

PC-ip

User Manual

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Chapter I

INTRODUCTION

MUSICAM USA extends its line of audio codec with a new software product marketed as “PC-ip”. Running this user friendly application on regular computers provides a professional audio codec in situations where dedicated hardware is not suitable to operate.

PC-ip is dedicated to communicate only with the Suprima Family of IP codecs.

At this time the compression algorithms available for PC-ip is a subset of those provided by the Suprima IP Family of codecs. Please check the latest status of the compression algorithms available for PC-ip on appendix A. Some of the available compression protocols might be provided under license.

Chapter II

INSTALLATION GUIDE

This document provides system requirements and instructions for installing the PC-IP software on a Windows computer.

II.1 Delivery

PC-IP is supplied in a CD case. Included is the CD containing the software and the licensing USB dongle.

II.2 System requirements

The following tables provide the minimum requirements for installing the PC-IP software on a Windows computer. As with any other software, a faster processor and/or additional RAM may result in increased performance.

The minimal hardware requirement is Pentium IV 1GHz processor core capable of running any of the [supported operating systems](#):

- Windows 2000
- Windows XP
- Windows Vista
- Windows7
- Windows Server 2003

Microsoft DirectX 8.1b or higher must be available in the computer.

Of course, the computer must be equipped with an IP interface, be it a 10/100BaseTx Ethernet, Wi-Fi, Dial-Up over ISDN or PSTN, or 3G network connection compatible with any of the supported operating systems and, in addition, a sound card compatible with any of the supported operating systems must be installed and configured in the computer.

IMPORTANT NOTE: A dongle provided by MUSICAM USA is required for this software to work. If the dongle is unplugged during the normal operation, the application will be closed automatically.

II.3 Installation

To install the software:

1. Insert it into your computer's CD-ROM drive.

After inserting the CD the following display should appear. After a series of setup screens appears, the installation process begins and the Welcome screen appears. Click Next.

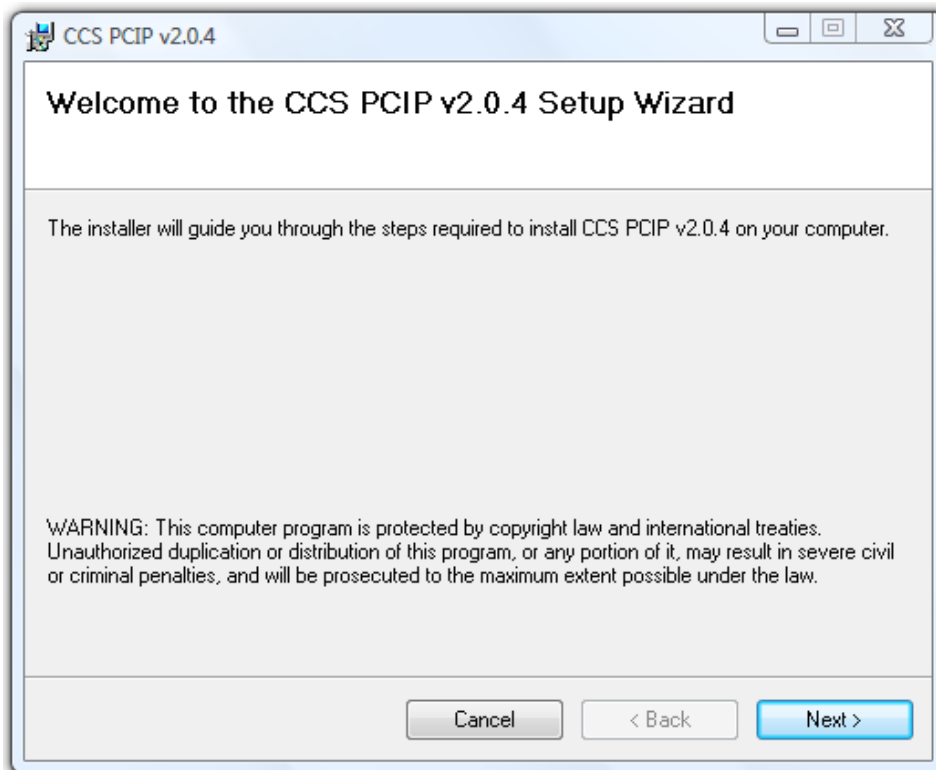


Figure 1. Welcome screen.

2. The destination folder screen appears:

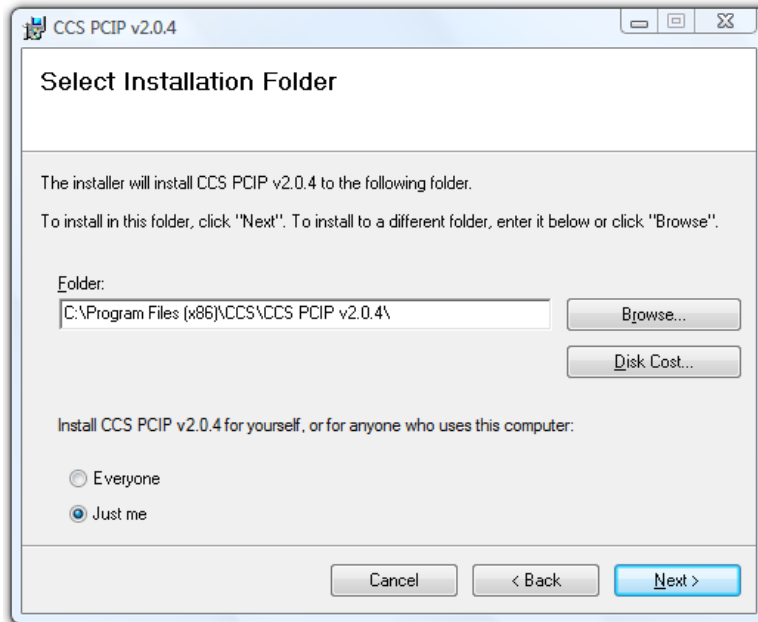


Figure 2. Destination Folder screen.

Choose a destination directory or accept the default.

3. The installation starts automatically and the Installation screen appears:

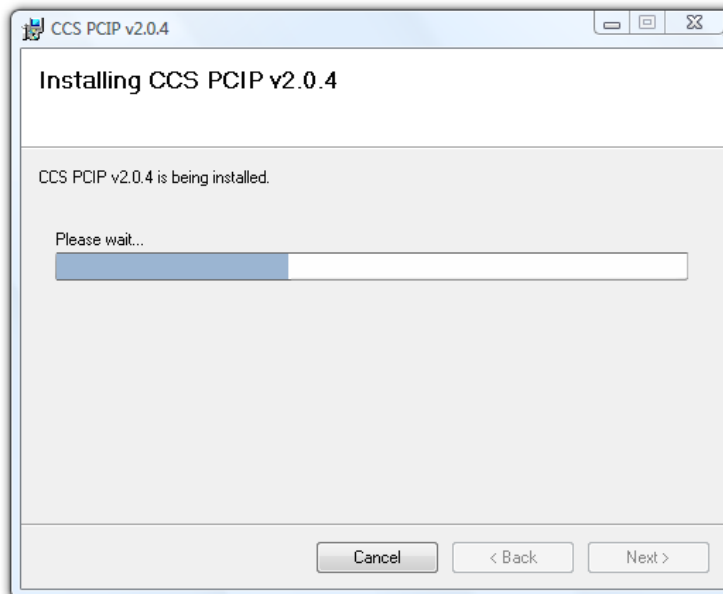


Figure 3. Installation screen.

During the installation, a progression bar will indicate the user how long it will take to finish. If the installation is finished successfully, the following widow will appear:

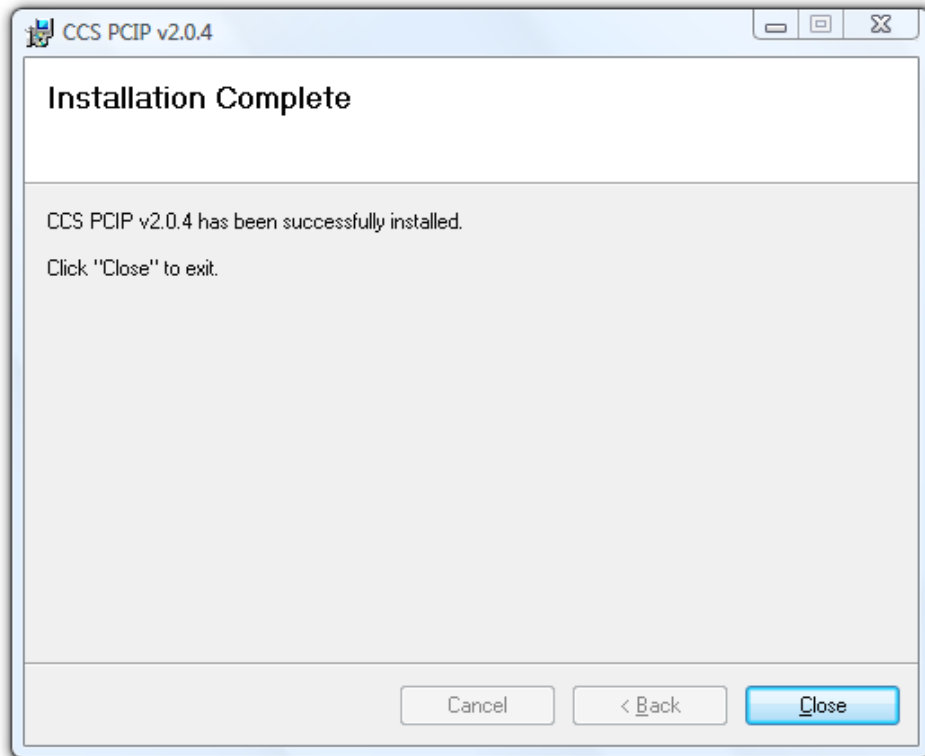


Figure 4. Installation completed.

Once the installation has been completed successfully, click on Finish. MUSICAM USA PC-IP has now been fully installed and opens automatically when you double-click its icon:



The overall time required for installation should last less than 3 minutes.

II.4 Uninstalling earlier versions

If you've installed an earlier PC-IP version, you may want to uninstall the older software before installing PC-IP. Usually this is unnecessary, but it can prevent any problems with previous versions from being inherited.

You can uninstall using the following procedure.

1. From the Start menu, point to Settings and then click Control Panel.
2. Double-click Add/Remove Programs in the Control Panel.
3. Click the Install/Uninstall tab in the dialog box that appears.
4. Select MUSICAM USA PC-IP, click Add/Remove, and then click OK.

II.5 Audio interfaces

Computer enabled headphones might be used for better comfort. Ask your computer provider for the best audio accessories available.

Chapter III

PC-IP MENU

PC-IP is a straight forward application. After installation and [placing the licensing USB dongle](#) the user can start immediately to use the software codec with the default parameter settings.

This chapter gives details of the configuration options available to the user.

Double-click the desktop icon:



III.1 Menu layout

The menu layout resembles MUSICAM USA Suprima IP Family graphical user interface. The GUI is divided into three areas:

- The left upper hand area provides the general [configuration options and the call log](#).
- The left lower hand area provides the [audio gain control](#) for the ingress and egress audio stream.
- The middle area provides the actual information of codec status and is the mean to set communications parameter of the current call. This area defines de [codec control](#). In the mid lower section, the file player¹ control allows the user to set a play list of audio files to be reproduced, encoded and sent over IP.
- The right hand area displays the [vu-meter](#) for the incoming and outgoing audio. Vu-meters will display the audio input level even when there is no audio connection.

¹ File player is available as an option.

Clicking on the any of the left and middle boxes unfolds further options.

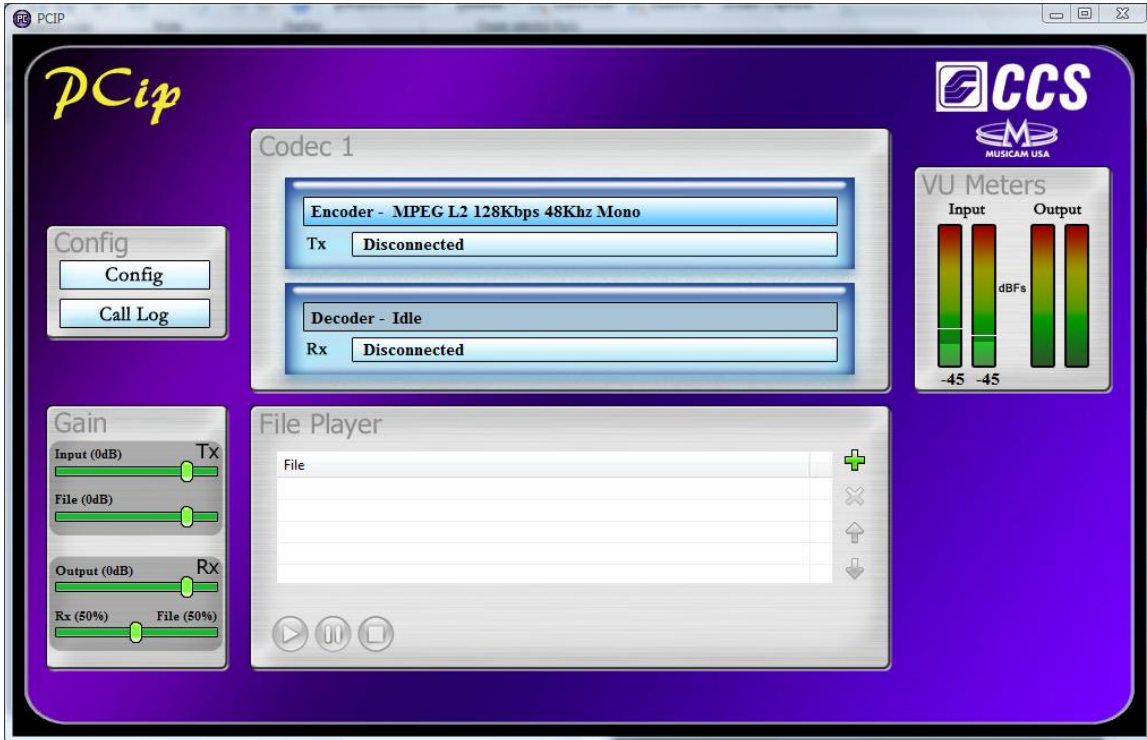


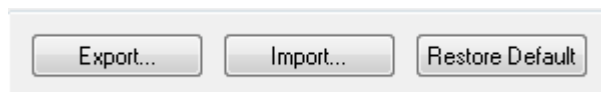
Figure 6. Main screen.

The GUI is a fix sized display regardless of the actual window size applied.

III.2 Configuration parameters

The configuration parameters are grouped in sections as follows. Any parameter modification is saved automatically. If the PC-IP is closed and reopened later for another session, the last settings are restored.

Alternately the user might save (**Export**) the current setting apart or reload (**Import**) a well-known configuration. This procedure asks you to write or read a “.PC-IP” file to a system folder of your choice.



The original factory configuration (default values) can be reloaded clicking the option <Restore Default>.

III.3 General Configuration

Clicking on the 'Config' button brings up the configuration page:

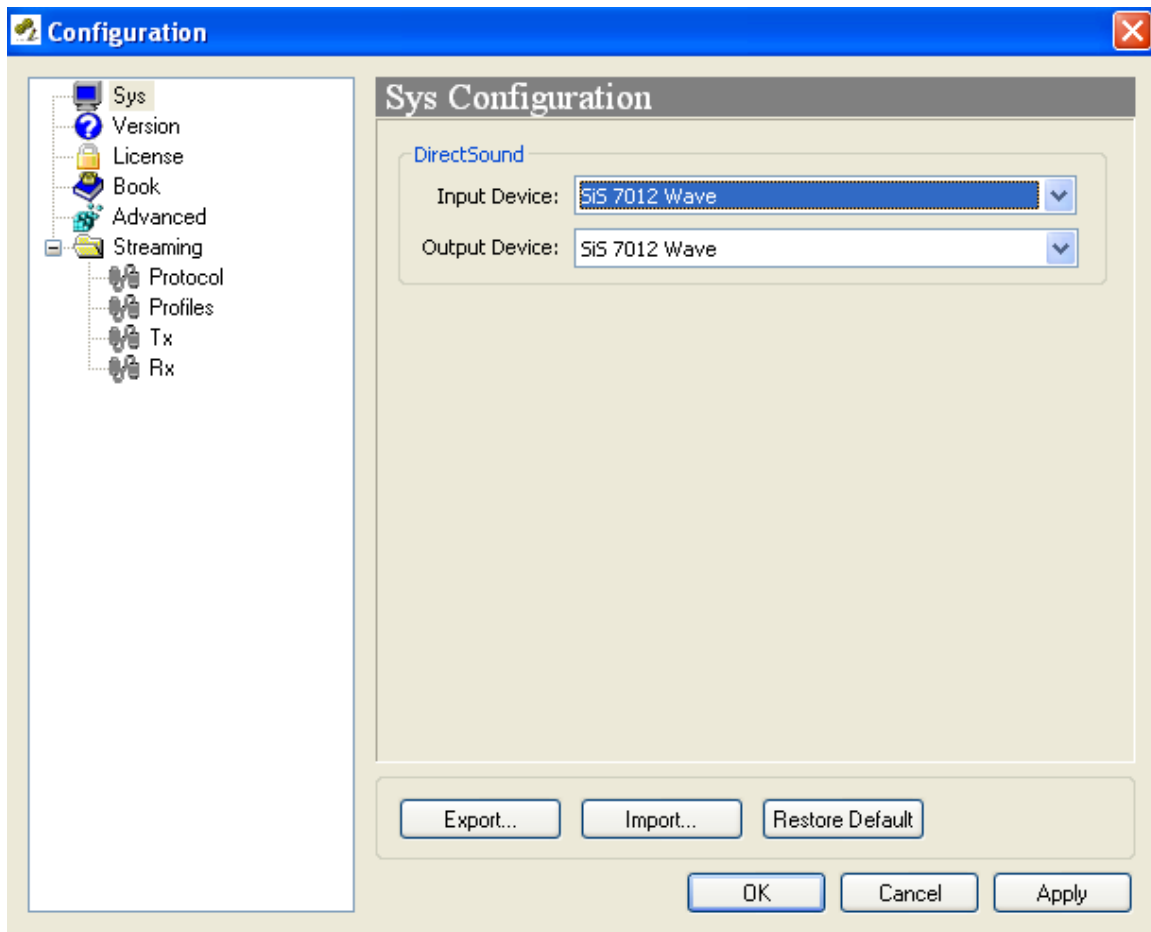


Figure 7. Configuration window.

To apply the changes, the user can press either the OK button or the Apply button. By pressing the Apply button the changes will be applied but the configuration window will remain.

III.3.1 System Configuration

<Sys> selects the actual audio input and output interfaces of the computer.

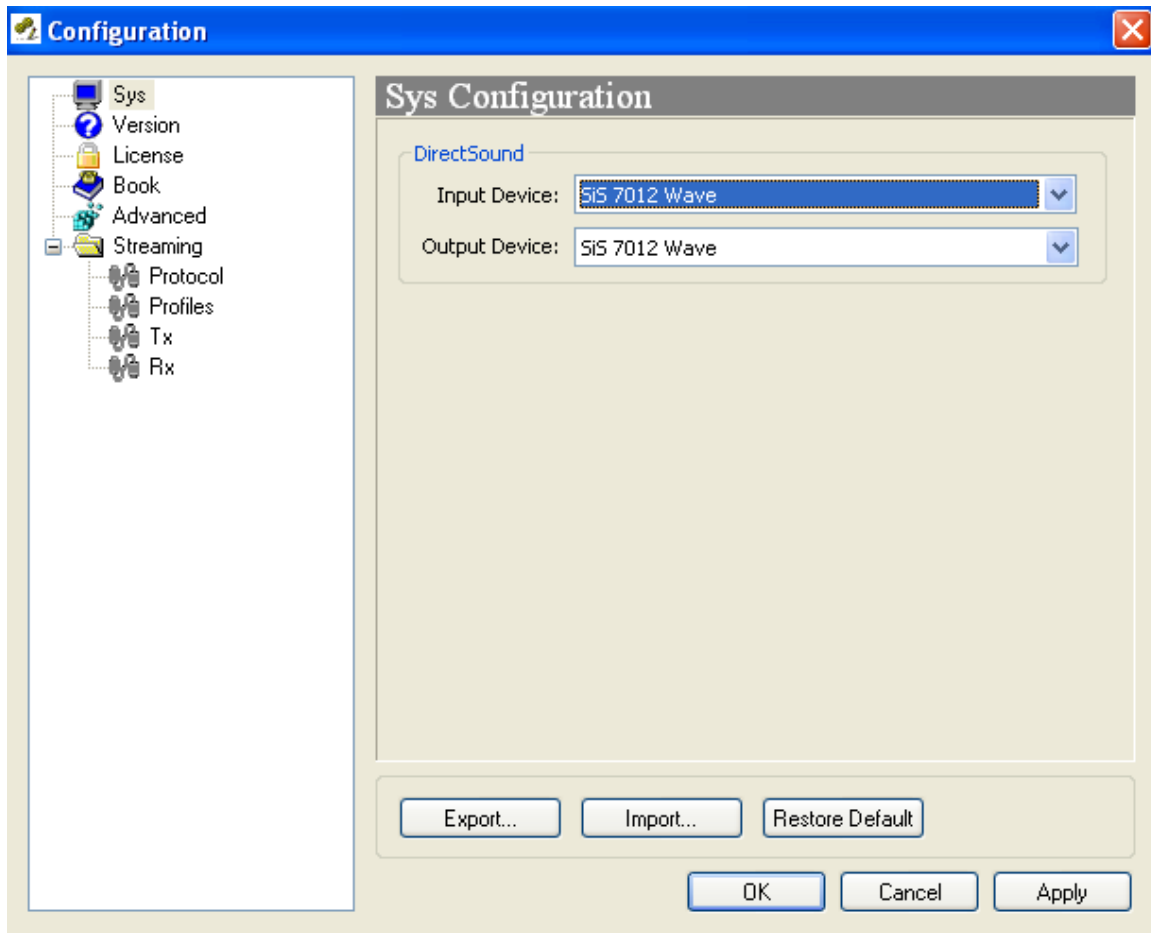


Figure 8. System Configuration Window.

III.3.3 License

Application licenses can be checked and loaded in this menu. The current PC-IP version provides the licenses checked as <Yes> in the figure.

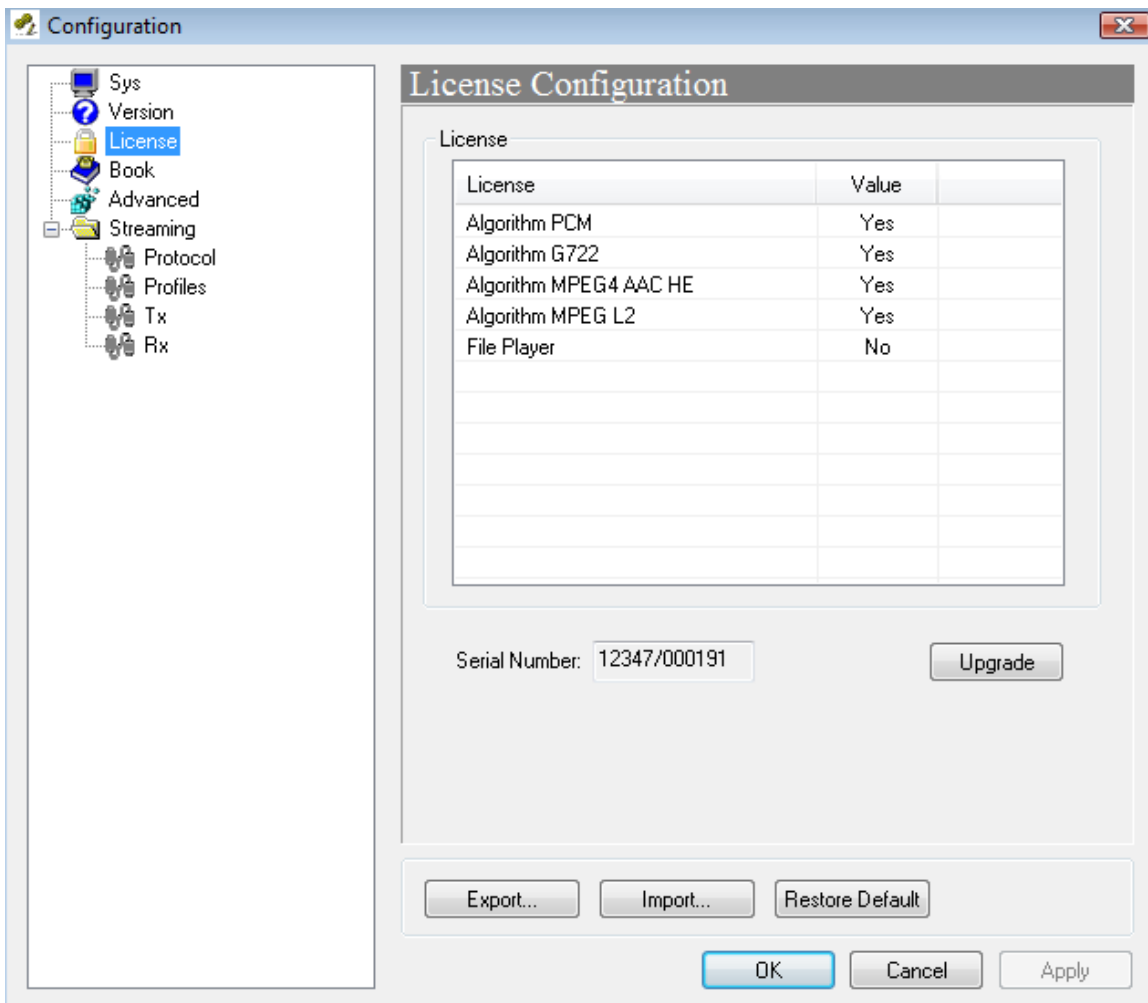


Figure 10. License Configuration Window.

The baseline PC-IP version disables the MPEG4 AAC HE algorithm and the File Player option.

Anyhow an [upgrade](#) for a new license is possible at any moment. This license is provided as a file which must be browsed and selected in the Upgrade window. From the License window, the user can see the serial number of PC-IP software

installed on the computer. That serial number must be indicated to the MUSICAM USA sales department in case of purchasing any additional license.

III.3.4 Book

When the <Book> option is selected, the phone book window is showed on the right side. The Phone Book records the user name, and an IP address. There are up to 64 indexes.

The procedure to edit a phone book index is as follows:

1. Select one index by clicking on its area.
2. Enter the IP address.
3. Select the compression mode.

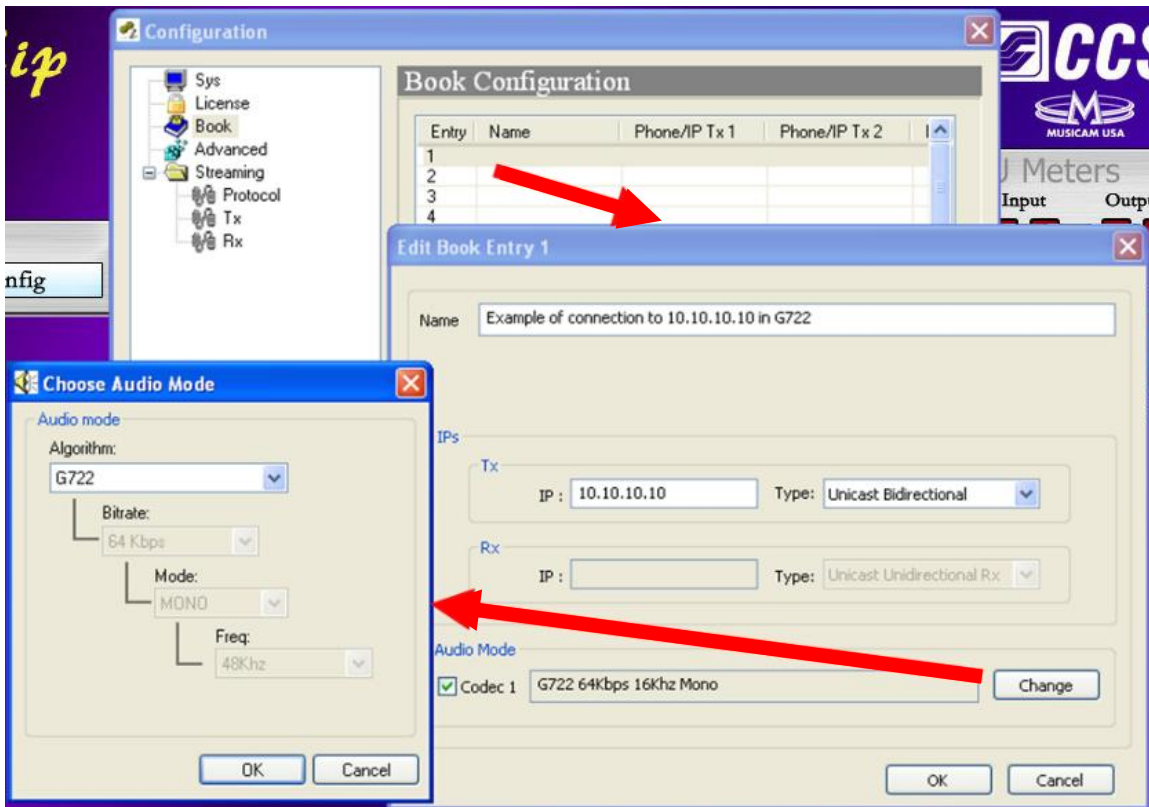


Figure 11. Book Configuration example.

To configure the encoder is optional. In case of that it is not entered, the unit will proceed to call in the current encoder configuration. It is possible to Export / Import the Book in XML format:

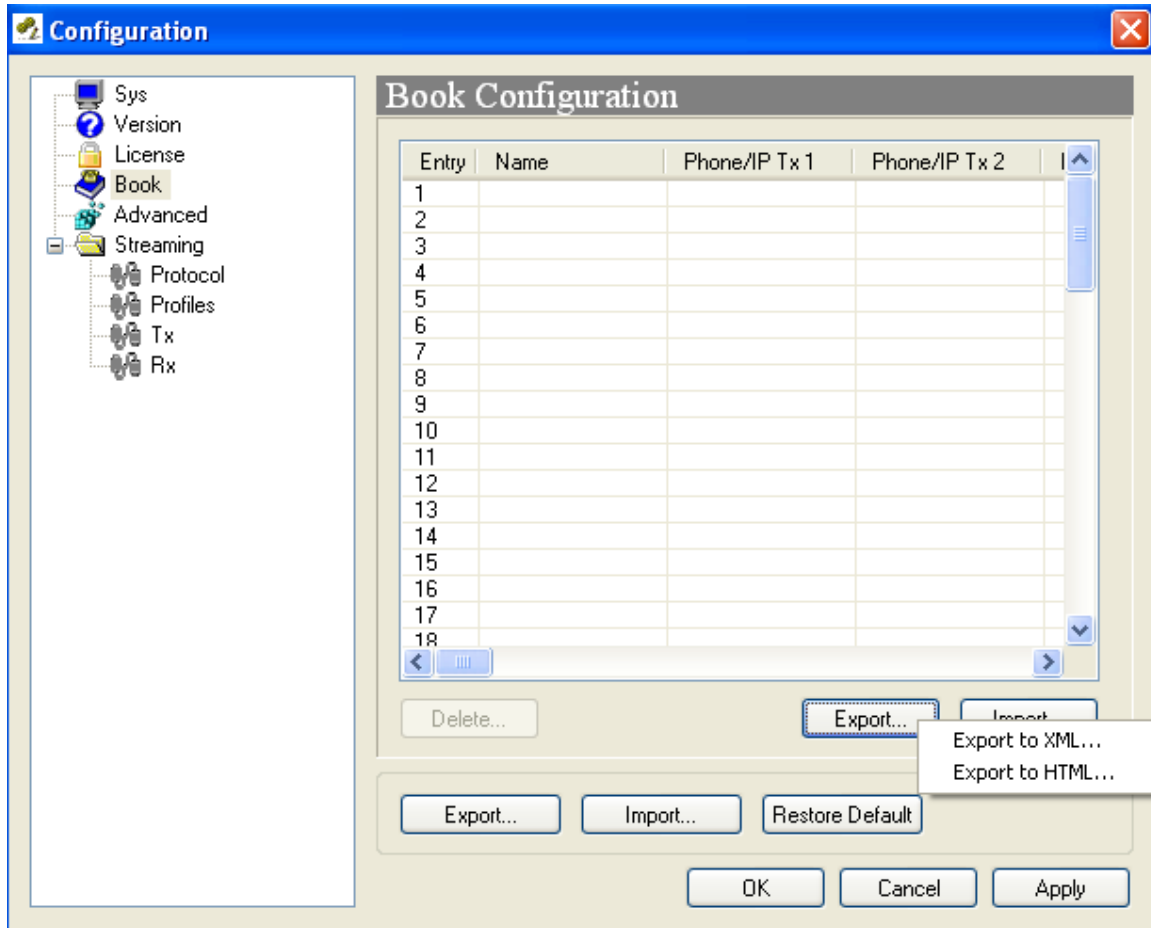


Figure 12. Book export screen.

The audio compression mode is restored to that one prior to the connection. This allows the user to change the compression mode during the connection, or to make calls through the book entries with compression modes different from the former one.

III.3.6 Streaming

The aim of the streaming parameters is to allow the user to adjust various transmission and reception parameters to optimize the unit and that way, provide the best quality real-time audio streaming for a particular network connection.

These tools are grouped in the following manner:

- 1.- Protocol Configuration.
- 2.- Profiles.
- 3.- Transmission parameters.
- 4.- Reception parameters.

III.3.7 PC-IP Protocols

MUSICAM USA developed its own proprietary protocols to carry out IP streaming connections, due to the lack of a standard in this regard. The following protocols used by PC-IP are part of the set of MUSICAM USA Proprietary Protocols:

- MUSICAM USA Real Time Control Protocol (P-RTCP): This is a protocol based on TCP that allows for the establishment and termination of a connection as well as for the negotiation of the codec mode (automatic audio synchronisation in all modes).
- MUSICAM USA Real Time Protocol (P-RTP): This is a protocol based on UDP used for the transmission of audio.
- MUSICAM USA Identifying Protocol (P-ID). This protocol is based on TCP and used to identify the units.

Since the first version of these protocols was rolled out, different versions have come up. PC-IP uses version 3 & version 4 of the set of proprietary protocols defined above. This new set of protocols (versions 3 & 4) are not compatible backward. Take that into account when trying to connect to old firmware versions where MUSICAM USA proprietary v3 and V4 are not available:

List of ports used by MUSICAM USA V3 Protocol:

P-RTCP: TCP 51000
P-RTP: UDP 51000
P-ID: TCP 50011

List of ports used by MUSICAM USA V4 Protocol:

P-RTCP: TCP 52000
P-RTP: UDP 52000
P-ID: TCP 50011

For more information regarding ports used by MUSICAM USA IP codecs, please refer to the MUSICAM USA IP Family User Manual.

Both v3 and v4 reduce the number of ports in the communications. In addition, these protocols have been modified so that no configuration at all is necessary in the router at the caller side: **NAT Traversal** Protocol. Only at the callee side, the router has to be configured to allow the incoming call to proceed.

This will **make possible to make calls from anywhere, regardless of whether there is a router which can be configured by the user or not. This is very useful for remote broadcasting from hotels, conference rooms or any other public location which offers a non configurable IP access to the internet, for example.**

III.3.8 Protocols Configuration

The <[Protocol Configuration](#)> provides the means to change the TCP/UDP ports from the default values.

The [Automatic](#) or [manual](#) answer of incoming calls might be defined from this window as well.

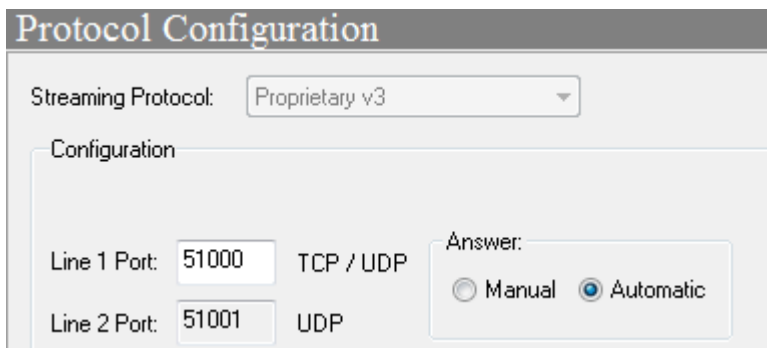


Figure 14. Protocol Configuration Screen.

III.3.9 Profiles

Different configuration profiles for different networks. This version incorporates a new configuration window which allows the user select different configuration profiles for different types of connections, depending on the network performance. These profiles are: Safe, Ultra Low delay and Custom.

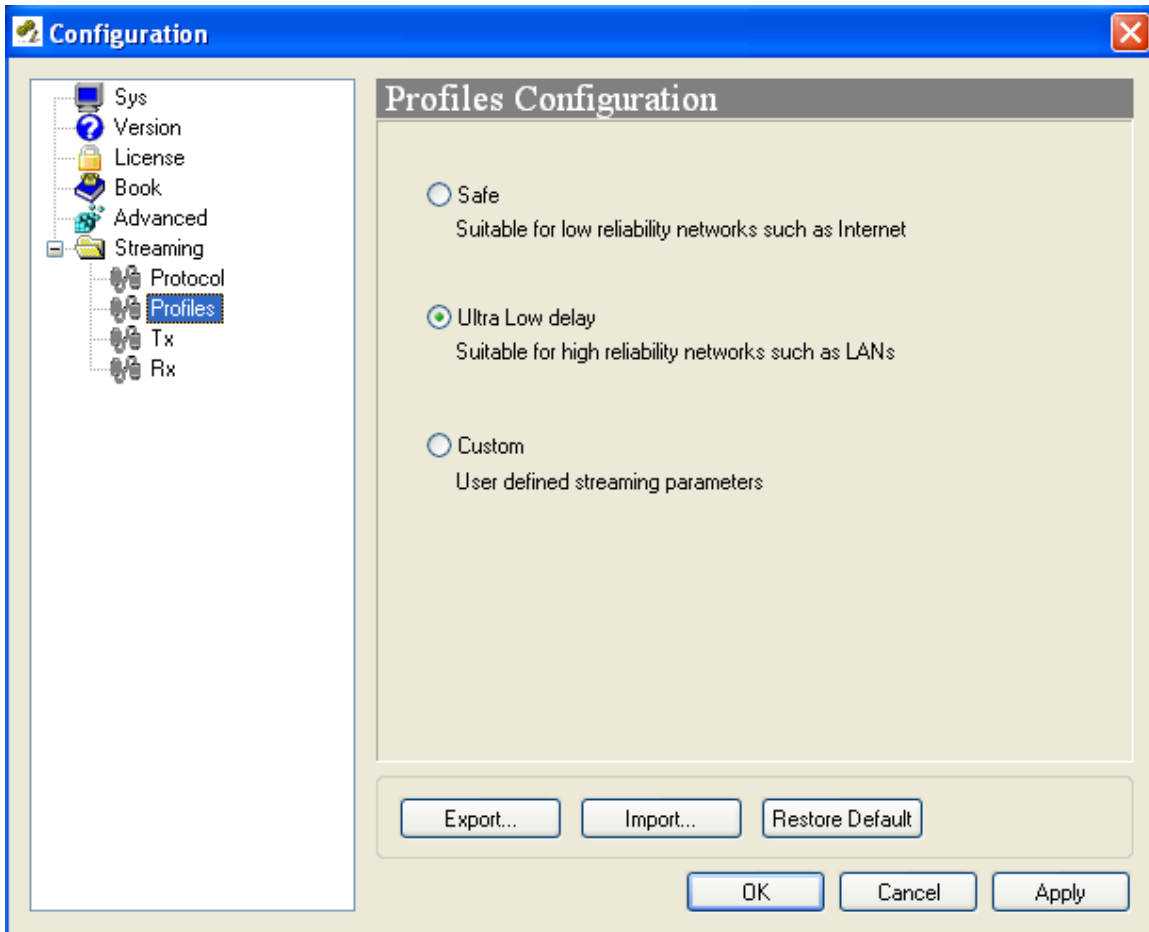


Figure 15. Profiles Configuration Screen.

Safe will set a longer receiver buffer, which will add more delay to the communications, but it will make it safer. It will also set the longer available value for the Time Between Packets parameter. On the contrary, the Ultra Low delay profile will do the opposite. To set these parameters manually, select Custom.

III.3.10 Tx Configuration

The <Tx configuration> menu defines the IP packet size for the outgoing audio stream².

Given an audio time per IP packet the application calculates and displays the packet size and the process time required for compression.

The audio interval can be increased or decreased shifting the linear trimmer or typing a value into the green box.

Care should be taken to avoid packet sizes above the usual MTU of 1500 bytes, in order to avoid packet fragmentation by the network. The PCM coded audio might easily overflow this performance threshold.

The audio interval is defined independently for every compression algorithm.

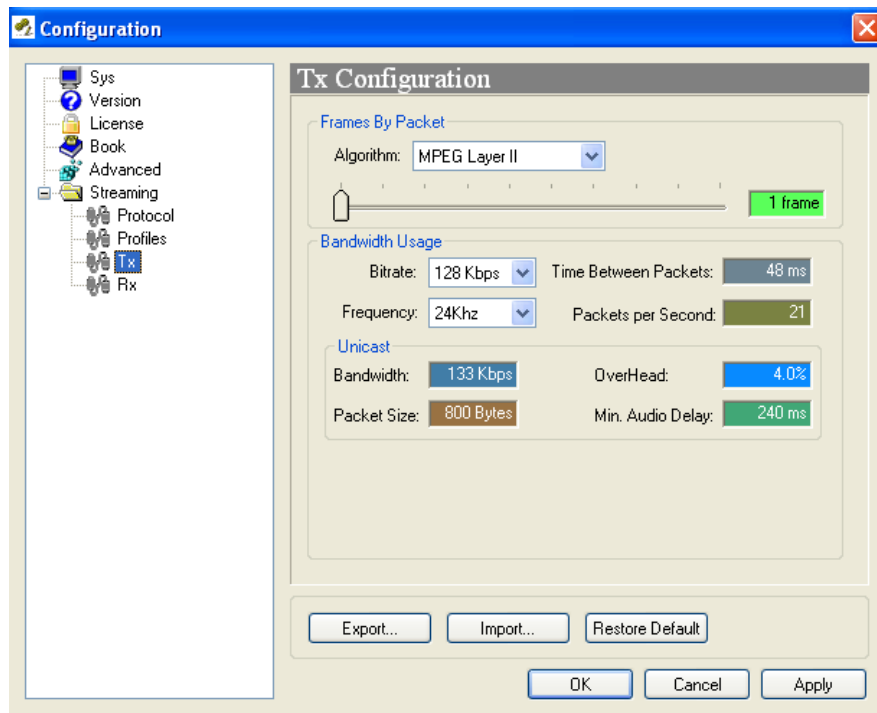


Figure 16. Tx Configuration Window.

² The decoder engine adapts automatically to the proper packet size of the incoming audio stream.

The 'Time Between Packets' (TBP) parameter is directly related with the packet size and therefore with the occupied bandwidth (overhead) and delay. Therefore, the appropriate value for this parameter is a trade off between delay and bandwidth.

In order to achieve the minimum delay between encoder and decoder it is necessary that the transmission time between packets is minimum as well. However, the greater the TBP, the less bandwidth is required (less overhead), but the more delay there will be in the connection. In other words, the smaller the TBP, the smaller the packet size, and the greater the overhead, due to the IP headers in the packets. With this tool, the user can know beforehand the required bandwidth, overhead, packet size and delay for the current compression mode and TBP value.

III.3.11 Rx Configuration

The <Rx configuration> menu defines the reception buffer for the incoming audio stream.

The buffer size can be increased or decreased shifting the linear trimmer or typing a value into the white box.

Reception buffer size can range from 0ms up to 10 seconds. The user must verify the best trade off for his application.

Large buffer sizes (over 150ms) improve the robustness of the IP communication in almost every circumstance³ but introduce perceptible audio delays in bidirectional communications (e.g. interviews).

Small buffer sizes require high quality IP networks with low jitter. The possibility of a communication disruption increases for very small buffer sizes.

³ Some field trials showed that the reception buffer if for 3G (UMTS) networks are used should be greater than 250ms. It is recommended to fine tune the best buffer size for this kind of IP networks.

III.4 Codec control

From the Codec1 area it is possible to configure the encoder, initiate, terminate or pick up a [call](#).

III.4.1 Configuring the Encoder

The Audio Mode area shows the Encoder / Decoder current status and also, it allows the user to configure the encoder. By clicking on the Encoder area the encoder configuration dialog will be showed:

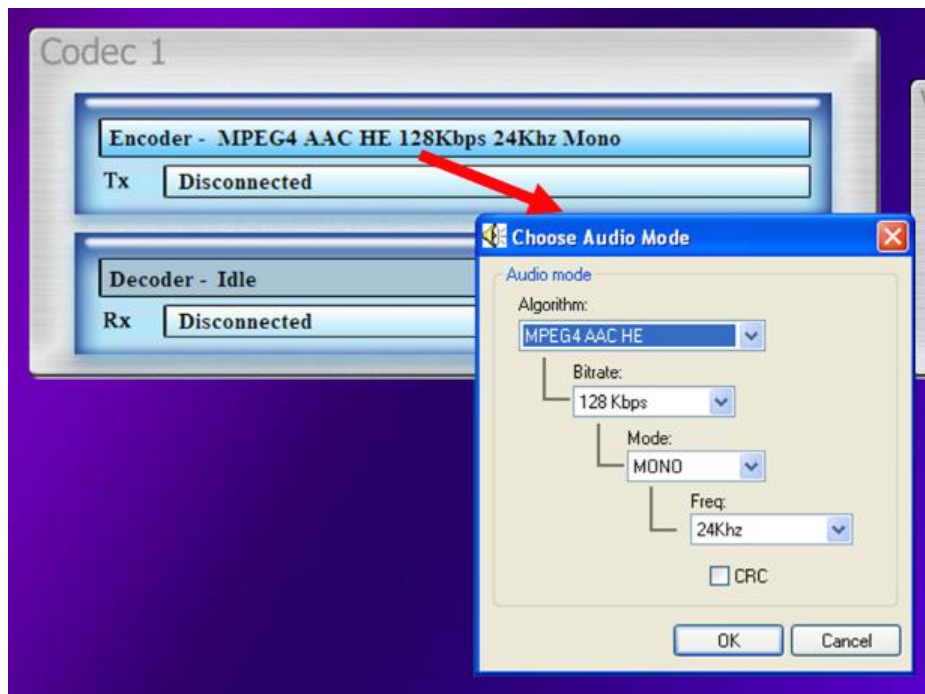


Figure 17. Audio Mode configuration.

Only the available encoder configuration parameters are displayed depending on which algorithm has been selected.

The audio compression mode is restored to that one prior to the connection. This allows the user to change the compression mode during the connection, or to make calls through the book entries with compression modes different from the former one.

The **AUTO** mode is applicable for bidirectional communications. In this case the encoder engine takes automatically the same setting than the incoming audio stream.

The supported compression modes are listed in Appendix A.

III.4.2 Making calls

A call be initiated clicking on the TX labelled box. Either an **IP address** can be typed or a **Book Entry** selected as destination of the call.

Please note that PC-IP inherits the IP configuration from your computer configuration (Host IP address, network mask and default gateway), therefore those network parameters must be accurate.

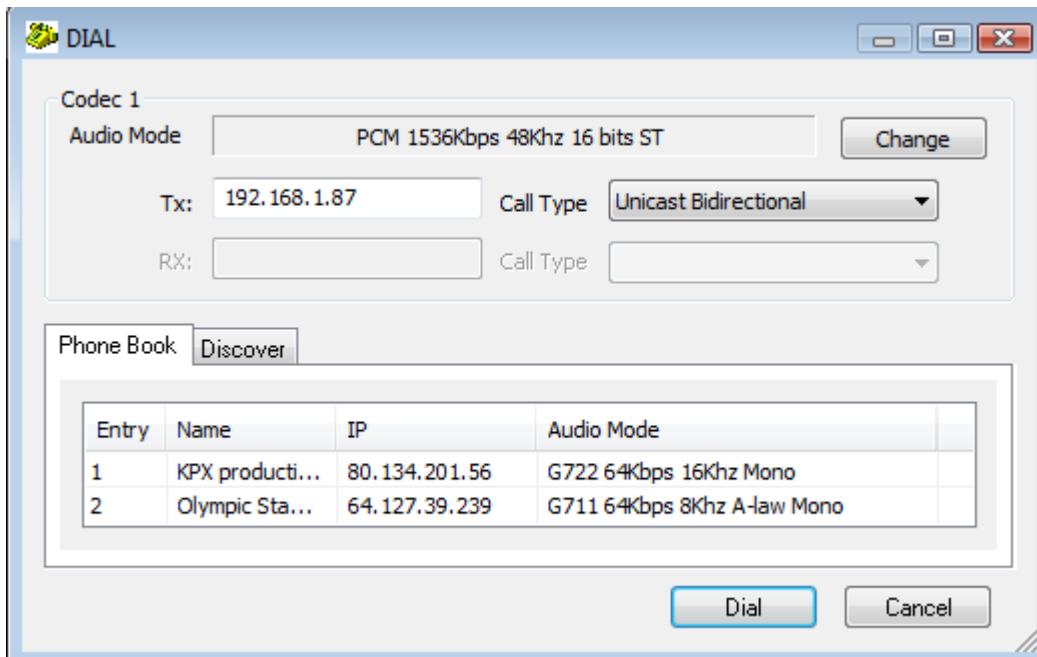


Figure 18. Dial screen.

A successful call is highlighted with steady green bars.

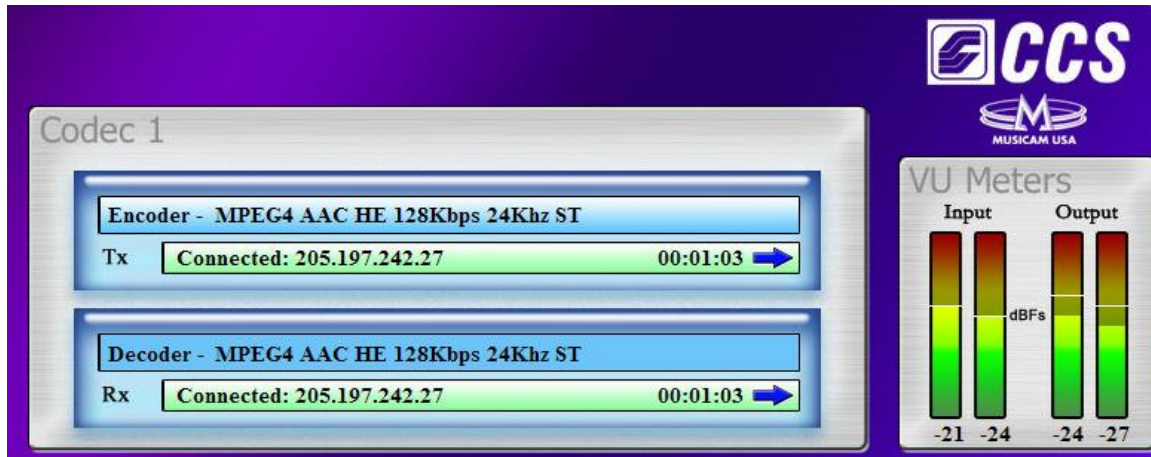


Figure 19. Example of line connected.

Call types:

- Unicast Bidirectional → This is a bidirectional point to point connection, that is, both ends will transmit and receive audio simultaneously. It will be necessary to check the upload and download bandwidth in the link.
- Unicast Unidirectional Tx → This is a unidirectional point to point communication where only the end which makes the call will send audio.
- Unicast Unidirectional Rx → This is a unidirectional point to point communication, where the calling end will be the receiver.
- Multicast Tx → This is point to multipoint communication in which the calling end will join a multicast group as a transmitter.
- Multicast Rx → This is point to multipoint communication in which the calling end will join a multicast group as a receiver.

To make bidirectional or unidirectional Tx calls over IP, click on the Tx connection bar, enter the IP address and select the type of call: Unicast Bidirectional or Unicast Bidirectional.

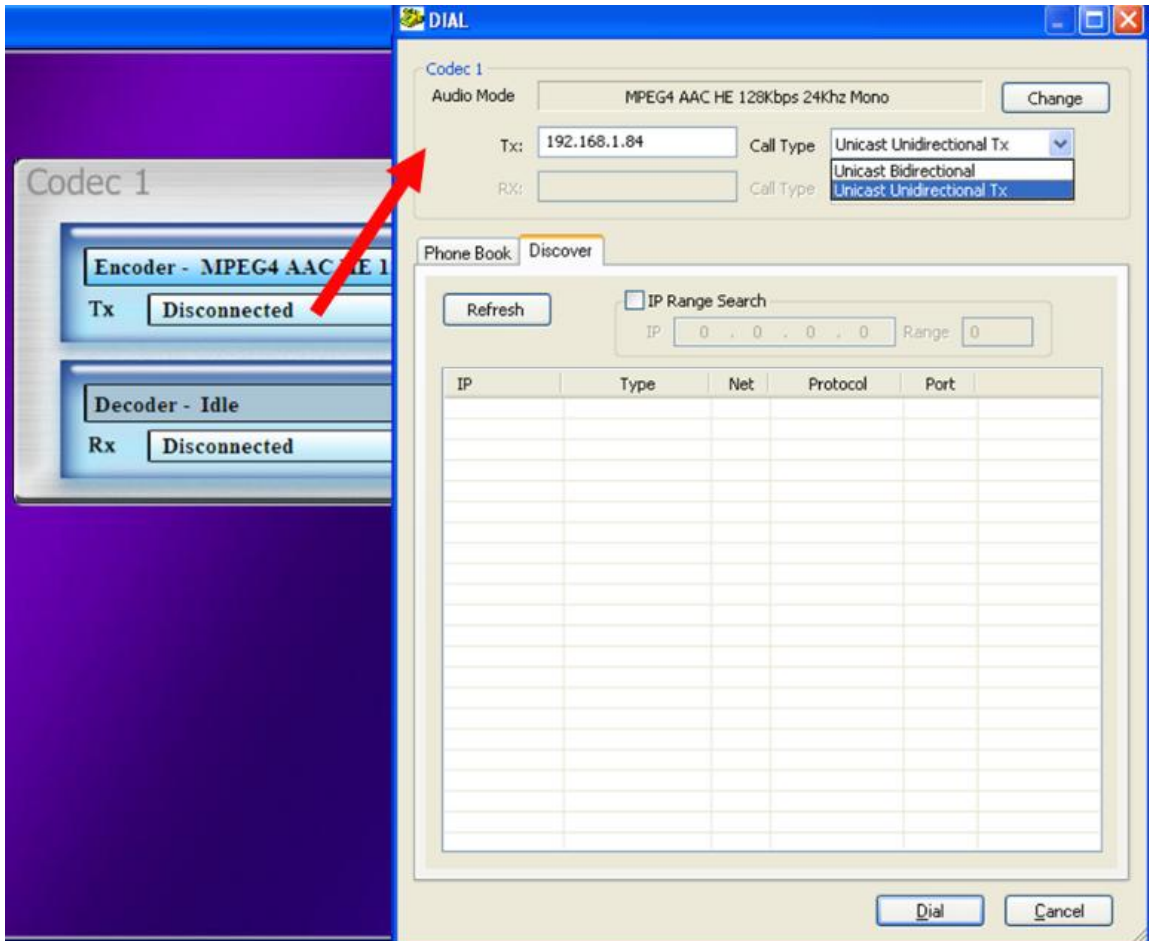


Figure 20. Tx Dial window.

The user can enter the IP address manually or it can select an index from the Phone Book.

To make a Unicast Rx call over IP, click on the Rx connection bar:

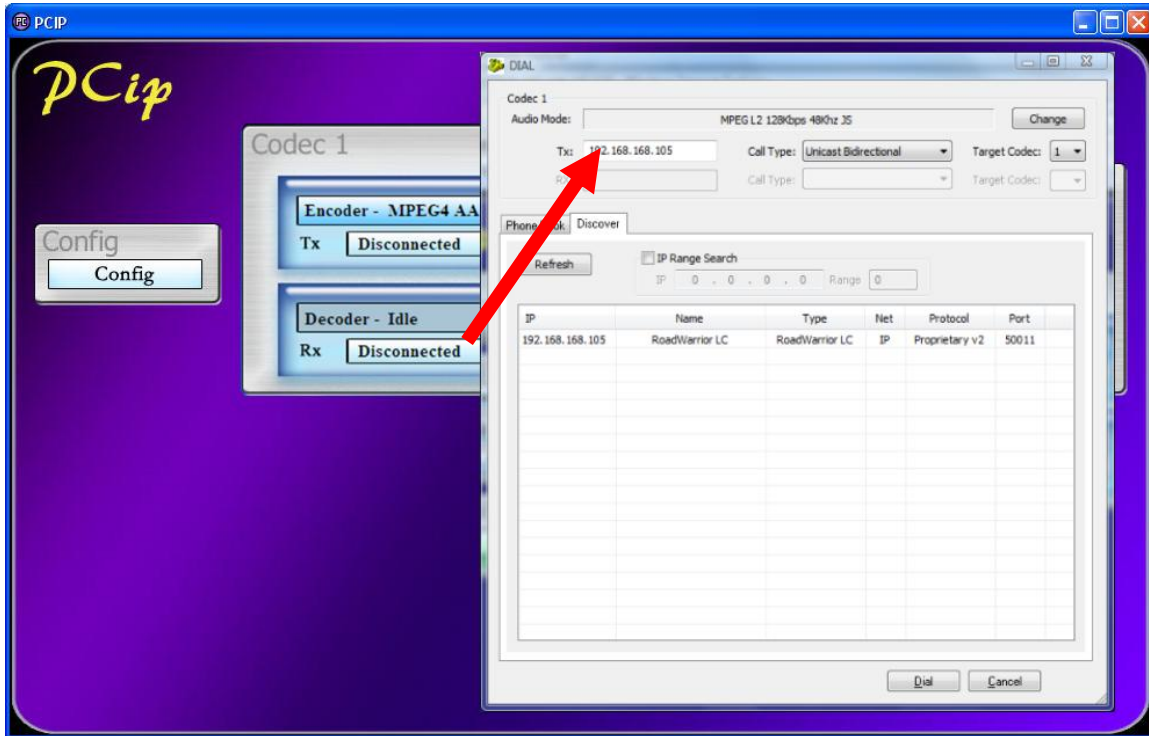


Figure 21. Rx Dial window.

The user can enter the IP address manually or it can select an index from the Phone Book.

In order to make easy the dialling operation over IP networks, a new facility was included in the Dial window. This new tool allows the discovering of the MUSICAM USA IP units connected to the network. To access the Dial Discover window, open the dial window, either by clicking on the Tx or the Rx bar, and click on the tab labelled 'Discover'.

There are two options under the Discover window:

- 1.- PC-IP sends a broadcast message. This is the default option and it is not necessary to enable anything but **the network must support broadcast traffic**.

- 2.- When the broadcast traffic is not allowed over the IP network it is still possible to discover the units on the network. The "IP range search" checkbox

must be enabled and a range of IP addresses must be introduced for a quicker search.

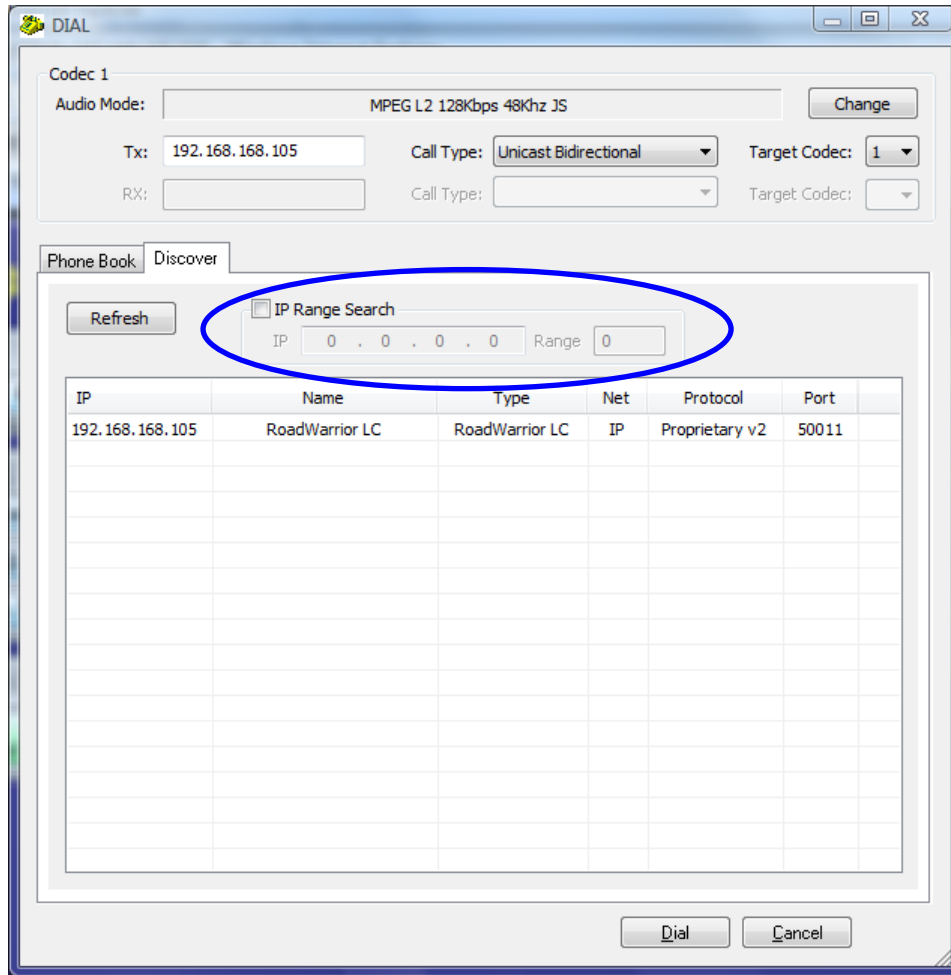


Figure 22. Dial Discover window.

III.4.3 Disconnecting the Line

The line can be hung up by clicking on the right side of the Connection area. Tx and Rx parts can be finished independently when the current connections are unidirectional.

III.4.4 Line Status

The Line status is shown on the right side of the Connection area:

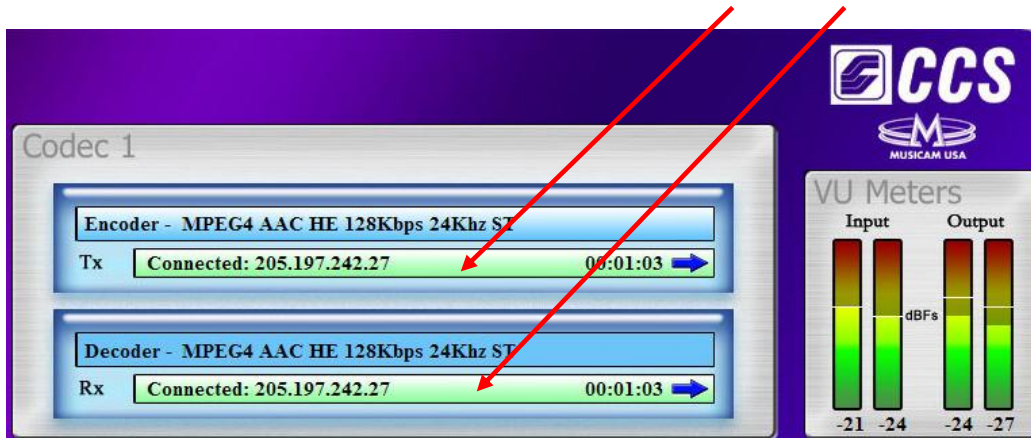


Figure 23. Line Status.

These are the different status messages which can be displayed:

- "No physical Line": The communication line is not physically detected. Most likely the interface is not plugged in. The Display shows "DOWN".
- "Connected": The line is connected. An arrow will indicate if it is an incoming or outgoing call. The duration of the call also is indicated.

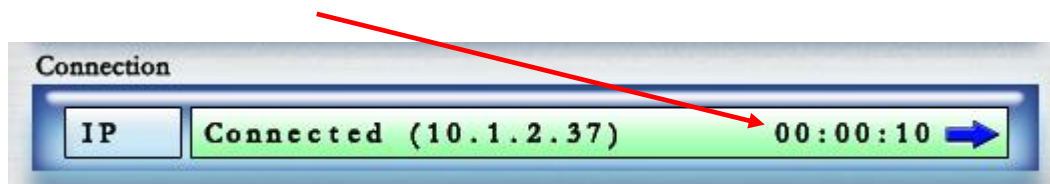


Figure 24. Duration of the call.

- "Disconnected": The line is detected physically but no connection is being made. Beside the text appear the disconnection codes. In appendix B there is a table describing the different IP disconnection codes.
- "Calling": In the process of making a connection.
- "RING": Receiving a call on the line.

III.4.5 Decoder Status

The Decoder status is shown on the right side of the Audio Mode area:

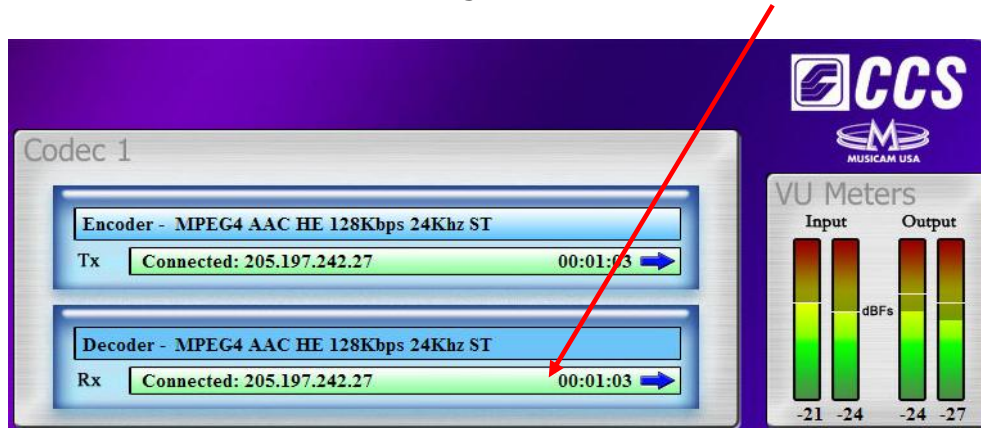


Figure 25. Decoder status.

The Decoder status:

- "Searching": The decoder is not synchronized.
- "Framed" : The decoder is synchronized.
- "Idle": The line is disconnected.
- "Not available": Decoder not available.

The PC-IP Decoder system doesn't need to be configured as it is totally automatic. In addition, the decoder operation is independent from the encoder, so it can encode and decode in different compression modes. However, it is necessary to point out some restrictions depending on the algorithm:

Algorithm	Automatic detection and decoding	Independent encoder/decoder
G722	YES	YES
MPEG1,2 LII	YES	YES
MPEG AAC HE	Only when the encoder is set to AAC HE	NO
PCM Linear Audio	YES	YES

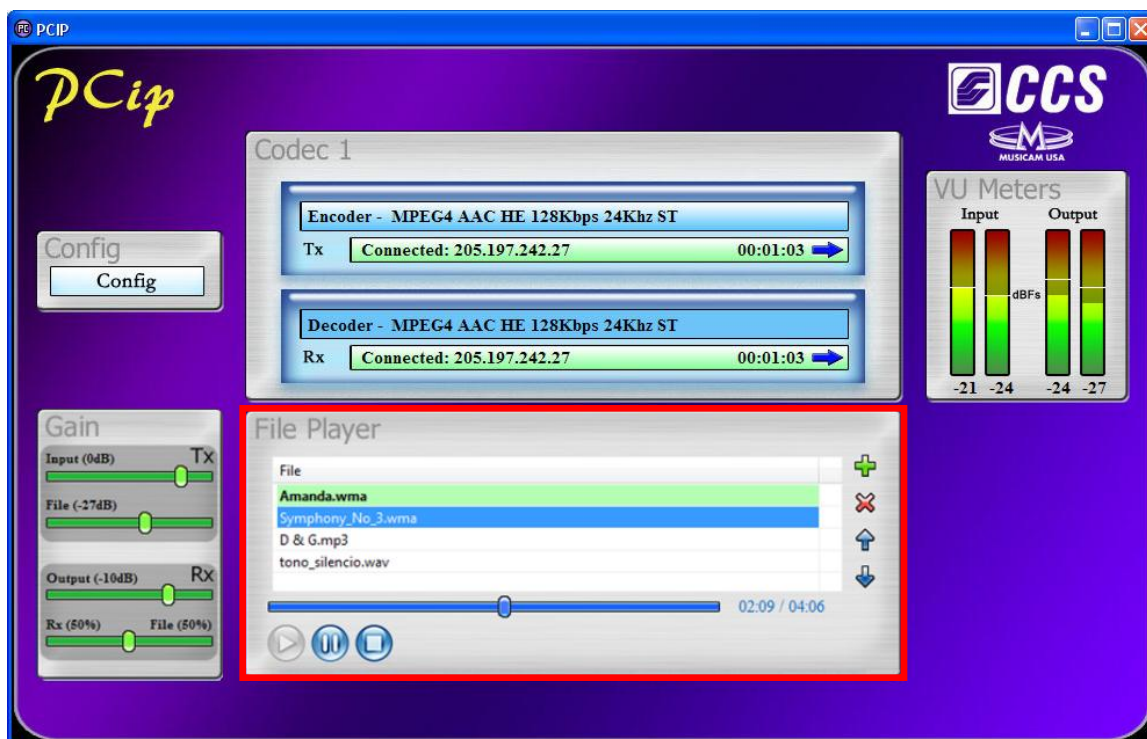
Table 1. Compression mode detection and decoding.

III.5 File Player option

PC-IP can be enabled for the <File Player> feature. This is a licensed option.



The <File Player> feature allows the transcoding of any Microsoft supported sound file (.mp3, .wma, .wav, etc.) into the selected compression algorithm and concurrent streaming over IP.



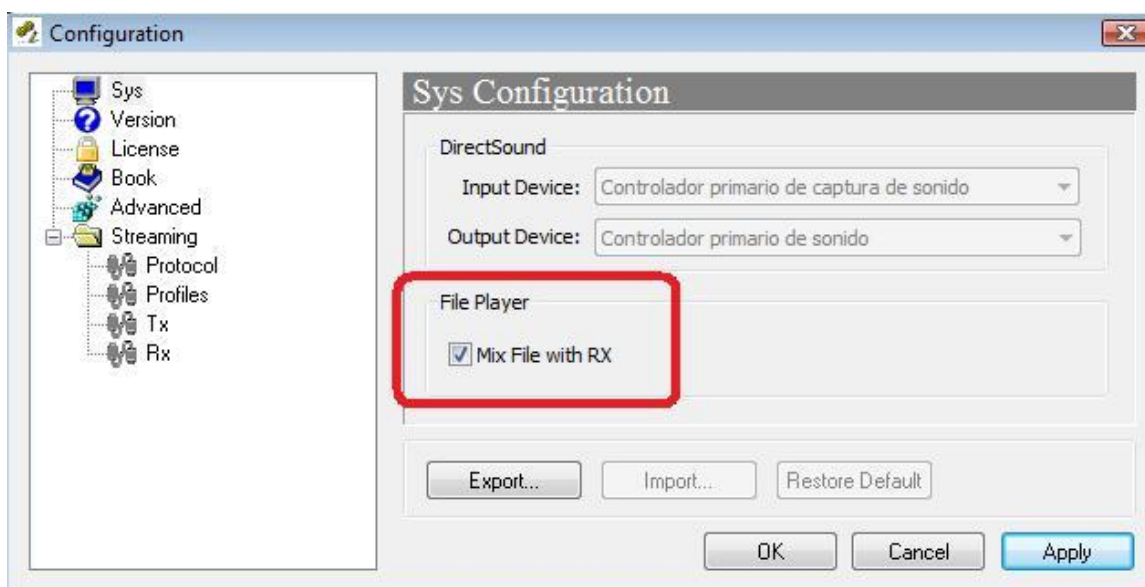
The user might pick up some sound files from any computer folder and make those files available to the <File Player>. Addition, deletion and scrolling thru the player list is possible at any time without disturbing the output stream in progress.⁴

Double clicking starts the sound file, which in consequence can be stopped or hold on "pause". Fast Forward or Fast Rewind is possible moving the lineal progress bar underneath the play list. The file player output will be mixed together with microphone input and streamed out.

The user can monitor the progress of the file player enabling the audio feedback on the local headphones according to the picture below <Mix File with RX>.⁵

⁴ Please remind that the play list is not persistent after closing the PC-IP application. This means that PC-IP starts every time with an empty play list.

⁵ The local audio feedback is available even no IP streaming connection is in progress.



III.6 Audio Gain Controls

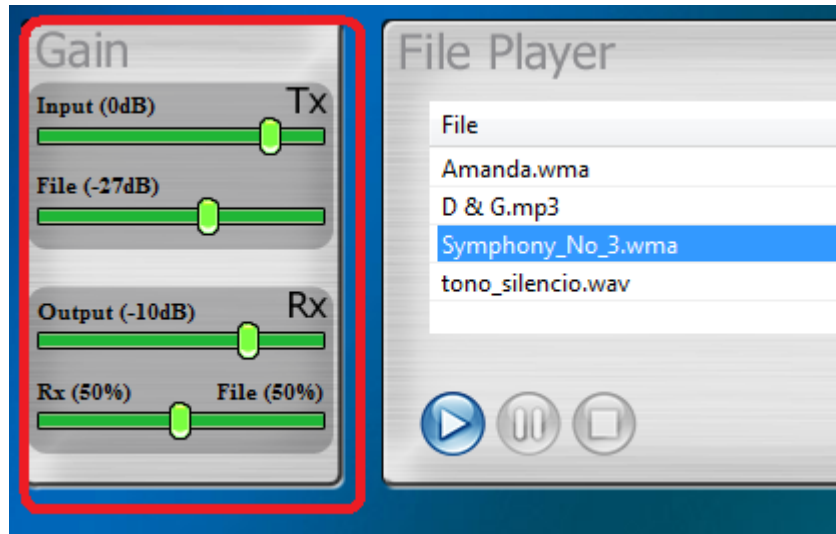
The PC-IP includes **audio gain controls** for the ingress and egress audio stream for every PC-IP configuration. The gain ranges from -96dB to +18dB for both controls.

However if the File Player option with local feedback is enabled, the audio gain control is an essential control for balancing all the sound sources involved for a panoramic sound.

On the TX path (egress audio stream) the user can balance the sound from the microphone against the File Player sound level. Two independent faders are provided <Input> (microphone input) and <File>.

On the RX path, which applies actually to the local headphones, the user might trim the overall headphone levels by the control <Output>. The lowest control is actually a local headphone balance. The user might emphasize the local file player sound or the sound from the studio.

All those **audio gain controls** might be trimmed during a live contribution without perceptible noise artifacts for the audience.



III.7 Call Log

An history report has been included to record the input and output calls according to the following information: telephone/IP, audio modes, date and start/end time, length of each call, etc...

The 'Call History' window displays a table with the following data:

L.	N.	Protocol	Target Codec	Number	Call Type	Audio Mode	Init Time	End Time
L1	IP	Proprietary v3	Codec 1	192.168.1.55	Outgoing Unicast Bidirectional	MPEG L2 128Kbps 24khz ST	30/10/2008 12:38:16 PM	30/10/2008 12:38:16 PM
L1	IP	Proprietary v3	Codec 1	192.168.1.84	Outgoing Unicast Bidirectional	MPEG L2 128Kbps 24khz ST	30/10/2008 12:38:03 PM	30/10/2008 12:38:03 PM
L1	IP	Proprietary v3		192.168.1.84	Incoming Unicast Bidirectional	MPEG L2 64Kbps 48khz Mono	30/10/2008 12:35:53 PM	30/10/2008 12:35:53 PM

Buttons on the right side of the window include: Delete, Delete All, Report..., Call, OK, and Cancel.

Figure 26. Call log window.

A report of the calls in html can be created with options to save and print:

PC-IP (192.168.168.104) CALL LOG									
Line	Net	Protocol	Target Codec	Number/IP	Call Type	Audio Mode	Init Time	End Time	Duration
L1	IP	Proprietary v4		192.168.168.61	Incoming Unicast Bidirectional	MPEG L2 256Kbps 48Khz ST	6/30/2009 9:44:24 AM	6/30/2009 9:44:32 AM	0d 00:00:08
L1	IP	Proprietary v2		192.168.168.105	Outgoing Unicast Bidirectional	MPEG L2 128Kbps 48Khz JS	6/18/2009 3:29:26 PM	6/18/2009 4:41:03 PM	0d 01:11:37
L1	IP	Proprietary v2		192.168.168.105	Outgoing Unicast Bidirectional	MPEG L2 128Kbps 48Khz JS	6/18/2009 3:28:33 PM	6/18/2009 3:29:07 PM	0d 00:00:34
L1	IP	Proprietary v4		192.168.168.105	Outgoing Unicast Bidirectional	MPEG L2 128Kbps 48Khz JS	6/18/2009 3:27:18 PM	6/18/2009 3:28:17 PM	0d 00:00:59
L1	IP	Proprietary v4	Codec 1	192.168.168.105	Outgoing Unicast Bidirectional	MPEG L2 128Kbps 48Khz JS	6/18/2009 3:19:59 PM	6/18/2009 3:26:45 PM	0d 00:06:46
						MPEG L2			

Figure 27. Html log view with print and save options.

Appendix A

TECHNICAL SPECIFICATIONS

IV.1 Compression

- G722.
- PCM (no compression).
- MPEG 1,2 layer II (ISO/IEC 11172-3 /13818-3).
- MPEG 4 AAC HE (ISO/IEC 14496-3) (Optional).

Note: AAC HE compression mode is available under license.

IV.1.1 BANDWIDTH (KHz)

Legend:

x = Not available in the standard.

#,*,- = Not implemented

▪ MPEG 1,2 LAYER II (ISO/IEC 11172-3 /13818-3)

Bit Rate	Fs=48KHz			Fs = 32 KHz			Fs=24 KHz		
	Mono	Stereo/Dual	JStereo	Mono	Stereo/Dual	JStereo	Mono	Stereo/Dual	JStereo
32	4	X	X	4,9	x	x	7,3	#	#
64	10,7	4	4,8	11,7	4,9	6,1	11,3	7,3	11,3
128	20	10,7	16,3	15	11,7	13,6	11,3	11,3	11,3
192	20	14,5	20	15	15	15	x	x	x
256	x	20	20	x	15	15	x	x	x
384	x	20	20	x	15	15	x	x	x

Bit Rate	Fs=16 KHz		
	Mono	Stereo/Dual	JStereo
32	7,5	#	#
64	7,5	7,5	7,5
128	7,5	7,5	7,5
192	x	x	X
256	x	x	X
384	x	x	X

- **G722**

Bit Rate	Fs=16KHz
	MN
64	7.6

- **MPEG 4 AAC HE (ISO/IEC 14496-3)**

Bit Rate	Fs=24KHz			Fs = 16 KHz		
	Mono	Stereo/Dual	JStereo	Mono	Stereo/Dual	JStereo
24	12	#*	#	12,3	#	#
32	16,8	#	#	15	#	#
48	16,8	12	15	15	12,3	15
56	16,8	12	15	15	12,3	15
64	20	16,8	20	15	15	15
128	20	20	20	x	15	15

Appendix B

DISCONNECTION CODES

- IP Diagnostic Codes:

Cause Code	Meaning
00	Start Status.
01	No answer from the remote unit.
02	Call rejected. The remote unit can be already busy.
03	Normal Disconnect from the remote unit.
04	Normal Disconnect from the local unit.