

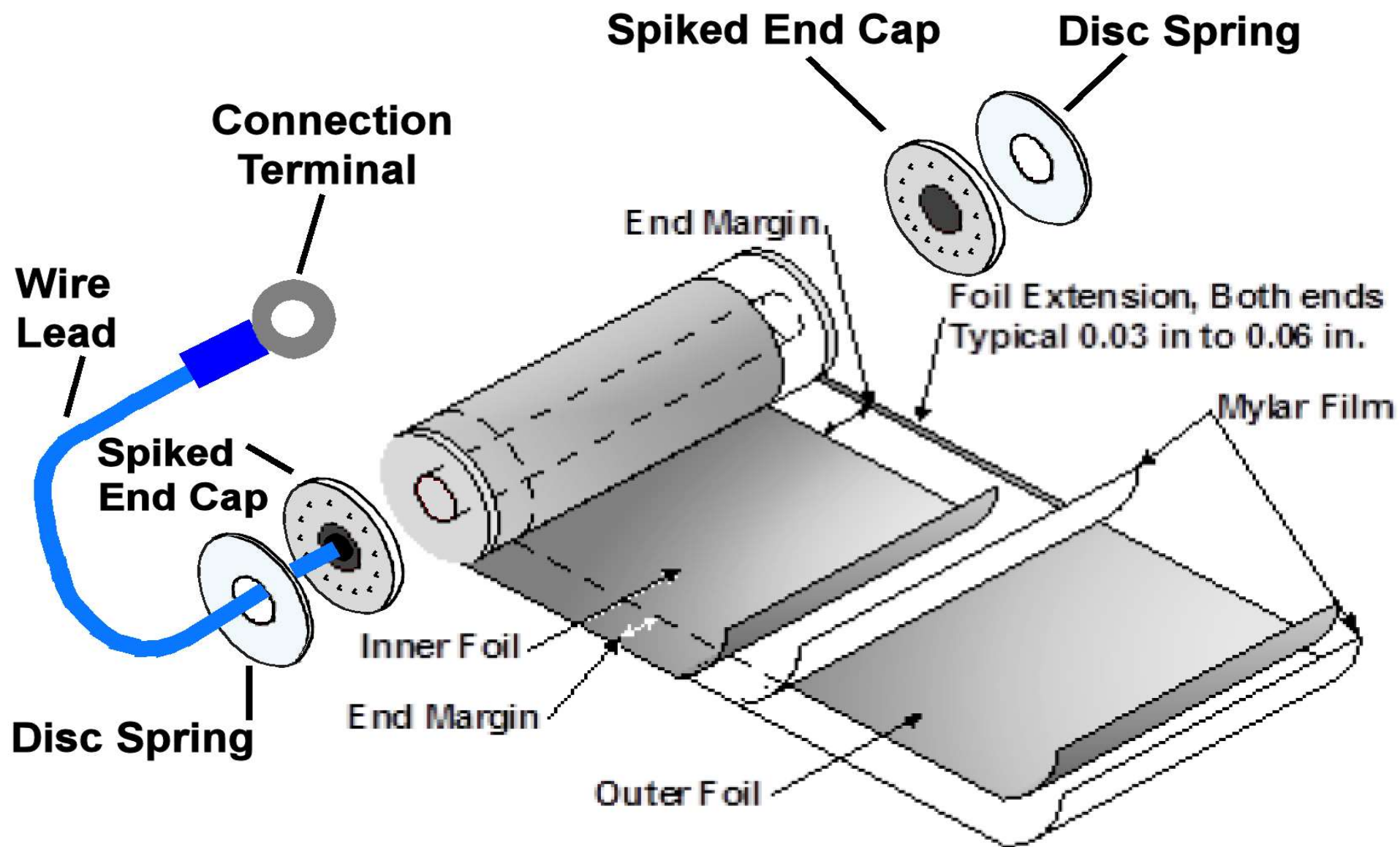


Condenser Failures, and Correct Testing Procedures

Bill Mohat – AOMCI Western Reserve Chapter

The picture on the next page shows how magneto condensers are built.

By far, the most common failure mode is when the mylar film dries out and develops “pinholes”, which allow electricity to arc between the two aluminum foil layers.



Most people think they can test condensers with an ohmmeter. The procedure they use is as follows:

- 1) Set ohmmeter to it's highest range (RX1K or RX10K, whatever the highest range is that your meter has).
- 2) Connect the test leads of the ohmmeter across your condenser. The meter should swing toward "0 ohms" momentarily, then quickly swing back to "infinite ohms" as the condenser charges up.

If this is what you see, it indicates that you are connected across a condenser, and that can hold a charge, and that it is not shorting out **AT THE VOLTAGE LEVEL BEING PUT ACROSS IT BY YOUR OHMMETER.** And that's the problem with ohmmeters; the test voltage they use typically is less than 10V, which is way too low to test a condenser correctly.

WHEN CONNECTED TO A CONDENSER, THE "NEEDLE" ON AN ANALOG OHMMETER WILL MOMENTARILY SWING TOWARD "0", THEN WILL SWING BACK TO "∞" (INFINITE OHMS)

A DIGITAL OHMMETER WILL MOMENTARILY DISPLAY "0.00" OHMS, THEN WILL SLOWLY COUNT UP UNTIL IT DISPLAYS SOME KIND OF "OVER RANGE" OR "OVERLOAD" STATE, INDICATING INFINITE OHMS



TESTING CONDENSER WITH OHMMETERS

You can, of course, use a “Capacitance Meter” to measure the exact value of your condenser. Almost all outboard condensers are in the 0.1 to 0.47 μ f (microfarad) range.

The exact value of the condenser isn't critical at all; anything from 0.1 to 0.47 μ F will work acceptably. The typical reading you will see is about 0.22 μ F.

However, just like the ohmmeter, your Capacitance Meter will only be putting a few volts across the condenser when testing it, and this is WAY TOO LOW to test a condenser correctly.

DEDICATED CAPACITANCE METER
MEASURES .206 MICROFARADS

CHEAP DIGITAL MULTIMETER
(WITH CAPACITANCE RANGE)
MEASURES .210 MICROFARADS.



MEASURING CAPACITANCE

The reason an Ohmmeter and Capacitance Meter can NOT be used to test condensers is because a condenser must be able to handle high voltage spikes, without “arcing over” internally between the two metal foil plates.

The picture on the next page is from an oscilloscope, which is showing the voltage across the condenser (in RED), and the voltage across the spark plug (in YELLOW).

Note that the voltage across the condenser hits 200V peaks. (On some outboards it can be higher; up to 300V peaks are not at all uncommon).

Points Voltage

1
-200V Peak

**Spark Voltage
8KV Initial Peak**

1 100V-

2.12div

(25MS/s)

M:100us

1 148V

2 2KV~

-3.00div

Depth:100K

Type

Image

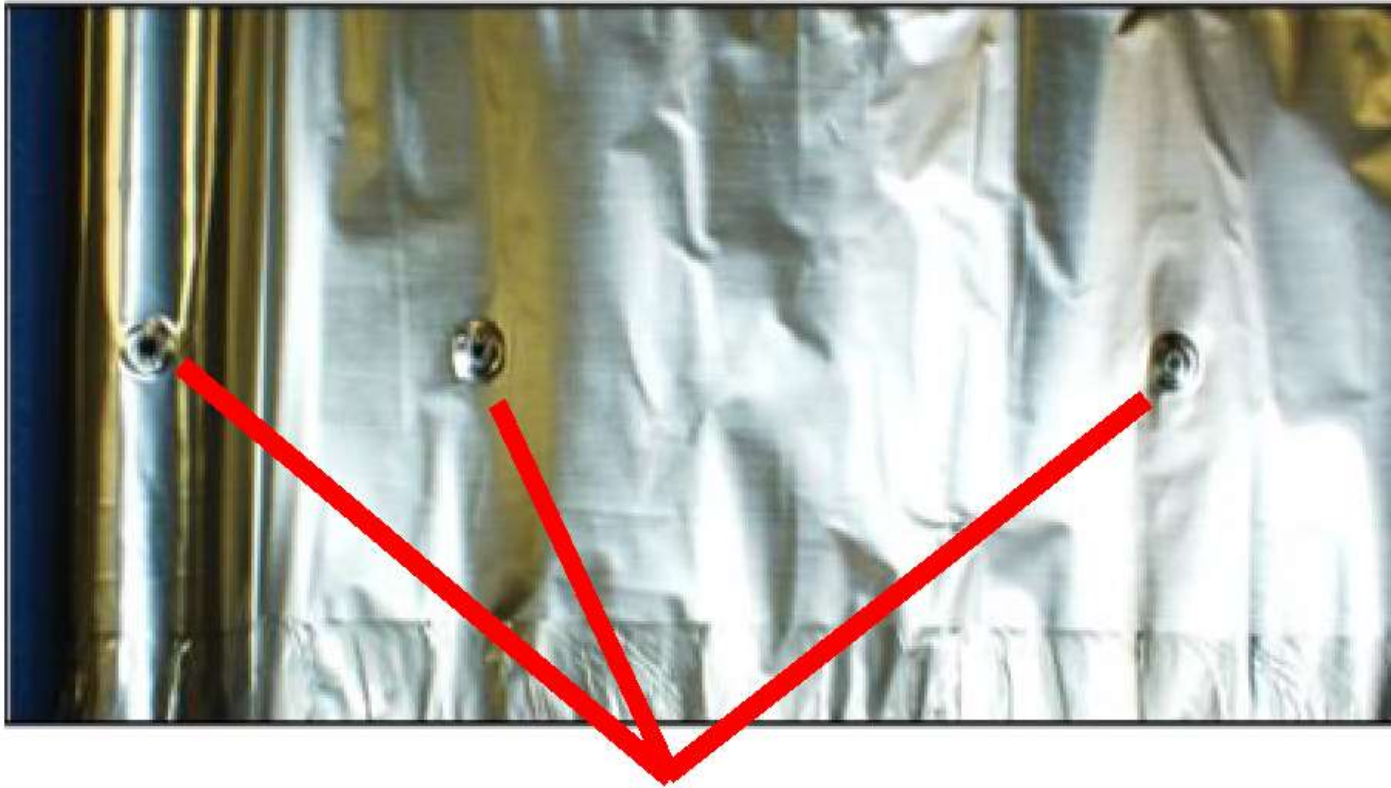
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As I showed earlier, outboard condensers are made from thin strips of aluminum foil, separated by Mylar (or other plastic) insulation. The Mylar film is VERY THIN; often only 0.002" of an inch or less. IF IT IS INTACT, this thin plastic film will prevent electricity from "arcing across" between the two aluminum foil plates.

HOWEVER, if the Mylar film fails and develops "pinholes", electricity CAN jump across between the aluminum foil plates. This will cause your outboard motor to misfire, sputter, stall, and possibly not even run at all.

The picture on the next page shows these "pinholes" in a failed condenser, at high magnification.

Dielectric Punch-Through Failures in Film Condensers (VERY common!)



**Pinholes / arcing through the film
insulation. (75X magnification).**

Your Ohmmeter and Capacitance Meters only put 1 to 10 volts across a condenser when testing it. This voltage is FAR LOWER than what will be seen across the points in your outboard. You MUST TEST with about 300V to see if the insulation inside your condenser can handle these 300V peak voltage spikes.

I'll repeat myself here because this is important: the MAIN FAILURE MODE of condensers is when the mylar film fails and develops pinholes, allowing the condenser plates to "arc over" internally. There are NO Ohmmeters or Capacitor Meters that test with anywhere near this high of a voltage level.

Decades ago (before electronic ignition systems), you could buy "coil and condenser testers" that DID put this much voltage across a condenser when testing it. But, these "vintage" testers have not been manufactured for some time, and are a bit difficult to locate today. **However, they are the ONLY way to test a condenser correctly.**

Graham-Lee
Model 31



Graham-Lee
Model 51



Merc-O-Tronic
7100 or 9800



King Electric
Model G218



Vintage Ignition / Coil / Condenser Testers

You can often find one of these old “vintage” condenser testers on e-bay (and other Internet sites). However, they often cost well over \$100, and quite often are broken and need to be repaired (which many people may not be able to do.)

As an option, I did design a **very simple** condenser tester, which can be built by anyone with even very simple electronic assembly skills. The cost of parts for this is about \$40. It's about as sophisticated as cinder block, but it works incredibly well....and could save you a lot of time. E-mail me for construction plans.

If you test with an ohmmeter and THINK your condenser is OK (and it's NOT), you could wind up cleaning your carburetors and re-setting your points MANY, MANY times, not realizing that the condenser you THOUGHT was good really isn't. The \$40 investment is really cheap, compared to all that wasted time.

A continuous glow of the neon light indicates a dead short. Continual, intermittent flashing of the light indicates arcing through bad insulation.



If you are a member of the AOMCI, it's highly probable that there is another member within driving distance of you that has one of the old "vintage" condenser testers, and will be willing test your condensers for you. Check your AOMCI "Members Directory", or go to the AOMCI main website, to locate the Local Chapter nearest to you.

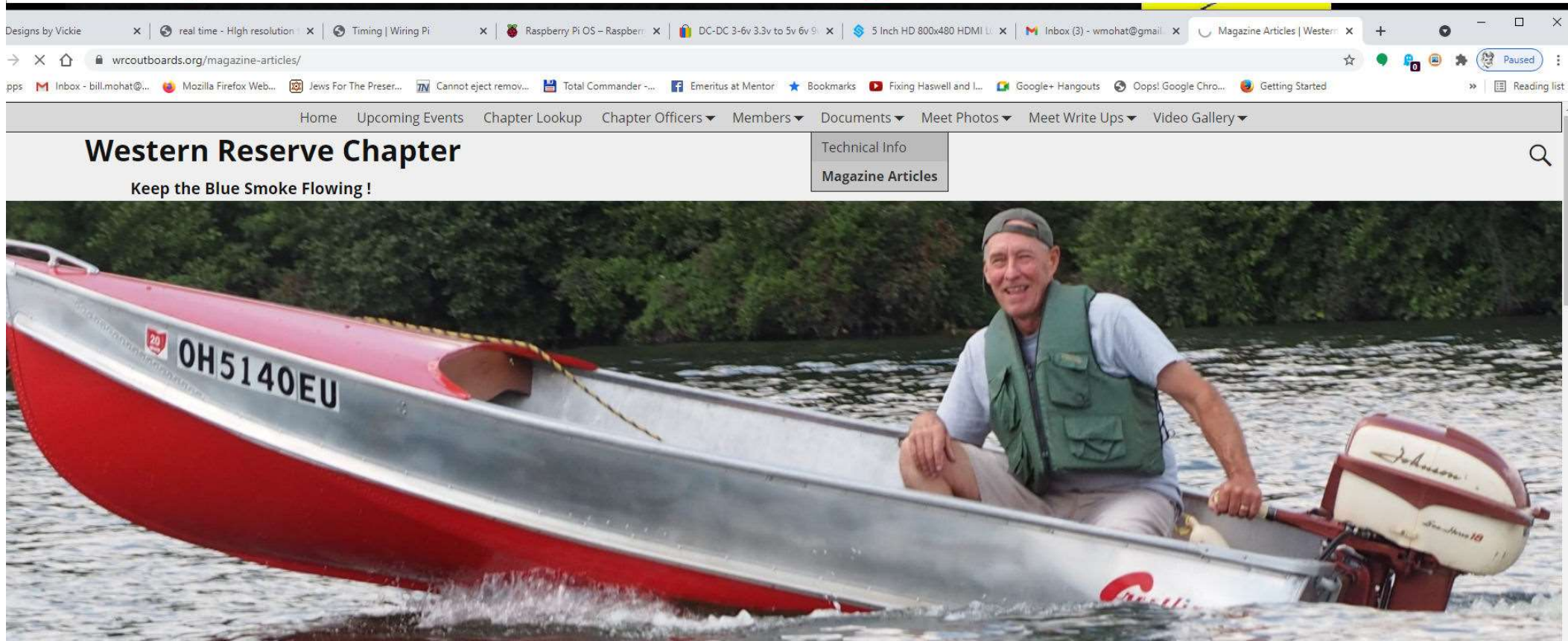
The AOMCI is a terrific resource for information, parts, tools, and **ACCURATE INFORMATION** on how to test and repair your old outboard. The cost of membership is very low, compared to the value you get in return. Go to <https://www.aomci.org/> for more information.

Also visit the Western Reserve chapter website, to download many technical articles on antique outboard ignition systems. See the References on the next page for details.

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Western Reserve Chapter:

<https://wrcoutboards.org>



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Magazine Articles

INDEX OF MAGAZINE ARTICLES: Here's a collection of The Antique Outboarder articles, authored by members of the Western Reserve Chapter!

*****Click on the "Download Buttons" below to view these articles! *****

[Articles_Outboard_Ignition_Systems_Parts1_and_2r.PDF](#) This document is an introduction to basic electrical components, (battery-powered) ignition systems. Part 1 uses mechanical analogies, to explain how basic electrical