

# EMuSer

**USB  $\leftrightarrow$  RS422 Adapter**  
**for use with E-Mu Emax, Emax II, Emulator II and Oberheim DPX-1**

## **USER MANUAL**

---



## **COPYRIGHT**

Copyright (c) 2010 - 2017 KRIS VAN DE CAPPELLE.

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with the Invariant Sections being GNU FREE DOCUMENTATION LICENSE, no Front-Cover Texts, and no Back-Cover Texts.  
A copy of the license is included in the section entitled "GNU Free Documentation License".

# CONTENTS

COPYRIGHT .....	2
CONTENTS .....	3
DISCLAIMER .....	4
INTRODUCTION .....	7
INSTALLING THE EMUSER DRIVER (WINDOWS ONLY) .....	8
USING THE EMUSER .....	11
Connecting the EMuSer .....	11
COM port assignment on Windows .....	13
COM port assignment on Mac OS X .....	14
Meaning of LEDs .....	17
Using the EMuSer with software applications .....	18
PIN ASSIGNMENTS .....	19
Serial DB9F connector pins .....	19
Wiring schema for serial cables (Emax, Emax-II, Emulator-II, Oberheim DPX-1).....	19
TROUBLESHOOTING .....	21
ANNEX: INSTALLING OR UPDATING THE EMUSER FIRMWARE .....	22
GNU FREE DOCUMENTATION LICENSE .....	25

# DISCLAIMER

**Version Number:** This is version 1.02 build 1 (June 2017)

**EMuSer definition:** The EMuSer package consists of:

- a Teensy 2.0 Atmel AVR based hardware device (produced by PJRC.COM LLC)
- a LUFA based firmware (*USBtoSerialEmu\_Teensy2\_0\_v1\_02\_1.HEX*)
- a LUFA serial driver for Windows (*optional*)
- EMuSer\_ConstructionManual\_v1\_02\_x.pdf (construction manual)
- EMuSer\_UserManual\_v1\_02\_x.pdf (user manual)

**Copyright:** The construction manual and the information, specifications and designs that can be found in the construction manual are provided free of charge for **personal use** and **non-commercial purposes only**. No other usage of the construction manual nor of the information, specifications and designs that can be found in it is allowed. **Building and selling EMuSers for commercial purposes is not allowed.**

The **firmware** is subject of a specific copyright, because it uses LUFA code. The copyright is based on the MIT license.

The following copyright is applicable on the firmware:

Copyright 2009 Dean Camera (dean [at] fourwalledcubicle [dot] com)

Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that the copyright notice and this permission notice and warranty disclaimer appear in supporting documentation, and that the name of the author not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

The author disclaim all warranties with regard to this software, including all implied warranties of merchantability and fitness. In no event shall the author be liable for any special, indirect or consequential damages or any damages whatsoever resulting from loss of use, data or profits, whether in an action of contract, negligence or other tortious action, arising out of or in connection with the use or performance of this software.

**LUFA version:** The firmware is based on the LUFA library version of 24 SEPTEMBER 2009 (LUFA 090924) . Earlier and later versions of LUFA are not compatible with the EMuSer firmware. The latest version of the firmware is USBtoSerialEmu\_Teensy2\_0\_v1\_02\_1

**Credits and history:** The roots of the EMuSer go back to an early prototype that had been built by Julian Higginson and which was based on an Atmel AT90USBKEY processor board. Many thanks to Julian who sent me his prototype for further investigation ! As the prototype didn't work yet, changes were required both on a hardware level and on a firmware level, resulting in the EMUCOMBOX. As a next step the processor board was replaced by the smaller Teensy2.0 and a proper PCB layout and mechanical design - including casing - was designed, resulting in the device called EMuSer. The EMuSer has been designed by Kris Van de Cappelle. A construction manual and user manual were written by Kris Van de Cappelle as well.

**Accountability / Responsibility:**    **The author is not responsible for any errors or damage caused by the EMuSer hardware, software or the output produced by the EMuSer hardware or software.**

Using this hardware and software is at risk of the user.

E-Mu Systems is not responsible for any errors or damage caused by the EMuSer hardware or software or the output produced by the EMuSer hardware or software.

Oberheim Electronics/ECC/Gibson is not responsible for any errors or damage caused by the EMuSer hardware or software or the output produced by the EMuSer hardware or software.

PJRC.COM LLC is not responsible for any errors or damage caused by the EMuSer hardware or software or the output produced by the EMuSer hardware or software.

Atmel Corporation is not responsible for any errors or damage caused by the EMuSer hardware or software or the output produced by the EMuSer hardware or software.

**Do not use this hardware, software or the output produced by it if you don't agree with this disclaimer.**

**Trademarks:**    **EMAX, EMAX-SE, EMAX-SE-HD, EMAX PLUS, EMAX-HD, EMAX II, EMAX 2, Emulator II, Emulator III, Emulator IIIX and SoundFont® are trademarks of E-Mu Systems.**  
**DPX-1 and Oberheim DPX-1 are trademarks of Oberheim Electronics/ECC/Gibson.**  
**AVR, AT90USB1287, AT90USBKEY and FLIP are trademarks of Atmel Corporation.**  
**TEENSY, TEENSY++, TeensyLoader are trademarks of PJRC.COM LLC.**

## VERSION INFORMATION

<b>Changes in version 1.02:</b>	<p><b>Following features, improvements and changes have been implemented since the previous version:</b></p> <p>No hardware changes, only some small firmware updates:</p> <ul style="list-style-type: none"><li>• The meaning of the EMuSer's orange LED has been slightly changed</li><li>• The support for POSIX compatible baud rates has been improved.</li></ul> <p>The new version of the firmware is USBtoSerialEmu_Teensy2_0_v1_02_1.HEX It is backward compatible with the previous versions, so any software which worked with the previous version of the EMuSer should still work with the new version of the EMuSer. The manuals have been updated: the new meaning of the orange LED is explained, the Oberheim DPX-1 is added to list of supported samplers, the cable layout for the Oberheim DPX-1 has been added and some text sections have been revised.</p>
<b>Build history of version 1.00:</b>	<p>Build 01.00.01 – 2010-11-03: Initial version</p> <p>Build 01.00.02 – 2010-12-28: Two capacitors C4 and C5 have been added to increase compatibility with Emulator-II Rev1 CPU boards (thanks for the hints Arti !). This is a small fix which can easily be applied to Build 1 boards.</p> <p>Build 01.00.03 – 2012-05-12: To further increase the compatibility with Emulator-II Rev1 CPU boards, the specification of capacitors C4 and C5 has been changed.</p> <p>Build 01.00.04 - 2014-05-29: To increase communication reliability, there's a choice between a (newer version of the) LUFA USBToSerial driver and a specific 64-bit USBToSerial64Bit driver.</p>
<b>Build history of version 1.01:</b>	<p>Build 01.01.01 – 2016-05-05: Initial version</p>
<b>Build history of version 1.02:</b>	<p>Build 01.02.00 – 2016-07-02: Initial version, not released to public</p> <p>Build 01.02.01 – 2017-06-24: Initial version, released to public (identical to build 01.02.00)</p>
<b>Test conditions:</b>	<p><b>This version has not gone through an extended testing cycle.</b></p> <p>This version has been tested on following hardware:</p> <ul style="list-style-type: none"><li>- AMD Athlon 64 3000+ 1.8 GHz with internal floppy drive and with 512 MB Ram running Windows XP</li><li>- Intel Core i5-3210 2.5Ghz 8GB Ram, without floppy drive, running Windows 7 Home Premium</li><li>- HP Pavilion X2 12 running Windows 10 Home Premium</li><li>- Apple Macbook Air running Mac OS X El Capitan and Wine.App version 1.8-rc4.</li><li>- EMAX Keyboard with SCSI and SE upgrade (type 1000) and internal card reader SCM PCD-50B running OS Plus 1.0</li><li>- EMAX II Turbo Rack 4MB (type 2213) running OS 2.14</li><li>- EMAX II Turbo Keyboard 4MB (type 2212) running OS 2.14</li><li>- EMAX II Turbo Keyboard 8MB (type 2205) running OS 2.14</li><li>- EMULATOR II+ Keyboard 2x512Kb (type 6050) running OS 3.10</li><li>- Oberheim DPX-1 running OS 2.2</li></ul>
<b>Your help:</b>	<p><b>The EMAX, Emulator II and Oberheim DPX-1 community can be considered the perfect "testing team" for the EMuSer :-)</b></p> <p>You can report bugs and problems to <a href="mailto:esynthesist[at]yahoo[dot]com">esynthesist [at] yahoo[dot] com</a></p>
<b>Support:</b>	<p><b>I am not a professional hardware and software builder.</b></p> <p>This means I don't have a lot of time to give support on the EMuSer.</p> <p>I will try however to respond to as many questions and problem as possible.</p>

## INTRODUCTION

The EMuSer is a custom designed USB $\leftrightarrow$ RS422 adapter that can be used with the E-Mu Emax-I, Emax-II, Emulator-II samplers and the Oberheim DPX-1 sample player.

The EMuSer (“**E-Mu Serial**”) is the successor of the original EMUCOMBOX, which was a bigger and more expensive device based on the Atmel AT90USBKEY board.



The reason why the EMuSer has been created is because most commercially available USB $\leftrightarrow$ RS422 adapters currently on the market do not support *synchronous communication*.

The E-Mu Emax I, Emax II and Emulator II samplers and the Oberheim DPX-1 sample player however require synchronous communication: the RS422 port on the computer must be capable of being *externally clocked* by the clock installed in the E-Mu sampler and the Oberheim DPX-1 sample player.

In order to use the EMuSer, a serial communications driver is required. The standard serial driver provided in Windows (usbser.sys) and Mac OS X (the ACM-CDC driver) should be OK. If the EMuSer is not detected by the operating system, an .INF file for the Windows driver is included in the EMuSer software package<sup>1</sup>. See chapter “Installing the EMuSer Driver”.

This driver supports only standard Windows serial communication instructions, which don't include the enabling and disabling of external clocking.

Because of this constraint, the EMuSer firmware has been designed in such way that when receiving a “set baud rate to 500000” instruction from the driver, it will *not* set the internal clock to 500000 baud but it will rather switch to external clocking and will expect an incoming clock signal from the connected device.

In order to support software that only allow POSIX compliant baud rate values, there are two additional baud rate values that have a specific meaning for the EMuSer firmware:

- the "set baud rate to 50" instruction has the same meaning as the "set baud rate to 500000" instruction
- the "set baud rate to 38400" instruction will instruct the EMuSer firmware to use normal, asynchronous communication at a MIDI compatible speed.

50 and 38400 are POSIX compliant baud rate values, as opposed to e.g. 500000 and 31250.

An example of software that requires POSIX compliant baud rates is Wine on Mac OS X.

The EMuSer can be used as a standard USB - RS422 adapter, both in synchronous and in asynchronous mode.

The EMuSer supports standard RS422 communication, so the usage of the device is not limited to E-Mu samplers only. The pin layout of the D-SUB DB9 Female connector complies with the RS422 standard (see later).

But - as explained before - the only pitfall when using the EMuSer as a standard RS422 adapter is that the baud rates 50, 38400 and 500000 are not supported in *asynchronous* (=standard) mode.

The EMuSer is not commercially available.

To obtain an EMuSer you will have to build it yourself based on the instructions and schemas provided in the “EMuSer Construction Manual” document. You don't have to be a professional electronics specialist to create the EMuSer. However some basic-to-medium soldering skills are required to assemble the unit.

<sup>1</sup> The EMuSer serial driver's .INF file is exactly the same as the original LUFA UsbToSerial driver's .INF file provided in the LUFA 090924 library

## INSTALLING THE EMUSER DRIVER (WINDOWS ONLY)

The EMuSer should be detected automatically as a "USB serial device" by Windows 7 or higher and by Mac OS X<sup>2</sup>. In that case this chapter can be skipped.

If for some Windows does not detect the EMuSer however, you should install the serial driver before using the EMuSer USB  $\leftrightarrow$  RS422 adapter.

(Note that the HalfKay driver from the previous chapter is NOT the same as the driver for actually using the EMuSer. HalfKay is only required to install the firmware into the EMuSer)

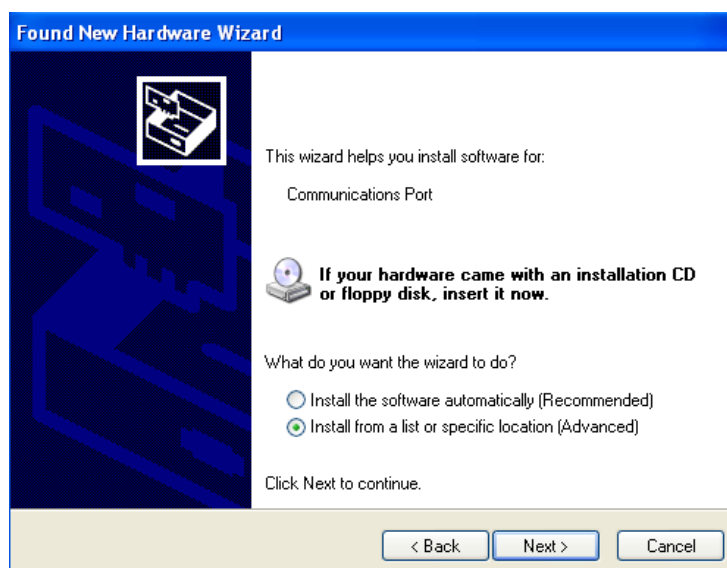
To install the EMuSer serial driver on your Windows PC, follow the next steps:

*Step 1:* connect the EMuSer to your Windows PC with the USB cable

*Step 2:* Windows will detect new hardware and will ask to search for software. Choose "No, not this time" and press NEXT.



*Step 3:* choose "Install from a list or specific location (Advanced)" and press NEXT:

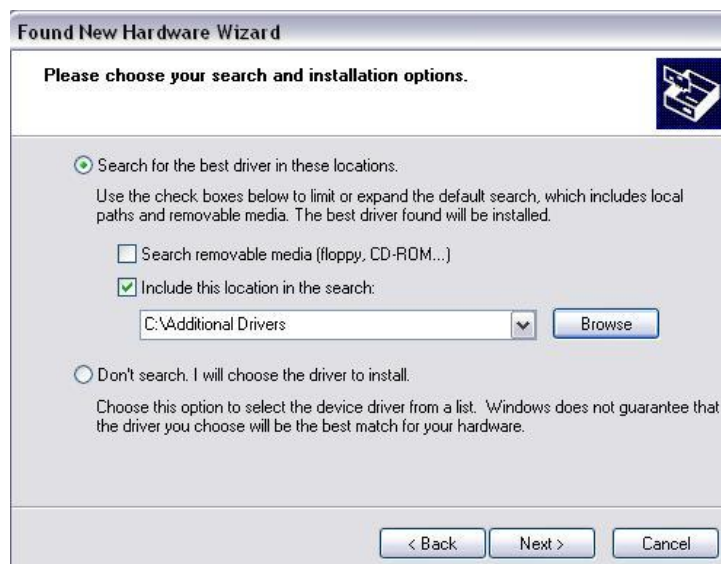


<sup>2</sup> or macOS - in this manual we refer to the Apple Mac operating system as "Mac OS X"

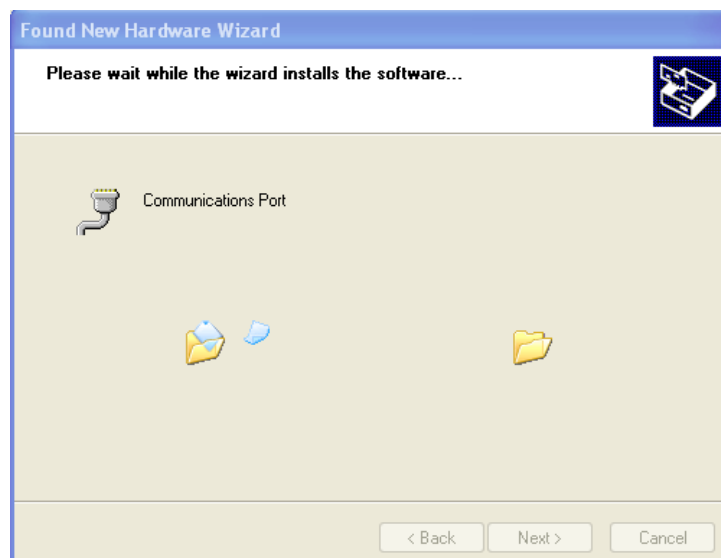


*Step 4a:* Make sure only *one* of the serial drivers provided in the EMuSer zip package is stored in the folder to which you have extracted the files from that zip package. Normally the driver file called LUFA USBToSerial.inf should work fine for both 32-bit and 64-bit Windows operating systems, but in case of any problem on 64-bit Windows you can use the USBToSerial64Bit.inf driver as an alternative. If both files have been extracted from the zip package, remove one of them now.

*Step 4b:* Choose “Search for the best driver in these locations”, select “Include this location in the search” and press the BROWSE button. Browse to the folder to which you have extracted the LUFA USBToSerial.inf or USBToSerial64Bit.inf file from the EMuSer zip package (see also step 4a). After having clicked on this folder (here: C:\Additional Drivers\), press OK. Then press NEXT.



*Step 5:* Windows is now installing the driver...



If Windows raises a warning about the compatibility, press CONTINUE ANYWAY.



Press NEXT after the installation is finished.

*Step 6:* Installation is finished. The orange LED should be ON now on the Teensy board. If the EMuSer is not connected to an E-Mu sampler or if the E-Mu sampler is not powered on, the red LED may be ON too...



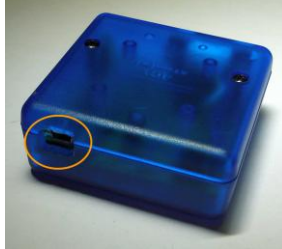
The EMuSer is ready for use with software like EMXP now.

# USING THE EMUSER

## Connecting the EMuSer

The E-MuSer has two connection ports:

- Mini-B USB port: this port must be used to connect the EMuSer to a computer



- D-SUB 9-pin (female) SERIAL port: this port must be used to connect the EMuSer to the E-Mu Emax, Emax-II or Emulator-II sampler, to the Oberheim DPX-1 sample player or to any other serial device which uses the RS422 protocol...



For connecting the E-MuSer to the USB port of your computer, a mini-B to type-A USB cable is required. See picture below.



For connecting the E-MuSer to an E-Mu sampler, a special serial cable is required. The cable is different between the Emax (or Emax-II), the Emulator-II and the Oberheim DPX-1:

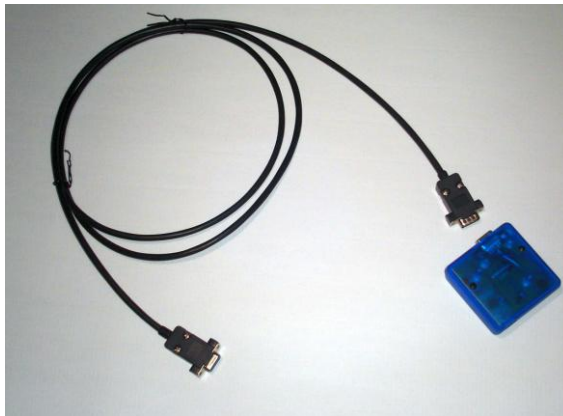
- For connecting the EMuSer to an Emax, a DB9M-to-DB9F serial cable is required.



- For connecting the EMuSer to an Emulator-II, a DB9M-to-DB25M serial cable is required.



- For connecting the EMuSer to an Oberheim DPX-1, a DB9M-to-DB9M serial cable is required



The wiring schema of the three cables can be found in the chapter “Pin Assignments”.

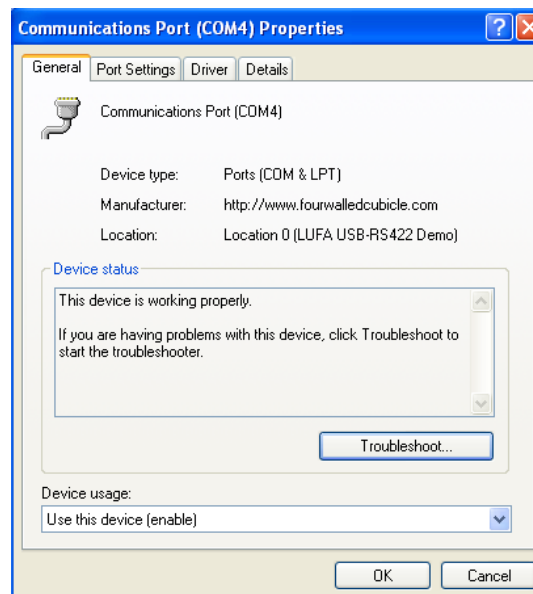
For connecting the E-MuSer to a any other RS422 device, please check the specifications of that device and use the information in the “Pin Assignment” chapter to choose an appropriate cable.

## COM port assignment on Windows

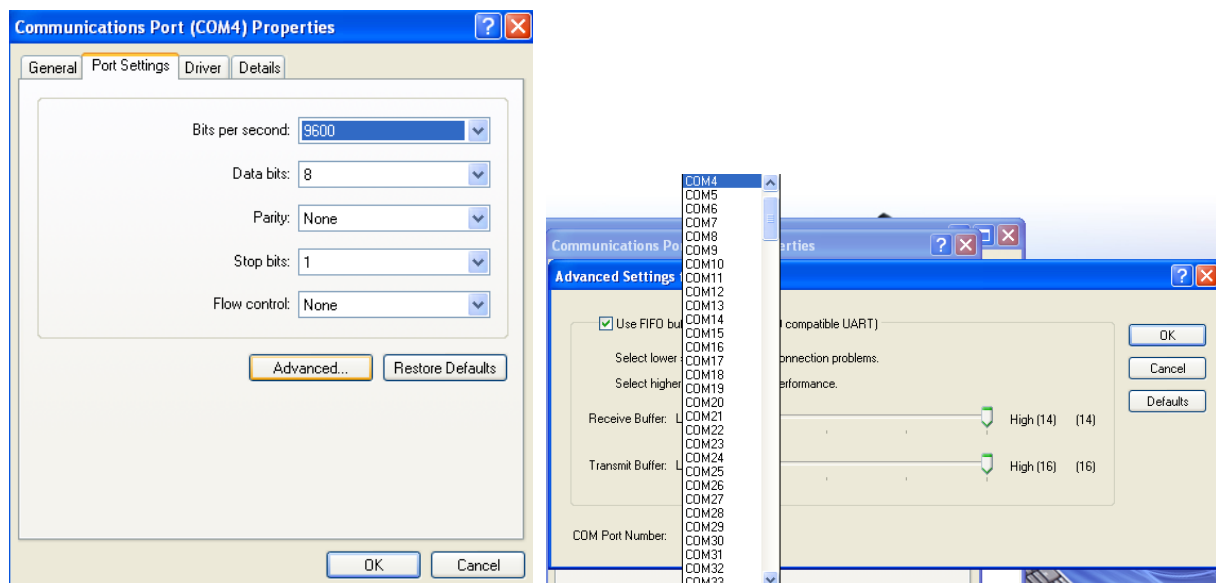
If the EMuSer driver has been installed correctly, Windows will detect the EMuSer as a serial COM port when you connect the EMuSer to the computer's USB port.



Windows will also assign an available COM port to the EMuSer, as depicted in the following picture:



In some exceptional cases, Windows may have assigned a COM port number which was already in use by another (virtual) device. In that case, you can change the COM port number in the driver's advanced properties:



## COM port assignment on Mac OS X<sup>3</sup>

This section is only applicable if you will use Windows software like EMXP under Wine on Mac OS X. When running EMXP under Wine, EMXP requires a COM port number. Since Mac OS X does not rely on COM port numbers, a symbolic link for the EMuSer must be made in Mac OS X first before EMXP can detect the EMuSer.

Assuming Wine 1.8 (or higher) has already been installed on your Mac OS X system, and the default Wine prefix ("Wine Files") has been configured during the installation of Wine, this section explains how to assign a COM port number to the EMuSer.

Start the Terminal application, which can be found in the Utilities applications of Mac OS X.

After opening Terminal, the "active" folder in Terminal should be the home folder (in this example, the active user account on Mac OS X is "krisvdc", see the first line in the picture above: "~krisvdc\$")

### Don't connect the EMuSer yet (or disconnect it now !)

**Step 1:** find the serial ports currently known/detected by Mac OS X. Make sure the EMuSer is not connected yet. Listing the serial ports can be done by listing all terminal devices (/dev/tty\*) and checking whether some serial ports are part of them. But since the EMuSer will normally be detected as a /dev/tty.\* terminal (with a dot after tty), you can limit the output by only listing the /dev/tty.\* devices:

Enter command: `ls /dev/tty.*`

In this example, only a bluetooth device is found with a device name starting with "tty."

<sup>3</sup> or macOS - in this manual we refer to the Apple Mac operating system as "Mac OS X"

**Connect the EMuSer now.**

**Step 2:** Make sure the EMuSer is connected now. Then enter the same command as in step 1.

Enter command: **ls /dev/tty.\***

In this example, an additional device is found. It's called tty.usbmodem1421. This is the device corresponding to the EMuSer RS422 port.

**Step 3:** let's assign a COM port number now to the EMuSer. This COM port is required as a "DOS" device in Wine, so let's navigate to the "dosdevices" folder first.

First, check if Wine's prefix is available as a folder in the home folder. The default prefix is "Wine Files".

Enter command: **ls**

In this example, the "Wine Files" is indeed available as a sub folder. This is normal if a standard Wine installation has been performed. If you have created another prefix, or it is located elsewhere (e.g. in the Documents subfolder), you should navigate to that folder first by using the "CD" command.

**Steps 4a and 4b:** navigate to the "dosdevices" folder of Wine, by entering following commands:

Enter command: **cd "Wine Files"**

Enter command: **cd dosdevices**

You can check which dos devices currently exist in Wine:

Enter command: **ls**

In this example, no COM ports are assigned yet. Only some drive letters can be found.

**Step 5:** assign a COM port to the EMuSer by defining a symbolic link to the serial device. Choose a COM port which is still available. Avoid COM0, COM1, COM2 and COM3. In this example we will use COM7.

Enter command: **ln -s /dev/tty.usbmodem1421 com7**

You can check which dos devices can be used in Wine after having created the COM port link:

Enter command: **ls**

In this example, COM7 has been added to the dos devices.

**Step 6:** assigning the COM port to the EMuSer is finished now. To check to which device the COM port is assigned, you can use following command:

Enter command: **ls -l**

The link between com7 and /dev/tty.usbmodem1421 can be found here.

### Note: undoing a COM port assignment

If for some reason you want to undo a COM port assignment, e.g. because you want to assign the COM port to another serial device, you can use the following command

Enter command: **unlink com7**

You can assign the COM port to another device now, see steps 5 and 6.

When starting EMXP and selecting a COM port (e.g. in the Emulator-II RS422 Communication Preferences ), the COM7 port will be available in EMXP. This is illustrated in the next picture:



```
C:\Users\krisvdc\EMXP\emxp.exe
SELECT COM PORT FOR RS422 COMMUNICATION WITH EMULATOR-II
-----
]X[ 1. Port 0: COM7
-----
[SPACE|1-1]Select _____ [U/D]Scroll [ESC]Back [RET]Go
-----
Please enter your choice:

dosdevices - -bash -- 95x55
krisvdc$ ls /dev/tty.*
n-Incoming-Port
krisvdc$ ls /dev/tty.*
n-Incoming-Port /dev/tty.usbmodem1421
krisvdc$ ls
Downloads  Movies  Pictures  Wine Files
Library    Music   Public
krisvdc$ cd "Wine Files"
krisvdc$ ls
drive_c    user.reg
system.reg userdef.reg
krisvdc$ cd dosdevices
krisvdc$ ls
c:  f:  g:  h:  i:  z:
krisvdc$ ln -s /dev/tty.usbmodem1421 com7
krisvdc$ ls
e:  f:  g:  h:  i:  z:
krisvdc$ ls -l
-rw-r--r-- 1 krisvdc staff 10 May 1 16:45 c: -> ../drive_c
-rw-r--r-- 1 krisvdc staff 21 May 10 19:27 com7 -> /dev/tty.usbmodem1421
-rw-r--r-- 1 krisvdc staff 10 May 9 12:22 d: -> /dev/disk2
-rw-r--r-- 1 krisvdc staff 13 May 1 16:56 e: -> /dev/rdisk2s1
-rw-r--r-- 1 krisvdc staff 13 May 8 13:20 f: -> /dev/rdisk3s1
-rw-r--r-- 1 krisvdc staff 13 May 8 13:41 g: -> /dev/rdisk4s2
-rw-r--r-- 1 krisvdc staff 13 May 9 16:50 h: -> /Volumes/Wine
-rw-r--r-- 1 krisvdc staff 13 May 8 14:07 i: -> /dev/rdisk2s2
-rw-r--r-- 1 krisvdc staff 1 May 1 16:45 z: -> /
krisvdc$
```



## Meaning of LEDs

The EMuSer contains 3 LEDs, as shown in the picture.



The following table explains when the LEDs are ON or OFF:

LED	Description
ORANGE	<p>Is OFF:</p> <ul style="list-style-type: none"><li>• when there's no USB proper connectivity</li><li>• <i>or</i> when the EMuSer is communicating at a MIDI compatible speed</li></ul> <p>Is ON:</p> <ul style="list-style-type: none"><li>• when USB connectivity works properly</li><li>• <i>and</i> when the EMuSer is communicating at a non-MIDI compatible speed</li></ul> <p>Flashes twice and then remains ON:</p> <ul style="list-style-type: none"><li>• when USB connectivity works properly</li><li>• <i>and</i> when a speed has been requested which is not supported by the E-Mu EMAX, E-Mu EMAX-II, E-Mu Emulator-II or Oberheim DPX-1</li></ul>
RED	<p>Is ON when the EMuSer is receiving data from the connected device (e.g. E-Mu sampler)</p> <p>Can also be ON if the EMuSer is NOT connected yet to a device (E-Mu sampler) or if that device (sampler) is not powered on yet.</p>
GREEN	<p>Is ON when the EMuSer is sending data to the connected device (e.g. E-Mu sampler)</p>

## **Using the EMuSer with software applications**

This document does not describe how to use the EMuSer with specific software; this depends on the software you are using with the EMuSer.

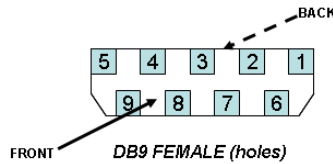
If you will use EMXP to transfer data with E-Mu samplers or with the Oberheim DPX-1 sample player, please check the EMXP manual how to select the COM port and how to set communication parameters.

If you want to write your own Windows or Mac OS X software which will use the EMuSer, you can use the standard serial communication functions (in Windows e.g. CreateFile, CloseHandle, ReadFile, WriteFile, BuildCommDCB, SetCommState, SetupComm, ...).

# PIN ASSIGNMENTS

## Serial DB9F connector pins

The EMuSer complies with the generally accepted signal-to-pin assignments for asynchronous RS422 ports (pins 1 → 5). In addition, pin 8 is used for the EXTERNAL CLOCK IN signal in synchronous mode.



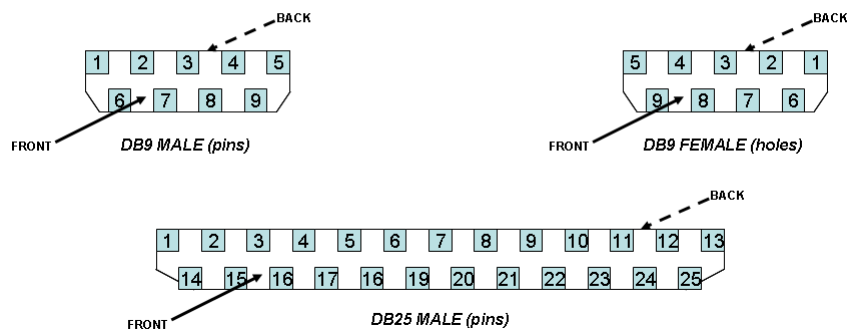
PIN	Description
1	TXD-
2	TXD+
3	RXD+
4	RXD-
5	GND
8	EXT CLOCK IN (+)

## Wiring schema for serial cables (Emax, Emax-II, Emulator-II, Oberheim DPX-1)

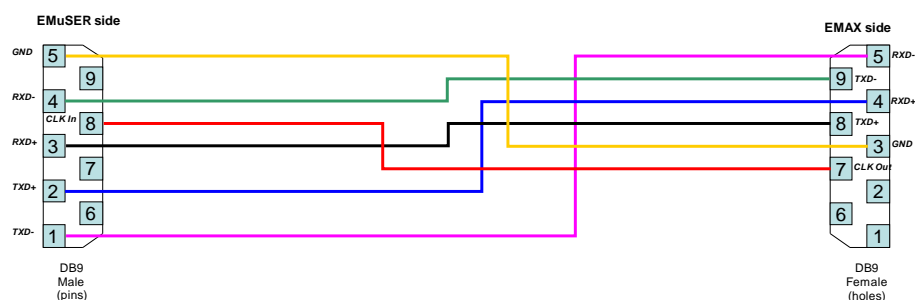
The serial cables to be used with the E-Mu Emax(II), the E-Mu Emulator-II and the Oberheim DPX-1 should be compliant with following wiring schemes. The pin conventions for the different D-SUB connectors are shown first.

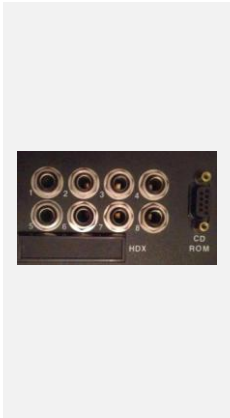
Please note that for connecting to the Oberheim DPX-1 the connector type (DB9M or DB9F) of the cable's connector at the DPX-1 side depends on the type of CDRom interface board installed in the DPX-1 !

### D-SUB DB9 and DB25 Pin Numbering Conventions

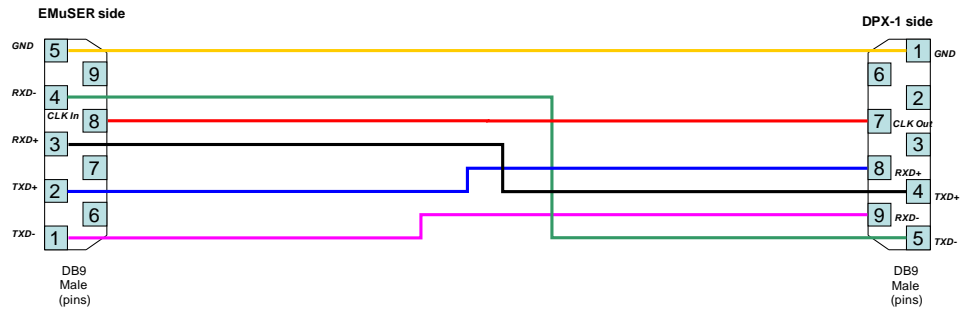


### EMuSer v1.02 Connection Cable Wiring Schema for Emax





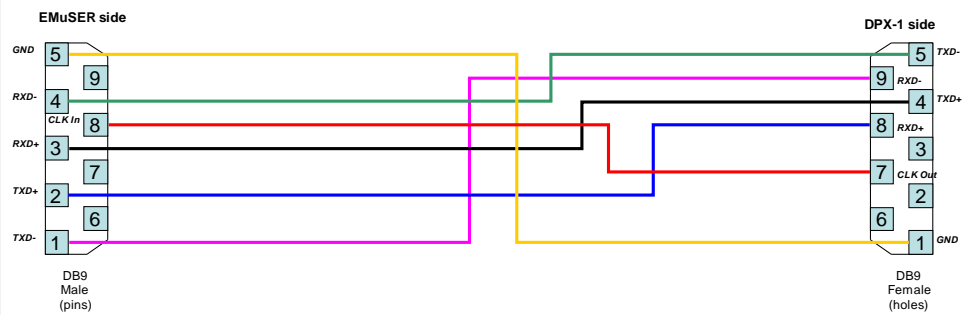
EMuSer v1.02 Connection Cable Wiring Schema for DPX-1  
(if an **Oberheim 8 x Output & CDROM extension board** has been installed in DPX-1)



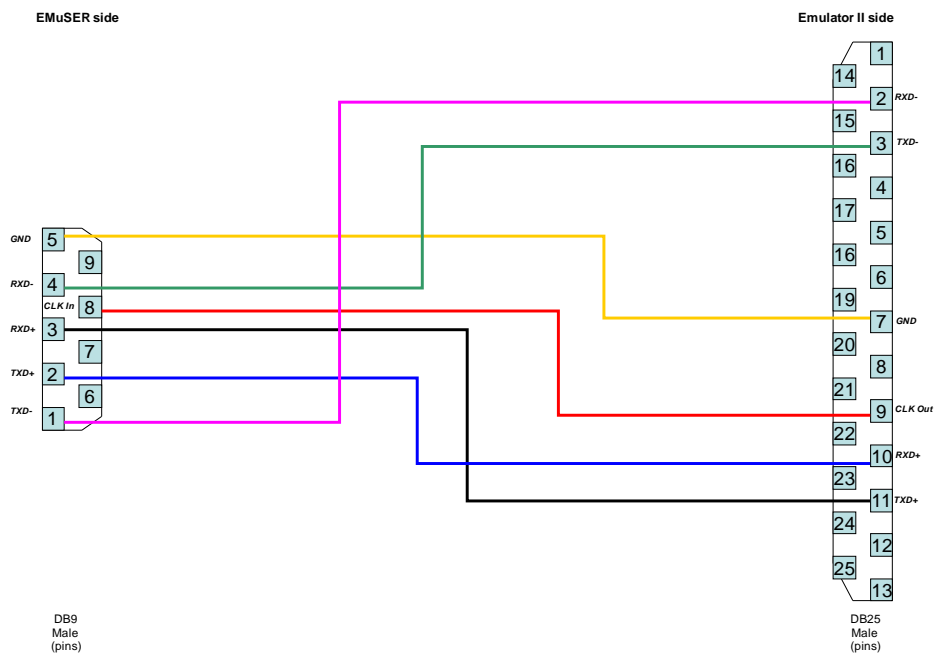
Note: since both ends of this cable have the same physical connector (male DB9) but with a different pin assignment, it's strongly recommended to label the left connector with "EMuSer" and the right connector with "DPX-1". If the cable would be reversed, the communication will not work and the EMuSer or DPX-1 could be damaged.



EMuSer v1.02 Connection Cable Wiring Schema for DPX-1  
(if an **OMI CDS3 to DPX1 interface board** has been installed in DPX-1)



EMuSer v1.02 Connection Cable Wiring Schema for Emulator II



## TROUBLESHOOTING

Problem	Possible causes and solutions
Inreliable communication No power No ORANGE LED	<ul style="list-style-type: none"> <li>- Make sure the EMuSer is connected properly to the USB port of the computer.</li> <li>- Make sure the EMuSer gets sufficient power from the computer via the USB port.</li> <li>- Avoid using USB HUBs, since they tend to lower the power supply voltage level to the connected devices.</li> </ul> <p><i>Note: it's normal that the orange LED is OFF during asynchronous communication at a MIDI compatible speed</i></p>
RED led is not always ON if EMuSer is not connected to a sampler/device	<p>That's normal.</p> <p>Most of the time the RED LED will be ON if the EMuSer is not connected to a sampler (or any device) or if that sampler (device) is not powered on. But due to the specific signal levels on which the LED reacts, it can happen that the LED is OFF from time to time.</p>
Communication fails	<ul style="list-style-type: none"> <li>- Make sure the EMuSer has the most recent firmware version installed.</li> <li>- If the ORANGE LED is OFF, check the USB connection with the computer.</li> <li>- Unplug/plug the USB cable to reset the COM port</li> <li>- Reboot the connected device (sampler)</li> <li>- Change communication settings in the configuration section of the software you are using (e.g. EMXP, see EMXP manual)</li> <li>- The COM port may be already in use by another (virtual) device. Choose another COM port or clean up the COM port list on your computer, as explained here: <a href="http://www.ehow.com/how_5232755_delete-clear-ports-use.html">http://www.ehow.com/how_5232755_delete-clear-ports-use.html</a></li> <li>- With some Rev1 CPU boards of the Emulator-II, a modification of the EMuSer may be required: the value of capacitors C4 and C5 may have to be increased or decreased. In general a capacitance of 220pF seems the best choice, in many cases 39pF seems to work fine too. Too high values may cause problems with Emulator-II Rev0 CPU boards, with Emax samplers and with the Oberheim DPX-1 though.</li> </ul>

## ANNEX: INSTALLING OR UPDATING THE EMUSER FIRMWARE

The EMuSer needs specific firmware for use with the E-Mu Emax I, Emax II, Emulator II and Oberheim DPX-1. This firmware is provided with the EMuSer in a file called **USBtoSerialEmu\_Teensy2\_0\_v1\_02\_1.hex**. (there are also firmware versions available for EMuSer variants based on the AT90UBSKEY (EmuComBox) or the Teensy++2.0 boards)

Newer versions of the firmware may be available on the EMuSer web page. Please check [www.emxp.net](http://www.emxp.net) for updates of the firmware.

In order to install this firmware on the EMuSer, you need software which can transfer software to the Teensy 2.0 board. This software is called **Teensy Loader**.

### Downloading and installing Teensy Loader

Teensy Loader can be downloaded from the PJRC website <http://www.pjrc.com>.

At the time of writing the following URL provides a direct link to the Teensy Loader download page:

<http://www.pjrc.com/teensy/loader.html>

Teensy Loader must not be installed. The software can be started immediately by running (double-clicking...) the Teensy.exe program file in Windows or by double-clicking the Teensy application in the downloaded DMG file on Mac OS X<sup>4</sup>.

### Installing the Teensy Loader / HalfKay driver

The Teensy board and Teensy Loader software use the HalfKay bootloader and protocol to update the firmware of the Teensy.

HalfKay is supported out-of-the box by Windows and Mac OS X.

So no drivers must be installed.

### Installing the EMuSer firmware with Teensy Loader

Teensy Loader is ready now for uploading the EMuSer firmware to the Teensy board.

To install the firmware, follow next steps:

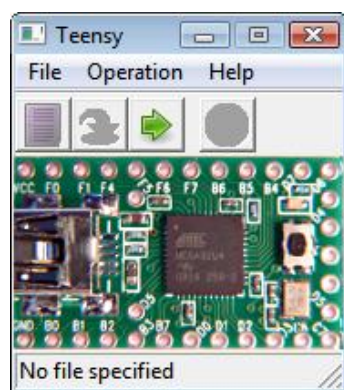
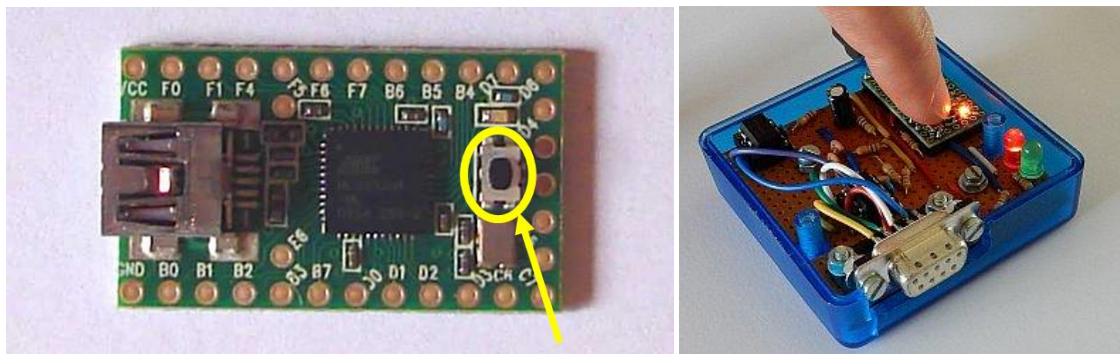
*Step 1:* Start Teensy Loader by starting (double clicking) the Teensy.exe file (Windows) or Teensy application in the DMG file (Mac OS X). The operating system will ask your for a confirmation. After confirmation the Teensy Loader window will appear:



<sup>4</sup> or macOS - in this manual we refer to the Apple Mac operating system as "Mac OS X"

*Step 2:* Connect the EMuSer device to your computer with a mini-B USB  $\leftrightarrow$  type A USB cable. If the Teensy board inside your EMuSer has been used for other (non-EMuSer) purposes before, there may be already some firmware installed into the Teensy. When using Windows, Windows *might* detect this and inform you that “a new hardware device” has been connected. If this is the case, just cancel any attempt of Windows to install the drivers for that “unknown” firmware.

*Step 3:* Press the small button on the Teensy Board inside the EMuSer (see picture below). The Teensy Loader software will detect the Teensy board now and will show a picture of the Teensy Board. Also, the green arrow button (“Reboot”) will be activated.

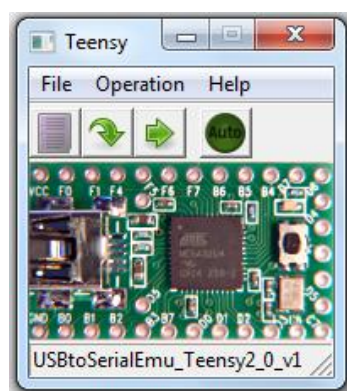


Windows



Mac OS X

*Step 4:* Select “File”  $\rightarrow$  “Open HEX file” (Mac OS X: click the left button) and select the USBtoSerialEmu\_Teensy2\_0\_v1\_02\_1.hex file which has been provided with the EMuSer package, or which has been downloaded from the EMuSer webpage. The window should change into:

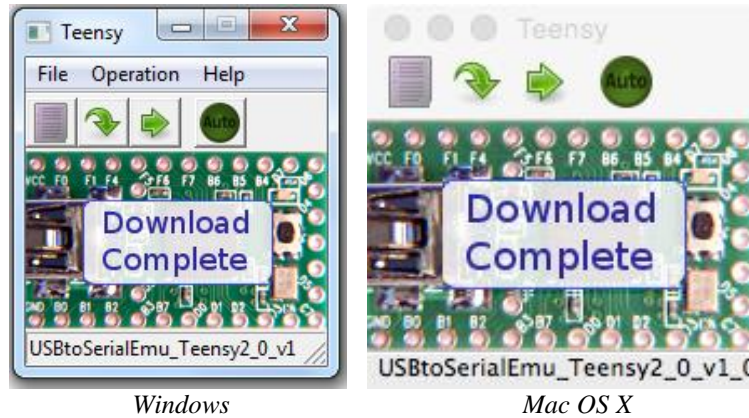


Windows



Mac OS X

*Step 5:* Press the “bowed arrow” button (“Program”). This will transfer the firmware to the EMuSer. After the transfer, the Teensy Loader window should change into:



*Step 6:* Press the “horizontal arrow” button (“Reboot”). This will reboot the EMuSer and make it run as aUSB ↔ RS422 adapter.

Windows or Mac OS X will detect that new hardware has been installed. When using Windows, the operating system might ask for an appropriate driver, although Windows 7 or higher should recognize the device as a serial port.

*Step 7:* Press the “horizontal arrow” button (“Reboot”). This will reboot the EMuSer and make it run as aUSB ↔ RS422 adapter.

Windows or Mac OS X will detect that new hardware has been installed. When using Windows, the operating system might ask for an appropriate driver, although Windows 7 or higher should recognize the device as a serial port (see *chapter "INSTALLING THE EMUSER DRIVER (WINDOWS ONLY)"*).

*Step 8:* Close the case of the EMuSer ☺



# GNU FREE DOCUMENTATION LICENSE

GNU Free Documentation License  
Version 1.2, November 2002

Copyright (C) 2000,2001,2002 Free Software Foundation, Inc.  
51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA  
Everyone is permitted to copy and distribute verbatim copies  
of this license document, but changing it is not allowed.

## 0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondly, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

## 1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you". You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal,

commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

A section "Entitled XYZ" means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "Acknowledgements", "Dedications", "Endorsements", or "History".) To "Preserve the Title" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

## 2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

## 3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

## 4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified

Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

- A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
- B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
- C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
- D. Preserve all the copyright notices of the Document.
- E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
- F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
- G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
- H. Include an unaltered copy of this License.
- I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
- J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
- K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.
- L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
- M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.
- N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.
- O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various

parties--for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

## 5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements".

## 6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

## 7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate

and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

## 8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

## 9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided for under this License. Any other attempt to copy, modify, sublicense or distribute the Document is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

## 10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See <http://www.gnu.org/copyleft/>.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or

of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation.

*LAST PAGE*