BH-20 PPV Fan

OPERATIONS MANUAL

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WARNING

The following information is important to the proper and safe use of your BlowHard-BH20 Positive Pressure Ventilation (PPV) Fan. Be sure to READ and UNDERSTAND completely the Operating Manual BEFORE operating the fan. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD CAUSE PROPERTY DAMAGE or PERSONAL INJURY.

SAFETY INSTRUCTIONS

It is the responsibility of the user to provide proper PPV/PPA Training and provide adequate Personal Protective Equipment (PPE) i.e. gloves and eye protection for handling this and other electrical equipment.

This electrical equipment utilizes 110/220V-AC which can cause serious electrical shock if not properly operated or maintained.

Use Rated and Approved Outdoor Electrical Extension Cord only with this equipment. Do not submerge this equipment under water. Avoid getting electrical connection wet. Do not come in contact with wet electrical connections without proper personal protective equipment.

The operating fan is a high speed rotating mechanical device that can cause serious injury if body parts come into contact with rotating surfaces or material thrown into moving parts. Although safety grills are installed, they do not block all objects from coming in contact with the rotating surfaces. Do not push body parts or foreign objects through the grill slots. Do not allow any object, material, or fluid into the intake or outlet of the fan, or to come into contact with the fan blade.

Pinch Hazards. The fan is made to fold in and out for storage and operation. Care must be taken when setting up the equipment for operation, and for storing the unit. Pinch points are at the hinged sections of the fan. Do not put body parts in the space between opposing parts that are coming together upon closure or opening of the fan.

Toe Hazards. This equipment may be stowed in elevated compartments and shelves. Safety handles and shoulder strap are provided for lifting and transporting the equipment. Safety Steel Toed shoes and boots, gloves should be worn when handling equipment.

Please observe the above warnings which are symbolized and displayed on the yellow Warning Label on the fan enclosure. Practice Common Sense.
**WARRANTY STATEMENT**

Please fill out the enclosed Warranty Registration with your information and return to The BlowHard Company for our records. All Mechanical Parts are covered for 2 years from date of purchase under normal operating conditions. All Electrical and Electronic Parts are covered for 1 year from date of purchase under normal operating conditions.

Any intentional misuse or abuse to the unit, accidental damages and anything outside “normal wear and tear” to the unit will is not covered under this general warranty policy.

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**Keep your fan Blowing Hard!!**

Regular battery maintenance is imperative. Our recommended maintenance is to completely discharge the battery, and then fully recharge it every 2 weeks for a long and healthy life.

A neglected battery will die, and must be replaced.

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**UNPACKING PROCEDURES**

Unpack and remove the fan from the cardboard boxes.

If possible, keep box and the package braces. If the fan needs to be returned for any reason, these items will be greatly helpful, and assure there will be no damage in transit.

Visually check to ensure nothing is loose or broken during shipping. Lay the fan flat on the ground. Lift the shroud part of the fan upright. Once the shroud is vertical, take note of the location of the Power Knob and Battery Indicator LED on the top right of the enclosure and the AC Plug on the left side.

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**CHARGING PROCEDURES**

Keep the unit plugged into the truck or wall socket when not in use. This will ensure the fan is always charged. Remember, there is no charge memory as in NiCad batteries, so the battery will always be fully charged if kept plugged in.

**STEP 1:** Make sure the Power Knob is turned to the left and clicked OFF. NOTE: If the LED is Steady GREEN, then the Fan is in ON Position regardless of whether or not the blades are moving and must be completely switched off. It will not charge otherwise.
**STEP 2:** Plug in the AC Power cord to an approved 120V-AC extension cord. The LED will start Blinking Slow GREEN during pre-charge, and then switch to either RED/GREEN alternating (recovery mode), Fast GREEN during fast charge, or Slow GREEN during trickle charge and maintenance. When the battery is fully charged, the LED will stop blinking and go OFF.

**Charge Time:** Expected charge times are 0% - 80% fast charge (fast blink) completed in 1 hour. Slow charge (Slow blink) can take 1 ½ hours longer, 80% - 100%. Battery maintenance can take a long time, depending upon if cell balancing needs to occur. The fan will continue to slow blink during this process, but if it has been plugged in for 2 ½ hours, it is fully charged. It is beneficial to leave the fan plugged in during the maintenance portion to achieve the most optimal performance, although unplugging it at any point to use it will not damage the fan.
Battery Maintenance:

The following are good maintenance practice:

- The battery has an integrated charging system. The integrated charging system will fully manage the battery when the fan is plugged in and the power switch is **off**.

- To charge your fan, simply plug it in and turn the power switch counterclockwise to the **off** position. The power switch must be in the **off** position for charging to take place.

- Quick Charge – A quick charge will charge your battery to about 80% of full capacity. A fully discharged battery takes approximately 60 minutes to Quick Charge.

- Full Charge – Full charge will trickle charge the battery to full capacity. If possible, leave the fan plugged in to maintain a full charge at all times. Be sure to complete a Full charge during maintenance.

- Charge Battery after each and every use even for a short period. The early recharging and constant charging does not damage the LiFePO4 battery. Unlike NiCad batteries, this battery does not develop memory, and may be charged as often as necessary.

- Always keep the battery in charged condition through constant charging or regular maintenance. This will ensure the readiness operation of the fan and the full capacity of each operation. It is a good practice to keep the fan plugged into either the truck or a standard AC outlet.

Trickle charging may take several hours before the Battery Management System (BMS) turns off, depending on the condition and characteristic of each individual battery cell. Trickle charging can restart during extended constant charging because the BMS does consume a small amount of power. The LED does not have to be OFF before using the fully charged battery.
Battery Life:

- If you have problems with your battery please contact BlowHard at 541-967-0063.

- The typical estimated life of the LiFePO4 battery supplied with BH-20 fans ordered with battery is up to 2,000 full discharge cycles.

- When your battery reaches its life cycle the run time of the fan will begin to decrease and the battery pack will need to be replaced.

- Periodically check your run time. After Full Charge your fan should be capable of running on battery for approximately 30 – 38 minutes under full load. As battery begins to reach the end of its life cycle, full charge runtime will drop to about 80% of the original time.

- Replace batteries with BlowHard battery pack only. Please contact factory with your fan serial number for assistance.

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**BlowHards want to Blow Hard!**

Seriously, every two weeks. Turn it on and let it blow until it stops, then plug it in and let it fully charge.

A happy BlowHard Blows Hard, a dead BlowHard sucks!
OPERATING PROCEDURES

STEP 1 - BATTERY OPERATION:
The LED should be OFF and the battery CHARGED. Turn the Power Knob to the right until it clicks ON. Do not turn the knob past the 90 degrees position where the fan will start. The LED should turn to Steady GREEN.

NOTE: If the LED turns Steady RED, then the battery is BAD and must be replaced. The fan can still be used in AC Mode if no damage has been done to the BMS. If the BMS is BAD then the fan will not work at all. See TROUBLESHOOTING and call for service.

Continue to turn the Power Knob to vertical position and the fan will start when passed the dead-band. The dead-band is the position of the Power Knob designed to check the GREEN LED power status without turning on the fan; it is inherent in the variable-speed control.

The following are conditions for Variable Speed settings:

- The fan can be started at maximum speed for PPV Operation by directly turning the Power Knob fully clockwise. The Electronic Speed Controller (ESC) will ramp-up the fan to maximum speed without causing any power surge.

- To set the fan at speed other than maximum, the fan can be started at maximum speed, and then dialed down, or start at minimum speed and quickly dialed up. The ESC will control and prevent any power surge.

- The minimum speed is factory preset to provide light ventilation, is useful for rehab situations, and will significantly extend the battery usage.

STEP 2 - AC OPERATION: Plug in the AC cord. Three conditions exist:

- While the Power Knob is in OFF position: The BMS will automatically charge the battery with available power from the AC power supply. The LED will show Slow Blinking GREEN.

- While charging as in the above condition: Turn the Power Knob to ON and start the Fan. The BMS will shut down the charging and redirect the AC power to run the fan. The LED will show Steady GREEN.

- While the fan is running in Battery Mode as in STEP 1: The BMS will automatically switch the power to AC and conserve battery power.

NOTE: If the power cord is disconnected while the fan is running on AC, the BMS will automatically switch back to Battery Power and fan continues to run until the battery is discharged and fan stops.
Operating Environment

The BH-20 has an ingress rating of IP-66 (No ingress of dust; complete protection against contact. Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.) Ensure electrical extension cords are not operating in standing water.

The surface temperature will generally get 40ºF (4.5ºC) higher than the ambient temperature. The BH-20 should operate “normally” in ambient temperatures ranging from -40º F (-40º C) to 110º F (43º C). The internal temperature will operate at 150º F (65ºC).

The following is a quick reference chart of Operating Modes, LED Status, and Performance Specs

<table>
<thead>
<tr>
<th>OPERATING MODES</th>
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<tbody>
<tr>
<td>BATTERY</td>
<td>While Fan is OFF</td>
<td>While AC Unplugged</td>
<td>Power Knob ON to Variable</td>
</tr>
<tr>
<td>AC</td>
<td>While Fan is OFF</td>
<td>Plug in AC Outlet</td>
<td>Power Knob ON to Variable</td>
</tr>
<tr>
<td>AUTO SWITCH</td>
<td>While Fan is ON</td>
<td>Plug in or Unplug AC</td>
<td>Power Knob ON to Variable</td>
</tr>
<tr>
<td>CHARGING</td>
<td>While Fan is OFF</td>
<td>Plug in AC Outlet</td>
<td>Power Knob ON to Variable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LED STATUS</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>No LED</td>
<td>Battery is charged, no maintenance needed. (or Nothing Works)</td>
<td>Power Knob OFF</td>
<td>AC/BATT</td>
</tr>
<tr>
<td>Steady GREEN</td>
<td>AC or Battery Power is available</td>
<td>Power Knob ON</td>
<td>AC/BATT</td>
</tr>
<tr>
<td>Slow Blinking GREEN</td>
<td>Pre-charge, Final Charge, Battery Maintenance.</td>
<td>Power Knob OFF</td>
<td>AC</td>
</tr>
<tr>
<td>Fast Blinking GREEN</td>
<td>Fast Charge</td>
<td>Power Knob OFF</td>
<td>AC</td>
</tr>
<tr>
<td>Blinking RED</td>
<td>Battery Low, Cell Low – Needs Recharge</td>
<td>Power Knob ON/OFF</td>
<td>BATT</td>
</tr>
<tr>
<td>Steady RED</td>
<td>No Battery, Bad Cell, Bad BMS</td>
<td>Power Knob OFF</td>
<td>AC/BATT</td>
</tr>
<tr>
<td>Blinking GREEN/RED</td>
<td>BMS attempting to recover weak cells prior to Pre-charge</td>
<td>Power Knob OFF</td>
<td>AC</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>PERFORMANCE</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>PPV MODE</td>
<td>4000 RPM Max Setting</td>
<td>11,000 CFM</td>
<td>30 Min. on Battery Unlimited on AC</td>
</tr>
<tr>
<td>VENTILATION MODE</td>
<td>2000 RPM Low Setting</td>
<td>6,000 CFM</td>
<td>180 Min. on Battery Unlimited on AC</td>
</tr>
</tbody>
</table>
PRODUCT SPECIFICATIONS

The BH-20 is a Portable Fully Integrated AC/DC Electric High Speed PPV/Ventilation/Industrial Fan System.

LIFEPO4 BATTERY TECHNOLOGY

38.4V 10Ah LiFePO4 Battery, up to 2000 recharge cycles. High Capacity Battery 10C Discharge. It is safe from over charging, over discharging, puncture, or high operating temperature 150° F (65° C). Iron phosphate is safer than other lithium chemistries like Cobalt oxides, Nickel/Cobalt Oxides and Manganese Oxides. No memory effect like NiCad or NiMH (metal hydride). Exceptionally low self-discharge rate.

AC POWER

The Dual-Power BH-20 also runs on standard 110 - 240VAC outlet powering the 1000W 48VDC-20A AC-DC Switching Power Supply with integrated safety features.

The fan consumes only 7A from 110VAC outlet. We have successfully operated three fans from one 110VAC-15A circuit with no power surge or additional issues.

BATTERY MANAGEMENT SYSTEM (BMS)

The proprietary BMS automatically protects batteries from over charging and over discharging.

Onboard the BMS is an integrated charging circuit which eliminates the need for external battery charger. This will automatically charge the battery when the fan is not in operation.

Another BMS feature is the Automatic Power Switch. This switches over to AC power operation to conserve battery power when AC is available. Automatically switches over to battery operation when AC power is interrupted. The BMS also does maintenance on the battery while the fan is in the “off” position and plugged in.

FAST CHARGING INTEGRATED CIRCUIT

- No external charger to buy
- Recharges to 80% in just 60 Minutes
- No memory effect from early recharging
- BMS manages Trickle Charge with no negative impact

ELECTRONIC SPEED CONTROLLER (ESC)

The Integrated ESC maintains constant high speed of the Brushless DC (BLDC) motor to provide consistent air flow and pressure. The Software is programmable and upgradeable motor control and protection proprietary firmware.

NEODYMIUM MAGNET BLDC MOTOR

The fan motor is a highly compact and robust 2000W 2.7hp, as used in aerospace and unmanned reconnaissance aerial vehicles (UAV).
ADVANCED PROPELLER DESIGN

Super lightweight, 20 inch two-bladed wood propeller designed for highest efficiency. This narrow propeller is designed to match the very high rotation speed of the BLDC motor and provide exceptionally higher pressure air flow than conventional fat and slow propellers.

HIGH CAPACITY

10,500 CFM, Tested per AMCA standards. Higher dynamic pressure outperforms 15,000 cfm rated competition fan in independent tests.

VARIABLE SPEED CONTROL

Matching propeller design to motor design allows the fan to operate at high 4,000 RPM PPV Mode and low 2000 RPM in Ventilation mode.

The variable control will allow the fan to operate at the optimum range between 2,000 rpm – 4,000 rpm.

RUN TIME PERFORMANCE

30 - 38 Minutes Battery Run Time on PPV (high) Speed.
180 Minutes Battery Run Time on Ventilation (low) Speed.

Unlimited Run time at any speed when operating on 110-240VAC-48VDC Switching Power Supply 1000W.

LIGHT WEIGHT AND COMPACT IN SIZE

Total system weight including Integrated Battery and Charging Circuit, 59lbs.

MULTI-PURPOSE FAN

- Fire and Rescue PPV Fan
- Smoke and Hazardous Chemical Ventilation
- Confined Space Air Source
- Firefighter heat stress rehabilitation
- Athletics Ventilation
- Commercial and Industrial process and product cooling
- Space Cooling and Air Circulation for Factories and Farms
- Cinematic Special Effects
- Fan Banks and Fan Matrix can be used for dust control
- Commercial Aircraft Brake Cooling

ATTACHMENTS

The center of the fan grill is a metallic hub to which attachments may be connected including the popular multipurpose Misting Ring. See your distributor for details.
**SPECS**

<table>
<thead>
<tr>
<th>SPEC</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>SIZE:</td>
<td>24” x 24” x 10”</td>
</tr>
<tr>
<td>WEIGHT:</td>
<td>59 lbs. (47 lbs. without Battery Pack)</td>
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<tr>
<td>RUN TIME:</td>
<td>30 - 180 minutes</td>
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<tr>
<td>BATTERY LIFE:</td>
<td>up to 2000 cycles</td>
</tr>
<tr>
<td>CHARGING TIME:</td>
<td>0%-80% 60 minutes; 3 hours fully charged</td>
</tr>
</tbody>
</table>

**VALUE ADDED**


Light weight, only 59 lbs compared to 110 lbs fans of same class.

Ergonomically designed with the operator in mind to reduce fatigue and injury.

Compact Collapsible design to be carried with shoulder harness. One person deployment, one hand operation.

Smart and rugged design allows two fans to occupy same space as 1 traditional fan would. Fits in small tool compartments.

**IP-66 rating for ingress protection of dust and water.**

Portable for easy storage and transport at running pace, up and down stairs, in narrow hall ways.

No Gasoline – Emission-free.

Brushless motor do does not produce sparks and is highly efficient at high speed. Compact and streamlined behind the propeller. The motor does not block the air intake like gas engines or AC motors.

LiFePO4 battery technology providing superb power, long life-expectancy, quick recharge rate, exceptionally low self-discharge rate.

No power surge. Works with AC outlets from buildings or generators on trucks. Unlimited AC operation hours. Common 110/240VAC outlet.

No external battery charger to buy or maintain. Power Base provides stabilizing counter weight while protecting battery, power supply, and integrated electronics.

**AC-DC POWER:** Automatic Power Switching. Use common household 110-240VAC outlets.

**FASTER RESPONSE TIME:** Significant reduction in time taken to deploy PPV. Advantage Operational Response Factor.
TROUBLESHOOTING

Do not forcefully over-turn the POWER KNOB too far to the right or left because this will damage the potentiometer and will result in the fan not starting or stopping. The control potentiometer is a robust industrial equipment component, but it is not indestructible.

When turning ON the fan, make sure the Power Knob “clicks” ON and is turned pass the dead-band to start the fan.

When turning OFF the fan, make sure the Power Knob “clicks” OFF to the left after the fan stops and the steady GREEN LED is off.

Do not attempt to repair, replace, or modify motor, propeller, any battery components, any electrical components or any electronic circuit board. Doing so will void the warranty, and possibly result in property damage and personal injury or death.

The following is a guide chart to troubleshoot the operation of the unit only and is not intended for performing repairs to the fan:

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>CAUSE OF PROBLEM</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blinking RED LED. No start</td>
<td>Battery is discharged and no AC</td>
<td>Run on AC, or recharge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>battery</td>
</tr>
<tr>
<td>Steady RED LED. No start</td>
<td>Bad battery or BMS</td>
<td>Send out for Service</td>
</tr>
<tr>
<td>Steady GREEN LED. No start</td>
<td>Knob is ON but in the dead-band</td>
<td>Turn clockwise slowly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>until it starts</td>
</tr>
<tr>
<td>No LED No start</td>
<td>Dead battery or bad BMS, ESC</td>
<td>Send out for Service</td>
</tr>
<tr>
<td>Rattling Noise</td>
<td>Loose fastener/nuts and bolts</td>
<td>Inspect fasteners and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tighten</td>
</tr>
<tr>
<td>Scraping Noise</td>
<td>Fan Blade touching shroud</td>
<td>Send out for Service</td>
</tr>
<tr>
<td>Smoke or smell</td>
<td>Over heat, bad electronics</td>
<td>Send out for Service</td>
</tr>
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SERVICE INFORMATION

For Technical Support, Service Arrangement and Warranty Issues, please contact the following:

Blowhard
1906 Rye Street SE
Albany, Oregon 97322-7069

541-967-0063

support@blowhardfans.com

Please prepare to provide the following information.

Your Name
Fan Serial Number
Name of Distributor/Reseller
Date of Purchase
Your contact information
Company/Department information


We want to know how your fan does. You email address will allow us to send you update information in a timely fashion.

The BH-20 is manufactured in Albany, Oregon by BlowHard Fans.
Recharging Log

<table>
<thead>
<tr>
<th>Date</th>
<th>Time On</th>
<th>Time Off</th>
<th>Signed by</th>
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