Stratomaster Smart Single

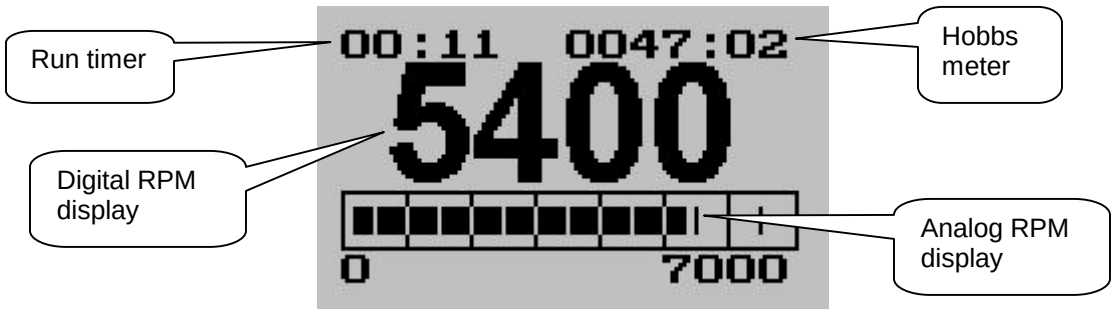
RV-1

Universal Engine RPM and Rotor RPM display

The RV-1 unit is a 2.25” instrument providing a universal rev counter that can be adapted to a variety of roles. Typical uses are engine RPM displays or Helicopter / Gyroplane Rotor RPM displays.

Digital engine RPM / Rotor RPM display with scale selectable analog display
Engine hobbs meter (can be set to current engine time)
Engine running timer (can be used as flight timer), resettable to zero at any time.

The main display



About RPM measurements

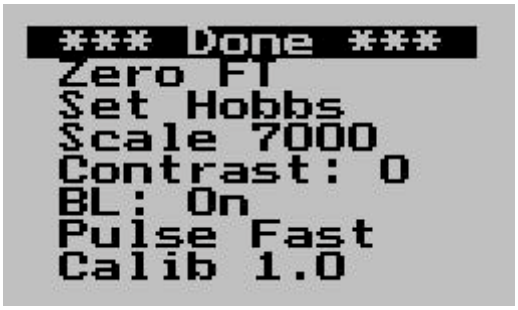
Generally, there are two different methods of measuring RPM. The RV-1 unit can be setup to perform either method.
The first method involves counting pulses generated by some device in the engine or from a sensor in case of Rotor RPM.
Pulses are counted over a period of time and the result is then used to calculate RPM. This method requires a high number of pulses and a short measurement interval. The RV-1 counts pulses for ½ second. This method is suitable for most two stroke engines such as produced by Rotax.
Engines producing few pulses (perhaps only one pulse per revolution) and run at low revs, as well as slow turning rotors require a different method. Here the RV-1 can use the time it takes to generate only two pulses as bases for the RPM calculation.

The particular method to be used and the number of pulses per revolution are entered as part of the RV-1 setup as given below.

Setting up the RV-1

Press the Menu key to enter the menu. You can move forward and backwards in the menu by using the + and – keys. To change or select a menu item, move the highlight to the desired item and then press the Menu key. To end an edit or function, press the Menu key again.

To exit the menu and continue normal operation, select the ***Done*** function and press the Menu key. Note, all changes you have initiated during your session will only be remembered by the instrument if you exit the menu using the ***Done*** function.



Zero FT

This function allows you to set the flight timer to zero. The flight timer counts hours and minutes while the engine is running.

Set Hobbs

This function allows you to set the hobbs meter to your current engine running time.

Use the plus and minus buttons to change the indicated part of the hobbs reading. Use the Menu button to change from hour hundreds to hours to minutes.
Moving the update cursor below the numbers past the minutes field on the right ends the edit of the hobbs meter reading and stores any changes.

Scale …

Choose your desired scale for the analog RPM display. You can choose values from 500 to 9500 RPM in steps of 500 RPM. You should select a value that is just higher than the highest RPM you expect during operation.

Contrast …

This function allows you to change the display contrast to your liking. You can select values from about 6 to 25.

BL …

This function allows you to switch the display backlight on or off.

Pulse …

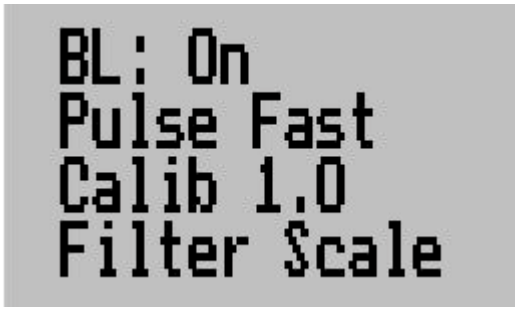
Select if you want the RV-1 to count pulses from the engine for ½ second period (Fast) or if you want the RV-1 to use the time between pulses to calculate revs (Slow).

Typical setups:

Rotax 503,582 DCDI - Fast (6 pulses per revolution).
Rotax 503 single ignition, Rotax 912/914 – Slow (one pulse per revolution).
Gyro Rotor RPM with gear tooth sensor – Fast (about 100 pulses per revolution).
Gyro Rotor RPM with single hall effect sensor – Slow (one pulse per revolution).
Helicopter Rotor RPM with single hall effect sensor – Slow (one pulse per revolution).

Calib …

Enter the number of pulses per RPM. For engines with an uneven number of cylinders like three cylinder four stroke engines you can enter values containing fractions (usually 1.5 in this example).
Most four stroke engines would generate one pulse for every two revolutions per cylinder. A four cylinder automotive four stroke engine would thus generate 2 pulses per revolution.
A typical Rotax DCDI two stroke engine would generate 6 pulses per revolution. The well known Rotax 912/914 engines generate one pulse per revolution.



Filter …

The RV-1 unit contains a digital filter. This filter is used to achieve a higher resolution of the digital rev counter than is available in ordinary operation.
In digital rev counters, resolution is largely dependant on the amount of time given to measure RPM. The more time available, the higher the resolution possible. However, on the downside of this, the more sluggish the display will react to changes in engine settings.
Resolution with the RV-1 is dependant on the number of pulses per rev and the type of measurement method you have selected (Pulse Fast/Slow).
The update rate for the measurement is a fixed, fast 0.5 seconds.
The digital filter is activated whenever input revs are fairly constant and this results in a very high resolution of the digital RPM display in a short time span. The filter needs to be setup for the expected base resolution. This can be between 10 and 30 RPM for most setups. The filter has the following settings:

Scale -The setting is made dependant on your Scale selection from 500 to 9500 RPM. The filter factor is fixed as follows:
Scale 500 – 10 RPM
Scale 1000 – 20 RPM
Scale 1500 – 30 RPM
Scale 2000 – 40 RPM
Scale 2500 – 50 RPM
Scale 3000 – 60 RPM
Scale 3500 – 70 RPM
Scale 4000 – 80 RPM
Scale 4500 – 90 RPM
Scale 5000 – 100 RPM
Scale 5500 – 110 RPM
Scale 6000 – 120 RPM
Scale 6500 – 130 RPM
Scale 7000 – 140 RPM

Scale 7500 – 150 RPM
Scale 8000 – 160 RPM
Scale 8500 – 170 RPM
Scale 9000 – 180 RPM
Scale 9500 – 190 RPM

10,20,30,40,50,60,70,80,90,100 – The filter factor can be set to any of these values independent of your scale selection. Choose a filter setting that results in a smooth, high resolution RPM display. A filter setting too low for your setup will result in a “jumpy” display. RPM display will change at your base resolution and no smoothing will happen. Choose the lowest setting that results on a smooth display for greatest sensitivity of the reading.

OFF – the digital filter is switched off and the display will result in fastest update rates at the resolution dictated by your setup.

Technical specifications:

Display temperature range (operational): -20 to +80 degrees C
Supply voltage: +8 to +18V. +24/28V with optional pre regulator.
Supply current: 25mA/40mA (backlight off/on)

Rev counter input:
Range: 0-9999 RPM.
Minimum signal for stable display: 2Vpp.
Fully A/C coupled, maximum voltage +/- 40V.
RF noise filter plus Schmidt trigger based input.

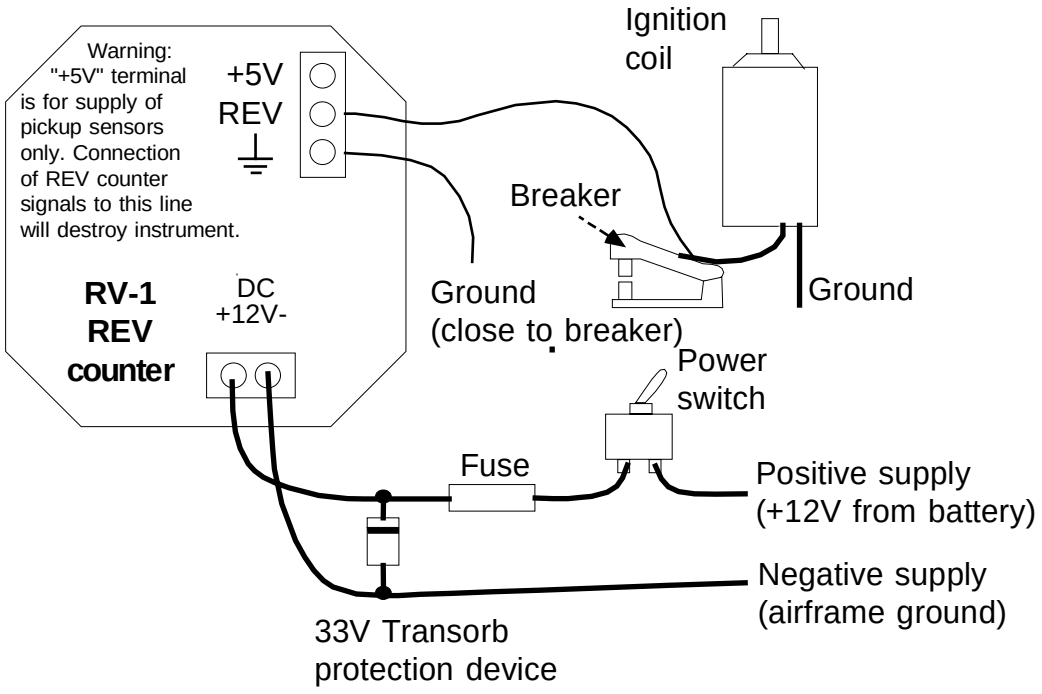
Note: It is essential that a single wire be connected from the minus terminal of the instrument to the engine block. This wire must not be used to share currents with other electrical users as this can affect accuracy of readings.

Warranty:
MGL avionics warrants their products for a period of one year from date of purchase against faulty workmanship. Warranty is limited to the replacement of faulty components and includes the cost of labor. Shipping costs are for the account of the purchaser.

Note for operation on supplies with inductive loads:

Any operation of electronic instrumentation on power supplies that are subject to high voltages caused by operation of inductive loads (starter motors, solenoids, relays) are required to be fitted with suitable protection.
All Smart Singles are guaranteed to withstand temporary over voltage up to 40V without additional protection. We recommend that measures are taken to prevent voltage transients in excess of this limit.
MGL Avionics recommends the fitment of a fuse in line with a 33V transorb (available from MGL Avionics at low cost) to protect electronic instruments, radios and intercom systems. Only one such arrangement is required for a cluster of instruments.
Please note that product warranty excludes damages caused by unprotected, unsuitable or incorrectly wired electrical supplies.

Installing the RV-1



Installation of the RV-1 is quite straight forward in most cases. The above drawing shows a typical connection for a standard “old fashioned” contact breaker system. Most electronic ignition systems are very similar, the only difference is that the breaker has been replaced with a semiconductor switching device. Most electronic ignition modules have an output terminal intended for connection to a rev counter.

The RV-1 input is quite universally usable. For example, it is common to connect a hall-effect sensor using the +5V line to supply the sensor. A small magnet it then mounted on a shaft (for example rotor shaft of a helicopter) and the hall effect sensor switches every time the magnet passes the sensor.

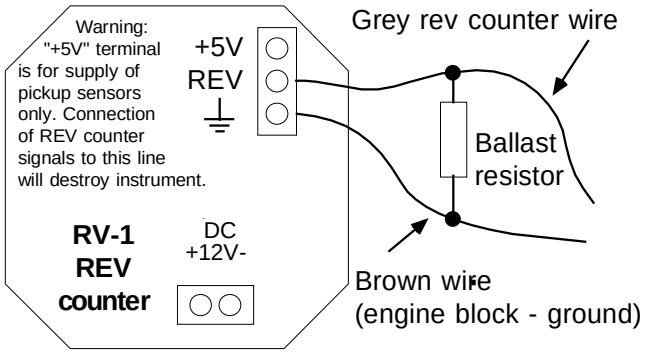
The RC-1 needs a typical voltage swing of about 2 to 2.5V minimum to operate and the input is A/C coupled for easy installation. This means that the voltage signal may have a DC voltage superimposed without affecting the instrument. For example, if you have a signal that varies in voltage from 5V to 8V with every pulse, it can be used with the RV-1.

For installations such as with the Rotax DCDI two-stroke engines, the rev counter input is simply connected to the grey rev counter wire from the engine. These engines produce six pulses per rev (set this up in the relevant menu item).

Most engines produce 0.5, 1 or 2 pulses per revolution. This needs to be setup in the “Calib” menu item.

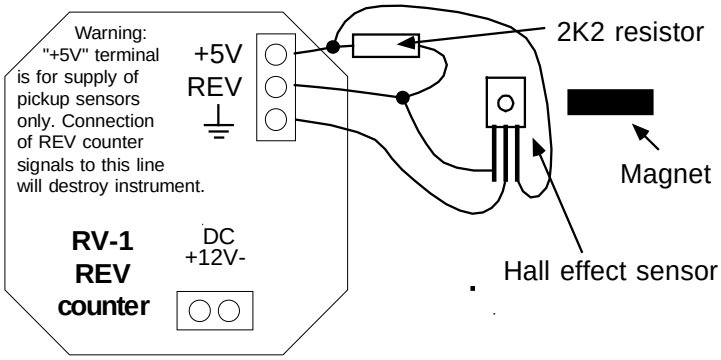
Please note: The 5V supply line is unprotected and intended only for the supply of hall-effect, optical or geartooth sensors. Connecting any voltages (such as the 12V supply) to this line will destroy the instrument.
The 5V line may supply currents of up to 30mA. Should your sensor require greater currents you must supply it from another source.

Various pickup / sensor installation possibilities



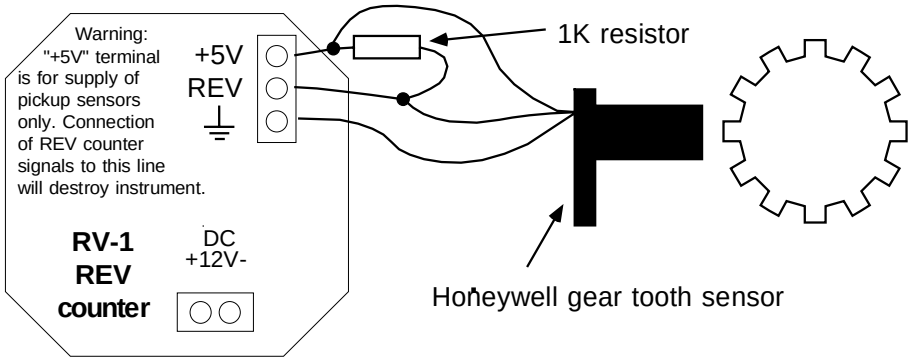
Rotax DCDI setup (Ballast resistor optional)

Note: On Rotax DCDI ignition systems it may be required to install a ballast resistor as shown. A typical value is 220 ohms. Many installations can omit this.



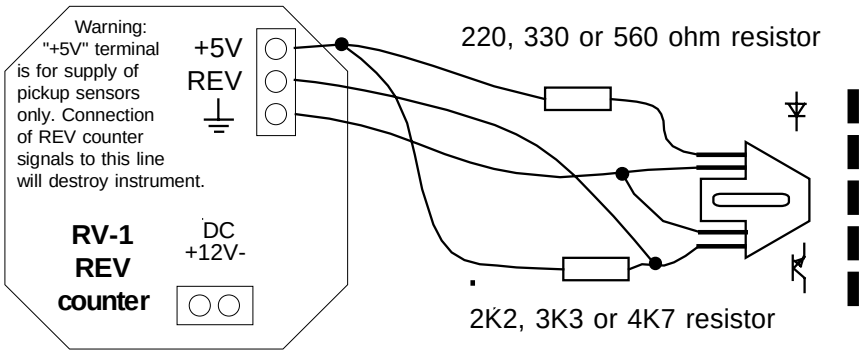
Magnetic pickup with Hall effect sensor

Typical hall effect sensor installation detects the passing of a magnet suitably fixed to prop flanges or shafts.



Magnetic pickup with active gear tooth sensor

The gear tooth sensor is a popular pickup used on the pre-rotation gear of a gyro plane. (rotor speed indication)



Optical, reflective sensor

The optical reflective pickup can provide a simple means of contactless RPM sensing in difficult installations.