THERMO KING

Operator's Manual

TriPac® Evolution

Revision C

January 2023

TK 55711-19-OP-EN

TRANE TECHNOLOGIES

Introduction

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

Thermo King's warranty shall not apply to any equipment which has been "so installed, maintained, repaired or altered as, in the manufacturer's judgment, to affect its integrity."

Manufacturer shall have no liability to any person or entity for any personal injury, property damage or any other direct, indirect, special, or consequential damages whatsoever, arising out of the use of this manual or any information, recommendations or descriptions contained herein. The procedures described herein should only be undertaken by suitably qualified personnel. Failure to implement these procedures correctly may cause damage to the Thermo King unit or other property or personal injury.

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

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

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

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

Customer Satisfaction Survey

Let your voice be heard!

Your feedback will help improve our manuals. The survey is accessible through any internet-connected device with a web browser.

Scan the Quick Response (QR) code or click Technical Publications TK Americas Feedback to complete the survey.

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Safety

Danger, Warning, Caution, and Notice

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

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

⚠ DANGER

Hazard!

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

⚠ WARNING

Hazard!

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

⚠ CAUTION

Hazard!

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

NOTICE

Hazard!

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

Safety Precautions

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

⚠ DANGER

Fire Hazard!

Always turn the TriPac system OFF at the HMI Control Panel On/Off button while the truck is being refueled. Fuel vapors could ignite if they come in contact with TriPac electrical or heater components.

⚠ DANGER

Risk of Injury!

Keep your hands, clothing, and tools clear of moving parts when the unit is operating or vehicle's engine is running. Loose clothing can become entangled in moving parts, causing serious injury or possible death.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

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

Equipment Damage and Risk of Injury!

Never drill holes into the unit unless instructed by Thermo King. Holes drilled into high voltage cables could cause an electrical fire, severe personal injury, or even death.

⚠ WARNING

Risk of Injury!

Turn the unit HMI Controller Off before opening the Battery Box or inspecting any part of the unit.

⚠ CAUTION

Sharp Edges!

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

Refrigerant Oil Hazards

Observe the following when working with or around refrigerant oil.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

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

Refrigerant Hazards

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

⚠ DANGER

Hazardous Gases - Personal Protective Equipment (PPE) Required!

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

⚠ DANGER

Refrigerant Vapor Hazard!

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

⚠ WARNING

Personal Protective Equipment (PPE) Required!

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

First Aid

REFRIGERANT

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

REFRIGERANT OIL

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

ENGINE COOLANT

- **Eyes:** Immediately flush with large amounts of water for at least 15 minutes. Get prompt medical attention.
- **Skin:** Remove contaminated clothing. Wash thoroughly with soap and water. Get medical attention if irritation persists.
- **Ingestion:** Do not induce vomiting. Immediately contact local poison control center or physician.

BATTERY ACID

- **Eyes:** Immediately flush with large amounts of water for at least 15 minutes. Get prompt medical attention. Wash skin with soap and water.

- **Skin:** Immediately remove contaminated clothing. Wash skin with large volumes of water, for at least 15 minutes. Wash skin with soap and water. Do not apply fatty compounds. Seek immediate medical assistance.
- **Inhalation:** Provide fresh air. Rinse mouth and nose with water. Seek immediate medical assistance.
- **Ingestion:** If the injured person is fully conscious: make the person drink extensive amounts of milk. Do not induce vomiting. Take the injured person immediately to a hospital.

ELECTRICAL SHOCK

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

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

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

ASPHYXIATION

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

Electrical Hazards

Low Voltage

⚠ WARNING

Live Electrical Components!

Control circuits used in the auxiliary power unit are low voltage (12 to 28 volts dc). This voltage potential is not considered dangerous, but the large amount of amperage available can cause severe burns if shorted or grounded. Do not wear jewelry, watches, or rings because they increase the risk of shorting out electrical circuits and damaging equipment or causing severe burns.

⚠ CAUTION

Risk of Injury!

Always disconnect power at the battery before removing or repairing electrical components. Failure to do so may result in personal injury or damage to the equipment.

Battery Installation and Cable Routing

⚠ WARNING

Hazard of Explosion!

An improperly installed battery could result in a fire, explosion, or injury. A Thermo King approved battery must be installed and properly secured to the battery tray.

⚠ WARNING

Hazard of Explosion!

Improperly installed battery cables could result in a fire, explosion, or injury. Battery cables must be installed, routed, and secured properly to prevent them from rubbing, chaffing, or making contact with hot, sharp, or rotating components.

⚠ WARNING

Fire Hazard!

Do not attach fuel lines to battery cables or electrical harnesses. This has the potential to cause a fire and could cause serious injury or death.

⚠ WARNING

Hazard of Explosion!

Always cover battery terminals to prevent them from making contact with metal components during battery installation. Battery terminals grounding against metal could cause the battery to explode.

⚠ CAUTION

Hazardous Service Procedures!

Set all unit electrical controls to the OFF position before connecting battery cables to the battery to prevent unit from starting unexpectedly and causing personal injury.

NOTICE

Equipment Damage!

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

Safety Decals

Figure 1. Danger Nameplate

Figure 2. Warning Nameplate

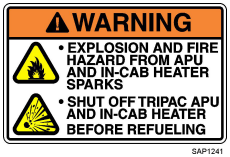

Figure 3. Caution Nameplate

Unit Description

The Thermo King TriPac Evolution APU (Auxiliary Power Unit) provides auxiliary heating, cooling temperature management that allows drivers to reduce unnecessary truck engine idling, conserve diesel fuel and save money. TriPac Evolution provides truck engine preheating, battery charging and truck cab sleeper compartment climate control.

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By using TriPac, drivers can reduce fuel cost, rest comfortably during stops and comply with local, state and federal anti-idle laws. Reducing unnecessary truck engine idling also reduces engine wear and extends engine maintenance intervals. TriPac's own diesel engine uses an automatic start/stop feature for additional fuel efficiency.

TriPac's two-cylinder diesel engine is EPA Tier 4 approved. An automotive type air conditioning compressor is used for sleeper compartment cooling. A fuel-fired air heater provides sleeper compartment heat in cold conditions. Voltage sensing automatically charges the truck batteries from TriPac's 12-volt alternator. Noise dampening construction assures quiet operation. Truck engine preheating provides easier cold-climate starts by exchanging coolant between TriPac and the truck engine. An optional inverter provides 120-volt power to operate on-board appliances.

An optional Arctic package aids truck engine startups in cold weather by sensing low coolant temperature. The TriPac is started automatically to heat the coolant as required.

Figure 4. TriPac Evolution APU

Standard Features

- Easy to operate Human Machine Interface (HMI) Controller
- Truck cab sleeper compartment cooling and heating for driver comfort in all climates
- Truck engine preheating for easy starts in cold climates
- Truck battery charging with automatic low voltage sensing
- 9.0 hp 2 cylinder diesel engine - EPA Tier 4
- Thermo King TK 15 compressor for air conditioning
- Diesel fuel-fired sleeper compartment air heater
- 65 amp alternator standard
- Noise-dampening construction for quiet operation
- Automatic start/stop operation for maximum fuel efficiency
- APU Telematics
- Easy to use Digital Human Machine Interface (HMI) and Controller
- Truck cab sleeper compartment cooling and heating for driver comfort in all climates
- Truck engine preheating for easy starts in cold climates

- Truck battery charging with automatic low voltage sensing
- 9.0 hp 2 cylinder diesel engine - EPA Tier 4
- Thermo King TK 15 compressor for air conditioning
- Diesel fuel-fired sleeper compartment air heater
- 65 amp alternator
- Noise-dampening construction for quiet operation
- Automatic start/stop operation for maximum fuel efficiency

TriPac System Components

The following are the main components of the TriPac :

- Auxiliary Power Unit (APU)
- Condenser
- Evaporator
- Heater
- HMI Controller
- Engine On/Off Switch
- Control Box
- APU
- Condenser
- Evaporator
- Heater
- Digital HMI Controller
- Engine On/Off Switch
- MAC (Main Application Controller)

APU

The TriPac Evolution APU is mounted onto the side of the tractor's frame rails and contains the diesel engine, air conditioning compressor, alternator and engine On/Off switch.

Figure 5. TriPac Evolution APU

The TriPac APU is mounted onto the side of the tractor's frame rails and contains the diesel engine, air conditioning compressor, alternator and engine On/Off switch.

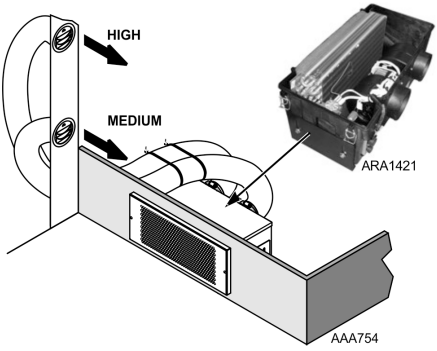
Condenser

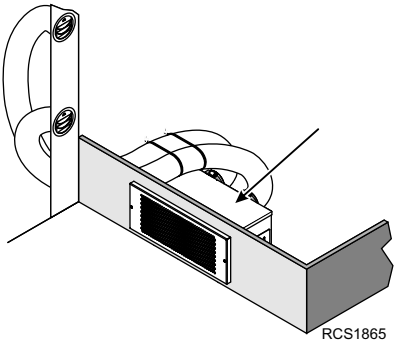
The air conditioning condenser is typically mounted on the back of the truck cab.

Evaporator

The air conditioning evaporator is typically installed under the bunk in the truck cab sleeper compartment. Air ducts from the evaporator carry conditioned air to the sleeper compartment. The evaporator has a air filter that can easily removed for cleaning.

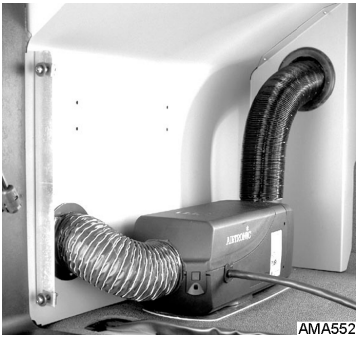
Figure 6. TriPac Evaporator and Air Ducts





Heater

The stand alone diesel fired heater is typically installed in the cargo compartment or under the truck cab sleeper compartment. The heater uses fuel from the truck's diesel fuel tank and is controlled bt the HMI. The inlet tube pulls air into the heater and the outlet tube provides heated air into the cab through a vent.



HMI Controller

⚠ DANGER

Fire Hazard!

Always turn the TriPac system OFF at the HMI Control Panel On/Off button while the truck is being refueled. Fuel vapors could ignite if they come in contact with TriPac electrical or heater components.

The TriPac HMI controller is installed in the truck cab, typically on a wall in the sleeper compartment. It is easily accessible to the driver and controls the heating, cooling and fan operation of the TriPac. If necessary, system operating parameters can be programmed by your Thermo King dealer.

Figure 7. HMI Controller

The digital HMI (Human Machine Interface) controller is typically installed on a wall in the sleeper compartment. The HMI communicates with the MAC to operate the TriPac.

Engine On/Off Switch

⚠ WARNING

Risk of Injury!

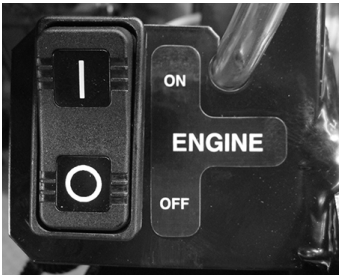
The unit may start automatically without warning if the Engine On/Off Switch is in the On position.

⚠ WARNING

Risk of Injury!

Immediately stand clear when the preheat buzzer sounds. This indicates that the engine is preheating. If the engine is hot, preheat time will only be a few seconds.

The APU Engine On/Off Switch is located inside the TriPac APU housing on the lower right side of the frame. This switch is used to disable the engine when performing service and maintenance on the TriPac system. The switch is normally in the ON position to allow the TriPac system to operate.

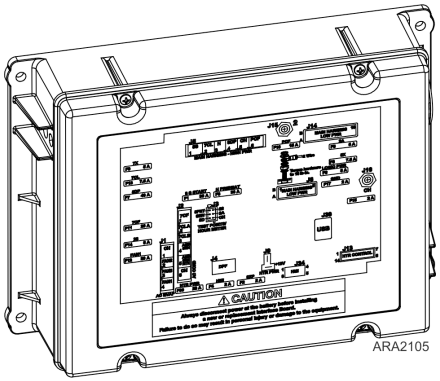


Control Box

The control box is typically located in the bunk area. The control box contains the circuit board and operates on 12 Volt DC supplied by the truck batteries.

The electrical system is protected by a number of fuses. Most of the fuses are located inside the control box. Other fuses are located in fuse holders in wire harnesses. Refer to ("Fuses," p. 43).

Figure 8. Control Box



TriPac Options

Driver Convenience Package

Includes 1,800 watt inverter and two GFI receptacles. 120 amp alternator provides quicker battery charging under heavy loads. Refer to the Operating Instructions included with your inverter.

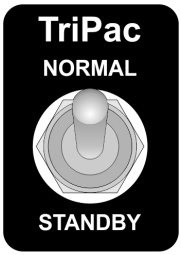
Standby Truck Integration

Provides seamless activation of the TriPac control system based on tractor off / on indication.

Standby Truck Integration - with Dash-Mounted Selector Switch

The switch allows the operator to disable the TriPac system without accessing the HMI Control Panel in the sleeper.

Figure 9. Dash-Mounted Standby Switch



Dual Remote Hour Meter

Provides separate heater and TriPac engine time tracking for accurate and effective maintenance/ Allows the technician to access and record hours of operation without entering tractor cab.

Remote Engine Hour Meter

Provides engine time tracking for accurate and effective preventive maintenance.

Closed Loop Cooling

Allows the TriPac to run independently of tractor coolant and allows “limp home” capability in case of tractor alternator failure.

High Output Heater

13,600 BTU heater for drivers operating in northern climates is available as an option.

Diesel Particulate Filter (DPF)

Certified CARB-compliant for operation in the state of California. Refer to the DPF Operator’s Manual included with your unit.

High Output Alternator

120 amp high output alternator for quicker battery charging is available as an option.

Arctic Package

Monitors tractor engine coolant temperature and automatically starts the TriPac to heat the shared engine coolant. Reduces cold weather starting issues for tractor even after extended periods of no operation in clod temperatures.

Appearance Package - Top Cover

Diamond plate top cover is available as an option.

Brushed Stainless Steel Condenser Cover

A brushed stainless steel condenser cover is available as an option.

Exhaust Tube Extension

A exhaust tube extension (also called a tailpipe) is available as an option and must be installed on TriPac Evolution APU's installed behind truck fairings, skirting, etc. The extension routes the APU's diesel exhaust outlet to an open area to help prevent exhaust fumes from entering the passenger compartment.

Manual Pre-Trip Inspection

Pre-trip inspections are an important part of a preventative maintenance program designed to minimize operating problems and breakdowns. Perform this pre-trip inspection before every trip.

Important: *Contact your nearest Thermo King Dealer immediately if problems are found.*

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

Before Starting the TriPac Unit

Engine: Check engine oil level. Check coolant level if equipped with optional closed loop cooling. Coolant should be visible in coolant tank sight glass.

Belts: Verify the TriPac APU belts are in good condition and adjusted to the proper tension. For more information about belt tension, see the Specifications chapter.

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

Structural: Visually inspect the unit for leaks, loose or broken parts, and other damage.

Coils: Verify the condenser, evaporator, and pre-cooler coils are clean and free of debris.

Heater: Check exhaust pipe and intake tube.

General: Listen for unusual noises and vibrations or fluid leaks.

Operating Instructions

HMI Control Panel

The HMI (Human Machine Interface) Control Panel is the operator's control module. The HMI is typically mounted in the bunk area of the truck cab. It has three selector knobs and a system condition display. The HMI contains an internal Cab Temperature Sensor. It communicates with the Base Controller using the Controller Area Network (CAN) communication bus.

The operator can select these functions from the HMI:

- System On/Off
- Mode (Cool, Fan, Heat)
- Desired Cab Temperature (Cooler-Warmer)
- Fan Speed (OFF, Auto, variable)

When any change of settings is made, there is a two second delay before the Base Controller will recognize the new setting. This prevents momentary or accidental mode changes.

The HMI indicator LEDs will dim after 90 seconds if no selections are made. Tap the On/Off button to activate bright display for an additional 90 seconds.

Figure 10. HMI Controller

On/Off Button

The On/Off Button is under the Mode Selector knob on the HMI. It provides several functions depending on how long the button is pressed.

- **Turn system On:** If the system is off, press the Mode Selector knob for a minimum of one second to turn the system on. The mode icon will flash for 10 seconds while the Base Controller completes a boot process. Once the system has been turned on the system mode, temperature or fan speed may then be selected. If no selection is made the system will remain in Monitor Mode. Refer to ("Monitor Mode," p. 35).

  Note: *Pressing the Mode Selector knob for less than one second will not turn the TriPac system on.*

- **Turn system Off:** If system is on, press the Mode Selector knob for a minimum of two seconds to turn the system off.

  Note: *Arctic Option and Battery Voltage Monitoring are disabled when the APU is turned off.*

- **Display System Status:** If system is on but display has dimmed, tap the Mode Selector knob for less than one second to restore display to full brightness. The display will automatically dim again in about 90 seconds. Pressing the Mode Selector knob for less than one second is referred to as a "Bump".

Figure 11. Press Mode Selector Knob to Turn System ON or OFF

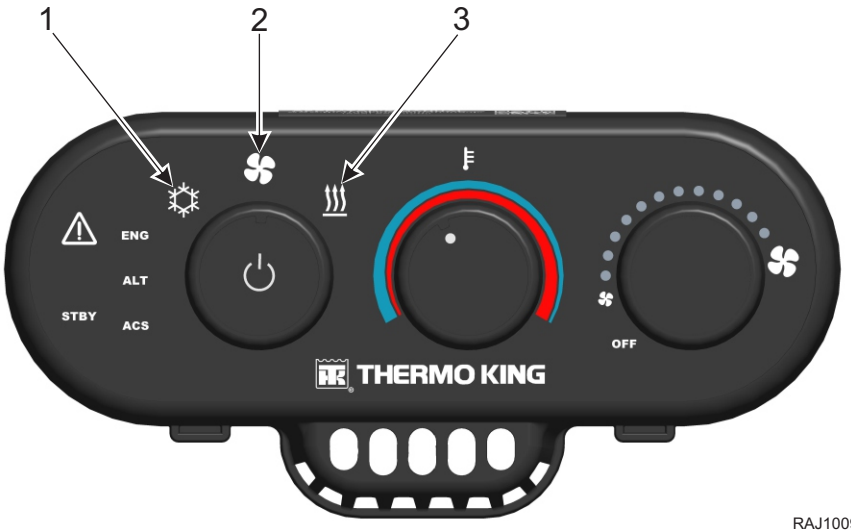
Mode Selection

Mode selection is accomplished by rotating the left Mode Selector knob. It selects between three operating modes. A mode icon will flash then illuminate indicating the selection. There is a two second delay before the new mode is activated to prevent momentary or accidental mode changes. When the system is first turned on there will be a 10 second delay before the selected mode is activated. The following modes are as follows:

- Cool Mode
- Fan Only Mode
- Heat Mode

Note: *When the system is turned on for the first time after replacing or disconnecting the Base Controller from power, the mode icon may flash for approximately 60 seconds. This indicates the Base Controller is powering up.*

Figure 12. Rotate Mode Selector Knob to Desired Operating Mode



RAJ1009

1.	Cool Mode	2.	Fan Only Mode	3.	Heat Mode

Temperature Selection

Temperature selection for driver comfort is accomplished by rotating the center Temperature Selector knob. It adjusts the desired cab temperature cooler (blue) or warmer (red). The default represented range is approximately 65° to 80°F (20° to 27°C) in Cool Mode and 50° to 80°F (10° to 27°C) in Heat Mode.

Figure 13. Rotate Temperature Selector Knob to Adjust Temperature

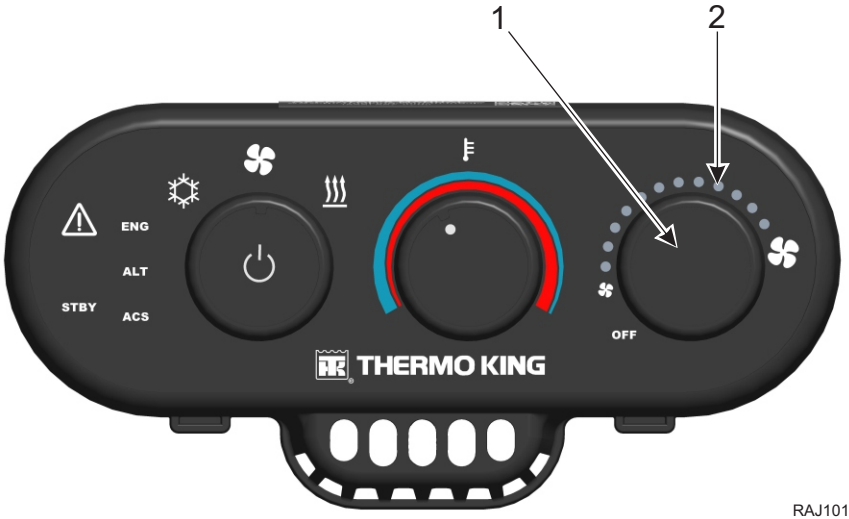
Fan Speed Selection

The available Evaporator Fan speed selections are:

- Off
- Low
- Medium
- High

Rotating the Fan Speed Selector knob clockwise will increase fan speed, counterclockwise will decrease fan speed. As fan speed increases or decreases, groups of four LEDs will progressively turn on or off as the fan operates at the chosen speed. If Air Conditioning mode is selected and Fan Speed is set OFF, the fan speed will default to LOW. When Fan Only or Heat mode are selected Fan Speed will default to OFF. A fan speed may then be chosen by rotating the Fan Speed Selector.

Figure 14. Rotate Fan Speed Selector Knob to Adjust Fan Speed



1.	Fan Selector Knob	2.	LEDs

System Condition Display

Several System Condition LED indicators are located on the left side of the HMI. These provide additional unit operating information.

Standby Indicator

STBY is illuminated when the system is in Standby or Monitor mode.

Figure 15. System Condition Display Icons

1.	ENG (engine) Icon	2.	ALARM Icon	3.	ALT (alternator) Icon
4.	STBY (standby) Icon	5.	ACS (air conditioning system) Icon		

Alarm Icon

If the system has an active alarm, the Alarm Icon will illuminate. It will be red for Shutdown Alarms and yellow for Check Alarms.

Alarm Group Indicator

System shutdown alarms have been organized into three general groups to aid diagnosis. When a Shutdown Alarm is generated, the red Alarm Icon and the corresponding Alarm Group name will illuminate.

- **[ENG]** are APU engine related alarms.
- **[ALT]** are alternator or charging system alarms.
- **[ACS]** are air conditioning system related alarms.

Clearing Alarms

Alarm codes can be cleared by turning the controller off and back on again. If the condition that caused the alarm still exists, the alarm will return. Refer to the TriPac Evolution Diagnostic Manual TK 55739 for more information about alarm codes. Contact the nearest Thermo King dealer if alarms continue to appear.

Operating Modes

Cool Mode

When Cool Mode is selected using the Mode Selector knob, the HMI Control Panel uses the Cab Temperature Sensor to measure sleeper compartment temperature. If it is above the temperature selected by the Temperature Selector knob, the APU engine will begin a start sequence (if not already running). The evaporator fan is defaulted ON and will run in low or the speed selected by the Fan Speed Selector knob. The compressor clutch and condenser fan will engage 60 seconds after a successful engine start. The system will cool the sleeper compartment until it falls to the selected setpoint temperature. The compressor clutch will disengage but the APU engine will continue to run for several minutes based on the Engine Delay Timer setting (default eight minutes). The evaporator fan will continue to run at the selected speed. If sleeper compartment temperature rises above setpoint by more than the Dead Band setting (default 3°F) during this time the compressor clutch will re-engage.

During normal air conditioning operation the compressor clutch may cycle on and off with no alarm but the evaporator fan will continue to run. This indicates the system is monitoring the Evaporator Coil temperature sensor to prevent frost buildup on the evaporator coil. If the Evaporator Coil temperature falls below 32°F (0°C) the compressor clutch is de-energized. When the Evaporator Coil temperature rises above 45°F (7.2°C) the compressor clutch is energized. With the optional 120 Amp Charging System, the alternator will not charge for 5 to 10 seconds after the compressor clutch is engaged. It will continue charging when the clutch is disengaged.

The APU engine will shut down when the sleeper compartment temperature reaches setpoint and no other demands exist. The Evaporator Fan will continue to run. If the sleeper compartment temperature rises above setpoint by more than the Dead Band setting (default 3°F) the APU engine will restart and compressor clutch will re-engage. Battery voltage sensing and engine coolant temperature sensing (if equipped with the Arctic Option) are enabled for the APU. Refer to (“Monitor Mode,” p. 35) for details.

Heat Mode

The air heater is a separate module that heats the sleeper compartment to the setpoint selected with the HMI Temperature Selector knob. Sleeper compartment temperature is sensed inside the air heater, it does not use the Cab Temperature Sensor on the HMI Control Panel. All heater functions are controlled by a separate module inside the heater. The TriPac Evaporator Fan is defaulted to OFF when Heat Mode is selected. It can be turned on to provide additional air circulation if desired. Battery voltage sensing and engine coolant temperature sensing (if equipped with the Arctic Option) are enabled for the APU. Refer to ("Monitor Mode," p. 35) for details.

Fan Mode

The TriPac Evaporator Fan can be turned on with the Fan Speed Selector knob to provide additional air circulation in the sleeper compartment and truck cab. Three fan speeds can be selected - (Low, Medium or High). LEDs around the Fan Speed Selector will indicate the selected speed. Battery voltage sensing and engine coolant temperature sensing (if equipped with the Arctic Option) are enabled for the APU. Refer to ("Monitor Mode," p. 35) for details.

Standby Mode (Optional)

The optional TriPac Standby Mode allows the system to be controlled by an external switch input. This is typically the truck ignition using the optional Standby Truck Integration. The feature is used to disable the TriPac APU when the truck engine is running. When the truck ignition switch is in the run position, a voltage signal is sent to the Base Controller. The TriPac system will enter Standby Mode. The following occurs when the TriPac system is in Standby Mode:

- The STBY indicator on the HMI will illuminate.
- Air conditioning, fan, or heat operation will terminate.
- The APU engine will stop.

The TriPac Base Controller remains on but will not respond to any operation requests, such as low battery voltage, low coolant temperature, or changes in cab temperature.

Standby Truck Integration (Optional)

An optional wire harness connects the truck ignition switch to an SBY circuit input connection on the TriPac Interface Board. The Base Controller monitors voltage on this circuit. The following conditions occur:

- **The Truck ignition switch is in the Off or Acc position.** If the TriPac system is turned on the unit operates normally.
- **The Truck ignition switch is in the Start or On position.** The TriPac unit is forced to Standby mode. The HMI Control Panel STBY indicator will illuminate.

Standby Truck Integration - with Dash-Mounted Selector Switch (Option)

An optional wire harness connects the truck ignition switch and dash mounted selector switch to an input connection on the TriPac interface board. The board monitors voltage on this circuit.

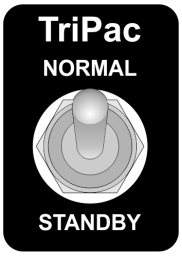
Dash-mounted selector switch is in the **NORMAL** position:

- If the TriPac system is turned on the unit operates normally. The system will respond to the truck ignition as with the Standby Truck Integration option.

Dash-mounted selector switch is in the **STANDBY** position:

- The TriPac system will enter Standby Mode. This allows the operator to disable the TriPac system without accessing the HMI Control Panel in the sleeper.

Figure 16. Dash-Mounted Standby Switch



Monitor Mode

Important: *Battery and engine temperature monitoring are disabled if TriPac system is turned off at the HMI.*

Activate

By default Monitor Mode is active when the TriPac system is turned on at the HMI Control Panel but an operating mode has not been selected by the operator. Monitor Mode is also active when the truck ignition has been

turned on (Standby) then turned off. The STBY indicator on the HMI Control Panel will be illuminated.

Deactivate

Monitor Mode will be deactivated and system will begin HVAC operation if the operator presses the On/Off button at the HMI, changes the Mode selection, or changes the Fan Speed selection. The selected HVAC mode will activate. The STBY indicator on the HMI will turn off. The system will continue to monitor battery voltage and engine coolant temperature (if the Arctic Option is installed).

Operation

While Monitor Mode is active the APU will continue to start and stop as necessary to maintain battery voltage and engine coolant temperature (if the Arctic Option is installed). While in Monitor Mode the system will not react to changes in cab temperature. TriPac Cool, Heat, and Fan modes will remain off.

Battery voltage sensing is enabled. When battery voltage falls to the level set by Battery Voltage Restart Value (default 12.2 Vdc), the APU engine will start to charge the batteries. The engine will continue to run until the Charge Current Shutoff Value setting has been reached (default 12 Amps).

If the Arctic Option is installed and enabled, the truck engine coolant temperature is monitored. If the engine coolant temperature at the Water Temperature 2 (WT2) sensor in the returning coolant line falls below 35°F (1.6°C), the APU engine will start to warm the truck engine. It will continue to run until the returning coolant temperature rises to 55°F (12.7°C).

Monitor Mode may be disabled through Programmable Settings > Switch To Monitor > NO. If disabled the system will return to the mode it was in when the TriPac system was turned off or the system entered Standby mode.

Note: *This is not the recommended setting. Refer to the TriPac Evolution Diagnostic Manual TK 55739 Section 3, Software Settings, Switch to Monitor for more information.*

Engine Load Management

To maintain Tier 4 engine emission levels, engine load may be reduced under some conditions.

Engine On/Off Switch

⚠ WARNING

Risk of Injury!

The unit may start automatically without warning if the Engine On/Off Switch is in the On position.

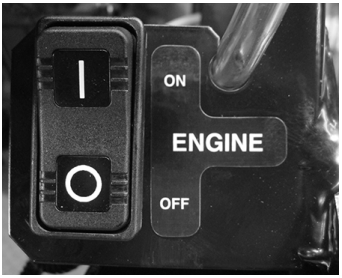
⚠ WARNING

Risk of Injury!

Immediately stand clear when the preheat buzzer sounds. This indicates that the engine is preheating. If the engine is hot, preheat time will only be a few seconds.

The Engine On/Off Switch is located inside the TriPac APU housing on the lower right side of the frame. This switch must be in the On position for the TriPac engine to operate.

Figure 17. Engine On/Off Switch



The APU Engine On/Off Switch functions as a service switch. It allows maintenance personnel to disable the APU engine. This assures the engine will not crank even if the HMI On/Off button is pressed on.

When the Engine On/Off switch is placed in the Off position:

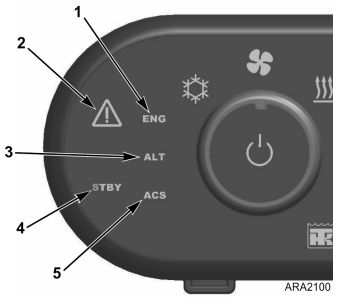
- If the TriPac system is OFF and the TriPac HMI On/Off button is pressed, no shutdown alarm will generate. The engine will not start.
- If the TriPac system is ON but the APU engine is not running, no shutdown alarm will generate. The engine will not start.
- If the TriPac engine is running or starting, the engine will stop and a shutdown alarm (code 35) will generate in the [ENG] group. The engine will not restart.

Alarm Codes

Alarm Notification

The TriPac control system continually monitors operation and can generate several alarm codes. If the unit has an alarm condition the operator will be notified by an illuminated Alarm Icon on the HMI Control Panel. The icon can be Yellow or Red.

Figure 18. System Condition Display Icons



1.	ENG (engine) Icon	2.	Alarm Icon	3.	ALT (alternator) Icon
4.	STBY (standby) Icon	5.	ACS (air conditioning system) Icon		

Yellow = Check Alarm: This indicates one or more of the system Check Alarms are active. This level of alarm serves as notice to take corrective action at the earliest convenience before a problem becomes severe. The system will continue to operate but some features and functions may be inhibited or disabled.

Red = Shutdown Alarm: This indicates one of the system Shutdown Alarms is active. This level of alarm serves as notice that a potentially severe system problem exists. Immediate corrective action should be taken. The system will not be operating. Along with the Red Alarm Icon, one of the shutdown alarm group names (ENG, ALT, or ACS) will be illuminated. This indicates which category the alarm falls into, helping to focus diagnosis and repair.

ENG: Alarms in this group are engine related.

ALT: Alarms in this group are alternator, battery or system voltage related.

ACS: Alarms in this group are air conditioning system related.

Clearing Alarm Codes

To clear alarm codes:

1. If the alarm icon is Red, first note the alarm group that is illuminated on the HMI display (ENG, ALT, ACS).
2. Use the HMI Control Panel System On/Off button to turn the TriPac unit off.
3. Resolve the condition that caused the alarm.
4. Use the HMI Control Panel System On/Off button to turn the TriPac unit on. Any active alarms will be cleared.

   Note: *If the alarm condition still exists, the alarm will return.*

Active alarms and those recently cleared by the operator can be read and cleared by a Thermo King service technician.

Power Inverter (Option)

A 12 Vdc to 120 Vac inverter is available as an option for TriPac. The inverter is normally connected directly to the truck batteries.

Inverter features will vary, depending upon the brand and model used. Typically, when the inverter detects an AC load, it automatically turns on and converts DC to AC power for onboard 120 Vac devices. If the TriPac is enabled and the inverter draws truck battery voltage down below the voltage limit established for the installation, the TriPac will start and attempt to recharge the truck batteries back to the level specified. If the TriPac is not enabled, the inverter could drain the truck batteries below the level required to start the truck or the TriPac.

Manufacturer's instructions for the optional inverter are provided separately. It is important to read and follow those instructions for proper use of the inverter.

Inverter Operation Hazards

⚠ DANGER

Risk of Injury!

Do not use the Thermo King Power Inverter in life support or health care applications where a malfunction or failure of the inverter could cause failure of a life support device or medical equipment or significantly alter the performance of that equipment.

⚠ DANGER

Hazardous Voltage!

Potentially lethal voltages exist within the power inverter as long as the battery supply is connected. During any service work, the battery supply should be disconnected.

⚠ DANGER

Risk of Injury!

Do not connect or disconnect batteries while the power inverter is operating from the battery supply. Dangerous arcing may result.

⚠ CAUTION

Risk of Injury!

Protect against possible electrical shock hazards. If the inverter is operated in wet or damp conditions a user-supplied, portable GFCI (ground fault circuit interrupter) must be connected between each inverter receptacle and the equipment it powers.

NOTICE

Equipment Damage!

You may experience uneven performance results if you connect a surge suppressor, line conditioner or UPS system to the output of the inverter.

Specifications

Engine

Engine	TK270F (Tier 4)
Fuel Type	No. 2 Diesel fuel under normal conditions No. 1 Diesel fuel is acceptable cold weather fuel

NOTICE

Equipment Damage!

Use fuel suitable for the climate you operate in (see truck engine manufacturer's recommendations). Blending used engine oil with diesel fuel is not permitted in the TriPac system. It will plug the filters and will not allow the air heater to run properly. Thermo King reserves the right to void all warranty on the unit.

Oil Capacity: Crankcase & Oil Filter	6.5 quarts (6.15 liters) maximum
Oil Type	API Type CK-4 multigrade oil. FA-4 is not approved. API Synthetic Type CK-4 multigrade oil is required for units equipped with the optional DPF (Diesel Particulate Filter)

Important: *The port on top of the engine should not be used to add engine oil. Always add oil through the lower port on the timing gear cover to prevent engine lock-up and/or serious internal damage. Approximately 1.5 quarts (1.4 liters) is required to move the oil level from the lower line (5.1 quarts [4.8 liters]) to the upper line (6.5 quarts [6.2 liters]) on the dipstick.*

Oil Viscosity	5 to 104 F (-15 to 40 C): SAE 15W-40 -4 to 86 F (-20 to 30 C): SAE 10W-30
Coolant System Capacity (TriPac engine only)	0.6 quarts (0.6 liters) 2.75 quarts (2.60 liters) with Closed Loop Cooling
Engine Thermostat	160 F (71 C)

Electrical Control System

TriPac Control System Voltage	12 Vdc (powered from tractor's batteries)
Fuses	Refer to ("Fuses," p. 43)
Power Inverter 1100 to 1800 Watts (Option)	12 Vdc to 120 Vac (1100 to 1800 Watts depending on model)

Fuses

Fuse Number	Amp Rating	Component Protected / Circuit - Connector
F1	30	Starter
F2	2	HMI Controller
F3	30	Glow Plugs
F4	2	HMI Controller
F5	5	Standby Switch (Option)
F6	5	Logic Power (Main Controller)
F7	40	Fuel Solenoid
F8	7.5	Engine Switch
F9	5	Engine Start Signal
F10	15	Pre-Cooler Fan
F11	25	Condenser Fan
F12	20	Evaporator Fan
F13	7.5	Compressor Clutch
F14	5	Heater ON
F15	2	Real Time Clock
F16	50	System Power
F17	2	Ground
F18	3	Voltage Sense
F19	1	Truck Ignition Input
F24	150	Main DPF Power (Option)

Fuse Number	Amp Rating	Component Protected / Circuit - Connector
F25	10	SECM Power
F26	1	Truck Ignition Input to SECM
F28	5	Heater Power Sense
F29	200	Main Power Cable
F30	3	Alternator Sense
F90	20	Cab Heater

Air Conditioning System

The TriPac air conditioning system must be serviced by an authorized Thermo King Dealer.

Truck Sleeper Compartment Heater

The TriPac heater system must be serviced by an authorized Thermo King Dealer.

Maintenance Inspection Schedule

Thermo King recommends all maintenance and service procedures be performed by an authorized Thermo King dealer.

Note: *Thermo King reserves the right to deny warranty coverage on claims due to lack of maintenance or neglect. Claims in question must be supported by maintenance records.*

Engine

Pretrip	500 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
•	•	•	Check engine oil level.
•	•	•	Check engine coolant level on units with optional closed loop cooling system.
•	•	•	Inspect belts for condition and proper tension.
•	•	•	Listen for unusual noises, vibrations, etc.
	•	•	Check air cleaner hose for damage.
	•	•	Inspect air cleaner. Change as needed or annually.
	•	•	Inspect fuel pre-filter screen. Clean as required or annually.
		•	Change fuel filter. Thermo King brand filter is required.
		•	Drain water from fuel tank and check vent.
	•	•	Check and adjust engine speed.
	•	•	Check condition of engine mounts.
		•	Maintain year-round anti-freeze protection at –30° F (-34° C). Change coolant every two years, or with truck coolant. For units equipped with optional closed loop cooling system and ELC (red) engine coolant, change ELC coolant every 5 years or 12,000 hours.
		—	Adjust engine valves (1,000 hours).*

Pretrip	500 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
		—	Test fuel injection nozzles at least every 3,000 hours.*
		—	Replace fuel return lines between fuel injection nozzles every 10,000 hours or sooner, as required.
* Based on EPA 40 CFR Part 89.			

Engine Oil Change Intervals

(Change oil and filters hot)

Pretrip	500 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
		•	**2,000 Hour Interval**– Oil change interval is every 2,000 hours of operation only when using a Thermo King brand oil filter and CK-4 or better oil. Units with optional DPF require CK-4 or better oil. FA-4 is not approved.
	•		**500 Hour Interval** – Oil change interval is every 500 hours of operation when using any other brand oil filter and CI-4 or better oil. Units with optional DPF require CK-4 or better oil.
Important: *The fill port on top of the engine should not be used to add engine oil. To prevent engine lock-up and/or serious internal damage after TriPac engine oil is added or changed always add oil through the lower port on the timing gear cover.*			

Electrical

Pretrip	500 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
	•	•	Check operation of protection shutdown devices.
	•	•	Check alternator voltage.
		•	Check alternator bearings. See Note.
	•	•	Inspect battery terminals.
	•	•	Inspect electrical connections.
	•	•	Inspect wire harness for rubbing or damage.
	•	•	Check electric condenser, evaporator and pre-cooler fans.

Note: *With belt removed spin alternator by hand. Listen for noise and verify bearings roll freely.*

Structural

Pretrip	500 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
•	•	•	Visually inspect unit for fluid leaks (coolant, oil, refrigerant).
•	•	•	Visually inspect unit for damaged, loose or broken parts.
		•	Check APU mounting bolts and brackets for cracks, damage, and poor alignment. Verify tightness and torque to 100 ft/lbs (135.6 N•m) for the claw mount, or 200 ft/lbs (271.2 N•m) for the direct frame mount.

Air Conditioning System

Pretrip	500 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
	•	•	Check refrigerant level.
	•	•	Check refrigerant lines for rubbing or damage.
	•	•	Inspect, clean and (if necessary) replace evaporator air filter. It may be necessary to check or replace it more often if conditions require.
	•	•	Inspect evaporator drain valves (kazoos) to ensure that they are in place, in good condition and are sealing.
		•	Steam clean condenser and APU pre-cooler coil. Do not bend coil fins.
		•	Blow out evaporator coil and evaporator water drains with air. Do not bend coil fins.

Heater

Montly	Annually	Check condition of or service the following:
•	•	Start and run for at least 20 minutes each month.
•	•	Inspect combustion air intake tube and exhaust pipe for restrictions or blockage.
•	•	Inspect ducting, air intake screen, and air outlet for restrictions or blockage.
	•	Remove glow pin and inspect for carbon build up. Clean as needed.
	•	Remove glow pin screen and inspect for carbon build up. Replace.
	•	Change fuel pump screen.

TriPac Warranty

Terms of the Thermo King Warranty are available on request. Please reference document TK 53051 for the Thermo King TriPac Evolution Warranty.

Serial Number Locations

APU: Unit nameplate is located on front right edge of APU frame near the Engine Switch (APU service access door must be opened to view the nameplate).

Engine: Nameplate located on the top of the engine. The engine is mounted in the APU housing.

Compressor: Nameplate located on compressor body. The engine driven compressor is located in the APU housing.

Heater: Sticker located on the side of the heater (Fabrik No.).

Emergency Cold Line

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.

RCS358

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.

CALIFORNIA Proposition 65 Warning

⚠WARNING:
Cancer and Reproductive Harm
www.P65Warnings.ca.gov

RCS1032

Notes

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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