THERMO KING

Operator's Manual

e1000 Single Temperature Unit
International® eMV™

Revision A

April 2025

TK 57504-1-OP-EN

TRANE TECHNOLOGIES

Introduction

This manual is published for informational purposes only and the information furnished herein should not be considered as all-inclusive or meant to cover all contingencies. If more information is required, consult your Thermo King Service Directory for the location and telephone number of the local dealer.

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.

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

Performing pre-trip checks and enroute inspections on a regular basis will minimize operating problems. A regular maintenance program will also help to keep your unit in top operating condition. If factory recommended procedures are followed, you will find that you have purchased the most efficient and dependable temperature control system available.

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 unit is valid only when the repair and replacement of component parts is performed by an authorized Thermo King dealer.

Software License

TK Americas: The product includes software that is licensed under a non-exclusive, non-sublicensable, terminable and limited license to use the software as installed on the product for its intended purpose. Any removal, reproduction, reverse engineering, or other unauthorized use of the software is strictly prohibited. Hacking the product or installing unapproved software may void the warranty. The owner or operator shall not reverse engineer, decompile, or disassemble the software, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation. The product may include third party software separately licensed as specified in any documentation accompanying the product or in an about screen on a mobile application or website that interfaces with the product.

Image Disclaimer

The images shown in this manual are for illustrative purposes only and may not accurately depict the actual item.

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Safety Precautions

Danger, Warning, Caution, and Notice

Thermo King® recommends that all service be performed by a Thermo King dealer and to be aware of several general safety practices.

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this unit depend upon the strict observance of these precautions. The four types of advisories are defined as follows:

⚠ Danger

Hazard!

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

⚠ Warning

Hazard!

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

⚠ Caution

Hazard!

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

Notice

Hazard!

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

General Safety Practices

⚠ Danger

Hazardous Voltage!

This unit is equipped with high voltage electrical components capable of causing serious injury or death. ONLY qualified individuals should service, repair, or replace any of the electrical power system components, including fuses.

⚠ Danger

Risk of Injury!

Improper servicing can lead to fire, electrocution, or explosion. Never service, repair, or troubleshoot a system unless you are a professional service person.

⚠ Danger

Hazardous Gases - Personal Protective Equipment (PPE) Required!

Refrigerant in the presence of an open flame, spark, or electrical short produces toxic gases that are severe respiratory irritants which can cause serious injury or possible death. When working with or around hazardous chemicals, ALWAYS refer to the applicable Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

⚠ Warning

Risk of Injury!

When using ladders to install or service refrigeration systems, always observe the ladder manufacturer's safety labels and warnings. A work platform or scaffolding is the recommended method for installations and servicing.

⚠ Warning

Risk of Injury!

Never operate the unit unless you completely understand the controls; otherwise serious injury may occur.

⚠ Caution

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

⚠ Caution

Risk of Injury!

Avoid direct contact with hot coolant.

Electrical Hazards

High Voltage

⚠ Danger

Hazardous Voltage!

This unit is equipped with high voltage electrical components capable of causing serious injury or death. ONLY qualified individuals should service, repair, or replace any of the electrical power system components, including fuses.

Low Voltage

⚠ Warning

Live Electrical Components!

Control circuits used in refrigeration units are low voltage (12 to 48 Vdc). However, the large amount of amperage available can cause severe burns if accidentally shorted to ground with metal objects, such as tools. Do not wear jewelry, watches, or rings because they increase the risk of shorting out electrical circuits and damaging equipment or causing severe burns. If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other local, state, or country-specific requirements for arc flash protection PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASHING CLOTHING. ELECTRICAL METERS AND EQUIPMENT MUST BE PROPERLY RATED FOR INTENDED VOLTAGE.

Refrigeration System Hazards

In the United States all technicians who maintain, service, repair, or dispose of equipment that could release refrigerants into the atmosphere must be EPA 608 certified. Thermo King recommends all service be performed by a Thermo King dealer.

⚠ Danger

Hazardous Gases - Personal Protective Equipment (PPE) Required!

Refrigerant in the presence of an open flame, spark, or electrical short produces toxic gases that are severe respiratory irritants which can cause serious injury or possible death. When working with or around hazardous chemicals, ALWAYS refer to the applicable Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

⚠ Danger

Refrigerant Vapor Hazard!

Do not inhale refrigerant. Use caution when working with refrigerant or a refrigeration system in any confined area with a limited air supply. Refrigerant displaces air and can cause oxygen depletion, resulting in suffocation and possible death. When working with or around hazardous chemicals, ALWAYS refer to the applicable Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

⚠ Warning

Personal Protective Equipment (PPE) Required!

Refrigerant in a liquid state evaporates rapidly when exposed to the atmosphere, freezing anything it contacts. Wear butyl lined gloves and other clothing and eye wear when handling refrigerant to help prevent frostbite. When working with or around hazardous chemicals, ALWAYS refer to the applicable Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

Refrigerant Oil Hazards

⚠ Warning

Personal Protective Equipment (PPE) Required!

Protect your eyes from contact with refrigerant oil. The oil can cause serious eye injuries. Protect skin and clothing from prolonged or repeated contact with refrigerant oil. To prevent irritation, wash your hands and clothing thoroughly after handling the oil. Rubber gloves are recommended. When working with or around hazardous chemicals, ALWAYS refer to the applicable Material Data Safety Sheets (MSDS) and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling instructions.

Notice

Material Damage!

Wipe up spills immediately. Refrigerant oil can damage paints and rubber materials.

Automatic Start/Stop Operation

⚠ Caution

Risk of Injury!

The unit can start and run automatically any time the unit is turned on. Units start automatically in both Cycle Sentry mode and Continuous mode. Turn the unit On/Off switch Off and disconnect the battery before doing inspections or working on any part of the unit.

⚠ Caution

Risk of Injury!

Thermo King units may have options that allow for remote starting from a fully off state. Turn the unit On/Off switch Off and disconnect the battery before doing inspections or working on any part of the unit.

Units Equipped With Telematics

⚠ Warning

Risk of Injury!

Thermo King units equipped with two–way communications can be turned on and off from remote locations at any time via satellite or cellular phone. Once turned on, the units can start and run automatically at any time.

Safety Nameplates

Safety nameplates are located throughout the unit and on certain individual components. These nameplates identify particular danger, warning, and caution areas that must be observed when working on or servicing the unit.

Figure 1. Proposition 65 Nameplate

RCS1032

Figure 2. Automatic Start Warning Nameplate

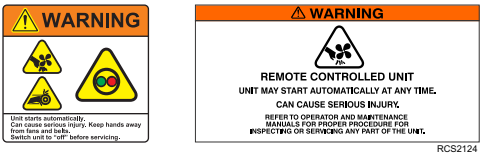

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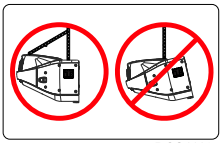
Figure 3. Caution Lifting Nameplate

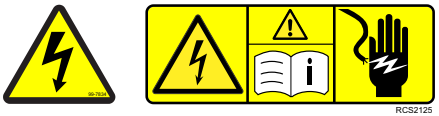


RCS1112

Figure 4. Caution No Grab No Step Nameplate

RCS1116

Figure 5. High Voltage Nameplates



RCS2125

Figure 6. Hot Surface Nameplate

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First Aid

REFRIGERANT

- **Eyes:** For contact with liquid, immediately flush eyes with large amounts of water and get prompt medical attention.
- **Skin:** Flush area with large amounts of warm water. Do not apply heat. Remove contaminated clothing and shoes. Wrap burns with dry, sterile, bulky dressing to protect from infection. Get prompt medical attention. Wash contaminated clothing before reuse.
- **Inhalation:** Move victim to fresh air and use Cardio Pulmonary Resuscitation (CPR) or mouth-to-mouth resuscitation to restore breathing, if necessary. Stay with victim until emergency personnel arrive.
- **Frost Bite:** In the event of frost bite , the objectives of First Aid are to protect the frozen area from further injury, warm the affected area rapidly, and to maintain respiration.

REFRIGERANT OIL

- **Eyes:** Immediately flush with large amounts of water for at least 15 minutes. Get prompt medical attention.
- **Skin:** Remove contaminated clothing. Wash thoroughly with soap and water. Get medical attention if irritation persists.
- **Inhalation:** Move victim to fresh air and use Cardio Pulmonary Resuscitation (CPR) or mouth-to-mouth resuscitation to restore breathing, if necessary. Stay with victim until emergency personnel arrive.
- **Ingestion:** Do not induce vomiting. Immediately contact local poison control center or physician.

BATTERY ACID

- **Eyes:** Immediately flush with large amounts of water for at least 15 minutes. Get prompt medical attention. Wash skin with soap and water.
- **Skin:** Immediately remove contaminated clothing. Wash skin with large volumes of water, for at least 15 minutes. Wash skin with soap and water. Do not apply fatty compounds. Seek immediate medical assistance.
- **Inhalation:** Provide fresh air. Rinse mouth and nose with water. Seek immediate medical assistance.

- **Ingestion:** If the injured person is fully conscious: make the person drink extensive amounts of milk. Do not induce vomiting. Take the injured person immediately to a hospital.

ELECTRICAL SHOCK

Take IMMEDIATE action after a person has received an electrical shock. Get quick medical assistance, if possible.

The source of the shock must be quickly stopped, by either shutting off the power or removing the victim. If the power cannot be shut off, the wire should be cut with an non-conductive tool, such as a wood-handle axe or thickly insulated cable cutters. Rescuers should wear insulated gloves and safety glasses, and avoid looking at wires being cut. The ensuing flash can cause burns and blindness.

If the victim must be removed from a live circuit, pull the victim away with a non-conductive material. Use wood, rope, a belt or coat to pull or push the victim away from the current. DO NOT TOUCH the victim. You will receive a shock from current flowing through the victim's body. After separating the victim from power source, immediately check for signs of a pulse and respiration. If no pulse is present, start Cardio Pulmonary Resuscitation (CPR). If a pulse is present, respiration might be restored by using mouth-to-mouth resuscitation. Call for emergency medical assistance.

ASPHYXIATION

Move victim to fresh air and use Cardio Pulmonary Resuscitation (CPR) or mouth-to-mouth resuscitation to restore breathing, if necessary. Stay with victim until emergency personnel arrive.

Unit Description

The e1000 is an all-electric, zero emissions transport refrigeration system designed specifically for installation onto Battery Electric Vehicles (BEV). This single temperature heating and cooling unit is powered from a direct DC connection to the vehicle's chassis electrical system. The condensing portion of the unit is mounted on to the front of the truck cargo box with the evaporator portion protruding into the box.

The e1000 utilizes the vehicle's DC power supply when either mobile or stationary when charging and only requests vehicle power when needed.

All-new high voltage architecture utilizes variable speed compressor and fans. Optimized control algorithms provide maximum efficiency by continuously monitoring functions and unit's performance to reduce battery consumption all while maintaining temperature of the cargo.

The onboard Pretrip unit self–check feature can be run before beginning the daily distribution route to identify any possible unit malfunctions and help prevent down time.

Telematics as a standard feature allows pull up data insights and energy consumption reports along with over-the-air-updates.

Figure 7. e1000 unit shown

RCS2042

Standard Features

- All-electric operation
- Microprocessor controller designed exclusively for transport refrigeration systems
- Easy-to-use HMI controller with graphic color screen
- Continuous temperature and battery voltage monitoring
- Variable speed scroll compressor and evaporator fans for optimum battery run-time
- Economizer for increased cooling performance
- Electric heat and defrost
- R-452A Chlorine-free Refrigerant
- ConnectedSuite™ TracKing™ Telematics
- ThermoLite™ 110W solar panel
- Door switch
- Coolant expansion tank with extended life coolant (ELC)
- Aerodynamic thermo plastic injection molded body panels
- Robotic welded steel frame
- Standard top screen

Optional Features

- Cargo door switch (for two doors)
- Stud unit mounting kit

Unit Components

Electrical Power Systems

High Voltage Components

⚠ Danger

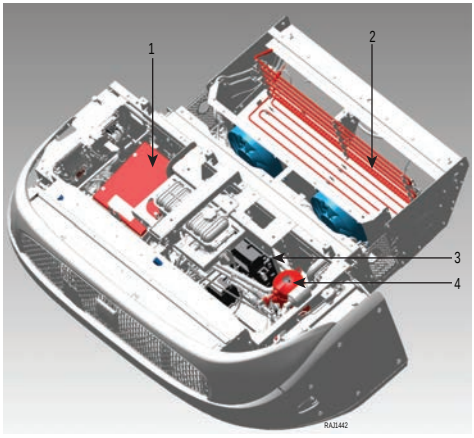
Hazardous Voltage!

This unit is equipped with high voltage electrical components capable of causing serious injury or death. ONLY qualified individuals should service, repair, or replace any of the electrical power system components, including fuses.

Various components on the e1000 operate using 230 Vac and 400 Vdc or 800 Vdc high voltage. These high voltage components are identified by warning nameplates. Additionally, all high voltage wiring is identified by ORANGE conduit.

Be aware of the locations of these components and understand that only certified and trained technicians should service them. Refer to the following illustration for locations of high voltage components.

Figure 8. High Voltage Components (panels removed only for clarity)



1.	Power Distribution Unit	3.	DC to DC Converter
2.	Heater Bars	4.	Scroll Compressor

Low Voltage Components

Important: *ONLY qualified individuals should service, repair, or replace any of the low voltage electrical power system components, including fuses.*

Various components on the e1000 operate using 12 Vdc voltage.

- HMI: User interface.
- MAC: Primary control of bus signals.
- Telematics System.
- Refrigeration Control Circuit and Sensors.
- 12 Vdc Battery: Provides power to Telematics system when unit is turned off.
- Coolant Pump: Maintains temperature of converter.
- Evaporator and Condenser Fans.
- High Power Module (HPM): Distributes power to LPM, MAC, battery, and water pump.
- Low Power Module (LPM): Distributes power to condenser and evaporator fans.
- Solar Panel: Charges 12 Vdc battery for Telematics system when unit is turned off.

Note: *Any time the battery is disconnected, the two-pin solar panel connector should be removed.*

Service Switch

⚠ Danger

Hazardous Voltage and Risk of Injury!

This unit is equipped with high voltage electrical components capable of causing serious injury or death. Turning the unit's Service Switch to the Off position ONLY prevents the unit from operating. 400/800 Vdc, 230 Vac, and 12 Vdc voltage is still present in the electrical power system components any time the unit is connected to the Battery Electric Vehicle (BEV) battery bank, Battery Management System (BMS), and unit 12 Vdc battery. ONLY qualified individuals should service, repair, or replace any of the electrical power system components, including fuses.

The Service Switch is located on the roadside access panel. The switch must be in the ON position for the unit to operate. Placing the switch in the OFF position prevents the unit from operating by disconnecting low voltage power to the HMI and MAC. The switch should be turned OFF if the unit is not going to be used for an extended period of time i.e., weekends, weeks, or months.

Note: *The switch should be placed in the OFF position when inspecting the unit or servicing the coolant system. Refer to DANGER hazard statement above.*

Figure 9. Unit Service Switch location shown

Control System

The e1000 controller based system has been designed for transport refrigeration. The controller consists of a Main Application Controller (MAC) and Human Machine Interface (HMI) control panel. The MAC is located inside the unit and the HMI is located in the truck cab. All system components of the e1000 are connected and operated by the MAC. The HMI provides user interface functions.

HMI

Note: *The Unit Service Switch must be in the ON position for the unit to operate.*

The HMI located inside the cab is used to operate the e1000. It provides the input to the MAC located inside the unit. Using the HMI, the user can access the following menus to interact with the unit:

- Power Up and Power Down Unit
- Display and Change Language
- Display and Change Temperature Setpoint
- Display and Initiate Defrost
- Display System Status of Engine, Refrigeration, Power and Controls
- Display and Clear Alarms

See Operating Instructions for more information.

Figure 10. e1000 HMI shown

TracKing™

The e1000 is equipped with Thermo King's ConnectedSuite™ wireless communication platform that offers fleet owners the ability to monitor their refrigerated units. Cellular, GPS, and Bluetooth® capabilities communicate with Thermo King's web-based TracKing application, and Bluetooth with the Thermo King Reefer App. A third party interface offers a gateway for telematics providers to communicate with the Thermo King unit. The TracKing system can easily be setup and activated if desired. To learn more about the TracKing features, contact your Thermo King dealer.

TracKing Components:

- **TKV5 Module:** Located inside the controls section of the unit. The telematics module with built-in antenna allows for wireless communication with the e1000 unit. No service is required by the operator.
- **AGM Battery:** Located inside the condenser section under the cooling system expansion tank. This battery is used to power the telematics system when in unit is turned off. The battery is charged when the unit is operating. No service is required by the operator.
- **110W Solar Panel:** Typically located on cargo box roof. The solar panel keeps the AGM battery charged when the unit is not in use. No service is required by the operator other then keeping the panel free of any dirt of debris.

Figure 11. Solar Panel Shown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Coolant Expansion Tank

⚠ Caution

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

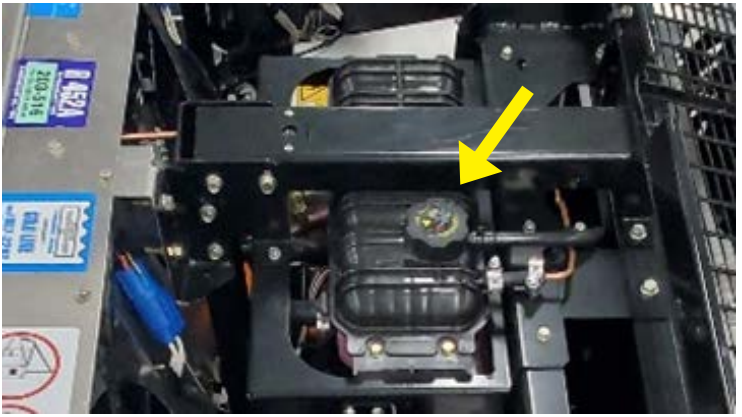
⚠ Caution

Risk of Injury!

Avoid direct contact with hot coolant.

The e1000 unit contains liquid cooled electrical devices. The liquid cooled system includes a coolant expansion tank located under the unit's top screen. Coolant level should be visually checked and maintained at the marks indicated on the tank. See the Maintenance Section for coolant information.

Figure 12. Expansion Tank shown



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Unit Protection Devices

Fuses

⚠ Danger

Hazardous Voltage!

Risk of fatal injury from electric shock! This unit is equipped with high voltage electrical components capable of causing serious injury or death. ONLY qualified individuals should service, repair, or replace any of the electrical power system components including fuses.

The e1000 has numerous fuse blocks and fuses that protect both the high voltage and low voltage system components.

Important: *None of the fuses are serviceable by an operator. Refer to DANGER hazard statement above.*

Operation

HMI Control Panel (In-Cab)

⚠ Caution

Risk of Injury!

Do not operate the HMI Control Panel until you are completely familiar with its function.

The Human/Machine Interface (HMI) Control Panel located inside the cab is used to operate the e1000. It provides the input to the Main Application Controller (MAC) located inside the e1000 unit. The HMI/MAC communicates with the Low Power Module (LPM) and High Power Module (HPM) via a Controller Area Network (CAN) bus.

The HMI Control Panel consists of a display, four buttons with dedicated functions, and four multi-function soft keys and is capable of showing both text and graphics. The function of the soft keys change depending on the operation being performed. If a soft key is active, its function will be shown in the display directly above the key.

1	**On/Off:** Used to turn the unit on/off. A short press will turn the unit on. A long press of five seconds will switch off the HMI and shut down the unit. Refer to "Start/ Shutdown Sequence," p. 26.
2	**Home:** Used to access the Standard Display.
3	**Defrost:** Used for temperature setpoint change.
4	**Low Noise Mode:** Used to activate Low Noise Mode.
5	**Setpoint:** Multi–Function Soft Key.
6	**Alarm Notifications (If alarm is present):** Multi–Function Soft Key.

7	**Sensor Menu (Includes Gauges):** Multi–Function Soft Key.
8	**Main Menu:** Multi–Function Soft Key.

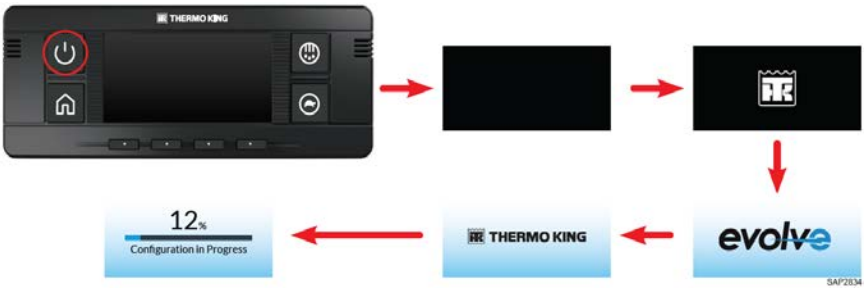
Truck Operation

The truck's 12V power switch, located on the drivers side in the battery compartment, must be on. Truck ignition must be on and ready anytime the e1000 is operating, including during charging. The Electric Power Takeoff (ePTO) switch must be on and illuminated green for the unit to operate. The yellow truck icon must also be illuminated on the dash.

Start/Shutdown Sequence

Note: *The Service Switch must be in the "ON" position for the unit to operate.*

To turn the HMI Controller On, a short press of the Power button is required. Once the start sequence is completed, the Standard Display will appear and the unit will start. The temperature setpoint or other system changes can now be made if required.

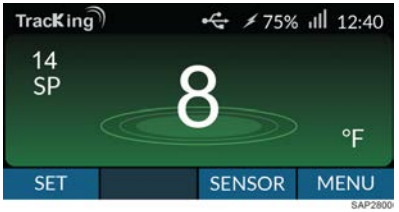


To turn the HMI Controller Off, press and hold the Power button for five seconds from any screen. Shutdown and HMI Off will be displayed briefly and Switching Off HMI will appear prior to the HMI turning off and the unit shutting down.

Standard Display

The Standard Display shows the box temperature and setpoint. The Standard Display is shown when the unit is operating normally. All menus are accessed from the Standard Display.

- The box temperature is the return air temperature and is displayed.
- The setpoint can be changed using the soft key below SET.
- The readings of the unit gauges and temperature sensors can be displayed using the soft key below SENSOR.
- The various submenus can be viewed using the soft key below MENU.
- If a USB Flash Drive or a computer is connected to the unit via a USB Port, a USB icon will illuminate in the display.
- The lightning bolt indicates the unit is receiving High Voltage (HV) and is ready to operate.



Alarm Notifications

If the unit has a Shutdown or Check alarm condition, an illuminated Alarm icon will be displayed. If an Alarm icon is present, press the soft key below ALARM to go directly to the Alarms submenu.

Temperature Setpoint Change

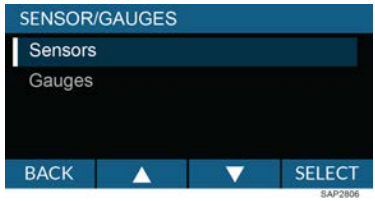
The Setpoint is changed from the Standard Display. Press the soft key below SET to access the Setpoint/Defrost menu. Use the soft keys below the Up/Down arrows to choose Setpoint, Defrost, or Pull Down Time and press the soft key below SELECT.

Use the soft keys below the Up/Down arrows to change the temperature.

- Pressing the soft key below the Up arrow will increase the value by one until setpoint reaches higher limit.
- Pressing the soft key below the Down arrow will decrease the value by one until setpoint reaches lower limit.

Sensor Menu

The Sensor Menu contains the Sensors and Gauges submenus to view the temperatures read by the unit temperature sensors and to view the unit gauges. To access the Sensor Menu, press the soft key below SENSOR. Use the soft keys below the Up/Down arrows to scroll through the menu choices. When the desired selection is shown, press the soft key below SELECT. Once selection is made, use the soft keys below the Up/Down arrows and press the soft key below SELECT to view information or modify unit operation. When finished, press the soft key below BACK or the Menu button to return to the Standard Display.



The following Sensors may be displayed:

- Return Air Temperature: Displays the temperature of the control return air sensor.
- Discharge Air Temperature: Displays the temperature of the control discharge air sensor.
- Coil Temperature: Displays the temperature of the evaporator coil sensor.
- Ambient Air Temperature: Displays the temperature of the ambient air sensor.

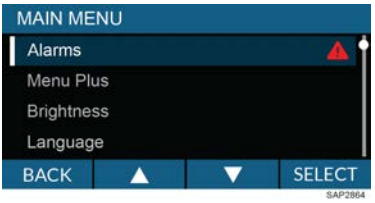
- Coolant Water Temperature: Displays the temperature of the coolant water.
- Drain Pan Temperature: Displays the temperature of the drain pan.
- PDU Temperature: Displays the temperature of the Power Distribution Unit.

The following Gauges may be displayed:

- Pressure: Displays the current state of the Suction Pressure, Discharge Pressure, Economizer Pressure.
- Compressor: Displays the current state of the Compressor Current, Compressor Speed, Compressor Discharge Temperature, Compressor Error Status.
- Heat: Displays the current state of the Actual Heater Bar Duty Cycle, Heater Bar Current.
- Power: Displays the current state of the EPTO Power Limit, Battery Volts, Battery Current, DCDC Voltage, DCDC Current, DC Bus Voltage, PDU High Voltage, PDU Total Input Current.
- Fans: Displays the current state of the Roadside/Curbside Evaporator Fan Speed, Evaporator Fan Current, Roadside/Curbside Condenser Fans Requested Speed, Condenser Fan Current.
- Inputs: Displays the current state of the HPCO, Radiator Coolant Level, Door Switch.
- Outputs: Displays the current state of the Economizer Liquid Line, Hot Gas Bypass, Damper, Liquid Injection, Water Pump.

Main Menu

The Main Menu contains several additional submenus that allow the user to view information and modify unit operation. To access the Main Menu, press the soft key below MENU. Use the soft keys below the Up/Down arrows to scroll through the menu choices. When the desired selection is shown, press the soft key below SELECT. Once selection is made, use the soft keys below the Up/Down arrows and press the soft key below SELECT to view information or modify unit operation. When finished, press the soft key below BACK or the Home button to return to the Standard Display.

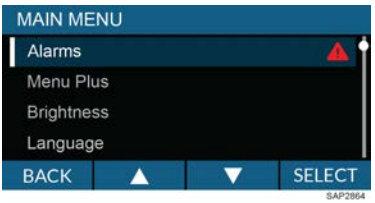


The following submenus can be accessed from the Main Menu:

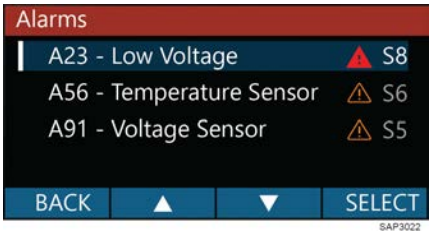
- Alarms
- Menu Plus
- Brightness
- Language
- Temp Efficiency
- Trip Energy Total

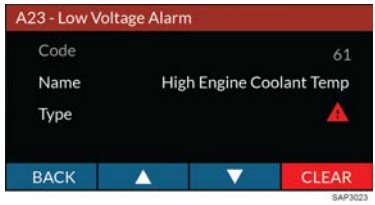
Alarms

Alarms are displayed and cleared using the Alarms submenu. This submenu can be accessed by pressing the soft key below the Menu button and scrolling to Alarms using the soft keys below the Up/Down arrows.

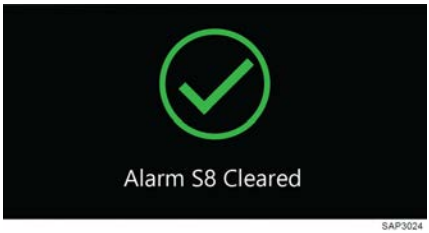


The Alarms list will appear displaying all active Shutdown (Red), Check (Amber), and Log (Yellow) alarms. The HMI Alarm screen displays up to 32 active alarms in priority order to assist in troubleshooting. Select an alarm for specific details. The option to Clear an alarm may or may not be available depending on the alarm type.



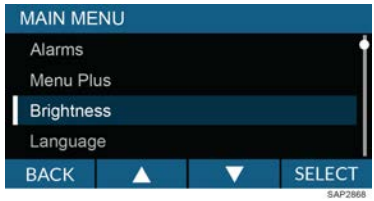


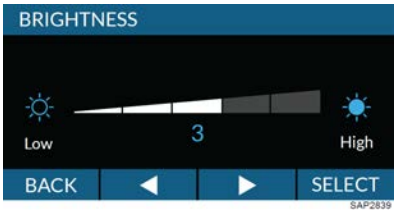
To clear an alarm, highlight the Alarm using the Up/Down arrows. Press the soft key below CLEAR. A Confirmation screen will be displayed.



Brightness

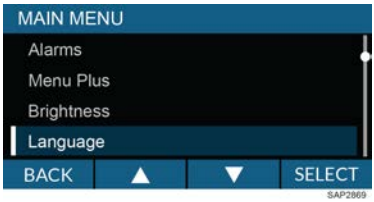
The Brightness submenu can be accessed by pressing the Menu button and scrolling to Brightness using the soft keys below the Up/Down arrows. Press the soft key below SELECT when Brightness is highlighted. Use the soft keys below the Up/Down arrows to increase/decrease screen brightness and press SELECT when finished. The HMI brightness level can be adjusted from Low (1) to High (5).

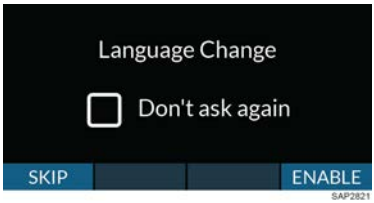




Language

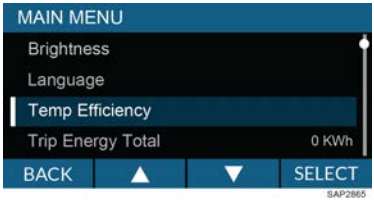
The Language submenu can be accessed by pressing the Menu button and scrolling to Language using the soft keys below the Up/Down arrows. Language allows the user to select a language from a list of up to four languages at one time. All subsequent displays are shown in the selected language. English is the default language.





Temp Efficiency

The Temp Efficiency submenu can be accessed by pressing the Menu button and scrolling to Temp Efficiency using the soft keys below the Up/Down arrows. Press the soft key below SELECT when Temp Efficiency is highlighted. Various operating modes can be selected using the Temp Efficiency submenu.



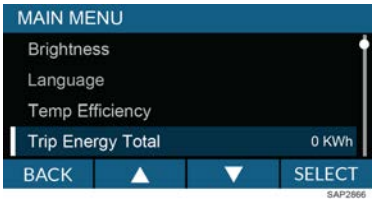
The following may be available:

- Restart Differential
- Evaporator Fan Usage

Trip Energy Total

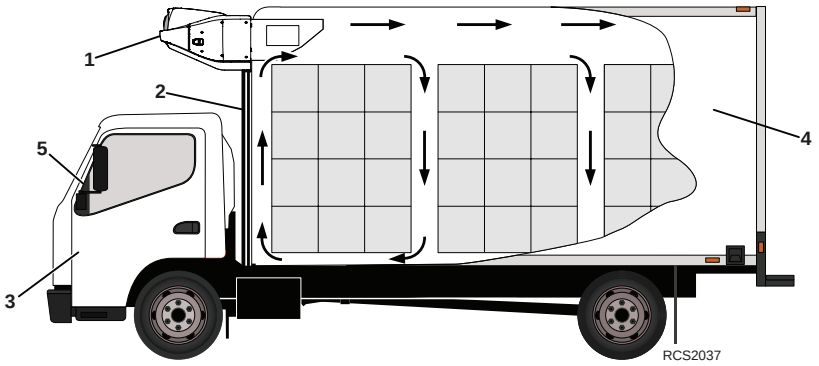
The Trip Energy Total submenu can be accessed by pressing the Menu button and scrolling to Trip Energy Total using the soft keys below the Up/Down arrows. Press the soft key below SELECT when Trip Energy Total is highlighted. Trip Energy Total will display a trip counter in KWh per hour.


THERMO KING
TracKing
75%
12:40
14
SP
8
°F
SET
SENSOR
MENU
SAP2818


MAIN MENU
Brightness
Language
Temp Efficiency
Trip Energy Total
0 KWh
BACK
SELECT
SAP2866

Loading and Enroute Inspections

Important: *Verify cargo is pre-cooled to the proper temperature before loading. The Thermo King e1000 unit is designed to maintain temperature, not cool an above-temperature load.*



1	Inspect condenser grille openings and top screen to ensure they are free of debris.
2	Inspect defrost drain tubes to ensure they are not plugged or kinked.
3	Confirm the Battery Electric Vehicle (BEV) has sufficient battery power to operate both the BEV and the e1000 unit for time required for deliveries.
4	Inspect the cargo box compartment inside and out for: • Inspect condition of door seals. They must seal tightly with no air leakage. • Damaged walls, missing insulation or blocked floor channels. • Inspect bulkheads (if applicable) for a air tight fit at ceiling, walls, and floor.
5	Using the HMI Controller, turn the unit on to pre-cool cargo compartment: • Adjust setpoint to desired cargo temperature and allow unit to run a minimum of 30 to 60 minutes (longer if possible) before loading.

Important: *As product is being loaded, verify evaporator air inlets and outlets are not blocked. Maximum air circulation is necessary to properly maintain the temperature of the entire load.*

Inspecting the Load

Never assume that the product has been loaded properly. Watch for and perform the following tasks. It takes only a few minutes and could save you or your employer considerable time and money later on.

1. Turn the unit off before opening the cargo box doors to maintain efficient operation. Opening the doors while the unit is running allows warm air to enter the cargo box.

Note: *The unit can be run with the doors open if the truck is backed into a refrigerated warehouse with tight loading dock door seals.*

2. Perform a final check of the load temperature. If the load is too hot or too cold, make a final notation on the manifest.
3. While inspecting to see that the cargo is loaded properly, verify the evaporator air inlets and outlets are not blocked.
4. Close or supervise the closing of the cargo compartment doors. Verify they are securely locked.
5. Check to verify the unit setpoint is set at the desired temperature as listed on the manifest.
6. If the unit was stopped, restart using the appropriate starting procedure outlined in this manual.
7. Repeat the after-start inspection.
8. Defrost the unit 30 minutes after loading by starting a manual defrost cycle.

Enroute Inspections

Note: *Enroute inspections are recommended every four hours for the prevention of damage to the cargo.*

1. Note the setpoint to verify no one has altered the setting since picking up the load.
2. Note the return air temperature reading. It should be within the desired temperature range. If the return air temperature reading is not within the desired temperature range, it indicates one of the following:
   a. The unit has not had sufficient time to pull down the temperature. Refer to log, if possible, for history of load (for example, above temperature load, properly pre-cooled cargo compartment, length of time on road).
   b. The unit is in defrost or has just completed defrost.

Note: *You can cancel defrost by turning the unit off, then restarting the unit.*

c. The evaporator is plugged with frost. Initiate a manual defrost cycle. The defrost cycle will be automatically terminated.

d. Improper air circulation within the cargo compartment. Inspect the cargo compartment (if possible) to determine if the evaporator fans are working and properly circulating the air. Poor air circulation can be due to improper loading of the cargo or shifting of the load, or the fan belt slipping

e. The unit did not start automatically.

f. The unit may have a low refrigerant charge. Refer such problems to the nearest Thermo King dealer or authorized Service Center, or call the Thermo King Cold Line telephone number shown on the inside back cover of this manual for referral.

Important: *Stop the unit if the compartment temperature remains outside the desired temperature range from the setpoint on two consecutive 30 minute inspections. Contact the nearest Thermo King Service Center or your company office immediately. Take all necessary steps to protect and maintain proper load temperature.*

Note: *If the temperature in the compartment is not within the desired temperature range, repeat the Enroute Inspection every 30 minutes until the compartment temperature comes within the desired temperature range.*

3. Initiate a Manual Defrost cycle after each Enroute Inspection.

Unit Maintenance

Electrical and Refrigeration System

⚠ Danger

Hazardous Voltage and Risk of Injury!

This unit is equipped with high voltage electrical components capable of causing serious injury or death. Turning the unit's Service Switch to the Off position ONLY prevents the unit from operating. 400/800 Vdc, 230 Vac, and 12 Vdc voltage is still present in the electrical power system components any time the unit is connected to the Battery Electric Vehicle (BEV) battery bank, Battery Management System (BMS), and unit 12 Vdc battery. ONLY qualified individuals should service, repair, or replace any of the electrical power system components, including fuses.

Important: *Thermo King recommends all electrical and refrigeration system maintenance on the e1000 unit be performed only by a Thermo King dealer. Refer to DANGER hazard statement above.*

Coolant Expansion Tank

⚠ Caution

Hazardous Pressures!

Do not remove expansion tank cap while coolant is hot.

⚠ Caution

Risk of Injury!

Avoid direct contact with hot coolant.

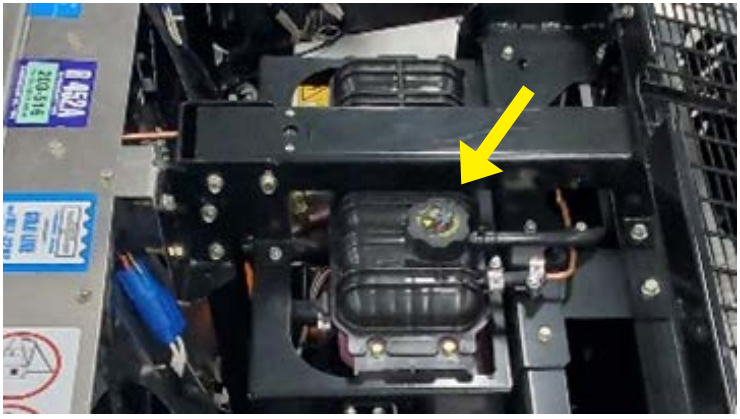
The e1000 unit contains liquid cooled electrical devices. The liquid cooled system includes a coolant expansion tank located under the unit's top screen.

- Coolant level should be visually checked and maintained at the marks indicated on the tank.
- Change ELC (red) engine coolant every 5 years or 12,000 hours.

Important: *Only OAT extended life coolants (Chevron Delo® XLC or equivalent) should be added to Thermo King systems. Conventional coolants should not be used (Typically identified by green or blue-green color). If a conventional coolant is combined with the Thermo King factory fill up to 25% by volume, the coolant must be changed at the next service opportunity. Above 25%, the coolant must be changed immediately. Conventional coolants dilute/interact with the additive packages of extended life coolant which significantly reduces the service life of the coolant.*

Note: *The use of 50/50% pre-mixed ELC is recommended to verify deionized water is being used. If 100% full strength concentrate is used, deionized or distilled water is recommended instead of tap water to verify the integrity of the cooling system is maintained. The engine must have antifreeze protection to -40°F/ -40°C. Check and add coolant in the expansion tank as needed.*

Figure 13. Expansion Tank shown



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Solar Panel

The solar panel must be kept clean of any debris such as dirt and leaves to perform as intended.

- Routinely clean the solar panel with soap and water.
- Avoid cleaning with harsh or caustic cleaning solutions.
- Avoid using high pressure power washers as damage to the solar panel may result.

Figure 14. Solar Panel Shown

Exterior Grille and Top Screen

The front grille allows air to pass through the condenser coil while the top screen allows the air to exit the unit. Regularly inspect the condenser grille openings and top screen to ensure they are free of debris and clean as needed.

- Avoid using high pressure power washers as damage to the condenser coil fins may result.

Exterior Body Panels

Exterior body panels are made from injection molded acrylonitrile styrene acrylate (ASA) material. The material is known for its high surface quality and good impact strength, including enhanced color fastness and delivering superior long-term performance when exposed to UV irradiation and heat. Routinely cleaning with soap and water will keep the body panels looking like new for many years.

- Avoid cleaning with harsh or caustic cleaning solutions.
- Avoid using high pressure power washers as damage to the condenser coil fins may result.

Specifications

Refrigeration System

All refrigeration service requirements, major and minor, should be handled by a Thermo King dealer.

Refrigerant Charge	7.5 lbs (3.4 Kg) R-452A
Scroll Compressor	Thermo King ZFW050AE Series Hermetic Scroll Compressor Three-Phase AC, Internal Permanent Magnet (IPM), 6-Pole
Compressor Weight	45 lbs. (20.4 Kg) with oil
Compressor Oil Charge	44 oz (1.3 liters) - New replacement scroll compressors are pre-filled with the proper type and amount of refrigerant oil.
Compressor Oil Type	Ester Based 3MAF-POE - Thermo King Part Number 2030964 (Oil - compressor, 1L)
Compressor RPM	1000-7000 RPM
Compressor Operating Current	1-22 Amps
Compressor Maximum Continuous Current (MCC)	24 Amps
System High Pressure Cutout	Opens: 470 ± 7 psig (3240 ± 1 kPa) Closes: 375 ± 38 psig (2590 ± 262 kPa)
Suction Pressure Transducer (SPT)	Range: 0-200 psia (0 to 1379 kPa)
Discharge Pressure Transducer (DPT)	Range: 0-500 psig (0-3447 kPa)
Economizer Pressure Transducer (EPT)	Range: 0-200 psig (0-1379 kPa)
Heat/Defrost Method	Electric heater bars

Electrical Control System and Electrical Supply

High Voltage Electrical Supply to e1000	800 Vdc Nominal From Truck Chassis Battery Pack (OEM supplied)
e1000 Low Voltage	12 Vdc (Controller, Telematics, Refrigeration Control Circuit, 12V battery, Coolant Pump, Evaporator and Condenser Fans)
e1000 High Voltage	230 Vac Scroll Compressor 800 Vdc Combo Device, Heater Bars, Power Distribution Unit (PDU), and Junction Box
e1000 Scroll Compressor	230 Vac (supplied by combo device inverter function)
e1000 Battery	12 Vdc, AGM Battery, M6 brass Receptacle, 15AH, 150 CCA Dimensions: L: 6.9, W: 3.3, H: 4.90 inches (Powersports sized) Weight: 11.4 lbs. (5.2 Kg) Terminal Torque: 50 in-lbs. (5.6 Nm) ***Note:*** *This battery is used to power the telematics system when in unit is turned off and to close high voltage contactors to allow power into e1000 unit from the truck chassis batteries.* ***Important:*** *Any time the battery is disconnected, the two-pin solar panel connector should be removed.*
e1000 Combo Device	Converts 800 Vdc (From Truck Chassis Battery Pack) to 12 Vdc and 230 Vac Liquid cooling system with expansion tank, radiator, and 12 Vdc electric coolant pump
e1000 Solar Panel Options	110 Watt Panel, 5 Amp Controller ***Important:*** *Any time the battery is disconnected, the two-pin solar panel connector should be removed.*

Cooling System

Notice

System Contamination!

Do not add other types of coolant to cooling systems using Chevron/Delo XLC except in an emergency. If another type of coolant is added, the coolant must be changed to Chevron/Delo XLC when available.

Coolant Type	Chevron/Delo XLC - a nitrite-free Extended Life Coolant (ELC) Use a 50/50 concentration Coolant replacement not necessary unless a major cooling system service needed. Coolant is approved for lifetime use in e1000.
Coolant System Capacity	Approximately 4.25 quarts (4 liters)
Expansion Tank Cap Pressure	15 psig (103 kPa)
Coolant Pump 12 Vdc	12 Vdc, Pulse Width Modulated Max Draw 9.5 Amps 24 to 7,000 RPM Replace electric water pump every 6,000 hours or 2 years (whichever occurs first)

Fuses

Main Fuse Block (12 Vdc)

Fuse	Size	Function
F1	30A	LPM Output Drive Supply
F2	25A	Switched Power to HPM
F3	Not Used	Not Used
F4	15A	Damper Solenoid
F5	Not Used	Not Used
F6	Not Used	Not Used
F7	Not Used	Not Used
F8	7.5A	Combo Device
F9	5A	In-Cab HMI
F10	5A	TK Telematics
F11	5A	LPM Supply (12V)
F12	5A	MAC
F13	Not Used	Not Used
F14	15A	Water Pump
F15	10A	I DC/DC
F16	2A	Remote Status Light

High Power Fuse Block (12 Vdc)

Fuse	Size	Function
FZ6 Evaporator Fan 1	60A	Evaporator Fan 1 Curbside Z Fuse
ZF5 Evaporator Fan 2	60A	Evaporator Fan 2 Roadside Z Fuse
FZ4 Condenser Fan 1	40A	Condenser Fan 1 Curbside Z Fuse
FZ3 Condenser Fan 2	40A	Condenser Fan 2 Roadside Z Fuse
FZ2	150A	2A Power to HPM
FZ1 Shunt	SHUNT	Shunt LV Current to HCM Busbar

High Power Fuse Block Input Inline Fuse (12 Vdc)

Fuse	Size	Function
IF4 - High Power Fuse Block Input	250A	Main LV DC power Supply from Combo Device

Battery Mounted Fuse (12 Vdc)

Fuse	Size	Function
FZ7	150A	2 Power From Battery SMZ Fuse – 12 Vdc Battery Circuit Protection

Main/Unified Harness Inline Fuse (12 Vdc)

Fuse	Size	Function
IF3	20A	PDU Battery Power Fuse

Telematics System Inline Fuses (12 Vdc)

Fuse	Size	Function
IF1 - 3rd Party Telematics Fuse 1	1A	Telematics System Protection Wake Power
IF2 - 3rd Party Telematics Fuse 2	3A	Telematics System Protection Power

Solar Charging System Inline Fuse (12 Vdc)

Fuse	Size	Function
IF5 - Solar	20A	Solar Power Inline Fuse

Maintenance Inspection Schedule

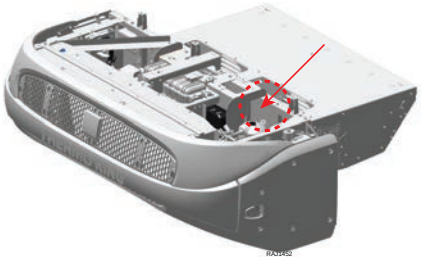
Pretrip	Every 2,000 Hours	Annual/ 3,000 Hours	Inspect/Check/Service These Items
			Control System
•			Run Pretrip Test ().
			Electrical
•			Check controller for alarms.
•			Run pretrip test.
	•		Inspect scroll compressor wire connections for tightness.
•			Check battery voltage.
	•		Inspect 12 Vdc battery terminals.
		•	Inspect electric motors for the evaporator and condenser fans.
			Refrigeration
•	•		Check refrigerant level.
	•		Check compressor oil level and condition.
		•	Check discharge and suction pressures.

			Coolant System
—	—	—	Replace electric water pump every 6,000 hours or 2 years (whichever occurs first). ***Note:*** *Hours can be found on the HMI > Menu Plus > View Hourmeters > Water Pump On Hours.*

Pretrip	Every 2,000 Hours	Annual/ 3,000 Hours	Inspect/Check/Service These Items
—	—	—	Coolant replacement not necessary unless a major cooling system service needed. Coolant is approved for lifetime use.
•			Check coolant level and inspect cooling system for leaks.
			Structural
•	•		Visually inspect unit for fluid leaks.
•	•		Visually inspect unit for damaged, loose or broken parts (includes air ducts and bulkheads).
		•	Clean entire unit including condenser coils, evaporator coils, and defrost drains.
	•	•	Check all unit, and scroll compressor mounting bolts, brackets, lines, hoses, etc.
	•		Inspect evaporator and condenser fan mounting hardware and fan blades.

Serial Number Locations

Unit: Nameplate is located on the roadside rear frame near the compressor.



Vehicle: A second unit nameplate is typically located on the inside driver's door jamb. This nameplate also lists the unit serial number, model number, and bill of material number.

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Unit Warranty

Please contact your nearest Thermo King dealer for terms of the Thermo King North American Self Powered Truck Unit Limited Warranty.

Emergency Cold Line

If you can't get your unit operating and need assistance, you can locate a Thermo King Dealer anywhere in the United States by going to thermoking.com or by using the Thermo King North American Service Directory (available from any Thermo King Dealer). If you are unable to reach a Dealer, call the Toll Free Emergency Cold Line Number (888) 887-2202. The answering service will assist you in reaching a Dealer to get the help you need. The Cold Line is answered 24 hours a day by personnel who will do their best to get you quick service at an authorized Thermo King Dealer.

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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Supersedes (New)