Advanced Wave Effects
ISA 16-bit Sound Card

Ultimate

Retro Gaming Experience

Plug and Play

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1. Introduction

Welcome to the exciting world of Retro Sound!

We are proud to present you AWE64 Legacy – a modern incarnation of the iconic Creative Sound Blaster®AWE64 Gold audio card!

AWE64 Legacy card takes the best features of the original AWE64 Gold and raises them up to an unattainable high by the means of modern technologies. The main idea of the whole project was to create an ultimate solution for retro gaming and listening synthesized music.

The card is built upon the original CT8920 processor and EMU8011 WaveROM from AWE64 Value for 100% compatibility with original drivers and software for the AWE64 series. To unveil a truly potential of AWE64 the card is also packed with a maximum supported amount of RAM (28MB) for loading soundfonts, a Wave Blaster connector, an S/PDIF digital output, and an AC'97 Audio connector for PC's front panel. But this is just a beginning of its feature list. The two essential elements of AWE64 Legacy are an integrated HardMPU Intelligent MIDI host controller and an integrated genuine Yamaha OPL3 FM-synthesizer:

- ➢ HardMPU is based on Atmega microcontroller and offers you "intelligent" mode support for handling external MIDI-devices, such as Roland MT-32 or various daughterboards.
- ➢ Yamaha YMF262 (also known as OPL3) gives you an alternative solution for FM-synthesis addition th the built-in Creative CQM synthesizer.

Both of these components can be enabled of disabled manually using a set of DIP-switches on the back side of the card. This gives you complete control over the music playback subsystem.

In addition, we have completely redesigned the analog audio section to achieve the highest possible sound quality. This included replacing old electrolytic capacitors to modern tantalum and high quality Japan aluminum caps, installing 2-channel amplifiers from Texas Instruments and replacing standard 3.5mm Line-Out jacks to stylish gold covered RCA connectors. All the components are assembled on a matte black PCB with gold-plated pins and contacts, granting AWE64 Legacy a gorgeous look.

This audio card will help you achieve realistic acoustic reproduction through a wide range of digitized sound samples and Creative 3D Stereo Enhancement technology. AWE64 Legacy is fully Sound Blaster and also supports a full set of original Creative features:

- Plug and Play ISA Specification version 1.0a compliance
- Major MIDI standards such as General MIDI, Roland GS and MT-32

- Compression algorithms such as A-law, Mu-law, CTADPCM, and IMA-ADPCM
- Full duplex operation for simultaneous audio recording and playback

EMU8000 hardware wavetable synthesizer chip comprises a powerful and flexible E-mu sampling synthesis system, and its effects processor is able to generate various effects (such as reverb and chorus) and environments on MIDI output. EMU8000 is also supports E-Mu's SoundFont standard, which allows you to build custom sound sets using your own samples stored in card's RAM.

Creative WaveSynth/WG employs the latest technologies for sound creation and playback in personal computer software: sample-based wavetable synthesis (WaveSynth) and physical model-based waveguide (WG) synthesis.

The sample-based wavetable synthesizer allows you to play high quality music and sound effects via software (instead of hardware FM synthesis) in any Windows-based multimedia application or game that supports synthesized music.

It also has a physical model-based waveguide synthesizer which uses Sondius®Sound Synthesis technology to play waveguide sounds polyphonically and multi-timbrally. In other words, it allows you to play many notes and different instruments or sound effects at once. WaveSynth/WG is also a General MIDI synthesizer that acts like a multi-channel mixer with high quality reverb. WaveSynth/WG can be disabled in AWE Control Panel if not needed.

Read this Manual to find out how to install and begin making the most of your new audio card.

2. General Specifications

This appendix lists the general specifications of your audio card.

Plug and Play

- ISA Specification version 1.0a compliant

Advanced WavEffects Synthesizer

- 32-voice polyphony
- 16 parts multi-timbral
- 1 MB ROM of General MIDI samples
- 32 MB built-in DRAM

Stereo Music Synthesizer

- CQM stereo music synthesizer working either in 4-operator 11-voice or 2-operator 20-voice mode
- Original Yamaha YMF262 OPL3 music synthesizer with 2-operator 18-voice mode
- Compatible with previous Sound Blaster and Adlib musicsynthesizer chips
- DIP Switch for routing CQM/OPL3

Stereo Digitized Voice Channel

- Full duplex
- 16-bit and 8-bit digitizing in stereo and mono modes
- Programmable sampling rates from 5 kHz to 44.1 kHz in linear steps.
- High and Low DMA channels using a single interrupt for audio playback and recording
- Dynamic filtering for digital audio recording and playback

Built-in Digital/Analog Mixer

- Mixes sources from digitized voice and inputs from MIDI devices, CD Audio, Line-In, Microphone, and PC Speaker
- Selectable input source or mixing of various audio sources for recording

Volume Control

- Software volume control of Master Volume, Digitized Voice, and inputs from MIDI device, CD Audio, Line-In, Microphone, and PC Speaker
- PC Speaker at 4 levels in 6 dB steps

- All sources at 32 levels in 2 dB steps

- Treble/Bass control at 15 levels from -14 dB to 14 dB in 2 dB steps

- Full software control of fade-in, fade-out, and panning

3D Stereo Enhancement Technology

- Increased depth and breadth in perceived audio

- Enhances mono and stereo audio output

- Independent of speaker quality

- Independent of setup configuration (for example, placement and alignment of speakers with the listener)

MIDI Interface

- Built-in MIDI interface for connection to external MIDI devices

- Discrete HardMPU MIDI host controller with intelligent mode support

- Wave Blaster connector for attaching various MIDI daughterboards

- DIP Switches for routing MIDI host controllers and selecting IRQ and Port for HardMPU

- DIP Switch for turning ON/OFF MFBEN (MIDI FeedBack Enable) function

3. System Requirements

Your computer must be compliant to the following hardware requirements in order to properly work with AWE64 Legacy sound card:

- Intel Pentium 90 MHz CPU of better
- VGA or SVGA video card
- Minimum of 8 MB RAM
- 20 MB of free hard disk space
- 4x speed CD-ROM drive (for installing drivers from CD)
- Windows 95 or Windows 3.1x with MS-DOS 5.0 and a Plug and Play (PnP) configuration manager

4. Examine Your Audio Card

AWE64 Legacy significantly differs from the original Creative AWE64 Value in jacks and connectors which allow you to attach other devices to your card:
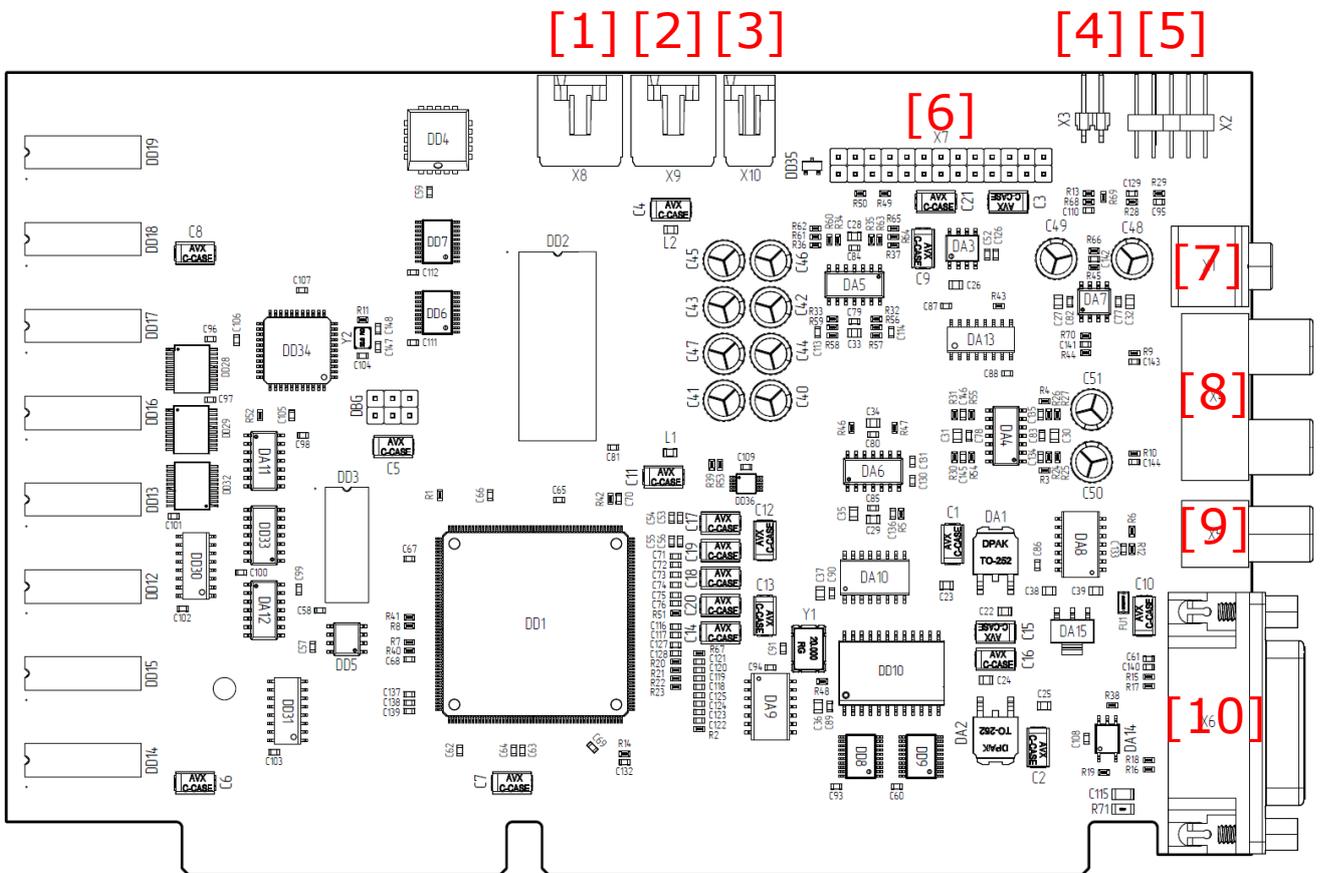

Figure 1. AWE64 Legacy front side view schematic

[1] Line-In Input (AUX). Connects an internal audio source, such as a TV Tuner, FM Radio or an MPEG card.

[2] CD-In Audio connector. Connect a CD-ROM drive using a CD audio cable.

[3] S/PDIF-Out connector. Sony/Philips Digital Interface format connector. Use it to output digital signal from EMU8000 to external receiver or other digital device.

[4] PC Speaker connector. Connects your motherboard's speaker connector.

[5] AC'97 Audio connector. Allows you to route Line-Out and Mic-In interfaces to the front panel of your PC's case.

[6] Wave Blaster connector. Connect your MIDI daughterboard here (for example, Yamaha DB50XG or Dreamblaster X2).

[7] Line-In jack. Connects external devices (such as cassette, DAT, or Minidisc player) for playback or recording.

[8] 2-RCA Line-Out connectors. Connect an AC or headphones for analogue stereo sound output. "White" is the Left channel, and "Red" is the Right channel.

[9] S/PDIF Out jack. Connects an external digital device that uses an S/PDIF connector, such as AV Receiver, for playback or recording.

The digital audio signals from the S/PDIF Out jack contain audio output from the EMU8000 wavetable chip mixed with digital voice playback if the playback is in 16-bit stereo mode, 44.1 kHz CD quality. If you want to listen to WaveSynth/WG through the S/PDIF Out jack, you must enable the "Enable WaveSynth to play at CD quality" feature. To do so:

1. Start «**Creative WaveSynth-Waveguide**».The WaveSynth/WG properties sheet appears, displaying the **Profile** tab.
2. Click the **Performance Settings** button.
3. In the **Settings** dialog box, select the Enable «**WaveSynth To Play At CD Quality**» check box and click the **OK** button.
4. In the **WaveSynth/WG** properties sheet, click the **Quit** button to close it.

[10] Joystick/MIDI connector. Connects a joystick or an external MIDI device (such as Roland MT-32 or MIDI-keyboard).
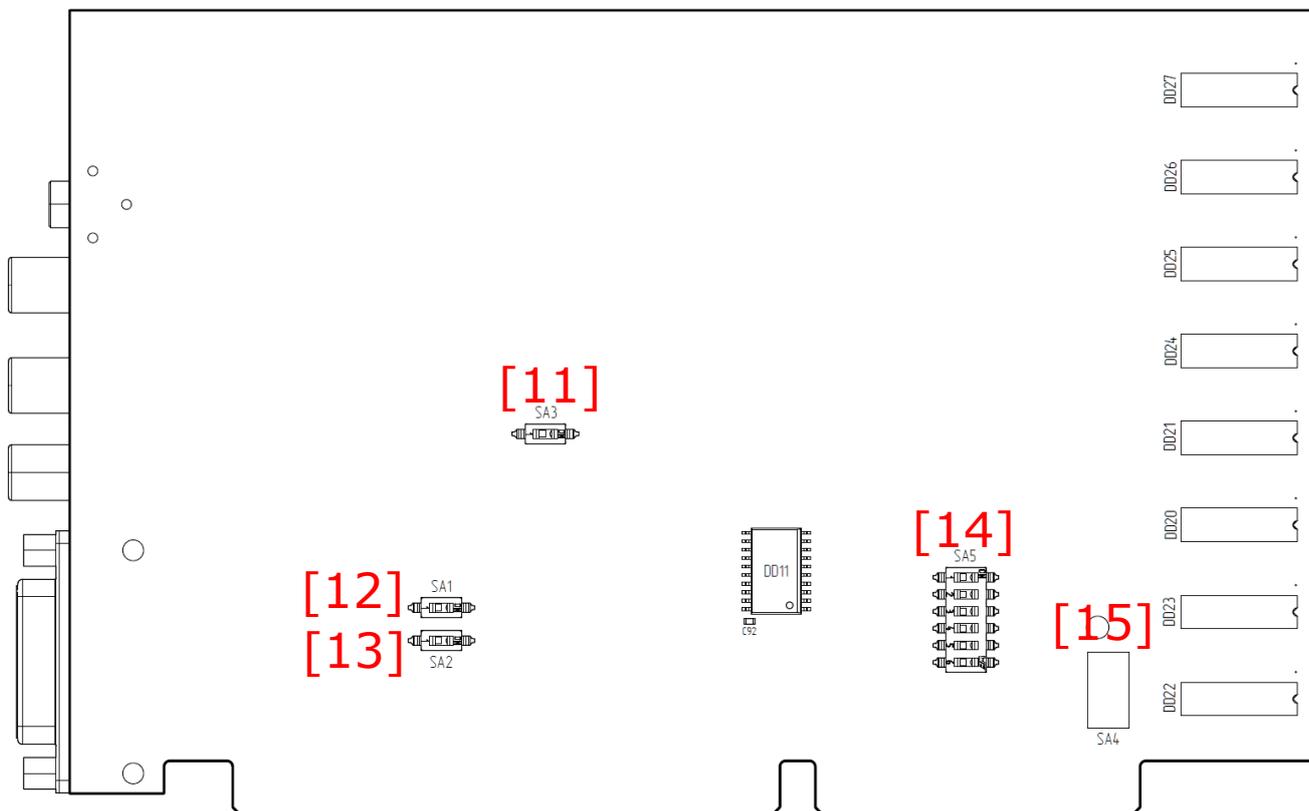
Figure 2. AWE64 Legacy back side view schematic

[11] MIDI Host Routing switch. Allow you to switch between built-in Creative MPU-401 MIDI and HardMPU MIDI host controllers.

[12] MFBEN (MIDI FeedBack Enable) switch. Sets MIDI Feedback Enable function ON or OFF (must be disabled in order for the AWE64 built-in MPU-401 host controller to function).

[13] Discrete OPL3 FM Synth switch. Sets Yamaha OPL3 synthesizer ON or OFF. Please, note that "ON" position disables OPL3, while "OFF (1)" position routes OPL3 to the port 388h.

[14] HardMPU IRQ Select switch. Use it to set the IRQ for HardMPU MIDI host controller (default is 2/9).

[15] HardMPU Port Select. Use it to set the port for HardMPU MIDI host controller (default is 330h).

5. Installing the Card into PC

To install the card and related peripherals:

1) Power down your system and all peripheral devices, and turn off PSU (or unplug power cord from the wall outlet).

2) Touch a metal plate on your PC case to ground yourself and discharge any static electricity.

3) Remove the shroud from your PC case

4) Find a free 16-bit ISA slot in your motherboard. Remove the corresponding metal plate from the back side of your PC case.

5) Align your card with the ISA expansion slot and gently lower the card into the free slot as shown.
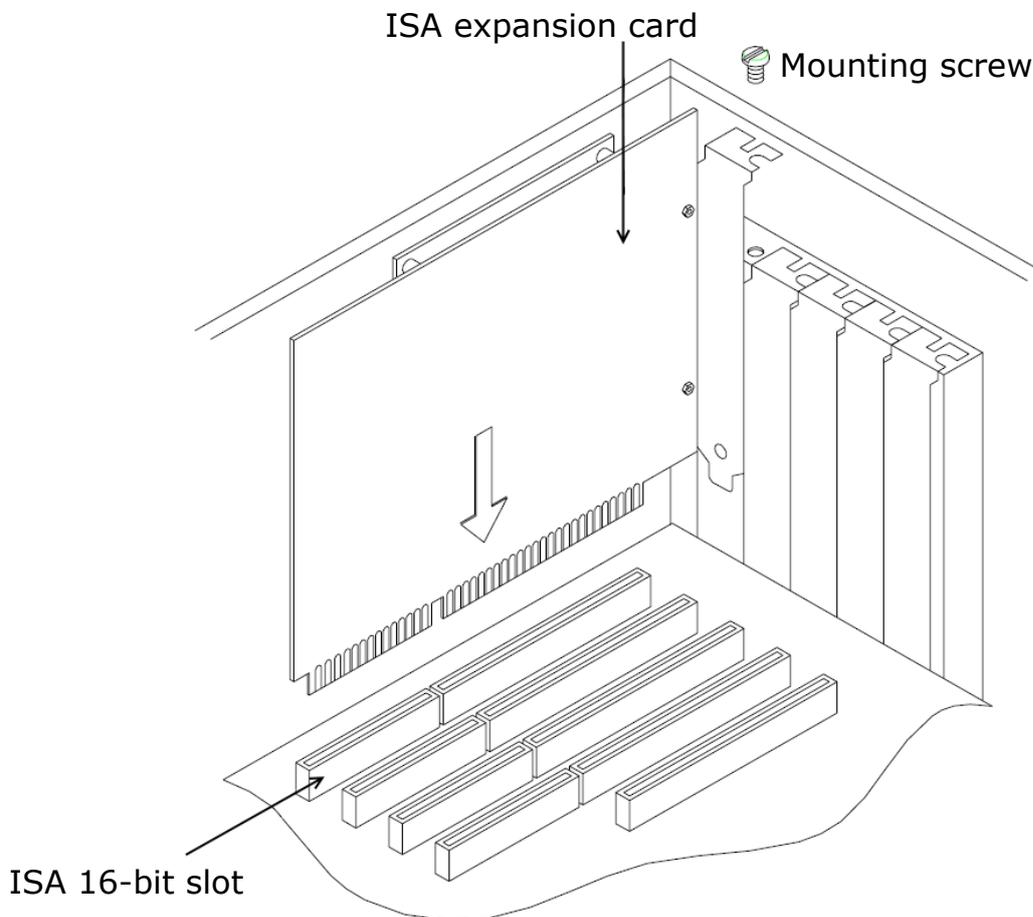

Figure 3. ISA card installation

6) Secure the card to the expansion slot with the screw.

7) Connect powered speakers, headphones or an external amplifier to the 2-RCA Line-Outs. Use 2-RCA to 3.5mm jack adapter if needed.

8) Put the PC case shroud back.

9) Turn On PSU (or plug the power cord back into the wall outlet). Power up your system.

6. Installing Drivers and Software

From this chapter you will know how to install the audio software in Windows 95/98 and MS-DOS.

Installing Drivers in Windows 95/98

You need to install device drivers to control the components on your audio card. AWE64 Legacy is "Plug and Play" card. Therefore, after you have installed it and booted into your system, Windows 95/98 automatically detects the components, and either installs the drivers or asks you to specify the path to the drivers:

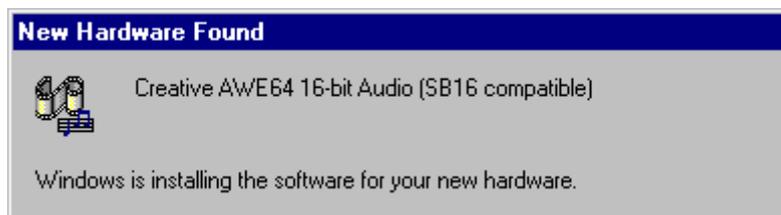
Figure 4. Detection of the New Hardware

The system will also ask you to insert Windows installation disk to copy drivers from it:

Figure 5. Insert Disk to Copy Drivers

Installing Audio Software from CD

Insert your AWE64 Value drivers and software disk into CD-ROM drive (or mount its ISO image using Daemon Tools utility). After that an Autorun window will appear on the screen.

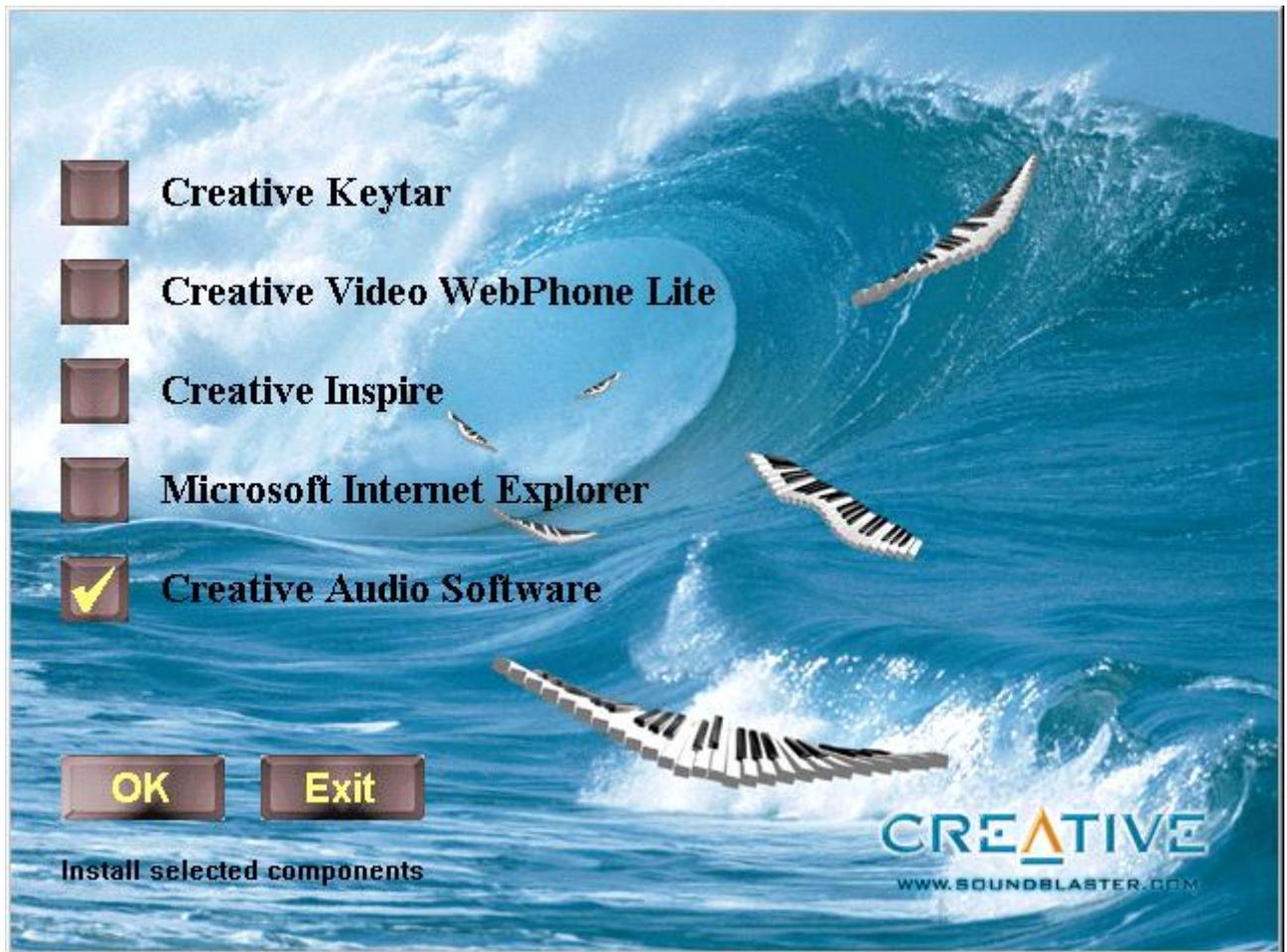**Figure 6. Autorun Window**

Check the "Creative Audio Software" and press OK.

If you have any previous versions of AWE64 drivers and software installed, the Setup program will ask your permission to automatically remove them.

Figure 7. Uninstall Sound Blaster AWE64

Then specify the path for Creative CTSND directory, which contains all the audio software for AWE64, and press **Next >**:
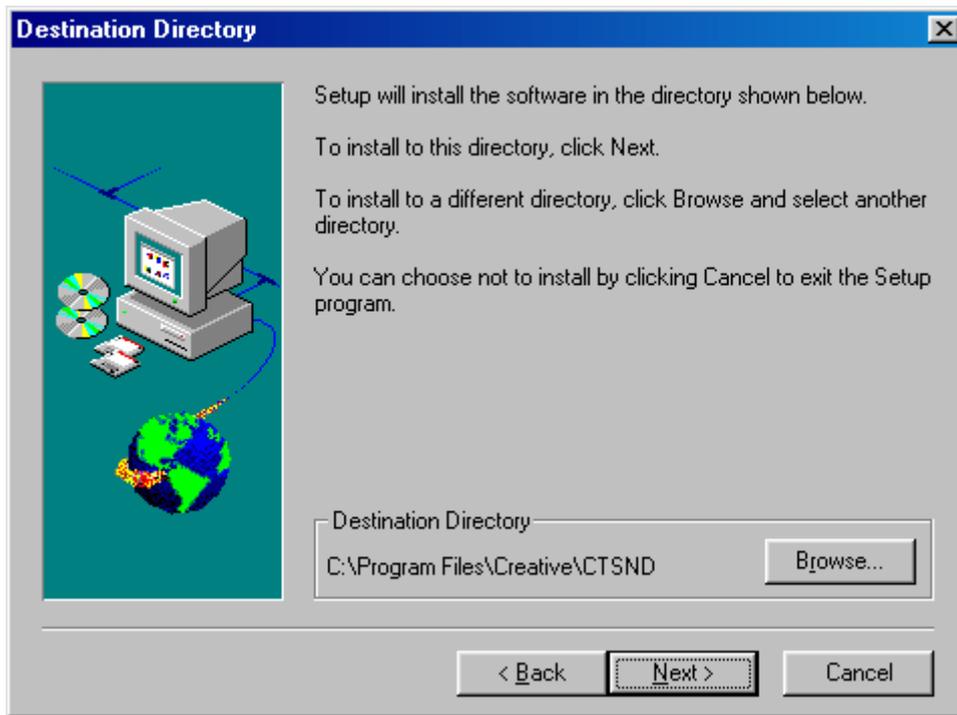
Figure 8. Select Destination Directory for CTSND

In the next window check the boxes with programs you want to be installed. If you want to use WaveSynth synthesizer you must install **Creative WaveSynth-WG** utility. And to get the ability of loading custom soundfonts you'll need to install **AWE Control** utility.

Reboot your PC after the installation.

Installing MPU-401

Please, note that MPU-401 is non Plug and Play component and must be installed manually via Windows 95/98 "Add New Hardware" wizard. To do that:

- Open the Control Panel and launch the "Add New Hardware" wizard.
- The wizard typically displays a screen explaining what it is used for. Click **Next >** to continue.
- You will be told that the wizard will scan for new Plug and Play devices. Click **Next >** to continue.
- You will be asked if Windows should search for non Plug and Play hardware. Select "Yes" and click **Next >**.
- Hardware Wizard will start search and detects MPU-401 Compatible device (see fig.9).

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Figure 9. Add MPU-401 via Hardware Wizard

- Click **Finish** to install drivers for MPU-401 and insert you Windows CD when prompted.

- Specify the path to the "**driver16.cab**" (e.g. E:\win98\) on your Windows CD:
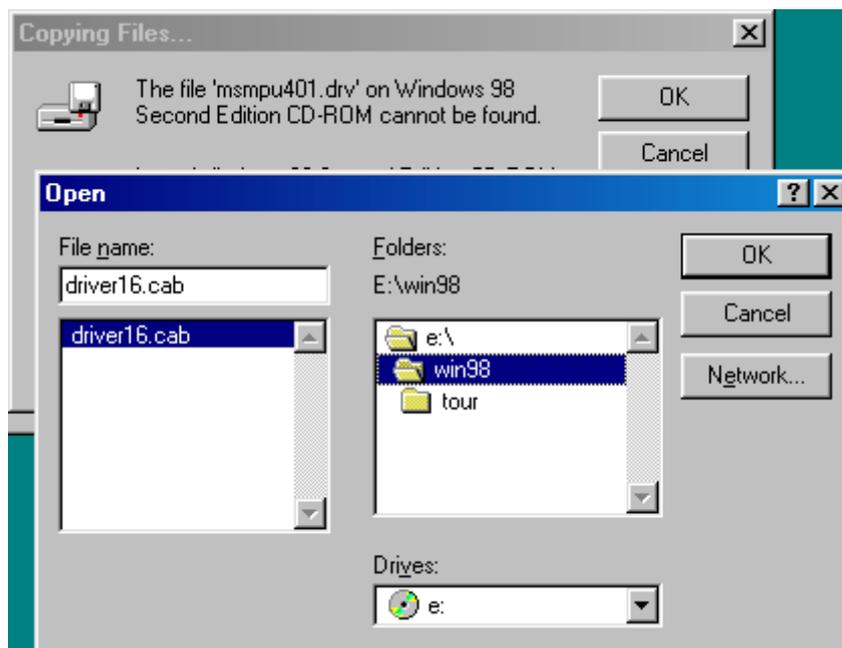

Figure 10. Specify the path to MPU-401 drivers on Windows CD

Upon successful installation of all components, you will see the following devices in Windows Device Manager:

Figure 11. Select Destination Directory for CTSND

Installing Software in DOS/Windows 3.1x (Classic Method)

To install your AWE64 Legacy card in DOS/Windows 3.1x you can follow the standard installation procedure with Creative tools and utilities or use UNISOUND utility.

To install the software using Creative Tools (classic method):

1) Insert the installation CD-ROM into your CD-ROM drive.

2) If you are in Windows, exit to DOS. The installation will not work if you install from the DOS prompt in Windows.

3) At the DOS prompt, change to the drive containing your CD-ROM. For example, type «D:».

4) Type **INSTALL** and press <Enter>.

5) Follow the instructions on the screen to complete the installation.

The Installer will copy all the initialization files to your hard disk (AWEUTIL, MIXERSET and DIAGNOSE) and add links to them to AUTOEXEC.BAT file.

After you have completed the installation and rebooted your system, proceed to the next section to test if your installation works.

> **Note:** *In order to use your AWE64 Plug and Play using DOS/Windows 3.x, you must install the **Creative Configuration Manager** first. This is located on the Creative CD in the directory <drive>\<lang>\ctcm\install, e.g. D:\english\ctcm\install*

7. Installation and Initialization via UNISOUND Utility

UNISOUND is a Freeware DOS-only tool useful to configure and initialize ISA PnP sound cards from several brands and models, and some non-PnP, like early SB16 software configurable models that required tools like DIAGNOSE. It works on all x86 CPUs, including 8088/8086/80286/386, etc.

> *Note: All credits and rights for UNISOUND belong to its author, JazeFox. AWE64 Legacy project team also avails itself of the opportunity to express respect and acknowledgement for the cooperation and support granted while making this sound card into reality.*

Here you can get more info and download UNISOUND:

https://www.vogons.org/viewtopic.php?t=72553

We recommend to use version **0.76b** or newer. Download and unzip UNISOUND.EXE to your hard disk, e.g. C:\UNISOUND\UNISOUND.COM

The most common usage to install and initialize your AWE64 Legacy card is setting a BLASTER variable in AUTOEXEC.BAT file first. Here is the default configuration example:

```
SET BLASTER=A220 I5 D1 H5 P330 E620 T6 J200

UNISOUND.COM /V70
```

When you run UNISOUND.EXE without any options it initializes first PnP card found in the system with internal default resource settings and the following Mixer volume defaults:

- ~85% Master vol,
- 80% Wave vol,
- 80% FM/Synth vol,
- 0% Line in vol,
- 0% Mic vol,
- 0% CD vol.

And for compatible Creative cards, Treble and Bass levels are 50% by default, and PC Speaker-In 0%.

To install and initialize your card with either CQM or OPL FM-Synthesizer you can just create and run one of the following .BAT files (should you need to initialize the sound card with some resources other than the default settings, feel free to modify them accordingly in the SET BLASTER line):

CQM Enabled, OPL3 Disabled

Find the «**Discrete OPL3 FM Synth**» switch on the back side of the sound card and set it to **ON (0)** position. This will disable the OPL3 FM Synth.

C:\UNISOUND\CQM-FM.BAT

```
@unisound /d
@SET BLASTER=A220 I5 D1 H5 F388 P300 E620
@unisound /v90 /vw70 /vf99 /vc70 /vl00 /vm00 /vp45 /vb65 /vt85
@echo.
@echo Please note that Line-IN channel is muted because of OPL3
muting!
@echo.
@pause
```

OPL3 Enabled, CQM Disabled

Find the «**Discrete OPL3 FM Synth**» switch on the back side of the sound card and set it to **OFF (1)** position. This will enable the OPL3 FM Synth at port 0x388h.

C:\UNISOUND\OPL-FM.BAT

```
@unisound /d
@SET BLASTER=A220 I5 D1 H5 F0 P300 E620 T6
@unisound /v90 /vw70 /vf99 /vc70 /vl80 /vm00 /vp45 /vb65 /vt85
@echo.
@echo Please note that OPL3 is usable as default "Adlib" setting,
0x388h.
@echo But in some games you can still take advantage of the CQM as it
is also available on Sound Blaster base IO address, 0x220h.
@echo.
@pause
```

You can download these BAT-files here:

https://vccollection.ru/wp-content/uploads/2022/05/unisound_fm_bat.zip

Now your AWE64 Legacy is ready to work. These .BAT files are suitable for changing settings on the fly, without turning off or restarting your PC. Just make sure the «**Discrete OPL3 FM Synth**» switch is set to **OFF (1)** if you ever need the OPL3 Synth.

> *Note: Your system may have different variables and interrupts. Read below to better understand them.*

8. Understanding the Software-Configurable Settings

Your audio card supports the Plug and Play (PnP) 1.0a standard. This allows a PnP system to assign the necessary resources such as I/O addresses, interrupt lines and DMA channels to your card when you install it.

If you are using Windows 95, its PnP configuration manager will automatically set up your card's resources. If you are using a non-PnP system such as Windows 3.1x, you must run your PnP configuration manager to configure the card. For details, refer to the documentation of your PnP configuration manager.

This section explains the following software-configurable resources of your audio card:

- Input/Output (I/O) Addresses
- Interrupt Request (IRQ) Lines
- Direct Memory Access (DMA) Channels

Input/Output (I/O) Addresses

I/O addresses are communication areas used by your computer's central processor to distinguish among various peripheral devices connected to your system when sending or receiving data.

Table 1 lists the default I/O address ranges assigned by the PnP system to various devices on your audio card.

I/O Address Range	Device
200H to 207H	Game/Joystick port
220H to 22FH	Audio interface
330H to 331H	MPU-401 UART MIDI
388H to 38BH	Stereo music synthesizer
620H to 623H, A20H to A23H, E20H to E23H	Advanced WavEffects synthesizer
100H	3D Stereo Enhancement device

Table 1. Possible default I/O addresses occupied by the audio card

Interrupt Request (IRQ) Lines

An IRQ line is a signal line a device uses to notify your computer's central processor that it wants to send or receive data for processing.

Table 2 lists an example of an IRQ line that may be assigned to the audio interface on your audio card.

IRQ Line	Device
5	Audio interface

Table 2. Possible default IRQ line assignments

Direct Memory Access (DMA) Channels

A DMA channel is a data channel a device uses to transfer data directly to and from the system memory. Your card's audio interface transfers data through the Low and High DMA channels.

Table 3 shows a possible combination of DMA channels that may be assigned to the audio interface.

DMA Channel	Usage
1	Audio Low DMA channel
5	Audio High DMA channel

Table 3. Possible default DMA channel assignments

9. Understanding the Environment Variables

Environment variables are used to pass information about how your card is configured to programs in your system. This section explains the environment variables of your audio card:

❑ SOUND Environment Variable

❑ BLASTER Environment Variable

❑ MIDI Environment Variable

SOUND Environment Variable

The SOUND environment variable specifies the directory location of your audio card's drivers and applications. The syntax for this variable is as follows:

    SOUND= path

where path is the drive and directory of the card's software (e.g., C:\SB16). No space is allowed before and after the equal sign.

BLASTER Environment Variable

The BLASTER environment variable specifies the base I/O address, IRQ line, and DMA channels of the audio interface. Its syntax is:

    BLASTER=A220 I5 D1 H5 P330 E620 T6

ATTENTION: The values shown earlier may be different for your system. No space is allowed before and after the equal sign. However, there must be at least one space between parameters.

The parameters in the command are described as follows.

Parameter	Description
Axxx	Specifies the audio interface's base I/O address. xxx defaults to 220.
Ix	Specifies the IRQ line used by the audio interface. x defaults to 5.
Dx	Specifies the Low DMA channel used by the audio interface. x defaults to 1.
Hx	Specifies the High DMA channel used by the audio

	interface. x defaults to 5 – that means 16-bit DMA
Pxxx	Specifies the MPU-401 UART interface's base I/O address. xxx defaults to 330.
Exxx	Specifies the Advanced WavEffects synthesizer chip's base I/O address. xxx can be 620.
Tx	Specifies the card type. T6 means Sound Blaster 16
Jxxx	Specifies the joystick address. Default value is J200

Table 4. Sound Blaster configuration parameters

MIDI Environment Variable

The MIDI environment variable specifies the MIDI file format used and where MIDI data is sent to. MIDI data can be sent to the internal stereo music synthesizer or MIDI port.

Generally, there are three MIDI file formats: General MIDI, Extended MIDI and Basic MIDI. The syntax for this variable is as follows:

```
MIDI=SYNTH:    xMAP:    xMODE:    x
```

The parameters in the command are described below.

Parameter	Description
SYNTH:x	x can be 1 or 2. 1 – (default setting) specifies the stereo music synthesizer. 2 – specifies the MIDI port.
MAP:x	x can be G, E, or B. G – specifies the General MIDI file format. E – (default setting) specifies the Extended MIDI file format. B – specifies the Basic MIDI file format.
MODE:x	x can be 0, 1, or 2. 0 – (factory default) specifies General MIDI mode. 1 – specifies General Standard mode. 2 – specifies MT-32 mode.

Table 5. MIDI environment parameters

10.Understanding the Installation Program in Windows 3.1x

When you install the audio software, the installation program creates a directory and copies the software into it. It then allows you to set up your Windows applications by adding a command to the WIN.INI file to run WINSETUP.EXE. This command automatically creates the audio card program group and the application icons when you next run Windows.

The AUTOEXEC.BAT File Settings

The installation program adds the following statements to the AUTOEXEC.BAT file:

```
SET BLASTER=A220 I5 D1 H5 P330 E620 T6
SET SOUND=C:\SB16
SET MIDI=SYNTH:1 MAP:E MODE:0
C:\SB16\DIAGNOSE /S /W=C:\WINDOWS
C:\SB16\MIXERSET /P /Q
C:\SB16\AWEUTIL /S
```

The first 3 statements set up the environment variables for your audio card. The last 3 statements run the DIAGNOSE, MIXERSET, and AWEUTIL utilities. The BLASTER statement is added by the DIAGNOSE utility, and the values shown above may differ from those in your system.

- Running DIAGNOSE with the /S parameter updates the BLASTER environment with the resource settings from the PnP configuration manager.
- Running DIAGNOSE with the /W=C:\WINDOWS parameter updates the SYSTEM.INI file in the Windows directory with the resource settings from the PnP configuration manager.

AWEUTIL is a standard Creative DOS utility. It allows you to perform the following operations on your AWE64 Legacy card:

- Initialize AWE hardware to play music synthesis effects
- Use MIDI Emulation to support computer games
- Control Music Synthesis Effects
- Troubleshooting

> *Note: For a description of the AWEUTIL utility, refer to the AWEUTIL.TXT file found in the installation directory of your audio card.*

The CONFIG.SYS File Settings

If you choose to install the low-level DOS device drivers under custom installation, the installation program also adds the following statements to the CONFIG.SYS file:

```
DEVICE= C:\SB16\DRV\CTSB16.SYS /UNIT=0 /BLASTER=A:220 I:5 D:1 H:5
DEVICE= C:\SB16\DRV\CTMMSYS.SYS
```

CTSB16.SYS and CTMMSYS.SYS are low-level device drivers that provide wave playback and recording for DOS applications. These applications include third-party DOS applications developed with Creative Labs' Sound Blaster Developer Kit. The applications work with the drivers (such as CTWDSK.DRV, CTWMEM.DRV, CTVDSK.DRV, and CT-VOICE.DRV) that require the low-level drivers. The drivers are found in the DRV subdirectory of your audio software directory.

11. Rerouting CQM/OPL3 Port 388h (Classic Method)

This section explains how to reroute FM Synth via Creative software. Skip it if you use UNISOUND.

> 📝 *Note: Due to unavailability of any documentation for Creative parts (especially, CT8920 chip), they've been treated as "black boxes", copying their input/output tracing and schematics from the CT4520 card.*
>
> *That way, we can't disable the CQM completely. It has to be moved away from the 388 port manually, what can be done with standard drivers both in DOS and Windows.*
>
> *OPL3 is hard wired to 388 port for Adlib compatibility. You'll always find CQM rather than OPL3 on the SB port when selecting SB FM output instead of Adlib. That's the consequence of the first two paragraphs above.*

To reroute CQM to another port and activate OPL3 on the port 388 make the following steps:

1) Find the «**Discrete OPL3 FM Synth**» switch on the back side of the sound card and set it to **OFF (1)** position. This will enable the OPL3 FM Synth at port 0x388h.

2) Open **ctpnp.cfg** file located in **CTCM** directory (for example, **C:\CTCM\ctpnp.cfg**). Go to section **[SB16]**. By default you'll see the following lines:

```
[SB16]
Disable=0
Csn=1
CardId=<your_card_id>
Serial=<your_card_serial_number>
LogDev=0
Port0=220
Port1=330
Port2=388
Irq0=5
Dma0=1
Dma1=5
```

3) Replace the line **Port2=388** with **Port2=398** to reroute the built-in CQM FM-synthesizer to port 398h. Save the changes. Now OPL3 Synth can take up the port 388h without any conflicts.

4) Launch default Creative mixer utility named «**MIXERSET**» (for example, **C:\SB16\mixerset.exe**). Activate «Line-In Output» for Left and Right channels and tune «Line-in Volume / Balance» (see the picture below). Do not forget to save your settings by pressing «**Save**» button.
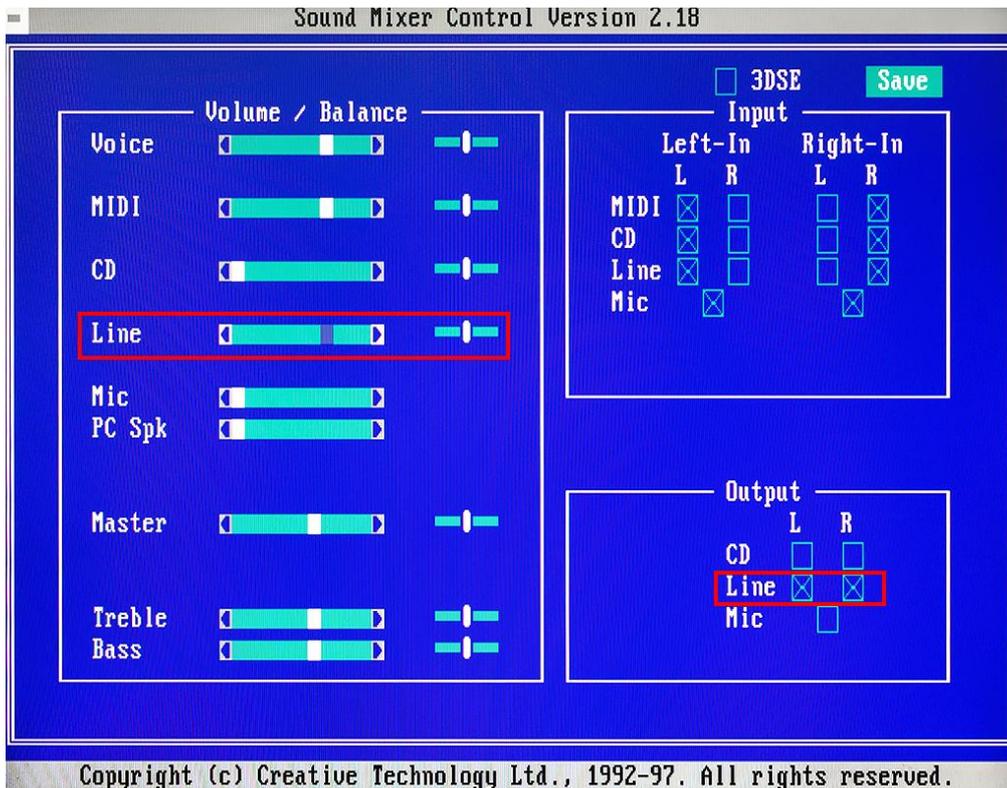
Figure 12. Switching Line-In in Sound Mixer Control Utility

5) Launch CTCM.EXE application (**C:\CTCM\CTCM.EXE**) to reconfigure audio settings.

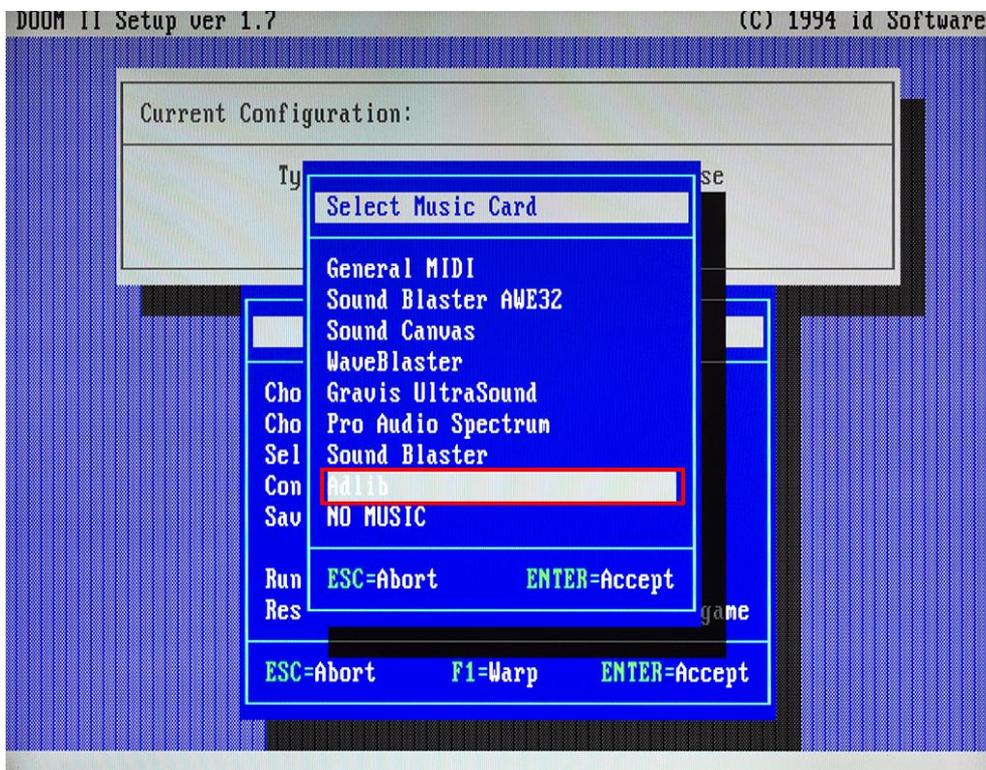6) In your game's Setup choose «Adlib» as «Music Card» to use OPL3 chip for playing music (Fig. 13):

Figure 13. Select Adlib Music Card in Doom II Setup

Now you can hear OPL3 on 388h (Adlib music) port and CQM on 220h (Sound Blaster music) port.

12. Switching Between HardMPU And Default Creative MPU-401

Both OPL3 and HardMPU are non-PnP devices sitting on the ISA bus in parallel to the CT8920 with some glue logic. So they don't need any drivers/initialization in DOS, but require manual installation of the default drivers in Windows from Microsoft package.

HardMPU

➢ To use HardMPU for processing MIDI In/Out messages by GamePort make the following steps:

1) Set the «**MIDI Host Routing**» switch on the back of the card to **ON** position. This will route HardMPU intelligent mode host controller to Game/MIDI port.

2) Select default IRQ_2/9 using the «**HardMPU IRQ Select**» switch.

3) Select default 330h port using the «**HardMPU Port Select**» switch.

Now HardMPU host controller will be handling your MIDI devices, connected to GamePort.

➢ To use HardMPU for processing MIDI In/Out messages by Wave Blaster header make the following steps:

1) Set the «**MIDI Host Routing**» switch on the back of the card to **OFF (1)** position. This will route HardMPU intelligent mode host controller to Wave Blaster header.

> *Note: CD-In* must be *enabled* in the mixer in order to activate the Wave Blaster header audio!

2) Select default IRQ_2/9 using the «**HardMPU IRQ Select**» switch.

3) Select default 330h port using the «**HardMPU Port Select**» switch.

Now HardMPU host controller will be handling your MIDI daughterboard, connected to Wave Blaster header.

AWE64 MPU-401

➢ To use the default Creative AWE64 built-in MPU-401 for processing MIDI In/Out messages by GamePort make the following steps:

1) Set the «**MFBEN (MIDI FeedBack Enable)**» switch on the back of the card to **OFF (1)** position.

2) Move HardMPU from default IRQ_2/9 to any free IRQ (for example, IRQ_7) using the «**HardMPU IRQ Select**» switch.

3) Move HardMPU from default port 330h to any free port (for example, 300h) using the «**HardMPU Port Select**» switch.

Now AWE64 MPU-401 host controller will be handling your MIDI devices, connected to GamePort.

Note: When **MFBEN** is turned to **OFF**, MPU-401 on the EMU8000 synth cannot be emulated in pure DOS. AWE64 built-in MPU-401 host controller is enabled and can be routed to Wave Blaster header or Game/MIDI port via the «**MIDI Host Routing**» switch.

➢ To use the default Creative AWE64 built-in MPU-401 for processing MIDI In/Out messages by Wave Blaster header make the following steps:

1) Set the «**MFBEN (MIDI FeedBack Enable)**» switch on the back of the card to **OFF (1)** position.

2) Set the «**MIDI Host Routing**» switch on the back of the card to **ON** position. This will route built-in MPU-401 host controller to Wave Blaster header.

3) Move HardMPU from default IRQ_2/9 to any free IRQ (for example, IRQ_7) using the «**HardMPU IRQ Select**» switch.

4) Move HardMPU from default port 330h to any free port (for example, 300h) using the «**HardMPU Port Select**» switch.

Now AWE64 MPU-401 host controller will be handling your MIDI daughterboard, connected to Wave Blaster header.

Note: MFBEN switch must be **disabled** in order for the AWE64 built-in MPU-401 host controller to function

Work with MT32 Synthesizer

➢ If you have Roland MT32 or compatible synthesizer and want it to work with AWE64 Legacy in DOS games, please, note:

Note: MT32 external synthesizers combined with early DOS games with MT32 support will require **SA3** switch to be **enabled** for Intelligent mode to function

13. Using the S/PDIF Output

ATTENTION: S/PDIF out is destined only for EMU8000 or CQM music output. Neither digitized sound, nor OPL3/daughterboard is supported!

The S/PDIF just copies the CT4520 behavior because we've been unable to discover any way of enabling the full S/PDIF on this card.

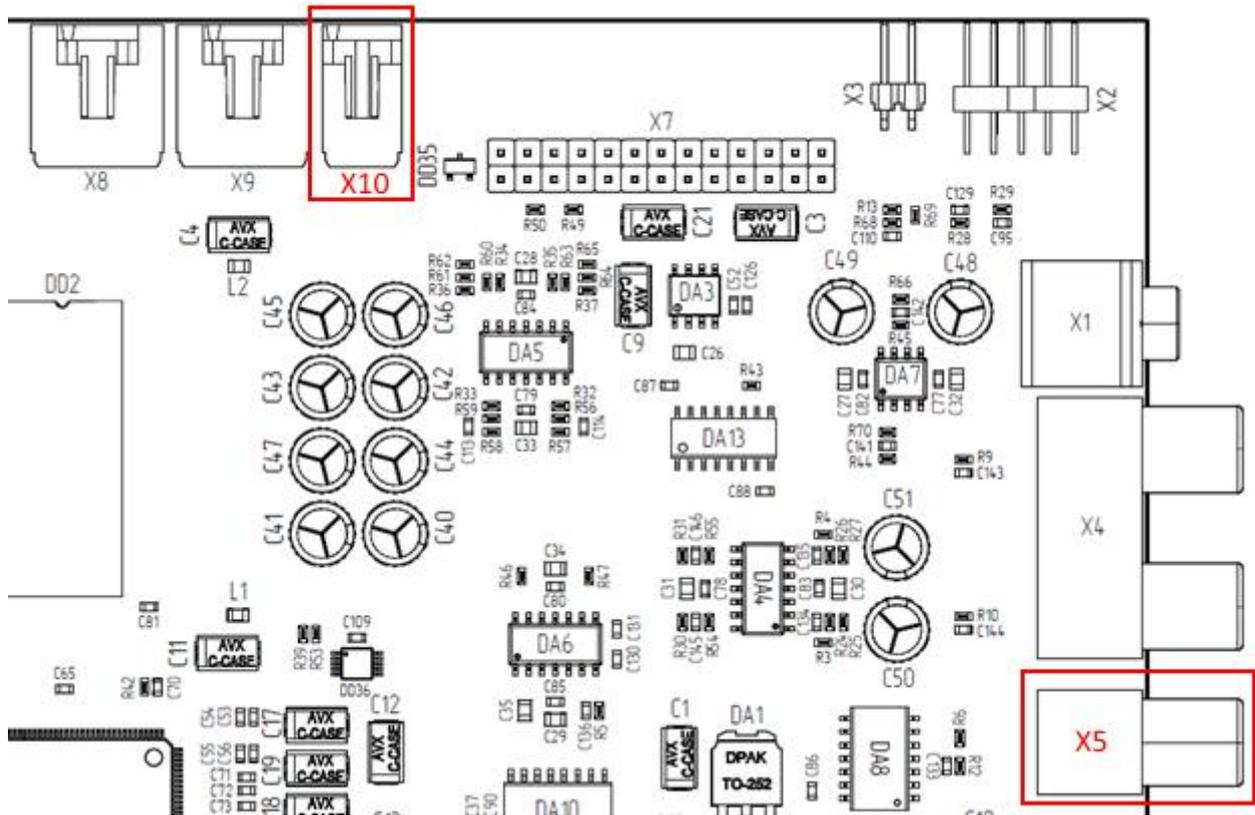AWE64 Legacy has two S/PDIF Outputs (see Fig.14).

Figure 14. S/PDIF Outputs

The first S/PDIF Out is located on the top edge of the sound card and marked as **X10**. This is an inner output. It is build on transistor-transistor logic (TTL) and intended to route EMU8000/CQM digital signal to another sound card in your PC.

ATTENTION: Common signal amplitude of internal 2-pin S/PDIF Out interface is 2-2.5V (and up to 4.5-5V). Use it only to connect AWE64 Legacy to another sound card. Do not connect it directly to your external audio receiver or you may cause an electrical damage to it!

The second S/PDIF output is located on the back panel and marked as **X5**. This is a common RCA connector with signal amplitude of 0.5-1V. This output is intended to route digital EMU8000/CQM signal to external audio receiver via coaxial cable with iterative impedance of 75 Ohm.

You won't need to install any additional drivers or make adjustments to use digital S/PDIF output. The signal will appear once you connect RCA jack to your digital audio receiver and turn on PC. If your receiver has a display, it would show an active connection.

Output digital signal is always translated in PCM 44 kHz 16-bit stereo mode (CD-Audio).

Note: You can't mute CQM on digital output by any means other than redirecting it to 398h port. But CQM still play if the game uses default port 220h.

*Note: Digital signal has **no volume control option**!*

14. Using MIDI Daughterboards

To attach your MIDI daughterboard to AWE64 Legacy align daughterboard's card female 26-pin connector with male 26-pin connector marked **X7** on AWE64 Legacy (Fig. 15). Push daughterboard down until all pins are in place inside 26-pin connector. Optionally, you can use the **Z1** mounting hole to secure your daughterboard with a mounting screw.
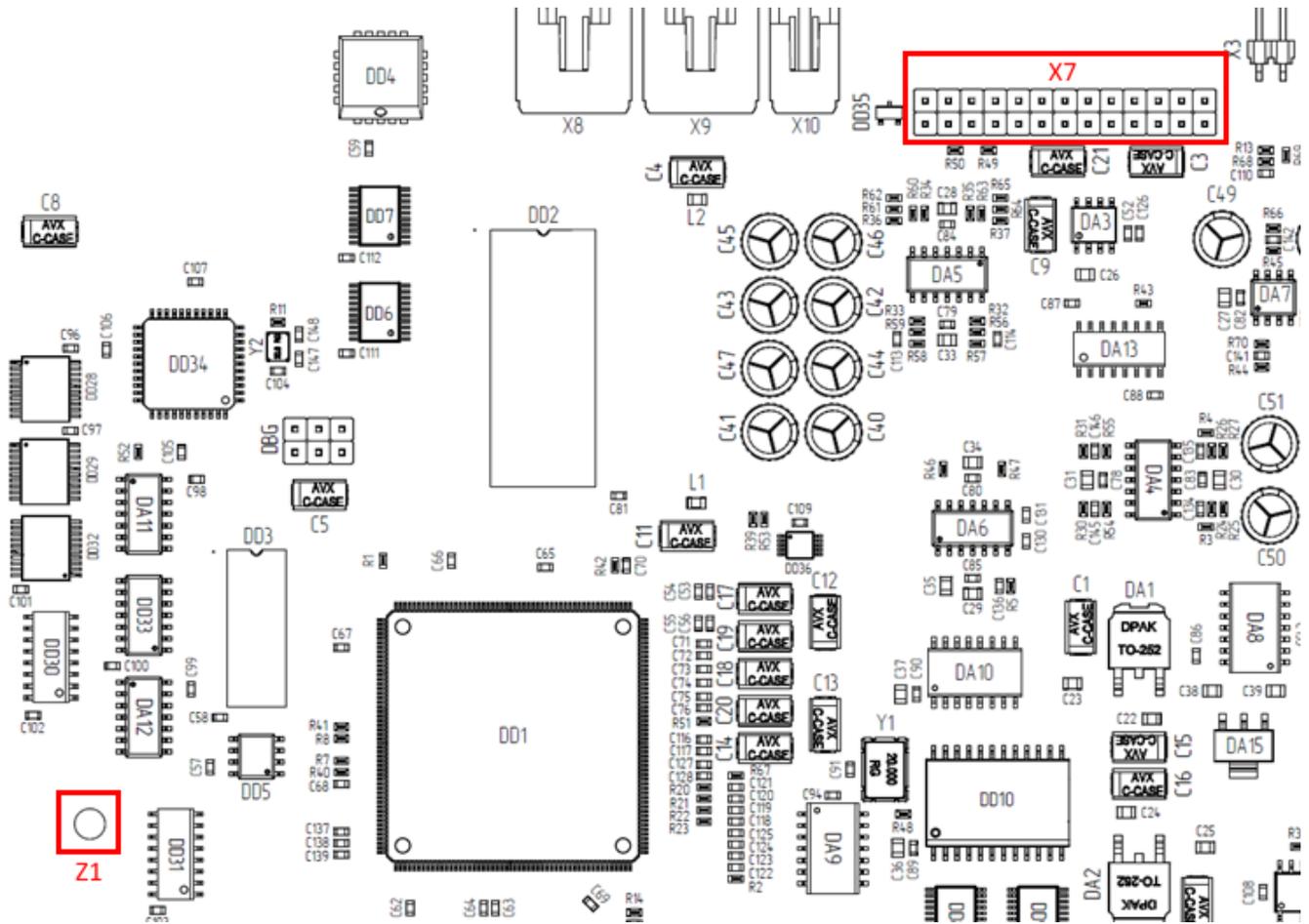

Figure 15. Connector for MIDI daughterboard

Select either HardMPU or Creative MPU-401 mode for handling your daughterboard (see Section 11).

There are no differences in installation process for LA32-based MIDI daughterboards.

> **Note:** *LA32-based MIDI daughterboards combined with early DOS games with MT32 support will require* **SA3** *switch to be* **disabled** *for Intelligent mode to function.*

> **Note: CD-In** *must be* **enabled** *in the mixer in order to activate the Wave Blaster header audio!*

15. Resolving Conflicts

Conflicts occur when two or more peripheral devices contend for the same resources. Conflicts between your audio card and another peripheral device may occur if your card and the other device are set to use the same I/O address, IRQ line, or DMA channel.

Resolving Conflicts in Windows 95/98

To resolve conflicts in Windows 95, run Device Manager to change the resource settings of your audio card or the conflicting peripheral device in your system.

To change the resource setting:

1) Click the Start button, point to Settings, and then click ControlPanel.
2) In the Control Panel window, double-click the System icon.
3) In the System Properties sheet, click the Device Manager tab.
4) In the Device Manager tab, double-click «Sound, Video And Game Controllers».
5) Select your audio card and click the Properties button.
6) In the properties sheet, click the Resources tab.
7) Select the Use Automatic Settings check box.If this check box is already selected, open the properties sheet of the conflicting device and select the same check box there.
8) Reboot your system to allow Windows 95 to reassign resources to your audio card and/or the conflicting device.

> *Note:* The Conflicting Device List box shows you which peripheral device is conflicting with your audio card. This box is displayed on the Resources tab of your audio card's properties sheet

Resolving Conflicts in MS-DOS/Windows 3.1x

To resolve conflicts in MS-DOS/Windows 3.1x:

1) Run your Plug and Play configuration utility.
2) Reselect the resource settings of your audio card that are inconflict. For more details, refer to the documentation that comes with your Plug and Play configuration utility.

How to test DRAM in DOS

AWE64 Legacy has 32MB of RAM for loading sound fonts.

To test the RAM launch standard Creative Diagnose utility (for example, path:

C:\SB16\diagnose.exe). Press Enter. First of all, the utility will test Base I/O address, and then asks

you: "Do you want to test the DRAM?"

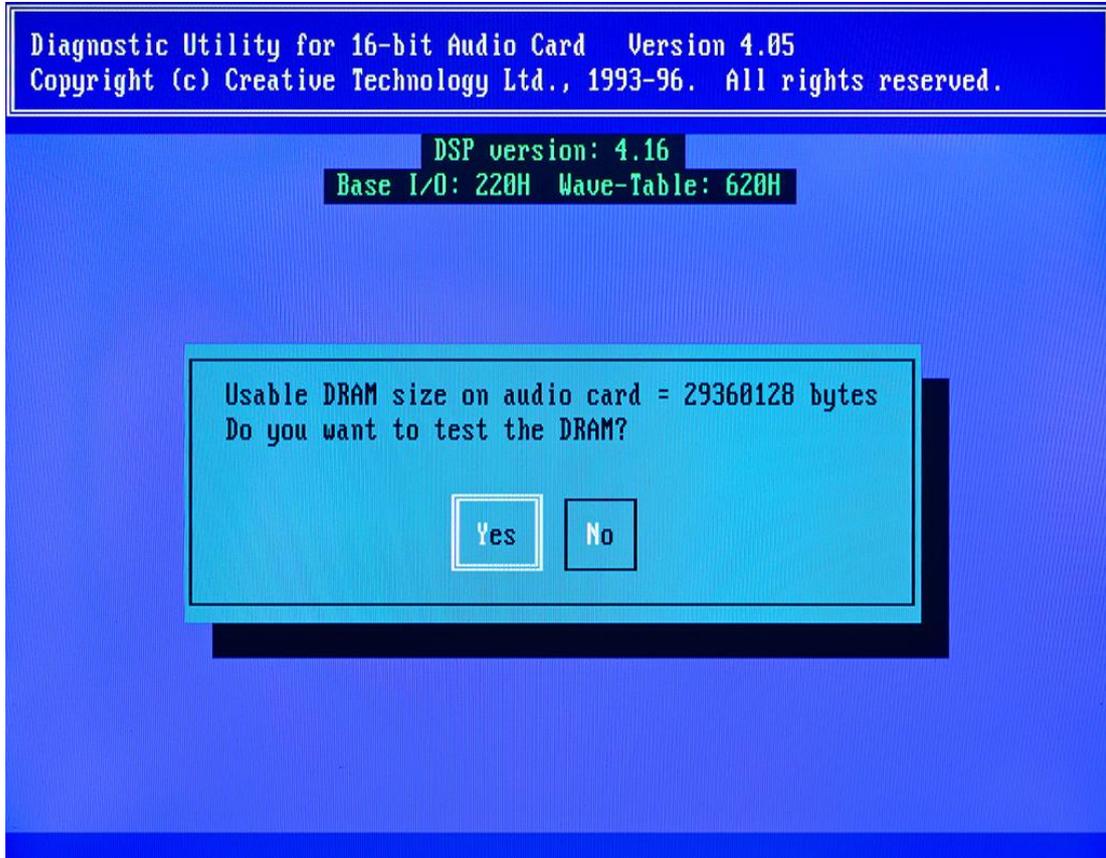Answer «**Yes**», and test will begin. This will take some time.

Figure 14. Onboard RAM Testing in DOS

If you encounter any failures during the testing process, try to run the test again. If DRAM error

persists, please, contact the developers on Vogons:

https://www.vogons.org/viewtopic.php?f=62&t=68555