



Operator's Manual

2000W Pure Sine Wave Power Inverter

Model 452855

Revision A

July 2020

TK 56838-8-OP-EN

TRANE
TECHNOLOGIES

Introduction

There is nothing complicated about operating and maintaining your Thermo King power inverter, but a few minutes studying this manual will be time well spent.

All service requirements, major and minor, should be handled by a Thermo King dealer for four very important reasons:

- They are equipped with the factory recommended tools to perform all service functions.
- They have factory trained and certified technicians.
- They have genuine Thermo King replacement parts.
- The warranty on your new inverter is valid only when the repair or replacement of component parts is performed by an authorized Thermo King dealer.

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.

Sale of product shown in this manual is subject to Thermo King's terms and conditions including, but not limited to, the THERMO KING LIMITED EXPRESS WARRANTY. Such terms and conditions are available upon request. 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.

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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General 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

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.

General Safety Precautions

⚠ WARNING

Equipment Damage and Risk of Injury !

Do not operate the Thermo King Inverter if it has received a sharp blow, been dropped, or otherwise damaged in any way. Equipment failure, vehicle damage, or serious injury may result.

⚠ WARNING

Equipment Damage and Risk of Injury !

Do not expose the Thermo King Inverter to rain, snow, moisture, or liquids of any type. Equipment failure, vehicle damage, or serious injury may result.

⚠ WARNING

Fire Hazard!

Do not cover or obstruct the Thermo King Inverter ventilation openings or install inverter in a zero-clearance compartment. Fire, equipment failure, vehicle damage, or serious injury may result.

⚠ WARNING

Fire Hazard!

Routinely inspect the Thermo King Inverter power cables for physical damage or loose connections or broken connections. Fire, equipment failure, vehicle damage, or serious injury may result.

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.

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



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Inverter Features

Overview

The Thermo King 2000W power inverter is a “pure” sine wave inverter designed to be powerful, yet simple to operate, and will provide you with reliable AC power for trouble-free use. Please take the time to read this manual to familiarize yourself with the features and benefits of your inverter.

When the inverter is properly connected to batteries and turned on, the direct current (DC) from the batteries is transformed into 2000 watts of continuous, pure sine wave alternating current (AC). This AC is similar to the voltage provided by your utility and is used to power any electrical appliances (i.e., AC loads) connected to the inverter’s output, e.g., microwaves, TVs, laptop computers, etc.

Figure 1. Thermo King 2000W Power Inverter

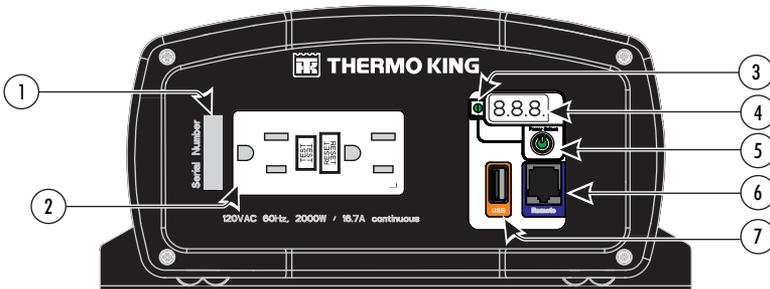


Front and Rear Panel Features

Front Panel features:

1. **Serial Number** – the unique identification number assigned to each inverter. This number needs to be recorded for warranty registration.
2. **GFCI** – a Ground Fault Circuit Interrupter protected AC outlet. The GFCI outlet quickly stops the flow of electricity in the event a ground fault occurs on the device that is plugged into the inverter.
3. **Status Indicator** – a green, red, or amber LED provides the inverter’s status.
4. **Digital Display** – a three-character alphanumeric display that shows the inverter’s measured battery voltage, total AC output power, and any error or warning codes.
5. **Power/Select Button** – a momentary button switch that allows the inverter to be quickly turned on or off.
6. **Remote Port** – not used.
7. **USB Port** – allows USB devices to be powered and charged.

Figure 2. Front Panel



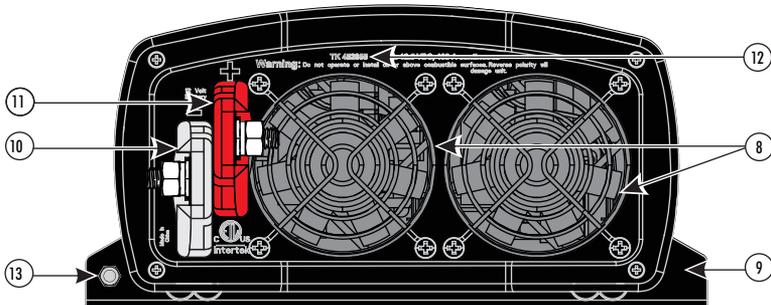
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Inverter Features

Rear Panel features:

8. **Cooling Fans** – intake cooling fans automatically turn on when the inverter’s internal temperature rises above a safe level, and turn off when the inverter’s internal temperature falls to a safe level.
9. **Mounting Flanges** (front and rear) – used to mount and secure the inverter to a shelf/wall.
10. **DC Negative Terminal (black)** – the inverter’s connection to the negative terminal on the 12 VDC battery bank.
11. **DC Positive Terminal (red)** – the inverter’s connection to the positive terminal on the 12 VDC battery bank.
12. **Model Number** – the model number of the inverter and other information.
13. **DC Chassis Ground Connection** – the connection is used to connect the chassis of the inverter to the vehicle’s ground. The grounding system could be the vehicle’s chassis, the grounding bus, or to the engine’s negative bus.

Figure 3. Rear Panel



Operating Inverter

Turning Inverter On and Off

1. Connect electrical device into inverter's GFCI outlet.
2. To turn the inverter on, press and hold the power/select button for 1 second until you hear a "beep".
 - The status indicator light will illuminate to indicate the inverter's status.
 - The digital display will alternately show the unit's measured battery voltage and AC output power.
3. To turn the inverter off, press the power/select button.

Important: *The power/select button is not a power disconnect switch and will not remove the DC power from the inverter. Disconnect all power to the inverter before working on the inverter.*

Status Indicator

When the inverter is on, the indicator may illuminate green, amber, or red to display the inverter's status:

- **Green** – inverter is operating normally.
- **Amber** – a warning has been detected. Inverter will shut down at any time. Check the error code on the digital display.
- **Red** – an error has been detected and the inverter has shut down. Check the error code on the digital display.

Note: *When the status indicator light is amber or red, use the digital display and the troubleshooting tables (starting on page 19) to resolve the issue.*

Digital Display

The digital display has one line of three alphanumeric characters that alternately shows the inverter's measured battery voltage (in volts) and AC output power (in kilowatts) under normal operating conditions. It also displays error/warning codes that alert you to problems with the inverter, and are used in conjunction with the troubleshooting tables (starting on page 19) to resolve any operating issues. See Table below.

Table 1. Examples of Digital Display Readings

Display	Meaning
12.5	Measured battery voltage.
0.80	Total AC output power in kW (800W as shown).
E01	Error or warning code. See Troubleshooting section for details.

Remote Port

The remote port is not used.

USB Port

The USB Port enables you to power and charge a USB device (provides 5 VDC/2.1 A).

Important: *Some USB powered products may be damaged when connected to this USB port. If in doubt, check with the product's manufacturer.*

GFCI Outlet

Two GFCI-protected AC outlets are used to power an AC load. It also protects the user against hazardous electrical shocks.

Understanding Electrical Loads

The inverter can power most electrical loads within its power rating, however, there are special conditions that can cause a load to behave differently than expected. Following are some common problems encountered when using an inverter.

USB loads – Be sure the device you will be connecting to the USB port will accept 5 volts (≤ 2.1 amps) and can be charged or powered using another power source. The USB port can safely power and charge devices such as: MP3 players, mobile phones, and portable video game players. However, some devices such as GPS receivers and some cameras may not work and may even be damaged. Refer to the owner's guide for each device to determine its compatibility.

Motor loads not starting – Some appliances, particularly those with induction motors, require a much higher start-up surge than they do when running. Pumps, freezers and refrigerators (compressors) are the most common. The inverter may not be able to start some of these appliances even though their rated current draw is within the inverter's limits. If your motor-operated appliance refuses to start, observe the VOLTS indicator on the digital display while you are trying to start the appliance. If display shows a battery drop below 11 volts while the inverter is trying to start the motor, this may explain why the appliance won't run. Make sure the length and diameter of the battery cables are appropriate. Check that the battery connections are good and that the battery is fully charged. If the cables are sized correctly, the connections are good, and the battery is charged, you may need a larger battery bank (see Loads turning on and off).

Loads turning on and off – If a load starts but quickly turns off, then the battery may not be able to deliver the necessary amperage to drive the load. If the battery bank cannot deliver the necessary amperage to drive a heavy load, the inverter will shut OFF due to low voltage (< 10.5 VDC). The battery voltage can then slowly rise back above the low voltage reconnect voltage (11.8 VDC) causing the inverter to resume operation. As soon as the heavy load draws the batteries down, this cycle will continue unless the load is reduced or more batteries are added.

Loads too large – Although the inverter can provide high surge power up to two times the rated output power, some appliances may still trigger the inverter shutdown/protection system. In these instances, a higher power inverter may be required.

Running several loads at once – Sometimes the total surge requirement of all the loads is higher than the inverter can deliver. You may want to turn

Understanding Electrical Loads

them on individually to ensure that the inverter does not have to deliver the starting current for all the loads at once.

Inverter Care and Maintenance

Routine maintenance is all that is required to keep your Thermo King power inverter operating properly.

Periodically you should:

- Clean the exterior of the inverter with a damp cloth to prevent the accumulation of dust and dirt.
- Clean the inverter's cooling fans by using canned air designed for electronics or a small vacuum. Do not disassemble the inverter to clean the fans.

***Note:** When using compressed air, try to position the air stream in a way that helps the dust and dirt escape the inverter and not inside the housing.*

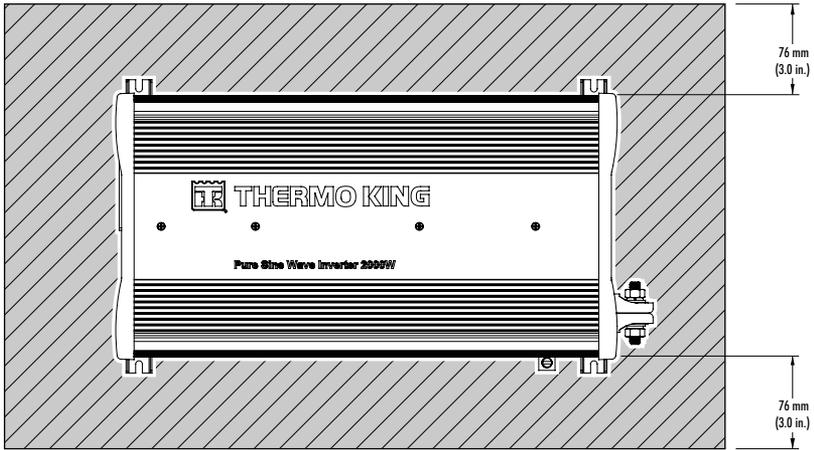
- Tighten the screws on the DC input terminals on the inverter.
- At the battery, check the in-line fuse cable connections and battery cable connections and tighten as necessary.
- Keep metal objects from coming in contact with the DC power connections at the back of the inverter.

Ventilation Requirements

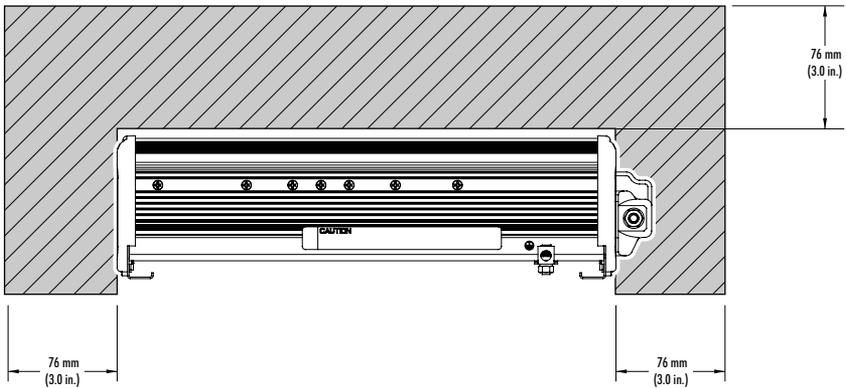
Poor or restricted ventilation around the inverter will cause it to overheat and shutdown. The illustration (Figure 4) shows the "KEEP OUT" areas around the inverter that must always be kept open for proper ventilation.

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Inverter Care and Maintenance

Figure 4. Keep Out Area shown



KEEP OUT OF AREA - NO OBSTRUCTIONS WITHIN SHADED AREA



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).

Testing Inverter Operation

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 2. 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 3. 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.

Testing Inverter Operation

Table 3. Inverter Error Codes (continued)

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.

Specifications

Electrical Specifications	
Continuous Power*	2000 W
Surge Power (Peak)**	4000 W
AC Output Voltage (12.5V)	120 VAC RMS \pm 5%
AC Output Current	16.6 AAC
AC Output Voltage Range	104-127 VAC
AC Output Frequency	60 Hz \pm 0.5 Hz
AC Output Waveform	Pure sine wave (<3% THD)
AC Output Receptacle	NEMA 5-15, Dual GFCI with LED indicator
Optimum Efficiency	>90%
DC Input Voltage (Nominal)	12.5 VDC
DC Operation Voltage Range ***	10.5 – 15.5 VDC
DC Input Current (Full Load)	187 DCA
DC Input Current (No Load)	<1.2 ADC
DC Output (USB port)	5V, 2.1A
Protection	
Low Voltage Alarm	11.2 VDC
Low Voltage Shutdown	10.5 VDC
Low Voltage Recovery	11.8 VDC
High Voltage Shutdown ***	15.5 VDC
Output Power Warning	Yes, with warning code
Output Power Shutdown	Yes, with shutdown code
Temperature Warning	Yes, with warning code
Temperature Shutdown	Yes, with shutdown code
Display Specifications	


THERMO KING
Specifications

LED Status Indicator	<p>Green – inverter is operating normally.</p> <p>Amber – a warning has been detected. Inverter will shut down at any time. Check the error code on the digital display.</p> <p>Red – an error has been detected and the inverter has shut down. Check the error code on the digital display.</p>
Digital display	volts in, power out, error codes
General Specifications	
Operating Temperature	32°F to 104°F (0°C to 40°C)
Inverter Weight	11.5 lb (5.2 kg)
Inverter Size (L x W x H)	16.378 x 9.055 x 4.43" (41.6 x 23.0 x 11.2 cm)
Regulatory Approval	
Conforms to UL STD 458, Certified to CSA STD C22.2 No. 107.1	
<p>*Specifications met when DC voltage at nominal (12.5V) and temp at 25°C. **Surge ratings are based on resistive load (output voltage may drop). ***Damage can occur if input voltage exceeds 16 VDC.</p>	

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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