



Operator's Manual

C-Series

C-150/ C-150 10/ C-150 MAX 10/ C-150 MAX 30
C-250/ C-250 10/ C-250 MAX 10/ C-250 MAX 30
C-350/ C-350 10/ C-350 MAX 10/ C-350 MAX 30
C-450/ C-450 10/ C-450 MAX 10/ C-450 MAX 30
C-550/ C-550 10/ C-550 MAX 10/ C-550 MAX 30
C-650/ C-650 10/ C-650 MAX 10/ C-650 MAX 30
C-750 MAX 10/ C-750 MAX 30
R-134a/R-404A/R452A

Revision A

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.

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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 Practices

▲ Danger

Risk of Injury!

Keep your hands, clothing, and tools clear of fans and/or belts when working on a unit that is running or when opening or closing compressor service valves. Loose clothing might entangle moving pulleys or belts, causing serious injury or possible death.

▲ Caution

Sharp Edges!

Exposed coil fins can cause lacerations. Service work on the evaporator or condenser coils should only be accomplished by a certified Thermo King technician.

Auto Start/Stop

▲ Caution

Risk of Injury!

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. Please note that only Qualified and Certified personnel should attempt to service your Thermo King unit.

▲ Caution

Risk of Injury!

Some vehicles may be equipped with an Auto Start-Stop feature allowing the engine to restart automatically if required by the system. Refer to your vehicle's operator's manual regarding the Auto Start-Stop safety warnings before accessing the engine compartment. Failure to do so may result in serious injuries due to automatic engine restart.

Electrical Hazards

Notice

Equipment Damage!

Do not connect other manufacturers equipment or accessories to the unit or to the Thermo King Batteries unless approved by Thermo King. Failure to do so can result in severe damage to equipment and void the warranty.

Refrigerant Hazards

Although fluorocarbon refrigerants (R-404A/R-452A and R-134a) are classified as safe, observe caution when working with refrigerants or around areas where they are being used in the servicing of your unit.

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

Observe the following when working with or around refrigerant oil.

⚠ 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.

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

Safety Precautions

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.

ENGINE COOLANT

- **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.
- **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 and locations vary depending on model.

Figure 1. Fan Caution



	FAN CONTROLLED BY PRESSURE SWITCH, FAN MAY START AUTOMATICALLY AND CAN CAUSE SEVERE INJURY
	VENTILATEUR CONTROLÉ PAR PRESSOSTAT PEUT DÉMARRER AUTOMATIQUEMENT ET PROVOQUER DE SÉVÈRES DOMMAGES
	DRUCKGESTEUERTER LÜFTER ACHTUNG VERLETZUNGSGEFAHR LÜFTER KANN AUTOMATISCH STARTEN
	IL MOTORE VENTOLA È REGOLATO CON PRESSOSTATO IL MOTORINO VENTOLA PUÒ AVVIARSI AUTOMATICAMENTE CAUSANDO GRAVI DANNI
	VENTILADOR CONTROLADO POR PRESOSTATO VENTILADOR PUEDE ARANCAR DE FORMA AUTOMÁTICA CAUSANDO GRAVES LESIONES

SAP1000

Figure 2. Automatic Start Caution

	UNIT MAY START AUTOMATICALLY AND CAN CAUSE SEVERE INJURY SWITCH UNIT TO "OFF" BEFORE SERVICING
	LE GROUPE EST EN FONCTIONNEMENT AUTOMATIQUE AVANT INTERVENTION METTRE L'INTERRUPTEUR DU GROUPE SUR ARRÊT
	AUTOMATISCHE STOP START MASCHINE VON SERVICE ABSCHALTEN
	AVVIO E ARRESTO AUTOMATICO DEL MOTORE. ARRESTARE L'UNITÀ PRIMA DEGLI INTERVENTI DI SERVIZIO
	UNIDAD CON PUESTA EN MARCHA AUTOMÁTICA PUDIENDO CAUSAR GRAVES LESIONES. PARAR LA UNIDAD ANTES DE HACERLE EL SERVICIO.

RCS351

Unit Description

Introduction

Figure 3. Unit — Example



BEF625

The Thermo King truck refrigeration systems are two-piece nose/roof-mounted units. The compressor is powered from the vehicle engine via a belt. Refrigeration hoses and tubing are used to connect the unit to the compressor.

The Thermo King refrigeration units are designed for fresh and frozen applications on vans and small trucks.

The control circuits operate on 12V or 24VDC supplied by the truck batteries for over-the-road operation. The refrigeration system is protected by a high pressure cutout switch and a low pressure cutout switch.

The digital controller with a programmable microprocessor controls unit operation and quickly and accurately shows information on the display.

Compressor operation is controlled by the thermostat, energizing the clutch during engine operation.

C-Series Units Include:

- C-150, C-150 10, C-150 MAX 10 and C-150 MAX 30
- C-250, C-250 10, C-250 MAX 10 and C-250 MAX 30

Unit Description

- C-350, C-350 10, C-350 MAX 10 and C-350 MAX 30
- C-450, C-450 10, C-450 MAX 10 and C-450 MAX 30
- C-550, C-550 10, C-550 MAX 10 and C-550 MAX 30
- C-650, C-650 10, C-650 MAX 10 and C-650 MAX 30
- C-750 MAX 10 and C-750 MAX 30

There are two basic models:

- **C-150, C-250, C-350 and C-450:** Cool with only vehicle powered engine driven compressor operation.
- **Model 10:** Cool and Defrost with only vehicle powered engine driven compressor operation.
- **Model 30:** Hot gas heat, Cool, and Defrost with only vehicle powered engine driven 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.
- **In-cab controller:** CSR
- **Digital thermometer**
- **Electronic thermostat** - adjustable:
 - R-134a without defrost: 0°C to +22°C
 - R-134a with defrost: -10°C to +22°C
 - R-404A: -32°C to +22°C
- **Hot gas automatic defrost**
- **Road compressor QP08** (C-150 Unit)
- **Road compressor QP13** (C-250 Unit)
- **Road compressor QP15** (C-350 Unit)
- **Road compressor QP16** (C-450 Unit)
- **Refrigerant** - R-134a, R-452A or R-404A (depending on unit model).

Electronic Control System

Thermo King direct drive refrigeration units are composed of a condenser unit, an evaporator unit, a vehicle compressor and a control panel (Incab Control Box) which operates the unit. The Electronic Control System is composed of an Electronic Control Module (located inside the condenser unit) and the In-cab Control Box. This In-cab Control Box allows the truck driver to operate the Thermo King refrigeration unit.

Figure 4. In-cab Control Box



BEF623

Description of the Electronic Control System

The Electronic Control System has the following characteristics:

- Auto Start
- Delayed Start
- Active Display
- Low Battery Voltage Alarm
- Battery voltage value display
- Unit Control without In-cab Control Box
- Manual or Automatic Defrost
- Return Air Temperature Sensor
- Setpoint Temperature Reading

Auto Start: In case of power shut off, if the unit was on, the unit will come back on again when the power is re-started.

Unit Description

Delayed Start: After an automatic start-up, the unit will remain inactive for few seconds.

Active Display: The In-cab Control Box display is always active except when the unit is disconnected (no power) or when the unit is connected but has been manually switched off from the In-cab Control Box (when there is no active alarm).

Total Hourmeter: Total number of hours the unit is in operation.

Vehicle Compressor Hourmeter: Number of hours the unit has been operating on-the-road.

Low Battery Voltage Alarm: Disconnects the unit when the battery voltage is too low.

Battery voltage value display: The battery voltage value is displayed in the information menu.

Unit Control without In-cab Control Box: The unit can also be operated by the Electronic Control System without the In-cab Control Box, under conditions selected by the In-cab Control Box before it is disconnected.

Manual or Automatic defrost: It is possible to choose between manual or automatic defrost and to select the defrost time interval in auto defrost mode.

Return Air Temperature Sensor: On-screen reading of the temperature in the load compartment.

Setpoint Temperature Reading: On-Screen Setpoint Temperature Reading.

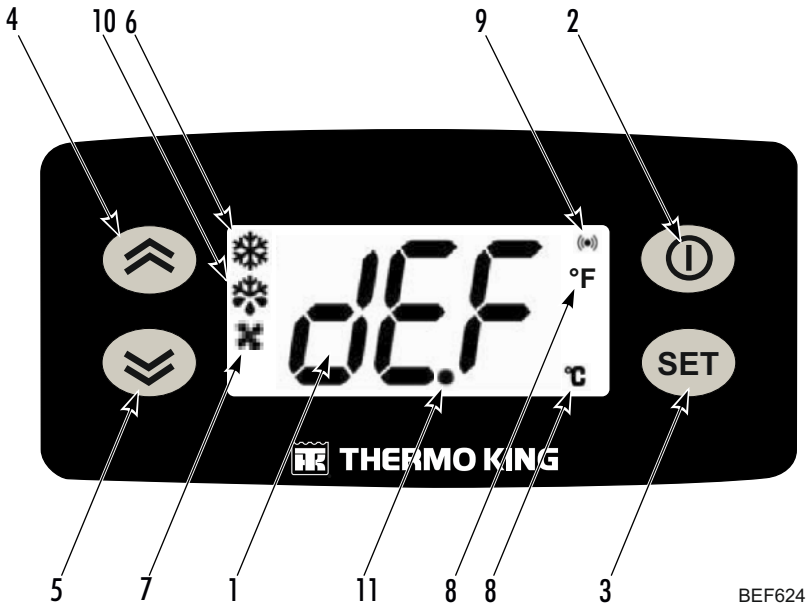
Unit Controls

⚠ Warning

Risk of Injury!

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

Figure 5. In-cab Control Box — Display, Keys and Symbols



1. **Display.** It is always active except when the unit is disconnected (no power) or when the unit is connected but has been manually switched off from the In-cab Control Box. It normally displays the return air temperature.
2. **ON/OFF Key.** This key is used to start/stop the unit by holding the key down for at least 1 second. Single press for exit to the previous level menu.
3. **Set Key.** Selects prompt screens and information screens. Single press: enter the next level menu.

Unit Description

4. **Up Key.** Is used to increase the setpoint temperature, display values, and for menu scroll up.
5. **Down Key.** Is used to reduce the setpoint temperature, display values, and for menu scroll down.
6. **Cool Symbol.** The unit is cooling.
7. **Heat Symbol.** The unit is heating.
8. **°C/°F Display.** Indicates whether the on-screen temperature reading is in degrees Celsius (°C) or degrees Fahrenheit (°F).
9. **Alarm Symbol.** Indicates that there is an alarm in the system.
10. **Defrost Symbol.** Indicates the evaporator unit is in Defrost Mode.
11. **Dot Symbol (decimal).** Indicates power presence, only when unit is off.

Operation Instructions

Weekly Pre-Trip Inspections

The following weekly pre-trip inspection should be completed before loading the truck. Weekly inspection does not replace the regular maintenance inspections (see the scheduled maintenance inspection section); however, it is an important part of the preventive maintenance program to avoid operating problems before they occur.

Leaks. Inspect for refrigerant leaks and worn coolant lines.

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

Belts. Check for cracks, wear, and proper belt tension.

Mounting Bracket. Ensure that bolts are fully tightened.

Electrical system. Electrical connections should be securely fastened. Wires and terminals should show no signs of corrosion, cracks or dampness.

Structural. Visually check for physical damage.

Coils. The condenser and evaporator coils should be clean and free of debris. 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 1 inch and 3 inches (25 to 75 millimetres) 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 scale. Ensure 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.

Operation Instructions

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 ensure they are not blocked.

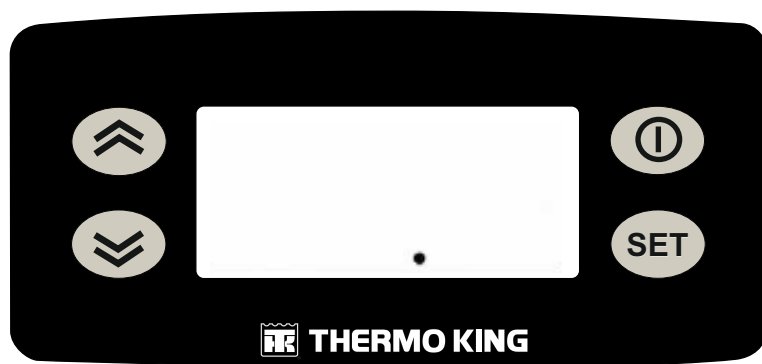
Doors. Ensure that doors and weather seals are in good condition and seal hermetically.

Sight Glass. Check that the refrigerant charge sight glass on the running unit is totally full (the cargo compartment temperature must be approximately 0°C).

Starting the unit

Engine Operation

1. Start the truck engine. The Dot Symbol will remain lit.



BEF610

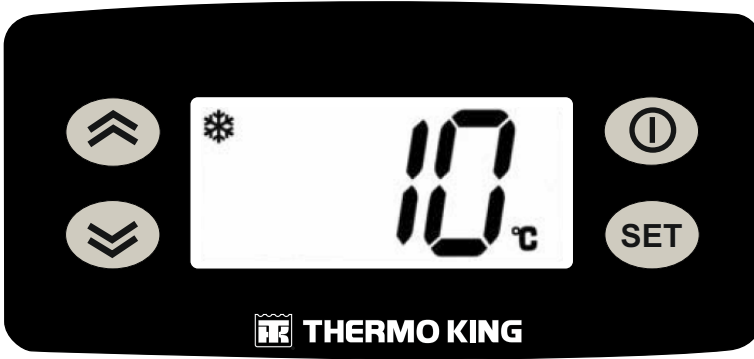
2. Press the On/Off switch located in the In-cab Control Box for at least 1 second. The In-cab Control Box display will be activated.
3. Check the setpoint, and adjust if needed.

Note: Regular monitoring of the unit is recommended, the frequency of this monitoring will depend on the type of cargo.

Standard Display

This is the display that appears when the ON/OFF key is pressed 1 second and the unit started. It normally displays the return air temperature and the current operating mode with the appropriate symbol.

If there is an alarm, the alarm symbol will also be shown on the screen.



BEF611

The example in the drawing shows: 10°C temperature, cool mode.

Entering the setpoint temperature

The Setpoint Temperature can be quickly and easily changed.

1. Press and release the SET key once, and the letters SP will appear on screen.



BEF612

2. Press SET key again and the current Setpoint Temperature will appear on screen.



BEF613

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 1 degree. Setpoint Temperature will also change continuously if UP/ DOWN key is continuously pressed without release.
4. Press and release the SET key to set the setpoint.
5. Press and release ON/OFF key twice to return to the Standard Display.

▲ Caution**Service Procedure!**

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

Initializing the evaporator manual defrost cycle**▲ Caution****Service Procedure!**

Before initiating a manual defrost, make sure that the unit is not already in a defrost cycle. The defrost symbol will appear in the display when the unit starts a defrost cycle.

Note: Defrost option is available on all the models except: C-150 / C-250 / C-350 / C-450.

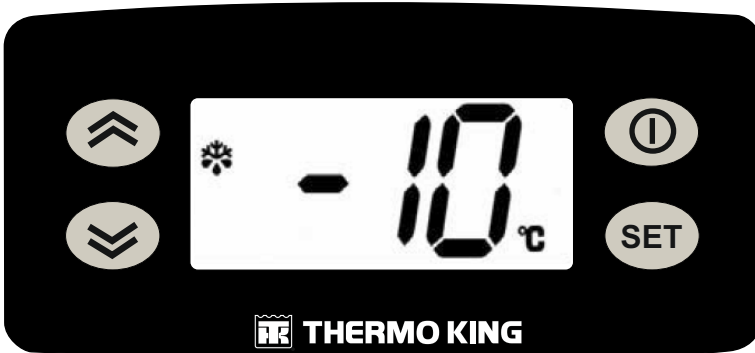
THERMO KING
Operation Instructions

1. Press and release the SET key once, then press UP or DOWN and the letters **dEF** will appear on screen.



BEF614

2. To activate manual defrost, press the SET key 3 seconds.
3. Press the ON/OFF key once to return to the STANDARD DISPLAY, where the DEFROST symbol will appear when the defrost cycle begins (*the temperature in the cargo compartment must be less than 0°C*).



BEF615

Note: for manually disabling the defrost repeat the same operation.

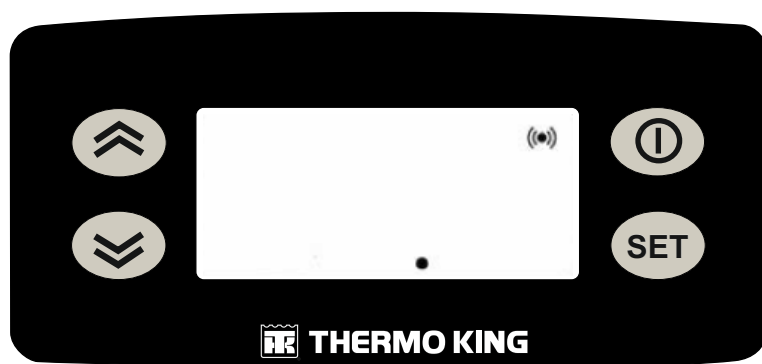
Alarms

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.

There are two alarm categories:

Manual start

The alarm stops the unit, the dot and the ALARM symbol appears on screen.



BEF616

Once the alarm condition has been rectified, the ON/OFF key must be pressed to start up again.

Press and release the SET key twice to display the current alarm code on screen. 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 SET and ARROW keys.

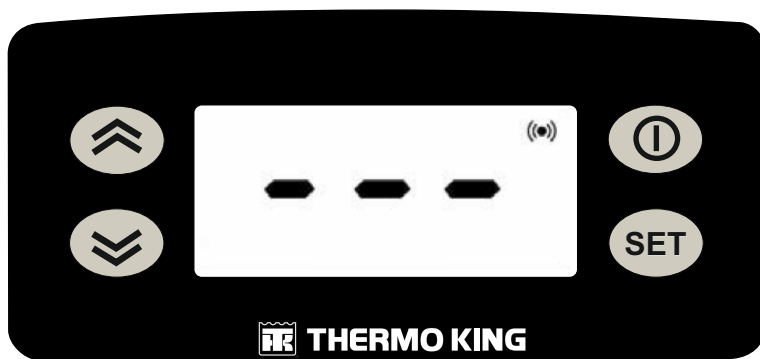
Auto start

The alarm stops the unit, the ALARM symbol appears on screen and the unit starts up automatically once the alarm condition has been rectified.



BEF617

Should a **P1E** alarm occur- return air temperature read error alarm code - appear, — will appear on screen together with the alarm symbol, instead of the return air temperature reading.



BEF618

Press and release the SET key twice to display the current alarm code on screen. 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 SET and ARROW keys.

Alarm Code Descriptions

	Manual start
bAt	Low battery voltage. Unit and battery protection system.
	Automatic start
P1E	Cargo Box Return Air Temperature Reading Error (open circuit or short-circuit). Contact your Service Dealer.
E7	Communications Failure (It is not possible to read any value from the In-cab, but the unit continues to work with previous operating command). Contact your Service Dealer.

Clearing Alarm Codes

The alarm condition in the unit must first be cleared. After clearing the alarm condition, press and release once the SET key to remove existing ALARM codes. The standard display will appear once the ALARM codes have been cleared.

Viewing Information Screens

Main Menu

From the **Standard Display** use the SET key to open the **Main Menu**, then use the ARROW keys to display:

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

Press ON/OFF key once to return to Standard Display

Information Menu

From the Standard Display press the UP key for 1 second to open the Information Menu, then use the SET key to display:

1. **tSt**: Display test (all icons on)
2. **reL**: Software version
3. **bAt**: Current battery voltage
4. **toH**: The total amount of time the unit has been switched on protecting the load
5. **coH**: Engine-driven compressor operating hours

Return to Main Menu by pressing ON/OFF key.

Note: Each Hour counter will be displayed in hours when the counted value is <1000. When the value will be >= 1000, the hours number will be displayed alternatively between hours and thousands, into "toh" or "coh" folders. For instance, if the counted value is 12055, "055" will be displayed alternatively with "12", where the number with 3 digits is always the number of "hours", the number with 2 digits is always the number of "thousand of hours".

After Start Inspection

Thermostat. Dial the thermostat setting above and below the box temperature to check thermostat operation (see Operating Modes).

Pre-Cooling. With the thermostat set at the desired temperature, allow the unit to run for one-half to one hour (longer if possible) before loading the truck. Pre-cooling will remove residual body heat and moisture from the box interior and provide a good test of the cooling system.

Operation Instructions

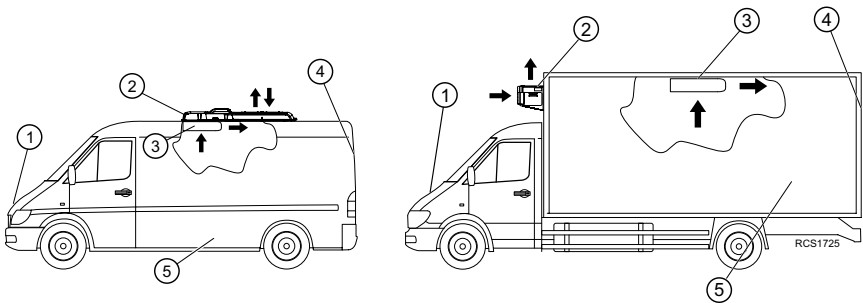
Defrost. When the unit has finished pre-cooling the truck interior, the evaporator temperature should have dropped below 35.6°F (2°C); initiate a manual defrost cycle. The defrost cycle should stop automatically.

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 6. 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 chapter 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

Important: *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.*

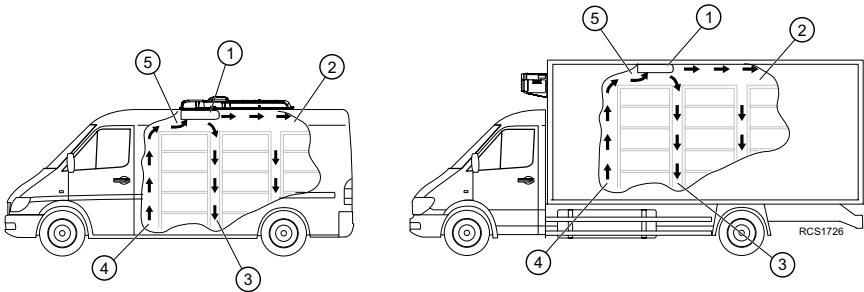
Note: *To minimize frost accumulation in the evaporator coil and a heat increase inside the load compartment, ensure that the unit is OFF before opening the doors.*

1. Carefully check and record the load temperature when loading the refrigerated cargo. Note whether any products are out of temperature range.
2. Load the product to verify sufficient air space is maintained around and through the load in compartment. Airflow around the cargo must not be restricted. DO NOT block the evaporator inlet or outlet. Refer to the Air Circulation Diagram on the following page.

Unit Operation and Loading Procedures

3. Minimize door opening times and close door(s) in between loading to preserve box temperature.

Figure 7. Air Circulation Diagram



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. 32).

Inspection Troubleshooting

1. If a return air temperature reading is not within the desired temperature range, refer to (Table 1, p. 32). 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.

Unit Operation and Loading Procedures

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: <i>Temperature will increase slightly during defrost cycle.</i>
	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.
Return air temperature reading is not within desired temperature range of the setpoint.	Improper air circulation in the cargo compartment.	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. ⚠ Caution Risk of Injury! 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. Please note that only Qualified and Certified personnel should attempt to service your Thermo King unit.

Unit Operation and Loading Procedures

Table 1. Inspection Troubleshooting (continued)

Problem	Cause	Remedy
	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		
C-150, C-250, C-350, C-450, C-550, C-650, C-750	12 Vdc	24 Vdc
Fuse 1	3 amps	3 amps
Fuse 2	15 amps	7.5 amps
Fuse 3	15 amps	7.5 amps
Fuse 4	15 amps	7.5 amps
Fuse 5	15 amps	7.5 amps
Fuse 14	5 amps	5 amps
Fuse 21	40 amps	30 amps
Fuse 30	2 amps	2 amps

Condenser Fan Motor		
Voltage	13 Vdc	26 Vdc
Full Load Current	9.2 amps	4.1 amps
Power Rating	100 W	100 W
RPM with Full Load	2,800	2,800
Control voltage range	?? Vdc	?? Vdc

Evaporator Fan Motors (Each)		
Voltage	13 Vdc	26 Vdc
Full Load Current	6.2 amps	3.7 amps
Power Rating	100 W	100 W
RPM with Full Load	2,800	2,800

Refrigeration System

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

Table 2. Refrigeration System C-Series

Refrigerant Charge:	C-150	1.54 lb (0.70 kg) R-134a
	C-150 10	1.54 lb (0.70 kg) R-134a
	C-150 10 MAX	1.54 lb (0.70 kg) R-404A
	C-150 30 MAX	1.54 lb (0.70 kg) R-404A
	C-250	2.09 lb (0.95 kg) R-134a
	C-250 10	2.09 lb (0.95 kg) R-134a
	C-250 10 MAX	2.09 lb (0.95 kg) R-404A
	C-250 30 MAX	2.09 lb (0.95 kg) R-404A
	C-350	2.64 lb (1.2 kg) R-134a
	C-350 10	2.64 lb (1.2 kg) R-134a
	C-350 10 MAX	2.64 lb (1.2 kg) R-404A
	C-350 30 MAX	2.64 lb (1.2 kg) R-404A
	C-450	2.64 lb (1.2 kg) R-134a
	C-450 10	2.64 lb (1.2 kg) R-134a
	C-450 10 MAX	2.64 lb (1.2 kg) R-404A
	C-450 30 MAX	2.64 lb (1.2 kg) R-404A
	C-550	2.86 lb (1.3 kg) R-134a
	C-550 10	2.86 lb (1.3 kg) R-134a
	C-550 10 MAX	3.52 lb (1.6 kg) R-452A
	C-550 30 MAX	3.52 lb (1.6 kg) R-452A
	C-650	3.52 lb (1.6 kg) R-134a
	C-650 10	3.52 lb (1.6 kg) R-134a
	C-650 10 MAX	3.75 lb (1.7 kg) R-452A
	C-650 30 MAX	3.75 lb (1.7 kg) R-452A
	C-750 10 MAX	4.20 lb (1.9 kg) R-452A
	C-750 30 MAX	4.20 lb (1.9 kg) R-452A
Defrost Method (10/ MAX 10/ MAX 30 versions)		Hot Gas
Defrost thermostat (Klixon) (10/ MAX 30 versions):	Opens	48.0 ± 37.4 F (8.9 ± 3.0 C)
	Closes	36.0 ± 37.4 F (2.2 ± 3.0 C)
Liquid injection switch (R-404A/ R452A):	Opens	48.0 ± 37.4 F (93 ± 3.0 C)
	Closes	36.0 ± 37.4 F (110 ± 3.0 C)

THERMO KING
Specifications

Table 2. Refrigeration System C-Series (continued)

High Pressure Cutout Switch (HPCO), R-134a	Opens Closes	300 ± 10 psi (2,068 ± 70 kPa) 200 ± 10 psi (1,379 ± 70 kPa)
High Pressure Cutout Switch (HPCO), R-404A	Opens Closes	450 ± 10 psi (3,100 ± 70 kPa) 375 ± 10 psi (2,585 ± 70 kPa)
CSPS (Condenser Pressure Control Switch)	Opens Closes	300+20 psi/-0 psi (2,068 +138 kPa/-0 kPa) 200 ± 20 psi (1,379 ± 138 kPa)
Low Pressure Cutout Switch (LPCO)	Opens Closes	5 to 11 inch vacuum 4 to 7 psi (27.6 to 48.3 kPa)
Suction Pressure Regulator (SPR) Valve Setting - Model MAX 10 & 30 Versions		29 psi (199.95 kPa)

Inspection and Service Intervals

Weekly Pre-Trip Checks

1. Listen for unusual noises, vibrations, etc.
2. Visually inspect unit for fluid leaks (coolant, oil, refrigerant).
3. Visually inspect unit for damaged, loose or broken parts (including air ducts and bulkheads, if so equipped).
4. In the event of excess of dirt or obstruction clean the unit, including condenser and evaporator coils.

Weekly Pretrip Inspection

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.

Belts: Inspect for cracks, wear, and proper belt tension.

Mounting Bolts: Verify bolts are properly tightened.

Electrical: Electrical connections should be securely fastened. Wires and terminals should be free of corrosion, cracks, or moisture.

Structural: Visually check for physical damage.

- 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 1 inch and 3 inches (25 to 75 millimeters) 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 scale. Ensure 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

Inspection and Service Intervals

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 ensure 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 totally full (the cargo compartment temperature must be approximately 0°C).

Weekly Post-Trip Checks

Notice

Equipment Damage!

Do not use pressurised water.

1. Clean the outside cover of the unit. Use a damp cloth and neutral detergents. Do not use harsh cleaning products or solvents.
2. Check for leaks.
3. Check for loose or missing hardware.
4. Check for physical damage to the unit.

Inspection and Service Schedules

To ensure 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.

Inspection and Service Intervals

Operating Hours per Year	1000	2000	3000
Inspection	6 months/ 500 hours		
Inspection	12 months/ 1000 hours (+ preventative maintenance)	6 months/ 1000 hours	4 months/ 1000 hours
Inspection	18 months/ 1500 hours	12 months/ 2000 hours (+ preventative maintenance)	8 months/ 2000 hours
Full Service	24 months/ 2000 hours	18 months/ 3000 hours	12 months/ 3000 hours (+ preventative maintenance)
	(continue as above)	(continue as above)	(continue as above)

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

Service Record

Each inspection and service performed should be recorded on the Service Record Sheet found at the back of this manual.

Preventative Maintenance

Refer to the previous page for checks that should be carried out daily/weekly on the unit. Please work with your Dealer in order to create a maintenance schedule which fits your needs.

Thermo King has extended the limited warranty on new units from 3,000 total hours to a maximum of 4,000 compressor run hours within the 2 year warranty period.

This limited warranty is dependent on the owner and/ or operator adhering to the preventative maintenance schedule as advised by your Thermo King Dealer.

Recover Refrigerant

At Thermo King®, we recognize the need to preserve the environment and limit the potential harm to the ozone layer that can result from allowing refrigerant to escape into the atmosphere.

We strictly adhere to a policy that promotes the recovery and limits the loss of refrigerant into the atmosphere.

In addition, service personnel must be aware of Federal regulations concerning the use of refrigerants and the certification of technicians. For additional information on regulations and technician certification programs, contact your local 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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