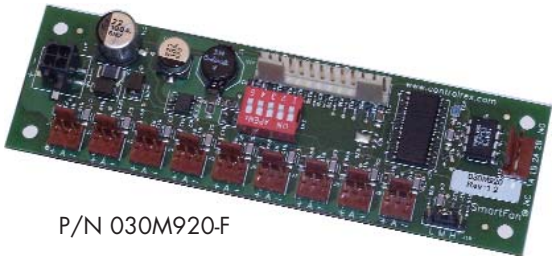
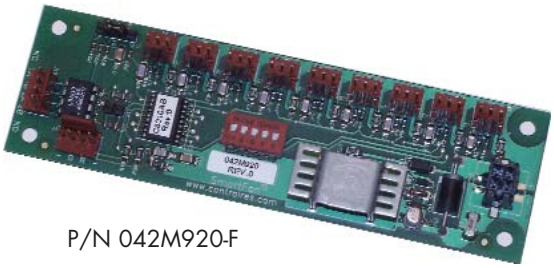
SmartFan® TachScan-9

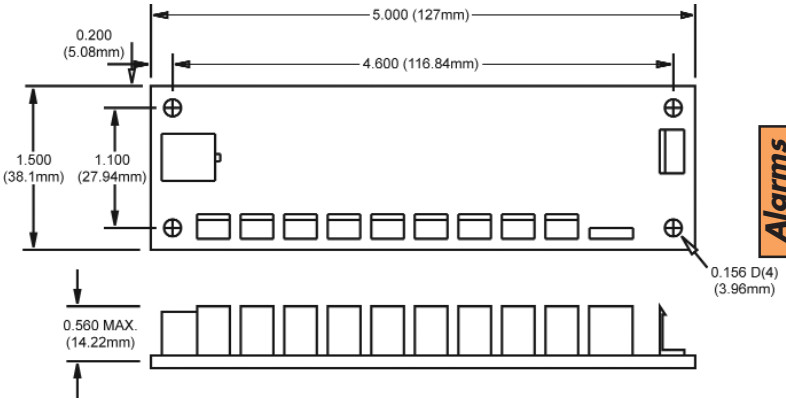
Fan Speed Alarm



P/N 030M920-F



P/N 042M920-F



SmartFan TachScan-9 is a digital fan speed alarm that monitors the tach pulses from up to nine DC or AC fans or blowers and provides both individual and OR'd pass/fail signals. TachScan-9 is compatible with any fan that provides open collector or voltage source tach pulses. Three trigger speeds are selectable by jumper. If the speed of any air mover falls below the trigger speed, alarm signals are generated. Alarm signals can drive LEDs, logic, optical isolators or MOS Relays.

FEATURES

- P/N 030M920-F accepts any supply voltage from 6 to 60 VDC and distributes power to DC fans through the same header used to sense tach pulses.
- P/N 042M920-F accepts any supply voltage from 10 to 75 VDC for telecom applications and distributes power to DC fans through the same header used to sense tach pulses.
- P/N 030M92010-F accepts any supply voltage from 6 to 60 VDC and power the DC tach circuits built into AC fans
- Nine inputs monitor fans with any open collector or voltage sources tach pulses. The setting of a dip switch allows fan headers to be disabled when fewer than nine fans are connected.
- P/Ns 030M920-F and 030M92010-F provide an OR'd alarm output plus individual outputs for each fan, which can drive logic, LEDs or remote optical isolators.
- P/N 042M920-F provides and OR'd output to drive two single LEDs or one bi-colored LED
- Provides simultaneous NO and NC isolated outputs from a Dual-Pole MOS Relay which can sink up to 100 mA to drive heavy loads.
- Jumper sets trigger speed to 1,000, 2,000 or 4,000 PPM.
- Compatible with any SmartFan speed controller.
- RoHS (6/6) compliant
- Small size of 5" X 1.5" permits mounting in small spaces within fan trays, etc.
- Optional fan fusing is available.

SPECIFICATIONS

Part Number	Fan Type	Supply Voltage Range	Maximum Input Current	Maximum Output Current to Any Fan
030M920-F	DC	6 to 60 VDC	8.0 Amps	4.0 Amps
042M920-F	DC	10 to 75 VDC		4.0 Amps
030M92010-F	AC	6 to 60 VDC		N/A
H116-F	Hardware Pack			

Note: Maximum operating temperature is 65°C

For complete product details visit: ***www.controlres.com***

CONTROL RESOURCES INCORPORATED

INSTALLATION

Power-In Connection (J11)

Refer to Figure 1 for supply power wiring. Connect supply power at header J11. Header J11 is rated at 4.0 Amps per pin. For applications requiring less than 4.0 Amps, a single pair of power and return wires should be connected to a single pair of + and – pins, respectively. For applications requiring between 4.0 and 8.0 Amps, connect two pairs of supply power and return leads to both pairs of + and – pins on J11 to handle the higher current.

Fan Connections

For three wire DC fans, TachScan-9 distributes power to the fans in addition to accepting tachometer pulses from the fans. Connect the fan wires to headers J1 through J9. Fan wires are usually color coded with red for +, black for - and white or yellow for A (alarm). Fan current at each header must not exceed 4.0 Amps. Total fan current through J11 must not exceed 8.0 Amps.

AC Fan Alarm Monitoring (P/N 030M92010-F)

TachScan-9 cannot distribute AC power to AC fans. AC fans usually have 5 wires, 2 for power and 3 for the tachometer pulse circuit. Connect the AC fan power leads to the rated source of power. Connect the tachometer pulse leads (+, -, tach pulse) to J1 through J9. TachScan-9 distributes power to run the tachometer pulse circuits within the fans. Apply a DC voltage as specified by the fan manufacturer for the tachometer pulse circuits at J11.

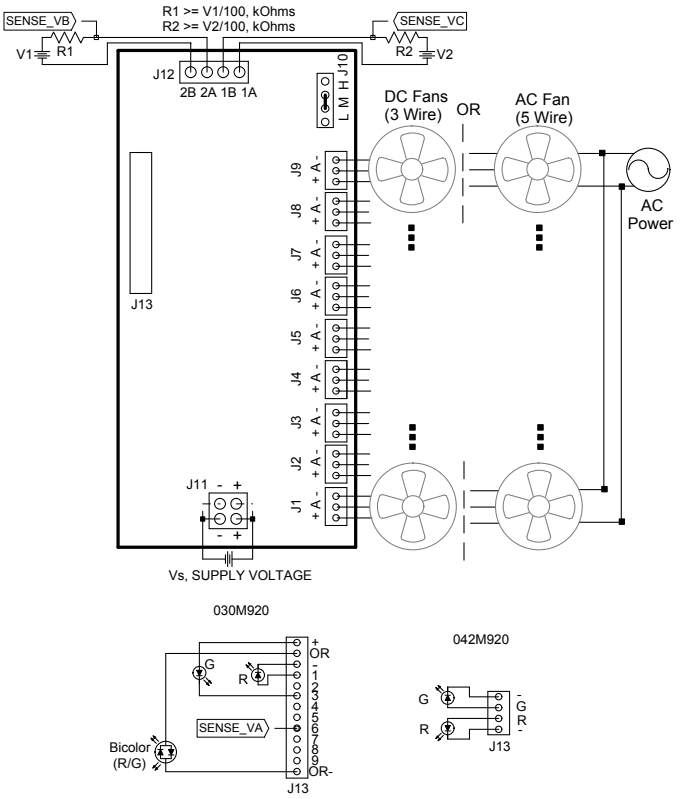
When Fewer Than 9 Fans Are Installed

If tachometer pulses are not connected to all of the A inputs at headers J1 through J9, TachScan-9 will indicate a fan failure. The 5-position switch at SW1 allows fan headers from J5 through J9 to be disabled. See Table 1 for switch settings. Standard TachScan-9 boards are shipped with the switches in the OFF position

Table 1: SW1 Settings

To Disable Fan Header	Turn On Switch
9	1
8	2
7	3
6	4
5	5

Connections/Jumpers/Switch



J1 through J9 – Fan Power and Tachometer Input
J10 – Trigger Speed Setting
J11 – Supply Power
J12 – Isolated Alarm Outputs
J13 – Non-isolated Alarm Outputs

Above Trigger Speed
Sense_VA <= 0.4 VDC
Sense_VB = V1 VDC
Sense_VC <= 0.4 VDC
Below Trigger Speed
Sense_VA = >2.0 VDC
Sense_VB <= 0.4 VDC
Sense_VC = V2 VDC
G = Green LED
R = Red LED

Figure 1: Wiring Diagram.

Using TachScan-9 with a SmartFan Speed Controller

Because of the wide range of power supply voltages that may be connected to J11, TachScan-9 may be used with any DC SmartFan speed controller. The power output of the speed controller that would otherwise be connected directly to the fan load is instead connected to J11 (see Figure 2). TachScan-9 in turn distributes this power to the fans.

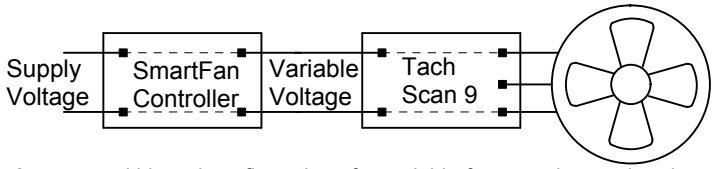


Figure 2 multi-board configurations for variable fan speed control and tachometer alarm monitoring.

Hi-Pot Testing
When installed using ¼" spacers, all versions of the Tachscan 9 are design to withstand a maximum voltage of 3000VDC or 3000RMS during Hi-Pot testing.

OPERATION

Setting Alarm Trigger Speed(J10)
Use jumper at J10 to set the alarm trigger speed (W_A):

Position L = 1000 PPM
Position M = 2000 PPM (Factory Setting)
Position H = 4000 PPM

Since fan tachometer circuits are designed with one, two, or even more pulse outputs per revolution, settings are listed in pulses per minute (PPM) rather than revolutions per minute (RPM). Given the fan's rated speed (W) and number of pulses per revolution (N), use the following formula to select the trigger speed (W_A):

$$W_A = W \times N \times 0.4$$

(Note: When used with a SmartFan speed controller the factor in the above equation should be changed from 0.4 to 0.3.)

For example, a 3300-RPM fan with two pulses per revolution would have a trigger speed (W_A) of

$$W_A = 3300 \text{ RPM} \times 2\text{PPR} \times 0.4 = 2640 \text{ PPM}$$

Since the 2000 PPM trigger is closest, set jumper J5 to the "M" position.
The alarm trigger accuracy is +/- 20%.

NON-ISOLATED ALARM OUTPUTS (J13)

The 60VDC Tachscan-9 (030M920-F) offers nine separate non-isolated alarm outputs plus an OR'd fan failure signal at header J13. Pins labeled 1 through 9 correspond to fan headers labeled J1 through J9.

The 75VDC Tachscan-9 (042M920-F) triggers a single alarm output if any of up to nine fans falls below the set trigger speed.

All versions of the Tachscan-9 can drive:

- ✓ LEDs
- ✓ Logic Circuits
- ✓ Optical Isolators
- ✓ MOS Relays

Connecting LED's to J13
Choose LEDs with rated forward voltage (V_f) between 1.6 and 2.4 VDC at forward current (I_f) of between 15 and 25 mA. Nominal current applied to the LEDs is 8 mA. Refer to the wiring diagram in Figure 1.

For the 60VDC Tachscan 9 (030M920-F), each of the pins labeled 1 through 9 on J13 will supply 8 mA to an LED connected between that pin and pin J13:- or J13:+. To turn on an LED in response to a fan failure (usually a red LED) connect it between the appropriate pin and pin J13:-. The cathode (negative lead) of the LED is connected to pin J13:-. To turn on an LED indicating that there has not been a failure (usually a green LED) connect it between the appropriate pin and pin J13:+. The anode (positive lead) of the LED is connected to pin J13:+.

For the 75VDC Tachscan 9 (042M920-F), a red LED will turn on in case of any fan failure when the anode is connected to "R" and the cathode is connected to "-". A green LED will turn off in case of any fan failure when the anode is connected to "G" and the cathode is connected to "-". A bicolored, 2 pin LED can be connected across "R" and "G". A bicolored 3 pin LED can be connected at "R", "G" and either "-" pin (cathode).

Connecting Logic Circuits to J13
Reference table 2 for 042M920-F or table 3 for 030M920-F. A logic circuit connected to J13 must have a ground reference connected to the Tachscan-9 circuit ground available at J13:-, J11:-, and J1 through J9:-. If the logic ground and Tachscan-9 circuit ground are common, only the appropriate pin on J13 need be connected to the logic circuit. If not, connect pin J13:- to the ground or negative terminal of the logic circuit.

When in a LOW state, the connected pin can sink at least 1.0 mA at ≤ 0.4VDC. When in a HIGH state, the connected pin will source ≥ 2VDC. In case of a power failure to the TachScan board, all J13 outputs are open. Connection of an external "pull-up resistor" will ensure an alarm state in case of power failure.

Table 2: Alarm Logic on J13 (042M920 only)

Pin	Function	Above Trigger Speed	Below Trigger Speed
-	Cathode	LOW	LOW
R	Red Anode	LOW	HIGH
G	Green Anode	HIGH	LOW
-	Cathode	LOW	LOW

Table 3: Alarm Logic on J13 (030M920-F only)

Pin	Above Trigger Speed	Below Trigger Speed
+	HIGH	HIGH
OR	LOW	HIGH
-	LOW	LOW
1	LOW	HIGH
2	LOW	HIGH
3	LOW	HIGH
4	LOW	HIGH
5	LOW	HIGH
6	LOW	HIGH
7	LOW	HIGH
8	LOW	HIGH
9	LOW	HIGH
OR-	HIGH	LOW

Connecting Optical Isolators or MOS Relays to J13
A resistor must be connected in series with the input to the optical isolator or MOS relay but otherwise it is connected in the same manner as an LED (see Connecting LED's to J13). A 1/4 watt resistor with a value of approximately 200 Ω is recommended to set isolator input current to approximately 5 mA.

Isolated OR'd Alarm Outputs (J12)
These optically isolated outputs provide both normally open (N.O.) and normally closed (N.C.) alarms permitting connection to logic circuits or other loads with no electrical connection to the TachScan-9 circuit.

The outputs are from a Dual-Pole MOS Relay, which are intended to drive heavy loads. These outputs have a maximum on-state resistance of 50 Ω, maximum sinking current is 100 mA, and a maximum of 230 VAC can be applied to the alarm terminals. The outputs also trigger in the event of cooling system power failure.

Table 4: Alarm Logic on J12

Circuit	Above Trigger Speed	Below Trigger Speed	Power Removed
1A-1B	Closed	Open	Open
2A-2B	Open	Closed	Closed

Note: At power-up, all outputs are held in the normal state for 10 seconds permitting the fans to come up to speed.

Suggested Connecting Hardware

Ref. Desc.	Header on Board[1]	H116-F Hardware Pack			
		Quantity	Description	Manufacturer[1]	Part Number[1]
J1 – J9	22-29-2031	9 27	Housing Terminal (Gold)	Molex	22-01-3037 08-65-0816
J11	43054-0412	1 4	Housing Terminal (Tin)	Molex	43025-0400 43030-0007
J12 or J13(042M920-F only)	22-29-2041	1 4	Housing Terminal (Gold)	Molex	22-01-3047 08-65-0816
J13 (030M920-F only)	22-29-2131	1 13	Housing Terminal (Gold)	Molex	22-01-3137 08-65-0816
		4	PCB Support	Richco	CBS-4-19

[1]or equivalent