

**TriPac^e™ Auxiliary
Heating/Cooling
Temperature
Management
System**

TK 54621-19-OP (Rev. 0, 04/2010)

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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.

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



DANGER: Always turn the TriPac[®] HMI Controller OFF while refueling the truck. Fuel vapors could ignite if they come in contact with TriPac electrical or heater components .



WARNING: Always wear goggles or safety glasses when working with or around the air conditioning 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.





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

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.

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.

First Aid

First Aid—Refrigerant

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

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

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 emergency personnel arrive.

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

Safety Decals



AMA1208

Figure 1: Disconnect Batteries



AMA1209

Figure 2: Do Not Jump Start Using HVAC Batteries

DO NOT STEP OR STAND HERE

AMA1207

Figure 3: No Step

Unit Description

Introduction

The Thermo King TriPac^e™ is an electric, battery-based Auxiliary Heating & Cooling Temperature Management System. The TriPac^e allows drivers to reduce unnecessary truck engine idling, conserve diesel fuel and save money.

With no diesel engine, the TriPac^e runs clean and emission-free, and is significantly quieter than engine-based APU systems. A fuel-fired air heater provides sleeper compartment heat in cold conditions. An air conditioning system provides sleeper compartment cooling in hot conditions.

Noise dampening construction assures quiet operation. An optional inverter provides 115 Vac power to operate on-board appliances.

TriPac^e batteries are automatically charged by the tractor alternator when the tractor is on the road.

An optional 115 Vac to 12 Vdc converter provides an additional source of power that will extend operation time. Must be plugged into an external 115 Vac, 15 Amp source.

Maximum climate control time is controlled by the total available power reserve in the TriPac^e batteries. To achieve maximum run time the operator should take steps to conserve power reserve by reducing power consumption, especially when outside temperature is high. Suggested steps include:

- Keep window curtains closed to reduce radiant heat that will increase cab temperature.
- Close curtain between cab and sleeper overnight to reduce air conditioning load.
- Limit the on time and number of cab lights and accessories to reduce battery power drain.
- Limit the on time and number of devices or appliances connected to the optional AC Power Inverter to reduce battery power drain.

Unit Description

With TriPac^e, drivers can rest comfortably during stops and comply with local, state and federal anti-idle laws. Reduction of unnecessary truck engine idling also reduces engine wear and extends engine maintenance intervals.

The system is designed for overnight driver comfort. Several hours of drive time are needed to charge the TriPac^e batteries before the next TriPac^e operation. Layover of more than one night may exhaust the TriPac^e battery reserve.



AMA1063

Figure 4: TriPac^e

Unit Features

- Easy to operate Human Machine Interface (HMI) Controller
- Truck cab sleeper compartment cooling and heating for driver comfort.
 - Variable speed 28 Vdc hermetic (sealed) air conditioning compressor.
 - Diesel fuel-fired sleeper compartment air heater.
- Depth of battery discharge sensing with automatic shutoff.
- Smart Charging Modules (SCM) connected to each pair of batteries.
- Noise-dampening construction for quiet operation.
- Integration with truck batteries, alternator and ignition switch.
- Optional 12 Vdc to 115 Vac 1000 Watt inverter for on-board appliances.

Unit Description

TriPac^e System

The TriPac^e system includes several major components:

- TriPac^e Battery Box
- Condenser
- Evaporator/Control Box
- Espar Heater
- HMI Controller
- 115 Vac Components (optional)



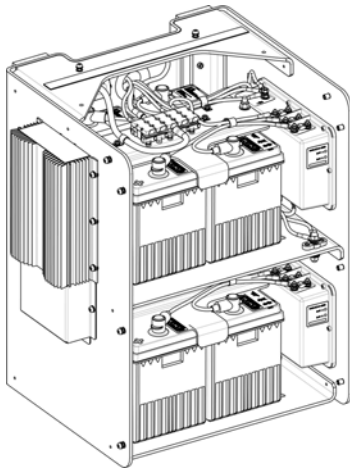
AMA1068

Figure 5: TriPac^e Battery Box, Cover On

TriPac^e Battery Box

The TriPac^e Battery Box is mounted to the truck frame rail. It contains four Thermo King NXT 1150 CCA AGM type batteries, Smart Charging Modules (for system power control), current sensor, a DC to DC converter and main power connections.

Unit Description



AMA1067

Figure 6: TriPac[®] Battery Box, Cover Off

Primary power for the TriPac[®] system is supplied by the four 12 Vdc batteries in the Battery Box. The Battery Box is also the central connection point for all of the system 12 Vdc power sources including the truck batteries.



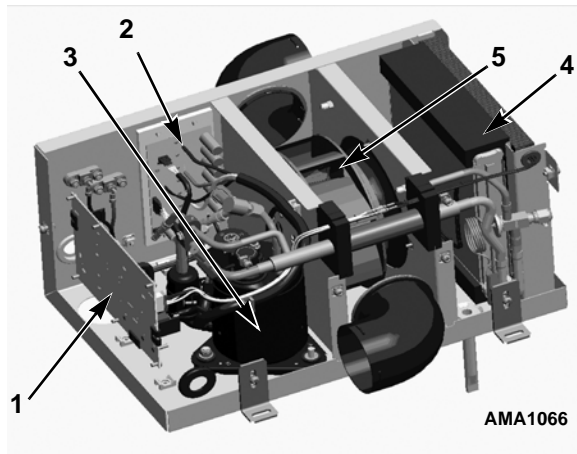
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Figure 7: TriPac[®] Evaporator/Control Box

Evaporator/Control Box

The TriPac[®] air conditioning Evaporator/Control Box is typically installed under the bunk in the truck cab sleeper compartment. Air ducts from the Evaporator/Control Box carry conditioned air to the sleeper compartment.

Unit Description



1.	Main Controller	2.	Compressor Controller
3.	Compressor	4.	Evaporator
5.	Evaporator Fan		

Figure 8: Evaporator/Control Box Components

The Evaporator/Control Box contains the following components:

1. **Main Controller:** The Main Controller contains the operating logic for the system. It receives and processes system information from the sensors, SCMs and driver inputs from the HMI. It controls the SCMs, Compressor Controller, heater, condenser fan, evaporator fan, and controls fan speeds. Plug connections and fuses are located here as well as power outputs and the data logger memory.
2. **Compressor Controller:** The Compressor Controller module monitors and controls the air conditioning compressor.
3. **Compressor:** Provides air conditioning capacity.
4. **Evaporator Coil:** The evaporator coil absorbs heat from the cab's air.
5. **Evaporator Fan:** The evaporator fan circulates air from the cab through the evaporator coil and back to the cab. It is a variable speed fan that receives power and speed commands from the Main Controller.

Unit Description

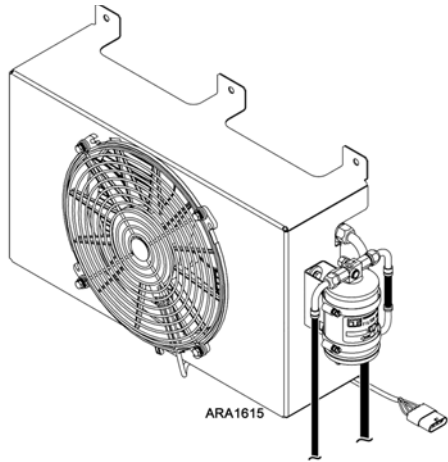


Figure 9: TriPac[®] Condenser

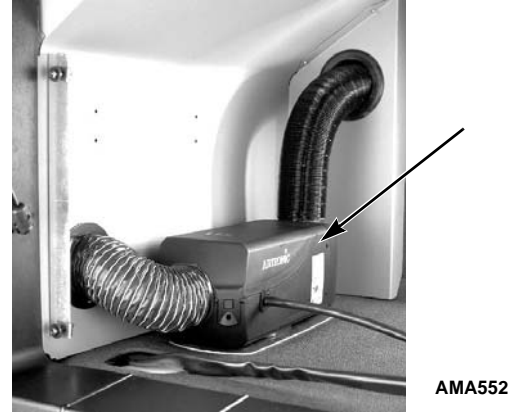


Figure 10: Heater

Condenser

The TriPac[®] Air Conditioning Condenser is mounted on the back of the truck cab.

Heater

The TriPac[®] Heater is typically installed in the cargo compartment under the truck cab sleeper compartment. It draws fuel from the truck's diesel fuel tank and electric power from the TriPac[®] batteries.

Unit Description



AMA1064

Figure 11: TriPac^e HMI Controller

HMI Controller

The TriPac^e HMI (Human Machine Interface) is a driver control panel that is typically mounted in the bunk area. The HMI allows the driver to select the desired function of the system. It also provides alarm, battery level and system status feedback to the driver. The HMI has three selector knobs and a

battery monitor display. The HMI also contains an integral Cab Temperature Sensor that helps control cab temperature when the TriPac^e air conditioning system is operating.

Compressor

The TriPac^e air conditioning compressor is a variable speed 28 Vdc hermetic (sealed) unit. Compressor operation is controlled by the Compressor Controller. Refrigeration lines connect the compressor to the TriPac^e air conditioning condenser and the evaporator.

Refrigerant

The TriPac^e uses R-134a refrigerant.

Batteries

The battery box contains four Thermo King NXT (green top) Absorbed Glass Mat (AGM) 1150 CCA batteries. These batteries have been specifically designed for the TriPac^e

Unit Description

system to maximize battery life and support deep discharge cycles. They provide increased power storage capacity for the system.

Smart Charging Modules (SCM)

Each pair of batteries is connected to a Smart Charging Module (SCM). The SCMs control current flow to and from the batteries based on commands from the Main Controller. The SCM can be in one of three modes (not selectable by the driver):

- Charge Mode allows current to flow into the TriPac^e batteries.
- Discharge Mode allows current to flow out of the TriPac^e batteries.
- Null Mode prevents flow of current in either direction.

Control Circuits

The control circuits operate on 12 Vdc supplied by the system batteries.

Power Sources

All of the batteries onboard the truck, including the TriPac^e system batteries, are a reservoir of electrical power. When the truck is parked the TriPac^e system, and any other electrical devices are in use, the power in this reservoir is being consumed. The faster the power is consumed, the sooner the power reservoir will be empty.

NOTE: Use of truck accessories such as lights, refrigerators, TVs, etc. draws power from the batteries and will compete with the climate control electrical demand of the TriPac^e system. Heavy use of these devices and/or use of the optional 12 Vdc to 115 Vac Power Inverter will reduce the potential run time of the TriPac^e system. In addition, high ambient temperature will cause near continuous operation of the TriPac^e air conditioning system. This increased electrical demand will reduce the number of hours the system can control cab temperature. In high ambient conditions the driver should reduce the use of electrical accessories to a minimum to extend air conditioning time.

Unit Description

The TriPac^e power management technology makes the most efficient use of available power. The TriPac^e system may draw from the truck batteries and TriPac^e battery pack at same time. There is a Current Sensor in the interconnect cable between the TriPac^e batteries and truck batteries. It provides the Main Controller with information to help manage power flow. A pair of Smart Charging Modules (SCM) monitor and control power flow to and from the TriPac^e batteries. The SCMs provide the Main Controller with battery status information. The TriPac^e system can draw as much as 100 amps during full air conditioning demand.

Power for the TriPac^e system comes from the following three sources. All system power is sent to a main fuse block in the TriPac^e battery box.

TriPac^e Battery Box: The TriPac^e Battery Box is the primary power source for the TriPac^e system.

Truck Batteries: The OEM truck battery bank is the secondary power source for the TriPac^e system.

Shore Power Converter (option): The Shore Power Converter is a 115 Vac to 12 Vdc power converter that provides low voltage power to the system. The Converter will help extend operation of the system before the batteries are depleted when the truck is parked and plugged into 115 Vac external or "Shore Power." During moderate ambient temperature conditions with moderate air conditioning demand the converter may support the system without draining the batteries. During high ambient temperature conditions with high air conditioning demand the converter will extend the operating time before the batteries are depleted. The Converter may also act as a secondary battery charging method during periods of low air conditioning or heating demand. The Converter is mounted in the cab, usually under the bunk. If the Shore Power Converter is plugged in while TriPac^e and all truck systems are off the converter will charge the truck batteries.

If shore power is available, it should be connected when the batteries are near full charge to receive the full extended run time benefit of the shore power converter.

Power Inverter (Option)

The optional 1000 watt Pure Sine Wave Power Inverter provides 115 Vac "Hotel Power" for the driver. It changes the low voltage DC available from the truck batteries to high voltage AC. The Inverter is mounted in the cab, usually under the bunk.

***NOTE:** Use of the Power Inverter will reduce the total time the air conditioning system is able to operate.*

Truck Integration

The TriPac[®] APU system is integrated with the following Truck systems.

Truck Batteries: The truck's own batteries provide part of the power for the TriPac[®] system. Four 12 Vdc batteries must be connected to provide basic 12 Vdc output. For optimum system performance the truck battery pack should be upgraded to a type recommended by Thermo King. These batteries have been specifically designed for the TriPac[®] system to maximize battery life and support deep discharge cycles. Shorter system runtime will be experienced without the battery upgrade.

Alternator: The truck's alternator provides primary battery charging for the system while the truck is driving. With some applications or truck operation profiles, such as short drive times or high system demand, increased battery charging capacity may be required. To provide the additional charging capacity the alternator and charging cables may need to be upgraded to 270 amps.

Ignition Switch: When the truck ignition switch is in the ON or RUN position a signal is sent to the TriPac[®] Main Controller.

After a 3 minute "Pull ahead" time delay the TriPac[®] system will be turned off (disabled) and the system will begin a shutdown sequence. When shutdown sequence is complete the TriPac[®] system does not draw power from the batteries. The time delay prevents short cycling the TriPac[®] system during short duration engine operation.

If the truck engine is still running when the 3 minute timer expires the battery charging process will begin. When the truck ignition is turned off the TriPac[®] system is defaulted off (disabled) and must be turned on (enabled) by the driver.

Protection Devices

The Evaporator/Control box contains sensors that protect the Air Conditioning system:

- The **High Pressure Cutout (HPCO) switch** monitors air conditioning system pressure and generates an alarm if abnormally high system pressure occurs.
- The **Compressor Overload Switch (OLS)** monitors compressor temperature and protects against high compressor temperature.

Fuses: for a complete list of TriPac[®] system fuses, see the Specifications chapter in this manual.

Manual Pretrip Inspection

(Before Starting the TriPac^e Unit)

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

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

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

Coils: Check and clean return air filter. Make sure the condenser and evaporator coils are clean and free of debris.

Ducts and Vents: Verify that air conditioning and heating vents are free of obstructions. Verify that air ducts under bunk are not crushed or kinked.

Heater: Check exhaust pipe and intake tube under truck cab.

General: Listen for unusual noises and vibrations.

TriPac^e HMI Controller Operation

The TriPac^e is operated using an HMI (Human Machine Interface) Controller which is typically mounted on a wall in the truck cab sleeper compartment.



Figure 12: TriPac^e HMI Controller

HMI Controller Display

The HMI is an easy to use control that allows the driver to select the desired function of the system. It also provides feedback to the driver of alarms, battery level and system

status. The HMI has three selector knobs and a battery monitor display. The HMI also contains an integral Cab Temperature Sensor.

The driver can select these functions from the HMI:

- System ON/OFF
- Mode (COOL, FAN, HEAT)
- Desired Cab Temperature (Cooler or Warmer)
- Fan Speed (OFF, Auto, Variable)

When any setting change occurs, there will be a two second delay before the controller recognizes the new setting.



DANGER: Always turn the TriPac^e HMI Controller OFF while refueling the truck. Fuel vapors could ignite if they come in contact with TriPac^e electrical or heater components .

ON/OFF Knob/Button

The left knob on the HMI face functions as the **ON/OFF** Button. Functions are accessed by pressing the left knob.



Figure 13: Press Knob for ON or OFF

Turn System ON: If the system is off, press the left knob for 1 second to turn the system on.

Turn System OFF: If the system is on, press the left knob for 3 seconds to turn the system off.

Other operation features can be accessed, depending on how long the left knob is pressed.

Display System Status: If the system is off, press the left knob for less than 1 second. Battery alarm status will display.

Mode Selection

Mode selection is accomplished by rotating the left knob. It selects between **COOL**, **FAN** and **HEAT** operating modes. A mode icon will light indicating the selection. There will be a two second delay before the new mode is activated to prevent momentary mode changes:



1.	COOL Mode	2.	FAN Only Mode	3.	HEAT Mode
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Figure 14: Mode Selection

Temperature Selection

Temperature selection is accomplished by rotating the center knob. It selects the desired cab temperature cooler (**blue**) or warmer (**red**). Adjust to driver comfort.



Figure 15: Center Knob Adjusts Temperature

FAN Selection

Evaporator fan speed is adjustable. Rotating the **FAN** selector knob clockwise will increase fan speed; counterclockwise will decrease fan speed.



1.	FAN Selector	2.	LEDs
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Figure 16: Right Knob Adjusts Fan Speed

As fan speed increases LEDs will progressively turn on. As fan speed decreases, LEDs will progressively turn off. The fan will continue to run at the chosen speed.

- AUTO fan speed is the default fan setting when COOL mode is selected. This allows the Main Controller to make fan speed decisions.
- OFF may be selected when in FAN or HEAT mode. OFF is the default setting when Heat mode is selected.

Driver Selectable Settings

The driver has access to three additional features. Bumping the ON/OFF (Left) Button three times will access these features:

HMI Dim: The brightness of the HMI display LEDs can be changed. Rotate the Fan Speed knob to change brightness.

Shore Power Charging: (If the optional 115 Vac Shore Power Converter is installed and plugged-in.) The driver may select to allow the TriPac[®] batteries to charge if excess charging capacity is available from the converter. The default setting will charge only the truck batteries. Bump the ON/OFF Button an additional two times to toggle the feature.

Alarm Clearing: If the alarm icon is on, the active alarms may be cleared. Press and hold the ON/OFF button for 5 seconds. If the alarm condition still exists, the icon may not turn off or may return quickly.

TriPace HMI Controller Operation

NOTE: Alarms indicate an abnormal system condition. A qualified technician should determine the cause of the alarms and correct the condition.

The HMI displays Battery Monitor icons, Low Battery icon and Alarm icon.

Battery Monitor

Figure 17 shows the Battery Monitor function.

6 green bars = battery power above 90 percent.

5 green bars = battery power 70 to 90 percent.

4 green bars = battery power 50 to 70 percent.

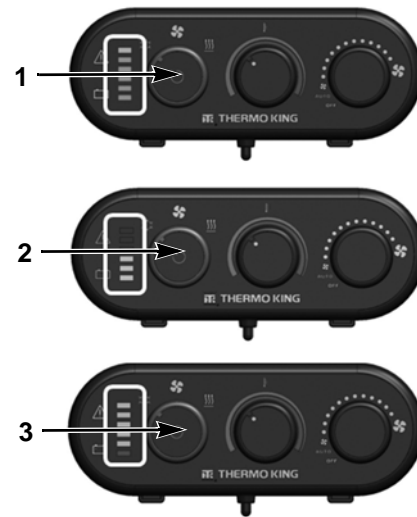
3 yellow bars = battery power 30 to 50 percent.

2 yellow bars = battery power 15 to 30 percent.

1 red bar = battery power less than 15 percent.

No bars = No battery power available.

The six Battery Monitor bars will scroll up in green while the truck engine is running and the alternator is charging. This indicates the TriPac^e system is in charge mode.



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1.	4 - 6 Green Bars = Power 50% to 100%	2.	2 - 3 Yellow Bars = Power 15% to 50%	3.	1 Red Bar = Power Less than 15%
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Figure 17: Battery Monitor

System Alarm Icon

The Alarm icon will alert the driver that an abnormal condition exists. Most alarms can be cleared from the HMI. Bump the ON/OFF button three times, then hold for five seconds. The alarm icon should go out. If it does not, or if it immediately returns, the alarm condition still exists. A qualified technician should determine the cause of the alarm and correct the condition.



Figure 18: Alarm Icon

Alarm Icon Yellow = Check Alarm: This type of alarm indicates the system has an abnormal condition that should be checked at the next opportunity. The system will continue to operate but may have reduced capacity.

Alarm Icon Red = Shutdown Alarm: This type of alarm indicates a system fault that should be checked by a technician immediately. The system will not operate with this alarm active.

Battery Icon



Figure 19: Battery Icon

Battery Icon Red = system off due to low power reserve: If the system has turned off for low power reserve it can be turned on by pressing the ON/OFF button on the HMI. The system batteries should be fully charged by running the truck before turning the system on again. If the batteries are not charged, the system may immediately turn off for low power

reserve or have very short run time. Repeated partial charging followed by fully discharging the system batteries will reduce battery life.

Operation Notes

If the TriPac^e system is operating and the truck ignition is turned on, the system will initiate a 3 minute "Pull Ahead" timer. If the truck ignition is still on when the timer expires the system will enter a shutdown sequence.

If system is cycled off, it will not restart until a shutdown sequence is completed.

When changing between operating modes the new mode will not initiate immediately. A 2 second delay will allow changing back or to another selection to avoid momentary mode starts.

The TriPac^e System is OFF by default. When the truck ignition is turned off the driver must re-enable the system by pressing the ON Button (left knob) on the HMI.

The Evaporator fan mode default is AUTO when Air Conditioning is selected and OFF when Heat is selected.

During Air Conditioning operation the compressor is limited to five ON events per hour. This will prevent short cycling of the system. The system will reset one hour after the first event.

Maximum climate control time is controlled by the total available power reserve in the TriPac^e batteries. To achieve maximum run time the operator should take steps to conserve power reserve by reducing power consumption, especially when outside temperature is high. Suggested steps include:

- Keep window curtains closed to reduce radiant heat that will increase cab temperature.
- Close curtain between cab and sleeper overnight to reduce air conditioning load.
- Limit the on time and number of cab lights and accessories to reduce battery power drain.
- Limit the on time and number of devices or appliances connected to the optional AC Power Inverter to reduce battery power drain.

During HEAT operation the heater is limited to five ON events per hour. This will prevent short cycling of the system. The system will reset one hour after the first event.

High electrical accessory use and high ambient temperature will shorten operating time.

Battery Charging While Truck Is Running

Charging amperage is provided by the truck alternator. With some applications or truck operation profiles, such as short drive times or high system demand, increased battery charging capacity may be required. To provide additional charging capacity the alternator and charging cables may need to be upgraded to 270 amps.

NOTE: While the truck is idling there may not be enough amperage produced by the alternator to effectively charge the batteries. Many alternators must be turning a minimum of 1,200 RPM before effective battery charging is available.

Battery charging occurs in progressive stages. This prevents an extremely high charge rate. The process begins when the truck engine is started. The Smart Charging Modules (SCMs) will be put in Null mode. All TriPac^e batteries will be isolated. The truck's batteries will be charged first.

Charging Process

The TriPac^e Main Controller will begin adding one battery at a time to the charging process if there is excess charging capacity available from the alternator. Each SCM is capable of charging one battery at up to 40 amps.

- First, the Main Controller will put one of the SCMs in Charge mode, charging the battery with the lowest state of charge. If system voltage does not drop significantly, the SCM will remain in Charge mode. If system voltage does drop, the truck batteries are not sufficiently charged. The SCM will return to Null mode for a time then retry. SCM will continue trying to engage Charge mode until it is successful.
- Once the first SCM is in Charge mode for a time the Main Controller will attempt to add the second SCM to the charging process. It will perform the same process until it has both SCMs charging one battery each. SCMs will switch between their batteries until all batteries are fully charged. Total battery charging time is expected to be 6 - 10 hours depending on depth of discharge, traffic, driving profile and alternator size.

TriPac HMI Controller Operation

- The six Battery Monitor bars will scroll up in green while the truck engine is running and alternator is charging. Battery charge state can be read at the HMI while the HVAC system is off by “bumping” the ON/OFF Button (knob) for less than one second.

preventing current from flowing to or from the TriPac^e batteries. If the shore power charging feature is selected by the driver, the TriPac^e batteries will also charge.

Shore Power Charging

Connect the optional 115 Vac Converter to external Shore Power. A 15 amp 115 Vac power source is required. If the optional Shore Power Converter is installed and Shore Power is available, it should be connected to external power soon after the truck is parked.

System On: If the TriPac^e HVAC system is drawing less than the available 85 amp output of the Shore Power Converter, the truck battery pack may begin charging. Depending on driver feature selection, if the truck batteries become fully charged and there is excess charging capacity, the Main Controller may begin charging the TriPac^e batteries. It will use the same charging process as when the truck is running.

System Off: If the TriPac^e system and truck systems are off, only the truck batteries will charge. This is because the SCMs are defaulted to NULL with the TriPac^e and truck off,

Optional Power Inverter

Inverter Operation Warnings



DANGER: Do not use an 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: Potentially lethal voltages exist within the inverter as long as the battery supply is connected. During any service work, the battery supply should be disconnected.



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



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



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



CAUTION: Some appliances or electronic devices may not operate properly when powered through a DC to AC power inverter.

A 1000 watt 12 Vdc to 115 Vac pure sine wave inverter is available as an option for TriPac[®]. The inverter is normally connected directly to the truck batteries.

Optional Power Inverter

Thermo King recommends that 800 watt or smaller microwave ovens be used with the optional TriPace power inverter.

When the inverter detects an AC load, it automatically turns on and converts DC to AC to power onboard 115 Vac devices. If the TriPac^e is enabled and the inverter draws system battery voltage down below the voltage limit established for the installation, the TriPac^e system will shut down.

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.

Specifications

Electrical Control System

Control System Voltage	12 Vdc		
Batteries	TriPac [®] Battery Box: Four Thermo King NXT, 1150 CCA, AGM Truck Battery Box: Four, Group 31, 1150 CCA Minimum, Thermo King NXT Recommended		
Alternator	Truck mounted, 12 V, 185 amp minimum required		
Fuses			
Fuse Number	Location	Amp Rating	Component Protected / Circuit
F1	Main Controller Interface Board	2	HMI / 2P
F2	Main Controller Interface Board	2	HMI / 8XP
F3	Main Controller Interface Board	20	Heater / N/A

Electrical Control System (Continued)

F4	Main Controller Interface Board	15	Condenser Fan / N/A
F5	Main Controller Interface Board	15	Evaporator Fan / N/A
F6	Main Controller Interface Board	5	Main Controller / N/A
F7	Heater Harness	5	Heater / RED
F8	Vehicle Ignition Harness	1	Ignition Input / IGN
F9	Fuse Block in Battery Box	60	Smart Charger 1 / 2B
F10	Fuse Block in Battery Box	150	DC to DC Converter / 12V
F11	Fuse Block in Battery Box	40	Main Controller / 2
F12	Fuse Block in Battery Box	60	Smart Charger 2 / 2C
F13	Fuse Holder in Positive Battery Harness	175	Truck Batteries / RED
F14	Fuse Holder in Positive Inverter/Converter Harness	150	Inverter/Converter / RED
F15	Smart Charger 1	60	Smart Charger 1 / 2B
F16	Smart Charger 1	60	System Battery A / RED
F17	Smart Charger 1	60	System Battery B / RED

Electrical Control System (Continued)

F18	Smart Charger 2	60	Smart Charger 2 / 2C
F19	Smart Charger 2	60	System Battery A / RED
F20	Smart Charger 2	60	System Battery B / RED

Electrical Components

	Current Draw (Amps) at 12.5 Vdc
Evaporator Blower, Variable Speed	7.3
Condenser Blower, Variable Speed	12.5
<i>NOTE: Disconnect components from unit circuit to check resistance.</i>	

R-134a Air Conditioning System

Cooling Capacity	7,200 BTU/hr (2.1 kW)
Compressor Model	Brushless DC, Variable Speed, Hermetic
Refrigerant Charge	2.0 lbs (0.9 Kg) R-134a refrigerant
Compressor Oil Charge	9.8 oz. (290 ml)*
Compressor Oil Type	PVE
High Pressure Cutout (HPCO):	Opens: 360 ± 10 psig (2482 ± 69 kPa) Closes: 240 ± 10 psig (1655 ± 69 kPa)
* When the compressor is removed from the unit, oil level should be noted or the oil removed from the compressor should be measured so that the same amount of oil can be added before placing the replacement compressor in the unit.	

Truck Sleeper Compartment Heater (D2)

Heat Output (±10%)	7,500 BTU/hr Boost (2.2 kW) 6,150 BTU/hr High (1.8 kW) 4,100 BTU/hr Medium (1.2 kW) 2,900 BTU/hr Low (0.85 kW)
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Truck Sleeper Compartment Heater (D2) (Continued)

Current at 12v ($\pm 10\%$)	8.3 amps - Start 2.8 amps - Boost 1.9 amps - High 1.0 amps - Medium 0.7 amps - Low
Fuel Consumption ($\pm 10\%$)	Boost 0.07 gal/hr (0.28 liter/hr.) High 0.06 gal/hr (0.23 liter/hr.) Medium 0.04 gal/hr. (0.14 liter/hr.) Low 0.03 gal/hr (0.10 liter/hr.)
Air Flow ($\pm 10\%$)	48 cfm Boost 40 cfm High 27 cfm Medium 19 cfm Low

Truck Sleeper Compartment Heater (D2) (Continued)

Motor Speed	<p>4800 ± 140 RPM - Boost</p> <p>4000 ± 120 RPM - High</p> <p>2800 ± 80 RPM - Medium</p> <p>2000 ± 60 RPM - Low</p> <p>600 ± 20 RPM - Adjustment in circulation mode with temperature sensor, internal.</p> <p>0 RPM - Adjustment in fresh air mode with temperature sensor, external.</p> <p>4800 ± 140 RPM - Ventilation</p>
Operating Voltage Range	10.5 - 16 vdc
Overheat Temperature Shutdown (±10%)	240 F (115 C)
Resistance Values:	
Glow Plug	0.42 to 0.70 Ohms at 68 F (20 C)
Fuel Metering Pump	10 ± 0.5 Ohms
Operator Control Unit Set Value Potentiometer	1750-2080 ± 0.5 Ohms

Truck Sleeper Compartment Heater (D4 - Option)

Heat Output ($\pm 10\%$)	13,600 BTU/hr Boost (4.0 kW) 10,200 BTU/hr High (3.0 kW) 6,800 BTU/hr Medium (2.0 kW) 3,400 BTU/hr Low (1.0 kW)
Current at 12v ($\pm 10\%$)	8.3 amps - Start 3.3 amps - Boost 2.0 amps - High 1.1 amps - Medium 0.6 amps - Low
Fuel Consumption ($\pm 10\%$)	Boost 0.13 gal/hr (0.51 liter/hr.) High 0.10 gal/hr (0.38 liter/hr.) Medium 0.07 gal/hr. (0.25 liter/hr.) Low 0.03 gal/hr (0.13 liter/hr.)

Truck Sleeper Compartment Heater (D4 - Option)

Air Flow ($\pm 10\%$)	85 cfm Boost 69 cfm High 50 cfm Medium 30 cfm Low
Motor Speed	4400 \pm 130 RPM - Boost 3600 \pm 100 RPM - High 2800 \pm 80 RPM - Medium 1600 \pm 50 RPM - Low 600 \pm 20 RPM - Adjustment in circulation mode with temperature sensor, internal. 0 RPM - Adjustment in fresh air mode with temperature sensor, external. 3600 \pm 100 RPM - Ventilation
Operating Voltage Range	10.5 - 16 vdc
Overheat Temperature Shutdown ($\pm 10\%$)	240 F (115 C)

Truck Sleeper Compartment Heater (D4 - Option)

Resistance Values:	
Glow Plug	0.42 to 0.70 Ohms at 68 F (20 C)
Fuel Metering Pump	10 ± 0.5 Ohms
Operator Control Unit Set Value Potentiometer	1750-2080 ± 0.5 Ohms

Optional Power Inverter

Input Voltage Range	10.5 to 15.5 Vdc
Output Voltage	104 to 127 Vac
Output Frequency	60 Hz
Output Waveform	True Sine Wave
Continuous Power Output	1000 Watts
Power Output Surge Rating	2000 Watts
Outlet Quantity / Type	2 / GCFI
USB Charge Port Output	5 Vdc / 500 mA
Low Input Voltage Alarm	11.0 Vdc
Working Temperature Range	32 to 149 F (0 to 65 C)

Optional Shore Power AC to DC Converter

Input Voltage Range	108 to 132 Vac
Input Voltage Frequency	47 to 63 Hz

Specifications

Maximum AC Current (@ 120 Vac)	12 Amps
Output Voltage (No Load) Approximate	13.6 Vdc
Output Voltage (Full Load) Approximate	>13.4 Vdc
Maximum Power Output, Continuous	1200 Watts
Working Temperature Range	32 to 104 F (0 to 40 C)

Maintenance Inspection Schedule

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.

NOTE: See the appropriate chapter in the maintenance manual for instructions on how to correctly perform required maintenance.

Electrical

Pre-Trip	Semi-Annual 1000 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
	•	•	Check TRACTOR alternator operation and voltage per OEM specifications.
	•	•	Verify indicator LEDs on the Smart Charging Modules (SCM) in TriPac ^e battery box are illuminated green.
	•	•	Inspect and clean all battery terminals.
	•	•	Inspect electrical connections for cleanliness and tightness.
	•	•	Inspect wire harness and battery cables for rubbing or damage.
	•	•	Check electric condenser and evaporator fans.

A/C System

Pre-Trip	Semi-Annual 1000 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
	•	•	Check refrigerant lines for rubbing or damage.

Heater

Pre-Trip	Semi-Annual 1000 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
<ul style="list-style-type: none"> • • • 	<ul style="list-style-type: none"> • • • 	<ul style="list-style-type: none"> • • • • • • 	<p>Start and run for at least 20 minutes each month.</p> <p>Inspect combustion air intake tube and exhaust pipe for restrictions or blockage.</p> <p>Inspect ducting, air intake screen, and air outlet for restrictions or blockage.</p> <p>Remove glow pin and inspect for carbon build up. Clean.</p> <p>Remove glow pin screen and inspect for carbon build up. Replace.</p> <p>Change fuel pump screen.</p>

Structural

Pre-Trip	Semi-Annual 1000 Hrs	Annual 2,000 Hrs	Check condition of or service the following:
<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • • • • • 	<ul style="list-style-type: none"> • • • • • • • • • 	<p>Visually inspect unit for damaged, loose or broken parts.</p> <p>Inspect, clean and (if necessary) replace evaporator air filter. It may be necessary to check or replace it more often if conditions require.</p> <p>Inspect evaporator vent tubes and air outlets for obstructions.</p> <p>Inspect evaporator drain valves (kazooos) to ensure that they are in place, in good condition and are sealing.</p> <p>Inspect condenser coil for debris.</p> <p>Pressure wash condenser coil. Do not bend coil fins or damage with air.</p> <p>Blow out evaporator coil and evaporator water drains with air. Do not bend coil fins.</p> <p>Check battery box 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.</p>

TriPac Warranty

Terms of the Thermo King Warranty are available on request.
Please reference document TK 50046 for the Thermo King
TriPac Warranty.

Serial Number Locations

Battery Box: Unit nameplate is located on front lower edge of the battery box housing frame (cover must be removed to view the nameplate).

Compressor: Nameplate located on compressor body. The compressor is located in the TriPac[®] evaporator/control box.

TriPac 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.*

APU: Auxiliary Power Unit.

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

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

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.

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.

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*.

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*.

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

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.

TriPac Glossary

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.

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

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

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

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

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.

SCM: Smart Charging Module, found in TriPace battery box. Controls system power flow.

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.

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

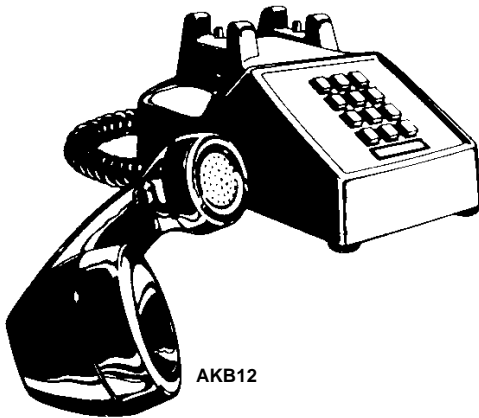
Vdc (volts direct current): An electric current that flows in one direction only and is constant in value.

TriPac Glossary

volts: The basic measuring unit of electrical potential.

watt: The basic measuring unit of electrical power.

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.

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.