

1 Introduction

[NMEA-0183](#) is an electrical standard to connect GPS, SONAR, sensors, auto pilot units, etc. in ships and boats. In difference to the newer NMEA 2000 standard (based on CAN) the NMEA 0183 is based on EIA RS422 (some older and/or simple systems use RS-232, or a single wire).

We want to show you in this application note how to connect a Raspberry Pi 3B to any NMEA-0183 device with differential output. Although the standard calls for isolated inputs and outputs its useful to use our RS422 / RS485 HAT with isolated interface.

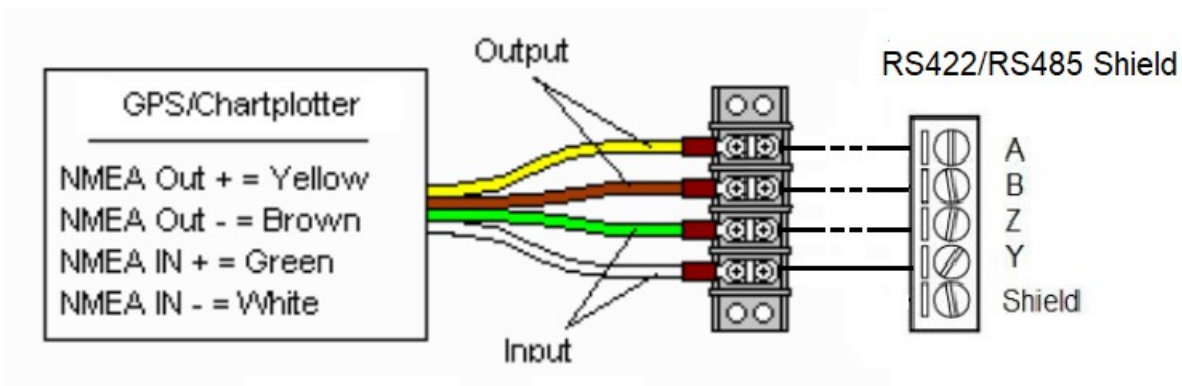


2 Bill of Material

- Raspberry Pi B+, B2 or B3
- [RS422/RS485 serial HAT](#) (available in our webstore)
- NMEA-0183 device with differential output

3 Wiring

In the picture below you can see a typical device with differential output. The terminals are NMEA OUT+ and NMEA OUT- or TX+ or TX-. The NMEA IN+ and NMEA IN- wires are optional.



If you have a single transmit wire from your device (most likely labeled TX or NMEA OUT or something like that), then your device uses the RS-232 protocol. In this case you will need a simple RS232 converter.

4 DIP Switch Settings

Configuration for RS422 mode is mandatory needed. Receiver is always on:

SW1	
1	ON
2	OFF
3	OFF
4	ON

SW2	
1	ON
2	ON
3	OFF
4	OFF

Please switch SW1 (terminating resistor) to ON position:

SW3	
1	ON
2	OFF
3	OFF
4	OFF

5 Free up Serial Line and Enable UART

5.1 Raspberry Pi 1 and 2 (old Raspbian Wheezy or Jessie)

On the Raspberry Pi 1 and 2 with an old Raspbian Wheezy or Jessie `ttyAMA0` might be used by the serial console.

To free it up do the following. Remove any references to `ttyAMA0` from `/etc/inittab` and `/boot/cmdline.txt`.

Our `/boot/cmdline.txt` looks like this:

```
dwc_otg.lpm_enable=0 console=tty1 root=/dev/mmcblk0p2 rootfstype=ext4 elevator=deadline rootwait
```

Please follow this link for more information:

http://elinux.org/RPi_Serial_Connection#Preventing_Linux_using_the_serial_port

If you want to run the latest version of Raspbian Stretch on your old Raspberry Pi 1 or 2 please follow the tutorial for Raspberry Pi 3 on the next page.

5.2 Raspberry Pi 3A, 3B and 3B+ (Raspbian Stretch)

The easiest way is to use the raspi-config tool to switch the UART to the GPIO14/15 pins.

- take a fresh Raspbian image
- `sudo raspi-config`
- goto '5 Interfacing Options'
- goto 'P6 Serial'
- 'Would you like a login shell to be accessible over serial?' --> NO
- 'Would you like the serial port hardware to be enabled?' --> YES
- Finish raspi-config
- reboot the Raspberry Pi

Now you can access the UART via **`/dev/serial0`**

5.3 UART test

You can easily test the function of the internal UART with Minicom or any other terminal program without a Modbus system.

If the UART `/dev/serial0` is free and connected to the GPIO14/15 pins of the 2x20 header of the Raspberry Pi then the TX Led of the HAT will blink when you send data from the terminal.

6 Firmware

You can find a lot of different NMEA-0183 software Python stacks for Raspberry Pi.

A very simple solution is the NMEA library by Nick Sweeting:

<https://github.com/nsweeting/NMEA0183>

Please note: pyserial is required for serial connections:

<https://github.com/pyserial/pyserial>