TACHO SIGNAL CONVERTER

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This module is used to convert the frequency / type of tacho signal, to allow the accurate use of a tachometer designed or calibrated for a different number of cylinders, or designed to be used with a different signal type.

The module can accept square wave (hall effect) inputs, including from the ignition primary circuit (coil negative), as well as inductive inputs (AC sine wave voltages). The input can be filtered to ignore multiple ignition events on the same cycle (multi-fire filter). The module produces 2 separate outputs for different applications:

1. A 5v or 12v selectable DC square wave output, with a fixed 50% duty cycle.
2. An AC coupled output to simulate the AC voltage produced by an inductive type sensor.

WIRING CONNECTIONS

RED	**BROWN**	**BLUE**
Ignition 12v	Input Signal	AC Output (Inductive)
BLACK		**GREEN**
Ground	DC Output Alternative Connection	DC Output (Square Wave)

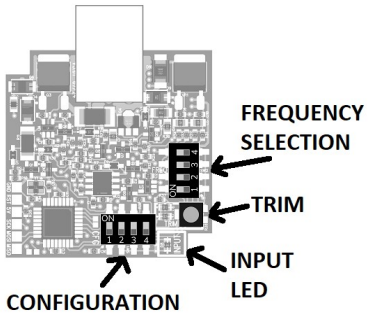
Red + Black should be connected to a fused switched ignition source and earth.
The input signal that requires conversion should be connected to the brown wire. This could be a DC voltage square wave signal from an ECU / ignition module or hall effect sensor, ignition coil negative, or an AC voltage from an inductive type sensor.

IMPORTANT: If using CDI type ignition (Capacitive Discharge Ignition, eg. MSD), use the tacho signal output supplied from the CDI module. Do not connect directly to the ignition coil.

If using a 2-wire inductive sensor as input, earth the opposite wire of the sensor directly at the module.

Selection of the output wire will depend on what type of signal is required by your tachometer (Blue for AC voltage or inductive signal types, and Green for DC square wave voltage / hall-effect types).

CONFIGURATION



Remove the 2 Phillips screws to open the module. Inside you will find:

- 4x DIP switches for main output frequency selection
- A trim pot - for fine trim adjustment to the output frequency
- An LED to indicate the module is receiving a valid input signal
- 4x DIP switches for configuration, with the following functions:

		OFF	ON
1	Output DC Voltage	5V	12V
2	Input Multi-fire Filter	Disabled	Enabled
3	Input Sensitivity	High	Low
4	Output Test	Disabled	Enabled

Output DC Voltage is used to set the voltage level on the DC output (green wire). The DC output is an open-collector type, that can sink up to 3 amps, and can safely switch most inductive loads. With switch 1 off, a 5v pullup resistor of 1KΩ ohm is applied to the output, creating a 5v square wave. With switch 1 on, the output will be actively driven to 12v during the high half of the waveform, creating a 12v square wave. The module is able to source up to 100mA of current to drive the output high to 12v.
The **Input Multi-fire Filter** can be used to retrieve a valid input signal from the ignition coil of some modern vehicles that fire more than one spark per cylinder at low RPM (eg. Ford Barra engines). With switch 2 on, multiple input pulses faster than approx. 2.5ms (400hz) will be counted as a single pulse.
Input Sensitivity (switch 3) should generally be set OFF for DC inputs (hall effect), and ON for AC inputs (inductive). In the OFF state, inputs of DC 3.0V or AC 2.0v RMS or greater will be received. In the ON state, inputs of DC 0.5v or AC 0.35v RMS or greater will be received.
Output Test (switch 4) will cause the module to generate a constant 50hz output, ignoring any actual input signal that may or may not be present. This can be useful for testing and troubleshooting, and determining if a problem is caused by the input to the module or output to tachometer. The input LED will flash to indicate this test is on.

FREQUENCY SELECTION

The main factor for frequency conversion is selected using the 4 frequency selection DIP switches. The switches are numbered, and are turned on when pushed towards the side labelled "ON" (towards center of PCB).

Mode	Switch 1	Switch 2	Switch 3	Switch 4	Ratio (in:out)	Output Pulse Length (% of Input Pulse)	Effective Change to Tachometer
0000	OFF	OFF	OFF	OFF	1:1	100	None
0001	OFF	OFF	OFF	ON	1:8	12.5	x 8
0010	OFF	OFF	ON	OFF	1:6	16.66	x 6
0011	OFF	OFF	ON	ON	1:4	25	x 4
0100	OFF	ON	OFF	OFF	1:3	33.33	x 3
0101	OFF	ON	OFF	ON	1:2	50	x 2
0110	OFF	ON	ON	OFF	4:7	57.14	x 1.75
0111	OFF	ON	ON	ON	3:5	60	x 1.66
1000	ON	OFF	OFF	OFF	2:3	66.66	x 1.5
1001	ON	OFF	OFF	ON	3:4	75	x 1.33
1010	ON	OFF	ON	OFF	4:5	80	x 1.25
1011	ON	OFF	ON	ON	4:3	133.33	x 0.75
1100	ON	ON	OFF	OFF	3:2	150	x 0.66
1101	ON	ON	OFF	ON	2:1	200	x 0.5
1110	ON	ON	ON	OFF	3:1	300	x 0.33
1111	ON	ON	ON	ON	4:1	400	x 0.25

To find the correct setting, take the actual RPM the engine is running at and divide it by the RPM displayed on the tachometer. For example, if the engine is actually at 1000rpm but the tachometer displays 1500rpm:
1000 ÷ 1500 = 0.66
Select the closest setting, using the "Effective Change to Tachometer" from the table above (in example: 1100).

FREQUENCY TRIM

The trim pot provides a further +/- 10% adjustment of the frequency selected by the DIP switches. Turn it anti-clockwise to reduce the RPM or clockwise to increase the RPM shown on the tachometer. A green LED will illuminate when no extra trim is being applied (the frequency is exactly as selected by the DIP switches). A red LED will illuminate to indicate some amount of trim is being applied.

When the DIP switches are all off (mode 0000), the trim pot can be used to manually select an output frequency of approx. 0.1x to 10x the input frequency, however the larger range means adjustment is not as fine or accurate.

HIGH LEVEL VOLTAGE TRIGGERED TACHOMETERS

A lot of older / vintage tachometers operated off the brief voltage spike on coil negative (up to several hundred volts) when the coil fires. This is created by the inductive nature of the ignition coil. If your tachometer originally ran from coil negative, and doesn't respond to the output of this module, wire the included inductor between Ignition 12v (red wire) and Output (green wire). This will add an inductive load to the module output to generate a similar voltage spike.

If this doesn't work, a larger inductive load can be tried. A standard automotive relay can be modified for this purpose. Open and remove the mechanical contact to prevent noise, disconnect any flyback resistor or diode within the relay, and wire terminals 85 and 86 between Ignition 12v (red wire) and Output (green wire).

It is sometimes also possible to modify the tachometer. If you follow the input signal into the tacho, and find a large value series resistor as the first item the signal travels through (eg. 33KΩ or bigger), try changing it for a smaller value resistor (eg. 1KΩ).

TROUBLESHOOTING

Find out if the problem relates to the input signal (into module) or output signal (to tachometer):

1. Use the yellow input LED to confirm you have a valid input signal (it will light up solid when you do).
2. Use the output test to confirm the output is driving the tachometer (input LED will flash while active).

This module works with signals in a frequency range of approx. 1 to 750hz.
This module is not suitable for signals that include a "missing tooth", or those that are timing critical (such as providing input to an ECU that is controlling ignition timing).