

Getting started electrically diagnosing your Shopsmith motor:

I encourage you to read all of this PDF before reading the one from Fluke regarding actual motor diagnostics.

Fluke, one of the most respected electronics tool manufacturers states; *Centrifugal, thermal, and capacitor switches cause most single-phase motor malfunctions.*

The Fluke PDF discusses this topic in the context of single-phase motors in general *NOT the specific GE, Emerson, A.O. Smith brands that are extensively in Shopsmith Mark V headstocks.* The principle is however, the same.

First let me state that more powerful single phase motors often use an aid to start the motor, which gets it up to running speed from not moving at all - in much the same way a transmission would in a vehicle. Equally, that can normal or overdrive (centrifugal *and* capacitor start) in motor terms.

Fluke discusses thermal auto-reset etc. in the document but you likely will not encounter those in power machinery for safety reasons. You wouldn't want to be changing a saw blade for example when a motor cooled down and auto restarted. It's one of the reasons they aren't used in tools, but might exist in other equipment you might service.

First always turn off the equipment, before you start electrical troubleshooting. **Better yet, unplug the equipment**, and for even the most fearful among us, put the end of the un-plugged power cord in your pocket if you have to 'continually know' a machine has been, and remains, disconnected from the power source. Don't laugh, I know a person who did that. Don't think you are safe, know you are safe he said.

Let me frame two definitions before you read that Fluke PDF to help you understand how the motors actually work.

1) A centrifugal switch is an electric switch that operates using the centrifugal force created from a rotating shaft of an electric motor. That means a spring-loaded portion of the switch assembly rotates with the shaft.

The centrifugal switch is designed to make and maintain contact or release contact as a function of the rotational speed of the shaft it is on reaching or falling below the inertia it takes to make it overcome the return spring's tension, which will restore the start circuit when the motor is eventually powered off.

Somewhat similar to a transmission in a vehicle that needed to climb a steep grade, the start windings of a motor functions as lower gear and the motor needs to manually shift to the run windings to take it to full speed once the starting load for the motor, or grade if you will, is overcome.

A centrifugal switch rests with start capacitor connected, spins up to speed to disconnect it, and leaves the final work to the run windings that remain in the circuit.

If you have a mass of something (sawdust, lint, etc.) preventing the contacts from making connection, or have so much sawdust in the coils of the return spring it can't return them to the run winding with the capacitor boost when the motor shuts off, you clearly will have motor problems, needing attention to prevent other more expensive repairs. Often service can be a relatively simple cleaning process.

Depending on where the centrifugal switch is mounted, you may or may not have to disassemble portions of the motor to service it. Other posts discuss that in detail.



Photo Credit jacobs-repairshop.com
Jacob Anderson

This is an Emerson 1 1/8 HP motor which has an internal centrifugal switch as an example.



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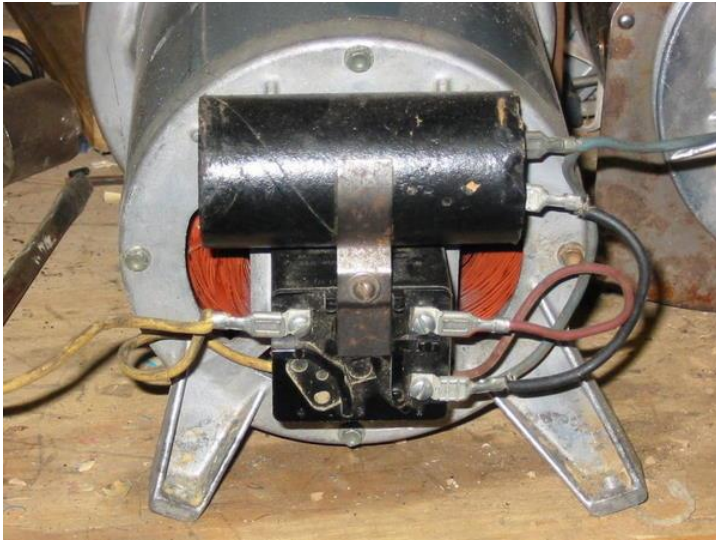
Sawdust can get into the motor over years of use. Routine maintenance and cleaning done as part of your normal lubrication process for the Shopsmith can help mitigate this as well as using dust collection ports on your Shopsmith equipment, enticing dust to move where you want it to opposed to flowing through the motor with the air flow that the motor uses to cool itself.

I have a 60 year old Greenie with the original $\frac{3}{4}$ HP motor that works well, so with proper maintenance and cleaning this remarkable machine can provide decades upon decades of service. Equally it can be brought to its knees by neglect.

The forums here will connect you to some folks who will help you discover a DIY process where your own "Phoenix" can rise from the ashes so to speak, and you can then maintain your existing equipment in top working order.

One such unit spent a few weeks submerged in a basement covered with storm surge waters from Katrina, and it was brought back into service.

Photo Credit Bill Mayo Post # 85462 - This is a GE Motor for example.



2) A capacitor start motor is more analogous to a low gear in a transmission that gives more starting torque to the motor when it is not spinning to get it up to speed, then it too drops out often as a result of a centrifugal switch.

Start capacitors briefly increase the motor starting torque which allows the motor to cycle up from not moving, to rotational speed. The Fluke document will explain how to test them.

A start capacitor stays in the circuit long enough to rapidly bring the motor up to a predetermined speed, which is usually about 75% of the full speed, and is then taken out of the circuit, by a centrifugal switch disconnecting it as the force of the fly-

weights attached to it overcomes the return spring(s) tension.

It's far rarer to have to replace the capacitor, than to resolve a mechanical malfunction of the centrifugal switch due to debris that has built up. As Fluke will discuss, a bad capacitor will test with an open circuit or a short circuit, or have some physical deformity or leakage, otherwise it's likely working. The point is you can safely determine the status if you are shown how.

You may encounter motors in other equipment in your shop or elsewhere that have both a start and a run capacitor.

There are numerous other posts in forums that outline how to disassemble, clean the various motor types, identify and replace the various bearings and which discuss the electrical testing of the motor and capacitor with a volt/ohmmeter.

I hope this coupled with the Fluke PDF will help you overcome reservations you might have about being able to do at least the motor electrical diagnostics, if not the complete motor repairs yourself, using other posts.

Respectfully,

Everett