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Shaft Speed Sensor Installation and Calibration

Corsa part #: SS1

Corsa part #: SS2

Nominal scale: 0.0167 hz/rpm for one magnet
0.0333 hz/rpm for two magnets
0.0667 hz/rpm for four magnets

The shaft speed sensor can be used to measure engine RPM, driveshaft, halfshaft, or intermediate shaft speed, etc. The sensor is essentially a switch that closes when a magnet passes by its face. The Corsa RPM interface box monitors this output signal and returns a RPM signal to the main Data Acquisition box. This sensor is wired to the DB9 input connector on the face of the RPM interface box which is in turn, wired to the 'Speed In' port on the face of the Main Box.

Installation:
Find a place to mount the sensor so the flat end faces the moving part. Then mount 1 or more magnets on the moving shaft or part. The brackets and mounts must be sturdy. The gap between the sensor and moving magnet should be 1/4 inch or less for best operation using the magnets supplied. Be careful of runout or movement of the shaft that may allow the shaft to hit the sensor or allow the magnets to move too far away from the sensor for it to work.

Other magnets can be used, and some other styles including threaded studs are available from Corsa Instruments. Either pole (North or South) will work.

Install the magnet(s) facing the sensor. One common practice is to epoxy the magnets in place on the shaft or rotating coupling. This works well if the magnet is on a flange, especially if the magnet fits against a ridge or into a hole in the flange. When mounted this way, centrifugal force is trying to slide the magnet off the flange. Gluing the magnet to the OD of a driveshaft or halfshaft is not so good, since centrifugal force will pull the magnet away from the mounting surface when the shaft is spinning. You can also fabricate a ring or bracket on the rotating shaft to hold the magnet.

The number of magnets to mount depends on the shaft speed and the resolution needed. For best resolution at shaft speeds under 1200RPM, use two or four magnets. One magnet is usually the easiest choice if you are not concerned with shaft speeds under 1200 RPM or with high sampling rates. If balance is an issue, you can use two magnets, 180 degrees apart off for balance. If you need to measure low speeds, you can use more magnets, equally spaced. It is important that the magnets are spaced exactly equally, or you will get "jitter" in the readings. Using more magnets also reduces accuracy at very high shaft speeds.

Magnets	Lowest speed Readable	Lowest speed Recommended	Highest speed for 1% accuracy
1	120 RPM	1200 RPM	30,000 RPM
2	60	600	15,000
4	30	300	7,500

Higher RPMs than listed above can also be obtained. Call Corsa Instruments for further information.

Suggestions about magnets:

- For drag race cars, use four magnets for driveshaft speed to get the best resolution at launch. If you use a Ford 9" rear end, Mark Williams Engineering makes a nice collar to hold the magnets on the pinion flange.

- Road racing formula cars or sports racers should use two magnets on the halfshaft or wheel, especially if you run relatively slow courses. Call Corsa Instruments for a magnet mount for the commonly used halfshaft flange. If you're putting the magnet on the driveshaft flange, one magnet is enough for most road racers.

- For engine RPM, one magnet is fine. Mount it in a milled dimple on the face of the crank pulley. If you have an oil pump or whatever driven by toothed belts, the sensor could be mounted on the pump pulley and the drive ratio programmed in the computer, if that's more convenient.

Hookup:

If you only have one shaft speed sensor wired to the DB9 connector, it will be wired to channel S2. (S1 is usually Engine RPM) The shaft speed sensors require a 1k 'pullup' resistor to be hooked up between the signal return and the +5v terminal. The RPM interface box has these resistors built in, with "jumpers" to connect or disconnect them. Normally the interface box is shipped with the jumpers connected for RPM channels 2, 3, and 4. If your sensor doesn't work, check these jumpers. Older Corsa RPM boxes have a terminal strip with the resistors attached inside the RPM box, and were usually shipped with a resistor attached to channel S2 only. If you are adding more speed sensors to an older (before 5/98) Corsa system, check inside the RPM interface box to see if the 1k resistors are in place; if not, see the appendix of the manual for instructions on how to hook them up or call Corsa for more information.

Calibration:
Set the “Zero Reference” to 0. Set the Scale to the number listed at the top of this sheet, if you want the readout in RPM. In some cases, especially drag racers, driveshaft RPM is more useful than MPH because it is easier to compare to engine or clutch RPM.

To calibrate the sensor to read vehicle speed in miles per hour, follow the procedure below. But be aware that the measured speed will change a little depending on actual tire size, vehicle weight, downforce, and tire growth with increasing speed.

- First you need to figure out “pulses per mile”. There are lots of ways to do this, but one good way is this:

- Put a chalk mark on the bottom sidewall of the tire, and a matching chalk mark on the ground. Now roll the car forward one tire revolution, and put another mark on the ground matching the mark on the tire. Measure between the marks on the ground in inches, this is the tire rolling circumference.

- Now divide 63360 by this number of inches. The result is the number of tire revolutions per mile. If you have more than one magnet on the tire or halfshaft, multiply the “revolutions per mile” by the number of magnets. If your magnets are on the driveshaft, also multiply by your final drive ratio. Now you have “pulses per mile”.

- For example, say the tire rollout is 59 inches. 63360 / 59 = 1073.9; and say we have two magnets on the halfshaft, so the pulses per mile = 2148.

- Now divide “pulses per mile” by 3600 to get the Scale in “hertz / MPH”. Enter this number in the “Scale” field in the configuration file.

- For example, 2148 pulses per mile would make a Scale of 0.5967 hertz per MPH.