

Installing Firmware 3.10i / Core 1.42 – Ultimate Documentation documentation

Instructions¶

Installing firmware 3.10i works in the same way as previous versions. You simply browse with the file browser in the Ultimate menu to the unzipped firmware file. Move to the appropriate file with the cursor keys and press RETURN to bring up the context menu. Select ‘Run Update’, and the updater program will be loaded and started.

There are different files in the download package. Which one you need depends on your hardware, and for the 1541 Ultimate-II also on the intended use, as not all features fit together in one firmware version.

It is important to note that the embedded processor of the 1541U2 will change from a Microblaze clone to my own implementation of RiscV. This means that older updaters that were built for Microblaze will no longer run. And this means, that you cannot downgrade from 3.10i using these older “.u2u” files. To make sure you don’t load the wrong file, the filename extension that the firmware recognizes changes from “.u2u” to “.u2r”. If you want to downgrade, you will first have to make sure your unit runs on Microblaze. This can be done by loading the “revert_to_mb.u2r” firmware, which loads *an unsupported version of 3.10i*, based on Microblaze. Using this unsupported version of the firmware, you can then load any “.u2u” file, including older versions. This is the *ONLY* reason that this unsupported version is provided! See the table below:

1541 Ultimate-II Migration Table¶

Current Firmware	CPU Type	Upgrade Method	Package / File	Updates to...
Any 2.x	ZPU	‘update.bin’ on Root of SD Card	1541u2_3.0beta7.zip	Microblaze / 3.0beta7
Any 3.x	Microblaze	Select ‘.u2u’ file from menu	1541u2_3.y.zip	Microblaze / 3.y
Any 3.x	Microblaze	Select ‘.u2u’ file from menu	ultimate_3.10i.zip	RiscV / 3.10i
3.10i and up	RiscV	Select ‘.u2r’ file from menu	update_yyy.u2r	RiscV / yyy
3.10i and up	RiscV	Select ‘.u2r’ file from menu	revert_to_mb.u2r	Microblaze / 3.10i(*)

*) Version only supplied to allow loading older firmware versions.

What is in the .zip package?¶

Filename	Purpose	Variant	1541	1571	1581	SID	Sampler	GMod2	ACIA-6551
3.10i/update.u64	Firmware for Ultimate 64		••	••	••	•	•	•	•
3.10i/update.u2p	Firmware for Ultimate-II+		••	••	••	•	•	•	•
3.10i/update.u2l	Firmware for Ultimate-II+L		••	••	••	•	•	•	•

Filename	Purpose	Variant	1541	1571	1581	SID	Sampler	GMod2	ACIA-6551
3.10i/update.u2u (*)	Firmware for 1541 Ultimate-II	Audio	●	–	–	●	●	–	–
3.10i/update.u2u (*)	Firmware for 1541 Ultimate-II	Dual Drive	●●	–	–	–	–	●	●
3.10i/update.u2r (*)	Firmware for 1541 Ultimate-II	Audio	●	–	–	●	●	–	–
3.10i/update.u2r (*)	Firmware for 1541 Ultimate-II	Dual Drive	●●	–	–	–	–	●	●
3.10i/revert_to_mb.u2r	Downgrade package to Microblaze	Audio	●	–	–	●	●	–	–
3.10i/revert_to_mb.u2r	Downgrade package to Microblaze	Modem	●●	–	–	–	–	–	●
3.10i/revert_to_mb.u2r	Downgrade package to Microblaze	Gmod2	●●	–	–	–	–	●	–
roms/kernal.bin	Hyperspeed Kernal								
changes.txt	Change Summary / Release notes								
carts	Directory with cartridge files								

*) Inside of the installer, you can choose which variant of the FPGA will be loaded

Cartridge Timing¶

One of the things that often goes wrong is the cartridge timing. With the introduction of the U2+L, the cartridge timing has been revised. This is not always an improvement, as has shown by some experiences from different users. Also, some firmware releases had quite strongly C128-biased settings, which did not work well for many C64s, especially NTSC ones. This is certainly an aspect that still needs improvement, with maybe some automatic calibration.

For best results, for now, choose the following timings. You can find these in the config menu (F2) - under 'C64 and Cartridge settings':

Cartridge	Machine	'PHI2'-timing	'PHI1'-timing
1541U2	C64	100 ns	140 ns
1541U2	C128	200 ns	200 ns
U2+	C64	96 ns	144 ns
U2+	C128	192 ns	192 ns

Cartridge	Machine	'PHI2'-timing	'PHI1'-timing
U2+L	C64	100 ns	140 ns
U2+L	C128	200 ns	200 ns

For kernal replacement, you may need the 80 ns setting for PHI2.

Kernal replacement on a C128 may work for PAL models, with the Shadow RAM disabled, and high timing values

Please help to extend this table to SX-64 and possibly different board revisions.

Changes in 3.10i, compared to 3.10

Background

If you would take some time to check the commit history of the repository at GitHub, you may find over 500 commits since the last released version, 3.10a. This is a lotttt more than it usually takes to release a next firmware version. The version is still 3.10, so there are not many functional changes. Yet, files have been touched, updated, or just made compatible with the new Ultimate-II+L hardware. It was more difficult than expected to get the Lattice FPGA to work correctly and keep compatibility with the existing hardware platforms.

On top of the new introduction of the Ultimate-II+L, there is still a need to support the “good old” 1541 Ultimate-II (or simply: U2). There have always been issues with the Microblaze processor and the compiler from Xilinx. Every version of the Xilinx compiler had different bugs that caused the Microblaze based firmware to be broken in one way or another. Since the U2+L runs well on the Risc-V, it was decided to upgrade the CPU inside of the U2 and ditch the Microblaze forever. Unfortunately, the CPU that was chosen to run inside of the U2+L did not fit in the same space as the Microblaze clone, so I decided to write my own Risc-V compatible CPU. This is the CPU that will be used from now on in the 1541 Ultimate-II.

General Fixes

[Important] Fixed ExFAT filesystems with 128kB clusters (Fixes failing D64 mounts from some ExFAT thumbdrives)

[Facebook Discussion] EasyFlash save function now saves all chip chunks to support incomplete CRT files

[Issue-271] GEORAM at boot (MarkusC64)

[Issue-279] Support for 2 MHz operation for any cartridge, including EasyFlash

[Issue-246] Fixed: Virtual Printer crashes when file cannot be created.

[Issue-234] Deleting last item in directory makes selection invisible

[Issue-236] Confirmation modal asking a question only gives ‘OK’ instead of ‘Yes/No’.

[Issue-R17] Added mapping of ESC key to RUN/STOP.

[Facebook Request] Added: Leave menu on mount (can be selected per drive)

[Facebook Bug Report]: Fixed starting Kingsoft Business Basic cartridge

[Facebook Bug Report]: Allow Maverick (and others?) to write wrong sector headers on MFM tracks.

[Facebook Bug Report]: Unable to select GeoRAM. Is now a mode of the RAM Expansion Unit.

[Facebook Bug Report]: Fixed color palette not loaded at boot (U64 only).

[Facebook Bug Report]: Fixed USB sticks not recognized

[Messenger Report]: Improvements to palette file read. Rejects faulty files. Fixes hang-up

[Messenger Report]: Fixes 'Create DNP' when run from Telnet. Turned out to be a stack overflow.

[Email Discussion]: Adds EEPROM segment to GMOD2 when it is missing in the CRT file

U64 core fixes

Multicolor graphics side border bug (core version V1.41 => V1.42)

Modem fixes

ACIA NMI pulse extension to extend over bad line. This allows the 6502 to see it always.

Performance optimization ACIA / Modem

Allow spaces after ATDT command.

Minor fixes in the modem emulation layer from Scott Hutter (xlar54)

Cartridge Support

[Issue-314] Added support for Blackbox V9.

Additional C128 cartridge variant that allows banking and offers some RAM (U2/U2+/U2+L only).

Additions

Firmware target added: Ultimate-II+L; the Lattice version!

System Information page (F4) now shows elaborate version info.

GEOS support functions from MarkusC64