GAS ENGINE MAGAZINE

Building and Using a Magneto Timer

November/December 2003

http://gasengine.farmcollector.com/Gas-Engines/Building-and-Using-a-Magneto-Timer.aspx

Morgan R. Davis

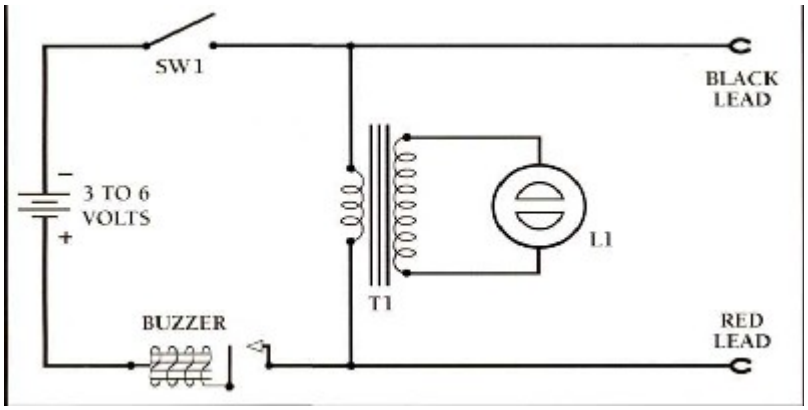

Diagram #1: Magneto Timer Schematic

Every so often, we read someone's request for help in timing a magneto to their engine. This isn't a particularly difficult job, but it can be made a little easier with the right tools and a bit of understanding.

In the high-tension magneto, the spark occurs when the breaker points open, just as it does with a coil and battery system. For the hottest possible spark, the points must open exactly at the magnetic neutral, or 'E-Gap' position of the armature. E-Gap is usually found by the alignment of marks on the gears inside the magneto or by a degree measurement made with a special fixture. The onset of breaker point opening at E-Gap determines the final point gap setting. For the engine to run properly, this hot spark must occur at a certain time in the piston's travel, usually several degrees before top dead center. Both types of timing depend on knowing exactly when the points open. While this may be accomplished by the old-time technique of placing a bit of cellophane between the points and noting the position of the timing mark at the time of the release of the cellophane, there is an easier and more accurate method: the aircraft mechanic's electronic magneto timer or 'buzz box.'

Virtually all piston aircraft engines use dual magneto ignition, and the magnetos must be properly timed, both internally and to the engine. The buzz box allows the mechanic to accomplish this quickly and accurately. Aircraft buzz boxes have two little lights to allow simultaneous timing of the two magnetos, but since this is not needed for a single ignition engine, the plans show how to build a one-magneto system timer.

Necessary components
These timers are available commercially from aircraft tool supply houses, but a suitable box may be simply constructed from materials often found in the well-equipped engine buff's shop. The following materials are needed:

Transformer: Table radio (tube-type) speaker output transformer, 5-watt, 3,500 ohm/3.2 to 4 ohms. Called

'T-92 Output.' May have numbers: 7483-1, 7668-1, 7842-1, 7510, 7495, 7743-1, 7244, 7590-1, 7947 or 7712-1.

Lamp: NE-51H neon lamp or any 125th watt such as NE-2, NE-48 or NE-51 without resistor. Operates on about 60 volts AC.

Buzzer: 3- to 6-volt door buzzer, vibrator-type (Sears, Roebuck "Dixon").

Battery: 3 to 6 VCD; use two or four D-cells in series, adjust buzzer to suit voltage.

Switch: Any single pole single throw.

Miscellaneous: Chassis box 3-inch by 4-inch by 5-inch, rubber grommet for lamp and wires, test leads, alligator clips, battery box, terminal strip.

Assembling Components

Assemble the components according to the schematic drawing. Polarity of the battery is not important. The lamp is wired across the transformer's original primary winding (the 3,500 ohm one) and the battery/buzzer connects to its original secondary, which is used to feed the speaker. Secure components inside the box. Mount the neon lamp in a grommet on the face of the box. Bring the test leads out through grommets. Turn the box on and adjust the buzzer's arm so that the device will buzz reliably on the battery voltage you are using. Test with the leads connected to each other and disconnected. The light will go out when the test leads are connected together; it will glow when they are not touching. In use, the light will glow and the buzzer will change note at the instant that the points in the magneto open; this is when the spark would normally occur.

The box works because the buzzer turns the battery current into pulsating DC. When the leads are connected to a magneto whose points are closed, the primary winding of the transformer is shorted out and no current is generated in the secondary winding; the lamp remains dark. When the points open, the electricity has the choice of going through the magneto's coil to ground or of going through the transformer's winding. Since the transformer winding is the path of least resistance, the current follows this route and, in so doing, induces a voltage in the secondary (about 65 volts) which causes the lamp to glow.

To use the timer, connect one lead to a good round (such as a magneto mounting bolt) and the other lead to the magneto's kill switch terminal. Be sure that the switch is in the 'On' or 'Run' position. For a non-impulse magneto on a single-cylinder engine, simply rotate the engine in its normal direction of rotation through the compression stroke while watching for the timing mark(s). The light on the box will come on when the magneto's points open; this is when the spark would occur. The timing marks should line up. If not, make adjustments and recheck. Timing a magneto with an impulse coupling (found on most modern magnetos) requires that you turn the engine until the impulse coupling trips, then back the engine up about 30 degrees. This is enough to reclose the points and take the play out of the gears or couplings, but not enough to reengage the impulse device. Again turn the engine in the normal direction of rotation until the light comes on. Now check the timing marks. Impulse couplings cause the magneto to delay firing until TDC for easier starting without kickback. When the engine starts, centrifugal force throws the coupling pawls out of engagement and the magneto advances itself to the correct number of degrees BTDC. This is why the impulse must be tripped before attempting to install the magneto or to set the timing. Be sure to turn the magneto's switch to 'off' or 'stop' after checking timing with the buzz box.

The box can also be used for magneto troubleshooting. If the light will not go out as the engine is rotated, the points are either staying open or are corroded or burned, thus not making contact. If the light will not come on, there is a short circuit to ground somewhere. This could be caused by a defective wire or a shorted condenser. It can be used as continuity checker for any wire and can check for continuity between a wire and ground.

Timing a high-tension magneto to an engine is not particularly difficult, but having the right tool can certainly make the job a lot easier. I hope that you will find this timer a useful addition to the toolbox.

This article originally appeared in the October 1990 issue of Gas Engine Magazine.