Aero Flow Switch!

A brilliant airflow-triggered switch.

By Julian Edgar

This is the first time that we have seen this done, anywhere in the world. Not even any OE cars use this technique, AFAIK.

It's brilliant, innovative and effective.

And what are we talking about? Just this: sensing the actual airflow speed around the car to switch devices on and off!

Some Applications

And what's an application of that, I hear you ask? Well, think about this.

Let's say that you have a turbo car running a fairly small intercooler. Maybe it's even mounted in that hot spot to end all hot spots - under the bonnet. Sure, when you're moving along, there's enough airflow being pushed through the bonnet scoop to keep the intercooler core cool, but when you slow down, well, that's when the core starts getting hot... real hot. In fact, the bonnet scoop starts to then act more as a bonnet **vent**, with hot air rising off the engine and through the intercooler. Suddenly it's not an intercooler... it's an intake air pre-heater!

But what if you had an electric fan (eg a 12V motorcycle radiator fan) mounted on the intercooler, one that came on only when there was insufficient airflow through the scoop? That way, you could be guaranteed that the intercooler core would always stay cool, even when you're stopped at traffic lights. But what if there's a strong wind blowing straight towards you, pushing air through the scoop? Well, that will be sensed and so the fan will stay off!

You see, we're talking about sensing the **actual speed of the air moving past the car**, not just road speed...

You want another application?

Well, exactly the same thing can be done with a front-mount intercooler as well - when the car is stopped, these intercoolers are often heated by the close proximity of the radiator. In this case, you could trigger the radiator or air-con condenser fan to help draw air through it.

And another application?

OK, how about a turbo cool-down blower? Using an in-line boat bilge blower (available cheaply from marine stores) you can have forced air cooling of the turbo. The blower can be triggered when the airflow past the car is less than (say) 30 km/h. Wire the blower in series with a temperature switch so that the system is active only when the engine bay is hot, and you'll have a very neat turbo cooler indeed.

If you power the system from an ignition-switched 12V source, what'll happen is this: you'll be driving along, blower off. As you slow below 30 km/h, the blower will come on, remaining turning as you come to a stop. As you idle the car, the blower stays right on whirring, pouring cold air all over the turbo. Then when you switch off the ignition, the fan blower will switch off as well. Very neat.

And other applications?

- If it annoys you that while the ventilation airflow into the cabin is fine at speed but every time that you slow down you need to turn the fan up a notch to keep a decent amount of air passing through the cabin - well, that's easily overcome. Just turn the fan on 'low' every time the airspeed drops too far.

- Your radiator and electric fan combo marginal at cooling when you're stationary? Configure the switch to turn on the rad fan each time that you drop below a pre-set airspeed.

We're sure that there's plenty of other applications as well - it's such a new approach that there are sure to be some we've not thought of here.

The Module

So how do you do it? How do you sense the different airflow speeds passing the car? With the incredibly sensitive AutoSpeed Pressure Switch, working in conjunction with the Pressure Switch Relay Module.

We've already covered in a full article how to build the Pressure Switch Relay Module, in Powering Up the Pressure Switch. It's important that you read that story to see what's involved - basically assembling a very simple (6 component!) electronic kit. And even if you've never done any electronic kit building before, don't worry - that article has step by step pics and descriptions of how to do it.

The Pressure Switch Relay Module kit is available from the AutoSpeed Shop for $7.95, while the ultra sensitive pressure switch costs $11.95. So, the main components of the Airflow Switch cost less than twenty bucks!

Step by Step

The switch is triggered by the sensing of air pressure acting on the body of the car. This signal is picked up by running a small diameter plastic hose from the switch to the area of the car where the pressure is highest when the car is moving. The highest pressure will be found on the front of the car, generally beneath headlight level and to one side of the radiator grille. The article Siting Cold Air Intakes has more on locating the highest aero pressures at the front of the car.

So how do you make it all happen?

1. Buy the pressure switch and Pressure Switch Relay Module kit.

2. Buy some small-bore plastic hose that is a tight fit over the sensing nipple on the pressure switch.

3. Build the Pressure Switch Relay Module kit and make sure it works correctly.

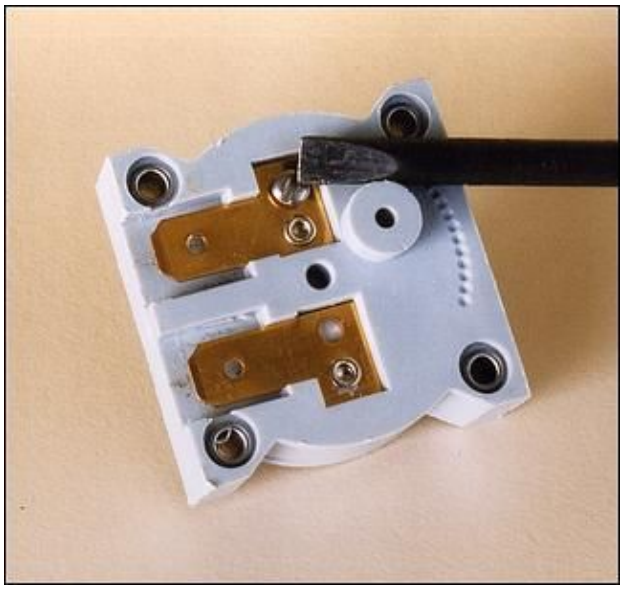
4. Do some road testing, placing the open end of the sensing hose at different points on the front of the car where you'd expect the pressure to be highest.

5. The spot where the switch triggers at the lowest speed is the best one to use.

To prevent small animals making nests in the open tube end, place some aluminium flywire over the end. To neaten the fitting we then slipped over the tube the plastic collar from the tail end of a coloured marker pen, but heatshrink could be used instead. Note that the end of the tube needs only to be exposed to the area of high pressure, and often this can be done without it even being in view.

For example, a high-pressure area in front of the radiator extends well behind the grille - try the tube in different hidden locations around the highest-pressure area. Also make sure that water cannot flow down the tube - positioning it with the end facing downwards will help achieve this. Finally, if you want to make it near invisible, give it a light spray with a can of black spray paint.

Adjustment



The pressure switch is adjustable for sensitivity. The small screw on the back (highlighted here by the screwdriver blade) is turned clockwise to make the switch more sensitive, and anticlockwise to reduce sensitivity. However turn it too far clockwise and the switch will be on all of the time; turn it too much the other way and the screw will fall out!

It is quite feasible to have the switch set so sensitively that it closes at very low road speeds. (In the test Lexus LS400, the switch could be set so that it triggered at 25 km/h!). However, going this low isn't recommended. The switch-on point will vary a small amount with temperature, and also you need to remember that the system also measures air movement caused by head- and tail-winds.

So if you have it set so that on a windless day it triggers at 30 km/h, on a day with light winds that set-point will vary over 15-25 km/h of road speed.

You also do not want to set the switch to a speed around which you expect to be travelling a lot. For example, if you live in an area with a 60 km/h urban speed limit - and you set the switch to trigger at 60 km/h airspeed - you will be turning the switch on and off frequently as you frequently travel at a little above and below this airspeed. (And the gusting wind takes you a little above and below this speed as well!). While the anti-chatter circuitry of the Pressure Switch Relay Module will stop the switch turning on and off quickly, it will still let the relay click over every couple of seconds. (The fastest switch on/off time will depend on the capacitor that you use in the relay module - more on that in a minute.)

So for example, if you want to activate an intercooler fan at slower speeds and when your car is stopped, it's best to set the switch-on point at about 40 km/h airspeed. In real life, with other cars affecting the airflow around your car, with light winds and temperature changes, this will give an actual switch point of about 35-45 km/h road speed. (Don't forget that if another car is close in front, the airflow going past your car is **actually** disrupted - the switch is measuring what's really happening!)

As with most of these adjustments, it is best to test on your own car. If the switch turns on and off more frequently than you like (when it is set for the turn-on airspeed that you want), you can increase the value of the capacitor used on the relay board. The default is 470uF, which gives a stay-on period of about 2-3 seconds after it was last triggered. In other words, when the airspeed dips below the switch-on point for less than 2-3 seconds, the relay will stay on constantly.

Increasing it to 2200uF (as shown here) will give a delayed 'on' time of about ten seconds. Doubling the capacitor value again will give about a 20-second 'on' time each time the pressure switch is triggered. Setting the switch delay to 20 seconds with the switch-on airspeed set to (say) 40 km/h will give the following behaviour: as you come up to a red traffic light at 60 km/h you will reach a complete halt for about ten seconds before the switch turns itself off. Juggling with different capacitor and switch-on airspeeds gives you a huge variety of behaviour - a lot will depend on your personal preferences and what you're actually controlling.

Wiring

The different ways in which the module can be wired to operate various devices is shown in the Powering Up the Pressure Switch article. Basically, you can have things switch on when the car exceeds a certain airspeed, or things switch off when that airspeed is reached. It's also easy enough to wire the module to a monster automotive relay so that you can switch big loads without any problem at all.

Conclusion

The way that you make use of the airflow switch is up to you - it's a device that suggests a myriad of possibilities. But even as a simple intercooler electric fan control (or for a fan on an oil cooler - there's another use!) it's definitely worth its cost.

AutoSpeed Shop:

Pressure Switch Relay Module
$7.95

Pressure Switch
$11.95

www.autospeed.com