



SV/KV/RV/TZ-S UNITS OPERATION MANUAL

SV/KV/RV/TZ-S 系列机组 操作手册



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. If you have questions or require further information, please contact your local Thermo King dealer. The procedures described herein should be undertaken only by 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.

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.

Contents

Safety Precautions	4
Safety Decals	7
Control System	8
Daily Inspections	16
Maintenance Inspection Schedule	20
Troubleshooting	21
Load Temperature Table.....	22
Serial Nameplate Location	23
Warranty	24
Recover Refrigerant.....	25

Safety Precautions

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



WARNING: Always wear goggles or safety glasses when working with or around the refrigeration system. 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.

Safety Precautions

Electrical Hazard



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

Refrigerant 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-Refrigerant

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

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

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

First Aid-Refrigerant Oil

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

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

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

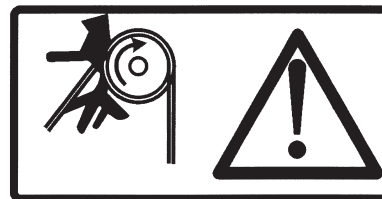
Ingestion: Do not induce vomiting. Immediately contact local poison control center or physician.

Safety Decals



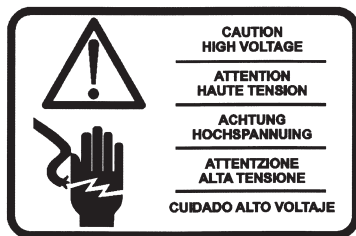
AMA 145

Fig 1: Fan Warning



AMA 146

Fig. 3 Belt Warning

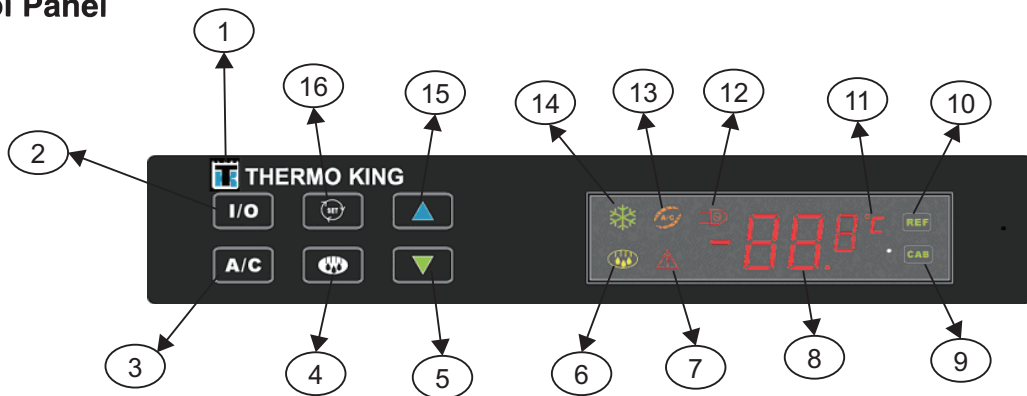


AMA 147

Fig.2: Caution: High Voltage

Control System

I. Control Panel



- | | |
|--|--|
| 1. Thermo King logo | 10. Ref temp setup indicator and operation indicator |
| 2. Power on/off switch for refrigeration operation | 11. Celsius degree indication |
| 3. Electric power switch for air conditioning operation | 12. Standby power input indicator |
| 4. Manual defrost switch | 13. Air-cond operation indicator |
| 5. Down arrow key | 14. Ref operation indicator |
| 6. Defrost indicator | 15. Up arrow key |
| 7. Malfunction indicator | 16. Temp setup key |
| 8. Temperature display zone | |
| 9. Air conditioner temperature setup indicator and operation indicator | |

Control System

II. Unit ON/OFF

1. Power ON/OFF Switch For Refrigeration Operation

a. Initialization display

All illuminated → setpoint → defrost mode → defrost interval → standard display

b. Standard display:

(10) and (14) is lit on. (8) display return air temperature of refrigeration compartment

2. Electric Power Switch For Air Conditioning Operation



a. Initialization display

All illuminated → setpoint → standard display

b. Standard display:

(9) and (13) is lit on. (8) display return air temperature of air conditioner

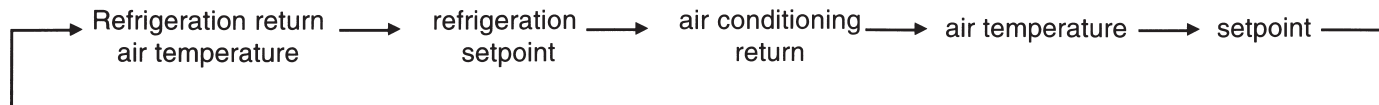
c. Other description:

- Only for the unit equipped with air conditioning system
- Display refrigeration mode when both refrigeration and air conditioning system are initiated.
- Set "A/C Enable" to be 1 when A/C is available.
- Set "Heat Enable" to be 1 when Heating is available.
- The orange wire of the controller (or 'ACI ') should be low electric level (0V).

Control System

III. Setpoint Temperature

During Unit is operating, press  Key to display the following cycles:



Press  key to change the setpoints for refrigeration and air conditioning

Increase the setpoint with  key.

Decrease the setpoint with  key.

Save the setpoint by press the  key again.

Control System

IV. Defrost

There are two ways to defrost. It is selectable through d4 in maintenance mode.

d4=0 off- cycle Unit off for defrost

d4=1 hot-gas Hot gas defrost

Initiate defrost

Defrost can be initiated automatically by defrosting timer, or by pressing down the defrost switch manually. Before initiation, the temperature of defrosting sensor should not be more than d20 in maintenance mode (d20 default value : 0 ° C, It has two options- 0 ° C or 7 ° C)

Defrost termination

Defrost termination is selectable through d7 in maintenance mode:

d7=0 defrost timeout, or temperature of defrosting sensor increased.

D7=1 defrost timeout.

Note:

Defrost interval is selectable through d5 in maintenance mode. Its unit is hour.

Defrost time limit is selectable through d6 in maintenance mode. Its unit is minute.

If d1=-30, d4=0 can not be selected.

Scope : 1E46674G04/G05 can set parameter d20

Control System

V. Error Code

If there is any error, Δ symbol will illuminate. If there is not any error, display[---].

Error code	Description	Remarks
E1	REF EVA Inlet Air Temperature Sensor Open	
E2	REF EVA Inlet Air Temperature Sensor Short	
E3	REF EEf Temperature Sensor Open	
E4	REF EEf Temperature Sensor Short	
E51	A/C EVA Inlet Air Temperature Sensor Open	For units w/o A/C, set "A/C Enable" to be to cancel this warning
E52	A/C EVA Inlet Air Temperature Sensor Short	For units w/o A/C, set "A/C Enable" to be to cancel this warning
E99	EEP-ROM writing error	
F1	Fuse 1 Open	
F2	Fuse 2 Open	
F3	Fuse 3 Open	
F4	Fuse 4 Open	
F5	Fuse 5 Open	

Error code	Description	Remarks
E97	Heat Relay Can't Reset Automatically	Heat Relay Can't Function Properly
E98	Standby Motor Overload	Standby Motor Can't Function Properly
E80	Artificially ON/OFF frequent failure	
E81	AC Power input failure	
E82	AC Power input frequent failure	
E83	Compressor overload or box over temperature failure	
E84	Compressor overload or box over temperature frequent failure	
E85	High or low pressure failure	
E86	High or low pressure frequent failure	
E87	Undefined d15 failure	
E91	High/Low Pressure Switch Shutdown	
E92	High/Low Pressure Switch on and off frequently	

Control System

Fuse Setup

SV-400 unit (Amp)

	F1	F2	F3	F4	F5	F7
12V	25	25	40	10	3	30
24V	15	15	30	7.5	2	20

SV-600 unit (Amp)

	F1	F2	F3	F4	F5	F7
12V	25	25	40	10	3	25
24V	15	15	30	7.5	2	15

SV-800 unit (Amp)

	F1	F2	F3	F4
24V	25	25	40	15

RV-200 unit (Amp)

	F1	F2	F3
12V	25	15	40
24V	15	15	30

KV-200 unit (Amp)

	F1	F2	F3	F4	F5
12V	20	20	40	20	20
24V	10	10	30	15	10

KV-200 II, KV-300 II unit (Amp)

	F1	F2	F3	F4	F5
12V	20	20	15	15	15
24V	10	10	10	10	10

KV-500 unit (Amp)

	F1	F2	F3	F4	F5
12V	20	25	15	15	15
24V	10	20	10	10	10

SV-400 Max20 (Ac Comp) unit (Amp)

	F1	F2	F3	F4	F5
12V	25	25	40	10	3
24V	15	15	20	7.5	2

Control System

SV-600 Max20 (Ac Comp)unit (Amp)

	F1	F2	F3	F4	F5
12V	25	20	40	10	3
24V	20	10	20	7.5	2

SV-700 unit (Amp)

	F1	F2	F3	F4
24V	10	25	40	15

SV-1000 unit (Amp)

	F1	F2	F3	F4
24V	25	25	40	15

RV-300 unit (Amp)

	F1	F2	F3	F4	F5
12V	30		40	10	3
24V	20		30	7.5	2

RV-380 unit (Amp)

	F1	F2	F3	F4	F5	F7
12V	15	15	40	10	3	30
24V	10	10	30	7.5	2	30

R380 ROOF UNIT (Amp)

	F1	F2	F3	F4	F5	F6	F7
12V	15	15	25	10	10	3	60
24V	10	10	15	7.5	15	2	60

RV-580 unit (Amp)

	F1	F2	F3	F4	F5	F7
12V	15	15	40	10	3	15
24V	10	10	30	7.5	2	10

TZ-500S unit (Amp)

	F1	F2	F3	F4	F5
12V	20	20	40	10	3
24V	15	15	20	7.5	2

TZ-600S unit (Amp)

	F1	F2	F3	F4	F5
12V	40	20	40	10	3
24V	30	15	20	7.5	2

Notes : RV380 MAX10/30;RV580 & RV580 PLUS MAX10/30 use controller 1E46674G05

Control System

SV980S UNIT (Amp)

	F1	F2	F3	F4	F5
24V	25	25	40	30	15

SV1080S UNIT (Amp)

	F1	F2	F3	F4	F5
24V	25	25	40	30	15

RV1200S UNIT (Amp)

	F1	F2	F3	F4	F5
24V	25	25	40	30	15

RV-580 PLUS机组 (单位Amp)

	F1	F2	F3	F4	F5	F7
12V	15	15	25	10	3	25
24V	10	10	30	7.5	2	30

VII. Maintenance Mode

Only authorized personnel can enter into maintenance mode and change parameters. Improper parameter settings will reduce unit performance. If you need to look for or change the controlling parameters of the unit, please contact your local Thermo King agent.

VIII. Standby Electric Mode

Standby Electric Mode refers to the situation that outside AC power provides driving power when the driving power of the vehicle stops, including standby electric controller, standby compressor and pipelines. The standby controller provides low voltage power supply and control the operation of standby electric compressor. For more details, please refer to Thermo King Maintenance Manual.

Standby Electric Control System for AC Compressor

Standby Electric with AC Compressor

Use new code controller 2E94034G01. After insert AC power and then turn on the controller, if no alarm  will blink for 2 minutes and then unit will work

CAUTION:

Please disconnect AC Power if you don't use for a long time.

Daily Inspection

Pre-trip Inspection (before starting Unit)

Pre-trip inspections are an important part of regularly scheduled preventive maintenance programs designed to minimize operating problems and breakdowns before they happen. You should perform the following suggested pre-trip inspection before every trip involving refrigerated cargo.

Note: Pre-trips are not intended to take the place of regular maintenance inspections.

Belts: The belts must be in good condition and adjusted to the proper tension.

Electrical: Check all electrical connections to make certain they are securely fastened. The wires and connections must be free of rust and breaks without moisture.

Structural: Visually inspect the unit for leaks, misses, or broken parts and other damage. Check if the bulkhead is tightly sealed. The bulkhead must be firmly mounted closely against the roof, compartment walls and floor so

as to reduce heat transferring between compartments. Check the floor channel for block of returning air or damage and ensure that retuning air not be obstructed.

Coils: The condenser and evaporator coils should be clean and free of debris.

Cargo Box: Inspect the interior and exterior of the box for damage. Any damage to the walls or insulation must be repaired.

Defrost Drain: Check the defrost drain hoses and fittings to be sure they are open.

Compartment Door: Be sure doors and weather seals are in good condition, the doors latch securely and weather seals fit tightly.

Daily Inspection

Pre-load Inspection

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

Pre-Loading Inspection

1. Products must be pre-cooled before loading. Note any variances on the manifest.
2. Inspect door seals and vent doors for condition and tight seal with no air leakage.
3. Inspect the cargo compartment inside and outside for:
 - Damaged or loose skin and insulation
 - Damaged walls, air ducts, floor channels or “T” flooring

- Clogged defrost drain tubes.
 - Blocked return air bulkhead.
4. Inspect bulkheads for a tight fit at ceiling, walls, and floor. Bulkheads must fit tightly to reduce heat transfer between compartments.
 5. Pre-cool the cargo compartments: adjust the setpoints for both compartments; adjust the setpoints for both compartments and run the unit 30-60 minutes (longer if possible) before loading.
 6. Supervise products loading to ensure sufficient air space is maintained around and through the load in both compartments. Airflow around the cargo must not be restricted.
Note: Loads should be separated from both sides of the bulkhead by at least 4in. (100mm). You can use a pallet as a spacer.
 7. For single temperature loads with or without a bulkhead, run the unit with controllers set to the same temperature.

Daily Inspection

Post-Load Inspection

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

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

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

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



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

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

Daily Inspection

Enroute Inspection

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

Inspection Procedure

1. Verify that the setpoints are correct.
2. Check the return air temperature readings. The temperature readings should be within the desired temperature range. If the readings are not within this range, see the “Inspection Troubleshooting” procedures below.
3. Initiate a manual defrost cycle after each enroute inspection.

Inspection Troubleshooting

1. If a return air temperature reading is not within the desired temperature range, refer to the troubleshooting table on the following pages. Correct the problem as needed.
2. Repeat the Enroute Inspection every 30 minutes until the compartment temperature is within the desired tem-

perature range. Stop the unit if the compartment temperature is not within desired temperature range on two consecutive 30 minute inspections, especially if the compartment temperature appears to be moving away from the setpoint.

3. Immediately contact the nearest Thermo King Service Center or your company office.
4. Take the necessary steps to protect and maintain proper load temperature.



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

Maintenance Inspection Schedule

Weekly	Monthly	Semi-Annual	Annual	Inspect/Service These Items
				Electrical
		• • •	• • • • • •	Check defrost initiation and termination. Check thermostat cycle sequence. Check operation of protection shutdown circuits. Check controller and sensors calibration in 0°C(32°F) ice-water bath. Inspect wire harness for damaged wires or connections. Inspect/replace DC fan motor brushes.
				Refrigeration
		•	• •	Check refrigeration level. Replace dehydrator.
				Structural
• •	• •	• •	• •	Visually inspect unit and refrigerant hoses for fluid leaks. Visually inspect unit for damaged, loose or broken parts.
•	• • •	• • • •	• • • •	Clean defrost drains. Inspect belts for condition and proper tension (belt tension tool P/N 204-427). Clean entire unit including evaporator coil and condenser coil. Check all unit mounting bolts, brackets, lines, hoses, etc.

Troubleshooting

Problem	Cause	Remedy
A return air temperature reading is not within desired temperature range of the setpoint.	The unit has not had time to cool down to correct menu temperature.	Refer to the load log history. Look for above temperature load records, properly pre-cooled cargo compartment, length of time on road, etc. correct as required. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.
	The unit may have a low refrigerant charge.	Check the receiver tank sight glass for refrigerant level. If liquid is not showing in the receiver tank sight glass, the refrigerant charge could be low. A competent refrigeration technician is required to add refrigerant or repair the system. Contact the nearest Thermo King dealer, authorized Service Center, or call the Thermo King Cold Line for referral. Consult the Table of Contents for Cold Line Information.
	The unit is in defrost or has just completed a defrost cycle.	Monitor the return air temperature after the defrost cycle is completed to see if the temperature returns to the desired temperature range of the setpoint.
	The evaporator is plugged with frost	Initiate a manual defrost cycle. The defrost cycle will automatically terminate when complete. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.
	Improper air circulation in the cargo compartment	Inspect the unit and cargo compartment to determine if the evaporator fans are working and properly circulating the air. Poor air circulation may be due to improper loading of the cargo, shifting of the load. Correct as required. Continue monitoring return air temperature until problem is corrected.
	The unit did not start automatically	Warning: the unit could start at any time when turned on. Turn the unit off before opening doors or inspecting any part of the unit. Determine the cause for not starting. Correct as required. Continue monitoring return air temperature until reading is within desired temperature range of the setpoint.

Load Temperature Table

Load Temperature Table

	Dairy products, Ice cream, Frozen fruit, concentrated juices, Frozen fish, Frozen meat, Frozen ham,	Dairy products Processed meats, Fresh meats, Chicken, Eggs, Lard, sausage Smoked bacon, Pickled ham	Dairy products Margarine, Cheese, Milk, cream, Butter	Fresh seafood Fresh fish, oysters, Smoked fish	Fresh fruits Grapes, apples, Cherries, plums, melons, pears, oranges, peaches, pineapples, Lemons, bananas	Fresh vegetables Mushrooms, asparagus, fresh flowers, potatoes, onions, sweet potatoes, pumpkin tomatoes	Confectionery Honey, Chocolates, Candy	Other products Film, medical supplies
20								
15								
10								
5								
0°C								
-5								
-10								
-15								
-20								
Classifi- cation	Frozen	Chilled					Cooled	

Serial Nameplate Location

Evaporator

The serial nameplate is located in side of evaporator frame (near expansion valve side)

Condenser

The serial nameplate is located in side of condenser frame (receiver tank side)

Warranty

Warranty

Should you require warranty service during the warranty period, simply present your copy of the Warranty Certificate at any of the dealer locations shown in the Thermo King Service Directory. They will be happy to help you in accordance with the summary below.

Thermo King Corporation Warranty Summary

Terms of the complete Thermo King Corporation Warranty are available on request. The complete unit is warranted to be free from defects in material and workmanship from the date in service for 12 months in accordance with the terms of such warranty. Please review the specific warranty that applies to your unit to determine whether additional warranty coverage is provided for specific components of your unit. The warranty shall only cover parts and labor.

Note: Thermo King shall have no liability in contract or

in tort (including negligence or strict liability) or otherwise, for any injury or damage caused to vehicles, contents, product cargo or other property or for any special incidental, indirect or consequential damages whatsoever, including, but not limited to loss or interruption of business, lost profits and loss of use.

Note: Replacement of parts or repairs under warranty must be made by an authorized Thermo King dealer.

Recover Refrigerant

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.