iKUSNET

User Manual

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Prodys
PROCESAMIENTO DIGITAL Y SISTEMAS, S.L

Index

Chapter I

INTRODUCTION

Ikusnet is a HD/SD Mpeg4 AVC/H.264 bidirectional portable IP video and audio codec that can broadcast live everywhere 24/7, supporting ad-hoc bandwidth aggregation of up to 11 links (3G/4G/WAN/LAN/WIFI). Ikusnet is the only portable video codec in the market supporting bidirectional live video and audio/talkback streams all in one compact unit, with 2 switchable video inputs (2 cameras) and 2 monitor screens that allow the user to monitor video inputs, video feedback (cue program) and the quality of locally encoded video.

These video screens allows the user to use them to do some basic video editing, like 'top and tail' of pre-recorded video files.

In this manual, all the aspects regarding the functions, configuration parameters and operation modes of the Ikusnet codecs are fully explained.

I.1 About this manual

The User Manual is applicable to most of the common features provided by the Ikusnet Family of codecs, as well as some other features that concern only to some of them. When one of this features is applicable only to some specific codecs, but not to all of them, it will be marked with the logo of the unit/s.

I.2 Contents

The information of the User Manual is arranged in the following sections:

- **Chapter I – Introduction**
  Contents of the Manual.

- **Chapter II – What's Ikusnet?**
  This chapter is a brief summary of Ikusnet, its features and applications

- **Chapter III – Quick Start**

This chapter is a quick guide aimed at the new users, so they can establish its first communications in a very simple way.

- **Chapter IV – Functional description**
  Ikusnet can be controlled from a touchpanel or from a Web Browser. This chapter describes, in a comprehensive way, how the unit can be configured using either controlling interface.

- **Chapter V – Ikusnet Applications**
  This chapter shows how Ikusnet can be configured to be used in different environments and situations. Several practical examples are explained.

- **Chapter VI – Technical specifications**
  This appendix describes the technical specifications common to all devices of the Ikusnet Family.

- **Appendix A – Updating the firmware**
  This appendix describes how to update the Ikusnet codec firmware.

- **Apéndice B – Backpack for Ikusnet Portable**

- **Apéndice C –Transportation case for Ikusnet Portable**

- **Appendix D – Glossary**
  This appendix provides definitions to some terminology that can be found along this User Manual.

- **Appendix E – Picture Index**

Chapter II

WHAT'S IKUSNET

II.1 Introduction

Ikusnet Portable is a HD/SD Mpeg4 AVC/H.264 bidirectional portable IP video and audio codec that can broadcast live everywhere 24/7, supporting ad-hoc bandwidth aggregation of up to 11 links (3G/4G/WAN/LAN/WIFI).

Ikusnet Portable is the only portable video codec in the market supporting bidirectional live video and audio/talkback streams all in one compact unit, with 2 switchable video inputs (2 cameras) and 2 monitor screens that allow the user to monitor video inputs, video feedback (cue program) and the quality of locally encoded video.

Picture 1. Ikusnet Portable codec.

These video screens allows the user to use them to do some basic video editing, like 'top and tail' of pre-recorded video files, making this unit even more unique in the ENG portable video codecs market.

II.2 Ikusnet Portable Features

Among Ikusnet Portable most remarkable features are:

- **H.264 video compression**. This is the most advanced standard for video compression and it is widely used by broadcast services and internet sources. The Ikusnet implementation of this standard has been realized using a specifically designed Hardware platform to leverage real-time operation. Furthermore, the compression algorithms have been adjusted to obtain the best possible quality at any bit rates, focusing on low bit rates where compression quality is critical and makes the big difference between our codecs and the rest. This implementation has also reduced the coding delay to the minimum.

- **Video + Audio.** Ikusnet Portable is not just a video codec; it is also a powerful MPEG AAC audio codec and mixer that allows the user to add a stereo audio channel to the video stream, either for transmission or recording.

  This audio channel may come from various sources:

  o The audio embedded in the video inputs (firs two embedded audio channels).
  o Two independent mic/line inputs.

  Ikusnet includes an audio mixer to compose the final audio stream based on those inputs.

- **2 HD or SD Video inputs.** Ikusnet Portable allows the user to select between two independent video inputs. This would allow the user, for example, to switch dynamically between two cameras during a real time contribution.
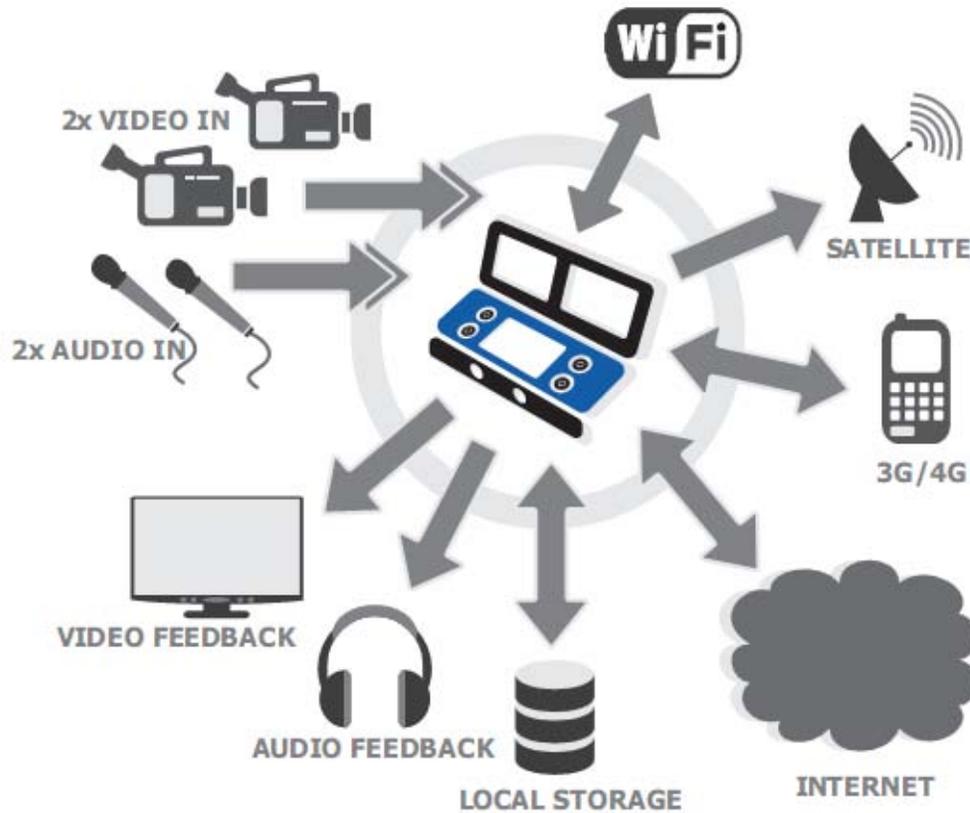
Picture 2 Ikusnet input/output diagram.

- **Bidirectional.** Ikusnet in not just an encoder, it's also a complete audio and video decoder that can simultaneously send and receive video and audio streams. This permits to establish bidirectional communications, opening the door to numerous and interesting applications such as video conferencing, video interviews, multisite news events, debates, etc.

- **2 Monitor Screens.** Its two monitor screens allow different visualization possibilities. These monitor screens can be configured to show the video input feed, the output of the encoder or the video signal returned from the remote end. These video screens allows the user to use them to do some basic video editing, like 'top and tail' of pre-recorded video files, making this unit even more unique in the ENG portable video codecs market.

- **Talkback audio channel:** Besides the main program communication, with audio and video, there's a possibility of establishing a second MONO audio communication. This can be useful for coordination purposes or as a second

independent audio channel. Both mic/line audio inputs can be switched to be mixed either on the main video stream (alone or mixed with the video input embedded audio), or to the Talkback audio channel.

- **LAN, 3G/4G, WIFI:** Ikusnet is an IP codec whose stream can be transmitted using a wired connection by means of one or two Ethernet ports or a wireless communication by means of bonding the bandwidth of several different 3G/4G mobile wireless data connections (up to 8) and one WIFI link. The key point is that it is also possible to combine wired and wireless data lines to get a wider transmission bandwidth (bandwidth aggregation of up to 11 IP interfaces).

- **DVB/ASI:** The DVB/ASI interface allows Ikusnet Portable codec to connect to a DVB/ASI enabled satellite modem and thus to transmit Mpeg4 compressed audio and video data over existing satellite link, offering another interface to stream the video and audio data.

- **Files:** Although Ikusnet is a device whose main applications are in the field of real-time transmissions, it also has the ability to record video files for later transmission.
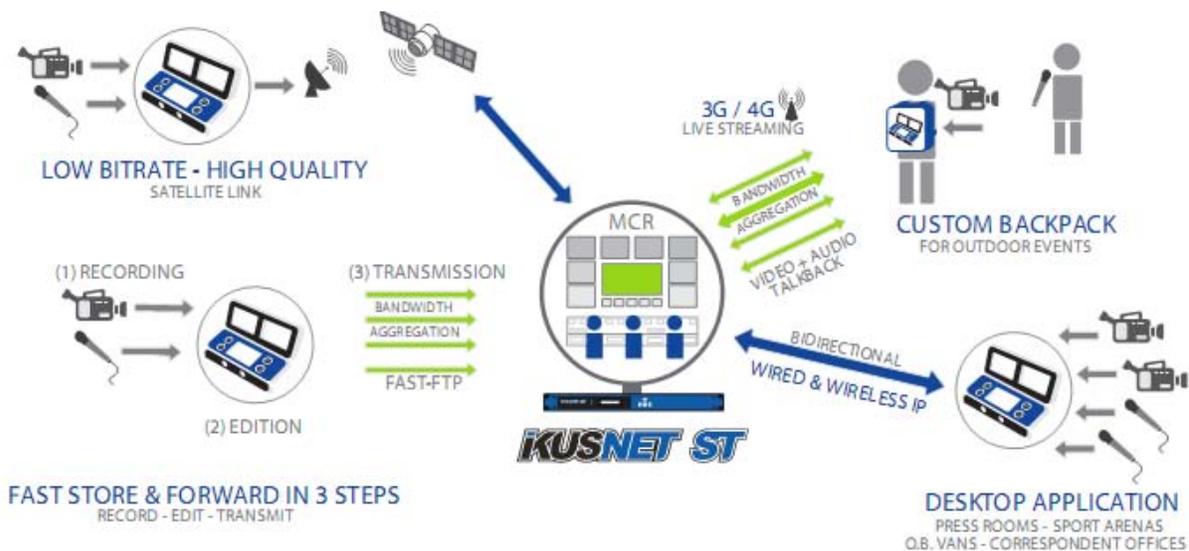
Picture 3. Ikusnet connectivity diagram.

II.3 Ikusnet ST

Picture 4. Ikusnet Studio codec.

Besides the portable version of Ikusnet, there is a 1U rack mount model called **Ikusnet ST** whose main application is to receive, decode and store video streams from remote Ikusnet units. But Ikusnet ST is not just a decoder, it is also capable of encoding video back to the portable unit and provide some video feedback to the remote unit.

This studio unit supports a high-capacity hard disk to store H.264 encoded video. This unit is controlled using a web graphical interface or its front panel display menu.

II.4 Ikusnet modes of operation

These are Ikusnet's four main modes of operation:

- **Real Time Ethernet transmission.** When an wired IP connection is available via an Ethernet connector, a bidirectional audio and video communication can be established between an Ikusnet Portable unit and an Ikusnet ST unit using a wired IP link.
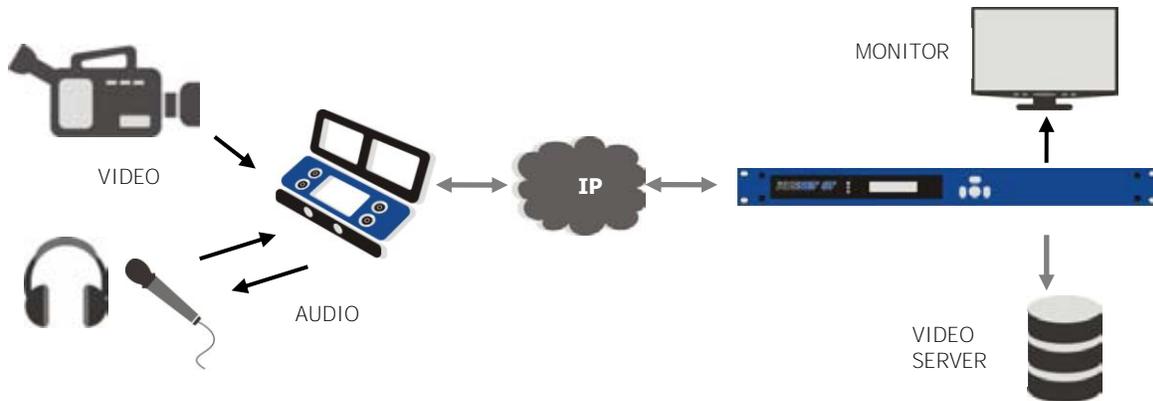
Picture 5. Real time Ethernet transmission.

It is also possible to split up the bitstream into 2 bit-streams, to be transmitted through the 2 Ethernet ports available in the unit. Those 2 sub-streams will be multiplexed at the receiving end. Both Ikusnet Portable and ST units come equipped with 2 Ethernet interfaces.

▪ **Real Time 3G/4G transmission.** When no wired IP connection is available, a bidirectional audio and video communication between an Ikusnet Portable unit and an Ikusnet ST unit can still be established using the wireless 3G/4G communication module. Ikusnet Portable is able to aggregate bandwidth from up to 8 3G/4G data links, dividing up (demux) the bitstream into N sub-streams that will be bonded (multiplexed) at Ikusnet ST. Using this technology, the bandwidth provided by the mobile network operators can be widely enlarged.
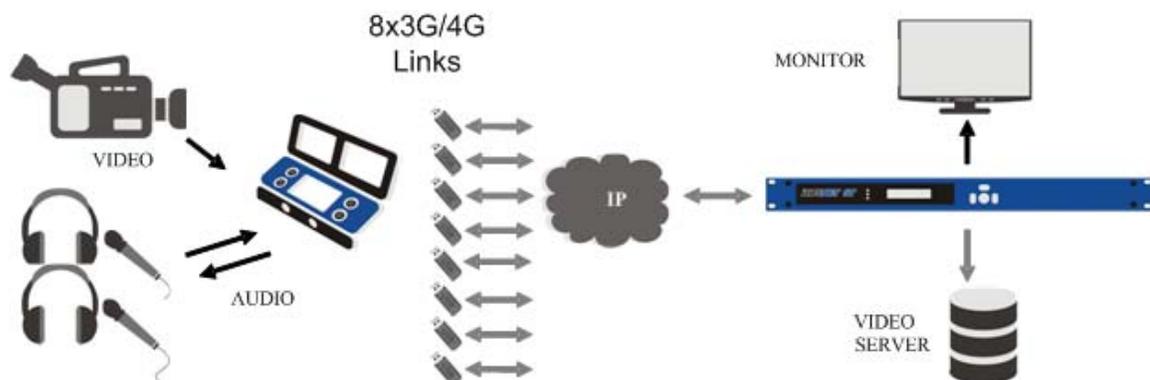
Picture 6. Real Time 3G/4G Transmission over 8 3G/4G links.

- **WIFI connectivity:** When WIFI networks are available, and the unit is equipped with the WIFI module, one WIFI network can be used for audio and video streaming. Take into account that the main purpose of the WIFI link is not to act as a primary link, but to be bonded to the some other available links lilke 3G/4G or Ethernet interfaces to get as much bandwidth as possible available for the connection.
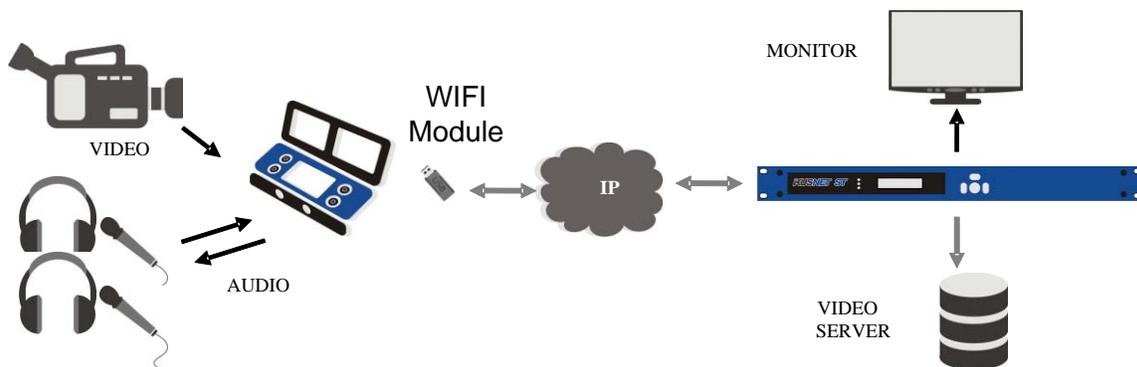
Picture 7. WIFI module transmission.

- **Real Time Custom Bonding.** When Ethernet, 3G/4G and WIFI connections are available, a combination of up to 11 different interfaces can be used to stream the audio and video as well as to upload pre-recordered files. This technology allows the user to get as much bandwidth as possible by aggregating the capacity of each of the available links. This is done by a proprietary statistical algorithm that evaluates in real time the capacity of each communication link and balance the bandwidth usage of each interface based on that information.

- **File Storage and Forward**. Even when no wired or wireless IP connections are available, Ikusnet Portable unit allows the user to encode and store video and audio in a SD card for a future transmission. The stored files can be uploaded to Ikusnet ST or to an FTP server as soon as an IP connection is available.
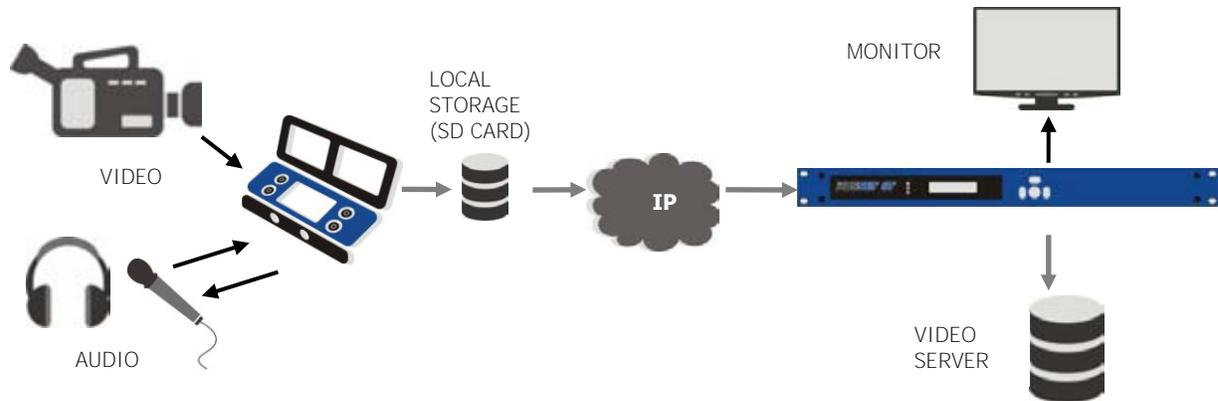
Picture 8. File storage and forward.

II.5 Applications

There is a wide range of applications where Ikusnet can fit:

- **Real Time News Contribution**: this is the main application because the design of the codec has been optimized for that. A portable unit can encode an SD/HD video input together with an audio channel and send them with a minimum delay through any of the following means of signal transportation:

  - o LAN
  - o WIFI
  - o Internet
  - o 3G/4G networks
  - o Satellite

- **Bidirectional communications**: An Ikusnet unit can send and receive video simultaneously. This unique feature permits to use the codec in other applications different from news gathering, like programs with interviews, commentators, debates... all those where a video and audio feedback is desirable. In addition to this, encoder and decoder (both audio and video) are independent, meaning that the unit is able to send and receive video and audio with different qualities and at different rates.

- **Program + talkback**: the support of a second audio channel enables Ikusnet's users to establish a separate bidirectional audio communication apart from the audio being transmitted on the main video link. This second

audio communication can be used for coordination or as a secondary audio feed to the studio (i.e. ambient sound).

- **News gathering** (store and forward). Many times, an IP connection is not available to make a live contribution. Under those circumstances, the program can be recorded in a compressed file and stored in the SD memory card. Later on, when an IP connection is available, that file can be uploaded to a FTP server or to an Ikusnet ST unit, usually at the studio end.

Chapter III

GETTING STARTED

This chapter is aimed at describing to new users the basic operation to start a video and audio connection over IP between two Ikusnet codecs. The usual application would be the connection of one Ikusnet Portable to one Ikusnet ST codec, but any combinations are possible. The following chapter explains how to connect one Ikusnet Portable to an Ikusnet ST.

All screen shots in this chapter belong to the front touch panel menu of the Ikusnet Portable version, but they can be extended to the embedded web control page, given that the menu structure is exactly the same on both models.

III.1 Turning on the units

Ikusnet Portable can be powered by an external battery, either V-Lock or Anton Bauer, or can be connected to any standard 110/220VDC power supply with the external power adapter supplied with the unit. Ikusnet ST can be connected directly to any standard 110/220VDC power supply as it comes equipped with an internal Power Supply Unit (PSU).

To connect the external power adaptor to Ikusnet Portable and the power cable to the Ikusnet ST unit look for the power inlet on the rear panel (please refer to the pictures below).

To turn on either Ikusnet Portable or Ikusnet ST unit look for the power switch on the rear panel and switch it on.

Picture 9. Ikusnet Portable Power switch and power inlet

Picture 10. Ikusnet ST Power switch and power inlet

III.2 Main menu

Once the units have been turned on, the booting sequence will start. In the Ikusnet ST the Power LED on the front panel will blink indicating that the booting sequence is taking place. Once the unit completes this sequence, both Power and System LEDs will light on Ikusnet ST, and the main menu will be accessible thorough the front panel keypad, just pressing the OK button.

Picture 11. Ikusnet ST main menu.

On Ikusnet Portable, the unit will show the main menu on the touch panel screen as shown in the picture below:
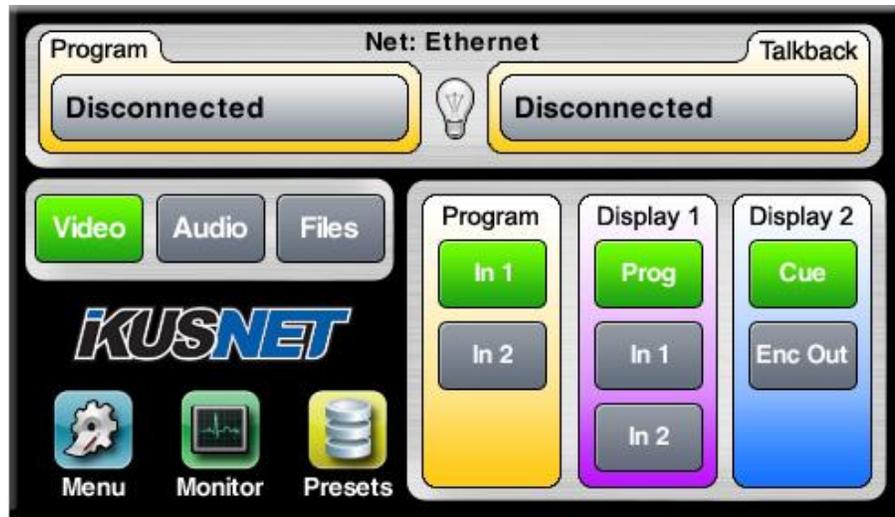
Picture 12. Ikusnet Portable main menu.

NOTE: Take into account that the web control menu of Ikusnet Portable codec is exactly the same as the touch panel menu, and the web interface on Ikusnet ST share most of the structure of Ikusnet Portable codec so, from now on, on this chapter, we are just showing the configuration for the Ikusnet Portable codec and, only in those cases where the configuration between Ikusnet ST and Portable codecs is different, we will notify this with the following picture:

III.3 Web Control Interface

Prodys Ikusnet codecs can be controlled remotely by using an Internet Explorer web browser. The computer can be locally connected directly via a crossover CAT-5 cable, sharing the same Ethernet switch with the codec's LAN interface or remotely via the Internet.

To access the Ikusnet codec from the browser, enter the IP address of the unit in the address bar of Internet Explorer.

Keep in mind that the Ikusnet factory default IP address is 192.168.100.100 and it could be necessary to modify the network configuration of the computer on which the web browser is running the first time.[1]

> **IMPORTANT: Please note that it is possible to enable a second LAN interface (optional). This interface will become the steaming interface while the the first LAN interface (LAN1) will be the interface to control the unit.**

> **IMPORTATANT: The Web browser must be Microsoft Internet Explorer 5.0 o superior.**

The first time the user accesses the Prodys IP Family codec web page, an OCX file has to be downloaded and installed on the computer. *Microsoft Internet Explorer can be configured to block OCX objects installation and/or execution.* So, depending on the configuration of the web browser, the following message can appear when first accessing the Prodys IP Family codec web page:

Go to Internet Options in IExplorer, click on 'Security' tab, and set 'prompt' when downloading ActiveX signed and unsigned controls at Local and Internet zones.

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[1] Ikusnet codecs support a front panel menu that allows the user to check and configure the IP address without having to enter the web control page.

Windows Vista: Should the user experience a problem when downloading the OCX file when first accessing the web page of the unit, *please disable UAC (User Access Control) on Windows Vista.* Once the OCX file has been installed in the computer, UAC can be enabled again.

Each firmware version might have a different OCX file, so the new OCX should be installed with the first access to the new web page version of the unit. When a **unit is upgraded, depending on the 'cache' configuration of the Internet explorer,** there might be problems when accessing the web page, given that the old web page might be offered by the browser instead of the real one, which should be **installed to replace the old one. In this case, a message indicating 'Incorrect Versions' will appear as soon as the user click on 'Control' or 'Monitor' on the** Prodys log**in page. Click on F5 to skip the cache entries, and access to the 'real'** web page. Even after pressing F5 and, depending on the IExplrorer configuration and/or version, this situation might continue. *In that case, go to Internet Options in IExplorer, click* **on 'General' tab, and delete temporary files**.

To access the Prodys IP Family codec from the Internet Explorer enter the IP address of the unit in the address bar as shown here:

The user has to enter the username and password settings to get access to the main web page. The defactory default configuration defines one user whose **name is 'Administrator' with no password associated and with full access to all** configuration settings and menus.

Web Ports: Ikusnet listens to port TCP 80 to give access to the login web page, and once the customer enters the user and password, the unit communicates to the web browser via port TCP 50011 to transmit/receive real time information (it is a dynamic web page).

<div style="border:1px solid #000; background:#ddf2dd; padding:10px;">

About Ports

There are two different ports regarding the web access:

- **Web Server Port**: It is port TCP 80. This port is used to access to the login page.

- **Base Port**: Port TCP 50011. This is the port used by the Internet Explorer browser to send and receive real time information to/from the unit.

</div>

When the user enters the main web page by entering a user name and a password, the following Windows will appear:
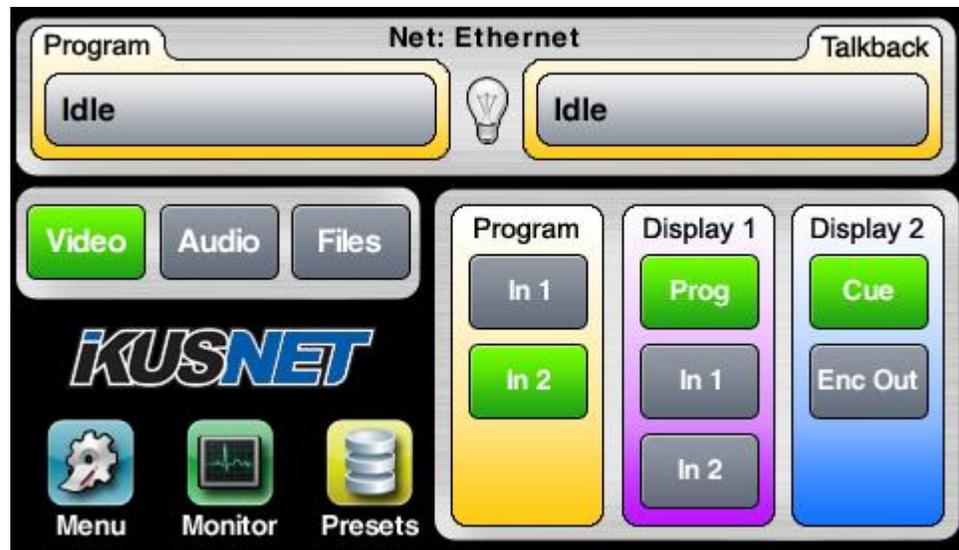
Ikusnet Web page is arranged in three main areas:

- General Configuration area. ❶
- Control area. ❷

■ Monitor area. ❸
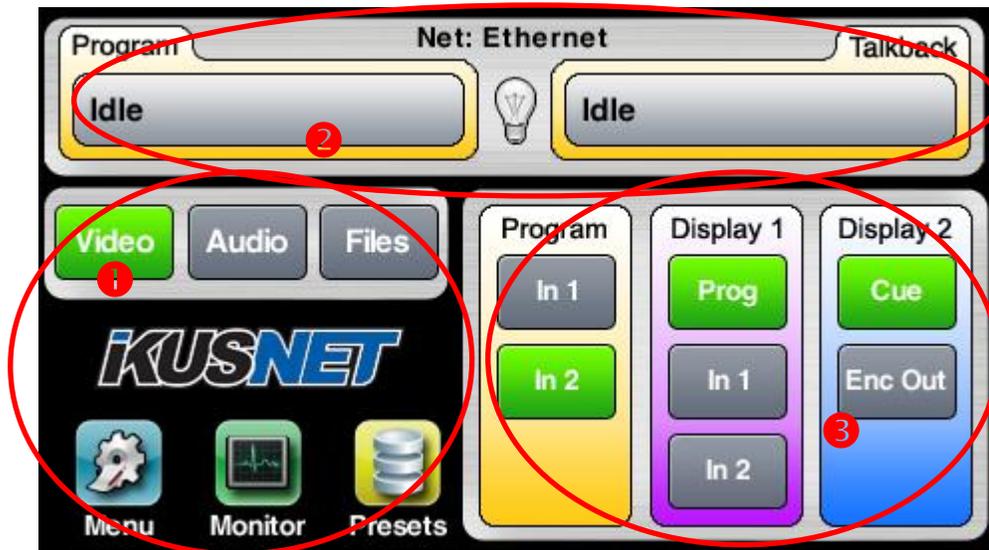
III.3.1 Accesing the web page at the remote codec

Many times it is not possible to access the web page of a remote Ikusnet Portable codec because of firewalls. A typical scenario is one Ikusnet Portable codec connected to the Internet via a 3G/4G link. Even though the user might know the public IP address of that link, it is not possible to access the web page of the unit behind the 3G/4G connection because the 3G/4G network acts as a firewall for incoming connections.

Even in those cases, it is possible to access the web page of a remote Ikusnet Portable unit by accessing the local Studio codec, Ikusnet ST. If the main PROGRAM line (video streaming line) is connected from a remote Ikusnet Portable codec to an Ikusnet ST codec, the user can access the remote web page by accessing the web page of the local Ikusnet ST unit. Please take a look at the image bellow:
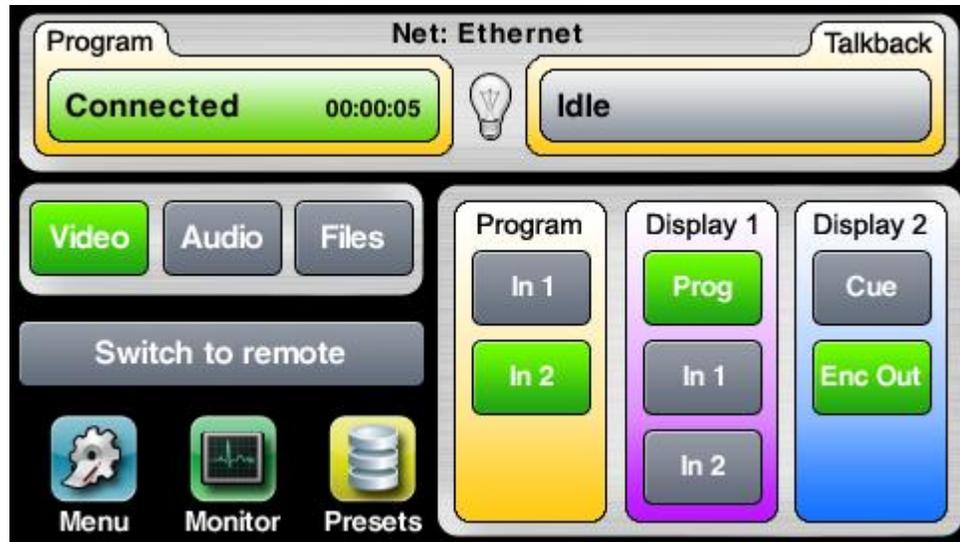
The image above is the main web page of an Ikusnet ST unit. As it can be seen, there is a connection in the main PROGRAM line. That connection allows the user to access the remote codec to which this Ikusnet ST codec is connected to, just **by clicking on the 'Switch to remote' button.**

Once the user click on that button, the web page will switch to the Ikusnet Portable main web page, and a warning message will appear at the bottom of the screen, as in the picture bellow:
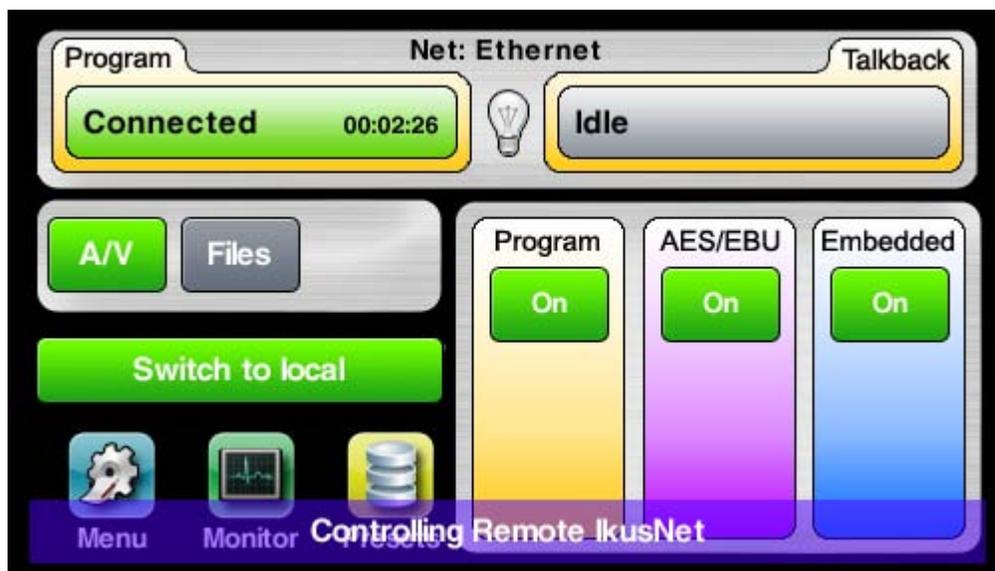
Please note that the button has changed to 'Switch to local' to allow the user to switch control back to Ikusnet ST again.

III.4 Connecting the video camera

Ikusnet Portable supports two video inputs, whilst Ikusnet ST supports only one[2]. In this chapter we will assume that these inputs are of the SDI type, but depending on the model and optionally they might be of some other types, like HDMI, for example.

III.4.1 Connectig the video camera to Ikusnet ST

As it can be seen in the picture below, the video input on Ikusnet ST is located on the rear panel.

Picture 13. Entrada de video 1 (SDI) en Ikusnet ST

When only one video input is available on Ikusnet ST (standard configuration), it is not necessary to enable or select this input for it to be used as the main video feed. Just connect the camera SDI output to the Ikusnet SDI input and that video signal will be the main video feed for Ikusnet ST.

III.4.2 Connecting the video camera to Ikusnet Portable

As it can be seen in the picture below, there are two video inputs on Ikusnet ST and they are located on the rear panel.

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[2] Ikusnet ST might be equipped with a second video input upon request.

Picture 14. Video inputs on the rear panel of Ikusnet Portable

These video inputs can be of some different types. In the picture above, the unit comes equipped with one HDMI input (Video input 1) and one SDI inputs (Video input 2). To connect a video camera to any of these video inputs, just connect the corresponding video camera output to the video input on Ikusnet Portable codec with the corresponding cable depending on the connection type.
Given that Ikusnet Portable codec comes equipped with two video inputs, the user must select which one will be used for the streaming purposes. By default input #1 is always enabled to be the video feed for transmission. In case you are going to use the second video input or both, please refer to chapter III.6 for more information about how to switch from one input to another.

Take into account that Ikusnet Portable supports two monitor screens. The left hand monitor screen shows always a preview of the video feed corresponding to the video input currently selected.

III.5 Setting the IP parameters

We will split this chapter in two different types of interfaces: Wired (Ethernet) and Wireless (3G/4G). WIFI can also be used as a streaming interface but it will not be described within this manual, but in the general manual.

III.5.1 Wired IP connection (Ethernet)

Ikusnet is equipped with one Ethernet interface[3]. This Ethernet interface is fully TCP/UDP/IP standard, and can be connected to any standard IP network, be it local or part of a wide network, such as the Internet.

First of all, the customer will have to set up all IP parameters. These settings will depend on the network topology. The assistance from the IT personnel might be necessary in some advanced networks.

To configure the IP parameters, click on the following icons of the front panel menu or the web page:

The following configuration window will appear:
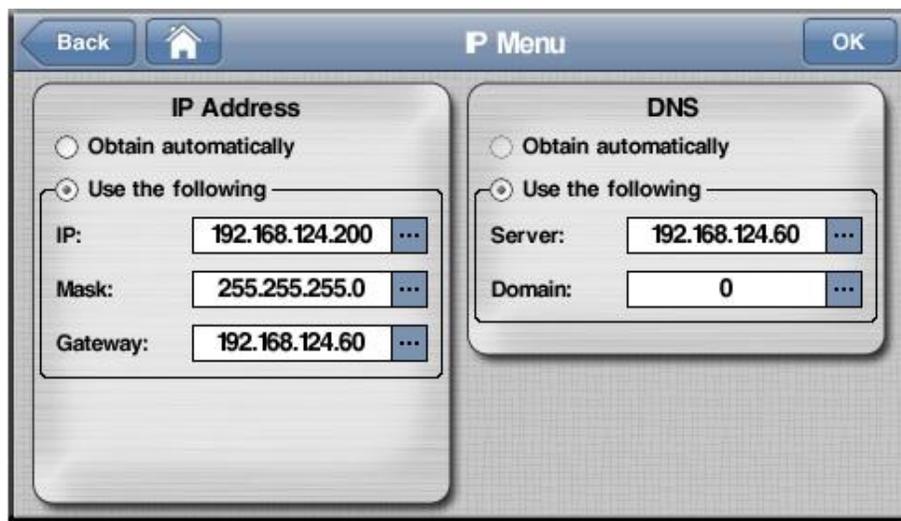
Picture 15. IP Menu.

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[3] Optionally Ikusnet can support a secondary Ethernet interface, allowing the user to split audio and control data, in order to prevent any access from affecting the amount of available bandwidth.

There are two different options: Either to get the IP address automatically from a DHCP server when available, or to set up these IP parameters manually. In the example above, we are configuring them manually. Optionally, the DNS protocol can be configured. It allows the user to use domain like names instead of IP addresses when establishing calls.

NOTE: When the unit is configured to get the IP address automatically from a DHCP server, if no DHCP server is available in the network, the unit will try for a while to get it, **indicating the message 'Negotiating DHCP' on the Program and** TalkBack connection bars on the main menu page and, after that, the default IP address and netmask will be assigned automatically: 192.168.100.100 / 255.255.255.0.

NOTE: It is possible to enable the second LAN interface of the unit to stream the audio and video on that interface and to split up media and control data.

III.5.2 Wireless IP connection (3G/4G)

Ikusnet Portable can be equipped with a Wireless communications module of up to 8 3G/4G data links, supporting up to 8 internal SIM card slots with their corresponding 3G/4G modems and an internal antenna system specifically designed to improve signal reception to strengthen the radio communications. Ikusnet will aggregate the bandwidth available from the different available wireless connections. This technology allows the user to get as much bandwidth as possible by aggregating the capacity of each of the available links. This is done by a proprietary statistical algorithm that evaluates in real time the capacity of each communication link and balance the bandwidth usage of each interface based on that information.

Please find bellow a picture of the Ikusnet Portable 3G/4G Wireless Communications Module:
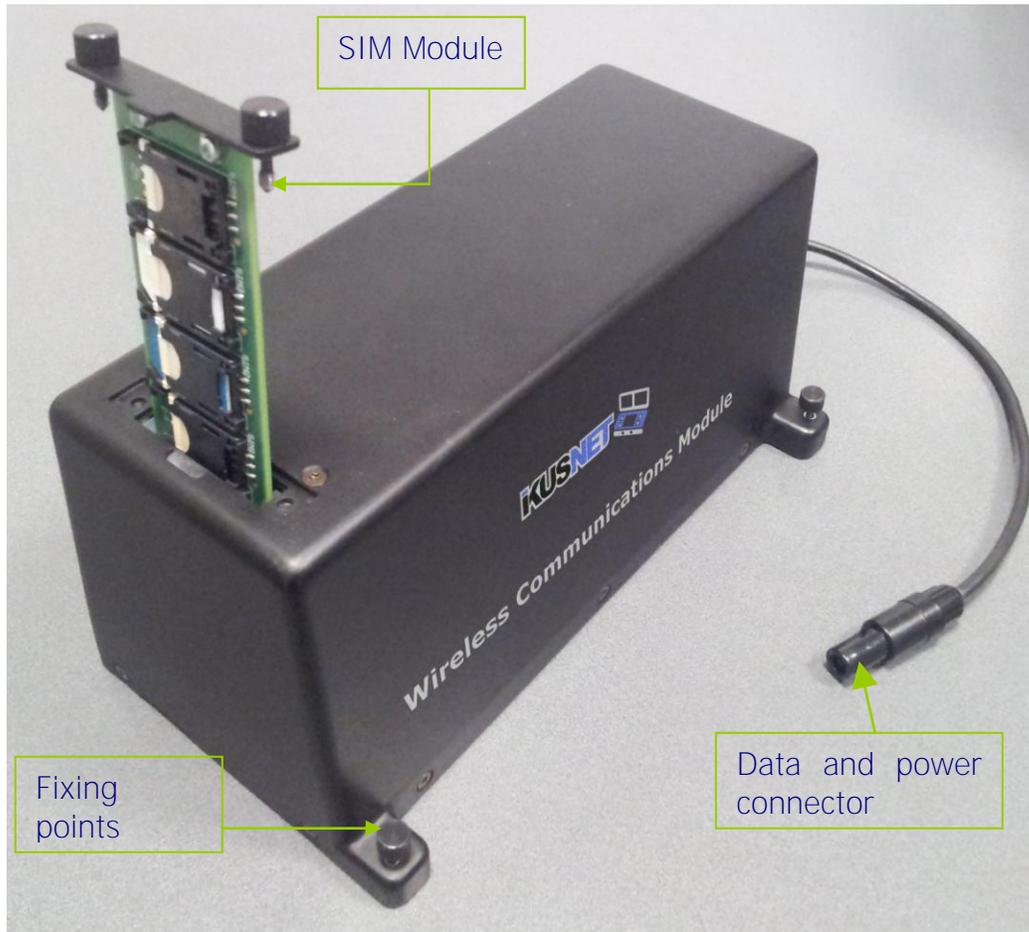
Picture 16. Ikusnet Wireless Communications Module.

The wireless communiations module is composed by the main box (it holds 8 3G/4G modems and the antenna system), the SIM module that holds 8 SIM card slots to insert the different SIM data cards, and the cable and connector that allows the user to hook this module up to the Ikusnet Portable unit. The connector for this module is on the rear panel of the Ikusnet Portable units as it can be seen in the picture bellow:

Picture 17. Rear panel connector for the Wireless Communications Module.

Before connecting the Wireless Communications module to the Ikusnet Portable device, the user must insert those SIM cards available for data connections into the SIM module. The SIM module can be swapped out by unscrewing two bolts on the top cover over Wireless Communications Module. Please take a look at the picture bellow to check the way the different SIM cards are inserted:
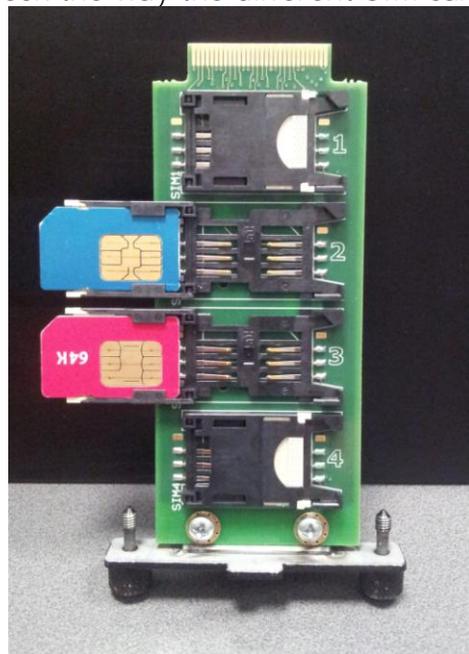
Picture 18. SIM Module.

Each SIM slot in the SIM module has been assigned a number. That number must be taking into consideration when configuring each of the different 3G/4G data connections (APN, user and password) so that the SIM cards and the different configuration parameters match. Once the SIM cards has been inserted into the SIM module, the module is ready to be swapped into the Wireless Communications Module again, and then this module should be connected to the unit on its rear panel.

As soon as the user connects the module, the unit will detect it automatically and will ask for the PIN number of each of the available SIM cards, on either the web interface or the front panel menu. Once the PIN number is entered, it will be checked and kept in memory till the 3G/4G module is disconnected or the unit is restarted.

Once the internal modems are up and running and, in order for the 3G/4G data connection to be used by the unit, the APN (Access Point Name), user and password settings for each mobile network operator being used must be configured by the user. To do that, click on the following icons of the front panel menu or the web page:

The following configuration window will appear:

Picture 19. 3G/4G Menu.

Just click on the corresponding icon to enter the APN configuration window:
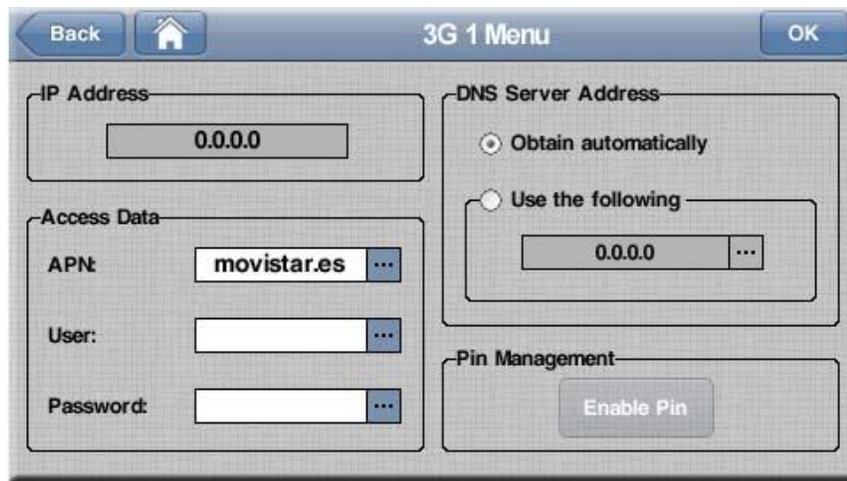
Picture 20. 3G/4G 1 Menu.

In this configuration window the user has to set up the APN (Access Point Name) information, corresponding to the provider of the IP data connection for the 3G/4G modem under configuration. The APN settings are widely available on the Internet for each 3G/4G data provider.

Take into account that the step above must be followed for all internal modems that have been provided with a SIM card in its corresponding SIM card slot. To

get detailed information on the status of the different 3G/4G connections, please take a look at the 3G/4G section in the monitor menu:

Picture 21. 3G/4G Monitor Menu.

III.6 ⬚ Configuring video feeds and monitor screens[4]

Before making the IP connection, the user has to configure the video inputs.
Go to the main menu page and click on the 'Video' button on the left. The main page will appear as follows:

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[4] Ikusnet ST is not equipped with monitor screens, nor with two video inputs, so this configuration only applies to Ikusnet Portable version.
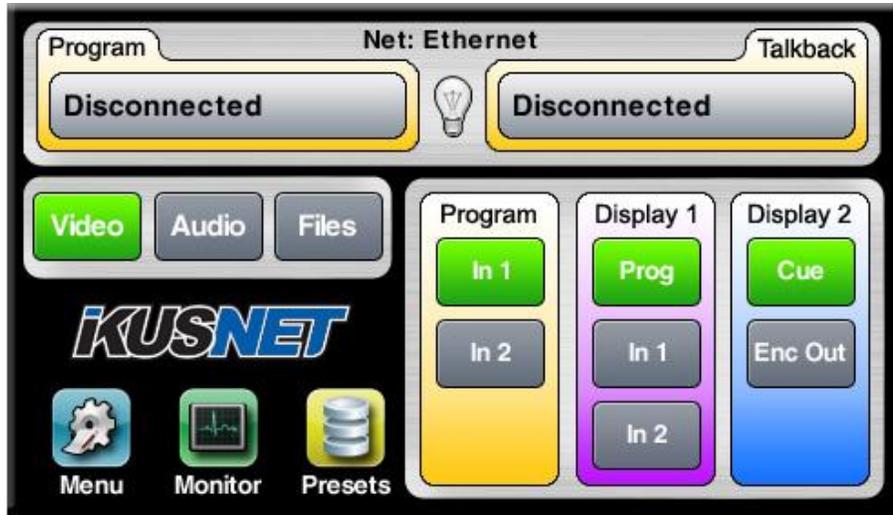
Picture 22. Configuring video feeds and monitor screens.

As can be seen in the picture above, the Video configuration button is enabled and the different video options are displayed on the right area of the screen. The Program column establishes which video input from the two available ones is being used as the main video feed. The other two columns set the video signal to be monitored on displays 1 and 2 respectively. In this example Display 1 will monitor the first video input feed and Display 2 the video signal returned from the far end (when the data connection is bidirectional).

In addition to this, and optionally, the user might have to configure the Format and Aspect Ratio of the video input. For more information about this please refer to chapter IV.6.1

Please, take into account that Ikusnet supports video test signals internally generated in case the customer does not have any video feeds at the time of testing the unit. More information about this on chapter IV.6.2.

III.7 Configuring audio feeds[5]

Click on the Audio button (between the Video and Files buttons) to set up the audio parameters. The following window will appear:

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[5] Ikusnet ST does not support mic inputs, so this configuration only applies to Ikusnet Portable.
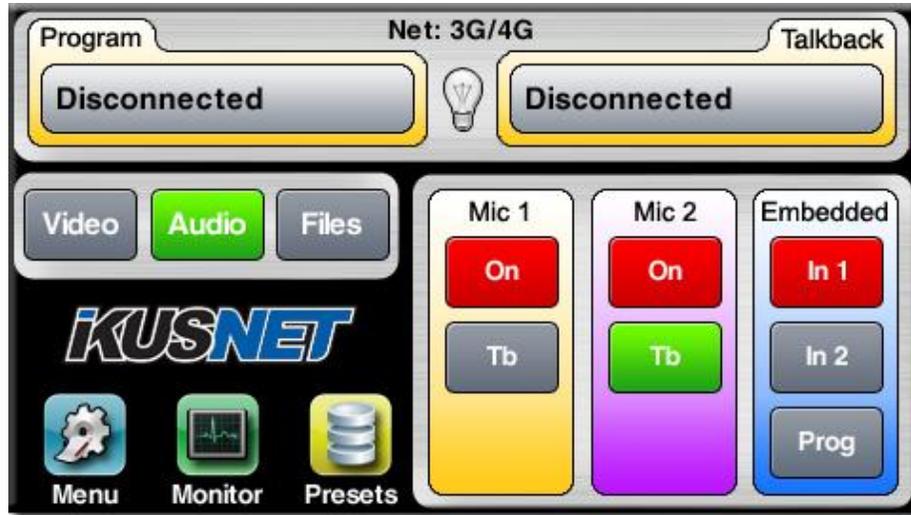
Picture 23. Configuring audio feeds.

The Mic 1 column sets the operation mode for the first audio input. This input can be enabled/disabled by means of the On button, and can be routed to the Program line or the TalkBack line by means of the Tb button. In the example above, Mic 1 input is enabled and mixed with the audio on the Program Line, whilst Mic 2 is enabled and mixed on the TalkBack line.

It is also possible to enable/disable the embedded audio. In this case, the audio embedded in the Video Input #1 will be mixed with the audio inputs enabled for the Program Line.

For more information on audio inputs configuration please refer to chapter IV.7.1

III.8 Configuring audio outputs[6]

It is very important to configure the audio outputs in order for the user to be able to monitor the different audio signals involved in the communication. The following window shows a graphical matrix that allows the user to mix any of the audio signals involved in the communications just by clicking on the different cross points:

---

[6] Ikusnet ST does not support headphone outputs, so this configuration only applies to Ikusnet Portable version.
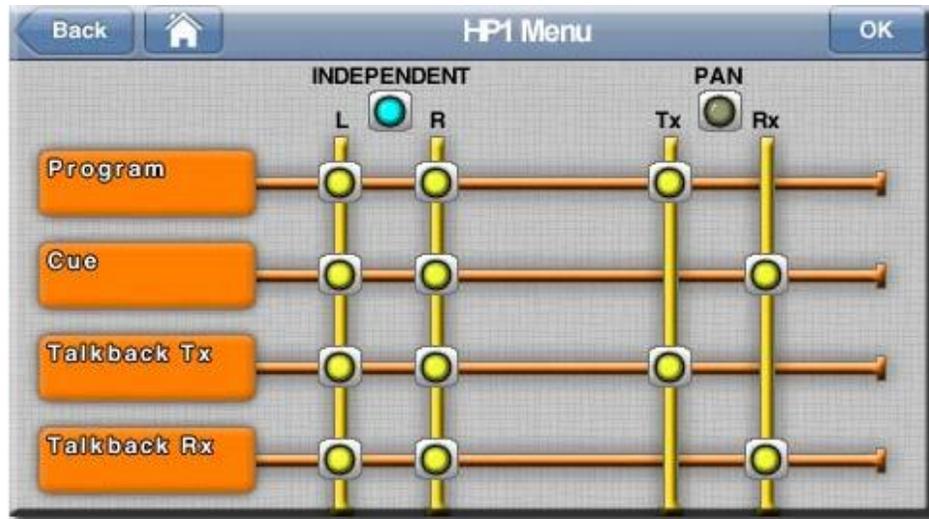
Picture 24. HP1 Menu.

For more information please refer to chapter IV.7.2.

III.9 Configuring the video encoder

Before configuring the video encoder settings, the user must configure the video inputs and the Encoder Mode, either SD or HD[7].

Press the following icons to get into the video configuration menu:

---

[7] Take into account that HD compression is an option and might not be available.

Picture 25. Video Menu.

Click on the Inputs button in the main video menu to access the video inputs configuration window:
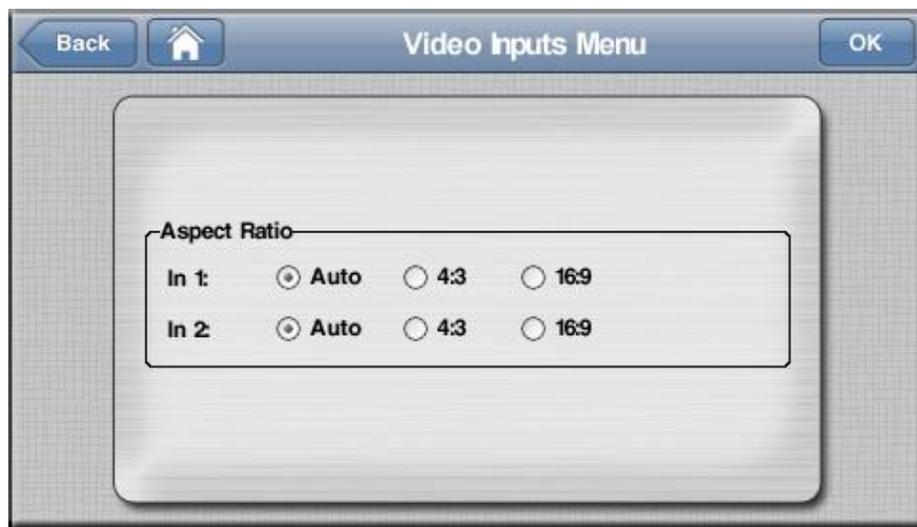
Picture 26. Video inputs menu.

This menu is only available when Encoder Mode is SD and it defines the input aspect ratio (4:3; 16:9 or automatic).

Take into account that when the Encoder Mode is set to SD, and the video input feed is in Standard Definition, PAL and NTSC video format will be automatically detected by the unit.

The user should check the current video input configuration if the *"Invalid Video Input format"* **message is shown on the left screen on Ikusnet Portable, as well as to check on chapter VI.4 the different supported video input formats.**

Following, click on the H.264 Encoder button in the main video menu to access the encoder mode and configuration window:

III.9.1 Video encoder H.264 configuration for Standard Definition Format (SD)

To choose SD encoder mode, click on the SD button. In this mode, the available H.264 encoder parameters for SD are shown.

Picture 27. Video Encoder Menu for SD.

- Resolution   *(from ½ D-1 up to D-1 image resolution)*

Full D-1 720x576	Full D-1 720x480
4CIF 704x576	4SIF 704x480
¾ D-1 544x576	¾ D-1 544x480
½ D-1 352x576	½ D-1 352x480

- Divisor Frame Rate *(encoder frames per second selection)*
- Bitrate   *(video payload bandwidth. From 128kbps until 5Mbps)*
- GOP Structure   *(low delay or best efficiency GOP)*
- Rate control mode *(Constant bit rate or Variable bit rate)*
- Scene   *(Default, Talking Head, Sports and Action)*

NOTE: Take into account that the bit rate configured by the user in this menu will not be used in case the unit is configured to perform automatic adjustment of the encoder bit rate depending on the performance of the network. *This automatic bit rate adaption is the recommended configuration in case the network performance is poor and there are some limitations, like lost packets, high jitter, etc. Please refer to chapter IV.9.5 for more information about the automatic bit rate adaption.*

III.9.2 Video encoder H.264 configuration for High Definition (HD)

To choose HD encoder mode, click on the HD button. In this mode, the available H.264 encoder parameters for HD are shown.
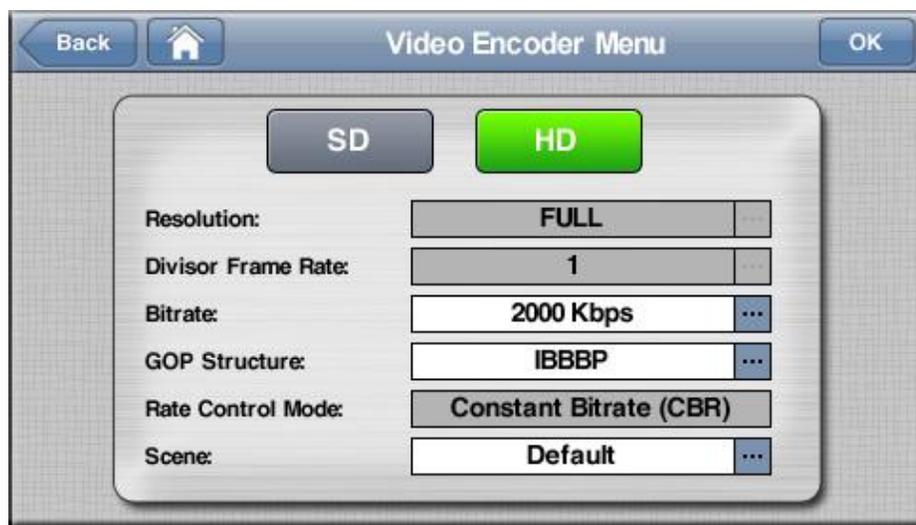
Picture 28. Video Encoder Menu for HD.

- Resolution: (video formats)
- Bitrate   (video payload bandwidth. From 2Mbps to 20Mbps)
- GOP Structure   (low delay or best efficiency GOP)
- Rate control mode   (Constant bit rate or Variable bit rate)
- Scene   (Default, Talking Head, Sports and Action)

NOTE: Take into account that the bit rate configured by the user in this menu will not be used in case the unit is configured to perform automatic adjustment of the encoder bit rate depending on the performance of the network. *This automatic bit rate adaption is the recommended configuration in case the network performance is poor and there are some limitations, like lost packets, high jitter, etc. Please refer to chapter IV.9.5 for more information about the automatic bit rate adaption.*

III.10 Audio Compression

The different audio compression parameters should be configured before the IP connection is established:
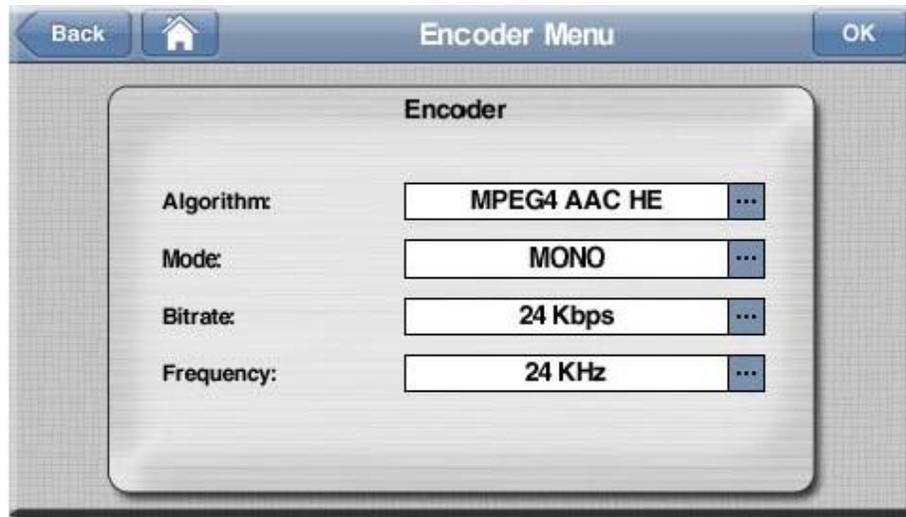
Picture 29. Encoder Menu.

Set the audio compression parameters according to the desired quality and bit rate available. This configuration should be done for all encoders (Program and Talkback Lines).

III.11 Selecting the interface

Ikusnet supports different data interfaces to transmit and receive audio and video. Before making the IP connection the user has to select what data interface will be used for the data connection: Ethernet (wired), 3G/4G (wireless) or custom (a combination of both). In this chapter we will only explain how to set the 3G/4G or the Ethernet interfaces to stream video and audio. For more information about Custom bonding, Ethernet or WIFI interfaces, please refer to chapter IV.9.1.

To select 3G/4G as streaming interface, please click on the following icons on the main menu:
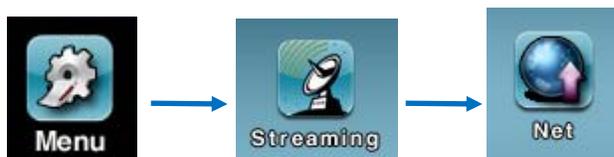
and check the desired interface:

Picture 30. Streaming Net Menu.

If the selected interface is 3G/4G, please take a look at the 3G/4G Monitor Screen to check how many 3G/4G connections have been detected and are properly configured. If the line corresponding to a SIM card does not show a blue colour, that connection will not be available for streaming. It is also important to note that the technology detected by the system for that link will determine the capacity of that connection.
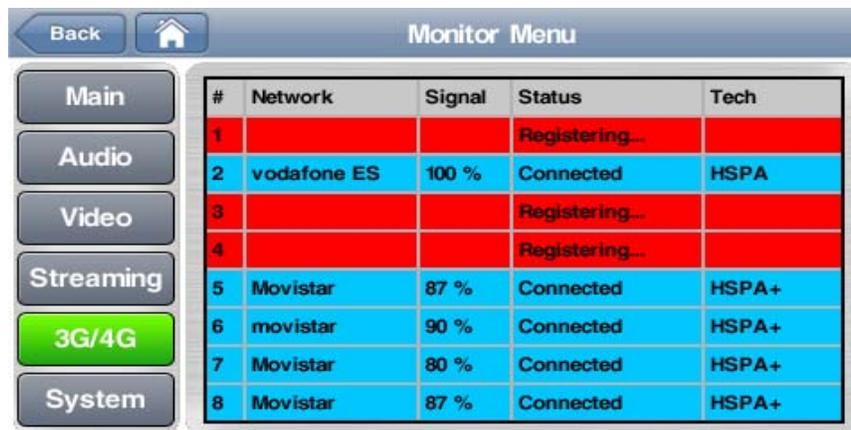
Picture 31. 3G/4G Monitor Menu.

Take into account that when one of those rows shows a red warning line, most likely the reason why it is not connected is because the APN, user and password settings has not been properly configured for that provider on that SIM card, or

that SIM card has not been enabled with a proper data plan to access the internet.

To select Ethernet as streaming interface, please click on the following icons on the main menu:

and check the desired interface:

Picture 32. Streaming Net Menu.

NOTE: When Ethernet is selected as streaming interface, the Ethernet port labelled as LAN1 will be used for control and management whilst the secondary Ethernet port labelled as LAN2 will be used for streaming.

III.12 Establishing the IP connection

Once the IP settings, be it over Ethernet or over 3G/4G, has been properly configured, and the Program and TalkBack connection bars show the word 'IDLE', the unit is ready to establish a call.

Please pay attention if LAN1 or LAN2 must be related to the proper Internet gateway according if LAN2 has been enabled. (please refer to IV.10.2 for details).

Possible communications statuses are:
- Disconnected   *(channel idle; ready for next connection)*
- Connecting   *(establishing the connection)*
- Connected   *(streaming is ongoing)*
- Reconnecting   *(resuming the connection)*
- Down   *(Ethernet or 3G/4G modem not detected)*
- Negotiating DHCP   *(acquiring IP address)*

In order for the user to be able to establish an IP connection, the Program and Talkback connection bars should **show the word 'Idle', meaning that the streaming interface is ready to be used. Otherwise, the message 'Down' would** appear in these bars:

Picture 33. Program and TalkBack connection bars with NET=Ethernet.

When working with 3G/4G as streaming network, or when bonding different interfaces, the information will be similar, but there will be some circles representing each of the different interfaces as in the picture bellow:

Picture 34. Program and TalkBack connection bars with NET=3G/4G.

One red circle means that the corresponding 3G/4G data link is not up and running. Grey means that the connection is fine. As long as one of them is up **and running, the connection bars will show 'Idle', allowing the user to establish a** connection. Otherwise, the connection bars will show **the word 'Down' in a red** background.

Ikusnet can service two independent bidirectional communications:
1. PROGRAM (video & audio)
2. TALKBACK (audio)

The PROGRAM communication includes compressed video as well as synchronous compressed audio contents. The TALKBACK communication provides only an audio communication between the parties.

To establish the first IP connection on the Talkback audio channel, just click on the TalkBack connection bar. The dial window will appear as follows:

Picture 35. TalkBack Dial Window

Just enter the destination IP address, the type of call, and the connection Profile **and press the 'Call' button.**

To establish the connection on the main Program line, just click on the Program connection bar. The dial window will appear as follows:

Picture 36. Program Dial Window.

Just enter the destination IP address, the type of call, and the connection Profile and press the 'Call' button.

The connection Profiles can be configured by the user (refer to chapter TODO), and they define the buffer (i.e. the delay) at the receiving end. The longer the buffer the more protection against packet losses and jitter but the longer the delay. The shorter the buffer, the less protection but the shorter the delay. The key point in being able to adjust this parameter from the calling end is that most likely the user who really knows what the capacity for the current IP link being used for streaming is will be the user that is establishing the call. If no profiles are selected, the buffer at the receiver end will keep its current configuration.

Prodys always recommends to start testing with different profiles before doing a live contribution when the capacity of the network is unknown or can vary depending on non managed external factors like the number of people sharing the same IP data connections at the same time.

The destination address can be dialed manually or can be chosen from the phone book, from the recently dialed addresses or from those discovered in the same network. By pressing at the right side of the destination box in the Dial Window (click on the '…' button), the following dialing window will appear:
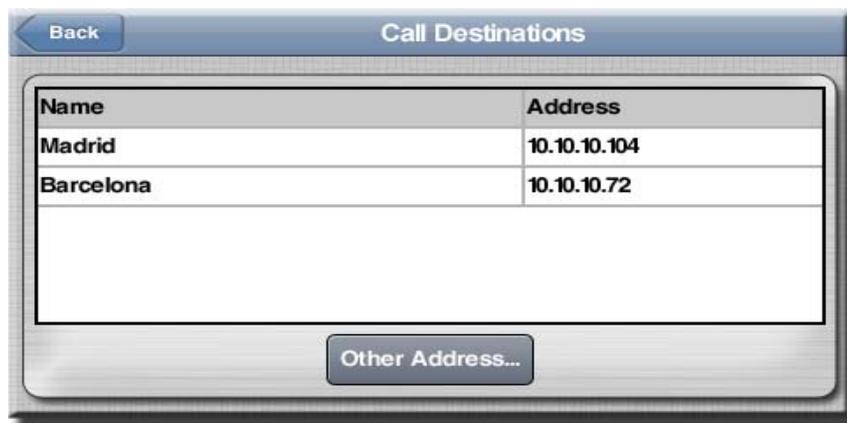
Picture 37. Phone book Dial Window.

We can either select one entry of the phone book or press on 'Other Address…' button to get the following window:
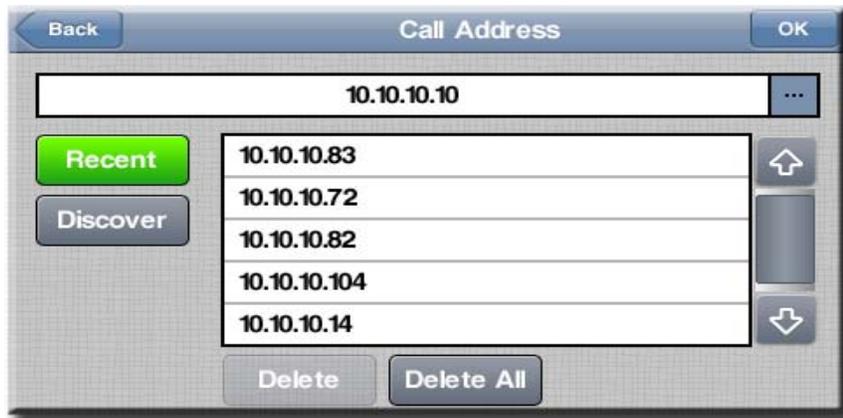
Picture 38. Other destinations, Dial Window

By pressing on 'Recent', the user will be able to select the destination from a list of previous destinations:
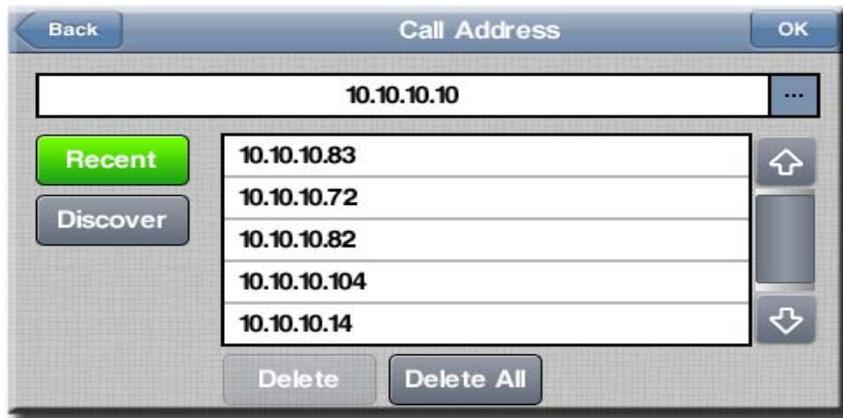
Picture 39. Recent destinations, Dial Window.

We can select any of those destinations or even click on 'Discover' to get a list of all compatible units detected in the local network.

Once the destination has been either manually entered or chosen from any of the available lists, just click on the 'OK' button and the 'Call' button at the main Dialing Window and the connection will be established.

If the connection gets through, the connection bar for the connected line will light on green and will show the word 'Connected' and the duration of the connection:

Picture 40. Program and TalkBack connection bars when NET=Ethernet.

This indicates that the Program line has been established and it is connected to the far end.

When establishing a connection over one or several wireless connections, the unit will bond the bandwidth available from all available wireless data links automatically, meaning that the user does not have to make a call for each data link, but just only one for all of them. As it can be seen bellow, the connection bar will show with a small circle in green what 3G/4G connections are properly connected when it is on green color.

If the user attempts to establish a call and it does not go through, a brief description of the reason will be shown on the connection bar:

Picture 41. Cuase of disconnection.

III.12.1 Bit rate configuration

When establishing a connection over 3G/4G, the unit will try to use as much bandwidth as possible by bonding the different wireless data links. Once the connection is established, if one of the 3G/4G links becomes very unstable or unavailable for any reason, the unit will detect it and transmit all data on the rest of interfaces preventing data losses.

In networks like 3G/4G or XDSL lines where the capacity of the link is shared between different users and/or the quality of the connection might depend on many different factors that might make the capacity of network very unstable, one of the most important parameters to configure is the bit rate. The more bit

rate the better the quality, but the more network capacity we need to transmit the same video contents.

Prodys always recommends the user to use AUTO bit rate configuration when working with such type of IP links:
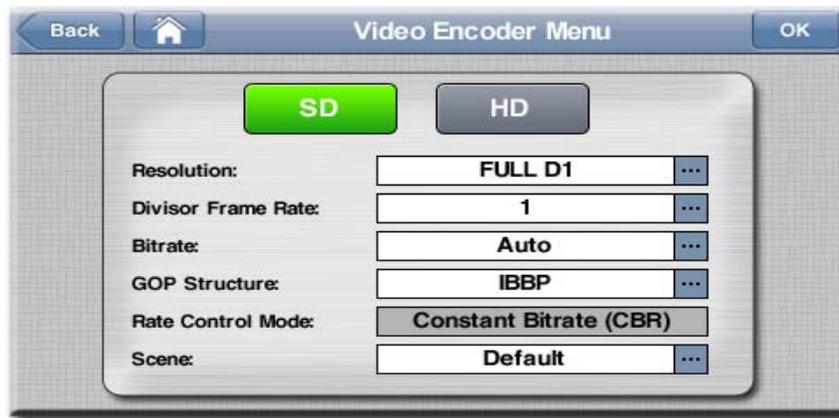
Picture 42. Video Encoder Configuration.

When the user select AUTO in the bit rate configuration for video encoder settings, the unit will adapt automatically the bit rate depending on the quality of the network. Prodys always recommend using this setting when the capacity of the network is not fixed or it is not within a very well known limits.

To get more information about the video encoder configuration please refer to chapter IV.6.2.

III.13 Monitoring the status of the connection

Once the connection has been established successfully, the user can monitor the performance of the link by means of the Real Time Network Analyzer on the Streaming Tab of the Monitor Section:

Picture 43. Monitor Menu.

This screen allows the user to access in real time and during the connection to some crucial parameters of the IP network performance, such as lost, recovered and obsolete packets, jitter, roundtrip… This information is offered for each interface involved in the communication and for the local and the remote terminal, so the user can monitor the remote end reception as well.

For more information on this please refer to chapter IV.15.

III.14 Finishing the connection

The communication might be stopped at any time by clicking the corresponding connection bar, either the Program or the Talkback bar.

III.15 File menu

Both Ikusnet Portable and Ikusnet ST share the same functionalities regarding **file operation and they all will be described briefly here (please refer to the 'File menu' chapter in the Ikusnet User Manual to get more information), with only** some minor differences that we will be mentioning along this chapter.

Users might perform the following actions:

- Compression and recording of the video input on a file.
- Recording a backup file of important contributions while streaming the live event to the studio.
- Uploading of recorded files via standard FTP to a file server or to Ikusnet ST.
- File edition : **'Top and tail' edition is available, allowing the user to** select a piece of a file that was previously recorded in the unit. This option is available only on Ikusnet Portable and only on the front panel interface.
- Local play out of previously recorded or edited files.

The user has to take into account that Ikusnet Portable and Ikusnet ST units might have different storage systems to allow the user to operate with files. For example, by default, Ikusnet Portable unit supports a SD memory slot, allowing the user to insert and use a SD memory card (SDHC type). Ikusnet ST, on the contrary, does not support any SD memory slots but it can optionally be equipped with an internal hard disk or can work with an external memory stick connected to one of its USB interfaces at the rear panel.

Picture 44. Ikusnet Files Menu.

III.15.1 File recording menu

Three actions might be controlled from this menu:

- To start the file recording, press on the button with the red circle. The file format and extension is <>.mp4 compatible with most edition and media player software.
- Stopping the recording is performed by pressing the button with the grey square on it.

Picture 45. File Recording Menu.

- Set the audio and video compression parameters to be used when recording while the main Program stream is not connected. The user has **to press the 'Settings' button. Take into** account that when the main Program Line is connected, the unit will use the same audio and video compression configuration as configured for the audio/video stream (see chapter III.8).
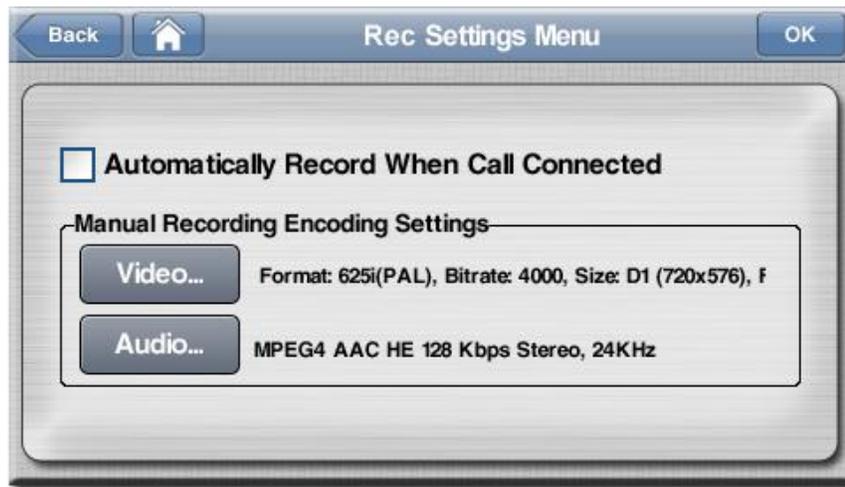
Picture 46. Rec Settings Menu

It is also possible to enable the **'Automatically Record When Call Connected'** option that sets the unit to record all audio and video contents being streamed on the main Program Line on a file. Take into account that the audio and video compression configuration taken for the file recording will be that of the audio and video streaming.

III.15.2 File upload menu
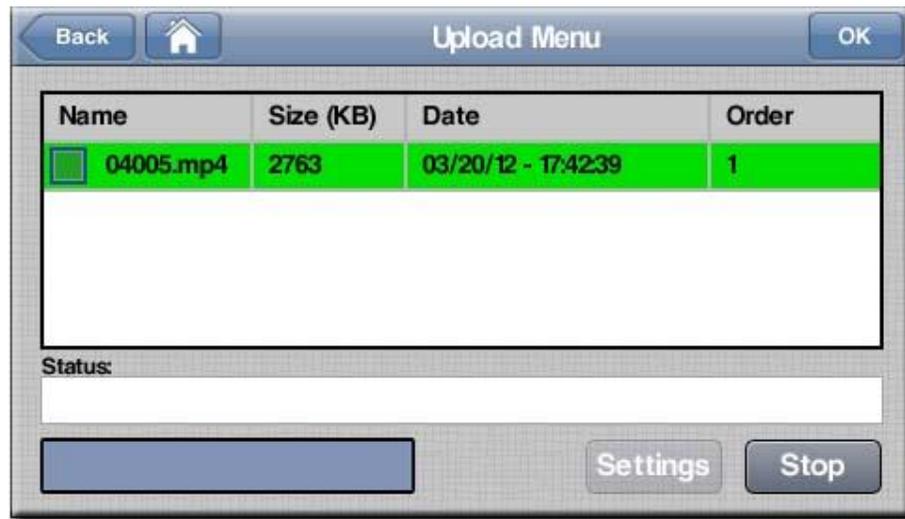
Picture 47. File Upload Menu.

Any file accessible by the unit in any of its storage means might be uploaded to an FTP server or to the internal storage of an Ikusnet ST. This can be configured in the <Settings> submenu.
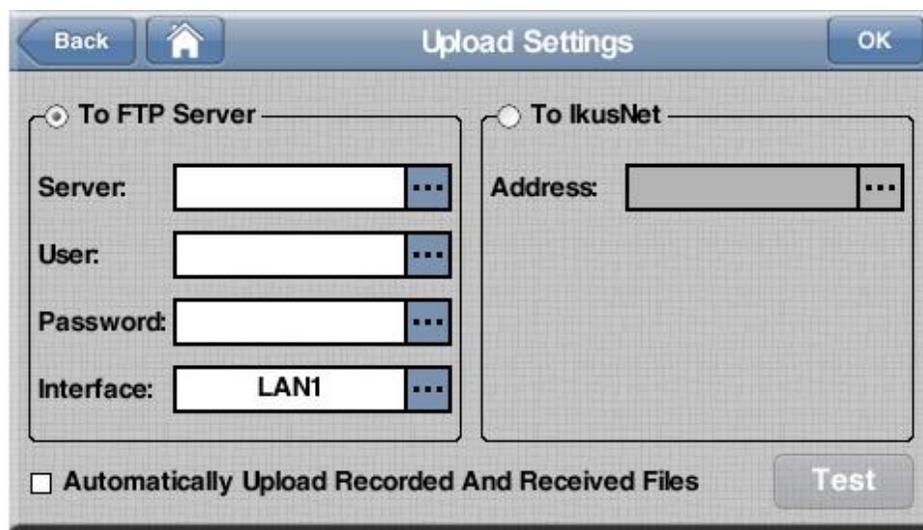
Picture 48. FTP Upload Settings Menu.

In the <Settings> submenu the uploading destination can be chosen between an FTP server or an Ikusnet ST.

If a FTP server is chosen, the FTP address and the user access rights must be filled in. Those are permanently valid unless modified by the user. It is also possible to specify which communication interface is going to be used: LAN1, LAN2 or 3G/4G. If 3G/4G is chosen, the transmission will be done through a single 3G/4G data wireless connection, the first available following an increasing order, as it is not possible to upload any files to an FTP server using 3G/4G **'bonding' (bandwidth aggr**egation).

If FTP upload to an Ikusnet ST is chosen, it is sufficient to indicate the IP address of that codec. The communications interface will be the one being in use by the codec at the time, so this mode does allow the usage of 3G/4G bonding or even "custom" bonding, thus performing bandwidth aggregation and resulting in a much faster file transfer than with any conventional IP link.

Once the file is in the Ikusnet ST unit, a second FTP upload can be configured to transfer automatically any incoming files to a FTP server automatically.

In fact, the option 'Automatically upload recorded and received files' enables the automatic transmission of any files that have been recorded or received from other units (Ikusnet ST or Ikusnet Portable codec). The file transmission will be performed according to the Upload Settings menu.

III.15.3 File player menu
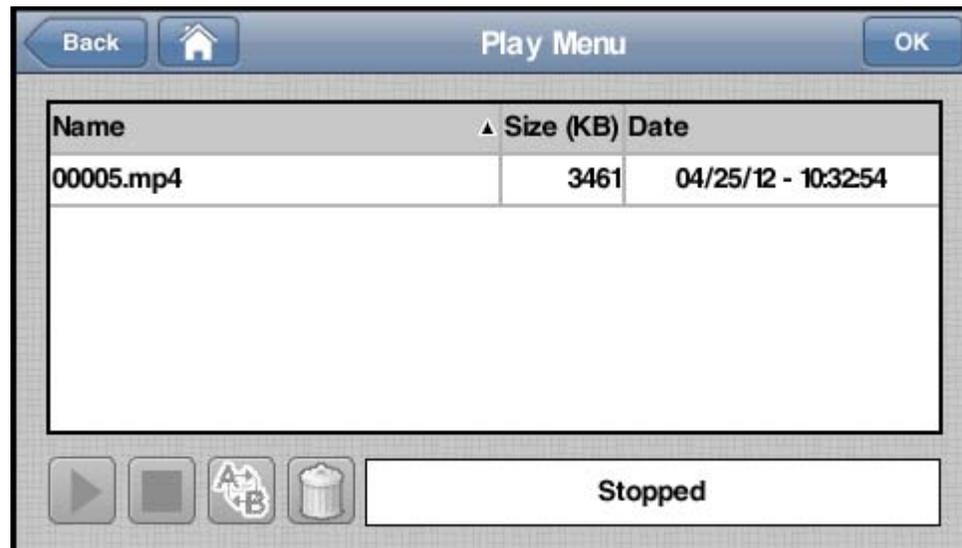
Picture 49. File Play Menu.

To play a file and preview it on the right hand monitor screen, just select one the available files and use the play and stop buttons on the tool bar at the bottom to start and stop playing the file. The right monitor screen will show the file contents when playing from an Ikusnet Portable unit, and it will be available on the video output available on both Ikusnet Portable and Ikusnet ST units.

III.15.4 File editor

The file editor menu is only accessible via the front panel menu on Ikusnet Portable device. To enter the file editor, select one file press the button:

Picture 50. File operations menu on the Ikusnet Portable front panel.

Once the file editor is opened, the user will be able to define a piece of the selected file by using the rotary controls at the right and left sides of the touch panel screen of the Ikusnet Portable unit, and by previewing the selected frames on the right hand monitor screen.

Picture 51. File editor.

When moving the right hand rotary control on the front panel, the left bar on the bar at the bottom will go back and forth selecting what part of the top of the file

will be left out of the selection. The same will be done for the tail of the file when moving the right hand rotary control.

Once the selection is done, click on the play button to preview the selection on the right hand monitor screen or save the selection to a file.

Chapter IV

OPERATION GUIDE

IV.1 Communications

Ikusnet can service two independent bidirectional communications:
   3. PROGRAM (video & audio)
   4. TALKBACK (audio)

Both communications have to share the same physical medium. This is: both are driven over Ethernet or 3G/4G medium.

The PROGRAM communication includes compressed video as well as synchronous compressed audio contents. The TALKBACK communication provides only an audio communication between the parties.

Each communication is operated and displays its actual status by means of a touch button on the main screen.

Picture 52. Connection bars.

Possible communications statuses are:
   ▪ Disconnected   *(channel idle; ready for next connection)*
   ▪ Connecting   *(establishing the connection)*
   ▪ Connected   *(streaming is ongoing)*
   ▪ Reconnecting   *(resuming the connection)*
   ▪ Down   *(Ethernet or 3G/4G modem not detected)*
   ▪ Negotiating DHCP   *(acquiring IP address)*

In 3G/4G mode or Custom mode, the communication bars show a series of points, one for each of the participant interfaces in the communication. These

points are grey when the interface is detected but the link is disconnected; green when the link is active and red when the link is down. When a point blinks is because communication is being established in that interface

Picture 53. Connection bars in 3G/4G and Custom mode.

IV.2 Ikusnet Portable VIDEO input /output menu tabs

The left-hand <video> menu tab provides input and output options on the right hand menu for Program, Display 1 and Display 2.
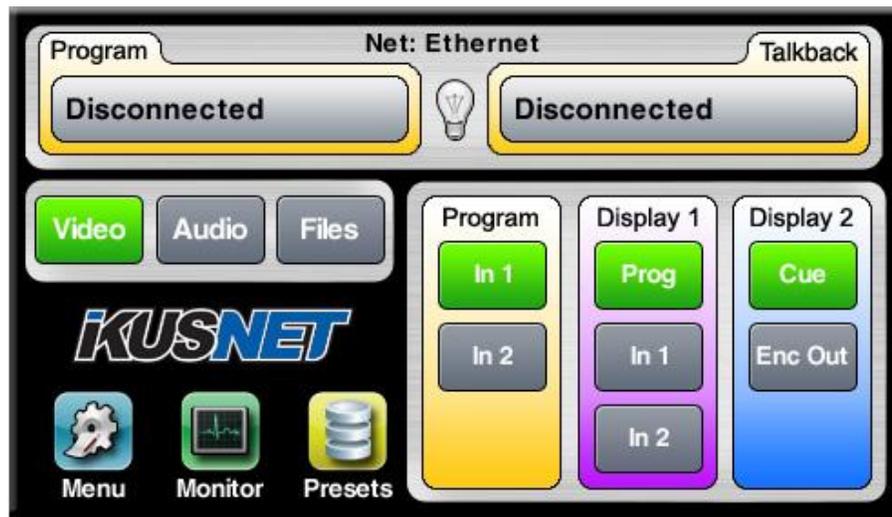
Picture 54. Main menu video configuration.

IV.2.1 PROGRAM video input selector

Two video sources might be connected to the Ikusnet Portable, Video In1 and Video In2. The user selects which input will be compressed and streamed out on the PROGRAM channel.

It is possible to switch from one input source to another during the connection. Best switching results are achieved if both video sources get synchronized externally.

NOTE: If the unit is equipped with the 'HD Video' option and the video input feed on Video Input #1 is of HD format, Video Input #2 format must be the same as in Video Input #1 in order for the unit to allow the user to switch between both video inputs.

IV.2.2 Display 1 output selector

Three options are available for the left hand monitor.
- Video In1   *(Left display monitors permanently video input source 1)*
- Video In2   *(Left display monitors permanently video input source 2)*
- PROG   *(Left display monitors the active streaming video source)*

IV.2.3 Display 2 output selector

Two options are available for the right hand monitor.
- CUE

  (Displays received video from the remote side if a bidirectional communication is active.)
- ENC OUT

  (Gives a local feedback of how the active video source after compression looks like.)

IV.3 Ikusnet Portable AUDIO mixer input menu tab

The left-hand <audio> menu tab provides audio mixing options on the right hand menu for the PROGRAM and the TALKBACK channel.
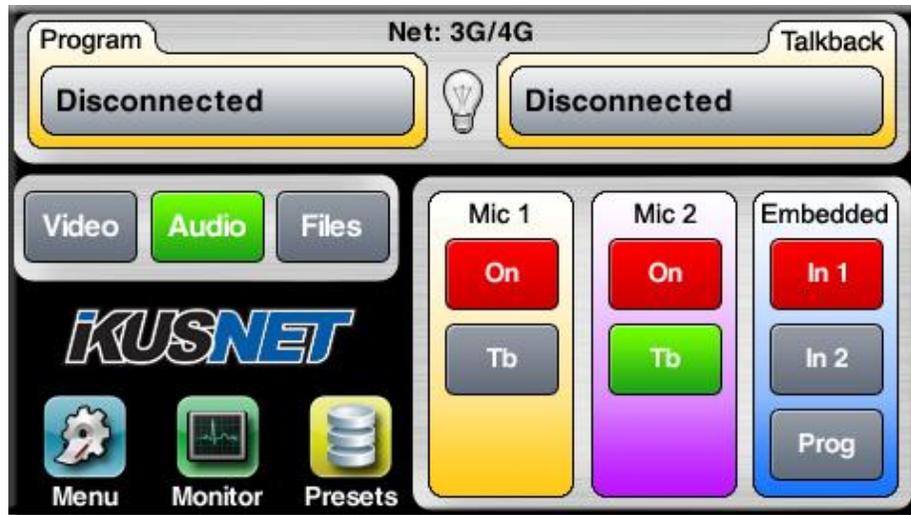
Picture 55. Main Menu audio configuration.

MIC1 and /or MIC2 simply enabled <ON> (red) mix those audio inputs with the PROGRAM audio channel.

MIC1 and /or MIC2 double enabled <ON> & <TB> (red & green) mix those audio inputs with the TALKBACK audio channel.

<Video In1> and /or <VideoIn2> simply enabled (red) mix the audio embedded with Video input #1 and Video Input #2 on the PROGRAM audio channel.

<Prog> simply enabled (red) will take the audio from the selected video feed, following automatically any changes in the video input feed selection.

IV.4 Ikusnet ST VIDEO & AUDIO input /output menu tab

The Ikusnet ST main menu supports less options than its counterpart Ikusnet Portable, given that it does not support mic/line audio inputs and monitor screens.

To access the main audio/video input/output menu, just click on the <A/V> button on the left side of the main menu screen.
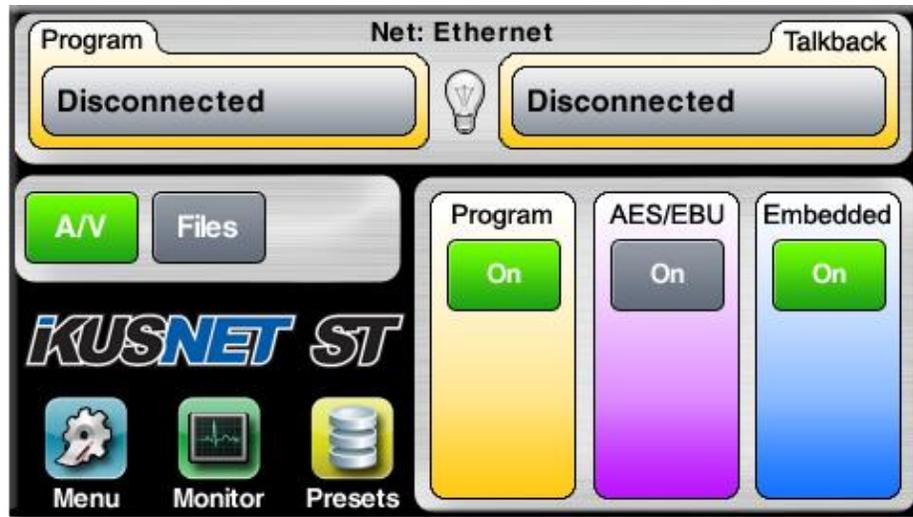
Picture 56. Ikusnet ST Audio and Video Menu.

Program enabled <ON> (green) enables the video and audio compression of the signal on the Video Input #1.

The AES/EBU-Program enabled <ON> (green) mixes this audio source together with the PROGRAM channel.

The Embeded Audio enabled <ON> (green) takes the embedded audio signal within the video feed and mixes it on the PROGRAM channel.

The AES/EBU-Talkback is automatically enabled if the TALKBACK channel is connected.

IV.5 File menu

Both Ikusnet Portable and Ikusnet ST share the same functionalities regarding file operation and they all will be described here, with only some minor differences that we will be mentioning along this chapter.

Ikusnet is a live contribution system, but the File menu adds further powerful capabilities to this product.

NOTE: When one action regarding files is taking place and, in order to warn the user about such activity, the FILE led on the front panel of Ikusnet Portable will

blink and so will the FILE button on the web interface and on the front panel menu of the Ikusnet Portable.

Users might perform the following actions:

- Recording of live events for later edition and transmission. The user might switch between the two video inputs during the recording.
- Recording a backup file of important contributions while streaming the live event to the studio. In this mode the video quality (encoder configuration) will match for both output feeds: streaming and file recording.
- Uploading of recorded files via standard FTP to a file server or to Ikusnet ST. When sending files from Ikusnet Portable to Ikusnet ST (not to a standard FTP server), bandwidth aggregation of up to 11 different IP interfaces is allowed, thus providing very fast file uploading. Once files reach Ikusnet ST, the studio codec can be configured to upload any incoming files automatically to a FTP server that might be located in the same internal network.
- File edition : 'Top and tail' edition is available, allowing the user to select a piece of a file that was previously recorded in the unit. With the help of the right hand display the user can preview the selected frames to decide what should be let in the selection. That selection can be saved to a different file. This option is available only on Ikusnet Portable and only on the front panel interface.
- Local play out of previously recorded or edited files. Take into account that the contents of the file can be played out and monitored on the right hand monitor screen, and this video signal will also be available on the video outputs, so that it can feed another external video device. When playing a file on the Ikusnet ST, this video signal can be monitored on the video output available on the rear panel. This option is only available when the PROGRAM line is disconnected only.

The user has to take into account that Ikusnet Portable and Ikusnet ST units might have different storage systems to allow the user to operate with files. For example, by default, Ikusnet Portable unit supports a SD memory slot, allowing the user to insert and use a SD memory card (SDHC type). Ikusnet ST, on the contrary, does not support any SD memory slots but it can optionally be equipped with an internal hard disk or can work with an external memory stick connected to one of its USB interfaces at the rear panel.

Picture 57. Ikusnet Files Menu.

IV.5.1 File recording menu

Three actions might be controlled from this menu:

- To start the file recording, press on the button with the red circle. Starting the recording of the actual PROGRAM channel content in the available storage system. The fail will get a name automatically, but that name can be edited later on by the user. The file format and extension is < >.mp4 compatible with most edition and media player software.
- Stopping the recording is performed by pressing the button with the grey square on it.

Picture 58. File Recording Menu.

- ▪ Set the audio and video compression parameters to be used when recording while the main Program stream is not connected. The user has **to press the 'Settings' button in the picture above and a new configuration** window will appear where the user will be able to set the audio and video compression parameters for recording. Take into account that when the main Program Line is connected, the unit will use the same audio and video compression configuration as configured for the audio/video stream (see chapter III.8).
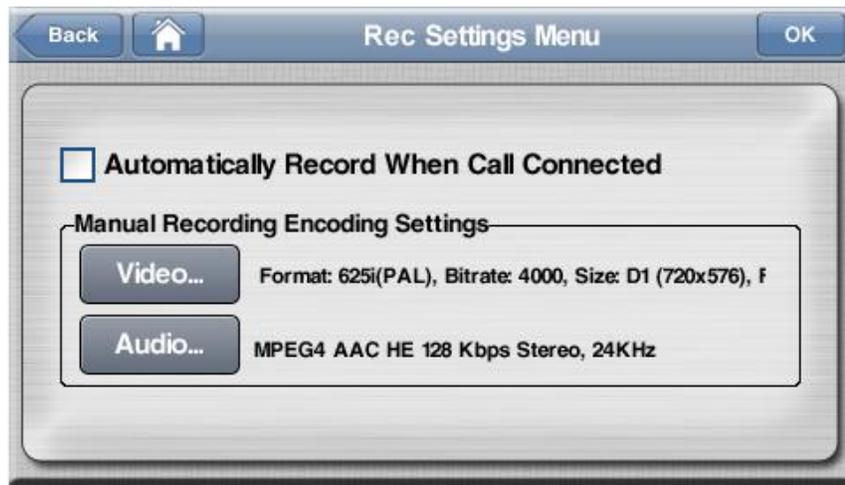
Picture 59. Rec Settings Menu

It is also possible to enable the **'Automatically Record When Call Connected'** option that sets the unit to record all audio and video contents being streamed on the main Program Line on a file. Take into account that the audio and video compression configuration taken for the file recording will be that of the audio and video streaming (see chapter III.8).

IV.5.2 File upload menu

This menu gives access to the embedded FTP client which can upload via FTP protocol one or several files. The order of the files in the list can also be configured.
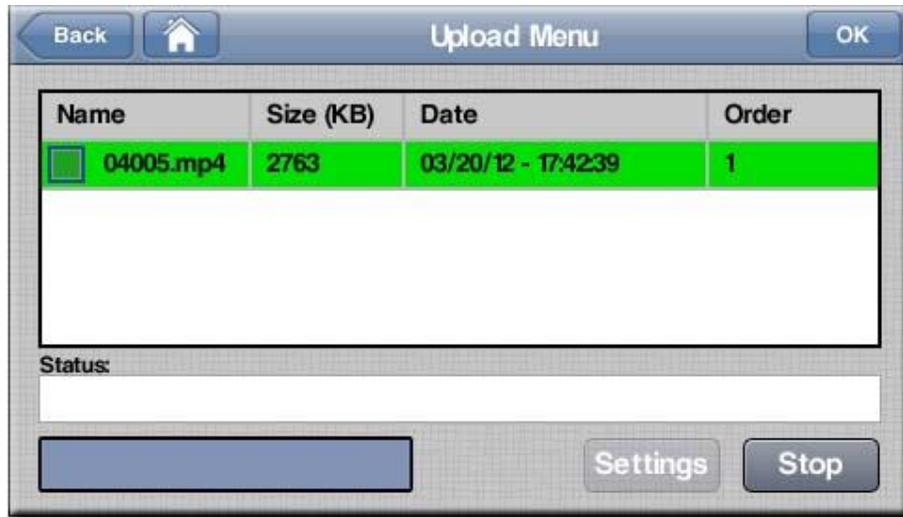
Picture 60. File Upload Menu.

Any file accessible by the unit in any of its storage means might be uploaded to an FTP server or to the internal storage of an Ikusnet ST. This can be configured in the <Settings> submenu.
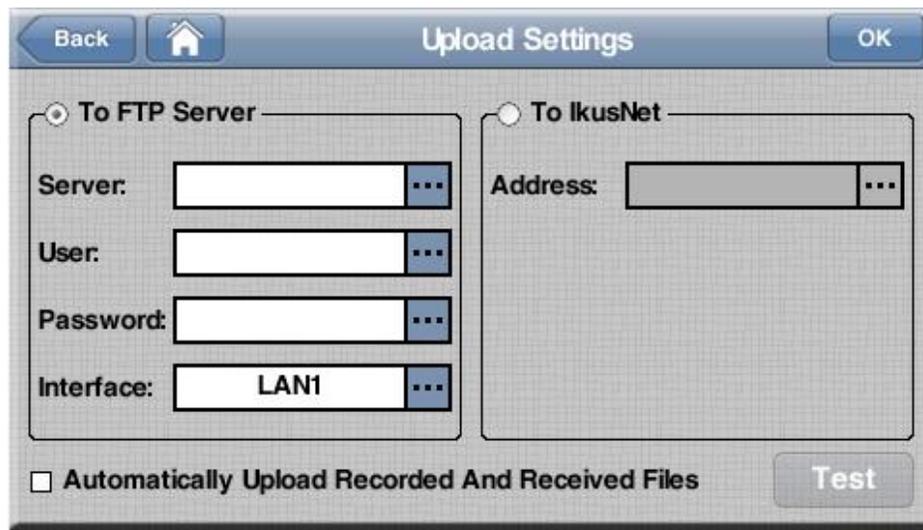
Picture 61. FTP Upload Settings Menu.

In the <Settings> submenu the uploading destination can be chosen between an FTP server or an Ikusnet ST.

If a FTP server is chosen, the FTP address and the user access rights must be filled in. Those are permanently valid unless modified by the user. It is also possible to specify which communication interface is going to be used: LAN1, LAN2 or 3G/4G. If 3G/4G is chosen, the transmission will be done through a single 3G/4G data wireless connection, the first available following an increasing order, as it is not possible to upload any files to an FTP server using 3G/4G 'bonding' (bandwidth aggregation).

If FTP upload to an Ikusnet ST is chosen, it is sufficient to indicate the IP address of that codec. The communications interface will be the one being in use by the codec at the time, so this mode does allow the usage of 3G/4G bonding or even "custom" bonding, thus performing bandwidth aggregation and resulting in a much faster file transfer than with any conventional IP link.

Once the file is in the Ikusnet ST unit, a second FTP upload can be configured to transfer automatically any incoming files to a FTP server automatically.

In fact, the option 'Automatically upload recorded and received files' enables the automatic transmission of any files that have been recorded or received from other units (Ikusnet ST or Ikusnet Portable codec). The file transmission will be performed according to the Upload Settings menu.

NOTE: Ikusnet units are able to receive up to ten file uploads simultaneously.

IV.5.3 File player menu
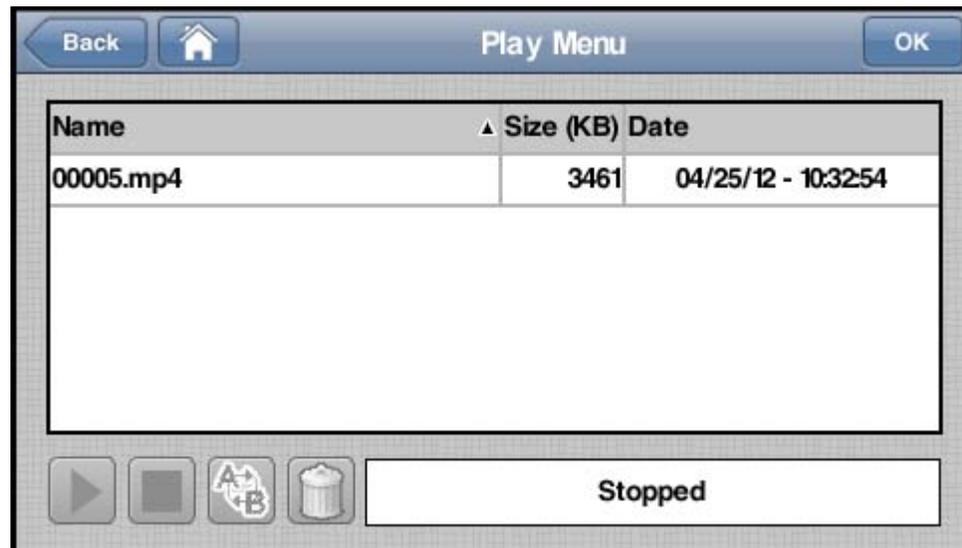
Picture 62. File Play Menu.

To play a file and preview it on the right hand monitor screen, just select one the available files and use the play and stop buttons on the tool bar at the bottom to start and stop playing the file. The right monitor screen will show the file contents when playing from an Ikusnet Portable unit, and it will be available on the video output available on both Ikusnet Portable and Ikusnet ST units.

The play menu provides also some icons for renaming or dismissing the selected file.

IV.5.4 File editor

The file editor menu is only accessible via the front panel menu on Ikusnet Portable device. To enter the file editor, select one file press the button:

Picture 63. File operations menu on the Ikusnet Portable front panel.

Once the file editor is opened, the user will be able to define a piece of the selected file by using the rotary controls at the right and left sides of the touch panel screen of the Ikusnet Portable unit. These buttons will be enabled automatically to do so, and a blue led will light on to indicate it. By moving those rotary controls the user will be able to select the top and tail parts to remove from the original selection, and with the help of the right hand monitor screen, the user can preview the selected parts of the video file that will be left out, and those that we remain in the selection. That selection can be saved to a file for a later edition or transmission.

Picture 64. File editor.

When moving the right hand rotary control on the front panel, the left bar on the bar at the bottom will go back and forth selecting what part of the top of the file will be left out of the selection. The same will be done for the tail of the file when moving the right hand rotary control. The right hand monitor screen will show the frames corresponding with the part of the file being selected by the black vertical bar at the top or tail parts of the selection.

Once the selection is done, click on the play button to preview the selection on the right hand monitor screen or save the selection to a file.

IV.5.5 File Monitor

The File Monitor Windows allows the user to monitor any activity regarding files, like uploads, previews, transmission, reception or recording. To enter the File Monitor click on the monitor icon in the File Menu:

Picture 65. Ikusnet Files Menu.

The File Monitor window will show and describe the different operations carried out in real time regarding files. As an example, see bellow a screen shot of the Monitor File Window when one file is being recorded on the SD card of the Ikusnet Portable unit from the web interface and another file is being edited from the front panel menu.

Picture 66. File Monitor Window.

IV.6 Video options menu

Click on the following icons to enter the video configuration window:

Picture 67. Video Menu.

IV.6.1 Video inputs configuration

Click on the Inputs button in the main video menu to access the video inputs configuration window:
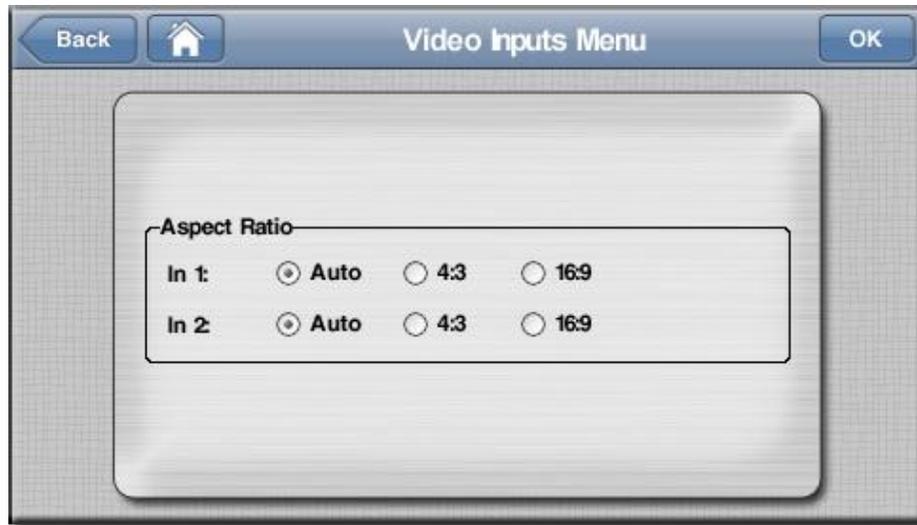
Picture 68. Video inputs menu.

This menu is only available when Encoder Mode is SD and it defines the input aspect ratio (4:3; 16:9 or automatic).

Take into account that when the Encoder Mode is set to SD, and the video input feed is in Standard Definition, PAL and NTSC video format will be automatically detected by the unit.

The user should check the current video input configuration if the *"Invalid Video Input format"* message is shown on the left screen on Ikusnet Portable, as well as to check on chapter VI.4 the different supported video input formats.

Here follows the different configuration windows for the Mpeg4 video encoder when the resolution is SD or HD.

IV.6.2 Video encoder H.264 configuration for Standard Definition Format (SD)

To choose SD encoder mode, click on the SD button. In this mode, the available H.264 encoder parameters for SD are shown.
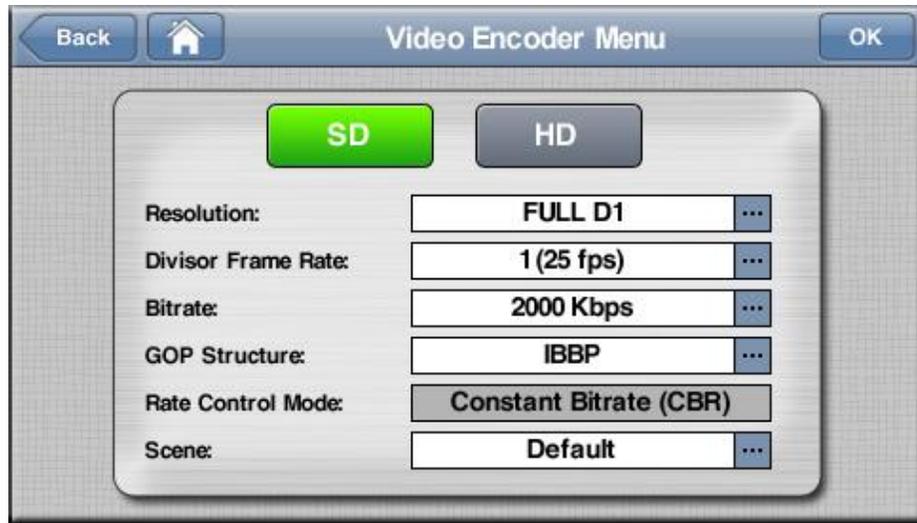
Picture 69. Video Encoder Menu for SD.

- Resolution   *(from ½ D-1 up to D-1 image resolution [8])*

Full D-1 720x576
4CIF 704x576
¾ D-1 544x576
½ D-1 352x576

Full D-1 720x480
4SIF 704x480
¾ D-1 544x480
½ D-1 352x480

- Divisor Frame Rate *(encoder frames per second selection)*
- Bitrate   *(video payload bandwidth. From 128kbps until 5Mbps)*
- GOP Structure   *(low delay or best efficiency GOP [9])*
- Rate control mode   *(Constant bit rate or Variable bit rate [10])*
- Scene   *(Default, Talking Head, Sports and Action [11])*

---

[8] For very narrow streaming bandwidths, lowering the resolution improves sometimes the perceived moving picture quality.

[9] Best delay is achieved with IP GOP structure; while the best quality compression is achieved with IBBP GOP structure. Please check appendix A for further information.

[10] CBR or Constant Bit Rate is convenient for most transmissions mediums. VBR or Variable Bit Rate is convenient for file storage or if the streaming connection is allowed to overshoot 50% of the average bandwidth.

[11] This parameter optimizes the video compression for the scene involved. The "Sport" scene improves quick movements and homogenous backgrounds like tennis courts or football fields.

NOTE: Take into account that the bit rate configured by the user in this menu will not be used in case the unit is configured to perform automatic adjustment of the encoder bit rate depending on the performance of the network (AUTO selection in the bit rate configuration menu). *This automatic bit rate adaption is the recommended configuration in case the network performance is poor and there are some limitations, like lost packets, high jitter, etc. Please refer to chapter IV.9.5 for more information about the automatic bit rate adaption.*

IV.6.3 Video encoder H.264 configuration for High Definition (HD)

To choose HD encoder mode, click on the HD button. In this mode, the available H.264 encoder parameters for HD are shown.
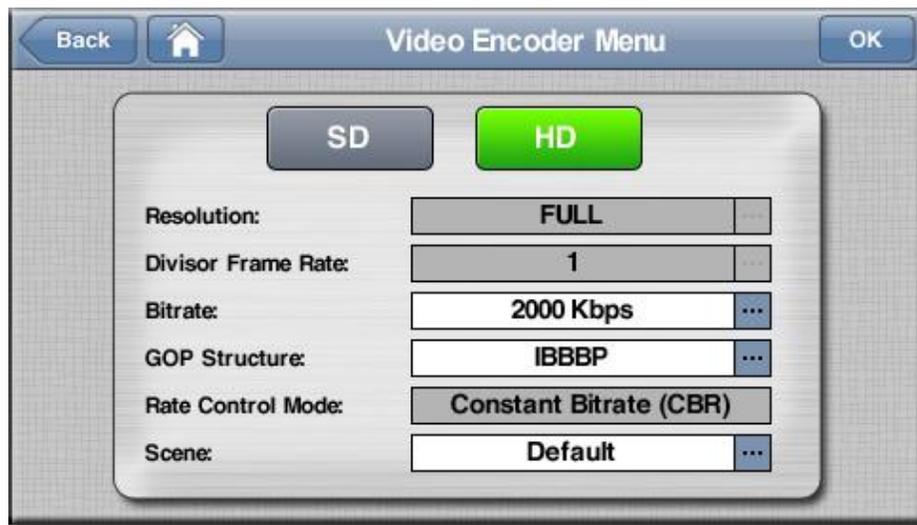
Picture 70. Video Encoder Menu for HD.

- Resolution: *(video formats)*
- Bitrate   *(video payload bandwidth. From 2Mbps to 20Mbps)*
- GOP Structure   *(low delay or best efficiency GOP [12])*

The "Action" scene improves sudden light conditions of the scenes like camera flashing or quick movement.

[12] Best delay is achieved with IP GOP structure; while the best quality compression is achieved with IBBBP GOP structure. Please check appendix A for further information.

- Rate control mode *(Constant bit rate or Variable bit rate [13])*
- Scene   *(Default, Talking Head, Sports and Action [14])*

NOTE: Take into account that the bit rate configured by the user in this menu will not be used in case the unit is configured to perform automatic adjustment of the encoder bit rate depending on the performance of the network (AUTO selection in the bit rate configuration menu). *This automatic bit rate adaption is the recommended configuration in case the network performance is poor and there are some limitations, like lost packets, high jitter, etc. Please refer to chapter IV.9.5 for more information about the automatic bit rate adaption.*

IV.6.4 Video output configuration (Only Ikusnet ST)

From the video output configuration menu the user can activate the genlock. The activation of this option enables synchronization of the video outputs signals to an external Sync signal. This GenLock input on Ikusnet ST supports locking to a Black Burst synchronization type signal (for SD) or a Tri-level synchronization type signal (for HD). The user must take into account that when a SD PAL mode video signal is being decoded, it is not possible to lock the video outputs signals to a NTSC Black Burst synchronization signal and vice versa.

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[13] CBR or Constant Bit Rate is convenient for most transmissions mediums. VBR or Variable Bit Rate is convenient for file storage or if the streaming connection is allowed to overshoot 50% of the average bandwidth.

[14] This parameter optimizes the video compression for the scene involved. The "Sport" scene improves quick movements and homogenous backgrounds like tennis courts or football fields. The "Action" scene improves sudden light conditions of the scenes like camera flashing or quick movement.
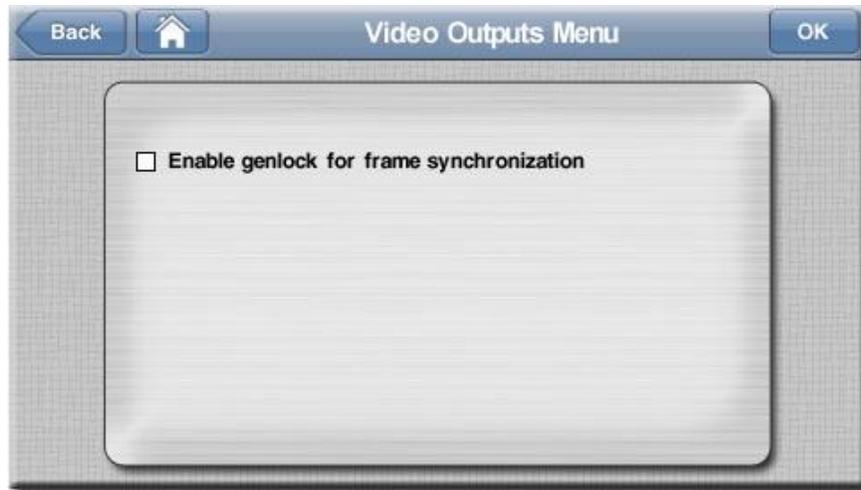
Picture 71. Video Outputs Menu.

IV.6.5 Video test functions

This menu provides a set of tools for testing the video inputs and outputs.

Picture 72. Video Test Menu.

By enabling the Loop Video IN -> Video out, the unit will forward the video and audio signal on the Video input to the Video outputs, without any signal processing.

It is also possible to enable the input or output colour bar tests. When enabling the input colour bar test, the input will not take the video signal from the video inputs, but it will generate internally a colour bar test video signal.

Likewise, the unit can be configured to feed the video outputs with a colour bar test video signal, instead of taking the output of the video decoder.

These two test tools are very helpful to check that both video input and output interfaces are working properly, isolating these tests from any external factor related to the encoding/transport/decoding of the video and audio data. The colour bar signal can be generated in PAL or NTSC.

IV.7 Audio options menu

Click on the following icons to enter the audio configuration window:

Picture 73. Audio Menu.

IV.7.1 Mic /Line inputs configuration

This menu defines if the front XLR inputs are pre-amplified as microphone level inputs or as line level inputs. From this menu it also possible to enable phantom power (48V).

Picture 74. Audio inputs menu for Ikusnet Portable.

NOTE: In a Ikusnet ST, this menu allows the user to choose between the analogue and the AES/EBU digital input for the talkback signal.

Picture 75. Audio inputs menu for Ikusnet ST.

IV.7.2 Audio headphone output configuration

This menu defines the Portable Ikusnet headphone configuration[15].
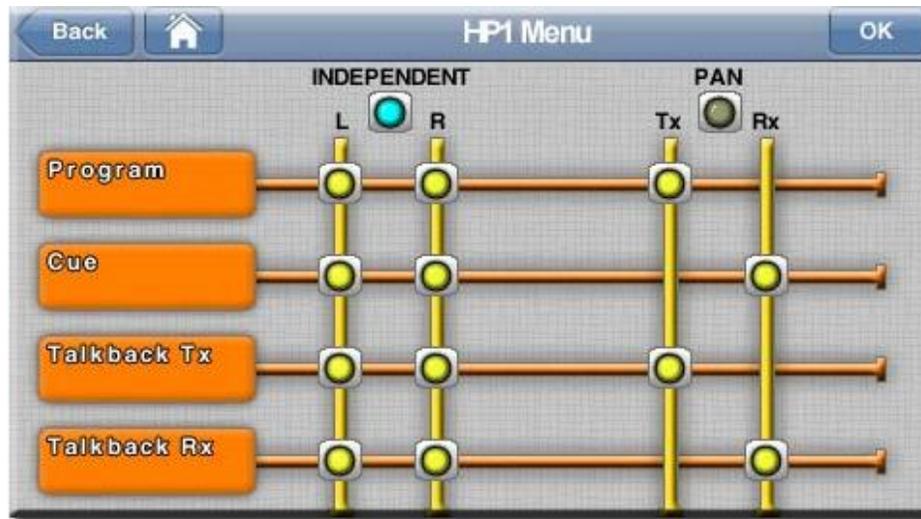
Picture 76. HP Menu.

This audio matrix allows the user to configure the signals to monitor on the headphones just by clicking on the corresponding cross points[16]:

- Program   *(transmitted audio signal of the PROGRAM channel)*
- Cue   *(received audio signal of the PROGRAM channel)*
- Talkback TX   *(transmitted audio signal of the TALKBACK channel)*
- Talkback RX   *(received audio signal of the TALKBACK channel)*

The user can choose first which mode, L & R <independent> or <PAN>, is preferred. The PAN mode enables modify the gain ratio between transmitted and received signal levels.

---

[15] For the Studio Ikusnet the <Audio output> menu specifies parameters of the AES/EBU audio output interface instead of the headphone configuration.

[16] Please remind PROGRAM and TALKBACK channels are bidirectional, but the selection matrix allows one-way monitoring.

IV.7.2.1. **Headphone L & R independent control**

The headphone audio level can be adjusted independently for each ear. This mode is especially useful when L and R signals on the headphones are not related (binaural monitoring) and it is the more convenient configuration in most applications.

The Headphone level controls are locked to prevent from unwanted changes. To unlock it, press the button in the middle and the current level gain for the left ear will be displayed on the screen. In addition, the central button will be illuminated by a blue LED to indicate that the rotary control is unlocked. Click again to access the level control for the right ear. Pressing again will confirm any changes and close this configuration window. This level control will be locked again automatically after 3 seconds without touching the controls, or after pressing the button until the blue light switches off.

Press softly on the round control and turn it to the left or to the right to decrease or increase the gain.

IV.7.2.2. **Headphone panoramic control**

This control is preferred for users uncomfortable with binaural monitoring that prefer to hear the same signal on the left and right ears.

This mode is useful if the user wishes to balance the relative level between transmission and reception signals. Firstly, the user should configure what signals take part on the transmission group and what signals take part on the reception. To do that, just click on the cross points at the right area of the following picture (PAN area) and select what signals will be added to TX and RX parts.
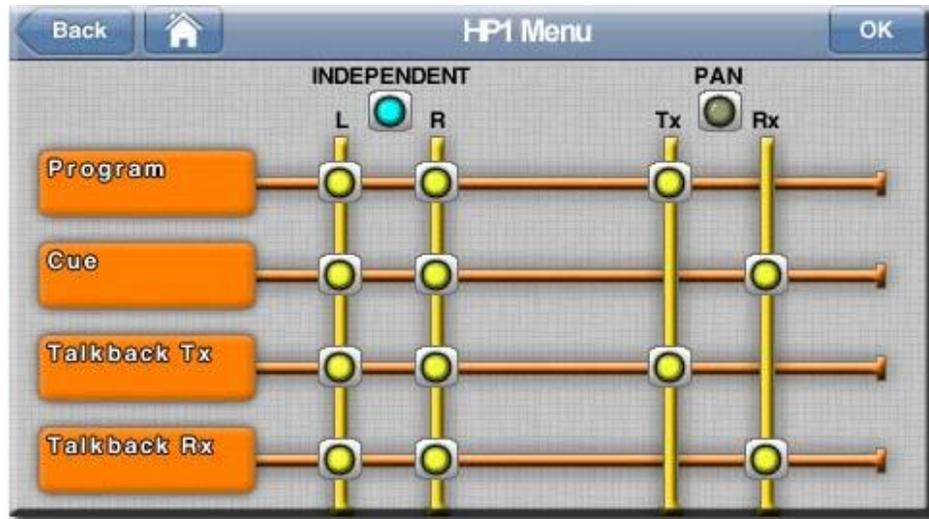
Picture 77. HP Menu.

The Headphone level controls are locked to prevent from unwanted changes. To unlock it, press the button in the middle and the current level gain for both the left ear and the right ear will be displayed on the screen. In addition, a round led around the button will light on blue to indicate that the control is unlocked.

Press softly on the round control and turn it to the left or to the right to decrease or increase the gain. To balance the relative level of the Tx and Rx audio signals **press again the middle button, the L and R' leds will start blinking, indicating that** the current audio level configuration is to balance the relative levels of Tx and Rx signals. The display will show the relative level as in the examples below:
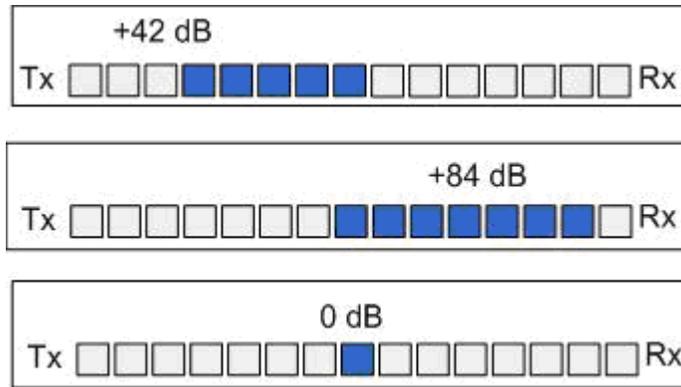
Picture 78. Relative level indication on the display.

IV.7.3 Audio encoders

This menu defines the compression parameters for the PROGRAM <encoder 1> and the TALKBACK <encoder 2> channels.

- Algorithm   *(MPEG4 HE AAC, AAC ELD or AAC LC)*
- Mode   *(Mono, Stereo or Joint Stereo [17])*
- Bitrate   *(audio payload bandwidth. From 24 until 384kbps)*
- Frequency   *(audio sampling)*

IV.7.4 Audio test functions

This menu provides a set of test tones in order to check the audio inputs and outputs of the unit.

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[17] The TALKBACK channel allows only MONO.
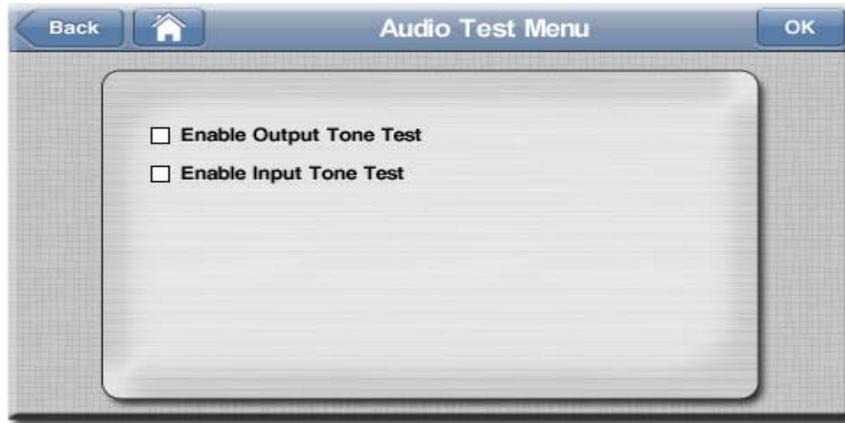
Picture 79. Audio Test Menu.

By enabling the output tone test, the user will generate and feed the audio outputs with an internally generated test tone signal instead of getting the audio from the decoder.

When the user enables the input tone test, the unit will use an internally generated test tone signal instead of getting the audio which comes embedded into the video signal.

IV.8 Menú Misc

This menu allows the user to control several different parameters related the audio mixer of Ikusnet Portable unit.
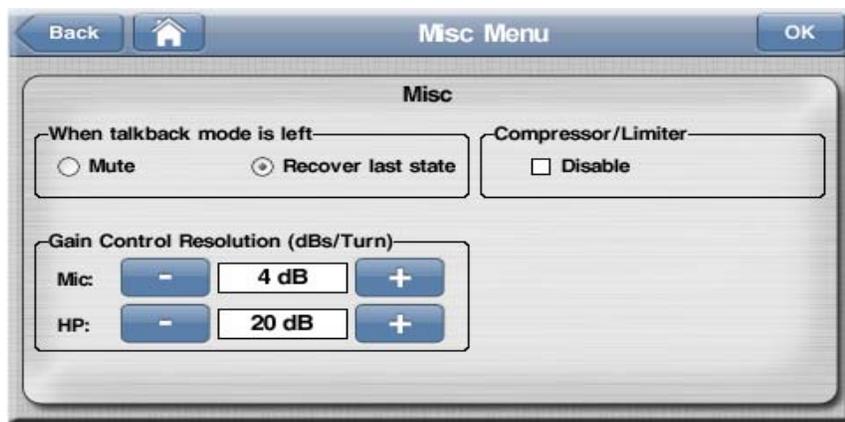
Picture 80. Misc Menu.

'When talkback mode is left': This option allows the user to define the behaviour of the MIC/Line level audio inputs of Ikusnet Portable unit when these audio inputs were assigned to the TalkBack audio channel and the user disable it by means of the TB button. At that time, the corresponding input can be either be muted, or recover the status it held before being mixed in the TalkBack audio channel.

The compressor/limiter can be enabled/disabled. It is recommended to disable the compressor/limiter when the unit is compression the audio in Stereo mode.

To end with, the user can also define the accuracy of the rotary audio controls regarding the number of dBs per round.

IV.9 Streaming options menu

Click the following icons on the main menu to enter the streaming configuration window:

The user switches the streaming network (3G/4G or Ethernet) thru this menu, as well as adapts some default parameters to specific network circumstances.

Picture 81. Streaming Menu.

IV.9.1 Network selection

Within this menu the user chooses if the Ethernet, 3G/4G or Custom streaming is applicable.

Picture 82. Streaming Net Menu.

If Custom mode is selected, a new menu appears with all the available interfaces that can be chosen for the transmission.
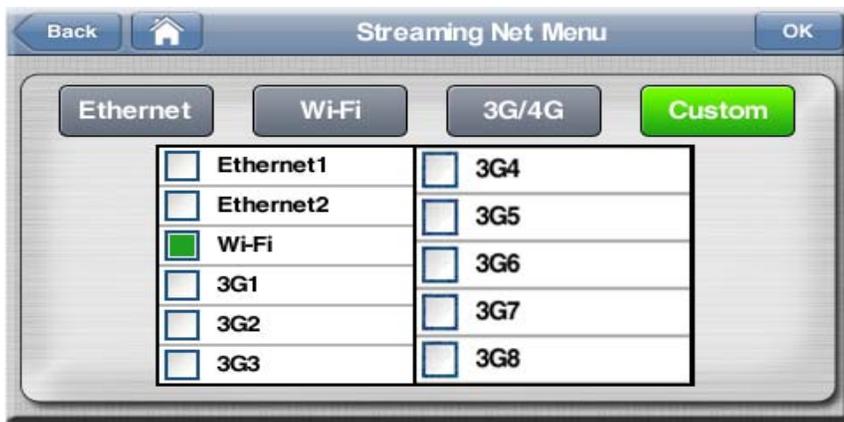
Picture 83. Custom Interfaces Selection Menu in Ikusnet Portable

The more links are selected, the more bandwidth the unit will be able to get for the video and audio streaming, and the more secure the connection. Up to 11 interfaces in the Ikusnet Portable might be linked together (bonding) to get as much bandwidth as possible.

IV.9.2 Connection options

This window permits the configuration of several parameters to control the way the calls are made:

Picture 84. Connection Menu

- **Enable Hangup Confirmation**. When the box is ticked, if the user touches the connection bar to end a communication, the codec will require the user confirmation before finishing the connection. This is useful to avoid accidental hang-ups.
- **1-Click call**. When this option is chosen, the codec will make a call just by pressing the connection bar, without the need to introduce any destination address or phone book entry. To set up this mode, an IP **destination address has to be selected in the <Settings...> dialog.**
  This option is very useful to make it easier for some non-technical users to establish a connection.

IV.9.3 IP Protocol parameters selection

This protocol specifies IP port and protocol parameters. For most applications the default values are suitable.

- Enable Control Port   *(by default enabled [18])*
- Program Port   *(53000 by default for PROGRAM channel [19])*
- Talkback Port   *(53001 by default for TALKBACK channel [20])*
- Timeout   *(the connection timeout is 15s by default [21])*

IV.9.4 Streaming RX parameters

This menu configures the jitter buffer. This configuration affects the overall communication delay. Independent configuration variables are available for PROGRAM and TALKBACK channel.
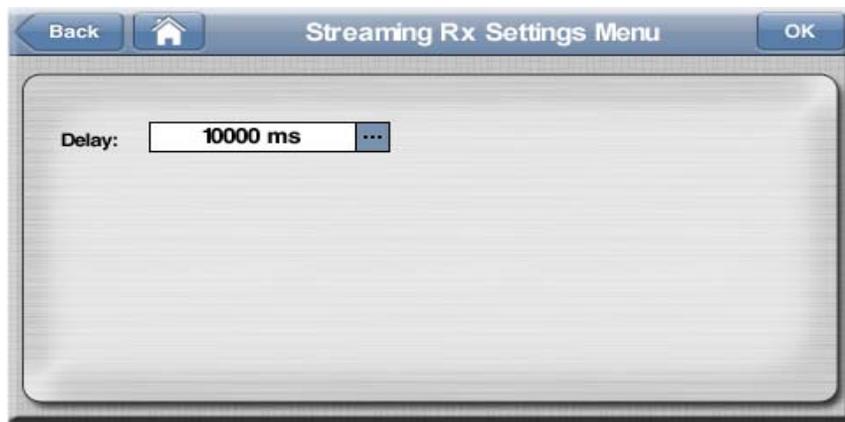
Picture 85. Streming Rx Settings Menu

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[18] Disabling the <Control Port>, means disabling the TCP protocol. Therefore any streaming connection should be request from both parties to meet the communication.

[19] Usually this number is more important for the receiving Ikusnet since the local router must provide "port forward" on this port number for the Ikusnet. This port must be "forwarded" for TCP & UDP. Please contact your IT specialist or network manager for details about this procedure.

[20] Preceding remark is applicable for the Talkback channel too.

[21] This parameter applies for the detection of interrupted streaming connections. After a streaming connection has been involuntary interrupted, Ikusnet retries indefinitely re-connections to the destination.

The maximum buffer size is 20 seconds. The minimum buffer size is 1 second. The user has to take into consideration that this size includes the codification/decodification delay, that is why the minimum possible configuration is 1 second.

As the value defined by the user includes the encoding/decoding delay, this would be the total delay for the communication if the network had zero delay.

The user should bear in mind that the longer the buffer, the longer the delay, but the more protection against jitter and the more robust the communication.

To end with, it is worth mentioning here that this configuration will be overridden by the configuration defined by the caller unit. Take into account that the user, when making a call, can define different configurations/profiles that affect the operation of the jitter buffer at the receiving end. Only when the user select **'None' a**s selected profile, the receiving end will use the configuration defined by the user in this configuration section.

IV.9.5 Streaming TX parameters

This menu allows the user to configure some advanced functions related to the video and audio streaming.
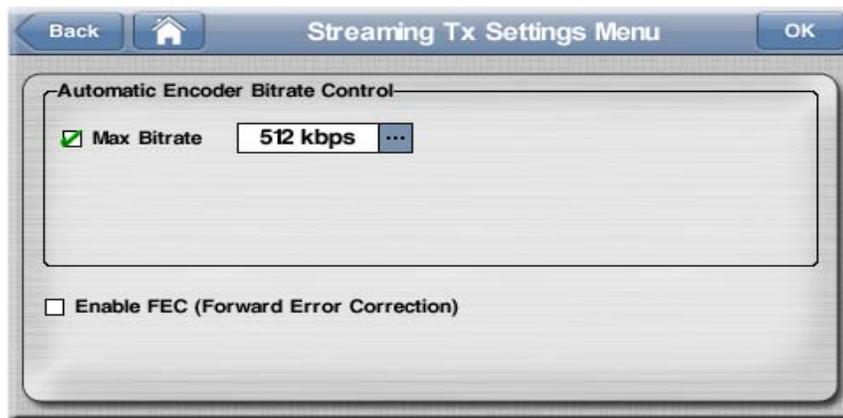
Picture 86. Streaming TX Menu.

When the AUTO option has been selected in the encoder configuration menu (see chapter III.9), the bit rate of the video and audio encoder will adapt automatically to the network conditions, trying to use as much bit rate as possible to get the best possible quality. That is why this menu allows the user to configure a threshold or maximum bit rate. **It is very useful to avoid problems when working with networks that have a well defined max capacity, like IP over satellite links, for example.**

The **Forward Error Correction** function enables redundant information streaming. Therefore the steaming bandwidth actually increases but the reception at the remote Ikusnet is more reliable against packet losses. FEC or Forward Error Correction increases de delay and bandwidth of the video and audio communication, but it makes the connection more reliable.

This function is convenient when detecting some few random packets losses. Typical application scenarios are public IP networks like Internet over ADSL or WiFi access points.

IV.9.6 Communications Profiles

This menu allows the user to define the profile to be used when making a call. Please take a look at the dial menu bellow:

Picture 87. Program Dial Window.

The connection Profiles can be configured by the user, and they define the buffer (i.e. the delay) at the receiving end. The longer the buffer the more protection against packet losses and jitter but the longer the delay. The shorter the buffer, the less protection but the shorter the delay. The key point in being able to adjust this parameter from the calling end is that most likely the user who really knows what the capacity for the current IP link being used for streaming is will be the user that is establishing the call. If no profiles are selected, the buffer at the receiver end will keep its current configuration.

Prodys always recommends to start testing with different profiles before doing a live contribution when the capacity of the network is unknown or can vary depending on non managed external factors like the number of people sharing the same IP data connections at the same time.

To enter the Profiles menu just click on the Profiles button at the main streaming menu:
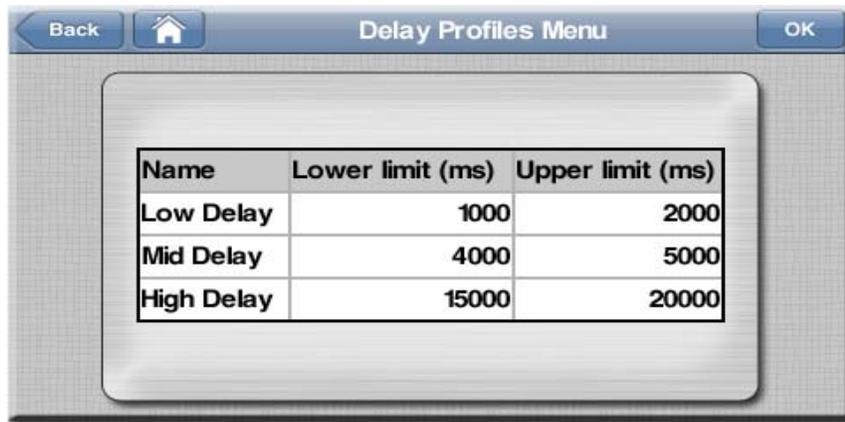
Picture 88. Profiles menu.

This menu allows the user to define the names and jitter buffer lengths for the different profiles that will be available when entering the dial window. Each profile defines a lower and an upper limit. The jitter buffer at the receiver end will move within that range of delay when selecting one of those profiles at the time of making a connection. The buffer length at the receiving end will vary trying to adapt itself automatically to the network conditions.

The user can change these three profiles just by clicking on them and entering the Profile Properties Window:
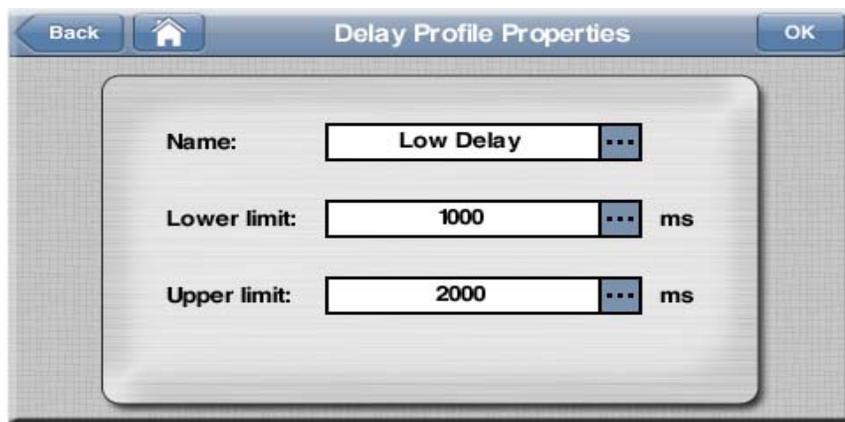
Picture 89. Profiles Properties Window.

IV.10 Interfaces options menu

In this menu several communication interfaces can be configured: Ethernet, WIFI, 3G/4G services for video and audio communications, and RS232 and GPIO for the transmission of auxiliary data.

Picture 90. Communication Interfaces Menu.

IV.10.1 LAN1 configuration

All configuration parameters related to the Ethernet port will be established here: IP address, IP mask, IP gateway, DNS and DHCP servers. The LAN1 interface is used for all IP communications when the LAN2 interface is not enabled. Once LAN2 is enabled, LAN1 will only carry all IP data related to the PROGRAM and TALKBACK streams, whilst the LAN1 interface will only carry control IP data, like the web control.
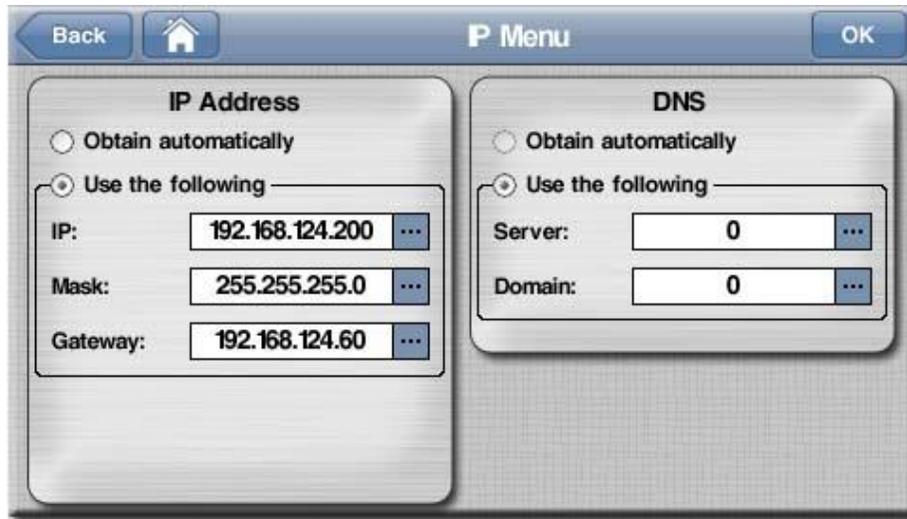
Picture 91. IP Menu.

IV.10.2 LAN2 configuration

IP address, IP mask, IP gateway, DNS and DHCP parameters are defined here. This interface is restricted to the PROGRAM and TALKBACK streaming if this LAN2 has been enabled; keeping just the web control access on LAN1.

Picture 92. Enabling independent control access /streaming.

IV.10.3 WIFI configuration

Ikusnet Portable can be equipped with an external USB to WIFI module. This chapter describes how to configure this interface. The user have to take into account that one thing is to configure this interface to connect to a WIFI network, and another thing is how to use this interface in terms of video streaming. For example, this interface might be defined as the main and only IP interface to stream the video and audio or for file uploading, or it might be used together with other IP interfaces to get more bandwidth (bonding or bandwidth aggregation (see chapter IV.9.1 for more information in this regard).

Please take a look at the picture bellow. It shows the main WIFI configuration menu:
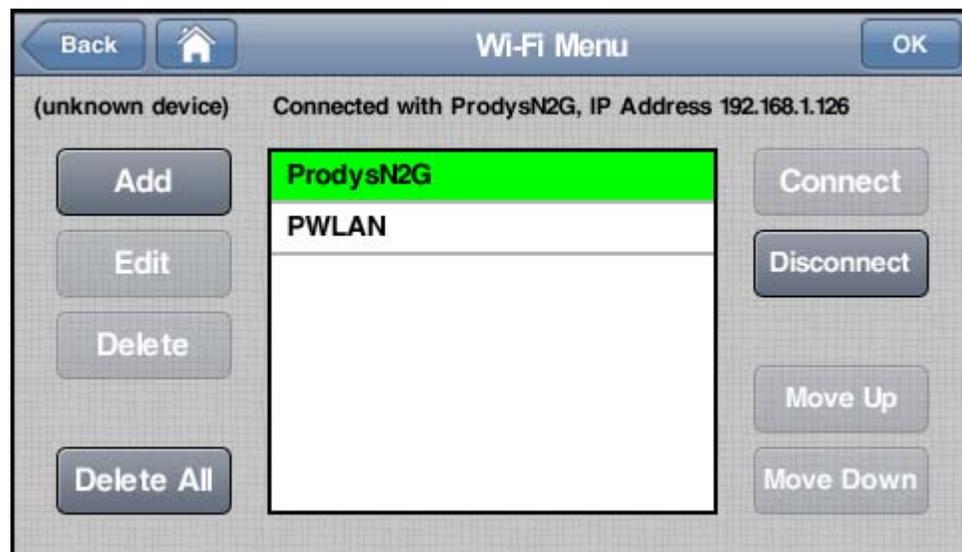
Picture 93. WIFI Menu.

From this menu the user can select what WIFI network will connect to. By pressing the Add button it is possible to access the Wireless Networks Menu where the different WIFI networks automatically detected by the unit will appear, so that the user can just select any of them and add them to the list of WIFI networks on the main WIFI menu. The type of encryption and the quality of reception will be shown for each of the available networks.
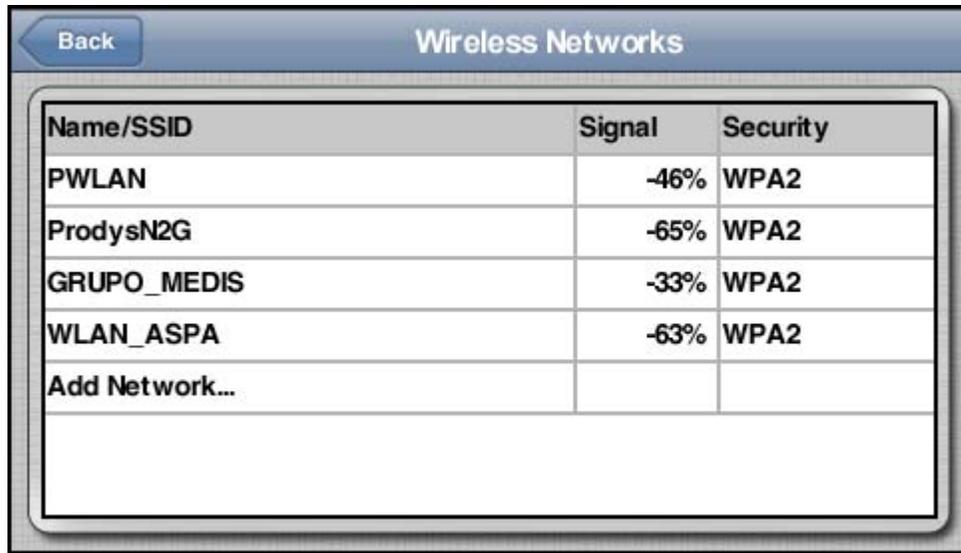
Picture 94. WIFI Add Menu.

Once in the main WIFI menu, just clicking on any of the WIFI networks available in the list, the user will edit the password settings for that specific network.
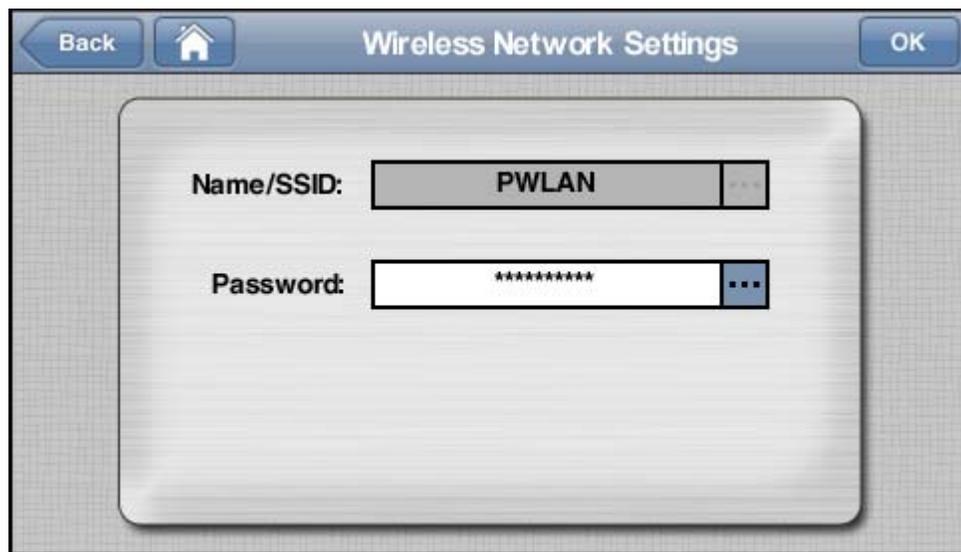
Picture 95. WIFI Network Settings Menu.

Once all network in the list have been configured with their corresponding security settings, in order for the unit to connect to any of those networks, the user has to click on the desired network and press the Connect button. The current WIFI network in use will be shown on a green background color, whilst

the currently selected WIFI network will be shown on a purple background colour.
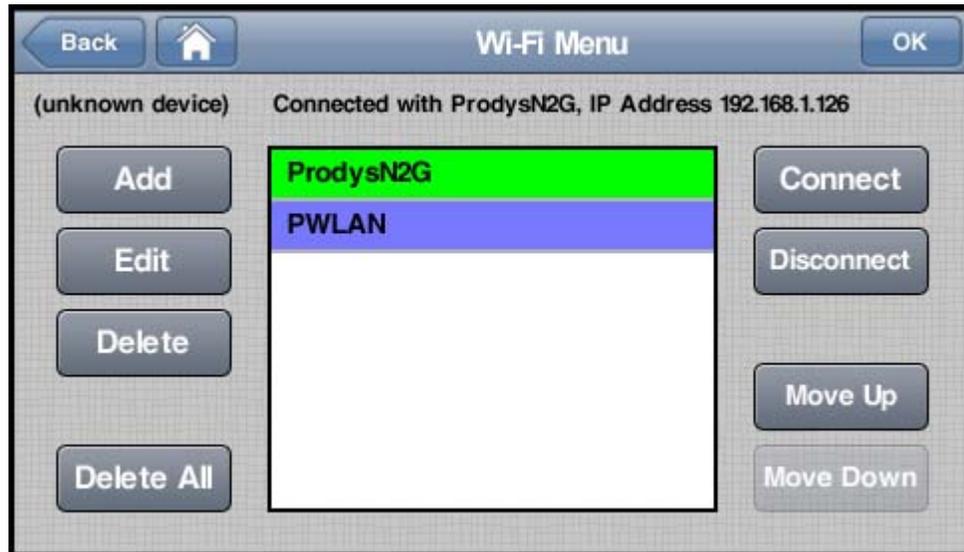
Picture 96. Main WIFI Menu.

In the picture above, ProdysN2G is the current WIFI Network in use, whilst the PWLAN network is currently selected by the user. By clicking on the Disconnect button the user can disconnect the unit from the current WIFI network.

To delete a network, just select one network and press the Delete button. The system will ask for a confirmation.

To end with, it is also possible to define the priority of the WIFI Networks. The unit will try to connect first to the WIFI network at the top of the list. The user can change the order of the different networks in the list by means of the Move Up and Move Down buttons.

Once all networks in the main list have been defined (password configured), and the user has selected one of the available networks, just by pressing on the Connect button the unit will try to connect to that network. Once the unit is connected, a message like 'Connected to WIFIx network' will appear at the top of the window.

If the WIFI interface is used as the main streaming interface, both the Main monitoring Windows and the Stremaing Monitoring Window will indicate this situation as in the pictures bellow:

Picture 97. Main Monitor Window.

Picture 98. Streaming Monitor Window.

IV.10.4 ![icon] 3G/4G network's configuration

Ikusnet Portable can stream over a bundle of up to four 3G/4G modems or up to 8 internal SIM card slots.

Different service providers can be used for this purpose, so every 3G/4G module must be configured according to the data access settings for that specific provider.

Picture 99. 3G/4G Menu.

In order for each of the 3G/4G connections to work properly, the user has to enter the proper APN, User and password settings. These settings depends on the 3G/4G provider. Each provider has different settings for each country. There are many lists open to the public on the Internet with these settings per most of 3G/4G providers around the world.

It is convenient to leave the default values of any other parameters or IP address field is just informative.
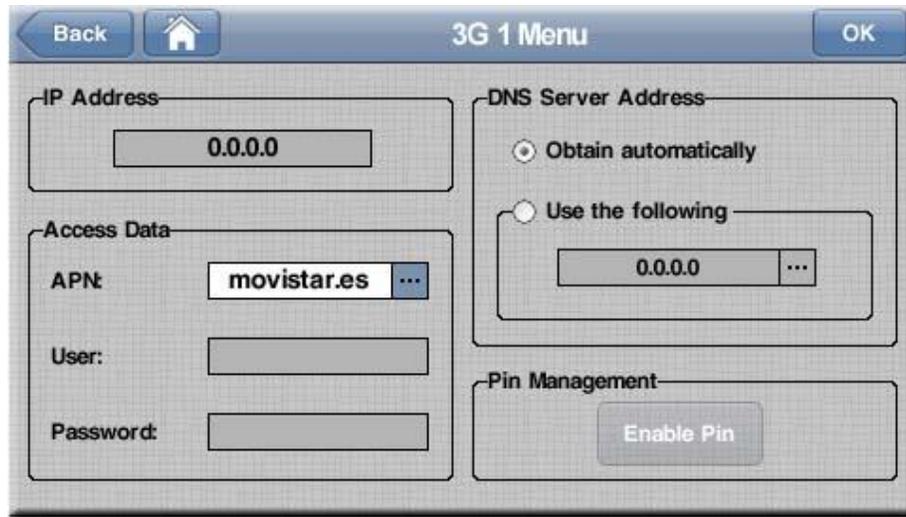
Picture 100. 3G/4G Configuration Menu.

IV.10.5 RS232 configuration

An auxiliary serial data channel can be established using the RS232 interface. The range of speeds varies between 300 bps to 9600 bps. When the serial interface is enabled, the user can embed auxiliary data coming from the serial interface (RS232) into the video and audio stream. This data will be available at the output of the serial port at the receiving end.
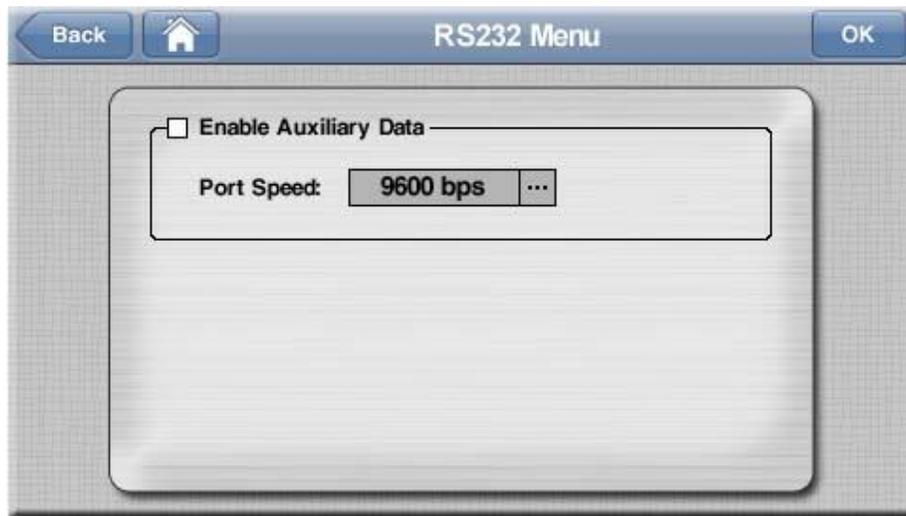
Picture 101. RS232 Configuration Menu.

IV.10.6 GPIOs

There are two ground contact inputs and two relay outputs mounted on a DB9 female connector.
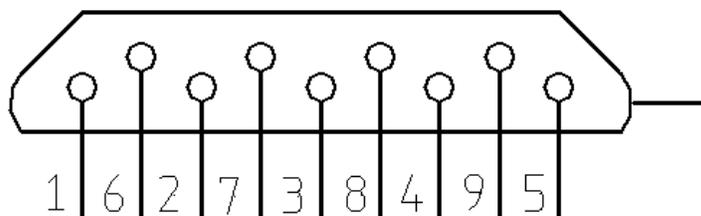
Picture 102. GPIO Pinout

Pin	Description	Pin	Description
Pin 1	Input 1		
		Pin 6	Input 2
Pin 2	GND		
		Pin 7	Normally Closed Relay 1
Pin 3	Common Relay 1		
		Pin 8	Normally Open Relay 1
Pin 4	Normally Closed Relay 2		
		Pin 9	Common Relay 2
Pin 5	Normally Open Relay 2		

The GPIO menu allows activating the GPIO transparent operation. When the GPIO transparent operation is enabled, the user can embed information about the status of the GPI into the video and audio stream. This information will be available at the corresponding GPOs of the GPIO port at the receiving end. This allows the user to get remote contact closures, a typical application in the broadcast market.
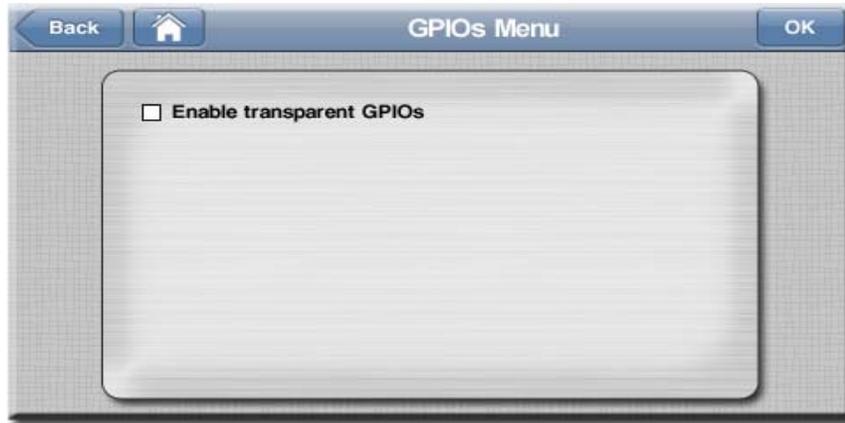
Picture 103. GPIO menu.

IV.11 Book options menu

Favorite addresses to call can be stored thru this path. Then direct dialing is possible to any stored destination (please refer to section **¡Error! No se encuentra el origen de la referencia.** "Starting a communication").
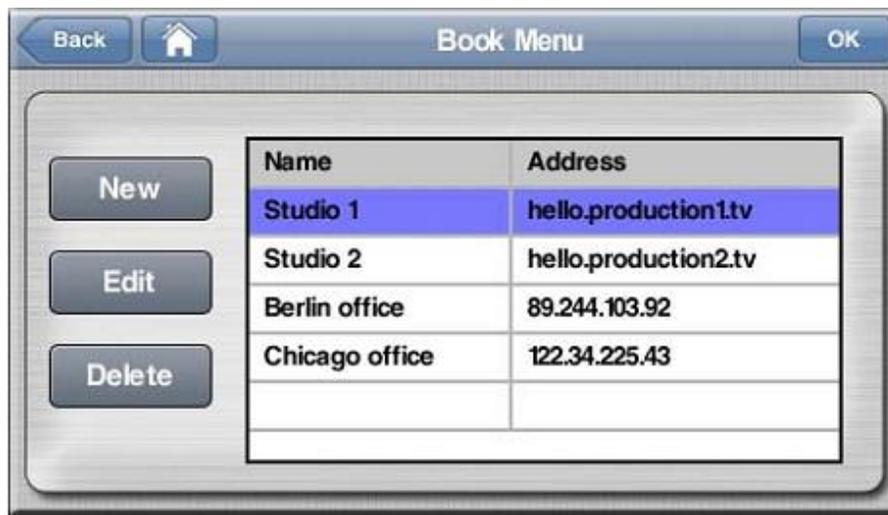
Picture 104. Book Menu.

IV.12 User options menu

This menu enables one[22] or more Ikusnet users with login name and password.

Picture 105. User Configuration.

Picture 106. Login Window.

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[22] By default the user Admin is enabled without password or operation restrictions.

The <Permissions> button opens a dialog for operation's restriction for this user.
Following example is a typical restrictive profile for basic users.

Picture 107. User Permissions.

IV.13 System menu

The system menu screen offers a number of options for the codec maintenance. The following figure shows the system menu as it appears when viewed through a web browser. When accessed through the touch panel not all options are available.

Picture 108. System menu.

The options available in this menu are:

- **Name**: Permits to assign a name to the codec.
- **Version**: Shows firmware versions of the codec processors.
- **Date/Time**: Permits to set date and time.
- **Default Conf.**: Restores the default equipment configuration. User can exclude from this restoration the following:
    - o LAN Settings
    - o Phone Book
    - o APN list
    - o Alarms
    - o Presets

Picture 109. Restore Default menú

- **Licenses**: Licenses management. **Accessing through the web browser, it's** possible to upgrade the unit with new licenses. These licenses will be provided by Prodys as a file with extension "hlf".
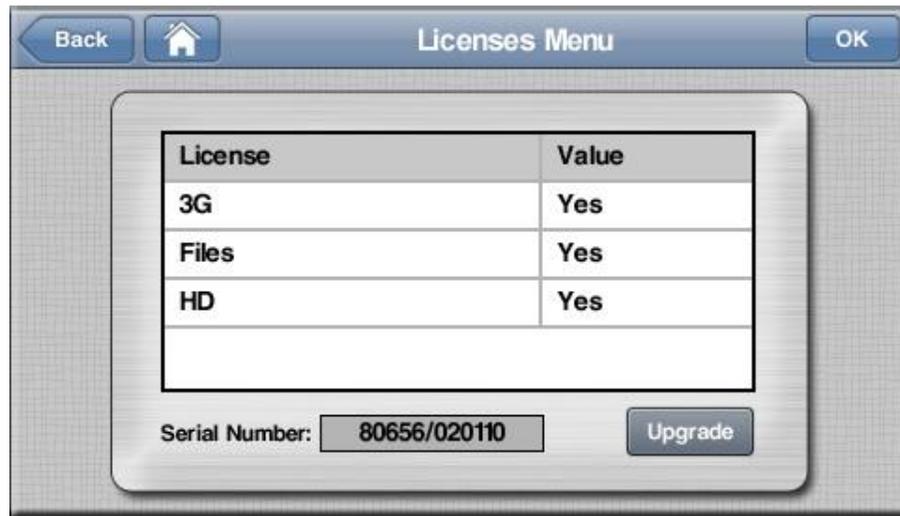
Picture 78. Licenses Menu

- **Save Log**. Only through web browser. Log file recording.
- **Reboot**: To force a reboot of the codec.
- **Import/Export Configuration.** Only through web browser. Recording of a configuration file and loading of a configuration file.

- **Enable Autologin**: to activate and deactivate the login screen for each user.
- **Set Normal/Advanced Mode**: Advanced Mode permits to access all the options in the Ikusnet menus. Normal Mode restricts access to Protocol, Tx y Rx configuration options inside Streaming menu.
  Normal mode is designed for nontechnical users.

IV.14 Preset menu

From the main screen the <Presets> menu gives access for its administration. Presets are customer configurations for the video and audio encoders which can be turned active with a simple click.

Not only the encoder parameters can be configured; also streaming specific parameters like 3G/4G or Ethernet, bit rate automatic adaption or FEC can be defined in advance. For this reason, this is a very convenient configuration option for non-technical users.

Picture 110. Presets Menu.

- New   *(Create a new preset)*
- Edit   *(Edit an existing preset)*
- Delete   *(Delete an existing preset)*
- Load   *(Loading a preset means turning this configuration active)*

IV.15 Monitor menu

The user can check in real time many different parameters regarding the streaming operation and network performance thru the monitor menu.

The monitor menu is divided into six sections for specific information:
- Main *(Line Status, buffers)*
- Audio *(TX /RX VU-meters, audio compression status)*
- Video *(Input 1/2 info, video compression status)*
- Streaming *(Complete statistics of the transmission)*
- 3G/4G *(Availability and strength of 3G/4G networks)*
- System *(local IP address, temperatures, feeding voltage)*

IV.15.1 Main monitor screen

This screen shows the status of the lines contributing to the PROGRAM and TALKBACK communications. This status may be *Connected / Disconnected /No physical line.*
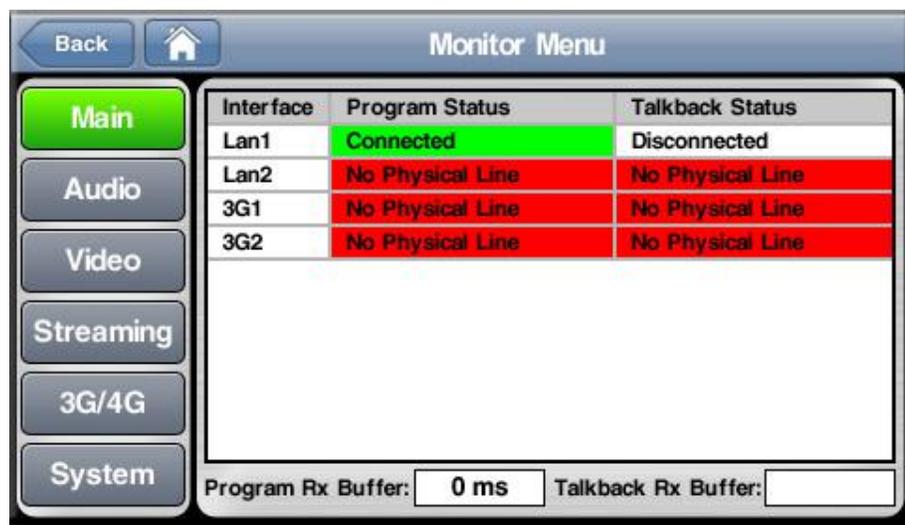
Picture 111. Monitoring Main Screen.

This screen also shows the size of the reception buffer for both communications.

IV.15.2 Audio monitor screen

L & R audio VU-meters for the PROGRAM channel and the mono VU-meter of the talkback channel give indication of the transmitted and the received audio level.
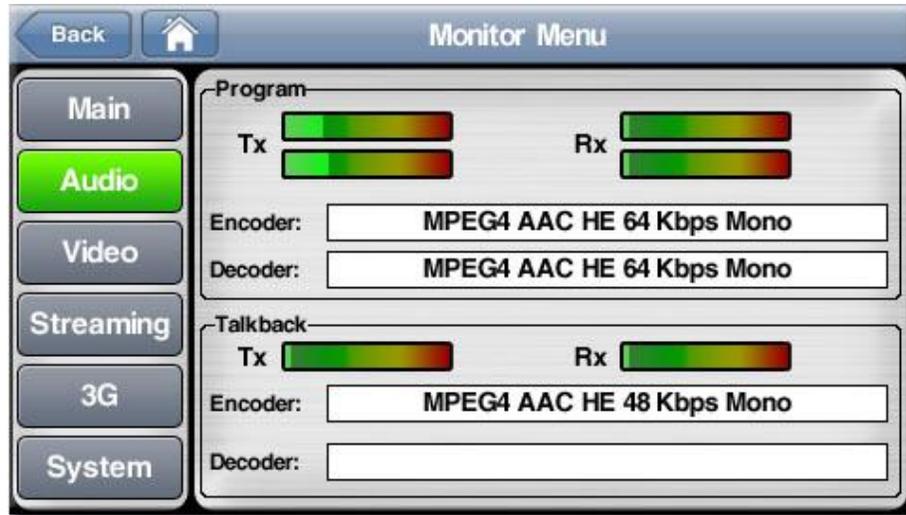
Picture 112. Audio Monitor Menu.

IV.15.3 Video monitor screen

This menú gives information about the video signal format for both video inputs, as well as the video compression parameters detected in the Decoder and configured by the user for the encoder.
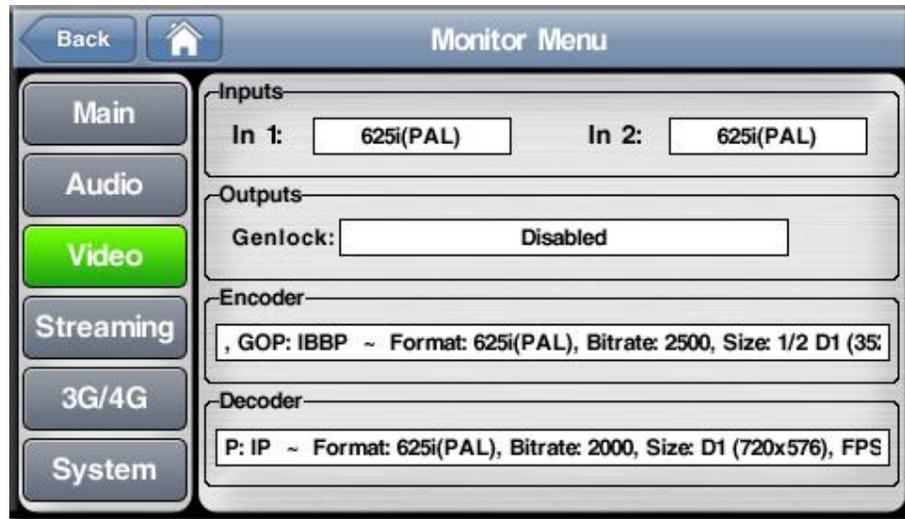
Picture 113. Video Monitor Menu.

IV.15.4 Streaming monitor screen

The <Streaming> monitor displays the foregoing performance indications for both communication parties. This is the **<Local>** field indicates the performance of the incoming stream, while the **<Remote>** field indicates the measured performance at the remote destination. Therefore the local user gets a valuable feedback about the reception quality at the destination.
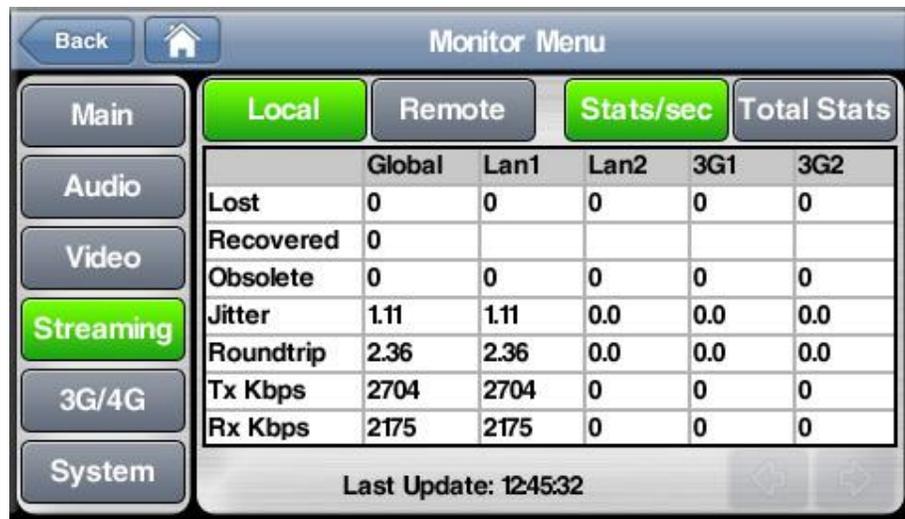
Picture 114. Monitor Menu.

The statistic data can be offered in two different ways:

- If the **<Stats/sec>** button is selected, the data appearing on the screen are an average value measured every second.
- If the **<Total Stats>** button is selected, the data shown are the accumulated values from the beginning of the communication.

The statistical data is presented for the whole communication ("Global" column) but also for each interface through which the communication is done in case 3G/4G or Custom bonding is used.

The **<Lost>** field accounts every streaming IP packet which does not arrived to the receiver. A large account will lead to a poor picture & audio quality. The first countermeasures should be:
1. *Check your network performance. Is the expected bandwidth available?*
2. *Increase (for example) 100% the depth of the reception buffer (please refer to section IV.9.4 Streaming RX parameters).*
3. *Lower the encoder bandwidth for video and/or audio (please refer to section IV.6.2 Video encoder H.264 configuration. You can use Preset for a quick bandwidth adaption).*

The **<Recovered>** packets field gives some feedback about the number of packets that the codec is able to recover.

The **<Obsolete>** packets field accounts every streaming IP packet which does not arrived to the receiver on time. It gives an indication that our RX buffer is not big enough.

The **<Jitter>** field indicates the highest jitter peak measured for this connection; it is a network impairment indication. Jitter is a time measurement in milliseconds and gives indication about instant changes of the streaming delay; low jitter usually indicates an optimal network performance.
Ikusnet's streaming buffer takes care about this network impairment automatically.

Some remarks about jitter:
1. *Some milliseconds of jitter are unavoidable for any streaming network.*
2. *Large jitter peaks over >100ms gives could mean a poor network performance.*

3. *The jitter peak adds additional delay to the video streaming delay.* [23]

The **<Roundtrip>** field shows the time, in milliseconds, that takes to go from the transmitter to the receiver, and back.

<Tx Kbps> and **<Rx Kbps>** show the bitrate of the transmitted and received streams. These values are interesting in the 3G/4G and Custom communications to know how the stream is divided into the several interfaces.

IV.15.5 3G/4G monitor screen

This monitor screen shows information about the 3G/4G connections available on the unit:
- Network Provider
- Percentage of signal strength. This information is useful to estimate the quality of the link
- Status of the connection
- 3G/4G Technology detected. This connection will only be used for the streaming purposes if the detected technology is 3G/4G or higher.

Picture 115. 3G/4G Monitor Menu

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[23] The overall communication delay, encoder→decoder, is build up by the encoding delay plus the buffer depth. The buffer depth in turn is related to the maximum jitter.

IV.15.6 System monitor screen
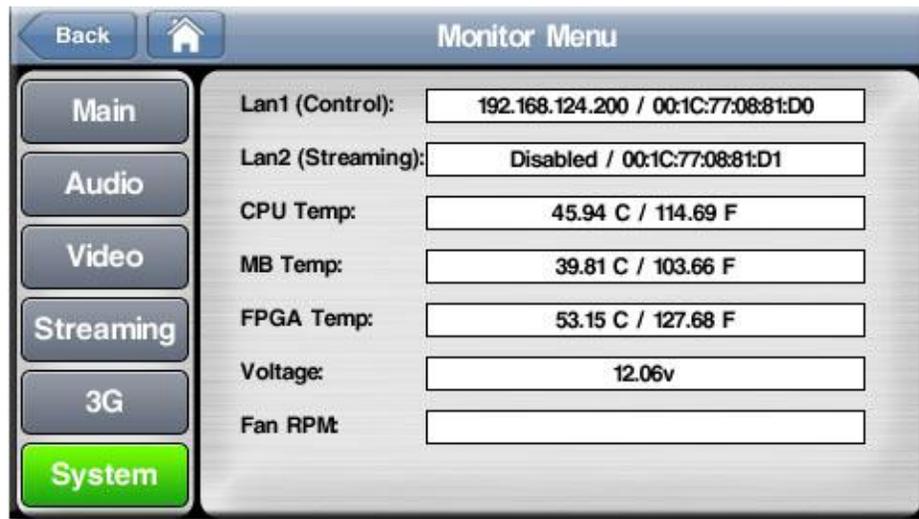
Picture 116. System Monitor Menu

IV.16 Alarm menu

Ikusnet is able to check and notify some alarm events. By means on a red lamp Ikusnet warns the user about the occurrence of one of these alarm events.
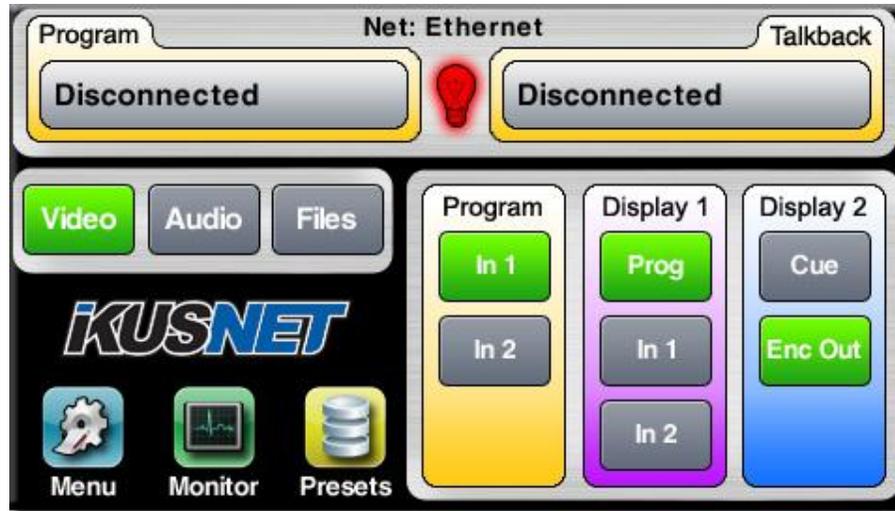
Picture 117. Main Menu with alarm indication.

Picture 118. Options Menu with alarm indication.

The alarm menu is opened clicking the red lamp from the main menu.
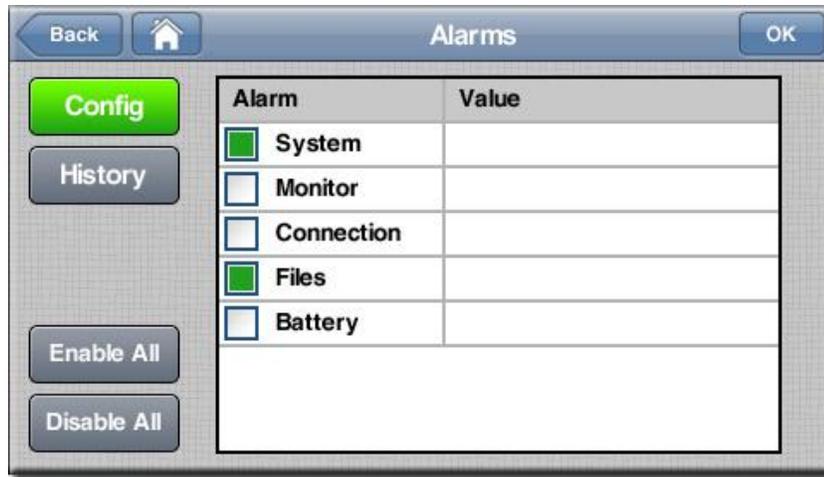
Picture 119. Alarms Menu

Four subsystems might be enabled or disabled individually for alarm notifications:

- System   *(power down or reset)*
- Monitor   *(hardware diagnostic parameters are out of range)*
- Connection   *(streaming connection has been interrupted)*
- Files   *(only 10% of the SD memory capacity is left)*
- Battery   *(external battery running out)*

The alarm history submenu displays the alarm log as they happened.
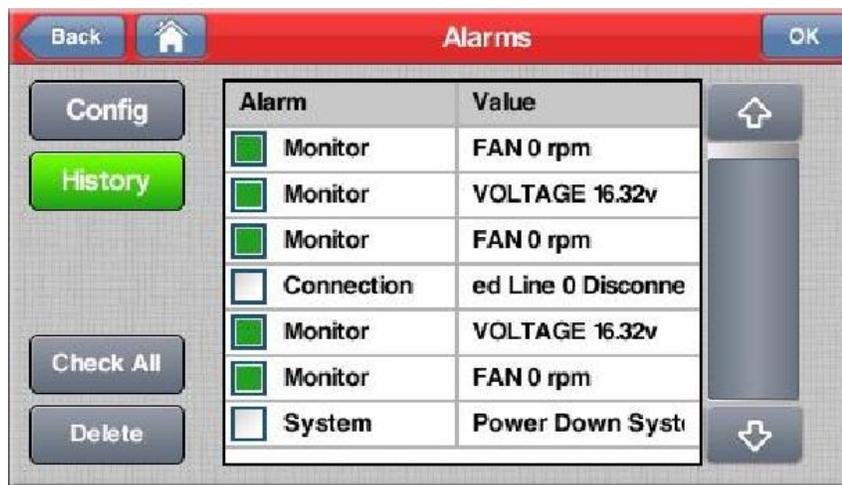
Picture 120. Alarms History Menu

Chapter V

APPLICATIONS

Ikusnet has been designed having in mind the news contribution applications and the different situations reporters and correspondents may find in their daily work. However, Ikusnet is also a versatile device that can adapt itself to different scenarios of use. In this chapter, several application examples are explained, **with a series of recommendations for achieving Ikusnet's best performance** according to the circumstances.

V.1 News Contribution Applications

This is the main field of application of the Ikusnet audio and video codec. The following five examples will show all the possibilities that a journalist with a camera can rely on for conveying their contributions to the studio regardless of the nature and the performance of the IP network available in the event site.

- Wide capacity IP connection
- Low capacity IP connection
- 3G/4G connection
- Satellite link
- Record/upload

V.1.1 News Contribution with wide capacity IP connection

When the reporters are on the field, they cannot control what kind of connection will be available for them, but if they were able to choose, they would prefer a wide and stable connection providing. Nowadays, the development of modern IP networks all over the work makes this scenario more and more frequent. And it is on those situations when Ikusnet comes into its own.
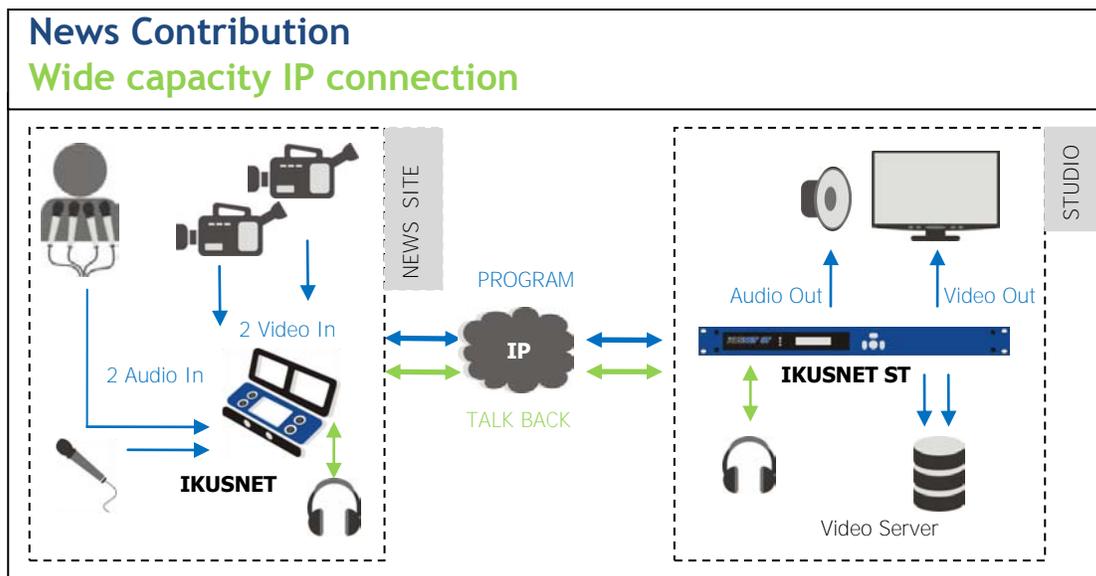
Picture 121. News Contribution with wide capacity IP connection.

The availability of bandwidth would allow the user to establish two different bidirectional communications. The first one would be the main program feed with both video and audio streams, while the second connection would be one corresponding to the audio coordination or talkback channel, both of them bidirectional.

This audio TalkBack channel can be used in two different ways:

▪ As a coordination channel between the studio and the news site.

- To provide a second audio source to the studio. This audio source can be mixed with the program audio in the studio, instead of making the mix in the Ikusnet Portable codec.

V.1.2 News Contribution with low capacity IP connection

This will be a very usual situation for reporters covering news. A good IP connection is not easy to find everywhere and they will have to adapt to the circumstances. Fortunately, Ikusnet is a highly versatile tool that permits to find a connectivity solution even in the most unfavorable conditions.

News Contribution
Low capacity IP connection
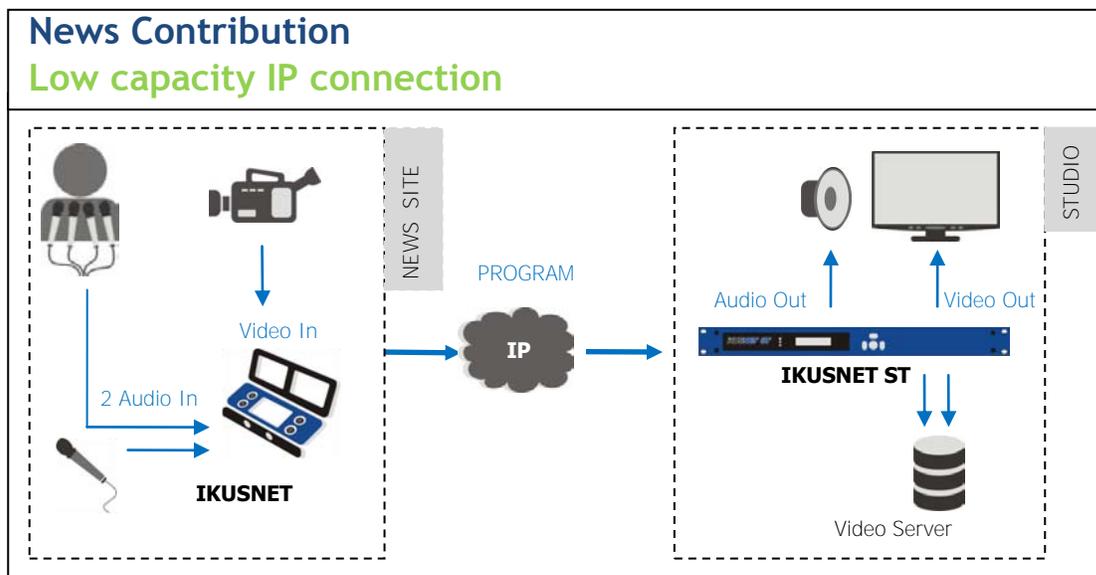
Picture 122. News Contribution with low capacity IP connection.

In a situation where the affordable bit rate is quite narrow it's important to follow these recommendations:

1. Avoid all camera movements, if possible. The lesser the movement, the bigger the quality of the encoded video.
2. Work preferably with only one video input. Changing between the two inputs implies a disruption of the video sequence with a high cost of bits necessary for encoding.
3. If artifacts still appear in the encoder output monitor, some video parameters can be changed to get a better quality:
   a. If the sequence is very dynamic, try to reduce the video resolution. As the amount of information to be transmitted decreases, the chance of getting artifacts in the encoded video decreases also.

b. If the sequence is static, try to increase de divisor frame rate. The video will become less fluid but the quality in each frame will be better.
4. Avoid the use of the talkback channel. Adding a talkback channel increases the IP traffic.
5. Enlarge the jitter buffer at both ends.

V.1.3 News Contribution with a 3G/4G connection

One of the strong points of Ikusnet Portable codec is the possibility of working in a totally autonomous way, using batteries and up to eight 3G/4G wireless connections.

Ikusnet offers the option of using an array of up to eight 3G/4G connections, thus trying to get as much bandwidth as possible for the communication.
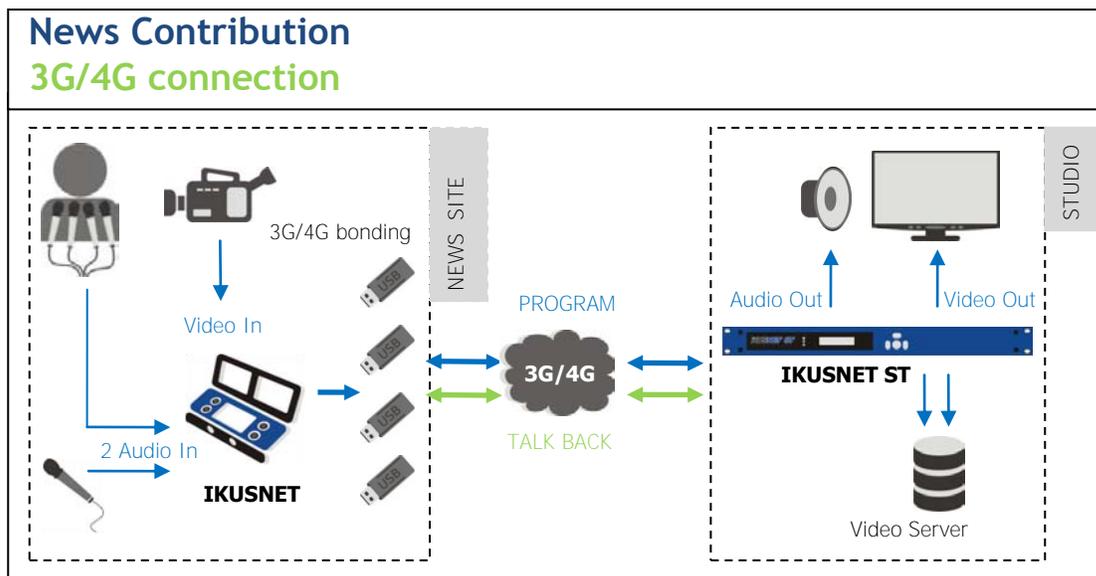
Picture 123. News Contribution with a 3G/4G connection.

Ikusnet supports a bonding scheme in which the IP traffic is shared among the available modems. For a good performance of such a connection, several points are to be taken care of:

1. Try to use always the maximum number of 3G/4G modems/data links.
2. Try to find out beforehand which operators work better in the area and use their SIM cards preferably.
3. **If one provider's signal shows a very low strength, it's better not to use it** because otherwise it will impair the overall performance of the system. The signal strength can be tested in the < monitor > 3G/4G > screen.
4. Sometimes a good strength is not a guarantee of a good performance in a communication. Network congestions can also make impossible the

connection. If a situation like this is suspected, try to remove the modems from the affected operator or the overall performance of the system will be affected.

5. Try to work with the FEC option activated to recover lost packets. Pay attention to the increasing of the IP traffic when this option is activated.

The recommended configuration regarding the video and audio encoder depends on the final performance of the 3G/4G communication, but AUTO is always a good option for the bit rate configuration of the video encoder.

V.1.4 News Contribution with a Satellite link

People covering news usually have to go to places where no Ethernet sockets are at hand and 3G/4G coverage is really poor, if anything. In those circumstances the only possibility of accomplishing a real time contribution is using a satellite link.

Ikusnet Ethernet output can be connected to a satellite terminal, like the widely used BGAN terminals for Inmarsat. This satellite permits the transmission of a streaming with a bit rate up to 384 kbps.
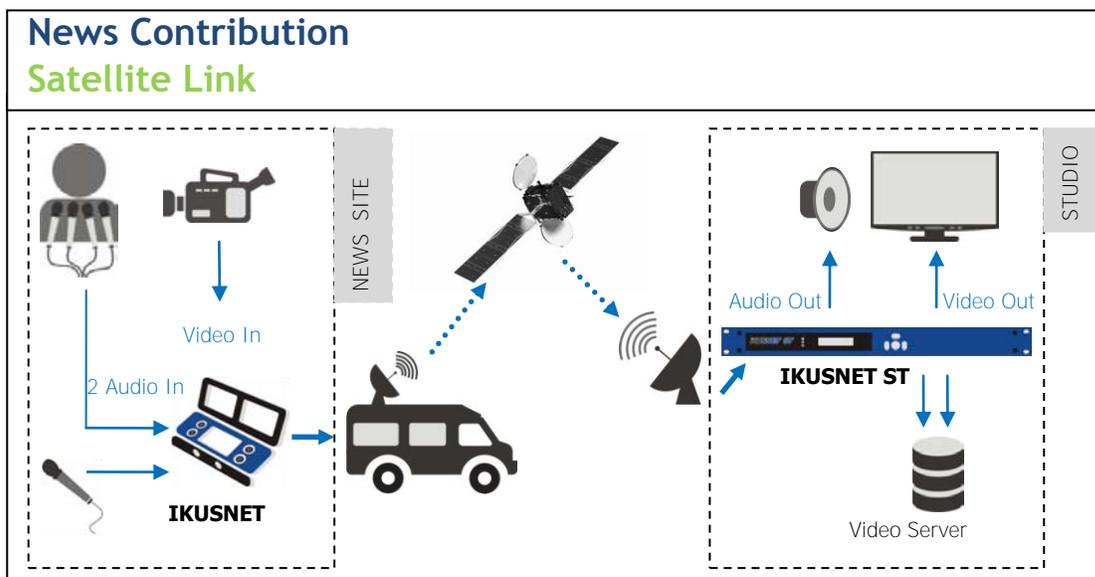
Picture 124. News Contribution with a Satellite link.

Due to this reduced bandwidth**, it's important to follow** these recommendations:
1. Avoid all camera movements.
2. Work with just one video input to avoid sharp changes in the video sequence.
3. Try to reduce the video resolution (when working with SD). As the amount of information to be transmitted decreases, the chance of getting artifacts in the encoded video decreases also.
4. Try to increase de divisor frame rate (SD resolution). The video will become less fluid but the quality in each frame will be better.

5. Do not use the talkback channel.

A recommended configuration in this case is (SD):
- Video:
  - o Resolution: *1/2 D-1 (352 x 480)*
  - o Divisor Frame Rate: 2
  - o Bit Rate: *300 kbps.*
  - o GOP structure: *IBBP*
  - o Rate Control Mode: *Constant Bitrate (CBR)*
  - o Scene: *According to the content*

- Audio:
  - o Algorithm: *MPEG4 HE AAC*
  - o Mode: *Mono*
  - o Bitrate: *48 kbps*
  - o Frequency: *24 KHz*

V.1.5 News Gathering. Record/Upload

This is the worst case scenario: no Ethernet, no 3G/4G connections and no satellite. Even under these circumstances, Ikusnet proves to be an excellent tool for the reporter.

Even if no real time transmission is possible, the content can be recorded with a maximum video and audio quality and later, when a means of transmission is found, it can be forwarded to the studio via FTP.
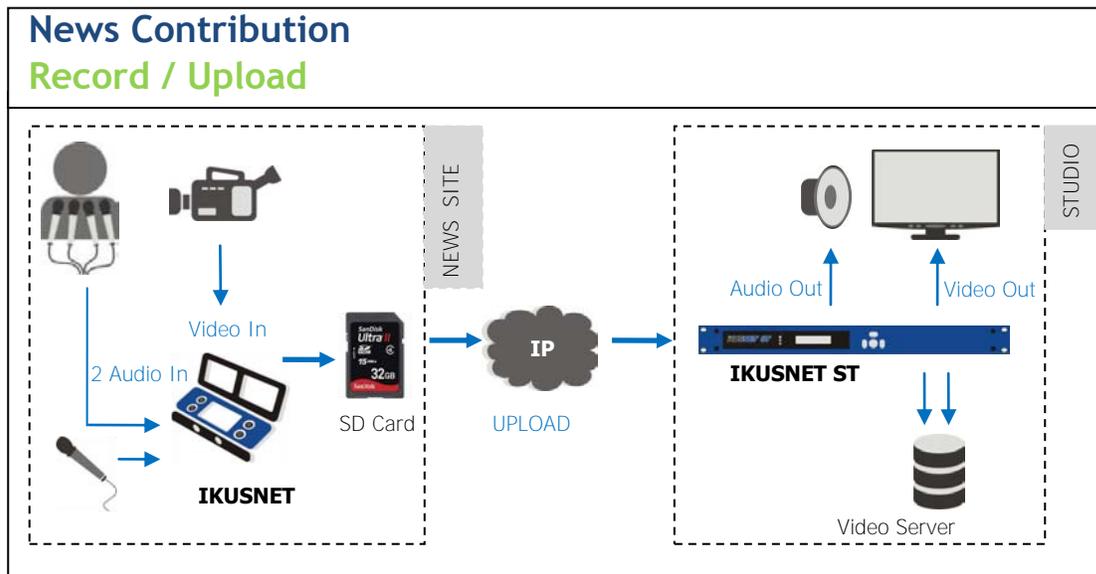
Picture 125. News Gathering. Record/Upload.

The bitrate selection has to be made having in mind the duration of the recording and the size of the memory SD card. In the next tables, an estimation of file size for standard definition (SD), for several bitrates and durations can be found.

File size, in MB:

Audio encoder	Audio @ 24kbps					@ 128kbps
Video encoder	512 Kbps	1 Mbps	2 Mbps	3 Mbps	4 Mbps	1 Mbps
1 min.	4.6	9.2	17.8	23.9	33.7	10.1
3 min.	14.8	26.2	50.4	75.6	98.8	29.3
5 min.	24.4	43.7	84.0	126.0	164.6	48.8
15 min.	73.2	130.3	252.3	372.5	491.3	145.6
60 min.	293.0	521.1	1.01GB	1.49GB	1.97GB	582.4
120 min.	586.0	1.04GB	2.02GB	2.98GB	3.93GB	1.16GB

Table 1. File Size in MB for SD compression.

All figures are for 24kbps audio encoding, but the last column. For example if a 128kbps audio encoding is set, the total file size of a 60 minute recording would increase by 61MB approximately.

It has to be remarked that this is the only case in which a Variable Bit Rate (VBR) is highly recommended. With this feature, the encoding process adapts itself better to the changing nature of the video sequences and therefore, the quality obtained is higher.

V.2 Bidirectional communications

Apart from the news gathering applications, there are other environments where Ikusnet can show its excellent performance.

V.2.1 Studio Links

When a media company has its infrastructure distributed among several centers, it will be necessary for them to implement a video distribution network. In such a network, the 1U rack unit Ikusnet ST can prove a very valuable tool.
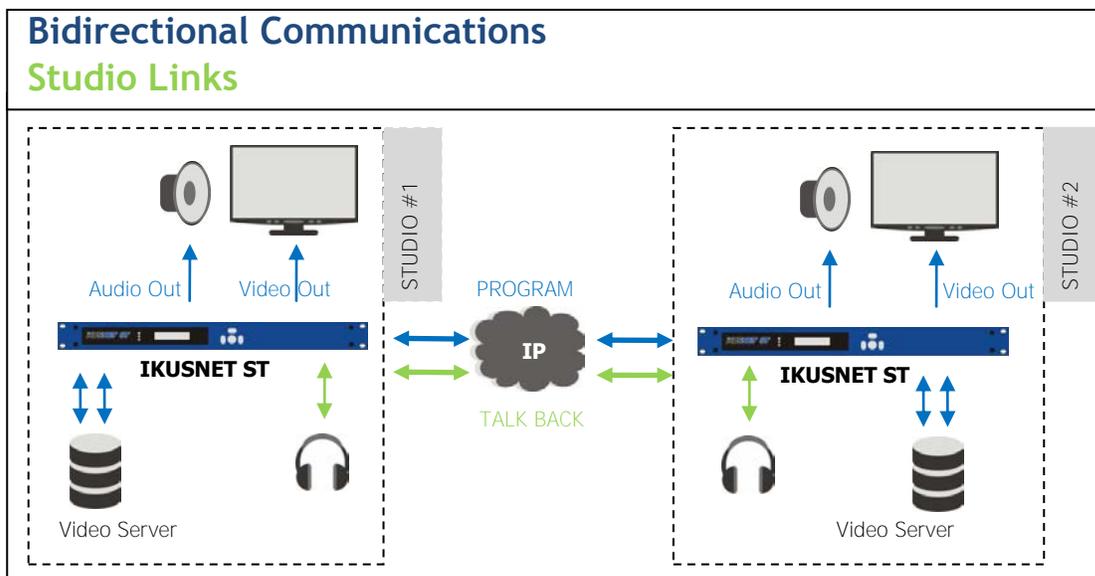
Picture 126. Studio links.

The most remarkable features of Ikusnet ST to be considered in this environment are:

- An excellent H.264 video compression quality, from the lowest bitrates (256kbps) up to 5 Mbps in SD mode and from 2 Mbps up to 20 Mbps in HD mode.
- It is a bidirectional codec, including in the same 1U rack unit a video encoder and a video decoder.

- It permits to enlarge the video distribution network adding Ikusnet Portable units for news contribution
- It includes a talkback channel that can act as an intercom for the network management.

V.2.1 Interview show

Bidirectionality is one of the most revolutionary features of Ikusnet Portable video codec. The possibility of getting a video feedback from the studio in the remote site opens a world of possibilities for the production of different kind of programs.
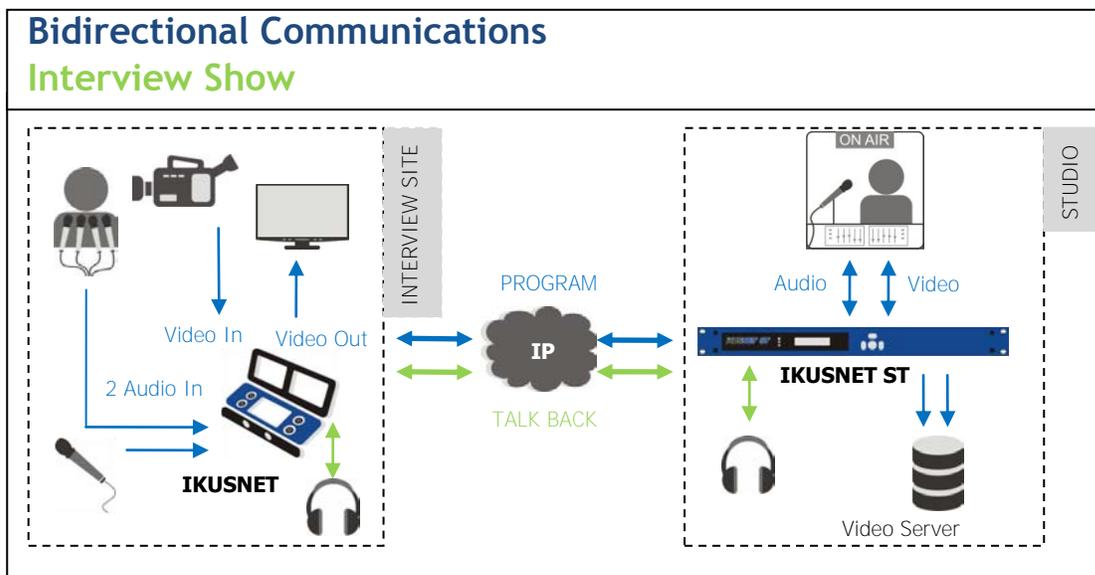
Picture 127. Interview Show.

For example, an Ikusnet Portable codec can transform a simple room in a small television set where a personality can be interviewed live from a remote studio, maintaining the visual contact from both sides during all the conversation.

The talkback channel can be used a coordination channel between the studio and the remote site.

The same scheme can be applied to other programs like game shows, political debates or reality shows.

The recommended configuration depends on the final performance of the communication interface. If a wide bandwidth is obtained, all the considerations

made in chapter V.1.1 are valid. If a reduced bandwidth has to be use, check the recommendations of chapter V.1.2.

V.3 Other Scenarios

Ikusnet is a communication device that can be used in a large number of applications outside the broadcast industry.

Its portability, flexibility and the high quality of video compression allows this device to be used in fields as diverse as:
- Distribution of educational content in colleges or universities.
- Emergency management by fire o police brigades, ambulances, etc
- Distribution of religious content among houses of worship.

One very attractive Ikusnet application in the field of education is shown in the diagram below.
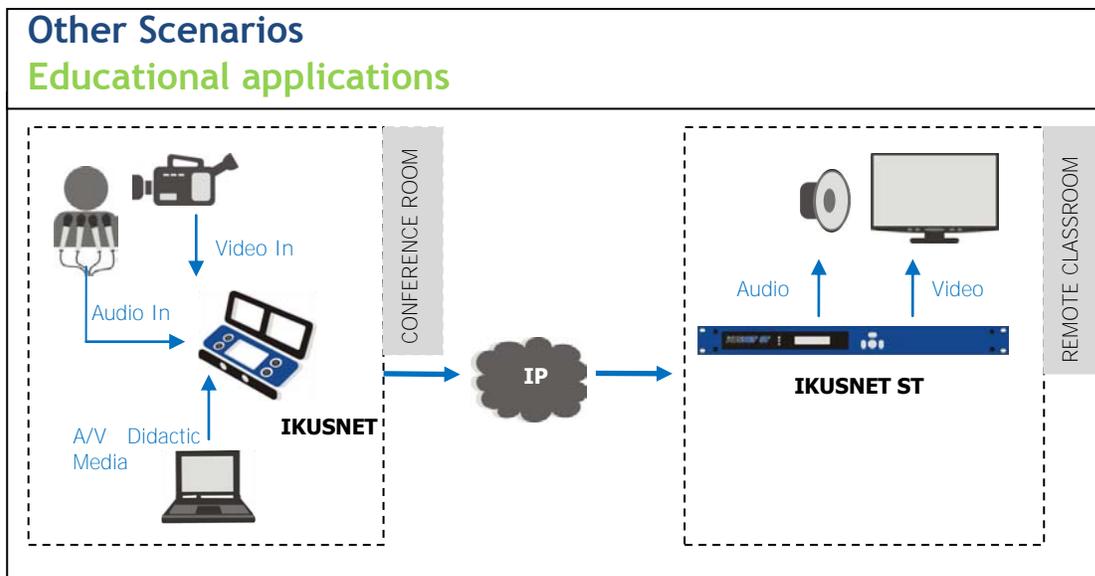
Picture 128. Other scenarios.

The diagram shows how Ikusnet can allow connecting a conference room with a remote classroom. In this setup Ikusnet can take advantage of the possibility of choosing between two different video input so the image of the speaker can be mixed with support material such as graphics or video presentations.

Chapter VI

TECHNICAL SPECIFICATIONS

VI.1 PORTABLE IKUSNET HARDWARE

VI.1.1 Video interfaces

Ikusnet Portable unit can be equipped with two different video inputs, SDI, HDMI or Video Composite, in any combination[24]:

- SDI inputs: BNC connector on the rear side; input Serial digital Interface according SMPTE 259M (SD) and SMPTE 292M (HD). (details in section VI.4)

- HDMI inputs: HDMI Type A receptacle connector, 19 contacts. HDMI version 1.4.
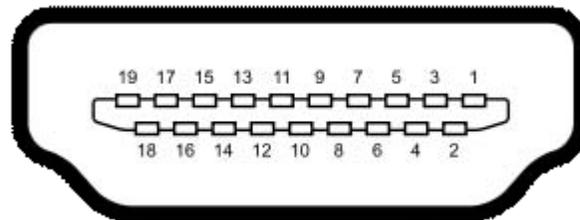
Pin	Function	Pin	Function
1	TMDS Data2+	11	TMDS Clock Shield
2	TMDS Data2 Shield	12	TMDS Clock-
3	TMDS Data2-	13	CEC
4	TMDS Data1+	14	N.C.
5	TMDS Data1 Shield	15	SCL
6	TMDS Data1-	16	SDA
7	TMDS Data 0+	17	DDC/CEC Ground
8	TMDS Data 0 Shield	18	+5 V Power
9	TMDS Data 0-	19	Hot Plug Detect
10	TMDS Clock+		

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[24] Take into account that first production series can only be equipped with SDI inputs.

- **Video Composite inputs:** (CVBS) according SMPTE170M (NTSC) or ITU-R BT.470 (PAL). Max input 0.75Vpp. BNC 75 Ohm unbalanced connector.

SDI OUT: BNC connector on the rear side; output Serial digital Interface according SMPTE 259M and SMPTE 292M. (details in section VI.4)

Foldable video monitors: 2 x 16:9 video monitors. Resolution 480 x 800; unitary display **size 4.5".**

VI.1.2 Audio feeds

Embedded audio: Any video input might contribute with the first two embedded audio channels (i.e. one stereo signal) to the PROGRAM stream.

MIC1 & MIC2: XLR input connectors on the front side.
- Maximum levels:
    o LINE levels: +20dBu.
    o MIC levels: -46dBu (without compressor).
    o MIC levels: -33dBu (with compressor).
- Input impedance:
    o LINE mode = 24Kohm.
    o MIC mode = 4Kohm.
- Mic input sensitivity adjustable from -25 to -65 dBu.
- THD+N < 0.02% (MIC mode), 0.005% (LINE mode). @ 1kHz.
- SNR > 75dB (MIC mode), 95dB (LINE mode).
- Phantom power (48 Volts).

Audio Out L & R: Two XLR output connectors on the rear side delivers the stereo signal of the received <Program channel>.
- Balanced Analog Outputs:
    o Maximum output level: +22 dBu.
    o Output Impedance: 50 ohm.

Headphone output: Jack 6,3 mm. Two high impedance headphones are available at the front side. The audio signal that feeds each headphone out will depend on the configuration according to section IV.7.2.

XLR analogue audio pin out:
The analogue audio I/O are available through the XLR connectors on the rear and front panel. The wiring conforms to the following scheme:

Pin	Función
1	Ground
2	Audio+
3	Audio-

VI.1.3 Network interfaces

LAN1: RJ-45 connector on the rear side; 10/100/1000BT Ethernet interface. Default interface for streaming and remote control.

LAN2: RJ-45 connector on the rear side; 10/100/1000BT Ethernet interface. This connector supports the remote control if this option is available for this equipment. It also works as a streaming interface in Custom bonding.

Internal 3G/4G SIM card slots: Up to 8 SIM cards. HSPA+: Peak Download rate: 21,1 Mbps; Peak Upload rate: 5,76 Mbps. WCDMA 850/900/1900/2100 MHz

3G/4G USB slots (optional): Four USB slots (USB1..USB4) on the top side allocates the 3G/4G modems.

PSTN: RJ-11 connector on the rear side. Spare for future applications.

VI.1.4 Media storage

SD removable storage: A SD memory slot is located on the front side for removable memory cards up to 64GB.

VI.1.5 Auxiliary interfaces

RS232: RJ-45 connector on the rear side. Dedicated to the transmission of auxiliary data.

Rear USB slots: Two USB slots are available on the rear side for future applications.

GPIO: Two ground contact inputs and two relay outputs mounted on a DB9 female connector.

Pin	Function	Pin	Function
1	Input 1		
		6	Input 2
2	GND		
		7	Normally Closed Relay 1
3	Common Relay 1		
		8	Normally Open Relay 1
4	Normally Closed Relay 2		
		9	Common Relay 2
5	Normally Open Relay 2		

MFC: Spare for future applications.

VI.1.6 Power supply

Neutrik power connector: Voltage feed is for 12VDC. Power consumption less than 50W (average ~30W).

Battery operation: Optional any of two different battery holders can be provided on the top side of the equipment. Possible options are possible for V-lock or Anton-Bauer batteries.

VI.1.7 Dimensions and weight.

Dimensions of the Portable Ikusnet are: 275 x 260 x 115mm (W x D x H).

Weight: 4.5kg.

VI.2 IKUSNET STUDIO HARDWARE

VI.2.1 Video interfaces

Ikusnet ST can be equipped with an SDI, HDMI or Video Composite video input[25]:

- SDI input: BNC connector on the rear side; input Serial digital Interface according SMPTE 259M (SD) and SMPTE 292M (HD). (details in section VI.4)

- HDMI input: HDMI Type A receptacle connector, 19 contacts. HDMI version 1.4.
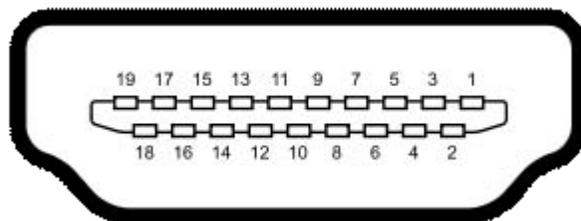
Pin	Function	Pin	Function
1	TMDS Data2+	11	TMDS Clock Shield
2	TMDS Data2 Shield	12	TMDS Clock-
3	TMDS Data2-	13	CEC
4	TMDS Data1+	14	N.C.
5	TMDS Data1 Shield	15	SCL
6	TMDS Data1-	16	SDA
7	TMDS Data 0+	17	DDC/CEC Ground
8	TMDS Data 0 Shield	18	+5 V Power
9	TMDS Data 0-	19	Hot Plug Detect
10	TMDS Clock+		

- Video Composite input: (CVBS) according SMPTE170M (NTSC) or ITU-R BT.470 (PAL). Max input 0.75Vpp. BNC 75 Ohm unbalanced connector.

SDI OUT1 and SDI OUT2: BNC connector on the rear side; output Serial Digital Interface according SMPTE 259M and SMPTE 292M. (details in section VI.4)

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[25] Take into account that first production series can only be equipped with SDI inputs.

SDI OUT2 copies exactly the same signal than SDI OUT1; therefore suitable for connecting an external video monitor.

GEN LOCK: BNC connector on the rear side. This input might synchronize the video codec externally.

VI.2.2 Audio interfaces

Embedded audio: The video input interface might contribute with the first two embedded audio channels (i.e. one stereo signal) to the PROGRAM channel or main stream.

Digital audio AES/EBU input/output for PROGRAM channel: This AES/EBU digital audio input and output interface delivers de-embedded stereo audio signal to be sent or received over the <Program channel>.
- Connector: female DB9.
- AES/EBU: EIAJ CP-340 type I/IEC-958 Pro
- Rate Converter: 1:3 to 3:1.

Digital audio AES/EBU input/output for TALKBACK channel: This AES/EBU digital audio input and output interface delivers the audio signal to be sent or received over the <Talkback channel>.
- Connector: female DB9.
- AES/EBU: EIAJ CP-340 tipo I/IEC-958 Pro
- Rate Converter: 1:3 to 3:1.

Analog audio input/output for Talkback: This interface is located on the rear panel of the unit on a DB15 connector and provides the unit with the analog audio input/output for the audio signals on the TalkBack channel. The user must select between the analog and the digital talkback audio inputs on the configuration menu
- Balanced Analog inputs:
  Maximum input level: +22 dBu.
  Input Impedance: 20 Kohm.

- Balanced Analog Outputs:
  Maximum output level: +22 dBu.
  Output Impedance: 50 ohm.

AES/EBU connector pin-out:

Both AES/EBU interfaces are available via the sub-D 9 ways connectors on the rear panel of the unit. These connectors provide the option to connect an externally synchronised signal. The user can select via software if the digital output is to synchronise with the audio input or with an external sync signal. The connector is wired in the following way:

Pin	Function	Pin	Function
1	AES/EBU IN -	6	AES/EBU IN +
2	GND	7	SYNC +
3	SYNC -	8	GND
4	GND	9	AES/EBU OUT +
5	AES/EBU OUT -		

TalkBack analog audio interface pinout:

Pin	Function	Pin	Function
1	NC	9	NC
2	NC	10	GND
3	GND	11	AUDIO OUT RIGHT -
4	AUDIO OUT RIGHT +	12	AUDIO OUT LEFT -
5	AUDIO OUT LEFT +	13	GND
6	AUDIO IN RIGHT -	14	AUDIO IN RIGHT +
7	GND	15	AUDIO IN LEFT -
8	AUDIO IN LEFT +		

VI.2.3 Network interfaces

LAN1: RJ-45 connector on the rear side; 10/100/1000BT Ethernet interface. Default interface for streaming and remote control.

LAN2: RJ-45 connector on the rear side; 10/100/1000BT Ethernet interface. This connector supports the remote control if this option is available for this equipment. It also works as a streaming interface in Custom bonding.

PSTN: RJ-11 connector on the rear side. Spare for future applications.

VI.2.4 Media storage

Internal Media storage: Internally a media storage of 500GB on hard disk is optionally available.

VI.2.5 Auxiliary interfaces

RS232: RJ-45 connector on the rear side. Dedicated to the transmission of auxiliary data

Rear USB slots: Three USB slots are available on the rear side for future applications.

GPIO: Two ground contact inputs and two relay outputs mounted on a DB9 female connector.
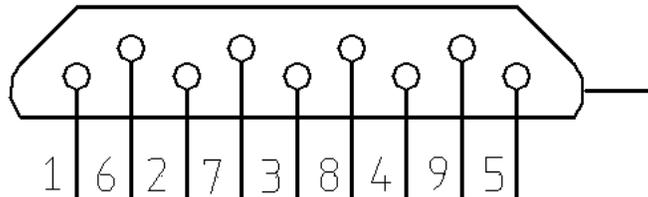
Pin	Function	Pin	Function
1	Input 1		
		6	Input 2
2	GND		
		7	Normally Closed Relay 1
3	Common Relay 1		
		8	Normally Open Relay 1
4	Normally Closed Relay 2		
		9	Common Relay 2
5	Normally Open Relay 2		

VI.2.6 Power supply

VAC power connector: Voltage feed is for 90 - 250VDC [@ 47-65Hz]. Power consumption less than 50W (average ~30W).

Redundant VDC power connector: DC power feeding is provided optionally for backup purpose. Possible nominal voltages are -48VDC or -24VDC.
- Input range for nominal -48VDC is [36 - 72VDC]
- Input range for nominal -24VDC is [18 - 36VDC]

VI.2.7 Dimensions and weight.

Dimensions of the Ikusnet Studio are: 43.4 x 482.5 x 295mm (H x W x D); (1U x **19″** rack system).

Weight of the Ikusnet Studio is 3kg.

VI.3 RS232 PORTS

The RS232 port allows the transmission and reception of data along with encoded video and audio. Note that these sockets are RJ45 connections, as opposed to the typical 9-pin sub-D connections. To make the conversion between RJ45 and RS232 there are modular connectors available that should be wired as follows:
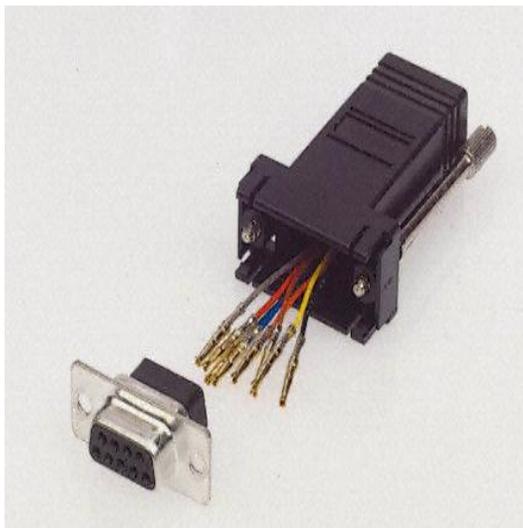
RJ45 Connector	9-pin female D-sub Connector
1 (NC)	1
2 (Rx)	3
3 (GND)	5
4 (NC)	4
5 (NC)	6
6 (GND)	7
7 (Tx)	2
8 (NC)	8

1,4,5,8 must be unconnected

The ports are always set to 8 DATA bits, NO parity, 1 START bit and 1 STOP bit. The bit rate can be adjusted to between 300 and 9600 bps via software.

VI.4 SUPPORTED VIDEO INPUTS FORMATS

The following video input formats are supported depending on the Encoder Mode:

Encoder SD	Input format	Resolution	Frames per second	Fields per second	Connector	Downscale to
	NTSC (480i59)	720x480	29,97	59,94	SDI, HDMI,CVBS	NTSC (480i59)
	PAL (576i50)	720x576	25	50	SDI, HDMI,CVBS	PAL (576i50)
	720p25	1280x720	25		SDI, HDMI	PAL (576i50)
	720p29	1280x720	29,97		SDI, HDMI	NTSC (480i59)
	720p30	1280x720	30		SDI, HDMI	NTSC (480i59)
	720p50	1280x720	50		SDI, HDMI	PAL (576i50)
	720p59	1280x720	59,94		SDI, HDMI	NTSC (480i59)
	720p60	1280x720	60		SDI, HDMI	NTSC (480i59)
	1080i50	1920x1080	25	50	SDI, HDMI	PAL (576i50)
	1080i59	1920x1080	29,97	59,94	SDI, HDMI	NTSC (480i59)
	1080i60	1920x1080	30	60	SDI, HDMI	NTSC (480i59)
	1080p25	1920x1080	25		SDI, HDMI	PAL (576i50)
	1080p29	1920x1080	29,97		SDI, HDMI	NTSC (480i59)
	1080p30	1920x1080	30		SDI, HDMI	NTSC (480i59)

NOTE: Take into account that when the compression format is configured to work as Standard Definition (SD), 720 and 1080 resolutions (HD) will be downscaled to SD.

Encoder HD	Input format	Resolution	Frames per second	Fields per second	Connector
	720p50	1280x720	50		SDI, HDMI
	720p59	1280x720	59,94		SDI, HDMI
	720p60	1280x720	60		SDI, HDMI
	1080i50	1920x1080	25	50	SDI, HDMI
	1080i59	1920x1080	29,97	59,94	SDI, HDMI
	1080i60	1920x1080	30	60	SDI, HDMI
	1080p25	1920x1080	25		SDI, HDMI
	1080p29	1920x1080	29,97		SDI, HDMI
	1080p30	1920x1080	30		SDI, HDMI

Appendix A

UPDATING THE FIRMWARE

To update the firmware of an Ikusnet unit follow these steps:

1. Make sure your Ikusnet and the computer to be used for the update are connected to the same LAN. Of the two Ethernet interfaces available in Ikusnet, the update operation is always done through the labeled LAN1

Picture 129. Ikusnet back panel.

2. If you do not have a LAN, it is also possible to connect the computer and the Ikusnet LAN1 port directly through a standard or crossover CAT-5 cable. The Ethernet port on the computer automatically adjusts to the type of cable.
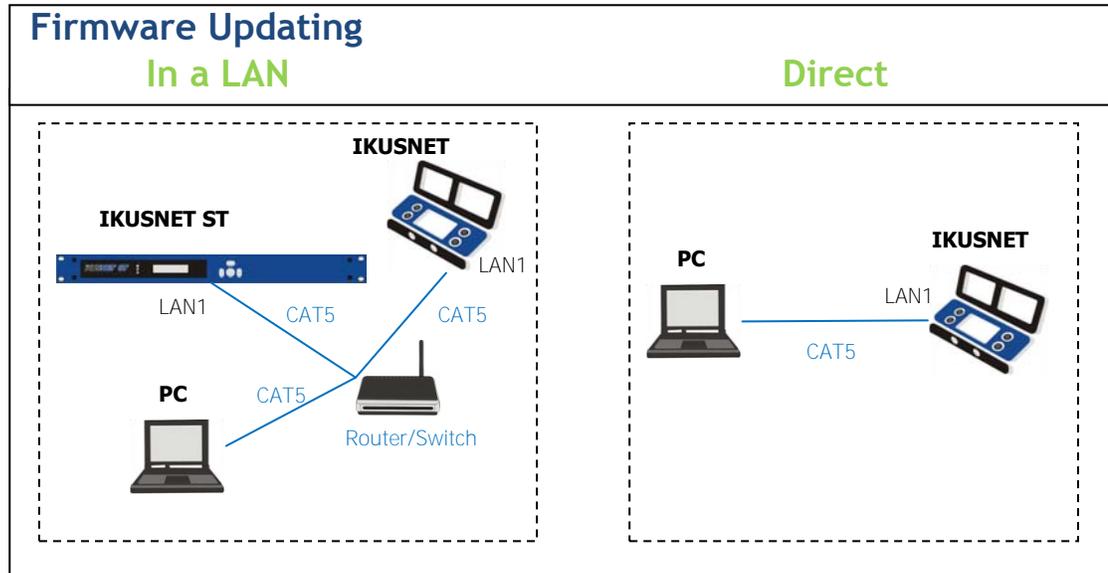
Picture 130. Ikusnet firmware updating.

3. Make sure the Ikusnet LAN1's (Control) and the PC's IP addresses belong to the same subnet. If this is not the case and you need to modify Ikusnet's IP address, follow these steps:

   a. Enter the IP menu by clicking the following icons on the touch screen menu or web page:

   b. The codec's IP address can be entered manually or can be obtained automatically:
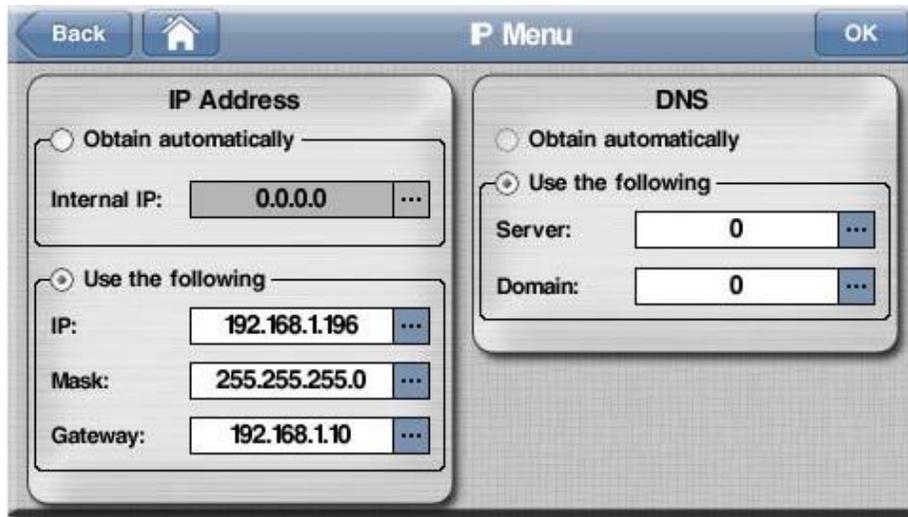
Picture 131. IP Menu.

i. If automatic IP address is chosen, a DHCP server will provide Ikusnet with an appropriate IP address value for the subnet where it is connected. To know the value of the address assigned, the monitoring system screen can be consulted:
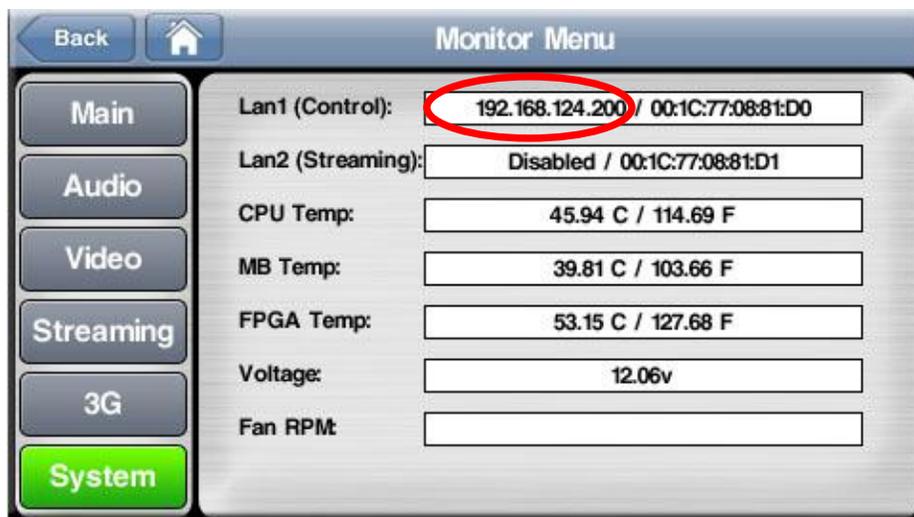
Picture 132. System Monitor Menu.

ii. If the manual option is chosen, you must enter values for IP address and mask consistent with the subnet where the PC is.

c. If you upgrade an Ikusnet ST and your PC is not in the same subnet, you must change the IP address and mask of the PC to match that of Ikusnet ST. To do this make sure what is the Ikusnet ST's subnet checking its values in the front display and then change the IP address and mask of the PC in the next configuration window:
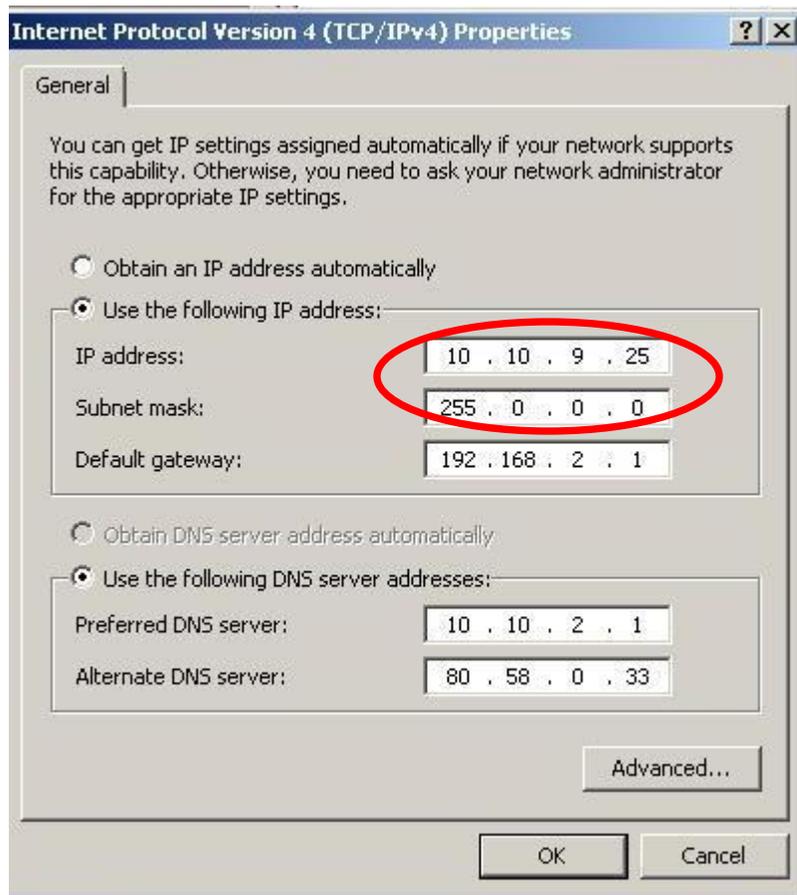
Picture 133. IP address configuration.

4. Ensure that the PC is able to access the codec opening the control page from the Internet Explorer by entering the LAN1 IP address in the address bar.

5. Start up the ProdysFlashPlus application.

6. Click on browse and select the file with the new firmware version.
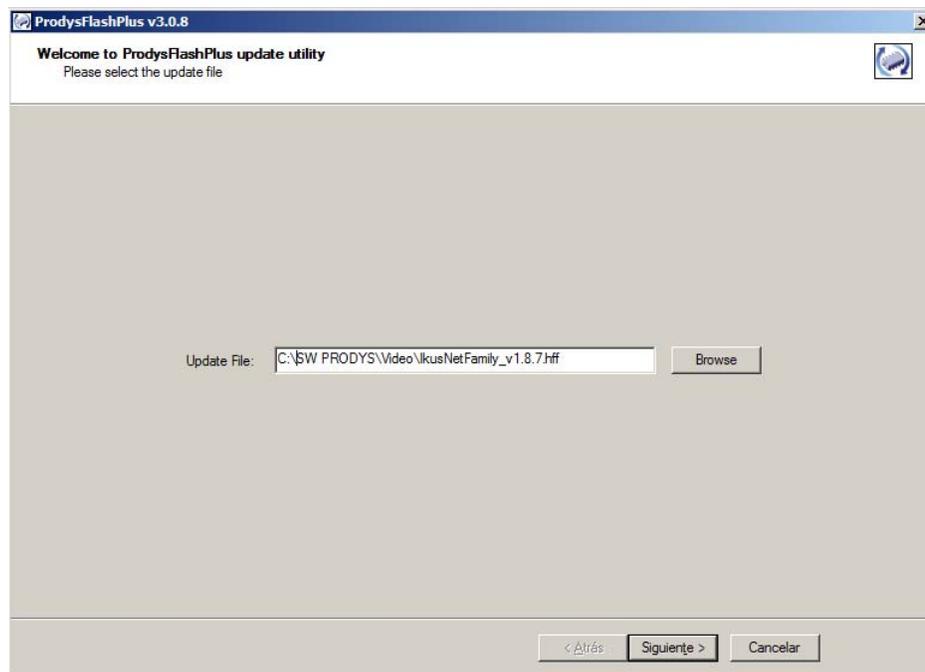
Picture 134. Choosing file in ProdysFlashPlus.

7. **All the units connected to the computer's network will be detected** automatically. Look in the first column the IP address configured on the **unit's** LAN1. Select the codec checking the box. If you are upgrading more than one codec, select all the boxes for the codecs you want to upgrade.
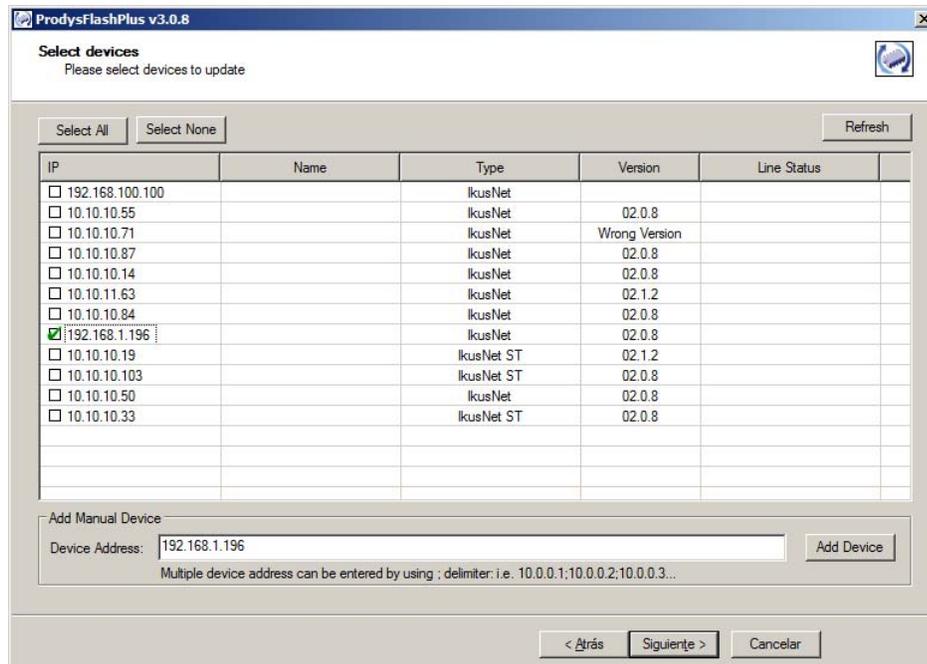
Picture 135. Choosing device in ProdysFlashPlus.

- Press next to start the update process. You will see a warning message telling you that all the contents of the Flash will be erased and that you must back-up this data BEFORE updating the device.

Picture 136. Warning message in ProdysFlashPlus.

- By clicking on next, the upgrading process will start.

Picture 137. Update process in ProdysFlashPlus.

The update process will begin, the Flash will be erased and a progress bar will tell you more info and alert you when it is finished.

- You are able to abort the update process until the recording process begins. At this point, the cancel button is disabled. In any case, even if a power failure or a similar failure takes place, it is always possible to return to start the recording process again.
- If everything has gone correctly, at the end of the recording, you will be shown the following message:

Picture 138. End of recording in ProdysFlashPlus.

Appendix B

BACKPACK FOR IKUSNET PORTABLE

Ikusnet Portable codec supports a customized backpack to ease transportation and to allow a camera man to carry the unit along with a camera to achieve live broadcast from anywhere. Here follows some pictures of this backpack and its different compartments:

Access to front panel connectors

3G/4G Wireless Module

Battery compartment

Access to rear panel connectors

Zip to access the unit

Auxiliary pocket

Appendix C

TRANSPORTATION CASE FOR IKUSNET PORTABLE

Ikusnet Portable codec supports a transportation case to ease transportation. Here follows some pictures of this case and its different compartments:

Left locker

Right locker

Auxiliary compartment

Ikusnet compartment

Picture 139. Ikusnet transportation case top view.

Appendix D

DETAILED PORTS DESCRIPTION

There are two main groups of ports: Management and Streaming ports:

X.1 Management Ports

**HeraFlash &
Prodys Control**

UDP 50013: This port is used by ProdysControl Management Software and the ProdysFlashPlus upgrading application their communication with Prodys IP units.

In case of remote upgrading, if a firewall is in between, these ports should be opened/forwarded to the corresponding IP codec.

Web Page

TCP 80: This port is used for the access to the web login page via HTTP (Internet Explorer). Once logged in, the OCX control web takes over and manages the connection.

TCP 50011: Dynamic Web Page (OCX). This is the port used in the communication between the PC running Internet Explorer and the IP codec, once the user has logged into the control web page.

In case of remote controlling the unit, if a firewall is in between the IP codec and the PC, these ports should be opened/forwarded.

X.2 Streaming Ports

TCP 53000: P-RTCP (Control): This port is used to control any IP streaming communication. This port can be disabled. In case this protocol is disabled, there will be a lack of control in the status of the connection at

the far end, and both ends will have to initiate the connection in order to be able to stream data.

UDP 53000: P-RTP Unicast PROGRAM channel Audio, Auxiliary and Video Data: This port is used to carry the audio, auxiliary and video data over IP for unicast communications on the PROGRAM line.

UDP 53001: P-RTP Unicast TALKBACK audio channel: This port is used to carry the audio data over IP for unicast communications on the talkback channel.

Ports	DEFAULT PORTS	
Management Ports	**ProdysFlash** UDP:50013	**Web Page** TCP 80 TCP 50011
Streaming[26] Ports	TCP 53000 UDP 53000 UDP 53001	
Protocol	Prodys Proprietary	

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[26] Default streaming ports: They can be changed by the user.

Appendix E

GLOSSARY

AAC: Advanced **A**udio **C**oding is a standardized, lossy compression and encoding scheme for digital audio. Designed to be the successor of the MP3 format, AAC generally achieves better sound quality than MP3 at similar bit rates.

AAC has been standardized by ISO and IEC, as part of the MPEG-2 and MPEG-4 specifications. Some parts/profiles of the AAC are High-Efficiency Advanced Audio Coding (HE-AAC) and LC-AAC Low Complexity Advance Audio coding.

AAC ELD: **A**dvanced **A**udio **C**oding, **E**nhanced **L**ow **D**elay. AAC ELD achieves the lowest compression delay of all AAC audio compression profiles but still keeps a high ratio quality/compression. This ratio would be lower than AAC LC or AAC HE but with a much lower delay than these ones.

AAC LC: **A**dvanced **A**udio **C**oding, **L**ow **C**omplexity. It is a compression algorithm for digital audio. AAC has been standardized by ISO and IEC, as part of the MPEG-2 and MPEG-4 specifications. AAC generally achieves better sound quality than mp2 and mp3 at similar or lower bit rates.

APN: **A**ccess **P**oint **N**ame. It is a configurable network identifier that allows a user's device to access the Internet using the mobile phone network.

CIF: **C**ommon **I**ntermediate **F**ormat. It is a standard for the resolution of PAL video sequences in pixels. CIF defines a video sequence with a resolution of 352 × 288 pixels. **4CIF** multiplies the CIF resolution 4 times, providing 704 x 576 pixels.

D-1: is an SMPTE digital video standard and was the first major professional digital video format. D-1 resolution is 720 × 486 for NTSC systems and 720 × 576 for PAL systems; these resolutions come from Rec. 601 and are also used in DVD-Video and Standard-definition television.

DVB-ASI: **A**synchronous **S**erial **I**nterface used in the DVB (**D**igital **V**ideo **B**roadcasting) suite of internationally accepted open standards for digital television. All data is transmitted through this interface in MPEG transport streams.

GOP: **G**roup **O**f **P**ictures. It is a group of successive pictures within a coded video stream that specifies the order in which intra- and inter-frames are arranged. Each coded video stream consists of successive GOPs.

H.264: is a standard for video compression, and is currently one of the most commonly used formats for the recording, compression, and distribution of high definition video.
H.264/MPEG-4 AVC is a block-oriented motion-compensation-based codec standard developed by the ITU-T Video Coding Experts Group (VCEG) together with the ISO/IEC Moving Picture Experts Group (MPEG). It was the product of a partnership effort known as the Joint Video Team (JVT). The ITU-T H.264 standard and the ISO/IEC MPEG-4 AVC standard are jointly maintained so that they have identical technical content.

HE-AAC: **H**igh-**E**fficiency **A**dvanced **A**udio **C**oding. It is an evolution of the AAC LC compression algorithm for digital audio. It includes Spectral Band Replication techniques and Parametric Stereo. It is especially suitable for low bitrates.

HSPA: **H**igh **S**peed **P**acket **A**ccess. It is a 3rd generation (**3G**) mobile telephony protocol, supporting high data rates, reaching till peak values of up to 14 Mbit/s in the downlink and 5.8 Mbit/s in the uplink.

Interlaced Video: is a technique of doubling the perceived frame rate of a video signal without consuming extra bandwidth. Since the interlaced signal contains the two fields of a video frame shot at two different times, it enhances motion perception to the viewer and reduces flicker by taking advantage of the persistence of vision effect.

Letterbox: Effect that occurs when transferring video in a widescreen aspect ratio to a standard-width video format using mattes (black bars) above and below the image.

MPEG 4 AVC: MPEG 4 **A**dvanced **V**ideo **C**oding. See H.264.

MXF: **M**aterial e**X**change **F**ormat. It is a container format for professional digital video and audio media standardized by SMPTE which supports a number of

different streams of coded "essence", encoded with any of a variety of codecs, together with a metadata wrapper which describes the material contained within the file.

Pillarbox: Effect that occurs when transferring video in a standard-width aspect ratio to a widescreen video format using mattes (black bars) on the sides of the image.

Progressive Video: It is a way of displaying, storing, or transmitting moving images in which all the lines of each frame are drawn in sequence. This is in contrast to the interlacing used in traditional television systems where only the odd lines, then the even lines of each frame (each image called a field) are drawn alternately.

SDI: **S**erial **D**igital **I**nterface. It is a video interface standardized by SMPTE. This standard is used for transmission of uncompressed, unencrypted digital video signals (optionally including embedded Audio and/or Time Code) within television facilities.

SIF: NTSC version of **CIF**. It is a standard for the resolution of NTSC video sequences in pixels. SIF defines a video sequence with a resolution of 352 × 240 pixels. **4SIF** multiplies the SIF resolution 4 times, providing 704 x 480 pixels.

SMPTE 259M-C: it is a standard which describes a 10-bit serial digital interface operating at 270 Mb/s with a D-1 video resolution. This standard defines a Serial Digital Interface or **SD-SDI** based on a coax cable.

SMPTE 292M: it is a standard which expands upon SMPTE 259M allowing for bit-rates of 1.485 Gbit/s. These bit-rates are sufficient for and often used to transfer uncompressed High Definition video. This standard is usually referred to as **HD-SDI**.

TCP: **T**ransmission **C**ontrol **P**rotocol. It is one of the two original protocols of the Internet Protocol Suite complementing the Internet Protocol (IP). TCP provides reliable, ordered delivery of a stream of bytes from a program on one device to another program on another device. TCP is the protocol that major Internet applications rely on.

Transport Stream: it is the standard format for transmission and storage of audio, video, and data used in DVB broadcast system. Transport Stream is specified in MPEG-2 Part 1, Systems (formally known as ISO/IEC standard

13818-1 or ITU-T Rec. H.222.0). Transport stream specifies a container format encapsulating packetized elementary streams, with error correction and stream synchronization features for maintaining transmission integrity when the signal is degraded.

UDP: **U**ser **D**atagram **P**rotocol. It is one of the core members of the Internet Protocol Suite. With UDP, computer applications can send messages to other hosts on an IP network without requiring prior communications to set up special transmission channels or data paths. Thus, UDP provides an unreliable service and messages may arrive out of order, appear duplicated, or go missing without notice.

Appendix F

PICTURE INDEX

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