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COLLABORATORS

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Chapter 1

in

1.1 Accelerators for Beginners

Accelerator Guide for Beginners

1. Amigas and Processors
2. List of Accelerators
3. Processor Differences
4. Choosing an Accelerator
5. Making the most of your Accelerator
6. PowerPC Acceleration
7. Common Problems
8. The Author

1.2 Amigas and Processors

The Amiga at the present uses the Motorola 68000 CISC (Complex Instruction Set Chip) series at the heart of the system. The Amiga Operating System (AmigaOS, Workbench or AmigaDOS) requires this processor as all the programs and OS routines are compiled for that particular chip.

The Amiga has a number of models and each has its own processor, as time has progressed since the A1000, newer models featured faster processors:

Amiga Model	Chip Set	OS	Processor	MHz
A1000	OCS	1.x	68000	7
A2000	OCS	1.x	68000	7
A1500	OCS	1.x	68000	7

A500	OCS	1.x	68000	7
A500+	ECS	2.x	68000	7
A3000	ECS	2.x	68030	16/25
A3000T	ECS	2.x	68030	16/25
A600	ECS	2.x	68000	7
A4000/040	AGA	3.x	68040	25
A4000/030	AGA	3.x	680EC30	25
A1200	AGA	3.x	680EC20	14
CD^32	AGA	3.x	680EC20	14
A4000T/040	AGA	3.x	68040	25
A4000T/060	AGA	3.x	68060	50
BoXeR	AGA	3.x	68040/060	25/40/50
DCE A5000	AGA	3.x	68030-060?	50?

The newer Chip Sets required a faster processor as more colours need to be processed and more data moved around so Commodore selected a 32-bit processor for that task ie the 68020 and above. Commodore also used EC (Economy) versions of some processors which have some features missing, usually no MMU and smaller addressing space.

The faster processor the Amiga can have is the 68060 which is at least 40 times faster than the original 68000.

Although the clock speed hasn't increased that much, the speed has been increased through the use of 32 bit architecture rather than 16 bit, the use of larger and faster caches, inclusion of FPU (Floating Point Units) and MMU (Memory Management Units) onto the chip itself and better memory and instruction processing.

For the Amiga to improve a new processor is to be used. For example, when Motorola finished developing the 68000 range, they designed the PowerPC processor. The PowerPC is a RISC or Reduced Instruction Set Chip which means that it has fewer complex instructions than CISC chips, it has more registers and it can do those instructions much much faster at higher and higher speeds.

For the Amiga to use such a processor requires two things:

1. Programs to be written and compiled for that processor
2. The Operating System has to support and even rewritten in PowerPC code to make full use of the PowerPC chip.

There are three operating systems in use that are written for the PowerPC and they are:

MacOS (System 7, 8)
 Windows NT 3.x (now discontinued)
 BeOS

We have yet to see a version of AmigaOS for the PowerPC. Haage & Partner are developing pOS for the Amiga and that may appear for the PowerPC.

Latest news:

The next generation of Amigas will be based on a brand new chips, better than any Pentium around today! Amigas with OS4 will be developer only machines based on x86 chips for development only using an add on board ready for the end-user

machine in late 1999 based on a 'super chip' yet to be announced!!

1.3 List of Accelerators

For the Amiga to grow and expand, some Amiga companies have produced Accelerator cards which replace your old processor with a faster version. ←

Currently, the AGA machines and the A600 have the best support for accelerators. Accelerators for the older OCS/ECS Amigas are no longer being produced as they are less common and not considered worth while supporting.

There are currently five major makes of Accelerators:

Blizzard by Phase 5
Cyberstorm by Phase 5
Apollo
Magnum
Viper

There are some other makes but they are less common these days and unlikely to be sold anymore. This is NOT a complete list as some older cards may be left out.

Accelerators for A500

Accelerators for A600

Accelerators for A1200

Accelerators for A2000/1500

Accelerators for A3000

Accelerators for A4000

1.4 A500 Accelerators

68020 Accelerators

ICD ADSpeed
68020 14MHz Accelerator.

Viper 520CD
Has a 33Mhz 68020 EC processor with room for 33Mhz FPU, space for a 2.5" IDE hard disk, 2 x 40 pin CD ROM socket and 8MB of RAM on board.
Includes 3.0 ROM and software.

Solid State Leisure A5000
Includes a 16.67 68020 processor which uses 256x4 DRAMs (total of 4 1MB

chips ie 5MB). Doesn't autoconfig or use DMA.

Supra 28 Turbo

Uses a 28MHz 68HC000 processor with high speed static RAM cache. Fits on the side expansion slot. Also, compatible with A2000.

68030 Accelerators

GVP A530

Includes a 40MHz 68EC030 processor with room for FPU and uses GVP SIMMS. Includes a on/off switch with turns off the 030/RAM and HD for backward compatibility. Up to 16/32 MB RAM.

Derringer 030

Uses a 25MHz 68030 processor with optional 25/50Mhz FPU and upto 32MB of RAM using one 32 bit SIMM.

68040 Accelerators

Progressive Peripherals A500/040

This includes a 25Mhz 68040 processor with 4 or 8 MB 32-bit ZIP Fast RAM. Requires KS/WB 2.0 to work.

1.5 Accelerators for A600

68030 Accelerators

Viper 630

Has a 33Mhz 68030 processor and FPU. One SIMM slot for upto 32MB of RAM.

1.6 Accelerators for A1200

68020 Accelerators

Blizzard 1204 or 1220/4

Has a 28MHz 68020 processor with optional FPU and upto 8MB RAM.

M-Tec T1230/28 RTC

Hasa 28MHz 68020 processor with 1 SIMM Slot, optional FPU and SCSI-II card.

Viper 620

68020 14Mhz accelerator fitted over the 68000, allows for 4MB SIMM RAM.

68030 Accelerators

Apollo 68030

Has a 25, 33 or 50MHz 68030 processor and room for a FPU. One SIMM slot for upto 64MB of Memory.

Blizzard 1230-II

Has a 68030 40 or 50MHz processor, optional FPU, upto 64MB RAM in 2 SIMM

slots and optional SCSI-II card.

Blizzard 1230-IV

Has a 50MHz 68030 processor and room for a FPU. One SIMM slot for upto 128MB of Memory. Inbuilt MMU. Optional SCSI II card with 2nd SIMM slot.

CSA 12-Gauge

Includes a 68030 50MHz processor with max of 32MB of RAM. Optional non-DMA SCSI card.

GVP 1230-II

Uses a 40/50MHz 68030 with 2 SIMM slots for GVP RAM only, 32MB RAM. Optional SCSI card.

Magnum 68030

Has a 40MHz 68030 processor and room for FPU. Upto 32MB of RAM can be added and there is an optional SCSI II card.

Microbiotics MBX1230

Has a 33MHz 68030 processor with one SIMM slot for upto 128MB RAM, optional SCSI card. (Not autoconfiguring)

Paravision MBX

Uses a 28/33/50MHz 68030 with one SIMM slot for upto 32MB RAM. SCSI option. (Not autoconfiguring)

Viper MkII

Has a 40MHz 68030 EC processor and room for a FPU. One or two SIMM slots for upto 64MB of Memory. No MMU.

68040 Accelerators

Apollo 68040

Has a 25 or 40MHz 68040 processor. One SIMM slot for upto 32MB RAM. Optional 2nd SIMM (32MB) and SCSI II card.

Blizzard 1240/TERC

Has a 68040 but due to heat problems it was designed for Towered A1200s.

DKB 1240 Cobra

Has a 40MHz 68040 with one SIMM slot for upto 128MB RAM. Optional SCSI-II card.

Magnum 68040

Has a 25 or 40Mhz 68040 processor. Upto 32MB of RAM and optional SCSI II card.

68060 Accelerators

Apollo 1260

Uses a 50/66Mhz 68060.

Blizzard 1260

Uses a 50Mhz 68060. Includes SCSI interface

Magnum 68060.

Has a 50/66Mhz 68060. Upto 32MB of RAM. Optional SCSI-II interface.

PowerPC Accelerators

All of these are dual-processor boards and come with 68040 or 68060 to run the OS functions.

Blizzard 603e PPC

Includes PowerPC 603e at 160/200/240MHz. No SCSI. Upto 128MB of RAM with two SIMM slots. The plus (+) version includes SCSI interface.

1.7 Accelerators for the A2000/1500

68030 Accelerators

2030 Turbo

Has a 25 or 50Mhz 68030 with optional SCSI card.

Derringer 030

Uses a 25MHZ 68030 processor with optional 25/50Mhz FPU and upto 32MB of RAM using one 32 bit SIMM (Compatible with A1000).

68040 Accelerators

Fusion Forty

Includes a 40MHz 68040 processor with 2 SIMM Sockets for upto 4 SIMMS each allowing upto 128MB of RAM. RAM doesn't autoconfigure.

68060 Accelerators

DKB Wildfire

Uses a 50MHz 68060 and includes SCSI, PCI bus, Ethernet and RAM Slots.

1.8 Accelerators for A3000

NB: Some A4000 accelerator cards can be used in the A3000!

68040 Accelerators

GVP G-Force

Uses a 28MHz 68040 with upto 8MB of RAM using GVP SIMMS. Requires 2.04 ROM and Setpatch 38.31 or higher.

PPI Mercury 68040

Uses a 28 or 35MHz 68040 processor with upto 32MB of RAM. Requires 2.04 ROM.

WarpEngine 3040

Uses a 40MHz 68040 processor with SCSI-II controller and RAM expansion upto 64MB RAM.

1.9 Accelerators for A4000

68040 Accelerators

Warp Engine

Has a 28,33 or 40Mhz 68040 processor. Has 4 SIMM slots for upto 128MB of memory. Includes fast SCSI II host adaptor. Will fit in a A3000T

Zeus 68040

Includes a 68040 processor with SCSI-II controller using upto 64MB of RAM. Runs at 28 or 33MHz. Can use 1x8 or 4x8 SIMMS in groups of four.

68060 Accelerators

Cyberstorm II/III

Uses a 50MHz 68060 with 4 SIMM slots for upto 128MB of RAM. Includes SCSI.

GVP T-Rexx 060

68060 Accelerator

PowerPC Accelerators

All of these are dual-processor boards and come with 68040 or 68060 to run the OS functions.

Cyberstorm PPC

Includes PowerPC 604e at 180/200MHz with Ultra Wide SCSI-III interface.

1.10 Processor Differences

68000

16-bit processor (bus is 16 bit, registers are 32bit internally), can address up 9MB RAM. Runs at 7Mhz.

68010

Faster version of 68000 at 14Mhz. Very few differences between it and the 68000.

68020

New 32-bit wide processor running at 14MHz. Has 256 bytes Instruction Caches to speed up instruction flow. Allows a co-processor such as the 68881 or 68882 FPU units. MMU also comes on a seperate chip.

The 68EC020 in the A1200 is a 24bit (rather than the full 32bit) addressing range.

68030

32-bit processor running from 16 to 50MHz. Has Data and Instruction caches and includes Burst mode (reads consecutive bytes very fast).

68030 can use 68881/68882 FPU co-processors. Includes MMU on some versions esp. the 33, 50MHz, the EC versions do not have a MMU.

68040

32-bit processor with in built FPU and MMU for maximum speed efficiency.

Includes two 4K caches for even faster speeds. Clocks at either 25 or 40Mhz. Includes Copyback made which allows cache memory to be written back to main memory (causes problems with self-modifying code).

NB: There is a LC version with no built in FPU unit (mainly occurs on Macs). The FPU has fewer instructions than the 68882 chip and the missing instructions have to be emulated in software.

68060

Similar to 68040 with built in FPU and MMU but has two 8k Caches. Clocks at either 50 or 66Mhz. Last in the 68000 series. Unlike the 68040 which can get very hot, the 68060 uses 3.3V and runs much cooler. Has to emulate some of the 'missing' 64 bit instructions that were present in earlier processors.

PPC 603/604

RISC based processor with speeds of 60MHz to 300MHz+. Some can access Gigabytes of memory. Not compatible with 680x0 at instruction level but with the correct software can emulate the 680x0 at 040 speeds.

1.11 Choosing an Accelerator

Choosing an accelerator is based on a number of factors which may affect your choice:

a) Which model of Amiga you own.

The A1200 and A4000 are well supported with new boards. The older Amigas have a limited choice of accelerators. If accelerating your current amiga is next to impossible then upgrading your Amiga to an AGA Amiga would be advisable. It is unadvisable to run an 040 board on a plain A1200 as the heat produced by the 040 board is quite high, if you do get an 040 then leaving the trapdoor lid off and attaching a fan unit will make it more usable though.

b) What software you are planning to run on it.

Modern games these days now require much faster processors. An 68030 is considered to be minimum specification these days and they are very cheap (<£100). High end Graphics and 3D Rendering work would require a 68060 processor for maximum performance but it is also the most expensive. A 68040 processor would be a cheaper alternative for the best of both worlds (fast but cheap).

c) How much money you are willing to spend.

Always include in the price some memory, an accelerator without any Fast RAM would be like running a Ferrari with no petrol. If you don't own a SCSI card then buying the SCSI interface option should also be considered.

d) What other expansions you have or about to buy

Buying a faster processor is not the only way to get faster speed from your Amiga. AGA is considered to be too slow especially for quality graphics. A good Graphics card is considered to be essential to improve graphics speed. Floppy disk systems are a rare breed these days and a Hard disk is absolutely essential, the difference is incredible once you've installed one.

e) Quality of the accelerator board.

It is important that the accelerator board is well built and that it doesn't crash the Amiga every five minutes. Check that your Amiga can handle a fast new processor, you may have to upgrade some other parts of your Amiga to get the best out of it.

f) Acceleration isn't everything.

An accelerator will improve the speed of the programs but won't improve drive speed or graphics speed. Buying a graphics card will substantially improve graphics performance better than any fast processor. Some programs will benefit more than others such as rendering programs which uses a lot of processor time.

Getting a better accel may actually speed up your drive, especially if you have an IDE drive, that's very dependent on the CPU. After all, the controller used in Amigas can only do PIO (Programmed Input/Output).

1.12 Making the Most of your Accelerator

An accelerator can provide more options and features than your old processor e.g.

Floating Point Unit for math intense applications eg Rendering

Memory Management Unit for Virtual Memory and FastROM (copies ROM image into Fast RAM for speedy access) and using alternative Kickstarts (Soft-kicking).

Workbench provides three methods to control features of your processor:

- a) Early Startup Screen. Allows you to turn off/on caches for backward compatibility with older software esp. games. ←
- b) The CPU command displays your current processor settings and allow you to set them e.g. Caches, Burst Mode, Copyback, FastROM, Traps, MMU etc. You will need a newer version of CPU if using an 68060 processor.
- c) 68040.library. Patches missing CPU instructions esp. FPU functions that exist on the 68882 but not on the 68040. Enabled with Setpatch program.

There are loads of third party programs that can make use of your accelerator:

Processor Based

- a) SysSpeed. Latest benchmark program for all processors inc. PPC (WarpOS only) ←
 - b) AIBB. Old benchmark program. Doesn't work on PPC, 060 requires CPU=68060 tooltype.
 - c) SysInfo. System benchmark and information for older Amigas only. Benchmarks aren't very accurate.
 - d) Speedychip. Speeds up chipmem writes for 060.
 - e) Board216. Recognises 370+ expansion boards.
 - f) BlizKick. Maps ROM into RAM for Blizzard boards
 - g) FastExec. Moves exec.library into fastest memory
 - h) BlizMagic. Softkicker for Blizzard boards
 - i) MCP. Includes some CPU preferences
 - j) System. Preferences program for your CPU.
-

- k) PCM_1_0 Patch Copymem/Quick for 68040
- l) FastROM Enhance 040 system performance
- m) QuickROM Boost kickstart speed on 040/060
- n) 68060-V43 68060 librarys
- o) Make060 Set AFF_68060 flag in ExecBase
- p) CPUBlit Replaces BltBitmap routine
- q) CPUClr31 Replaces BltClear routine
- r) FBlit Replaces Blitter with CPU routines
- s) CPU112 CPU Control utility
- t) Stepdown_10 CPU Degradar system
- u) CacheControl CPU Cache control utility
- v) CPUControl CPU Preferences
- w) SystemPrefs CPU Preferences

FPU Based

- a) TMathTrans. Speeds up FPU mathtrans functions.
- b) FFPPatch. MathFFP FPU speed up patch
- c) MSBPatch. Mathieeesingbas FPU patch
- d) Mult64Patch. 060 patches for UMult64/SMult64
- e) MathPatch. Bug fix for 68040

MMU Based

- a) CheckMMU Check if MMU exists
- b) VirtualMEM Virtual memory utility
- c) FastROM MMU tool to enhance perf.
- d) VMM_3_3a Virtual Memory
- e) MMUList Display MMU tables
- f) MMUX32 Analysis MMU tables and translations

There are some commercial software available for accelerators, some come with the accelerator and some seperately:

- a) CPU060. Newer version of the CPU command which recognises the 060 properly.
- b) CyberPatcher. Replaces missing 040/060 instructions with emulated ones.
- c) 68060.library. Called via a dummy 68040.library to replace missing FPU instructions. Enabled via Setpatch.
- d) OxyPatcher. Commercial 68060 instruction patcher. Faster than other patch programs available and more compatible with some programs.

A lot of programs these days can come in different versions, some are optimised to run faster on newer processors. The installer will allow you to choose the best program to install and in some cases install an FPU version. You can achieve big speed ups upgrading from a 16-bit 68000 version to a 32-bit version 020 or better and you will need an 040/060 version for fpu functions.

1.13 PowerPC Acceleration

The latest Accelerator cards now have PowerPC 603e and 604e Processors as well as 68040/060 processors.

Those who are considering buying one of these cards must realise this:

Standard 68000 Programs will NOT run faster on the PowerPC cards

this is because Amiga programs are written in 680x0 code which the PowerPC cannot run because it uses a completely different instruction set. The Programs must be written specifically for the PowerPC to run on the PowerPC otherwise they will run normally on the 680x0 processor on the card like other 68k accelerators.

There are two different methods of running PowerPC programs on the Amiga.

Phase 5 has a `ppc.library` which has a range of functions written for the PPC including Exec type functions for memory management and 64 bit math functions. PPC programs are loaded via `ELFLoadSeg` which resides in memory.

WarpOS by Haage and Partner is a different system to access the PPC

1.14 Common Problems

1. My machine keeps crashing after installing my accelerator.

There are a number of factors that can cause this to happen, some are hardware related or software related:

Software:

a) You may be trying to use software which breaks under a new processor. This will especially occur with WB 1.3 software, demos and games.

b) You are using a patch program which no longer works or trying to patch some thing which is incompatible.

c) Make sure that appropriate software is installed before attaching the board. Copy the files onto other bootable disks in case of emergency.

Hardware:

a) The accelerator is using too much power. IF using a standard 23W A1200 PSU, it is advisable to remove other devices or upgrade the PSU to a higher wattage.

b) The accelerator isn't fitted properly. You must ensure that the accelerator is plugged in correctly. For the A1200 it may help to dismantle the casing to allow you to fit in the accelerator.

c) The processor is getting too hot and it is shutting itself down (thus causing a crash). Make sure enough air is getting to the processor. It is advisable to leave the trapdoor lid off. If using a 040 or PPC processor that a fan is fitted to the processor to keep it cool. Placing the system in a tower unit will allow for more air to get to the processor. Also, lifting the unit off the desk will allow more fresh air to get to the processor.

If you are using a fan, make sure that it is spinning fully and that it is the right way up (it has happened to one person!).

d) Other hardware is too old or incompatible with the new accelerator card. Check custom chip versions and upgrade them if necessary. Check docs for these things. This will occur on older OCS and ECS amigas.

e) Get the right kind of RAM. Most Amiga accelerators will use 32-bit Paged non-parity SIMM memory. Single sided SIMMs will fit better than double-sided SIMMS (chips on both sides). There are newer types of RAM eg EDO and SDRAM but check with the manufacturer/dealer before buying these kind as may or may not work on your accelerator.

2. My accelerator isn't as fast as it should be.

Check that all the caches are enabled and that other features are enabled. Some features like Burst modes and Copyback can cause problems with some programs. Make sure that if using a Benchmark program, that you are using a more recent version (AIBB and SysInfo won't work on 060 processors).

3. I cannot get older software to work.

Disable some of the new features of the board eg Caches and Copyback are the best ones to disable. Disable AGA for really old games or programs, KILLAGA2 and Degradar are good programs to get for this.

4. The MMU doesn't work on my machine.

The MMU is only used for ROM kicking and Virtual Memory. The 68030 will probably won't have it enabled on processors slower than 50MHz. The 68040 and 060 has it inbuilt. To check that the MMU works, use a virtual memory type program to check eg GigaMem, VMM, VMEM. Anything that says EC or LC do not have MMUs.

5. Can I overclock my processor to a faster speed.

This is possible by replacing the clock oscillator to a faster clock speed. Whether it works and for how long depends the processor. Some can work at faster speeds than others upto 10-15% faster in some cases. So it may be possible to speed up a 25MHZ processor to a 28Mhz clock rate, a 33MHZ to 37Mhz and a 50MHZ to 55Mhz. Bigger clocks speeds may cause you machine to crash as the processor may fail to run at the higher speed, reduce the clock speed if this occurs.

6. Can I replace my processor with a different one directly.

Only if the new processor is pin and volt compatible. For example, it may be possible to replace a 25MHz 68030 with a 50MHz 68030 if the oscillator AND the processor where changed. The chip itself usually indicates the recommended clock speed on the end of the number eg 68EC030-50 for a 50Mhz 030. A 040 and 060 are pin compatible but the 040 runs at 5V and the 060 runs at 3.3V so replacing it is not possible.

1.15 The Author

This guide was written by Peter J Hutchison on a A1200 with Blizzard 1230-IV, 16MB RAM, 1.1GB 2.5" HD, Microvitec 1440, 12x CDROM, ZyFi Speakers.

Disclaimer:

Information in this guide is accurate as far as I know. Any modifications made to your system is done at your own risk. I cannot claim responsibility for any damage caused directly or indirectly by the advice given in this guide.

Other Guides in the series:

Foozle
Workbench1.3
PC Task 4.x
Printer Guide
Upgrading WB
Expanding the Amiga

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