ShipModul
Marine Electronics

MiniPlex-42BT NMEA-0183 multiplexer Manual

Bluetooth™
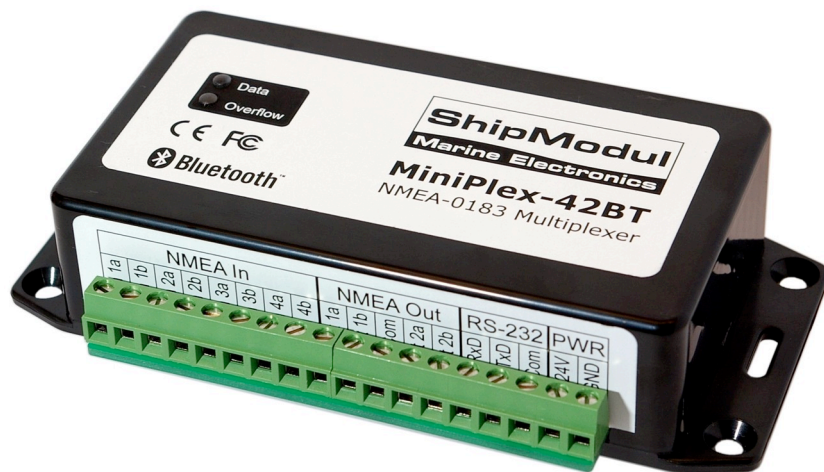
Introduction

The MiniPlex-42BT is a four-channel NMEA multiplexer, enabling the connection of multiple NMEA-0183 instruments to each other and a computer. Available are four NMEA inputs (*listener*-ports), two NMEA outputs (*talker*-ports) and one Bluetooth interface for a wireless connection with a computer or PDA (Personal Digital Assistant, like Windows CE PDA's or Palm PDA's). For special purposes, an RS-232 port is also available, but this port only outputs NMEA data, when the multiplexer is in factory configuration. The MiniPlex-42BT offers many features for manipulating incoming NMEA data like sentence filtering, real time mode, talker ID modification etc.

Specifications:

Supply voltage:	8 – 30 V_{DC}, protected against reversed polarity.
Current consumption:	100 mA (150 mA max. with fully loaded talker ports and active Bluetooth connection).
Inputs:	4 x NMEA-183/RS-422, galvanically isolated.
Input resistance:	>800 Ohm.
Outputs:	1 x RS-232, 2 x NMEA-183/RS-422, 1 x Bluetooth
Buffers:	5 buffers of 1000 characters (4 x NMEA, 1 x Bluetooth).
Filter list size:	50 sentence types
Priority list size:	50 sentence types
NMEA Out1:	Combined data from NMEA inputs.
NMEA Out2:	Combined data from NMEA, Bluetooth and serial inputs or only from Bluetooth and serial input..
Speed NMEA in:	4800 Baud.
Speed NMEA out 1 / RS-232	4800-38400 Baud (NMEA HS).
Speed Bluetooth:	38400 Baud internal, any speed selectable on computer.
Speed NMEA out 2:	4800 Baud.
Indicators:	Overflow and Data.
Bluetooth Device Name:	"MiniPlex 42BT"
Bluetooth Pass Key (PIN):	"0000"
Bluetooth tranceiver:	Type: TDK TRBLU20-00100, Class 1 device. FCC ID: PI4-TDK-BTISM. Canada: 1931-TDK-BTISM.
Dimensions:	138 x 72 x 33 mm.
Housing:	Flame retardant ABS.

Operation

The MiniPlex-42BT reads NMEA sentences from the listener ports and stores them in a buffer, one for each input. The sentences are read from the buffers in a round robin fashion, one sentence at a time, giving each listener port equal priority. Each sentence is then sent to the talker port(s), the Bluetooth interface and the RS-232 port. Also, sentences received from the RS-232 port and the Bluetooth interface, are sent to the talker port NMEA Out2. De selected operating mode (Server, Hub, AIS) determines which information is being sent to which port, as shown in the matrix below.

	NMEA In 1	NMEA In 2	NMEA In 3	NMEA In 4	Bluetooth In	RS-232 In
NMEA Out 1	H/S/A	H/S/A	H/S/A	H/S/A		A
NMEA Out 2	H	H	H	H	H/S/A	H/S
Bluetooth Out	H/S/A	H/S/A	H/S/A	H/S/A		H/A
RS-232 Out	H/S/A	H/S/A	H/S/A	H/S/A	H	A

H: Hub mode, S: Server mode, A : AIS mode

The speed of the listener ports is fixed to 4800 Baud (= bits per second), which equals 480 characters per second. When all listener ports receive data at this rate, the buffers will not be emptied in time and an overflow situation occurs. The red LED indicates this situation. When a buffer is full, a partially received sentence will be discarded, to ensure that the MiniPlex-42BT only sends complete and valid NMEA sentences.

There are three ways to resolve this overflow situation:

1. Configure the instruments on the listener ports to send less data or with greater intervals. It is often possible to disable non-relevant sentences.

2. Many instruments do not allow selection of NMEA sentences to be output. In this case, use the NMEA sentence filter in the multiplexer to block unwanted sentences. Unwanted sentences are discarded immediately.

3. Set the operation mode of the multiplexer to Server mode (factory default). This mode only sends incoming data to the computer/PDA and to NMEA Out1, which is high speed. In Hub mode, the high speed ports must wait for every character to be transmitted over the low speed NMEA Out 2 port.

The MiniPlex-42BT has two talker ports, 'Out 1' and 'Out 2'. All received sentences from the listener ports are available on talker port 'Out 1'. Talker port 'Out 2' can be configured either to output all received sentences from the listener ports and the computer/PDA (Hub Mode), or only sentences from the computer/PDA (Server Mode).
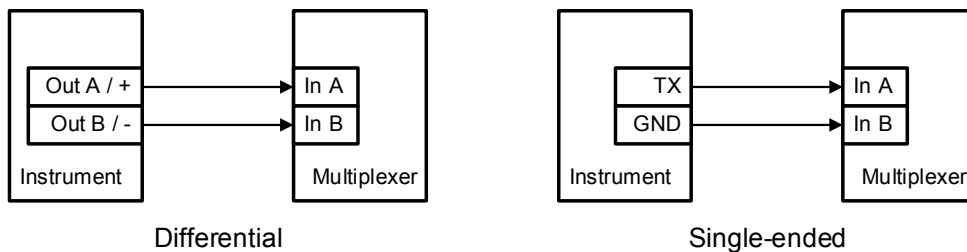
Connections

NMEA Listener Ports

The MiniPlex-42BT has four listener ports, 'In 1' to 'In 4'. Each listener port should be connected to one instrument only. These inputs are galvanically isolated from the multiplexer, as specified in the NMEA-0183 standard.

Connect the 'a' and 'b' terminals of the listener port on the MiniPlex-42BT to the 'a' and 'b' terminals of the talker port on the instrument. Other designations used are 'Data +' and 'Data -', 'TX+' and 'TX-' or 'Out +' and 'Out −'.

Some instruments have single ended talker ports, with only one data terminal. Connect this terminal to the 'a' terminal on the MiniPlex-42BT, and connect the 'b' terminal on the MiniPlex-42BT with the instrument ground.

Differential   Single-ended

NMEA Talker Ports

Both talker ports can be connected to up to four instruments. Connect the 'a' and 'b' terminals of the talker port on the MiniPlex-42BT to the 'a' and 'b' terminals of the listener port(s) on the instrument(s). Other designations used are 'Data +' and 'Data -', 'RX+' and 'RX-' or 'In +' and 'In −'.

Some instruments have single ended listener ports, with only one data terminal. Connect this terminal to the 'a' terminal on the MiniPlex-42BT, and leave the 'b' terminal on the MiniPlex-42BT unconnected. Connect the 'Com' terminal on the MiniPlex-42BT with the instrument ground.

Differential   Single-ended

Multiple instruments

rear-view of
9-pin sub-D connector

MiniPlex-42
terminals
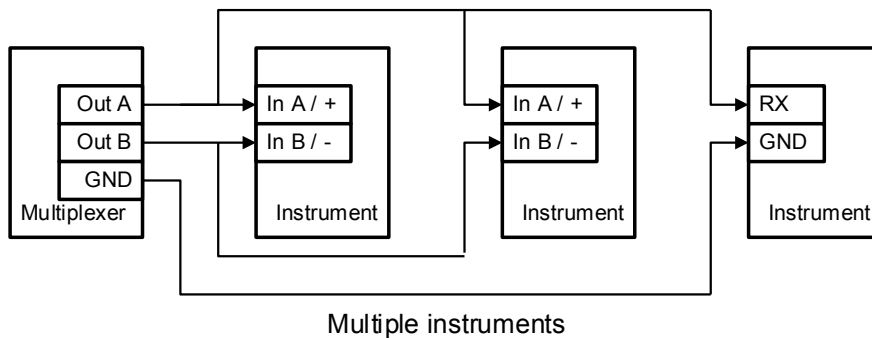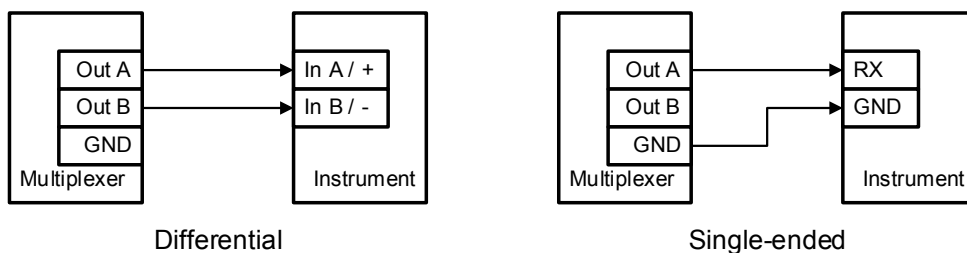
SeaTalk

SeaTalk is a proprietary protocol developed by Raymarine®. This protocol is used for communication between marine navigation instruments like the ST40, ST50 and ST60 series. To be able to use this data with commonly available navigation programs or to feed this data to other, non-Raymarine instruments, it needs to be translated to NMEA. Even Raymarine's own navigation software, Raytech Navigator, needs this translation.

The MiniPlex-42BT can be connected to the SeaTalk bus and translate all SeaTalk data required for navigation into NMEA sentences. NMEA Input 4 can be switched to SeaTalk mode and should be connected as follows:
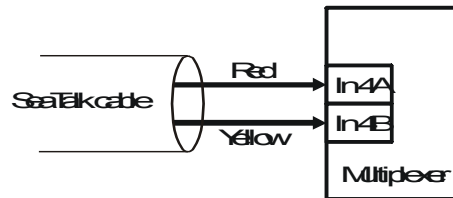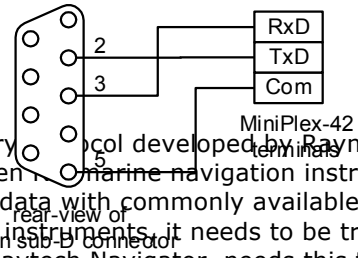
Connecting SeaTalk

The screen of the Seatalk cable is not connected to the multiplexer.

Bluetooth

The MiniPlex-42BT communicates with a computer or PDA through it's Bluetooth interface, allowing the computer/PDA to receive all incoming NMEA data. The computer/PDA can also send data back to the multiplexer, which can be used to control an autopilot connected to NMEA Out2.
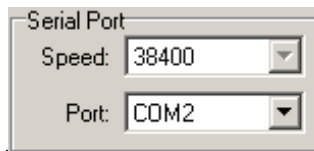
The Bluetooth interface uses the 'Serial Profile', which means that on the computer/PDA, this connection is presented as a standard COM port. Such a COM port can be opened by any application. To setup a connection, the MiniPlex-42BT must be paired to your computer/PDA. Pairing is a process that makes a Bluetooth device know to a computer and vice versa, by their unique address. Pairing is initiated on the computer or PDA by issuing the appropriate commands on the respective devices. Mostly this will be something like 'Find Bluetooth Devices'. This operation will show a list of Bluetooth devices in the near surroundings that have responded to the computer's/PDA's inquiry scan. The MiniPlex-42BT will be listed as "MiniPlex42BT". Select the MiniPlex42BT entry and enter the required passkey when asked. The passkey of the MiniPlex-42BT is '0000' (four zeros). Follow the directions of your Bluetooth adapters' software to finish the pairing process and assigning it to a COM port (in case of a computer). This COM port will now be assigned to the MiniPlex-42BT.

Your navigation software can now open this COM port and function as normal. Depending on the implementation of the bluetooth software on your computer/PDA, it might ask for the passkey when you start your nagivation software.

Data which is sent over the Bluetooth connection will appear at NMEA Out2 but also at the serial port of the multiplexer when configured in Hub-mode.

RS-232 Computer Port

The RS-232 port on the MiniPlex-42BT can be connected directly with the serial port of a computer, as shown in the diagram below.

The serial port behaves in exactly the same way as the Bluetooth interface. All received NMEA data is available at the serial port as well as at the Bluetooth interface. If data is sent to the serial port in Hub-mode, it will not only be sent to the NMEA Out2 port, but also to the Bluetooth interface.

The serial port is set to 38400 baud when shipped. It can however be set to any speed in the range from 4800 to 38400 baud using the MPX-Config utility.

Power Supply

The MiniPlex-42BT operates from a DC supply voltage from 8 to 30V and is protected against reversed polarity. It is recommended to connect the MiniPlex-42BT to the same power source or circuit breaker as the ships instruments and/or computer.

Configuration

Various options can be configured on the MiniPlex-42BT, using the supplied configuration program MPX-Config. There is no installation procedure for this utility, just start it from the CD or copy it to a suitable folder on the harddisk of your computer.

The top part of MPX-Config shows the NMEA sentences which are received by the multiplexer. The bottom part shows the configuration controls. The File menu allows you to store the configuration settings of the multiplexer to a file or load the configuration from a file. This file format is similar to the Windows INI file format, allowing editing the files with a text editor. Appendix A shows an example of a configuration file.

The MiniPlex-42BT is configured with proprietary NMEA sentences. MPX-Config sends these sentences to the multiplexer but they can also be issued with a terminal program. See Appendix B for a complete reference of the supported proprietary sentences.
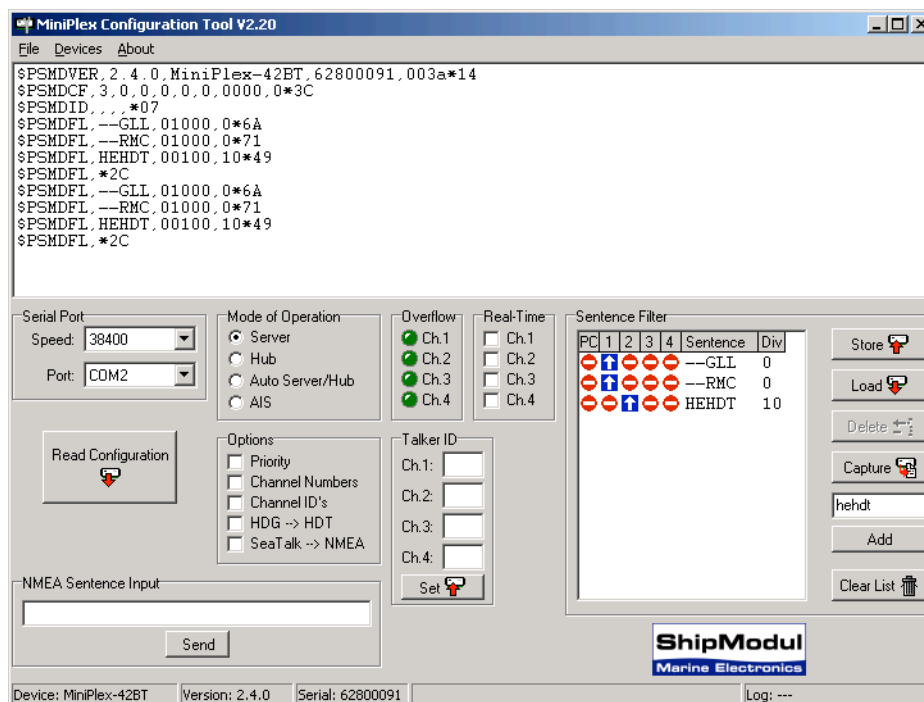
Screenshot of MPX-Config

Connecting

The MiniPlex-42BT can be configured with MPX-Config, a utility that talks to the multiplexer through a Bluetooth connection or the serial port. Before being able to configure the MiniPlex-42BT, select the COM port to which the multiplexer is paired using Bluetooth or the physical COM port when using a direct serial connection. When

GPRMB	LCRMB
GP(	
GPI	

Options
- ☐ Priority
- ☑ Channel Numbers
- ☐ Channel ID's
- ☐ HDG --> HDT
- ☐ SeaTalk --> NMEA
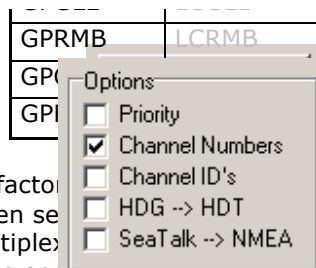
selecting the baudrate for the first time, choose 38400 (facto... ...Automatic' to let MPX-Config detect to what speed the multiplexer has been se... ...seconds, especially when instruments are sending data to the multiplex... ...er does not respond' - message appears, set the speed manually. The spe... ...applies to the RS-232 port and NMEA Out1 (these work in parallel). There is no speed setting for the Bluetooth interface.

Read Configuration

Every time you start MPX-Config, it will request the current configuration from the MiniPlex-42BT. When this is unsuccessfull (various controls on the MPX-Config window are greyed), you can manually request the current configuration with this button.

The status line on the bottom of the MPX-Config window will show the name of the multiplexer, the internal software version, the serial number and the optinally loaded configuration file.

Priority

The Priority option assigns priority to incoming NMEA data, based on which input channel it is received. The Bluetooth input has the highest priority, followed by NMEA In 1, 2, 3 and 4 in descending order. If for instance two GPS receivers are connected to input 1 and 2 and both GPS receivers output a GPRMC sentence, only the one from the GPS on input 1 is passed. The multiplexer only uses the sentence formatter (the 'RMC' part) to compare. Another useful application is when a Loran-C receiver is used as a backup for the GPS. With the GPS connected to input 1 and the Loran-C receiver connected to input 2, the NMEA data from the GPS is passed while similar NMEA sentences (eg. LCRMB, LCGLL) from the Loran-C are blocked. When the GPS fails, a timeout mechanism ensures that after 10 seconds the NMEA data from the Loran-C is passed through the multiplexer.
Please note that not every sentence from a lower priority input is blocked. When for instance the Loran-C outputs GLC sentences (which a GPS definately does not), these are passed through the multiplexer too. The priority mechanism only works on sentences with a similar formatter (characters 3 to 5).

The following example shows what is passed and what not. The left column in the table shows the sentences from an imaginairy GPS and the right column the sentences from an imaginairy Loran-C. The sentences that are greyed in the table are blocked by the priority mechanism. The table shows that only the GLL and RMB sentences from the Loran-C are blocked. If it is necessary to block the remaining sentences from the Loran-C, the Sentence Filter can be used.

The priority mechanism can store up to 50 sentence types to determine their priority. The list is scanned every second and entries older than 10 seconds are removed. This ensures that sentence types on lower priority inputs are passed when their counterparts on higher priority inputs are no longer received.

Channel Numbers

This option inserts channel number information in the NMEA stream output by the MiniPlex-42BT. Each NMEA sentence that is output on the Bluetooth interface is preceded by a proprietary NMEA sentence '$PSMDCN', to indicate on which NMEA input the following sentence was received. The following example shows that the IIGGA sentence was received on input 1, the GPGGA sentence on input 2, the IIGLL sentence on input 1 and the HEHDT sentence on input 3.

```
$PSMDCN,1*1A
$IIGGA,143357.999,5301.0061,N,00635.5479,E,1,06,1.9,90.0,N
$PSMDCN,2*19
$GPGGA,143357.999,5301.0061,N,00635.5479,E,1,06,1.9,90.0,N
$PSMDCN,1*1A
$IIGLL,5301.0061,N,00635.5479,E,143357.999,A*22
$PSMDCN,3*18
$HEHDT,67.0,T*1E
```
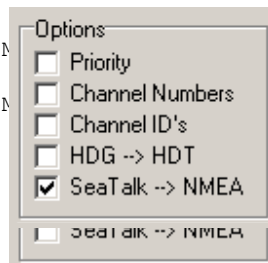
This channel number infor[mation]
used by our utility VirtualPl[ex]
NMEA sentences from a ce[rtain]
port on the MiniPlex-42BT [to a]
virtual serial port.

In the example on the righ[t]
VirtualPlex-1 is configured
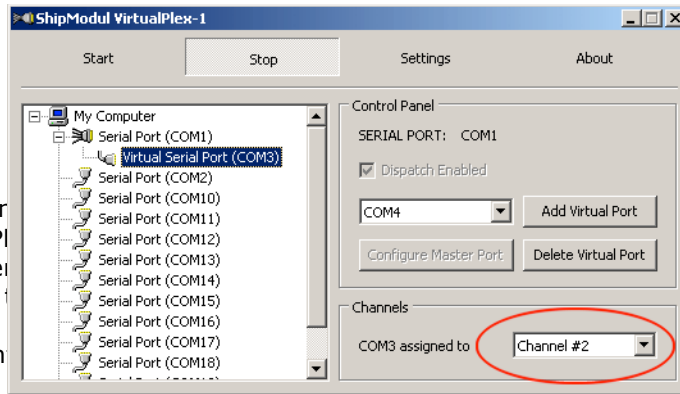virtual serial port COM3, which is
assigned to input channel 2 on the
multiplexer. Applications that open
COM3 will thus only receive NMEA
sentences from input channel 2 on the
multiplexer.

Channel ID's

The Channel ID's option changes the talker ID of incoming NMEA
sentences into 'Mx' where 'x' represents a number from 1 to 4. This
number corresponds with the input channel on which the sentence was
received. If for instance a GPS is connected to input channel 1 and this
GPS sends a GPRMC sentence, the multiplexer will change this into
M1RMC. This is a useful feature for navigation software that allows
selection of NMEA sentences based on the talker ID part.

HDG -> HDT

This option changes an HDG sentence (magnetic heading) into an HDT
sentence (true heading). If the HDG sentence contains a magnetic
variation, it is used to calculate the true heading from the magnetic
heading in the HDG sentence, otherwise the magnetic headign is just
copied into the HDT sentence. This option can be used when a device
like a Voyage Data Recorder needs a true heading from a gyro compass
while only a fluxgate compass is available.

Seatalk -> NMEA

To enable translation of SeaTalk into NMEA, check this option. Incoming
SeaTalk data from Raymarine instruments like the ST40, ST50 or ST60
series is translated into NMEA sentences which can be used by other
instruments or navigation software. Even Raymarine's own Raytech
Navigator software works with NMEA only and needs some form of
translation from SeaTalk into NMEA. Appendix C lists the SeaTalk data
that is translated into NMEA.

Mode of Operation

The MiniPlex-42BT can operate in three different modes: Server, Hub
and Automatic. Basically, these modes determine which NMEA data is
available on NMEA Out2.

Server mode: In this mode, the combination of computer/PDA and multiplexer acts as an NMEA server. Incoming NMEA data from NMEA In1 to In4 is sent to the computer/PDA over the Bluetooth port or the serial port. Only NMEA data from the computer/PDA is available on NMEA Out2.

Hub mode: In Hub mode, the multiplexer acts as a hub where all NMEA data comes together and is sent to all outputs. All incoming NMEA data, from NMEA In1 to In4 and the computer/PDA is available on NMEA Out2.
This mode has one limitation: since all NMEA data is sent to the Bluetooth port *and* NMEA Out2, the total throughput is limited by the speed of NMEA Out2, which is fixed to 4800 baud. Even while the Bluetooth port is set to 38400, the throughput will be 480 characters per second, the same as on NMEA Out2.

Auto mode: When Auto mode is selected, the multiplexer automatically switches between Hub- and Server mode, depending on the presence of computer/PDA generated data. When the computer sends NMEA data to the multiplexer (on the Bluetooth interface), the multiplexer is in Server mode. When no data is received on the Bluetooth interface, the multiplexer will switch to Hub mode after a time out of 10 seconds.

AIS mode: This mode is used to connect an AIS receiver running at 38400 baud. The AIS receiver must be connected to the RS-232 port of the multiplexer (RxD and COM only) while the computer must be using the Bluetooth interface. The communication speed of the multiplexer must be set to 38400 baud. The multiplexer will now send the data received from the RS-232 port to the Bluetooth channel and to NMEA Out1, unlike in Hub or Server mode, where it is also sent to NMEA Out2. NMEA Out1 can be connected to a chartplotter like the Raymarine[©] C or E series, which can display AIS information.

Auto mode is very useful when sailing alternately with our without a laptop. Consider a typical setup as shown:
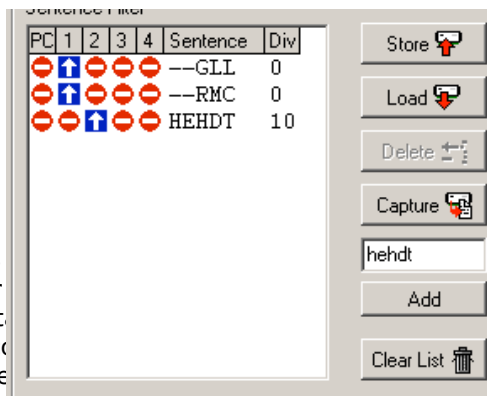
When the laptop is on board, it will receive all information from the instruments and the running navigation software is able to calculate the course to steer and drive the autopilot accordingly. Because the laptop is sending NMEA data, the multiplexer is in server mode and the autopilot will therefore receive information from the laptop only.

When the laptop is not on board, the multiplexer switches to in hub mode and sends all data from the intruments directly to the autopilot. This way, the autopilot will receive course information directly from the GPS.

NMEA Out1 is not affected by the mode setting. On this output, only NMEA data from the NMEA inputs is available at NMEA HS (High Speed) at 38400 baud. The same is true for the RS-232 port.

Real-Time

The Real-Time option bypasses the buffer on a specific channel. In normal operation, all incoming NMEA sentences are stored in a buffer, one for each channel, which holds approximately 2 seconds of NMEA. In situations with heavy NMEA traffic, these buffers can be filled up quite rapidly until an overflow occurs (read LED blinks). Normally an overflow situation is not dangerous, it only means that every

PC	1	2	3	4	Sentence	Div
⊖	⬆	⊖	⊖	⊖	--GLL	0
⊖	⬆	⊖	⊖	⊖	--RMC	0
⊖	⊖	⬆	⊖	⊖	HEHDT	10

Store
Load
Delete
Capture
hehdt
Add
Clear List

now and then an incoming NMEA sentence [...] [...]oom left to store the entire sentence.

However, when a fluxgate or gyrocompass [...] 0 or 20 times per second, the corresponding input buffer [...]. Together with NMEA data from other instruments, the tot[...]ultiplexer gets so high that almost all used inputs are in c[...]table delay of information of up to 12 seconds. This make[...]n a compass course.

By enabling the Real-Time option on a channel that is connected to a compass, the buffer on that channel is bypassed and the NMEA data from the compass is passed through the multiplexer immediately. Some NMEA sentences will be discarded when the multiplexer is servicing another channel, but this is far less a problem than having a 12 second delay in the course information.

The overflow indicators on the MPX-Config screen can also be used to determine which channel is causing the overflow. The LED corresponding to the compass channel will be lit almost continuously.

Running the multiplexer in Server mode will never result in overflow or long delays.

Talker ID

The MiniPlex-42BT allows you to change the talker ID of incoming sentences. The effect is the same as with the Channel ID option, but here you can specify the talker ID per input channel. Enter the desired talker ID in the edit box of the desired channel and press the Set button to send the setting to the multiplexer. Pressing the Read Configuration button will read the Talker ID settings from the multiplexer. To clear a talker ID, simply clear the edit box(es) and press the Set button. Please note that any combination of two characters can be used as talker ID, including spaces. Therefore, make sure you clear the edit box and not fill it with spaces if you want to clear a talker ID. With the setting as shown on the right, any NMEA sentence received on input channel 1 will get talker ID 'II'. Thus a GPRMC sentence from a GPS will be changed into IIRMC.

Sentence Filter

The sentence filter is a powerful feature that allows you to specifiy exactly which NMEA sentence may be received on any channel, including the Bluetooth interface. Up to 50 rules can be entered, either manually or by capturing the NMEA sentences that are received by the multiplexer.

Each filter rule constists of the address field (2 characters for the talker ID and 3 characters for the sentence formatter) of an NMEA sentence (eg. 'GPRMC') and an indicator for each channel (Inputs 1 to 4 and the PC). The indicator can be toggled between a pass sign (⬆) and a block sign (⊖) by clicking on it and determines whether that specific sentence will be passed or blocked by the multiplexer. Wildcards are allowed too, using the '-' character.

An Example
The first step is to fill the list with NMEA sentences to be filtered. This can be done automatically by pressing the 'Capture' button. All controls will be disabled during capture and the 'Capture' button changes to 'Stop'.

Leave the capture mode running for approximately 10 seconds. By that time, all connected instruments will have sent NMEA sentences. Press 'Stop' to end capture mode.

To make sure all sentences are captured properly, no Talker ID's may be specified for input channels 1 to 4.

After the capture process, the list may look like the example on the right: the list shows received sentences GLL and RMC on input 1 and HEHDT on input 2 (GLL and RMC would have been preceded by GP but more on that later).
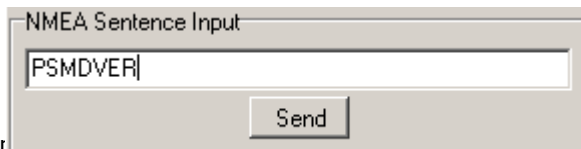
If for instance the GGA and GLL ser[...]ass signs of both sentences, to change them into a block sign. Pressing the Store button sends the list to the multiplexer. Now the filter is operational.

As can be seen in the picture, the GLL and RMC sentences contain two dashes ('--') to indicate a wildcard. This means that the first two characters are not used in the comparison with received data. Anything that has a sentence formatter of GLL or RMC is processed by the filter. When a list is caputered, you can click with the cursor on a sentence and edit the characters in the list. Thus, a captured seuqence with 'GPRMC' and 'GPGLL' can be changed into '--RMC' and '--GLL'. A useful purpose for wildcards is to block proprietary sentences from a device by entering 'P----' in the filter list. This will block any sentence that starts with a 'P'.

The number in the last column is a divisor factor. By default, this number is 0 and means that every sentence is passed. To lower the frequency of a sentence, a number between 2 and 99 can be entered. For instance, if a fluxgate compass is sending 10 sentences per second, and the multiplexer is suffering from an overflow situation due to the fluxgate sentences (or another device connected to NMEA Out1 or NMEA Out2), you can enter a 5 in the divisor column. The effect is that every fifth sentence will be passed while all others are blocked. This brings the sentence frequency down from 10 to 2 sentences per second.

Managing the list

The filter list is managed in MPX-Config and can be stored to or retrieved from the MiniPlex-42BT. Clicking on a traffic sign toggles it between a pass sign (⬆) and a block sign (⛔), which determines whether that specific sentence will be passed or blocked on that channel. Each column represents an input of the multiplexer, including the input from the computer (PC). The following management functions are available:

Store   Stores the filter list from MPX-Config into the multiplexer. Any existing filter rules in the multiplexer are overwritten with the ones in the list.

Load   Loads the filter list from the multiplexer into MPX-Config. The loaded filter rules are added to any existing rules in the list. If you do not want this, clear the list by pressing the Clear List button first.

Delete   Delete a filter rule from the list. Select the filter rule to be deleted by clicking on the formatter (e.g. 'RMC') and press the Delete button.

Capture   Enables the capture mode. The filter list will be filled automatically with the NMEA sentences that are received by the multiplexer. For this function to work, it is necessary that any 'Talker ID' settings be cleared first, since MPX-Config enables the 'Channel ID's' option to determine the input channel on which sentences are received. Any programmed Talker ID overrules the Channel ID for that channel, effectively blocking that channel for capturing.

Add   Add a filter rule. Type the desired sentence address into the edit box left of the Add button and press Add or the enter key. This will enter a new filter rule with all channels blocked (⛔). The input is case-insensitive; every entered sentence formatter will be converted into uppercase. The input must contain 5 characters, including wildcards.

Clear List   This button clears the filter list in MPX-Config (not the multiplexer!). To clear the list in the multiplexer, press the Store button after clearing the list in MPX-Config.

Manual NMEA input

MPX-Config allows manual entry of NMEA sentences for testing, configuration etc. Type the desired NMEA sentence in the edit box as shown on the right and press the Send button or the enter key. Do not precede the NMEA sentence with a '$' as MPX-Config will do this for you. The input is case sensitive, so whatever you type will be sent literally to the multiplexer. Since all NMEA commands are uppercase, you have to enter them as uppercase.

Indicators

The MiniPlex-42BT has two LED's. The green LED indicates the reception of valid NMEA data on the listener ports or the Bluetooth port. The LED only blinks on valid NMEA sentences that start with a

'$' or '!' and end with a LF character, thus indicating a proper connection and polarity of the connected instrument. In case of a reverse polarity, the green LED will not blink.

The red LED indicates a buffer overflow, in case more data is coming in than can be transmitted. When a buffer is full, a partially received sentence will be discarded, to ensure that the MiniPlex-42BT only passes complete and valid sentences.

There are three ways to resolve this overflow situation:

1. Configure the instruments on the listener ports to send less data or with greater intervals. It is often possible to disable non-relevant sentences.

2. Many instruments do not allow selection of NMEA sentences to be output. In this case, use the NMEA sentence filter in the multiplexer to block unwanted sentences. Unwanted sentences are discarded immediately.

3. Set the operation mode of the multiplexer to Server mode (factory default). This mode only sends incoming data to the computer/PDA and to NMEA Out1, which is high speed. In Hub mode, the high speed ports must wait for every character to be transmitted over the low speed NMEA Out 2 port.

Both LED's will blink once when the power is applied to the MiniPlex-42BT. When the red LED stays lit, a hardware error is found during execution of the self-test.

Mounting

The MiniPlex-42BT is not waterproof. It should be mounted at a dry place, like behind the instrument panel, on a flat surface. Do not mount the MiniPlex-42BT in a metal enclosure or behind a metal panel, as this obstructs the radiowaves used for the Bluetooth connection.

Appendix A:

MPX-Config INI file format

The configuration file format of MPX-Config resembles the standard Windows INI file format. Below is an example with has all possible options listed.

```
[Configuration]
Priority=0
Channel Numbers=0
Channel IDs=0
HDG Translation=0
SeaTalk=0
Mode=0
RealTime Ch.1=0
RealTime Ch.2=0
RealTime Ch.3=0
RealTime Ch.4=0
Talker ID1=
Talker ID2=
Talker ID3=
Talker ID4=
[Filter]
--GLL=01000,0
--RMC=01000,0
HEHDT=00100,5
```

The serial port settings of MPX-Config are not stored in the configuration file. They are stored in the Windows registry, using the following keys:

```
HKEY_CURRENT_USER\Software\CustomWare\MPXConfig\BaudRate
HKEY_CURRENT_USER\Software\CustomWare\MPXConfig\SerialPort
```

Appendix B:

MiniPlex-42BT Proprietary NMEA commands

The MiniPlex-42BT multiplexers support some NMEA commands through proprietary NMEA sentences. They also generate certain proprietary NMEA sentences in some modes of operation or as a response to NMEA commands.

All commands have the following format:

$PSMDxx

$P: Start of a proprietary command. Dictated by the NMEA standard.
SMD: ShipModul manufacturer's mnemonic.
xx: Two- or three-character command code.

For ease of manual configuration, the commands issued to the multiplexer do not require a checksum. Sentences output by the multiplexer always contain a checksum. Sentences output by the multiplexer always contain a checksum, denoted with *hh in the descriptions below.

Command reference

VER – Get Version

Retrieves version information from the multiplexer. The multiplexer responds with the following version sentence:

$PSMDVER,2.4.0,MiniPlex-42BT,60025943,0012*hh<CR><LF>

2.4.0:   software version number
MiniPlex-42BT: product descriptor
60025943:   serial number
001F: Multiplexer capabilities. This is a 4 digit, 16-bit field represented as a
                   hexadecimal number. Each bit identifies a capability of the multiplexer. The
                   following bits are defined:
                   2-0: Interface type, 0 = serial, 1 = USB, 2 = Bluetooth
                   3:    -42 model
                   4:    Seatalk -> NMEA conversion

CN - Channel Number indicator
This sentence precedes an NMEA sentence to indicate through which input channel the sentence was received.

$PSMDCN,x*hh<CR><LF>

x: channel number 1,2,3 or 4.

Example: $PSMDCN,1*1A<CR><LF>

This sentence sets the configuration of the multiplexer. The same sentence is sent by the multiplexer in response to a CFQ sentence.

Command: $PSMDCF,b,m,s,p,n,i,rrrr,h[*hh]<CR><LF>

b: baudrate selector: 0 = 4800 baud
   1 = 9600 baud
   2 = 19200 baud
   3 = 38400 baud

m: mode selector: 0 = Server mode
   1 = Hub mode
   2 = Auto mode
   3 = AIS mode (BT models only)

s: Seatalk translation: 0 = off
   1 = on
   2 = dump all unknown Seatalk datagrams (PSMDST,xx,xx,…)
   3 = dump all Seatalk datagrams

p: Channel priority: 1 = on, 0 = off

n: Channel numbers: 1 = on, 0 = off

i: Channel ID's: 1 = on, 0 = off

r: Real-time mode: 1 = on, 0 = off. Four digits, one digit channel, numbered from 1 to 4

h: Heading translation: 1 = on, 0 = off

hh: optional checksum

When sending this command to the multiplexer, it is not necessary to specify every field when only one configuration parameter has to be changed. Fields preceeding the one to be changed can be left blank. Fields after the one to be changed may be omitted. When for example only the channel priority must be changed, the command "$PSMDCF,,,,1" may be sent. The fields 'b', 'm' and 's' are left blank while the fields for 'n' and 'i' are omitted.
The 's' field will always return a 0 or 1 in response to a CFQ command.

CFQ – Request current configuration

This sentence requests the current configuration settings from the multiplexer.

$PSMDCFQ<CR><LF>

The multiplexer responds with a CF sentence.

FL – Filter

This sentence speficies a filter rule which is applied on every incoming NMEA sentence. Sentences for which a rule is specified, will only be transferred if the input on which they are received matches the input specified in the filter rule.
Filter rules are specified by the formatter part of the NMEA address field, for instance the "RMC" part of a GPS "$GPRMC" sentence. For each filter rule, the inputs to be passed can be specified. Sentences for which no rule exists are passed unrestricted.

$PSMDFL,ccccc,xxxxx,[dd][*hh]<CR><LF>

ccccc: Sentence address of the filter rule (e.g. "GPRMC", "IIMWV", etc). This field may contain wildcard characters ('-'). For instance, "GP---" will apply to all sentences starting with "GP". Similarly, "--MWV" will apply to all sentences ending on "MWV" regardless of the talker ID.

xxxxx:	Inputs to pass. Each 'x' represents an input to assign to this rule, numbered from 0 to 4, where input 0 is the computer interface (serial or USB) and 1 to 4 represent NMEA inputs 1 to 4. A '1' means to pass, a '0' means to block. When all x'es are '1', the filter rule is removed.
dd:	Optional divisor factor (0..99). The frequency of a sentence is divided by this number to reduce the number of sentences in time. If for instance a divisor of 6 is specified for a sentence, only every 6th sentence is passed. This can be used to reduce the output of a high-speed heading sensor.
hh:	Optional checksum

A FL sentence without any parameters will erase all rules.

Example: $PSMDFL,GPRMC,10011<CR><LF>

This sentence specifies a rule for all sentences which have the "GPRMC" sentence formatter. When this rule is applied, only "GPRMC" sentences on inputs 0 (the computer), 3 and 4 are transferred. An FL sentence with wildcards on all positions is discarded.

FLQ – Request filter list

This sentence requests the filter list from the multiplexer. The multiplexer responds by sending FL sentences, one for each list entry. An empty FL sentence denotes the end of the list.

Example:

```
$PSMDFL,GPRMC,10011,0*hh<CR><LF>
$PSMDFL,GPGGA,10001,0*hh<CR><LF>
$PSMDFL,--VWT,01000,5*hh<CR><LF>
$PSMDFL,GPGSV,00001*hh<CR><LF>
$PSMDFL,*hh<CR><LF>
```

The sentences may not be dumped as one contiguous block. In case of heavy NMEA traffic, they may be interspersed with other NMEA sentences.

ID – Talker ID

Enables a Talker ID to be set for a specific channel. If the talker ID is set for a specific channel, the specified ID, before sending the sentence to the computer, replaces the original talker ID in the sentences received on that channel.

$PSMDID,aa,bb,cc,dd<CR><LF>

aa:	Talker ID for channel 1
bb:	Talker ID for channel 2
cc:	Talker ID for channel 3
dd:	Talker ID for channel 4

An empty field clears the ID and disables the translation for that specific channel. Sending PSMDID without any fields clears all translations.

IDQ – Request talker ID's

Requests the Talker ID Translation settings. The multiplexer responds with an ID sentence.

OV – Overflow

In case of a buffer overflow (blinking red LED on the multiplexer), an overflow sentence is output, to indicate on which input buffer the overflow occurred. To conserve bandwidth, this sentence has no checksum.

$PSMDOV,x<CR><LF>

x: Binary field. The first four bits indicate on which input buffer the overflow occurred.

Appendix C

Translated Seatalk datagrams

When the Seatalk translation is enabled, the following datagrams are translated into NMEA sentences:

SeaTalk	NMEA	Description
00	DBT	Depth below transducer
10	MWV	Wind angle, (10 and 11 combined)
11	MWV	Wind speed, (10 and 11 combined)
20	VHW	Speed through water
21	VLW	Trip mileage (21 and 22 combined)
22	VLW	Total mileage (21 and 22 combined)
23	MTW	Water temperature
25	VLW	Total and Trip mileage
26	VHW	Speed through water
27	MTW	Water temperature
50	---	Lattitude, value stored
51	---	Longitude, value stored
52	---	Speed over ground, value stored
53	RMC	Course over ground. RMC sentence is generated from stored values from 5x datagrams.
54	---	GMT time, value stored
56	---	Date, value stored
58	---	Lat/Long, values stored
89	HDG	Magnetic heading, including variation (99)
99	---	Magnetic variation, value stored

As appears from the table, not all datagrams result in an NMEA sentence. Some datagrams are only used to retrieve a certain value to be combined into one NMEA sentence.

When the Seatalk translation is enabled with with option 2 (the 's' parameter in the CF sentence is 2), unlisted datagrams are translated into a proprietary NMEA sentence with the following format:

$PSMDST,aa,bb,cc,dd…*hh<CR><LF>

aa,bb,cc,dd… represent the hexadecimal value of the bytes from the received Seatalk datagram.

Declaration of Conformity

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Declare under our sole responsibility that the product

ShipModul MiniPlex-42BT

to which this declaration relates is in conformity with the following specifications:

EN/IEC60945:2002 and EN/IEC61162-1:2000
EN300328 and EN301489
FCC Title 47 CFR, Part 15, FCC ID: PI4-TDK-BTISM

The product herewith complies with the requirements of the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

Assen, 06-06-2006   M. Sprang

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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