Universal 12000 RPM Digital Speedometer Wiring Information

There are many aftermarket motorcycle speedometers being offered for sale. One very popular model of speedometer being offered online through Amazon, Ebay, Alibaba and other sites is the “Universal 12000 RPM Motorcycle Gauge”. It goes by many other names as well. There are variations on the styling available. Two packaging styles are pictured below:

Figure 1 - Round Style Package

Figure 2 - Futuristic Style Package

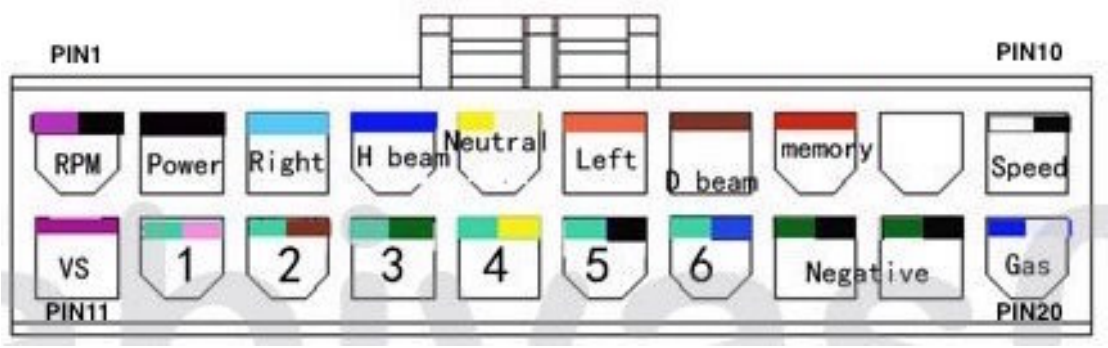
The gauge has several indicator lights in the main area above the needle, and an LCD information display section below the needle. Some of the features of the gauge are:

- Analogue engine RPM indication
- Digital speed indication
- Gear indicator
- Odometer
- Fuel level indicator
- Low battery indicator
- Turn signal indicator (right, left, both)
- High beam indicator
- Neutral indicator

Wiring the Gauge

All the available models are based on the same electronics; it's just that the breakout cable might vary. As of this writing, I have discovered three wiring differences for the Round style gauge and two wiring differences for the Futuristic style gauge. The functions of the wires in the breakout cable are exactly the same; it's just that the colour of the wires varies as well as the pin layout for the connectors.

The following is the pinout for the main connector on the circuit card within the gauge itself, irrespective of the styling used. This consists of a 20-pin AMP Mate-n-Loc connector:



Round Style Gauge Wiring Chart

This is the functional chart for the main connector and the wiring for three versions of the Round Style gauge that I have encountered so far:

Main Connector	Gauge Function	Signal	Version 1 Wire Colours	Version 2 Wire Colours (above)	Version 3 Wire Colours	BMW K100 Harness Wiring
Pin 1	Engine RPM	Low going 12V pulse, 10% - 90% duty cycle	Black / Yellow	Violet / Black	Red / Black	Tachometer output from TGPI board
Pin 2	Switched 12V	--	Black	Black	Black	Green / Black off Fuse #1
Pin 3	Right indicator	Active high	Light Blue	Light Blue	Light Green	Blue / Black Pin 17
Pin 4	High beam headlight	Active high	Dark Blue	Dark Blue	Blue	White Pin 15
Pin 5	Neutral	Active low	Green / Red	Yellow / White	White / Yellow	Neutral output from TGPI board
Pin 6	Left indicator	Active high	Orange	Orange	Orange	Blue / Red Pin 19
Pin 7	D-beam (???)	Active high	Brown / White	Brown	Brown	
Pin 8	Un-switched 12V	--	Red	Red	Red	Red / White Pin 1
Pin 9	N/C	--	N/C	N/C	N/C	N/C
Pin 10	Speed Sensor Signal	Low going 12V pulse, 10% - 90% duty cycle	White / Black	White/Black	White	Speedometer output from TGPI board
Pin 11	Speed Sensor Pwr	--	Red / White	Violet	White / Black	N/C
Pin 12	Gear 1	Active low	Pink	Green / Pink	Light Green / Tan	JST Pin "B" from TGPI board
Pin 13	Gear 2	Active low	Blue / Red	Green / Brown	Light Green / Brown	JST Pin "C" from TGPI board

Main Connector	Gauge Function	Signal	Version 1 Wire Colours	Version 2 Wire Colours (above)	Version 3 Wire Colours	BMW K100 Harness Wiring
Pin 14	Gear 3	Active low	Green / Black	Green / Dark green	Green / Dark Green	JST Pin "D" from TGPI board
Pin 15	Gear 4	Active low	Yellow / Red	Green / Yellow	Light Green / Yellow	JST Pin "E" from TGPI board
Pin 16	Gear 5	Active low	Yellow / White	Green / Black	Light Green / Black	JST Pin "F" from TGPI board
Pin 17	Gear 6	Active low	Green / White	Green / Blue	Green / Red	JST Pin "G" from TGPI board
Pin 18	Ground	--	Green	Dark Green / Black	Green	Brown Pin 13 or Pin 18
Pin 19	Speed Sensor Gnd	--	Green	Dark Green / Black	Green	Brown Pin 13 or Pin 18
Pin 20	Fuel level	100, 250 Ohms	Blue / White	Blue / White	Blue / White	Yellow from Additional Instruments conn. Pin 3

Futuristic Style Gauge Wiring Chart

This is the functional chart for the main connector and the wiring for two versions of the Futuristic Style gauge that I have encountered so far:

Main Connector	Gauge Function	Signal	Version 1 Wire Colours	Version 2 Wire Colours (above)	BMW K100 Harness Wiring
Pin 1	Engine RPM	Low going 12V pulse, 10% - 90% duty cycle	Red / Black	Blue / Yellow	Tachometer output from TGPI board
Pin 2	Switched 12V	--	Black	Black	Green / Black off Fuse #1
Pin 3	Right indicator	Active high	Light Blue	Light Blue	Blue / Black Pin 17
Pin 4	High beam headlight	Active high	Dark Blue	Dark Blue	White Pin 15
Pin 5	Neutral	Active low	Green / Red	Green / Red	Neutral output from TGPI board
Pin 6	Left indicator	Active high	Orange	Orange	Blue / Red Pin 19
Pin 7	Water Temp	Active high	Green / White	N/C	
Pin 8	Un-switched 12V	--	Red	Red	Red / White Pin 1
Pin 9	N/C	--	N/C	N/C	N/C
Pin 10	Speed Sensor Signal	Low going 12V pulse, 10% - 90% duty cycle	Black / White	Black / White	Speedometer output from TGPI board
Pin 11	Speed Sensor Pwr	--	Red / White	Yellow	N/C
Pin 12	Gear 1	Active low	Pink	Pink	JST Pin "B" from TGPI board
Pin 13	Gear 2	Active low	Blue / Red	Blue / Red	JST Pin "C" from TGPI board
Pin 14	Gear 3	Active low	Green / Black	Green / Black	JST Pin "D" from TGPI board
Pin 15	Gear 4	Active low	Yellow / Red	Yellow / Red	JST Pin "E" from TGPI board
Pin 16	Gear 5	Active low	Yellow / White	Yellow / White	JST Pin "F" from TGPI board
Pin 17	Gear 6	Active low	Grey	N/C	JST Pin "G" from TGPI board
Pin 18	Ground	--	Green	Green	Brown Pin 13 or Pin 18
Pin 19	Speed Sensor Gnd	--	Yellow / Green	Green	Brown Pin 13 or Pin 18
Pin 20	Fuel level	100 Ohms	Yellow / Blue	Blue / White	Yellow from Additional Instruments conn. Pin 3

Active high / Active low signals

Some indicator lights on the gauge activate when a +12V signal is applied to the wire. This is termed *active high*. Opening the circuit or grounding the input can turn off the indicator.

Alternatively, some of the indicator lights activate when they get grounded. This is termed *active low*. Opening the circuit to the input will turn off the indicator.

Speedometer signal

The speedometer expects to see a negative or positive going pulse proportional to the road speed of the motorcycle. Normally the signal will be held to +12 volts but with each impulse from the wheel rotation sensor, the pulse goes to ground for a while.

Tachometer signal

The tachometer expects to see an AC signal at least +/- 5V in amplitude and proportional in frequency to the engine rotational speed. The input signal frequency is translated to needle movement as programmed by the user; see Programming Mode Stage 3 below. The signal can be a sine wave, a square wave or a pulse. It must swing around a 0V reference, meaning the signal must "cross zero". A positive going signal will not work with this gauge.

Under charging or over charging

The battery symbol in the LCD display will illuminate if the battery charging voltage is less than 11.9V (voltage too low) or greater than 15V (voltage too high). It will remain off if the battery voltage lies anywhere between these two values.

Fuel Level Indicator

The fuel level indicator must be attached to a sender otherwise it will flash continuously. The fuel sender is a variable resistor that changes value as the float varies with the level of fuel in the tank. The gauge expects full tank to be close to 0 Ohms and an empty tank to be close to the programmed value in Programming Mode Stage 4. If you don't intend to connect up a fuel level sender, then the best way to stop the display from flashing is to add a fixed resistance from the fuel level wire to ground. Use a 100 Ohm 1/4W resistor and set the Programming Mode Stage 4 to "3" (see below).

Operating and Programming the Gauge

There is an operator button on the back of the gauge that allows the driver to switch functions on the gauge when in use. It also serves to put the gauge into "programming mode" which will then allow the operator to set parameters in memory that determine how the gauge behaves.

Normal operation

1. When power is applied to the gauge, the computer inside goes through a reset procedure that includes resetting the servomotor that drives the needle, cycling the needle full scale and back.
2. When the gauge is in its normal operating mode, pressing the button momentarily on the back will cycle between the trip meter and odometer.

3. When the gauge is indicating trip distance, pressing and holding the button for more than 3 seconds will reset the trip meter.
4. When the gauge is indicating odometer distance, pressing and holding the button for more than 3 seconds will cycle through the two measuring systems - Metric (Kilometers) and American (Miles). This will change the indicated speed and the odometer readings using the selected measuring system.

Programming Mode

To put the gauge into programming mode, first power off the gauge. While pressing and holding the button, apply power to the gauge and continue to hold the button for greater than 5 seconds. The speedometer will start flashing "1". This indicates that it is now ready for programming and is in Stage 1. See below.

There are five separate stages in the programming. To move between stages, press and hold the button for more than 5 seconds. The current stage will be left and the next stage will be entered.

Stage 1 Wheel Circumference

To indicate speed properly, the gauge needs to know the circumference of the vehicle's wheel, measured in millimeters. To get this number, either measure the circumference of the fully inflated tire in millimeters, or measure the exact diameter of the tire in millimeters and multiply by 3.1415. If you measure the diameter in inches, multiply the value you get by 79.79. Whichever way you come up with the number, enter the result into the flashing digits.

Pressing the button will increment the digit by one for each press. The numbers will cycle through 0-9. When the desired number is reached, wait 5 seconds and the next digit will start flashing. Repeat on each digit in sequence until the full circumference has been entered.

Stage 2 Speed Pulses per Revolution

To indicate speed properly, the number of pulses per wheel revolution must be entered. Pressing the button will increment the digit by one for each press. The numbers will cycle through 0-9

Stage 3 Engine Cylinders

To indicate the correct engine speed, the number of ignitions (pulses) per rotation has as to be entered. A modern motorcycle using a four-stroke engine will fire the spark plug once per engine rotation. This is termed 1 pulse 1 revolution (1p1r). Rarely, a motorcycle may have a "wasted spark ignition system" meaning that there will be two ignitions for each 360° rotation of the engine. This is termed 1 pulse 2 revolutions (1p2r).

For example, for most modern motorcycles, enter the number "1". If you have a wasted spark equipped motorcycle, enter the number "2". **Note:** *The number "1" is only available from a factory-fresh unit; once this Stage value is changed, "1" cannot be recovered.*

Stage 4 Fuel Sender

To indicate the correct level of fuel in the tank, this parameter will determine the full scale fuel sender resistance compatibility. There are usually two common ranges of fuel senders. The parameter is chosen to be either “2” (250 Ohms sender) or “3” (120 Ohms sender). Select the correct number that corresponds with the range of your fuel sender. Remember that the lowest resistance from the sender represents full tank and the highest resistance represents an empty tank.

Stage 5 Odometer

This allows one to reset the indicated odometer reading back to zero. From the factory, the gauge will have zero for the odometer reading and the odometer reading will increment as the vehicle is driven.