

Sound Blaster 16

Introduction

I definitely encourage you to read or print all of this document. This data has changed the way not only how I look at hardware, but it also has given me the courage to say “screw that driver, I’ll just program the hardware directly!” I have no idea how you ended up here, but let me say that we share the same pain and torment of using insufficient drivers and functions. Sometimes we just have to do things ourselves! This document goes hand in hand with the sound programming doc. Together you can build a Real-time Sound FX Mixing Machine! This tutorial serves as a reference to some common issues that face sound card programmers. More in depth tutorials are in the form of several examples, each having its own source and .pdf available on my site.

Overview

If you are unfamiliar with programming hardware, then this section should be able to shed a little light on the mystery. Basically we are going to figure out information about the available sound card, given it is either a true Sound Blaster or a compatible card. With this information we can deduce what functions are available for us to use. From there we will begin to initialize the card and perform some simple functions using a mixture of outport (outp) commands and some additional information we get from the card itself. Specifically we know that the hardware uses a base io port that is given to us. Additions to that port number are the location of other ports specific to the SB. Later we will experiment with some different kinds of playback and sharpen our programming skills to manipulate the sound card the way WE want to :)

AutoDetecting SB Settings

Autodetecting is really kind of a cheap trick. We aren’t doing any fancy hardware checking or any system checking. All we have to do is grab a system variable name BLASTER. Each Sound Blaster card has this system variable set in the autoexec.bat file. By grabbing this string and going through its various sections, we can get all the information we need to talk to the card.

Resetting the DSP

In order to reset the DSP we have to write a 1 to the RESET port, wait a few milliseconds and then write a 0 to the RESET port. After this we proceed to poll the DSPREAD port to see if it gives us the OK (DSP_READY signal). Immediately afterward we can request that the DSP give us its major and minor version numbers.

Available Modes

The DSP Version of your Sound Blaster card is the determining factor as to how you can output sound on the Sound Blaster. With the release of version 4.0+ programming has gotten a lot easier and a pretty wide variety of playback modes are supported, including 16 bit Stereo Auto Init playback! The following is a quick listing of all available modes and their appropriate DSP versions.

DMA Operation Mode	1.xx	2.00	2.01+	3.xx	4.xx
8 Bit Mono PCM Single Cycle	x	x	x	x	x
8 Bit Mono PCM Auto-Init		x	x	x	x
8 Bit Mono ADPCM Single Cycle	x	x	x	x	x
8 Bit Mono ADPCM Auto-Init		x	x	x	x
8 Bit Mono High Speed PCM Single Cycle			x	x	
8 it Mono High Speed PCM Auto-Init			x	x	
8 Bit Stereo High Speed PCM Single Cycle				x	
8 Bit Stereo High Speed PCM Auto-Init				x	
8/16 Bit Mono PCM Single Cycle					x
8/16 Bit Mono PCM Auto-Init					x
8/16 Bit Stereo PCM Single Cycle					x
8/16 Bit Stereo PCM Auto-Init					x

Sound Playback Ability

Here's a listing of what playback rates are available on which DSP versions!

DSP Version	Transfer Mode	Format	Sampling Range
4.xx	Mono	8 Bit unsigned	5000 to 44100 Hz
	Mono	16 Bit unsigned	5000 to 44100 Hz
	Stereo	8 Bit unsigned	5000 to 44100 Hz
	Stereo	16 Bit unsigned	5000 to 44100 Hz
3.xx	Mono	8 Bit unsigned	4000 to 23000 Hz
	Mono/High Speed	8 Bit unsigned	23000 to 44100 Hz
	Stereo/High Speed	8 Bit unsigned	11025 to 22050 Hz
2.01+	Mono	8 Bit unsigned	4000 to 23000 Hz
	Mono/High Speed	8 Bit unsigned	23000 to 44100 Hz
2.0 and 1.xx	Mono	8 Bit unsigned	4000 to 23000 Hz
All	Mono	8 to 4 Bit ADPCM	4000 to 12000 Hz
All	Mono	8 to 3 Bit ADPCM	4000 to 13000 Hz
All	Mono	8 to 2 Bit ADPCM	4000 to 11000 Hz

IO Port Listing

IO Address	Description	Access
Base + 0h	FM Music Status Port	Read
Base + 0h	FM Music Register Address Port	Write
Base + 1h	FM Music Data Port	Write Only
Base + 2h	Advanced FM Music Status Port	Read
Base + 2h	Advanced FM Music Register Address Port	Write
Base + 3h	Advanced FM Music Data Port	Write Only
Base + 4h	Mixer Chip Register Address Port	Write Only
Base + 5h	Mixer Chip Data Port	Read / Write
Base + 6h	DSP Rest	Write Only
Base + 8h	FM Music Status Port	Read
Base + 8h	FM Music Register Port	Write
Base + 9h	FM Music Data port	Write Only
Base + Ah	DSP Read Data Port	Read Only
Base + Ch	DSP Write Command / Data	Write
Base + Ch	DSP Write Buffer Status (Bit 7)	Read
Base + Eh	DSP Read Buffer Status (Bit 7)	Read Only
Base + 10h	CD-ROM Command or Data Register	Read / Write
Base + 11h	CD-ROM Status Register	Read Only
Base + 12h	CD-ROM Reset Register	Write Only
Base + 13h	CD-ROM Enable Register	Write Only

DSP Command Listing

I decided not to give the usual listing of DSP commands because all tables and possible modes can be found in the SB16 and Compatibles Hardware Programming Manual available from Creative Labs at www.creatif or www.soundblaster.com.

Contact Information

I just wanted to mention that everything here is copyrighted, feel free to distribute this document to anyone you want, just don't modify it! You can get a hold of me through my website or direct email. Please feel free to email me about anything. I can't guarantee that I'll be of ANY help, but I'll sure give it a try :-)

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