THERMO KING

Operator's Manual

Truck Edition

T-1000 SPECTRUM
With Standard HMI

Revision 1

May 2012

TK-54339-1-OP

TRANE TECHNOLOGIES

T-1000 SPECTRUM
With Standard HMI

TK 54339-1-OP (Rev. 1, 05/12)

Disclaimer

This manual is published for informational purposes only. Thermo King Corporation makes no representations or warranties, express or implied, with respect to the information, recommendations and descriptions contained in this manual and such information, recommendations and descriptions should not be regarded as all-inclusive or covering all contingencies. In the event you have any questions or require further information, please contact your local Thermo King dealer.

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.

Thermo King Corporation and its affiliates shall have no liability in contract or tort (including negligence and/or strict liability) or otherwise, to any person or entity for any personal injury, property damage or any other direct, indirect, special or consequential damage or liability whatsoever, arising out of or resulting from any actions by any person that are contrary to this manual or any of the information, recommendations or descriptions contained herein or the failure of any person to implement the procedures described herein correctly or to follow caution and safety decals located on the Thermo King unit.

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Introduction

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 on-the-road 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.

IMPORTANT: 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.

Safety Precautions

Thermo King recommends that all services be performed by a Thermo King dealer. However, there are several general safety practices which you should be aware of:

WARNING: Always wear goggles or safety glasses when working with or around the refrigeration system or battery. Refrigerant or battery acid can cause permanent damage if it comes in contact with your eyes.

WARNING: Keep hands and loose clothing clear of fans and belts at all times when the unit is operating or when opening or closing compressor service valves.

WARNING: Exposed coil fins can cause painful lacerations. Service work on the evaporator or condenser coils is best left to a certified Thermo King technician.

CAUTION: Use extreme caution when drilling holes in the unit. Drilling into electrical wiring or refrigerant lines could cause a fire. Never drill into structural components.

Automatic Start/Stop Operation

This unit is capable of automatic operation and may start at any time without prior warning.

WARNING: The unit may start at any time when the controller is turned on. The controller display lights up when the controller is turned on.

WARNING: Units equipped with electric standby may start at any time when the unit is connected to live electric power and the controller is turned on.

WARNING: Be sure to press the OFF key to turn the controller off before opening doors or inspecting any part of the unit.

Electrical Hazard

CAUTION: Be sure to turn off the high voltage power supply, and disconnect the electric cable before working on the unit. Units with electric standby present a potential electrical hazard.

Refrigerant

Although fluorocarbon refrigerants 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: Fluorocarbon refrigerants may produce toxic gases. In the presence of an open flame or electrical short, these gases are severe respiratory irritants CAPABLE OF CAUSING DEATH.

DANGER: Fluorocarbon refrigerants tend to displace air and can cause oxygen depletion which could result in DEATH BY SUFFOCATION. Provide adequate ventilation in enclosed or confined areas.

WARNING: Fluorocarbon refrigerants evaporate rapidly, freezing anything they contact if accidentally released into the atmosphere from the liquid state.

Refrigerant Oil

Observe the following precautions when working with or around refrigerant oil:

WARNING: Always wear goggles or safety glasses to protect eyes from refrigerant oil contact.

WARNING: Protect skin and clothing from prolonged or repeated contact with refrigerant oil. Rubber gloves are recommended.

WARNING: Wash thoroughly immediately after handling refrigerant oil to prevent irritation.

First Aid

First Aid–Refrigerant

Eyes: For contact with liquid, immediately flush eyes with large amounts of water. Get prompt medical attention.

Skin: Flush areas with large amounts of warm water. Do not apply heat. Wrap burns with dry, sterile, bulky dressing to protect from infection or injury. Get prompt medical attention.

Inhalation: Move victim to fresh air and restore breathing if necessary. Stay with victim until arrival of emergency medical personnel.

First Aid–Refrigerant Oil

Eyes: Immediately flush eyes with large amounts of water for at least 15 minutes while holding the eyelids open. Get prompt medical attention.

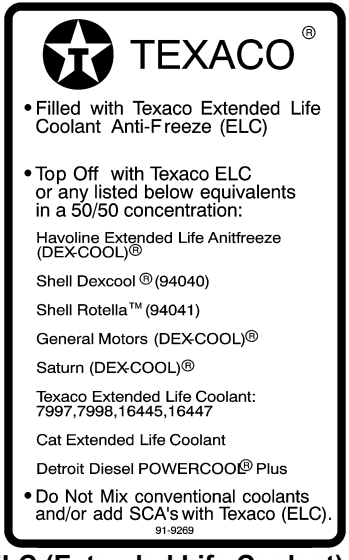
Skin: Remove contaminated clothing. Wash thoroughly with soap and water. Get medical attention if irritation persists.

Inhalation: Move victim to fresh air and restore breathing if necessary. Stay with victim until arrival of emergency personnel.

Ingestion: Do not induce vomiting. Immediately contact local poison control center or physician.

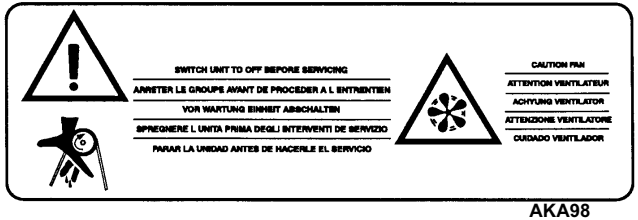
Safety Decals and Locations

Figure 1: Antifreeze Caution (Attached near radiator fill cap.)



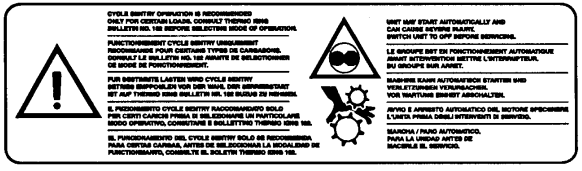
ARB108

Figure 2: ELC (Extended Life Coolant) Nameplate (Located On Expansion Tank In Units Equipped With ELC)



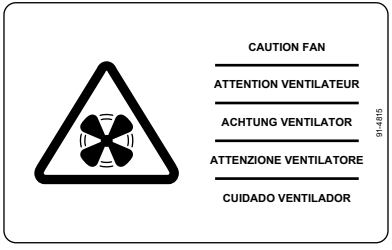
AKA98

Figure 3: Belt Caution (Locations vary depending on model. Decals are located near areas that contain belts and fans which can cause severe injuries if hands or clothing become tangled.)



AKA99

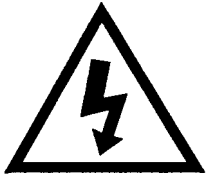
Figure 4: Automatic Start Caution (Locations vary depending on model. Decals are located near areas that contain moving parts which can cause severe injuries if hands or clothing become tangled when the unit automatically starts.)



ARA183

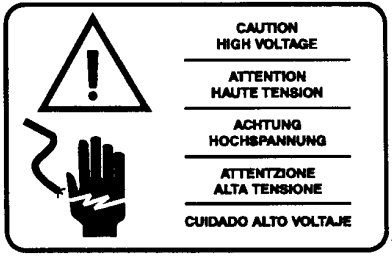
Figure 5: Fan Caution (Locations vary depending on model. Decals are located near areas that contain fans which can cause severe injuries if hands or clothing become tangled.)

Model 50 Units (Electric Standby)



AKB01

Figure 6: Electrical Hazard (Locations vary depending on model. Typically located near power receptacle, high voltage tray cover and interface board.)



AKB02

Figure 7: High Voltage Caution (Located near high voltage box.)

Emission Control

In compliance with the California ULG (Utility, Lawn and Garden) Rules, the following information is provided:

1. Selection Of Fuel Oil: Use diesel fuel only.

2-1. Modification To Any Engine Component:

Modifications to any engine component which many cause engine exhaust emission output changes are not allowed.

Any engine modification not in compliance with regulation will be the responsibility of the engine manufacturer, dealer or customer who made the modification.

2-2. Air Induction System: Air induction system must remain intact and receive regular prescribed maintenance. *Example*: Air cleaner element replacement at required operation hour interval.

2-3. Exhaust System: Exhaust system must remain intact and cannot be modified in any manner that will further restrict exhaust flow.

2-4. Fuel Oil System: Fuel oil system must remain intact and receive regular prescribed maintenance. *Example*: Fuel filter replacement at required operation hour interval.

3. Engine Identification: Engines must be identified in a manner that will determine when they were built and what regulations they comply with. The engine must be labeled with an emission control label and the engine family name, both described below.

a. Emission control label: a new label, shown in Figure 8, contains important engine information.

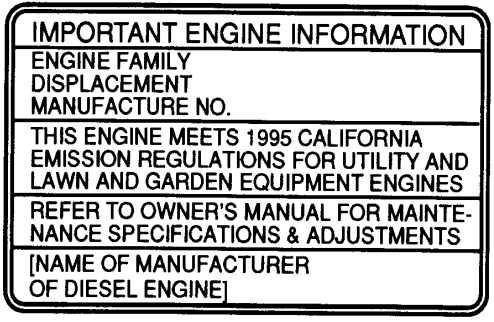


Figure 8: Emission Control Label

b. Engine Family Name, as assigned by the California Air Resources Board, identifies engine family group, by largest displacement, within an engine family, and is shown in Figure 9.

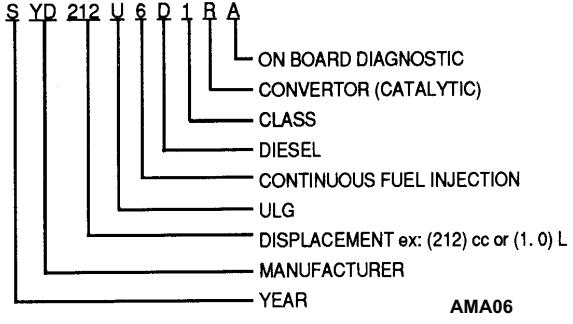


Figure 9: Engine Family Name

3-1 Emission Control Labels: Emission control labels are a requirement of the California ULG Rules. In the event the emission control label provided on the engine is inaccessible, there will be a supplemental label containing the same information, provided by the equipment manufacturer, located in a readily accessible location, shown in Figure 10:

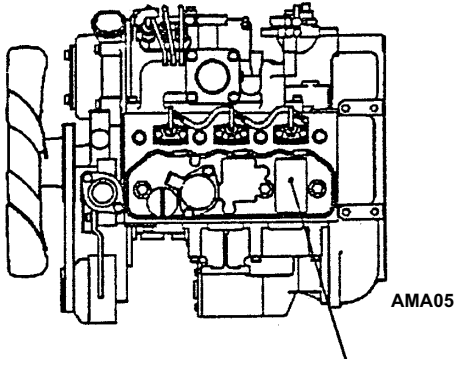


Figure 10: Emission Control Label Location

All engine labels and supplementary labels will contain the following information:

- Engine Family Name
- Displacement
- Manufacturer

The above information, along with the engine serial number, will be required to obtain proper service information and correct service repair parts. An example list which identifies the exhaust control system is shown in Figure 11.

	Engine Model	Engine Family Name
1.	3TNV70-TK	6YDXL0.85W3N
2.	3TNV76-TK	6YDXL1.11W3N
Note: Design parameters to bring engine family into compliance were utilized; no after treatment measures incorporated.		

Figure 11: Exhaust Control Systems

4. Emission Control Related Parts: The California ULG Rules require a manufacturing defect warranty on all emission control parts, including:

- Fuel Injection Pump
- Fuel Injection Nozzle
- High Pressure Oil Line
- Air Cleaner Element[1]
- Fuel Filter Element[1]
- Air Cleaner Gasket
- Air Intake Pipe (Manifold) Gasket
- Muffler Gasket

The warranty period is two years and complete details are included in the section of this manual titled "*California Emission Control System Warranty Statement, Your Warranty Rights And Obligations*."

[1]Any warranted part which is scheduled for replacement as required maintenance shall be warranted for the period of time up to the first scheduled replacement point for that part.

5. Maintenance Schedule: To maintain optimum engine performance and compliance with the California ULG Rules, the maintenance schedule must be adhered to.

Regular scheduled maintenance is the major key to engine service life and emission regulation compliance. Scheduled maintenance requirements must be performed regularly. See the Maintenance Schedule provided in this Operator's Manual.

California Emission Control System Warranty Statement

Your Warranty Rights And Obligations

The California Air Resources Board and Thermo King are pleased to explain the California emission control system warranty on your 1996 and later utility equipment (ULG) engine. In California, new utility equipment (ULG) engines must be designed, built, and equipped to meet the state's stringent anti-smog standards. Thermo King must warrant the California emission control system on your utility equipment

(ULG) engine for the time listed below, provided there has been no abuse, neglect or improper maintenance of your utility equipment (ULG) engine.

Your California emission control system includes parts such as the fuel injection pump, the fuel injection nozzle, and the high-pressure fuel line. Also included are the air filter element and the fuel filter element which are covered under this California emission control system warranty only up to the first scheduled maintenance replacement.

Where a warrantable condition exists, Thermo King will repair your utility equipment (ULG) engine with California emission control system parts or components at no cost to you, including diagnosis, parts and labor.

Manufacturer's Warranty Coverage

1996 and later utility equipment (ULG) engines: California emission control system parts and components are warranted for the period of two years (24 months). If any California emission control system part or component on your utility equipment (ULG) engine is defective, the part or component will be repaired or replaced by Thermo King.

Owner's Warranty Responsibilities

As the utility equipment (ULG) engine owner, you are responsible for the performance of the required maintenance listed in this Operator's Manual. Thermo King recommends that you retain all receipts covering maintenance on your utility equipment (ULG) engine, but Thermo King cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.

As the utility equipment (ULG) engine owner, you should be aware that Thermo King may deny you warranty coverage if your utility equipment (ULG) engine, or a part or component, has failed due to abuse, neglect, improper maintenance, or unapproved modifications.

You are responsible for presenting your utility equipment (ULG) engine to an authorized Thermo King dealer as soon as a problem exists. The emission control system parts or component repairs should be completed in a reasonable amount of time not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities, contact a Thermo King service representative at 952-887-2337.

Manufacturer Explanation Of Emission Control System Warranty Coverage

A. Warranty Commencement Date

The California emission control system warranty period begins on the date the engine or equipment is delivered to the original retail purchaser.

B. Length Of Coverage

Thermo King warrants to the original purchaser, and each subsequent purchaser, that the engine emission control system is free from defects in material and workmanship that cause the failure of the warranted California emission control system part or component for a period of two years (24 months) beginning on the day the utility equipment (ULG) engine is delivered to the original purchaser.

C. What Is Covered

1. **Repair or Replacement of Parts:** Repair or replacement of any California emission control system warranted part or component will be performed at no charge to the owner at a Thermo King authorized service dealer. To obtain the phone number of your nearest Thermo King authorized service dealer, call the Cold Line at: 952-887-2202.
2. **Warranty Period:** Any warranted California emission control system part or component that is not scheduled for replacement as required maintenance, or that is scheduled only for regular inspection to the effect of repair or replacement as necessary, shall be warranted for the warranty period. Any warranted part that is scheduled for replacement as required maintenance shall be warranted for the period of time up to the first scheduled replacement point for that part or component.
3. **Diagnosis:** The owner shall not be charged for diagnostic labor which leads to the determination that a California emission control system warranted part or component is defective, if the diagnostic work is performed at a Thermo King authorized service dealer.
4. **Consequential Damages:** Thermo King is liable for damages to other engine parts or components caused by the failure of an emission control system part or component within the above stated California emission control system warranty period.

D. What is Not Covered

1. Failures caused by abuse, neglect, or improper maintenance.
2. Add-On or Modified Parts. The use of add-on or modified parts can be grounds for disallowing a warranty claim. Thermo King is not liable for failures of emission control system parts or components caused by the use of add-on or modified parts.
3. Use of fuel other than the California Title 13, CCR Section 2282 (g)(3), low sulfur, low aromatic, with a cetane number of 48 minimum, will nullify this warranty.

E. How to File a Claim

Warranty claims for California emission control system parts or components are to be filed by the Thermo King authorized servicing dealer on behalf of the engine owner.

F. Where to Get Warranty Service

Warranty service or repairs shall be provided at all Thermo King authorized service dealers. You can generally find dealers in the Yellow Pages of your regional telephone directory, or call the customer service representative at 888-887-2202 for the location of the nearest Thermo King authorized service dealer.

G. Maintenance, Replacement and Repair of Emission Control System Related Parts

Any Thermo King approved replacement part can be used in the performance of any warranty maintenance or repairs on emission control system parts or components, and must be provided without charge to the owner if the part is still under the California emission control system warranty.

H. Emission Control System Warranty Parts List

- Part Name
- Fuel Injection Pump
- Fuel injection Nozzle
- High Pressure Fuel Oil Line
- Air Cleaner Element
- Fuel Filter Element
- Air Cleaner Gasket
- Air Intake Pipe (Manifold)

- Gasket Muffler Gasket

I. Maintenance Statements

The owner is responsible for the performance of the required maintenance as defined by Thermo King within this Operator's Manual.

EPA Emission Control System Warranty Statement

Thermo King warrants to the initial owner and each subsequent owner that the certified non-road diesel engine in your unit is:

1. Designed, built and equipped so as to conform, at the time of sale, with all applicable regulations adopted by the United States Environmental Protection Agency (EPA).
2. Free from defects in materials and workmanship in specific, emission-related parts for a period of five years or 3,000 hours of operation, whichever comes first, after date of delivery to the initial owner.

If an emission-related part or component fails during the warranty period, it will be repaired or replaced. Any such part or component repaired or replaced under warranty is warranted for the warranty period.

During the term of this warranty, Thermo King will provide, through a Thermo King authorized service dealer or other establishment authorized by Thermo King, repair or replacement of any warranted part at no charge to the non-road engine owner.

In an emergency, repairs can be performed at any service establishment, or by the owner, using any replacement part. Thermo King will reimburse the owner for their expenses, including diagnostic charges, for such emergency repair. These expenses shall not exceed Thermo King's suggested retail price for all warranted parts replaced, and labor changes based on Thermo King's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate.

Any replacement part can be used for maintenance or repairs. The owner should ensure that such parts are equivalent in design and durability to genuine Thermo King parts. However, Thermo King is not liable for parts which are not genuine Thermo King parts.

A part not being available within 30 days or repair not being completed within 30 days constitutes an emergency.

As a condition of reimbursement, replaced parts and received invoices must be presented at a place of business of a Thermo King authorized service dealer or other establishment authorized by Thermo King.

This warranty covers the following emission-related parts and components:

- Fuel Injection System
- Intake Manifold
- Exhaust Manifold
- Miscellaneous hoses, clamps, connectors and sealing devices used in the above systems.

If failure of one of these parts or components results in failure of another part or component, both will be covered by this warranty.

Responsibilities

This warranty is subject to the following:

Thermo King Corporation Responsibilities

During the emission warranty period, if a defect in material or workmanship of a warranted part or component is found, Thermo King will provide:

- New, remanufactured, or repaired parts or components required to correct the defect.

NOTE: Items replaced under this warranty become the property of Thermo King.

- Labor, during normal working hours, required to make the warranty repair. This includes diagnosis and labor to remove and install the engine, if necessary.

Owner Responsibilities

During the emission warranty period, the owner is responsible for:

- The performance of all required maintenance. A warranty claim will not be denied because the scheduled maintenance was not performed. However, if the lack of required maintenance was the reason for the repair, then the claim will be denied.

- Premium of overtime cost.
- Cost to investigate complaints that are not caused by defect in Thermo King material or workmanship.
- Providing timely notice of a warrantable failure and promptly making the product available for repair.

Limitations

Thermo King is not responsible for resultant damages to an emission-related part or component resulting from:

- Any application or installation Thermo King deems improper as explained in this Operator's Manual, or any other manuals provided with the unit.
- Attachments, accessory items, or parts not authorized for use by Thermo King.
- Improper off-road engine maintenance, repair, or abuse.
- Owner's unreasonable delay in making the product available after being notified of a potential product problem.

This warranty is in addition to Thermo King's standard warranty applicable to the off-road engine product involved.

Remedies under this warranty are limited to the provision of material and services as specified herein. Thermo King is not responsible for incidental or consequential damages such as downtime or loss of engine-powered equipment.

Unit Description

General Description

The T-1000 SPECTRUM^{TM} unit is a microprocessor based transport temperature control system that uses the SR-2 Truck HMI microcontroller to manage system functions.

The unit is a self-powered multi-temperature unit for straight trucks and includes the latest in scroll compressor technology. The T-1000 condensing unit mounts on the front of the truck cargo compartment. Remote evaporators are used to control temperatures in up to three individual cargo compartments.

The T-1000 is designed for use with chlorine free R-404A refrigerant. Two basic models provide the following:

Model 30: Cooling and hot gas heating on engine operation.

Model 50: Cooling and hot gas heating on engine operation and electric standby operation. Electric evaporator heaters are optional.

Engine power for the unit is provided by a diesel engine. Optional electric standby power (Model 50) is provided by an electric motor. A clutch on the diesel engine isolates the engine during electric standby operation.

The continuous monitoring function of the microprocessor optimizes the unit's performance, reducing fuel consumption and unit down time. The unit has a self check feature that can be run before the daily distribution route to identify possible malfunctions.

The built-in CYCLE-SENTRY, an exclusive Thermo King feature, automatically starts and stops the unit according to temperature demands.

Design Features

- Microprocessor Controller, SR-2 Truck
  - Alarm Code Display
  - Continuous System Monitoring

  - CYCLE-SENTRY™ Start/Stop Controls
  - Engine and Electric (Model 50) Hour Display
  - In-Cab Remote
  - Smart Defrost
  - Symbolic Controller Interface
  - Unit Self Check-pretripping
- Aerodynamic Thermo Plastic Recyclable Geloy Injection Molded Skins with In-mold Color
- Air Cleaner, Dry Type
- Alternator, 12 Volt, 120 Amp
- Automatic Phase Correction (Model 50)
- Bypass Oil Filter
- Coolant Expansion Tank
- Diesel/Electric Autoswitching (Model 50)
- Economy Mode
- Fahrenheit and Celsius Scales
- Fuel Filter, Spin On
- Low Decible Kit
- Oil Filter, Full Flow
- Poly-V Stretchy Belt System with Quiet Channel Technology
- R-404A Chlorine-free Refrigerant
- Robotic Welded Steel Frame with Automotive Grade 2 Coat Paint Finish
- Scroll Compressor, New Generation TK06
- Stainless Steel Condenser and Evaporator Hardware
- TK376 Tier 4 Diesel Engine
- Top Cover System

Unit Options

- SmartPower™ Electric Standby (standard 230 v/3 phase/60 Hz) 460/3/60, 400/3/50
- Hand Held TSR-2 Diagnostic Tool
- Body Mount Enclosure for HMI
- Rear Remote Control (flushmount)

- Easy-Read Thermometer
- Remote Indicator Lights
- DAS (Data Acquisition System)
- Door Switch
- Battery Box
- Battery (truck)
- Heat (electric)
- Engine Block Heater
- Fuel Tank (30 gal. aluminum side-fill)
- Quick Oil Drain Kit
- Whisper™ Plus Sound Kit
- Silicone Hoses
- Hose Management Channel
- Top Cover and Screen
- Evap Side Screens
- Snow Cover
- Special Finish Paint
- Chrome Grills

Engine

Engine power for the T-1000 SPECTRUM is provided by the TK376, a three cylinder, EPA Tier 4, special clean and quiet diesel engine rated at 19.6 continuous horsepower (14.6 kW) at 2425 RPM. A belt drive system transfers energy to the compressor, unit fans and alternator.

ELC (Extended Life Coolant)

The maintenance interval for ELC is five years or 12,000 hours. A nameplate on the coolant expansion tank identifies units with ELC (see “Safety Decals and Locations”). The new engine coolant, Texaco Extended Life Coolant, is Red instead of the previous Green or Blue-Green coolants.

CAUTION: Do not add Green or Blue-Green coolants to cooling systems that use Red Extended Life Coolants.

NOTE: The use of 50/50% pre-mixed ELC is recommended to ensure that deionized water is being used. If 100% full strength concentrate is used, deionized or distilled water is recommended instead of tap water to ensure the integrity of the cooling system is maintained.

Clutch

The centrifugal clutch engages fully at 600 ± 100 RPM on engine operation, constantly turning the compressor, alternator, and fans at both high and low speed. The clutch isolates the engine from the belt drive system during electric standby operation on Model 50 units.

Scroll Compressor

The unit features the high performance new generation TK06 scroll compressor.

Standard HMI Control Panel

The Standard HMI Control Panel (Human/Machine Interface) is used to operate the unit and display unit information. The Control Panel is typically located in the vehicle driver's compartment and communicates with the base controller using a connection on the interface board.

Figure 12: Standard HMI Control Panel

CYCLE-SENTRY™ Start/Stop System

The CYCLE-SENTRY Start/Stop fuel saving system provides optimum operating economy.

WARNING: Turn the unit off by pressing the OFF key before opening doors or inspecting any part of the unit. The unit can start at any time without warning if it has been turned on by pressing the ON key.

The CYCLE-SENTRY system automatically starts the unit on microprocessor demand and shuts down the unit when all demands are satisfied.

The system monitors and maintains the compartment temperature, the engine block temperature, and battery charge levels at a point where quick, easy starts are possible.

Defrost

Frost will gradually build up on the evaporator coils as a result of normal operation. Periodically this frost must be melted to prevent a loss of cooling and airflow.

Defrost is accomplished by passing hot refrigerant gas through the evaporator coil, thus melting the frost (or ice). Melted frost drains out of the unit onto the ground through the drain tubes.

The defrost damper closes during defrost to prevent warm air from entering the cargo area. The optional electric heater strips are also energized in defrost during electric standby operation.

Defrost can be initiated at any time the evaporator coil temperature is below 42 F (5.5 C).

There are two methods of defrost initiation:

SR-2 Microprocessor Controller: The Microprocessor Controller is programmed to automatically initiate timed and forced defrost cycles. The SR-2 uses temperature sensors to determine if forced defrost is required.

Manual Defrost: Manual Defrost allows the operator to initiate a defrost cycle by pressing the **DEFROST** key. See “Initiating a Manual Defrost Cycle.”

DAS - Data Acquisition System (Optional)

The DAS (Data Acquisition System) monitors and records the temperatures of (up to) six additional sensors. The sensors are independent from the microprocessor controller and are normally located in the truck box to monitor load temperatures.

DAS data can be downloaded through a serial port to an IBM® PC compatible computer. WinTrac™ 4.0 (or higher) software is used to view and analyze the data. Brief reports can be printed on a microprinter connected to the serial port.

Electric Standby (Model 50 Units Only)

The Electric Standby option allows the unit to be operated on either the diesel engine or external electric power.

DANGER: High voltage AC power is present whenever the unit is operating in the Electric mode and whenever the unit is connected to external standby power. Voltages of this magnitude can be lethal. Exercise extreme caution when working on the unit.

Standard Model 50 Features

The following features are standard equipment on units equipped with Electric Standby.

Automatic Diesel/Electric Selection: The unit will automatically switch to electric operation when a power cord is connected and the standby power is switched On.

Overload Relay: The overload relay is self-resetting.

Hot Gas Heat: Hot gas heat is utilized on all units.

Automatic Phase Correction: The control system features two motor contactors. This allows correct motor rotation regardless of phase rotation on the incoming power.

Optional Model 50 Features

The following features are available as options on units equipped with Electric Standby.

- Electric Heater Strips
- Auto Switching

Engine Compartment Components

Coolant Expansion Tank: The coolant level and temperature are monitored by the base controller. If the coolant temperature becomes too high or the level becomes too low, an alarm will occur.

The engine must have antifreeze protection to –30 F (–34 C). Check and add coolant in the expansion tank as needed.

CAUTION: Do not remove expansion tank cap while the coolant is hot.

CAUTION: Do not add Green or Blue-Green coolants to cooling systems that use Red Extended Life Coolants.

Engine Oil Dipstick: Use the engine oil dipstick to check the engine oil level.

Receiver Tank Sight Glass: The receiver tank sight glass is used to assist in checking the amount of refrigerant in the system.

Compressor Oil Sight Glass: The compressor oil sight glass is used to check the relative level of compressor oil in the compressor sump.

Unit Protection Devices

High Pressure Cutout Switch (HPCO): This normally closed switch monitors the discharge pressure at the compressor. It opens on high discharge pressure to shut the unit down to prevent damage.

Suction Pressure Regulator (SPR): This component is a mechanical control device used to limit the suction pressure to the compressor. The valve controls suction pressure based on the actual system pressure.

Engine Oil Pressure Switch/Sensor: The engine oil pressure switch/sensor is located on the filter head above the bypass oil filter. Engine oil pressure should rise immediately

on starting. If engine oil pressure drops below 10 ± 2 psig (69 ± 14 kPa), the switch/sensor signals the microprocessor to stop the engine.

Preheat Buzzer: The preheat buzzer sounds when the CYCLE-SENTRY™ system energizes the glow plugs. This should warn anyone near the unit that the CYCLE-SENTRY™ system is about to start the diesel engine.

Coolant Temperature Sensor: This sensor provides an engine coolant temperature input to the microprocessor. If the engine coolant temperature is too high, the controller stops the unit and records an alarm.

Electric Motor Overload Relay (Model 50): The overload relay protects the electric standby motor. The overload relay opens the circuit from the contactor to the electric motor if the motor overloads for any reason and an alarm will occur. The relay resets when the alarm code is cleared.

Fuses: Sizes and functions are described in the Specifications section of this manual.

AMA1063

Figure 13: T-1000 SPECTRUM Front View

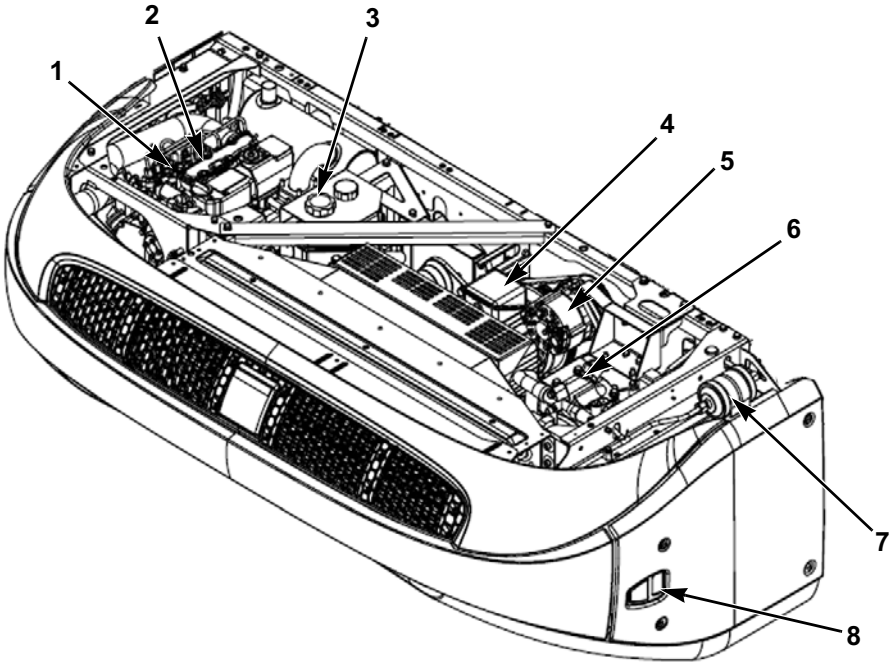


Figure 14: Main Components

1.	Engine Oil Dipstick (on side of engine)	5.	Alternator
2.	Engine	6.	Scroll Compressor
3.	Coolant Expansion Tank	7.	Dehydrator (Filter-Drier)
4.	Electric Motor	8.	On/Off Switch

Main Components in Figure 14

Operation

SR-2 Truck HMI Controller

The SR-2 Standard Truck HMI (Human/Machine Interface) Control Panel is supplied as standard equipment on SR-2 Single Temperature and Multi-Temperature Truck applications. It is used to operate the unit and display some unit information. The SR-2 Standard Truck HMI Control Panel communicates with the base controller via the CAN (Controller Area Network) bus. It is connected to the base controller via CAN Connector J14 on the interface board. The SR-2 Standard Truck HMI Control Panel is typically located in the vehicle driver's compartment. It may also be located in the truck dashboard using a DIN mounting ring or under the dashboard using an under dash mounting kit.

Figure 15: SR-2 Truck HMI Controller

Controller Features

- Displays Box Temperature and Setpoint in Fahrenheit or Celsius
- Displays Engine Running and Motor Running Hourmeters
- Indicates the current Zone on Multi-Temperature Applications
- Changes unit or Zone Setpoints

- Selects and Indicates CYCLE-SENTRY or Continuous Mode Operation
- Selects and Indicates High Speed Lock-Out Operation
- Initiates and Indicates a unit or Zone Defrost Cycle
- Indicates an Alarm Condition Exists, Displays and Clears Alarms
- Initiates and Indicates a Pretrip Test
- Sends a Start of Trip to the ServiceWatch data logger.
- Changes Display Brightness
- Shows HMI Control Panel Serial Number and Software Revision.
- The SR-2 Standard Truck HMI Control Panel consists of a display and nine touch-sensitive keys.
- The display is capable of showing numbers and lighting several icons. It does not display text, thereby making it suitable for use with any language.
- Amber indicator LED's are located next to each of the four function keys below the display. The LED will light when that function is active.
- A red indicator LED is located between the ON Key and OFF Key. This indicator will glow if Alarm Code 91 Check Electric Ready Input occurs. It will also glow if a 15 pin Thermo King data cable is connected to the serial port on the back of the controller..

Display

Display The display presents information to the operator. This information includes setpoint and box temperature, hourmeter readings, alarms and several icons as shown below. All display segments and icons are shown in Figure 16.

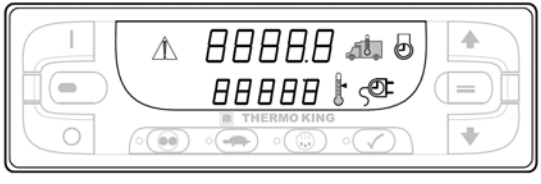


Figure 16: Display

The upper row of numbers can display the Box Temperature, Engine Run Time Hourmeter, Current Zone or Alarm Code(s). The lower row of numbers can display the Setpoint, Electric Run Time Hourmeter or Total Number of Alarms. The meaning of the display icons are shown in the following table.

When this icon is present the upper display is showing the actual box temperature inside the truck box.

When this icon is present the lower display is showing the current setpoint.

When this icon is present the upper display is showing the diesel engine run time.

When this icon is present the lower display is showing the electric motor run time (if the unit equipped with optional ELECTRIC STANDBY).

When this Alarm Icon is present one or more alarm conditions have occurred. If the display is not flashing any alarms are Check Alarms. If the display is flashing on and off a shutdown alarm has occurred and the unit has been shut down. Immediate action must be taken.

Keys and LED Indicators

There are nine touch sensitive keys. Some of these keys have more than one function as shown in Figure 17.

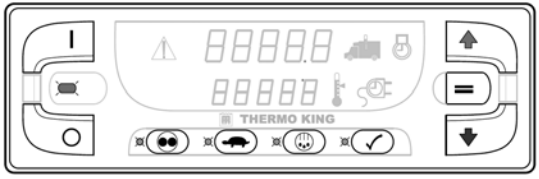


Figure 17: Keys and LED Indicators

- The ON Key and OFF Key are located at the left side of the display.
- A red indicator LED is located between the ON Key and OFF Key. This indicator will glow if Alarm Code 91 Check Electric Ready Input occurs. It will also light if a 15 pin Thermo King data cable is connected to the serial port on the back of the controller.
- There are amber indicator LED's located next to each of the four function keys below the display. The LED will glow amber when that function is active.
- The UP ARROW, DOWN ARROW and ENTER Keys are located at the right side of the display

The primary and secondary uses for each key are shown in the table below. If a key has more than one use, the primary use is shown first.

ON Key

Primary Use – Pressing the ON Key will turn the unit on.

Secondary Use – When the unit is on and a different display is shown, pressing this key will return to the Standard Display of box temperature and setpoint.

Secondary Use – When the unit is on, pressing this key and the PRETRIP Key at the same time will display any alarm codes that are present.

Secondary Use – When the unit is on, pressing and holding this key allows the UP ARROW Key and DOWN ARROW Key to increase or decrease the display brightness.

Multi-Temp Use – When Manual Zone Selection is active the selected zone can be turned on and off by simultaneously pressing the ON Key and ENTER Key.

POWER OFF Key

Primary Use – Pressing the OFF Key will turn the unit off..

UP ARROW Key

Primary Use – When the unit is turned on and the Standard Display is shown, pressing the UP ARROW Key will increase the setpoint.

Secondary Use – When alarms are being displayed, pressing this key will scroll thru the alarms (if more than one alarm is present).

Secondary Use – While holding ON Key down with the unit turned on, pressing this key will increase the display brightness (Low, Medium, High).

DOWN ARROW Key

Primary Use – When the unit is turned on and the Standard Display is shown, pressing the DOWN ARROW Key will decrease the setpoint.

Secondary Use – While holding ON Key down with the unit turned on, pressing this key will decrease the display brightness (High, Medium, Low).

ENTER Key

Primary Use – If the setpoint has been changed using the UP ARROW Key and/or DOWN ARROW Key, pressing the ENTER Key enters the setpoint into the base controllers memory.

Secondary Use – When alarms are being displayed, pressing this key will clear the alarm shown on the display.

Secondary Use – When the unit is turned on, press and hold this key for 5 seconds to send a Start of Trip (SOT) to the data logger.

Multi-Temp Use – Pressing this key will enable Manual Zone Selection mode and scroll through the installed zones, one zone at a time. When a zone is manually selected the zone can be turned on or off, the setpoint can be changed and a manual defrost cycle can be initiated if zone conditions permit.

CYCLE-SENTRY/Continuous Key

Primary Use – If the unit is turned on and is in Continuous Mode, pressing the CYCLE-SENTRY/CONTINUOUS Key will switch operation to CYCLE-SENTRY Mode and the amber LED indictor will glow. If the unit is running in CYCLE-SENTRY Mode, pressing this key will switch operation to Continuous Mode and the amber LED will turn off.

HIGH SPEED LOCK-OUT Key

Primary Use – If the unit is turned on, pressing the HIGH SPEED LOCK-OUT Key will activate High Speed Lock-Out. The unit will switch to low speed operation and the amber LED indictor will glow. No further high speed operation is allowed until this feature is turned off. If the High Speed Lockout Timer is enabled, the unit will automatically return to high speed after a programmed time limit. This feature is typically used in noise sensitive areas to reduce unit noise.

NOTE: The HIGH SPEED LOCK-OUT Key is only used when the unit is operating in Diesel Mode. The HIGH SPEED LOCK-OUT Key does not have any effect in Electric Mode operation.

DEFROST Key

Primary Use – If the unit is turned on, pressing the DEFROST Key will initiate a manual defrost cycle if conditions allow. If the evaporator coil temperature less than 45°F (7°C) the unit will enter a defrost cycle. The amber LED will flash while the defrost cycle is initialized and will glow during the defrost cycle. The defrost cycle will terminate automatically and the amber LED will turn off when the evaporator coil temperature is greater than 52°F (11°C). To manually terminate a defrost cycle turn the unit off and back on.

Multi-Temp Use – A zone must be selected before initiating a manual defrost cycle.

PRETRIP TEST Key

Primary Use – Pressing and holding the PRETRIP TEST Key for 5 seconds will initiate either a Full Pretrip Test or Engine Running Pretrip Test so long as no alarm conditions exist. If the Alarm Icon is glowing, record and clear the alarms before starting the Pretrip Test.

Press and hold the PRETRIP TEST Key for 5 seconds. The amber LED may flash while the Pretrip Test is initialized and will glow steady while the Pretrip Test is running. When the Pretrip Test is complete the amber LED will turn off.

- If there are no alarm codes set when the Pretrip Test is complete, the unit passed.
- If there are alarm codes set when the Pretrip Test is complete, the unit failed. Check and correct the alarm conditions and repeat the test.
- If a shutdown alarm occurred, Alarm Code 28 Pretrip Abort will be set and the unit will be shut down. Check and correct the alarm conditions and repeat the test.

Secondary Use – When the unit is turned off press and hold this key for 5 seconds to show the HMI Control Panel Serial Number (in the upper display) and the HMI Control Panel Software Revision (in the lower display).

The Multi-Temperature Display and Zone Indicators

Horizontal bars to the left of the box temperature are used to indicate the zone currently shown on the display. In Figure 18 Zone 3 is being shown on the display.

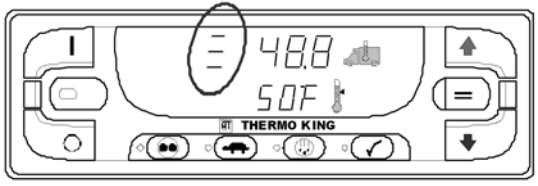


Figure 18: Display

When one horizontal bar is present at the left side of the box temperature, then Zone 1 is being shown on the display. The display will automatically scroll through all configured zones, showing each zone for 10 seconds.

When two horizontal bars are present at the left side of the box temperature, then Zone 2 is being shown on the display. The display will automatically scroll through all configured zones, showing each zone for 10 seconds.

When three horizontal bars are present at the left side of the box temperature, then Zone 3 is being shown on the display. The display will automatically scroll through all configured zones, showing each zone for 10 seconds. Zone 3 only appears on units configured with 3 zones.

IMPORTANT: If the unit is configured as a 2 zone unit, Zone 3 will still appear in Automatic Zone Scrolling and Manual Zone Selection mode. However, Zone 3 is turned off and cannot be turned on.

In Figure 19, Zone 1 is being shown on the display. The box temperature in Zone 1 is -8.2°F (-22.3°C) and the setpoint is -10°F (-23.3°C).

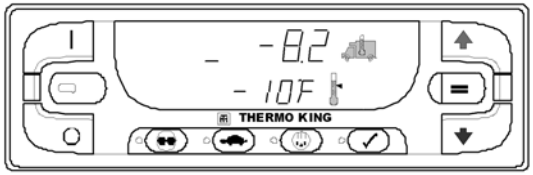


Figure 19: Zone 1

In the screen in Figure 20, Zone 2 is being shown on the display. The box temperature in Zone 2 is 35.8°F (2.1°C) and the setpoint is 35°F (1.7°C).

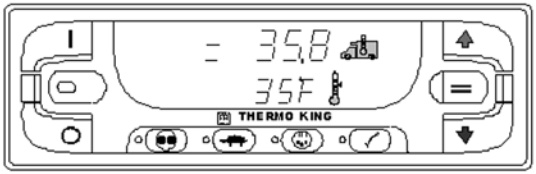


Figure 20: Zone 2

In Figure 21, Zone 3 is being shown on the display. The box temperature in Zone 3 is 48.8°F (9.3°C) and the setpoint is 50°F (10°C). Zone 3 only appears on units configured with 3 zones.

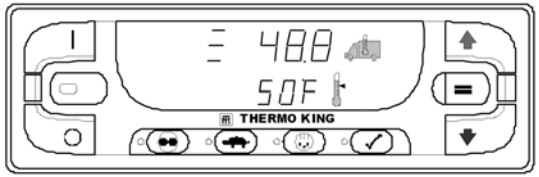


Figure 21: Zone 3

Turning the Unit On and Off

Verify the Base Controller On/Off switch is in the ON position. The unit is turned on by pressing the ON Key and off by pressing the OFF Key. When the ON Key is pressed the display briefly shows dashes (Figure 22) as the display initializes.

IMPORTANT: If the display flashes on and off continuously when the ON Key is pressed, check to make sure the Base Controller On/Off switch is in the ON position.

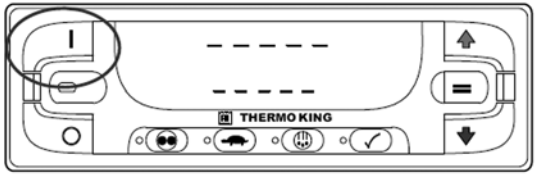


Figure 22: Dashes Displayed

Then the unit running time hourmeters are shown for 30 seconds. The diesel engine run time hours and Diesel Icon are shown in the upper display. If the optional Electric Standby Feature is installed, the electric motor run time hours and Electric Icon are shown in Figure 23.

A Full Pretrip Test is initiated from this display by pressing and holding the Pretrip Key as shown later in this section.

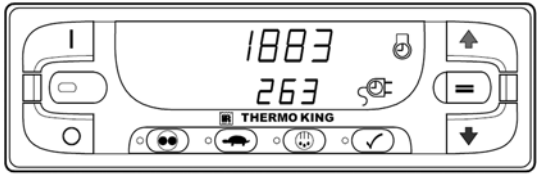


Figure 23: Hourmeters

When the unit is ready to run the Standard Display of box temperature and setpoint appears. The box temperature and Box Temp Icon are shown in the upper display. The setpoint and Setpoint Icon are shown in the lower display. On multi-temperature applications, the Zone indicators are shown to the left of the box temperature. In Figure 24, the two bars indicate that Zone 2 is currently being shown. The Zone 2 box temperature shown in Figure 24 is 35.8°F (2.1°C) with a 35°F (1.7°C) setpoint.

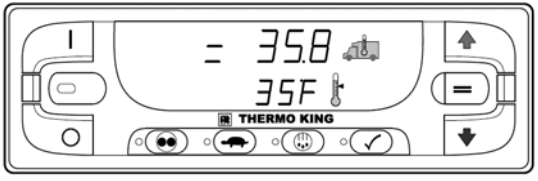


Figure 24: Zone 2 Temperature

Pressing the OFF Key stops unit operation. The unit shuts down immediately and the display briefly shows dashes and then goes blank. To start the unit again, press the ON Key (Figure 25).

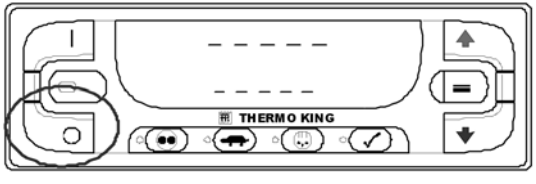


Figure 25: ON Key

The Multi-Temperature Standard Display

The Standard Display is the default display that appears if no other display function is selected. The Standard Display shows the current zone box and the temperature and setpoint of that zone.

Horizontal bars to the left of the box temperature are used to indicate the zone currently shown on the display. Zone 1 is shown in Figure 26.

The box temperature is that measured by the return air sensor. The box temperature and Box Temperature Icon are shown in the upper display. The setpoint and Setpoint Icon are shown in the lower display. The box temperature in Figure 26 is -8.2°F (-22.3°C) with a -10°F (-23.3°C) setpoint.

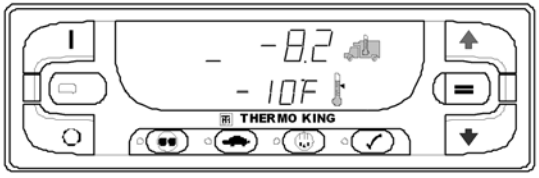


Figure 26: Box Temperature and Box Temperature Icon, Setpoint Temperature and Setpoint Icon

IMPORTANT: If the unit is configured as a 2 zone unit, Zone 3 will still appear in Automatic Zone Scrolling and Manual Zone Selection mode. However, Zone 3 is turned off and cannot be turned on.

If another display is shown, pressing the ON Key will return the display to the Standard Display.

Automatic Zone Scrolling

When the Standard Display is shown, the operating conditions for each zone will automatically be shown for 10 seconds. At the end of that time, the next zone will appear on the display.

- If a zone is currently turned on, the box temperature and setpoint for that zone will be shown.

IMPORTANT: On SR-2 Truck SPECTRUM Multi-Temperature units, Zone 1 can be turned off while the unit is running. The unit will continue to run with Zone 1 turned off.

- If a zone is turned off, dashes will be shown instead of the box temperature and setpoint for that zone.
- If a zone is in defrost, the LED indicator next to the Defrost Key will be illuminated when that zone is shown on the display.
- If the unit is configured as a 2 zone unit, Zone 3 will still appear in Automatic Zone Scrolling. However, Zone 3 is turned off and cannot be turned on.
- Unit operating conditions are shown by the LED indicators next to the Cycle Sentry Key, High Speed Lock-out Key and Pretrip Test Key.

In Figure 27, Zone 1 is being shown as indicated by the single horizontal bar to the left of the box temperature. The box temperature of -8.2°F (-22.3°C) and setpoint of -10°F (-23.3°C) indicate that Zone 1 is turned on. Since the Cycle

Sentry LED is turned off, the unit operating in Continuous Mode. The illuminated LED next to the High Speed Lock-out Key indicates that high speed operation is locked out. The absence of the Alarm Icon indicated that no alarm conditions exist.

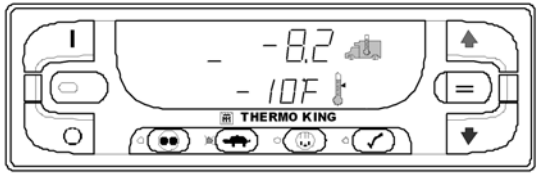


Figure 27: Zone 1 Display

Manual Zone Selection Mode

Manual Zone Selection mode allows the operator to select a desired zone when the Standard Display is being shown. Once a zone is selected, the zone can be turned on or off, the zone setpoint can be changed or a manual defrost cycle can be initiated.

To manually select a zone when the Standard Display is being shown, press the Enter Key once. A decimal point will be illuminated to the right of the Zone 1 horizontal bar as shown in Figure 28. This indicates that Manual Zone Selection MODE is active. The unit will remain in Manual Zone Selection MODE for 30 seconds after the last key press.

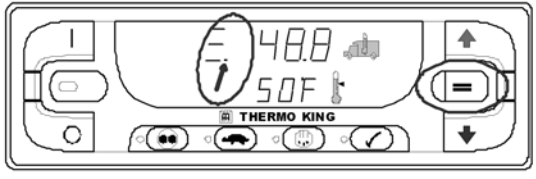


Figure 28: Decimal Point

When Manual Zone Selection MODE is active, pressing the Enter Key manually scrolls through the zones. When the desired zone is shown on the display, operation of that zone can be changed as required.

- The selected zone can be turned on or off.
- The selected zone setpoint can be changed.

- A manual defrost cycle can be initiated in the selected zone if zone conditions permit.

Turning Zones On and Off

Each configured zone can be individually turned on or off. The On and Off state for each zone is maintained even if the unit is turned off and back on. For example, if Zone 2 is turned off and the unit is then turned off and back on, Zone 2 will still be off.

IMPORTANT: At least one zone must be turned on. If all configured zones but one are turned off, the controller will not allow the last zone to be turned off.

IMPORTANT: Unlike trailer unit applications, Zone 1 can be turned off without affecting unit operation, so long as at least one other zone is turned on.

From the Standard Display, press the Enter Key to put the unit in Manual Zone Selection mode. Press the Enter Key again as required to select the desired zone. In Figure 29, Zone 2 has been selected.

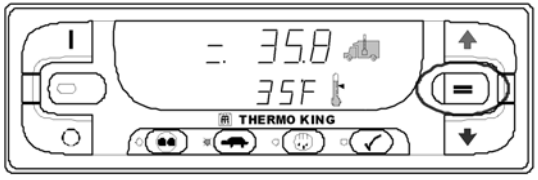


Figure 29: Zone 2 Selected

When the desired zone is selected, simultaneously press the ON Key and ENTER Key to turn the zone off. The box temperature and setpoint show all dashes to indicate the zone is turned off as shown in Figure 30.

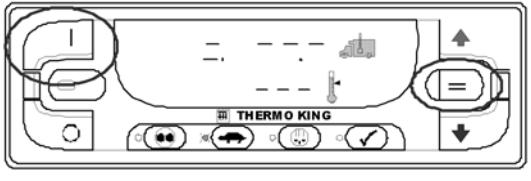


Figure 30: Dashes Indicate Zone is Off

Simultaneously pressing the ON Key and ENTER Key again will turn the selected zone back on as shown in Figure 31.

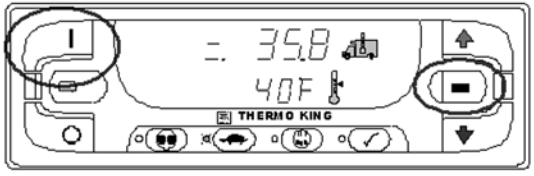


Figure 31: Simultaneously Press ON Key and ENTER Key

Changing the Zone Setpoint

From the Standard Display, press the Enter Key to put the unit in Manual Zone Selection mode. Press the Enter Key again as required to select the desired zone. In Figure 32, Zone 2 has been selected.

Figure 32: Zone 2 Selected

When the desired zone is selected, press the UP ARROW Key and/or DOWN ARROW Key until the desired setpoint is shown. In Figure 33, the setpoint has been increased to 40°F (4.4°C) using the UP ARROW Key.

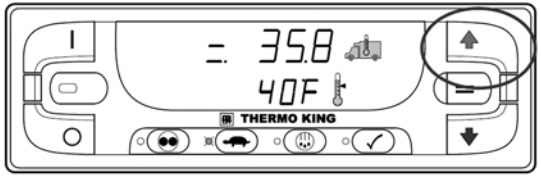


Figure 33: Setpoint Increased

When the desired setpoint has been selected using the UP ARROW Key and DOWN ARROW Key, the ENTER Key (Figure 34) must be pressed to confirm and load the new setpoint.

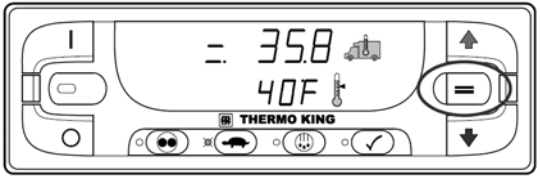


Figure 34: Press Enter Key

The new setpoint of 40°F (4.4°C) will remain on the display after the ENTER Key has been pressed.

- If the setpoint is changed using the UP ARROW Key and DOWN ARROW Key, the setpoint display will begin to flash 10 seconds after the last press of the Up Arrow or Down Arrow key as a reminder to press the ENTER Key.
- The setpoint display will flash for 10 additional seconds. If at the end of this time the ENTER Key still has not been pressed to complete the setpoint change, the setpoint will return to the old setpoint and Alarm Code 127 Setpoint Not Entered will be set. The Alarm Icon will appear in the display.

Failure to confirm the new setpoint by pressing the ENTER Key within 20 seconds of changing the setpoint will result in no setpoint change. In addition, Alarm Code 127 Setpoint Not Entered is set, to indicate that the setpoint change was started but was not completed.

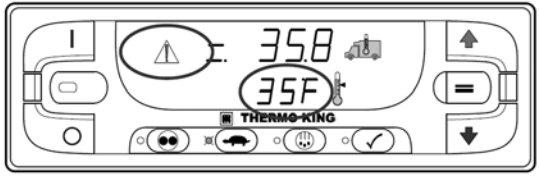


Figure 35: Alarm Icon Displayed

Notice that the setpoint (Figure 35) has returned to the old setpoint of 35°F (1.6°C) and the Alarm Icon has lighted indicating that Alarm Code 127 Setpoint Not Entered is set.

IMPORTANT: If the setpoint is changed using the UP ARROW Key or DOWN ARROW Key, the change must be confirmed by pressing the ENTER Key within 20 seconds of changing the setpoint.

- If the ENTER Key is pressed, the setpoint change made with the UP ARROW Key and/or DOWN ARROW Key is accepted, the setpoint is changed, and the display returns to the Standard Display showing the new setpoint.
- If the ENTER Key is not pressed within 20 seconds of making a change with the UP ARROW Key and/or DOWN ARROW Key, the setpoint is not changed and the display returns to the Setpoint Display showing the old setpoint. Alarm Code 127 Setpoint Not Entered is set and the Alarm Icon will appear on the display, to indicate that the setpoint change was started but not completed.

Starting the Diesel Engine

Verify the Base Controller On/Off switch is in the ON position. Diesel engine preheats and starts are automatic in both Continuous Mode and CYCLE-SENTRY Mode. The engine will preheat and start as required when the unit is turned on.

The engine pre-heat and start sequence will be delayed in CYCLE-SENTRY mode if there is no current need for the engine to run.

NOTE: If the unit is equipped with optional Electric Standby there may be some additional prompts before the engine will start. See STARTING THE ELECTRIC MOTOR on the following pages for details.

CAUTION: The engine may start automatically any time the unit is turned on.

WARNING: Never use starting fluid.

When the engine is preparing to start, the SR-2 Standard Truck HMI Control Panel will continue to display the Standard Display as shown in Figure 36. The preheat buzzer at the unit (located on the unit Interface Board) sounds during the engine pre-heat and crank sequence.

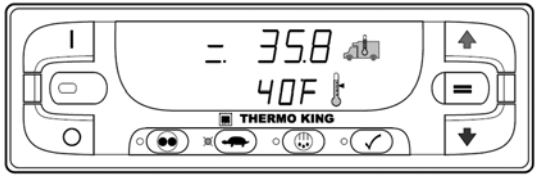


Figure 36: Standard Display

Starting the Electric Motor

Units equipped with the Electric Standby option only.

Verify the Base Controller On/Off switch is in the ON position. Electric motor starting is automatic in both Continuous Mode and CYCLE-SENTRY Mode. The motor will start as required when the unit is turned on in Standby Mode and standby power is connected.

CAUTION: The motor may start automatically any time the unit is turned on.

When the motor is preparing to start, the SR-2 Standard Truck HMI Control Panel will continue to show the Standard Display as shown in Figure 37. The preheat buzzer at the unit (located on the unit Interface Board) sounds for 20 seconds before the electric motor starts.

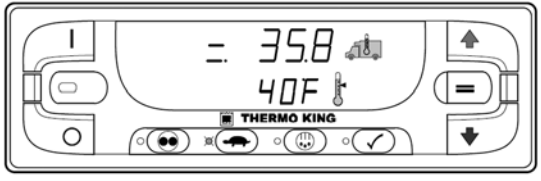


Figure 37: Standard Display

Switching From Diesel to Electric

IMPORTANT: Applies to units with the Electric Standby Option only. The operation of this feature can be changed using the Guarded Access Menu. See the Guarded Access / Unit Configuration Menu / Diesel to Electric Auto Switch Enabled feature in the Unit Diagnostic Manual for details. The Diesel to Electric Auto Switch Enabled feature should be set YES on units equipped with the Standard Truck HMI Control panel.

Diesel to Electric Auto Switch Enabled set YES (Default): If this feature is set YES, the unit will switch automatically from Diesel Mode to Electric Mode when standby power is connected and present.

Diesel to Electric Auto Switch Enabled set NO: The Diesel to Electric Auto Switch Enabled feature should not be set NO on units equipped with the Standard Truck HMI Control panel.

Switching from Electric to Diesel

IMPORTANT: Applies to units with the Electric Standby Option only. The operation of this feature can be changed using the Guarded Access Menu. See the Guarded Access / Unit Configuration Menu / Electric to Diesel Auto Switch Enabled feature in the HMI Diagnostic Manual for details.

Electric to Diesel Auto Switch Enabled feature set YES : If this feature is set YES, the unit will switch automatically from Electric Mode to Diesel Mode when standby power is removed or fails.

Electric to Diesel Auto Switch Enabled feature set NO (Default) : If the unit is operating in Electric Mode and standby power is disconnected or fails, the unit will not automatically switch to Diesel mode. This is primarily designed to prevent unauthorized diesel engine starts when the truck is indoors or on a ferry where engine operation is strictly prohibited.

If the unit is operating in Electric Mode and standby power is disconnected or fails, Alarm Code 91 Check Electric Ready Input will be set. The red LED between the ON key and OFF

Key will glow, the Alarm Icon will glow and the box temperature and setpoint displays will disappear as shown in Figure 38.

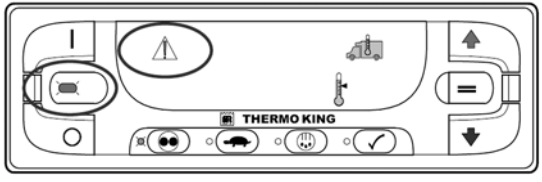


Figure 38: Alarm Icon

IMPORTANT: If the unit is running in Electric Mode and electric standby power is lost and then restored, Alarm Code 91 Check Electric Ready Input will be automatically cleared and the unit will restart in Electric Mode.

IMPORTANT: When the display shown in Figure 39 is present, do not press the Standard Truck HMI Control Panel OFF Key to turn the unit off. Press the Standard Truck HMI Control Panel ON Key twice to clear Alarm Code 91 Check Electric Ready Input and turn the unit back on in Diesel Mode.

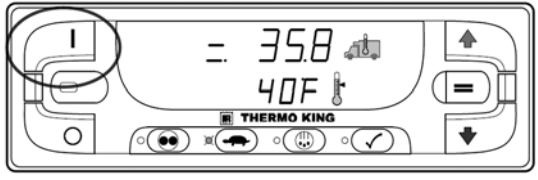


Figure 39: Alarm Code Cleared, Unit in Diesel Mode

Preferred Method for Manually Switching from Electric Mode to Diesel Mode.

1. Press the Standard Truck HMI Control Panel OFF Key to turn the unit off.
2. Turn off the standby power and disconnect the cord.
3. Press the Standard Truck HMI Control Panel ON Key to turn the unit on. The Hourmeters display will briefly appear and then the screen will appear as shown in Figure 40.

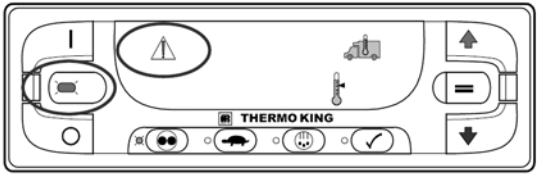


Figure 40: Alarm Code Displayed

4. Press the Standard Truck HMI Control Panel ON Key twice to clear Alarm Code 91 Check Electric Ready Input and turn the unit back on in Diesel Mode.

IMPORTANT: When the display shown in Figure 41 is present, do not press the Standard Truck HMI Control Panel OFF Key to turn the unit off. Press the Standard Truck HMI Control Panel ON Key twice to clear Alarm Code 91. Check Electric Ready Input and turn the unit back on in Diesel Mode.

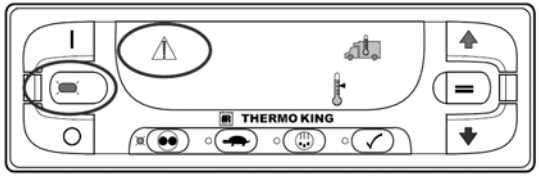


Figure 41: Press ON Key to Clear Alarm and Turn Unit ON in Diesel Mode

If the Standard Truck HMI Control Panel OFF Key is pressed when the display shown in Figure 41 is present, the unit will turn off and the display will be blank. To restart the unit in Diesel Mode, proceed as follows:

- Press the Standard Truck HMI Control Panel ON Key. The Hourmeters display and a blinking Alarm Icon will appear.
- When the Hourmeters display and a blinking Alarm Icon is shown, press the Standard Truck HMI Control Panel ON Key again. The display will go blank but the blinking Alarm Icon will remain on and blinking.

- When the display goes blank and the blinking Alarm Icon is shown, press the Standard Truck HMI Control Panel ON Key again. The box temperature and setpoint will appear, the blinking Alarm Icon will disappear and the unit will start in Diesel Mode.

Selecting CYCLE SENTRY or Continuous Mode

When Cycle Sentry mode is selected the unit will start and stop automatically to maintain setpoint, keep the engine warm and the battery charged. When Continuous Mode is selected, the unit starts automatically and runs continuously to maintain setpoint and to provide constant airflow throughout the truck box.

CYCLE SENTRY Mode or Continuous Mode is selected by pressing the CYCLE SENTRY/CONTINUOUS Key when the unit is turned on. If the unit is running in Continuous Mode, pressing this key will switch operation to CYCLE SENTRY Mode and the amber LED indictor will glow. If the unit is running in CYCLE SENTRY Mode, pressing this key will switch operation to Continuous Mode and the amber LED will turn off.

The unit shown below in Figure 42 is running in CYCLE SENTRY Mode.

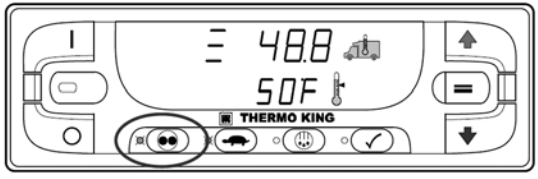


Figure 42: CYCLE SENTRY Mode

CAUTION: The engine may start automatically any time the unit is turned on.

CAUTION: If the unit is in CYCLE SENTRY null and the mode is switched to Continuous Mode, the unit will start automatically.

Selecting the High Speed Lock-Out Feature

If the High Speed Lock-Out feature is enabled and turned on, the unit will run only in low speed until the High Speed Lock-Out feature is turned off or the High Speed Lock-Out Timer is exceeded. This feature is typically used in noise sensitive areas to reduce unit engine noise.

High Speed Lock-Out is turned on or off by pressing the HIGH SPEED LOCK-OUT Key when the unit is turned on. Pressing this key will turn High Speed Lock-Out on, pressing it again will turn High Speed Lock-Out off. If High Speed Lock-Out is turned on, unit will switch to low speed operation and the amber LED indictor will glow. No further high speed operation is allowed until this feature is turned off or the High Speed Lock-Out Timer is exceeded.

IMPORTANT: HIGH SPEED LOCK-OUT TIMER: If High Speed Lock-Out Mode is selected, the High Speed Inhibit Timeout feature may be enabled to return the unit to normal operation after a set time period has expired. This prevents unintended extended operation with high speed operation locked out. The time period may be set from 15 minutes to 2 hours. If a time period is set and exceeded, the unit will return to normal operation with high speed operation allowed and the amber LED indicator will turn off. If necessary to return to High Speed Lock-Out Mode, press the HIGH SPEED LOCK-OUT Key again.

The unit shown in Figure 43 has High Speed Lock-out turned on..

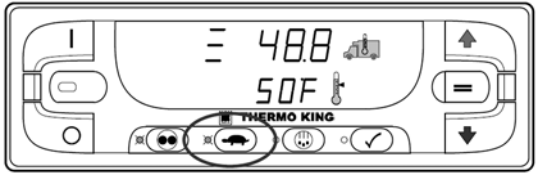


Figure 43: High Speed Lock-Out Turned On

NOTE: The HIGH SPEED LOCK-OUT Key is only used when the unit is operating in Diesel Mode. The HIGH SPEED LOCK-OUT Key does not have any effect in Electric Mode operation.

Initiating a Zone Manual Defrost Cycle

Defrost cycles are usually initiated automatically based on time or demand. Manual defrost may also be available. Defrost is only available if the unit is running and the evaporator coil temperature is less than 45°F (7°C). Other features such as door switch settings may not allow manual defrost under some conditions.

From the Standard Display, press the Enter Key to put the unit in Manual Zone Selection mode. Press the Enter Key again as required to select the desired zone. In Figure 44, Zone 2 has been selected.

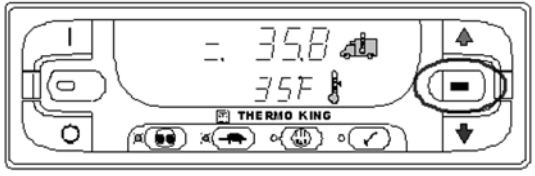


Figure 44: Zone 2 Selected

To initiate a manual defrost cycle in the selected zone, press the DEFROST Key as shown below. If zone conditions allow, the zone will enter a defrost cycle and the amber LED next to the DEFROST Key will glow (Figure 45).

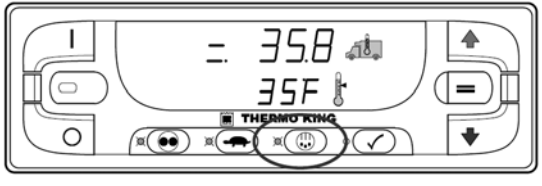


Figure 45: Amber LED

*IMPORTANT: **During the defrost cycle, the box temperature of the zone in defrost will rise toward 50°F (10°C) (Figure 46). This is normal and is caused by the defrost cycle warming the evaporator coil. Since the damper door is closed during the defrost cycle, this warm air is not allowed to pass into the truck box.***

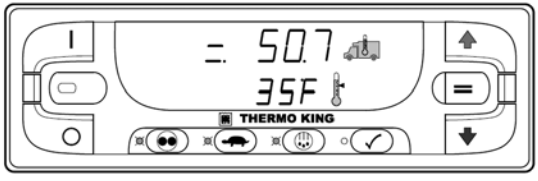


Figure 46: Box Temperature of Zone in Defrost

Terminating a Defrost Cycle: The defrost cycle terminates automatically when the evaporator coil temperature is greater than or equal to 52°F (11°C) or the defrost timer expires. When the defrost cycle is completed the amber LED next to the DEFROST Key will turn off. Defrost can also be terminated by turning the unit off and back on.

Alarms

Alarm Code Notification: If an alarm condition occurs, the Alarm Icon will appear on the display. If the alarm is a Check Alarm, the Alarm Icon will turn on but the unit will continue to run. If the alarm is a Shutdown Alarm, the Alarm Icon and the display will flash on and off and the unit will shut down. If the alarm is zone specific, the zone indicator (Figure 47) will be present to show which zone has the alarm condition.

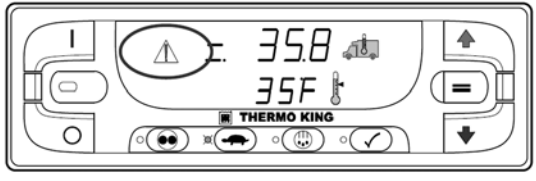


Figure 47: Alarm Icon

Displaying Alarm Codes: Alarm Codes are displayed by simultaneously pressing and holding the ON Key and PRETRIP TEST Key (Figure 48).

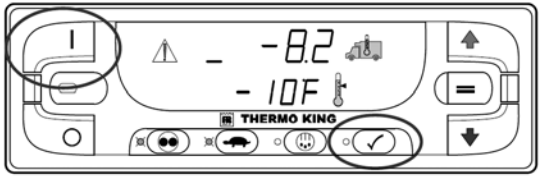


Figure 48: ON and PRE TRIP TEST Keys

The Alarm Display will appear as shown in Figure 49.

Figure 49: Alarm Display

Unit Alarm Codes: Unit alarms affect the operation of the entire unit. The Alarm Display shown above indicates that Alarm Code 50 Reset Clock exists and that there is only one alarm condition present.

Zone Specific Alarm Codes: If an alarm condition is specific to a zone, the zone indicator will be present to identify the zone experiencing the alarm condition. The Alarm Display shown in Figure 50 indicates that Alarm Code 127 Setpoint Not Entered exists in Zone 2. It also shows that a total of three alarm conditions exist.

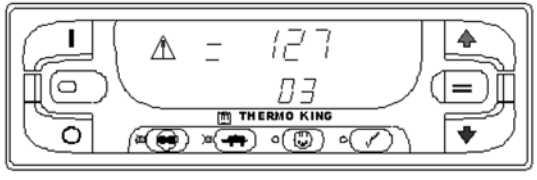


Figure 50: Alarm Code 127

Multiple Alarm Codes: If more than one alarm code has been set, they are displayed with the most recent alarm shown first. Use the UP ARROW Key to scroll through the alarms.

Clearing Alarm Codes: After the alarm situation is resolved, press the ENTER Key to clear the alarm code currently being shown. When all alarms have been cleared the display will show all zeros to indicate that no alarm codes exist (Figure 51).

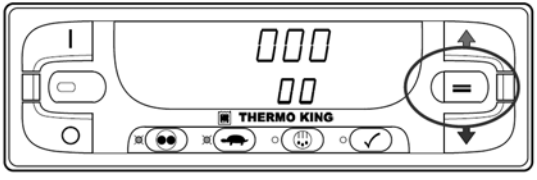


Figure 51: All Zeros, No Alarm Codes Exist

The display will return to the Standard Display about 30 seconds after all alarms have been cleared.

Important Alarm Notes

- All alarms must be viewed before any of the alarms can be cleared.
- If an alarm will not clear, it may still exist. If the alarm is not corrected, it will not clear or may be immediately set again
- Some alarms cannot be cleared using the Standard Truck HMI Control Panel. These alarms must be cleared by maintenance personnel from the Maintenance or Guarded Access Menus.
- Alarm Code 91 Check Electric Ready Input is cleared by turning the unit off and back on. See SWITCHING FROM ELECTRIC TO DIESEL in this chapter.

SR-2 Alarm Codes

NOTE: Not all alarm codes are used with all applications.

Code	Description	Operator Help
0	No Alarms Exist	
2	Check Evaporator Coil Sensor	Manually monitor load temperature. Report alarm at end of the day.

Code	Description	Operator Help
3	Check (Control) Return Air Sensor	Manually monitor load temperature. Report alarm at end of the day.
4	Check (Control) Discharge Air Sensor	Manually monitor load temperature. Report alarm at end of the day.
5	Check Ambient Air Sensor	Report alarm at end of the day.
6	Check Coolant Temp Sensor	Report alarm at end of the day.
7	Check Engine RPM Sensor	Report alarm at end of the day.
9	High Evaporator Temperature	Manually monitor load temperature. Report alarm at end of the day.
10	High Discharge Pressure	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
11	Unit Controlling on Alternate Sensor	Manually monitor load temperature. Report alarm at end of the day.
12	Sensor or Digital Input Shutdown	The indicated zone is not longer able to operate and has been shut down. Repair immediately.
13	Sensor Check	Manually monitor load temperature. Report alarm at end of the day.
15	Check Glow Plugs or Intake Air Heater	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.

Code	Description	Operator Help
17	Engine Failed to Crank	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
18	High Engine Coolant Temperature	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
19	Low Engine Oil Pressure	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
20	Engine Failed to Start	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
21	Cooling Cycle Check	Manually monitor load temperature. Report alarm at end of the day.
22	Heating Cycle Check	Manually monitor load temperature. Report alarm at end of the day.
23	Cooling Cycle Fault	The indicated zone is not longer able to operate and has been shut down.
24	Heating Cycle Fault	The indicated zone is not longer able to operate and has been shut down.
25	Alternator Check	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
26	Check Refrigeration Capacity	Manually monitor load temperature. Report alarm at end of the day.

Code	Description	Operator Help
28	Pretrip or Self Check Abort	Report alarm at end of the day.
29	Defrost Damper Circuit Check	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
30	Defrost Damper Stuck	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
31	Check Oil Pressure Switch	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
32	Refrigeration Capacity Low	The indicated zone is not longer able to operate and has been shut down. Repair immediately.
33	Check Engine RPM	Report alarm at end of the day.
35	Check Run Relay Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
36	Electric Motor Failed to Run	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
37	Check Engine Coolant Level	Report alarm at end of the day.
38	Electric Phase Reversed	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.

Code	Description	Operator Help
39	Check Water Valve Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
40	Check High Speed Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
41	Check Engine Coolant Temperature	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
42	Unit Forced to Low Speed	Report alarm at end of the day.
43	Unit Forced to Low Speed Modulation	Report alarm at end of the day.
44	Check Fuel System	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
45	Hot Gas or Hot Gas Bypass Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
46	Check Air Flow	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
48	Check Belts or Clutch	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
50	Reset Clock	Report alarm at end of the day.

Code	Description	Operator Help
52	Check Heat Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
54	Test Mode Timeout	Service Test or Interface Board Test timed out after 15 minutes. Report alarm at end of the day.
61	Low Battery Voltage	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
62	Ammeter Out of Calibration	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
63	Engine Stopped	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
64	Pretrip Reminder	Report alarm at end of the day.
66	Low Engine Oil Level	Check engine oil level. If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
67	Check Liquid Line Solenoid Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
68	Internal Controller Fault Code	Report alarm at end of the day.
70	Hourmeter Failure	Report alarm at end of the day.

Code	Description	Operator Help
74	Controller Reset to Defaults	Report alarm at end of the day.
77	Controller EPROM Checksum Failure	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
79	Internal Data Logger Overflow	Report alarm at end of the day.
80	Check Compressor Temp Sensor	Report alarm at end of the day.
81	High Compressor Temp	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
82	High Compressor Temp Shutdown	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
83	Low Engine Coolant Temperature	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
84	Restart Null	Report alarm at end of the day.
85	Forced Unit Operation	Report alarm at end of the day.
86	Check Discharge Pressure Sensor	Report alarm at end of the day.
87	Check Suction Pressure Sensor	Report alarm at end of the day.
89	Check Electronic Throttling Valve Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.

Code	Description	Operator Help
90	Electric Overload	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
91	Check Electric Ready Input	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
92	Sensor Grades Not Set	Report alarm at end of the day.
93	Low Compressor Suction Pressure	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
94	Check Loader #1 Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
95	Check Loader #2 Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
96	Low Fuel Level	Check engine fuel level. If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
98	Check Fuel Level Sensor	Report alarm at end of the day.
99	High Compressor Pressure Ratio	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
108	Door Open Timeout	Close Doors. Report alarm at end of the day.
111	Unit Not Configured Correctly	Report alarm at end of the day.

Code	Description	Operator Help
113	Check Electric Heat Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
114	Multiple Alarms - Can Not Run	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
115	Check High Pressure Cut Out Switch	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
116	Check High Pressure Cut In Switch	Report alarm at end of the day.
117	Auto Switch from Diesel to Electric	Report alarm at end of the day.
118	Auto Switch from Electric to Diesel	Report alarm at end of the day.
120	Check Alternator Excite Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
121	Check Liquid Injection Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
122	Check Diesel/Electric Circuit	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
127	Setpoint Not Entered	Be sure the setpoint is set to the required temperature.
128	Engine Run Time Maintenance Reminder #1	Report alarm at end of the day.

Code	Description	Operator Help
129	Engine Run Time Maintenance Reminder #2	Report alarm at end of the day.
130	Electric Run Time Maintenance Reminder #1	Report alarm at end of the day.
131	Electric Run Time Maintenance Reminder #2	Report alarm at end of the day.
132	Total Unit Run Time Maintenance Reminder #1	Report alarm at end of the day.
133	Total Unit Run Time Maintenance Reminder #2	Report alarm at end of the day.
134	Controller Power On Hours	Report alarm at end of the day.
135	Check Spare Digital Inputs	Report alarm at end of the day.
136	Check Spare Digital Outputs	Report alarm at end of the day.
137	Check Damper Motor Heater Output	Report alarm at end of the day.
141	Autoswitch Diesel to Electric Disabled	Report alarm at end of the day.
145	Loss of Controller "On" Feedback Signal	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
146	Software Version Mismatch	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
148	Autoswitch Electric to Diesel Disabled	Report alarm at end of the day.

Code	Description	Operator Help
149	Alarm Not Identified	If unit is shut down repair immediately. Otherwise, report alarm at end of the day.
150	Out of Range Low	Manually monitor load temperature. Report alarm at end of the day.
151	Out of Range High	Manually monitor load temperature. Report alarm at end of the day.
203	Check Display Return Air Sensor	Manually monitor load temperature. Report alarm at end of the day.
204	Check Display Discharge Air Sensor	Manually monitor load temperature. Report alarm at end of the day.

Sending a Data Logger Start of Trip

When the unit is turned on, press and hold the ENTER Key (Figure 52) for 5 seconds to send a Start of Trip (SOT) marker to the unit ServiceWatch Data Logger and the optional DAS Data Logger (if equipped).

For additional ServiceWatch Data Logger information, see Service Procedure A50A in Section 6 of the unit Diagnostic Manual.

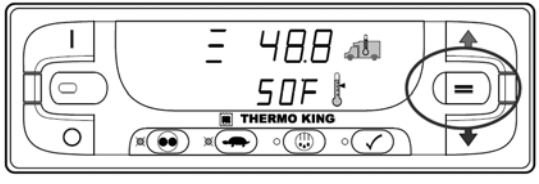


Figure 52: ENTER Key

Pretrip Test

A Pretrip Test verifies unit operation. The PRETRIP Key allows either a Full Pretrip Test or an Engine Running Pretrip Test to be initiated by the operator.

Pretrip Test Conditions

- The current unit settings are saved and restored at the end of the Pretrip Test or if the unit is turned off and back on.
- The Pretrip Test can be run in either Diesel or Electric Mode.
- The unit will auto switch from Diesel Mode to Electric Mode or from Electric Mode to Diesel Mode during a Pretrip Test if these features are enabled and the auto switch conditions occur.

Conditions where Pretrip Tests are not allowed

- Pretrip Tests are not allowed if any Shutdown alarms are present.
- Pretrip tests are not allowed with some Check alarms present.

Pretrip Test Sequence

Pretrip tests proceed in the order shown below. A Full Pretrip Test is started with the engine or motor not running and includes all tests. A Running Pretrip TestsTest is started with the engine or motor running and does not include the Amp Checks or Engine Start Check

- Amp Checks – Each electrical control component is energized and the current drawn is confirmed as within specification.
- Engine Start – The Engine will start automatically.
- Defrost – If the coil temperature is below 45 F (7 C), a defrost cycle is initiated for that zone.
- RPM Check – The engine RPM in high and low speed is checked.
- Zone 1 Cool Check – The ability of the unit to cool in low speed is checked.
- Zone 1 Heat Check - The ability of the unit to heat in low speed is checked.
- Zone 1 Return to Cool Check - The ability of the zone to return to cool mode is checked.

- Zone 2 Cool Check - The ability of the zone to cool in low speed is checked.
- Zone 2 Heat Check - The ability of the zone to heat in low speed is checked.
- Zone 2 Return to Cool Check - The ability of the zone to return to cool mode is checked.
- Zone 3 Cool Check - The ability of the zone to cool in low speed is checked.
- Zone 3 Heat Check - The ability of the zone to heat in low speed is checked.
- Zone 3 Return to Cool Check - The ability of the zone to return to cool mode is checked.
- Report Test Results – The test results are reported as PASS, CHECK or FAIL when the Pretrip Test is completed. If test results are CHECK or FAIL alarm codes will exist to direct the technician to the source of the problem.

Pretrip Test Considerations

When performing a Pretrip Test, the following issues should be considered.

- Whenever possible, run the Pretrip Test with an empty truck box.
- If running a Pretrip Test on a truck loaded with dry cargo, insure that proper airflow can occur around the load. If the load restricts airflow, false test results may occur. Also, units have high refrigeration capacity which results in rapid temperature change. Sensitive dry cargo may be damaged as a result.
- If running a Pretrip Test on a truck that has just been washed down, the extremely high humidity inside the truck box may result in false test results.
- If running a Pretrip Test on a truck loaded with sensitive cargo, monitor the load temperature during the test as normal temperature control is suspended during pre-trip operation.
- Always perform Pretrip Tests with the cargo doors closed to prevent false test results.

Performing a Pretrip Test

Starting a Full Pretrip Test

The Full Pretrip Test must be started with the unit not running. Turn the unit on and clear all alarm codes. Turn the unit off.

Turn the unit on and wait for the unit running time hourmeters to be shown on the display. When the unit running time hourmeters are shown on the display, press and hold the PRETRIP Key for 5 seconds (Figure 53).

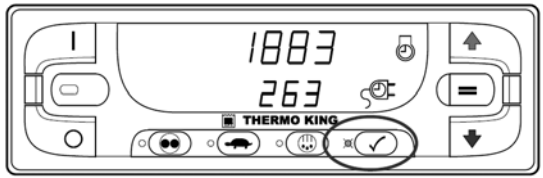


Figure 53: PRETRIP Key

- A flashing Pretrip LED indicates that the Pretrip Test is being initialized. When the Pretrip Test starts, the Pretrip LED will glow steady amber. The display will show the Standard Display.
- The Amps Check Test will be preformed and then the unit will start automatically. The balance of the tests will be completed.
- The Pretrip Test will take about 20 – 30 minutes, depending on conditions.

IMPORTANT: The box temperature will vary during the Pretrip Test. This is normal operation.

- When the Pretrip Test is complete or if a Shutdown Alarm occurs, the amber Pretrip LED will turn off.
- **Stopping a Pretrip Test:** To stop a Pretrip Test at any time, press the POWER OFF Key to turn the unit off. This will generate Alarm Code 28 Pretrip Abort. Other alarm codes may also be generated. This is normal when the Pretrip Test is halted before completion.

Starting a Engine Running Pretrip Test

The Engine Running Pretrip Test must be started with the unit running. Turn the unit on and clear all alarm codes. Allow the unit to start.

With the unit running, press and hold the PRETRIP Key for 5 seconds (Figure 54).

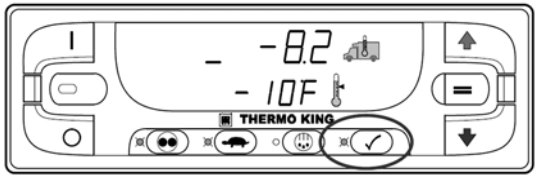


Figure 54: PRETRIP Key

- A flashing Pretrip LED indicates that the Pretrip Test is being initialized. When the Pretrip Test starts, the Pretrip LED will glow steady amber to indicate the test is in progress. The display will show the Standard Display.
- The Pretrip Test will take about 20 – 25 minutes, depending on conditions.
- **IMPORTANT: The box temperature will vary during the Pretrip Test. This is normal operation.**
- When the Pretrip Test is complete or if a Shutdown Alarm occurs, the amber Pretrip LED will turn off.
- **Stopping a Pretrip Test:** To stop a Pretrip Test at any time, press the POWER OFF Key to turn the unit off. This will generate Alarm Code 28 Pretrip Abort. Other alarm codes may also be generated. This is normal when the Pretrip Test is halted before completion.

Pretrip Test Results

Pass Pretrip Test

- If the unit passes the Pretrip Test, the amber Pretrip Test LED will turn off at the completion of the test and the unit will continue to run as required. This signifies that the unit passed the Pretrip Test.

Fail Pretrip Test with Check Alarms

- If the unit fails the Pretrip Test with Check alarms, the Alarm Icon will appear when the alarm condition occurs. The Pretrip Test will continue to run unless a Shutdown Alarm occurs.

- The amber Pretrip Test LED will turn off at the completion of the test, but the Alarm Icon will remain lit. This indicates that one or more Check Alarm conditions occurred during the Pretrip Test. More than one alarm may be present.
- View and record the alarm(s), correct as necessary, clear the alarm(s) and repeat the Pretrip Test.

Fail Pretrip Test with Shutdown Alarms

- If the unit fails the Pretrip Test with a Shutdown alarm, the Alarm Icon will appear when the alarm condition occurs, the unit will immediately shut down and the amber Pretrip Test LED will turn off.
- The Pretrip Test will be aborted.
- Alarm Code 28 Pretrip Abort will be set along with the Shutdown Alarm that was detected. This signifies that a Shutdown Alarm occurred during the Pretrip Test and that the test was aborted. Other alarms may also be present.
- View and record the alarm(s), correct as necessary, clear the alarm(s) and repeat the Pretrip Test.

Display Brightness

The brightness of the SR-2 Standard Truck HMI Control Panel display can be adjusted to allow for changing ambient light conditions. The choices available to the operator are HIGH, MEDIUM and LOW.

To change the display brightness press and hold the ON key then press the UP ARROW Key to increase display brightness and the DOWN ARROW Key to decrease display brightness.

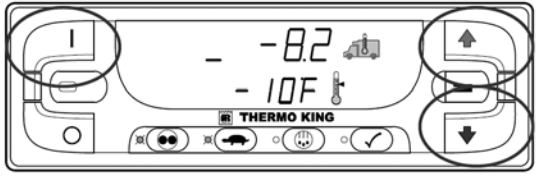


Figure 55: ON Key

Keypad Lockout

The Keypad Lockout feature allows the operator to lock the keypad to prevent tampering. If the Keypad Lockout feature is turned on, all keys except the ON Key and OFF Key are prevented from functioning. The unit can still be turned On and Off, but doing so does not clear Keypad Lockout.

To turn Keypad Lockout on, simultaneously press and hold the ON Key, CYCLE SENTRY Key and HIGH SPEED LOCK-OUT Key for 5 seconds. The display shown below in Figure 56 will appear, with [0 - - - n] replacing the box temperature. When the three keys are released, the display will return to the Standard Display of box temperature and setpoint.

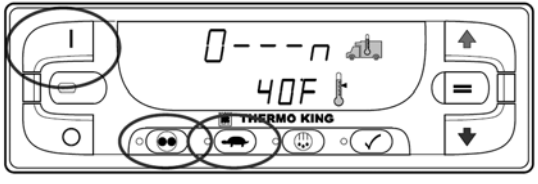


Figure 56: [0 - - - n] Replaces Box Temperature

When Keypad Lockout is turned on, only the ON and OFF Keys are functional. All other keys are locked out. Pressing any key other than the ON Key and OFF Key will cause the box temperature to display [0 - - - n]. When the key is released, the display will return to the Standard Display of box temperature and setpoint.

To turn Keypad Lockout off, simultaneously press and hold the ON Key, CYCLE SENTRY Key and HIGH SPEED LOCK-OUT Key for 5 seconds. The display shown above will appear, with [0 - - - n] replacing the box temperature. When the three keys are released, the display will return to the Standard Display of box temperature and setpoint. All keys will function normally.

NOTE: With the Standard Truck HMI Control Panel, the Keypad Lockout feature is present even if the Guarded Access / Main Menu Configuration / Add Keypad Lockout to Mode Menu feature is disabled.

Checking Truck HMI Control Panel Serial Number and Software Revision

The Standard Truck HMI Control Panel serial number and software revision can be displayed if necessary. To display the serial number and software revision press and hold the PRETRIP key (Figure 57) for 5 seconds when the unit is turned off.

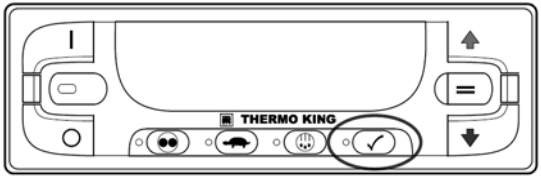


Figure 57: PRETRIP Key

The HMI Control Panel serial number is shown at the top of the display and the installed software revision is shown below. The HMI Control Panel serial number shown below in Figure 58 is 00243 and the software revision is Revision 2201.

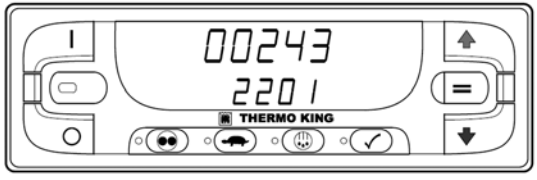


Figure 58: Software Revision

Time and Date

With all SR-2 control systems, the system time and date is maintained by the HMI Control Panel.

The time and date held by the HMI Control Panel cannot be viewed using the Standard Truck HMI Control Panel. Time and date can be checked and changed using WinTrac 4.8.1 or later. Power must be connected to the Standard Truck HMI Control Panel and the unit must be turned off in order to check or change the time and date.

1. Remove the Standard Truck HMI Control Panel as necessary to gain access to the back of the device.

2. Turn the unit on to verify that power is available to the Standard Truck HMI Control Panel. Turn the unit back off.
3. Remove the back cover from the Standard Truck HMI Control Panel. 4
4. Connect a Thermo King 9 to 15 pin serial cable from the PC computer to the 15 pin connector on the back of the Standard Truck HMI Control Panel shown in Figure 59.

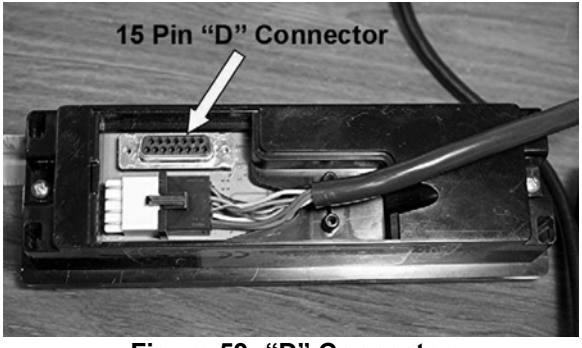


Figure 59: “D” Connector

5. When the cable is connected, be sure the red LED indicator located between Standard Truck HMI Control Panel POWER ON Key and POWER OFF Key is illuminated as shown below (Figure 60). If the red LED indicator is not illuminated the time and date cannot be changed. If the red LED indicator is not illuminated, be sure the unit is turned off.

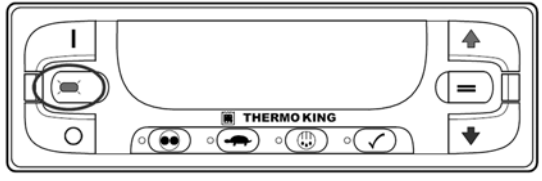


Figure 60: Red LED Indicator

6. Open WinTrac 4.8.1 or later. Earlier versions of WinTrac will not work.
7. Select Seek Device.
8. Use WinTrac to set the time and date. See the WinTrac Manual for additional information.
9. When the time and date is set and checked, disconnected the cable, replace the back cover and reinstall the Standard Truck HMI Control Panel as necessary.

10. Turn the unit on and perform a ServiceWatch Data Logger download using WinTrac to verify the time and date are correct.

Electric Standby Operation

Model 50 units are equipped with Electric Standby. This feature allows the unit to operate on electric power as well as be powered by the standard diesel engine.

During Electric Standby operation, power to the unit is supplied by an electric motor connected to a high voltage power source. Check the unit for proper power source ratings.

WARNING: Units equipped with electric standby can start at any time when the unit is connected to live electric power and the controller is turned on.

CAUTION: Always turn the electric power supply off when handling, connecting, or disconnecting high voltage power cords.

Electric Power Receptacle

The electric power receptacle is used to connect the unit to an appropriate electric power source for electric standby operation. Turn the unit OFF before connecting or disconnecting the power cord.

Figure 61: Model 50 Power Receptacle Box

NOTE: The Model 50 control system automatically determines if diesel or electric power is desired.

See “Starting the Electric Motor” in the Unit Operation chapter of this manual.

Loading and Enroute Inspections

This chapter describes pre-loading, post loading, and enroute inspection procedures. Thermo King refrigeration units are designed to maintain the required product load temperature during transit. Follow these recommended loading and enroute procedures to help prevent cargo spoilage.

Pre-Loading Inspection

1. Products must be pre-cooled before loading. Note any variances on the manifest.
2. Inspect door seals and vent doors for condition and tight seal with no air leakage.
3. Inspect the cargo compartment inside and out. Look for:
   - Damaged or loose skin and insulation
   - Damaged walls, air ducts, floor channels or “T” flooring
   - Clogged defrost drain tubes
   - Blocked return air bulkhead.
4. Inspect bulkheads for a tight fit at ceiling, walls, and floor. Bulkheads must fit tightly to reduce heat transfer between compartments.
5. Pre-cool the cargo compartments: adjust the setpoints for both compartments and run the unit 30–60 minutes (longer if possible) before loading.
6. Supervise product loading to ensure sufficient air space is maintained around and through the load in both compartments. Airflow around the cargo must not be restricted.

   NOTE: Loads should be separated from both sides of the bulkhead by at least 4 in. (100 mm). You can use a pallet as a spacer.

Post-Loading Inspection

Post-loading inspections ensure the cargo has been loaded properly. To perform a post-load inspection:

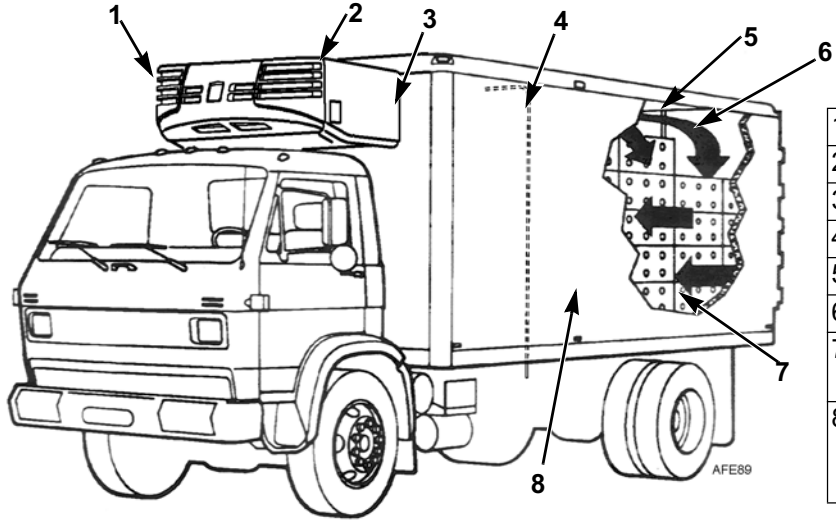
1. Inspect the evaporator outlets for blockage.
2. Turn the unit off before opening the cargo box doors to maintain efficient operation.

   NOTE: You can run the unit with the cargo box doors open if the truck is backed into a refrigerated warehouse with tight door seals.

3. Perform a final check of the load temperature. If the load is above or below temperature, make a final notation on the manifest.

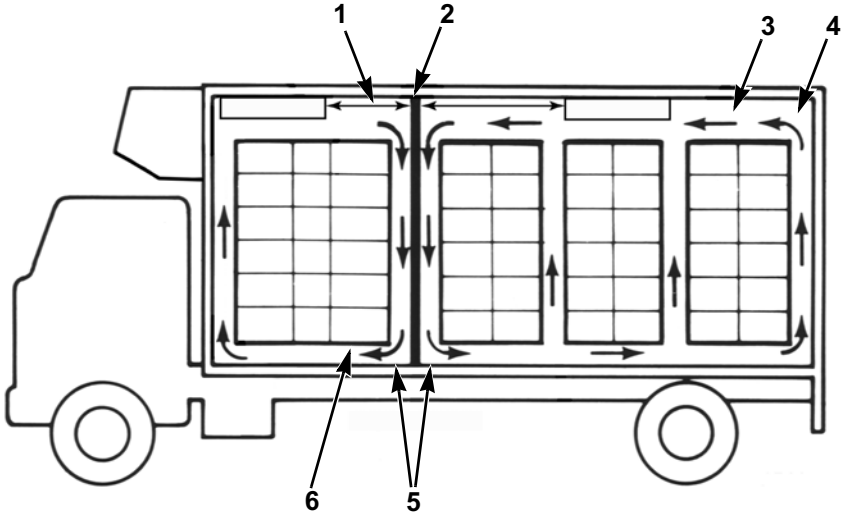
   CAUTION: Pre-cool cargo to the correct temperature before loading. The unit is designed to maintain temperature, not cool an above-temperature load.

4. Close or supervise the closing of the cargo box doors. Make sure they are securely locked.
5. Make sure the setpoint is at the temperature listed on the manifest.
6. If the unit was stopped, restart using the correct starting procedure. See the 'Unit Operation" chapter in this manual.
7. Repeat the after-start inspection. See the "Unit Operation" chapter in this manual.
8. Defrost the unit 30 minutes after loading by starting a manual defrost cycle.



1.	Unit Inspection
2.	Good Outside Air Circulation
3.	Gaskets Equally Compressed
4.	Clear Defrost Drains
5.	Tight Doors
6.	Good Air Circulation Around Load
7.	Cargo at Proper Temperature Prior to Loading
8.	Interior and Exterior Walls and Insulation in Good Condition

Figure 62: Loading Considerations



1.	At Least 48 in. (1219 mm) Between Air Outlet and Wall or Bulkhead
2.	Bulkhead Tightly Sealed
3.	Good Air Circulation Around Load
4.	Rear Compartment
5.	Load Separated from Bulkhead by 4 in. (100 mm)
6.	Front Compartment

Figure 63: Air Circulation Diagram

Enroute Inspections

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

Inspection Procedure

1. Verify that the setpoints are 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, see the “Inspection Troubleshooting” procedure below.
3. Initiate a manual defrost cycle after each enroute inspection.

Inspection Troubleshooting

1. If a return air temperature reading is not within the desired temperature range, refer to the troubleshooting table on the following pages. 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 Service Center or your company office.
4. Take the necessary steps to protect and maintain proper load temperature.

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

Inspection Troubleshooting

Problem	Cause	Remedy
A return air temperature reading is not within desired temperature range of the setpoint.	The unit has not had time to cool down to correct temperature.	Refer to the 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.
	The unit may have a low refrigerant charge.	Check the receiver tank sight glass for refrigerant level. If liquid is not showing in the receiver tank sight glass, the refrigerant charge could be low. A competent refrigeration technician is required to add refrigerant or repair the system. Contact the nearest Thermo King dealer, authorized Service Center, or call the Thermo King Cold Line for referral. Consult the Table of Contents for Cold Line information.
	The unit is in defrost or has just completed a defrost cycle.	Monitor the return air temperature after the defrost cycle is completed to see if the temperature returns to the desired temperature range of the setpoint.
	The evaporator is plugged with frost.	Initiate a manual defrost cycle. The defrost cycle will automatically terminate when complete. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.

Inspection Troubleshooting (Continued)

Problem	Cause	Remedy
	Improper air circulation in the cargo compartment.	Inspect the unit and cargo compartment to determine if the evaporator fans are working and properly circulating the air. Poor air circulation may be due to improper loading of the cargo, shifting of the load. Correct as required. Continue monitoring return air temperature until problem is corrected. ***WARNING: The unit could start at any time when turned on. Turn the unit off before opening doors or inspecting any part of the unit.***
	The unit did not start automatically.	Determine the cause for not starting. Correct as required. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.

Specifications

Engine

Model	TK376 (Tier 4)
Fuel Type	No. 2 Diesel fuel under normal conditions No. 1 Diesel fuel is acceptable cold weather fuel
Oil Capacity:Crankcase & Oil Filter w/Bypass Oil Filter	12.0 quarts (11.4 liters) 13.0 quarts (12.3 liters) Fill to full mark on dipstick
Oil Type	API Classification CI-4 or better (ACEA Rating E3 or better for Europe)
Oil Viscosity	14 F to 122 F (-10 C to 50 C): SAE 15W-40 (Synthetic) 5 to 104 F (-15 to 40 C): SAE 15W-40 -13 to 104 F (-25 to 40 C): SAE 10W-40 -13 to 86 F (-25 to 30 C): SAE 10W-30 -22 to 122 F (-30 to 50 C): SAE 5W-40 (Synthetic) Below -22 F (-30 C): SAE 0W-30 (Synthetic)
Engine rpm:Low Speed Operation High Speed Operation	1650 ± 25 rpm 2425 ± 25 rpm

Engine (Continued)

Engine Oil Pressure	20 to 50 psig (138 to 345 kPa) in low speed 40 to 60 psig (276 to 414 kPa) in high speed
Intake Valve Clearance	0.006 to 0.010 in. (0.15 to 0.25 mm)
Exhaust Valve Clearance	0.006 to 0.010 in. (0.15 to 0.25 mm)
Valve Setting Temperature	70 F (21 C)
Fuel Injection Timing	16 ± 1 degrees BTDC
Injection Nozzle Pressure	1784 to 1929 psig (12,300 to 13,300 kPa)
Low Oil Pressure Switch/Sensor	10 ± 2 psig (69 ± 14 kPa)—shutdown
High Coolant Temperature Sensor	220 ± 5 F (104 ± 3 C)—shutdown
Engine Thermostat	160 F (71 C)

Engine (Continued)

Engine Coolant Type	ELC (Extended Life Coolant), which is “RED” Use a 50/50 concentration of any of the following equivalents: Chevron Dex-Cool Texaco ELC Havoline Dex-Cool® Havoline XLC for Europe Shell Dexcool® Shell Rotella Saturn/General Motors Dex-Cool® Caterpillar ELC Detroit Diesel POWERCOOL® Plus
	CAUTION: Do not add “GREEN” or “BLUE-GREEN” conventional coolant to cooling systems using “RED” Extended Life Coolant, except in an emergency. If conventional coolant is added to Extended Life Coolant, the coolant must be changed after 2 years instead of 5 years.

Engine (Continued)

Coolant System Capacity: With Tube and Fin Radiator Coil (ending 6/12) With Micro-Channel Radiator Coil (starting 6/12)	 5.0 qts (4.7 liters) with coolant expansion tank 5.4 qts (5.1 liters) with coolant expansion tank
Coolant Expansion Tank Cap Pressure	15 psig (103 kPa)

Belt Tension

Belt	**Tension No. on TK Gauge P/N 204-427 (Frequency Gauge Setting Where Applicable)**	
	New Belt	**Field Reset**
Water Pump Belt	40	40
Engine/Electric Motor (Jackshaft)	91 (85 Hz)	85 (70 Hz)
Electric Motor (Jackshaft)/Compressor	Automatically tensioned by tensioner position. See “Belts” in Maintenance Manual Engine Maintenance Chapter.	

Engine Clutch - Hilliard

Engagement	600 ± 100 RPM
Dynamic Torque	66 ft-lb (89.5 N•m) minimum @ 1600 RPM

Refrigeration System

Compressor Model	TK06 Scroll 6 HP
Refrigerant Charge: With Tube and Fin Condenser Coil (ending 6/12) With Micro-Channel Condenser Coil (starting 6/12)	 Approximately 13.4 lbs (6.1 kg) R-404A Approximately 12.0 lbs (5.4 kg) R-404A
Compressor Oil Charge	2.0 quarts (1.9 liters)
Compressor Oil Type	Ester base P/N 203-516 required for Scroll compressor
Suction Pressure Regulator Valve Setting	26 to 29 psig (179 to 200 kPa)
Discharge Pressure Regulator Valve Setting	350 ± 5 psig (2413 ± 34 kPa)
High Pressure Cutout Switch: Open Close	470 ± 7 psig (3241 ± 48 kPa) 375 ± 38 psig (2586 ± 262 kPa)

Electrical Control System

Control System Voltage	12.5 Vdc
Battery Charging System	12 volt, 120 amp, brush type, Thermo King alternator
Voltage Regulator Setting	13.8 to 14.4 volts @ 77 F (25 C)
NOTE: Fuse F4 (Bypass resistor for Prestolite Alternator) must be removed for the Thermo King Alternator.	

Fuses

Fuse	Size	Function
F2	15A	Power to On/Off Switch
F3	40A	Fuel Sol Pull-In/Starter Circuit
F4	None 2A	No Fuse - All Bosch and Thermo King Alternators 2A Fuse - All Prestolite Alternators
F5	40A	Preheat Circuit
F6	15A	High Speed Circuits

Fuses (Continued)

Fuse	Size	Function
F7	2A	8XP Circuit - Controller On Feedback to HMI
F8	5A	CAN Connector J12
F9	5A	CAN Connector J14
F10	10A	8X Power (Install fuse in upper position)
F11	10A	Zone 1 LLS
F12	5A	CAN Connector J13
F13	2A	8FC Circuit (Remote Lights)
F15	P/S	On/Off Relay
F20	2A	Alternator Sense
F21	60A	Main Fuse (2 Circuit)

Fuses (Continued)

Fuse	Size	Function
F25	7.5A	HPCO/Run Circuit
F4 Remove fuse F4 for Model 30 units with Australian Bosch or Thermo King Alternators. Install fuse F4 for Model 50 units with Prestolite Alternator.		
F10 When fuse F10 is installed in the upper position the On/Off keys on the HMI turn the unit on and off. When fuse F10 is installed in the lower position the unit will start and run without the HMI control panel.		
F15 The device identified as F15 is a poly switch. These over-current devices reset automatically and are not replaceable.		

Electrical Components

Component	Current Draw (Amps) at 12.5 Vdc	Resistance (Ohms)
Glow Plugs (3) Each	4.3	2.3 ± 0.2
Fuel Solenoid:Pull In Coil Hold In Coil	35 to 45 0.5	0.2 to 0.3 24 to 29
High Speed (Throttle) Solenoid	3.3	3.8

Electrical Components (Continued)

Component	Current Draw (Amps) at 12.5 Vdc	Resistance (Ohms)
Condenser Inlet Solenoid (CIS)	1.8	6.9
Hot Gas Bypass Solenoid (HGBS)	0.8	15.6
Liquid Injection Solenoid (LIS)	1.1	11.3
Purge Valve (PV)	1.1	11.3
Receiver Tank Pressure Solenoid (RTPS)	1.1	11.3
Starter Motor (No Load Bench Test)	90	—
Hot Gas Solenoids (HGS) - Remote	1.5	8.3
Liquid Line Solenoids (LLS) - Remote	1.3	9.6
Suction Line Solenoids (SLS) - Remote	1.3	9.6
Drain Heaters (each) - Remote	2.1	6.0
Fan Motors (each) - Remote	7.3	—

Electrical Standby (Model 50 Units Only)

Electric Motor and Overload Relay

Voltage/Phase/Frequency	Horsepower	Kilowatts	rpm	Full Load (amps)	Overload Relay Setting (amps)
230/3/50	10.0	7.5	1460	22.5	25
230/3/60	12.0	8.9	1750	28.8	32
400/3/50	10.0	7.5	1460	17.0	16
460/3/60	12.0	8.9	1750	14.4	16

Standby Power Requirements

Supply Circuit Breaker: 200-230/3/50-60 380-460/3/50-60	50 amps 20 amps
Extension Cord Size:	Up to 50 ft—10 gauge 75 ft—8 gauge

Maintenance Inspection Schedule

A closely followed maintenance program will help to keep your Thermo King unit in top operating condition. The following general schedule is provided to assist in monitoring that maintenance.

For more specific detail, see the maintenance manual for your unit and to the PreTrip Inspection chapter in this manual.

After first week of operation:

- Check belt tension.
- Tighten unit mounting bolts.
- Check coolant level.
- Check refrigerant oil level.
- Check refrigerant level.

Maintenance Inspection Schedule

Condenser Unit

Pretrip	1,200 Hours	2,000 Hours	Annual/ 3,000 Hours	Inspect/Service These Items
				Microprocessor
•				Run pretrip test (see “Pretrip Test” in Operating Instructions Chapter).
				Engine
•				Check fuel supply.
•	•			Check engine oil level.
•	•			Check condition of belts.
•	•			Check engine oil pressure hot, on high speed.
•	•	•	•	Listen for unusual noises, vibrations, etc.
	•			Check air cleaner hose for damage.
	•			Inspect and clean electric fuel pump filter.

Condenser Unit (Continued)

Pretrip	1,200 Hours	2,000 Hours	Annual/ 3,000 Hours	Inspect/Service These Items
		•		Dry air cleaner. Replace air cleaner element at 2,000 hours or 1 year (whichever occurs first)
		•		Change EMI 2000 (black) fuel filter.
		•		Change engine oil and oil filters (hot). Requires oil with API Rating CI-4 or better (ACEA Rating E3 for Europe) and EMI 2000 bypass oil filter.
		•		Adjust electric motor (jackshaft)/compressor belt to field reset position. See “Electric Motor (Jackshaft)/Compressor Belt” in Engine Maintenance Chapter.
		•		Check restraining mount (snubber) pre-load adjustment.
			•	Drain water from fuel tank and check vent.
			•	Check and adjust engine speeds (high and low speed).
			•	Check condition of engine mounts.
			•	Maintain year round antifreeze protection at –30 F (–34 C).

Condenser Unit (Continued)

Pretrip	1,200 Hours	2,000 Hours	Annual/ 3,000 Hours	Inspect/Service These Items
			•	Test fuel injection nozzles at least every 3,000 hours.*
			—	Replace the fuel return lines between fuel injection nozzles every 10,000 hours or sooner as required.
			—	Change ELC (red) engine coolant every 5 years or 12,000 hours. Units equipped with ELC have an ELC nameplate on the expansion tank.

* Based on EPA 40 CFR Part 89.

Condenser Unit (Continued)

Pretrip	1,200 Hours	2,000 Hours	Annual/ 3,000 Hours	Inspect/Service These Items
				Electrical
•				Check controller for alarms.
•				Run pretrip test
•				Check battery voltage.
	•			Inspect battery terminals and electrolyte level.
	•			Inspect wire harness for damaged wires or connections.
			•	Inspect alternator bearings and brushes.**
			•	Inspect electric motor bearings (Model 50).**
** With belt removed, spin bearings by hand. Listen for noise (bearings roll freely).				

Condenser Unit (Continued)

Pretrip	1,200 Hours	2,000 Hours	Annual/ 3,000 Hours	Inspect/Service These Items
				Refrigeration
•	•			Check refrigerant level.
	•			Check compressor oil level.
			•	Check suction pressure regulator setting on Defrost or Heat (if so equipped).
			•	Check discharge and suction pressures.
			•	Check compressor efficiency.
			—	Replace dehydrator and compressor oil filter every two (2) years.

Condenser Unit (Continued)

Pretrip	1,200 Hours	2,000 Hours	Annual/ 3,000 Hours	Inspect/Service These Items
				Structural
•	•			Visually inspect unit for fluid leaks.
•	•			Visually inspect unit for damaged, loose or broken parts (includes air ducts and bulkheads).
	•		•	Inspect clutch for shoe and anchor bushing wear with a mirror. Check bearings.**
			•	Inspect idlers and jackshaft (if so equipped) for leakage and bearing wear.**
			•	Clean entire unit including condenser coils, evaporator coils, and defrost drains.
	•	•	•	Check all unit, fuel tank, engine, and electric motor mounting bolts, brackets, lines, hoses, etc.

** With belt removed, spin bearings by hand. Listen for noise (bearings roll freely).

Remote Evaporators

Pretrip	1,200 Hours	2,000 Hours	Annual/ 3,000 Hours	Inspect/Service These Items
				Electrical
	•		•	Inspect wire harness for damaged wires or connections.
			•	Inspect/replace DC fan motors.
				Structural
•	•		•	Visually inspect unit for fluid leaks.
•	•			Visually inspect unit for damaged, loose or broken parts.
	•		•	Clean entire unit including evaporator coils and defrost drains.
			•	Check all mounting bolts, brackets, lines, hoses, etc.

Glossary

This glossary is published for informational purposes only and the information being furnished herein should not be considered as all-inclusive or meant to cover all contingencies.

NOTE: Additional terms not found in the glossary may be located in the index section of this manual.

accumulator: A device located in the suction line to collect liquid refrigerant and meter it safety back to the compressor as gas.

ambient air temperature: Temperature of the air surrounding an object.

amp: Abbreviation for ampere. The basic measuring unit of electrical current.

bar: A metric unit of pressure. 1 bar = 100 kPa = 14.5 psi.

Battery Sentry: Part of the CYCLE-SENTRY™ system. The Battery Sentry module monitors alternator charge rate and will keep the unit running until the battery is adequately charged.

box temperature: The temperature within a temperature-controlled compartment.

Btu (british thermal unit): The quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit. 1 Btu = 252 calories.

bulkhead: 1) *return air bulkhead.* A metal or plastic "wall" placed at the front of the box to prevent loading of product tightly against the Thermo King unit. (Loading too close to the unit restricts air flow and system efficiency.) 2) *bulkhead divider.* A thick, insulated "wall" used to separate compartments of a multi-temperature truck or trailer.

calorie: The amount of heat required to raise temperature of one gram of water one degree Celsius. 1 calorie = 0.004 Btu.

Celsius: The metric unit of temperature measurement. The preferred alternate to the term centigrade. Abbreviated "C."

centigrade. See *Celsius.*

CFC: Chlorofluorocarbon. A chlorine-based refrigerant consisting of chlorine, fluorine and carbon. Example: R12. In many countries it is illegal to release this type of refrigerant to the atmosphere because chlorine damages the earth's atmosphere. CFC refrigerants are not used in modern Thermo King units.

circuit breaker: A thermal device that automatically interrupts an electrical circuit when the current in the circuit exceeds the predetermined amperage rating of the breaker. See *amp.*

coil: A cooling or heating element made of pipe or tube, formed into a helical or serpentine shape, that may be equipped with thin metal fins to aid heat transfer.

cold curtains: Flexible vinyl curtains used to reduce air exchange between the refrigerated compartment and the outside during door openings.

compound gauge: A gauge calibrated in psig (or kPa) to measure pressure, and in inches of mercury (Kg/cm2) to measure vacuum.

compressor: The refrigeration component that compresses refrigerant vapor and creates refrigerant flow.

condenser: An arrangement of tubing in which the vaporized and compressed refrigerant is liquefied as heat is removed.

cycles per second: See *Hertz.*

damper door: A door on the evaporator section that closes during defrost to prevent hot air from entering the refrigerated cargo compartment.

data logger: An electronic device that monitors and stores unit operating and temperature data for later review. Examples: DMS, DAS, DRS and AccuTrac.

DE: Dual Evaporator. A multi-temp host unit with two evaporators capable of refrigerating two separate, longitudinal compartments.

defrost: The removal of accumulated ice from an evaporator coil. Periodic defrost is necessary when the evaporator coil is operating below freezing. Defrost is required more frequently when the air passing through the evaporator has a high moisture content.

defrost termination switch: A component that terminates defrost operation at a specific temperature.

defrost timer: A solid state module that initiates defrost at selected intervals. Also establishes a maximum defrost duration if normal circuits malfunction.

dehydrator: A device used to remove moisture from refrigerant. Also called a drier.

discharge air temperature: The temperature of air leaving the evaporator.

drier: See *dehydrator.*

ECT: A ceiling-mounted Thermo King remote evaporator. See *EW* and *TLE*.

ERC: Extended Remote Unit Control. (Door switches) An option on Thermo King multi-temperature units to improve temperature control when doors are opened during delivery. When a compartment door is opened, the refrigeration unit for that compartment may be forced to NULL, defrost, or some other mode. Opening a compartment door may also affect the operating mode of other compartments. ERC systems are connected in a variety of ways to meet customer needs.

ETV (Electronic Throttling Valve) : A device used with a microprocessor to precisely control the refrigeration system.

evaporator: The part of the refrigeration system that absorbs heat during the cooling cycle.

EW: A wall-mounted Thermo King remote evaporator. See *ECT* and *TLE*.

F: See *Fahrenheit*.

Fahrenheit: A unit of temperature measurement used in the United States. Abbreviated “F.”

freeze up: 1) Failure of a refrigeration system to operate normally due to moisture in the refrigerant and the formation of ice at the expansion valve. The expansion valve may be frozen shut or open, causing improper unit operation in either case. 2) The formation of a solid ice mass over the evaporator coil reducing air flow.

fuse: An electrical safety device (typically a cartridge) inserted into an electrical circuit. It contains material that will melt or break when the current is increased beyond a specific value. When this occurs, the circuit is opened and electrical current flow is stopped.

fusible link: An electrical safety device (typically a short piece of wire) inserted into an electrical circuit. The wire melts or breaks when the current is increased beyond a specific value. When this occurs, the circuit is opened and electrical current flow is stopped.

HCFC: Hydrochlorofluorocarbon. A chlorine-based refrigerant containing hydrogen, chlorine, fluorine and carbon. Example: R22. Because chlorine damages the earth's atmosphere, in many countries, it is illegal to release this type of refrigerant to the atmosphere. HCFC refrigerants are not used in modern Thermo King units.

Hertz: A unit of frequency equal to one cycle per second. Abbreviated "Hz."

HFC: A refrigerant consisting of hydrogen, fluorine and carbon. Examples: R134a and 404A. HFC refrigerants contain no chlorine and are, therefore, considered "safe" for the environment.

high pressure relief valve: A safety valve on the refrigeration system that allows refrigerant to escape from the system if pressure exceeds a predetermined value.

hp (horsepower): A unit of power equivalent to 746 watts or 550 foot-pounds per second.

HPCO (High Pressure Cut Out Switch): A pressure-operated switch that opens to stop unit operation when discharge pressure reaches a predetermined maximum.

invertible: A multi-temperature truck or trailer unit designed to allow the placement of deep-frozen cargo in any compartment. See *Multi-Temp.*

kPa: Kilopascals. A metric unit of pressure. 1 kPa = 0.01 bar = 0.145 psi.

load: 1) The product being refrigerated and transported. 2) The amount of heat being removed by the refrigeration system. (For example, a compressor is under a heavy heat load when expected to cool a very warm box.)

LPCO (Low Pressure Cut Out Switch): A pressure-operated switch that opens to stop unit operation when suction pressure reaches a predetermined minimum.

modulation: An optional system that reduces load (product) dehydration and avoids "top freeze."

movable bulkhead: A thick, insulated, portable wall-like device used to compartmentalize a temperature-controlled truck or trailer. See *bulkhead*.

Multi-Temp: A Thermo King truck or trailer unit capable of maintaining different set-points in multiple compartments.

no. 1 diesel fuel: A grade of diesel fuel formulated to prevent “jelling” in low ambient temperatures.

no. 2 diesel fuel: A grade of diesel fuel formulated for moderate to warm ambient temperatures.

ohm: An electrical unit measuring the amount of resistance (opposition to the current flow) in an electrical circuit.

pre-cooling: 1) To cool down an empty box (temperature-controlled area) to the desired load temperature prior to loading. 2) To cool cargo to a desired temperature before loading.

pre-heat: The heating of diesel engine glow plugs prior to start-up. Some engines use an intake manifold heater rather than glow plugs.

pre-trip inspection: Checking the operation of a refrigeration system before loading.

psi: Pounds per square inch. A unit of pressure. 1 psi = 0.069 bar = 6.89 kPa.

psig: Pounds per Square Inch Gauge. Pressure in pounds per square inch as displayed by a gauge calibrated to zero when open to the atmosphere.

receiver tank: A refrigerant storage device included in nearly all Thermo King units.

refrigerant: The medium of heat transfer in a refrigeration system which absorbs heat by evaporating at a low temperature and releases heat by condensing at a higher temperature.

refrigerant oil: A special oil used to lubricate compressors in refrigeration systems.

remote evaporator: A separate evaporator unit located in a second or third compartment of a multi-temperature truck or trailer unit.

return air bulkhead: A structure (metal or plastic) mounted in the front of a trailer and designed to prevent restriction of return air flow to the Thermo King unit due to improper loading. See *bulkhead*.

return air temperature: The temperature of the air returning to the evaporator. See box temperature.

rpm: Revolutions per minute.

setpoint: The temperature selected on a thermostat or microprocessor controller. This is normally the desired box temperature.

short cycling: When a refrigeration unit cycles between the heat and cool modes more often than normal.

sight glass: A system component that permits visual inspection of oil or refrigerant level and condition.

thermostat: A device that controls unit modes of operation to maintain a selected box temperature.

TLE: Thin-line evaporator. A Thermo King remote evaporator designed to be compact (thin) while supplying superior air flow. See *ECT* and *EW.*

top freeze: When the top portion of perishable cargo is damaged by freezing temperatures discharged from the refrigeration unit. This may occur near the front of the box when product is placed too close to the cold, discharge air flow.

Vac (volts alternating current): An electric current that reverses direction at regularly recurring intervals.

Vdc (volts direct current): An electric current that flows in one direction only and is constant in value.

volts: The basic measuring unit of electrical potential.

watt: The basic measuring unit of electrical power.

Serial Number and Refrigerant Label Locations

Write the unit model and unit serial number in the spaces provided in the following Emergency Cold Line chapter. This information is needed to service the unit.

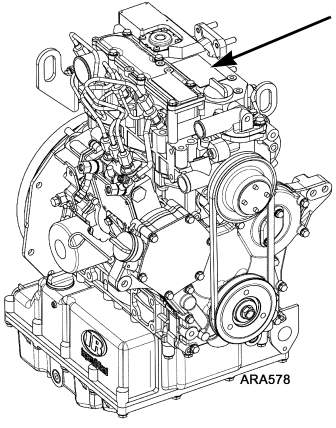


Figure 64: Engine Serial Number Location

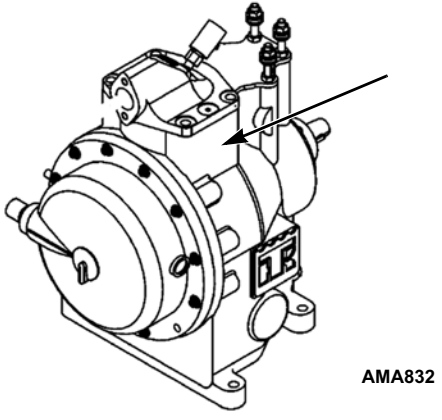
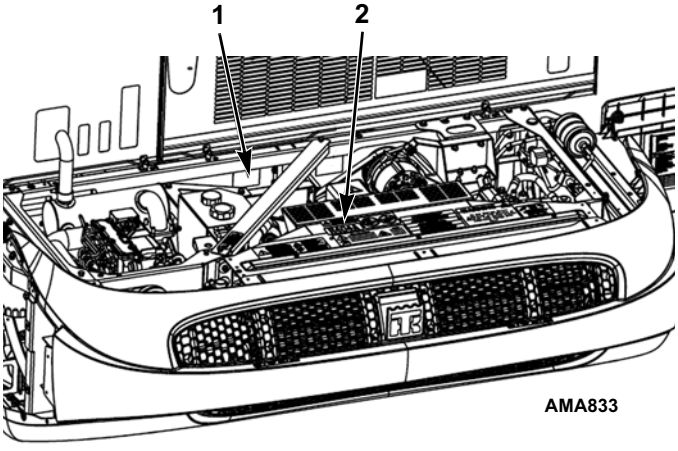


Figure 65: Compressor Serial Number Location



1.	Unit Serial Plate
2.	Refrigerant Type

Figure 66: Label Locations

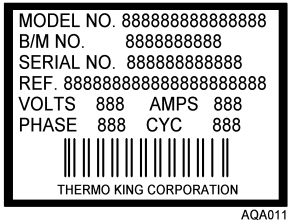


Figure 67: Laminated Unit Serial Number Plate

Figure 68: Refrigerant Type Label

- This label identifies the type of refrigerant in the unit.

Serial Number and Refrigerant Label Locations

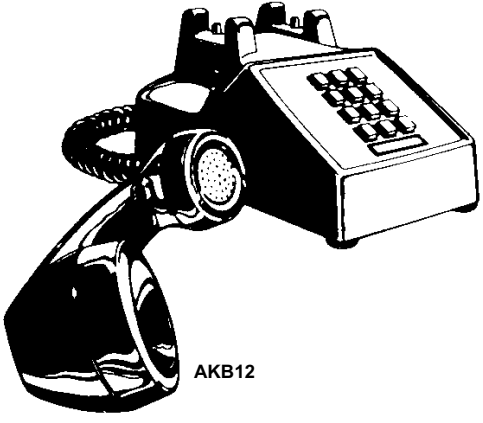
Recover Refrigerant

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.

Emergency Cold Line



AKB12

If you can't get your rig rolling, and you have tried the Thermo King North American Service Directory (available from any Thermo King dealer) to reach a dealer without success, *then* call the Toll Free Emergency Cold Line Number (888) 887-2202.

The answering service at the factory 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.

California
Proposition 65 Warning

Diesel exhaust is a chemical known to the State of California to cause cancer.

Warranty

Terms of the Thermo King Warranty are available on request. Please reference document TK 50047 for the Thermo King Self-Powered Truck Unit Warranty.

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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