

Ample Power Company

Alternator Tachometer Signals

Introduction

Most alternators provide a signal that can be used to indicate how fast the alternator is turning. The signal is a half-wave rectified output which has an amplitude about one-half the DC output voltage.

Using a signal from the alternator as a reference to engine RPM is not without problems. The purpose of this application note is to clarify these issues.

Pulley Ratios

The alternator typically rotates faster than the engine because the engine has a larger pulley than the alternator. A rough idea of the ratio can be obtained by measuring the outside diameters of the two pulleys. However, the depth that the drive belt seats into each pulley must also be considered.

Number of Poles

The frequency of signals from the alternator depends on the number of magnetic poles in the alternator. Ample Power alternators have seven poles in the small frame units and six poles in the large frames. These produce seven and six signals per revolution.

Belt Slip

It's not uncommon to experience a small amount of belt slip even in well tensioned applications. Obviously, if slip gets too much, the belt will fail from overheating. Because of the possibility of belt slippage, many people choose not to use alternator signals for RPM indication.

Signal Strength

Alternator tachometer signals are derived from the stator windings. The signal is thus dependent on the amount of energy being produced by the alternator. When batteries are being charged, signals are strong enough to produce good tach stability.

When multi-step regulators are used to charge batteries, the tach signal strength can vary according to the charge state. When the regulator switches from the absorption state to the float state, there may be complete loss of tachometer signal during the time that battery voltage decays. During this pe-

riod most regulators shutdown completely, and the tach signal does likewise. Ample Power regulators step down from the absorption voltage in several steps, keeping the tach signal strength at a sufficient level to drive the tachometer.

Full Batteries

In the past, full batteries were more of a concept than a reality. With Ample Power regulators, batteries do get charged to a full state.

When the regulator finds that the battery is full, alternator field current is reduced as necessary to avoid overcharging the batteries. This often results in a tach signal which is too weak to trigger some tachometers. Erratic tachometer readings result, particularly at low RPM. One possible solution is to turn on some electrical loads, forcing the alternator to produce more output, and hence, more tachometer signal strength.

Solar Panels

If solar panels are charging the batteries as well as the alternator, then expect tachometer drop-out when the batteries are full. The alternator regulator will cut back the alternator output until there isn't enough energy left to generate tach signals. If the regulator has the smarts to detect that the battery voltage is greater than the regulator setpoint it will issue warning signals . . . on an Ample Power regulator, the warning signal is a Red LED that flashes an error code.

Tachometer Pickup

Because the alternator's prime function is to charge and maintain batteries, and because some regulators can actually provide a full charge, loss of tach signals is a given . . . the regulator favors the battery. No one wants a boiling battery just so the tachometer reads properly.

Virtually all diesel engines have a port which will accept an RPM sensor. This mechanism produces a reliable tach signal without regard to battery state of charge. The RPM sensor does not suffer from belt slippage, and continues to operate even if the alternator has failed. We strongly recommend RPM pickups rather than using a signal from the alternator.