How to check your Dwell Meter

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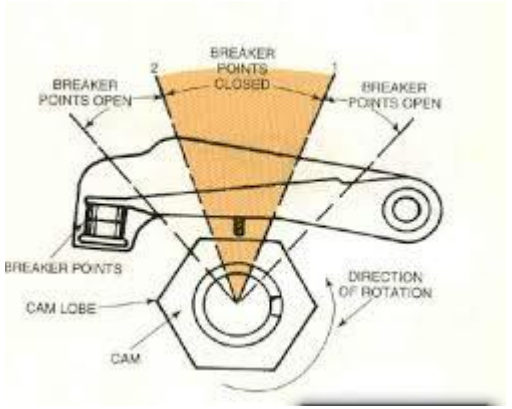
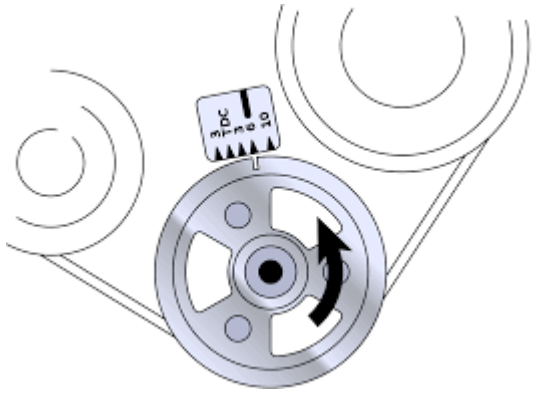
10/7/2019

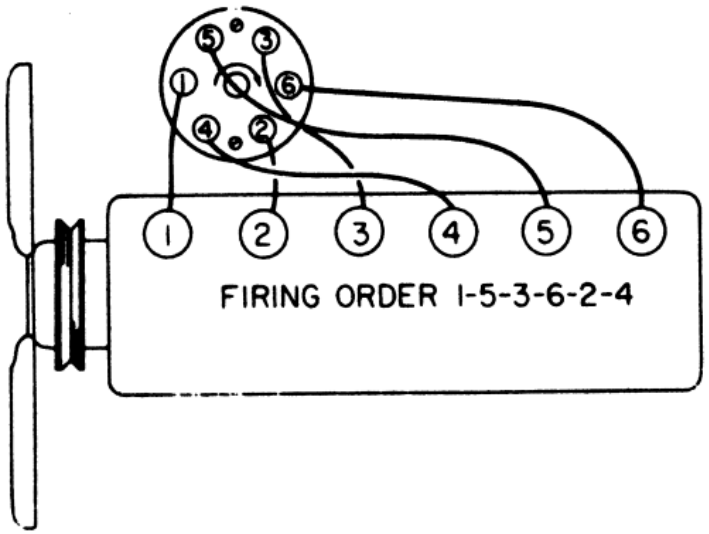
DO IT IN THE CORRECT ORDER

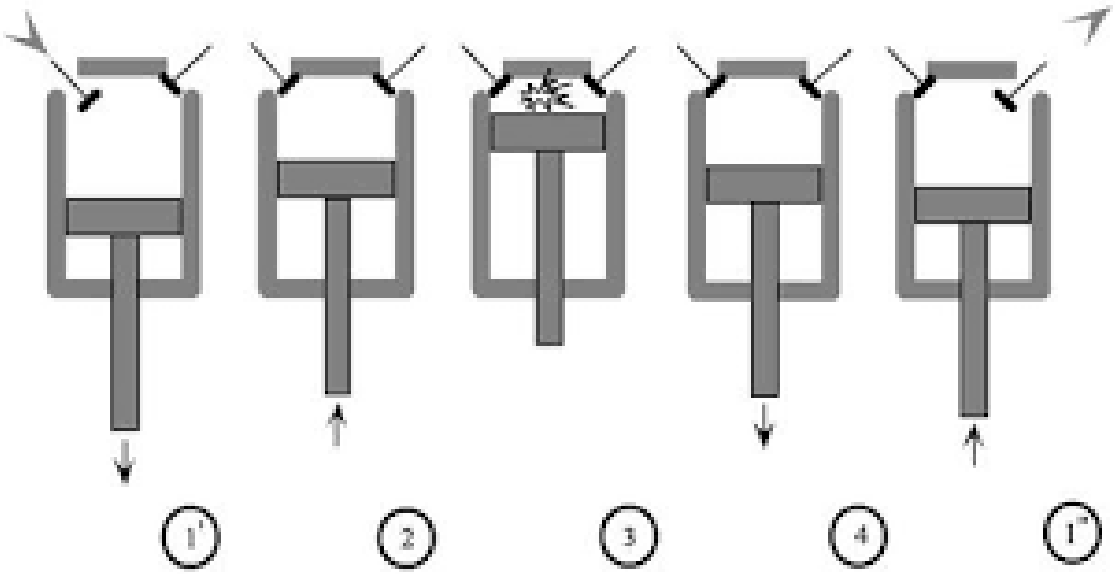
The order of your tune-up should be:

1) Spark plug gap
2) Ignition gap with confirmation of dwell angle
3) Timing









1 Distributor rotation (dwell)

= 2 Crankshaft rotations (timing)

When changing the dwell, it changes the timing. which changes by TWICE as much since the crank turns twice for each distributor rotation.

What is Dwell?

The time that the points are CLOSED.

QUESTION:
What is the *maximum amount of dwell*?

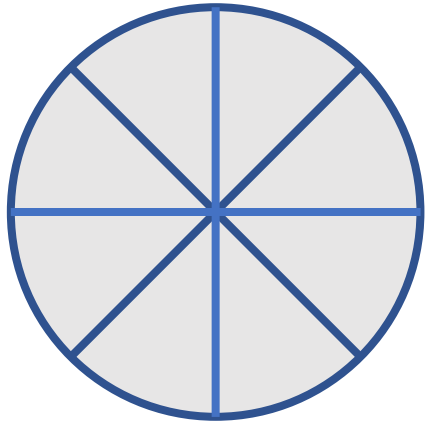
If the points are <u>closed</u> all the time, then you'd get the full amount.

If it is <u>open</u> all the time, then you'd get Zero.

THE ANSWER!

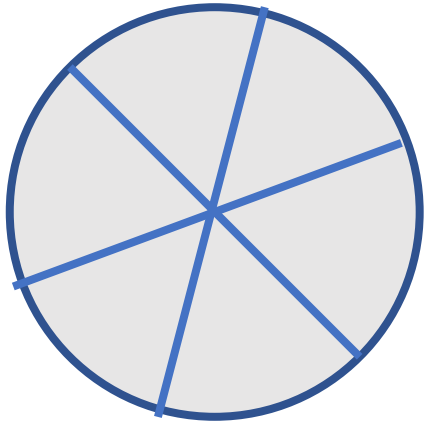
The distributor rotates ONCE for every firing cycle.
So the maximum dwell that is *physically* possible is:

8 Cylinder



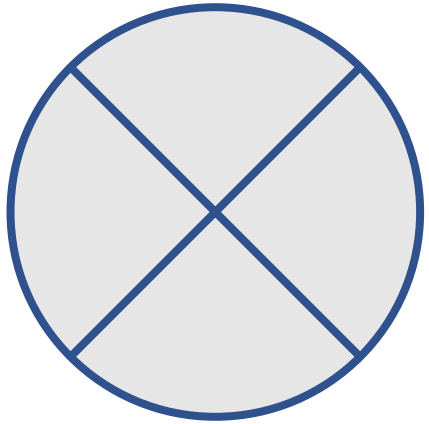
360/8 = 45°

6 Cylinder

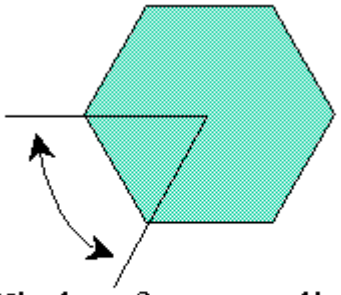


360/6 = 60°

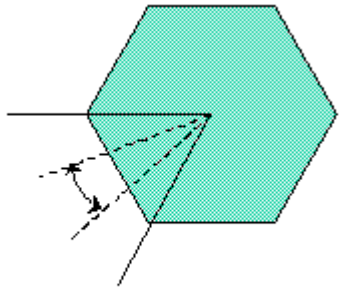
4 Cylinder



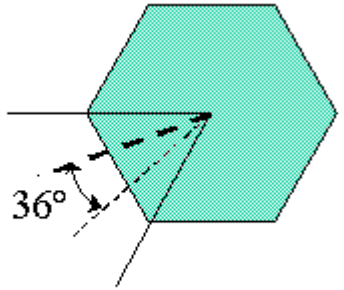
360/4 = 85°



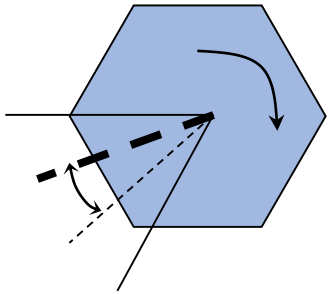
Window for one cylinder
in a 6-cylinder engine



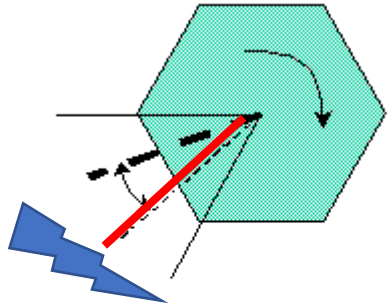
Dwell = Points closed



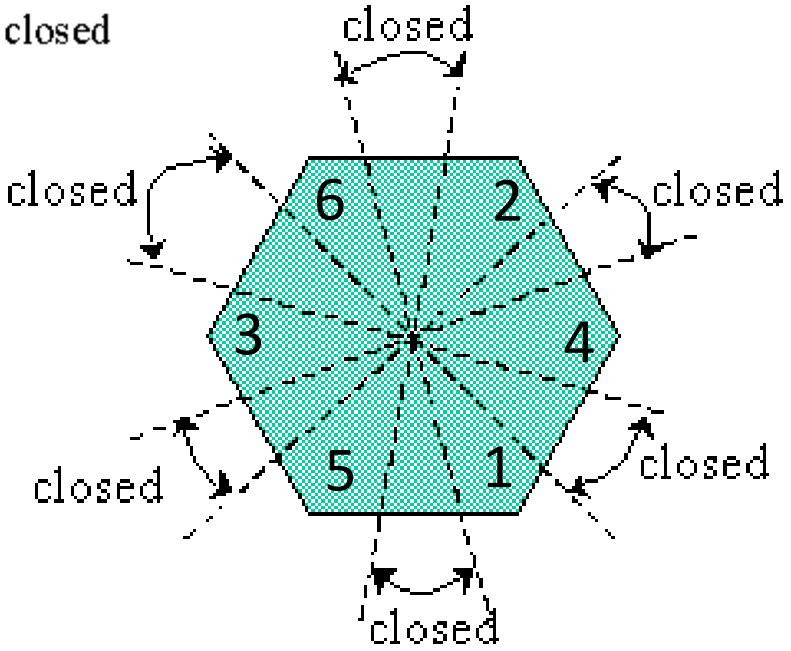
Dwell = Points closed



Clockwise rotation causes
the points to close
on the left side of the dwell window



Clockwise rotation causes the points
to open on the right side of the dwell
with the spark occuring here.



All cylinders fire once during
a complete revolution of the
distributor shaft

DWELL – TIMING

The purpose of closing the ignition points is to allow time for the coil to build up a charge. When the points open, the high voltage charge is released and the plugs arc to ground. (This is when you see the "spark".) Since the highest RPM of these engines is relatively low, the 6 volt coil has more than sufficient time to reach it's full charge. Therefore, the actual dwell setting is not all that important. It appears that being 4 to 6 degrees off the recommended amount will not be too noticeable. But you must have adjusted the timing so that it is fairly accurate. When the ignition points wear (and pit), it's not uncommon for the dwell to change by a few degrees.

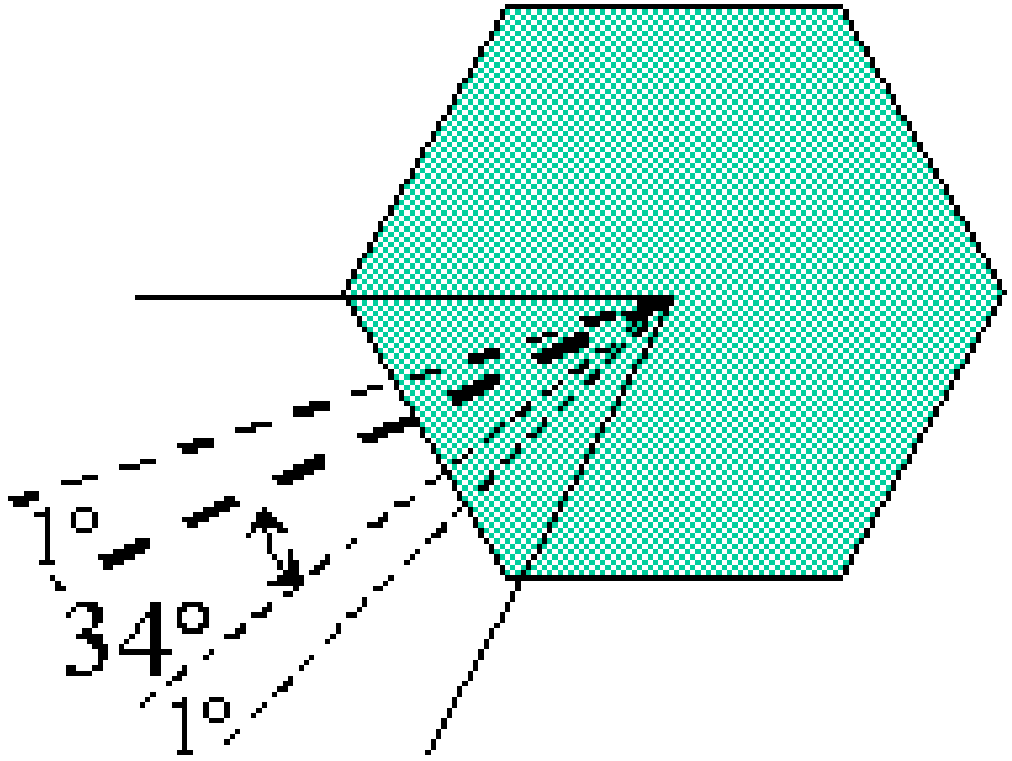
Check your timing as the LAST setting since it can be changed by gap (and resultant dwell) settings. The timing at the moment of when the spark ignition occurs is the most important setting of all. **Changing the dwell changes the timing but changing the timing does not change the dwell.**

IGNITION ADVANCE – BTDC

The reason for ignition advance is that the air/fuel mix doesn't burn instantaneously - it takes a little bit of time from the instant that the spark is set off to the moment when the peak pressure in the cylinder is reached. During that time, the crankshaft keeps rotating. So if you ignite most of the fuel mixture at top dead center (TDC), the piston will be well down the bore by the time the peak cylinder pressure is reached, and you'll get less horsepower and lots of unburned fuel out the tailpipe. The solution is to ignite the air/fuel mix BEFORE the piston reaches TDC, so that the peak cylinder pressure is achieved at just the time that the piston has reached the top of its path and is positioned to take full advantage of it. This is called ignition advance.

SITUATION:

I got the dwell set to 34 degrees. I was trying to get 36. What should I do?



2° lower dwell means only 1° later firing time since it splits on both sides of the dwell angle

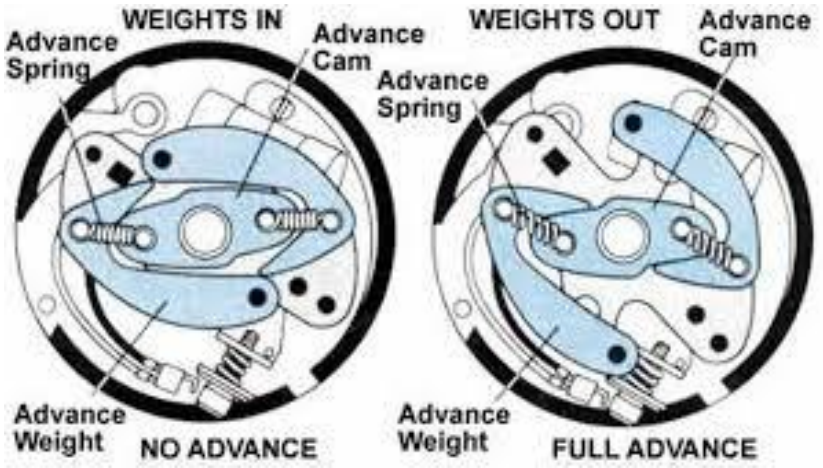
CONCLUSION:
Looking at this diagram, you can see that our lower dwell reading of 34, only changed the spark timing by 1 degree. Trying to change the ignition points gap setting to get 2 more degrees was probably not feasible.

ADVANCE

You never want your total advance to go over **36 degrees**. Therefore, if you set your timing at **18 deg** BTC (flywheel) and you add **12 deg** advance from your distributor weights, your total maximum advance would be **30 degrees**.

NOTE:
*Early manuals state that 1930-31 engines should be set to **12** degrees BTDC. Later shop manuals and VCCA members say that a much better setting is **18** degrees BTDC. This is further improved by setting the spark plugs at **.040**.*

1929-1931 Distributor Weights



"...at speeds **below 22 miles per hour**, the automatic distributor advance feature (ie. Weights) **does not function** and the only variation in firing is obtained by the spark control button on the instrument panel. At speeds 22 miles per hour or more, centrifugal force begins to throw both weights out until at a maximum speed, they reach full advance..."

CALIBRATING YOUR DWELL METER

After searching for the past six months, I finally found a tip that appears to be valid for dwell meters that have their own source of power (ie. Battery).

With the meter set to “6 cylinder” and the leads NOT touching each other, the reading should be ZERO. Right? The same as if the points were open with no coil charge.

If you TOUCH the two leads together, then you’re getting the full battery CHARGE across the meter similar to when the points open (and energize the ignition circuit). On the six cylinder scale the meter should read **60 degrees** per our earlier diagram.

CALIBRATING YOUR DWELL METER, cont

I don't have a simple way to check older meters that do not have a battery in them. It's possible that placing a 1.5 v battery across the leads would register on the dwell scale. But I didn't want to try that on any of my working meters.

The best way to check it would be to connect it to a Sun Analyzer. Unfortunately, I've never found one in my price range.

Maybe someone can connect us to someone who would like to share their machine with us. ☺

EXTRA CREDIT

- **How fast does the flame travel in an engine?**

How fast does the flame travel in an engine?

- Here's a hint:

$$s_{\mathrm{L}}^{\circ} = \sqrt{\alpha\dot{\omega}\left(\frac{T_{\mathrm{b}} - T_{\mathrm{i}}}{T_{\mathrm{i}} - T_{\mathrm{u}}}\right)}$$

- Please note that the speed varies due to temperature, engine speed, turbulence, fuel mixture, pressure, and other factors.

How fast does the flame travel in an engine?

- A gasoline engine at 1500 rpm would have a flame speed of about *90 Feet per second*.

This says that the flame front has progressed across half of the combustion chamber (2”)
while the crankshaft has rotated around 18 degrees.

If the ignition spark was timed for around 15°BTDC, the max pressure in the chamber would occur around 18° later, or 3° after TDC.