Buying an Amiga in the Year 2017

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1 Introduction

This article article provides information about how to buy an Amiga in the year 2017 for writing code, playing games and listen to music. It is intended for people like me who used the Amiga computer as a gaming device in their childhood, grew up, became developers, still like Commodore and want to get in touch with their old machines again. Therefore, this article sums up my experiences in choosing the right machine. Afterwards, the reader should be able to avoid the pitfalls I went into.

The desire to buy an Amiga grew through several years since my youth. When I was a kid, me and my friends loved video games. In my neighbourhood, people had an *Atari 2600*, *C64*, *Game Boy*, *Nintendo Entertainment System*, etc. Some kids also had an Amiga but I was a console guy. Nevertheless, I was always fascinated by these machines because:

- Their graphics and sound capatibilities were better than my Nintendo Entertainment System or my dads IBM-PC.
- In contrast to consoles, you could write your own software, install a tracker to compose music, etc.

It combined the best of two worlds: You could play awesome games but still enjoy the freedom of a personal computer to be creative. And besides games, there was the demo scene which designed beautiful animations and good music. Unfortunatly, I never got an Amiga, grew up and almost forgot about Commodore. Later at university, I did alot of low level stuff for microcontrollers. Due to the internet, it became possible not only to download the corresponding data sheets, but also technical specifications, programming tutorials and development tools for old gaming consoles. Therefore, I started some home brew projects for the *Atari VCS* and *Nintendos Game Boy* [1][2].

Afterwards, I wanted to write a simple game or demo for the Amiga. I love to see my code running on real devices. Therefore I did some research about Amiga models, their architecture and hardware development since Commodores bankruptcy. I planned to buy a device, upgrade its RAM, install the most state-of-the-art *AmigaOS*, play my old games, write code, have fun with trackers and see what else could be done. At this point, my journey began and is described by this article.

2 Choosing an Amiga

Back in the days, me and my friends used an *Amiga 500*. It ran with 512 KB of RAM, AmigaOS 1.x [3] and a 320x256 pixels, non-interlaced display mode on our 1084 monitor [4]. When I planned to buy an Amiga, I saw screenshots with much more advanced desktops and wanted to have something comparable myself. Unfortunatly, many Amiga

models and platforms exist and it is necessary to have a basic understanding of their features. Otherwise, you risk being disappointed after buying the wrong model which lacks certain graphic capatibilities. Personally, I had the following requirements:

- Run a broad range of games.
- Watch old and new demos.
- Use software for productivity like development, IRC, word processing and music.

The next sections discus Amiga models and their features to derive a device which fits the requirements above. Afterwards, I will present some example configurations to give you an idea what to expect when buying a certain device.

2.1 Model Overview

Basically, two categories exist: *Classic Amigas* and *Next-Gen Amigas*. *Classic Amigas* were produced by Commodore until 1994 and afterwards by Escom for a short amount of time [5]. They can be divided into two categories:

- *Low End* Amigas house the keyboard and CPU in one shell. Their upgrade capatibility is limited. Some devices have an expansion slot, a trapdoor slot or an IDE connector. The following models exist: A500, A500plus, A600 and A1200.
- *Desktop* Amigas come in a desktop or tower chassis. Popular models are the A1000, A1500, A2000, A2500, A3000 and A4000. They contain internal expansion slots (except the A1000) which allow users to add multiple cards and therefore a broad amount of new features. Furthermore, it is possible to extend them with internal compact disc or floppy disc drives. The drawback of the Amiga desktop models is they are less widespread. Due to this, they are sold at a higher price and less people may be able to help if a problem with an A3000 occurs compared to a more common A1200 machine.

Classic Amigas use a Motorola CPU. Graphics and sound come from a custom chipset which made the Amiga superior and ahead of its time. *AmigaOS* is supported until version *3.9*.

After Commodores demise, its technology and trademarks were sold. Because of this, new Amiga models and AmigaOS versions are still released by the corresponding owners. They are called *Next-Gen Amigas* and utilize a PowerPC CPU instead of Motorolas 68k processor. Furthermore, modern graphic processing units, audio hardware and USB connectors are supported. Classic Amiga software is emulated. On the hardware side, devices like the *Amiga One* exist but PowerPC-based Macs or PowerPC accelerators cards for classic Amigas are used as well. On the software side, AmigaOS 4.x

or MorphOS are available as next-gen Amiga operating systems. They have a modern architecture, support office products, provide enough CPU speed for cryptographic algorithms and therefore can be used for daily work as a Linux, Mac or Windows alternative. A next-gen Amiga screenshot can be found in figure 1.

Figure 1: AmigaOS 4.1 Desktop [6]

2.1.1 Custom Chipset

The custom chipset in classic Amigas consists of three units: *Agnus*, *Denise*, and *Paula*. They are responsible for video processing, audio, memory access, etc. This chapter focusses on their graphical capatibilities because they have to be taken in mind when chosing a proper Amiga model. Giving a brief introduction of the graphical performance is difficult because it supports several display modes. Due to this, this paper emphasis is on normal operation. Audio does not differ significantly on newer chipset revisions therefore it is less interesting and not part of this tutorial.

The first custom chipset manufactured by Commodore is called OCS (Original Chip Set) [7]. In normal operation, each pixel can use up to 32 unique colors selected from a 4096 color palette. OCS was succeeded by ECS (Enhanced Chipset) which bought minor graphical enhancements. The final commercial release is AGA (Amiga Advanced Graphics Architecture) which is capable of 256 colors per pixel selected from a 16,777,216 colors palette.

Besides the colour palette, the display resolution is an important aspect. Games usually switch to PAL or NTSC which are supported by every existing custom chipset. However, the workbench offers more advanced display modes. They are suitable for word proces-

sors, source code editing, etc. With a proper display driver, the AGA chipset is capable of 1024x768 in interlaced mode. Higher resolutions and colour palettes consume memory and decrease responsiveness. Therefore, a memory upgrade should be considered if you want to use them.

Custom chipsets are downwards compatible. Unfortunatly, there exist older software titles which have problems running on AGA based Amiga models. On the other hand, games or demos which rely on AGA features are not compatible to OCS/ECS systems. Due to this, no matter which chipset is chosen some software may not work on the corresponding machine.

2.1.2 Expandability

As already mentioned in the former section, especially RAM is important if you want to use a higher resolution for productivity and still be able to launch software titles. Unfortunatly, most stock Amigas contain 512KB to 2MB of RAM, no network access, data has to be transferred with floppy disks and internal hard drives are missing.

Therefore, expansion cards exist. They provide SVGA resolutions with 24 bit color depth per pixel, increase the device memory or add a faster CPU. Adding lots of additional hardware to low end Amiga models is difficult due to the limited amount of space and expansion slots. Nevertheless, turbo cartridges for their trapdoor slots are very popular which extend low end models with RAM, a faster CPU or an FPU. Some low end Amigas also contain PCMCIA and IDE connectors which can be used add a hard drive, exchange data with a compact flash card or an ethernet connection.

If you still want more hardware features, pushing low end Amigas to the limits with new graphic accelerators or even a PowerPC coprocessor [8][9] becomes challenging. The corresponding hardware is rare, expensive and the additional processing power caused by higher clock rates increases temperature as well. Therefore, a cooling concept for low end Amiga cases becomes necessary.

Because of these disadvantages, Commodore manufactured desktop models which come in a desktop or tower chassis. They provide multiple expansion bus slots like *Zorro* [10] which can be used to connect advanced graphic accelerators. Besides higher resolutions, expansion cards exist which add hardware support for MP3 decompression, ISDN, USB ports, PCI, ISA, etc.

2.1.3 Monitors

No matter which Amiga model you use: Higher resolutions require proper monitors. Unfortunatly, you can not connect modern displays to an Amiga because it creates a video signal with 15 kHz HSync. To be more precise: Amigas like the A1200 support

30 kHz HSync modes too and you can activate them while running AmigaOS. However, most games take over your video hardware and use 15 kHz PAL/NTSC mode instead. This means, you can connect a modern LCD display to a classic Amiga with a simple adapter and run the workbench but games will not work properly. Therefore, additional hardware is necessary which is called *Scandoubler*. It converts the video output into a 30 kHz signal.

2.2 Recommendation

My first problem was to decide whether to get a next-gen or a classic Amiga. I have chosen a classic device. Although next-gen models are great machines, they have a completely different PowerPC-based architecture than the classic Amigas I grew up with. Of course they run old software on an emulation basis as well, but each Windows or Linux PC can do the same. Furthermore, I wanted to execute games and demos on real hardware.

Classic Amigas can be turned into a next-gen device and run Amiga OS 4.1 as well. My idea was to install AmigaOS 4.1 as a second operating system and play around with its impressing graphic capatibilities as a part of further work. I learned that this is not an easy task: There is a Youtube video with an A1200 booting into a next-gen OS [11]. It also reveals the Amigas mainboard and shows a heavy amount of upgrades. The graphic performance of the classic chipset is limited and Motorola CPUs are not supported by modern Amiga operating systems. Therefore, an additional graphics accelerator and a PowerPC turbo cardridge are installed. This leads to several problems:

- The hardware upgrades deactivate many parts of the original Amiga.
- PowerPC turbo cartridges are rare and very expensive (about 1.000 Euros).
- The original A1200 case is removed and the whole device lives in a tower or desktop chasis.

Basically, not much is left of the original device. Instead, you have to rely on old and expensive hardware. Therefore, my advice is: If you are impressed by AmigaOS 4.x screenshots, plan to play around with it or even replace your desktop PC, buy next-gen hardware like an AmigaOne. If you are interested in the original Amiga, write Motorola code, run custom chipset games or demos, buy classic hardware.

After deciding to buy a classic Amiga, one question remains: Which model to choose? As described in the previous sections, I want to be able to play a broad range of demos, games and productivity software on an increased Workbench resolution. Based on these requirements, the following features are necessary:

- A RAM upgrade to be able to run a workbench with an increased resolution, productivity software and a game in memory at the same time.

- A hard drive with more than 1GB of space to store my software library and avoid switching floppy disks.
- Installation of a flicker fixer to use a decent monitor.

The good news: During my research, I found addons for almost every Amiga model to fit the requirements above. Personally, I prefer newly produced hardware because of its higher reliability. Here are some examples:

- The *Indivision ECS* is an internal flicker fixer which is mounted on an Amiga circuit board. It is compatible to A500, A500+, A1500, A2000 and A3000 devices.
- The *Indivision AGA 1200 MK2cr* is a flicker fixer for the A1200 and A4000.
- The *A508IDE* is an internal A500/A2000 cardridge with up to 8 MB of RAM and a compact flash connector as well.
- The *ACA-1233n* is an accelerator for the A1200 which adds a 68030 CPU and 128 MB of RAM.

No matter which Amiga model and hardware upgrades you choose: Planning is important. You want to use a bootable hard drive? In this case, you have to buy a model which contains kickstart version ¿2.05 or at least upgrade the ROMs manually. You are interested in a workbench with a higher resolution and increased colour palette? Consider buying an AGA Amiga or a desktop model which allows you to add an advanced graphics accelerator. If you plan to use a memory extension and PCMCIA cartridge at the same time, verify that your additional memory is not mapped into the PCMCIA memory range. You plan to install more than one internal upgrade? Will they fit into a low-end Amiga chasis? Finally, read the *WHDLoad* [12] documentation and its requirements to run the software you need (*WHDLoad* allows you to start old software titles from a hard drive which were originally designed to run only from floppy disks).

One last thing: This paper does not cover the *Vampire II* accelerator [13]. It is an impressing peace of hardware based on an FPGA which adds RAM, a fast CPU and advanced graphics. But as mentioned above, my goal is to get a device which mainly relies on the classic Amiga hardware like the custom chipset. The *Vampire II* disables parts of the mainboard and processing is done inside the FPGA. Nevertheless, if that is ok for you, a single *Vampire II* is all you need to to turn a stock Amiga into a very fast and powerful machine.

2.3 Example Configurations

The previous sections give a general Amiga introduction and hardware requirements for a modern desktop experience. This chapter describes two system configurations to give you a better idea what to except when you buy a certain device.

Figure 2: AmigaOS 3.9 Desktop on an Amiga 1200

2.3.1 Basic

This configuration is based on an Amiga 1200. Figure 2 shows its desktop. The Amiga contains a *ACA 1233n* turbo cartridge which adds 128 MB of RAM and a 68030 CPU. A four GB compact flash card is connected as a hard drive to its internal IDE slot. A *AGA Mk2 CR* allows you to use a modern display using a DVI port. The workbench has a 640x512 PAL resolution (HiRes No Flicker) with 64 different colours per pixel. A floating point unit is missing. It runs almost everything of my gaming library, a word processor, an assembler to write code, a player for MOD files and a tracker to compose music. Listening to MP3s or using a browser works slowly (especially when loading images) and pushes the CPU to its limits. Increasing the colour palette or resolutions reduces the systems responsiveness sigificantly. Besides adding a faster turbo cartridge, further modifications are difficult because of the limited space in the A1200 chasis. Therefore, if you plan to add more hardware like a graphics accelerator, I recommand sticking to a desktop Amiga.

2.3.2 Advanced

This is an example of a desktop A4000 using a 1024x768 resolution. Its workbench is shown in figure 3. In comparison to the previous A1200, the increased resolution due to an additional graphics accelerator allows a very comfortable source code editing experience. It contains a 68060 which is the fastest possible CPU for classic Amigas and delivers a highly responsive desktop. Another advantage compared to the A1200 is the chasis: You can install many addons, like an ISA bus, MP3 decoder.

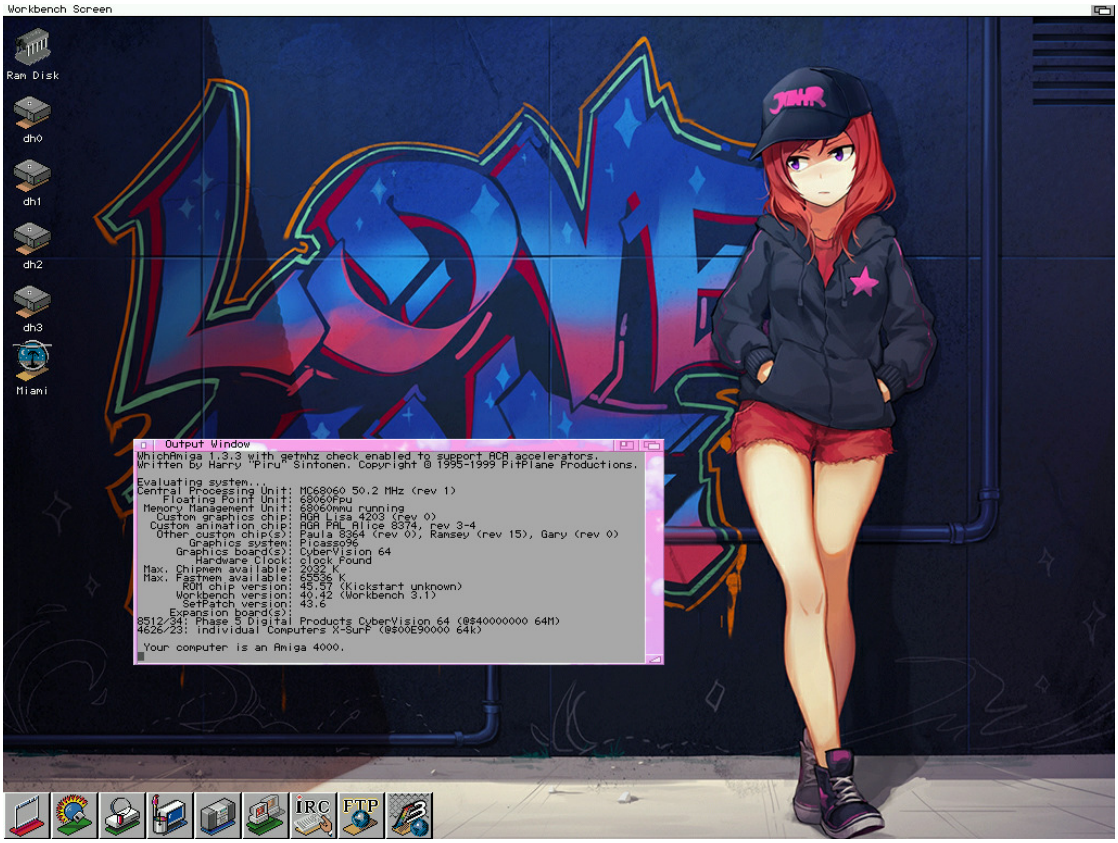

Figure 3: AmigaOS 3.1 Desktop on an Amiga 4000 [14]

3 Acknowledgement

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4 License

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