

ShipModul

Marine Electronics

MiniPlex-41USB NMEA-0183 multiplexer Manual



MiniPlex-41USB, V1.0
Firmware V1.30

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Introduction

The MiniPlex-41USB 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 USB port for connection with a computer.

Specifications:

Supply voltage:	5V _{DC} from USB bus or 8 – 30 V _{DC} , protected against reversed polarity.
Current consumption:	50 mA (100 mA max. with fully loaded talker ports).
Inputs:	4 x NMEA-183/RS-422, galvanically isolated.
Input resistance:	>800 Ohm.
Outputs:	1 x USB, 2 x NMEA-183/RS-422.
Buffers:	5 buffers of 1000 characters (4 x NMEA, 1 x USB).
NMEA Out1:	Combined data from NMEA inputs.
NMEA Out2:	Combined data from NMEA and USB inputs or only from USB input.
Speed NMEA in:	4800 Baud.
Speed NMEA1/USB out:	4800, 9600, 19200 or 38400 Baud.
Speed NMEA2 out:	4800 Baud.
Indicators:	Overflow and Data.
Dimensions:	138 x 72 x 33 mm.
Housing:	Flame retardant ABS.

Operation

The MiniPlex-41USB 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 ports and the USB port.

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-41USB only sends complete and valid NMEA sentences.

There are two 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. Increase the speed of the USB port on the MiniPlex-41USB. The maximum speed is 38400 Baud. From 19200 Baud and up (4 x 4800!) an overflow will never occur (except when in Hub Mode).

The MiniPlex-41USB 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 USB port (Hub Mode), or only sentences from the USB port (Server Mode).

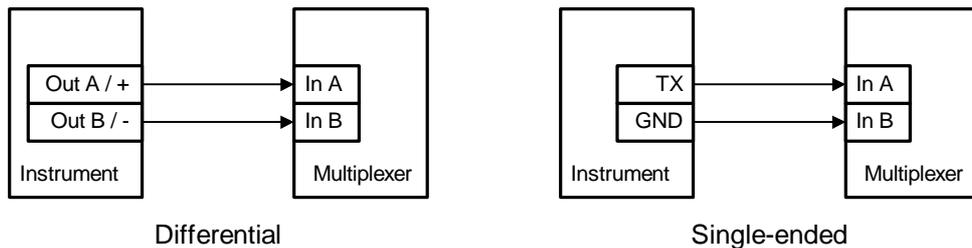
Connections

NMEA Listener Ports

The MiniPlex-41USB 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-41USB 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 -'.

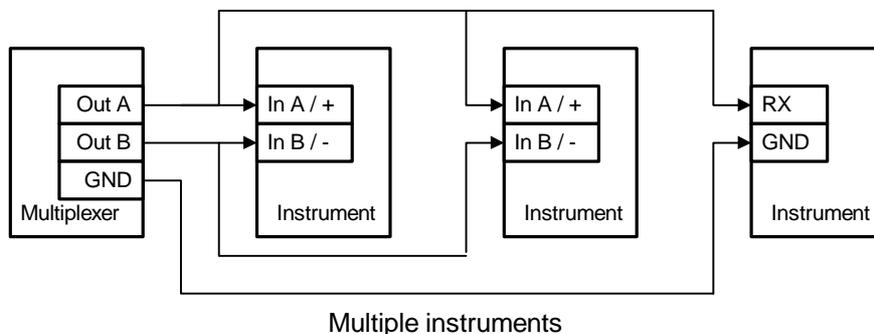
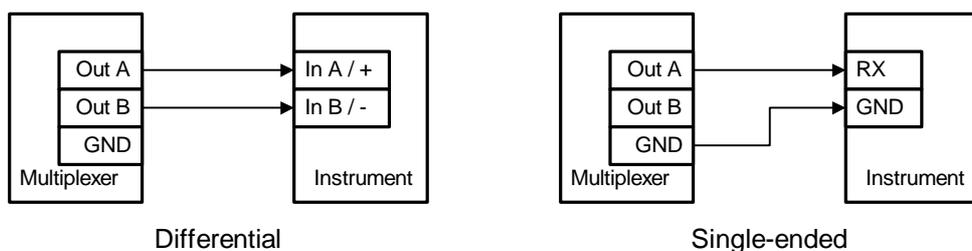
Some instruments have single ended talker ports, with only one data terminal. Connect this terminal to the 'a' terminal on the MiniPlex-41USB, and connect the 'b' terminal on the MiniPlex-41USB with the instrument ground.



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-41USB 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-41USB, and leave the 'b' terminal on the MiniPlex-41USB unconnected. Connect the 'Com' terminal on the MiniPlex-41USB with the instrument ground.



USB Port

The MiniPlex-41USB can be connected directly with the USB port of a computer or a USB hub with the supplied cable. The first time the MiniPlex-41USB is connected, the computer will detect new hardware and ask for a driver disk. Insert the driver disk into the diskdrive and click OK. Follow the directions on the screen to complete the installation. The installation on Windows 2000 and XP is a two step process. First, the driver for the MiniPlex-41USB will be installed. Next, Windows will detect a USB Serial device and will install a driver for that.

Power Supply

The MiniPlex-41USB operates from a DC supply voltage from 8 to 30V and is protected against reversed polarity. It is recommended to connect the MiniPlex-41USB to the same power source or circuit breaker as the ships instruments and/or computer.

Driver Installation

The MiniPlex-41USB needs a device driver for proper operation which is supplied on the driver disk. When the MiniPlex-41USB is connected for the first time, Windows will detect new hardware and ask for a driver disk. Insert the supplied disk into the disk-drive and follow the instructions on your screen. The installation on Windows 2000 and XP is a two step process. First, the driver for the MiniPlex-41USB will be installed. Next, Windows will detect a USB Serial device and will install a driver for that.

The installed driver will provide a virtual serial port, which can be used by existing applications like any normal serial port. This port will be named 'COMx' were 'x' is the first number available after the existing serial ports. If for instance COM1 and COM2 are already present, the created virtual serial port will be named COM3.

To determine the number of the newly created port, go to the 'Device Manager' and open the branch 'Ports (COM & LPT)'. The port for the multiplexer is listed as 'USB Serial Port (COMx)' where 'COMx' is the name of the newly created serial port.

To change this port number, double click on the 'USB Serial Port (COMx)' entry to open the property page of this port. Next, select the 'Port Settings' tab and click on the 'Advanced...' button. In the appearing window the used port number can be changed. Do not change any other setting in this window.

It is possible to select a port number that is already present on the computer, like COM1. The original COM1 port will then be disabled als long as the MiniPlex-41USB is connected to the computer. This feature allows the port number to be set in a low range from COM1 to COM4, to accommodate software that only allows COM1 to COM4 to be selected.

More than one MiniPlex-41USB can be connected at the same time. Every new unit will create a new virtual serial port. The number of this port will always be assigned to the same unit.

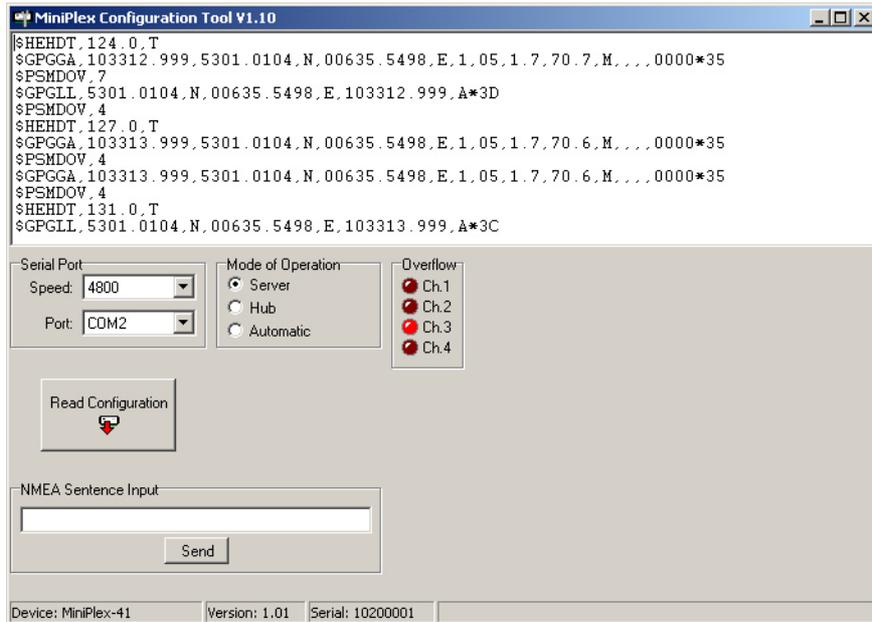
Windows allows a maximum of 256 virtual serial ports. Not all software may be compatible however, with serial ports numbered above COM9.

When installing updated drivers, uninstall the original drivers first with the 'Add/Remove Programs' icon in the Control Panel or use the 'Update Driver' button on the 'Driver' page of the 'USB Serial Port' property-page.

Configuration

Various options can be configured on the MiniPlex-41USB, using the supplied configuration program MPX-Config. There is no installation procedure for this utility, just start it from the diskette 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 has the configuration controls.

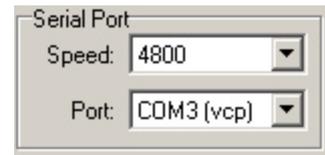
The MiniPlex-41USB is configured with proprietary NMEA sentences. MPX-Config sends these sentences to the multiplexer but they can also be issued with a terminal program. See Appendix B for a complete reference of the supported proprietary sentences.



Screenshot of MPX-Config

Serial Port

Before being able to configure the MiniPlex-41USB, select the COM port to which the multiplexer is connected. The virtual port created by the driver is marked with '(vcp)'. When selecting the baudrate, either choose 4800 (factory default) or choose 'Automatic' to let MPX-Config detect to what speed the multiplexer has been set. This may take a few seconds, especially when instruments are sending data to the multiplexer. When a 'Multiplexer does not respond' - message appears, disconnect or shut down any connected instrument. Another option is to try every possible setting from 4800 to 38400 baud, until NMEA data appears in the top window of MPX-Config. When the right baudrate has been found, the multiplexer will follow any change you make: when you set MPX-Config to 38400 baud, the multiplexer will also be set to this value, in order to keep 'synchronized' with MPX-Config. If you exit MPX-Config, the settings will be saved.



Read Configuration

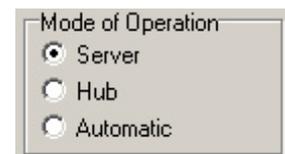
Every time you start MPX-Config, it will request the current configuration from the MiniPlex-41USB. When this is unsuccessful (various controls on the MPX-Config window are greyed), you can manually request the current configuration with this button.



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

Mode of Operation

The MiniPlex-41USB can operate in three different modes: Server, Hub and Automatic. Basically, these modes determine which NMEA data is available on NMEA Out2.



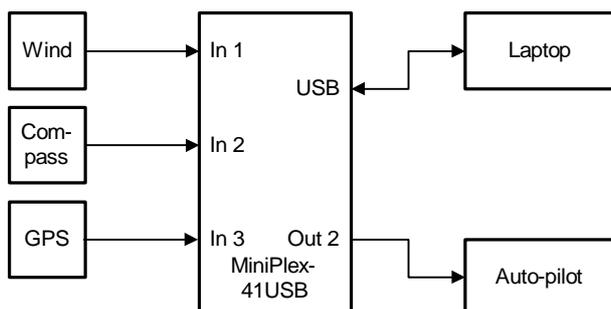
Server mode: In this mode, the combination of computer and multiplexer acts as an NMEA server. Incoming NMEA data from NMEA In1 to In4 is sent to the computer on the USB port. Only NMEA data from the computer is available on NMEA Out2.

Hub mode: In Hub mode, the multiplexer acts as a hub where all NMEA data comes together and is sent out again. All incoming NMEA data, from NMEA In1 to In4 and the computer, is available on NMEA Out2. This mode has one limitation: since the NMEA data is sent to the USB port *and*

NMEA Out2, the total throughput is limited by the speed of NMEA Out2, which is fixed to 4800 baud. Even when the USB port is set to 38400 baud, 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 generated data. When the computer sends NMEA data to the multiplexer (on the USB interface), the multiplexer is in Server mode. When no data is received on the USB interface, the multiplexer will switch to Hub mode after a time out of 10 seconds.

Auto mode is very useful when sailing alternately with our without a laptop. Consider a typical setup as shown below:



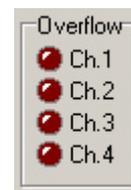
When the laptop is connected, it will receive all information from the instruments and the running navigation software is able to calculate the course to steer and drive the autopilot accordingly. Because the laptop is sending NMEA data, the multiplexer is in server mode and the autopilot will therefore receive information from the laptop only.

When the laptop is not connected, the multiplexer switches to in hub mode and sends all data from the instruments 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. Since this output is connected in parallel with the USB port, it will operate at the same speed as the USB port. When the USB port is set to 38400 baud, NMEA Out1 will also run at 38400 baud.

Overflow

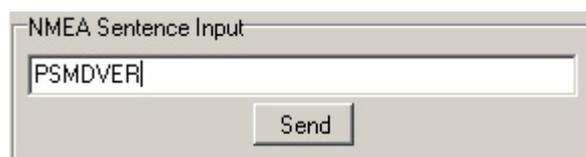
The overflow indicators on the MPX-Config screen indicate which channel is causing the overflow. Running the multiplexer at a serial port speed of 19200 baud or higher will never result in overflow or long delays.



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-41USB has two LED's. The green LED indicates the reception of valid NMEA data on the listener ports or the USB 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-41USB 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. Increase the speed of the talker port and the USB port on the MiniPlex-41USB. The maximum speed is 38400 Baud. From 19200 Baud and up (4 x 4800!) an overflow will never occur (except when in Hub Mode).

Both LED's will blink once when the power is applied to the MiniPlex-41USB. When the red LED stays lit, a hardware error is found during execution of the self-test.

Mounting

The MiniPlex-41USB is not waterproof. It should be mounted at a dry place, like behind the instrument panel, on a flat surface.

Appendix A:

MPX-Config Registry keys

The serial port settings of MPX-Config 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-41USB Proprietary NMEA commands

The MiniPlex-41USB 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,1.00,MiniPlex-41USB,1020f9a3*hh<CR><LF>

1.00: software version number
MiniPlex-41USB: product descriptor
1020f9a3: serial number

CF – Configuration

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<CR><LF> or
\$PSMDCF,b,m*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

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 preceding the one to be changed can be left blank. Fields after the one to be changed may be omitted. When for example only the mode must be changed, the command '\$PSMDCF,,1' may be sent. The field 'b' is left blank.

CFQ – Request current configuration

This sentence requests the current configuration settings from the multiplexer.

```
$PSMDCFQ<CR><LF>
```

The multiplexer responds with a CF 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.

Declaration of Conformity

We,

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The Netherlands
Tel.: +31 592 375700
Fax: +31 592 375550

Declare under our sole responsibility that the product

ShipModul MiniPlex-41USB

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

EN/IEC61000-6-1:1997 and EN/IEC61000-6-3:1996
FCC Title 47 CFR, Part 15 Class B

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

Assen, 5-6-2003

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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