

# ***GoldServ Monitor***

An AuSIM GoldServ™ Server Guide

**User's Guide and Reference**

v1.925

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# Chapter 1 Introduction

## 1.1 Overview

The purpose of this document is to serve as a user's guide, tutorial, and general reference for the monitor interface for the software package "GoldServ™" such as can currently be found on an AuSIM GoldMiner™ system, or any other system in AuSIM's GoldSeries™ product line. Currently, the GoldServ technology is packaged as an application that runs in the foreground of a Windows session, displaying a window that allows read-only monitoring of the execution of this application. Future versions of the GoldServ package, however, are expected to run in the background as a Windows service, in which case the monitor will be a separate application that will display information about the GoldServ service execution in the same manner. This document is intended to apply to both incarnations of GoldServ technology.

## 1.2 Background

The GoldServ application is the server portion of the client-server audio simulation system designed by AuSIM to implement AuSIM3D technology. The GoldServ application is specifically an executable software file that runs on a GoldServer computing system, which is physically assembled and sold by AuSIM.

The GoldServ server application is controlled by a separate client application, which can be located on a different physical system. The client application can be written based on an open API and compiled into an executable by the end user of the system, although a number of example and demo client applications come bundled with the GoldServer system upon initial delivery. The client application can communicate with the server application by any of several different physical mechanisms, including an RS-232 serial cable, a USB connection, and an Ethernet network using RPC or TCP transport protocols. When the server application receives commands from a client application via one of these physical connections, it responds by producing audio or changing the audio currently being produced in the directed way.

Audio produced by the GoldServ is a binaural pair that consists of a mix of input audio signals filtered as directed by commands from the client application. The audio input signals to the GoldServ include both "live" physical inputs to the GoldServer along with pre-recorded audio files that have been stored on a physical drive on the GoldServer system. The filtering applied by the GoldServ is based upon mathematical models that together represent a virtual environment. These models include mathematical descriptions of Sound Sources, an acoustic Environment, and one or more Listeners. Application of these filters as directed by a client application causes the GoldServ application to generate a binaural pair that renders audio input sources in a virtual acoustic space to a listener.

The purpose of the GoldServ monitor window is to display the input audio signals the system is aware of, the rendering instructions that have been sent by the client application, and the resulting state of the key parameters that describe the virtual acoustic space being rendered. This chiefly assists client application developers with verifying that the instructions sent from the client are creating the desired virtual acoustic space for each listener. A secondary purpose would be for an end user to verify what is heard from the system with a text-based visual confirmation, to aid in comprehension of the content.

## 1.3 Setup

The GoldServ application may be triggered in any of the ways that any executable may be launched from a Windows or DOS-console interface. In fact, GoldServer systems are delivered configured to automatically activate a GoldServ executable file upon system boot. However, the

most common way to launch a GoldServ window while performing development or system testing is probably through a desktop or menu shortcut.

When the GoldServ is launched through a shortcut, command line parameters may be specified that direct that instance of the GoldServ to listen to a specific port for client commands. This allows multiple instances of a GoldServ server to run simultaneously on a GoldServer system, with each application instance listening only to its assigned ports for control instructions. Help in use of the command line arguments can be had by typing */?* after the executable name in a DOS-console window, or from other GoldServ user guides in this series.

Once a GoldServ window has been launched using one of the methods above, it is automatically in a state where it can begin receiving commands from a client. At this point, a client can be launched, either on the same system, or on a different system with an appropriate physical connection mechanism, and the GoldServ monitor will begin to display its state as it responds to client commands.

## Chapter 2 Getting Started

The GoldServ application can be launched by double-clicking on the GoldServ.exe icon or on a shortcut to this application. This file is generally stored in the AuSIM3D\bin directory. Shortcuts to the file on a GoldServer system are generally found 1) on the desktop, 2) on the AuSIM submenu accessed from the “start” button, and 3) in the Startup folder for the “goldminer” user account. These shortcuts have typically been pre-configured to direct the GoldServ to monitor one or more of the physically ports on the system. The number of the port being monitored is typically included in the shortcut name for ease of use.

### 2.1 Launching the GoldServ window

The first step in rendering an acoustic workspace is to open and initialize a GoldServ window. Select “GoldServ: COM1” from the desktop or from the Start/AuSIM submenu. A GoldServ instance that is initialized and listening to serial port 1 should be displayed within less than a second, as shown in Figure 1 below.

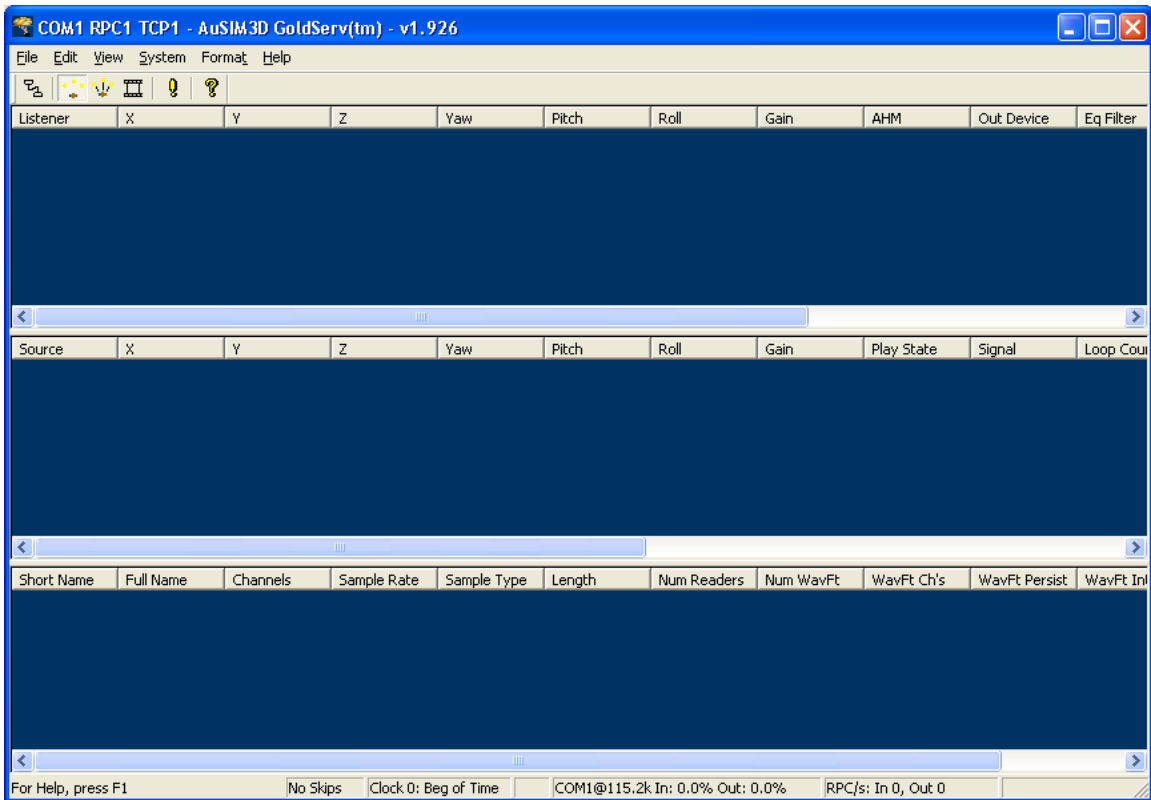


Figure 1 - Initial Screen

### 2.2 The GoldServ Window Display

There are a number of types of data and interactive controls displayed in this window. The title bar at the top shows the name and version number of the executing application, along with the



names and numbers of the data ports this instance of the application is monitoring for control commands, as shown in Figure 2 below.



Figure 2 - Title Bar

Below the title bar are a set of pull-down menus, which mainly control what information is displayed and how it is displayed, but also allow for a few minor modifications of the simulation parameters themselves. The menu bar is shown in Figure 3 below:

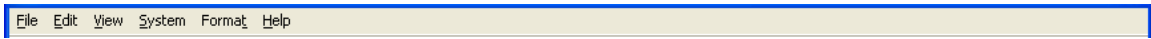


Figure 3 - Menu Bar

Below the menus are the toolbar buttons, which provide more convenient access to a few of the most often used menu items. The tool bar is shown in Figure 4 below:



Figure 4 - Toolbar Buttons

Below the toolbar buttons are the primary data display panels which show continuously-updated simulation parameters during rendering. An example of a data display panel is shown in Figure 5 below:

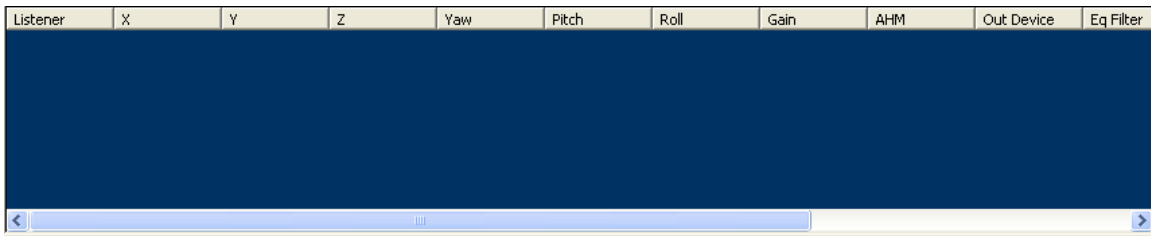


Figure 5 - Data Display Panel

At the bottom of the window is the status bar, which displays several useful monitors of low-level system status. The status bar is shown in Figure 6 below:

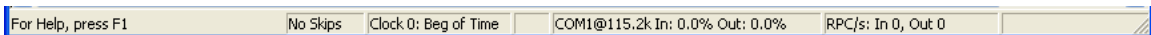


Figure 6 - Status Bar

Chapter 3 of this document provides a detailed explanation of the purpose of each menu item and toolbar button and how they can be used to manage the display, along with detailed descriptions of each display field on the main panels and on the status bar.

## 2.3 Connecting a Client

The GoldServ server application is controlled by separate client applications, which are typically located on a different physical system. In theory, a client can be run on the GoldServ system itself, assuming the appropriate physical connections and settings, but this is not recommended, as it will degrade system performance. A number of example client applications are bundled with each GoldServer upon initial shipment, but custom clients can also be written based on an open API known as CRE\_TRON.

To install example client applications on a client system, an installation program called "AuSIM\_Win32\_Client\_Installer.exe" can be found on the GoldServer in the folder D:\AuSIM3D\Client. This installer program should be copied via a disk or network to the client computer, and launched by double-clicking on it with a mouse or pointing device. The client installation program will install the example client applications by default to a folder named "AuSIM" that it will create in the "Programs" folder, but a different folder can be specified at installation time if desired.

This installation program will install such standard example clients as Nordjorvik, RendographClient, GoldTools, and Theodolite, among others. Detailed reference manuals/user guides for operating these applications are available from AuSIM as separate documents.

The client application can communicate with the server application by any of several different physical mechanisms, including an RS-232 serial cable, a USB connection, and an Ethernet network using RPC or TCP transport protocols. To use a serial cable, one end should be connected to a serial port on the client system and the other end should be connected to a serial port on the GoldServer. On the client system, the serial cable should be connected to the serial port number that matches the first digit of the TRONCOM environment variable, which by default is set to "1@1152", which specifies COM1 as the sending port. On the GoldServer system, the serial cable should be connected to serial port listed in the server shortcut name or also in the GoldServ window title bar.

After a physical connection has been completed, and the GoldServ application has been launched, an example client such as Nordjorvik, RendographClient, GoldTools, or Theodolite can be used to initialize the server and launch an acoustic simulation.

## 2.4 Monitoring the Simulation Configuration

After a client application has been started and the server initialization step has been completed, the GoldServ window can be viewed to monitor the effect that the client control commands are having on the GoldServ rendering the simulation. However, it is recommended that this window be minimized during serious GoldServ operation to maximize performance.

When an acoustic simulation has been launched, at least one row of data should appear on the top panel, representing information pertaining to the listener(s) defined by the client application. Also, at least one row of data should appear on the middle panel, representing information pertaining to the sound source(s) defined by the client. Finally, at least one row of data should appear on the bottom panel, representing information pertaining to the input audio signal(s) assigned to each sound source. An input audio signal can be either a physical input channel such as can be found on an MME or ASIO input device, or it can be an audio file in the .WAV format stored on the hard drive of the GoldServer. Figure 7 shows the monitor window after a simple simulation of one listener and one sound source has been launched by a client:

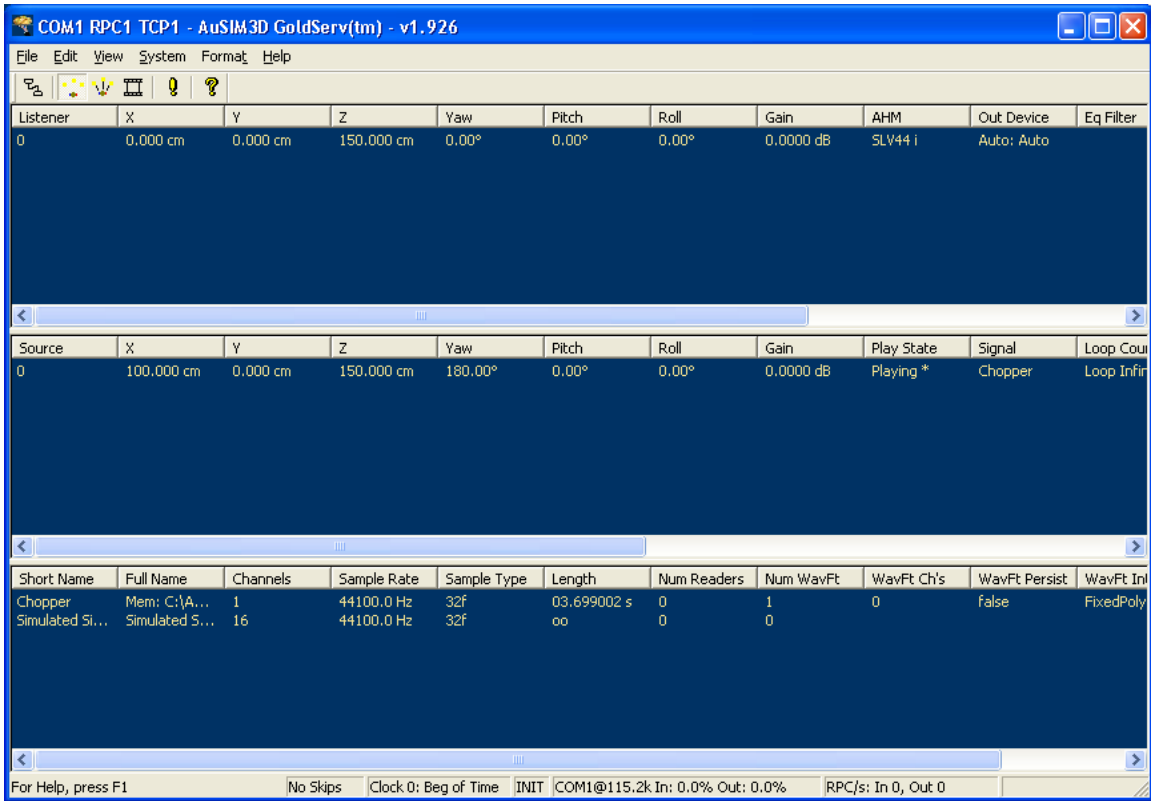


Figure 7 - Simple Simulation Launched

The information pertaining to each listener, sound source, and signal should appear to be continuously updated as it is changed by the client application. Also, whenever the client application adds or deletes listeners, sound sources, or signals, new rows of data should appear or disappear from the main display panels.

## 2.5 Alternate Views of the Acoustic Simulation

Although the 3 main display panels described above are displayed by default when the GoldServ monitor opens, there are other display tables that are available for viewing at any time. These views can be activated with the four left-most toolbar buttons. The following sections provide summary descriptions of each of the available view configurations. (More detailed descriptions of the data available in these views can be found in Chapter 3.)

### 2.5.1 Main View

The “Main View” is defined to be the set of Listener, Sound Source, and Input Audio Signal display panels that are displayed top-to-bottom when the GoldServ monitor window is first opened. This view can also be activated by selecting “Main View” from the “View” menu or clicking with the mouse or pointing device on the “Main View” toolbar button, which is the second button from the left, and marked with a symbol of a listener surrounded by a few sound sources – see Figure 8 below.

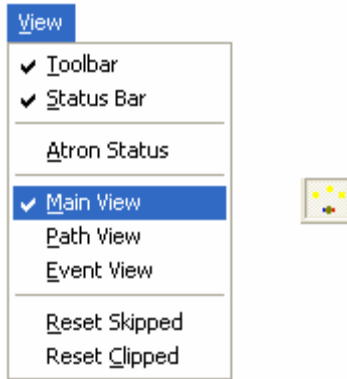


Figure 8 - Main View via Menu or Toolbar Button

The top panel in this view displays information pertaining to the listeners in the acoustic simulation – see Figure 9 below. Each row of data corresponds to a different listener in the simulation, and there can be one or more listeners at any given time. Each column corresponds to a listener attribute, and the columns contain data such as listener number, position, orientation, gain, and AHM and EQ filters used.

Listener	X	Y	Z	Yaw	Pitch	Roll	Gain	AHM	Out Device	Eq Filter
0	0.000 cm	0.000 cm	150.000 cm	0.00°	0.00°	0.00°	0.0000 dB	SLV44 I	Auto: Auto	

Figure 9 - Listener Panel

The middle panel in this view displays information pertaining to the sound sources in the acoustic simulation – see Figure 10 below. Each row of data corresponds to a different sound source in the simulation, and there can be one or more sound sources defined at any given time. Each column corresponds to a sound source attribute, and the columns contain data such as sound source number, position, orientation, gain, play state and assigned signal.

Source	X	Y	Z	Yaw	Pitch	Roll	Gain	Play State	Signal	Loop Cou
0	100.000 cm	0.000 cm	150.000 cm	180.00°	0.00°	0.00°	0.0000 dB	Playing *	Chopper	Loop Infr

Figure 10 - Sound Source Panel

The bottom panel in this view displays information pertaining to the audio input signals used by the sound sources in the acoustic simulation – see Figure 11 below. Each row of data corresponds to a different physical input channel or wave file, and there can be one or more audio input signals defined at any given time. Each column corresponds to an audio input signal attribute, and the columns contain data such as short and long name, number of channels in the signal, sample rate, and sample type.

Short Name	Full Name	Channels	Sample Rate	Sample Type	Length	Num Readers	Num WavFt	WavFt Ch's	WavFt Persist	WavFt Int
Chopper	Mem: C:\A...	1	44100.0 Hz	32f	03.699002 s	0	1	0	false	FixedPoly
Simulated Si...	Simulated S...	16	44100.0 Hz	32f	oo	0	0			

Figure 11 - Input Signal Panel

## 2.5.2 Path View

The “Path View” is defined to be the set of Path, Path Location, and Path Model display panels that are displayed top-to-bottom. This view can be activated by selecting “Path View” from the “View” menu or clicking with the mouse or pointing device on the “Path View” toolbar button, which is the third button from the left, and marked with a symbol of a listener surrounded by a few sound sources, with path lines extending from the sound sources to the listener – see Figure 12 below.

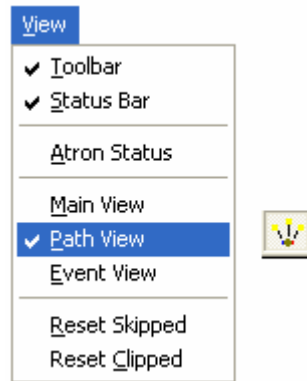


Figure 12 - Path View via Menu or Toolbar Button

The top panel in this view displays information pertaining to the individual audio propagation paths from each sound source to each listener – see Figure 13 below. Each row of data corresponds to a different path from a sound source to a listener in the simulation, and so the number of paths defined at any given time will be the number of sound sources multiplied by the number of listeners. Each column corresponds to a path attribute, and the columns contain data such as path number, signal, left ear gain, right ear gain, left ear time delay, right ear time delay, and ITD.

Path ID	Signal	Gain Left	Gain Right	Time Delay L	Time Delay R	ITD	Time Origin	Pre Level	Filter Level L	Filter Level R
0: L: 0 S: 0	Chopper	-9.5428 dB	-9.5428 dB	494,335 $\mu$ s	492,210 $\mu$ s	2,125 $\mu$ s	16:10:55.4...	-19.2532 dB	-25.7164 dB	-25.3908 dB

Figure 13 - Path Panel

The middle panel in this view displays information pertaining to the locations of each audio propagation path – see Figure 14 below. The data displayed on this panel pertains to the path that has been selected in the top panel with the mouse or pointing device. Each column corresponds to a path location attribute, and the columns contain data such as path position and orientation information.

Location	X	Y	Z	Yaw	Pitch	Roll	

Figure 14 - Location Panel

The bottom panel in this view displays information pertaining to the mathematical models used to process each audio propagation path – see Figure 15 below. The data displayed on this panel pertains to the path that has been selected in the top panel with the mouse or pointing device. Each row of data corresponds to a different mathematical model used for the selected path. Each column corresponds to a model attribute, and the columns contain data such as model name, model type, left ear gain from the model, right ear gain from the model, and model filter description.

Model Type	Model Name	Global Enable	Model Enable	Gain Left	Gain Right	Delay Left	Delay Right	Filters	Int Attributes	Double At

Figure 15 - Model Panel

### 2.5.3 Event View

The “Event View” is defined to be the set of Clock and Event display panels that are displayed top-to-bottom. This view can be activated by selecting “Event View” from the “View” menu or clicking with the mouse or pointing device on the “Event View” toolbar button, which is the fourth button from the left, and marked with a symbol of what appears to be an image frame from a movie film – see Figure 16 below.



Figure 16 - Event View via Menu or Toolbar Button

The top panel in this view displays information pertaining to audio timeline Clocks – see Figure 17 below. Each row of data corresponds to a different clock, or sequence of audio events. Each column corresponds to a clock attribute, and the columns contain data such as clock number, clock time, number of defined events, and play state.

Clock	Curr Time	Num Events	Relative Qu...	Immediate ...	Running
Clock 0	Beg of Time	0	0	0	Paused

Figure 17 - Clock Panel

The bottom panel in this view displays information pertaining to the audio events associated to each clock – see Figure 18 below. The event data displayed on this panel pertains to the clock that has been selected in the top panel with the mouse or pointing device. Each row of data corresponds to a different event associated with the selected clock. Each column corresponds to an event attribute, and the columns contain data such as event name, event time, event type, and others.

Event Time	Event Type	Object ID	Object Name	Arguments 1	Arguments 2
------------	------------	-----------	-------------	-------------	-------------

Figure 18 - Event Panel

## 2.5.4 Atron Status

The Atron status display appears in a separate window from the main window which displays the other views. This window can be opened by selecting “Atron Status” from the View menu or clicking with the mouse or pointing device on the “Atron Status” toolbar button, which is the left-most button, and marked with a symbol of what could be two data ports connected by a physical cable – see Figure 19 below.

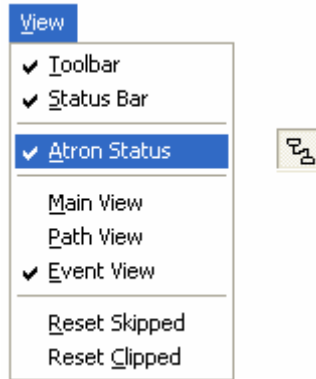


Figure 19 - Atron Status via Menu or Toolbar Button

The data displayed by the Atron Status window – see Figure 20 below – is a running log of every command sent by the connected client and received by the GoldServ audio server. It can be used to verify accurate communication between the client and server, as well as to verify that the commands received by the server match what the operator intended for the client application to send. Control buttons at the bottom of this window provide features to help manage this data stream, including the ability to save the content to a text file for later viewing with a text or document editor.

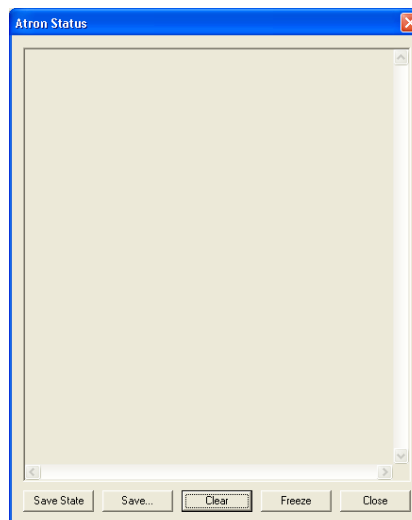


Figure 20 - Atron Status Window

This completes a summary of the basic features of the GoldServ monitor. For additional help in understanding the use of the menu selections and toolbar buttons, please see the reference guide in Chapter 3.

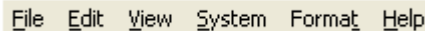


## Chapter 3 Menu, ToolBar, and Display Reference

The purpose of this chapter is to serve as a comprehensive reference guide to the various interface objects and display field available in the GoldServ monitor window. The items described are grouped by type of object, and ordered by the sequence in which they occur on the GoldServ monitor screen from left to right, top to bottom.

### 3.1 Menu Selections

The GoldServ application contains six menus arranged from left to right across the top of the application window below the title bar – see Figure 3 above. The items on these menus – see Figure 21 below – primarily control what information is displayed on the monitor and how it is displayed, but they also permit a few minor modifications of the simulation parameters themselves.



File Edit View System Format Help

Figure 21 - Application Menus

#### 3.1.1 File

The first menu from the left is the “File” menu. Its menu items invoke common functions that are related to management of the event list files that can be used by the GoldServ application. These functions include:

- Load Clock... – This menu item loads a new clock into server memory from the specified event list file.
- Save Clock... – This menu item saves a current clock definition to a specified event list file.
- Exit – This menu item ends execution of the GoldServ application, closing the main window and any child windows that might have been open, such as “Atron Status” or “About GoldServ”.

#### 3.1.2 Edit

The second menu from the left is the “Edit” menu. It includes the following functions:

- Undo – This menu item is inactive at this time.
- Cut – This menu item is inactive at this time.
- Copy – This menu item is inactive at this time.
- Paste – This item is inactive at this time.

#### 3.1.3 View

The third menu from the left is the “View” menu. Its menu items invoke functions that are related to viewing the content of the acoustic simulation being rendered by the GoldServ application. These functions include:

- Tool Bar – Selecting this menu item when it is checked causes the checkmark next to it to disappear, and the tool bar at the top of the window (below the menu) to be hidden from view. Selecting this item when it is not checked causes a checkmark to

- appear next to it and the tool bar to be displayed. The default state for the tool bar display is on/displayed.
- Status Bar – Selecting this menu item when it is checked causes the checkmark next to it to disappear, and the status bar at the bottom of the window to be hidden from view. Selecting this item when it is not checked causes a checkmark to appear next to it and the status bar to be displayed. The default state for the status bar display is on/displayed.
  - Atron Status – Selecting this menu item when it is unchecked causes a checkmark to appear next to it, and the Atron Status window to be opened. Selecting this item when it is checked causes the checkmark next to it to disappear and the Atron Status window to be closed. The default state for the Atron Status window is off/undisplayed.
  - Main View – Selecting this menu causes a checkmark to appear next to it, and the “Main View”, which is defined to be the set of Listener, Sound Source, and Input Audio Signal display panels, to be displayed. The Path View and Event View are not displayed while the Main View is being displayed.
  - Path View – Selecting this menu causes a checkmark to appear next to it, and the “Path View”, which is defined to be the set of Path, Path Location, and Path Model display panels, to be displayed. The Main View and Event View are not displayed while the Path View is being displayed.
  - Event View – Selecting this menu causes a checkmark to appear next to it, and the “Event View”, which is defined to be the set of Clock and Event display panels, to be displayed. The Main View and Path View are not displayed while the Event View is being displayed.
  - Reset Skipped – Selection of this menu item resets the counter of the number of skipped buffers to zero. The skipped buffer counter is located on the status bar at the bottom of the window, immediately to the right of the status message field. (Audio buffers can be skipped when the load placed on the system by client commands is momentarily greater than the system capacity, so these occurrences are counted and displayed on the status bar.)
  - Reset Clipped – Selection of this menu item resets the counter(s) of the number of clipped output audio occurrences to zero. The clipped audio counter(s) is/are located in the right-most column of the listener panel in the Main View. (Audio signals can be clipped when the total gain computed for the output signal to a Listener results in signal amplitude that is greater than the allowed maximum value; these occurrences are counted and displayed in the clipped output signal field.)

### 3.1.4 System

The third menu from the left is the “System” menu. Its menu items modify the parameters of the simulation being rendered by the GoldServer system. These functions include:

- Reset – This menu item resets the GoldServ application to its initial state, removing any active simulation objects and closing any open files, in preparation for receiving a new set of commands from a client application.
- Legacy Synchronization – Selecting this menu item when it is checked causes the checkmark next to it to disappear, and the Legacy Synchronization Mode to be disabled. Selecting this item when it is not checked causes a checkmark to appear next to it and the Legacy Synchronization Mode to be re-enabled. The default state for the Legacy Synchronization Mode is enabled. It is recommended that Legacy Synchronization mode be left enabled as much as possible, as it is currently improves reliability/robustness of GoldServ operation.
- Headphone EQ Enable – Selecting this menu item when it is checked causes the checkmark next to it to disappear, and the headphone equalization filtering to be suspended. Selecting this item when it is not checked causes a checkmark to

appear next to it and the headphone equalization filtering to be restarted. The default state for the headphone equalization filtering is on.

- Select EQ File ... – This menu item opens a dialog box that enables browsing to and selecting an equalization file (.eqf) for use by the GoldServ for headphone equalization filtering.
- Edit Tracker Mappings ... – Selecting this menu item opens a dialog box which allows tracker devices which have been detected to be connected to the system to be assigned to a Listener or to a Sound Source. Existing assignments can also be edited and/or removed.

### 3.1.5 Format

The fifth menu from the left is the “Format” menu. Its menu items set options that help format the GoldServ text-based information displays. Data types include:

- Time – One of four possible formats for the display of all time data can be selected:
  - Time Seconds – the times will be displayed as an integer number of seconds
  - Time Samples – the times will be displayed as an integer number of samples
  - Time HH::MM::SEC – hours, minutes, and seconds will be displayed
  - Time HH::MM::SEC.SAMP – hours, minutes, seconds, and samples will be displayed
- Angle – One of two possible formats for the display of all angle data can be selected:
  - Angle Degrees – the angles will be displayed in degrees
  - Angle Radians – the angles will be displayed in radians
- Amplitude – One of three possible formats for the display of all amplitude data can be selected:
  - Amplitude dB – the amplitudes will be displayed on a decibel scale
  - Amplitude Linear – the amplitudes will be displayed on a linear scale
  - Amplitude Meters – the amplitudes will be displayed on meters

Only one display format for each data type can be active at a time; the active format will be the one most recently selected with the mouse or pointing device, and a checkmark will appear on the menu next to the selected display format item.

### 3.1.6 Help

The right-most menu is the “Help” menu. It currently only has one selectable item:

- About GoldServ... – This menu item opens a window entitled “About GoldServ” – see Figure 22 below – displaying the application name, version number, copyright notice, and a table of the current values of all the state variables (for debugging purposes).

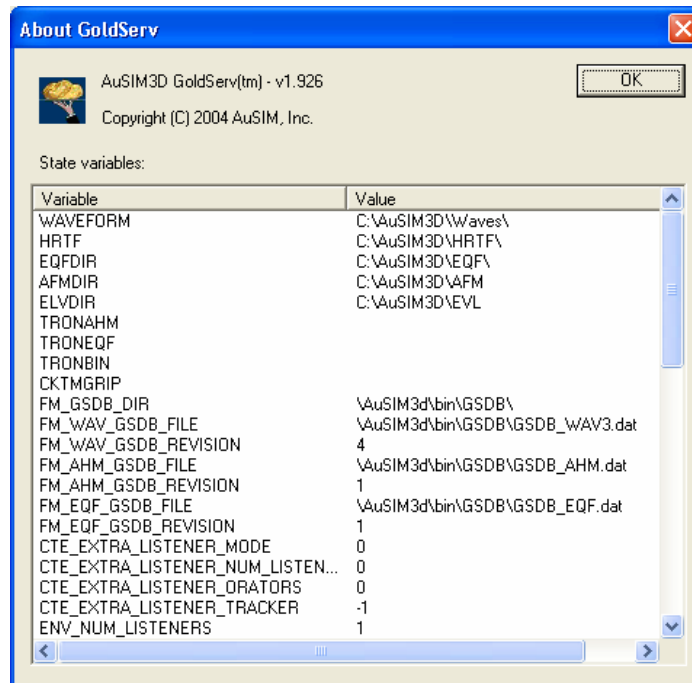


Figure 22 - About GoldServ Window

## 3.2 Toolbar Buttons

The GoldServ application contains six toolbar buttons arranged from left to right near the top of the application window – see Figure 4 above. The first four buttons activate views of the simulation data, the fifth resets the GoldServ, and the sixth opens the “About GoldServ” window.

### 3.2.1 Atron Status

The “Atron Status” toolbar button is the left-most button, and it is marked with a symbol of what could be two data ports connected by a physical cable – see Figure 23 below. When clicked with the mouse or pointing device, it opens the Atron Status window, which displays a running log of all commands sent by the connected client and received by the GoldServ. Pressing this button has the same effect as selecting “Atron Status” from the “View” menu.

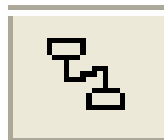


Figure 23 - Atron Status Toolbar Button

### 3.2.2 Main View

The “Main View” toolbar button is the second button from the left, and it is marked with a symbol of a listener surrounded by a few sound sources – see Figure 24 below. When clicked with the mouse or pointing device, it opens the “Main View”, which is defined to be the set of Listener, Sound Source, and Input Audio Signal display panels. The Path View and Event View are not

displayed while the Main View is being displayed. Pressing this button has the same effect as selecting “Main View” from the “View” menu.

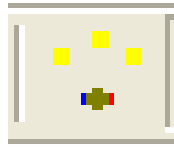


Figure 24 - Main View Toolbar Button

### 3.2.3 Path View

The “Path View” toolbar button is the third button from the left, and it is marked with a symbol of a listener surrounded by a few sound sources, with path lines extending from the sound sources to the listener – see Figure 25 below. When clicked with the mouse or pointing device, it opens the “Path View”, which is defined to be the set of Path, Path Location, and Path Model display panels. The Main View and Event View are not displayed while the Path View is being displayed. Pressing this button has the same effect as selecting “Path View” from the “View” menu.



Figure 25 - Path View Toolbar Button

### 3.2.4 Event View

The “Event View” toolbar button is the fourth button from the left, and it is marked with a symbol of what appears to be an image frame from a movie film – see Figure 26 below. When clicked with the mouse or pointing device, it opens the “Event View”, which is defined to be the set of Clock and Event display panels. The Main View and Path View are not displayed while the Event View is being displayed. Pressing this button has the same effect as selecting “Event View” from the “View” menu.

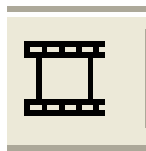


Figure 26 - Event View Toolbar Button

### 3.2.5 Reset GoldServ

The “Reset GoldServ” toolbar button is the fifth button from the left, and is marked with a small yellow exclamation symbol (“!”) – see Figure 27 below. When pressed, it resets the GoldServ application to its initial state (or “reinitializes” it), removing any active simulation objects and closing any open files, in preparation for receiving a new set of commands from a client application. Clicking this button with a mouse or pointing device has the same effect as selecting “Reset” from the “System” menu.



Figure 27 - Reset GoldServ Toolbar Button

### 3.2.6 About GoldServ

The “About GoldServ” toolbar button is the right-most button, and is marked with a small yellow question mark symbol (“?”) – see Figure 28 below. When clicked with the mouse or pointing device, a window is opened entitled “About GoldServ” displaying the application name, version number, copyright notice, and a table of the current values of all the state variables (for debugging purposes). Pressing this button has the same effect as selecting “About GoldServ...” from the “Help” menu.



Figure 28 - About GoldServ Toolbar Button

### 3.3 Main View Panels

The “Main View” is the default view and consists of three panels or tables of data – see Figure 29 below. The “Listener Panel” is the top-most panel or table; the “Sound Source Panel” is the middle panel, and the “Input Audio Signal Panel” is the bottom panel.

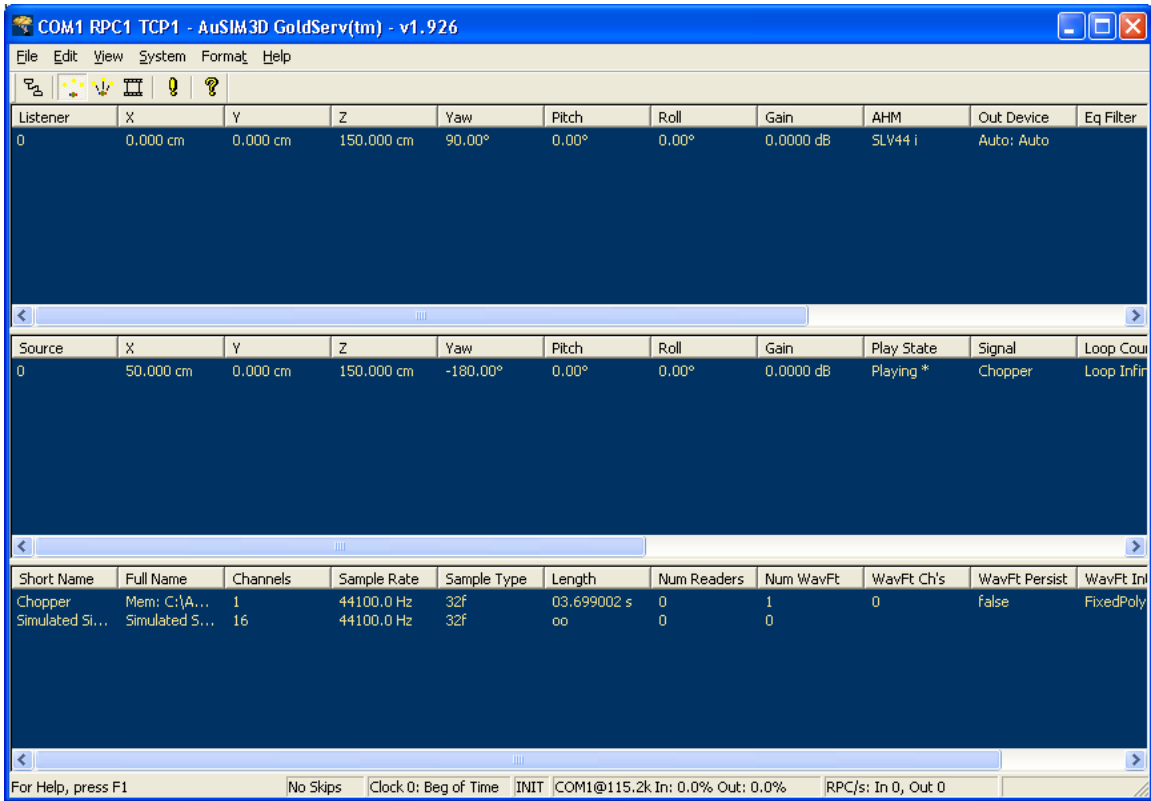


Figure 29 - The Main View

The following subsections describe the information displayed by each panel.

### 3.3.1 Listener Panel

The top panel on the Main View is the “Listener Panel”. Each row in the table corresponds to a listener in the acoustic simulation, and each of the 15 columns in the table represents a field of data pertaining to listeners – see Figure 30 below.

Listener	X	Y	Z	Yaw	Pitch	Roll	Gain	AHM	Out Device	Eq Filter	Update	Level L	Level R	Clipped
0	0.000 cm	0.000 cm	150.000 cm	90.00°	0.00°	0.00°	0.0000 dB	SLV44 i	Auto: Auto		0.00 Hz	-33.5511 dB	-24.2704 dB	0

Figure 30 - The Listener Panel Fields

The following subsections describe each of these fields and the information each provides about the listeners.

#### 3.3.1.1 Listener ID

The first column, entitled “Listener”, displays an index integer number that uniquely identifies each listener. The serial numbering is zero-based, so the first Listener will be “0”, the second Listener will be “1”, etc. This identifying number, also sometimes referred to as the “Listener ID”, is used to identify the listener when calls to the cre\_tron API are made.

### 3.3.1.2 X

The second column, entitled “X”, displays the X-coordinate (in Cartesian coordinates) of the Listener in the simulated acoustic environment. The default value is zero, but would increase as the listener moves forward from his or her default location/orientation. Likewise, the value would decrease as the listener moves backward. The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.3.1.3 Y

The third column, entitled “Y”, displays the Y-coordinate (in Cartesian coordinates) of the Listener in the simulated acoustic environment. The default value is zero, but would increase as the listener moves to the left from his or her default location/orientation. Likewise, the value would decrease as the listener moves to the right. The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.3.1.4 Z

The fourth column, entitled “Z”, displays the Z-coordinate (in Cartesian coordinates) of the Listener in the simulated acoustic environment. The default value is zero, but would increase as the listener moves to the vertically upward from his or her default location/orientation. Likewise, the value would decrease as the listener moves downward. The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.3.1.5 Yaw

The fifth column, entitled “Yaw”, displays the rotation of the listener’s head about the vertical axis in the simulated acoustic environment. The default value is zero, but would increase as the listener rotates his or her head counter-clockwise from his or her default location/orientation. Likewise, the value would decrease as the listener rotates his or her head clockwise.

The default units used by the client and displayed by the GoldServ monitor are degrees, which are indicated by a degree symbol next to the value, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

### 3.3.1.6 Pitch

The sixth column, entitled “Pitch”, displays the rotation of the listener’s head about the line between the listener’s ears, such as would occur if the listener moved to face upward or downward. The default value is zero, but would increase as the listener rotates his or her head to face downward from his or her default orientation. Likewise, the value would decrease as the listener rotates his or her head to face less downward and more upward.

The default units used by the client and displayed by the GoldServ monitor are degrees, which are indicated by a degree symbol next to the value, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

### 3.3.1.7 Roll



The seventh column, entitled “Roll”, displays the rotation of the listener’s head about the line from the nose to the back of the head, such as would occur if the listener leaned his head toward one of his or her shoulders. The default value is zero, but would increase as the listener leans his or her head away from the default orientation to bring the right ear closer to the right shoulder. Likewise, the value would decrease as the listener leans his or her head to bring the left ear closer to the left shoulder.

The default units used by the client and displayed by the GoldServ monitor are degrees, which are indicated by a degree symbol next to the value, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

### 3.3.1.8 Gain

The eighth column, entitled “Gain”, displays Gain specified by the client for the specified listener. The default value is zero, and the units are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu. A setting of zero would not cause the listener model to affect the overall gain. Positive values will add that many decibels to the overall gain for that specific listener, while negative values will attenuate that many decibels from the overall gain.

### 3.3.1.9 AHM

The ninth column, entitled “AHM”, displays the name of the default built-in Acoustic Head Map definition selected or a pre-saved Acoustic Head Map file name selected to filter the signal for the specified listener with an individual Head-Related Transfer Function (HRTF). A common standard for naming AHM files is to let the first three letters specify the initials of the individual from whom the AHM was measured, and to let the last two digits, if they are present, specify the sample rate in kHz. This standard is often followed for AuSIM-supplied AHM’s.

### 3.3.1.10 Output Device

The tenth column, entitled “Out Device”, displays the name of the output device that has been selected to receive the specified listener’s left and right output signals or binaural mix.

### 3.3.1.11 Equalization Filter

The eleventh column, entitled “Eq Filter”, displays the name of the file containing the equalization filter specified for the analog output display device, such as headphones or nearphones. These can be specified either by a client application or from an environment variable on the GoldServer. If the environment variable has not been set and the client hasn’t specified a name, no equalization filter will be used, and this field will remain blank.

### 3.3.1.12 Update

The twelfth column, entitled “Update”, displays the frequency in times per second with which the location of the listener is updated via client update commands and/or server side tracking.

### 3.3.1.13 Level of Left Channel

The thirteenth column, entitled “Level L”, displays the signal level, in decibels by default, of the left-ear output channel after being processed by the Output Model, but before clipping detection.

### 3.3.1.14 Level of Right Channel

The fourteenth column, entitled “Level R”, displays the signal level, in decibels by default, of the right-ear output channel after being processed by the Output Model, but before clipping detection.

### 3.3.1.15 Clipped

The fifteenth column, entitled “Clipped”, displays a running counter for the number of left and right channel output audio signal sample blocks for which any clipping occurred for that listener. Audio signals are automatically clipped by the system when the total gain computed for the output signal to a Listener results in signal amplitude that is greater than the allowed maximum value.

## 3.3.2 Sound Source Panel

The middle panel on the Main View is the “Sound Source Panel”. Each row in the table corresponds to a sound source in the acoustic simulation, and each of the 19 columns in the table represents a field of data pertaining to sound sources – see Figure 31 below.

Source	X	Y	Z	Yaw	Pitch	Roll	Gain	Play State	Signal	Loop Count	Abs Position	Loop Pos	Loop Num	Update	Level	Skipped	Interp	Delay Line Len
0	50.000 cm	0.000 cm	150.000 cm	-180.00°	0.00°	0.00°	0.000	Playing *	Chopper	Loop Infinite	01:23:55...	01:60...	1361	0.00 Hz	-20.4092 dB	0	None	3 - No Interp; max 1.0 sec

Figure 31 - The Sound Source Panel Fields

The following subsections describe each of these fields and the information each provides about the sound sources.

### 3.3.2.1 Source ID

The first column, entitled “Source”, displays an index integer number that uniquely identifies each sound source. The serial numbering is zero-based, so the first sound source will be “0”, the second sound source will be “1”, etc. This identifying number, also sometimes referred to as the “Source ID”, is used to identify the source when calls to the cre\_tron API are made.

### 3.3.2.2 X

The second column, entitled “X”, displays the X-coordinate (in Cartesian coordinates) of the Source in the simulated acoustic environment. A positive X value corresponds to positions in front of the default location/orientation of the listener, and increasing values of X represent locations further away from the listener. Negative X values correspond to positions in back of the default location/orientation of the listener.

The default value is typically non-zero, but it is automatically generated to provide reasonable separation between the sources. Thus, the default location of each source in a simulation is unique to the simulation, and the default coordinates assigned to the set of sources varies based on how many sources were initialized. Of course, this coordinate value can be changed by the client at any time, before or after initialization.

The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.3.2.3 Y

The third column, entitled “Y”, displays the Y-coordinate (in Cartesian coordinates) of the Source in the simulated acoustic environment. A positive Y value corresponds to positions to the left of the default location/orientation of the listener, and increasing values of Y represent locations further away from the listener. Negative Y values correspond to positions to the right of the default location/orientation of the listener.

The default value is typically non-zero when multiple sources are present, but values are automatically generated to provide reasonable separation between the sources. Thus, the default location of each source in a simulation is unique to the simulation, and the default coordinates assigned to the set of sources varies based on how many sources were initialized. Of course, this coordinate value can be changed by the client at any time, before or after initialization.

The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.3.2.4 Z

The fourth column, entitled “Z”, displays the Z-coordinate (in Cartesian coordinates) of the Source in the simulated acoustic environment. A positive Z value corresponds to positions above the default location/orientation of the listener, and increasing values of Z represent locations higher above the listener. Negative Z values correspond to positions below the default location/orientation of the listener.

The default value of Z is typically zero. The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.3.2.5 Yaw

The fifth column, entitled “Yaw”, displays the rotation of directional source’s primary propagation axis about the vertical axis in the simulated acoustic environment. The default value is -180 degrees, representing an orientation of facing back toward the negative X direction, but will increase as the source rotates counter-clockwise from the default location/orientation, and it will become zero when facing the positive X direction. Likewise, the value will decrease as the source rotates clockwise.

The default units used by the client and displayed by the GoldServ monitor are degrees, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

### 3.3.2.6 Pitch

The sixth column, entitled “Pitch”, displays the rotation of the source about the line in the horizontal plane perpendicular to the primary propagation axis, such as would occur if the source’s primary propagation direction was moved to point upward or downward. The default value is zero, but will increase as the source is rotated to point downward from the default orientation of level with respect to the horizontal plane. Likewise, the value would decrease as the source is rotated to point less downward and more upward.

The default units used by the client and displayed by the GoldServ monitor are degrees, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

### 3.3.2.7 Roll

The seventh column, entitled “Roll”, displays the rotation of the source about the primary propagation direction axis. The default value is zero, but non-zero values will not change the emission pattern from the sound source, because emission is defined by the Source Model to be radially symmetric around this axis. The default units used by the client and displayed by the GoldServ monitor are degrees, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

### 3.3.2.8 Gain

The eighth column, entitled “Gain”, displays Gain specified by the client for the specified sound source. The default value is zero, and the units are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu. A setting of zero would not cause the sound source model to affect the overall gain. Positive values will increase the overall gain for that specific sound source, while negative values will attenuate the gain.

### 3.3.2.9 Play State

The ninth column, entitled “Play State”, displays the state of the signal assigned to each sound source with respect to whether it is playing, paused or stopped. Its specific values can be one of the following states:

- “Paused” – the source is in paused or stopped state where it is not playing
- “Playing” – the source is in a state of playing and is generating sound
- “Past Loop” – the source is in state of playing, but the assigned signal has reached the end of its definition and there are no more samples to play to generate further sound

### 3.3.2.10 Signal

The tenth column, entitled “Signal”, displays the name of the input audio signal assigned to the specified sound source. This signal name can be looked up in the “Short Name” column of the Input Signal table below to find more information pertaining to this input audio signal. For a wave file, this will be the file name without the full path or file extension. For a physical input channel, this will be the physical channel number.

### 3.3.2.11 Loop Count

The eleventh column, entitled “Loop Count”, displays the number of times the input audio signal is scheduled to be repeated on this sound source. Possible values are zero when the loop mode is off, in which case “No Loop” would be displayed, infinity when the loop mode is on, in which case “Loop Infinite” would be displayed, and any other positive integer number in between, which can be specified with a client command.

### 3.3.2.12 Absolute Position

The twelfth column, entitled “Abs Position”, displays the amount of elapsed time since the point in time when the signal was most recently directed to start Playing at time zero on that source.

### 3.3.2.13 Loop Position

The thirteenth column, entitled “Loop Pos”, displays the amount of elapsed time since the point in time when the Playing signal was most recently looped back to the beginning of the signal stored in memory, which is considered to be time zero.

### 3.3.2.14 Loop Number

The fourteenth column, entitled “Loop Num”, displays the number of loop iterations that have occurred on that sound source since the point in time when the signal was most recently directed to Play in loop mode on that source.

### 3.3.2.15 Update

The fifteenth column, entitled “Update”, displays the frequency in times per second with which the location of the source is updated via client update commands and/or server side tracking.

### 3.3.2.16 Level

The sixteenth column, entitled “Level”, displays the amplitude level of the assigned audio input signal after leaving Input Model processing but before entering Path Model processing.

### 3.3.2.17 Skipped

The seventeenth column, entitled “Skipped”, displays the number of blocks of samples of audio input signal which are “missing” and assumed by the GoldServ engine to have been skipped by the application supplying the signal. This typically would involve a stream-from-disk capability.

This field differs from the Skipped Buffers Counter in the status bar at the bottom of the window, as that counter is tallying skips in the GoldServ output signal rather than an input signal.

### 3.3.2.18 Interpolation

The eighteenth column, entitled “Interp”, displays the type of interpolator used when extracting data from the absolute delay line. Its specific values can be one of the following methods:

- “None” – no interpolation is performed
- “Linear” – linear interpolation is performed
- “DynamicPoly” – Dynamic Polyphase\* interpolation is performed

\*Dynamic Polyphase is a very sophisticated higher-order interpolator which has been optimized for the processor. It can be described as an “ideal lowpass filter with Kaiser window applied”. It is dynamic in that it varies with the distance, speed, and acceleration of the sound source.

### 3.3.2.19 Delay Line Length

The nineteenth column, entitled “Delay Line Len”, displays 3 pieces of information related to the delay line. It first displays the number of items in position delay line, followed by a hyphen, whether or not position interpolation currently occurs (“Interp” / “No Interp”), followed by a semicolon, and finally the length of the delay line in seconds (e.g. “max 1.1 sec”).

### 3.3.3 Input Audio Signal Panel

The bottom panel on the Main View is the “Input Audio Signal Panel”. Each row in the table corresponds to an input audio signal coming into the acoustic simulation, and each of the 12 columns in the table represents a field of data pertaining to those signals – see Figure 32 below.

Short Name	Full Name	Channels	Sample Rate	Sample Type	Length	Num Readers	Num WavFt	WavFt Ch's	WavFt Persist	WavFt Interp	Create Str
Chopper	Mem: C...	1	44100.0 Hz	32f	03.699002 s	0	1	0	false	FixedPoly	MemoryWaveFile: ...
Simulated ...	Simulat...	16	44100.0 Hz	32f	oo	0	0				LiveAudio: BaseSp...

Figure 32 - The Input Audio Signal Panel Fields

The following subsections describe each of these fields and the information each provides about the input audio signals.

#### 3.3.3.1 Short Name

The first column, entitled “Short Name”, displays the name of the input audio signal described by the remaining fields. For a wave file, this will be the file name without the full directory path or file extension. For a physical input channel, this will be the physical device description, such as “Channel Manager Input” when the AuSIM Channel Manager is used, “ASIO Input” when ASIO hardware is in use and being polled for data directly, etc.

#### 3.3.3.2 Full Name

The second column, entitled “Full Name”, displays the full name of the input audio signal described by the remaining fields. For a wave file, this will be the file name including the full directory path and file extension. For a physical input channel, this will be the physical device description, such as “Channel Manager Input” when the AuSIM Channel Manager is used, “ASIO Input” when ASIO hardware is in use and being polled for data directly, etc.

#### 3.3.3.3 Channels

The third column, entitled “Channels”, displays the number of independent channels present in a signal. For a mono wave file, for example, there would be one channel. For a stereo wave file (more common), there would be two channels. It is also possible to have wave files with more than two channels. For physical input signals, there are commonly 8, 16, or 24 ADAT channels and often two more SPIDF channels, for a total of 10, 18, or 26. Use of the Channel Manager as an intermediary to the input/output ports allows for these numbers to be further limited to the known maximum number of signals that will be used, which can further optimize system operation and maximize processing capacity.

#### 3.3.3.4 Sample Rate

The fourth column, entitled “Sample Rate”, displays the number of audio samples per second (in Hz) that are being produced by the signal.

#### 3.3.3.5 Sample Type

The fifth column, entitled “Sample Type”, reports the quality of the sample being provided by the signal, e.g. “32f” specifies a 32-bit floating-point sample, while “16s” specifies a 16-bit integer.

### 3.3.3.6 Length

The sixth column, entitled “Length”, reports the length of the signal source. For a wave file, this value is the length of the wave file in seconds or minutes/seconds. For a live input channel, this value is infinity.

### 3.3.3.7 Number of Readers

The seventh column, entitled “Num Readers”, reports the number of sound sources to which the signal has been assigned and which are actively playing the signal.

### 3.3.3.8 Number of WavFt’s

The eighth column, entitled “Num WavFt”, reports the total number of sound sources to which the signal has been assigned via `cre_open_wave`, regardless of how many of them are actively playing the signal. (“WavFt” refers to a data structure which represents a waveform, which is used by the `cre_tron` API.)

### 3.3.3.9 WavFt Channels

The ninth column, entitled “WavFt Channels”, reports how many of the signal’s channels are being played by at least one sound source. (“WavFt” refers to a data structure which represents a waveform, which is used by the `cre_tron` API.)

### 3.3.3.10 WavFt Persistence

The tenth column, entitled “WavFt Channels”, indicates whether or not the WavFt structure and the data contained therein will persist through a `cre_close` call and still be available after the next `cre_init`. A value of FALSE indicates the WavFt structure will no longer have valid data after `cre_close`, while a value of TRUE indicates that the data in the WavFt structure will continue to have valid data after a `cre_close` and a subsequent `cre_init`.

### 3.3.3.11 WavFt Interpolation

The eleventh column, entitled “WavFt Interp”, indicates the quality of the interpolator used (if needed) to resample a signal from its native sample rate to the sample rate used by the GoldServ’s DSP engine. The default value is “FixedPoly” which has been determined to be the best possible choice for the current implementation, but this interpolation method can be modified by a client to a lower-quality interpolator such as “Linear” if it wishes to do so to conserve processing resources for other priorities. Since this interpolation is real-time, it has a significant impact on overall system performance.

### 3.3.3.12 Create String

The twelfth column, entitled “Create Str”, displays a string of all the signal parameters, including parameter names and their values, stored in the WavFt data structure, including:

- Wave File Name
- Sample Rate

- Loop Spec Count
- Loop Spec Start Time in Microseconds
- Loop Spec End Time in Microseconds
- Persistence
- Interpolation Type
- Interpolation Quality

### 3.4 Path View Panels

The “Path View” can be selected from the “View” menu or by using the third toolbar button from the left, and it also consists of three panels or tables of data – see Figure 33 below. The “Path Panel” is the top-most panel or table; the “Location Panel” is the middle panel, and the “Model Panel” is the bottom panel.

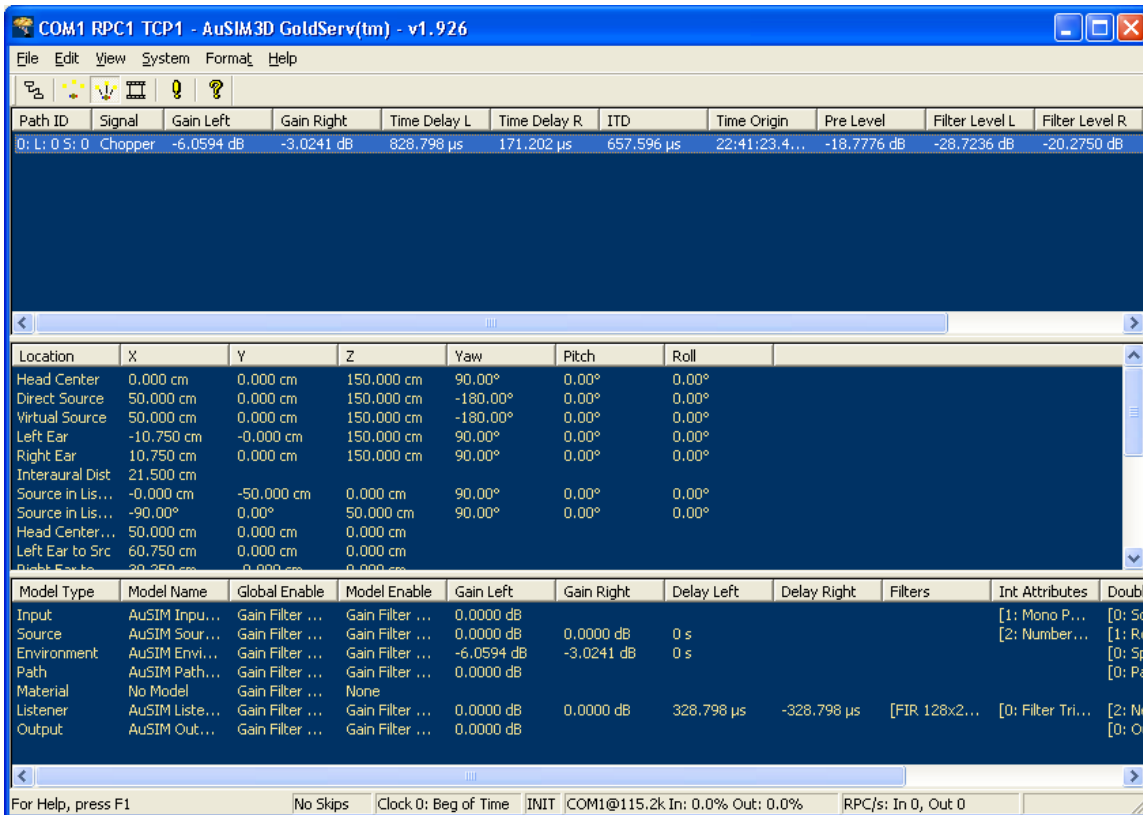


Figure 33 - The Path View

The following subsections describe the information displayed by each panel.

#### 3.4.1 Path Panel

The top panel on the “Path View” is the “Path Panel”. Each row in the table corresponds to an audio propagation path from a sound source to a listener in the acoustic simulation. Thus, the number of paths displayed will be equal to the number of sound sources defined multiplied by the number of listeners defined. Each of the 13 columns in the table represents a field of data pertaining to one of those paths from a source to a listener – see Figure 34 below.



Path ID	Signal	Gain Left	Gain Right	Time Delay L	Time Delay R	ITD	Time Origin	Pre Level	Filter Level L	Filter Level R	Post Level L	Post Level R
0: L: 0 S: 0	Chopper	-9.5428 dB	-9.5428 dB	494.335 $\mu$ s	492.210 $\mu$ s	2.125 $\mu$ s	04:42.05...	-9.655...	-17.3847 dB	-17.0960 dB	-26.9275...	-26.6388 dB

Figure 34 - The Path Panel Fields

The following subsections describe each of these fields and the information each provides about the audio propagation paths.

### 3.4.1.1 Path ID

The first column, entitled “Path ID”, displays an index integer number that uniquely identifies each unique audio propagation path, which can also be thought of as source-listener combinations. Thus, the number of paths displayed will be equal to the number of sound sources defined multiplied by the number of listeners defined. The serial numbering is zero-based, so the first path index number will be “0”, the second path index number will be “1”, etc.

### 3.4.1.2 Signal

The second column, entitled “Signal”, displays the name of the input audio signal assigned to the source in the selected path. For a wave file, this will be the file name without the full directory path or file extension. For a physical input channel, this will be the physical device description, such as “Channel Manager Input” when the AuSIM Channel Manager is used, “ASIO Input” when ASIO hardware is in use and being polled for data directly, etc.

### 3.4.1.3 Gain Left

The third column, entitled “Gain Left”, displays the sum of the left-ear-channel gains from the following Models: Source, Environment, Material, Path, and Listener. Positive quantities represent true gain, while negative values represent attenuation. The units displayed are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu.

### 3.4.1.4 Gain Right

The third column, entitled “Gain Right”, displays the sum of the right-ear-channel gains from the following Models: Source, Environment, Material, Path, and Listener. Positive quantities represent true gain, while negative values represent attenuation. The units displayed are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu.

### 3.4.1.5 Time Delay Left

The fifth column, entitled “Time Delay L”, displays the sum of the left-ear-channel time delays from the following Models: Source, Environment, Material, Path, and Listener. Because overall time delays are calculated according to a fixed reference point on the head, the Listener Model time delay to may be less for propagation to a nearer ear and display as a negative value, or be positive if the ear is further than the reference point.

### 3.4.1.6 Time Delay Right

The sixth column, entitled “Time Delay R”, displays the sum of the right-ear-channel time delays from the following Models: Source, Environment, Material, Path, and Listener. Because overall time delays are calculated according to a fixed reference point on the head, the Listener Model time delay to may be less for propagation to a nearer ear and display as a negative value, or be positive if the ear is further than the reference point.

#### 3.4.1.7 ITD

The seventh column, entitled “Time Delay R”, displays the interaural time delay or ITD, which is defined to be the difference in time delay between when a signal reaches the left and right ears of a listener. In this implementation, it is calculated to be the difference between “Time Delay L” and “Time Delay R”.

#### 3.4.1.8 Time Origin

The eighth column, entitled “Time Origin”, displays the amount of time passed in seconds or minutes/seconds since the current acoustic simulation began. The format for the display of this field can be modified by selecting one of the “Time” options on the “Format” menu.

#### 3.4.1.9 Pre Level

The ninth column, entitled “Pre Level”, displays the signal level of the audio traversing the propagation path from the source to the listener before any of the model filters or gains are applied to it. The units displayed are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu.

#### 3.4.1.10 Filter Level, Left Channel

The tenth column, entitled “Filter Level L”, displays the signal level of the audio traversing the propagation path from the source to the left ear of the listener after the Source, Environment, Material, Path, and Listener model filters have been applied, but before any of these model gains are applied to it. The units displayed are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu.

#### 3.4.1.11 Filter Level, Right Channel

The eleventh column, entitled “Filter Level R”, displays the signal level of the audio traversing the propagation path from the source to the right ear of the listener after the Source, Environment, Material, Path, and Listener model filters have been applied, but before any of these model gains are applied to it. The units displayed are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu.

#### 3.4.1.12 Post Level, Left Channel

The twelfth column, entitled “Post Level L”, displays the signal level of the audio traversing the propagation path from the source to the left ear of the listener after the Source, Environment, Material, Path, and Listener model filters and gains have been applied to it. The units displayed are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu.

#### 3.4.1.13 Post Level, Right Channel

The thirteenth column, entitled “Post Level R”, displays the signal level of the audio traversing the propagation path from the source to the right ear of the listener after the Source, Environment, Material, Path, and Listener model filters and gains have been applied to it. The units displayed are decibels by default, but the display can be changed to linear units or meters by selecting one of these options from the “Format” menu.

### 3.4.2 Location (Path-specific) Panel

The middle panel on the “Path View” is the “Location Panel”. This table of data displays location information pertaining to whichever path in the above table has been selected/highlighted with the mouse or pointing device. Each row in the table corresponds to a specific 3D location, vector, or scalar value that is unique to a path, and provides orientation of the associated acoustic object when applicable – see Figure 35 below. The acoustic object could be a listener, a sound source, or something in the acoustic environment that affects how the audio sounds.

The acoustic simulation 3D locations listed on this panel for the selected path are:

- Head Center
- Direct Source
- Virtual Source
- Left Ear
- Right Ear

The 3D vectors listed on this panel for the selected path are:

- Source in Listener Coordinates
- Source in Listener Polar Coordinates
- Head Center to Source
- Left Ear to Source
- Right Ear to Source
- Head Center to Virtual Source
- Left Ear to Virtual Source
- Right Ear to Virtual Source

The scalar values listed on this panel for the selected path are:

- Interaural Distance
- Direct Path Length, to Head Center
- Direct Path Length, to Left Ear
- Direct Path Length, to Right Ear
- Virtual Path Length, to Head Center
- Virtual Path Length, to Left Ear
- Virtual Path Length, to Right Ear

Location	X	Y	Z	Yaw	Pitch	Roll
Head Center	0.000 cm	0.000 cm	150.000 cm	0.00°	0.00°	0.00°
Direct Source	100.000 cm	0.000 cm	150.000 cm	180.00°	0.00°	0.00°
Virtual Source	100.000 cm	0.000 cm	150.000 cm	180.00°	0.00°	0.00°
Left Ear	0.000 cm	7.620 cm	150.000 cm	0.00°	0.00°	0.00°
Right Ear	0.000 cm	-7.620 cm	150.000 cm	0.00°	0.00°	0.00°
Interaural Dist	15.240 cm					
Source in Listener Coordinates	100.000 cm	0.000 cm	0.000 cm	-180.00°	0.00°	0.00°
Source in Listener Polar Coords	0.00°	0.00°	100.000 cm	-180.00°	0.00°	0.00°
Head Center to Src	100.000 cm	0.000 cm	0.000 cm			
Left Ear to Src	100.000 cm	-7.620 cm	0.000 cm			
Right Ear to Src	100.000 cm	7.620 cm	0.000 cm			
Head Center to VSrc	100.000 cm	0.000 cm	0.000 cm			
Left Ear to VSrc	100.000 cm	-7.620 cm	0.000 cm			
Right Ear to VSrc	100.000 cm	7.620 cm	0.000 cm			
Direct Path Length Center	100.000 cm					
Direct Path Length Left	100.290 cm					
Direct Path Length Right	100.290 cm					
Path Length Center	100.000 cm					
Path Length Left	100.290 cm					
Path Length Right	100.290 cm					

Figure 35 - The Location Panel Fields

The following subsections describe each of these fields and the specific information each provides with respect to the selected path.

### 3.4.2.1 Location

The first column, entitled “Location”, displays the description of the location being described by the rest of the values in the table. Each row corresponds to a specific 3D location, vector, or scalar value that is unique to a path, and provides orientation of the associated acoustic object when applicable. The remaining columns in the table provide the numeric values corresponding to the description found in the “Location” column.

### 3.4.2.2 X

The second column, entitled “X”, displays the X-coordinate (in Cartesian coordinates) of each path-related location, using the same acoustic simulation axes system described for the Listener and Sound Sources. Also, this column displays the X-component of the vector when 3D vector parameters are listed and the scalar value when scalar values are listed.

The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.4.2.3 Y

The third column, entitled “Y”, displays the Y-coordinate (in Cartesian coordinates) of each path-related location, using the same acoustic simulation axes system described for the Listener and Sound Sources. Also, this column displays the Y-component of the vector when 3D vector parameters are listed.

The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

### 3.4.2.4 Z

The fourth column, entitled “Z”, displays the Z-coordinate (in Cartesian coordinates) of each path-related location, using the same acoustic simulation axes system described for the Listener and Sound Sources. Also, this column displays the Z-component of the vector when 3D vector parameters are listed.

The units of the coordinate system in use are listed next to the coordinate; the default unit is centimeters (cm), but other units that the client may specify for use include inches (in), feet (ft), meters (m), and millimeters (mm).

#### 3.4.2.5 Yaw

The fifth column, entitled “Yaw”, displays an orientation angle for the path locations which are part of the source or listener definitions. The Listener Yaw is displayed for path locations directly linked to the listener, such as head center and ear locations, while the Source Yaw is displayed for path locations directly linked to the source. No Yaw values are displayed for the vector and scalar parameters listed.

The default units used by the client and displayed by the GoldServ monitor are degrees, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

#### 3.4.2.6 Pitch

The sixth column, entitled “Pitch”, displays an orientation angle for the path locations which are part of the source or listener definitions. The Listener Pitch is displayed for path locations directly linked to the listener, such as head center and ear locations, while the Source Pitch is displayed for path locations directly linked to the source. No Pitch values are displayed for the vector and scalar parameters listed.

The default units used by the client and displayed by the GoldServ monitor are degrees, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

#### 3.4.2.7 Roll

The seventh column, entitled “Roll”, displays an orientation angle for the path locations which are part of the source or listener definitions. The Listener Roll is displayed for path locations directly linked to the listener, such as head center and ear locations, while the Source Roll is displayed for path locations directly linked to the source. No Roll values are displayed for the vector and scalar parameters listed.

The default units used by the client and displayed by the GoldServ monitor are degrees, but the display can be changed to radians by selecting “Angle Radians” from the “Format” menu.

### 3.4.3 Model (Path-specific) Panel

The bottom panel on the “Path View” is the “Model Panel”. This table of data also displays information pertaining to whichever path in the above table has been selected/highlighted with the mouse or pointing device. Each row in the table corresponds to a mathematical Model that is used to filter audio traveling along the virtual propagation path, to re-create the changes the audio would undergo if it were traveling naturally through a real or artificial environment. The Models used by the simulation are listed in the order they are used for processing, which is:

1. Input

2. Source
3. Environment
4. Path
5. Material
6. Listener
7. Output

Each of the 13 columns in the table represents a field of data pertaining to one of those Models for the selected path from a source to a listener – see Figure 36 below.

Model Type	Model Name	Global Enable	Model Enable	Gain Left	Gain Right	Delay Left	Delay Right	Filters	Int Attributes	Double Attributes	Double Array...	String Attri...
Input	AUSIM Input Model	Gain Filter Delay	Gain Filter Delay	0.0000 dB					[1: Mono P...	[0: Source Gain...		
Source	AUSIM Source Model	Gain Filter Delay	Gain Filter Delay	0.0000 dB	0.0000 dB	0 s			[2: Number...	[1: Roll Off Exp...	[3: Radiation...	
Environment	AUSIM Environment Model	Gain Filter Delay	Gain Filter Delay	-9.5428 dB	-9.5428 dB	0 s				[0: Spreading R...		
Path	AUSIM Path Model	Gain Filter Delay	Gain Filter Delay	0.0000 dB						[0: Path Gain =...		
Material	No Model	Gain Filter Delay	None									
Listener	AUSIM Listener Model	Gain Filter Delay	Gain Filter Delay	0.0000 dB	0.0000 dB	-5.665 $\mu$ s	-7.790 $\mu$ s	[F1...	[0: Filter Tri...	[2: Near Field D...		[5: AHM Na...
Output	AUSIM Output Model	Gain Filter Delay	Gain Filter Delay	0.0000 dB						[0: Output Gain...		[1: Headph...

Figure 36 - The Model Panel Fields

The following subsections describe each of these fields and the specific information each provides about the Model used.

### 3.4.3.1 Model Type

The first column, entitled “Model Type”, displays the model types listed in the list above.

### 3.4.3.2 Model Name

The second column, entitled “Model Name”, displays the name of the model. If the model is one of the default models built-in by AuSIM, the name of the model will begin with the string “AuSIM”. If the model has been defined and plugged-in by the end user, the name will be the one specified by the client programmer.

### 3.4.3.3 Global Enable

The third column, entitled “Global Enable”, displays the simulation-wide state of enabledness of the Gain, Filter, and Delay processing. The default value of the character string displayed is “Gain Filter Delay”, which indicates processing is globally enabled for all three. If one or more of these key words is missing from the display, this indicates that the missing processing has been globally disabled.

### 3.4.3.4 Model Enable

The fourth column, entitled “Model Enable”, displays the model-specific state of enabledness of the Gain, Filter, and Delay processing. The default value of the character string displayed is “Gain Filter Delay”, which indicates processing is enabled for all three for this model. If one or more of these key words is missing from the display, this indicates that the missing process has been disabled for this model.

### 3.4.3.5 Gain, Left Channel

The fifth column, entitled “Gain L”, displays the quantity of signal Gain introduced by each model, when performing model processing for the left-ear channel. Positive quantities represent true

gain, while negative values represent attenuation. The default units are decibels, but the display units can be changed by selected any of the last three options on the “Format” menu: “db”, “Linear”, or “Meters”.

#### 3.4.3.6 Gain, Right Channel

The sixth column, entitled “Gain R”, displays the quantity of signal Gain introduced by each model, when performing model processing for the right-ear channel. Positive quantities represent true gain, while negative values represent attenuation. The default units are decibels, but the display units can be changed by selected any of the last three options on the “Format” menu: “db”, “Linear”, or “Meters”.

#### 3.4.3.7 Delay, Left Channel

The seventh column, entitled “Delay L”, displays the quantity of signal time delay introduced by each model, when performing model processing for the left-ear channel. Possible units of time displayed include microseconds, seconds, or seconds/minutes. The format for the display of this field can be modified by selecting one of the “Time” options on the “Format” menu.

#### 3.4.3.8 Delay, Right Channel

The eighth column, entitled “Delay R”, displays the quantity of signal time delay introduced by each model, when performing model processing for the right-ear channel. Possible units of time displayed include microseconds, seconds, or seconds/minutes. The format for the display of this field can be modified by selecting one of the “Time” options on the “Format” menu.

#### 3.4.3.9 Filters

The ninth column, entitled “Filters”, displays information describing the filter used by the model. Possible information includes the type of filter (FIR, IIR, etc.), how many coefficients used by the filter (also referred to as its “length”), and the portion of the filter activated by the selected path (i.e. signal arrival direction for AHM filters).

#### 3.4.3.10 Integer Attributes

The tenth column, entitled “Integer Attributes”, displays a list of the names and current values of all the integer-type model attributes, concatenated into a single character string. Each list is unique to the model it represents. A blank field value indicates there are no integer-type attributes for this model.

#### 3.4.3.11 Double Attributes

The eleventh column, entitled “Double Attributes”, displays a list of the names and current values of all the double-precision-type model attributes, concatenated into a single character string. Each list is unique to the model it represents. A blank field value indicates there are no double-precision-type attributes for this model.

#### 3.4.3.12 Double Array Attributes

The twelfth column, entitled “Double Array Attrs”, displays a list of the names and current values of all the double-precision-array-type model attributes, concatenated into a single character string. Each list is unique to the model it represents. A blank field value indicates there are no

double-precision-array-type attributes for this model. An empty array indicates that the attribute exists, but that no values have yet been defined for the array.

### 3.4.3.13 String Attributes

The thirteenth column, entitled “String Attributes”, displays a list of the names and current values of all the character-string-type model attributes, concatenated into a single character string. Each list is unique to the model it represents. A blank field value indicates there are no character-string-type attributes for this model. A blank value indicates that the attribute exists, but that no values have yet been defined for the character string.

## 3.5 Event View Panels

The “Event View” can be selected from the “View” menu or by using the fourth toolbar button from the left, and it consists of only two panels or tables of data – see Figure 37 below. The “Clock Panel” is the top-most panel or table, and the “Event Panel” is the bottom panel.

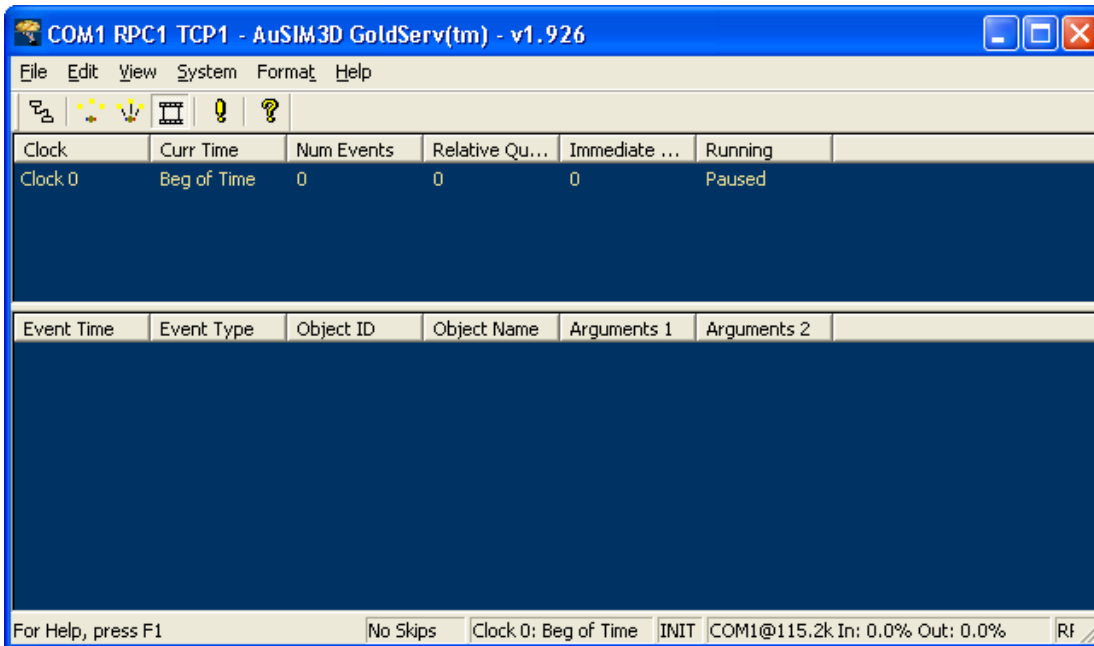


Figure 37 - The Events View

The following subsections describe the information displayed by each panel.

### 3.5.1 Clock Panel

The top panel on the “Event View” is the “Clock Panel”. Each row in the table represents a “clock” or list of acoustic events that are scheduled to occur at a specified time. Each of the 6 columns in the table represents a field of data pertaining to one of those clocks or timelines – see Figure 38 below.



Clock	Curr Time	Num Events	Relative Queue	Immediate Queue	Running
Clock 0	Beg of Time	0	0	0	Paused

Figure 38 - The Clock Panel Fields

The following subsections describe each of these fields and the specific information each provides about the clock.

### 3.5.1.1 Clock

The first column, entitled “Clock”, displays an index integer number that uniquely identifies each sound source. The serial numbering is zero-based, so the first sound source will be “0”, the second sound source will be “1”, etc. This identifying number, also sometimes referred to as the “Clock ID”, is used to identify the source when calls to the `cre_tron` API are made.

### 3.5.1.2 Current Time

The second column, entitled “Current Time”, displays a pointer to the current point in time on the clock’s timeline.

### 3.5.1.3 Number of Events

The third column, entitled “Num Events”, displays a count of the total number of absolute events defined for the clock or event list. An absolute event is defined to be an audio event which has been assigned a specific, absolute time on the clock’s timeline. Such events will also be the ones displayed on the Event Panel below.

### 3.5.1.4 Relative Queue

The fourth column, entitled “Relative Queue”, displays a count of the total number of relative events that have been added to a queue, and which are waiting to be added to an event list upon the next call to `cre_set_events` or `cre_update_audio`. A relative event is defined to be an audio event which will be executed a specified amount of time after the next execution of a call to `cre_set_events` or `cre_update_audio`. Such events will NOT be displayed on the Event Panel below.

### 3.5.1.5 Immediate Queue

The fifth column, entitled “Immediate Queue”, displays a count of the total number of immediate events that have been added to a queue, and which are waiting to be added to an event list upon the next call to `cre_set_events` or `cre_update_audio`. An immediate event is defined to be an audio event which will be executed immediately upon the next execution of a call to `cre_set_events` or `cre_update_audio`. Such events will NOT be displayed on the Event Panel below.

### 3.5.1.6 Running

The sixth column, entitled “Running”, displays a status word indicating whether or not a clock timeline or event list is actively being executed. The field will display “Playing” if so, “Paused” if not.

## 3.5.2 Events Panel

The bottom panel on the “Event View” is the “Events Panel”. This table of data also displays a list of acoustic events that have been scheduled on the clock’s timelines. Possible types of events include a change in play state of a sound source, a change in position of a sound source or listener, etc. The time the event will occur, the nature of the event, and which acoustic object will be responsible for the event are listed in this table – see Figure 39 below.

Event Time	Event Type	Object ID	Object Name	Arguments 1	Arguments 2
[Redacted content]					

Figure 39 - The Events Panel Fields

The following subsections describe each of these fields and the specific information each provides about the events associated to the selected clock.

### 3.5.2.1 Event Time

The first column, entitled “Event Time”, displays the point in time at which the audio event is scheduled to be executed.

### 3.5.2.2 Event Type

The second column, entitled “Event Type”, displays the type or nature of the event on the list. Possible types of events include a change in play state of a sound source, a change in position of a sound source or listener, etc.

### 3.5.2.3 Object ID

The third column, entitled “Object ID”, displays an index integer number that uniquely identifies each acoustic object in the acoustic environment. The serial numbering is zero-based, so the first object will be “0”, the second will be “1”, etc. This object could be a listener, a sound source, or something in the acoustic environment that affects how the audio sounds.

### 3.5.2.4 Object Name

The fourth column, entitled “Object ID”, displays the specific name of the object that the event is operating on. This object could be a listener, a sound source, or something in the acoustic environment that affects how the audio sounds.

### 3.5.2.5 Argument 1

The fifth column, entitled “Argument 1”, displays event attribute data set by the client. It could be anything, depending on the application.

### 3.5.2.6 Argument 2

The sixth column, entitled “Argument 2”, also displays application-specific event attribute data determined by the client.

## 3.6 Status Bar Fields

The GoldServ application monitor also displays a status bar at the very bottom of the window – see Figure 6 above. It contains seven separate fields which show continually updated status for various measures of GoldServ operation. The first area displays a context-sensitive message, the next two report buffer overflows and clock time elapsed, and the remaining fields report the rate of each transport mechanism throughput.

### 3.6.1 Status Message

The status message area of the Status Bar is the left-most field on the status bar – see Figure 40 below. A short context-sensitive message is displayed here when the mouse or pointing device arrow is placed over a toolbar button or menu item. The message is a short description of the function of the button or menu item. (When the pointing device is not pointing to a button or menu item, the default Windows status message is “For help, press F1”; however, pressing F1 does not display any further help at this time.)

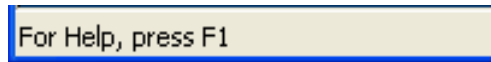


Figure 40 - The Status Message Area

### 3.6.2 Skipped Buffers Counter

To the immediate right of the message section is a field that displays a continuously updated counter of how many digital audio input channel data buffers have been skipped – see Figure 41 below. Audio buffers can be skipped when the load placed on the system by client commands is momentarily greater than the system capacity, so these occurrences are counted and displayed on the status bar. The rate at which the number of skipped buffers is increasing is a proportional measure of audio degradation due to inadequate system processing capacity. This counter can be reset to zero with a click of the appropriate menu item or tool bar button, which forces the tally to include only subsequently skipped buffer occurrences.

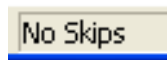


Figure 41 – The Skipped Buffers Counter

### 3.6.3 Clock

To the immediate right of the skipped buffers counter section is a field that displays a clock, or, more accurately, a time counter that starts at zero when a simulation starts and keeps track of how long the simulation has been running – see Figure 42 below.

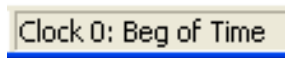
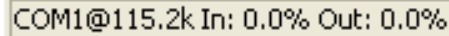


Figure 42 – The Clock or Time Counter

### 3.6.4 RS-232 Serial Port Transport Mechanism

To the immediate right of the clock/time counter section is a field that displays data throughput rates for the connected serial port connection. Rates for both incoming data as well as outgoing data are showed, represented as a percentage of the maximum capacity – see Figure 43 below.

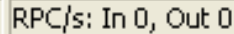


COM1@115.2k In: 0.0% Out: 0.0%

Figure 43 - The Serial Port Throughput Display

### 3.6.5 RPC Ethernet Transport Mechanism

To the immediate right of the RS-232 serial port display section is a field that displays data throughput rates for the RPC-protocol connection. Rates for both incoming data as well as outgoing data are showed, represented with a number of cre\_tron function calls (In) or data items returned to cre\_tron function calls (Out) per second – see Figure 44 below.



RPC/s: In 0, Out 0

Figure 44 - The RPC Ethernet Throughput Display

### 3.6.6 USB 2.0 Transport Mechanism

To the immediate right of the RPC throughput display section is a field that displays data throughput rates for the USB connection, if one exists. Rates for both incoming data as well as outgoing data are showed, represented with a number of cre\_tron function calls (In) or data items returned to cre\_tron function calls (Out) per second. However, if no USB PCI hardware device is installed in the GoldServ system, this display area will remain blank – see Figure 45 below.

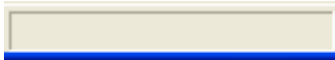
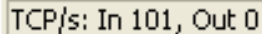


Figure 45 - The USB 2.0 Throughput Display

### 3.6.7 TCP Ethernet Transport Mechanism

To the immediate right of the USB throughput display section is a field that displays data throughput rates for the TCP-protocol connection. Rates for both incoming data as well as outgoing data are showed, represented with a number of cre\_tron function calls (In) or data items returned to cre\_tron function calls (Out) per second – see Figure 46 below.



TCP/s: In 101, Out 0

Figure 46 - The TCP Ethernet Throughput Display