



Operator's Manual

E-100e/E-200e Series with Direct Smart Reefer Single Temperature Unit

Revision A

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TK 57596-18-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

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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.

Danger

Risk of Injury!

Keep hands and loose clothing clear of fans and belts at all times when the unit is operating.

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.

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

Safety Precautions

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

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/Lockout Tagout the power cables before performing 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/Lockout Tagout the power cables before performing inspections or working on any part of the unit.

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 a 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.

Safety Decals

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

Figure 1. Proposition 65



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Figure 2. Automatic Start Warning

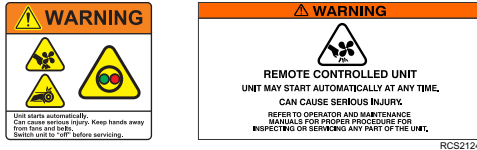


Figure 3. Caution No Grab No Step



Figure 4. High Voltage

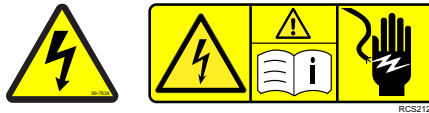


Figure 5. Caution



Figure 6. Condenser and Evaporator Fans



Unit Description

Introduction

The Thermo King E-100e/E-200e Series are two-piece units comprised of a condenser and evaporator designed for fresh, frozen, and deep-frozen applications on small trucks and vans.

Operated by a variable speed semi-hermetic compressor. During road operation, energy is provided by the vehicle (if available) or by holdover batteries. Standby mode is powered from the mains supply through AC/DC converters included in the condenser section. Defrost is accomplished by reverse cycle heating. Heat is provided by the reverse cycle system and by the forced-convection airflow created by the fans.

The user-friendly Direct Smart Reefer (DSR) controller makes operating the unit simple, while its modular design allows for ease of service.

E-100e/E-200e units include:

- **E-100e MAX, E-200e MAX:** For frozen temperature applications below 32°F (0°C) and down to -13°F (-25°C). It also supports fresh temperature conditions when flexibility is needed.

There is one basic model:

- **Model 50:** Cool, Defrost, and Heat with both vehicle and electric standby compressor operation.

Standard Unit Features

- **Condenser:** Lightweight design, easy to service with automotive grade polypropylene cover.
- **Evaporator:** Ultra slim design, aluminum construction automotive grade Acrylonitrile Butadiene Styrene (ABS) cover.
- **Controls:** User friendly Direct Smart Reefer (DSR) In-Cab controller.
- **Refrigerant:** R-452A.
- **Electric Standby**
- **Start/Stop and Increased Idle Speed Functionality:** Improves the refrigeration performance during long periods of engine stops due to vehicle Start/Stop activation/vehicle running in idle (e.g., traffic jam, urban distribution with high density of traffic lights, etc.). Needs dealer activation and installation according to each chassis OEMs conversion manual.

Optional Features

- **Door Switch Kit:** Installing door switch(es) is strongly recommended if the customer application requires many door opening events.

System Components

The system consists of the following main components.

Compressor(s)

The E-100e/E-200e units' mobile operation and electric standby modes operate with a compressor driven by a 12 Vdc power intake. Power is taken from the vehicle battery or auxiliary batteries in mobile operation or from shore power in electric standby.

Condenser

The E-100e/E-200e unit features a single, one piece condenser. The condenser cover(s) can easily be removed to access the fuses or service the unit.



Evaporator

The evaporator is mounted on the ceiling inside the cargo box. The cover can easily be removed for service.



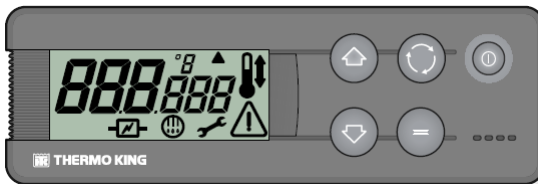
Electronic Control System

⚠ Warning

Risk of Injury!

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

The Electronic Control System is composed of an Electronic Control Module and the HMI. This HMI allows the truck driver to operate the Thermo King refrigeration unit.



Description

The Electronic Control System has the following features:

- **Auto Start:** Should the unit stop due to a failure in the power supply, whether during on-the-road or electric standby operation, it will start up again as soon as the power supply is re-established.
- **Soft Start:** All operation modes remain inactive for a few seconds after an Auto Start.

Unit Description

- **Active Display:** The HMI display is always active and backlit except when the unit is disconnected (no power) or when the unit is connected but has been manually switched off from the HMI (when there is no active alarm).
- **Lit Keypad:** The HMI keys are always lit except when the unit is disconnected (no power) or when the unit is connected but has been manually switched off from the HMI (when there is no active alarm). The On/Off key is always lit except when the unit is disconnected (no power) and thus indicates the presence of power in the unit.
- **Total Hourmeter:** Total number of hours the unit is in operation.
- **Vehicle Compressor Hourmeter:** Compressor hours in road mode.
- **Variable Compressor Speed Depending on Power Available:** The controller will manage the compressor speed to keep the electrical power consumption within the limits.
- **Electric Standby Compressor Hourmeter:** Compressor hours in electrical standby mode.
- **Low Battery Voltage Alarm:** Disconnects the unit when the battery voltage falls below 11 Vdc in 12 Vdc systems.
- **Buzzer:** It is energized when the vehicle battery and the electric power supply are connected at the same time. It is also energized if the doors are opened while the refrigeration unit is running.
- **Manual or Automatic Defrost:** The unit will launch automatically timed defrosts when the compartment is freezing. Additionally, the user can manually trigger a defrost sequence using the HMI.
- **Maintenance Warning:** On-screen warning of the need to carry out maintenance on the unit.
- **Return Air Temperature Sensor:** On-screen reading of the temperature in the load compartment.
- **Setpoint Temperature Reading:** On-screen setpoint temperature reading.
- **Electric Power Warning:** On-screen warning that the unit is connected to an electric power supply.

Electrical System

The unit's controls and refrigeration components operate on 12 Vdc. These units have a semi-hermetic motor-compressor taking power from either of the following sources (depending on the options supplied in the unit):

- Vehicle Battery

- Auxiliary Battery (if installed by the vehicle manufacturer/dealer)

Two AC/DC converters in the condenser unit convert the shore power supply to 12 Vdc to operate the unit's controls and refrigeration components in standby mode.

The unit also features Start/Stop and increased idle speed functionalities to enhance refrigeration performance during extended engine stops due to vehicle Start/Stop activation (e.g., traffic jams, urban areas with many traffic lights). These functionalities require external vehicle support for Start/Stop control and increased idle speed adjustment. For further details, consult your Thermo King Dealer Representative.

Fuses

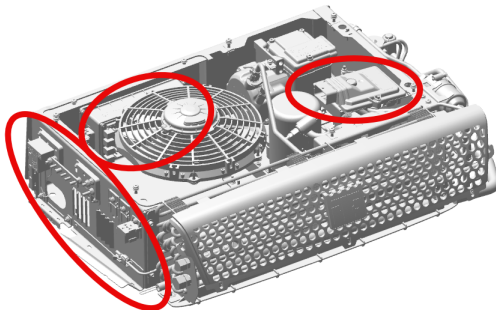
The electrical components are protected by various fuses.

Main Power Fuse: The main power fuse is located in the vehicle's engine compartment and is connected directly to the vehicle's battery (or extended hold-over battery if fitted). This inline fuse (100A or 150A) is non-serviceable and must only be replaced by an authorized Thermo King Dealer.

Ignition Power Fuse: The ignition power fuse is connected to the vehicle's fused ignition system. Depending on the vehicle, the location of the fuse panel could be located inside the cab or under the hood of the vehicle.

Unit Component Fuses: These fuses are located in the condenser unit. Remove the condenser cover to access them. Depending on your model, some fuses may not be present.

Figure 7. Fuse Location (condenser cover and electric box cover removed)



Standby Operation

⚠ Warning

Hazardous Voltage!

A certified electrician should verify that the proper standby power requirements are being met before connecting to a new power source.

These units may be operated in electric standby mode by connecting the proper voltage power cable to the unit's power receptacle mounted on the vehicle. Standby operation is used when the truck engine is off.

Operating Instructions

General Operation

In these units, temperature control is based on two values: The setting (Setpoint) of the electronic thermostat and the evaporator return temperature. The difference between these two temperatures will determine the mode of operation: cool, heat, or null.

- **Cool:** When the temperature in the load compartment is higher than the setpoint, the unit runs in cool mode to reduce the evaporator return temperature.
- **Heat:** When the temperature in the load compartment is lower than the setpoint, the unit changes to heat mode to raise the evaporator return temperature.
- **Null:** Once the Setpoint Temperature has been reached, and while the temperature remains between X°F/C above or below the setpoint, there is no demand for transfer of heat or cold, and the unit runs in null mode.
- **Defrost:** After a scheduled period of time in cool mode, between one and eight hours, the unit runs in this fourth mode of operation to eliminate ice that has accumulated in the evaporator or condenser coil. Defrost can be initiated automatically or manually.

Electric Standby Operation

Warning

Hazardous Voltage!

For outdoor settings, verify the connection is established under safe conditions.

Notes:

1. *Regular monitoring of the unit is recommended, the frequency of this monitoring will depend on the type of cargo.*
2. *The operating mode, whether engine-driven or electric standby, is selected automatically. When the unit is connected to an electric power source, engine-driven operation is automatically blocked. If the truck engine is started up while the power cable is still connected to the electrical power source, the unit will continue to operate in electric standby mode and the buzzer will be activated.*

Operating Instructions

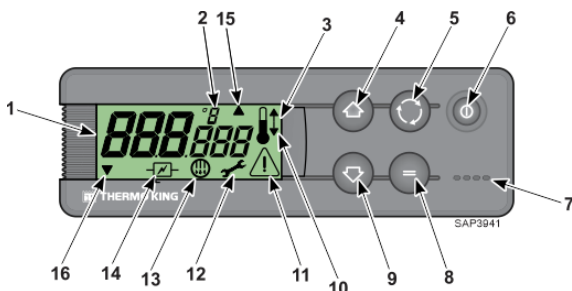
1. Connect the external power supply to the electric power receptacle. Verify the power supply is of the correct voltage and phase for the unit.
2. Press the On/Off Key on the HMI. The HMI display will be activated. The electric symbol will appear on the screen.
3. Check the setpoint and adjust if necessary.

Unit Controls

⚠ Warning

Risk of Injury!

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



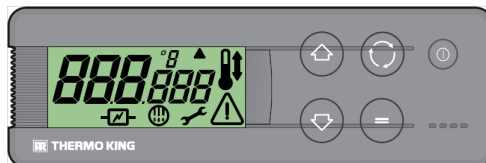
1	Main Display	Always active and back-lit except when the unit has been manually switched off from the In-Cab Controller. It normally displays the evaporator return air temperature but also displays setpoint temperature, hours, etc. depending on the selection chosen.
2	C/F Symbol	Indicates temperature reading is in degrees Fahrenheit (F) or degrees Celsius (C).
3	Heat Symbol	The unit is heating (Thermometer with an arrow pointing upward).
4	Up Key	Is used to increase the setpoint temperature.
5	Select Key	Is used to scroll through prompt displays and information displays.
6	On/Off Key	This key is used to start/stop the unit.

Operating Instructions

7	Buzzer	Alerts when vehicle battery and electric power supply are connected simultaneously. Alerts if doors are opened while the refrigeration unit is running (Door Switch Option Only). Can be configured by Thermo King dealer to suit individual customer needs.
8	Enter Key	Is used to enter a new command such as manual defrost, etc.
9	Down Key	Is used to reduce the setpoint temperature.
10	Cool Symbol	The unit is cooling (Thermometer with an arrow pointing downward).
11	Alarm Symbol	Indicates there is an alarm in the system.
12	Maintenance Symbol	Indicates the need to carry out maintenance to the unit.
13	Defrost Symbol	Indicates the unit is in Defrost Mode.
14	Electrical Symbol	Indicates the unit is connected to electric standby AC power.
15	Battery Status	Indicates the unit is connected to shore power and that the TK batteries are charged. If this icon is blinking, the E-100e/ E-200e is charging the TK batteries.
16	Unit Derating Mode	The down arrow indicates compressor derating (compressor has slowed down). This means that the controller is reducing the power delivered due to battery voltage, over-temperature, too high standby power. When the battery voltage rises sufficiently, this mode is disabled and the icon will no longer appear.

Standard Display

The Standard Display appears when the On/Off key is pressed and the unit started. It typically displays the return air temperature and the current operating mode along with the corresponding icon. Should there be an alarm, the alarm icon will appear.

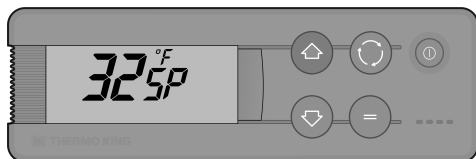


Entering Setpoint Temperature

1. Access the Main Menu by pressing the Select key.

Operating Instructions

2. Press and release the Select key twice and the current Setpoint Temperature and the letters SP will display.



RCS366

3. Press the Up or Down arrow keys to select the desired Setpoint Temperature. Each time either of these buttons is pressed and released, the Setpoint Temperature will change one degree.
4. Press and release the Enter key to set the setpoint or press and release Select key to set the setpoint and return to the Standard Display.

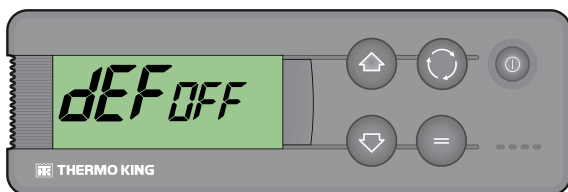
Important: If the Select key is not pressed within 20 seconds to select the new Setpoint Temperature, the unit will continue to run at the original Setpoint Temperature.

Note: Once the Setpoint Temperature has been entered, unit operation is fully automatic.

Initiating Manual Defrost Cycle

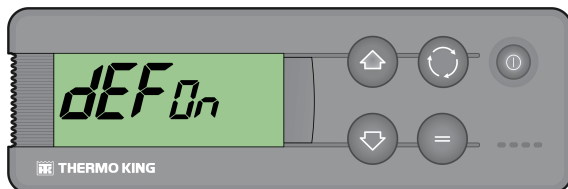
Important: Before initiating a manual defrost, verify the unit is not already in a defrost cycle. When the unit is in a defrost cycle the defrost symbol appears on screen.

1. Press and release the Select key once, and the letters dEF will appear (flashing) on display along with the present defrost condition OFF.



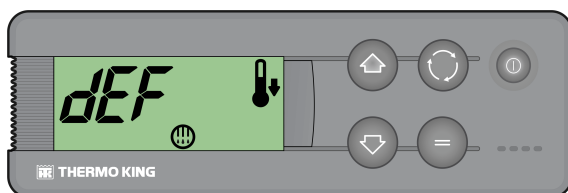
RCS371

2. To activate manual defrost, press the Enter key and then the Up or Down key and the defrost will change to ON.



RCS372

- Press the Select key twice to return to the Standard Display where the Defrost symbol will appear when the defrost cycle begins.



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Important: The evaporator coil must be below 36°F (2.26°C) for a defrost to be allowed.

Note: The letters dEF will remain on screen for a while after returning to cool mode.

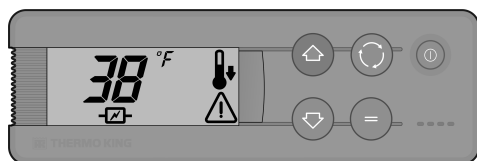
Alarms

When the unit is not operating properly, the microprocessor records the alarm code, alerts the operator by displaying the Alarm symbol and, depending on the type of alarm, shuts the unit down. Press and release the Select key to display the current alarm code. If there is more than one active alarm, all the alarm codes on the unit can be viewed in sequence by pressing and releasing the Select key.

Auto Start (after an alarm)

When an alarm stops unit operation, the Alarm icon appears on the Standard Display. After the condition that caused the alarm is corrected and the alarm has been cleared, the unit will start automatically.

Figure 8. Auto Start Alarm



RCS368

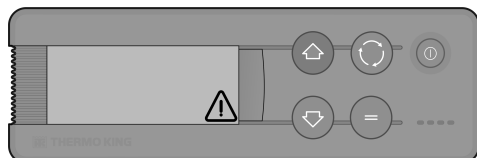
Manual Start (after an alarm)

When a Manual Start alarm stops unit operation, the Alarm icon appears on the Standard Display with no other icons present.

Note: This information applies only to the OL (Combo Device Fault) alarm and bAt (Low Battery Voltage) alarm.

After the condition that caused the alarm is corrected, the On/Off key on the In-Cab Control Box must be pressed, in order to start unit operations. Once the unit is powered back up, the alarm must be cleared. Refer to ("[Clearing Alarm Codes](#)," p. 31).

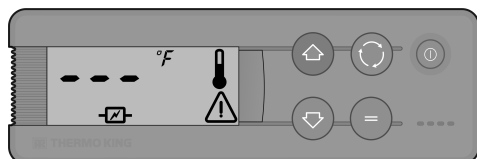
Figure 9. Alarm Symbol



RCS370

Should a **P1E** alarm occur (Faulty Cargo Box Return Air Temperature Sensor), three dashes will appear on the display together with the alarm symbol, instead of the return air temperature reading.

Figure 10. P1E Alarm



RCS369

Press and release the Select key to display the current alarm code. If there is more than one active alarm, all the alarm codes on the unit can be viewed in sequence by pressing and releasing the Select key.

Alarm Code Descriptions

Color Code Definitions

OK TO RUN	CHECK AS SPECIFIED	TAKE IMMEDIATE ACTION
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DSR Alarms

Alarm	Description
P1E	Temperature Probe 1 Fault - Shutdown alarm - Faulty or disconnected return air temperature sensor. <i>Contact your Thermo King Dealer.</i>
P2E	Temperature Probe 2 Fault - Shutdown alarm - Remote Cargo Box Return Air Temperature Reading Error (open circuit or short-circuit) <i>Contact your Thermo King Dealer.</i>
bAt	Low Battery Voltage - Shutdown alarm - Manual Start <i>Contact your Thermo King Dealer.</i>
HP	High Pressure Cut-out - Shutdown alarm - The system has detected excessively high discharge pressure. <i>If the problem persists when the unit is restarted, contact your Thermo King Dealer.</i>
LP	Low Pressure Cut-out - Shutdown alarm The system has detected excessively low suction pressure and has protected the compressor from an abnormal condition. Unit operation will resume automatically once the normal suction pressure is restored, and the alarm can be cleared (see chapter "Clearing Alarm Codes"). Among other reasons, this could be due to: <ul style="list-style-type: none"> • Dirty evaporator coil – excessive ice formation. • Load stacked in front of the evaporator does not allow proper air recirculation through the box. <i>Contact your Thermo King Dealer.</i>
PSE	High Pressure Sensor Failure - Shutdown alarm The high pressure sensor has become faulty or disconnected. <i>Contact your Thermo King Dealer.</i>
dr1	Door 1 Open - Shutdown alarm - Check if the door 1 open. if not, then the door switches are faulty, or improper door switch configuration. <i>Contact your Thermo King Dealer.</i>

Operating Instructions

Alarm	Description
dr2	Door 2 Open - Shutdown alarm - Check if the door 2 is open. if not, then the door switches are faulty, or improper door switch configuration. <i>Contact your Thermo King Dealer.</i>
SOF	Software Failure - Shutdown alarm <i>Contact your Thermo King Dealer.</i>
bAL	Shutdown alarm — Incorrect or too low input voltage in DSR controller <i>Contact your Thermo King Dealer.</i>
tEP	Thermal Protection Alarm — activation of pin C2 (DK3) of the DSR which is not in use in this unit If the problem persists when the unit is restarted, contact your Thermo King Dealer
tP4	Thermal Protection Alarm – activation in pin C8 (DK4) of the DSR This pin is not in use in this unit.
P3E	Shutdown alarm — Faulty or disconnected evaporator Coil Temperature sensor 1. <i>Contact your Thermo King Dealer.</i>
P4E	Shutdown alarm — Faulty or disconnected evaporator Coil Temperature sensor 2. <i>Contact your Thermo King Dealer.</i>
OL	Overload protection. Pin B2 (OL) of the DSR has been activated. This pin is not in use in this unit.
-C-	Wrong communication between the Gateway Controller and HMI. The HMI is powered but does not receive valid reply messages from the GC.

Gateway Internal Alarms

Alarm	Description
Auto Start	
H01	DSR Communication Lost - Communication lost to the Gateway controller. The DSR might be unpowered. <i>Contact your Thermo King Dealer.</i>
H02	HMI Communication Lost - Communication lost to the HMI. <i>Contact your Thermo King Dealer.</i>
H0B	Sleep Mode Activation - While the unit OFF, the vehicle battery voltage dropped below a threshold. Normal operation of the controller will resume as soon as the power is restored. <i>Report Alarm at the end of the day.</i>

Operating Instructions

Alarm	Description
H0C	Power Derating Shutdown - Low Voltage Shutdown alarm - your battery voltage has dropped below a defined level. The shutdown alarm is automatically cleared once the voltage rises over this limit once more. Give voltage to the system.
H0D	Power Source Issue - The output voltage of the power source is lower than expected. The Output voltage of the Power supply should be around 13.5V. <i>Contact your Thermo King Dealer.</i>
H0E	RTC Lost <i>Contact your Thermo King Dealer.</i>
H10	Internal Flash Erase Error - Internal, System reset needed <i>Report Alarm at the end of the day.</i>
H11	Internal Flash write Error - Internal, System reset needed <i>Report Alarm at the end of the day.</i>
H12	Default Parameters in Use - This will typically happen after a new firmware version has been loaded. New parameter map corresponding to the units needs to be flash loaded. <i>If the problem persists when the unit is restarted, contact your Thermo King Dealer.</i>
H15	eMMC Erase Error - An error occurred while loading parameters to the DSR Controller. <i>Internal, System reset needed, contact your Thermo King Dealer.</i>
H17	eMMC Read Error - An error during powering-up when reading configuration parameters. <i>Internal, System reset needed, contact your Thermo King Dealer.</i>
H18	Flash Loading Failed - An error occurred while loading firmware to the DSR Controller. <i>Internal, System reset needed, contact your Thermo King Dealer.</i>
H1B	Testing Software <i>Contact your Thermo King Dealer.</i>

Parameters Alarms

Alarm	Description
H60	ParEr0 - Shutdown alarm - Refrigerant type does not match between GC and Ecomp. <i>Contact your Thermo King Dealer.</i>
H61	ParEr1 - Shutdown alarm - Displacement does not match between GC and Ecomp. <i>Contact your Thermo King Dealer.</i>

Operating Instructions

Alarm	Description
H62	ParEr2 - Shutdown alarm - Voltage does not match between GC and Ecomp. <i>Contact your Thermo King Dealer.</i>
H63	ParEr3 - Shutdown alarm - Refrigerant type does not match between GC and DSR. <i>Contact your Thermo King Dealer.</i>

Electric Compressor Alarms

Alarm	Description
H80	Communication Error - CEN active but no communication for more than two seconds <i>Contact your Thermo King Dealer.</i>
H81	Input Over Voltage - Shutdown alarm <i>Contact your Thermo King Dealer.</i>
H82	Input Under Voltage <i>Contact your Thermo King Dealer.</i>
H83	Over Temperature - Shutdown alarm <i>Contact your Thermo King Dealer.</i>
H84	Over Current - Shutdown alarm <i>Contact your Thermo King Dealer.</i>
H85	Phase Loss - One of the phases carrying current to the Compressor. <i>Contact your Thermo King Dealer.</i>
H86	Low Frequency - Running under minimum frequency for longer than 30 seconds or minimum frequency not reached in 45 seconds during the start-up. <i>Contact your Thermo King Dealer.</i>
H87	Start Blocked - Motor temperature higher than ECMST (167°F). Prevents the start. Once the temperature decreased 167°F, the H87 is cleared. Most of the cases will not be linked to a malfunction of the unit. It can be considered a warning to the user to indicate the reason why the eCompressor is not starting. <i>Contact your Thermo King Dealer.</i>
H88	Compressor discharge temperature sensor reads a temperature higher than LITM. Automatically cleared.
H89	Temperature of the eCompressor exceeds OTC (201°F)



Clearing Alarm Codes

The alarm condition in the unit must first be corrected. After resolving the alarm condition, press and release the Select key to remove existing alarm codes. The Standard Display will appear once the alarm codes have been cleared. To Clear Alarm Codes:

- Correct the cause of the alarm code.
- Press the Select key to remove the alarm code.
- If more than one alarm code is present, press the Select key to clear each alarm code individually.

Important: *Continually clearing alarm codes without resolving the problem will result in damage to the unit and compressor.*

- The bAt alarm is the unique DSR-IV alarm that requires manual confirmation. The DSR-IV will keep in OFF condition until the operator acknowledges and the voltage is above the BCH value (Factory Setting 10.5 Vdc). The way to acknowledge this alarm is as follows:
 - Press the Select key once to display the Alarm screen. The bAt Alarm code will display.
 - Press the Select key again to acknowledge the alarm and press the select key again and again until the screen returns to the Standard Display.

Viewing Information Displays

Main Menu

From the Standard Display use the Select key to display:

1. Alarms (if any active).
2. Evaporator Manual Defrost.
3. Temperature Setpoint.

Hourmeter Menu

From the Standard Display press the Select key for three seconds to open the Hourmeter Menu, then use the Select key to display:

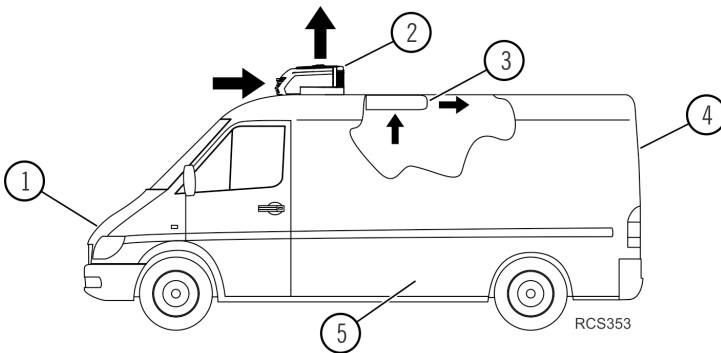
1. **HC:** Hours remaining to maintenance notice.
2. **tH:** The total amount of time the unit has been switched on protecting the load.
3. **EC:** Electric standby compressor operating hours.

Pretrip Inspection (Before Loading Refrigerated Cargo)

Pretrip inspections are an important part of preventative maintenance designed to minimize on-the-road operating problems. Perform this visual pretrip inspection before loading refrigerated cargo.

Note: *Pretrip inspections are not intended to take the place of regular maintenance inspections.*

Figure 11. Visual Pretrip Inspection



1.	Check that engine driven compressor belt is in good condition.
2.	Check that condenser inlet and outlet areas are clean and free of debris.
3.	Check that evaporator inlet and outlet areas are clean and free of debris and the drain hoses are in place and operational.
4.	Check that doors and seals are in good condition. Doors should latch securely and the seals should fit tightly.
5.	Check interior and exterior of cargo box for damage. Any damage to walls or insulation must be repaired.

Unit Operation and Loading Procedures

This section describes unit operation and proper loading procedures. Thermo King refrigeration units are designed to maintain the required product load temperature during transit. Transport refrigeration units are not designed to reduce the load temperature. Follow these recommended procedures to help prevent cargo spoilage.

Unit Operation (Before Loading Refrigerated Cargo)

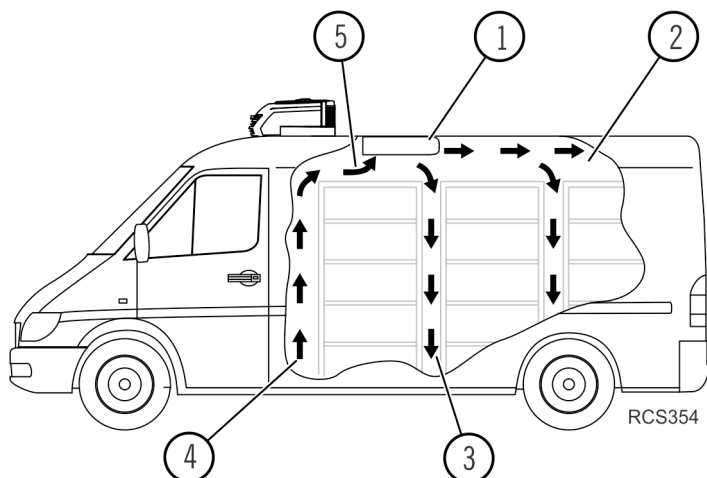
Start Unit: Adjust the thermostat setting to above and below the compartment temperature to check thermostat operation.

Pre-Cooling: With the thermostat set at the desired temperature, run the unit for half-an-hour to one hour (or until the desired setpoint is reached) before loading the refrigerated cargo. Pre-cooling eliminates residual heat and acts as a good test of the refrigeration system.

Defrost: When the unit has finished pre-cooling the cargo box the evaporator temperature should have dropped below 36°F (2.2°C). Initiate a manual defrost cycle with the In-Cab Controller. The defrost cycle will stop automatically.

Loading Procedure

1. To minimize frost accumulation in the evaporator coil and a heat increase inside the load compartment, verify the unit is OFF before opening the doors. The unit may continue to run when the cargo space is being loaded in an enclosed space with the doors closed.
2. Carefully check and record the load temperature when loading the cargo space. Note whether any products are out of temperature range.
3. Load the product in such a way that there is sufficient space for the air to circulate throughout the load. DO NOT block the evaporator inlet or outlet.



4. Product should be pre-cooled before loading. Thermo King units are designed to maintain the load at the temperature at which it is loaded. Transport refrigeration units are not designed to reduce the load temperature.

1.	Evaporator air outlet not blocked by cargo.
2.	Sufficient air space is maintained above cargo.
3.	Good air circulation around and between cargo.
4.	Cargo separated from bulkhead and walls a minimum of 4.00 inch (100 mm).
5.	Evaporator air inlet not blocked by cargo.

Post Load Procedure

1. Verify all doors are closed and locked.
2. Adjust the thermostat to the desired temperature setpoint.
3. Start the unit.
4. Half an hour after loading the cargo space, initiate a defrost cycle with the In-Cab controller. If the coil temperature is below 36°F (2.2°C), the unit will defrost. The defrost cycle should stop automatically.

Unit Operation and Loading Procedures

Enroute Inspections

To help prevent damage to the cargo, complete the following enroute inspection every four hours.

Inspection Procedure

1. Verify the setpoint is correct.
2. Check the return air temperature readings. The temperature readings should be within the desired temperature range. If the readings are not within this range, refer to (Table 1, p. 35).

Inspection Troubleshooting

1. If a return air temperature reading is not within the desired temperature range, refer to (Table 1, p. 35). Correct the problem as needed.
2. Repeat the Enroute Inspection every 30 minutes until the compartment temperature is within the desired temperature range. Stop the unit if the compartment temperature is not within desired temperature range on two consecutive 30 minute inspections, especially if the compartment temperature appears to be moving away from the setpoint.
3. Immediately contact the nearest Thermo King Dealer.
4. Take the necessary steps to protect and maintain proper load temperature.

Table 1. Inspection Troubleshooting

Problem	Cause	Remedy
Return air temperature reading is not within desired temperature range of the setpoint.	Unit has not had time to cool cargo to correct temperature.	Refer to load log history. Look for above temperature load records, properly pre-cooled cargo compartment, length of time on road, etc. Correct as required. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.
	Unit may have a low refrigerant charge	Contact nearest Thermo King dealer, or call the Thermo King Cold Line for referral.
	Unit is in defrost or has just completed a defrost cycle.	Monitor return air temperature after defrost cycle is completed to see if temperature returns to desired temperature range of the setpoint. Note: Temperature will increase slightly during defrost cycle.

Unit Operation and Loading Procedures

Table 1. Inspection Troubleshooting (continued)

Problem	Cause	Remedy
Return air temperature reading is not within desired temperature range of the setpoint.	Evaporator is plugged with frost.	Initiate a manual defrost cycle. Defrost cycle will automatically terminate when complete. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.
	Improper air circulation in the cargo compartment.	<p>Inspect unit and cargo compartment to determine if evaporator fans are working and properly circulating the air. Poor air circulation may be due to improper loading of the cargo or shifting of the load. Correct as required. Continue monitoring return air temperature until problem is corrected.</p> <div style="background-color: yellow; text-align: center; padding: 5px;">⚠ Caution</div> <div style="border: 1px solid black; padding: 5px;"> <p>Risk of Injury!</p> <p>The unit can start and run automatically any time the unit is turned on. Turn the unit On/Off switch Off before doing inspections or working on any part of the unit. Only Qualified and Certified personnel should attempt to service your Thermo King unit.</p> </div>
	The unit did not start automatically.	Contact nearest Thermo King dealer, or call the Thermo King Cold Line for referral.
	Air leaks in cargo box.	Inspect cargo box for air leaks such as doors that are not fully closed or bad/missing door seals. Repair as necessary.

Specifications

Electrical System

Fuses (12 Vdc)

Fuse	Size	Function
F1	100A	Main Fuse for E-100e
F1	150A	Main Fuse for E-200e
F3	15A	Evaporator Fan
F5	20A	Distribution Fuse
F6	2A	Drain Heaters
F8	20A	Solenoids
F10	5A	Fuse Holder - DC BUS Presence
F11	5A	Fuse Holder - Battery Power Presence
F12	15A	Condenser Fan
F13	5A	Fuse Holder - Shore Power Presence
F14	5A	ACC1 Ignition Fuse
F25	5A	Vehicle Battery

Relays

Relay	Function
K10	Connects the unit to the vehicle battery
K11	Connects the unit to the AC/DC PSU output

Condenser Fan Motor E-100e

Voltage	13 Vdc
Max. Load Current	9.2 Amps
Power Rating	119.60 W
Max. Airflow	800 CFM

Specifications

Condenser Fan Motor E-200e

Voltage	13 Vdc
Max. Load Current	10.8 Amps
Power Rating	140.4 W
Max. Airflow	886 CFM

Evaporator Fan Motors (Each) E-100e/E-200e

Voltage	13 Vdc
Max. Load Current	7.9 Amps
Power Rating	102.7 W
Max. Airflow	686 CFM

Electric Standby Power Supply Requirements

				Power Cord Length Power Cord Size (AWG)		
Voltage	Phase	Hz	Power Supply Circuit Breaker	25 ft	50 ft	100 ft
230 Vac	1	50/ 60	20 amp	AW- G12	AW- G10	AW- G8
115 Vac	1	50/ 60	30 amp	AW- G12	AW- G10	AW- G8

Refrigeration System

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

Refrigerant Charge	<p>E-100e MAX: 1.9 lb (0.9 kg) (including 60" (1.5m) hoses supplied as standard) R-452A E-200e MAX: 2.6 lb (1.2 kg) (including 237" (6m) hoses supplied as standard) R-452A</p> <p>Important:</p> <ol style="list-style-type: none"> 1. For each additional 39 inches of hose extension, add 0.17lb (80g) of refrigerant. 2. It is a good idea to utilize the WinTrac service tool to set compressor speed at an intermediate level (e.g., 60Hz) during refrigeration charge. If the unit is charged with the compressor at full speed, overcurrent protection may trip. 3. DO NOT overcharge the system. Checking the sight glass for bubbles can be misleading if the evaporator box is warm. Decrease the temperature of the box to 41°F or below before checking the sight glass.
Defrost Method	Reverse Cycle
Liquid Injection Switch (LISW)	
Low Pressure Cutout Switch (LPCO)	<p>Opens: 7.97 ± 5.906 inch Hg vacuum (-0.27 ± 0.2 Bar) Closes: 14.765 ± 8.86 inch Hg vacuum (-0.50 ± 0.3 Bar)</p>

Compressor

Notice

Equipment Damage!

Use the correct oil in Thermo King systems to avoid damaging equipment and nullifying its warranty.

Compressor Type	Scroll Semi-Hermetic (variable speed)
System Oil Capacity - Hermetic Compressor	6.08 oz (0.18 liter)
Compressor Oil Type	POE 68 type PN 2031006 - 8 oz. (0.24 liter) container
Motor Voltage	Variable Frequency 12V
Defrost Method	Reverse Cycle

 THERMO KING
Specifications

Defrost Timer Initiation Interval	Adjustable, 1 minute to 8 hours, default is 4 hours
Defrost Termination Interval	Defrost is terminated by coil temperature sensor, or by Defrost Termination Timer [dtt] adjustable, 5 to 50 minutes, default is 30 minutes

Maintenance Inspection Schedule

Weekly Pretrip Inspection

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.

The following Weekly Pretrip Inspection should be completed before starting the unit and loading the truck. While the weekly inspection is not a substitute for regularly scheduled maintenance inspections, it is an important part of the preventive maintenance program designed to head off operating problems before they happen.

Leaks: Inspect for refrigerant leaks and worn refrigerant lines.

Battery: Terminals should be properly tightened and show no signs of corrosion.

Mounting Bolts: Verify bolts are properly tightened.

Electrical: Inspect the electrical connections to confirm they are securely fastened. Wires and terminals should be free of corrosion, cracks, or moisture.

Structural: Visually check for physical damage.

Coils: The condenser and evaporator coils should be clean and free of debris.

Notice

Equipment Damage!

Do not use pressurized water.

- Washing with clean water should be sufficient. The use of cleaning agents or detergents is strongly discouraged due to the possibility of degradation of the construction. If using a power washer, the nozzle pressure should not exceed 600 psi (41 bar). For the best results, spray the coil perpendicular to the face of the coil. The spray nozzle should be kept between 3 to 4 inch (75 to 100 mm) from the coil surface. If necessary to use a chemical cleaner or detergent use a cleaner that does not contain any hydrofluoric acids and is between 7 and 8 on the pH

Maintenance Inspection Schedule

scale. Verify dilution instructions provided by the detergent supplier are followed. In case of doubt about the compatibility of the detergent with the type of materials listed above, always ask the supplier a written confirmation of the compatibility. Should a chemical cleaner be required, it is **MANDATORY** that all components are thoroughly rinsed with water even if the instructions of the cleaner specify that it is a “no rinse” cleaner. Failure to comply with above mentioned guidelines will lead to a shortened life of the equipment to an indeterminable degree. The repeated transportation of meat and fish waste can cause extensive corrosion to the evaporator coils and evaporator section tubing over time due to ammonia formation and can reduce the lifespan of the coils. Appropriate additional measures should be taken to protect the coils against the aggressive corrosion that can result from transportation of such products.

Load Compartment: Inspect the interior and exterior of the truck for any damage. Any damage to the walls or insulation should be repaired.

Defrost Drains: Check the defrost drain hoses and fittings to verify they are not blocked.

Doors: Verify doors and weather seals are in good condition and seal hermetically.

Sight glass: Check that the refrigerant charge sight glass on the running unit is full when ambient 68°F (20°C) and box about 32°F (0°C) or lower.

Inspection and Service Schedules

To verify that your Thermo King unit operates reliably and economically over its full life, and to avoid limiting its warranty cover, the appropriate inspection and service schedule must be followed. Inspection and service intervals are determined by the number of unit operating hours and by the age of the unit. Examples are shown in the table below. Your Dealer will prepare a schedule to suit your specific needs.

Operating Hours per Year	Service	
500	Installation Inspection (Performed only once)	500 hours or 6 months (whichever comes first)
2000	Inspection	2000 hours or 12 months (whichever comes first)
4000	Full Service	4000 hours or 24 months (whichever comes first)

Maintenance Inspection Schedule

Important: *Installation inspection needs to be carried out on all units at 6 months/500 hours (whichever occurs first).*

Serial Number Locations

Condenser (Main Unit)



Nameplate located on the side wall of condenser frame.

Evaporator



Nameplate located on the back wall of evaporator frame.

Compressor



Nameplate located on compressor body.

Warranty

Terms of the Thermo King North American Small Truck Unit Limited Warranty are available on request from your Thermo King Dealer.

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.



RCS358

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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