RS232
SeaTalk <-> NMEA
Converter

Installation and Operation

Manual

V 1.0
with galvanic isolation

June 2009

.

SeaTalk <-> NMEA
SeaTalk <-> RS232
Converter

Contents

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.

Never use this product as your only source of navigation data. Always apply "good seamanship" by using proper charts, keeping lookout and cross check electronic data with other sources.

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 Seatalk technical specifications available from the manufacturer. I have used the Technical Reference of the Seatalk protocol, compiled by Thomas Knauf GmbH. See http://www.thomas-knauf.de/seatalk.htm .Thank you to Thomas Knauf for his work.

Do not use for navigation

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An operating GSM mobile phone should not be placed within 2m of an
unshielded Seatalk/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 )
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S e a T a l k < - > N M E A
S e a T a l k < - > R S 2 3 2
C o n v e r t e r

Function overview

The converter interconnects two different data communication systems – SeaTalk[1] and NMEA.

- Information from the SeaTalk bus is transformed into NMEA Data and sent to the USB port of the boat computer.
- Information from navigation software in NMEA format is transformed into SeaTalk data and sent to the SeaTalk bus.

Installation

The RS232-SeaTalk NMEA bridge comes with two connectors.

A combined Power Supply/RS232 Plug   A SeaTalk Terminal

Just connect the RS232 lines to your computer and the power lines to the power supply

Connect a SeaTalk Instrument to the SeaTalk terminal

The SeaTalk plug has a 3 pin detachable screw terminal. Connect the SeaTalk Terminal to one of your SeaTalk instruments.
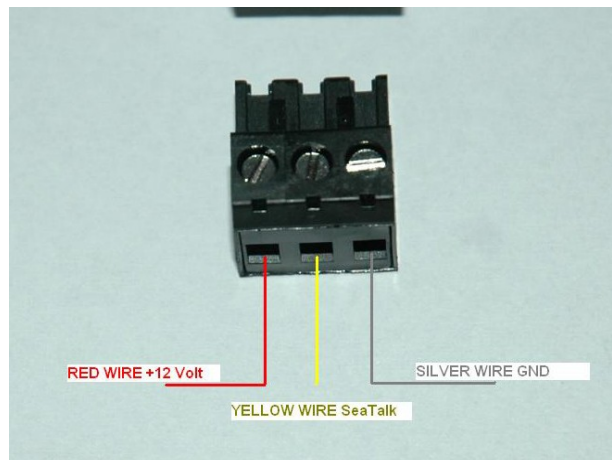
Make sure, that cables are connected as shown above. A wrong connection could damage the converter or other devices on the SeaTalk Bus.

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[1] SeaTalk is Reg. Trademark of Raymarine Inc.

Please note :
Since the SeaTalk Port is galvanic isolated from the RS232 port, the "STalk +12V" from the SeaTalk plug are not used for operating power. The SeaTalk-NMEA-Link gets it's operating power from the RS232 port - not from the SeaTalk Port.

The combined Power Supply/RS232 plug has a 4 pin detachable screw terminal. Connect it to power supply, as well as your computer.

The power supply voltage should be between 6 ... 12 V-. In order to keep the galvanic isolation the supply power should be isolated from the SeaTalk Power. If you do NOT need galvanic isolation the device may connected as shown :
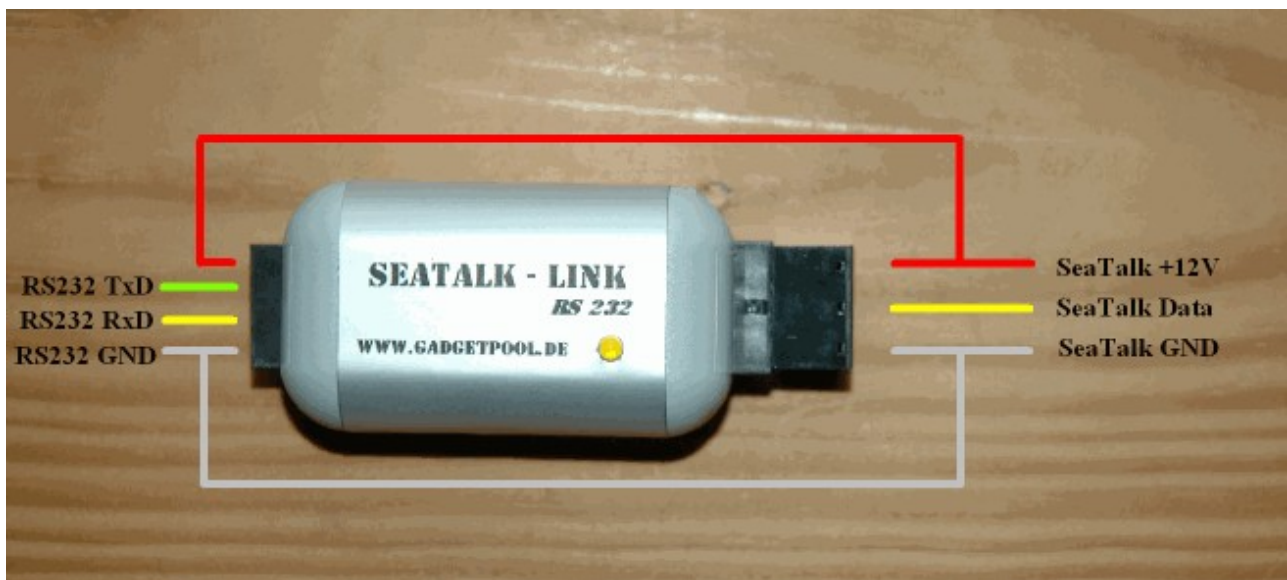
Please note that there's no need for external power supply, but NO GALVANIC ISOLATION as well if you do so.

Driver installation.

There's no need for driver installation.

SeaTalk and NMEA Data

NMEA Input

The SeaTalk NMEA bridge reads and writes NMEA Data to/from the USB Port. Processing of incoming NMEA data starts, when a complete NMEA sentence has been received ($xxxxx,.....<CR><LF>) from the boat computer

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 of the sentence, the data are processed and translated into SeaTalk

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.
$xxDPT	Depth below keel
$xxMTW	Water Temperature
$xxVLW	Total / Trip Mileage
$xxMWV	Wind angle Wind Speed
$xxHDM	Heading magnetics
$xxHDG	" "
$xxGLL	Position
$xxZDA	Date & Time
$STALK	Special SeaTalk datagram
$SNBSE	Board configuration

NMEA Output

The converter continuously checks for new incoming SeaTalk data.
Incoming SeaTalk data is converted to NMEA Data and transferred to the NMEA-RS232 Port.

The following NMEA sentences can be sent :

|	
$IIDBT	Depth below transducer
	Optional $IIDPT can be sent instead of $IIDBT
$IIVHW	Speed t. Water
$IIMTW	Water Temperature
$IIVLW	Total / Trip Mileage
$IIMWV	Wind angle & Wind speed
$IIHDM	Heading compass
$IIRMC	Speed over ground, Course over ground, Latitude, Longitude, UTC time, Date
	Optional an additional $IIGLL sentence can be sent for position information
$IIRSA	Rudder Position
$STALK	special SeaTalk datagram
$SNBSE	special system configuration datagram

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 datagram's 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
     9C Compass Heading & Rudder position

SeaTalk Input

SeaTalk -> NMEA
translation

NMEA USB
Output
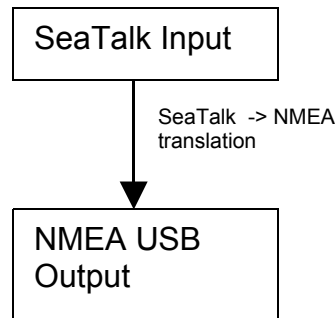
SeaTalk Output

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
With SeaTalk it can happen, that two instuments try to send data at the same time. This may causes a data collision on the SeaTalk bus. In this case, the SeaTalk NMEA Bridge immediately stops sending the current datagram.

To detect data collision, every single bit sent out to the SeaTalk bus is read back again and checked for successful transmission. If the transmission was corrupted, this transmission is stopped immediately. This single datagram will be discarded.
When the bus becomes free again, the transmission will be started again.
The lost datagram will be repeated on the next update from NMEA data.

At this time the following SeaTalk datagrams can be sent

00 Depth
10 app. Wind angle
11 app. Wind speed
25 Total & Trip mileage
27 Water temperature
30 Lamp intensity
50 Latitude
51 Longitude
52 Speed over ground
53 Course over ground
54 Time
56 Date
89 Compass ST40 heading
20 Speed through water
   (see "Configuration settings" Item 14)

NMEA USB Input

NMEA -> SeaTalk
translation

SeaTalk Output
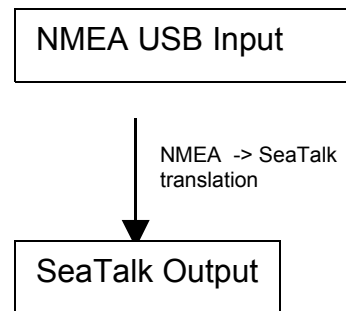
Same type of Data on NMEA & SeaTalk

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 in 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. So - If one device should break, we have an automatic switchover to the remaining functioning device.

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 also be sent to the NMEA Bus for every received SeaTalk datagram – regardless as to whether it was recognised and processed or not.
(Transmission of the $STALK sentence is switch off by default and can be switched on by control setting – see below)

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 **NMEA B**ridge **S**et **E**eprom)
Configuration settings a read, when the bridge gets switched on. So when you change the configuration, you need to switch it off/on to activate the changes.

How to set the configuration :

Connect the bridge to a PC.
Open a terminal programm (i.e. hypertern) and set it to 4800 Baud, 8 Bit, no parity, no handshake.
Type " $xxx " and press ENTER
Bridge responds with " $xxx ". When you receive the $xxx, connection to your bridge is ok. If $xxx does not appear after you pressed ENTER, check connection, setting of Com-Port, Baudrate etc.

Example 1 :

> In this example, we configure the bridge, so that every incoming SeaTalk sentence will be sent to the PC as $STALK,xx,yy   sentence.
>
> In your terminal programm enter
>
> $SNBSE,0,1
>
> The bridge will respond with
>
> $SNBSE,0,1
>
> Next time you switch the bridge on, it will send every incoming SeaTalk sentence to the PC as a $STALK,xx,yy,zz …   sentence.

Example 2 :

In this example, we configure the bridge, so that it only translates data from SeaTalk to NMEA – but does not sand anything the the SeaTalk Bus.

In your terminal programm enter

$SNBSE,16,0 ⮐

The bridge will respond with

$SNBSE,16,0

Next time you switch the bridge on, it will not send anything to the SeaTalk Bus but it will only listen for SeaTalk data and translate them to NMEA.

Addresses and descriptions for $SNBSE Sentence

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 (Default) 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, the only way to reconfigure the device is loading new Software which resets all settings to default values.**
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 below
4	1= Echo every incoming NMEA Sentence 0 = Do not echo incoming NMEA sentences
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	Not used for USB SeaTalk bridge

13	Not used with USB SeaTalk NMEA Link
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 **Only valid if Address "0" is switch on.**
16	0 = Don't send any data to the SeaTalk Port. SeaTalk Port is READ-ONLY
17	0 = Display windspeed in knots. 1= Display windspeed in m/s
18	0 = Don't send SOG to SeaTalk 1 = Send SOG to SeaTalk
19	0 = Don't send Position to SeaTalk 1= Send Position to SeaTalk
20	0 = Display depth on SeaTalk instrument in feet, 1 = display in meters
21	Currently not used
22	0=send only RMC Sentence for Position 1=send GLL and RMC Sentence for Position
23	23+24 Offset of depth transducer. In mm (+- 1000th Meter) If this value is set to -1, the bridge will send DBT NMEA Sentence and no offset will be used. If this values is set to something between -32000 to 32000, the bridge will produce DPT sentences including the offset.

25	0 = translate data from SeaTalk to NMEA even if allready received from
	     NMEA (default)
	1 = if the same type of data are available on SeaTalk and NMEA,
	     stop translating of this type of data .
	
	Needed if the PC Software echoes incomming NMEA Data to NMEA Port.
	Example :
	The bridge reveives position data from SeaTalk from a SeaTalk GPS
	-> It sends the position data as NMEA to the PC
	-> The PC echoes position back to the bridge,
	** The bridge receives it on it's NMEA Port.**
	
	In this case, Bridge would receive position data on it's SeaTalk port and
	on it's NMEA Port. It would stop translating any new arriving position data from the SeaTalk GPS because it "thinks" there are already postion data available on the NMEA side.

26	0=don't send RSA Sentence 1=send RSA Sentence for Rudder angle

Reading actual configuration settings :

In your terminal programm, enter

$SNBSE,address [⬅]

(Example : $SNBSE,0 [⬅])

The bridge will respond with „ $SNBSE,0,1„

- Parameter 0 is currently set to 1 -

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@gadgetPool.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 PC Software is needed. (Provided with every bridge on CD)
Latest Software versions can be found at http://www.gadgetPool.de

Bootstrap Loader

Disconnect bridge from USB and from SeaTalk Bus.

Connect the SeaTalk NMEA bridge to your PC (plug in USB connector)

Open a terminal programm (i.e. hypertern), select your serial port and set it to 4800 Baud, 8 Bit, no parity, no handshake.

Enter :
> **$SWUPDATE** ⏎

The Bridge will respond with :
> **$SWUPDATE**
> **Software Update Function will start in 040 sec.**
> **......**

Exit the terminal programm.
Immediately start "Megaload" - the supplied bootstrap software - on the PC.
Open the programm image file you would like to program into the bridge. (xxx.hex)
Open the eeprom image file you would like to program into the bridge. (xxx.eep)
Select **9600 Baud**
Select your serial port in bootstrap software
Wait until the 40 sec. have passed.
The Bootstrap Software finds the SeaTalk NMEA Bridge and flashes the new software.

Warning :
Always select a proper image file. If a file not suitable for the bridge is selected (like a text file, an image file for a different device,or anything else) the bridge software will be reprogrammed with this wrong data and the bridge will not be working anymore !!

SeaTalk & NMEA conversion Table

Function	SeaTalk ID	NMEA	Stalk -> NMEA	NMEA->Stalk
Depth	0	DBT	X	X
Speed t. water	20	VHW	X	X (See SNBSE,14)
Speed t. water	26	VHW	X	
Trip mileage	21	VLW	X	
Total mileage	22	VLW	X	
Water temperature	23	MTW	X	
Water temperature	27	MTW	X	X
Total / Trip mileage	25	VLW	X	X
Wind angle	10	MWV	X	X
Wind speed	11	MWV	X	X
Compass	84	HDM (VHW)	X	
Compass ST40	89	HDM	X	X
Speed over ground	52	RMC	X	X
Course over ground	53	RMC	X	X
Compass heading and Rudder position	9C	HDM/ RSA	X	
Latitude	51	RMC	X	X
Latitude	51	GLL		X
Longitude	50	RMC	X	X
Longitude	50	GLL		X
UTC time	54	RMC	X	X
UTC time	54	ZDA		X
# of sats	57	GGA		X
Date	56	RMC	X	X
Date	56	ZDA		X
Special NM->ST	any	$STALK	X	X
Special config.	-	$SNBSE		

News and Info on the web.

If you have any question or suggestions – there is a SeaTalk NMEA Bridge forum on our web page. http://www.gadgetPool.de

Errata

Nothing known

November, 18th 2006

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		