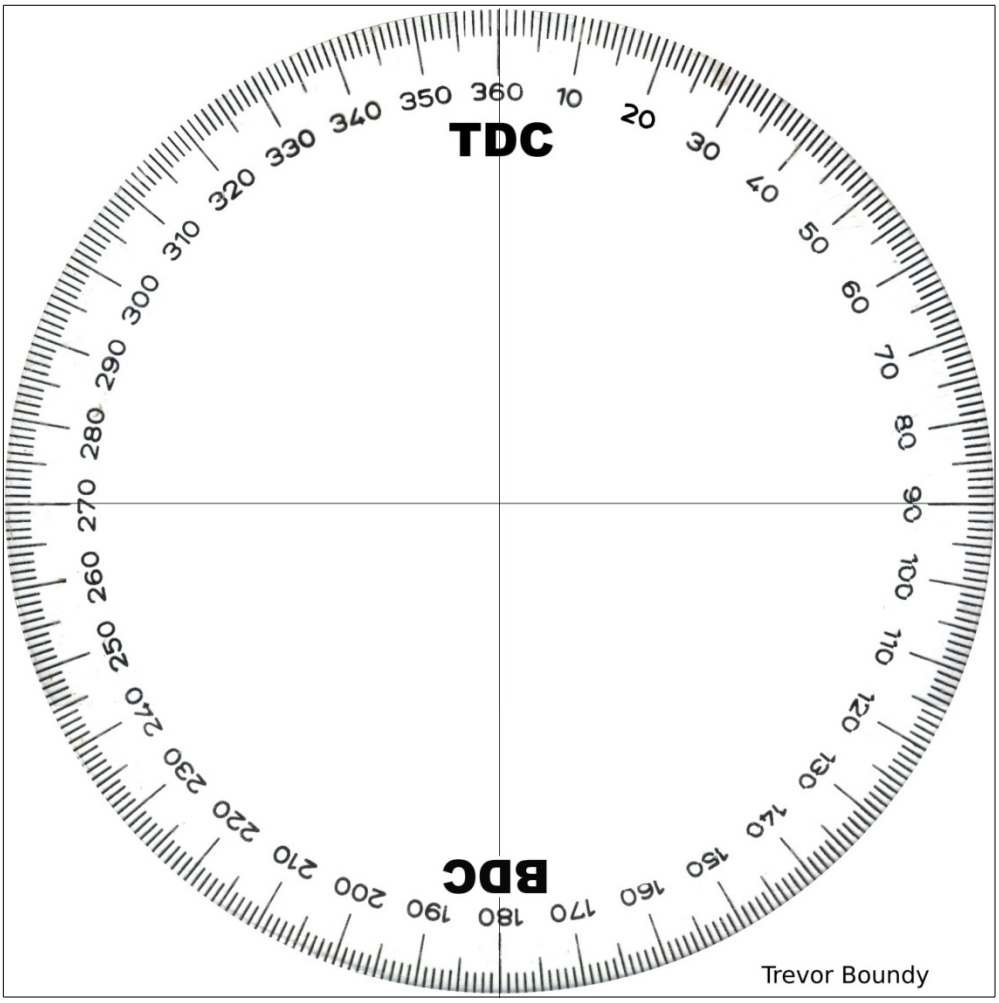
SETTING IGNITION TIMING. By Bob Angel

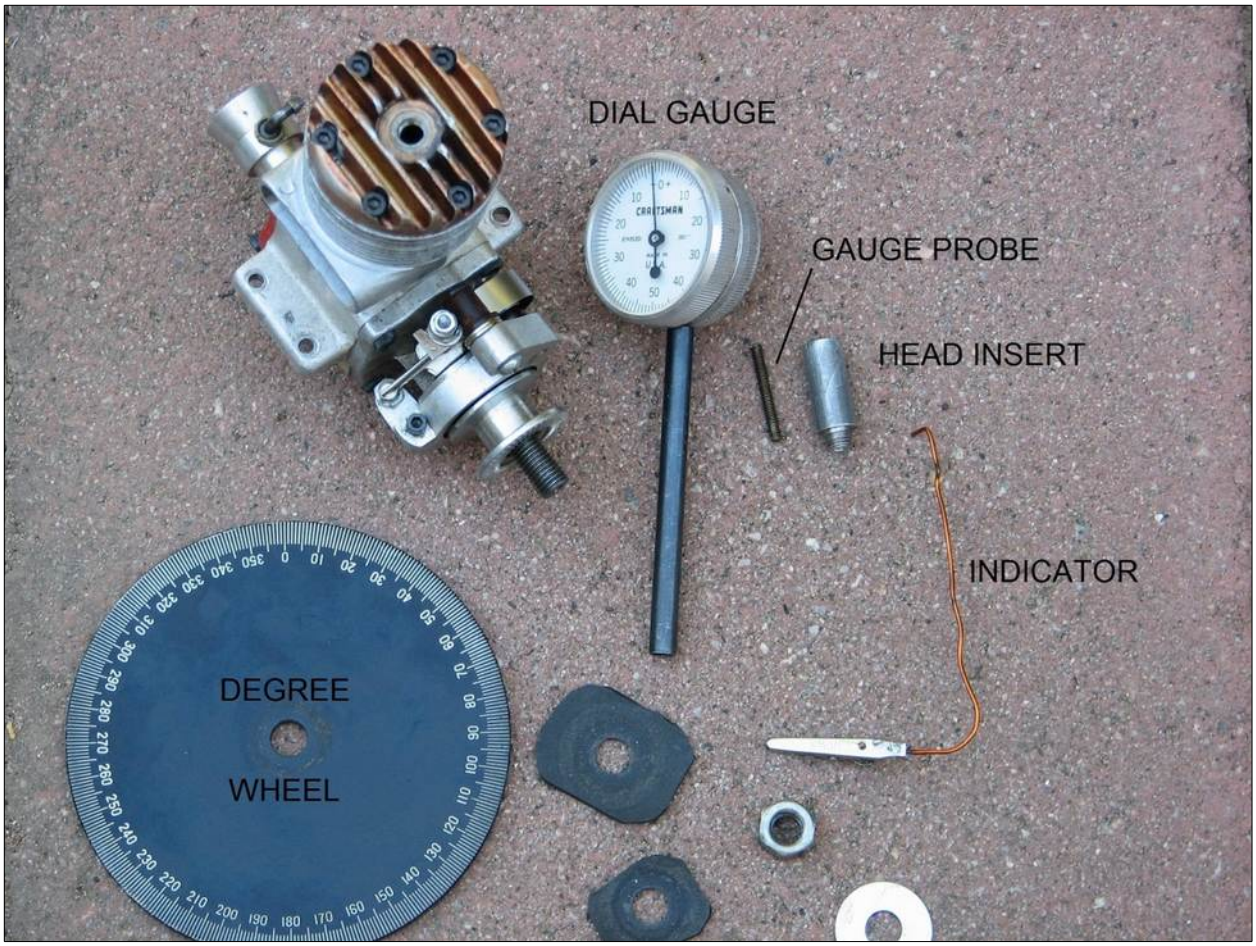
Some engines (such as the McCoy 60) almost require that the timer be locked down instead of being advanced and set “by ear” each time they’re started. This method can give the best and most repeatable performance if you test various settings with a tachometer to find that best setting. Setting ignition advance for performance is a lot like needle valve adjustment. Using a tach, you should adjust the needle for peak RPM, then back off (richen) just a tad to prevent overheating and premature wear or damage. Similarly, the spark should be advanced for peak RPM, then backed off by a hundred or so RPM.

The main piece of equipment you need for this operation is a degree wheel. I bought a nice pair of degree wheels from one of the scientific products catalogs years ago, but the exact source is forgotten and probably non-existent today. Fortunately our SAM webmaster Trevor Boundy has a nice do it yourself printable one on the SAM website. You can just cut and glue it onto a piece of smooth plywood, plastic, metal or whatever. I’d suggest making at least a couple with center holes drilled for different prop shaft sizes. You can download this copy from the SAM web site and resize it to any convenient diameter.



The wheel can, of course, also be used for checking engine port timing and dwell if you’re into more extensive engine work.

EQUIPMENT NEEDED is shown below.



Well, actually it shows a bit more than what's really needed. The machinists dial gauge gives a more accurate reading of the pistons top dead center (TDC) location, but isn't strictly necessary. The gauge probe and head insert had to be custom made to use the dial gauge. The head insert screws into the spark plug hole. It's hollow to allow the longer than stock gauge probe to reach in and touch the piston top. I made an insert for each of the two plug sizes.

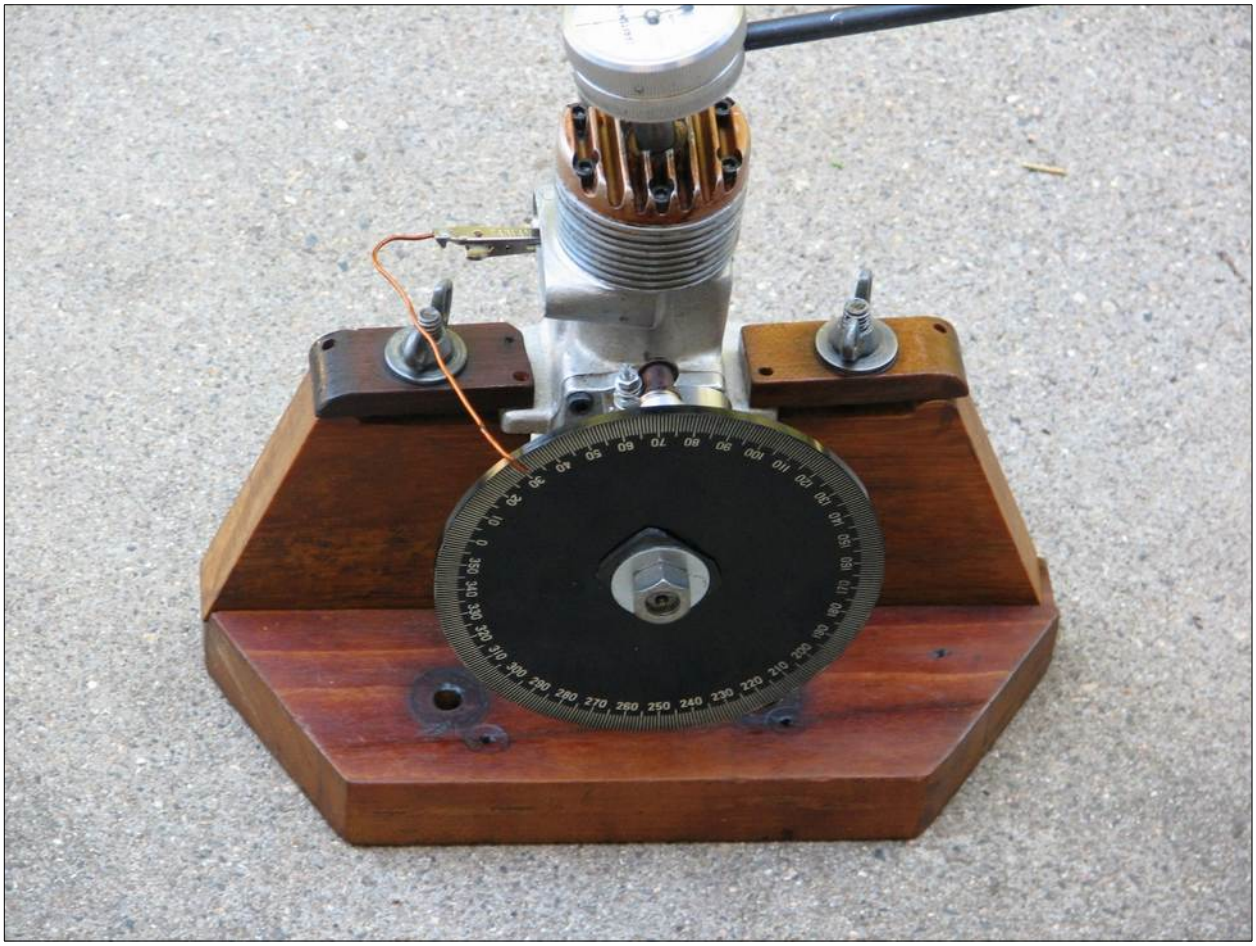
The four small unmarked parts at the bottom right are used to lock the degree wheel onto the prop shaft. The two crude looking black washers are made from rubber to prevent the degree wheel from slipping.

FINDING TOP DEAD CENTER (TDC) is the first step in the process. All engines have a zone of excess "play" at TDC where a very slight clearance in each end of the connecting rod is magnified. Unless you bring the piston to the top from each direction you can get a false reading of up to 5° or more, depending on rod clearance.

That indicator wire shown is just one approach to getting a reading. In this case I clamp the alligator clip to the lower edge of the exhaust stack and bend the other end around in front of the degree wheel. As an alternative you could attach an indicator to the motor mount.

Lacking a dial gauge, you can get the piston to TDC by just looking into the exhaust port while rotating the crank from each direction and averaging the few degrees of difference. Some people like to line up the degree wheel and the indicator (or pointer) at top dead center. This makes life simpler for recording readings. But I find it mechanically easier to just read

and record the degree number wherever TDC happens to hit. That does require more mental attention to do the adding and subtracting.



This view shows the indicator wire in place, along with the dial gauge for establishing TDC. The dial gauge isn't locked in, but is just hand held solidly in place while rotating the wheel and taking readings.

"ENGINE TIMING FOR DUMMIES" would be the title for the next three paragraphs if they appeared in a book. So you experts can skip ahead, while those who I've insulted read this part. By the way guys don't be offended, as I also happen to keep a couple of "For Dummies" books around on other subjects.

The only point to be made or repeated here is that a spark ignited engine has to have the spark plug light the charge off before the piston reaches TDC for best power and efficiency. The reason is that the charge doesn't "explode" instantly, but builds up pressure over a few milliseconds. And we won't plod through the mysterious electrical workings of a spark coil, but will just point out that the coil fires when the points open, not when they close.

A lot of variables go into the exact time in degrees that an engine needs to fire for best efficiency. And those variables are never the same between engines, fuels, prop load, etc.

MEASURING THE ADVANCE:
The picture below shows the dial gauge removed and a simple continuity light attached between engine ground and the insulated point. If you just want to know what advance you've been running, you just rotate the degree wheel in the normal running direction, note where the light goes out and take the difference between that point and TDC.

As a point of reference, some of the the older, slower engines run best with just 10 or 15° of advance. By contrast the McCoy 60's or other high speed engines need up to 40° or more. So this whole exercise is usually preceded by a running adjustment using a tachometer as described in the first paragraph of this diatribe. Then, whenever some change to the points happens, you can re-set the advance in the shop without having to run the engine. This assumes you haven't made any significant change to fuel, prop, etc. and just want to re-set.

But when you're trying to re- set timing to some known value it usually takes a bit of cut and try to get it exact. You may find you can rotate the timer to the point where the timing light goes out at the right spot on the degree wheel, but when you tighten down the timer clamp, that sweet spot has moved a few degrees. So you note the degrees and the direction of the deflection (sounds like poetry?) and compensate. With luck you'll hit it exact or close enough with just a couple of tries.