

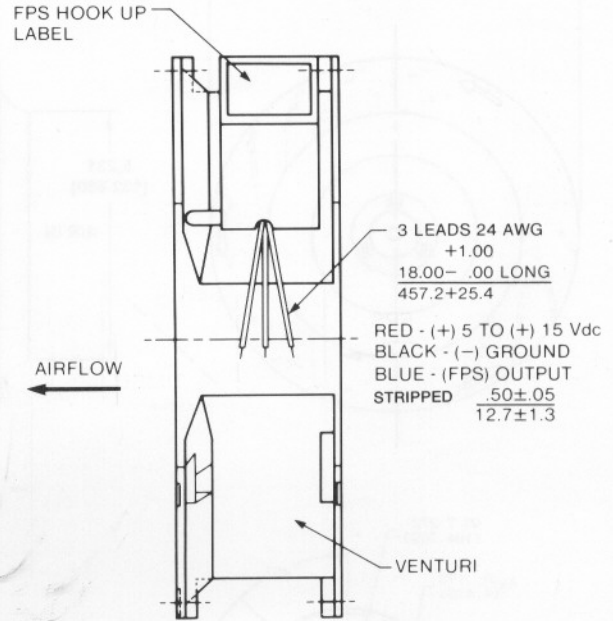
AC Fan Performance Sensor (FPS)

For Major and Patriot AC Fans

Thermal management of electronic packages is increasingly challenging as package sizes decrease and circuit complexities increase. In order to avoid critical internal temperature increases within the electronic system, it is necessary to make provisions for a continuous supply of cooling airflow by monitoring and remote warning of potential airflow interruption.

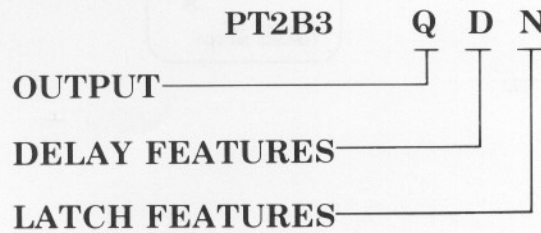
Comair Rotron supplies a variety of Fan Performance Sensor-equipped Major & Patriot AC fans which provide both monitoring and remote warning capabilities. Should cooling airflow be reduced or interrupted due to a drop in RPM, these FPS systems can trigger back-up cooling devices to go on line, or for less critical equipment, for system shutdown in order to avoid excessive internal temperature rise.

Two different types of Fan Performance Sensors are currently available for the Major & Patriot AC product line. All are designed around an electrically isolated pick-up coil which generates an AC signal with an amplitude proportional to the speed of the fan and the voltage applied to the fan. This output signal is then conditioned by additional electronic circuitry to yield a discrete pass or fail signal.



NOMENCLATURE FOR THE FPS

EXAMPLE:



OUTPUT

Q = Open Collector -- The signal is derived from the collector of the output transistor. The output is high on pass, low on fail. Downstream electronics can be tied between the supply voltage (V_{CC}) and output only.

T = TTL Compatible -- This is the same as an open collector output, but has an internal pull-up resistor tied between the supply voltage (V_{CC}) and the collector of the output transistor. The output signal is high on pass (logical 1) and low on failure (logical 0). Downstream electronics can be tied between the supply voltage (V_{cc}) and/or output and ground.

DELAY FEATURES

D = 10 ± 4 second delay -- The failure signal is delayed approximately 10 seconds, thereby eliminating temporary or nuisance failure indication such as at fan start-up.

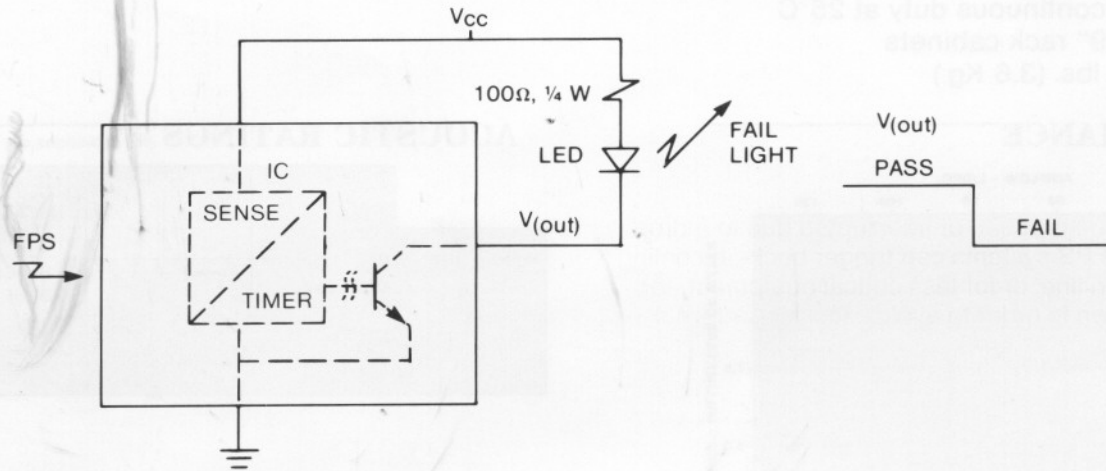
N = < 1 second delay

LATCH FEATURES

L = Latched -- Once the sensor outputs a failure signal, that signal is latched on even if the fan goes back into a pass condition. The latch is reset by interrupting the power to the FPS and the output load.

N = No Latch.

TYPICAL FPS APPLICATION EXAMPLE



CIRCUIT DESIGN

This circuit (above) utilizes the open collector output option with delay feature (10 ± 4 seconds) and latch feature. The output signal is used to power one LED labelled to indicate failure. Failure indication is determined as a fan sees the equivalent of 80 VAC, 60 Hz. Rotational speed less than this nominal value may be caused by a reduced applied voltage to the fan, a physical obstruction impeding fan rotation or failure of the motor or bearing.

CIRCUIT OPERATION

The red FPS lead is applied to the FPS power source (+5 to +15 Vdc), the black FPS lead to ground, and the blue output lead as shown in the above schematic. Power is applied to the fan, which will start and reach full rotational speed (3350 RPM) in five to ten seconds. The delay feature specified in this example will not allow a failure indication on start-up unless the fan fails to reach the specified minimum operating point (80 VAC, 60 Hz.) within ten seconds. If the delay option had not been specified, the failure indicator would have been lit until the fan reached minimum operating level.

Should a failure occur or fan rotational speed drop below the minimum for more than ten seconds, the failure indicator would be illuminated. Should the fan then speed up above the minimum level the failure indicator would remain on. The latch feature maintains the failure indication until a system operator resets the FPS. The FPS is reset by interrupting the FPS supply voltage and output load for more than 40 milliseconds. An advantage of this FPS design is the continual fan status indication. Because of the latch feature chosen in this example, the user need not constantly monitor the pass/fail LED indicators in order to determine if a failure has occurred.

SPECIFICATIONS

PARAMETER	CONDITIONS	Open Collector (Output)	TTL (Output)
Input Voltage Requirements		5–15Vdc	
Supply Current (Quiescent)	$V_{CC} = 5Vdc$	15 mA MAX	
	$V_{CC} = 15Vdc$	30 mA MAX	
Inrush Current	$V_{CC} = 5Vdc$	50 mA MAX	
Temperature	Non-Operating (Storage)	–28°C TO +70°C	
	Operating	0°C TO +60°C	
Alarm Signal	No Delay	<1 SEC	
	Delay	10 ± 4 SEC	
Alarm Set Point	115 V, 60 Hz	80 ± 10 VAC	
	115 V, 50 Hz	70 ± 15 VAC	
	230 V, 60 Hz	165 ± 10 VAC	
	230 V, 50 Hz	155 ± 15 VAC	
V_C Collector-Emitter	MAX	28 Vdc	
I_C Continuous Collector Current	MAX	100 mA	
$V_{CE(SAT)}$ Collector Emitter SAT. Voltage	$I_C = 10mA$	100 mV(TYP)	
	$I_C = 100mA$	200 mV(TYP)	
Pull-Up Resistance V_{CC} To Collector			1K Ω

NOTES:

- Specifications presently cover FPS used on 115V or 230V full speed (2 pole) design only. For information on half speed (4 pole) design, contact factory.
- Sample discussed above mentions voltages that only pertain to 115V models.