

prior to TDC, so the starting spark is “retarded” at or near TDC on the compression stroke. An impulse coupler is used to snap the magneto through its firing position rapidly so it will produce a high-energy spark, even though the engine is being cranked slowly and simultaneously to retard the spark. In such a system, it typically is the left magneto that has the impulse coupler, while the right mag is grounded automatically during the start procedure to prevent its advanced spark from prematurely igniting the fuel/air mixture and causing the piston to kick back.

The entire system (impulse coupler, retarded left spark, grounded right magneto, and starter motor) is controlled by the starter position on the ignition switch. Switching magneto P-lead will deactivate the impulse coupler and cause the wrong mag to fire in advance TDC. The probable result will be an engine that will try to run backwards with potentially significant damage. When hand propping, never put the switch to BOTH for the same reason. Always set it to the magneto that has the impulse coupler. Even the more expensive systems that use a starter-vibrator instead of an impulse coupler operate functionally the same and require proper mag selection when hand propping.

The differential magneto check, familiar to all pilots, compares one mag to the other. Using the manufacturer’s recommended power setting, ground one magneto and note the RPM difference from BOTH. Then ground the other, note its difference from BOTH, plus note the difference from the previous reading. The RPM drop is the result of incomplete combustion. Using only one set of plugs is not as efficient as using both sets, so there is a loss of engine power and RPM. The manufacturer publishes a maximum-allowable RPM drop from BOTH and a maximum allowable RPM difference between magnetos. If the RPM drops in excess of these figures, ground the aircraft.

Several other possible conditions may be noted during the differential mag check. For example:

- Immediate, excessive RPM drop probably indicates failure of the secondary mag coil, which prevents a sufficient current flow to get the spark to jump across the spark-plug gap.
- Slow, excessive RPM drop indicates a problem with magneto timing. If the engine slowly dies, it again is probably because of a failure of the secondary coil, which prevents sufficient high voltage at the lower RPM used for the check.
- No observable drop in RPM indicates probable P-lead failure.
- An engine failure during the mag check can be traced to probable failure of either the primary coil or the breaker points. Caution: do not switch back to BOTH. Unburned fuel/air mixture can build up in the cylinders and exhaust. Switching to both will ignite the mixture and possibly cause major damage to the cylinder and exhaust. Throttle to idle, then switch ignition to BOTH to prevent damage.
- A condenser failure typically shows up as high RPM miss and is not noticeable during low RPM testing. Points will prove to be pitted and burned upon inspection.