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Technical Bulletin

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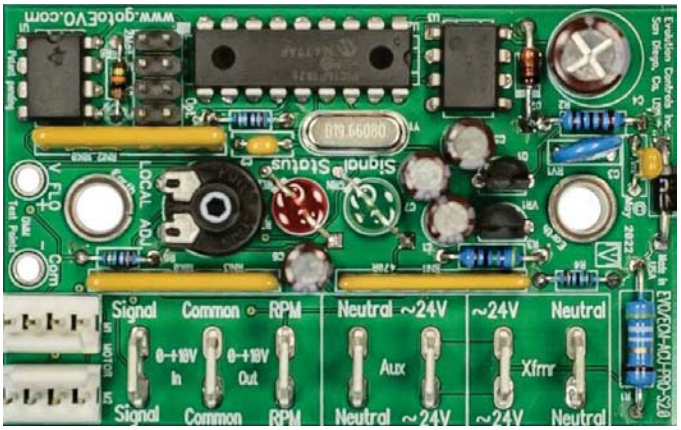
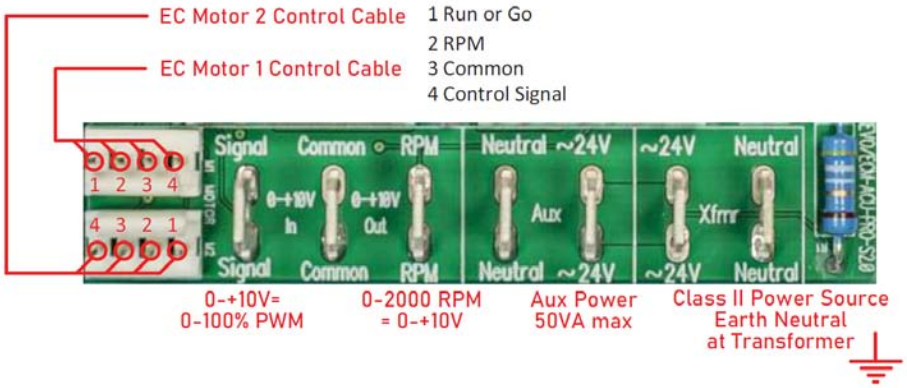
A-PULSE PRO

EC MOTOR CONTROLLER (PN: 15-119-P)

Controlling the EC Motor



The Anemostat A-Pulse Pro controller allows VAV terminal controllers with analog output signals of 0-10vdc to adjust and monitor Anemostat Energy Smart EC Motors. The EC motor features an internal microprocessor based drive and provides exceptional efficiency, performance, and motor life. The motor may be factory configured to provide constant mass airflow, constant torque, or constant speed over the configured control range. The A-Pulse Pro controller provides remote adjustment of the motor output from 0 to 100% of the motor's programmed control range. A green signal lamp on the control continuously flashes out the flow index. A 0-10 vdc output signal from the A-Pulse can communicate motor RPM back to the VAV terminal controller. Alternately, the A-Pulse Pro can be configured for manual adjustment up at the air terminal.



Picture on the left shows the wire terminations on the A-Pulse Pro control board.

Green Signal Lamp

The green signal lamp continuously indicates the flow index (flow index refers to the min to max flow range of the motor). After a pause, the lamp flashes out the tens digit, then the units digit of a number between 1 and 99. Long flashes represent the tens digit, and short flashes represent the units digit. For example, a flow index of 23 will flash TWO long, then THREE short. Two extra-long flashes indicate a flow index of 0 (ZERO). One extra-long flash and ten short flashes indicates a flow index of 100. The lamp flashes the signal that was present when the flash sequence started. The flow index relates to the % On Time of the PWM signal from the A-Pulse Pro controller to the EC motor.

Red Status Lamp

The red status lamp illuminates when the motor is running and is dark when the motor is stopped.

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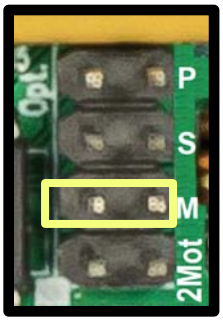
Manual EC Motor Control (M Jumper)

When the VAV box is configured for Manual fan control, the fan flow adjustment is made at the air terminal by turning a potentiometer on the A-Pulse Pro controller with a small slot screwdriver. This is accessible through a hole in the control enclosure without having to remove the cover. Turning the potentiometer fully CCW will turn the fan OFF. Conversely, full CW rotation will run the fan at maximum fan capacity.

In this mode, there should be only a jumper on the M pins. The pins labeled 2Mot selects RPM averagingng when 2 motors are connected. Remove any jumpers on the P or S pins. The voltage at the SIGNAL tap on the A-Pulse Pro controller MUST be 0 vdc. There should be NO wire terminating on the SIGNAL terminal.



After adusting the fan airflow to the required flow, it may be desirable to record the flow index % that generates the design flow. This can be determined by observing the Green Signal lamp and sequence of flashes. RPM can be recorded by measureing the vdc at the RPM terminal.

Fan RUN - STOP Options

There are 2 ways that the fan can be turned on and off:

1. Switching the ~24vac power to the A-Pulse Pro controller. 0 vac = STOP, ~24 vac = RUN. This is often done using a Binary Output from the connected VAV box direct digital controller. This method of switching is most commonly used when the fan capacity is adjusted using the manual control method. Some controller designs may prevent switching the ~24vac (ungrounded leg) and the use of a relay betweeen the digital controller Binary Output and the A-Pulse Pro controller may be required. Switching the high voltage power to the motor via a fan relay is not recommended and can shorten the motor life.

2. A 0-10vdc Analog Output signal connected to the SIGNAL tap can be used for both the fan Stop (.5 vdc) & Run (>2 vdc) function as well as fan airflow control (2-10vdc) from this one analog output. Refer to the section using automation control in this bulletin.

Fan Status - RPM Feedback

The A-Pulse Pro controller includes an RPM tap with an analog output signal of 0-10 vdc proportional to 0 - 2,000 RPM. In lieu of using a current sensor wired to a binary input back to the controller to determine if the fan is on or off, the RPM output can be wired into an analog input on the box digital controller. With the fan normally running no less than 200 RPM = 1.0 vdc, controller logic can be written based on this RPM voltage to report the Fan Status as ON or OFF.

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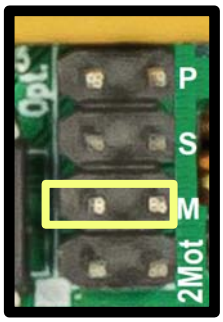
VAV Controller Automation (.5 - 10 VDC , M Jumper)

When the VAV box is configured for remote fan control, the fan flow adjustment is made by the connected box Direct Digital controller. The controller will typically use a 0-10 vdc Analog output connected to the SIGNAL terminal on the A-Pulse Pro controller.

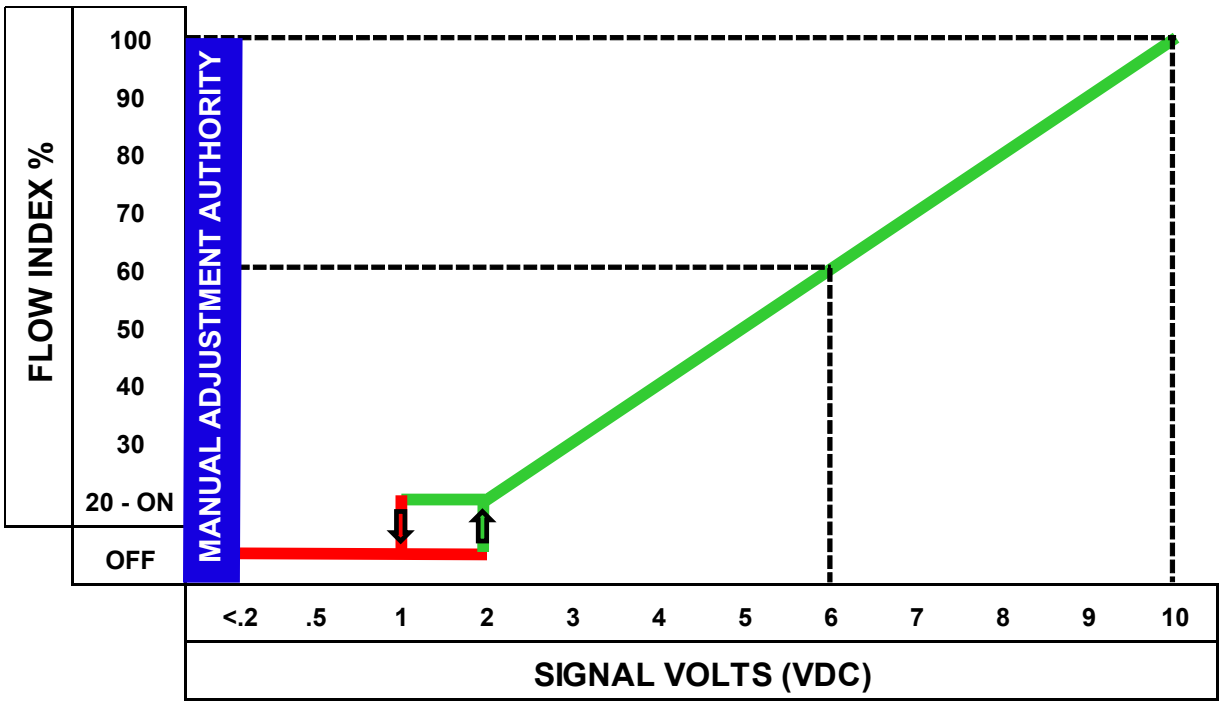
In this mode, there should be an M jumper on the M pins. The pins labeled 2Mot selects RPM averaging when 2 motors are connected. Remove any jumpers on the P or S pins.



IMPORTANT - Turning the Manual Adjustment potentiometer will ALWAYS give the manual adjust setpoint authority for about 15 minutes REGARDLESS of the voltage at the SIGNAL terminal.

The motor is configured to use one .5 - 10 vdc analog signal for BOTH the Run-Stop function as well as setting the fan capacity (CFM). 2-10 vdc will modulate the fan from minimum to maximum capacity. .5 vdc will turn the fan off. Below .2 vdc, the Manual Adjust set point becomes active. **It is strongly recommended that .5 vdc be used as the OFF voltage and 2-10vdc used for fan airflow set point.**

Note that if it is desired to use a Binary Output from the controller for the fan Run-Stop function, this can be achieved by switching the ~24vac power to the A-pulse controller. 0 vac = STOP, ~24 vac = RUN. The controller analog output then works between 2-10 vdc for fan capacity control.



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Temporary Fan Operation

The fan powered air terminal can be operated prior to the vav box controller being installed or a with 0 vdc signal at the SIGNAL terminal on the A-Pulse Pro controller. DO NOT run the fan without a discharge duct connected to it and a minimum of .10" of downstream static pressure in that duct as permanent motor damage can occur. The fan can be adjusted using the Manual Adjustment potentiometer as long as the SIGNAL voltage is 0 vdc. After the VAV digital controller is installed and wired to the SIGNAL terminal on the A-Pulse Pro controller AND WITH A SIGNAL VOLTAGE ABOVE .20 vdc, the VAV controller has authority for controlling the fan. If the SIGNAL voltage drops below .20 vdc, the Manual Adjustment set point becomes active.

Balancing / Adjusting the Fan Capacity Using BMS

If the VAV controller is already installed and the SIGNAL voltage can be adjusted remotely via the Building Management System, measure the airflow at the outlets and change the SIGNAL voltage until the design CFM is obtained. The Signal vdc and RPM can be recorded for documentation purposes. Note that the RPM can change as filters are changed out, become dirty/loaded, or outlet adustments are made. It is recommended that .5 vdc is used to turn the fan OFF, and 2-10 vdc is used for fan adjustment. A SIGNAL voltage of less than .2 vdc will relinquish control to the manual adjustment setting. Note that manually adjusting the setpoint using the Manual Adjustment potentiometer at ANY time will give that setting authority for about 15 minutes. After the timer runs out, the control will revert to the actual SIGNAL vdc.

Balancing / Adjusting the Fan Capacity Without BMS

The A-Pulse Pro controller can be manually adjusted before the VAV terminal controls are installed or commissioned. The preferred method of adjustment uses the BMS as described above with primary air available and calibrated during the process as system pressure changes can alter fan capacities.

With a SIGNAL voltage of 0 vdc, the balancer's Manual Adjustment has authority until automation is connected. The method of transferring the balancers setting to the BMS setting:

Air Balancer:
1. Use Manual Adjust to set the fan airflow to the desired capacity.
2. Read the flashing Green lamp and record the flow index (Example: 42)

VAV Controls Integrator:
1. Set the SIGNAL to 0 vdc to invoke manual override.
2. Record the RPM if monitored via an analog input on the VAV controller.
3. Adjust the SIGNAL vdc to the Flow Index from the air balancer's report (Ex: Flow Index 42 = 4.2 vdc)
4. Observe the RPM is at or near the RPM observed in step 2.

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Typical Wiring

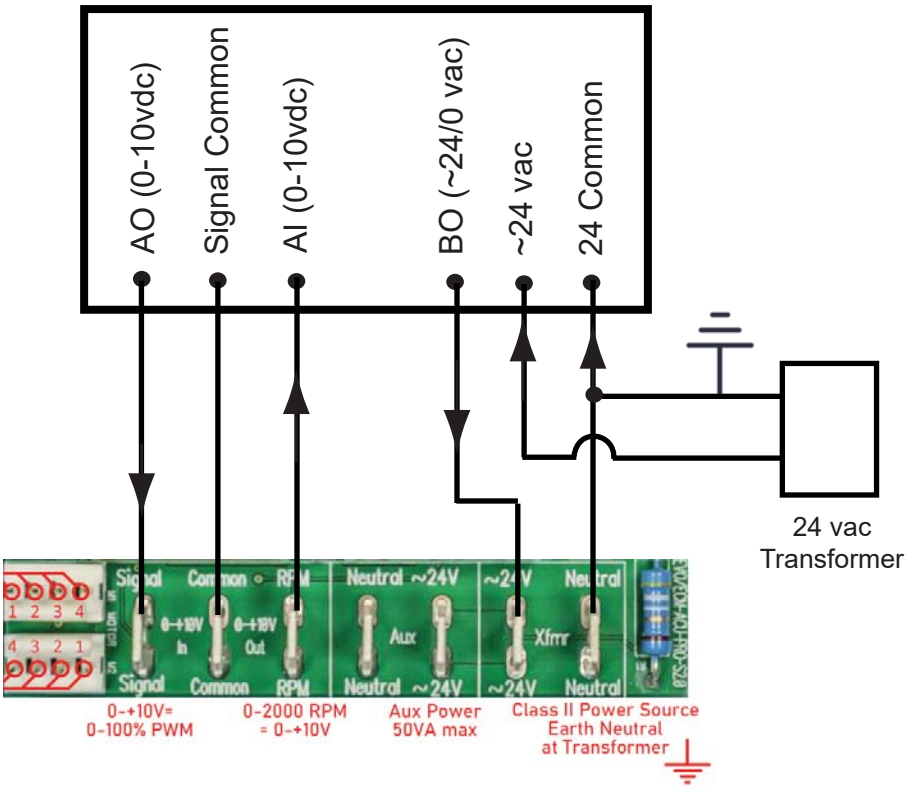
Figure 1.

AO : 0-10vdc controls both Fan On-OFF and Fan set point. This is single ended where the neutral and signal common are internally connected in the A-Pulse Pro controller. As previously described in this bulletin on page 3, .5 vdc is recommended as the OFF voltage.

A I : 0-10vdc signal to the air terminal controller for reporting FAN RPM which can be used for BMS ON-OFF status.

BO : 0 / ~24vac output from the air terminal controller will also turn the fan On - Off. The A-Pulse Pro controller acts like a fan relay such that when it is powered off or on, the motor turns off or on. This method of ON-OFF control is typically used ONLY when Manual Adjusment of the fan is specified. This cannot be done by switching the 24vac earthed neutral - an intermediate relay should be used if this is the method needed.

Fig 1. VAV Controller & A-Pulse Pro Typical Wiring



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A-PULSE PRO

EC MOTOR CONTROLLER

A-Pulse Pro Specifications / Notes

Power:	~24vac ± 20%, 50/60 Hz NEC Class II or Equal 2 W, 4VA + 1 VA/Motor
RPM Signal:	0-10vdc (5 mA Max) = 0 to 2,000 RPM in 10 RPM Steps
Control Signal :	0 - 10 vdc (Recommended .5vdc = Fan Off, 2-10vdc Fan Airflow Adjust
Thermal Stability:	>.01% / ^{o}F
Operating Environment:	0 ^{o}F to 130^{o}F , 10-80% rh
Connections:	1/4” Male Spade
Part Number:	15-119-P

Power the A-Pulse Pro controller with a ~24v NEC Class II power limited transformer. 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 earthing scheme. Follow applicable code requirements and carefully observe all safety practices concerning earthing and safety requirements for low voltage circuits.

Earth one lead of the ~24v side of the power transformer. Connect the earthed lead to the controller transformer neutral connection.

Connect the hot lead of the ~24v side of the power transformer to the controller ~24v connection.

AUX Terminals labeled ~24vac and Neutral are convenience connections. Up to 20 VA loads may be connected to these terminals.

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