Amiga Accelerators

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Quick start guide

Revision 3

applicable to firmware pack version 1.4xx

1. General Information

Warp System Components

Warp accelerator card is modern approach to classic Amiga addons.
It integrates many improvements in a single, easy to install and use device.
Main system components:

- MC68060 CPU, last and best microprocessor from 68K Motorola family[1]
- MC68040 CPU, 060 predecessor, slower but still very capable[2]
- 256MB DDR3 RAM
  Currently splitted to 224MB for AmigaOS and 32MB for RTG
- 64kB L2 Cache to minimize impact of high memory latency and take benefit from large memory bandwidth
- RTG graphics with digital video output, 128bit blitter and up to 1920x1080[3] resolution in full color
- 16bit audio codec with original Amiga audio mixing capability
- 32bit 400MHz ARM microcontroller which act as board manager and specialized chipset giving additional IO like USB, and offload 68K CPU from various tasks
- ESP32 WiFi module for WiFi networking support
- 8MB ROM which contains board firmware, but also can be used to store up to four kickstart versions
- Fast IDE port optimized for use with CF cards
- SD card slot

[1] Warp1260 model
[2] Warp1240 model
[3] Digital video output is NOT 100% compatible with HDMI standard, so especially full HD resolution, may not work on some TV sets or other receivers.

Current stage of the project

All system components are proven to be working at hardware and low-level software layer, but some of them are waiting to be integrated with the AmigaOS.

Software components that still need to be developed:

- 16bit sound driver (AHI driver)
- MP3 decoder (mpega.library)
- JPEG decoder (jpeg.datatype)

RTG will also be improved over the time. More operations can be accelerated by the hardware. Mouse pointer should be implemented as hardware sprite. Now it is done by software, and it flickers a little in some situations.
RTG update and scandoubler support is currently on the top of our TODO list ;-)

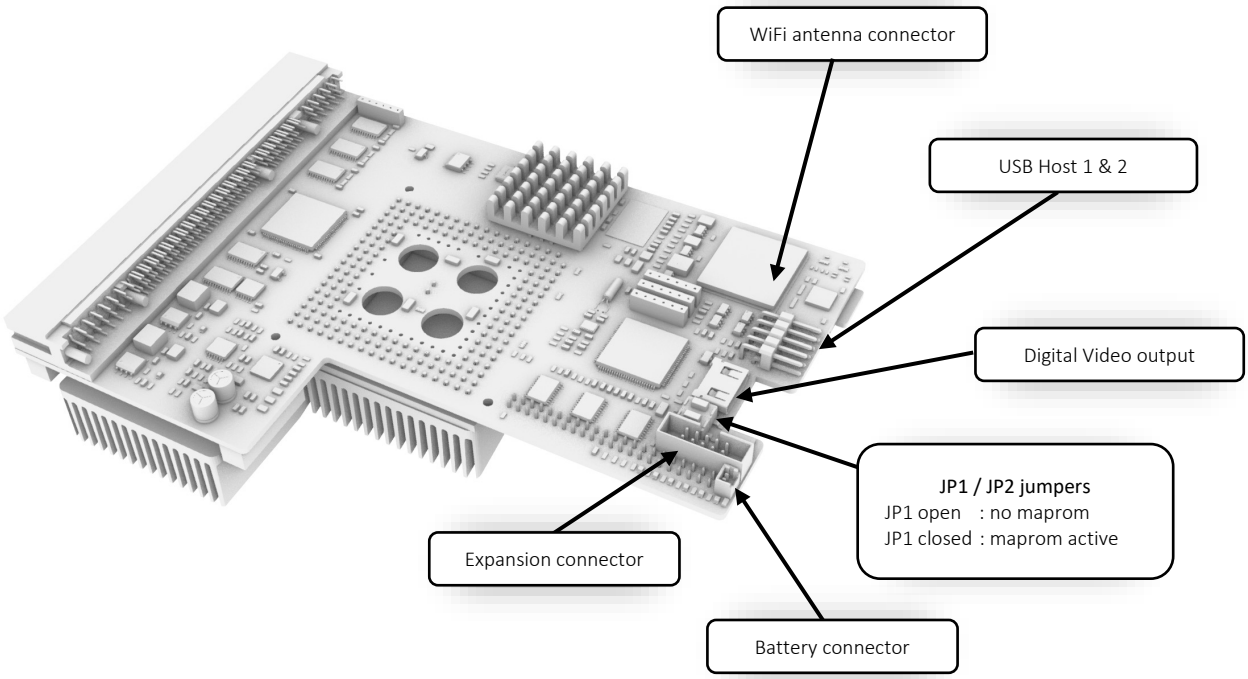
L2 Caching can be also significantly improved, so there is potential for future improvements.

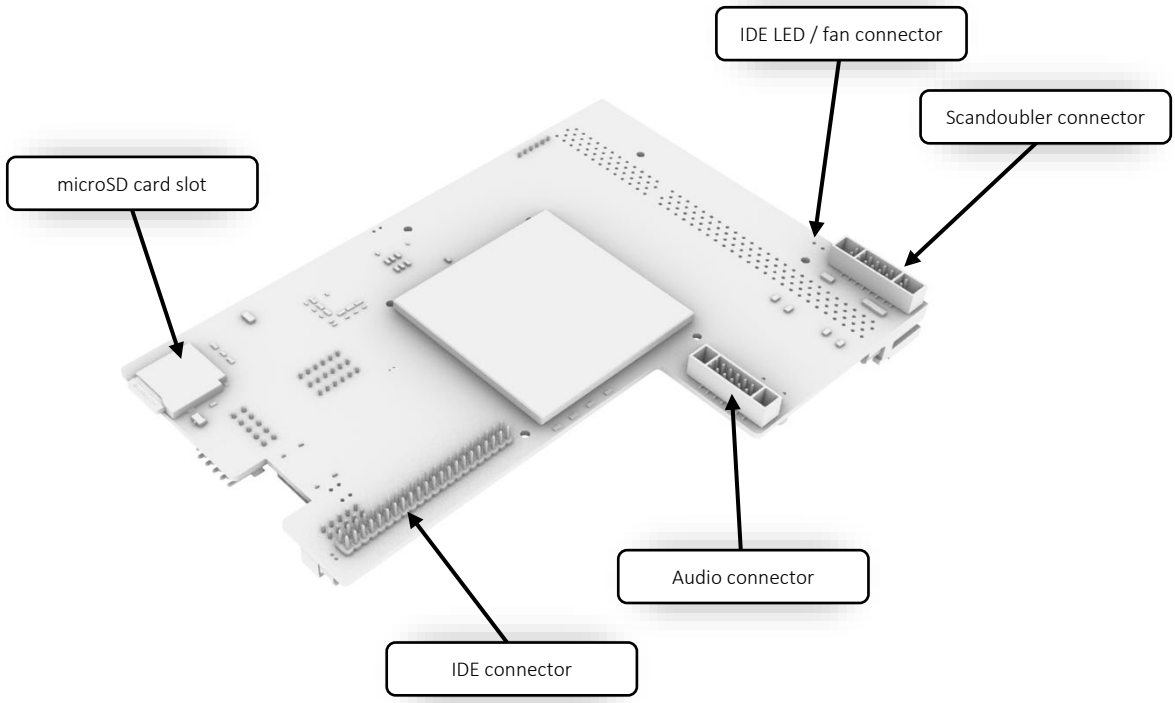
AmigaOS currently supported features:

- 68060/68040 Turbo with decent amount of memory ☺
- Easy adjustable 68K clock frequency
    - 50, 66, 75, 85, 90, 95, 100, 105MHz for 68060
    - 25, 33, 40, 45, 50, 55, 60, 65MHz for 68040[4]
- Fast onboard IDE (~8MB/s read speed in native mode on 060/100MHz)
    - Gayle chip emulation mode (warp seen as scsi.device)
    - Native mode (default) that works with dedicated warpATA.device driver[5]
- USB mouse support (seen by the Amiga like original mouse connected to game port)
- Easy Kickstart switching and fast ROM access – onboard ROM is fast enough, that popular “map ROM” solutions are not needed anymore in most cases.
- Integrated bootloader for easy firmware upgrade.
- SD card disk driver with DMA support and up to 20MB/s read speeds
- USB disk driver with DMA support and up to 800kB/s read speeds
- AutoBoot from SD/USB disks and onboard IDE
- warpNET.device SANA-2 network driver compatible with Amiga TCP/IP stacks like Roadshow(recommended), MiamiDX or AmiTCP

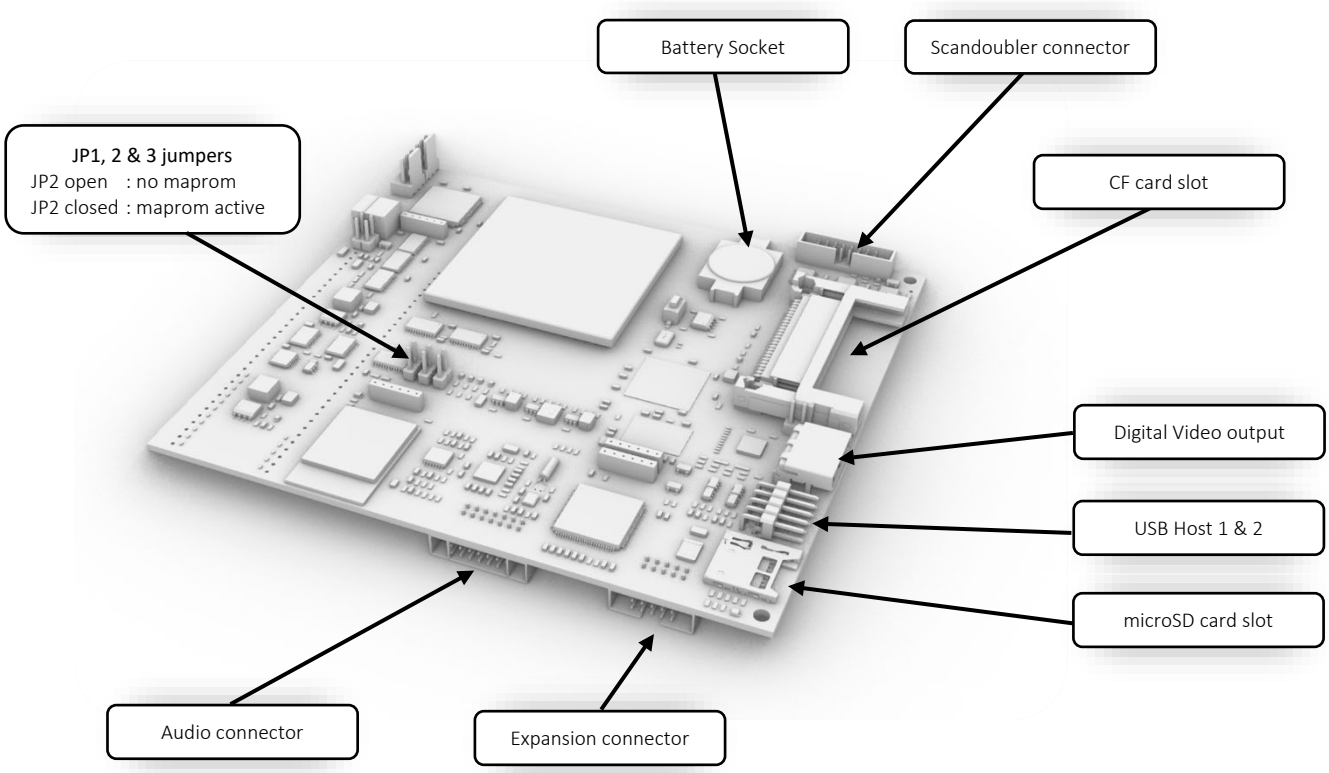
[4] 50MHz seems to be max, for 40MHz 68040 version. You can try clock it higher, but it rather wouldn’t work, and factory reset will be necessary.
[5] In native mode on A1200, if original IDE on Amiga mainboard is not used, startup time can be quite long, because AmigaOS scsi.device is waiting about 30s for hard disk. Workaround for this is to have IDE terminator or any CF card (even with no partitions) inserted into mainboard IDE connector.

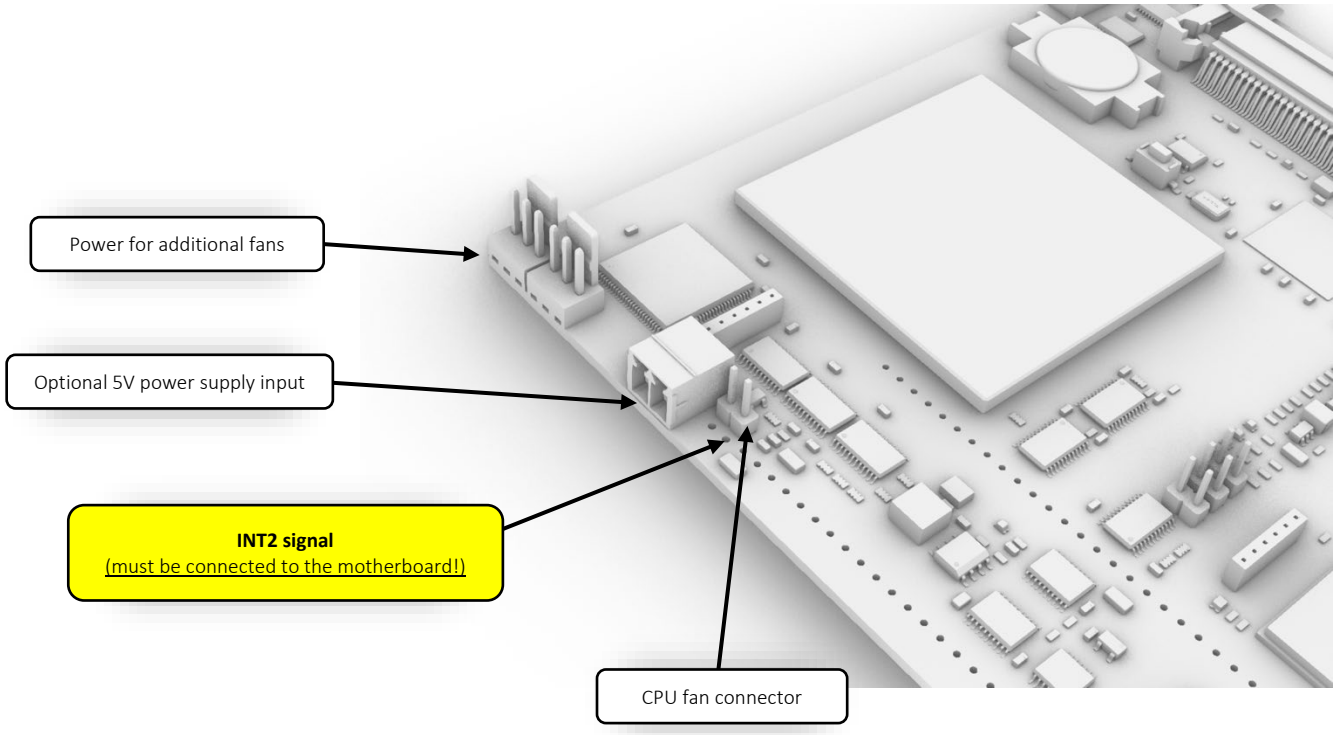
Warp1260/1240 connectors and jumper placement





Warp560 connectors and jumper placement





2. Warp drivers and software

cswarp.library

This library is used by all other system components and tools. It is already in the ROM of the board, but in some cases, it needs to be reloaded from disk, so it is highly recommended to have it installed in the LIBS: directory of boot disk.

warpSD.device

Onboard uSD card slot driver. It makes possible to use uSD as ordinary hard disk in AmigaOS and boot from such card. It is recommended to have warpSD.device in DEVS: directory.

warpUSBDisk.device

Onboard USB slot, disk driver. It makes possible to use USB stick as ordinary hard disk in AmigaOS and boot from such drive. It is recommended to have warpUSBDisk.device in DEVS: directory.

warpATA.device

Onboard ATA/IDE slot, disk driver. This slot is optimized for CF cards to be used as ordinary hard disk in AmigaOS and be able to boot from it. It is recommended to have warpATA.device in DEVS: directory.

warpNET.device

Onboard WiFi driver. It is required to be installed in DEVS:Networks[6].

warpNET network interface script file

Onboard WiFi network interface description file. Should be installed in DEVS:NetInterfaces[7].

68060 Library

Warp boards are tested with excellent libraries provided by the MMULib package by Thomas Richter, so use of these libraries is strongly recommended.
You can download it from: http://aminet.net/package/util/libs/MMULib
This software package contains also very useful tools like:

- MuMove4k
- MuFastZero
- MuRedox

Math libraries

It is recommended to use standard math libraries provided with AmigaOS.
Previously recommended HSMathLibs are reported to have some issues on latest AmigaOS versions.

[6] If you're using TCP/IP stack other than Roadshow, you should check if this location is correct
[7] If you're using TCP/IP stack other than Roadshow, you should check if this location is correct

RTG P96 Setup

To use onboard RTG graphics first you need to install Picasso (P96) system. You can use free version from Aminet http://aminet.net/package/driver/video/Picasso96 or latest versions from http://icomp.de.

Copy files from warp firmware package:

- 'csgfx.card' to LIBS:Picasso96
- 'Picasso96Settings' to DEVS:
- 'csgfx' (and 'csgfx.info') to DEVS:Monitors

Restart system and change screen prefs to use new RTG modes and resolutions.

csgfx monitor file tooltypes

- NOBLITTER=Yes
  set this to disable hardware acceleration in RTG modes
- SOFTSPRITE=Yes
  set this to disable hardware sprite in RTG modes

WarpTool – command line diagnostic and control

Usage:
WarpTool <options>

<table>
<tr><th>Option name</th><th>Arguments</th><th>Description</th></tr>
<tr><td>Diag</td><td></td><td>Print diagnostic information and current settings</td></tr>
<tr><td>CPUTurboLevel or CTL</td><td>0 – 7</td><td>Set MC680x0 clock frequency (MHz)
<table>
<tr><th>value</th><th>Warp1260/560</th><th>Warp1240</th></tr>
<tr><td>0</td><td>50</td><td>25</td></tr>
<tr><td>1</td><td>66.6</td><td>33</td></tr>
<tr><td>2</td><td>75</td><td>40</td></tr>
<tr><td>3</td><td>85</td><td>45</td></tr>
<tr><td>4</td><td>90</td><td>50</td></tr>
<tr><td>5</td><td>95</td><td>55*</td></tr>
<tr><td>6</td><td>100</td><td>60*</td></tr>
<tr><td>7</td><td>105</td><td>65*</td></tr>
</table>
* Probably not usable, at least we don’t know about any 68040RC40 working stable on clock higher than 50MHz. Use at your own risk. You’ll have to do factory reset if system becomes unresponsive.</td></tr>
<tr><td>IDEMode[8]</td><td>native, emulation</td><td>Native mode is default and is using warpATA.device for onboard IDE. In this mode A1200 original IDE is unaffected - using system provided scsi.device.
Emulation mode turns on Gayle chip emulation, so warp IDE is seen like port on Amiga mainboard and handled by scsi.device.
Original IDE port is switched off and PCMCIA is also not usable. This mode is not really recommended anymore.</td></tr>
<tr><td>IDESpeed</td><td>0 – 2</td><td>(not yet implemented) onboard IDE timing settings.</td></tr>
<tr><td>WiFiSSID</td><td><ssid></td><td>set WiFi network name (always set together with WiFiPass)</td></tr>
<tr><td>WiFiPass</td><td><password></td><td>set WiFi password (always set together with WiFiSSID)</td></tr>
<tr><td>WiFiShowPass</td><td></td><td>Shows wifi password in diagnostic information</td></tr>
<tr><td>HIDMouseRes</td><td>1 – 4096</td><td>Set USB mouse resolution multiplier 256 for 1.0</td></tr>
<tr><td>KickSel or KS[9]</td><td>0 – 3</td><td>Kickstart slot select (system will restart after issuing this command)</td></tr>
<tr><td>FANCpuTemp[10]</td><td>0 – 90</td><td>Set CPU temperature at which fan will have 100% speed</td></tr>
<tr><td>FANMinPWM</td><td>0 – 100</td><td>Set minimum PWM duty for fan. It is useful when fan is making annoying noises on lower values.</td></tr>
<tr><td>volMaster</td><td>0 – 255</td><td>Set audio mixer master volume</td></tr>
<tr><td>volAmiga</td><td>0 – 255</td><td>Set audio mixer amiga volume</td></tr>
<tr><td>volWarp</td><td>0 – 255</td><td>Set audio mixer 16bit codec volume</td></tr>
<tr><td>ARMInfo</td><td></td><td>Print ARM co-processor silicon revision and HAL software version. Important – if you have Warp Board with ARM silicon revID 0x1003, you may experience issues with writing data to SD card. Contact with CS-Lab is such case.</td></tr>
<tr><td>sdInfo, sdBlockRead, sdTest, sdWrTest, testfile, usbDiskInfo, usbBlockRead</td><td></td><td>These arguments are for debug and testing purposes. Don’t use it, you can corrupt filesystem on your uSD and/or USB drive.</td></tr>
</table>

[8] System will restart after issuing this command
[9] System will restart after issuing this command
[10] Fan is automatically switched off when CPU temp is below 33,5°C

Examples:

```
WarpTool Diag
```

Print current settings and diagnostic information.

```
WarpTool CPUTurboLevel=4 HIDMouseRes=102
```

Set (MC68060) CPU clock to 90MHz and USB mouse sensitivity to 40%

```
WarpTool Diag CPUTurboLevel=2 IDEMode=native FANCPUTemp=50 FANMinPWM=30
```

*Set (MC68060) CPU clock to 75MHz, cooling fan parameters, IDE to **native** mode and print diagnostic data*

```
WarpTool WiFiSSID=”mywifi” WiFiPass=”mypassword”
```

Setup WiFi network name (ssid) and password. Keep in mind that you need also TCP/IP stack like Roadshow to use internet on your Amiga.

```
WarpTool ARMInfo
```

Print ARM co-processor revision ID information

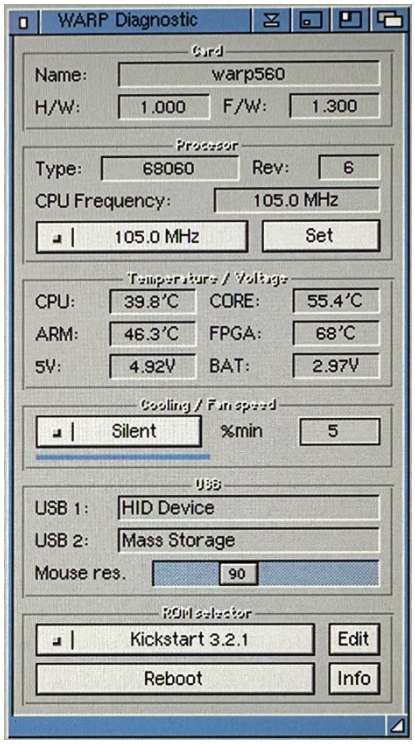
```
WarpTool ks=2
```

Set kickstart slot 2 and restart

Notes:

1. KickSel command on A1200 not always restart Amiga correctly, if system seems to be frozen, issue keyboard reset. Computer should then restart with newly selected kickstart slot. It will be fixed in the future updates.
2. To use KickSel command JP2 jumper must be closed. Otherwise, system will use Amiga mainboard ROM chip.
3. Hold reset for >10s to switch back to default (0) Kickstart slot.
4. Hold reset for >30s to reset all settings to default. This will also reset stored WiFi credentials.
5. Settings will be retained after power off only if backup battery is present and not discharged.

WarpDiag – GUI diagnostic and control tool



1. **Card**
    a. Name – board model name
    b. H/W – hardware version
    c. F/W – firmware version
2. **Processor**
    a. Type – CPU type
    b. Rev – CPU revision
    c. CPU Frequency – current CPU clock
    d. Frequency selector
    e. **Set** button to switch to new clock
3. **Temperature / Voltage**
    a. CPU – ext. sensor CPU temp.
    b. CORE – int. sensor CPU temp.
    c. ARM – ARM MCU temp.
    d. FPGA – Artix FPGA temp.
    e. 5V – 5V power supply voltage
    f. BAT – backup battery voltage
4. **Cooling / Fan speed**
    a. **Silent / Performance / Max** selector
    b. Minimum PWM duty setting
5. **USB**
    a. USB1: port 1 device
    b. USB2: port 2 device
    c. USB Mouse sensitivity setting
6. **ROM selector**
    a. ROM slot selector
    b. Edit button to set names of the kickstarts
    c. Reboot – set ROM slot and reboots the computer
    d. Info – information about the program
7. **Device/WiFi** menu option
    a. WiFi SSID and password configuration

Notes:

1. Even with WiFi status “Connected” you still need some TCP/IP stack like Roadshow to use internet on your Amiga.
2. Reboot command on A1200 not always restart Amiga correctly, if system seems to be frozen, issue keyboard reset. Computer should then restart with newly selected kickstart slot. It will be fixed in the future updates.
3. To use ROM selector JP2 jumper must be closed. Otherwise, system will use Amiga mainboard ROM chip.
4. Hold reset for >10s to switch back to default (0) Kickstart slot.
5. Hold reset for >30s to reset all settings to default.

warpSD.device notes

This file should be copied to your DEVS: folder.
You can also find WSD drive in the firmware pack “Amiga Software/Storage/DOSDrivers” directory. This drive mountlist is for the FAT32 formatted volumes. You also need fat95 filesystem from Aminet for this to work (https://aminet.net/package/disk/misc/fat95).

warpSD.device supports essential SCSI commands, so you can prepare SD card with the HDToolBox to use Amiga RDB partition format and even boot your Amiga from SD card.

Remember to edit HDToolBox icon tooltypes before using it to prepare SD card:

- SCSI_DEVICE_NAME=warpSD.device
- SCSI_MAX_ADDRESS=0

Firmware v1.200 and later, scans SD card for Amiga partitions after reset and automatically mounts them. Custom filesystems (like PFS) are also supported.

warpUSBDisk.device notes

This file should be copied to your DEVS: folder.
You can also find WUSB drive in the firmware pack “Amiga Software/Storage/DOSDrivers” directory. This drive mountlist is for the FAT32 formatted volumes. You also need fat95 filesystem from Aminet for this to work (https://aminet.net/package/disk/misc/fat95).

warpUSBDisk.device supports essential SCSI commands, so you can prepare USB stick with the HDToolBox to use Amiga RDB partition format and even boot your Amiga from USB drive.

Remember to edit HDToolBox icon tooltypes before using it to prepare USB disk:

- SCSI_DEVICE_NAME=warpUSBDisk.device
- SCSI_MAX_ADDRESS=0

Firmware v1.200 and later, scans USB disk for Amiga partitions after reset and automatically mounts them. Custom filesystems (like PFS) are also supported.

Warning!
Maximum available current on the Warp’s USB ports is 500mA or less (depending on what power supply powers your Amiga). Attaching HDD’s is not recommended, because even small 2,5’’ drives usually need more power. Using solid state drives and pendrives is much better choice.

warpATA.device notes

This file should be copied to your DEVS: folder.

warpATA.device supports essential SCSI commands, so you can prepare CF card with the HDToolBox to use Amiga RDB partition format and even boot your Amiga from it.
Remember to edit HDToolBox icon tooltypes before using it to prepare CF disk connected to warp IDE with native mode enabled:

- SCSI_DEVICE_NAME=warpATA.device
- SCSI_MAX_ADDRESS=0

Firmware v1.300 and later, scans CF disk for Amiga partitions after reset and automatically mounts them. Custom filesystems (like PFS) are also supported.

Warning!
In native mode on A1200, if original IDE on Amiga mainboard is not used, startup time can be quite long, because AmigaOS scsi.device is waiting about 30s for hard disk.
Workaround for this:

- IDE terminator (https://amigastore.eu/752-amiga-ide-terminator-44-pin.html)

or

- Any CF card (even with no partitions) connected in mainboard IDE connector.

3. USB HID keyboard support

USB connected keyboard is seen by the Amiga like an original keyboard.
No driver is needed.
You can also use composite USB device, like integrated mouse/keyboard wireless receiver.

- "Amiga" keys are mapped to Windows/Command keys. If your keyboard doesn't have right Windows key, right Amiga key is mapped also on right Ctrl key.
- You can switch between original and USB keyboard by F11/F12 keys.
- "Help" key is mapped to the insert key.
- You can also reset Amiga by pressing Ctrl-Win-Win, or Ctrl-Win-RightCtrl

4. Roadshow TCP/IP stack notes

warpNET interface description file

Parameters description:

parameter	value	Description
Device	warpNET.device	SANA-2 network driver to use.
Unit	0	Device unit, warpNET only supports unit 0.
configure	dhcp	Automatically obtain IP and other network parameters from local DHCP server. (most often router in your network)
requiresinitdelay	no	This parameter should be “yes” only for some old network cards which requiring additional delay for startup.
copymode	FAST	Faster network data packets copy routine.
iprequests	64	Depth of IP packets read queue. 64 is for better performance.
writerequests	64	Depth of IP packets write queue 64 is for better performance.
debug	no	Changing to ‘yes’ can help tracking issues with dhcp
id	AMIGA-WARP	It is the host name which will appear in most routers when you list dhcp assigned ip addresses. You can change it, but no spaces are allowed and try to keep it short.

For all possible parameters please investigate Roadshow docs.

Setting bigger TCP receive buffer for better performance

It also possible to set configuration variable for Roadshow to allocate bigger TCP buffer.
Enter command line interface and issue following command:

```
Setenv save Roadshow/tcp/recvspace 200000
```

For all possible parameters please investigate Roadshow docs.

Roadie – GUI for Roadshow

If you want to have graphical user interface for Roadshow TCP/IP stack check this package:
http://aminet.net/search?query=roadie

Troubleshooting

In case of connectivity issues first off all check WiFi connection status. You can do it by WarpDiag (menu Device/WiFi), or `WarpTool diag` from shell. WiFi state should be “Connected”.
Beside that you can reconnect TCP stack by issuing following commands in shell:

```
NetShutdown
AddNetInterface warpNET
```

5. WHDLoad compatibility notes

Firmware package version 1.300 and later contains fixed P96 driver which doesn't interfere with WHDLoad anymore. However, if you are using network (warpNET.device) then special care must be taken to disable network interrupts on WHDLoad startup. This can be automated, so network will be disabled when WHDLoad starts and restored when you exit the game.
Here's example how to do that (example assuming that Roadshow TCP/IP stack is used, if you're using another stack check its documentation on how disable/enable network connection).

S:WHDLoad.prefs file

Uncomment following lines:

```
ExecuteStartup=Execute S:WHDLoad-Startup
ExecuteCleanup=Execute S:WHDLoad-Cleanup
```

S:WHDLoad-Startup file

Modify "stop Roadshow" section as follows:

```
; stop Roadshow
C:NetShutdown
avail >nil: flush
```

Please note "**avail >nil: flush**" line!
It's important to ensure warpNET.device driver will be unloaded.

S:WHDLoad-Cleanup file

Modify „start Roadshow" section as follows:

```
; start Roadshow
AddNetInterface warpNET Quiet
```

At this point everything should work automatically, and you can run WHDLoad games without any additional operations.

6. Updating board firmware

1. Download update package and save it on FAT32 formatted USB stick in the "__cswarp" directory (two underscores before 'cswarp').
    a. Package name is warp560.pk, warp1260.pk or warp1240.pk depending for which model is intended for.
    b. You can have packages for all models on drive, board will find and use the right one
2. Insert USB stick in the USB port and power cycle the computer to reset the ARM MCU.
3. After turning the power on, update process will begin and after max. 2 minutes computer should boot.
    a. Sometimes reset after upgrade doesn't restart properly. If after 5 mins. nothing happens, remove stick and power cycle Amiga.
4. Remove USB drive

Notes:

1. Interrupting the update is not recommended, however Warp bootloader is never erased, so if for any reason update was interrupted, just insert USB stick with the firmware package turn on the computer and update process should complete normally.

Reprograming of Kickstart ROM slots

You can store up to four different Kickstart versions on the onboard fast ROM memory.
To program kickstarts into onboard ROM you will need also update package file warp560.pk, warp1260.pk or warp1240.pk depending on your board model. It is ok to have all firmware files. Board bootloader will choose the right one. There is no support for 1MB ROMs yet, but it will be added in future updates.

1. Put files with the Kickstarts data on the FAT32 formatted USB stick in the "__cswarp" directory together with firmware package file.
    a. File names should be "kick0.bin", "kick1.bin", "kick2.bin", "kick3.bin"
    b. If you have already same firmware version flashed, then you must also put **config.txt** file in **__cswarp** folder with "force-prog" text in it (without quotes). This ensures that firmware and kickstarts will be reflashed to Warp board.
2. Insert USB drive and power cycle the computer
3. After power on, Kickstarts should be programmed into the onboard ROM
4. System will restart when operation completes

Notes:

1. There are often two version of Kickstart files: one intended to burn physical chips, and normal binaries. **Always use normal binaries**.