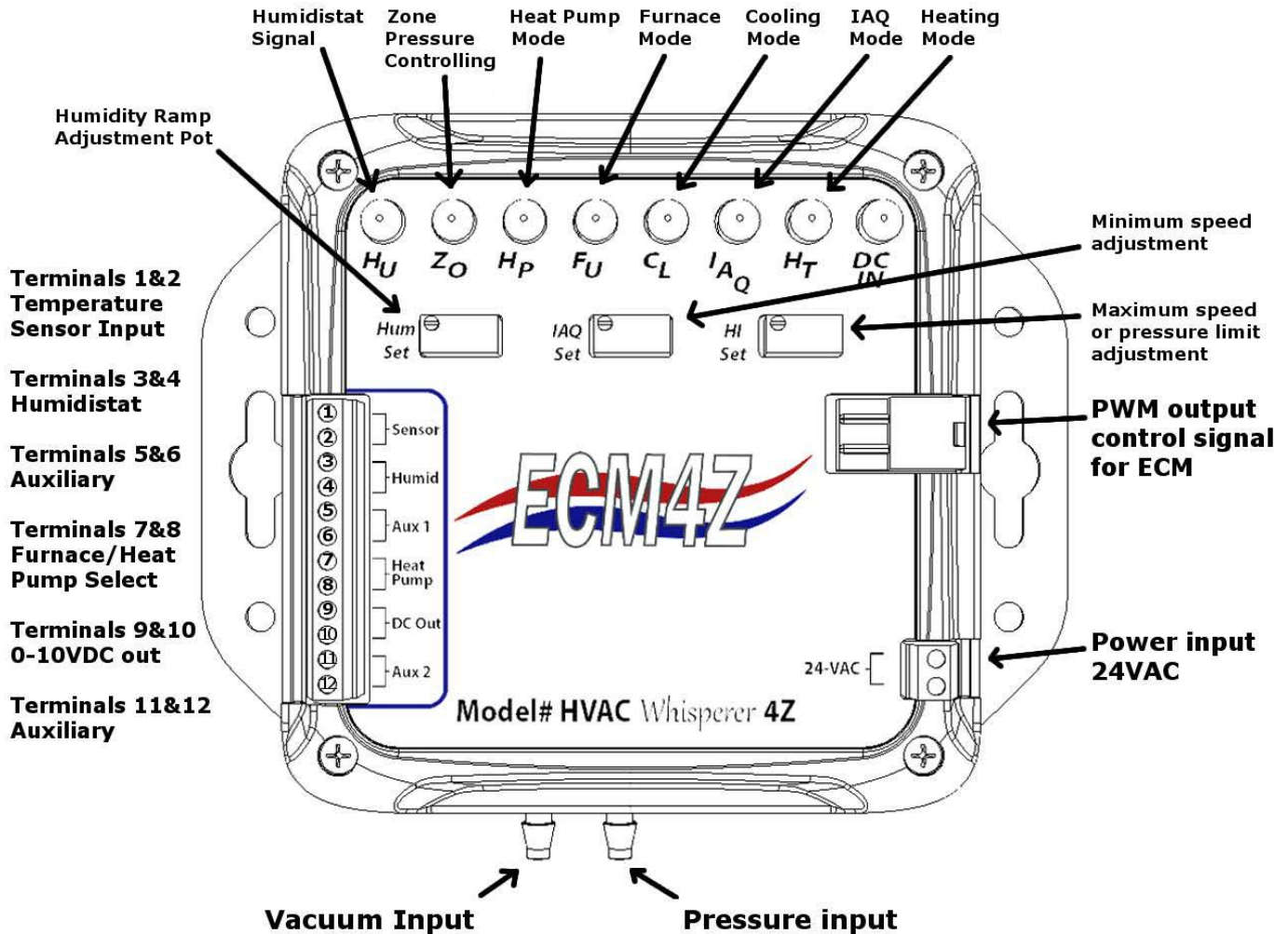# ECMODULATOR™

INSTALLATION INSTRUCTIONS

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

Humidistat Signal — **Zone Pressure Controlling** — **Heat Pump Mode** — **Furnace Mode** — **Cooling Mode** — **IAQ Mode** — **Heating Mode**

Humidity Ramp Adjustment Pot

H_U Z_O H_P F_U C_L I_{A_Q} H_T DC_{IN}

Terminals 1&2 Temperature Sensor Input

Terminals 3&4 Humidistat

Terminals 5&6 Auxiliary

Terminals 7&8 Furnace/Heat Pump Select

Terminals 9&10 0-10VDC out

Terminals 11&12 Auxiliary

Hum Set   IAQ Set   HI Set

Minimum speed adjustment

Maximum speed or pressure limit adjustment

PWM output control signal for ECM

Power input 24VAC

1 2 3 4 5 6 7 8 9 10 11 12 — Sensor, Humid, Aux 1, Heat Pump, DC Out, Aux 2

ECM4Z

24-VAC

Model# HVAC Whisperer 4Z

Vacuum Input   **Pressure input**

WARNING!

- Only trained and qualified HVAC professionals should install this system.
- Before installation, ensure that power to the system is shut off. Failure to do so may result in personnel injury or system damage.
- Always ensure the voltage jumper on the motor is set to match the voltage of the system.
- The ambient operating temperature range is -20 deg F to 140 deg F
- 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 3-prong plug at the opposite end from the high voltage wire is ready for 115/120 VAC (standard household current) voltage.
- For 240V systems see the instructions below.

Installation

Note: Before beginning installation, verify that the rotation of the existing motor is the same as the rotation of the motor you purchased with your kit(most are Counter Clock Wise Lead End). If not the same, motor reversing cables can be purchased from Fanhandler.

Begin by shutting off all power to the unit and removing the blower.
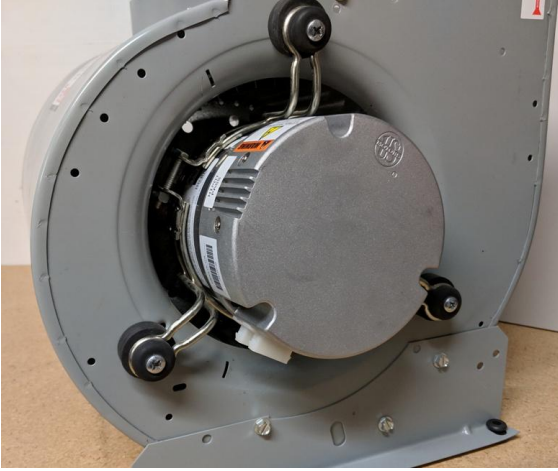
Once the blower is out, replace the old PSC or x-13 motor with the high efficiency ECM included in the kit.

The motor should be installed in such a way that the power plug is facing downward when reinstalled in the unit. This will reduce the chance of moisture getting into the plug.

The blower and motor can then be reinstalled in the unit.

These motors can operate on either 120VAC or 240VAC.

For 208/230/277 volt application, cut the Yellow wire as shown. Then wire nut the ends of the wires, and tape over the wire nuts to further secure them.
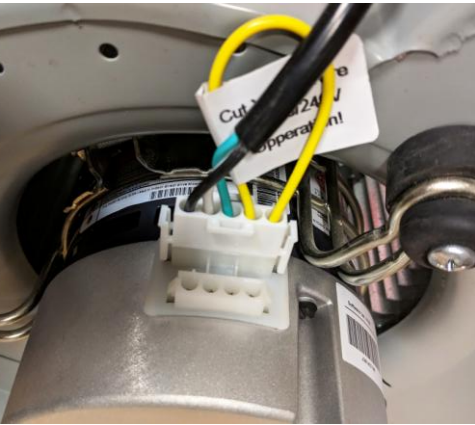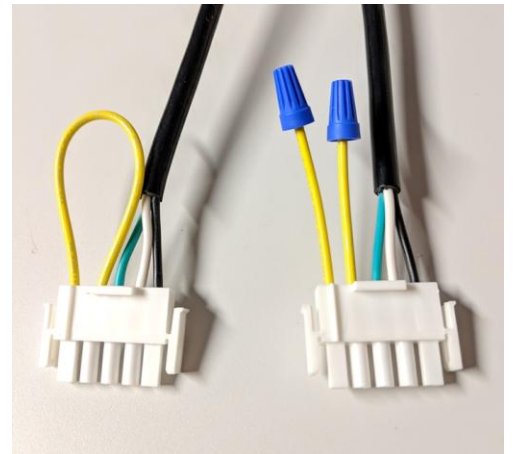
120VAC   **240VAC**

The power cable plugs into the 5 pin socket on the motor.
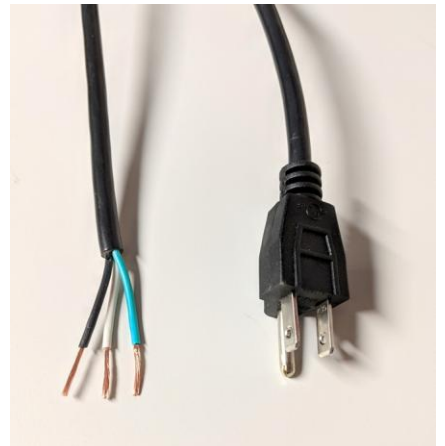
The motors main power should be continuous (not turned on and off via relay or the units control board).

The power plug comes with a standard 120V plug that can be cut for direct wire application if desired.

The ECM4 or 4Z control can be mounted with standard sheet metal screws. The control should be placed in a location where it will be kept clean and dry. The location of the controller should also not exceed the maximum temperature of 140 °F nor fall below -20 °F

Once mounted, the control cable can be connected. Plug one side into the motors 4 pin connector, and the other side into the white connector on the right side of the control as shown.

Installing the sensor.
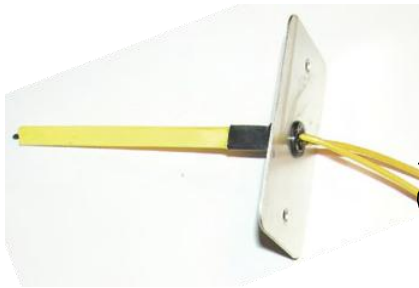
The sensor should be located in the delivered air and can be mounted using standard sheet metal screws.
Proper sensor placement is important. Mount sensor in location where it will see a good mix of the delivered air at any air speed. The best location is usually close to the unit, but where the air isn't too turbulent. We recommend 1 to 2 feet down the main trunk if possible. If the sensor must be placed around a corner, make sure it is at the top of the corner so the air doesn't blow over it.

You will need an extra length of wire to connect the sensor to the controller.
The sensor should be wired into the top 2 terminals of the controller as shown.

Powering the controller.

The ECM Modulator is powered by 24VAC connected to the bottom right terminals. *Do not connect voltage to any other terminal.*

We recommend using a dedicated 24V transformer rated for at least 10VA. If not using a dedicated transformer, we recommend that the transformer be at least 40VA.

The system is designed to be run continuously. However, if intermittent operation is desired, the control can be powered off the **G** and **Common** terminals of the thermostat. This will allow the user to switch between continuous operation and intermittent by using the "Fan On/Auto" switch on the thermostat. *Do not try to run the blower intermittently by cycling the main power to the blower motor as it will reduce the life of the motor significantly.*
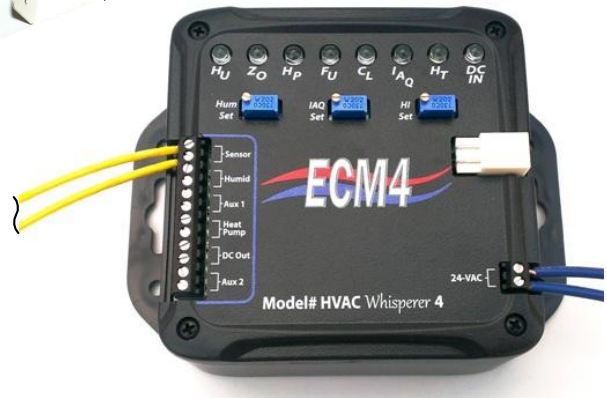
CONTROL MODES

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.

STANDARD FURNACE MODULATION OF HEAT, COOL & IAQ
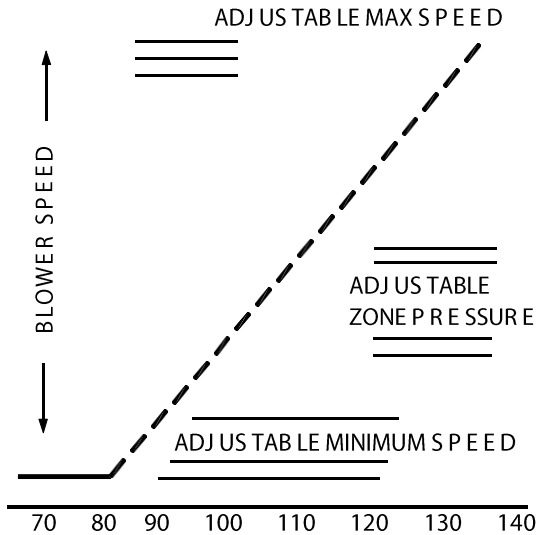
In this mode, and most other modes, the temperature sensor is mounted in the delivered air. You are trying to get a well mixed sample of the air that is going into the building. Usually high up in one of the trunk lines and close to the plenum will give you a good sample. From there, the ecMModulator 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 200 rpm) to close to full speed. When the heating element comes on and the delivered air begins to warm, the blower's speed will follow the temperature/speed line (shown above). 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.

Cooling and humidity control.

The ECM4 has 2 cooling modes. The primary cooling mode has a cooling ramp that is fixed and cannot be adjusted.

The secondary mode or the "humidity mode" has an adjustable cooling ramp that can be used with humidistat to give you greater control over the humidity level in the home. This mode is indicated by the HU light.
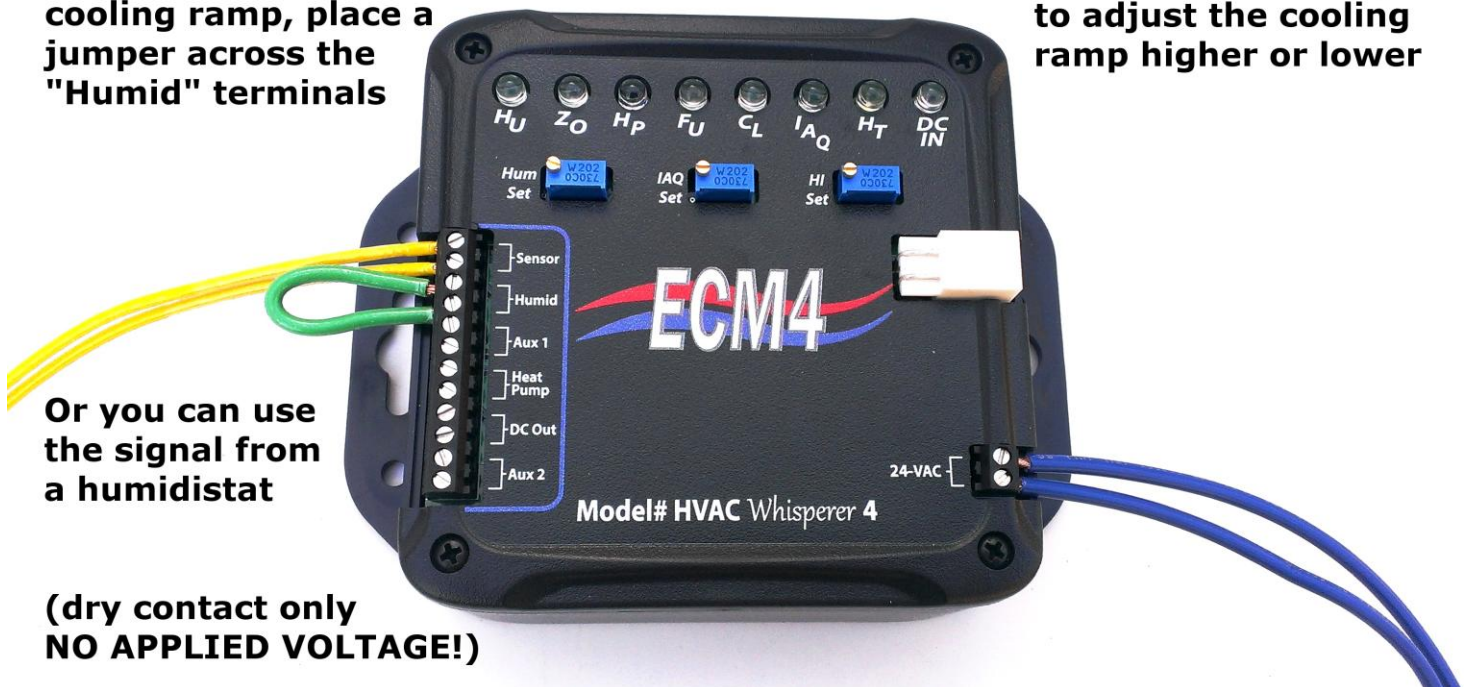
This secondary cooling ramp is activated by shorting the humid terminals together. This can be done with a signal from your humidistat (dry contact only NO APPLIED VOLTAGE!) or by placing a jumper across the terminals for constant use as shown. When the jumper is removed the control will automatically go back to the primary cooling mode.

The ramp can be adjusted using the "*Hum Set*" pot. Clockwise will increase the cooling speed, counterclockwise will decrease the cooling speed.

A/C RESPONSE

Adjustable Humidity mode Cooling ramp

BLOWER SPEED

40 50 60 70 80 90
Delivered Air Temperature
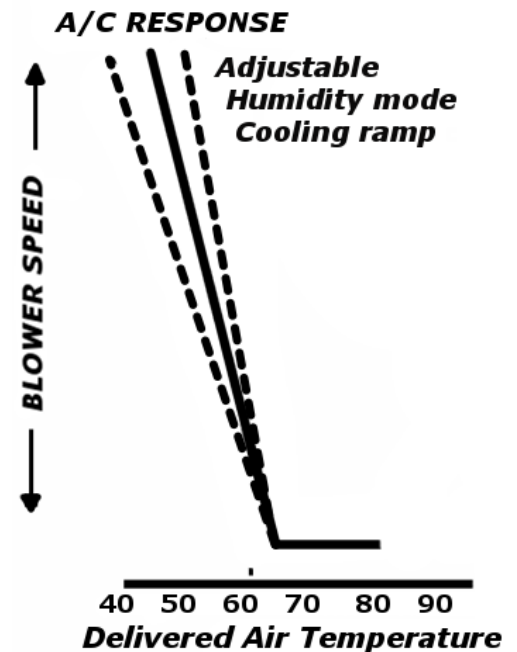
To select the Humidity cooling ramp, place a jumper across the "Humid" terminals

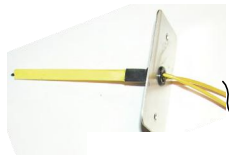**Use the "HumSet" pot to adjust the cooling ramp higher or lower**

H_U Z_O H_P F_U C_L I_AQ H_T DC IN

Hum Set   IAQ Set   HI Set

Sensor
Humid
Aux 1
Heat Pump
DC Out
Aux 2

ECM4

24-VAC

Model# HVAC Whisperer 4
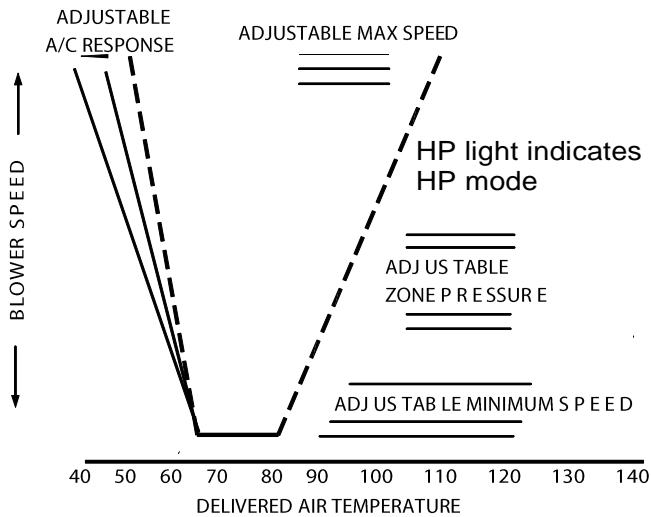
Or you can use the signal from a humidistat

(dry contact only NO APPLIED VOLTAGE!)

NOTE: by default the humidity ramp is set approximately 100 rpm below the primary ramp and should only be adjusted after the control has been installed for at least 2 days as it will take some time for the AC unit to reduce the level of humidity in the home.

HEAT PUMP MODE

TEMPERATURE SENSOR
IN DELIVERED AIR

BLOWER SPEED

ADJUSTABLE
A/C RESPONSE

ADJUSTABLE MAX SPEED

HP light indicates
HP mode

ADJUSTABLE
ZONE PRESSURE

ADJUSTABLE MINIMUM SPEED

40   50   60   70   80   90   100   110   120   130   140
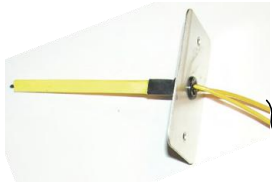DELIVERED AIR TEMPERATURE

Place Jumper between terminals 7&8

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 an 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% or more 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
ELIMINATING BYPASS DUCTS AND DUMP ZONES

Temperature sensor
Place this in delivered air
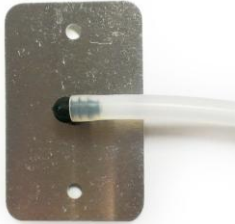
Pressure pickup plate and tubing. Place this on duct before any Zone dampers.

For zoning applications place the pressure tube on the right hand port.

The left hand port can be used for vacuume control

Setting Your Maximum Duct Pressure

On the ecMMModulator 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

PULSE WIDTH
MODULATION
OUT

0 TO 10 VDC
OUT

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.