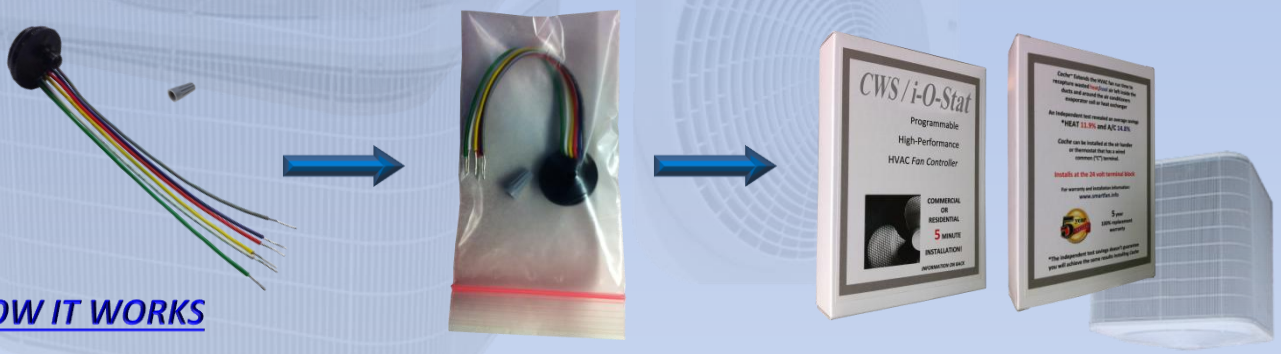
PROGRAMMABLE HIGH- PERFORMANCE HVAC VENTILATION FAN CONTROLLER CHIP

INTRODUCING THE Patent Pending CWS/i-O-Stat

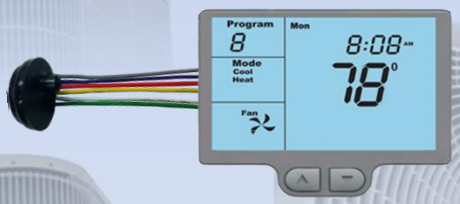
FEATURES

- **Extends** the ventilation fan runtime for a programmed period after compressor or heater shuts off
- **Reduces** the number of times the HVAC system powers on/off
- **Increases** the life of the HVAC system
- **Suitable** for central HVACs
- **Easy Installation** either at the thermostat or at the air handler unit or at the roof top unit
- **Ability** to handle "floating state" of the green wire when the thermostat is switched off
- **Works** in 24Vac section of the HVAC system



HOW IT WORKS

The patent pending CWS/i-O-Stat records how long the cooling or heating unit has been running and automatically programs the ventilation fan to remain on for a precise amount of extended time, thus utilizing the heat or cold air still left in the system that would have been wasted.



SPECIFICATIONS

- **MECHANICAL:**
  - Maximum Dimensions (mm) diameter x height: 29 x 15
  - Lead Length: 50mm minimum
  - Stripping Length: 10 mm minimum
  - Moisture and Rain Proof : Encapsulated with Epoxy
  - Color: Black

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- **ELECTRICAL:**
  - Installs on the low voltage (24Vac) section of the HVAC System
  - Operating Temperature: -40°C to 85°C
  - Wire Color: White (Heat Input Signal), Yellow (Cool Input Signal), Brown or Purple (24Vac Common Line), Red (Ground), Green (Output to the Fan Controller), Gray (Auxiliary Input from the Thermostat)
- **FAN DELAY:**
  - 110 seconds minimum
  - 320 seconds maximum
  - The Fan Delay Time is set according to the time that the unit has been turned on (Software installed inside the CWS/i-O-Stat)

- **BROWN or PURPPLE:**
  - **Common Wire**: Connects to the 24 VAC at the thermostat or air handler unit
- **RED:**
  - **Ground Wire**: Connects to the ground at the thermostat or air handler unit
- **YELLOW:**
  - **Cooling Wire**: Connects to the wire which controls the compressor (AC) the thermostat or air handler unit
- **WHITE:**
  - **Heating Wire**: Connects to the wire which controls the heater source (AC) at the thermostat or air handler unit
- **GREEN:**
  - **Fan Wire**: Controls the ventilation fan of the system. When the CWS/i-O-Stat is installed, it controls the ventilation fan (thermostat will no longer control the ventilation fan). The installation sheets show how to make the connections
- **GRAY :**
  - **Auxiliary Wire**: Regardless where the CWS/i-O-Stat is installed (thermostat or air handler unit), this wire receives signals from the thermostat fan control (green wire). See installation sheets

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⇨ BACKGROUND

A typical HVAC consists of heating unit, air conditioning unit and the ventilation fan or blower at the air handler unit. A thermostat is used to control the conditions of the air in a conditioned space by sending control signals to the HVAC furnace controller or HVAC air conditioning controller or HVAC fan controller housed in a PCB located at the air handler unit. HVAC fan controller typically operates the ventilation fan for 0 second to 90 seconds after the furnace or air conditioner compressor has been turned off. Studies have shown that even after this 90 second duration, the furnace surface and the air conditioner cooling coil still has some energy left. This wasted energy is not delivered to the conditioned space when the ventilation fan stops blowing. There is a need in a HVAC system with a secondary fan controller device (the patent pending CWS/i-O-Stat) that can be used to recover additional heating and cooling capacity and operate HVAC equipment at a higher efficiency.

⇨ OPERATION PRINCIPLES

The CWS/i-O-Stat adjusts the ventilation fan run time automatically for heating based on gas valve activation time or furnace operating time or heat pump activation time. For air conditioning, the same CWS/i-O-Stat will adjust fan run time automatically for cooling based on air-conditioning compressor run time. The amount of time the ventilation fan continues to operate after the furnace is turned off or after the air conditional compressor is turned off, varies with the amount of time the furnace or compressor has been running. The CWS/i-O-Stat uses microprocessor and firmware and unique circuitry to achieve this. The furnace's additional fan run time indicates how much left over heat is stored in the heat exchanger. The air conditioner compressor's additional run time indicates how much cold water is condensed on the evaporator coil.

The CWS/i-O-Stat recovers and delivers more heating and cooling energy to the conditioned space than is possible with original HVAC fan controllers based on thermostat signals. The CWS/i-O-Stat improves the efficiency of HVAC equipment by delivering additional heating or cooling capacity for a small amount of additional electric energy (kWh).

Air conditioners cool conditioned spaces by removing sensible and latent heat from the return air which reduces the supply air temperature and humidity. Latent heat is removed as water vapor is condensed out of the air due to the temperature of the evaporator coil being less than the return air dew point temperature.

⇨ OPERATION PRINCIPLES (Cont.)

Latent heat is the quantity of heat absorbed or released by air undergoing a change of state, such as water vapor condensing out of the air as water onto a cold evaporator coil or cold water evaporating to water vapor which will cool the air.

Most evaporators are cold and wet (below 40 to 50°F) after the compressor turns off. Cooling energy left on the evaporator coil after the compressor turns off is generally wasted. The evaporator absorbs heat from the attic and cold water on the coil flows down the condensate drain. The *CWS/i-O-Stat* recovers the remaining cooling energy from evaporator coil by operating the fan after the compressor turns off to cool the conditioned space.

Most furnace heat exchangers are still hot (above 135 to 210°F) after the furnace fan turns off. The *CWS/i-O-Stat* recovers the remaining heat energy from the hot furnace heat exchanger after the furnace turns off and delivers this heat to the conditioned space.

The *CWS/i-O-Stat* works by hijacking the fan control signals emitted by the thermostat and replaces it with the new fan control signal emitted by the *CWS/i-O-Stat* itself. In this way, the HVAC fan controller only receives the fan control signals from the *CWS/i-O-Stat* itself and not from the thermostat directly.

CWS/i-O-Stat reads the commands from the thermostat and computes the additional ventilation fan run time. The *CWS/i-O-Stat* then sends the adjusted command signal to the HVAC fan controller at the air handler unit requesting it to run for a programmed additional extended time.

For the *CWS/i-O-Stat* to work universally, it has to interface with every type of thermostats used in HVAC system. There are many thermostats where the fan output command signal goes into a floating or unknown state when the thermostat is shut off by putting the thermostat switch to system off.

In such a case, if a fan extender device is connected to the thermostat, the fan command signal being in unknown state, could be read in as ON state, and the fan extender device may turn the fan on and run continuously.

However, the ***CWS/i-O-Stat* is the only device in the market that is able to read any unknown or floating signals from the thermostat fan command signal and make it as a 24vac or 0vac state**. By using the *CWS/i-O-Stat,* the fan will always be turned off even when the green fan line is in float state.