

FLORIDA SOLAR



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Air Conditioner Fan Speed Controller for Comfort and Dehumidification

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Fact Sheet

FLORIDA SOLAR ENERGY CENTER

Public Information Office

Air Conditioner Fan Speed Controller for Comfort and Dehumidification

Mukesh Khattar

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Air conditioners perform the dual functions of cooling and dehumidifying. Many air conditioner units do not adequately dehumidify the air in Florida's humid climate. The quest for higher energy efficiency ratings (EER) has produced units that perform poorly in moisture removal. What follows is a simple and cheap method to increase the moisture removal performance of any air conditioner.

The blower fan motor in most air conditioners has three speed settings — low, medium and high. In the factory, the fan is usually set at medium speed, but another speed may be selected during installation. User selection of fan speeds on a day-to-day basis is not available. Caution must be exercised in selecting speeds lower than manufacturer's recommendation. It might cause frosting on the coil.

Adjusting the fan speed during air conditioner operation can offer several advantages from the standpoints of comfort, humidity control and energy consumption. The fan speed can simply be switched manually or with a special controller.

The advantages are:

- High-speed setting
 - Quick cooling
 - More cooling and less moisture removal
 - Good for daytime, when cooling loads are high
 - Energy efficiency, partly because it removes less moisture.
- Low-speed setting
 - More moisture removal
 - Lower fan noise and quieter operation
 - Good for nighttime, when cooling loads are low and humidity is high
 - Increased comfort levels
 - Slight loss in efficiency.
- Medium-speed setting
 - A good compromise between the low and high setting.

Figure 1 shows the control wiring of a typical air conditioner fan motor. Figure 2 shows the control wiring with a selector switch that can be used to set the speed at low, medium or high. The selector switch could be a manual or a specialized controller (thermostat, humidistat or microprocessor).

The speed selector can be installed in the field. A kit consisting of the following materials is required:

- (1) Three contactors with 24 V coil, which are rated for a fan motor
- (2) A manual selector switch or specialized controller
- (3) Control wires and electrical connectors.

The installation procedure is simple. However, field wiring must comply with local and national fire, safety and electrical codes. First, ascertain that the blower motor is a three-speed model by looking at the manufacturer's catalog, electrical wiring or the unit itself. Next, install three contactors on the air handling unit and the selector switch next to the room thermostat. Draw 24 V control wiring from the thermostat to the new contactors according to Figure 2. Be sure to locate the proper control wires.

The kit can be made from readily available components for about \$30-40. The labor time to install it in the field would be about an hour. It may be commercially installed for about \$100. For a factory assembled unit, the equipment cost may increase by \$20-40.

This control method would provide more dehumidification when needed. It can overcome some of the inherent disadvantages of high efficiency air conditioners that have lower moisture removal rates.

The moisture removal performance of an air conditioner also depends upon the unit's operation. For example, an air conditioner operated with the fan switch in the "ON" mode will operate the fan continuously, while the compressor cycles on

thermostat demand. This mode will remove less moisture than when the fan switch is in the "AUTO" mode, which will cause the fan and compressor to cycle together. The primary reason for this difference is that water will re-evaporate from the cooling coil when the fan runs

and the compressor has stopped. For a discussion on the disadvantages and advantages of fan cycling and its adverse effects on moisture removal, please refer to FSEC publication PF-75, ***Fan Cycling Effects on Air Conditioner Moisture Removal Performance in Warm, Humid Climates.***

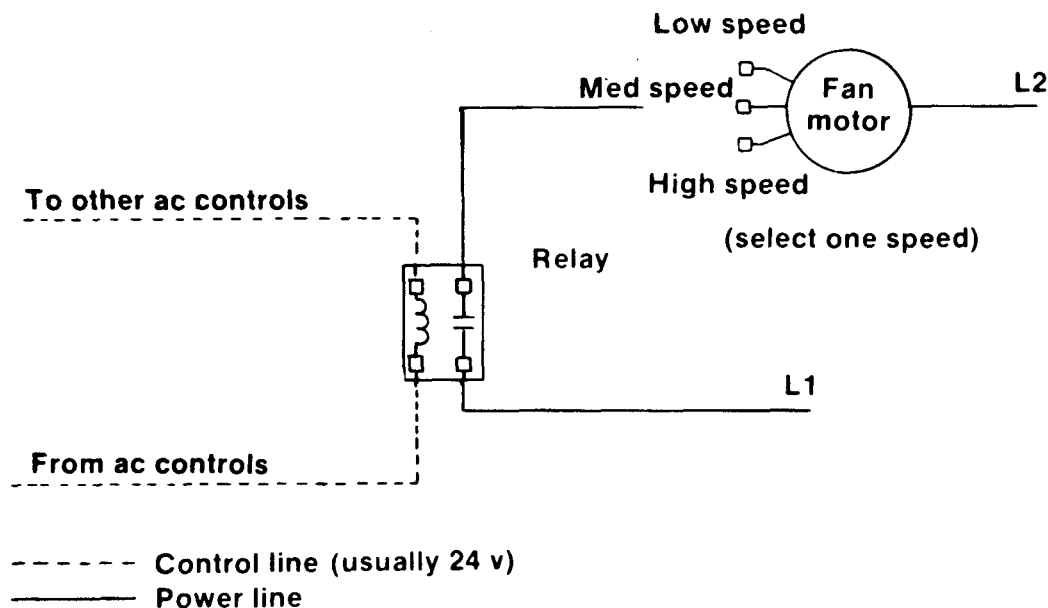


Figure 1. Typical fan motor control in air conditioner.

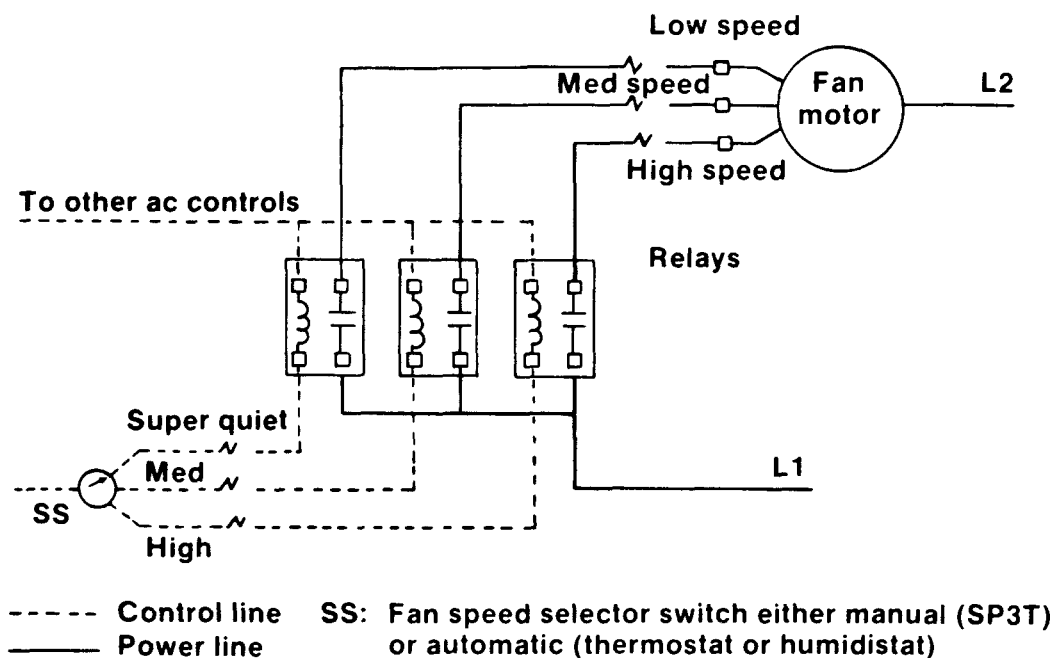


Figure 2. Control arrangement to switch fan speed in air conditioner.