

## EC Motor

### Differential Air Pressure Controller

The EVO/ECM-DPC controls an EC Motor powered fan to maintain an adjustable static or differential air pressure. Set the air pressure setpoint to the desired pressure. Then proportional & integral control technology modulates the fan to maintain setpoint.

### Applications

Rooftop Exhaust  
Cleanrooms  
Ventilation Systems  
Modulating diffuser systems  
Restaurant

### Display

Display shows pressure during operation. When adjust  is turned, the display shows the setpoint.

The display backlight uses color to indicate control loop status. Green indicates the pressure is at setpoint. Red indicates the pressure is far from setpoint. Shades of yellow indicate the pressure is near setpoint.

When a system disturbance or change in setpoint occurs, the backlight changes from green to yellow or red. As the system works to recover from the disturbance, the backlight graduates from red, to yellow and then to green when the pressure is back to setpoint.

Displayed values without a sign are positive, and values with a (-) sign are negative.

### Alarms

If the system fails to maintain setpoint, the display remains red. After remaining red for 6 minutes, the red display flashes and an alarm relay drops out. The alarm relay also drops out when power is removed from the control.

The alarm relay contact may be jumper selected to open on alarm or power fail or close on alarm or power fail.

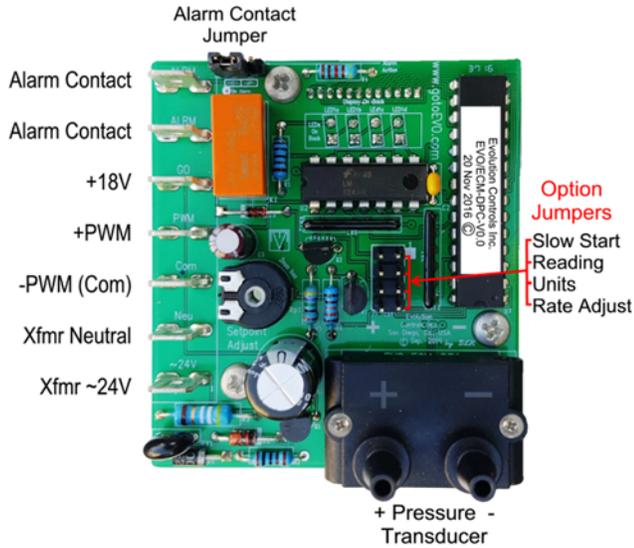


### Specifications

Power	~24V ± 10%, 5VA, 3W
Control Range	0.05 iwc <sup>1</sup> /12.5 Pa <sup>2</sup> to 1.25 iwc/310 Pa
Accuracy	±0.01 iwc/ 2.5 Pa
Adj. Tool	5/64in/2mm Hex driver or wrench
Pressure Sensor	Thermal bridge Differential piping 3/16in/5mm tubing
Alarm Contact	Class 2 Circuit ~30V / +60V max 1A max
Operating Temperature	32°F/0°C to 122°F/50°C
Storage Temperature	-4°F/-20°C to 160°F/70°C

<sup>1</sup> Inches of Water Column. Imperial Units

<sup>2</sup> Pascals. The International System of Units (SI)



### Option Jumpers

- Slow Start** On power up or motor start, fan flow is held at minimum for 10 seconds, making it easier for multiple motors to start.
- Reading** Insert the reading jumper when controlling a negative pressure. A (-) is displayed when the HI (+) port is higher than the LO (-) port.
- Units** Insert jumper to display pressure in Pa (Pascals). Remove the jumper to display the pressure in iwc (inches of water column).
- Rate Adjust** Insert jumper if integration rate needs adjustment.

### Control Loop

The DPC features a proportional/integral control loop that calculates the fan volume needed to maintain the air pressure setpoint.

The DPC calculates the difference between the measured pressure and setpoint. This error value continuously adjusts the fan volume to maintain the fan volume within the proportional control band.

The integrator calculates the average difference between the measured pressure and setpoint. This control band error periodically corrects the fan volume, moving the measured pressure to setpoint.

### Adjustment

Adjustments are made through the front panel. The adjustment point is intentionally unmarked and requires a special tool to discourage tampering with the adjustment.

The front panel adjustment is used to set setpoint and integration rate. A jumper on the back side of the control selects setpoint or integration rate adjust. The display shows the jumper selected value.

When working between the two adjustments, notice adjust begins to move the displayed value when the adjust position equals the displayed value.

### Setpoint

Adjust the setpoint to display the desired value. When adjustment is finished, observe that the system settles on the setpoint. Where possible, create a normal disturbance by turning on an appliance connected to a controlled duct, opening a door, etc. Observe the system correct to setpoint.

Best practice uses a test and balance instrument to adjust setpoint. Set the adjust as described above, then adjust as necessary so the test instrument displays the desired setpoint. Record the actual and displayed setpoint for future reference. This procedure is important where long lines are used to connect the DPC's pressure sensor.

### Integration Rate

The DPC default integration rate (period) is 3.0 seconds, fitting many applications. If this integration rate causes the system to be unstable, the rate needs adjustment. Put the rate adj. jumper in place to adjust the integration rate. The display will show the current integration rate in seconds. The rate can be set between 0.5 seconds and 25.0 seconds. Increase the rate until the system becomes unstable. Then decrease the rate until the system becomes stable. Best practice sets the integration rate 3.0 seconds slower than this stable point.

### Wiring

#### Power

Power the EVO/ECM-DPC with a ~24V NEC Class 2 power limited transformer<sup>3</sup>. Observe all code requirements and follow all safety practices regarding low voltage power supplies and circuits to insure a safe, reliable installation.

Some applications may require an isolated power supply or alternative low voltage electrical safety scheme. Follow code requirements and carefully observe all safety practices concerning unearthed low voltage circuits.

Earth one of the ~24V power transformer leads. Wire the DPC's ~24V neutral connection to the earthed lead.

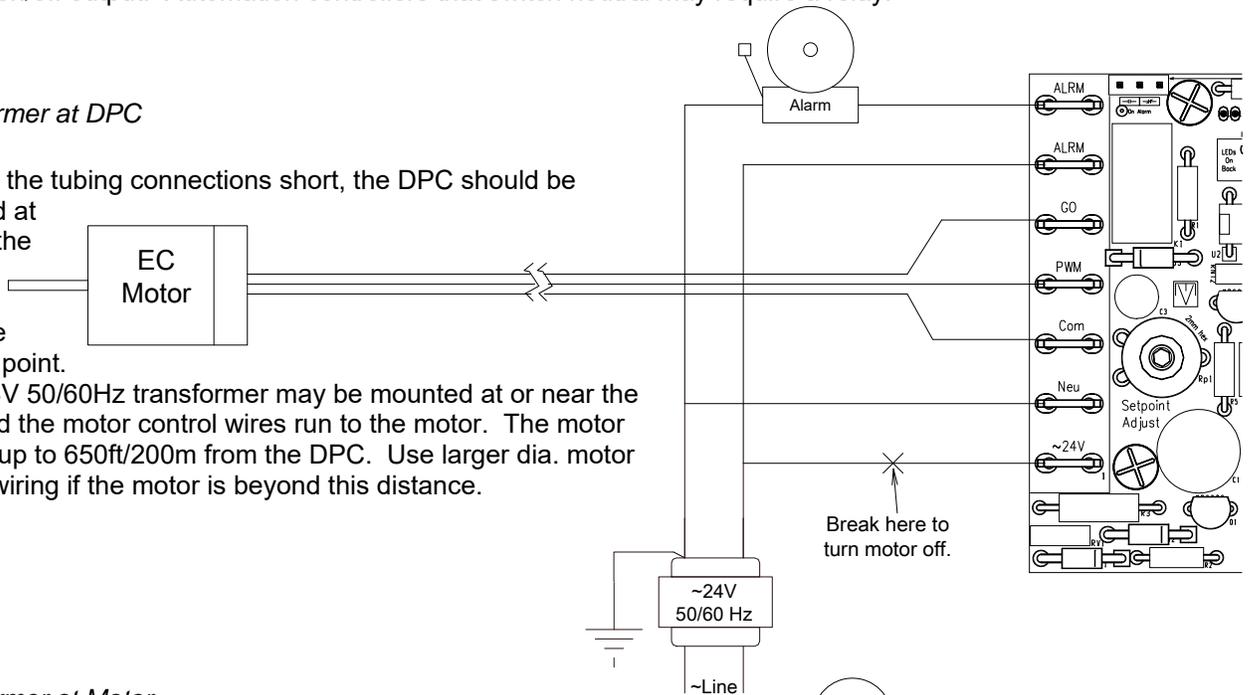
Wire the hot side of the ~24V Class 2 power source to the DPC's ~24V 50/60Hz connection. You may interrupt this connection as a means to stop the EC Motor. Most automation controllers will power the DPC directly from a ~24V on/off output. Automation controllers that switch neutral may require a relay.

#### Transformer at DPC

To keep the tubing connections short, the DPC should be mounted at or near the

pressure sensing point.

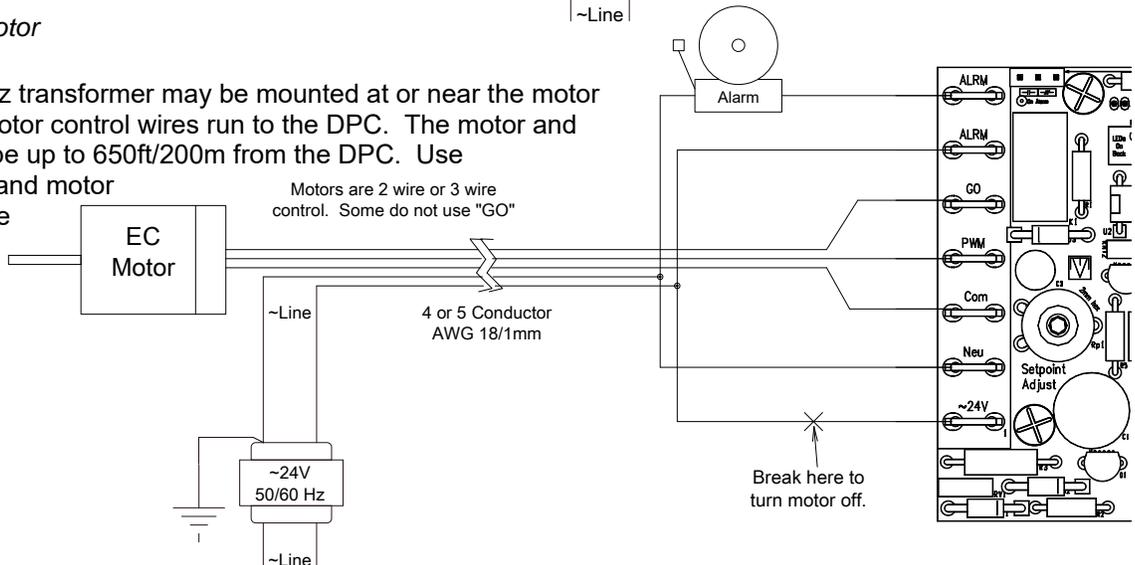
The ~24V 50/60Hz transformer may be mounted at or near the DPC and the motor control wires run to the motor. The motor may be up to 650ft/200m from the DPC. Use larger dia. motor control wiring if the motor is beyond this distance.



#### Transformer at Motor

The ~24V 50/60Hz transformer may be mounted at or near the motor with power and motor control wires run to the DPC. The motor and transformer may be up to 650ft/200m from the DPC. Use larger dia. power and motor control wiring if the motor is beyond this distance.

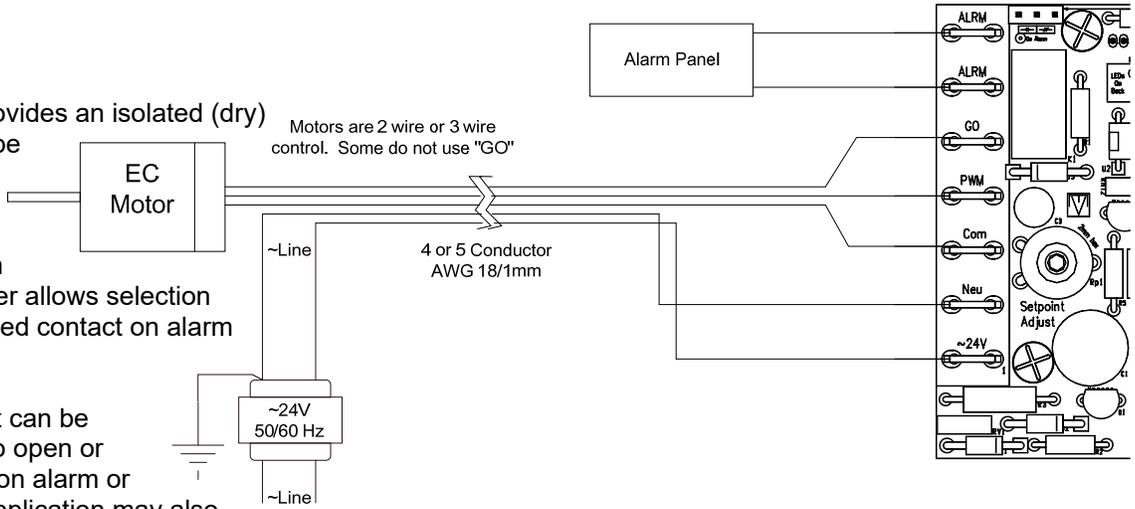
Motors are 2 wire or 3 wire control. Some do not use "GO"



<sup>3</sup> See NEC<sup>USA</sup> 725-C

Alarm Panel Connection

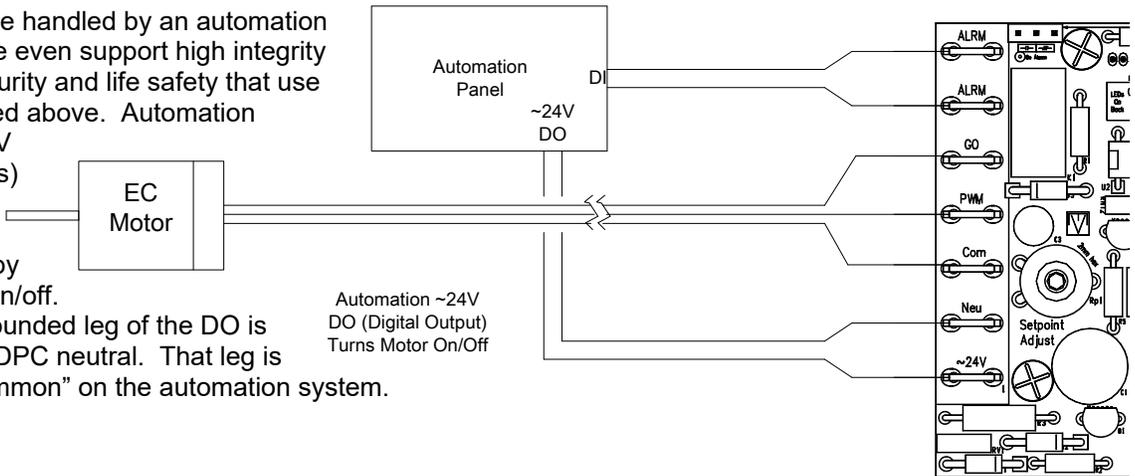
An alarm relay provides an isolated (dry) contact that may be connected to an automation system or a local light or horn alarm indicator. A jumper allows selection of an open or closed contact on alarm or power fail.



The alarm contact can be jumper selected to open or close the contact on alarm or power fail. The application may also need to monitor alarm wiring integrity. An open on alarm or power fail configuration provides some level of line failure protection since an open wire will also create an alarm. Some alarm panels can be configured to monitor an EOLR (end of the line resistor). Place the wiring ELOR across the ALRM connections and Jumper select open on alarm or power fail.

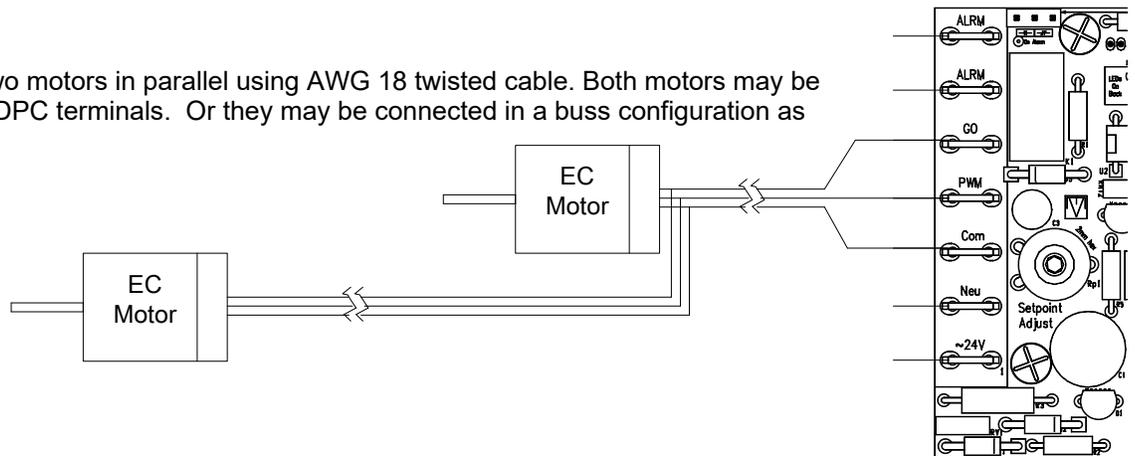
Automation Panel Connection

Alarms can also be handled by an automation system. And some even support high integrity wiring for fire, security and life safety that use EOLR as described above. Automation systems with ~24V DO (digital outputs) can provide ON/OFF control for the EC Motor by turning the DPC on/off. Make sure the grounded leg of the DO is connected to the DPC neutral. That leg is often marked "common" on the automation system.



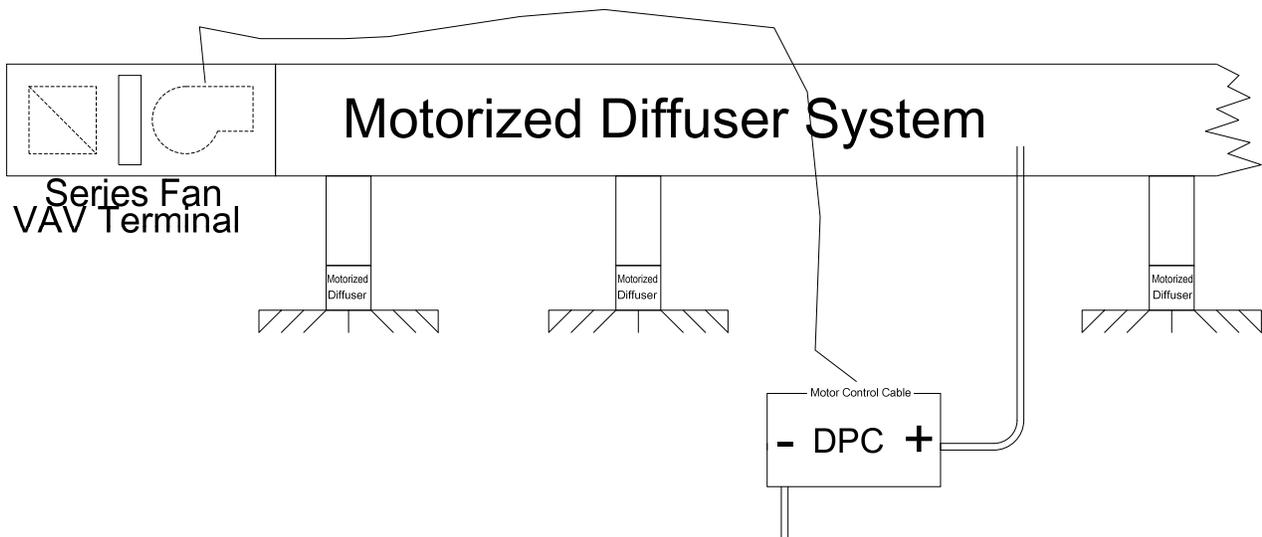
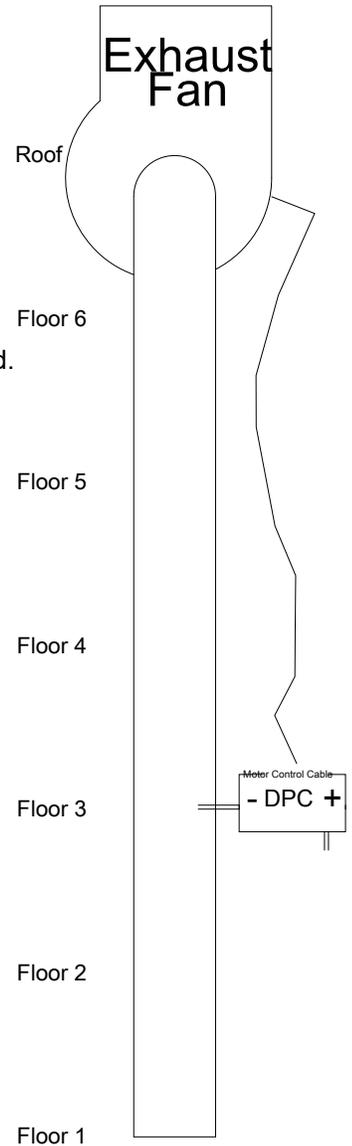
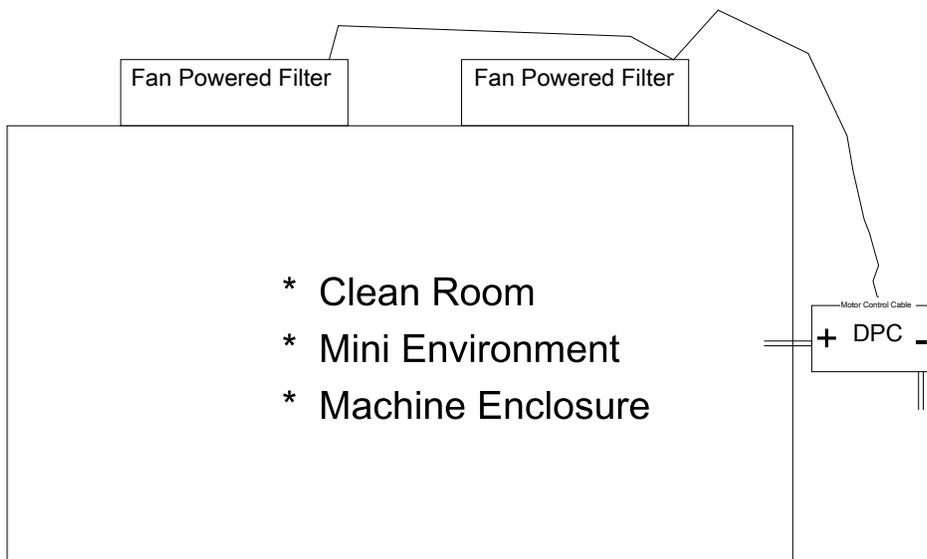
Two Motors

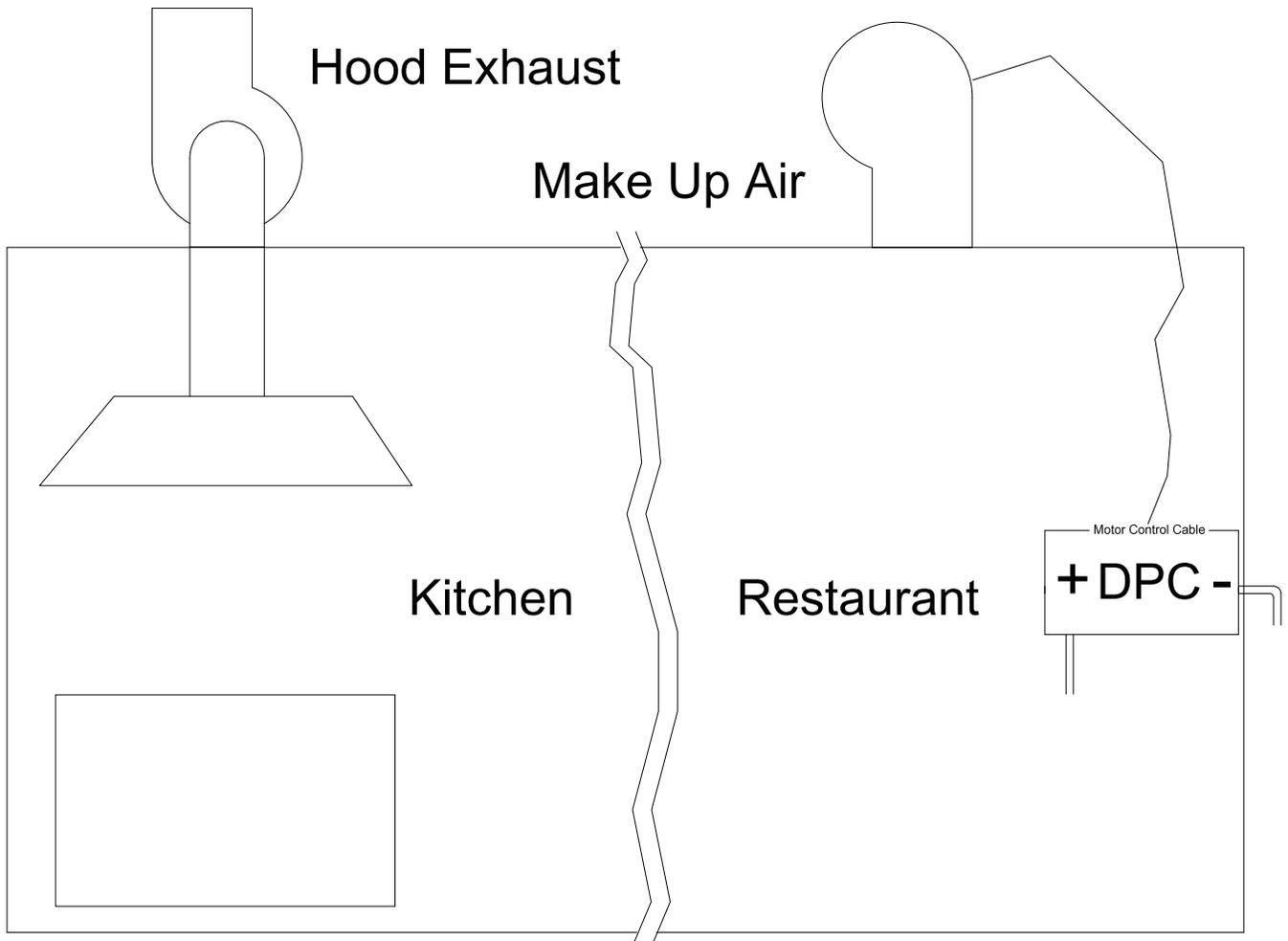
Connect one or two motors in parallel using AWG 18 twisted cable. Both motors may be connected at the DPC terminals. Or they may be connected in a buss configuration as shown.



**Piping**

Pipe with 3/16in/4.5mm ID tubing. Use a flexible tubing that seals well over the tubing connections, and meets the requirements of the application. Where the total tubing length exceeds 12ft/4m, transition from 3/16in/4.5mm tubing to larger tubing to reduce error caused by tubing length. Some applications may require transition from the application tubing to a flexible, softer tubing once inside the mounting box. In all cases, make sure tubing connections are without leaks. Most applications require gauge, not differential pressure. For gauge applications, one port is connected to the point of measurement. The other port is simply left open to the atmosphere. In gauge applications, make sure the open port is exposed to the atmosphere. The unconnected port is inside the box or panel where the DPC is mounted. Conduits and mounting holes penetrating the box or panel can cause air movement or pressure changes inside, changing the DPC's pressure reference point. Good practice pipes the open port to still air outside of the box or panel.





**Mounting**

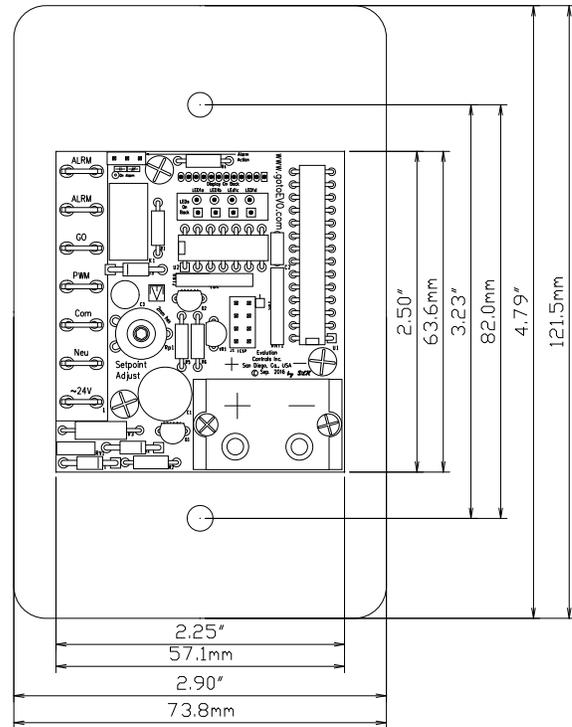
Keep all tubing short by mounting the control near the pressure measuring point. Prevent collection of moisture and dust by pointing the open end of the vent tube down.

Mount the control to a single gang electrical box, or through a single gang cutout in a control cabinet or enclosure.

Leave clearance for the tubing, ~24V power wires, alarm wires and motor control wires.

Keep high voltage wiring away from DPC circuitry or wiring. Follow electrical code requirements for separation of high and low voltage wiring and components.

Mount the control away from heat and out of direct sun. For cold or damp locations, mount the control in a weather-proof box. Install the control with a box gasket under the control.



**Surface Mount**

Best practice uses a PVC single gang deep electrical box. Drill a small hole in the bottom if your application uses a vent tube. Make sure the tubing does not crimp when placing the DPC onto the box.

Carlton  
E9801EN



Vent