

Introduction:

This application note describes how to install a magnetic pickup on an engine.

Background:

The PERFECT POWER units can handle:
Magnetic (reluctance) sensors
Optical sensors
Hall effect sensors

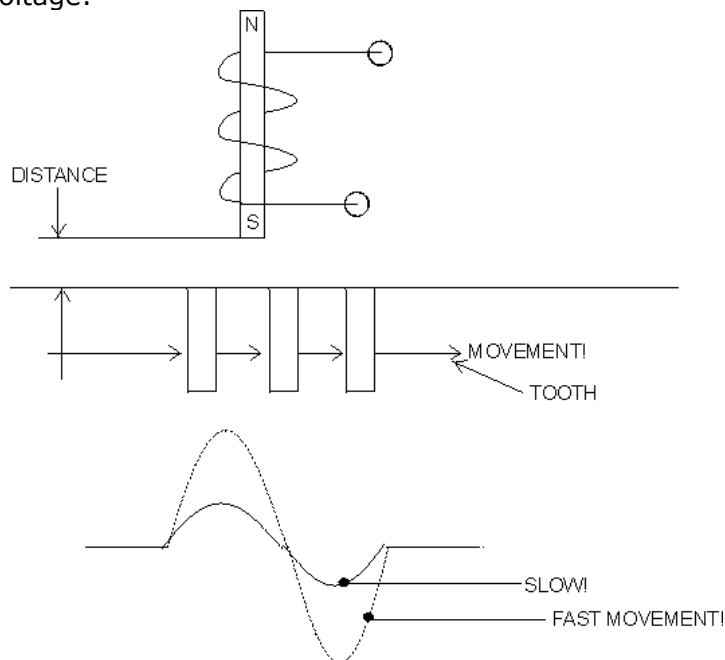
The magnetic sensor is preferred by the DIY enthusiast, because it is easy to fit and available. And, it is nearly indestructible!

How it works:

A coil is wound over a permanent magnet. Once the magnet is brought near other magnetic material (A screw head!), then the magnetic flux changes, and voltage is induced in the coil. The voltage amplitude depends on:

- The permanent magnet
- The coil construction
- The magnetic flux change (distance to the other magnetic material)
- The speed of flux change

The last two items are important, because we can influence them. A magnetic pickup produces the following output voltage:



The magnetic flux change can be produced by a "tooth", which is protruding from the other material, or a "notch" which was machined in to the material. The protruding tooth is more popular! In the following sections we talk about "teeth" only.

How many magnetic pickups must be installed?

In engines with a single coil and a distributor ONE pickup is required. Engines without a distributor require TWO pickups. This system is sometimes called "WASTED SPARK", because it sparks a cylinder during the exhaust stroke, and this spark is "wasted".

The two pickup systems require:

A pickup to signal "FIRING". We call this pickup CB1. This pickup requires cylinders/2 teeth on the crank.

A pickup to signal "CYLINDER" information. We call this pickup CB2.

It doesn't have to be cylinder #1. Any cylinder will do! It isn't required to be accurate, but the tooth must be BEFORE or AFTER a particular CB1 tooth. DO NOT PLACE THE CB2 PICKUP TOGETHER WITH CB1!

Where to install a magnetic pickup?

CB1 PICKUP: Install on the crank. On the pulley or the flywheel. Largest possible turning diameter (this gives it speed, which produces a larger signal).

CB2 PICKUP: On the CAM, the distributor, the crank or pulley. Accuracy is not required, so the CAM or distributor will do fine.

Interference:

This is a nasty thing! Interference can be produced by:

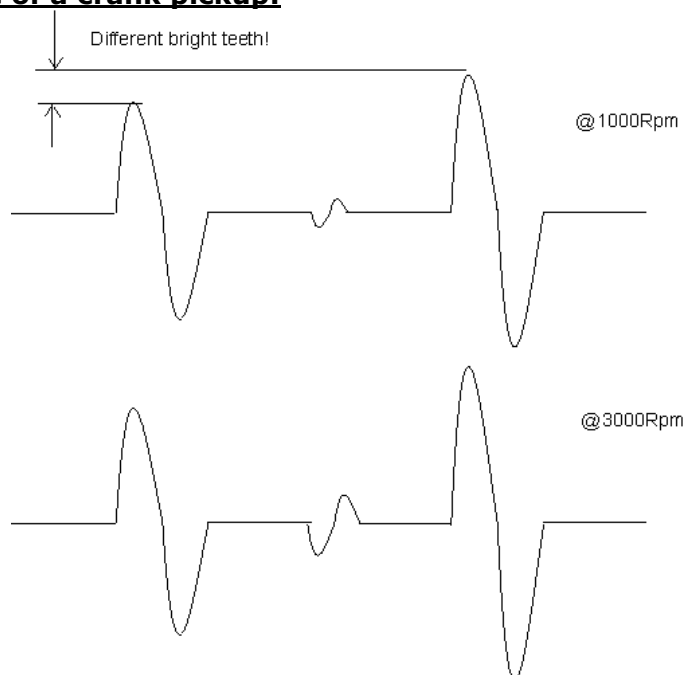
MECHANICAL! Wholes, or other protruding magnetic materials can produce an output signal, which may trigger the unit under high RPM.

TEETH WITH UNEVEN HEIGHT/WIDTH. This should not happen, and a friendly machine shop can fix it.

ELECTRICAL! The signal is small, and the wires should be screened, and routed away from high tension and high current wires. Do not place the pickup close to the starter motor or other magnetic devices.

MECHANICAL! The bracket may vibrate, thus changing the pickup clearance and the output signal.

Here is a signal trace of a crank pickup:



How do you detect interference? A scope helps, but you can use a timing light as well: It should flash REGULAR! All the PERFECT POWER units have filters build in to avoid some electrical interference. You can place a 0.1UF capacitor over the pickup wires, and in extreme cases you can put a 2K2 resistor in series with the wire, but before the capacitor. The interference from holes can be solved by adjusting the pickup clearance, or by dampening the pickup output with a resistor. This reduces the pickup voltage, and the interfering "hole" voltage.

Where to place the teeth?

All PERFECT POWER products require that the CB1 (firing) pickup is placed at the IDLE (or starting) position. This is normally 10 to 15 degrees BEFORE TDC. This is not critical, as long as the engine starts on this setting. At very low RPM (starting) the units "spark" at the pickup point, without any timing applied.

Summary:

It may sound difficult, but the problems are small and easy recognised. The magnetic pickup is still the best for retrofitting.