



VANAIR®
A Lincoln Electric Company

EPEQ INVERTER3600 Electrified Power Equipment®

**EPEQ® Electrified Power Equipment®
3600W, 48VDC, 120VAC Inverter
Manual Part No. 090231**



OPERATION MANUAL AND SERVICE PARTS LIST KEEP THE MANUAL WITH THE VEHICLE

NOTE: Read this manual before installing, operating or servicing this equipment. Failure to comply with the operation and maintenance instructions in this manual will VOID THE EQUIPMENT WARRANTY.

This publication contains the latest information available at the time of preparation. Every effort has been made to ensure accuracy. Vanair®, a Lincoln Electric Company, reserves the right to make design change modifications or improvements without prior notification.

Making unauthorized modification to the system components WILL VOID THE WARRANTY! Always contact Vanair® before making any changes to the EPEQ® system.

EPEQ® ELECTRIFIED POWER
EQUIPMENT®

EXCLUDES
ELIEMENT® BATTERY



VANAIR® VANTAGE WARRANTY

This limited warranty supersedes all previous Vanair® warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY—Subject to the expressed terms and conditions set forth below, Vanair®, a Lincoln Electric Company ("Vanair"), of Michigan City, Indiana (USA), warrants to the original retail purchaser of new Vanair® equipment that such equipment is free from defects in materials and workmanship when shipped by Vanair®.

For warranty claims received by Vanair® within the applicable warranty periods described below, Vanair® will repair or replace any warranted equipment, parts or components that fail due to defects in material or workmanship or refund the purchase price for the equipment, at Vanair's discretion. Vanair® is not responsible for time or labor to gain access to the machine to preform work. **WARRANTY WILL BE VOID IF GENUINE VANAIR® PARTS AND FLUIDS ARE NOT USED.**

Vanair® must be notified in writing within thirty (30) days of any such defect or failure. **All warranty or returns must be pre-authorized in writing prior to performing warranty work.** Call Vanair® for process and forms. Vanair® will provide instructions on the warranty claim procedures to be followed.

Warranty will commence upon receipt of the Warranty Registration Card. If the Warranty Registration Card is not received within six (6) months of shipment from Vanair®, the warranty commencement date shall be thirty (30) days from the date of shipment from Vanair®. Records of warranty adherence are the responsibility of the end user.

1. Inverters: 1 Year Parts / 1 Year Labor
2. Converters: 1 Year Parts / 1 Year Labor
3. Chargers: 1 Year Parts / 1 Year Labor
4. Electric Motors: 1 Year Parts / 1 Year Labor
5. EPEQ® Lithium Welder: 1 Year Parts / 1 Year Labor
6. Alternators: 1 Year Parts / 1 Year Labor
7. Compressor Air End:
 - Rotary Screw: Lifetime with Vanair® Authorized Service Kits and Lubricants : 3 Years Labor
 - Reciprocating: 3 Years Parts / 1 Year Labor
 - Scroll: 1 Year Parts / 1 Year Labor
8. Hydraulic Pumps/Motors: 2 Years Parts / 1 Year Labor
9. 1 Year Parts/Labor on the following:
 - All electronics and controls including, but not limited to:
 - (i) I/O Boards
 - (ii) Modules
 - (iii) Panel Boxes
 - (iv) Instrumentation
 - (v) Clutches
 - (vi) Solenoids
 - (vii) Running Gear/Trailers
 - (viii) Cooler Cores and Fans
 - (ix) Battery Management Systems and Controllers

This Limited Warranty shall not apply to:

1. Consumable components, such as: shaft seals, valves, belts, filters, capacitors, contactors, relays, brushes, wire or parts that fail due to normal wear and use.
2. Items furnished by Vanair®, but manufactured by others, such as engines and trade accessories (these items are covered by the manufacturer's warranty, if any).
3. Equipment that has been modified by any party other than Vanair® or equipment which has not been used and maintained in accordance with Vanair's specifications.

4. Equipment which has been improperly installed and/or improperly operated, based upon Vanair's specifications for the equipment or industry standards.
5. Equipment installed by non-authorized or third party personnel. Vanair® products are intended for purchase and use by commercial/industrial users and persons trained and experienced in the use and maintenance of industrial equipment.

In the event of a warranty claim covered by this Limited Warranty, the exclusive remedies shall be, at Vanair's sole discretion: (i) repair; or (ii) replacement; (iii) where authorized in writing by Vanair® in appropriate cases, the reasonable cost of repair or replacement at an authorized Vanair® service facility; or (iv) payment of (or credit for) the purchase price (less reasonable depreciation based upon actual use) upon return of the equipment at the warranty claimant's risk and expense. Vanair® will pay standard ground freight for any warranty item shipped to and from Vanair® or (Vanair® designated facility) within the first year of the applicable warranty period. Any additional expedited freight cost is the responsibility of the purchaser.

TO THE GREAT EXTENT PERMITTED BY APPLICABLE LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES APPLICABLE TO THE VANAIR® EQUIPMENT. IN NO EVENT SHALL VANAIR® BECOME LIABLE FOR DIRECT, INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT OR LOST BUSINESS OPPORTUNITY), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY. IN NO EVENT SHALL VANAIR® BECOME OBLIGATED TO PAY MORE ON ANY WARRANTY CLAIM THAN THE PURCHASE PRICE ACTUALLY PAID BY THE ORIGINAL RETAIL PURCHASER.

THIS LIMITED WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY OR GUARANTY ARISING BY OPERATION OF LAW. ANY WARRANTY NOT EXPRESSLY PROVIDED HEREIN, IMPLIED WARRANTY, GUARANTY AND ANY REPRESENTATION REGARDING THE PERFORMANCE OF THE EQUIPMENT, AND ANY REMEDY FOR BREACH OF CONTRACT, IN TORT, OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE, OR COURSE OF DEALING ARE EXCLUDED AND DISCLAIMED BY VANAIR®.

Some states in the United States of America do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, and as such, the above limitations and exclusions may not apply to you. This warranty provides specific legal rights. Other rights may be available to you, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be saved, the limitations and exclusions set out forth above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

**ALL WARRANTY OR
RETURNS MUST BE
PRE-AUTHORIZED PRIOR
TO PERFORMING
ANY WARRANTY WORK.**

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EFFECTIVE: MAY 20, 2022

VANAIR®
A Lincoln Electric Company

WARRANTY AND CLAIMS PROCEDURE

WARRANTIED VANAIR® PARTS

This process must be used by owners of Vanair® equipment in situations where a warrantied item needs repair or replacement under the terms of the purchase warranty. Do not return items to Vanair® without prior authorization from the Vanair® Warranty Administrator.

PROCEDURE:

Customers needing assistance in troubleshooting a system and/or returning parts, please follow the steps below.

1. Locate the machine's serial number(s).
2. Make a list of the symptoms/condition/malfunctions noticed along with any applicable temperature and pressure readings, and also the number of operational hours available:
3. Note that the above information will also need to be included on the Return Material Authorization Form; this form is necessary for warranty processing if the warranty claim is deemed valid by the service case review.
4. Contact the Vanair® Service Department by phone (1-844-VANSERV or 1-219-879-5100) to speak with a Service Technician.
5. Vanair® Service will troubleshoot the problem based on the information provided by the customer, and attempt to return the unit to service as quickly as possible.
6. If the unit cannot be returned to service, and Vanair® determines this matter is a warranty issue, the Service Technician will assign an RMA (Return Material Authorization) number that will provide for the return of the item to Vanair® for analysis and a final determination as to the item's warranty status.

7. Warranty Claims are solicited via a case number provided by the Vanair® Service Department. Blank Warranty Claim forms can be found on the Vanair® website under the Resources section.

All of the field information including the case number, serial number and description of the work performed is required.

IMPORTANT NOTES:

Once a Return Merchandise Authorization (RMA) has been issued, the customer has 30 days to return that item or parts to the Vanair® Service Department. After 30 days, it becomes void and any claims under it will be denied.

The customer is responsible for requesting a new RMA.

All estimated labor costs, invoices, and the cost of the repair must be approved by the Vanair® Warranty Administrator prior to starting any repair work. All paperwork associated with the returned item and warranty repair cost must reference the RMA number issued against the part, and be forwarded to Vanair® within 30 days of the completion of work.

The RMA number must appear and be legible on the outside of the package where it can be seen before being returned.

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SECTION 1: Safety

1.1 SAFETY / WARNING SYMBOLS AND MEANINGS

	WEAR EYE PROTECTION (Flying debris or other eye hazard may be present)		EXPLOSIVE MATERIAL OR EXPLOSIVE HAZARD (Conditions or materials may exist that can cause explosion)
	WEAR HEARING PROTECTION (Harmful sound volume may be present)		HOT SURFACE WARNING (Surfaces may be hot - use caution, proper protection or allow to cool before handling)
	READ INSTRUCTIONS OR MANUAL		ROTATING OR MOVING PARTS WARNING (Moving/rotating parts present, may cause damage or physical injury)
	DISCONNECT POWER (Disconnect from power to avoid accidental start or avoid electrical current)		HAND ENTANGLEMENT BELT DRIVE WARNING (Belt drive present, use caution to avoid pinch points and personal injury)
	WEAR PROTECTIVE GLOVES (Chemical, thermal or harmful conditions may exist that may be harmful to bare hands)		AUTOMATIC START UP WARNING (Equipment can start up/run automatically without warning)
	DO NOT USE WATER TO EXTINGUISH ELECTRICAL FIRES (Water may spread, cause harm or further damage when used on certain types of fires)		BURST / PRESSURE RELEASE WARNING (High pressure condition may exist that can cause equipment to burst or cause bodily injury)
	GENERAL CAUTION OR WARNING (Important information regarding cautions or warnings)		BATTERY CHARGING WARNING (Beware of heat, leaks and harmful gas around certain types of batteries being charged)
	ELECTRICAL SHOCK / ELECTROCUTION HAZARD (Electricity and electrical circuits present that may cause electrical shock or sparking)		FLAMMABLE MATERIAL / FIRE HAZARD WARNING (Conditions and/or materials exist that may be flammable or cause a fire)

SAFETY / WARNING SYMBOLS
AND MEANINGS *CONTINUED*

	WEAR EAR AND EYE PROTECTION (Loud noise level and flying debris or other eye hazard may be present)
	WEAR WELDING MASK (While welding, always use a proper welding helmet to protect face and eyes from hot metal and intense light)
	ASPHYXIATING ATMOSPHERE (DANGER - Area does or may contain a dangerous gas that creates an unbreathable environment. Ventilate area.)
	HEALTH HAZARD (Magnetic fields produced by this machine may affect Pacemakers)
	BEWARE FALLING UNIT CAN CAUSE INJURY (When transporting or moving, please note falling unit can cause severe injury or death)
	ARC FLASH An electrical arc flash or flying sparks may ignite combustibles and cause fire and/or explosion

1.2 GENERAL INFORMATION

The products provided by Vanair® are designed and manufactured for safe operation and maintenance. But it is ultimately the responsibility of the users and maintainers for safe use of this equipment. Part of this responsibility is to read and be familiar with the contents of this manual before operation or performing maintenance actions.

1.3 DANGERS, WARNINGS, CAUTIONS, AND NOTES

**DANGER**

Identifies actions or conditions which, if not avoided, *will* result in serious bodily injury or death.

**WARNING**

Identifies actions or conditions which, if not avoided, *may* result in serious bodily injury or death.

**CAUTION**

Identifies actions or conditions which, if not avoided, *could* cause minor to moderate serious bodily injury.

NOTICE

Additional information (or existing information) which should be brought to the attention of operators/maintainers affecting safety, operation, maintenance or warranty requirements.

1.4 INTERNATIONAL SAFETY SYMBOL



Many of the symbols and meanings shown in **Section 1: Safety** are used to call attention to and identify possible hazards that may be encountered using powered equipment.

International warning symbols are used on all decals, labels and signs that concern information pertaining to bodily harm. When you see the international warning symbol, pay extremely

careful attention, and follow the given instructions or indications to avoid any possible hazard.



1.5 IMPORTANT PRODUCT SAFETY INSTRUCTIONS

This manual contains important safety instructions for installing and operating the EPEQ® INVERTER3600.

Before installation or use, read all instructions and safety information in this manual. Familiarize yourself with the following information to ensure safe operation:

- **Electrical Work Compliance:** Any electrical work must adhere to local, state, and federal electrical codes. Follow these regulations to minimize risks associated with electrical shock or fire.
- **Indoor Installation Only:** This product is not waterproof, it is designed for indoor or compartmentalized installation. Avoid exposure to rain, snow, moisture, or any liquids that could compromise safety.
- **Insulated Tools:** When performing maintenance or installation, use insulated tools. This precaution reduces the risk of electrical shock or accidental short circuits.
- **Remove Jewelry:** Prior to working on the inverter, remove all jewelry (such as rings, watches, bracelets). This prevents accidental contact with live components.
- **Disconnect Energy Source:** Always disconnect batteries or the energy source before installing or maintaining the inverter. Remember that live power may exist at multiple points due to the inverter's dual use of batteries and AC. Even if the inverter is turned off, AC power can still flow through it.
- **Verify Wiring:** The conductor insulation must be approved for the specific voltage, operation, temperature, and location of use. Ensure wire connections are secure to prevent hazards.

- **AC and DC Disconnects:** This inverter does not include integral AC or DC disconnects. The AC output adapter cabling includes four (4) heavy duty 120VAC outlets and two (2) in-line circuit breakers. As part of the system installation, ensure that both AC and DC disconnects are provided.
- **Battery Overcurrent Protection:** The inverter lacks overcurrent protection from the battery. It is crucial to incorporate overcurrent protection for the battery cables during installation.
- **AC Output Wiring Overcurrent Protection:** Similarly, the inverter does not offer built-in overcurrent protection for AC output wiring. As part of the installation process, provide overcurrent protection specifically for the AC output wiring.

Remember to follow these safety instructions diligently to maintain a secure environment and prevent accidents.



1.6 IMPORTANT BATTERY SAFETY INSTRUCTIONS

- **Eye Protection:** When working with batteries, wear safety glasses to protect your eyes.
- **Remove Jewelry:** Prior to battery installation or maintenance, remove all jewelry (such as rings, watches, bracelets). This reduces the risk of accidental contact with live components.
- **Lifting Techniques:** Use proper lifting techniques when dealing with batteries. Proper lifting reduces strain and prevents injuries.
- **Battery Selection:** Avoid old or untested batteries. Check each battery's label for information on age, type, and date code. Ensure all batteries are identical.
- **Temperature Sensitivity:** Some batteries

are sensitive to temperature changes. Install batteries in a stable environment to maintain their performance.

- **Ventilation:** For safety, install batteries in a well-ventilated area. Some batteries (such as lead-acid types) can produce explosive gases. In compartment or enclosure installations, always vent batteries to the outside.
- **Air Space:** Provide at least one inch (2.5 cm) of air space between batteries. Optimum cooling helps prevent overheating.
- **Verify Polarity and Voltage:** Always verify proper polarity and voltage before connecting batteries to the inverter.
- **Avoid Short-Circuits:** Do not short-circuit the batteries. Short circuits can lead to fire or explosion.
- **Accidental Exposure:** In case of battery acid exposure, wash thoroughly with soap and water. For eye exposure, flood eyes with running water for at least 15 minutes and seek immediate medical attention.

This inverter is intended to recharge batteries. The battery that is connected to this product is only suitable if it complies with the given battery standard for that battery type and is provided with a battery management system that will monitor and control the electrical and thermal health of the battery during charging.

When installing this inverter, the battery is to be verified as in compliance with the applicable battery standard.



1.7 OTHER SAFETY PRECAUTIONS

- Lockout/tag out input power according to OSHA29 CFR1910.147 (see Section 1.9, Principal Safety Standards).
- Properly install and ground this and related equipment according to its Owner's Manual and applicable national, state, and local codes.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Keep all panels and covers securely in place.
- Always verify the supply ground to be safe: check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first and double-check connections.
- Frequently inspect power cords for damage or exposed wiring. Replace cord immediately if damaged. Exposed wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.



1.7.1 NOISE CAN DAMAGE HEARING

- Noise from some processes or equipment can damage hearing.
- Wear approved ear protection when exposed to high noise levels.



1.7.2 EYE PROTECTION

- Use of some attached tools and processes can produce flying grit, debris or hazards that can harm or damage eyes.
- Wear approved eye protection when exposed to potential flying debris, dust or similar hazards.



1.7.3 READ INSTRUCTIONS

- Use only genuine Vanair® replacement parts.
- Perform unit maintenance on attached equipment (if applicable) and service according to this manual and the vehicle's and air compressor's manuals.



1.7.4 HIGH FREQUENCY (HF) RADIATION CAN CAUSE INTERFERENCE

- High-frequency (H.F.) radiation can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.

- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

1.8 CALIFORNIA PROPOSITION 65



WARNING: This product contains or produces a chemical known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health and Safety Code §25249.5 et seq.)



1.9 PRINCIPAL SAFETY STANDARDS

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone: 617-770-3000, web site: www.nfpa.org and www.sparky.org).

Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 11West 42nd Street, New York, NY10036-8002 (phone: 212-642-4900, web site: www.ansi.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (there are 10 Regional Offices; phone for Region 5, Chicago, is 312-353-2220, web site: www.osha.gov).



1.10 SAFETY DECALS

Safety decals are placed onto, or located near, system components that can present a hazard to operators or service personnel. All pertinent decals listed in (See Section 7.17, Decal Locations), and are located near components or access paths. All information given on these decals is subject to respect, and to make users aware of safety precautions and/or hazardous conditions. Always heed the information noted on the safety decals.



WARNING

**DO NOT REMOVE OR COVER ANY
SAFETY LABEL**

**Replace any safety labels that become
damaged or illegible.**

**For machine packages that ship with labels to be
affixed upon arrival, all safety decals MUST be
placed on the machine in their proper locations, as
shown on the Decal pages of *Section 7* of that
machine's Manual.**

SECTION 2: Specifications

2.1 GENERAL INFORMATION

The EPEQ® INVERTER3600 is a mobile 120VAC power inverter that creates 120VAC power from the 48VDC input source. It is a pure sine wave inverter, making it highly efficient in power conversion, so less power is wasted. A pure sine wave provides a cleaner electric signal for your connected electrical devices identical to the waveform from a building's grid 120VAC powered outlets.

The EPEQ® INVERTER3600 is designed specifically for use in trucks, boats, RVs and other vehicles.

2.2 MAIN FEATURES

- Built-in protection such as over-charge, over-current, and short-circuit detection, high temperature shutdown and high and low battery voltage shut-off.
- Uses CAN communications to communicate and share data with other CAN enabled EPEQ® products.
- Continuous 3600W, pure sine wave AC output.
- Multi-stage battery charger with power factor correction (PFC), making it more efficient and lowers total harmonic distortion (THD).
- Internal 30A-AC transfer switch, allows incoming AC power to continue powering attached loads, even if the inverter is OFF.
- AC input support pulls power from the battery to continue powering loads that may exceed the current capacity of the incoming AC power source.
- As a safeguard, the EPEQ® INVERTER3600 will automatically turn off when the battery source gets too low to keep your battery from becoming over-discharged.

2.3 REGULATORY COMPLIANCE

This inverter is listed to UL458 (Power Converters/Inverters and Power Converter/ Inverter Systems for Land Vehicles and Marine Crafts) and UL1741 (Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources) for use in the US; and is also certified to CSA C22.2 No. 107.1-01 (General Use Power Supplies) for use in Canada.

Tested and Certified by a Nationally Recognized Testing Laboratory. (NRTL). NRTL's are qualified to meet Occupational Safety and Health Administration (OSHA) regulations to perform independent safety and product testing.

2.4 SPECIFICATIONS

Please see “**Table 2A: EPEQ® Inverter3600 Specifications**” on the following page.

2.5 INVERTER POWER VS TEMPERATURE

Power output will begin to decline from 3.6kW once ambient temperatures reach 134.5°F (57°C) to 3.05kW at 149°F (65°C).

2.6 TEMPERATURE AND CHARGER CURRENT

Charger current begins derating once ambient temperatures reach 127.4°F (53°C) to 40.5 A at 149°F (65°C).

TABLE 2A: EPEQ® INVERTER3600 SPECIFICATIONS

Inverter Specifications	
Input Battery Voltage	40 to 63VDC (48VDC with ELiMENT® Battery)
AC Output Voltage	120VAC $\pm 2\%$
Output frequency and accuracy	60Hz ± 0.1 Hz
Total Harmonic Distortion	<5%
5 sec Surge Power	>5400W
30 sec Surge Power	5400W
5 min Surge Power	4500W
30 min Surge Power	3690W
Continuous Power Output @ 40°C	3600VAC
Max. Continuous Input Current	108ADC
Inverter Efficiency (Max.)	95%
Transfer Time (Typical)	4 mSecs
AC Pass-Through Capability	30A
Power Draw: Inverter ON	<22W No Remote
Power Draw: Inverter OFF	<4W No Remote
Output AC Waveform Type	Pure Sine Wave
Charger Specifications	
Power Factor	> 0.95
General Features and Capabilities	
Protection Circuitry	Low/High Battery, over-temperature and overload
Corrosion Protection	PCB's conformal coated, powder coated chassis
Internal Cooling	Yes, 0 to 69 CFM variable speed fan
Mounting	Shelf or Wall
UL Listing	Listed to UL458, UL1741, CSA C22.2 #107.1
Environmental Specifications	
Operating Temperature	-4°F to 140°F (-20°C to +60°C)
Non-operating Temperature	-40°F to 158°F (-40°C to +70°C)
Operating Humidity	0 to 95% RH non-condensing
Physical Specifications	
Unit Dimensions (LxWxH)	20.25"x9"x6" (51.4 cm x 22.9 cm x 15.1 cm)
Shipping Dimensions (LxWxH)	22"x10"x8.5" (55.9 cm x 25.4 cm 21.6 cm)
Unit Weight	17.4 lb (7.9 kg)

SECTION 3: INSTALLATION

3.1 MACHINE PACKAGE RECEIPT/INSPECTION

Upon receipt of this inverter unit, inspect the exterior of the shipping container for signs of shipping/transit damage. Any damage should be reported immediately to the shipping company.

NOTICE

Keep wire runs as short as safely possible to prevent low-voltage shutdowns.

NOTICE

To report missing or damaged items, or other discrepancies, contact:
Vanair® at:
(219) 879-5100 / (800) 526-8817
vanair.com

3.2 HOW THE EPEQ® INVERTER3600 WORKS

The EPEQ® INVERTER3600 takes direct current (DC) from the battery power source and turns it into an alternating current (AC) for use with normal 120VAC electric devices.

1. **Inverter Mode:** When properly connected to battery source and powered on, the DC current from the battery source is converted into 120V alternating current (AC).
2. **Standby (Charger/Transfer) Mode:** when an external AC power source is connected to the inverter's input, it operates in Standby Mode. In this mode, it operates as a battery charger to convert the AC power into DC power to recharge the batteries, also in this mode, it closes an internal AC transfer relay to pass incoming AC power to any AC devices that may be connected to the inverter's AC output. If there is a power

failure, the EPEQ® INVERTER3600 Standby Mode automatically switches to Inverter Mode.

3.3 RUN TIME AND POWERING LOADS

The unit is capable of powering a wide variety of 120VAC powered electrical tools and devices. Inverter run time is proportional to the total AC load weighed against the total battery capacity of the system. Battery capacity is impacted by the total number of batteries, their state of charge, and their age. High demand devices such as hot water heaters and stoves are NOT recommended for this Inverter.

Power consumption is normally listed on the information tags on the product. Should the battery's charge level become too low, the inverter will automatically shut itself off to protect the battery from over-discharge.

3.4 PRE-INSTALLATION

Carefully read and understand the entire Installation section prior to performing the install of this product.

NOTE: Make sure to review the safety information prior to proceeding with the installation. Before beginning the installation, Please review the following.

1. **System Diagram Review:** Use ***"Figure 3-4: System Installation Diagram"*** as a reference for planning and laying out the installation. Final installation and compliance with all applicable regulations for the location, remain the responsibility of the installer and those inspecting the installation.
2. **Ownership Documentation:** Save your sales documents as proof of purchase. This will be required to register your product or when the unit ever requires warranty service. Also make sure to record the unit's model and serial number for future reference. (See ***"Warranty Claims Procedure"*** for details.)

3.5 LOCATING/MOUNTING THE INVERTER

3.5.1 INSTALLATION ENVIRONMENT

The inverter should only be installed in a location that meets the following criteria:

1. Clean and Dry:

- Inverter is rated for indoor use only
- Avoid installing where it is exposed to dust, fumes, insects, rodents, or an enclosed area that can block the in/out ventilation openings.
- Keep away from areas that risk condensation, water or any other liquids that can enter or fall into the inverter.
- The inverter case and fasteners are made with corrosive-resistant materials such as stainless steel, zinc-coated fasteners, plated copper busbars, powder-coated enclosures, conformal coated circuit boards, etc.
- However, using the inverter in a corrosive environment may reduce the lifespan of the unit, and failure under these conditions is not covered by the warranty.

2. Cool:

- The inverter should be protected from direct exposure from sunlight and high-heat sources.
- The ideal temperature for operating the unit is between 4°F and 140°F (15.5°C and 60°C).

3. Ventilated: To prevent over-temperature error conditions and ensure continuous output power:

- Do not cover or block ventilation openings.
- Provide at least 3 in (7.5 cm) of clearance at the intake and exhaust vents to provide adequate cooling and circulation.
- Provide enough air circulation around the unit to allow heated air inside the inverter to escape to ambient air.

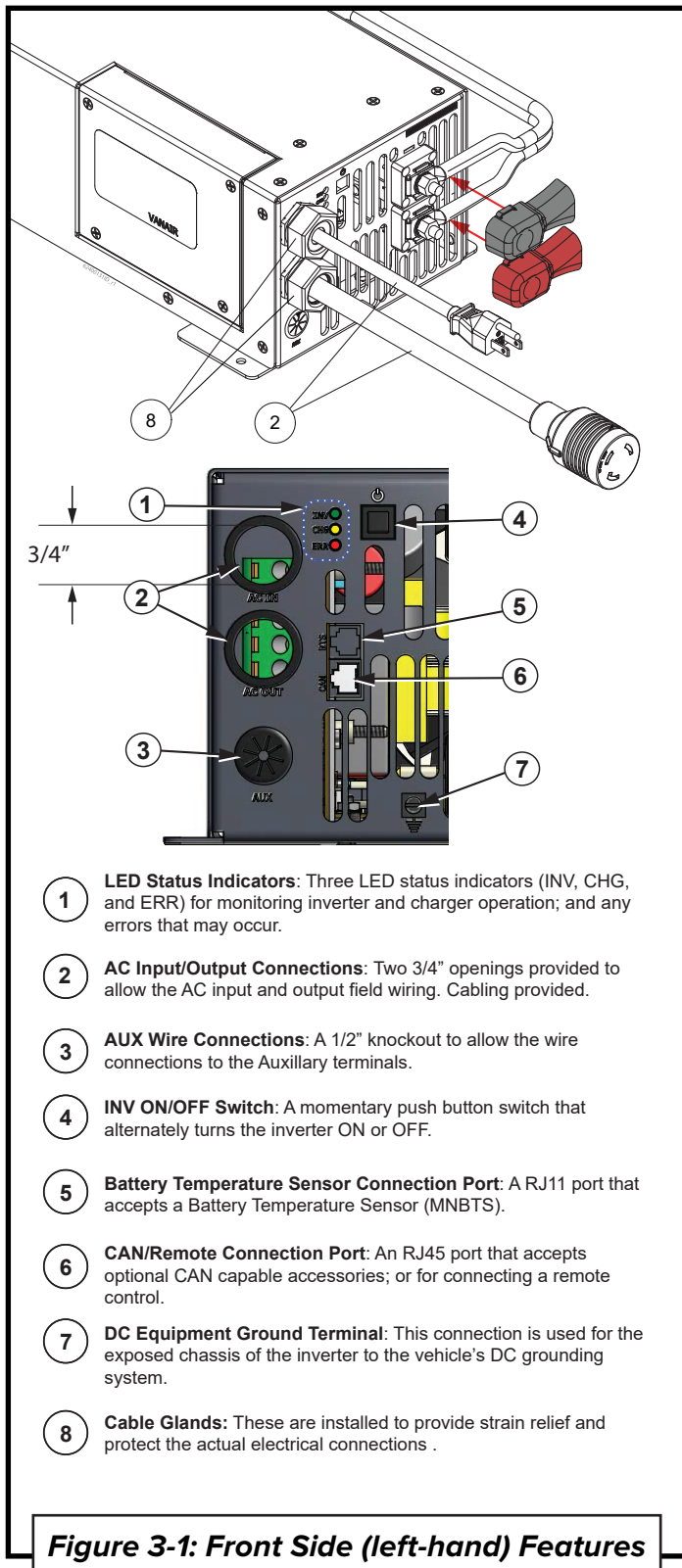


Figure 3-1: Front Side (left-hand) Features

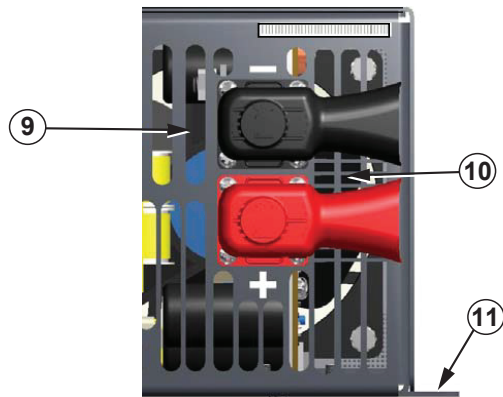
! WARNING

Do not mount the inverter near flammable or combustible materials, gases or fluids.

Provide proper clearances for cooling and ventilation.
See Section 3.5 for more details.

! WARNING

Installations should be performed by qualified personnel only, such as a licensed or certified electrician. The installer is responsible for complying with all applicable safety codes, which may vary depending on the location and purpose of the installation.



- 9 **Exhaust Vents** - ventilation openings that allow heated air to be removed from inside the unit by the internal fan.
- 10 **Battery Connection Terminals** - provides the Negative (black) and Positive (red) connection points for the battery cables from the battery bank.
- 11 **Mounting Flange** - used to secure the inverter to a wall or shelf.
- 12 **Intake Air Opening** - opening that allows fresh air from outside the unit to be pulled in by the internal fan for cooling purposes.

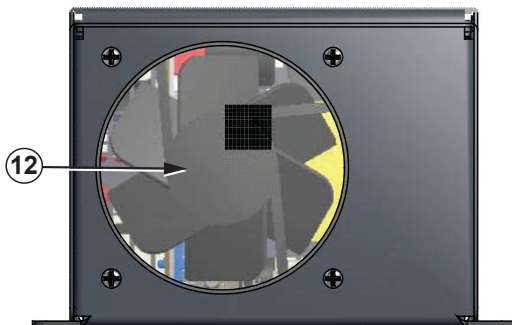


Figure 3-2: Rear Side Features

- If installing in a compartment or an enclosure, it is recommended to add a fresh air intake opening to allow cool air to flow in and heated air to escape away from the inverter and enclosure.

- Safe:** Maintain a minimum distance of 2 ft (60 cm) between the inverter and any flammable or combustible materials (e.g., paper, cloth, or plastic) that could be affected or ignited by heat, sparks, or flames.

5. Close to the Battery:

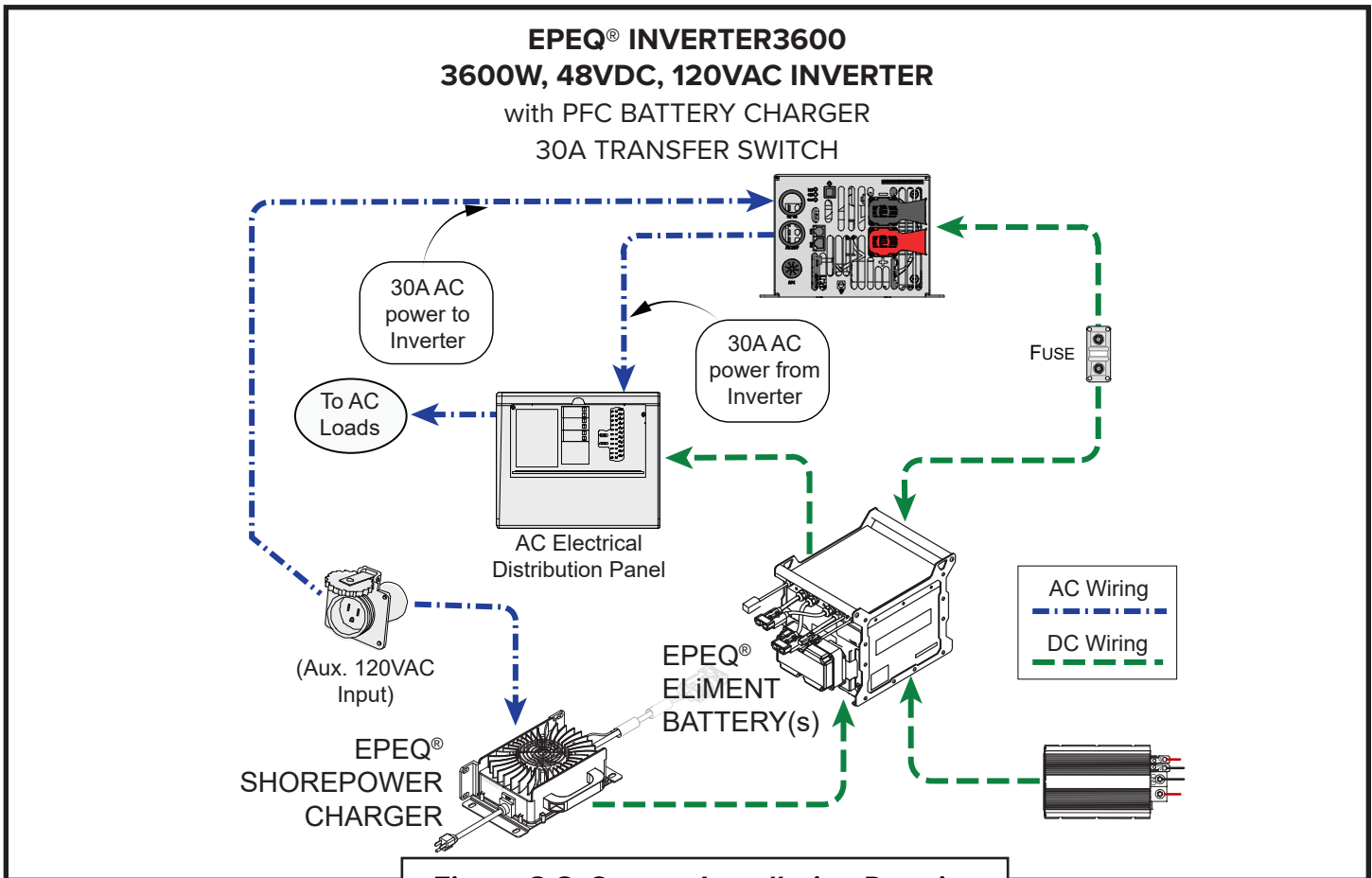
- Position the inverter near the battery source to minimize the length of the DC wiring.

6. Accessibility:

- Do not block access to the inverter's accessory ports
- Allow room to access the DC wiring connections for periodic checks and tightening, access to the ON/OFF button and a clear view of the LED status indicator lights (INV, CHG, or ERR). This is needed to monitor the inverter operations and any errors that may occur.

7. Mounting:

- Regulations dictate how the inverter can be mounted. (See **"Figure 3-5: Approved Mounting Orientations"**) to determine how you can mount your EPEQ® INVERTER3600.
- The mounting surface must be non-combustible and capable of supporting at least TWICE the inverter's weight.
- Use the base of the inverter as a template to mark the mounting hole locations. Or refer to the dimensions shown in **"Figure 3-6: Dimension Diagram"**.



! WARNING

The INVERTER3600 should not be installed in any location that requires ignition-protected or spark-free equipment. Also, avoid installing this inverter in areas with highly flammable liquids or gases (e.g., gas or propane).

- To reduce vibration, use flexible washers or bushings between the mounting surface and the inverter's flanges.
- Once the inverter has been mounted properly, you can begin to wire the DC connections.

3.6 DC WIRING

Cables to the DC power source are installed on the EPEQ® INVERTER3600 at the factory, but if they should ever need to be replaced or repaired, please refer to **Figure 3-6**. Remember to keep the

! CAUTION

Do not mount this inverter in a zero-clearance compartment, or obstruct the ventilation openings as overheating will result.

positive and negative cables at the same length, to keep the inherent resistance of the cables equal for efficient current flow. The longer the cable run, the larger the wire gauge should be.

3.6.1 PERFORMANCE

For optimum performance, consider the following:

- **Secure the cables adjacent to each other:** Using zip ties, straps or electrical tape secure the negative cable adjacent to the positive cable every 6 in (15.3 cm). This minimizes electromagnetic interference (EMI) and inductance by allowing their magnetic fields to cancel each other out. It also minimizes wear on the inverter's filter capacitors while



CAUTION

This inverter is intended to recharge batteries that comply with a compatible battery standard and type, that has a battery management system (BMS) with the ability to monitor the battery's electrical and thermal state during charging. The battery must be verified to be in compliance with the applicable battery standard.

improving the inverter waveform and surge capability

- **Battery Voltage Range:** the battery voltage must be between 40 and 63VDC for the inverter to operate correctly. Voltage in excess of 68VDC may damage the inverter.
- **Minimize Connections:** Minimize all connections from the battery source to the inverter. Exceptions include the DC fuse and DC disconnect in the positive line; and a DC shunt in the negative line. Voltage drops may occur when additional connection points are used.

3.6.2 DC WIRE SIZE

Proper DC wire size is critical for an inverter's performance, efficiency and the overall safety of a system.

- **Selecting the Right Wire Size:** To achieve maximum efficiency and minimize fire hazards be sure to select the correct DC wire size needed. See Table 3A to select the minimum wire size needed. If the distance between the inverter and the battery source exceeds 10 ft (3.0 m), refer to the lower part of Table 3A for longer distances.
- **Hazards of Undersized Cables:** Can reduce voltage at peak output affecting the ability to handle heavy loads during surges, increase the risk of overheating, and may cause the battery to be under-charged.



CAUTION

DO NOT mount the INVERTER3600 with the DC terminals facing DOWNWARD.

3.6.3 DC OVERCURRENT PROTECTION

In a mobile DC electrical system, an overcurrent protection device is required. Its main function is to protect the DC wiring from excessive current flow, which might occur due to overload or short-circuits. In a mobile system, this protection device is normally a fuse.

Choosing the right fuse type and size is crucial. Batteries can deliver massive surge of current (thousands of amps) during a short circuit. The fuse you choose must be a DC-rated fuse that has an interrupt current rating (Amps Interrupt Circuit or AIC) that can withstand the short-circuit current without explosion or damage. A Class-T type fuse or its equivalent is highly recommended, especially when paired with an inverter.

The fuse size should match the size of the DC cables being used; it must open before the cable reaches maximum current carrying capability, and causes an overheating wire condition - which is a safety and fire hazard. Refer to **"Table 3A: Recommended DC Wire/Overcurrent Device"** for the recommended fuse size coordinated with the DC wire size for the inverter.

NOTE: Electrical systems in mobile installations typically do not use a DC disconnect; however an overcurrent protection device is still required. Such installations do not normally use a conduit, therefore the fuse should be placed in the ungrounded conductor (positive line) within 18 in of the battery. This allows the fuse to safeguard the entire DC wiring system effectively.

3.6.4 DC GROUNDING

Proper grounding is essential for safe operation of an inverter. The metal enclosures of all electrical components should be connected together to maintain the same voltage potential and minimize the risk of electric shock.

NOTICE

Keep wire runs as short as safely possible to prevent low-voltage shutdowns.

Typically the inverter chassis and negative battery cable are connected to a common point in the system's ground bond using a dedicated safety-grounding conductor.

The conductor needs to be sized according to the National Electrical Code (NEC) specifications for your type of installation, but must be at least #6 AWG copper wire.

It is important when installing in a vehicle, the metal frame is not used as a substitute for the negative connection to the battery. The inverter needs a reliable and dedicated return directly back to the battery.

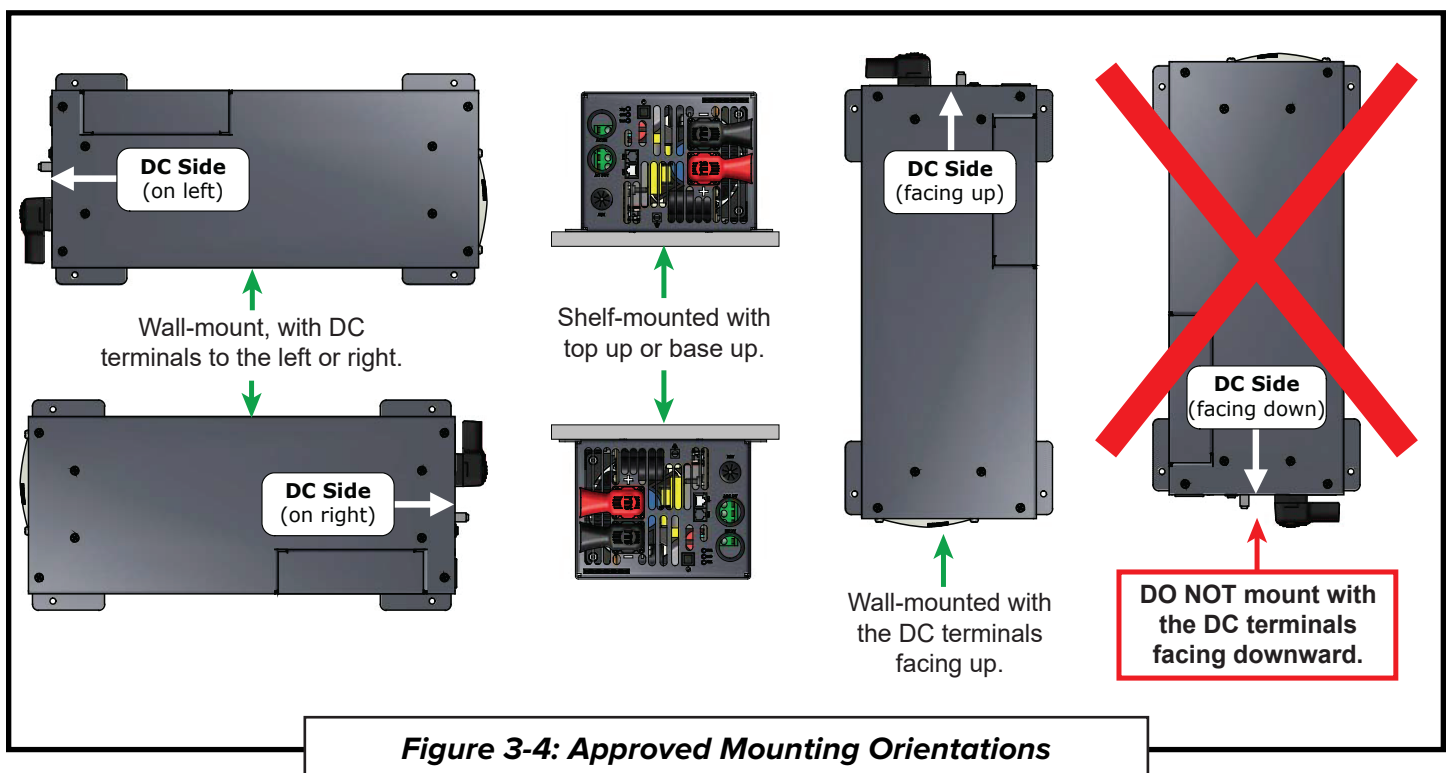
The inverter provides a DC equipment ground terminal for this purpose. This connector accepts copper or aluminum conductors from 4-14 AWG. (See **"Figure 3-1: Front Side (Left-Hand) Features"**, item [7].)

3.6.5 INVERTER TO BATTERY WIRING

The ELiMENT® battery already produces the required 48VDC to power the EPEQ® INVERTER3600 unit. If using another power source in the installation, the batteries may need to be wired in series, parallel or series-parallel to provide 48VDC. The cables that come with Vanair® EPEQ® are properly sized and rated for the equipment they are connected to at the factory. If the cables need to be replaced for any reason, be sure they are properly sized in accordance with **"Table 3A: Recommended DC Wire/Overcurrent Device"**

Place inverter and battery(s) as close as practical to one another, ideally in an insulated and ventilated enclosure. Provide enough space around the battery(s) to access terminals or vent caps (if applicable).

Provide ~1in (2.5cm) of space between batteries if using more than one. When using gas-emitting type batteries, **DO NOT** mount them directly beneath the inverter, or in the same compartment as the inverter or other source of ignition, as this may become an explosion hazard.



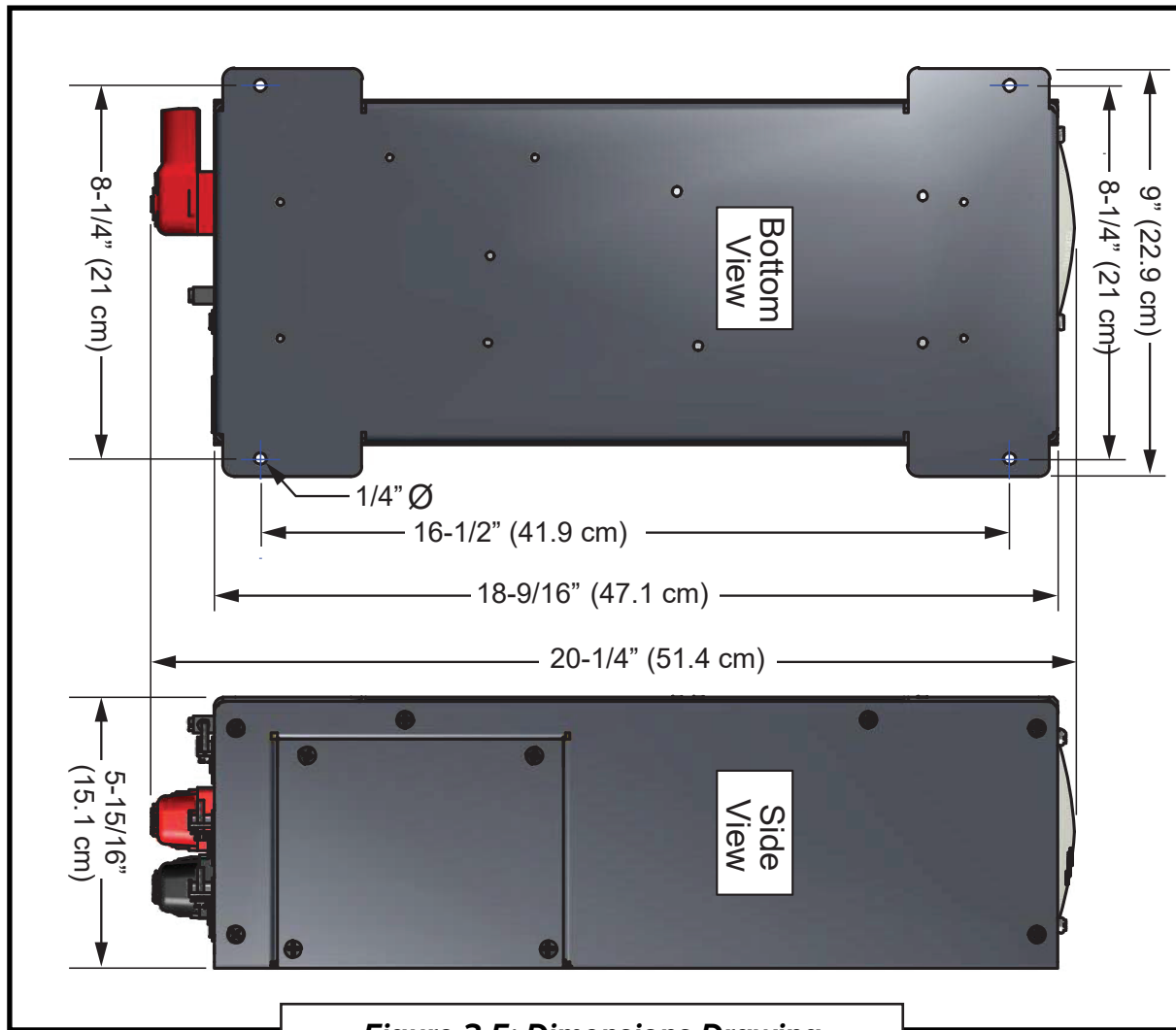


Figure 3-5: Dimensions Drawing

3.6.6 WIRING THE BATTERY SOURCE TO THE EPEQ® INVERTER3600

Before you begin, be sure ALL power sources are completely shut off. This includes both:

1. **DC Power sources:** Disconnect and isolate the batteries
2. **AC Power sources:** Turn off and lock out breakers for utility/shore power or AC generators.

Never work on an electrical system when it is energized. Use the following information to safely connect the EPEQ® INVERTER3600:

DC Equipment Ground Wire

- Route a properly sized DC grounding wire from the DC equipment ground terminal to the DC system's ground. (See **Figure 3-7**).



CAUTION

DO NOT use the vehicle chassis as a substitute for the battery's negative connection to the INVERTER3600. The inverter requires a reliable return path directly to the battery. Be sure the cable is connected from the battery's negative connection to the inverter's negative terminal.



WARNING

DC voltage is often associated with "low voltage." Recognize that it can still pose a significant hazard, especially in the case of system battery short circuits.



CAUTION

DO NOT connect the battery cable to the inverter until all the wiring is complete and the correct voltage and polarity have been verified.



CAUTION

The INVERTER3600 is NOT reverse polarity protected. Connecting the negative and positive battery voltage to the wrong terminals could result in damage. Use a voltmeter to correctly identify voltage BEFORE connecting the DC wires.

Recommended tightening torque for a #6 AWG ground wire is 45 in/lbs. (5.1Nm).

DC Negative Wire

- Route a proper size DC Negative wire from the inverter's negative terminal (Refer to **Figure 3-7** [9]).

DC Positive Wire

- Mount the fuse assembly as near as practical to the battery(s), but do not connect it yet. (i.e., no power to the inverter).
- Route and connect a properly sized DC positive wire from the inverter's positive DC terminal (**Figure 3-7** [9], red cover).
- Recheck all DC wire connections (On battery(s), inverter and DC fuse terminals.)
- Attach the red and black terminal covers over the inverter's DC terminals in place. (See **Figure 3-7**, item [2].)
- If the battery(s) are in an enclosure, perform a final check of the connections to the battery(s) terminals, the close and secure the battery enclosure.

3.7 AC WIRING

The section provides information to make the connections to the EPEQ® INVERTER3600 using the correct wire size and corresponding overcurrent protection.

3.7.1 PRE-AC WIRING REQUIREMENTS

Before installing any AC wiring, review all safety information and the following:

NOTICE

Keep the wire runs short as safely as possible to prevent low-voltage shutdowns.

NOTICE

If the combined short-circuit current of all batteries in the bank is 2700 amps or less, an ANL type fuse may suffice. When in doubt, it is advisable to use a Class-T fuse.

NOTICE

DO NOT connect the DC wires from the battery source to the inverter until the wiring is complete, the DC overcurrent protection is in place, the correct DC voltage and polarity has been verified.



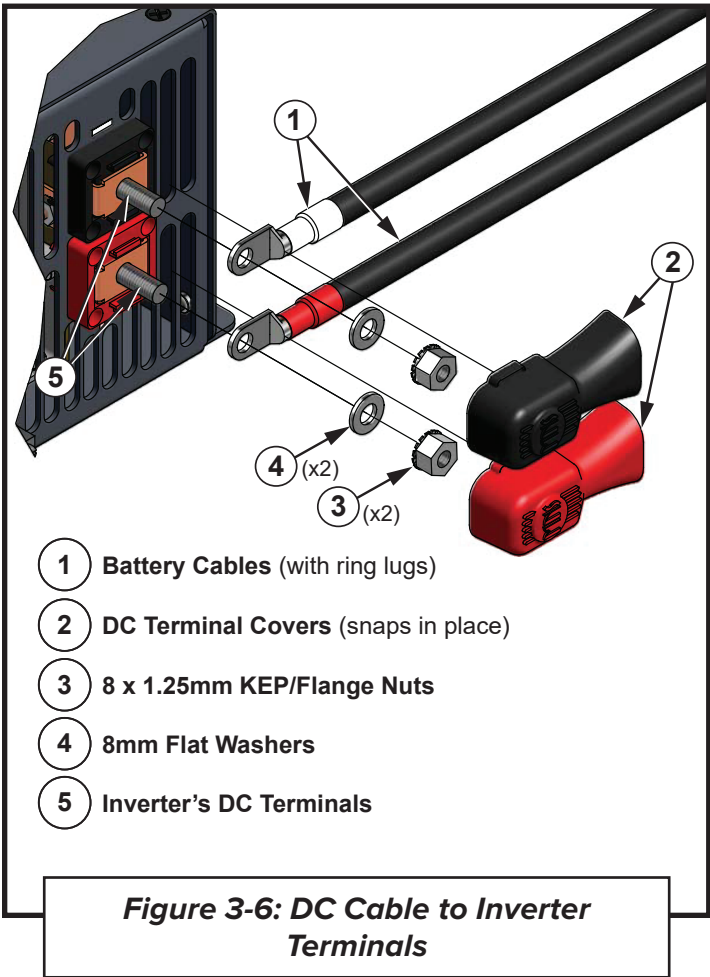
CAUTION

DO NOT place washers or anything between the DC power cable and the DC terminal of the inverter. The cable and the terminal should make direct contact. If an anti-oxidant grease or spray is used, apply it AFTER all connections are made and properly tightened.

NOTICE

Using different types of unmatched batteries can lead to uneven charging and discharging, reducing overall system efficiency, and potentially shortening the lifespan of the components. Avoid old or batteries, or with low-charge as they may not provide the required power, and may become a safety risk.

TABLE 3A: RECOMMENDED DC WIRE/OVERCURRENT DEVICE		
Maximum Continuous Current ¹		108 amps
Case Grounding Electrode Wire Size ²		#6 AWG (13.3mm ²)
Minimum DC Wire Size ³ [75°C Rating in free air]		#4 AWG (21.2 mm ²) [125 amps]
DC Fuse Size ⁴		125 amps with time delay
Increased sizes for longer distances	1 to 10 ft (0.3 to 3.0 m) =	#4 AWG (21.2 mm ²)
	10 to 15 ft (3.0 to 4.6 m) =	#2 AWG (33.6 mm ²)
NOTE1: Maximum continuous current is determined by the inverter's continuous power rating at the lowest input voltage, and account for any inefficiency. NOTE2: Per the NEC, the DC grounding electrode conductor can be a #6 AWG 13.3 mm²) conductor if that is the only connection to the grounding electrode and that grounding electrode is a pipe, rod or plate electrode. NOTE3: Wire size is based on the requirements needed to increase efficiency and reduce stress to the inverter. NOTE4: This fuse is matched with the 'Minimum DC Wire Size' to ensure the current rating of the fuse does not exceed the ampacity of the wire. If a larger fuse is used, ensure the ampacity of the DC wire is sized correctly.		



3.7.2 AC WIRE SIZE AND OVERCURRENT PROTECTION

Ensure the AC input and output wires are sized in accordance with local electrical codes to be able to handle the maximum current. Also, the AC wiring needs to have overcurrent protection (which is NOT a part of the inverter) to protect against short-circuits and overloads. A separate disconnect switch may be needed to isolate the AC circuits for maintenance and emergencies. The overcurrent protection device must be properly sized for the wire gauge and the connected devices it protects.

3.7.2.1 AC GROUND TERMINALS

Inverter power systems must be connected to a grounded wiring system. This reduces risk of electric shock and reduces RFI (radio frequency interference). Proper grounding is to make sure any fault currents are safely directed away to the ground should an electrical malfunction occur. The AC terminal of the EPEQ® INVERTER3600 provides two (2) AC ground terminals. (Refer to **“Figure 3-8: AC Terminal Block”**.) One terminal is to connect the incoming ground from the AC panel and the other terminal is to connect the equipment powered by the inverter (or sub-panel).



WARNING

Making a direct connection between the positive and negative terminals of a battery can cause a dangerous electrical short-circuit. To prevent this hazard, always be sure cable ends are properly insulated and may not accidentally touch one another during installation or wiring.



CAUTION

Be aware that when connecting live battery cables to the inverter, a brief spark or arc may occur. This is normal and due to the inverter's internal capacitors being charged.



WARNING

DO NOT connect the fuse or connect battery power to the inverter at this time. This step takes place after the installation is complete, during functional testing.



CAUTION

Certain batteries generate explosive gases during operation (e.g., acid-lead type) To ensure safety, always install these batteries in a well-ventilated area. If placing them within an enclosure or compartment be sure it has good ventilation to the outside.

Be aware a safety requirement is to have one (1) neutral to ground connection in the electrical system.

3.7.3 AC CONDUCTOR WIRING

The following steps are basic guidelines for installing and connecting the AC wiring to and from the EPEQ® INVERTER3600.

Verify strain relief and/or grommets are in place to prevent damage to any wiring that passes through bulkheads, walls, or other openings.

AC Wiring Inspection

1. When used in a mobile installation, use cable ties or other no-conductive fasteners to reduce movement and vibration of wires that might otherwise be damaged due to chaffing or abrasion.
2. Once all AC connections have been verified to be correct and all AC terminal levers are firmly in the down position and the wires are clamped down, replace the AC access cover on the inverter, securing in place with the four (4) Phillips head screw. Additionally, replace the access cover on the main electrical distribution panel.

3.8 COMMUNICATIONS PORTS

The EPEQ® INVERTER3600 provides two (2) communication connection ports. The upper RJ11 port; and the lower RJ45 port.

3.8.1 CAN/PORT

The RJ45 CAN port is provided to allow CANBUS enabled devices to communicate with the EPEQ® INVERTER3600.

NOTICE

There should be one (1) terminator **ONLY** at each end of the CAN network. The CAN **terminator** should be set to **OFF** if there is an external terminator already connected at each end of the network bus.



WARNING

To reduce the risk of fire, do not connect this inverter to an AC load center (circuit breaker panel). that has multi-wire branch circuits connected.



WARNING

Ground Fault Circuit Interrupters (GFCIs) shall be installed in the vehicle's wiring system to protect all branch circuits.



WARNING

Risk of electrical shock. The following CFCI circuit breaker model has been tested to work with this inverter, (Eaton CHFN120A1CS). Other models that have NOT been tested may fail to operate properly when connected to the EPEQ® INVERTER3600.

3.9 FUNCTIONAL TEST

After all electrical connections to the inverter, battery source and vehicle have been made, use the following steps to test the installation and operation of the EPEQ® INVERTER3600.

1. Check the battery voltage and polarity before connecting the batteries to the EPEQ® INVERTER3600.
2. Apply battery power to the inverter. The inverter will remain off, but the LED status indicators go through a start up test and the fans will spin briefly to indicate DC power is connected and ready to go.
3. Check the AC output voltage of the inverter using a multimeter or voltmeter. It should be reading 120VAC, +/- 2.5VAC.
4. Connect a load to the inverter and power it on.
5. (For AC Input Only) Apply AC power to the inverter's AC input. Once the AC power is verified (about 10 seconds), the incoming AC power transfers through the inverter to the AC output and the connected device should turn on.
6. Disconnect the incoming AC power to the inverter. Verify the connected device remains on - powered by the inverter.
7. If all of the previous steps were successful, the inverter is ready for use.
8. Should any of these tests fail, please refer to the Troubleshooting section.

3.10 SETUP

The EPEQ® INVERTER3600 will arrive with default settings, which are the settings used for most installations. Default battery type is already set for Lithium to work with the EPEQ® ELiMENT® Battery as the DC Power source.

No further setup or programming is required for the EPEQ® INVERTER3600 installation.



CAUTION

DO NOT connect the inverter's output to an AC power source! This can cause severe damage to the inverter and will not be covered under warranty!



CAUTION

If the inverter's output wiring is not wired to handle a minimum of 55 amps, a correctly sized and rated over-current protection device must be installed on the inverter output circuit to prevent damage.



WARNING

Before making any AC connections, be sure the inverter is disconnected from the battery and there is no other source of live power to the inverter.

SECTION 4: Operation

4.1 OPERATION

This section discusses how the EPEQ® INVERTER3600 operates and how to identify the current inverter or charging states.

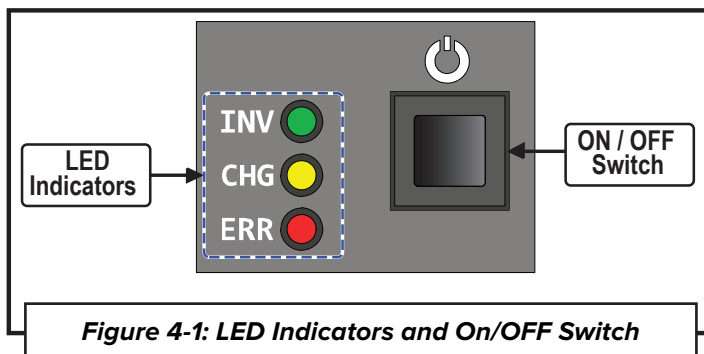


Figure 4-1: LED Indicators and On/OFF Switch

4.2 FRONT PANEL FEATURES

The ON/OFF switch and LED (Light Emitting Diode) indicators are located on the front panel to enable the EPEQ® INVERTER3600 and monitor its operation status. (See **Figure 4-1** for reference.)

4.2.1 ON/OFF SWITCH

The inverter is always ON when power is present on the EPEQ® system.

4.2.2 LED INDICATORS



WARNING

When an external AC power is passing through the inverter and is present on the output, pressing the ON/OFF switch will not remove the AC power on the inverter's output.

NOTICE

The ON/OFF switch does not turn the battery charger function on or off.

NOTICE

When the LED indicator blinks on, there is a four-second pause between each blink-on sequence.

Example: "blink-on x2" means the LED is normally off, blinks on twice, then turns off for 4 seconds. The pattern repeats indefinitely while in this status.

View the LED indicators for at least 10 seconds to see the inverter's operational state and the information in this section.

4.2.2.1 INV (INVERTER) LED INDICATOR

The INV (Inverter) indicator is a green LED that provides information about the mode of operation the inverter is in.

- **INV OFF (Inverter OFF):** The inverter is not actively using power from the battery to provide power to the inverter's output.
- **INV ON and NOT blinking (Inverter ON):** Power from the battery is being used to provide power to the SC output terminals.
- **INV blinking ON/OFF every second, without a 4-Second pause. (Search Mode):** The EPEQ® INVERTER3600 is in the Power Save Search Mode, ready to supply full power to the AC outputs, when a load greater than the Power Save Search setting is connected to the AC output.
- **INV blink-ON x1 (inverter Standby):** The EPEQ® INVERTER3600 is connected to an external AC source (utility or generator) and is not actively inverting, but the inverter function is enabled and ready, should the external AC power fail or be shut off.
- **CHG (Charge LED Indicator):** The yellow CHG (Charge) LED provides informations on the inverter's charge status while in the Standby mode.
- **CHG OFF (Charger OFF):** Either there is no external AC source connected or the unit

has been placed in Charger Standby via CAN network.

- **CHG blinks ON/OFF each second without a 4-second pause (AC Present):** AC Power has been detected on the AC terminals. If the CHG constantly blinks without connecting and charging, the AC power may not be meeting the source AC voltage and frequency required.
- **NOTE:** The factory default setting for AC input are: AC Voltage 106 to 132VAC; Frequency: 56 to 64Hz.
- **CHG ON and NOT blinking (Bulk Charge):** The bulk charge stage delivers maximum current to the batteries. The charger remains in bulk until the absorb target voltage is achieved.

NOTICE

When an AC input power is present (AC Utility or Generator) and is within the AC input limits (both voltage and frequency), it connects and passes through the inverter regardless if the inverter is turned on or not.

- **CHG blink-ON x1 (Absorb Charge):** The absorb charge stage is a constant voltage stage and begins after reaching the bulk voltage. In absorb, the current will taper down in order to maintain the battery at the absorb target voltage.
- **CHG blink-ON x2 (Float Charge):** The float charge stage occurs at the end of the absorb charging time - this charge stage reduces the charge voltage to maintain the batteries at the float target voltage.
- **CHG blink-ON x3 (EQ Charge):** The charger is in the Equalize Charge stage, regulating the current to maintain the battery at the equalize target voltage.
- **CHG blink-ON x4 (Charger Back-off):** In Charger Back-off, the charging current to the battery is reduced.

NOTE: Charger Back-off occurs if the internal temperature of the inverter is very hot (charge current is reduced to maintain temperature).

NOTICE

Target Voltage - will be the same as the charge state voltage setting for all EPEQ® Installations.

4.2.2.2 ERR (ERROR) LED INDICATOR

Under normal operation, the red ERR (Error) LED Indicator will be off. Should an error condition occur, however, this indicator provides important information for diagnosing issues. It will blink in a specific pattern to identify the error that shut down the inverter.

If the ERR LED comes on, DO NOT turn it off, Count and confirm the number of times it blinks before shutting it off.

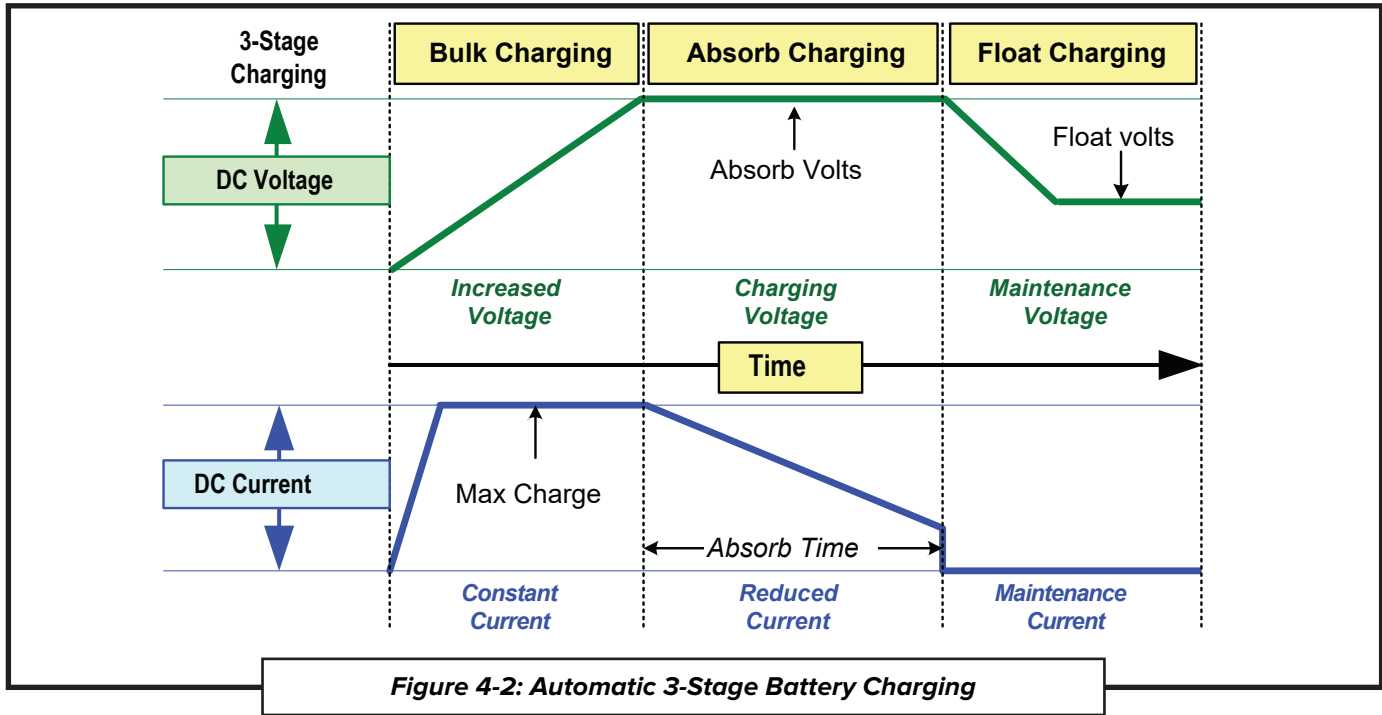
Once the error has been identified, and the error has been cleared, the inverter can be turned back on.

- **ERR OFF (No Error):** This is the expected state when the inverter is operating normally. No error conditions exist,

NOTICE

Refer to Table 6A: Troubleshooting to help diagnose and clear any error conditions that may be present.

- **ERR ON and NOT blinking (Low Battery Voltage):** Indicates that the battery voltage has fallen below the 45VDC default setting for more than a minute.
Solution: Charge your battery(s) to raise the voltage. The error will automatically clear once the battery exceeds 48VDC.
- **ERR blink-ON x1 (High Battery Voltage):** Battery voltage is at or above the default setting of ≥ 66 VDC for 3 seconds.
Solution: Turn off any external charging source to lower the battery voltage. The error will automatically clear once the battery falls below the default setting of ≤ 65 VDC.
- **ERR blink-OFF x2 (Over-Temperature):** The inverter's internal temperature is above acceptable limits. This can be caused by excessive loads or inadequate ventilation.



Solution: Allow the unit to cool down, and when it has cooled sufficiently. Power cycle the EPEQ® System.

- **ERR blink-OFF x3 (AC Overcurrent):** The inverter has turned off due to connected loads exceeding its output capacity. It could also be a sign there is a short in the output wiring. Solution: Reduce AC loads or fix the wiring issue.
- **ERR blink-ON x4 (Internal Error):** The inverter has turned off because an internal error has been detected. To clear this error, the inverter needs to be reset by disconnecting all DC power to the inverter for a minimum of 15 seconds, then reconnect. If the error remains, contact your dealer or contact Vanair® Service.

4.3 OPERATING MODES

The EPEQ® INVERTER3600 has two normal modes of operation.

1. Inverter Mode, which powers AC loads using the DC battery(s) as its power source.
2. Standby Mode, transfers incoming AC power (when used), from utility AC or a generator to power the loads and recharge battery(s).

This inverter includes comprehensive protection circuitry to shut down the inverter under certain error conditions.

4.3.1 INVERTER MODE

When the inverter is properly connected to the battery source and turned on, the DC current from the battery(s) is converted into true sine wave alternating current (AC), similar to the utility AC current found in normal AC outlets in buildings to power electrical devices that are connected to the inverter's AC output.

- **Inverter OFF:** When the inverter is OFF, no power is used from the batteries to power the AC loads and the INV status LED will be OFF. If AC power from an external source however (shore power or generator) is connected and verified on the inverter's AC input, the AC input power will be passed through the inverter to the AC output of the inverter to any connected devices, even with the inverter turned OFF. If the AC input power is turned OFF or disconnected, any attached loads will no longer be powered when the inverter is OFF/disabled.
- **Searching:** The Power Save Search feature is provided to conserve battery power when AC power is not required. When enabled, this feature is enabled, the inverter sends pulses on the AC output seeking an attached AC load or device. When the AC load demand is greater than the AC input, and the Power Save

NOTICE

While charging, if the internal temperature starts to become too hot, the unit may go into Charger Back-off protection. This reduces the charge current in an attempt to maintain the temperature instead of shutting down.

Search setting is turned on, the inverter recognizes the need for more power and kicks in and starts inverting automatically. Once the connected AC loads are turned off, the inverter returns to Search mode to minimize battery consumption. When the inverter is "searching", the green INV LED blink-on x2 indication will be present.

- **Inverting:** When the EPEQ® INVERTER3600 is powered ON, it defaults to the OFF mode. The inverter's ON/OFF power switch must be pressed to toggle the inverter to the ON state. Pressing the ON/OFF switch toggles it between OFF and ON. The green INV LED will illuminate and stay lit to indicate it is inverting. The time it can provide AC power to connected loads depends on the DC input power available and the total load of all connected devices.

4.3.2 STANDBY (TRANSFER/CHARGER) MODE

When an external AC power source is connected and qualified is detected on the inverter's AC input, it operates in Standby Mode. In Standby Mode, an AC transfer relay automatically closes to allow AC current to pass through the inverter to provide power to the inverter's AC output to connected AC devices. The unit also monitors the AC input and "standby" to switch to the Inverter Mode should the AC power to the input be interrupted or switched off.

While in Standby Mode the inverter can operate:

1. As a Battery Charger; which converts incoming AC power to DC output to charge the battery(s)

or

2. In AC Load Support; when the incoming AC source power is not large enough to power a load connected to the inverter's AC output, additional current from the battery is used to create added AC power by the inverter.

4.3.2.1 MULTI-STAGE BATTERY CHARGER

While not normally used in EPEQ® System installations, the EPEQ® INVERTER3600 is equipped with an active Power Factor Corrected (PFC) multi-stage battery charger. The PFC feature maximizes the real power available from the AC power source (whether that is a utility AC source, or from a generator), which allows less power to be wasted and a higher charging capability.

The charger can use up to four charging states to help monitor and keep batteries healthy. (See **"Figure 4-2: Automatic 3-Stage Battery Charging"**).

The automatic 3-stage charging process includes:

- **Bulk Charging:** This is the initial stage of charging. While in this stage - the charger supplies the battery with constant current until the absorb charging voltage is achieved.
- **Absorb Charging:** This is the second charging stage. This stage provides the batteries with a constant voltage and reduces the DC current in order to maintain the absorb voltage setting.
- **Float Charging:** The third charging stage occurs next. This keeps the battery(s) at optimum capacity and ready for use by the inverter.

4.3.2.2 AC LOAD SUPPORT

While in the Standby Mode, the EPEQ® INVERTER3600 operates in parallel with the incoming AC source (utility or generator) to power the AC loads. When connected to the incoming AC source, the current from the AC source and used by the AC loads is constantly monitored. If the current to power the AC loads increases enough, the EPEQ® INVERTER3600 reduces the charge current to the batteries to allow more current to power the AC loads.

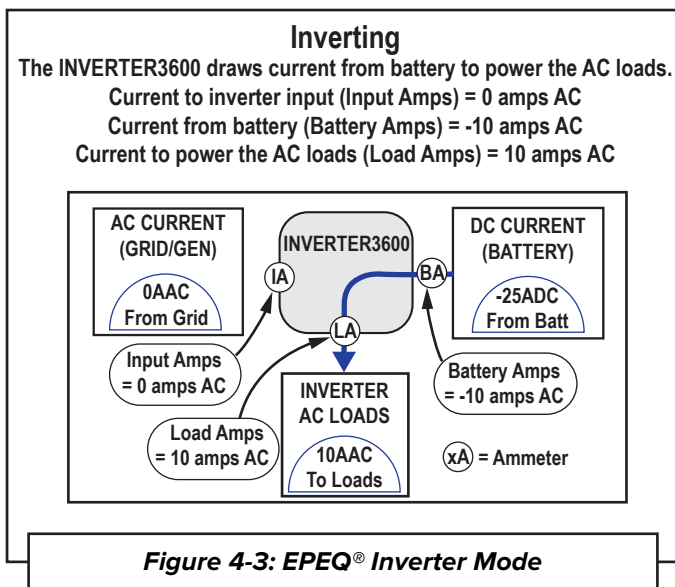
4.4 CURRENT FLOW

"Figure 4-3: EPEQ® Inverter Mode" shows the current flow in the EPEQ® INVERTER3600 during the different modes: Over-Charge Protection;

The EPEQ® INVERTER3600 has protection mechanisms to prevent overcharging and extend the lifespan of your battery system.

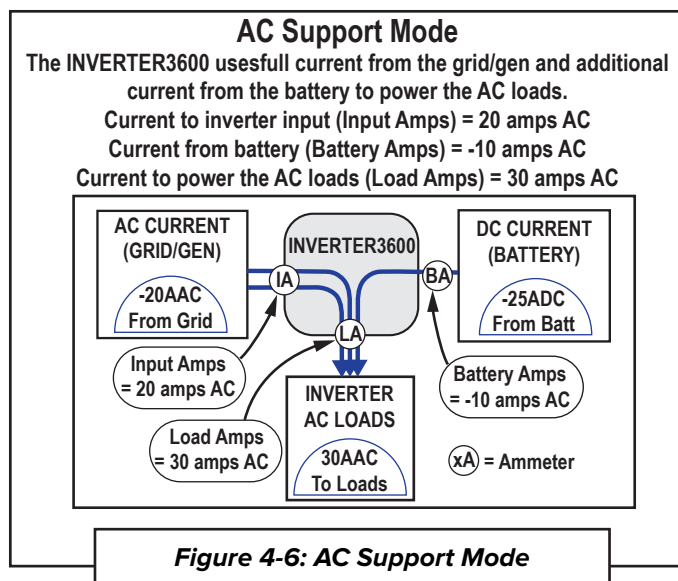
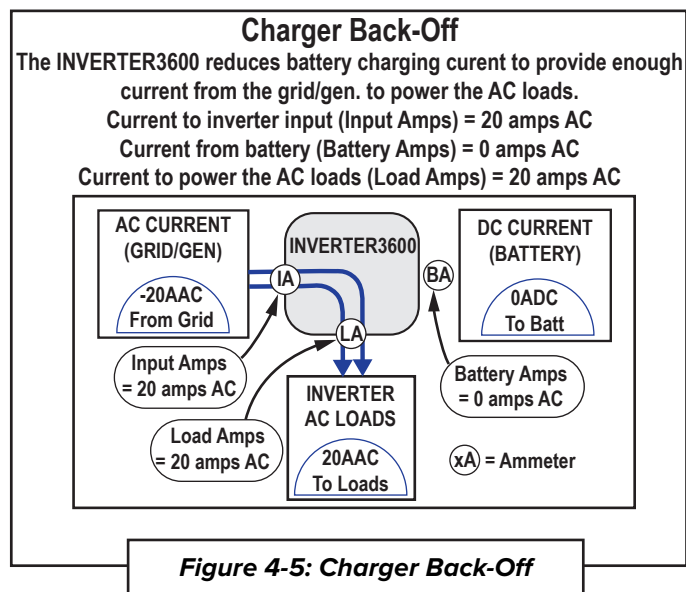
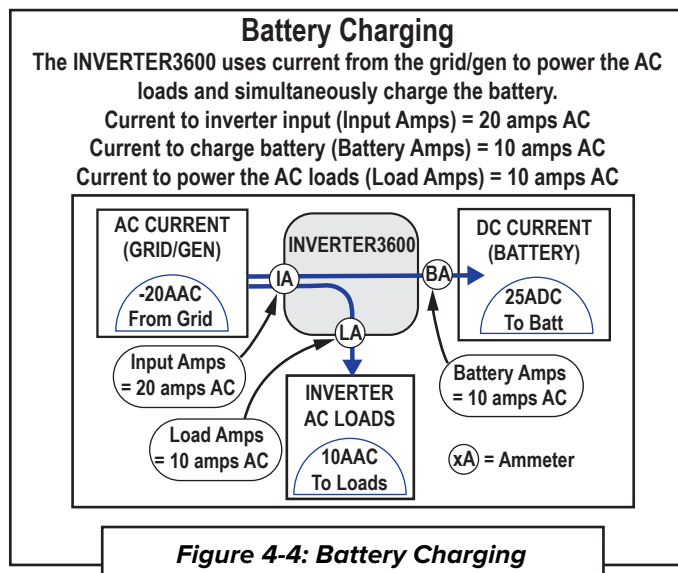
When the AC source is connected to the AC input of the EPEQ® INVERTER3600, the system starts monitoring incoming AC voltage and frequency. Once the voltage and frequency is determined to meet the standards required by the inverter, the AC transfer relay closes, allowing the inverter to determine which stage to enter. If the battery voltage is low, the charger initiates the bulk charging stage.

NOTE: Keep in mind that a typical EPEQ® equipment installation may not utilize all of the EPEQ® INVERTER3600's features, but these features are still shown in this manual for future reference.



NOTICE

If an AC input is connected the INVERTER3600, it will always enter the bulk charge mode.



NOTICE

In AC Load Support, even though the yellow LED indicator may indicate charging, the inverter may not be sending current to the battery.

NOTICE

High battery voltage may be due to excessive or unregulated voltage from solar panels or other external charging sources.

NOTICE

When the inverter is initially connected to the battery, the fan will come on for one second during the power up test.

4.5 PROTECTION CIRCUITRY OPERATION

The inverter is protected against error conditions, which are rarely seen during normal operation. However, if an error condition is detected outside the designed operating parameters, then it will shut down in an attempt to protect itself, the battery(s) and any equipment attached to the inverter. Listed below are some error conditions that may present themselves. Identification and troubleshooting these errors can be found in the **Troubleshooting Section**.

- **Low Battery:** The inverter shuts down when the battery voltage falls below the Low Battery Cut Out (LBCO) level for one minute or more to prevent the battery(s) from being over-discharged. Once the battery voltage rises above the Low Battery Cut In (LBCI) level, the inverter will restart automatically.
The INV LED turns off when a low battery condition occurs. (See **"Table 4A: Inverter Battery Turn On/Off LEvEls"** for Cut IN/Cut OUT voltage levels.)
- **High Battery:** If the battery voltage

approaches the High Battery Cut Out (HBCO) level, the inverter automatically shuts down to prevent the inverter from supplying unregulated AC output voltage. The INV LED turns off when a high battery voltage condition occurs.

- **Overload:** During inverter and standby operations, the inverter monitors DC and AC current levels. If a short-circuit or overload condition is detected for more than a few seconds, the inverter will shut down. To resume operation after such a fault is detected, the inverter needs to be restarted once the AC loads have been reduced/removed.
- **Over-Temperature:** If internal power components exceed safe operating temperature levels, the inverter will shut down to protect it from damage. Once the inverter cools down - the inverter will automatically restart.
- **Internal Error:** The inverter continually monitors several internal components and processor communications. If an error exists that does not permit proper internal operation, the inverter will shut down to protect itself. The inverter will require a restart to resume operation.

4.6 INVERTER FAN OPERATION

The inverter contains a variable speed cooling fan that is controlled automatically. The speed of the fan is determined by either the internal heat of the inverter or the loads on the inverter. The fans will run at full speed once the internal temperature of the inverter reaches maximum temperature or running at 100% of its rated load.

NOTICE

The inverter’s fans do not operate based on the battery’s temperature.

4.7 NEUTRAL TO SAFETY GROUND BONDING

The recommended standards for safely wiring mobile installations stipulate that the neutral and safety ground must be connected only at the AC source, whether it's an inverter, utility power or a generator. This is crucial for ensuring that a circuit breaker will activate in the event of a hot-wire-to-ground fault. Additionally these standards require that the AC neutral be bonded to safety ground in only one place at any time. The single bond is established in order to make the electrical panel's neutral line safe, by connecting it with ground. Installers want to avoid the inverter connecting the neutral-to-ground while another AC source is actively powering the inverter loads.

To address this, the mobile EPEQ® INVERTER3600 uses automatic neutral-to-ground switching, designed to use in multiple source applications. The inverter uses an internal relay that automatically connects the neutral AC output terminal to the ground of the vehicle when the unit is operating in the inverter mode. (If the inverter is connected to an external AC source, an additional neutral-to-ground connection is made automatically. In standby mode, the internal relay opens the neutral-to-ground connection, (See **"Figure 4-7: Neutral-to-Ground Connection"**.) This design makes sure two neutral-to-ground connections do not occur simultaneously, which prevents electrical shock hazards between the vehicle's neutral and the AC source's neutral.

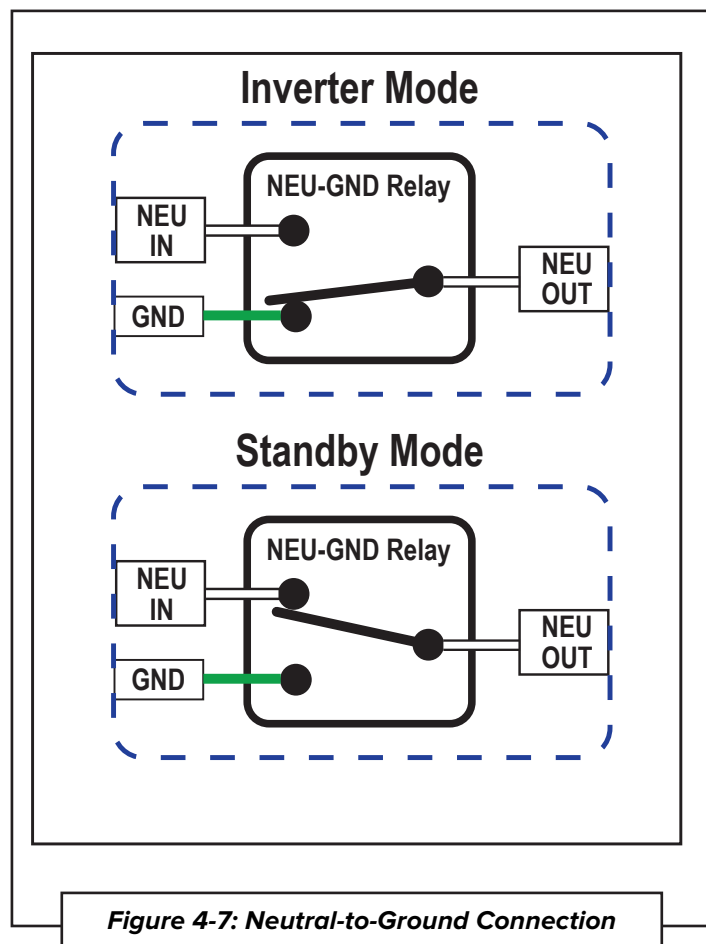


WARNING

If multiple bonds are created, currents can circulate between neutral and ground, in what is referred to as a “ground loop” current. These ground loops can trip ground fault circuit interrupters (GFCIs), cause electric shock hazards, and lead to other undesirable effects.

TABLE 4A: INVERTER BATTERY TURN ON/OFF LEVELS

Inverter Battery Turn On/ Off Levels	Inverter Model
	EPEQ® INVERTER3600
HBCO	≥66VDC (after 3 seconds)
HBCI	≤65VDC
LBCI (one minute delay)	48VDC
LBCO One minute delay	45VDC



SECTION 5: Maintenance

5.1 GENERAL

The EPEQ® INVERTER3600 is a self-contained electrical unit that **does not require** much maintenance. Keeping the unit dirt and dust free in a moisture-free environment is recommended.

Any internal servicing and repairs should be performed only by a trained service technician. Call Vanair® Service for assistance.

1. When servicing or cleaning the EPEQ® INVERTER3600, make sure the unit is OFF and all input power has been disconnected from the unit. Disconnect the inverter's DC connector from the DC input. If AC input power is connected to the inverter, open (disable) the AC circuit providing power to the unit and LOCK OUT to prevent accidental electrical shock.
2. Dirt and dust can be wiped off the surface of the equipment cover with a clean, damp cloth, slightly moistened with water.
3. Keep the exhaust vents and the intake vent free of debris and obstructions to allow for proper cooling and ventilation. (See **Figure 3-1 and Figure 3-2.**)
4. After some time, dirt and dust may accumulate around the fan intake and the exhaust vents. Fan blades and vents may be blown clean with canned, compressed air designed for cleaning electronic devices.
5. With all power OFF and disconnected from the inverter, check the electrical connections attached to the DC power input and other terminals used to ensure they are secure. Additionally, examine the cables and wires to make sure the connecting cables are in good condition and not damaged. Replace any damaged power cables before using.
6. When maintenance procedures are complete, re-connect any AC power to the inverter by closing the circuit breaker, connect the inverter's DC power connector, and any AC loads.

(Be aware that in some cases, this may create a cloud of dust - so consider blowing dust from the unit near an open door to the outside.) The use of an air compressor is not recommended as there may be moisture in the line. (See **"Figure 3-2: Rear Side Features"**.)



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SECTION 6: Troubleshooting

6.1 OVERVIEW

The following table is provided to assist in the diagnosis and troubleshooting of errors and non-operation conditions with the EPEQ® INVERTER3600. (See **Table 6A**.)

See also the built-in Inverter circuit protections in **Sections 4.5 and 4.6** for additional troubleshooting information if experiencing automatic shutdowns.

TABLE 6A: TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Low Battery Voltage Error (Error Indicator is ON and NOT blinking.)	Battery voltage level has dropped below the Low Battery Cut Out (LBC) set-point for more than one minute (45VDC is default.)	Battery voltage too low. Check fuses, circuit breakers and cable connections. Check battery voltage at the at the DC power connection to the inverter. Battery(s) may need to be charged. Error condition clears when the battery voltage exceed 48VDC.
High Battery Voltage Error (Error Indicator blinks one time every 4 seconds.)	Battery voltage is above 66VDC for more than 3 seconds. Inverter resets automatically and resumes operations when the battery voltage drops to 65VDC or lower.	Usually occurs only when an external battery charging source is used. (Solar, alternator, etc.) Reduce, disconnect or turn off any external battery charging source and allow the voltage to drop.
Over Temperature Error (Error Indicator blinks two times every 4 seconds.)	Temperature inside the inverter has risen above acceptable limits and/or the connected loads are too great for the inverter to continually operate. Also it could be an indication of poor ventilation around the inverter.	Reduce number of operating electrical loads.
		Check that the inverter's air vents are not clogged or obstructed. Fresh cooling air must be available.
		Once the unit has cooled, turn the inverter back on.
AC Overload Error (Error Indicator blinks 3 times every 4 seconds.)	Invert has turned off because connected loads are greater than the rated AC output of the inverter, or the output wires are shorted.	Reduce AC loads connected to the inverter. Be sure there is not a short in the inverter's output wiring by removing all AC output wiring, and restarting the inverter.
Internal Error (Error Indicator blinks 4 times every 4 seconds.)	An internal error has been detected.	To clear, perform a power reset. Remove all power input to the inverter. Turn ON. If Error does not clear, unit will have to be serviced.
Inverter's INV Status Error (Error Indicator is Off.)	No DC voltage (battery) connected to inverter.	Connect a battery to the inverter.

OVERVIEW *CONTINUED*

TABLE 6A: TROUBLESHOOTING (CONT.)		
SYMPTOM	POSSIBLE CAUSE	SOLUTION
AC input will not connect (CHG LED on remote blinks every second.)	Incoming AC is not accepted if either voltage or frequency do not fall within accepted limits.	Check incoming AC voltage and frequency.
Appliances turn off and on, or there is low AC output power.	AC output connections are loose.	Tighten AC output connections.
	Battery cables are loose or corroded.	Clean and tighten all cables.
	Battery voltage on ampacity is low.	Recharge or replace batteries.
Low charging rate when connected to shore power.	The AC input voltage is low.	Check AC input source or input wiring.
Charging rate is Low when using a generator.	Generator output is too low to power AC loads and charger.	Reduce the load, increase the generator's RPMs.

Vanair® attempts to cover all possible issues that may arise during normal use of the EPEQ® INVERTER3600 in this manual. We understand unusual, unknown or lesser known symptoms may possibly occur that require added assistance that is not covered in this manual.

Should any issue arise with the EPEQ® INVERTER3600 that is not covered in “**Table 6A: Troubleshooting**” contact your dealer, or call Vanair® Service for additional assistance.



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SECTION 7: Illustrated Parts List

7.1 PARTS ORDERING INFORMATION

Part orders should be placed through the distributor from whom the unit was purchased. If for any reason parts cannot be obtained in this manner, contact your dealer or the factory directly at the address or phone numbers below.

When ordering parts always indicate the Serial Number of the machine package.

This can be obtained from the Bill of Lading for the machine package, or from the unit's serial number plate. See **“Figure 3-3: Left Side Features”** for location of machine package serial number.

See **“Figure 7-1: EPEQ® INVERTER3600 and Parts”** for reference.

Use the blank **NOTES** page for important numbers, notes, and references.



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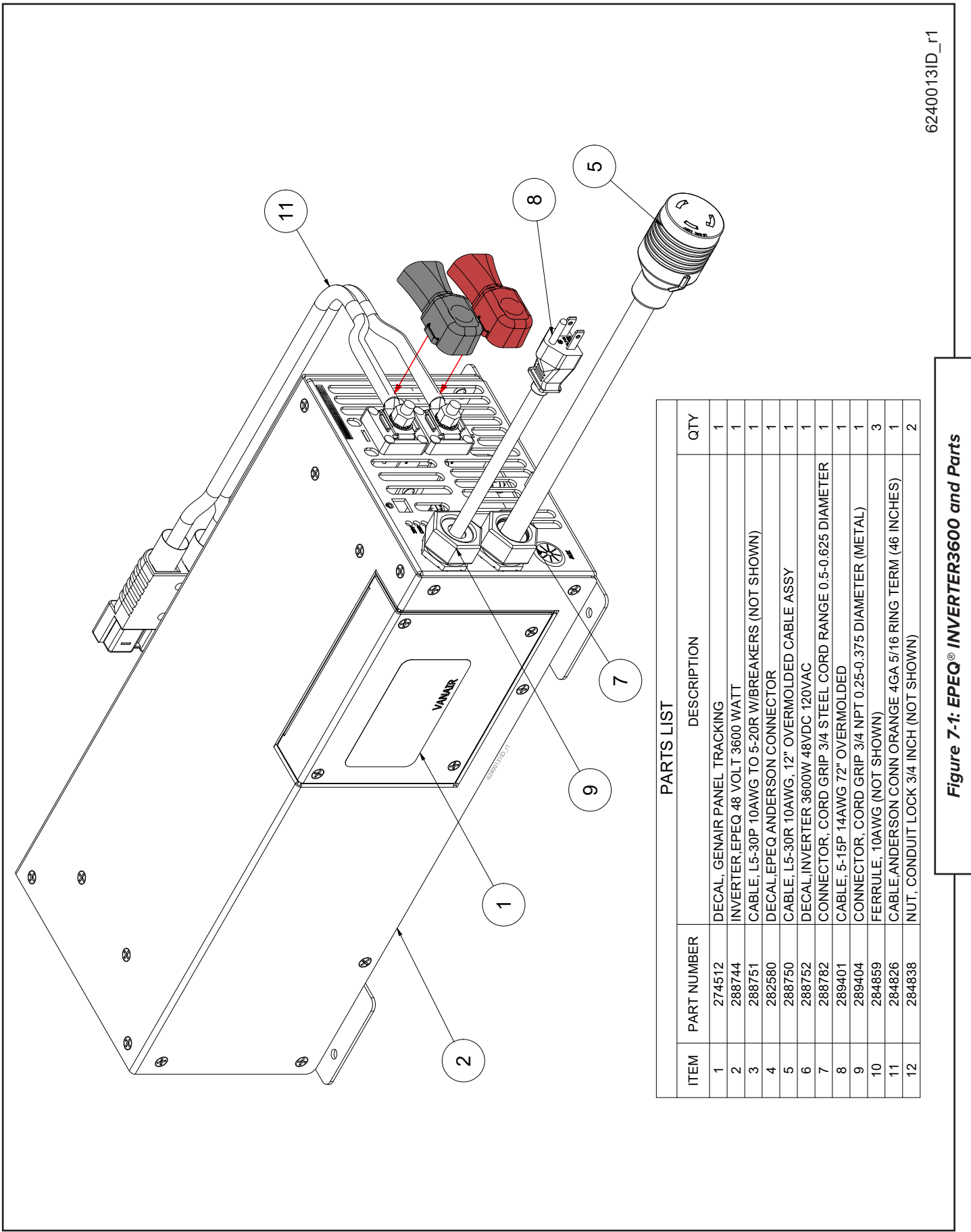


Figure 7-1: EPEQ® INVERTER3600 and Parts

Figure 7-2: NOTES



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