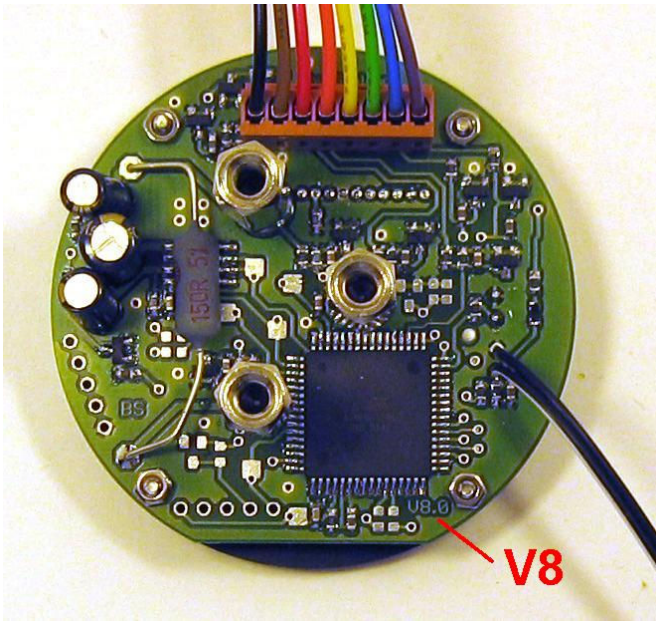
Overview

The Multi Gauge is an on-board computer for Yamaha FZS1000 (FZ1 Gen1) motorbikes and the like. It also provides the option to connect external “add-ons” to enhance functionality.

Most popular is the use of a GPS receiver, the software is already capable to decode and display the data.

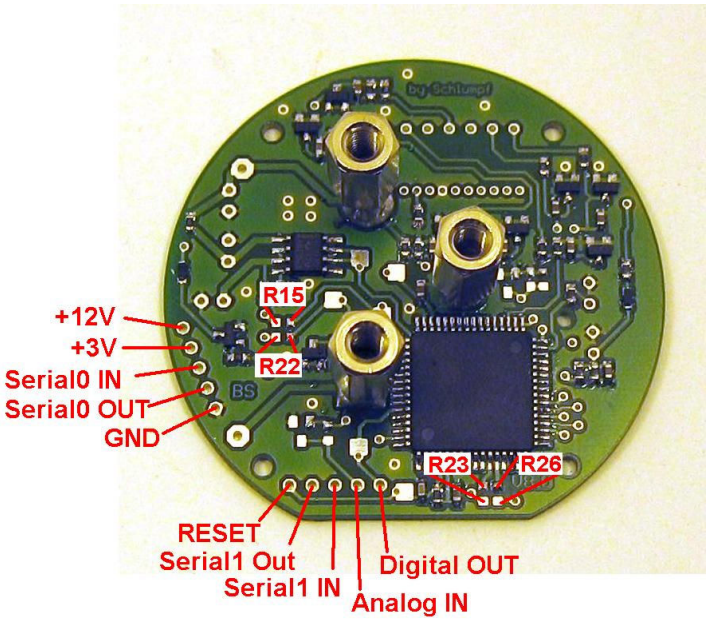
Hardware version

First check which hardware version is in place. The following explanantions only refer to version **V8**. The version number is etched into the copper. Older versions are electrically similar but do not offer dedicated solder points for easy access:



Extension headers

The following extension headers are intended to be used for connections.



cvieth@vodafone.de

Connecting a GPS receiver

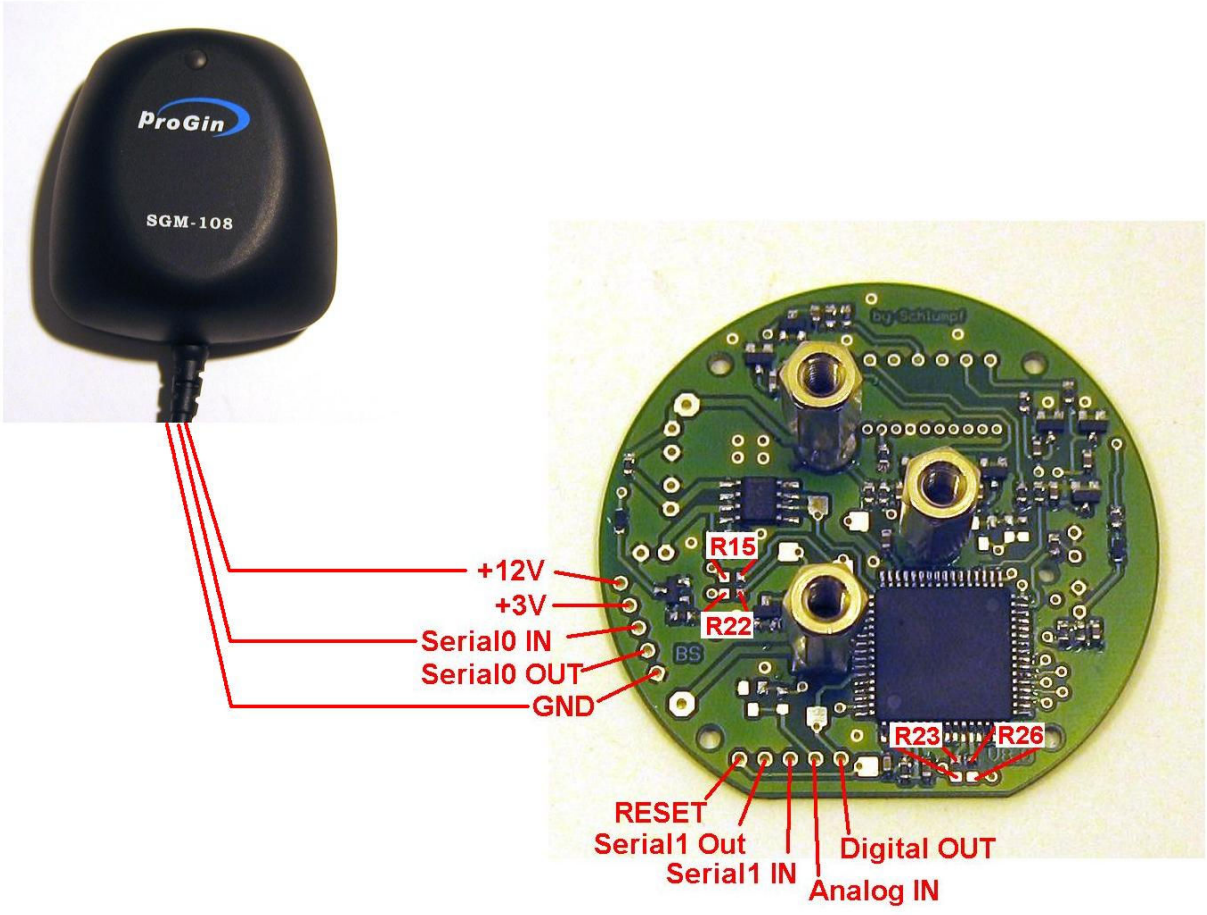
The Multi Gauge is able to process a standard GPS-NMEA signal at its serial0 input with the following properties:

- Output voltage level: 3V TTL, normal logic
- Baudrate: 1200 .. 38400 Baud
- Required messages: RMC, GGA

Those signals are typical for most GPS-modules. RS-232 signals are not usable due to invers logic and too high amplitudes. A cheap way to get such a module is to modify a cabled USB GPS receiver:

- Those devices typically run at 5V. You have to add a 12V to 5V voltage regulator for power supply or use the cockpit's supply, see below. The 3V supply of the multi gauge can not be used as its current capability is limited to less than 30mA.
- Tap the 3V NMEA TTL signal at the input of the USB-bridge IC (often PL2303) and route it to Serial0 IN.
- Populate R15 with 100 Ohm or similar.

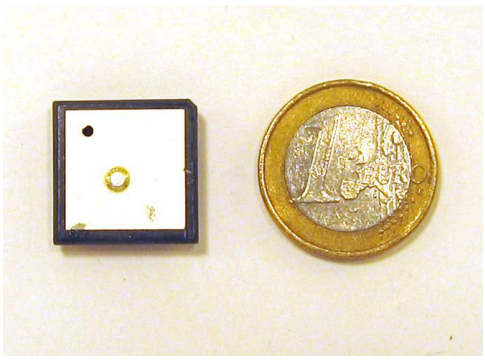
Connection to the multi gauge is done by 3 wires. As an example:

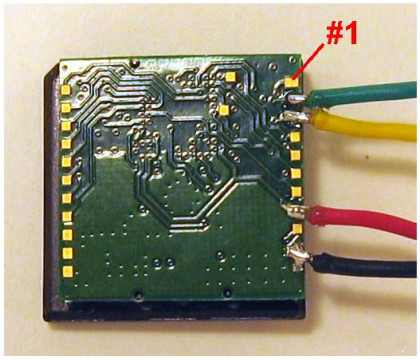


R15 has to be populated with a ~100 Ohm resistor to close the signal path. This also provides a minimum of protection for the processor in case of different signal levels between multi gauge and GPS module. The NMEA signal goes to serial input #0 of the processor only. *Serial0 OUT* is not used as the multi gauge is a listen-only device.

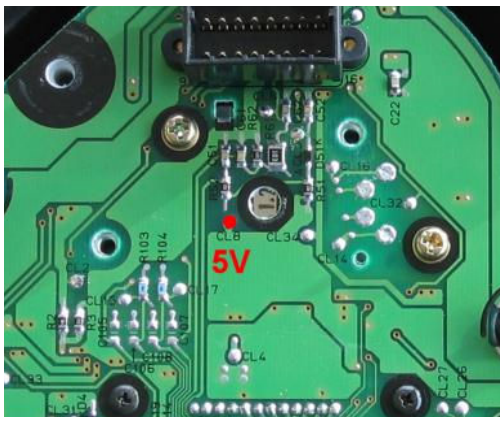
Those GPS receivers also exist as bare modules. Typical example are "*Navilock NL-552ETTL*" or *OriginGPS ORG1318*. Those modules need no modification as the output is already of 3V TTL type, only 5V has to be supplied.

The ORG1318 looks as follows, front and back:



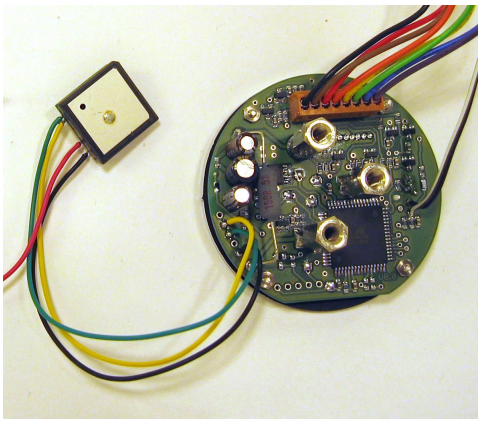


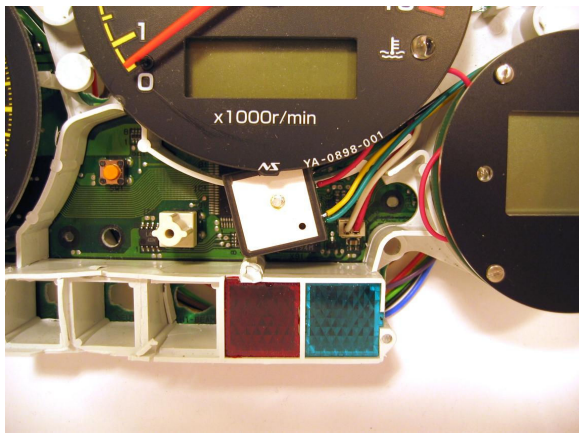
The 3V supply at #3 is used as reference for the I/O signal level. Other modules might run their outputs directly at 3V. A 5V level might also be acceptable if R15 is selected large enough to restrict compensations currents, or a Z-diode is added.
Connection to the multi gauge is done by 3 wires. The remaining wire has to be connected to 5V:



The most simple way to get a 5V supply is to tap the existing cockpit supply at "CL8". This supply is easily strong enough to also support a GPS module.

Using a (tiny) module gives the great advantage to place it inside the cluster. The housing's plastic is transparent for GPS signalsand gives best receiving conditions. To avoid vibrations the module should be wrapped into some air-bubble foil or alike.

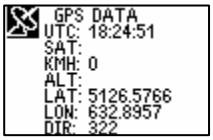


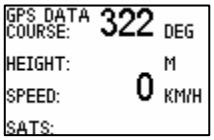


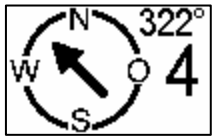
cvieth@vodafone.de

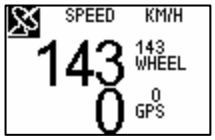
GPS support has to be enabled and set up in menu 2. Consult the user guide document for further details if needed. Enable, select baudrate and save. 4800 baud is a widely used standard. If set correctly message names will be shown in the upper right. Typically they are updated and altered every second:

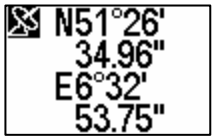
Viewmodes 30 up to 37 will start to display the GPS content. Depending on signal quality the antenna symbol (upper left corner) will be normal or inversed:

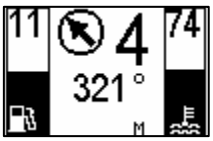


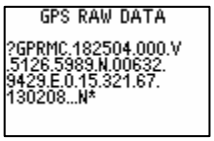












cvieth@vodafone.de

Connecting an external shift light LED

Terminal X2-4 (previously named Analog IN, processor port PF5) can be used as output to control an external shift light. Output is active high and can deliver a few mA@3V. See schematic for details if additional high current switching transistor is needed.

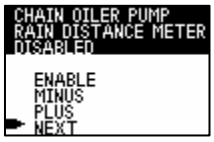
This function is activated by default.

Connecting a chain oiler pump

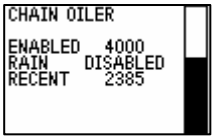
Terminal X2-5 (previously named Digital OUT, processor port PB1) can be used as output to control a chain oiler pump. Originally this function was designed to work with a “McCoi” chain oiler system. It provides a short pulse at every 4000 meters (adjustable). Very first pulse distance is halved. RAIN mode can be set manually, distance is then set to 2000 meters (adjustable).

The multi gauge is in no way capable to carry the pump’s current, a high current switching unit has to follow (e.g. MOSFET)!

This function has to be activated in menue 1. First menu sets normal distance (dry), second menu for rain:



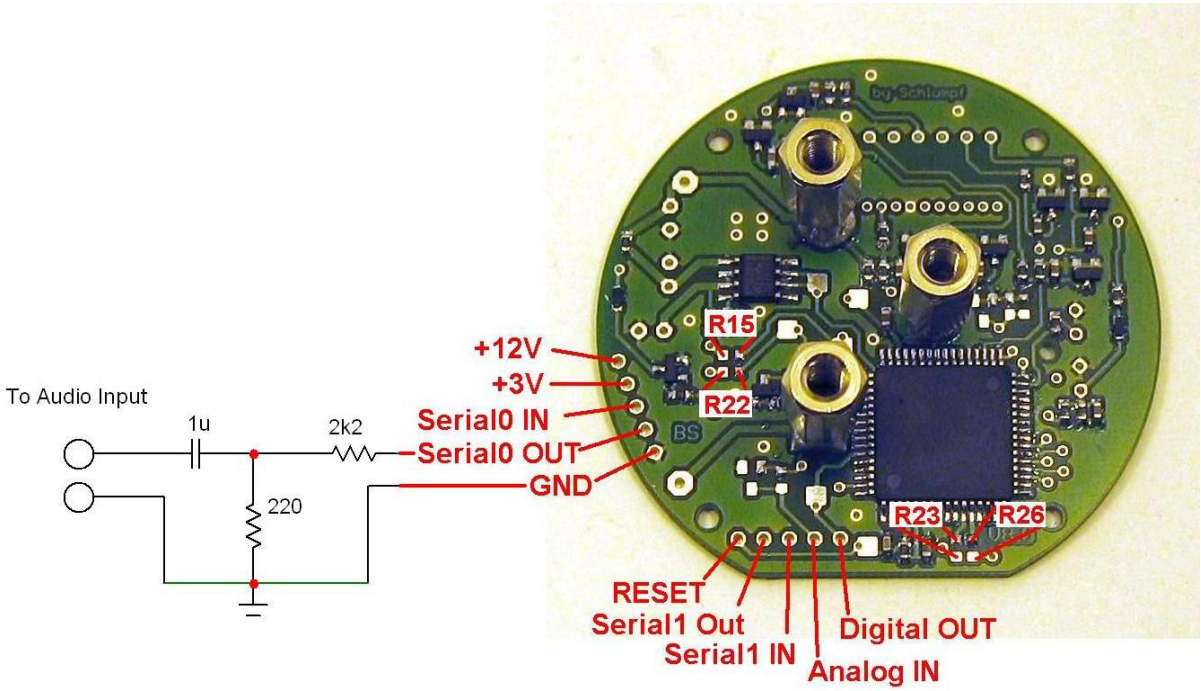
Viewmode 22 provides information about the actual status and elapsed distance:



cvieth@vodafone.de

Data Audio Streaming

The multi gauge is capable to provide all measurement values as an audio stream. The format is a kind of FSK, similar to early computer modem transmission. Storage can be done on any audio recorder, e.g. camcorder audio track or MP3 player. The data has to be post-processed on a PC to get it back in tabular format for subtitling or the like. A simple filter has to be added to the multi gauge and R22 shorted:



This function uses the same serial port as the GPS modification. It is not possible to run both at the same time.

Data audio streaming has to be enabled in menu 2. PLUS / MINUS shifts the fundamental frequencies:

The stream contains the following values, updated several times per second:

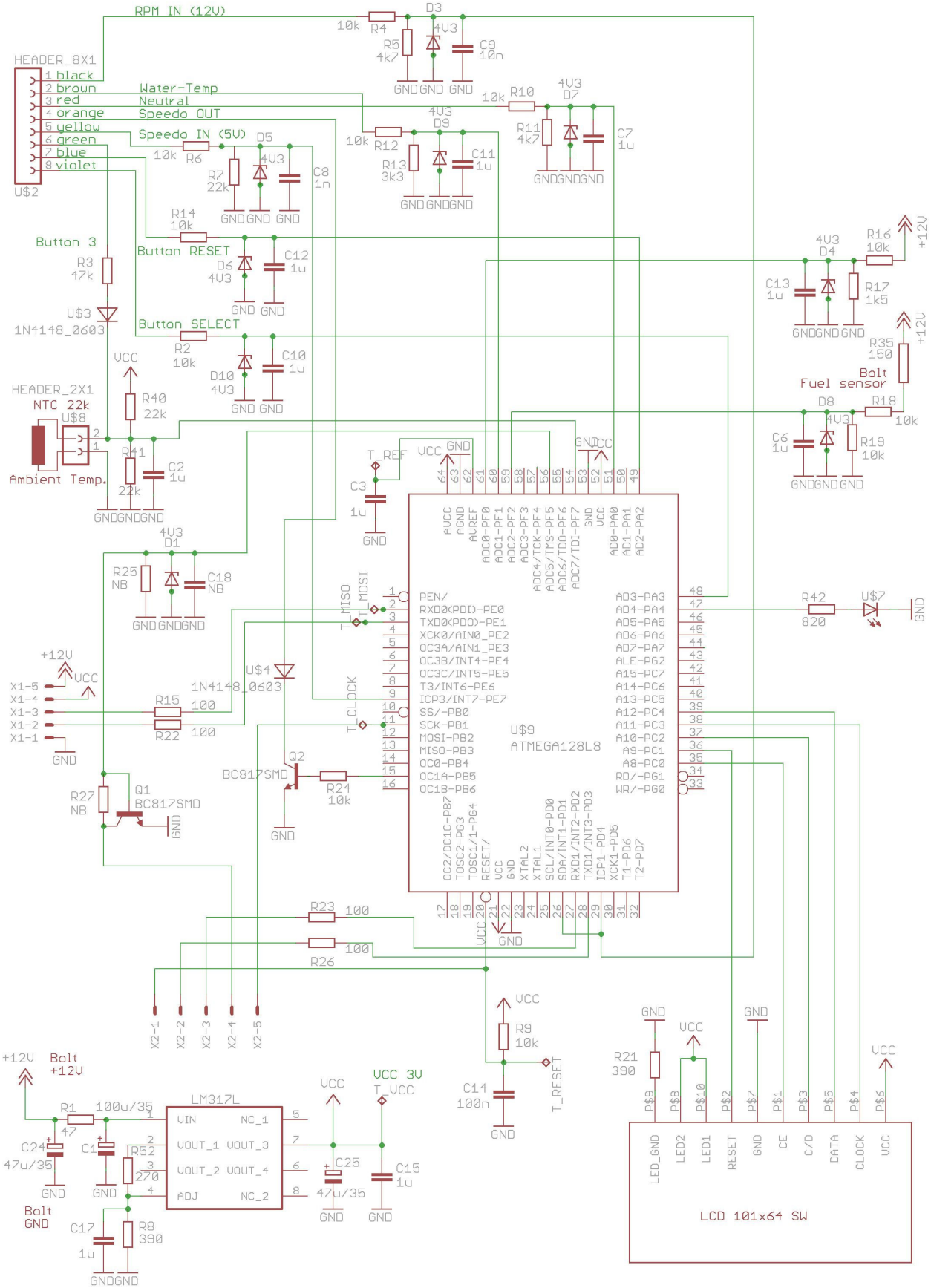
- Speed
- RPM
- Gear
- Elapsed distance
- Temperature water
- Temperature ambient
- Fuel level

Also realtime subtiteling with e.g. MAX7456 is thinkable. This circuit is directly looped into the video signal. It gets the data from the multi gauge and adds the data as a subtitle into the video signal. Further informations on request.

cvieth@vodafone.de

Multi Gauge schematic

Extension terminals: X1 and X2



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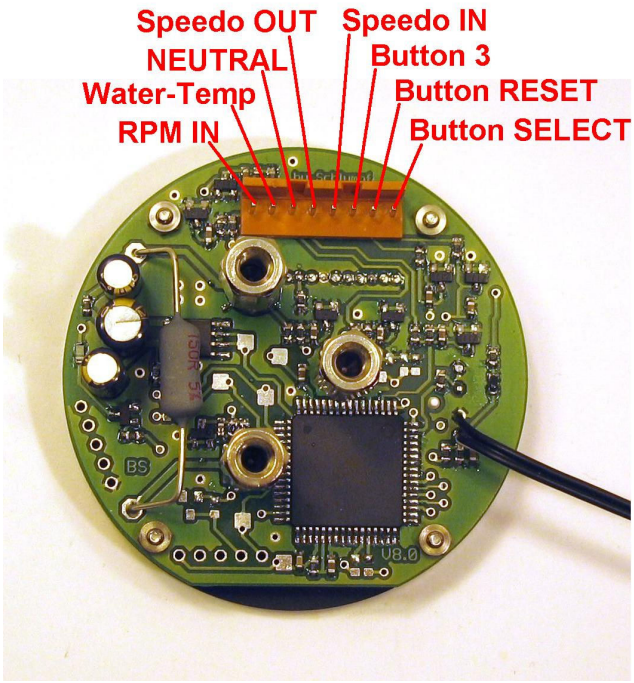
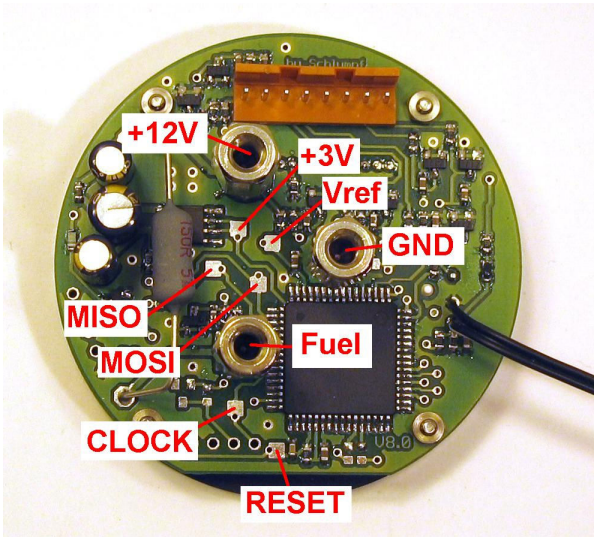
Important signals





cvieth@vodafone.de