

## Introduction

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This file is a collection of all the old Readme files distributed with OSS/Lite by Hannu Savolainen. Since the new Linux sound driver is founded on it I think these information may still be interesting for users that have to configure their sound system.

Be warned: Alan Cox is the current maintainer of the Linux sound driver so if you have problems with it, please contact him or the current device-specific driver maintainer (e.g. for aedsp16 specific problems contact me). If you have patches, contributions or suggestions send them to Alan: I'm sure they are welcome.

In this document you will find a lot of references about OSS/Lite or ossfree: they are gone forever. Keeping this in mind and with a grain of salt this document can be still interesting and very helpful.

[ File edited 17.01.1999 - Riccardo Facchetti ]  
[ Edited miroSOUND section 19.04.2001 - Robert Siemer ]

## OSS/Free version 3.8 release notes

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Please read the SOUND-HOWTO (available from sunsite.unc.edu and other Linux FTP sites). It gives instructions about using sound with Linux. It's bit out of date but still very useful. Information about bug fixes and such things is available from the web page (see above).

Please check <http://www.opensound.com/pguide> for more info about programming with OSS API.

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- THIS VERSION \_\_\_\_REQUIRES\_\_\_\_ Linux 2.1.57 OR LATER.

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Packages "snd-util-3.8.tar.gz" and "snd-data-0.1.tar.Z" contain useful utilities to be used with this driver. See <http://www.opensound.com/ossfree/getting.html> for download instructions.

If you are looking for the installation instructions, please look forward into this document.

## Supported sound cards

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See below.

## Contributors

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This driver contains code by several contributors. In addition several other persons have given useful suggestions. The following is a list of major contributors. (I could have forgotten some names.)

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Craig Metz	1/2 of the PAS16 Mixer and PCM support
Rob Hooft	Volume computation algorithm for the FM synth.
Mika Liljeberg	uLaw encoding and decoding routines
Jeff Tranter	Linux SOUND HOWTO document
Greg Lee	Volume computation algorithm for the GUS and lots of valuable suggestions.
Andy Warner	ISC port
Jim Lowe,	
Amancio Hasty Jr	FreeBSD/NetBSD port
Anders Baekgaard	Bug hunting and valuable suggestions.
Joerg Schubert	SB16 DSP support (initial version).
Andrew Robinson	Improvements to the GUS driver
Megens SA	MIDI recording for SB and SB Pro (initial version).
Mikael Nordqvist	Linear volume support for GUS and nonblocking /dev/sequencer.
Ian Hartas	SVR4.2 port
Markus Aroharju and	
Risto Kankkunen	Major contributions to the mixer support of GUS v3.7.
Hunyue Yau	Mixer support for SG NX Pro.
Marc Hoffman	PSS support (initial version).
Rainer Vranken	Initialization for Jazz16 (initial version).
Peter Trattler	Initial version of loadable module support for Linux.
JRA Gibson	16 bit mode for Jazz16 (initial version)
Davor Jadrijevic	MAD16 support (initial version)
Gregor Hoffleit	Mozart support (initial version)
Riccardo Facchetti	Audio Excel DSP 16 (aedspl6) support
James Hightower	Spotting a tiny but important bug in CS423x support.
Denis Sablic	OPTi 82C924 specific enhancements (non PnP mode)
Tim MacKenzie	Full duplex support for OPTi 82C930.

Please look at lowlevel/README for more contributors.

There are probably many other names missing. If you have sent me some patches and your name is not in the above list, please inform me.

Sending your contributions or patches

First of all it's highly recommended to contact me before sending anything or before even starting to do any work. Tell me what you suggest to be changed or what you have planned to do. Also ensure you are using the very latest (development) version of OSS/Free since the change may already be implemented there. In general it's a major waste of time to try to improve a several months old version. Information about the latest version can be found from <http://www.opensound.com/ossfree>. In general there is no point in sending me patches relative to production kernels.

Sponsors etc.

The following companies have greatly helped development of this driver in form of a free copy of their product:

Novell, Inc.	UnixWare personal edition + SDK
The Santa Cruz Operation, Inc.	A SCO OpenServer + SDK

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Ensoniq Corp, a SoundScape card and extensive amount of assistance  
MediaTrix Peripherals Inc, a AudioTrix Pro card + SDK  
Acer, Inc. a pair of AcerMagic S23 cards.

In addition the following companies have provided me sufficient amount  
of technical information at least some of their products (free or \$\$\$):

Advanced Gravis Computer Technology Ltd.  
Media Vision Inc.  
Analog Devices Inc.  
Logitech Inc.  
Aztech Labs Inc.  
Crystal Semiconductor Corporation,  
Integrated Circuit Systems Inc.  
OAK Technology  
OPTi  
Turtle Beach  
miro  
Ad Lib Inc. (\$\$)  
Music Quest Inc. (\$\$)  
Creative Labs (\$\$\$)

If you have some problems

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Read the sound HOWTO ([sunsite.unc.edu:/pub/Linux/docs/...?](http://sunsite.unc.edu/pub/Linux/docs/...?)).  
Also look at the home page (<http://www.opensound.com/ossfree>). It may  
contain info about some recent bug fixes.

It's likely that you have some problems when trying to use the sound driver  
first time. Sound cards don't have standard configuration so there are no  
good default configuration to use. Please try to use same I/O, DMA and IRQ  
values for the sound card than with DOS.

If you get an error message when trying to use the driver, please look  
at /var/adm/messages for more verbose error message.

The following errors are likely with /dev/dsp and /dev/audio.

- "No such device or address".  
This error indicates that there are no suitable hardware for the  
device file or the sound driver has been compiled without support for  
this particular device. For example /dev/audio and /dev/dsp will not  
work if "digitized voice support" was not enabled during "make config".
- "Device or resource busy". Probably the IRQ (or DMA) channel  
required by the sound card is in use by some other device/driver.
- "I/O error". Almost certainly (99%) it's an IRQ or DMA conflict.  
Look at the kernel messages in /var/adm/notice for more info.
- "Invalid argument". The application is calling ioctl()  
with impossible parameters. Check that the application is  
for sound driver version 2.X or later.

## Linux installation

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IMPORTANT!      Read this if you are installing a separately distributed version of this driver.

Check that your kernel version works with this release of the driver (see Readme). Also verify that your current kernel version doesn't have more recent sound driver version than this one. IT'S HIGHLY RECOMMENDED THAT YOU USE THE SOUND DRIVER VERSION THAT IS DISTRIBUTED WITH KERNEL SOURCES.

- When installing separately distributed sound driver you should first read the above notice. Then try to find proper directory where and how to install the driver sources. You should not try to install a separately distributed driver version if you are not able to find the proper way yourself (in this case use the version that is distributed with kernel sources). Remove old version of linux/drivers/sound directory before installing new files.
- To build the device files you need to run the enclosed shell script (see below). You need to do this only when installing sound driver first time or when upgrading to much recent version than the earlier one.
- Configure and compile Linux as normally (remember to include the sound support during "make config"). Please refer to kernel documentation for instructions about configuring and compiling kernel. File Readme.cards contains card specific instructions for configuring this driver for use with various sound cards.

## Boot time configuration (using lilo and insmod)

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This information has been removed. Too many users didn't believe that it's really not necessary to use this method. Please look at Readme of sound driver version 3.0.1 if you still want to use this method.

## Problems

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Common error messages:

- /dev/??????: No such file or directory.  
Run the script at the end of this file.

- /dev/??????: No such device.  
You are not running kernel which contains the sound driver. When using modularized sound driver this error means that the sound driver is not loaded.

- /dev/?????: No such device or address.  
Sound driver didn't detect suitable card when initializing. Please look at Readme.cards for info about configuring the driver with your card. Also check for possible boot (insmod) time error messages in /var/adm/messages.

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- Other messages or problems

Please check <http://www.opensound.com/ossfree> for more info.

### Configuring version 3.8 (for Linux) with some common sound cards

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This document describes configuring sound cards with the freeware version of Open Sound Systems (OSS/Free). Information about the commercial version (OSS/Linux) and its configuration is available from <http://www.opensound.com/linux.html>. Information presented here is not valid for OSS/Linux.

If you are unsure about how to configure OSS/Free you can download the free evaluation version of OSS/Linux from the above address. There is a chance that it can autodetect your sound card. In this case you can use the information included in soundon.log when configuring OSS/Free.

IMPORTANT! This document covers only cards that were "known" when this driver version was released. Please look at <http://www.opensound.com/ossfree> for info about cards introduced recently.

When configuring the sound driver, you should carefully check each sound configuration option (particularly "Support for /dev/dsp and /dev/audio"). The default values offered by these programs are not necessarily valid.

### THE BIGGEST MISTAKES YOU CAN MAKE

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#### 1. Assuming that the card is Sound Blaster compatible when it's not.

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The number one mistake is to assume that your card is compatible with Sound Blaster. Only the cards made by Creative Technology or which have one or more chips labeled by Creative are SB compatible. In addition there are few sound chipsets which are SB compatible in Linux such as ESS1688 or Jazz16. Note that SB compatibility in DOS/Windows does NOT mean anything in Linux.

IF YOU REALLY ARE 150% SURE YOU HAVE A SOUND BLASTER YOU CAN SKIP THE REST OF THIS CHAPTER.

For most other "supposed to be SB compatible" cards you have to use other than SB drivers (see below). It is possible to get most sound cards to work in SB mode but in general it's a complete waste of time. There are several problems which you will encounter by using SB mode with cards that are not truly SB compatible:

- The SB emulation is at most SB Pro (DSP version 3.x) which means that you get only 8 bit audio (there is always an another ("native") mode which gives the 16 bit capability). The 8 bit only operation is the reason why many users claim that sound quality in Linux is much worse than in DOS.

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In addition some applications require 16 bit mode and they produce just noise with a 8 bit only device.

- The card may work only in some cases but refuse to work most of the time. The SB compatible mode always requires special initialization which is done by the DOS/Windows drivers. This kind of cards work in Linux after you have warm booted it after DOS but they don't work after cold boot (power on or reset).
- You get the famous "DMA timed out" messages. Usually all SB clones have software selectable IRQ and DMA settings. If the (power on default) values currently used by the card don't match configuration of the driver you will get the above error message whenever you try to record or play. There are few other reasons to the DMA timeout message but using the SB mode seems to be the most common cause.

## 2. Trying to use a PnP (Plug & Play) card just like an ordinary sound card

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Plug & Play is a protocol defined by Intel and Microsoft. It lets operating systems to easily identify and reconfigure I/O ports, IRQs and DMAs of ISA cards. The problem with PnP cards is that the standard Linux doesn't currently (versions 2.1.x and earlier) don't support PnP. This means that you will have to use some special tricks (see later) to get a PnPcard alive. Many PnP cards work after they have been initialized but this is not always the case.

There are sometimes both PnP and non-PnP versions of the same sound card. The non-PnP version is the original model which usually has been discontinued more than an year ago. The PnP version has the same name but with "PnP" appended to it (sometimes not). This causes major confusion since the non-PnP model works with Linux but the PnP one doesn't.

You should carefully check if "Plug & Play" or "PnP" is mentioned in the name of the card or in the documentation or package that came with the card. Everything described in the rest of this document is not necessarily valid for PnP models of sound cards even you have managed to wake up the card properly. Many PnP cards are simply too different from their non-PnP ancestors which are covered by this document.

## Cards that are not (fully) supported by this driver

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See <http://www.opensound.com/ossfree> for information about sound cards to be supported in future.

## How to use sound without recompiling kernel and/or sound driver

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There is a commercial sound driver which comes in precompiled form and doesn't require recompiling of the kernel. See <http://www.4Front-tech.com/oss.html> for more info.

## Configuring PnP cards

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New versions of most sound cards use the so-called ISA PnP protocol for soft configuring their I/O, IRQ, DMA and shared memory resources. Currently at least cards made by Creative Technology (SB32 and SB32AWE PnP), Gravis (GUS PnP and GUS PnP Pro), Ensoniq (Soundscape PnP) and Aztech (some Sound Galaxy models) use PnP technology. The CS4232/4236 audio chip by Crystal Semiconductor (Intel Atlantis, HP Pavilion and many other motherboards) is also based on PnP technology but there is a "native" driver available for it (see information about CS4232 later in this document).

PnP sound cards (as well as most other PnP ISA cards) are not supported by this version of the driver. Proper support for them should be released during 97 once the kernel level PnP support is available.

There is a method to get most of the PnP cards to work. The basic method is the following:

- 1) Boot DOS so the card's DOS drivers have a chance to initialize it.
- 2) Cold boot to Linux by using "loadlin.exe". Hitting ctrl-alt-del works with older machines but causes a hard reset of all cards on recent (Pentium) machines.
- 3) If you have the sound driver in Linux configured properly, the card should work now. "Proper" means that I/O, IRQ and DMA settings are the same as in DOS. The hard part is to find which settings were used. See the documentation of your card for more info.

Windows 95 could work as well as DOS but running loadlin may be difficult. Probably you should "shut down" your machine to MS-DOS mode before running it.

Some machines have a BIOS utility for setting PnP resources. This is a good way to configure some cards. In this case you don't need to boot DOS/Win95 before starting Linux.

Another way to initialize PnP cards without DOS/Win95 is a Linux based PnP isolation tool. When writing this there is a pre alpha test version of such a tool available from <ftp://ftp.demon.co.uk/pub/unix/linux/utls>. The file is called isapnptools-\*. Please note that this tool is just a temporary solution which may be incompatible with future kernel versions having proper support for PnP cards. There are bugs in setting DMA channels in earlier versions of isapnptools so at least version 1.6 is required with sound cards.

Yet another way to use PnP cards is to use (commercial) OSS/Linux drivers. See <http://www.opensound.com/linux.html> for more info. This is probably the way you should do it if you don't want to spend time recompiling the kernel and required tools.

Read this before trying to configure the driver

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There are currently many cards that work with this driver. Some of the cards have native support while others work since they emulate some other card (usually SB, MSS/WSS and/or MPU401). The following cards have native support in the driver. Detailed instructions for configuring these cards will be given later in this document.

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Pro Audio Spectrum 16 (PAS16) and compatibles:

Pro Audio Spectrum 16

Pro Audio Studio 16

Logitech Sound Man 16

NOTE! The original Pro Audio Spectrum as well as the PAS+ are not  
and will not be supported by the driver.

Media Vision Jazz16 based cards

Pro Sonic 16

Logitech SoundMan Wave

(Other Jazz based cards should work but I don't have any reports  
about them).

Sound Blasters

SB 1.0 to 2.0

SB Pro

SB 16

SB32/64/AWE

Configure SB32/64/AWE just like SB16. See lowlevel/README.awe  
for information about using the wave table synth.

NOTE! AWE63/Gold and 16/32/AWE "PnP" cards need to be activated  
using isapnptools before they work with OSS/Free.

SB16 compatible cards by other manufacturers than Creative.

You have been fooled since there are no SB16 compatible  
cards on the market (as of May 1997). It's likely that your card  
is compatible just with SB Pro but there is also a non-SB-  
compatible 16 bit mode. Usually it's MSS/WSS but it could also  
be a proprietary one like MV Jazz16 or ESS ES688. OPTi  
MAD16 chips are very common in so called "SB 16 bit cards"  
(try with the MAD16 driver).

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"Supposed to be SB compatible" cards.

Forget the SB compatibility and check for other alternatives  
first. The only cards that work with the SB driver in  
Linux have been made by Creative Technology (there is at least  
one chip on the card with "CREATIVE" printed on it). The  
only other SB compatible chips are ESS and Jazz16 chips  
(maybe ALSxxx chips too but they probably don't work).  
Most other "16 bit SB compatible" cards such as "OPTi/MAD16" or  
"Crystal" are NOT SB compatible in Linux.

Practically all sound cards have some kind of SB emulation mode  
in addition to their native (16 bit) mode. In most cases this  
(8 bit only) SB compatible mode doesn't work with Linux. If  
you get it working it may cause problems with games and  
applications which require 16 bit audio. Some 16 bit only  
applications don't check if the card actually supports 16 bits.  
They just dump 16 bit data to a 8 bit card which produces just  
noise.

In most cases the 16 bit native mode is supported by Linux.  
Use the SB mode with "clones" only if you don't find anything  
better from the rest of this doc.

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## Gravis Ultrasound (GUS)

- GUS
- GUS + the 16 bit option
- GUS MAX
- GUS ACE (No MIDI port and audio recording)
- GUS PnP (with RAM)

## MPU-401 and compatibles

The driver works both with the full (intelligent mode) MPU-401 cards (such as MPU IPC-T and MQX-32M) and with the UART only dumb MIDI ports. MPU-401 is currently the most common MIDI interface. Most sound cards are compatible with it. However, don't enable MPU401 mode blindly. Many cards with native support in the driver have their own MPU401 driver. Enabling the standard one will cause a conflict with these cards. So check if your card is in the list of supported cards before enabling MPU401.

## Windows Sound System (MSS/WSS)

Even when Microsoft has discontinued their own Sound System card they managed to make it a standard. MSS compatible cards are based on a codec chip which is easily available from at least two manufacturers (AD1848 by Analog Devices and CS4231/CS4248 by Crystal Semiconductor). Currently most sound cards are based on one of the MSS compatible codec chips. The CS4231 is used in the high quality cards such as GUS MAX, MediaTrix AudioTrix Pro and TB Tropez (GUS MAX is not MSS compatible).

Having a AD1848, CS4248 or CS4231 codec chip on the card is a good sign. Even if the card is not MSS compatible, it could be easy to write support for it. Note also that most MSS compatible cards require special boot time initialization which may not be present in the driver. Also, some MSS compatible cards have native support. Enabling the MSS support with these cards is likely to cause a conflict. So check if your card is listed in this file before enabling the MSS support.

## Yamaha FM synthesizers (OPL2, OPL3 (not OPL3-SA) and OPL4)

Most sound cards have a FM synthesizer chip. The OPL2 is a 2 operator chip used in the original AdLib card. Currently it's used only in the cheapest (8 bit mono) cards. The OPL3 is a 4 operator FM chip which provides better sound quality and/or more available voices than the OPL2. The OPL4 is a new chip that has an OPL3 and a wave table synthesizer packed onto the same chip. The driver supports just the OPL3 mode directly. Most cards with an OPL4 (like SM Wave and AudioTrix Pro) support the OPL4 mode using MPU401 emulation. Writing a native OPL4 support is difficult since Yamaha doesn't give information about their sample ROM chip.

Enable the generic OPL2/OPL3 FM synthesizer support if your card has a FM chip made by Yamaha. Don't enable it if your card has a software (TRS) based FM emulator.

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NOTE! OPL3-SA is different chip than the ordinary OPL3. In addition to the FM synth this chip has also digital audio (WSS) and MIDI (MPU401) capabilities. Support for OPL3-SA is described below.

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## Yamaha OPL3-SA1

Yamaha OPL3-SA1 (YMF701) is an audio controller chip used on some (Intel) motherboards and on cheap sound cards. It should not be confused with the original OPL3 chip (YMF278) which is entirely different chip. OPL3-SA1 has support for MSS, MPU401 and SB Pro (not used in OSS/Free) in addition to the OPL3 FM synth.

There are also chips called OPL3-SA2, OPL3-SA3, ..., OPL3SA-N. They are PnP chips and will not work with the OPL3-SA1 driver. You should use the standard MSS, MPU401 and OPL3 options with these chips and to activate the card using isapnptools.

## 4Front Technologies SoftOSS

SoftOSS is a software based wave table emulation which works with any 16 bit stereo sound card. Due to its nature a fast CPU is required (P133 is minimum). Although SoftOSS does not use MMX instructions it has proven out that recent processors (which appear to have MMX) perform significantly better with SoftOSS than earlier ones. For example a P166MMX beats a PPro200. SoftOSS should not be used on 486 or 386 machines.

The amount of CPU load caused by SoftOSS can be controlled by selecting the CONFIG\_SOFTOSS\_RATE and CONFIG\_SOFTOSS\_VOICES parameters properly (they will be prompted by make config). It's recommended to set CONFIG\_SOFTOSS\_VOICES to 32. If you have a P166MMX or faster (PPro200 is not faster) you can set CONFIG\_SOFTOSS\_RATE to 44100 (kHz). However with slower systems it recommended to use sampling rates around 22050 or even 16000 kHz. Selecting too high values for these parameters may hang your system when playing MIDI files with high degree of polyphony (number of concurrently playing notes). It's also possible to decrease CONFIG\_SOFTOSS\_VOICES. This makes it possible to use higher sampling rates. However using fewer voices decreases playback quality more than decreasing the sampling rate.

SoftOSS keeps the samples loaded on the system's RAM so much RAM is required. SoftOSS should never be used on machines with less than 16 MB of RAM since this is potentially dangerous (you may accidentally run out of memory which probably crashes the machine).

SoftOSS implements the wave table API originally designed for GUS. For this reason all applications designed for GUS should work (at least after minor modifications). For example gmod/xgmod and playmidi -g are known to work.

To work SoftOSS will require GUS compatible patch files to be installed on the system (in /dos/ultrasnd/midi). You can use the public domain MIDIA patchset available from several ftp sites.

\*\*\*\*\*  
IMPORTANT NOTICE! The original patch set distributed with the Gravis  
Ultrasound card is not in public domain (even though it's available from

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some FTP sites). You should contact Voice Crystal ([www.voicecrystal.com](http://www.voicecrystal.com)) if you like to use these patches with SoftOSS included in OSS/Free.

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### PSS based cards (AD1848 + ADSP-2115 + Echo ESC614 ASIC)

Analog Devices and Echo Speech have together defined a sound card architecture based on the above chips. The DSP chip is used for emulation of SB Pro, FM and General MIDI/MT32.

There are several cards based on this architecture. The most known ones are Orchid SW32 and Cardinal DSP16.

The driver supports downloading DSP algorithms to these cards.

NOTE! You will have to use the "old" config script when configuring PSS cards.

### MediaTrix AudioTrix Pro

The ATP card is built around a CS4231 codec and an OPL4 synthesizer chips. The OPL4 mode is supported by a microcontroller running a General MIDI emulator. There is also a SB 1.5 compatible playback mode.

### Ensoniq SoundScape and compatibles

Ensoniq has designed a sound card architecture based on the OTTO synthesizer chip used in their professional MIDI synthesizers. Several companies (including Ensoniq, Reveal and Spea) are selling cards based on this architecture.

NOTE! The SoundScape PnP is not supported by OSS/Free. Ensoniq VIVO and VIVO90 cards are not compatible with Soundscapes so the Soundscape driver will not work with them. You may want to use OSS/Linux with these cards.

### OPTi MAD16 and Mozart based cards

The Mozart (OAK OTI-601), MAD16 (OPTi 82C928), MAD16 Pro (OPTi 82C929), OPTi 82C924/82C925 (in `_non_` PnP mode) and OPTi 82C930 interface chips are used in many different sound cards, including some cards by Reveal miro and Turtle Beach (Tropez). The purpose of these chips is to connect other audio components to the PC bus. The interface chip performs address decoding for the other chips.

NOTE! Tropez Plus is not MAD16 but CS4232 based.

NOTE! MAD16 PnP cards (82C924, 82C925, 82C931) are not MAD16 compatible in the PnP mode. You will have to use them in MSS mode after having initialized them using `isapnptools` or DOS. 82C931 probably requires initialization using DOS/Windows (running `isapnptools` is not enough). It's possible to use 82C931 with OSS/Free by jumpering it to non-PnP mode (provided that the card has a jumper for this). In non-PnP mode 82C931 is compatible with 82C930 and should work with the MAD16 driver (without need to use `isapnptools` or DOS to initialize it). All OPTi chips are supported by OSS/Linux (both in PnP and non-PnP modes).

### Audio Excel DSP16

Support for this card was written by Riccardo Faccetti ([riccardo@cdc8g5.cdc.polimi.it](mailto:riccardo@cdc8g5.cdc.polimi.it)). The AEDSP16 driver included in the `lowlevel/` directory. To use it you should enable the "Additional low level drivers" option.

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Crystal CS4232 and CS4236 based cards such as AcerMagic S23, TB Tropez \_Plus\_ and

many PC motherboards (Compaq, HP, Intel, ...)  
CS4232 is a PnP multimedia chip which contains a CS3231A codec, SB and MPU401 emulations. There is support for OPL3 too.  
Unfortunately the MPU401 mode doesn't work (I don't know how to initialize it). CS4236 is an enhanced (compatible) version of CS4232.  
NOTE! Don't ever try to use isapnptools with CS4232 since this will just freeze your machine (due to chip bugs). If you have problems in getting CS4232 working you could try initializing it with DOS (CS4232C.EXE) and then booting Linux using loadlin. CS4232C.EXE loads a secret firmware patch which is not documented by Crystal.

Turtle Beach Maui and Tropez "classic"

This driver version supports sample, patch and program loading commands described in the Maui/Tropez User's manual.  
There is now full initialization support too. The audio side of the Tropez is based on the MAD16 chip (see above).  
NOTE! Tropez Plus is different card than Tropez "classic" and will not work fully in Linux. You can get audio features working by configuring the card as a CS4232 based card (above).

### Jumpers and software configuration

Some of the earliest sound cards were jumper configurable. You have to configure the driver use I/O, IRQ and DMA settings that match the jumpers. Just few 8 bit cards are fully jumper configurable (SB 1.x/2.x, SB Pro and clones).  
Some cards made by Aztech have an EEPROM which contains the config info. These cards behave much like hardware jumpered cards.

Most cards have jumper for the base I/O address but other parameters are software configurable. Sometimes there are few other jumpers too.

Latest cards are fully software configurable or they are PnP ISA compatible. There are no jumpers on the board.

The driver handles software configurable cards automatically. Just configure the driver to use I/O, IRQ and DMA settings which are known to work. You could usually use the same values than with DOS and/or Windows. Using different settings is possible but not recommended since it may cause some trouble (for example when warm booting from an OS to another or when installing new hardware to the machine).

Sound driver sets the soft configurable parameters of the card automatically during boot. Usually you don't need to run any extra initialization programs when booting Linux but there are some exceptions. See the card-specific instructions below for more info.

The drawback of software configuration is that the driver needs to know how the card must be initialized. It cannot initialize unknown cards even if they are otherwise compatible with some other cards (like SB, MPU401 or Windows Sound System).

What if your card was not listed above?

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The first thing to do is to look at the major IC chips on the card. Many of the latest sound cards are based on some standard chips. If you are lucky, all of them could be supported by the driver. The most common ones are the OPTi MAD16, Mozart, SoundScape (Ensoniq) and the PSS architectures listed above. Also look at the end of this file for list of unsupported cards and the ones which could be supported later.

The last resort is to send `_exact_` name and model information of the card to me together with a list of the major IC chips (manufactured, model) to me. I could then try to check if your card looks like something familiar.

There are many more cards in the world than listed above. The first thing to do with these cards is to check if they emulate some other card or interface such as SB, MSS and/or MPU401. In this case there is a chance to get the card to work by booting DOS before starting Linux (boot DOS, hit ctrl-alt-del and boot Linux without hard resetting the machine). In this method the DOS based driver initializes the hardware to use known I/O, IRQ and DMA settings. If sound driver is configured to use the same settings, everything should work OK.

Configuring sound driver (with Linux)

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The sound driver is currently distributed as part of the Linux kernel. The files are in `/usr/src/linux/drivers/sound/`.

```
*****
*   ALWAYS USE THE SOUND DRIVER VERSION WHICH IS DISTRIBUTED WITH   *
*   THE KERNEL SOURCE PACKAGE YOU ARE USING. SOME ALPHA AND BETA TEST *
*   VERSIONS CAN BE INSTALLED FROM A SEPARATELY DISTRIBUTED PACKAGE   *
*   BUT CHECK THAT THE PACKAGE IS NOT MUCH OLDER (OR NEWER) THAN THE  *
*   KERNEL YOU ARE USING. IT'S POSSIBLE THAT THE KERNEL/DRIVER       *
*   INTERFACE CHANGES BETWEEN KERNEL RELEASES WHICH MAY CAUSE SOME  *
*   INCOMPATIBILITY PROBLEMS.                                         *
*                                                                       *
*   IN CASE YOU INSTALL A SEPARATELY DISTRIBUTED SOUND DRIVER VERSION, *
*   BE SURE TO REMOVE OR RENAME THE OLD SOUND DRIVER DIRECTORY BEFORE *
*   INSTALLING THE NEW ONE. LEAVING OLD FILES TO THE SOUND DRIVER     *
*   DIRECTORY _WILL_ CAUSE PROBLEMS WHEN THE DRIVER IS USED OR        *
*   COMPILED.                                                           *
*****
```

To configure the driver, run "make config" in the kernel source directory (`/usr/src/linux`). Answer "y" or "m" to the question about Sound card support (after the questions about mouse, CD-ROM, ftape, etc. support). Questions about options for sound will then be asked.

After configuring the kernel and sound driver and compile the kernel following instructions in the kernel README.

## The sound driver configuration dialog

---

Sound configuration starts by making some yes/no questions. Be careful when answering to these questions since answering y to a question may prevent some later ones from being asked. For example don't answer y to the first question (PAS16) if you don't really have a PAS16. Don't enable more cards than you really need since they just consume memory. Also some drivers (like MPU401) may conflict with your SCSI controller and prevent kernel from booting. If you card was in the list of supported cards (above), please look at the card specific config instructions (later in this file) before starting to configure. Some cards must be configured in way which is not obvious.

So here is the beginning of the config dialog. Answer 'y' or 'n' to these questions. The default answer is shown so that (y/n) means 'y' by default and (n/y) means 'n'. To use the default value, just hit ENTER. But be careful since using the default \_doesn't\_ guarantee anything.

Note also that all questions may not be asked. The configuration program may disable some questions depending on the earlier choices. It may also select some options automatically as well.

"ProAudioSpectrum 16 support",

- Answer 'y' ONLY if you have a Pro Audio Spectrum 16, Pro Audio Studio 16 or Logitech SoundMan 16 (be sure that you read the above list correctly). Don't answer 'y' if you have some other card made by Media Vision or Logitech since they are not PAS16 compatible.  
NOTE! Since 3.5-beta10 you need to enable SB support (next question) if you want to use the SB emulation of PAS16. It's also possible to the emulation if you want to use a true SB card together with PAS16 (there is another question about this that is asked later).

"Sound Blaster support",

- Answer 'y' if you have an original SB card made by Creative Labs or a full 100% hardware compatible clone (like Thunderboard or SM Games). If your card was in the list of supported cards (above), please look at the card specific instructions later in this file before answering this question. For an unknown card you may answer 'y' if the card claims to be SB compatible.  
Enable this option also with PAS16 (changed since v3.5-beta9).

Don't enable SB if you have a MAD16 or Mozart compatible card.

"Generic OPL2/OPL3 FM synthesizer support",

- Answer 'y' if your card has a FM chip made by Yamaha (OPL2/OPL3/OPL4). Answering 'y' is usually a safe and recommended choice. However some cards may have software (TSR) FM emulation. Enabling FM support with these cards may cause trouble. However I don't currently know such cards.

"Gravis Ultrasound support",

- Answer 'y' if you have GUS or GUS MAX. Answer 'n' if you don't have GUS since the GUS driver consumes much memory. Currently I don't have experiences with the GUS ACE so I don't know what to answer with it.

"MPU-401 support (NOT for SB16)",

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- Be careful with this question. The MPU401 interface is supported by almost any sound card today. However some natively supported cards have their own driver for MPU401. Enabling the MPU401 option with these cards will cause a conflict. Also enabling MPU401 on a system that doesn't really have a MPU401 could cause some trouble. If your card was in the list of supported cards (above), please look at the card specific instructions later in this file.

In MOST cases this MPU401 driver should only be used with "true" MIDI-only MPU401 professional cards. In most other cases there is another way to get the MPU401 compatible interface of a sound card to work.

Support for the MPU401 compatible MIDI port of SB16, ESS1688 and MV Jazz16 cards is included in the SB driver. Use it instead of this separate MPU401 driver with these cards. As well Soundscape, PSS and Maui drivers include their own MPU401 options.

It's safe to answer 'y' if you have a true MPU401 MIDI interface card.

"6850 UART Midi support",

- It's safe to answer 'n' to this question in all cases. The 6850 UART interface is so rarely used.

"PSS (ECHO-ADI2111) support",

- Answer 'y' only if you have Orchid SW32, Cardinal DSP16 or some other card based on the PSS chipset (AD1848 codec + ADSP-2115 DSP chip + Echo ESC614 ASIC CHIP).

"16 bit sampling option of GUS (\_NOT\_ GUS MAX)",

- Answer 'y' if you have installed the 16 bit sampling daughtercard to your GUS. Answer 'n' if you have GUS MAX. Enabling this option disables GUS MAX support.

"GUS MAX support",

- Answer 'y' only if you have a GUS MAX.

"Microsoft Sound System support",

- Again think carefully before answering 'y' to this question. It's safe to answer 'y' in case you have the original Windows Sound System card made by Microsoft or Aztech SG 16 Pro (or NX16 Pro). Also you may answer 'y' in case your card was not listed earlier in this file. For cards having native support in the driver, consult the card specific instructions later in this file. Some drivers have their own MSS support and enabling this option will cause a conflict.

Note! The MSS driver permits configuring two DMA channels. This is a "nonstandard" feature and works only with very few cards (if any).

In most cases the second DMA channel should be disabled or set to the same channel than the first one. Trying to configure two separate channels with cards that don't support this feature will prevent audio (at least recording) from working.

"Ensoniq Soundscape support",

- Answer 'y' if you have a sound card based on the Ensoniq SoundScape chipset. Such cards are being manufactured at least by Ensoniq, Spea and Reveal (note that Reveal makes other cards also). The oldest cards made by Spea don't work properly with Linux. Soundscape PnP as well as Ensoniq VIVO work only with the commercial OSS/Linux version.

"MediaTrix AudioTrix Pro support",

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- Answer 'y' if you have the AudioTrix Pro.
- "Support for MAD16 and/or Mozart based cards",
- Answer y if your card has a Mozart (OAK OTI-601) or MAD16 (OPTi 82C928, 82C929, 82C924/82C925 or 82C930) audio interface chip. These chips are currently quite common so it's possible that many no-name cards have one of them. In addition the MAD16 chip is used in some cards made by known manufacturers such as Turtle Beach (Tropez), Reveal (some models) and Diamond (some recent models). Note OPTi 82C924 and 82C925 are MAD16 compatible only in non PnP mode (jumper selectable on many cards).
- "Support for TB Maui"
- This enables TB Maui specific initialization. Works with TB Maui and TB Tropez (may not work with Tropez Plus).

Then the configuration program asks some y/n questions about the higher level services. It's recommended to answer 'y' to each of these questions. Answer 'n' only if you know you will not need the option.

- "MIDI interface support",
- Answering 'n' disables /dev/midi## devices and access to any MIDI ports using /dev/sequencer and /dev/music. This option also affects any MPU401 and/or General MIDI compatible devices.
- "FM synthesizer (YM3812/OPL-3) support",
- Answer 'y' here.
- "/dev/sequencer support",
- Answering 'n' disables /dev/sequencer and /dev/music.

Entering the I/O, IRQ and DMA config parameters

---

After the above questions the configuration program prompts for the card specific configuration information. Usually just a set of I/O address, IRQ and DMA numbers are asked. With some cards the program asks for some files to be used during initialization of the card. For example many cards have a DSP chip or microprocessor which must be initialized by downloading a program (microcode) file to the card.

Instructions for answering these questions are given in the next section.

#### Card specific information

---

This section gives additional instructions about configuring some cards. Please refer manual of your card for valid I/O, IRQ and DMA numbers. Using the same settings with DOS/Windows and Linux is recommended. Using different values could cause some problems when switching between different operating systems.

#### Sound Blasters (the original ones by Creative)

---

NOTE! Check if you have a PnP Sound Blaster (cards sold after summer 1995 are almost certainly PnP ones). With PnP cards you should use isapnptools



to activate them (see above).

It's possible to configure these cards to use different I/O, IRQ and DMA settings. Since the possible/default settings have changed between various models, you have to consult manual of your card for the proper ones. It's a good idea to use the same values than with DOS/Windows. With SB and SB Pro it's the only choice. SB16 has software selectable IRQ and DMA channels but using different values with DOS and Linux is likely to cause troubles. The DOS driver is not able to reset the card properly after warm boot from Linux if Linux has used different IRQ or DMA values.

The original (steam) Sound Blaster (versions 1.x and 2.x) use always DMA1. There is no way to change it.

The SB16 needs two DMA channels. A 8 bit one (1 or 3) is required for 8 bit operation and a 16 bit one (5, 6 or 7) for the 16 bit mode. In theory it's possible to use just one (8 bit) DMA channel by answering the 8 bit one when the configuration program asks for the 16 bit one. This may work in some systems but is likely to cause terrible noise on some other systems.

It's possible to use two SB16/32/64 at the same time. To do this you should first configure OSS/Free for one card. Then edit local.h manually and define SB2\_BASE, SB2\_IRQ, SB2\_DMA and SB2\_DMA2 for the second one. You can't get the OPL3, MIDI and EMU8000 devices of the second card to work. If you are going to use two PnP Sound Blasters, ensure that they are of different model and have different PnP IDs. There is no way to get two cards with the same card ID and serial number to work. The easiest way to check this is trying if isapnptools can see both cards or just one.

NOTE! Don't enable the SM Games option (asked by the configuration program) if you are not 101% sure that your card is a Logitech Soundman Games (not a SM Wave or SM16).

## SB Clones

First of all: There are no SB16 clones. There are SB Pro clones with a 16 bit mode which is not SB16 compatible. The most likely alternative is that the 16 bit mode means MSS/WSS.

There are just a few fully 100% hardware SB or SB Pro compatible cards. I know just Thunderboard and SM Games. Other cards require some kind of hardware initialization before they become SB compatible. Check if your card was listed in the beginning of this file. In this case you should follow instructions for your card later in this file.

For other not fully SB clones you may try initialization using DOS in the following way:

- Boot DOS so that the card specific driver gets run.
- Hit ctrl-alt-del (or use loadlin) to boot Linux. Don't switch off power or press the reset button.
- If you use the same I/O, IRQ and DMA settings in Linux, the card should work.

If your card is both SB and MSS compatible, I recommend using the MSS mode.

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Most cards of this kind are not able to work in the SB and the MSS mode simultaneously. Using the MSS mode provides 16 bit recording and playback.

### ProAudioSpectrum 16 and compatibles

---

PAS16 has a SB emulation chip which can be used together with the native (16 bit) mode of the card. To enable this emulation you should configure the driver to have SB support too (this has been changed since version 3.5-beta9 of this driver).

With current driver versions it's also possible to use PAS16 together with another SB compatible card. In this case you should configure SB support for the other card and to disable the SB emulation of PAS16 (there is a separate questions about this).

With PAS16 you can use two audio device files at the same time. /dev/dsp (and /dev/audio) is connected to the 8/16 bit native codec and the /dev/dspl (and /dev/audiol) is connected to the SB emulation (8 bit mono only).

### Gravis Ultrasound

---

There are many different revisions of the Ultrasound card (GUS). The earliest ones (pre 3.7) don't have a hardware mixer. With these cards the driver uses a software emulation for synth and pcm playbacks. It's also possible to switch some of the inputs (line in, mic) off by setting mixer volume of the channel level below 10%. For recording you have to select the channel as a recording source and to use volume above 10%.

GUS 3.7 has a hardware mixer.

GUS MAX and the 16 bit sampling daughtercard have a CS4231 codec chip which also contains a mixer.

Configuring GUS is simple. Just enable the GUS support and GUS MAX or the 16 bit daughtercard if you have them. Note that enabling the daughter card disables GUS MAX driver.

NOTE for owners of the 16 bit daughtercard: By default the daughtercard uses /dev/dsp (and /dev/audio). Command "ln -sf /dev/dspl /dev/dsp" selects the daughter card as the default device.

With just the standard GUS enabled the configuration program prompts for the I/O, IRQ and DMA numbers for the card. Use the same values than with DOS.

With the daughter card option enabled you will be prompted for the I/O, IRQ and DMA numbers for the daughter card. You have to use different I/O and DMA values than for the standard GUS. The daughter card permits simultaneous recording and playback. Use /dev/dsp (the daughtercard) for recording and /dev/dspl (GUS GF1) for playback.

GUS MAX uses the same I/O address and IRQ settings than the original GUS (GUS MAX = GUS + a CS4231 codec). In addition an extra DMA channel may be used. Using two DMA channels permits simultaneous playback using two devices

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(dev/dsp0 and /dev/dsp1). The second DMA channel is required for full duplex audio.

To enable the second DMA channels, give a valid DMA channel when the config program asks for the GUS MAX DMA (entering -1 disables the second DMA). Using 16 bit DMA channels (5,6 or 7) is recommended.

If you have problems in recording with GUS MAX, you could try to use just one 8 bit DMA channel. Recording will not work with one DMA channel if it's a 16 bit one.

Microphone input of GUS MAX is connected to mixer in little bit nonstandard way. There is actually two microphone volume controls. Normal "mic" controls only recording level. Mixer control "speaker" is used to control volume of microphone signal connected directly to line/speaker out. So just decrease volume of "speaker" if you have problems with microphone feedback.

GUS ACE works too but any attempt to record or to use the MIDI port will fail.

GUS PnP (with RAM) is partially supported but it needs to be initialized using DOS or isapnptools before starting the driver.

## MPU401 and Windows Sound System

---

Again. Don't enable these options in case your card is listed somewhere else in this file.

Configuring these cards is obvious (or it should be). With MSS you should probably enable the OPL3 synth also since most MSS compatible cards have it. However check that this is true before enabling OPL3.

Sound driver supports more than one MPU401 compatible cards at the same time but the config program asks config info for just the first of them. Adding the second or third MPU interfaces must be done manually by editing sound/local.h (after running the config program). Add defines for MPU2\_BASE & MPU2\_IRQ (and MPU3\_BASE & MPU3\_IRQ) to the file.

## CAUTION!

The default I/O base of Adaptec AHA-1542 SCSI controller is 0x330 which is also the default of the MPU401 driver. Don't configure the sound driver to use 0x330 as the MPU401 base if you have a AHA1542. The kernel will not boot if you make this mistake.

## PSS

---

Even the PSS cards are compatible with SB, MSS and MPU401, you must not enable these options when configuring the driver. The configuration program handles these options itself. (You may use the SB, MPU and MSS options together with PSS if you have another card on the system).

The PSS driver enables MSS and MPU401 modes of the card. SB is not enabled since it doesn't work concurrently with MSS. The driver loads also a

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DSP algorithm which is used to for the general MIDI emulation. The algorithm file (.ld) is read by the config program and written to a file included when the pss.c is compiled. For this reason the config program asks if you want to download the file. Use the genmidi.ld file distributed with the DOS/Windows drivers of the card (don't use the mt32.ld). With some cards the file is called 'synth.ld'. You must have access to the file when configuring the driver. The easiest way is to mount the DOS partition containing the file with Linux.

It's possible to load your own DSP algorithms and run them with the card. Look at the directory pss\_test of snd-util-3.0.tar.gz for more info.

### AudioTrix Pro

---

You have to enable the OPL3 and SB (not SB Pro or SB16) drivers in addition to the native AudioTrix driver. Don't enable MSS or MPU drivers.

Configuring ATP is little bit tricky since it uses so many I/O, IRQ and DMA numbers. Using the same values than with DOS/Win is a good idea. Don't attempt to use the same IRQ or DMA channels twice.

The SB mode of ATP is implemented so the ATP driver just enables SB in the proper address. The SB driver handles the rest. You have to configure both the SB driver and the SB mode of ATP to use the same IRQ, DMA and I/O settings.

Also the ATP has a microcontroller for the General MIDI emulation (OPL4). For this reason the driver asks for the name of a file containing the microcode (TRXPRO.HEX). This file is usually located in the directory where the DOS drivers were installed. You must have access to this file when configuring the driver.

If you have the effects daughtercard, it must be initialized by running the setfx program of snd-util-3.0.tar.gz package. This step is not required when using the (future) binary distribution version of the driver.

### Ensoniq SoundScape

---

NOTE! The new PnP SoundScape is not supported yet. Soundscape compatible cards made by Reveal don't work with Linux. They use older revision of the Soundscape chipset which is not fully compatible with newer cards made by Ensoniq.

The SoundScape driver handles initialization of MSS and MPU supports itself so you don't need to enable other drivers than SoundScape (enable also the /dev/dsp, /dev/sequencer and MIDI supports).

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!
!!!!!! NOTE! Before version 3.5-beta6 there WERE two sets of audio  !!!!
!!!!!! device files (/dev/dsp0 and /dev/dsp1). The first one WAS  !!!!
!!!!!! used only for card initialization and the second for audio  !!!!
!!!!!! purposes. It WAS required to change /dev/dsp (a symlink) to  !!!!
!!!!!! point to /dev/dsp1.                                          !!!!
```

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```
!!!!
!!!! This is not required with OSS versions 3.5-beta6 and later !!!!
!!!! since there is now just one audio device file. Please !!!!
!!!! change /dev/dsp to point back to /dev/dsp0 if you are !!!!
!!!! upgrading from an earlier driver version using !!!!
!!!! (cd /dev;rm dsp;ln -s dsp0 dsp). !!!!
!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

The configuration program asks one DMA channel and two interrupts. One IRQ and one DMA is used by the MSS codec. The second IRQ is required for the MPU401 mode (you have to use different IRQs for both purposes). There were earlier two DMA channels for SoundScape but the current driver version requires just one.

The SoundScape card has a Motorola microcontroller which must be initialized after boot (the driver doesn't initialize it during boot). The initialization is done by running the 'ssinit' program which is distributed in the snd-util-3.0.tar.gz package. You have to edit two defines in the ssinit.c and then compile the program. You may run ssinit manually (after each boot) or add it to /etc/rc.d/rc.local.

The ssinit program needs the microcode file that comes with the DOS/Windows driver of the card. You will need to use version 1.30.00 or later of the microcode file (sndscape.co0 or sndscape.col depending on your card model). THE OLD sndscape.cod WILL NOT WORK. IT WILL HANG YOUR MACHINE. The only way to get the new microcode file is to download and install the DOS/Windows driver from <ftp://ftp.ensoniq.com/pub>.

Then you have to select the proper microcode file to use: soundscape.co0 is the right one for most cards and sndscape.col is for few (older) cards made by Reveal and/or Spea. The driver has capability to detect the card version during boot. Look at the boot log messages in /var/adm/messages and locate the sound driver initialization message for the SoundScape card. If the driver displays string <Ensoniq Soundscape (old)>, you have an old card and you will need to use sndscape.col. For other cards use soundscape.co0. New Soundscape revisions such as Elite and PnP use code files with higher numbers (.co2, .co3, etc.).

NOTE! Ensoniq Soundscape VIVO is not compatible with other Soundscape cards. Currently it's possible to use it in Linux only with OSS/Linux drivers.

Check /var/adm/messages after running ssinit. The driver prints the board version after downloading the microcode file. That version number must match the number in the name of the microcode file (extension).

Running ssinit with a wrong version of the sndscape.co? file is not dangerous as long as you don't try to use a file called sndscape.cod. If you have initialized the card using a wrong microcode file (sounds are terrible), just modify ssinit.c to use another microcode file and try again. It's possible to use an earlier version of sndscape.co[01] but it may sound weird.

MAD16 (Pro) and Mozart

---

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You need to enable just the MAD16 /Mozart support when configuring the driver. Don't enable SB, MPU401 or MSS. However you will need the /dev/audio, /dev/sequencer and MIDI supports.

Mozart and OPTi 82C928 (the original MAD16) chips don't support MPU401 mode so enter just 0 when the configuration program asks the MPU/MIDI I/O base. The MAD16 Pro (OPTi 82C929) and 82C930 chips have MPU401 mode.

TB Tropez is based on the 82C929 chip. It has two MIDI ports. The one connected to the MAD16 chip is the second one (there is a second MIDI connector/pins somewhere??). If you have not connected the second MIDI port, just disable the MIDI port of MAD16. The 'Maui' compatible synth of Tropez is jumper configurable and not connected to the MAD16 chip (the Maui driver can be used with it).

Some MAD16 based cards may cause feedback, whistle or terrible noise if the line3 mixer channel is turned too high. This happens at least with Shuttle Sound System. Current driver versions set volume of line3 low enough so this should not be a problem.

If you have a MAD16 card which have an OPL4 (FM + Wave table) synthesizer chip (not an OPL3), you have to append a line containing `#define MAD16_OPL4` to the file `linux/drivers/sound/local.h` (after running `make config`).

MAD16 cards having a CS4231 codec support full duplex mode. This mode can be enabled by configuring the card to use two DMA channels. Possible DMA channel pairs are: 0&1, 1&0 and 3&0.

NOTE! Cards having an OPTi 82C924/82C925 chip work with OSS/Free only in non-PnP mode (usually jumper selectable). The PnP mode is supported only by OSS/Linux.

### MV Jazz (ProSonic)

The Jazz16 driver is just a hack made to the SB Pro driver. However it works fairly well. You have to enable SB, SB Pro (not SB16) and MPU401 supports when configuring the driver. The configuration program asks later if you want support for MV Jazz16 based cards (after asking SB base address). Answer 'y' here and the driver asks the second (16 bit) DMA channel.

The Jazz16 driver uses the MPU401 driver in a way which will cause problems if you have another MPU401 compatible card. In this case you must give address of the Jazz16 based MPU401 interface when the config program prompts for the MPU401 information. Then look at the MPU401 specific section for instructions about configuring more than one MPU401 cards.

### Logitech Soundman Wave

Read the above MV Jazz specific instructions first.

The Logitech SoundMan Wave (don't confuse this with the SM16 or SM Games) is a MV Jazz based card which has an additional OPL4 based wave table

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synthesizer. The OPL4 chip is handled by an on board microcontroller which must be initialized during boot. The config program asks if you have a SM Wave immediately after asking the second DMA channel of jazz16. If you answer 'y', the config program will ask name of the file containing code to be loaded to the microcontroller. The file is usually called MIDI0001.BIN and it's located in the DOS/Windows driver directory. The file may also be called as TSUNAMI.BIN or something else (older cards?).

The OPL4 synth will be inaccessible without loading the microcontroller code.

Also remember to enable SB MPU401 support if you want to use the OPL4 mode. (Don't enable the 'normal' MPU401 device as with some earlier driver versions (pre 3.5-alpha8)).

NOTE! Don't answer 'y' when the driver asks about SM Games support (the next question after the MIDI0001.BIN name). However answering 'y' doesn't cause damage your computer so don't panic.

## Sound Galaxies

---

There are many different Sound Galaxy cards made by Aztech. The 8 bit ones are fully SB or SB Pro compatible and there should be no problems with them.

The older 16 bit cards (SG Pro16, SG NX Pro16, Nova and Lyra) have an EEPROM chip for storing the configuration data. There is a microcontroller which initializes the card to match the EEPROM settings when the machine is powered on. These cards actually behave just like they have jumpers for all of the settings. Configure driver for MSS, MPU, SB/SB Pro and OPL3 supports with these cards.

There are some new Sound Galaxies in the market. I have no experience with them so read the card's manual carefully.

## ESS ES1688 and ES688 'AudioDrive' based cards

---

Support for these two ESS chips is embedded in the SB driver. Configure these cards just like SB. Enable the 'SB MPU401 MIDI port' if you want to use MIDI features of ES1688. ES688 doesn't have MPU mode so you don't need to enable it (the driver uses normal SB MIDI automatically with ES688).

NOTE! ESS cards are not compatible with MSS/WSS so don't worry if MSS support of OSS doesn't work with it.

There are some ES1688/688 based sound cards and (particularly) motherboards which use software configurable I/O port relocation feature of the chip. This ESS proprietary feature is supported only by OSS/Linux.

There are ES1688 based cards which use different interrupt pin assignment than recommended by ESS (5, 7, 9/2 and 10). In this case all IRQs don't work. At least a card called (Pearl?) Hypersound 16 supports IRQ 15 but it doesn't work.

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ES1868 is a PnP chip which is (supposed to be) compatible with ESS1688 probably works with OSS/Free after initialization using isapnptools.

### Reveal cards

---

There are several different cards made/marketed by Reveal. Some of them are compatible with SoundScape and some use the MAD16 chip. You may have to look at the card and try to identify its origin.

### Diamond

---

The oldest (Sierra Aria based) sound cards made by Diamond are not supported (they may work if the card is initialized using DOS). The recent (LX?) models are based on the MAD16 chip which is supported by the driver.

### Audio Excel DSP16

---

Support for this card is currently not functional. A new driver for it should be available later this year.

### PCMCIA cards

---

Sorry, can't help. Some cards may work and some don't.

### TI TM4000M notebooks

---

These computers have a built in sound support based on the Jazz chipset. Look at the instructions for MV Jazz (above). It's also important to note that there is something wrong with the mouse port and sound at least on some TM models. Don't enable the "C&T 82C710 mouse port support" when configuring Linux. Having it enabled is likely to cause mysterious problems and kernel failures when sound is used.

### miroSOUND

---

The miroSOUND PCM1-pro, PCM12 and PCM20 radio has been used successfully. These cards are based on the MAD16, OPL4, and CS4231A chips and everything said in the section about MAD16 cards applies here, too. The only major difference between the PCMxx and other MAD16 cards is that instead of the mixer in the CS4231 codec a separate mixer controlled by an on-board 80C32 microcontroller is used. Control of the mixer takes place via the ACI (miro's audio control interface) protocol that is implemented in a separate lowlevel driver. Make sure you compile this ACI driver together with the normal MAD16 support when you use a miroSOUND PCMxx card. The ACI mixer is controlled by /dev/mixer and the CS4231 mixer by /dev/mixer1 (depends on load time). Only in special cases you want to change something regularly on the CS4231 mixer.

The miroSOUND PCM12 and PCM20 radio is capable of full duplex



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operation (simultaneous PCM replay and recording), which allows you to implement nice real-time signal processing audio effect software and network telephones. The ACI mixer has to be switched into the "solo" mode for duplex operation in order to avoid feedback caused by the mixer (input hears output signal). You can de-/activate this mode through toggling the record button for the wave controller with an OSS-mixer.

The PCM20 contains a radio tuner, which is also controlled by ACI. This radio tuner is supported by the ACI driver together with the miropcm20.o module. Also the 7-band equalizer is integrated (limited by the OSS-design). Developement has started and maybe finished for the RDS decoder on this card, too. You will be able to read RadioText, the Programme Service name, Programme TYpe and others. Even the v4l radio module benefits from it with a refined strength value. See aci.[ch] and miropcm20\*. [ch] for more details.

The following configuration parameters have worked fine for the PCM12 in Markus Kuhn's system, many other configurations might work, too:  
CONFIG\_MAD16\_BASE=0x530, CONFIG\_MAD16\_IRQ=11, CONFIG\_MAD16\_DMA=3,  
CONFIG\_MAD16\_DMA2=0, CONFIG\_MAD16\_MPU\_BASE=0x330, CONFIG\_MAD16\_MPU\_IRQ=10,  
DSP\_BUFFSIZE=65536, SELECTED\_SOUND\_OPTIONS=0x00281000.

Bas van der Linden is using his PCM1-pro with a configuration that differs in: CONFIG\_MAD16\_IRQ=7, CONFIG\_MAD16\_DMA=1, CONFIG\_MAD16\_MPU\_IRQ=9

### Compaq Deskpro XL

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The builtin sound hardware of Compaq Deskpro XL is now supported. You need to configure the driver with MSS and OPL3 supports enabled. In addition you need to manually edit linux/drivers/sound/local.h and to add a line containing "#define DESKPROXL" if you used make menuconfig/xconfig.

### Others?

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Since there are so many different sound cards, it's likely that I have forgotten to mention many of them. Please inform me if you know yet another card which works with Linux, please inform me (or is anybody else willing to maintain a database of supported cards (just like in XF86)?).

### Cards not supported yet

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Please check the version of sound driver you are using before complaining that your card is not supported. It's possible you are using a driver version which was released months before your card was introduced.

First of all, there is an easy way to make most sound cards work with Linux. Just use the DOS based driver to initialize the card to a known state, then use loadlin.exe to boot Linux. If Linux is configured to use the same I/O, IRQ and DMA numbers as DOS, the card could work.

(ctrl-alt-del can be used in place of loadlin.exe but it doesn't work with

new motherboards). This method works also with all/most PnP sound cards.

Don't get fooled with SB compatibility. Most cards are compatible with SB but that may require a TSR which is not possible with Linux. If the card is compatible with MSS, it's a better choice. Some cards don't work in the SB and MSS modes at the same time.

Then there are cards which are no longer manufactured and/or which are relatively rarely used (such as the 8 bit ProAudioSpectrum models). It's extremely unlikely that such cards ever get supported. Adding support for a new card requires much work and increases time required in maintaining the driver (some changes need to be done to all low level drivers and be tested too, maybe with multiple operating systems). For this reason I have made a decision to not support obsolete cards. It's possible that someone else makes a separately distributed driver (diffs) for the card.

Writing a driver for a new card is not possible if there are no programming information available about the card. If you don't find your new card from this file, look from the home page (<http://www.opensound.com/ossfree>). Then please contact manufacturer of the card and ask if they have (or are willing to) released technical details of the card. Do this before contacting me. I can only answer 'no' if there are no programming information available.

I have made decision to not accept code based on reverse engineering to the driver. There are three main reasons: First I don't want to break relationships to sound card manufacturers. The second reason is that maintaining and supporting a driver without any specs will be a pain. The third reason is that companies have freedom to refuse selling their products to other than Windows users.

Some companies don't give low level technical information about their products to public or at least they require signing a NDA. It's not possible to implement a freeware driver for them. However it's possible that support for such cards become available in the commercial version of this driver (see <http://www.4Front-tech.com/oss.html> for more info).

There are some common audio chipsets that are not supported yet. For example Sierra Aria and IBM Mwave. It's possible that these architectures get some support in future but I can't make any promises. Just look at the home page ([http://www.opensound.com/ossfree/new\\_cards.html](http://www.opensound.com/ossfree/new_cards.html)) for latest info.

Information about unsupported sound cards and chipsets is welcome as well as free copies of sound cards, SDKs and operating systems.

If you have any corrections and/or comments, please contact me.

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Personal home page: <http://www.compusernic.fi/~hannu>  
home page of OSS/Free: <http://www.opensound.com/ossfree>

home page of commercial OSS

README.OSS.txt

(Open Sound System) drivers: <http://www.opensound.com/oss.html>