

Wozamp for Apple II

User guide

Version 2.4

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Introduction

Wozamp for Apple II is a project I wanted to tackle since long. As my other Apple II projects, it's doesn't have any practical value beyond being fun and very interesting to do.

It is a network multimedia player. It can receive audio and video data over the Apple II serial port(s), and play them to the best of the 6502 CPU and ACIA 6551 serial chip abilities: the sound uses an 11.52kHz sampled rate, with a 5 bits precision. The video is either about 140x90 pixels resolution (which, technically, is 13K, so it's not as bad as it sounds once marketing tricks do their magic), or fullscreen with a (much) lower framerate.

Along this core feature are a few bells and whistles: an UI to navigate the contents of your FTP media server, basic playback control (rewind, fast-forward, pause and stop). You will also be able to play a whole directory, view your music files' metadata (Artist, Album, Title and Track number). When available, Wozamp will display the current song's album cover art. Last but not least, a VU meter will be displayed at the bottom of the screen.

Startup and initial configuration

Requirements

This software requires an Apple //c, //c+, IIgs, or IIe with:

- a language card, providing 64kB of RAM
- a 6502 CPU, optionally 65c02 for video playback
- a serial card, optionally two for video playback

The video playback is not yet available on the IIgs.

Serial communications setup

By default, the serial port Wozamp uses is the modem port. On a Apple IIe, this translates to slot 2. If you want to use a different slot, you can configure it at startup after the initial connection fails.

Apple II type	Serial ports
Apple //c and //c+	Slot 1: Printer port Slot 2: Modem port (default)
Apple IIe	Physical installation slot of the Super Serial Card (default: 2)
Apple IIgs	Channel A: Printer Channel B: Modem (default)

Table 1: Serial ports by Apple II type

The serial cable to use is a standard Apple II serial cable, the same you would use with ADTPro.

Other side of the communications setup

The proxy server installation is out of scope of this document, and documented at <https://www.colino.net/wordpress/surl-server-a-serial-proxy-for-8bit-computers/>.

As video playback in Wozamp requires a dual-serial cable setup, though, a few words about dual-serial setup. On the hardware side, you will need a second Apple II serial - to - DB-9 cable, and a second USB serial adapter.

Plug the first serial cable in the Apple II's modem port (or slot 2) and the proxy; it should appear on the proxy as /dev/ttyUSB0, and will be the main link (referenced as the 'tty:' parameter of the proxy's configuration file). Plug the second cable in the Apple II's printer port (or slot 1) and the proxy. It should appear as /dev/ttyUSB1, and is referenced as 'aux_tty:' in the proxy configuration file.

The problem with ttyUSBx is that the number depends on the order of which adapter is plugged first. You can work around this, on the proxy, by using the /dev/serial/by-id/ directory: identify which USB adapter is plugged in the Apple II's modem port (slot 2), and on the proxy, do the following to get their ID:

```
root@surl-server:~# ls -l /dev/serial/by-id/

total 0

lrwxrwxrwx 1 root root 13 11 avril 03:17 usb-FTDI_FT232R_USB_UART_ABOPXCGI-if00-port0 -> ../../ttyUSB1

lrwxrwxrwx 1 root root 13 11 avril 03:17 usb-Prolific_Technology_Inc._USB-Serial_Controller-if00-port0 -> ../../ttyUSB0
```

You can now use the following in /etc/a2tools/tty.conf and be sure they won't switch at the next proxy reboot:

```
root@surl-server:~# cat /etc/a2tools/tty.conf

tty: /dev/serial/by-id/usb-FTDI_FT232R_USB_UART_ABOPXCGI-if00-port0

baudrate: 115200

hw_handshake: on

aux_tty: /dev/serial/by-id/usb-Prolific_Technology_Inc._USB-Serial_Controller-if00-port0
```

The welcome screen

Choosing what to play

When starting Wozamp, you will be greeted with a start screen, where you will be able to load an URL. By default, the last used URL will be suggested.



Figure 1: The welcome screen

You can use two kinds of URLs in Wozamp:

- A direct URL to a file or stream, for example '<http://8bit.fm:8000/live>', '<https://example.com/filename.mp3>', '<smb://NAS/Videos/movie.mp4>', etc.
- An URL to an FTP server, for example '<ftp://nas.local/music/>'.

In the first case, Wozamp will play the file, and return to the start screen at the end of the playback.

In the second case, Wozamp will load the contents of the FTP server, and allow you to browse into subdirectories and select file(s) to play.

It is not possible (yet) to use a Youtube, Peertube, Dailymotion etc URL.

Connection error

If you get a connection error (Timeout), you will be able to use the 'C' key to configure your serial port. Please check the serial cable is in the slot you intended to use, and try again. Wozamp requires the serial port speed to be set to 115.200bps.

Playing videos

Wozamp can play video files in two manners. The first one is audio+video; the second one is audio only. If your Apple II computer has a 65c02 CPU, two serial ports, and video playback is enabled in the configuration screen, Wozamp will start Video Wozamp when you connect to a direct URL to a video, or when you browse and choose a video file to play.

If your computer has a 65c02 CPU and a single serial port, you should disable video playback in the configuration screen, in order to avoid writing to another extension card's RAM space.

If your computer has a 6502 CPU, video+audio playback is not possible.

Note: When playing a video file with Video Wozamp, the sound quality is less than when playing only its soundtrack. This limitation is due to the very constrained power of the 65(c)02 CPU: when playing audio only, each sample is played twice to emulate 22kHz and make the carrier signal less audible. When playing video, the CPU cycles of that second sample are dedicated to video data, and the carriers drops to 15kHz, which is more audible.

When starting to play a video, Video Winamp's loading screen may stay longer than expected; this depends on the quality and weight of the video, which the proxy has to start decoding enough to make sure it can feed data to the Apple II. An estimation of the time remaining will appear after a few seconds if this is the case.

Controlling playback

Audio

While an audio file is playing, the following controls are available:

Table 2: Audio playback controls

Key	Action
Space	Pause/resume the playback
Left	Rewind 10 seconds
Right	Fast forward 10 seconds
Escape	Stop the playback
-	Decrease amplification
=	Set amplification to normal
+	Increase amplification

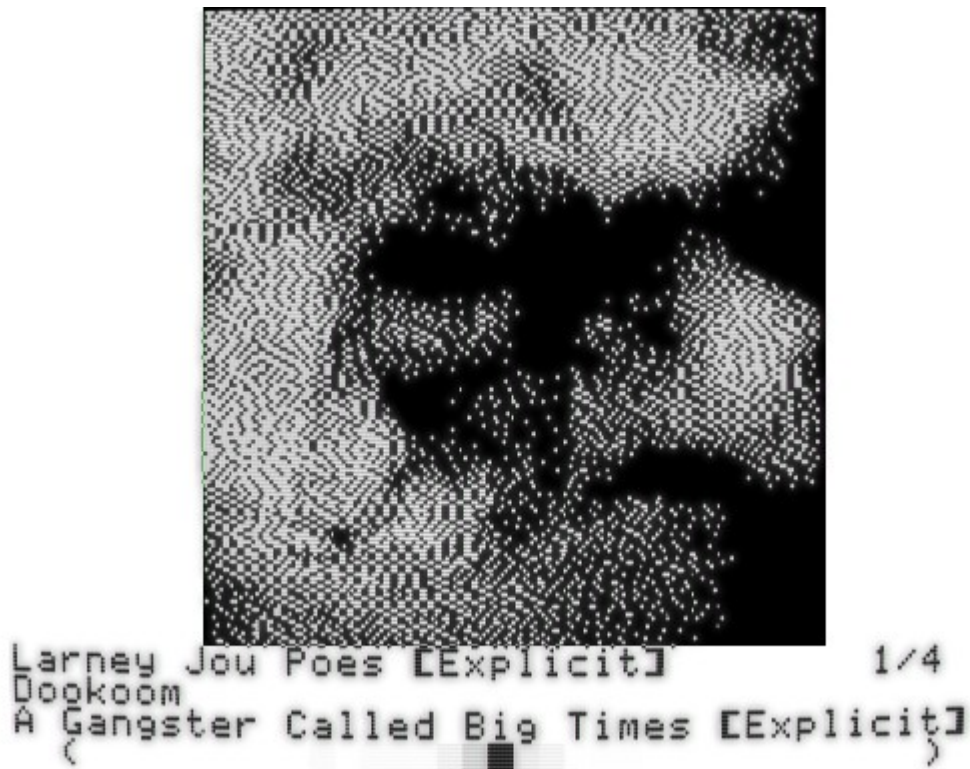


Figure 2: Playing an audio file

Video

While a video file is playing, the following control is available:

Table 3: Video playback controls

Key	Action
Space	Pause/resume the playback
Left	Rewind 10 seconds
Right	Fast forward 10 seconds (if enough of the stream is decoded on the proxy)
Escape	Stop the playback
Tab	Toggle subtitles on/off
-/=/+	Decrease amplification, set to normal, increase amplification
S	Toggle speed/quality



Figure 3: Playing a video file (Prodigy's Breathe)

Subtitles generation must be enabled (in the Configuration screen) for the Tab key to have an effect. If disabled server-side, subtitles will not be available.

The proxy loads subtitles from two possible sources: first subtitle stream embedded in the video file if one exists, or from an SRT file named the same as the video file and stored alongside the video file.

The speed/quality toggle controls which lines of the video are rendered. In faster mode, only one every second line is displayed. This doubles framerate at the expense of precision, in a way that the human eye tolerates surprisingly well.

Volume control (for audio and video)

As soon as the proxy finishes decoding the audio stream, it will adapt the amplification level so that over the whole file, the sound signal will use the whole dynamic range.

You can still increase the amplification with the '+' key, but the loudest parts of the audio stream will be distorted. You can decrease it with '-', but the quietest parts will be less audible. Using '=' resets the amplification to the best compromise.

Browsing an FTP server

You can navigate around the contents of the FTP server using:

- Enter: open a subdirectory
- Escape: go back to the parent directory
- Up and down: move the selection (U and J on a non-enhanced Apple II)
- C: Open the configuration screen
- /: Search in the current directory
- N: Search for the next match in the current directory
- A: Play all the files in the current directory

```
...tp://a2:*****@diskstation.lan/music
-----
> Queens Of The Stone Age
RAMMSTEIN
Rachid Taha
Radiohead
Rafale
Rage Against The Machine
Raised Fist
Raphael Gualazzi
Renan Luce
Renaud
Rene Biname
Rob Dougan
Rob Zombie
Robert Rodriguez
Rolling Stones
Rose
Rufus Wainwright
Run DMC
-----
Up,Down,Enter,Esc:nav /:search C:config
A:play all files in directory N:next
```

Figure 4: Browsing a NAS FTP server

When playing all files in the current directory, Video Wozamp will not be used if one of the files is a video file, even if enabled; instead, only the soundtrack of the video will be played.

When playing all files in the current directory, subdirectories will not be entered.

The configuration screen

On the configuration screen, you will be able to specify which kind of keyboard your Apple II has, if applicable. This allows Wozamp to select the appropriate character set and transcode UTF-8 filenames to the Apple II's native character set. This setting does not appear on non-enhanced Apple II computers, for which the US-ASCII charset is used.

You will then be able to specify whether you have a monochrome or color screen. This setting will be used for displaying cover art. It will not, however, be used for Video Wozamp. Video Wozamp's streaming protocol makes it impossible to use color for the video stream; this means that on a color screen, videos will have green and purple artefacts where some pixels should be white.

The third setting, "Enable video playback", controls whether you want to play the video on video files. If disabled, only the video's soundtrack will be played, but at a better quality. This setting does not appear on non-enhanced Apple II computers.

"Video size" controls how large the video will be rendered. Choose "Small" for a higher framerate. In this case, the video will be a maximum of 12800 pixels, centered on the screen.

Choose "Large" for a full-height video (192px if subtitles are disabled, 160px otherwise). In Large mode, the framerate is very low on the majority of videos, but can be increased while watching it by toggling Speed/Quality to Speed.

"Enable subtitles" controls proxy-side generation of subtitles for video. If disabled, using Tab while watching a video will have no effect.

```
...tp://a2:*****@diskstation.lan/music
-----
Please choose your keyboard layout:
0. US (US-ASCII charset)
1. French (ISO646-FR1 charset)
2. Spanish (ISO646-ES charset)
3. Italian (ISO646-IT charset)
4. German (ISO646-DE charset)

Is your monitor monochrome? (y/n)
Enable video playback? (y/n)

-----
Up,Down,Enter,Esc:nav /:search C:config
A:play all files in directory
```

Figure 5: The configuration screen

Links and resources

The project code lives at <https://github.com/colinleroy/a2tools/>

Its homepage is at <https://www.colino.net/wordpress/en/wozamp-an-apple-ii-music-and-video-player/>

It is built using cc65, <https://github.com/cc65/cc65/>

Understanding PWM sound generation: <https://www.youtube.com/watch?v=UhDgV0sv37o>

Thanks and acknowledgments

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