



## Ceiling Fan Capacitors- Diagnosis and Replacement

Most ceiling fans use a type of motor known as a “permanent split capacitor motor. These motors have two coils, a start and run winding. A capacitor is connected in series with the start winding to insert a phase shift, but once the motor is up to speed it becomes an auxiliary winding. In order to reverse the motor, the capacitor is applied to the run winding which then becomes the start winding. In some cases the windings may have taps to provide different speeds, in others the value of the start/run capacitor is lowered to provide different speeds. Other designs will have additional capacitors wired in series with the motor as a whole to regulate speed.

Signs of a bad capacitor in a ceiling fan include:

- Fan runs slowly or not at all on all speeds
- Fan will not start but will spin if started by hand
- Certain speeds are slow or do not work
- The motor hums and turns freely by hand but will not spin

The capacitor is usually a black box inside the switch housing of the fan. If the case appears burnt or melted in any way, that is also the sign of a bad capacitor and it should be replaced. Keep in mind that there may be other components in the circuit with the defective capacitor. These should also be properly checked and replaced if found defective. Not doing so may simply render the replacement capacitor defective upon power up.

### How to Replace a Ceiling Fan Capacitor

Prepare by opening the case. Make sure you have the necessary tools, including a voltage tester, a screwdriver that matches the screws on the fan, wire nuts, wire cutters and wire strippers. Switch off the power to the room that contains the fan by opening the breakers at the electrical panel or removing the corresponding fuses. Place a stepladder under the fan and make sure it is high enough for you to reach the fan without having to stand on the top two steps.

Replacing the actual capacitor is usually straight forward but first you need to determine the correct value. If the marking on the case of the original part is obliterated or unreadable you should consult with the fan manufacturer or check the schematic to determine the original value. Otherwise determine if 2 wire or 3 wire. Two wire capacitors are easy as they only contain one capacitance value. Capacitor values are measured in “microfarads” (uf), ex: 4uf is a 4 microfarad capacitor. Fans that have more than one speed will often use more than one capacitor for speed regulation. To save space quite often capacitors that contain more than one value will often be used. Three wire capacitors are a bit more

difficult as they contain two different values. For example a three wire capacitor may contain a 2uf and a 4uf capacitor in the same case with one common wire. One wire goes to the 2uf side and the other goes to the 4uf side.

The color of the wires is not always the same as the original device so in the case of a 3-wire capacitor care must be taken to determine which wire was originally connected to which value.

NTE has a complete selection of 2 wire and 3 wire capacitors in various values suitable for most applications. Check out our full offering at: [http://www.nteinc.com/capacitor\\_web/pdf/cfc.pdf](http://www.nteinc.com/capacitor_web/pdf/cfc.pdf)

For capacitors containing more than 3 wires there is usually a schematic on the inside or the original owner's manual explaining the various values.