FumeOut ™
Battery Compartment Vent Fan

Owner's Manual – Installation & Operating Instructions, Trouble-shooting, Specifications & Warranty

GENERAL INFORMATION - FumeOut™ is an automatic exhaust fan that is designed to remove fumes which are normally produced during battery recharge or equalization. Consisting mostly of hydrogen and oxygen, these gases can become explosive if allowed to accumulate in the battery compartment or other enclosed spaces. By drawing these fumes outdoors, FumeOut™ performs an essential safety function.

The FumeOut™ package consists of a 12 volt DC brushless Exhaust Fan and a Fan Controller. The Controller continuously measures your battery bank voltage, turning on the Fan whenever the voltage becomes high enough to generate fumes during the recharge process. As soon as the battery voltage drops below the point where gassing occurs, the Controller shuts off the Exhaust Fan.

The Fan Controller also has several other important features:

PURGE TIMER - This function is designed to evacuate any fumes which may accumulate in between periods when the batteries are being recharged. When enabled, the Purge Timer turns on the Exhaust Fan for approximately 5 minutes every 24 hours, regardless of battery voltage.

FAN STALL ALARM - Whenever the Exhaust Fan is running, the Fan Controller continuously checks the Fan for adequate motor speed. If the motor should stop spinning or fail to start, the Controller will sound an alarm beeper and blink a red LED warning light on the front panel.

In addition to the beeper on the Fan Controller, provision is also included for connecting an external fan stall alarm, which will also sound whenever the fan stalls or fails to start.

MULTI-VOLTAGE OPERATION - The Fan Controller can be used on 12, 24 or 48 volt battery banks. It has a built-in voltage regulator which allows the 12 volt fan to also be operated from 24 or 48 volt battery banks. This regulator is an efficient switching design that minimizes power consumption, regardless of battery bank voltage.

PROGRAMMABLE SETPOINTS - The Fan Controller is factory-calibrated with a default fan turn-on voltage (Von) of 2.33 volts per battery cell, and a turn-off voltage (Voff) of 2.30 volts per battery cell. Depending on whether a 12, 24 or 48 volt battery bank is present, these values will correspond to bank voltages of:

	12 Volt Battery Bank:	24 Volt Battery Bank:	48 Volt Battery Bank:
Fan Turn-On Voltage:	14.0 Volts	28.0 Volts	56.0 Volts
Fan Turn-Off Voltage:	13.8 Volts	27.6 Volts	55.2 Volts

However, the user can override these defaults to program in another Von and/or Voff value. This is accomplished by momentarily pressing either the **Set Von** or **Set Voff** buttons as soon as the desired fan turn-on or turn-off voltage is reached. Settings are stored in non-volatile RAM.

BATTERY DISCONNECTED ALARM - This feature sounds an alarm if the voltage sensing connnection between the batteries and the Fan Controller fails.
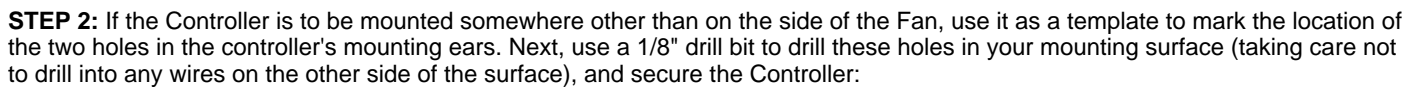
(NOTE: Refer to the OPERATING INSTRUCTIONS section for additional information.)
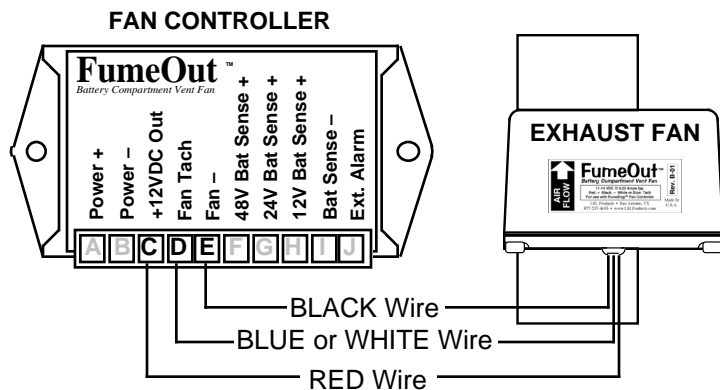
> ⚠ **CAUTION - BEFORE PROCEEDING WITH INSTALLATION:**
> USE CARE WHEN WORKING AROUND BATTERIES — SPARKS CAN IGNITE EXPLOSIVE GAS. SHORT CIRCUITS CAN CAUSE BURNS OR FIRE. CORROSIVE ACID CAN CAUSE SKIN BURNS OR BLINDNESS. EXPOSED CONNECTIONS CAN CAUSE SHOCK OR ELECTROCUTION.

MECHANICAL INSTALLATION INSTRUCTIONS

STEP 1: Identify appropriate mounting locations for both the Exhaust Fan and the Fan Controller. **Neither part should be installed inside the battery compartment.** Particular consideration should be given to locating the controller where (1.) it can be easily accessed for adjusting settings or viewing status, and (2.) its built-in beeper can be easily heard in living quarters. **NOTE:** The controller provides best accuracy when it is mounted in a relatively dry, temperate location. If desired, the aluminum bracket and 4 sheet metal screws (included) can be used to mount the Controller to the side of the Exhaust Fan:

Exhaust Fan

Bracket

Fan Controller

Center 2 Screws

Outer 2 Screws

STEP 2: If the Controller is to be mounted somewhere other than on the side of the Fan, use it as a template to mark the location of the two holes in the controller's mounting ears. Next, use a 1/8" drill bit to drill these holes in your mounting surface (taking care not to drill into any wires on the other side of the surface), and secure the Controller:

3.5 " Hole Spacing

Mark & Drill Here

Mark & Drill Here

Screws (2)

FAN CONTROLLER

1/8" Holes (2)

Mounting Surface

Typical Installation

90° Elbow | 90° Elbow

Elbows installed on both pipe ends for protection against rain, debris entry

90° Elbow | 90° Elbow

Optional Air Inlet Pipe

STEP 3: Install the fan with 2" PVC DWV pipe, using RTV Silicone to tightly seal the pipe where it enters or exits the battery compartment. Use PCV pipe cement on all joints **EXCEPT** the connections to the fan - leave these connections as friction-fit only, to permit removal/reinstallation of the fan for cleaning, motor replacement, etc. Avoid dripping cement down into the inside of the fan.

Since battery fumes tend to be lighter than air, the air inlet pipe should be located low in the compartment, and the exhaust pipe should be located high in the compartment. For best crossflow, the pipe ends should be on opposite sides of the compartment. If the battery compartment is in a well-ventilated location away from living areas, the air inlet pipe is optional - If you omit it, cut an air inlet in the bottom of the compartment instead.

If the outdoor ends of the pipes will be exposed to rain, leaves or other debris, use 90 degree elbows and short pieces of pipe to make protective covers for the pipe ends (as shown above).

NOTE: The fan must be installed on the air **outlet** side of your battery compartment, **NOT** the air **inlet**. This ensures that a slight vacuum is created inside the compartment, preventing battery fumes from being forced out into adjacent areas.

Inlet and outlet located at opposite sides of compartment

Air inlet located near bottom of compartment

Exhaust outlet located near top of compartment

BATTERY COMPARTMENT

ELECTRICAL INSTALLATION INSTRUCTIONS

FAN CONTROLLER

FumeOut™
Battery Compartment Vent Fan

Power + | Power − | +12VDC Out | Fan Tach | Fan − | 48V Bat Sense + | 24V Bat Sense + | 12V Bat Sense + | Bat Sense − | Ext. Alarm

A B C D E F G H I J

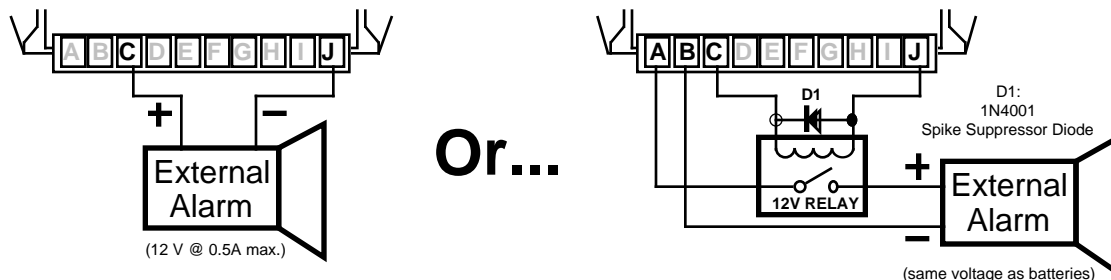**EXHAUST FAN**

FumeOut™

BLACK Wire
BLUE or WHITE Wire
RED Wire

NOTE: The connections to your battery bank should be made **LAST**. Make all other connections **BEFORE** connecting the Fan Controller to your batteries.

STEP 1: Strip approx. 1/4" of insulation off the ends of the Exhaust Fan's 3 wires, insert their bare ends into the wire holes of terminals **C**, **D** and **E** on the Fan Controller, and tighten these same three terminal block screws to secure the wires. **CAUTION: Do not overtighten the terminal block screws, or damage may occur.**

If any additional wire length is needed to connect the Fan to the Controller, use 22 gauge wire or thicker. If using a third-party fan that lacks a Tach Output, connect the **Fan Tach** terminal (**D**) to the **Fan −** terminal (**E**).

STEP 2 (optional): If used, connect an external alarm to the terminal block on the Controller, using terminals **J** and **C** . If your external alarm operates on 12 volts and draws less than 0.5 amps, connect it directly to terminals **C** and **J**. If your alarm operates on 24 or 48 volts or draws more than 0.5 amps, connect the coil of a 12VDC relay to terminals **A** and **J** instead, supplying DC battery power to the alarm through the relay's contacts.
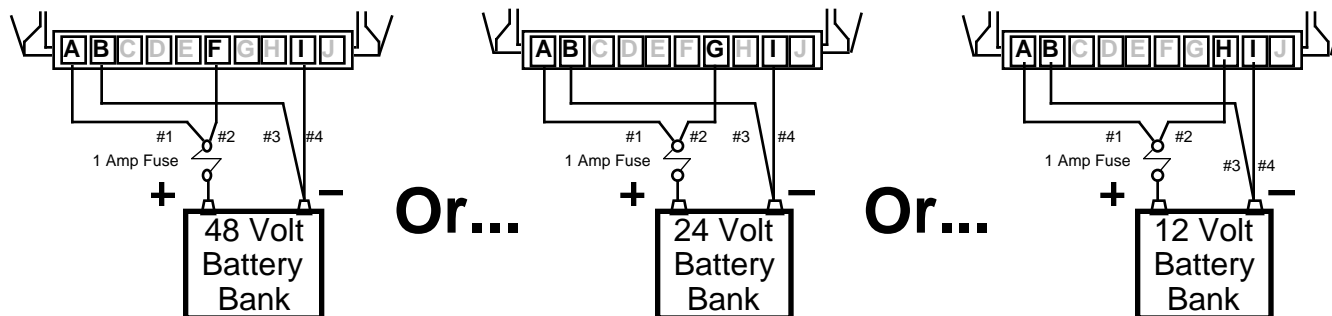
NOTE: If using a relay, also connect a diode (1N4001 or similar) across terminals C and J as shown, in order to protect the Fan Controller from voltage spikes produced whenever the relay coil is switched off.

A B C D E F G H I J

\+ −

External Alarm

(12 V @ 0.5A max.)

Or...

A B C D E F G H I J

D1
D1: 1N4001 Spike Suppressor Diode

12V RELAY

\+ External Alarm −

(same voltage as batteries)

STEP 3: Run 2 pair of wires (wires #1 to #4, as shown below) from the Fan Controller to your battery bank, **BUT MAKE NO CONNECTIONS TO THE BATTERIES YET**. Connect these wires to the terminal block on the Controller, as shown below - Be sure to use Terminal **F** for a 48 volt battery bank, or Terminal **G** for a 24 volt battery bank, or Terminal **H** for a 12 volt battery bank.

Next, connect wire #1 and #2 through a fuse holder to the positive terminal on your battery bank, temporarily leaving the fuse out of the holder. Next, connect wire #3 and wire #4 to the negative battery terminal. Finally, install a 1 amp fuse in the fuseholder to power the Fan Controller up. The Controller will beep several times in quick succession to confirm power-up.
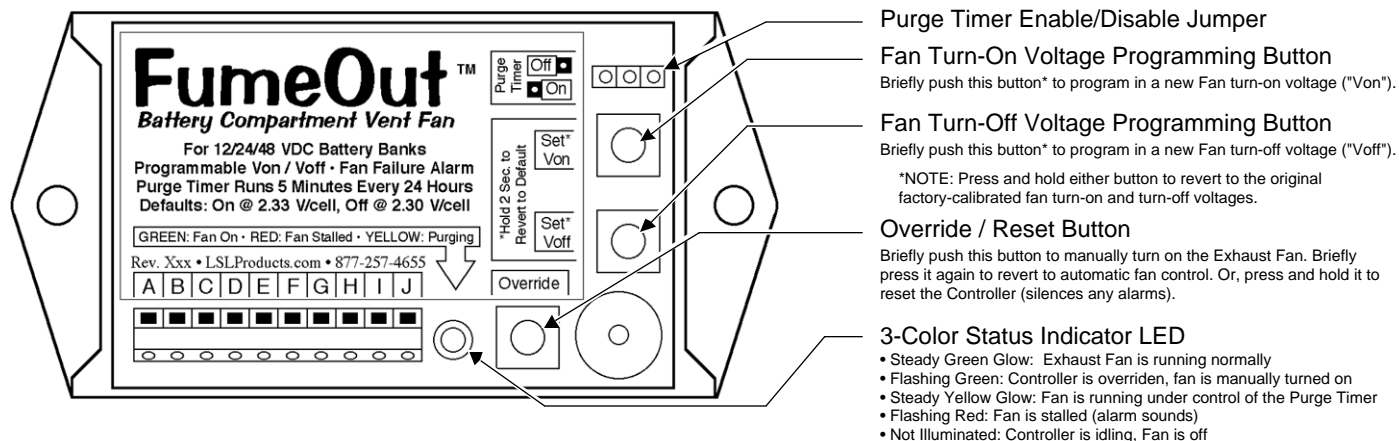
NOTE: The Fan Controller **MUST** have 2 separate pairs of wires connected to the battery bank. This "four-wire" technique is used in order to provide a separate voltage-sensing connection to the battery which is unaffected of any voltage drops in the Power + and Power − wires. Failure to use this technique will result in inaccurate or erratic fan turn-on and turn-off operation.

A B C D E F G H I J

#1 #2 #3 #4
1 Amp Fuse

\+ − 48 Volt Battery Bank

Or...

A B C D E F G H I J

#1 #2 #3 #4
1 Amp Fuse

\+ − 24 Volt Battery Bank

Or...

A B C D E F G H I J

#1 #2 #3 #4
1 Amp Fuse

\+ − 12 Volt Battery Bank

CAUTION: Dangerous battery voltages may be present!

This completes the installation procedure. Refer to the **OPERATING INSTRUCTIONS** for info on set-up and normal use.

Purge Timer Enable/Disable Jumper

Fan Turn-On Voltage Programming Button
Briefly push this button* to program in a new Fan turn-on voltage ("Von").

Fan Turn-Off Voltage Programming Button
Briefly push this button* to program in a new Fan turn-off voltage ("Voff").

*NOTE: Press and hold either button to revert to the original factory-calibrated fan turn-on and turn-off voltages.

Override / Reset Button
Briefly push this button to manually turn on the Exhaust Fan. Briefly press it again to revert to automatic fan control. Or, press and hold it to reset the Controller (silences any alarms).

3-Color Status Indicator LED
• Steady Green Glow: Exhaust Fan is running normally
• Flashing Green: Controller is overriden, fan is manually turned on
• Steady Yellow Glow: Fan is running under control of the Purge Timer
• Flashing Red: Fan is stalled (alarm sounds)
• Not Illuminated: Controller is idling, Fan is off

FumeOut™
Battery Compartment Vent Fan
For 12/24/48 VDC Battery Banks
Programmable Von / Voff • Fan Failure Alarm
Purge Timer Runs 5 Minutes Every 24 Hours
Defaults: On @ 2.33 V/cell, Off @ 2.30 V/cell

GREEN: Fan On · RED: Fan Stalled · YELLOW: Purging
Rev. Xxx • LSLProducts.com • 877-257-4655
A B C D E F G H I J

Purge Timer Off/On
*Hold 2 Sec. to Revert to Default
Set* Von
Set* Voff
Override

TO MANUALLY TURN THE FAN ON: Briefly press the **Override** button. The Fan will start and run continuously, and the indicator LED will be flashing green. Briefly press the **Override** button again to cancel manual Fan operation, restoring the fan to automatic control.

TO PROGRAM A NEW FAN TURN-ON OR TURN-OFF VOLTAGE: Briefly press either the **Set Von** or **Set Voff** buttons as soon as your new desired fan turn-on or turn-off battery voltage is reached. The Controller will store your new setting in non-volatile RAM, beeping ONCE and flashing a green indicator LED to confirm acceptance of the new voltage. The other setting will remain unchanged from its previous value.

NOTE: The Fan Controller will not accept a new programmed Von voltage that is lower than the current Voff value, and will not accept a new programmed Voff voltage that is higher than the current Von value. If a new programmed value is rejected, the Controller will beep 3 times and flash a red indicator LED, and the old value will still remain in effect.

TO RESTORE THE CONTROLLER TO FACTORY DEFAULT SETTINGS: Press and hold either the **Set Von** or **Set Voff** button for at least several seconds. After you release the button, the Controller will revert to the factory default settings for both Von and Voff, beeping TWICE and flashing a green indicator LED to confirm the change.

TIP: Although battery gassing typically occurs at around 2.4 volts per cell, it can vary somewhat with plate chemistry, temperature, battery condition and Controller calibration. For this reason, it is important to select a fan turn-on voltage which is low enough to ensure adequate compartment ventilation under worst-case conditions. The Controller's default Von value of 2.33 volts/cell was chosen to meet this requirement, even though it might be lower than your actual gassing voltage. **When programming in a new turn-on voltage, it is always smart to err on the low side.**

TO ENABLE THE PURGE TIMER: Move the small jumper plug so that it occupies the LAST (rightmost) 2 pins on the **Purge Timer** connector. To disable the Purge Timer, move the jumper plug so that it occupies the FIRST (leftmost) 2 pins on the connector, or remove the jumper entirely.

When enabled, the Purge Timer runs a cycle that turns the fan on for approximately 5 minutes every 24 hours whenever the battery voltage is below the Controller's programmed turn-on setting. A cycle is canceled if the battery voltage rises enough to turn on the fan, after which a new 24 hour cycle is started as soon as battery voltage drops enough turn off the fan. Resetting the Controller also resets the 24 hour cycle.

TO RESET THE FAN CONTROLLER: Press and hold the **Override** button for several seconds. After you release the button, the Controller will briefly turn off the fan and any alarm before resuming normal operation. (**NOTE:** Resetting the Controller does not erase any user-programmed Von or Voff settings).

IN CASE OF TROUBLE

WHY IS THE FAN CONTROLLER BEEPING CONTINUOUSLY AND THE LED INDICATOR FLASHING RED? This is the FAN STALLED alarm, and indicates that the Controller is not receiving any confirmation that the Fan motor is spinning. Listen to see if you can hear the fan motor running, - If not, check for tight electrical connections between the Controller and Fan, and then check the inside of the fan to see that the blade spins freely (i.e., isn't blocked by debris). If the cause of the problem isn't apparent, temporarily disconnect the fan's 3 wires from the Controller, connecting the Red and Black wires instead to a 12 volt DC battery (Red to +, Black to –). If the fan blades still don't spin, remove the fan motor from inside the Fan housing and replace it. (Note: Replacement fan motors are available from the factory).

WHY WON'T THE FAN CONTROLLER WON'T ACCEPT MY NEW SETTING?
The voltage setting you are attempting to program may be invalid with respect to the other setting - i.e., you may be attempting to set the fan to turn on at a voltage which is lower than the current fan turn-off voltage, or vice-versa. The controller beeps three times and flashes a red LED when this is occuring. To avoid it, try programming the other setting to its new value first.

WHY ARE MY USER-PROGRAMMED SETTINGS ERRATIC OR UNPREDICTABLE?
The Von setting may be too close to the Voff setting. Try increasing the difference between the two settings - i.e., set your desired Von voltage, and then set the Voff voltage a little lower than it was before. Also, make sure that the battery voltage sense terminals (F, G, H and I) on the Fan Controller are connected to the batteries via their own dedicated + and – wires. Finally, make sure that the 1 amp fuse holder connected to the + post of your batteries is not introducing an excessive voltage drop (i.e., more than 50 mV), particularly while the fan is running.
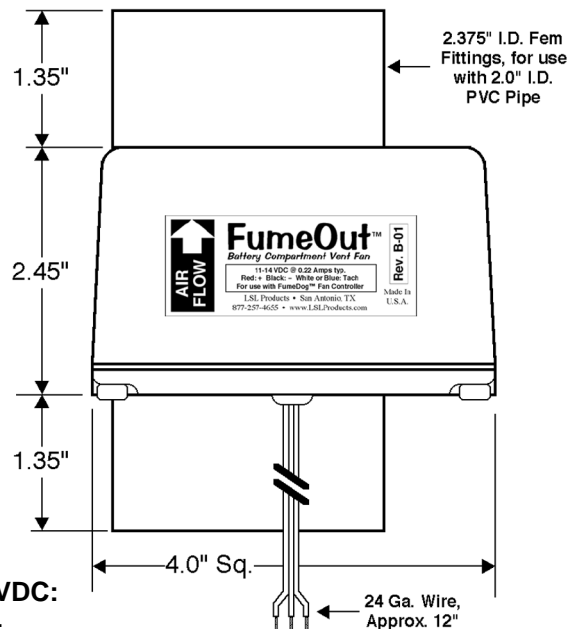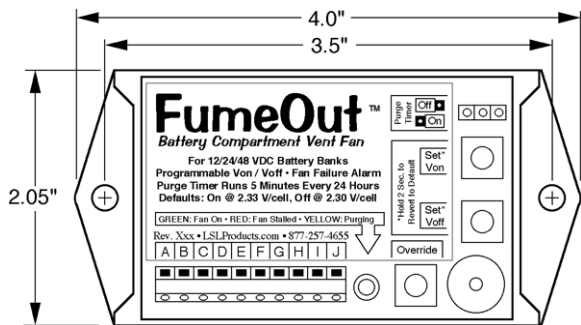
WHY IS THE FAN CONTROLLER RAPIDLY BEEPING THREE TIMES PER SECOND? This BATTERY DISCONNECTED alarm indicates that the Controller is not measuring any significant voltage at the Battery Sense + Terminal (Terminal F, G or H). Check for a disconnected wire or poor connection between this terminal and your batteries.

WHY IS THE FAN CONTROLLER NOT DOING ANYTHING? If the Controller does not appear to be starting or stopping the fan when it should, try resetting it by pressing and holding the **Override** button for several seconds. Immediately after being reset, the controller will beep 4 times and flash a green LED - if not, check the fuse that connects it to your batteries. Finally, try momentarily disconnecting DC power to the controller by removing and reinstalling the 1 amp fuse. (CAUTION: Dangerous battery voltages may be present!)

WHY IS THE FAN RUNNING ALL THE TIME? The controller may have been placed in the Override mode, allowing the fan to run continously. This is accompanied by a flashing green LED. To restore the Controller to normal automatic operation, briefly press the **Override** button.

Notes:

_____

_____

_____

_____

_____

_____

SPECIFICATIONS

FumeOut™ Battery Compartment Vent Fan

For 12/24/48 VDC Battery Banks
Programmable Von / Voff • Fan Failure Alarm
Purge Timer Runs 5 Minutes Every 24 Hours
Defaults: On @ 2.33 V/cell, Off @ 2.30 V/cell

GREEN: Fan On • RED: Fan Stalled • YELLOW: Purging
Rev. Xxx • LSLProducts.com 877-257-4655

Purge Timer: Off / On

"Hold 2 Sec. to Revert to Default"

Set" Von
Set" Voff
Override

A B C D E F G H I J

Exhaust Fan Dimensions

2.375" I.D. Fem Fittings, for use with 2.0" I.D. PVC Pipe

1.35"
2.45"
1.35"
4.0" Sq.

AIR FLOW — **FumeOut™** Battery Compartment Vent Fan
11-14 VDC @ 0.22 Amps typ.
Red: + Black: – White or Blue: Tach
For use with FumeDog™ Fan Controller
LSL Products • San Antonio, TX
877-257-4655 • www.LSLProducts.com
Rev. B-01
Made In U.S.A.

24 Ga. Wire, Approx. 12"

Absolute Min. / Max. Supply Voltage (at Terminal A): 8.0 / 78.0 VDC

Nominal Battery Voltage: (measured with respect to Terminal I)
  12 volt / 6 cell battery bank (Terminal H): 9 to 16 VDC
  24 volt / 12 cell battery bank (Terminal G): 18 to 32 VDC
  48 volt / 24 cell battery bank (Terminal F): 36 to 64 VDC

Current Consumption: (at Terminal A)

	Vbat = 12.8 VDC:	Vbat = 25.6 VDC:	Vbat = 51.2 VDC:
Fan Off:	5 mA typ.	3 mA typ.	2 mA typ.
Fan On:	220 mA typ.	120 mA typ.	60 mA typ.

Default Fan Turn-On / Turn-Off Voltage: 2.33 / 2.30 Volts Per Cell ± 1%

Von, Voff Voltage Stability: ± 1% typ.

Von, Voff Voltage Range: 0 to 2.65 volts per cell in 1024 increments
(Note: Von must be a higher value than Voff)

BATTERY SENSE WIRE DISCONNECTED Alarm Turn-On Voltage: 0.2 Volts Per Cell typ.

Purge Timer Duration & Interval: 5 Minutes every 24 hours ± 10%

Regulated +12V Output Voltage (at Terminal C): 12.3 volts typ. @ Vbat ≥ 14.0 VDC

Regulated +12V Output Maximum Current (at Terminal C): 500 mA
(including current supplied to Exhaust Fan)

Fan Control Max. Voltage & Sink Current (at Terminal E): 20 VDC, 1500 mA
(An internal low-side MOSFET switch grounds this terminal to turn on the fan)

External Alarm Max. Voltage & Sink Current (at Terminal J): 20 VDC, 1500 mA
(An internal low-side MOSFET switch grounds this terminal to turn on the alarm)

Fan Type: 12VDC Brushless, Ball Bearings, 3.5" 7-Blade Impeller

Rated Airflow: 45 CFM (free-air)

Operating Noise: 27 dBa @ 1 Meter, with air inlet & outlet pipes installed

Notes:
1. Unless otherwise stated, all voltages are POSITIVE with respect to Ground (Terminal B).
2. Specifications tested at 72 °F.
3. Installed airflow will be less than free-air rating, and will vary by application.
4. All specifications subject to change without notice.

WARRANTY