

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Installation and Operation

Manual

V 3.4
August 2006



SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Contents

CREDITS / WARNING / DISCLAIMER	3
FUNCTION OVERVIEW.....	4
NMEA INPUT	4
NMEA OUTPUT	4
THE \$STALK SENTENCE.....	5
SEATALK INPUT.....	6
SEATALK OUTPUT	7
SAME TYPE OF DATA ON NMEA & SEATALK.....	7
SEATALK CONNECTION.....	8
NMEA / RS232 CONNECTION.....	9
JUMPER RS232	10
JUMPER RS422	12
JUMPER RS422 IN -> RS232 OUT	13
JUMPER RS422 IN -> RS232 & RS422 OUT	14
CONFIGURATION SETTINGS	16
OPTIONS	18
LCD DISPLAY	18
CONNECTING DISPLAY TO PCB.....	19
PUSHBUTTON	20
CONNECTING PUSHBUTTON TO PCB:.....	20
SOFTWARE UPDATE	21
BOOTSTRAP LOADER METHOD	21
CIRCUIT DIAGRAM.....	22
SEATALK & NMEA CONVERSION TABLE.....	23
TERMINALS & CONNECTORS.....	24
ERRATA	25
ASCII TABLE	26

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Credits / Warning / Disclaimer

The Protocol converter is a
RESEARCH PROJECT.

It is used for research on data communication, computer communication and data conversion on computers used on board boats.

Hard- and Software are still under development and have NOT been fully tested. Malfunctions of the protocol converter and of any connected device are possible at any time.

It is not an end user product and must not be used for navigation.

The protocol converter could cause damage to connected devices.

Liability **cannot** be accepted for any damages, personal injuries or malfunctions caused by the converter.

There are no Seataalk technical specifications available from the manufacturer. I have used the Technical Reference of the Seataalk protocol, compiled by Thomas Knauf GmbH. See <http://www.thomas-knauf.de/seataalk.htm> .Thank you to Thomas Knauf for his work.

Do not use for navigation

An operating GSM mobile phone should not be placed within 2m of an unshielded Seataalk/NMEA Bridge because of interference from the phone's radio transmissions. If a phone is brought closer than this 2m distance, the bridge may stop operating or data may become corrupted.
(Thank's John Blaiklock for testing)

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Function overview

The converter interconnects two different data communication systems – SeaTalk¹ and NMEA.

- Information from the SeaTalk bus is transformed into NMEA Data and sent to the NMEA bus.
- Information from the NMEA bus is transformed into SeaTalk data and sent to the SeaTalk bus.
- Optionally information from both busses can be shown on a LCD display.

NMEA Input

Processing of NMEA data starts, when a complete NMEA sentence has been received. (\$xxxxx,.....<CR><LF>)

If the received sentence contains a checksum, this checksum is used to check for communication errors. If the checksum does not match the sentence, the received NMEA sentence is discarded.

If the sentence does not contain a checksum, the sentence is always regarded as valid.

After complete reception and checksum verification the sentence is sent to the NMEA-Out port of the converter Board. (This function can be switched off by control setting – see below)

If the received sentence is known, the sentence information is extracted and processed.

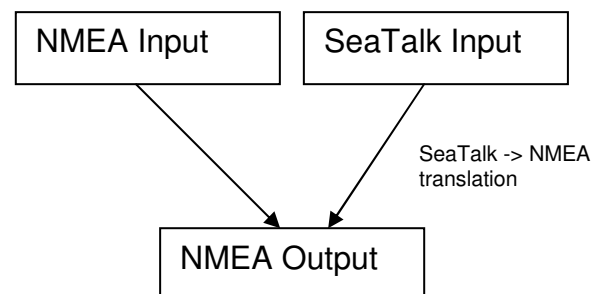
At this time the following NMEA sentences can be received:

\$GPRMC Speed over Ground, Course over Ground, Latitude, Longitude, Time, Date
\$xxDBT Depth below transducer.
\$xxMTW Water Temperature
\$xxVLW Total / Trip Mileage
\$xxMWV Wind angle Wind Speed
\$xxHDM Heading magnetics

\$STALK special SeaTalk datagram
\$SNBSE Board configuration

NMEA Output

All valid NMEA sentences – whether processed by the converter or not – are forwarded to the NMEA-Out port.. If the NMEA-Out port is busy, the sentence is temporarily stored in memory and



¹ SeaTalk is Reg. Trademark of Raymarine Inc.

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

transmitted as soon as the NMEA-Out port becomes free.

The converter also continuously checks for new incoming SeaTalk data.
Incoming SeaTalk data is converted to NMEA Data and transferred to the NMEA-Out Port.

The following NMEA sentences can be sent :

\$xxDBT Depth below transducer
\$xxVHW Speed t. Water
\$xxMTW Water Temperature
\$xxVLW Total / Trip Mileage
\$xxMWV Wind angle & Wind speed
\$xxHDM Heading compass
\$xxRMC Speed over ground, Course over ground, Latitude, Longitude, UTC time, Date

\$STALK special SeaTalk datagram
\$SNBSE special system configuration datagram

The \$STALK sentence

The converter can process a special NMEA-like sentence.
With this special sentence any SeaTalk command can be sent to SeaTalk.

\$STALK,cc,p1,p2...,pn*xx

cc = SeaTalk Command

p1 = Parameter1

p2 = Parameter 2

..

*xx = NMEA checksum (optional) .

This special sentence will be sent to the NMEA Bus for every received SeaTalk datagram
– regardless as to whether it was recognised and processed or not.
(This function can be switch off by control setting – see below)

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SeaTalk Input

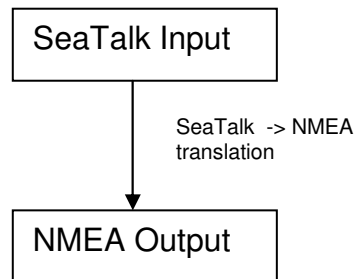
When a SeaTalk datagram was received the system checks if this datagram is known and should be processed. When the datagram is known, all datagram parameters are extracted and stored.

Any unknown datagram is ignored.

(Exception: \$STALK is sent even for unknown datagrams)

At this time the following SeaTalk datagrams can be received.

- 00 Depth
- 10 Wind angle
- 11 Wind speed
- 20 Speed through water
- 21 Trip mileage
- 22 Total mileage
- 23 Water temperature
- 25 Total & trip mileage
- 26 Speed through water
- 27 Water temperature
- 30 Lamp intensity
- 50 Latitude
- 51 Longitude
- 52 Speed over ground
- 53 Course over ground
- 54 UTC time
- 56 Date
- 84 Compass heading
- 89 Compass ST40 heading



SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

SeaTalk Output

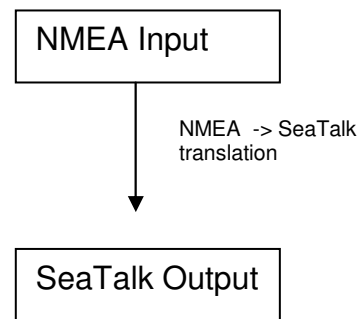
The converter periodically checks if any new data has arrived from NMEA, that needs to be sent to SeaTalk. New data is written to the SeaTalk bus only if the bus is not in use by any other instrument. If the bus is in use, the converter waits for a while, and tries again.

Collision detection

Every single bit sent out to the SeaTalk bus is read back again and checked for successful transmission. If the transmission was corrupted, the transmission is stopped immediately. When the bus becomes free, the transmission will be started again.

At this time the following SeaTalk datagrams can be sent

- 10 Wind angle
- 11 Wind speed
- 25 Total & Trip mileage
- 27 Water temperature
- 30 Lamp intensity
- 50 Latitude
- 51 Longitude
- 52 Speed over ground
- 53 Course over ground
- 89 Compass ST40 heading
- 20 Optional – Speed through water
(see Page 17 Item 14)



Same type of Data on NMEA & SeaTalk

Information available from like instruments on both Busses (SeaTalk & NMEA) are not converted.

Example:

We have a depth sounder on the SeaTalk Bus and another depth sounder on the NMEA bus.

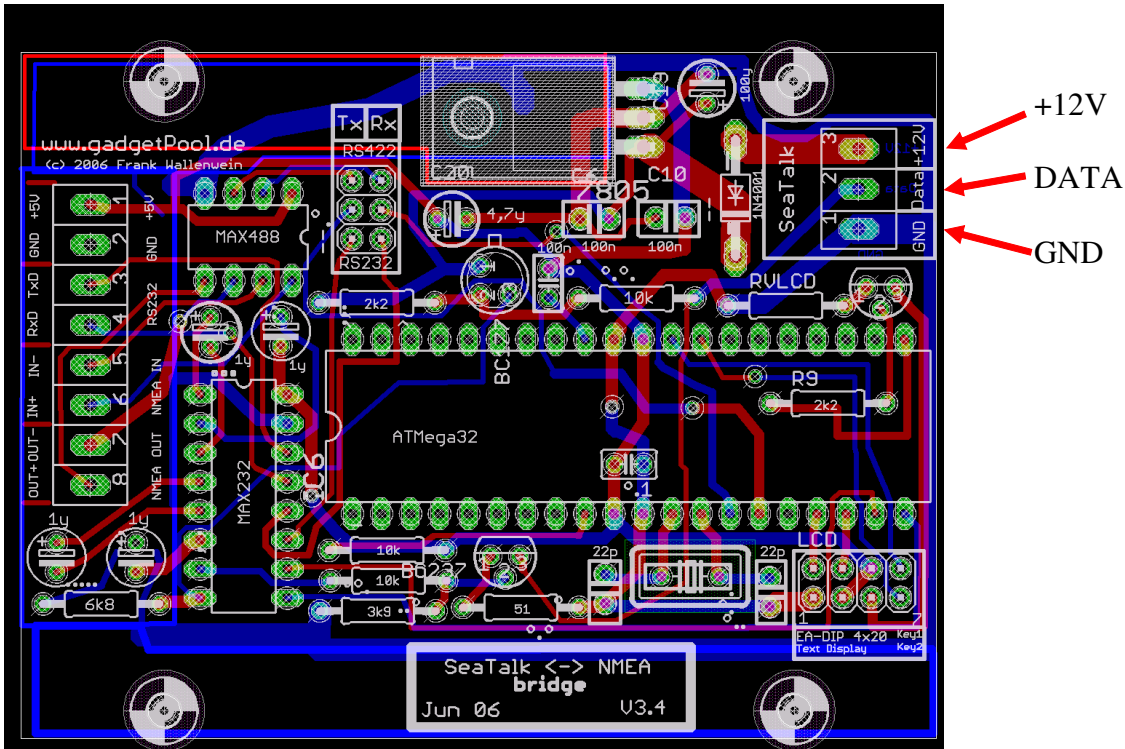
So, on both sides depth information is available.

In this case no depth information is transferred from one bus to the other.

(If depth information is not updated within 30 sec. on one bus, sending to the other bus is activated again.)

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

SeaTalk Connection



There is a 3-Pin terminal for the connection to the SeaTalk bus.
Please double check for correct connection.

The board takes it's power supply from +12V and GND.

+12V & GND MUST be connected, even if the SeaTalk bus is not needed.

A wrong connection could damage the converter or other devices on the SeaTalk Bus.

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

NMEA / RS232 Connection

Choosing RS232 <-> RS422

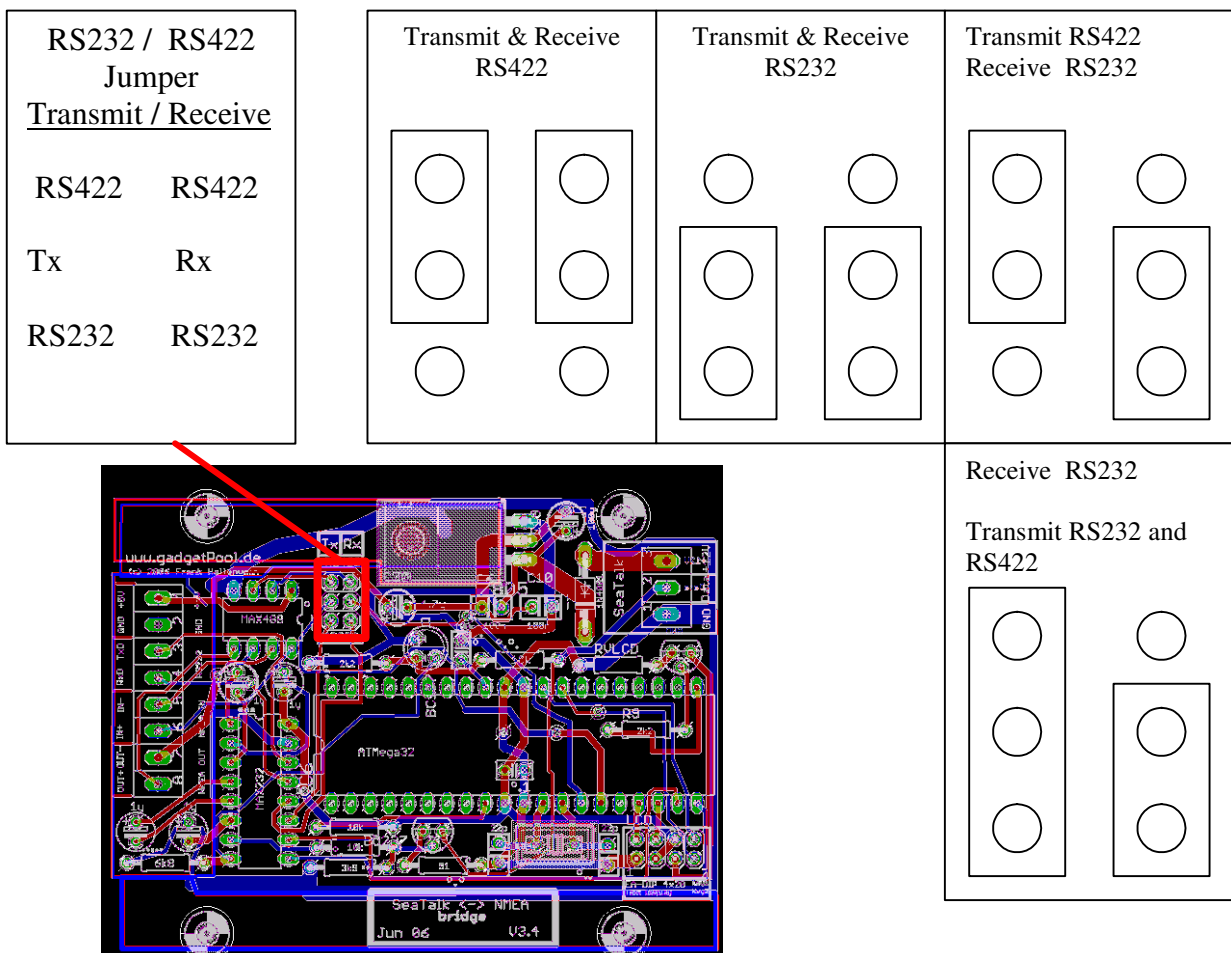
The serial in/output ports can be used as RS232 or RS422 port by setting a jumper.

RS232 setting is used for connecting a PC, a notebook, a GPS mouse, a Garmin GPS, or any other device with a RS232 port.

RS422 is used for standard NMEA devices.

Standard NMEA devices have terminals marked with NMEA IN+, NMEA IN- , while RS232 devices usually have RxD, TxD .

Please double check the correct Jumper setting before usage. Wrong settings can damage your Computer, or any other connected device.



SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

You must use **only 1 input port**.

Either RxD with Jumper setting RS232

Or IN+/IN- with Jumper setting RS422

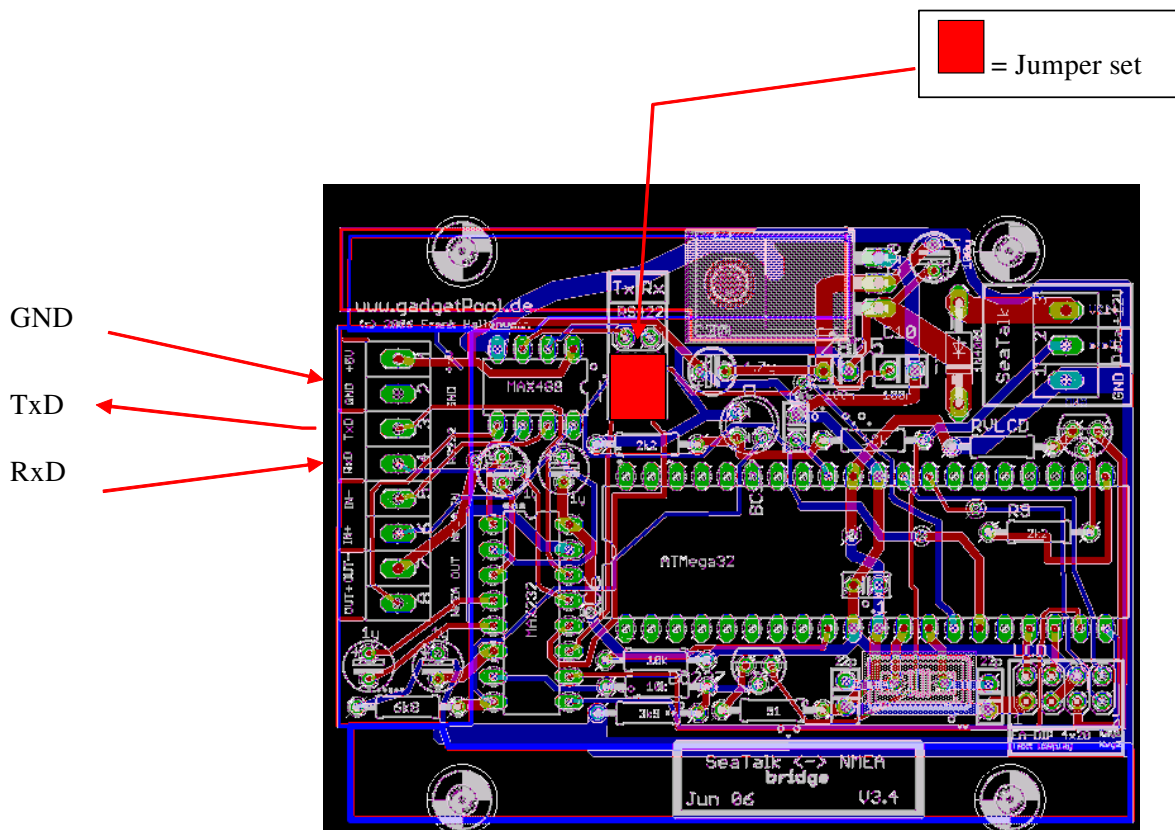
It is not allowed to use both Input ports at the same time.

It is allowed to use **both output ports**.

In this configuration you can for example send data from the SeaTalk NMEA Bridge to a Computer **and** a GMDSS Radio.

If RS422 ports are not used at all the IC MAX488 (small 8-Pin circuit) can be removed to save power.

Jumper RS232

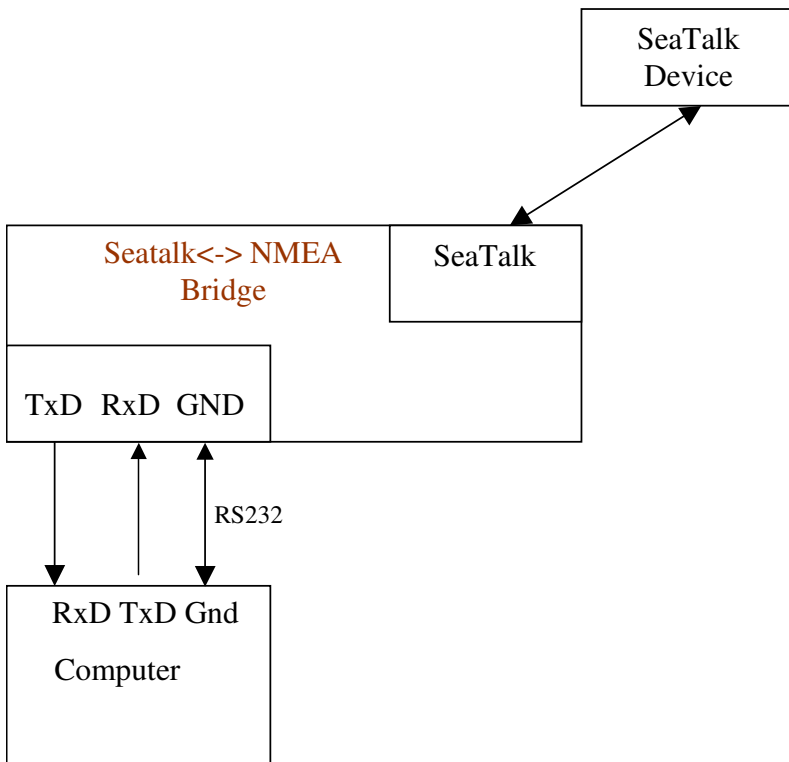


In this setting the terminals marked TxD, RxD and GND and are used.

The terminal marked "NMEA-OUT" are not used in this setting

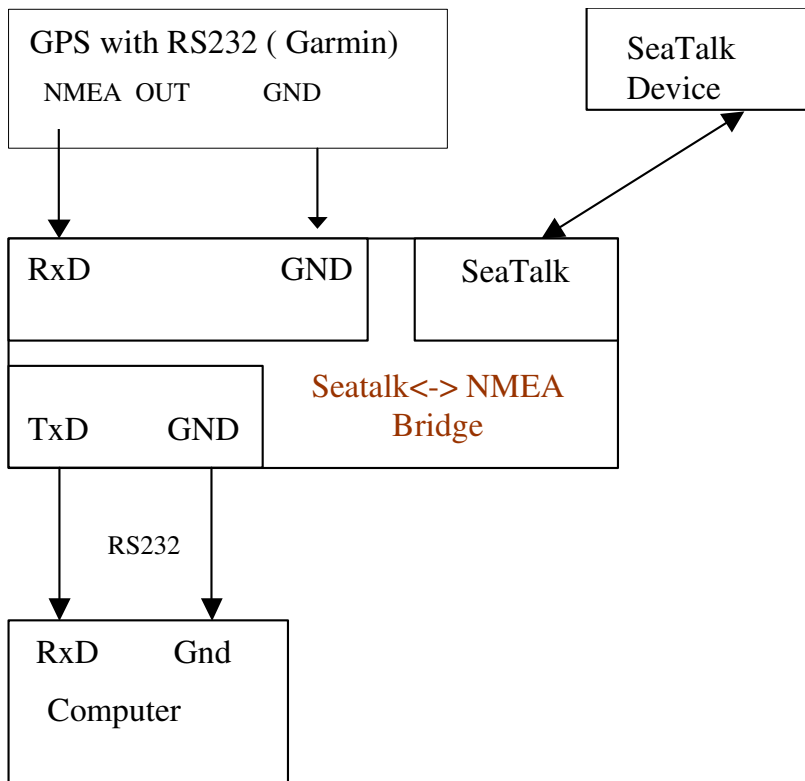
SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Example : Sending & Receiving SeaTalk Data to/from a Computer



In this configuration SeaTalk Data can be received from the Computer AND the computer can send Data to the SeaTalk bus.

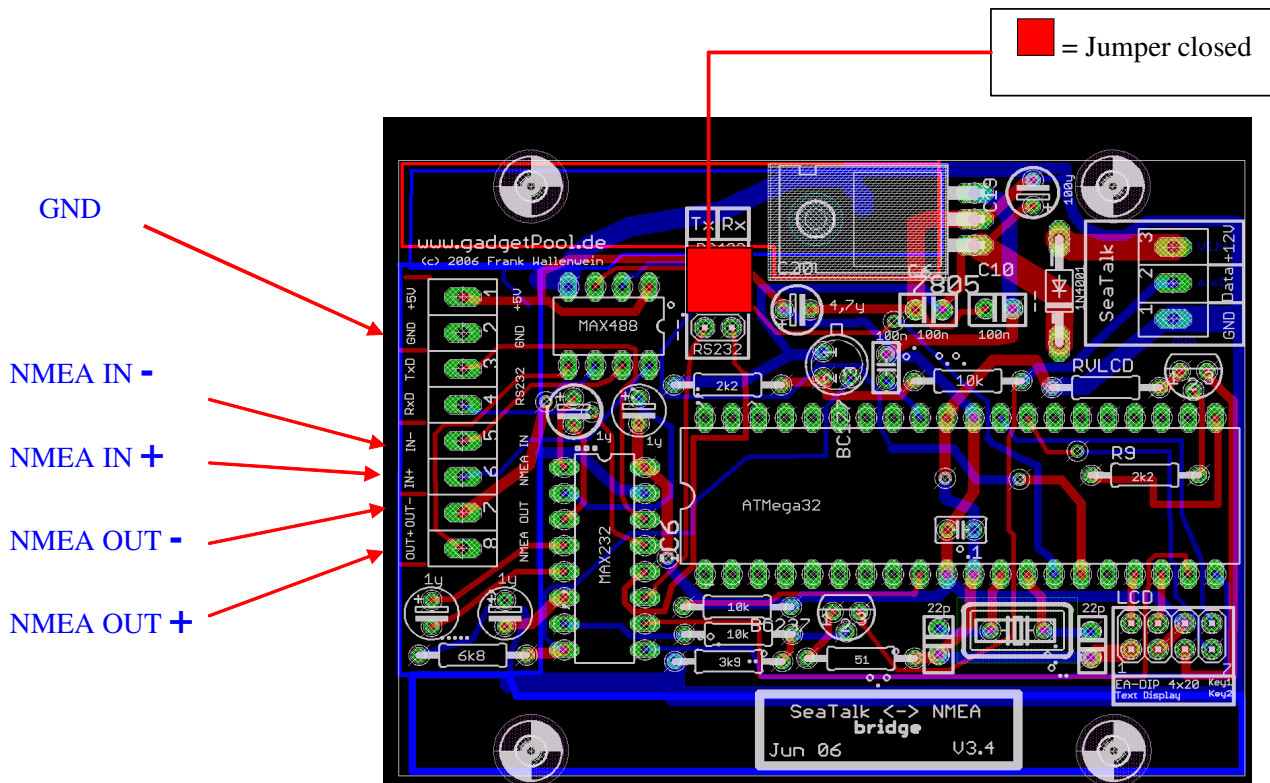
Example : Connecting a Garmin GPS, and Computer and the SeaTalk Bus.



In this configuration the GPS sends Data to the Computer AND to the SeaTalk bus. The Computer can only receive Data from the GPS and from the SeaTalk bus. It can not send any data.

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Jumper RS422



In this configuration the terminals NMEA-OUT and NMEA-IN are used.
The terminals marked "RS232" are not used.

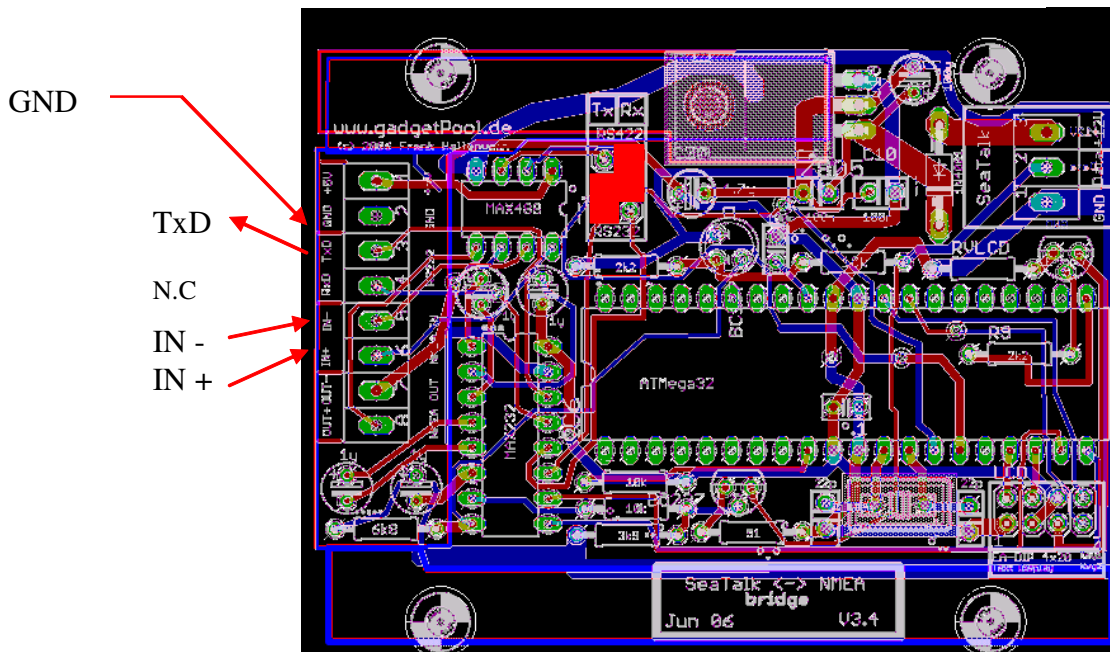
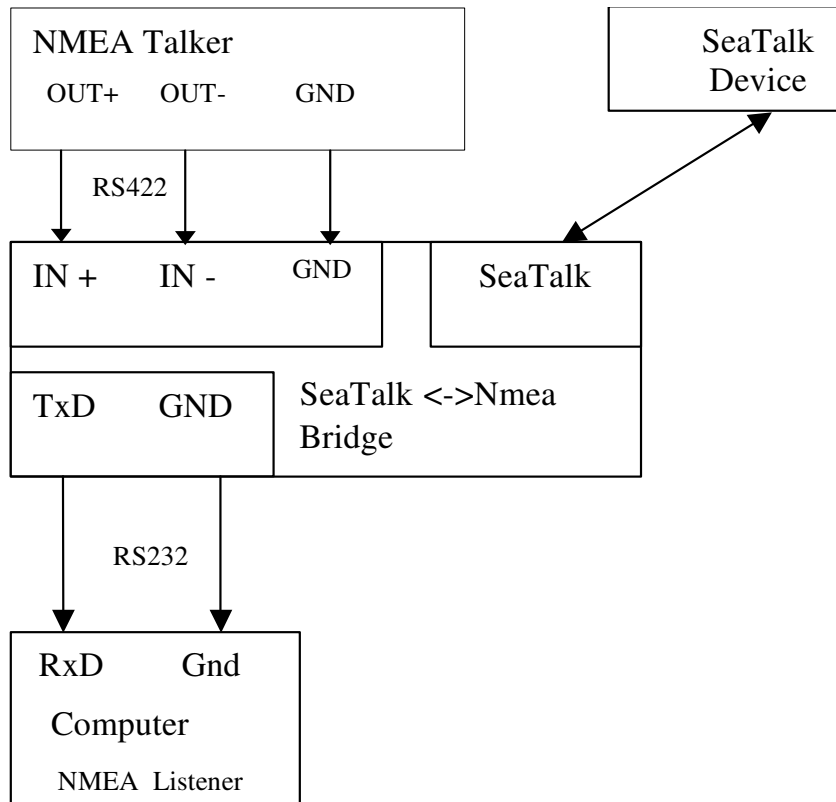
On some devices the NMEA terminals are labelled with **A** and **B** instead of **+** and **-**
On some devices the NMEA terminals + and - are even reversed. If communication can not be established, just try to swap NMEA + and NMEA - . Swapping NMEA + and NMEA - only results in communication failure.

!! Please check your manual before connecting !!

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Jumper RS422 In -> RS232 Out

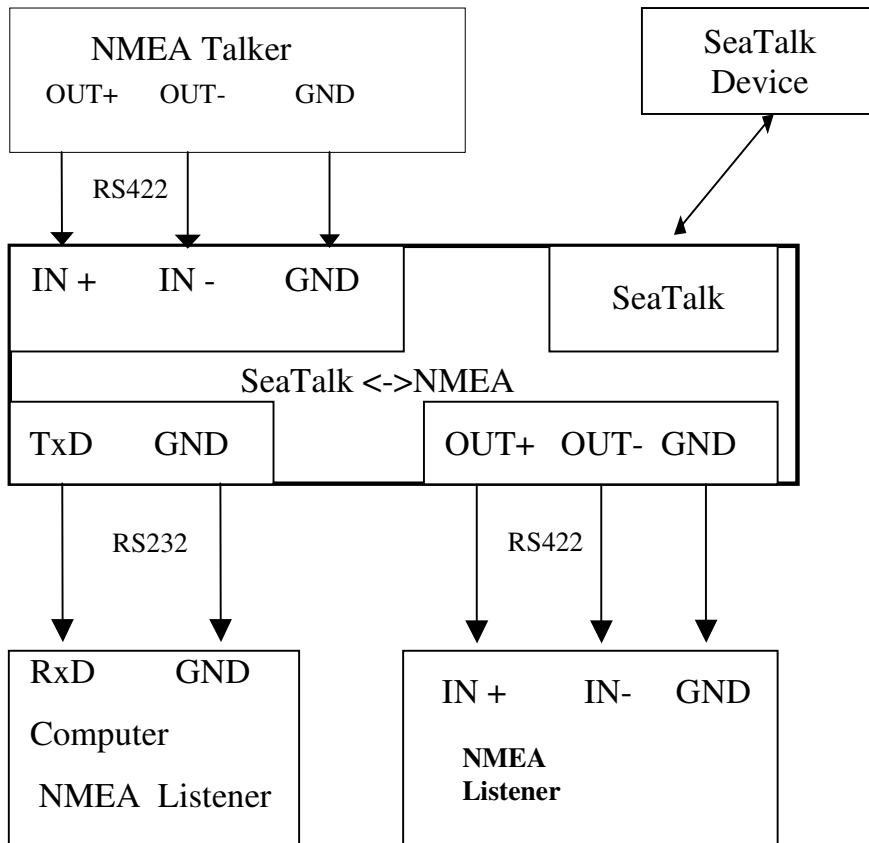
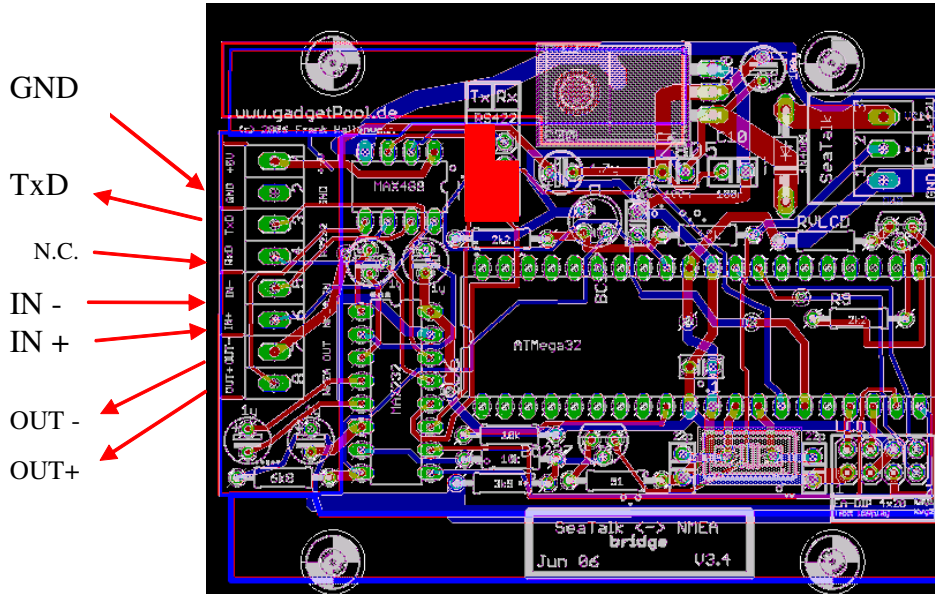
You can use the SeaTalk NMEA Bridge to connect a RS422 device to an RS232 computer.



SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Jumper RS422 In -> RS232 & RS422 Out

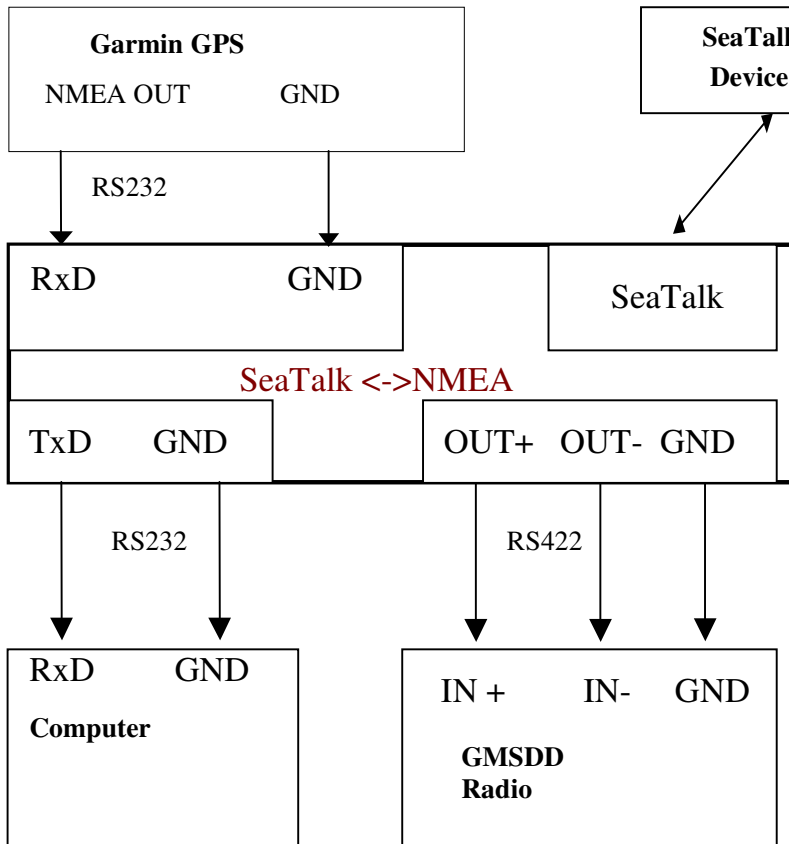
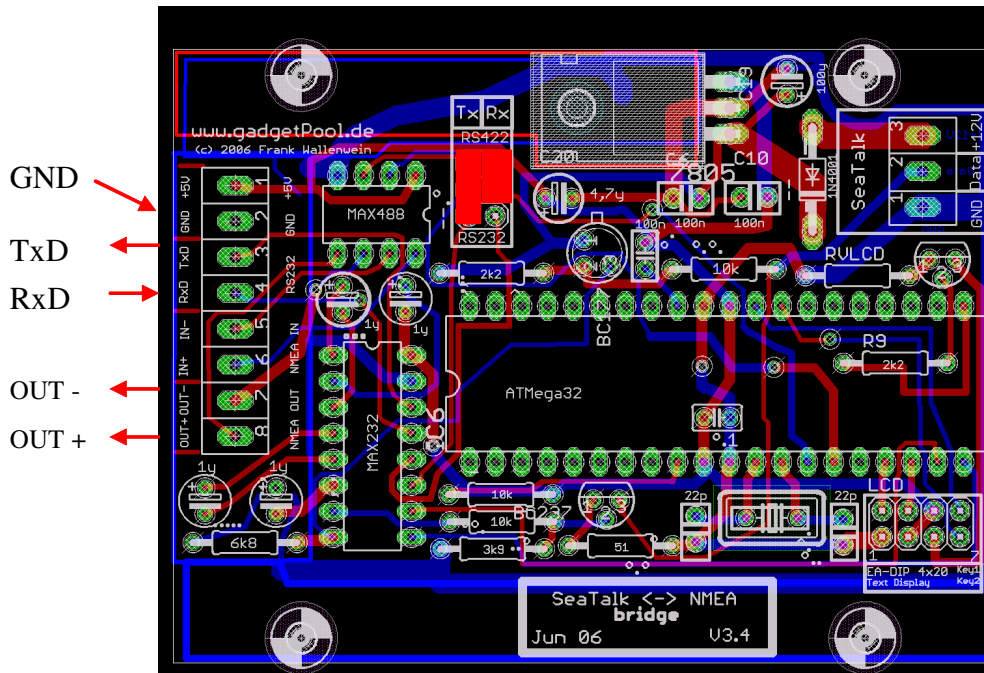
Output can also be routed to both Ports. Rs232 AND RS422



SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Jumper RS232 In -> RS232 & RS422 Out

Output can also be routed to both Ports. Rs232 AND RS422



In this example the GPS sends Data to the SeaTalk Bus and to the computer and to a GMDSS radio.

Computer and GMSDD Radio receive data from GPS and from SeaTalk instruments.

SeaTalk Instruments receive data from other SeaTalk instruments and from GPS.

The computer cannot send any data.

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Configuration settings

The SeaTalk NMEA converter can be configured to meet the users requirements.

The configuration is made by sending a NMEA-like sentence. The settings are stored in an EEPROM.

The configuration sentence is :

\$SNBSE,address,data<CR><LF>

(Optionally a Checksum can be appended \$SNBSE,address,data*XX<CR><LF>)
(SNBSE = **S**eatalk **N**MEA **B**ridge **S**et **E**eprom)

Address	Data
0	1 = Send out every incoming SeaTalk datagram as "\$STALK...." to NMEA 0 = Do not generate \$STALK,xx,yy sentence for each incoming SeaTalk datagram If you don't really need this function – better switch if OFF. It causes additional load on the NMEA Bus.
1	Set NMEA Port Baudrate 1 = 300 Baud 2= 600 Baud 3= 1200 Baud 4 = 2400 Baud 5 = 4800 Baud 6 = 9600 Baud 7 = 19200 Baud 8 = 38400 Baud any other value defaults to 4800 Baud Baud rate is changed at next start of the converter Warning : The baudrate selected is also the baudrate used for any further configuration. If your configuration program can not handle the selected baudrate, there is no way to reconfigure the device.
2+3	Prefix for generated NMEA Sentence - Character 1+2 Every NMEA Sentence generated from the system begins with this two letters Default = "II" (Integrated Instrumentation) WARNING You have to enter the ASCII Value of the character, not the character itself. Example : To set character 1 to "I" and character 2 to "A" \$SNBSE,2,73 (Character "I" is a 73 in ascii) \$SNBSE,3,65 (Character "A" is a 65 in ascii) See Ascii Table

**SeaTalk <-> NMEA
SeaTalk <-> RS232
Converter**

4	1= Echo every incoming NMEA Sentence to NMEA Out Port 0 = Do not copy incoming NMEA sentences to NMEA Out Port
5	N.A:
6	1 = Send \$IIVHW Sentence when new Data from SeaTalk arrives 0 = Do not send \$IIVHW Sentence
7	1 = Send \$IIHDM Sentence when new Data from SeaTalk arrives 0 = Do not send \$IIHDM Sentence
8	1 = Send \$IIMWV Sentence when new Data from SeaTalk arrives 0 = Do not send \$IIMWV Sentence
9	1 = Send \$IIDBT Sentence when new Data from SeaTalk arrives 0 = Do not send \$IIDBT Sentence
10	1 = Send \$IIMTW Sentence when new Data from SeaTalk arrives 0 = Do not send \$IIMTW Sentence
11	1 = Send \$IIVLW Sentence when new Data from SeaTalk arrives 0 = Do not send \$IIVLW Sentence
12	1= If the LCD Display light is switched on/off by key - send out "Light On/Off" command to SeaTalk port. 0= Do not send "Light On/Off" command to SeaTalk bus if the LCD light has been switched on/off by Key
13	1 = Send welcome message after power up 0 = Do not send welcome message
14	0 = Speed over Ground from NMEA input is sent to SeaTalk bus as Speed over Ground and as Speed through Water (Needed for ST60 Wind instrument, that does not recognise Speed Over Ground) 1 = Normal operation. No special SOG => STW handling) (default) (See Webpage www.gadgetPool.de for more on this special ST60 Wind function.
15	0 = Every incoming SeaTalk datagram is sent to NMEA as "\$STALK,xxx,yyy" – no matter if the system can interpret the SeaTalk data or not. 1 = Normal operation. Only SeaTalk sentences known to the system are echoed as \$STALK,xxx,yyy

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Options

The NMEA SeaTalk converter is normally used without any visualisation or user input. Optionally however, a LCD Display and a Pushbutton can be connected.

In standard mode – without LCD and Pushbutton – the board consumes less power and data conversion is faster than with LCD.

LCD Display

If data visualisation is needed, a serial 4x20 character LCD Display Type „LCD Modul EA-DIP204-4“ can be connected.

It is available from

- Conrad Elektronik - www.conrad.de Part No. 181863-14
- Electronic Assembly GmbH <http://www.lcd-module.de/>

Display illumination can be switched on/off by a pushbutton or by SeaTalk command.

The display shows :

Page 1 :	Speed through water, Depth, Position Long. Position Lat.	Speed over ground Temperature Track
----------	---	---

Page 2 :	App. Wind Speed. Compass Trip Miles Total Miles	App. Wind Direction Track UTC-Time
----------	--	--

The displayed values are blanked out if no new data has been received for more than 30 seconds.

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Connecting display to PCB.

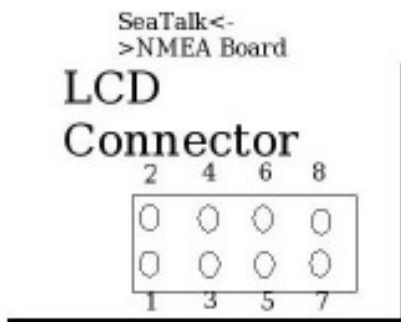
LCD Connector

Pin 1 GND
 Pin 2 Data
 Pin 3 VCC
 Pin 4 Clock
 Pin 5 Light GND
 Pin 6 Light Switched

LCD Display

Pin 1 and Pin 4
 Pin 5
 Pin 2
 Pin 6
 Pin 18
 Pin 17

Pin 7 Pushbutton #1 (See Pushbutton)
 Pin 8 Pushbutton #2 (See Pushbutton)



PIN LCD DISPLAY

PINBELEGUNG				PINBELEGUNG			
Pin	Symbol	Level	Funktion	Pin	Symbol	Level	Funktion
1	VSS	L	Stromversorgung 0V (GND)	10	D0	H/L	Display Data
2	VDD	H	Stromversorgung +5V	11	D4 (D0)	H/L	Display Data
3	VEE	-	Kontrastspannung (ca. 0V)	12	D6 (D1)	H/L	Display Data
4	RS (CS)	H/L	Umschaltung Befehl / Daten	13	D6 (D2)	H/L	Display Data
5	RW (SD)	H/L	R-Read, L-Write	14	D7 (D3)	H/L	Display Data, MSB
6	E (CLK)	H	Enable (blinde Flanke)	15	-	-	Irref. (siehe EA.DP122-04)
7	DD (SCD)	H/L	Display Data, LSB	16	RES	L	Reset (interner Pullup 10K)
8	D1	H/L	Display Data	17	A	-	LED-Bele. + (RV-erleucht.)
9	D2	H/L	Display Data	18	C	-	LED-Bele. -

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Pushbutton

When an LCD Display is connected, the user can switch between two display pages. Pressing the pushbutton for a short time (approx. 2 sec) switches between the pages. Pressing the pushbutton for a longer time (approx. 5 sec) switches the display illumination on/off.

Switching illumination on/off can be transmitted to SeaTalk bus. With this function the lights on all other instruments on the Seataalk bus can be remote controlled.

Connecting Pushbutton to PCB:

The pushbutton is connected to Pin 7 of LCD connector and GND.

Another pin for a second pushbutton is available at pin 8 of the LCD connector. This second pushbutton pin for future extensions is currently not used.

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Software update

The Software can be updated by using the built in Bootstrap-Loader function.

If you find anything missing in the Software, if you should find any software errors or if you have new Ideas – just sent a mail to FWallenwein@tklinux.de

I can send new / revised software by E-Mail and you can update the controller software yourself.

Bootstrap method advantages :

No Hardware programmer needed.

Just a RS232 connection to PC and a PC Software is needed.

Fuses and Bootstrap Software can not be erased accidentally.

Latest Software versions can be found at <http://www.gadgetPool.de>

Bootstrap Loader Method

Set Jumpers to RS232.

Connect the SeaTalk NMEA Bridge to your PC (using RxD, TxD and GND)

Start the supplied bootstrap software on the PC.

Open the Image file you would like to program into the Bridge.

Select your serial port in bootstrap software

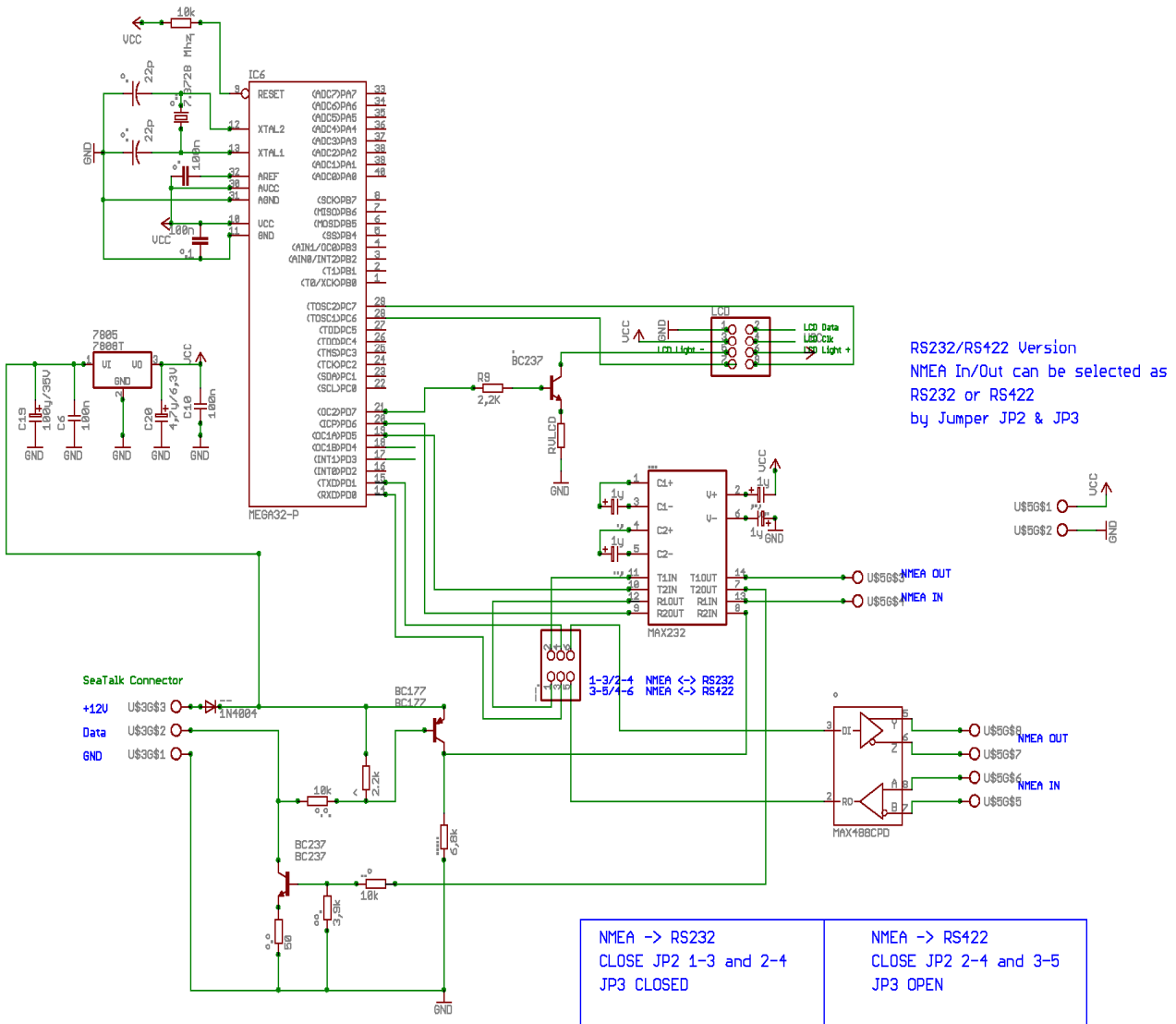
Select **9600 Baud**

Switch on the SeaTalk NMEA Bridge.

The Bootstrap Software finds the SeaTalk NMEA Bridge and flashes the new software.

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Circuit Diagram



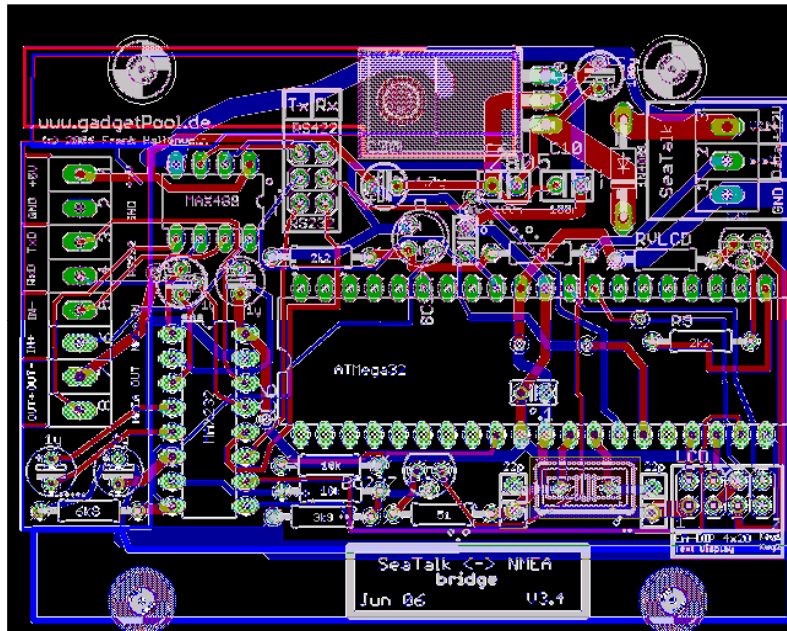
**SeaTalk <-> NMEA
SeaTalk <-> RS232
Converter**

SeaTalk & NMEA conversion Table

Function	SeaTalk ID	NMEA	Stalk -> NMEA	NMEA->Stalk	LCD
Depth	0	DBT	X	X	X
Speed t. water	20	VHW	X	X (See SNBSE,14)	X
Speed t. water	26	VHW	X		X
Trip mileage	21	VLW	X		X
Total mileage	22	VLW	X		X
Water temperature	23	MTW	X		X
Water temperature	27	MTW	X	X	X
Total / Trip mileage	25	VLW	X	X	X
Wind angle	10	MWV	X	X	X
Wind speed	11	MWV	X	X	X
Compass	84	HDM (VHW)	X		X
Compass ST40	89	HDM	X	X	X
Speed over ground	52	RMC	X	X	X
Course over ground	53	RMC	X	X	X
Lamp intensity	30			Pushbutton	X
Latitude	51	RMC	X	X	X
Latitude	51	GLL		X	X
Longitude	50	RMC	X	X	X
Longitude	50	GLL		X	X
UTC time	54	RMC	X	X	X
Date	56	RMC	X	X	X
Special NM->ST	any	\$STALK	X	X	
Special config.	-	\$SNBSE			
NMEA->Stalk = Read from NMEA Bus, send to Seataalk Bus					
Stalk->NMEA = Read from Seataalk Bus, send to NMEA Bus					

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

Terminals & Connectors



Terminal on the left side

+5V	5Volt Output (for GPS Mouse etc.)
GND	Ground (For RS232, GPS Mouse etc.)
TxD	RS232 Transmit Data. Serial Data sent from bridge to a PC
RxD	RS232 Receive Data. Serial Data received by the bridge from PC
IN+/IN-	NMEA Data Input (RS422)
OUT+/OUT-	NMEA Data Output (RS422)

Terminal on the right side

+12V	12 Volt Power Supply	Plus
Data	SeaTalk In/Output	
GND	12 Volt Power Supply	Minus (GND)

If you use the 5V output to power other devices please make sure, that the chip 7805 has a heat sink. This chip can get very hot if it has no heat sink attached.

**SeaTalk <-> NMEA
SeaTalk <-> RS232
Converter**

Errata

Nothing known

August, 14th 2006

SeaTalk <-> NMEA SeaTalk <-> RS232 Converter

ASCII Table

Upper case letters

Character	Ascii Value
A	65
B	66
C	67
D	68
E	69
F	70
G	71
H	72
I	73
J	74
K	75
L	76
M	77
N	78
O	79
P	80
Q	81
R	82
S	83
T	84
U	85
V	86
W	87
X	88
Y	89
Z	90

Lower case letters

a	97
b	98
c	99
.....	
x	120
y	121
z	122

Digits

0	48	6	54
1	49	7	55
2	50	8	56
3	51	9	57
4	52		
5	53		