Instructions for the MotoBrick MPG gauge

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Installation:

Tools Needed:

- Sockets
- Utility Knife
- Pliers
- Wire Cutters
- Screwdrivers
- String
- Tape Measure
-

Installation Steps:

WARNING: Before you begin, disconnect power by removing the ground cable from the transmission! I am not liable for any damage to you bike or your body.

The first step is to gain access to necessary wires. The primary location for these is the relay box, under the rear of the tank. Depending on your model/trim, the required tools and procedure may vary.

For a K75/100 Naked or “C” Model, simply pull the radiator cowl’s mounting pins out of their bushings, and remove the Cowl. Next, remove the side covers, if present. Finally, pull the rear of the tank out of its mounting bushings. I would suggest greasing these with some dielectric grease or Vaseline for simpler assembly and future disassembly.

For a faired model, the procedure may be slightly different.

With the tank loose, slide it forward and to the side slightly, being careful to support it. Remove the cover from the relay box.

At the left rear of the relay box, the turn signal relay is held in with two hex-head screws. Remove these, and set them aside. Pull the relay out from the box, and separate out the wires. Examine the wires, and compare them to the following images.

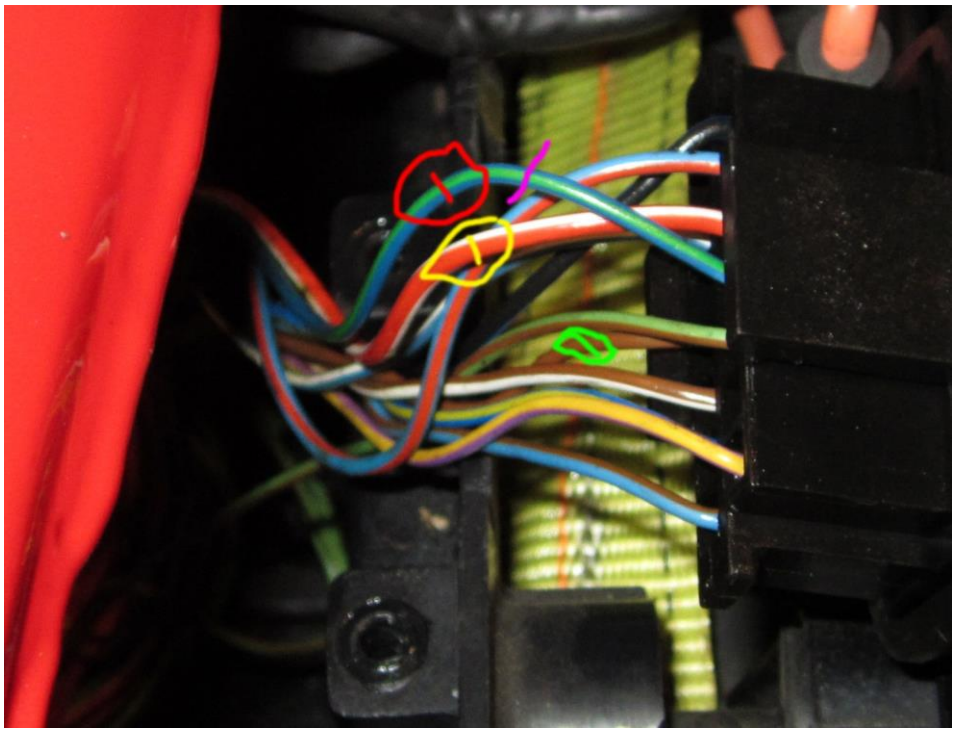

Figure 1: Flasher Relay

Install the “VSS In” tap on the Blue/Green wire, at the location indicated by the **RED** mark in the image. This is the pulsed, conditioned output for the speedometer sensor. Be careful not to short or apply power to this wire. This particular wire controls the turn signal auto cancel feature. If you wish to disable this functionality, cut the wire at the **PURPLE** mark indicated. Wrap the cut wire in electrical tape or heat shrink tubing.

Next, install the “12 Volt In” tap on the thick, Red/White wire, as indicated by the **YELLOW** mark. This is fused power that leads to the indicator and clock fuse, and is always on.

Finally, install the “GROUND” tap on the solid brown wire, as indicated by the **GREEN** mark.

Reinstall the flasher relay, carefully tightening the screws, and running the new wire out towards the front of the bike. Press it into the rubber bushing at the front of the relay box.

Next, remove the connector from the rear fuel injector. This is best accomplished with a small screwdriver, used to push the wire clip aside while pulling on the connector. For clarity, examine the female connector that is included with the gauge.

With the connector removed, plug the connector into the male side of the MPG gauge harness. Next, press the female side over the fuel injector. If needed, clip the zip-ties on the fuel rail. Use the included zip-ties to replace these, and route the new wires neatly up the fuel injection harness, to the frame rail, and then under the tank.

The Gauge is provided with some extra wire, to allow for a variety of mounting options. Options include handlebar mounts, suction cups on the tank, and fairing mounts. If holes are needed for mounting, loosen the cable gland located on the side of the device, and then unscrew the outer set of screws on the case. The circuit is mounted to the lid of the box. Do not remove unless necessary. Slide the wires through the cable gland, providing enough slack to work on the box. Drill any necessary holes, install any mounting hardware, and reassemble. In order to preserve water resistance, use rubber washers, rubber gasket material, or silicone sealer on any new holes.

Configuration:

Once the device is installed, re-connect the battery ground cable. When you do this, the gauge will boot for the first time. After the boot menus, you will be able to configure the various values for its calculations.

To access the configuration menu, press both the top and bottom button at the same time, then release. You will first be presented with the contrast setting. Set this to what is most readable. You may not need to adjust it. The allowable values range from 0 to 255.

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To change a value, use the top and bottom buttons to move the cursor, and the center button to change the value of that digit. To confirm the value, move the cursor to the “OK” position, and press the center button. To cancel changes to the value, select the “XX” position, and press the center button.

Next, you will set your “Pulses Per Mile” value. This is 12 times the number of wheel rotations required for a mile. (In other words, there is a pulse that occurs 12 times per wheel revolution.) I have provided some default values for various configurations, but yours may vary, depending on your tire size and condition. You can easily calculate this by measuring the circumference of the tire. Divide the circumference in inches by 12, then divide 1 mile in inches (63,360 inches) by this number. Your result should be close to 9200.

Next, you will set the fuel flow value, in microseconds per gallon of fuel. If your injectors are stock, just follow the values from the table. If your injectors are non-stock, email me and I can help. If you have fuel usage errors, you may need to slightly adjust this value.

Next, you set the injection pulses per two revolutions. This is not needed, so just ignore the value.

Next, set the trip timeout. This is the amount of time in microseconds before the “Current” values reset with the engine off.

The next value is your tank size in thousandths of a gallon.

The next value is the injector opening time in microseconds. It should be relatively constant for all of the stock injectors. If you have inaccurate fuel mileage/consumption readings, that are not constant in one direction or the other, this value may be off. A value that is too high will result in a bigger error at low speed/load than high speed/load. A value that is too small will result in a bigger error at high speed than at low speed. If you have issues with troubleshooting fuel usage errors, feel free to email me.

The next setting is Vehicle Speed Sensor (VSS) debounce. For K-Bikes you do not need to worry about this value, and should leave it at zero. If you are using the device on a different bike, and are using a Reed Switch and magnet to determine wheel rotations, you may need to raise this value. Email me with questions on this, and I can try to help.

The next setting is the “Edge” that starts the injection of fuel. For the K-Bikes, and most vehicles, this is a “0” or “Down,” meaning that the injector is supplied with voltage full time, and is grounded to inject fuel.

The final value is the Units setting. If you want to configure the device to Report in Metric units (L/100km, L, km/h, km) set this to”1.” Note: You will still need to enter the configuration values in standard units.

If you want to use UK/Imperial gallons, all you need to do is scale all volume measurements by 1.201. This means you will multiply the microseconds per (US) gallon value by 1.201. For the tank size value, you need only enter the value in imperial gallons.

Default Value Table:

Variable	K75	K100	K1100
Pulses Per Mile	9240	9240	
Microseconds per gallon	573,700,000	430,275,000	
Tank Size	5400 Gallons/1000	5400 Gallons/1000	
Injector Opening Time	500 us	500 us	

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Usage:

Warning: Motorcycles are dangerous. They are more so when you are fidgeting with electronic gizmos at high speed. Pay attention to the road. Mount the gauge in an easy to see location, and avoid changing things on it while moving, especially if they would require you to look down at it. Memorize the functions, so you can control the gauge without needing to take your eyes off the road.

The following screens are provided in the code. Others can be readily enabled in the code, but are not usually useful for the bike, and some are hard to read. If you are interested in them, they can be re-enabled with the programmer.

1. Instant MPG
2. Current Trip MPG
3. Tank MPG
4. Fuel used
5. Fuel Remaining
6. Range Remaining, based on tank MPG
7. Speedometer (useful for calibration of pulses/mile value)
8. Tank Odometer
9. Voltmeter

In order to cycle through screens, use the top or bottom button.

To reset the Tank, press the top and center button. To reset the Trip/Current meters, press the bottom and center button.

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To adjust the brightness, press the center button.

Specifications (For Eggheads):

- Hardware/software:
    - Based on Atmel ATmega328 processor
    - Code is based on OpenGauge MPGuino version .86 and code mods by Falcon4
    - I have optimized and modified the code, features, and interface for easy use on motorcycles

- Code is released under the GNU/GPL license. You are free to adapt and use the code, so long as the source code is released, and attribution is given to Me, OpenGauge and Falcon4. Source for this version is provided at www.motobrick.com/
- The main board is provided with a 6 pin ISP (In System Programming) header, for use with AVR programmers. This allows for updates and code modification.
- I have included "Breakout" points for unused processor interface pins, which allows for the addition of other features (IE: Coolant Temperature, Air Temperature, Oil Temp). If you are interested in anything along these lines or have any ideas, contact me, and I can look at including them in the code. See the source file, which includes a schematic.
- Onboard configuration, with values defaulted for a K75.

- Device:
  - The enclosure is water resistant. The buttons are sealed, and are not vulnerable to water intrusion. If you need to disassemble the enclosure, be careful to preserve the gasket and o-rings.
  - Dimensions:
    - 4.4 X 2.4 X 1.1 inches

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