

**USB Controller
for AMIGA**

HIGHWAY

HIGHWAY

Notes

Legal notes

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- Damages caused by misaligned plugging and static discharges at the expansion module and / or the computer it was installed are explicitly not covered by guarantee.

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Memory regions marked with "reserved" partially contain mirrors of other regions and may not be used for programming.

Clockport and expansion port memory regions can be used for programming without further documentation. You are not encouraged to access USB controller or control register regions without deeper knowledge of these parts. Don't play with things you don't understand.

A Software Developer Kit is available on request.

Please contact us if you are interested in USB programming.

A.3.3 Register definition

Information on register mapping of the *HIGHWAY* is available for interested programmers on request. We will support any efforts like driver development for NetBSD or Linux.

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Thanks for choosing our *HIGHWAY* card !

By acquiring the *HIGHWAY* you have chosen a high quality product. *HIGHWAY* allows you to connect many USB peripheral devices to your Amiga. Depending on driver availability you can use standard USB devices from the PC market on your Amiga.

Your package contains Poseidon - a very powerful USB stack. As a Software Developer Kit (SDK) is available (containing all information needed on how to program USB drivers) you can expect software development also from third party companies.

This documentation is intended to guide you through the installation process of the *HIGHWAY* board. Moreover it contains basic information on operation of USB devices.

Please read this documentation carefully **BEFORE** trying to install software or hardware on your own. You will avoid problems and - in a worst case scenario - hardware damage to your Amiga and / or your new *HIGHWAY* board.

The AmigaGuide file "ReadMe" enclosed on the disk in your *HIGHWAY* package contains last minute information which couldn't be added in this printed documentation.

Please check this file for latest information before starting installation !

Most recent information as well as software updates can be found on our web site: <http://www.e3b.de/usb/>

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A.3. Programming information

A.3.1 Autoconfig data

The *HIGHWAY* registers with the following specs:

```
-Manufacturer ID: 0x0861
-ProductId: 0xC8
-Adress range: 64 kB
-Shutup: supported
-serial number: D[31:24] hardware revision
                D[23:16] firmware revision
                D[15:0] serial number
```

Some Zorro cards do not save the base address assigned to them during autoconfig process completely. If too many cards get into the expansion space you might encounter errors. In this case the *HIGHWAY* should be placed into a slot behind the card causing this malfunction.

Usually this avoids the problems caused by the maldesigned card.

A.3.2 Memorymap

HIGHWAY memory space is used as follows:

```
0x0000 - 0x1ffe  USB Controller
0x2000 - 0x3ffe  reserved
0x4000 - 0x401e  Clockport
0x4020 - 0x403e  reserved
0x4040 - 0x4040  Control Register
0x4042 - 0x7ffe  reserved
0x8000 - 0x81fe  Expansion Port
0x8200 - 0xffff  reserved
```

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A.2. Zorro bus timing

The *HIGHWAY* has been designed according to the Zorro II specification. We tried to get it working with as many busboards as possible, even with non-Commodore busboards.

Despite many testing efforts we cannot guarantee the functionality of the *HIGHWAY* on third party busboard, as there are too many different revisions of these boards on the market.

Please consult the manufacturer of your busboard for compatibility issues.

A list of already tested busboards can be found on our website.

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1. Unpacking

Your *HIGHWAY* package should contain the following items:

- one *HIGHWAY* card (Zorro version)
- two holding plates with two USB adapter cables each
- one disk with Poseidon USB software
- this manual
- one registration card

Please check your *HIGHWAY* package after unpacking for missing parts! Missing parts should immediately be reported to your dealer.

Please fill out the registration card completely and return it to us. Support and software updates will be available for registered customers only.

Moreover, you help us making our products better.

2. Specifications of *HIGHWAY*

- USB controller for Amiga Zorro II bus
- integrated root hub with four ports
- compatible with USB 1.1 and 2.0 devices (**no** highspeed mode)
- all ports are protected against overcurrent and short circuit
- power saving 3.3V technology
- integrated power management on port-by-port basis
- complete autoconfiguration according to Zorro II standard
- compatible with many Non-Commodore busboards

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3. Basic informationen on USB

The USB (Universal Serial Bus) has been designed by several large companies to standardize connection of peripheral devices to computers. USB allows data rates of 1.5Mbits/s (low speed) and 12Mbits/s (full speed) in its revision 1.1. Next generation devices designed according to the USB specification 2.0 allow a rate of 480Mbits/s in addition. Upto now only few devices with highspeed support are available.

Your *HIGHWAY* card connects to USB devices which are compatible with USB specification 1.1 and 2.0; anyhow highspeed mode is **not** supported.

The USB has a bus structure that is organised like a tree: each port allows connecting only one device at a time. More ports can be added by hubs. Devices can be connected and disconnected while power-on (hot plugging). Devices connected to the USB can be bus powered (power is drawn from USB host, up to 500mA) or self powered (own power supply).

Your *HIGHWAY* has already an integrated hub with four ports: you can start with up to four devices without spending extra money on hub hardware!

3.1. General hints

Your *HIGHWAY* has been designed for internal Zorro busses as found in Amiga 2000, 3000, 4000 and 1200 tower housings. Please check your computers manual before installation on information how to add an expansion card.

Be careful: the *HIGHWAY* card may not be inserted into Zorro slots the wrong way !

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A.1.3 Clockport

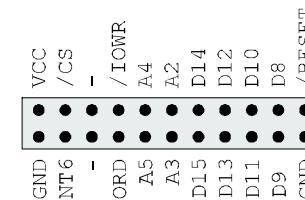
The *HIGHWAY* offers one clockport for easy expandibility. Timing of this port is **not** as slow as on the original Amiga 1200, but much faster (corresponds to one normal Zorro II four clock cycle).

Please mind the correct orientation of the clockport hardware when connecting a module to the *HIGHWAY*!

Refer to figure 1 on page 6.

Please verify that your card is capable of the fast timing and if there is driver support for the combination clockportmodule and *HIGHWAY*.

For adaption of drivers please contact the corresponding vendor of the clockport module. Instructions on how to modify a driver may also be given by the support team if the above fails.



[Fig. 5] Clockport pinout (connector top view)

A.1.5 JTAG interface

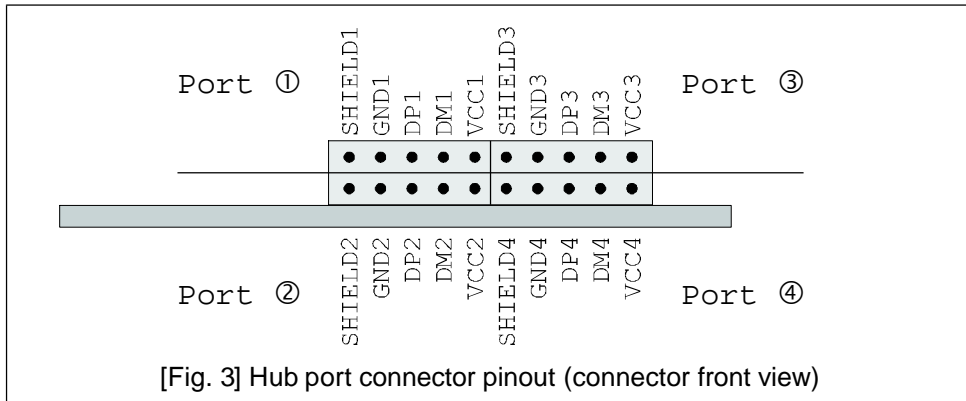
The JTAG interface on the lower left side of the *HIGHWAY* is intended for bus interface logic upgrades.

Upgrades are only available by authorized support.

This connector is not intended for use by customers.

WARNING: Do not connect any cable to this port!
Your *HIGHWAY* can be rendered unusable by doing so.
You have been warned.

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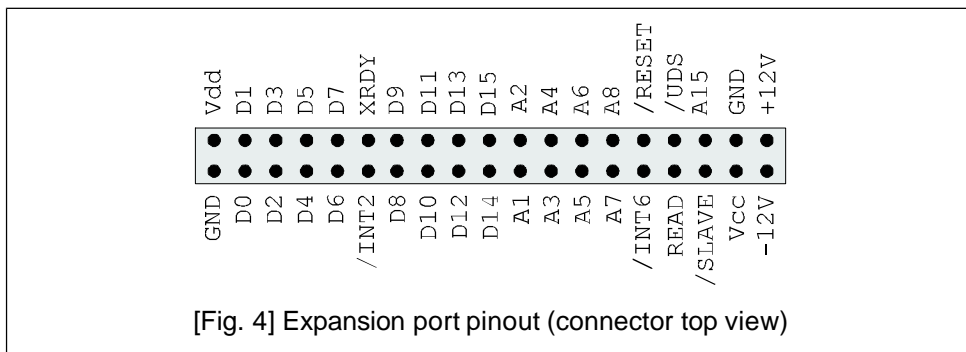
[Fig. 3] Hub port connector pinout (connector front view)

A.1.2 Expansion port

The *HIGHWAY* can connect to expansion modules by a 38 pin expansion port. This port is electrically compatible to the vmc isdn blaster if only the 26 rightmost pins are used.

This connector is **not** compatible to individual computers expansion modules.

Timing information for development of own expansion modules are available on request.



[Fig. 4] Expansion port pinout (connector top view)

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Damages caused by incorrectly fitted boards on the *HIGHWAY* and / or your Amiga are not covered by guarantee. Refer to page 7 for detailed installation guide.

3.2. Powerconsumption

One *HIGHWAY* with four devices connected to her ports can consume up to 2 Ampere of current. Especially fully equipped Amigas (harddisks, turbo cards) can get unstable in this condition. Please check carefully if your power supply is able to deliver the power needed by external devices before connecting USB devices to your *HIGHWAY*.

Especially modern turbo- and graphic cards and fast harddisks may use almost all power resources delivered by Commodore or Amiga original power supplies.

Connecting additional bus powered USB devices can get you over the 2Ampere power limit of the Zorro specification !

Possible solutions:

- If possible, use your USB devices "self powered" with their own power supplies attached
- Use an external hub with own power supply ("self powered"). Bus powered hubs won't help with this issue !

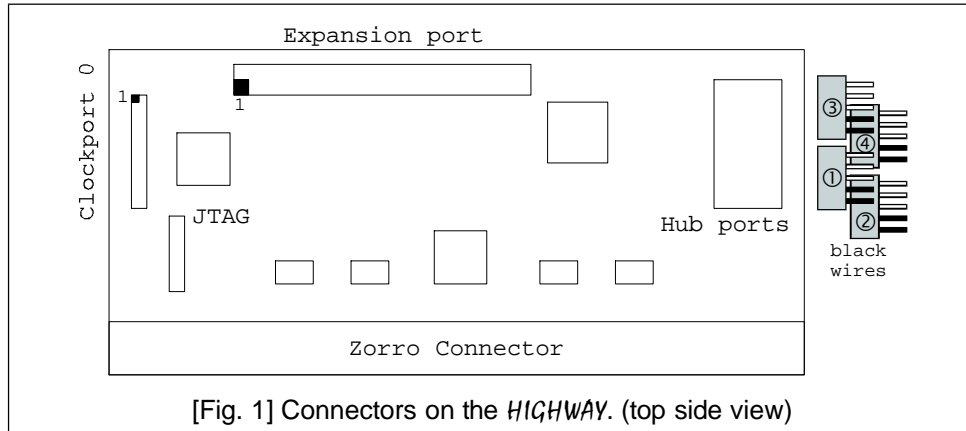
3.3 HIGHWAY connectors

The *HIGHWAY* has several connectors: the hub ports (20 pin header), one clockport (22 pin header) and one expansion port (38 pin header).

Please have a look at figure 1; all connector positions and PCB markings can be found there for reference issues.

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While installing the *HIGHWAY* board, four cables have to be connected to the board. Figure 1 illustrates the connection to be made. Please use this figure as reference, if any doubts arise during installation.



Connector pinout details are given in the appendix of this manual (page 11).

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Appendix A

A.1. Connector pinout

A.1.1 Hub ports

The four USB ports of the *HIGHWAY* are contacted by cables containing five wires each. These cables usually are standardized. In case you want to use cables from a different manufacturer please check carefully if these cables are 100% compatible with the *HIGHWAY*.

Each hub port has five pins which are connected to one adaptor cable. The two black wires are to be connected to **SHIELD_n** and **GND_n** (**n** corresponds to the number of port).

The color code of USB wires is given by the USB specification and is defined as follows:

- red Vcc
- white DataMinus
- green Data Plus
- black GND
- (black) Shielding

USB motherboard cables with a 10 pin connector (often found in computer stores) are usually **not** compatible with the *HIGHWAY* !

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5. First steps

Do not connect any USB device for the first test. After you have completed the hardware installation and closed your Amiga's housing you can switch on your computer.

Should you recognize any unusual behaviour of your Amiga, please switch it off immediately. Please consult chapter 5.2. and 5.3. for trouble shooting instructions.

5.1. A first check

Newer kickstart versions can display a list of all found expansion boards in the early startup menu (keep both mouse buttons pressed after reset). You should find the *HIGHWAY* entry in the "Expansion Board Diagnostic" menu:

```
Manufacturer: 2145      Product: 200  Status: Working
```

After booting your Amiga please install the USB stack using the installer skript in the "Poseidon" directory on the disk enclosed in your package. The AmigaGuide "Poseidon.guide" (also installed by the installer) contains all necessary instructions on the stack.

5.2. Troubleshooting the Zorro bus

Should problems occur during the first test, please carefully check if:

- the *HIGHWAY* has been installed in the right orientation ?
- the *HIGHWAY* is inserted 100% into the slot ?
- any cables have been removed or damaged during installation ?

5.3. Troubleshooting the USB

For further diagnosis you should also disconnect the USB adapter cables from the *HIGHWAY*.

If you don't succeed in getting the *HIGHWAY* working please contact the support team.

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4. Installation of the *HIGHWAY*

Your *HIGHWAY* board has been designed for the Commodore Zorro II standard. Installation is possible in third party companies' bus boards if the Zorro standard is followed by these boards.

4.1. Safety recommendations

Please follow these recommendations
for your own safety:

- ▶ Switch off your Amiga before installation.
- ▶ Remove the power supply AC cable.
- ▶ Disconnect all external devices.
- ▶ Avoid static charge.
- ▶ Follow your computer manufacturer's installation guide for expansion cards.

4.2. List of required material

- HIGHWAY* expansion card
- two holding plates with two USB adaptor cables each
- Philips style screw driver
- (perhaps) isolating material (thick paper)

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4.3. HIGHWAY installation in the Amiga 2000

Open your Amiga 2000 housing by removing five screws in total: two on each side and one at the back of the housing. Afterwards, the upper part of the housing can easily be removed.

Zorro slots can be found on the left side of the mainboard. Insert your *HIGHWAY* into a free Zorro slot. Components on the expansion card must be **on the right side**, facing your power supply unit!

Close your computer before reconnecting the AC power cable.

4.4. HIGHWAY installation in Amiga 3000 / 4000

The Amiga 3000 / 4000 housing is fixed by several screws on the back of the housing. After removing these screws the upper part of the housing can be taken off. Zorro slots are located on a daughterboard in the left part of the computer.

Insert your *HIGHWAY* into a free Zorro slot. Components on the expansion card must be **visible from top**!

If your Zorro slot has already been used many times, then the *HIGHWAY* card might not be fixed properly to the slot. In this case it is a good idea to electrically isolate the card by inserting some isolating stuff (not burnable!) between other installed cards. This will prevent shortcuts.

Close your computer before reconnecting the AC power cable.

4.5. HIGHWAY installation in Amiga 3000T / 4000T

The Amiga 3000T / 4000T housing can be opened after removing several screws at the backside. Zorro slots can be found in the lower part of the computer on the mainboard.

Insert your *HIGHWAY* into a free Zorro slot. Components on the expansion card must be **visible from top**!

Isolation issues: see 4.4 above.

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Close your computer before reconnecting the AC power cable.

4.6. HIGHWAY installation in Amiga 1200 Tower systems

Please consult your tower housing manual on instructions how to open the housing.

Usually the *HIGHWAY* card has to be installed so that components on the expansion card are **visible from top**. The hub port connector usually is the on the back side of the slots.

Close your computer before reconnecting AC power cable.

4.7. Installing the hub ports

Four external USB connectors (two on each holding plate) are included in your package. These plates fit perfectly into the corresponding counterparts on the backside of your computer. Should not enough empty plates be available, you can also mount only one plate, reducing the maximum number of devices to connect (without adding an external hub) to two devices.

After complete remounting of your computer's housing you can continue with a first test and the software installation. These issues are described in the following chapter.

The Amiga 4000T has an additional slot plate at the bottom, which is not directly usable for full size Zorro cards. It is recommended to use the lowermost slots for the hub port plates.