



THERMO KING

Installation Manual

**2000W Pure Sine Wave
Power Inverter**
Model 452855

Revision A

July 2020

TK 56837-8-IM-EN

TRANE
TECHNOLOGIES

Introduction

This manual is intended to assist in the installation of the Thermo King 2000W Pure Sine Wave power inverter and related components inside the cab of a typical semi tractor. While it is not intended to be specific to a particular vehicle, the information in this manual will provide the installer with details to correctly and safely install the inverter.

This power inverter is intended to be used for land vehicles (RVs or trucks) or marine craft. It is listed to UL Standard 458, 5th Edition (Power Converters/Inverters and Power Converter/Inverter Systems for Land Vehicles and Marine Crafts) for use in the US; and are also certified to CSA Standard C22.2 No. 107.1-01 (General Use Power Supplies) for use in Canada.

Before beginning the installation, the installer should confirm with the customer the desired location of the power inverter. The customer should also be made aware of any modifications to existing equipment that may be necessary to complete the installation.

Due to its complexity, you should not attempt this installation unless you:

- are a certified electrician or knowledgeable technician who can install this product in compliance with applicable electrical codes and regulations.
- have a basic understanding of electricity and electrical wiring.
- have the necessary tools and equipment to complete the installation.

Safety Precautions

Please read the Safety Precaution Section in this manual before beginning the installation. This section contains definitions and safety precautions when working with batteries and battery cables, fuse, fuse holder, and installing the inverter. The section also describes safety considerations for locating and installing the inverter.

This manual is published for informational purposes only. Thermo King® makes no representations warranties express or implied, with respect to the information recommendations and descriptions contained herein. Information provided should not be regarded as all-inclusive or covering all contingencies. If further information is required, Thermo King Corporation Service Department should be consulted.

Thermo King's warranty shall not apply to any equipment which has been "so installed, maintained, repaired or altered as, in the manufacturer's judgment, to affect its integrity."

Manufacturer shall have no liability to any person or entity for any personal injury, property damage or any other direct, indirect, special, or consequential damages whatsoever, arising out of the use of this manual or any information, recommendations or descriptions contained herein. The procedures described herein should only be undertaken by suitably qualified personnel. Failure to implement these procedures correctly may cause damage to the Thermo King unit or other property or personal injury.

Revision History

Revision A (07/20) New manual.

Customer Satisfaction Survey

Let your voice be heard!

Your feedback will help improve our manuals. The survey is accessible through any internet-connected device with a web browser.

Scan the Quick Response (QR) code or click or type the web address https://tranetechnologies.iad1.qualtrics.com/jfe/form/SV_2octfSHoUJxsk6x?Q_CHL=qr&Q_JFE=qdg to complete the survey.



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Safety Precautions

Important: Correct installation of the Thermo King Power Inverter is necessary to ensure safe and proper operation. *BEFORE* installing the inverter, thoroughly read and follow these safety precautions.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury and unsafe practices.

NOTICE

Indicates a situation that could result in equipment or property-damage only accidents.

DANGER

Electrical Shock and Fire Hazard!

Installation must be done by qualified personnel to ensure compliance with all applicable installation and electrical codes and regulations. Instructions for installing the Thermo King Power Inverter are provided here for use by qualified personnel only. Failure to follow these instructions could result in death or serious injury.

DANGER

Risk of Injury!

Do not use the Thermo King Power Inverter in life support or health care applications where a malfunction or failure of the inverter could cause failure of a life support device or medical equipment or significantly alter the performance of that equipment.

DANGER

Hazardous Voltage!

Potentially lethal voltages exist within the power inverter as long as the battery supply is connected. During any service work, the battery supply should be disconnected.

DANGER

Risk of Injury!

Do not connect or disconnect batteries while the power inverter is operating from the battery supply. Dangerous arcing may result.

WARNING

Electrical Shock and Burn Hazard!

Do not dismantle the Thermo King Power Inverter. It does not contain any user-serviceable parts. Attempting to service the unit yourself could result in an electrical shock or burns.

NOTICE

Equipment Damage!

Some appliances or electronic devices may not operate properly when powered through a DC to AC power inverter. Refer to the owner's guide for each device to determine its compatibility.

General Safety Precautions

- Turn the power inverter's power switch off before making any electrical connections.
- Never smoke or allow a spark or flame near the batteries.
- Use caution when working near batteries with metal tools.
- When working near batteries, always wear complete eye protection and clothing protection. Avoid touching your eyes while working near batteries.
- If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least twenty minutes and get medical attention immediately.
- Do not route inverter battery cables together with fuel lines.
- Do not use any battery cables other than those supplied with the inverter.
- Do not allow battery cables to rub or chafe against sharp metal edges, rotating components, or hot objects.
- Battery cables must be installed and routed to allow for vibration and movement of the cab. The battery cables should never be stretched tight.
- Battery cables should be neatly routed and secured with band wraps or clamps.
- All accessory electrical connections must be installed directly on top of the vehicle's battery terminal post and tightened securely. Never install the accessory electrical connections under the OEM battery cables.
- Do not replace the inverter fuse with any other type or style. It must be the same type of fuse as supplied by Thermo King.

First Aid: Electrical Shock

IMMEDIATE action must be initiated after a person has received an electrical shock. Obtain immediate medical assistance if available.

The source of the shock must be immediately removed by either shutting down the power or removing the victim from the source.

If it is not possible to shut off the power, the wire should be cut with either an insulated instrument (e.g., a wooden handled axe or cable cutters with heavy insulated handles) or by a rescuer wearing electrically insulated gloves and safety glasses. Whichever method is used do not look at the wire while it is being cut. The ensuing flash can cause burns and blindness.

If the victim has to be removed from a live circuit, pull the victim off with a non-conductive material.

DO NOT TOUCH the victim! You can receive a shock from current flowing through the victim's body.

Use the victim's coat, a rope, wood, or loop your belt around the victim's leg or arm and pull the victim off.

After separating the victim from power source, check immediately for the presence of a pulse and respiration.

- If a pulse is not present, start CPR (Cardio-Pulmonary Resuscitation) and call for emergency medical assistance.
- If a pulse is present, respiration may be restored by using mouth-to-mouth resuscitation, but call for emergency medical assistance.

CALIFORNIA Proposition 65 Warning

 **WARNING:**
Cancer and Reproductive Harm
www.P65Warnings.ca.gov

RCS1032

Installation Best Practices

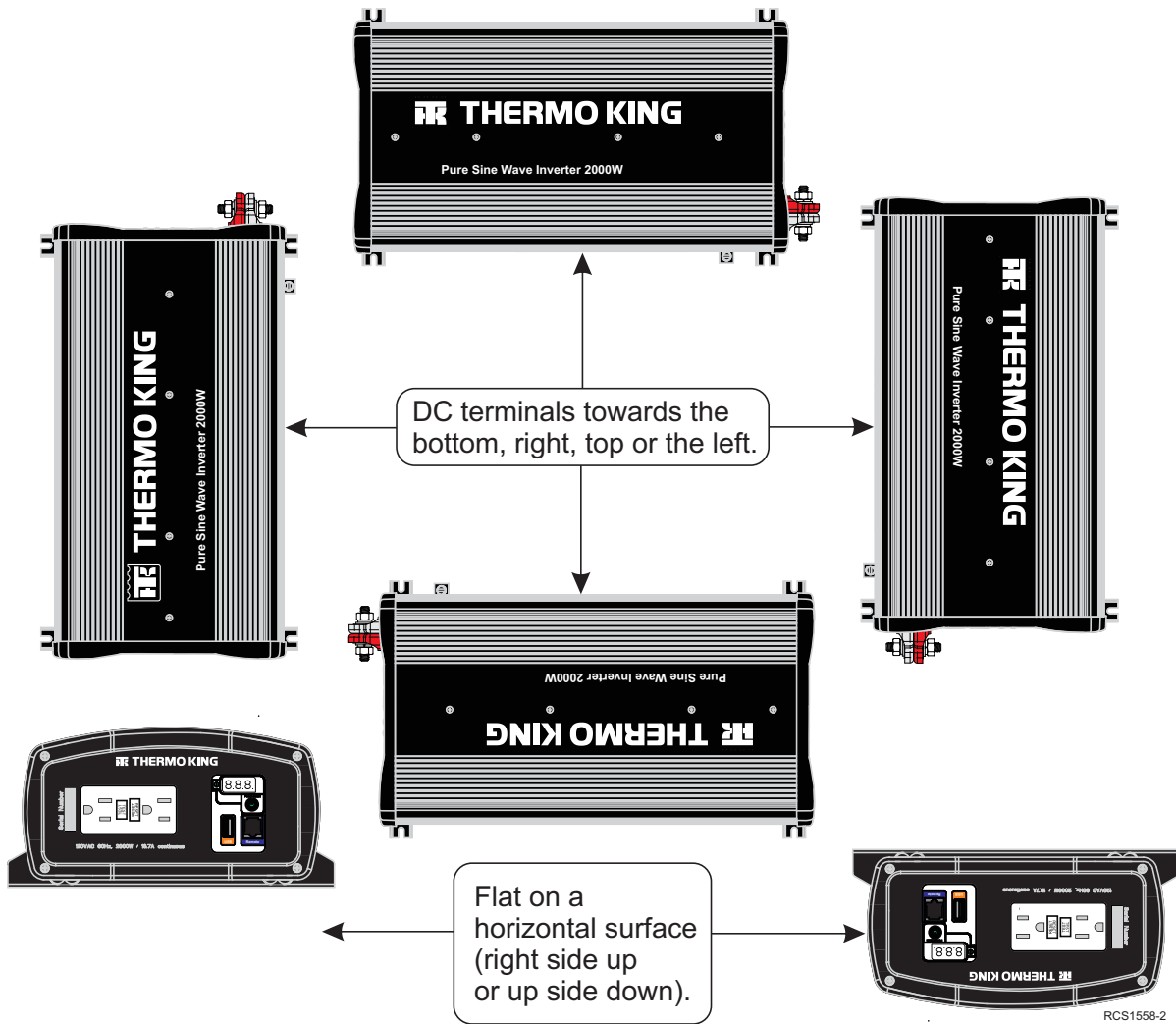
Inverter Location Requirements

Important: Before mounting the inverter, thoroughly read and understand the following important points:

The mounting location chosen must provide the following:

- **Clean and dry** – The inverter is rated “For indoor use only”. It should not be installed in an area that allows dust, fumes, insects, or rodents to enter or block the inverter’s ventilation openings. This area also must be free from any risk of condensation, water, or any other liquid that can enter or fall on the inverter. Inverter failure under these conditions is not covered under warranty.
- **Cool** – The inverter should be protected from direct exposure to the sun or to any equipment that produces extreme heat. The ambient temperature should be between 32°F (0°C) and 104°F (40°C); note that the inverter’s output specifications are rated at 77°F (25°C), so the cooler the better. Prolonged contact to high heat or freezing temperatures will decrease the working life of the unit.
- **Ventilated** – In order for the inverter to provide full output power and avoid over-temperature fault conditions, do not cover or block the inverter’s ventilation openings, or install this inverter in an area with limited airflow. Allow a minimum airspace clearance of 3” (7.6 cm) around the unit to provide optimum ventilation.
- **Safe** – Do not mount the inverter near any flammable or combustible fluid or components, or in locations that require ignition-protected devices.
- **Close to the battery bank** – As with any inverter, it should be located as close to the batteries as possible. Long DC wires tend to lose efficiency and reduce the overall performance of an inverter. However, the unit should not be installed in the same compartment as the batteries or mounted where it will be exposed to gases produced by the batteries. These gases are corrosive and will damage the inverter; also, if these gases are not ventilated and if allowed to collect, they could ignite and cause an explosion.
- **Accessibility** – Do not block access to the front or back of the inverter. Allow room to view any indicators or digital display and to access the AC and DC wiring connections—they will need to be checked and tightened periodically.
- **Orientation** – This inverter has no restriction on the direction on which it can be mounted. It can be mounted on/ underneath a horizontal surface (shelf or table), on a vertical surface (wall or bulkhead) with the DC terminals facing left or right, or towards the top or bottom. Use the base of the inverter’s chassis as a template to mark your mounting screw locations (or, refer to the dimensions). If this unit is used in a mobile application, you may want to place flexible washers or bushings between the mounting surface and the inverter’s mounting flanges to reduce vibration.

Figure 1. Inverter mounting orientations.



In-Line Fuse Requirements

Important: The NEC (National Electrical Code) requires over-current protection for wiring and equipment in both AC and DC circuits.

- The supplied in-line 250 amp fuse holder and fuse must be installed as shown in this manual.
- Fuse replacement must be the same type and amperage as originally provided by Thermo King.

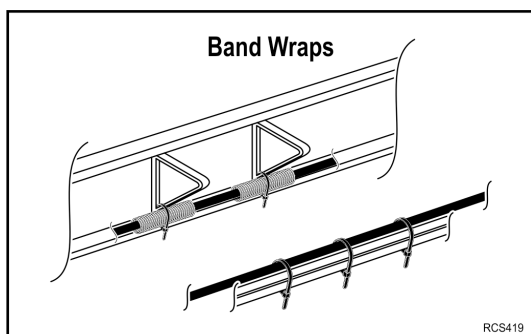
DC Power Cable Requirements

Important: Thoroughly read and understand the following best practices. Taking your time to properly route, secure and connect the DC power cables will go a long way in providing a trouble free inverter operation.

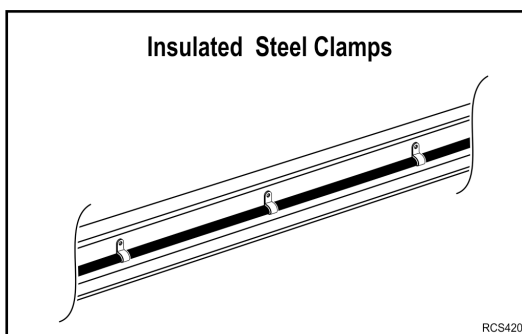
Routing and Securing Cables

All DC power cables must be neatly routed and secured adequately to prevent damage from rubbing, chafing, or making contact with hot or rotating components.

- Band wraps can be used to secure DC power cables to existing vehicle harnesses or frame mounts.
- Secure DC power cables to vehicle's chassis with insulated steel clamps when no existing attaching points are available.
- DC power cables can also be bundled together with other harnesses.



DC power cables should be secured to existing frame mounts or to vehicle's harnesses with band wraps as shown.



DC power cables should be secured to vehicle's frame with insulated clamps as shown.

Routing Cables Through Metal Holes

DC power cables routed through metal holes must be protected from damage and to avoid electrical shorts.

Figure 2. All burrs and sharp edges must also be removed from all holes drilled in metal.

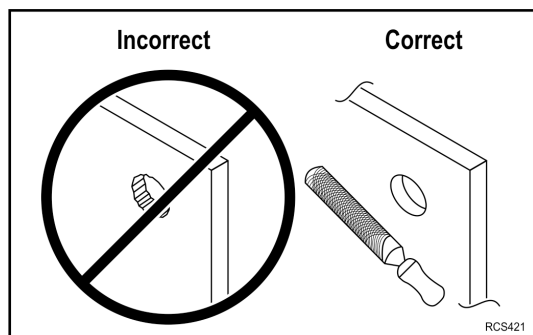


Figure 3. Rubber grommets (installer supplied) must be used to provide protection to DC power cables running through metal holes.

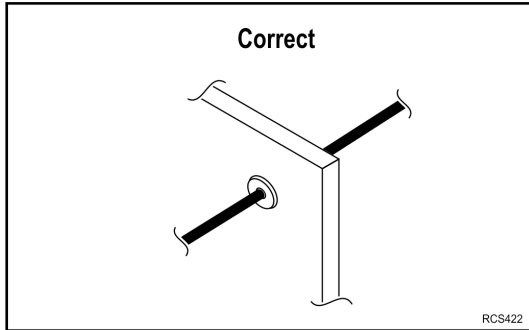
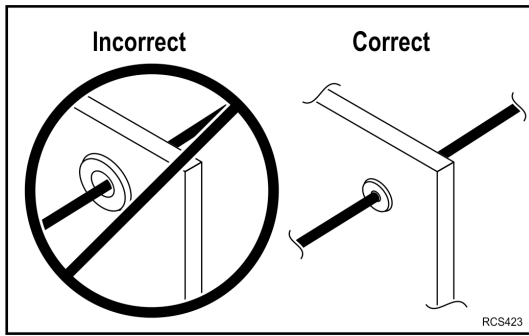


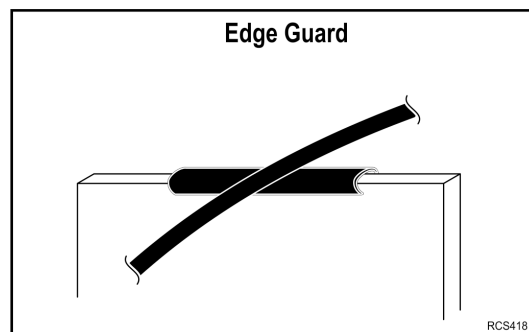
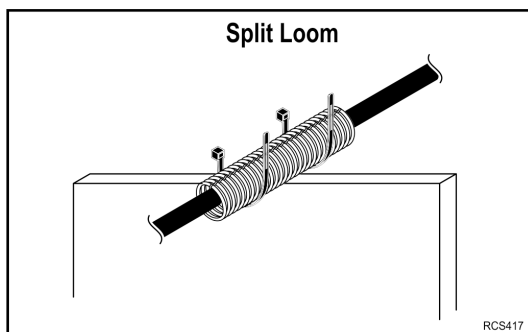
Figure 4. Rubber grommets must be sized correctly for both the hole and for the DC power cable to prevent water intrusion.



Abrasion Protection

Abrasion protective is required on all DC power cables where rubbing and chafing may be an issue. Split loom or edge guard (installer supplied) is recommended to help provide protection. DC power cables should also be secured with band wraps in these areas as well to minimize movement.

- Always keep DC power cables from rubbing or chafing against sharp metal objects, rotating components or hot components.
- Protective covers, split loom, shields or high temperature wraps (installer supplied) should be used if necessary.



Cable Connections

- Turn the inverter's power switch off before connecting battery cables.
- A brief spark or arc may occur when connecting the battery cables to the inverter DC terminals; this is normal and due to the inverter's internal capacitors being charged.
- All DC power cable connections to the inverter must be positive-to-positive and negative-to-negative. A reverse polarity connection (positive to negative) will blow the inverter's internal fuse and might permanently damage the inverter. The fuse is not user replaceable and the inverter will need to be returned for servicing. Damage caused by a reverse polarity connection is not covered by your warranty.
- DO NOT over tighten the nuts on the inverter's DC terminals as they can cause the bolts to strip or break off. Follow the torque requirements specified.
- All DC power cable connections to the battery must be tight. Loose connections can cause excessive voltage drop and can cause overheated cables and melted insulation.
- All DC power cable connections must be clean and dry. DO NOT apply Superlube (or equivalent) between the battery cable lugs and the battery/fuse holder stud, or while installing the cables. Only apply Superlube (or equivalent) after connections are completed and the battery cables are tightly secured.
- The inverter's positive and negative battery cables should be tied together with band wraps, straps, or electrical tape approximately every 6 inches (15.3 cm). This helps improve the surge capability and reduces the effects of inductance, which improves the inverter waveform and reduces the wear of the inverter's filter capacitors. Keeping the battery cables close together also reduces the chance of radio frequency interference.
- Make sure DC power cables have a smooth bend radius and do not become kinked. Follow existing wire runs where possible.
- DC power cables and chassis ground wire must have addition slack from the vehicle chassis to the cab to allow for normal tractor cab movement.
- The battery bank voltage MUST be between 10.5 – 15.5 Vdc for the inverter to operate. If the voltage exceeds 16.0V, the inverter may be damaged.
- To ensure the maximum performance from the inverter, all DC power cable connections from the battery to the inverter should be minimized. The exceptions are the DC fuse in the positive line. Any other additional connection will contribute to additional voltage drops, and these extra connection points may loosen during use.
- The negative battery cable should be connected directly from the inverter negative terminal to the battery negative connection; this ensures the inverter has a reliable return path directly to the battery. **Do not** use the chassis ground in place of the battery negative connection to the inverter.

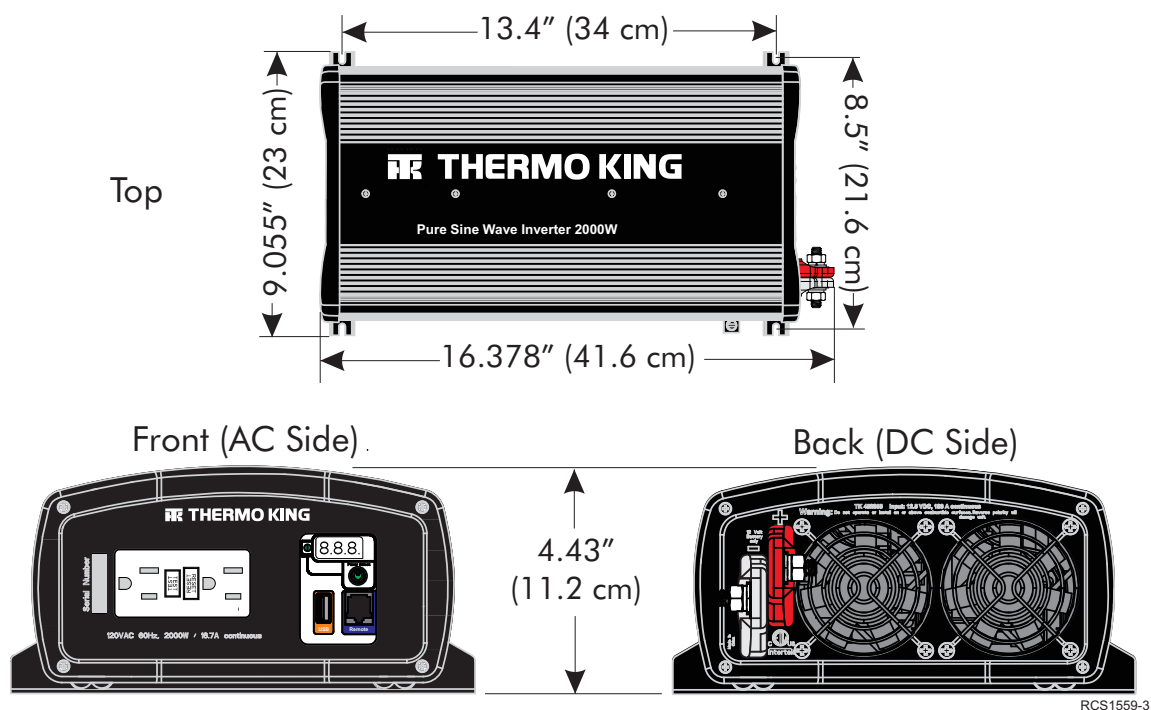
Chassis Ground Requirements

Note: *The NEC (National Electrical Code) requires the grounding conductor for the DC system shall meet the sizing requirements specified in for the application, but no smaller than 8 AWG copper.*

- The supplied 8 AWG ground wire must be installed on to the inverter's ground connection and attached to a permanent, grounded wiring system (i.e., chassis ground). **Do not** use the battery's negative cable connection in place of the chassis ground to the inverter.

Inverter Dimensions

Figure 5. Inverter dimensions.

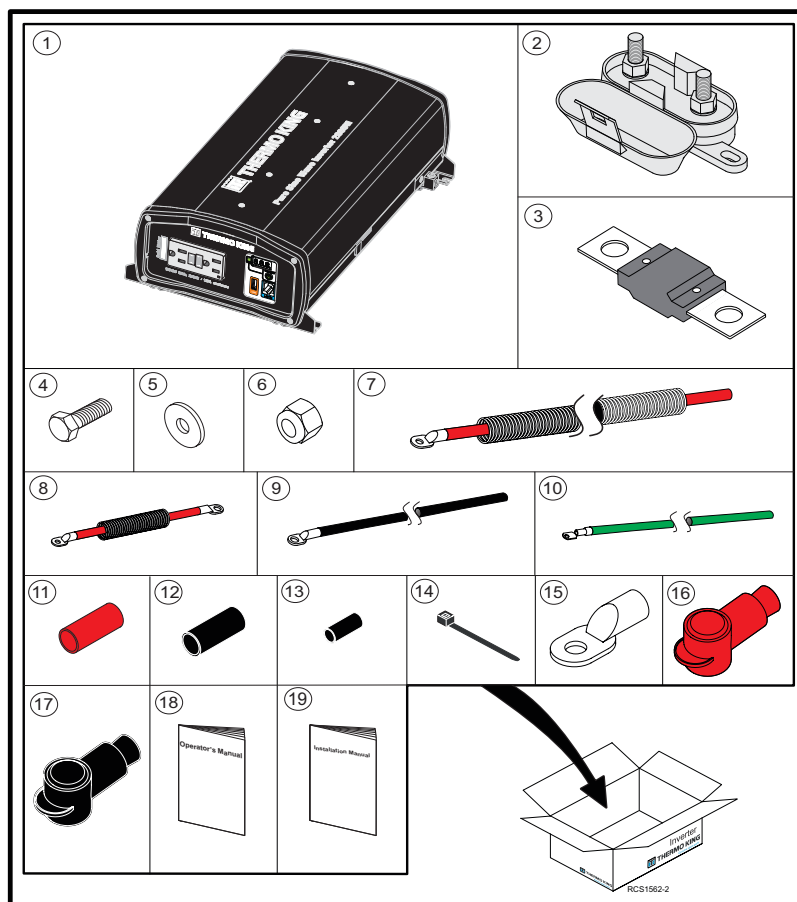


Installation Procedures

Unpack and Inspect Inverter

Note: Notify your Thermo King dealer immediately if components are damaged or missing.

Figure 6. Inverter Kit Components



Item	Description	Qty.	Item	Description	Qty.
1.	Inverter, 2000W Sine Wave	1	11.	Heat Shrink, Red 2.0 in.	1
2.	Holder, Fuse	1	12.	Heat Shrink, Black 2.0 in.	1
3.	Fuse, 250 Amp	1	13.	Heat Shrink, Black 1.50 in.	1
4.	Screw, 1/4-20 SS	2	14.	Band Wraps	6
5.	Washer, flat 1/4 SS	4	15.	Terminal Lug, 5/16, 1/0 AWG	2
6.	Nut, locking 1/4-20 SS	2	16.	Cover, red terminal	1
7.	Cable, Positive 15 ft.	1	17.	Cover, black terminal	1
8.	Cable, Positive 1 ft.	1	18.	Operator's Manual	1
9.	Cable, Negative 16 ft.	1	19.	Installation Manual	1
10.	Ground cable, 10 ft.	1			

Mounting the Inverter

Important: The inverter must be properly secured in the vehicle. **Before** mounting the inverter, thoroughly read and understand the “**Safety Precautions**” and “**Installation Best Practices**” sections in this manual.

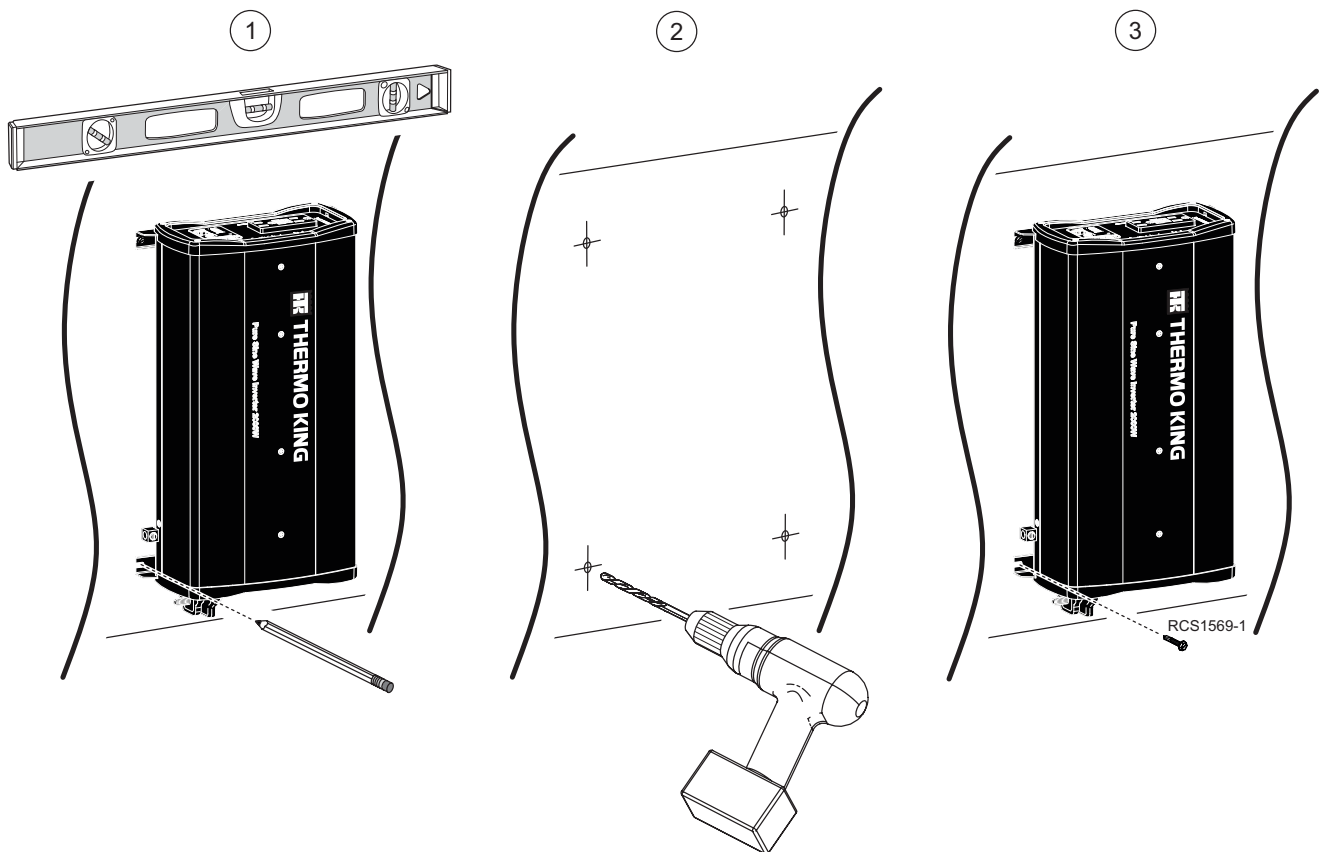
Note: Due to the various mounting surfaces in vehicles, the installer must supply the appropriate fasteners for their particular installation.

Typical inverter installation method shown.

1. Hold inverter level against mounting surface, mark the four (4) mounting locations and remove inverter.
2. Drill appropriate size pilot mounting holes.
3. Secure inverter onto mounting surface with installer supplied fasteners.

Note: An access hole is required for routing the DC power cables and chassis ground wire into the vehicle. It is the installers responsibility to determine the best location for the access hole. After completing the installation, the hole must be properly sealed to prevent exhaust, water, etc. from entering the vehicle.

Figure 7. Typical inverter installation shown.



Installing In-Line Fuse and Battery Cables

Important: Before installing the battery cables, thoroughly read and understand the “**Safety Precautions**” and “**Installation Best Practices**” sections in this manual.

Important: When installing the battery cables and chassis ground wire, additional slack must be provided to allow for normal tractor cab movement.

In-Line Fuse

Important: The supplied 250 amp in-line fuse assembly must be installed as shown.

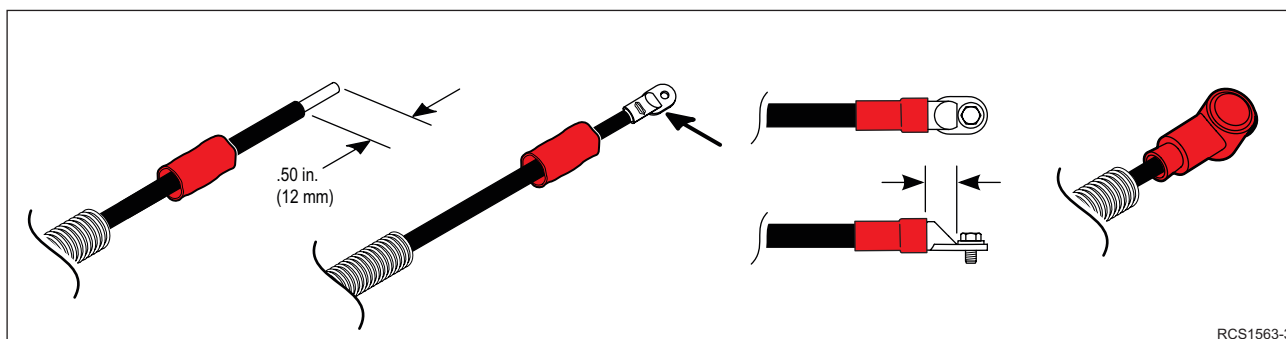
1. Mount fuse holder securely with supplied 1/4–20 hardware and within 12.0 inches (304.8 mm) of the battery and tighten mounting hardware securely (**Figure 9**).
2. Remove nuts from fuse holder studs and install the supplied 250 amp fuse onto the studs. Leave nuts off for now.

Positive Battery Cables

Important: Positive (+) battery cables are identified with **RED** heat shrink at the terminal lug.

1. **15 ft. LONG CABLE** – Attach cable end with terminal lug onto fuse holder stud and reinstall nut (**Figure 9**).
 - a. Tighten fuse holder nut to 10.0 ft-lb (13.5 N•m).
2. Route cable to inverter and cut to desired length (**Figure 8**).
 - a. Strip 1/2 to 3/4 in. (13 to 19 mm) of insulation from cable end.
 - b. Slide supplied red heat shrink onto cable.
 - c. Attach supplied 5/16 terminal lug firmly on end of cable.
 - d. Position heat shrink tubing so it covers part of lug body and use a heat gun to shrink tubing over both cable and lug.
 - e. Slide red terminal cover onto cable.

Figure 8. Attach terminal lug and cover onto positive cable.



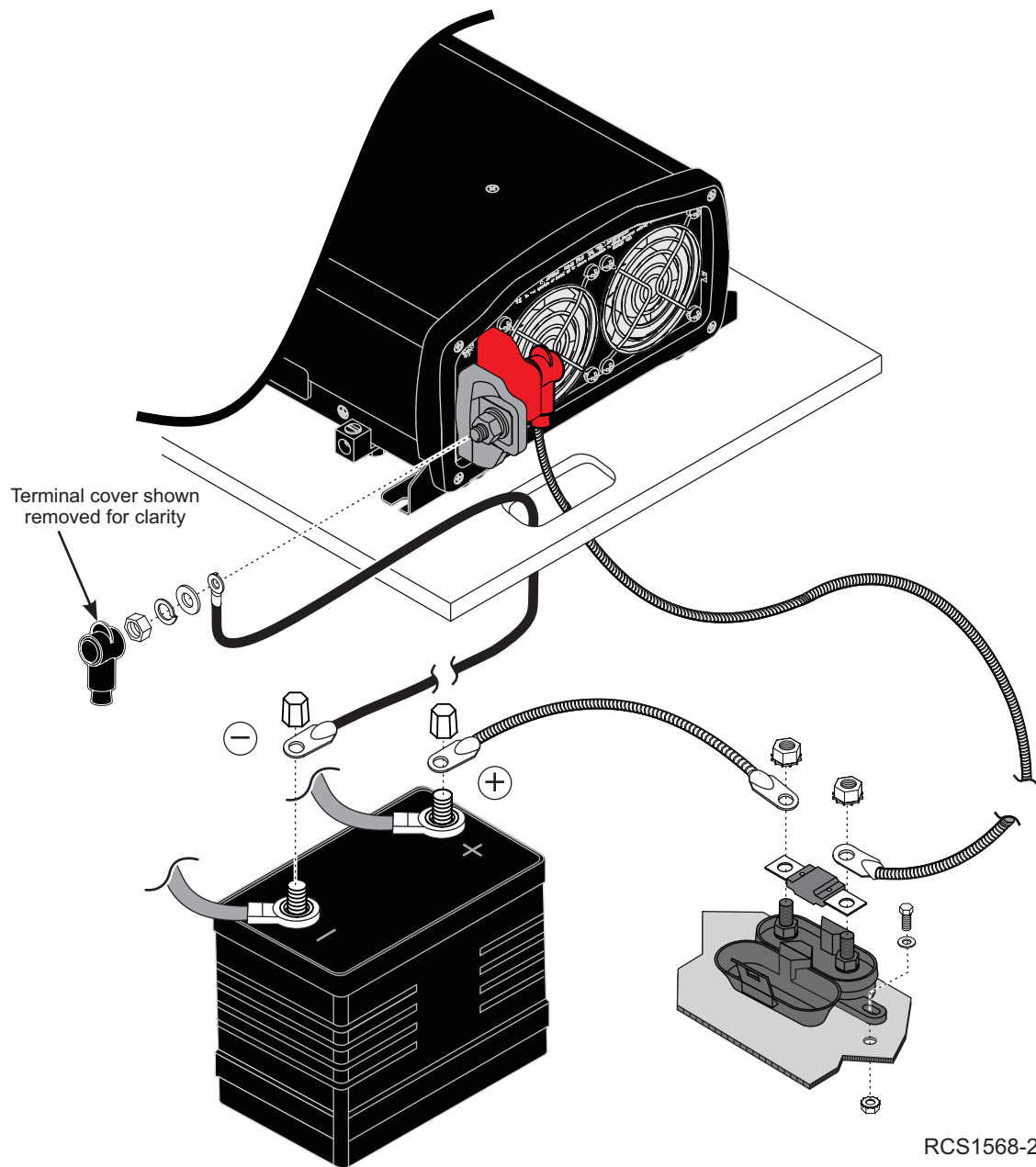
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3. Attach the cable's 5/16" terminal lug onto inverter's positive (+) terminal connection (**Figure 9**).
 - a. Use torque wrench and 13 mm socket and tighten the M8 nut to 16 - 21 ft-lb. (22 - 28 N•m)

Note: Make sure connection is tight so cable lug does not move on inverter's terminal, but do not overtighten.

 - b. Position terminal cover over the terminal connection.
4. **12.00" SHORT CABLE** – This battery cable has two different size lugs. Install lug with **small hole** onto other fuse holder stud and reinstall nut (**Figure 9**).
 - a. Tighten fuse holder nut to 10.0 ft-lb. (13.5 N•m).
 - b. Apply Superlube (or equivalent) onto both studs of fuse holder.
 - c. Close fuse holder cover securely.
5. Install lug with **large hole** onto battery's positive (+) connection and tighten securely (**Figure 9**).
 - a. Apply Superlube (or equivalent) onto battery's positive (+) terminal.

Figure 9. Typical inverter installation shown.

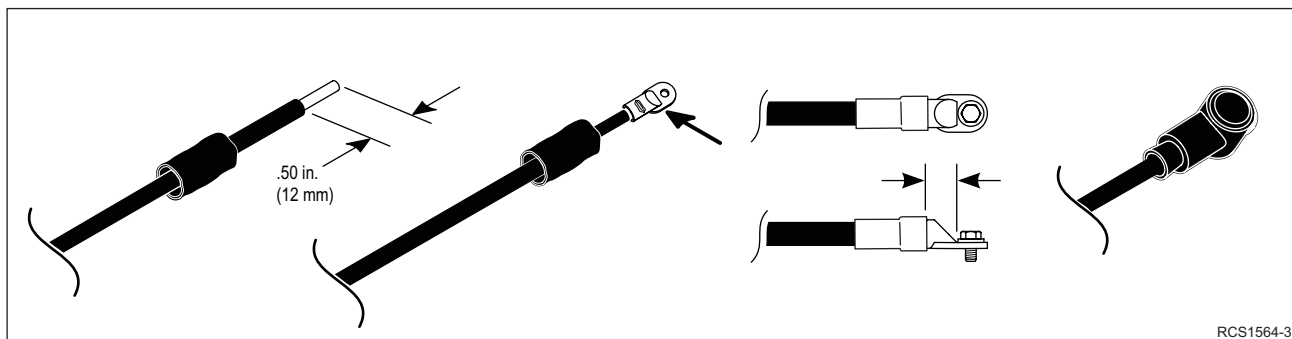


Negative Battery Cable

Important: Negative (-) battery cable is identified with **BLACK** heat shrink at the terminal lug.

1. Place negative battery cable and terminal lug near negative post of battery but **DO NOT** attach the terminal lug to the battery at this time.
2. Route cable to power inverter and cut to desired length (**Figure 10**).
 - a. Strip 1/2 in (12 mm) of insulation from end of cable.
 - b. Slide supplied black heat shrink onto cable.
 - c. Attach supplied 5/16 in. lug firmly to end of cable.
 - d. Position heat shrink tubing so it covers part of the lug body and use a heat gun to shrink tubing over both cable and lug.
 - e. Slide black terminal cover onto cable.

Figure 10. Attach terminal lug and cover onto negative cable.



3. Install the cable's 5/16" terminal lug onto the negative (-) terminal connection of the inverter (**Figure 9**).
 - a. Use torque wrench and 13 mm socket and tighten M8 nut to 16 - 21 ft-lb. (22 - 28 N•m)

Note: Make sure connection is tight so cable lug does not move on inverter's terminal, but do not overtighten.

 - b. Position terminal cover over the terminal connection.
4. At the battery, securely attach negative (-) battery cable lug onto negative (-) battery terminal (**Figure 9**).
 - a. Apply Superlube (or equivalent) onto battery's negative terminal.
5. Properly route and secure all cables with provided band wraps.

Installing Chassis Ground Wire

Important: Before installing the chassis ground wire, thoroughly read and understand the “Safety Precautions” and “Installation Best Practices” sections in this manual.

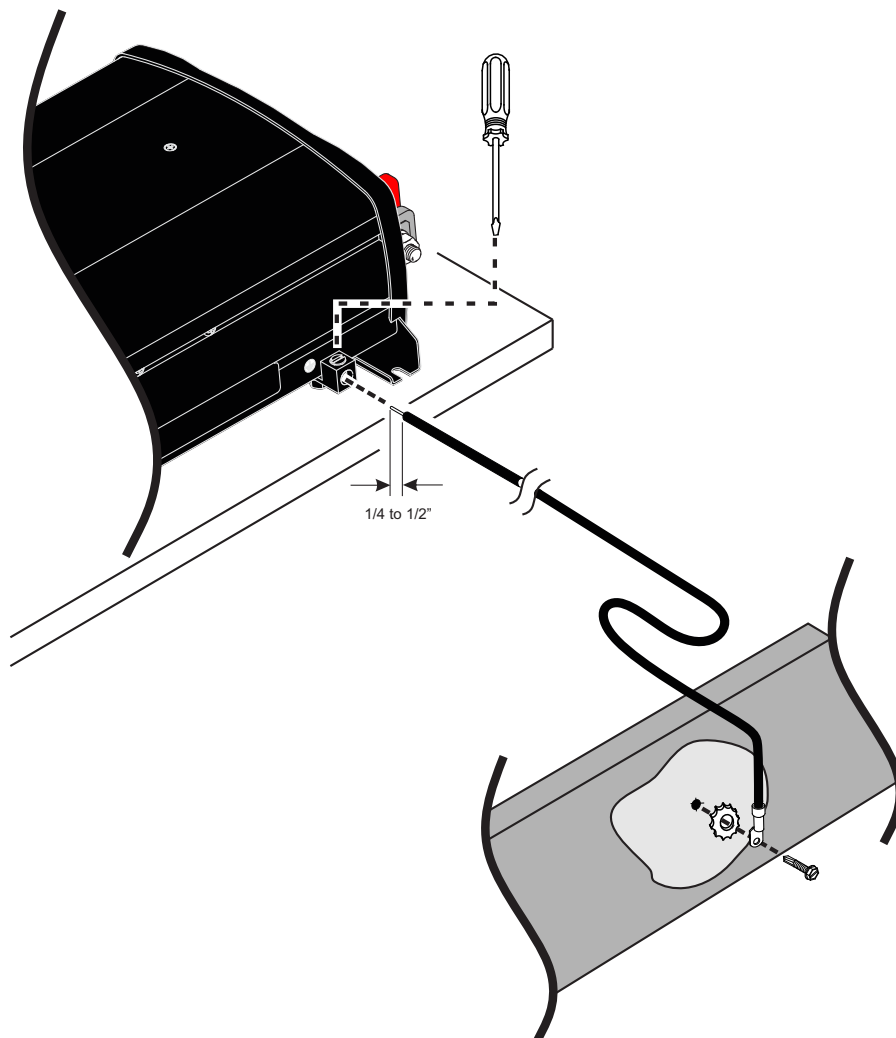
Important: The supplied ground wire must be connected from the inverter ground lug to the vehicle chassis ground. Additional slack must be provided to allow for normal tractor cab movement.

1. Locate a suitable ground location (i.e., vehicle’s chassis) and thoroughly clean the surface area of any paint, rust, etc.
2. The supplied 8 AWG ground wire has a terminal ring attached to one end. Attach terminal ring to the chassis ground location with installer supplied hardware.

Note: It is recommended that an external star washer be installed between the chassis and the terminal ring as shown for best ground connection.

3. Route ground wire from the chassis ground to the inverter’s ground lug and cut wire to desired length.
 - a. Strip 1/4 in. (6.5 mm) of insulation from end of wire.
 - b. Loosen ground lug retaining screw, insert ground wire into lug and retighten lug screw to 40 in-lb (4.5 N•m).
4. Properly route and secure ground wire with provided band wraps.

Figure 11. Inverter to chassis ground.



Testing Inverter Operation

Inverter Functional Test

Follow these steps to test the inverter's operation:

1. Press and hold the Power/Select button until a beep sound is heard (about 1 second) — the GREEN status light will illuminate.
2. Plug a small AC load (e.g., 40W light bulb) into the GFCI's outlet.
3. Confirm the digital display alternately shows the inverter's measured battery voltage and output power.
4. Confirm the AC load is on (i.e., the bulb lights).

Note: If the bulb does not light, the GFCI may have tripped. Reset the GFCI by pressing the RESET button.

If the inverter passes all steps, it is functioning properly and ready for use.

If the inverter fails any of the steps, refer to the Troubleshooting section.

GFCI Function Test

Follow these steps to test the GFCI operation:

1. Press and hold the Power/Select button until a beep sound is heard (about 1 second) — the GREEN status light will illuminate.
2. Plug a small AC load (e.g., 40W light bulb) into the GFCI's outlet.
3. Verify the AC load is on (i.e., the bulb lights).
4. Press the GFCI's TEST button — the GFCI's RESET button should pop out and the power should shut off (light bulb goes out).

Note: If the bulb remains lit or the RESET button does not pop out, the GFCI may not be functioning properly.

5. Press the RESET button — the AC load should come back on (the bulb lights again).

Troubleshooting

Use the Table 2 to troubleshoot your inverter. Use Table 3 to view the unit's digital display to determine what condition triggered the error/warning code and what corrective action is needed.

Table 1. Troubleshooting Guide

Problem	Symptom	Solution
No AC output. Status indicator is off.	The inverter is off.	Turn on the inverter.
	No power to inverter.	Check if fuse or disconnect switch (if installed) is either blown or turned off.
No AC output. Status indicator is GREEN.	GFCI was tripped.	Check the connected load and reset the GFCI.
No AC output. Status indicator is RED	Inverter has detected a fault and has shut down.	Determine and resolve the fault condition (e.g., high or low voltage, load too large, or over-temperature).
		Check error code on the display. Refer to " Inverter Error Codes Table ".

Table 2. Inverter Error Codes

Code	Condition	Corrective Action
E01	Inverter has sensed the input voltage is low (<10.5 VDC) and has shut down.	Immediately recharge the battery (to at least 11.8 VDC), and then restart inverter.
E02	Inverter has sensed the input voltage is high (≥ 15.5 VDC) and has shut down.	Check the battery voltage, or if an external charger is connected to the battery bank.
E03	Inverter output has sensed an overload or short circuit and was shut down.	Check the load connected to the output. Reduce the load and restart the inverter.
E04	Inverter has sensed the internal temperature was high and has shut down.	Turn inverter off and wait 15 minutes before restarting. Check inverter for blocked ventilation and air flow.
E05	Inverter has sensed the input voltage is low and has initiated a warning alarm (@11.2 VDC).	The alarm will continue until the battery has been recharged to ≥ 11.8 VDC.
E06	Inverter has sensed the connected load is close to the overload shutdown limit.	Reduce the connected load.
E07	Inverter has sensed the internal temperature is high and close to the thermal shutdown limit.	Reduce load and check inverter for blocked ventilation and air flow.

Thermo King – by Trane Technologies (NYSE: TT), a global climate innovator – is a worldwide leader in sustainable transport temperature control solutions. Thermo King has been providing transport temperature control solutions for a variety of applications, including trailers, truck bodies, buses, air, shipboard containers and railway cars since 1938. For more information, visit www.thermoking.com or www.tranetechnologies.com.

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