

Amoric v0.8a

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Chapter 1

Amoric v0.8a

1.1 Amoric v0.8a

Amoric (v0.8a)
The first ORIC Atmos 48K emulator for the Amiga
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1.2 Introduction

INTRODUCTION

As the ORIC Atmos was my first computer, I never forgot its fantastic 8 fixed color games. The games were not that bad or ininteresting but the main problems were :

- Tape loading durations could drive you mad, mostly if that doesn't worked because of the volume, or treble, or tape speed, or the washing-machine, etc...
- The f...ing protections in games forced you to switch on and off the ORIC, damaging the chips.
- What a shame to plug in the ORIC again in 1995 to play games while you've got a new computer at your work or at home
- While C64, Amstrad, ZX81, VIC20, BBC, Apple II emulators exist for the Amiga, there were no room for the ORIC domain, while ORIC was very popular in Europe (actually, more than the Vic20 or the BBC !!)

That's why I decided to write Amoric. I first wrote a UNIX X/Windows version, then I tried to adapt it on my favourite computer : the Amiga.

I waited a long time for another programmer to release an Amiga version but noone did, so I think I'm the first one :-)

1.3 Features

This ORIC emulator features :

- Graphics emulation (HIRES and TEXT mode, including double height and flash ↔ modes)
- 6522 and 8912 emulation, including Timers 1 & 2 and the keyboard.
- Load on Floppy/Hard Disk (faster than the tape (really ?))
- Control Metakeys to perform different operations (Reset button, etc...)

Obviously, this is not a real Oric, that means that there are problems in ↔ emulating

some software. See the

Bugs

chapter for more information.

This emulator does NOT emulate :

- 50/60Hz switch (it could but I don't know how to reproduce a desynchronized screen (60Hz is NTSC and it is still synchronized))
 - Half-TEXT Half-HIRES mode, used in some games
 - Sound
-

- Most of undocumented instructions of the 6502 (but that doesn't matter)

1.4 Setup

USER PREFERENCES

The oric.cfg file contains the user preferences. You can edit this file to change them.

An example config file is the best way to explain the features :

```
--- oric.cfg : cut here ---
```

```
Atmos.ROM
HOPPER.DAT
/games
/dumps
/sounds
0
1
French
1
7
```

```
--- cut here ---
```

```
Atmos.ROM <--- Allows you to specify the ROM you want to run
HOPPER.DAT <--- Allows you to specify the tape inserted once at amoric startup
/games <--- Allows you to specify the default directory for tapes
/dumps <--- same thing, but for hexdumps (snapshots, memblocks)
/sounds <--- where are the soundfiles copied (forget it for the moment)
0 <--- sound on/off (1/0)
1 <--- allows illegal instructions on/off (1/0)
1 <--- allows fastreset at startup, 0 turns it off.
7 <--- Screen refresh rate (in frame/sec, in PAL).
```

PS : only Atmos ROM works for the moment. You can try Oric1 ROM but the Load ↔ routines won't work because the ROM is not patched at all for the moment.

WARNING:

You can use Oric 1 and Oric Atmos ROMs and you can modify the ROM files for your personal use only. However, there are some locations which are patched after ROM loading by the emulator (Tape load, Fastreset) . Modifying those routines may ↔ lead to Oric crashes.

1.5 Configuration and Requirements

CONFIGURATION AND REQUIREMENTS

AmOric is written both in C and in 680x0 assembler code. It was adapted

from a former emulator that I wrote for UNIX platforms, and which was written exclusively in C. But UNIX workstations are usually a lot more powerful than a 68030 or even a 68040 Amiga. Due to the RISC architecture, C programs are usually faster than assembler programs, if the compiler is worth (gcc), and that also allows portability on others processors. My emulator worked fine on HP-PA1, Sun SPARC, PowerPC and Silicon Graphics.

But on Amiga, we must accept to program in assembly language for this type of software as speed is critical during the emulation, and the famous Amiga chipset (Paula, Denise, Gary...) can't help us with processor emulation. Furthermore, the 6502 and the 680x0 have got lots of common features, and the main idea is to use them (direct CCR flags conversion, same instructions...) with a minimum of adaptation.

There were 2 versions : a 68000 version and a 68020 version, but I decided to release only the 68020 version, as a 68000 is really too slow. Anyway, if I am requested to, I will release a 68000 version (but by now, I would have to handle one more version, and that would increase bug risks).

I don't conceal that Amoric will be SLOW on a basic A1200.
Try REAL fast RAM and maybe a 68030 card.

Anyway, I tested the precedent version on a A1200/020/14MHz with fast RAM and it worked at a good speed. I think the current version should run nearly at nominal speed.

Now, it runs at 120% speed on a 68030/40MHz, but I should optimize it in later versions, even if I think it will be hard to go further, but Fabrice Frances gave me an idea how to improve speed again.

Anyway, if your computer is slow, you can always experiment with the frame rate refresh in the

```
    oric.cfg  
    file.
```

It should run on KS 2.0 and requires asl.library V36 or higher.

1.6 Startup

HOW TO RUN AMORIC

Here, I'll explain how to get started with Amoric.

Simply click on the Amoric icon or type Amoric in the shell
The program will try to load the ROM file and the config file.
Then, the Oric screen will appear.

If you press the HELP key at any moment, the summary of the commands will appear on the Oric screen.

To exit Amoric, simply press F10.

To select a tape, just press F3. The screen will return to the Amiga part and a ← requester will ask you for a tape file. After that, just type CLOAD"" like you were used to.

If CLOAD"" stays stuck in 'Searching...', maybe that you've not selected a tape, ←
 or that
 you've reached the end of the current tape. So select a tape or press F7 to rewind ←
 the
 current one (if there is one).

1.7 Keyboard Map

There is a unique keyboard mapping, that does not depend on the localization of ←
 the
 keyboard, but on the raw keycodes only, which means that it matches USA keyboard.

Anyway, some extra keys are used to perform useful control functions :

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Reset	Refresh	Change		Reboot		Rewind		Break	
	Tape		Tape						

The F1 key jumps to the NMI oric routine (the unreachable black button under the ←
 computer).

The F2 key refreshes completely the screen (may be useful).

The F3 key allows you to change the current tape.

The F5 key has the same effect as switchng on/off the computer.

The F7 key allows you to rewind the current virtual tape.

F10 allows you to return to the workbench screen and to stops the emulation

Help displays a helpscreen reminding you those useful control keys.

The Oric Atmos 'FUNCT' key is emulated by the Right Alt key.

Del acts the same as backspace.

The numeric keyboard can also be used, as well as 'Enter' instead of 'Return'.

Note: With some games, for instance Zorgon's Revenge, the keys X and Down Arrow ←
 are used
 to go up/down because they are supposed to be one above the other, but that ←
 is no
 longer true for the Amiga and I'm sorry.

1.8 Hints

USEFUL HINTS USING AMORIC

- Because I adress directly the hardware (interrupts,screen), I had to disable multitasking during the emulation. I'm sorry for that but I'm not a very good system programmer. But don't worry, Amoric won't trash the memory. It always

frees everything before exiting. I saw multitasking emulation (A-MAX !!) and I was very impressed but if you're not happy with my program, just delete it ;-). Just take care of not writing on hard disks while you start amoric. If for any reason the emulator crashed, you could have to revalidate your HD. But the problems I met until now were in the tape loading part, where multitasking is active, and I can ensure that the emulation cannot crash the machine (only the Oric programs can be affected ;-))

- To improve speed, you can turn caches/burst mode on (68030) and also copyback (68040). I don't use self-modifying code or DMA transferts so all the caching devices should work. You can also relocate the VBR in Fast Ram, with tools such as TUDE from N.O.M.A.D, or SystemPrefs, to improve speed while fetching ←
interrupts
vectors.
- As I don't consider the Amiga timers but only the Oric ones, on slow machines ←
you
could have some difficulties to make the keyboard react, because the key could be pressed and released just before the Oric ROM routine tests the key, and ←
misses
the key on peak. In this case, just press longer on the key. In later versions, ←
I'll
try to buffer the keyboard accesses.

1.9 Tapeimport

IMPORTING GAMES OR SOFTWARE FROM TAPES

THAT'S an intricate part. How to get games or programs that are originally stored on audio tapes ?

On the ORIC, the 6522 and the ROM manage to receive and send this horrible and unmelodious 2400 baud signal. This fucking signal is the easier bridge between today's computers and the ORIC (ORIC Microdisk or Jasmin would be hard to emulate for me.

I've no knowledge about electronics, although I'm supposed to, and ORIC disks are 3'', that means there would be no way to read them with Amiga or PC drives. Anyway there isn't much documentation about Oric disks. The C64 drives were more documented and many interfaces for drives were developed for the Amiga (A64 package...))

I will not talk about RS232. I think the ORIC has got one but I've no idea how to program it neither on the ORIC nor on any other computer. Anyway, you'd need to carry your ORIC with you to do that (not convenient). That would be the safest way to transfer data though.

But I concentrated more on sound tape recordings :

On any computer, it's easy to sample sounds, if you've got enough mem or hard disk space.

For this operation, you'll need some !

First, sample your cassettes at a high rate in 8-bit mode (22050 KHz or more). The format is lo8 (unsigned 8 bit : range 0-255)

After that, use the program 'transf', written by Boris GRANVEAUD, included in this package. It's not very user-friendly because it's supposed to be seldom used. The syntax is as follows :

```
> transf file.lo8 GAME.DAT
```

You'll be asked for the sample rate you recorded the file.
The program displays info about the file (name,length) and reads the data.
Because of a timing difference between ORIC-1 and Atmos, before reading data,
the program skips some bytes in the sample (time for the Atmos to display
Saving... GAME OF THE DEATH C, while the ORIC-1 only displays Saving...).

If an error occurs, try to transfer as follows :

```
> transf file.lo8 GAME.DAT wretwr
```

wretwr can be eirutu or uerhgiugh (or even nbmmbn), because the test is made only ←
on the number
of args passed to the program. In this case, the program will skip no byte in
the sample. Conversely, an error will (normally) occur at the first byte.
As it is really hard to motivate Boris to improve his program, just consider
this error as a feature.

55 U Error found.

New value: <- Here just enter the value above in hexadecimal (here 55)

If you get another error, two possibilities :

- 1) Your tape or/and your tape player is/are fucked up
- 2) The sampling rate is not high enough
- 3) The volume is not loud enough
- 4) The program doesn't use the same method to read bytes than the 6522
as the 6522 is an analogic device and here we process the data numerically
- 5) It's merely a tape from ZX-Spectrum.

Actually, it makes five possibilities but that doesn't matter.

If you manage to load tapes on the ORIC (if your cat hasn't pissed on the
keyboard) and not with this program, just use a copy program on the ORIC
and send back the loaded data to the digitizer.

The program manages perfectly with a direct ORIC signal. If that doesn't
work, or if you can't carry your ORIC, save the signal on a new tape : it
will improve the signal.

ORIC's 6522 chip is very good at reading tapes and correcting errors.

Take ORIC loading program as the only reference.

If the game has many parts, save them separately, and then join them (cat).

Sometimes you'll need to put some 0x16 bytes between them (don't ask why).

Good luck !

For any technical questions, don't hesitate to contact
me
.

PS : I provided the C source code for the 'transf' routine and you should be
able to compile it on UNIX Workstations and Pee Cees, if you find that
sampling is more convenient on those platforms.

Anyway, you can get almost all the existing games on the Oric in a http site:

<http://arlesienne.ensica.fr/LOCAL/ORIC>

1.10 Other platforms

UNIX VERSION

As I told before in this text, my first attempt to an Amiga emulation was on a UNIX platform. I released a version which did not handle graphics correctly, and I contacted

Fabrice Frances

at the same moment,

who had wrote a version for PC (Euphoric). He introduced me to Olivier Balet, which improved my UNIX version with graphical optimizations, but now they try to release a UNIX version with Fabrice. Maybe that I'll release a XMotif version later.

PC VERSION

For your friends owning a PC and who want to get a very good emulation, you should try Euphoric from

Fabrice Frances

Fabrice is really an amazing programmer and his emulator is really a jewel in the jungle of PC software. You can upload it at <ftp.ensica.fr> or at the <http> address given above.

There's also some interesting Netscape information about the ORIC, its history, etc...

We often exchanged ideas and suggestions with Fabrice. If you're yourself the unlucky owner of a Pee Cee, Euphoric should wipe your tears away. It is fast and supports sound emulation, Oricl, Atmos, and Telestrat (!), Oric Microdiscs, virtual disks, RS232, there's almost nothing missing...

ATARI-ST VERSION

Olivier Galibert

downloaded my emulator for UNIX and e-mailed me telling me he was going to make an emulation for ST. He gave me precious hints which allowed me to correct 6502 emulation bugs and to gain a lot of speed. I hope his excellent knowledge of the 680x0 will allow him to release his emulator soon, even if the ST is a bit obsolete now. (What about the amiga...)

ORIC VERSION

Very accurate, it was developped by Oric Systems, UK in 1983.

ZX-81 VERSION

No version seems to come on this platform, sorry.

1.11 Disclaimer

DISCLAIMER

I cannot be held responsible for any damage caused directly or indirectly by the use of this program, irrespective of its correct or improper usage. Use it at your own risk.

1.12 Changes

CHANGES SINCE THE LAST VERSION

Amoric has been released under version number 0.8a, the 'a' means that some serious bugs have been corrected :

- * the screen will behave OK if you use multiscan or dblpal modes.
- * I partially implemented Timer2 emulation.
- * I optimized the main emulation loop and that improved the speed by 25% !
- * Amoric won't crash so easily than the former version ;-)

1.13 Bugs

BUGS AND PROBLEMS

The main bugs come from difficulties with the emulation.

I had some difficulties in making some games work. In fact, some bugs in games taught me a lot about ORIC internal structure, and allowed me to improve a lot the fidelity of the emulation. For me, trying 10 or 20 games is compulsory when you program an emulator, most of all when it is a 8bit one, which has no other utility than allowing you to play the old games !

* First, I did not implement all the undocumented instructions properly (there are a lot of them), but they are implemented as NOPs with skips. That is because a few programs use them, and it is often not on purpose but due to a frequent error from the programmers who believed that the BRK instruction returned at PC+1 after the RTI while it's actually PC+2.

If you don't believe me, just try this on your Oric :

```
DOKE #400,#6000 -> BRK
-> RTS
POKE #402,#4C -> JMP $FAE1 (ZAP)
DOKE #403,#E1FA
```

If you type CALL #400 you will hear ZAP which means that the RTS instruction is skipped.

Note : On C64 and Apple II, undocumented instructions were found very convenient by some foolish programmers and were used on purpose.

Actually, Amoric handles the undocumented instructions by skipping the PC by the same number of bytes as they did on the real 6502, but they don't perform any other operation. Amoric will only quit if it meets some instructions which originally crashed the Oric (like \$x2).

- * Second, I did not implement in a very natural way the screen refresh, in order to improve the speed, that's why some bugs could occur when flipping in HIRES. Some games use a hybrid video mode half-text half-hires (DOGGY, FIRE FLASH, ...), which is hard to reproduce without corrupting the emulation of the others ones (TEXT and HIRES). Those modes are not supported yet, but although I told in the docs of version 0.8 that they would be supported for sure in the next release, and that IS the next release, you can see that I lied ;-), but I tried hard to implement it, I swear, and I had lots of problems. I could do a good graphics emulation but it will considerably slow down your CPU.
- * Third, the 6522 VIA, used for I/O (Keyboard, sound), is non-trivial to emulate. I tried to emulate the vital functions (Timer 1, Timer 2, Communication with 8912), I have some trouble with Timer 2 and with PCR, and some functions are activated on a read, and as I can't intercept every read, they will never work ! I'll ask Fabrice Frances for more details about it.

1.14 Register

WHY REGISTERING AMORIC ?

The version of Amoric I released is V0.8a, although I experimented some bugs and emulation problems with it. Amoric can be freely distributed as long as the integrity of the files provided is kept.

Amoric is not limited that is to say that it won't quit after 5 minutes, no emulation feature is disabled.

However, I did not implement sound emulation, and data saving on this version neither,

and that's the only reason it does not work. I think that 8bits emulators should never

been released as crippled shareware. What do you think you'll earn with an emulator eh ?

However, it is important for you to register for two things :

- On my UNIX version I developed a powerful monitor for hacking/debugging purposes.

I implemented tons of commands

and I adapted it on the Amiga,

with a syntax a la Action Replay MKIII. That monitor helped me to understand tons of

emulation bugs. I couldn't have written Amoric and Oric Unix without it. It was ←
 the
 first step to an emulation program. The ones who don't write a monitor before ←
 they
 write an emulator are either very strong or they copied an existing source ←
 somewhere.
 On the Amiga, there are still a few bugs, but if I receive enough registrations, ←
 I'll
 try to correct them seriously, and you'll receive the complete version (with ←
 monitor)
 and the source code of the program.

- If you register, I'll provide you an emulator with a programmable joystick ←
 emulation
 and some kind of sound and printer emulation. All those extensions are currently
 on developpement or adaptation from UNIX and I need support to improve it.

How to register :

Amoric is Giftware, so send me anything you want to register. I accept ←
 registrations
 for games and/or utilities that you've written, and also translations in German, ←
 Spanish,
 and other languages for the manual.

Anyway, if you think that my program is not worth registering, or that you've lost ←
 all
 your money playing Mortal Kombat II, you can send
 me
 a mail to tell me what you think
 of my program. Many people already e-mailed me about Amiga when I uploaded the ←
 UNIX version
 because I said in the .readme that I had got an Amiga.
 It's a cheap and quick way for U to tell me you're interested in my program.
 I think the worst thing is indifference.

1.15 Monitor Commands

If you register, you'll recieve a version including a powerful monitor.
 Look at the available commands :

Command list :

- Monitor

g [address]	: jumps to an address. If not specified, continues execution.
x	: continues execution.
bs [address]	: set a breakpoint
bd [address]	: remove a breakpoint
bda	: remove all breakpoints
b	: list breakpoints

```

st          : step mode
tr          : trace mode (subroutines not entered)
r           : display register values
r [nom_reg] [val] : modify a register
caller      : returns the procedure which called the program.
a           : enter assembly mode (not implemented yet)
d           : enter disassembly mode.
m [addr1] [addr2] : Dump bytes from addr1 to addr2.
med [address] : Edit memory from an address.
p           : Shows the current ORIC screen
pt          : Shows the current ORIC screen in ASCII mode

lm [file] [address] : Load a memory block from an address
sm [file] [addr1] [addr2] : Save the memory block from addr1 to addr2

la [file] : Load a snapshot
sa [file] : Save a snapshot

lq : Load a snapshot in RAM
sq : Save a snapshot in RAM

fi [addr] : search for a string or hex bytes in the Oric ←
  memory
fi [opcode] [startadr] : search for instructions addressing [opcode] in the ←
  memory.

illegal : Trap illegal instructions (on/off)

- Misc

cht ([filename]) : Change loading tape file name.
ost ([filename]) : Open a save tape file.
ust : Uptdate a save tape file, turning it into
     the load tape file.

lrom : Reload ROM and patches (not implemented).
reboot : Reboot the ORIC.
reset : Reset the ORIC (the unreachable black button)

? [expr] : Evaluate an expression.
![command] : Execute a shell command (dir, copy...).

exit, or quit : Exits the program

help : Displays this help.

```

The synopsis of the listed functions may change with time.

1.16 Acknowledgements

ACKNOWLEDGEMENTS

I would like to thank the following persons :

- Fabrice Frances, who provided me the complete 6522 and AY8912 docs, and who gave the PC world a program it doesn't deserve ;-). He helped me to correct bugs in the Unix version and gave me his 6522 emulation code (in i80x86)
- Olivier Galibert, who contacted me about the Unix version to report me a bug. Great thanks for your powerful hints in 6502 emulation with 68000, and for your accurate docs on the 6502 emulation (including undocumented opcodes). Maybe Amoric would have never been released without you.
- Boris Granveaud, who wrote the tape digitizing routine, for his friendship and his great debugging help when I decided to write the Unix version.
- Olivier Balet, for working on my Unix version.
- Sylvain SOUCHE and Jean-Yves ROSSI for providing me some games the tape of which I had eaten. Special thanks to Jean-Yves who lent me his ORIC (I had lost mine), his cables and his (f***ing) tape recorder.
- The late 'Theoric' french magazine, in which precious technical information was found on the 6522 and on the tape format.
- Oliver Rummeyer, for his great program "RO".
- The Amiga, for being such a great computer.
- All the people who tested and enjoyed this program on its UNIX form the ORIC nostalgics and the others, and who e-mailed me about it.
- The Pixies, the Breeders, and Franck Black. That's not music for PC users !

1.17 The Author

THE AUTHOR

If you have any feeling about this program, or you want to make suggestions or bug reports, please contact me at one of my e-mail addresses :

fabre@supaero.fr
or
fabre@cert.fr

Mails of love or death threatening ones will be welcome.

1.18 Fabrice Frances

FABRICE FRANCES

He wrote the PC version, available at <ftp.ensica.fr>.
He is very active in the Oric Mailing List.
To reach him, you can try :

`frances@ensica.fr`
or
`frances@laas.fr`

1.19 Olivier Galibert

OLIVIER GALIBERT

He is currently writing the ST version.
To reach him, you can try :

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