specification, and represents a standard for binding network adapters (hardware) to network protocols (software). NDIS WAN is a Microsoft extension of this standard for Wide Area Networking (WAN). The NDIS WAN CAPI Device Driver for Windows NT thus allows the ISDN adapter to be used as a WAN adapter, addressed through the Common ISDN API (CAPI) 2.0 applications interface.

Please install the software according to these instructions. You should also refer to the Windows NT documentation pertaining to Remote Access Services (RAS).

Installation

You will need system administrator access privileges to install the NDIS WAN CAPI Device Driver for Windows NT.

Copy the NDIS WAN CAPI Device Driver software onto a floppy disk and label it accordingly.

The following components are necessary to use RAS services over ISDN:

- A computer with the Windows NT 4.0 operating system
- A fully installed ISDN adapter with CAPI 2.0 device driver (see the installation instructions in the ISDN adapter manual)
- A diskette (or CD) with the NDIS WAN CAPI Device Driver for Windows NT

The exact procedure for installing the NDIS WAN CAPI Device Driver depends on the network components already installed on your computer. To illustrate

some of the different requirements possible, two basic configuration examples are presented here:

1. You have not yet installed a network, and must therefore perform a complete network installation including the NDIS WAN CAPI Device Driver and RAS (see Section 13.2.1.1 on page 185).
2. You have not yet installed a network, and must therefore perform a complete network installation including the NDIS WAN CAPI Device Driver and RAS (see Section 13.2.1.1 on page 185).

Complete network installation

- Open the Start menu and click **Settings**, then **Control Panel**. Double-click the **Network** icon. If no network has been installed, you are prompted to do so now. Click **Yes** to start the installation.
- Select the option **Wired to the Network**, then click **Next**.
- Now you must install a network adapter. The NDIS WAN CAPI Device Driver for Windows NT makes your ISDN adapter function as a network adapter. In the next window, click **Select from list**. The **Select Network Adapter** window opens. Click **Have disk**.
- Insert the diskette containing the NDIS WAN CAPI Device Driver for Windows NT into the disk drive, and confirm the path to this drive.
- The **Select OEM Option** window opens. Select the entry **NDIS WAN CAPI Device Driver for Windows NT** and confirm by clicking **OK**.
- Once the adapter has been installed, click **Next**.
- Now you must specify the network protocols for the network adapter. Select the desired protocols and confirm your selection by clicking **Next**.
- You have now installed all the required network components. To confirm your settings, click **Next**.
- Windows NT now copies the files required for the selected components onto your hard drive. Specify the path to the Windows NT CD or to the installation files and confirm by clicking **Next**.
- The **NDIS WAN CAPI Driver Properties** window opens.
- You have the option of specifying two MSNs. If you have not installed any other CAPI application, or if you only want to use the NDIS WAN CAPI Device Driver for Windows NT for outgoing calls, then you can simply click **OK** without entering an MSN.
- MSNs (Multiple Subscriber Numbers, only on ISDN lines using DSS1) are used to route incoming and outgoing calls. If you have other CAPI applications installed on your computer that accept data calls (with the ISDN service indicator DATA64K), then enter one of your ISDN line's numbers here under which the NDIS WAN CAPI Device Driver for Windows NT will accept incoming calls.
- A setup message appears. Acknowledge it by clicking **OK**.
- Windows NT then informs you that RAS needs to be installed. Insert the Windows NT CD and enter the corresponding path. Now you must select a RAS device. The **Add RAS Device** window opens. Select **ISDN1 - WAN (ISDN**

B channel 1) or ISDN2 - WAN (ISDN B channel 2) and confirm this by clicking **OK**.

- The Remote Access Setup window opens. Select ISDN1 - WAN or ISDN2 - WAN and click **Configure**. The Configure Port Usage window opens. Specify here whether you want to receive calls, dial out, or both.
- Set the port usage to **Dial out only**.
- If you intend to use both ISDN B channels for RAS, you can configure the second B channel as a RAS device now by clicking **Add**. Confirm your port usage settings by clicking **OK**.
- Now click the **Network** button in the Remote Access Setup window. In the Network Configuration window which opens, select only TCP/IP as **Dial-out protocol**, then click **OK**.
- If you also want to receive calls, and you have selected the corresponding option in the Configure Port Usage window, then select the desired network protocol under **Server Settings**, as well as the options for authentication of incoming calls. To obtain maximum compatibility with other products, activate the option **Allow any authentication including clear text**.
- Windows NT now copies the files for the selected components. During this process, Setup displays the message "TCP/IP Version 4.0 is already installed on the system". Acknowledge this message by clicking **OK**, and do the same for other protocols if necessary. Windows NT now displays a summary of the network installation. Check your bindings!
- A message appears saying that Windows NT can now start the network. Click **Next** to complete the network installation.
- Restarting the computer completes the installation of the network components.

Installation in an existing network

Installing the NDIS WAN CAPI device driver for Windows NT:

- Open the Start menu and move the pointer to **Settings**. Open the Control Panel and double-click the **Network** icon.
- In the network configuration window, click the **Adapters** tab.
- Now you must install a network adapter. The NDIS WAN CAPI Device Driver for Windows NT makes your ISDN adapter function as a network adapter! In the next window, click **Add**, then in the Select Network Adapter window, click **Have Disk**.
- Insert the NDIS WAN CAPI Device Driver for Windows NT installation disk into the floppy disk drive and enter the path to the files. Confirm the path by clicking **OK**.
- The Select OEM Option window opens. Select the entry **NDIS WAN CAPI for Windows NT** and click **OK**. Windows NT now copies the device driver from the floppy disk onto your hard drive.
- The NDIS WAN CAPI Driver for Windows NT Properties window then opens.

- You have the option of defining two MSNs for each ISDN B channel. If you have not installed any other CAPI application or if you only want to use the NDIS WAN CAPI Device Driver for Windows NT for outgoing calls, then you can simply click **OK**.
- MSNs (Multiple Subscriber Numbers, only on ISDN lines using DSS1) are used to route incoming and outgoing calls. If you have other CAPI applications installed on your computer that accept data calls (with the ISDN service indicator DATA64K), then enter one of your ISDN line's numbers here under which the NDIS WAN CAPI Device Driver for Windows NT will accept incoming calls.
- A message appears saying that the NDIS WAN CAPI Device Driver for Windows NT setup is complete, and that RAS (Remote Access Service) will now be installed or configured.
- Acknowledge the message by clicking **OK**.

Installing remote access services (RAS) and the network protocol (TCP/IP)

- The Windows NT RAS installation now starts automatically. Since the RAS service has not yet been installed on your system, the Windows NT Setup window opens first. Specify the path to the installation files or to the Windows NT CD, and confirm by clicking **Next**. Windows NT now copies the necessary files for the RAS service. Now you must select a RAS device. The Add RAS Device window opens. Choose **ISDN1 - WAN** or **ISDN2 - WAN** and confirm by clicking **OK**.
- Next, click **Configure**. The Configure Port Usage window opens. Specify here whether you want to receive calls, dial out, or both.
- If you intend to use both ISDN B channels for RAS, you can configure the second B channel as a RAS device now by clicking **Add**. Windows NT can only use one channel for incoming calls.
- Confirm your port usage settings by clicking **OK**.
- Now click **Network** in the Remote Access Setup window.
- In the Network Configuration window which then opens, select only **TCP/IP** as **Dial out protocol**, then click **OK**.
- If you have configured the RAS ports to receive or to dial and receive calls, then an additional network configuration window opens in which you can provide information on TCP/IP address pools, etc. In this case, select the desired network protocols under **Server Settings** and configure them as required for your network environment, then set the authentication options for incoming calls. To obtain maximum compatibility with other product, activate the option **Allow any authentication including clear text**.
- Close the Remote Access Setup window by clicking **Next**. Windows NT prompts you for additional files from the installation CD.
- Click **Close** in the Network window. Windows NT now updates the protocol bindings. If you have also installed an internal network adapter, the Microsoft TCP/IP Properties window opens. Set the necessary options here as required for your network environment.
- You are then prompted to restart the computer. Confirm this by clicking **Yes**.

This completes the installation of the network components.

Notes on RAS server configuration in Windows NT Server 4.0

General

This section contains details about certain possible RAS configurations of in Windows NT and Windows 95. It does not contain details specific to ISDN. If you have any further questions, please refer to your Windows NT documentation. These notes are based on the assumption that a Windows 95 remote client (referred to here as “the remote”) is dialing up a Windows NT server network (referred to here as “the central site”) over ISDN.

Windows NT server (central site)

The remote client must be able to log on to the LAN. In addition, an NT server must be installed in the LAN as a Primary Domain Controller (PDC). The remote client must be registered in the domain as a user (User Manager for Domains). Extra dial-up rights must be configured for RAS.

The RAS server is installed on an Windows NT server equipped with an ISDN adapter. If necessary, the PDC and RAS can be configured on the same machine. The RAS port ISDN1 or ISDN2 is installed as described in Section 13.2.1, and configured to accept incoming calls in Remote Access Setup.

RAS client with Windows 95 (remote)

The ISDN CAPI Port Device Driver for Windows 95 can be installed along with Dial-Up Networking according to the instructions in the on-line Help. Enter the following settings in the Control Panel:

Network/Identification:

- Workgroup = domain name.

Network/Configuration:

- Client for Microsoft Networks
- Properties: Log on to Windows NT domain; enter the name of the NT domain
- Network log-on options: Quick log-on
- Dial-Up Networking adapter
- Network protocol TCP/IP or NetBEUI bound to the Dial-Up Adapter (see further details in Sections 13.2.2.2 and 13.2.2.3)

Use the ISDN RAS or ISDN Internet modem entry for the Dial-Up Networking connection, and select the server type **PPP: Windows 95, Windows NT 3.5, Internet**.

TCP/IP is a routable network protocol. The public Internet is based on this protocol. It is also commonly used in LANs and WANs.

Windows NT server (central site)

If the Internet protocol (TCP/IP) is used as the transport protocol for Microsoft networking, WINS and DHCP services can be installed on the Windows NT server. These services manage and assign of NetBIOS names and IP addresses where necessary. Neither service is absolutely essential, and both can be replaced by using LMHOSTS files and fixed IP address configuration on the workstations. Important WINS and DHCP configuration parameters are listed below:

- Install the WINS service on the RAS server or another server in the network by clicking on **Network -> Properties -> Services -> Add -> WINS Service**.
Install WINS Service with WINS Manager.
- Install the DHCP service on the RAS server or another server in the network by clicking on **Network -> Properties -> Services -> Add -> DHCP server**.
Install DHCP Service with DHCP Manager by clicking on **Add Domain -> Option Add Domain -> 003 router, 044 WINS/NBNS servers, 046 WINS/NBT node type**.

The following configuration permits both DHCP and fixed IP addressing for RAS clients:

- **Network -> Services-> Remote Access Service -> Properties... -> Port ISDN1 -> Network -> TCP/IP -> Configure: Use DHCP, Allow remote clients to request a predetermined IP address.**

RAS Client with Windows 95 (Remote)

- Bind TCP/IP to Dial-Up Adapter:
Obtain an IP address automatically
Bindings / Client for Microsoft Networks
WINS Configuration: Use DHCP for WINS Resolution
- Dial-Up Networking: **Server Type -> Allowed Network Protocols: TCP/IP; Server-assigned IP address**

Notes on using the network protocol NetBEUI

NetBEUI is a broadcast-oriented network protocol which is not routable. This means that its use in LANs and WANs is limited, but it is easy to configure in Microsoft networks.

Windows NT Server (Central Site)

The following configuration installs NetBEUI for RAS clients:

- **Network -> Services -> Remote Access Service -> Properties... -> Port ISDN1 -> Network -> NetBEUI**

RAS Client with Windows 95 (Remote)

- Network Setup: bind NetBEUI protocol (from Microsoft) to the Dial-Up Adapter
- Dial-Up Networking: **Server type -> Allowed network protocols: NetBEUI**

Problem solving

This section describes the remedies for a few errors which could occur while operating the NDIS WAN CAPI Device Driver for Windows NT.

- **Symptom:** CAPI applications which accept incoming data calls (with the ISDN service indicator DATA64K) do not work alongside the NDIS WAN CAPI Device Driver for Windows NT and the RAS Server mode.

Cause: Both the NDIS WAN CAPI Device Driver for Windows NT and the other CAPI applications are attempting to answer the same incoming calls.

Remedy: Because the incoming calls for the CAPI applications and the RAS both have the same service indicator, they can only be distinguished by assigning them different Multiple Subscriber Numbers (MSNs, on DSS1 lines). To assign an MSN, proceed as follows:

Configure an MSN (on a DSS1 line) for the NDIS WAN CAPI Device Driver for Windows NT. To do this, open the Network Settings (**Start -> Settings -> Control Panel -> Network**) and click the **Network Adapter** tab. Select the NDIS WAN CAPI Device Driver in the list and click **Properties**. The NDIS WAN CAPI Device Driver for Windows NT properties window opens, and you can enter one of your ISDN line's MSNs.

- **Symptom:** PPP connections fail.

Cause: The Windows NT RAS Service uses PPP over ISDN in accordance with RFC 1618. This protocol is also referred to as "synchronous PPP", and is a widely-used standard for network connections over ISDN.

Remedy: The remote computer or Internet provider must also support this standard. You will find further information in the Word document STRUCTUR.DOC, which contains the specifications for the NDIS WAN CAPI Device Driver for Windows NT.

- **Remedy:** The remote computer or Internet provider must also support this standard. You will find further information in the Word document STRUCTUR.DOC, which contains the specifications for the NDIS WAN CAPI Device Driver for Windows NT.

Cause: CompuServe does not use the standard PPP over ISDN (RFC 1618).

Remedy: Use a fossil device driver (such as cFos/NT) that provides a suitable modem emulation.

Legal notice

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13. ISDN CAPI Port Device Driver

Prerequisites for the CAPI Port installation

Before the CAPI port device drivers may be installed, the device drivers for the IBM International ISDN PC Card must be installed. If you already have CAPI port device drivers installed, reinstallation may not be possible without removing older driver versions. See "Removing the ISDN CAPI Port device driver" on page 179 for more details.

Version 02.02.01 for Windows 95 and 98

The ISDN CAPI Port Device Driver is a universal ISDN connectivity solution for the Microsoft Windows 95/98 operating system. It facilitates the use of Remote Access Services (RAS) and Dial-Up Networking connections to the Internet and to on-line services.

Technically, the ISDN CAPI Port Device Driver mediates between Windows 95/98's UNIMODEM/VCOMM architecture and the applications interface COMMON-ISDN-API 2.0 (CAPI). The CAPI 2.0 interface, a manufacturer-independent standard, is provided with the ISDN-Controller and loaded by the Controller's installation program.

Virtual modems

After simple installation in Windows 95/98, the CAPI Port Device Driver supplies up to eight virtual modems which are immediately available for use. These modems allow the ISDN-Controller in your computer to be used even by programs that expect an analog modem.

Each of the virtual modems is available for a different application. For instance, the ISDN FAX (G3) modem is configured for fax applications, while ISDN RAS can be used for remote-access connections to remote computers.

The default configurations of the virtual modems allow them to be used immediately in most conventional implementations without any further configuration required. However, it is also possible to adapt the ISDN CAPI Port Device Driver for special cases such as the configuration of the Internet connection and RAS (see "Modem Settings Using Registry Commands").

Programs that use the CAPI interface directly can exploit the CAPI Port modem to use the second B channel for their own use, parallel to an existing Dial-Up Networking connection. This is possible because the B-channel assignments are performed by CAPI automatically.

The fax functions of MS Exchange/Outlook and other Fax Group 3 applications can be used through the virtual CAPI Port modem ISDN FAX (G3).

Installing / removing the ISDN CAPI Port device driver

If you have not yet done so, first install the CAPI 2.0 device drivers for your ISDN-Controller according to the instructions in the manual.

Before starting installation of the ISDN CAPI Port Device Driver, note the following:

- During installation up to eight different virtual modems are created, each of which fulfills a different function.
- To use the virtual modems "ISDN FAX (G3)" and "ISDN Analog Modem (V.32bis)" with passive ISDN-Controllers, the device driver software of your ISDN-Controller must support these services. Contact the manufacturer for more information.
- The virtual modem "ISDN Analog Modem (V.32bis)" can be used only with passive ISDN-Controllers. The analog/digital conversion is performed by the computer's CPU. A Pentium computer with 133 MHz and at least 32 MB RAM will provide optimal performance.
- It might be necessary to assign COM ports to the virtual modems. This is the case when using Dial-Up Networking software which can access only COM ports (such as older versions for Windows 3.x). See the instructions in the section "Using Data Communications Software with an Emulated COM Port". Before making any assignments, check which COM ports are already in use by other hardware devices like serial interfaces.

Start installation

1. Insert the disk or CD with the ISDN CAPI Port Device Driver in the appropriate drive.
2. Start the installation by double-clicking on the SETUP.EXE
3. The Modems page lists eight virtual modems which can be selected for installation:
 - ISDN - ISDN (X.75)
 - ISDN Analog Modem (V.32bis)
 - ISDN Custom Config
 - ISDN FAX (G3)
 - ISDN Internet (PPP over ISDN)
 - ISDN Mailbox (X.75)
 - ISDN RAS (PPP over ISDN)
 - ISDN SoftCompression X.75-V.42bis

Select the desired modems from the list.

4. To learn more about the different virtual modems, click the question mark in the title bar and then the modem type. A small window with information about the modem opens.
5. On the Ports page, the virtual modems can be assigned to COM ports.
6. If no Dial-Up Software requiring COM ports is used, accept the default settings.
7. Confirm the selected configuration by clicking OK.
8. Once installation is completed, you will be prompted to restart Windows.
9. To view the list of installed modems and have the opportunity to change any modem settings, select "Start / Settings / Control Panel / Modems."

Removing the ISDN CAPI Port device driver

To remove the ISDN CAPI Port Device Driver completely from your system, proceed as follows:

1. Open the Control Panel and double-click the **Add/Remove Programs** icon.
2. Select the entry **ISDN CAPI Port**.
3. Click the **Add/Remove...** button. The uninstallation routine will be started and the modem entries will be removed from your system.
4. Once the device driver has been removed from your system, you will be prompted to restart Windows.

Modem settings using registry commands

Using registry commands the user can control all modems universally.

During installation of the ISDN CAPI Port Device Driver, the virtual modems initially are installed with a default configuration. It is generally not necessary to change these default settings. If a change should become necessary, however, modem settings can be adapted to your needs using registry commands.

Such a configuration is essentially the same for all virtual modems. The general procedure is described below. The individual registry commands are listed in the corresponding sections as well as in Appendix A.

1. Open **Start -> Settings -> Control Panel -> Modems**.
2. Select the desired modem.
3. Click the **Properties** button.
4. Click the **Advanced...** button on the **Connection** page.
5. Enter the registry command in the **Extra Settings** input field.

To enter multiple registry commands, separate commands with a semicolon and a space. Only the first command entered should begin with the characters "AT".

Example: AT\$31=2; S35=38400; S51=0

6. Confirm your entries by clicking OK and close the modem window.

Connections to internet service providers (ISPs)

There is no binding standard for ISDN dial-in access to the Internet via Internet providers. PPP/SLIP protocol variants, fixed or dynamically assigned IP addresses, static or dynamic DNS and a variety of authentication techniques make it impossible to set a universally valid Internet access configuration for the ISDN CAPI Port Device Driver.

For TCP/IP connections using the ISDN CAPI Port Device Driver, you must also use 32-bit client software (i.e., WWW browsers, FTP clients, etc.) rather than 16-bit applications for Windows 3.x. Otherwise, no connection to the 32-bit TCP/IP protocol stack integrated in Windows 95/98 is possible.

ISDN B-channel protocols and PPP variants

Many providers use the "HDLC" or "X.75" protocol on the ISDN B channel. Two protocol variants are used for PPP connections: "PPP over ISDN" in accordance with RFC 1618 (also known as synchronous PPP), and "PPP modem style" in accordance with RFC 1162 (also called asynchronous PPP).

Note: Please ask your Internet provider which combination of protocols and authentication procedures are required for ISDN dial-in access.

Incorrect protocol settings either result in an immediate termination of the connection or prevent the ISDN connection from being established in the first place (error message: "The computer you are dialing in to is not answering.").

Setting modem registers for ISDN B-channel protocols and PPP: The virtual modem ISDN Internet (PPP over ISDN) is set by default to "HDLC" and "PPP over ISDN" according to RFC 1618. If a different configuration is requested by your Internet provider, you can change the B-channel ISDN protocol by setting the register "S31":

- S31=0X.75 protocol
- S31=1HDLC protocol (default)
- S31=2V.110 protocol
- S31=7V.120 protocol

The registers "S41", "S42" and "S43" can also be used to set the B1, B2 and B3 protocol layers individually. However, this is not necessary in most cases.

The PPP protocol variant used can be configured using register "S51":

- S51=0 asynchronous PPP ("modem style", RFC 1162)
- S51=1 synchronous PPP ("PPP over ISDN", RFC 1618)

Authentication

For PPP connections, the dial-in user is authenticated by a user ID and password (PAP/CHAP standards). This information, entered in the configuration of a Dial-Up Networking connection, is transmitted automatically to the remote dial-up server upon connection. More user information generally is not required.

Some Internet providers (including many universities, etc.) use the calling line identification transmitted over the ISDN D channel in addition to or instead of the user name and password. The next section explains how the virtual modem must be configured to transmit the ISDN D-channel number.

ISDN D channel

Note: The ISDN D-channel number can be transmitted only if you did not expressly request that your network provider deactivate transmission of this number.

Entering the ISDN D-channel number: Using the registry command `S49=<multiple subscriber number>` any multiple subscriber number (MSN) from the block assigned can be specified for transmission in the D channel. The block of numbers for your line is assigned by the network provider. An invalid number entry is automatically replaced with the first MSN in the assigned block.

If no number is set in register "S49", the first subscriber number assigned to your DSS1 (Euro ISDN) line is sent.

Suppressing caller ID display (CLIR): Use the registry command `"S54=1"` to suppress the display of the ISDN D-channel number. This allows anonymity for ISDN connections, for instance, in Dial-Up Networking. At a number of ISDN connections, the ISDN feature "Case-by-case suppression of Caller ID (CLIR)" must be explicitly requested. The network provider generally activates this feature free of charge.

If your ISDN-Controller is connected to an internal S0 access "behind" an ISDN telecommunication system (internal S0 bus), some ISDN telecommunications systems require that the connected device signal an MSN when the connection is established (please see also the documentation of your ISDN telecommunication system). In cases where caller ID of the outgoing MSN is to be suppressed at the remote site enter the registry `ATS49=<MSN>; S54=1`

Summary of charge information: To record the on-line charges accrued, specify an MSN for outgoing calls to which all charges then will be billed.

For ISDN PBX systems with an internal S0 bus, the on-line charges for the specified MSN can be calculated using the telecommunication system's software.

Specify the MSN for outgoing calls using the registry command `ATS49=<MSN>`.

Example configuration

In this section we present a sample ISDN CAPI Port Device Driver configuration for the Internet provider UUNet (as of December 1999).

- UUNet (HDLC, PPP over ISDN):
- AT S31=1; IP address and DNS assigned by the server

Multi-link PPP connections

In "Multi-link PPP connections", both ISDN B channels are used to connect to the one call destination. This doubles the available transmission capacity.

In order to use channel bundling in Windows 95, the Microsoft "ISDN Accelerator Pack 1.1" must be installed. This feature is already included as a component of the Windows 98 operating system; no extra installation is necessary.

The "ISDN Accelerator Pack 1.1" can be downloaded from the Internet website: <http://www.microsoft.com> .

Before establishing a multi-link PPP connection, please note the following:

- Charges will be incurred for both ISDN B channels.
- The remote site, e.g. your Internet service provider (ISP), must support this operating mode.
- RAS connections (see "Remote Access Service") also are possible with multi-link PPP.

After installing the "ISDN Accelerator Pack 1.1" (only necessary in Windows 95), proceed as follows to establish a multi-link PPP connection:

1. Create a new connection in Dial-Up Networking.
2. Click once on the connection with the right mouse button and select **Properties**.
3. Click the Settings... button in the Additional Devices: field (Windows 98: select Multilink page).
4. Activate the option **Use additional devices**.
5. Click the Add... button.
6. Under **Name of Device**, enter the **ISDN RAS (PPP over ISDN) modem**.
7. Enter in the **Number** field the number of the main connection configured above.
8. Close the window by clicking **OK**.

Now the system automatically will attempt to connect to the destination ISDN number using both ISDN B channels whenever this dial-up connection is activated.

If only one ISDN B channel can be connected, for instance, if your Internet provider does not support multi-link PPP connections, no unambiguous message to this effect is returned. To find out whether both B channels were connected, double-click the Dial-Up Networking icon in the Windows 95/98 task bar. If desired, select the Details button to connect or disconnect the second B channel manually.

This technique allows you to increase the transmission capacity to download large files from the Internet and to reduce it again afterwards to avoid excessive charges.

Clearing internet connections automatically

Some Internet browsers offer you the option of clearing a connection automatically when the connection is idle for a certain amount of time.

To activate this option in the MS Internet Explorer 4.x/5.x, click through the steps below:

Start -> Settings -> Control Panel -> Internet -> Connections -> Select modem... -> Settings... -> Advanced... -> Disconnect if idle for ... minutes

Using MS Money 99 and MS Exchange/Outlook

MS Money 99

MS Money 99 allows the CAPI 2.0 interface to be used directly, so that the virtual modem of the CAPI Port device driver is no longer necessary. For more information, see the MS Money 99 documentation.

Faxing with MS Exchange/Outlook and other Fax Group 3 applications (e.g. WinFax PRO 8.x/9.x)

With the virtual modem ISDN FAX (G3), the fax function of MS Exchange/Outlook and other Fax Group 3 applications can be used. Fax polling is not supported.

Note: To use this modem a CAPI device driver software supporting T.30 (Fax Group 3) is required.

The hardware requirements for Fax G3 are higher than for other CAPI applications, as the analog/digital conversion is performed by the computer's CPU. A Pentium computer with 133 MHz and at least 32 MB RAM will provide optimal performance.

The maximum fax speed depends on the CAPI device driver software, the fax machine/software on the other side, the line quality and the hardware standard of your computer. The CAPI Port Device Driver supports a speed of up to 14,400 Bit/s for receiving and sending faxes.

MS Exchange/Outlook: When you install MS Exchange/Outlook, specify the modem ISDN FAX (G3). No additional settings are required (modem's default

setting: AT S31=3). For more information about the configuration of MS Exchange/Outlook, see the documentation of Windows 95, or contact your dealer or Microsoft.

In Windows 98, MS Exchange is no longer automatically installed with the operating system. You can install it manually, however, as the software is available in the \TOOLS\OLDWIN95\MESSAGE directory on the Windows 98 CD-ROM.

WinFax PRO: If you want to use the software WinFax Pro 8.x/9.x by Symantec, please do not select the virtual modem ISDN FAX G3 in the configuration window. Select instead the direct use of the CAPI 2.0 interface. Setting: Generic ISDN or Generic ISDN (CAPI 2.0).

Data communications software

Thanks to support for Windows 95/98's UNIMODEM architecture, the CAPI Port Device Driver also can be used with 32-bit data communications applications such as "HyperTerminal". The following virtual modems can be used for this purpose:

- ISDN Mailbox (X.75)
- ISDN Analog Modem (V.32bis)
- ISDN - ISDN (X.75)
- Custom Config

The registers available for custom configuration are described in Appendix A. Please note the default values for the various registers.

Data transfer with transfer protocols (ZModem, Xmodem, etc.) with Hyperterminal in Windows 95 is possible only to a limited degree, due to a software error. With the new version of this software included in the Windows 98 package, this error has been resolved. Should problems arise in exchanging data in command mode (+++) in Windows 95, change the time interval for the escape sequence (e.g. AT S12=1000).

The ISDN - ISDN (X.75) modem can be used to establish point-to-point connections over secured data link (X.75).

Data communications software and analog modems at the remote site

As long as your CAPI 2.0 device driver software supports analog connections, the virtual modem ISDN Analog Modem (V.32bis) can be used to access analog remote sites like BBSs. The maximum speed possible is 14,400 Bit/s (V.32bis). This virtual modem also will support any higher speeds offered by future versions of the CAPI 2.0 device driver software.

The required protocols (V.32bis and asynchronous PPP) are set by default on the ISDN Analog Modem (V.32bis) virtual modem.

Using data communications software with an emulated COM port

If the ISDN CAPI Port Device Driver is installed with its default settings, all virtual modems are assigned to the virtual port ISDN1. Thus any software using the UNIMODEM interface (TAPI modems) of Windows 95/98 can work with the virtual modems. No changes to the virtual ports are necessary. Such software includes, for instance, Windows 95/98 Dial-Up Networking and Hyperterminal.

However, using data communications software which does not support the UNIMODEM architecture of Windows 95/98 and requires COM ports, a COM port must be assigned to each virtual port. (Such data communications programs include older versions for Windows 3.x).

The assignment of COM ports to the virtual ports ISDN1 and ISDN2 is only possible during installation of the ISDN CAPI Port Device Driver (see "Installing the ISDN CAPI Port Device Driver"). During installation, COM ports can be assigned on the Ports page. The settings are implemented upon completion of the installation routine.

Note: Before assigning COM ports, check which COM ports are already being used by other hardware components such as serial interfaces.

The COM ports assigned now can be used in Windows 3.x, 95 and 98.

The following protocols are set by default:

- ISDN B2 protocol: X.75
- PPP variants: PPP over ISDN (synchronous PPP).

To configure other protocol settings, use AT commands (see Appendix A).

Example: To set up a connection to an analog BBS using 16-bit Windows 3.x software such as Procomm Plus 3.0 and a passive ISDN-Controller over COM 3, the modem initialization commands must be set to AT S31=8 and S51=0 (analog modem and asynchronous PPP) in your communications software.

The modem "ISDN SoftCompression X.75/V.42bis": Using data compression according to V.42bis for X.75 connections

Using the virtual modem ISDN SoftCompression X.75/V.42bis connections can be established with activated data compression. This allows data to be transmitted at a rate up to four times higher per B channel, depending on the type of data to be transmitted. Some basic conditions must be met, however:

- The latest CAPI 2.0 device drivers are required:
The CAPI 2.0 device drivers for your ISDN-Controller must support V.42bis. If this is not the case, the virtual modem ISDN SoftCompression X75/V42bis is not available for selection in the installation window.

- Only for X.75 connections:

Data compression according to V.42bis can be used only for X.75 connections. Possible applications include ISDN Point-to-Point connections and connections to ISDN BBSs. According to CAPI 2.0, a secured data link is imperative for V.42bis connections. As only the X.75 protocol guarantees this feature, V.42bis can be used only with this protocol. As HDLC is nearly always used as an ISDN B2 protocol in connections to Internet providers, it is not possible to establish connections with data compression on ISDN protocol level.

- Automatic negotiation:

When a connection to an X.75 remote site is established, the system automatically tries to negotiate V.42bis. If this does not succeed, e.g. because the remote site does not support V.42bis, a connection without data compression is made automatically.

- Cannot yet be applied to connections to AOL or CompuServe:

The PoPs (points of presence) of AOL and CompuServe do support the X.75 protocol, but, at the time this document was printed, did not yet allow the use of V.42bis. Should problems arise in dialing up these services, select the virtual modem AVM ISDN Mailbox (X.75) rather than the modem ISDN SoftCompression X.75/V.42bis.

Keep in mind that the V.42bis data compression algorithm of passive ISDN-Controllers is processed on the host's CPU and thus demands more powerful hardware. In the case of active controllers of the B1 family, the algorithm is processed completely on the Controller.

Note: With the command `ATS42=8`, V.42bis can be activated manually for X.75 connections as well.

Remote access service (RAS)

The ISDN CAPI Port Device Driver can be used for RAS connections to Windows 95/98 and Windows NT 3.51/4.0 computers. The virtual modem ISDN RAS (PPP over ISDN) is provided for this purpose.

In Windows 95/98, Dial-Up Networking requires an additional server module to serve as a remote site. Windows NT 3.51/4.0 computers can use the NDIS WAN CAPI Device Driver for Windows NT or the ISDN CAPI Port Device Driver for Windows NT to make WAN connections over ISDN.

Connections and caller authentication are managed by the PPP protocol (PPP over ISDN, RFC 1618) for both operating systems. HDLC is the specified ISDN B2 protocol. The remote computer is then accessible over ISDN using network protocols such as TCP/IP, SPX/IPX or NetBEUI.

Remote access service (RAS) with Windows 95/98

See the Windows 95/98 documentation for instructions about how to configure Remote Access Service (RAS). Should any problems with RAS arise, contact your

dealer or Microsoft. In order to use Windows 95/98 RAS over ISDN, the following components must be installed:

- ISDN-Controller
- CAPI device drivers (installed during the ISDN-Controller Setup)
- ISDN CAPI Port Device Driver
- Dial-Up Networking (and Dial-up Server module, if desired)
- .Network protocol with appropriate client software (such as NetBEUI), bound to the Dial-up Adapter.

Make sure that all of these components are installed.

Note that Windows 95/98 can use only one Dial-up Networking connection at a time.

In the following example configuration, the Microsoft NetBEUI protocol is used to "map" a drive on the remote computer to the local computer, so that the remote drive can be addressed as a local drive over ISDN.

Example RAS configuration (Windows 95/98 computer to Windows 95/98 computer using ISDN controllers): Preparations (client and server)

1. Install Dial-Up Networking server module (server computer only)
2. In order to provide RAS services from a Windows 95 computer, the file RNASERV.DLL must be contained in the Windows\System folder. This file can be installed from the Windows 95 Plus Pack. It is already included in certain Windows 95 release versions, and can be extracted from the compressed installation files on the original Windows 95 disk using the command EXTRACT /E WIN95_06.CAB RNASERV.DLL.
3. Windows 98 users must install the Dial-Up Networking server module via: Start -> Settings -> Control Panel -> Software -> Windows Setup -> Communications -> Details... -> Dial-Up Networking
4. Install the NetBEUI protocol: Start -> Settings -> Control Panel -> Network -> Add... -> Protocol -> Add... -> Microsoft -> NetBEUI -> OK
5. Verify protocol binding: Start -> Settings -> Control Panel -> Network -> Dial-Up Adapter -> Properties -> Bindings. NetBEUI must be selected.
6. Install client: Start -> Settings -> Control Panel -> Network -> Add... -> Client -> Add... -> Microsoft -> Client for Microsoft networks -> OK.
7. Install File and Print Sharing (server only): Start -> Settings -> Control Panel -> Network -> Add... -> Service -> Add... Microsoft -> File and print sharing for Microsoft networks -> OK.

Configuring the Windows 95/98 client:

1. Create a new Dial-Up Networking connection: My Computer -> Dial-Up Networking -> Make New Connection. Enter a name for the connection. Select modem ISDN RAS (PPP over ISDN) and click Continue. Enter the phone number (when dialing from a PBX extension, remember to include the outside line prefix). Click Continue and then Finish.

2. Configure Dial-Up Networking connection. Select the newly created Dial-Up Networking connection. Right-click and select **Properties**. Deactivate **Use country code and area code**. Click **Server type...** -> **Type of Dial-Up Server: "PPP: Windows 95/98, Windows NT 3.5, Internet"** -> **Advanced options: activate "Log on to network" and "enable software compression"** -> **Allowed network protocols: select NetBEUI**. Click **OK** and **OK** again.
3. Activate Dial-Up Networking connection: Double-click the new connection in Dial-up Networking. Verify that the number to dial is correct, then click **Connect**.
4. Map a folder on the remote computer's drive: Start **Explorer** . Click on **Tools** and select **Map network drive....** Select an available drive. Enter a path with the following notation: "**\\<computer name>\<server's shared folder>**". Click **OK**.

Note: Please make sure you enter the path name with the correct notation!

Example: \\SERVER\TEST

Configuring the Windows 95/98 server:

1. Enter a name for the computer: **Control Panel -> Network -> Identification** and type a name.

Example: SERVER

2. Activate File and Print Sharing:

Control Panel -> Network -> Control Panel -> Network -> File and Print Sharing. Activate the option **I want to be able to give others access to my files.**

3. Share a folder:

Start **Explorer**. Select the folder to be shared, e.g. **TEST**. Right-click and select **Share...** -> **Share as...** Enter a name for the shared folder, e.g. **TEST**. Go to **Access type** and select **Activate Read/Write Access** . Click **OK**.

4. Activate Server Mode:

My Computer -> Dial-Up Networking -> Connections -> Dial-Up Server... . Select **ISDN RAS (PPP over ISDN) modem** . Activate **Caller Access**

Setting the ISDN number for incoming calls: In the default configuration, incoming data calls are accepted for all MSNs.

To accept data calls for only one MSN of your ISDN line, enter **ATS 42=1; S50=<MSN>** for the virtual modem **ISDN RAS (PPP over ISDN)**.

For more information on RAS configuration, see the **Windows 95/98** documentation or contact your dealer or Microsoft.

Remote access service (RAS) with Windows NT

To use **Windows NT RAS**, the **NDIS WAN CAPI Device Driver for Windows NT** or the **ISDN CAPI Port Device Driver for Windows NT** must be installed. These device drivers can be used in **Windows NT 3.51** and **4.0**. The documentation

accompanying the device driver contains complete installation instructions. The Windows 95/98 RAS server can use the CAPI Port modem ISDN RAS (PPP over ISDN) in the Dial-up Server. Please make sure of the following:

- the same network protocols are installed and configured for RAS connections on both computers;
- you have configured the necessary user rights (RAS caller access, resource sharing, etc.).

See the Windows NT documentation for a description of the necessary steps.

If you use a third-party product as RAS server, inquire about the exact configuration of the PPP protocol used (synchronous or asynchronous) and the ISDN B-channel protocol.

Legal notice

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Appendix A:

Description of the registry commands

The ISDN CAPI Port Device Driver can be configured for individual requirements using the AT commands described in this section. To change the configuration of any of the virtual modems, proceed as follows:

1. Click **Start -> Settings -> Control Panel -> Modems**.
2. Select the desired modem.
3. Click the **Properties** button.
4. On the Settings page, click the **Advanced...** button.
5. Enter the AT command in the **Extra Settings** field.

To set more than one register, separate each individual register with semicolons followed by a space. Only the first command entered requires the prefix "AT".

Example: AT S31=2; S35=38400; S51=0

6. Confirm your entries by clicking **OK** and close the modem window.

AT Command	Value	Parameter
ATS0=	0	0=AUTOANSWER off (default)
	1	1=AUTOANSWER on
ATS2=	43	ASCII code for escape sequence character
ATS3=	13	Code for CR
ATS4=	10	Code for LF
ATS5=	8	Code for BS
ATS12=	100	Time interval for escape sequence
ATS30=		Error Level:
	0	No AT command; syntax, illegal register value, command not executed
	1	Unknown command parameter
	2	Unknown command
ATS31=	0	Protocol: X.75 (default)
	1	Protocol: HDLC
	2	Protocol: V.110
	3	Fax Group 3
	4	Protocol: TEL
	5	Protocol: X.25
	7	Protocol: V.120
	8	Protocol: Analog Modem (V.32bis)
ATS35=	14400	Baud rate
ATS36=	0	Parity: none (default)
	1	odd
	2	even
ATS37=	0	Stopbits: 1 bit (default)
	1	2 bits
ATS38=	0	Data bits: 8 (default)
	1	Data bits: 7

AT Command	Value	Parameter
ATS41=	0	B1 protocol: sets X.75 (default)*
ATS42=	0	B2 protocol: sets X.75 (default)*
	8	B2 protocol: sets X.75/V.42bis data compression*
ATS43=	0	B3 protocol: sets X.75 (default)*
ATS44=	2	CIP value: sets X.75 (default)*
ATS45=	2048	Frame size
ATS48=	1	For multiple active ISDN-Controllers (like the AVM Controller B1), sets the number of the CAPI 2.0 controller used, or (for the AVM Controller C4) the number of the So port.
ATS49=	<number>	Sets number for outgoing calls***
ATS50=	<number>	Sets number for incoming calls***
ATS51=	0	Asynchronous PPP ("modem style", RFC 1162)
	1	Synchronous PPP ("PPP over ISDN", RFC 1618) (default)
ATS54=	0	No caller ID suppression (default)
	1	Caller ID suppression active***
ATA		Accept an incoming call
ATD	0...9	Dial specified number
	L	Dial previous number
	P	Ignored
	T	Ignored
ATE	0	Echo in command mode off
	1	Echo in command mode on (default)

AT Command	Value	Parameter
ATH		Terminate existing connection
ATQ	0	Display messages in command mode (quiet)
	1	Suppress messages in command mode (quiet)
ATV	0	Display results as numeric codes
	1	Display results as text ("verbose") (default)
ATZ		Reset
+++		Switch from on-line to command mode

* For a detailed description of these parameters, see the "COMMON-ISDN-API Version 2.0" specification.

** see also Section 4.3.2 "Suppressing Caller ID Display"

*** Generally, the number is the MSN given by the network provider (e.g. British Telecom) without the dialing code. If your ISDN-Controller is connected to the internal S0 bus of a PBX, use the MSN of the respective extension. For more information, please refer to your PBX manual.

More detailed information about the application interface CAPI is available on the Internet at <http://www.capi.org>.

Version 01.02.00 for Windows NT and 2000

The ISDN CAPI Port Device Driver is a universal ISDN connectivity solution for the Microsoft Windows NT 4.0 and Windows 2000 operating systems. It facilitates the use of Remote Access Services (RAS) and Dial-Up Networking connections to the Internet and to on-line services.

Technically, the ISDN CAPI Port Device Driver mediates between the UNIMODEM architecture of Windows NT/2000 and the applications interface COMMON-ISDN-API 2.0 (CAPI). The CAPI 2.0 interface, a manufacturer-independent standard, is provided with all ISDN-Controllers and loaded by each Controller's installation program.

Virtual modems

After simple installation in Windows NT/2000, the ISDN CAPI Port Device Driver supplies up to eight virtual modems which are immediately available for

use. These modems allow the ISDN-Controller in your computer to be used even by programs that expect an analog modem.

Each of the virtual modems is available for a different application. For instance, the ISDN FAX (G3) modem is configured for fax applications, while ISDN RAS can be used for remote-access connections to remote computers.

The default configurations of the virtual modems allow them to be used immediately in most conventional implementations without any further configuration required. However, it is also possible to adapt the ISDN CAPI Port Device Driver for special cases such as the configuration of the Internet connection and RAS (see " Modem Settings Using Registry Commands").

Programs that use the CAPI interface directly can exploit the CAPI Port modem to use the second B channel for their own use, parallel to an existing Dial-Up Networking connection. This is possible because the B-channel assignments are performed by CAPI automatically.

The fax functions of MS Exchange/Outlook and other Fax Group 3 applications can be used through the virtual CAPI Port modem "ISDN FAX (G3)".

Installing and removing the ISDN CAPI Port device driver

Please note the following before starting the ISDN CAPI Port Device Driver installation:

Note: Only users with system access rights as an administrator can perform installation.

- During installation, up to eight virtual modems are installed, each of which is designed to perform a different function.
- The virtual modems ISDN FAX (G3) and ISDN Analog Modem (V.32bis) can only be used with passive ISDN-Controllers if the ISDN-Controller's device driver software supports these services. Contact the distributor or manufacturer of your ISDN-Controller for more information.
- The virtual modem ISDN Analog Modem (V.32bis) can only be used with passive ISDN-Controllers. The analog/digital conversion is performed by the computer's CPU. A Pentium computer with 133 MHz and at least 32 MB RAM will provide optimal performance.
- It might be necessary to assign COM ports to the virtual modems. This is the case when using Dial-Up Networking software which can access only COM ports (such as older versions for Windows 3.x). See the instructions in the section " Using Data Communications Software with an Emulated COM Port". Before making any assignments, check which COM ports are already in use by other hardware devices like serial interfaces.

Start installation

1. Insert the disk or CD with the ISDN CAPI Port Device Driver in the appropriate drive.

2. Switch to the folder <disk/CD drive>:\PROGRAMS\CAPIPORT.NT\ENGLISH\ or \PROGRAMS\CAPIPORT.W2K\ENGLISH\, respectively.
3. Start installation by double-clicking the file SETUP.EXE.
4. The Modems page lists eight virtual modems which can be selected for installation:
 - ISDN - ISDN (X.75)
 - ISDN Analog Modem (V.32bis)
 - ISDN Custom Config
 - ISDN FAX (G3)
 - ISDN Internet (PPP over ISDN)
 - ISDN Mailbox (X.75)
 - ISDN RAS (PPP over ISDN)
 - ISDN SoftCompression X.75-V.42bis

Select the desired modems from the list.

5. To learn more about the different virtual modems, click the question mark in the title bar and then the modem type. A small window with information about the modem opens.
6. On the Ports page, the virtual modems can be assigned to COM ports. If no Dial-Up Software requiring COM ports is used, accept the default settings.
7. Confirm the selected configuration by clicking OK.
8. Once installation is completed, you will be prompted to restart Windows.
9. To view the list of installed modems and have the opportunity to change any modem settings, select **Start -> Settings -> Control Panel -> Modems (Windows NT)** or **Start -> Settings -> Control Panel -> Phone and Modem Options (Windows 2000)**.

Removing the ISDN CAPI Port device driver

To remove the ISDN CAPI Port Device Driver completely from your system, proceed as follows:

1. Open the Windows Control Panel (**Start -> Settings**) and double-click the **Add/Remove Programs** icon.
2. Select the entry **ISDN CAPI Port**.
3. Click **Add/Remove Programs (Windows NT)** or **Change or Remove Programs (Windows 2000)**. The uninstallation routine will be started and the modem entries will be removed from your system.
4. Once uninstallation is complete you will be prompted to restart Windows.

Modem settings using registry commands

Using registry commands the user can control all modems universally.

During installation of the ISDN CAPI Port Device Driver, the virtual modems initially are installed with a default configuration. It is generally not necessary to change these default settings. If a change should become necessary, however, modem settings can be adapted to your needs using registry commands.

Such a configuration is essentially the same for all virtual modems. The general procedure is described below. The individual registry commands are listed in the corresponding sections as well as in Appendix A.

1. Click **Start -> Settings -> Control Panel -> Modems (Windows NT)** or **Start -> Settings -> Control Panel -> Phone and Modem Options (Windows 2000)**.
2. Select the desired modem (Windows 2000: on the Modems page).
3. Click the **Properties** button.
4. Click the **Advanced...** button on the Connection page (Windows 2000: on the Advanced page).
5. Enter the registry command in the **Extra Settings** input field (Windows 2000: Extra initialization commands).

To enter multiple registry commands, separate commands with a semicolon and a space. Only the first command entered should begin with the characters **AT**.

Example: `ATS31=2; S35=38400; S51=0`

6. Confirm your entries by clicking **OK** and close the modem window.

Connections to internet service providers (ISPs)

There is no binding standard for ISDN dial-in access to the Internet via Internet providers. PPP/SLIP protocol variants, fixed or dynamically assigned IP addresses, static or dynamic DNS and a variety of authentication techniques make it impossible to set a universally valid Internet access configuration for the ISDN CAPI Port Device Driver.

For TCP/IP connections using the ISDN CAPI Port Device Driver, you must also use 32-bit client software (i.e., WWW browsers, FTP clients, etc.) rather than 16-bit applications for Windows 3.x. Otherwise, no connection to the 32-bit TCP/IP protocol stack integrated in Windows NT/2000 is possible.

ISDN B-channel protocols and PPP variants

Many providers use the "HDLC" or "X.75" protocol on the ISDN B channel. Two protocol variants are used for PPP connections: "PPP over ISDN" in accordance with RFC 1618 (also known as synchronous PPP), and "PPP modem style" in accordance with RFC 1162 (also called asynchronous PPP).

Note: Please ask your Internet provider which combination of protocols and authentication procedures are required for ISDN dial-in access.

Incorrect protocol settings either result in an immediate termination of the connection or prevent the ISDN connection from being established in the first place (error message: "The computer you are dialing in to is not answering.").

Setting modem registers for ISDN B-channel protocols and PPP

The virtual modem ISDN Internet (PPP over ISDN) is set by default to HDLC and PPP over ISDN according to RFC 1618. If a different configuration is required by your Internet provider, you can change the B-channel ISDN protocol by setting the register S31:

- S31=0X.75 protocol
- S31=1HDLC protocol (default)
- S31=2V.110 protocol
- S31=7V.120 protocol

The registers "S41", "S42" and "S43" can also be used to set the B1, B2 and B3 protocol layers individually. However, this is not necessary in most cases.

The PPP protocol variant used can be configured using register "S51":

- S51=0asynchronous PPP ("modem style", RFC 1162)
- S51=1synchronous PPP ("PPP over ISDN", RFC 1618)

Authentication

For PPP connections, the dial-in user is authenticated by a user ID and password (PAP/CHAP standards). This information, entered in the configuration of a Dial-Up Networking connection, is transmitted automatically to the remote dial-up server upon connection. More user information generally is not required.

Some Internet providers (including many universities, etc.) use the calling line identification transmitted over the ISDN D channel in addition to or instead of the user name and password. The next section explains how the virtual modem must be configured to transmit the ISDN D-channel number.

ISDN D-channel

Entering the ISDN D-channel number: Note: The ISDN D-channel number can be transmitted only if you did not expressly request that your network provider deactivate transmission of this number.

Using the registry command **S49=<multiple subscriber number>** any multiple subscriber number (MSN) from the block assigned can be specified for transmission in the D channel. The block of numbers for your line is assigned by the network provider.

An invalid number entry is automatically replaced with the first MSN in the assigned block.

If no number is set in register "S49", the first subscriber number assigned to your DSS1 (Euro ISDN) line is sent.

Suppressing caller ID display (CLIR): Use the registry command **S54=1** to suppress the display of the ISDN D-channel number. This allows anonymity for ISDN connections, for instance, in Dial-Up Networking. At a number of ISDN connections, the ISDN feature **Case-by-case suppression of Caller ID (CLIR)** must be explicitly requested. The network provider generally activates this feature free of charge.

If your ISDN-Controller is connected to an internal S0 access "behind" an ISDN telecommunication system (internal S0 bus), some ISDN telecommunications systems require that the connected device signal an MSN when the connection is established (please see also the documentation of your ISDN telecommunication system). In cases where caller ID of the outgoing MSN is to be suppressed at the remote site enter the registry command **ATS49=<MSN>; S54=1** .

Summary of charge information: To record the on-line charges accrued, specify an MSN for outgoing calls to which all charges then will be billed.

For ISDN PBX systems with an internal S0 bus, the on-line charges for the specified MSN can be calculated using the telecommunication system's software.

Specify the MSN for outgoing calls using the registry command **ATS49=<MSN>**.

Multi-link PPP connections

In Multi-link PPP connections, both ISDN B-channels are used to connect to the one call destination. This doubles the available transmission capacity.

Before establishing a multi-link PPP connection, please note the following:

- Charges will be incurred for both ISDN B channels.
- The remote site, e.g. your Internet service provider (ISP), must support this operating mode.
- RAS connections (see "Remote Access Service") also are possible with multi-link PPP.

To establish a multi-link PPP connection in Windows NT, proceed as follows:

1. Create a new connection to your Internet Service Provider (ISP) in Dial-Up Networking or select an already existing connection to your ISP.
2. Select the telephone book entry created in Dial-Up Networking and click the More button. Select the entry **Edit entry and modem properties....**
3. On the Basic page, enter the setting **Multiple Lines for Dial using**.
4. Click the **Configure...** button to prompt a special window in which the virtual modems to be used for the multi-link PPP can be selected.

5. Select **ISDN Internet (PPP over ISDN)** and **ISDN RAS (PPP over ISDN)** and identify identical dial-up numbers for your ISP using the button **Phone numbers.....**
6. Close the window by clicking **OK**.

To establish a multi-link PPP connection in Windows 2000, proceed as follows:

1. Create a new connection to your Internet Service Provider (ISP) in **Dial-Up Networking** or select an already existing connection to your ISP.
2. Select the telephone book entry created in **Dial-Up Networking** and click the **Properties** button.
3. From the **Basic** page, enter **ISDN Internet (PPP over ISDN) Modem** and the virtual modem **ISDN RAS (PPP over ISDN)** under **Dial using**.
4. Above the button **All devices call the same numbers...**, define the same dial-in node for the ISP for both virtual modems.
5. Close the window by clicking **OK**.

Now the system automatically will attempt to connect to the destination ISDN number using both ISDN B channels whenever this dial-up connection is activated. Which kind of connection actually has been established (PPP or multi-link PPP) is displayed in the Dial-up icon. Activate the Dial-up icon in the Windows NT task bar. Then click the **Details** button. If the entry **PPP multi-link** is displayed under **Frames** on the **Network Registry** page, you are connected to the Internet at the maximum transfer rate of 2*64kBit.

Using the **Summary** page in **Dial-up networking**, you connect and disconnect the second B channel manually as required. This technique allows you to increase the transmission capacity to download large files from the Internet and to reduce it again afterwards to avoid excessive charges (

Windows NT).

Users of Windows 2000 find these entries on the **Details** page instead.

Clearing internet connections automatically

Some Internet browsers offer you the option of clearing a connection automatically when the connection is idle for a certain amount of time.

To activate this option in the MS Internet Explorer 4.x/5.x, click on **Start -> Settings -> Control Panel -> Internet -> Connections -> Select modem... -> Settings... -> Advanced... -> Disconnect if idle for ... minutes"**

Faxing with MS Money 98/99 and MS Exchange/Outlook and other Fax Group 3 applications (e.g. WinFax PRO 8.x/9.x)

With the virtual modem **ISDN FAX (G3)** the fax function of MS Exchange/Outlook and other Fax Group 3 applications can be used. Fax polling is not supported.

Note: To use this modem a CAPI device driver software supporting T.30 (Fax Group 3) is required.

The hardware requirements for Fax G3 are higher than for other CAPI applications, as the analog/digital conversion is performed by the computer's CPU. A Pentium computer with 133 MHz and at least 32 MB RAM will provide optimal performance.

The maximum fax speed depends on the CAPI device driver software, the fax machine/software on the other side, the line quality and the hardware standard of your computer. The ISDN CAPI 2.0 device driver software and the ISDN CAPI Port device driver support a speed of up to 14,400 Bit/s for receiving and sending faxes.

MS Exchange/Outlook

If you install MS Exchange/Outlook, specify the modem **ISDN FAX (G3)**. No additional settings are required (modem's default setting: AT S31=3). For more information about the configuration of MS Exchange/Outlook, see the documentation of your operating system, or contact your dealer or Microsoft.

WinFax PRO

If you want to use the software WinFax PRO 8.x/9.x by Symantec, do not select the virtual modem **ISDN FAX G3** in the configuration window. Select instead the direct use of the **CAPI 2.0** interface.

Setting: **Generic ISDN** or **Generic ISDN (CAPI 2.0)**.

Alternatively, select the **ISDN-Controller** installed if implemented in your WinFax version.

Data communications software

Thanks to support for the UNIMODEM architecture of Windows NT/2000, the CAPI Port Device Driver also can be used with 32-bit data communications applications such as "HyperTerminal". The virtual modems

- ISDN Mailbox (X.75)
- ISDN Analog Modem (V.32bis)
- ISDN - ISDN (X.75)
- Custom Config

can be used for this purpose. The registers available for custom configuration are described in Appendix A. Please note the default values for the various registers.

Should problems in changing to command mode (+++) arise, adjust the time interval for the escape sequence (e.g., AT S12=1000).

The "ISDN - ISDN (X.75)" modem can be used to establish point-to-point connections over secured data link (X.75).

Data communications software and analog modems at the remote site

As long as your CAPI 2.0 device driver software supports analog connections, the virtual modem ISDN Analog Modem (V.32bis) can be used to access analog remote sites like BBSs. The maximum speed possible is 14,400 Bit/s (V.32bis). This virtual modem also will support any higher speeds offered by future versions of the CAPI 2.0 device driver software.

The required protocols ("V.32bis" and "asynchronous PPP") are set by default on the ISDN Analog Modem (V.32bis) virtual modem.

Using data communications software with an emulated COM port

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If the ISDN CAPI Port Device Driver is installed with its default settings, one port (ISDNx) is assigned to each virtual modem. Thus any software using the UNIMODEM interface (TAPI modems) of Windows NT/2000 can work with the virtual modems. No changes to the virtual ports are necessary. Such software includes, for instance, Windows NT/2000 Dial-Up Networking and Hyperterminal.

However, using data communications software which does not support the UNIMODEM architecture of Windows NT/2000 and requires COM ports, a COM port must be assigned to each virtual port. (Such data communications programs include older versions for Windows 3.x).

The assignment of COM ports to the virtual ports "ISDN1" and "ISDN2" is only possible during installation of the ISDN CAPI Port Device Driver (see "Installing the ISDN CAPI Port Device Driver"). During installation, COM ports can be assigned on the Ports page. The settings are implemented upon completion of the installation routine.

Note: Before assigning COM ports, check which COM ports are already being used by other hardware components such as serial interfaces!

The COM ports assigned now are available to Windows NT/2000 with 32-bit or 16-bit applications.

The following protocols are set by default::

- ISDN B2 protocol: X.75
- PPP variants: PPP over ISDN (synchronous PPP).

To configure other protocol settings, use AT commands (see Appendix A).

Example: To set up a connection to an analog BBS using 16-bit Windows 3.x software such as Procomm Plus 3.0 and a passive ISDN-Controller over COM 3, the modem initialization commands must be set to AT S31=8 and S51=0 (analog modem and asynchronous PPP) in your communications software.

The modem "ISDN SoftCompression X.75/V.42bis":

Using data compression according to V.42bis for X.75 connections

Using the virtual modem ISDN SoftCompression X.75/V.42bis connections can be established with activated data compression. This allows data to be transmitted at a rate up to four times higher, depending on the type of data to be transmitted. Some basic conditions must be met, however:

- The latest CAPI 2.0 device drivers are required:
The CAPI 2.0 device drivers for your ISDN-Controller must support V.42bis. If this is not the case, the virtual modem ISDN SoftCompression X75/V42bis is not available for selection in the installation window.
- Only for X.75 connections:
Data compression according to V.42bis can be used only for X.75 connections. Possible applications include ISDN Point-to-Point connections and connections to ISDN BBSs. According to CAPI 2.0, a secured data link is imperative for V.42bis connections. As only the X.75 protocol guarantees this feature, V.42bis can be used only with this protocol. For connections to ISPs, HDLC is (nearly always) used as an ISDN B2 protocol. For this reason, a connection with data compression is not possible on ISDN protocol level.
- Automatic negotiation
When a connection to an X.75 remote site is established, the system automatically tries to negotiate V.42bis. If this does not succeed, e.g. because the remote site does not support V.42bis, a connection without data compression is made automatically.

Keep in mind that the V.42bis data compression algorithm of passive ISDN-Controllers is processed on the host's CPU and thus demands more powerful hardware. In the case of active controllers of the B1 family, the algorithm is processed completely on the Controller.

Note: With the command `ATS42=8`, V.42bis can be activated manually for X.75 connections as well.

Remote access service (RAS)

The ISDN CAPI Port Device Driver can be used for RAS connections to Windows 95/98/NT and Windows 2000 computers. The virtual modem ISDN RAS (PPP over ISDN) is provided for this purpose.

In Windows 95/98 Dial-Up Networking requires an additional server module to serve as a remote site. Windows NT computers can use the "NDIS WAN CAPI Device Driver for Windows NT" or the ISDN CAPI Port Device Driver for Windows NT to make WAN connections over ISDN.

Windows 2000 users can use the ISDN CAPI Port Device Driver or the NDIS WAN CAPI Device Driver installed with the CAPI 2.0 device drivers

Connections and caller authentication are managed by the PPP protocol (PPP over ISDN, RFC 1618) for both operating systems. HDLC is the specified ISDN B2 protocol. The remote computer is then accessible over ISDN using network protocols such as TCP/IP, SPX/IPX or NetBEUI.

Remote access service (RAS) with Windows 95/98

See the documentation of your operating system for instructions about how to configure Remote Access Service (RAS). Should any problems with RAS arise, contact your dealer or Microsoft. In order to use Windows 95/98 RAS over ISDN, the following components must be installed:

- an ISDN-Controller
- CAPI device drivers (installed during the ISDN-Controller Setup)
- ISDN CAPI Port Device Driver
- Dial-Up Networking (and Dial-up Server module, if desired)
- network protocol with appropriate client software (such as NetBEUI), bound to the Dial-up Adapter.

Make sure that all of these components are installed.

Note that Windows 95/98 can use only one Dial-up Networking connection at a time.

Setting the ISDN number for incoming calls

In the default configuration, incoming data calls are accepted for all MSNs.

To accept data calls for only one MSN of your ISDN line, enter for the virtual modem ISDN RAS (PPP over ISDN) the AT command `ATS 42=1; S50=<MSN>`. For more information on RAS configuration, see the documentation of your operating system or contact your dealer or Microsoft.

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Appendix A: Description of the registry commands

You can configure the ISDN CAPI Port Device Driver for individual requirements using the AT commands described in this section. To change the configuration of any of the virtual modems, proceed as follows:

1. Open **Start -> Settings -> Control Panel -> Modems** (Windows NT) or **Start -> Settings -> Control Panel -> Telephone and Modem Options** (Windows 2000).
2. Select the desired modem (Windows 2000: on the "Modems" page).
3. Click the **Properties** button.
4. On the Settings page, click the **Advanced...** button (Windows 2000: Advanced Options page).
5. Enter the AT command in the **Extra Settings** field.

If you want to set more than one register, separate each individual register with semicolons followed by a space. Only the first command entered requires the prefix "AT".

Example: AT S31=2; S35=38400; S51=0

6. Confirm your entries by clicking **OK** and close the modem window.

AT Command	Value	Parameter
ATS0=	0	0=AUTOANSWER off (default)
	1	1=AUTOANSWER on
ATS2=	43	ASCII code for escape sequence character
ATS3=	13	Code for CR
ATS4=	10	Code for LF
ATS5=	8	Code for BS
ATS12=	100	Time interval for escape sequence
ATS30=		Error Level:
	0	No AT command; syntax, illegal register value, command not executed
	1	Unknown command parameter
	2	Unknown command
ATS31=	0	Protocol: X.75 (default)
	1	Protocol: HDLC
	2	Protocol: V.110
	3	Fax Group 3
	4	Protocol: TEL
	5	Protocol: X.25

AT Command	Value	Parameter
	7	Protocol: V.120
	8	Protocol: Analog Modem (V.32bis)
ATS35=	14400	Baud rate
ATS36=	0	Parity: none (default)
	1	odd
	2	even
ATS37=	0	Stopbits: 1 bit (default)
	1	2 bits
ATS38=	0	Data bits: 8 (default)
	1	Data bits: 7
ATS41=	0	B1 protocol: sets X.75 (default)*
ATS42=	0	B2 protocol: sets X.75 (default)*
	8	B2 protocol: sets X.75/V.42bis data compression*
ATS43=	0	B3 protocol: sets X.75 (default)*
ATS44=	2	CIP value: sets X.75 (default)*
ATS45=	2048	Frame size
ATS48=	1	For multiple active ISDN-Controllers (like the AVM Controller B1), sets the number of the CAPI 2.0 controller used, or (for the AVM Controller C4) the number of the So port.
ATS49=	<number>	Sets number for outgoing calls***
ATS50=	<number>	Sets number for incoming calls***
ATS51=	0	Asynchronous PPP ("modem style", RFC 1162)
	1	Synchronous PPP ("PPP over ISDN", RFC 1618) (default)

AT Command	Value	Parameter
ATS54=	0	No caller ID suppression (default)
	1	Caller ID suppression active***
ATA		Accept an incoming call
ATD	0...9	Dial specified number
	L	Dial previous number
	P	Ignored
	T	Ignored
ATE	0	Echo in command mode off
	1	Echo in command mode on (default)
ATH		Terminate existing connection
ATQ	0	Display messages in command mode (quiet)
	1	Suppress messages in command mode (quiet)
ATV	0	Display results as numeric codes
	1	Display results as text ("verbose") (default)
ATZ		Reset
+++		Switch from on-line to command mode

* For a detailed description of these parameters, see the "COMMON-ISDN-API Version 2.0" specification. The CAPI 2.0 specification can be obtained free over the Internet (<http://www.capi.org>).

** see also Section 4.3.2 "Suppressing Caller ID Display"

*** Generally, the number is the MSN given by the network provider (e.g. British Telecom) without the dialing code. If your ISDN-Controller is connected to the internal S0 bus of a PBX, use the MSN of the respective extension. For more information, please refer to your PBX manual.

More detailed information about the application interface CAPI is available under <http://www.capi.org>.

14. Removing the IBM International ISDN PC Card

The IBM International ISDN PC Card is removed in two steps from your Windowsbased computer:

- Remove any NDIS WAN CAPI Device Drivers installed
- Remove the CAPI 2.0-compliant device drivers

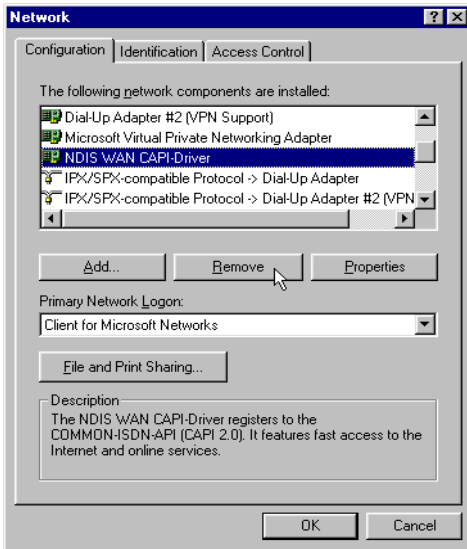
Removing the IBM ISDN PC Card from Windows 95, Windows 98, and Windows Me

To remove the IBM ISDN PC Card from Windows 95, Windows 98, and Windows Me, do the following:

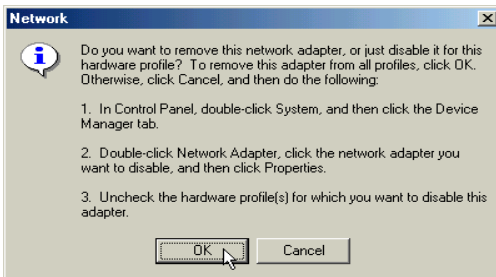
1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect the card's ISDN cable from the ISDN Line.
2. Click **Start -> Settings -> Control Panel** to open the Control Panel.
3. Double-click the **Network** icon.



4. On the Configuration window page, select the **NDIS WAN CAPI Driver** in the list of network components.
5. Click **Remove** button, then **OK**. Confirm that you want to restart your computer.



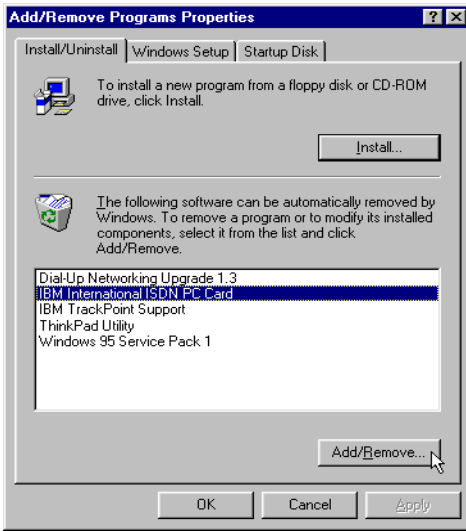
In Windows Me, the following window prompts you to confirm that you want to remove the device driver from all hardware profiles. Click **OK** to confirm that you want to remove the NDIS WAN CAPI device driver.



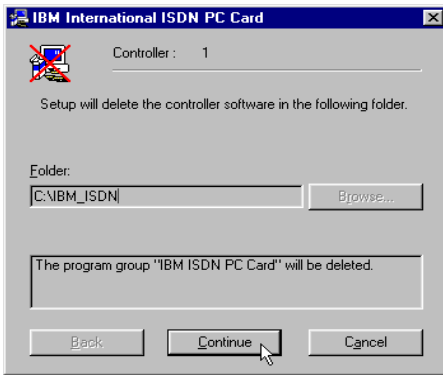
6. After your computer has restarted, open the Control Panel again. Double-click the **Add/Remove Programs** icon.



7. In the Install/Uninstall window, select **IBM International ISDN PC Card** in the list of programs.



8. In the IBM International ISDN PC Card window, click **Continue**.



9. When the card has been completely removed, click **OK**. When prompted to restart the computer, click **No**.
10. Shut down Windows and turn off the computer if necessary.
11. Remove the IBM International ISDN PC Card from the PCMCIA slot.

This completes the removal of the adapter.

Removing the IBM ISDN PC Card from Windows NT

The following section assumes that you are logged on to a Windows NT 4.0 system as Administrator. If you are not logged on as Administrator, you might not be able to perform all the steps outlined in this chapter.

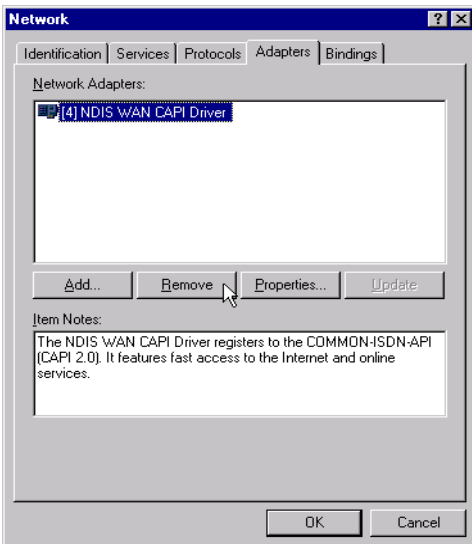
To remove the IBM ISDN PC Card from Windows NT, do the following:

1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect the card's ISDN cable from the ISDN line.
2. Click **Start -> Settings -> Control Panel** to open the Control Panel. Double-click the **Network** icon.

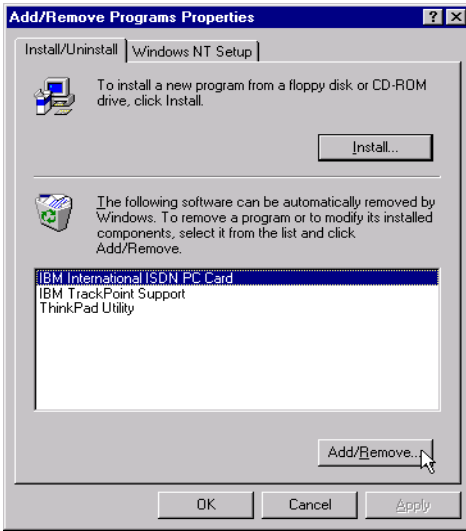


Click the **Adapters** tab and then **NDIS WAN CAPI Device Driver**.

3. Click the **Remove** button and confirm that you want to remove this device.



4. Click **Close**. After Windows NT 4.0 has finished updating the network configuration, restart your system.
5. When your computer has restarted, open the Control Panel again. Double-click the **Add/Remove Programs** icon.
6. In the **Install/Uninstall** window, select **ISDN CAPI Port** in the list of programs.



7. In the IBM International ISDN PC Card window, click **Continue**.



8. When prompted to restart the computer, click **No**. Shut down Windows and turn off the computer if necessary. Remove the IBM International ISDN PC Card from the PCMCIA slot.

This completes the removal of the adapter.

Removing the IBM ISDN PC Card from Windows 2000

The following section assumes that you are logged on to a Windows 2000 system as Administrator. If you are not logged on as Administrator, you might not be able to perform all the steps outlined in this chapter.

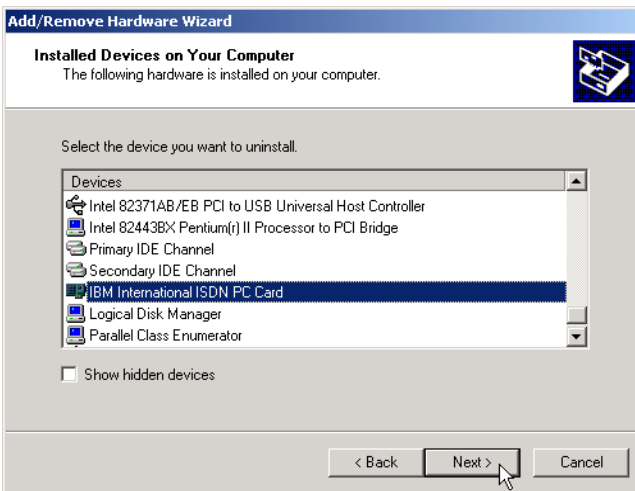
To remove the IBM ISDN PC Card from Windows 2000, do the following:

1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect the card's ISDN cable from the ISDN line.
2. Click **Start -> Settings -> Control Panel** to open the Control Panel.
3. Double-click the **Add/Remove Hardware** icon.



4. When the Add/Remove Hardware Wizard starts, click **Next**.
5. In the **Choose a Hardware Task** window, select the option **Uninstall/Unplug a device**, then click **Next**.

In the subsequent window click **Uninstall a device** and then **Next**.



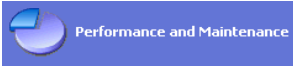
6. In the device list, select **IBM International ISDN PC Card**, then click **Next**.
7. In the **Uninstall a Device** window, confirm that you want to remove the IBM International ISDN PC Card. Click **Next**.
8. Click **Finish** and then shut down Windows. Switch off your computer if necessary.
9. Remove the IBM International ISDN PC Card from the PCMCIA slot.

This completes the removal of the adapter.

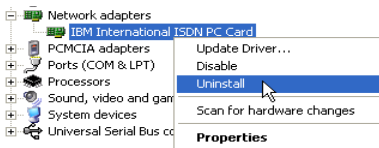
Removing the IBM ISDN PC Card from Windows XP

To remove the IBM ISDN PC Card from Windows XP, do the following:

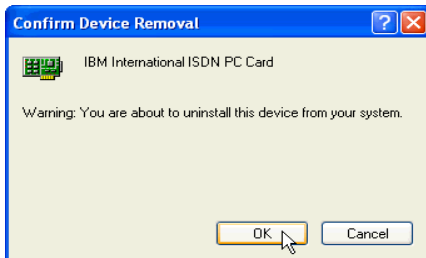
1. Leave the IBM International ISDN PC Card in the PCMCIA slot. Disconnect the card's ISDN cable from the ISDN line.
2. Click **Start -> Control Panel** to open the Control Panel.
3. Double-click the **Performance and Maintenance** icon.



4. In the System Properties window, click the **Hardware** tab, then the **Device Manager** button. In the Device Manager, scroll down to **Network adapters** in the device list and click the plus beside it to expand the node. Select **IBM International ISDN PC Card**. Right-click it and select the command **Uninstall** in the context menu.



5. The next window prompts you to confirm that you want to remove the IBM International ISDN PC Card. Click **OK**.



When windows announces that the IBM International ISDN PC Card has been removed, close all the remaining windows. This completes the removal procedure.

15. The FRITZ! and EXTRAS folders

This CD contains two sub directories \FRITZ! and \EXTRAS.

The Fritz! folder

This directory contains the AVM Fritz! software package v3.00 in English, German, French, Italian, and Spanish. The software can be installed via the Autorun menu of the CD for each corresponding language.

Note: The AVM Fritz! software in this folder is supplied by IBM "as is". IBM cannot held be responsible for any damages to your system incurred through the use of it, and provides no support for this software. If you encounter any kind of problems with this software please contact AVM for further assistance or software updates.

The EXTRAS folder

The Extras folder contains additional Windows software. These tools and utilities are to assist you in the operation of the IBM International ISDN PC Card.

Note: The tools in this folder are supplied by IBM "as is". IBM cannot held be responsible for any damages to your system incurred through their use, and provides no support for these components.

Adobe	Contains the Adobe Acrobat Reader 5.0x for Windows 95, Windows 98, Windows ME, Windows NT 4.0, Windows 2000, and Windows XP
cFos	Contains the cFos software v4.14 for Windows 95, Windows 98, Windows ME, Windows NT 4.0, Windows 2000, and Windows XP
cFos\nt4wk2	Contains the cFos software v4.14 Windows NT 4.0, Windows 2000, and Windows XP
cFos\Win9X	Contains the cFos software v4.14 for Windows 95, Windows 98, and Windows ME
CW52NT	Contains SystemSofts CardWizard 5.20.06 for Windows NT 4.0 try and buy version
CW52NT\DE	Contains SystemSofts CardWizard 5.20.06 for Windows NT 4.0 try and buy version in German

CW52NT\DOCS	Contains the documentation for SystemSofts CardWizard 5.20.06 for Windows NT 4.0 in Adobe Acrobat PDF format
CW52NT\EN	Contains SystemSofts CardWizard 5.20.06 for Windows NT 4.0 try and buy version in English
CW52NT\FR	Contains SystemSofts CardWizard 5.20.06 for Windows NT 4.0 try and buy version in French
CW52NT\IT	Contains SystemSofts CardWizard 5.20.06 for Windows NT 4.0 try and buy version in Italian
CW52NT\REGTOOL	Contains the Windows NT 4.0 Registry Tool v5.20.04 for SystemSofts CardWizard for Windows NT 4.0
CW52NT\REGUPD	Contains a Windows NT 4.0 Registry update for enabling SystemSofts CardWizard 5.10.xx to SystemSofts CardWizard 5.20.01 for Windows NT 4.0 to recognize the IBM International ISDN PC Card
CW52NT\SP	Contains SystemSofts CardWizard 5.20.06 for Windows NT 4.0 try and buy version in Spanish
ISDNW	Contains ISDN Watch
Notes	Contains the CAPI device driver interfaces for Lotus Notes 4.6, 4.65a, 5.0, and 5.01. For more details please read the file lotuscapi.txt
PORT	Contains the CAPI-Port device drivers for Windows 95, Windows 98, Windows ME, Windows NT 4.0, Windows 2000, and Windows XP
WIN95	Windows 95 software and updates
WIN95\DIALS	Contains the IBM Dials Client v5.03 Patch 2 for Windows 95 and Windows 98 for dialing into the following IBM routers: <ul style="list-style-type: none"> • 8235 DIALs Server • 2210 Nways Multiprotocol Router and Multiprotocol Routing Services (MRS) • 2212 Access Utility (AIS) 2216 Nways Multiaccess Connector
WIN95\DUN	Windows 95 Dial-Up Networking updates

WIN95\DUN\DUN13Y2K	Windows 95 Dial-Up Networking Update 1.3 Year 2000 fix. For more details please read the files _info.txt and _y2kdun13.txt.
WIN95\DUN\MSDUN13	Windows 95 Dial-Up Networking Update 1.3, multi language. For more details please read the files _info.txt and _msdun13.txt
WIN95\DUN\MSDUN14	Windows 95 Dial-Up Networking Update 1.4. Available in English only. For more details please read the file msdun14.txt.
WIN95\DUN\VPNUPD	Windows 95 Virtual Private Networking Update. For more details please read the file vpnupd.txt. Requires Dial-Up Networking Update 1.3.
WIN95\SCRIPTSLIP	Windows 95 SLIP and Scripting support for use with Dial-Up Networking. For more details please read the file readme.txt.
WIN95\SP1	Windows 95 Service Pack 1 multi language. This is for the initial Windows 95 release of August 1995 only! For more information please read the file _info.txt.
WIN95\Y2K	Windows 95 Year 2000 update, multi language. For more information please read the files _info.txt and _readme.1st.
WIN98	Windows 98 software and updates
WIN98\DIALS	Contains the IBM Dials Client v5.03 Patch 2 for Windows 95 and Windows 98 for dialing into the following IBM routers: <ul style="list-style-type: none"> • 8235 DIALs Server • 2210 Nways Multiprotocol Router and Multiprotocol • 2212 Access Utility (AIS) • 2216 Nways Multiaccess Connector
WIN98\DUN14	Windows 98 Dial-Up Networking Update 1.4 multi language. For more information please read the file dun14.txt and _info.txt files in the directories FE (Windows 98 First Edition) and SE (Windows 98 Second Edition)
WIN98\SHUTSE	Windows 98 Second Edition shutdown supplement, multi language. For more details please read _info.txt and _shutse.txt.

Appendix A. Package contents

The IBM International ISDN PC Card is a passive ISDN adapter in PCMCIA (credit card size) format that works with any basic-rate ISDN line. The card can be used with one B channel at 64 kbit/s, or for multilink connections with two B channels simultaneously at 128 kbit/s.

In addition to this manual, your option package includes:

- 1 IBM Warranty Statement (multilingual)
- 1 International Program License Agreement (multilingual)
- 1 Safety Information manual (multilingual)
- 1 CE approval flyer (English only)
- 1 Product Support Guide (PSG) (English only)
- 1 International ISDN PC Card Installation Software CD
- 1 ISDN cable for the PC Card - 4 m (13 ft)

If any of these items is missing or damaged, contact your vendor.

Replacement Information

Replacements can be ordered in case any of the following parts breaks. Use the FRU numbers listed in the following table to refer to the part that needs replacing.

Hardware Item	FRU p/n
ISDN PC Card	09N3607
ISDN cable	09N9823

Appendix B. Product features

The current device driver software supports all ISDN services.

The following B-channel protocols are provided:

- X.75
- HDLC transparent
- X.25
- ISO 8208 (X.25 DTE-DTE)
- X.31 case a/b
- T.70
- T.90
- Fax G3/G4
- V.110
- V.120
- V.32bis

Fax protocols:

- V.17
- V.29
- V.27ter

Additional features:

- Fully CAPI 2.0-compliant
- CAPI SoftFax G3: analog fax emulation in accordance with G3/T.30 at up to 14,400 baud
- Half-duplex fax communication
- Auto-dial, auto-answer
- Automatic call detection
- CAPI SoftModem V.32bis: connections to analog modems at up to 14,400 baud
- Hayes AT command set when cFos and/or the CAPI Port Device Driver are installed
- CAPI SoftCompression X.75/V.42bis: data compression in accordance with the CAPI 2.0 standard
- Support for dial-in and call-back with the IBM DIALs client for IBM 8235, 2210, 2212, and 2216 hubs
- Multilink PPP

Operating system support:

- Microsoft® Windows® 95
- Microsoft® Windows® 98
- Microsoft® Windows® Millennium Edition
- Microsoft® Windows® NT 4.0 Workstation
- Microsoft® Windows® 2000

D-channel protocols:

- Windows 95, Windows 98, Windows Millennium Edition, Windows NT 4.0 Workstation: DSS1 (Euro ISDN), 1TR6, NI-1 and AT&T 5ESS
- Windows 2000 Professional: DSS1 (Euro-ISDN), NI-1 and AT&T 5ESS

Device Driver version and limitations

This CD contains the device driver version 3.09.02 for all supported Windows platforms.

The following D-channel protocols are supported for all Windows operating systems using the 3.09.02 device driver:

- DSS1 - Euro ISDN
- 5ESS
- NI-1

Windows 95, Windows 98, Windows Me, and Windows NT 4.0:

- 1TR6 - older national D-channel protocol, only used in Germany

The diagnostics software for the IBM International ISDN PC Card is only available in Windows 95, Windows 98, Windows Me, and Windows NT 4.0.

Physical specifications:

- Approximate length: 85.6 mm (3.37 in)
- Approximate width: 54.0 mm (2.30 in)
- Approximate height: 5.0 mm (0.20 in)

Operating environment:

- Temperature: 0° C to 70° C (32° F to 155° F)
- Relative humidity: 80 % (non-condensing)

Agency approvals:

- CE Mark
- EN41003

Appendix C. A brief ISDN glossary

Note: Some of the information provided in this chapter has been retrieved from <http://whatis.techtarget.com>. IBM fully recognizes and acknowledges that these articles are copyrighted by TechTarget.com, Inc.

This chapter gives a brief overview of technical terms used in the world of ISDN as well as a few computer-related terms.

Historical survey

The first steps in the development of ISDN –the Integrated Services Digital Network– took place in the early 1980s in France. Many other European countries soon joined in the development work, however. ISDN was considered the logical successor to the analog telephony technology commonly used in Europe at that time. ISDN offered the potential for high speed bi-directional data communications at 64 kbit/s or 128 kbit/s. The ISDN specifications were submitted to the ITU and have since been standardized. However, ITU standards are only recommendations, and some countries have implemented their own versions of ISDN. Thus ISDN protocols are not exactly the same in every country. However, the IBM International ISDN PC Card supports all major D-channel switching protocols, so that this adapter can be used in a great number of countries throughout the world.

Today ISDN is very easily implemented, since telephone companies in most countries use only digital interfaces within their networks. The difference between an analog telephone line and an ISDN line today lies in the wire used from the telephone company's exchange to the subscriber's access interface, the type of signals traveling on these lines, and the voltage. Hence you cannot connect an analog device to an ISDN line, nor vice versa.

Glossary

- **a/b interface** - Copper interface of the analog telephone network for use of analog telephones or other equipment such as modems or fax machines. The term a/b interface is derived from the designation of the two wires in the analog subscriber line.
- **Adapter types** - There are three categories of ISDN adapters available for use in computers:
 - Passive adapters are the cheapest and generally the best choice among today's ISDN adapters. Passive ISDN adapters work primarily on OSI Layer 1. The IBM International ISDN PC Card is a passive ISDN device.
 - Semi-active adapters support protocols on OSI Layer 2.
 - Semi-active adapters have a DSP (digital signal processor) on board that is primarily used to provide fax capabilities over ISDN. However, in most

cases this capability can also be implemented in the device drivers of passive ISDN adapters. Active ISDN adapters are top-of-the-line ISDN cards, and the most expensive.

- Active ISDN adapters handle all ISDN protocols on OSI Layers 1, 2 and 3. These cards have one or more on-board microprocessors and a certain amount of RAM. Active ISDN adapters relieve the host system's CPU of all ISDN communication processing. Their primary area of application is in RAS servers, for which many manufacturers offer a special line of active adapters.

Note: ISDN adapters cover OSI Layer 1, but differ in the higher-layer protocols that they provide!

- **AO/DI** - Always On/Dynamic ISDN. This is an ISDN technology that was originally developed by IBM and is now an open ISDN standard. This technology is currently only used in the United States of America and Canada. AO/DI allows the user to connect to an ISP (Internet Service Provider) for example, then drop the idle B-channel connection after a delay. A D-channel connection is maintained, however, and permits a quicker reconnection when data is queued.
- **B channel** - One of the two channel types available in ISDN. The B channel is primarily used for data transfer at 64 kbit/s in each direction.
- **Basic-rate interface** - One of the two channel types available in ISDN. The B channel is primarily used for data transfer at 64 kbit/s in each direction.
- **BRI** - See basic-rate interface.
- **CAPI** - Common ISDN API. This is a programming interface for ISDN that has been developed in Germany and is today a de facto standard for European ISDN cards. CAPI allows software developers to write ISDN-capable applications without having to deal with specific ISDN adapter implementations— as long as the adapter is equipped with CAPI device drivers. Thus any CAPI-compliant application software works out of the box on any CAPI-compliant ISDN device. The CAPI interface is independent both from the telephone company's implementation of ISDN and from the hardware manufacturer's implementation of the ISDN adapter. CAPI is thus universal. The CAPI interface has been defined for a broad range of operating systems, including DOS, Windows 3.x, Windows 95, Windows NT, Linux, etc. More information can be obtained from <http://www.capi.org>.
 - CAPI 1.1 was the original CAPI specification for the German ISDN implementation.
 - CAPI 2.0 is the current CAPI specification for Euro-ISDN.

The IBM International ISDN PC Card is fully CAPI 2.0-compliant.

- **cFos** - CAPI Fossil device driver. This device driver package emulates an analog modem over a CAPI-compliant ISDN adapter. Many communications applications today still expect to talk to an analog modem through a COM port. cFos gives such software the impression of talking to an analog modem, even though the underlying hardware is in fact an ISDN adapter. cFos only works with CAPI-compliant devices such as the IBM International ISDN PC Card.

- **Cold insertion/removal** - Denotes the installation or removal of a peripheral device when the computer system is powered off and/or disconnected from the wall sockets.
- **D channel** - The second type of channel in ISDN BRI line. It carries 16 kbit/s and is mainly limited to signaling functions to control the B channels.
- **D-channel switching protocol** - Describes the telephone company's particular implementation of ISDN. The switching protocol is one of the key elements that determines whether a given ISDN adapter can be used in a given country. D channel switching protocols in use include:
 - DSS1: Digital Subscriber System No. 1, commonly used in Europe where it is also called E-DSS1 or Euro ISDN
 - NI-1: National ISDN 1, used in the United States of America and Canada
 - 5ESS: AT&T switching protocol, used in the United States of America and Canada
 - G3 PBX Custom: AT&T switching protocol, used in the United States of America and Canada
 - DMS-100 Custom: Nortel protocol, used in the United States of America and Canada
 - NTT INS Net 64: NTT Docomo, used in Japan
 - TPH 1962: obsolete D-channel switching protocol used in Australia; replaced by DSS1
 - 1TR6: obsolete D-channel switching protocol used in Germany; replaced by DSS1.
- **DCE** - Data communication equipment
- **dpi** - Dots per inch: a measurement unit for image resolution.
- **DTE** - Data terminal equipment
- **E carrier system** - E1 (or E-1) is a European digital transmission format devised by the ITU-TS and given its name by the Conference of European Postal and Telecommunication Administrations (CEPT). It is the European equivalent of the North American T carrier system format. E2 through E5 are carrier signals in increasing multiples of the E1 format.

The E1 signal format carries data at a rate of 2,048 Mbit/s and thus can carry 32 channels of 64 kbit/s each. E1 carries at a somewhat higher data rate than T1 (1.544 Mbit/s) because, unlike T1, it does not use bit-robbing, so that all eight bits per channel are used for signal encoding. E1 and T1 can be interconnected for international use.

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- **ETSI** - European Telecommunications Standards Institute.
- **Euro ISDN** - The D-channel switching protocol adopted throughout Europe. In 1989, 18 telephone companies from different European states signed a

“Memorandum of Understanding” which led to the implementation of Euro ISDN in 1993. Euro ISDN is documented in the ETSI Net-3 standard.

- Fax standards - There are two important fax standards for ISDN:
 - G3 (Group 3, ITU standard T.4) which comes from the analog telephony world and allows a maximum resolution of 200 dpi by 200 dpi. Transfer speeds usually are 2,400 bps, 4,800 bps, 7,200 bps, 9,600 bps, and 14.4 kbps. The IBM International ISDN PC Card supports the fax G3 standard.
 - G4 (Group 4, ITU standard T.6) is a digital fax standard which is available only in ISDN. It allows a maximum resolution of 400 dpi by 400 dpi. Transfer speeds are 2,400 bps, 4,800 bps, 9,600 bps, 48 kbps, and 64 kbps. However there are hardly any G4 fax devices on the market, and they are prohibitively expensive. G4 stands for Group 4 (ITU standard T.6).
- Fossil - Fido Opus Seadog Standard Interface Layer. This is a modem emulation standard developed for analog BBS communications. A FOSSIL device driver supports most of the AT commands set used by analog modems.
- Hot insertion/removal - Denotes the installation or removal of a peripheral device when the system is powered on and running.
- ISDN voltage - The ISDN network voltage at the subscriber interface, where the ISDN terminal equipment is connected, is 40 VDC.
- ITU - International Telecommunication Union. A United Nations body which develops recommendations for international telecommunication standards.
- kbps, kbit/s - megabits per seconds One Mbit/s is 1,000,000 bits per second, or 125,000 bytes per second, or roughly 122 kilobytes per second.
- Mbps, Mbit/s - megabits per seconds One Mbit/s is 1,000,000 bits per second, or 125,000 bytes per second, or roughly 122 kilobytes per second.
- MSN - Multiple Subscriber Number. A feature that is available only in Euro ISDN. Some telephone companies assign multiple numbers to each ISDN subscriber line ordered. These MSNs are usually (but not necessarily) in sequence starting with ISDN line's primary number. Each MSN is an independent telephone number. Each ISDN terminal device connected to the line can be assigned one of the line's MSNs to permit internal call routing. Ask your ISDN service provider if your line will be equipped with MSNs and, if so, how many.

Note: MSNs can be assigned to terminal equipment without regard to specific ISDN services.

- Multilink - A multilink connection is one that uses two or more B channels as a single communication link. The two B channels of a BRI can be bundled to yield a data rate of 2x64 kbit/s. Multilink connections generally result in higher connection charges.
- NT-1 - Network Terminator 1. This is the endpoint of the ISDN network at the customer premises. The term also denotes a device which is connected to the U interface and provides the S/T interface to subscriber equipment.
- OSI reference model - The Open Systems Interconnection model is a standard description or "reference model" of data transmission between any two points in a communication network. Its purpose is to guide product developers and maximize interoperability among different products. The reference model

defines seven layers of communication functions that take place at each end of a communication link. Although the OSI model is not always clearly organized in the same well-defined layers, many if not most products involved in telecommunication can be described in relation to the OSI model. It is also valuable as a uniform reference that furnishes a common ground for education and discussion in the communications field. Its seven layers are:

- Layer 7: The application layer. This is the layer at which communication partners are identified, quality of service is identified, user authentication and privacy are considered, and any constraints on data syntax are identified. (This layer is not the application itself, although some applications can perform layer functions.)
 - Layer 6: The presentation layer. This is a layer, usually part of an operating system, that converts incoming and outgoing data from one presentation format to another (for example, from a text stream into a popup window with the newly arrived text). Sometimes called the syntax layer.
 - Layer 5: The session layer. This layer sets up, coordinates, and terminates conversations, exchanges, and dialogs between the applications at each end. It deals with session and connection coordination.
 - Layer 4: The transport layer. This layer manages the end-to-end control (for example, determining if all packets have arrived) and error checking. It ensures complete data transfer.
 - Layer 3: The network layer. This layer handles the routing of the data (sending outgoing transmissions in the right direction to the right destination and receiving transmissions at the packet level). The network layer performs routing and forwarding.
 - Layer 2: The data link layer. This layer provides synchronization for the lower physical layer, performing bit-stuffing for strings of 1s in excess of 5, for example. It furnishes transmission protocol knowledge and management.
 - Layer 1: The physical layer. This layer conveys a bit stream through the network at the electrical and mechanical level. It provides the hardware a means of sending and receiving data on a carrier.
- **PPP** - The Point-to-Point Protocol. A TCP/IP protocol used in the dial-up networking environment. PPP works on the OSI layers 1 and 2. It is a full-duplex protocol that can be used on various physical media, including twisted pair or fiber optic lines, or satellite links. It uses a variant of High Speed Data Link Control (HDLC) for packet encapsulation.
 - **PPTP** - PPoint-to-Point Tunneling Protocol. A variation of the PPP protocol. It is a protocol (set of communication rules) that allows corporations to extend their own corporate network through private "tunnels" over the public Internet. In effect, a corporation uses a wide-area network as a single large local-area network. Companies no longer need to lease their own lines for wide-area communication, but can securely use the public Internet. This kind of interconnection is known as a virtual private network (VPN).
 - **PRI** - See Primary rate interface.
 - **Primary rate interface** - Access to the ISDN network comes in two different flavors, known as basic-rate and primary-rate access. The primary-rate

interface is similar to an E1 line. The total data rate is 2.048 Mbit/s. However, the PRI provides 30 ISDN B channels and one D channel, all operating at 64 kbit/s. PRIs can be used in large RAS environments.

- **S₀ interface** - Another name for the BRI interface in Europe, where the telephone company generally provides the NT device. For BRIs in point-to-multipoint configuration, the S₀ interface is a four-wire data bus.
- **S_{2M} interface** - Another name for the PRI in Europe.
- **S/T interface** - The European reference point for connecting ISDN terminal equipment to the ISDN network. This interface is provided by the NT-1, which in Europe is furnished by the telephone company.
- **SLIP** - Serial Line Internet Protocol. A TCP/IP protocol used for communication between two machines that have been previously configured for communication with each other. Your Internet service provider can provide you with an SLIP connection, for example, so the provider's server can respond to your requests, pass them on to the Internet, and forward your responses from the Internet back to you. Your dial-up connection server is typically on a slower serial line, rather than on the parallel or multiplex lines, such as those of a provider's network. SLIP only works with static IP addresses and is considered obsolete. SLIP works on OSI layer 2.
- **SPID** - The Service Profile Identifier (SPID) is a number assigned by the telephone company to a terminal on an ISDN B channel. A SPID tells equipment at the phone company's central office about the capabilities of each terminal (computer, phone etc.) on the B channels. A basic-rate home or business user can divide service on the two B channels using one for normal telephone service and the other for data. The SPID tells the phone company whether the terminal accepts voice or data information. Technically, the SPID is a numeric string from 3 to 20 digits in length. One or more SPIDs are assigned when you order the ISDN basic-rate interface (BRI) from the phone company. Beginning in 1998, most phone companies began to use a generic SPID format. In this format, the SPID is a 14-digit number that includes your 10-digit telephone number (which in turn includes the 3-digit Numbering Plan Area [NPA] or area code), a 2-digit Sharing Terminal Identifier, and a 2-digit Terminal Identifier (TID). The generic SPID format makes it easier to tell users what to specify when installing ISDN equipment, and simplifies corporate installation procedures. SPIDs are used only in the United States of America and Canada.
- **Supplementary Service** - Additional ISDN capabilities that are available only in Euro ISDN. Some of them are standard convenience features, others are only available upon request. Supplementary Services include Calling Line Identification (CLI), Call Forwarding (CF), Closed User Group (CUG), etc. Your telephone company can provide more information on Supplementary Services.
- **T carrier system** - The T carrier system, introduced by the Bell System in the U.S. in the 1960s, was the first successful system that supported digitized voice transmission. The original transmission rate (1,544 Mbit/s) of the T1 line is in widespread use today in enterprise connections to the Internet. A higher multiplex level, the T-3 line, providing 44,736 Mbit/s, is also commonly used by Internet service providers. Another commonly installed service is fractional T1, which is the rental of some portion of the 24 channels in a T1

line, with the other channels going unused. The T carrier system is entirely digital. The T1 (or T-1) carrier is the most commonly used digital line in the United States, Canada, and Japan. The T1 digital stream consists of twenty-four 64-kbit/s channels. The T1 system also uses 8,000 framing bits.

- **U interface** - The reference point for connecting ISDN subscriber equipment to the ISDN network in the United States of America, Canada, Australia, and New Zealand. In these countries, users might have to buy an NT-1 and supply it with power. The NT-1 is necessary in order to connect European ISDN terminal equipment, such as the IBM International ISDN PC Card, in these countries. Note: Although the U interface also exists in Europe, it is not available to the subscriber. The U interface has not been standardized in Europe and varies from one telephone company to another. Thus North American ISDN devices cannot be connected to the S/T interface of European ISDN lines. Furthermore, European ISDN terminal equipment cannot be directly connected to the U interface, only to an NT-1.
- **Warm insertion/removal** - Denotes the installation or removal of a peripheral device when the system is in suspend or hibernation mode (also called “sleep mode”).

Appendix D. Troubleshooting and frequently asked questions

General

What device driver version is supplied on the CD?

The device driver level on the IBM International ISDN PC Card Installation Software CD for all Windows operating systems is 3.09.02.

Where on the Internet is the IBM International ISDN PC Card support Web page located?

For device driver updates, tips, etc. please consult the PCD support Web page at:

<http://www.pc.ibm.com/support>

In the drop-down list labeled Browse the support site, select Options . In the Category list, select Communication Adapters . In the Subcategory list, choose ISDN, then select the option 09N3606 International ISDN PC Card.

How do I determine which version of the Installation Software CD I am using?

Insert the Installation Software CD for the IBM International ISDN PC Card. Double click on the "My Computer" icon on the desktop and read the CD name underneath the CD-ROM drive icon:

- CD version 1: The CD name is IBM_ISDN
- CD version 2: The CD name is IBMISDN_02
- CD version 3: The CD name is IBMISDN_03

Starting with version 2 of the Installation Software CD an autorun menu has been implemented.

No connection to ISDN

If a problem is reported in the connection to ISDN (when using Dial-Up Networking or any other software), make sure the ISDN connection cable is connected correctly to both the IBM International ISDN PC Card and the ISDN line socket. Then try the dial or connect command again.

No connection to an internet service provider

If the IBM International ISDN PC Card fails to connect to your Internet Service Provider (ISP), verify the following:

1. Your ISP supports ISDN connections.
2. The telephone number that you are dialing is correct for dial-in access to your service provider over ISDN.

3. You are using the correct Dial-Up Networking connection that configured for use with with the PC Card.
4. Your ISP supports the appropriate protocols. The ISP might conceivably recommend any protocol, such as V.120, asynchronous PPP, X.75, or any other protocol. Contact your ISP and find out the protocol to use. Install cFos and create a Dial-Up Networking connection according to the procedures in this guide and your ISP's instructions.

No connection to your ISP at 128 kbit/s

If you suspect that the IBM International ISDN PC Card is only operating using one ISDN B channel (64 kbit/s) although you have configured the system to use both B channels, please verify the following:

1. Your ISP supports multilink connections, a 128 kbit/s connection over two ISDN B channels simultaneously.
2. If you are using Windows 95, make sure you have installed the Microsoft Dial-Up Networking Update 1.3. Various language versions are available on the CD. Installation instructions can be found in Section "Upgrading Dial-Up Networking for Windows 95" on page 18.
3. You have followed the instructions in Section "Setting Up Internet Access" on page 106.

cFos was installed with all COM ports selected. Now my modem takes COM port 10 or higher. How can this be solved?

If you select all available COM ports during the cFos installation, then cFos will occupy all COM ports, up to COM9. This might cause problems later when you install an analog modem. There are two ways to circumvent this problem:

1. Try to use as few COM ports as possible. Three to four COM ports should be enough for day-to-day use of cFos with the IBM International ISDN PC Card.
2. If possible, install the analog modem before you install the IBM International ISDN PC Card and cFos.
3. If you have already installed the IBM International ISDN PC Card, then click **Start -> Programs -> cFos ISDN & DSL Driver** and select **Configure cFos**. In the cFos configuration program, select the menu command **Configure COM ports**. In the list of available COM ports, deactivate the one you want to use for your analog modem. Click **OK**, then **Exit**. When asked whether you want to save the changes, click **Yes**. In the last window, click **OK**. Restart your computer if necessary.

CAUTION:

When following the instructions above to make a certain COM port available for your analog modem, make sure that the COM port you release is not currently used by one of cFos's emulated modems. You can verify this by clicking "Start / Settings / Control Panel / Modems". Furthermore, make sure that your Dial-Up Network connections are not using this COM port.

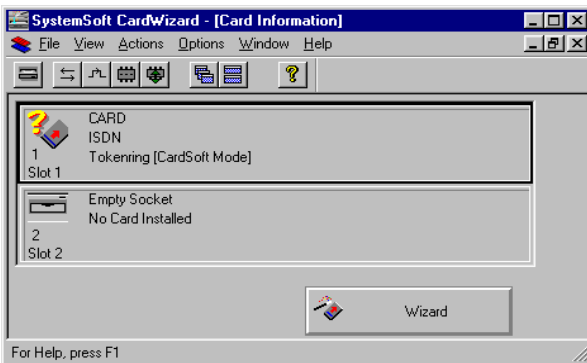
Windows 9x, Windows Me

After I installed the IBM International ISDN PC Card in Windows 95, I reinstalled CardWizard for Windows 95. Now the adapter is not properly recognized any more. What can I do?

The device driver installation instructions for Windows 95 state:

Some notebook computer manufacturers install PCMCIA support software such as SystemSoft's CardWizard as part of the Windows 95 package. IBM includes this program with its ThinkPad notebook computer series. This section briefly describes how to remove CardWizard from the system. This software must be removed to ensure correct operation of the IBM International ISDN PC Card.

When you reinstall CardWizard for Windows 95 –even the latest version available– you might see a message from CardWizard like the one illustrated below:



You can get the adapter to work by stopping it in CardWizard, removing the adapter from the PCMCIA slot, and then reinserting it. However, you might have to do this every time you want to use the IBM International ISDN PC Card, regardless of whether you hot-insert the card or cold-start your system. The best solution is to completely remove SystemSoft's CardWizard software from Windows 95 and use the adapter without it.

I have followed the instructions for installing the IBM International ISDN PC Card in Windows 95. I am using Windows 95 OSR 2.x. Whenever I try to hot-plug the adapter, the system freezes. What can be done to solve this?

It appears that there is a problem with the PCMCIA support in Windows 95 OSR 2.x. This problem was not seen in the initial release of Windows 95 and Service Pack 1. If you experience this problem, then the only solution is to cold-insert or cold-remove the adapter, i. e. shut down and turn off your notebook computer, insert or remove the IBM International ISDN PC Card in any PCMCIA slot, and then restart your computer.

How do I install the English Microsoft Windows 95 Dial-Up Networking 1.4 update onto a non-English Windows 95 version?

Note: The screen shots in this tip are taken from a German Windows 95 installation. They are provided for demonstration purposes only. The windows and menus may look different in your language version of Windows 95.

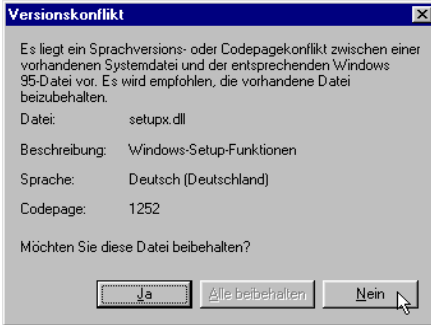
Before you launch the msdun14.exe file, backup the following files from your C:\WINDOWS\SYSTEM directory:

- SETUPX.DLL
- MSSHRUI.DLL

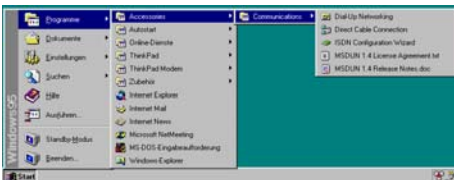
If you decide not to keep a backup, this will not influence the usability or stability of your Windows 95 installation. To install:

1. Launch **msdun14.exe**, click **Yes** to accept the installation of this upgrade. Click **Yes** to accept EULA. The installation may inform you that no TCP/IP protocol has been installed. Click **OK** to install TCP/IP.
2. When the installation program tells you it encountered a different language version or code conflict with an existing file, you must click **No** to replace the file. Follow the onscreen instructions to complete the installation.

Note: If you do not click **No** when you see this message, the installation of the Dial-Up Networking update fails. This may lead to a Windows system that is unstable or cannot use the dial-up anymore. Furthermore, you may not be able to uninstall and reinstall the Dial-Up Networking update. You must always click **No** when this message appears.



3. When the installation is complete, you will see a new entry in the Start menu called **Accessories**. This contains all necessary programs for your dial-up networking.



How do I install the English Microsoft Windows 98 Dial-Up Networking 1.4 update onto a non-English Windows 98 version?

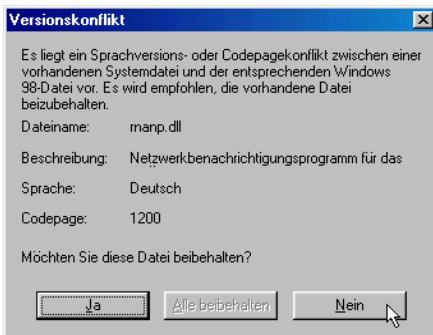
Note: Before you follow the instructions of this tip, please read "Installing the Dial-Up Networking 1.4 Update for Windows 98" on page 19 .

The screen shots in this tip are taken from a German Windows 98 installation. They are provided for demonstration purposes only. The dialog boxes and menus may look different in your language version of Windows 98.

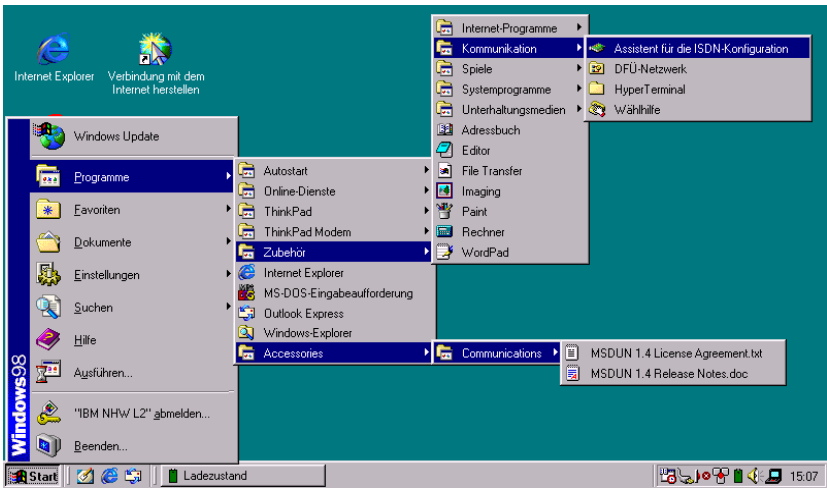
1. Launch the appropriate Microsoft Dial-Up Networking 1.4 Update program, e. g. dun14-98de.exe for Windows 98 First Edition in German or dun14-SEde.exe for Windows 98 Second Edition in German.
2. Click on **Yes** to accept the installation of this upgrade. Click on **Yes** in order to accept the EULA.
3. When the installation program prompts you that it encountered a different language version or a code page conflict of an already existing file you **MUST** click on **No** in order to replace the file. Follow the onscreen instructions in order to complete the installation.

Note: If you do not click on "No" when you see this message the installation of the Dial-Up Networking 1.4 Update fails.

This may lead to a Windows system that either becomes instable or you cannot use the dial-up networking any more. Further more you may not be able to uninstall and reinstall the Dial-Up Networking update!



4. When the installation is complete, you will see a new entry on your Start Up menu called **Accessories**. This contains all necessary programs for your dial-up networking.



When the Microsoft Dial-Up Networking 1.4 update is installed, these are the files that may be changed or updated:

- Windows 98 First Edition

Directory	File Name
C:\WINDOWS\SYSTEM	rnanp.dll
C:\WINDOWS\SYSTEM	rnathunk.dll
C:\WINDOWS\SYSTEM	rnauui.dll
C:\WINDOWS\SYSTEM	smmscript.dll

- Windows 98 Second Edition

Directory	File name
C:\WINDOWS\SYSTEM	pppmac.vxd
C:\WINDOWS\SYSTEM	rasapi32.dll
C:\WINDOWS\SYSTEM	rnanp.dll
C:\WINDOWS\SYSTEM	rnauui.dll
C:\WINDOWS\SYSTEM	smmscript.dll
C:\WINDOWS\SYSTEM	rnaapp.exe

I have installed the IBM International ISDN PC Card under Windows 98 Second Edition. When I try to shut down or restart the system, it hangs.

This is a known problem in Windows 98 Second Edition and is independent from of PC Card or other hardware device in use. Microsoft has confirmed this to be a problem with Windows 98 Second Edition. In the directory \EXTRAS\WIN98\SHUTSE on the CD you will find the official Microsoft patch for this problem in various languages. For more information, see the file 01INFO.TXT. Install this patch. If this problem still persists after you have done so, then contact Microsoft support for further assistance.

Windows NT

SystemSoft's CardWizard 5.10 for Windows NT is installed and the IBM International ISDN PC Card is still not recognized.

In order to get the IBM International ISDN PC Card to work in Windows NT 4.0 with SystemSoft's CardWizard 5.10, you must add an entry to the Windows NT 4.0 Registry. This Registry patch is provided on the CD in the directory \EXTRAS\CW52NT\REG. Open this directory in the Windows NT 4.0 Explorer and double-click the file IBMISDN.REG to merge it into the Windows NT 4.0 Registry. Shut down and restart your computer. The card will then be recognized by SystemSoft's CardWizard and will function properly.

SystemSoft's CardWizard has been installed in Windows NT 4.0, and after the installation of a Windows NT 4.0 Service Pack the CardWizard does not work anymore.

In order to get the IBM International ISDN PC Card to work in Windows NT 4.0 with SystemSoft's CardWizard 5.10, you must add an entry to the Windows NT 4.0 Registry. This Registry patch is provided on the CD in the directory \EXTRAS\CW52NT\REG. Open this directory in the Windows NT 4.0 Explorer and double-click the file IBMISDN.REG to merge it into the Windows NT 4.0 Registry. Shut down and restart your computer. The card will then be recognized by SystemSoft's CardWizard and will function properly.

SystemSoft's CardWizard has been installed in Windows NT 4.0, and after the installation of a Windows NT 4.0 Service Pack the CardWizard does not work anymore.

When installing a Service Pack for Windows NT 4.0 you might see the message that a different PCMCIA.SYS exists in your Windows NT 4.0 software. The Service Pack installation program might ask you whether it should replace this OEM version of the file. In this case, you should click "No". However, if the PCMCIA.SYS from SystemSoft's CardWizard has already been replaced with the version from the Service Pack then CardWizard might no longer work. In this case, remove CardWizard, restart your system, and reinstall CardWizard.

What features are supported by CardWizard for Windows NT 4.0?

The IBM International ISDN PC Card is fully supported out of the box by SystemSoft's CardWizard 5.20 and higher for Windows NT 4.0. This means that after you have installed CardWizard 5.20 or higher, the IBM International ISDN

PC Card will work properly with CardWizard. The IBM International ISDN PC Card will be supported with hot insertion, but only with cold removal. These features are also available with SystemSoft's CardWizard 5.10 for Windows NT 4.0 after you apply the Windows NT 4.0 Registry patch described above.

Windows 2000

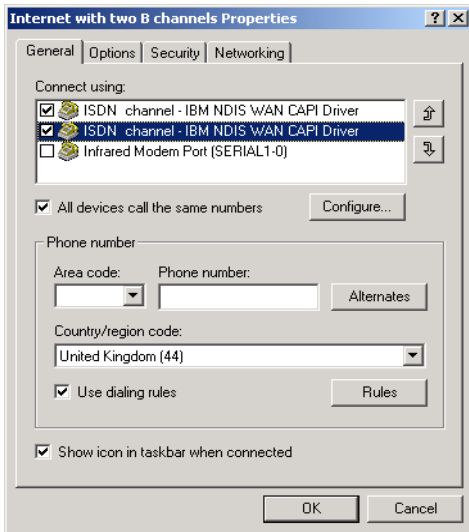
When connecting to CompuServe the message “?? LOGINE - Invalid entry - try again” appears in the After Dial Terminal window, even though the password entered is correct.

This seems to be due to a bug in Microsoft Windows 2000. Windows 2000 does not properly store the password that is entered in Dial-Up Networking. For further assistance, please contact either your local CompuServe help desk or the Microsoft support desk.

Windows 2000 and XP

I have installed the device drivers for the IBM International ISDN PC Card in the operating system but I only can create a connection with one B channel.

Please refer to chapter 11.2.4.2 (Windows 2000) or 11.2.5.2 (Windows XP) which is titled "Creating a Connection Using Both B Channels" for more details. If you have not installed cFos or the CAPI port device drivers you might notice during the set up of the internet connection that you only can select an entry called IBM NDIS WAN CAPI. This entry is twice in the system, as each entry represents one B channel. If you follow the instructions in the quoted chapters you can create a multilinked connection by selecting the second IBM ISDN WAN CAPI entry. The picture below shows how the settings should be looking like if you use the IBM NDIS WAN CAPI device drivers.



Windows XP

Windows XP bandwidth issue

Note: This information is provided "as is". IBM does not take any responsibility for the accuracy of this tip. Furthermore IBM does not accept any liability for any damages that might arise for using this tip. This tip has been retrieved from <http://www.tweakxp.com>. The article can be found here.

When installing Windows XP it will take away up to 20 % from the bandwidth when using Dial-Up Networking. This will help increase your bandwidth for any network connection in Windows XP.

1. Make sure your logged on as actually Administrator. Do not log on with any account that just has administrator privileges. To log in as an administrator:
 - Click on **Start -> Logoff-> Logoff**
 - In the logon screen hold **Ctrl+Alt+Del**
 - In the user field type 'Administrator' (case sensitive).
 - In the password field type the password for the administrator (if you don't have one leave this field blank)
 - Click **OK**.
2. Click on **Start -> Run -> Type gpedit.msc**
3. Expand the **Computer configuration** branch
4. Expand the **Administrative templates** branch
5. Expand the **Network** branch
6. Highlight the **QoS Packet Scheduler** in the left window
7. In the right window, double click the **limit reservable bandwidth** setting.
8. On the setting tab, check the **enabled** item.
9. In the **Bandwidth limit %** field, enter **0**. Click on **Apply, OK, Exit gpedit.msc**.
10. Go to your **Network connections (Start->My Computer->My Network Connection-> View Network Connections)**. Right click on your connection, choose properties then under the **General** or the **Networking** tab (where it lists your protocols) make sure **QoS packet scheduler** is enabled
11. Reboot your computer.

This is largely a way to "counter what XP does". In other words, XP seems to want to reserve 20% of the bandwidth for itself even with QoS disabled. So you can use this to your advantage. To demonstrate the problem, start up a large download from a server with an FTP client. Try to find a server that doesn't max out your bandwidth. In this case you want a slow to medium speed server to demonstrate this. Let it run for a couple of minutes stabilize. Then start up another download from the same server with another instance of your FTP client. You will notice that the available bandwidth is now being fought over and one of the downloads will be very slow or both will slow down when they should both be using the available bandwidth. Using this "tweak" gives both clients a fair share of the bandwidth.

Appendix E. Help and service information

This section contains information on how to obtain technical support on-line and by telephone .

Technical support

Technical support is available during the life of your product. Assistance can be obtained through the Personal Computing Support Web site. During the warranty period, assistance is available for the replacement or exchange of defective components. In addition, if your IBM option is installed in an IBM computer, you might be entitled to service at your location. Your technical support representative can help you determine the best alternative.

Technical Support Web Pages:

IBM Personal Computing Support Web Site	URL
English	http://www.ibm.com/pc/support
German	http://www.ibm.com/pc/support/de
French	http://www.ibm.com/pc/support/fr
Italian	http://www.ibm.com/pc/support/it
Spanish	http://www.ibm.com/pc/support/es

Note: If the national language version of the IBM Personal Computing Web Site is not available or not working, you can use the English language version at <http://www.ibm.com/pc/support>.

Type of support

Marketing, installation, and configuration support through the HelpCentre will be withdrawn or made available for a fee, at IBM's discretion, 90 days after the option has been withdrawn from marketing. Additional support offerings, including step-by-step installation assistance, are available for a nominal fee.

Telephone technical support

To assist the technical support representative, have available as much of the following information as possible:

1. Option name

2. Option Number
3. Proof of Purchase
4. Computer manufacturer, model, serial number (if IBM), and manual
5. Exact wording of the error message (if any)
6. Description of the problem
7. Hardware and software configuration information for your system

If possible, call from your computer. Your technical support representative might want to walk you through the problem during the call.

For the support telephone number and support hours by country, refer to the following table or to the enclosed technical support insert. If the number is not provided, contact your IBM reseller or IBM marketing representative. Response time might vary depending on the number and nature of the calls received.

Country	Phone Number	Language
Austria	01-24592-5901	Deutsch
Belgium	02-210 9800	Français
Belgium	02-210 9820	Vlaams
Denmark	03-525-0291	Dansk
Finland	9-22-931840	Suomi
France	02-3855-7450	Français
Germany	07032-1549 201	Deutsch
Ireland	01-815 9200	English
Italy	02-482-75040	Italiano
Luxembourg	298-977-5063	Français
Netherlands	020-514-5770	Nederlands
Portugal	02-791 5147	Portogues
Spain	91-662-4916	Español
Sweden	08-751-5227	Svenska
Switzerland	0848-805252	Deutsch, Français, Italiano
United Kingdom	01475-555 055	English

Note: The above table was correct at the time of writing of this manual. Alternatively, you can consult IBM's website at <http://www.ibm.com/pc/qttechinfo/MIGR-4HWSE3.html> for the correct phone number. The URL for the phone number is case-sensitive.

Note: The support phone number is available Monday through Friday during normal business hours. However, IBM reserves the right to change the availability of this service and its telephone numbers without notice.

Appendix F. Product warranties and notices

The following section provides product warranty information and legal notices.

Warranty statements

The warranty statements consist of two parts: Part 1 and Part 2. Part 1 varies by country. Part 2 is the same for both statements. Be sure to read both the Part 1 that applies to your country and Part 2.

- United States, Puerto Rico, and Canada (Z125-4753-05 11/97) “IBM Statement of Limited Warranty for United States, Puerto Rico, and Canada (Part 1: General Terms)”
- Worldwide except Canada, Puerto Rico, Turkey, and United States (Z125-5697-01 11/97) “IBM Statement of Warranty Worldwide except Canada, Puerto Rico, Turkey, United States (Part 1: General Terms)”
- Worldwide Country-Unique Terms “Part 2 - Worldwide Country-unique Terms”

IBM Statement of Limited Warranty for United States, Puerto Rico, and Canada (Part 1: General Terms)

This Statement of Warranty includes Part 1: General Terms and Part 2 - Country-unique Terms. The terms of Part 2 may replace or modify those of Part 1. The warranties provided by IBM in this Statement of Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term “Machine” means an IBM Machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term “Machine” does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

The IBM warranty for machines

Warranty period	Service delivery method
Parts - 1 year, labor - 1 year	*** On-site *** Courier or depot *** Customer carry-in or mail-in ***

Warranty service and support

With the original purchase of an IBM computer, you have access to extensive support. During the IBM Machine warranty period, you may call IBM or your reseller for problem-determination assistance under the terms of the IBM Statement of Limited Warranty.

The IBM Machine Warranties Web site at http://www.ibm.com/servers/support/machine_warranties/ contains a worldwide overview of the IBM Limited Warranty for IBM Machines, a glossary of terms used in the Statement of Limited Warranty, Frequently Asked Questions (FAQ), and links to Product Support Web pages. The IBM Statement of Limited Warranty is available from this Web site in 29 languages in Portable Document Format (PDF).

The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered under warranty service:

- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXXX.
- Identification of non-IBM software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of machine code or licensed internal code that is designated as customer installable.

If you do not register your computer with IBM, you might be required to present proof of purchase to obtain warranty service.

Before you call for service

You can solve many computer problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your computer and software.

Most computers, operating systems, and application programs come with information that contains troubleshooting procedures and explanations of error

messages and error codes. The information that comes with your computer also describes the diagnostic tests that you can perform.

If you suspect a software problem, refer to the information for the operating system or application program.

Calling for service

If possible, be at your computer when you call. Please have the following information ready:

- Machine type, model, and serial number
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

To find the telephone number for the HelpCenter nearest you, see “Telephone numbers” in the “Getting information, help, and service” chapter.

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

The IBM Warranty for Machines: IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications"). The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded.

Extent of Warranty: The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

Items Not Covered by Warranty: IBM does not warrant uninterrupted or error-free operation of a Machine. Any technical or other support provided for a Machine under warranty, such as assistance via telephone with "how-to"

questions and those regarding Machine set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

Warranty Service: To obtain warranty service for a Machine, contact IBM or your reseller. If you do not register your Machine with IBM, you may be required to present proof of purchase.

During the warranty period, IBM or your reseller, if approved by IBM to provide warranty service, provides without charge certain types of repair and exchange service to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. At its discretion, IBM or your reseller will 1) either repair or exchange the failing Machine and 2) provide the service either at your location or a service center. IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Some parts of IBM Machines are designated as Customer Replaceable Units (called "CRUs"), e.g., keyboards, memory, or hard disk drives. IBM ships CRUs to you for replacement by you. You must return all defective CRUs to IBM within 30 days of your receipt of the replacement CRU. You are responsible for downloading designated Machine Code and Licensed Internal Code updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
 - a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides;
 - b. secure all programs, data, and funds contained in a Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations; and
 - d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

Limitation of Liability: Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST SAVINGS, EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Governing Law: Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Part 2 - Country-unique Terms

AMERICAS

BRAZIL

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Agreement will be settled exclusively by the court of Rio de Janeiro.

NORTH AMERICA

Warranty Service: *The following is added to this Section:*

To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*
laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*
laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

The IBM Warranty for Machines: *The following paragraph is added to this Section:*
The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this Section:*
Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*
laws of the State or Territory.

CAMBODIA, LAOS, AND VIETNAM

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*
laws of the State of New York.

The following is added to this Section:

Disputes and differences arising out of or in connection with this Agreement shall be finally settled by arbitration which shall be held in Singapore in accordance with the rules of the International Chamber of Commerce (ICC). The arbitrator or arbitrators designated in conformity with those rules shall have the power to rule on their own competence and on the validity of the Agreement to submit to arbitration. The arbitration award shall be final and binding for the parties

without appeal and the arbitral award shall be in writing and set forth the findings of fact and the conclusions of law.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator.

The two arbitrators appointed by the parties shall appoint a third arbitrator before proceeding upon the reference. The third arbitrator shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the ICC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

The English language version of this Agreement prevails over any other language version.

HONG KONG AND MACAU

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of Hong Kong Special Administrative Region.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this Section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence;
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

JAPAN

Governing Law: *The following sentence is added to this Section:*

Any doubts concerning this Agreement will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

NEW ZEALAND

The IBM Warranty for Machines: *The following paragraph is added to this Section:*

The warranties specified in this Section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this Section:*

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces this Section:*

Both you and IBM consent to the application of the laws of the State of New York (except when local law requires otherwise) to govern, interpret, and enforce all your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Any disputes arising from or in connection with this Agreement will first be resolved by friendly negotiations, failing which either of us has the right to submit the dispute to the China International Economic and Trade Arbitration Commission in Beijing, the PRC, for arbitration in accordance with its arbitration rules in force at the time. The arbitration tribunal will consist of three arbitrators. The language to be used therein will be English and Chinese. An arbitral award will be final and binding on all the parties, and will be enforceable under the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958).

The arbitration fee will be borne by the losing party unless otherwise determined by the arbitral award.

During the course of arbitration, this Agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:

The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

Warranty Service: If you purchase an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM. If you purchase an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase an IBM Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM authorized service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM authorized service provider.

Governing Law: The applicable laws that govern, interpret and enforce rights, duties, and obligations of each of us arising from, or relating in any manner to, the subject matter of this Statement, without regard to conflict of laws principles, as well as Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided, except that in 1) Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Former Yugoslav Republic of Macedonia, Romania, Slovakia, Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, the laws of Austria apply; 2) Estonia, Latvia, and Lithuania, the laws of Finland apply; 3) Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Mali, Mauritania, Morocco, Niger, Senegal, Togo, and Tunisia, this Agreement will be construed and the legal relations between the parties will be determined in accordance with the French laws and all disputes arising out of this Agreement or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 4) Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe, this Agreement will be governed by English Law and disputes relating to it will be submitted to the exclusive jurisdiction of the English courts; and 5) in Greece, Israel, Italy, Portugal, and Spain any legal claim arising out of this Statement will be brought before, and finally settled by, the competent court of Athens, Tel Aviv, Milan, Lisbon, and Madrid, respectively.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

The IBM Warranty for Machines: *The following replaces the first sentence of the first paragraph of this Section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this Section:

The minimum warranty period for Machines is six months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

Extent of Warranty: *The second paragraph does not apply.*

Warranty Service: *The following is added to this Section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this Section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this Section:*

as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this Section:*

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: *(items 1 and 2 unchanged).*

IRELAND

Extent of Warranty: *The following is added to this Section:*

Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces items one and two of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and
2. the amount of any other actual direct damages, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY

Limitation of Liability: *The following replaces the second sentence in the first paragraph:*

In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than:

1. *(unchanged)*
2. as to any other actual damage arising in all situations involving nonperformance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim.

Applicability of suppliers and resellers (unchanged).

The following replaces the third paragraph of this Section:

Unless otherwise provided by mandatory law, IBM and your reseller are not liable for any of the following: *(items 1 and 2 unchanged)* 3) indirect damages, even if IBM or your reseller is informed of their possibility.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this Section:*

IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces items 1 and 2 of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;
2. the amount of any other actual direct damages or loss, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim;

The following item is added to this paragraph:

3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

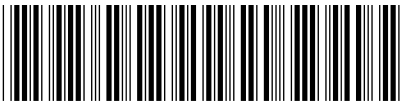
The following is added to the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.



Part Number: 19K5716

19K5716







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