INTRODUCING THE HVAC-CHIP

FEATURES

➔ Extends the ventilation fan runtime for a predicted period after the compressor or heater cycles off
➔ Stops the compressor for 4 minutes after it has been running continuously for 30 minutes with ventilation fan running
➔ Reduces the frequency of On/Off cycle runs by the HVAC system
➔ Increases the life of the HVAC systems
➔ Suitable for split type central HVAC’s or independent heater and compressor systems
➔ Easy Installation either at the thermostat or at the air handler unit
➔ Ability to handle “floating state” of the fan and compressor when the thermostat is set to OFF or if the thermostat malfunctions
➔ Works in the safe, low voltage 24Vac section of the HVAC system

HOW IT WORKS

The patent pending HVAC-Chip records the duration of the ON and the OFF periods of previous cooling or heating cycles and computes how long the ventilation fan should remain on at the end of the next cycle’s ON period. The residual heating/cooling energy that is left at the heat exchanger that would otherwise be wasted, is now pushed through to the desired space. The HVAC-Chip also shuts the compressor down for four minutes (leaving the fan running) when the compressor runs continuously for 30 minutes and harvests the latent cool energy from the cooling coils. Independent studies reveal average savings of 15% - 18%.

SPECIFICATIONS

➔ MECHANICAL:

➔ Maximum dimensions (mm) Diameter x Height: 29 x 15
➔ Lead Length: 50mm Minimum
➔ Stripping length: 10 mm Minimum
➔ Moisture Proof (Fully encapsulated with epoxy)
➔ Color: Black
HIGH - PERFORMANCE HVAC ENERGY SAVINGS
CONTROLLER CHIP

- **ELECTRICAL:**
  - Install on the safe 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 (24Vac Common Line), Red (Ground), Green (Output to the Fan controller), Gray (Auxiliary Input from the thermostat) and Purple (Compressor Bypass Wire)

- **FAN DELAY:**
  - 110 Seconds Minimum
  - 320 Seconds Maximum
  - The Fan Delay Time is set according to the compressor ON and OFF duration, and predicts the fan extension of the next cycle’s ON duration. Software within HVAC-Chip controls calculate and predicts the energy savings additional fan run time

- **BROWN:**
  - Connects to the 24 VAC common wire at the thermostat or air handler unit.

- **RED:**
  - Connects to the ground red colored wire at the thermostat or air handler unit.

- **YELLOW:**
  - Connects to the yellow wire which controls the air conditioner compressor of the HVAC system at the thermostat or air handler unit.

- **WHITE:**
  - Connects to the white wire which controls the Heater Source of the HVAC system at the thermostat or air handler unit.

- **GREEN:**
  - This green wire controls the ventilation Fan of the HVAC system. When HVAC-CHIP is installed, it controls the ventilation fan. The installation instructions at [www.hvac-chip.com](http://www.hvac-chip.com) show how to make the proper connections.

- **GRAY:**
  - Regardless of where HVAC-CHIP is installed (thermostat or air handler unit) this wire receives signals from the thermostat fan control (green wire). See installation instructions.

- **PURPLE:**
  - Regardless of where HVAC-CHIP is installed (thermostat or air handler unit) this wire connects directly to the HVAC compressor. The original Yellow wire from the thermostat now gets connected to the HVAC-CHIP yellow wire. See installation instructions at [www.hvac-chip.com](http://www.hvac-chip.com)
BACKGROUND

A typical HVAC system consists of a heating unit, an air conditioning unit and the ventilation fan or blower at the air handler unit. A thermostat is used to control the conditioning of the air in a desired space by sending control signals to the HVAC furnace or heater, the HVAC air conditioning and the HVAC blower or ventilation fan housed in a PCB located at the air handler unit. The HVAC fan controller typically operates the ventilation fan for 0 second to 90 seconds after the furnace or air conditional compressor cycles off. Studies show that even after this automatic 90 second extension, the furnace surface / air conditioner cooling coil still has latent energy left over. This wasted energy is not delivered to the desired space when the ventilation fan stops blowing. HVAC systems need a secondary controller (HVAC-CHIP) for recovery of remaining heating and cooling capacity and optimum HVAC equipment efficiency.

In systems where the air conditioning compressor runs continuously due to extreme outside temperatures, water will still condense onto the cooling coils. This water can be made to evaporate away and release additional latent cooling energy. The HVAC-CHIP makes use of the condensation latent cooling capacity by shutting down the compressor for four minutes whenever it runs for 30 continuous minutes and leaving the fan running over the wet cooling coils pushing the air cooled by evaporation into the desired space.

OPERATION PRINCIPLES:

HVAC-CHIP adjusts the ventilation fan run time automatically for cooling or heating based on: (a) how long the compressor or heater has been running (b) how long the compressor or heater was off (c) predicts how long the fan should stay on at the end of the next cooling or heating cycle. The run time of the ventilation fan varies with the run time plus the off time of the furnace / compressor in the previous cycle. The HVAC-CHIP uses a microprocessor, firmware and unique patent pending circuitry to achieve this. The furnace additional fan run time indicates how much left over heat is stored in the heat exchanger. The air conditioner compressor additional run time indicates how much cold water is condensed on the evaporator coil.

The HVAC-CHIP recovers and delivers more heating and cooling energy to the conditioned space than is possible with original HVAC fan controllers based on thermostat signals. HVAC-CHIP improves the efficiency of HVAC equipment by delivering additional heating or cooling capacity for reduced cost to run just the fan.

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°F to 50°F) after the compressor turns off. The cold water on the coil that accumulates over time usually flows down the condensate drain. The cooling energy left on the evaporator coil after the compressor turns off is generally wasted. As the evaporator coils dry away after the compressor shuts off, it absorbs heat from its vicinity but this cooling energy are not sent to the rooms unless the fan is blowing. The HVAC-CHIP 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°F to 210°F) after the furnace blower turns off. The HVAC-CHIP 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 HVAC-CHIP works by taking over the controls of the fan control signals and the compressor control signals being sent out by the thermostat. In this way, the HVAC fan and compressor only receives the control signals from the HVAC-CHIP itself and not from the thermostat directly.

For the HVAC-CHIP to work universally, it has to interface with every manufacturers of thermostats used in HVAC system. There are many manufacturers of 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 an HVAC-CHIP is connected to the thermostat, the fan command signal being in unknown state could be read in as ON state, and the HVAC-CHIP will turn the fan on and run continuously.

*The HVAC-CHIP is the only device in the market that is able to read any unknown or floating signals from the thermostat fan command signal as known 24vac or 0vac state.* In this way, the fan will always be turned off when it is at not at an ON state.

For more technical information, application notes, installation guides and selection charts, please visit [www.hvac-chip.com](http://www.hvac-chip.com)