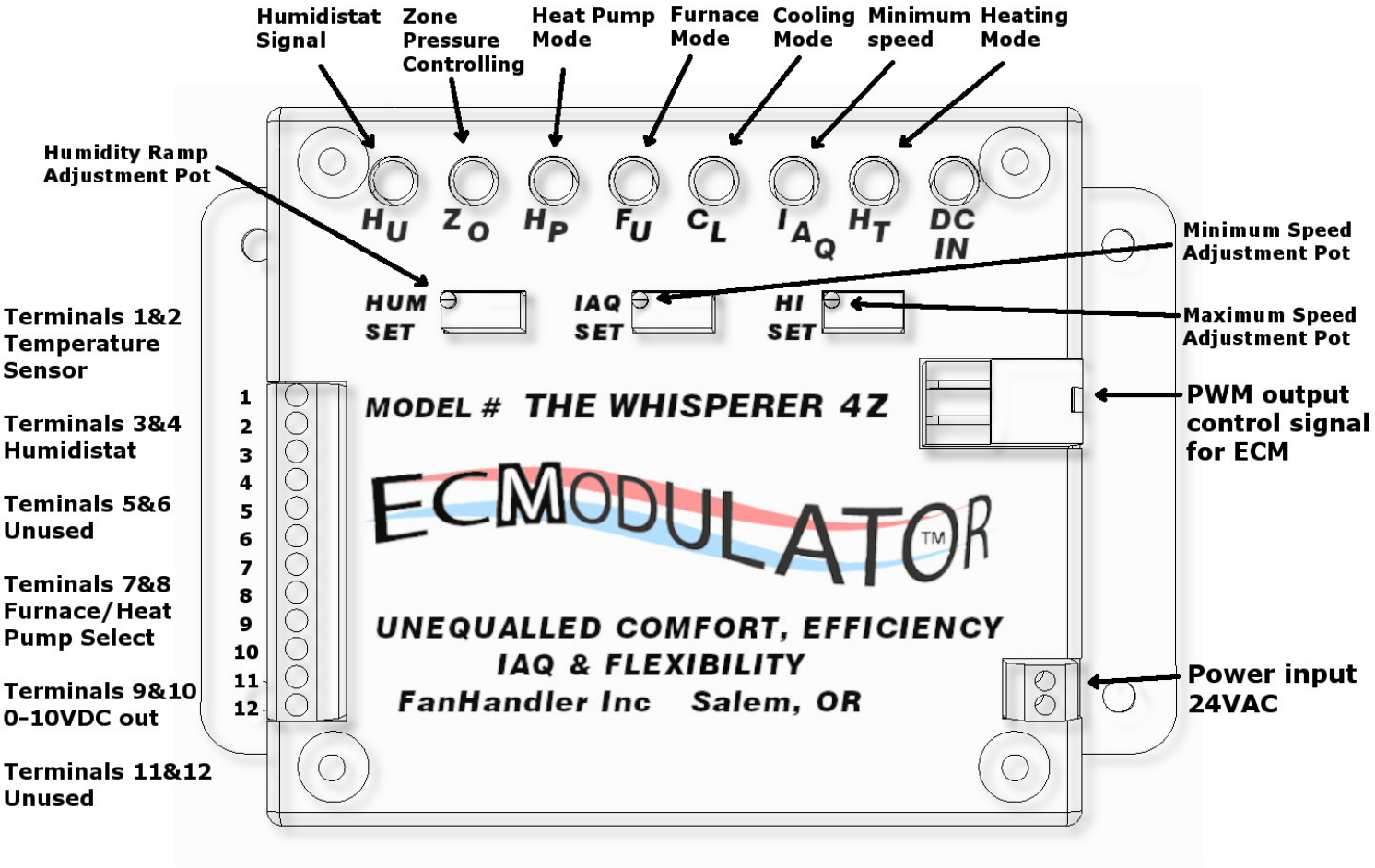
ECMODULATOR™

INSTALLATION INSTRUCTIONS

All electrical work must be done with the power off by trained HVAC technicians and to all governing codes.

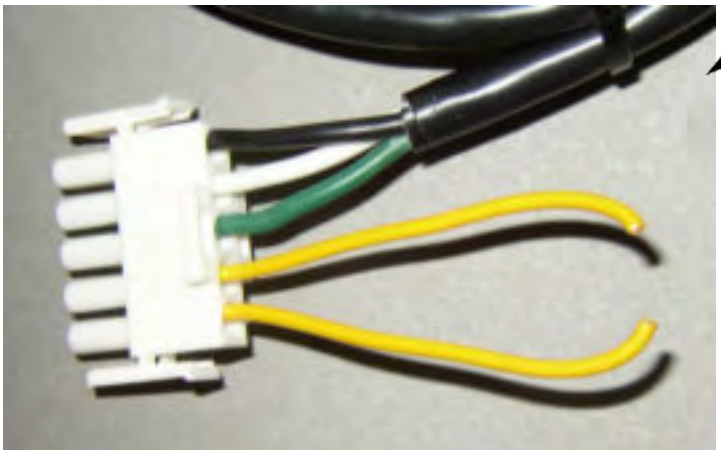


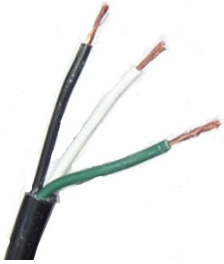
ECM Motors

- ECM motors are designed for continuous operation
- ECM motors should not be turned on and off by switching the line voltage to the motor. They should only be activated by switching the low voltage to the ecMModulator.
- The motor's high voltage supply terminates in a five position (socket) plug that plugs into the motor's 5-pin socket.
- The 3-prong plug at the opposite end from the high voltage wire is ready for 115/120 vac (standard household current) voltage.
- For higher voltages, see the instructions below.

The high voltage cord and 5-pin plug are configured for 115/120 volt application.

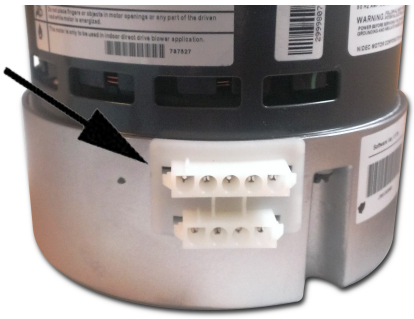
For 208/230/277 volt application, cut the Yellow wire as shown. Then wire nut the ends of the wires. Next, tape over the wire nuts to further secure them.

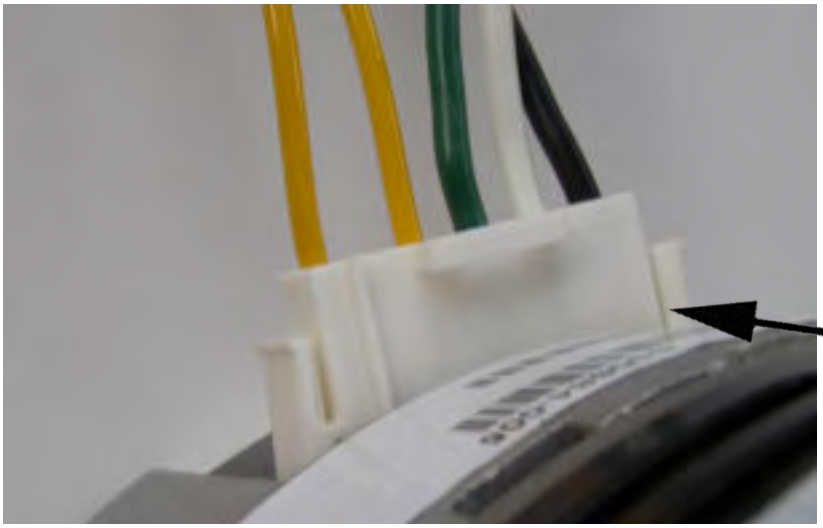




When using the high voltage option of 208/230/277 volts to the motor, remove the 120 volt plug, expose the wire ends and attach the green wire to earth ground, the black and white to L1 @ L2.

5 - PIN HIGH VOLTAGE SOCKET





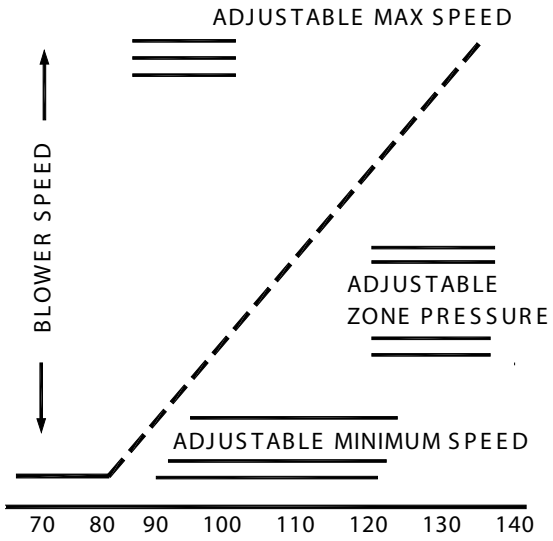
NEXT, PLUG THE 5-PIN PLUG INTO THE FIVE-PIN HI VOLTAGE SOCKET.

Plug one end of the low voltage Pulse Width control cable into the ecMModulator and the other end into the motor's 4-pin socket.

CONTROL MODES

The following control modes are some of the obvious strategies that can be employed. The ecMModulator can be used for a wide variety of applications and we can program the ecMModulator to suit a wide variety of specialized applications.

TRUE FURNACE MODULATION OF HEAT, COOL & IAQ



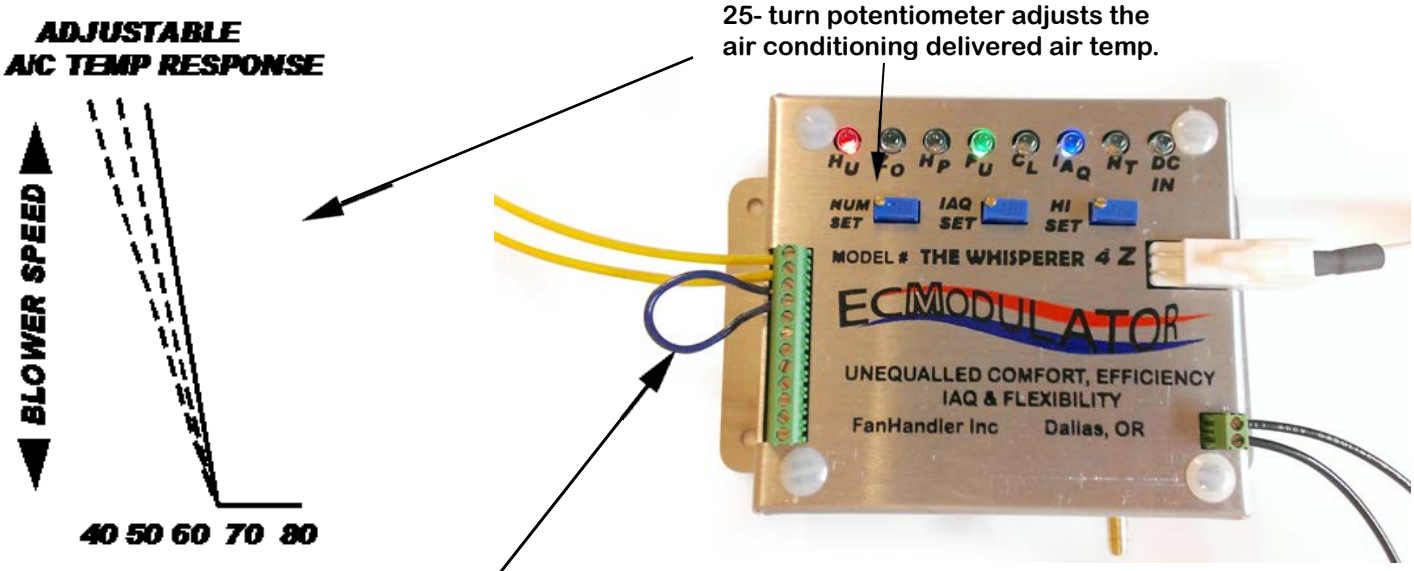
TEMPERATURE SENSOR IN DELIVERED AIR

In this mode, and most other modes, the temperature sensor is mounted in the delivered air. In all cases, you are trying to get a well mixed sample of the air that is going into the building. Usually high up in one of the trunk lines and close to the plenum will give you a good sample. From there, the ecMModulator response is: With no heat or cool and delivered air between about 62° and 80° the blower will be at the (adjustable) minimum IAQ speed. You can set this minimum speed from super low (say 100 rpm) to close to full speed. When the burner, electric strip heater, hot water coil, etc comes on and the delivered air begins to warm, the blower's speed will follow the temperature/speed line to the right. There is no way to blow a cold draft. Because of the immediate but smooth response, there is no way the heat can get ahead of the blower speed. When the heat turns off, the blower's speed follows the same path down.

AIR CONDITIONING

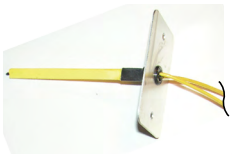
When the AC turns on, the coil gets cold very quickly. This allows the coil to latch on to the latent load. A couple seconds later, the sensor detects the cold temperature and ramps the speed faster. Because of the instant speed/ temperature response, it can't slug. Because the compressor has a fixed capacity, and because the coil has latched onto the latent load first, and because the blower's speed has not overpowered the coil's latent capacity, the latent/ sensible ratio remains weighted towards latent. The ratio will stay pretty much the same until the latent load decreases. On a new (high humidity) installation you will notice that the blower doesn't reach full speed and the delivered air temperature seems a bit warm. However, when you put your gauges on, you'll notice that the machine is running full capacity. When you look at the overflow it will be running water down the drain at a fast pace. The reason for this is that much of the compressor's capacity is still working on the latent load. An example would be: with an indoor RH of 78% on the installation day with maybe 55° delivered air temperature. The next day it might be RH 65% with delivered air 53°. Pretty soon the system will be putting out pretty close to 50° and the RH will be in the low 50% range, This is a quick and rough explanation. This is the operation in all air conditioning modes. More on this later.

When the compressor shuts off, The delivered air temperature rises rapidly, and the blower's speed drops with the temperature rise. This process is quick enough to keep from blowing water off the coil. Thus it allows constant fan even in the muggiest climates. From that point on, the system takes full advantage of the refrigeration and latent capturing effect of pressure equalization.

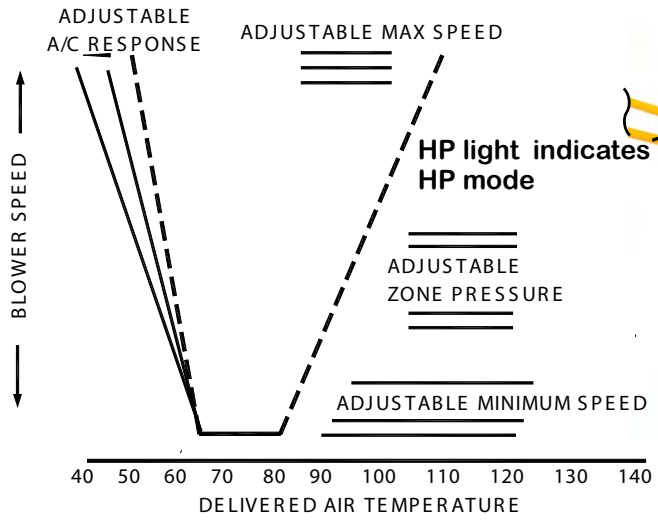


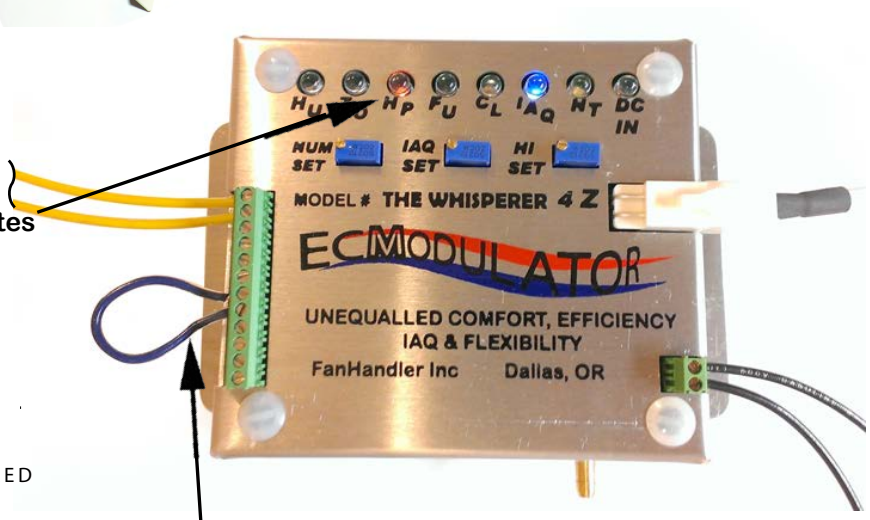
Terminals 3 & 4 will accept a dry contact (NO APPLIED VOLTAGE!) From a humidistat, relay, or can be jumpered for permanent setting. By shorting between terminals 3 & 4 the (HUM SET) Humidity Set potentiometer allows you to adjust the cooling temperature speed line. This can be done with a simple return air humidistat, room humidistat, relay, or they can be jumpered for special conditions. We recommend this be done only by highly qualified, experienced (a/c refrigeration) technicians. We do not recommend that this be done without first monitoring the installation for several days. We do not recommend that this be done without hooking up and watching the refrigerant gauges.

HEAT PUMP MODE



TEMPERATURE SENSOR IN DE-LIVERED AIR





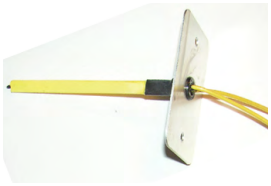
Jumper terminals 7 & 8 for Heat Pumps

Terminals 7 & 8 can be shorted together to place the ecMModulator into the heat pump mode. In this mode of operation, the heating temperature speed line is steeper so that the blower reaches top speed at 115°. The air conditioning is not affected and remains the same as in the other modes. When there is no heating or cooling, the blower's speed is in the adjustable minimum (IAQ) speed. When the system switches to heat, the blower is loafing along at the adjustable minimum IAQ speed. This results in immediately building head pressure. Head pressure results in immediate heat. The system cannot blow cold. As the delivered air temperature increases, the blowers speed increases. Temperature and speed are locked together. This action can be compared to having a extremely high quality head pressure control operating the indoor fan. The result of this action is an average increase in delivered air temperature of about 15° and a significant lowering of the balance point and increased energy efficiency. 10% is common.

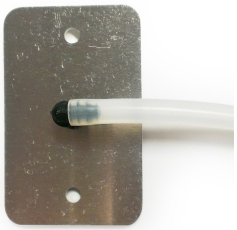
ZONED SYSTEM PRESSURE CONTROL

The ecMModulator Model # Whisperer 4 Z is designed to modulate the blower's speed in response to delivered air temperatures but will not exceed the desired maximum duct pressure setting (easily field adjustable). The Factory pressure setting is about 0.3" wc. With all zones open, the blower will prob-ably achieve full speed under some conditions. As zones close and the duct pressure increases, the ecMModulator senses and responds to the pressure increase by limiting the blower's speed so that the duct pressure will not exceed the pressure setting. This eliminates the need for the bypass damper or dump zone, but does not eliminate the need for the low or high temperature or pressure shut off switches that are common to well equipped zoned systems

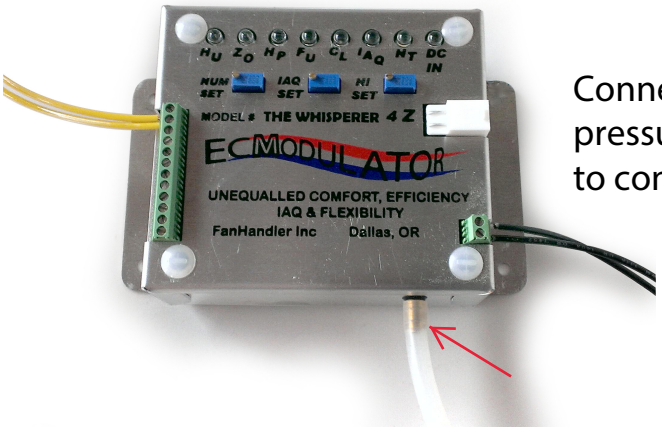
CRUISE CONTROL FOR ZONED SYSTEMS
ROCK SOLID PRESSURE CONTROL
BY ELIMINATING BYPASS DUCTS AND DUMP ZONES



Temperature sensor
Place this in delivered air



Pressure pick up plate and tubing. Place this on duct before any Zone dampers.



Connect pressure tube to control

Setting Your Maximum Duct Pressure

On the ecMModulator 4 Z controls the **HI SET** pot is used to adjust the pressure limit. Turning the pot clockwise will increase the maximum duct pressure and counter clockwise will decrease the maximum duct pressure. 2 full turns will approximately equal 0.1" wc. ecMModulator 4 Z controls are shipped with a factory duct pressure setting of about 0.3" wc. Before you begin setting the pressure re-move the temperature sensor wire from the control (top terminal). This will drive the blower up to and slightly past the present pressure setting speed. Wait while the blower's speed settles before changing the pressure setting. If you want to control from pressure alone, then just remove the temperature sensor and leave it off. A step by step procedure for adjusting the pressure is listed below.

1. Re-move the temperature sensor wire from the control to cause the motor to go full speed.
2. For a **higher pressure**, turn the screw on the HI SET pot **clockwise**.
3. For a **lower pressure**, turn the screw on the HI SET pot **counterclockwise**.
4. If the pressure is close to what you want, turn the pot slowly about a quarter turn at a time to give the motor and control time to adjust. A rough calculation is that about two turns will change the pressure about 0.1" wc.
5. When you are at or above the programmed pressure setting, the ZO light will be on.
6. If you overshoot the adjustment and wish to reverse the setting you made, you can figure that it takes about 1/4 turn to take up the slack in the pot's clutch before you will notice a change.

8 Once you achieve the pressure setting you want, reconnect the sensor wire.

CAUTION - THE TRANSDUCER IS A VERY SENSITIVE AND EXPENSIVE DEVICE. DO NOT BLOW INTO THE TUBING OR SUBJECT IT TO HIGHER THAN ACCEPTABLE SYSTEM PRESSURES!!!!!!!!

FREQUENCY DRIVES

All of the previously described features that are built into the ecMModulator control can be used to control frequency drives for large three-phase fans, pumps, or any equipment that accepts a Pulse Width modulation or 0 to 10 vdc signal. There are a large number of applications for the ecMModulator. Some suggestions are: Control of parallel piped ECM pumps that feed mixing valves could accept the signal from building automation controls. This could save huge amounts of energy and do away with three way valves. Rooftop HVAC units located in facilities where they do not have building automation. Upgrading millions of rooftop gas packs. Control of terminal fan boxes. Control cooling tower fans to maintain steady temperature to large chillers. The energy saving, comfort producing list is endless.