

BiDiBone / BiDiBonePlus

The Heart of the Addon-Modules of the
One-Series



Assembly Instructions

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Changelog

Version	Changes	Page	changed by	Date of change
V1.0	German documentation v1.1 translated into English	complete	H. Falkenstein	10.11.2013
V1.1	Extended instructions for BiDiBonePlus	complete	C. Schörner	22.11.2014

Introduction

This document describes the assembly, configuration, and layout of the BiDiBone-plugin-device, which is a part of the DiY-series of OpenDCC and Fichtelbahn.

A comprehensive and continuative set of instructions for the use of this device with Addon-modules (called „applications“) is provided in the download section of the respective application (e.g. OneHub)

Please read this document carefully before assembling the kit and take notice of the security instructions.

Our products do not claim to be commercial products. This document is purely meant to be a means of help and information of how to assemble the kit for private use only.

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Commercial use of the software or parts of it is illegal and not allowed!

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BiDiBone / BiDiBonePlus:

To increase the readability of the text, we have chosen not to use the term BiDiBone / BiDiBonePlus with each use and leave BiDiBone as the description. See the description no detailed indication of a difference, does the description or the function for both modules.

Safety Advice

The described module is an electric driven device
All necessary precautions have to be taken when using the device, also all generally necessary precaution for use of electric currents.

- Never use mains voltage with this device.
- Never use switching power supplies from PCs. Those power supplies are not ground-free, that means there might be high voltages on the layouts, tracks and other connected devices – Danger To Life !
- Never ground-wire any conductive parts of your layout !
- All shieldings and wire-shieldings etc. can be put together at the same ground-free point, if regarded necessary.
- The finished module is only to be used with safety extra-low voltage and electrically protective separation.
- Modelrailroads are regarded as toys by law. Therefore special regulations apply.
- Only commercially available and certified power supplies are to be used with this device.

Watch out for the appropriate certification when you buy a power supply. You can find more information about that on www.vde.de

Specified normal operation:

The module is only to be used for digitally operated modeltrain layouts. This module is only to be used for switching, manoeuvring and feedback.

Any other use is not a specified normal operation and is therefore not allowed.

The device is not meant to be assembled by, mounted by, nor operated by children under the age of 14 years.

Tools and Supplies of Work

You will need:

- solder 0,5 oder 0,3 mm in diameter
- flux melting agent in some cases
- cleaning solution, brushes, 100% Isopropanol
- illuminated magnifier, a microscope can be better
- soldering iron 30 Watt, or better a thermally regulated soldering iron station

1. General information on BiDiBone

1.1 Description

The **BiDiBone** is a piggyback module for a lot of BiDiBone Addon-boards from the One-series like OneDMX, OneHub, OneControl and others.

The BiDiBone is equipped with all necessary components for acting as a BiDiB-node. It carries the bus-interface, the BiDiB connectors, identifier-button and status LEDs. A switch control provides the necessary voltages of 5V and 3.3V. Those can be used to supply the addon-boards.

Due to its complexity and the use of small SMD-parts the BiDiBone-assembling kit is available as „SMD premounted“-version only. It can be purchased as stand-alone for development of your own applications or as a combination set together with an addon-board.



The kit contains all necessary THT-parts for assembly. Detailed instructions for assembling the kit can be found on the following pages.

The processor comes preprogrammed with the latest bootloader and a BiDiB-serial number (Unique ID) for a BiDiBone. With the help of either BiDiB-Wizard or BiDiB-Monitor you can install the appropriate firmware for acting as OneHub, OneDMX or the like. Further informations on how to do that can be found in the manual for the individual application's startup procedure.

This manual only deals with the assembly of the BiDiBone assembly kit.

1.2 Characteristics of BiDiBone

- mountable with 20pin pin strips, 2,54mm grid
- suitable for experimental circuit boards
- max. 28 freely programmable In- and Outputs
- max. 8 analog In- and Outputs
- max. 2 serial interfaces, one primed for the use with FTDI wire
- max. 2 SPI and I2C interfaces
- max. 12 PWM channels
- input 6V-17V, switch control for 5V at 700mA
- size: 44mm x 39mm, 2 * 20 pins
- all pins are grid 2,54mm
- BiDiBus-connector (two RJ45 sockets)
- 4 control-LEDs for power, identify, message and BiDiB connectivity
- Identify-switch
- Atxmega128D3, 128k Flash, 8k RAM
- Bootloader, automatic connection to the BiDiBus
- Firmware-Update via the BiDiBus (no programmer needed)

1.3 Wiring diagram, Layout, and list of parts

The following 5 pictures are only included for information purposes, they are not needed for assembly.

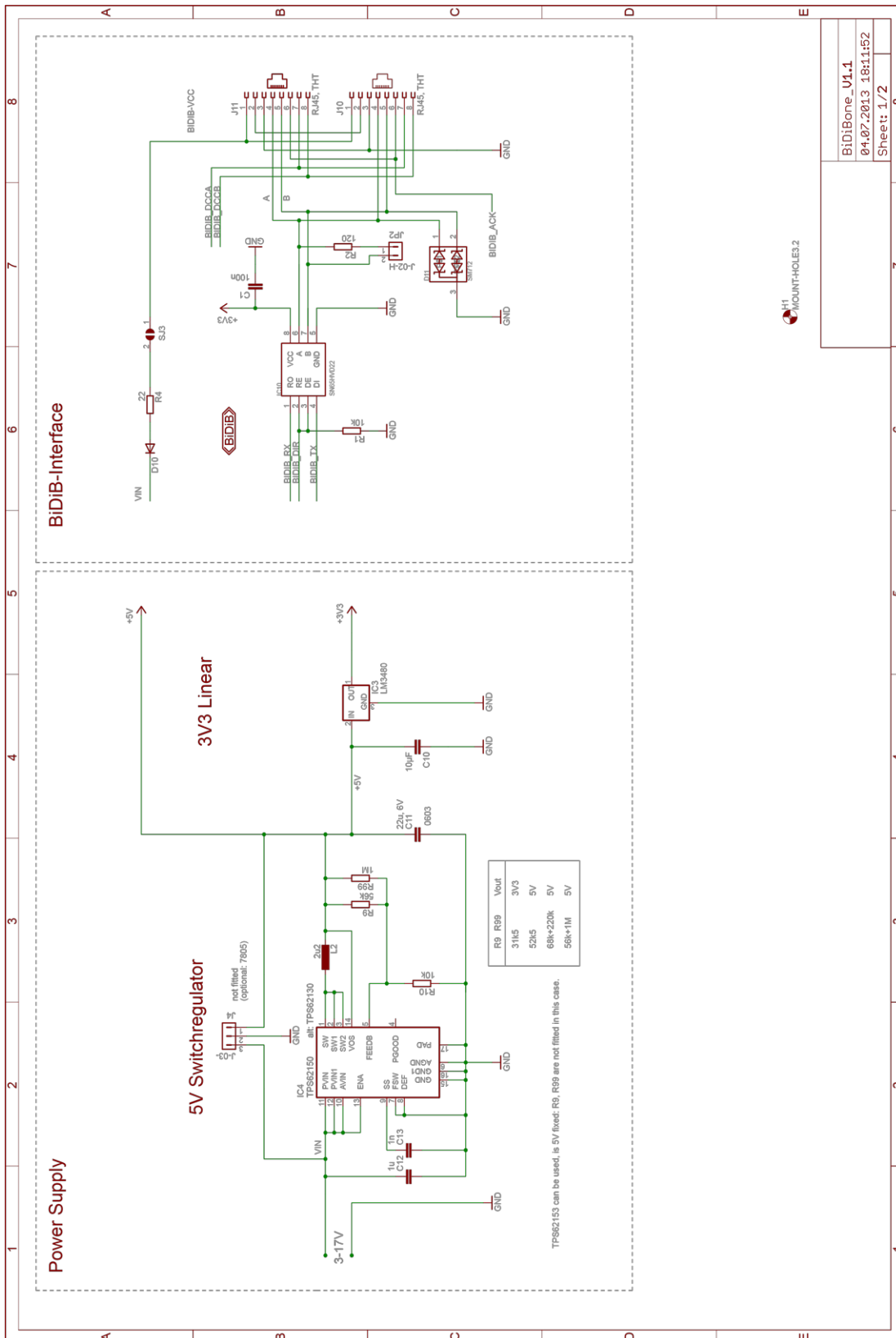


Figure 1: Wiring diagram BiDiBone page 1

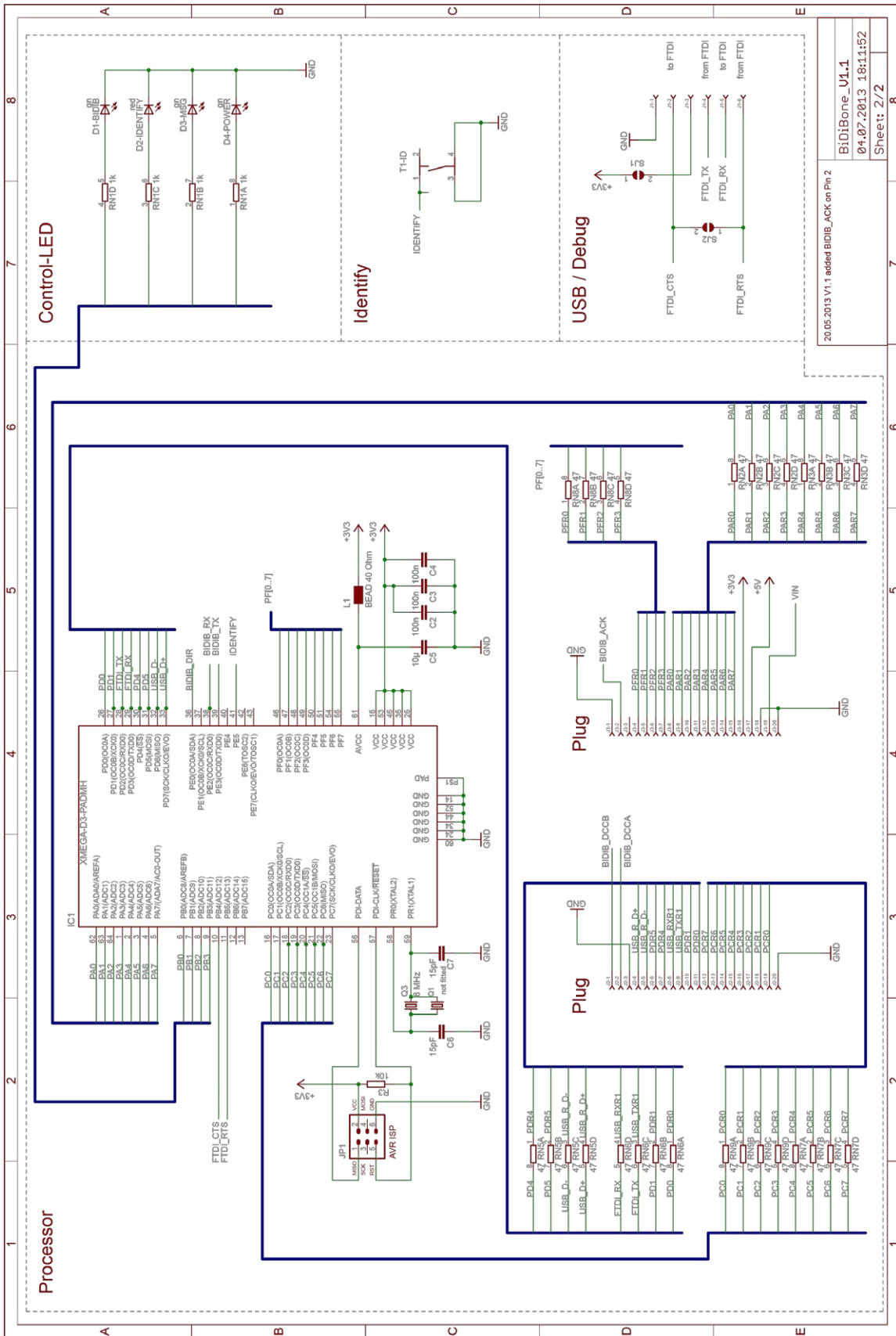


Figure 2: Wiring diagram BiDiBone page 2

When a BiDiBonePlus ATXMEGA128A3 is used.

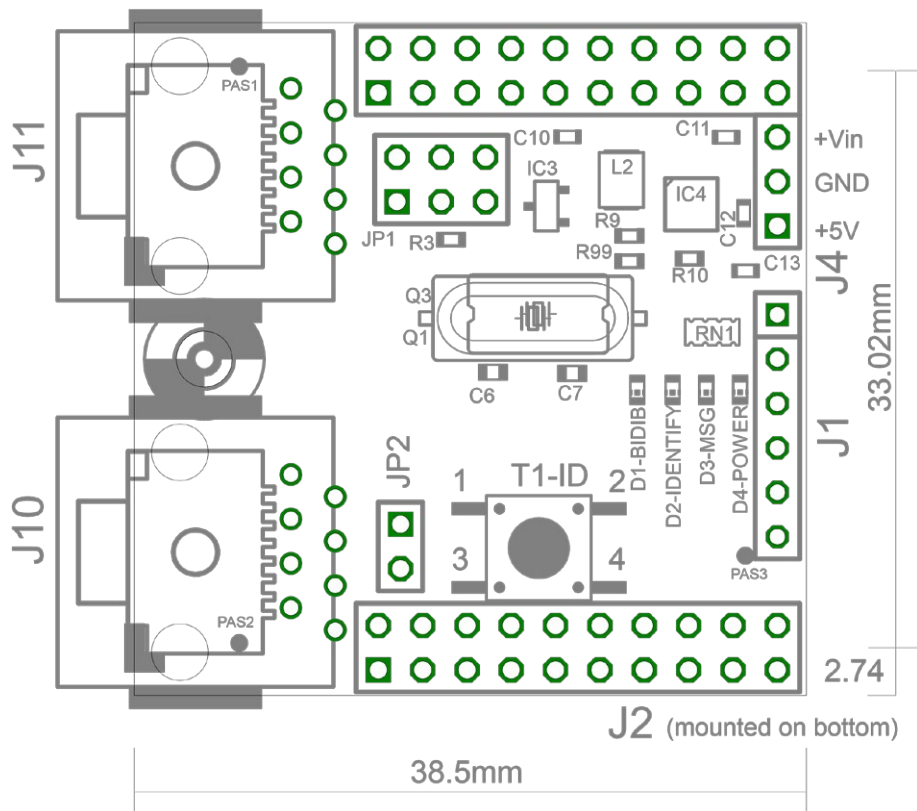


Figure 3: Layout TOP BiDiBone

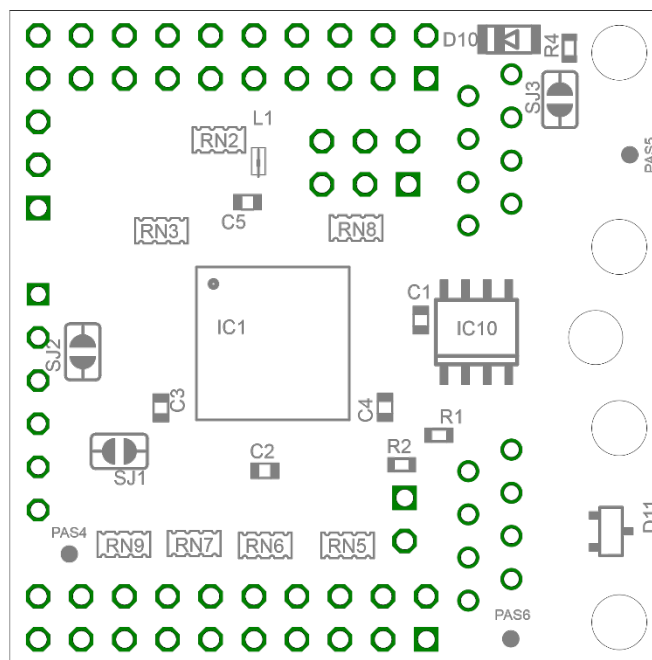


Figure 4: Layout Bottom Emergency Stop

You can find high-res PDF-files for download on the Fichtelbahn.de webpage of:

- Wiring diagram
- Layout
- List of Parts

2. Assembling the BiDiBone

The assembly takes only a small number of parts (included in the kit) and shouldn't be too difficult. **Figure 5** on the right shows the THT-parts to be soldered to the board, which we will do in the next three steps.

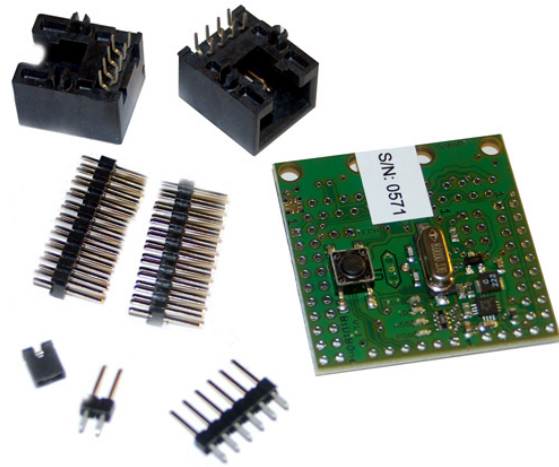
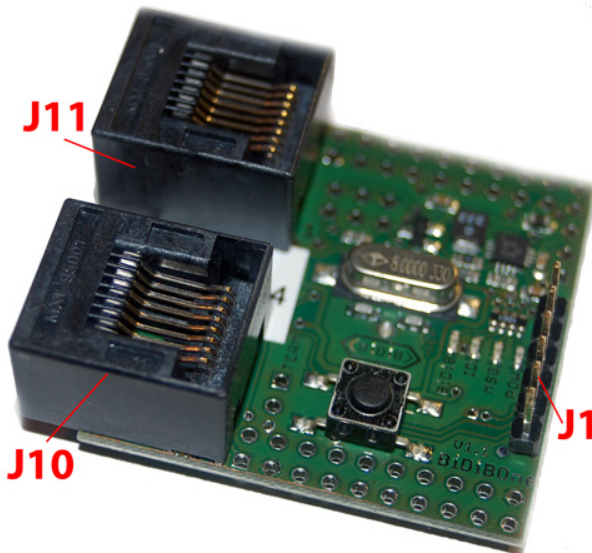


Figure 5: Parts of the BiDiBone kit



Assembly Step 1:

Mount the RJ45 sockets **J10** and **J11** to the front and solder them on the back of the board. Watch out for the correct positioning, **Figure 6** shows the correct positioning of the board.

Then we place and solder the 6pin pin strip **J1** for FTDI-communication.

Figure 6: Assembly Step 1

Assembly Step 2:

Mount the termination-jumper **JP2** to the top of the board.

Find more information about "Termination of the Bus" in its own chapter

4. Terminating the BiDiBus.

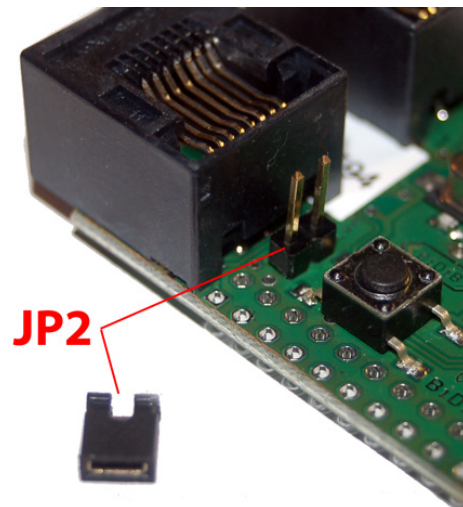


Figure 7: Assembly Step 2

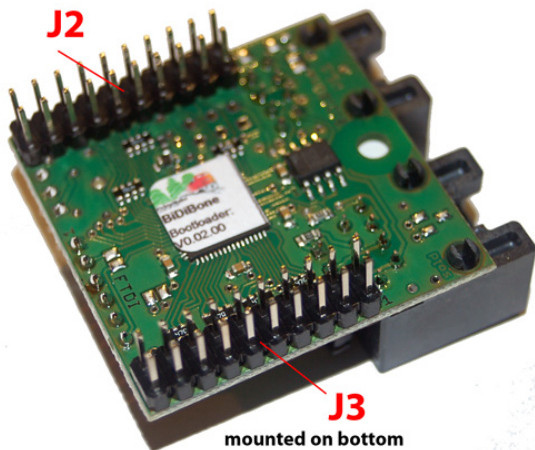


Figure 8: Assembly Step 3 from below

Assembly Step 3:

In this last step, double-row pin strips **J2** and **J3** are mounted to the back of the board (Figure 8). Soldering is done on the top side. (Figure 9).

Watch out for correct mounting before soldering.

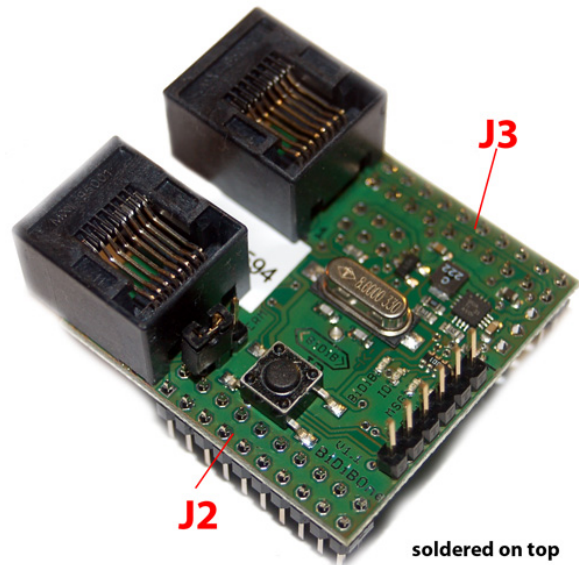


Figure 9: Assembly Step 3 from top



You can place the provided Unique ID sticker between the two RJ45 sockets (Figure 10). The module can be identified by a PC program via this number.

More information on „Unique ID“ can be found in chapter 3. **Unique-ID, general information.**

Figure 10: Unique ID sticker

That all done, your BiDiBone kit is ready for first use.

...go ahead with the instructions for the wanted application's startup.

3. Unique-ID, general information



Figure 11: Unique ID on the board

Figure 11 shows a **Unique-ID** sticker on a BiDiBus Device.

All SMD-premounted kits purchased on Fichtelbahn-Shop and are part of a BiDiBus are all delivered with their Serial Number programmed into them. This serial number is a part of the Unique ID. Therefore the complete Unique ID is printed to the back of the kit's board.

What is a Unique-ID?

The Unique Id is a combination of the 16bit manufacturer's ID and a 32bit manufacturer-specific number, like product-index or serial-number.

V = VID (Manufacturer ID)

OD = DIY-project

P = PID (Product ID)

6800 = GBMboost Master

6700 = GBMboost Node

6B00 = LightControl

0029 turns into **2900** = serial number

Unique-ID is provided in HEX-format.

How to use Unique-ID

As the name says, Unique-ID is an absolutely unique number. Through this number the module can be identified, no matter where it is mounted or where it is placed within the bus. In simple words: The Unique ID is like a phone number in a phone book. The hostprogram provides the names for the individual „extensions“. So Unique ID is the link between the label of the model on a PC and the module itself.

Example:

A BiDiBone is placed under a train station on your layout and carries the Unique-ID **0D6B001234**.

In the hostprogram it is labeled „Station West“. The BiDiB-system tells the hostprogram that 0D6B001234 can be reached under extension 3. So if anything changes in Station West, the hostprogram knows it has to call extension 3. There you go!

So no more fiddling with addresses or dip-switches.!

Why should I use the Unique ID sticker? What is the use of this piece of information?

All BiDiB-tools and up-to-date PC-control programs communicate with and control all modules via this number. There is no more “DCC-Address X” kind of thing anymore, all commands will be sent to the node’s Unique ID and its ports.

That means, coming from the other end of the chain, the Unique ID of the BiDiB-module needs to be published to the control-program in order to configure a new action at the output of a decoder (like LightControl) or the allocation of a detector in your layout (like GBM).

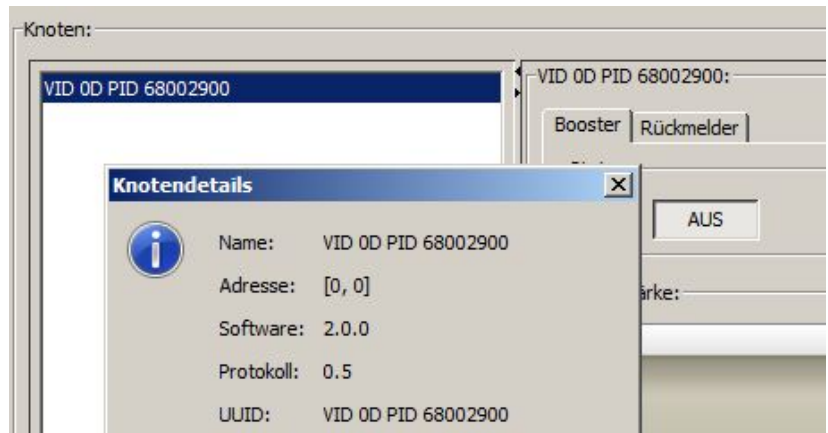


Figure 12: Unique ID in the BiDiB-Tool

Hardware-Serial number:

The sticker on the back of the board contains the serial number (S/N) of the hardware and has nothing to do with its Unique ID. The S/N is used for registering the module with our internal and shop system

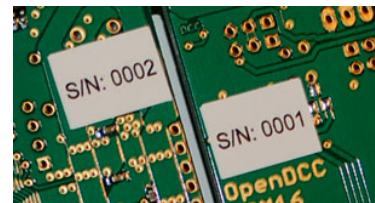


Figure 13: Hardware S/N

Where is the Unique ID stored on the module itself?

This is split into two parts actually. The VID and PID are already programmed to the Flash/EEPROM-firmware and is sent to the module, yet it does not include the serial number. That means the firmware can be loaded onto the processor at will as well as updating it. If a serial-number is already present (in case of a firmware update), it will not be overwritten by an update. If the module does not detect a serial number at start, LEDs will blink and the module won't work.

The firmware does not work without a serial number!

(Exception: GBMboost as Master: A temporary or „emergency“ serial number is created with identifier 0100. It can easily be updated with a valid s/n at any time)

The serial number is loaded to the device as the third step of the process to put the device into use. It will be put on the EEPROM first.

At startup every module runs the following tests:

The user signature area is scanned for a serial number. If there is none, the serial number from the EEPROM is stored in the user signature area and the module starts working. If there already is a serial number stored in the user signature area, the one stored in EEPROM will be discarded and the s/n from the user signature area will be used.

The s/n stored in the user signature area will „survive“ a CHIP ERASE. It can only be deleted through a USER Signature ERASE.

In case you want to exchange the s/n on a BiDiBus-device you must do a USER Signature ERASE first. But keep in mind that all calibration values will be lost, because they are stored in the same area.

So a USER Signature ERASE should only be done for a very good reason!

I accidentally erased the serial number. How can I get it installed again?

1. NEW serial number: Get a new serial number from the serial-number-generator and program it into the BiDiBus-device after deleting the USER signature area.

Important: Do not forget to replace the obsolete Unique ID on the sticker with the new one. The s/n generator is located at http://www.opendcc.de/elektronik/bidib/opendcc_bidib.html

2. I like to use the „old“ Unique ID on the sticker again: In order to do that you need to contact Fichtelbahn-support at support@fichtelbahn.de . Do not forget to provide the **Unique-ID from the sticker and the corresponding hardware-serial number.**

Beware: This only works for SMD-premounted kits. If you created your Unique-ID yourself (for the non-SMD-premounted kits) you need to search the generator's history for the correct number!

4. Terminating the BiDiBus

The **BiDiBus** is established through a RS485-2 wire connection that was especially engineered for high-speed and long-range data transfer. Its use is becoming more and more common in professional industrial applications. Wires can be stretched over a distance of more than 500 metres with high data transfer rates.

To guaranty both speed and data accuracy for those great distances it is necessary to terminate the bus. We call it "terminating the communications bus". (RT1 in right figure)

If the length of the cable is below 5 metres no termination is necessary.

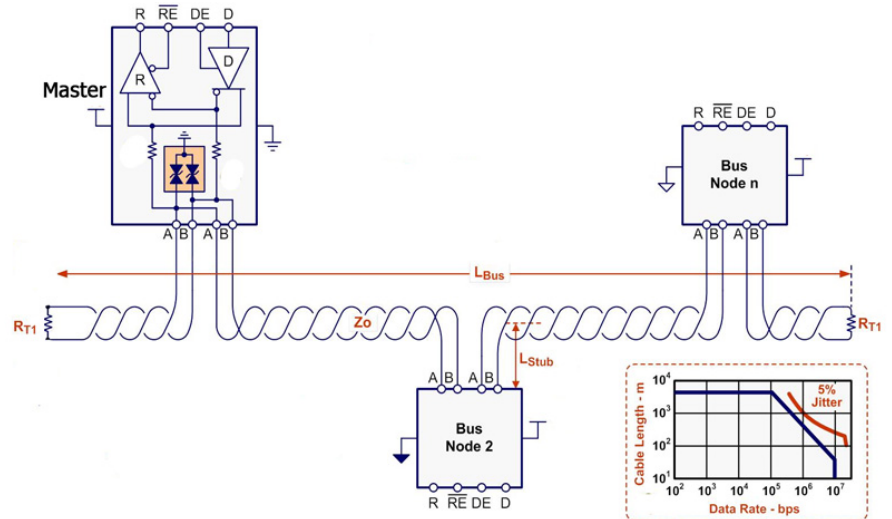


Abbildung 14: Terminierung einer Leitung

4.1 How to terminate the bus

The BiDiBus has to be terminated at both ends with a 120 Ohm resistor. That means that the nodes at all ends of the bus have to be terminated, even with branched buses. That is done by placing a resistor between **BiDiB_A** and **BiDiB_B**.

All our BiDiB-nodes (GBM, LightControl, BiDiBone, s88-BiDiB-Interface...) are prepared for that to make it easier. You just have to place the termination jumper

Attention:

The jumper must only be set at the last nodes at the ends of the bus. In case you branched the BiDiBus with OneHub and generated dead-ends those have to be terminated, too.

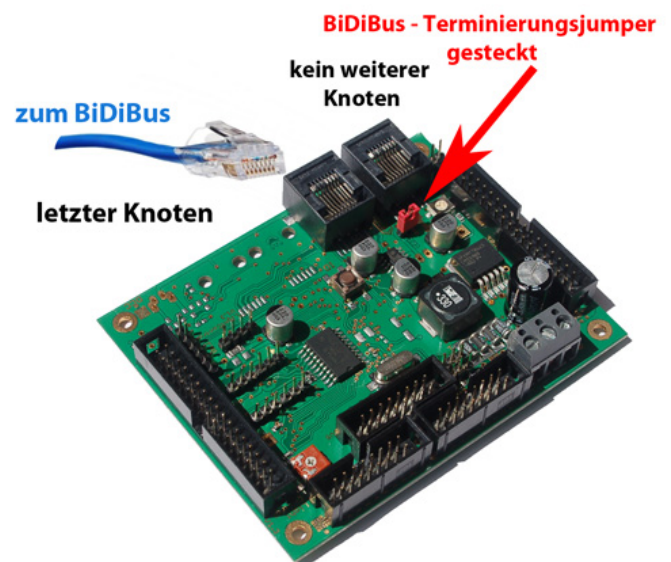


Figure 15: Terminating a module

We highly appreciate your input. If you have suggestions on how to improve the document or should you have found any errors please let us know.

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The support-forum is a great source of information in case you have question
(forum.opendcc.de)

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