



WinUAE Help 4.0

Official help for WinUAE, the Amiga emulator for Windows

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1. Welcome to WinUAE

[WinUAE](#) is an Amiga Emulator for the Windows platform. It started out as port of the Ubiquitous Amiga Emulator (UAE) and has evolved since then. It is the collaborative effort of a number of Amiga enthusiasts to create a portable Amiga emulator under the [GNU Public License](#). Source code for all UAE versions is available so it can be studied, and help is always appreciated.



WinUAE allows you to run Amiga software in Windows, including games, demos, and applications. General compatibility is excellent, and there are a number of enhancements in WinUAE compared to a standard Amiga computer.

This help will give you information on how to [Get Started](#) with WinUAE, a description of all the [GUI Settings](#), information about the [Emulation](#) itself, and additional information about real Amigas and the creators of WinUAE in the [Background Information](#) section. Also, there is a [How-To](#) section with step by step guides for some common tasks.

The latest version of this file can be found here: [Help file release pages](#). Alternatively, it is also available online.

2. Features

WinUAE is a very feature-rich implementation of an Amiga:

2.1 Chipsets

- A1000 original chipset
- OCS
- ECS (Agnus and/or Denise)
- AGA
- RTG (via Picasso 96)

PAL and NTSC chipset support.

All chipset types have optional cycle-exact emulation mode.

2.2 CPU

- 68000
- 68010
- 68EC020
- 68020
- 68030
- 68040 (including EC/LC)
- 68060 (including EC/LC)
- PPC support

68000 has optional more compatible prefetch and cycle-exact modes.

68020 and higher CPU: optional JIT (Very fast x86 just in time translation) emulation mode available.

68030, 040 and 060 have optional MMU emulation support. MMU emulation is not JIT compatible.

68060 has optional exception emulation for unimplemented integer instructions.

PPC support via CyberStorm PPC or Blizzard PPC boards.

All CPUs also have user adjustable and fastest possible speed options and optional FPU support.

2.3 FPU

- 68881
- 68882
- 68040
- 68060

FPU speed is not restricted, it is always fastest possible.

Optional accurate softfloat mode (v3.4.1) that also emulates all arithmetic exceptions.

68040 and 68060 have optional emulation for unimplemented FPU instruction/datatype exceptions.

2.4 Memory

- Chip memory max 2M (real chipset limit), 8M (UAE only, 24-bit CPU), max 512M (UAE only, 32-bit CPU)

- Fast memory. 24-bit CPU max 8M, 32-bit CPU max 2G/3.5G (*)
- Model specific memory regions supported ("Slow RAM", A3000/A4000 mainboard RAM etc)

*) 64-bit Windows required, 3.5G only possible with 64-bit WinUAE. 32-bit max is 512M.

2.5 Floppy drives

- 0 to 4 floppy drives supported.
- Multiple floppy speed options, compatible, 2x/4x/8x or turbo mode (floppy rotation not emulated, as fast as possible).
- DD and HD drives supported.
- PC Bridgeboard floppy drives (SD/DD 5.25" and DD/HD 3.5")

2.6 Parallel port printer

- Passthrough. Data from Amiga is sent directly to printer. Only works if Amiga native printer driver is available for selected printer.
- PostScript passthrough. Amiga PostScript printer driver and PostScript printer required.
- PostScript emulation. Amiga PostScript printer driver, Windows GhostScript installation. Any Windows compatible printer.
- Epson matrix printer emulation. Emulates 1980/90s de-facto Epson control codes (fonts, positioning, colors, graphics etc..) supported by nearly all programs that had printer support. Any Windows compatible printer.

2.7 Serial port

- Amiga native serial port to host serial port option. Only supports standard 7/8-bit serial protocols, 9-bit serial protocol is not supported by PC hardware.
- Supports all host serial-port like serial ports, bluetooth adapters etc.
- Connect two running WinUAE instances with emulated null modem cable.
- Serial port to TCP socket support.
- Telnet-like serial port to WinUAE log window support.

2.8 MIDI

- Amiga native serial port to host MIDI device option. Automatically used when serial port is programmed to 31200 bps speed.
- Optional MIDI in to MIDI out routing.

2.9 UAEGFX Picasso96 compatible RTG (Retargetable graphics) board

- Configurable 24-bit CPU Zorroll (max 8M) or 32-bit CPU ZorrollIII (max 512M) VRAM.
- Full color depth support, including modes that host OS/hardware don't support (for example 8-bit, 24-bit and big-endian RGB modes)
- All native hardware resolutions available.
- Also supports Amiga common modes that host OS/hardware may not support, for example 320×256.

2.10 Miscellaneous emulator expansions

- Host harddrive directory mounted as Amiga harddrive.
- uaehf.device. Hard disk image support and direct block device support (Physical HD, CF card etc..)
- bsdsocket.library. Amiga TCP/IP stack that uses host's TCP/IP stack.
- uanet.device SANA-II device driver. SLIRP or WinPCap backends supported.

- `uaeserial.device`. Multiport serial device, Amiga side unit x = host serial port COMx:.
- `uaescsi.device`. Access host PC optical drives. SCSI emulation and CD audio supported.

All above harddrive options support Amiga automount and autoboot, even under Kickstart 1.2 and older.

2.11 CD support

- Most popular CD images are directly supported: iso, cue/bin, cue/iso/wav, cue/iso/mp3, cue/iso/flac, mds, chd, nrg. (All sector sizes supported, automatic conversion)
- Compressed images supported, transparent on the fly decompression, no temporary files used.
- Physical CD/DVD/BD drives supported, including CD emulators that emulate CD/DVD/BD drives.
- Multiple emulated CD drives, each with its own CD image, can be used simultaneously.
- Physical drive audio tracks supported, uses real time digital audio extraction, does not require analog audio cables.
- SCSI command emulation, including audio track support using digital audio extraction.
- Hardware ATAPI and SCSI emulation, CD image or drive connected to any hardware emulated IDE or SCSI controller.

2.12 CDTV/CD32 special CD features

- Hardware subchannel (CD+G/CD+MIDI audio CD) emulation.
- Autodetects CDTV/CD32 media in any physical or virtual drive.
- CD32 FMV module (VCD player).

2.13 File support

- Transparent decompression of popular compression formats, supported by all file types, including disk and CD images (zip, 7zip, lzx, lha, lzx, rar)
- Floppy disk image formats supported: adf, adz, dms, ipf, fdi, scp, dsq, st, img.

2.14 Amiga models emulated

Very high compatibility and accuracy:

- A500
- A500+
- A600
- A1000
- A2000
- CDTV

A500 emulation in cycle-exact mode has practically 100% compatibility.

Good compatibility (Cycle-exact chipset emulation, CPU memory accesses are cycle-exact, CPU internal instruction execution speed is not exact):

- A1200
- CD32

Fast CPU emulation only, chipset/chip ram CPU accesses optionally cycle-exact:

- A3000
- A3000T
- A4000
- A4000T

2.15 Customized Amiga based hardware emulated

- Arcadia (A500)
- American Laser Games, including light gun(s) and laserdisc player (A500)
- Cubo (CD32)

3. Bugs

Over the years, WinUAE has been improved to the point where almost all Amiga software ever created runs without problems.

If you have problems to get a certain program working, look at the [links page](#), there are some great resources online which are also frequented by developers.

Still, WinUAE is not perfect, so if you feel you need to report a bug, please use the following type of template with all bug reports:

- WinUAE Version
- Host Operating System (Windows 7, 8, 10 etc.)
- DirectX version
- PC Graphics card and the driver version
- Sound card and the driver version
- AmigaOS version (Kickstart and Workbench)
- Extensions running (MagicWB, NewIcons, DirOPUS, ToolManager, etc.)
- Amiga settings that may have caused the problem

If you made sure your request is still valid, see the [Credits](#) page to contact one of the developers.

4. Links

This page contains links to some useful pages on the Internet.

4.1 All In One Solutions

Amiga Forever	Distribution of Kickstart, Workbench, and emulators
AmiKit	Distribution of fully configured and supported programs, needs Kickstart and AmigaOS to run

4.2 Official UAE Pages

The official WinUAE page	The main WinUAE page - downloads, plugins, etc
E-UAE page	E-UAE Development page
Ubuntu E-UAE Emulator page	E-UAE on Ubuntu Linux
FS-UAE Emulator page	The main FS-UAE page

4.3 Help file

WinUAE Help Online	Online version of the official WinUAE help
vware	Georg's site with freeware projects
pjhutchison.org	Peter's site with FAQs and freeware programs

4.4 Essential Programs

WinPCap	Required for SANA2 networking capability in WinUAE
Picasso 96	Get the latest version of Picasso96

4.5 Helpful Sites

English Amiga Board	If you have questions, ask there
RS232 Cable Information	Offers detailed information about RS232
Patch & HD Installers Page	Page with patches for installing floppy games on the HD

4.6 Extensions/Tools

AmiKit	Pre-configured AmigaOS with lots of freeware programs
AmigaSYS	Pre-configured setup for the emulated Amiga
ADF View	Good Windows program to manipulate ADF's
Disk2FDI	Amiga Disk to FDI format program
ADFopus	Another useful ADF explorer program
EasyADF	ADF transfer tool
AmigaTrans	Another data transfer program
WHDLoad	Hard-disk install package
HRTMon	A prominent monitor tool for AmigaOS

4.7 Original Amiga

Amiga Wiki	Extensive information about Amigas
Aminet	The largest archive of Amiga software
Amiga News	Multilingual Amiga news site

4.8 Shops

Individual Computers	Shop in Aachen, Germany with other offices world wide
AmigaKit	Shops in UK, Europe, USA and Canada

4.9 Other Emulators

WinFellow	The second Amiga emulator out there
PearPC	PowerPC architecture emulator
ShapeShifter	A 68k Mac emulator for AmigaOS

5. Glossary

Computer sciences have spawned many awkward terms and acronyms which are often hindering novice users to understand how-tos and manuals. Emulation has some terms of its own, as does the Amiga, due to its unique hardware design. This page aims to explain the most common terms.

5.1 Computers

Term	Explanation
BIOS	Basic Input Output System. Initializes the PC hardware in order to prepare the machine so programs can be run.
Bus	A subsystem that transfers data between computer components inside a computer or between computers.
CPU	Central Processing Unit. Also referred to as the "processor", all calculations are done in this unit.
FPU	Floating Point Unit. In the early days, this was a separate unit used for floating point calculations. Nowadays integrated in the main CPU.
RAM	Random Access Memory. Main type of storage for a computer to work with. It is by nature volatile memory, i.e. it gets cleared when the computer is shut down. For WinUAE RAM emulation, see RAM & Kickstart .
ROM	Read Only Memory. Most commonly used to store Firmware, Kickstart, and BIOS programs. In contrary to RAM, it is not volatile.
ZIP	The world's most-used compression format, tools for handling these files can be found almost on any computer system.

5.2 Amiga Specific

Term	Explanation
AHI	Audio Hardware Interface, see Emulation Speed .
AGA	Advanced Graphics Architecture, see Custom Chips .
Autoconfig	Method for configuring Amiga expansion cards. Mostly equivalent to Plug&Play in the PC world Autoconfig .
Blitter	Graphics coprocessor, see Custom Chips .
Copper	Graphics coprocessor, see Custom Chips .
DMS	DiskMasher archive, stores the contents of entire disks. Supported by DiskMasher and ADFOpus.
ECS	Enhanced Chip Set, see Custom Chips .
HAM	Hold And Modify, see Custom Chips .
Kickstart	The most basic program used to start up an Amiga, mostly equivalent to the BIOS in the PC world. See RAM & Kickstart .
LHA	The most common compressed file format on the Amiga and Aminet.
LZX	File archiver and format for the Amiga, released in 1995.
OCS	Original Chip Set, see Custom Chips .
Paula	Amiga custom hardware, See Custom Chips .
Zorro	Zorro is the standard bus for expansions in Amigas. See Zorro Bus .

5.3 Emulation Specific

Term	Explanation
ADF	Amiga Disk File, used to store raw information from a single Amiga floppy disk.
ADZ	ADF files compressed with the GZIP algorithm. Many archive applications are able to unpack this format, and WinUAE handles it natively.
JIT	Just In Time [Compiling]. Gives a huge boost to emulation speed, see JIT - Just In Time .

5.4 Technology

Term	Explanation
PAL	Phase Alternating Line, television system used in large parts of the world. 576 lines, typically 50Hz.
NTSC	National Television System Committee, TV system used mainly in the USA and Japan. 480 lines, 60Hz.

6. FAQ

6.1 Where can I get the latest WinUAE?

Have a look at our collection of [official UAE sites](#).

6.2 What version of Windows is supported?

Windows 7 SP1 is the absolute minimum. See [Requirements](#).

6.3 Can a PC read Amiga floppy disks?

Yes, if you have two floppy drives and the new [Disk2FDI](#) program which will read Amiga Disks and write it to FDI format which is compatible with WinUAE.

For the PC to read Amiga disks directly, extra hardware will need to be purchased which can read (or write) Amiga disks easily. The ISA Catweasel floppy controller can be used on the PC to read (or write) Amiga disks. Further information is available from the web site at [Individual Computers](#).

6.4 How can I troubleshoot AmigaOS startup?

Start UAE and immediately press both mouse buttons when the main window is shown. In the Amiga Early Startup select "Boot without Startup-Sequence", try disabling drivers or settings that may cause the problem.

6.5 What are ADFs, ADZ, LHA, LZX, DMS, ZIP and Z files?

Compression or disk image file formats. Please check our [Glossary](#) for explanations of these acronyms.

You can download all the Amiga (de)archivers from here: Amiga Archivers for use within WinUAE or try X-Arc from [Aminet](#) for use in Workbench.

6.6 Can I emulate a Hard Disk?

Yes, that is possible. You can either specify a directory on the PC's hard disk e.g. C:\UAE\AmigaHD or you can specify a hard file. The advantage of a directory is that you can copy files directly from the PC site into the directory for immediate access by the Emulator. For hardfiles you can use the Amiga's long filenames, file comments and protection flags. For a hard disk to be bootable, make sure you copy the whole Workbench disk including hidden directories. Some programs work better with Hard Files than directories.

For more information see [Hard Disk](#) page.

If using Workbench 1.3, it is now possible to use HardFiles if you copy the FastFileSystem file to the WinUAE ROMs directory first (0.8.22r1 or later).

The HDF may not be recognized on boot, in which case, boot off a WB2 or later disk to format it, then WB1.3 can then see it.

6.7 Why does the uae_german keymap not support µ or € Symbols?

Recommended is the use of `german_keymap_new.zip` and input set to anything other than compatibility mode.

6.8 What are the differences of CD drivers?

AsimCDFS:

- Fails if you mount more than 1 CD drive (all devices show the same CD content)
- Seems to be a bug in AsimCDFS, because it happens on real Amigas as well

CacheCDFS:

- Set the MaxTransfer size to 0x10000 (65 kb) in the mountfile
- This makes cacheCDFS work and not display read/write error Requesters

6.9 Why does WinUAE not accept my hardfiles or show only CLI with my standard configuration?

This happens if another instance of WinUAE is running. It is not allowed to use the same hardfile with multiple WinUAE sessions at the same time. In very rare situations a crash could happen and prevent WinUAE from releasing the hardfile. In this case, free the file manually or reboot Windows. If WinUAE takes long to boot you can switch on drive LEDs in the GUI. If the hard drive LED is on you know the hardfile is valid.

6.10 I have several Amigas - can I use the Kickstart from them?

Follow the instructions on the [Create Image Files](#) page.

6.11 After resuming from hibernation, the Amiga clock shows the wrong time?

Use the Amiga program [timehack](#) to fix this.

6.12 Can I use native Amiga Hard Disks with WinUAE?

WinUAE 0.8.22 or later can read Amiga Formatted hard disks directly via the Hard Drives tab on WinUAE. Click on Add Hard Drive and it will list any connected Amiga hard drives or any empty hard drive space to add to WinUAE. On older emulators, you could only access hard disks via the ADFS file system on Linux or a third party program such as ADFOpus.

6.13 Can I access Amiga CDs via the Emulator?

Yes, Amiga CDs use the same file system for CDs as the PC i.e. ISO9660 except that it uses the Rock Ridge extension for long filenames, PCs use a file system called Joliet for long filenames. CacheCDFS can read all these formats.

There are two ways to access Amiga CDs:

- On the Hard Drive screen of WinUAE, click 'Add Directory' and then enter the volume name of the CD and the drive letter of the CD-ROM drive e.g. D: (without the slash). Use the Diskchange <device> command in a Shell if you change CDs (type Info for list of devices).
- You can install the CacheCDFS CD-ROM drivers from either AmigaOS3.9 CD or a third party driver such as AmiCDFS. You need to enable uaescsi.device on the Misc tab before starting WinUAE and enable Logging to determine the Unit numbers (see WinUAEllog.txt file) for your CD-ROM drive. When you install the drive make sure the device is uaescsi.device and the unit numbers match the unit numbers in the log file.

6.14 What limitations can I expect from using WinUAE?

Depending on your hardware and operating system, none, really. WinUAE exceeds the capabilities of most hardware Amigas.

6.15 Can I use the mouse wheel?

Yes, but like on a real Amiga, you need the Freewheel tool from AmiNet.

6.16 How do I create a blank disk for saving files or games?

Go to the [Floppy Drives](#) and click the button "Create Standard Floppy" for use in Workbench or use "Create Custom Floppy" for some games to save files to.

6.17 I have all my floppy drives full, how do I change disks?

Use the [keyboard shortcuts](#) to change disks directly or press F12 for the full GUI. Also, be aware of the [Disk Swapper](#) mechanism, which makes this task much less tedious.

6.18 How do I save the current "State" of a game?

Press F12, go to the Misc screen and click 'Save current state' which will save the state as a .USS file. Use 'Load a save-state snapshot' to load state file. There are also [keyboard shortcuts](#) available.

6.19 Why should I buy Amiga Forever CD or AF Online?

Unless you have access to a real Amiga, or have bought a Kickstart and Workbench disks, there is no other legal way of getting the OS for your emulation. The software is the property of Amiga Corporation and only they can license it to companies. Cloanto have a license to distribute Amiga Emulation with Kickstart ROM files and Workbench images from CD or from their web site. The CD also includes some popular Amiga Software, a complete Workbench hard disk setup, MPEG videos of Jay Miner's speech and the Deathbed Vigil (last days of Commodore), Amiga Explorer network program etc. You can also boot from the CD direct into the Emulator without the need of a host OS using KX Light.

For easy access, you can download the online version for as little as \$20, you get Kickstart and Workbench 1.3 and 3.0, PPaint 7.1, an easy setup menu system, Amiga Explorer and the Emulation programs themselves. These would cost a lot more if bought separately. For beginners, it is ideal to set up an Amiga on your PC within minutes than having to search the web for them and fiddle with setups to get it to work!

To check it out and get your copy visit [Amiga Forever](#).

6.20 Can I access the Internet through WinUAE?

Yes, you can through the PC's Internet connection by enabling the **BSD socket library support** feature on the [Expansions](#) page in configuration.

6.21 How can I make or see inside ADF files without using an emulator?

You need ADFOpus or ADFView which will allow you to create and explore and manipulate the contents of Amiga Disk Format images easily. ADFOpus also features a DMS-ADF-ADZ image converter as well. Both tools can be found in our [links section](#).

6.22 Why does my program / game not work correctly?

First make sure your UAE configuration matches the game's requirements. Very old games depend on specific versions of Kickstart, processor and memory. See [Example Configurations](#) for a list of the most common Amiga configurations. If you still have problems then download a patch from the [Patch & HD Installers Page](#) or [WHDLoad](#), which can degrade the Amiga to such a state that the program will run correctly. You will probably need to get the latest AmigaOS Installer from [Aminet](#) to install these tools.

6.23 Where can I download a good Workbench set up with useful programs?

Get the latest [AmiKit](#) which includes Directory Opus and many utilities including AmiStart, AMPlifier, Antiword, Apdf, AWeb, ClassAct, Eagleplayer, EvenMore, FFmpeg, FreeDB, HippoPlayer, Hollywood Player, HomeBank, IBrowse, ixemil, KingCON, MagicASL, MagicMenu, MCP, Midisplay, MUI, NetSurf, MUIBase, NewsCoaster, PerfectPaint, Picasso96, PFS III, Scalos theme, ScummVM, ShowAmiga96, StormMesa, SysInfo, TTEngine, twittAmiga, Warp3D, XPKMaster, YAM, and many others.

6.24 When I run WinUAE, I get an error DINPUT8.DLL not found?

Please update your OS and WinUAE. If you are intentionally trying to run an old WinUAE version on an outdated Windows, you need DirectX 8 or later installed. Run DXDiag.exe to see what version you have installed.

6.25 How do I create a bootable floppy (real or ADF)?

There is a dedicated [guide](#) for this.

6.26 I have a Workbench disk but no Install disk, how do I install Workbench?

You can download UAEInstall.adf disk which has some AmigaDOS or Installer scripts to install Workbench for most Workbench versions including 1.3 to 3.1.

If you have the AmigaOS 3.9 CD-ROM, you can boot from the \Emergency-boot folder via the Hard Drives, Add Directory option.

For AmigaOS 4.1 Final Edition, you can find instructions online.

6.27 Is there an emulator for the AmigaOne or PPC processor?

There is a Classic Amiga emulator for the AmigaOne that comes with AmigaOS 4. Winuae 4.0 or later now supports PowerPC (PPC) processors using the CyberStorm PPC or Blizzard PPC expansion accelerator boards, along with Picasso IV Zorro for graphics, Blizzard PPC SCSI-2 HD Controller for Hard disk support.

Unfortunately, you cannot use uaescsi.device, uaenet.device, bsdsocket.library, PC drives or removable drive options as they are not compatible with PPC emulation.

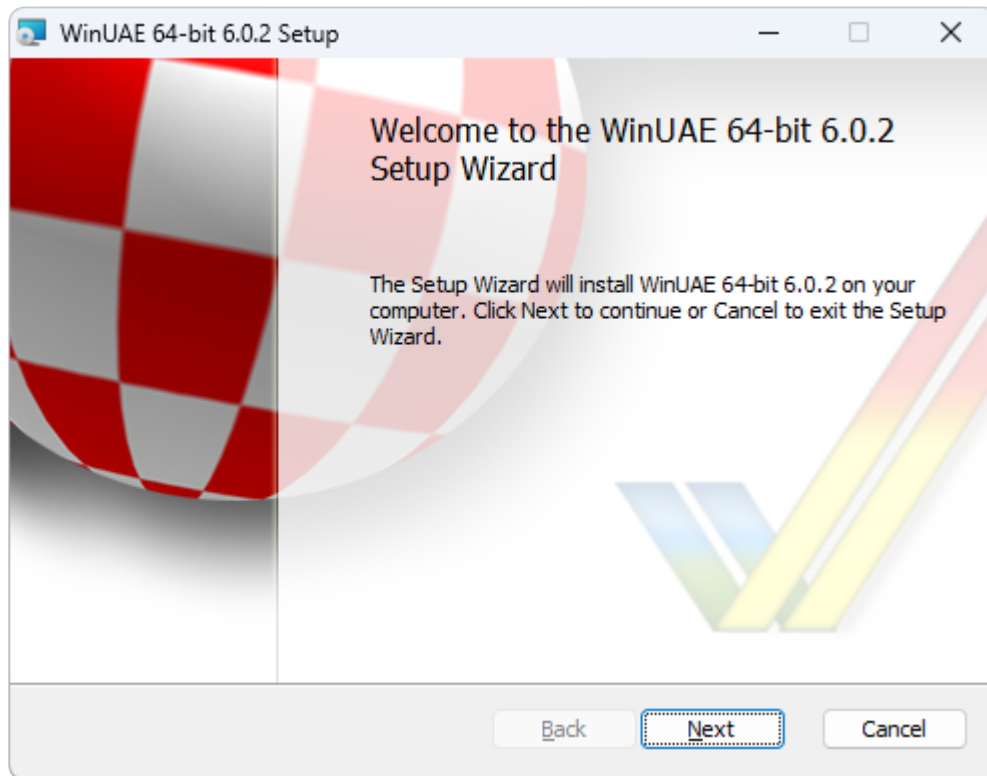
6.28 What is the folder "displaydrivers" for?

These are the picasso96 UAE drivers. It is usually safe to ignore the drawer. The latest Picasso96 installer has working display drivers included.

7. Getting Started

7.1 Getting Started

WinUAE is a complex program that has a lot of configurable options. This section will help getting it running easily.



7.1.1 Topics

- [Requirements](#)
- [Info For First Time Users](#)
- [Example Configurations](#)

7.2 Requirements

7.2.1 Introduction

WinUAE runs on any reasonably current Windows PC:

- Windows 7 or newer, 32-bit or 64-bit (64-bit is recommended)
- A CPU with SSE2 support

Memory is rarely a concern: the emulated Amiga needs only as much RAM as you configure for it. Accurate emulation, especially cycle-exact A1200 or other AGA setups, depends heavily on single-core performance, so a fast modern CPU gives the best results. On weaker machines, using the [JIT](#) compiler will help with performance.

WinUAE 4.2.1 was the last version to support Windows XP SP3 (32-bit only). Users of older Windows versions have to stay with even older WinUAE releases.

7.2.2 Emulation Requirements

WinUAE requires some Amiga software in order to work properly. This software is not included for legal reasons:

- A copy of a [Kickstart](#) ROM. Sometimes referred as a ROM-image, ROM-file, KickFile, or KickROM - has to be loaded by WinUAE on startup, just like a real Amiga would. It can be extracted from an original Amiga with the [transrom](#). Alternatively, a legal copy can be obtained with the [Amiga Forever](#) software package. Kickstarts are supplied on the **Amiga Forever** CD in `\Emulation\shared\ROM`. If you have the **Amiga Classix CD**, you can find a Kickstart version 1.3 ROM file on it.
- The Workbench, which is the Amiga's user interface to manage files and start applications, in other terms AmigaOS.
Workbench disks can be transferred to the ADF file-format used by WinUAE by running the included [transdisk](#) utility. Also, a legal copy of various AmigaOS releases can be found in the Amiga Forever software package.
A larger set of Workbench disks (up to 3.1) can be found on the **Amiga Forever** CD in `\Emulation\shared\ADF` and a full Workbench directory hard disk set up in `\Emulation\shared\dir`.
Workbench or **AmigaOS 3.5 or 3.9** CDs can be purchased from any [Amiga dealer](#) and can be read directly on the PC by WinUAE.

If you have everything you need, continue with the [GUI](#) to configure WinUAE. If the setup of the program is complete and the emulation is working, please refer to [Emulation](#) for information on how to get the most out of WinUAE.

NOTE: Neither WinUAE itself nor this help will point you at illegal content sites, nor will you be provided with copyrighted material by any of the involved people.

7.3 Info for First Time Users

7.3.1 Introduction

WinUAE essentially simulates the Amiga hardware on other computers. Just like a real Amiga, it needs a [Kickstart](#) and Workbench to function. Please read the [Requirements](#) for information about what these are and how to obtain them.

Several Amiga models have been released over the years, hence the complexity of WinUAE: it can emulate everything from the first A1000 right up to the A4000 and even the CD32 gaming console. So you need to know a little about how to configure WinUAE to emulate a specific Amiga model with their small variations in specifications such as memory, CPU, custom chipset, etc.

7.3.2 Basics

The first screen when running WinUAE is the Quickstart section, which offers you an extremely easy way to configure your emulated Amiga. Just select the desired Amiga model you have a [Kickstart ROM](#) for. For your convenience, a comparison table of popular Amiga models is available at the [Examples](#) page.

If using one configuration a lot, save it as **default**, and WinUAE will use this configuration without you having to **Load** it every time.

When your configuration is complete, click the **Start** button to start the emulation. If no hard disk or bootable floppy is found, you may see the Insert Disk screen, press F12 and click on Floppies to change the disk and click OK to restart. If the emulation crashes or fails to boot, press F12, goto Misc screen and click **Reset Amiga** and then OK.

When finished with the emulation you can either press **Ctrl+F11**, close the window, or press F12 and click **Quit** on the bottom left of the window.

7.3.3 Data Storage

Floppy Disks

- Programs and games are usually distributed on floppy disks in a format which PC's cannot read directly. So, these disks are copied into a file called an ADF (Amiga Disk Format). To load an ADF disk, use the [Floppy Drives](#) menu entry.

WinUAE offers 4 emulated disk drives (DF0-DF3), so further floppies may be inserted at any time. Note that a few games assume there is only one floppy drive (DF0) and will only look there. If you need to change disks, press **F12** to load the WinUAE GUI and click on Floppies, select **Eject** next to floppy drive and load the next disk. Alternatively, press END and F1, F2, F3 or F4 to change a disk in DF0-DF3.

Hard Drives

Of course, Amigas can also use [Hard Drives](#). You can either use a normal directory on a PC hard disk to store Amiga files or you can use a hardfile, which is one big file that stores all the Amiga files together. You can also use real Amiga formatted disks as well. To access data on PC volumes, tick **Add PC Drives at Startup**.

- To set up a Directory, click Hard Drives, click Add Directory, then give the disk a device name e.g. DH0, a volume name e.g. System and the location of the directory e.g. C:\AmigaForever\System for example.
- To set up a hardfile, click Hard Drives, click Add Hardfile, under **New Hard File**, enter the size of the Hard file in Megabytes, anything from 10MB to 2GB is possible, click on **Create**, select the location and name of the hard file and click **Save**. You can load an existing hardfile via the **Path ...** button.
- If you have a real Amiga Hard Disk, and it is connected directly to your PC, you can select it from a list via the **Add Hard Drive** button.

CD-ROMs

To set up a CD-ROM drive for access via WinUAE, click on the [Expansions](#) tab and enable the **uaescsi.device**, when you load up Workbench, you need to install an Amiga compatible CD-ROM file system such as CacheCDFS, AmiCDFS, IDEFix and so on. The device name for the **CD0** DosDriver should be UaEscsi.device and the unit number is usually 0 or 1 (if unsure, enable **Create Log file** on the Miscellaneous page and start WinUAE to create a log file and it will tell you what your CD-ROM unit numbers are), see the Icon Information and tooltips to change these values.

7.4 Example Configurations

7.4.1 Introduction

To get you started at emulating Amigas you need to know the configuration of the most popular or frequently used Amigas to get your games or software working.

All the other settings can be set as desired. If using Workbench, it is suggested using as much Fast RAM or Z3: 8-32MB would cover most software applications.

Adding some Fast RAM can help a lot.

For PowerPC Emulation you only use Accelerator RAM, plus a Picasso IV ROM, Cyberstorm or Blizzard PPC ROMs and the qemu-uae.dll plugin.

7.4.2 Real Amiga Examples

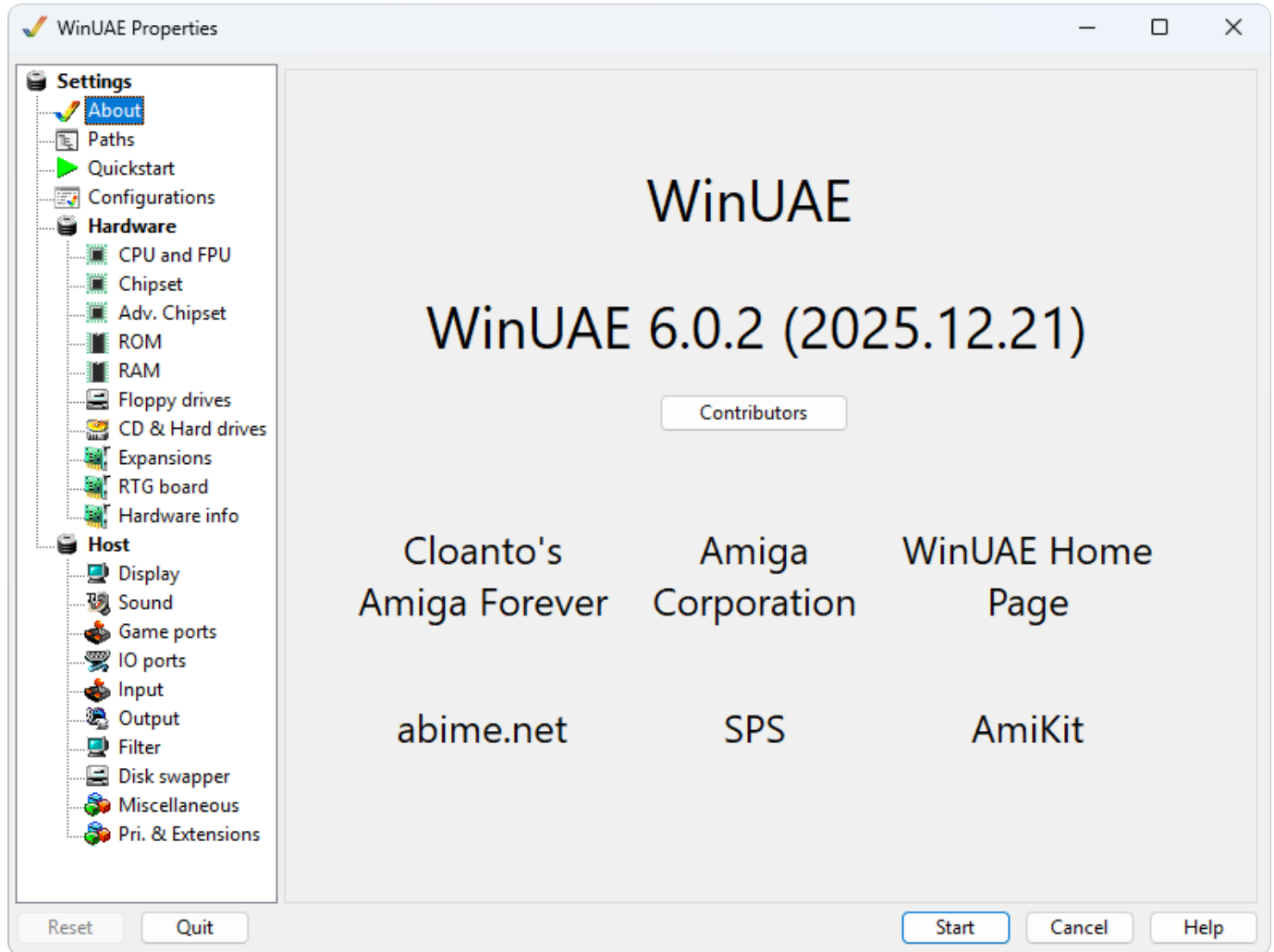
To get you started at emulating Amigas you need to know the configuration of the most popular or frequently used Amigas to get your software working:

	A500	A500+	A600	A3000	A1200	CD32
Processor	68000	68000	68000	68030	68EC020	68EC020
Chip RAM	512kB, 1MB	1MB	1MB	1MB	2MB	2MB
Fast RAM	0 - 8MB	0 - 8MB	0 - 8MB	0 - 8MB	0 - 8MB	0MB
Slow RAM	0 - 1MB	0 - 1MB	n/a	n/a	n/a	0MB
Z3-Fast	n/a	n/a	n/a	0 - 256MB	0 - 256MB	0MB
Accelerator	n/a	n/a	n/a	n/a	n/a	n/a
RTG RAM	n/a	n/a	n/a	0 - 32MB	0 - 32MB	0MB
ROM File	1.2, 1.3, 2, 3.1	2.0, 3.1	2.0, 3.1	2.0, 3.1	3.0, 3.1	3.1 Ext
Hard Drive	Yes	Yes	Yes	Yes	Yes	No
Chip Set	OCS	ECS	ECS	ECS	AGA	AGA
Floppies	880kB	880kB	880kB	880kB	880kB	None
HD Controller	A590	A590	A600 IDE	A3000 SCSI	A1200 IDE	n/a
Network card	n/a	n/a	n/a	n/a	n/a	n/a
RTG Graphics	n/a	n/a	n/a	n/a	Picasso IV	n/a

8. The GUI

8.1 The GUI

WinUAE includes a powerful and fairly complicated Graphical User Interface to manage the various settings and abilities of the virtual Amiga. This section contains descriptions of those settings.

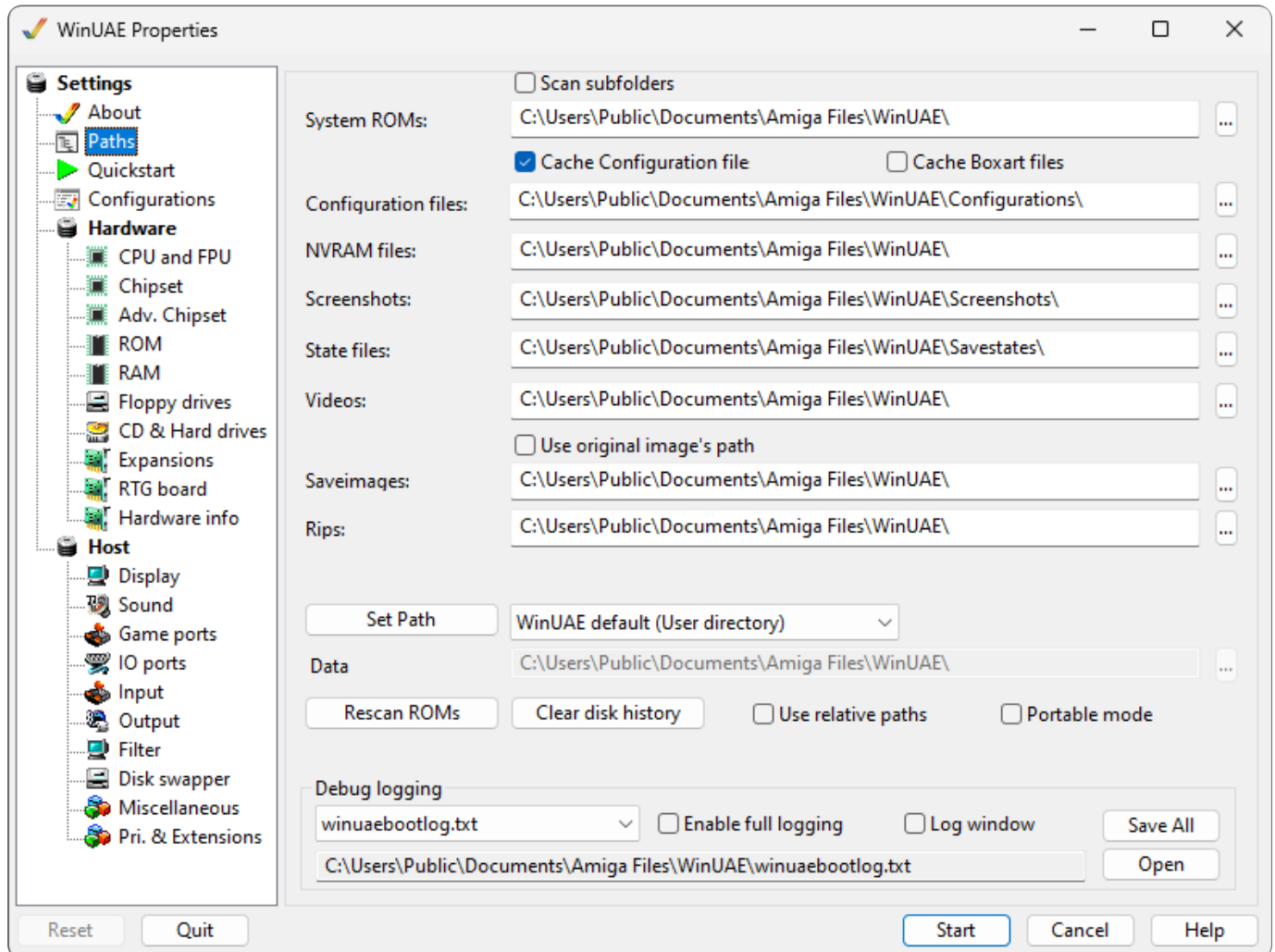


8.1.1 Subsections

- [Paths](#)
- [Quickstart](#)
- [Configurations](#)
- [Hardware](#)
- [Host](#)

8.2 Paths

Here are the default paths for where WinUAE will store configurations, save states, logs and screenshots, but also search for, ROMs. By default, WinUAE stores this in the public documents folder.



System ROMs Location of [Kickstart ROMs](#) needed to boot Amiga. Use **Scan subfolders** to search subfolders for ROMs.

Configuration files Location of .uae [configuration](#) files for different models or configurations of Amigas.

NVRAM files Non-Volatile memory files.

Screenshots Saves screenshots of the Amiga screen, see the [Output](#) tab.

State files Saves memory to a [state file](#). Useful for saving game positions.

Videos Saves [video](#) output to files here.

Use original image's path Use the original paths for images rather than the Saveimage image path.

Saveimages Saves ADF floppy images here.

Rips Saves music and sound ripped files here.

Set Path Resets changes to all paths back to the AmigaForever, WinUAE defaults (User or EXE) or Custom paths.

Data path Path for Winuae data files.

Rescan ROMs Look for Kickstart ROMs on hard disk.

Clear disk history Remove history of disks used previously.

Use relative paths Allows use of relative paths to WinUAE program location for running via USB e.g. .\Configurations, .\Screenshots, those will be relative to the path where WinUAE.exe is located

Portable mode will prevent settings to be written to the system's registry

8.2.1 Debug logging

Debug logging Name of the WinUAE boot log file.

Enable full logging Determines if a full rather than a shorter log file is created.

Log window Display log in a window.

Log path and file name Full path to the log name.

Save All Saves the log file.

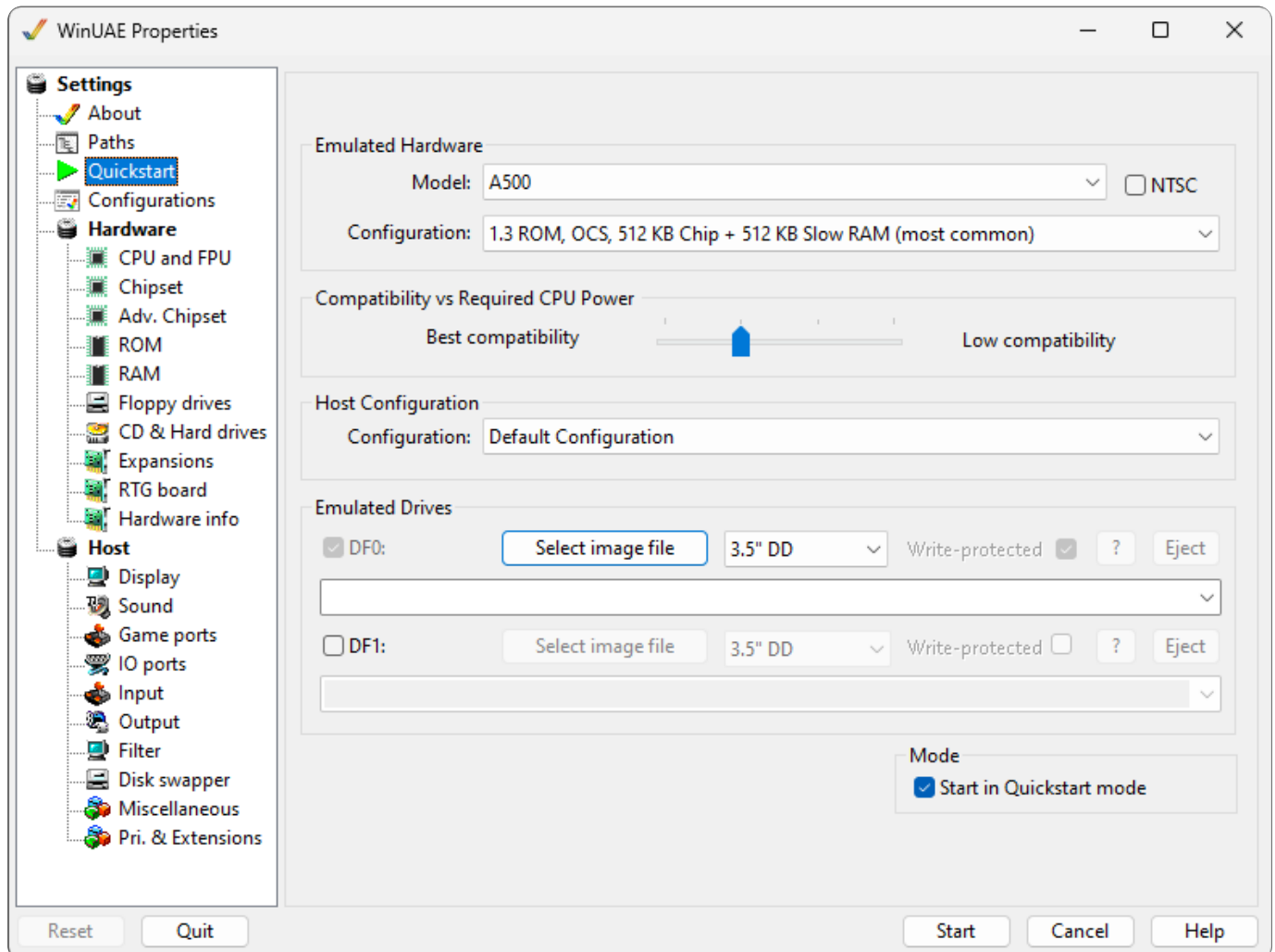
Open Opens the current log file.

Logging can also be captured by redirecting standard output on the [command line](#), e.g. `winuae.exe >log.txt`. The output is written in UTF-8 format.

8.3 Quickstart

Setting up WinUAE can be an extremely complex task, especially for users who are not tech affine. That's where Quickstart comes in: it will quickly get you going if all you want is to emulate a certain model of Amiga.

It is entirely optional.



8.3.1 Emulated Hardware

Model - Select the model of Amiga you want to emulate e.g. Amiga 500, 2000, 500+, 600, 1000, 1200, 3000, 4000, CD32, CDTV, Arcadia or Expanded UAE example configuration.

Configuration - Select the common types of Kickstart, chipset and memory configurations you require from this list. This list changes depending on the model of Amiga you selected.

8.3.2 Compatibility vs required CPU power

Best - Low compatibility - Select whether you want more Amiga chipset compatibility or faster CPU speeds from this slider.

8.3.3 Host Configuration

Configuration - Select a default, Full screen 640x480, Full screen 800 x 600 or windowed configuration.

8.3.4 Emulated Drives

These options are identical between **Disk drive DF0:** / **Disk drive DF1:**:

Select image file - To load an ADF file to the emulated drive.

3.5" DD / 3.5" HDD - Allows to select the emulated floppy drive density.

? - Open the disk image information.

Write protect - Write protect the disk image.

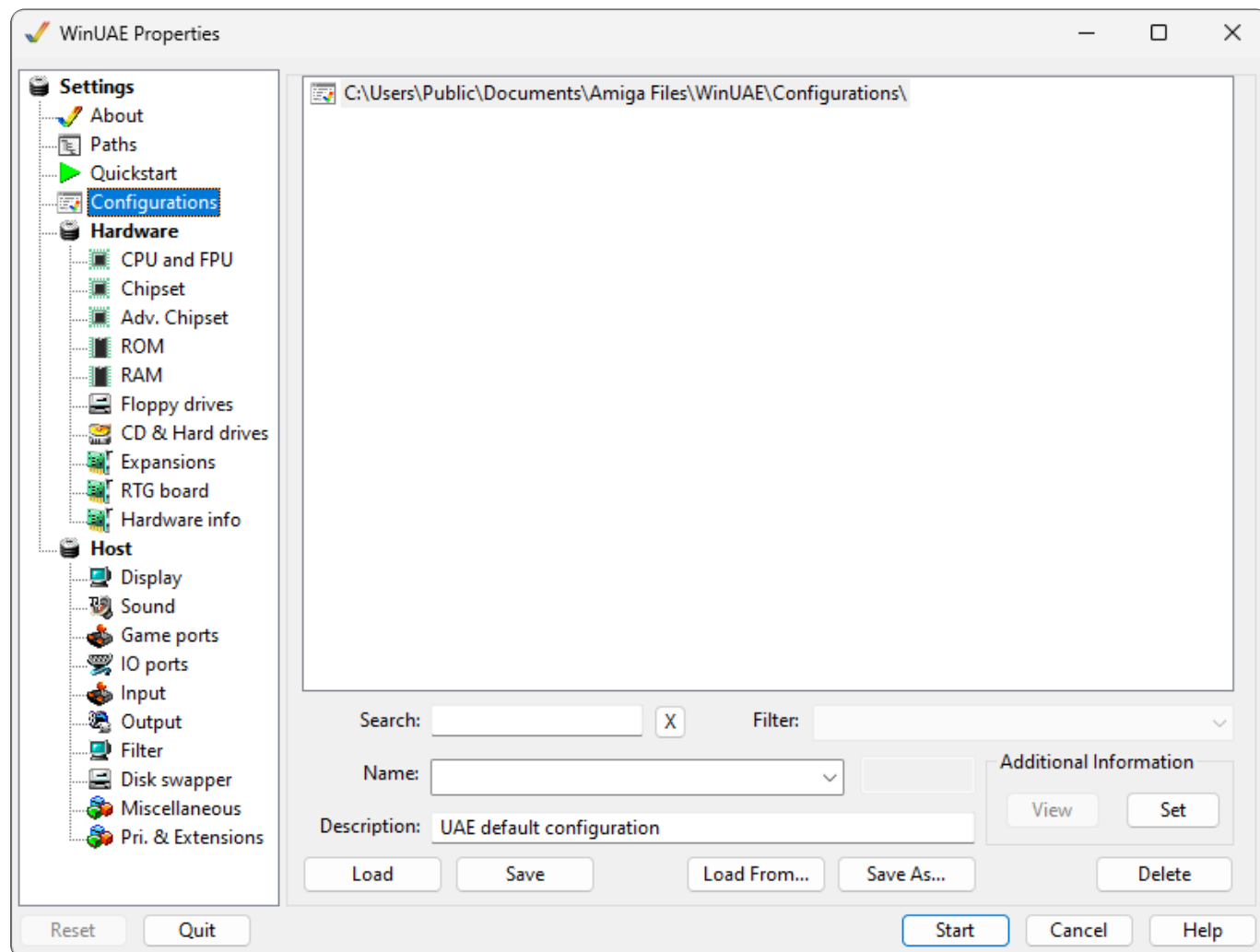
Eject - Eject the disk image.

8.3.5 Mode

Start in Quickstart mode - If enabled, then the Quickstart mode is the default.

8.4 Configurations

These settings allow you to manage config-files (which have the extension .uae). These files have both a name and description, and control the behavior of WinUAE. Basically, a configuration file is an encapsulation of the settings found on all the other pages in the GUI.



You can load a configuration by selecting it from the list, perform a **Search** or use a **Filter** and then clicking the **Load** button, or by double-clicking a configuration in the list. You can use the **Load from** button to load a configuration from a different location on the hard disk. Click **Start** to begin the emulation.

Additionally, you can double-click any .uae config-file from the Windows Explorer, or from a Desktop Shortcut. The configuration will load, and if the [Show GUI on Startup](#) setting is disabled, WinUAE will immediately launch into emulation-mode, bypassing the GUI completely.

If you have a lot of configurations, you can use the Search or Filter boxes to list the required configurations you want to use.

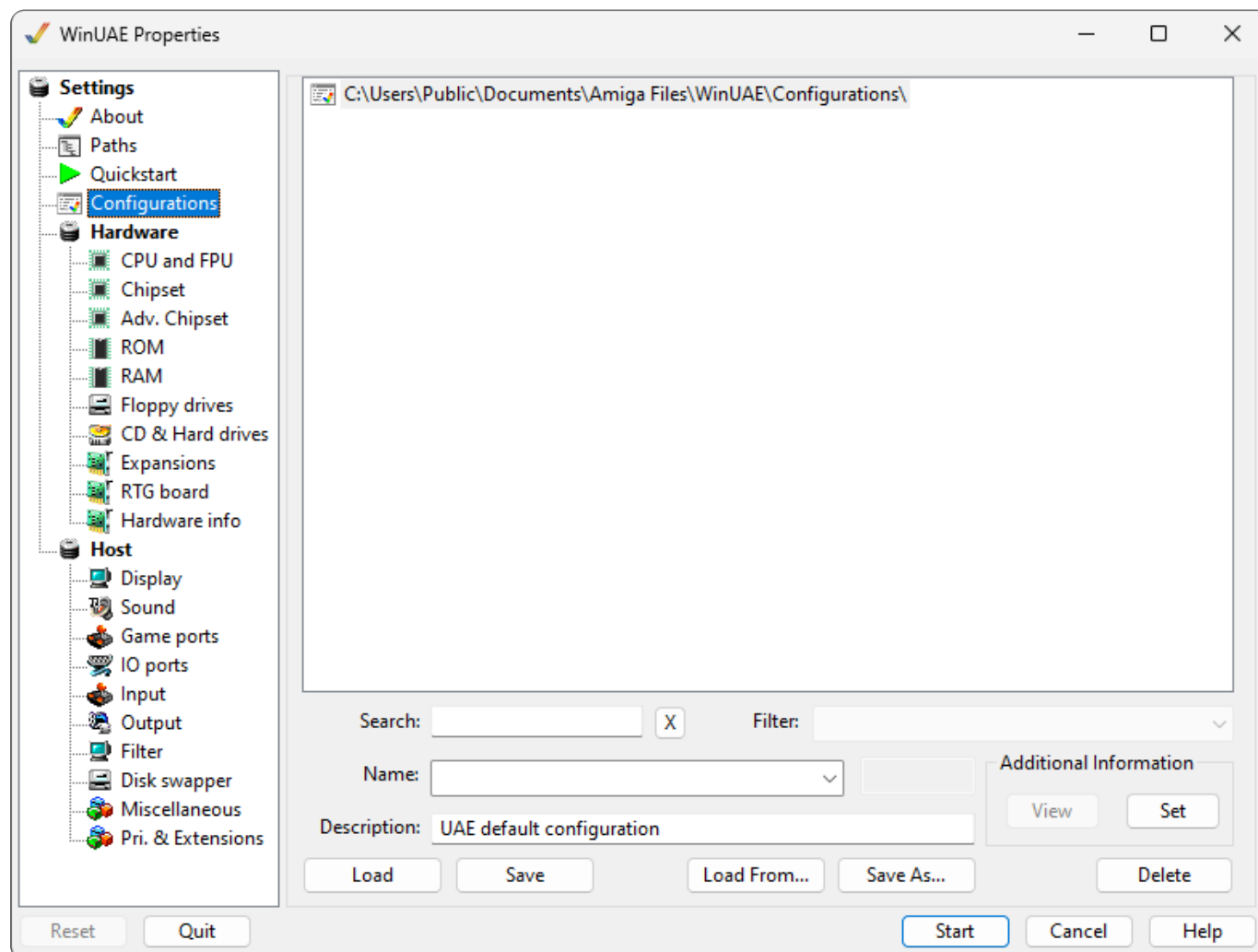
To save your changes for a configuration which you've loaded, simply press the **Save** button. If you've made changes to a configuration and want to save it under a different name, simply change the Name field on this page of the GUI or select **Save As**. You can also adjust the Description field.

To remove an old configuration, select a configuration from the list, and click the **Delete** button.

8.5 Hardware

8.5.1 Hardware

The Hardware section contains all settings for the emulated Amiga hardware.

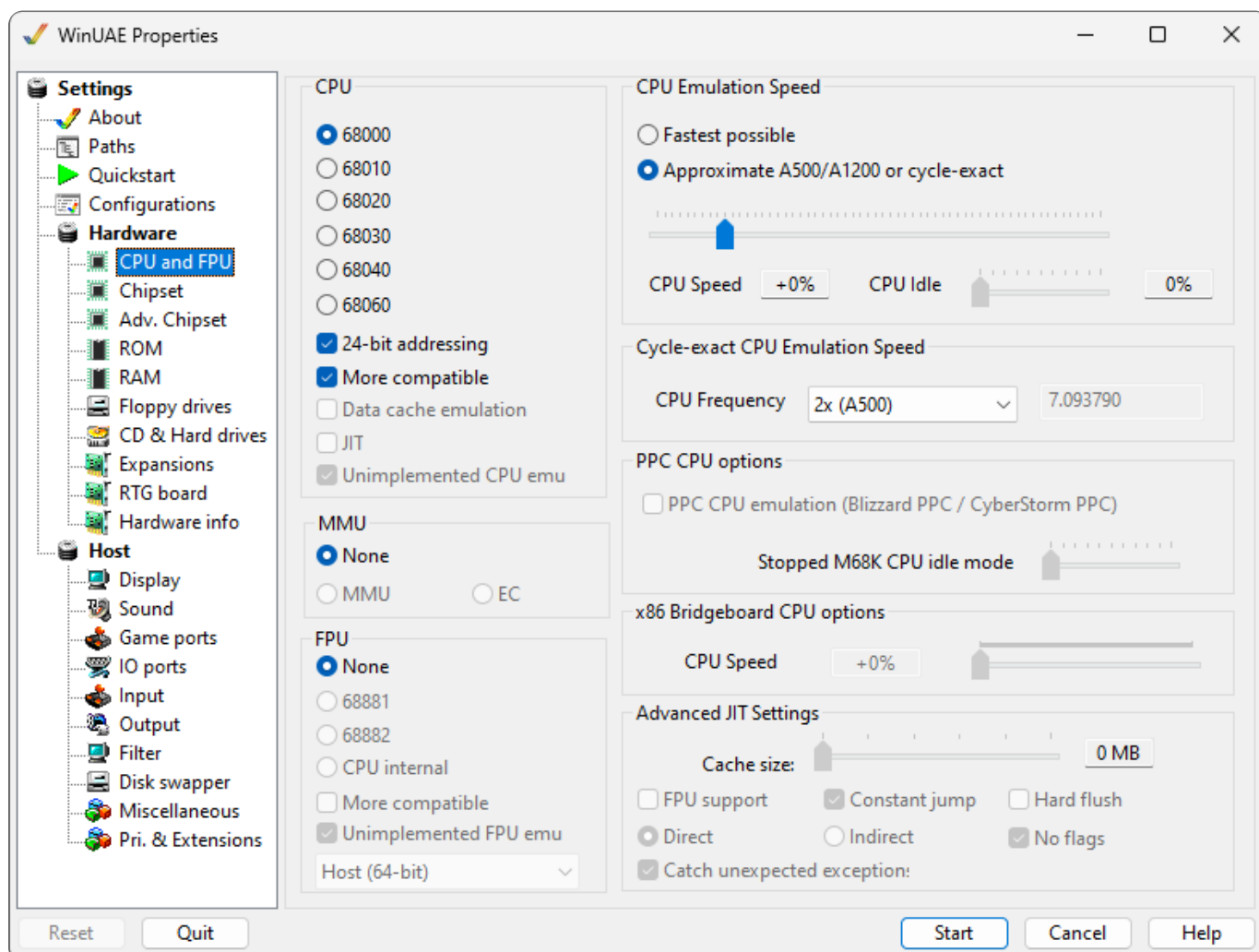


Subsections

- [CPU and FPU](#)
- [Chipset](#)
- [Adv. Chipset](#)
- [ROM](#)
- [RAM](#)
- [Floppy Drives](#)
- [CD & Hard Drives](#)
- [Expansions](#)
- [RTG board](#)
- [Hardware info](#)

8.5.2 CPU and FPU

These settings control the type of processor to emulate.



CPU

Choose between the classic Motorola processors:

- **68000** is the basic CPU type, as found in the Amiga 500, 1000, and 2000 models.
- **68010** is a slightly more advanced 68K member, but never actually shipped in a real Amiga.
- **68020** is a much more advanced 68K CPU, with some new instructions, and it has a fully 32-bit engine. Used in the A2500 for brief period on the A2520 card. If 24 bit addressing is enabled, it is the same as the 68EC020 chip in the A1200.
- **68030** This is a mid range CPU used in the A3000 and the low end A4000s.
- **68040** is the top CPU provided with the A4000 desktop computer.
- **68060** is the top end CPU mainly provided on accelerator cards and the A4000T. It requires the 68060.library installed before using.

24 bit addressing is used mainly by the **68EC020** CPU such as the A1200.

More compatible is only available when the CPU type is a **68000**. Some games and demos require this setting for proper compatibility.

Data cache emulation Besides the instruction cache, you can also emulate the data cache on the CPU.

JIT can be enabled to access the Advanced Just In Time settings if the 68030 or better is selected (see below).

68040 MMU enables the Memory Management Unit of the 68040 for operating systems like Linux on the Amiga. It is not compatible with JIT.

Unimplemented CPU emu emulates the full 68060 CPU (in case you forget to load Setpatch and 68040.library and 68060.library).

FPU (Floating Point Unit)

- **None** No FPU is provided, this is the only option for the 68000 and 68010.
- **68881** Can be specified with the 68020 and 68030.
- **68882** Can be specified with the 68020 and 68030.
- **CPU internal** Can be specified for the 68040 and 68060.

More Compatible is available if a FPU is selected. Some applications require this for proper compatibility.

Unimplemented FPU emu emulates the full 68881 FPU (in case you forget to load Setpatch and 68040.library and 68060.library).

Host FPU precision size: 64 bit, 80 bit or Soft float (80 bit).

CPU Emulation Speed

- **Fastest possible** lets the CPU section of the emulation run as many cycles as possible, while still maintaining emulation of the custom chips at the appropriate rate. It is important to keep sound and graphics synchronized, no matter how fast the PC is
- **Approximate A500/A1200 or cycle exact** limits the CPU emulation to run the same number of cycles per vertical-blank as a standard A500 or A1200 would. In other words, for every 50Hz refresh of the graphics, the same number of CPU instructions will be executed as on a real A500 or A1200 computer.

CPU Speed lets you tweak the balance of power between custom-chip emulation, and CPU speed. Some games and demos require this setting to be adjusted. This setting is the only CPU setting which can be changed once WinUAE is running.

CPU Idle You can adjust the idle status of the CPU with this slider. This feature can be useful on notebooks to save battery.

Cycle-Exact CPU Emulation Speed

CPU Frequency will change the frequency multiplies for the CPU

PPC CPU Settings

PPC CPU Emulation (Blizzard PPC / Cyberstorm PPC) Enables the PPC emulation; A separate plugin is required - see [Expansions](#).

Stopped M68K CPU idle mode Sets level of idle mode for the 680x0 processor

x86 Bridgeboard CPU options

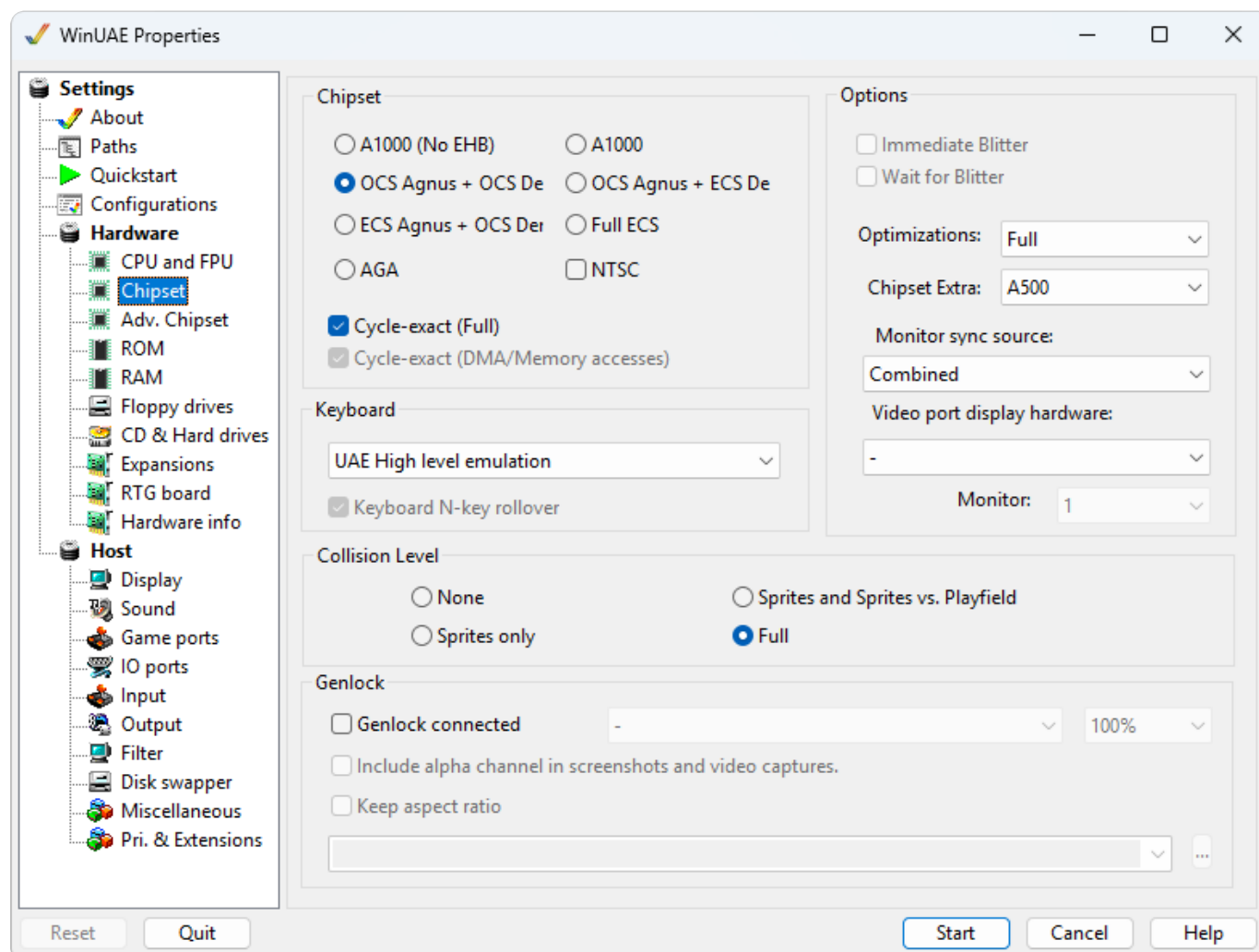
CPU Speed set between 0 and 100% CPU speed of the bridge to a x86 board

JIT (Just in time) Settings

Due to the importance of the JIT engine and its complexity, it has its own [page](#) where you will find a description of its possibilities.

8.5.3 Chipset

This will select which [Custom Chipset](#) to use for emulation.



Chipset

- **A1000 (NoEHB)**: First Amiga A1000 with OCS chipset but no Extra Half Bright mode.
- **A1000**: A1000 with OCS chipset.
- **OCS Agnus + OCS Denise**: This was the first or original chipset, used in the Amiga : Agnus 512M, Denise (32 color graphics, HAM mode).
- **OCS Agnus + ECS Denise**: This is mixed chipset, used in the Amiga : Agnus 512M/1M, ECS Denise (Prod VGA, SuperHiRes modes)
- **ECS Agnus + OCS Denise**: Uses enhanced Fat [Agnus](#) which supplies 1MB of Chip RAM and original Denise graphics chip.
- **Full ECS**: This was the next generation of Amiga chipsets. Compared to OCS, they provided higher resolutions, but no expansion of the color palette.
- **AGA**: This is the latest and most advanced chipset with 256 colors, HAM-8 mode (262K colors).
NOTE: AGA modes do not work with 8-bit color depth screen modes

NTSC Enables US NTSC screen mode (200 lines). The default is PAL (256 lines).

Cycle-exact Enables cycle exact chipsets as the real hardware for some games.

Cycle-exact (DMA/Memory accesses). Enables cycle exact chipsets just for Direct Memory Accesses or normal memory accesses.

Chipset extra: List of Amiga models to choose to select appropriate chipset automatically.

Options

Keyboard connected Sets whether a keyboard is connected to the machine

Subpixel display emulation Support hires/superhires pixel positioning and borderblank horizontal hires pixel offset fully emulated. Requires more CPU power.

Immediate Blitter Does requested [blits](#) immediately.

Wait for Blitter Wait for the Blitter to complete operations.

Monitor sync source Selection of Combined, Composite Sync or H/V Sync.

Video port display hardware Selection of Autodetect, A2024, Graffiti, Black Belt systems HAM-E, HAM-E Plus, Video DAC 18, AVideo 12 or 24, Firecracker 24, DCTV, OpalVision or ColorBurst.

Monitor. Multi-monitor selection (default: 1 of 1-4).

Collision Level

- **None** No collision detection used.
- **Sprites Only** Collision detection between sprites only enabled.
- **Sprites and Sprites vs Playfield** Collision detection between Sprites and background graphics.
- **Full** enables all levels of collision detection.

HINT: Full is not recommended because it causes unnecessary performance loss, and it is just very rarely needed.

Genlock

Genlock connected Specifies whether a Genlock (generator locking) device is connected. A Genlock is used where the video output of one source, or a specific reference signal from a signal generator, is used to synchronize other television picture sources together.

Genlock type Specified type of Genlock: Noise, Test card, image file, Video file, Capture device, American Laser Games LaserDisc Player, Sony LaserDisc Player, Pioneer LaserDisc Player.

Percentage of lock between sources.

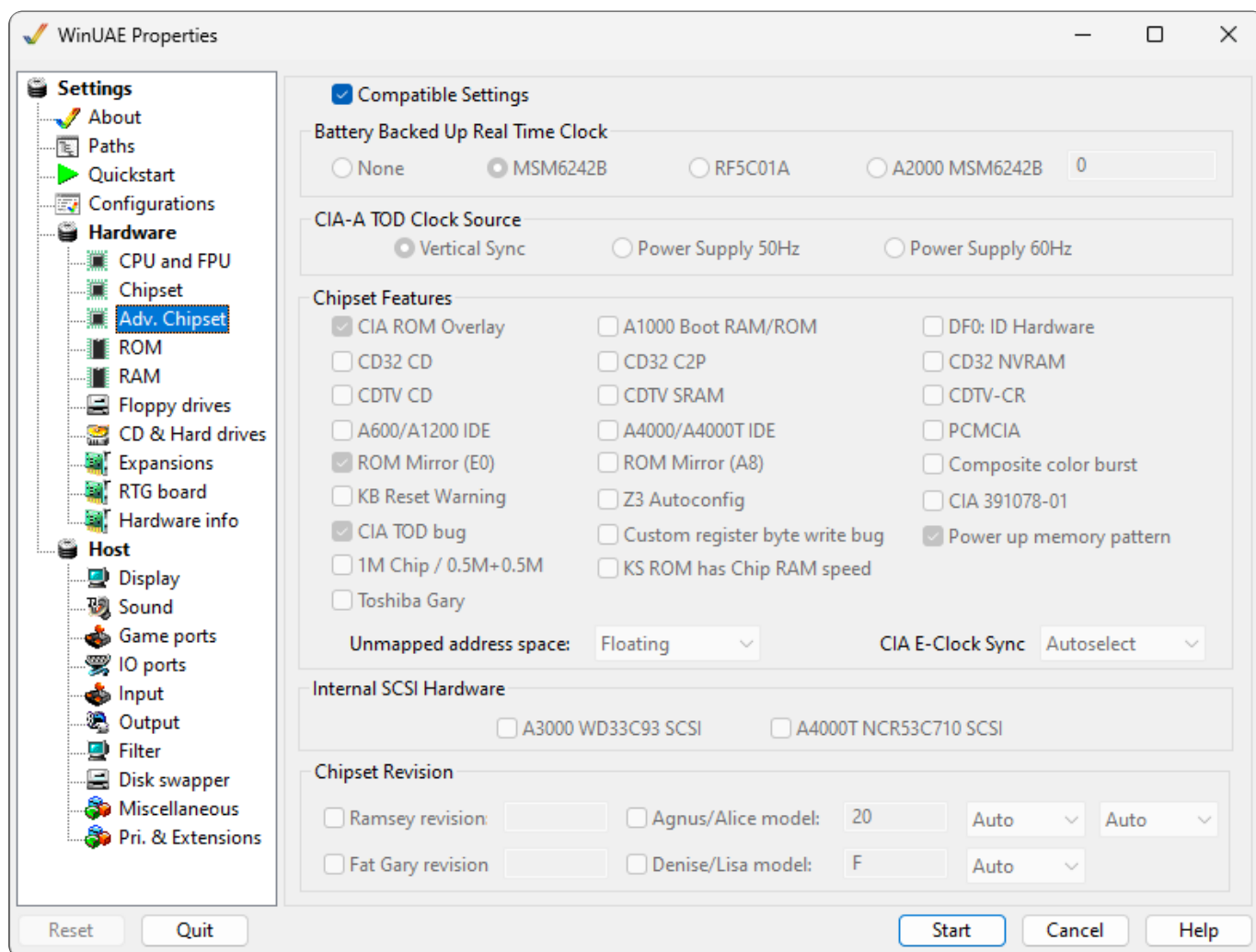
Include alpha channel in screenshots and video captures.

Keep aspect ratio Keep source width and height.

Genlock file Image file or video file to use.

8.5.4 Advanced Chipset

This page allows you to set advanced parameters for the [Custom Chipset](#).



Compatible Settings - removing the check will enable changing options on this page. It should be left checked, as the settings are for advanced users.

Battery Backed Up Read Time Clock

Configures the clock type used in the Amiga or a custom clock. The RF5C01A is used in the A1200.

CIA-A TOD Clock Source

These options allow changing the TOD (Time Of Day) clock source for CIA-A (Complex Interface Adapter A) chip.

The Amiga 500 used the Vertical Sync as signal for the real time clock, which is not precise. It is the default setting for compatibility reasons.

Chipset Features

CIA ROM Overlay - CIA/Gayle overlay emulation.

A1000 Boot RAM/ROM - This is enabled when 8/64K ROM is used in the A1000.

DF0: ID Hardware - No ID is used if DF0: is a 3.5" Double Density drive.

CD32 CD - Enable use of CD32 custom CD drive.

CD32 C2P - Enable use of CD32's Chunky to Planar graphics modes.

CD32 NVRAM - Enable use of CD32's Non-Volatile RAM for saving games etc.

CDTV CD - Enable use of the CDTV (Commodore Dynamic Total Vision) custom CD drive.

CDTV SRAM - Enable use of CDTV's Static RAM.

CDTV-CR - Enable CDTV Cost Reduced or Mk II version (CDTV based on A600 rather than A500)

A600/A1200 IDE - Enable use of the Amiga 600 or 1200 internal IDE port.

A4000/A4000T IDE - Enable use of the Amiga 4000 or 4000T internal IDE port(s).

PCMCIA - Enable use of PCMCIA port featured on the A600/A1200. Useful for external memory, storage and other uses.

ROM Mirror (E0) - 1 MB ROM image support.

ROM Mirror (A8) - 2 MB ROM image support.

Composite color burst Use analog video, composite video signal generated by a video-signal generator for color TV.

KB Reset Warning - Keyboard reset warning.

Z3 Autoconfig - Enable Zorro3 Autoconfiguration.

CIA 391078-01 - Enable Complex Interface Adapter 391078-01 chip which has a bug in IO port output mode, reading output mode port will always read output mode data state.

CIA TOD Bug Emulate the Complex Interface Adapter (CIA) Time of Day bug.

Custom register byte write bug - Enable a custom register byte write bug feature.

Power up memory pattern - Chip and Slow RAM power up pattern emulation.

1MB Chip / 0.5M+0.5M Enable 1MB Chip RAM made of two 512KB chips.

KS ROM has Chip RAM speed Set speed of Kickstart ROM to Chip RAM speed.

Power up memory pattern Chip RAM and Slow RAM power up pattern emulation, enabled by default.

Toshiba Gary - Optional Toshiba Gary (Gate Array) slow (chip ram like) Z2 IO.Gary looks after bus control and functions for floppy drivers.

Unmapped address space Set unmapped address space to Floating, all zeros or all ones.

CIA E-Clock Sync - Set to AutoSelect, 68000, Gayle or 68000 Alternate.

Internal SCSI Hardware

A3000 WD33C93 SCSI - Emulate the A3000 Western Digital 33C93 SCSI controller.

A4000T NCR53C710 SCSI - Emulate the A4000T NCR 53C710 SCSI controller.

Chipset Revision

Ramsey revision - Specify the specific version of the Ramsey chip (default is 0F). This is the gate array Dynamic-static RAM controller.

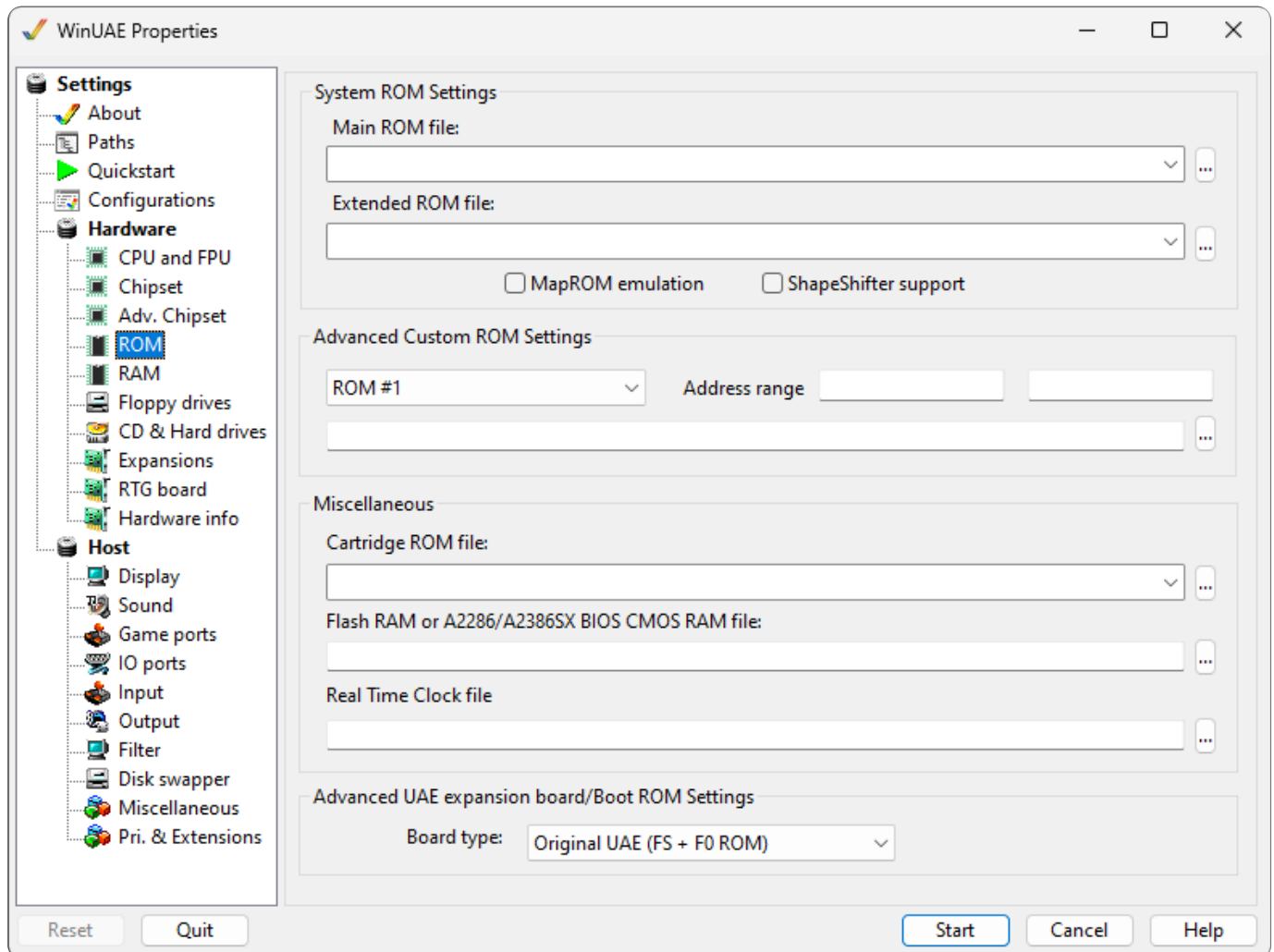
Fat Gary revision - Specify the specific version of the Fat Gary chip (default is 00). This is the gate array system address decoding chip.

Agnus/Alice revision - Specify the specific version of the Agnus/Alice chip (default is 21). Memory: Auto, 512K, 1M, or 2M.

Denise/Lisa revision - Specify the specific version of the Denise/Lisa chip (default is F). This is the graphics chip. Type: Auto, Velvet, A1000-No EHB, or A1000.

8.5.5 ROM

These settings control which ROM image(s) WinUAE will use. At least a [Kickstart ROM](#) is required to emulate a classic Amiga.



System ROM Settings

Main ROM File specifies which Kickstart ROM file to use. ROMs in the specified path will be automatically detected.

Extended ROM File will provide CDTV or CD32 support (supplied with [Amiga Forever](#)).

MapROM Emulation will provide support for BlitzKick type tools.

ShapeShifter support will enable the [ShapeShifter](#) 'PrepareEmul' support, so you don't have to KickShift your ROM-images. This also allows Amiga Forever users (encrypted ROM-images can't be KickShift'ed) to use ShapeShifter.

Advanced Custom ROM Settings

ROM Number select a custom rom from 1 to 4.

Address Range can be used to select a memory address range for ROM code to occupy.

ROM file is the selected rom file to be loaded.

Miscellaneous

Cartridge ROM File will allow to add Action Replay ROM files

Flash RAM or A2286/A2386SX BIOS CMOS RAM File will allow you to save to NVRAM (Non-Volatile RAM) like the CD32

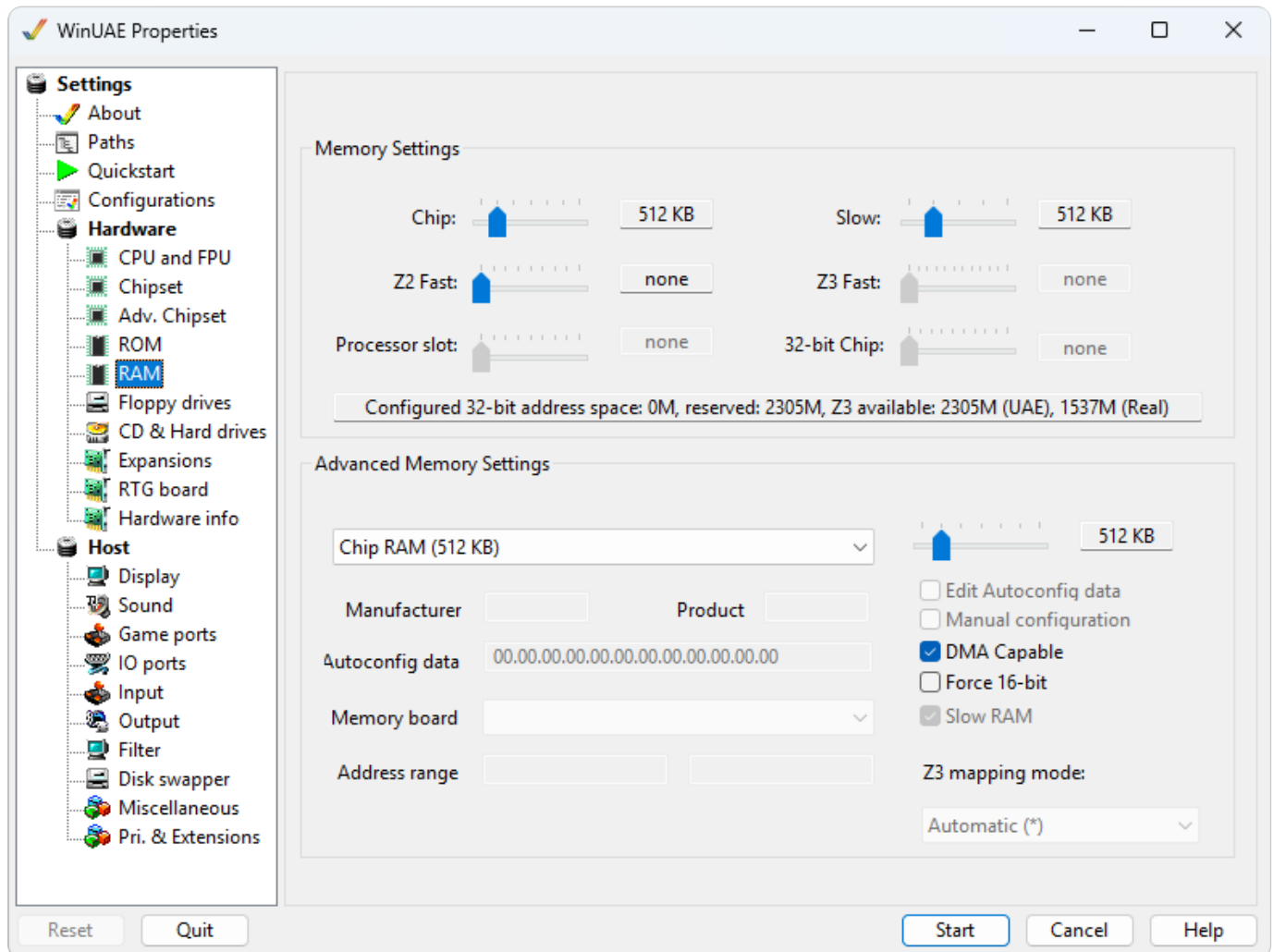
Real Time Clock file allow you to specify a RTC file.

Advanced UAE expansion board/Boot ROM Settings

Board type: Original or new UAE, 64K or 128K , Direct or Indirect board types.

8.5.6 RAM

These settings let you set up how much memory you will allocate for the Amiga side.



Memory Settings

Each slider controls the amount of respective memory to be used. For an explanation of types of RAM, please see the [RAM](#) page.

32-bit Chip allows to add additional Chip RAM in the 32-bit address space. If the maximum of 1GB is selected, UAE Z3 mapping is always used.

If a slider's memory is also used as accelerator board RAM, changing it here adjusts the [accelerator board memory](#) as well.

Advanced Memory Settings

The **drop down menu** offers selection for all available RAM slots

Slider adjusts the amount of RAM for the selected slot (256KB to 8MB)

Edit Autoconfig data Change the Manufacture code, Product code and Autoconfig data values.

Manual configuration Change the Address range values.

DMA capable Enable Direct Memory Address capability.

Force 16-bit Use 16 bit memory addressing.

Slow RAM Enable slow RAM (used by CPU and Chipset).

Z3 mapping mode. Select Automatic, UAE or real Zorro 3 mapping mode.

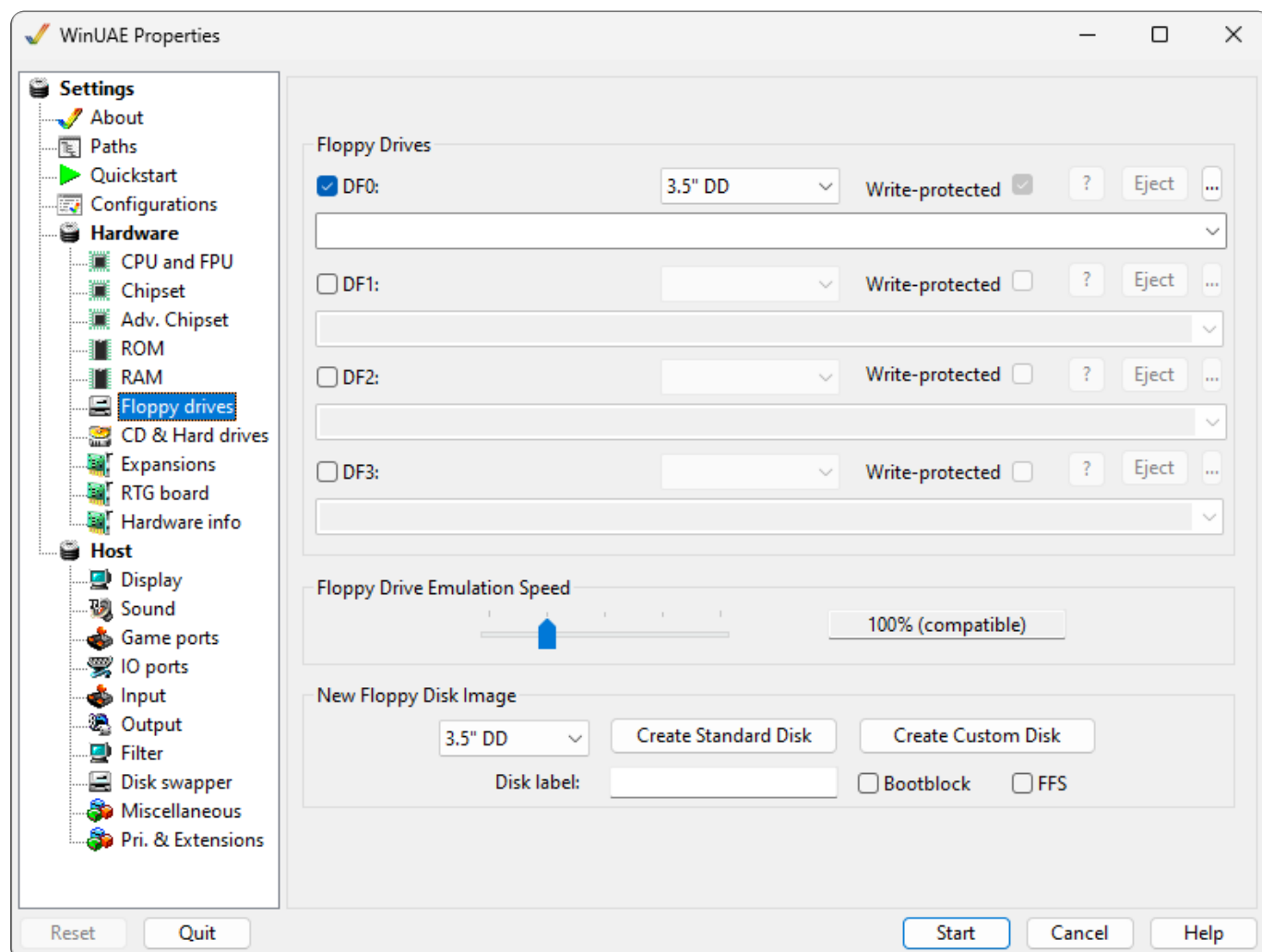
Manufacturer, Product, Autoconfig Data Display data about memory board.

Memory board Select a UAE, DKB, Kupke or Supra memory board.

Address range Set address range for memory.

8.5.7 Floppy Drives

Using this tab, you can "insert" disks into your virtual Amiga, and adjust floppy speeds.



General

Up to 4 floppy drives can be enabled via the check marks and will then be usable in the emulation.

Enable the **Write Protected** option to emulate the write protect tab on your disk images.

Disable will disable the drive and free up some memory (vital for old games). Note that **DF0** is the default drive to boot from, so please use this before other drives.

Eject removes the disk from the drive.

... buttons will show a file picker to insert a disk image.

Floppy Drive Emulation Speed

The slider will allow changing the emulated disk access speed, from **Turbo**, **100%**, **200%**, **400%** or **800%**. **Turbo**-floppy speed enables fast writing, and uses the maximum transfer rate from the media that the floppy image is accessed from, i.e. the host hard disk.

New Floppy Disk Image

Disk image size. 3.5" DD = 800KB, 3.5" HD = 1.76MB, 3.5" DD (PC) = 720kB, 3.5" HD (PC) = 1.44MB, 5.25" SD = 440kB.

Create Standard "Floppy" creates a blank ADF.

Create Custom "Floppy" allows you to create a special ADF file for saving games onto if the Standard floppy does not work.

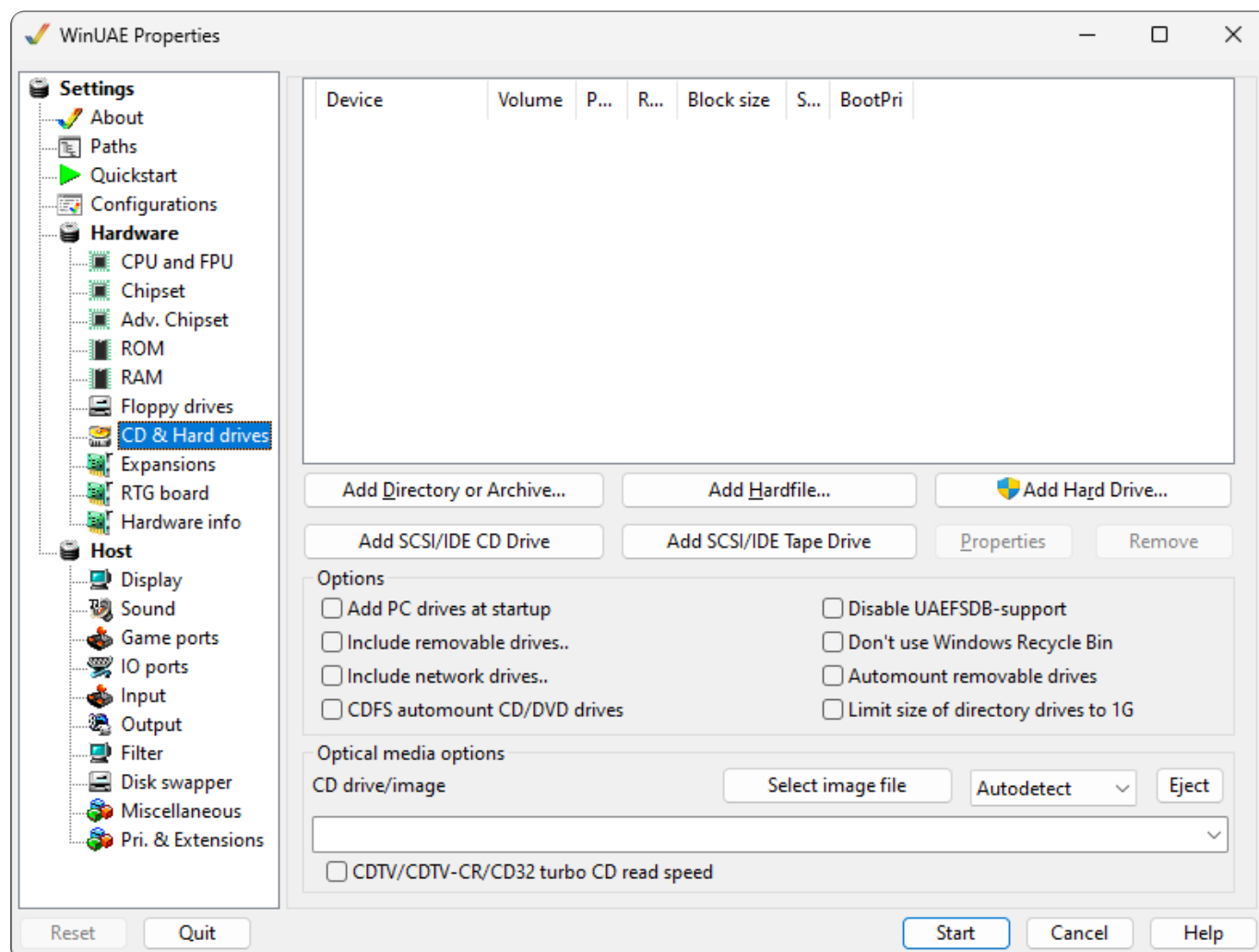
Disk Label will label the new disk image without having to in Workbench.

Bootblock will make the disk bootable.

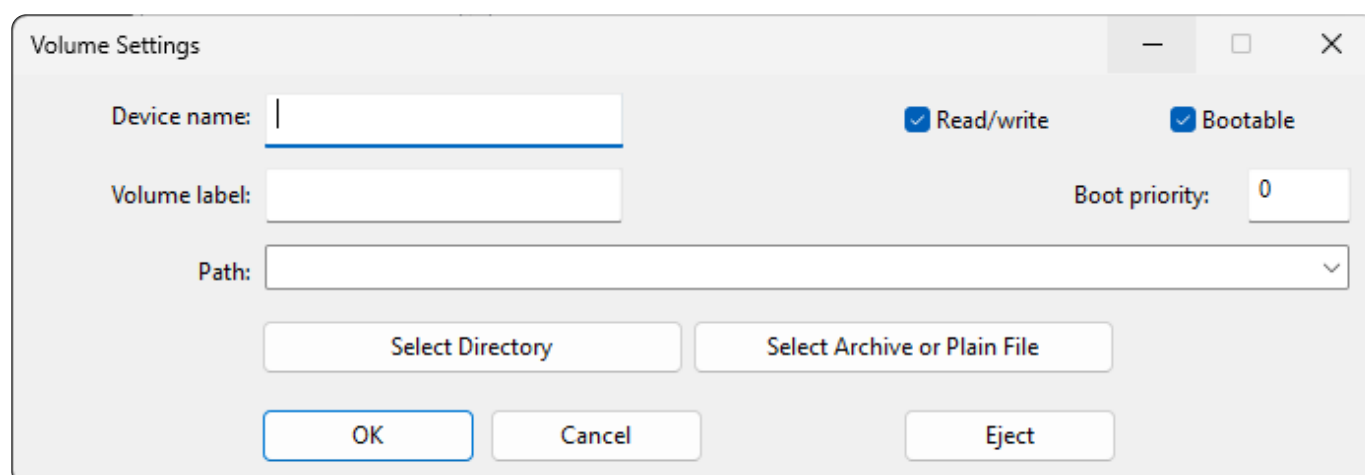
FFS will format the disk using the Fast File System.

8.5.8 Hard Drives

This tab contains some very important and complex options, please make sure to read the [Drive Emulation](#) page for details!



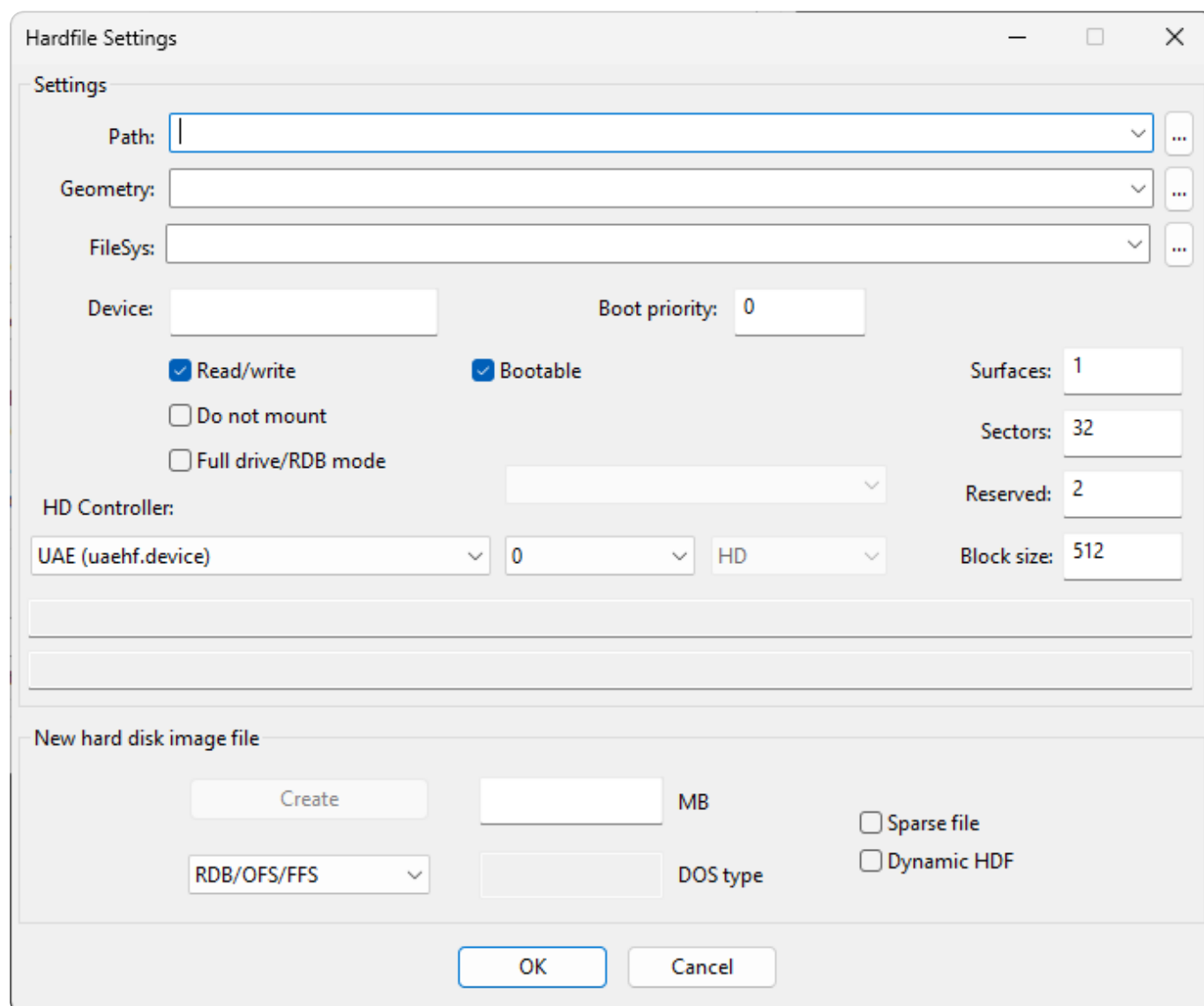
Add Directory or Archive...



Adds a directory or an archive on the host as virtual HDD to the Amiga. You can specify a path to your desired folder in Windows, set a Volume and a Device name.

Use **Select Archive or plain file** to add an archive file (.zip, .7z, .rar, .lha, .lzh, .lzx) to appear as a disk on Workbench so there is no need to extract the files first.

Add Hardfile...



The 'Hardfile Settings' dialog box is divided into two main sections: 'Settings' and 'New hard disk image file'.

Settings Section:

- Path:** A text input field with a dropdown arrow and an ellipsis button.
- Geometry:** A text input field with a dropdown arrow and an ellipsis button.
- FileSys:** A text input field with a dropdown arrow and an ellipsis button.
- Device:** A text input field.
- Boot priority:** A text input field containing the value '0'.
- Read/write:** A checked checkbox.
- Do not mount:** An unchecked checkbox.
- Full drive/RDB mode:** An unchecked checkbox.
- Bootable:** A checked checkbox.
- Surfaces:** A text input field containing the value '1'.
- Sectors:** A text input field containing the value '32'.
- Reserved:** A text input field containing the value '2'.
- Block size:** A text input field containing the value '512'.
- HD Controller:** A dropdown menu showing 'UAE (uae.hf.device)'.
- 0:** A text input field containing the value '0'.
- HD:** A dropdown menu showing 'HD'.

New hard disk image file Section:

- Create:** A button.
- MB:** A text input field.
- RDB/OFS/FFS:** A dropdown menu.
- DOS type:** A text input field.
- Sparse file:** An unchecked checkbox.
- Dynamic HDF:** An unchecked checkbox.

At the bottom of the dialog are **OK** and **Cancel** buttons.

SETTINGS

Add a hardfile; if you want to use an existing file, just click the ... button opposite **Path** and select the hdf file. If you want to add a new file, skip over to "New hard disk image file".

HD Controller changes which controller to use such as **UAE, IDE, SCSI, PCMCIA SRAM or IDE**.

Once you have selected a hardfile, it will display details about the cylinders, blocks, size and DOS type in the box.

Settings:

Full drive/RDB mode enables Rigid Disk Block mode, this stores the partition and file system information in a special block of disk (similar to the Master Boot Record on PCs).

NEW HARD DISK IMAGE FILE

RDB/OFS/FFS - Set file system to Rigid Disk Block mode, Original File System (WB 1.3) or Fast File System (WB 2.x, 3.x). Newer file systems include PFS3 (Professional Filing System), PDS3, SFS (Smart File System) and Custom file system.

DOS type - Displays the file system name in Hexadecimal format.

Sparse file - Formats disk file as a file which attempts to use disk space more efficiently when it is mostly empty by using metadata to represent

empty space.

Dynamic HDF - Modern disk file format which expands as more data is added to the disk file, minimizes disk usage like Dynamic VHD files on PC.

Add Hard Drive...

Harddrive Settings

Hard drive:

Geometry:

☒ Read/write ☐ Lock ☐ Manual geometry

☐ Identity

UAE (uaehf.device)

Surfaces:

Sectors:

Cylinders:

Block size:

It is also possible to add actual, full hard drives to WinUAE. The drop down list will only show Amiga formatted drives, Amithlon partitions and empty partitions (no Windows partitions). Tick the **Read/Write** option if you wish to read and write to such a partition. The boxes below will display details about the hard drive selected, such as size. You can select the device used (uaehd.device). Manual some drives you can select Manual geometry for Surfaces, Sectors, Cylinders and Block size.

NOTE: Administrator rights are required for this feature!

Add SCSI/IDE Tape Drive...

Tape Drive Settings

Path:

HD Controller: ☐ Read/write

Select a Path to a folder where data can be read or written to. It will work with Amix and any backup software that requires a tape drive.

Select directory Browse for an directory on hard disk to emulate tape drive.

Select archive or plain file Browse for an archive or normal backup file.

Eject Remove the tape from the drive.

HD Controller Specify controller to emulate e.g. UAE, IDE, SCSI, PCMCIA SRAM, PCMCIA IDE.

Read / write Enable read and write mode for tape drive otherwise it will use Read only mode.

Add Tape Drive will add the new emulated tape drive to the Hard drive list.

Options

Add PC Drives at Startup mounts all available fixed drives for the Amiga to use

Include removable drives also mounts all removable drives, such as CD-ROM, USB drives, SD cards

Include network drives also mounts all mapped network drives

Disable CDFS automount CD/DVD drives will disable mounting compact discs and DVDS without having to install a CD file system

Disable UAEFSDB Support disable creating UAEFSDB files when a directory is mounted as drive

Don't use Windows Recycle Bin - Excludes Windows Recycle Bin from emulation.

Automount Removable drives will mount a removable drive such as soon as the media is inserted

Limit size of directory drives to 1GB will do just that

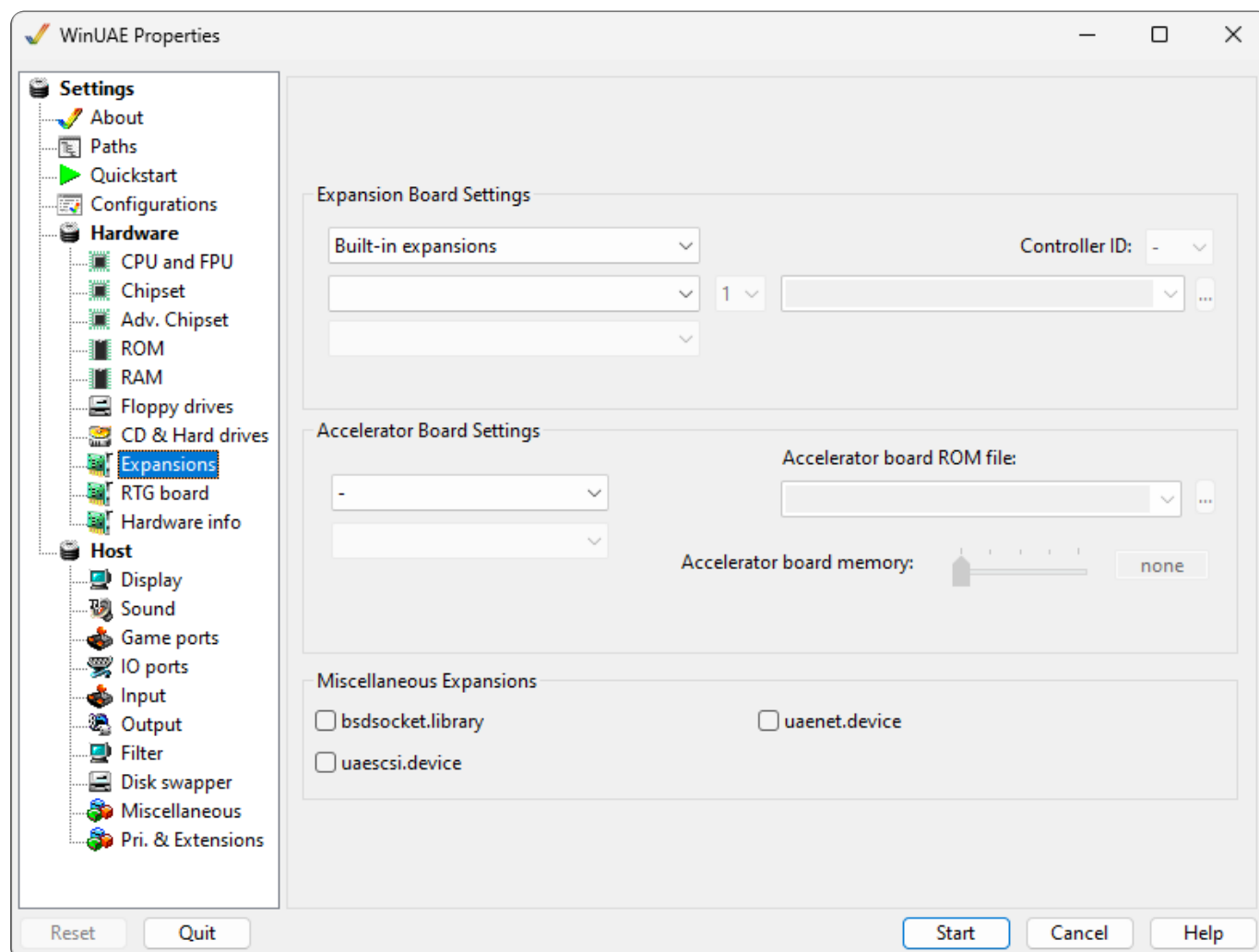
Optical media options

Similar to virtual floppies, a CD image can be inserted or injected in this section. Multiple emulated CD drives can be connected, each with its own CD image, and used at the same time.

CDTV/CDTV-CR/CD32 turbo CD read speed will emulate the CD drive at maximum speed

8.5.9 Expansions

This will change settings for expansion cards such as RTG, Network, and SCSI cards.



Expansion Board Settings

Controller or Bridgeboard selection for Built-in, SCSI, IDE, SASI, Custom, PCI, x86 Bridgeboards, Graphics, Sound, Network or Disk boards.

Controller model selection for the make and model of required controller or bridgeboard. Click **Enabled** to enable/disable this controller selection.

Controller series selection for controllers in the same series.

SCSI Controller ID: Specify a SCSI controller ID (0-7).

SCSI/IDE/Boot ROM file. allow you to specify a expansion card and ROM file and model. Upto 4 separate files can be selected.

Accelerator Board Settings

Accelerator make selection. Select ACT, Commodore, DKB, GVP, Kupke, Macrosystem, M-Tec, Phase 5, RCS, Interactive Video makes.

Accelerator board selection. Select the actual accelerator board.

Accelerator board ROM file. Select the Blizzard PPC or Cyberstorm accelerator board ROMs.

Accelerator board memory amount of memory for the board (0-256 MB). This is kept in sync with the matching memory size on the [RAM](#) page.

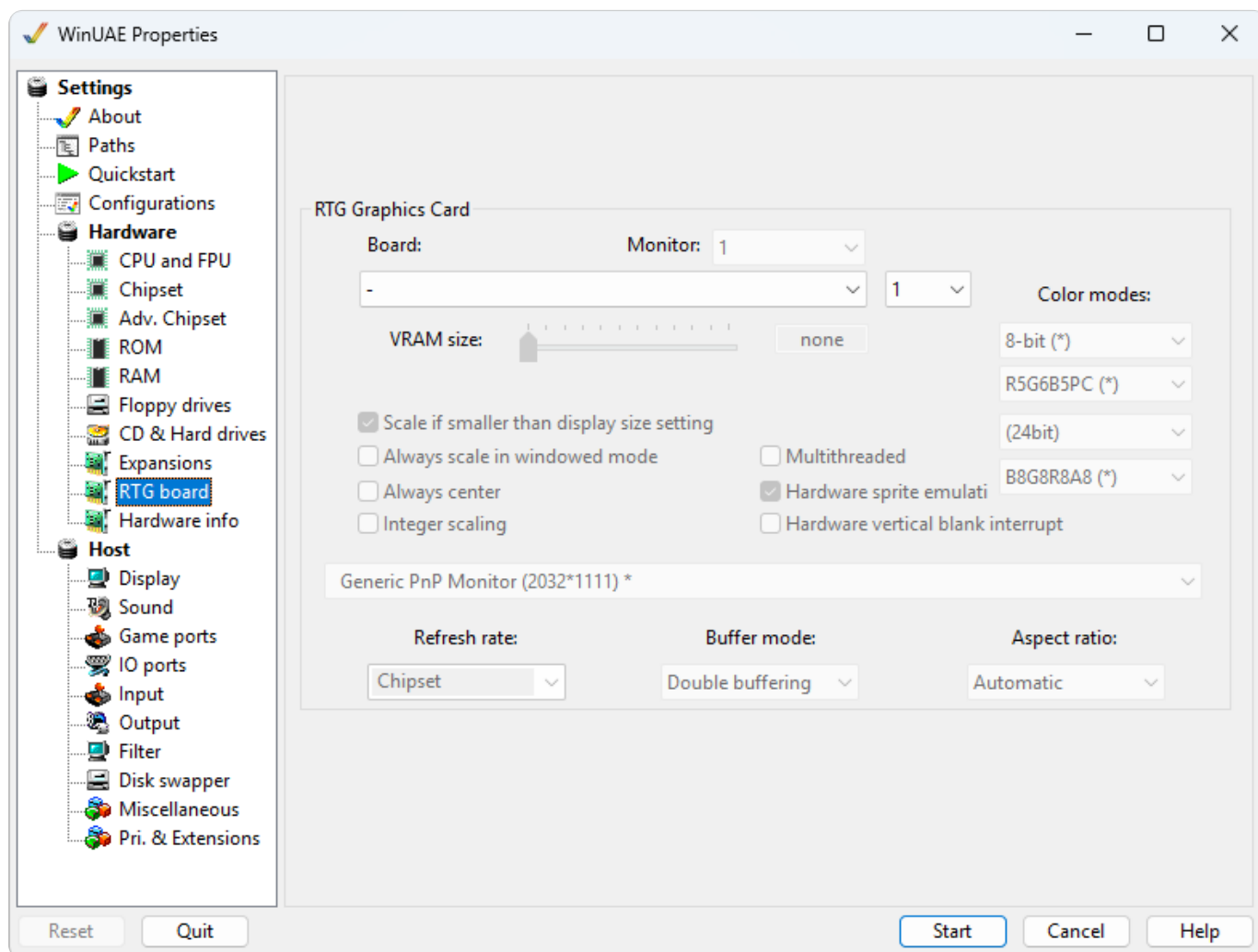
Miscellaneous Expansions

bsdsocket.library Allows the Amiga to use the network connection of the host.

uaescsi.device Adds support for IDE/SCSI CD-ROM drives on the Amiga side.

uaenet.device Enable SANA2 compatible network devices. Requires [WinPCap](#) (Windows Packet Capture Library).

8.5.10 RTG Board



RTG Graphics Card

Monitor. Multi-monitor selection (default: 1 of 1-4).

RTG Graphics Card to select either of these: UAE, A2410, Zorro II, Zorro III, Picasso II, Piccolo, Spectrum EGS-28/24, Picasso II, II+, IV, x86 Bridgeboard VGA Cybervision 64[/3D], Harlequin, Voodoo 3, Virge, or Pixel 64.

VRAM size. Video ram is for graphics card use such as the Picasso96 RTG so that you can use your PC's graphics card rather than the custom chips for extra speed. Upto 512 MB

Scale if smaller than display size setting Rescale display if current window is smaller than the display size setting given

Always scale in windowed mode Rescale display instead if using windowed mode.

Always center Will make sure RTG display is centered in middle of monitor.

Integer scaling Use integer type scaling for RTG.

Multithreaded Use RTG board's multithreading for performance.

Hardware sprite emulation If board supports it, enable sprite emulation

Hardware vertical blank interrupt emulation

Color modes: Specify color depth (in bits), and other modes available for the card.

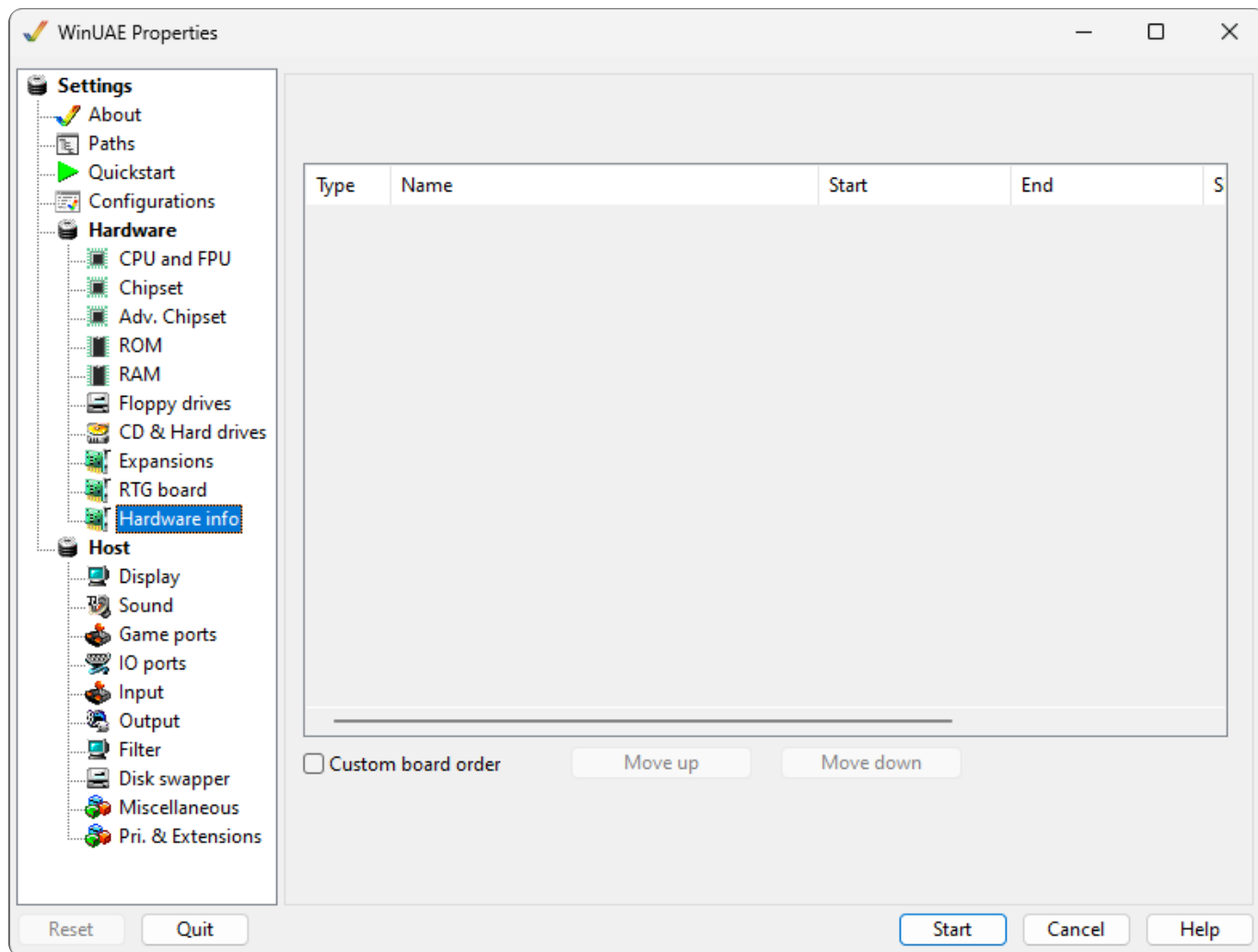
Monitor selection to select the output screen. It will be grayed out if only one screen is detected

Refresh Rate This can be Disabled, Chipset, Real or 50, 60, 70 or 75 Hz.

Buffer Mode This can be Double or Tripe Buffering for graphics.

Aspect Ratio This can be Disabled, Automatic, 4:3, 5:4, 15:9, 16:10, 27:16, 128:75, 16:9, 256:135, 21:9 or 16:3

8.5.11 Hardware Info



A list of hardware attached to the emulator once the configuration is defined. For example, it will list disk interfaces (IDE or SCSI), ROMs used, RAM used, graphics cards, accelerator boards, and others.

Type is the interface type. Z2 = Zorro 2, Z3 = Zorro 3

Name name of the hardware

Start starting memory address of the device

Size memory size used

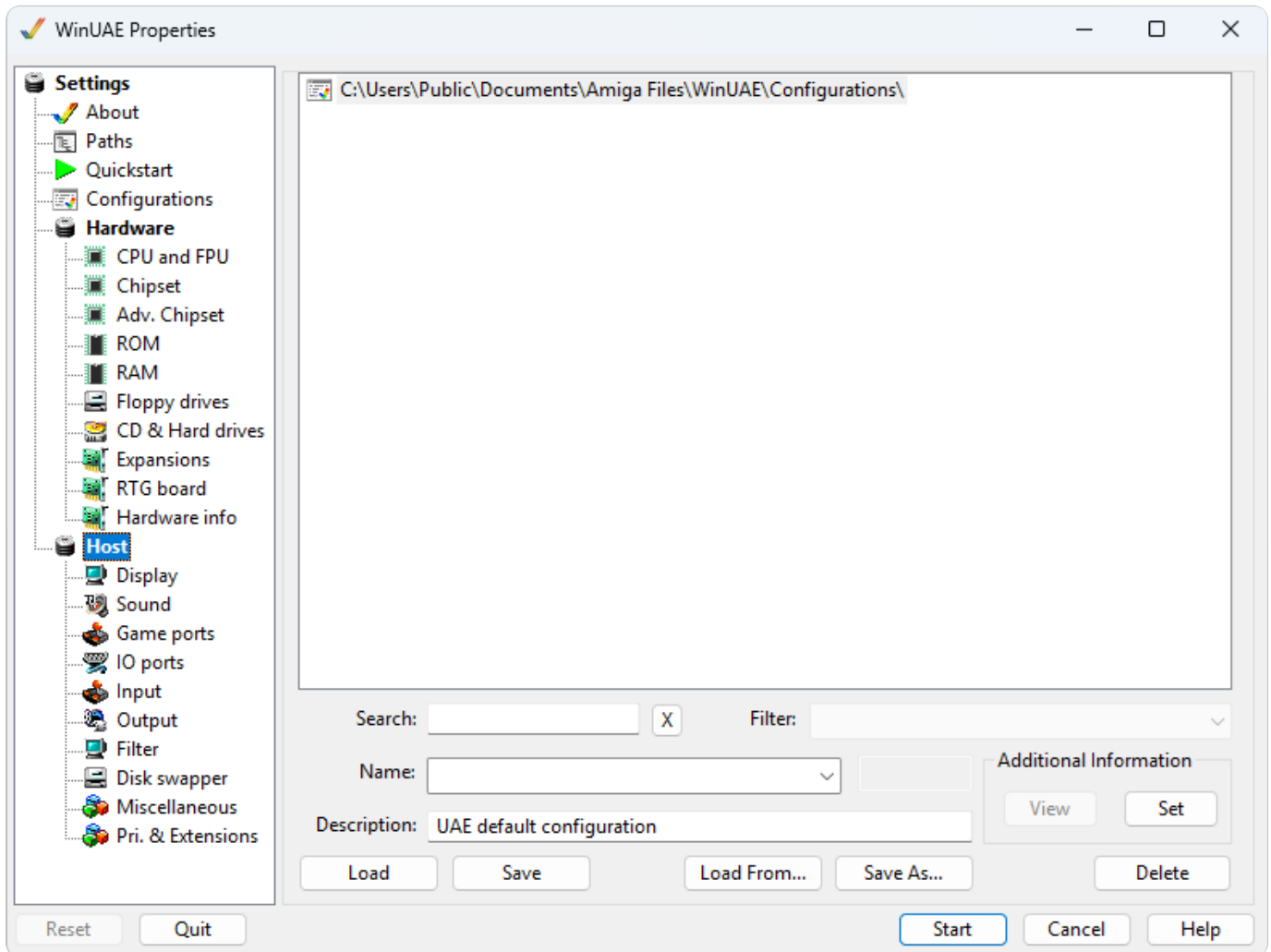
ID ID number used by AutoConfig.

Custom board order changes the order of the devices.

Once enabled, selecting an entry and pressing **Move up** or **Move down** will change the items' position on the list.

8.6 Host

8.6.1 Host



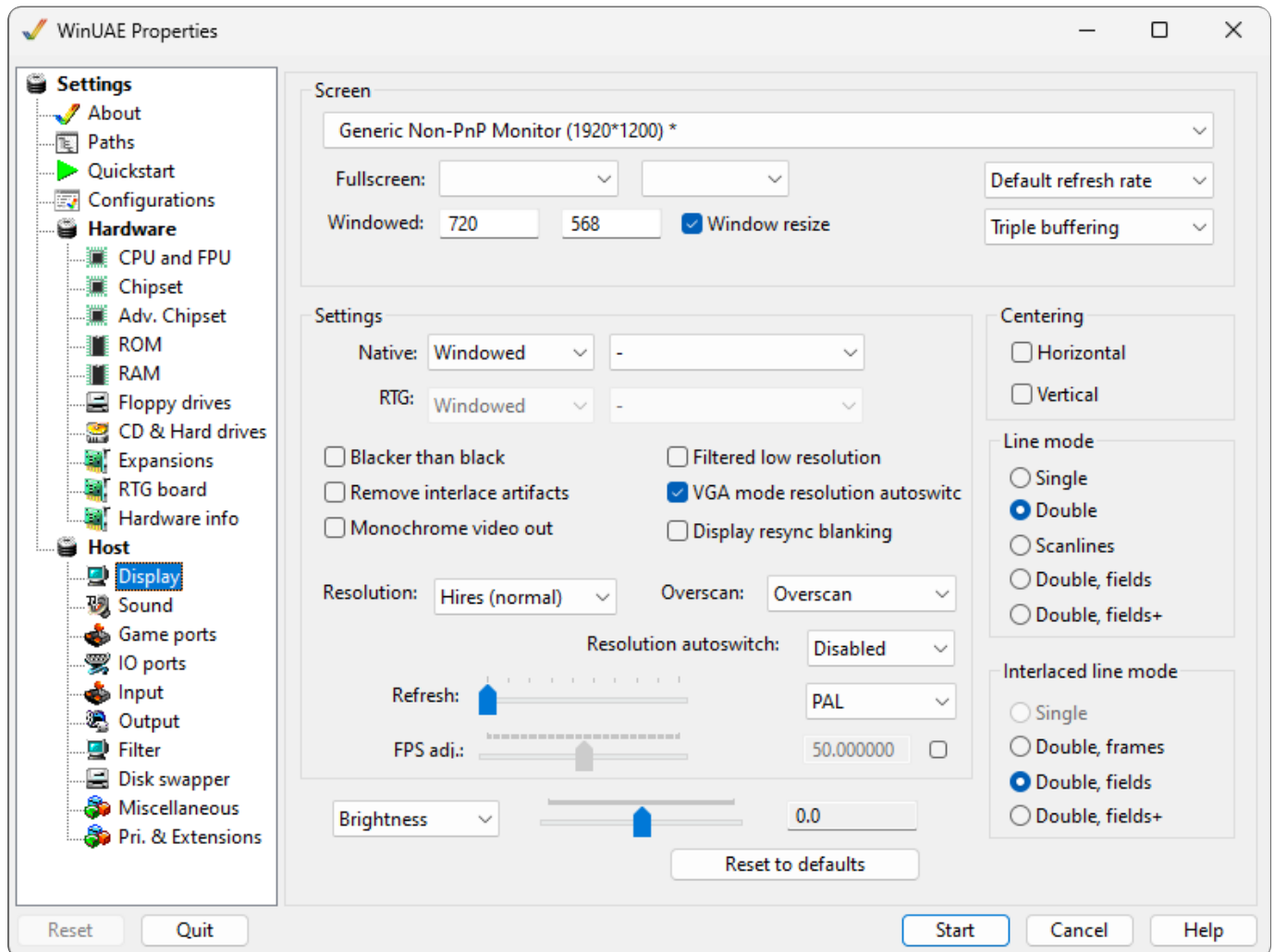
The Host section contains all host related settings.

Subsections

- [Display](#)
- [Sound](#)
- [Game Ports](#)
- [IO Ports](#)
- [Input](#)
- [Output](#)
- [Filter](#)
- [Disk Swapper](#)
- [Miscellaneous](#)
- [Pri. & Extensions](#)

8.6.2 Display

These settings allow you to choose how WinUAE will display your Amiga-generated graphics.



Screen

Primary Display driver Here, you can select which screen or graphics card you can display your Amiga screen on, useful if you have multiple monitors connected to your system.

Fullscreen sets the full screen resolution (see Settings), color depth and the Frequency (usually set to screen Default).

Windowed This lets you change the resolution used for the Amiga displayed in a Window on the PC screen.

Window resize allows window to be resized after starting emulation. *Hint:* to keep the aspect ratio, press CTRL while resizing the window.

Refresh rate can be set to default, 56Hz, 60Hz NTSC, 72Hz or 75Hz.

Buffering. Select type of buffering required: No buffering, double or triple buffering.

Settings

Native Windowed, Fullscreen or Full-Window with VSync setting.

RTG Windowed, Fullscreen or Full-Window with VSync setting.

Blacker than black

Remove interlace artifacts

Monochrome video out

Filtered Low Resolution will fix incorrect colors used in games that use the super hires trick.

VGA mode Resolution Autoswitch**Display resync blanking**

Resolution can be set to Lores, Hires or Super Hires.

Overscan can be set to TV (narrow, standard or wide), Overscan, Overscan+ or Extreme.

Resolution autoswitch can be disabled, always on, 10%, 33% or 66%.

Refresh rate will set how often the screen will be updated. Useful on slower PCs or graphics cards.

PAL or **NTSC** to set the video out mode

FPS adj is used to adjust the Frames per Second to the display to speed up or slow down the display (default is 50 fps)

Brightness levels can be set for the correct display set up (-200 to 200).

Reset to defaults is used to update brightness settings back to defaults.

Centering

Checking the boxes will cause the Amiga output to be centered on the configured screen

Line mode

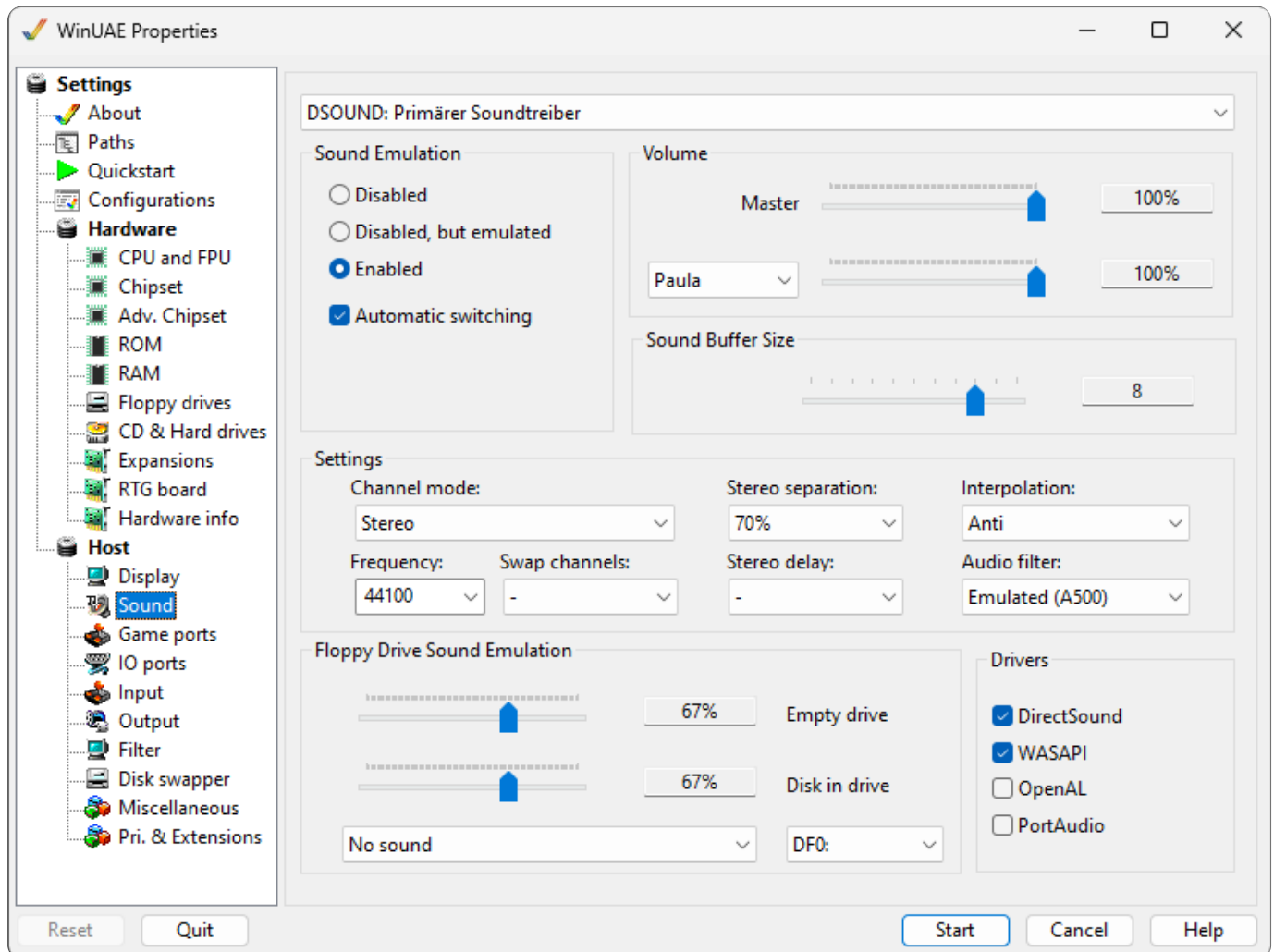
- **Single** draws every line once.
- **Double** draws every line twice. This allows interlace mode to be emulated nicely, but of course you also need a display that is twice as high.
- **Scanlines** will not draw certain lines, leaving them black.
- **Double, frames or fields [+]**

Interlaced line mode

Line mode when output is interlaced.

8.6.3 Sound

Here you can select, if (and how) UAE will provide sound emulation.



Sound device drop down menu to select which host sound card to use

Sound Emulation

- **Disabled** causes UAE not to emulate sound.
- **Disabled, but emulated** tries to emulate most of the sound hardware, but doesn't actually output sound.
- **Enabled** will emulate all of the sound hardware, and some programs won't work with other settings.

Automatic switching allows switching between sound modes automatically.

Volume

Master volume. Set overall volume between 0% (silent) to 100% (loud).

Paula,CD,AHI Audio, MIDI, Genlock. Set audio from either Paula, direct CD, AHI sound between 0% (silent) to 100% (loud), MIDI Or Genlock.

Sound Buffer Size

Gives access to the level of the used Direct Sound buffer. If sound output is choppy, this should be changed.

Settings

Channel mode can be set to Mono, Stereo, Cloned Stereo or 4 Channel and 5.1 Channels. Stereo will use more CPU time.

Stereo Separation can be set to improve stereo sound.

Interpolation improved quality by smoothing calculation results, but needs more computing power.

Frequency higher Frequency and/or Sample Type, the higher the sound quality will be, but the slower the emulation.

Swap channels can be used to swap between channels for Paula, AHI or both types of Sound chipsets.

Stereo delay can be set to improve stereo sound.

Audio Filter allows you to emulate Sound Power LED and can be Always on, Always off or Emulated (for A500 or A1200).

Floppy Drive Sound Emulation

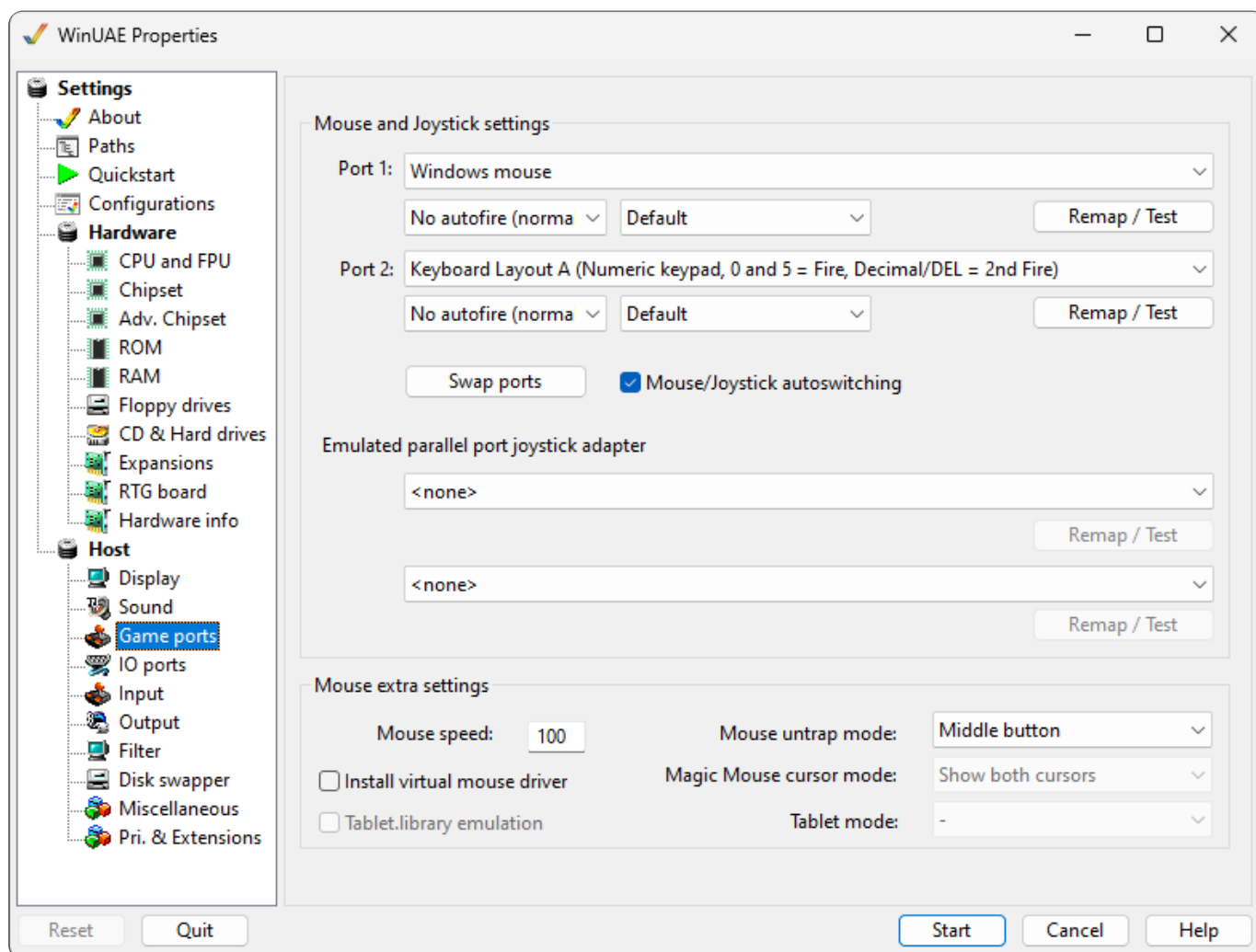
This feature enables the Disk Drive sounds like on a real Amiga so you can hear disks being read or written to. Select a drive and the Amiga emulation mode to use (A500 by default). The sliders are the volume controls.

Drivers

You can enable which host sound drivers you can use to ensure sound works such as **DirectSound**, **WASAPI (Windows Audio Session API)**, **OpenAL**, **PortAudio**.

8.6.4 Game Ports

These settings let you control how joystick support is provided in WinUAE, as well as choosing serial and parallel port emulations.



Mouse and Joystick settings

With these 2 options you can select the configuration of the "Amiga" - ports. Port 0 is usually used by the Amiga - mouse. It is easy to exchange the settings with the swap button.

Mouse * uses DirectInput to control the mouse, **Windows Mouse** uses the windows desktop mouse and **Mousehack mouse** is for **Tablet** users. **X-Arcade** is for Joystick with built in key mappings.

For either port you can select a Mouse, an X-Arcade device, a pre-defined Keyboard layout or a joystick if it is installed and connected to your PC. If you move your mouse over **X-Arcade layout information**, you can view the buttons and so on and what keys they are mapped to.

For the **Parallel port joystick adapter** you can select an X-Arcade device, Keyboard layout or other installed joystick.

Use the **Remap** button for an easy way to remap directions and buttons for the device.

Press **F12** to exit remap or test modes. Press **F11** to skip an event in the window.

Mouse extra settings

Mouse speed controls the speed of the mouse pointer across the screen. 100 is max speed, 50 is half speed etc.

Magic mouse allows you to move Amiga mouse outside borders (requires. HD installation, window mode using Picasso96).

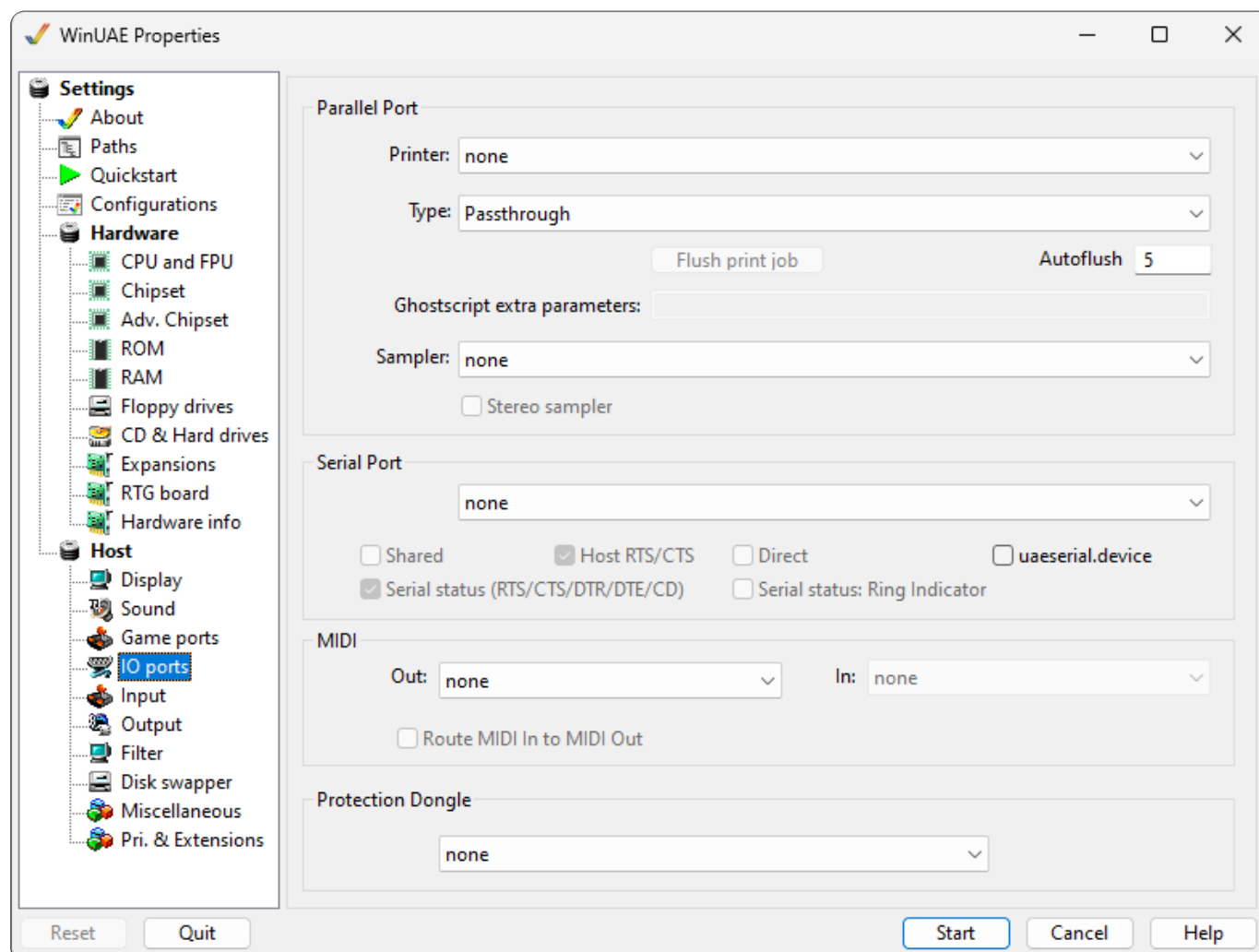
A Virtual mouse driver can be installed for other features.

Cursor mode can be Show both cursors, show native cursor only or show host cursor only.

Full tablet input emulation and the tablet.library emulation can be used to emulate the alternative tablet devices for input control.

8.6.5 I/O Ports

These settings let you control how parallel, serial and MIDI port emulations work.



Parallel Port

This lets you specify which PC installed printer you want to use for printing on the Amiga side.

Type can be ASCII-Only for text only printing, Epson Matrix Printer Emulation for older dot matrix type printers, The Postscript (Passthrough) for the postscript language. NOTE: The Postscript printer emulator will use Ghostscript.

Ghostscript extra parameters are additional command line parameters to open Ghostscript with.

Sampler can be None or DSound.

Stereo sampler is available if the sound sampler has been selected.

Serial Port

The drop down menu allows which host port to use. All ports including virtual ports on your PC will be available.

Shared will keep the port available for other programs

RTS/CTS handshaking can be enabled if it's required for modems or similar devices

Direct will fix PC to PC Lotus 2 serial link problems

uaeserial.device for access to different types of serial ports if a program requires it including multiple ports and unit numbers.

Serial Status for handshake/status pin emulation of RTS, CTS, DTS, DTR, DTE and CD modes.

Serial Status for handshake/status pin emulation of Ring Indicator.

MIDI

Out specifies the MIDI output device

In specifies the MIDI input device

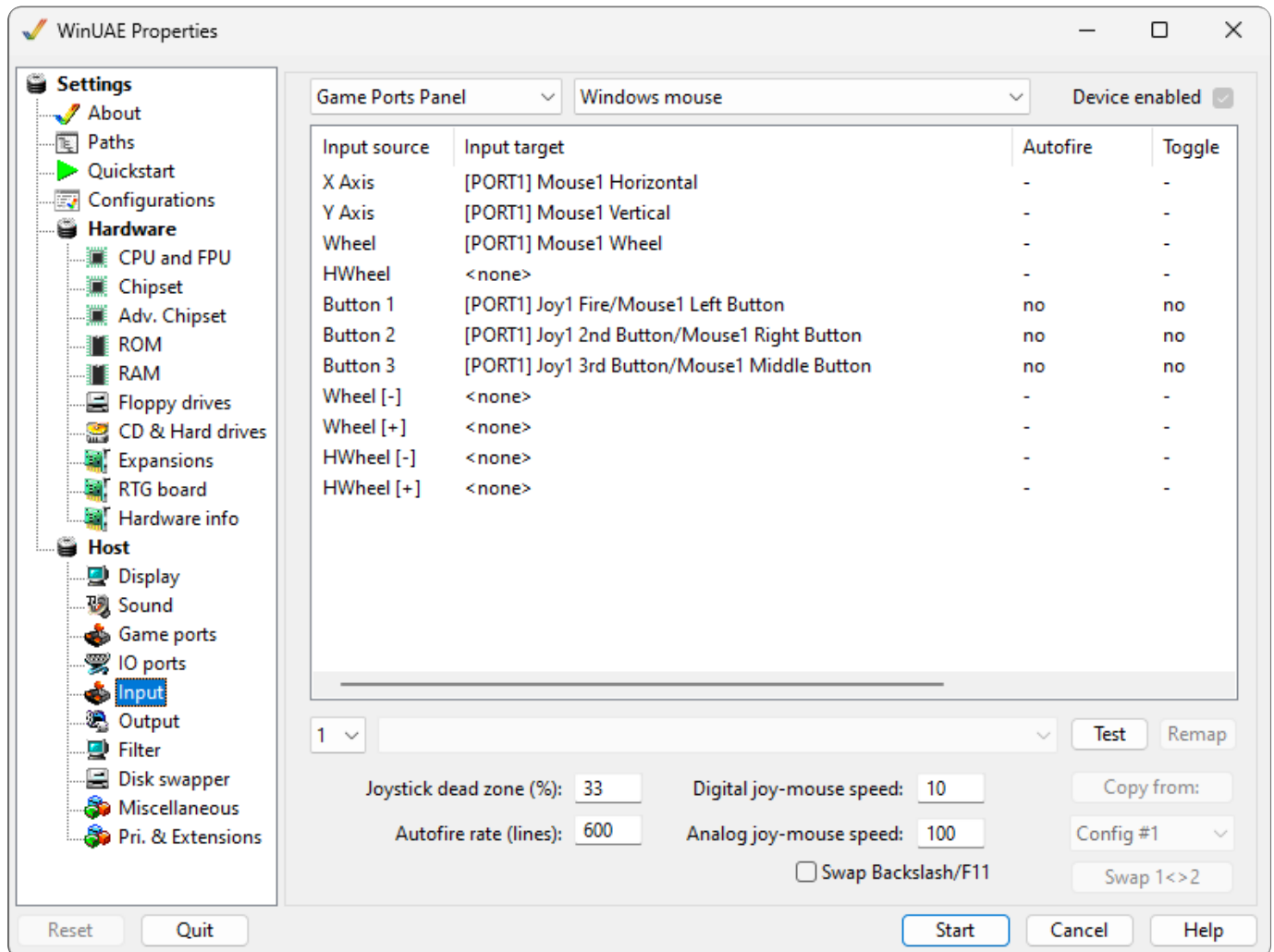
Route MIDI in to MIDI Out forwards all input directly to the output device

Protection Dongle

Using the drop down list, one of the supported dongle types can be selected.

8.6.6 Input

You can configure your Input device such as Joysticks to match your requirements for games or other software:



You can specify **Compatibility mode** with standard Windows setup or specify up to 4 configurable settings yourself. For each **Input Source** you can configure each **Input Target** using options from the drop down menu. For example you can specify whether it's a Joystick, Mouse, Keyboard, Lightpen, Lightgun or Parallel Joystick or whether it's a Horizontal, Vertical, Button or direction.

Clicking on entries in each of these columns will alter the setting:

- **Autofire** toggles autofire on and off
- **Toggle** switches the toggle on and off
- **Invert** toggles inversion on and off
- **Qualifiers** allows choosing qualifiers, i.e. additional buttons that have to be pressed to activate

Test is used to test the new input configuration. Press F12 to exit test mode or F11 to skip the current event in remap mode.

Remap allows changing what the input will do

Joystick dead zone can be specified for a percentage of the Joystick's movement to prevent unwanted movement.

Autofire rate (frames) specifies how often firing occurs over a number of frames, if enabled.

Digital joy-mouse speed can be specified for how fast response is for digital input devices (e.g. USB).

Analog joy-mouse speed can be specified for how fast response is for analogue input devices (e.g. MIDI port).

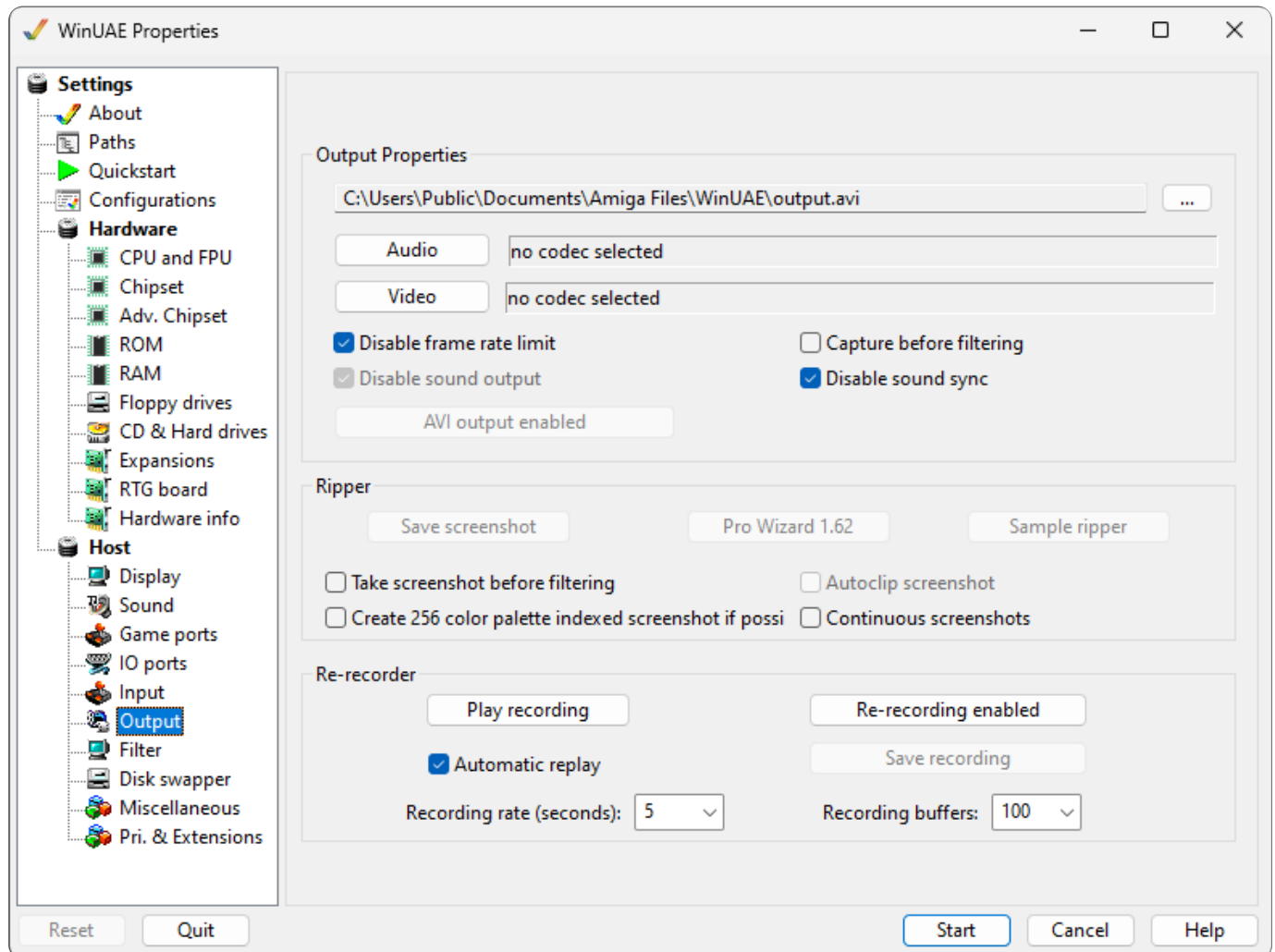
Swap Backslash/F11 allows swapping these keys for compatibility.

Copy from option allows you to copy a configuration from another configuration into the current configuration to save time.

Swap 1<>2 button allows you to swap between joystick/mouse ports.

8.6.7 Output

The Output tab allows you record video and audio



Output Properties

Output name of output file to save to.

Video type of video codec used to create/compress the video file.

Audio type of audio codec used to create/compress the audio data.

Disable frame rate limit removes any limits when recording certain types of screen

Disable sound output - removes sound when record videos if not required

Capture before filtering - Capture audio or video before filtering output

Disable sound sync disables sound sync with video

AVI output enabled writes the output in Audio Video Interleave (AVI) format

Ripper

Save screenshot saves a snapshot of what's on the screen while emulation is running. There are [Keyboard shortcuts](#) to accomplish the same.

Pro Wizard Rips music scores.

Sample ripper will sample sounds.

Take screenshot before filtering will capture screen contents before any of the configured [filters](#) have been applied.

Create 256 color palette index screenshot if possible

Autoclip screenshot will trim the picture to output format
Create 256 color palette index screenshot if possible
Continous screenshots Screen shot taken on every frame.

Re-recorder

This can allow you to **Record** and **Playback** recorder input events saved with WinUAE. They are saved as **.inp** files.

Automatic replay Allow auto-replay of the recording.

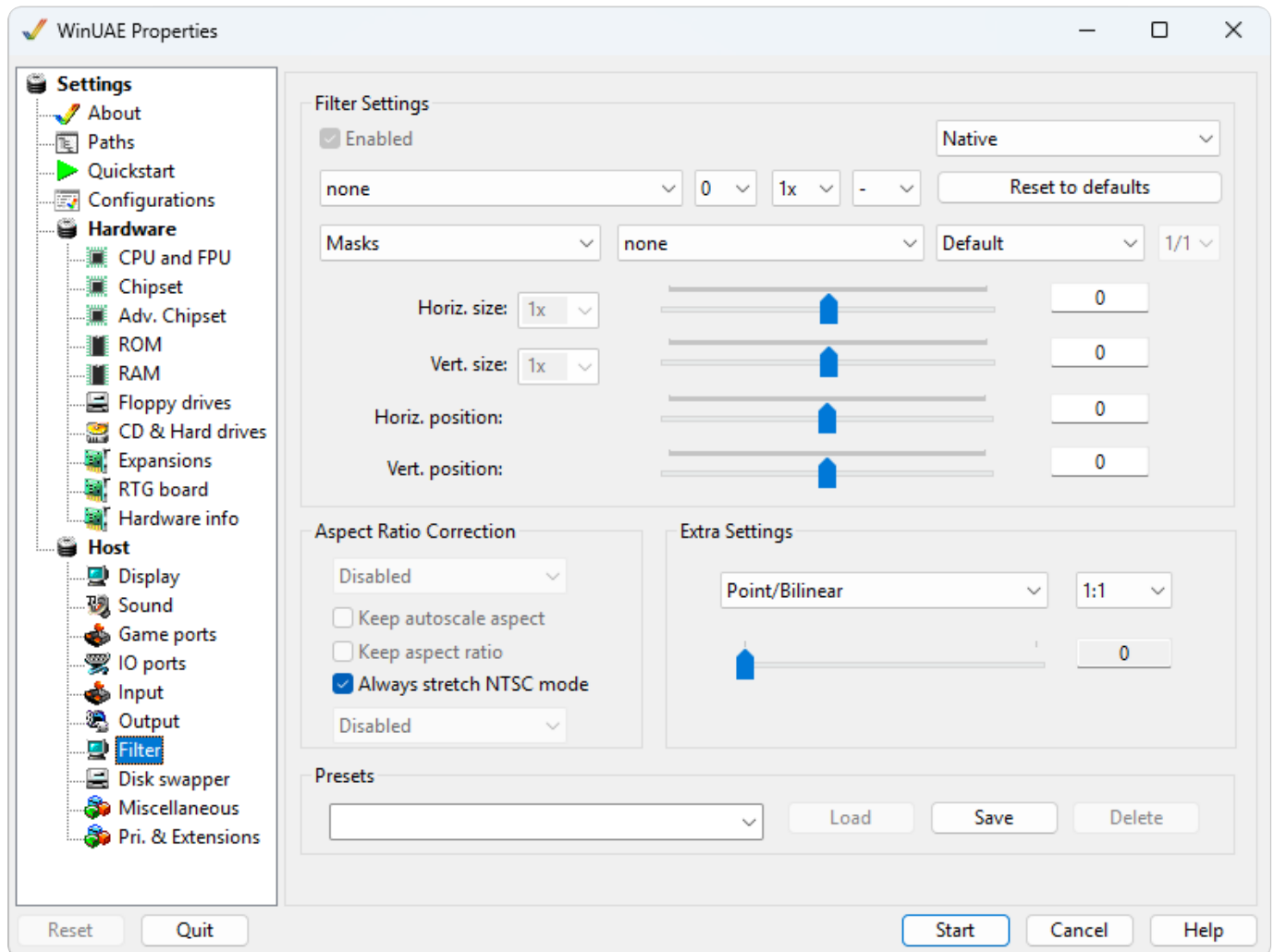
Save recording Save a recording to an **.inp** file.

Recording rate Set to 1 to 60 seconds.

Recording buffers Set buffer from 50 to 10000.

8.6.8 Filter

In this section, filters can be applied to the graphics output, useful for example in games with limited resolutions.



Filter Settings

Set to either **Native**, **Native (Interlaced)** or **RTG** mode.

You can specify whether to use **Null Filter**, **Direct3D**, **OpenGL**, **Scale2X**, **hq2x**, **SuperEagle**, **Super2XSaI**, **2xSaI** or **PAL** graphics support with **Point** or **Bilinear** graphics in either 16 or 32 bit modes.

The **Horizontal and Vertical Sizes** can be specified from -50 to 50 or 1x to 8x if using filters except Direct3D or OpenGL.

The **Horizontal and Vertical Positions** can be specified from -50 to 50.

Aspect Ratio Correction

You can specify the aspect ratio such as Disabled, Automatic, 4:3, 5:4, 15:9, 16:9, 16:10.

Keep autoscale aspect ensures that any filter will ensure display keeps its autoscale ratio correct to avoid distortions.

Keep aspect ratio ensures that any filter will ensure display keeps its aspect ratio correct to avoid distortions.

Monitor type can be Disabled, VGA or TV.

Always stretch NTSC mode expands the NTSC mode to fit the window or screen.

Extra Settings

Point/Bilinear can be specified, and ratios from 1:1 to 3:3 and from slider from 0 to 1.

Scanline can be specified as Scanline opacity, level or offset and ratios from 1:1 to 3:3.

Scanline Brightness can be specified from 0 to 100.

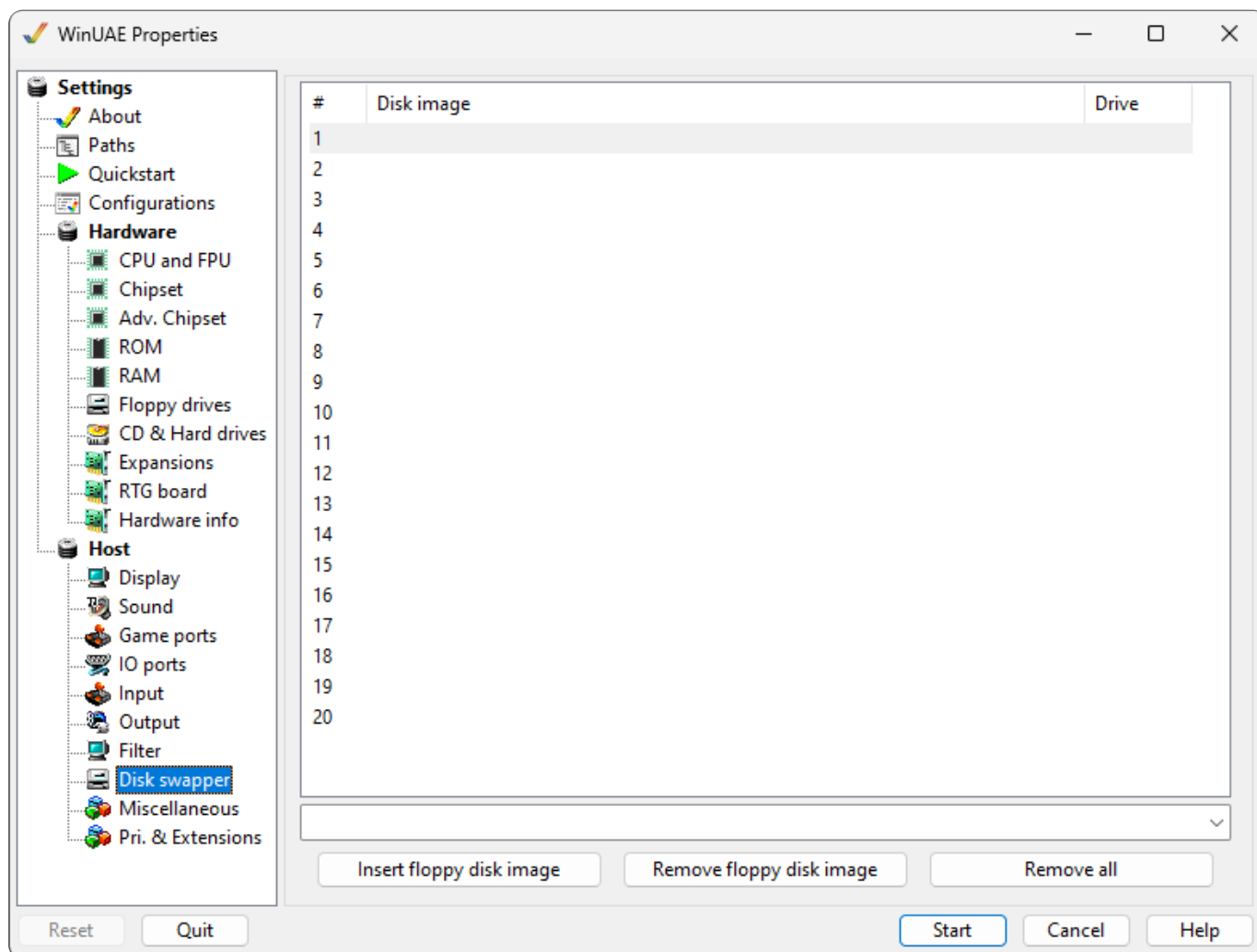
Presets

Filter settings can be saved as a **Preset** if you wish to reuse Filter settings in other configurations.

Previous saved settings can be **Loaded** or **Deleted**, if not required.

8.6.9 Disk Swapper

The disk swapper mechanism is similar in concept to a playlist or a CD changer: up to 20 disk images can be added to a list for swapping them quickly.



Double clicking on a line or selecting it and choosing **Insert floppy disk image** will bring up a file picker to add an ADF image to the list. All slots may be filled with images.

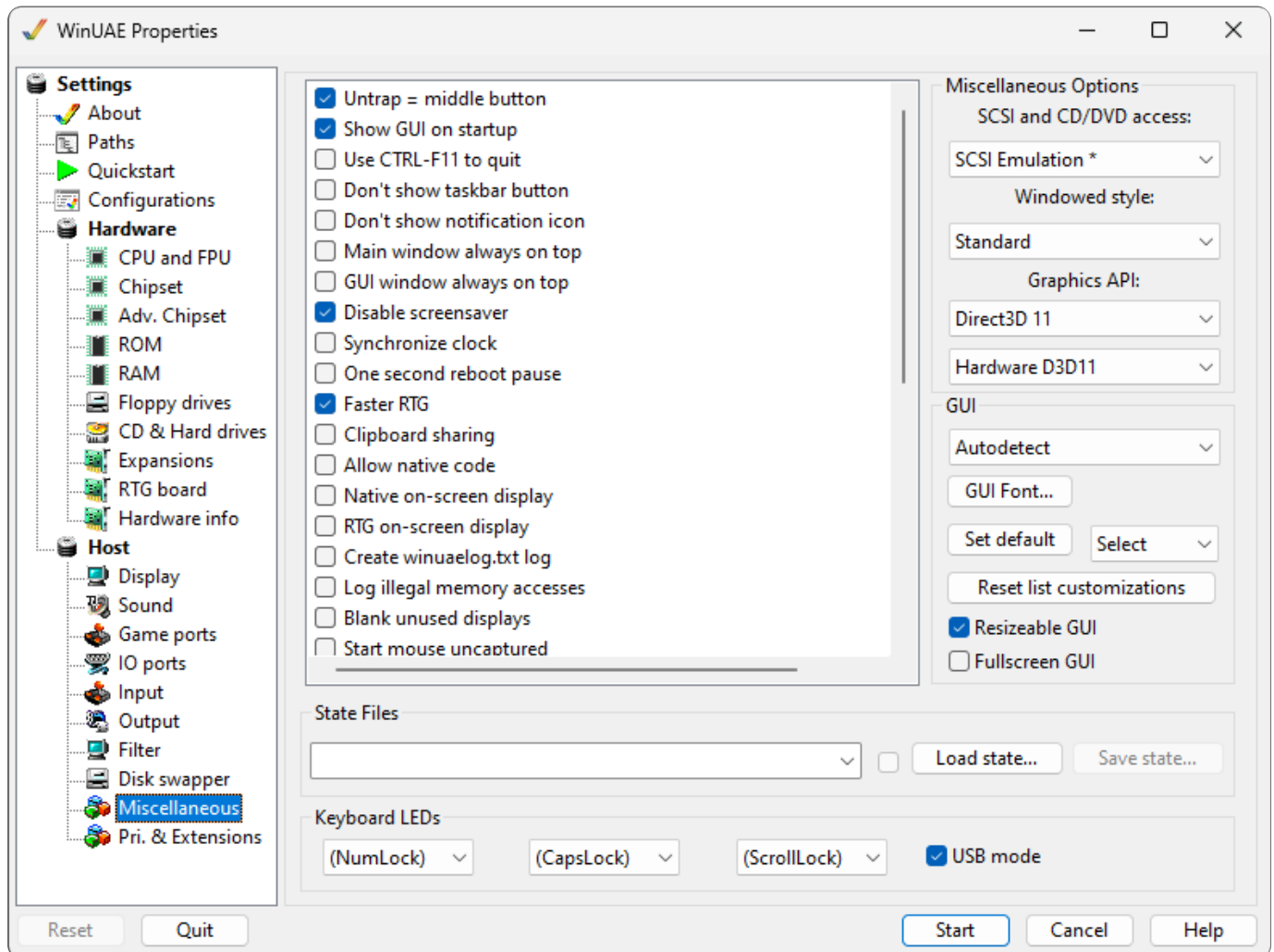
Clicking in the **Drive** column next to each entry will cycle through all enabled floppy drives. Once the disks have a drive name next to them, they will appear in the appropriate [Floppy Drives](#) slots.

Selecting an entry and clicking **Remove floppy disk image** will remove the image from the list.

Use **Remove all** to remove all the images from the list.

8.6.10 Misc

Advanced settings which do not fit into other categories.



Advanced

Untrap = Middle Button allows the middle button on your mouse to act like ALT-TAB, switching focus away from the WinUAE emulation. This is useful because WinUAE traps the mouse-cursor within its Window borders, and if your hand is already on the mouse and you want to escape this capture, you can just press the middle button.

Show GUI on startup will allow you to double-click a .uae [configuration](#) file without it immediately launching the emulation.

Use CTRL-F11 to quit Just press this key combination to quit WinUAE. If this option is enabled, the ALT-F4 combination can be used by the Amiga properly, and CTRL-F11 will quit WinUAE.

Don't show taskbar button Removes the taskbar button.

Don't show notification icon Removes the WinUAE icon from the notification area.

Main window always on top Make sure WinUAE window is always on top of other windows.

GUI window always on top. Make sure the GUI window is always on top of the windows.

Disable screensaver Temporarily stops screen saver feature for the display when using WinUAE

Synchronize clock Synchronizes Amiga [clock](#) with the PC clock.

One second reboot pause introduces a short pause before a reboot.

Faster RTG. Disables non needed emulation features such as internal bitplane emulation and copper, when [RTG](#) (P96) is in use.

Clipboard sharing allows you to share the contents of your clipboard between the Amiga and Windows if enabled.

Allow Native code is disabled by default. Context switching between native or emulated code (PPC/ 68k)

Native on-screen display overrides Display setting to use only native screen modes.

RTG on-screen display overrides Display setting to use only [RTG](#) screen modes.

Create winuaelog.txt log can be enabled to debug WinUAE when experiencing problems (see [Paths](#) for more settings)

Log illegal memory accesses can be enabled to debug memory access to protected or unallocated memory areas.

Blank unused displays opens full screen topmost black window(s) option.

Start mouse uncaptured. Start WinUAE but do not capture mouse pointer in WinUAE window.

Start minimized. Minimize WinUAE window when WinUAE is started.

Minimize when focus is lost will minimize the WinUAE window if you switch to another program or window.

Black frame insertion is supported in variable refresh modes.

Master floppy write protection overrides write protection on the [Floppy](#) drives window, so you can't accidentally untick it.

Master harddrive write protection overrides write protection on the Hard drives window, so you can't accidentally untick it.

Hide all UAE autoconfig boards will hide any extra [Zorro](#) boards from the emulator.

Right Control = Right Windows key. Map the Windows key to a Right Ctrl key for some keyboards.

Windows shutdown / logoff notification. Display WinUAE screen in Windows shutdown or logoff screen if emulation session is active.

Warn when attempting to close window. Display a warning if window close is attempted.

Power led dims when audio filter is disabled. Dim the power light when audio filter is disabled (see [Sound](#) tab).

Automatically capture mouse when window is activated. Saves having to capture mouse when swapping windows to WinUAE.

Debug memory space Debug accesses to memory space (memwatch).

Force hard reset if CPU halted. Ensures a full hard reset when the CPU is halted.

A600/A1200/A4000 IDE scsi.device disable Disable onboard IDE scsi.device.

Warp mode reset Auto switches off Warp mode when running a program or KS ROM shows something.

GUI gamepad control Allow control of the GUI via a gamepad

Default on screen keyboard (Pad button 4) Allows disabling the default on screen keyboard mapping on the pad

Default mapping in the GUI:

Button	Explanation
A	select or left mouse click
B	right mouse click
Y	Change active GUI area or TAB key
D-Pad	select UI elements
Left stick	Move (requires a XInput compatible pad)

Pad button 4 is default mapped to open/close on screen keyboard input event.

Pad button/d-pad that normally controls Amiga Joystick moves keyboard selection.

Miscellaneous Options

SCSI and CD/DVD access . Select type of [ASPI layer](#) to use, e.g. SCSI Emulation, SPTI, SPTI + SCSI Scan.

Windowed style. Select the following styles: Borderless, Minimal, Standard or Extended

Graphics API to specify API to use for graphics e.g. Direct3D 9, Direct3D 11 or DirectDraw.

DirectDraw Specify type of ram for display buffer system as Default RAM, Local VRAM, Non Local VRAM or System RAM.

GUI

Specify the language used for WinUAE. **Autodetect** will attempt to load the language of the host system if it is available, or default to English.

GUI Font. Select a font for GUI, select a font using Windows font selection window.

Set default. Set the default font.

Select font size from 60% to 140%.

Reset list customizations sets all list customizations back to defaults.

Resizable GUI option to allow you expand or shrink the WinUAE Window.

Fullscreen GUI option to expand the WinUAE window to fill the screen.

State Files

Load State. Loads a saved state from disk into memory either as a USS, GZ or GZIP file.

Save State Saves state of system and memory to disk, to a USS file.

Keyboard LEDs

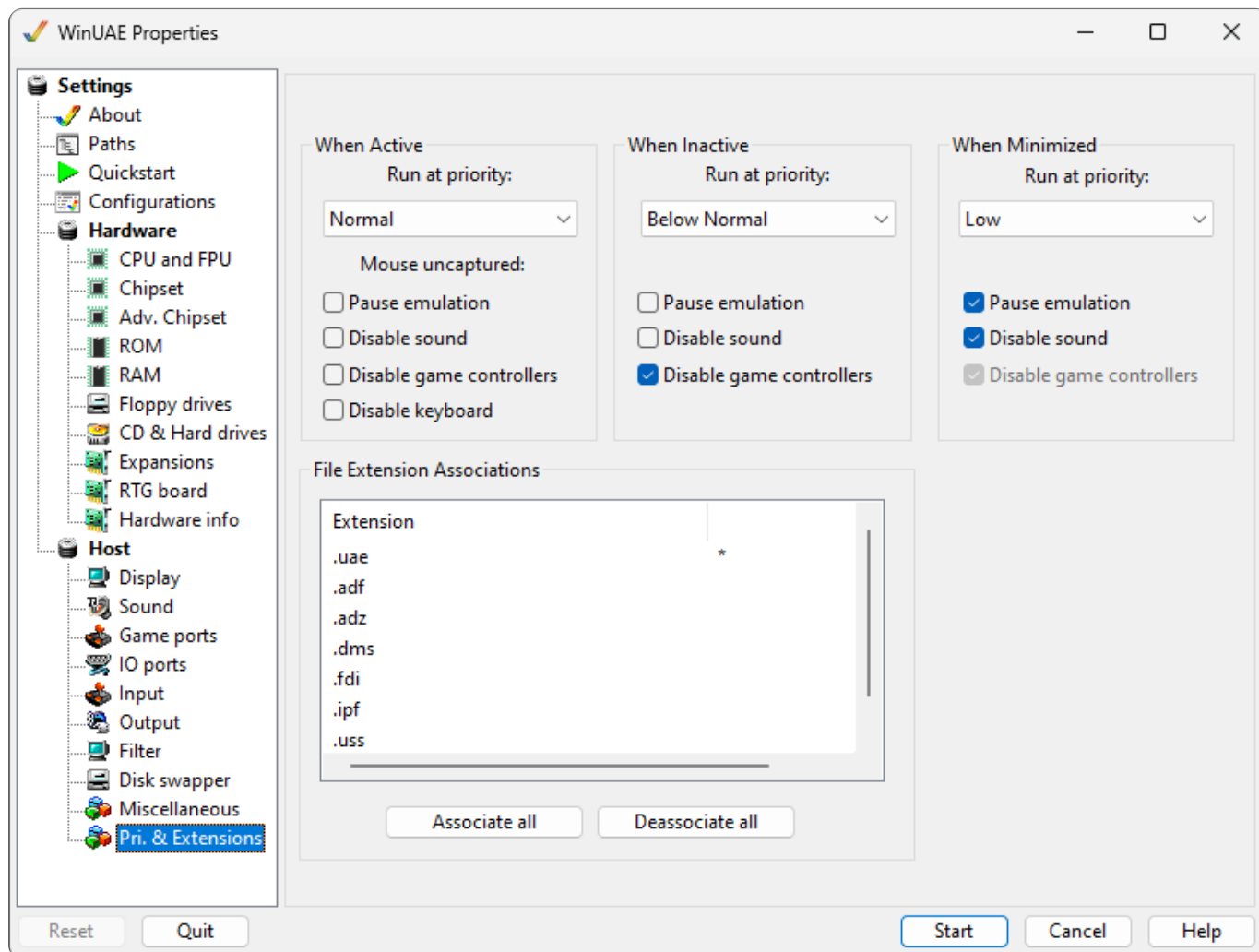
(NumLock) Sets which LED to emulate e.g. Power, HD, CD, DFX

(CapsLock) Set which LED to emulate e.g. Power, HD, CD, DFX

(ScrollLock) Set which LED to emulate e.g. Power, HD, CD, DFX

USB-Mode Add support for Multimedia keyboards.

8.6.11 Pri. & Extensions

**When Active**

Run at priority Choose which priority WinUAE should have when it's window is active. Depending on which other programs are running on the host, this should be set to Normal or higher.

Pause emulation Pause the emulation if mouse is uncaptured.

Disabled sound Disable the sound if mouse is uncaptured.

Disable game controllers Disable any game controllers if mouse is uncaptured.

Disable keyboard Disable the keyboard if mouse if mouse is uncaptured.

When Inactive

Run at priority Choose which priority WinUAE should have when it's window is in the background. To save processing time, this should be set to Below Normal or lower.

Pause emulation will completely halt emulation

Disable sound turns off audio output

Disable game controllers will disable inputs from game controllers

When Minimized

These options are identical to the ones in the Inactive section, but they only apply when the window has been minimized, and isn't just in the background.

File Extension Associations

File associations enable double click functionality in Windows, and can be changed by either double clicking an entry in the list or using the **Associate all** and **Disassociate all** buttons. An asterisk indicates that the file extension is associated with WinUAE.

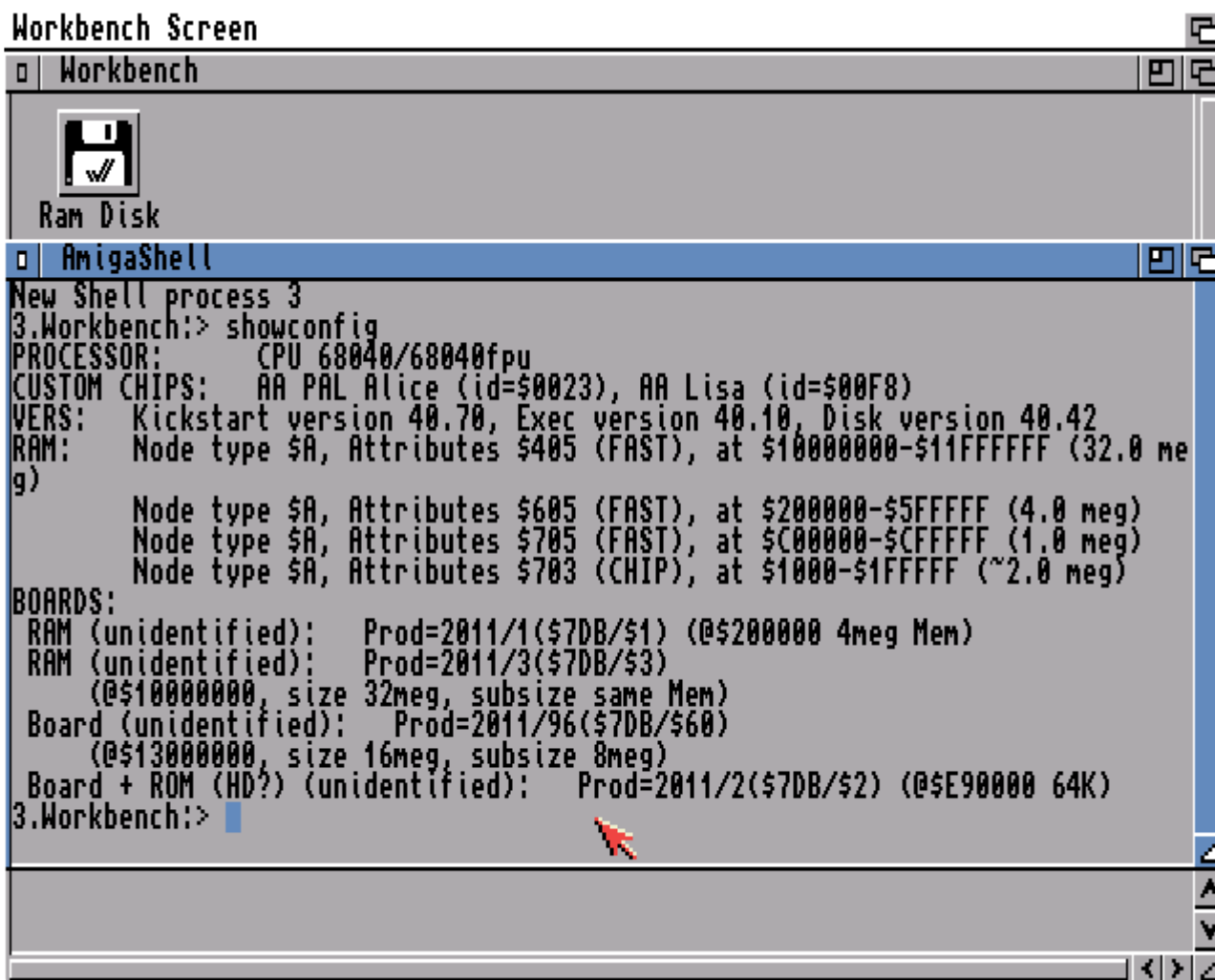
These extensions are known by WinUAE:

Extension	Explanation
uae	Configuration file for WinUAE
adf	Amiga disk format image
adz	Amiga disk format image compressed
dms	Disk masher format image
fdi	Floppy disk image
ipf	Image preservation format
uss	UAE save state file

9. The Emulation

9.1 The Emulation

There are several ways to improve the experience, such as video acceleration, speed improvements, or cheating devices.



9.1.1 Subsections

- [Drives](#)
- [JIT](#)
- [Printing](#)
- [Keyboard](#)
- [Speed](#)
- [Command Line Parameters](#)
- [Amiga Programs](#)

9.2 Drives

9.2.1 Hard Disks

Directories

When mounting a directory as hard disk in WinUAE, files will be placed into the host directory. However, the Amiga file systems used different and/or additional meta information, so by default, UAEFSDB files will be created which store this extra information, such as additional protection flags for files when using the Directory type of file systems.

Hardfiles

Hard disk files are large files that contain the image of an Amiga file system. They work much the same way as a disk file. You can simply create a large empty file and tell UAE to use it as a hardfile, but you will need to format it from the emulation before you can actually use it.

If you are want to boot a hardfile under Kickstart 1.3, you need the FastFileSystem file from the L: directory to be placed in the Kickstart ROMs-directory where WinUAE is installed.

If you are using WinUAE 0.8.22r1 or earlier and Kickstart 1.3 or earlier, hardfiles can't currently be mounted at boot time, and therefore you can't boot from it either. You will have to boot either from a [Floppy Disk Image](#) or from a file system, and mount the hardfile.device later. To do this, add the following to "DEVS:mountlist":

```
UAE0:
Device = uaeHF.device
Unit = 0
Flags = 0
Surfaces = 1
BlocksPerTrack = 32
Reserved = 1
Interleave = 0
LowCyl = 0 ; HighCyl = 511
Buffers = 5
DosType = 0x444F5300
BufMemType = 1
```

You may need to adjust the values if you specified a different geometry, and/or your hardfile has a different size than 8MB, and/or the hardfile is not mounted as UAE0: because you mounted other hard disks before it. Then, type "mount UAE0:" (or put that command in your startup-sequence), and you should be able to access it. Don't forget to format it with the AmigaOS!

If using HDTtoolbox to manage Hard files, you must create hardfile normally or use hard disk image from your real Amiga but clear all hardfile parameters except block size.(sectors, surfaces and reserved). HDTToolBox must be run with "uaeHF.device"-parameter ("tools/hdtoolbox uaeHF.device")

9.2.2 Mounted Drives

The following conventions apply for mounting drives:

- If the drive-letter has a Windows volume-name associated with it, the drive will get mounted in the Amiga using its volume-name. On PCs, the volume name can be set via the Properties of the drive in My Computer.
- If no volume-name, the drive gets assigned an Amiga volume-name based on its drive-type (the 'x:' is the PC drive-letter):

Type	Drive Letter
Hard Drives	WinDH_x:
CD-ROM Drives	WinCD_x:
Floppy Drives	WinDF_x:
Network Drives	WinNW_x:
Removable Drives	WinRMV_x:
RAM Disk Drives	WinRAM_x:

NOTE: If a drive doesn't currently have a disc in it (floppy, CD-ROM, etc.), then this option will NOT mount the drive for use by the Amiga.

9.3 JIT - Just In Time

UAE can emulate the main CPU at considerably more speed than what any classic Amiga was capable of. Still, a huge speedup can be achieved by activating the JIT compiler in the [CPU tab](#).

A description of what the settings will cause the JIT compiler to do:

Cache Size: The size (in kB) the JIT compiler uses to store pre-translated code. When this becomes full, or when the OS issues a flush icache instruction, this gets completely emptied, and then refilled during execution. Setting it to 0 will disable the JIT compiler.

FPU Support: If this is enabled, the JIT compiler will be used for the most commonly used FPU instructions. Unchecking this option will disable JIT-compiling for the FPU.

Constant Jump: If this enabled, unconditional branches will not end a block. Effectively, UAE-JIT compiles "through" them. Generally, that's a good idea, as it improves performance.

However, it makes soft cache flushing impossible for some blocks, so if you experience lots and lots of soft cache flushes (e.g. when using a Mac emulator), you might try "no" and see whether it does any better.

Hard Flush: If this is unchecked, an OS induced icache flush doesn't actually empty the cache, but instead a checksum will be used to check whether blocks have to be discarded. You'll probably want to leave this at its default (otherwise lots of stuff, like the OS, gets translated over and over).

Direct, Indirect: These describe how aggressive to be when it comes to accessing Amiga memory. If you choose "Direct", the emulation will be very aggressive. If you choose "Indirect", the emulation will always use the slower but safe method. Unless you are not using P96 graphics, there isn't much point setting this to "Direct".

No Flags: Whether to optimize away flag generation when it isn't needed. There really shouldn't be any reason why you'd want to disable this option. If you find something that works with "no" and doesn't with "yes", it most likely is a bug and you should [report](#) it.

Catch unexpected exceptions If there is an error, then this option will catch it to avoid a system crash.

9.4 Printing

Currently, there are 3 ways to print with WinUAE:

- For the same way as on classic Amigas, you can set a parallel printer in the WinUAE settings tab [Game & I/O Ports](#). Make sure Postscript detection and Post Script Printer Emulation are not checked. Now you can save your config and can start WinUAE and do the rest on the Amiga. If you use turboprint, do not use the turboprint spooler and chose parallel port or turbopar for the print device. If you print something you should see an entry in the Windows printer spooler.
- If you have a printer that the Amiga does not support, you can choose the Postscript output. For this you need to install GhostScript for Windows. In WinUAE, select the printer and check the Postscript detection and Post Script Printer Emulation. Note: You can't change these settings while the emulation is running.

Boot your emulated Amiga. There is a large probability that turboprint does not work with these printer settings, and prints out an empty page instead.

Remove turbostart if you have it and chose the Workbench Postscript Printer. Please note that the OS3.5 and OS3.9 drivers crash when you use grayscale or black and white, this function also does not work on real Amigas. So either use an older driver or choose color instead. Set it on all printer preferences pages. You can chose the real output format in the Windows printer driver. The printer must dither colors, so it is important to chose 600 or 1200 dpi on the Windows side.

- TurboPrint, GhostScript etc. are no longer required, or at least the EpsonQ emulator is the easiest way to print.

9.5 Keyboard

Amigas had different keyboard layouts, so WinUAE re-purposes a couple of keys. Some to control emulation, some to emulate keys on Amiga keyboards that other systems do not have. Below is a description of standard mappings, but keys can be configured freely in the [Input Configuration](#).

9.5.1 Shortcut Keys

Key/Combination	Description
F12	Show the WinUAE GUI
Shift + F12 End + F12	Bring up the GUI based debugger
Ctrl + F12	Switch to full-screen display
PrintScreen	Copy WinUAE's current screen to clipboard
End + PrintScreen	Save screenshot to a file
End + F5	Restore a machine snapshot file
Shift + End + F5	Save a machine snapshot file
Pause	Halt emulation
End + F1 End + F2 End + F3 End + F4	Select an ADF to be loaded into one of the four emulated disk drives
Shift + End + F1 Shift + End + F2 Shift + End + F3 Shift + End + F4	Eject a disk from one of the four emulated drives
End + J	Swap joystick ports
End + Insert	Insert text from host clipboard

9.5.2 Amiga Keys

Amiga Key	Mapped To Key(s)
Left AMIGA	Left Windows Insert
Right AMIGA	Right Windows App Menu / Context Menu Home
HELP	Page Down on numerical keypad

Action Replay

If an ActionReplay module is configured, the FREEZE button will be mapped to Page Up on the numerical keypad

9.5.3 CDTV

If the host keyboard has multimedia keys, they will be used for their equivalent functions in CDTV emulation:

- Stop
- Pause
- Previous Track
- Next Track

9.6 Speed

On a sufficiently powerful PC, UAE will give you quite an authentic flashback into the past.

Use the tips below to maximize the performance of your emulated Amiga.

9.6.1 Memory

As a rule of thumb, WinUAE needs 60+Z3+Chip+Fast+Picasso96 MB of system memory. Memory is allocated dynamically. This means you can select 512MB Z3 memory, which will only be used when needed.

Make sure that the used RAM on your computer is always well below the amount of physical memory it has, otherwise the operating system has to swap the data to the hard disk if it runs out of RAM, which is a huge performance hit.

Also try to activate "Suspend to Disk" mode. If you do, do not forget to use the [timehack](#) to set the Amiga clock to a correct value.

9.6.2 Picasso96

When using Workbench, it is strongly recommended to make use of WinUAE's Picasso96 support. Using this, you can utilize the power of your computer's graphics card to display higher resolutions, more colors, and give all graphics output a significant speedup.

Read more details about the correct usage on the [Picasso96 page](#).

9.6.3 AHI

Again, if you are using the Workbench, it is recommended to use AHI as your preferred sound interface.

For a further speedup, use [ahitweak](#). Increase the poll rate (the rate WinUAE checks for sound buffers). You may also try to adjust the sound buffer size in the [Sound](#) tab.

9.6.4 Hardfiles

It is recommended to install the AmigaOS and programs on a hardfile, so the access and backup can be done quickly. To store pictures and other data, you may use a Windows directory for easier data exchange with the PC.

Transferring data from/to a hardfile can be done by simply copying it, so you don't have to install all your Amiga stuff again.

9.7 Command-Line Parameters

WinUAE offers many command line parameters to control its startup behavior.

9.7.1 WinUAE Specific

Parameter	Description
<code>-diskswapper=d1.adf,d2.adf</code>	Comma-separated list of disk images. Pre-loads disk images into the Disk Swapper mechanism.
<code>-cfgparam=</code> <code>-cfgparam</code>	Previously used to pass configuration parameters, currently ignored - see the <code>-s</code> parameter.
<code>-config=configfile.uae</code>	Load the given configuration file during startup.
<code>-statefile=statefile.uss</code>	Load a saved system state file.
<code>-f configfile.uae</code>	Similar to <code>-config</code> , but without the equals sign: will load a configuration file.
<code>-s option=value</code>	Pass on one or more options from a configuration file directly, without loading a file.
<code>-h</code> <code>-help</code>	Opens the help, if available (the one you are reading right now).
<code>-cdimage=image.iso</code>	Inserts the given image into the emulated CD-ROM drive.
<code>-version</code>	Outputs the header lines of winuaebootlog.txt (version and build information), then exits.

If the last parameter entry is an orphan and nothing else was loaded, WinUAE will check if it is a config file or statefile and load it.

If standard output is redirected (e.g. `winuae.exe >log.txt`), all logging is redirected to that file in UTF-8 format.

9.7.2 Generic

Parameter	Description
-0 <i>disk.adf</i> -1 <i>disk.adf</i> -2 <i>disk.adf</i> -3 <i>disk.adf</i>	Insert specified ADF image into emulated floppy drive 0-3
-r <i>kick.rom</i>	Load main ROM from the specified path.
-K <i>kick.rom</i>	Load extended ROM from the specified path.
-p <i>value</i>	Name for the parallel port to be configured, i.e. LPT2:
-m <i>VOLNAME:mount_point</i> -M <i>VOLNAME:mount_point</i>	Attach a volume directly to the specified mount point.
-W <i>value</i>	Hardfile specification.
-S <i>value</i>	Sound parameter specification
-R <i>value</i>	Output framerate in frames per second.
-i	Enable illegal memory.
-J <i>xy</i>	Specify joystick 0 (x) and 1 (y). Possible values: 0/1 for joystick 0/1, M for mouse, and a/b/c.
-w <i>value</i>	CPU emulation speed. Possible values: 0 for cycle exact, -1 for maximum speed.
-G	Don't show the GUI.
-D	Start the debugger.
-n	Enable immediate blits. Only available when illegal memory is not enabled.
-v <i>value</i>	Set chipset. Possible values: 0 (OCS), 1 (ECS Agnus), 2 (ECS Denise), 3 (Full ECS), 4 (AGA)
-C <i>value</i>	Set CPU specs.
-Z <i>value</i>	Z3 Fastmem size, value in 1MB blocks, i.e. 2=2MB.
-U <i>value</i>	RTG memory size, value in 1MB blocks, i.e. 2=2MB.
-F <i>value</i>	Fastmem size, value in 1MB blocks, i.e. 2=2MB.
-b <i>value</i>	Bogomem size, value in 256kB blocks, i.e. 2=512kB.
-c <i>value</i>	Chipmem size, value in 512kB blocks, i.e. 2=1024kB.
-l <i>value</i>	Set keyboard layout language. Possible values: de, dk, us, se, fr, it, es.
-O <i>value</i>	Set graphics specs.
-d <i>value</i>	Serial or parallel port on demand, insert s or p as value.
-H <i>value</i>	Color mode.

9.7.3 Obsolete

For the sake of completeness, these parameters are no longer supported: `accuracy`, `gfx_opengl`, `gfx_32bit_blits`, `32bit_blits`, `gfx_immediate_blits`, `gfx_ntsc`, `win32`, `gfx_filter_bits`, `sound_pri_cutoff`, `sound_pri_time`, `sound_min_buff`, `sound_bits`, `gfx_test_speed`, `gfxlib_replacement`, `enforcer`, `catweasel_io`, `kickstart_key_file`, `fast_copper`, `sound_adjust`, `sound_latency`, `serial_hardware_dtrdsr`, `gfx_filter_upscale`, `gfx_correct_aspect`, `gfx_autoscale`, `parallel_sampler`, `parallel_ascii_emulation`, `avoid_vid`, `avoid_dga`, `z3chipmem_size`, `state_replay_buffer`, `state_replay`, `z3realmapping`, `force_0x10000000_z3`, `fpu_arithmetic_exceptions`, `gfx_filter_vert_zoom`, `gfx_filter_horiz_zoom`, `gfx_filter_vert_zoom_mult`, `gfx_filter_horiz_zoom_mult`, `gfx_filter_vert_offset`, `gfx_filter_horiz_offset`, `gfx_tearing`, `gfx_tearing_rtg`, `uaehf0*`, `uaehf1*`, `uaehf2*`, `uaehf3*`, `uaehf4*`, `uaehf5*`, `uaehf6*`, `uaehf7*`,

pcibridge_rom_file, pcibridge_rom_options, cpuboard_ext_rom_file, uaeboard_mode, comp_oldsegv, comp_midopt, comp_lowopt, avoid_cmov, compforcesettings

9.8 Amiga Programs

Along with the WinUAE emulator program, some programs are supplied in the 'Amiga Programs' folder in the C:\Program Files\WinUAE folder. Here is an explanation of what these files are for and where to copy them to:

9.8.1 MouseHack

Copy this program file to your C directory on your Workbench disk or hard disk. This program will hack your mouse connected to your PC to work with WinUAE. In most cases it may not be needed. You can auto run it by adding a line to the s:user-startup file on your Workbench disk. Needed when using tablets. Tablets only work properly if you select "mousehack mouse" and run mousehack on the Amiga side.

9.8.2 Picasso96fix

Copy this program file to your C directory on your Workbench disk or hard disk. This program will fix Picasso 96 RTG screens greater than 1024 pixels when using your PC's graphics card with the uaegfx driver in WinUAE. Load it before LoadWB in the startup-sequence. The **Picasso96fix.bb** file is the source code to this program written in Blitz Basic.

9.8.3 rtg.library

Retargetable Graphics Library. Copy this library file to your libs:picasso96. This library will increase the speed of WinUAE a lot.

9.8.4 timehack

This tool synchronizes the Amiga time with the current Windows time every second. You need this when you use the hibernation feature of your PC and resume to get exact time. If you need exact time (for compiler make) it is also recommended to use this because UAE cycletiming differs of about 1-2 seconds per hour.

Copy it to the Amiga system directory c. Start it in your Userstartup with the command run >nil: timehack.

9.8.5 transdisk

Copy this program file to your C directory on your Workbench disk or hard disk. This can Transfer Disk images to or from floppy disk to an image or vice versa in ADF (Amiga Disk Format). Type *transdisk ?* for more options. See [Create Image Files](#) page for more details on this program.

9.8.6 transrom

Copy this program file to your C directory on your Workbench disk or hard disk. This can Transfer the Kickstart ROM image from a real Amiga to an image file to use with your Amiga Emulator. It will produce either a 256K or 512kB sized file. See [Create Image Files](#) page for more details on this program.

9.8.7 UAE

Copy this file to the AHI driver drawer in Devs on your Workbench disk or hard disk. It is used to emulate the Amiga's sound system using AHI retargetable sound driver system.

9.8.8 UAE.audio

This is the AHI Driver for UAE. It enables support for recording and playback with a sampling rate up to 96 kHz in 16 bit. Copy this file to the Devs:AHl driver drawer in Devs on your Workbench disk or hard disk. It is used to emulate the Amiga's sound system using AHI retargetable sound driver system. This driver works fully independent from Paula sound. For a speed boost on slower systems, you can set the Paula buffer to 5 or 6, and chose 11kHz Mono, which is enough to hear system sounds.

If you installed the driver correctly, it should offer you only 1 mode: UAE HiFi stereo++.

9.8.9 UAE_German

This is a German keymap file for access to @\~{[] with ALT-GR like windows. Copy it to devs/keymaps and select in Input prefs.

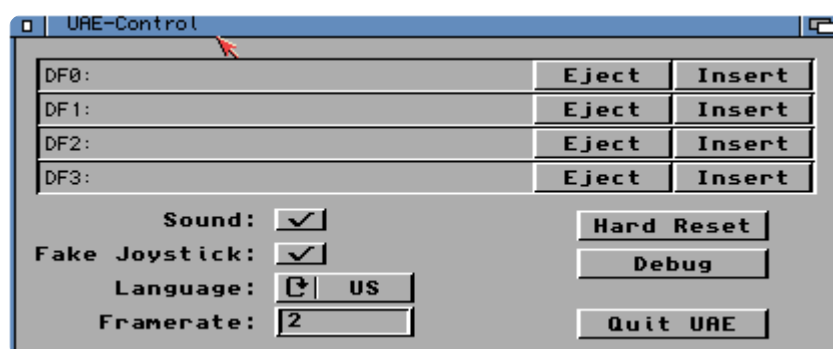
Note: This is an old one that works in input compatibility mode. For 100% compatibility Mode (Euro Char) use German_keymap_new.lha in this folder and choose anything other in input tab then Compatibility Mode and remap # Key to 0x2b.

9.8.10 uae_rcli

Remote CLI. Usage: uae_rcli [?|-h] [-debug] [-nofifo] [<delay>]

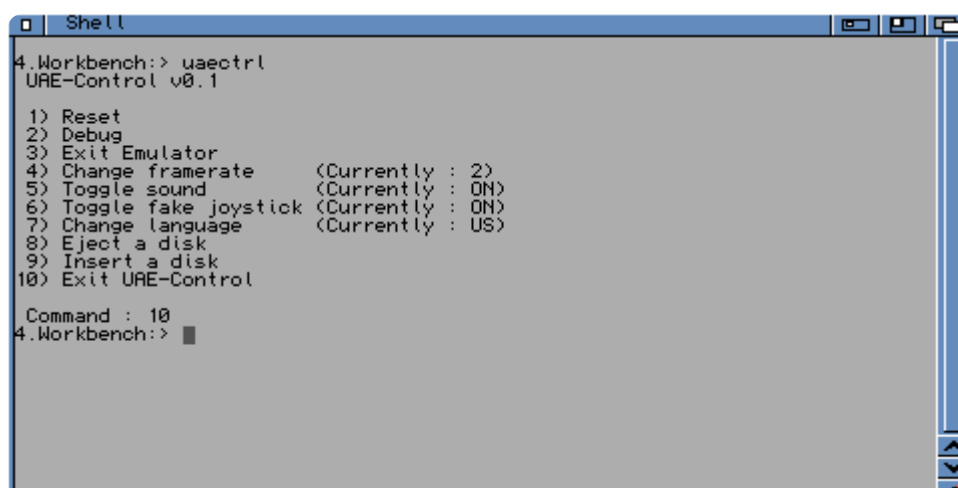
9.8.11 uae-control

Copy this program file to your Utilities folder or some other folder on your Workbench disk or hard disk. It will provide a user interface within the emulator to control the floppy drives, reset, quit and other features without having to press F12 to bring up the WinUAE interface.



9.8.12 uaectl

Copy this program file to your C directory on your Workbench disk or hard disk. This is the Shell equivalent of the uae-control program where you can change floppies, sound, joystick, reset or quit the emulator from a simple text menu.



9.8.13 WinUAEclip

This program allows you to have access to Windows Clipboard so you can copy/paste files from/to WinUAE.

9.8.14 WinUAEnforcer

This program allows Enforcer support to detect bad memory access when developing programs or debugging. For 100% safety, use [JIT](#) in Indirect Mode. Make sure you use a tool that moves your VBR to Fast RAM. MCP or some other tools on Aminet do that. You can also use Segtracker from a real Amiga to find the program and offset of a hit.

9.8.15 winxpprinthelper

Not sure what this does yet. Need printer switched on before running this.

9.8.16 p96_uae_tweak

It must run after P96 monitor drivers in user startup.

If you have copy this program to c:, then type `>nil: c:p96_uae_tweak` in the CLI.

It is also recommended to set P96 memory from the 4 MB AIAB config to 16 or 32 MB, because it works faster. If not enough graphics card space is free you will see flicker as before and slower moves. Save the configuration and restart WinUAE when you have increased the graphics memory size. Crashes may occur when you only reboot the emulated Amiga.

To test it you can boot AIAB open the screenmode prefs window. Now put the screenmode prefs window to back and move it around underneath other windows.

If the window moves fast and does not flicker all, you are done. With that patch it is also impossible that P96 graphics actions can block WinUAE, so you get no AHI 16bit sound stuttering when doing a lot of graphics actions.

The patch splits large P96 blits (>60 pixels) in smaller blocks and checks in all blocks if a 16bit AHI buffer is free. This avoids speed losses and sound stuttering with 4ms AHI latency. Swapbitmaprastport (used for solid window moving and some slow layer actions) is patched to use UAE Blitter functions that exchange the data directly instead calling 3 times EOR. It is faster and avoids the heavy flickering when moving a smart layer window underneath another window.

9.8.17 ahitweak

Usage: AHItweak posoffset,pollrate

This is a program you can start from the CLI or user-startup and allows you to tune the AHI driver for better latency, because on Windows XP the play pointer position has a delay depending on the system and sound card used. Most users do not need this tool, but if you have crackle problems with 16bit AHI, play a song and try values of 50, 200, 500, 2000, -50, -200, -500, and -2000. With some trying, you may be able to get good results. You may also try to set the pollrate which WinUAE checks for buffers freely between 10 and 60. If you notice a speed loss you should set it to 60. If you use low latency music software that lets you chose AHI block sizes less than 8 ms (AHI uses 20ms by default) you can set this to a lower value if you hear crackle.

9.8.18 p96refresh

Start this program to get higher mouse pointer redraw rates than 50Hz with P96. Results are seen immediately after call. You can start this in your user-startup for automatic load during booting the system.

Note: If you use this, you must check if your CPU IDLE slider is set in correct position. In the worst case, the Amiga system clock will run slower. Set the IDLE slider so that in Windows task manager the CPU load of a Workbench screen shows about 10-15%.

Example: p96refresh 75 sets the redraw rate to 75Hz. It is recommended to set the rate according to the actual monitor refresh rate, or the doubled number. Do not set it higher or you get a speed loss greater than 2%.

10. Background Information

10.1 Background Information

In this section you will find some background information on Amigas.



10.1.1 Subsections

- [Custom Chips](#)
- [Amiga RAM](#)
- [Kickstart](#)
- [Zorro Bus](#)
- [Autoconfig](#)
- [AmigaDOS Commands](#)

10.2 Custom Chips

The so-called "Custom Chips" are arguably the most famous and differentiating feature of Amigas, compared to other computing architectures. They allowed the - for its time - very advanced capabilities.

In the first one, the A1000, the chips "Agnus", "Paula", and "Denise" did the hard work. Together, they formed a specialized multiprocessor system that took much of the time-critical load off of the main processor. This included the display of image information, 4-channel sound output, floppy control, general DMA control, and much more.

In the latest Amigas you find the "AGA chipset", which consists of the original "Paula" and the advanced chips named "Alice" (the replacement for Agnus) and "Lisa" (the replacement for Denise).

10.2.1 Chipset Generations

- **OCS** (Original Chip Set): This was the first chipset, used in the Amiga 1000. It consists of the chips Paula, Agnus, and Denise. With these, you can display graphics in resolutions up to 640x512 and in up to 4096 colors.
- **ECS** (Enhanced Chip Set): This was the next generation of Amiga chipsets. The chip names remained unchanged, except some minor additions like "Fat Agnus". Only Agnus and Denise were changed. Compared to OCS, they provided higher resolutions, but no expansion of the color palette so far.
- **AGA** (Advanced Graphics Architecture): This is the latest and most advanced chipset. The current generation was created in the labs as AA chipset (for Advanced Amiga), but in some countries it was later marketed as AGA (Advanced Graphics Architecture). Agnus was replaced by Alice and Denise by Lisa. The resolutions now reach up to 1280x512 in VGA scan frequencies. The color palette is now 24 bits or 16.8 million colors. You can display up to 256 colors simultaneously or in HAM mode more than 640,000. Backwards compatibility with Video and OCS modes is assured.
- **Discrete graphics** and **RTG**. After AGA, the Amiga used discrete graphics cards to improve display resolutions and color depths but lost some of the features like HAM, Copper effects and Sprites on the earlier boards.

10.2.2 Paula

The Amiga's third custom chip, **Paula** took care of audio generation and I/O. There were four voices of sound, output as two (stereo) channels. Nine octaves were available with both amplitude (e.g. speech playback) and frequency modulation.

Amplitude modulation was the normal way of generating sound, with the DMA chip reading amplitude data from memory and the I/O chip translating the digital data to an analog voltage level. Frequency modulation always took place "on top of" amplitude modulation, modulating the frequency with which the DMA chip would read new amplitude data. One voice's amplitude data was usurped to modulate the frequency of another voice. Frequency modulation was not needed to play normal tones, and usually had little to do with the perceived pitch of the actual sound played, at least as experienced by a human listener.

10.2.3 HAM

The HAM (Hold And Modify) mode is one of several graphics modes that's provided by the Amiga custom chips from their start. With HAM, you can display many colors simultaneously while using up very little memory. Simply put, it's sort of a hardware data compression method by a factor of ca. three. Still you can display practically all colors of the palette on screen. This modification of one color component serves to render soft color transitions very accurately, as they are typical for natural pictures like portraits. In the HAM8 mode you can theoretically display more than 640,000 colors simultaneously on screen. The dependence on previous pixel contents sets certain limits, so that the HAM mode is less suited for realtime action. But in still pictures or precalculated animations, it lives with its many colors. Due to data compression, the HAM mode is also responsible for the Amiga being so famous for animations that can run at full speed, even on smaller Amiga models. Basically you can display all 16.8 million colors of the 24-bit palette in HAM8 mode.

10.2.4 Copper

Copper is the short name for a "Coprocessor" which is integrated into the Amiga custom chips. It makes fast action games possible, as well as unbelievable color effects, and the capability to drag down a screen partially on the Amiga's display and thus show several screens at once. Technically, the Copper is a highly specialized microprocessor which knows only three different commands, but can process these extremely fast and efficiently. It provides the ability to change e.g. graphics mode, color values, or sprite definitions somewhere at a well defined location within the screen. This way the Amiga can display many different actions on one screen simultaneously without activity by the main CPU.

10.2.5 Blitter

Blitter is the short name for another graphics coprocessor which is part of the Amiga custom chips. With it you can copy rectangular image parts extremely fast to other areas. During this, you can take up to three source data areas and perform logical operations on them. This allows e.g. to define certain color values of the copied object as transparent, thus not modifying the destination area. As an add-on, the Blitter can also draw lines and fill areas fast. All in all it serves to provide extremely fast, animated graphics that can be designed to be especially realistic.

10.3 Amiga RAM

The Amiga's unique hardware design is also reflected in how RAM is used.

- The **Fast RAM** is for CPU's use only, capacity are differentiated by different CPU.
- **Chip RAM** is shared between CPU and [Custom Chips](#) (up to 4MB), similar to other computers' Video RAM and Sound Buffer. In an Amiga, it can also be used by the CPU. A500 or A600 had 512kB or 1MB of Chip RAM, A1200 or A4000 had 2MB Chip. In WinUAE, up to 8MB can be configured (no real Amiga had this!)
- **Slow RAM** is extra RAM added via the A500 trapdoor and is slower than Fast RAM, which is due to A500's architecture.
- **Z3-Fast** is Fast RAM in [Zorro 3](#) address space and can be used instead of Fast RAM.
- **RTG (graphics card)** is memory for Retargetable Graphics cards needed for Picasso 96 support.
- **Motherboard Fast RAM** is memory fitted to the motherboard.
- **Processor Slot Fast RAM** is memory fitted to a board in processor slot.
- **Second Z2 Fast RAM board** is memory fitted to a 2nd Zorro 2 board.

Z3-Fast and RTG RAM is supported on the 68020, 68020+FPU and 68040 only. PPC systems will use Processor slot Fast RAM.

Depending on the processor variant, you can expand the RAM up to 10 MB or theoretically up to 2 GB. The limit of 2 GB is valid for the Amiga models A3000 and A4000. On the Motherboard of these computers you can plug in up to 18 MB RAM, and for every of the four Zorro-III bus expansion you can expand memory to the maximum.

10.4 Kickstart

The Kickstart, a ROM chip which contains essential parts of the Operating System and an Amiga can not boot without it.

10.4.1 Kickstart Disk

Originally, the first Amiga (A1000) had a small bootstrap ROM, which contained code to load the basic operating system from a disk, known as the "**Kickstart disk**" into 256 kilobytes of RAM, which was then transformed into ROM by disabling the write signal to this RAM. Of course, the contents of this pseudo-ROM was lost when the computer was turned off. The point of using RAM was that Commodore wanted to be able to continue developing the operating system without requiring people to change ROMs when a version was available; instead, they could just distribute new "Kickstart" disks, which they did three times, upgrading version 1.0 to 1.1 and later 1.2.

10.4.2 Kickstart ROM

Version 2.0 was too large to fit into this pseudo-ROM, so the Kickstart was stored on ROM chips directly. This is the reason why Amiga 1000s cannot run more modern versions of AmigaOS.

10.5 Zorro Bus

The Zorro bus is the standard for expansion cards on the bigger Amiga models. One of the main features of the Zorro bus is [Autoconfig](#).

10.5.1 Zorro

The Zorro bus was introduced with the Amiga 1000. Cards based on the original Zorro bus are not compatible with the later versions.

10.5.2 Zorro-II

The 16 bit wide Zorro-II was introduced with the A2000.

10.5.3 Zorro-III

Zorro-III had its premiere with the A3000. This 32 bit wide bus was one of the fastest bus systems at the time it was released. It's also backward compatible with the Zorro-II bus. By multiplexing signal lines, the connectors between the two latest Zorro versions remained unchanged. The Amiga could automatically detect if a 32 bit enabled card was in a slot, and then use the faster Zorro-III mode.

10.6 Autoconfig

On early computing systems, configuration of extension hardware usually involved configuring cards manually via "jumpers" or DIP switches for certain address areas or interrupt numbers. This is a very tedious and error-prone process, and in practice, requires in-depth knowledge of the system to avoid conflicts among different cards used simultaneously. AutoConfig was introduced with the Amiga 1000 in the year 1987, and automated this procedure totally, so that the user never had to bother with such details. A similar technology - called Plug&Play - was released by Microsoft with the introduction of Windows 95.

When the Amiga is switched on, the Kickstart begins to search for an expansion card every expansion slot. When a card is found, information about its type and needed resources is read from that card. The Kickstart then automatically allocates all necessary resources. The important difference to Plug&Play is that Amigas already allocate all expansions before the operating system is loaded. On Windows machines, the operating system itself searches and invokes expansion cards.

10.7 AmigaDOS Commands

These are the AmigaDOS commands found in the C directory with an explanation of the command and an example.

Addbuffers

Format: Addbuffers Drive/A Buffers/N
 Purpose: Add memory to floppy disk buffers to improve speed.
 Parameters: Drive = Name of drive, Buffers = Size of buffers to add.
 Example: Addbuffers DF0: 10

AddDatatypes

Format: AddDataTypes files/M QUIET/S REFRESH/S
 Purpose: Activates datatypes or adds another datatype.
 Parameters: files = List of datatypes to add, Quiet = No output, Refresh = Update datatypes.
 Example: AddDataTypes gif.datatype REFRESH

Alias

Format: Alias Name String/F
 Purpose: Assigns a short name to a command.
 Parameters: Name = Alias name, String = String or command to use for alias.
 Example: Alias Del Delete

Ask

Format: Ask Prompt/A
 Purpose: Asks a question in a script (reply y/n). Use IF WARN to test for a yes.
 Parameters: Prompt = Text to be displayed.
 Example: Ask "Are you sure? Y/n"

Assign

Format: Assign Name Target/M LIST/S EXISTS/S DISMOUNT/S DEFER/S PATH/S ADD/S REMOVE/S VOLS/S DIRS/S DEVICES/S
 Purpose: Assign names to directory paths.
 Parameters: Name = Name of the assign, Target = Directory path, List = Display list of assigns, Exists = Test if assign exists (use IF WARN), Dismount = Remove assign, Defer = Assign later, Path = Add assign with path, Add = Add a new target to existing path (like LIBS:), Remove = Remove an assign, Vols = List volumes, Dirs = List directories, Devices = List devices.
 Example: Assign PPaint: DH0:PPaint

Avail

Format: Avail CHIP/S FAST/S TOTAL/S FLUSH/S
 Purpose: Memory availability
 Parameters: Chip = Display chip memory, Fast = Display fast memory, Total = Display all memory, Flush = Free up memory.
 Example: Avail TOTAL

Binddrivers

Format: BindDrivers
 Purpose: Load device drivers for old hardware.
 Example: BindDrivers

Break

Format: Break Process/A/N ALL/S C/S D/S E/S F/S
 Purpose: Stop a program (see Status)
 Parameters: Process = Process name, All = Apply C,D,E and F, C = Apply Ctrl+C, D = Apply Ctrl+d, E = Apply Ctrl+E,

F = Apply Ctrl+F.
Example: Break 2 C

CD

Format: CD Dir/A
Purpose: Change directory
Parameters: Dir = Directory to change to
Example: CD Text_Files

ChangeTaskPri

Format: ChangeTaskPri Pri=Priority/A/N Process/K/N
Purpose: Changes program's execution priority (see Status)
Parameters: Pri = Priority to apply (-128 to +127), Process = Process number (see Status).
Example: ChangeTaskPri 2 1

Conclip

Format: Conclip Unit/N OFF/S
Purpose: Activates clipboard device
Parameters: Unit = Clipboard unit, Off = Turn off clipboard.
Example: Conclip 1

Copy

Format: Copy from/M To/A ALL/S QUIET/S BUF=BUFFER/K/N CLONE/S
DATES/S NOPRO/S COM/S NOREQ/S
Purpose: Copy files (with/without protection bits)
Parameters: from = Files to copy, To = Directory or file to copy to, All = Copy all files, Quiet = No output,
Buffer = Size of buffer (default = 100K), Clone = Copy file and timestamp, protect bits and comment, Dates =
Copy timestamp as well, NoPro = Set default protection bits, Com = Copy comment, NoReq = No requester popups.
Example: Copy mydoc.txt docs: Dates

CPU

Format: CPU CACHE/S BURST/S NOCACHE/S NOBURST/S DATACACHE/S DATABURST/S
NODATACACHE/S NODATABURST/S INSTCACHE/S INSTBURST/S NOINSTCACHE/S
NOINSTBURST/S COPYBACK/S NOCOPYBACK/S EXTERNALCACHE/S
NOEXTERNALCACHE/S FASTROM/S NOFASTROM/S NOMMUTEST/S CHECK/K
Purpose: Change or display CPU settings e.g. caches, burst, fastrom. Useful for some backward compatibility.
Parameters: Cache|NoCache|DataCache|InstCache|NoDataCache|NoInstCache = Turn all or some caches on or off,
Burst|NoBurst|DataBurst|InstBurst|NoDataBurst|NoInstBurst = Turn all or some burst modes on or off,
CopyBack|NoCopyBack = Enable/disable copyback mode for 68040, ExternalCache|NoExternalCache = Enable/disable external
cache for 68040, FastRom|NoFastRom = Copy ROM Fast memory or not, NoMMUTest = Don't check for MMU, Check = Check cpu.
Example: CPU INSTCACHE FASTROM

Date

Format: Date Day Date Time To=Ver/K
Purpose: Display/change date or time
Parameters: Day = Day of the Week, Date = Date in dd-mmm-yy format, Time = Time in hh:mm[:ss] format, To = Save to
filename.
Example: Date To=date.txt

Delete

Format: Delete File/M/A ALL/S QUIET/S FORCE/S
Purpose: Delete files and/or directories.
Parameters: Files = One or more files, All = Delete all subfolders and files, Quiet = No output, Force = Ignore
protection flags when deleting.
Example: Delete OldFilesDir All

Dir

Format: Dir Dir Opt/K ALL/S DIRS/S FILES/S INTER/S
Purpose: List contents of a directory
Parameters: Dir = Directory, Opt = Option, Dirs = List directories, Files = List Files, Inter = Interactive mode.
Example: Dir S: Files

Diskchange

Format: Diskchange Device/A
 Purpose: Tell AmigaDOS that a disk has been swapped in a non-autosensing disk drive.
 Parameters: Device = Name of removable device.
 Example: Diskchange DF2:

Diskcopy

Format: Diskcopy from/A To/A Name/K NOVERIFY/S MULTI/S
 Purpose: Duplicates disks
 Parameters: from = Disk to copy from, To = Disk to copy to, Name = Volume name, NoVerify = Do not verify copy,
 Multi = Make more than one copy.
 Example: Diskcopy DF0: to DF1:

DiskDoctor

Format: Diskdoctor Drive/A
 Purpose: Repairs disk problems (in place). Deprecated in WB2.
 Parameters: Drive = Disk drive name.
 Example: DiskDoctor DF0:

Echo

Format: Echo String/M NOLINE/S FIRST/K/N LEN/K/N TO/K
 Purpose: Display text in a script or part of a string of text.
 Parameters: String = Text to display, NoLine = Do not print a new line, First = Position of first character, Len = Length of substring, To = Destination file.
 Example: Echo "Enter your name: " NoLine

Ed

Format: ED from/A Size/N With/K Window/K Tabs/N Width=Cols/N
 Height=Rows/N
 Purpose: Edit text files (screen editor)
 Parameters: from = File to Edit, Size = Size of Memory for file, With = Extended commands file, Window = Console window
 (e.g. * = current), Tabs = Tab size, Width = Number of columns, Height = Number of rows.
 Example: ED S:User-Startup

Edit

Format: Edit from/A To With/K Ver/K Opt/K Width/N Previous/N
 Purpose: Edit text files (line editor)
 Parameters: from = File to Edit, To = Destination file, With = Extended commands file, Opt = Options
 Width = Number of columns, Previous = Number of previous versions.
 Example: Edit s:User-Startup With Ed-Script

Else

Format: Else
 Purpose: Used with IF, if not true do these commands
 Example: If Exists s:User-Startup
 Say "User Startup already exists"
 Else
 Ed s:User-Startup
 Endif

Endcli

Format: Endcli
 Purpose: Close CLI console window
 Example: Endcli

Endif

Format: Endif
 Purpose: End a IF..ELSE..ENDIF block
 Example: If \$Age GT 65

```
Say "You are a pensioner!"
Endif
```

Endskip

```
Format: Endsip
Purpose: Stops a SKIP branch (for debugging)
Example: Endsip
```

Eval

```
Format: Eval Value1/A Op Value2/M To/K LFormat/K
Purpose: Evaluate a simple arithmetic expression
Parameters: Value1, Value2 = Values to evaluate (Decimal, Hex (0xn) or Octal (0nnn), Op = Operation (+,-,*,/,^,%),
To = File to save result, LFormat = Output format string (use *n to give a line feed).
Example: Eval $count + 1 to env:count
```

Execute

```
Format: Execute File/A
Purpose: Execute a script or batch file
Parameters: File = Script file to execute
Example: Execute PCD
```

Failat

```
Format: Failat RCLIM/A
Purpose: Change failure limit for scripts (0,5,10,20)
(0 - Ok, 5 - Warn, 10 - Error, 20 - Fail)
Parameters: RCLIM = Failat number (0-20)
Example: Failat 20
```

Fault

```
Format: Fault Error/N/M
Purpose: Display error message from a code
Parameters: Error = One or more error numbers
Example: Fault 221
"Fault 221: Disk is full"
```

FF

```
Format: FF
Purpose: Turns on Fast Fonts
Example: FF
```

FileNote

```
Format: Filenote File/A Comment ALL/S QUIET/S
Purpose: Attach a comment to a file (see LIST)
Parameters: File = File to add comment to, Comment = Text to apply, All = Apply to all files, Quiet = No output
Example: FileNote List.txt "A list of people's names"
```

Format

```
Format: Format Device=Drive/K/A Name/K/A OFS/S FFS/S
INTL=INTERNATIONAL/S NOINTL=NOINTERNATIONAL/S
DIRCACHE/S NODIRCACHE/S NOICONS/S QUICK/S
Purpose: Initialises Amiga disks (in System drawer)
Parameters: Device|Drive = Disk device or name to format, Name = New volume name, OFS = Old Filing System,
FFS = Fast File System, Intl|International = FFS International mode, NoIntl|NoInternational = International mode
off, DirCache|NoDirCache = Directory caching on or off, NoIcons = No disk or trash icons, Quick = Less thorough format
Example: Format Drive DF0: Name "Docs" NOICONS FFS
```

Get

Format: Get Name/A
 Purpose: Returns contents of local env variable
 Parameters: Name = Environment variable name
 Example: Get RC

Getenv

Format: Getenv Name/A
 Purpose: Return contents of a global environment variable
 Parameters: Name = Environment variable name
 Example: Getenv Workbench

Iconx

Format: Iconx
 Purpose: Enables a script to be run from Workbench. The script must have a Project .info file and the Default Tool set to c:IconX to run it.
 Example: Iconx

If

Format: If NOT/S WARN/S ERROR/S FAIL/S EQ/K GT/K GE/K VAL/S EXISTS/K
 Purpose: If condition is true execute following commands until an ELSE or ENDIF occurs.
 Parameters: Not = Reverse boolean result, Warn = Test warn flag from previous command, Error = Test error flag from previous command, Fail = Test fail flag from previous command, EQ = Equality test, GT = Greater than test, GE = Greater or equal test, VAL = Input is a number, Exists = Test file exists.
 Example: IF WARN, IF \$count GT 10, IF EXISTS C:List

Info

Format: Info Device
 Purpose: Displays information about disks
 Parameters: Device = Name of device to display
 Example: Info DH0:

Install

Format: Install Device/A NOBOOT/S CHECK/S FFS/S
 Purpose: Saves a bootblock to a disk. If you have only one drive type INSTALL ? and swap disks and then type DF0: and press RETURN to save bootblock.
 Parameters: Device = Disk to install bootblock, NoBoot = Erase bootblock, Check = Test for bootblock, FFS = Use Fast File System.
 Example: Install DF0:

IPrefs

Format: IPrefs
 Purpose: Initialises preferences files on startup.
 Example: IPrefs

Join

Format: Join File/M/A AS=TO/K/A
 Purpose: Join two or files together.
 Parameters: File = File(s) to join together, To/as = Destination file
 Example: Join File1 File2 File3 as FileFull

Lab

Format: Lab Label
 Purpose: State a Label to Skip to in a script
 Parameters: Label = Name of label
 Example: Lab PROC2

List

```
Format: List Dir/M P=PAT/K KEYS/S DATES/S NODATES/S To/K Sub/K
        Since/K Upto/K QUICK/S BLOCK/S NOHEAD/S FILES/S DIRS/S
        LFORMAT/K ALL/S
Purpose: List file details in a directory.
Parameters: Dir = One or more directory name(s), Keys = Display keys, NoDates = Do not display dates, To = Destination
file, Sub = Subdirectories included, Since = List files since date given, Upto = List files up to given date, Quick =
Simple directory list, Block = List files in block sizes, NoHead = Do not display header lines, Files = Files only,
Dirs = Directory only, LFormat = Output list using this format string, All = All files.
Example: List Workbench: Block Dates Since=01-Jul-00
```

LoadWB

```
Format: Loadwb -DEBUG/S DELAY/S CLEANUP/S NEWPATH/S
Purpose: Display workbench screen
Parameters: Debug = Activate debug menu, Delay = Wait 3 secs before loading, Cleanup = Clean up desktop,
NewPath = Resnap current path settings.
Example: LoadWB -Debug
```

Lock

```
Format: Lock Drive/A ON/S OFF/S Passkey
Purpose: Lock a device from writing.
Parameters: Drive = Drive to lock, On|Off = Turn lock on or off, PassKey = Specify password.
Example: Lock DH1: On GHK459
```

MagTape

```
Format: MagTape Device/K Unit/N/K RET=RETENSION/S REW=REWIND/S SKIP/N/K
Purpose: Controls magnetic tape device.
Parameters: Device = Tape device, Unit = Unit number, Ret|Retension = Retension tape, Rew|Rewind = Rewind tape,
Skip = Skip parts of tape by a value.
Example: Magtape Device TAPE1: Unit 0 REWIND
```

MakeDir

```
Format: Makedir Name/M
Purpose: Create one or more new directories.
Parameters: Name = One or more directories to create.
Example: MakeDir DH1:Docs DH1:Basic DH0:TempFiles
```

MakeLink

```
Format: MakeLink from/A To/A HARD/S FORCE/S
Purpose: Creates a logical link between files
Parameters: from = Link file, To = Actual file, Hard = Hard link, Force = Link to sub-directory
Example: MakeLink T C:Type Hard
```

Mount

```
Format: Mount Device/M from/K
Purpose: Loads and mount a device
Parameters: Device = Device to mount, from = Mount file
Example: Mount DEVS:CD0
```

Newcli

```
Format: Newcli Window from
Purpose: Open a new CLI console (CON) window
        Window format: CON:X/Y/Width/Height/Name/Option(s)
        Options: Auto,Backdrop,Noborder, Nodrag,Simple,
        Smart,Wait,Close
Parameters: Window = Window config string, from = Alternative script to Shell-Script.
Options: Auto = Open only when output sent to it, Backdrop = Open as a backdrop behind other windows, NoBorder = No left or
bottom borders, NoDrag = No draggable title bar, Simple = Simple refresh, Smart = Smart refresh, Wait = Remain open
under window is close manually.
Example: Newcli CON:0/10/400/200/Shell/CLOSE
```

NewShell

Format: NewShell Window from
 Purpose: Open a new Shell console (CON) window
 Parameters: Window = Window config string, from = Alternative script to Shell-Script.
 Example: NewShell from S:Shell-Startup

Path

Format: Path Path/M ADD/S SHOW/S RESET/S REMOVE/S QUIET/S
 Purpose: Set or change the program search path
 Parameters: Path = Directory path to change, Add = Add path, Show = Display path, Reset = Clear path,
 Remove = Remove entry from path, Quiet = No output
 Example: Path SC:C Add

Prompt

Format: Prompt Prompt
 Purpose: Change the prompt text (Codes: %R = last return code,
 %S = Current path, %N = CLI Number)
 Parameters: Prompt = Path format
 Example: Prompt "%N.%S> "

Protect

Format: Protect File/A Flags ADD/S SUB/S ALL/S QUIET/S
 Purpose: Change the 'rwedsp' flags of a file. (r=read,w=write,
 e=execute,d=delete,s=script,p=pure)
 Parameters: File = File to change, Flags = One or more flags, Add = Add flag(s) to existing flags, Sub = Remove
 flags from file, All = Change all files, Quiet = No output
 Example: Protect Editor rwed

Quit

Format: Quit RC/N
 Purpose: Quit a script with optional return code
 Parameters: RC = Return Code
 Example: Quit 5

Relabel

Format: Relabel Drive/A Name/A
 Purpose: Change name of a disk
 Parameters: Drive = Disk to change, Name = New volume name
 Example: Relabel DF0: "Documents"

RemRAD

Format: RemRAD Device FORCE/S
 Purpose: Remove RAD device from memory
 Parameters: Device = RAD device, Force = Remove even if in use
 Example: RemRAD RAD:

Rename

Format: Rename from/A/M To=As/A QUIET/S
 Purpose: Rename or move one or more files
 Parameters: from = Old filename, To|As = New filename, Quiet = No output
 Example: Rename MyDoc as MyDoc.doc

RequestChoice

Format: RequestChoice Title/A Body/A Gadgets/M PubScreen/K
 Purpose: Asks for input via a requester
 Parameters: Title = Title for dialog box, Body = Text for dialog box, Gadgets = List of buttons, Pubscreen = Screen
 to use.

```
Example: RequestChoice >ENV:RT "Format" "About to format your hard
disk*
Are you sure?" "Go ahead" "No way!"
```

RequestFile

```
Format: RequestFile Drawer File/K Pattern/K Title/K Positive/K
Negative/K AcceptPattern/K RejectPattern/K SAVEMODE/S
MULTISELECT/S DRAWERONLY/S NOICONS/S PUBSCREEN/K
Parameters: Drawer = Initial drawer to use, File = Initial file name, Pattern = Use pattern as filter, Title =
Title of dialog box, Positive = Text for OK button, Negative = Text for Cancel button, AcceptPattern = Defines
file pattern(s) to show (overrides Pattern), RejectPattern = Pattern(s) of files to hide, SaveMode = Change colors
to indicate Save or other mode, MultiSelect = Allow multiple file selection, DrawersOnly = Display only directories,
NoIcons = Suppress info files, PubScreen = Screen to use.
Purpose: Asks for a filename via ASL file requester
Example: RequestFile >ENV:File Title "Select a File" Positive "Load" Noicons
```

Resident

```
Format: Resident Name File REMOVE/S ADD/S REPLACE/S PURE=FORCE/S SYSTEM/S
Purpose: Stores AmigaDOS command in memory (quicker then reloading
from disk each time it is executed). To ensure a
command can be made resident check the pure flag (see List).
Parameters: Name|File = File to be made resident, Remove = Remove file from resident list, Add = Add file to resident
memory, Pure|Force = Force a non-pure file to be resident, System = Show system's resident code segments.
Example: Resident C:Dir Pure
```

Run

```
Format: Run Command/F
Purpose: Execute a program in the background (multi-task)
Parameters: Command = Program to run
Example: Run Printfiles Doc1
```

Search

```
Format: Search from/M Search/A ALL/S NONUM/S QUIET/S QUICK/S
FILE/S PATTERN/S
Purpose: Search for a string in a file or a file on a disk
Parameters: from = Directory to search from, Search = Text to search for, All = Search sub-directories, NoNum = Line
numbers are not displayed, Quiet = No Output, Quick = Reduce output listing, File = Search a file rather than
content, Pattern = Search using a pattern.
Example: Search SYS: "List" File All
```

Set

```
Format: Set Name String/F
Purpose: Sets or lists a local environment variable (local to current
shell or current process)
Parameters: Name = Variable name, String = Text or number for variable
Example: Set MyName "Peter"
```

SetClock

```
Format: Setclock LOAD/S SAVE/S RESET/S
Purpose: Load or set the date and time from battery-backed clock
Parameters: Load = Load date from clock, Save = Save date and time to clock, Reset = Resets the clock
Example: Date 27-Nov-00 10:00, SetClock Save
```

SetDate

```
Format: Setdate File/A Weekday Date Time ALL/S
Purpose: Set date of a file or directory (see List)
Parameters: File = File to change, Weekday = Day of week, Date = Date, Time = Time, All = All files
Example: Setdate DEVS: Monday 10:30
```

Setenv

```
Format: Setenv Name String/F
Purpose: Change the contents of an environment variable
```

Parameters: Name = Variable name, String = Text or number for variable
 Example: Setenv Workbench "3.1"

SetFont

Format: Setfont Name/A Size/N/A SCALE/S PROP/S ITALIC/S
 BOLD/S UNDERLINE/S
 Purpose: Sets console font
 Parameters: Name = Font name, Size = Font size, Scale = Scale font to size, Prop = Specify if a Proportional font,
 Italic = Use italic font, Bold = Use bold font, Underline = Use underlined font
 Example: SetFont Courier 15 Bold

SetKeyboard

Format: Setkeyboard Keymap/A
 Purpose: Sets keyboard layout using layouts in Devs:Keymaps.
 You can use the Input preferences instead.
 Parameters: Keymap = Keymap file to use
 Example: SetKeyboard USA0

SetMap

Format: SetMap <keymap id>
 Purpose: Sets keyboard layout. Deprecated in WB2.
 Keymaps include CDN,CH1,CH2,D,DK,E,F,GB,I,IS,N,S,USA0,USA1,USA2.
 Keymap can be set in icon using Tooltype: KEYMAP=<map>
 Parameters: Keymap = Keymap file to use
 Example: Setmap GB

SetPatch

Format: Setpatch QUIET/S NOCACHE/S REVERSE/S NOAGA/S
 Purpose: Patch Operating System functions and remove bugs (43.4)
 Example: Setpatch Quiet

SetPatch

Format: Setpatch QUIET/S NOCACHE/S REVERSE/S NONSD/S NOAGA/S PATCHCONFIGFILE=PCF/K
 PATCHCONFIGLINE=PCL/K PATCHINFO=PI/S FORCEUPDATE/S KILLUPDATE/S NOROMUPDATE/S
 DISABLEROMMODULES/S SKIPROMUPDATES=SKIPROMMODULES/K WAITFORVALIDATE/S
 AVOIDMEMFKICKFORPATCHES/S
 Purpose: Patch Operating System functions, enable/disable ROM updates, disable
 HD NDS mode, wait for disk validation and remove bugs (44.38)
 Parameters: Quiet = No output, NoCache = Cache off, Reverse = Reverse action of setpatch, NoNSD = No New Style
 Device (Large HD support), PatchConfigFile = Specify a patch config file, PatchConfigLine = Specify a Patch
 Config line, PatchInfo = Show patch info, ForceUpdate = Install updates despite something installed
 earlier, NoRomUpdate = Do not install ROM updates, DisableRomModules = Remove some ROM modules (can cause a
 crash), SkipROMUpdates = Skip following updates,WaitForValidate = Waits for all volumes to be
 validated, AvoidMemFKickForPatches = Ignore MemFKick for Patches.
 Example: Setpatch NOROMUPDATE NONSD QUIET

Skip

Format: Skip Label BACK/S
 Purpose: Jump to a label in a script (see Lab). Use back if
 label occurs before Skip command.
 Parameters: Label = Label name to skip to, Back = Go back in script to label
 Example: Skip Lab2 Back

Sort

Format: Sort from/A To/A Colstart/K CASE/S NUMERIC/S
 Purpose: Sort a file and output to new file
 Parameters: from = File to sort, To = Output file, Colstart = Column to sort from, Case = Upper
 case entries are done first, Numeric = Input treated as numbers.
 Example: Sort Figures To SortedFigures Numeric

Stack

```
Format: Stack Size/N
Purpose: Change/display amount of stack space in bytes.
Parameters: Size = Stack size in bytes
Example: Stack 10000
```

Status

```
Format: Status Process/N FULL/S TCB/S CLI=ALL/S COM=COMMAND/K
Purpose: Display status of running programs. TCB is Task Control Block
Parameters: Process = Task number, Full = Full output of process info, TCB = Information except
the command name, CLI|All = Command info only, COM|Command = Search for command.
Example: Status 2 Full
```

Type

```
Format: Type from/A/M TO/K OPT H|N/K HEX/S NUMBER/S
Purpose: Display contents of text file on screen and binary files using
HEX with optional line numbers.
Parameters: from = Text file to display, To = Output file or device, Opt H | Hex = Display
as hex values, Opt N | Number = Number the lines.
Example: Type C:DIR HEX
```

Unset

```
Format: Unset Name
Purpose: Remove a local env variable
Parameters: Name = Environment variable name
Example: Unset MyName
```

UnSetEnv

```
Format: UnSetEnv Name
Purpose: Remove a global env variable
Parameters: Name = Environment variable name
Example: UnSetEnv Workbench
```

Unalias

```
Format: Unalias Name
Purpose: Remove a short name for a command
Parameters: Name = Alias name
Example: UnAlias MyDir
```

Version

```
Format: Version Name Version/N Revision/N FILE/S FULL/S
Unit/N INTERNAL/S RES/S
Purpose: Display workbench, library or device version information.
Parameters: Name = File, Version = Print Kickstart or Workbench number and sets env variables and sets
Warn flag, Revision = As Version but for Revision number, File = Check file rather than memory,
Full = Display full information, Internal = Check internal files, Res = Check resident files.
Example: Version Kickstart Version=39 Revision=106
```

Wait

```
Format: Wait Time/N SEC=SECS/S MIN=MINS/S UNTIL/K
Purpose: Wait for a specified period of time
Parameters: Time = Time period in either Sec (Seconds) or Mins (Minutes), Until = Wait until a time
Example: Wait Until 12:00
```

Which

```
Format: Which File/A NORES/S RES/S ALL/S
Purpose: Find where a file is in command path (see Path) and sets Warn flag.
Parameters: File = File to locate, NoRes = Resident list is not searched, Res = Only the resident
list is searched, All = Search full path.
Example: Which Multiview
```

Why

```
Format: Why
Purpose: Display reason why a previous command failed
Example: Why
```

Key

```
/A Required argument
/F Final argument in list
/K Keyword must be entered with argument
/M Multiple arguments
/N Number
/S Switch (optional)
```

10.7.1 Additional AmigaDOS commands

DMS

```
Format: DMS Read file[.DMS] [from dev:] [TEXT filetext] [CMODE mode] [LOW lowtrack] [HIGH hightrack] [NOVAL] [NOZERO] [ENCRYPT password]
DMS Write file[.DMS],,, [TO dev:] [LOW lowtrack] [HIGH hightrack] [NOVAL] [NOTEXT] [NOPAUSE] [DECRYPT password]
DMS Repack file[.DMS] [TO dev:] [LOW lowtrack] [HIGH hightrack] [CMODE mode]
DMS View file[.DMS],,, [FULL] DMS Text file[.DMS],,,
DMS Test file[.DMS],,, DMS Help
Purpose: To read, write or view Disk Masher disk images of floppy disks.
Example: DMS Write MyDisk.DMS from DF0:
```

Installer

```
Format: Installer [SCRIPT] filename <[APPNAME] name> <[MINIUSER] level> <[DEFUSER] default> <[LOGFILE]
logname> <[LANGUAGE] language> <NOPRETEND> <NOLOG> <NOPRINT>
Purpose: To install an application via an installer script. Usually provided as a default tool for script
files in icon.
Example: Installer SCRIPT InstallApp APPNAME MyProgram LOGFILE DH0:MyProgram.log
```

LHA

```
Format: LHA [-options] <command> <archive[.LZH|LHA]> [[homedir] <filespec...>] [@file] [destination]
Purpose: To create, modify or list LHA or LZH files
Examples:
LHA a pictures.lha #?.jpg (archives all jpg files into pictures.lha)
LHA l pictures.lha (lists all files in pictures.lha)
LHA x pictures.lha (extracts all files from pictures.lha)
```

LZX

```
Format: LZX [-options] <command> <archive> [<file> ...] [<destdir>]
Purpose: To create, modify or list LZX archive files.
Examples:
LZX a documents.lzx #?.doc (archives all doc files into documents.lzx)
LZX l documents.lzx (lists all files in documents.lzx)
LZX x documents.lzx (extracts all files from documents.lzx)
```

10.7.2 Additional AmigaDOS Information

Clear Screen

Example: Echo `"*E[0;0H*E[J"`

Purpose: Clears the AmigaOS screen. Uses printer commands to control text formatting in CLI, so `*E` is equivalent to ESC character.

The command **clear** is normally defined using an **Alias** or an AmigaDOS script in S: folder.

Text in Italics

Example: Echo `"*E[3mItalics*E[23m"`

Purpose: `*E[3m` turns on italics and `*E[23m` turns off italics

Text in Bold

Example: Echo `"*E[1mBold*E[22m"`

Purpose: `*E[1m` turns on bold, and `*E[22m` turns off bold.

Underline Text

Example: Echo `"*E[4mUnderline*E[24m"`

Purpose: `*E[4m` turns on underline, and `*E24m` turns off underline.

Colored Text

Example: Echo `"*E[32mRed Text*E[0m"`

Purpose: `*E[nm` where `n=30-39` for foreground color or `n=40-49` for background color.

`*E[0m` resets to normal character set.

11. How-To

11.1 How-To

This section includes step by step guides, from transferring files to real Amigas to setting up Picasso96.

11.1.1 Topics

- [Create Image Files](#)
- [Transfer Data from/to Amiga](#)
- [Set Up Action Replay](#)
- [Set Up Picasso96](#)
- [Create a Boot Disk](#)
- [Install AmigaOS 3.5/3.9](#)

11.2 Create Image Files

In the [Amiga Programs](#) subdirectory you will find two small Amiga programs that will help you generate the necessary image files.

11.2.1 ROM Images

Transrom will dump the contents of your Kickstart ROM to a file.

To create a file called "kick.rom" in the RAM disk, use the following syntax:

```
transrom >RAM:kick.rom
```

This will create a 524288 Byte ROM image in the RAM disk. The file has to be [transferred](#) to the PC.

11.2.2 Disk Images

A disk file is an image of the raw data on an Amiga floppy disk, it contains 901120 bytes (880kB), which is the standard capacity of an Amiga disk. Transdisk will dump an image of a floppy in one of the drives, or write an image to an Amiga disk.

Disk to ADF

```
transdisk >RAM:DF0.adf
```

This command will create a file called "DF0.adf" in the RAM disk. Such a file is 901120 bytes of size for one disk.

You can also create disk images in several parts. To create 4 parts of the disk in DF0: do the following:

```
transdisk >ram:DF0_1.adf -s 0 -e 19
transdisk >ram:DF0_2.adf -s 20 -e 39
transdisk >ram:DF0_3.adf -s 40 -e 59
transdisk >ram:DF0_4.adf -s 60 -e 79
```

After [transferring the files](#) to a PC, they need to be merged again. To do so in a command prompt:

```
COPY /B DF0_1.adf+DF0_2.adf+DF0_3.adf+DF0_4.adf DF0.adf
```

ADF to Disk

It is possible to transfer an ADF disk image back to an original Amiga disk. Copy the ADF to an original Amiga and insert a disk into DF0. Then, you will also need transdisk in order to transfer the data to the disk. Do the following:

```
transdisk -w filename.adf
```

If you do not have an Amiga to write to Amiga disks, then it is suggested to get hold of the PCI Catweasel device which will allow you to write ADF files to Amiga formatted disks on your PC. See [Individual Computers](#) for more information.

You can also get direct access to an Amiga's floppy drive if you have your PC and Amiga networked and using the [Amiga Explorer](#) supplied with Cloanto's Amiga Forever software.

11.3 Transfer Data from/to Amiga

11.3.1 Overview

You may need to transfer files between a computer where the emulation is run and a real Amiga. There are several options to choose from, each with pros and cons. In either case, you ought to read the documentation for the programs that you use for the transfer.

11.3.2 Serial Cable

If you are using a null modem cable, you will need a terminal program on your Windows machine and your Amiga. 68000 equipped Amigas are only able to reach approximately 3000cps through the null modem cable. This speed is achieved with the standard serial.device or the new baudbandit.device There are some tools available which can speed up the connection speed up to 5500cps. For more help on how to set up a serial transfer see [ADF Sender Terminal FAQ](#) and [WarTrans](#). The [Aminet](#) is a great source for such tools such as TwinExpress and AmiTrans.

All you need is the following:

- Terminal software for Amiga and PC, preferably ones than can do Binary Transfers using common protocols such as Kermit and X/Y/ZModem. Amiga term programs include NComm, JRComm, and Term. PC term programs include Terminal and Terminus.
- A commonly used program called Twin Express can be used instead or *PC2Ami* or [AmigaTrans](#) or Amiga Explorer from [Cloanto](#).
- A serial cable with 9pin end for PC and 25 pin end for Amiga. It has to be a null-modem cable which means that lines 2 and 3 have to cross over to receive/transmit between peers and line 7 for control signals. See [RS232 cable information](#) for a null modem cable specification.

Then, do the following:

- Connect the computers with serial lead and load up the software on each end.
- Start binary receive on one end using one of the protocols common to both programs.
- Start binary transmit on the other and load the file to be transmitted, it should then transfer to the other end in seconds/minutes depending on size.
- Further details of networking can be found at [Amiga Emulation FAQ](#)

11.3.3 Floppy Disks

If you have an Amiga with OS 2.0 or later, you may use **CrossDOS**. It is a part of the AmigaOS and enables you to read and write DOS formatted floppies on your Amiga. **MessyDOS** or **MSH** is a freeware program with the same functionality. It can be found on Aminet. If you do not have a high density floppy drive in your Amiga, you will have to use 720kB formatted disks. Compress the disk image with - for example - LHA and copy the compressed file on the floppy. Copy the file to your Windows machine and decompress it.

11.3.4 Compact Flash Card

If your PC or Mac has a Compact Flash reader installed and have a real Amiga, you can install [EasyADF](#) which includes a CF card reader which allows you to easily create, read and transfer ADF or other files between the Amiga and your Mac or PC to run on your Emulator.

11.3.5 Direct Copy

If you have a PC with 2 floppy drives then you can use [Disk2FDI](#) which will allow you to read an Amiga disk in A: and read and transfer the contents to the B: drive. The FDI files can then be directly read with WinUAE.

11.3.6 Network

If your Amiga has a network card, this is probably the fastest and most convenient way of exchanging data with the rest of the world. You may use [Cloanto's](#) Amiga Explorer program to set up a PC to Amiga link and use a friendly front end program to transfer programs to and from your PC and your Amiga.

You can also use AmigaToPC, which is a professional network software setup, and can be found at our links page in the [tools section](#).

11.4 Set Up Action Replay

11.4.1 Requirements

- You need an AR 1, AR 2 or 3 ROM (see below for rip instructions)
- Set path to Action Replay ROM in the [GUI](#) as Cartridge ROM file.
- Freeze button = Page Up
- Don't use AR support to save game states, use the built-in state save option instead, it is much faster and more compatible.
- WARNING: Action Replay may have problems with fast Amigas or 68020+ CPUs, and the max supported FastRAM ram is 4MB.

11.4.2 ROM ripping instructions

Find an A500 with an Action replay-cartridge, press the 'freeze'-button, and enter the correct codes for the version of AR you have.

Action Replay 1

lord olaf<RETURN>

Action Replay 2 / 3

may<RETURN>
 the<RETURN>
 force<RETURN>
 be<RETURN>
 with<RETURN>
 you<RETURN>
 new<RETURN> (AR 3 only)

Writing the ROM to an empty Floppy

AR1: "sm ar1.rom,f00000 f10000"
 AR2: "sm ar2.rom,400000 420000"
 AR3: "sm ar3.rom,400000 440000"

11.5 Picasso96

Emulating the [Custom Chipset](#) is comparatively slow, instead, you can use the PC's graphics card. This also gives access to higher resolutions and better color modes.

11.5.1 Set Up

- To use this feature, you must select at least a 68020 CPU with a 32 bit address space in the [CPU](#) tab. You also need a Kickstart 3.x ROM.
- To specify how much graphics memory you want to emulate, you must adjust the RTG in the [RAM](#) tab.
- Make sure Full Screen RTG is enabled on the [Display](#) tab.

Then, you need the [Picasso 96 software](#) which is not distributed with WinUAE. Version 1.31 or higher is recommended. Once the software is installed on the emulated Amiga, it must be rebooted. After that new display modes will be available - which are identified as *uaegfx* - from the ScreenModes program on the Amiga.

11.5.2 Maximize Stability and Performance

Make sure you utilize the latest *rtg.library* which is located in the [Amiga Programs](#) folder of your WinUAE installation. You have to copy that file into the following directory on your Workbench drive: *libs:picasso96*.

Start the program *p96_uae_tweak* from the Amiga Programs folder if you notice large slowdown when 16bit AHI is activated.

11.5.3 Trouble Shooting

- Currently only Permedia 2 and Voodoo cards are compatible with the Warp3D driver software for 3D games on the Amiga.
- If you get no Picasso screens larger than 1024x768 in 32bit, you have to copy *picasso96fix* from the [Amiga Programs](#) directory to a drive in your emulated Amiga, and load it in the startup-sequence before the LoadWB command.

11.6 Create a Boot Disk

11.6.1 In Workbench

Boot off your Workbench disk, insert a floppy disk in DF1:, open a command Shell and type **Install DF1:** which will copy the boot block on to the disk. Then type **MakeDir DF1:S** to create the Script directory. Copy your program file(s) on the disk, preferably root or use directories if you wanted to. Then change directory to DF1:S and type **Ed Startup-sequence** and type in commands to load your program, usually just the name of the Program file will do. Test the disk by inserting the disk into DF0: and reboot the Amiga.

11.6.2 Create a boot disk manually

You can use the following procedure to create a fresh Workbench boot disk from within the emulator:

1. Create a blank formatted disk using WinUAE
2. Click on Floppies tab
3. Tick Bootblock to make it bootable.
4. Click 'Create Standard Floppy'
5. Type a filename and save it
6. Install **ADFView** and **ADFOpus** (see [Links](#))
7. Locate Workbench files from either a CD, Hard file, Directory or hard disk or some other location
8. Open the floppy to view the contents of your new ADF disk
9. Create the following folders and copy any .info files from source folder to your floppy folders:
10. **S, C, L, T**
11. **Devs**
12. **System**
13. **Utilities**
14. **Libs**
15. **Expansion**
16. **Prefs**
17. **Classes**
18. **Rexxc**
19. **WBStartup**
20. Copy these files from the source **S** directory to S on your floppy: **startup-sequence, user-startup** (other files are optional)
21. Copy these files from the source **C** directory to C on your floppy: **addbuffers, adddatatypes, assign, avail, binddrivers, break, conclip, copy, date, delete, dir, ed, eval, execute, iconx, iprefs, list, loadwb, mkdir, mount, protect, relabel, rename, setclock, setdate, setfont, setkeyboard, setpatch, version, wait, which** (other commands are optional, if they are used in the startup-sequence or user-startup then include them too)
22. Copy these files from the source **Libs** directory to Libs on your floppy: **amigaguide.library, asl.library, bullet.library, commodities.library, datatypes.library, diskfont.library, iffparse.library, locale.library, lowlevel.library, mathieeedoubbas.library, mathieeedoubtrans.library, mathieeesingtrans.library, mathtrans.library, realtime.library, rexxsupport.library, rexxsyslib.library, version.library**
23. Copy these files from the source **L** directory to L on your floppy: **aux-handler, CDFileSystem, CrossDosFileSystem, port-handler, queue-handler, FileSystem_Trans (and contents)**
24. Copy these files from the source **System** directory to System on your floppy (including .info files): **CLI, DiskCopy, FixFonts, Format, NoFastMem, RexxMast, Shell**
25. Copy these files from the source **Prefs** directory to Prefs on your floppy: Contents of **env-archive** and **Presets**
26. Copy these files from the source **RexxC** directory to RexxC on your floppy: **HI, RX, RXC, RXLIB, RXSET, TCC, TCO, TE, TS, WaitForPort**
27. Copy these files from the source **Devs** directory to Devs on your floppy: Contents of **Datatypes, DOSDrivers, Keymaps, Monitors and Printers** (contents should only contain what you need as this can take up quite a bit of disk space). Also these files: **clipboard.device, mfm.device, parallel.device, postscript_init.ps, printer.device, parallel.device**
28. Copy any additional drivers or programs you require if there is still room

To test the file, insert the Workbench.adf in DF0: and try to boot WinUAE from it. It should boot and load Workbench.

11.7 Install AmigaOS 3.5/3.9

11.7.1 Requirements

It is only allowed to either use OS3.5 or 3.9 on 1 Computer at the same time. Read the license carefully.

Booting off any Workbench ADF should be sufficient to install AmigaOS 3.5 or 3.9, make sure you have correct access to your CD-ROM drive (see below).

To install AmigaOS versions 3.5 and 3.9, you have to make sure you set the following options:

- CPU emulation set to 68020
- Kickstart ROM version 3.1
- Sound emulation enabled

11.7.2 Prepare emergency disk for CD-ROM access

Here we go:

1. Boot your emulated Amiga with WinUAE and "insert" the ADF in a floppy drive
2. Open the file `devs/dosdrivers/emergency_CD` on the disk with a texteditor
3. Change the line `device = "xxxxxx"` to `device = "uaescsi.device"`
4. Change `UnitNum` if needed
5. Change the text `MaxTransfer = xxxxxxx` to `MaxTransfer = 0xFFFF`
If you get read/write errors from CD use a value of `0x1FFF` instead
6. Save the changed file to disk

11.7.3 Crashes during install?

Try changing the Sound options to a better level, e.g. 16 bit and 44.1 kHz; change the CPU settings to adjustable and level 1. Alternatively, remove the references to playing sounds (such as the clapping noise) from the installer script if you know what you are doing.

There is an update available for AmigaOS 3.9 called a *Boing Bag* and to get it to install on WinUAE you need a patch available from [Amiga, Inc.](#)

11.7.4 Installing OS3.9 using an AmiKit installation

If you don't have [AmiKit](#), it is recommended to install it. This is the fastest way to get a working OS 3.9 installation.

1. Boot from Host machine
2. Copy `kick.rom` to `AmiKit/ROMs` folder
3. Optionally, copy `Picasso96.lha` to `AmiKit/RabbitHole` folder
4. Insert the OS 3.9 CD
5. Run `Amikit.exe` program and click Configure to import AmigaOS files
6. Select 1366x768 32bit screen mode

Hint: If you get CD read errors you need reduce the max transfer rate in your CD-ROM driver settings.

12. Credits

12.1 Credits

In this section you will find information about the creators of WinUAE and this help file.

If you want to contact a programmer or one of the authors of this file, please note: do not send illegal content of any kind, no matter how good they work for you. Never ask for ROM files, Workbench disks, etc.

12.1.1 Subsections

- [About WinUAE](#)
- [Help file credits](#)
- [Changelog](#)
- [GPL](#)
- [FDL](#)
- [UAE People](#)

12.2 About WinUAE

12.2.1 Major Contributors

Name	Area
Bernd Schmidt	The Grand-Master
Sam Jordan	Custom-chip, floppy-DMA, etc.
Mathias Ortmann	Original WinUAE Main Guy, BSD Socket support
Brian King	Picasso96 Support, Integrated GUI for WinUAE, previous WinUAE Main Guy
Toni Wilen	Core updates, WinUAE Main Guy
Gustavo Goedert, Peter Remmers Michael Sontheimer, Tomi Hakala Tim Gunn, Nemo Pohle	DOS Port Stuff
Samuel Devulder, Olaf Barthel, Sam Jordan	Amiga Ports
Krister Bergman	XFree86 and OS/2 Port
A. Blanchard, Ernesto Corvi	MacOS Port
Christian Bauer	BeOS Port
Ian Stephenson	NextStep Port
Peter Teichmann	Acorn/RiscOS Port
Stefan Reinauer	Zorroll/III AutoConfig, Serial Support
Christian Schmitt, Chris Hames	Serial Support
Herman ten Brugge	68020/68881 Emulation Code
Tauno Taipaleenmaki	Various UAE-Control/UAE-Library Support
Brett Eden, Tim Gunn Paolo Besser, Nemo Pohle	Various Docs and Web-Sites
Georg Veichtlbauer	Help File coordinator, German GUI
Fulvio Leonardi	Italian translator for WinUAE
Arnljot Arntsen, Bill Panagouleas Cloanto, Zak Jennings	Hardware support
Alexander Kneer, Tobias Abt	Special thanks to the Picasso96 Team
Steven Weiser	Postscript printing emulation idea and testing.
Péter Tóth, Balázs Rátkai Iván Herczeg, András Arató	Hungarian translation.
Karsten Bock, Gavin Fanc Dirk Trowe, Christian Schindler	Freezer cartridge hardware support.
Mikko Nieminen	Demo compatibility testing.
Arabuusimiehet	[This information is on a need-to-know basis]

Check out the [links](#) to reach the homepage of WinUAE and core UAE!

If you have found an error, please view the [Bugs](#) section for guidance!

12.3 Help credits

12.3.1 License Notice

All content of this help is released exclusively under the terms of the GNU [Free Documentation License](#)! Please read the FDL page for the exact terms.

12.3.2 Credits

This help was created by:

- [Georg Veichtlbauer](#) (1999-2026)
- [Peter Hutchison](#) (2002-2026)
- Bernd Roesch (2004)

12.3.3 Thanks

Shout-outs to these contributors:

- Brian King for providing information
- Toni Wilen for keeping us up-to-date, providing information
- Ralf Steines for all the time he spent with great help
- James M. Battle for his help with the file size and screenshots
- Juergen Beck for some very useful suggestions
- Bernie Meyer for his excellent JIT documentation
- Wolfgang Stoeggl for extensive error corrections
- Michele Console Battilana for his care
- All the people who reported errors

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12.4 Changelog

12.4.1 Version 4.0

- Complete conversion to Markdown / Mkdocs
- Updates for WinUAE 6.0.3
- Update sytem requirements

12.4.2 Version 3.1.1

- Update for WinUAE 6.0.2
- Add some keywords to the index
- Compress all images to save some space

12.4.3 Version 3.1.0

- Update for WinUAE 6.0

12.4.4 Version 3.0.9

- Update for WinUAE 5.3
- Fix up some incorrect headlines

12.4.5 Version 3.0.8

- Update images and compress them

12.4.6 Version 3.0.7

- Updated for WinUAE 5.1.0

12.4.7 Version 3.0.6

- Updated for WinUAE 5.0

12.4.8 Version 3.0.5

- Updated for WinUAE 4.10

12.4.9 Version 3.0.4

- Update for WinUAE 4.9
- Spell-check and correct typos
- Remove dead hyperlinks
- Upgrade hyperlinks to HTTPS where available

12.4.10 Version 3.0.3

- No longer split changelog between contributors
- Update for WinUAE 4.4
- Add A4000/PPC example

- Update About page

12.4.11 Version 3.0.2

Peter:

- Fix some typos
- Update FAQs, HowTos
- Various minor updates

Georg:

- Merge in some changes
- Fix typos, improve HTML standard adherence

12.4.12 Version 3.0.1

Peter:

- Updates for WinUAE 4.2: ROM, Quickstart, Misc, Display

Georg:

- Rename the Known Bugs section, make info a bit more relevant

12.4.13 Version 3.0

Georg:

- Major structural reorganization
- Pull FAQ into root
- Re-purpose the Tips section into How-To
- Move Action Replay, unified Transdisk & Transrom, Data Transfer, Picasso96 to How-To
- Unify all Background pages in one section
- Move Amiga Programs and Command Line Options to Emulation
- Move UAE people to Credits
- Get rid of separate Compatibility, Transrom, Required Files pages
- Fix all hyperlinks
- Dissolve "Hints for Power Users", create a new Printing page in Emulation
- Split HDD information into its own page
- Tons of clean-ups and removal of redundant information
- Re-shuffle text to fit the actual UI layout
- Completely re-do the Keyboard page
- Modernize and clean up a lot of outdated information
- Split RAM into its own page
- Various cleanups and clarifications.
- Modernize about page
- Completely re-do Contributors page
- Completely re-do the Command Line Reference
- Remove or consolidate a lot of redundant information
- Move acronyms to the Glossary
- Remove redundant information, update remaining one
- Introduce new headlines
- Move "Create A Boot Disk" article to the Tips section
- Import new logo from winuae.net
- Update and fix some redundancies in the Links section
- Update welcome page to be less 2001
- Get rid of external links from within the pages
- Correct a load of typos, spelling errors, terminology
- Clean up all HTML files with Tidy
- Purge the style sheet CSS to start over
- Strip all styling from HTML files
- Convert to HTML5, use new tags available
- Fix, correct and update a lot of broken HTML
- Remove obsolete frame-based index and menu
- Fix some images being stretched too far
- New screenshots in PNG format for all pages
- Harmonize file names, sync with WinUAE
- Re-order and correctly name GUI entries

Peter:

- Updates for WinUAE 4.0: CPU & FPU, Chipset, Adv. Chipset, Add Harddrive, RTG Board, Misc
- Updates for WinUAE 4.1
- Various updates and grammar corrections
- A few index changes

12.4.14 Version 2.2.15

Georg:

- Fix errors in pages due to mismerges
- Update copyright years
- Fix up and refresh changelog from git history

Peter:

- New updates for WinUAE 3.6.0
- Include Windows 10

12.4.15 Version 2.2.14

Peter:

- New updates for WinUAE 3.5.0
- Updated Quickstart, CPU, Expansions and Game ports

12.4.16 Version 2.2.13

Peter:

- Updated screenshots
- Updated pages for latest WinUAE

12.4.17 Version 2.2.12

Peter:

- Latest updates for WinUAE help for WinUAE 3.3.0.

12.4.18 Version 2.2.11

Peter:

- Minor updates esp Hard disk files, WinUAE 3.2.1 GUI.

12.4.19 Version 2.2.10

Peter:

- Added RTG Board page
- GUI screenshots updated
- RAM accelerator board moved to expansions
- ROM Accelerator board moved to expansions
- RTG board moved to new RTG page.

12.4.20 Version 2.2.9

Peter:

- GUI changes for Paths, CPU, Adv. Chipset, ROM, RAM, CD and HD, Expansion, Sound, Game port, Filters, Misc
- New features: Portable mode, Expansion ROMs, CDTV/CD32 turbo, Toccota, Sound volume, Table.library, Native or RTF filters.
- Web links updates
- Setup screen updated
- Added A4000/PPC to examples

12.4.21 Version 2.2.8

Peter:

- GUI changes for CPU and FPU, ROM, RAM, Floppy, Priority, About
- PPC emulation and Accelerator RAM added.

12.4.22 Version 2.2.3

Peter:

- Updates for WinUAE 2.4.0
- GUI changes for Paths, About, Chipset, HDD, Expansions, Display, Sound, Misc
- Additions to index incl. Zorro, PAL, NTSC, Screen, Custom chips
- Bootdisk creation changes
- Additional command line options

Georg:

- Update contributor information and changelog

12.4.23 Version 2.2.2

Peter:

- Chipset - Remove Sound emulation options
- Main - Application name updated (UAE Amiga Emulator)
- Bugs - Windows 2000 reference removed
- General Tips - Added another printer option
- Links - AmigaKit added. Amiga Forever name updated.
- About - Brand name list updated.

Georg:

- Minor cleanups, slightly extend glossary

12.4.24 Version 2.2.1

Georg:

- Correct lots of internal and external links
- Fix HTML validity problems
- Various content and layout updates, error corrections
- Convert changelog into HTML, include it in the help itself

Peter:

- Added new About screen
- Floppy - Bootblock, FFS
- Input - Test and remap
- Output - Recording section
- Misc - More new options

12.4.25 Version 2.2.0

Peter:

- New Chipset screenshot - sound emulation removed
- New Hard Disk screenshot - CD drive/image option
- Display - No, double and triple buffer option
- Filter - New screenshot
- Misc - New Window style option
- Index - some minor changes

12.4.26 Version 2.1.9

Peter:

- New Test and Remap options for Game Ports
- New 32 bit Chip RAM option

Georg:

- Minor credits page updates

12.4.27 Version 2.1.8

Peter:

- GUI Screenshots updated
- IO Ports. New Sampler option
- CPU. New CPU Exact option
- Output: Two new options
- First Time User. uaescsi link changed
- Installation. New screenshot

12.4.28 Version 2.1.7

Peter:

- All GUI screenshots updated.
- New Expansions tab added.
- CPU - New 68040 MMU option
- IO Ports - New Protection Dongle option
- Sounds - New Drivers options
- Various options moved around.
- AmigaDOS - Parameter information added to all commands.

12.4.29 Version 2.1.6

Peter:

- All GUI screenshots updated.
- New Getting Started install screenshot
- Game and I/O Ports now split into two: IO Ports and Game Ports.
- Credits - about - Year updated from 2008 to 2009
- Examples - added Kickstart 3.1 for A3000
- Data Transfer - Added EasyADF to list
- Requirements - Added Vista to OS list
- Transfer ROM/Disk - Link added to Data Transfer page
- GUI - New settings for Hard disks, Game Ports, IO Ports, Paths, Quickstart
- Index - Updated entries for keyboard, joypad, joystick, parallel, printer, serial, MIDI
- Known bugs - CDTV emulation is better now. So removed this.

12.4.30 Version 2.1.5

Georg:

- Remove references to Win 95/98/ME as they are not supported anymore

Peter:

- New screenshots for WinUAE 1.5.3
- Updated GUI Pages: Paths, Quickstart, RAM, Filter, Priority
- Add File Association to index

12.4.31 Version 2.1.4

Georg:

- Rework the About page
- New screen shot of the workbench screen, saving about 70k
- Add a reference to the FDL to all page footers
- Put all of the documentation under the GNU FDL, make according changes
- Fix a slew of typos, formatting, and HTML errors
- Move a few links to the main links page for consistency
- Add a missing link to the Action Replay page
- Minor rewording in the main Emulation page

Peter:

- Added new command line options
- New options for Advanced Chipset in WinUAE 1.4.6
- Add new limits for RAM settings esp. Z3 and RTG.
- Added new screen shots for WinUAE 1.5.0
- Wording for new Chipset, RAM, Misc options

12.4.32 Version 2.1.3

Georg:

- Add a glossary explaining a few terms
- Change link to the online version
- Overhaul the readme file, update copyright years
- Fix and update wrong index entries
- Add a link to a source for free Amiga games
- Remove the unneeded Amiga Inc link, replace it with Amiga Wiki
- New logo aligned with WinUAE, from a vectorized version

12.4.33 Version 2.1.2

Georg:

- Fixed the version number display
- Minor Windows version updates
- Revamped contributors and known bugs pages
- Updated or removed a lot of dead links from the Links section

Peter:

- New About screen (for 1.4.5)
- Paths. WinUAE default pull down menu
- Adv Chipset. New 'C00000 in Fast Ram' option
- Misc. uaenet.device added
- Index. uaescsi, uaehf and uaenet added.

12.4.34 Version 2.1.1

Peter:

- Replaced logo with one with a white background until we get a good replacement.
- New About screen.
- Hard drives. Two new buttons for automount removable and optical drives.
- Display. New layout.
- Filter. New hq2x option added to text.
- NB: Unable to update Help file version number in Vista. Still says 2.0.9.

12.4.35 Version 2.1.0

Georg:

- Major style update, changing the outdated color and layout schemes to something more MSDN-like.
- Update copyright information
- Include Windows Vista in the DirectX list and other areas

12.4.36 Version 2.0.11

Peter:

- Chipset: New screen shot
- Adv Chipset: New screen shot and new options
- ROM: New screen shot. HRTMon now integrated with Cartridge ROM.
- Display: New screen shot. Vert sync removed.
- Index entries for PCMCIA,IDE,SCSI,CD32,CDTV

12.4.37 Version 2.0.10

Peter:

- New screenshots: About, Quickstart, CPU, Adv Chipset, ROM, display, Sound, Game & IO, Filter
- New CPU and FPU options
- New Adv. Chipset options
- Changed Display, Sound and filter options

12.4.38 Version 2.0.9a

Peter:

- Replaced all screenshots
- New entry for Chipset Extra
- New entry for sound in Output
- Added text for Magic Mouse
- Updated version number (not updated last time)

12.4.39 Version 2.0.9

Peter:

- New screenshots: About, Adv.Chipset, RAM, Misc
- New page in Hardware: Adv.Chip
- New entries for Motherboard RAM
- New entry for Magic Mouse in Misc
- Added Index entry for Adv.Chipset
- Updated Known bugs page

12.4.40 Version 2.0.8

Peter:

- New screenshots of About, Game & I/O Ports, Filter
- Updated known bugs page (not done for a while)
- Updated keyboard page. Table text now shows, added more shortcuts
- Updated AmigaDOS page. More commands added
- Updated Contribution page.

12.4.41 Version 2.0.7

Georg:

- Various minor typo corrections, layout and HTML fixes

Peter:

- Added descriptions for Faster RTG and More Accurate FPU.

12.4.42 Version 2.0.6

Peter:

- New screenshots of About, CPU, Chipset, Sound, Misc and Input.
- CPU: More accurate FPU added.
- Chipset: Faster RTG added.
- Sound: Sound lag removed.
- Misc: Power savings added.
- Input: Light gun/pen added.
- Index: Light gun and pen added.

12.4.43 Version 2.0.5

Peter:

- New screenshots of Paths, ROM, Floppy, Hardfile settings, Display, Output, Filter, Disk Swapper and Misc.
- ROM. Enable HRTMon option added
- Hard Disks. DOS Type settings for Hardfiles.
- Output. Input recorder buttons added.
- Filter. Two 1x list options added.
- Misc. Language list added
- Floppy. Disk label option added
- Index. Added HRTMon, Language.

12.4.44 Version 2.0.4

Peter:

- All new set of screenshots due to Disk Drives renamed as Floppy Drives
- Chipset. Fast Copper removed. Genlock connected added
- Floppy drives. Layout changed
- Display. Colour depth and two low res options
- Misc. Untrap mouse option
- Index. Added Genlock, removed Copper.

12.4.45 Version 2.0.3

Peter:

- Updated GUI pages for WinUAE V1.1 in particular: Paths, Harddrives, Disk Swapper, and Misc.
- Added new entries to Index.

12.4.46 Version 2.0.2

Peter:

- Updated GUI pages for WinUAE V1.0 in particular: Quickstart, RAM, Hard Drives, Sound, Game & I/O, Output, Misc, About and Paths.

12.4.47 Version 2.0.1

Georg:

- Further updates to FAQ page with corrections, additional links, etc.
- Changed Bernd Roesch's email address
- Added index and menu files for the online version - WinUAHelp.back2roots.org
- Link to online version of the file in links page
- Miscellaneous typo and information corrections
- Command line parameters page was not linked from main tips page
- Consolidate information about OS 3.5/3.9 installation in a separate page
- Various grammar/spelling/typo/information corrections, suggested by Wolfgang Stoegg
- Various additions suggested by Wolfgang Stoegg
- Removed animated gif in credits section
- Moved legal notes to a separate page, include it in the Getting Started area

12.4.48 Version 2.0.0

Georg:

- Created Subversion repository to enable access for contributors
- Fixed up internal hyperlinks and insane external ones
- Made all pages HTML4 compliant, optimized HTML structure
- New screenshots, saving 200kB overall file size
- Various fixes in texts and layout changes
- Moved ADF to Disk section to transdisk page
- Removed page dedicated to Mathias Ortmann, contained practically no information
- Directly jump to required subsections when being directed to the links page
- Fixed/updated obsolete hyperlinks
- Updated first time users page for use with new quickstart feature
- Cleaned up and updated GUI chipset settings description
- Added hardware and host sections to align help layout with actual GUI style
- Created new subsection containing usage tips
- Updated pages for data transfer, required files with data from the FAQ
- Moved FAQ and Amiga Programs pages to tips section
- Merged in new information from Bernd Roesch
- Fixed page not found errors when help was called from more recent WinUAE GUI pages
- Moved Amiga DOS commands page to background information
- Fixed several typos, grammar mistakes, ...
- Directed all external links over the dedicated links page
- Added AmigaForever and Cloanto links to the links page
- Updated developer information about Bernd Schmidt

Peter:

- Updated FAQ page

Bernd:

- Removed obsolete information from bugs page
- Updated FAQ and general tips pages

12.5 GPL

12.5.1 GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

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12.7 UAE People

12.7.1 UAE People

Here you will get some information on the people who are behind UAE. Since it is not possible to present more detailed information about everyone who has ever contributed code to UAE, this section only includes a few select people who have had a major influence on the development.

The people

- [Bernd Schmidt](#)
- [Toni Wilen](#)
- [Brian King](#)

12.7.2 Bernd Schmidt

Bernd, a German native, was the great mastermind of UAE. He started the main UAE development on the 25th of February, 1995. Bernd has continued updating UAE, incorporating contributions and making progress on the core that all other versions of UAE were derived of. In the year 2002 he began to loose interest in the development of the emulator.

These days, WinUAE still receives very frequent updates, which is why other developers moved on to port features of WinUAE in versions on other platforms. A good example for this is [E-UAE](#), which ports the WinUAE base back to Linux, where the original UAE came from.

12.7.3 Toni Wilen

Toni Wilen is the maintainer of WinUAE, he took over this position from [Brian King](#). He has been at the helm for many years now, and has become famous for his incredible speed of answering bug reports, fixing the reported issues, as well as for implementing a big bunch of features users would not want to miss in WinUAE.

Also, Toni was interviewed by Georg Veichtlbauer on the 19th of November, 2002. It may be a bit lengthy but sure worth a read.

Interview:

Q: Would you tell a few things about yourself Toni?

A: I am from Finland, 27 years old, working as programmer/sysadmin. I haven't really done anything lately than working, watching Anime, reading Manga and programming something stupid and of course idling :).

Q: Did you ever own an original Amiga?

A: Of course, and many models... A1000 was my first Amiga (1988 or so), then I had two A500s (another was my brothers) and later two A1200's (again one for my brother). Now I have one A500 and A1200 for emulator compatibility testing :).

Q: When (and how) did your programming career start?

A: My first computer was Spectra Video svi-328. My first "programming" was writing and modifying some basic programs from computer magazines. I think I was 9 or 10 when I had my first computer :). I had c64 about 2-3 years later, wrote some stupid programs with C64-assembler...

Q: How did you get involved in UAE?

A: I think I saw someone say something like "it is impossible to emulate AGA" or something (I believe everything is possible). Then I started to examine UAE's code and add AGA support slowly (and this is true!). It took about 0.5 years until I understood UAE and even now I don't understand everything.

Q: You did not use any AGA documentation?

A: The unofficial aga.guide is the only documentation, but I knew it is correct because I programmed some AGA programs on my A1200 ages ago...

Q: Why did you decide to realize it with UAE instead of Fellow?

A: Choice was easy, UAE was in C. I hate Intel assembler!

Q: How much progress do you think UAE has made over the past years?

A: Too much? :) I'd say A500 emulation is very close. Only 100% correct cycle-exact CPU/Blitter emulation is not yet complete (because there is no documentation, you have to run test-programs on a real A500 to find everything out. Very time consuming. I am not really interested...). Of course 68020+ emulation needs MMU support (but probably not useful until everyone have 4GHz+ CPU :).

Q: What are the main features you implemented in UAE/WinUAE?

A: AGA, much more compatible disk emulation, more compatible Blitter emulation, rdb, booting from real HDD's, more compatible sprite emulation, CD32, A1000 boot ROM, state save, drive LEDs :), partial CDTV (because of missing hardware documentation).

Q: Why did you accept the position as WinUAE maintainer? It sure isn't the nicest and best paid "job" you could get...

A: Because I wanted to continue improving UAE :). Sending patches to someone else is much more complex, and anyway, Brian wasn't interested in continuing for a long time. I'd probably have become win32 maintainer even if I didn't want :).

Q: Do you actually use WinUAE? I remember Brian saying he didn't do much with it apart from coding it...

A: Yes, mostly for classic A500 demos and games.

Q: How do you see the cooperation with the other coders of UAE?

A: Usually I disagree with Bernd Schmidt but unfortunately he has been too quiet lately. Unfortunately it appears only me and Bernd know how the UAE core works. Bernd Roesch and 2-3 other coders send me fixes for picasso96, bsdsocket etc., non-core emulation but thats it. Finding someone who knows Amiga hardware, has programmed demos/games on an Amiga, knows C (Amiga demos/games were mostly in assembler) and knows Unix or Windows programming is nearly impossible... and especially one who has time to learn how UAE works.

Q: Are you working on other publicly available programs?

A: Great Nations (Civilization clone, don't know if I ever have time to continue), NHLinfo (EA Sports NHL-game editor, mostly I have lost interest on that too because all NHL games since 2001 have been total crap), Filemaster for Amiga, and some other smaller Amiga programs.

Q: What are you planning for the WinUAE future?

A: File system notification support, "sprites-outside-playfield" AGA-feature (but probably requires big rewrite of display code, don't expect too soon), Catweasel support, full CDTV emulation, MK3 (PCI) support.

12.7.4 Brian King

Brian King, the man from Seattle, has been a long time supporter of UAE. He entered the team in 1996 and is known as one of the main guys behind WinUAE, which he maintained for more than 5 years. He gave up due to a lack of time and handed over to [Toni Wilen](#).

Brian was interviewed by Malc Jennings from [Amiga Legal Emulation](#).

Interview:

Q: To start off, have you ever owned a real Amiga?

A: Yes. Several Amigas in my lifetime. Started with a used A1000, graduated to an A2000 with 040 accelerator. Eventually got an A1200 with 030 accelerator, and then briefly had an A3000T before it got stolen. Finally ended up with an A3000 here.

Q: About how much per year did/do you spend on hardware/software for the Amiga?

A: \$1000

Q: What made you decide to code/help code an Amiga emulator?

A: It just seemed like a great way to keep the Amiga alive, especially combined with the rapid pace of PC-hardware development and CPU speed, when compared to the high prices and slow speeds of newer Amiga hardware.

Q: What is your main role in the team?

A: I primarily just work on the Windows port of UAE, from Linux. I have added some core features to UAE (such as Picasso96 RTG support), by implementing them first on WinUAE.

Q: Are there any other projects you are working on at the moment?

A: No, my full-time job keeps me far too busy.

Q: Are there any new features users should expect in the future releases of WinUAE?

A: Still hoping for AHI audio-support, along with better/faster Picasso96 support.

Q: How many people are working on WinUAE in total?

A: Five or six. Bernd Schmidt contributes the most, via the core UAE code on Linux. Toni Wilen contributes a lot of the disk and custom-chip emulation, including AGA support. Bernie Meyer did the JIT engine on Linux, which I ported into WinUAE. Bernd Roesch has been contributing a lot of small fixes and enhancements. And I tend to do the "dirty work" of merging all these things together into a packaged installer.

Q: For the technical people out there, what language(s) are/is used to code WinUAE?

A: C and Assembly.

Q: Do you use any other programs during the development of WinUAE?

A: VisualC++, GCC.

Q: How much progress do you feel WinUAE has made over the years?

A: Limited progress, based on the amount of time I have to contribute to it. In some areas it's gotten a lot better (application support, emulation speed, compatibility) and in some areas it's gotten worse (custom-chip emulation speed).

Q: What is/was the most difficult part of the Amiga to emulate?

A: I imagine that the interaction between the custom h/w is the most difficult, with copper/disk/sprite/sound all churning away simultaneously. Toni or Bernd could answer this question better.

Q: How much experience do you have as a programmer?

A: 15 years, with all sorts of languages: BASIC, Forth, 680x0 Assembly, Pascal, Fortran, C, C++.

Q: How long have you been working on WinUAE?

A: Too long! <grin> About 5 years now?

Q: How do you feel about the legalities surrounding the emulation of the Amiga?

A: I understand the copyright issues, but it's a shame that an older version of Kickstart isn't freely available. It would save me so much time answering the typical e-mail of "Where do I get a Kickstart ROM man?".

Q: I know how you feel! anyway ... Have you ever developed software for anything other than the PC?

A: Yes. TRS-80 Colour Computer I, II, and III. Also Amiga software.

Q: Which do you prefer, Windows or Workbench and why?

A: I prefer Windows, but only barely. Mostly due to superior development tools and capabilities of the OS, such as memory-protection.

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