



THERMO KING

Operator's Manual

TriPac™

*Auxiliary Heating/Cooling
Temperature Management System*

TK 53035-19-OP (Rev. 6, 12/11)



**TriPac Auxiliary
Heating/Cooling
Temperature
Management
System**

TK 53035-19-OP (Rev. 6, 12/11)

Copyright© 2005 Thermo King Corp., Minneapolis, MN, USA

Printed in USA

Disclaimer

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

The procedures described herein should only be undertaken by suitably qualified personnel. Failure to implement these procedures correctly may cause damage to the Thermo King unit or other property or personal injury.

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

Table of Contents

Introduction	5	Control Circuits	15
Safety Precautions	7	Refrigerant	16
Refrigerant Oil	8	Protection Devices	16
Refrigerant	8	Engine Reset Switch	17
First Aid	9	Closed Loop Cooling Option	17
First Aid—Refrigerant	9	Manual Pretrip Inspection (Before Starting the	
First Aid—Refrigerant Oil	9	TriPac Unit)	21
Safety Decals	10	TriPac HMI Controller Description and .Operation	23
Unit Description	11	TriPac HMI Controller Description	24
Introduction	11	HMI Controller Display	24
Unit Features	12	Main Power Key	24
TriPac System	12	Mode Key	24
Auxiliary Power Unit	13	Up and Down Arrow Keys	24
Condenser	13	Fan Speed Key	25
Evaporator	14	APU System Key	25
Heater	14	System Fault Indicator	25
HMI Controller	15	Operating Modes	26
Compressor	15	Air Conditioning Mode	26

Table of Contents

Heat Mode	26	Compressor	40
Fan Mode	26	R-134a Refrigeration System	40
Monitor (Null) Mode	26	Fuses	41
Engine On/Off Switch	27	Belt Tension	43
TriPac HMI Controller Operation	28	Truck Sleeper Compartment Heater (D2)	44
Press HMI Controller Main Power Key	28	Optional Power Inverter	48
Enable APU System	28	Optional Extreme Arctic Package Components	48
Engine Hourmeter Display	29	Maintenance Inspection Schedule	49
Select Mode of Operation	29	Engine	49
Select Fan Speed	30	Engine Oil Change Intervals (.....	50
Select Temperature Setpoint	30	Electrical	51
System Fault Indicator	31	Structural	52
Alarm Codes	32	A/C System	53
To Clear Alarm Codes	32	Heater	53
Optional Standby Operation	33	TriPac Warranty	55
Options Used With Standby Operation	33	Serial Number Locations	57
Standby Truck Integration	33	TriPac Glossary	59
Truck Integration Selector Switch	33	Emergency Cold Line	63
Optional Power Inverter	35		
Inverter Operation Warnings	35		
Specifications	37		
Engine Specifications	37		

Recover Refrigerant 64

CALIFORNIA Proposition 65 Warning 65

Table of Contents

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.

Introduction

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 Main Power On/Off Key on the 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 Main Power key to Off before opening the APU or inspecting any part of the unit.

Safety Precautions

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.

Safety Precautions

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



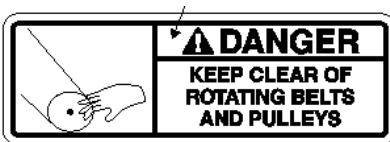
AMA647

Figure 1: Caution - Unit May Start Automatically



AMA690

Figure 3: Shut Off Before Fueling Warning



AMA646

Figure 2: Belt and Pulley Warning

Unit Description

Introduction

The Thermo King TriPac Auxiliary Heating & Cooling Temperature Management System allows drivers to reduce unnecessary truck engine idling, conserve diesel fuel and save money. TriPac provides truck engine preheating, battery charging and truck cab sleeper compartment climate control.

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 2 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-temperature starts by exchanging coolant between TriPac and the truck engine. Optional Closed Loop Cooling allows the TriPac to operate independently of truck engine coolant. An optional inverter provides 120-volt power to operate on-board appliances. The optional Arctic package aids truck engine startups in cold weather by sensing low coolant temperature. The TriPac is started to heat the coolant as required.



AMA691

Figure 4: TriPac

Unit Description

Unit 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
- 7.5 hp 2 cylinder diesel engine - EPA Tier II
- Thermo King TM-15-XD compressor for air conditioning
- Diesel fuel-fired sleeper compartment air heater
- 65 amp 12 VDC alternator
- Noise-dampening construction for quiet operation
- Automatic start/stop operation for maximum fuel efficiency
- Optional Standby Truck Integration
- Optional dash mounted Truck Integration Selector Switch (select normal or standby operation)
- Optional Arctic Package

- Optional Closed Loop Cooling (CLC)
- Optional Extreme Arctic Package
- Optional 12 Vdc to 120 Vac 1800 Watt inverter for on-board appliances
- Optional chrome plated exhaust pipe
- Optional stainless steel condenser shroud
- Optional Exhaust Diesel Particulate Filter (DPF)

TriPac System

The TriPac system includes several major components:

- An APU (auxiliary power unit)
- Condenser
- Evaporator
- Heater
- HMI Controller.

Unit Description



AMA691

Figure 5: TriPac APU

Auxiliary Power Unit

The TriPac APU contains the diesel engine, air conditioning compressor, alternator and engine power switch.



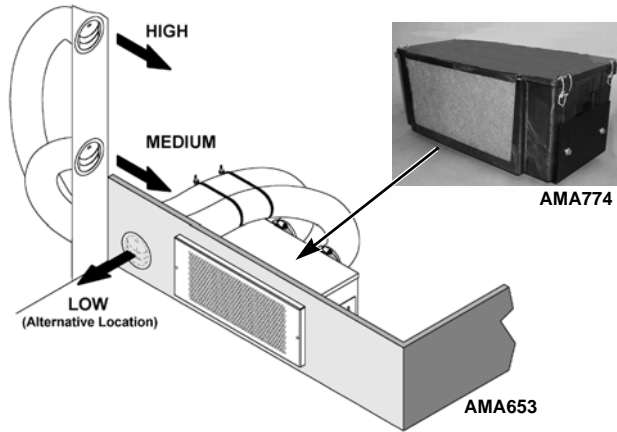
AMA550

Figure 6: Condenser

Condenser

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

Unit Description



**Figure 7: TriPac Evaporator and Air Ducts
(Evaporator installed under sleeper cab bunk)**

Evaporator

The TriPac 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.

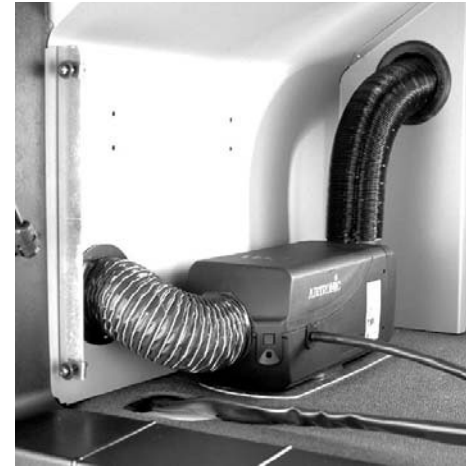


Figure 8: Heater

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 truck's batteries.

Unit Description

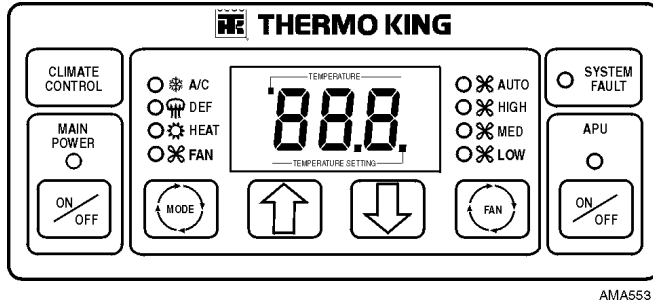


Figure 9: HMI Controller

HMI Controller

The TriPac HMI (Human Machine Interface) Controller is installed in the truck cab, typically on a wall in the sleeper compartment. It is easily accessible to the driver and controls TriPac operation. Standard, typically used operating parameters are enabled in the HMI Controller when TriPac is installed. If necessary, HMI operating parameters can be adjusted through programming by your Thermo King dealer.

Compressor

The TriPac air conditioning compressor is mounted in the TriPac APU and is driven by the TriPac engine. Refrigeration lines connect the compressor to the TriPac air conditioning condenser on the back wall of the truck cab and the evaporator, usually mounted under the truck sleeper compartment bunk.

Compressor operation is controlled by the TriPac Interface Board. The Interface Board receives instructions from the HMI Controller. The HMI Controller will instruct the Interface Board to start the TriPac engine and energize the compressor clutch when cab cooling is needed. The refrigeration system is protected by high pressure and low pressure cutout switches.

Control Circuits

The control circuits operate on 12V DC supplied by the truck batteries.

Unit Description

Refrigerant

The TriPac uses R-134a refrigerant.

Protection Devices

The **High System Pressure Cutout Switch** is a normally closed system pressure sensitive switch. On models manufactured prior to 9/06, it is part of the binary pressure switch, mounted on the receiver-drier, typically near the TriPac condenser. On models manufactured during 9/06 and after, a High Pressure Cutout Switch (HPCO) is located at the receiver/drier.

If the discharge pressure rises above the switch's opening pressure, the switch opens the circuit to stop the unit and generates an AcS Alarm Code. When the discharge pressure falls below the switch's closing pressure, the switch closes to allow compressor operation.

The **Low System Pressure Cutout Switch** is a normally closed pressure sensitive switch.

On models manufactured prior to 9/06, it is part of the binary pressure switch, mounted on the receiver-drier, typically near the TriPac condenser. On models manufactured during 9/06 and after, a Low Pressure Cutout Switch (LPCO) is installed at the evaporator coil.

If the pressure falls below the switch's opening pressure, the switch opens the circuit to stop the compressor. When the pressure rises above the switch's closing pressure, the switch closes to allow compressor operation.

Unit Description

Engine Reset Switch

The engine is protected by a reset switch. When the reset switch opens the engine will shut down and an “Eng” Alarm Code will be displayed on the HMI. Typical causes for an open engine reset switch are low oil pressure, high water temperature or an engine start failure. The engine reset switch is located on the side of the Interface Board control box enclosure.

On units with Interface Board Revision 1.5 and earlier, the button on the engine reset switch pops out when the switch opens. You can also feel it click and stay in when you push it to reset it.

On units with Interface Board Revision 1.6, the reset switch button does not pop out when the reset circuit opens. Also, you will not feel a click when you push the button to reset the circuit.



Figure 10: Engine Reset Switch

Closed Loop Cooling Option

The CLC option is designed for warm climate operation and also to isolate the TriPac system from the tractor engine coolant if desired. The TriPac will run independently of the tractor engine coolant while providing battery charging and cab comfort options.



1.	Coolant Tank
2.	Coolant Tank Sight Glass

Figure 11: Closed Loop Cooling Option

Unit Description

Fuses

Fuse Number	Amp Rating	Component Protected / Circuit
F1	30	Starter / 8S
F2	30	Glowplugs / H
F3	5	HMI Controller / —
F4	20	Cab Heater / RED
F5	5	Standby Switch / 2A
F6	1	Standby Integration / IGN
F7	40	Fuel Solenoid / 8DP
F8	7.5	Engine Switch / 8FET
F9	5	Engine Start Signal / 7X/7A

Unit Description

Fuse Number	Amp Rating	Component Protected / Circuit
Fuse Number	Amp Rating	Component Protected / Circuit
F10	15	Pre-cooler Fan / PCF
F11	20	Condenser Fan / 7CF
F12	20	Evaporator Fan / PWM1/PWM2/7D
F13	7.5	Compressor Clutch / 7CL
F14	5	Heater On / 26/YLW
F15	3	Voltage Sense / SEN
F16	50	Main Power / 2
F17	2	Ground / CH
F18	3	Hourmeter (Option) / 2
F19	3	Hourmeter (Option) / 8D
F20	3	Hourmeter (Option) / 26
F21	100	Supplemental Heater Contactor (Extreme Arctic Option) / SHR

Unit Description

Fuse Number	Amp Rating	Component Protected / Circuit
F22	70	Supplemental Heater (Extreme Arctic Option) / SH
F23	30	Oil Pan Heater (Extreme Arctic Option) / OPH



CAUTION: 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.

Manual Pretrip Inspection (Before Starting the TriPac 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.*

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: Make sure 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 make sure 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: Make sure the condenser, evaporator and pre-cooler coils are clean and free of debris.

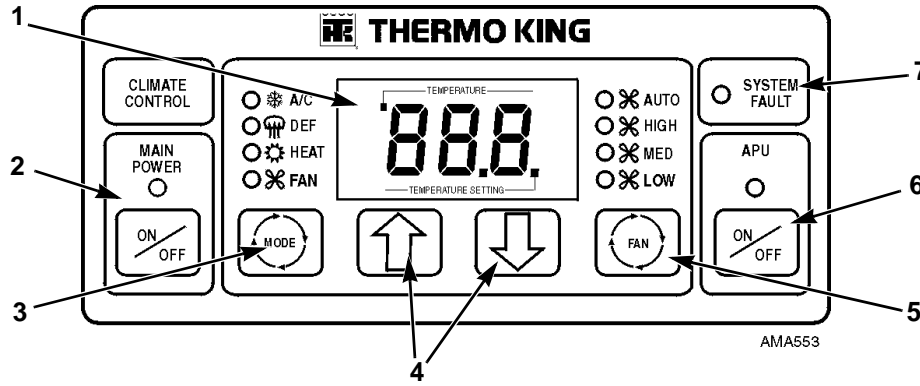
Heater: Check exhaust pipe and intake tube.

General: Listen for unusual noises and vibrations.

Manual Pretrip Inspection (Before Starting the TriPac Unit)

TriPac HMI Controller Description and Operation

The TriPac is operated using an HMI (Human Machine Interface) Controller which is typically mounted on a wall in the truck cab sleeper compartment. The HMI Controller includes a display screen, operation keys and indicator LEDs.

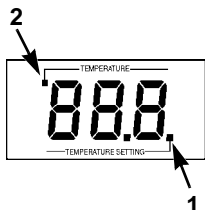


1.	HMI Controller Display
2.	HMI Controller Main Power Key and LED
3.	Mode Key
4.	Up and Down Arrow Keys
5.	Fan Speed Selector Key
6.	APU On/Off Key and LED
7.	System Fault LED

Figure 12: HMI Controller

TriPac HMI Controller Description

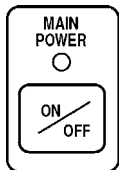
HMI Controller Display



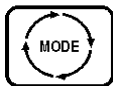
1.	Cab Setpoint Temp LED
2.	Inside/Outside Temp LED

The HMI Controller Display is used to indicate temperature setpoint, alarm codes, hourmeter reading, and other information. The LED indicator at lower right will be illuminated when the sleeper cab temperature setpoint is displayed. The LED indicator at upper left will be illuminated when the inside or outside temperature is displayed..

Main Power Key



The HMI Controller Main Power Key is used to turn the TriPac system on and off from the sleeper compartment. The green LED indicator is illuminated when the TriPac system is turned on..



Mode Key

The HMI Controller Mode Key is used to select the desired operating mode. When the TriPac system is turned on the mode will default to the setting last used. A/C (air conditioning), Fan and Heat modes are selected by pressing the Mode key. (“DEF” is not used.) A Monitor (Null) mode will occur when no LEDs are illuminated. This allows the unit to monitor the battery voltage, and optionally the coolant temperature, without monitoring the truck cab temperature.



Up and Down Arrow Keys

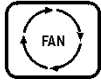
The HMI Controller Up and Down Keys are used to raise and lower the temperature setpoint in the display. Each press of the Up or Down key will raise or lower the setpoint temperature by one degree. The display will scroll up or down if the Up or

TriPac HMI Controller Description and Operation

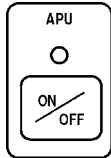
- ✂ AUTO
- ✂ HIGH
- ✂ MED
- ✂ LOW

Down key is pressed continuously. The HMI Controller setpoint temperature range is 50 to 90 degrees.

Fan Speed Key



The HMI Controller Fan Speed Key is used to select the desired evaporator fan speed. When the TriPac APU system is turned on, the fan speed will default to the setting last used. High, Medium and Low fan speeds are selected with the Fan Key. Auto fan is currently not available.



APU System Key

The HMI Controller APU System Key is used to enable the APU diesel power unit. The APU must be ON to provide sleeper compartment air conditioning, air circulation, truck battery voltage sensing and engine coolant temperature sensing. This key also allows access to the diesel engine hourmeter reading. The APU does not have to be On to operate the TriPac sleeper compartment heater.



System Fault Indicator

This red indicator illuminates when an alarm condition occurs and an alarm code is displayed.

Operating Modes

Air Conditioning Mode

If the HMI controller senses that the truck cab sleeper compartment temperature is 5 F above setpoint, the APU engine will start (if not already running) and the compressor clutch will engage. The A/C system will operate for at least 15 minutes after the temperature in the sleeper compartment reaches setpoint. This is to ensure that the truck battery is sufficiently charged. The APU engine will shut down if the sleeper compartment temperature setpoint and truck battery voltage have been attained (and, when the optional Arctic Package is installed, if the coolant temperature has been attained).

Heat Mode

The air heater controls the sleeper cab temperature to the setpoint entered in the HMI. If the APU is enabled, the evaporator fans can be on to circulate more air, and battery voltage sensing is enabled..

Fan Mode

The fans can be turned on for air circulation in the truck cab. Fan speed is selected and battery voltage sensing is enabled. The APU must be enabled..

Monitor (Null) Mode

The Monitor (Null) mode occurs when the HMI controller is on, the APU system is enabled and no Mode or Fan LEDs are illuminated (fans are off). Battery voltage sensing is enabled. If the optional Arctic Package is installed, coolant temperature sensing is enabled. Truck cab temperature sensing is not enabled.

Engine On/Off Switch



DANGER: Always turn the TriPac Main Power On/Off Key on the HMI Controller OFF while refueling the truck. Fuel vapors could ignite if they come in contact with TriPac electrical or heater components.

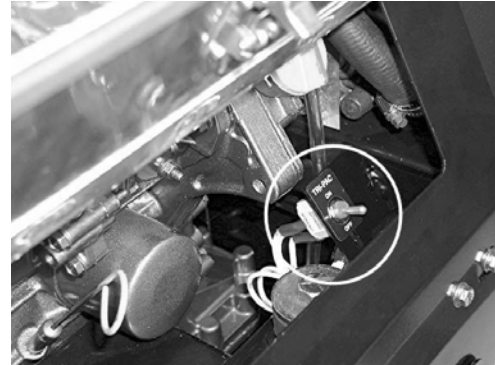


WARNING: The unit may start automatically without warning if the Engine On/Off Switch is in the On position.



WARNING: 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 right side of the frame. This switch must be in the On position for the TriPac engine to operate.



AMA695

Figure 13: Engine On/Off Switch

TriPac HMI Controller Operation

Press HMI Controller Main Power Key

1. Press the Main Power Key. The green LED indicator will be illuminated when the HMI Controller is turned on.

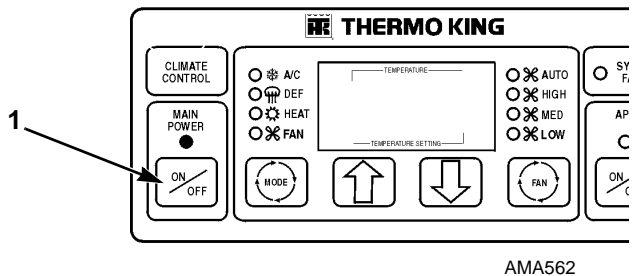


Figure 14: HMI Controller Main Power Key

Enable APU System

2. The Engine On/Off Switch (inside the TriPac APU) must be on for the engine to run. Press the HMI Controller APU Key to enable the diesel power unit and also enable sleeper compartment air conditioning, air circulation, truck battery voltage sensing and engine coolant temperature sensing. The APU Key LED will be illuminated while the APU is enabled. When the APU Key is initially pressed, the TriPac unit engine hourmeter reading will be displayed. (See next step.)

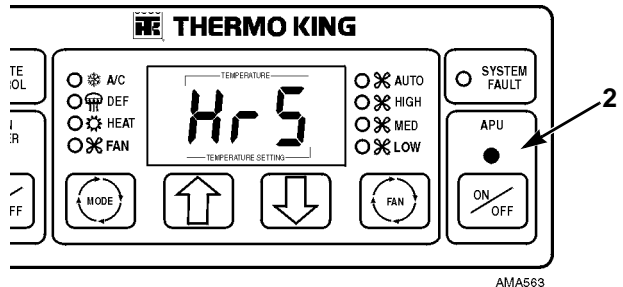


Figure 15: APU Key

Engine Hourmeter Display

- When the APU Key is initially pressed, the TriPac unit engine hourmeter reading will be displayed. The display will flash three screens, starting with “HrS” and followed by “tXX” for thousands of hours and then “XXX” for hundreds of hours. Example for 1,230 hours:

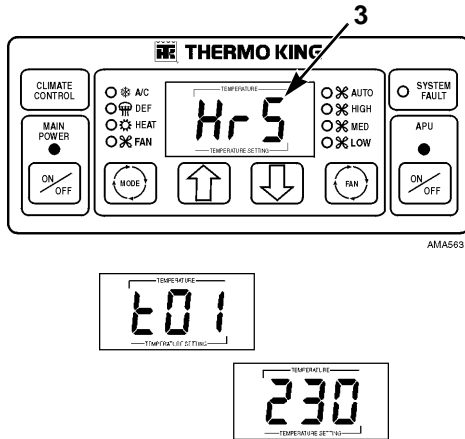


Figure 16: Engine Hour Meter Display

Select Mode of Operation

- Press the HMI Mode Key to select the desired operating mode. Select Air Conditioning, Heat or air circulation Fan operation. (“DEF” is not used.) When the TriPac is first started, the controller will default to the previous setting. Press the Mode Key repeatedly to scroll through the selections. The operating mode selected will be indicated by an illuminated LED. A Monitor (Null) mode will occur when no LEDs are illuminated. If heat is required, the TriPac heater may operate while the TriPac APU engine is off and the HMI Fan Speed Key is off (no LED illuminated).

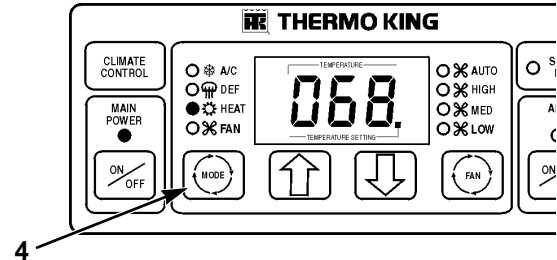


Figure 17: Mode Key

Select Fan Speed

5. Press the HMI Fan Speed Key to select the desired fan speed. Select High, Medium or Low speed. When the TriPac is first started, the HMI Controller will default to the previous setting. The fan speed selected will be indicated by an illuminated LED. (Auto fan speed is not currently used.)

The TriPac heater will operate while the Fans are off (no fan LED is illuminated – fan is in “Null”). If additional air circulation in the truck cab sleeper compartment is desired, the fans may be turned on by enabling the APU.

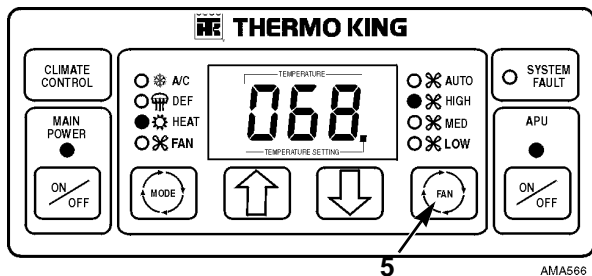


Figure 18: Fan Speed Key

Select Temperature Setpoint

6. Press the HMI Up or Down Keys to raise or lower the temperature setpoint. Each time an Up or Down Key is pressed, the display will increment up or down by one degree. If a key is pressed continuously, the display will scroll up or down. The setpoint will be changed to the value shown in the display. The HMI setpoint temperature minimum is 50 degrees and the maximum is 90 degrees.
7. The lower right LED in the HMI Display indicates that the sleeper compartment temperature setpoint is displayed..

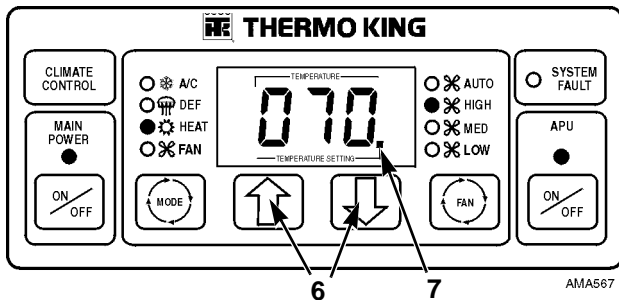


Figure 19: Up and Down Keys

TriPac HMI Controller Description and Operation

NOTE: When the temperature in the sleeper compartment has reached the heating or cooling setpoint, the TriPac may shut down. This is normal operation. No alarm codes will be displayed.

If other conditions also exist, such as low battery voltage or low coolant temperature, the TriPac will continue to run. When all conditions are satisfied (sleeper compartment heating or cooling temperature setpoint reached, minimum battery voltage is present and minimum coolant temperature is present [with the Arctic option]) the TriPac will shut down. The TriPac will restart if the TriPac system is on and any of these conditions require a restart. (The truck's ignition switch must be in the Off or Accessory position.) No alarm codes will be displayed during these normal operations.

System Fault Indicator

- The HMI System Fault red indicator glows any time an alarm condition occurs and an alarm code is displayed.

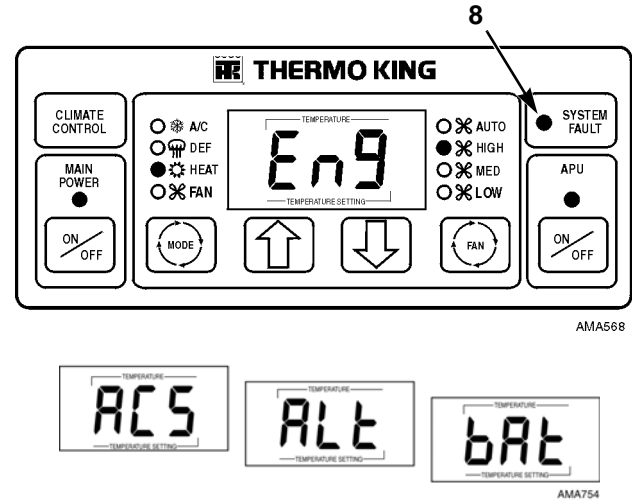


Figure 20: System Fault Indicator

Alarm Codes

TriPac HMI Controller alarm codes are:

- **Eng:** This code indicates that the that the “8” circuit has a failure. This can be caused by an open engine reset switch or the engine compartment On/Off Switch is in the Off position. Typical causes for an open engine reset switch are low oil pressure, high water temperature or a start failure.

NOTE: If the unit is equipped with the optional DPF an [Eng] code can be generated by the Regeneration switch being placed in the "Off" position or a DPF shutdown code. Verify the DPF Regeneration switch is in the "On" position and check to see if there are any DPF alarm codes.

- **AcS:** This code indicates that an abnormal air conditioning system condition has occurred. Typical causes are high discharge pressure or low system pressure.
- **ALt:** This code indicates that a charging system failure has occurred. This code will occur if there is no alternator output after 2 minutes of operation.
- **bAT:** This code indicates that the battery voltage is low.

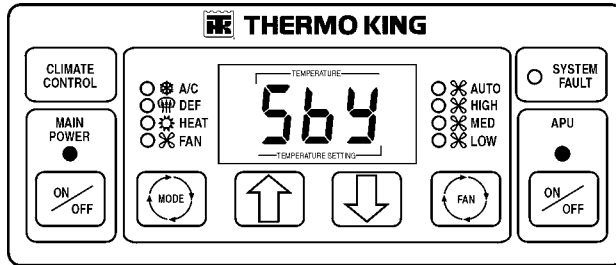
To Clear Alarm Codes

Record the alarm code shown in the display. To clear an alarm code, use the HMI Main Power Key to turn off the TriPac system. Then resolve the condition that caused the alarm.

Check the engine reset switch. If the alarm tripped the switch, the switch must be reset to allow the TriPac engine to be restarted. The engine reset switch is located on the side of the Interface Board control box enclosure.

Optional Standby Operation

The optional TriPac HMI Controller Standby Mode allows the system to be controlled by an external source which is typically the truck's ignition system. This is used to disable the TriPac system when the truck's engine is running. The display will show "Sby" when the controller is in this mode. *During Standby mode the controller is temporarily disabled and none of the TriPac systems will operate.* Voltage sensing and the optional coolant temperature sensing functions are also disabled while in this mode.



AMA570

Figure 21: Standby Operation

Options Used With Standby Operation

Standby Truck Integration

When the truck's ignition switch is in the Off or Accessory position, the TriPac APU will operate normally if the APU Engine On/Off switch and the TriPac HMI Controller Main Power Key are On. If the truck's ignition switch is in the On position, the TriPac HMI Controller will be forced to Standby Mode.

Truck Integration Selector Switch

When the dash mounted Truck Integration Selector Switch is in the Normal position, the TriPac APU will operate the same as with Standby Truck Integration above.

However, if the dash mounted Selector Switch is in the Standby position, the APU will be forced to Standby mode.



TriPac HMI Controller Description and Operation

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.

A 12 volt dc to 120 volt ac 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 to power onboard 120 volt ac devices. If the TriPac is enabled and the inverter

Optional Power 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.

Specifications

Engine Specifications

Engine

TK 270 (Tier 2)

Fuel Type

No. 2 Diesel fuel under normal conditions

Caution: 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.

No. 1 Diesel fuel is acceptable cold weather fuel

Oil Capacity: Crankcase & Oil Filter

4.5 quarts (4.3 liters), Fill to full mark on dipstick.
Fill the crankcase slowly so oil will not run into the breather hose, thus filling up an open cylinder. Leaving the dipstick out while adding engine oil will vent the crankcase.

Specifications

Oil Type*	API Type CI-4 or better multigrade oil API Synthetic Type CI-4 or better after first 1000 hours (optional) API Type CJ-4 or better multigrade oil is required for units equipped with the optional DPF (Diesel Particulate Filter)
Oil Viscosity	Multigrade Oil Ambient Temperature 5 to 104 F (-15 to 40 C): SAE 15W-40 -4 to 86 F (-20 to 30 C): SAE 10W-30
Engine rpm: No Load Operation, compressor clutch disengaged	1850 rpm
Under Load Operation, compressor clutch engaged	1800 rpm
Engine Oil Pressure	50 psig (345 kPa) at rated output. 18 psig (128 kPa) at low idle.

Specifications

Coolant System Capacity (TriPac engine only)

0.6 quarts (0.6 liters)

2.75 quarts (2.6 liters) with Closed Loop Cooling

Engine Coolant Type: Conventional

Conventional coolant (antifreeze) is green or blue-green. Units equipped with conventional coolant *do not* have an ELC nameplate on the expansion tank.

Make sure you know what type of coolant is in your unit. Do not mix conventional coolant and ELC.

ELC (Extended Life Coolant)

ELC is red. Units equipped with ELC have an ELC nameplate on the expansion tank (see “Safety Decals and Locations”).

Use a 50/50 concentration of any of the following equivalents:

Texaco ELC (16445, 16447)

Havoline Dex-Cool® (7994, 7995, 7997, 7998)

Havoline XLC for Europe (30379, 33013)

Shell Dexcool® (94040)

Shell Rotella (94041)

Saturn/General Motors Dex-Cool®

Caterpillar ELC

Detroit Diesel POWERCOOL® Plus

Engine Thermostat

180 F (82 C)

Specifications

Radiator Cap Pressure, Closed Loop Cooling

10 psig (69 kPa)

Drive

Belts to compressor, 12 V alternator, water pump

Compressor

Compressor

TM-15-XD

Compressor Oil Charge

8 oz. (236.5 ml)*

Compressor Oil Type (R134a
Refrigerant Used)

Oil Viscosity
100

Polyalkylene glycol (PAG 100) TK P/N 203-502

R-134a Refrigeration System

Refrigerant Charge

1.2 lbs. (0.54 Kg) minimum, 2.0 lbs (0.9 Kg)
maximum.

Correct system charge varies, depending upon
installation and refrigeration line lengths.

Specifications

Fuses

	Component Protected / Circuit	Voltage	Amp
F1	Starter/8S	12	30
F2	Glowplugs/H	12	30
F3	HMI Controller / —	12	5
F4	Cab Heater/RED	12	20
F5	Standby Switch/2A	12	5
F6	Standby Integration/IGN	12	1
F7	Fuel Solenoid/8DP	12	40
F8	Engine Switch/8FET	12	7.5
F9	Engine Start Signal/7X/7A	12	5
F10	Pre-cooler Fan/PCF	12	15
F11	Condenser Fan/7CF	12	20
F12	Evaporator Fan / PWM1/PWM2/7D	12	20
F13	Compressor Clutch / 7CL	12	7.5

Specifications

F14	Heater On / 26/YLW	12	5
F15	Voltage Sense / SEN	12	3
F16	Main Power / 2	12	50
F17	Ground / CH	12	2
F18	Hourmeter (Option) / 2	12	3
F19	Hourmeter (Option) / 8D	12	3
F20	Hourmeter (Option) / 26	12	3
F21	Supplemental Heater Contactor (Extreme Arctic Option) / SHR	12	100
F22	Supplemental Heater (Extreme Arctic Option) / SH	12	70
F23	Oil Pan Heater (Extreme Arctic Option) / OPH	12	30
FL1 (Prior To 9/06)	Fusable Link, 20 Gauge, Voltage Sensing Wire		

Specifications

FL2 Fusible Link, 12 Gauge, APU Main
(Prior To Power
9/06)

Belt Tension

Field Reset

Engine/Compressor/Alternator Belt

The belt tension should be set at 95 lbs force. A deflection of 1/4" between the alternator and compressor (longest free span of belt) may be used if a guage is not available to test tension.

Specifications

Truck Sleeper Compartment Heater (D2)

Heat Output ($\pm 10\%$)	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)
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

Specifications

Motor Speed

800 ± 140 RPM - Boost

4000 ± 120 RPM - High

2800 ± 80 RPM - Medium

2000 ± 60 RPM - Low

600 ± 20 RPM - Adjustment in circulation mode with temperature sensor, internal.

0 RPM - Adjustment in fresh air mode with temperature sensor, external.

4800 ± 140 RPM - Ventilation

Specifications

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.)
Air Flow ($\pm 10\%$)	85 cfm Boost 69 cfm High 50 cfm Medium 30 cfm Low

Specifications

Motor Speed

4400 ± 130 RPM - Boost

3600 ± 100 RPM - High

2800 ± 80 RPM - Medium

1600 ± 50 RPM - Low

600 ± 20 RPM - Adjustment in circulation mode with temperature sensor, internal.

0 RPM - Adjustment in fresh air mode with temperature sensor, external.

3600 ± 100 RPM - Ventilation

Specifications

Optional Power Inverter

1800 Watts; see manufacturer's specifications

Optional Extreme Arctic Package Components

	Approximate Current Draw (Amps) at 12.5 Vdc	Approximate Resistance— (Ohms)
Coolant Heater (800 Watts)	50	0.25
Oil Pan Heater (300 Watts)	19	0.65
Supplemental Heater Contactor Coil		13.5

NOTE: Disconnect components from unit circuit to check resistance.

Maintenance Inspection Schedule

Pre-Trip	500 Hrs	Annual 2,000 Hrs	Inspect/Service These Items
			ENGINE
<ul style="list-style-type: none"> • • • • 	<ul style="list-style-type: none"> • • • • • • • • 	<ul style="list-style-type: none"> • • • • • • • • • • • 	<ul style="list-style-type: none"> Check engine oil level. If equipped with Closed Loop Cooling option: Check coolant level; coolant should be visible in coolant tank sight glass. 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. Change as required or annually. Change fuel filter. Thermo King brand fuel filter is required. Drain water from fuel tank and check vent. Check and adjust engine speed. Check condition of engine mounts.

Maintenance Inspection Schedule

Pre-Trip	500 Hrs	Annual 2,000 Hrs	Inspect/Service These Items
		<ul style="list-style-type: none"> • • - - - 	Maintain year-round anti-freeze protection at -30° F (-34° C). Change coolant every two years, or with truck coolant. For units with optional Closed Loop Cooling system and ELC (red) engine coolant, change ELC coolant every 5 years or 12,000 hours. Adjust engine valves. Test fuel injection nozzles at least every 3,000 hours. (Based on EPA 40 CFR Part 89.)
			ENGINE OIL CHANGE INTERVALS (Change oil and filters hot)
	<ul style="list-style-type: none"> • 	1,000 Hour Intervals 500 Hour Intervals	<p>1,000 Hour Interval - Oil change interval is every 1,000 hours of operation <u>only when using a Thermo King brand oil filter and CI-4 or better oil</u>. Units with optional DPF require CJ-4 or better oil.</p> <p>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 CJ-4 or better oil.</p> <p>IMPORTANT: Fill the crankcase slowly so oil will not run into the breather, thus filling up a cylinder with an open valve. Leaving the dipstick out while adding oil will ventilate the crankcase.</p>

Maintenance Inspection Schedule

Pre-Trip	500 Hrs	Annual 2,000 Hrs	Inspect/Service These Items
			ELECTRICAL
	<ul style="list-style-type: none"> • • • • • • 	<ul style="list-style-type: none"> • • • • • • 	<p>Check operation of protection shutdown circuits.</p> <p>Check alternator voltage.</p> <p>Check alternator bearings. See Note 1</p> <p>Inspect battery terminals.</p> <p>Inspect electrical connections.</p> <p>Inspect wire harness for rubbing or damage.</p> <p>Check electric condenser, evaporator and pre-cooler fans.</p> <p>Note 1 - With belt removed spin alternator by hand. Listen for noise and ensure that bearings roll freely.</p>

Maintenance Inspection Schedule

Pre-Trip	500 Hrs	Annual 2,000 Hrs	Inspect/Service These Items
			STRUCTURAL
<ul style="list-style-type: none"> • • 	<ul style="list-style-type: none"> • • • • 	<ul style="list-style-type: none"> • • • • • • • 	<p>Visually inspect unit for fluid leaks (coolant, oil, refrigerant).</p> <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 it.</p> <p>Inspect evaporator drain valves (kazoos) to ensure that they are in place, in good condition and are sealing.</p> <p>Steam clean condenser coil, APU pre-cooler coil. Do not bend over coil fins.</p> <p>Blow out evaporator coil and evaporator water drains with air. Do not bend over coil fins.</p> <p>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.</p>

Maintenance Inspection Schedule

Pre-Trip	500 Hrs	Annual 2,000 Hrs	Inspect/Service These Items
			A/C SYSTEM
	•	•	Check refrigerant level.
	•	•	Check refrigerant lines for rubbing or damage.
			HEATER
•	•	•	Start and run for at least 20 minutes each month.
•	•	•	Inspect combustion air intake tube and exhaust pipe for restrictions or blockage.
•	•	•	Inspect the ducting, the air intake screen and air outlet for restrictions or blockage.
		•	Remove the glow pin and inspect for carbon build up. Clean.
		•	Remove the glow pin screen and inspect for carbon build up. Replace.
		•	Change fuel pump screen.

Maintenance Inspection Schedule

TriPac Warranty

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

TriPac Warranty

Serial Number Locations

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

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

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

Serial Number Locations

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.

TriPac Glossary

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.

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

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

kPa: Kilopascals. A metric unit of pressure. $1 \text{ kPa} = 0.01 \text{ bar} = 0.145 \text{ psi}$.

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

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

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

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

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

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

psi: Pounds per square inch. A unit of pressure.
 $1 \text{ psi} = 0.069 \text{ bar} = 6.89 \text{ kPa}$.

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.

rpm: Revolutions per minute.

TriPac Glossary

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.

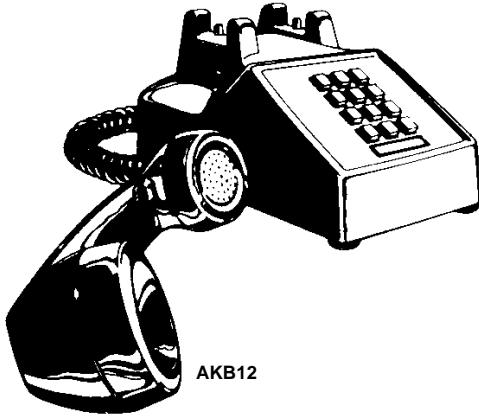
Vac (volts alternating current): An electric current that reverses direction at regularly recurring intervals.

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

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.

CALIFORNIA Proposition 65 Warning

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



Ingersoll Rand's Climate Solutions sector delivers energy-efficient HVACR solutions for customers globally. Its world class brands include Hussmann, a manufacturer of refrigeration and food merchandising solutions, Thermo King, the leader in transport temperature control and Trane, a provider of energy efficient heating, ventilating and air conditioning systems, building and contracting services, parts support and advanced controls for commercial buildings and homes.