Manual

EyeSDN USB-S0
EyeSDN USB-E1
EyeSDN USB-A2
EyeSDN USB-4S
EyeSDN USB-4SBx

Call Recording System/ISDN Test- and Measurement Equipment

www.innoventif.com

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Contents

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web: www.innoventif.com, email: info(at)innoventif.com

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[1]This manual can also be found as a PDF-document on the installation CD.

1   Introduction and System Requirements

1.1   Introduction

Thank you for choosing an EyeSDN USB recording device. The EyeSDN USB devices allows you to monitor and record all the information on a ISDN[2] S0/E1 or analogue telephone line.

The ISDN versions of the product support both the DSS1 or Q.931 signalling protocol and the British protocols (DASS2/DPNSS). These protocols are in widespread use in Europe and elsewhere. Using the third-party software supplied, a detailed protocol analysis of both the B and D channel protocols can be made. This can be used to detect flaws in your ISDN setup.

The device for analogue phone lines is able to obtain the called party number on outbound calls and the calling party number on inbound calls by decoding the DTMF and V.23 Modem (CLIP) signalling if present. Furthermore, the devices can be used to record all incoming and/or outgoing calls for playback or analysis.

Together with this manual you should also have received:

- either a small recording device (EyeSDN USB-S0, EyeSDN USB-A2, EyeSDN USB-E1) or the PC internal recording card EyeSDN USB-4S or the recording box EyeSDN USB-4SBx,

- an cable to connect the device to your S0/E1 line or to your analogue lines,

- 4 Y-Adaptors (EyeSDN USB-4S/-4SBx only),

- an USB[3]-cable to connect the device to your PC and

- an installation CD.

If any of the above mentioned items are missing, please contact the dealer where you purchased the device or the manufacturer directly.

1.2   System Requirements

To operate the EyeSDN USB device, the computer must fulfil certain requirements. The device may still operate properly if any of the requirements are not met, but operation under such conditions is not guaranteed. To use the EyeSDN USB device your computer should have:

- a CD drive to load the software,

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[2]Integrated Services Digital Network

[3]Universal Serial Bus

- min. 5 MB to max. 170 MB hard drive space free (depending on installation options),

- either a processor with at least a 500 MHz processor clock (minimum for single S0/A2/4S/4SBx device operation) or a processor with at least a 2 GHz processor clock (minimum for single EyeSDN USB-E1 device operation),

- an USB port for each device (S0- and A2-devices can be connected to an USB hub alternatively),

- a sound card with correctly installed driver (only if playback of recorded calls is desired),

- the Media Player, only when the recorded calls should be stored in MP3 or GSM formats and

- either Windows 2000, Windows Server 2003, Windows XP or Windows Vista (other operating systems may be supported in the future).

Additional hard drive space will be required to store recorded calls. A CD- or DVD-recorder is recommended to simplify archiving of the data. The recording software runs as a Windows service and uses about 2 to 15 MB of RAM depends on how many devices are connected.

1.3 Safety Advice

1. Please read the manual first and keep it at hand for future reference.

2. Unplug the device from both the ISDN Bus and the computer before cleaning it. Never clean it using solvents or detergents.

3. Do not use the device near water.

4. Do not place the device on an unstable surface, stand or table. The device may fall, possibly damaging it seriously.

5. Do not attempt to service the device yourself, except for those instances described in the manual. Opening the device may expose you to dangerous voltages or other risks. There are no user servicable parts inside.

6. Unplug the device and contact qualified service personnel if:

   (a) liquid has been spilled on it or it has been exposed to rain or water.
   (b) it has been dropped or the housing has been damaged.
   (c) it does not operate normally although the operating instructions were followed.

7. *Please note:* In many countries it is illegal to record calls without the consent of all or some participants. If you are uncertain which laws apply in your area, please check the local legislation or consult a lawyer.

2   Software Installation

2.1   Running the Installation Programme

Please install the software before you attach the device to the computer. During software installation the device driver is copied to the computer's hard-disk.

Figure 1: Select Components to install

2.1.1   Getting Started

When you load the CD into your computer the installation programme should be started automatically. If the programme has not been started after a short while, run the installation programme manually by doubling-clicking the BANNER icon (banner.exe) on the installation CD.

Only one programme can be selected and installed at a time. Follow the on-screen installation instructions of the chosen programme from start to finish. Using the installation assistant (see figure 1) you can then select another programmes for installation. Not all of the software components (programmes) must be installed in order to use the device. You will find some commentaries about the software components in the following paragraph.

2.1.2   Selectable Software Components

You have the choice to install one or more of the following components:

EyeSDN USB Software: includes the components Call Browser, RestrictedBrowser, Call Recording Service and Demo Files.

- The Call Browser is a software solution that has been developed by innoventif Ltd. for the management of recorded calls. It allows:

  - to select recorded calls for play-back, deletion or archiving,
  - to sort and to filter data according to certain criteria,
  - to listen into telephone conversations, and
  - to calculate telephone charges by exporting comma-separated lists (see Chapter 4.4.3).

  The Microsoft programme ".Net" is required to run the Call Browser, and will be installed if you choose to install the Call Browser. The Call Browser is not necessary to record data, but it will be the application that you use most to find, listen to and manage your calls. If you do not wish to install the Call Browser, you can also retrieve the recorded data directly from the target directory to play or analyse it.

- RestrictedBrowser is a reduced version of the software solution Call Browser. This software component will only show the saved conversations for a specific amount of time. The protocol data and configurations dialogue are not accessible by the user of this version. The installation of RestrictedBrowser makes sense when the reduced viewing and use of the saved call data is sufficient for subsequent evaluation or when the user should only be allowed access to a part of a conversation.

- The Call Recording Service is necessary for the recording and storage of data. It must be selected upon installation of the EyeSDN USB software on a computer to which the EyeSDN USB device is connected. If the EyeSDN USB software is being installed on a computer which will only be used for the evaluation of saved data and to which no EyeSDN USB device is connected, then the installation of the Recording Service is not absolutely necessary.

- Recordings of the B and D channels, speech data and CDR data are available as Demo Files for test purposes. These files are not required for the device to function and do not have to be installed. If you have only obtained the software without the actual device then installing the demo files could be useful for carrying out evaluation of the software.

Lame MP3 Converter: The installation of the Lame Converter is optional, but useful if you want to use the programme GoldWave. The LameConverter makes possible to convert WAV files into MP3 files in GoldWave.

GoldWave Wave-Editor: GoldWave is a WAV editor that allows you to play and process speech files. The installation CD comes with a shareware version of this software, which is limited to 150 operations per session and a maximum of 3000 operations in total. You can obtain a full licence for GoldWave either from innoventif Ltd. or directly from GoldWave Inc. Further information about this programme available on the GoldWave homepage www.goldwave.com. This programme can be used to convert speech files from WAV format into MP3 format and thereby compress them. However, WAV files can also be played with the Microsoft Media Player, so it is not essential to install GoldWave.

It may happen that although GoldWave has been installed, the WAV files open automatically in the Microsoft Media Player. You can change this by right-clicking on one of the WAV files, moving the cursor to "Open With" and choosing "GoldWave" from the list of programmes. Checking the box marked "Always open file with this programme" will ensure that in future all WAV files will be opened and played with GoldWave.

Wireshark Protocol Analyser: The EyeSDN USB software can produce trace files readable by Wireshark. Wireshark is a network analysis software that allows you to decode packets or messages used by various protocols. Wireshark is available for a number of platforms and is covered by the GNU public license, which can be found on the CD. The source code for Wireshark can be found free of charge at www.wireshark.org.

You only need to install Wireshark if you intend to analyse network communications. It is not required for call recording and playback. To install Wireshark, run wireshark-setup-x.y.z.exe (where x.y.z denotes the version number) on the installation CD. After selecting an installation directory the necessary files will be copied to harddisk. Trace files use the file extension *.TRC by default. If you double click on such a file, you will be asked with which programme it should be opened. Select Wireshark and check the "Always open file using this programme" box to associate Wireshark with *.TRC files in the future.

Network protocol analysis requires a basic understanding of computer communications. If you are not an expert on computer networks we recommend to not install Wireshark, as this will save disk space.

Adobe Acrobat Reader: This manual can also be found on the installation CD. To read the manual in PDF[4] you need to run Adobe's Acrobat Reader programme. If this has not already been installed on your computer, you can install it from the CD by running AcrobatReaderSetup.exe in the 3rdparty folder. If you prefer the printed version

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[4]Portable Document Format

of the manual you do not need to install Acrobat Reader. This will save considerable disk space.

2.1.3   Completing the Installation

Close the installation assistant using the "Exit" button once all of the selected programmes have been installed.

2.2   Driver Installation

Please install the software first before you attach the device to your PC. During the software installation the device driver is copied to the hard disk. The device should be detected by Windows after you had connected it to you computer. If the device is not detected, either a driver is already installed or there is a problem with the hardware. Please check the cabling, Windows version and USB port before contacting technical support.
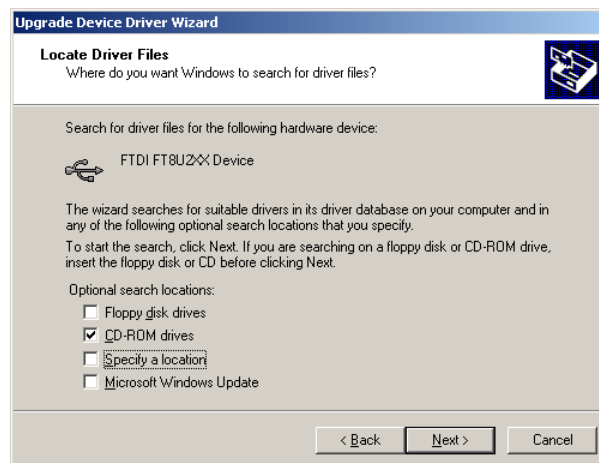
Figure 2: Select Driver's Location

If the device has been detected, Windows will search its driver database for a known driver for the newly detected hardware. Since the device is not yet known to Windows, it will request a driver. Select "Search for a suitable driver" and click "Next". You will then be asked to specify the location of the driver, as shown in figure 2. Please select the directory where the software has installed and let Windows search this folder for a driver information (INF) file. When the driver has been selected Windows may warn you about the absence of a digital signature. Please click "Next" or "Continue with Installation" to proceed. Windows will complete the installation of the driver and may request a restart. If asked to do so, please restart the computer before continuing with the software installation.

2.3   Uninstall

The EyeSDN USB software can be uninstalled by selecting "Start" from the task bar, then "All Programs/EyeSDN/Uninstall". This uninstall both the Call Recording Service and, if it was installed, the Call Browser. The driver (FTDI FTD2xxUSB Drivers), the Wireshark programme, GoldWave and Microsoft's ".Net" must be uninstalled separately by selecting "Start" from the task bar, then "Control Panel/Add or Remove programs". If you are performing the uninstall in order to install an update, only the EyeSDN USB Software (see chapter 2.4) needs to be uninstalled.

2.4   Update

The installation CD contains the latest version of the software at the moment of purchase. Updated or enhanced versions of the software can be found on the download page of our website at www.innoventif.com. In order to install an update, the existing version of the EyeSDN USB software must first be uninstalled (see chapter 2.3). Then the downloaded "Update-x.x.x.exe" file can be started and the new software version will be installed. It is a good idea to save the filter rules before you uninstall, since these will otherwise be deleted.

3   Hardware Installation

3.1   EyeSDN USB-S0

3.1.1   Device Description

The EyeSDN USB-S0 is a small device. It does not need a separate power supply, the device requires very little power and uses the USB port of your computer to draw its supply current. There are no user adjustable components on the device, everything is configured by call-recording software from your computer. Figure 3 shows a picture of the device explaining the connectors and indicators.
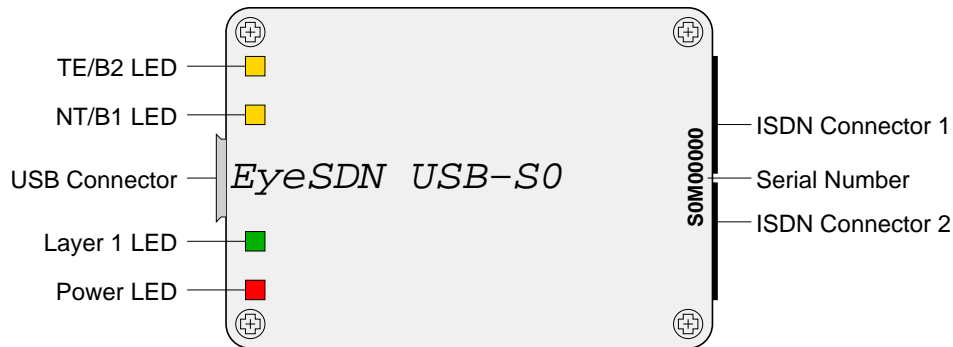
Figure 3: EyeSDN USB-S0 Device Overview

The USB Connector is used to connect the device to the computer and the ISDN connectors are used to attach the device to the ISDN line. There are four bi-coloured LEDs[5] (red/green). These LEDs indicate the state of the device and properties of the ISDN line. Table 1 explains the meaning of the different LED states.

LED	off	red	yellow	green
TE/B2	no TE Signal	TE Signal Polarity Error	TE Signal OK	B2 active
NT/B1	no NT Signal	NT Signal Polarity Error	NT Signal OK	B1 active
Layer 1	no Layer 1	Layer 1 active	USB transfer	Layer 2 active
Power	Device is off	no Line Power	Emergency Power	ISDN powered

Table 1: LED Indicators of EyeSDN USB-S0

3.1.2   Connecting to the Computer

To connect the EyeSDN USB-S0 tester to your computer, attach one end of the USB cable supplied to an unused USB socket on your computer and the other end to the EyeSDN USB-S0. Alternatively, if your computer does not have a free USB port, you can use an USB hub. If you intend to operate multiple devices using a single computer, install the software first and then attach one device. When the software is running, attach the other devices and they will be detected automatically and numbered by the software in order of their detection. If all devices are attached before the software is running, then the device numbering depends on USB Bus arbitration.
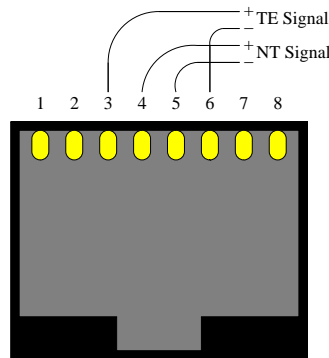
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[5]LED: Light Emitting Diode

Figure 4: Assignment of RJ45 Socket for ISDN-2 Lines

3.1.3   Connecting to the ISDN-Bus

The EyeSDN USB-S0 passively monitors the signals of the ISDN S0-bus. To achieve this, the device must be connected to the bus. To do that, the device has two identical RJ45 Western Modular sockets, either of which can be used to connect the device to the ISDN line. Because there are two sockets, no additional patch panel is required to add the device to the bus. Follow the steps below to install the ISDN connection:

- Disconnect the ISDN cable from your TE[6] device (usually your telephone),

- and connect it to either of the EyeSDN USB-S0's RJ45 sockets.

- Then use the supplied ISDN cable to connect the other RJ45 socket to your telephone.

- Lift the receiver of the telephone: If you can hear a dial tone, everything has been installed properly.

Alternatively to the above described process you can use the supplied ISDN cable to connect the S0 device with the second socket of the NTBA (Network Termination Basic Access) or S0 bus patch panels.

Please note that you are not able to receive calls when you disconnect your telephone during installation. Since installing the cable only takes a short time, this should not cause a problem. If you have more than one device on the ISDN Bus, choose the TE device closest to your computer to minimize the cable length.

Please note: The latest revisions of the EyeSDN USB-S0 are initialized by a firmware download every time you start your computer. This process may take up to a minute.

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[6]Terminal Endpoint

3.2   EyeSDN USB-E1

3.2.1   Device Description

The EyeSDN USB-E1 is a small recording device for ISDN primary rate lines. It does not need a separate power supply, the device requires very little power and uses the USB port of your computer to draw its supply current. There are no user adjustable components on the device, everything is configured by the software on your computer. Figure 5 shows a picture of the device explaining the connectors and indicators.
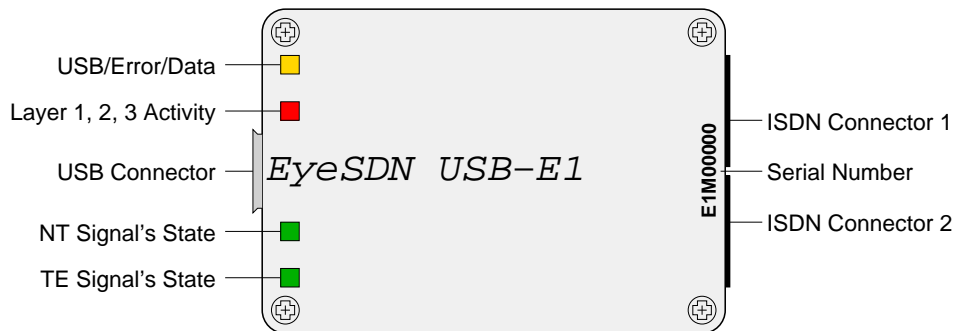
Figure 5: EyeSDN USB-E1 Device Overview

There are four bi-coloured (red/green) light emitting diodes (LED). These LEDs indicate the state of the device and properties of the ISDN line. Table 2 explains the meaning of the different LED states.

LED	off	red	yellow	green
USB	no power	USB Error	USB active	Software active
Layer	no Layer1	Layer 1 active	Layer 2 active	Layer 3 active
NT signal	not active	no Signal	NT Signal present	G.704 Signal
TE signal	not active	no Signal	TE Signal present	G. 704 Signal

Table 2: LED Indicators of EyeSDN USB-E1

The LED indicating activity of the various protocol layers of the ISDN gives an indication of the state of the E1-line. If there is no layer 1 activity, there is a physical problem with cabling or synchronization. If the layer 1 is active, but there are no data frames the LED stays red. If protocol frames (layer 2 activity) are detected, the LED turns orange. Finally, if there are calls active (i.e. in connected state) the LEDs colour will be green. The NT-signal and TE-signal LEDs help to locate problems if there is no layer 1 activity or synchronization.

Layer 1 active (LED red):   A functioning connection to the nearest switching centre has been established. Both communication end-points send a correct signal and are synchronized.

Layer 2 active (LED yellow):   An exchange of data packets is taking place through this connection and the line is available for use.

Layer 3 active (LED green):   Telephone calls are currently active on this line. This could mean one call or up to 30 calls simultaneously.

3.2.2   Connecting to the Computer

To connect the EyeSDN USB-E1 tester to your computer, attach one end of the USB cable supplied to an unused USB socket on your computer and the other end to the EyeSDN USB-E1. If you intend to operate multiple devices using a single computer, install the software first and then attach one device. When the software is running, attach the other devices and they will be detected automatically and numbered by the software in their order of detection. If all devices are attached before the software is running, then the device numbering depends on USB Bus arbitration.

Please note that you should not use an USB hub with the EyeSDN USB-E1. The EyeSDN USB-E1 is using more than 50% of the available bandwidth of an USB 1.1 interface. If multiple devices should be operated on the same computer please make sure that each device is connected to a different USB host controller. Neighbouring USB ports on a mainboard are often connected to the same USB host controller via an USB root. No two EyeSDN USB-E1 devices may be connected to the same USB host controller due to the high rate of data transfer. If problems should arise with the operation of more than one E1 devices on one PC, we recommend that you try different USB ports or different combinations of connections.

3.2.3   Connection to the ISDN Line

The EyeSDN USB-E1 monitors the ISDN E1-line passively, or with high impedance. The device has two identical RJ45 Western Modular sockets, one of which can be used to connect the EyeSDN USB-E1 to the ISDN line. As there are two sockets, no further cable distributor (Y-cable, patch panel) is necessary to connect the device to the line. Unfortunately, different sockets and cables are used for the E1 or S2M connectors.
If your system still uses asymmetrical cabling with 2 coaxial cables with 75 Ohm characteristic impedance, you will require two T-junctions and an adaptor (coaxial to RJ45, balun[7]). These components are available as accessories. The standard pinning

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[7]balun is the short form for balanced/unbalanced

for the balanced variant of the E1/S2M connectors uses an RJ45 connector and a cable with 120 Ohm characteristic impedance, in which pins 1 and 2, 4 and 5 are each assigned a pair (Figure 6). The EyeSDN USB-E1 uses this pinning as standard, and you will require a special patch cable if your pinning is different. Please indicate the pinning of your RJ45 socket when ordering this cable.
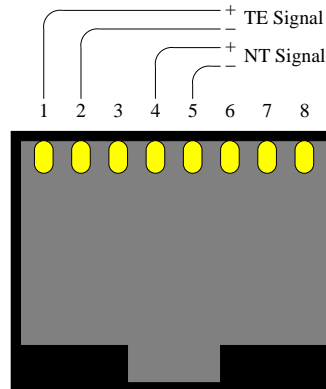
Figure 6: Balanced RJ45 Socket for ISDN-30 Lines

If the connection between the NTPM and the terminal equipment (i.e. telephone system) in your system leads through a patch panel, simply connect the EyeSDN USB-E1 parallel to the telephone line by connecting an RJ45 patch cable (contained in the package) from the patch panel to one of the device's two ISDN sockets. That completes the installation for this configuration. Otherwise the connection must be interrupted briefly in order to install the EyeSDN USB-E1. In this case, please proceed as follows:

- Disconnect the ISDN cable with the RJ45 connector from the TE (terminal endpoint) device (usually the telephone system),

- and connect it to one of the EyeSDN USB-E1's two RJ45 ports.

- Use the delivered patch cable to re-establish the connection to the endpoint device by connecting it to the EyeSDN USB-E1's other RJ45 port.

- The protocol resynchronization may take a while (up to 15 minutes), but unfortunately it is difficult to tell in this state whether the resynchronization is taking place or whether the device has been cabled wrongly. However, one can see on the EyeSDN USB-E1 device whether or not the TE and NT pairs are receiving a signal with the correct G.704 framing. If this is the case, the device has been cabled correctly and the line will resynchronize itself. Interrupting the line causes a link alarm in the central office which will be reset after a certain period of time.

- The EyeSDN USB-E1 should only be installed in productive systems at off-peak times (such as in the evening or at the weekend), as calls may be lost when the connection is interrupted, potentially leading to financial losses.

Please note: The EyeSDN USB-E1 is initialized by a firmware download every time you start your computer. This process may take up to a minute.

3.3   EyeSDN USB-4S/-4SBx

3.3.1   Device Description

The EyeSDN USB-4S is an internal PC card. It will be connected to the USB socket of the PC mainboard. The EyeSDN USB-4SBx is a recording box which is used as an external device. The box will be connected to the USB port of a PC. Both ISDN recorders do not need a separate power supply, the devices require very little power and use their USB ports to draw their supply current. Table 3 gives a device overview.

Device	Case	USB	ISDN	LED
EyeSDN USB-4S	installed inside a computer, no case	USB connector Type A	4x ISDN2	4
EyeSDN USB-4SBx	external device with black case	USB socket Type B Standard USB cable	4x ISDN2	4

Table 3: Overview EyeSDN USB-4S and EyeSDN USB-4SBx

There are no user adjustable components on the hardware, everything is configured by the call-recording software from your computer. Figure 7 shows a picture of the device explaining the connectors and indicators.
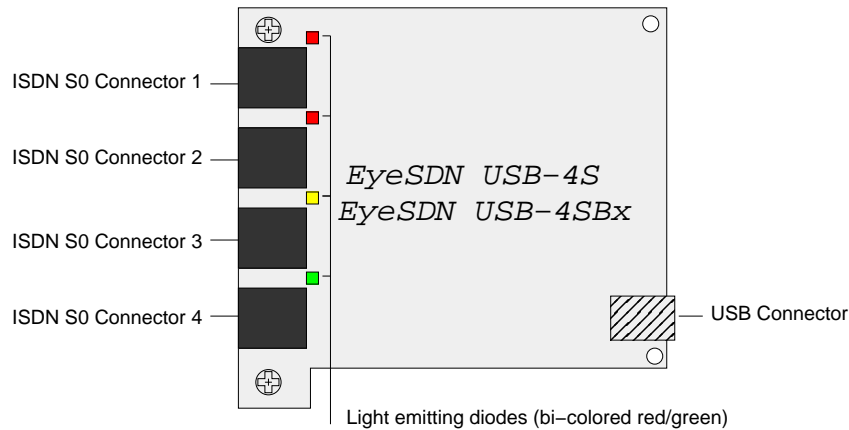
Figure 7: EyeSDN USB-4S/-4SBx Device Overview

There is only one LED for each connected S0 interface. Table 4 explains the meaning of the different LED states.

LED	State Display
Green blinking	Device Power, USB transfer
Red blinking	not enabled
Red permanent	Layer 1 active
Yellow permanent	Layer 2 active
Green permanent	Layer 3 active, Channel busy

Table 4: LED Indicators of EyeSDN USB-4S

3.3.2 Connecting to the Computer

To connect the EyeSDN USB-4S tester to your computer, you have to use the supplied special USB cable to attach it to your mainboards internal USB socket.

Figure 8 shows the USB socket of a mainboard. The dots represent pins and the numbers represent pin numbers.

```
2   4   6   8   10
■   ■   ■   ■   ■

■   ■   ■   ■
1   3   5   7   9
```
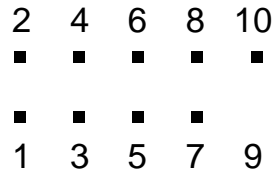
Figure 8: Mainboards internal USB Socket

The pins have different definitions which are described in table 5

PIN no	Definition
1	power +5V
2	power +5V
3	USB1 D-
4	USB2 D-
5	USB1 D+
6	USB2 D+
7	GND
8	GND
9	No Pin
10	No Connection

Table 5: PIN Definition

The provided USB cable has following pin assignment:

Colour	Signal
red	+5V
white	D-
green	D+
black	GND

Table 6: USB Cable Assignment

The red plug will connected with pin 1 or pin 2. Pin 9 and pin 10 will be uncon-nected.

To connect the EyeSDN USB-4SBx to your computer, you can use a standard USB cable to attach it to an USB-port. Alternatively, if your computer does not have a free USB port, you can use an USB hub. In both cases connect the other end of the cable to the EyeSDN USB-4S.

If you intend to operate multiple devices using a single computer, install the software first and then attach one device. When the software is running, attach the other devices and they will be detected automatically and numbered by the software in their order of detection. If all devices are attached before the software is running, then the order of detection and device numbering depend on USB bus enumeration.

3.3.3   Connecting to the ISDN Line

The EyeSDN USB-4S/-4SBx passively monitors the signals of four ISDN S0-buses (BRI). To achieve this, the device must be connected to the ISDN lines. To do that, the device has four RJ45 Western Modular sockets, either of these can be connected to a different ISDN line via the external Y-adaptors that you received together with the device.

If your S0 line has a spare RJ45 socket you can directly connect the device without using the four Y-adaptors. The Y-adaptor contains termination resistor internally. Make sure that you do not have too many termination resistor on the S0 bus.
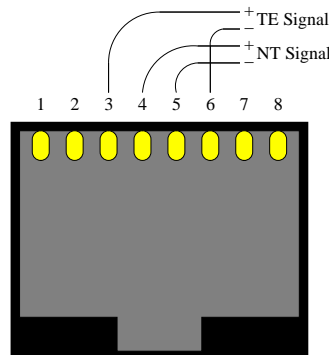
Figure 9: Assignment of RJ45 Socket for ISDN S0-Lines

Follow the steps below to install the ISDN connection using the Y-adaptor:

- Take an Y-Adaptor and connect it to one of the four RJ45 socket of the EyeSDN USB-4S/-4SBx device.

- Disconnect the ISDN cable from your TE[8] device (usually your telephone).

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[8]Terminal Endpoint

- Connect the free end of the ISDN cable to either of the two Y-Adaptors RJ45 sockets.

- Then use the supplied ISDN cable to connect the other Y-Adaptors RJ45 socket to your telephone.

- Lift the receiver of the telephone: If you can hear a dial tone, everything has been installed properly.

Repeat these steps to connect the other three ISDN interfaces.

Please note that you are not able to receive calls when you disconnect your telephone during installation. Since installing the cable only takes a short time, this should not cause a problem. If you have more than one device on the ISDN-bus, choose the TE device closest to your computer to minimize the cable length.

Please note: The EyeSDN USB-4S/4SBx is initialized by a firmware download every time you start your computer. This process will take up to a minute.

3.4   EyeSDN USB-A2

3.4.1   Device Description

The recording of data from analogue lines is enabled by the EyeSDN USB-A2 device. The analogue recording device gets its power from the USB port of your computer.

The EyeSDN USB-A2 decodes the DTMF and V.23 Modem signalling (ETS-300-659-1). So that the device detects the Caller-ID (Caller Identification) and further dial information (e.g. called party number) and displays them in Call Browser, if present. Furthermore, the EyeSDN USB-A2 device can also be connected to other analogue lines, such as a taxi or household radio. With this sort of connection recording takes place by voice activation. The necessary configuration settings for this type of use are explained on page 31, table 10.

Figure 10 shows a picture of the device explaining the connectors and indicators.
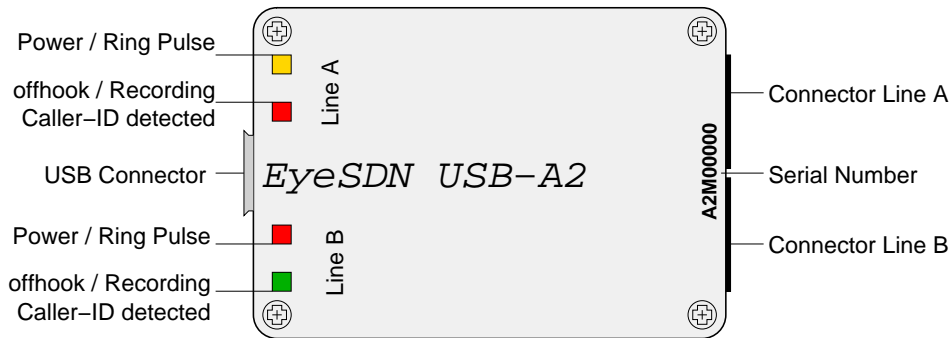
Figure 10: EyeSDN USB-A2 Device Overview

There are no user adjustable components on the device, everything is configured by the software on your computer. The USB connector is used to connect the device to the computer and the connector line A/B are used to attach the device to the analogue telephone lines.

The device can monitor two analogue lines simultaneously, using the connectors for line A and line B. There are four bi-coloured (red/green) LEDs[9]. These LEDs indicate the state of the device and of the line. Table 7 explains the meaning of the different LED states for line A. The LED states for line B have the same meaning as for line A.

LED	red	yellow	green
Line A: Power / Ring Pulse	No Line Power	Ring Pulse present	Line is powered
Line A: off hook, Caller-ID, Recording	Caller-ID detected	Telephone is off hook	Recording of calls

Table 7: LED Indicators of EyeSDN USB-A2

3.4.2   Connecting to the Computer

To connect the EyeSDN USB-A2 tester to your computer, attach one end of the USB cable supplied to an unused USB socket on your computer and the other end to the EyeSDN USB-A2. Alternatively, if your computer does not have a free USB port, you can use an USB hub.

Your computer should detect the device and you can proceed with the installation of the software as described in section 2. If you intend to operate multiple devices

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[9]LED: Light Emitting Diode

using a single computer, install the software first and then attach one device. When the software is running, attach the other devices and they will be detected automatically and numbered by the software in their order of detection. If all devices are attached before the software is running, then the device numbering depends on USB Bus arbitration.
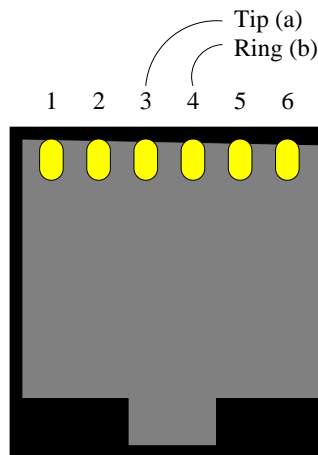

Figure 11: Assignment of RJ11 Socket

3.4.3   Connecting to an analogue Line

Use the cables you received together with the device to connect the EyeSDN USB-A2 to the telephone lines. Each RJ11 Western Modular Socket at the device can be use to monitor one analogue phone line. A RJ11 socket has six PINs. PIN 3 and PIN 4 are connected with both lines (Tip and Ring) of the analogue telephone interface.

Connectors for analogue telephone lines vary from country to country, please make sure that you ordered the package for your country.

Please note: The EyeSDN USB-A2 is initialized by a firmware download every time you start your computer. This process will take up to a minute.

4   The EyeSDN USB Software

4.1   Introduction

The recording software comprises two parts. The first part is the Call Recording Service, a Windows service, which automatically records and saves the data. This service is necessary for the use of the EyeSDN USB devices. The way in which the Call

Recording Service works can be influenced by the configuration settings described in the section 4.3. The second part is the Call Browser, a programme developed by innoventif Ltd. for the administration of the recorded files.

Using an EyeSDN USB device and its software you are able to:

- record, play and archive telephone calls,

- record and analyse data calls,

- log and decode the D channel protocol,

- generate charge information and telephone use information for billing or controlling,

- support the installation of ISDN devices by using the device as test equipment with protocol analysis support.

The recorded data will be stored automatically by the Call Recording Service (see Chapter 4.2). Audio files will be stored to your hard disk in WAV format using mono or stereo A-LAW encoding with a sample rate of 8000Hz.

There are the following categories of recorded data:

- the audio contents of phone calls (stored for example as WAV files),

- the protocol frames of a data call (stored in a suitable trace format),

- the protocol frames of the D channel (stored as a trace file),

- call related data (one record per call stored in database format).

The file formats used for each category can be modified to suit your needs. The recorded data can then be processed off-line using the appropriate programmes like GoldWave or Wireshark.

4.2   The Call Recording Service

The conversation data is recorded by a Windows service programme called Call Recording Service. This service is a separate programme which can be controlled from the Call Browser or the Windows service control manager.

The Windows' service control manager can be found by selecting "start" from the task bar, then choose "Control Panel". Please proceed in window "Control Panel" as follows: "Pick the category: Performance and Maintenance" / "Pick a Control Panel Icon: Administrative Tools" / double-click on "Services"[10].

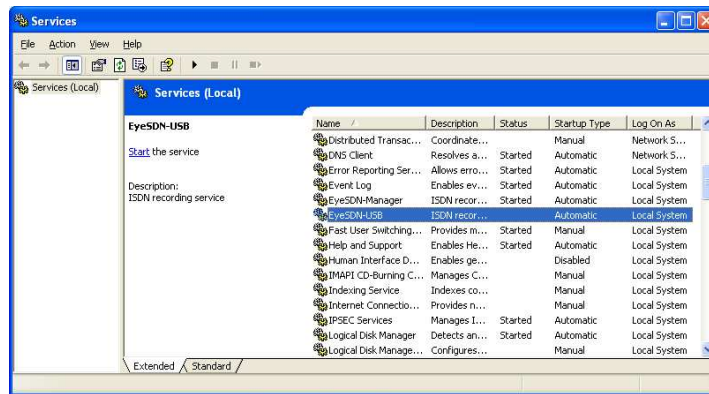
[10]Described for Windows XP System

Figure 12: Windows Service Control Manager

The Call Recording Service name of the software for the EyeSDN USB products is
"EyeSDN-USB". By highlighting the "EyeSDN-USB" and clicking either the symbol
for "play" or "stop", the EyeSDN USB software will be either started or stopped. The
start properties of a service specify whether or not it is started automatically when the
computer is switched on. You can choose between a manual start, automatic start or
disabled. Automatic start is the default setting after the software installation.
Another possibility is to use the Call Browser. To start or stop the Call Recording
Service select the entry "Settings/Service" from the Call Browser menu.
It is useful to stop and restart the Call Recording Service if you have changed any
software parameters. The service will use the settings that it found when it started for
the duration of its execution.

4.3   Configuring the Service

4.3.1   Configuration Dialogue

Parameters that influence the Call Recording Service can be changed in a configuration
dialogue. This configuration dialogue is found under the "Settings/Devices" tab on the
menu bar of the Call Browser programme. If the EyeSDN device is being used with-
out the Call Browser programme, this dialogue can be found directly under Start/All
Programs/EyeSDN USB/Service Configuration. A screenshot of this programme can
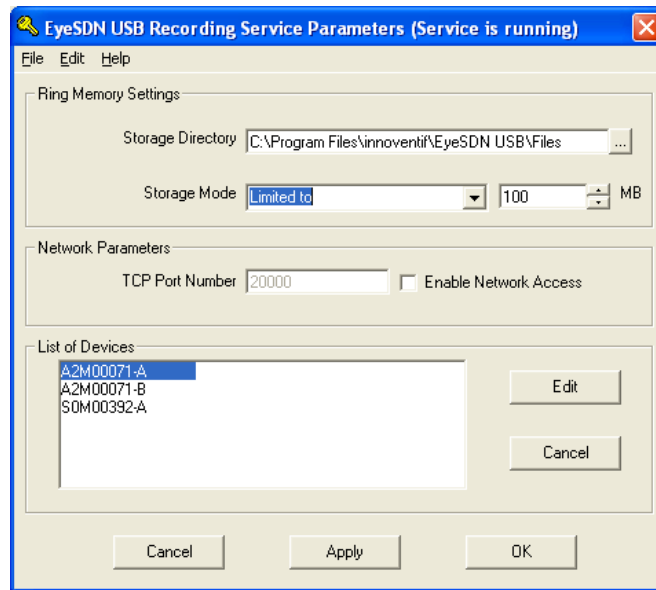be found in figure 13.

Figure 13: Parameter Settings Utility

Please note that the default values were chosen carefully to guarantee smooth operation and do not generally require adjustment. We recommend that you only change the parameters if you are acquainted with the operation of the software and its parameters and if the parameters you wish to change are necessary for your intended usage of the device.

Any changes performed in this dialogue will only take effect after the Call Recording Service has been restarted (described in chapter 4.2). To save your parameter changes and close the dialogue choose File/Save and then Exit, or click the "OK" button. The "Apply" button allows you to save and use the new settings without closing the dialogue window.

The configuration dialogue is divided into two areas: adjustments can be made to the general parameters in the first and parameters can be set for each individual device in the second dialogue (see paragraph 4.3.3 Configuration of Device).

4.3.2 Global Settings

The general parameters include Ring Memory Settings (Storage Directory and Storage Mode), Network Parameters and List of Devices.

Storage Directory: The Storage Directory is a parameter of the Ring Memory Settings and indicates where on the hard drive the data is stored. All recorded data are

saved automatically to this directory. It is not absolutely necessary to change the details of this directory. Recording Files will not be saved in this storage directory if you specified a different storage directory for the connected EyeSDN USB device in the window "Configuration of device" (see on page 30).
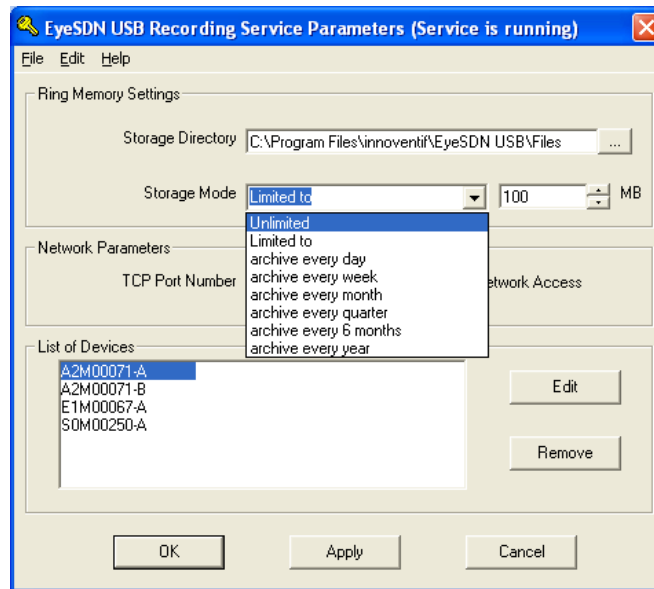
Figure 14: Storage Mode

Storage Mode: The Storage Mode field offers the possibility of either storing the recordings for stipulated periods of time or defining the size of memory available. The "limited to" setting enables the necessary memory for the recordings to be limited. When the allocated disk space is full, the oldest data will be deleted automatically so that new recordings can be saved. The value "unlimited" is the default setting, which means that there is no limit for the amount of memory allocated to recorded data. This could, in the worst case, eventually lead to a full hard drive. The minimum value that can be entered is 100 MB. One minute of non-compressed recorded speech uses approximately 1 MB of memory. If particular calls are not to be deleted they can be archived, as described in Chapter 4.4.4.

Storage Mode	Explanation
unlimited	no memory limit on the hard disk
limited to	restriction of memory for recordings to a certain size
archive every day	a new folder is created every day in which the archived recordings of the day are saved
archive every week	weekly allocation of the recordings
archive every month	recordings make within the month are saved on a per folder basis
archive every quarter	a new folder for the recordings is created every 3 months
archive every 6 months	six-monthly sub-division of the saved files
archive every year	recordings made within a year are saved in a folder

Table 8: Overview of Storage Mode

The allocation of the recordings to certain time-defined folders means it is possible to sort large amounts of recorded files in advance.

TCP Port Number: This parameter sets the TCP port number for the network server port of the Call Recording Service. If the value is set to 0, network access is disabled. This server port is not necessary for basic operation of the Call Recording Service or the Call Browser. However, there are third party applications that extract ISDN data from distributed devices over the network. In this case enable the TCP port by assigning it a valid port number. The default port number for this service is 20000.

List of Devices: The List of Devices panel shows the serial numbers of all of the EyeSDN devices connected to the computer. Click on a number in the list with the left mouse button to select it. The "Remove" button removes the chosen serial number from the list. This erases all settings for this device. The default settings will be automatically re-entered once the device is connected to the USB interface again. The "Edit" button opens a further dialogue window in which adjustments can be made to the selected device.

4.3.3   Configuration of Device

After selecting a serial number in the first window "EyeSDN Recording Service Parameters" and clicking the "Edit" button, a further window opens containing the settings of the selected device. The dialogue title bar also shows which device has been selected. The following parameters can be changed in this window (see figure 15).
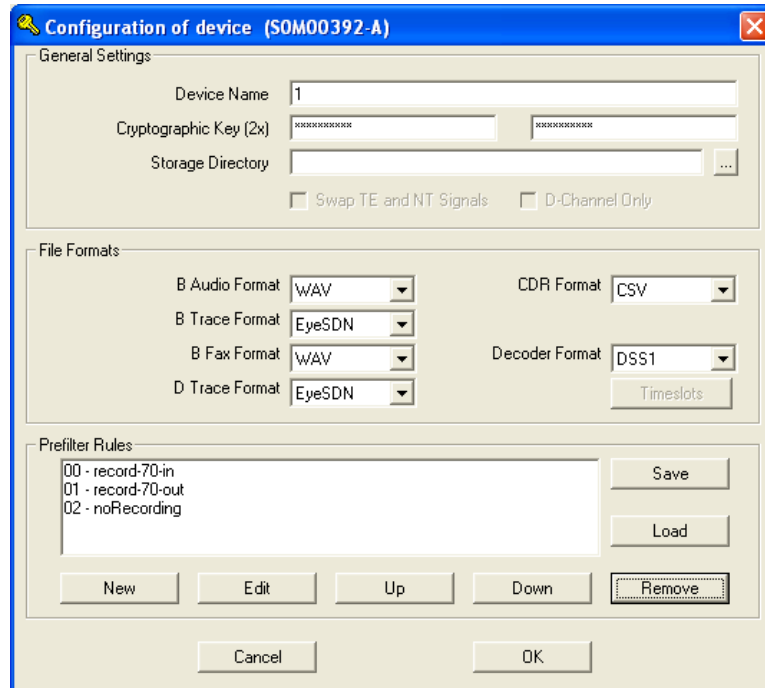
Figure 15: Device Settings

Device Name: Multiple devices connected to the same computer are distinguished by their serial number, which is visible at one side of the device. To ease identification, each device may be assigned a name. As a default these names are numbers, that indicate the order of device attachment. If you intend to use multiple devices, attach them one by one after the software has been installed.

If the Call Recording Service is running the devices are numbered in the order of their appearance on the Universal Serial Bus. Later you can assign a logical name to the device to simplify searching for specific recordings. It might be a good idea to use the name of the owner of the telephone or the telephone number. All names must be unique, do not use the same name twice and do not use "or" in the name.

Cryptographic Key: It is also possible to save recorded calls in encrypted form, so the opening and playing of these calls can only be performed after the correct key has been entered. To encrypt the speech data, select the trace format "RC4 Encrypted" in the field "B Audio Format". Furthermore, each device can use a different encryption key which can be entered in the field "Cryptographic Key". Please enter the key twice. The second entry is used to verify the correctness of the blindly typed key. When you wish to open and listen to encrypted calls you will be prompted to enter the key that has been used for encryption (shown in figure 17 on page 39).

Storage Directory: You can set a separate storage directory for every EyeSDN USB device which you have connected to your computer. This procedure is useful if you have to manage the call recording files of different companies or users on single computer. The recording files of each EyeSDN USB device are saved in separate directories. So every user can manage their own files without having an access to the other recording data.

Please note: If you have chosen a device-specific storage directory you have to change the directory in the Call Browser's Settings/Directory menu. This is important since otherwise the Call Browser will not show any saved recording files.

The Call Browser reads saved recording data from the storage directory which is created by default during the software installation. You will find the standard storage directory in configuration dialogue in field "Storage Directory". If you change the storage directory for the connected device no data will be saved in the standard storage directory. Therefore you have to specify the changed storage directory in the menu Settings/Directory. That means you refer to the device-specific storage directory in this dialogue.

If you connected multiple EyeSDN USB devices and adjusted a device-specific storage directory for each device in configuration dialogue you should open the Call Browser several times (once for each user group or device). The specific Storage Directory can be set in each Call Browser's menu bar "Setting/Directory". So you are able to manage the recorded data of each connected EyeSDN USB device separately.

Swap NT and TE Signals: If you have swapped incoming and outgoing calls, then you must tick the corresponding box. This box is only active, when you use an Eye-SDN USB-E1.

D Channel only: If you wish to use the EyeSDN USB-E1 to record D-channel data for protocol analysis only then the corresponding box must be ticked.

File Formats: You can adjust the storage format of the B and D channel's data or of the CDR data. If you no longer wish to save the data of the B and D channels or of call detailed records (CDR), you can deactivate the storage of these data by choosing "Disabled". Then the disabled data category will no longer be stored after the service is restarted. Table 9 shows the recommended values.

Parameters	Meaning	recommended Value
B Audio Format	File format of voice data	WAV
B Trace Format	File format of data calls	EyeSDN
B Fax Format	File format of fax data	WAV
D Trace Format	File format of data calls	EyeSDN
CDR Format	Format of Call Detailed Record data	CSV
Decoder Format*/ Analogue Line Type*	Specification of signalling protocol/ Type of analogue connection	DSS1, DASS2

Table 9: Configuration of parameters

*Upon connecting the ISDN device EyeSDN USB-S0, EyeSDN USB-E1, as well as EyeSDN USB-4S to the computer a configuration setting for the "Decoder Format" will appear. If the analogue recording device EyeSDN USB-A2 is connected to the computer, then the type of analogue connection should be chosen in this field.
You will find the meaning of the other formats in the following tables. The most of them are specific to special applications of certain costumers. So changing these formats is generally not recommended.

Format	Meaning
G.711 Stereo	Recording and storage of voice data in Stereo, coded in G.711 Format, 128 kBit/s
G.711 Mono	Recording and storage of data in Mono, 64 kBit/s
G.711 TE	Recording and storage of outgoing voice channel only, coded in G.711 Format, 64 kBit/s
G.711 NT	Recording and storage of incoming voice channel only, coded in G.711 Format, 64 kBit/s
MP3 Mono	Storage of calls in MP3 format (compressed, 8 kBit/s)
GSM Mono	Storage of calls in GSM format (compressed, 13 kBit/s)
MP3 TE, MP3 NT GSM TE, GSM NT	Compressed storage of incoming or outgoing calls in MP3 (8 kBit/s) or GSM format (13 kBit/s)
Raw B-channel	Raw B channel data (128 kBit/s)
RC4 Encrypted	Encrypted storage (128 kBit/s)

Table 10: Overview of Audio Formats

All audio-recordings will saved as a WAV file. The adjustable Codecs change the format of the WAV file and influence the file size. The compressed storage of the speech files in MP3 or GSM format requires a Windows Codec, which will only become available when the Media Player is installed.

Format	Meaning
PCAP	Trace Format of libpcap
Toshiba	Trace Format of Toshiba ISDN router
EyeSDN	Native Trace Format for the EyeSDN products
Actris, TRN,TRM	Trace Formats of the company Actris
Tek RF5	Trace Format of the company Tektronix

Table 11: Overview of Trace Formats

Format	Meaning
DSS1	European signalling protocol
DASS2/DPNSS	Signalling protocol used in Great Britain
Public Line	Standard configuration for analogue telephone connections
Voice Activated	Configuration for voice activation using analogue connections
small PBX	Configuration of the type of connection for the use of smaller telephone switches with analogue extensions

Table 12: Overview of Decoder Formats

Prefilter Rules: You can decide which telephone calls should be recorded on an individual basis for each device (Recording Filter). To do this you create filter rules, which are then automatically applied to each call as it as made. You can create a new rule by clicking the button "New". You can change existing rules using the "Edit" button and remove them using the button "Remove".

Once a telephone conversation begins, the rules governing the recording are checked one after the other, beginning at the top. As an expedient use of rules depends on their order, they can be moved about the list using the buttons "Up" or "Down". The rules which have been set up can be saved and reloaded. Saving the rules is a good idea before installing an update. A detailed explanation of defining filter rules can be found in section 4.6.

4.4   The Call Browser

4.4.1   Layout of the Call Browser Window

As described in Chapter 2.1.2, the Call Browser helps you to manage the recorded calls. It produces a clearly laid out list of the recorded calls and thus enables a quick overview of the important information relevant to each call, such as telephone number or time of call. The main window of the Call Browser has four main areas:

- the main menu,

- the action buttons,

- the tabs with the data grids and

- the status bar.
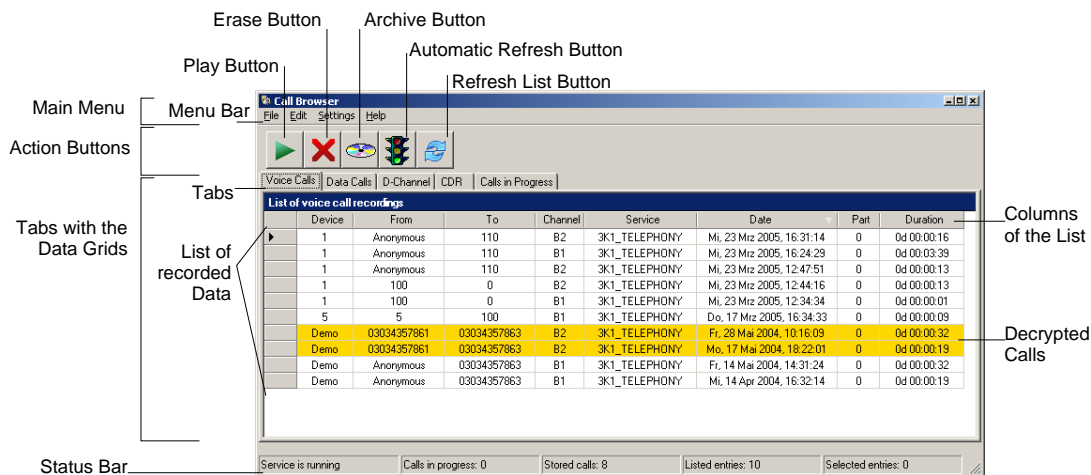
Figure 16: Layout of the Call Browser

4.4.2   Status Bar

The status bar will give you information about the state of the recording system. The status bar is refreshed together with the lists in the data grids. If you disable the automatic update of information, the number in the status bar might be out-of-date. In this case, perform a refresh operation first (see chapter 4.4.4). You will find following information in status bar of the Call Browser:

Status Bar	Meaning
Service is running/ is stopping/ is stopped	current state of the Call Recording Service
Calls in progress	number of current calls
Stored calls	number of stored calls in menu "Voice Calls"
Listed entries	number of calls in the current display list
Selected entries	number of selected calls in the display list

Table 13: Fields of the Status Bar

4.4.3 Tabs

The tabs of the Call Browser's main window allow to select the category of the lists in the data grid to be changed. The following five tabs are available:

- "Voice Calls",

- "Data Calls",

- "D Channel",

- "CDR" and

- "Calls in Progress".

Clicking a tab selects the data view of the corresponding category. The lists allow to select one or more entries for processing. All entries of a list can be selected by either dragging the mouse or more quickly by pressing Control-A. If a record is selected it can be played, erased or archived. See section 4.4.4 for an overview of the action buttons.

Voice Calls Tab: The call related data of the recorded audio calls are listed in table form and sorted according to the default criteria "Date". Each line contains the call related data of one recorded call. If the recorded file exceeds a certain size, the file will be split up into smaller files and displayed over several lines. The individual files are numbered increasingly, and this number is listed in the column marked "Part" (see table 14). Chapter 4.3 describes how to change the maximum file size.

Columns	Meaning
Device	Device's name or number
From	Number of caller
To	Number of receiver
Channel	Used channel
Service	ISDN service/bearer type
Date	Date and time of the call
Part	Part number of splited up files
Duration	Length of call
<–>	Display call origination: inbound or outbound

Table 14: List of recorded Calls

The column contents are explained in the column headings. The call related data can be sorted according to other criteria than the default settings. To do this, click on the head of the column representing the criteria according to which the data should be sorted. An arrow will appear to the right of the heading to show whether the data was sorted in ascending or descending order. Another click on the column header changes the sort order.

The columns "Service" shows the ISDN service/bearer type, which is detected by the Call Recording Software (see table 15). The using of service characteristics is optional. That means that an encoding of DATA_UR_64K can be used for a X.25 dial-in. However, a digital end-to-end connection is only guaranteed to be established if a digital bearer is requested on call setup. ISDN telephones use either SPEECH (common speech) or more specifically 3K1_ TELEPHONY.

Analogue interfaces can be used for fax, modem (data) or telephony. Some ISDN switches allow the configuration of bearer type for each analogue port. This is not possible on analogue telephone lines. All analogue calls will be signalled as AUDIO_3K1. This may be fax, modem or speech.

Short Name	Explanation
SPEECH	Speech, which is signalled by ISDN telephone
DATA_UR_64K	Unrestricted digital data 64 kbits/s, e.g. internet dial-up PPP
DATA_56K	Digital Data 56 kbits/s, robbed bit (7 bit per Byte)
AUDIO_3K1	Audio 3,1kHz, e.g. speech/fax/modem of analogue interfaces
7K_AUDIO	Audio 7kHz, telephony with higher sample rate and codec
3K1_TELEPHONY	ISDN telephony, which is signalled by ISDN telephone
7K_TELEPHONY	Audio 7kHz, telephony with higher sample rate and codec
VIDEO	Video conference over a B channel
VIDEO_7K	Video conference over two B channels
VIDEO_TEXT	Video text over B channel
VIDEO_TEXT_NEW	Video text, alternative coding
X21_UC_19	X.21 over B channel, e.g. data lines for POS terminals
X25_BCHAN	X.25 over B channel, e.g. Datex-P
FTAM_APP	File Transfer Application (data transfer)
EURO_FILE	Euro File Transfer (data transfer)
FAX_GR_4	FAX group 4 (digital fax)
FAX_3C	FAX group 3C (analogue fax with digital transfer)
FAX_GR_2_3	FAX group 2 or group 3 (analogue fax)

Table 15: Overview of ISDN service

Data Calls Tab: If there is a ISDN-connection that is used to transfer data between computers the Call Recording Service does not create a WAV file for it. Instead the data is stored as a trace file. This trace file can be opened by network analysis software (e.g. Wireshark) and the data exchange between the two machines can be analysed.

An example of such a data call is included in the demo files. A typical application of a data call is a dial-in internet connection to an internet service provider. Using the EyeSDN USB device and its software you can restore the contents of such an internet session. See section 5.1.1 for a short introduction to protocol analysis.

D-Channel Tab: ISDN switches and telephones use a computer protocol to negotiate the setup and release of telephone calls. This protocol uses a dedicated data channel called the D Channel. This channel contains all call related information (e.g. call time and duration, called and calling party numbers, bearer service etc.).

The EyeSDN recording service will log the data frames of the D Channel protocol to a trace file. This data is very helpful when there are problems with the ISDN line or ISDN switches or PBXs have been misconfigured.

The D Channel trace data can be opened and decoded with network analysis software (e.g. the programme Wireshark that is included on the installation CD). See section 5.1.2 for a short introduction to protocol analysis.

CDR Tab: CDR (Call Detailed Records) store the data of recorded calls in a database format (CSV, comma-separated list), which can be imported by external programmes such as Microsoft Excel for further editing. This can be used to calculate and list the telephone charges of several telephones, whose data has been recorded by the EyeSDN USB devices.

The CDR files are stored in .CSV format. Which programme you use to open these files depends on the software installed on your PC. Suitable programmes are Excel or StarOffice, but you can also import the data into many SQL databases. If you have not previously specified which programme should be used, you can change this by right-clicking a CSV file in the directory, selecting "Open With" and clicking on one of the programmes in the list, such as Excel, with which such files should be opened in the future. You can also use this method again to change the setting and to choose a different programme.

Calls in Progress Tab: The "Calls in Progress" tab shows the calls that are currently taking place and are being recorded. The "Play" button opens the file and the call can be played back. The call will be automatically entered into the "Voice Calls" list when it is finished.

4.4.4   Action Buttons

There are five icon buttons, called Action Buttons, "Play", "Erase", "Archive", "Automatic Refresh" and "Refresh List", which have similar functions for all tabs.

Play: A call must be chosen or highlighted to be played back. This is done by clicking on the desired call. Using the "Ctrl" or "Shift" key and the mouse you can select multiple calls. Pressing Control-A selects all calls. Both the black arrow, which appears on the very left, and the coloured highlighting show which call has been chosen. By clicking the "Play" button (icon ▶) the file will be opened for play-back in Gold-Wave, assuming GoldWave has been set as the default application for opening WAV files. If GoldWave was not installed, the file will open automatically in the Microsoft Media Player or in another player programme depending on your Windows settings.

Erase: The "Erase" button (icon ✖) can be used to selectively delete specific calls. To do this, choose the line to be deleted and click on the "Erase" icon. Open files, which are currently being written, cannot be deleted.

Please note that if you use the Storage Mode then recorded data will be automatically deleted as soon as the maximum storage size is reached. The meaning of the parameter Storage Mode and how to change it is explained in Chapter 4.3.2, on page 27. In this case the oldest recordings are deleted automatically and you do not need to clean up manually.

Archive: Individual calls can also be archived selectively. This is advisable if particular calls are to be stored for a longer period of time or if they are to be stored in a different directory or on a different media. To do this, choose the entries to be archived and click the "Archive" button (icon 💿). The selected calls will then be copied to the target directory chosen. The archive function only exports the data to be archived. For permanent storage on an external media like CD-R or DVD-R you need a CD/DVD-drive with write capability and additional software.

Automatic Refresh: When the Call Browser is running the lists are updated whenever recorded data is added to the lists. If you want to stop or activate this automatic update of data just click this icon 🚦. If it shows green light, the data is automatically updated. The update may take long if the lists contain thousands of entries.

In this case the automatic update can be stopped by clicking the icon until it shows red light (🚦). By clicking the icon once more you can enable the automatic update process again. Data can always be updated by clicking the refresh button 🔄 or by changing tabs. Stopping automatic update is also useful if you want to select group of recordings according to filter rules.

Refresh List: Clicking the "Refresh List" button (icon 🔄) updates the display data manually. You may also update the list manually by selecting the menu entry "Edit/ Refresh" or by changing tabs.

4.5 Decrypting Recorded Calls

If you have activated call encryption (described in the paragraph "Cryptographic Key" on page 29), the lines representing these encrypted calls will have a coloured background. These calls can only be opened and played back if the correct key is entered for decryption (see figure 17). The default key is the string "innoventif".

After the chosen call has been successfully decrypted it will be added to the Voice Calls list as an unencrypted call and can be opened. If this unencrypted call is deleted after playback, the encrypted version will remain in the list. Encrypted calls can also be decrypted using the application "decrypt", shown in figure 17.
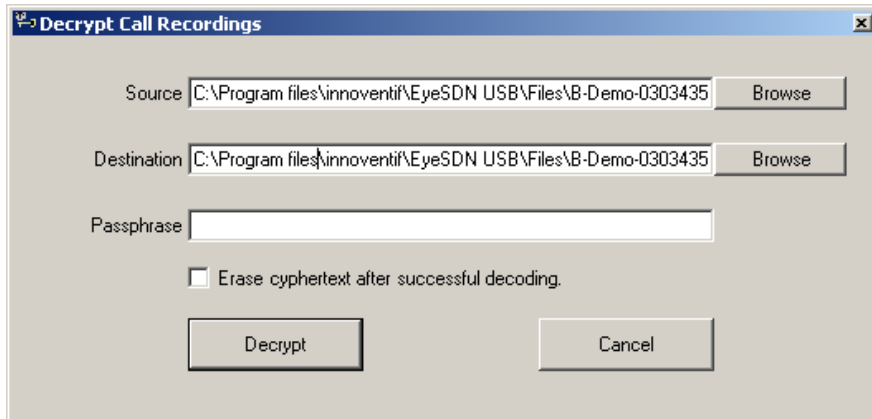
Figure 17: Decrypt Calls Recording

This is necessary if the Call Browser hasn't been installed or if these calls have been archived separately. To do this, right-click a selected file, move to "Open With.../choose program..." and search the local drive for the "Decrypt" application in the installation directory "innoventif". To ensure that RC4 files are opened with this programme in the future, check the "Always use the selected program to open this kind of file" box.

4.6   Filter Function

Routine call recording means a multitude of stored calls. In order that you can nevertheless find relevant calls quickly and easily, the Call Browser programme offers a series of comfortable instruments for data management. One instrument is the Selective Recording Filter (Prefilter). The filter dialogue allows you to determine which calls should be stored at what times. A successive search of recorded call according to telephone numbers called, time of day or date of the conversation can also be performed in the filter dialogue, named as Postfiltering.

4.6.1   Selective Recording Filter

With the dialogue "Rule Properties" you can define rules that decide which of the recorded calls are stored or not on the hard drive. The rules can be defined individually for each connected EyeSDN USB device. If the Recording Filter is active, the rules are applied to the recorded calls. If no rules have been defined, the entire data transfer will be recorded and stored.
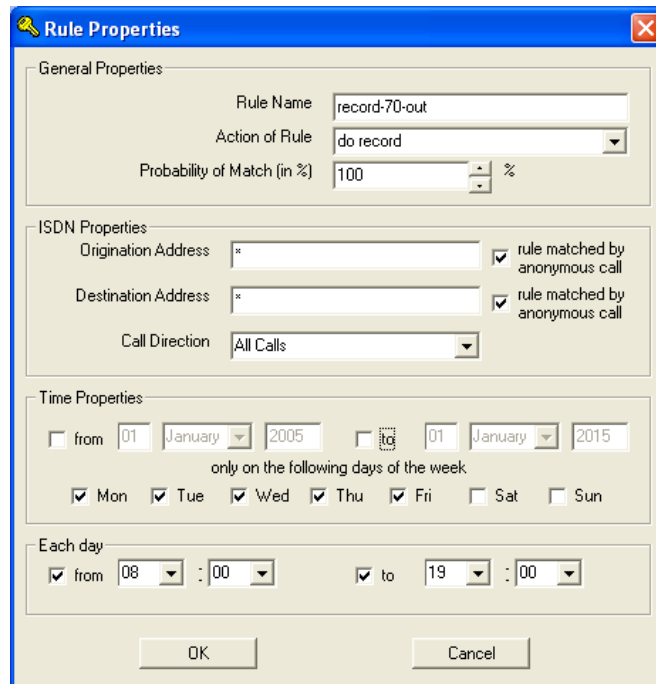
Figure 18: Selective Recording Filter

The dialogue for entering filter rules can be called up by selecting a serial number in the configuration dialogue and clicking "Edit" (see chapter 4.3). In the new window you can then select either the button "New" or "Edit".

Rule name: We recommend that you assign your rules meaningful names, as this saves time if you should later wish to reorder the rule list. The order of the rules is very important, as the rules are checked through from top to bottom. If, when executing the list of rules, the end should be reached without one of the rules being fulfilled, the call will be recorded.

Action of Rule: Using the "do record" or "do not record" actions, you can decide whether or not the call, if it fulfils the rules, should be stored.

Probability of Match: The probability with which a rule should be applied can also be set. If the probability is set to 100% then the rule will always be executed when all of its conditions are met. If the probability of the rule application is reduced then even though all of the rule conditions may be fulfilled, examination may continue with the next rule anyway. This is useful if you wish to randomly record the conversations held by one particular number or extension. In this case the probability should be reduced,

i.e. to 10%. This means that the rule will be applied on average to every tenth call that fulfils its conditions.

Field	Meaning
Origination Address	Caller ID
Destination Address	Calling ID
rule matched by anonymous call	Includes all unknown telephone numbers given as "unknown" or "anonymous"
All Calls	Choose this option if you wish to apply the sequence of numbers or figures to all incoming and outgoing calls
Incoming Calls	Choose this option if you wish to apply the rule to incoming calls
Outbound Calls	Choose this option if you wish to apply the rule to outgoing calls

Table 16: Search Field "ISDN Properties"

ISDN Properties: You can limit the application of the rule to particular telephone numbers or extensions in the search field "ISDN Properties". You can find further details on these search criteria in the tables 16 and 17.

Enter	Meaning
?	The question mark is a wildcard representing any number, may be used repeatedly in any sequence in any position
1234567?	All numbers between 12345670 and 123456789 fulfil the rule
*	The asterisk represents any given sequence of figures and may only appear once
*	All telephone numbers will be examined;
*123	Only telephone numbers ending with the numbers 123 fulfil the rule
123*	Only telephone numbers beginning with the numbers 123 fulfil the rule
12345670	Only this specific telephone number fulfils the rule

Table 17: Description of Wild Card Characters

Time Properties: The timespan in which the filter rules are applied to calls can be defined in the "Time Properties"-field. The length of time in which the rule is to be applied can be defined by ticking the "From" and "To" boxes. If no boxes are ticked the rule will always be applied. The rule can also be activated either for every day of the week, or only for particular days, e.g. Mondays. You can also define at which time of day the rule should be applied to recorded calls ("Each Day"-field).

Generate a filter rule (example):   All telephone calls will be recorded and stored if no recording filter rules are established. Setting filter rules allows you to follow one of two rationales:

1. the rules can be defined such that all recorded calls are stored but for a few exceptions, or

2. conversely that no recorded calls are stored but for a few defined exceptions.

It is easy to create rules under number one; always choose the option "Do Not Record" in order to prevent the call being stored.

Figure 19: Rule "NoRecording"

Defining rules for the second situation is somewhat more difficult, as a rule must first be created according to which no telephone calls are stored (rule "NoRecording").

This rule must occupy the last place in the rule list so that this rule will be applied if the other rule conditions are not fulfilled for the telephone call being examined.

Figure 19 demonstrates how the "NoRecording" rule is defined. After you have created the rule "NoRecording", you can then define the remaining rules needed in order to store particular telephone calls. If, for example, you wish to store all calls to and from a particular telephone number, you need two rules:

The first rule contains the desired telephone number in the "Origination Address" field and the "Outbound Calls" box must be listed in the "Call Direction" field (see figure 18).

The second rule contains the telephone number in the "Destination Address" field, and the call direction is set to "Inbound Calls". The other telephone number field contains in each case the asterisk wildcard character.
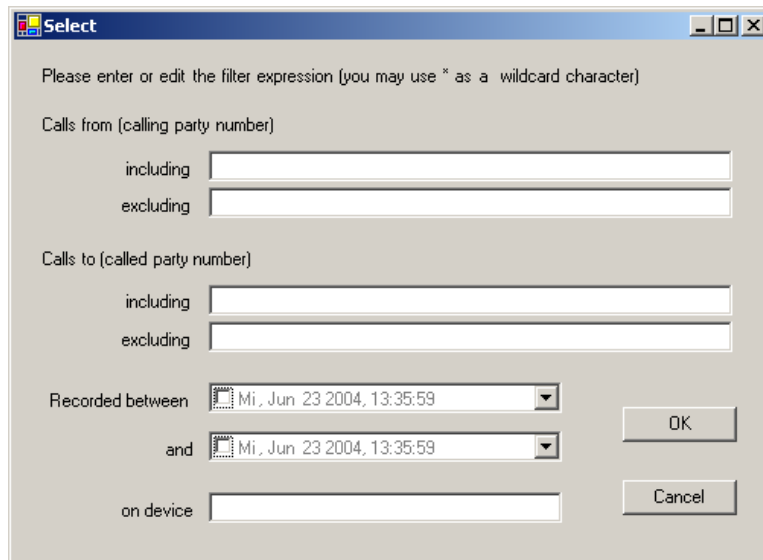
Figure 20: Dialogue Postfiltering

Postfiltering: Postfiltering allows to filter certain records from the list of recorded calls. By using the filter function, you can call up a list of only those calls that fulfil certain conditions. To do this, select the menu entry "Edit/Select" to open the filter dialogue (shown in figure 20).

In this dialogue enter the filter parameters and activate them by clicking the "OK" button. The recorded calls list will now only show the filtered calls. New calls, which fulfil the filter conditions, will be added to the list automatically.

You can also complete your filter conditions by using the wildcard symbol "*". This symbol may only appear at the start (*10) or at the end (10*) of the filter conditions, not in the middle (1*0). The filtering can be cancelled by selecting the menu

"Edit/Reset Filter", and once again all calls will be visible. The filter conditions will also be reset when another tab is chosen or when the programme is ended.

5   Protocol Analysis and ISDN Installation

5.1   Protocol Analysis

You can use the EyeSDN USB-S0/E1/4S monitor to decode the D channel traffic to detect any misconfiguration or software errors. By default, the software creates D channel trace files for inspection with Wireshark. See chapter 2.1.2 on how to install this software. Wireshark can decode Q.921 and Q.931 frames and display them in legible form. It does not automatically detect errors. You need to examine the protocol messages to detect any malfunctions.

The EyeSDN USB-S0/E1/4S also records the data exchange through the D and B channels and stores this data on the hard drive. Analysis of this data can help to identify misconfiguration, software errors or dialling problems, among other things. The recorded data is stored as a trace file. There are different trace formats from which you can choose. The selection takes place in the configuration tool (see chapter 4.3). Wireshark (see chapter 2.1.2) opens automatically when a particular file has been opened. An open TRC file, which is currently being written, cannot be deleted.
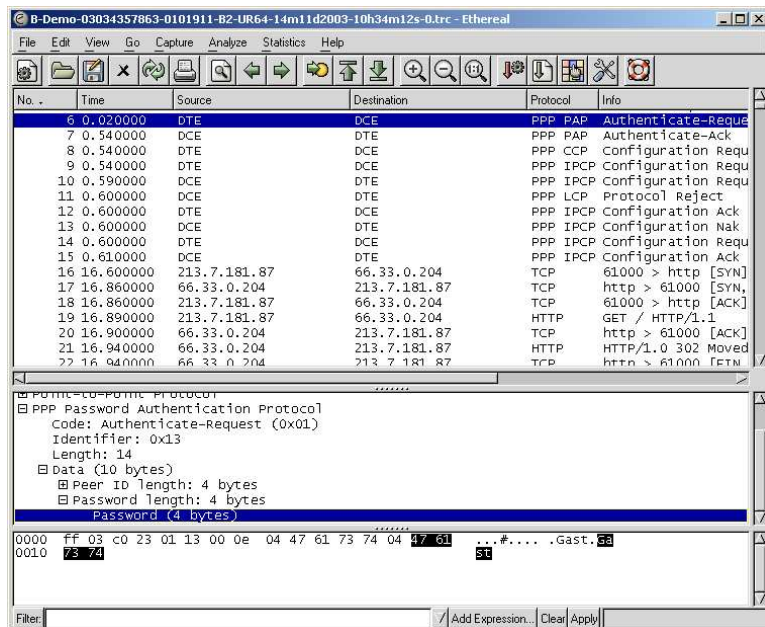
Figure 21: Point-to-Point Protocol, link establishment

5.1.1   Data Calls (B Channel)

If there are problems with ISDN data calls (e.g. internet access), then the device can be used to analyse the PPP[11]-traffic to find dialer problems, wrong password settings or other link establishment problems. Currently, the software can only process B Channel protocols based on HDLC framing. There is no support for other protocols like V.110 or V.120. Figure 21 shows a typical PPP link establishment. As you can see, it is possible to see the user password and ID. If the internet provider uses a challenge/response based authentication method this will no longer be possible - only the challenge and the response remain visible. Once the IP link has been established, IP packets are exchanged via this link.

5.1.2   D Channel

Each time the layer 1 goes down on an ISDN Bus, the trace file is closed and a new trace file is created. Therefore, during prolonged periods of inactivity the trace file is not written to. You can find the desired trace file by checking its timestamp. Figure 22 shows a D channel protocol dump as displayed by Wireshark.

Figure 22: D Channel decoding

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[11]Point-to-Point Protocol

45

5.2   ISDN Installation Support

Another application area for the EyeSDN USB-S0/E1 monitor is the installation support of telecommunications equipment. The device can detect errors in the physical layer by providing information about ISDN bus power, layer 1 status, signal activity and wiring polarity. This is all shown at the device by the LED indicators. If the pr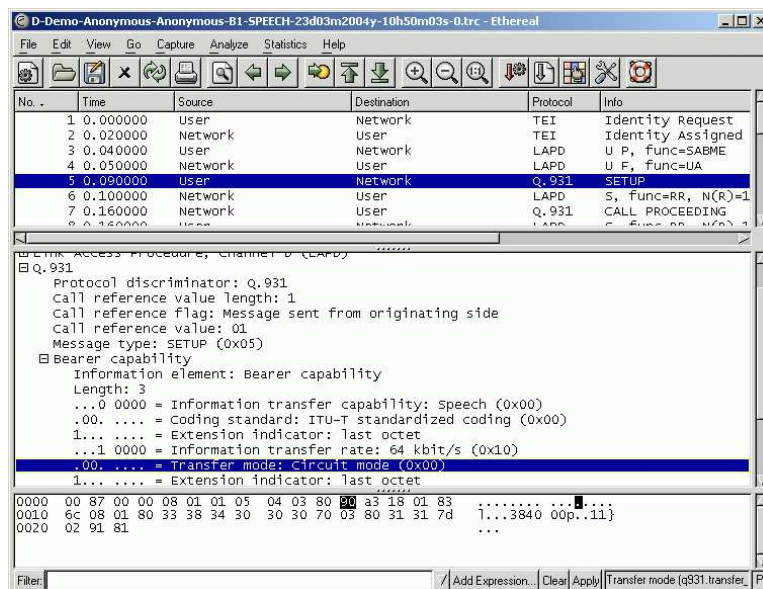oblem is not of a physical nature but involves software and protocol settings, the EyeSDN USB-S0/E1 can be used to analyse the D and B channels to detect any errors present. See section 5.1 for details about protocol analysis. Equipped with a notebook and the EyeSDN USB device, a technician in the field could detect all ISDN related problems. If the service staff already use notebooks as standard, the EyeSDN USB-S0/E1 is much more affordable and comparable than other ISDN test and measurement equipment.

6   Frequently Asked Questions

6.1   General Questions

(Questions on the EyeSDN USB devices, their performance features and compatible operating systems)

6.1.1   What are the differences between the EyeSDN USB devices?

Device	Attribute
EyeSDN USB-S0	Application for ISDN Basic Rate Interface (S0, ISDN2)
	Records two channels simultaneously from one S0
EyeSDN USB-E1	Application for Primary Rate Interface (S2M, ISDN30)
	Records up to 30 channels simultaneously from one E1
EyeSDN USB-A2	Application for analogue Interface
	Records calls from up to two analogue lines
EyeSDN USB-4S	Application for four Basic Rate Interfaces (S0. BRI)
	Records up to eight channels simultaneously from four S0
EyeSDN USB-4SBx	Application for four Basic Rate Interfaces (S0, BRI)
	Records up to eight channels simultaneously from four S0

Table 18: Differences of EyeSDN USB Devices

6.1.2   What happens to the calls if my computer crashes?

The EyeSDN USB device will stop recording calls if your computer crashes, although you can continue to make and receive them. The EyeSDN USB device is supplied with power by the computer, and if this crashes or is turned off then the recording device is off-line. The EyeSDN USB device will automatically resume call recording once the computer is running again.

6.1.3   Which telephone systems are suitable for the EyeSDN USB devices?

All telephone systems, which support the Q.931 or DSS1 (Euro ISDN) and British ISDN protocols as well as analogue phone lines. Different variants are supported for caller-recognition in analogue systems (DTMF before the first dial tone and V.23 between dial tones).

6.1.4   Can I connect the EyeSDN USB devices to hand-held computers, such as the Microsoft CE?

No. The EyeSDN USB devices are intended for use with PCs or laptops. These computers then require either the Windows 2000 or Windows XP operating systems and a processor with a clock frequency of at least 500 MHz for the S0 and analogue devices and 2 GHz for the E1 device.

6.2   Questions about Software

(Questions on the Call Browser Software, the programme settings and the Call Recording Service)

6.2.1   Must the Call Browser programme or the software always be open or activated manually in order to begin recording data?

No. The EyeSDN USB devices are set to automatically record and store data by default. As soon as the computer to which the device is connected is turned on the device begins recording. The Call Browser programme does not have to be open permanently.

6.2.2   What do I need the Microsoft dotNet (.Net) Framework for?

The Microsoft .Net Framework programme is required to use the Call Browser programme. It is installed together with the Call Browser, if you have chosen to install this programme.

6.2.3   The software has been installed as instructed, but I receive the "..Microsoft .Net Framework is not loaded" error message when I try to open the Call Browser programme?

If the Call Browser has been chosen for installation when installing the software, the Microsoft .Net Framework programme will be installed automatically. Before it is installed, the computer is checked to see if this programme is already present, and if so, the programme will not be installed. Under certain circumstances this verification may fail, and you will need to install the programme .Net manually. Insert the CD provided into the computer and choose either the programme dotnetfx_eng.exe or dotnetfx_ger.exe from the "third parties" folder, depending on whether the English or German language version is required. A double click will start the installation, and after the restart the Call Browser should open itself automatically, with no error message.

6.2.4   Which settings do I need to apply so that only the voice of the caller (such as the agent) is recorded?

An ISDN connection has two terminals, the NT (network termination) and the TE (terminal equipment). Both sides broadcast an audio stream. Outgoing calls begin at the TE terminal. Your desired setting can be applied in the Call Browser. To do this, call up the serial number of the EyeSDN USB device in the Call Browser in the menu under Settings/Devices and click on "Edit". In the new window, "Configuration of device", the B Audio Format may be changed in the centre panel. Choose the audio stream you would like to record, G.711 NT or G.711 TE, from the list.

6.2.5   Why is one of the conversing parties quieter than the other when replaying recorded calls?

The EyeSDN USB devices create a digital copy of telephone conversations held over the telephone line. The recording device has no influence on the quality of the conversations, performs no compression and undertakes no changes. The causes of this problem may lie with either the recording (i.e. one of the two telephone microphones is quieter than the other) or the playback (soundcard, speakers, Media Player settings). We also recommend that you check your speakers.

6.2.6   I changed the storage directory and now I don't see any calls in the Call Browser.

If you have chosen a device-specific storage directory you have to change the directory in the Call Browser's Settings/Directory menu. This is important since otherwise the

Call Browser will not show any saved recording files.

The Call Browser reads saved recording data from the storage directory which is created by default during the software installation. You will find the standard storage directory in configuration dialogue in field "Storage Directory". If you change the storage directory for the connected device no data will be saved in the standard storage directory. Therefore you have to specify the changed storage directory in the menu Settings/Directory. That means you refer to the device-specific storage directory in this dialogue.

6.2.7   I have renamed the call files. Why does the Call Browser no longer display them?

The Call Browser only displays those calls that are stored in the same format as the one in which they were generated during recording. This allows the details to be entered into the proper columns. If the file name is changed, the file may be opened directly from the storage folder or through the File/Open menu of the WAV player.

6.2.8   What is the TCP port number in the configuration window for?

The TCP port number is not an IP address, but rather the port number of a TCP server port. This allows the recording service to be accessed remotely using client software. Integrators can be supplied with the network interface specifications. The network interface is deactivated if this value is set to zero.

6.2.9   How do I establish a network connection with the computer to which the EyeSDN USB device is attached?

This function requires that the PC to which the EyeSDN USB device is attached (the recording computer) be connected to a network. Open the "My Computer" dialogue window on the external computer and choose the option "Map Network Drive" from the "Tools" tab folder. Enter both the drive letter and the path of the recording computer and establish a connection. This gives access to the data and programmes on the recording computer.

6.2.10   Which protocols are supported by Wireshark?

Wireshark can decode the Q.921/Q.931 (DSS1) ISDN protocols, the PPP/LCP/CCP protocols and many other IP protocols which are based on these.

6.3   Questions about Hardware

(Questions on the products hardware, on the LEDs and different connection configurations)

6.3.1   The calls recorded through an E1 interface stop on playback after approximately 30 to 60 seconds. According to the LEDs device has been connected properly. There is also an increased bit error rate. What could be the reason?

There are two possible reasons for interrupted recordings: The first is bit errors that could cause a layer 1 resynchronization. This interrupts both the recording of the B channel and the updating of the D channel protocol.

- An increased bit error rate could be caused by the way in which the EyeSDN USB-E1 device is connected, for example, if it is connected in parallel. We therefore recommend the following methods of connection for the EyeSDN USB-E1:

  1. Insertion into the line using its own two RJ45 female connectors. This guarantees that the stub cable is kept short.

  2. Keep the stub cable as short as possible if using a patch panel. One to two meters long should be fine, but the shorter the better!

  3. Using a signal enhancer, or booster, and an additional terminator on the EyeSDN USB-E1. This enables distances of several hundred meters to be covered. If covering the distance between the PC and the connector is problematic, an USB extender can also be used as well as a booster (for distances up to 45m). This converts the USB cable to category 5 or category 6 and then a second adaptor at the end of the cable converts it back to an USB connector.

- The second cause is that the PC may be too slow. If all 30 channels are occupied, the EyeSDN USB-E1 transmits 512 KB/s via the USB interface. This is equivalent to approximately 50% of the actual bandwidth available for bulk transfer. The PC must be able to continuously process this data rate. We recommend a processor with a clock frequency >1.5 GHz.

The procedure for finding out which of these two causes is at the root of the problem is simple: record only one active call over the E1 interface. If the recording is still interrupted, then it's because of the bit error rate or the quality of the connection. Otherwise, we recommend you try a PC with different components.

6.3.2 The device's LEDs don't react, even though the software has been correctly installed.

Several seconds pass before the LEDs on the installed device react. This time is required to load certain firmware into the device. If the LEDs still aren't lit after approximately 30 seconds, then it could be due to one of the following:

1. The hardware (the EyeSDN USB device) is not being recognized by the PC because the PC was unable to locate the driver during installation. This can be checked by opening the tab folder "Settings/Devices" in the Call Browser software. If the device's serial number does not appear there at the bottom then the driver must be reinstalled, as described in the "Driver Installation" chapter.

2. Either the windows service or the computer was not restarted after the driver was installed, the device connected or changes made in the settings, meaning that none of these changes have yet come into effect. You may either close the Call Browser programme and restart the computer or manually start the windows service for the recording software. This may be found in the chapter "Configuring the Service".

3. If neither points 1 nor 2 have helped to solve the problem, then try using a different USB slot or, if you are using an USB hub, a different USB hub and then restart the windows service or the computer.

4. The ISDN and USB cables provided with the device are not checked individually before packaging; although a rare occurrence, it is possible that one of these cables may be defective. Please test the cables by exchanging them with others. If you have no extra cables available to use, please contact us.

5. If none of the above has helped to solve the problem, please contact us.

6.3.3 I have successfully installed an EyeSDN USB-E1 device but it is only recording inbound/outbound calls.

In this case if you have not set filter rules in the software's configuration tool, it is most likely that the wiring of the TE and NT pairs is swapped. You don't need to exchange the wiring, it is sufficient to check the box "Swap TE and NT pairs" in the device configuration dialogue (described in chapter 4.3).

6.3.4 Does the EyeSDN USB-S0 device need to be connected directly to the NTBA?

The device may be connected directly to the NTBA but may also be connected directly to a telephone or your telephone system.

6.3.5   Can the EyeSDN USB device be connected to my internal Fritz!Card and the S0 interface?

Yes, you may connect the device between your internal Fritz!Card and the NTBA connector.

6.3.6   How many devices can I connect to one computer?

EyeSDN USB-S0 and EyeSDN USB-A2:   You can connect up to eight EyeSDN USB-S0/A2 devices to one computer, and can also use an USB hub. All of the recorded data can be managed from one software.

EyeSDN USB-4S: You can connect up to four EyeSDN USB-4S devices to one computer, and can also use an USB hub to connect up to two device to a single USB bus.

EyeSDN USB-E1:   We recommend that only one E1 device should be attached per computer, since the data quantity can accumulate very quickly when recording 30 channels. If the computer is suitably equipped and each E1 device has its own USB host controller, then up to four devices may be connected to one computer. The multiple EyeSDN USB-E1 devices should not be connected via an USB hub (including the root hub), as one device alone requires over 50% of the available data rate.

6.3.7   What do the "Layer 1 active, Layer 2 active and Layer 3 active" states mean on the EyeSDN USB-E1?

Layer 1 active (LED red):   A functioning connection to the nearest switching centre has been established. Both communication end-points send a correct signal and are synchronized.

Layer 2 active (LED yellow):   An exchange of data packets is taking place through this connection and that the line is available for use.

Layer 3 active (LED green):   Telephone calls are currently active on this line. This could mean one call or up to 30 calls simultaneously.

7   Technical Data

EyeSDN USB-S0

Property	Value	Unit
Dimensions	76x55x19	mm
Weight	50	g
S0-Interface	ITU Standard I.430	
Connectors	2x RJ45 Western Modular	
Tests	Polarity, Framing, Power, Protocol	
Channels	2x (D, B1, B2), E, M, A, Q, S	
USB	1.1 and 2.0 (full speed)	
Socket	USB Type B	
Power	< 90	mA
LEDs	4 x red/green	
Disk Space (non-compressed WAV file)	16 per channel, second and call	KBytes
Sample Frequency	8000	Hz
WAV Formats	A-Law Mono/Stereo, MP3, GSM	
Operating System	Windows 2000, Windows XP Windows Server 2003, Windows Vista	
Processor Clock	min 500	MHz
Disk Space Software	5 - 170	MB
Connection to Telephone System	Point to Point Point to Multipoint	

Table 19: Specifications EyeSDN USB-S0

EyeSDN USB-E1

Property	Value	Unit
Dimensions	76x55x19	mm
Weight	50	g
E1-Interface	ITU Standard G.703/G.704	
Connectors	2x RJ45, Western Modular	
Tests	LOS, AIS, G.704 Framing, Protocol	
Channels	2x (D, B1, B2....B30)	
USB	1.1 and 2.0 (full speed)	
Socket	USB Type B	
Power	< 150	mA
LEDs	4x red/green	
Disk Space (non-compressed WAV file)	16 per channel, second and call	KBytes
Sample Frequency	8000	Hz
WAV Formats	A-Law Mono/Stereo, MP3, GSM	
Operating System	Windows 2000, Windows XP Windows Server 2003, Windows Vista	
Processor Clock	2	GHz
Disk Space Software	5 - 170	MB
Connection to Telephone System	Point to Point	

Table 20: Specifications EyeSDN USB-E1

EyeSDN USB-4S

Property	Value	Unit
Dimensions	120x97x13	mm^3
Weight	70	g
S0-Interface	ITU Standard I.430	
Connectors	4x RJ45 Western Modular	
Tests	Polarity, Layer 1, Power, Protocol	
Channels	8x (B1, B2, D), E, M, A, Q, S	
USB	1.1 and 2.0 (full speed)	
USB Connector	Type A	
Power	< 150	mA
LEDs	4x red/green	
Disk Space (non-compressed WAV file)	16 per second, channel and call	KBytes
Sample Frequency	8000	Hz
WAV Formats	A-Law Stereo/Mono, MP3, GSM	
Operating System	Windows 2000, Windows XP Windows Server 2003, Windows Vista	
Processor Clock	min 500	MHz
Disk Space Software	5 - 170	MB
Connection to Telephone System	Point to Point Point to Multipoint	

Table 21: Specifications EyeSDN USB-4S

EyeSDN USB-4SBx

Property	Value	Unit
Dimensions	120x102x21	mm^3
Weight	80	g
S0-Interface	ITU Standard I.430	
Connectors	4x RJ45 Western Modular	
Tests	Polarity, Layer 1, Power, Protocol	
Channels	8x (B1, B2, D), E, M, A, Q, S	
USB	1.1 and 2.0 (full speed)	
USB Socket	Type B	
Power	< 150	mA
LEDs	4x red/green	
Disk Space (non-compressed WAV file)	16 per second, channel and call	KBytes
Sample Frequency	8000	Hz
WAV Formats	A-Law Stereo/Mono, MP3, GSM	
Operating System	Windows 2000, Windows XP Windows Server 2003, Windows Vista	
Processor Clock	min 500	MHz
Disk Space Software	5 - 170	MB
Connection to Telephone System	Point to Point Point to Multipoint	

Table 22: Specifications EyeSDN USB-4SBx

EyeSDN USB-A2

Property	Value	Unit
Dimensions	76x55x19	mm
Weight	50	g
Interface	analogue Lines or Phone Lines	
Quantity Interfaces	2x analogue interfaces	
Connectors	2x RJ11 Western Modular	
Tests	Power, Caller-ID, off hook, Ring Pulse, Recording	
Signals	DTMF, V.23 Modem	
USB	1.1 and 2.0 (full speed)	
Socket	USB Type B	
Power	< 90	mA
LEDs	4x red/green	
Disk Space (non-compressed WAV file)	8 per second and call	KBytes
Sample Frequency	8000	Hz
WAV Formats	A-Law Mono, MP3, GSM	
Operating System	Windows 2000, Windows XP Windows Vista, Windows Server 2003	
Processor Clock	min 500	MHz
Disk Space Software	5 - 170	MB
Connection to Telephone System	2x analogue lines or analogue phone lines	

Table 23: Specifications EyeSDN USB-A2

8 Declarations of Conformity and WEEE

Electromagnetic Compatibility

This Declaration of Conformity is suitable to the European Standard EN45014, "General criteria for supplier's declaration of conformity".

Applied Council Directive(s): Directives on Electromagnetic Compatibility (EMC) 89/336/EEC as amended by 92/31/EEC and 93/68/EEC

We, Manufacturer:
innoventif Ltd.
Wismarer Str. 44
12207 Berlin

declare under our sole responsibility that the call recording products :
  EyeSDN USB-S0, EyeSDN USB-4S, EyeSDN USB-E1 (ISDN lines) and EyeSDN USB-A2 (analogue line)
  to which this declaration relates is in conformity with the relevant provisions of the following standards or other normative document(s):

- **EN55022:1994** (Class A) with amendments A1/A2 to include Radiated and Conducted Emissions, and

- **EN50082-1** to include Immunity.

Year of CE Marking: 2003 for EyeSDN USB-S0, 2004 for EyeSDN USB-E1 and 2005 for EyeSDN USB-4S/A2

We, the undersigned, hereby declare that the products specified above conform to the listed directive(s) and standard(s).

Dr. Rolf Fiedler, innoventif Ltd.

Declaration of Electrical and Electronic Equipment

Statement to the Directive 2002/96/EC of the European Parliament and of the council of 27 January 2003 on waste electrical and electronic equipment (WEEE) and to the Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS):

According to the Act Governing the Sale, Return and Environmentally Sound Disposal of Electrical and Electronic Equipment (Electrical and Electronic Equipment Act, or ElektroG) of 16 March 2005 innoventif is registered as a producer of their EyeSDN USB products. The Registration Number is DE 86287401.

   After the 24th of November 2005 the Registration Number from the Clearing House is displayed on our business stationary. The EyeSDN USB products will be labled according to the act.
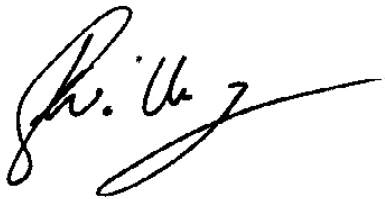
Return and Disposal
   Devices of the EyeSDN USB family, which

- are disabled for their original purpose or

- will not used any more

should be sent back to the producer innoventif Ltd. for recycling or environmentally friendly disposal.

If you have some questions about this subject please send an e-mail to info (at) innoventif.de.

Sandra Wilkens
Director innoventif Ltd.

WEEE Reg No DE-86287401, 24 November 2005