

AVM ISDN-CONTROLLER

A1

M a n u a l

High-Performance ISDN by ...



AVM ISDN-Controller A1

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Conventions Used in this Manual

Graphical Symbols



This symbol points to useful supplementary or background information.



This symbol indicates important sections.



This symbol indicates especially important instructions that absolutely must be observed in order to avoid malfunctions.

Typographical Conventions

Text printed in **bold** letters represents keys, buttons or program icons. Examples: **RETURN**, **OK**, **Load A1**.

Quotation marks are used to highlight menus, menu commands, options, etc. Examples: "File", "AVM", "Installation".

Pointed brackets indicate variables such as

<CD-ROM drive>:

User entries input at the DOS prompt or the Novell NetWare console are represented as follows:

a:install <RETURN>

1 Introduction

1.1 What is ISDN?

ISDN is the internationally standardized digital telecommunications network. The abbreviation ISDN stands for **I**ntegrated **S**ervices **D**igital **N**etwork.

ISDN has three important new features that distinguish it from conventional communications media:

Integrated services The first is the integration of services. This means that all public telecommunications services, such as telephony, data communications, telefax, Teletex or videotex, are carried over a single data network. Voice, text, files and even images can be transmitted over ISDN. Users can connect several different terminals and use all available services with one ISDN line. Because the ISDN subscriber access (called a basic-rate interface, or BRI) provides two user data channels (B channels), two different telecommunications services may be used at the same time—to receive a fax during a telephone conversation, for example.

High speed The second significant difference is the extraordinary speed of data transmission in ISDN. Voice and data are transmitted over both of the BRI's B channels at the rate of 2 x 64000 bits per second. Furthermore, the **AVM ISDN-Controller A1 PCMCIA** allows ISDN applications to bundle the two B channels so that throughput is doubled.

Excellent line quality The third important feature of ISDN is the end-to-end digital transmission of user data: this is the basis for high transmission quality. Poor connections, noise and interference, which can cause transmission errors or interruptions in analog networks, are eliminated. Data communication over ISDN thus is not only faster, but also more reliable than in analog networks.

Yet it was the personal computer that opened up the full potential of ISDN: it used to be that each service required different terminal equipment (a fax machine to send

faxes, a Vtx terminal for Videotex, etc.). Today all that is needed is a PC, an ISDN PC adapter and the desired application software. **AVM** has played a major role in bringing about this revolutionary development to combine the power and flexibility of the personal computer and the ISDN network. ISDN and the appropriate communications software make the PC truly multifunctional!

1.2 The AVM ISDN-Controller A1

The **AVM ISDN-Controller A1** creates the connection between your PC and the ISDN network.

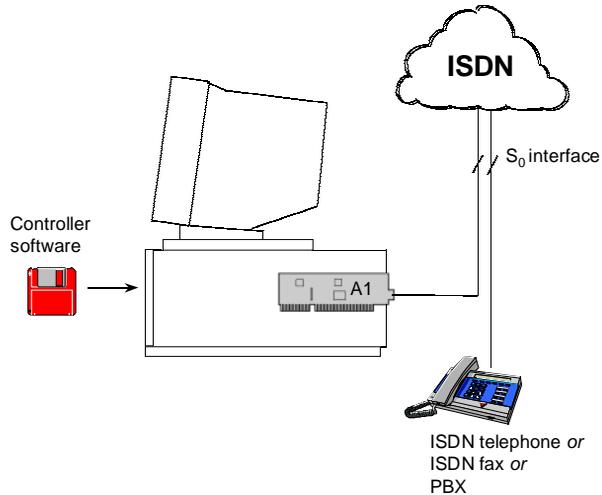


Figure 1 PC with AVM ISDN-Controller A1

As the illustration shows, the ISDN-Controller is simply plugged into a free ISA/EISA bus slot in the PC. A cable supplied with the ISDN-Controller connects the ISDN-Controller's S_0 interface to the ISDN line.

The **AVM ISDN-Controller A1** handles both B channels of an ISDN BRI line (2 x 64000 bit/s) simultaneously. Thanks to its compact dimensions, the **A1** is quite suitable for small computer housings. The **AVM ISDN-Controller A1** is a passive adapter: that is, the card has no microprocessor of its own. All computing is performed by the PC's processor.

Supported protocols The driver software for the **AVM ISDN-Controller A1** is loaded from the PC's hard disk and controls the signaling processes and data transmission, including the simultaneous use of both B channels. The software supports the international D-channel protocol DSS1 (Euro-ISDN) as well as national protocols like 1TR6. In Microsoft Windows, the protocols 5ESS and NI1 also are supported.

Protocols supported on the B channels include the common data communications protocols X.75, HDLC transparent and others.

CAPI The **AVM ISDN-Controller A1**'s driver software provides the industry standard application interface COMMON-ISDN-API (CAPI) Version 2.0 (see the Appendix). In Windows 98, Windows 95, Windows NT and Windows 3.x, this CAPI version also supports applications based on CAPI 1.1.



This manual describes installation of the AVM ISDN-Controller A1 hardware and software. This installation establishes the connection between the computer and ISDN. Also included in delivery of the Controller are AVM ISDN-Tools, a collection of CAPI-based applications. Contact your distributor to purchase any additional CAPI applications.

1.3 Package Contents

The Controller package contains:

- The **AVM ISDN-Controller A1**
- 1 cable to connect the Controller to the ISDN network (6 m)
- 1 CD with the following directory structure:

```
\CARDWARE\A1\\\
Setup programs to install the AVM ISDN-Controller A1
in the various operating systems and for different
countries (D-channel protocols).
```

\DEVELOPER\

Application Development Kit and tools for the development of CAPI applications. See the corresponding documentation in the directory.

\PROGRAMS\

Applications mainly based on CAPI 2.0 such as the AVM ISDN-Tools. See the AVM ISDN-Tools manual and the corresponding documentation in the directories.

- 1 AVM ISDN-Controller A1 manual
- 1 AVM ISDN-Tools manual

2 Hardware Installation

2.1 Instructions for Various Operating Systems

The **AVM ISDN-Controller A1** can be operated on a variety of software platforms. The exact installation procedure for the ISDN-Controller varies according to the operating system in question.

Windows NT, Windows 3.x and MS-DOS

If you work with Windows NT, Windows 3.x or MS-DOS, first check which I/O address is available in your PC and change the jumper position on the Controller if necessary (see Section 2.2). Then install the Controller and the driver software.

Windows 95/98

A different sequence of steps is valid for installation in Windows 95/98. See the instructions for these operating systems in Chapter 3, "Driver Software Installation".

2.2 Adjusting the I/O Address

In order to manage and use the ISDN-Controller, the system must communicate with it through an I/O (input/output) address.



The default values set on the AVM ISDN-Controller A1 are an I/O address of 300 and an interrupt (IRQ) level of 5.

If the I/O address is already being used by another adapter, change the setting **before** installing the Controller. The ISDN-Controller has one jumper row; the position of the jumper determines the I/O address. The I/O address corresponding to each jumper position is listed in Chapter 4, "Technical Specifications", and also is marked beside the jumper contacts on the ISDN-Controller itself. The interrupt can be changed using the **A1 Setup** program after completion of the software installation.

2.3 Installing the ISDN-Controller in the PC

The next step is to insert the Controller card in your computer. Proceed as follows:

1. First, make sure that the PC and all peripherals are switched off. Unplug their power cords.
2. Open the cover of the PC. Touch the metal of the PC housing to discharge any static electricity.
3. Choose an appropriate bus slot, unscrew and remove the slot blanking plate at the back of the PC, and insert the Controller in the slot.
4. Screw the back plate of the Controller onto the back panel of the PC.
5. Close the computer and plug in the power cords.

2.4. Connecting the ISDN-Controller to the ISDN Socket

The S_0 cable supplied has a 9-pin sub-D connector at one end, which fits the socket on the back plate of the ISDN-Controller, and an RJ45 plug at the other to connect to your ISDN line (see Figure 2).

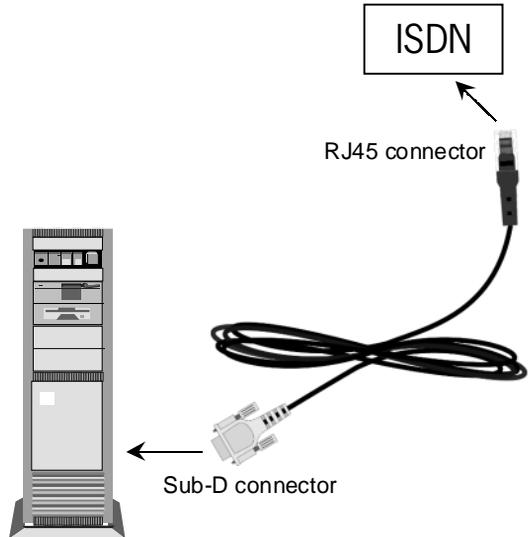


Figure 2 The cable connectors

Proceed as follows:

1. Connect the 9-pin sub-D connector to the ISDN-Controller.
2. Tighten the finger screws.
3. Insert the RJ45 plug in your ISDN socket.

Route the six-meter cable as desired.

The hardware installation is now complete.

3 Driver Software Installation

Driver software for the **AVM ISDN-Controller A1** is supplied for the operating systems Windows 98, Windows 95, Windows NT, Windows 3.x and MS-DOS.

This chapter contains a section for each of these platforms describing the software installation, ISDN-Controller configuration, loading and unloading of the driver software and uninstallation of the ISDN-Controller.

CAPI Once installed, the driver provides the application interface COMMON-ISDN-API (CAPI) Version 2.0 to all programs. In Windows 98, Windows 95, Windows NT and Windows 3.x, this CAPI driver also supports applications designed for CAPI Version 1.1. For more information on the COMMON-ISDN-API interface provided, please see the Appendix.

Driver Software Updates AVM ISDN-Controller driver software undergoes continuous development. Updated drivers are available free of charge. The latest drivers for your **AVM ISDN-Controller A1** can be downloaded from the AVM Data Call Center using Connect2/Connect32 (included) or FRITZ!data. The drivers are also found in the Internet on AVM's FTP server.

AVM Data Call Center

+49 (0)30/39 98 43 00 (IDtrans file transfer protocol)

AVM in the Internet

<http://www.avm.de>

<ftp://ftp.avm.de>

D-channel protocol Before installation, find out which D-channel protocol is used on your ISDN line. This may be either DSS1 (Euro-ISDN) or 1TR6. In Microsoft Windows, the protocols 5ESS and NI1 also are supported.

 **US only:** In addition to the D-channel protocol, ISDN users in the USA must find out their SPID.

SPID stands for **S**ervice **P**rofile **I**dentifier. A SPID is a number assigned by your ISDN service provider to each subscriber interface. SPIDs let the ISDN switch know

which ISDN services a given logical terminal (ISDN device) can access. This is particularly important for ISDN telephones. 

3.1 Installation in Windows 95/98

The **AVM ISDN-Controller A1** is supplied complete with specially developed drivers for use in Microsoft Windows 98 and Windows 95. The architecture of the Windows 98 driver complies with the Microsoft Win 32 Driver Model (WDM). For Windows 95, a driver compliant with the virtual device driver interface (VxD) is supplied. The true 32-bit device drivers provide full support for all Windows 95/98 features.

CAPI The COMMON-ISDN-API (CAPI) 2.0 included with delivery supports both Windows applications and applications running (simultaneously) in DOS boxes. This CAPI driver also allows you to use applications based on CAPI 1.1. For more information about CAPI, see the Appendix.

AVM ISDN-Controller A1 installation in Windows 95/98 comprises four main steps:

1. installing a new hardware component with the Windows Add New Hardware Wizard
2. configuring the Controller
3. physically installing the Controller
4. installing the driver software.

The individual steps are described in detail in the following sections.

3.1.1 Installing a New Hardware Component



Physical installation of the Controller in the PC is not the first step.

At the start of installation, activate the Windows Add New Hardware Wizard by selecting “Settings” in the Start menu and opening the “Control Panel”. Double-click the “Add New Hardware” folder.

The Add New Hardware Wizard appears. This program facilitates the installation of new hardware components. To start installation, click **Next**.

1. The Add New Hardware Wizard announces that it will search for new Plug & Play devices. Click **Next**.
2. Click **No** to skip the hardware search, and then **Next**.
3. In the next window, select the type of hardware to be installed. Select the entry “Other devices” and then **Next**.
4. The Windows driver database is created. When complete, Windows displays a list of hardware models and manufacturers. Click the **Have Disk...** button.
5. Insert the driver CD included with delivery into your CD-ROM drive. Enter the path to your CD-ROM drive and the folder with the setup program:

For **Windows 98** enter:

```
<CD-ROM> : \CARDWARE\A1\WINDOWS.98\  
<Language>\A1SETUP.INF
```

For **Windows 95** enter:

```
<CD-ROM> : \CARDWARE\A1\WINDOWS.95\  
<Language>\A1SETUP.INF
```

<Language>: Specify the folder with the driver software for your country (“English” for European countries or “USA”).

Start installation by clicking **OK** and then **Next**.

6. In the next window, the **AVM ISDN-Controller A1** is displayed as a hardware component. Click **Next**.
7. The Add New Hardware Wizard displays a free I/O address and a free interrupt in the following window. Write down the I/O address; the values cannot be changed here. Click **Next**.



Figure 3 Settings for the ISDN-Controller A1



It is advisable to accept the value displayed here for the I/O address and change the jumper position on the Controller accordingly. To use a different I/O address, start the Device Manager ("Settings / Control Panel / System") and enter the desired values before restarting Windows.

8. The driver software now is copied to your computer. A message appears announcing that the software for the new hardware component has been installed. Click **Finish**.
9. The next window indicates that the computer must be shut down. The computer must be switched off before physically installing the Controller so that all settings performed can be activated.
10. Switch off your PC and all connected devices and then pull the power plug.

3.1.2 Configuring the Controller

In the second step of installation, change the jumper position on the **AVM ISDN-Controller A1**, if necessary. Use the value displayed by the Add New Hardware Wizard. Upon delivery the jumper is preset to the I/O address 300 (see Chapter 2, "Hardware Installation" and Chapter 4, "Technical Specifications").

After installing the hardware components in Windows 95/98 and setting the jumpers on the **Controller A1** comes the step of physically installing the **Controller A1** in your PC.

3.1.3 Physically Installing the Controller

To install the **AVM ISDN-Controller A1** in your PC and connect the cables, follow the instructions given in Chapter 2, “Hardware Installation”.

3.1.4 Installing the Driver Software

Once the **Controller A1** has been installed in the PC, the next step is to install the driver software for the Controller.

1. Turn the computer back on. At the start of Windows, the sign-on screen of the installation program appears immediately. From this window you can access the current Readme file, call up additional information with the **F1** key, or abort installation at any time by clicking **Cancel**. Click **Continue**.
2. In the next window, specify the folder in which the **AVM ISDN-Controller A1** driver software is to be installed. The default folder is C:\DRIVER, but any other path desired may be entered. Once your entries are complete, click **Continue**.
3. In the next dialog, specify the D-channel protocol used by your ISDN line, e.g. DSS1 or a national protocol. Select the appropriate protocol type and click **Continue**.

 **US only:** The next dialog asks you to enter your first complete ISDN directory number (area code plus telephone number) in the first input field. In the second field, enter your first complete SPID.

In the following dialog box, enter your second complete ISDN directory number and your second SPID. If you have been assigned only one directory number and one SPID, leave the input fields in this dialog blank and click **Continue**. 

4. The setup program now copies all driver files to the specified folder.

5. At the end of the installation procedure, a message box displaying the Controller settings appears. Click **Continue**.

The folder “AVM” is created in the Programs group of the Windows Start menu. This folder contains the shortcuts **A1 Readme**, **A1 Setup**, **A1 Test** and **AVM Internet Homepage** (a link to the AVM’s Internet site, requiring a web browser and Internet access).

 **US only:** In addition to the above files, your AVM program folder also contains the program **A1 SPID Tool**. With this tool, you can change the Directory Number(s) and SPID(s) for the ISDN-Controller. Restart Windows 95/98 to activate the changes.

Note that the StartUp folder also contains the program **SPID Test**. This test program runs automatically each time Windows is started and the **AVM ISDN-Controller A1** is loaded. **SPID Test** runs in the background, contacting the ISDN switch and checking the validity of your SPIDs. If your SPIDs are valid, no message is displayed; otherwise, a message appears. If you want to change the SPIDs at this time, select **Yes** in the message window. The program **A1 SPID Tool** is opened. Enter the desired changes and restart Windows. 

Installation of the **AVM ISDN-Controller A1** in Windows 95/98 is now concluded.

The Controller’s driver software will be loaded automatically whenever Windows is started. When Windows is closed, the Controller will be deactivated.



If the Controller’s I/O address has to be changed at a later date, e.g. because of new hardware components, open the Device Manager (“Settings/Control Panel/System”) and enter the new value for the Controller there. Then remove the Controller and reset the jumpers. Windows manages the interrupt values automatically.

3.1.5 AVM ISDN CAPI Port Driver

To connect your computer to the Internet over ISDN using the integrated TCP/IP stack of Windows 95/98, AVM supplies the ISDN CAPI Port Driver. This driver provides virtual modems which applications can use for Internet connections, on-line services, BBS access or RAS (Remote Access Services) connections to other computers. The AVM ISDN CAPI Port Driver is located in the folder \PROGRAMS\CAPIPORT.W95 on the CD-ROM supplied with the Controller, and is also available from the AVM Data Call Center (ADC) or AVM's Internet site.

For a detailed description and instructions for installing and using the driver, see its accompanying help file.

3.1.6 AVM NDIS WAN CAPI Driver

To facilitate the use of "Remote Access Services" (RAS), AVM provides the NDIS WAN CAPI Driver free of charge. The drivers for Windows 95 and Windows 98 are located on the Controller CD in the directories \PROGRAMS\NDISWAN.95 and \NDISWAN.98 respectively. The drivers also can be obtained from the AVM Data Call Center or downloaded from the Internet.

A detailed description of the installation and functions of the NDIS WAN CAPI Driver is available in the accompanying help files included on the Controller CD.

3.1.7 Uninstalling the Controller

To uninstall the **AVM ISDN-Controller A1**, open the Control Panel ("Start/Settings") and double-click the **Add/Remove Programs** symbol. The list of installed software includes the **AVM ISDN-Controller A1**. Select this entry and then click the **Add/Remove** button.

The uninstallation program is started and displays the folder of driver software which is being deleted. The registry entries of the AVM ISDN-Controller and the "AVM" program group are also removed. At the end of uninstallation you are prompted to restart Windows.

3.2 Installation in Windows NT

CAPI Specially developed Windows NT driver software is supplied with the **AVM ISDN-Controller A1**. The applications interface COMMON-ISDN-API (CAPI) Version 2.0 included with the Controller supports both 16-bit and 32-bit applications (applications in DOS windows are not supported, however).

This CAPI driver also allows you to use applications based on CAPI 1.1. For more information about CAPI, see the Appendix.

Check I/O address Before installation, check that the Controller has been installed correctly in the PC. Make sure that the I/O address set on the Controller is not occupied by any other hardware in the computer (see Chapter 2, “Hardware Installation”).

3.2.1 Installing the Driver Software

Proceed as follows to install the driver software:

1. Start Windows NT.
2. Insert the A1-CD in your CD-ROM drive.
3. Open the Windows NT 4.0 Start menu and select the “Run” command. Enter the path to the setup program in the command line, e.g.:

```
CD-ROM: \CARDWARE\A1\WINDOWS.NT\  
<Language>\SETUP.EXE
```

<Language>: Specify the folder with the driver software for your country (“English” for European countries or “USA”).

Alternatively, search for the path using the **Browse...** button. Confirm your selection by clicking **OK**.

4. The sign-on screen of the installation program appears. From this window you can access the current Controller A1 Readme file. Installation can be aborted at any time by clicking **Cancel**. To proceed, click **Continue**.

5. Specify the folder in which the driver software is to be installed.

The default folder is C:\DRIVER, but any other path desired may be entered. Once your entries are complete, click **OK**.

6. Enter the interrupt (IRQ) for the Controller in the next window.

Then specify the I/O address under which the Controller is to be managed in the system. Enter the I/O address which corresponds to the jumper position on the Controller (see Chapter 2, "Hardware Installation" and Chapter 4, "Technical Specifications").

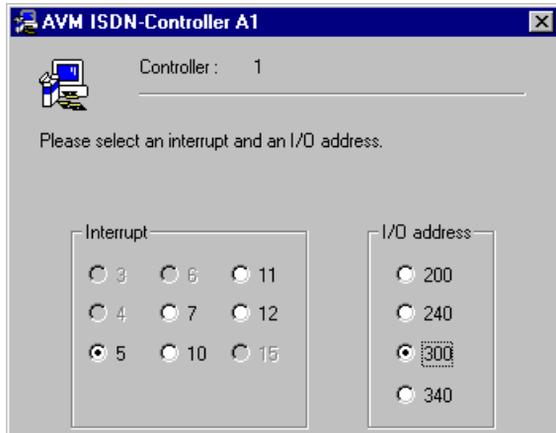


Figure 4 Setting Interrupt and I/O address

7. In the next dialog, specify the D-channel protocol used by your ISDN line, e.g. DSS1 or a national protocol.

Select the appropriate protocol type and click **Continue**.

 **US only:** The next dialog asks you to enter your first complete ISDN directory number (area code plus telephone number) in the first input field. In the second field, enter your first complete SPID.

In the following dialog box, enter your second complete ISDN directory number and your second

SPID. If you have been assigned only one directory number and one SPID, leave the input fields in this dialog blank and select the **Continue** button. 🇺🇸

8. The setup program now copies all driver files to the specified folder.
9. In the final window you are prompted to restart the computer so that the settings made in the Windows NT registry can be implemented.

Installation of the driver software in Windows NT is concluded. The Controller is ready for operation.

The folder “AVM” is created in the Programs group of the Start menu. This folder contains the shortcuts **A1 Readme**, **A1 Setup**, **A1 Test** and **AVM Internet Homepage** (a link to the AVM's Internet site, requiring a web browser and Internet access).

🇺🇸 **US only:** In addition to the above files, your AVM program group or folder also contains the program **A1 SPID Tool**. With this tool you can change the Directory Number(s) and SPID(s) for the ISDN-Controller. Restart Windows to activate the changes.

Note that the Startup folder now contains the program **SPID Test**. This test program is run automatically each time Windows NT is started and the ISDN-Controller A1 is loaded. **SPID Test** runs in the background, contacting the ISDN switch and checking the validity of your SPIDs. If your SPIDs are valid, no message is displayed, otherwise a message appears. If you want to change the SPIDs at this time, select **Yes** in the message window. The program **A1 SPID Tool** is opened. Enter the desired changes and restart your computer. 🇺🇸

The Controller's driver software will be loaded automatically whenever Windows is started. When Windows is closed, the Controller will be deactivated.



*If the Controller's I/O address and interrupt have to be changed at a later date, reset the jumpers on the Controller first. Then start the **A1 Setup** program and enter the new values there.*

3.2.2 AVM ISDN CAPI Port Driver

To connect your computer to the Internet over ISDN using the integrated TCP/IP stack of Windows NT, AVM supplies the ISDN CAPI Port Driver for Windows NT. This driver provides virtual modems which applications can use for Internet connections, on-line services, BBS access or RAS (Remote Access Services) connections to other computers. The AVM ISDN CAPI Port Driver is located in the folder \PROGRAMS\CAPIPORT.NT on the CD supplied with the Controller, and is also available from the AVM Data Call Center (ADC) or AVM's Internet site.

For a detailed description and instructions for installing and using the driver, see its accompanying help file.

3.2.3 AVM NDIS WAN CAPI Driver

To facilitate the use of "Remote Access Services" (RAS), AVM provides the NDIS WAN CAPI Driver for Windows NT free of charge. The driver is located on the Controller CD in the directory \PROGRAMS\NDISWAN.NT. The driver also can be obtained from the AVM Data Call Center or downloaded from the Internet.

A detailed description of the installation and functions of the NDIS WAN CAPI Driver is available in the help file included on the Controller CD.

3.2.4 Uninstalling the Controller

To uninstall the **AVM ISDN-Controller A1** in Windows NT 4.0, open the Windows NT Control Panel ("Start/Settings") and double-click the **Add/Remove Programs** symbol. The list of installed software includes the **AVM ISDN-Controller A1**. Select this entry and then click the **Add/Remove** button. The uninstallation program starts and displays the folder of driver software which is being deleted.

3.3 Installation in Windows 3.x

Specially developed driver software for Microsoft Windows 3.x is supplied with the ISDN-Controller. This true 32-bit virtual device driver (VxD) takes advantage of Windows' Protected Mode.

CAPI The AVM ISDN-Controller's COMMON-ISDN-API 2.0 driver for Windows supports both Windows and DOS applications running simultaneously within Windows. This CAPI version also can be used with older applications designed for CAPI 1.1. See the Appendix for more information about CAPI.



Do not load a DOS-based CAPI driver before starting Windows! If you want to use DOS applications, run them in a DOS window, or end your Windows session and install the ISDN-Controller driver for DOS.

Check I/O address Before beginning with the software installation, make sure that the ISDN-Controller card is installed correctly in your computer and set to an I/O address that is not used by any other adapter in your PC (see Chapter 2, "Hardware Installation").

3.3.1 Installing the Driver Software

To install the ISDN-Controller software for Windows 3.x, proceed as follows:

1. Start Windows.
2. Insert the driver CD supplied with the ISDN-Controller into your CD-ROM drive. In the "File" menu of the Program Manager, select the "Run" command. In the command line, enter the path and file name of the installation program, e.g.

```
CD-ROM: \CARDWARE\A1\WINDOWS.3XX\  
<Language>\SETUP.EXE
```

<Language>: Specify the directory with the driver software for your country ("English" for European countries or "USA").

Alternatively, click the **Browse** button to search for the path in the directory list.

3. Click **OK** to start the installation program.

The "Initialize Setup" message is displayed. Once initialization is complete, the installation program's sign-on message appears. Click the **Continue** button.



*The installation can be canceled at any time by selecting **Exit**.*

4. In the next dialog, enter the name of the directory in which the ISDN-Controller software is to be installed. The default is C:\NDRIVER; accept this suggestion or enter any other directory name. Once your entry is complete, confirm by clicking the **Continue** button.
5. Select the D-channel protocol used by your ISDN line by clicking the desired option.

 **US only:** The next dialog asks you to enter your first complete ISDN directory number (area code plus telephone number) in the first input field. In the second field, enter your first complete SPID.

In the following dialog box, enter your second complete ISDN directory number and your second SPID. If you have been assigned only one directory number and one SPID, leave the input fields in this dialog blank and click the **Continue** button. 

6. Now the installation routine copies the necessary files to the specified drive and directory. When all files have been copied, you will be prompted to restart Windows.

The driver software installation for the Controller A1 in Windows 3.x is now concluded.

The Controller's driver software will be loaded automatically whenever Windows 3.x is started. When Windows is closed, the Controller will be deactivated.

The program group “AVM” is created in the Program Manager. This group contains the entries **A1 Readme** and **A1 Setup**.

Changed I/O address? If you set the jumper to another I/O address before installing the hardware, or if you wish to use a different interrupt (IRQ), make these changes with the **A1 Setup** program before beginning operation. If you accepted the default values (I/O address 300, interrupt 5), skip section 3.4.2.

Changing SPID or Directory No. after Installation  **US only:** Has your SPID or ISDN directory number changed? To change the ISDN directory number or the SPID for the **AVM ISDN-Controller A1**, run the installation program again and enter the new number and SPID.



3.3.2 Configuring the Controller

Start the **A1 Setup** program by double-clicking on its icon in the “AVM” program group. The following window appears:

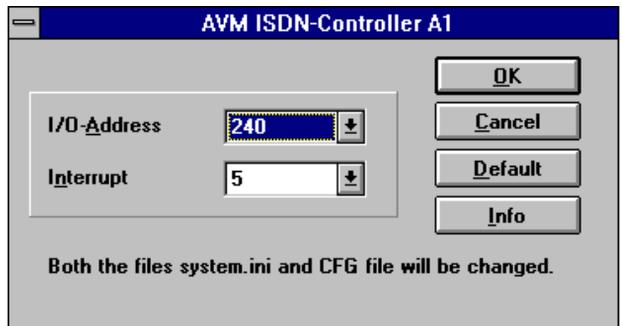


Figure 5 Dialog window of the A1 Setup program

Click the selection arrow next to the entry field to select a value for the I/O address and interrupt (IRQ).

Save your changes by clicking **OK**. The specified values for the ISDN-Controller are entered in the SYSTEM.INI (Windows directory) and ISDNLOAD.CFG (directory of the Controller software) files.

In order to implement the changes, you must restart Windows.

The AVM ISDN-Controller is loaded automatically whenever Windows is started and deactivated when Windows is closed.



*If the Controller's I/O address and interrupt have to be changed at a later date, e.g. because of new hardware components, reset the jumpers on the Controller first. Then start the **A1 Setup** program and enter the new values as described above.*

3.3.3 Uninstalling the Controller

To uninstall the **AVM ISDN-Controller A1** in Windows 3.x, start the setup program on the driver CD.

The setup indicates that an installed Controller was found. Select the "Deinstallation" option and follow the instructions on the screen.

3.4 Installation in MS-DOS

CAPI Special DOS driver software is supplied with the ISDN-Controller. Once installed, the driver provides the application interface COMMON-ISDN-API (CAPI) Version 2.0 to all programs (see the Appendix). This CAPI driver also supports applications designed for CAPI Version 1.1.

Check I/O address Before starting the software installation, make sure that the ISDN-Controller card has been installed correctly in your computer and set to an I/O address that is not used by any other adapter in your PC (see Chapter 2, “Hardware Installation”).

3.4.1 Installing the Driver Software

The driver software for the AVM ISDN-Controller B1 is installed on your computer using a simple installation program.

1. Insert the driver CD supplied with the ISDN-Controller into your CD-ROM drive.
2. Change the current drive to your CD-ROM drive by entering the drive letter (with colon) at the DOS prompt, e.g. D:. Then use the DOS command **cd** to change to the directory containing the DOS drivers:

```
\CARDWARE\A1\DOS\<Language>
```

<Language>: Specify the directory with the driver software for your country (“English” for European countries or “USA”).

Start the installation program by entering

```
install <RETURN>
```

at the DOS prompt. If the installation files are located on a different drive or in a subdirectory, use the appropriate path name.

3. The installation routine’s sign-on screen appears. Installation can be aborted at any time by pressing **Ctrl+X**. To proceed with installation, press **Return**.

4. A list of available drives appears. Choose the drive on which the controller software is to be installed.

Use the arrow keys to browse in the list and confirm your choice by pressing **Return**.

5. Next, choose the subdirectory where the Controller software is to be installed.

The default is \DRIVER, but this can be changed to any name desired. Confirm again by pressing **Return**.

6. Select the D-channel protocol used by your ISDN line (DSS1 or a national protocol).

Use the **Tab** key to browse through the options and select the desired entry; then confirm by pressing **Return**.

-  **US only:** The next dialog asks US ISDN users to enter the first complete ISDN directory number (area code plus telephone number) in the first input field. In the second field, enter your first complete SPID.

Enter in the following dialog your second complete directory number and the second SPID. If you have been assigned only one directory number and one SPID, leave the input fields in this dialog blank and press **Return**. 

7. Now the installation routine copies the necessary files to the specified drive and directory. If there is not enough free space on the drive, the program will return an error message.

The installation of the driver software is now complete.

Changed I/O address? If you changed the I/O address by moving the jumper before installation, the new address now must be registered using the **A1 Setup** program. If you would like to use a different interrupt, this must be changed here as well. If you accepted the default Controller settings (I/O address 300, Interrupt 5), skip section 3.4.2.

Changing SPID or Directory No. after Installation

US only: Has your SPID or ISDN directory number changed? To change the ISDN directory number or the SPID for the **AVM ISDN-Controller A1**, run the installation program again and enter the new number and SPID. You can also edit the file ISDNLOAD.CFG in the installation directory by using a text editor. Enter the directory number(s) and SPID value(s) in the [ISDN-Controller-XX] section:

```
:DN = X
:SPID = X
:DN2 = X
:SPID2 = X 
```

3.4.2 Configuring the Controller

The I/O address defined by the jumper position must correspond with the I/O address entered in the Controller software. To enter the I/O address, run the program **A1 Setup**. The following dialog appears on the screen:

A1 Setup Version 1.2	
Hardware configuration for AVM ISDN-Controller A1	
Controller I/O address:	300
(Values permitted are 200, 240, 300, 340, default is 300)	
Controller IRQ level:	5
(Values permitted are 2, 3, 4, 5, 6, 7, 10, 11, 12, 15, default is 5)	
(c) Copyright AVM GmbH, Berlin 1997	Press Ctrl + Home to save Press Esc or Ctrl A to cancel
Space = Change value Tab = List	

Figure 6 The A1 Setup Program in MS-DOS

Enter the I/O address you chose in the first input field. The given value can be changed by pressing the space bar. Press the **Tab** key to view a list of all possible values. Select the desired I/O address by moving the highlighted bar to the desired entry and then press **Return**.

Enter a new value for the interrupt in the second input field. Press the space bar or use the **Tab** key to choose another value.

Save your entries by pressing **Return**.



If the Controller's I/O address and interrupt have to be changed at a later date, e.g. because of new hardware components, reset the jumpers on the Controller first. Then start the **A1 Setup** program and enter the new values as described above.

3.4.3 Loading and Unloading the Controller

Load ISDN-Controller

Now you may begin Controller operation. Change to the directory which contains the driver software, e.g. IDRIVER, and enter the following command at the DOS prompt:

ibase <RETURN>

This command initializes the ISDN-Controller and loads its driver software. After successful loading, the following message is displayed on the screen:

AVM Berlin	ISDN-Controller A1
COMMON-ISDN-API Version 2.0	Serial No. xxxxxxx
E-DSS1 / Release xxxxx	Address xxx / IRQ x
Add. Service: V.110, X.25, X.31	

Figure 7 Message after loading in MS-DOS

You may now begin working with your CAPI applications. The **AVM ISDN-Controller A1**'s resident driver occupies about 110 KB of your PC's memory.

Unloading the ISDN-Controller

To remove the driver software from memory, enter the command

ibase - <RETURN>

at the DOS prompt. The program displays a message to acknowledge that the driver has been removed.



To load the AVM ISDN-Controller A1 driver automatically every time the computer is started, enter the batch command **ibase.bat** to your AUTOEXEC.BAT file (remember to specify the path !).

3.4.4 Uninstalling the Controller

To uninstall the **AVM ISDN-Controller A1** in MS-DOS, first remove the driver from memory by entering the command **ibase -**.

Then use the DOS commands **del** and **rmdir** to delete the driver software and the installation directory. If the command **ibase** has been added to your AUTOEXEC.BAT file, it must be removed as well.

4 Technical Specifications

4.1 Jumper Positions for I/O Address Selection

To install the Controller it may be necessary to change the I/O address from the factory setting of 300, for instance, if other hardware components use this address.

The I/O address is changed by moving a jumper on the ISDN-Controller card, then entering the new address in the ISDN-Controller driver software or operating system configuration. This section describes the hardware adjustment: moving the jumper. The procedure for adjusting the software configuration is described for each operating system in Chapter 3, "Driver Software Installation".

The ISDN-Controller has one jumper row containing one jumper. To locate the jumper row, hold the board in front of you with the component side up. The controller sockets are at the right side, the contact fingers are at the bottom (see illustration):

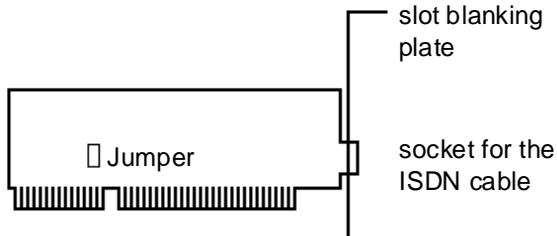


Figure 8 AVM ISDN-Controller A1

The position of the jumper determines the I/O address.

The following diagrams show the jumper settings and the corresponding I/O addresses. To change the I/O address, pull the jumper off and slide it onto the contacts at the corresponding position.

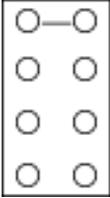
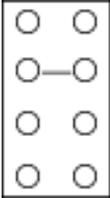
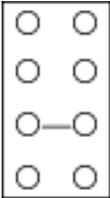
Jumper position	Jumper row	I/O address
closed open open open		I/O address 200
open closed open open		I/O address 240
open open closed open		I/O address 300
open open open closed		I/O address 340

Figure 9 Jumper positions and I/O addresses



If the jumper row contains no jumpers at all, the Controller is set to the default I/O address 300.

4.2 Cable Connector Pin Assignments

The **AVM ISDN-Controller A1** is connected to the ISDN socket by a 9-pin sub-D connector.

Pin Assignments, S₀ Interface (9-pin sub-D connector) to RJ 45 ISDN socket

Sub-D connector	RJ45 connector	Signal
1-		
2- SR1-	-5 (b1)	transmit
3- SR2+	-4 (a1)	transmit
4- SX1+	-3 (a2)	receive
5- SX2-	-6 (b2)	receive
6-		
7-		
8-		
9-		

Table 1 Pin assignments for the RJ 45 ISDN socket

4.3 Features and Technical Specifications

- ISDN PC adapter card in SMD technology for PC with ISA or EISA bus system.
- Dimensions: 160 x 70 mm
- Power consumption: approx. 0.35 W
- Can be operated in an 8-bit or a 16-bit slot
- Avoids collisions with other adapters by using only the I/O address and interrupt to address the card in the system; uses no system memory
- Freely configurable interrupt (IRQ) level and I/O address

- S₀ interface for BRI lines and PBX extensions
- Supports both B channels (at 64 kbit/s each) and the D channel (at 16 kbit/s) of the BRI
- Supports data and voice applications using two channels simultaneously
- COMMON-ISDN-API (CAPI) Version 2.0 as standard software interface, including support for CAPI 1.1 applications in Windows
- Driver software for international and national D-channel protocols (DSS1, 1TR6, 5ESS and NI 1)
- Loadable B-channel protocols, Layer 2: X.75, HDLC transparent and V.110 transparent
Loadable B-channel protocols, Layer 3: transparent, X.31 for ISDN packet services, ISO 8208 for X.25 and Eurofile transfer; T.70, T.30 and V.32bis
- Operating systems supported: Windows 98, Windows 95, Windows NT, Windows 3.x, MS-DOS and Linux
- 32-bit device drivers for Windows 98, Windows 95, Windows NT and Windows 3.x
- AVM ISDN-Tools included: Connect2 (MS-DOS) and Connect32 (Windows 98, 95 und NT), compatible with FRITZ!data and IDtrans, NDIS WAN CAPI Driver, AVM ISDN CAPI Port Driver, AVM ISDN TAPI Services for CAPI, Terminal (MS-DOS)
- PTT certification in USA and throughout Europe, including Germany and France in accordance with the CE standard
- Approvals: CE 0170X, TÜV tested, GS seal
- EMC tested in accordance with EN410003 at 4000 V surge voltage

5 Possible Errors and Remedies

This chapter describes general malfunctions and specific error messages and suggests how these may be resolved. Error messages are sorted by operating platform: Windows 98, Windows 95, Windows NT, Windows 3.x and MS-DOS.

5.1 General Malfunctions

The AVM ISDN-Controller is not detected or not initialized.

- Have you installed other new hardware components or changed the configuration of existing hardware?

If so, check for conflicts in the interrupt and I/O address assignments using the program MSD.EXE, which is included with MS-DOS and Microsoft Windows 3.x. In Windows 95/98, look for resource conflicts in the Device Manager (“Start / Settings / Control Panel / System”). In Windows NT, run the program “Windows NT Diagnostics” in the “Administrative Tools” folder.

- If your computer is a PCI/ISA bus system, check your BIOS setup or ICU utility to make sure that the interrupt you assigned to the **AVM ISDN-Controller A1** is actually allocated to the corresponding bus.
- Have you made changes in your computer’s BIOS setup?
- Have you made other configuration changes (boot menus, memory managers, etc.)?

You are unable to establish an ISDN connection.

If the AVM ISDN-Controller is correctly installed, but you are unable to establish a connection, check the following:

- Is the ISDN-Controller firmly inserted in the bus slot? Is its slot plate screwed down?

- Are the ISDN cable connectors firmly inserted (and screwed tightly) in the AVM ISDN-Controller? Is the connector cable connected to in your ISDN socket?
- Is your ISDN line active? Use another terminal device, such as an ISDN telephone, to check it.
- Is your network terminator (NT) installed correctly? Some NTs need to be connected to an electrical outlet as well as to the incoming ISDN line.
- If your ISDN-Controller is connected to a PBX extension, have you included the outside dialing prefix (usually '0') in the numbers dialed?
- Are all the relevant services (data transmission) available and enabled on your PBX extension?
- Did you specify the correct D-channel protocol for your ISDN line when installing the ISDN-Controller software?

Problems during ISDN-Controller operation:

If problems arise regularly during operation, run the program **A1 Test**, located in the "AVM" program group or in the driver software installation directory. This program performs functional tests of the ISDN-Controller's individual components and displays the results.

If **A1 Test** reports no malfunctions in the ISDN-Controller hardware, you should attempt a test connection to the AVM Data Call Center (ISDN file transfer server). You may do so using the program **Connect2** (MS-DOS) or **Connect32** (Windows 95/98 and NT), which are among the AVM ISDN-Tools included with your ISDN-Controller. The number of the AVM Data Call Center is +49-30-399 84 300.

After you have run the diagnostic program “A1 Test”, the CAPI interface is no longer available

Reload the **AVM ISDN-Controller A1**: in Windows, restart the systems; in MS-DOS, enter the command **ibase**.

Connections to analog dial-in ports.

Your AVM ISDN-Controller can establish connections to digital ISDN terminal equipment. In addition to this, you may send and receive faxes (Fax Group 3 = analog fax) in Windows. The drivers for Windows 95, 98 and Windows NT also allow connections to analog ports like modems. For this purpose, you can use FRITZ!com or other applications together with the AVM ISDN CAPI Port Driver. See the CAPI Port Driver’s help file. In the Appendix, you find more information about the driver software’s features CAPI SoftFax G3 and CAPI SoftModem V32bis.

DOS and Windows drivers are loaded at the same time

Load either only the DOS drivers or only the Windows drivers for your AVM ISDN-Controller. Windows drivers also support CAPI applications in DOS windows.

No line charge information is displayed

The drivers for the **AVM-ISDN Controller A1** allow CAPI-based applications to display charge information. This information is available only if the corresponding ISDN service has been enabled by your ISDN service provider, however. Contact your ISDN service provider to request charge information.

5.2 Error Messages

5.2.1 Error Messages in Windows 98

In Windows 98 no error messages are returned directly. Thus error conditions are not visible until an application has been opened. Possible error messages include “CAPI not installed” and “Error 680: no dial tone”, a message from Windows Dial-Up Networking.

Possible solution: Check the Controller configuration in the Windows 98 Device Manager. The Device Manager is opened via “Start / Settings / Control Panel / System”. The entry “AVM ISDN-Controller” displays all ISDN-Controllers installed. Double-click on an ISDN-Controller entry to view the properties of the device. The page lists all resources currently assigned in the system including I/O addresses and interrupts. Any resource conflicts in the system also will be displayed. Should any conflicts exist, change the Controller configuration accordingly here. See also Chapter 3 for allocating resources.

5.2.2 Error Messages in Windows 95

Error message: “No AVM ISDN-Controller with the configured I/O address found.”

Possible error source: The I/O address set with the jumper on the Controller is different from the entry in the Windows Control Panel (Device Manager), or the hardware is not installed.

Solution: The I/O address set with the jumper must match the entry in the Device Manager. Open the Device Manager (“Start / Settings / Control Panel / System”) and select the **AVM ISDN-Controller A1**. Click **Properties** and then on the “Resources” page. Use the **Change Setting** button to enter the I/O address corresponding to the jumper position on the Controller. Restart Windows for the changes to take effect.

If the Device Manager indicates a device conflict for the desired I/O address, select another one. After shutting down the computer, move the jumper on the Controller to this address and then restart the computer.

Error message: “The configured interrupt cannot be used”.

Possible error source: The **AVM ISDN-Controller A1** and another hardware component (e.g. a sound card) are set to the same IRQ value.

Solution: Open the Device Manager (“Start / Settings / Control Panel / System”) and select the **AVM ISDN-Controller A1**. Click **Properties** and then on the “Resources” page. Select “Interrupt Request” as the resource type. Use the **Change Setting** button to set the value to a free IRQ. Windows 95 automatically displays any potential conflicts with other installed hardware. To implement changes made here, Windows 95 must be restarted.

Error message: “A required .DLL file, CAPI*.DLL, was not found.”

Possible error source: The DLL file (CAPI.DLL, CAPI20.DLL or CAPI2032.DLL) has been renamed or removed from the Windows\System directory.

Solution: Perform a complete new installation of the **AVM ISDN-Controller A1** to replace the missing files.

Error message: “Windows has finished detecting hardware, but did not find any new devices on your system.”

Possible error source: The Add New Hardware Wizard’s question “Do you want Windows to search for your new hardware?” was answered with “Yes” during **AVM ISDN-Controller A1** installation.

Solution: Start the Add New Hardware Wizard again and answer this question with “No”. Confirm by clicking **Next**. See “Installation in Windows 95/98” in Chapter 3, “Driver Software Installation”.

5.2.3 Error Messages in Windows NT

Error message from Windows NT: “At least one service or driver failed during system startup. Use Event Viewer to examine the event log for details.”

Possible error source: The **AVM ISDN-Controller A1** driver software cannot be loaded. This may be due to an incorrect I/O address setting (jumper setting on the Controller) or to an incorrect interrupt (IRQ).

Solution: For detailed information about the error, open the Windows NT Event Viewer (“Administrative Tools” folder). Check the messages from A1BASE and the Service Control Manager.

The “Administrative Tools” folder also includes the “Windows NT Diagnostics” program, with which you can check the resources in your system. Find out which I/O addresses and interrupts (IRQs) are available.

If the jumper position on the Controller must be changed to another I/O address, exit Windows and turn off the computer. Change the jumper position, restart Windows NT, and then start the **A1 Setup** program from the “AVM” group to enter the new I/O address and any change to the interrupt (IRQ).

As a final step, Windows must be restarted to implement these changes.

Error message: “Resource conflict detected...”

Possible error source: The ISDN-Controller cannot use the configured I/O address or interrupt (IRQ), as it is already assigned to another device.

Solution: Change the IRQ or the I/O address. Use the “Windows NT Diagnostics” program from the “Administrative Tools” folder to find out which I/O addresses and interrupts are available. Turn off your computer, change the jumper position and then restart Windows. Use the **A1 Setup** program to make the corresponding changes to the software. See sections 4.1 and 3.2.2 for more information.

Error message: The interrupt does not work.

Possible error source: The interrupt (IRQ) may be assigned to another hardware component which was not installed with a driver correctly in NT.

Solution: Set the **AVM Controller A1** to another IRQ. Turn off the computer, change the jumper position on the Controller and then restart Windows. Start the **A1 Setup** program and follow the instructions on the screen. See also section 4.1.

Error message: The ISDN-Controller has not been found, has not been activated by the system or does not work properly.

Solution: Perform the Controller installation again. Work through the steps in the sequence listed in the installation routine in section 3.2. If problems persist, contact AVM Support. See section 5.3 for contact information and useful instructions.

5.2.4 Error Messages in Windows 3.x

Error message: “No AVM ISDN-Controller with the configured I/O address found.”

Possible error source: The jumper position on the Controller which determines the I/O address does not correspond to the settings in the **A1 Setup** program, the I/O address is used by another hardware component (e.g. sound card), or the hardware is not installed.

Solution: Find out which I/O addresses are available in your PC and set the jumper position on the Controller accordingly (see Chapter 4, “Technical Specifications”). Then enter the new I/O address in the driver software using the **A1 Setup** program from the “AVM” program group. Windows must be restarted for the changes to be implemented.

Error message: “The configured interrupt cannot be used”.

Possible error source: The **AVM ISDN-Controller A1** and another hardware component (e.g. a sound card) are set to the same IRQ value.

Solution: Check which interrupts (IRQs) are available in your computer using the MSD.EXE program (Windows directory). Then start the **A1 Setup** program from the “AVM” program group and define another interrupt for the Controller. Windows must be restarted for these changes to take effect.

Error message: “Missing or wrong entry in SYSTEM.INI: invalid I/O address”.

Possible error source: The I/O address entry in the SYSTEM.INI file is incorrect or missing.

Solution: Start the **A1 Setup** program from the “AVM” program group and enter a valid I/O address. Windows must be restarted for these changes to take effect.

Error message: “Missing or wrong entry in SYSTEM.INI: invalid interrupt number”.

Possible error source: The interrupt entry in the SYSTEM.INI file is incorrect or missing.

Solution: Start the **A1 Setup** program from the “AVM” program group and enter a valid interrupt. Windows must be restarted for these changes to take effect.

Error message: “Error while initializing hardware”.

Possible error source: The **AVM ISDN-Controller A1** driver files are damaged or the hardware is defective.

Solution: Perform the SETUP.EXE program from the installation CD again. In order to load the Controller, Windows must be restarted. If the error message persists, contact AVM.

Error message: “Cannot find a device file that may be needed to run Windows.... A1base.386”

Possible error source: The driver file A1BASE.386 is not located in the /Windows/System directory.

Solution: Run the setup program from the installation CD again.

Error message: “COMMON-ISDN-API is not installed”.

Possible error source: The device driver for the Controller A1 (A1BASE.386) was removed from the SYSTEM.INI file.

Solution: Run the setup program from the CD.

5.2.5 Error Messages in MS-DOS

Error message: „ISDNLOAD: installation error, controller-xx with I/O address <xxx> not found.”

Possible error source: The jumper position on the Controller which determines the I/O address does not correspond with the entry in the **A1 Setup** program, the I/O address is used by another hardware component (e.g. a sound card) or the hardware does not exist.

Solution: Check which I/O addresses are available in your computer and set the jumper on the Controller accordingly (see Chapter 4 “Technical Specifications”). Then enter the new I/O address in the driver software using the **A1 Setup** program. After making these changes, load the Controller using the **ibase.bat** file.

Error message: “ISDNLOAD: installation error, interrupt <xx> not available”.

Possible error source: The **AVM ISDN-Controller A1** and another hardware component (e.g. a sound card) are configured to the same interrupt.

Solution: Check which interrupts (IRQs) are available in your computer using the MSD.EXE program (DOS directory). Start the **A1 Setup** program and set another interrupt. Then load the Controller using **ibase.bat**.

5.3 Technical Assistance from AVM Support

If the tips above have not succeeded in resolving your problem, please contact AVM Support for additional technical assistance.

AVM Support can be reached in the following ways:

5.3.1 Support by E-mail

You can send a support inquiry to AVM by e-mail. Please use the e-mail form from our Internet site

<http://www.avm.de/support/english>

Fill out the form and send it to AVM Support by clicking the **Submit** button.

5.3.2 Support by Fax

If you do not have Internet access, you can reach AVM by fax under the number

+49 (0)30/3 99 76-266

Please supply the following information with your support inquiry:

- For which AVM ISDN-Controller are you requesting support?
- Include the version number of the driver used. The version number is included in the README file in the "AVM" program group.
- Which type of D-channel protocol is used on your ISDN line: DSS1 or a national protocol?
- Is your ISDN-Controller connected directly to the ISDN jack of an ISDN line or do you work from a PBX?
- In which operating system is the AVM ISDN-Controller installed?
- Please note the exact wording of any error messages returned.

- Provide as detailed an error description as possible: when the error occurs, what programs are active, etc.

Please also note the following to assist us in resolving your problem:

- Is the error reproducible?
- Do you receive error messages when you perform the **A1 Test** program from the “AVM” program group?

If so, which error messages are returned?

- Can you establish a data connection the the AVM Call Center (ADC) with your AVM ISDN-Controller?

A connection to the ADC can be established with the programs Connect/Connect32 included with delivery or with FRITZ!data. Use the IDtrans transmission protocol and the telephone number +49 (0)30 / 39 98 43 00.

If such a connection is not successful, what error message do you receive?

- Please supply an exact description of your computer and peripheral equipment including: computer type, sound card, resources used (I/O addresses, IRQs and interrupts used) and other components installed.

Appendix: The Applications Interface CAPI 2.0

Introduction

What is CAPI? **COMMON ISDN API (CAPI)** is a standardized software interface that provides applications with access to ISDN adapters on basic-rate and primary-rate lines. Applications that build on this standard interface use uniform mechanisms for communication over ISDN connections, and thus do not need to adapt to the peculiarities of particular manufacturers' hardware. This means that such applications are also unaffected by future extensions or hardware modifications: CAPI makes such changes transparent to the application. ISDN hardware manufacturers benefit from this standard too, since it makes all kinds of applications compatible with their products.

CAPI contains an abstract definition of ISDN services which is independent of the specifics of underlying telecommunications networks or the adapter cards used to connect PCs to ISDN. The specification provides an interface that is easy for application programmers to use, and thus offers uniform access to various ISDN services such as data, voice and fax transmission, video conferencing and telephony.

Benefits of CAPI CAPI has evolved into an internationally recognized standard. Key in this development have been the numerous advantages offered by this uniform interface: independence from specific manufacturers and consequent high investment security, a wide variety of compatible applications for all kinds of operating systems and ISDN protocols, etc. ISDN (the **I**ntegrated **S**ervices **D**igital **N**etwork) is becoming attractive for an increasing number of companies since it affords fast and reliable transfer of information in many different forms.

CAPI 1.1 As early as 1989, ISDN manufacturers began development work on a standard interface for the rapidly expanding ISDN market. The first version of CAPI concentrated on the German national ISDN protocol 1TR6, as an international standard for ISDN protocols was not yet available. In 1990 development was complete, and a CAPI Working Group was formed by ISDN application and hardware manufacturers, large-scale ISDN users, user groups and the German PTT, at that time DBP Telekom. CAPI Version 1.1 was a milestone in the development of the national ISDN market in Germany. Today all German ISDN solutions and a large proportion of international products are based on CAPI.

The international standardization of ISDN-protocol specifications is now complete, and nearly all telecommunications network operators provide BRI and PRI lines on the basis of the international standard Q.931/ETS 300 102. With CAPI 2.0 a version based on this standard now is available. The experience gained in Germany and other countries over the past years in the development of an ISDN applications programming interface, along with the enormous base of installed CAPI solutions, have contributed greatly to the development of this new applications interface for international ISDN systems.

CAPI 2.0 Over ten years of experience in the growing ISDN market have gone into CAPI 2.0. This version has all the advantages of an open interface and covers most ISDN features (including data communications, telephony, Group 3 fax and video conferencing). Since CAPI handles ISDN subscriber interface control functions, these no longer have to be programmed. This simplifies the development of ISDN applications. Furthermore, applications no longer have to be tailored to national or manufacturer-specific systems, so that a greater variety of applications is available.

By using CAPI Version 2.0, the international market benefits from comprehensive technological know-how with great profit potential.

For more information about CAPI, see the CAPI Association's Web site,

<http://www.capi.org/>

CAPI Features

CAPI offers a number of important features:

- Support for basic call features such as call set-up and clear-down
- Support for multiple B channels for data and/or voice connections
- Support for multiple logical data connections within a single physical channel
- Selection of specific services and protocols on dialing and in answering incoming calls
- Transparent interface for protocols above OSI Layer 3
- Support for one or several BRIs and PRIs through one or several ISDN adapters
- Support for multiple concurrent applications
- Message definitions independent of operating systems
- A message-passing mechanism tailored to specific operating systems for optimum system integration
- An asynchronous, event-driven mechanism for high throughput

IDM Architecture

The ISDN Driver Model (IDM) illustrated below integrates ISDN into the Microsoft family of operating systems.

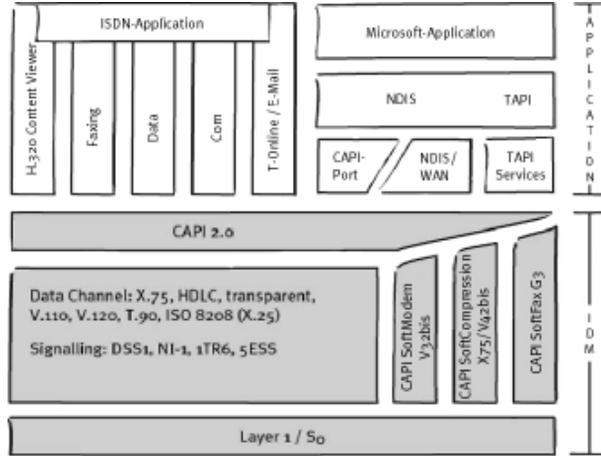


Figure 10 IDM architecture

The ISDN Driver Model provides the framework for all driver components of AVM ISDN products. The IDM describes the integration of all ISDN services and their utilization by the application. The IDM also fixes the transparent integration of ISDN hardware resources in the operating system.

An important element of IDM is the bonding of existing communications components like RAS to CAPI-based ISDN solutions. This is achieved using Middleware like the AVM CAPI Port Driver or the NDIS WAN CAPI Driver.

The IDM architecture allows the parallel use of CAPI, modem and network application functions in ISDN. A particularly important feature is the option of defining and activating additional functions, for example integrated data compression according to V.42bis and Fax G3 service.

CAPI SoftCompression X.75/V.42bis

CAPI SoftCompression is a feature of the **Controller A1** driver software. Data compression for X.75 connections according to V.42bis significantly reduces connection times and costs by increasing transmission rates.

Applications which support the V.42bis standard can negotiate data compression with the remote site for the duration of data transmission. In this case, data compression is activated or deactivated at the request of your ISDN application, e.g. by **Connect32**. When the driver software is installed, CAPI SoftCompression X.75/V.42bis is deactivated by default.

When using older ISDN applications which do not support data compression, you have the option of switching on data compression directly in the **AVM ISDN Controller A1** driver. Thus data compression is enabled for all ISDN connections.

When data compression is activated in the driver, the program will attempt to negotiate data compression according to V.42bis for all X.75 connections, independent of the CAPI application in use. If the remote partner does not perform data compression, data will be transmitted without compression. This procedure runs in the background and is invisible to the user.



Once the driver software has been installed, V.42bis data compression can be activated in Windows 98/95 and Windows NT using the A1 Setup program. In Windows 3.x you have the option of activating data compression during the installation routine.

If your laptop or notebook does not meet the hardware requirements or if unexpected problems arise when exchanging data with remote sites without V.42bis capability, it is advisable to deactivate data compression in both the driver and the application.



If problems in establishing connections arise, deactivate data compression.

CAPI SoftFax G3 and CAPI SoftModem V32bis

Along with CAPI SoftCompression, CAPI SoftFax and CAPI SoftModem are also features of the Controller software. In addition to digital features, the **Controller A1** also allows the use of analog services like Fax Group 3 (CAPI SoftFax G3) and modem (CAPI SoftModem V32bis).

The **AVM ISDN-Controller A1** can be used with the Controller software as a platform for CAPI-based fax applications in Windows. The Controllers support send and receive procedures for faxes with up to 14400 baud, with both B channels available for fax communication. The Controller functions as a Group 3 fax machine.

The **AVM ISDN-Controller A1** also offers SoftModem V.32bis. On the basis of this modem emulation, communications applications can use an ISDN line to establish connections to analog remote partners connected to the telephone network by modem. The modem emulation enables data transmission according to V.32bis. This means that data connections can be operated at up to 14400 baud.

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