# Gauge Wizard MK4   (firmware 4.4)

General

The Gauge Wizard MK4 is a gauge matching device capable of matching virtually any resistive sender to any gauge designed for resistive senders. It features a two stage warning output that can be used to indicate low fuel (steady first, then flash) or over temperature. Calibration allows for a 5 point adjustment of the gauge output which will cover all linearity mismatches caused by oddly shaped tanks, weirdly wound senders, ancient thermal gauges etc.

Connections

aux (white)
sender (green)
+12V (red)
lamp (orange)
gauge (blue)
ground (0V) (black)
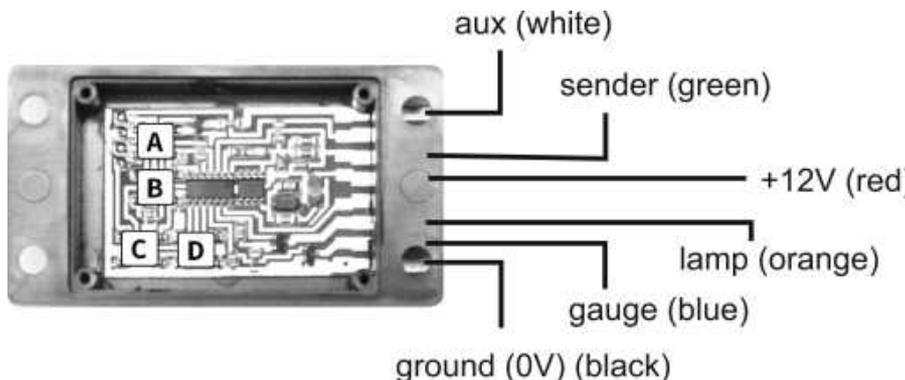
Electrical   (Maximum values)

Supply voltage   10 - 15V

Sensor resistance   0 – 2000 Ohms

Gauge output Load   3A (sink)

Low Fuel Load   3A (sink)

Load < 80mA @ 14.1V

(all outputs combined < 3A)

Note -
- +12V   Connect to a switched live (the module does not need to be powered to keep its memory) ideally direct to 12V, not through a voltage stabiliser and ***certainly not through a thermal voltage stabiliser***
- The wire from the sender to the gauge should be cut, and each part connected as shown
- The lamp output grounds to turn on the lamp, so the other connection on the lamp should be +12V
- Likewise the aux output grounds to turn on a lamp relay or sounder,
- The two unused socket ways are for future expansion DO NOT CONNECT

Calibrating.

The four buttons [A] [B] [C] [D] are used to select the various menu options to calibrate the wizard.

You need to calibrate both the input resistances AND the gauge positions as two separate processes.

There are several different methods of calibrating the sender input, each has its own advantages and disadvantages.

1. set each of the 5 individual calibration points one by one, by filling the tank, (heating the sender) to the required level (temperature). This is the most accurate method but is not required in all installations. If you do this, combine it with method 2 and measure the resistances with a multimeter for each calibration point in case for some reason you need to reprogram the inputs or make an error.

2. go through the process of filling the tank (heating the sender) but this time measure the resistance with a multimeter. Then, in turn, adjust the included variable resistor to each of the 5 resistances and use it as the input to the wizard.

3. enter each of the 5 individual calibration values by entering their resistance in Ohms.

4. set the empty and full calibration points and use the "set intermediates" option to set the intermediate values. Note, this is only suitable for linear senders in uniform shaped tanks and is unsuitable for temperature senders

5. measure the resistance of your sender at Empty and Full (*37C.(98F) and 100C.(212F)*) then choose the closest preset from the lists, this is the quickest and the easiest!

Once the inputs have been set as above, follow the instructions to set the 5 Gauge calibration points. with the [D] button.

Please ignore the gauge when setting up the inputs and ignore the sender position or temperature when setting the gauge positions. We hear of a lot of customers who try to set the gauge positions while they are setting the sender values..
                    this just makes it hard work and more complicated than it really is.

Throughout this instruction leaflet   [A] [B] [C] [D]   refer to the buttons in the module
       [4]   means 4 flashes of the LED
       ▲   means wait for the wizard to repeat the number of flashes

Example - so   [A] **[4]** ▲   means press and hold the "A" button until the LED has flashed 4 times then release the button, whereupon the wizard will repeat the 4 flashes back to you.

In this case the wizard will save the current sender value for ¾. The repetition is to allow you to check that you entered the correct number of flashes. In menu items with more than one step, if you get the wrong number, you exit the process by turning off the power.

After completing a change to the calibration, the wizard will flash one long flash before returning to the main menu.

Main Menu (Fuel)

[A]

     [1]   save current sender value for empty   * see ***save sender values*** section
     [2]   save current sender value for 1/4
     [3]   save current sender value for 1/2
     [4]   save current sender value for 3/4
     [5]   save current sender value for Full

[B]

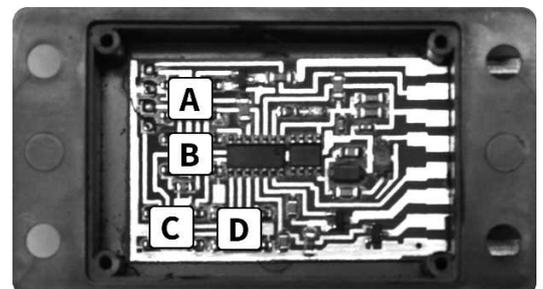   **[1]**   set anti slosh   * see ***anti – slosh*** section
     [2]   set intermediate sender values   * see ***intermediate values*** section
     [3]   invert operation of Aux output   just inverts the operation of the aux output
     [4]   choose preset block 1   * see ***choosing presets*** section
     [5]   choose preset block 2

[C]

     [1]   enter Ohms for empty   *   see ***entering values in Ohms*** section
     [2]   enter Ohms for ¼
     [3]   enter Ohms for ½
     [4]   enter Ohms for ¾
     [5]   enter Ohms for Full

[D]

     [1]   set gauge position for empty   * see ***setting gauge positions*** section
     [2]   set gauge position for ¼
     [3]   set gauge position for 1/2
     [4]   set gauge position for 3/4
     [5]   set gauge position for Full
     [6]   set gauge position for AUX
     [7]   set gauge position for Low Fuel
     [8]   set gauge position for Low Fuel Flash

Main Menu (Temperature)

[A]

    [1]   save current sender value for end of scale High Temp.   * see *save sender values* section
    [2]   save current sender value for boiling water (100C 212F)
    [3]   save current sender value for body temperature (37C / 98F)
    [4]   save current sender value for cold water
    [5]   save current sender value for end of scale Low Temp.

[B]

    [2]   set intermediate sender values   * see *intermediate values* section
    [3]   invert operation of Aux output   just inverts the operation of the aux output
    [4]   choose preset block 1   * see *choosing presets* section
    [5]   choose preset block 2

[C]

    [1]   enter Ohms for end of scale High Temp.   * see *entering values in Ohms* section
    [2]   enter Ohms for boiling water (100C 212F)
    [3]   enter Ohms for body temperature (37C / 98F)
    [4]   enter Ohms for cold water
    [5]   enter Ohms for end of scale Low Temp.

[D]

    [1]   set gauge position to stop of scale   * see *setting gauge positions* section
    [2]   set gauge position for boiling water (100C 212F)
    [3]   set gauge position for body temperature (37C / 98F)
    [4]   set gauge position for cold water
    [5]   set gauge position for bottom of scale
    [6]   set gauge position for AUX
    [7]   set gauge position for High Temperature
    [8]   set gauge position for High Fuel Flash

Example –
To invert the aux output (make on = off and off = on)   [B] **[3]** ▲
(or hold the A button down for 4 flashes release and the wizard will flash back 4)

Entering values in Ohms

This one is the most complicated! Once the wizard has repeated back the main menu selection, it will wait for user input.

Use the [A] key to choose whether to enter 100s, 10s or single Ohms (and finish) and the [B] key to enter the value
.   The best way to illustrate this is by way of example.

Example - Lets enter 245 Ohms.

[A] **[1]**   [B] **[2]**   (that enters 200 Ohms)
[A] **[2]**   [B] **[4]**   (that enters 40 Ohms)
[A] **[3]**   [B] **[5]**   (that enters 5 Ohms)
[A] **[4]**   (this tell the wizard to add the values, do the maths and store the result)

so [A] **[1]**▲   [B] **[2]**▲   [A] **[2]**▲   [B] **[4]**▲   [A] **[3]**▲   [B] **[5]** ▲   [A] **[4]**▲

Save Sender Values

You would normally use this with a sender or variable resistor connected to the input. When you select to save a sender value, after repeating the number of flashes back to you, the wizard will record the current value of the resistance connected to its sender input and store it in memory. There is no need to press any other key.

Anti-Slosh

Anti-slosh or needle damping is adjustable, leave this set to none until you are happy with all the other calibration settings. Once you have selected Anti-Slosh from the menu, the single flash will be repeated back to you and the wizard will wait for input.
Press and hold the [D] key to select how much anti slosh you want,

[D]

    [1]   No anti-Slosh
    [2] to **[8]**   Needle damping the higher the number, the more damping

Intermediate Values

This is a shortcut for linear sender. Selecting this menu item will calculate and store the three middle sender resistances using the current two end values. No further key entry is required.

C*hoosing presets*

The wizard has the pre-programmed input values for some common senders. To select these and load one into memory, choose the correct preset bank from the main menu, then, when the wizard has completed repeating the selection, select which individual sender by pressing and holding the [D] key for the requisite number of flashes.

Example - So a complete example to choose the MGA preset including the Main Menu selection would be

[B] **[4]** ▲   [D] **[1]** ▲
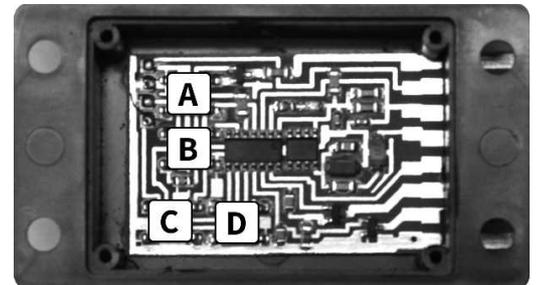
Bank 1   (Preset Fuel Gauge Senders)
[D]

		Resistances	
	Vehicle	Empty	Full
[1]	MGA	0	68
[2]	Hotham Healey	0	80
[3]	Chevrolet Camaro 1976	1.5	90
[4]	Murphy Sender	10	180
[5]	Middlebridge scimitar	17	249
[6]	Ultima GTR	74	9
[7]	Westfield SE1W long range with vdo dip tube	76	8
[8]	90 Ohm LPG sender in toirodal tank	93	4
[9]	1941 Ford	105	16
[10]	Thermal MGB/Midget 1965 on	230	18
[11]	Murphy Sender	240	33
[12]	Murphy Sender	240	30
[14]	Discovery	270	19

Bank 2   (Preset Temperature Gauge Senders)
D

	Vehicle	Resistances	
		37C.(98F)	100C.(212F)
[1]	Ford	70000	2070
[2]	Ford	20000	2070
[3]	Saturn Oil	1600	190
[4]	IAT	17000	2000
[5]	BMW	13000	2910
[6]		8000	910
[7]	TR67 Industrial	9011	1014
[8]	JEEP G. Cher.	6000	720
[9]	BMW	5500	1200
[10]	GM	1600	185
[11]	GM	1802	177
[12]	Land Rover	1500	200
[13]	WEMA	700	75
[14]	WEMA	300	46
[15]	PT100	113	138
[16]	SPIYDA "A"	480	50

Setting gauge positions

The quickest part of the process is setting the gauge positions. Once the wizard has repeated the menu selection back, just move the needle of the gauge using the A and B buttons, once you are happy with the needle position, press the C button to commit this to memory.

Example - So to set the gauge position for Low Fuel, D **[7]** ▲
Then use the A and B buttons to move the needle, up and down, until it is in the correct position , finally pressing the C button to finish.
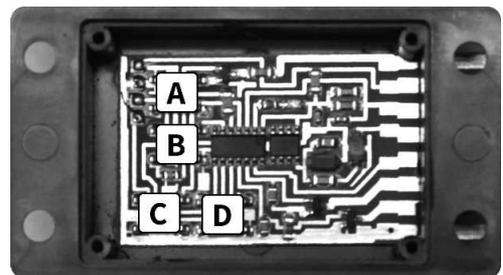
Further Notes on setting up

 The Outputs
        The gauge output is pulse width modulated, that means it connects the output to ground many hundreds of times a second. During the pulse, the length of time the output is grounded is varied. If the pulse doesn't ground at all, it is equivalent to a high resistance output. If the pulse grounds the output for its complete duration, that is equivalent to an output of zero Ohms. The wizard can vary this for zero to 100% so the equivalent of zero Ohms to a very high resistance.

        The aux and lamp outputs are a simple transistors that when active, grounds the output. So if you want to connect an LED for example, connect one end of your LED to +12V and the other leg to the wizard output (observing the correct polarity). The same is true of a relay, connect one side of the coil to +12V and the other to the wizard.

        When used with a fuel gauge, the auxiliary output can be used to switch between tanks or switch from LPG to conventional fuel, or it can be connected to a warning sounder to warn you to fill the tank!

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When used with a temperature gauge, the warning lamp is used to warn of high temperature and the aux output to switch on a cooling fan. It is also possible to move the warning lamp flashing to the end of the scale, then used the steady warning lamp to switch another cooling fan or water pump.

Using the outputs in this way will probably require a relay. Fans have a very high start up current and often, a device called an "inrush thermistor" is used to limit the start up current and protect the relay contacts from damage. Choose an inrush thermistor rated at a similar current to the steady running current of the fan.

It is even possible to use the gauge output to control a fan by pulse width modulation, but this requires a hefty transistor switch to carry the load, a relay will not work. Contact us for details.

Hints

The module uses a tiny amount of power, so you can connect to any existing fuse without compromising the existing circuits.

Included in the pack is a small 22 turn variable resistor that can be adjusted from 0 to 500 Ohms. This can save a lot of time and effort when calibrating. It is used when calibrating the input. You will still need to move the sender, fill the tank, or heat the thermistor but, use a multimeter to record the resistance of the sender at the various calibration points then you can simply set the variable resistor to the value and use it as a substitute sender! If you make a mistake calibrating, you won't have to empty the tank or go hold the temperature sender at a particular temperature, just re-adjust the resistor to your recorded value and try again ! You don't have to use this method, but it is strongly advised!

Use the back end of a pencil to push the buttons, the small tops can make your finger sore after a while, and the pencil gives a more positive press, reducing errors.

Fit the module on decent length wires so that you are not in an awkward position when calibrating.

If your gauge is designed to work with a voltage stabiliser, it may be included, but the wizard will correct for a missing stabiliser if you leave it out of the circuit). However, the power to the wizard should be direct from 12V and NOT through a stabiliser.

For environments with a lot of vibration, the tracks where the connector plugs on can be soldered to, bear in mind that the track will tear if too much force is applied. The connector is an 8P 3.96mm Pitch Card Edge Connector

Wiring into a vehicle

You may notice that a wiring diagram is not included. The minimum connection is power, ground, sender and gauge. You shouldn't need a diagram for that and since there are so many options for further connections, we will include those on the website rather than include pages of diagrams which may not be relevant

Let us know the values

If you do measure the values of your sender, please let us know what they are by email for future releases to

data@spiyda.com   **(you can also contact us on this email)**

we need the type of sender / tank / vehicle and the 5 resistance values.

That is a lot to take in, at the time of writing these instructions, we are preparing a series of videos for YouTube that will hopefully make it even easier to install. Search for **"Gauge Wizard 4.4"**

or find the link on our product page   **https://spiyda.com/Link/WIZARD.html**