

THE NEW WARREN G-V "THERMULATOR"™ SWITCH MONITORS FORCED AIR COOLING SYSTEMS WITH TWO LOGIC OUTPUTS

GENL SIG/WARREN G-V

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DLS Series only from WARREN G-V

T-65-13

DESCRIPTION

Warren G-V's new thermal emulator, or "Thermulator," is a switching device that monitors both temperature and air velocity in a forced air cooling system. This dual output logic switch (DLS) has the unique capability of providing two separate, preset alarm logic outputs.

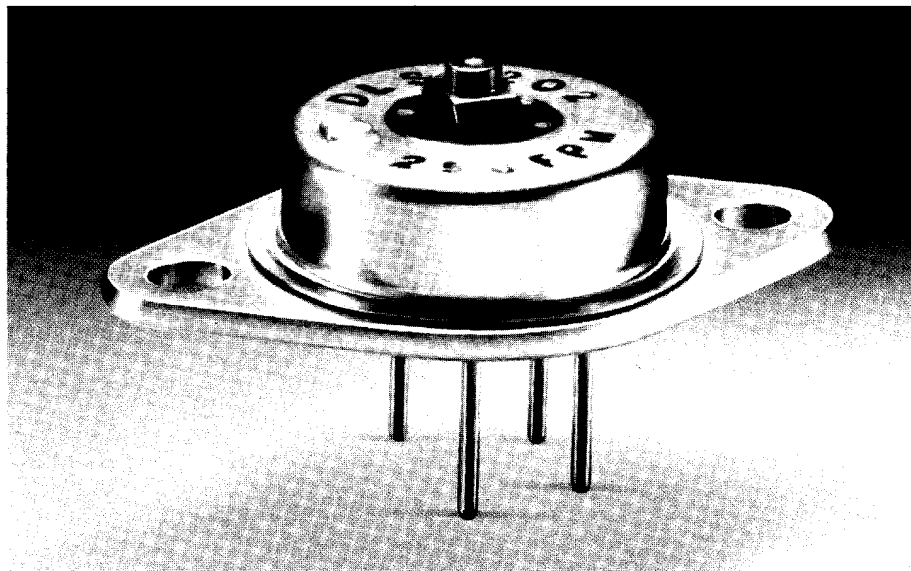
Completely self-contained, it monitors a rise in temperature or a decrease in air velocity. This solid state airflow switch is designed to provide an early warning "minor" alarm if the air velocity decrease or temperature increase has exceeded predetermined limits. A "major" alarm signal would be activated if this malfunction continued, requiring possible equipment shutdown or power removal.

These alarms insure thermal protection for sophisticated electronic equipment. The Thermulator is factory set and ready for operation within customer circuitry.

TYPICAL APPLICATIONS

The Thermulator is equipped with two distinct sensing levels, which may be used to increase the velocity of a cooling fan or blower to acceptable system limits. This adjustment should restore normal levels of air velocity and temperature. If the increase does not provide the desired correction, the Thermulator will provide the second or "major alarm" output, connected to provide either complete system shutdown or limit power to sensitive component areas.

Three different fan velocities can be controlled with the Thermulator. In this



mode, an additional thermal device should be available to provide system shutdown. The Warren G-V Thermulator is powered by a +5V.DC source, available in most modern systems. The input voltage required should be a low ripple regulated source with a maximum $\pm 5\%$ tolerance in voltage.

"Fail safe" logic level outputs, which require a minimum of 16mA load each, will provide a low logic level at the outputs under normal conditions. This configuration will switch to the high logic level in the event of an *alarm condition*. In this format a failure in the Thermulator, or its input voltage, will alarm both outputs. A low logic will indicate that the output transistor is "on" and sinking the current to ground (common zero volt).

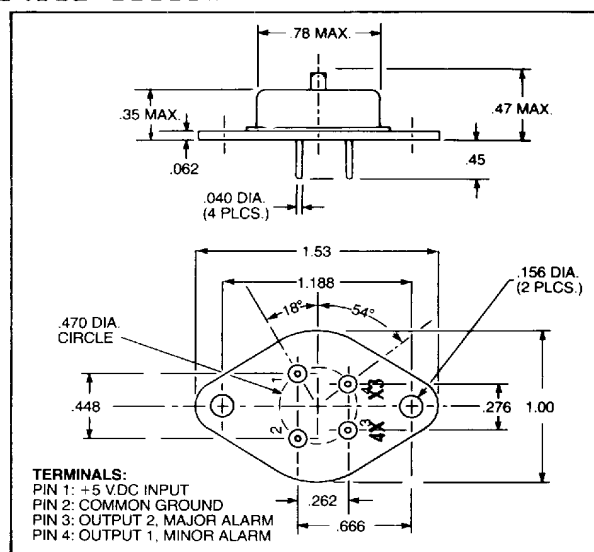
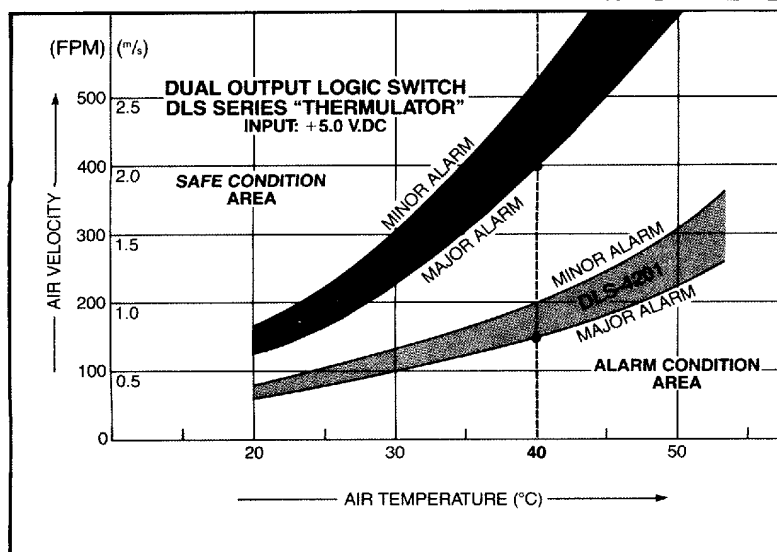
Both outputs are open collector NPN transistors with emitters tied to common ground, allowing flexibility in the applica-

tion of this device. External pull-up resistors will then be required at the output pins. The voltage on the outputs could be either +5V.DC or any voltage up to +30V.DC. Pull-up resistors are typically 1K ohms for 5V. TTL interfacing, and the maximum of 16mA loading applies for the other voltages.

FACTORY SETTING FOR AIR VELOCITY AND TEMPERATURE

The Thermulator will be factory calibrated at a fixed temperature setting, which has been standardized at 40°C. Warren G-V engineers can review other temperature setting selections from 25°C





to 55°C upon request. The air velocity factory setting will be established at the selected temperature; differential between the two air velocities could be from 50 to 100FPM. Calibration will be based on the "major alarm" air velocity at the selected air temperature. The "minor alarm" output will track the major alarm setting, at a pre-determined air velocity differential.

Both alarms will maintain their sequence as shown on the illustrated graph of air velocity setting versus air temperature. The graph plots an example of both a high and low setting. Other settings between the two levels can be factory calibrated.

Calibration: Per Exponential Curves based on desired alarm air velocities for both alarm points, at a given ambient temperature (see examples shown in attached curves). Adjustment temperatures can be selected from 25°C to 50°C (40°C is standard).

Note: Calibration made with base parallel to airflow plane and airflow in line with mounting holes.

Temperature Range: +10°C to +60°C in Calibration

Outline Dimensions: Style TO-3 Package (see outline drawing, attached)

Note: Outputs are "Open Collector" NPN transistors with emitters commoned to zero volt (ground).

Output on Alarm Condition Both Outputs	
Output Transistor	Logic Interface (Pull-up Resistor)
ON	LOW
OFF	HIGH

Warren G-V will calibrate each unit ordered to the major air velocity alarm setting point. Minor alarm points for air velocity or temperature setting will not be specified but will bear an approximated percentage difference as to the major respective alarm points. This is illustrated on the air velocity temperature graph on this page. Minor alarms will always occur in decreasing airflow at a higher air velocity point than the major alarm. Minor alarm will always occur at a lower temperature as temperature rises toward the major temperature alarm point.

SPECIFICATIONS

Input Voltage: +5 VDC ($\pm 5\%$) PIN 1
Common Ground (OV.) PIN 2
Power Dissipation $\frac{1}{2}$ Watt Max.

Output Ratings: Up to 16 mA. each,
5 to 30 VDC Source
Alarm Condition: LOGIC HIGH
Normal Condition: LOGIC LOW (0.5 VDC max.)

Output Designation: Minor Alarm
Output, PIN 4
Major Alarm Output, PIN 3

HOW TO ORDER

The standard part number order table below is keyed to the major alarm air velocity setting point at Warren G-V's standard setting of 40°C.

Standard Part Number Ordering Table All Settings at 40°C		
Standard Part Number	Major Alarm	Minor Alarm
DLS-4201	150 FPM	Approx. 200 FPM
DLS-4202	250 FPM	Approx. 340 FPM
DLS-4203	400 FPM	Approx. 525 FPM

Setting tolerance for "Major Alarm" is $\pm 10\%$, or 25 FPM, whichever is greater.

Special applications contact WARREN G-V

MOUNTING ACCESSORIES

- Mounting Socket — PN 4-1-320
- Socket with 12 in leads — PN 4-1-321
- Same with mounting bracket — PN 4-1-322



EXPERTS IN THERMAL MANAGEMENT

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